NETGEAR®

User Manual

M4300 Intelligent Edge Series Fully Managed Stackable Switches

Software Version 12.0.11 and Earlier Versions

M4300 Series Switches
M4300-96X Modular Switch

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Trademarks

Revision History

Publication Part Number	Publish Date	Comments
202-11998-04	July 2021	We made some minor changes to the maximum allowed PoE power per port (see Configure PoE Ports on page 124).
202-11998-03	May 2020	We added the following sections: • Configure IGMP Snooping Automatically with IGMP Plus Mode on page 237. • Configure IGMP Snooping for VLANs Automatically with IGMP Plus Mode on page 242. • Configure MLD Snooping Automatically with MLD Plus Mode on page 250. • Configure MLD Snooping for VLANs Automatically with MLD Plus Mode on page 254. • Configure the Port Link Flap Settings on page 276. • Add Mroute Static Multicast Entries on page 420. We revised the following sections: • Configure IGMP Snooping Manually on page 238. • Configure IGMP Snooping for VLANs Manually on page 243. • Configure MLD Snooping Manually on page 251. • Configure MLD Snooping for VLANs Manually on page 256. • Configure the Memory Log Settings on page 645.

202-11998-02	December 2019	We added information about the new third-party TPM404H HDMI port card in the following sections: • Third-party TPM404H HDMI Port Card for model M4300-96X on page 20. • Slot and Port Numbering on the Third-Party TPM404H HDMI Port Cards on page 30. • Configure and View Information About Slots and Port Cards on page 47. We changed information about the password that is required to log in to the local browser user interface (UI) in Step 3 of all tasks and provided more information in the following sections: • Local Browser UI Overview on page 23 • Use a Web Browser to Access the Switch and Log In on page 24 • We removed information about the Initial Setup page, which is no longer in the local browser UI. • Using SNMP on page 32. • Configure User Accounts on page 501.
202-11998-01	September 2019	We added and changed the following sections: • We changed Supported Switches on page 18 to add models M4300-16X, M4300-24XF, and M4300-48XF. • We added Manage Precision Time Protocol on page 77. • We changed the IGMP Snooping sections and the MDL Snooping sections (see Manage Multicast on page 234). We published the manual in a new format.
202-11865-03	October 2018	We made the following major changes: • Configure the HTTPS Settings on page 522. • Configure SSH Settings on page 526. • Manage Host Keys on page 528. • Download Host Keys on page 530. • Removed references to SSH-1 Rivest-Shamir-Adelman (RSA) key file throughout the manual.
202-11865-02	June 2018	We made the following major changes: • Revised Slot-Based Port Numbering for model M4300-96X on page 19. • Revised Stacking for model M4300-96X on page 21. • Revised Available Publications and Online Help on page 21. • Revised Slot and Port Numbering for Switch Model M4300-96X on page 27. • Revised Configure and Display the System and Slot Information on page 35. • Revised Configure an SNTP Server on page 70. • Revised Configure Global DNS Settings on page 79. • Added Configure and Display Bonjour Settings on page 94. • Added Configure Expandable Port Settings on page 275. • Revised View Port and EAP Packet Statistics on page 633. We made minor changes and additions to other sections.
202-11865-01	April 2018	First publication.

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Get Started

This user manual is for the M4300 Intelligent Edge Series Fully Managed Stackable Switches and covers all M4300 switch models and modular model M4300-96X.

This chapter provides an overview of how you can using your switch and access the local browser user interface (UI).

The chapter contains the following sections:

Note: For more information about the topics covered in this manual, visit the support website at netgear.com/support.

Note: Firmware updates with new features and bug fixes are made available from time to time at netgear.com/support/download/. Some products can regularly check the site and download new firmware, or you can check for and download new firmware manually. If the features or behavior of your product does not match what is described in this guide, you might need to update your firmware.

Supported Switches

This release and this user manual are for the following M4300 switch models:

- Full 10G models:
  - **M4300-16X (XSM4316PA and XSM4316PB)**. Full 10G switch model with sixteen 10G PoE+ copper ports in a half-width chassis
  - **M4300-8X8F (XSM4316S)**. Full 10G switch model with eight 10G copper ports and eight 10G fiber ports in a half-width chassis
  - **M4300-12X12F (XSM4324S)**. Full 10G switch model with twelve 10G copper ports and twelve 10G fiber ports in a half-width chassis
  - **M4300-24X24F (XSM4348S)**. Full 10G switch model with twenty-four 10G copper ports and twenty four 10G fiber ports in a full-width chassis
- 1G models with 10G uplinks:
  - **M4300-28G (GSM4328S)**. Switch model with twenty-four 1G copper ports, two 10G copper ports, and two 10G fiber ports in a full-width chassis
  - **M4300-28G-POE+ (GSM4328PA and GSM4328PB)**. Switch model with twenty-four 1G PoE+ copper ports, two 10G copper ports, and two 10G fiber ports in a full-width chassis
  - **M4300-52G (GSM4352S)**. Switch model with forty-eight 1G copper ports, two 10G copper ports, and two 10G fiber ports in a full-width chassis
  - **M4300-52G-POE+ (GSM4352PA and GSM4352PB)**. Switch model with forty-eight 1G PoE+ copper ports, two 10G copper ports, and two 10G fiber ports in a full-width chassis
- 10G models with RJ45/SFP+ combo ports:
  - **M4300-24X (XSM4324CS)**. Switch model with twenty copper RJ45 ports and four 10G RJ45/SFP+ combo ports in a half-width chassis
  - **M4300-24XF (XSM4324FS)**. Switch model with twenty-two 10G fiber ports and two 10G RJ45/SFP+ combo ports in a half-width chassis
  - **M4300-48X (XSM4348CS)**. Switch model with forty-four copper RJ45 ports and four 10G RJ45/SFP+ combo ports in a full-width chassis
  - **M4300-48XF (XSM4348FS)**. Switch model with forty-six 10G fiber ports and two 10G RJ45/SFP+ combo ports in a full-width chassis
- 10G modular chassis model:
  - **M4300-96X (XSM4396K0 and XSM4396K1)**. Modular chassis model for up to 12 port cards and slot-based port numbering. For more information, see Features for Switch Model M4300-96X on page 19.

Features for Switch Model M4300-96X

For hardware information about switch model M4300-96X, including information about supported port cards, power supply units (PSUs), and Power over Ethernet (PoE) budgets, see the *Fully Managed Stackable Switch M4300-96X Hardware Installation Guide*.

This section describes the features that this release supports for switch model M4300-96X.

Slot-Based Port Numbering for model M4300-96X

All physical ports on switch model M4300-96X are based on slots. Because this model supports 12 slots and each port card provides eight ports, the port numbering is in the format *unit number/slot number/port number*.

APM408C, APM408P, and APM408F Port Cards for model M4300-96X

For the APM408C, APM408P, and APM408F port cards, the numbering is as follows:

- The unit is the number that is assigned to the switch, either automatically generated and assigned by the system, or manually assigned. The unit range is from 1 to 8.
- The slot is one of 12 slots that this model supports. Therefore, the slot number ranges from 1 to 12.
- Each slot can accommodate one port card, and each port card provides eight ports. Therefore, the port range is from 1 to 8.

For example, the fifth port in the sixth slot of a switch model M4300-96X with a unit number 1 is designated as 1/6/5. Similarly, the very first port on the switch is 1/1/1 and the very last port is 1/12/8.

APM402XL Port Card for model M4300-96X

The numbering of the ports on the APM402XL port card is different from the other port cards. You can use a 40G port either with a break-out cable, in which case the single 40G port can support up to four individual 10G ports, or with a connection to another single 40G port.

- Port 1 (the left 40G port on the port card) uses the following numbering:
  - If connected with a break-out cable to four individual 10G ports, the port numbers are 1, 2, 3, and 4.
  - If connected to another single 40G port, the port number is 1. In that situation, only port number 1 is used and port numbers 2, 3, and 4 are not used on the port card.
- Port 2 (the right 40G port on the port card) uses the following numbering:
  - If connected with a break-out cable to four individual 10G ports, the port numbers are 5, 6, 7, and 8.
  - If connected to another single 40G port, the port number is 5. In that situation, only port number 5 is used and port numbers 6, 7, and 8 are not used on the port card.

For example, if a switch with unit number 1 includes an APM402XL port card in slot 9, port 1 on the port card is connected to four individual port cards, and port 2 on the port card is connected to another single 40G port, the port numbering is as follows: 1/9/1, 1/9/2, 1/9/3, 1/9/4, and 1/9/5.

By default, the 40G ports on the APM402XL port card (that is, port 1 and port 5) are active, which means that they are in the attached state, can be detected, and you can use them. The expandable 10G ports on the APM402XL port card (that is, ports 2–4 on the first 40G port and ports 6–8 on the second 40G port) are nonactive, which means that they are in the detached state and you cannot use them. However, you can configure them to be in the attached state so that you can use them (see Configure Expandable Port Settings on page 275).

Third-party TPM404H HDMI Port Card for model M4300-96X

For the third-party TPM404H HDMI port card, the numbering is as follow:

- The unit is the number that is assigned to the switch, either automatically generated and assigned by the system, or manually assigned. The unit range is from 1 to 8.
- The slot is one of the 6 upper slots that this model supports. Therefore, the slot number ranges from 1 to 6.

  Note: Do not insert a TPM404H port card in any of the lower slots (7 to 12) of the switch.
- Each slot can accommodate one port card, and each port card provides four ports. Therefore, the port range is from 1 to 4.

For example, the third HDMI port in the fifth slot of a switch model M4300-96X with a unit number 1 is designated as 1/5/3. Similarly, the very first HDMI port on the switch is 1/1/1 and the very last HDMI port is 1/6/4.

Slot Configuration for model M4300-96X

By default, the slots of the M4300-96X are configured as *empty* slots, that is, as slots in which no port cards are installed. None of the slots are preconfigured. For information about configuring slots, see Configure and View Information About Slots and Port Cards on page 47.

PoE Operation and Configuration for model M4300-96X

The PoE feature supports port cards in the slots of switch model M4300-96X:

- When you start switch model M4300-96 with APM408P PoE port cards already installed, the switch initializes these port cards for PoE operation. Any existing configurations for the slots is automatically applied. Therefore, PoE is operational immediately after the switch completes its startup process.

- When you install one or more APM408P PoE port cards while switch model M4300-96 is operating, the switch detects these modules, initializes them, and automatically apples any existing configurations for the slots.
- When you remove one or more APM408P PoE port cards while switch model M4300-96 is operating, the switch detects the absence of these port cards and automatically adjusts the configuration.

Power management enhances PoE functionality through the following features:

- Priority-based dynamic power management
- Automatic power rebalancing to meet the PoE power demand if system power is limited
- Automatic detection of insertion and removal of a power supply unit (PSU) and automatic recalculation of the available power

PoE firmware updates occur on a slot basis (that is, for each APM408P port card).

For more information about PoE, see Configure Power over Ethernet on page 122.

Stacking for model M4300-96X

You can configure all ports on switch model M4300-96X as stacking ports. However, a limit of a maximum of 16 active stacking links applies.

The APM402XL port card supports stacking over 40G ports only (that is, over port 1 and port 5 only). When you expands the ports, you cannot use the 10G ports for stacking.

For more information about stacking, see Chapter 3, Manage Stacking.

Available Publications and Online Help

You can download the following publications by visiting netgear.com/support/download/:

- The installation guide for your switch and for the components:
  - *Installation Guide M4300 Intelligent Edge Series Fully Managed Stackable Switches*
  - *Installation Guide Fully Managed Switches Model M4300-96X*
  - *Installation Guide Fully Managed Switch Port Cards APM408C, APM408P, APM408F, and APM402XL*
  - *Installation Guide NETGEAR Power Supplies Units for Managed Switches, APS150W, APS250W, APS299W, APS550W, APS1000W, APS600W, and APS1200W*
- The hardware installation guide for your switch:
  - *M4300 Intelligent Edge Series Fully Managed Stackable Switches*
  - *Fully Managed Stackable Switch M4300-96X*

- The software manuals for the M4300 series switches, including modular model M4300-96X:
  - *M4300 Intelligent Edge Series Fully Managed Stackable Switches Software Administration* Manual
  - *M4300 Intelligent Edge Series Fully Managed Stackable Switches CLI Command Reference* Manual
  - *M4300 Intelligent Edge Series Fully Managed Stackable Switches User Manual* (this manual)
  - *M4300 Intelligent Edge Series Fully Managed Stackable Switches Software Setup Manual*

You can also access this document online when you are logged in to the switch. Select **Help > Online Help > User Guide.**

When you log into the local browser UI, online help is available. See Online Help on page 30.

Register Your Product

To qualify for product updates and product warranty, we encourage you to register your product. The first time that you log in to the switch, you can register with NETGEAR by clicking the **REGISTER NOW** button.

Registration confirms that your email alerts work, lowers technical support resolution time, and ensures that your shipping address accuracy. We would also like to incorporate your feedback into future product development. We never sell or rent your email address and you can opt out of communications at

To register your switch with NETGEAR:

1. Visit the NETGEAR website for registration at https://my.netgear.com/registration/login.aspx.
2. Click the **Login** button, and follow the directions onscreen to register the switch with your NETGEAR email address and password.

   If you did not yet create a NETGEAR account, click the **Create account** link, follow the directions onscreen to create an account, and then register the switch with your NETGEAR email address and password.

Understanding the User Interfaces

The switch software includes a set of comprehensive management functions for configuring and monitoring the system by using one of the following methods:

- Local browser user interface (UI), either over an Ethernet network port or over the out-of-band (OOB) port (also referred to as the service port)
- Simple Network Management Protocol (SNMP)
- Command-line interface (CLI)

Each of the standards-based management methods allows you to configure and monitor the components of the switch The method you use to manage the system depends on your network size and requirements, and on your preference.

This manual describes how to use the local browser UI to manage and monitor the system.

Local Browser UI Overview

Your switch contains an embedded web server and management software for managing and monitoring switch functions. The switch functions as a simple switch without the management software. However, you can use the management software to configure more advanced features that can improve switch efficiency and overall network performance.

The local browser UI is a web-based management tool that lets you monitor, configure, and control your switch remotely using a standard web browser. From your web browser, you can monitor the performance of your switch and optimize its configuration for your network. You can configure all switch features, such as VLANs, QoS, and ACLs, by using the local browser UI.

The first time that you log in as an admin user to the local browser UI, no password is required (that is, the password is blank). As of software version 12.0.9.3, after you log in for the first time, you are required to specify a local device password that you must use each subsequent time that you log in.

Software Requirements for Using the Local Browser UI

To access the switch by using a web browser, the browser must meet the following software requirements:

- Microsoft Internet Explorer 10 or 11
- Microsoft Edge 25
- Google Chrome 44 or 45
- Mozilla Firefox 40 or 40.6.01
- Apple Safari on OS X 9.0

Note: Other and later versions might work too but were not tested.

The Device View is based on HTML version 5.

Use a Web Browser to Access the Switch and Log In

If this is the first time that you log in to the switch and you must use the default IP address of the switch, see the information in the installation guide for your switch and in the *M4200 and M4300 Series ProSAFE Managed Switches Software Setup Manual.*

You can use a web browser to access the switch and log in. You must be able to ping the IP address of the management interface or out-of-band (OOB) port from your computer for web access to be available.

The first time that you log in as an admin user to the local browser UI, no password is required (that is, the password is blank). As of software version 12.0.9.3, after you log in for the first time, you are required to specify a local device password that you must use each subsequent time that you log in.

Access the Switch Using a Static IP Address

To use a static IP address to access the switch over the local browser UI:

1. Prepare your computer with a static IP address:
   - For access over an Ethernet network port, use a static IP address in the 169.254.0.0 subnet with subnet mask 255.255.0.0.

     For example, use 169.254.100.201 for your computer.
   - For access over the OOB port, use a static IP address in the 192.168.0.0 subnet with subnet mask 255.255.0.0.

     For example, use 192.168.0.201 for your computer.
2. Connect an Ethernet cable from an Ethernet port on your computer to either an Ethernet network port on the switch or to the OOB port on the switch.
3. Launch a web browser such as Google Chrome, Mozilla Firefox, or Microsoft Internet Explorer.
4. Enter the default IP address of the switch in the web browser address field:
   - For access over an Ethernet network port, enter **169.254.100.100**.
   - For access over the OOB port, enter **192.168.0.239**.

The login window opens.

5. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

Access the Switch When You Know the IP Address

The procedures in this manual assume that you know the IP address of your switch.

To access the switch over the local browser UI:

1. Launch a web browser such as Google Chrome, Mozilla Firefox, or Microsoft Internet Explorer.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

Local Browser UI Buttons and User-Defined Fields

The following table shows the command buttons that are used on the pages in the local browser UI:

Table 1. Local browser UI command buttons

Button	Function
Add	Clicking the **Add** button adds the new item configured in the heading row of a table.
Apply	Clicking the **Apply** button sends the updated configuration to the switch. Configuration changes take effect immediately.
Cancel	Clicking the **Cancel** button cancels the configuration on the page and resets the data on the page to the previous values of the switch.
Delete	Clicking the **Delete** button removes the selected item.
Refresh	Clicking the **Refresh** button refreshes the page with the latest information from the device.
Save	Clicking the **Save** button saves your settings.
Logout	Clicking the **Logout** button ends the session.

IMPORTANT:

When you click the Apply button, your changes are saved for the web management session but are not retained by the switch when it is rebooted. You can manually save the configuration permanently (see Save the Configuration on page 671**) or you can enable the automatic saving feature (see** Configure Auto Save Mode on page 671**), which lets the switch save the configuration permanently.**

User-defined fields can contain 1 to 159 characters, unless otherwise noted on the configuration web page. All characters can be used except for the following (unless specifically noted in for that feature):

Table 2. Invalid characters for user-defined fields

Invalid characters for user-defined fields
\	/ < > * ?

Interface Naming Conventions

The switch supports physical and logical interfaces. Interfaces are identified by their type and the interface number. The physical ports are Gigabit Ethernet or multispeed 10G Ethernet interfaces and are numbered on the front panel. You configure the logical interfaces by using the software.

The following table describes the naming convention for all interfaces available on the switch.

Table 3. Naming conventions for interfaces

Interface	Description	Example
Physical interfaces for all M4300 switch models except for model M4300-96X	The physical ports are Gigabit Ethernet or multispeed 10G Ethernet interfaces. The interface number consists of the switch unit number from 1 to 8, the slot number (which is always 0), and the port number, which is a sequential number starting from 1.	1/0/1, 1/0/2, 1/0/3, and so on 2/0/1, 2/0/2, 2/0/3, and so on 3/0/1, 3/0/2, 3/0/3, and so on
Physical interfaces for model M4300-96X	The physical ports are Gigabit Ethernet, multispeed 10G Ethernet, or 40G Ethernet interfaces. The interface number consists of the switch unit number from 1 to 8, the port card number from 1 to 12, and the port number from 1 to 8. **Note:** The numbering for the APM402XL 40G port card differs (see Slot and Port Numbering on the APM402XL Port Card on page 28).	See Slot and Port Numbering for Switch Model M4300-96X on page 27.

Table 3. Naming conventions for interfaces

Interface	Description	Example
Link aggregation group (LAG)	LAG interfaces are logical interfaces that are used only for bridging functions.	LAG 1, LAG 2, LAG 3, and so on
CPU management interface	This is the internal switch interface responsible for the switch base MAC address. This interface is not configurable and is always listed in the MAC Address Table.	0/15/1
Routing VLAN interfaces	This is an interface used for routing functionality.	VLAN 1, VLAN 2, VLAN 3, and so on

Slot and Port Numbering for Switch Model M4300-96X

For switch model M4300-96X, the slots in the upper row of the chassis are numbered 1 through 6 from left to right. These slots can support PoE. The slots in the lower row of the chassis are numbered 7 through 12 from left to right. These slots do not support PoE.

The port numbering depends on the port card.

Slot and Port Numbering on the APM408C, APM408P, and APM408F Port Cards

For the APM408C, APM408P, and APM408F port cards, the ports in the port cards in the slots are numbered as described in the following table.

Table 4. Port numbering for the APM408C, APM408P, and APM408F port cards

Slot Number	Slot Location	Port Number for Upper Ports in Port Card	Port Number for Lower Ports in Port Card	Interface Convention
1	Upper row	1, 3, 5, 7	2, 4, 6, 8	1/1/1, 1/1/2, 1/1/3, and so on through 1/1/8
2	Upper row	1, 3, 5, 7	2, 4, 6, 8	1/2/1, 1/2/2, 1/2/3, and so on through 1/2/8
3	Upper row	1, 3, 5, 7	2, 4, 6, 8	1/3/1, 1/3/2, 1/3/3, and so on through 1/3/8
4	Upper row	1, 3, 5, 7	2, 4, 6, 8	1/4/1, 1/4/2, 1/4/3, and so on through 1/4/8
5	Upper row	1, 3, 5, 7	2, 4, 6, 8	1/5/1, 1/5/2, 1/5/3, and so on through 1/5/8
6	Upper row	1, 3, 5, 7	2, 4, 6, 8	1/6/1, 1/6/2, 1/6/3, and so on through 1/6/8
7	Lower row	1, 3, 5, 7	2, 4, 6, 8	1/7/1, 1/7/2, 1/7/3, and so on through 1/7/8
8	Lower row	1, 3, 5, 7	2, 4, 6, 8	1/8/1, 1/8/2, 1/8/3, and so on through 1/8/8
9	Lower row	1, 3, 5, 7	2, 4, 6, 8	1/9/1, 1/9/2, 1/9/3, and so on through 1/9/8
10	Lower row	1, 3, 5, 7	2, 4, 6, 8	1/10/1, 1/10/2, 1/10/3, and so on through 1/10/8

Table 4. Port numbering for the APM408C, APM408P, and APM408F port cards (continued)

Slot Number	Slot Location	Port Number for Upper Ports in Port Card	Port Number for Lower Ports in Port Card	Interface Convention
11	Lower row	1, 3, 5, 7	2, 4, 6, 8	1/11/1, 1/11/2, 1/11/3, and so on through 1/11/8
12	Lower row	1, 3, 5, 7	2, 4, 6, 8	1/12/1, 1/12/2, 1/12/3, and so on through 1/12/8

Slot and Port Numbering on the APM402XL Port Card

The numbering of the ports on the APM402XL port card is different from the other port cards. You can use a 40G port either with a break-out cable, in which case the single 40G port can support up to four individual 10G ports, or with a connection to another single 40G port.

Port 1 (the left 40G port on the port card) uses the following numbering:

- If connected with a break-out cable to four individual 10G ports, the port numbers are 1, 2, 3, and 4.
- If connected to another single 40G port, the port number is 1. In that situation, only port number 1 is used and port numbers 2, 3, and 4 are not used on the port card.

Port 2 (the right 40G port on the port card) uses the following numbering:

- If connected with a break-out cable to four individual 10G ports, the port numbers are 5, 6, 7, and 8.
- If connected to another single 40G port, the port number is 5. In that situation, only port number 5 is used and port numbers 6, 7, and 8 are not used on the port card.

For example, if a switch with unit number 1 includes an APM402XL port card in slot 9, port 1 on the port card is connected to four individual port cards, and port 2 on the port card is connected to another single 40G port, the port numbering is as follows: 1/9/1, 1/9/2, 1/9/3, 1/9/4, and 1/9/5.

For the APM402XL port card, the ports on the port cards in the slots are numbered as described in the following table. (In the interface convention examples in the table, the switch is designated as unit number 1.)

For the APM402XL port card, the ports in the port cards in the slots are numbered as described in the following table.

Table 5. Port numbering for the 40G ports on the APM402XL port card

Slot Number	Slot Location	Port	Port Numbers for 10G	Port Numbers for 40G	Interface Convention
1	Upper row	1	1, 2, 3, 4	1	For 10G: 1/1/1, 1/1/2, 1/1/3, and 1/1/4. For 40G: 1/1/1.
		2	5, 6, 7, 8	5	For 10G: 1/1/5, 1/1/6, 1/1/7, and 1/1/8. For 40G: 1/1/5.
2	Upper row	1	1, 2, 3, 4	1	For 10G: 1/2/1, 1/2/2, 1/2/3, and 1/2/4. For 40G: 1/2/1.
		2	5, 6, 7, 8	5	For 10G: 1/2/5, 1/2/6, 1/2/7, and 1/2/8. For 40G: 1/2/5.
3	Upper row	1	1, 2, 3, 4	1	For 10G: 1/3/1, 1/3/2, 1/3/3, and 1/3/4. For 40G: 1/3/1.
		2	5, 6, 7, 8	5	For 10G: 1/3/5, 1/3/6, 1/3/7, and 1/3/8. For 40G: 1/3/5.
4	Upper row	1	1, 2, 3, 4	1	For 10G: 1/4/1, 1/4/2, 1/4/3, and 1/4/4. For 40G: 1/4/1.
		2	5, 6, 7, 8	5	For 10G: 1/4/5, 1/4/6, 1/4/7, and 1/4/8. For 40G: 1/4/5.
5	Upper row	1	1, 2, 3, 4	1	For 10G: 1/5/1, 1/5/2, 1/5/3, and 1/5/4. For 40G: 1/5/1.
		2	5, 6, 7, 8	5	For 10G: 1/5/5, 1/5/6, 1/5/7, and 1/5/8. For 40G: 1/5/5.
6	Upper row	1	1, 2, 3, 4	1	For 10G: 1/6/1, 1/6/2, 1/6/3, and 1/6/4. For 40G: 1/6/1.
		2	5, 6, 7, 8	5	For 10G: 1/6/5, 1/6/6, 1/6/7, and 1/6/8. For 40G: 1/6/5.
7	Lower row	1	1, 2, 3, 4	1	For 10G: 1/7/1, 1/7/2, 1/7/3, and 1/71/4. For 40G: 1/7/1.
		2	5, 6, 7, 8	5	For 10G: 1/7/5, 1/7/6, 1/7/7, and 1/7/8. For 40G: 1/7/5.
8	Lower row	1	1, 2, 3, 4	1	For 10G: 1/8/1, 1/8/2, 1/8/3, and 1/8/4. For 40G: 1/8/1.
		2	5, 6, 7, 8	5	For 10G: 1/8/5, 1/8/6, 1/8/7, and 1/8/8. For 40G: 1/8/5.
9	Lower row	1	1, 2, 3, 4	1	For 10G: 1/9/1, 1/9/2, 1/9/3, and 1/9/4. For 40G: 1/9/1.
		2	5, 6, 7, 8	5	For 10G: 1/9/5, 1/9/6, 1/9/7, and 1/9/8. For 40G: 1/9/5.
10	Lower row	1	1, 2, 3, 4	1	For 10G: 1/10/1, 1/10/2, 1/10/3, and 1/10/4. For 40G: 1/10/1.
		2	5, 6, 7, 8	5	For 10G: 1/10/5, 1/10/6, 1/10/7, and 1/10/8. For 40G: 1/10/5.
11	Lower row	1	1, 2, 3, 4	1	For 10G: 1/11/1, 1/11/2, 1/11/3, and 1/11/4. For 40G: 1/11/1.
		2	5, 6, 7, 8	5	For 10G: 1/11/5, 1/11/6, 1/11/7, and 1/11/8. For 40G: 1/11/5.
12	Lower row	1	1, 2, 3, 4	1	For 10G: 1/12/1, 1/12/2, 1/12/3, and 1/12/4. For 40G: 1/12/1.
		2	5, 6, 7, 8	5	For 10G: 1/12/5, 1/12/6, 1/12/7, and 1/12/8. For 40G: 1/12/5.

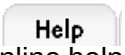
Slot and Port Numbering on the Third-Party TPM404H HDMI Port Cards

For the TPM404H port card, the ports in the port cards in the slots are numbered as described in the following table.

Table 6. Port numbering for the TPM404H port card

Slot Number	Slot Location	Port Number for Ports in Port Card	Interface Convention
1	Upper row	1, 2, 3, 4	1/1/1, 1/1/2, 1/1/3, and so on through 1/1/4
2	Upper row	1, 2, 3, 4	1/2/1, 1/2/2, 1/2/3, and so on through 1/2/4
3	Upper row	1, 2, 3, 4	1/3/1, 1/3/2, 1/3/3, and so on through 1/3/4
4	Upper row	1, 2, 3, 4	1/4/1, 1/4/2, 1/4/3, and so on through 1/4/4
5	Upper row	1, 2, 3, 4	1/5/1, 1/5/2, 1/5/3, and so on through 1/5/4
6	Upper row	1, 2, 3, 4	1/6/1, 1/6/2, 1/6/3, and so on through 1/6/4
7	Lower row	Do not insert a TPM404H port card in any of the slots in the lower row.	
8	Lower row		
9	Lower row		
10	Lower row		
11	Lower row		
12	Lower row		

Online Help

When you log in to the switch, each page contains a link to the online help 

that contains information to assist in configuring and managing the switch. The online help pop-up windows are context sensitive. For example, if the IP Addressing page is open, the help topic for that page displays if you click the **Help** button.

You can connect to the online support site at netgear.com/support when you are logged in to the switch.

To access the online support link:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Help > Online Help > Support**.
5. To connect to the NETGEAR support site for the M4300 Series and M4300-96X switches, click the **APPLY** button.

Local Browser UI Device View

The Device View is an HTML applet that displays the ports on the switch. This graphic provides an alternate way to navigate to configuration and monitoring options. The graphic also provides information about device ports, current configuration and status, tables, and feature components.

To use Device View:

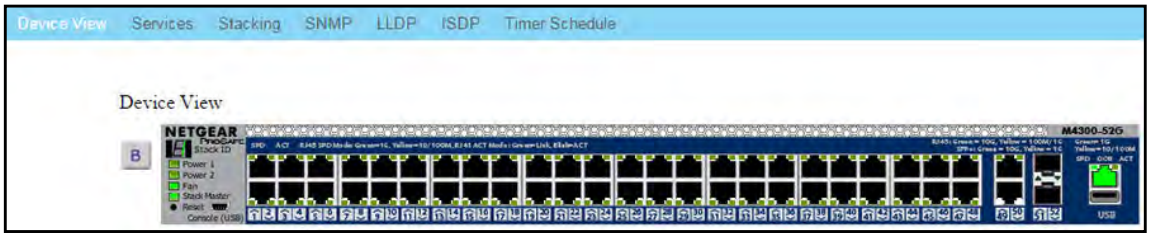
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name and your local device password.

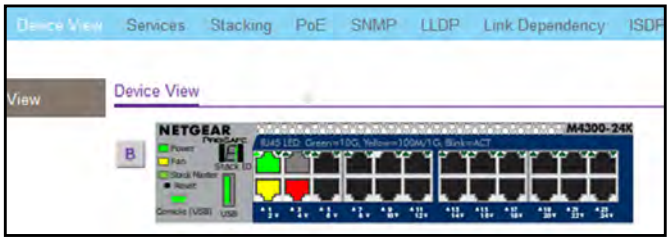
   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Device View**.

   As an example, the following figure shows the Device View page for model M4300-52G.



As another example, the following figure shows a close up of the Device View page for model M4300-24X.



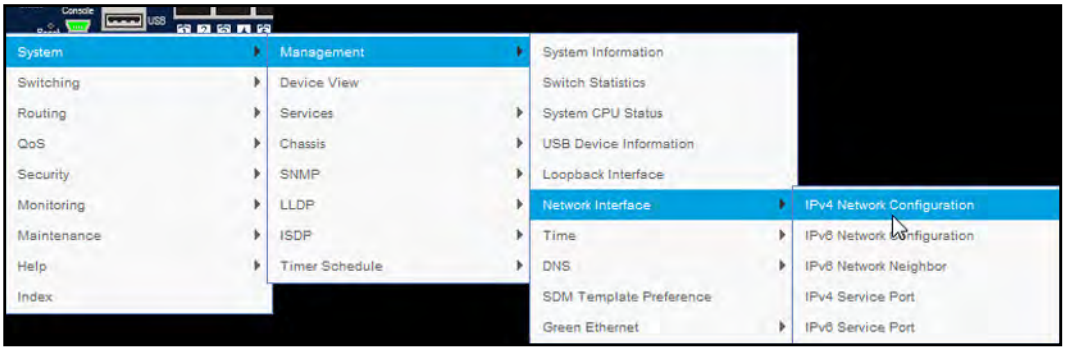
The port coloring indicates whether a port is currently active. Green indicates that the port is enabled; red indicates that an error occurred on the port, or that the link is disabled.

As yet another example, the following figure shows a close up of the Device View page for model M4300-96X. This figure shows an APM402XL port card in slot 5 and another in slot 8. Port 1/5/6 is expanded into four 10G ports, but port 1/5/5 is in 40G mode. Both port 1/8/1 and port 1/8/5 are in the default 40G mode.

5. Click a port to see a menu that displays statistics and configuration options.

   You can click a menu option to access the page that contains the configuration or monitoring options.

   If you click the graphic, but do not click a specific port, the main menu displays. This menu contains the same options as the navigation tabs at the top of the page.



Using SNMP

The switch software supports the configuration of SNMP groups and users that can manage traps that the SNMP agent generates.

The switch uses both standard public MIBs for standard functionality and private MIBs that support additional switch functionality. All private MIBs begin with a “-” prefix. The main object for interface configuration is in -SWITCHING-MIB, which is a private MIB. Some interface configurations also involve objects in the public MIB, IF-MIB.

SNMP is enabled by default. The System Information page, which is the page that displays when you log in, displays the information that you need to configure an SNMP manager to access the switch.

Any user can connect to the switch using the SNMP v3 protocol, but for authentication and encryption, the switch supports only one user, which is the admin user; therefore, only one profile can be created or modified.

As of software version 12.0.9.3, you cannot access the switch using SNMPv3 until you log in to the switch as an admin and change the default password (see Use a Web Browser to Access the Switch and Log In on page 24). After you do, SNMPv3 is automatically configured with the MD5 authentication protocol and the new password for admin user.

For SNMPv3 switch access, the authentication protocol must be MD5 or SHA. You cannot use the “none” option for the authentication protocol.

To configure authentication and encryption settings for the SNMPv3 admin profile:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > SNMP > SNMP v3 > User Configuration**.

   The User Configuration page displays.
5. To enable authentication, select an **Authentication Protocol** option, which is either **MD5** or **SHA**.
6. To enable encryption, select the **DES** option in the **Encryption Protocol** list Then enter an encryption code of eight or more alphanumeric characters in the **Encryption Key** field.
7. Click the **APPLY** button.

   Your settings are saved.

Note: To access configuration information for SNMP V1 or SNMP V2, select **System > SNMP > SNMPv1/v2** and select the page that contains the information that you want to configure.

2

Configure System Information

This chapter covers the following topics:

- Configure and Display the System and Slot Information
- Configure a Loopback Interface
- Configure Management Interfaces
- Manage the Time Settings
- Manage Precision Time Protocol
- Configure DNS Settings
- Configure the Switch Database Management Template Preference
- Configure Green Ethernet Settings
- Configure and Display Bonjour Settings
- Configure DHCP Server Settings
- Manage a DHCP L2 Relay
- Manage the DHCPv6 Server
- Configure Power over Ethernet
- Configure SNMP
- Configure LLDP
- Configure Link Dependency
- Configure ISDP
- Manage Timer Schedules

Configure and Display the System and Slot Information

You can configure the view and configure the switch system information.

For model M4300-96X, you can also configure the slot and port card information.

View or Define System Information

When you log in, the System Information page displays. You can configure and view general device information.

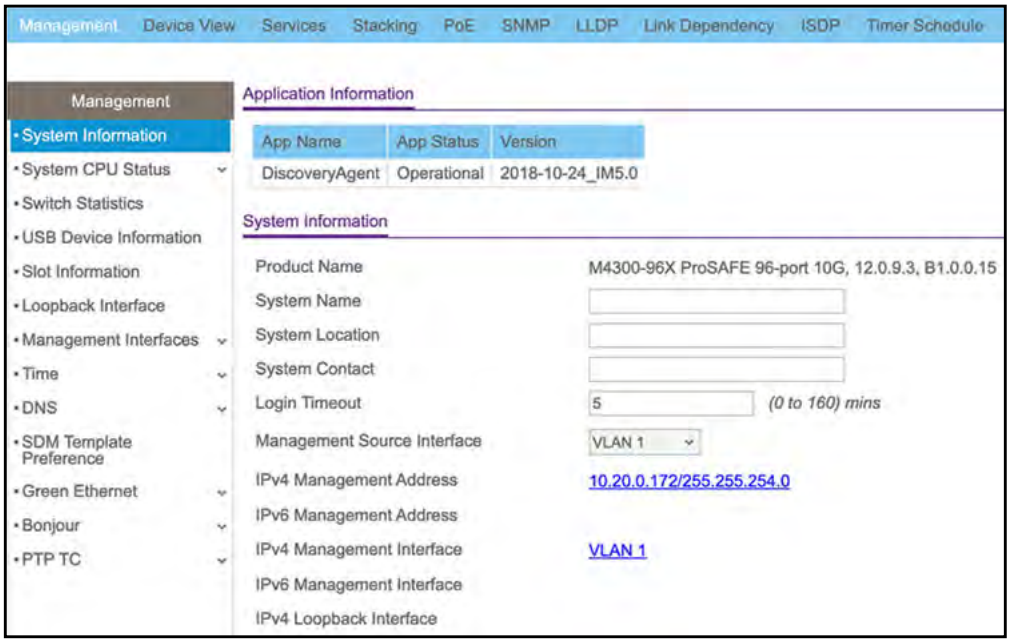
To view or define system information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > System Information**.



5. Define the following fields:
   - **System Name**. Enter the name to identify this switch. You can use up to 255 alphanumeric characters. The factory default is blank.
   - **System Location**. Enter the location of this switch. You can use up to 255 alphanumeric characters. The factory default is blank.
   - **System Contact**. Enter the contact person for this switch. You can use up to 255 alphanumeric characters. The factory default is blank.
   - **Login Timeout.** Specify how many minutes of inactivity can occur on a serial port connection before the switch closes the connection. Enter a number between 0 and 160 minutes. The factory default is 5. Entering 0 disables the time-out.
   - **Management Source Interface**. Select the management interface that is used as source interface for SNMP trap, syslog, DNS, TACACS+, RADIUS, sflow, and SNTP applications. Possible values are as follows:
     - **None**
     - **Routing Interface**
     - **Routing VLAN**
     - **Routing Loopback Interface**
     - **Service Port**
     - **Different**. For some applications from the list, the source interface is configured separately. They display in the list only if this is the case.

     By default VLAN 1 is used as the source interface.
6. Click the **Apply** button.

   Your settings are saved.

The following table describes the status information in the Application Information and System Information sections on the page.

Table 7. Application Information and System Information

Field	Description
Application Information	
App Name	The name of the application that functions as the Universal Plug and Play (UPnP) agent.
App Status	The status of the application.
Version	The version of the application.
System Information	
Product Name	The product name of this switch.
IPv4 Management Address	The IPv4 address and mask assigned to the management VLAN interface.
IPv6 Management Address	The IPv6 address and mask assigned to the management VLAN interface.

Table 7. Application Information and System Information (continued)

Field	Description
IPv4 Management Interface	The IPv4 management VLAN ID of the switch. Click the displayed Management VLAN ID value to jump to the configuration page. See Configure an IPv4 Management VLAN on page 55.
IPv6 Management Interface	The IPv6 management VLAN ID of the switch. Click the displayed Management VLAN ID value to jump to the configuration page. See Configure an IPv6 Management VLAN on page 57.
IPv4 Loopback Interface	The IPv4 address and mask assigned to the loopback interface.
IPv6 Loopback Interface	The IPv6 prefix and prefix length assigned to the loopback interface.
System Date	The current date.
Current SNTP Sync Status	The current SNTP sync status.
System SNMP OID	The base object ID for the switch's enterprise MIB.
System Mac Address	Universally assigned network address.
Service Port MAC Address	The MAC address used for out-of-band connectivity.
L2 MAC Address	The MAC address used for communications on the Layer 2 network segment.
L3 MAC Address	The MAC address used for communications on the Layer 3 network segment.
Current SNTP Synchronized Time	The SNTP synchronized time.

View the Fan Status

This page shows the status of the fans in all units. These fans remove the heat generated by the power, CP,U and other chipsets, and allow the chipsets work normally. Fan status has three possible values: **OK**, **Failure**, and **Not Present**.

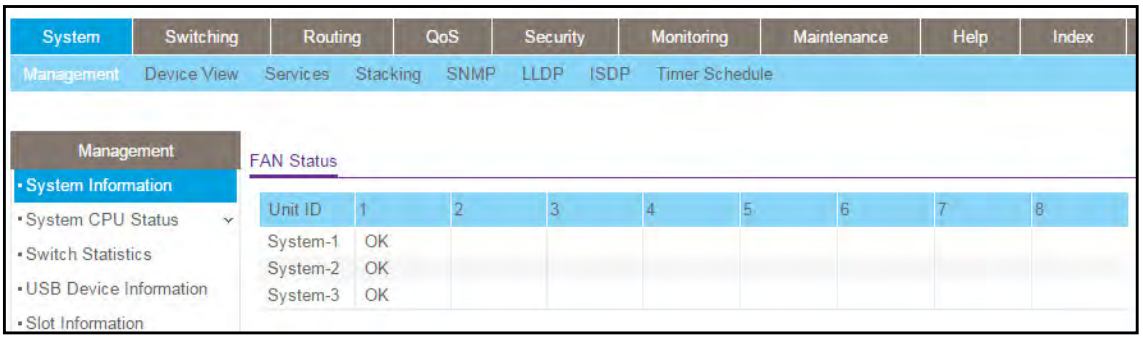
To view the fan status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Management > System Information > Fan Status**.



5. To refresh the page, click the **Refresh** button.

The following table describes the nonconfigurable Fan Status information.

Table 8. Fan Status

Field	Description
Unit ID	The unit ID of the switch to which the fan belongs.
System-1	The working status of the System-1 fan in each unit.
System-2	The working status of the System-2 fan in each unit.
System-3	The working status of the System-3 fan in each unit.

View the Temperature Sensor Information

You can view the current temperature of different system sensors using the Temperature Status table. The temperature is instant and can be refreshed with the latest information on the switch when the **Refresh** button is clicked. The maximum temperature of the CPU and MACs depends on the actual hardware.

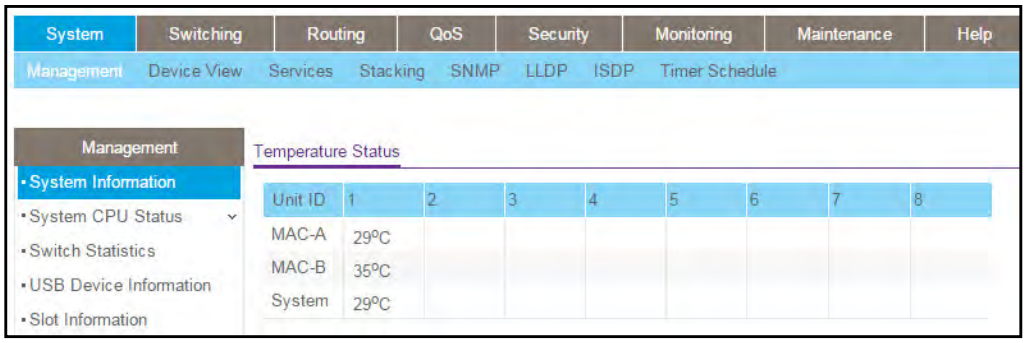
To view temperature information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > System Information > Temperature Sensors**.



5. To refresh the page, click the **Refresh** button.

The following table describes the nonconfigurable Temperature Status information.

Table 9. Temperature Status information

Field	Description
Unit ID	The unit number in the switch.
MAC-A	The current temperature (in degrees Centigrade) of the MAC-A sensor of the switch. The maximum is 31°C.
MAC-B	The current temperature (in degrees Centigrade) of the MAC-B sensor of the switch. The maximum is 37°C.
System	The current temperature (in degrees Centigrade) of the System sensor of the switch. The maximum is 31°C.

View the Device Status

This page shows the software version of each device.

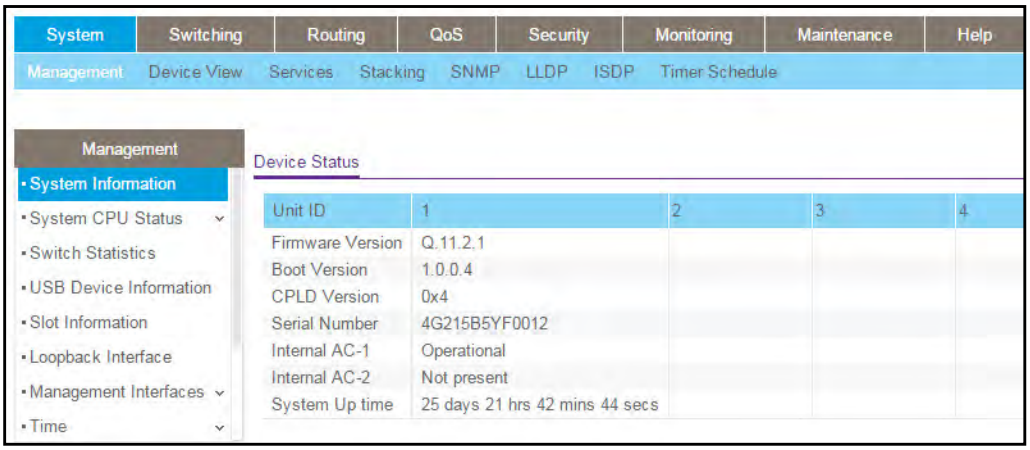
To view the device status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Management > System Information > Device Status**.



5. To refresh the page, click the **Refresh** button.

The following table describes the nonconfigurable Device Status information.

Table 10. Device Status

Field	Description
Unit ID	The unit number in the switch.
Firmware Version	The release.version.maintenance number of the code currently running on the switch. For example, if the release was 1, the version was 2, and the maintenance number was 4, the format would be 1.2.4.
Boot Version	The version of the boot code that is in the flash memory to load the firmware into the memory.
CPLD Version	The version of the software for CPLD.
Serial Number	The serial number of this switch.
Internal AC-1, Internal AC-2, and so on	Indicates the status of the appropriate power module in each unit. Status can be any of the following: • **Operational**. Power module is present and functioning properly. • **Powering**. Main power is failed or disconnected but RPS provides power to the switch. • **Not Present**. Power module is not present in the slot. • **Not powered**. Power module is present but not connected to the power source. • **Not powering**. Power module is present and connected but the switch uses another power source. • **Incompatible**. Power module is present but incompatible. • **Failed**. Power module is present, but power cable is not plugged in or a bad cable is plugged in.
System Up Time	The time in days, hours, and minutes since the last switch reboot.

View the System CPU Status

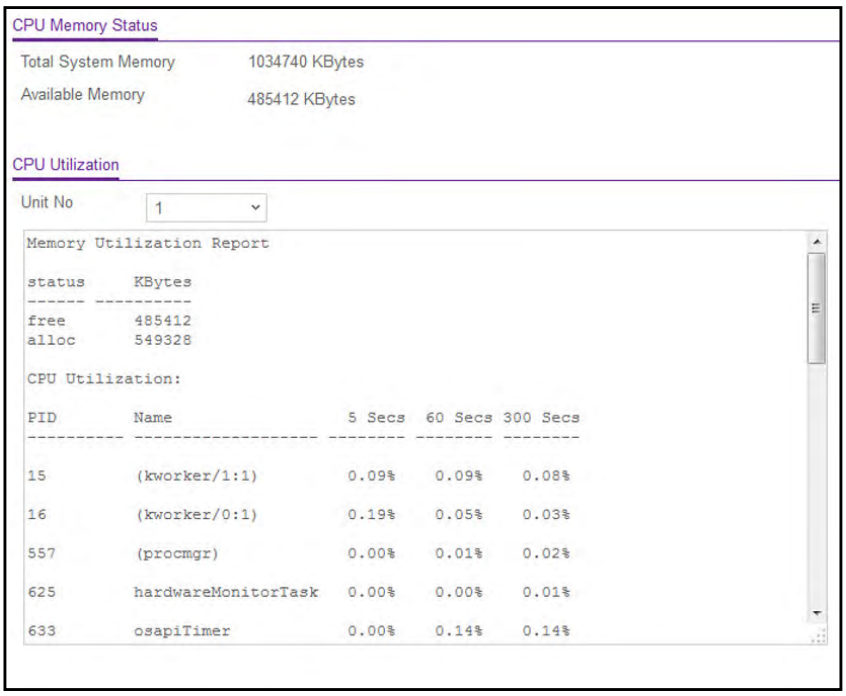
To view the system CPU status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > System CPU Status**.



5. You can view the CPU Utilization information, which contains the memory information, task-related information, and percentage of CPU utilization per task.
   - Select the **Unit No.** to display the CPU Utilization information.
   - Select **All** to display the CPU Utilization information for all units in a switch.

The following table describes CPU Memory Status information.

Table 11. CPU Memory Status information

Field	Description
Total System Memory	The total memory of the switch in KBytes.
Available Memory	The available memory space for the switch in KBytes.

Configure the CPU Thresholds

The CPU Utilization Threshold notification feature allows you to configure thresholds that, when crossed, trigger a notification. The notification is done through SNMP trap and syslog messages.

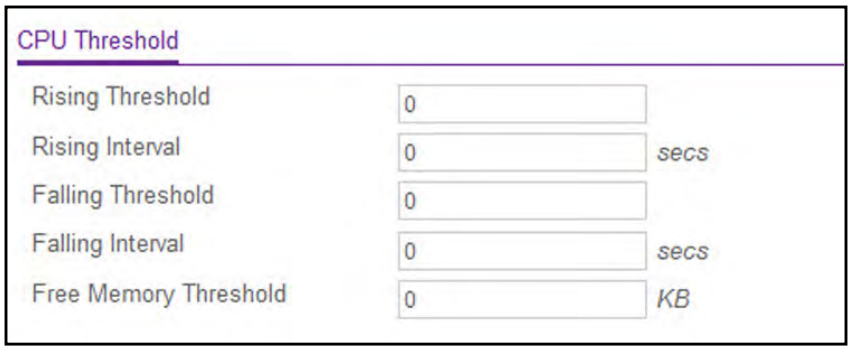
To configure the CPU thresholds:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > System CPU Status > CPU Threshold**.



5. Configure the **Rising Threshold** value.

   Notification is generated when the total CPU utilization exceeds this threshold value over the configured time period. The range is 1 to 100.
6. Configure the **Rising Interval** value.

   This utilization monitoring time period can be configured from 5 to 86400 seconds in multiples of 5 seconds.

7. Configure the **Falling Threshold**.

   Notification is triggered when the total CPU utilization falls below this level for a configured period of time.

   The falling utilization threshold must be equal to or less than the rising threshold value. The falling utilization threshold notification is made only if a rising threshold notification was done previously. Configuring the falling utilization threshold and time period is optional. If the Falling CPU utilization parameters are not configured, then it takes the same value as Rising CPU utilization parameters. The range is 1 to 100.

8. Configure the **Falling Interval**.

   The utilization monitoring time period can be configured from 5 seconds to 86400 seconds in multiples of 5 seconds.

9. Configure the CPU **Free Memory Threshold** value in KB.
10. Click the **Apply** button.

    Your settings are saved.

View and Clear Switch Statistics

To view and clear the switch statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

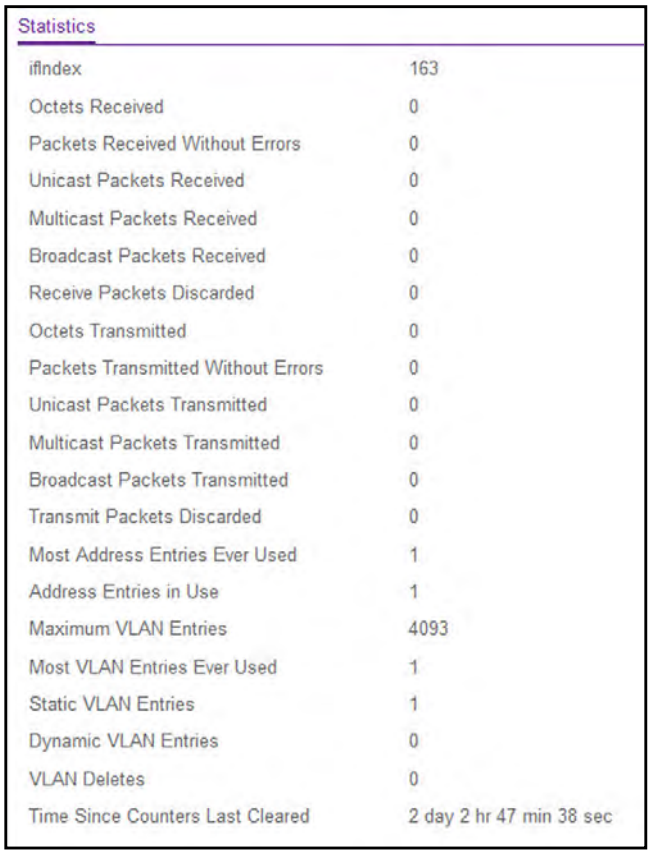
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Management > Switch Statistics**.



5. To clear all the counters, resetting all switch summary and detailed statistics to default values, click the **Clear** button.

   The discarded packets count cannot be cleared.

The following table describes Switch Statistics information.

Table 12. Switch Statistics information

Field	Description
ifIndex	The ifIndex of the interface table entry associated with the processor of this switch.
Octets Received	The total number of octets of data received by the processor (excluding framing bits but including FCS octets).
Packets Received Without Errors	The total number of packets (including broadcast packets and multicast packets) received by the processor.
Unicast Packets Received	The number of subnetwork-unicast packets delivered to a higher-layer protocol.
Multicast Packets Received	The total number of packets received that were directed to a multicast address. This number does not include packets directed to the broadcast address.

Table 12. Switch Statistics information (continued)

Field	Description
Broadcast Packets Received	The total number of packets received that were directed to the broadcast address. This does not include multicast packets.
Receive Packets Discarded	The number of inbound packets that were discarded even though no errors were detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Octets Transmitted	The total number of octets transmitted out of the interface, including framing characters.
Packets Transmitted Without Errors	The total number of packets transmitted out of the interface.
Unicast Packets Transmitted	The total number of packets that higher-level protocols requested that are transmitted to a subnetwork-unicast address, including those that were discarded or not sent.
Multicast Packets Transmitted	The total number of packets that higher-level protocols requested that are transmitted to a multicast address, including those that were discarded or not sent.
Broadcast Packets Transmitted	The total number of packets that higher-level protocols requested that are transmitted to the broadcast address, including those that were discarded or not sent.
Transmit Packets Discarded	The number of outbound packets that were discarded even though no errors were detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Most Address Entries Ever Used	The highest number of Forwarding Database Address Table entries learned by this switch since the most recent reboot.
Address Entries in Use	The number of learned and static entries in the Forwarding Database Address Table for this switch.
Maximum VLAN Entries	The maximum number of virtual LANs (VLANs) allowed on this switch.
Most VLAN Entries Ever Used	The largest number of VLANs that were active on this switch since the last reboot.
Static VLAN Entries	The number of presently active VLAN entries on this switch that were created statically.
Dynamic VLAN Entries	The number of presently active VLAN entries on this switch that were created by GVRP registration.
VLAN Deletes	The number of VLANs on this switch that were created and then deleted since the last reboot.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds, since the statistics for this switch were last cleared.

View USB Device Information

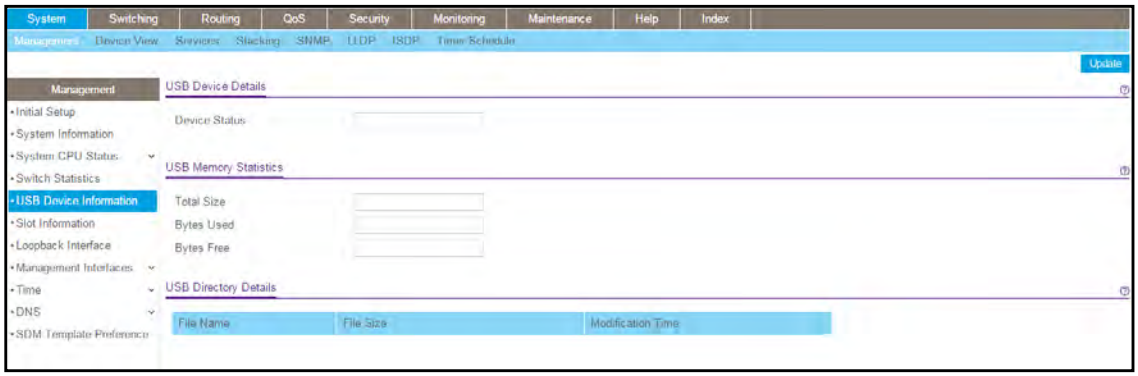
To display the USB device information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > USB Device Information.**



   The Device Status field displays the current status of the device. The status is one of the following:

   - **Active**. The device is USB plugged in and recognized by the switch.
   - **Inactive**. The device is not mounted.
   - **Invalid**. The device is not present or an invalid device is plugged in.
5. To refresh the page, click the **Refresh** button.

The following table describes the USB Memory Statistics information.

Table 13. USB Memory Statistics information

Field	Description
Total Size	The USB flash device storage size in bytes.
Bytes Used	The size of memory used on the USB flash device.
Bytes Free	The size of memory free on the USB flash device.

The following table describes the USB Directory Details information.

Table 14. USB Directory Details information

Field	Description
File Name	The name of the file stored in the USB flash drive.
File Size	The size of the file stored in the USB flash drive in bytes
Modification Time	The last modification time of the file stored in the USB flash drive.

Configure and View Information About Slots and Port Cards

You can configure information about the port cards that are installed in the switch's slots and view information about the port cards and other switches that are compatible with the switch.

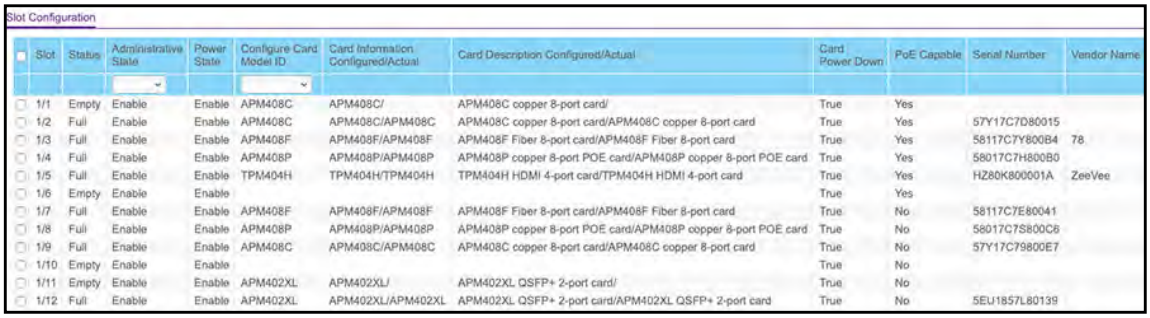
To configure and view information about slots and port cards:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Slot Information**.



Slot	Status	Administrative State	Power State	Configure Card Model ID	Card Information Configured/Actual	Card Description Configured/Actual	Card Power Down	PoE Capable	Serial Number	Vendor Name
1/1	Empty	Enable	Enable	APM408C	APM408C/	APM408C copper 8-port card/	True	Yes		
1/2	Full	Enable	Enable	APM408C	APM408C/APM408C	APM408C copper 8-port card/APM408C copper 8-port card	True	Yes	57Y17C7D80015	
1/3	Full	Enable	Enable	APM408F	APM408F/APM408F	APM408F Fiber 8-port card/APM408F Fiber 8-port card	True	Yes	58117C7Y800B4	78
1/4	Full	Enable	Enable	APM408P	APM408P/APM408P	APM408P copper 8-port POE card/APM408P copper 8-port POE card	True	Yes	58017C7H800B0	
1/5	Full	Enable	Enable	TPM404H	TPM404H/TPM404H	TPM404H HDMI 4-port card/TPM404H HDMI 4-port card	True	Yes	HZ80K800001A	ZeeVee
1/6	Empty	Enable	Enable				True	Yes		
1/7	Full	Enable	Enable	APM408F	APM408F/APM408F	APM408F Fiber 8-port card/APM408F Fiber 8-port card	True	No	58117C7E80041	
1/8	Full	Enable	Enable	APM408P	APM408P/APM408P	APM408P copper 8-port POE card/APM408P copper 8-port POE card	True	No	58017C7S800C6	
1/9	Full	Enable	Enable	APM408C	APM408C/APM408C	APM408C copper 8-port card/APM408C copper 8-port card	True	No	57Y17C79800E7	
1/10	Empty	Enable	Enable				True	No		
1/11	Empty	Enable	Enable	APM402XL	APM402XL/	APM402XL QSFP+ 2-port card/	True	No		
1/12	Full	Enable	Enable	APM402XL	APM402XL/APM402XL	APM402XL QSFP+ 2-port card/APM402XL QSFP+ 2-port card	True	No	5EU1857L80139	

   The previous figure does not show all columns on the page.

   Note: In the previous example for model M4300-96X, a third-party HDMI port card is shown in slot 1/5. You can insert a third-party HDMI port card in any of the upper slots (1–6), but not in the lower slots.

5. For model M4300-96X only, from the **Administrative State** menu, select **Enable** or **Disable**.

   By default, all slots are enabled, but you can select to disable a slot.

6. For model M4300-96X only, from the **Configured Card Model ID** menu, select the port card.

   This option allows you to preconfigure the port card before you insert the port card.

7. For model M4300-96X, if you changed the settings, click the **Apply** button.

   Your settings are saved.

   The following table describes the nonconfigurable information in the Slot Configuration table.

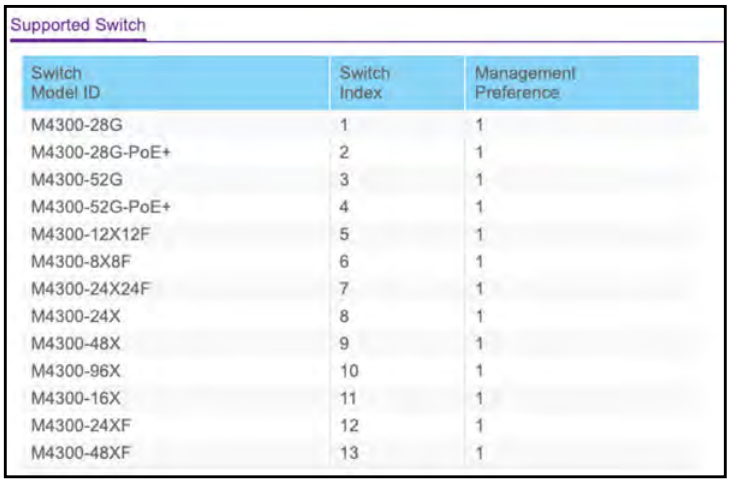
Field	Description
Slot	The unit and slot number.
Status	Indicates whether the slot is empty or full.
Power State	For model M4300-96X only, the power state is always Enable. For other models, the Power State column does not display.
Card Information Configured/Actual	The model of the configured port card and the model of the port card that is inserted in the slot.
Card Description Configured/Actual	The description of the configured port card and the description of the port card that is inserted in the slot.
Card Power Down	If the value is True, the power state can be administratively enabled or disabled. If the value is False, the power state cannot be configured.
PoE Capable	Indicates whether the port card is PoE-capable.
Serial Number	The serial number of the installed port card.
Vendor Name	The vendor name of the installed port card.
Manufacturer Name	The manufacturer name of the installed port card.
FPGA Version	The FPGA (Field Programmable Gate Array) version of the installed port card.
Software Version	The software version of the installed port card.
Board Revision ID	The board revision ID of the installed port card.
Product Name	The product name of the installed port card.
Product Description	The detailed product description of the installed port card.

Supported Card

Card Model	Card Index	Card Type	Card Descriptor
APM408C	11	0xc6860000	APM408C copper 8-port card
APM408P	12	0xc6870000	APM408P copper 8-port POE card
APM408F	13	0xc6880000	APM408F Fiber 8-port card
APM402XL	14	0xc6890000	APM402XL QSFP+ 2-port card
TPM404H	15	0xc68a0000	TPM404H HDMI 4-port card

The following table describes information in the Supported Card table.

Field	Description
Card Model	The model ID of the supported port card.
Card Index	The index assigned to the port card type.
Card Type	The hardware type of the supported port card, which is assigned by the manufacturer.
Card Descriptor	The description of the supported port card, which includes the manufacturer product number and information about the number and speed of the supported interfaces.



Supported Switch

Switch Model ID	Switch Index	Management Preference
M4300-28G	1	1
M4300-28G-PoE+	2	1
M4300-52G	3	1
M4300-52G-PoE+	4	1
M4300-12X12F	5	1
M4300-8X8F	6	1
M4300-24X24F	7	1
M4300-24X	8	1
M4300-48X	9	1
M4300-96X	10	1
M4300-16X	11	1
M4300-24XF	12	1
M4300-48XF	13	1

The following table describes information in the Supported Switch table. If you preconfigure a new stack member, the switch index identifies the type of switch that is being added to the stack.

Field	Description
Switch Model ID	The model number of the supported switch.
Switch Index	The index that is assigned to the supported switch.
Management Preference	The management preference of the supported switch.

Configure a Loopback Interface

You can create, configure, and remove loopback interfaces.

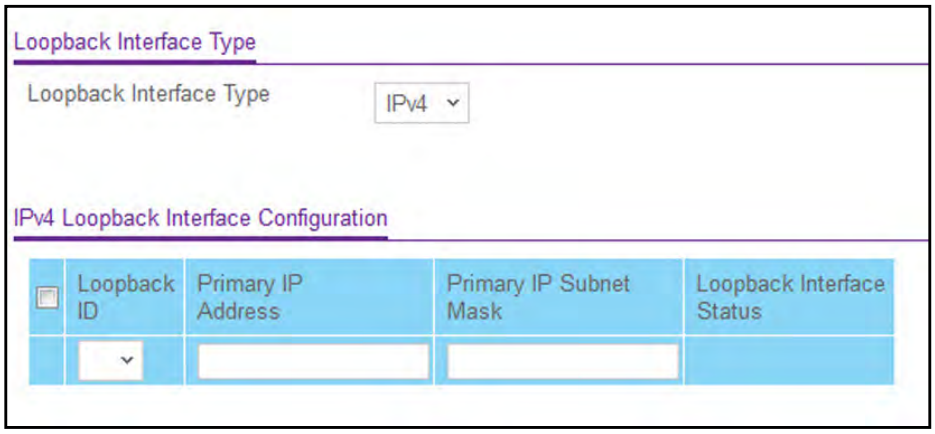
To configure a loopback interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Loopback Interface**.



5. Use the **Loopback Interface Type** list to select **IPv4** or **IPv6** loopback interface.
6. In the **Loopback ID** list, select a list of currently configured loopback interfaces.
7. In the **Primary IP Address** field, enter the primary address for this interface in dotted-decimal notation.

   This option is visible when IPv4 loopback is selected.
8. In the **Primary IP Subnet Mask** field, enter the primary IPv4 subnet mask in dotted-decimal notation.

   This option is visible when IPv4 loopback is selected.
9. In the **Secondary IP Address** field, enter the secondary IP address in dotted-decimal notation.

   This input field is visible only when **Add Secondary** is selected. This option is visible when IPv4 loopback is selected.

10. In the **Secondary Subnet Mask** field, enter the secondary subnet mask for this interface in dotted-decimal notation.

    This input field is visible only when **Add Secondary** is selected. This option is visible when IPv4 loopback is selected.

11. In the **IPv6 mode** field, enable IPv6 on this interface using the IPv6 address.

    This option is configurable before you specify an explicit IPv6 address. This option is visible when IPv6 loopback is selected.

12. Use the **IPv6 Address** field to enter the IPv6 address in the format prefix/length.

    This option is visible when IPv6 loopback is selected.

13. Use the **EUI64** field to optionally specify the 64-bit extended unique identifier (EUI-64).

    This option is visible when IPv6 loopback is selected.

14. Click the **Apply** button.

    Your settings are saved.

Configure Management Interfaces

The local browser UI includes separate options for interface and port-based IP management. Port-based IP management disables VLAN-based (default/existing) IP management once you configure the port-based IP management and vice versa.

The source interface for applications is set to VLAN 1 by default. Changes in IPv4 Management VLAN and port to a non-default value also sets the source interface to the VLAN 1 default VLAN/port automatically.

Configure the IPv4 Service Port

You can configure network information on the IPv4 service port. The service port is a dedicated Ethernet port for out-of-band management of the device. Traffic on this port is segregated from operational network traffic on the switch ports and cannot be switched or routed to the operational network.

To configure the IPv4 service port:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **System > Management > Management Interfaces > IPv4 Service Port Configuration**.

5. Select a Service Port Configuration Protocol radio button:
   - **BootP**. During the next boot cycle, the BootP client on the device broadcasts a BootP request in an attempt to acquire information from a BootP server on the network.
   - **DHCP**. During the next boot cycle, the DHCP client on the device broadcasts a DHCP request in an attempt to acquire information from a DHCP server on the network.
   - **None**. The device does not attempt to acquire network information dynamically.
   - This specifies how the device acquires network information on the service port.
6. In the **IP Address** field, specify the IP address of the interface.
   - If the service port configuration protocol is **None**, you can manually configure a static IP address.
   - If the service port configuration protocol is **BootP** or **DHCP**, this field displays the IP address that was dynamically acquired (if any).
7. In the **Subnet Mask** field, specify the IP subnet mask for the interface:
   - If the service port configuration protocol is **None**, you can manually configure a static subnet mask.
   - If the service port configuration protocol is **BootP** or **DHCP**, this field displays the subnet mask that was dynamically acquired (if any).
8. In the **Default Gateway** field, specify the default gateway for the IP interface:
   - If the Service Port Configuration Protocol is **None**, you can manually configure the IP address of the default gateway.
   - If the Service Port Configuration Protocol is **BootP** or **DHCP**, this field displays the default gateway address that was dynamically acquired (if any).
9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable fields on the Service Port Configuration page.

Table 15. IPv4 Service Port Configuration

Field	Description
Burned-in MAC Address	The burned-in MAC address used for out-of-band connectivity.
Interface Status	Indicates whether the link status is up or down.

Configure the IPv6 Service Port

You can configure IPv6 network information on the service port. The service port is a dedicated Ethernet port for out-of-band management of the device. Traffic on this port is segregated from operational network traffic on the switch ports and cannot be switched or routed to the operational network.

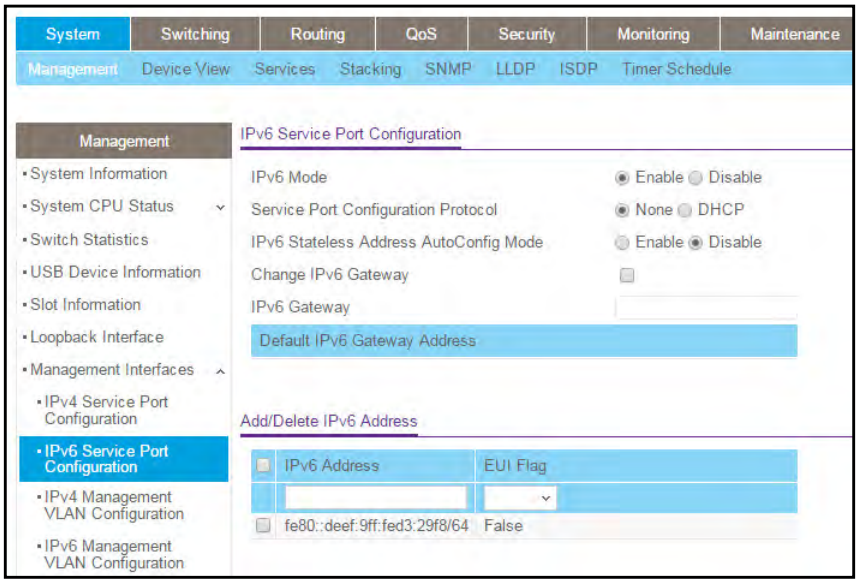
To configure the IPv6 service port:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Management Interfaces > IPv6 Service Port Configuration**.



5. Select the IPv6 mode **Enable** or **Disable** radio button.

   This specifies the IPv6 administrative mode on the service port.

6. Select the Service Port Configuration Protocol **None** or **DHCP** radio button.

   This specifies whether the device acquires network information from a DHCPv6 server. Selecting **None** disables the DHCPv6 client on the service port.

7. Select the IPv6 Stateless Address AutoConfig mode **Enable** or **Disable** radio button:
   - **Enable**. The service port can acquire an IPv6 address through IPv6 Neighbor Discovery Protocol (NDP) and through the use of router advertisement messages.
   - **Disable**. The service port does not use the native IPv6 address autoconfiguration feature to acquire an IPv6 address.

   This sets the IPv6 stateless address autoconfiguration mode on the service port.

8. The **DHCPv6 Client DUID** field displays the client identifier used by the DHCPv6 client (if enabled) when sending messages to the DHCPv6 server.
9. To configure the IPv6 gateway, select the **Change IPv6 Gateway** check box.

   The IPv6 gateway is the default gateway for the IPv6 service port interface.

10. Use the **IPv6 Gateway** field to specify the default gateway for the IPv6 service port interface.

    The **Add/Delete IPv6 Address** table lists the manually configured static IPv6 addresses on the service port interface.

11. Specify the following:
    a. In the **IPv6 Address** field, specify the IPv6 address to add or remove from the service port interface.
    b. Select the **EUI Flag** option to enable the Extended Universal Identifier (EUI) flag for IPv6 address, or clear the option to omit the flag.
12. Click the **Add** button.

    The IPv6 address is added to the service port interface.

13. Click the **Apply** button.

    Your settings are saved.

Management VLAN Overview

For you to manage the device by using the web-based configuration utility, the device management IP address must be defined and known. A management VLAN interface is created by default and it gets an IP address if a DHCP server is present. If it fails to get an IP address, a fallback address 169.254.100.100/255.255.0.0 is assigned to it. Management VLAN is used as the default source interface for syslog, message log, and SNMP client, and so on The network interface is disabled by default.

The management VLAN is the logical interface used for in-band connectivity with the switch through any of the switch's front panel ports. The configuration parameters associated with the switch's management VLAN do not affect the configuration of the front panel ports through which traffic is switched or routed.

To access the switch over a network, you must first configure it with IP information (IP address, subnet mask). You can configure the IP information using any of the following:

- DHCP
- Terminal interface through the EIA-232 port

After you establish in-band connectivity, you can change the IP information using any of the following:

- Terminal interface through the EIA-232 port
- Terminal interface through Telnet
- SNMP-based management
- Web-based management

Configure an IPv4 Management VLAN

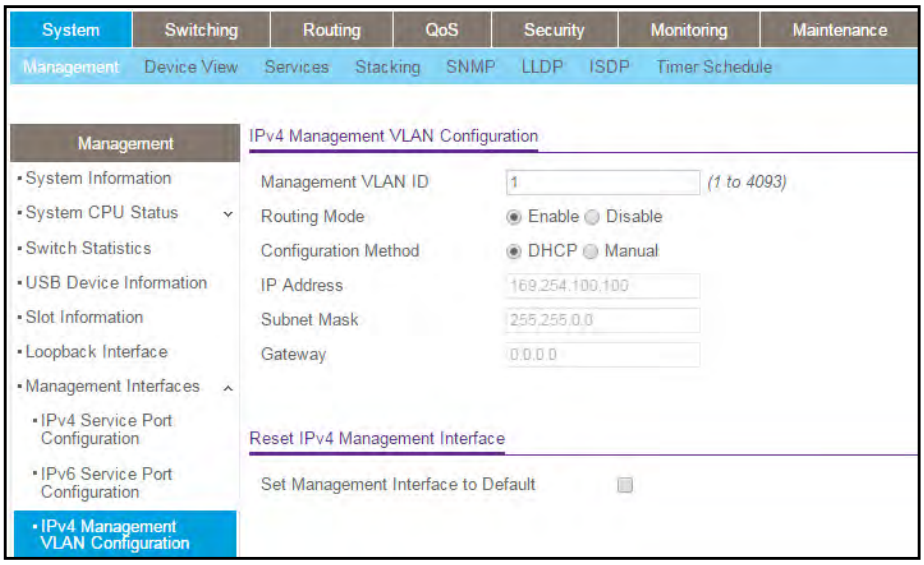
To configure an IPv4 Management VLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Management Interfaces > IPv4 Management VLAN Configuration**.



5. In the **Management VLAN ID** field, specify the Management VLAN ID of the switch. The management VLAN is used for management of the switch. It can be configured to any value in the range of 1–4093.
6. Select the **Routing Mode** radio button to **Enable** or **Disable** the global routing on the device. The default value is Enable.
7. Select the **Configuration Method DHCP** or **Manual** radio button:
   - **DHCP**. Transmit a DHCP request.
   - **Manual**. Do nothing.

   This specifies what the switch does on start-up.
8. Specify the **IP Address** of the interface.

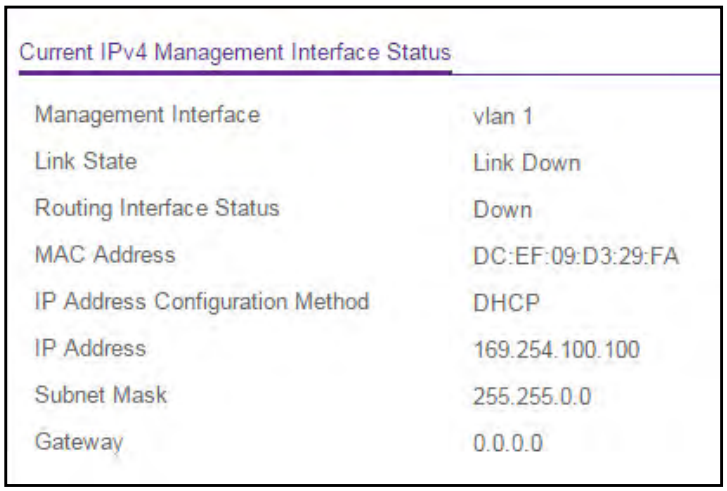
   The factory default value is 169.254.100.100.
9. Specify the IP **Subnet Mask** for the interface. This is also referred to as the subnet/network mask and defines the portion of the interface's IP address that is used to identify the attached network.

   The factory default value is 255.255.0.0.
10. Specify the **Gateway** for the management VLAN interface.

    The factory default value is 0.0.0.0.
11. In the Reset IPv4 Management Interface section of the page, use the **Set Management Interface to Default** option to set the IPv4 management interface to the default VLAN 1.
12. Click the **Apply** button.

    Your settings are saved.

The Current IPv4 Management Interface Status is displayed at the bottom of the page.



The table below describes the nonconfigurable fields.

Table 16. Nonconfigurable IPv4 Management Interface Status

Field	Description
Management Interface	Displays the current IPv4 management interface
Link State	Indicates whether the link status is up or down.
Routing Interface Status	Indicates whether the link status is up or down for the management interface.
MAC Address	The MAC address assigned to the management interface.
IP Address Configuration Method	Indicates whether the IP address configuration method is DHCP or manual.
IP Address	The IP address of the management interface.
Subnet Mask	The IP subnet mask for the management interface.
Gateway	The specified default gateway for the management interface.

Configure an IPv6 Management VLAN

To configure IPv6 Management, you have the choice to configure IPv6 Management using the same VLAN as is used for IPv4 Management or using a different VLAN. IPv6 Management configuration is non-default and you need to create it manually.

To configure an IPv6 management VLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

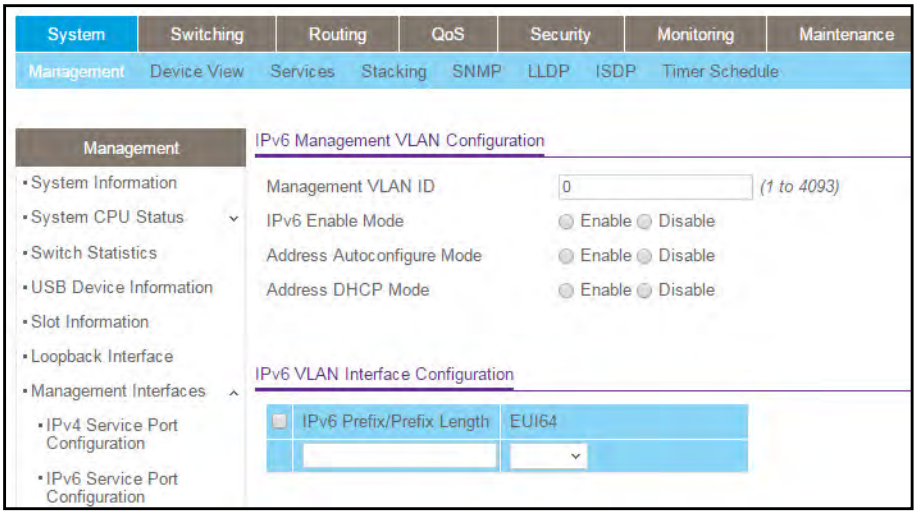
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Management > Management Interfaces > IPv6 Management VLAN Configuration**.



5. In the **Management VLAN ID** field, specify the Management VLAN ID of the switch. The management VLAN is used for management of the switch. The VLAN ID can be any value from 1 to 4093. There is no IPv6 management interface configured by default.
6. Select the **IPv6 Enable Mode** radio button **to Enable** or **Disable** the administration mode for the management VLAN IPv6 interface on the switch.
7. Select the radio button to **Enable** or **Disable Address Autoconfigure Mode**. If you select Enable, the IPv6 network parameters (IPv6 prefix and prefix length) are autoconfigured for the configured management VLAN interface. The default value for VLAN 1 is Auto Config.

   Note: The Address Autoconfigure mode option is available only if unicast routing is globally disabled.

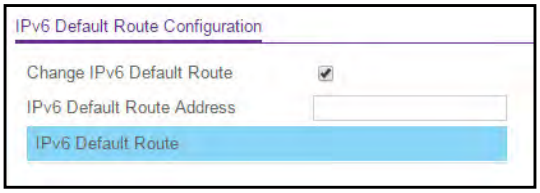
8. Select the **Address DHCP Mode Enable** or **Disable** radio button.
9. In the IPv6 VLAN Interface Configuration section of the page, select the **IPv6 Prefix/Prefix Length** option, then specify the IPv6 address to add or remove from the management VLAN interface. When Address Autoconfigure Mode is selected, the appropriate IPv6 prefix and prefix length is shown in this field.
10. Select the **EU164** option to **True** (enabled) the Extended Universal Identifier (EUI) flag for an IPv6 address. The value is False if not specified.
11. Click the **Add** button.

    The IPv6 address is added to the management VLAN.

12. Click the **Apply** button.

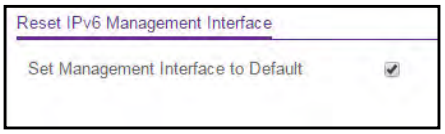
Your settings are saved.

In the IPv6 Default Route Configuration section of the page, the nonconfigurable **IPv6 Default Route** that is displayed is the default route for the IPv6 VLAN interface.



13. To make changes, do the following:

- To add or remove the IPv6 default route, select the **Change IPv6 Default Route** option, and specify the address value in the **IPv6 Default Route Address** field.
- To reset the IPv6 management interface to the default VLAN 1, select the **Set Management Interface to Default** option.

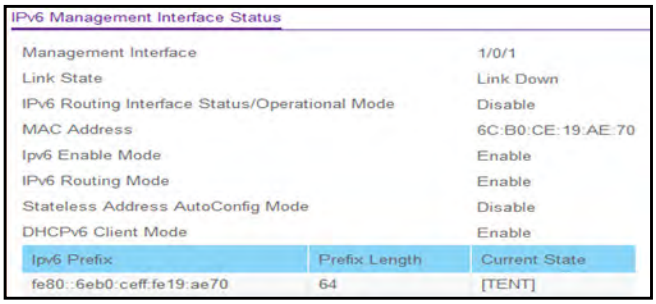


14. If you make any changes, click the **Apply** button.

Your settings are saved.

By default there is no IPv6 Management Interface.

The current **IPv6 Management Interface Status** is displayed at the bottom of the page.



The table below describes the nonconfigurable fields.

Table 17. Current IPv6 Management Interface Status

Field	Description
Management Interface	Displays the current IPv6 management interface
Link State	Indicates whether the link status is up or down.
IPv6 Routing Interface Status/Operational Mode	Indicates whether the link status is up or down for the management interface.

Table 17. Current IPv6 Management Interface Status

Field	Description
MAC Address	The MAC address assigned to the management interface.
IPv6 Enable Mode	Indicates whether IPv6 Enable Mode on the management interface is enabled or disabled.
IPv6 Routing Mode	Indicates whether IPv6 Routing Mode on the management interface is enabled or disabled.
Stateless Address Autoconfig Mode	Indicates whether the IP address autoconfiguration mode on the management interface is enabled or disabled.
DHCPv6 Client Mode	The Address DHCP mode on the management interface.
IPv6 Default Gateway	The IPv6 default gateway of the switch.
IPv6 Next Hop Interface	The IPv6 next hop interface of the switch.
Prefix Length	The prefix length on the management interface.
EU164	The EUI-64 flag of the IPv6 address on the management interface.
Current State	The current state of the IPv6 address on the management interface.

Configure an IPv4 Management Interface

Use this page for port-based IP management for IPv4.

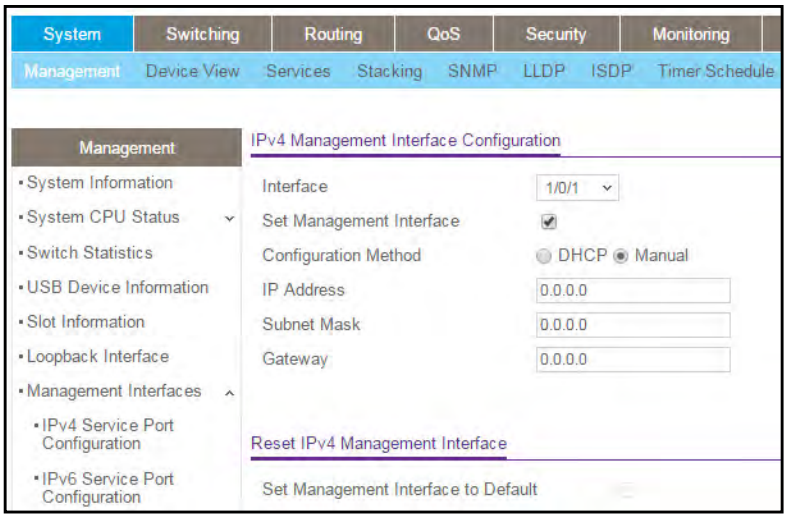
To configure an IPv4 management interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Management Interfaces > IPv4 Management Interface Configuration**.



5. Use the **Interface** list to select the interface for which IPv4 parameters or management interface can be changed.
6. When you select the **Set Management Interface** option, it means that the management interface must be configured based on the interface selected.

   By default, this option is not selected.
7. Select the **Configuration Method** DHCP or Manual radio button.
8. Specify the **IP Address** of the interface and the subnet mask for the management interface.

   This is also referred to as the subnet/network mask, and defines the portion of the interface's IP address that is used to identify the attached network. The factory default value is 169.254.100.100.
9. In the **Subnet Mask** field, specify the IP subnet mask for the interface.

   The factory default value is 255.255.0.0.
10. In the **Gateway** field, specify the default gateway for the management interface.

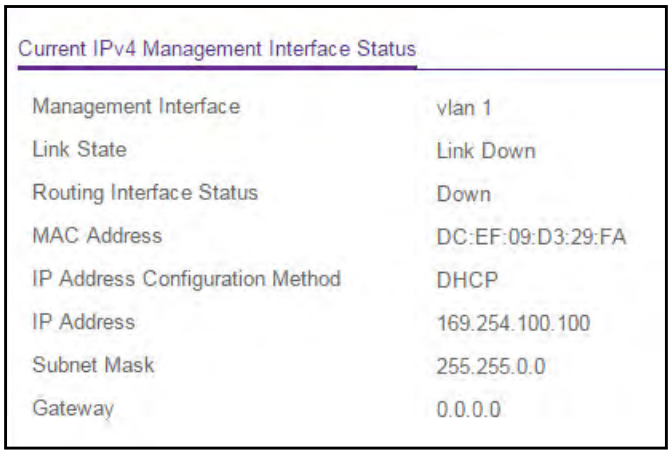
    The default value is 0.0.0.0.

Note: If you need to reset the IPv4 management interface, in the Reset IPv4 Management Interface section of the page, use the **Set Management Interface to Default** option to delete the port-based IPv4 management interface configuration and set the IPv4 management interface back to the default VLAN 1.

11. Click the **Apply** button.

    Your settings are saved.

    The Current IPv4 Management Interface Status is displayed at the bottom of the page.



The table below describes the nonconfigurable fields.

Table 18. Nonconfigurable IPv4 Management Interface Status

Field	Description
Management Interface	Displays the current IPv4 management interface
Link State	Indicates whether the link status is up or down.
Routing Interface Status	Indicates whether the link status is up or down for the management interface.
MAC Address	The MAC address assigned to the management interface.
IP Address Configuration Method	Indicates whether the IP address configuration method is DHCP or manual.
IP Address	The IP address of the management interface.
Subnet Mask	The IP subnet mask for the management interface.
Gateway	The specified default gateway for the management interface.

Configure an IPv6 Management Interface

Use this page for port-based IP management for IPv6.

To configure an IPv6 management interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

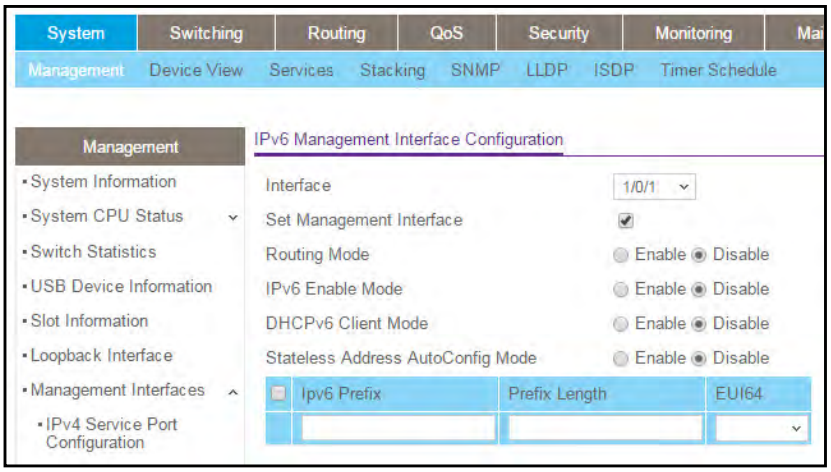
   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

4. Click the **Login** button.

   The System Information page displays.

5. Select **System > Management > Management Interfaces > IPv6 Management Interface Configuration**.



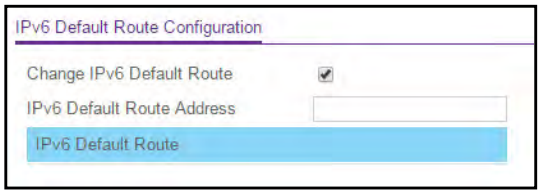
6. Use the **Interface** list to select the interface for which IPv6 parameters or management interface can be changed.
7. When you select the **Set Management Interface** option, it means that the management interface must be configured based on the interface selected. By default, this option is not selected.
8. Select the radio button to enable or disable the **Routing Mode** on the management interface.
9. Select the radio button to enable or disable the **IPv6 Mode** on the management interface.
10. Select the radio button to enable or disable the **DHCPv6 Client Mode** on the management interface.
11. Select the radio button to enable or disable the **Address Autoconfigure Mode** on the management interface.

    Note: The Address AutoConfigure Mode option is available only if Unicast Routing is globally disabled.

12. Click the **Apply** button.

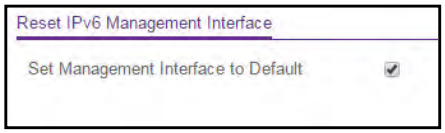
    Your settings are saved.

    In the IPv6 Default Route Configuration section of the page, the nonconfigurable **IPv6 Default Route** that is displayed is the default route for the IPv6 management interface.



13. To make changes, do the following:

- To add or remove the IPv6 default route, select the **Change IPv6 Default Route** option, and specify the address value in the **IPv6 Default Route Address** field.
- In the Reset IPv6 Management Interface section of the page, use the **Set Management Interface to Default** option to delete the port-based IPv6 management interface configuration and set the IPv6 management interface back to the default VLAN 1.



14. If you make any changes, click the **Apply** button.

Your settings are saved.

The current IPv6 Management Interface Status is displayed at the bottom of the page. The table below describes the nonconfigurable fields.

Table 19. Current IPv6 Management Interface Status

Field	Description
Management Interface	Displays the current IPv6 management interface
Link State	Indicates whether the link status is up or down.
IPv6 Routing Interface Status/Operational Mode	Indicates whether the link status is up or down for the management interface.
MAC Address	The MAC address assigned to the management interface.
IP Address Configuration Method	Indicates whether the IP address configuration method is DHCP or manual.
IP Address	The IP address of the management interface.
Subnet Mask	The IP subnet mask for the management interface.
Gateway	The specified default gateway for the management interface.

Manage the Time Settings

The switch software supports the Simple Network Time Protocol (SNTP). As its name suggests, it is a less complicated version of Network Time Protocol, which is a system for synchronizing the clocks of networked computer systems, primarily when data transfer is handled through the Internet.

Configure the Time Setting

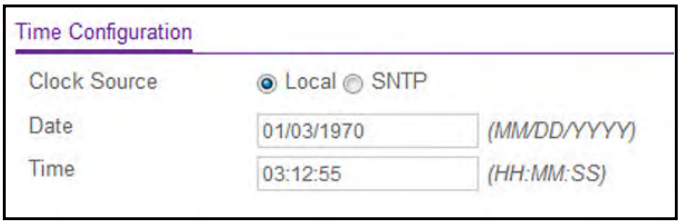
To configure the time setting:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Time > Time Configuration**.



5. Select the Clock Source **Local** or **SNTP** radio button.

   The default is SNTP. The local clock can be set to SNTP only if the following two conditions are met:

   - The SNTP server is configured.
   - The SNTP last attempt status is successful.
6. In the **Date** field, specify the current date in months, days, and years.
7. In the **Time** field, specify the current time in hours, minutes, and seconds.
8. Click the **Apply** button.

   Your settings are saved.

Configure the SNTP Global Settings

To configure the SNTP global settings:

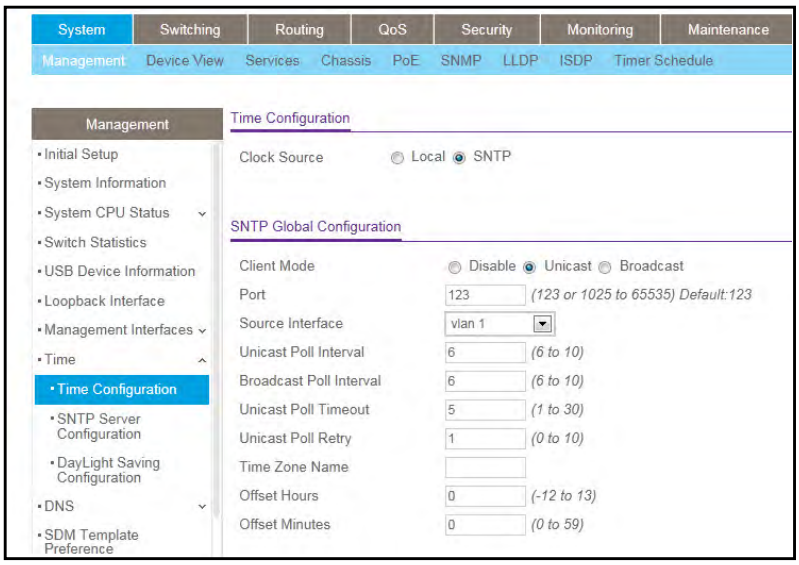
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Time > Time Configuration > SNTP Global Configuration.**

   When you select the **SNTP** option as the **Clock Source**, the SNTP Global Configuration section is displayed below the Time Configuration section of the page.



5. Select a **Client mode** radio button to specify the mode of operation of the SNTP client:
   - **Disable**. SNTP is not operational. No SNTP requests are sent from the client and no received SNTP messages are processed.
   - **Unicast**. SNTP operates in a point-to-point fashion. A unicast client sends a request to a designated server at its unicast address and expects a reply from which it can determine the time and, optionally, the round-trip delay and local clock offset relative to the server.
   - **Broadcast**. SNTP operates in the same manner as multicast mode but uses a local broadcast address instead of a multicast address. The broadcast address has a single subnet scope while a multicast address has Internet wide scope.

The default value is Unicast.

6. In the **Port** field, specify the local UDP port that the SNTP client receives server packets on.

   The allowed range is 1025 to 65535 and the value 123. The default value is 123. When the default value is configured, the actual client port value used in SNTP packets is assigned by the operating system.

7. Select the **Source Interface** to use for the SNTP client.

   Possible values are as follows:

   - None
   - VLAN 1
   - Routing interface
   - Routing VLAN
   - Routing loopback interface
   - Tunnel interface
   - Service port

   By default VLAN 1 is used as the source interface.

8. Specify the **Unicast Poll Interval**.

   This is the number of seconds between unicast poll requests expressed as a power of two when configured in unicast mode. The allowed range is 6 to 10. The default value is 6.

9. Specify the **Broadcast Poll Interval**.

   This is the number of seconds between broadcast poll requests expressed as a power of 2 when configured in broadcast mode. Broadcasts received prior to the expiry of this interval are discarded. The allowed range is 6 to 10. The default value is 6.

10. Specify the **Unicast Poll Timeout**.

    This is the number of seconds to wait for an SNTP response when configured in unicast mode. The allowed range is 1 to 30. The default value is 5.

11. Specify the **Unicast Poll Retry**.

    This is the number of times to retry a request to an SNTP server after the first time-out before attempting to use the next configured server when configured in unicast mode. The allowed range is 0 to 10. The default value is 1.

12. Use the **Time Zone Name** field to configure a time zone specifying the number of hours and, optionally, the number of minutes difference from UTC with **Offset Hours** and **Offset Minutes**.

    The time zone can affect the display of the current system time. The default value is UTC. When using SNTP/NTP time servers to update the switch's clock, the time data received from the server is based on Coordinated Universal Time (UTC), which is the same as Greenwich Mean Time (GMT). This might not be the time zone in which the switch is located.

13. Use the **Offset Hours** field to specify the number of hours of difference from UTC.

    The allowed range is –12 to 13. The default value is 0.

14. Use the **Offset Minutes** field to specify the number of minutes of difference from UTC.

    The allowed range is 0 to 59. The default value is 0.

15. Click the **Apply** button.

    Your settings are saved.

View SNTP Global Status

When you select the **SNTP** option as the **Clock Source**, the SNTP global status is displayed below the SNTP Global Configuration section of the page.

To view SNTP global status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

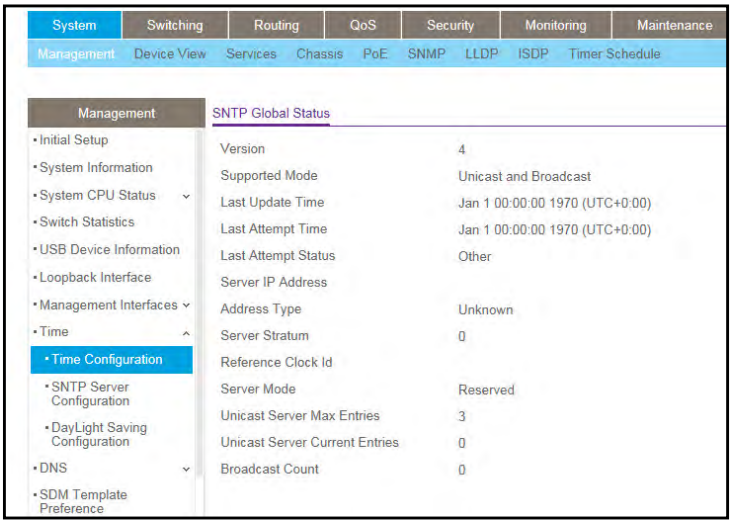
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. **Select System > Management > Time > Time Configuration > SNTP Global Status**
5. Select the **SNTP** option as the **Clock Source**.

   The SNTP Global Status is displayed below the SNTP Global Configuration section.



The following table displays the nonconfigurable SNTP Global Status information.

Table 20. SNTP Global Status

Field	Description
Version	The SNTP version that the client supports.
Supported mode	The SNTP modes that the client supports. Multiple modes can be supported by a client.
Last Update Time	The local date and time (UTC) that the SNTP client last updated the system clock.
Last Attempt Time	The local date and time (UTC) of the last SNTP request or receipt of an unsolicited message.
Last Attempt Status	The status of the last SNTP request or unsolicited message for both unicast and broadcast modes. If no message was received from a server, a status of **Other** is displayed. These values are appropriate for all operational modes. • **Other**. None of the following enumeration values. • **Success**. The SNTP operation was successful and the system time was updated. • **Request Timed Out**. A directed SNTP request timed out without receiving a response from the SNTP server. • **Bad Date Encoded**. The time provided by the SNTP server is not valid. • **Version Not Supported**. The SNTP version supported by the server is not compatible with the version supported by the client. • **Server Unsynchronized**. The SNTP server is not synchronized with its peers. This is indicated through the *leap indicator* field on the SNTP message. • **Server Kiss Of Death**. The SNTP server indicated that no further queries were to be sent to this server. This is indicated by a stratum field equal to 0 in a message received from a server.
Server IP Address	The IP address of the server for the last received valid packet. If no message was received from any server, an empty string is shown.
Address Type	The address type of the SNTP server address for the last received valid packet.
Server Stratum	The claimed stratum of the server for the last received valid packet.
Reference Clock ID	The reference clock identifier of the server for the last received valid packet.
Server mode	The mode of the server for the last received valid packet.
Unicast Server Max Entries	The maximum number of unicast server entries that can be configured on this client.
Unicast Server Current Entries	The number of current valid unicast server entries configured for this client.
Broadcast Count	The number of unsolicited broadcast SNTP messages that were received and processed by the SNTP client since the last reboot.

Configure an SNTP Server

SNTP assures accurate network device clock time synchronization up to the millisecond. Time synchronization is performed by a network SNTP server. The switch software operates only as an SNTP client and cannot provide time services to other systems.

Time sources are established by stratums. Stratums define the accuracy of the reference clock. The higher the stratum (where zero is the highest), the more accurate the clock. The device receives time from Stratum 1 and above since it is itself a Stratum 2 device.

The following is an example of stratums:

- **Stratum 0**. A real-time clock is used as the time source, for example, a GPS system.
- **Stratum 1**. A server that is directly linked to a Stratum 0 time source is used. Stratum 1 time servers provide primary network time standards.
- **Stratum 2**. The time source is distanced from the Stratum 1 server over a network path. For example, a Stratum 2 server receives the time over a network link, through NTP, from a Stratum 1 server.

Information received from SNTP servers is evaluated based on the time level and server type.

SNTP time definitions are assessed and determined by the following time levels:

- **T1**. Time that the original request was sent by the client.
- **T2**. Time that the original request was received by the server.
- **T3**. Time that the server sent a reply.
- **T4**. Time that the client received the server's reply.

The device can poll unicast server types for the server time.

Polling for unicast information is used for polling a server for which the IP address is known. SNTP servers that were configured on the device are the only ones that are polled for synchronization information. T1 through T4 are used to determine server time. This is the preferred method for synchronizing device time because it is the most secure method. If this method is selected, SNTP information is accepted only from SNTP servers defined on the device using the SNTP Server Configuration page.

The device retrieves synchronization information, either by actively requesting information or at every poll interval.

You can view and modify information for adding and modifying Simple Network Time Protocol SNTP servers.

To configure the SNTP server settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

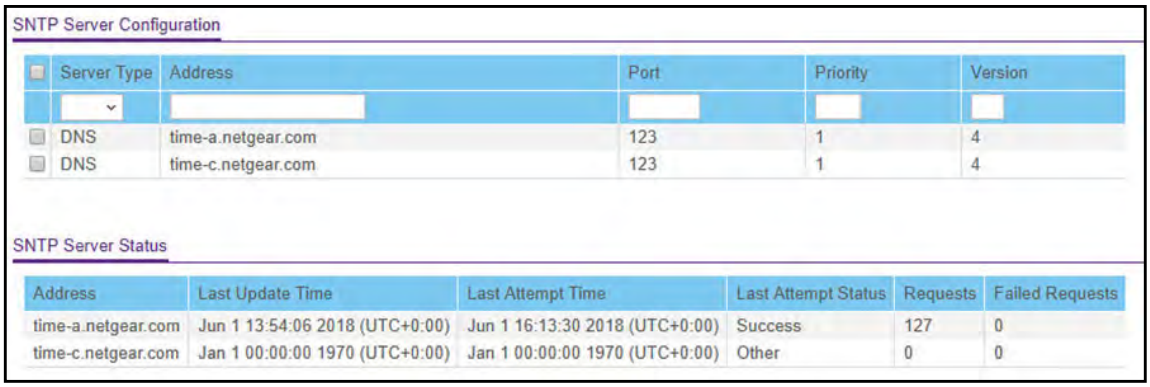
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Management > Time > SNTP Server Configuration**.



5. In the **Server Type** list, select the address type of the configured SNTP server address.

   Possible values are as follows:

   - IPv4
   - IPv6
   - DNS

   The default value is IPv4.

6. In the **Address** field, specify the address of the SNTP server.

   This is a text string of up to 64 characters, containing the encoded unicast IP address or host name of an SNTP server. Unicast SNTP requests are sent to this address. If this address is a DNS host name, then that host name is resolved into an IP address each time an SNTP request is sent to it.

   Two SNTP servers exist by default:

   - time-a.netgear.com
   - time-c.netgear.com

7. Enter a **Port** number on the SNTP server to which SNTP requests are sent.

   The valid range is 1 to 65535. The default value is 123.

8. Specify the **Priority** of this server entry in determining the sequence of servers to which SNTP requests are sent.

   The client continues sending requests to different servers until a successful response is received, or all servers are exhausted. The priority indicates the order in which to query the servers. A server entry with a precedence of 1 is queried before a server with a priority of 2, and so forth. If more than one server has the same priority, then the

requesting order follows the lexicographical ordering of the entries in this table. The valid range is 1 to 3. The default value is 1.

9. Specify the **NTP Version** running on the server.

   The range is 1 to 4. The default value is 4.

10. Click the **Add** button.

    The SNTP server entry is added.

11. Repeat the previous steps to add additional SNTP servers.

    You can configure up to three SNTP servers.

12. Click the **Apply** button.

    Your settings are saved.

13. To change the settings, remove an SNTP server, or refresh the page, do the following:
    - **Change the settings**. To change the settings for an existing SNTP server, select the check box next to the configured server, enter new values in the available fields, and click the **Apply** button.

      Your settings are saved.
    - **Remove an SNTP server**. To remove an SNTP server entry, select the check box next to the configured server to remove, and then click the **Delete** button.

      The entry is removed, and the device is updated.
    - **Refresh the page**. To refresh the page, click the **Refresh** button.

The SNTP Server Status table displays status information about the SNTP servers configured on your switch. The following table displays SNTP Server Status information.

Table 21. SNTP Server Status

Field	Description
Address	All the existing server addresses. If no server configuration exists, a message saying No SNTP server exists flashes on the page.
Last Update Time	The local date and time (UTC) that the response from this server was used to update the system clock.
Last Attempt Time	The local date and time (UTC) that this SNTP server was last queried.

Table 21. SNTP Server Status (continued)

Field	Description
Last Attempt Status	The status of the last S9 NTP request to this server. If no packet was received from this server, a status of Other is displayed. • **Other**. None of the following enumeration values. • **Success**. The SNTP operation was successful and the system time was updated. • **Request Timed Out**. A directed SNTP request timed out without receiving a response from the SNTP server. • **Bad Date Encoded**. The time provided by the SNTP server is not valid. • **Version Not Supported**. The SNTP version supported by the server is not compatible with the version supported by the client. • **Server Unsynchronized**. The SNTP server is not synchronized with its peers. This is indicated through the leap indicator field on the SNTP message. • **Server Kiss Of Death**. The SNTP server indicated that no further queries were to be sent to this server. This is indicated by a stratum field equal to 0 in a message received from a server.
Requests	The number of SNTP requests made to this server since last agent reboot.
Failed Requests	The number of failed SNTP requests made to this server since last reboot.

Configure Daylight Saving Time Settings

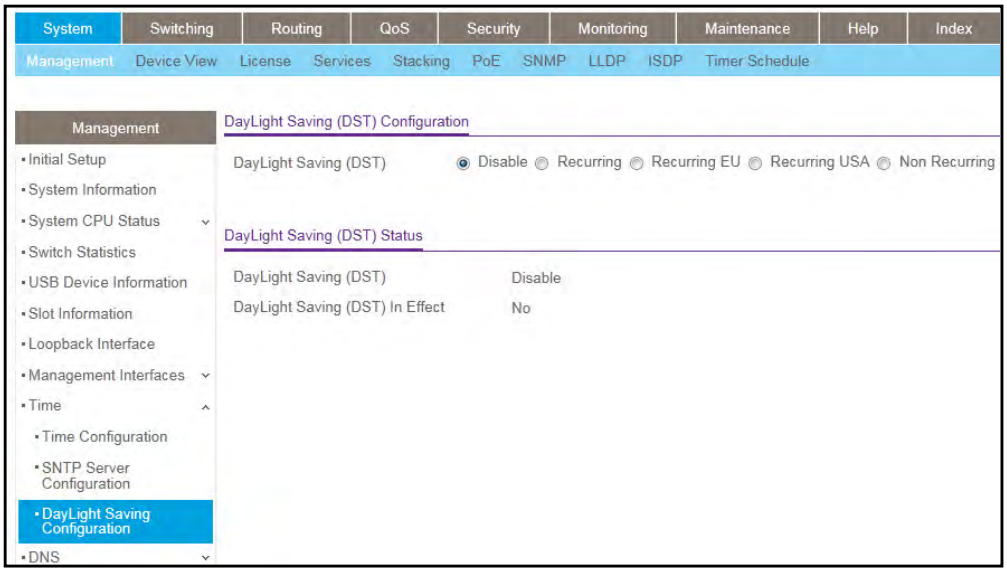
To configure the Daylight Saving Time settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Time > Daylight Saving Configuration**.



5. Select Daylight Saving (DST) radio button:
   - **Disable**. Disable daylight saving time.
   - **Recurring**. Enable Recurring daylight saving time.
   - **Recurring EU**. Enable recurring EU daylight saving time.
   - **Recurring USA**. Enable recurring USA daylight saving time.
   - **Non Recurring**. Configure non-recurring daylight saving time.
6. Click the **Apply** button.

   Your settings are saved.

The fields in the following tables are visible only when DayLight Saving is **Recurring** or **Recurring EU** or **Recurring USA**.

Table 22. DayLight Saving - Recurring

Field	Description
Begins At	These fields are used to configure the start values of the date and time. • **Week**. Configure the start week. • **Day**. Configure the start day. • **Month**. Configure the start month. • **Hours**. Configure the start hours. • **Minutes**. Configure the start minutes.
Ends At	These fields are used to configure the end values of date and time. • **Week**. Configure the end week. • **Day**. Configure the end day. • **Month**. Configure the end month. • **Hours**. Configure the end hours. • **Minutes**. Configure the end minutes.

Table 22. DayLight Saving - Recurring

Field	Description
Offset	Configure recurring offset in minutes. The valid range is 1–1440 minutes.
Zone	Configure the time zone.

The fields in the following table are visible only when DayLight Saving is **Non Recurring**.

Table 23. DayLight Saving - Non Recurring

Field	Description
Begins At	These fields are used to configure the start values of the date and time. • **Week**. Configure the start week. • **Day**. Configure the start day. • **Month**. Configure the start month. • **Hours**. Configure the start hours. • **Minutes**. Configure the start minutes.
Ends At	These fields are used to configure the end values of date and time. • **Week**. Configure the end week. • **Day**. Configure the end day. • **Month**. Configure the end month. • **Hours**. Configure the end hours. • **Minutes**. Configure the end minutes.
Offset	Configure the non-recurring offset in minutes. The valid range is 1–1440 minutes.
Zone	Configure the time zone.

View the DayLight Saving Time Status

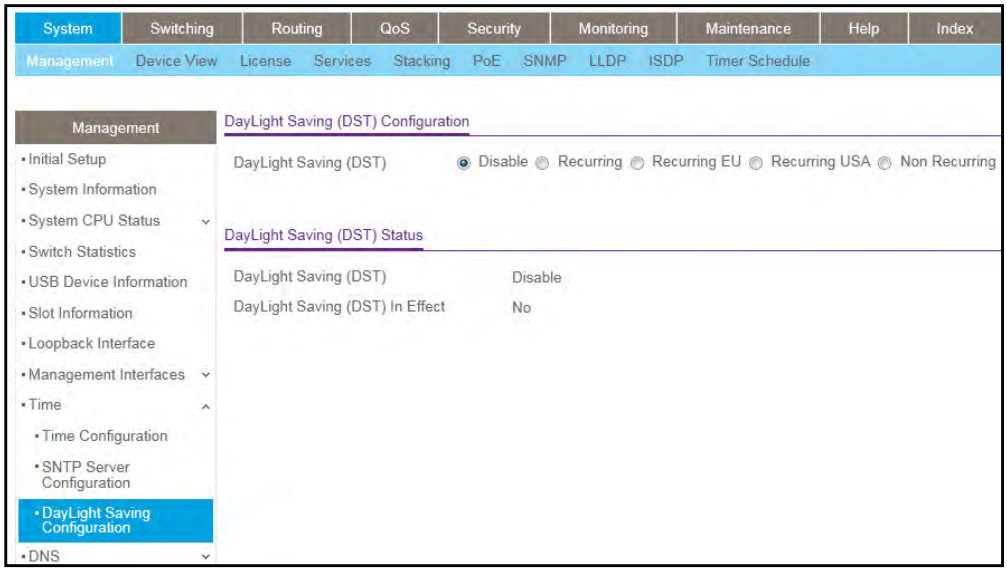
To view the DayLight Saving Time status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Time > DayLight Saving Configuration**.



5. To refresh the page, click the **Refresh** button.

The following table displays the nonconfigurable Daylight Saving (DST) status information.

Table 24. DayLight Saving Status

Field	Description
Daylight Saving (DST)	The Daylight Saving value, which is one of the following: • **Disable** • **Recurring** • **Recurring EU** • **Recurring USA** • **Non Recurring**
Begins At	Displays when the daylight saving time begins. This field is not displayed when daylight saving time is disabled.
Ends At	Displays when the daylight saving time ends. This field is not displayed when daylight saving time is disabled.
Offset (in Minutes)	The offset value in minutes.This field is not displayed when daylight saving time is disabled.
Zone	The zone acronym. This field is not displayed when daylight saving time is disabled.
Daylight Saving (DST) in Effect	Displays whether daylight saving time is in effect.

Manage Precision Time Protocol

Precision Time Protocol (PTP, IEEE 1588) is a protocol that enables precise synchronization of clocks with a sub-microsecond accuracy across a packet-based network. PTP lets network devices of different precision and resolution synchronize to a grandmaster clock through an exchange of packets across the network. The switch supports a PTP end-to-end transparent clock, which is enabled by default, both globally and at the port level.

Note: The switch itself is not affected by PTP.

Manage the Global PTP Settings

By default, PTP is enabled globally on the switch. You can disable PTP to globally, in which case the switch does not support PTP pass-through.

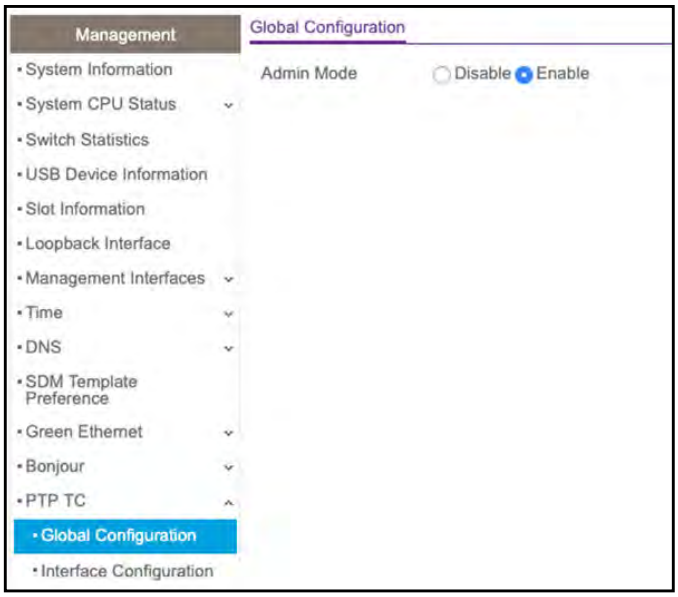
To configure the PTP end-to-end transparent clock settings globally:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > PTP TC > Global Configuration**.



5. Select the Admin Mode **Enable** or **Disable** radio button.

   The default is Enable.

6. Click the **Apply** button.

   Your settings are saved.

Manage the PTP Interface Settings

On a standalone switch, by default, PTP is enabled globally on all interfaces. In a switch stack, by default, PTP is disabled for all interfaces. You can select individual interfaces on which you can enable or disable PTP. If you disable PTP on an interface, the interface does not support PTP pass-through.

To configure the PTP end-to-end transparent clock settings for one or more interfaces:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

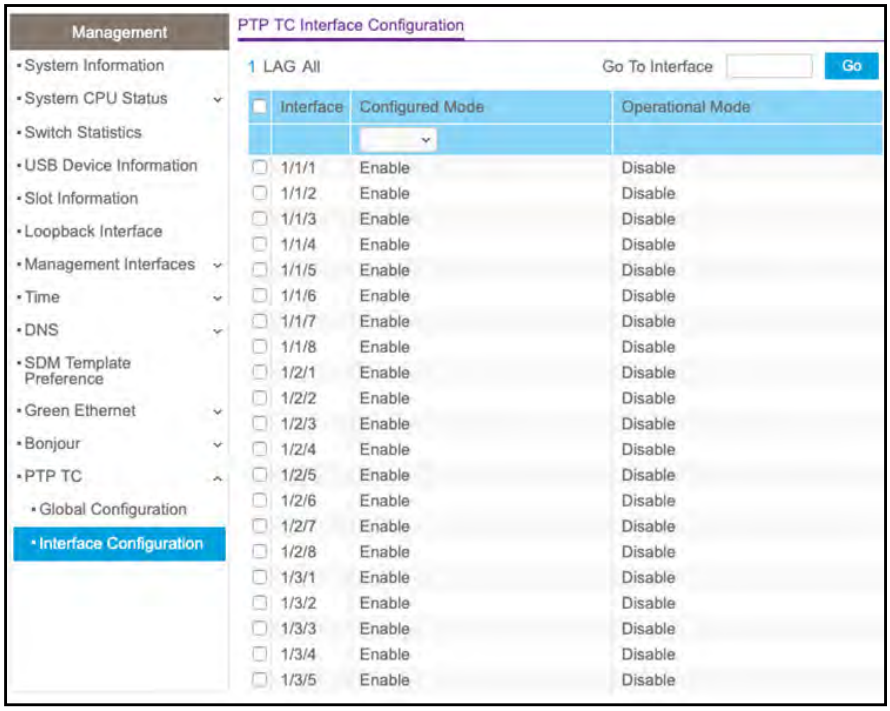
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Management > PTP TC > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure
6. From the **Configured Mode** menu, select **Enable** or **Disable**.

   The default is Enable.
7. Click the **Apply** button.

   Your settings are saved.

   The Operational Mode field shows whether PTP is enabled or disabled for an interface.

Configure DNS Settings

You can configure information about DNS servers that the network uses and how the switch operates as a DNS client.

Configure Global DNS Settings

You can configure global DNS settings and DNS server information.

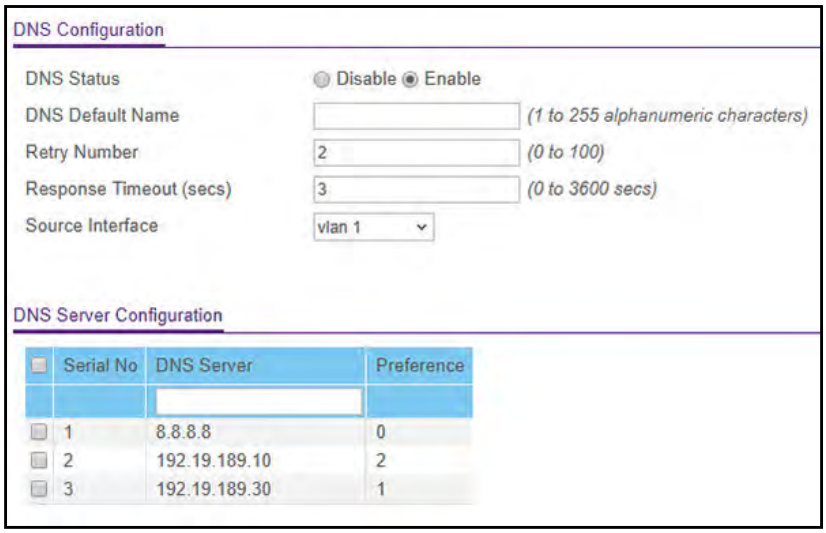
To configure the global DNS settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > DNS > DNS Configuration**.



The DNS Server Configuration table includes a default DNS server with IP address 8.8.8.8.

5. Select the DNS Status **Disable** or **Enable** radio button:
   - **Enable**. Allow the switch to send DNS queries to a DNS server to resolve a DNS domain name. The default value is Enable.
   - **Disable**. Prevent the switch from sending DNS queries.
6. Enter the **DNS Default** domain **Name** to include in DNS queries.

   When the system is performing a lookup on an unqualified host name, this field is provides the domain name (for example, if default domain name is netgear.com and the user enters test, then test is changed to test.netgear.com to resolve the name). The length of the name must not be longer than 255 characters.
7. Use **Retry Number** to specify the number of times to retry sending DNS queries to the DNS server.

   This number ranges from 0 to 100. The default value is 2.
8. Use **Response Timeout (secs)** to specify the amount of time, in seconds, to wait for a response to a DNS query.

   This time-out ranges from 0 to 3600. The default value is 3.
9. Specify the **Source Interface** to use for DNS.

   Possible values are as follows:

   - None
   - VLAN 1
   - Routing interface
   - Routing VLAN
   - Routing loopback interface

- Tunnel interface
- Service port

By default VLAN 1 is used as the source interface.

10. To specify the DNS server to which the switch sends DNS queries, do the following:
    a. In the **DNS Server Address** field in the DNS Server Configuration table, enter an IP address in standard IPv4 or IPv6 dot notation.
    b. Click the **Add** button.

    The server is added to the table. You can specify up to eight DNS servers. The precedence is set in the order that you add the servers.
11. To remove a DNS server from the DNS Server Configuration table, do the following:
    a. Select the check box for the server.
    b. Click the **Delete** button.

    Note: If you click the **Delete** button without selecting a DNS server, all the DNS servers are deleted from the table.
12. Click the **Apply** button.

    Your settings are saved.

The following table displays DNS Server Configuration information.

Table 25. DNS Server Configuration

Field	Description
Serial No	The sequence number of the DNS server.
Preference	Shows the preference of the DNS server. The preference is determined by the order in which they were entered.

Add a Static Entry to the Local DNS Table

You can manually map host names to IP addresses or to view dynamic DNS mappings.

To add a static entry to the local DNS table:

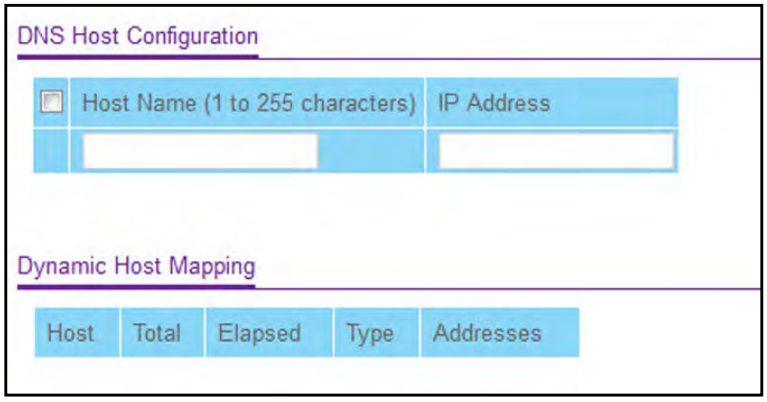
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Management > DNS > Host Configuration**.



5. In the **Host Name (1 to 255 characters)** field, specify the static host name to add.

   Its length cannot exceed 255 characters and it is a mandatory field.

6. In the **IP Address** field, enter the IP address in standard IPv4 dot notation to associate with the host name.
7. Click the **Add** button.

   The entry appears in the list on the page.

The Dynamic Host Mapping table shows host name-to-IP address entries that the switch learned. The following table describes the dynamic host fields.

Table 26. DNS Dynamic Host Mapping

Field	Description
Host	Lists the host name that you assign to the specified IP address.
Total	Amount of time since the dynamic entry was first added to the table.
Elapsed	Amount of time since the dynamic entry was last updated.
Type	The type of the dynamic entry.
Addresses	Lists the IP address associated with the host name.

Configure the Switch Database Management Template Preference

A Switch Database Management (SDM) template is a description of the maximum resources a switch or router can use for various features. Different SDM templates allow different combinations of scaling factors, enabling different allocations of resources depending on how the device is used. In other words, SDM templates enable you to reallocate system resources to support a different mix of features based on your network requirements.

Note: If you attach a unit to a stack and its template does not match the stack's template, then the new unit automatically reboots using the template used by the other stacking members. To avoid the automatic reboot, first set the template to the SDM template used by existing members of the stack. Then power off the new unit, attach it to the stack, and power it on.

You can configure SDM template preferences for the switch.

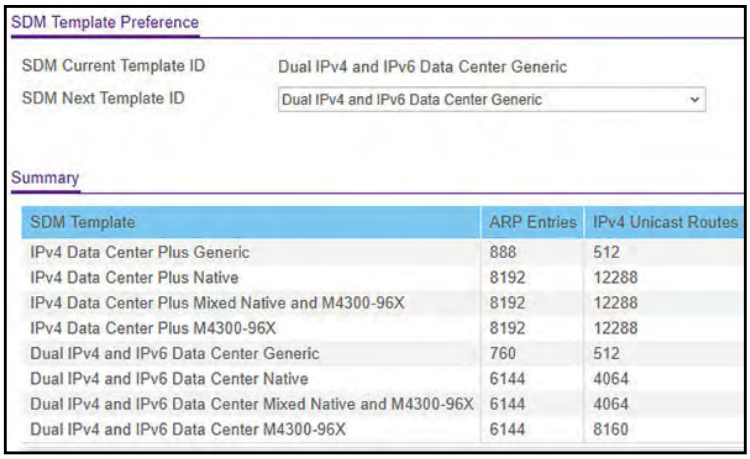
To configure the SDM Template Preference settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > SDM Template Preference**.



5. Use **SDM Next Template ID** to configure the next active template.

   It is active only after the next reboot. To revert to the default template after the next reboot, use the Default option. Possible values are as follows:

   - Default
   - IPv4 Data Center Plus Generic
   - Dual IPv4 and IPv6 Data Center Generic
   - IPv4 Data Center Plus Mixed Native and M4300-96X
   - IPv4 Data Center Plus M4300-96X
   - IPv4 Data Center Plus Native
   - Dual IPv4 and IPv6 Data Center Native
   - Dual IPv4 and IPv6 Data Center Plus Mixed Native and M4300-96X
   - Dual IPv4 and IPv6 Data Center M4300-96X

Note: The templates with the Native keyword are supported only on the M4300-24X24F and M4300-48X stand-alone switches and on a homogenous stack of M4300-24X24F and M4300-48X switches.

The following table displays Summary information.

Table 27. SDM Template Preference Summary

Field	Description
SDM Current Template ID	The current active SDM template. Possible values are as follows: • IPv4 Data Center Plus Generic • IPv4 Data Center Plus Native • IPv4 Data Center Plus Mixed Native and M4300-96X • IPv4 Data Center Plus M4300-96X • Dual IPv4 and IPv6 Data Center Generic • Dual IPv4 and IPv6 Data Center Native • Dual IPv4 and IPv6 Data Center Plus Mixed Native and M4300-96X • Dual IPv4 and IPv6 Data Center M4300-96X
SDM Template	Identifies the template. The possible values are as follows: • IPv4 Data Center Plus Generic • IPv4 Data Center Plus Native • IPv4 Data Center Plus Mixed Native and M4300-96X • IPv4 Data Center Plus M4300-96X • Dual IPv4 and IPv6 Data Center Generic • Dual IPv4 and IPv6 Data Center Native • Dual IPv4 and IPv6 Data Center Plus Mixed Native and M4300-96X • Dual IPv4 and IPv6 Data Center M4300-96X

Table 27. SDM Template Preference Summary (continued)

Field	Description
ARP Entries	The maximum number of entries in the IPv4 Address Resolution Protocol (ARP) cache for routing interfaces.
IPv4 Unicast Routes	The maximum number of IPv4 unicast forwarding table entries.
IPv6 NDP Entries	The maximum number of IPv6 Neighbor Discovery Protocol (NDP) cache entries.
IPv6 Unicast Routes	The maximum number of IPv6 unicast forwarding table entries.
ECMP Next Hops	The maximum number of next hops that can be installed in the IPv4 and IPv6 unicast forwarding tables.
IPv4 Multicast Routes	The maximum number of IPv4 multicast forwarding table entries.
IPv6 Multicast Routes	The maximum number of IPv6 multicast forwarding table entries.

Configure Green Ethernet Settings

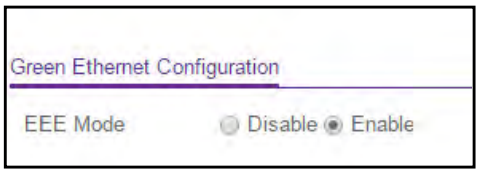
To configure the Green Ethernet settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Green Ethernet > Green Ethernet Configuration**.



5. Select the **EEE mode Disable** or **Enable** radio button. The factory default is enable.

   Energy Efficient Ethernet (EEE) combines the MAC with a family of PHYs that support operation in a low power mode. It is defined by IEEE 802.3az Energy Efficient Task Force. Lower power mode enables both the send and receive sides of the link to disable some functionality for power savings when lightly loaded. Transition to low power mode does not change the link status. Frames in transit are not dropped or corrupted in transition to and from low power mode. Transition time is transparent to upper layer protocols and applications.

6. Click the **Apply** button.

   Your settings are saved.

Configure Green Ethernet Interface Settings

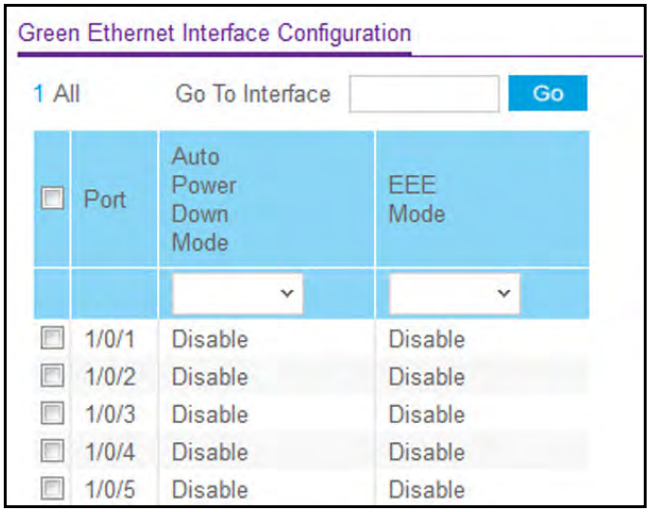
To configure the Green Ethernet interface settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Green Ethernet > Green Ethernet Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure
6. Use the **Auto Power Down mode** selection to enable or disable this option.

   The factory default is Enable. When the port link is down, the PHY automatically goes down for a short period of time, and then wakes up to check link pulses. This allows the switch to perform autonegotiation and save power consumption when no link partner is present.

7. Use the **EEE mode** menu to **Enable** or **Disable** this option.

   The factory default is Disable. IF the EEE mode is not supported, then *N/A* is displayed.

8. Click the **Apply** button.

   Your settings are saved.

Configure Green Ethernet Local and Remote Devices

To configure green Ethernet local and remote devices:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

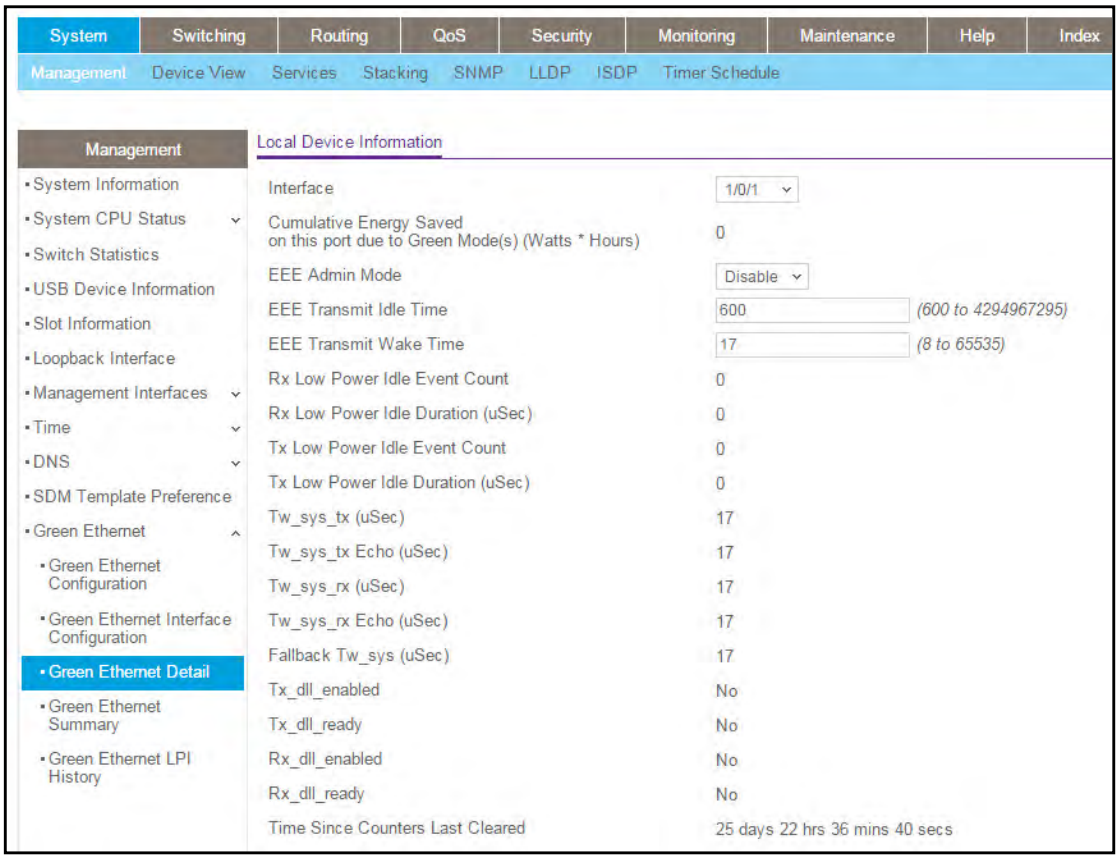
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System** > **Management** > **Green Ethernet** > **Green Ethernet Details**.



5. From the **Interface** menu, select the interface.
6. Use the **EEE Admin Mode** selection to enable or disable Energy Efficient Ethernet Admin Mode on the port. With EEE mode enabled, the port transitions to low power mode during a link idle condition. The default value is Disabled. If EEE Admin Mode is not supported, then N/A is displayed.
7. In the **EEE Transmit Wake Time** field, enter the time for which MAC/switch must wait to go back to active state from LPI state when it receives a packet for transmission. The range is 8 to 65535. The default value is 17.
8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable fields.

Table 28. Green Ethernet Local Device information

Field	Description
Cumulative Energy Saved on this port due to Green mode(s) (Watts * Hours)	Cumulative energy saved due to all green modes enabled on this port in (Watts * Hours).
Rx Low Power Idle Event Count	This field is incremented each time MAC RX enters low-power idle (LPI) state. Shows the total number of Rx LPI events since EEE counters were last cleared.
Rx Low Power Idle Duration (uSec)	This field indicates duration of Rx LPI state in 10 us increments. Shows the total duration of Rx LPI since the EEE counters were last cleared.
Tx Low Power Idle Event Count	This field is incremented each time MAC TX enters LPI state. Shows the total number of Tx LPI events since EEE counters were last cleared.
Tx Low Power Idle Duration (uSec)	This field indicates duration of Tx LPI state in 10 us increments. Shows the total duration of Tx LPI since the EEE counters were last cleared.
Tw_sys_tx (uSec)	Integer that indicates the value of Tw_sys that the local system can support.
Tw_sys_tx Echo (uSec)	Integer that indicates the remote system's Transmit Tw_sys that was used by the local system to compute the Tw_sys that it wants to request from the remote system.
Tw_sys_rx (uSec)	Integer that indicates the value of Tw_sys that the local system requests from the remote system.
Tw_sys_rx Echo (uSec)	Integer that indicates the remote system’s Receive Tw_sys that was used by the local system to compute the Tw_sys that it can support.
Fallback Tw_sys (uSec)	Integer that indicates the value of fallback Tw_sys that the local system requests from the remote system.
Tx_dll_enabled	Data Link Layer Enabled: Initialization status of the EEE transmit Data Link Layer management function on the local system.
Tx_dll_ready	Data Link Layer ready: This variable indicates that the tx system initialization is complete and is ready to update/receive LLDPDU containing EEE TLV.

Table 28. Green Ethernet Local Device information (continued)

Field	Description
Rx_dll_enabled	Status of the EEE capability negotiation on the local system.
Rx_dll_ready	Data Link Layer ready: This variable indicates that the rx system initialization is complete and is ready to update/receive LLDPDU containing EEE TLV.
Time Since Counters Last Cleared	Time Since Counters Last Cleared (since the time of power up, or after EEE counters are cleared).

Configure Green Ethernet Remote Device Details

To configure the Green Ethernet remote device information:

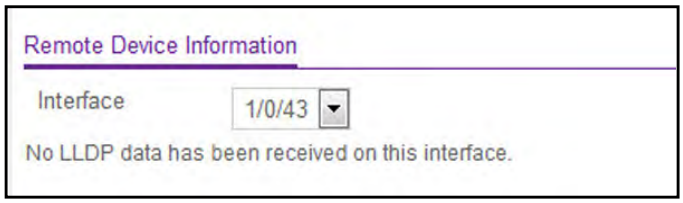
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System** > **Management** > **Green Ethernet** > **Green Ethernet Details.**

   The Green Ethernet Details page displays.
5. Scroll down to the Remote Device Information section.



6. Select the **Interface**.

The following table describes the nonconfigurable fields.

Table 29. Green Ethernet Remote Device Information

Field	Description
Remote ID	The remote client identifier assigned to the remote system.
Remote Tw_sys_tx (uSec)	Integer that indicates the value of Tw_sys that the remote system can support.
Remote Tw_sys_tx Echo (uSec)	Integer that indicates the value of Transmit Tw_sys echoed back by the remote system.
Remote Tw_sys_rx (uSec)	Integer that indicates the value of Tw_sys that the remote system requests from the local system.
Remote Tw_sys_rx Echo (uSec)	Integer that indicates the value of Receive Tw_sys echoed back by the remote system.
Remote Fallback Tw_sys (uSec)	Integer that indicates the value of fallback Tw_sys that the remote system is advertising.

View the Green Ethernet Statistics Summary

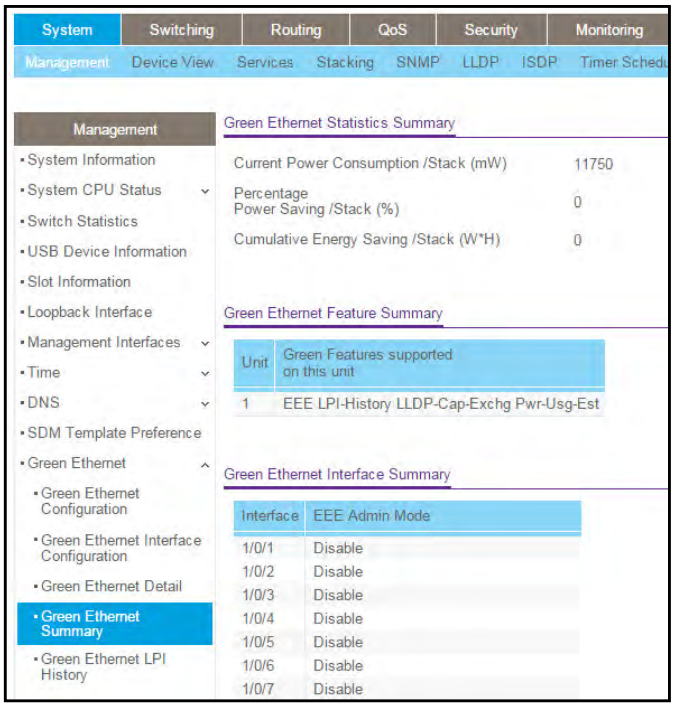
To view the green Ethernet statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System** > **Management** > **Green Ethernet** > **Green Ethernet Summary**.



5. To refresh the page, click the **Refresh** button.

The following table describes the nonconfigurable fields.

Table 30. Green Ethernet Statistics Summary

Field	Description
Current Power Consumption /Stack (mWatts)	Power Consumption by all ports in switch in mWatts (mW).
Percentage Power Saving /Stack (%)	Percentage of power saved on all ports in switch when Green mode is enabled.
Cumulative Energy Saving /Stack (Watts * Hours)	Cumulative energy saved per switch in (watts * hour) when all green modes are enabled.

The following table describes the nonconfigurable fields.

Table 31. Green Ethernet Feature Summary

Field	Description
Unit	The Unit ID.
Green Features supported on this unit	List of green features supported on the given unit, which could be one or more of the following: • EEE (Energy Efficient Ethernet) • LPI-History (EEE Low Power Idle History) • LLDP-Cap-Exchg (EEE LLDP Capability Exchange) • Pwr-Usg-Est (Power Usage Estimates).

Table 31. Green Ethernet Feature Summary (continued)

Field	Description
Interface	Interface for which data is displayed or configured.
Energy Detect Admin mode	Enable or disable Energy Detect mode on the port. When this mode is enabled, when the port link is down, the PHY automatically goes down for a short period of time, then wakes up to check link pulses. This allows the switch to perform autonegotiation and save power consumption when no link partner is present.
Energy Detect Operational Status	Current operational status of the Energy Detect mode.
Short Reach Admin mode	Enable or disable Short Reach Admin mode on the port. With Short Reach mode enabled, PHY is forced to operate in low power mode irrespective of the cable length.
Short Reach Operational Status	Current operational status of the Short Reach mode.
EEE Admin mode	Enable or disable Energy Efficient Ethernet mode on the port. With EEE mode enabled, the port transitions to low power mode during link idle conditions.

The following table describes the nonconfigurable fields.

Table 32. Green Ethernet Interface Summary

Field	Description
Interface	Interface for which data is displayed or configured.
EEE Admin mode	Enable or disable Energy Efficient Ethernet mode on the port. When EEE mode is enabled, the port transitions to Low Power mode during Link Idle condition. If EEE Admin Mode is not supported, then N/A is displayed.

Configure the Green Ethernet EEE LPI History

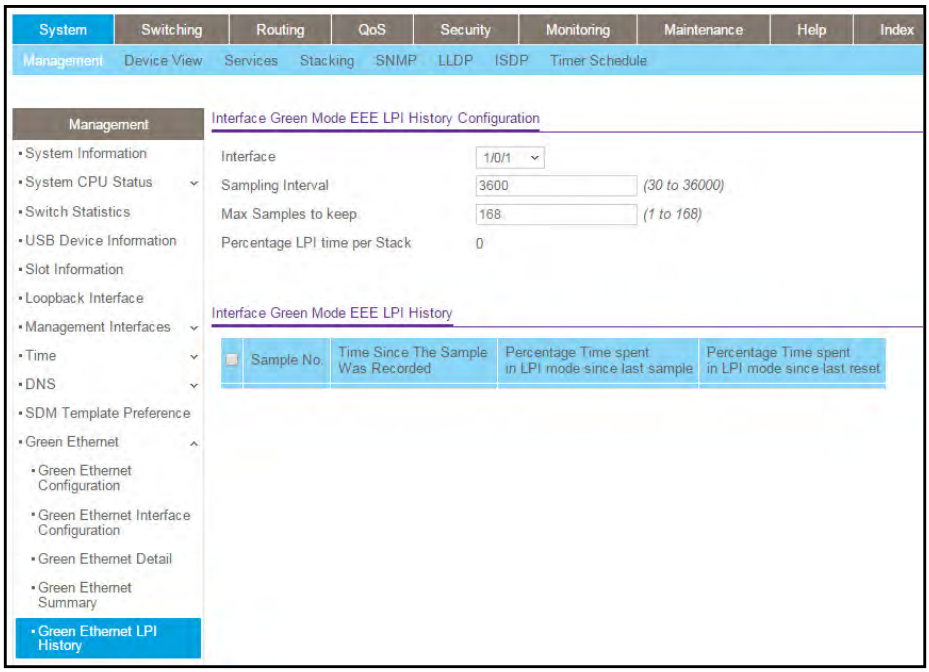
To configure the port Green Mode EEE history:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System** > **Management** > **Green Ethernet** > **Green Ethernet LPI History**.



5. Select the **Interface**.
6. In the **Sampling Interval** field, enter the interval at which EEE LPI data is collected.

   This is a global setting and is applied to all interfaces. The range is 30 to 36000.The default value is 3600.
7. In the **Max Samples To Keep** field, enter the maximum number of samples to keep.

   This is a global setting and is applied to all interfaces. The range is 1 to 168.The default value is 168.
8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable fields.

Table 33. Interface Green mode EEE LPI History

Field	Description
Percentage LPI time per switch	Time spent in LPI mode per switch since EEE counters were last cleared.
Sample No.	Sample index.
Time Since The Sample Was Recorded	Each time the page is refreshed, it shows a different time as it reflects the difference in current time and time at which the sample was recorded.

Table 33. Interface Green mode EEE LPI History

Field	Description
Percentage Time spent in LPI mode since last sample	Percentage of time spent in LPI mode during the current measurement interval.
Percentage Time spent in LPI mode since last reset	Percentage of time spent in LPI mode since EEE LPI statistics were reset.

Configure and Display Bonjour Settings

A Mac OS device that supports Bonjour can discover the switch in the network so that you can find the switch IP address and log in to the local browser UI of the switch. Bonjour is enabled by default. You can disable Bonjour for security reasons.

Enable or Disable Bonjour

To enable or diable Bonjour:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Bonjour > Bonjour Configuration**.

   The Bonjour Global Configuration page displays.
5. Select one of the following radio buttons:
   - **Enable**. Bonjour is enabled. This is the default setting.
   - **Disable**. Bonjour is disabled.
6. Click the **Apply** button.

   Your settings are saved.

Display Bonjour Information

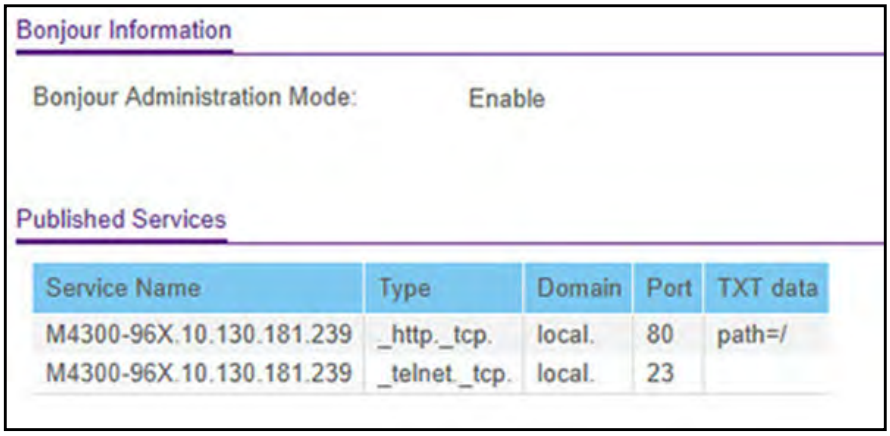
To display Bonjour information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Management > Bonjour > Bonjour Details**.



   The Bonjour Administration Mode field displays whether Bonjour is enabled or disabled.
5. To refresh the page, click the **Refresh** button.

The following table describes the nonconfigurable fields that are displayed.

Table 34. Bonjour Published Services

Field	Description
Service Name	The Bonjour service names in the switch.
Type	The Bonjour service type names in the switch.
Domain	The Bonjour service domain in the switch.
Port	The Bonjour service port number.
TXT Data	The Bonjour service text.

Configure DHCP Server Settings

You can configure settings for DHCP server, DHCP pools, DHCP bindings, and DHCP relay. You can also view DHCP statistics and conflicts.

Configure DHCP Server

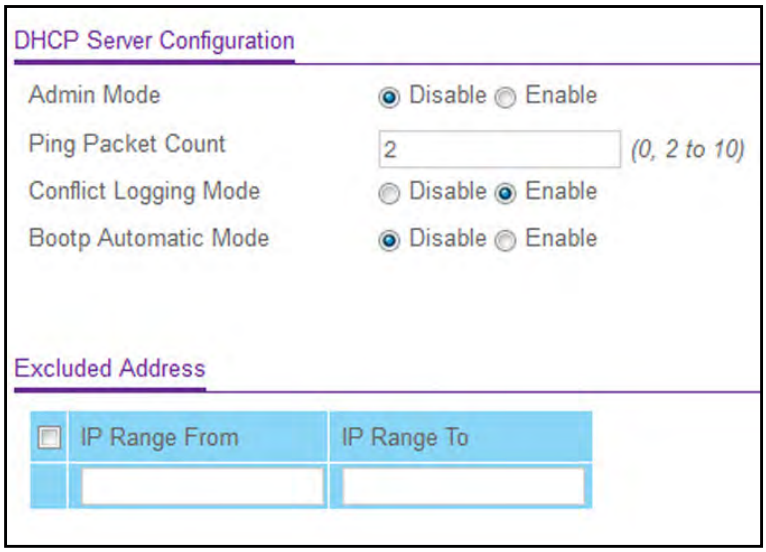
To configure a DHCP server:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCP Server > DHCP Server Configuration**.



5. Select the **Admin Mode Disable** or **Enable** radio button.

   This specifies whether the DHCP service is enabled or disabled. The default value is Disable.
6. Use **Ping Packet Count** to specify the number of packets a server sends to a pool address to check for duplication as part of a ping operation.

   The default value is 2. Valid range is 0, 2 to 10. Setting the value to 0 disables the function.

7. Select the **Conflict Logging mode Disable** or **Enable** radio button.

   This specifies whether conflict logging on a DHCP server is to be enabled or disabled. The default value is Enable.

8. Select the **BootP Automatic mode Disable** or **Enable** radio button.

   This specifies whether BootP for dynamic pools is to be enabled or disabled. The default value is Disable.

9. To exclude addresses, do the following:
   a. In the **IP Range From** field, enter the lowest address in the range or a single address to be excluded.
   b. In the **IP Range To** field, to exclude a range, enter the highest address in the range. To exclude a single address, enter the same IP address as specified in the **IP Range From** field, or leave it as 0.0.0.0.
10. Click the **Add** button.

    The exclude addresses are added to the switch

11. Click the **Apply** button.

    Your settings are saved.

Configure the DHCP Pool

To configure the DHCP pool:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

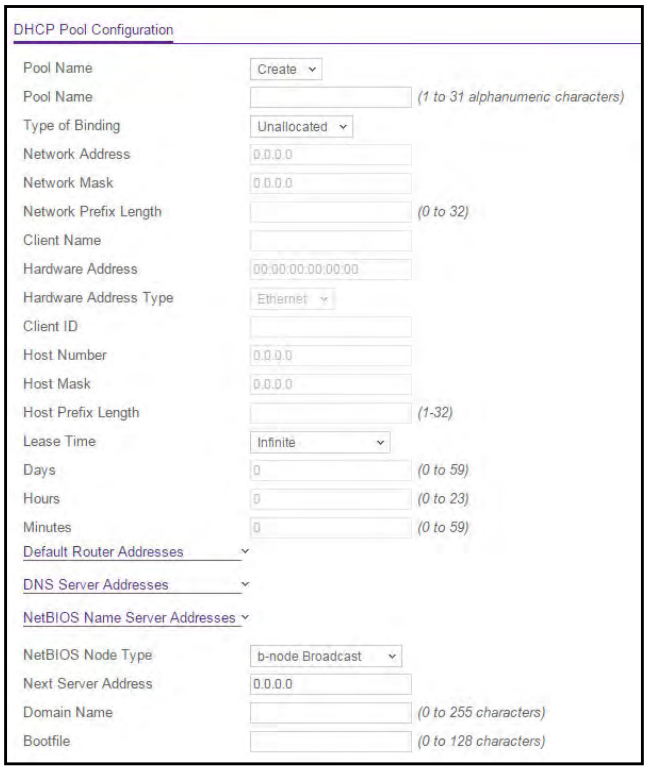
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Services > DHCP Server > DHCP Pool Configuration**.



5. Click the **Add** button.

   The pool configuration is added.

6. Click the **Apply** button.

   Your settings are saved.

The following table describes the DHCP Pool Configuration fields.

Table 35. DHCP Pool Configuration

Field	Description
Pool Name*	For a user with read/write permission, this field shows names of all the existing pools along with an additional option **Create**. When the user selects **Create**, another text box **Pool Name**, appears where the user can enter a name for the pool to be created. For a user with read-only permission, this field shows names of the existing pools only.
Pool Name	The name of the pool to be created. This field appears when the user with read-write permission selects **Create** in the Pool Name list*. **Pool Name** can be up to 31 characters in length.
Type of Binding	The type of binding for the pool: • Unallocated • Dynamic • Manual
Network Address	The subnet address for a DHCP address of a dynamic pool.

Table 35. DHCP Pool Configuration (continued)

Field	Description
Network Mask	The subnet number for a DHCP address of a dynamic pool. Either **Network Mask** or **Prefix Length** can be configured to specify the subnet mask but not both.
Network Prefix Length	The subnet number for a DHCP address of a dynamic pool. Either **Network Mask** or **Prefix Length** can be configured to specify the subnet mask but not both. The valid range is 0 to 32.
Client Name	The client name for DHCP manual pool.
Hardware Address	The MAC address of the hardware platform of the DHCP client.
Hardware Address Type	The protocol of the hardware platform of the DHCP client. Valid types are Ethernet and ieee802. The default value is Ethernet.
Client ID	The client identifier for DHCP manual pool.
Host Number	The IP address for a manual binding to a DHCP client. The host can be set only if f Client Identifier or Hardware Address is specified. Deleting Host would delete the client name, client ID, and hardware address for the manual pool, and set the pool type to Unallocated.
Host Mask	The subnet mask for a manual binding to a DHCP client. Either **Host Mask** or **Prefix Length** can be configured to specify the subnet mask but not both.
Host Prefix Length	The subnet mask for a manual binding to a DHCP client. Either **Host Mask** or **Prefix Length** can be configured to specify the subnet mask but not both. The valid range is 0 to 32.
Lease Time	Can be selected as **Infinite** to specify lease time as Infinite or **Specified Duration** to enter a specific lease period. In case of dynamic binding infinite implies a lease period of 60 days and In case of manual binding infinite implies indefinite lease period. The default value is Specified Duration.
Days	The number of days of the lease period. This field appears only if the user specified **Specified Duration** as the Lease time. The default value is 1. The valid range is 0 to 59.
Hours	The number of hours of the lease period. This field appears only if the user specified **Specified Duration** as the Lease time. The valid range is 0 to 22.
Minutes	The number of minutes of the lease period. This field appears only if you specified **Specified Duration** as the lease time. The valid range is 0 to 86399.
Default Router Addresses	The list of **Default Router Addresses** for the pool. Click the arrow beside the field name to expand the page and display a table where you can specify up to eight default router addresses in order of preference.

Table 35. DHCP Pool Configuration (continued)

Field	Description
DNS Server Addresses	The list of **DNS Server Addresses** for the pool. Click the arrow beside the field name to expand the page and display a table where you can specify up to eight DNS Server Addresses in order of preference.
NetBIOS Name Server Addresses	The list of **NetBIOS Name Server Addresses** for the pool. Click the arrow beside the field name to expand the page and display a table where you can specify up to eight NetBIOS name server addresses in order of preference.
NetBIOS Node Type	The NetBIOS node type for DHCP clients: • b-node Broadcast • p-node Peer-to-Peer • m-node Mixed • h-node Hybrid
Next Server Address	The **Next Server Address** for the pool.
Domain Name	The domain name for a DHCP client. **Domain Name** can be up to 255 characters in length.
Bootfile	The name of the default boot image for a DHCP client. File Name can be up to 128 characters in length.

Configure DHCP Pool Options

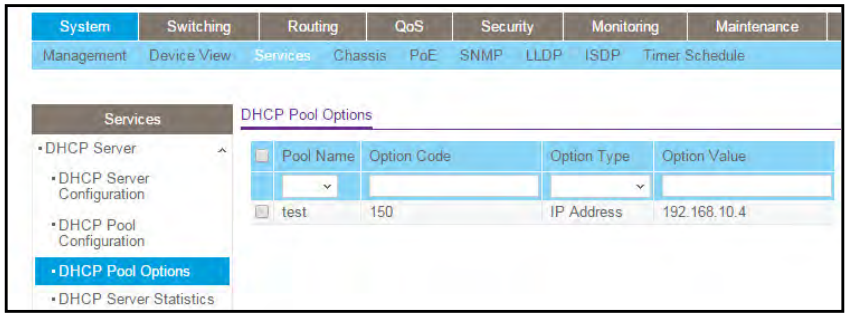
To configure DHCP Pool options:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCP Server> DHCP Pool Options**.



5. In **Pool Name** list, select the pool name.
6. **Option Code** specifies the Option Code configured for the selected Pool.
7. Use **Option Type** to specify the Option Type against the Option Code configured for the selected pool:
   - ASCII
   - Hex
   - IP Address
8. **Option Value** specifies the value against the Option Code configured for the selected pool.
9. Click the **Add** button.

   The Option Code is added for the selected pool.

View DHCP Server Statistics

To view the DHCP server statistics:

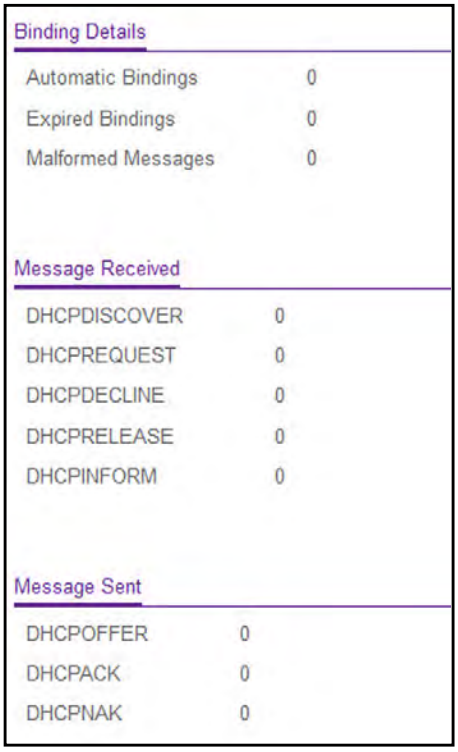
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Services > DHCP Server > DHCP Server Statistics**.



The following table describes the DHCP Server Statistics fields.

Table 36. DHCP Server Statistics

Field	Description
Automatic Bindings	The number of automatic bindings on the DHCP Server.
Expired Bindings	The number of expired bindings on the DHCP Server.
Malformed Messages	The number of the malformed messages.
DHCPDISCOVER	The number of DHCPDISCOVER messages received by the DHCP Server.
DHCPREQUEST	The number of DHCPREQUEST messages received by the DHCP Server.
DHCPDECLINE	The number of DHCPDECLINE messages received by the DHCP Server.
DHCPRELEASE	The number of DHCPRELEASE messages received by the DHCP Server.
DHCPINFORM	The number of DHCPINFORM messages received by the DHCP Server.
DHCPOFFER	The number of DHCPOFFER messages sent by the DHCP Server.

Table 36. DHCP Server Statistics (continued)

Field	Description
DHCPACK	The number of DHCPACK messages sent by the DHCP Server.
DHCPNAK	The number of DHCPNAK messages sent by the DHCP Server.

View DHCP Bindings Information

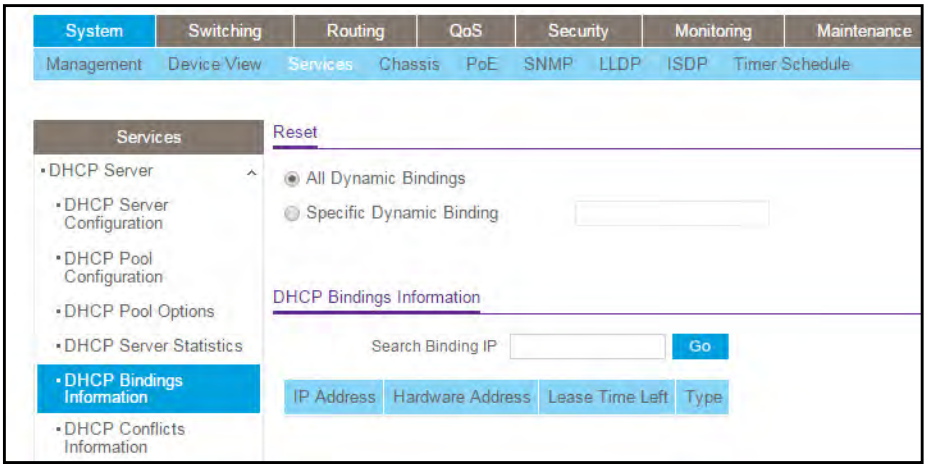
To view the DHCP bindings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCP Server > DHCP Bindings Information**.



5. To display DHCP Bindings Information, select one of the following radio buttons:
   - **All Dynamic Bindings**. Specify all dynamic bindings to be deleted.
   - **Specific Dynamic Binding**. Specify specific dynamic binding to be deleted.

The following table describes the DHCP Bindings Information fields.

Table 37. DHCP Bindings Information

Field	Description
IP Address	The client's IP address.
Hardware Address	The client's hardware address.
Lease Time Left	The Lease Time Left in Days, Hours and Minutes dd:hh:mm format.
Type	The Type of Binding: Dynamic or Manual.

View DHCP Conflicts

You can view information on hosts with address conflicts, such as when the same IP address is assigned to two or more devices on the network.

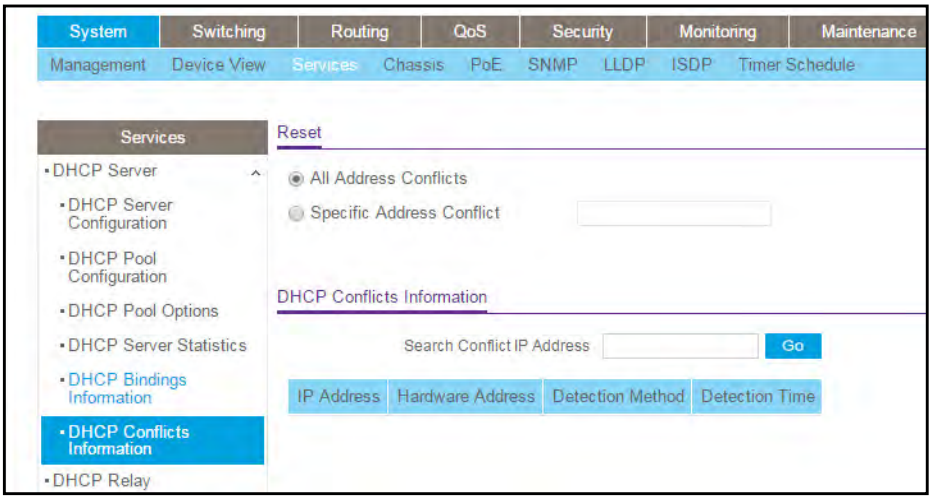
To view the DHCP conflicts:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCP Server > DHCP Conflicts Information**.



5. To display DHCP conflicts information, select one of the following radio buttons:
   - **All Address Conflicts**. Specify all address conflicts to be deleted.
   - **Specific Address Conflict**. Specify a specific dynamic binding to be deleted.

The following table describes the DHCP Conflicts Information fields.

Table 38. DHCP Conflicts Information

Field	Description
IP Address	The IP address of the host as recorded on the DHCP server.
Hardware Address	The client's hardware address.
Detection Method	The manner in which the IP address of the hosts were found on the DHCP server.
Detection Time	The time when the conflict was detected in N days NNh:NNm:NNs format with respect to the system up time.

Configure the DHCP Relay

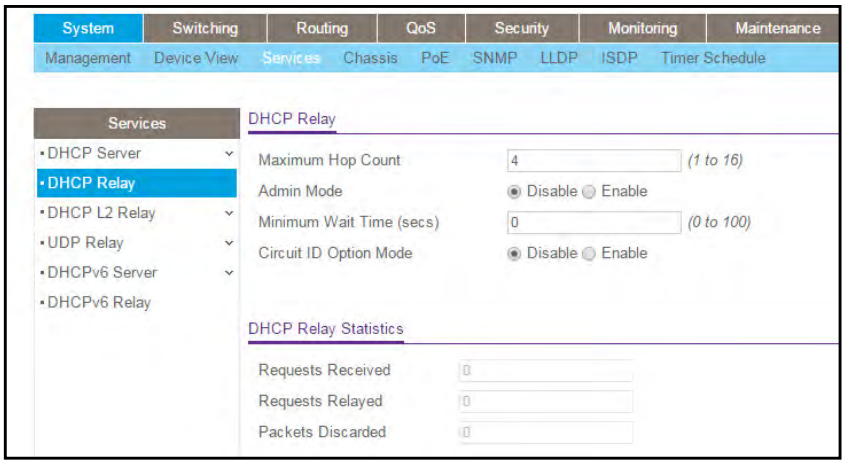
To configure DHCP relay:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCP Relay**.



5. Use **Maximum Hop Count** to enter the maximum number of hops a client request can take before being discarded.

   The range is (1 to 16). The default value is 4.

6. Select the **Admin mode Disable** or **Enable** radio button.

   When you select Enable, DHCP requests are forwarded to the IP address you entered in the **Server Address** field.

7. Use **Minimum Wait Time** to enter a Minimum Wait Time in seconds.

   This value is compared to the time stamp in the client's request packets, which represents the time since the client was powered up. Packets are forwarded only when the time stamp exceeds the minimum wait time. The range is (0 to 100).

8. Select the **Circuit ID Option mode Disable** or **Enable** radio button.

   If you select **Enable**, Relay Agent options are added to requests before they are forwarded to the server and removed from replies before they are forwarded to clients.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the DHCP Relay Statistics fields.

Table 39. DHCP Relay Status

Field	Description
Requests Received	The total number of DHCP requests received from all clients since the last time the switch was reset.
Requests Relayed	The total number of DHCP requests forwarded to the server since the last time the switch was reset.
Packets Discarded	The total number of DHCP packets discarded by this Relay Agent since the last time the switch was reset.

Manage a DHCP L2 Relay

Configure Global DHCP L2 Relay Settings

To configure global DHCP L2 Relay settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

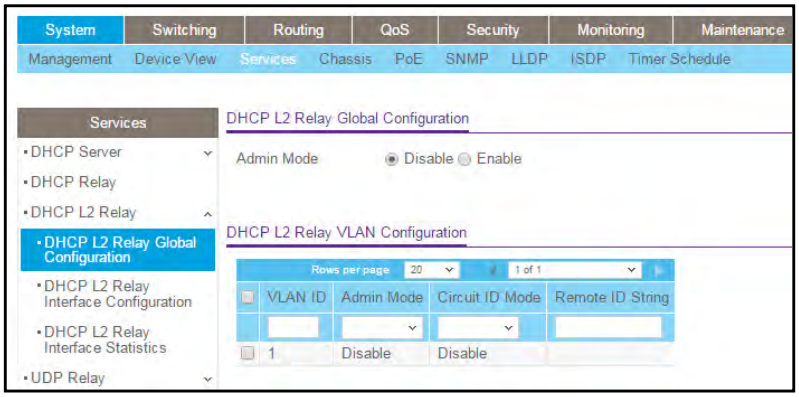
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **System > Services > DHCP L2 Relay > DHCP L2 Relay Global Configuration**.



5. Select the **Admin mode Disable** or **Enable** radio button.

   For global configuration, this enables or disables the DHCP L2 Relay on the switch. The default is Disable.

6. **For VLAN configuration, VLAN ID** shows the VLAN ID configured on the switch.
   a. Use **Admin mode** to enable or disable the DHCP L2 Relay on the selected VLAN.
   b. Use **Circuit ID mode** to enable or disable the Circuit ID suboption of DHCP Option-82.
   c. Use **Remote ID String** to specify the Remote ID when Remote ID mode is enabled.
7. Click the **Apply** button.

   Your settings are saved.

   The pagination navigation menu functions as follows:

   - **Rows per page**. Select how many table entries are displayed per page. Possible values are 20, 50, 100, 200, and All. If you select All, the browser might be slow to display the information.
   - **<**. Display the previous page of the table data entries.
   - **>**. Display the next page of the table data entries.

Configure a DHCP L2 Relay Interface

To configure DHCP L2 Relay:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

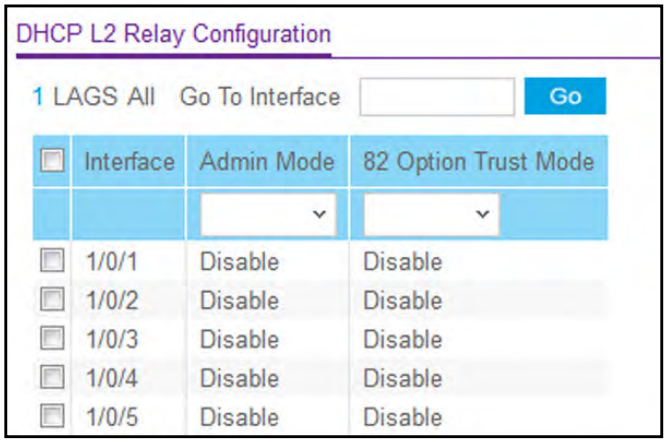
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Services > DHCP L2 Relay > DHCP L2 Relay Interface Configuration**.



5. Use **Admin mode** to enable or disable the DHCP L2 Relay on the selected interface.

   The default is Disable.

6. Use **82 Option Trust mode** to enable or disable an interface to be trusted for DHCP L2 Relay (Option-82) received.
7. Click the **Apply** button.

   Your settings are saved.

View DHCP L2 Relay Interface Statistics

To view the DHCP L2 Relay Interface Statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

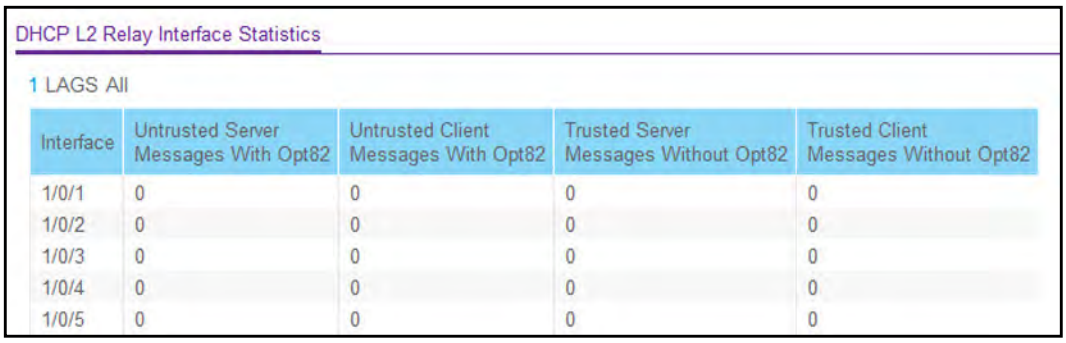
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Services > DHCP L2 Relay > DHCP L2 Relay Interface Statistics**.



The following table describes the DHCP L2 Relay Interface Statistics fields.

Table 40. DHCP L2 Relay Interface Statistics

Field	Description
Interface	Shows the interface from which the DHCP message is received.
UntrustedServerMsgsWithOpt82	Shows the number of DHCP message with option82 received from an untrusted server.
UntrustedClientMsgsWithOpt82	Shows the number of DHCP message with option82 received from an untrusted client.
TrustedServerMsgsWithoutOpt82	Shows the number of DHCP message without option82 received from a trusted server.
TrustedClientMsgsWithoutOpt82	Shows the number of DHCP message without option82 received from a trusted client.

Configure UDP Relay Global Settings

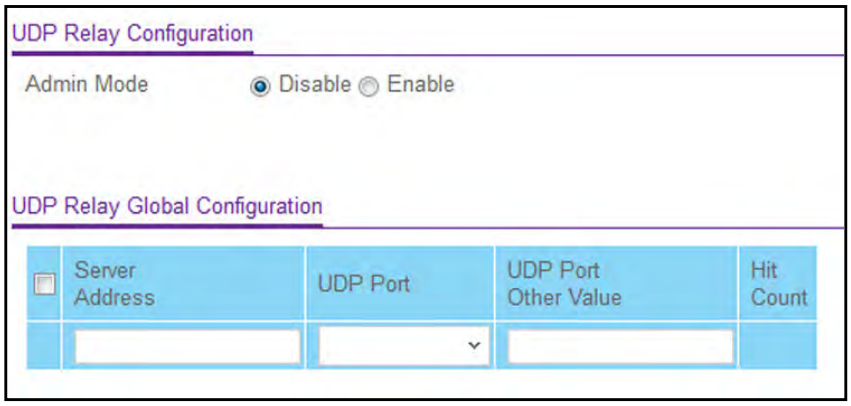
To configure UDP relay global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > UDP Relay > UDP Relay Global Configuration**.



5. Select the **Admin mode Disable** or **Enable** radio button.

   This enables or disables UDP Relay on the switch. The default value is Disable.

6. Use **Server Address** to specify the UDP Relay Server Address in x.x.x.x format.
7. Use **UDP Port** to specify the UDP Destination Port.

   These ports are supported:

   - **DefaultSet**. Relay UDP port 0 packets. This is specified if no UDP port is selected when creating the Relay server.
   - **dhcp**. Relay DHCP (UDP port 67) packets.
   - **domain**. Relay DNS (UDP port 53) packets.
   - **isakmp**. Relay ISAKMP (UDP port 500) packets.
   - **mobile-ip**. Relay Mobile IP (UDP port 434) packets
   - **nameserver**. Relay IEN-116 Name Service (UDP port 42) packets
   - **netbios-dgm**. Relay NetBIOS Datagram Server (UDP port 138) packets
   - **netbios-ns**. Relay NetBIOS Name Server (UDP port 137) packets
   - **ntp**. Relay network time protocol (UDP port 123) packets.
   - **pim-auto-rp**. Relay PIM auto RP (UDP port 496) packets.
   - **rip**. Relay Routing Image Protocol (RIP) (UDP port 520) packets
   - **tacacs**. Relay TACACS (UDP port 49) packet
   - **tftp**. Relay TFTP (UDP port 69) packets
   - **time**. Relay time service (UDP port 37) packets
   - **Other**. If this option is selected, the UDP Port Other Value is enabled. This option permits you to enter your own UDP port in UDP Port Other Value.

8. Use **UDP Port Other Value** to specify a UDP Destination Port that lies between 0 and 65535.
9. Click the **Add** button.

   An entry with the specified configuration is created in the UDP Relay Table.

10. Click the **Apply** button.

    Your settings are saved.

    The Hit Count field displays the number of UDP packets that are detected on the UDP port.

Configure UDP Relay Interface Settings

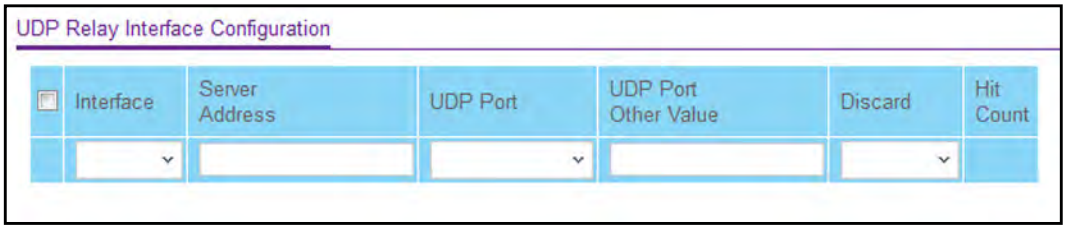
To configure UDP Relay Interface settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > UDP Relay > UDP Relay Interface Configuration**.



5. Use **Interface** to select an Interface to be enabled for the UDP Relay.
6. Use **Server Address** to specify the UDP Relay Server Address in x.x.x.x format.
7. Use **UDP Port** to specify UDP Destination Port.

   The following ports are supported:

   - **DefaultSet**. Relay UDP port 0 packets. This is specified if no UDP port is selected when creating a Relay server.
   - **dhcp**. Relay DHCP (UDP port 67) packets.
   - **domain**. Relay DNS (UDP port 53) packets.
   - **isakmp**. Relay ISAKMP (UDP port 500) packets.
   - **mobile-ip**. Relay Mobile IP (UDP port 434) packets
   - **nameserver**. Relay IEN-116 Name Service (UDP port 42) packets
   - **netbios-dgm**. Relay NetBIOS Datagram Server (UDP port 138) packets
   - **netbios-ns**. Relay NetBIOS Name Server (UDP port 137) packets
   - **ntp**. Relay network time protocol (UDP port 123) packets.

- **pim-auto-rp**. Relay PIM auto RP (UDP port 496) packets.
- **rip**. Relay RIP (UDP port 520) packets
- **tacacs**. Relay TACACS (UDP port 49) packet
- **tftp**. Relay TFTP (UDP port 69) packets
- **time**. Relay time service (UDP port 37) packets
- **Other**. If this option is selected, the UDP Port Other Value is enabled. This option permits the user to enter their own UDP port in UDP Port Other Value.

8. Use **UDP Port Other Value** to specify UDP Destination Port that lies between 0 and 65535.
9. Use **Discard** to enable/disable dropping of matched packets.

   Enable can be chosen only when a user enters 0.0.0.0 IP address. Discard mode can be set to Disable when user adds a new entry with a non-zero IP address.
10. Click the **Add** button.

    An entry with the specified configuration is created in the UDP Relay Table.
11. Click the **Apply** button.

    Your settings are saved.

    The Hit Count field displays the number of UDP packets that are detected on the UDP port.

Manage the DHCPv6 Server

Enable or Disable the DHCPv6 Server

You can configure the Dynamic Host Configuration Protocol for IPv6 (DHCPv6) server settings on the device. The device can act as a DHCPv6 server or DHCPv6 relay agent to help assign network configuration information to IPv6 clients.

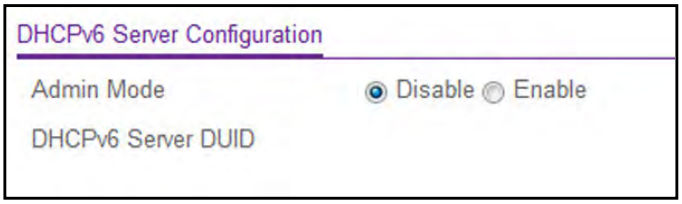
To enable or disable DHCP service:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCPv6 Server > DHCPv6 Server Configuration**.



5. Select the **Admin mode Disable** or **Enable** radio button.

   This specifies whether the DHCPv6 Service administrative mode is enabled or disabled The default value is Disable.

6. Use the **DHCPv6 Server DUID** field to specify the DHCP Unique Identifier (DUID) of the DHCPv6 server.
7. Click the **Apply** button.

   Your settings are saved.

Configure the DHCPv6 Pool

You can view the currently configured DHCPv6 server pools as well as to add and remove pools. A DHCPv6 server pool is a set of network configuration information available to DHCPv6 clients that request the information.

To configure DHCPv6 pool settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

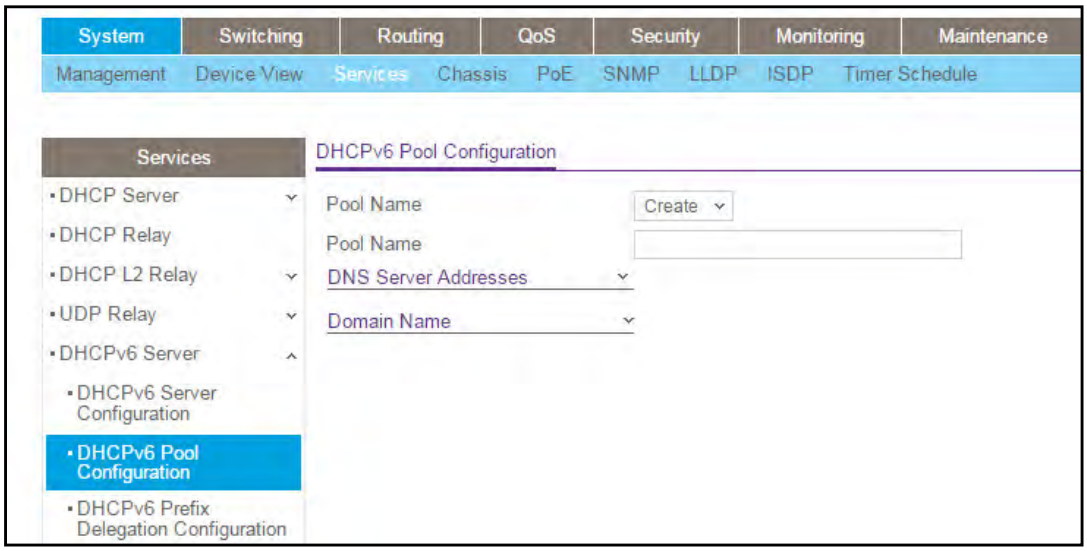
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Services > DHCPv6 Server > DHCPv6 Pool Configuration**.



The **Pool Name** field shows the names of all the existing pools and the **Create** option.

5. To create a pool, select **Create**, and enter a unique name that identifies the DHCPv6 server pool to be created.

   The name can be up to 31 alphanumeric characters in length.

6. Use the **Default Router Addresses** field to specify the list of default router addresses for the pool.

   The user can specify up to eight default router addresses in order of preference.

7. User the **Domain Name** field to specify the domain name for a DHCPv6 client in the pool.

   The domain name can be up to 255 alphanumeric characters in length.

   To delete the selected pool on the switch, click the **Delete** button.

8. Click the **Apply** button.

   Your settings are saved.

Configure the DHCPv6 Prefix Delegation

To configure the DHCPv6 Prefix delegation settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **System > Services > DHCPv6 Server > DHCPv6 Prefix Delegation Configuration**.

5. Select from the list of configured **Pool Names**.
6. In the **Prefix** and **Prefix Length** fields, specify the delegated IPv6 prefix.
7. In the **DUID** field, specify the DUID identifier used to identify the client's unique DUID value.
8. Specify the **Client Name**, which is useful for logging or tracing only.

   The name can be up to 31 alphanumeric characters.
9. Specify the **Valid Lifetime** in seconds for the delegated prefix.

   Valid values are 0 to 4294967295.
10. Specify the **Prefer Lifetime** in seconds for the delegated prefix.

    Valid values are 0 to 4294967295.
11. Click the **Add** button.

    The delegated prefix is added for the selected pool.
12. Click the **Apply** button.

    Your settings are saved.

Configure DHCPv6 Interface Settings

You can configure the per-interface settings for DHCPv6. The DHCPv6 interface modes are mutually exclusive. The fields that can be configured on this page depend on the selected mode for the interface.

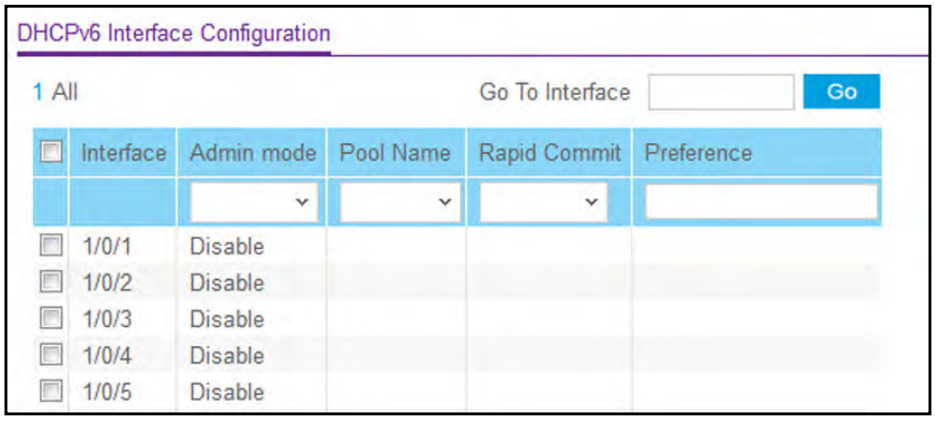
T**o configure DHCPv6 Interface settings:**

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCPv6 Server > DHCPv6 Interface Configuration**.



5. Select the Interface with the information to view or configure. You can either:
   a. In the **Go To Interface** field, enter the interface in unit/slot/port format and click the **Go** button. The entry corresponding to the specified interface is selected.
   b. Select the check box from the list of **Interface**s configured for DHCPv6 server functionality.
6. In the **Admin mode** list, select to **Enable** or **Disable** DHCPv6 mode to configure server functionality.

   DHCPv6 server and DHCPv6 relay functions are mutually exclusive.
7. In the **Pool Name** field, specify the DHCPv6 pool containing stateless and/or prefix delegation parameters.
8. **Rapid Commit** is an optional parameter. In the **Rapid Commit** list, select to **Enable** or **Disable** allowing an abbreviated exchange between the client and server.
9. In the **Preference** field, specify the preference value used by clients to determine the preference between DHCPv6 servers.

   Valid values are 0 to 4294967295. The default value is 0.
10. Click the **Apply** button.

    Your settings are saved.

View DHCPv6 Bindings Information

You can view entries in the DHCP Bindings table. After a client acquires IPv6 configuration information from the DHCPv6 server, the server adds an entry to its database. The entry is called a binding.

To view DHCPv6 bindings information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

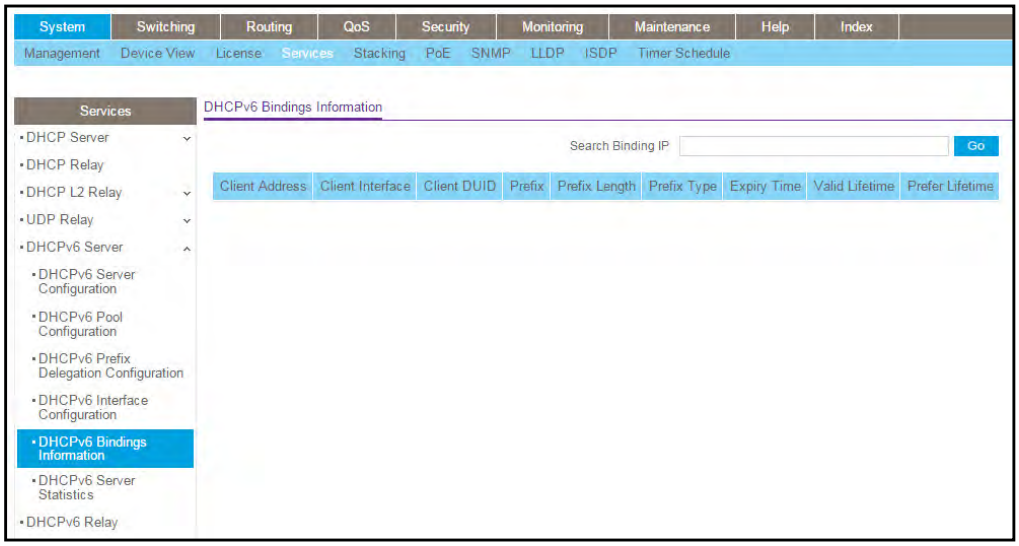
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Services > DHCPv6 Server > DHCPv6 Bindings Information**.



5. To refresh the page, click the **Refresh** button.

The following table describes the nonconfigurable fields that are displayed.

Table 41. DHCPv6 Binding Information

Field	Description
Client Address	The IPv6 address of the client associated with the binding.
Client Interface	The interface number where the client binding occurred.
Client DUID	The DHCPv6 Unique Identifier (DUID) of the client. The DUID is a combination of the client's hardware address and client identifier.
Prefix	The IPv6 address for the delegated prefix associated with this binding.
Prefix Length	The IPv6 mask length for the delegated prefix associated with this binding.
Prefix Type	The type of IPv6 prefix associated with this binding.
Expiry Time	The number of seconds until the prefix associated with a binding expires.

Table 41. DHCPv6 Binding Information (continued)

Field	Description
Valid Lifetime	The maximum amount of time in seconds that the client is allowed to use the prefix.
Prefer Lifetime	The preferred amount of time in seconds that the client is allowed to use the prefix.

View DHCPv6 Server Statistics

You can view the DHCPv6 server statistics for the device, including information about the DHCPv6 messages, sent, received, and discarded globally and on each interface. The values on the page indicate the various counts that accumulated since they were last cleared.

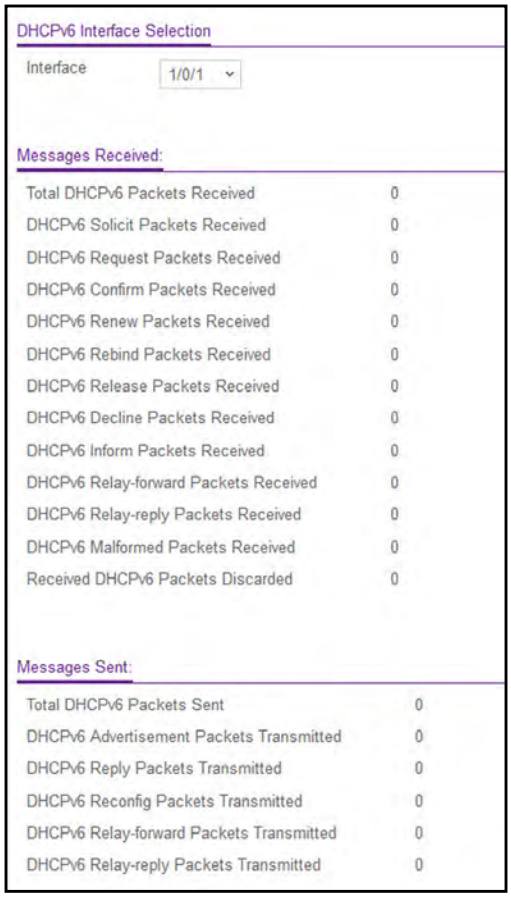
To view DHCPv6 server statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCPv6 Server > DHCPv6 Server Statistics**.



5. To view detailed DHCPv6 statistics for an interface, from the **Interface** list select the entry for which data is to be displayed.

   If you select **All**, data is shown for all interfaces.

6. To reset the DHCPv6 counters for one or more interface, select each interface with the statistics to reset and click the **Clear** button.
7. To refresh the page, click the **Refresh** button.

The following table describes the nonconfigurable fields that are displayed.

Table 42. DHCPv6 Server Statistics

Field	Description
Messages Received	The aggregate of all interface level statistics for received messages.
Total DHCPv6 Packets Received	The number of DHCPv6 messages received on the interface. The DHCPv6 messages sent from a DHCP v6 client to a DHCP v6 server include solicit, request, confirm, renew, rebind, release, decline, and information-request messages. Additionally, a DHCP v6 relay agent can forward relay-forward messages to a DHCP v6 server.
DHCPv6 Solicit Packets Received	The number of DHCPv6 Solicit messages received on the interface. This type of message is sent by a client to locate DHCPv6 servers.

Table 42. DHCPv6 Server Statistics (continued)

Field	Description
DHCPv6 Request Packets Received	The number of requests.
DHCPv6 Confirm Packets Received	The number of DHCPv6 Confirm messages received on the interface. This type of message is sent by a client to all DHCPv6 servers to determine whether its configuration is valid for the connected link.
DHCPv6 Renew Packets Received	The number of DHCPv6 Renew messages received on the interface. This type of message is sent by a client to extend and update the configuration information provided by the DHCPv6 server.
DHCPv6 Rebind Packets Received	The number of DHCPv6 Rebind messages received on the interface. This type of message is sent by a client to any DHCPv6 server when it does not receive a response to a Renew message.
DHCPv6 Release Packets Received	The number of DHCPv6 Release messages received on the interface. This type of message is sent by a client to indicate that it no longer needs the assigned address.
DHCPv6 Decline Packets Received	The number of DHCPv6 Decline messages received on the interface. This type of message is sent by a client to the DHCPv6 server to indicate that an assigned address is already in use on the link.
DHCPv6 Inform Packets Received	The number of DHCP v6 information-request messages received on the interface. This type of message is sent by a client to request configuration information other than IP address assignment.
DHCPv6 Relay-forward Packets Received	The number of DHCPv6 relay-forward messages received on the interface. This type of message is sent by a relay agent to forward messages to servers.
DHCPv6 Relay-reply Packets Received	The number of DHCP v6 relay-reply messages received on the interface. This type of message is sent by a server to a DHCP v6 relay agent and contains the message for the relay agent to deliver to the client.
DHCPv6 Malformed Packets Received	The number of DHCPv6 messages that were received on the interface but were dropped because they were malformed.
Received DHCPv6 Packets Discarded	The number of Packets Discarded.
Messages Sent	The aggregate of all interface level statistics for messages sent.
Total DHCPv6 Packets Sent	The number of DHCPv6 messages sent by the interface. The DHCPv6 messages sent from a DHCPv6 server to a DHCPv6 client include Advertise, Reply, Reconfigure, and Relay-Reply messages.
DHCPv6 Advertisement Packets Transmitted	The number of DHCPv6 Advertise messages sent by the interface. This type of message is sent by a server to a DHCPv6 client in response to a Solicit message and indicates that it is available for service.
DHCPv6 Reply Packets Transmitted	The number of DHCPv6 Reply messages sent from the interface to a DHCPv6 client in response to a solicit, request, renew, rebind, information-request, confirm, release, or decline message.

Table 42. DHCPv6 Server Statistics (continued)

Field	Description
DHCPv6 Reconfig Packets Transmitted	The number of DHCPv6 reconfigure messages sent by the interface. This type of message is sent by a server to a DHCPv6 client to inform the client that the server has new or updated information. The client then typically initiates a renew/reply or Information-request/reply transaction with the server to receive the updated information.
DHCPv6 Relay-forward Packets Transmitted	The number of DHCPv6 Relay-Forward messages sent by the interface. This type of message is sent by a relay agent to forward messages to servers.
DHCPv6 Relay-reply Packets Transmitted	The number of DHCPv6 Relay-Reply messages sent by the interface. This type of message is sent by a server to a DHCPv6 relay agent and contains the message for the relay agent to deliver to the client.

Configure DHCPv6 Relay for an Interface

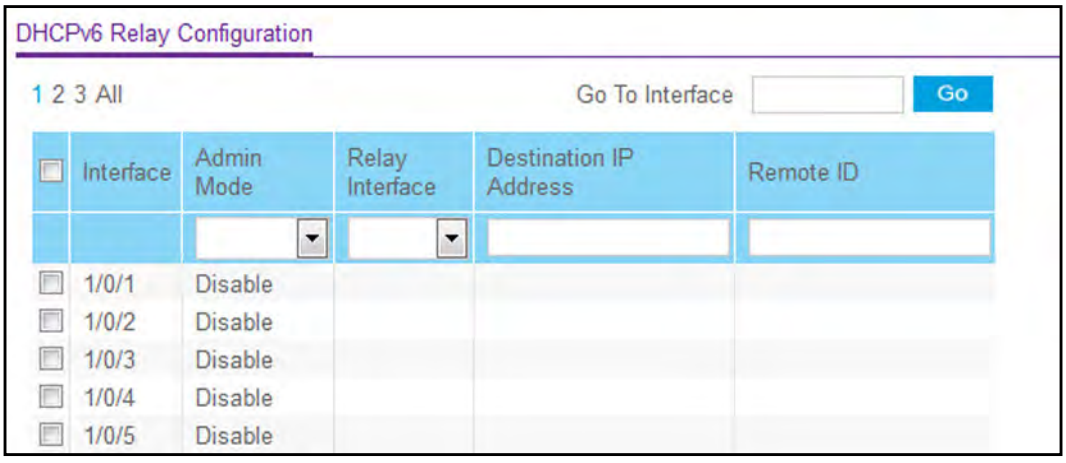
To configure DHCPv6 Relay for an interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > DHCPv6 Relay**.



5. Select the Interface with the information to view or configure.

You take one of the following actions:

- In the **Go To Interface** field, enter the interface in unit/slot/port format and click the **Go** button. The entry corresponding to the specified interface is selected.
- Select the check box from the list of **Interface**s configured for DHCPv6 Relay functionality.

6. In the **Admin mode** field, specify the DHCPv6 mode, either Enable or Disable, to configure DHCPv6 Relay functionality.

   The default is Disable. DHCPv6 server and DHCPv6 relay functions are mutually exclusive.

7. From the **Relay Interface** list, select an interface to reach a relay server.
8. In the **Destination IP Address**, specify an IPv6 address to reach a relay server.
9. In the **Remote ID** field, specify the relay agent information option.

   The remote ID is derived from the DHCPv6 server DUID and the relay interface number, or it can be specified as a user-defined string.

10. Click the **Apply** button.

    Your settings are saved.

Configure Power over Ethernet

Note: Power over Ethernet (PoE) is supported on models M4300-16X, M4300-28G-POE+, M4300-52G-POE+, and M4300-96X. The latter model requires one or more APM408 port cards.

Configure Basic PoE Settings

To configure basic PoE settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

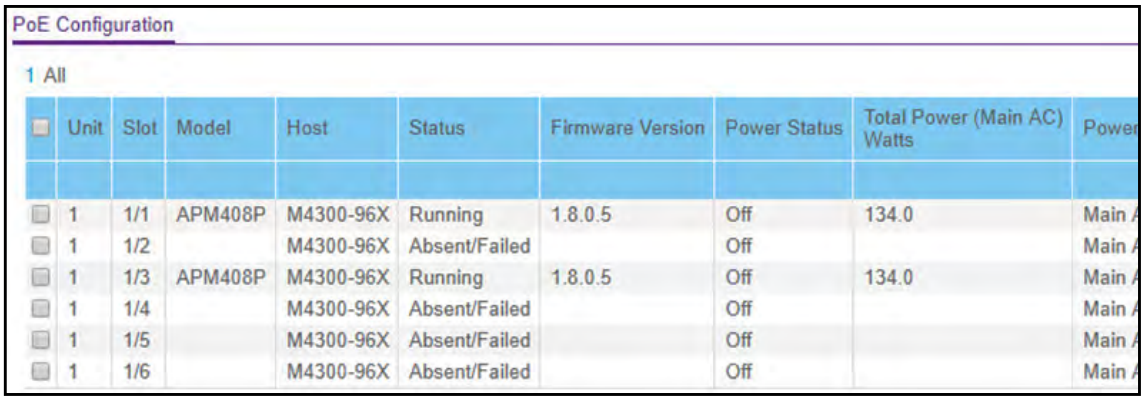
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > PoE > Basic > PoE Configuration**.



The **Unit** field displays the current PoE switch unit number. The **Slot** field displays the current PoE slot number for model M4300-96X.

5. To configure the settings for a PoE switch unit, select the check box for the switch unit number.
6. From the **Power Management mode** menu, select the power management algorithm that the switch uses to deliver power to the requesting PDs:
   - **Static**. Select **Static** to specify that the power allocated for each port depends on the type of power threshold that is configured on the port.
   - **Dynamic**. Select **Dynamic** to specify that the power consumption on each port is measured and calculated in real time.
7. To set the traps, from the **PoE Trap Configuration** menu, select **Enable** to activate the PoE traps or **Disable** to deactivate the PoE traps.

   The default setting is enabled.
8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable fields on the page.

Table 43. Nonconfigurable fields on the basic PoE Configuration page

Field	Description
Model	The model of the PoE port card.
Host	The switch in which the PoE port card is installed.
Status	The status of the PoE port card.
Firmware Version	The firmware version of the PoE software.
Power Status	Indicates the power status.
Total Power (Main AC)	The maximum power in watts the switch can deliver to all ports. If N/A is displayed, the power supply is not present.

Table 43. Nonconfigurable fields on the basic PoE Configuration page (continued)

Field	Description
Power Source	The source of the system power.
Consumed Power	Total power in watts that is being delivered to all ports.

Configure PoE Ports

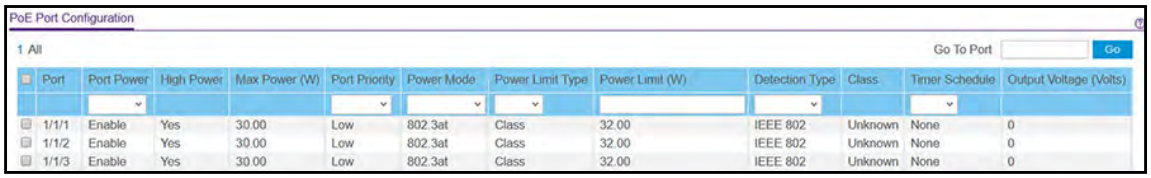
To configure PoE ports:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > PoE > Advanced > PoE Port Configuration**.



5. Select one or more ports by selecting the check boxes.
6. From the **Port Power** menu, select **Enable** or **Disable** to specify whether the port can deliver power.
7. Use the **Port Priority** menu to specify which ports can still deliver power if the total power delivered by the switch exceeds a specific threshold.

   If the switch cannot supply power to all connected devices, the port priority determines which ports can still supply power. The lowest numbered ports with the same port priority setting are given higher priority. Select one of the following priorities:

   - **Low**. Low priority
   - **Medium**. Medium priority
   - **High**. High priority
   - **Critical**. Critical priority
8. From the **Power Mode** menu, select one of the following options:
   - **802.3af**. Specifies that the port is powered in the IEEE 802.3af mode. For example, if the class detected by the switch is not class 4, the switch port does not power up the PD.

- **Legacy**. Specifies that the port is powered using a high-inrush current, used by legacy PDs for which startup power requirements exceed 15W.
- **Pre-802.3at**. Specifies that the port is powered in the IEEE 802.3af mode initially and then switched to the high-power IEEE 802.3at mode within a period of 75 msec. This mode must be selected if the PD does not perform Layer 2 classification or if the switch performs 2-event Layer 1 classification.
- **802.3at**. Specifies that the port is powered in the IEEE 802.3at mode.

9. From the **Power Limit Type** menu, select the maximum power that a port can deliver. Select one of the following options from the menu:
   - **None**. Specifies that the port draws up to class 0 maximum power in low-power mode and up to class 4 maximum power in high-power mode.
   - **Class**. Specifies that the port power limit is equal to the class of the attached PD.
   - **User**. Specifies that the port power limit is equal to the value specified in the **Power Limit** field.
10. In the **Power Limit (W)** field, specify the maximum power in watts that a port can deliver.

    The maximum allowed power is 30W per port.
11. From the **Detection Type** menu, select how the port detects the PD:
    - **pre-ieee**. The port performs legacy detection.
    - **IEEE 802**. The port performs a 4-point resistive detection. This is the default setting.
    - **auto**. The port performs a 4-point resistive detection, and if required, continues with legacy detection.
12. From the **Timer Schedule** menu, select a timer schedule that just be assigned to the port.

    By default, the selection is **None**, which specifies that no timer schedule is assigned to the port. For more information about timer schedules, see Manage Timer Schedules on page 160.
13. Click the **Apply** button.

    Your settings are saved.
14. To reset the selected ports, click the **Reset** button.

    The ports are reset.

The following table describes nonconfigurable fields on the advanced PoE Configuration page.

Table 44. Nonconfigurable fields on the Advanced PoE Configuration page

Field	Description
Port	The interface for which data is to be displayed or configured.
High Power	Enabled when particular port supports High Power mode.
Max Power	The maximum power in Watts that can be provided by the port.

Table 44. Nonconfigurable fields on the Advanced PoE Configuration page (continued)

Field	Description
Class	The Class defines the range of power a PD is drawing from the system. Class definitions: 0 – 0.44-12.95 (watts) 1 – 0.44-3.83 (watts) 2 – 0.44-6.48 (watts) 3 – 0.44-12.95 (watts) 4 – 0.44-25.5 (watts)
Output Voltage	Current voltage being delivered to device in volts.
Output Current	Current being delivered to device in mA.
Output Power	Current power being delivered to device in Watts.
Status	The status is the operational status of the port PD detection. • **Disabled**. No power being delivered. • **DeliveringPower**. Power is being drawn by device. • **Fault**. Indicates a problem with the port. • **Test**. The port is in test mode. • **otherFault**. The port is idle due to error condition. • **Searching**. The port is not in one of the above states.
Fault Status	Describes the error description when the PSE port is in fault status. • **No Error**. The PSE port is not in any error state. • **MPS Absent**. The PSE port has detected an absence of main power supply. • **Short**. The PSE port has detected a short circuit condition. • **Overload**.The PD connected to the PSE port tried to provide more power than it is permissible by the hardware. • **Power Denied**. The PSE port was denied power because of shortage of power or due to administrative action.

Configure PoE Power Settings

To configure PoE power settings:

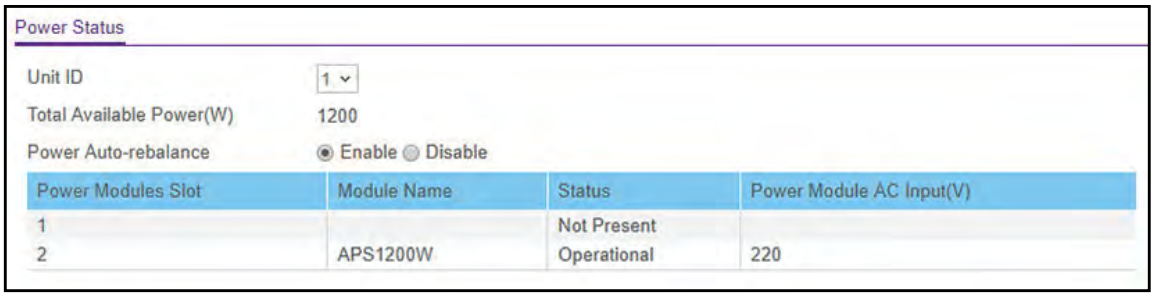
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > PoE > Advanced > Power Configuration**.



5. In the Power Status section, from the **Unit ID** menu, select the unit for which you want to display the power status.
6. For switch model M4300-96X only, select the Power Auto-rebalance **Enable** or **Disable** radio button.

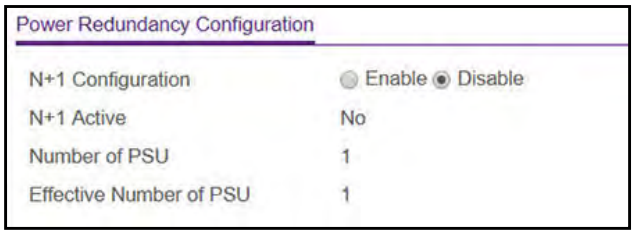
   By default, the **Enable** radio button is selected. However, you can disable automatic power rebalancing among the PSU bays (power module slots) on switch model M4300-96X.

   The following table describes the nonconfigurable fields in the Power Status section.

Field	Description
Total Available Power	The total available power for the unit in watts.
Power Modules Slot	The PSU bay number (power module slot number).
Module Name	The power module name.
Status	The power module status, which can be one of the following: • **Not Present**. The power module is not present. • **Operational**. The power module is connected and works properly. • **Failed**. The switch cannot detect the power module status.
Power Module AC Input	The power module input voltage.

7. For switch models M4300-28G-POE+ and M4300-52G-POE+ only, in the Redundancy Mode Status section, select the N+1 Configuration **Enable** or **Disable** radio button.

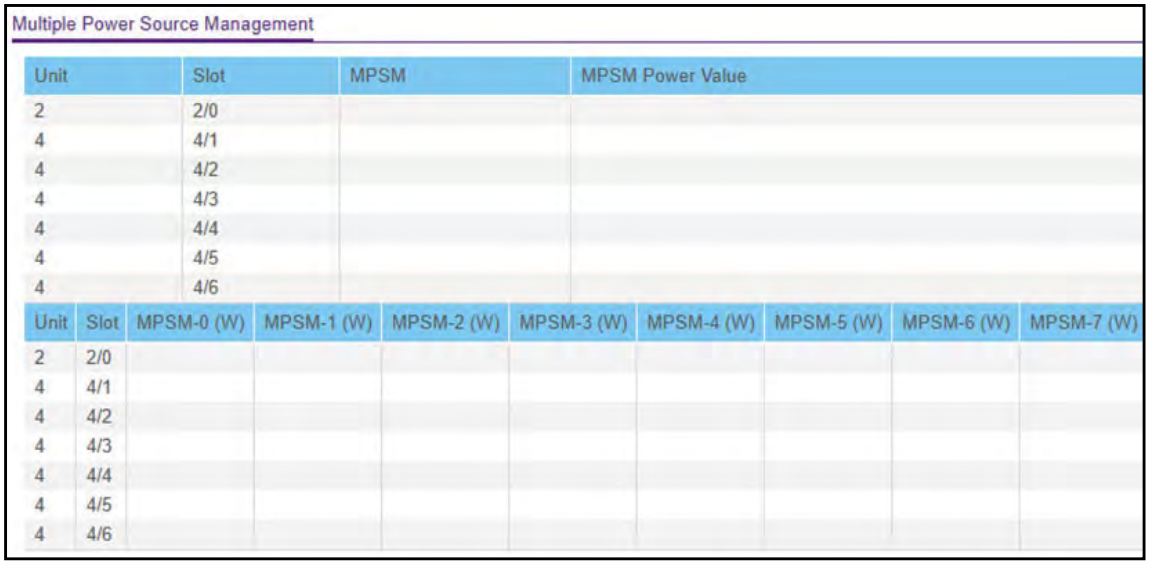
   If you select the **Enable** radio button, the power redundancy feature is enabled, causing the total usable power that is delivered by all available PSUs to be less than the power that a single PSU can deliver. In such a configuration, the power load is shared evenly by all PSUs, which operate as if they are one large uninterruptible power supply. The power redundancy feature is disabled by default.



The following table describes the nonconfigurable fields in the Power Redundancy Configuration section.

Field	Description
N+1 Active	Displays whether the N+1 power redundancy feature is enabled. The possible values are Yes (enabled) and No (disabled).
Number of PSU	The total number of PSUs.
Effective Number of PSU	The effective number of PSUs, taking the N+1 power redundancy feature into account.

The Multiple Power Source Management table displays the number of active power sources (such as port cards providing PoE) for each switch unit.



8. Click the **Apply** button.

   Your settings are saved.

Configure SNMP

You can configure SNMP settings for SNMP V1/V2 and SNMPv3.

Configure the SNMP V1/V2 Community

By default, two SNMP communities exist:

- Private, with read/write privileges and status set to **Enable**.
- Public, with read-only privileges and status set to **Enable**.

These are well-known communities. You can change the defaults or to add other communities. Only the communities that you define can access to the switch using the SNMP V1 and SNMP V2 protocols. Only those communities with read/write level access can be used to change the configuration using SNMP.

Note: If you want to use SNMP v3, use the User Accounts menu.

To configure the SNMP V1/V2 community:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > SNMP > SNMP V1/V2 > Community Configuration**.

5. Use **Community Name** to reconfigure an existing community, or to create a new one.

   Use this menu to select one of the existing community names, or select 'Create' to add a new one. A valid entry is a case-sensitive string of up to 16 characters.

6. **Client Address**. Taken together, the Client Address and Client IP Mask denote a range of IP addresses from which SNMP clients can use that community to access this device.

   If either (Client Address or IP Mask) value is 0.0.0.0, access is allowed from any IP address. Otherwise, every client's address is ANDed with the mask, as is the Client Address, and, if the values are equal, access is allowed. For example, if the Client Address and Client IP Mask parameters are 192.168.1.0/255.255.255.0, then any client whose address is 192.168.1.0 through 192.168.1.255 (inclusive) is allowed access. To allow access from only one station, use a Client IP Mask value of 255.255.255.255, and use that machine's IP address for Client Address.

7. **Client IP Mask**. Taken together, the Client Address and Client IP Mask denote a range of IP addresses from which SNMP clients can use that community to access this device.

   If either (Client Address or IP Mask) value is 0.0.0.0, access is allowed from any IP address. Otherwise, every client's address is ANDed with the mask, as is the Client Address, and, if the values are equal, access is allowed. For example, if the Client Address and Client IP Mask parameters are 192.168.1.0/255.255.255.0, then any client whose IP address is 192.168.1.0 through 192.168.1.255 (inclusive) is allowed access. To allow access from only one station, use a Client IP Mask value of 255.255.255.255, and use that machine's IP address for Client Address.

8. In the **Access mode** menu, select **Read-Write** or **Read-Only**.

   This specifies the access level for this community.

9. Use **Status** to specify the status of this community by selecting **Enable** or **Disable**.

   If you select enable, the Community Name must be unique among all valid Community Names or the set request are rejected. If you select disable, the Community Name becomes invalid.

10. Click the **Add** button.

    The selected community is added to the switch.

Configure SNMP V1/V2 Trap Settings

To configure the SNMP V1/V2 trap settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

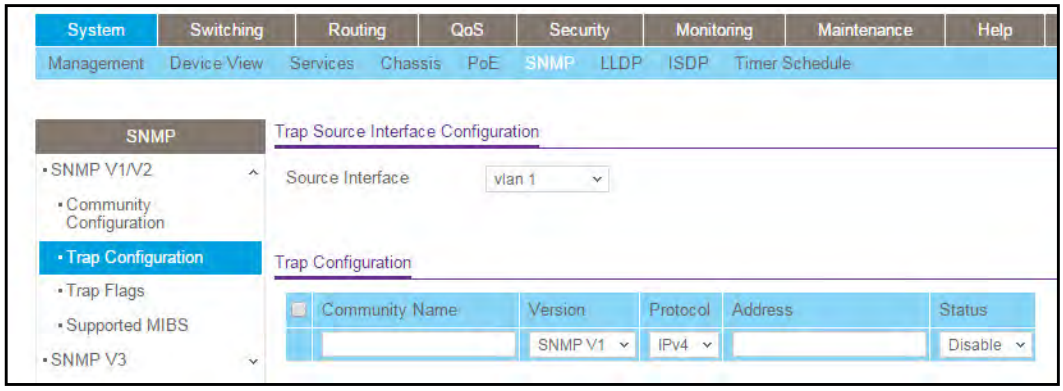
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > SNMP > SNMP V1/V2 > Trap Configuration**.



5. In the **Source Interface** list, select the source interface to use for SNMP Trap receiver.

   Possible values are as follows:

   - Routing interface
   - Routing VLAN
   - Routing loopback interface
   - Tunnel interface
   - Service port

   VLAN 1 is used as source interface by default.

6. To add a host that receives SNMP traps, do the following steps:
   a. **Community Name**. Enter the community string for the SNMP trap packet to be sent to the trap manager. This name can be up to 16 characters and is case-sensitive.
   b. **Version**. Select the trap version to be used by the receiver:
      - **SNMP V1**. Uses SNMP V1 to send traps to the receiver.
      - **SNMP V2**. Uses SNMP V2 to send traps to the receiver.
   c. **Protocol**. Select the protocol to be used by the receiver. Select **IPv4** if the receiver's address is IPv4 address or **IPv6** if the receiver's address is IPv6.
   d. **Address**. Enter the IPv4 address in x.x.x.x format or the IPv6 address in xxxx:xxxx:xxxx:xxxxx:xxxx:xxxx:xxxx:xxxx to receive SNMP traps from this device. The length of the address cannot exceed 39 characters.
   e. **Status**. Select the receiver's status:
      - **Enable**. Send traps to the receiver
      - **Disable**. Do not send traps to the receiver.
   f. Click the **Add** button.
7. To make changes, do the following:
   - To modify information about an existing SNMP recipient, select the check box for the recipient, and change the desired fields.
   - To delete a recipient, select the check box for the recipient and click the **Delete** button.

8. Click the **Apply** button.

   Your settings are saved.

Configure SNMP V1/V2 Trap Flags

You can enable or disable traps. When the condition identified by an active trap is encountered by the switch, a trap message is sent to any enabled SNMP Trap Receivers, and a message is written to the trap log.

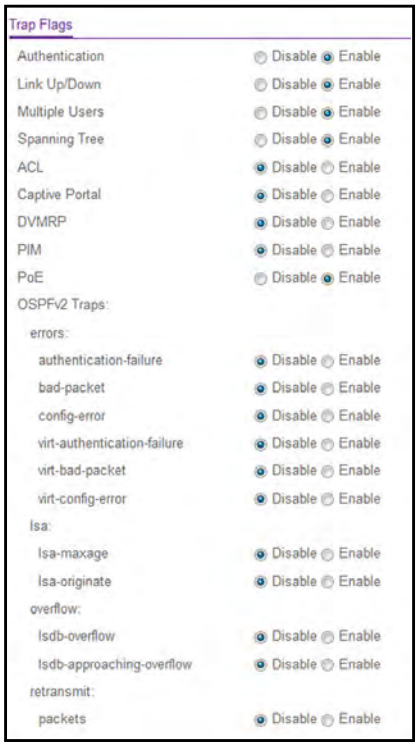
To configure the trap flags:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > SNMP > SNMP V1/V2 > Trap Flags**.



5. Select the **Authentication Disable** or **Enable** radio button.

This enables or disables activation of authentication failure traps. The factory default is Enable.

6. Select the **Link Up/Down Disable** or **Enable** radio button

   This enables or disables activation of link status traps.The factory default is Enable.

7. Select the **Multiple Users Disable** or **Enable** radio button

   This enables or disables activation of multiple user traps.The factory default is Enable. This trap is triggered when the same user ID is logged into the switch more than once at the same time (either through Telnet or the serial port).

8. Select the **Spanning Tree Disable** or **Enable** radio button.

   This enables or disables activation of spanning tree traps. The factory default is Enable.

9. Select the **ACL Disable** or **Enable** radio button.

   This enables or disables activation of ACL traps. The factory default is Disable.

10. Select the **PoE Disable** or **Enable** radio button.

    This enables or disables activation of PoE traps. The factory default is Enable. Indicates whether PoE traps are sent.

11. Click the **Apply** button.

    Your settings are saved.

View the Supported MIBs

To view all the MIBs supported by the switch:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

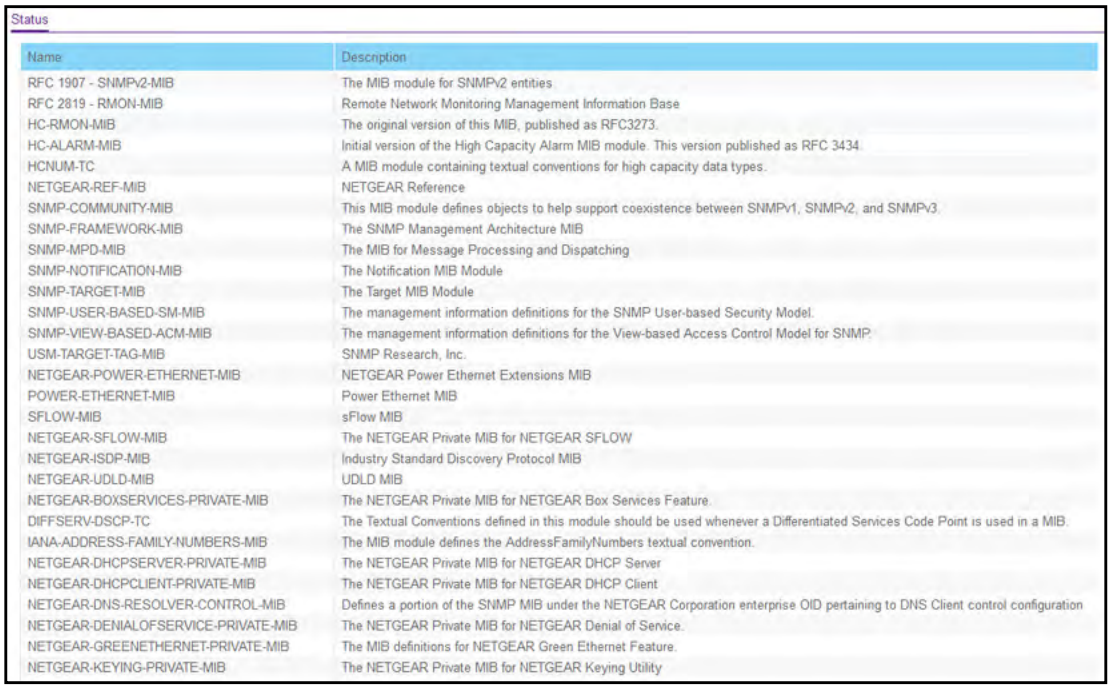
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > SNMP > SNMP V1/V2 >Supported MIBs**.


Status

Name	Description
RFC 1907 - SNMPv2-MIB	The MIB module for SNMPv2 entities
RFC 2819 - RMON-MIB	Remote Network Monitoring Management Information Base
HC-RMON-MIB	The original version of this MIB, published as RFC3273.
HC-ALARM-MIB	Initial version of the High Capacity Alarm MIB module. This version published as RFC 3434.
HCNUM-TC	A MIB module containing textual conventions for high capacity data types.
NETGEAR-REF-MIB	NETGEAR Reference
SNMP-COMMUNITY-MIB	This MIB module defines objects to help support coexistence between SNMPv1, SNMPv2, and SNMPv3.
SNMP-FRAMEWORK-MIB	The SNMP Management Architecture MIB
SNMP-MPD-MIB	The MIB for Message Processing and Dispatching
SNMP-NOTIFICATION-MIB	The Notification MIB Module
SNMP-TARGET-MIB	The Target MIB Module
SNMP-USER-BASED-SM-MIB	The management information definitions for the SNMP User-based Security Model.
SNMP-VIEW-BASED-ACM-MIB	The management information definitions for the View-based Access Control Model for SNMP.
USM-TARGET-TAG-MIB	SNMP Research, Inc.
NETGEAR-POWER-ETHERNET-MIB	NETGEAR Power Ethernet Extensions MIB
POWER-ETHERNET-MIB	Power Ethernet MIB
SFLOW-MIB	sFlow MIB
NETGEAR-SFLOW-MIB	The NETGEAR Private MIB for NETGEAR SFLOW
NETGEAR-ISDP-MIB	Industry Standard Discovery Protocol MIB
NETGEAR-UDLD-MIB	UDLD MIB
NETGEAR-BOXSERVICES-PRIVATE-MIB	The NETGEAR Private MIB for NETGEAR Box Services Feature.
DIFFSERV-DSCP-TC	The Textual Conventions defined in this module should be used whenever a Differentiated Services Code Point is used in a MIB.
IANA-ADDRESS-FAMILY-NUMBERS-MIB	The MIB module defines the AddressFamilyNumbers textual convention.
NETGEAR-DHCPSERVER-PRIVATE-MIB	The NETGEAR Private MIB for NETGEAR DHCP Server
NETGEAR-DHCPCLIENT-PRIVATE-MIB	The NETGEAR Private MIB for NETGEAR DHCP Client
NETGEAR-DNS-RESOLVER-CONTROL-MIB	Defines a portion of the SNMP MIB under the NETGEAR Corporation enterprise OID pertaining to DNS Client control configuration
NETGEAR-DENIALOFSERVICE-PRIVATE-MIB	The NETGEAR Private MIB for NETGEAR Denial of Service.
NETGEAR-GREENETHERNET-PRIVATE-MIB	The MIB definitions for NETGEAR Green Ethernet Feature.
NETGEAR-KEYING-PRIVATE-MIB	The NETGEAR Private MIB for NETGEAR Keying Utility

The following table describes the SNMP Supported MIBs Status fields.

Table 45. SNMP Supported MIBs

Field	Description
Name	The RFC number if applicable and the name of the MIB.
Description	The RFC title or MIB description.

Configure SNMP V3 Users

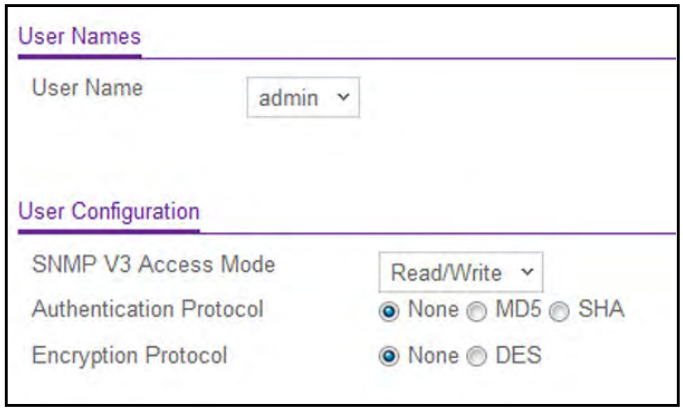
To configure SNMPv3 settings for the user account:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > SNMP > SNMP V3 > User Configuration**.



5. In the **User Name** list, select the user account to be configured.

   The SNMP v3 Access mode field indicates the SNMPv3 access privileges for the user account. The admin account has read/write access, and all other accounts are assigned read-only access.

6. Select an **Authentication Protocol** radio button.

   The valid Authentication Protocols are None, MD5 or SHA:

   - If you select **None**, the user cannot access the SNMP data from an SNMP browser.
   - If you select **MD5** or **SHA**, the user login password are used as the SNMPv3 authentication password, and you must therefore specify a password, and it must be eight characters long.

   This specifies the SNMPv3 Authentication Protocol setting for the selected user account.

7. Select a **Encryption Protocol** radio button.

   The valid Encryption Protocols are None or DES:

   - If you select the DES Protocol you must enter a key in the **Encryption Key** field.
   - If **None** is specified for the Protocol, the Encryption Key is ignored.

   This specifies the SNMPv3 Encryption Protocol setting for the selected user account.

8. If you selected **DES** in the **Encryption Protocol** field, enter the encryption key in the **SNMPv3 Encryption Key** field.

   If you did not select DES, this field is ignored. Valid keys are 0 to 15 characters long.

9. Click the **Apply** button.

   Your settings are saved.

Configure LLDP

The IEEE 802.1AB-defined standard, Link Layer Discovery Protocol (LLDP), allows stations on an 802 LAN to advertise major capabilities and physical descriptions. This information is viewed by a network manager to identify system topology and detect bad configurations on the LAN.

LLDP is a one-way protocol; there are no request/response sequences. Information is advertised by stations implementing the transmit function, and is received and processed by stations implementing the receive function. The transmit and receive functions can be enabled/disabled separately per port. By default, both transmit and receive are disabled on all ports. The application is responsible for starting each transmit and receive state machine appropriately, based on the configured status and operational state of the port.

The Link Layer Discovery Protocol-Media Endpoint Discovery (LLDP-MED) is an enhancement to LLDP with the following features:

- Auto-discovery of LAN policies (such as VLAN, Layer 2 Priority, and DiffServ settings), enabling plug and play networking.
- Device location discovery for creation of location databases.
- Extended and automated power management of Power over Ethernet endpoints.
- Inventory management, enabling network administrators to track their network devices and determine their characteristics (manufacturer, software and hardware versions, serial/asset number).

Configure LLDP Global Settings

You can specify LLDP parameters that are applied to the switch.

To configure global LLDP settings:

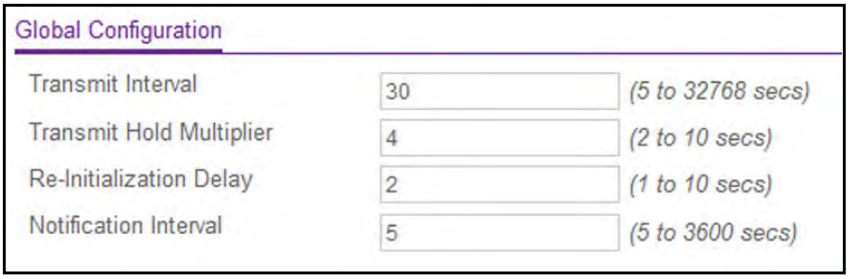
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > LLDP > Global Configuration**.



5. In the **Transmit Interval** field, enter the interval in seconds to transmit LLDP frames.

   The range is from 5 to 32768 secs. The default value is 30 seconds.

6. In the **Transmit Hold Multiplier** field, enter the multiplier on Transmit Interval to assign TTL.

   The range is from 2 to 10 secs. The default value is 4.

7. In the **Re-Initialization Delay** field, enter the delay before re-initialization.

   The range is from 1 to 10 secs. The default value is 2 seconds.

8. In the **Notification Interval** field, enter the interval in seconds for transmission of notifications.

   The range is from 5 to 3600 secs. The default value is 5 seconds.

9. Click the **Apply** button.

   Your settings are saved.

Configure the LLDP Interface

To configure the LLDP interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

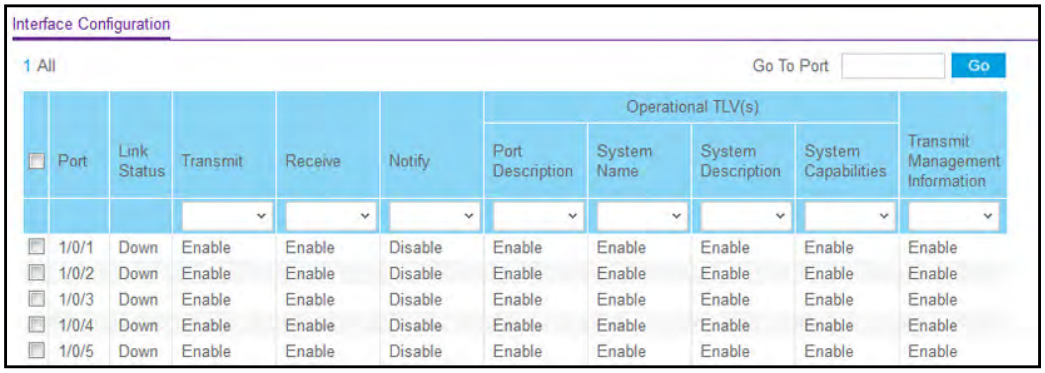
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > LLDP > Interface Configuration**.



5. Use **Go To Port** to enter the Port in unit/slot/port format and click the **Go** button.

   The entry corresponding to the specified Port, is selected.

6. Use **Port** to specify the list of ports on which LLDP - 802.1AB can be configured.

   The Link Status field indicates whether the link is up or down.

7. Use **Transmit** to specify the LLDP - 802.1AB transmit mode for the selected interface.
8. Use **Receive** to specify the LLDP - 802.1AB receive mode for the selected interface.
9. Use **Notify** to specify the LLDP - 802.1AB notification mode for the selected interface.
10. Optional TLV(s):
    - Use **Port Description** to include port description TLV in LLDP frames.
    - Use **System Name** to include system name TLV in LLDP frames.
    - Use **System Description** to include system description TLV in LLDP frames.
    - Use **System Capabilities** to include system capability TLV in LLDP frames.
11. Use **Transmit Management Information** to specify whether management address is transmitted in LLDP frames for the selected interface.
12. Click the **Apply** button.

    Your settings are saved.

View LLDP Statistics

To view LLDP statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

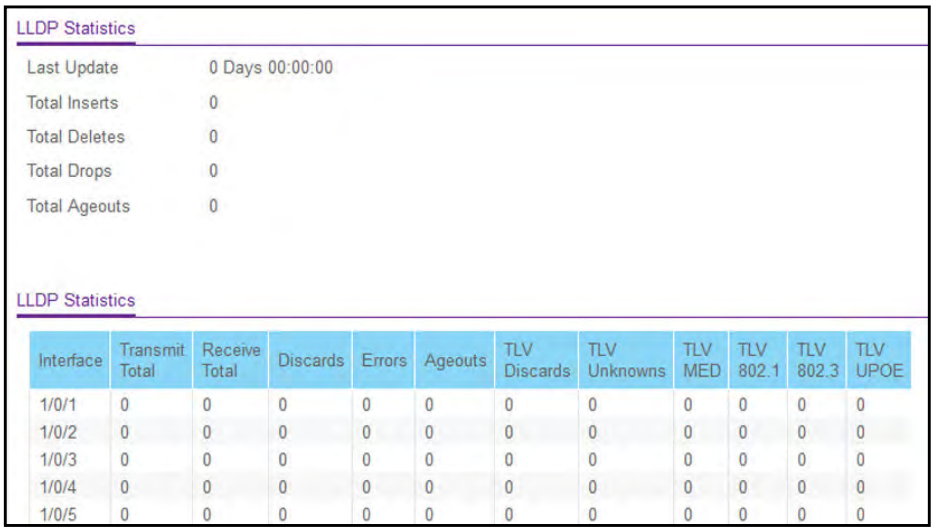
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **System > LLDP > Statistics**.



The following table describes the LLDP Statistics fields.

Table 46. LLDP Statistics

Field	Description
Last Update	The time when an entry was created, modified or deleted in the tables associated with the remote system.
Total Inserts	The number of times the complete set of information advertised by a particular MAC Service Access Point (MSAP) was inserted into tables associated with the remote systems.
Total Deletes	The number of times the complete set of information advertised by a particular MAC Service Access Point (MSAP) was deleted from tables associated with the remote systems.
Total Drops	The number of times the complete set of information advertised by a particular MAC Service Access Point (MSAP) could not be entered into tables associated with the remote systems because of insufficient resources.
Total Age outs	The number of times the complete set of information advertised by a particular MAC Service Access Point (MSAP) was deleted from tables associated with the remote systems because the information timeliness interval has expired.
Interface	The unit/slot/port for the interfaces.
Transmit Total	The number of LLDP frames transmitted by the LLDP agent on the corresponding port.
Receive Total	The number of valid LLDP frames received by this LLDP agent on the corresponding port, while the LLDP agent is enabled.

Table 46. LLDP Statistics (continued)

Field	Description
Discards	The number of LLDP TLVs discarded for any reason by the LLDP agent on the corresponding port.
Errors	The number of invalid LLDP frames received by the LLDP agent on the corresponding port, while the LLDP agent is enabled.
Age outs	The number of age-outs that occurred on a given port. An age-out is the number of times the complete set of information advertised by a particular MAC Service Access Point (MSAP) was deleted from tables associated with the remote entries because information timeliness interval expired.
TLV Discards	The number of LLDP TLVs discarded for any reason by the LLDP agent on the corresponding port.
TLV Unknowns	The number of LLDP TLVs received on the local ports which were not recognized by the LLDP agent on the corresponding port.
TLV MED	The total number of LLDP-MED TLVs received on the local ports.
TLV 802.1	The total number of LLDP TLVs received on the local ports which are of type 802.1.
TLV 802.3	The total number of LLDP TLVs received on the local ports which are of type 802.3.

View LLDP Local Device Information

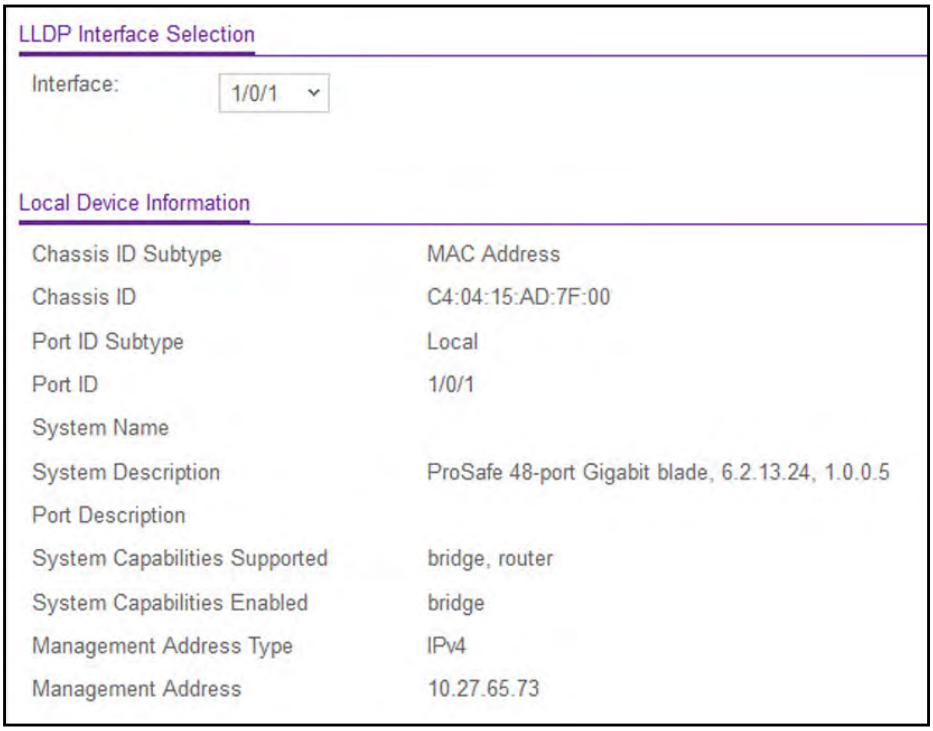
To view LLDP local device information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > LLDP > Local Device Information**.



5. In **Interface** list, select the ports on which LLDP - 802.1AB frames can be transmitted.

The following table describes the LLDP Local Device Information fields.

Table 47. LLDP Local Device Information

Field	Description
Chassis ID Subtype	The string that describes the source of the switch identifier.
Chassis ID	The string value used to identify the switch component associated with the local system.
Port ID Subtype	The string that describes the source of the port identifier.
Port ID	The string that describes the source of the port identifier.
System Name	The system name of the local system.
System Description	The description of the selected port associated with the local system.
Port Description	The description of the selected port associated with the local system.
System Capabilities Supported	The system capabilities of the local system.
System Capabilities Enabled	The system capabilities of the local system which are supported and enabled.
Management Address Type	The type of the management address.
Management Address	The advertised management address of the local system.

View LLDP Remote Device Information

You can view information on remote devices connected to the port.

To view LLDP remote device information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > LLDP > Remote Device Information**.

5. Use **Interface** to select the local ports which can receive LLDP frames.

The following table describes the LLDP Remote Device Information fields.

Table 48. LLDP Remote Device Information

Field	Description
Remote ID	The remote ID.
Switch ID	The switch component associated with the remote system.
Switch ID Subtype	The source of the switch identifier.
Port ID	The port component associated with the remote system.
Port ID Subtype	The source of port identifier.
System Name	The system name of the remote system.
System Description	The description of the given port associated with the remote system.
Port Description	The description of the given port associated with the remote system.
System Capabilities Supported	The system capabilities of the remote system.

Table 48. LLDP Remote Device Information (continued)

Field	Description
System Capabilities Enabled	The system capabilities of the remote system which are supported and enabled.
Time to Live	The Time To Live value in seconds of the received remote entry.
Management Address Type	The type of the management address.
Management Address	• Management Address. The advertised management address of the remote system. • Type. The type of the management address.

View LLDP Remote Device Inventory

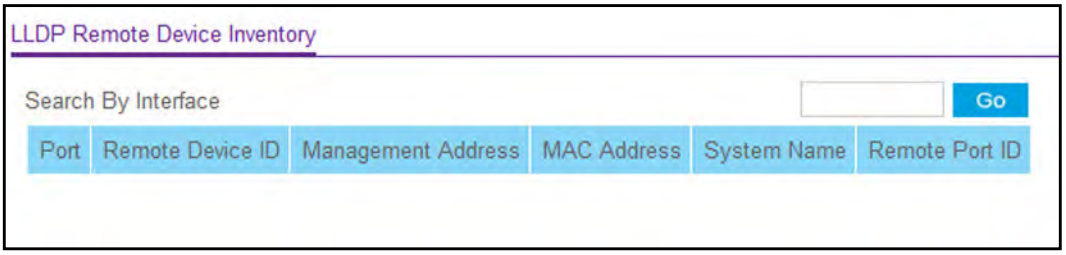
To view LLDP remote device inventory:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > LLDP > LLDP > Remote Device Inventory**.



The following table describes the LLDP Remote Device Inventory fields.

Table 49. LLDP Remote Device Inventory

Field	Description
Port	The list of all the ports on which LLDP frame is enabled.
Remote Device ID	The remote device ID.
Management Address	The advertised management address of the remote system.
MAC Address	The MAC address associated with the remote system.

Table 49. LLDP Remote Device Inventory (continued)

Field	Description
System Name	Specifies model name of the remote device.
Remote Port ID	The port component associated with the remote system.

Configure LLDP-MED Global Settings

You can specify LLDP-MED parameters that are applied to the switch.

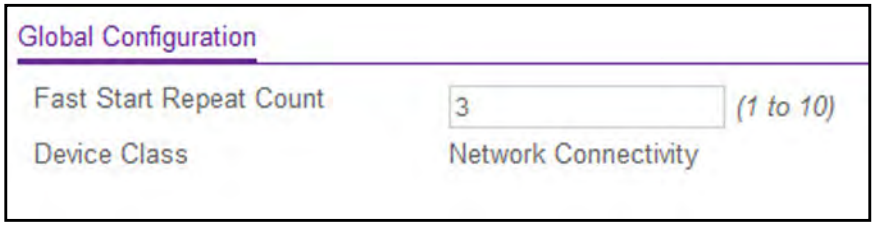
To configure LLDP-MED global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > LLDP > LLDP-MED > Global Configuration**.



5. In the **Fast Start Repeat Count** field, enter the number of LLDP PDUs that are transmitted when the protocol is enabled.

   The range is from (1 to 10). Default value of fast repeat count is 3.

   The **Device Class** field specifies local device's MED classification. There are four different kinds of devices, three of them represent the actual end points (classified as Class I Generic [IP Communication Controller and so on], Class II Media [Conference Bridge and so on], Class III Communication [IP Telephone and so on]). The fourth device is Network Connectivity Device, which is typically a LAN Switch/Router, IEEE 802.1 Bridge, IEEE 802.11 Wireless Access Point and so on.
6. Click the **Apply** button.

   Your settings are saved.

Configure LLDP-MED Interface

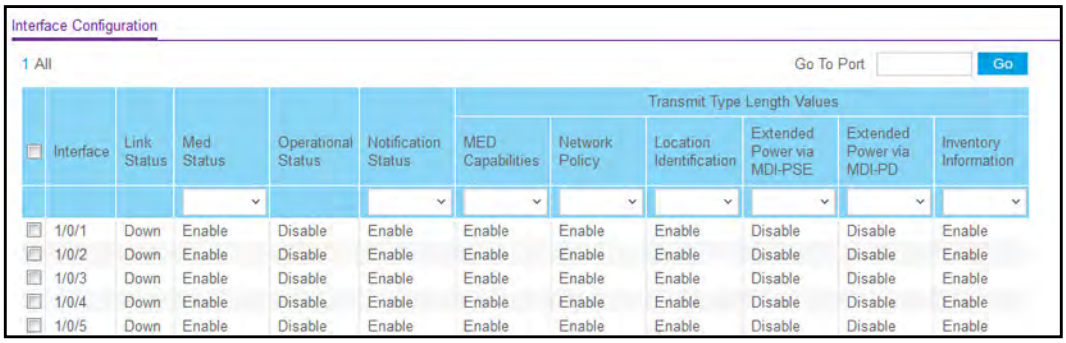
To configure LLDP-MED Interface

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > LLDP > LLDP-MED > Interface Configuration**.



   The **Link Status** field displays the link status of the port (up or down).

   The **Operational Status** field displays whether the LLDP-MED TLVs are transferred on this interface.
5. Use **Go To Port** to enter the Port in unit/slot/port format and click the **Go** button.

   The entry corresponding to the specified Port, is selected.
6. Use **Interface** to specify the list of ports on which LLDP-MED - 802.1AB can be configured.
7. Use **MED Status** to specify whether LLDP-MED mode is enabled or disabled on this interface.
8. Use **Notification Status** to specify the LLDP-MED topology notification mode of the interface.
9. Use **Transmit Type Length Values** to specify which optional type length values (TLVs) in the LLDP-MED is transmitted in the LLDP PDUs frames for the selected interface:
   - **MED Capabilities**. To transmit the capabilities TLV in LLDP frames.
   - **Network Policy**. To transmit the network policy TLV in LLDP frames.
   - **Location Identification**. To transmit the location TLV in LLDP frames.
   - **Extended Power via MDI - PSE**. To transmit the extended PSE TLV in LLDP frames.

- **Extended Power via MDI - PD**. To transmit the extended PD TLV in LLDP frames.
- **Inventory Information**. To transmit the inventory TLV in LLDP frames.

10. Click the **Apply** button.

    Your settings are saved.

View LLDP-MED Local Device Information

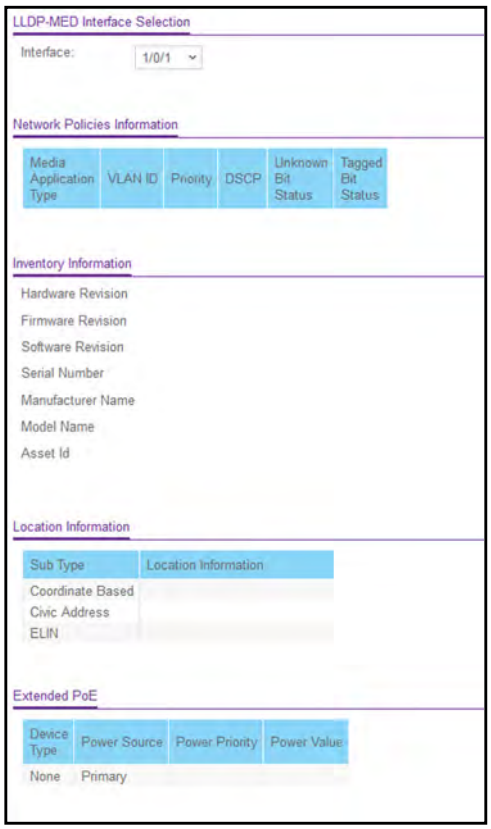
To view LLDP-MED local device information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > LLDP > LLDP-MED > Local Device Information**.



5. Use **Interface** to select the ports on which LLDP-MED frames can be transmitted.

The following table describes the LLDP-MED Local Device Information fields.L

Table 50. LDP-MED Local Device Information

Field	Description
Network Policy Information: Specifies if network policy TLV is present in the LLDP frames.	
Media Application Type	The application type. Types of application types are **unknown**, **voicesignaling**, **guestvoice**, **guestvoicesignalling**, **softphonevoice**, **videoconferencing**, **streammingvideo**, **vidoesignalling**. Each application type that is received has the VLAN ID, priority, DSCP, tagged bit status and unknown bit status. A port can receive one or many such application types. If a network policy TLV was transmitted, only then would this information be displayed
Inventory: Specifies if inventory TLV is present in LLDP frames	
Hardware Revision	Specifies hardware version.
Firmware Revision	Specifies Firmware version.
Software Revision	Specifies Software version.
Serial Number	Specifies serial number.
Manufacturer Name	Specifies manufacturers name.
Model Name	Specifies model name.
Asset ID	Specifies asset ID.
Location Information: Specifies if location TLV is present in LLDP frames.	
Sub Type	Specifies type of location information.
Location Information	The location information as a string for given type of location ID.

View LLDP-MED Remote Device Information

To view LLDP-MED remote device information:

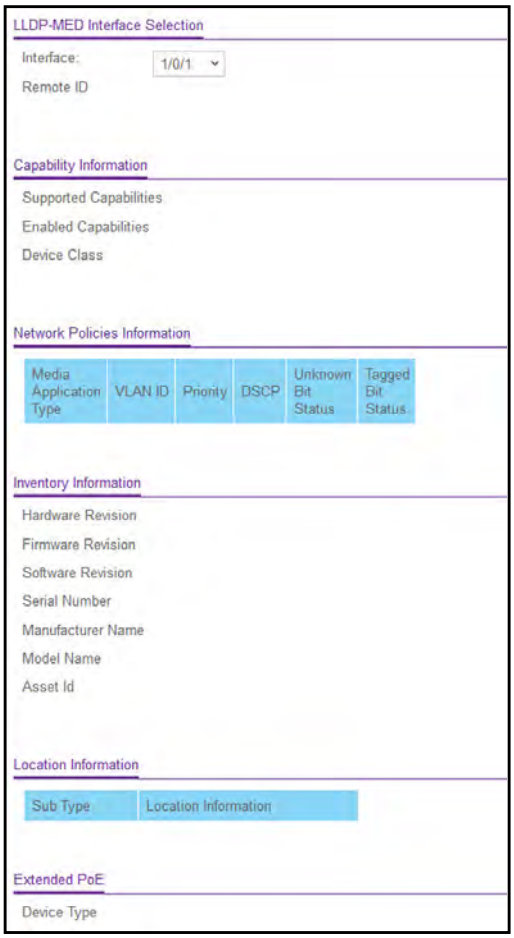
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > LLDP > LLDP-MED > Remote Device Information**.



5. Use **Interface** to select the ports on which LLDP-MED is enabled.

The following table describes the LLDP-MED Remote Device Information fields.

Table 51. LLDP-MED Remote Device Information

Field	Description
Capability Information: The supported and enabled capabilities that was received in MED TLV on this port.	
Supported Capabilities	Specifies supported capabilities that was received in MED TLV on this port.
Enabled Capabilities	Specifies enabled capabilities that was received in MED TLV on this port.
Device Class	Specifies device class as advertised by the device remotely connected to the port.

Table 51. LLDP-MED Remote Device Information (continued)

Field	Description
Network Policy Information: Specifies if network policy TLV is received in the LLDP frames on this port.	
Media Application Type	The application type. Types of application types are **unknown**, **voicesignaling**, **guestvoice**, **guestvoicesignalling**, **softphonevoice**, **videoconferencing**, **streammingvideo**, **vidoesignalling**. Each application type that is received has the VLAN ID, priority, DSCP, tagged bit status and unknown bit status. A port can receive one or many such application types. If a network policy TLV was received on this port, only then would this information be displayed.
VLAN Id	The VLAN ID associated with a particular policy type.
Priority	The priority associated with a particular policy type.
DSCP	The DSCP associated with a particular policy type.
Unknown Bit Status	The unknown bit associated with a particular policy type.
Tagged Bit Status	The tagged bit associated with a particular policy type.
Inventory Information: Specifies if inventory TLV is received in LLDP frames on this port.	
Hardware Revision	Specifies hardware version of the remote device.
Firmware Revision	Specifies Firmware version of the remote device.
Software Revision	Specifies Software version of the remote device.
Serial Number	Specifies serial number of the remote device.
Manufacturer Name	Specifies manufacturers name of the remote device.
Model Name	Specifies model name of the remote device.
Asset ID	Specifies asset ID of the remote device.
Location Information: Specifies if location TLV is received in LLDP frames on this port.	
Sub Type	Specifies type of location information.
Location Information	The location information as a string for given type of location ID.
Extended POE: Specifies if remote device is a PoE device.	
Device Type	Specifies remote device's PoE device type connected to this port.
Extended POE PSE: Specifies if extended PSE TLV is received in LLDP frame on this port	
Available	The remote ports PSE power value in tenths of watts.
Source	The remote ports PSE power source.
Priority	The remote ports PSE power priority.

Table 51. LLDP-MED Remote Device Information (continued)

Field	Description
Extended POE PD: Specifies if extended PD TLV is received in LLDP frame on this port.	
Required	The remote port's PD power requirement.
Source	The remote port's PD power source.
Priority	The remote port's PD power priority.

View LLDP-MED Remote Device Inventory

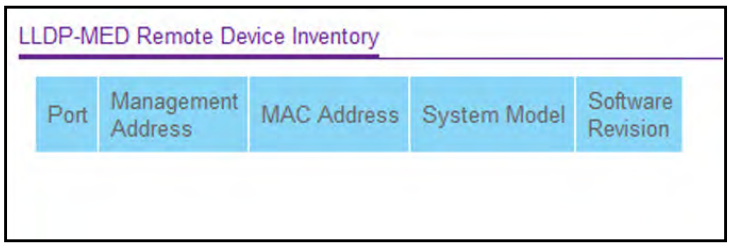
To view LLDP-MED remote device inventory:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > LLDP > LLDP-MED > Remote Device Inventory**.



The following table describes the LLDP-MED Remote Device Inventory fields.

Table 52. LLDP-MED Remote Device Inventory

Field	Definition
Port	The list of all the ports on which LLDP-MED is enabled.
Management Address	The advertised management address of the remote system.
MAC Address	The MAC address associated with the remote system.
System Model	Specifies model name of the remote device.
Software Revision	Specifies Software version of the remote device.

Configure Link Dependency

The link dependency feature provides the ability to enable or disable one or more ports based on the link state of one or more different ports. With link dependency enabled on a port, the link state of that port is dependent on the link state of another port. For example, if port A is dependent on port B and the switch detects a link loss on port B, the switch automatically brings down the link on port A. When the link is restored to port B, the switch automatically restores the link to port A.

Configure Link Dependency Group

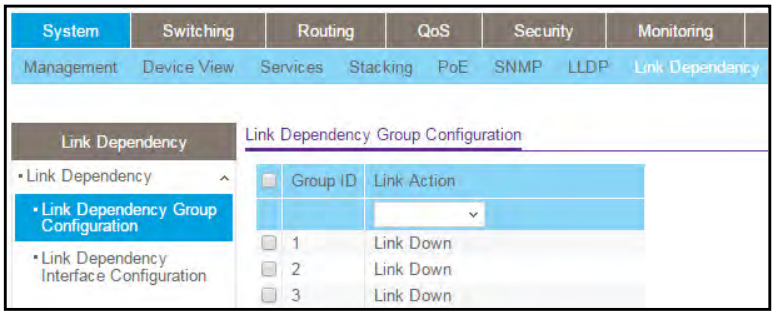
To configure a link dependency group:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Link Dependency > Link Dependency Group Configuration**.



5. Select the **Group ID** option for which data is to be displayed. The range for Group ID is 1 to 16.
6. From the **Link Action** list, specify the action to be performed on the downstream interfaces when all the interfaces in the upstream list go down. The default value is Link Down.
   a. Link Down—When all the upstream interfaces are down, then all the downstream interfaces are brought down. When any of the upstream interfaces are up, then all the downstream interfaces are brought up.
   b. Link Up—When all the upstream interfaces are down, then all the downstream interfaces are brought up. When any of the upstream interfaces are up, then all the downstream interfaces are brought down.

7. Click the **Apply** button.

   Your settings are saved.

Configure a Link Dependency Interface

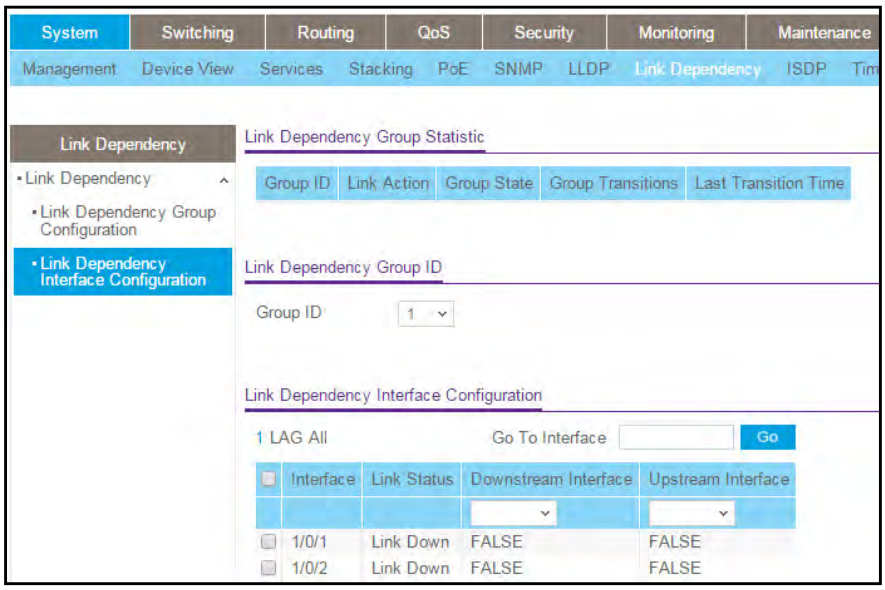
To configure a link dependency interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Link Dependency > Link Dependency Interface Configuration**.



5. In the Link Dependency Group ID section of the page, use the **Group ID** menu to select the Group ID for which you want to display or configure data.

   The range for Group ID is 1 to 16.
6. To make changes, do the following:
   - Click the **Clear** button to clear all interfaces from the specified group.
   - Click the **Refresh** button to refresh the page with the latest information on the switch.
7. Click the **Apply** button.

   Your settings are saved.

8. In the Link Dependency Interface Configuration section of the page, select which interfaces are displayed on the page:
   - Use **LAG** to display LAGs only.
   - Use **All** to display all physical ports and LAGs.
9. Use one of the following methods to select an interface:
   - Use the **Go To Interface** field by entering the interface in unit/slot/port format and click the **Go** button. The entry corresponding to the specified interface, is selected.
   - Use **Interface** to select the interface for which data is to be displayed or configured.
10. In the **Downstream Interface** field, specify whether the interface belongs to the group's downstream list.

    An interface that is defined as an upstream interface cannot be defined as a downstream interface in the same link state group. The default value is False.
    - Select **False** to delete an interface from the downstream list of the specified group.
    - Select **True** to add an interface to the downstream list of the specified group.
11. In the **Upstream Interface** field, specify whether the interface belongs to the group's upstream list.

    An interface that is defined as an upstream interface cannot be defined as a downstream interface in the same link state group. The default value is False.
    - Select **False** to delete an interface from the upstream list of the specified group.
    - Select **True** to add an interface to the upstream list of the specified group.
12. Click the **Apply** button.

    Your settings are saved.
13. Click the **Refresh** button to refresh the page with the latest information on the switch.

The following table describes the Link Dependency Interface Configuration nonconfigurable information that displays on the page.

Table 53. Link Dependency Interface Configuration Nonconfigurable Field

Field	Description
Link Status	Indicates whether the link for the corresponding interface is up or down.

The following table describes the Link Dependency Group Statistic nonconfigurable information that displays on the page.

Table 54. Link Dependency Group Statistic

Field	Description
Group ID	The Group ID for which data is displayed. The range is 1 to 16.
Link Action	The action to be performed on downstream interfaces when all the interfaces in the upstream list go down.
Group State	The current state of the group.

Table 54. Link Dependency Group Statistic (continued)

Field	Description
Group Transitions	Indicates the number of group transitions.
Last Transition Time	Indicates the time of the last group transitions.

Configure ISDP

You can configure ISDP global and interface settings.

Configure ISDP Basic Global Settings

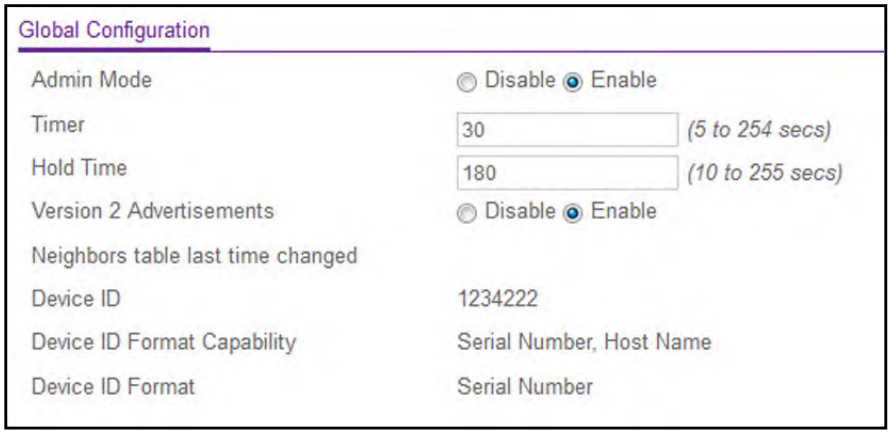
To configure ISDP basic global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > ISDP > Basic > Global Configuration**.



5. Select the **Admin mode Disable** or **Enable** radio button.

   This specifies whether the ISDP Service is enabled or disabled. The default value is Enabled.

6. Use **Timer** to specify the period of time between sending new ISDP packets.

   The range is 5 to 254 seconds. The default value is 30 seconds.

7. Use **Hold Time** to specify the hold time for ISDP packets that the switch transmits.

   The hold time specifies how long a receiving device must store information sent in the ISDP packet before discarding it. The range 10 to 255 seconds. The default value is 180 seconds.

8. Select the **Version 2 Advertisements Disable** or **Enable** radio button.

   This enables or disables the sending of ISDP version 2 packets from the device. The default value is Enabled.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the ISDP Basic Global Configuration fields.

Table 55. ISDP Basic Global Configuration

Field	Description
Neighbors table last time changed	Specifies if
Device ID	The device ID of this switch.
Device ID Format Capability	The device ID format capability.
Device ID Format	The device ID format.

Configure ISDP Global Settings

To configure ISDP global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

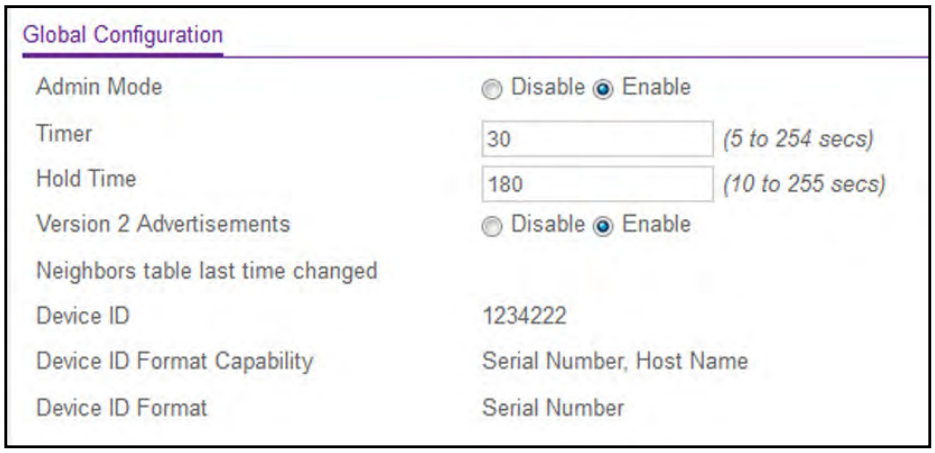
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > ISDP > Advanced > Global Configuration**.



5. Select the **Admin mode Disable** or **Enable** radio button.

   This specifies whether the ISDP Service is enabled or disabled. The default value is Enable.

6. In the **Timer** field, specify the period of time between sending new ISDP packets.

   The range is 5 to 254 seconds. The default value is 30 seconds.

7. In the **Hold Time** field, specify the hold time for ISDP packets that the switch transmits.

   The hold time specifies how long a receiving device must store information sent in the ISDP packet before discarding it. The range 10 to 255 seconds. The default value is 180 seconds.

8. Select the **Version 2 Advertisements Disable** or **Enable** radio button.

   This enables or disables the sending of ISDP version 2 packets from the device. The default value is Enable.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the ISDP Advanced Global Configuration fields.

Table 56. ISDP Advanced Global Configuration

Field	Description
Neighbors table last time changed	Displays when the Neighbors table last changed.
Device ID	The device ID of this switch.
Device ID Format Capability	The device ID format capability.
Device ID Format	The device ID format.

Configure an ISDP Interface

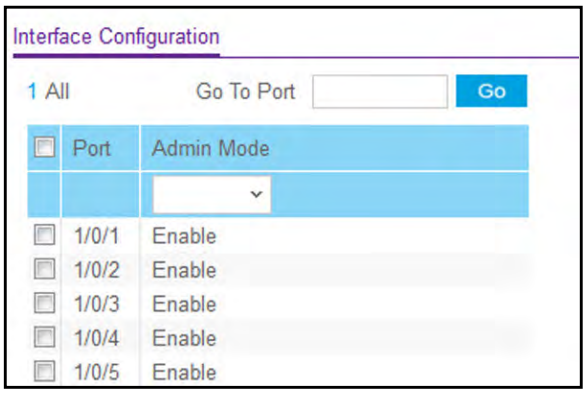
To configure an ISDP interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > ISDP > Advanced > Interface Configuration**.



5. Use **Port** to select the port on which the admin mode is configured.
6. Use **Admin mode** to enable or disable ISDP on the port.

   The default value is Enable.
7. Click the **Apply** button.

   Your settings are saved.

View an ISDP Neighbor

To view an ISDP neighbor:

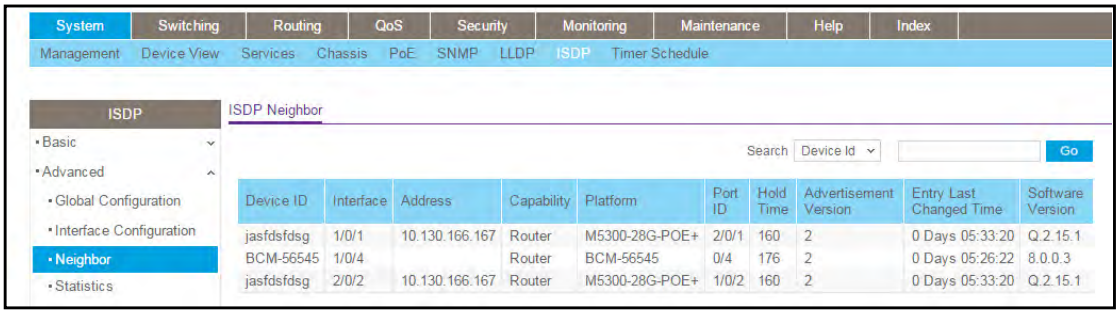
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **System > ISDP > Advanced > Neighbor**.



The following table describes the ISDP Neighbor fields.

Table 57. ISDP Neighbor

Field	Description
Device ID	The device ID of the ISDP neighbor.
Interface	The interface on which the neighbor is discovered.
Address	The address of the neighbor.
Capability	The capability of the neighbor. These are supported: • Router • Trans Bridge • Source Route • Switch • Host • IGMP • Repeater
Platform	The model type of the neighbor. (0 to 32)
Port ID	The port ID on the neighbor.
Hold Time	The hold time for ISDP packets that the neighbor transmits.
Advertisement Version	The ISDP version sending from the neighbor.
Entry Last Changed Time	The time since last entry is changed.
Software Version	The software version on the neighbor.

View ISDP Statistics

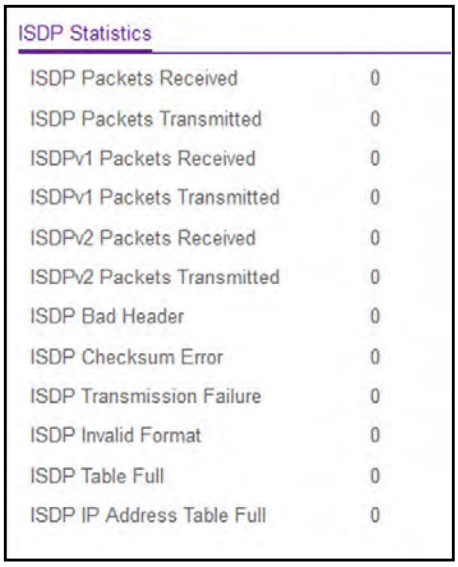
To view ISDP statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > ISDP > Advanced > Statistics**.



The following table describes the ISDP Statistics fields.

Table 58. ISDP Statistics

Field	Description
ISDP Packets Received	The ISDP packets received including ISDPv1 and ISDPv2 packets.
ISDP Packets Transmitted	The ISDP packets transmitted including ISDPv1 and ISDPv2 packets.
ISDPv1 Packets Received	The ISDPv1 packets received.
ISDPv1 Packets Transmitted	The ISDPv1 packets transmitted.
ISDPv2 Packets Received	The ISDPv2 packets received.
ISDPv2 Packets Transmitted	The ISDPv2 packets transmitted.
ISDP Bad Header	The ISDP bad packets received.

Table 58. ISDP Statistics (continued)

Field	Description
ISDP Checksum Error	The number of the checksum error.
ISDP Transmission Failure	The number of the transmission failure.
ISDP Invalid Format	The number of the invalid format ISDP packets received.
ISDP Table Full	The table size of the ISDP table.
ISDP Ip Address Table Full	The table size of the ISDP IP address table.

Manage Timer Schedules

You can configure the global timer settings and set up timer schedules.

Configure the Global Timer Settings

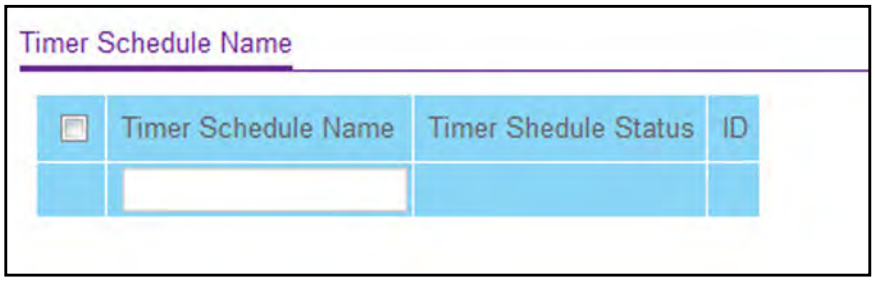
To add or delete a global timer schedule:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Timer Schedule > Basic > Global Configuration**.



5. Use the **Timer Schedule Name** to specify the name of a timer schedule.
6. Take one of the following actions:
   - Click the **Add** button.

     The timer schedule is added.

- Click the **Delete** button.

  The timer schedule is deleted.

Configure the Timer Schedule

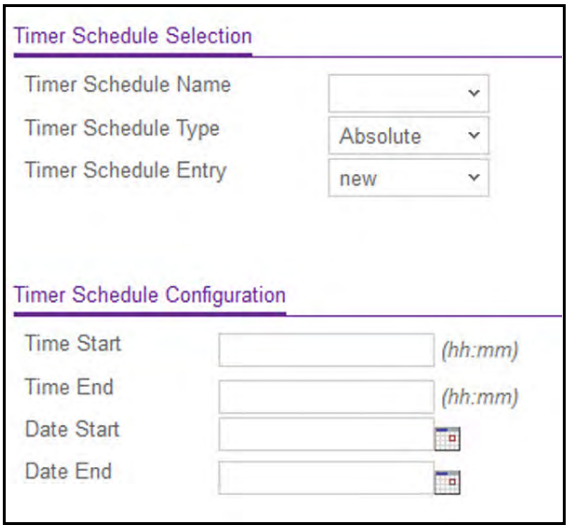
To configure the timer schedule:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Services > Timer Schedule > Advanced > Schedule Configuration**.



5. In the **Timer Schedule Name** list, select the timer schedule.
6. In the **Timer Schedule Type** list, select **Absolute** or **Periodic**.
7. In the **Timer Schedule Entry** list, select the number of the timer schedule entries to be configured or added.

   If you are adding an entry, select **new**.
8. In the **Time Start** field, enter the time of the day in format (HH:MM) when the schedule operation is started.

   This field is required. If no time is specified, the schedule does not start running.
9. In the **Time End** field, enter the time of the day in format (HH:MM) when the schedule operation is terminated.

10. Use the **Date Start** to set the schedule start date.

If no date is specified, the schedule starts running immediately.

11. Use the **Date Stop** to set the schedule termination date.

If No End Date selected, the schedule operates indefinitely.

12. Use the **Recurrence Pattern** to show with what period the event repeats.

If recurrence is not needed (a timer schedule must be triggered just once), then set Date Stop as equal to Date Start. There are the following possible values of recurrence:

- **Daily**. The timer schedule works with daily recurrence

  Daily mode. Every WeekDay selection means that the schedule is triggered every day from Monday to Friday. Every Day(s) selection means that the schedule is triggered every defined number of days. If number of days is not specified, then the schedule is triggered every day.

- **Weekly**. The timer schedule works with weekly recurrence
  - **Every Week(s)**. Define the number of weeks when the schedule is triggered. If number of weeks is not specified, then the schedule is triggered every week.
  - **WeekDay**. Specify the days of week when the schedule operates.
- **Monthly**. The timer schedule works with monthly recurrence

  Monthly mode. Show the day of the month when the schedule is triggered. Field Every Month(s) means that the schedule is triggered every defined number of months.

13. Click the **Apply** button.

Your settings are saved.

3

Manage Stacking

This chapter covers the following topics:

M4300 Series Switch Stacking Overview

A stackable switch is a switch that is fully functional operating as a stand-alone unit but can also be set-up to operate together with up to seven other switches. This group of switches shows the characteristics of a single switch while having the port capacity of the sum of the combined switches.

One of the switches in the stack controls the operation of the stack. This switch is called the stack *master*. The remaining switches in the stack are stack *members*. The stack members use stacking technology to behave and work together as a unified system. Layer 2 and higher protocols present the entire switch stack as a single entity to the network.

The stack master is the single point of stack-wide management. From the stack master, you configure the following:

- System-level (global) features that apply to all stack members
- Interface-level features for all interfaces on any stack member

A switch stack is identified in the network by its network IP address. The network IP address is assigned according to the MAC address of the stack master. Every stack member is uniquely identified by its own stack member number, which is from 1 to 8. The stack master can be any number within that range.

Stacking supports the following:

- Up to eight switches per stack
- Single IP address management through a web browser, the CLI, or SNMP.
- Master-slave configuration:
  - The master retains configuration for entire stack.
  - Automatic detection of new members, with synchronization of firmware (upgrade or downgrade as needed).
- Configuration updates across the stack through a single operation.
- Automatic master failover. Fully resilient stack with chain and ring topology.
- Hot swapping (insertion and removal) of stack members.

Firmware Synchronization and Upgrade

All stack members must run the same software version to ensure compatibility within the stack. By default, if a unit is added to the stack and its software version is not the same as the stack master, that unit is not allowed to join the stack. You can enable the Stack Firmware Auto Upgrade feature, which automatically synchronizes the firmware version on the new unit with the version running on the stack master. The synchronization operation might result in either upgrade or downgrade of firmware on the mismatched stack member.

Upgrading the firmware on a stack of switches is the same as upgrading the firmware on a single switch. After you download a new image by using the File Download page or SCC, the downloaded image is distributed to all the connected units of the stack.

Note: We recommend that you set the active image for all stack members the same as the active image of the stack master. In other words, if image1 is the active image on the stack master, all units must use image1 as the active image. For information about configuring the active image, see Configure Dual Image Settings on page 684.

Stack Configuration Maintenance

The stack master stores and maintains the saved and running configuration files for the switch stack. The configuration files include the system-level settings for the switch stack and the interface-level settings for all stack members. Each stack member retains a copy of the saved file for backup purposes. If the master is removed from the stack or becomes unavailable, another member is elected master and then runs from that saved configuration.

The switch master copies its running configuration to the stack member configured as the *standby* unit whenever it changes (subject to some restrictions to reduce overhead). This enables the standby unit to take over the stack operation with minimal interruption if the stack master becomes unavailable. The running-config synchronization also occurs when the running configuration is auto-saved on the stack master or when the standby unit changes.

Stack Master Election

All stack members are eligible stack masters. If the stack master becomes unavailable, the remaining stack members participate in electing a new stack master from among themselves. The following factors determine which switch is elected the stack master:

- The switch that is master always has priority to retain the role of master.
- Assigned priority.
- MAC address.

When the stack is powered up and completes the boot process or the original stack master becomes unavailable, the stack master is determined through an election process.

The rules for stack master election are as follows:

- If a unit was elected stack master previously, then it remains the stack master and other units are stack members.
- If no units were stack masters, or more than one unit was a stack master, then the unit with the highest management preference is elected stack master. The management

preference can be assigned by the administrator. However, if all units are assigned the same management preference, then the unit with the highest MAC address is assigned as the stack master.

Stack Factory Defaults Reset Behavior

If the stack master is reset to the factory default settings (see Reset the Switch to Its Factory Default Settings on page 672), the stack master applies the default settings to all the stack members and resets the stack, including all participating stack members. When the stack boots, the stack master election process begins.

A switch can be described in terms of three semi-independent functions called the forwarding plane, the control plane, and the management plane. The forwarding plane forwards data packets. The forwarding plane is implemented in hardware. The control plane is the set of protocols that determine how the forwarding plane forwards packets, deciding which data packets are allowed to be forwarded and where they go. Application software on the management unit acts as the control plane. The management plane is application software running on the management unit that provides interfaces allowing a network administrator to configure and monitor the device.

Stack NSF

Nonstop forwarding (NSF) allows the forwarding plane of stack units to continue to forward packets while the control and management planes restart as a result of a power failure, hardware failure, or software fault on the management unit. A nonstop forwarding failover can also be manually initiated by clicking the Initiate Failover button on the NSF Summary page. Traffic flows that enter and exit the stack through physical ports on a unit other than the management continue with at most sub-second interruption when the management unit fails.

To prepare the backup management unit in case of a failover, applications on the management unit continuously checkpoint some state information to the backup unit. Changes to the running configuration are automatically copied to the backup unit. MAC addresses stay the same across a nonstop forwarding failover so that neighbors are not required to relearn them.

When a nonstop forwarding failover occurs, the control plane on the backup unit starts from a partially initialized state and applies the checkpointed state information. While the control plane is initializing, the stack cannot react to external changes, such as network topology changes. Once the control plane is fully operational on the new management unit, the control plane ensures that the hardware state is updated as necessary. Control plane failover time depends on the size of the stack, the complexity of the configuration, and the speed of the CPU.

The management plane restarts when a failover occurs. Management connections must be reestablished.

For NSF to be effective, adjacent networking devices must not reroute traffic around the restarting device. The switch uses three techniques to prevent traffic from being rerouted:

- A protocol can distribute a part of its control plane to stack units so that the protocol can give the appearance that it is still functional during the restart. Spanning tree and port channels use this technique.
- A protocol can enlist the cooperation of its neighbors through a technique known as graceful restart. OSPF uses graceful restart if it is enabled.
- A protocol can restart after the failover if neighbors react slowly enough that they cannot normally detect the outage. The IP multicast routing protocols are a good example of this behavior.

To take full advantage of nonstop forwarding, Layer 2 connections to neighbors must be through port channels that span two or more stack units, and Layer 3 routes must be ECMP routes with next hops through physical ports on two or more units. The hardware can quickly move traffic flows from port channel members or ECMP paths on a failed unit to a surviving unit.

Configure a Stack

You can move the primary management unit functionality from one unit to another. Upon execution, the entire stack (including all interfaces in the stack) is unconfigured and reconfigured with the configuration on the new primary management unit. After the reload is complete, all stack management capability must be performed on the new primary management unit. To preserve the current configuration across a stack move, save the current configuration to the NVRAM before performing the stack move. A stack move causes all routes and Layer 2 addresses to be lost. The administrator is prompted to confirm the management move.

Select a New Stack Master

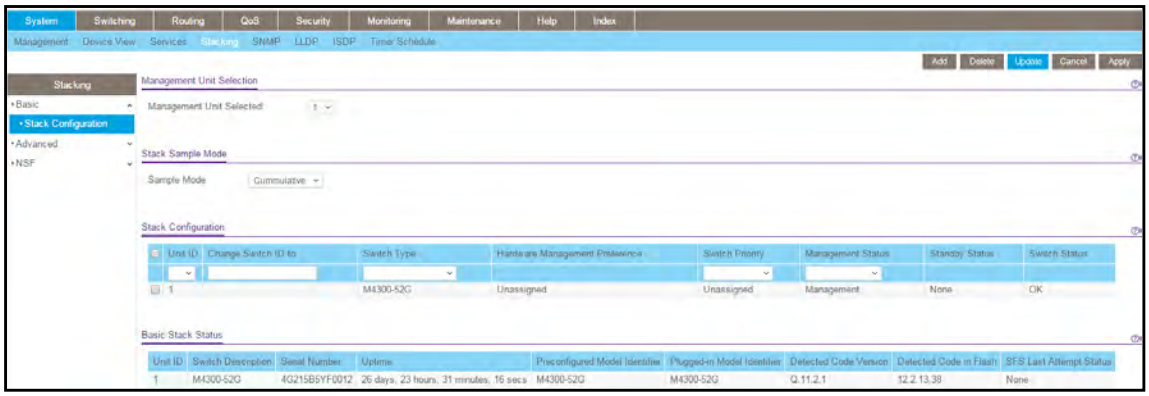
To select a new stack master:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Stacking > Basic > Stack Configuration**.



The **Management Unit Selected** menu displays the current primary management unit.

5. To change the primary management unit, select another unit ID of the stack member to become the stack master.

   A message displays to notify you that moving stack management unconfigures the entire stack including all interfaces.

6. Click the **OK** button to confirm the selection and reload the stack.

   The stack is unavailable until the boot process completes.

Specify the Stack Sample Mode

To specify the stack sample mode:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Stacking > Basic > Stack Configuration**.

   Use the Stack Sample mode section of the page to configure global status management mode, and sample size. The mode and sample size parameters are applied globally to all units in the stack.

5. In the **Sample mode** list, select one of the following:
   - **Cumulative**. Tracks the sum of received time-stamp offsets cumulatively.
   - **History**. Tracks the history of received timestamps.
6. In the **Max Samples** field, configure the maximum number of samples to keep.

The valid range is 100 to 500.

7. Click the **Apply** button.

   Your settings are saved.

Configure a Stack Member

To configure a stack member before adding it to the stack:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

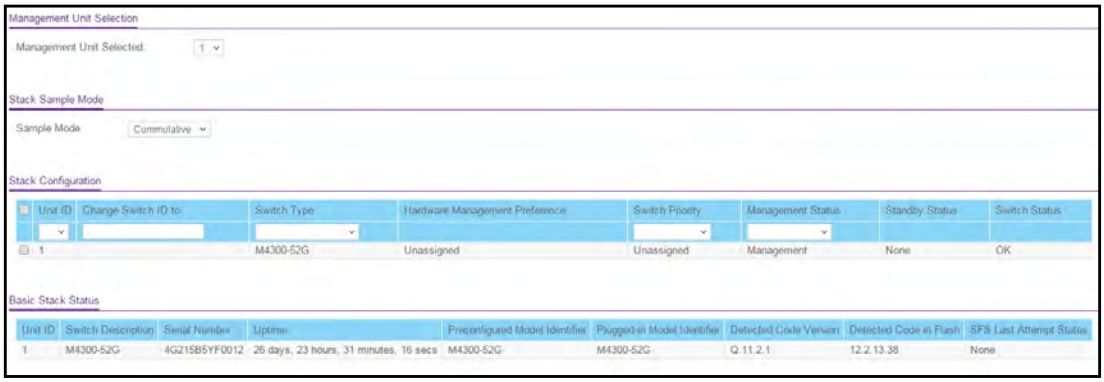
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **System > Stacking > Stack Configuration**.



5. Select the **Unit ID** of the stack member to add.
6. Select the switch model number of the new unit from the **Switch Type** field.
7. Optionally, specify the **Switch Priority** to select whether this unit becomes a management unit in preference to another unit.

   The default value for this setting is undefined. If the preference level is set to zero, then the device cannot become a management unit. A higher value indicates a higher priority. The maximum value is 15.

8. Use the **Management Status** field to indicate whether the selected switch is the stack master, a normal stacking member, or the standby unit.

   A standby unit takes over the stack master responsibilities if the stack master becomes unavailable.

9. Click the **Add** button.

   The preconfigured unit is added to the stack.

Change the Settings for an Existing Stack Member

To change the settings for an existing stack member:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Stacking > Stack Configuration**.

   The Stack Configuration page displays.
5. Select the check box next to the stack member to configure.
6. If desired, specify a new unit ID for the stack member in the **Change to Switch ID** field.

   The renumbering process causes the unit to reload.
7. Specify the switch type, priority, or management status from the available fields.
8. Click the **Apply** button.

   The changes to the stack member are saved.

   Note: If you configured a new unit number for an existing stack member, you are asked to confirm the change. Click the **OK** button to continue or click the **Cancel** button to retain the original settings.
9. To make other changes, do the following:
   - To remove the selected unit from the stack, click the **Delete** button.
   - To update the page with the latest information from the switch, click the **Refresh** button.

   Note: If you are adding or removing a dummy unit with PoE for preconfiguration, you must log in again to an actual web session to apply changes and observe relevant PoE web pages.
10. If you made any changes, click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable Stack Configuration fields.

Table 59. Stack Configuration

Field	Description
Hardware Management Preference	The hardware management preference of the switch. The hardware management preference can be disabled or unassigned.
Standby Status	Identifies the switch that is configured as the standby unit. The possible values are as follows: • **Cfg Standby**. Indicates that the unit is configured as the standby unit. The unit configured as the standby switch becomes the stack manager if the current manager fails. • **Opr Standby**. Indicates that this unit is operating as the standby unit and the configured standby unit is not part of the stack. • **None**. The switch is not configured as the standby unit.
Switch Status	The status of the selected unit. The possible values are as follows: • **OK**. The unit is connected and works properly. • **Unsupported**. The type of inserted unit is not supported. • **Code Mismatch**. The firmware version is not identical to the master or management unit. • **Config Mismatch**. The inserted device type is different from the configured devices. • **Not Present**. The unit is not connected. • **SDM Mismatch**. The SDM template does not match. • **Updating Code**. A firmware update is in progress. • **STM Mismatch**. The STM template does not match.

The following table describes the nonconfigurable Stack Status information that is displayed.

Table 60. Stack Status nonconfigurable fields

Field	Description
Hardware Management Preference	The hardware management preference of the switch, which can be disabled or unassigned.
Standby Status	Identifies the switch that is configured as the standby unit: • **Cfg Standb**y. The unit is configured as the standby unit. The unit configured as the standby switch becomes the stack manager if the current manager fails. • **Opr Standb**y. This unit is operating as the standby unit and the configured standby Unit is not part of the stack. • **None**. The switch is not configured as the standby unit.

Table 60. Stack Status nonconfigurable fields (continued)

Field	Description
Switch Status	The status of the selected unit. Possible values are as follows: • **OK**. The unit is connected and works properly. • **Unsupported**. The type of inserted unit is not supported. • **Code Mismatch**. The code version is not identical to the master/management unit. • **Config Mismatch**. The inserted device type is different from the configured devices. • **Not Present**. The unit is not connected. • **SDM Mismatch**. SDM template mismatch. • **Updating Code**. A code update is in progress. • **STM Mismatch**. STM template mismatch.
Unit ID	The unit ID of the specific switch.
Switch Description	The description for the unit that is configured by the user.
Serial Number	The unique box serial number for this switch.
Up Time	The relative time since the last reboot of the switch.
Preconfigured Model Identifier	The model type assigned by the device manufacturer to identify the device.
Plugged-In Model Identifier	The model type assigned by the device manufacturer to identify the plugged-in device.
Detected Code Version	The detected version of code on this unit.
Detected Code in Flash	The release number and version number of the code stored in flash.
SFS Last Attempt Status	The stack firmware synchronization last attempt status.

Configure the Mode of the Stack Ports

By default, the stack ports on each switch are configured for stacking. However, you can use these ports as standard Ethernet ports. Use the Stack Port Configuration page to configure the mode of the stack ports and to view information about the ports.

To configure the mode of the stack ports:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

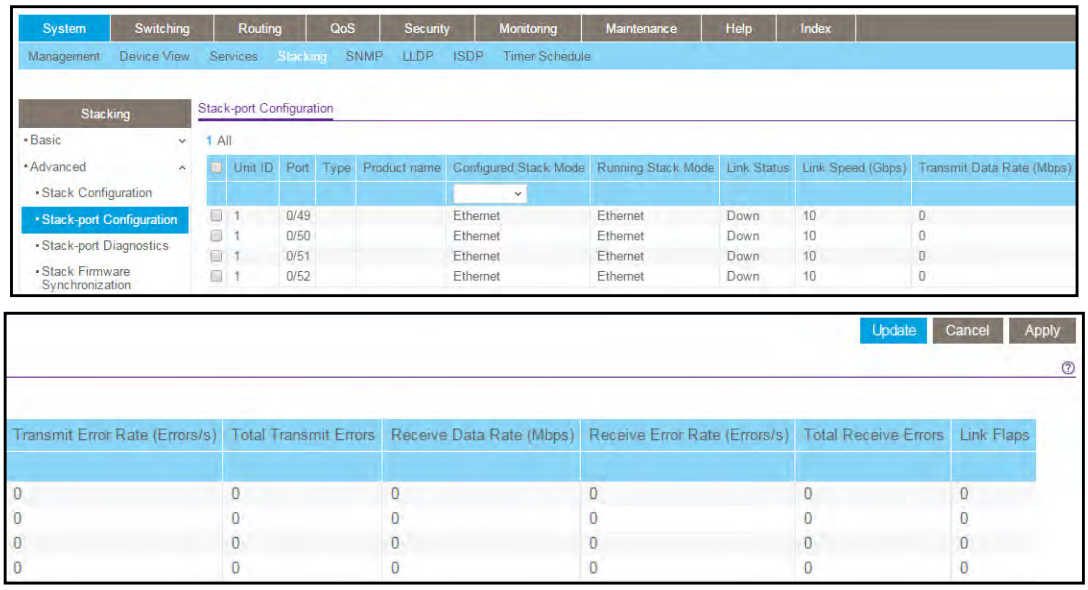
   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **System > Stacking > Advanced > Stack Port Configuration**.

   The page is shown in two parts.



5. Select the check box associated with the unit and port to configure:
6. From the **Configured Stack mode** field, select the operating mode of the port to be either:
   - **Stack**. The port connects to the stack port on another stack member. This is the default value for back panel stack mode.
   - **Ethernet**. The port operates as a standard switch port that receives and transmits network traffic. This is the default value for front panel stack mode.
7. Click the **Apply** button.

   Your settings are saved.

The following table describes Stack Port Configuration fields.

Table 61. Stack Port Configuration

Field	Description
Unit ID	The unit.
Port	The stackable interfaces on the given unit.
Slot ID	The slot ID in the format unit/slot.
Type	The type of stackable interfaces on the given unit.
Product Name	The name of the XFP/SFP+ adapter.
Running Stack mode	The run-time mode of the stackable interface.
Link Status	The link status (UP/DOWN) of the port.

Table 61. Stack Port Configuration (continued)

Field	Description
Link Speed (Gbps)	The maximum speed of the stacking port.
Transmit Data Rate (Mbps)	The approximate transmit rate on the stacking port.
Transmit Error Rate	The number of errors in transmit packets per second.
Total Transmit Errors	The total number of errors in transmit packets since boot. The counter might wrap.
Receive Data Rate (Mbps)	The approximate receive rate on the stacking port.
Receive Error Rate	The number of errors in receive packets per second.
Total Receive Errors	The total number of errors in receive packets since boot. The counter might wrap.
Link Flaps	The total number of link flaps.

Run Stack Port Diagnostics

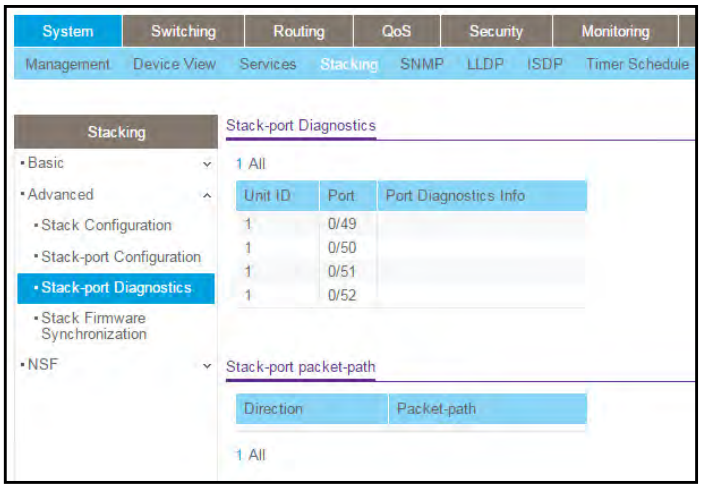
To run stack port diagnostics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Stacking > Advanced > Stack Port Diagnostics**.



5. Select **Unit ID** to display the packet path starting from the selected unit.
6. Select **All** to display the packet path from all the units in the stack.
7. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the Stack Port Diagnostics fields.

Table 62. Stack Port Diagnostics

Field	Definition
Unit ID	The unit.
Port	The stackable interface on the given unit.
Port Diagnostics Info	Displays three text fields (80 character strings) populated by the driver containing debug and status information.

The following table describes the nonconfigurable Stack Port Packet Path fields.

Table 63. Stack Port Packed Path

Field	Definition
Direction	The path direction.
Packet Path	The packet path.

Configure Stack Firmware Synchronization

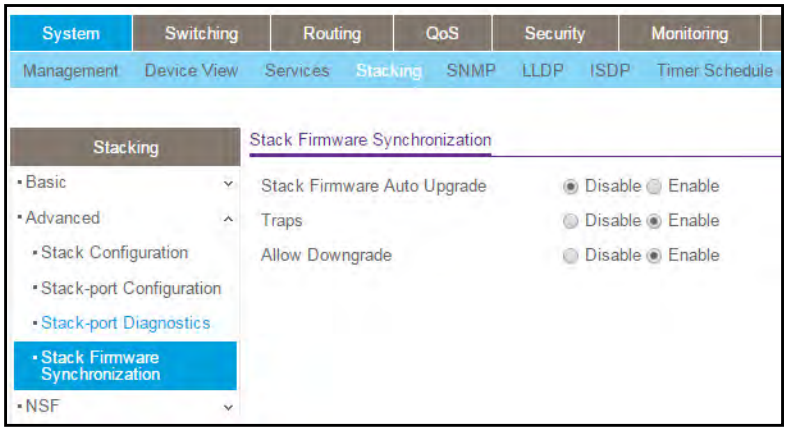
To configure the stack firmware synchronization features:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Stacking > Advanced > Stack Firmware Synchronization**.



5. Specify whether **Stack Firmware Auto Upgrade** is enabled or disabled.

   This feature determines what to do when a new member attempts to join the stack, and its firmware does not match the version running on the master.

   - **Enable**. The stack master upgrades the version on the new member to match the version running on the rest of the stack.
   - **Disable**. The new member is not allowed to join.
6. Use the **Traps** field to enable or disable sending of traps during stack firmware synchronization start, failure, or finish.
7. Use the **Allow Downgrade** field to determine whether the stack master downgrades the firmware version on a new member that attempts to join the stack if the new member has a firmware version that is more recent that the stack.
8. Click the **Apply** button.

   Your settings are saved.

View NSF Summary Data

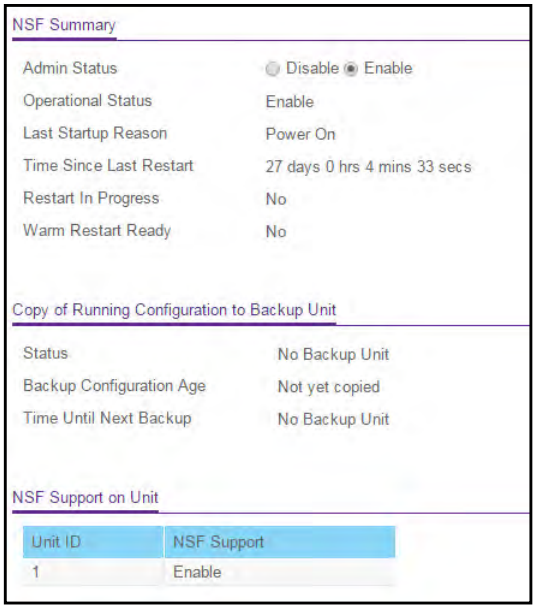
To display NSF Summary data:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Stacking > NSF > NSF Summary**



5. Use the **Admin Status** radio button to enable or disable the NSF feature on the stack. When enabled, the stack selects a backup unit. Applications on the management unit copy data to the backup unit.
6. To cause the supervisor unit to fail over to the backup blade, click the **Initiate Failover** button on the top right corner of the page.
7. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable NSF Summary data that is displayed.

Table 64. NSF Summary

Field	Description
Operational Status	Indicates whether NSF is enabled on the chassis. NSF is enabled by default.
Last Startup Reason	The type of activation that caused the software to start the last time. The possible values are as follows: • **Power On**. The switch is rebooted. A power cycle or an administrative reload command might caused this • **Cold Admin Move**. The system resets all hardware tables without a reboot and the application begins from a pre-initialized state, but no data is retained from before the failover. • **Warm Admin Move**. The administrator issued a command for the standby manager to take over. • **Auto Warm**. The primary management card restarted due to a failure, and the system executed a nonstop forwarding failover. • **Auto Cold**. The system switched from the active manager to the backup manager and could not maintain user data traffic. This is usually caused by multiple failures occurring close together.
Time Since Last Restart	Time since the current management card because the active management card. For the backup manager, the value is set to 0d:00:00:00.
Restart In Progress	Indicates whether a restart is in progress. A restart is not considered complete until all hardware tables are fully reconciled.
Warm Restart Ready	Indicates whether the initial full checkpoint finished.
Copy of Running Configuration to Backup Unit	
Status	Status of copying the running configuration to backup blades.
Backup Configuration Age	Indicates the time since the running configuration was last copied to the backup blade.
Time Until Next Backup	Indicates the number of seconds until the running configuration is copied to the backup blade.
NSF Support on Unit	
Unit ID	The slot number for the blade.
NSF Support	Displays whether the switch supports the nonstop forwarding (NSF) feature.

View NSF Checkpoint Statistics

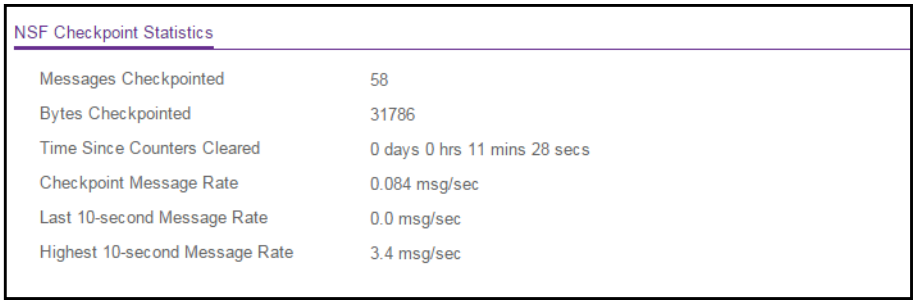
To view NSF checkpoint statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **System > Chassis > NSF > Checkpoint Statistics.**



5. To reset the statistics on the page, click the **Clear** button.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 65. NSF Checkpoint Statistics

Field	Description
Messages Checkpoint	The number of messages sent from the supervisor to the backup blade.
Bytes Checkpointed	How much data was sent from the supervisor until to the backup blade.
Time Since Counters Cleared	The amount of time since the counters were reset.
Checkpoint Message Rate	The number of seconds between measurements.
Last 10-second Message Rate	How many messages were sent in the last measurement interval.
Highest 10-second Message Rate	The highest number of messages that were sent in a measurement interval.

4

Configure Switching Information

This chapter covers the following topics:

Configure VLANs

Adding virtual LAN (VLAN) support to a Layer 2 switch offers some of the benefits of both bridging and routing. Like a bridge, a VLAN switch forwards traffic based on the Layer 2 header, which is fast, and like a router, it partitions the network into logical segments, which provides better administration, security, and management of multicast traffic.

By default, all ports on the switch are in the same broadcast domain. VLANs electronically separate ports on the same switch into separate broadcast domains so that broadcast packets are not sent to all the ports on a single switch. When you use a VLAN, users can be grouped by logical function instead of physical location.

Each VLAN in a network is assigned an associated VLAN ID, which appears in the IEEE 802.1Q tag in the Layer 2 header of packets transmitted on a VLAN. An end station can omit the tag, or the VLAN portion of the tag, in which case the first switch port to receive the packet can either reject it or insert a tag using its default VLAN ID. A given port can handle traffic for more than one VLAN, but it can support only one default VLAN ID.

You can define VLAN groups stored in the VLAN membership table. Each switch in the M4300 Series and M4300-96X family supports up to 1024 VLANs. VLAN 1 is created by default and is the default VLAN of which all ports are members.

Configure Basic VLAN Settings

The internal VLAN is reserved by a port-based routing interface and invisible to the end user. Once these internal VLANs are allocated by the port-based routing interface, they cannot be assigned to a routing VLAN interface.

To configure internal VLAN settings:

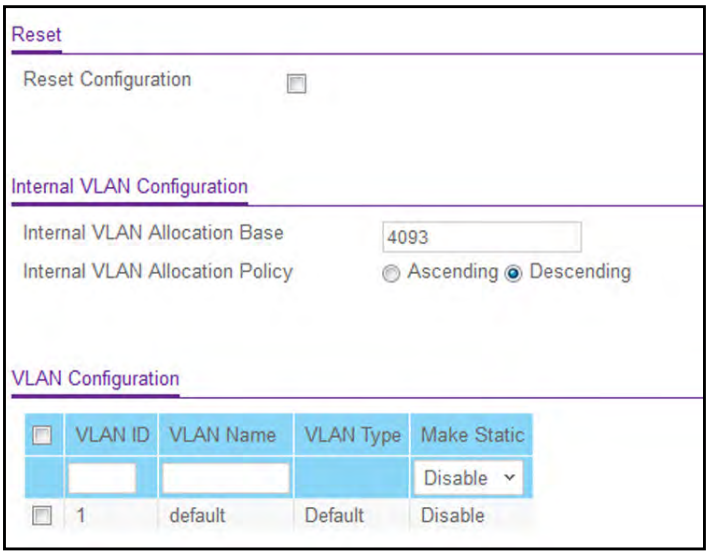
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Basic > VLAN Configuration**.



5. To reset VLAN settings to their default values, select the **Reset Configuration** check box.

   The factory default values are as follows:

   - All ports are assigned to the default VLAN of 1.
   - All ports are configured with a PVID of 1.
   - All ports are configured to an Acceptable Frame Types value of Admit All Frames.
   - All ports are configured with Ingress Filtering disabled.
   - All ports are configured to transmit only untagged frames.
   - GVRP is disabled on all ports and all dynamic entries are cleared.

   All VLANs, except for the default VLAN, are deleted.

6. Specify the internal VLAN settings.

   The Internal VLAN Configuration section displays the allocation base and the allocation mode of internal VLAN.

   a. Use **Internal VLAN Allocation Base** to specify the VLAN allocation base for the routing interface.

      The default base range of the internal VLAN is 1 to 4093.

   b. Select the **Internal VLAN Allocation Policy Ascending** or **Descending** radio button.

      This specifies a policy for the internal VLAN allocation.

7. Use **VLAN ID** to specify the VLAN identifier for the new VLAN.

   The range of the VLAN ID is 1 to 4093.

8. Use the optional **VLAN Name** field to specify a name for the VLAN.

The VLAN name can be up to 32 alphanumeric characters long, including blanks. The default is blank. VLAN ID 1 always uses the name Default.

The **VLAN Type** field identifies the type of the VLAN you are configuring. You cannot change the type of the default VLAN (VLAN ID = 1): it is always type Default. When you create a VLAN using this page, its type is always Static. A VLAN that is created by GVRP registration initially uses a type of Dynamic. When configuring a dynamic VLAN, you can change its type to Static.

9. Click the **Add** button.

   The VLAN is added to the switch.

10. Click the **Apply** button.

    Your settings are saved.

Reset the VLAN Configuration to Default Setting

To reset the VLAN configuration to default settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

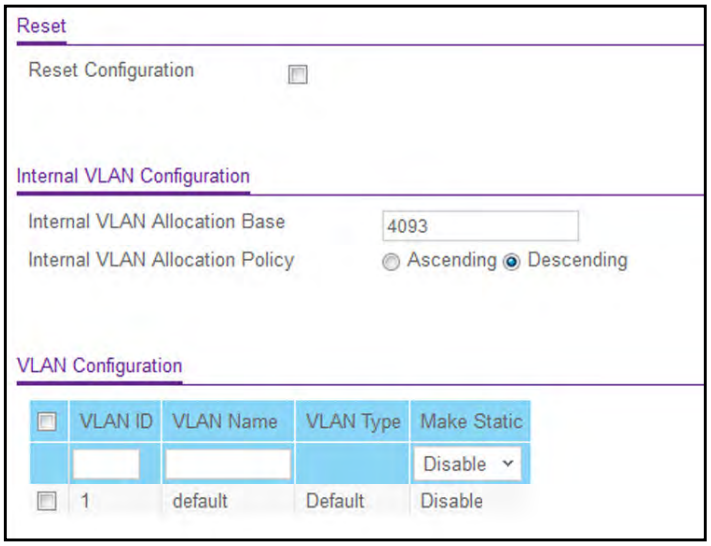
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > VLAN Configuration**.



5. Select the **Reset Configuration** check box.

WARNING:

If you select this button and confirm your selection on the next page, all VLAN configuration parameters are reset to their factory default values.

6. Confirm your selection.

   All VLANs, except for the default VLAN, are deleted. The factory default values are as follows:

   - All ports are assigned to the default VLAN of 1.
   - All ports are configured with a PVID of 1.
   - All ports are configured to an Acceptable Frame Types value of Admit All Frames.
   - All ports are configured with ingress filtering disabled.
   - All ports are configured to transmit only untagged frames.
   - GVRP is disabled on all ports and all dynamic entries are cleared.

Configure an Internal VLAN

The Internal VLAN section displays the allocation base and the allocation mode of internal VLAN. The internal VLAN is reserved by a port-based routing interface and invisible to the end user. Once these internal VLANs are allocated by the port-based routing interface, they cannot be assigned to a routing VLAN interface.

To configure an internal VLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

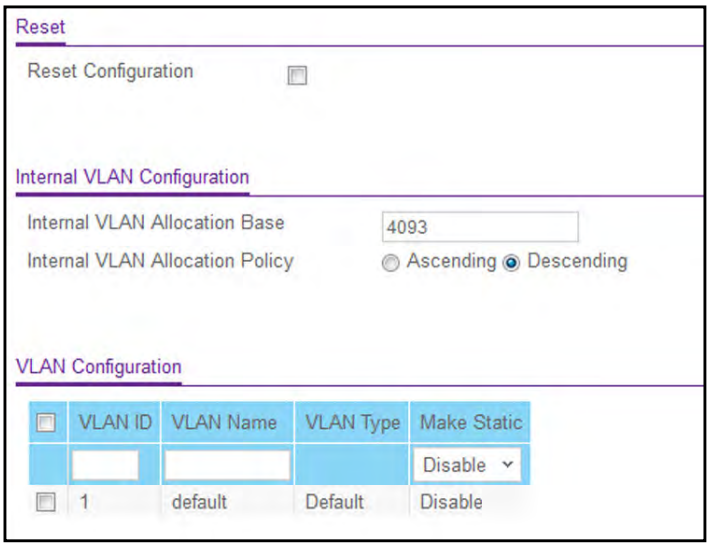
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > VLAN Configuration**.



5. In the **Internal VLAN Allocation Base** field, specify the VLAN allocation base for the routing interface.

   You can enter a value from 1 to 4093.

6. Select the Internal VLAN Allocation Policy **Ascending** or **Descending** radio button.

   This specifies a policy for the internal VLAN allocation.

7. Click the **Apply** button.

   Your settings are saved.

Configure VLAN Trunking

You can configure switchport mode settings on interfaces. The switchport mode defines the purpose of the port based on the type of device it connects to and constraints the VLAN configuration of the port accordingly. Assigning the appropriate switchport mode helps simplify VLAN configuration and minimize errors.

To configure VLAN trunking:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

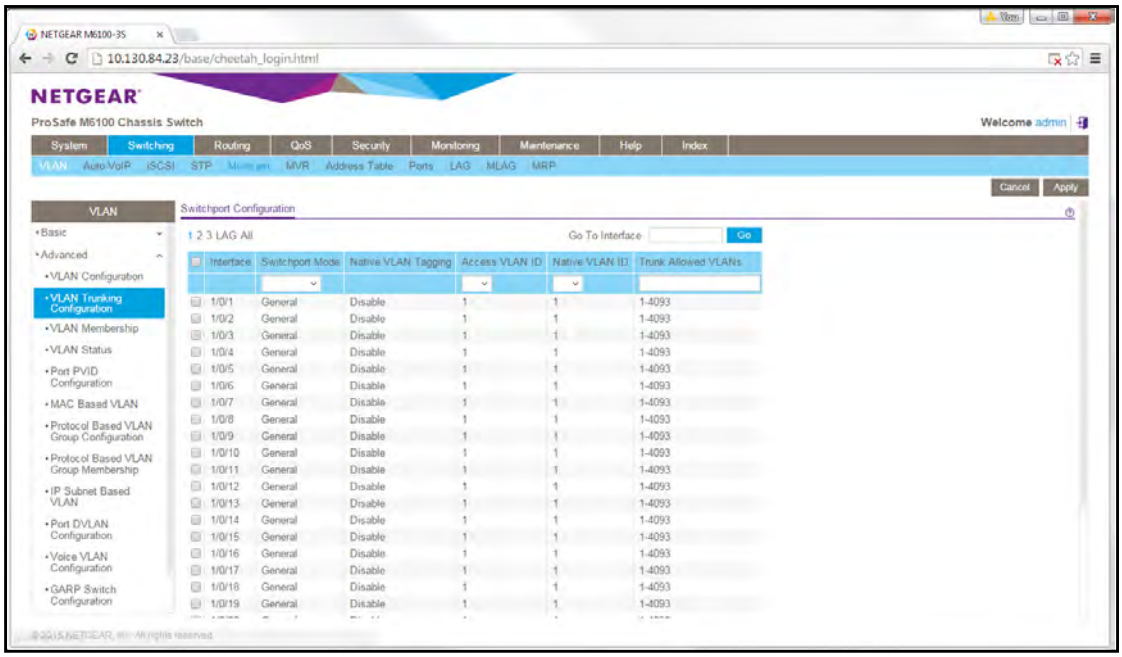
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > VLAN Trunking Configuration**.



5. To specify which interfaces are displayed on the page, select one of the following options:
   - Select the **Unit ID** field to display physical port information for the selected unit.
   - Use **LAG** to display LAGs only.
   - Use **All** to display all physical ports.
6. Use one of the following methods to select an interface:
   - Use **Go To Interface** to select an interface by entering its number.
   - Use **Interface** to select the interface for which data is to be displayed or configured.
7. In the **Switchport Mode** list, select one of the following:
   - **Access**. This mode is suitable for ports connected to end stations or end users. Access ports participate in only one VLAN. They accept both tagged and untagged packets, but always transmit untagged packets.
   - **Trunk**. This mode is intended for ports that are connected to other switches. Trunk ports can participate in multiple VLANs and accept both tagged and untagged packets.
   - **General**. This mode enables custom configuration of a port. You configure the general port VLAN attributes, such as membership, PVID, tagging, ingress filter, and so on, using the settings on the Port Configuration page. By default, all ports are initially configured in **General** mode.
   - **Host**. This mode is used for private VLAN configuration.
   - **Promiscuous**. This mode is used for private VLAN configuration.
8. Select from the list to configure the **Access VLAN ID**.

   This is the access VLAN for the port, and is valid only when the port switchport mode is **Access**.

9. Select from the list to configure the **Native VLAN ID**.

   This is the native VLAN for the port, and is valid only when the port switchport mode is **Trunk**.

10. Configure the **Trunk Allowed VLANs**.

    This is the set of VLANs of which the port can be a member when configured in **Trunk** mode. By default, this list contains all possible VLANs, even if they are not yet created. VLAN IDs are in the range 1 to 4093. Use a hyphen (-) to specify a range, or a comma (,) to separate VLAN IDs in a list. Spaces are not permitted. A zero value clears the allowed VLANs. An **All** value sets all VLANs in the range (1 to 4093).

11. Click the **Apply** button.

    Your settings are saved.

The Native VLAN Tagging field displays enabled or disabled:

- When VLAN tagging is enabled, if the trunk port receives untagged frames, it forwards them on the native VLAN with no VLAN tag.
- When VLAN tagging is disabled, if the trunk port receives untagged frames, it includes the native VLAN ID in the VLAN tag when forwarding

Configure VLAN Membership

To configure VLAN membership:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

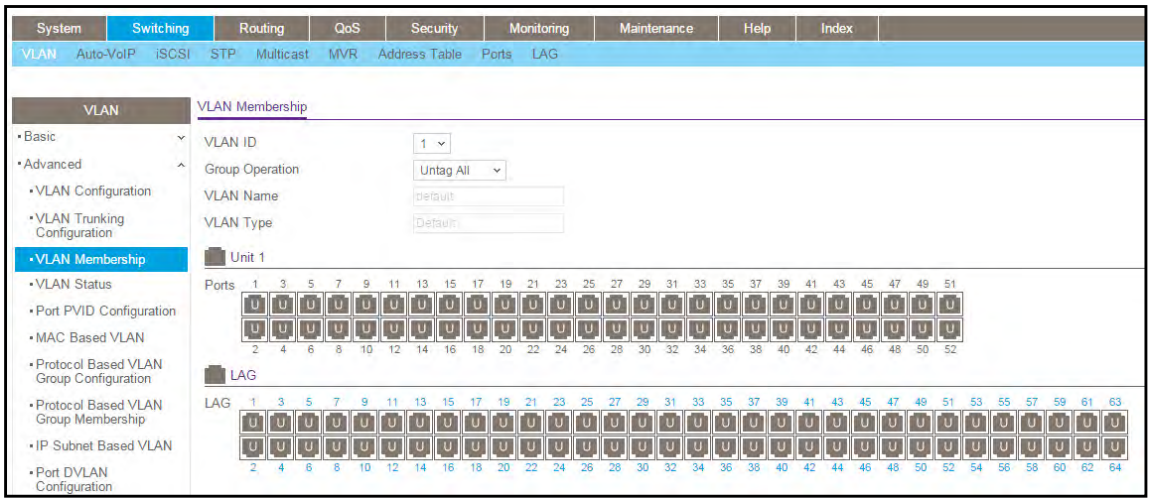
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > VLAN Membership**.



5. In the **VLAN ID** list, select the VLAN ID.
6. In the **Group Operation** list, select all the ports and configure them:
   - **Untag All**. Select all the ports on which all frames transmitted for this VLAN are untagged. All the ports are included in the VLAN.
   - **Tag All**. Select the ports on which all frames transmitted for this VLAN are tagged. All the ports are included in the VLAN.
   - **Remove All**. All the ports that can be dynamically registered in this VLAN through GVRP. This selection excludes all ports from the selected VLAN.
7. In the **Port** display, select port numbers to add them to this VLAN.

   Each port can use one of three modes:

   - **T (Tagged)**. Select the ports on which all frames transmitted for this VLAN are tagged. The ports that are selected are included in the VLAN.
   - **U (Untagged)**. Select the ports on which all frames transmitted for this VLAN are untagged. The ports that are selected are included in the VLAN.
   - **BLANK (Autodetect)**. Select the ports that can be dynamically registered in this VLAN through GVRP. This selection excludes a port from the selected VLAN.
8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 66. Advanced VLAN Membership

Field	Definition
VLAN Name	The name for the VLAN that you selected. It can be up to 32 alphanumeric characters long, including blanks. VLAN ID 1 always uses the name Default.
VLAN Type	The type of the VLAN you selected: • **Default** (VLAN ID = 1). Always present • **Static**. A VLAN that you configured • **Dynamic**. A VLAN created by GVRP registration that you did not convert to static, and that GVRP can therefore remove

View the VLAN Status

You can view the status of all currently configured VLANs.

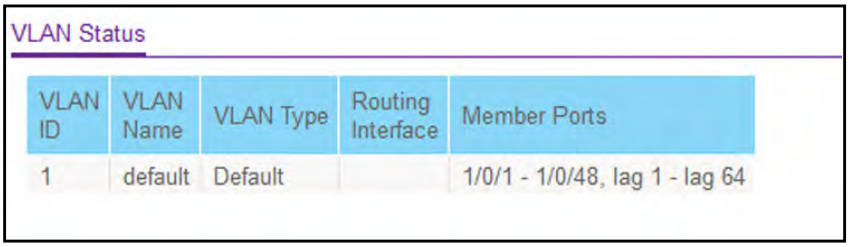
To view the VLAN status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > VLAN > Advanced > VLAN Status**.



The following table describes the nonconfigurable information displayed on the page.

Table 67. VLAN Status

Field	Definition
VLAN ID	The VLAN identifier (VID) of the VLAN. The range of the VLAN ID is 1 to 4093.
VLAN Name	The name of the VLAN. VLAN ID 1 is always named `Default`.
VLAN Type	The VLAN type: • **Default** (VLAN ID = 1). Always present • **Static**. A VLAN that you configured • **Dynamic**. A VLAN created by GVRP registration that you did not convert to static, and that GVRP can therefore remove
Routing Interface	The interface associated with the VLAN, in the case that VLAN routing is configured for this VLAN.
Member Ports	The ports that are included in the VLAN.

Configure Port PVID Settings

You can assign a port VLAN ID (PVID) to an interface. There are certain requirements for a PVID:

- You must define a PVID for all ports.
- If no other value is specified, the default VLAN PVID is used.
- To change the port's default PVID, you must first create a VLAN that includes the port as a member.
- Use the Port VLAN ID (PVID) Configuration page to configure a virtual LAN on a port.

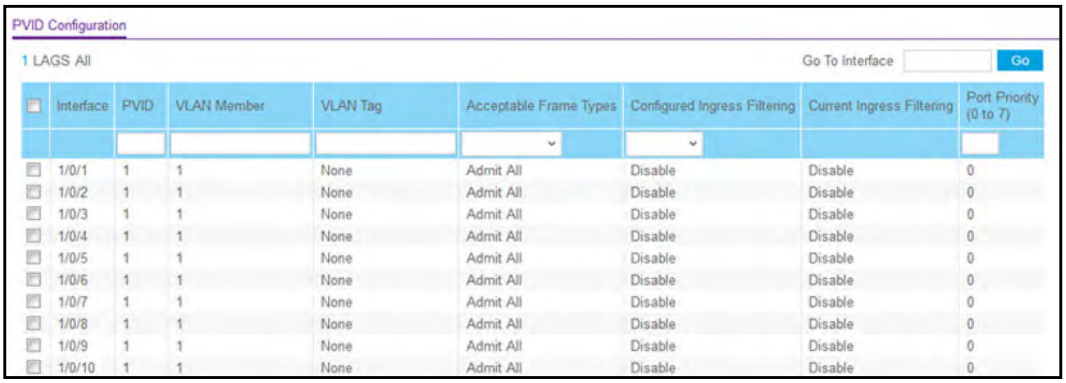
To configure PVID settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > VLAN > Advanced > Port PVID Configuration**.



5. To display information for all physical ports and LAGs, click the **ALL** button.
6. Select the interfaces.

   Select the **Interface** check box next to the interfaces. You can select multiple interfaces. To select all the interfaces, select the **Interface** check box in the heading row.
7. In the **PVID** field, specify the VLAN ID to assign to untagged or priority-tagged frames received on this port.

   The factory default is 1.
8. In the **VLAN Member** field, specify the VLAN ID or list of VLANs of a member port.

   VLAN IDs range from 1 to 4093. The factory default is 1. Use a hyphen (-) to specify a range or a comma (,) to separate VLAN IDs in a list. Spaces and zeros are not permitted.
9. In the **VLAN Tag** field, specify the VLAN ID or list of VLANs of a tagged port.

   VLAN IDs range from 1 to 4093. Use a hyphen (-) to specify a range or a comma (,) to separate VLAN IDs in a list. Spaces and zeros are not permitted. To reset the VLAN tag configuration to the defaults, use the **None** keyword. Port tagging for the VLAN can be set only if the port is a member of this VLAN.
10. In the **Acceptable Frame Types** list, specify the types of frames that can be received on this port.

    The options are **VLAN only** and **Admit All**:

    - When set to **VLAN only**, untagged frames or priority-tagged frames received on this port are discarded.
    - When set to **Admit All**, untagged frames or priority-tagged frames received on this port are accepted and assigned the value of the port VLAN ID for this port. With either option, VLAN-tagged frames are forwarded in accordance to the 802.1Q VLAN specification.
11. **In the Configured Ingress Filtering** field, select **Enabled** or **Disabled**.
    - When enabled, the frame is discarded if this port is not a member of the VLAN with which this frame is associated. In a tagged frame, the VLAN is identified by the VLAN ID in the tag. In an untagged frame, the VLAN is the port VLAN ID specified for the port that received this frame.

- When disabled, all frames are forwarded in accordance with the 802.1Q VLAN bridge specification. The factory default is disabled.

12. In the **Port Priority** field, specify the default 802.1p priority assigned to untagged packets arriving at the port.

    You can enter a number from 0 to 7.

13. Click the **Apply** button.

    Your settings are saved.

Configure a MAC-Based VLAN

The MAC-Based VLAN feature allows incoming untagged packets to be assigned to a VLAN and thus classify traffic based on the source MAC address of the packet.

You define a MAC to VLAN mapping by configuring an entry in the MAC to VLAN table. An entry is specified through a source MAC address and the desired VLAN ID. The MAC to VLAN configurations are shared across all ports of the device (that is, there is a system-wide table with MAC address to VLAN ID mappings).

When untagged or priority-tagged packets arrive at the switch and entries exist in the MAC to VLAN table, the source MAC address of the packet is looked up. If an entry is found, the corresponding VLAN ID is assigned to the packet. If the packet is already priority tagged it maintains this value; otherwise, the priority is set to zero. The assigned VLAN ID is verified against the VLAN table, if the VLAN is valid, ingress processing on the packet continues; otherwise the packet is dropped. This implies that the user is allowed to configure a MAC address mapping to a VLAN that was not created on the system.

To add or delete a MAC-based VLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

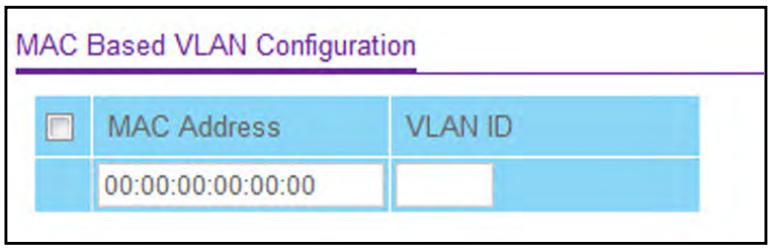
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > MAC Based VLAN**.



5. **In the MAC Address** field, type a valid MAC address to be bound to a VLAN ID.

   This field is configurable only when a MAC-based VLAN is created.

6. In the **VLAN ID** field, specify a VLAN ID in the range of 1 to 4093.
7. Take one of the following actions:
   - To add the add a MAC address to the VLAN mapping, click the **Add** button.
   - To delete a MAC address from VLAN mapping, click the **Delete** button.

Configure Protocol-Based VLAN Groups

You can use a protocol-based VLAN to define filtering criteria for untagged packets. By default, if you do not configure any port-based (IEEE 802.1Q) or protocol-based VLANs, untagged packets are assigned to VLAN 1. You can override this behavior by defining either port-based VLANs or protocol-based VLANs, or both. Tagged packets are always handled according to the IEEE 802.1Q standard, and are not included in protocol-based VLANs.

If you assign a port to a protocol-based VLAN for a specific protocol, untagged frames received on that port for that protocol are assigned the protocol-based VLAN ID. Untagged frames received on the port for other protocols are assigned the Port VLAN ID, either the default PVID (1) or a PVID you specifically assigned to the port using the Port VLAN Configuration page.

You define a protocol-based VLAN by creating a group. Each group has a one-to-one relationship with a VLAN ID, can include one to three protocol definitions, and can include multiple ports. When you create a group, you specify a name and a group ID is assigned automatically.

To configure a protocol-based VLAN group:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

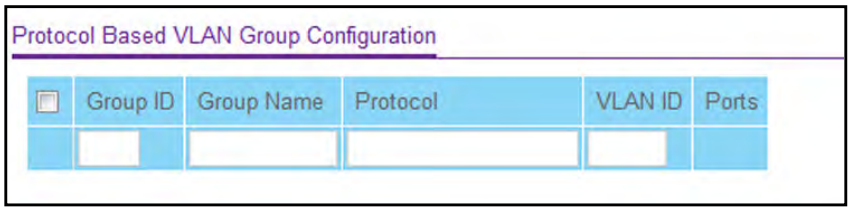
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > Protocol Based VLAN Group Configuration**.



5. In the **Group Name** field, type a name for the new group.

   You can enter up to 16 characters.

6. In the **Protocol** field, select the protocols to be associated with the group.

   There are three configurable protocols:

   - **IP**. IP is a network layer protocol that provides a connectionless service for the delivery of data.
   - **ARP**. Address Resolution Protocol (ARP) is a low-level protocol that dynamically maps network layer addresses to physical medium access control (MAC) addresses.
   - **IPX**. The internetwork packet exchange (IPX) is a connectionless datagram network-layer protocol that forwards data over a network.

7. In the **VLAN ID** field, select the VLAN ID.

   It can be any number in the range of 1 to 4093. All the ports in the group assigns this VLAN ID to untagged packets received for the protocols that you included in this group.

8. Click the **Add** button.

   The protocol-based VLAN group is added to the switch.

The following table describes the nonconfigurable information displayed on the page.

Table 68. Protocol Based VLAN Group

Field	Description
Group ID	A number used to identify the group created by the user. Group IDs are automatically assigned when a group is created by the user.
Ports	Display all the member ports that belong to the group.

Configure Protocol-Based VLAN Group Membership

To configure protocol-based VLAN group membership:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

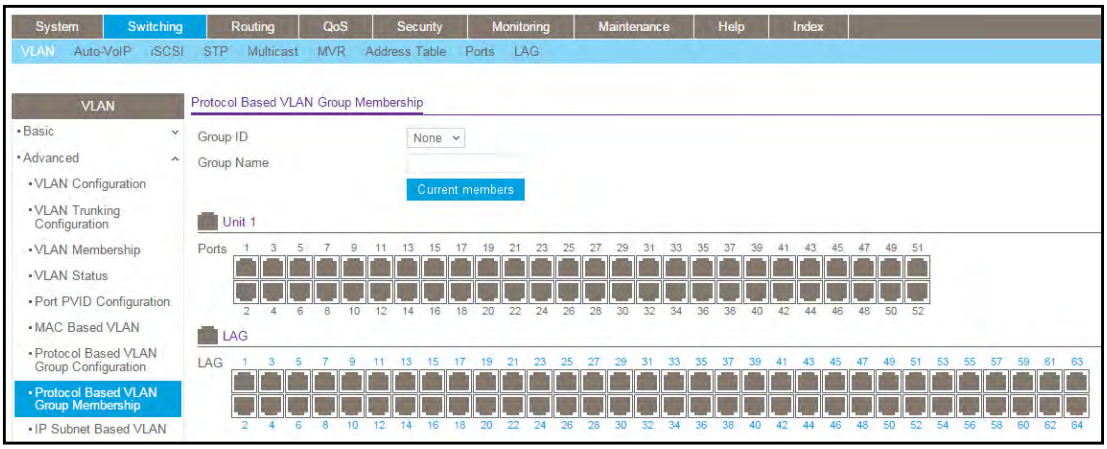
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > Protocol Based VLAN Group Membership**.



5. In the **Group ID** list, select the protocol-based VLAN group ID.
6. Select **port** numbers (**1**, **2**, **3**, and so on) to select ports to add to this protocol-based VLAN group.

   An interface can belong to only one group for a given protocol. If you already added a port to a group for IP, you cannot add it to another group that also includes IP, although you can add it to a new group for IPX.

7. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 69. Protocol-Based VLAN Group Membership

Field	Description
Group Name	This field identifies the name for the protocol-based VLAN that you selected. It can be up to 32 alphanumeric characters long, including blanks.
Current Members	This button can be click to show the current numbers in the selected protocol-based VLAN group.

Configure an IP Subnet-Based VLAN

IP subnet-to-VLAN mapping is defined by configuring an entry in the IP Subnet to VLAN table. An entry is specified through a source IP address, network mask, and the desired VLAN ID. The IP subnet-to-VLAN configurations are shared across all ports of the device.

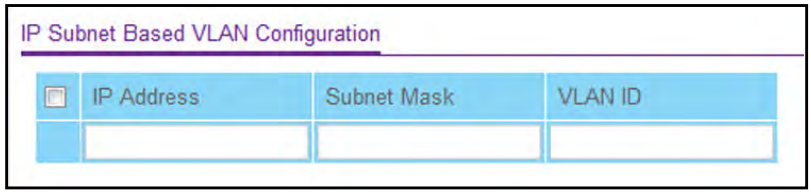
To add or delete an IP subnet-based VLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > VLAN > Advanced > IP Subnet Based VLAN**.



5. In the **IP Address** field, specify a valid IP address bound to the VLAN ID.

   Enter the IP address in dotted-decimal notation.
6. In the **Subnet Mask** field, specify a valid subnet mask of the IP address.

   Enter the subnet mask in dotted-decimal notation.
7. In the **VLAN ID** field, specify a VLAN ID in the range of (1 to 4093).
8. Take one of the following actions:
   - To add the IP subnet-based VLAN, click the **Add** button.
   - To delete the IP subnet-based VLAN, click the **Delete** button.

Configure a Port DVLAN

To configure a port DVLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

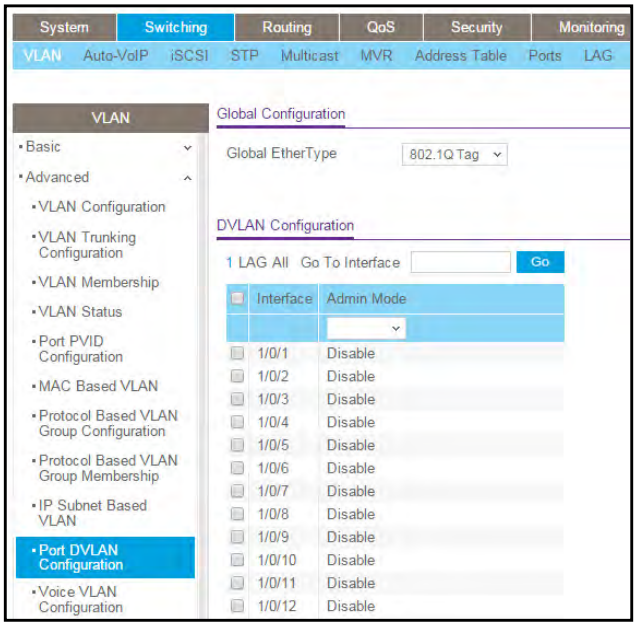
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > Port DVLAN Configuration**.



5. Select **Interface** check boxes to select the physical interface.

   To select all ports, select the Interface check box at the top of the column.

6. In the **Admin Mode** field, select **Enabled** or **Disabled**.

   This specifies the administrative mode through which double VLAN ragging can be enabled or disabled. The default value for this is Disabled.

7. In the **Global EtherType** field, specify the first 16 bits of the DVLAN tag:
   - **802.1Q Tag**. Commonly used tag representing 0x8100
   - **vMAN Tag**. Commonly used tag representing 0x88A8
   - **Custom Tag**. Configure the EtherType in any range from 0 to 65535
8. Click the **Apply** button.

   Your settings are saved.

Configure a Voice VLAN

You can configure the parameters for voice VLAN configuration. Only users with read/write access privileges can change the data on this page.

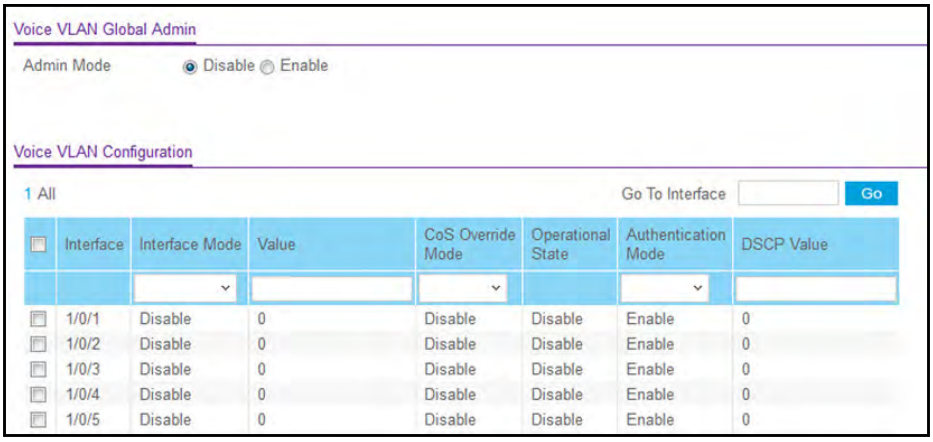
To configure a voice VLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > VLAN > Advanced > Voice VLAN Configuration**.



5. Select the **Admin Mode Disable** or **Enable** radio button.

   This specifies the administrative mode for voice VLAN for the switch. The default is Disable.
6. Use **Interface** to select the physical interface.
7. Use **Interface Mode** to select the voice VLAN mode for selected interface:
   - **Disable**. This is the default value.
   - **None**. Allow the IP phone to use its own configuration to send untagged voice traffic.
   - **VLAN ID**. Configure the phone to send tagged voice traffic.
   - **dot1p**. Configure voice VLAN 802.1p priority tagging for voice traffic. When this is selected, enter the dot1p value in the Value field.
   - **Untagged**. Configure the phone to send untagged voice traffic.
8. Use **Value** to enter the VLAN ID or dot1p value.

This is enabled only when VLAN ID or dot1p is selected as the interface mode.

9. In the **CoS Override Mode** field, select **Disable** or **Enable**.

   The default is Disable.

10. In the **Authentication Mode** field, select **Enable** or **Disable**.

    The default is **Enable**. When the authentication mode is enabled, voice traffic is allowed on an unauthorized voice VLAN port. When the authentication mode is disabled, devices are authorized through dot1x.

    Note: Authentication through dot1x is possible only if dot1x is enabled.

11. In the **DSCP Value** field, configure the Voice VLAN DSCP value for the port.

    The valid range is 0 to 64. The default value is 0.

    The Operational State field displays the operational status of the voice VLAN on the interface.

12. Click the **Apply** button.

    Your settings are saved.

Configure GARP Switch Settings

Note: It can take up to 10 seconds for GARP configuration changes to take effect.

To configure GARP switch settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

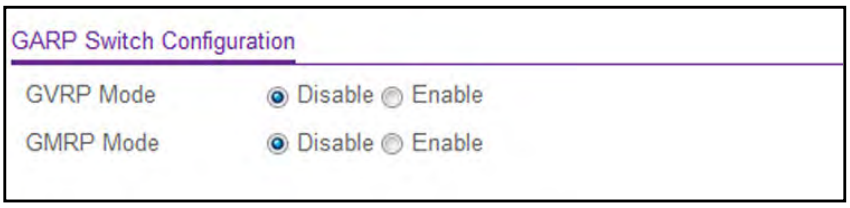
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > GARP Switch Configuration**.



5. Select the **GVRP Mode Disable** or **Enable** radio button.

   This selects the GARP VLAN registration protocol administrative mode for the switch. The factory default is Disable.

6. Select the **GMRP Mode Disable** or **Enable** radio button.

   This selects the GARP multicast registration protocol administrative mode for the switch. The factory default is Disable.

7. Click the **Apply** button.

   Your settings are saved.

Configure a GARP Port

Note: It can take up to 10 seconds for GARP configuration changes to take effect.

To configure a GARP port:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

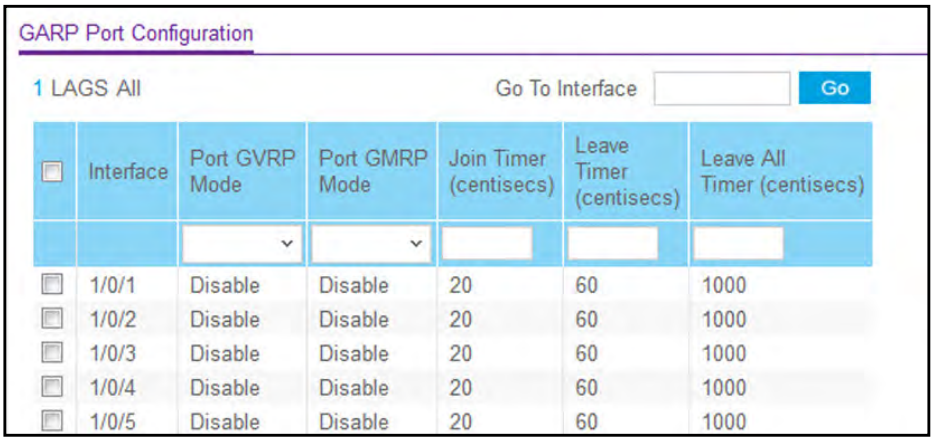
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > VLAN > Advanced > GARP Port Configuration**.



5. Use **Interface** to select the physical interface for which data is to be displayed or configured.
6. In the **Port GVRP Mode** field, select **Enable** or **Disable**.

   This specifies the GARP VLAN registration protocol administrative mode for the port.If you select Disable, the protocol is not active and the join time, leave time, and leave all time have no effect. The factory default is Disable.
7. In the **Port GMRP Mode** field, select **Enable** or **Disable**

   This specifies the GARP multicast registration protocol administrative mode for the port. If you select Disable, the protocol is not active, and the join time, leave time, and leave all time have no effect. The factory default is Disable.
8. In the **Join Time (centiseconds)** field, specify the time between the transmission of GARP PDUs registering (or re-registering) membership for a VLAN or multicast group in centiseconds.

   Enter a number between 10 and 100 (0.1 to 1.0 seconds). The factory default is 20 centiseconds (0.2 seconds). An instance of this timer exists for each GARP participant for each port.
9. In the **Leave Time (centiseconds)** field, specify the time to wait after receiving an unregister request for a VLAN or multicast group before deleting the associated entry, in centiseconds.

   This allows time for another station to assert registration for the same attribute to maintain uninterrupted service. Enter a number between 20 and 600 (0.2 to 6.0 seconds). The factory default is 60 centiseconds (0.6 seconds). An instance of this timer exists for each GARP participant for each port.
10. Use **Leave All Time (centiseconds)** to control how frequently LeaveAll PDUs are generated.

    A LeaveAll PDU indicates that all registrations will be deregistered soon. To maintain registration, participants must rejoin. The leave all period timer is set to a random value in the range of LeaveAllTime to 1.5*LeaveAllTime. The timer is specified in centiseconds. Enter a number between 200 and 6000 (2 to 60 seconds). The factory default is 1000 centiseconds (10 seconds). An instance of this timer exists for each GARP participant for each port.

11. Click the **Apply** button.

    Your settings are saved.

Configure Auto-VoIP

You can configure protocol-based port settings and OUI settings.

Configure Protocol-Based Port Settings

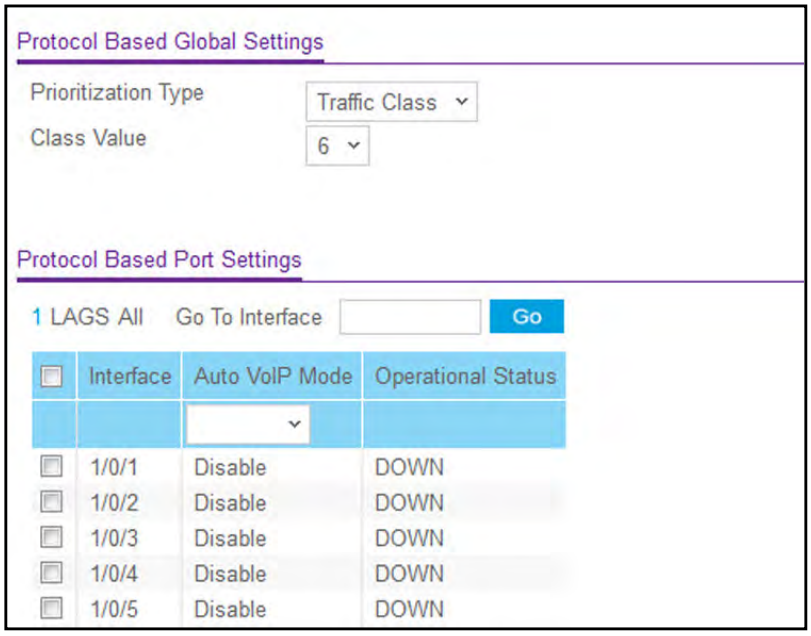
To configure protocol-based port settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Auto-VoIP > Protocol-based > Port Settings**.



5. In the **Prioritization Type** field, select **Traffic Class** or **Remark**.

   This specifies the type of prioritization.

6. In the **Class Value** list, specify the CoS tag value to be reassigned for packets received on the voice VLAN when Remark CoS is enabled.
7. Click the **Apply** button.

   Your settings are saved.

Configure Auto-VoIP OUI-Based Properties

To configure auto-VoIP OUI-based properties:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Auto-VoIP > OUI-based > Properties**.

5. In the **VoIP VLAN ID** field, type the VoIP VLAN ID of the switch.

   There is no default VLAN for auto-VoIP, you must create a VLAN for it first.
6. In the **OUI-based priority** list, select the OUI-based priority of the switch.

   The default value is 7.
7. Click the **Apply** button.

   Your settings are saved.

OUI-Based Port Settings

To configure auto-VoIP OUI-based port settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

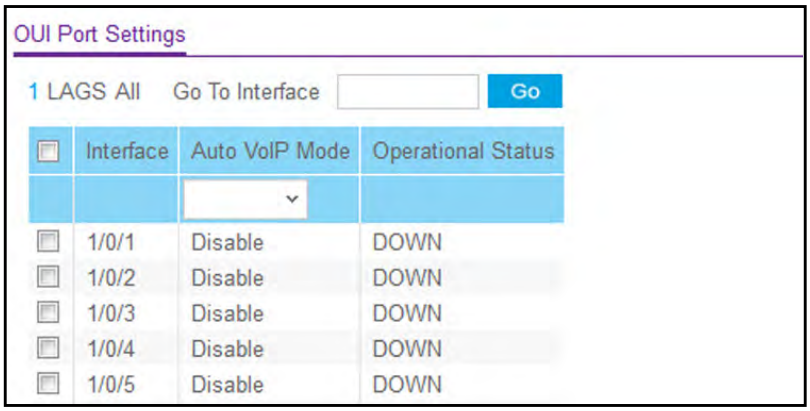
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > Auto-VoIP > OUI-based > Port Settings**.



   The Operational Status field displays the current operational status of each interface.

5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. In the **Auto VoIP Mode** field, select **Disable** or **Enable**.

   Auto-VoIP is disabled by default.

7. Click the **Apply** button.

   Your settings are saved.

Add a New Entry to the OUI Table

To add a new entry to the OUI table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

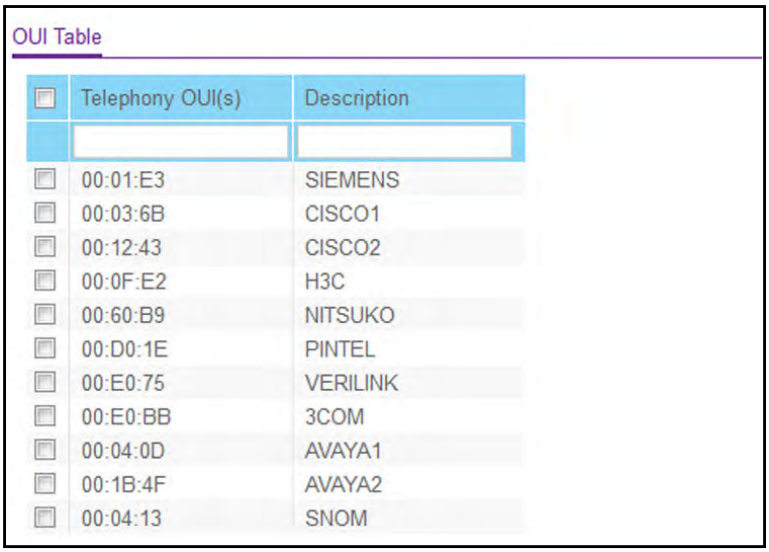
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Switching > Auto-VoIP > OUI-based > OUI Table**.



5. In the **Telephony OUI(s)** field, specify the VoIP OUI prefix to be added in the format AA:BB:CC.

   Up to 128 OUIs can be configured.

6. In the **Description** field, enter the description for the OUI.

   The maximum length of description is 32 characters. The following OUIs are present in the configuration by default:

   - 00:01:E3 - SIEMENS
   - 00:03:6B - CISCO1
   - 00:12:43 - CISCO2
   - 00:0F:E2 - H3C
   - 00:60:B9 - NITSUKO
   - 00:D0:1E - PINTEL
   - 00:E0:75 - VERILINK
   - 00:E0:BB - 3COM
   - 00:04:0D - AVAYA1
   - 00:1B:4F - AVAYA2

7. Click the **Add** button.

   The telephony OUI entry is added.

Delete Entries From the OUI Table

To delete one or more entries from the OUI table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Auto-VoIP > OUI-based > OUI Table**.

   The OUI table displays.
5. Select one or more entries in the table.
6. Click the **Delete** button.

   The entries are deleted.

View the Auto-VoIP Status

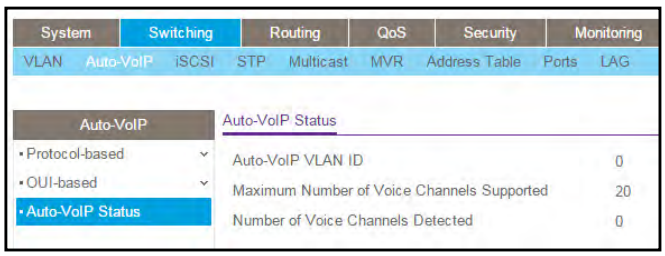
To view the auto-VoIP status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Auto-VoIP > Auto-VoIP Status**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable Auto-VoIP status information.

Table 70. Auto-VoIP Status

Field	Description
Auto-VoIP VLAN ID	The auto-VoIP VLAN ID.
Maximum Number of Voice Channels Supported	The maximum number of voice channels supported.
Number of Voice Channels Detected	The number of VoIP channels prioritized successfully.

Configure iSCSI Settings

The Internet Small Computer System Interface (iSCSI) feature helps network administrators track iSCSI traffic between iSCSI initiators and target systems. This is accomplished by monitoring or snooping traffic to detect packets used by iSCSI stations in establishing iSCSI sessions and connections. Data from these exchanges is used to create classification rules that assign the traffic between the stations to a configured traffic class. Packets in the flow are queued and scheduled for egress on the destination port based on these rules.

In networks containing iSCSI initiators and targets, iSCSI helps to monitor iSCSI sessions or give iSCSI traffic preferential Quality of Service (QoS) treatment. Dynamically-generated classifier rules are used to direct the iSCSI data traffic to queues that can be given the desired preference characteristics over other data traveling through the switch. This might help to avoid session interruptions during times of congestion that would otherwise cause iSCSI packets to be dropped. However, in systems where a large proportion of traffic is iSCSI, it might also interfere with other network control-plane traffic, such as ARP or LACP.

The preferential treatment of iSCSI traffic must be balanced against the needs of other critical data in the network.

You can view and manage iSCSI Optimization settings on the device. iSCSI Optimization provides a means of giving traffic between iSCSI initiator and target systems special Quality of Service (QoS) treatment.

In addition, if configured, the packets can be updated with IEEE 802.1 or IP-DSCP values. This is done by enabling Remark. Remarking packets with priority data provides special QoS treatment as the packets continue through the network.

Configure Global iSCSI Settings

To configure the global iSCSI settings on the switch:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > iSCSI > Basic > Global Configuration**.

5. In the **iSCSI Status** field, select **Enable** or **Disable**.

   This globally enables or disables the iSCSI Optimization feature. By default, iSCSI Optimization is disabled.
6. Select the QoS Profile **VLAN Priority Tag** or **DSCP** radio button.

   This specifies the Quality of Service (QoS) profile that is applied to iSCSI flows. By default, iSCSI flows are assigned to the highest VLAN Priority tag (VPT)/DSCP mapped to the highest queue not used for switch management or voice VLAN.

   Setting the VLAN Priority tag/DSCP sets the QoS profile which determines the egress queue to which the frame is mapped. The switch default setting for egress queues scheduling is Weighted Round Robin (WRR). Complete the QoS setting by configuring the relevant ports to work in other scheduling and queue management modes through the Class of Service settings. Depending on the platform, these choices might include strict priority for the queue used for iSCSI traffic. The downside of strict priority is that, in certain circumstances (under heavy high priority traffic), other lower priority traffic might get starved. In WRR, the queue to which the flow is assigned to can be set to get the required percentage.
7. Configure the global traffic class mapping in Class of Service.

The global traffic class mapping configuration determines the traffic class used to transmit iSCSI packets. The traffic mapping configuration options are as follows:

- IEEE 802.1P
- IP-DSCP

The configuration of the CoS component determines changes in the mapping of IEEE 802.1p or IP-DSCP values to traffic classes. For more information, see Manage Class of Service on page 471.

8. If you are using VLAN Priority as the QoS profile, in the **VLAN Priority Tag** field, select the iSCSI session packets.

   The range is 0 to 7. The default is 5.

9. If you are using DSCP as the QoS profile, in the **DSCP** list, select a value to assign iSCSI session packets.

   The range is 0 to 63. The default is 46.

10. Select the Remark **Enable** or **Disable** radio button.

    This enables or disables the marking of iSCSI frames with the configured VLAN Priority tag/DSCP when egressing the switch. Enabling remarks updates the packets with IEEE 802.1p or IP-DSCP values. Remarking packets with priority data provides special QoS treatment as the packets continue through the network. Remark is enabled by default.

11. In the **iSCSI Aging Time** field, set the number of minutes a session can be inactive prior to If using DSCP as the QoS profile, useremoval.

    The iSCSI Aging Time must be a whole number in the range of 1 to 43200 minutes. The default is 10 minutes.

12. Click the **Apply** button.

    Your settings are saved.

View iSCSI Sessions

To view active iSCSI session information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

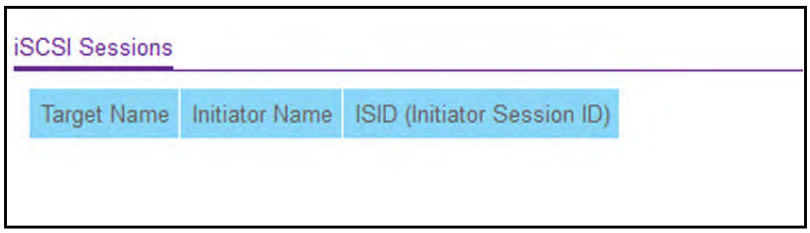
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. click **Switching > iSCSI > Basic > Sessions**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable iSCSI Sessions information.

Table 71. iSCSI Sessions

Field	Description
Target Name	The target's name.
Initiator Name	The initiator's name.
Initiator Session ID (ISID)	The iSCSI identifier.

Control iSCSI Target Settings

You can view iSCSI targets and assign target ports/port IP address combinations for iSCSI optimization on the switch.

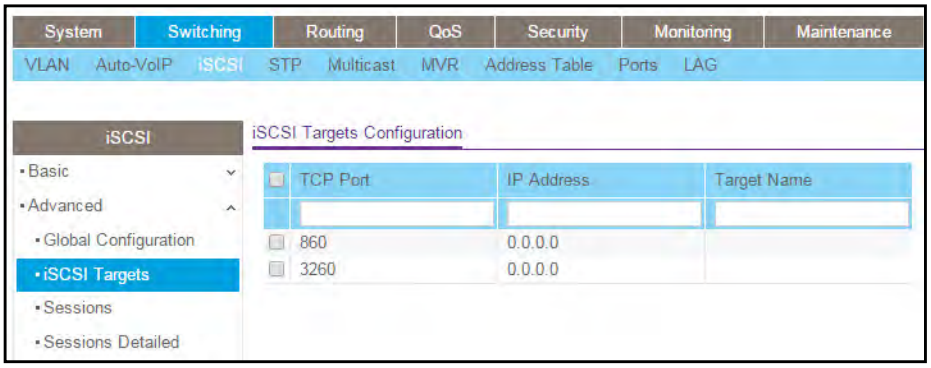
To configure iSCSI target settings

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > iSCSI > Advanced > iSCSI Targets**.



5. In the **TCP Port** field, specify the TCP port for the target that monitors iSCSI traffic.

   Up to 16 TCP ports can be defined in the system. The well-known iSCSI ports 860 and 3260 are configured as defaults but you can remove them as any other configured target.

6. In the **IP address** field, specify an IP address for the target that monitors iSCSI traffic.

   The default is 0.0.0.0.

7. In the **Target Name** field, specify a name to assign to the target.

   The iSCSI **Target Name** can be up to 233 characters in length.

8. Click the **Add** button.

   The iSCSI targets configuration is added.

View iSCSI Sessions

To view information about active iSCSI sessions:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

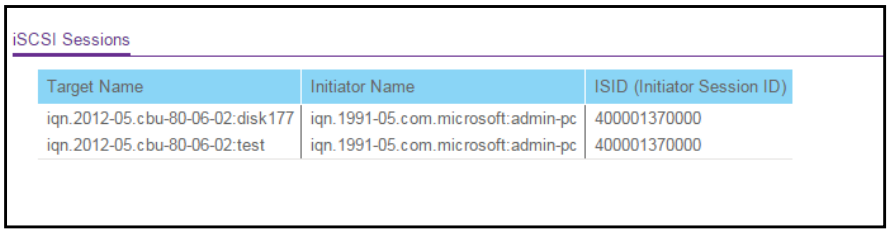
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > iSCSI > Advanced > Sessions.**



The following describes the nonconfigurable iSCSI Sessions information that is displayed.

Table 72. iSCSI Sessions

Field	Description
Target Name	The target's name.
Initiator Name	The initiator's name.
Initiator Session ID (ISID)	The unique identifier an initiator assigns to its session endpoint which, when combined with the iSCSI initiator name, provides a unique name for the iSCSI initiator port.

View iSCSI Session Details

You can view detailed information about active iSCSI sessions.

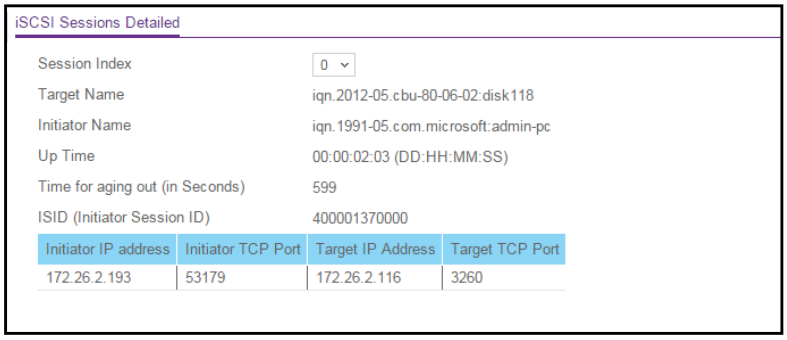
To view the iSCSI session details:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > iSCSI > Advanced > Sessions Detailed**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable iSCSI Sessions Detailed information.

Table 73. iSCSI Sessions Detailed

Field	Description
Session Index	The list of session indices.
The rest of the fields on this page correspond to the currently selected Session Index.	
Target Name	The target's name.
Initiator Name	The initiator's name.
Up Time	The time elapsed since the creation of the current session.
Time for Aging Out (in Seconds)	The time left for the current session to expire in seconds.
Initiator Session ID (ISID)	The unique identifier an initiator assigns to its session endpoint which, when combined with the iSCSI initiator name, provides a unique name for the iSCSI initiator port.
Initiator IP Address	The initiator's IP address.
Initiator TCP Port	The initiator's TCP port number of one of the connections between the target and initiator.
Target IP Address	The IP address of the target.
Target TCP Port	The target's TCP port number of one of the connections between the target and initiator.

Configure Spanning Tree Protocol

The Spanning Tree Protocol (STP) provides a tree topology for any arrangement of bridges. STP also provides one path between end stations on a network, eliminating loops. Spanning tree versions supported include Common STP, Multiple STP, and Rapid STP.

Classic STP provides a single path between end stations, avoiding and eliminating loops. For information on configuring Common STP, see Configure CST Port Settings on page 221.

Multiple Spanning Tree Protocol (MSTP) supports multiple instances of Spanning Tree to efficiently channel VLAN traffic over different interfaces. Each instance of the Spanning Tree behaves in the manner specified in IEEE 802.1w, Rapid Spanning Tree (RSTP), with slight modifications in the working but not the end effect (chief among the effects, is the rapid transitioning of the port to Forwarding). The difference between the RSTP and the traditional STP (IEEE 802.1D) is the ability to configure and recognize full-duplex connectivity and ports which are connected to end stations, resulting in rapid transitioning of the port to Forwarding state and the suppression of Topology Change Notification. These features are represented by the parameters *pointtopoint* and *edgeport*. MSTP is compatible to both RSTP and STP. It behaves appropriately to STP and RSTP bridges. A MSTP bridge can be configured to behave entirely as a RSTP bridge or a STP bridge.

Note: For two bridges to be in the same region, the force version must be 802.1s and their configuration name, digest key, and revision level must match. For additional information about regions and their effect on network topology, refer to the IEEE 802.1Q standard.

Configure Basic STP Settings

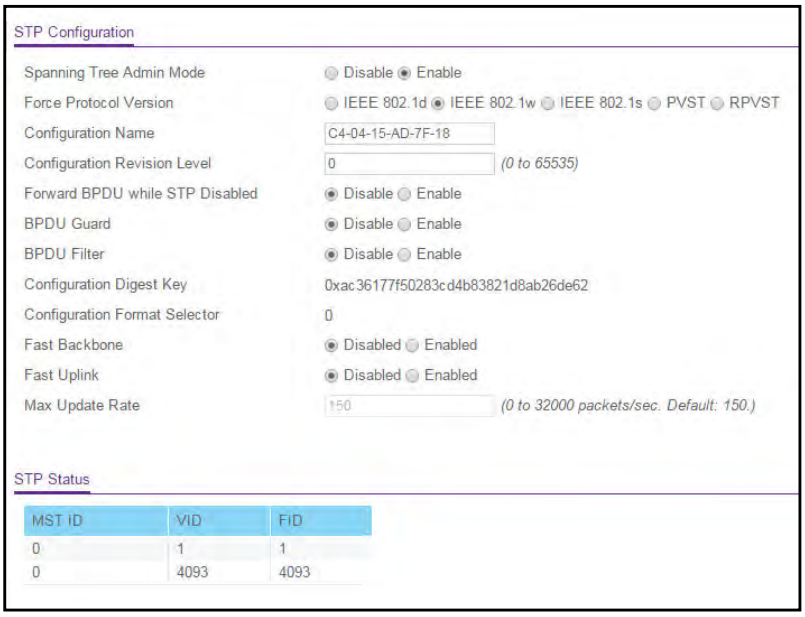
To configure STP basic settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Basic > STP Configuration**.



5. Select the **Spanning Tree Admin Mode Disable** or **Enable** radio button.

   This specifies whether spanning tree operation is enabled on the switch.
6. Use **Force Protocol Version** to specify the Force Protocol Version parameter for the switch.

The options are IEEE 802.1d, IEEE 802.1w, IEEE 802.1s, PVST, and RPVST.

7. Use **Configuration Name** to specify an identifier used to identify the configuration currently being used.

   It can be up to 32 alphanumeric characters.

8. Use **Configuration Revision Level** to specify an identifier used to identify the configuration currently being used.

   The values allowed are between 0 and 65535. The default value is 0.

9. Select the **Forward BPDU while STP Disabled Disable** or **Enable** radio button.

   This specifies whether spanning tree BPDUs are forwarded or not while spanning-tree is disabled on the switch.

10. Select the **BPDU Guard Disable** or **Enable** radio button.

    This specifies whether the BPDU guard feature is enabled. The STP BPDU guard allows a network administrator to enforce the STP domain borders and keep the active topology consistent and predictable. The switches behind the edge ports with STP BPDU guard enabled do not influence the overall STP topology. At the reception of BPDUs, the BPDU guard operation disables the port that is configured with this option and transitions the port into disable state. This would lead to an administrative disable of the port.

11. Select the **BPDU Filter Disable** or **Enable** radio button.

    This specifies whether the BPDU Filter feature is enabled. STP BPDU filtering applies to all operational edge ports. Edge Port in an operational state is supposed to be connected to hosts that typically drop BPDUs. If an operational edge port receives a BPDU, it immediately loses its operational status. In that case, if BPDU filtering is enabled on this port then it drops the BPDUs received on this port.

12. Select the e **Fast Backbone** Mode **Disable** or **Enable** radio button. (*PVSTP only.*)

    Use this option to choose a new indirect link when an indirect link fails. The system does not ignore inferior BPDUs, as is done in 802.1d. Rather the system uses the BPDUs to age out on the port it received the BPDUs. Later the system sends out root link queries on other non-designated ports. Based on the replies, if there is a positive response to at least one of them, it chooses a new indirect link. Fast Backbone mode is disabled by default.

13. Select the **Fast Uplink** Mode **Disable** or **Enable** radio button. (*PVSTP only.*)

    This option reduces the recovery time in selecting a new root port when the primary root port goes down. Fast Uplink mode is disabled by default.

14. Use the **Max Update Rate** field to configure the Fast Uplink Maximum Update Rate.

    This field is enabled for configuration when Fast Uplink mode is enabled. Allowed values are 0 to 32000 packets per second. The default value is 150.

15. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable fields.

Table 74. STP Configuration

Field	Description
Configuration Digest Key	Identifier used to identify the configuration currently being used.
Configuration Format Selector	The version of the configuration format being used in the exchange of BPDUs.
MST ID	Table consisting of the MST instances (including the CST) and the corresponding VLAN IDs associated with each of them.
VID ID	Table consisting of the VLAN IDs and the corresponding FID associated with each of them.
FID ID	Table consisting of the FIDs and the corresponding VLAN IDs associated with each of them.

Configure Advanced STP Settings

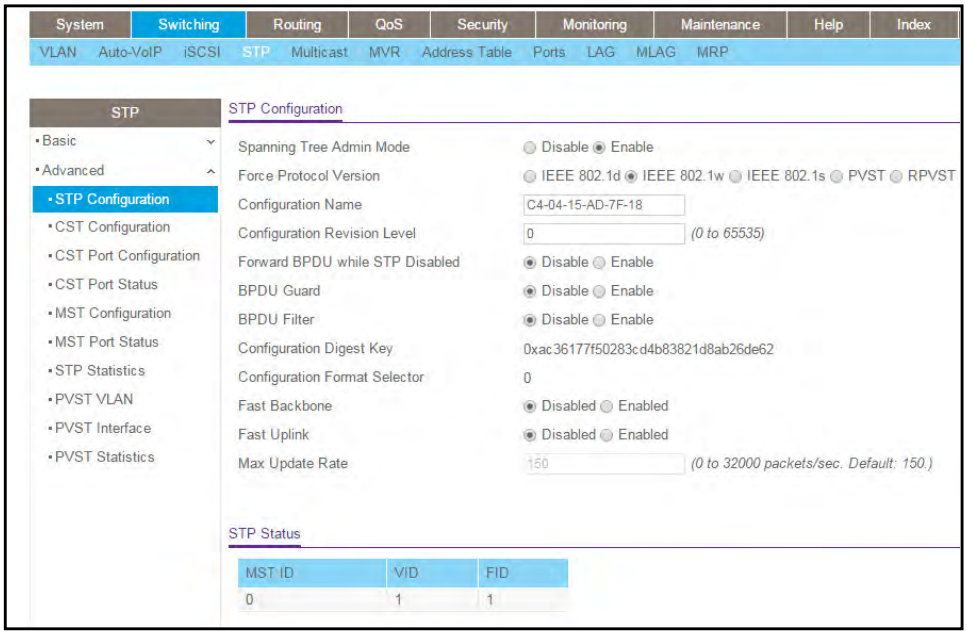
To configure advanced STP settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Advanced > STP Configuration**.



5. Select the **Admin Mode Disable** or **Enable** radio button.

   This specifies whether spanning tree operation is enabled on the switch. The default is Enable.

6. Use **Force Protocol Version** to specify the Force Protocol Version parameter for the switch.

   The options are IEEE 802.1d, IEEE 802.1w, IEEE 802.1s, PVST, and RPVST. The default is IEEE 802.1w.

7. Use **Configuration Name** to specify the identifier used to identify the configuration currently being used.

   It can be up to 32 alphanumeric characters.

8. Use **Configuration Revision Level** to specify the identifier used to identify the configuration currently being used.

   The values allowed are between 0 and 65535. The default value is 0.

9. Select the **Forward BPDU while STP Disabled Disable** or **Enable** radio button.

   This specifies whether spanning tree BPDUs are forwarded while spanning-tree is disabled on the switch. The default is Disable.

10. Select the **BPDU Guard Disable** or **Enable** radio button.

    This specifies whether the BPDU guard feature is enabled. The STP BPDU guard allows a network administrator to enforce the STP domain borders and keep the active topology consistent and predictable. The switches behind the edge ports with STP BPDU guard enabled do not influence the overall STP topology. At the reception of BPDUs, the BPDU guard operation disables the port that is configured with this option and transitions the port into disable state. This would lead to an administrative disable of the port.

11. Select the **BPDU Filter Disable** or **Enable** radio button.

This specifies whether the BPDU Filter feature is enabled. STP BPDU filtering applies to all operational edge ports. Edge Port in an operational state is supposed to be connected to hosts that typically drop BPDUs. If an operational edge port receives a BPDU, it immediately loses its operational status. In that case, if BPDU filtering is enabled on this port then it drops the BPDUs received on this port.

12. Select the Fast Backbone Mode **Disable** or **Enable** radio button. (*PVSTP only.*)

Use this option to choose a new indirect link when an indirect link fails. The system does not ignore inferior BPDUs, as is done in 802.1d. Rather the system uses the BPDUs to age out on the port it received the BPDUs. Later the system sends out root link queries on other non-designated ports. Based on the replies, if there is a positive response to at least one of them, it chooses a new indirect link. Fast Backbone mode is disabled by default.

13. Select the Fast Uplink Mode **Disable** or **Enable** radio button. (*PVSTP only.*)

This option reduces the recovery time in selecting a new root port when the primary root port goes down. Fast Uplink mode is disabled by default.

14. Use the **Max Update Rate** field to configure the Fast Uplink Maximum Update Rate.

This field is enabled for configuration when Fast Uplink mode is enabled. Allowed values are 0 to 32000 packets per second. The default value is 150.

15. Click the **Apply** button.

Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 75. STP Configuration

Field	Description
Configuration Digest Key	The 16-byte signature of type HMAC-MD5 created from the MST Configuration Table (a VLAN ID-to-MST ID mapping) which is used to identify the configuration currently being used.
Configuration Format Selector	The version of the configuration format being used in the exchange of BPDUs.
STP Status	
MST ID	Table consisting of the MST instances (including the CST) and the corresponding VLAN IDs associated with each of them.
VID ID	Table consisting of the VLAN IDs and the corresponding FID associated with each of them.
FID ID	Table consisting of the FIDs and the corresponding VLAN IDs associated with each of them.

Configure CST Settings

You can configure Common Spanning Tree (CST) and Internal Spanning Tree on the switch.

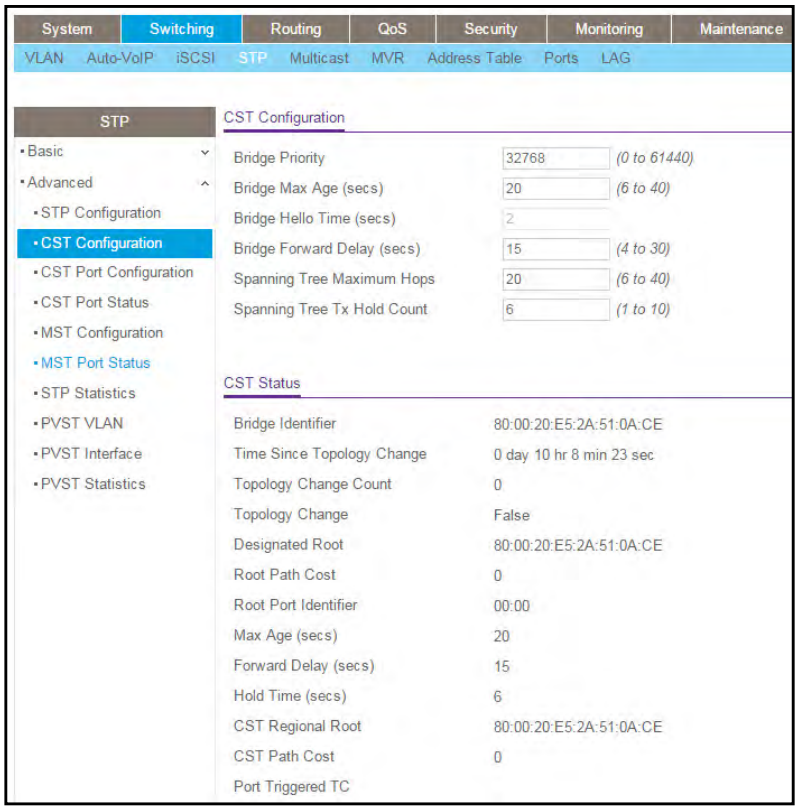
To configure CST settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Advanced > CST Configuration**.



5. Specify values for CST in the appropriate fields:
   - **Bridge Priority**. When switches or bridges are running STP, each is assigned a priority. After exchanging BPDUs, the switch with the lowest priority value becomes the root bridge. Specifies the bridge priority value for the Common and Internal Spanning Tree (CST). The valid range is 0–61440. The bridge priority is a multiple of 4096. If you specify a priority that is not a multiple of 4096, the priority is automatically

set to the next lowest priority that is a multiple of 4096. For example, if the priority is attempted to be set to any value between 0 and 4095, it is set to 0. The default priority is 32768.

- **Bridge Max Age (secs)**. The bridge maximum age time for the Common and Internal Spanning Tree (CST), which indicates the amount of time in seconds a bridge waits before implementing a topological change. The valid range is 6–40, and the value must be less than or equal to (2 * Bridge Forward Delay) – 1 and greater than or equal to 2 * (Bridge Hello Time +1). The default value is 20.
- **Bridge Hello Time (secs)**. The bridge hello time for the Common and Internal Spanning Tree (CST), which indicates the amount of time in seconds a root bridge waits between configuration messages. The value is fixed at 2 seconds. The value must be less than or equal to (Bridge Max Age / 2) - 1. The default hello time value is 2.
- **Bridge Forward Delay (secs).** The bridge forward delay time, which indicates the amount of time in seconds a bridge remains in a listening and learning state before forwarding packets. The value must be greater or equal to (Bridge Max Age / 2) + 1. The time range is from 4 seconds to 30 seconds. The default value is 15 seconds.
- **Spanning Tree Maximum Hops**. The maximum number of bridge hops the information for a particular CST instance can travel before being discarded. The valid range is 6–40. The default is 20 hops.
- **Spanning Tree Tx Hold Count**. Configures the maximum number of bpdus the bridge is allowed to send within the hello time window. The valid range is 1–10. The default value is 6.

6. Click the **Apply** button.

   Your settings are saved.

The following table describes the CST Status information that is displayed.

Table 76. STP Advanced CST Configuration

Field	Description
Bridge identifier	The bridge identifier for the CST. It is made up using the bridge priority and the base MAC address of the bridge.
Time since topology change	The time in seconds since the topology of the CST last changed.
Topology change count	Number of times topology changed for the CST.
Topology change	The value of the topology change parameter for the switch indicating if a topology change is in progress on any port assigned to the CST. It takes a value if True or False.
Designated root	The bridge identifier of the root bridge. It is made up from the bridge priority and the base MAC address of the bridge.
Root Path Cost	Path Cost to the Designated Root for the CST.
Root Port Identifier	Port to access the Designated Root for the CST.
Max Age(secs)	Path Cost to the Designated Root for the CST.

Table 76. STP Advanced CST Configuration

Field	Description
Forward Delay(secs)	Derived value of the Root Port Bridge Forward Delay parameter.
Hold Time(secs)	Minimum time between transmission of Configuration BPDUs.
CST Regional Root	Priority and base MAC address of the CST Regional Root.
CST Path Cost	Path Cost to the CST tree Regional Root.

Configure CST Port Settings

You can configure the Common Spanning Tree (CST) and Internal Spanning Tree on a specific port on the switch.

A port can become *Diagnostically Disabled* (D-Disable) when DOT1S experiences a severe error condition. The most common cause is when the DOT1S software experiences BPDU flooding. The flooding criteria is such that DOT1S receives more than 15 BPDUs in a 3-second interval. The other causes for DOT1S D-Disable are extremely rare.

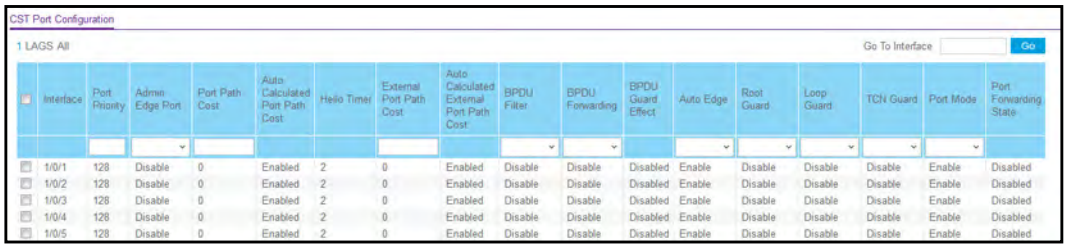
To configure CST port settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Advanced > CST Port Configuration**.



5. Select an interface.

   You can select a physical or port channel interface associated with VLANs associated with the CST.
6. Use **Port Priority** to specify the priority for a particular port within the CST.

The port priority is set in multiples of 16. For example if the priority is attempted to be set to any value between 0 and 15, it is set to 0. If it is tried to be set to any value between 16 and (2*16-1) it is set to 16 and so on. The default value is 128.

7. Use **Admin Edge Port** to specify if the specified port is an Edge Port within the CIST.

   Use the menu to select **Disable** or **Enable**. The default value is Disable.

8. Use **Port Path Cost** to set the Path Cost to a new value for the specified port in the common and internal spanning tree.

   It takes a value in the range of 1 to 200000000. The default is 0.

9. Use **External Port Path Cost** to set the External Path Cost to a new value for the specified port in the spanning tree.

   It takes a value in the range of 1 to 200000000. The default is 0.

10. Use **BPDU Filter** to configure the BPDU Filter, which filters the BPDU traffic on this port when STP is enabled on this port.

    The possible values are **Enable** or **Disable**. The default value is Disable.

11. Use **BPDU Flood** to configure the BPDU Flood, which floods the BPDU traffic arriving on this port when STP is disabled on this port.

    The possible values are **Enable** or **Disable**. The default value is Disable.

12. Use **Auto Edge** to configure the auto edge mode of a port, which allows the port to become an edge port if it does not see BPDUs for some duration.

    The possible values are **Enable** or **Disable**. The default value is Enable.

13. Use **Root Guard** to configure the root guard mode, which sets a port to discard any superior information received by the port and thus protect against root of the device from changing.

    The port gets put into discarding state and does not forward any packets. The possible values are **Enable** or **Disable**. The default value is Disable**.**

14. Use **Loop Guard** to enable or disable the loop guard on the port to protect Layer 2 forwarding loops.

    If loop guard is enabled, the port moves into the STP loop inconsistent blocking state instead of the listening/learning/forwarding state. The default value is Disable

15. Use **TCN Guard** to configure the TCN guard for a port restricting the port from propagating any topology change information received through that port.

    The possible values are **Enable** or **Disable**. The default value is Disable.

16. Use **Port Mode** to enable or disable Spanning Tree Protocol Administrative mode associated with the port or port channel.

    The possible values are **Enable** or **Disable**. The default value is **Disable**.

17. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 77. CST Port Configuration

Field	Description
Auto Calculated Port Path Cost	Displays whether the path cost is automatically calculated (Enabled) or not (Disabled). Path cost is calculated based on the link speed of the port if the configured value for Port Path Cost is zero.
Hello Timer	The value of the parameter for the CST.
Auto Calculated External Port Path Cost	Displays whether the external path cost is automatically calculated (Enabled) or not (Disabled). External Path cost is calculated based on the link speed of the port if the configured value for External Port Path Cost is zero.
BPDU Guard Effect	Display the BPDU Guard Effect, it disables the edge ports that receive BPDU packets. The possible values are Enable or Disable.
Port Forwarding State	The Forwarding State of this port.

View CST Port Status

You can view the Common Spanning Tree (CST) and Internal Spanning Tree on a specific port on the switch.

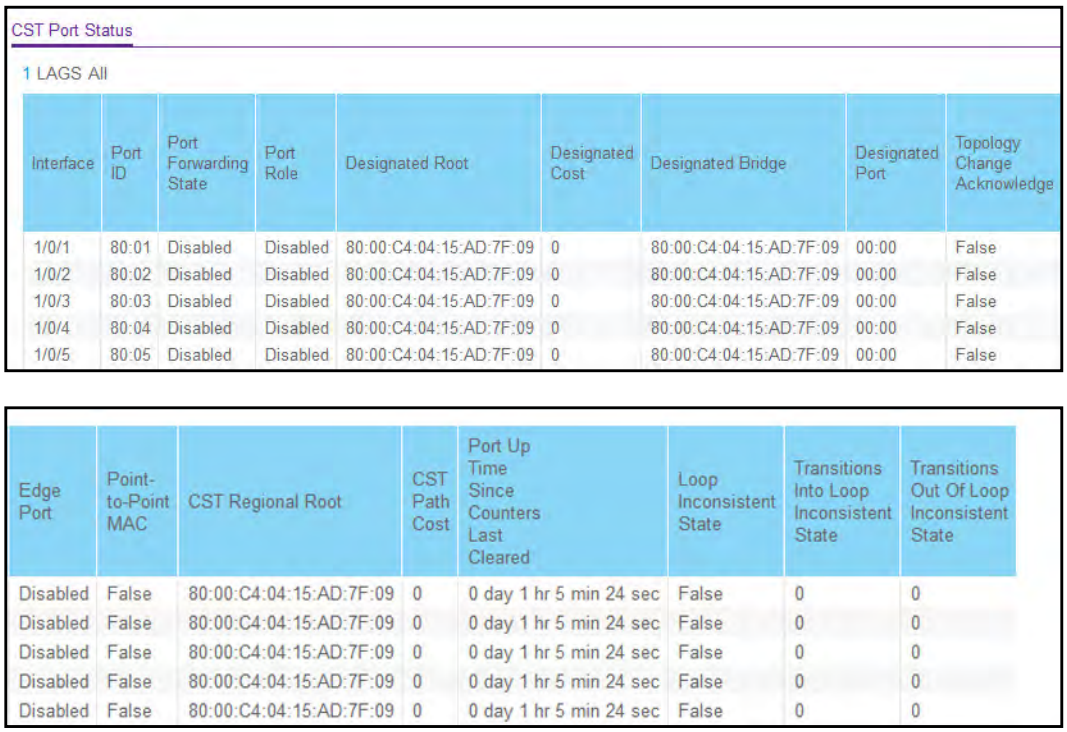
To view the CST port status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Advanced > CST Port Status**.



CST Port Status

1 LAGS All

Interface	Port ID	Port Forwarding State	Port Role	Designated Root	Designated Cost	Designated Bridge	Designated Port	Topology Change Acknowledge
1/0/1	80:01	Disabled	Disabled	80:00:C4:04:15:AD:7F:09	0	80:00:C4:04:15:AD:7F:09	00:00	False
1/0/2	80:02	Disabled	Disabled	80:00:C4:04:15:AD:7F:09	0	80:00:C4:04:15:AD:7F:09	00:00	False
1/0/3	80:03	Disabled	Disabled	80:00:C4:04:15:AD:7F:09	0	80:00:C4:04:15:AD:7F:09	00:00	False
1/0/4	80:04	Disabled	Disabled	80:00:C4:04:15:AD:7F:09	0	80:00:C4:04:15:AD:7F:09	00:00	False
1/0/5	80:05	Disabled	Disabled	80:00:C4:04:15:AD:7F:09	0	80:00:C4:04:15:AD:7F:09	00:00	False

Edge Port	Point-to-Point MAC	CST Regional Root	CST Path Cost	Port Up Time Since Counters Last Cleared	Loop Inconsistent State	Transitions Into Loop Inconsistent State	Transitions Out Of Loop Inconsistent State
Disabled	False	80:00:C4:04:15:AD:7F:09	0	0 day 1 hr 5 min 24 sec	False	0	0
Disabled	False	80:00:C4:04:15:AD:7F:09	0	0 day 1 hr 5 min 24 sec	False	0	0
Disabled	False	80:00:C4:04:15:AD:7F:09	0	0 day 1 hr 5 min 24 sec	False	0	0
Disabled	False	80:00:C4:04:15:AD:7F:09	0	0 day 1 hr 5 min 24 sec	False	0	0
Disabled	False	80:00:C4:04:15:AD:7F:09	0	0 day 1 hr 5 min 24 sec	False	0	0

5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the CST Status information displayed on the page.

Table 78. CST Port Status

Field	Description
Interface	Identify the physical or port channel interfaces associated with VLANs associated with the CST.
Port ID	The port identifier for the specified port within the CST. It is made up from the port priority and the interface number of the port.
Port Forwarding State	The Forwarding State of this port.
Port Role	Each MST Bridge Port that is enabled is assigned a Port Role for each spanning tree. The port role is one of the following values: **Root Port**, **Designated Port**, **Alternate Port**, **Backup Port**, **Master Port** or **Disabled Port**.
Designated Root	Root Bridge for the CST. It is made up using the bridge priority and the base MAC address of the bridge.
Designated Cost	Path Cost offered to the LAN by the Designated Port.
Designated Bridge	Bridge Identifier of the bridge with the Designated Port. It is made up using the bridge priority and the base MAC address of the bridge.
Designated Port	Port Identifier on the Designated Bridge that offers the lowest cost to the LAN. It is made up from the port priority and the interface number of the port.

Table 78. CST Port Status (continued)

Field	Description
Topology Change Acknowledge	Identifies whether the topology change acknowledgement flag is set for the next BPDU to be transmitted for this port. It is either True or False.
Edge port	Indicates whether the port is enabled as an edge port. It takes the value Enabled or Disabled.
Point-to-point MAC	Derived value of the point-to-point status.
CST Regional Root	Bridge Identifier of the CST Regional Root. It is made up using the bridge priority and the base MAC address of the bridge.
CST Path Cost	Path Cost to the CST Regional Root.
Port Up Time Since Counters Last Cleared	Time since the counters were last cleared, displayed in Days, Hours, Minutes, and Seconds.
Loop Inconsistent State	This parameter identifies whether the port is in loop inconsistent state or not.
Transitions Into Loop Inconsistent State	The number of times this interface transitioned into loop inconsistent state.
Transitions Out Of Loop Inconsistent State	The number of times this interface transitioned out of loop inconsistent state.

Configure MST Settings

You can configure Multiple Spanning Tree (MST) on the switch.

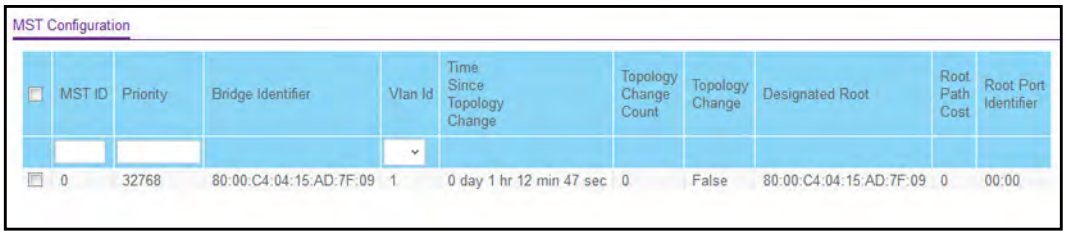
To configure an MST instance:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Advanced > MST Configuration**.



5. To add a new MST, do the following:
   a. Configure the MST values,
      - **MST ID**. Specify the ID of the MST to create. The valid values for this are 1 to 4094. This is only visible when the select option of the MST ID select box is selected.
      - **Priority**. The bridge priority value for the MST. When switches or bridges are running STP, each is assigned a priority. After exchanging BPDUs, the switch with the lowest priority value becomes the root bridge. The bridge priority is a multiple of 4096. If you specify a priority that is not a multiple of 4096, the priority is automatically set to the next lowest priority that is a multiple of 4096. For example, if the priority is attempted to be set to any value between 0 and 4095, it is set to 0. The default priority is 32768.The valid range is 0–61440.
      - **VLAN ID**. This gives a combo box of each VLAN on the switch. These can be selected or unselected for re-configuring the association of VLANs to MST instances.
   b. Click the **Add** button

      This creates the new MST that you configured.
6. To modify an MST instance, do the following:
   a. Select the check box next to the instance.

      You can select multiple check boxes to apply the same setting to all selected ports.
   b. Update the values.
   c. click the **Apply** button.
7. To delete an MST instance, do the following:
   a. Select the check box for the instance.
   b. Click the **Delete** button.

For each configured instance, the information described in the following table displays on the page.

Table 79. MST Configuration

Field	Description
Bridge Identifier	The bridge identifier for the selected MST instance. It is made up using the bridge priority and the base MAC address of the bridge.
Time Since Topology Change	The time n seconds since the topology of the selected MST instance last changed.
Topology Change Count	Number of times topology changed for the selected MST instance.
Topology Change	The value of the topology change parameter for the switch indicating if a topology change is in progress on any port assigned to the selected MST instance. It takes a value if True or False.
Designated Root	The bridge identifier of the root bridge. It is made up from the bridge priority and the base MAC address of the bridge

Table 79. MST Configuration (continued)

Field	Description
Root Path Cost	Path Cost to the Designated Root for this MST instance.
Root PortIdentifier	Port to access the Designated Root for this MST instance.

View the Spanning Tree MST Port Status

You can configure and display Multiple Spanning Tree (MST) settings on a specific port on the switch.

A port can become *Diagnostically Disabled* (D-Disable) when DOT1S experiences a severe error condition. The most common cause is when the DOT1S software experiences BPDU flooding. The flooding criteria is such that DOT1S receives more than 15 BPDUs in a 3-second interval. The other causes for DOT1S D-Disable are extremely rare.

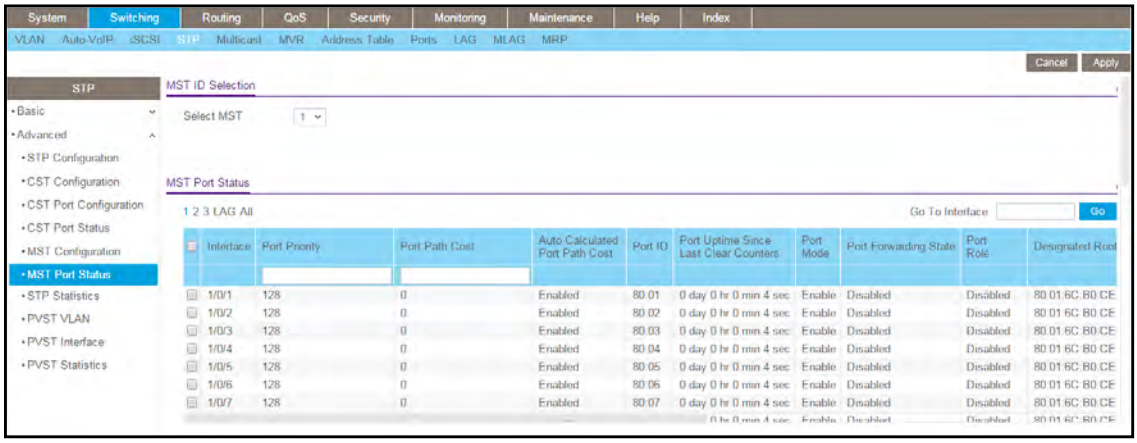
To view the Spanning Tree MST port status:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Advanced > MST Port Status**.



Note: If no MST instances were configured on the switch, the page displays a *No MSTs Available* message and does not display the fields shown in the field description table that follows.

5. Use **MST ID** to select one MST instance from existing MST instances.
6. Use **Interface** to select one of the physical or port channel interfaces associated with VLANs associated with the selected MST instance.
7. Use **Port Priority** to specify the priority for a particular port within the selected MST instance.

   The port priority is set in multiples of 16. For example if the priority is attempted to be set to any value between 0 and 15, it is set to 0. If it is tried to be set to any value between 16 and (2*16-1) it is set to 16 and so on.
8. Use **Port Path Cost** to set the Path Cost to a new value for the specified port in the selected MST instance.

   It takes a value in the range of 1 to 200000000.
9. Click the **Apply** button.

   Your settings are saved.

The following table describes the read-only MST port configuration information displayed on the Spanning Tree CST Configuration page.

Table 80. MST Port Status

Field	Description
Auto Calculated Port Path Cost	Displays whether the path cost is automatically calculated (**Enable**) or not (**Disable**). Path cost is calculated based on the link speed of the port if the configured value for Port Path Cost is zero.
Port ID	The port identifier for the specified port within the selected MST instance. It is made up from the port priority and the interface number of the port.
Port Uptime Since Last Clear Counters	Time since the counters were last cleared, displayed in Days, Hours, Minutes, and Seconds.
Port Mode	Spanning Tree Protocol Administrative mode associated with the port or port channel. The possible values are **Enable** or **Disable**.
Port Forwarding State	The Forwarding State of this port.
Port Role	Each MST Bridge Port that is enabled is assigned a Port Role for each spanning tree. The port role is one of the following values: **Root Port**, **Designated Port**, **Alternate Port**, **Backup Port**, **Master Port** or **Disabled Port**.
Designated Root	Root Bridge for the selected MST instance. It is made up using the bridge priority and the base MAC address of the bridge.
Designated Cost	Path Cost offered to the LAN by the Designated Port.
Designated Bridge	Bridge Identifier of the bridge with the Designated Port. It is made up using the bridge priority and the base MAC address of the bridge.
Designated Port	Port Identifier on the Designated Bridge that offers the lowest cost to the LAN. It is made up from the port priority and the interface number of the port.

View STP Statistics

You can view information about the number and type of bridge protocol data units (BPDUs) transmitted and received on each port.

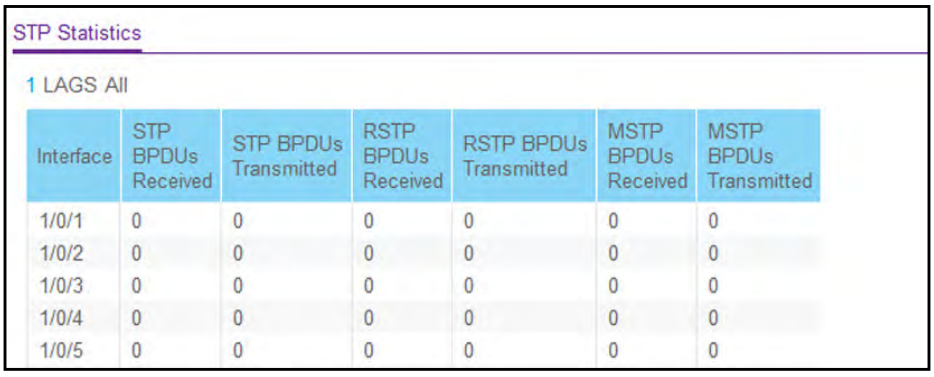
To view Spanning Tree statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Advanced > STP Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the information available on the STP Statistics page.

Table 81. STP Statistics

Field	Description
Interface	Selects one of the physical or port channel interfaces of the switch.
STP BPDUs Received	Number of STP BPDUs received at the selected port.
STP BPDUs Transmitted	Number of STP BPDUs transmitted from the selected port.
RSTP BPDUs Received	Number of RSTP BPDUs received at the selected port.
RSTP BPDUs Transmitted	Number of RSTP BPDUs transmitted from the selected port.
MSTP BPDUs Received	Number of MSTP BPDUs received at the selected port.
MSTP BPDUs Transmitted	Number of MSTP BPDUs transmitted from the selected port.

Configure PVST VLAN Settings

You can view and configure Per VLAN Spanning Tree Protocol (PVST)/Per VLAN Rapid Spanning Tree Protocol (RPVST) VLAN settings for the device.

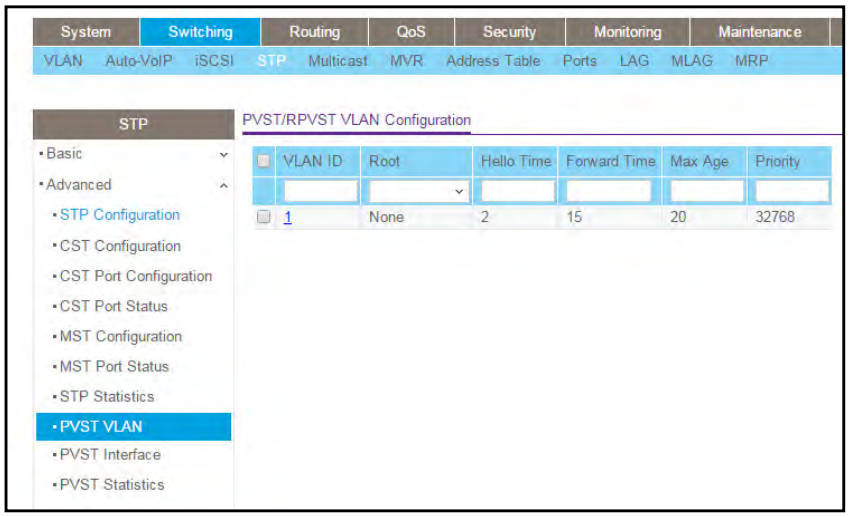
To configure PVST/RPVST VLAN settings for the device:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > STP > Advanced > PVST VLAN** in the navigation menu.



5. Select a **VLAN ID**, a unique VLAN identifier, from the list of VLANs with enabled STP Admin mode and PVST or RPVST.
6. In the **Root** list, select **None**, **Primary**, or **Secondary**.

   The default value is None. This setting configures the switch to become the root bridge or standby root bridge by modifying the bridge priority from the default value of 32768 to a lower value calculated to ensure the bridge is the root (or standby) bridge.
7. In the **Hello Time** field, configure the spanning tree hello time interval for the specified VLAN

   The hello time is the interval between sending successive BPDUs. Allowed values range from 1 to 10 seconds. The default value is 2 seconds.

8. In the **Forward Time** field, configure the spanning tree forward delay time for a specified VLAN.

   The range is 4 to 30 seconds. The default value is 15 seconds. This interval is a time for listening and learning states before transitioning a port to the forwarding state.

9. Use the **Max Age** field to configure the spanning tree maximum age time for a specified VLAN.

   Max age is the maximum age time before a bridge port saves its configuration information. The range is 6 to 40 seconds. The default value is 20 seconds.

10. Configure the bridge **Priority** of a VLAN.

    The allowed values are between 0 and 61440. The valid values are listed in the following table.

    Table 82. PVST/RPVST VLAN Configuration - VLAN Bridge Priority

0	4096	8192
12288	16384	20480
24576	28672	32768 (default)
36864	40960	45056
49152	53248	57344
61440		

    The default value is 32768. If the value configured is not among the specified values, then it is rounded off to the nearest valid value.

11. Click the **Add** button.

    PVST/RPVST is enabled for the selected VLAN.

12. Click the **Apply** button.

    Your settings are saved.

Configure the PVST Interface Settings

You can view and configure Per VLAN Spanning Tree Protocol (PVST)/Per VLAN Rapid Spanning Tree Protocol (RPVST) Interface settings for the device.

To configure the PVST/RPVST Interface settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

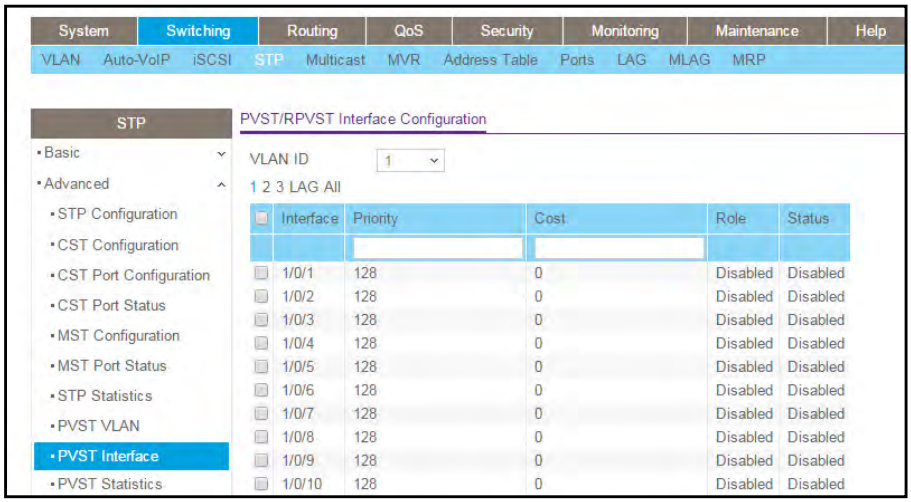
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Switching > STP > Advanced > PVST Interface**.



5. Select a **VLAN ID** from the list of VLANs with enabled STP Admin mode and PVST or RPVST.

   Note: The Other option is used for configuring a VLAN which is not yet created. Specify the required value for VLAN ID and click the **Apply** button to observe actual values.

6. Configure the **Priority** value used to allow the operator to select the relative importance of the port in the selection process for forwarding.

   Set this value to a lower number to prefer a port for forwarding of frames. This priority configuration is used when the port is configured as a point-to-point link type. The allowed values are between 0 and 240. The priority values are listed in the following table. All other values are rounded off. The default value is 128.

   Note: The value must be a multiple of 16.

Table 83. PVST/RPVST Interface Configuration Priority Values

0	16	32
48	64	80
96	112	128 (default)
144	160	176
192	208	224
240	–	–

7. The Per VLAN **Cost** is the path cost from the port to the root bridge.

   The values allowed are between 1 and 200,000,000. By default, cost is not configured. Use the value 0 to unconfigure the setting. If per VLAN cost is not configured, the path cost value is set based on Link Speed.

8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that the PVST/RPVST Interface Configuration page displays.

Table 84. PVST/RPVST Interface Configuration

Field	Description
Interface	The list of physical interfaces and LAGs.
Role	Indicates the role of the interface. Possible values are as follows: Disabled, Root, Designated, Alternate, Backup, and Master. **Note:** The blank field is displayed for the interface which is not included for the specified VLAN.
Status	Indicates the status of the interface. Possible values are as follows: Discarding, Learning, Forwarding, and Disabled. **Note:** The blank field is displayed for the interface which is not included for the specified VLAN.

View PVST Statistics

You can view and configure Per VLAN Spanning Tree Protocol (PVST)/Per VLAN Rapid Spanning Tree Protocol (RPVST) Statistics settings for the device.

To view the PVST/RPVST statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

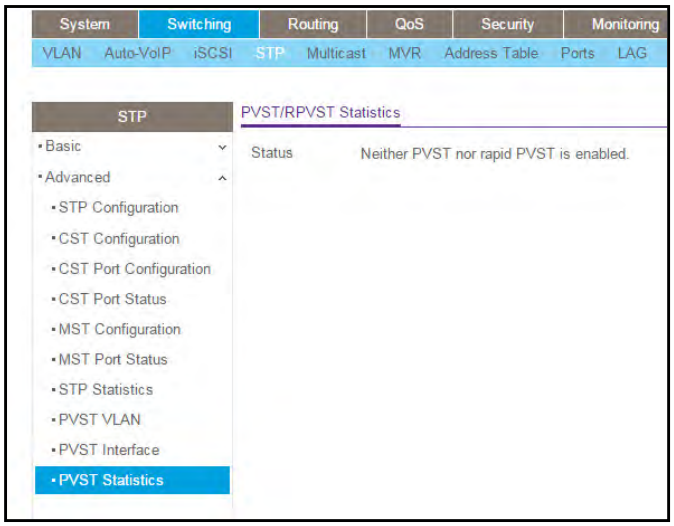
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > STP > Advanced > PVST Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

   The **Status** field displays Neither PVST nor Rapid-PVST is enabled. If you change the STP mode to PVST or to RPVST, the page displays statistic information.

Manage Multicast

Multicast IP traffic is traffic that is destined to a host group. Host groups are identified by class D IP addresses, which range from 224.0.0.0 to 239.255.255.255.

View the MFDB Table

The Multicast Forwarding Database holds the port membership information for all active multicast address entries. The key for an entry consists of a VLAN ID and MAC address pair. Entries can contain data for more than one protocol.

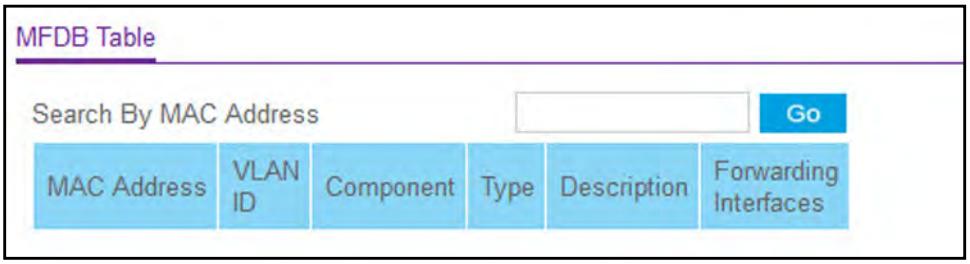
To view the MFDB Table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > MFDB > MFDB Table**.



5. Use **Search by MAC Address** to enter a MAC address.

   Enter six two-digit hexadecimal numbers separated by colons, for example 00:01:23:43:45:67.

6. Click the **GO** button.

   If the address exists, that entry is displayed. An exact match is required.

Table 85. MFDB Table

Field	Description
MAC Address	The multicast MAC address for which you requested data.
VLAN ID	The VLAN ID to which the multicast MAC address is related.
Type	This displays the type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Component	This is the component that is responsible for this entry in the Multicast Forwarding Database. Possible values are IGMP snooping, GMRP, Static Filtering and MLD snooping.
Description	The text description of this multicast table entry. Possible values are Management Configured, Network Configured and Network Assisted.
Forwarding Interfaces	The resultant forwarding list is derived from combining all the forwarding interfaces and removing the interfaces that are listed as the static filtering interfaces.

View the MFDB Statistics

To view the MFDB statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

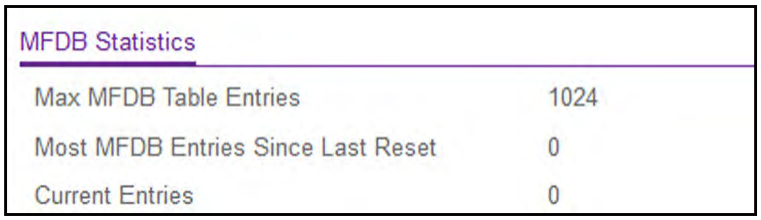
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Switching > Multicast > MFDB > MFDB Statistics**.



The following table describes the MFDB Statistics fields.

Table 86. MFDB Statistics

Field	Description
Max MFDB Table Entries	The maximum number of entries that the Multicast Forwarding Database table can hold.
Most MFDB Entries Since Last Reset	The largest number of entries that were present in the Multicast Forwarding Database table since last reset. This value is also known as the MFDB high-water mark.
Current Entries	The current number of entries in the Multicast Forwarding Database table.

Manage IGMP Snooping

Internet Group Management Protocol (IGMP) snooping is a feature that allows a switch to forward multicast traffic intelligently on the switch. Multicast IP traffic is traffic that is destined to a host group. Host groups are identified by class D IP addresses, messages, the switch forwards traffic only to the ports that request the multicast traffic. This prevents the switch from broadcasting the traffic to all ports and possibly affecting network performance.

A traditional Ethernet network can be separated into different network segments to prevent placing too many devices onto the same shared media. Bridges and switches connect these segments. When a packet with a broadcast or multicast destination address is received, the switch forwards a copy into each of the remaining network segments in accordance with the IEEE MAC Bridge standard. Eventually, the packet is made accessible to all nodes connected to the network.

This approach works well for broadcast packets that are intended to be seen or processed by all connected nodes. In the case of multicast packets, however, this approach could lead to less efficient use of network bandwidth, particularly when the packet is intended for only a small number of nodes. Packets are flooded into network segments where no node is receptive to the packet. While nodes rarely incur any processing overhead to filter packets addressed to unrequested group addresses, they cannot transmit new packets onto the shared media for the period of time that the multicast packet is flooded. The problem of wasting bandwidth is even worse when the LAN segment is not shared, for example in full-duplex links.

Allowing switches to snoop IGMP packets is a creative effort to solve this problem. The switch uses the information in the IGMP packets as they are being forwarded throughout the network to determine which segments receive packets directed to the group address.

Configure IGMP Snooping Automatically with IGMP Plus Mode

IGMP Plus mode lets you automatically configure IGMP snooping, which is used to build forwarding lists for multicast traffic. You can also configure IGMP snooping manually (see Configure IGMP Snooping Manually on page 238).

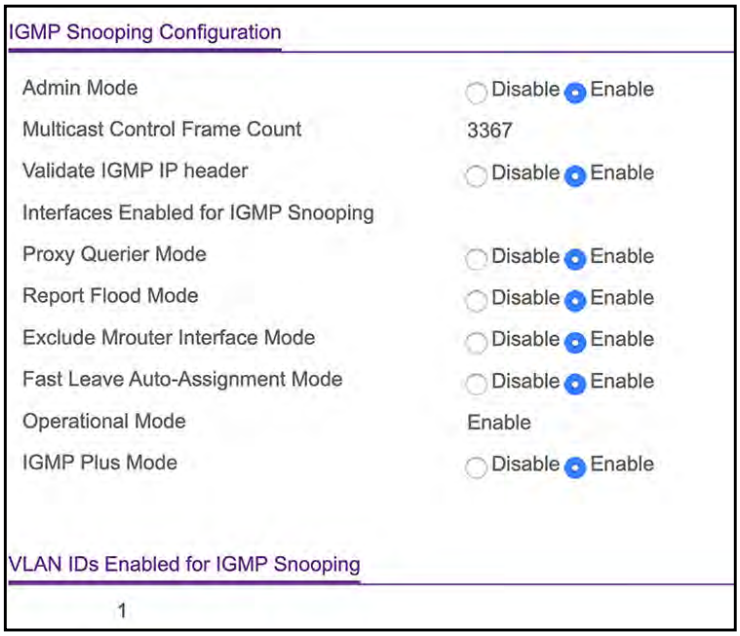
To configure IGMP snooping automatically:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > IGMP Snooping > Configuration**.



5. Select the IGMP Plus Mode **Enable** or **Disable** radio button.

If enabled, the following IGMP snooping modes are automatically enabled:

- Admin mode
- Proxy Querier mode
- Report Flood Mode
- Exclude Mrouter Interface Mode
- Fast Leave Auto-assignment Mode

The default is Enable.

If disabled, these IGMP snooping modes are automatically disabled.

Note: For information about other settings on the page, see Configure IGMP Snooping Manually on page 238.

6. Click the **Apply** button.

   Your settings are saved.

The following table displays information about the global IGMP snooping status and statistics on the page.

Table 87. IGMP Snooping Configuration

Field	Description
Multicast Control Frame Count	Displays the number of multicast control frames that are processed by the switch.
Interfaces Enabled for IGMP Snooping	Displays the interfaces on which IGMP snooping is enabled.
Operational Mode	Displays whether IGMP snooping is globally enabled or disabled on the switch.
VLAN IDs Enabled For IGMP Snooping	Displays the VLANs on which IGMP snooping is enabled.

Configure IGMP Snooping Manually

You can manually configure the settings for IGMP snooping, which is used to build forwarding lists for multicast traffic. You can also configure IGMP snooping automatically (see Configure IGMP Snooping Automatically with IGMP Plus Mode on page 237).

To configure the settings for IGMP snooping manually:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

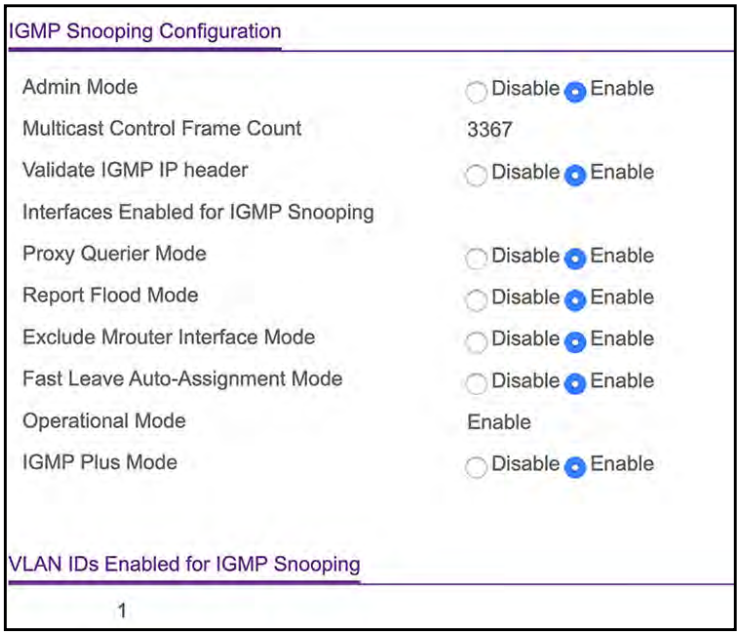
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Switching > Multicast > IGMP Snooping > Configuration**.



5. Select the Admin Mode **Enable** or **Disable** radio button.

   This selection enables or disables the administrative mode for IGMP snooping for the switch. The default is Disable.

6. Select the Validate IGMP IP header **Enable** or **Disable** radio button.

   This selection enables or disables header validation for all IGMP versions on the switch. If enabled, a packet IGMP IP header validates the Router Alert option, ToS and TTL. The default is Enable.

7. Select the Proxy Querier Mode **Enable** or **Disable** radio button.

   This selection enables or disables the IGMP proxy querier for the switch. If disabled, the IGMP proxy query with source IP address 0.0.0.0 is not sent in response to an IGMP leave packet. The default is Enable.

8. Select the Report Flood Mode **Enable** or **Disable** radio button.

   This selection enables or disables the report flooding mode on the switch. If enabled, IGMP Join/Leave PDUs that the switch receives from a host on a downstream port are forwarded to all other ports in the associated VLAN. The default is Enable.

9. Select the Exclude Mrouter Interface Mode **Enable** or **Disable** radio button.

   This selection specifies the type of information that is forwarded to the upstream multicast router interface.

If enabled, the switch forwards IGMP Join/Leave PDUs that it receives on a downstream port to an upstream mrouter interface. In addition, the switch forwards a multicast data stream to an upstream mrouter interface only if that port already received an IGMPv1 or IGMPv2 membership message. The switch drops unknown multicast streams. The default is Enable.

If disabled, the switch forwards IGMP Join/Leave PDUs, known multicast streams, and unknown multicast streams to the upstream mrouter interface.

10. Select the Fast Leave Auto-Assignment Mode **Enable** or **Disable** radio button.

    This selection enables or disables the automatic assignment of fast-leave messages to all ports and LAGs on the switch. The default is Enable.

    Note: For information about IGMP Plus mode, see Configure IGMP Snooping Automatically with IGMP Plus Mode on page 237.

11. Click the **Apply** button.

    Your settings are saved.

The following table displays information about the global IGMP snooping status and statistics on the page.

Table 88. IGMP Snooping Configuration

Field	Description
Multicast Control Frame Count	Displays the number of multicast control frames that are processed by the switch.
Interfaces Enabled for IGMP Snooping	Displays the interfaces on which IGMP snooping is enabled.
Operational Mode	Displays whether IGMP snooping is globally enabled or disabled on the switch.
VLAN IDs Enabled For IGMP Snooping	Displays the VLANs on which IGMP snooping is enabled.

Configure IGMP Snooping for Interfaces

To configure IGMP snooping for interfaces:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

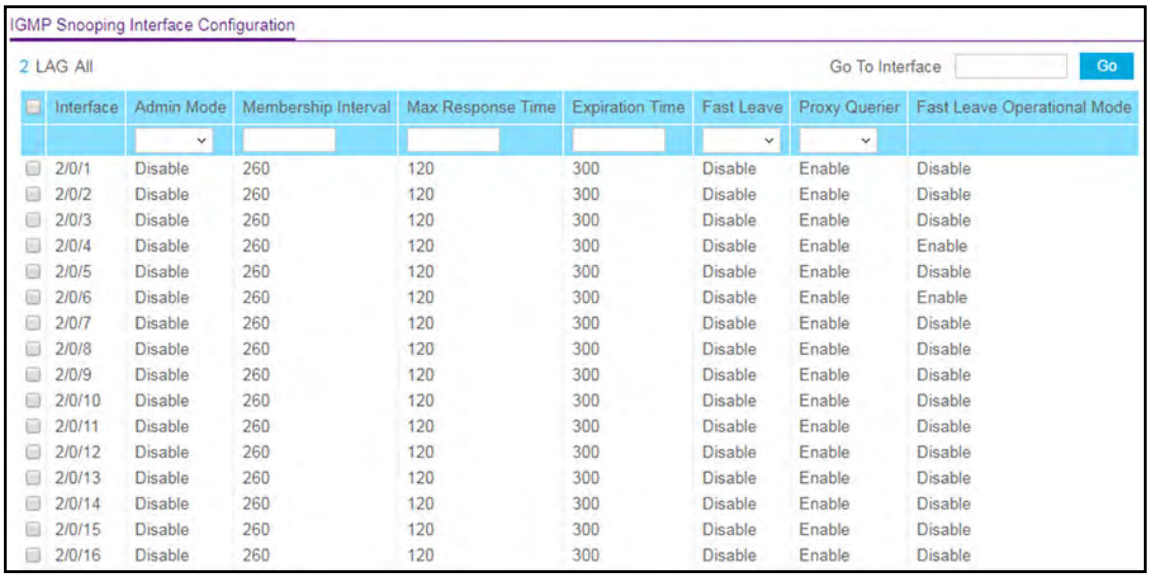
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Switching > Multicast > IGMP Snooping > Interface Configuration**.



The page lists all physical, VLAN, and LAG interfaces.

5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure
6. From the **Admin Mode** menu, select **Disable** or **Enable**.

   This selection enables or disables the administrative mode for IGMP snooping for the interface. The default is Disable.
7. In the **Membership Interval** field, specify the period that the switch waits for a group report before it removes the interface as a member of the group.

   Enter a value between 1 and 3600 seconds. The default is 600 seconds.
8. In the **Max Response Time** field, specify the period that the switch waits after it sent a query on an interface because it did not receive a report from a group on that interface.

   Enter a value that is 1 or greater but less than the value in the Membership Interval field. The default is 120 seconds.
9. In the **Expiration Time** field, specify the period that the switch waits to receive a query on the interface before it removes the interface from the list of interfaces with multicast routers attached.

   Enter a value between 0 and 3600 seconds. The default is 0 seconds, which indicates an infinite time-out (no expiration).

10. From the **Fast Leave** menu, select to enable or disable the IGMP snooping fast leave mode for the interface. This selection enables or disables the automatic assignment of fast-leave messages for the interface. The default is Disable.

    The Fast Leave Operational Mode field shows the status of the interface.

11. From the **Proxy Querier** menu, select to enable or disable the proxy querier for the interface. If disabled, the IGMP proxy query with source IP address 0.0.0.0 is not sent in response to an IGMP leave packet. The default is Enable.
12. Click the **Apply** button.

    Your settings are saved.

Configure IGMP Snooping for VLANs Automatically with IGMP Plus Mode

IGMP Plus mode lets you automatically configure IGMP snooping for VLANs, which is used to build forwarding lists for multicast traffic. You can also configure IGMP snooping for VLANs manually (see Configure IGMP Snooping Manually on page 238).

To configure IGMP snooping for VLANs automatically:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > Multicast > IGMP Snooping > IGMP VLAN Configuration**.

5. Select the check box next to the VLAN ID.
6. From the **IGMP Plus Mode** menu, select to enable or disable the IGMP Plus mode on the VLAN.

   If enabled, the following IGMP snooping modes are automatically enabled for the VLAN:

   - Admin mode
   - Exclude Mrouter Interface Mode
   - Fast-Leave
   - Report Flood Mode

- Proxy Querier
- Querier Election Mode
- Installs reserved Multicast MAC addresses into the system.

If disabled, these IGMP snooping modes are automatically disabled for the VLAN.

Note: For information about other settings on the page, see Configure IGMP Snooping for VLANs Manually on page 243.

7. Click the **Apply** button.

   Your settings are saved.

Configure IGMP Snooping for VLANs Manually

You can manually configure the settings for IGMP snooping for VLANs, which is used to build forwarding lists for multicast traffic. You can also configure IGMP snooping for VLANS automatically (see Configure IGMP Snooping for VLANs Automatically with IGMP Plus Mode on page 242).

To configure the settings for IGMP snooping for VLANs manually:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > IGMP Snooping > IGMP VLAN Configuration**.

5. To enable IGMP snooping on a VLAN, do the following:
   a. Select the check box next to the VLAN ID.
   b. Configure the IGMP snooping settings:
      - **Admin Mode**. From the menu, select to enable or disable IGMP snooping for the VLAN. The default is Disable.
      - **Fast Leave**. From the menu, select to enable or disable the IGMP snooping fast leave mode for the VLAN. This selection enables or disables the automatic assignment of fast-leave messages for all members of the VLAN. The default is Enable.

- **Membership Interval**. Specify the value for the group membership interval of IGMP snooping for the VLAN. The value must be the value in the Maximum Response Time field plus a value of 1 to 3600 seconds.
- **Maximum Response Time**. Specify the value for the maximum response time of IGMP snooping for the VLAN. The range must be from 1 to the value in the Group Membership Interval field minus 1. The value in the Maximum Response Time must be greater than the value in the Group Membership Interval field.
- **Multicast Router Expiry Time**. Specify the value of the multicast router expiration time of IGMP snooping for the VLAN. The range must be from 0 to 3600 seconds.
- **Report Suppression**. From the menu, select to enable or disable the IGMP snooping report suppression mode for the VLAN. This mode allows for the suppression of IGMP reports that are sent by multicast hosts. The switch does so by building a Layer 3 membership table and sending only the essential reports to IGMP routers that must receive the multicast traffic. As a result, the multicast report traffic that is sent to the IGMP routers is reduced. The default is Disable.
- **Proxy Querier**. From the menu, select to enable or disable the proxy querier for the VLAN. If disabled, the IGMP proxy query with source IP address 0.0.0.0 is not sent in response to an IGMP leave packet. The default is Enable.
- **Report Flood Mode**. From the menu, select to enable or disable the report flooding mode on the VLAN. If enabled, IGMP Join/Leave PDUs that the VLAN receives from a host on a downstream port are forwarded to all other ports in the VLAN. The default is Enable.
- **Exclude Mrouter Interface Mode**. From the menu, select to enable or disable the Exclude Mrouter Interface Mode. This selection specifies the type of information that is forwarded to the upstream multicast router interface.

  If enabled, the VLAN forwards IGMP Join/Leave PDUs that it receives on a downstream port to an upstream mrouter interface. In addition, the VLAN forwards a multicast data stream to an upstream mrouter interface only if that port already received an IGMPv1 or IGMPv2 membership message. The VLAN drops unknown multicast streams. The default is Enable.

  If disabled, the VLAN forwards IGMP Join/Leave PDUs, known multicast streams, and unknown multicast streams to the upstream mrouter interface.

Note: For information about IGMP Plus mode for VLANs, see Configure IGMP Snooping for VLANs Automatically with IGMP Plus Mode on page 242.

c. Click the **Apply** button.

Your settings are saved.

6. To disable IGMP snooping on a VLAN manually, do the following:

a. Select the check box next to the VLAN ID.

b. Click the **Delete** button.

The VLAN is removed from the list.

7. To modify the IGMP snooping settings for a VLAN manually, do the following:
   a. Select the check box next to the VLAN ID
   b. Update the settings.
   c. Click the **Apply** button.

      Your settings are saved.

Configure a Multicast Router

You can configure the interface as the one the multicast router is attached to. All IGMP packets snooped by the switch are forwarded to the multicast router reachable from this interface. The configuration is not needed most of the time since the switch automatically detects the multicast router and forwards IGMP packets accordingly. It is needed only if you want to make sure that the multicast router always receives IGMP packets from the switch in a complex network.

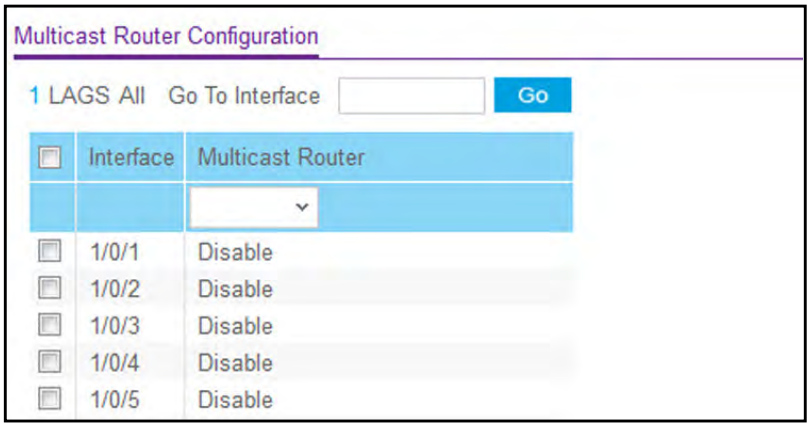
To configure a multicast router:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > IGMP Snooping > Multicast Router Configuration**.



5. Use **Interface** to select the physical interface.
6. In the **Multicast Router** field, select **Enable** or **Disable**.
7. Click the **Apply** button.

   Your settings are saved.

Configure a Multicast Router VLAN

You can configure an interface to forward the snooped IGMP packets from a specific VLAN only to the multicast router that is connected to the interface. The configuration is not needed most of the time since the switch automatically detects a multicast router and forwards the IGMP packets accordingly. It is needed only when you want to make sure that the multicast router always receives IGMP packets from the switch in a complex network.

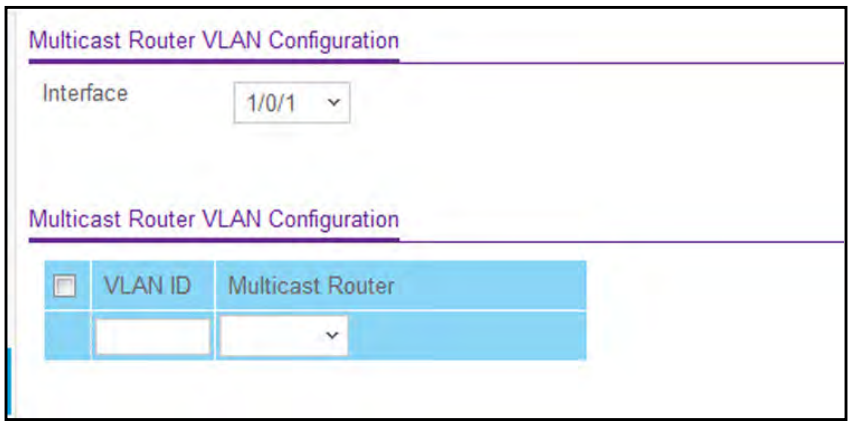
To configure a multicast router VLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > IGMP Snooping > Multicast Router VLAN Configuration**.



5. Use **Interface** to select the interface.
6. Use **VLAN ID** to select the VLAN ID.
7. In the **Multicast Router** field, select **Enable** or **Disable**.
8. Click the **Apply** button.

   Your settings are saved.

IGMP Snooping Querier Overview

IGMP snooping requires that one central switch or router periodically query all end-devices on the network to announce their multicast memberships. This central device is the IGMP querier. The IGMP query responses, known as IGMP reports, keep the switch updated with the current multicast group membership on a port-by-port basis. If the switch does not receive updated membership information in a timely fashion, it stops forwarding multicasts to the port where the end device is located.

You can configure and display information on IGMP snooping queriers on the network and, separately, on VLANs.

Configure IGMP Snooping Querier

You can configure the parameters for IGMP snooping querier.

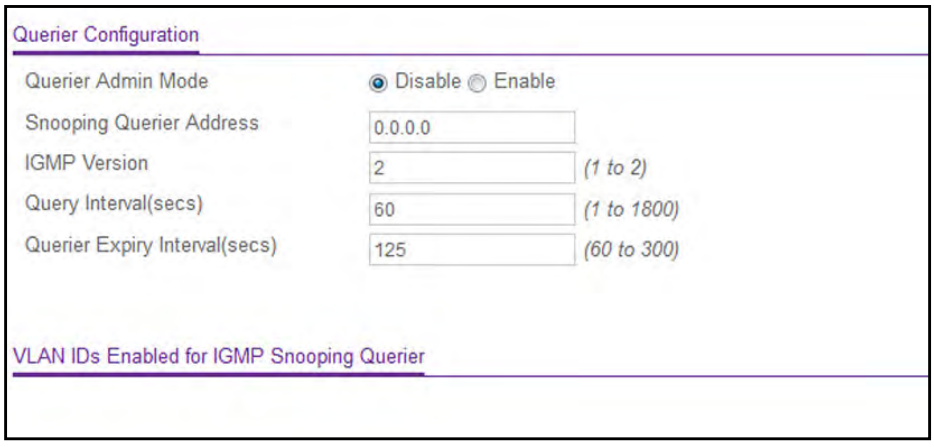
To configure IGMP snooping querier settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > IGMP Snooping > Querier Configuration**.



5. Use **Querier Admin Mode** to select the administrative mode for IGMP snooping for the switch.

   The default is Disable.
6. In the **Snooping Querier IP Address** field, type an IP address.

This specifies the snooping querier address to be used as the source address in periodic IGMP queries. This address is used when no address is configured on the VLAN on which query is being sent.

7. Use **IGMP Version** to specify the IGMP protocol version used in periodic IGMP queries.

   The range is 1 to 2. The default value is 2.

8. Use **Query Interval(secs)** to specify the time interval in seconds between periodic queries sent by the snooping querier.

   The query Interval must be a value in the range of 1 and 1800. The default value is 60.

9. Use **Querier Expiry Interval(secs)** to specify the time interval in seconds after which the last querier information is removed.

   The querier expiry Interval must be a value in the range of 60 and 300. The default value is 125.

10. Click the **Apply** button.

    Your settings are saved.

    The page displays the VLAN IDs enabled for IGMP snooping querier.

Configure IGMP Snooping Querier for VLANs

You can configure IGMP queriers for use with VLANs on the network.

To configure querier VLAN settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

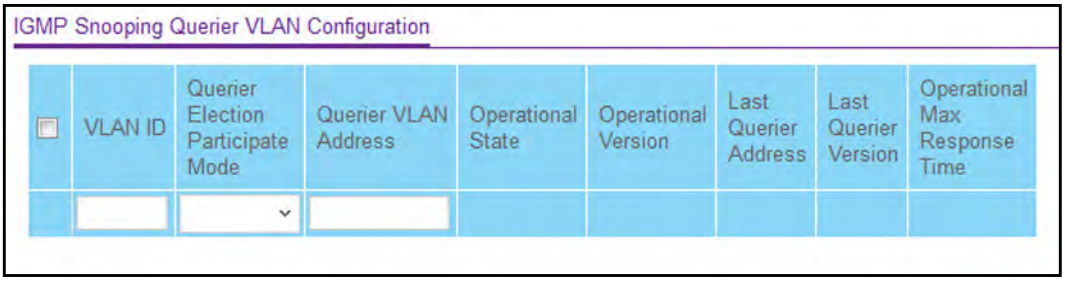
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > Multicast > IGMP Snooping > Querier VLAN Configuration**.



5. To create a new VLAN ID for IGMP snooping, select **New Entry** from the VLAN ID field and complete the following fields.

   You can also set pre-configurable snooping querier parameters.

   - **VLAN ID**. The VLAN ID for which the IGMP snooping querier is to be enabled.
   - **Querier Election Participate Mode**. Enable or disable querier Participate mode.
     - **Disabled**. Upon seeing another querier of the same version in the VLAN, the snooping querier moves to the non-querier state.
     - **Enabled**. The snooping querier participates in querier election, in which the least IP address operates as the querier in that VLAN. The other querier moves to non-querier state.
   - **Snooping Querier VLAN Address**. Specify the snooping querier IP address to be used as the source address in periodic IGMP queries sent on the specified VLAN.

6. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 89. Querier VLAN Configuration

Field	Description
Operational State	The operational state of the IGMP snooping querier on a VLAN. It can be in any of the following states: • **Querier**: The snooping switch is the querier in the VLAN. The snooping switch sends out periodic queries with a time interval equal to the configured querier query interval. If the snooping switch finds a better querier in the VLAN, it moves to non-querier mode. • **Non-Querier**: The snooping switch is innNon-querier mode in the VLAN. If the querier expiry interval timer expires, the snooping switch moves into querier mode. • **Disabled**: The snooping querier is not operational on the VLAN. The snooping querier moves to disabled mode when IGMP snooping is not operational on the VLAN or when the querier address is not configured or the network management address is also not configured.
Operational Version	The operational IGMP protocol version of the querier.
Last Querier Address	The IP address of the last querier from which a query was snooped on the VLAN.
Last Querier Version	The IGMP protocol version of the last querier from which a query was snooped on the VLAN.
Operational Max Response Time	Displays maximum response time to be used in the queries that are sent by the snooping querier.

Configure MLD Snooping Automatically with MLD Plus Mode

MLD Plus mode lets you automatically configure MLD snooping, which is used to build forwarding lists for multicast traffic. You can also configure MLD snooping manually (see Configure MLD Snooping Manually on page 251).

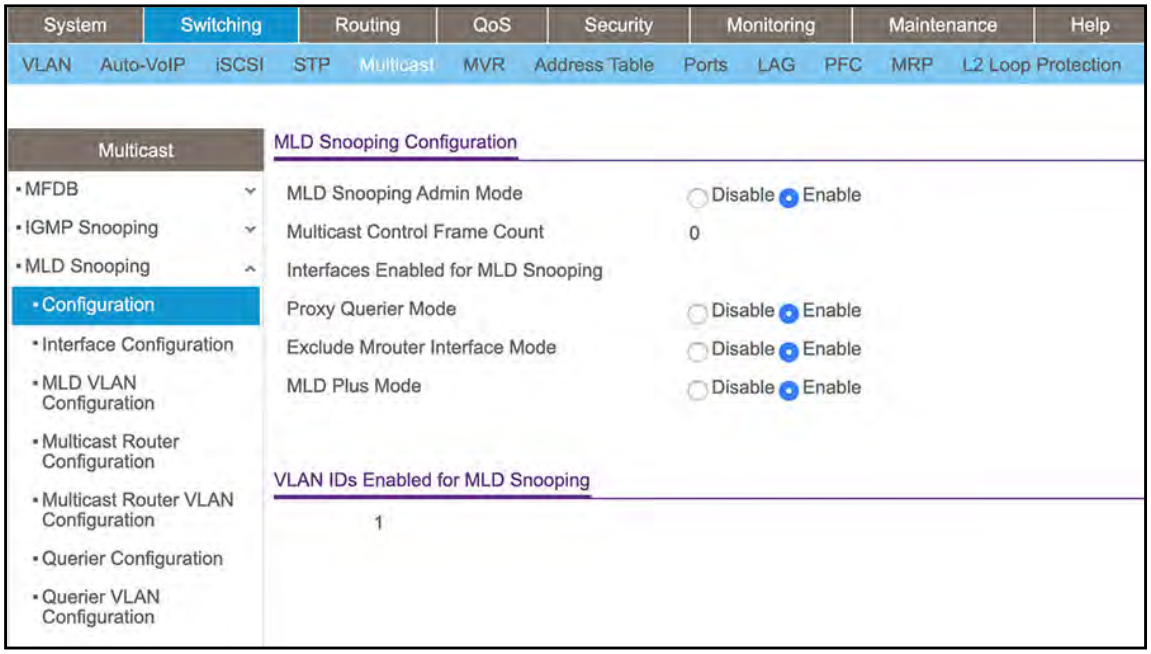
To configure MLD snooping automatically:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > MLD Snooping > Configuration**.



5. Select the MLD Plus Mode **Enable** or **Disable** radio button.

   If enabled, the following MLD snooping modes are automatically enabled:

   - MLD Snooping Admin mode
   - Exclude Mrouter Interface Mode

   The default is Enable.

If disabled, these MLD snooping modes are automatically disabled.

Note: For information about other settings on the page, see Configure MLD Snooping Manually on page 251.

6. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable MLD Snooping Configuration fields.

Table 90. MLD Snooping Configuration

Field	Definition
Multicast Control Frame Count	The number of multicast control frames that have been processed by the CPU.
Interfaces Enabled for MLD Snooping	One or more interfaces on which MLD snooping is administratively enabled. MLD snooping must be enabled globally and on an interface for the interface to be able to snoop MLD packets to determine which segments should receive multicast packets directed to the group address.
VLAN IDs Enabled For MLD Snooping	Displays one or more VLANs on which MLD snooping is administratively enabled.

Configure MLD Snooping Manually

You can manually configure the settings for MLD snooping, which is used to build forwarding lists for multicast traffic. You can also configure MLD snooping automatically (see Configure MLD Snooping Automatically with MLD Plus Mode on page 250).

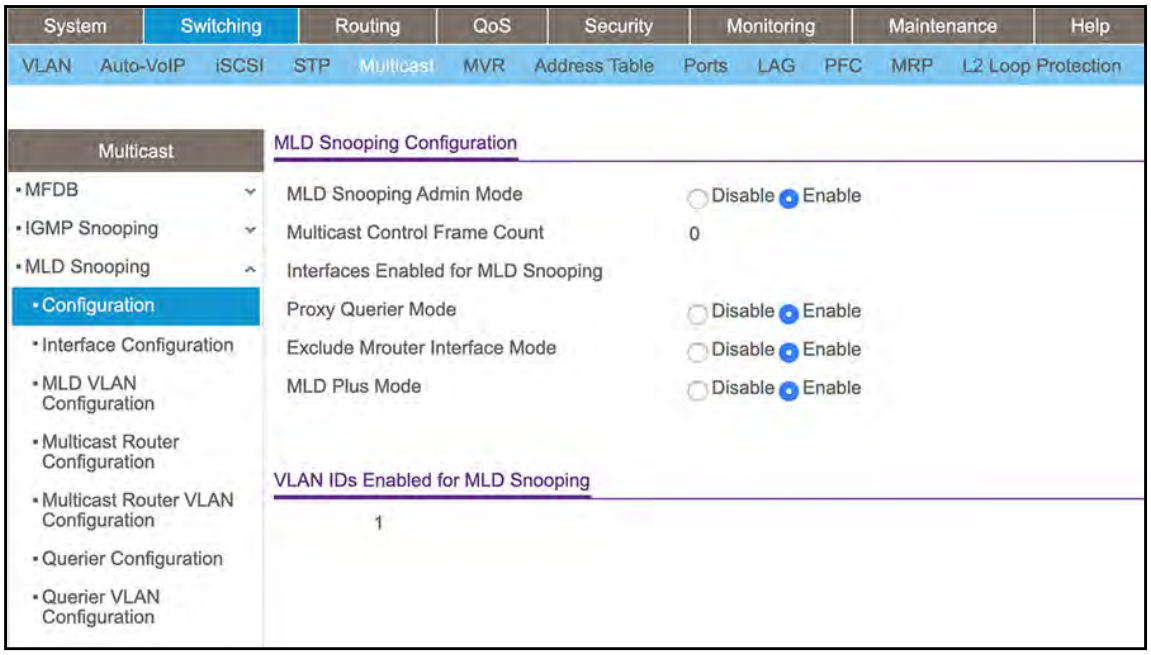
To configure the settings for MLD snooping manually:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > MLD Snooping > Configuration**.



5. Select the MLD Snooping Admin Mode **Enable** or **Disable** radio button to specify the administrative mode for MLD snooping for the switch. The default is Disable.
6. Select the Proxy Querier Mode **Enable** or **Disable** radio button.

   This enables or disables an MLD proxy querier on the system. If it is disabled, then an MLD proxy query with source IP 0::0 is not sent in response to an MLD leave packet. If it is enabled, then MLD proxy queries are sent. The default value is Enable.
7. Select the Exclude Mrouter Interface Mode **Enable** or **Disable** radio button.

   This selection specifies the type of information that is forwarded to the upstream multicast router interface.

   If enabled, the switch blocks all unknown multicast data through the mrouter port, whether the port is configured dynamically or statically. Only MLD PDUs are allowed to pass through the mrouter port to the upstream router interface.

   The default is Enable. If disabled, the switch forwards both unknown multicast data and MLD PDUs to the upstream multicast router interface.

   Note: For information about MLD Plus mode, see Configure MLD Snooping Automatically with MLD Plus Mode on page 250.
8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable MLD Snooping Configuration fields.

Table 91. MLD Snooping Configuration

Field	Definition
Multicast Control Frame Count	The number of multicast control frames that have been processed by the CPU.
Interfaces Enabled for MLD Snooping	One or more interfaces on which MLD snooping is administratively enabled. MLD snooping must be enabled globally and on an interface for the interface to be able to snoop MLD packets to determine which segments should receive multicast packets directed to the group address.
VLAN IDs Enabled For MLD Snooping	Displays one or more VLANs on which MLD snooping is administratively enabled.

Configure an MLD Snooping Interface

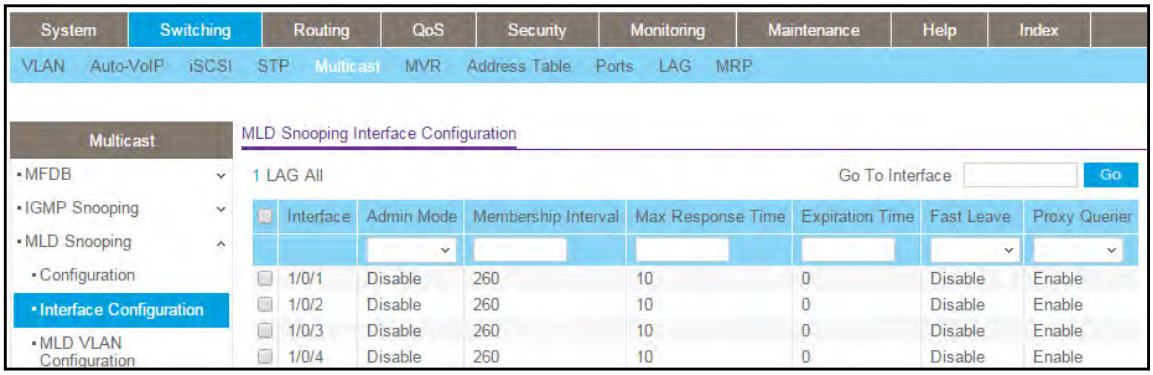
To configure an MLD snooping interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. **Select Switching > Multicast > MLD Snooping > Interface Configuration**.



   All physical, VLAN, and LAG interfaces are displayed.
5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.

- Next to the Interface column, select the check box for the interface that you want to configure

  All physical, VLAN, and LAG interfaces are listed in the Interface column.

6. Use **Admin Mode** to select the interface mode for the selected interface for MLD snooping for the switch. The default is Disable.
7. Use **Group Membership Interval(secs)** to specify the amount of time you want the switch to wait for a report for a particular group on a particular interface before it deletes that interface from the group.

   The valid range is from 2 to 3600 seconds. The configured value must be greater than Max Response Time. The default is 260 seconds.
8. Use **Max Response Time (secs)** to specify the amount of time you want the switch to wait after sending a query on an interface because it did not receive a report for a particular group on that interface.

   Enter a value greater than or equal to 1 and less than the group membership interval in seconds. The default is 10 seconds. The configured value must be less than the group membership interval.
9. Use **Present Expiration Time** to specify the amount of time you want the switch to wait to receive a query on an interface before removing it from the list of interfaces with multicast routers attached.

   Enter a value between 0 and 3600 seconds. The default is 0 seconds. A value of zero indicates an infinite time-out, that is, no expiration.
10. **Fast Leave Admin Mode** is the administrative mode of Fast Leave on the interface.

    If Fast Leave is enabled, the interface can be immediately removed from the Layer 2 forwarding table entry upon receiving an MLD leave message for a multicast group without first sending out MAC-based general queries. The default is Disable.
11. Select **Enable** or **Disable** for the **Proxy Querier Mode** for a particular interface.

    If the mode is disabled, an MLD proxy query with source IP 0::0 is not sent in response to an MLD leave packet. If the mode is enabled, MLD proxy queries are sent. The default value is Enable.
12. Click the **Apply** button.

    Your settings are saved.

Configure MLD Snooping for VLANs Automatically with MLD Plus Mode

MLD Plus mode lets you automatically configure MLD snooping for VLANs, which is used to build forwarding lists for multicast traffic. You can also configure MLD snooping for VLANs manually (see Configure IGMP Snooping Manually on page 238).

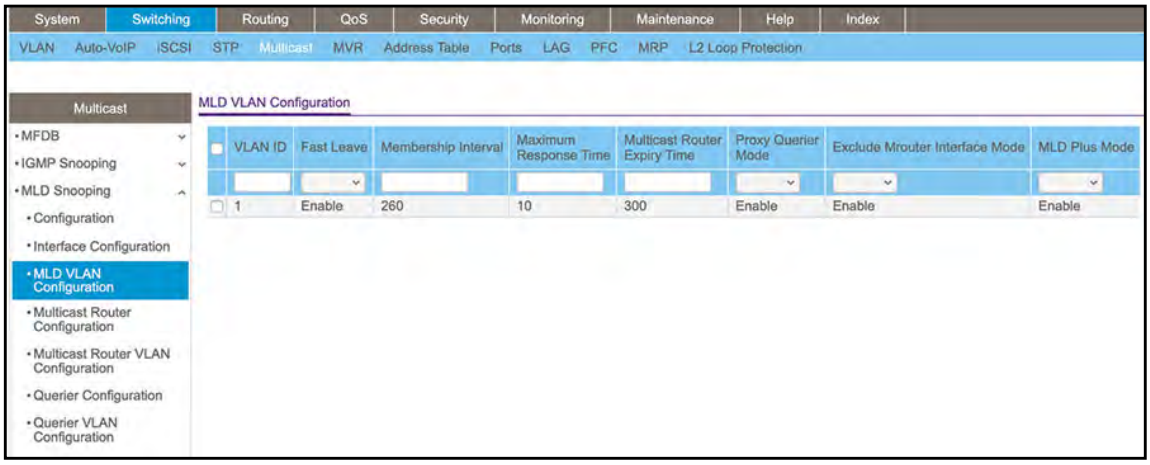
To configure MLD snooping for VLANs automatically:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > MLD Snooping > MLD VLAN Configuration**.



5. Select the check box for the VLAN ID for which MLD snooping must be enabled.
6. From the **MLD Plus Mode** menu, select to enable or disable the MLD Plus mode on the VLAN.

   If enabled, the following MLD snooping modes are automatically enabled for the VLAN:

   - Admin mode
   - Fast-Leave
   - Exclude Mrouter Interface Mode

   If disabled, these MLD snooping modes are automatically disabled for the VLAN.

   Note: For information about other settings on the page, see Configure MLD Snooping for VLANs Manually on page 256.
7. Click **Add** to enable MLD Snooping on the specified VLAN.
8. Click the **Apply** button.

   Your settings are saved.

Configure MLD Snooping for VLANs Manually

You can manually configure the settings for MLD snooping for VLANs, which is used to build forwarding lists for multicast traffic. You can also configure MLD snooping for VLANS automatically (see Configure MLD Snooping for VLANs Automatically with MLD Plus Mode on page 254).

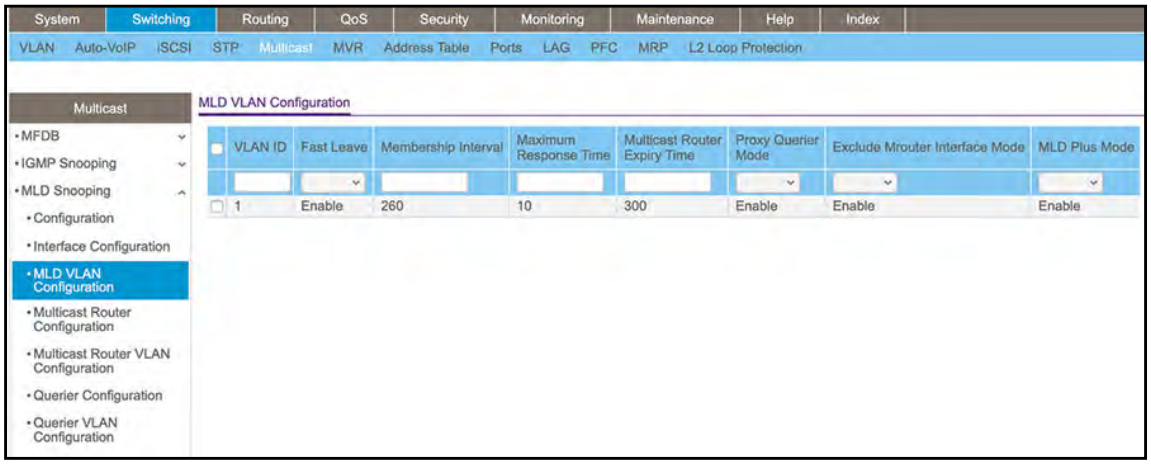
To configure the settings for MLD snooping for VLANs manually:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > MLD Snooping > MLD VLAN Configuration**.



5. Select the check box for the VLAN ID for which MLD snooping must be enabled.
6. From the **Fast Leave** menu, select to enable or disable the MLD snooping Fast Leave Mode for the specified VLAN ID.
7. In the **Membership Interval** field, specify the value for the group membership interval of MLD snooping for the specified VLAN ID.

   The valid range is (Maximum Response Time + 1) to 3600.
8. In the **Maximum Response Time** field, specify the value for the maximum response time of MLD snooping for the specified VLAN ID.

   The valid range is 1 to (Group Membership Interval –1). Its value must be less than group membership interval value.

9. In the **Multicast Router Expiry Time** field, specify the value for the multicast router expiration time of MLD Snooping for the specified VLAN ID.

   The valid range is 0 to 3600.

10. From the **Proxy Querier Mode** menu, select to enable or disable the proxy querier mode for the specified VLAN ID.

    If you select Disable, the MLD proxy query with source IP 0::0 is not sent in response to an MLD leave packet. The default value is Enable.

11. From the **Exclude Mrouter Interface Mode** menu, select to enable or disable the mrouter interface mode.

    This selection specifies the type of information that is forwarded to the upstream multicast router interface.

    If enabled, the interface blocks all unknown multicast data through the mrouter port, whether the port is configured dynamically or statically. Only MLD PDUs are allowed to pass through the mrouter port to the upstream router interface.

    The default is Enable. If disabled, the interface forwards both unknown multicast data and MLD PDUs to the upstream multicast router interface.

    Note: For information about MLD Plus mode for VLANs, see Configure MLD Snooping for VLANs Automatically with MLD Plus Mode on page 254.

12. Click **Add** to enable MLD Snooping on the specified VLAN.
13. Click the **Apply** button.

    Your settings are saved.

Enable or Disable a Multicast Router on an Interface

To enable or disable a multicast router on an interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

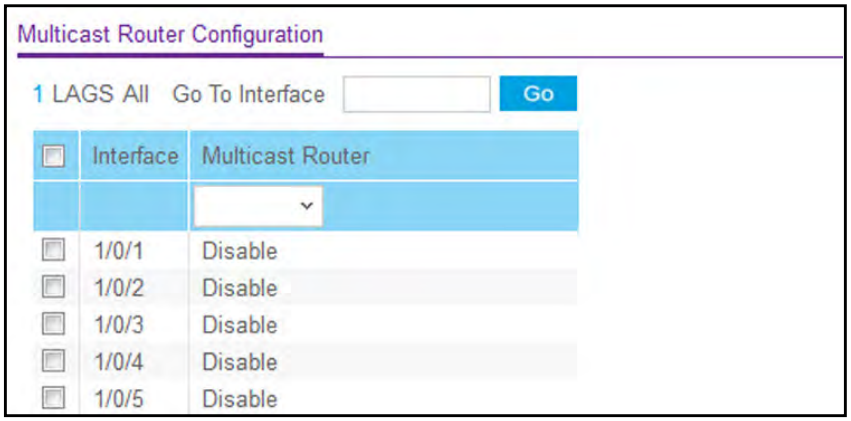
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > Multicast > MLD Snooping > Multicast Router Configuration**.



5. From the **Interface** menu, select the interface for which you want to enable or disable the multicast router configuration.
6. From the **Multicast Router** menu, select **Enable** or **Disable**.
7. Click the **Apply** button.

   Your settings are saved.

Configure Multicast Router VLAN Settings

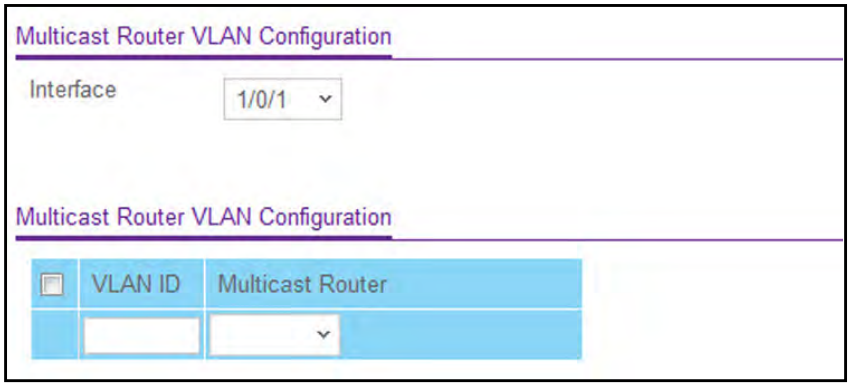
To configure multicast router VLAN settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > MLD Snooping > Multicast Router VLAN Configuration**.



5. From the **Interface** menu, select the interface for which you want to enable or disable the multicast router configuration.
6. Use the **VLAN ID** field to specify the VLAN ID for which you want to enable or disable the multicast router configuration.
7. Form the **Multicast Router** menu, select **Enable** or **Disable**.
8. Click the **Apply** button.

   Your settings are saved.

Configure MLD Snooping Querier

You can configure the parameters for an MLD snooping querier.

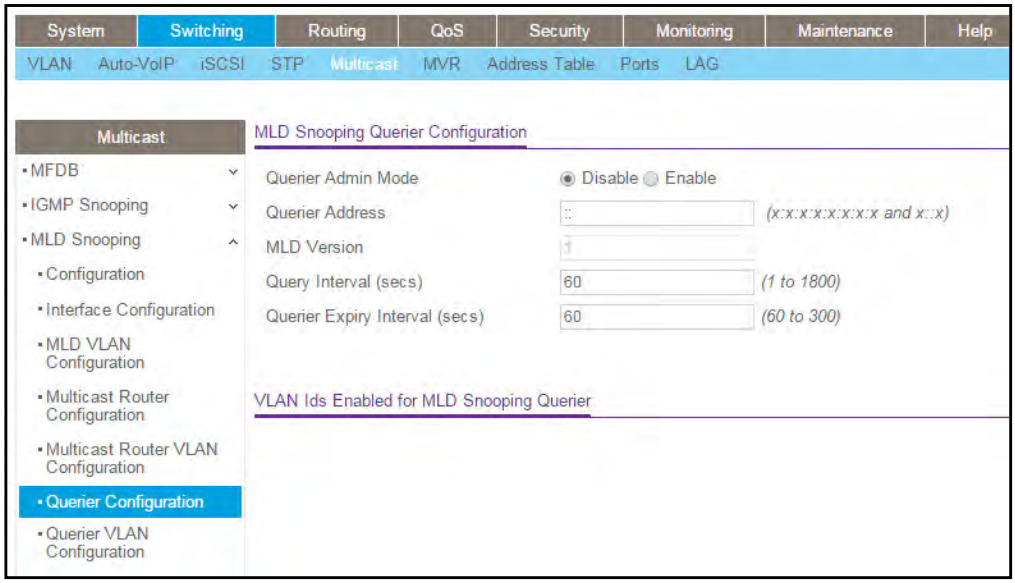
To configure an MLD snooping querier:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Multicast > MLD Snooping > Querier Configuration**.



5. Use **Querier Admin Mode** to select the administrative mode for MLD snooping for the switch. The default is Disable.

6. Use **Querier Address** to specify the snooping querier address to be used as source address in periodic MLD queries.

   This address is used when no address is configured on the VLAN on which query is being sent. The supported IPv6 formats are x:x:x:x:x:x:x:x and x::x.

7. Use **MLD Version** to specify the MLD protocol version used in periodic MLD queries.
8. Use **Query Interval(secs)** to specify the time interval in seconds between periodic queries sent by the snooping querier.

   The query interval must be a value in the range of 1 to 1800. The default value is 60.

9. Use **Querier Expiry Interval(secs)** to specify the time interval in seconds after which the last querier information is removed.

   The querier expiry Interval must be a value in the range of 60 to 300. The default value is 60. The page displays VLAN IDs enabled for the MLD snooping querier.

10. Click the **Apply** button.

    Your settings are saved.

Configure MLD Snooping Querier VLAN Settings

To configure MLD snooping querier VLAN settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

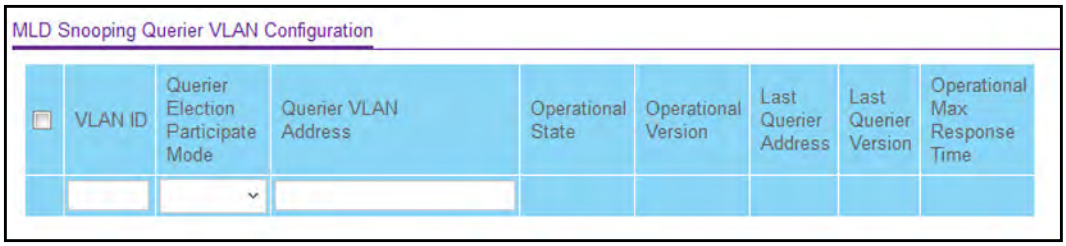
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > Multicast > MLD Snooping > Querier VLAN Configuration**.



5. **Use VLAN ID** to select the VLAN ID on which the MLD snooping querier is administratively enabled and a VLAN exists in the VLAN database.
6. Use **Querier Election Participate Mode** to enable or disable the MLD snooping querier participation in election mode.

When this mode is disabled, on detecting another querier of same version in the VLAN, the snooping querier moves to a non-querier state. When this mode is enabled, the snooping querier participates in querier election where the lowest IP address wins the querier election and operates as the querier in that VLAN. The other querier moves to non-querier state.

7. Use **Querier VLAN Address** to specify the snooping querier address to be used as the source address in periodic MLD queries sent on the specified VLAN.
8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 92. Querier VLAN Configuration

Field	Description
Operational State	The operational state of the MLD snooping querier on a VLAN. It can be in any of the following states: • **Querier**: Snooping switch is the querier in the VLAN. The snooping switch sends out periodic queries with a time interval equal to the configured querier query interval. If the snooping switch sees a better querier in the VLAN, it moves to non-querier mode. • **Non-Querier**: Snooping switch is in non-querier mode in the VLAN. If the querier expiry interval timer is expired, the snooping switch moves into querier mode. • **Disabled**: Snooping querier is not operational on the VLAN. The snooping querier moves to disabled mode when MLD snooping is not operational on the VLAN or when the querier address is not configured or the network management address is also not configured.
Operational Version	The operational MLD protocol version of the querier.
Last Querier Address	The IP address of the last querier from which a query was snooped on the VLAN.
Last Querier Version	The MLD protocol version of the last querier from which a query was snooped on the VLAN.
Operational Max Response Time	Displays maximum response time to be used in the queries that are sent by the snooping querier.

Configure MVR

You can configure basic, advanced, group, interface or group membership settings.

Configure Basic MVR Settings

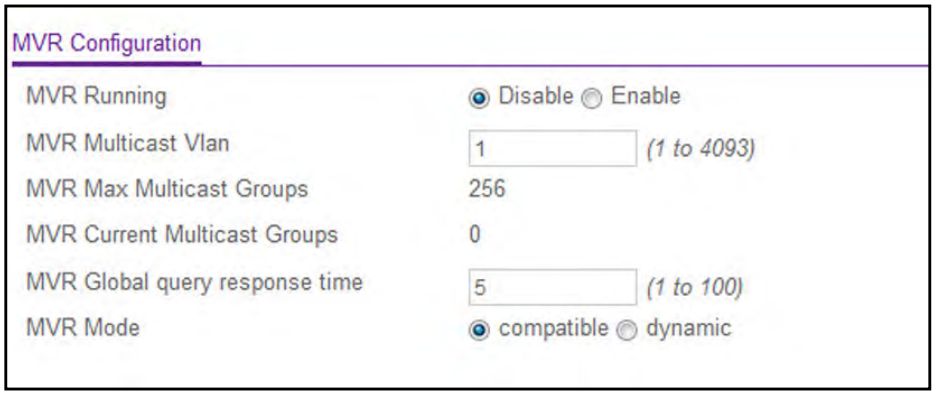
To configure basic MVR settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > MVR > Basic > MVR Configuration**.



5. Use **MVR Running** to **Enable** or **Disable** the MVR feature.

   The factory default is **Disable**.
6. Use **MVR Multicast VLAN** to specify the VLAN on which MVR multicast data is received.

   All source ports belong to this VLAN. The value can be set in a range of 1 to 4093. The default value is 1.
7. Use **MVR Global Query Response Time** to set the maximum time to wait for the IGMP reports membership on a receiver port.

   This time applies only to receiver-port leave processing. When an IGMP query is sent from a receiver port, the switch waits for the default or configured MVR query time for an IGMP group membership report before removing the port from the multicast group

membership. The value is equal to the tenths of a second. The range is from 1 to 100 tenths. The factory default is 5 tenths or one-half.

8. Use **MVR Mode** to specify the MVR mode of operation.

   Possible values are compatible or dynamic. The factory default is compatible.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 93. MVR Configuration

Field	Definition
MVR Max Multicast Groups	The maximum number of multicast groups that MVR supports.
MVR Current Multicast Groups	Displays current number of the MVR groups allocated.

Configure Advanced MVR Settings

To configure advanced MVR settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

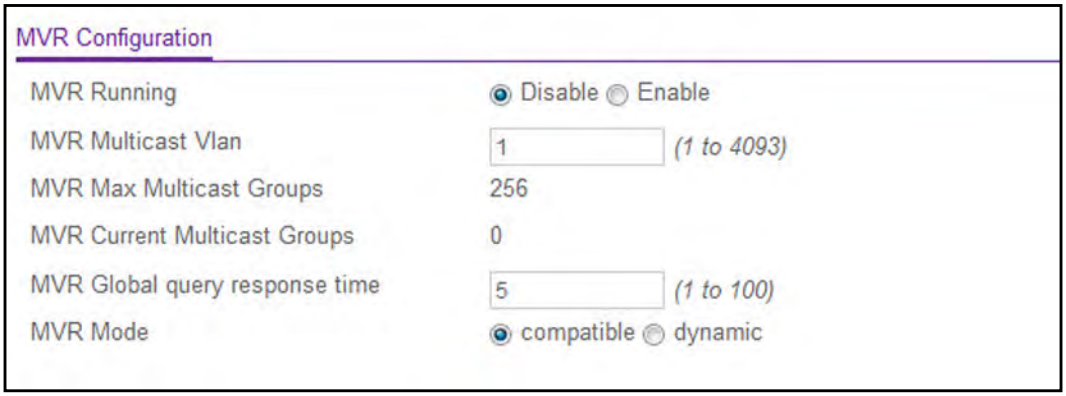
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > MVR > Advanced > MVR Configuration**.



5. Select the **MVR Running Enable** or **Disable** radio button.

   The factory default is Disable.

6. Use the **MVR Multicast VLAN** to specify the VLAN on which MVR multicast data is received.

   All source ports belong to this VLAN. The value can be set in a range of 1 to 4094. The default value is 1.

7. Use the **MVR Global query response time** to set the maximum time to wait for the IGMP reports membership on a receiver port. This time applies only to receiver-port leave processing. When an IGMP query is sent from a receiver port, the switch waits for the default or configured MVR query time for an IGMP group membership report before removing the port from the multicast group membership. The value is equal to the tenths of second. The range is from 1 to 100 tenths. The factory default is 5 tenths or one-half.
8. Select a **MVR Mode** radio button to specify the MVR mode of operation.

   The factory default is compatible.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 94. Advanced MVR Configuration

Field	Definition
MVR Max Multicast Groups	The maximum number of multicast groups that MVR supports.
MVR Current Multicast Groups	Displays the current number of MVR groups allocated.

Configure an MVR Group

To configure an MVR group:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

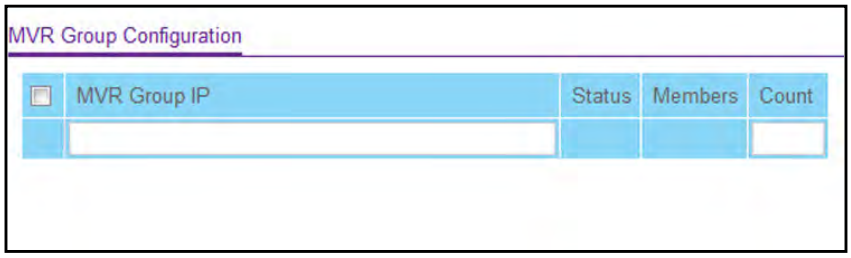
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > MVR > Advanced > MVR Group Configuration**.



5. Use the **MVR Group IP** to specify the IP address for the new MVR group.
6. Use the **Count** to specify the number of contiguous MVR groups.

   This helps you to create multiple MVR groups through a single click of the **Add** button. If the field is empty, then clicking the button creates only one new group. The field is displayed as empty for each particular group. The range is from 1 to 256.
7. Click the **Add** button.

   The MVR group is added.

The following table describes the nonconfigurable information displayed on the page.

Table 95. MVR Group Configuration

Field	Definition
Status	The status of the specific MVR group.
Members	The list of ports that participate in the specific MVR group.

Configure an MVR Interface

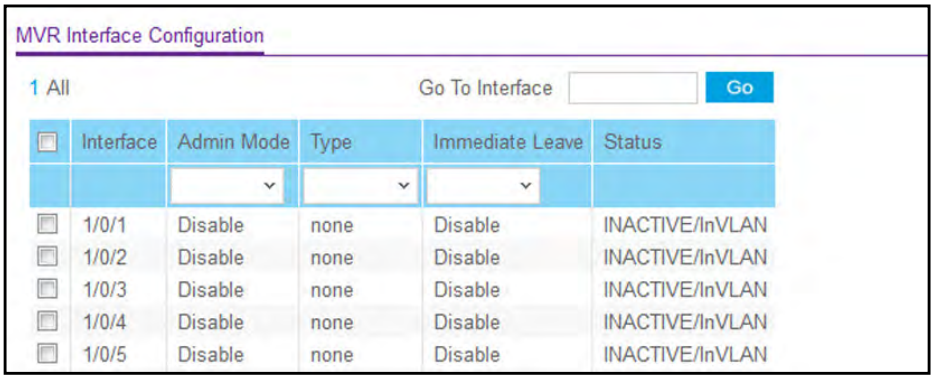
To configure an MVR interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > MVR > Advanced > MVR Interface Configuration**.



The status of each port displays.

5. Use **Interface** to select the interface.
6. Use **Admin Mode** to **Enable** or **Disable** MVR on a port.

   The factory default is **Disable**.
7. Use **Type** to configure the port as an MVR **receiver** port or a **source** port.

   The default port type is **none**.
8. Use **Immediate Leave** to **Enable** or **Disable** the **Immediate Leave** feature of the MVR on a port.

   The factory default is **Disable**.
9. Click the **Apply** button.

   Your settings are saved.

Configure MVR Group Membership

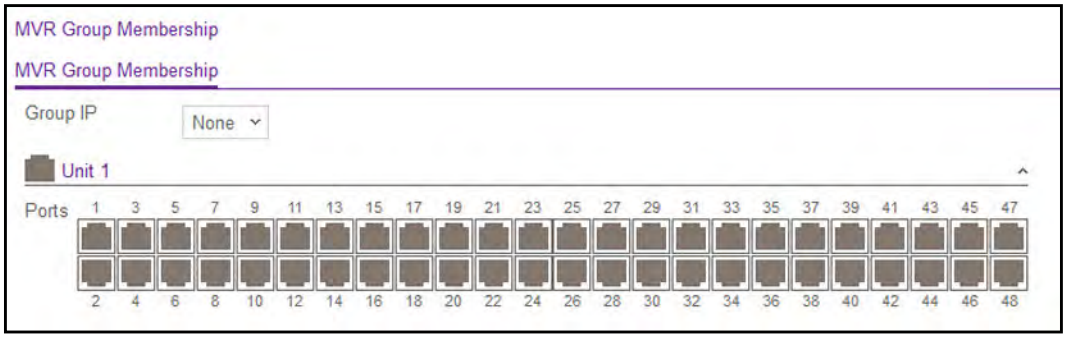
To configure MVR group membership:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > MVR > Advanced > MVR Group Membership**.



5. Use the **Group IP** to specify the IP multicast address of the MVR group.
6. Use the **Port List** to view the configured list of members of the selected MVR group.

   You can use this port list to add the ports you selected to this MVR group.
7. Click the **Apply** button.

   Your settings are saved.

View MVR Statistics

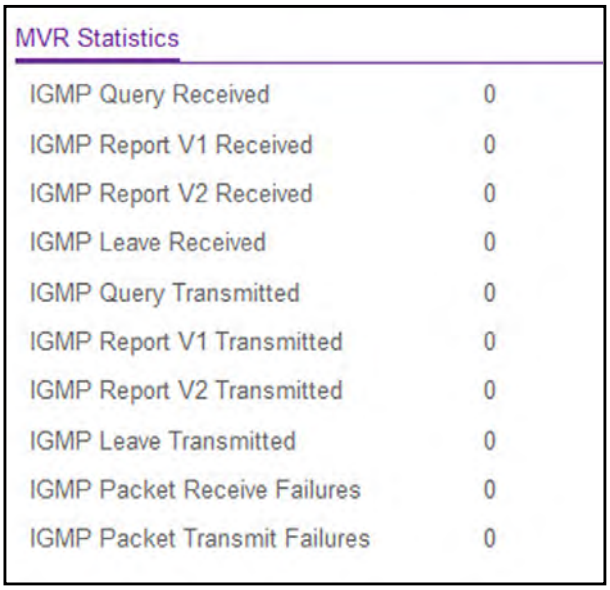
To view MVR statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > MVR > Advanced > MVR Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information displayed on the page.

Table 96. MVR Statistics

Field	Definition
IGMP Query Received	The number of received IGMP queries.
IGMP Report V1 Received	The number of received IGMP reports V1.
IGMP Report V2 Received	The number of received IGMP reports V2.
IGMP Leave Received	The number of received IGMP leaves.
IGMP Query Transmitted	The number of transmitted IGMP queries.
IGMP Report V1 Transmitted	The number of transmitted IGMP reports V1.
IGMP Report V2 Transmitted	The number of transmitted IGMP reports V2.
IGMP Leave Transmitted	The number of transmitted IGMP leaves.
IGMP Packet Receive Failures	The number of IGMP packet receive failures.
IGMP Packet Transmit Failures	The number of IGMP packet transmit failures.

Search and Manage the MAC Address Table

You can view or configure the MAC Address Table. This table contains information about unicast entries for which the switch has forwarding or filtering information. This information is used by the transparent bridging function in determining how to propagate a received frame.

Search the MAC Address Table

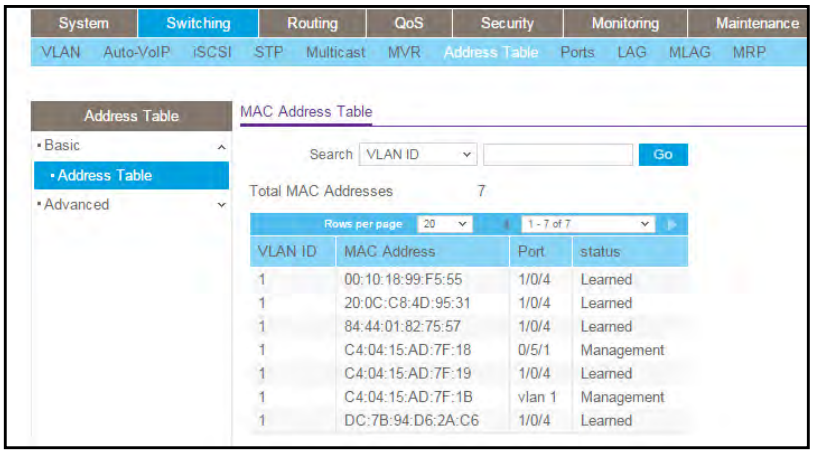
To search the MAC address table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Address Table> Basic > Address Table**.



5. Use **Search By** to search for MAC addresses by MAC address, VLAN ID, or port:
   - **Searched by MAC Address**. Select **MAC Address**, enter the 6-byte hexadecimal MAC address in two-digit groups separated by colons, for example, 01:23:45:67:89:AB. Then click the **Go** button. If the address exists, that entry is displayed as the first entry followed by the remaining (greater) MAC addresses. An exact match is required.

- **Searched by VLAN ID**. Select **VLAN ID**, enter the VLAN ID, for example, 100. Then click the **Go** button. If the address exists, the entry is displayed as the first entry followed by the remaining (greater) MAC addresses.
- **Searched by Port**. Select **Port**, enter the port ID in Unit/Slot/Port format, for example, 2/1/1. Then click the **Go** button. If the address exists, the entry is displayed as the first entry followed by the remaining (greater) MAC addresses.

The following table describes the nonconfigurable information displayed on the page.

Table 97. Basic Address Table

Field	Description
Total MAC Address	Displaying the number of total MAC addresses learned or configured.
MAC Address	A unicast MAC address for which the switch has forwarding and/or filtering information. The format is a 6 byte MAC address that is separated by colons, for example 01:23:45:67:89:AB.
VLAN ID	The VLAN ID associated with the MAC address.
Port	The port upon which this address was learned.
Status	The status of this entry. The meanings of the values are as follows: • Static. The value of the corresponding instance was added by the system or a user and cannot be relearned. • Learned. The value of the corresponding instance was learned, and is being used. • Management. The value of the corresponding instance is also the value of an existing instance of dot1dStaticAddress.

Set the Dynamic Address Aging Interval

You can set the address aging interval for the specified forwarding database.

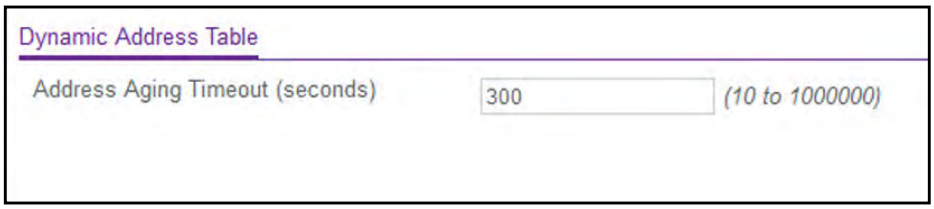
To set the address aging interval:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Address Table> Advanced > Dynamic Addresses**.



5. Use **Address Aging Timeout (seconds)** to specify the time-out period in seconds for aging out dynamically learned forwarding information.

   IEEE 802.1D-1990 recommends a default of 300 seconds. The value can be specified as any number between 10 and 1000000 seconds. The factory default is 300.

6. Click the **Apply** button.

   Your settings are saved.

Configure a Static MAC Address

To configure a static MAC address:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

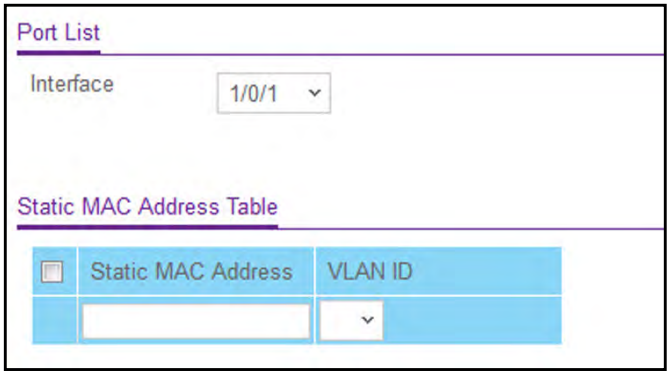
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > Address Table> Advanced > Static MAC Address**.



5. Use **Interface** to select the physical interface/LAGs.
6. In the **Static MAC Address** field, type the MAC address.
7. Select the **VLAN ID** associated with the MAC address.

8. Take one of the following actions:
   - Click the **Add** button.

     The static MAC address is added to the switch.
   - Click the **Delete** button.

     The static MAC address deleted from the switch.

Manage Port Settings

You can view and monitor the physical port information for the ports available on the switch.

Configure Port Settings

You can configure the physical interfaces on the switch.

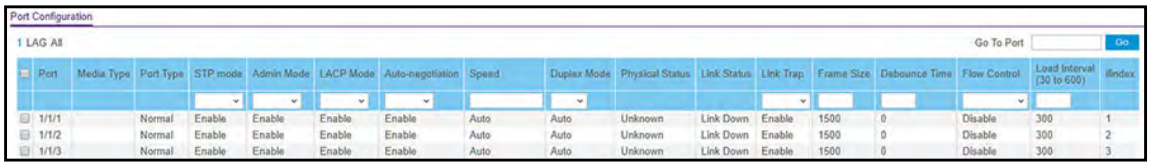
To configure port settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Ports > Port Configuration**.



5. In the Port column, select the check box for one or more ports or LAGs.
6. From the **STP Mode** menu, select the Spanning Tree Protocol administrative mode for the port or LAG.

   The possible values are as follows:
   - **Enable**. Enables the Spanning Tree Protocol for this port.
   - **Disable**. Disables the Spanning Tree Protocol for this port.

   The default is Enable.

7. From the **Admin Mode** menu, select **Enable** or **Disable**.

   This sets the port control administrative mode. For the port to participate in the network, you must select **Enable**. The factory default is Enable.

8. From the **LACP Mode** menu, select **Enable** or **Disable**.

   This selects the Link Aggregation Control Protocol administrative mode. The mode must be enabled in order for the port to participate in link aggregation. The factory default is Enable.

9. From the **Auto-negotiation** menu, select **Enable** or **Disable**.

   This specifies the auto-negotiation mode for this port. The default is Enable.

   Note: After you change the auto-negotiation mode, the switch might be inaccessible for a number of seconds while the new settings take effect.

10. From the **Speed** menu, select one of the following speeds:
    - **Auto**. The speed is set by the auto-negotiation process.
    - **100**. 100 Mbits/second
    - **10G**. 10 Gbits/second.

    The delimiter characters for setting different speed values are a comma (,), a period (.) and a space ( ). For you to set the auto-negotiation speed, the auto-negotiation mode selection must be **Enable**. The default is Auto.

    Note: After you change the speed value, the switch might be inaccessible for a number of seconds while the new settings take effect.

11. From the **Duplex Mode** menu, select one of the following values are as follows:
    - **Auto**. The duplex mode is set by the auto-negotiation process.
    - **Full**. Transmission between the devices occurs in both directions simultaneously.
    - **Half**. Transmission between the devices occurs in only one direction at a time.

    The default is Auto.

    Note: After you change the duplex mode, the switch might be inaccessible for a number of seconds while the new settings take effect.

12. From the **Link Trap** menu, select whether to send a trap when link status changes.

    The factory default is Enable.

13. In the **Frame Size** field, specify the maximum Ethernet frame size that the port supports or is configured to use, including Ethernet header, CRC, and payload.

    The range is 1518 to 9398. The default maximum frame size is 1518.

14. In the **Debounce Time** field, specify the timer value for port debouncing in a multiple of 100 milliseconds (msec) in the range to 100 to 5000.

The default debounce timer value is 0, which means that debouncing is disabled.

15. From the **Flow Control** menu, select to enable or disable IEEE 802.3 flow control.

    The default is Disable. The switch does not send pause frames if the port buffers become full. Flow control helps to prevent data loss when the port cannot keep up with the number of frames being switched. When enabled, the switch can send a pause frame to stop traffic on a port if the amount of memory used by the packets on the port exceeds a preconfigured threshold and responds to pause requests from partner devices. The paused port does not forward packets for the period of time specified in the pause frame. When the pause frame time elapses, or the utilization returns to a specified low threshold, the switch enables the port to again transmit frames. For LAG interfaces, flow control mode is displayed as *blank* because flow control is not applicable.

16. In the **Load Interval** field, specify the load interval period for which data is used to compute load statistics.

    Enter the interval in multiples of 30 seconds. The allowable range is 30 to 600. The default load interval is 300 seconds. The smaller the load interval is, the more accurate the instantaneous rate for load statistics is.

17. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 98. Port Configuration

Field	Description
Media Type	The media type.
Port Type	For normal ports this field is **Normal**. Otherwise the possible values are as follows: • **Mirrored**. The port is a mirrored port on which all the traffic is copied to the probe port. • **Probe**. Use this port to monitor a mirrored port. • **Trunk Member**. The port is a member of a link aggregation trunk. Look at the LAG pages for more information.
Admin Status	When the port's admin mode is D-Disable, this field indicates the reason. Possible reasons are as follows: • **STP**. Spanning Tree Protocol violation. • **UDLD**. UDLD protocol violation. • **XCEIVER**. Unsupported SFP/SFP+ inserted.
Physical Status	Indicates the port speed and duplex mode.
Link Status	Indicates whether the link is up or down.
ifIndex	The ifIndex of the interface table entry associated with this port.

Configure Expandable Port Settings

You can view and configure the expandable ports.

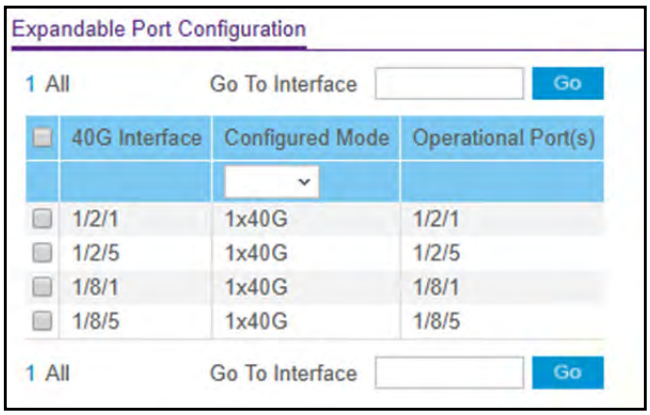
To view and configure expandable ports information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Ports > Expandable Port Configuration**.



   The nonconfigurable Operational Port(s) column displays the ports that are operational.
5. In the 40G Interface column, select the check box for the interface.
6. From the **Configured Mode** menu, select the expandable port mode:
   - **1x40G**. The interface is not expanded and functions in 40 mode. This is the default setting.
   - **4x10G**. The interface is expanded to four 10G ports.
7. Click the **Apply** button.

   Your settings are saved.
8. To refresh the page with the latest information on the switch, click the **Refresh** button.

Configure the Port Link Flap Settings

You can configure the port link flap settings, which determine when a port is automatically placed in the disabled state. You can also configure the automatic recovery settings, which allows a port to be automatically activated again.

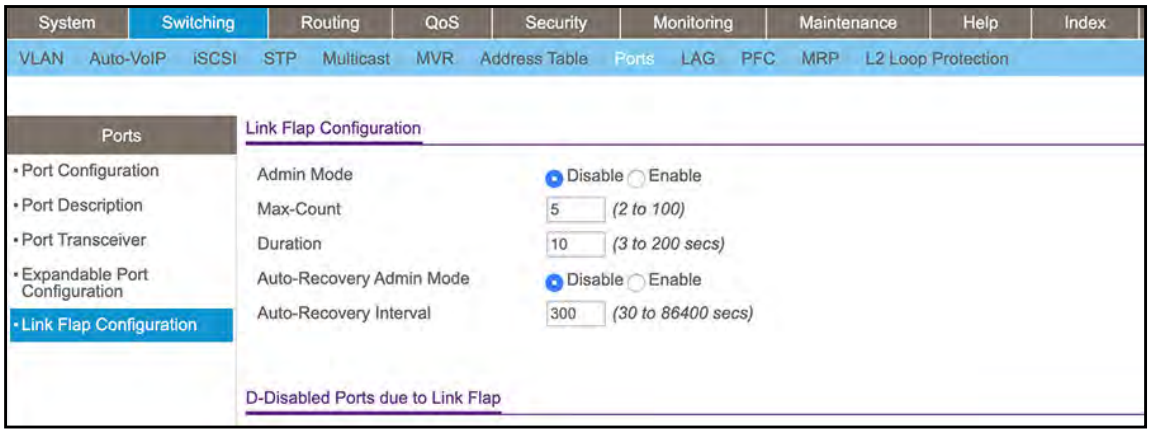
To configure the port link flap settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Ports > Link Flap Configuration**.



5. Configure the following settings:
   - **Admin Mode**. Select the **Enable** or **Disable** radio button.

     This setting determines the link flap configuration administrative mode. For you to be able to configure the link flap settings, you must select **Enable**. The default is Disable.
   - **Max-Count**. Enter the maximum number of flaps that are allowed before the port is placed in the disabled state. By default, the number is 5. You can enter a number from 2 to 10. This setting applies only if the Admin Mode Enable radio button is selected.
   - **Duration**. Enter the maximum period in seconds during which the number of link flaps is counted. If the number of link flaps on the port is greater than or equal to the number that you enter in the **Max-Count** field, the port is placed in the disabled state. By default, the period is 10 seconds. You can enter a period from 3 to 200 seconds. This setting applies only if the Admin Mode Enable radio button is selected.

- **Auto-Recovery Admin Mode**. Select the **Enable** or **Disable** radio button.

  This setting determines the auto-recovery administrative mode. To enable auto-recovery, you must select **Enable**. The default is Disable.

  If enabled, the port is automatically removed from the disabled state after the interval is reached.

- **Auto-Recovery Interval**. Enter the period in seconds after which the port is automatically removed from the disabled state. The default period is 300 seconds. You can enter a period from 30 to 8640 seconds. This setting applies only if the Auto-Recovery Admin Mode radio button is selected.

6. Click the **Apply** button.

   Your settings are saved.

   The D-Disabled Ports due to Link Flap section lists the ports that are in the disabled state.

Configure Port Descriptions

To configure and display the description for all ports in the device:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

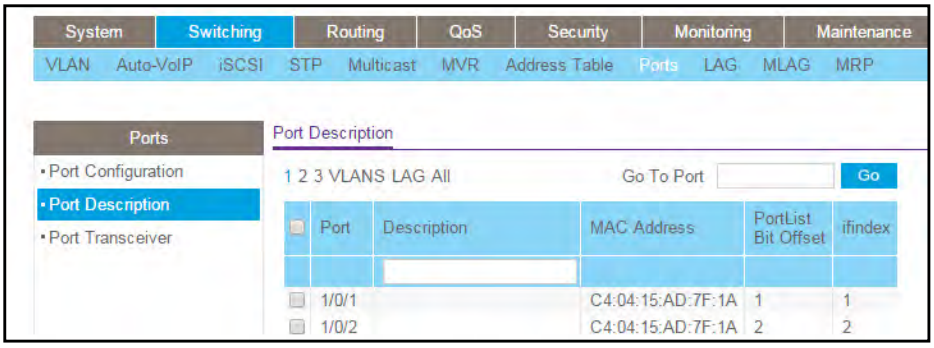
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > Ports > Port Description**.



5. Use **Port Description** to enter the description string to be attached to a port.

   It can be up to 64 characters in length.

The following table describes the nonconfigurable information displayed on the page.

Table 99. Port Description

Field	Description
Port	Selects the interface for which data is to be displayed or configured.
MAC Address	The physical address of the specified interface.
PortList Bit Offset	The bit offset value that corresponds to the port when the MIB object type PortList is used to manage in SNMP.
ifIndex	The interface index associated with the port.

View Port Transceiver Information

You can view the transceiver information for all fiber ports on the switch

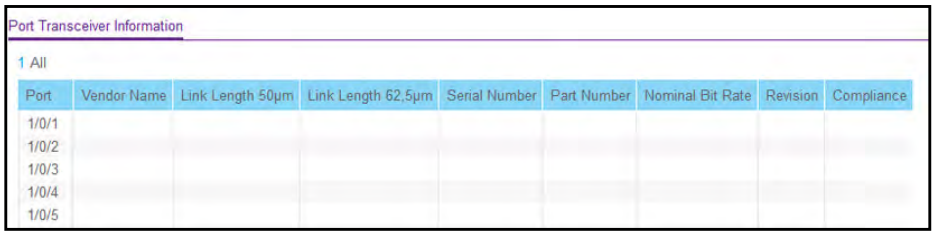
To view port transceiver information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > Ports > Port Transceiver**.



5. Select **Unit ID** to display physical ports of the selected unit or select **All** to display physical ports of all units.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following describes the nonconfigurable information that is displayed.

Table 100. Port Transceiver

Field	Description
Port	The interface for which data is to be displayed.
Vendor Name	Vendor name of the SFP.
Link Length 50 µm	Link length supported for 50 µm fiber.
Link Length 62, 5 µm	Link length supported for 62, 5 µm fiber.
Serial Number	Serial number of the SFP.
Part Number	Part number of the SFP.
Nominal Bit Rate	Nominal signalling rate for SFP.
Revision	Vendor revision of the SFP.
Compliance	Compliance of the SFP.

Manage Link Aggregation Groups

Link aggregation groups (LAGs), which are also known as port-channels, allow you to combine multiple full-duplex Ethernet links into a single logical link. Network devices treat the aggregation as if it were a single link, which increases fault tolerance and provides load sharing. You assign the LAG VLAN membership after you create a LAG. The LAG by default becomes a member of the management VLAN.

A LAG interface can be either static or dynamic, but not both. All members of a LAG must participate in the same protocols. A static port-channel interface does not require a partner system to be able to aggregate its member ports.

Static LAGs are supported. When a port is added to a LAG as a static member, it neither transmits nor receives LACPDUs.

Configure LAG Settings

You can group one or more full-duplex Ethernet links to be aggregated together to form a link aggregation group, which is also known as a port-channel. The switch treats the LAG as if it were a single link.

To configure LAG settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

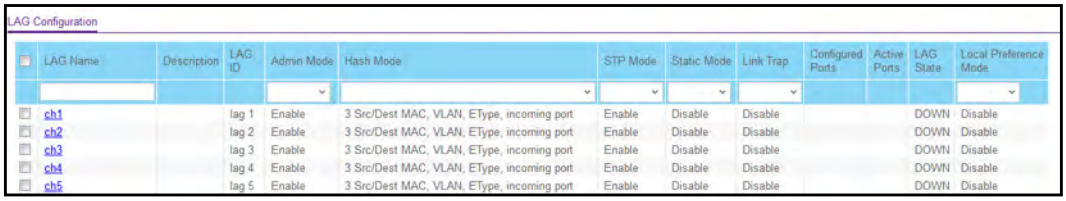
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > LAG > LAG Configuration**.



5. Use **LAG Name** to enter the name to be assigned to the LAG.

   You can enter any string of up to 15 alphanumeric characters. A valid name must be specified for you to create the LAG.

6. Use **Admin Mode** to select Enable or Disable.

   When the LAG is disabled, no traffic flows and LACPDUs are dropped, but the links that form the LAG are not released. The factory default is Enable.

7. Use **Hash Mode** to select the load-balancing mode used on a port-channel (LAG).

   Traffic is balanced on a port-channel (LAG) by selecting one of the links in the channel over which to transmit specific packets. The link is selected by creating a binary pattern from selected fields in a packet, and associating that pattern with a particular link:

   - **Src MAC, VLAN, EType, incoming port**. Source MAC, VLAN, EtherType, and incoming port associated with the packet.
   - **Dest MAC, VLAN, EType, incoming port**. Destination MAC, VLAN, EtherType, and incoming port associated with the packet.
   - **Src/Dest MAC, VLAN, EType, incoming port**. Source/Destination MAC, VLAN, EtherType, and incoming port associated with the packet. **Src/Dest MAC, VLAN, EType, incoming port** is the default.
   - **Src IP** and **Src TCP/UDP Port** fields. Source IP and Source TCP/UDP fields of the packet.
   - **Dest IP** and **Dest TCP/UDP Port** fields. Destination IP and Destination TCP/UDP Port fields of the packet.
   - **Src/Dest IP** and **TCP/UDP Port Fields**. Source/Destination IP and source/destination TCP/UDP Port fields of the packet.
   - **Enhanced hashing Mode**. Features MODULO-N operation based on the number of ports in the LAG, non-unicast traffic and unicast traffic hashing using a common hash

algorithm, excellent load balancing performance, and packet attributes selection based on the packet type:

- For L2 packets, source and destination MAC address are used for hash computation.
- For L3 packets, source IP, destination IP address, TCP/UDP ports are used.

8. Use **STP Mode** to enable or disable the Spanning Tree Protocol administrative mode associated with the LAG.

   The possible values are as follows:

   - **Disable**. Spanning tree is disabled for this LAG.
   - **Enable**. Spanning tree is enabled for this LAG. Enable is the default.

9. Use **Static Mode** to select **Enable** or **Disable**.

   When the LAG is enabled, it does not transmit or process received LACPDUs that is, the member ports do not transmit LACPDUs and all the LACPDUs it can receive are dropped. The factory default is Disable.

10. Use **Link Trap** to specify whether to send a trap when the link status changes.

    The factory default is Enable, which causes the trap to be sent.

11. Use **Local Preference Mode** to **Enable** or **Disable** the LAG interface's local preference mode.

    The default is Disable.

12. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 101. LAG Configuration

Field	Description
LAG Description	Enter the description string to be attached to a LAG. It can be up to 64 characters in length.
LAG ID	Identification of the LAG.
LAG State	Indicates whether the link is up or down.
Configured Ports	Indicate the ports that are members of this port-channel
Active Ports	Indicates the ports that are actively participating in the port-channel.

Configure LAG Membership

You can select two or more full-duplex Ethernet links to be aggregated together to form a link aggregation group (LAG), which is also known as a port-channel. The switch can treat the port-channel as if it were a single link.

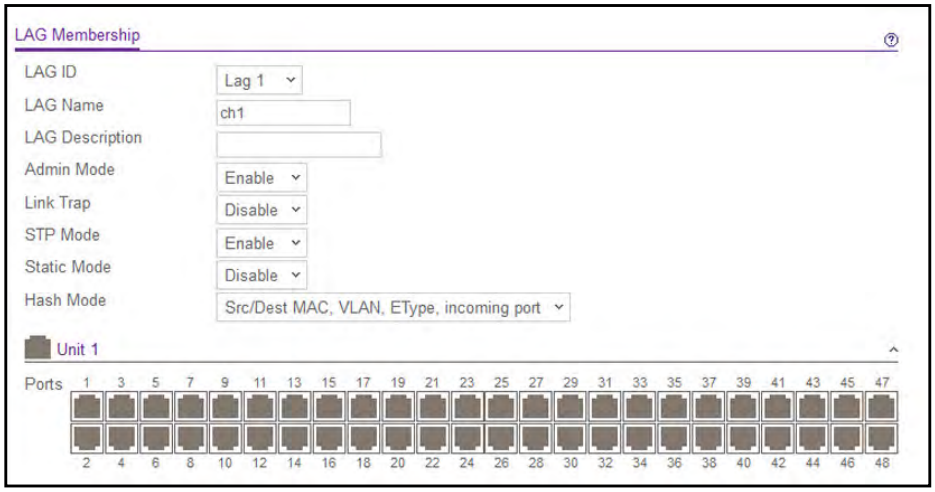
To configure LAG membership:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > LAG > LAG Membership**.



5. Use **LAG ID** to select the identification of the LAG.
6. Use **LAG Name** to enter the name to be assigned to the LAG.

   You can enter any string of up to 15 alphanumeric characters. A valid name must be specified for you to create the LAG.
7. Use **LAG Description** to enter the description string to be attached to a LAG.

   It can be up to 64 characters in length.
8. Use **Admin Mode** to select **Enable** or **Disable**.

   When the LAG is disabled, no traffic flows and LACPDUs are dropped, but the links that form the LAG are not released. The factory default is Enable.
9. Use **Link Trap** to specify whether to send a trap when the link status changes.

The factory default is Enable, which causes the trap to be sent.

10. Use **STP Mode** to enable or disable the Spanning Tree Protocol administrative mode associated with the LAG.

    The possible values are as follows:

    - **Disable**. Spanning tree is disabled for this LAG.
    - **Enable**. Spanning tree is enabled for this LAG. Enable is the default.

11. Use **Static Mode** to select enable or disable.

    When the LAG is enabled, it does not transmit or process received LACPDUs that is, the member ports do not transmit LACPDUs and all the LACPDUs it can receive are dropped. The factory default is Disable.

12. Use **Hash Mode** to select the load-balancing mode used on a port-channel (LAG).

    Traffic is balanced on a port-channel (LAG) by selecting one of the links in the channel over which to transmit specific packets.

    The link is selected by creating a binary pattern from selected fields in a packet, and associating that pattern with a particular link:

    - **Src MAC,VLAN,EType,incoming port**. Source MAC, VLAN, EtherType, and incoming port associated with the packet.
    - **Dest MAC,VLAN,EType,incoming port**. Destination MAC, VLAN, EtherType, and incoming port associated with the packet.
    - **Src/Dest MAC,VLAN,EType,incoming port**. Source/Destination MAC, VLAN, EtherType, and incoming port associated with the packet. This option is the default.
    - **Src IP** and **Src TCP/UDP Port** fields. Source IP and Source TCP/UDP fields of the packet.
    - **Dest IP** and **Dest TCP/UDP Port** fields. Destination IP and Destination TCP/UDP Port fields of the packet.
    - **Src/Dest IP** and **TCP/UDP Port** fields. Source/Destination IP and source/destination TCP/UDP Port fields of the packet.
    - **Enhanced Hashing Mode**. Features MODULO-N operation based on the number of ports in the LAG, non-unicast traffic and unicast traffic hashing using a common hash algorithm, excellent load balancing performance, and packet attributes selection based on the packet type:
        - For L2 packets, source and destination MAC address are used for hash computation.
        - For L3 packets, source IP, destination IP address, TCP/UDP ports are used.

13. Use the **Port Selection Table** to select the ports as members of the LAG.
14. Click the **Apply** button.

    Your settings are saved.

Manage the Multiple Registration Protocol Settings

Like 802.1AS, Multiple Registration Protocol (MRP) is an audio video bridging (AVB) feature that is available on some FASTPATH platforms. MVR is a base registration protocol that enables devices running an MRP application to register attributes to other devices in a network. MRP provides an application to register attributes such as bandwidth for a given AV stream and MAC address information. It is used by various applications to propagate the registration. Blade switches support the following MRP applications:

- **Multiple MAC Registration Protocol (MMRP)**. MMRP allows for the propagation MAC address information in the network, and allows for the registration and deregistration of both individual MAC address information and group MAC address membership. End stations can request to join or leave a multicast group, or to register an individual MAC address with a specific VLAN. MAC address entries can be dynamically registered and deregistered if MMRP is administratively enabled on the switch.
- **Multiple VLAN Registration Protocol (MVRP)**. MVRP registers VLANs in the network, enabling automatic VLAN configuration on the switch. In a typical network, VLAN tagging is common. Many nodes require ingress traffic to be tagged with a specific VLAN ID, and other nodes require egress traffic to be transmitted with a specific VLAN ID. With the use of MVRP on both ingress and egress, no manual VLAN configuration is required to pass tagged traffic through the network.

Note: MRP framework must be available and enabled in all intermediate devices to ensure that the propagation of the attributes occurs throughout the network.

With MRP, network attributes are declared, registered, withdrawn, and removed completely dynamically without any user intervention. This dynamic nature is especially useful in networks where the following is true:

- Network attributes are likely to change frequently, requiring reconfiguration of the intermediate devices.
- Recipients of these attributes frequently increase or decrease in number.
- Each of these changes without a dynamic self-adjusting framework would require constant attention from the network administrator.

Configure Global MRP Settings

You can configure global MRP settings for the switch.

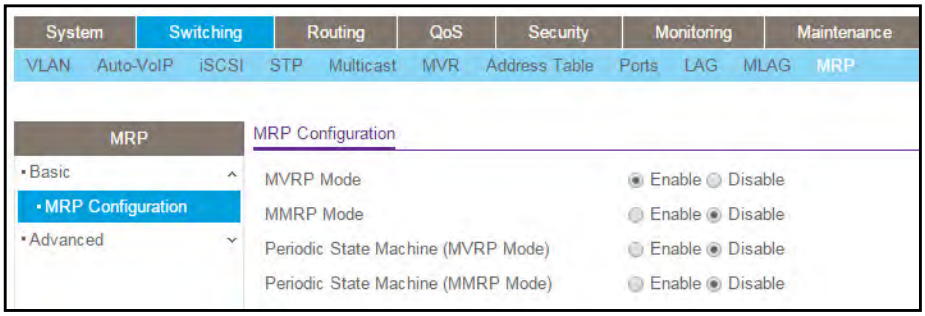
To configure global MRP settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > MRP > Basic > MRP Configuration**.



   Note: The fields available on the MRP Configuration page vary based on the platform and its supported features.
5. Select the MVRP Mode **Enable** or **Disable** radio button.

   This specifies the global administrative mode of MVRP on the device. The default is Disable.

   Multiple VLAN Registration Protocol (MVRP) registers VLANs in the network, enabling automatic VLAN configuration on the device. In a typical network, VLAN tagging is common. Many nodes require ingress traffic to be tagged with a specific VLAN ID, and other nodes require egress traffic to be transmitted with a specific VLAN ID. With the use of MVRP on both ingress and egress, no manual VLAN configuration is required to pass tagged traffic through the network.
6. Select the MMRP **Enable** or **Disable** radio button.

   This specifies the global administrative mode of MMRP on the device. The default is Disable.

   Multiple MAC Registration Protocol (MMRP) allows the propagation of MAC address information in the network, and allows for the registration and deregistration of both

individual MAC address information and group MAC address membership. End stations can request to join or leave a multicast group, or to register an individual MAC address with a specific VLAN. MAC address entries can be dynamically registered and deregistered if MMRP is administratively enabled on the device.

7. Select the Periodic State Machine (MVRP) **Enable** or **Disable** radio button.

   When enabled, the state machine can help limit the effect of topology changes and reduce the number of protocol data units (PDUs) transmitted between devices. The default is Disable.

8. Select the Periodic State Machine (MMRP) **Enable** or **Disable** radio button.

   When enabled, the state machine can help limit the effect of topology changes and reduce the number of protocol data units (PDUs) transmitted between devices. The default is Disable.

9. Click the **Apply** button.

   Your settings are saved.

Configure MRP Port Settings

You can configure the per-port MRP mode and timer settings. The timers control when and how often various messages are transmitted on each interface.

To configure MRP port settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

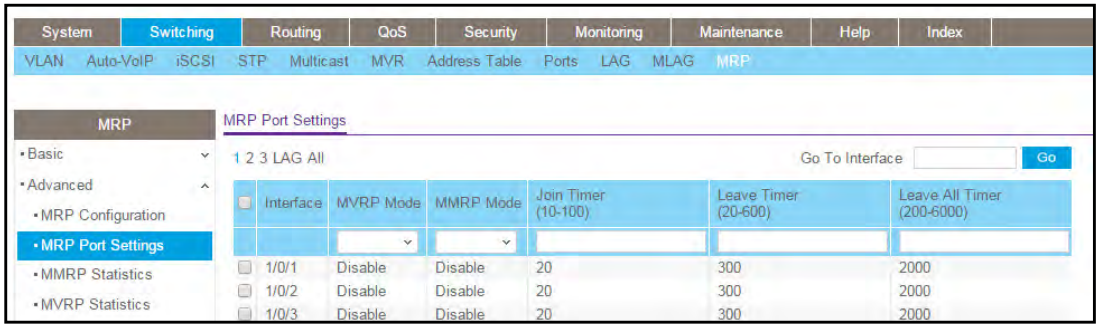
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > MRP > Advanced > Port Settings**.



5. To configure one or more ports or LAGs, select the check box next to each port or LAG to configure.

   You can select multiple ports to apply the same settings to the selected interfaces.

6. In the **MVRP Mode** field, select **Enable** or **Disable**.

   This specifies the administrative mode of Multiple VLAN Registration Protocol (MVRP) on the interface. MVRP registers VLANs in the network, enabling automatic VLAN configuration on the device.

7. In the MMRP Mode field, select **Enable** or **Disable**.

   This specifies the administrative mode of Multiple MAC Registration Protocol (MMRP) on the interface. MMRP allows the propagation of MAC address information in the network and allows for the registration and deregistration of both individual MAC address information and group MAC address membership.

8. Use the MRP **Join Timer** field to configure the amount of time in centiseconds to wait for JoinIn messages from other MRV participants after the interface sends a Join message.

   If the amount of time specified in this field passes before the interface receives a JoinIn message, the interface resends the Join message. The range is 10 to 100 centiseconds. The default value is 20.

9. Use the MRP **Leave Timer** field to configure the amount of time in centiseconds to wait before the interface deregisters attributes from other MRV participants.

   If the interface receives Join messages from other participants before the Leave timer expires, the attributes are not deregistered. The range is 20 to 600 centiseconds. The default value is 300.

10. Use the MRP **Leave All Timer** field to configure the amount of time to wait, after the interface starts the MRP registration process, before the participants refresh and reregister their attributes.

    The range is 200 to 6000 centiseconds. The default value is 2000.

11. Click the **Apply** button.

    Your settings are saved.

View MMRP and Clear Statistics

You can view and clear information regarding the MMRP frames transmitted and received by the switch and by each interface.

To view and clear MMRP statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

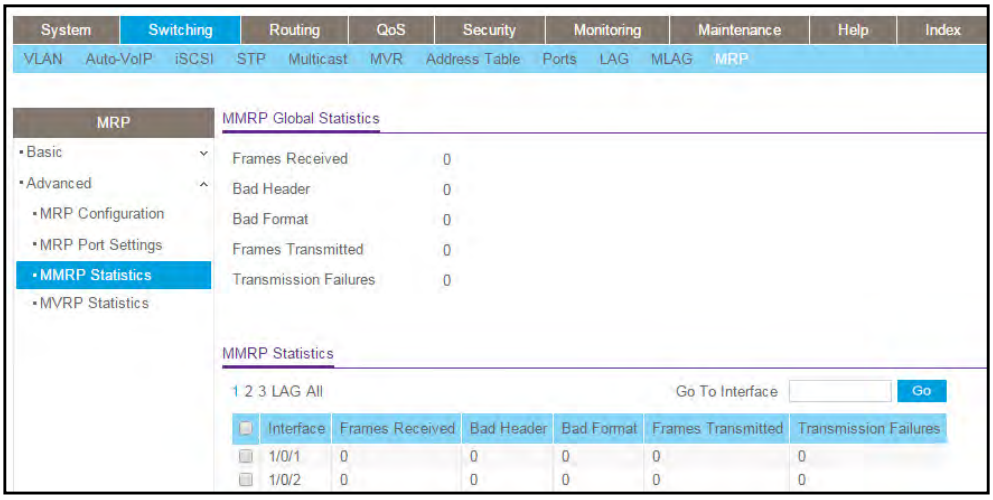
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Switching > MRP > Advanced > MMRP Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.
6. To clear the statistics for one or more ports, do the following:
   a. Select the check box next to the interface or interfaces.
   b. Click the **Clear** button.

      The statistics are cleared.

The following table describes the nonconfigurable information that the MMRP Global Statistics page displays.

Table 102. MMRP Global Statistics

Field	Description
Interface	In the MMRP Statistics table, this field identifies the interface associated with the rest of the data in the row.
Frames Received	The number of MMRP frames that were received on the device or on the particular interface.
Bad Header	The number of MMRP frames with bad headers that were received on the switch.
Bad Format	The number of MMRP frames with bad PDUs body formats that were received on the switch.
Frames Transmitted	The number of MMRP frames that were transmitted on the switch.
Transmission Failures	The number of MMRP frames that the switch failed to transmit.

View and Clear MVRP Statistics

You can view and clear information about the MVRP frames transmitted and received by the switch and by each interface.

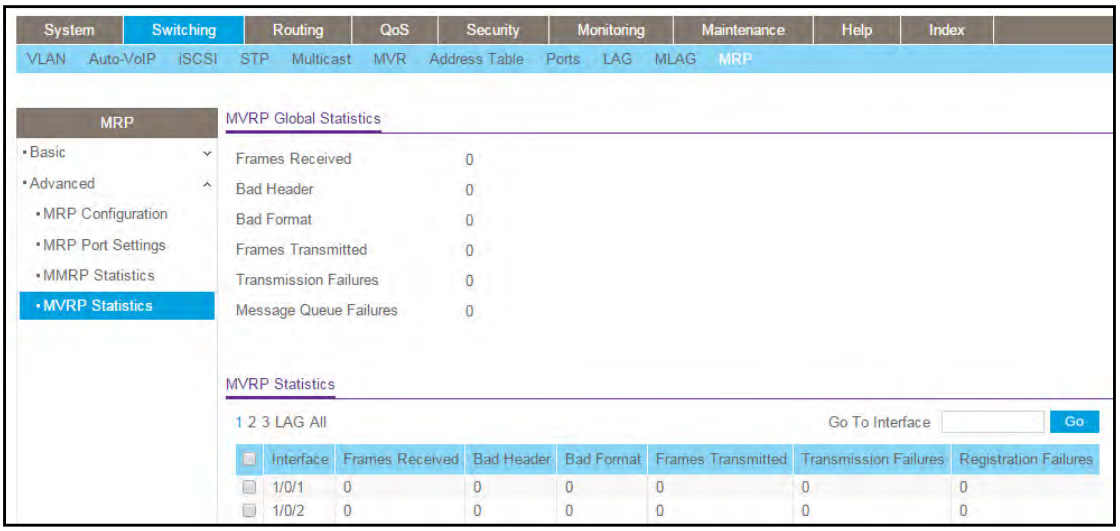
To view and clear MVRP statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > MRP > MVRP Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.
6. To clear the statistics for one or more ports, do the following:
   a. Select the check box next to the interface or interfaces.
   b. Click the **Clear** button.

      The statistics are cleared.

The following table describes the nonconfigurable information that the MVRP Global Statistics page displays.

Table 103. MVRP Statistics

Field	Description
Interface	In the MVRP Statistics table, this field identifies the interface associated with the rest of the data in the row.
Frames Received	The number of MVRP frames that were received on the switch.
Bad Header	The number of MVRP frames with bad headers that were received on the switch.
Bad Format	The number of MVRP frames with bad PDUs body formats that were received on the switch.
Frames Transmitted	The number of MVRP frames that were transmitted on the switch.
Transmission Failures	The number of MVRP frames that the switch failed to transmit.
Message Queue Failures	The number of messages that failed to be added to the queue.
Registration Failures	The number of MVRP frames that failed to register on a device or particular interface.

Manage Loop Protection

Loop protection can detect physical and logical loops between Ethernet ports on a device.

About Loop Protection

Loops inside a network are costly because they consume resources and reduce the performance of the network. Detecting loops manually can be cumbersome.

The switch can automatically identify loops in the network. You can enable loop protection per port or globally.

If loop protection is enabled, the switch sends predefined protocol data unit (PDU) packets to a Layer 2 multicast destination address (09:00:09:09:13:A6) on all ports for which the feature is enabled. You can selectively disable PDU packet transmission for loop protection on specific ports even while port loop protection is enabled. If the switch receives a packet with the previously mentioned multicast destination address, the source MAC address in the packet is compared with the MAC address of the switch. If the MAC address does not match, the packet is forwarded to all ports that are members of the same VLAN, just like any other multicast packet. The packet is not forwarded to the port from which it was received.

If the source MAC address matches the MAC address of the switch, the switch can perform one of the following actions, depending on how you configure the action:

- The port is shut down.
- A log message is generated. (If a syslog server is configured, the log message can be sent to the syslog server.)
- The port is shut down and a log message is generated.

If loop protection is disabled, the multicast packet is silently dropped.

Loop protection is not intended for ports that serve as uplinks between spanning tree–aware switches. Loop protection is designed for unmanaged switches that drop spanning tree bridge protocol data units (BPDUs).

You need to enable the feature globally before you can enable it at the port level so that the system policy filter can be installed.

Loop Protection and PDU Packet Transmission

Loop protection sends loop protocol packets from all ports on which it is enabled. You can configure the interval (1 to 5 seconds) between two successive loop protection PDU packets. The default interval is 5 seconds. If the switch receives a loop protocol packet on a port for which the action is set to shut down the port, the port can no longer receive and send frames.

Loop protection operates at a port level, regardless of VLAN assignment and membership, detecting loops across VLANs.

Loop Protection and Spanning Tree Protocol

Loop protection does not impact end nodes and is not intended for ports that serve as uplinks between spanning tree–aware switches. Loop protection can coexist with Spanning Tree Protocol (STP). You can enable both loop protection and STP on a port because these features function independently of each other. STP does not bring a port down when a loop is detected but keeps the port in blocking state. Because PDUs are allowed in a blocking state, loop protection packets are received and loop protection brings down the port that is involved in the loop (if the configured action is to shut down the port).

Configure the Global Loop Protection Settings

Before you can configure loop protection for individual ports (see Configure the Loop Protection Settings for Ports and View the Loop Protection State on page 293), you must globally enable and configure loop protection.

To globally enable and configure loop protection:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

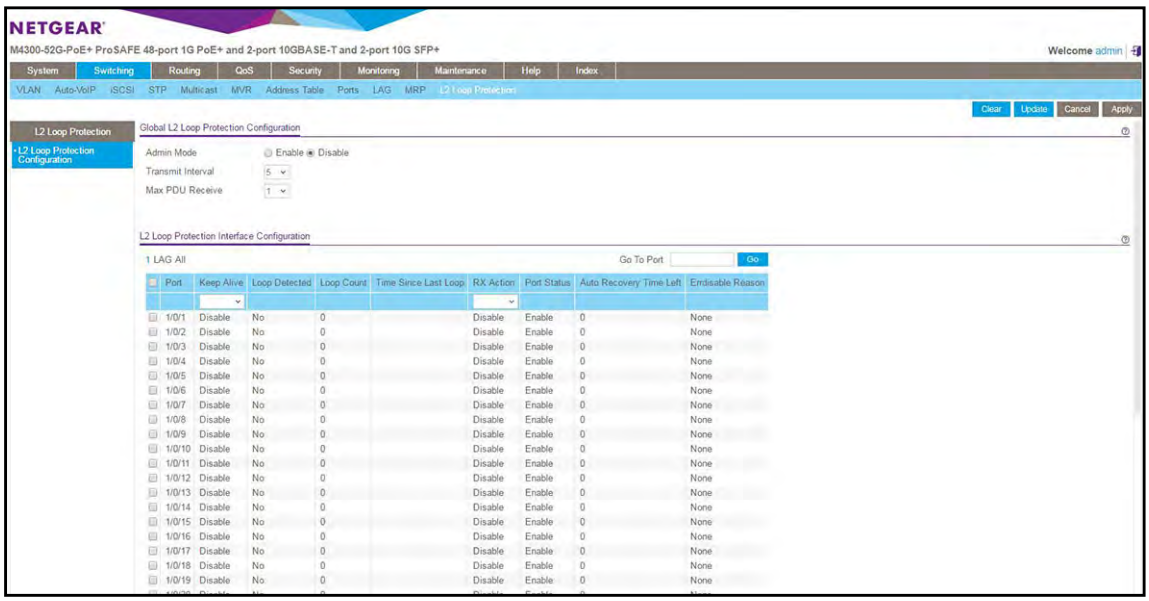
The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Switching > L2 Loop Protection > L2 Loop Protection Configuration**.



5. In the Global L2 Loop Protection Configuration section, configure the following settings:

   - Next to Admin Mode, select the **Enable** or **Disable** radio button to specify the administrative mode of loop protection on the switch.

     By default, loop protection is globally disabled.

   - From the **Transmit Interval** menu, select the interval between the transmissions of loop packets on a port.

     The range is from 1 to 5 seconds. The default setting is 5 seconds. The selected interval applies to all ports for which you enable loop protection.

   - From the **Max PDU Receive** menu, select the maximum number of packets that a port can receive before an action is taken.

     The default setting is 1 packet. The selected number of packets applies to all ports for which you enable loop protection.

6. Click the **Apply** button.

   Your settings are saved.

Configure the Loop Protection Settings for Ports and View the Loop Protection State

Before you can configure loop protection for individual ports, you must globally enable loop protection (see Configure the Global Loop Protection Settings on page 291).

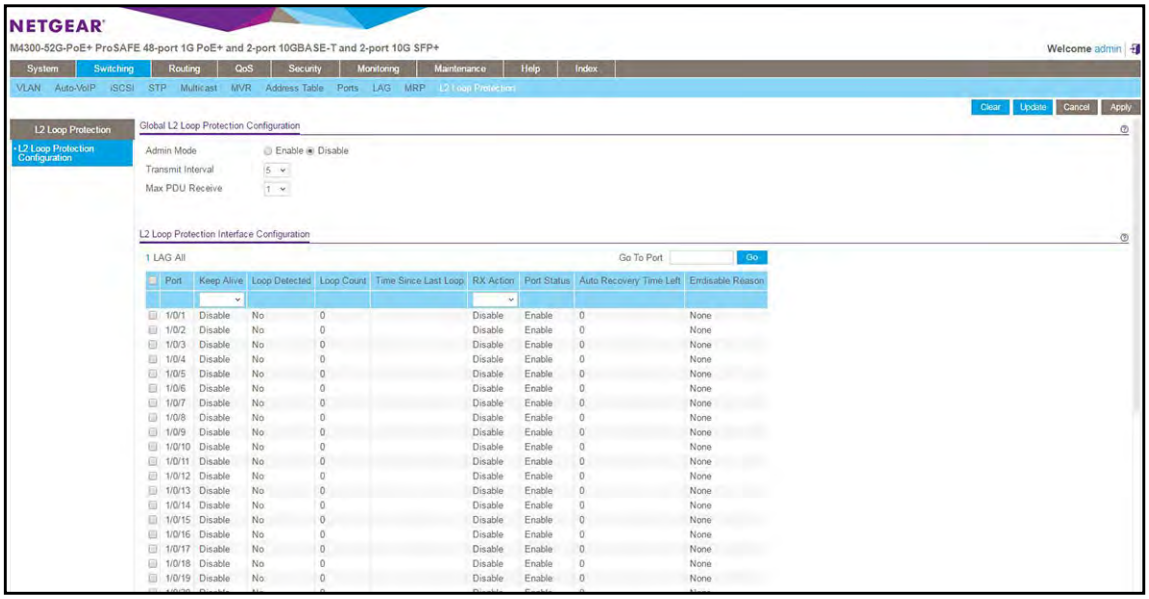
To enable and configure loop protection for a port and view the loop protection state on the switch:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Switching > L2 Loop Protection > L2 Loop Protection Configuration**.



5. Select one of the following options to specify which ports are displayed on the page:
   - Click **LAG** to show the list of all LAG interfaces.
   - Click **All** to show the list of all physical ports as well as LAG interfaces.
6. Use one of the following methods to select a port:
   - In the **Go To Port** field, enter the port in the unit/slot/port format and click on the **Go** button.
   - Next to the Port column, select the check box for the port that you want to configure.

Note: You can select multiple ports. You can select all ports by selecting the check box in the table header.

7. From the **Keep Alive** menu, select **Enable** to specify that loop protection must be enabled on the port.

   By default, loop protection is disabled for a port.

8. From the **RX Action** menu, select the action that the switch takes when a loop is detected on the port:
   - **Log**. Log the message when a loop is detected on the port.
   - **Disable**. Disable the port when a loop is detected. This is the default setting.
   - **Both**. Log and disable the port when a loop is detected.
9. Click the **Apply** button.

   Your settings are saved.

10. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information displayed on the page.

Table 104. Loop protection interface configuration information

Field	Description
Loop Detected	Indicates (Yes or No) whether a loop is detected on the port.
Loop Count	The number of packets that were received on the port after the loop was detected.
Time Since Last Loop	The time since the loop was detected.
Port Status	The status of the port (Enabled or Disabled).
Auto Recovery Time Left	The time that is left before the port is reenabled through the autorecovery process. The time is in the range from 30 to 604800 seconds.
Errdisable Reason	The reason that the port was disabled. In addition to being disabled because of loop protection, the port can be disabled because of Unidirectional Link Detection (UDLD), a broadcast storm, a unicast storm, and so on.

5

Manage Routing

This chapter covers the following topics:

- Manage Routes
- Configure the Routing IP Settings
- Configure Routing Parameters for the Switch
- Manage IPv6
- Manage VLANs
- Configure Address Resolution Protocol
- Configure RIP
- Configure Router Discovery
- Configure Virtual Router Redundancy Protocol

Manage Routes

The Routing Table collects routes from multiple sources: static routes and local routes. The Routing Table can learn multiple routes to the same destination from multiple sources. The Routing Table lists all routes.

Configure a Basic Route

To configure a basic route:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Routing Table > Basic > Route Configuration**.

5. In the **Route Type** list, select one of the following route types.
   - **Default**. To create a default route, all that must be specified is the next hop address, and preference.
   - **Static**. To create a static route, specify the network address, subnet mask, next hop address, and preference.
   - **Static Reject**. To create a static reject route, specify the network address, subnet mask, and preference.
6. **Network Address** displays the IP route prefix for the destination.
7. **Subnet Mask** indicates the portion of the IP interface address that identifies the attached network.

   This is also referred to as the subnet/network mask.

8. **Next Hop IP Address** displays the outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination.

   The next router is always one of the adjacent neighbors or the IP address of the local interface for a directly attached network.

9. **Preference** displays an integer value from 1 to 255.

   You can specify the preference value (sometimes called administrative distance) of an individual static route. Among routes to the same destination, the route with the lowest preference value is the route entered into the forwarding database. By specifying the preference of a static route, the user controls whether a static route is more or less preferred than routes from dynamic routing protocols. The preference also controls whether a static route is more or less preferred than other static routes to the same destination.

10. Use **Description** to specify the description of this route that identifies the route.

    Description must consist of alphanumeric, hyphen, or underscore characters and can be up to 31 characters in length.

11. Click the **Add** button.

    The static route is added to the switch.

12. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 105. Routing Table Basic Route Configuration

Field	Description
Network Address	The IP route prefix for the destination.
Subnet Mask	Also referred to as the subnet/network mask, this indicates the portion of the IP interface address that identifies the attached network.
Protocol	This field tells which protocol created the specified route. The possibilities are one of the following: • Local • Static
Route Type	This field can be **Connected** or **Static** or **Dynamic** based on the protocol.
Next Hop Interface	The outgoing router interface to use when forwarding traffic to the destination.
Next Hop Address	The outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination. The next router is always one of the adjacent neighbors or the IP address of the local interface for a directly attached network.

Table 105. Routing Table Basic Route Configuration (continued)

Field	Description
Preference	The preference is an integer value from (0 to 255). The user can specify the preference value (sometimes called *administrative distance*) of an individual static route. Among routes to the same destination, the route with the lowest preference value is the route entered into the forwarding database. By specifying the preference of a static route, the user controls whether a static route is more or less preferred than routes from dynamic routing protocols. The preference also controls whether a static route is more or less preferred than other static routes to the same destination.
Metric	Administrative cost of the path to the destination. If no value is entered, default is 1. The range is 0–255.

Configure Advanced Routes

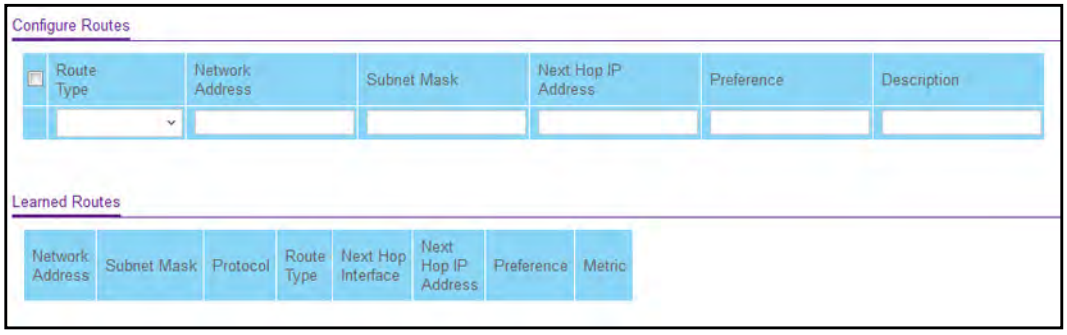
To configure advanced routes:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Routing Table> Advanced > Route Configuration**.



5. Use the **Route Type** field to specify Default or static reject route.

   If you are creating a default route, all that must be specified is the next hop IP address; otherwise, each field must be completed.
6. **Network Address** displays the IP route prefix for the destination.

7. **Subnet Mask** indicates the portion of the IP interface address that identifies the attached network.

   This is also referred to as the subnet/network mask.

8. **Next Hop IP Address** displays the outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination.

   The next router is always one of the adjacent neighbors or the IP address of the local interface for a directly attached network.

9. **Preference** displays an integer value from 1 to 255.

   You can specify the preference value (sometimes called *administrative distance*) of an individual static route. Among routes to the same destination, the route with the lowest preference value is the route entered into the forwarding database. By specifying the preference of a static route, the user controls whether a static route is more or less preferred than routes from dynamic routing protocols. The preference also controls whether a static route is more or less preferred than other static routes to the same destination.

10. Use **Description** to specify the description of this route that identifies the route.

    The description must consist of alphanumeric, hyphen or underscore characters and can be up to 31 characters in length.

11. Click the **Add** button.

    The static route is added to the switch.

The following table describes the nonconfigurable information displayed on the page.

Table 106. Route Configuration - Learned Routes

Field	Description
Network Address	The IP route prefix for the destination.
Subnet Mask	Also referred to as the subnet/network mask, this indicates the portion of the IP interface address that identifies the attached network.
Protocol	This field tells which protocol created the specified route. The possibilities are one of the following: • Local • Static
Route Type	This field can be either default or static.
Next Hop Interface	The outgoing router interface to use when forwarding traffic to the destination.
Next Hop IP Address	The outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination. The next router is always one of the adjacent neighbors or the IP address of the local interface for a directly attached network.

Table 106. Route Configuration - Learned Routes (continued)

Field	Description
Preference	The preference is an integer value from 0 to 255. The user can specify the preference value (sometimes called administrative distance) of an individual static route. Among routes to the same destination, the route with the lowest preference value is the route entered into the forwarding database. By specifying the preference of a static route, the user controls whether a static route is more or less preferred than routes from dynamic routing protocols. The preference also controls whether a static route is more or less preferred than other static routes to the same destination.
Metric	Administrative cost of the path to the destination. If no value is entered, default is 1. The range is 0–255.

Specify Route Preferences

You can configure the default preference for each protocol, for example, 60 for static routes, 120 for RIP. These values are arbitrary values in the range of 1 to 255 and are independent of route metrics. Most routing protocols use a route metric to determine the shortest path known to the protocol, independent of any other protocol.

The best route to a destination is chosen by selecting the route with the lowest preference value. When there are multiple routes to a destination, the preference values are used to determine the preferred route. If there is still a tie, the route with the best route metric is chosen. To avoid problems with mismatched metrics (such as RIP and Open Shortest Path First [OSPF] metrics, which are not directly comparable) you must configure different preference values for each of the protocols.

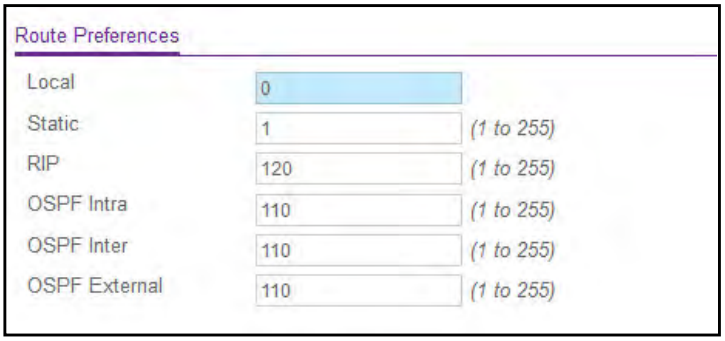
To specify route preferences

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Routing Table > Advanced > Route Preferences**.



5. Use **Static** to specify the static route preference value in the router.

   The default value is 1. The range is 1 to 255.

6. Specify the **RIP** route preference value in the router.

   The default value is 120. The range is 1 to 255.

7. Specify the **OSPF Intra** route preference value in the router.

   The default value is 110. The range is 1 to 255. The OSPF specification (RFC 2328) requires that preferences must be given to the routes learned through OSPF in the following order: intra < inter < type-1 < type-2.

8. Specify the **OSPF Inter** route preference value in the router.

   The default value is 110. The range is 1 to 255. The OSPF specification (RFC 2328) requires that preferences must be given to the routes learned through OSPF in the following order: intra < inter < type-1 < type-2.

9. Specify the **OSPF External** route preference value in the router.

   The default value is 110. The range is 1 to 255. The OSPF specification (RFC 2328) requires that preference value must be the same for all the OSPF external route types, such as type1/type2/nssa1/nssa2.

10. Click the **Apply** button.

    Your settings are saved.

    The Local field displays the local route preference value.

Configure the Routing IP Settings

You can configure routing IP settings for the switch, as opposed to the IP settings for an interface.

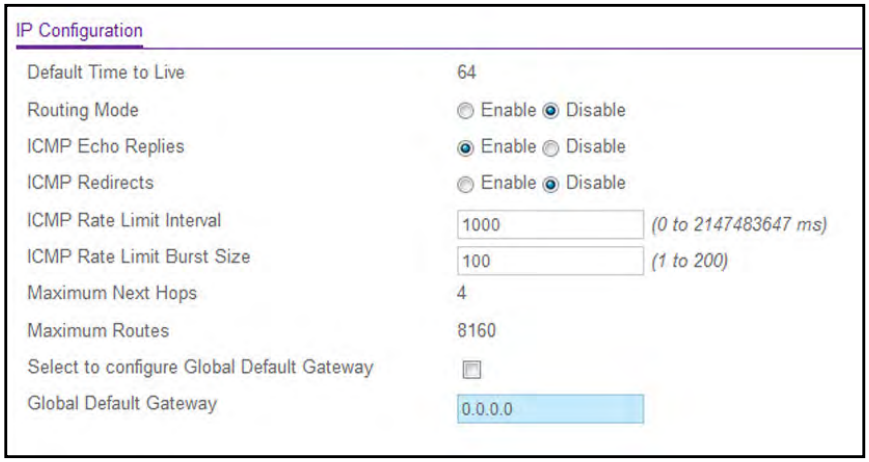
To configure the routing IP settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IP > Basic > IP Configuration**.



5. Use **Routing Mode** to select **Enable** or **Disable**.

   You must enable routing for the switch before you can route through any of the interfaces. The default value is Disable.
6. Use **ICMP Echo Replies** to select **Enable** or **Disable**.

   If you select Enable, then only the router can send ECHO replies. By default ICMP Echo Replies are sent for echo requests.
7. Use **ICMP Redirects** to select **Enable** or **Disable**.

   If this is enabled globally and on an interface level, then only the router can send ICMP Redirects.
8. Use **ICMP Rate Limit Interval** to control the ICMP error packets by specifying the number of ICMP error packets that are allowed per burst interval.

By default, the rate limit is 100 packets/sec (the burst interval is 1000 msec). To disable ICMP Rate limiting, set this field to 0. The valid rate Interval is from 0 to 2147483647.

9. Use **ICMP Rate Limit Burst Size** to control the ICMP error packets by specifying the number of ICMP error packets that are allowed per burst interval.

   By default, burst size is 100 packets. When the burst interval is 0, then configuring this field is not a valid operation. The valid burst size range is 1 to 200.

10. Use **Select to configure Global Default Gateway** to edit the Global Default Gateway field.
11. Use **Global Default Gateway** to set the global default gateway to the manually configured value. A default gateway configured with this command is more preferred than a default gateway learned from a DHCP server. Only one default gateway can be configured. If you invoke this command multiple times, each command replaces the previous value.
12. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 107. Routing IP Configuration

Field	Description
Default Time to Live	The default value inserted into the Time-To-Live field of the IP header of datagrams originated by the switch, if a TTL value is not supplied by the transport layer protocol.
Maximum Next Hops	The maximum number of hops supported by the switch. This is a compile-time constant.
Maximum Routes	The maximum number of routes (routing table size) supported by the switch. This is a compile-time constant.

View Statistics

The statistics reported on this page are as specified in RFC 1213.

To view statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

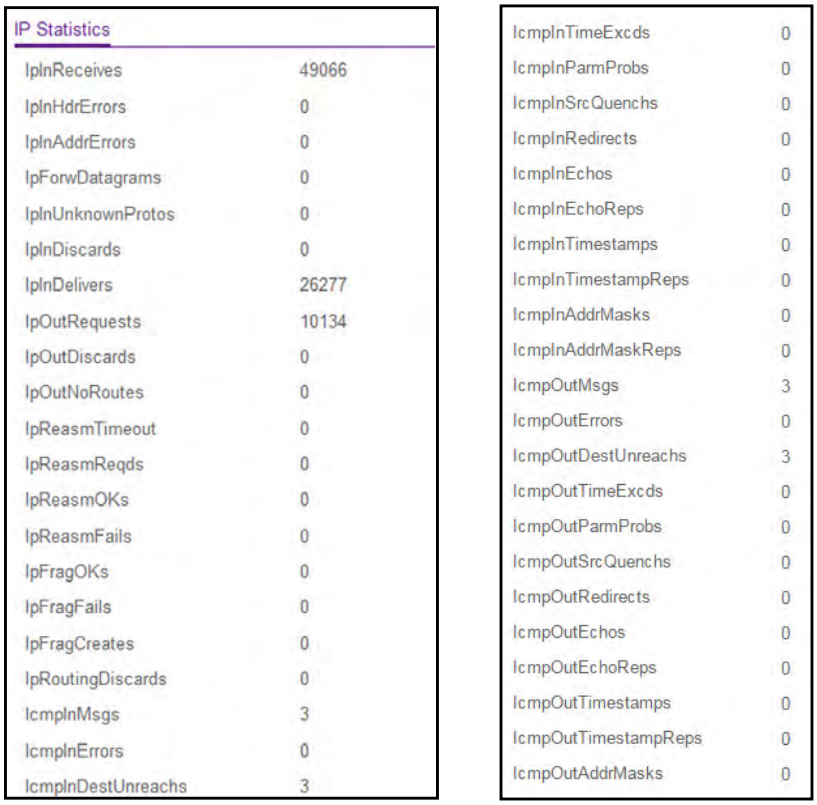
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > IP > Basic > Statistics**.



IP Statistics

IpInReceives	49066
IpInHdrErrors	0
IpInAddrErrors	0
IpForwDatagrams	0
IpInUnknownProtos	0
IpInDiscards	0
IpInDelivers	26277
IpOutRequests	10134
IpOutDiscards	0
IpOutNoRoutes	0
IpReasmTimeout	0
IpReasmReqds	0
IpReasmOKs	0
IpReasmFails	0
IpFragOKs	0
IpFragFails	0
IpFragCreates	0
IpRoutingDiscards	0
IcmpInMsgs	3
IcmpInErrors	0
IcmpInDestUnreachs	3
IcmpInTimeExcds	0
IcmpInParmProbs	0
IcmpInSrcQuenchs	0
IcmpInRedirects	0
IcmpInEchos	0
IcmpInEchoReps	0
IcmpInTimestamps	0
IcmpInTimestampReps	0
IcmpInAddrMasks	0
IcmpInAddrMaskReps	0
IcmpOutMsgs	3
IcmpOutErrors	0
IcmpOutDestUnreachs	3
IcmpOutTimeExcds	0
IcmpOutParmProbs	0
IcmpOutSrcQuenchs	0
IcmpOutRedirects	0
IcmpOutEchos	0
IcmpOutEchoReps	0
IcmpOutTimestamps	0
IcmpOutTimestampReps	0
IcmpOutAddrMasks	0

The following table describes the nonconfigurable information displayed on the page.

Table 108. IP Basic Statistics

Field	Description
IpInReceives	The total number of input datagrams received from interfaces, including those received in error.
IpInHdrErrors	The number of input datagrams discarded due to errors in their IP headers, including bad checksums, version number mismatch, other format errors, time-to-live exceeded, errors discovered in processing their IP options, and so on.
IpInAddrErrors	The number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity. This count includes invalid addresses (for example, 0.0.0.0) and addresses of unsupported classes (Class E). For entities that are not IP gateways and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.
IpForwDatagrams	The number of input datagrams for which this entity was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination. In entities that do not act as IP gateways, this counter includes only those packets that were source-routed through this entity, and the source-route option processing was successful.

Table 108. IP Basic Statistics (continued)

Field	Description
IpInUnknownProtos	The number of locally addressed datagrams received successfully but discarded because of an unknown or unsupported protocol.
IpInDiscards	The number of input IP datagrams for which no problems were encountered to prevent their continued processing, but that were discarded (for lack of buffer space). This counter does not include any datagrams discarded while awaiting re-assembly.
IpInDelivers	The total number of input datagrams successfully delivered to IP user protocols (including ICMP).
IpOutRequests	The total number of IP datagrams that local IP user protocols (including ICMP) supplied to IP in requests for transmission. This counter does not include any datagrams counted in ipForwDatagrams.
IpOutDiscards	The number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but that were discarded for reasons such as lack of buffer space. This counter would include datagrams counted in ipForwDatagrams if any such packets met this (discretionary) discard criterion.
IpOutNoRoutes	The number of IP datagrams discarded because no route could be found to transmit them to their destination. This counter includes any packets counted in ipForwDatagrams that meet this no-route criterion. This includes any datagrams that a host cannot route because all of its default gateways are down.
IpReasmTimeout	The maximum number of seconds for which received fragments are held while they are awaiting reassembly at this entity.
IpReasmReqds	The number of IP fragments received that were reassembled at this entity.
IpReasmOKs	The number of IP datagrams successfully re-assembled.
IpReasmFails	The number of failures detected by the IP re-assembly algorithm (for whatever reason: timed out, errors, and so on). This is not necessarily a count of discarded IP fragments since some algorithms can lose track of the number of fragments by combining them as they are received.
IpFragOKs	The number of IP datagrams that were fragmented at this entity.
IpFragFails	The number of IP datagrams that were discarded because they needed to be fragmented at this entity but could not be, for reasons such as their Don't Fragment flag was set.
IpFragCreates	The number of IP datagram fragments that were generated as a result of fragmentation at this entity.
IpRoutingDiscards	The number of routing entries that were discarded even though they were valid. One possible reason for discarding such an entry could be to free up buffer space for other routing entries.
IcmpInMsgs	The total number of ICMP messages that the entity received. This counter includes all those counted by icmpInErrors.

Table 108. IP Basic Statistics (continued)

Field	Description
IcmpInErrors	The number of ICMP messages that the entity received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, and so on).
IcmpInDestUnreachs	The number of ICMP destination unreachable messages received.
IcmpInTimeExcds	The number of ICMP time exceeded messages received.
IcmpInParmProbs	The number of ICMP parameter problem messages received.
IcmpInSrcQuenchs	The number of ICMP source quench messages received.
IcmpInRedirects	The number of ICMP redirect messages received.
IcmpInEchos	The number of ICMP echo (request) messages received.
IcmpInEchoReps	The number of ICMP echo reply messages received.
IcmpInTimestamps	The number of ICMP timestamp (request) messages received.
IcmpInTimestampReps	The number of ICMP rimestamp reply messages received.
IcmpInAddrMasks	The number of ICMP address mask request messages received.
IcmpInAddrMaskReps	The number of ICMP address mask reply messages received.
IcmpOutMsgs	The total number of ICMP messages that this entity attempted to send. This counter includes all those counted by icmpOutErrors.
IcmpOutErrors	The number of ICMP messages that this entity did not send due to problems discovered within ICMP such as a lack of buffers. This value does not include errors discovered outside the ICMP layer such as the inability of IP to route the resultant datagram. In some implementations there might be no types of error that contribute to this counter's value.
IcmpOutDestUnreachs	The number of ICMP destination unreachable messages sent.
IcmpOutTimeExcds	The number of ICMP time exceeded messages sent.
IcmpOutParmProbs	The number of ICMP parameter problem messages sent.
IcmpOutSrcQuenchs	The number of ICMP source quench messages sent.
IcmpOutRedirects	The number of ICMP redirect messages sent. For a host, this is always zero, since hosts do not send redirects.
IcmpOutEchos	The number of ICMP echo (request) messages sent.
IcmpOutEchoReps	The number of ICMP echo reply messages sent.
IcmpOutTimestamps	The number of ICMP timestamp (request) messages.
IcmpOutTimestampReps	The number of ICMP timestamp reply messages sent.
IcmpOutAddrMasks	The number of ICMP address mask request messages sent.

Configure Routing Parameters for the Switch

You can configure routing parameters for the switch as opposed to an interface.

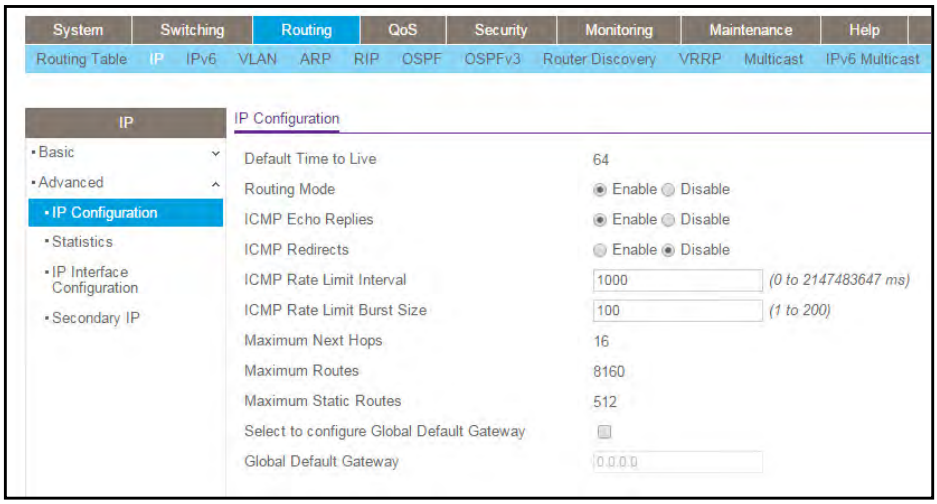
To configure routing parameters for the switch:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IP > Advanced > IP Configuration**.



5. Use **Routing Mode** to select **Enable** or **Disable**.

   You must enable routing for the switch before you can route through any of the interfaces. The default value is Disable.
6. Use **ICMP Echo Replies** to select **Enable** or **Disable**.

   If you select Enable, then only the router can send ECHO replies. By default ICMP echo replies are sent for echo requests.
7. Use **ICMP Redirects** to select **Enable** or **Disable**.

   If it is enabled globally and on interface level then only the router can send ICMP redirects.

8. Use **ICMP Rate Limit Interval** to control the ICMP error packets by specifying the number of ICMP error packets that are allowed per burst interval.

   By default, the rate limit is 100 packets/sec, (the burst interval is 1000 msec). To disable ICMP Ratelimiting set this field to 0. The valid rate interval is in the range 0 to 2147483647.

9. Use **ICMP Rate Limit Burst Size** to control the ICMP error packets by specifying the number of ICMP error packets that are allowed per burst interval.

   By default, the burst size is 100 packets. When the burst interval is 0, then configuring this field is not a valid operation. The valid burst size is 1 to 200.

10. Use **Select to Configure Global Default Gateway** to edit the Global Default Gateway field.
11. Use **Global Default Gateway** to set the global default gateway to the manually configured value.

    A default gateway configured with this command is more preferred than a default gateway learned from a DHCP server. Only one default gateway can be configured. If you invoke this command multiple times, each command replaces the previous value.

12. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 109. Routing IP Configuration

Field	Description
Default Time to Live	The default value inserted into the Time-To-Live field of the IP header of datagrams originated by the switch, if a TTL value is not supplied by the transport layer protocol.
Maximum Next Hops	The maximum number of hops supported by the switch. This is a compile-time constant.
Maximum Routes	The maximum number of routes (routing table size) supported by the switch. This is a compile-time constant.
Maximum Static Routes	The maximum number of static routes supported by the switch.

View IP Statistics

The statistics reported on this page are as specified in RFC 1213.

To view IP statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

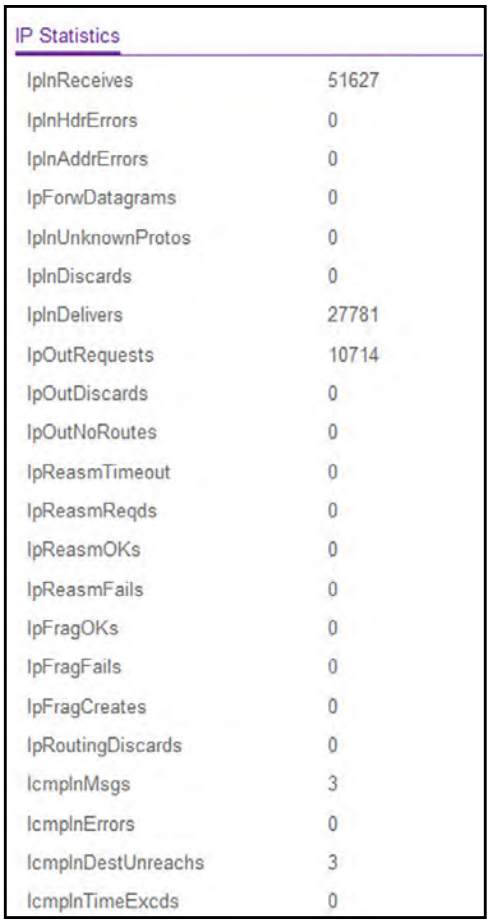
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > IP > Advanced > Statistics**.



The following table describes the nonconfigurable information displayed on the page.

Table 110. IP Statistics

Field	Description
IpInReceives	The total number of input datagrams received from interfaces, including those received in error.
IpInHdrErrors	The number of input datagrams discarded due to errors in their IP headers, including bad checksums, version number mismatch, other format errors, time-to-live exceeded, errors discovered in processing their IP options, and so on

Table 110. IP Statistics (continued)

Field	Description
IpInAddrErrors	The number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity. This count includes invalid addresses (for example, 0.0.0.0) and addresses of unsupported classes (such as., Class E). For entities that are not IP gateways and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.
IpForwDatagrams	The number of input datagrams for which this entity was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination. In entities that do not act as IP gateways, this counter includes only those packets that were source-routed through this entity, and the source-route option processing was successful.
IpInUnknownProtos	The number of locally-addressed datagrams received successfully but discarded because of an unknown or unsupported protocol.
IpInDiscards	The number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded for reasons such as lack of buffer space. This counter does not include any datagrams discarded while awaiting re-assembly.
IpInDelivers	The total number of input datagrams successfully delivered to IP user-protocols (including ICMP).
IpOutRequests	The total number of IP datagrams that local IP user-protocols (including ICMP) supplied to IP in requests for transmission. This counter does not include any datagrams counted in ipForwDatagrams.
IpOutDiscards	The number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but that were discarded for reasons such as lack of buffer space. This counter would include datagrams counted in ipForwDatagrams if any such packets met this (discretionary) discard criterion.
IpOutNoRoutes	The number of IP datagrams discarded because no route could be found to transmit them to their destination. This counter includes any packets counted in ipForwDatagrams that meet this no-route criterion. This includes any datagrams that a host cannot route because all of its default gateways are down.
IpReasmTimeout	The maximum number of seconds for which received fragments are held while they are awaiting reassembly at this entity.
IpReasmReqds	The number of IP fragments received that needed to be reassembled at this entity.
IpReasmOKs	The number of IP datagrams successfully reassembled.
IpReasmFails	The number of failures detected by the IP reassembly algorithm (for whatever reason: timed out, errors, etc). This is not necessarily a count of discarded IP fragments since some algorithms can lose track of the number of fragments by combining them as they are received.

Table 110. IP Statistics (continued)

Field	Description
IpFragOKs	The number of IP datagrams that were fragmented at this entity.
IpFragFails	The number of IP datagrams that were discarded because they needed to be fragmented at this entity but could not be, for example this can occur because their Don't Fragment flag was set.
IpFragCreates	The number of IP datagram fragments that were generated as a result of fragmentation at this entity.
IpRoutingDiscards	The number of routing entries that were discarded even though they are valid. One possible reason for discarding such an entry could be to free up buffer space for other routing entries.
IcmpInMsgs	The total number of ICMP messages that the entity received. This counter includes all those counted by icmpInErrors.
IcmpInErrors	The number of ICMP messages that the entity received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, and so on).
IcmpInDestUnreachs	The number of ICMP destination unreachable messages received.
IcmpInTimeExcds	The number of ICMP time exceeded messages received.
IcmpInParmProbs	The number of ICMP parameter problem messages received.
IcmpInSrcQuenchs	The number of ICMP source quench messages received.
IcmpInRedirects	The number of ICMP redirect messages received.
IcmpInEchos	The number of ICMP echo (request) messages received.
IcmpInEchoReps	The number of ICMP echo reply messages received.
IcmpInTimestamps	The number of ICMP timestamp (request) messages received.
IcmpInTimestampReps	The number of ICMP timestamp reply messages received.
IcmpInAddrMasks	The number of ICMP address mask request messages received.
IcmpInAddrMaskReps	The number of ICMP address mask reply messages received.
IcmpOutMsgs	The total number of ICMP messages that this entity attempted to send. This counter includes all those counted by icmpOutErrors.
IcmpOutErrors	The number of ICMP messages that this entity did not send due to problems discovered within ICMP such as a lack of buffers. This value does not include errors discovered outside the ICMP Layer such as the inability of IP to route the resultant datagram. In some implementations there might be no types of error that contribute to this counter's value.
IcmpOutDestUnreachs	The number of ICMP destination unreachable messages sent.
IcmpOutTimeExcds	The number of ICMP time exceeded messages sent.
IcmpOutParmProbs	The number of ICMP parameter problem messages sent.

Table 110. IP Statistics (continued)

Field	Description
IcmpOutSrcQuenchs	The number of ICMP source quench messages sent.
IcmpOutRedirects	The number of ICMP redirect messages sent. For a host, this is zero, since hosts do not send redirects.
IcmpOutEchos	The number of ICMP echo (request) messages sent.
IcmpOutEchoReps	The number of ICMP echo reply messages sent.
IcmpOutTimestamps	The number of ICMP timestamp (request) messages.
IcmpOutTimestampReps	The number of ICMP timestamp reply messages sent.
IcmpOutAddrMasks	The number of ICMP address mask request messages sent.
IcmpOutAddrMaskReps	The number of ICMP address mask reply messages sent.

Configure the IP Interface

You can update IP interface data for this switch.

To configure the IP interface:

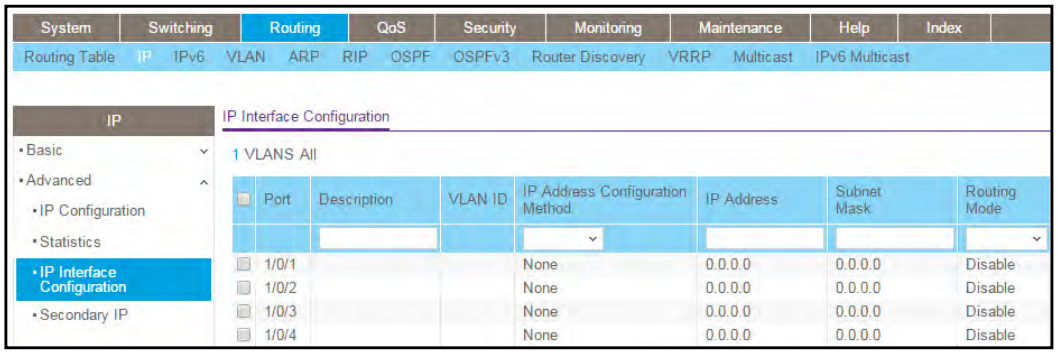
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

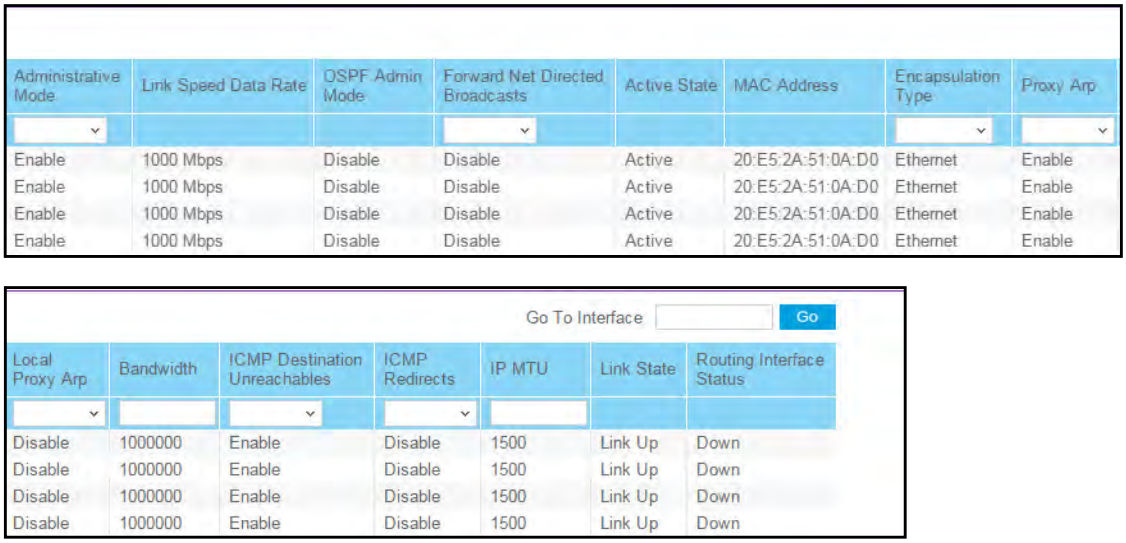
   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IP > Advanced > IP Interface Configuration**.

   The page is shown in three parts.





Administrative Mode	Link Speed Data Rate	OSPF Admin Mode	Forward Net Directed Broadcasts	Active State	MAC Address	Encapsulation Type	Proxy Arp
Enable	1000 Mbps	Disable	Disable	Active	20:E5:2A:51:0A:D0	Ethernet	Enable
Enable	1000 Mbps	Disable	Disable	Active	20:E5:2A:51:0A:D0	Ethernet	Enable
Enable	1000 Mbps	Disable	Disable	Active	20:E5:2A:51:0A:D0	Ethernet	Enable
Enable	1000 Mbps	Disable	Disable	Active	20:E5:2A:51:0A:D0	Ethernet	Enable

Go To Interface Go

Local Proxy Arp	Bandwidth	ICMP Destination Unreachables	ICMP Redirects	IP MTU	Link State	Routing Interface Status
Disable	1000000	Enable	Disable	1500	Link Up	Down
Disable	1000000	Enable	Disable	1500	Link Up	Down
Disable	1000000	Enable	Disable	1500	Link Up	Down
Disable	1000000	Enable	Disable	1500	Link Up	Down

5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Port column, select the check box for the interface that you want to configure.
6. Use **Description** to enter the description for the interface.
7. Use **IP Address Configuration Method** to enter the method by which an IP address is configured on the interface.

   There are three methods: **None**, **Manual**, and **DHCP**. By default the method is None. Use the **None** method to reset the DHCP method.

   Note: When the configuration method is changed from **DHCP** to **None**, there is a minor delay before the page refreshes.

8. Use **IP Address** to enter the IP address for the interface.
9. Use **Subnet Mask** to enter the subnet mask for the interface.

   This is also referred to as the subnet/network mask, and defines the portion of the interface's IP address that is used to identify the attached network.

10. In the **Routing Mode** list, select **Enable** or **Disable**.

    The default value is Enable.

11. Use **Administrative Mode** to enable or disable the administrative mode of the interface.

    The default value is Enable. This mode is not supported for logical VLAN interfaces.

12. Use **Forward Net Directed Broadcasts** to select how network directed broadcast packets are handled.

    If you select Enable, network directed broadcasts are forwarded.

If you select Disable, they are dropped. The default value is Disable.

13. Use **Encapsulation Type** to select the link layer encapsulation type for packets transmitted from the specified interface.

    The possible values are **Ethernet** and **SNAP**. The default is Ethernet.

14. Use **Proxy Arp** to disable or enable proxy ARP for the specified interface.
15. Use **Local Proxy Arp** to disable or enable local proxy ARP for the specified interface.
16. Use **Bandwidth (kbps)** to specify the configured bandwidth on this interface.

    This parameter communicates the speed of the interface to higher level protocols. OSPF uses bandwidth to compute link cost. The valid range is 1 to 10000000.

17. Use **ICMP Destination Unreachables** to specify the mode of sending ICMP destination unreachables on this interface.

    If this is Disabled then this interface does not send ICMP destination unreachables. By default destination unreachables mode is enabled.

18. Use **ICMP Redirects** to enable or disable ICMP redirects mode.

    The router sends an ICMP redirect on an interface only if redirects are enabled both globally and on the interface. By default ICMP redirects mode is enabled.

19. Use **IP MTU** to specify the maximum size of IP packets sent on an interface.

    The valid range is 68 bytes to the link MTU. The default value is 0. A value of 0 indicates that the IP MTU is unconfigured. When the IP MTU is unconfigured, the router uses the link MTU as the IP MTU. The IP MTU is the maximum frame size minus the length of the Layer 2 header.

20. To delete the IP address from the selected interface, click the **Delete** button.
21. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 111. IP Interface Configuration

Field	Description
VLAN ID	The VLAN ID for the interface.
OSPF Admin Mode	Displays the OSPF admin mode of the interface. The default value is Disable.
Link State	The state of the specified interface is either Active or Inactive. An interface is considered active if it the link is up and it is in forwarding state.
Routing Interface Status	Indicates whether the link status is up or down.

Configure the Secondary IP Address

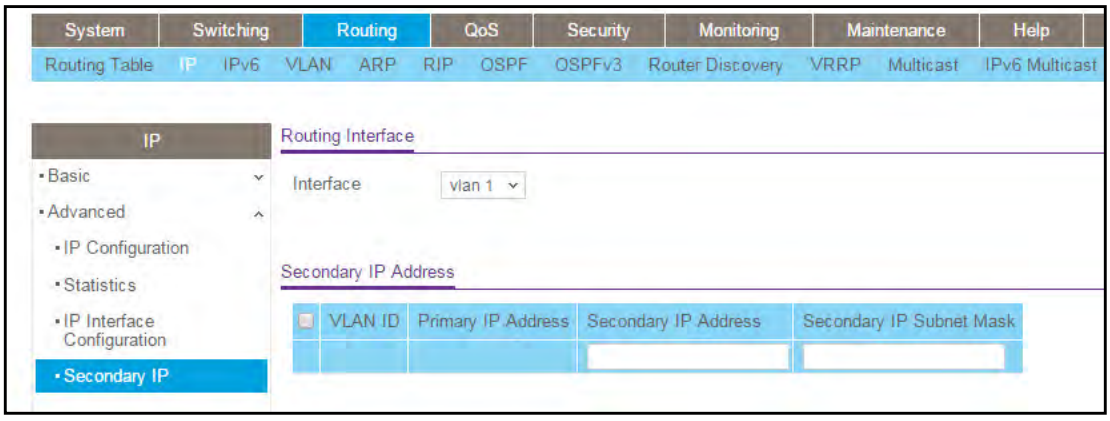
To configure the secondary IP address:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IP > Advanced > Secondary IP**.



5. In the **Routing Interface** list, select the interface.
6. In the **Secondary IP Address** field, add a secondary IP address to the selected interface.
7. In the **Secondary IP Subnet Mask** field, enter the subnet mask associated with the secondary IP address.

   This is also referred to as the subnet/network mask, and defines the portion of the interface's IP address that is used to identify the attached network. This value is read-only once configured.
8. Click the **Add** button.

   The secondary IP address for the selected interface is added.

The following table describes the nonconfigurable information that is displayed.

Table 112. Secondary IP

Field	Description
VLAN ID	The VLAN ID associated with the displayed or configured interface.
Primary IP Address	The primary IP address for the interface.

Manage IPv6

Configure IPv6 Global Settings

You can configure IPv6 routing parameters for the switch, as opposed to an interface.

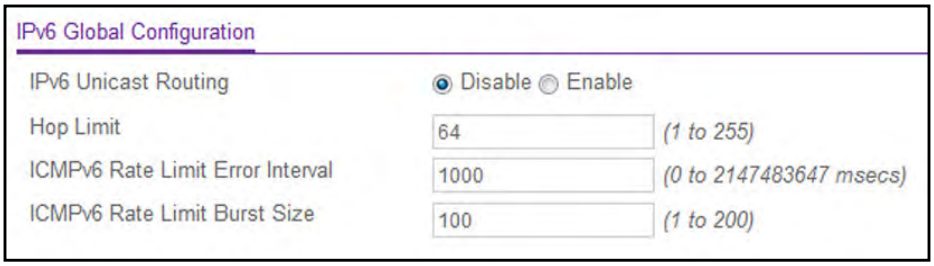
To configure IPv6 global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 > Basic > Global Configuration**.



5. In the **IPv6 Unicast Routing** field, select the option to globally **Enable** or **Disable** IPv6 unicast routing.
6. In the **Hop Limit** field, enter a value for the unicast hop count used in IPv6 packets originated by the node.

   The value is also included in router advertisements. The valid values for hops are 1 to 255, inclusive. The default is Not Configured, which means that a value of zero is sent in router advertisements.
7. In the **ICMPv6 Rate Limit Error Interval** field, specify the number of ICMP error packets allowed per burst interval.

   This value controls the ICMPv6 error packets. The default rate limit is 100 packets per second, meaning that the burst interval is 1000 mseconds. To disable ICMP rate limiting, set this field to 0. The valid rate interval must be in the range 0 to 2147483647 mseconds.
8. In the **ICMPv6 Rate Limit Burst Size** field, specify the number of ICMP error packets allowed per burst interval.

This value controls the ICMP error packets. The default burst size is 100 packets. When the burst interval is 0, then configuring this field is not a valid operation. The valid burst size is 1 to 200.

9. Click the **Apply** button.

   Your settings are saved.

View the IPv6 Route Table

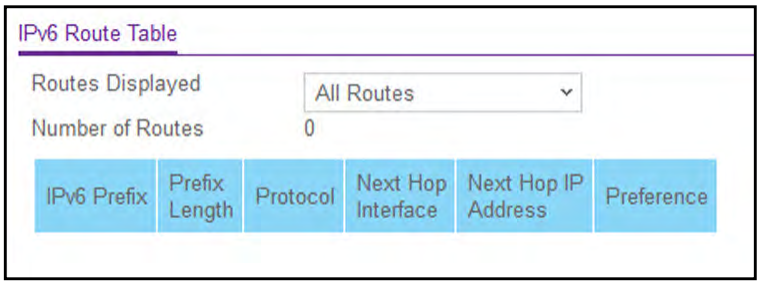
To view the IPv6 Route Table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 > Basic > Route Table**.



5. In the **Routes Displayed** list, select from the following:
   - **All Routes**. Shows all active IPv6 routes.
   - **Best Routes Only**. Shows only the best active routes.
   - **Configured Routes Only**. Shows the routes configured by the user.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 113. IPv6 Route Table

Field	Description
Number of Routes	The total number of active routes in the route table.
IPv6 Prefix	The network prefix for the active route.
Prefix Length	The prefix length for the active route.

Table 113. IPv6 Route Table

Field	Description
Protocol	The type of protocol for the active route.
Next Hop Interface	The interface over which the route is active. For a reject route, the next hop would be a *Null0* interface.
Next Hop IP Address	The next hop IPv6 address for the active route.
Preference	The route preference of the configured route.

Configure IPv6 Interface Settings

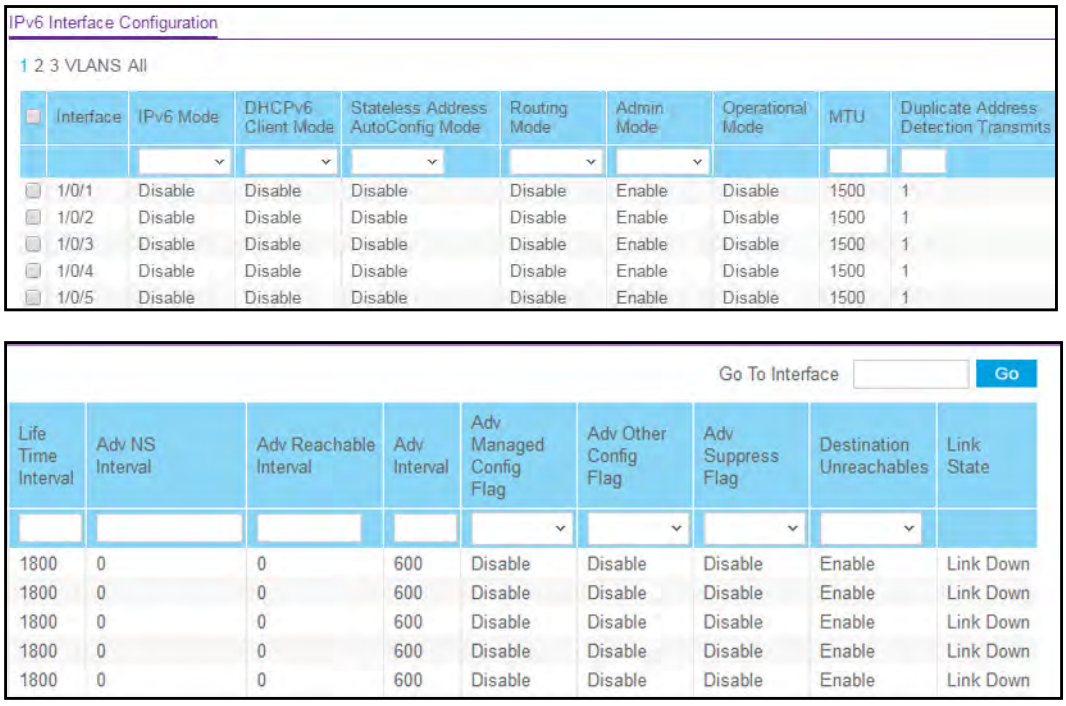
Configure IPv6 interface settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 > Advanced > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.

     All physical interfaces are valid.
6. Select **Enable** or **Disable** in the **IPv6 Mode** list.

   When IPv6 mode is enabled, the interface is capable of IPv6 operation without a global address. In this case, an EUI-64 based link-local address is used. The default value is Disable.
7. In the **DHCPv6 Client Mode** list, select to **Enable** or **Disable** DHCPv6 client mode on an interface.

   At any point in time, only one interface can act as a client. The default value is Disable.
8. In the **Stateless Address AutoConfig Mode** list, select to **Enable** or **Disable** Stateless Address AutoConfig mode on an interface.

   The default value is Disable.
9. In the **Routing Mode** list, select to **Enable** or **Disable** the routing mode of an interface.

   The default is Disable.
10. In the **Admin Mode** list, select to **Enable** or **Disable** IPv6 mode.

    The default is Disable. When IPv6 mode is enabled, the interface is capable of IPv6 operation without a global address. In this case, an EUI-64 based link-local address is used.
11. In the **MTU** field, specify the maximum transmit unit on an interface.

    If the value is 0, then this interface is not enabled for routing. It is not valid to set this value to 0 if routing is enabled. The MTU range 1280 to 1500. The default is 1500.
12. In the **Duplicate Address Detection Transmits** field, specify the number of duplicate address detection (DAD) transmits on an interface.

    DAD transmits values must be in the range 0 to 600. The default is 1.
13. Specify the router advertisement **Life Time Interval** sent from the interface.

    This value must be greater than or equal to the maximum advertisement interval. 0 means do not use the router as the default router. The range of router life time is 0 to 9000. The default is 1800.
14. In the **Adv NS Interval** field, specify the retransmission time field of router advertisements sent from the interface.

    A value of 0 means the interval is not specified for the router. The range of the neighbor solicit interval is 1000 to 4294967295. The default is 0.
15. In the **Adv Reachable Interval** field, specify the router advertisement time.

This is the amount of time allocated to consider the neighbors reachable after ND confirmation. The range of reachable time is 0 to 3600000. The default is 0.

16. Use the **Adv Interval** field to specify the maximum time allowed between sending router advertisements from the interface.

    The range of the maximum advertisement interval is 4 to 1800. The default value is 600.

17. In the **Adv Other Config Flag** list, select **Enable** or **Disable** to specify the router advertisement other stateful configuration flag.

    Default value of other config flag is Disable.

18. In the **Adv Suppress Flag** list, select to **Enable** or **Disable** router advertisement suppression on an interface.

    The default value of the suppress flag is Disable.

19. In the **Destination Unreachables** list, select to **Enable** or **Disable** the mode of sending ICMPv6 destination unreachables on this interface.

    If disabled, then this interface does not send ICMPv6 destination unreachables. By default, the IPv6 destination unreachables mode is enabled.

20. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 114. IPv6 Advanced Interface Configuration

Field	Description
Operational Mode	Specifies the operational state of an interface. The default value is Disable.
Link State	Indicates whether the link is up or down.

Configure the IPv6 Prefix Settings

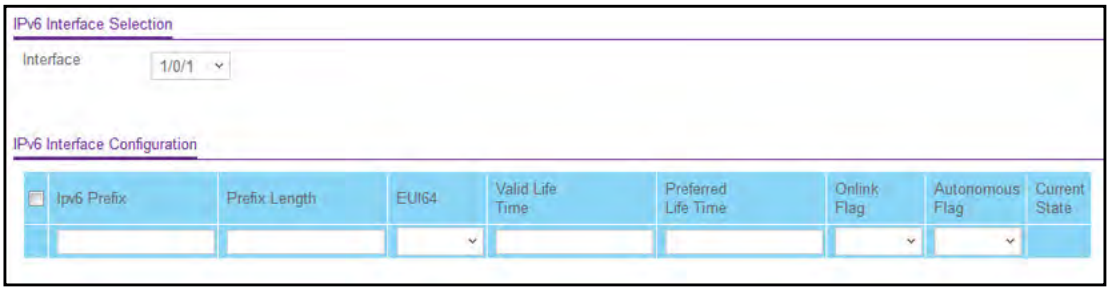
Configure the IPv6 prefix settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 > Advanced > Prefix Configuration**.



5. From the **Interface** list, select the interface.

   When the selection is changed, a page update occurs, causing all fields to be updated for the newly selected port. All physical interfaces are valid.
6. In the **IPv6 Prefix** field, specify the IPv6 prefix for an interface.
7. In the **Prefix Length** field, specify the IPv6 prefix length for an interface.
8. In the **EUI64** list, select to **Enable** or **Disable** the specified 64-bit unicast prefix.
9. In the **Valid Life Time** field, specify the router advertisement per prefix time.

   This is the amount of time allowed to consider the prefix valid for the purpose of on-link determination. The valid life time is 0 to 4294967295.
10. In the **Preferred Life Time** field, specify the router advertisement per prefix time.

    An autoconfigured address generated from this prefix is preferred. The preferred life time must be in the range 0 to 4294967295.
11. From the **Onlink Flag** list, select **Enable** or **Disable**.

    This specifies whether the selected prefix can be used for on-link determination. The default is Enable.

12. In the **Autonomous Flag** list, select **Enable** or **Disable.**

    This specifies whether the selected prefix can be used for autonomous address configuration. The default value is Enable.

13. Click the **Add** button.

    The IPv6 address is added to the interface.

14. Click the **Apply** button.

    Your settings are saved.

    The **Current State** field displays the state of the IPV6 address. The state is TENT if routing is disabled or DAD fails. The state is Active if the interface is active and DAD is successful.

View IPv6 Statistics

To view IPv6 interface statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

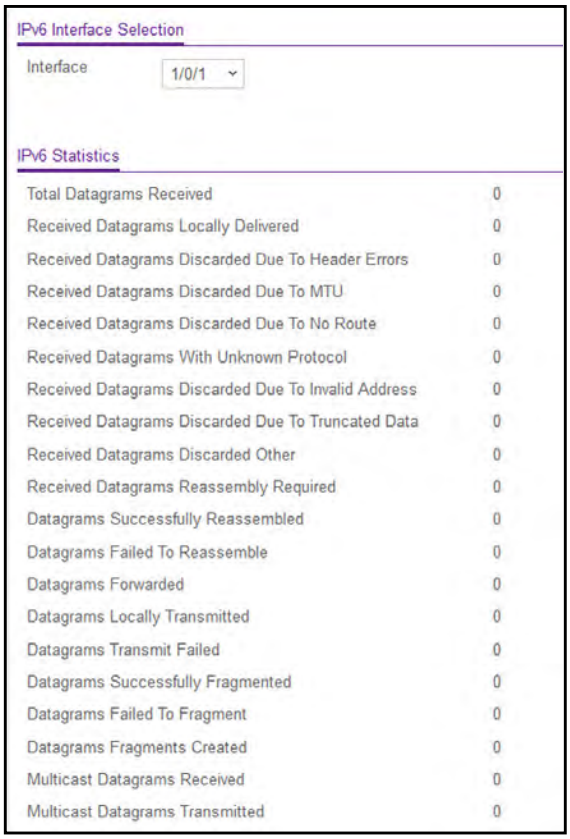
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > IPv6 > Advanced > Statistics**.



5. From the **Interface** list, select the interface.

   When the selection is changed, a page refresh occurs, causing all fields to be updated for the newly selected port.

6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 115. IPv6 Advanced Interface Statistics

Field	Description
Total Datagrams Received	The total number of input datagrams received by the interface, including those received in error.
Received Datagrams Locally Delivered	The total number of datagrams successfully delivered to IPv6 user-protocols (including ICMP). This counter is incremented at the interface to which these datagrams were addressed, which might not be the input interface for some of the datagrams.
Received Datagrams Discarded Due To Header Errors	The number of input datagrams discarded due to errors in their IPv6 headers, including version number mismatch, other format errors, hop count exceeded, errors discovered in processing their IPv6 options, and so on
Received Datagrams Discarded Due To MTU	The number of input datagrams that could not be forwarded because their size exceeded the link MTU of outgoing interface.

Table 115. IPv6 Advanced Interface Statistics (continued)

Field	Description
Received Datagrams Discarded Due To No Route	The number of input datagrams discarded because no route could be found to transmit them to their destination
Received Datagrams With Unknown Protocol	The number of locally-addressed datagrams received successfully but discarded because of an unknown or unsupported protocol. This counter is incremented at the interface to which these datagrams were addressed, which might not be the input interface for some of the datagrams.
Received Datagrams Discarded Due To Invalid Address	The number of input datagrams discarded because the IPv6 address in their IPv6 header's destination field was not a valid address to be received at this entity. This count includes invalid addresses (for example, ::0) and unsupported addresses (such as addresses with unallocated prefixes).For entities that are not IPv6 routers and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.
Received Datagrams Discarded Dut To Truncated Data	The number of input datagrams discarded because datagram frame didn't carry enough data.
Received Datagrams Discarded Other	The number of input IPv6 datagrams for which no problems were encountered to prevent their continued processing, but that were discarded for reasons such as lack of buffer space. This counter does not include any datagrams discarded while awaiting re-assembly.
Received Datagrams Reassembly Required	The number of IPv6 fragments received that needed to be reassembled at this interface. This counter is incremented at the interface to which these fragments were addressed, which might not be the input interface for some of the fragments.
Datagrams Successfully Reassembled	The number of IPv6 datagrams successfully reassembled. This counter is incremented at the interface to which these datagrams were addressed, which might not be necessarily the input interface for some of the fragments.
Datagrams Failed To Reassemble	The number of failures detected by the IPv6 reassembly algorithm (for whatever reason: timed out, errors, and so on). This is not necessarily a count of discarded IPv6 fragments since some algorithms (notably the algorithm in RFC 815) can lose track of the number of fragments by combining them as they are received. This counter is incremented at the interface to which these fragments were addressed, which might not be the input interface for some of the fragments.
Datagrams Forwarded	The number of output datagrams that this entity received and forwarded to their final destinations. In entities that do not act as IPv6 routers, this counter includes only those packets that were source-routed through this entity, and the source-route processing was successful. For a successfully forwarded datagram the counter of the outgoing interface is incremented.
Datagrams Locally Transmitted	The number of datagrams that this entity successfully transmitted from this output interface.
Datagrams Transmit Failed	The number of datagrams that this entity failed to transmit successfully.

Table 115. IPv6 Advanced Interface Statistics (continued)

Field	Description
Datagrams Successfully Fragmented	The number of IPv6 datagrams that were fragmented at this output interface.
Datagrams Failed To Fragment	The number of output datagrams that could not be fragmented at this interface.
Datagrams Fragments Created	The number of output datagram fragments that were generated as a result of fragmentation at this output interface.
Multicast Datagrams Received	The number of multicast packets received by the interface.
Multicast Datagrams Transmitted	The number of multicast packets transmitted by the interface.

The following table describes the nonconfigurable information that is displayed.

Table 116. ICMPv6 Statistics

Field	Description
Total ICMPv6 Messages Received	The total number of ICMP messages received by the interface, which includes all those counted by IPv6IfIcmpInErrors. This interface is the interface to which the ICMP messages were addressed, which might not be the input interface for the messages.
ICMPv6 Messages With Errors Received	The number of ICMP messages that the interface received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, and so on).
ICMPv6 Destination Unreachable Messages Received	The number of ICMP Destination Unreachable messages received by the interface.
ICMPv6 Messages Prohibited Administratively Received	The number of ICMP destination unreachable/communication administratively prohibited messages received by the interface.
ICMPv6 Time Exceeded Messages Received	The number of ICMP Time Exceeded messages received by the interface.
ICMPv6 Parameter Problem Messages Received	The number of ICMP Parameter Problem messages received by the interface.
ICMPv6 Packet Too Big Messages Received	The number of ICMP Packet Too Big messages received by the interface.
ICMPv6 Echo Request Messages Received	The number of ICMP Echo (request) messages received by the interface.
ICMPv6 Echo Reply Messages Received	The number of ICMP Echo Reply messages received by the interface.
ICMPv6 Router Solicit Messages Received	The number of ICMP Router Solicit messages received by the interface.
ICMPv6 Router Advertisement Messages Received	The number of ICMP Router Advertisement messages received by the interface.

Table 116. ICMPv6 Statistics (continued)

Field	Description
ICMPv6 Neighbor Solicit Messages Received	The number of ICMP Neighbor Solicit messages received by the interface.
ICMPv6 Neighbor Advertisement Messages Received	The number of ICMP Neighbor Advertisement messages received by the interface.
ICMPv6 Redirect Messages Received	The number of ICMPv6 Redirect messaged received by the interface.
ICMPv6 Group Membership Query Messages Received	The number of ICMPv6 Group Membership Query messages received by the interface.
ICMPv6 Group Membership Response Messages Received	The number of ICMPv6 Group Membership Response messages received by the interface.
ICMPv6 Group Membership Reduction Messages Received	The number of ICMPv6 Group Membership Reduction messages received by the interface.
Total ICMPv6 Messages Transmitted	The total number of ICMP messages that this interface attempted to send. This counter includes all those counted by icmpOutErrors.
ICMPv6 Messages Not Transmitted Due To Error	The number of ICMP messages that this interface did not send due to problems discovered within ICMP such as a lack of buffers. This value does not include errors discovered outside the ICMP layer such as the inability of IPv6 to route the resultant datagram. In some implementations there might be no types of error that contribute to this counter's value.
ICMPv6 Destination Unreachable Messages Transmitted	The number of ICMP Destination Unreachable messages sent by the interface.
ICMPv6 Messages Prohibited Administratively Transmitted	Number of ICMP Destination Unreachable/Communication Administratively Prohibited messages sent.
ICMPv6 Time Exceeded Messages Transmitted	The number of ICMP Time Exceeded messages sent by the interface.
ICMPv6 Parameter Problem Messages Transmitted	The number of ICMP Parameter Problem messages sent by the interface.
ICMPv6 Packet Too Big Messages Transmitted	The number of ICMP Packet Too Big messages sent by the interface.
ICMPv6 Echo Request Messages Transmitted	The number of ICMP Echo (request) messages sent by the interface.
ICMPv6 Echo Reply Messages Transmitted	The number of ICMP Echo Reply messages sent by the interface.
ICMPv6 Router Solicit Messages Transmitted	The number of ICMP Neighbor Solicitation messages sent by the interface.
ICMPv6 Router Advertisement Messages Transmitted	The number of ICMP Router Advertisement messages sent by the interface.

Table 116. ICMPv6 Statistics (continued)

Field	Description
ICMPv6 Neighbor Solicit Messages Transmitted	The number of ICMP Neighbor Solicitation messages sent by the interface.
ICMPv6 Neighbor Advertisement Messages Transmitted	The number of ICMP Neighbor Advertisement messages sent by the interface.
ICMPv6 Redirect Messages Transmitted	The number of Redirect messages sent.
ICMPv6 Group Membership Query Messages Transmitted	The number of ICMPv6 Group Membership Query messages sent.
ICMPv6 Group Membership Response Messages Transmitted	The number of ICMPv6 Group Membership Response messages sent.
ICMPv6 Group Membership Reduction Messages Transmitted	The number of ICMPv6 Group Membership Reduction messages sent.
ICMPv6 Duplicate Address Detects	The number of duplicate addresses detected by the interface.

View the IPv6 Neighbor Table and Clear IPv6 Neighbors

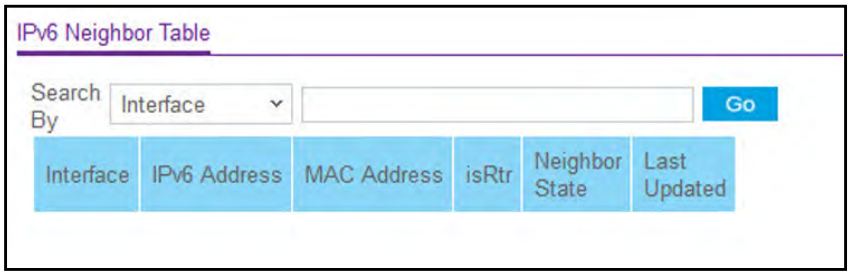
To view the IPv6 neighbor table and clear IPv6 neighbors:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 > Advanced > Neighbor Table**.



5. Use the **Search By** field to search for IPv6 routes by **IPv6 Address** or **Interface**.
   - To search by IPv6 address, select **IPv6 Address** from the **Search By** list. Enter the 128-byte hexadecimal IPv6 address in four-digit groups separated by colons, for

example, 2001:231F:::1. Then click the **Go** button. If the address exists, that entry is displayed. An exact match is required.

- To search by Interface, select **Interface** from the **Search By** list, enter the interface ID in unit/slot/port format, for example, 2/1/1. Then click the **Go** button. If the address exists, that entry is displayed.

6. To refresh the page with the latest information on the switch, click the **Refresh** button.
7. To clear the IPv6 neighbors on a selected interface or on all interfaces, click the **Clear** button.

The following table describes the nonconfigurable information that is displayed.

Table 117. IPv6 Advanced Neighbor Table

Field	Description
Interface	The interface whose settings are displayed in the current table row.
IPv6 Address	The IPv6 address of the neighbor or interface.
MAC Address	Specifies MAC address associated with an interface.
isRtr	Indicates whether the neighbor is a router. If the neighbor is a router, the value is **True**. If the neighbor is not a router, the value is **False**.
Neighbor State	The state of the neighbor cache entry. Following are the states for dynamic entries in the IPv6 neighbor discovery cache: • **Incmp**. Address resolution is being performed on the entry.A neighbor solicitation message was sent to the solicited-node multicast address of the target, but the corresponding neighbor advertisement message has not yet been received. • **Reach**. Positive confirmation was received within the last Reachable Time milliseconds that the forward path to the neighbor was functioning properly. While in REACH state, the device takes no special action as packets are sent. • **Stale**. More than ReachableTime milliseconds elapsed since the last positive confirmation was received that the forward path was functioning properly. While in STALE state, the device takes no action until a packet is sent. • **Delay**. More than ReachableTime milliseconds elapsed since the last positive confirmation was received that the forward path was functioning properly. A packet was sent within the last DELAY_FIRST_PROBE_TIME seconds. If no reachability confirmation is received within DELAY_FIRST_PROBE_TIME seconds of entering the DELAY state, send a neighbor solicitation message and change the state to PROBE. • **Probe**. A reachability confirmation is actively sought by resending neighbor solicitation messages every RetransTimer milliseconds until a reachability confirmation is received.
Last Updated	Time since the address was confirmed to be reachable.

Configure an IPv6 Static Route

Configure an IPv6 static route:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 > Advanced > Static Route Configuration**.

5. In the **IPv6 Prefix** field, specify the IPv6 prefix for the configured route.
6. In the **Prefix Length** field, specify the IPv6 prefix length for the configured route.
7. In the **Next Hop IPv6 Address Type** list, select one of the following options:
   - Global IPv6 Address.
   - **Link-Local** IPv6 address. If the next hop IPv6 address specified is a link-local IPv6 address, then specify the interface for the link-local IPv6 next hop address.
   - **Static-Reject**. Select **Static-Reject** to create a static-reject route for a destination prefix. No next hop address is specified in that case.
8. Enter the **Next Hop IPv6 Address** for the configured route.
9. Select from the **Interface** list to specify in unit/slot/port format, the link-local IPv6 next hop address.

   This field is enabled only if Link-Local is selected.
10. Specify the route **Preference** of the configured route.
11. Click the **Add** button.

    The route is added.

View the IPv6 Route Table

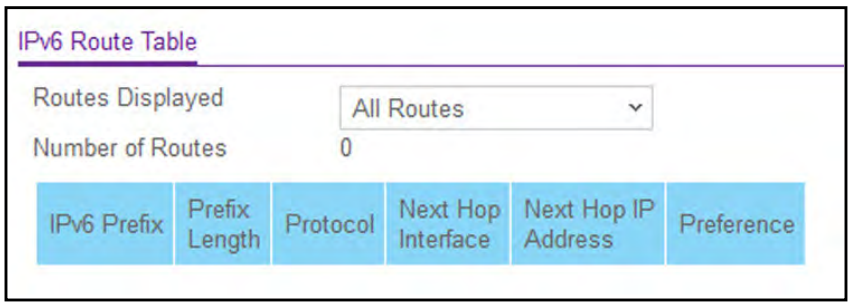
To view the IPv6 route table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 > Advanced > Route Table**.



5. In the **Routes Displayed** field, select which routes to display from the following list:
   - **All Routes**. Show all active IPv6 routes.
   - **Best Routes Only**. Show only the best active routes.
   - **Configured Routes Only**. Show the routes configured by the user.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 118. IPv6 Advanced Route Table

Field	Description
Number of Routes	The total number of active routes in the route table.
IPv6 Prefix	The network prefix for the active route.
Prefix Length	The prefix length for the active route.
Protocol	The type of protocol for the active route.
Next Hop Interface	The interface over which the route is active. For a reject route, the next hop would be a *Null0* interface.

Table 118. IPv6 Advanced Route Table (continued)

Field	Description
Next Hop IP Address	The next hop IPv6 address for the active route.
Preference	The route preference of the configured route.

Configure IPv6 Route Preferences

Use this page to configure the default preference for each protocol. These values are arbitrary values in the range of 1 to 255 and are independent of route metrics. Most routing protocols use a route metric to determine the shortest path known to the protocol, independent of any other protocol. The best route to a destination is chosen by selecting the route with the lowest preference value. When there are multiple routes to a destination, the preference values are used to determine the preferred route. If there is still a tie, the route with the best route metric is chosen. To avoid problems with mismatched metrics you must configure different preference values for each of the protocols.

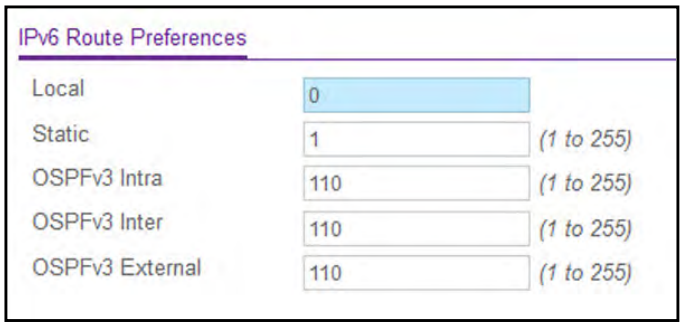
Configure the IPv6 route preferences:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 > Advanced > Route Preference**.



5. In the **Static** field, specify the static route preference value for the router.

   The range is 1 to 255. The default value is 1.
6. In the **OSPFv3 Intra** field, specify the OSPFv3 intra route preference value in the router.

   The range is 1 to 255. The default value is 110.

7. In the **OSPFv3 Inter** field, specify the OSPFv3 inter route preference value in the router.

   The range is 1 to 255. The default value is 110.

8. In the **OSPFv3 External** field, specify the OSPFv3 external route preference value in the router.

   The range is 1 to 255. The default value is 110.

9. Click the **Apply** button.

   Your settings are saved.

   The **Local** field displays the local preference.

Configure IPv6 Tunnels

You can create, configure, and delete tunnels.

To configure an IPv6 tunnel:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > IPv6 > Advanced > Tunnel Configuration**.

5. In the **Tunnel ID** field, select from the list of available tunnel IDs.
6. In the **Mode** list, select a supported mode:
   - 6-in-4-configured
   - 6-to-4
7. Select the **IPv6 Mode** from the list.
8. **Enable** IPv6 on this interface using the IPv6 address.

   This option is configurable only until you specify an explicit IPv6 address.

9. From the **IPv6 Unreachables** list, select to **Enable** or **Disable**.

This specifies the mode of sending ICMPv6 Destination Unreachables on this interface. If you select Disable, then this interface does not send ICMPv6 destination unreachables. By default IPv6 destination unreachables mode is enabled.

10. In the **IPv6 Address/Prefix Length** field, enter a configured IPv6 address for the selected interface.

    The address must be entered in the format prefix/length.

11. From the **EUI64** list, select to **Enable** or **Disable** the 64-bit extended unique identifier (EUI-64).

    For 6to4 tunnels, configure the IPv6 address with first 48-bits in the format 2002:tunnel-source-IPv4-address::/48.

12. Specify the desired **Source Address** for this tunnel.

    This value must be entered in dotted-decimal notation.

13. Select the **Source Interface** for this tunnel.

    The address associated with the selected interface is used as the source address.

14. Enter the **Destination Address** for this tunnel in dotted-decimal notation.
15. Click the **Add** button.

    The tunnel is added.

16. Click the **Apply** button.

    Your settings are saved.

    The **Interface Link Status** field indicates whether the tunnel interface is up or down.

Manage VLANs

You can configure the switch software so that some ports support VLANs and other ports support routing. You can also configure the software to allow traffic on a VLAN to be treated as if the VLAN were a router port.

When a port is enabled for bridging (default) rather than routing, all normal bridge processing is performed for an inbound packet, which is then associated with a VLAN. Its MAC destination address (MAC DA) and VLAN ID are used to search the MAC address table. If routing is enabled for the VLAN, and the MAC DA of an inbound unicast packet is that of the internal bridge-router interface, the packet is routed. An inbound multicast packet is forwarded to all ports in the VLAN, plus the internal bridge-router interface, if it was received on a routed VLAN.

Since a port can be configured to belong to more than one VLAN, VLAN routing might be enabled for all of the VLANs on the port, or for a subset. VLAN routing can be used to allow more than one physical port to reside on the same subnet. It could also be used when a VLAN spans multiple physical networks, or when additional segmentation or security is required. This section shows how to configure the NETGEAR switch to support VLAN

routing. A port can be either a VLAN port or a router port, but not both. However, a VLAN port can be part of a VLAN that is a router port.

Use the VLAN Static Routing Wizard

The VLAN Static Routing Wizard creates a VLAN, adds selected ports to the VLAN. The VLAN Static Routing Wizard gives you the option to add the selected ports as a link aggregation (LAG). The Wizard does the following:

- Creates a VLAN and generates a unique name for VLAN.
- Adds selected ports to the newly created VLAN and removes selected ports from the default VLAN.
- Creates a LAG, add selected ports to a LAG, then adds a LAG to the newly created VLAN.
- Enables tagging on selected ports if the port is in another VLAN. Disables tagging if a selected port does NOT exist in another VLAN.
- Excludes ports NOT selected from the VLAN.
- Enables routing on the VLAN using the IP address and subnet mask entered.

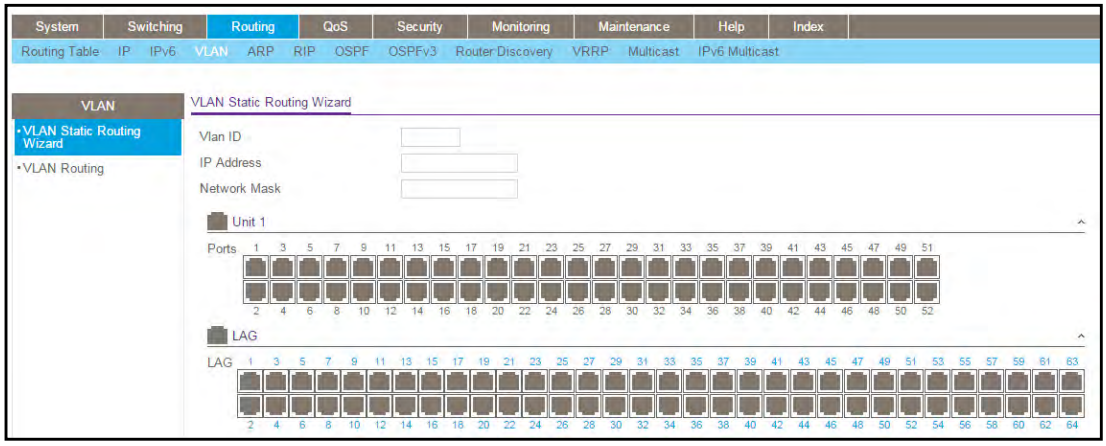
To use the VLAN Static Routing Wizard:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > VLAN > VLAN Static Routing Wizard**.



5. Use **VLAN ID** to specify the VLAN identifier (VID) associated with this VLAN.

   The range of the VLAN ID is 1 to 4093.

6. Use **Ports** to display selectable physical ports and LAGs (if any).

   Selected ports are added to the routing VLAN. Each port has three modes:

   - **T (Tagged)**. Select the ports on which all frames transmitted for this VLAN are tagged. The ports that are selected are included in the VLAN.
   - **U (Untagged)**. Select the ports on which all frames transmitted for this VLAN are untagged. The ports that are selected are included in the VLAN.
   - **BLANK(Autodetect)**. Select the ports that can be dynamically registered in this VLAN through GVRP. This selection has the effect of excluding a port from the selected VLAN.

7. Use the **LAG Enabled** option to add selected ports to VLAN as a LAG.

   The default is No.

8. Use **IP Address** to define the IP address of the VLAN interface.
9. Use **Network Mask** to define the subnet mask of the VLAN interface.
10. Click the **Apply** button.

    Your settings are saved.

Configure VLAN Routing

To configure VLAN routing:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > VLAN > VLAN Routing**.

5. Select the **VLAN ID**.

This field displays the IDs of all the VLANs configured on this switch.

6. Use **IP Address** to enter the IP address to be configured for the VLAN routing interface.
7. Use **Subnet Mask** to enter the subnet mask to be configured for the VLAN routing interface.
8. Click the **Add** button.

   The VLAN routing interface is added for the selected VLAN ID.

The following table describes the nonconfigurable information displayed on the page.

Table 119. VLAN Routing Configuration

Field	Description
Port	The interface assigned to the VLAN for routing.
MAC Address	The MAC Address assigned to the VLAN routing interface

Configure Address Resolution Protocol

The Address Resolution Protocol (ARP) associates a Layer 2 MAC address with a Layer 3 IPv4 address. The switch software features both dynamic and manual ARP configuration. With manual ARP configuration, you can statically add entries into the ARP table.

ARP is a necessary part of the Internet Protocol (IP) and is used to translate an IP address to a media (MAC) address, defined by a local area network (LAN) such as Ethernet. A station needing to send an IP packet must learn the MAC address of the IP destination, or of the next hop router, if the destination is not on the same subnet. This is achieved by broadcasting an ARP request packet, to which the intended recipient responds by unicasting an ARP reply containing its MAC address. Once learned, the MAC address is used in the destination address field of the Layer 2 header prepended to the IP packet.

The ARP cache is a table maintained locally in each station on a network. ARP cache entries are learned by examining the source information in the ARP packet payload fields, regardless of whether it is an ARP request or response. Thus, when an ARP request is broadcast to all stations on a LAN segment or virtual LAN (VLAN), each recipient has the opportunity to store the sender’s IP and MAC address in its respective ARP cache. The ARP response, being unicast, is normally seen only by the requestor, who stores the sender information in its ARP cache. Newer information always replaces existing content in the ARP cache.

The number of supported ARP entries is platform dependent.

Devices can be moved in a network, which means that the IP address that was at one time associated with a certain MAC address is now found using a different MAC, or it disappeared from the network altogether (for example, it was reconfigured, disconnected, or powered off). This leads to stale information in the ARP cache unless entries are updated in reaction to new information seen on the network, periodically refreshed to determine if an address still exists, or removed from the cache if the entry was identified as a sender of an ARP packet during the course of an ageout interval, usually specified through configuration.

Display the ARP Entries in the ARP Cache

Use this page to display ARP entries in the ARP cache. The table lists the remote connections most recently seen by this switch.

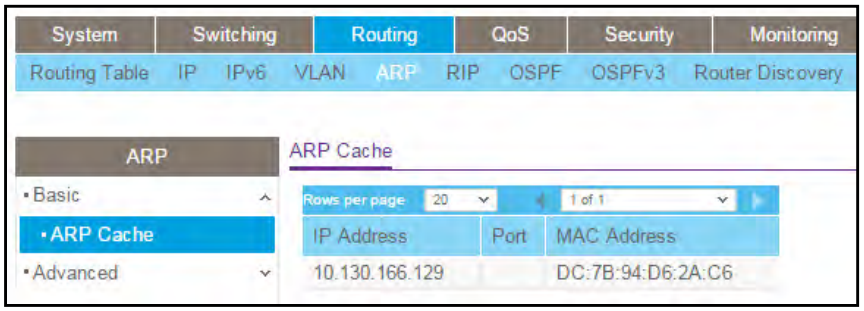
To display ARP entries in the ARP cache:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > ARP > Basic > ARP Cache**.



   The page displays the following information:

   - **IP Address.** Displays the IP address associated with the system's MAC address. This address must be the IP address of a device on a subnet attached to one of the switch's existing routing interfaces.
   - **Port**. Displays the associated unit/slot/port of the connection.
   - **MAC Address**. Displays the unicast MAC address of the device. The address is six 2-digit hexadecimal numbers separated by colons, for example, 00:06:29:32:81:40.

   The pagination navigation menu functions as follows:

   - **Rows per page**. Select how many table entries are displayed per page. Possible values are 20, 50, 100, 200, and All. If you select All, the browser might be slow to display the information.
   - **<**. Display the previous page of the table data entries.
   - **>**. Display the next page of the table data entries.
5. To refresh the page with the latest information on the switch, click the **Refresh** button.

Add an Entry to the ARP Table

You can add an entry to the Address Resolution Protocol (ARP) table.

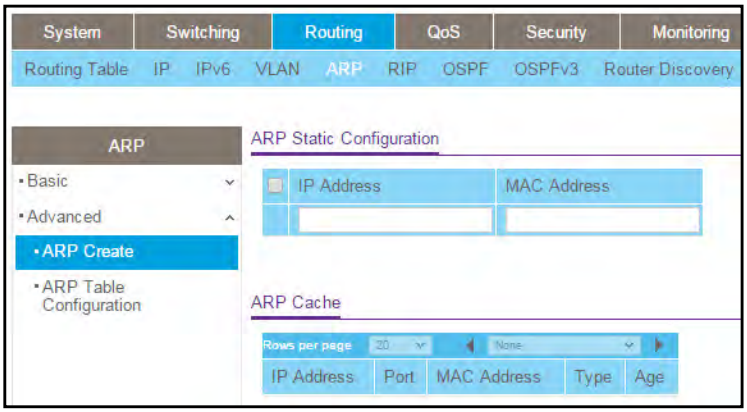
To add an entry to the ARP table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > ARP > Advanced > ARP Create**.



5. Use **IP Address** to enter the IP address to add.

   It must be the IP address of a device on a subnet attached to one of the switch's existing routing interfaces.
6. Use **MAC Address** to specify the unicast MAC address of the device.

   Enter the address as six 2-digit hexadecimal numbers separated by colons, for example, 00:06:29:32:81:40.
7. Click the **Add** button.

   The static ARP entry is added to the switch.
8. Click the **Apply** button.

   Your settings are saved.

The pagination navigation menu functions as follows:

- **Rows per page**. Select how many table entries are displayed per page. Possible values are 20, 50, 100, 200, and All. If you select All, the browser might be slow to display the information.
- **<**. Display the previous page of the table data entries.
- **>**. Display the next page of the table data entries.

The following table describes the nonconfigurable information displayed on the page.

Table 120. ARP Cache

Field	Description
IP Address	The IP address. It must be the IP address of a device on a subnet attached to one of the switch's existing routing interfaces.
Port	The associated unit/slot/port of the connection.
MAC Address	The unicast MAC address of the device. The address is six two-digit hexadecimal numbers separated by colons, for example 00:06:29:32:81:40.
Type	The type of ARP entry. Possible values are as follows: • **Local**. An ARP entry associated with one of the switch's routing interface's MAC addresses. • **Gateway**. A dynamic ARP entry whose IP address is that of a router. • **Static**. An ARP entry configured by the user. • **Dynamic**. An ARP entry that was learned by the router.
Age	Age since the entry was last refreshed in the ARP table (in seconds).

View or Configure the ARP Table

You can change the configuration parameters for the Address Resolution Protocol (ARP) table. You can also use this page to display the contents of the table.

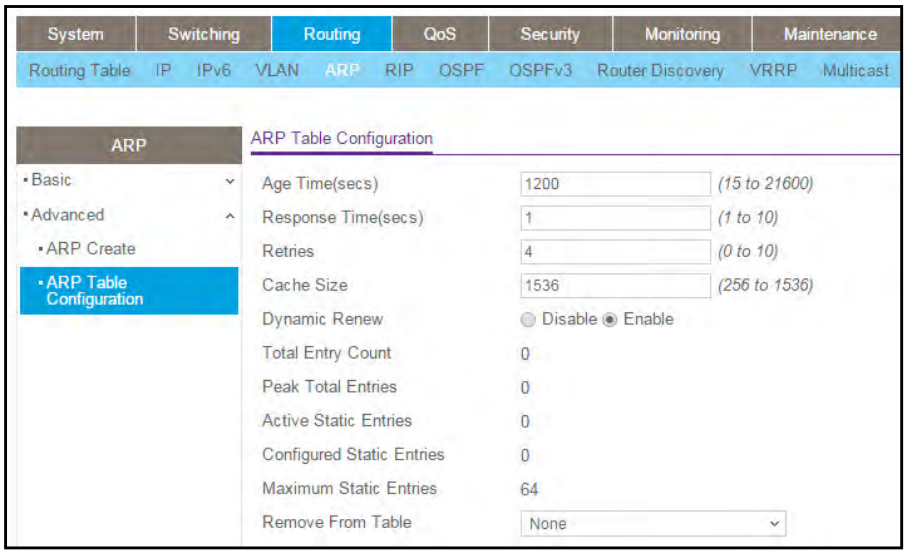
To configure the ARP table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > ARP > Advanced > ARP Table Configuration**.



5. Use **Age Time** to enter the amount of time, in seconds, that a dynamic ARP entry remains in the ARP table before aging out.

   The range is 15 to 21600 seconds. The default value for Age Time is 1200 seconds.

6. Use **Response Time** to enter the amount of time, in seconds that the device waits for an ARP response to an ARP request that it sends.

   The range for this field is 1 to 10 seconds. The default value is 1 second.

7. Use **Retries** to enter the maximum number of times an ARP request will be retried after an ARP response is not received.

   The number includes the initial ARP request. The range for this field is 0 to 10. The default value for Retries is 4.

8. Use **Cache Size** to specify the maximum number of entries allowed in the ARP table.

   This number includes all static and dynamic ARP entries.The range for this field is 256 to 1536. The default value for Cache Size is 1536.

9. When selected, the **Dynamic Renew option allows the** ARP component to automatically attempt to renew dynamic ARP entries when they age out.

   The default setting is Enable.

10. Use **Remove from Table** to remove certain entries from the ARP table.

    The choices listed specify the type of ARP entry to be deleted:

    - **All Dynamic Entries**
    - **All Dynamic and Gateway Entries**
    - **Specific Dynamic/Gateway Entry**. Selecting this allows the user to specify the required IP address.
    - **Specific Static Entry**. Selecting this allows the user to specify the required IP address.

- **None**. Selected if the user does not want to delete any entry from the ARP Table.
- **Remove IP Address**. This field displays only if you select **Specific Dynamic/Gateway Entry or Specific Static Entry** in the **Remove from Table** list. The **Remove IP Address** field allows you to enter the IP address against the entry that is to be removed from the ARP table.

11. Click the **Apply** button.

Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 121. ARP Table Configuration

Field	Description
Total Entry Count	Total number of entries in the ARP table.
Peak Total Entries	Highest value reached by Total Entry Count. This counter value is restarted whenever the ARP table Cache Size value is changed.
Active Static Entries	Total number of active static entries in the ARP table.
Configured Static Entries	Total number of configured static entries in the ARP table.
Maximum Static Entries	Maximum number of static entries that can be defined.

Configure RIP

Enable RIP

To enable RIP:

1. Launch a web browser.

2. In the address field of your web browser, enter the IP address of the switch.

The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > RIP > Basic > RIP Configuration**.

5. In the **RIP Admin Mode** field, select the **Enable** or **Disable** option.

   If you select **Enable**, RIP is activated for the switch. The default is Enable.

6. Click the **Apply** button.

   Your settings are saved.

Configure RIP Settings

To configure advanced RIP settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

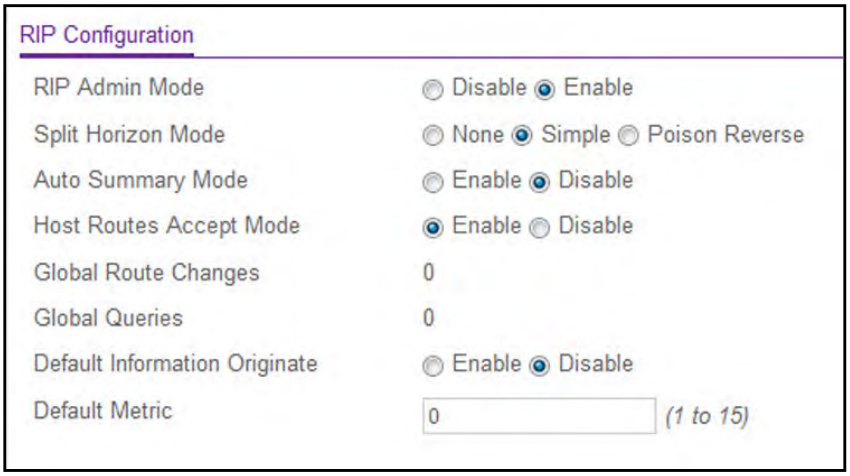
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > RIP > Advanced > RIP Configuration**.



5. Select the RIP Admin Mode **Disable** or **Enable** radio button.

   If you select **Enable**, RIP is activated for the switch. By default, RIP is enabled.

6. Select a **Split Horizon Mode** radio button:
   - **None**. No special processing for this case.
   - **Simple**. A route is not included in updates sent to the router from which it was learned. The default is Simple.
   - **Poison Reverse**. A route is included in updates sent to the router from which it was learned, but the metric is set to infinity.

   Split horizon is a technique for avoiding problems caused by including routes in updates sent to the router from which the route was originally learned
7. In the **Auto Summary Mode** field, select the **Enable** or **Disable** option.

   If you select **Enable**, groups of adjacent routes are summarized into single entries reduce the total number of entries. The default is Disable.
8. In the **Host Routes Accept Mode** field, select the **Enable** or **Disable** option.

   If you select Enable, the router accepts host routes. The default is Enable.
9. In the **Default Information Originate** field, select to **Enable** or **Disable** default route advertisement.
10. In the **Default Metric** field, specify a default value for the metric of redistributed routes.

    This field displays the default metric if one has already been set, or 0 if one was not configured earlier. The valid values are 1 to 15.
11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 122. RIP Advanced Configuration

Field	Description
Global Route Changes	The number of route changes made to the IP route database by RIP. This does not include the refresh of a route's age.
Global Queries	The number of responses sent to RIP queries from other systems.

Configure Advanced RIP Interface Settings

To configure advanced RIP interface settings:

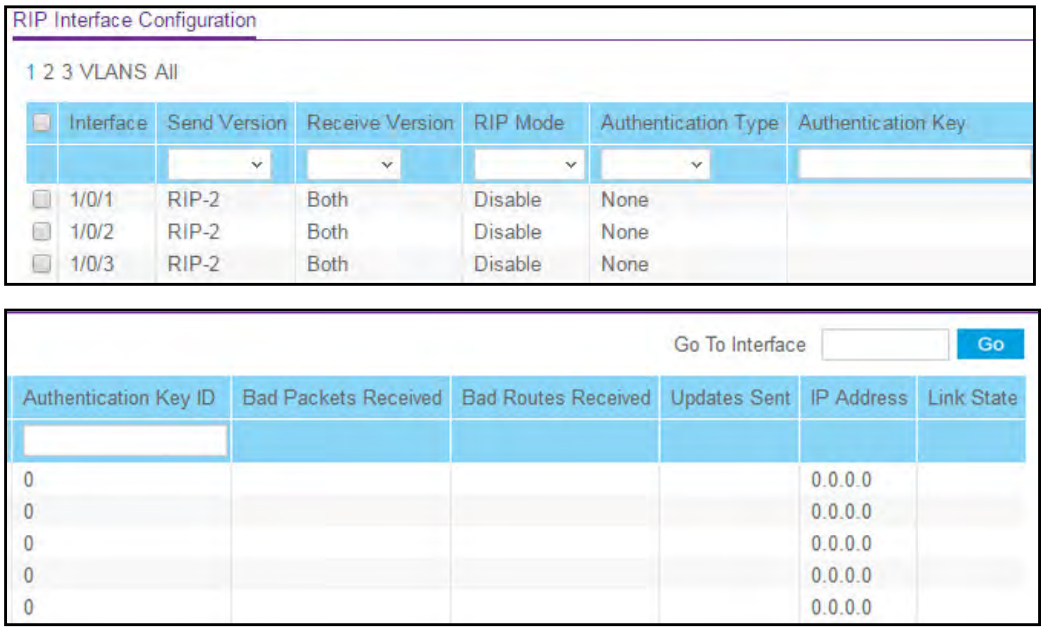
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > RIP > Advanced > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. From the **Send Version** list, select the version of RIP control packets that the interface will send.

   The value is one of the following:

   - **None**. No RIP control packets are sent.
   - **RIP-1**. Send RIP version 1 formatted packets through broadcast.
   - **RIP-1c**. RIP version 1–compatibility mode. Send RIP version 2–formatted packets through broadcast.
   - **RIP-2**. Send RIP version 2 packets using multicast. The default is RIP-2.
7. From the **Receive Version** list, select which RIP control packets the interface accepts.

   The value is one of the following:

   - **RIP-1**. Accept only RIP version 1–formatted packets.
   - **RIP-2**. Accept only RIP version 2–formatted packets.
   - **Both**. Accept packets in either format. The default is Both.
   - **None**. No RIP control packets are accepted.

8. Select **Enable** or **Disable** from the **RIP Mode** list.

   Before you enable RIP version 1 or version 1c on an interface, you must first enable network directed broadcast mode on the corresponding interface. The default value is Disable.

9. Select the **Authentication Type** from the list.

   The types are as follows:

   - **None**. This is the initial interface state. If you select this option, no authentication protocols are run.
   - **Simple**. If you select **Simple**, you are prompted to enter an authentication key. This key is included, in the clear, in the RIP header of all packets sent on the network. All routers on the network must be configured with the same key.
   - **Encrypt**. If you select **Encrypt**, you are prompted to enter both an authentication key and an authentication ID. Encryption uses the MD5 Message-Digest algorithm. All routers on the network must be configured with the same key and ID.

10. Enter the RIP **Authentication Key** for the specified interface.

    If you selected **Authentication Type None**, you are not prompted to enter a key. If you selected **Simple** or **Encrypt**, the key can be up to 16 octets long. The key value is displayed only if you are logged on with read/write privileges.

11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 123. RIP Advanced Interface Configuration

Field	Description
Bad Packets Received	The number of RIP response packets received by the RIP process that were subsequently discarded for any reason.
Bad Routes Received	The number of routes in valid RIP packets that were ignored for any reason (for example, unknown address family, or invalid metric).
Updates Sent	The number of triggered RIP updates actually sent on this interface. This explicitly does *not* include full updates sent containing new information.
IP Address	The IP address of the router interface.
Link State	Indicates whether the RIP interface is up or down.

Manage Route Redistribution

Use this page to configure the RIP route redistribution parameters. The allowable values for each field are displayed next to the field. If any invalid values are entered, an alert message is displayed with the list of all the valid values.

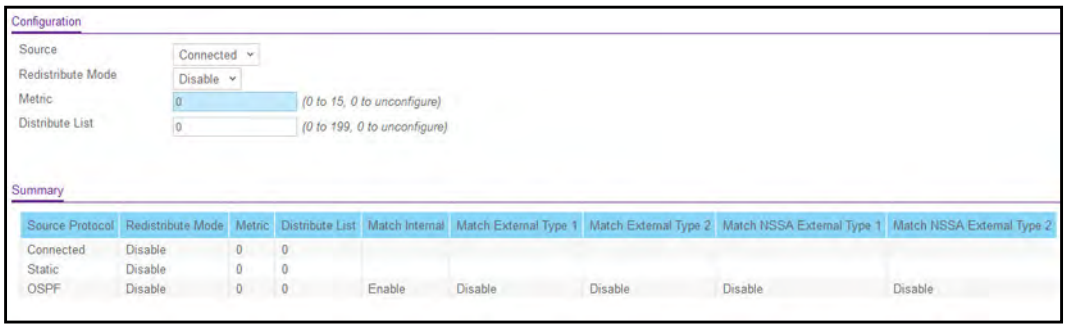
To configure advanced RIP route redistribution settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > RIP > Advanced > Route Redistribution**.



   The **Source** list is populated by only those source routes that are already configured for redistribution by RIP. This allows you to configure another source route among the available source routes.
5. In the Source list, select a value.

   The valid values are as follows:

   - Connected
   - Static
   - OSPF
6. From the **Redistribute Mode** list, select to **Enable** or **Disable** RIP redistribute mode.

   The default is Disable.
7. Enter the **Metric** of redistributed routes for the given source route.

   The valid values are is 0 to 15; 0 means unconfigure.
8. Use the **Distribute List** field to set the access list that filters the routes to be redistributed by the destination protocol.

   Only permitted routes are redistributed. If this command refers to a non-existent access list, all routes are permitted. The valid values for Access List IDs are 0 to 199. When used for route filtering, the only fields in an access list that get used are as follows:

   - Source IP address and netmask

- Destination IP address and netmask
- Action (permit or deny)

All other fields (such as Source and Destination Port, Precedence, Tos, and so on) are ignored.

The source IP address is compared to the destination IP address of the route. The source IP netmask in the access list rule is treated as a wildcard mask, indicating which bits in the source IP address must match the destination address of the route.

Note: A 1 in the mask indicates a *do not care* in the corresponding address bit.

When an access list rule includes a destination IP address and netmask (an extended access list), the destination IP address is compared to the network mask of the destination of the route. The destination netmask in the access list serves as a wildcard mask, indicating which bits in the route's destination mask are significant for the filtering operation.

9. Click the **Apply** button.

Your settings are saved.

The following table describes the RIP Route Redistribution nonconfigurable data that is displayed.

Table 124. RIP Route Redistribution Summary

Field	Description
Source Protocol	The source route to be redistributed by RIP. The valid values are as follows: • Connected • Static • OSPF
Redistribute Mode	The route redistribution mode for a particular source protocol. By default this is disabled.
Metric	The metric of redistributed routes for the given source route. The field displays 0 when the metric is not configured.
Distribute List	The access list that filters the routes to be redistributed by the destination protocol. The field displays 0 when not configured.
The following list of redistributed routes is valid when **OSPF** is selected as source. The list can include one or more of:	
Match Internal	Sets internal OSPF routes to be redistributed.
Match External Type 1	Sets external type 1 OSPF routes to be redistributed.
Match External Type 2	Sets external type 2 OSPF routes to be redistributed.
Match NSSA External Type 1	Sets NSSA external type 1 OSPF routes to be redistributed.
Match NSSA External Type 2	Sets NSSA external type 2 OSPF routes to be redistributed.

Configure Router Discovery

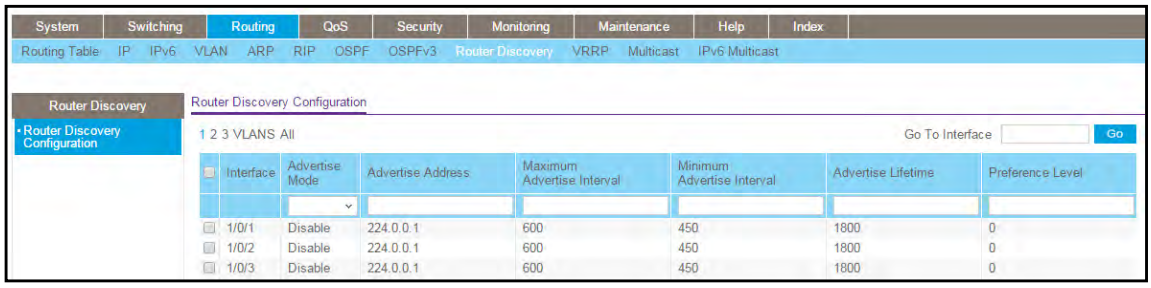
To configure router discovery:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Router Discovery > Router Discovery Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. Use **Advertise Mode** to select **Enable** or **Disable**.

   If you select **Enable**, router advertisements are transmitted from the selected interface.
7. Use **Advertise Address** to select **Enable** or **Disable**.

   If you select **Enable**, router advertisements are transmitted from the selected interface.
8. Use **Maximum Advertise Interval** to enter the maximum time (in seconds) allowed between router advertisements sent from the interface.
9. Use **Minimum Advertise Interval** to enter the minimum time (in seconds) allowed between router advertisements sent from the interface.

   The value must be in the range of 3 to 1800. The default value is 450.000000.
10. Use **Advertise Lifetime** to enter the value (in seconds) to be used as the lifetime field in router advertisements sent from the interface.

This is the maximum length of time that the advertised addresses are to be considered as valid router addresses by hosts.

11. Use **Preference Level** to specify the preference level of the router as a default router relative to other routers on the same subnet.

    Higher numbered addresses are preferred. You must enter an integer.

12. Click the **Apply** button.

    Your settings are saved.

Configure Virtual Router Redundancy Protocol

Configure Global VRRP Settings

To configure the global VRRP settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

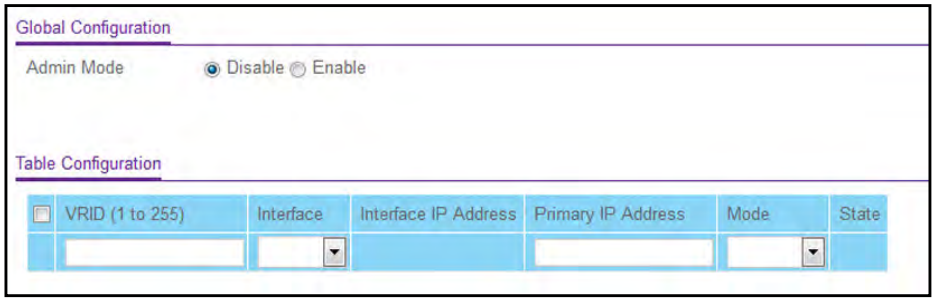
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > VRRP > Basic > VRRP Configuration**.



5. In the Global Configuration **Admin Mode** field, set the administrative status of VRRP in the router by selecting the **Enable** or **Disable** radio button.

   By default, VRRP is disabled.

6. Select the VRID.

The **VRID** field is configurable only if you are creating a new virtual router.

The valid values are 1 to 255.

7. Select the unit/slot/port for the new virtual router from the **Interface** menu.
8. In the **Primary IP Address** field, enter the primary IP address of the virtual router.
9. From the **Mode** menu, select the **Active** or **Inactive** mode for the new virtual router.
10. Click the **Add** button.

    The virtual router is added to the switch configuration.
11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 125. VRRP Global Configuration

Field	Description
Interface IP Address	Indicates the IP address associated with the selected interface.
State	The current state of the virtual router. Possible values are as follows: • Initialize • Master • Backup

Configure Advanced VRRP Settings

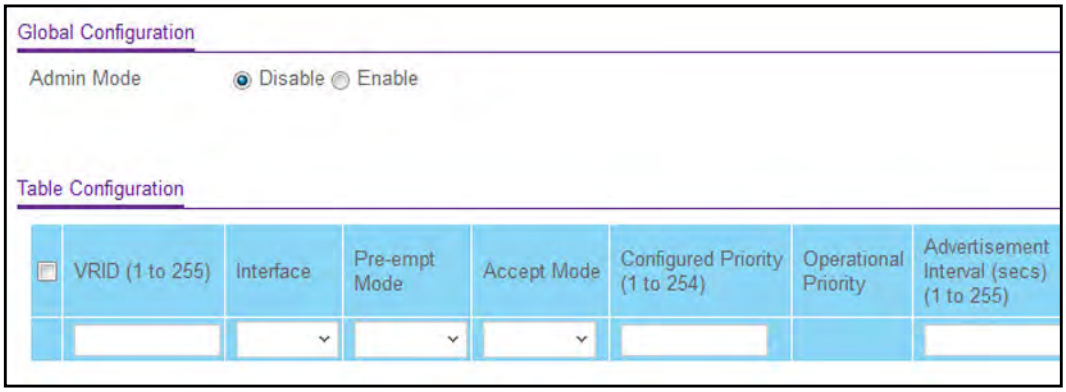
To configure the advanced VRRP global settings.

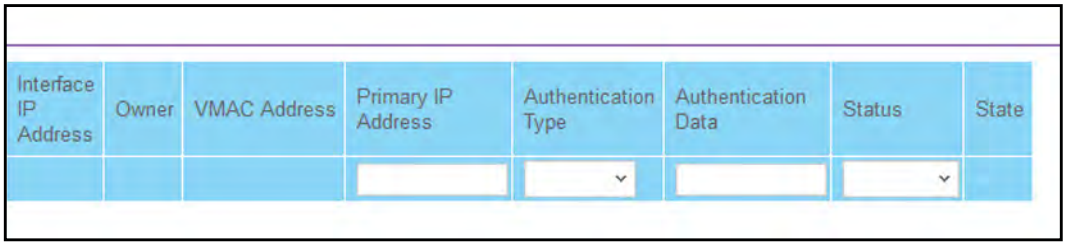
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > VRRP > Advanced > VRRP Configuration**.





5. In the Global Configuration **Admin Mode** field, set the administrative status of VRRP in the router by selecting the **Enable** or **Disable** radio button.

   By default, VRRP is disabled.

6. Select the VRID.

   The **VRID** field is configurable only if you are creating a new virtual router.

   The valid values are 1 to 255.

7. Select the unit/slot/port for the new virtual router from the **Interface** menu.
8. In the **Pre-empt Mode** field, select the **Enable** or **Disable** option.

   If you select **Enable**, a backup router preempts the master router if it has a priority greater than the master virtual router's priority, provided the master is not the owner of the virtual router IP address. The default is Enable.

9. In the **Accept Mode** field, select the **Enable** or **Disable** option.

   If you select **Enable**, the VRRP master accepts all types of data packets addressed to IP addresses associated with the virtual router. If you select **Disable**, the VRRP master discards all types of data packets addressed to IP addresses associated with the virtual router, if it is not the IP address owner. The default is Disable.

10. In the **Configured Priority** field, enter the to be used by the VRRP router in the election for the master virtual router.

    The valid values are 1 to 254. If the virtual IP address is the same as the interface IP address, the priority gets set to 254, no matter what you enter.

11. In the **Advertisement Interval** field, enter the time, in seconds, between the transmission of advertisement packets by this virtual router.

Enter a number from 1 to 255. The default value is 1 second.

12. In the **Primary IP Address** field, enter the IP address that is associated with the virtual router.

    The default is 0.0.0.0.

13. From the **Authentication Type** menu, select the type of authentication for the virtual router.

    The options are as follows:

    - **0-None**. No authentication is performed. The default is None.
    - **1-Simple**. Authentication is performed using a text password.

14. From the **Status** menu, select the **Active** or **Inactive** option to start or stop the operation of the virtual router.

    The default is inactive.

15. Click the **Add** button.

    The virtual router is added to the switch configuration.

16. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 126. Advanced VRRP Global Configuration

Field	Description
Operational Priority	Indicates the priority to be used for the virtual router master election process. Higher values imply higher priority. • A priority of 0 is sent by the master router to indicate that this router has ceased to participate in VRRP and a backup virtual router transitions to become a new master. • A priority of 255 is used for the router that owns the associated IP addresses.
Interface IP Address	Indicates the IP address associated with the selected interface.
Owner	Set to **True** if the virtual IP address and the interface IP address are the same, otherwise set to **False**. If this parameter is set to True, the virtual router is the owner of the virtual IP address, and always wins an election for master router when it is active.
VMAC Address	The virtual MAC address associated with the virtual router, composed of a 24-bit organizationally unique identifier, the 16-bit constant identifying the VRRP address block and the 8-bit VRID.
State	The current state of the virtual router. Possible values are as follows: • Initialize • Master • Backup

Configure an Advanced VRRP Secondary IP Address

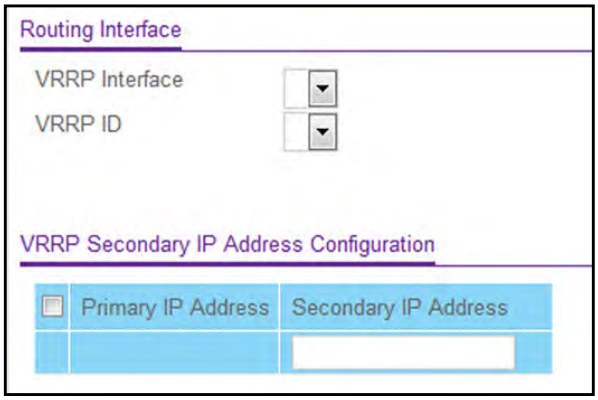
To configure the advanced VRRP secondary IP address settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > VRRP > Advanced > VRRP Secondary IP Address Configuration**.



5. From the **VRRP Interface** and **VRRP ID** menus, select a virtual router.

   The virtual routers are listed by interface number and VRRP ID.
6. In the **Secondary IP Address** field, enter the IP address for the interface.

   This address must be a member of one of the subnets currently configured on the interface. This value is read-only once configured.
7. Click the **Add** button.

   The secondary IP address is added to the selected VRRP interface.
8. Click the **Apply** button.

   Your settings are saved.

   The Primary IP Address field displays the primary IP address of the virtual router.

Configure an Advanced VRRP Tracking Interface

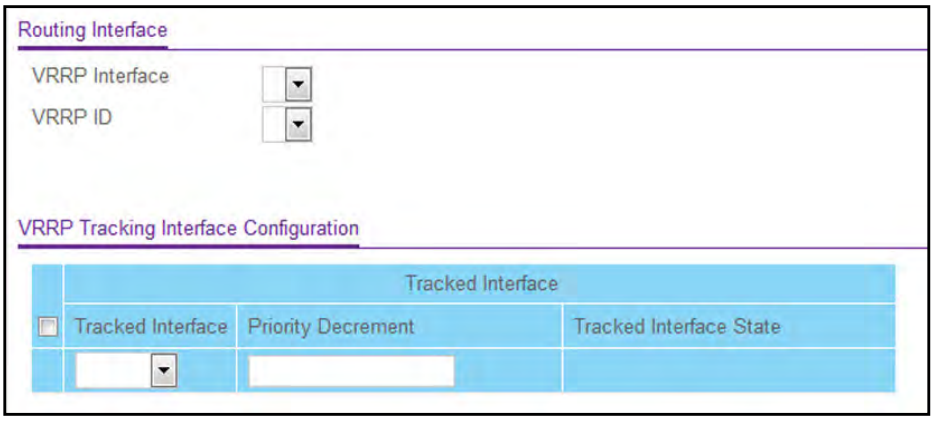
To configure an advanced VRRP tracking interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > VRRP > Advanced > VRRP Tracking Configuration**.



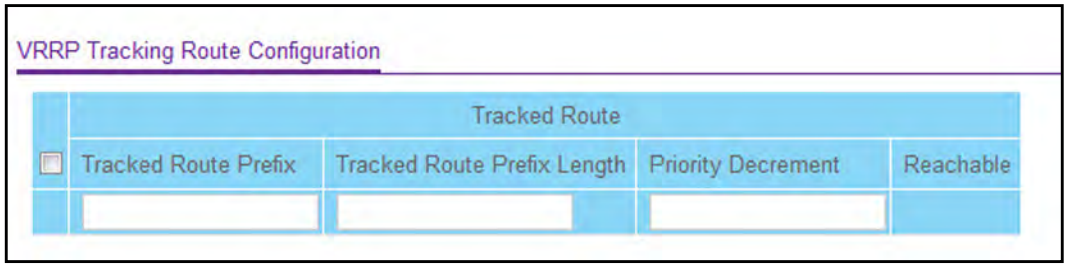
5. From the **VRRP Interface** and **VRRP ID** menus, select a virtual router.

   The virtual routers are listed by interface number and VRRP ID.
6. From the **Tracked Interface** menu, select a routing interface.

   The menu lists all routing interfaces that are not yet tracked for the VRRP ID and interface configuration. The menu does not list the loopback interfaces and tunnels that could not be tracked.
7. In the **Priority Decrement** field, enter priority decrement value the for the tracked interface.

   The valid range is 1 to 254. The default value is 10.

   The nonconfigurable Tracked Interface State field displays the state of the tracked interface.



8. In the **Tracked Route Prefix** field, enter the prefix of the route.
9. In the **Tracked Route Prefix Length** field, enter the prefix length of the route.
10. In the **Priority Decrement** field, enter priority decrement value the for the route.

    The valid range is 1 to 254. The default value is 10.

    The nonconfigurable Reachable field displays the reachability of the tracked route.
11. Click the **Add** button.

    The traced interface or tracked route is added to the VRRP.
12. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 127. Advanced VRRP Tracking Configuration

Field	Description
Tracked Interface State	The state of the tracked interface.
Reachable	The reachability of the tracked route.

View Advanced VRRP Statistics

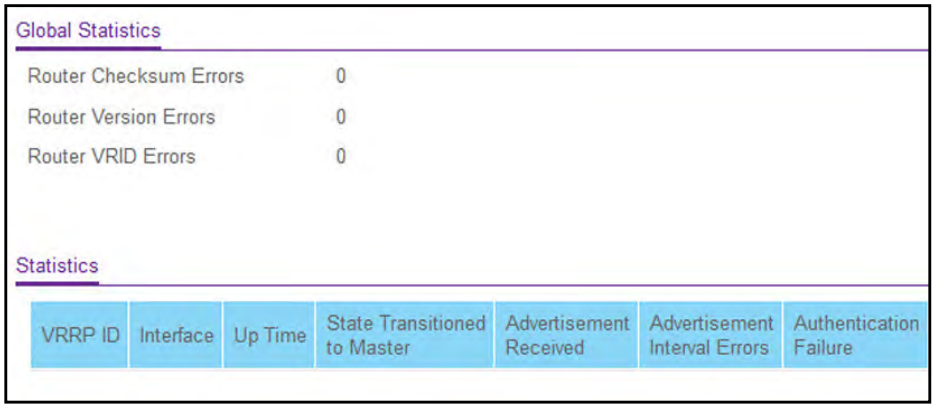
To view advanced VRRP statistics:

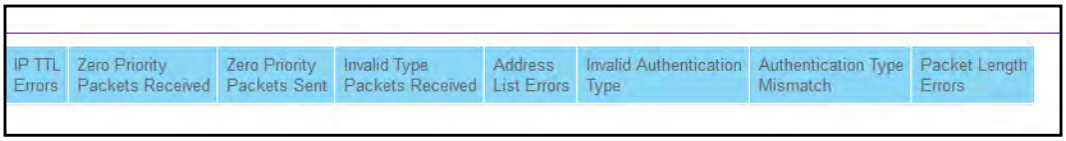
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > VRRP > Advanced > VRRP Statistics**.





5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 128. Advanced VRRP Statistics

Field	Description
Global Statistics	
Router Checksum Errors	The total number of VRRP packets received with an invalid VRRP checksum value.
Router Version Errors	The total number of VRRP packets received with an unknown or unsupported version number.
Router VRID Errors	The total number of VRRP packets received with an invalid VRID for this virtual router.
Statistics	
VRRP ID	The VRID for the selected virtual router.
Interface	The unit/slot/port for the selected virtual router.
Up Time	The time, in days, hours, minutes and seconds, that elapsed since the virtual router transitioned to the initialized state.
State Transitioned to Master	The total number of times that this virtual router's state transitioned to Master.
Advertisement Received	The total number of VRRP advertisements received by this virtual router.
Advertisement Interval Errors	The total number of VRRP advertisement packets received for which the advertisement interval was different from the one configured for the local virtual router.

Table 128. Advanced VRRP Statistics (continued)

Field	Description
Authentication Failure	The total number of VRRP packets received that did not pass the authentication check.
IP TTL Errors	The total number of VRRP packets received by the virtual router with IP Time-To-Live (TTL) not equal to 255.
Zero Priority Packets Received	The total number of VRRP packets received by the virtual router with a priority of 0.
Zero Priority Packets Sent	The total number of VRRP packets sent by the virtual router with a priority of 0.
Invalid Type Packets Received	The number of VRRP packets received by the virtual router with an invalid value in the Type field.
Address List Errors	The total number of packets received for which the address list does not match the locally configured list for the virtual router.
Invalid Authentication Type	The total number of packets received with an unknown authentication type.
Authentication Type Mismatch	The total number of packets received with an authentication type different from the locally configured authentication method.
Packet Length Errors	The total number of packets received with a packet length less than the length of the VRRP header.

6

Configure OSPF and OSPFv3

This chapter covers the following topics:

- Configure OSPF
- Configure OSPFv3

Configure OSPF

Configure Basic OSPF Settings

To configure basic OSPF settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPF > Basic > OSPF Configuration**.

5. Select the Admin Mode **Disable** or **Enable** radio button.

   If you select Enable, OSPF is activated for the switch. By default, OSPF is enabled. You must configure a router ID before OSPF can become operational. Use the IP Configuration page to configure a router ID or issue the **`config router id`** CLI command. For more information, see Configure the Routing IP Settings on page 302.

   The **Router ID** displays the 32-bit integer in dotted-decimal format that uniquely identifies the router within the autonomous system (AS).

   To change the router ID, you must first disable OSPF. After you set the new router ID, you must reenable OSPF for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.
6. Click the **Apply** button.

   Your settings are saved.

Configure the OSPF Default Route Advertise Settings

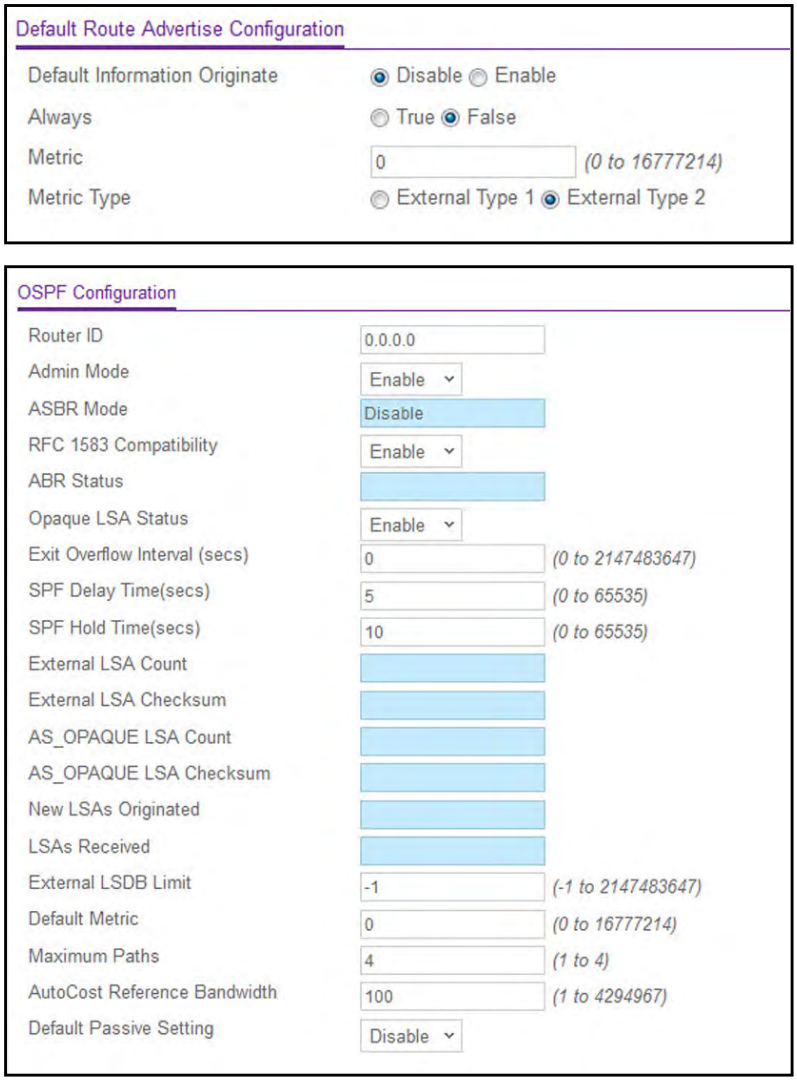
To configure default route advertise settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPF > Advanced > OSPF Configuration**.



5. In the **Default Information Originate** field, select the **Enable** or **Disable** option.

   If you select Enable, OSPF originates an external LSA advertising a default route (0.0.0.0/0.0.0.0). Default Information Originate is disabled by default.

6. In the **Always** field, select **True** or **False**.

   If **Default Information Originate** is enabled, but the **Always** option is False, OSPF originates a default route only if a default route is already in the router's routing table.

   Set **Always** to **True** to force OSPF to originate a default route regardless of whether a default route already exists. The default is False.

7. In the **Metric** field, specify the metric of the default route.

   The valid values range from 0 to 16777214. The default is 0.

8. In the **Metric Type** field, select the OSPF metric type of the default route.

   Two types are supported: **External Type 1** and **External Type 2**. The default is External Type 2.

9. Click the **Apply** button.

   Your settings are saved.

Configure OSPF Settings

To configure the OSPF settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

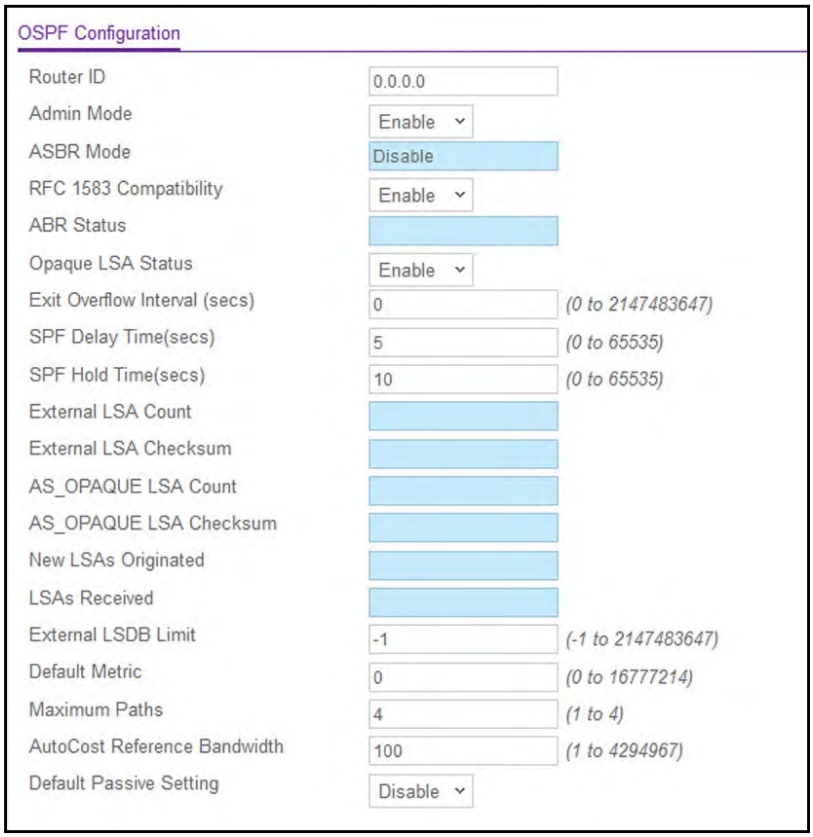
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPF > Advanced > OSPF Configuration**.



5. In the **Router ID** field, enter the 32-bit integer in dotted-decimal format that uniquely identifies the router within the autonomous system (AS).

   To change the router ID, you must first disable OSPF. After you set the new router ID, you must reenable OSPF for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.

6. In the **Admin Mode** field, select **Enable** or **Disable**.

   If you select **Enable**, OSPF is activated for the switch. The default value is Enable. You must configure a router ID before OSPF can become operational. For more information, see Configure the Routing IP Settings on page 302.

7. In the **RFC 1583 Compatibility** field, select **Enable** or **Disable**.

   This specifies the preference rules that are used when choosing among multiple AS-external-LSAs advertising the same destination. If you select **Enable**, the preference rules are those defined in Section 16.4.1 of the OSPF-2 standard (RFC 2328), which prevents routing loops when AS-external-LSAs for the same destination originated from different areas. The default value is Enable. All routers in the OSPF domain must be configured the same. If all OSPF routers are capable of operating according to RFC 2328, **RFC 1583 Compatibility** must be disabled.

8. Set the **Opaque LSA Status** to **Enable** if OSPF will store and flood opaque LSAs.

An opaque LSA is used for flooding user-defined information within an OSPF router domain.

9. When the number of nondefault external LSAs exceeds a configured limit, the router enters an overflow state as defined in RFC 1765.

   Use the **Exit Overflow Interval** field to specify how long in seconds OSPF must wait before attempting to leave overflow state. In overflow state, OSPF cannot originate nondefault external LSAs. If the Exit Overflow Interval is 0, OSPF does not leave the overflow state until it is disabled and reenabled. The range is 0 to 2,147,483,647 seconds. The default is 0.

10. Configure the **SPF Delay Time**.

    This is the number of seconds from when OSPF receives a topology change to the start of the next SPF calculation. Delay Time is an integer from 0 to 65535 seconds. The default is 5 seconds. A value of 0 means that there is no delay; that is, the SPF calculation is started upon a topology change.

11. Configure the **SPF Hold Time**.

    This is the minimum time in seconds between two consecutive SPF calculations. The range is 0 to 65,535 seconds. The default time is 10 seconds. A value of 0 means that there is no delay; that is, two SPF calculations can be done, one immediately after the other.

12. Use the **External LSDB Limit** field to set the number of the external LSDB limit for OSPF.

    If the value is –1, then there is no limit. When the number of nondefault AS-external-LSAs in a router's link state database reaches the external LSDB limit, the router enters overflow state. The router never holds more than the external LSDB limit none-default AS-external-LSAs in the database. The external LSDB limit must be set identically in all routers attached to the OSPF backbone and/or any regular OSPF area. The range for the External LSDB Limit field is –1 to 2147483647. The default value is –1.

13. Use the **Default Metric** field to set a default for the metric of redistributed routes.

    This field is blank if a default metric was not configured. The range of valid values is 1 to 16777214. The default value is 0.

14. Use the **Maximum Paths** field to set the number of paths that OSPF can report for a given destination.

    The range of valid values is 1 to 16. The default value is 4.

15. Configure the **AutoCost Reference Bandwidth** to control how OSPF calculates link cost.

    Specify the reference bandwidth in megabits per second. Unless a link cost is configured, the link cost is computed by dividing the reference bandwidth by the interface bandwidth. The range is 1 to 4294967. The default is 100.

16. In the **Default Passive Setting** field, select **Enable** or **Disable** from the list to configure the global passive mode setting for all OSPF interfaces.

Configuring this field overwrites any present interface level passive mode setting. OSPF does not form adjacencies on passive interfaces, but does advertise attached networks as stub networks. The default is Disabled.

17. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 129. OSPF Configuration

Field	Description
ASBR Mode	The router is an autonomous system boundary router if it is configured to redistribute routes from another protocol, or if it is configured to originate an external LSA advertising the default route.
ABR Status	The router is an autonomous system boundary router if it is configured to redistribute routes from another protocol, or if it is configured to originate an external LSA advertising the default route.
External LSA Count	The number of external (LS type 5) LSAs (link state advertisements) in the link state database.
External LSA Checksum	The sum of the LS checksums of the external LSAs (link state advertisements) contained in the link state database. This sum can be used to determine if there was a change in a router's link state database, and to compare the link state databases of two routers. This value is in hexadecimal.
AS_OPAQUE LSA Count	The number of opaque LSAs with domain-wide flooding scope.
AS_OPAQUE LSA Checksum	The sum of the LS checksums of the opaque LSAs with domain wide flooding scope. This sum can be used to determine if there was a change in a router's link state database, and to compare the link state databases of two routers. This value is in hexadecimal.
New LSAs Originated	In any given OSPF area, a router originates several LSAs. Each router originates a router-LSA. If the router is also the designated router for any of the area's networks, it originates network LSAs for those networks. This value represents the number of LSAs originated by this router.
LSAs Received	The number of LSAs (link state advertisements) received that were determined to be new instantiations. This number does not include newer instantiations of self-originated LSAs.

Configure the OSPF Common Area ID

To add or delete an area ID:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

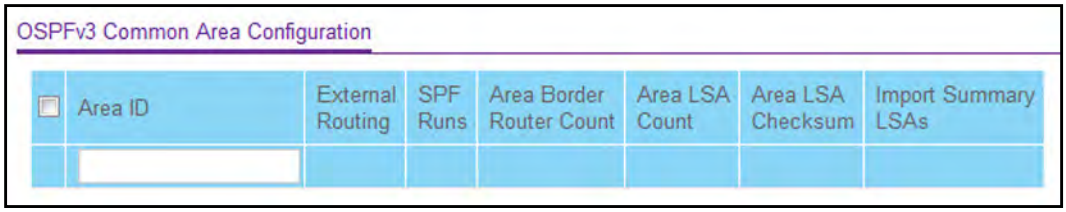
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPF > Advanced > Common Area Configuration**.



5. Enter the OSPF **Area ID**.

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.

6. Take one of the following actions:
   - Click the **Add** button.

     The area ID is added.
   - Click the **Delete** button.

     The area ID is deleted.

The following table describes the nonconfigurable information that is displayed.

Table 130. OSPF Common Area Configuration

Field	Description
External Routing	A definition of the router's capabilities for the area, including whether or not AS-external-LSAs are flooded into/throughout the area. If the area is a stub area, then these are the possible options for which you can configure the external routing capability; otherwise, the only option is *Import External LSAs*. • Import External LSAs. Import and propagate external LSAs. • Import No LSAs. Do not import and propagate external LSAs.
SPF Runs	The number of times that the intra-area route table was calculated using this area's link state database. This is typically done using Dijkstra's algorithm.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
Area LSA Count	The total number of link state advertisements in this area's link state database, excluding AS external LSAs.

Table 130. OSPF Common Area Configuration (continued)

Field	Description
Area LSA Checksum	The 32-bit unsigned sum of the link state advertisements' LSA checksums contained in this area's link state database. This sum excludes external (LSA type 5) link state advertisements. The sum can be used to determine if there was a change in a router's link state database, and to compare the link state database of two routers.
Flood List Length	This is the number of LSAs on this area's flood list.
Import Summary LSAs	The summary LSAs are imported into this area.

Configure the OSPF Stub Area

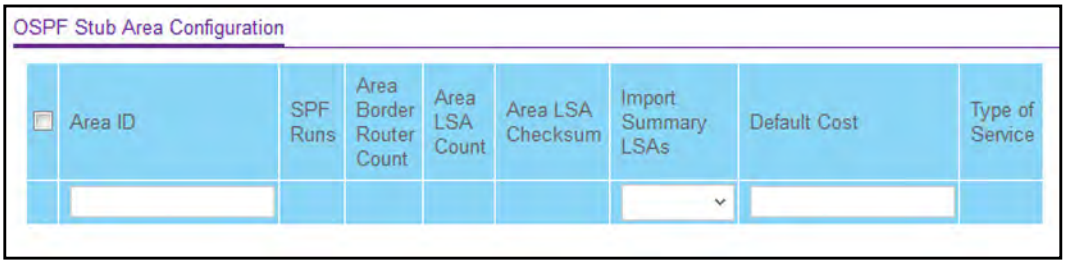
To configure the OSPF stub area:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPF > Advanced > Stub Area Configuration**.



5. Enter the OSPF **Area ID.**

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.
6. Configure the **Import Summary LSAs** by selecting **Enable** or **Disable** from the list.

   If you select **Enable**, summary LSAs are imported into stub areas.
7. Configure the **Default Cost** by entering the metric value to be applied for the default route advertised to the stub area.

   The valid values range from 1 to 16,777,215.

8. Click the **Add** button.

   The area is configured as a stub area.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 131. OSPF Stub Area Configuration

Field	Description
SPF Runs	The number of times that the intra-area route table was calculated using this area's link state database. This is typically done using Dijkstra's algorithm.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
Area LSA Count	The total number of link state advertisements in this area's link state database, excluding AS external LSAs.
Area LSA Checksum	The 32-bit unsigned sum of the link state advertisements' LSA checksums contained in this area's link state database. This sum excludes external (LSA type 5) link state advertisements. The sum can be used to determine if there was a change in a router's link state database, and to compare the link state database of two routers.
Type of Service	This field is the normal ToS associated with the stub metric.

Configure the OSPF NSSA Area

To configure the NSSA area:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

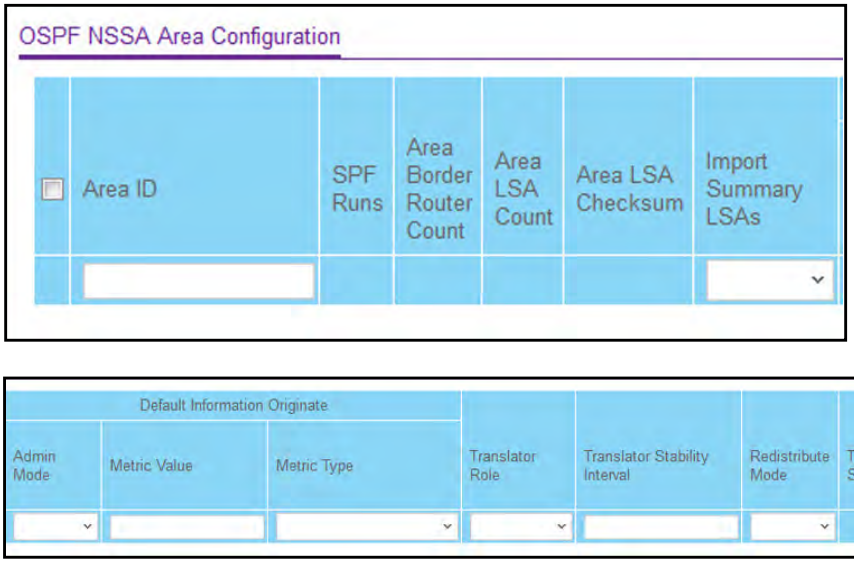
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPF > Advanced > NSSA Area Configuration**.



5. Enter the OSPF **Area ID.**

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.

6. Configure the **Import Summary LSAs** by selecting **Enable** or **Disable** from the list.

   If you select **Enable**, summary LSAs are imported into NSSA areas.

7. Configure the **Default Information Originate**.

   This option lets you advertise a default route into the NSSA when the import of summary LSAs is disabled.

   a. In the **Admin Mode** list, select to **Enable** or **Disable** the default information originate.
   b. In the **Metric Value** field, set the default metric value for default information originate. The value range of values is 1 to 16777214.
   c. In the **Metric Type** field, select the type of metric specified in the Metric Value field. Options are as follows:
      - **Comparable Cost**. External type 1 metrics that are comparable to the OSPF metric.
      - **Non-comparable Cost**. External type 2 metrics that are assumed to be larger than the cost of the OSPF metric.

8. Select the **Translator Role** of the NSSA.

   Options are as follows:

   a. **Always**. Cause the router to assume the role of the translator the instant it becomes a border router.
   b. **Candidate**. Cause the router to participate in the translator election process when it attains border router status.

9. In the **Translator Stability Interval** field, configure the translator of the NSSA.

The value is the period of time that an elected translator continues to perform its duties after it determines that its translator status was deposed by another router. The valid range is 0 to 3600.

10. In the **Redistribute Mode** field, select **Enable** or **Disable** from the list.

    This configures the NSSA ABR so that learned external routes are redistributed to the NSSA.

11. Click the **Add** button.

    The area is configured as an NSSA area.

12. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 132. OSPF NSSA Area Configuration

Field	Description
SPF Runs	The number of times that the intra-area route table was calculated using this area's link state database. This is typically done using Dijkstra's algorithm.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
Area LSA Count	The total number of link state advertisements in this area's link state database, excluding AS external LSAs.
Area LSA Checksum	The 32-bit unsigned sum of the link state advertisements' LSA checksums contained in this area's link state database. This sum excludes external (LSA type 5) link state advertisements. The sum can be used to determine if there was a change in a router's link state database, and to compare the link state database of two routers.
Translator State	This field displays if and how the NSSA border router translates Type 7 into Type 5. Possible options are as follows: • **Enabled**. The NSSA border router's translator role is set to always. • **Elected**. The candidate NSSA border router is translating Type 7 LSAs into Type 5. • **Disabled**. The candidate NSSA border router is not translating Type 7 LSAs into Type 5.

Configure the OSPF Area Range

Configure the OSPF area range:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

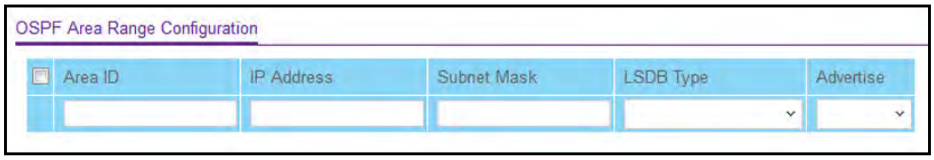
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPF > Advanced > Area Range Configuration**.



5. Enter the OSPF **Area ID.**

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.

6. Enter the **IP Address** for the address range for the selected area.
7. Enter the **Subnet Mask** for the address range for the selected area.
8. From the list in the **LSDB Type** field, select the type of link advertisement associated with the specified area and address range.

   Options are as follows: **Network Summary** or **NSSA External**. The default type is Network Summary.

9. In the **Advertise** list, select **Enable** or **Disable**.

   If you select **Enable**, the address range is advertised outside the area through a network summary LSA. The default is Enable.

10. Click the **Add** button.

    The new address range is added.

11. Click the **Apply** button.

    Your settings are saved.

Configure the OSPF Interface

To configure the OSPF interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

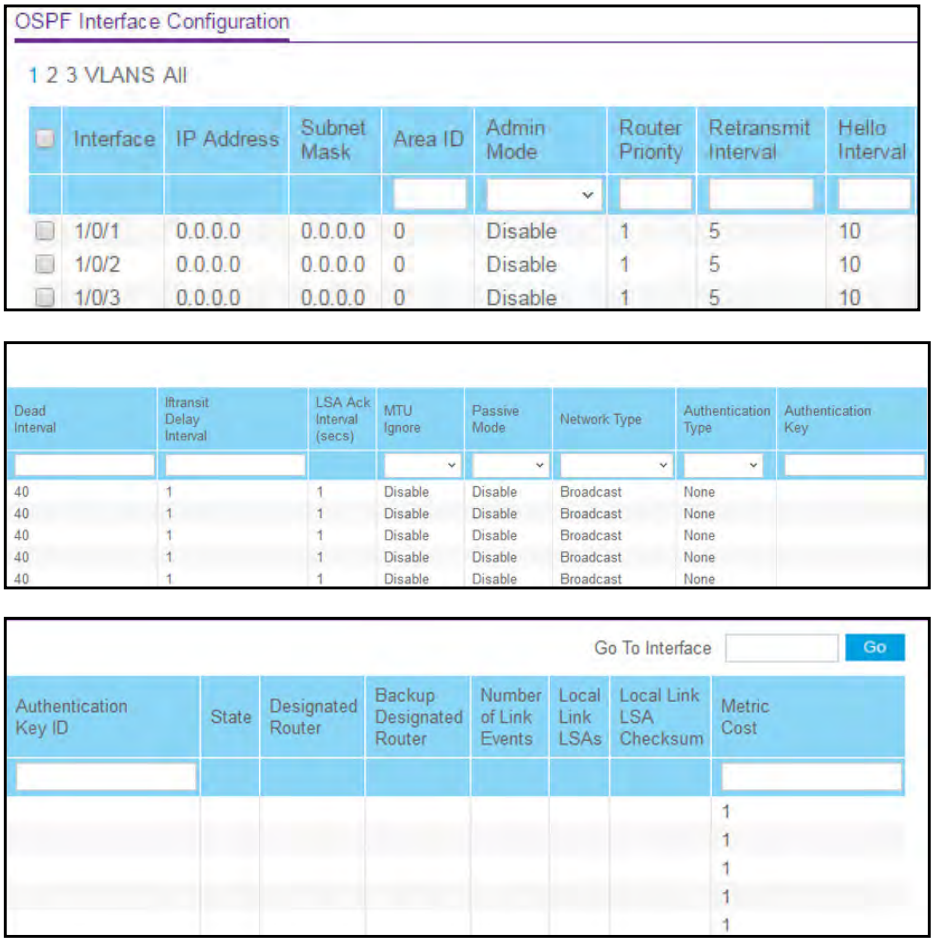
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > OSPF > Advanced > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. In the OSPF **Area ID** field, enter the 32-bit integer in dotted-decimal format.

   This ID uniquely identifies the OSPF area to which the selected router interface connects. If you assign an area ID that does not exist, the area is created with default values.
7. In the **Admin Mode** list, select **Enable** or **Disable**.

   The default value is **Disable**. You can configure OSPF parameters without enabling OSPF admin mode, but the change does not take effect until you enable admin mode. The following information is displayed only if admin mode is enabled:

- State
- Designated router
- Backup designated router
- Number of link events
- LSA Ack interval
- Metric cost

For OSPF to be fully functional, you must enter a valid ID address and subnet mask. For more information, see Configure the IP Interface on page 312.

Note: Once OSPF is initialized on the router, it remains initialized until the router is reset.

8. In the **Router Priority** field, enter the OSPF priority for the selected interface.

   The priority of an interface is specified as an integer from 0 to 255. The default is 1, which is the highest router priority. A value of 0 indicates that the router is not eligible to become the designated router on this network.

9. Configure the **Retransmit Interval** by entering the OSPF retransmit interval for the specified interface.

   This is the number of seconds between link state advertisements for adjacencies belonging to this router interface. This value is also used when retransmitting database descriptions and link state request packets. The valid values range from 1 to 3600 seconds (1 hour). The default is 5 seconds.

10. Configure the **Hello Interval** by entering the OSPF hello interval for the specified interface in seconds.

    This parameter must be the same for all routers attached to a network. Values range from 1 to 65,535. The default is 10 seconds.

11. Enter the OSPF **Dead Interval** for the specified interface in seconds.

    This specifies how long a router waits to see a neighbor router's hello packets before declaring that the router is down. This parameter must be the same for all routers attached to a network. This value must be a multiple of the hello interval (for example, 4). The valid values range from 1 to 65,535. The default is 40 seconds.

12. In the **Iftransit Delay Interval** field, enter the OSPF transit delay for the specified interface.

    This specifies the estimated number of seconds it takes to transmit a link state update packet over the selected interface. The valid values range from 1 to 3600 seconds (1 hour). The default value is 1 second.

13. Configure **MTU Ignore** by selecting **Enable** or **Disable** from the list.

    MTU Ignore disables OSPF MTU mismatch detection on received database description packets. The default value is Disable (MTU mismatch detection is enabled).

14. Configure **Passive Mode** by selecting **Enable** or **Disable** from the list.

Make an interface passive to prevent OSPF from forming an adjacency on an interface. OSPF advertises networks attached to passive interfaces as stub networks. Interfaces are not passive by default, meaning that the passive mode default is Disable.

15. In the OSPF **Network Type** list, select **Broadcast** or **Point-to-Point**.

    OSPF selects a designated router and originates network LSAs only for broadcast networks. No more than two OSPF routers can be present on a point-to-point link. The default network type for Ethernet interfaces is broadcast**.**

16. Select an **Authentication Type** other than **None** by selecting from the list.

    The choices are as follows:

    - **None**. This is the initial interface state. If you select this option from the list, no authentication protocols are run. The default is None.
    - **Simple**. You are prompted to enter an authentication key. This key is included, in the clear, in the OSPF header of all packets sent on the network. All routers on the network must be configured with the same key.
    - **Encrypt**. You are prompted to enter an authentication key and an authentication ID. Encryption uses the MD5 Message-Digest algorithm. All routers on the network must be configured with the same key and ID.

17. Enter the **Authentication Key ID** to be used for authentication.

    You are prompted to enter an ID only if you select Encrypt as the authentication type. The ID is a number between 0 and 255, inclusive.

18. In the **Metric Cost** field, enter the link cost.

    OSPF uses this value in computing shortest paths. The range is from 1 to 65,535. The default is 1.

19. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 133. OSPF Interface Configuration

Field	Description
IP Address	The IP address of the interface.
Subnet Mask	The network mask, indicating the portion of the IP address that identifies the attached network.
LSA Ack Interval (secs)	The number of seconds to wait before sending a delayed acknowledgement.

Table 133. OSPF Interface Configuration (continued)

Field	Description
State	The state of the selected router interface. State is one of the following: • **Down**. This is the initial interface state. The lower-level protocols indicated that the interface is unusable. Interface parameters are set to their initial values. All interface timers are disabled, and there are no adjacencies associated with the interface. • **Loopback**. The router's interface to the network is looped back either in hardware or software. The interface is unavailable for regular data traffic.You can get information on the quality of this interface by sending ICMP pings to the interface or through something like a bit error test. For this reason, IP packets can still be addressed to an interface in loopback state. To facilitate this, such interfaces are advertised in router- LSAs as single host routes, whose destination is the IP interface address. • **Waiting**. The router is trying to determine the identity of the backup designated router for the network by monitoring received hello packets. The router cannot elect a backup designated router or a designated router until it transitions out of the waiting state. This prevents unnecessary changes of the backup designated router. • **Designated Router**. This router is the designated router on the attached network. Adjacencies are established to all other routers attached to the network. The router must also originate a network LSA for the network node. The network LSA contains links to all routers (including the designated router) attached to the network.
State (continued)	• **Backup Designated Router**. This router is the backup designated router on the attached network. It is promoted to designated router if the present designated router fails. The router establishes adjacencies to all other routers attached to the network. The backup designated router performs slightly different functions during the LSA flooding, as compared to the designated router. • **Other Designated Router**. The interface is connected to a broadcast on which other routers are the designated router and backup designated router. The router attempts to form adjacencies to both the designated router and the backup designated router.
Designated Router	The identity of the designated router for this network, in the view of the advertising router. The designated router is identified here by its router ID. The value 0.0.0.0 means that there is no designated router. This field displays only if the OSPF admin mode is enabled.
Backup Designated Router	The identity of the backup designated router for this network, in the view of the advertising router. The backup designated router is identified here by its router ID. Set to 0.0.0.0 if there is no backup designated router.
Number of Link Events	The number of times the specified OSPF interface changed its state.
Local Link LSAs	The number of opaque LSAs whose flooding scope is the link on this interface.
Local Link LSA Checksum	The sum of the checksums of local link LSAs for this link.

View and Clear OSPF Statistics for an Interface

If OSPF is enabled, you can view and clear statistics for the selected interface.

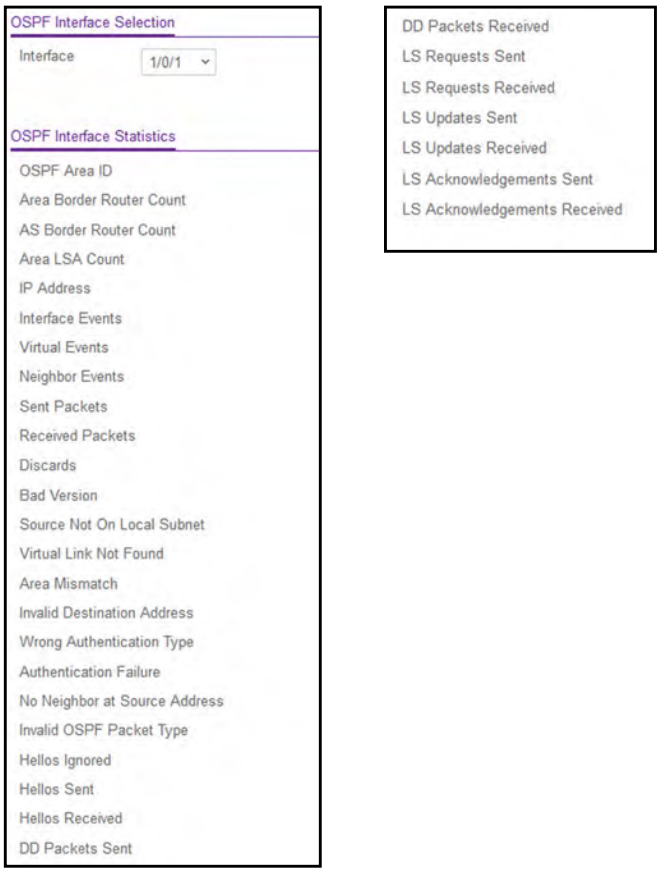
To view and clear OSPF statistics for an interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPF > Advanced > Interface Statistics**.



5. In the OSPF Interface Selection area of the page, from the list in the **Interface** field, select the interface for which you want to display statistics.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.
7. To clear all the statistics of the OSPF interface, click the **Clear** button.

The following table describes the nonconfigurable OSPF Interface Statistics data that is displayed.

Table 134. OSPF Interface Statistics

Field	Description
OSPF Area ID	The OSPF area to which the selected router interface belongs. An OSPF area ID is a 32 bit integer in dotted-decimal format that uniquely identifies the area to which the interface connects.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
AS Border Router Count	The total number of autonomous system border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
Area LSA Count	The total number of link state advertisements in this area's link state database, excluding AS external LSAs.
IP Address	The IP address of the interface.
Interface Events	The number of times the specified OSPF interface changed its state, or an error occurred.
Virtual Events	The number of state changes or errors that occurred on this virtual link.
Neighbor Events	The number of times this neighbor relationship changed state, or an error occurred.
Sent Packets	The number of OSPF packets transmitted on the interface.
Received Packets	The number of valid OSPF packets received on the interface.
Discards	The number of received OSPF packets discarded because of an error in the packet or an error in processing the packet.
Bad Version	The number of received OSPF packets whose version field in the OSPF header does not match the version of the OSPF process handling the packet.
Source Not on Local Subnet	The number of received packets discarded because the source IP address is not within a subnet configured on a local interface.
Virtual Link Not Found	The number of received OSPF packets discarded where the ingress interface is in a non-backbone area and the OSPF header identifies the packet as belonging to the backbone, but OSPF does not have a virtual link to the packet's sender.
Area Mismatch	The number of OSPF packets discarded because the area ID in the OSPF header is not the area ID configured on the ingress interface.
Invalid Destination Address	The number of OSPF packets discarded because the packet's destination IP address is not the address of the ingress interface and is not the AllDrRouters or AllSpfRouters multicast addresses.
Wrong Authentication Type	The number of packets discarded because the authentication type specified in the OSPF header does not match the authentication type configured on the ingress interface.

Table 134. OSPF Interface Statistics (continued)

Field	Description
Authentication Failure	The number of OSPF packets dropped because the sender is not an existing neighbor or the sender's IP address does not match the previously recorded IP address for that neighbor.
No Neighbor at Source Address	The number of OSPF packets dropped because the sender is not an existing neighbor or the sender's IP address does not match the previously recorded IP address for that neighbor.
Invalid OSPF Packet Type	The number of OSPF packets discarded because the packet type field in the OSPF header is not a known type.
Hellos Ignored	The number of received hello packets that were ignored by this router from the new neighbors after the limit was reached for the number of neighbors on an interface or on the system as a whole.
Hellos Sent	The number of hello packets sent on this interface by this router.
Hellos Received	The number of hello packets received on this interface by this router.
DD Packets Sent	The number of database description packets sent on this interface by this router.
DD Packets Received	The number of database description packets received on this interface by this router.
LS Requests Sent	The number of LS requests sent on this interface by this router.
LS Requests Received	The number of LS requests received on this interface by this router.
LS Updates Sent	The number of LS updates sent on this interface by this router.
LS Updates Received	The number of LS updates received on this interface by this router.
LS Acknowledgements Sent	The number of LS acknowledgements sent on this interface by this router.
LS Acknowledgements Received	The number of LS acknowledgements received on this interface by this router.

View the OSPF Neighbor Table and Clear OSPF Neighbors

You can view the OSPF neighbor table list. When a particular neighbor ID is specified, detailed information about a neighbor is given. The information is displayed only if OSPF is enabled. You can also clear OSPF neighbors.

To view the OSPF neighbor table and clear OSPF neighbors:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

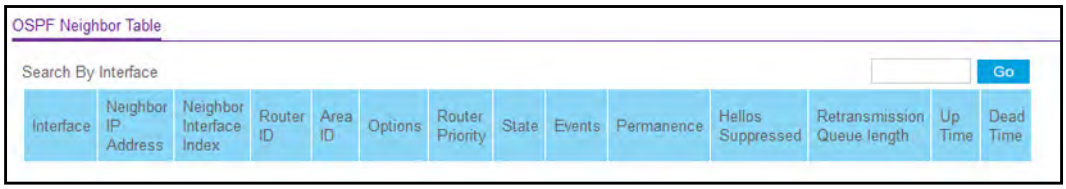
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPF > Advanced > Neighbor Table**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.
6. To clear all the neighbors in the table, click the **Clear** button.

The following table describes the nonconfigurable information that is displayed.

Table 135. OSPF Neighbor Table

Field	Description
Interface	The interface for which data is to be displayed or configured. Slot 0 is the base unit.
Neighbor IP Address	The IP address of the neighboring router's interface to the attached network. It is used as the destination IP address when protocol packets are sent as unicasts along this adjacency. Also used in router LSAs as the lik ID for the attached network if the neighboring router is selected to be designated router. The neighbor IP address is learned when hello packets are received from the neighbor. For virtual links, the neighbor IP address is learned during the routing table build process.
Neighbor Interface Index	A unit/slot/port identifying the neighbor interface index.
Router ID	A 32-bit integer in dotted-decimal format representing the neighbor interface.
Area ID	The area ID of the OSPF area associated with the interface.
Options	An integer value that indicates the optional OSPF capabilities supported by the neighbor. The neighbor's optional OSPF capabilities are also listed in its hello packets. This enables received hello packets to be rejected (for example, neighbor relationships do not even start to form) if there is a mismatch in certain crucial OSPF capabilities.
Router Priority	The OSPF priority for the specified interface. The priority of an interface is a priority integer from 0 to 255. A value of 0 indicates that the router is not eligible to become the designated router on this network.

Table 135. OSPF Neighbor Table (continued)

Field	Description
State	The state of a neighbor can be the following: • **Down**. This is the initial state of a neighbor conversation. It indicates that no recent information was received from the neighbor. On NBMA networks, hello packets can still be sent to *Down* neighbors, although at a reduced frequency. • **Attempt**. This state is valid only for neighbors attached to NBMA networks. It indicates that no recent information was received from the neighbor, but that a more concerted effort must be made to contact the neighbor. This is done by sending the neighbor hello packets at hello intervals. • **Init**. A hello packet was recently seen from the neighbor. However, bidirectional communication was not yet established with the neighbor (for example, the router did not appear in the neighbor's hello packet). All neighbors in this state (or greater) are listed in the hello packets sent from the associated interface. • **2-Way**. Communication between the two routers is bidirectional. This was assured by the operation of the hello protocol. This is the most advanced state short of beginning adjacency establishment. The backup designated router is selected from the set of neighbors in state 2-way or greater. • **Exchange Start**. This is the first step in creating an adjacency between the two neighboring routers. The goal of this step is to decide which router is the master, and to decide upon the initial DD sequence number. Neighbor conversations in this state or greater are called adjacencies.
State (continued)	• **Exchange**. The router is describing its entire link state database by sending database description packets to the neighbor. The link state request packets can also be sent asking for the neighbor's more recent LSAs. All adjacencies in the exchange state or greater are used by the flooding procedure. These adjacencies are fully capable of transmitting and receiving all types of OSPF routing protocol packets. • **Loading**. Link state request packets are sent to the neighbor asking for the more recent LSAs that were discovered (but not yet received) in the exchange state. • **Full**. The neighboring routers are fully adjacent. These adjacencies now appear in router LSAs and network LSAs.
Events	The number of times this neighbor relationship changed state, or an error occurred.
Permanence	This variable displays the status of the entry. **Dynamic** and **Permanent** refer to how the neighbor became known.
Hellos Suppressed	This indicates whether hellos are being suppressed to the neighbor.
Retransmission Queue Length	An integer representing the current length of the retransmission queue of the specified neighbor router ID of the specified interface.
Up Time	Neighbor uptime; how long since the adjacency last reached the Full state.
Dead Time	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.

View the OSPF Link State Database

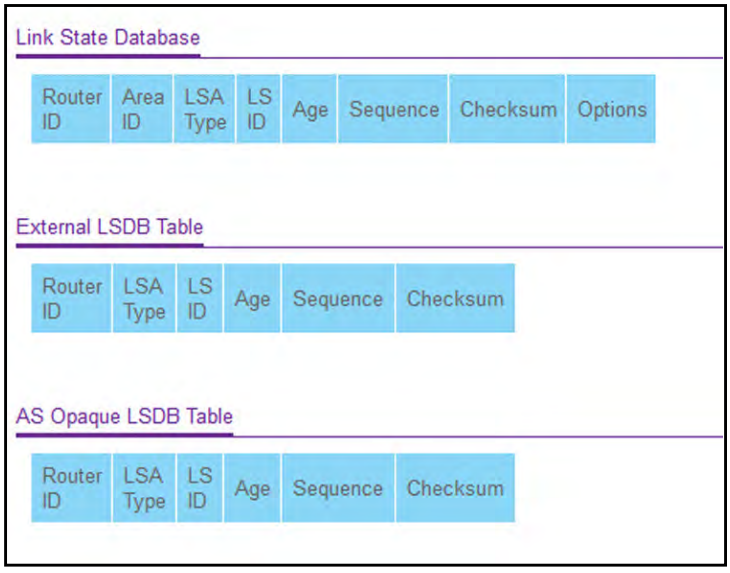
To view the OSPF link state database:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPF > Advanced > Link State Database**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 136. OSPF Link State Database

Field	Description
Router ID	The 32-bit integer in dotted-decimal format that uniquely identifies the router within the autonomous system (AS). The router ID is set on the IP Configuration page. To change the router ID you must first disable OSPF. After you set the new router ID, you must reenable OSPF for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.
Area ID	The ID of an OSPF area to which one of the router interfaces is connected. An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which an interface is connected.

Table 136. OSPF Link State Database (continued)

Field	Description
LSA Type	The format and function of the link state advertisement. LSA Type is one of the following: • Illegal • Router Links • Network Links • Network Summary • ASBR Summary • AS-external • Group Member • NSSA • TMP2 • Link Opaque • Area Opaque • AS Opaque • Unknown
LS ID	The link state ID identifies the piece of the routing domain that is being described by the advertisement. The value of the LS ID depends on the advertisement's LS type.
Age	The time since the link state advertisement was first originated, in seconds.
Sequence	The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The larger the sequence number, the more recent the advertisement.
Checksum	The checksum is used to detect data corruption of an advertisement. This corruption can occur while an advertisement is being flooded, or while it is being held in a router's memory. This field is the checksum of the complete contents of the advertisement, except the LS age field.
Options	The Options field in the link state advertisement header indicates which optional capabilities are associated with the advertisement. The options are as follows: • **Q**. This enables support for QoS traffic engineering. • **E**. This describes the way AS external LSAs are flooded. • **MC**. This describes the way IP multicast datagrams are forwarded according to the standard specifications. • **O**. This describes whether opaque LSAs are supported. • **V**. This describes whether OSPF++ extensions for VPN/COS are supported.

The following table describes the nonconfigurable information that is displayed in the External Link State Database (LSDB) table.

Table 137. OSPF External Link State Database Table

Field	Description
Router ID	The 32-bit integer in dotted-decimal format that uniquely identifies the router within the autonomous system (AS). The router ID is set on the IP Configuration page. To change the router ID you must first disable OSPF. After you set the new router ID, you must reenable OSPF for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.
LSA Type	The format and function of the link state advertisement. LSA Type is one of the following: • ASBR Summary • AS-external • NSSA • TMP2
LS ID	The link state ID identifies the piece of the routing domain that is being described by the advertisement. The value of the LS ID depends on the advertisement's LS type.
Age	The time since the link state advertisement was first originated, in seconds.
Sequence	The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The larger the sequence number, the more recent the advertisement.
Checksum	The checksum is used to detect data corruption of an advertisement. This corruption can occur while an advertisement is being flooded, or while it is being held in a router's memory. This field is the checksum of the complete contents of the advertisement, except the LS age field.

The following table describes the nonconfigurable information that is displayed in the AS Opaque Link State Database (LSDB) table.

Table 138. OSPF AS Opaque Link State Database Table

Field	Description
Router ID	The 32-bit integer in dotted-decimal format that uniquely identifies the router within the autonomous system (AS). The router ID is set on the IP Configuration page. To change the router ID you must first disable OSPF. After you set the new router ID, you must reenable OSPF for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.
LSA Type	The format and function of the link state advertisement. LSA Type is one of the following: • Area Opaque • AS Opaque • Link Opaque

Table 138. OSPF AS Opaque Link State Database Table (continued)

Field	Description
LS ID	The link state ID identifies the piece of the routing domain that is being described by the advertisement. The value of the LS ID depends on the advertisement's LS type.
Age	The time since the link state advertisement was first originated, in seconds.
Sequence	The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The larger the sequence number, the more recent the advertisement.
Checksum	The checksum is used to detect data corruption of an advertisement. This corruption can occur while an advertisement is being flooded, or while it is being held in a router's memory. This field is the checksum of the complete contents of the advertisement, except the LS age field.

Configure the OSPF Virtual Link

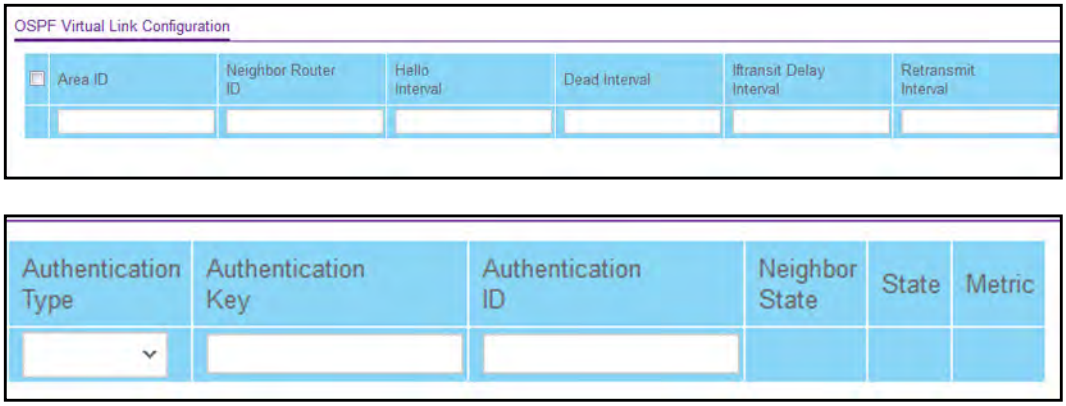
To configure the OSPF virtual link:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPF > Advanced > Virtual Link Configuration**.



5. In the **Area ID** field, enter the OSPF area ID.

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.

Virtual links can be configured between any pair of area border routers having interfaces to a common (non-backbone) area.

6. Configure the **Neighbor Router ID** by entering the neighbor portion of a virtual link specification.

   Virtual links can be configured between any pair of area border routers having interfaces to a common (non-backbone) area.

7. In the **Hello Interval** field, enter the OSPF hello interval for the specified interface in seconds.

   This parameter must be the same for all routers attached to a network. The valid values range from 1 to 65,535. The default is 10 seconds.

8. In the **Dead Interval** field, enter the OSPF dead interval for the specified interface in seconds.

   This specifies how long a router waits to see a neighbor router's hello packets before declaring that the router is down. This parameter must be the same for all routers attached to a network. This value must be a multiple of the hello interval (for example, 4). The valid values range from 1 to 65,535. The default is 40.

9. In the **Iftransit Delay Interval field**, enter the OSPF transit delay for the specified interface.

   This specifies the estimated number of seconds it takes to transmit a link state update packet over the selected interface. The valid values range from 1 to 3600 seconds (1 hour). The default value is 1 second.

10. In the **Retransmit Interval** field, enter the OSPF retransmit interval for the specified interface.

    This is the number of seconds between link state advertisements for adjacencies belonging to this router interface. This value is also used when retransmitting database descriptions and link state request packets. The valid values range from 1 to 3600 seconds (1 hour). The default is 5 seconds.

11. From the **Authentication Type** menu, select one of the following authentication types:
    - **None**. This is the initial interface state.
    - **Simple**. If you select Simple, you are prompted to enter an authentication key. This key is included, in the clear, in the OSPF header of all packets sent on the network. All routers on the network must be configured with the same key.
    - **Encrypt**. If you select Encrypt you are prompted to enter both an authentication key and an authentication ID. Encryption uses the MD5 Message-Digest algorithm. All routers on the network must be configured with the same key and ID.

12. In the **Authentication Key** field, enter the OSPF authentication key for the specified interface.

    If you do not select authentication, you are not prompted to enter a key.

    - If you select **Simple** authentication, you cannot use a key of more than 8 octets.
    - If you select **Encrypt**, the key can be up to 16 octets long.

The key value is displayed only if you are logged on with read/write privileges; otherwise, it is displayed as asterisks.

13. In the **Authentication ID** field, enter the ID to be used for authentication.

    You are prompted to enter an ID only when you select **Encrypt** as the authentication type. The ID is a number between 0 and 255, inclusive.

14. Click the **Add** button

    The new virtual link is added.

15. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 139. OSPF Virtual Link Configuration

Field	Description
Neighbor State	The OSPF interface state can be one of these values: • **Down**. This is the initial interface state. The lower-level protocols indicated that the interface is unusable. Interface parameters are set to their initial values. All interface timers are disabled, and there are no adjacencies associated with the interface. • **Waiting**. The router is trying to determine the identity of the backup designated router by monitoring received hello packets. The router is not allowed to elect a backup designated router or a designated router until it transitions out of Waiting state. This prevents unnecessary changes of backup designated router. • **Point-to-Point**. The interface is operational, and is connected either to the virtual link. On entering this state the router attempts to form an adjacency with the neighboring router. hello packets are sent to the neighbor every hello interval seconds. • **Designated Router**. This router is the designated router on the attached network. Adjacencies are established to all other routers attached to the network. The router must also originate a network-LSA for the network node. The network-LSA contain links to all routers (including the designated router) attached to the network. • **Backup Designated Router**. This router is the backup designated router on the attached network. It is promoted to designated router if the present designated router fails. The router establishes adjacencies to all other routers attached to the network. The backup designated router performs slightly different functions during the flooding procedure, as compared to the designated router. • **Other Designated Router**. The interface is connected to a broadcast or NBMA network on which other routers were selected to be the designated router and backup designated router either. The router attempts to form adjacencies to both the designated router and the backup designated router.

Table 139. OSPF Virtual Link Configuration (continued)

Field	Description
State	The state of the interface. It takes one the following values: • **Down**. This is the initial interface state. The lower-level protocols indicated that the interface is unusable. Interface parameters are set to their initial values. All interface timers are disabled, and there are no adjacencies associated with the interface. • **Waiting**. The router is trying to determine the identity of the backup designated router by monitoring received hello packets. The router is not allowed to elect a backup designated router or a designated router until it transitions out of waiting state. This prevents unnecessary changes of backup designated router. • **Point-to-Point**. The interface is operational, and is connected either to the virtual link. On entering this state the router attempts to form an adjacency with the neighboring router. hello packets are sent to the neighbor every hello interval seconds. • **Designated Router**. This router is the designated router on the attached network. Adjacencies are established to all other routers attached to the network. The router must also originate a network-LSA for the network node. The network-LSA contain links to all routers (including the designated router) attached to the network. • **Backup Designated Router**. This router is the backup designated router on the attached network. It is promoted to designated router if the present designated router fails. The router establishes adjacencies to all other routers attached to the network. The backup designated router performs slightly different functions during the flooding procedure, as compared to the designated router. • **Other Designated Router**. The interface is connected to a broadcast or NBMA network on which other routers were selected to be the designated router and backup designated router either. The router attempts to form adjacencies to both the designated router and the backup designated router.
Metric	The metric value used by the Virtual Link.

Configure the OSPF Route Redistribution

You can configure the OSPF Route Redistribution parameters. The allowable values for each field are displayed next to the field. If any invalid values are entered, an alert message is displayed with the list of all the valid values.

Configure the OSPF route redistribution:

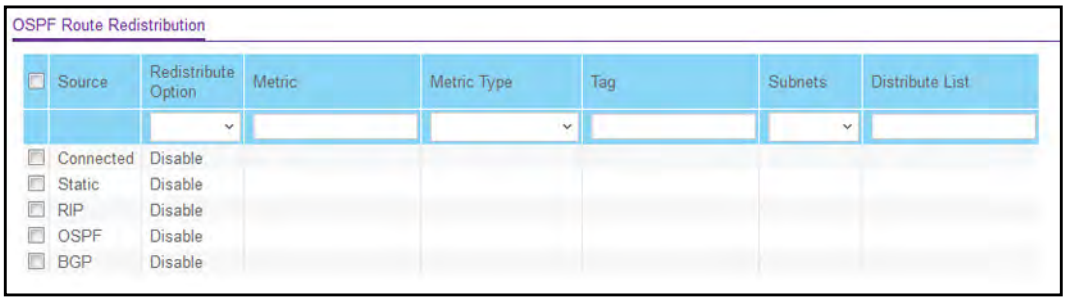
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPF > Advanced > Route Redistribution**.



5. From the **Source** menu, select from the list of available source routes that were not previously configured for redistribution by OSPF.

   The valid values are as follows:

   - BGP
   - Connected
   - OSPF
   - RIP
   - Static

6. In the **Redistribute** list, select to **Enable** or **Disable** the redistribution for the selected source protocol.
7. Set the **Metric** value to be used as the metric of redistributed routes.

   This fields displays the metric if the source was preconfigured and can be modified. The valid values are 0 to 16777214.

8. From the **Metric Type** list, select the OSPF metric type of redistributed routes.
9. Set the **Tag** field in routes redistributed.

   This field displays the tag if the source was preconfigured; otherwise, the tag is 0 and can be modified. The valid values are 0 to 4294967295.

10. From the **Subnets** list, select whether the subnetted routes will be redistributed (Enable) or not (Disable).
11. In the **Distribute List** field, set the access list that filters the routes to be redistributed by the destination protocol.

    Only permitted routes are redistributed. If this command refers to a nonexistent access list, all routes are permitted. The valid values for access list IDs are 1 to 199.

    When used for route filtering, the only fields in an access list that get used are as follows:

    - Source IP address and netmask
    - Destination IP address and netmask
    - Action (permit or deny)

    All other fields (source and destination port, precedence, ToS, and so on) are ignored.

The source IP address is compared to the destination IP address of the route. The source IP netmask in the access list rule is treated as a wildcard mask, indicating which bits in the source IP address must match the destination address of the route.

Note: A 1 in the mask indicates a *do not care* in the corresponding address bit.

When an access list rule includes a destination IP address and netmask (an extended access list), the destination IP address is compared to the network mask of the destination of the route. The destination netmask in the access list serves as a wildcard mask, indicating which bits in the route's destination mask are significant for the filtering operation.

12. Click the **Apply** button.

Your settings are saved.

View the NSF OSPF Summary

You can view the NSF OSPF summary. The allowable values for each field are displayed next to the field. If any invalid values are entered, an alert message is displayed with the list of all the valid values.

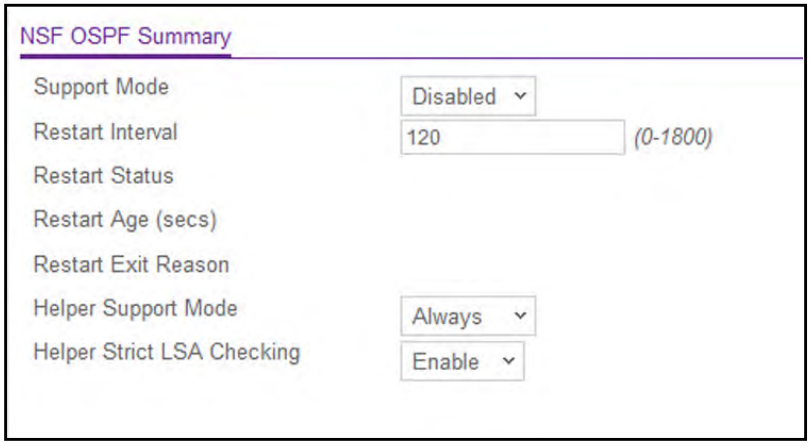
To configure the NSF OSPF summary:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPF > Advanced > NSF OSPF Summary**.



5. From the **Support Mode** list, configure how the unit performs graceful restarts by selecting from the following possible values:
   - **Always**. Indicates that OSPF performs a graceful restart for all planned and unplanned warm restart events.
   - **Disabled**. Disables OSPF performing graceful restarts.
   - **Planned**. Indicates that OSPF performs a graceful restart only when a restart is planned (for example, due to an **initiate failover** command).

   The default is Disabled.
6. Configure the **Restart Interval**. The valid values are 0 to 1800 in seconds.

   The default is 120 seconds.
7. Use the **Helper Support Mode** field to configure how the unit acts when a neighbor performs a warm restart.

   The possible values are as follows:
   - **Always**. Indicates that OSPF helps a restarting neighbor only during all planned and unplanned warm restart events.
   - **Disabled**. Disables OSPF acting as a helpful neighbor.
   - **Planned**. Indicates that OSPF helps a restarting neighbor only during planned events.

   The default is Always.
8. Configure **Helper Strict LSA Checking** by selecting **Enable** or **Disable**.

   When enabled, the unit exits helper mode whenever the topology changes.
9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 140. NSF OSPF Summary

Field	Description
Restart Status	The restart status of OSPF Helper feature. The possible values are as follows: • Not Restarting • Planned Restart • Unplanned Restart
Restart Age (seconds)	The amount of time since the last restart occurred.
Restart Exit Reason	Displays how the master unit on the switch last started up. The possible values are as follows: • **Not Attempted**. Graceful restart was not attempted. • **In Progress**. Restart is in progress. • **Completed**. The previous graceful restart completed successfully. • **Timed Out**. The previous graceful restart timed out. • T**opology Changed**. The previous graceful restart terminated prematurely because of a topology change.

Configure OSPFv3

Configure Basic OSPFv3 Settings

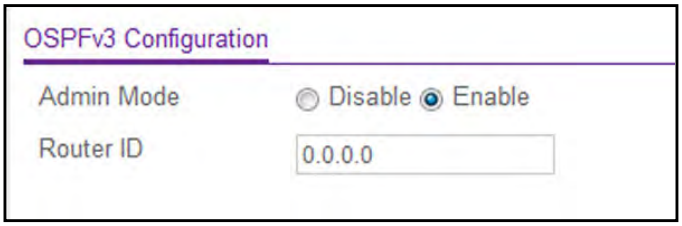
To configure the basic OSPFv3 settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPFv3 > Basic > OSPFv3 Configuration**.



5. Select the Admin Mode **Disable** or **Enable** radio button.

   If you select **Enable**, OSPFv3 is activated for the switch. By default, OSPFv3 is enabled. You must configure a router ID before OSPFv3 can become operational. For more information, see Configure the Routing IP Settings on page 302.

   Note: Once OSPFv3 is initialized on the router, it remains initialized until the router is reset.

6. Enter the **Router ID** as a 32-bit integer in dotted-decimal format that uniquely identifies the router within the autonomous system (AS).

   To change the router ID, you must first disable OSPFv3. After you set the new router ID, you must reenable OSPFv3 for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.

7. Click the **Apply** button.

   Your settings are saved.

Configure OSPFv3 Default Route Advertise Settings

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

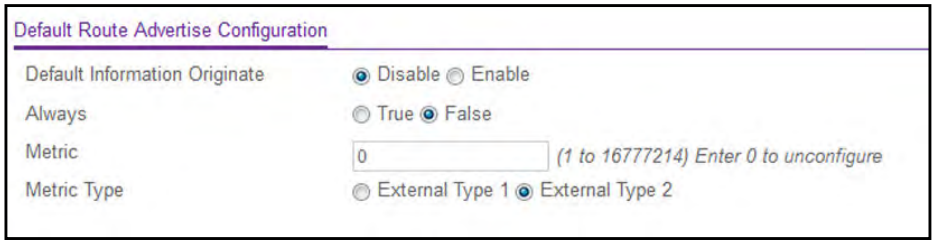
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPFv3 > Advanced > OSPFv3 Configuration**.



5. Select the Default Information Originate **Enable** radio button.

   Selecting Enable makes it possible to specify the other settings on this page. Selecting Disable returns the other fields on this page to their default values.

6. Select the **Always True** or **False** radio button.

   When set to True, this field sets the router advertise. The default is False.

7. In the **Metric** field, specify the metric of the default route.

   The valid values range from 0 to 16777214. The default is 0.

8. Select the **Metric Type External Type 1** or **External Type 2** radio button.

   This sets the OSPFv3 metric type of the default route. The default is External Type 2.

9. Click the **Apply** button.

   Your settings are saved.

Configure the Advanced OSPFv3 Settings

To configure the advanced OSPFv3 settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

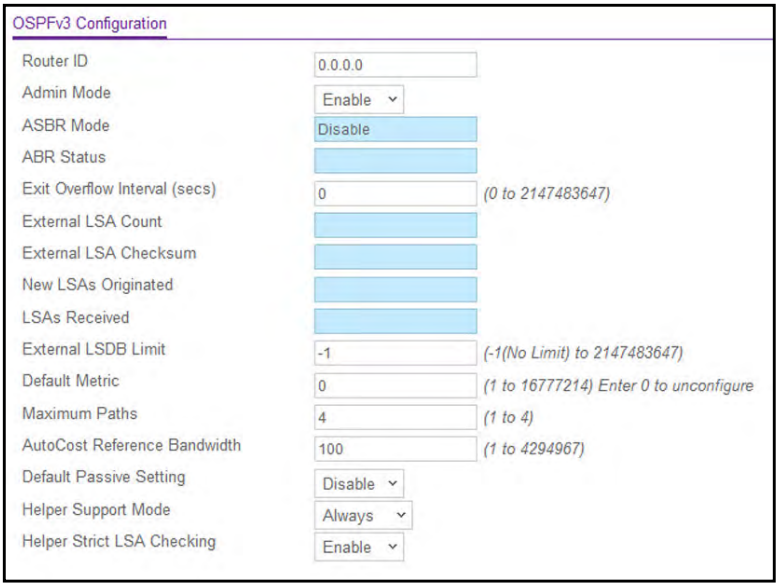
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPFv3 > Advanced > OSPFv3 Configuration**.



5. Enter the **Router ID** in 32-bit integer, dotted-decimal format that uniquely identifies the router within the autonomous system (AS).

   To change the router ID you must first disable OSPFv3. After you set the new router ID, you must reenable OSPFv3 for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.

6. In the **Admin Mode** field, select **Enable** or **Disable**.

   If you select **Enable**, OSPFv3 is activated for the switch. The default value is Enable. You must configure a router ID before OSPFv3 can become operational. For more information, see Configure the Routing IP Settings on page 302.

   Note: Once OSPFv3 is initialized on the router, it remains initialized until the router is reset.

7. In the **Exit Overflow Interval** field, specify the number of seconds that, after entering overflow state, the router must wait before attempting to leave overflow state.

   Because OSPFv3 cannot originate nondefault external LSAs while in overflow state, this allows the router to again originate nondefault AS-external-LSAs. If you enter an exit overflow interval of 0, the router does not leave the overflow state until it is restarted. The range is 0 to 2,147,483,647 seconds. The default is 0.

   When the number of nondefault external LSAs exceeds a configured limit, the router enters an overflow state as defined in RFC 1765.

8. Enter the **External LSDB Limit**. This is the maximum number of AS-external-LSAs that can be stored in the database.

   A value of –1 implies there is no limit on the number that can be saved. The valid range of values is –1 to 2147483647. The default is –1 (no limit).

9. Use the **Default Metric** field to set a default for the metric of redistributed routes.

   This field displays the default metric if one was already set, or blank if one was not configured earlier. The valid values are 1 to 16777214. The default is 0 (unconfigured).

10. Use the **Maximum Paths** field to configure the maximum number of paths that OSPFv3 can report to a given destination.

    The valid values are 1 to 4.

11. Configure the **AutoCost Reference Bandwidth** to control how OSPF calculates default metrics for the interface.

    The valid values are 1 to 4294967. The default is 100.

12. In the **Default Passive Setting**, select the **Enable** or **Disable** option to configure the global passive mode setting for all OSPF interfaces.

    Configuring this field overwrites any present interface-level passive mode setting. OSPF does not form adjacencies on passive interfaces, but does advertise attached networks as stub networks.

13. Use **Helper Support Mode** to configure how the unit acts when a neighbor performs a warm restart.

    The possible values are as follows:

    - **Planned**. OSPF helps a restarting neighbor only during planned events.
    - **Always**. OSPF helps a restarting neighbor during all planned and unplanned warm restart events.
    - **Disabled**. OSPF does not act as a helpful neighbor.

14. Configure **Helper Strict LSA Checking** by selecting the **Enable** or **Disable** option.

    When enabled, the unit exits helper mode whenever the topology changes.

15. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 141. Advanced OSPFv3 Configuration

Field	Description
ASBR Mode	Reflects whether the ASBR mode is enabled or disabled. Enable implies that the router is an autonomous system border router. Router automatically becomes an ASBR when it is configured to redistribute routes learned from other protocol.
ABR Status	The values of this are Enabled or Disabled. Enabled implies that the router is an area border router. Disabled implies that it is not an area border router.
External LSA Count	The number of external (LS type 5) link state advertisements (LSAs) in the link state database.

Table 141. Advanced OSPFv3 Configuration (continued)

Field	Description
External LSA Checksum	The sum of the LS checksums of the external LSAs contained in the link state database. This sum can be used to determine if there was a change in a router's link state database, and to compare the link state databases of two routers.
New LSAs Originated	In any given OSPFv3 area, a router originates several LSAs. Each router originates a router-LSA. If the router is also the designated router for any of the area's networks, it originates network-LSAs for those networks. This value represents the number of LSAs originated by this router.
LSAs Received	The number of LSAs received that were determined to be new instantiations. This number does not include newer instantiations of self-originated LSAs.

Configure the OSPFv3 Common Area

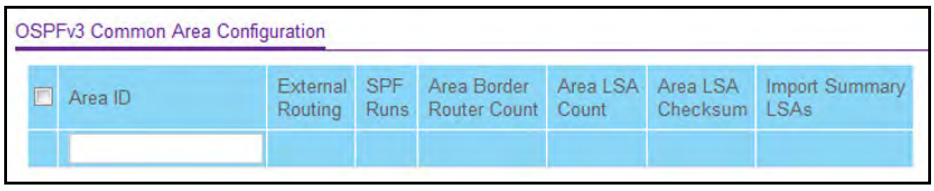
To configure an OSPFv3 common area or return an OSPFv3 common area to the normal state:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPFv3 > Advanced > Common Area Configuration**.



5. In the **Area ID** field, enter the OSPF area ID.

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.
6. Take one of the following actions:
   - Click the **Add** button.

     The area is configured as a common area.
   - Click the **Delete** button.

The area is returned to the normal state.

The following table describes the nonconfigurable information that is displayed.

Table 142. Advanced OSPFv3 Common Area Configuration

Field	Description
External Routing	A definition of the router's capabilities for the area, including whether or not AS-external-LSAs are flooded into or throughout the area.
SPF Runs	The number of times that the intra-area route table was calculated using this area's link state database. This is done using Dijkstra's algorithm.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
Area LSA Count	The total number of link state advertisements in this area's link state database, excluding AS external LSAs.
Area LSA Checksum	The 32-bit unsigned sum of the link state advertisements' LSA checksums contained in this area's link state database. This sum excludes external (LSA type 5) link state advertisements. The sum can be used to determine if there was a change in a router's link state database, and to compare the link state database of two routers.
Import Summary LSAs	The summary LSAs are enabled or disabled imported into this area.

Configure an OSPFv3 Stub Area

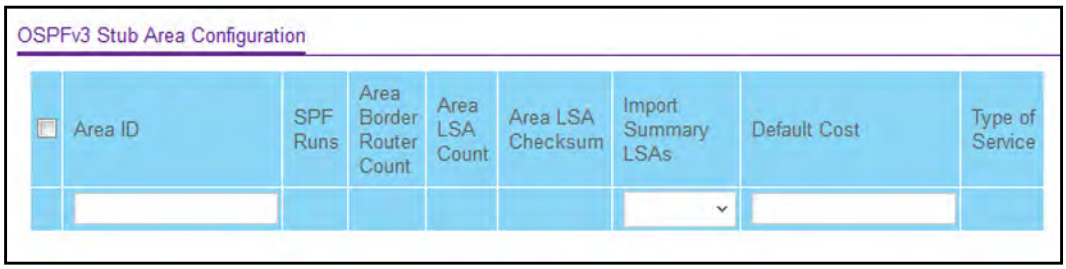
To configure the OSPFv3 stub area:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPFv3 > Advanced > Stub Area Configuration**.



5. In the **Area ID** field, enter the OSPF area ID.

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.

6. In the **Import Summary LSAs** list, select the **Enable** or **Disable** option.

   If you select **Enable**, summary LSAs are imported into areas. The default is Enable.

7. In the **Default Cost** field, enter the metric value to be applied for the default route advertised into the stub area.

   The valid values range from 1 to 16,777,215. This value is applicable only to stub areas.

8. Click the **Add** button.

   The area is configured as a stub area.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 143. Advanced OSPFv3 Stub Area Configuration

Field	Description
SPF Runs	The number of times that the intra-area route table was calculated using this area's link state database. This is done using Dijkstra's algorithm.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF Pass.
Area LSA Count	The total number of link state advertisements in this area's link state database, excluding AS External LSAs.
Area LSA Checksum	The 32-bit unsigned sum of the link state advertisements' LSA checksums contained in this area's link state database. This sum excludes external (LSA type 5) link state advertisements. The sum can be used to determine if there was a change in a router's link state database, and to compare the link state database of two routers.
Type of Service	This field is the normal ToS associated with the stub metric.

Configure the OSPFv3 NSSA Area

To configure the OSPFv3 NSSA area:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

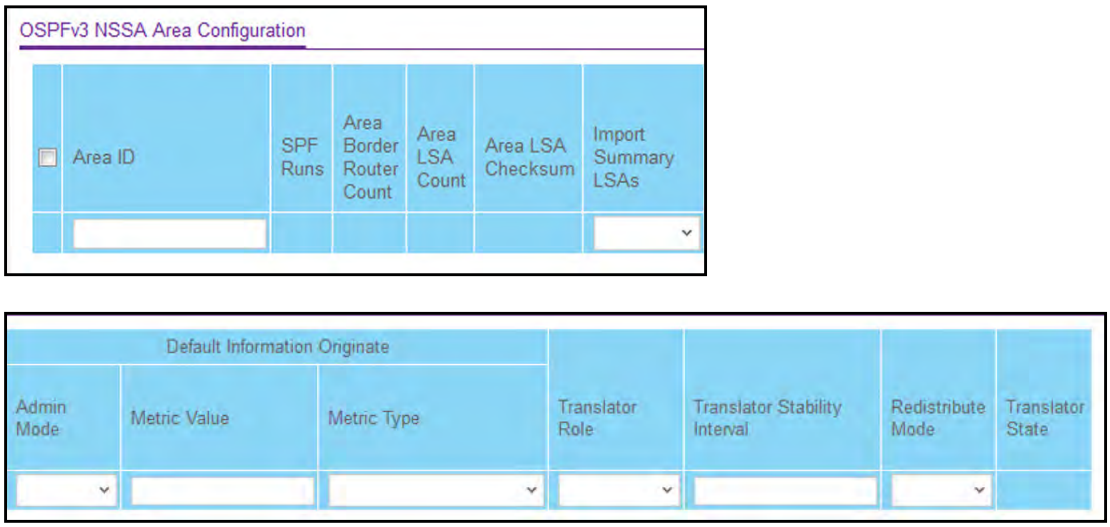
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > OSPFv3 > Advanced > NSSA Area Configuration**.



5. In the **Area ID** field, enter the OSPF area ID.

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.

6. Configure the **Import Summary LSAs** by selecting **Enable** or **Disable** from the list.

   If you select **Enable**, summary LSAs are imported into stub areas.

7. Configure the **Default Information Originate**.

   This option permits you to advertise a default route into the NSSA when the import summary LSAs are disabled.

   a. In the **Admin Mode** list, select to **Enable** or **Disable** the default information originate.
   b. In the **Metric Value** field, set the default metric value for default information originate. The value range of values is 1 to 16777214.
   c. In the **Metric Type** field, select the type of metric specified in the Metric Value field. Options are as follows:
      - **Comparable Cost.** External type 1 metrics that are comparable to the OSPF metric.
      - **Non-comparable Cost**. External type 2 metrics that are assumed to be larger than the cost of the OSPF metric.

8. Select the **Translator Role** of the NSSA.

   Options are as follows:

   a. **Always**. Cause the router to assume the role of the translator the instant it becomes a border router.

   b. **Candidate**. Cause the router to participate in the translator election process when it attains border router status.

9. In the **Translator Stability Interval** field, configure the translator of the NSSA.

   The value is the period of time that an elected translator continues to perform its duties after it determines that its translator status was deposed by another router. The valid range is 0 to 3600.

10. In the **Redistribute Mode** field, select to **Enable** or **Disable**.

    This configures the NSSA ABR so that learned external routes are redistributed to the NSSA.

11. Click the **Add** button.

    The area is configured as an NSSA area.

12. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 144. Advanced OSPFv3 NSSA Area Configuration

Field	Description
SPF Runs	The number of times that the intra-area route table was calculated using this area's link state database. This is typically done using Dijkstra's algorithm.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
Area LSA Count	The total number of link state advertisements in this area's link state database, excluding AS external LSAs.
Area LSA Checksum	The 32-bit unsigned sum of the link state advertisements' LSA checksums contained in this area's link state database. This sum excludes external (LSA type 5) link state advertisements. The sum can be used to determine if there was a change in a router's link state database, and to compare the link state database of two routers.
Translator State	The field tells you if and how the NSSA border router translates Type 7 into Type 5. Possible values are as follows: • **Enabled**. The NSSA border router's translator role was set to always. • **Elected**. The candidate NSSA border router is translating Type 7 LSAs into Type 5. • **Disabled**. The candidate NSSA border router is NOT translating Type 7 LSAs into Type 5.

Configure the OSPFv3 Area Range

To configure the OSPFv3 area range:

1. Launch a web browser.

2. In the address field of your web browser, enter the IP address of the switch.

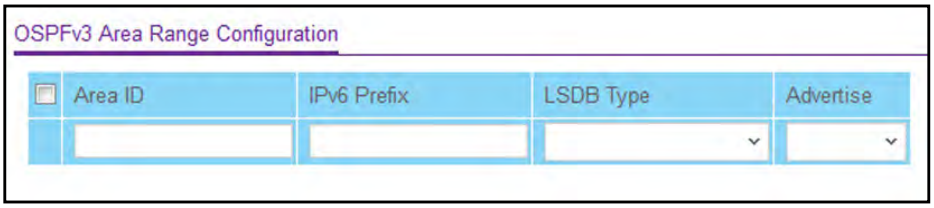
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPFv3 > Advanced > Area Range Configuration**.



5. Enter the OSPFv3 **Area ID**.

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects.

6. Enter the **IPv6 Prefix** for the address range for the selected area.
7. From the list in the **LSDB Type** field, select the type of link advertisement associated with the specified area and address range.

   Options are: **Network Summary** or **NSSA External**. The default type is **Network Summary**.

8. In the **Advertise** field, select the **Enable** or **Disable** option.

   If you select Enable, the address range is advertised outside the area through a network summary LSA. The default is Enable.

9. Click the **Add** button.

   The new address range is added to the switch.

Configure the OSPFv3 Interface

To configure the OSPFv3 interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

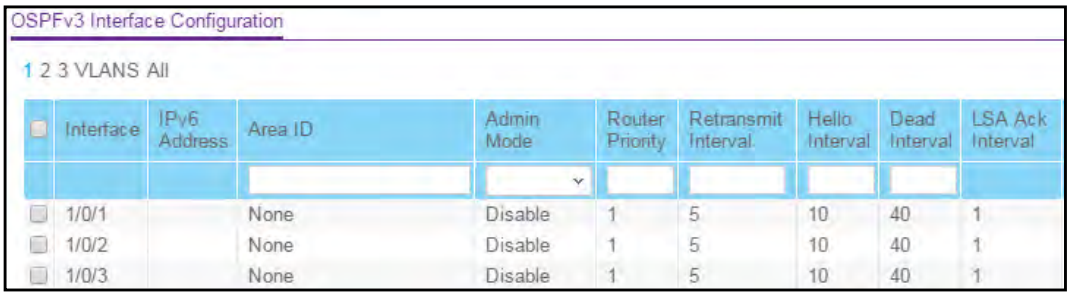
   The login window opens.

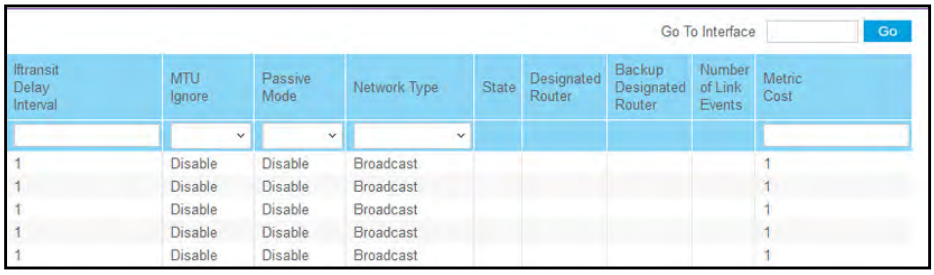
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > OSPFv3 > Advanced > Interface Configuration**.





5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. In the **Area ID** field, enter the 32-bit integer in dotted-decimal format that uniquely identifies the OSPFv3 area to which the selected router interface connects.

   If you assign an area ID that does not exist, the area is created with default values.
7. Configure the **Admin Mode** by selecting the **Enable** or **Disable** option from the list.

   The default value is Disable. You can configure OSPFv3 parameters without enabling OSPFv3 admin mode, but the settings do not take effect until you enable admin mode. The following information is displayed only if admin mode is enabled:

   - State
   - Designated router
   - Backup designated router
   - Number of link events
   - LSA Ack interval
   - Metric cost

   For OSPFv3 to be fully functional, you must enter a valid IPv6 prefix/prefix length. This can be done using the CLI **IPv6 address** command.

Note: Once OSPFv3 is initialized on the router, it remains initialized until the router is reset.

8. Configure the **Router Priority** by entering the OSPFv3 priority for the selected interface.

   The priority of an interface is specified as an integer from 0 to 255. The default is **1**, which is the highest router priority. A value of 0 indicates that the router is not eligible to become the designated router on this network.

9. Configure the **Retransmit Interval** by entering the OSPFv3 retransmit interval for the specified interface.

   This is the number of seconds between link state advertisements for adjacencies belonging to this router interface. This value is also used when retransmitting database descriptions and link state request packets. The valid values range from 0 to 3600 seconds (1 hour). The default is 5 seconds.

10. Configure the **Hello Interval** by entering the OSPFv3 hello interval for the specified interface in seconds.

    This parameter must be the same for all routers attached to a network. Value values range from 1 to 65,535. The default is 10 seconds.

11. Enter the OSPFv3 **Dead Interval** for the specified interface in seconds.

    This specifies how long a router waits to see a neighbor router's hello packets before declaring that the router is down. This parameter must be the same for all routers attached to a network. This value is a multiple of the hello interval (for example, 4). The valid values range from 1 to 65,535. The default is 40 seconds.

12. In the **Iftransit Delay Interval** field, enter the OSPFv3 transit delay for the specified interface.

    This specifies the estimated number of seconds it takes to transmit a link state update packet over the selected interface. The valid values range from 1 to 3600 seconds (1 hour). The default value is 1 second.

13. Configure **MTU Ignore** by selecting **Enable** or **Disable** from the list.

    MTU Ignore disables OSPF MTU mismatch detection on receiving database description packets. The default value is **Disable** (MTU mismatch detection is enabled).

14. Configure **Passive Mode** by selecting **Enable** or **Disable** from the list.

    Make an interface passive to prevent OSPF from forming an adjacency on an interface. OSPF advertises networks attached to passive interfaces as stub networks. Interfaces are not passive by default, meaning that the passive mode default is Disable.

15. Set the OSPFv3 **Network Type** on the interface by selecting either **Broadcast** or **Point-to-Point** Mode from the list.

    OSPFv3 selects a designated router and originates network LSAs only for broadcast networks. No more than two OSPFv3 routers can be present on a point-to-point link. The default network type for Ethernet interfaces is Broadcast.

16. In the **Metric Cost** field, enter the value for the cost Type of Service (TOS).

OSPF uses this value in computing shortest paths. The range is from 1 to 65,535. The default is **1**. Metric Cost is configurable only if OSPFv3 is initialized on the interface.

17. Click the **Apply** button.

Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 145. Advanced OSPFv3 Interface Configuration

Field	Description
IPv6 Address	The IPv6 address of the interface.
LSA Ack Interval (secs)	The number of seconds between LSA acknowledgment packet transmissions, which must be less than the retransmit interval.
State	The current state of the selected router interface. State is one of the following: • **Down**. This is the initial interface state. The lower-level protocols indicate that the interface is unusable. Interface parameters are set to their initial values. All interface timers are disabled, and there are no adjacencies associated with the interface. • **Loopback**. The router's interface to the network is looped back in either the hardware or software. The interface is unavailable for regular data traffic. However, you might want to gain information about the quality of this interface, either through sending ICMP pings to the interface or through something like a bit error test. For this reason, IP packets can still be addressed to an interface in the loopback state. To facilitate this, such interfaces are advertised in router LSAs as single host routes, whose destination is the IP interface address. • **Waiting**. The router is trying to determine the identity of the backup designated router for the network by monitoring received hello packets. The router is not allowed to elect a backup designated router or a designated router until it transitions out of waiting state. This prevents unnecessary changes of backup designated router. • **Designated Router**. This router is the designated router on the attached network. Adjacencies are established to all other routers attached to the network. The router must also originate a network-LSA for the network node. The network-LSA contains links to all routers (including the designated router) attached to the network. • **Backup Designated Router**. This router is the backup designated router on the attached network. It is promoted to designated router if the present designated router fails. The router establishes adjacencies to all other routers attached to the network. The backup designated router performs slightly different functions during the LSA flooding procedure, as compared to the designated router. • **Other Designated Router**. The interface is connected to a broadcast or NBMA network on which other routers were selected to be either the designated router or backup designated router. The router attempts to form adjacencies to both the designated router and the backup designated router. **Note:** The state is displayed only if the OSPFv3 Admin mode is enabled.

Table 145. Advanced OSPFv3 Interface Configuration (continued)

Field	Description
Designated Router	The identity of the designated router for this network, in the view of the advertising router. The designated router is identified here by its router ID. The value 0.0.0.0 means that there is no designated router. **Note:** This field displays only if the OSPFv3 admin mode is enabled.
Backup Designated Router	The identity of the backup designated router for this network, in the view of the advertising router. The backup designated router is identified here by its router ID. Set to 0.0.0.0 if there is no backup designated router. **Note:** This field displays only if the OSPFv3 admin mode is enabled.
Number of Link Events	This is the number of times the specified OSPF interface changed its state. **Note:** This field displays only if the OSPFv3 admin mode is enabled.

View and Clear OSPFv3 Interface Statistics

You can view and clear statistics for the selected interface. The information is displayed only if OSPFv3 is enabled.

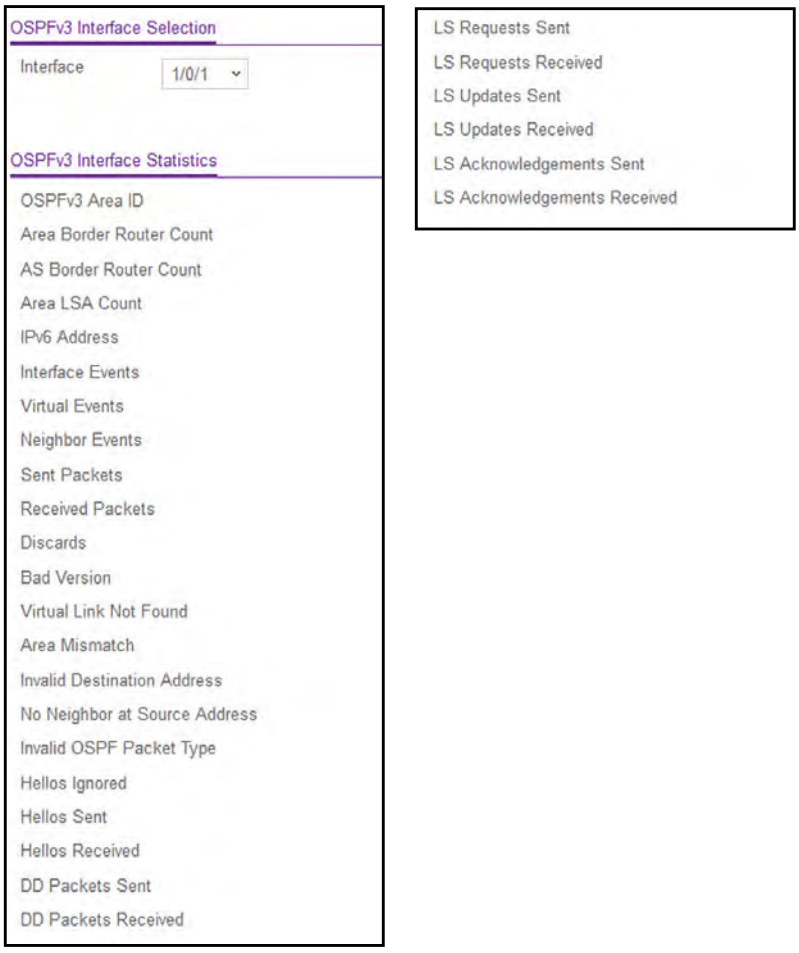
To view and clear the OSPFv3 interface statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPFv3 > Advanced > Interface Statistics**.



5. In the OSPFv3 Interface Selection area of the page, in the **Interface** list, select the interface.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.
7. To clear all the statistics of the OSPFv3 interface, click the **Clear** button.

The following table describes the nonconfigurable OSPF Interface Statistics data that is displayed.

Table 146. Advanced OSPFv3 Interface Statistics

Field	Description
OSPFv3 Area ID	The OSPFv3 area to which the selected router interface belongs. An OSPFv3 area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which the interface connects.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
AS Border Router Count	The total number of autonomous system border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.

Table 146. Advanced OSPFv3 Interface Statistics (continued)

Field	Description
Area LSA Count	The total number of link state advertisements in this area's link state database, excluding AS External LSAs.
IPv6 Address	The IPv6 address of the interface.
Interface Events	The number of times the specified OSPFv3 interface changed its state, or an error occurred.
Virtual Events	The number of state changes or errors that occurred on this virtual link.
Neighbor Events	The number of times this neighbor relationship changed state, or an error occurred.
Sent Packets	The number of OSPFv3 packets transmitted on the interface.
Received Packets	The number of valid OSPFv3 packets received on the interface.
Discards	The number of received OSPFv3 packets discarded because of an error in the packet or an error in processing the packet.
Bad Version	The number of received OSPFv3 packets whose version field in the OSPFv3 header does not match the version of the OSPFv3 process handling the packet.
Virtual Link Not Found	The number of received OSPFv3 packets discarded where the ingress interface is in a non-backbone area and the OSPFv3 header identifies the packet as belonging to the backbone, but OSPFv3 does not have a virtual link to the packet's sender.
Area Mismatch	The number of OSPFv3 packets discarded because the area ID in the OSPFv3 header is not the area ID configured on the ingress interface.
Invalid Destination Address	The number of OSPFv3 packets discarded because the packet's destination IP address is not the address of the ingress interface and is not the AllDrRouters or AllSpfRouters multicast address.
No Neighbor at Source Address	The number of OSPFv3 packets dropped because the sender is not an existing neighbor or the sender's IP address does not match the previously recorded IP address for that neighbor.
Invalid OSPF Packet Type	The number of OSPFv3 packets discarded because the packet type field in the OSPFv3 header is not a known type.
Hellos Ignored	The number of received hello packets that were ignored by this router from the new neighbors after the limit was reached for the number of neighbors on an interface or on the system as a whole.
Hellos Sent	The number of hello packets sent on this interface by this router.
Hellos Received	The number of hello packets received on this interface by this router.
DD Packets Sent	The number of database description packets sent on this interface by this router.
DD Packets Received	The number of database description packets received on this interface by this router.

Table 146. Advanced OSPFv3 Interface Statistics (continued)

Field	Description
LS Requests Sent	The number of LS requests sent on this interface by this router.
LS Requests Received	The number of LS requests received on this interface by this router.
LS Updates Sent	The number of LS updates sent on this interface by this router.
LS Updates Received	The number of LS updates received on this interface by this router.
LS Acknowledgements Sent	The number of LS acknowledgements sent on this interface by this router.
LS Acknowledgements Received	The number of LS acknowledgements received on this interface by this router.

View the OSPFv3 Neighbor Table and Clear OSPFv3 Neighbors

This page displays the OSPFv3 neighbor table list. This information is displayed only if OSPFv3 is enabled, and there exists at least one OSPFv3-enabled interface having a valid neighbor. You can also clear OSPFv3 neighbors.

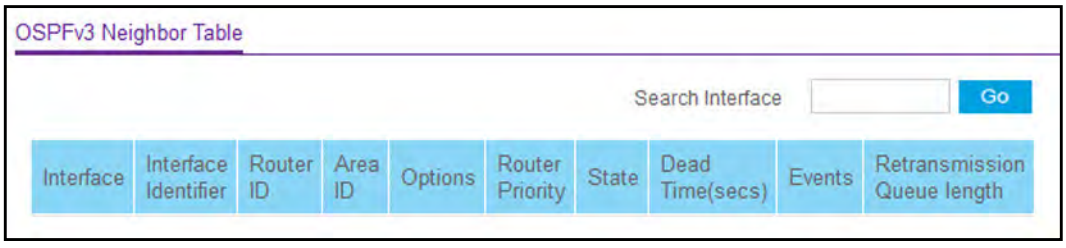
To view the OSPFv3 neighbor table and clear OSPFv3 neighbors:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPFv3 > Advanced > Neighbor Table**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.
6. To clear all the neighbors in the table, click the **Clear** button.

The following table describes the nonconfigurable information that is displayed.

Table 147. Advanced OSPFv3 Neighbor Table

Field	Description
Interface	The interface for which data is to be displayed or configured. Slot 0 is the base unit.
Interface Identifier	The interface ID that the neighbor advertises in its hello packets on this link.
Router ID	A 32-bit integer in dotted-decimal format representing the router ID of the neighbor on the selected interface.
Area ID	A 32-bit integer in dotted-decimal format representing the area common to the neighbor selected.
Options	A bit mask corresponding to the neighbor's options field.
Router Priority	The priority of this neighbor in the designated router election algorithm. A value of 0 signifies that the neighbor is not eligible to become the designated router on this particular network.
State	The state of the relationship with this neighbor.
Dead Time	The amount of time, in seconds, since the last hello was received from adjacent neighbors. Set to 0 for neighbors in a state less than or equal to Init.
Events	The number of times this neighbor relationship changed state, or an error occurred.
Retransmission Queue Length	An integer representing the current length of the selected neighbor's retransmit queue.

View the OSPFv3 Link State Database

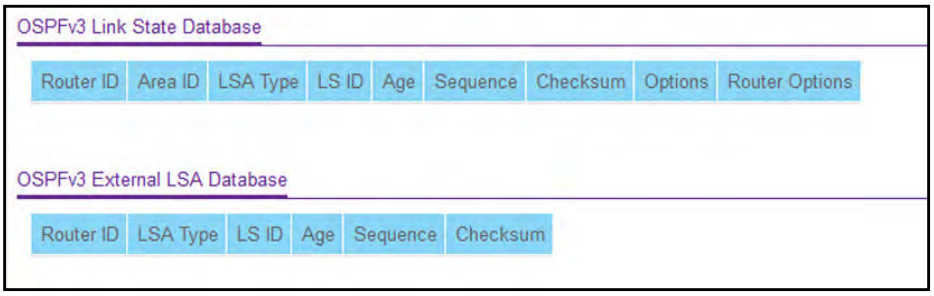
To view the OSPF link state database:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > OSPFv3 > Advanced > Link State Database**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 148. Advanced OSPFv3 Link State Database

Field	Description
Router ID	The 32-bit integer in dotted-decimal format that uniquely identifies the router within the autonomous system (AS). The router ID is set on the OSPFv3 Configuration page. To change the router ID you must first disable OSPFv3. After you set the new router ID, you must reenable OSPFv3 for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.
Area ID	The ID of an OSPFv3 area to which one of the router interfaces is connected. An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which an interface is connected.
LSA Type	The format and function of the link state advertisement. LSA Type is one of the following: • **Router LSA**. A router can originate one or more router LSAs for a given area. Each router LSA originated in an area describes the collected states of all the router's interfaces to the area. • **Network LSA**. A network LSA is originated for every link having two or more attached routers, by the designated router. It lists all the routers attached to the link. • **Inter-Area Router LSA**. This type describes a prefix external to the area, yet internal to the autonomous system. It is originated by an area border router. • **AS-External LSA**. This LSA type describes a path to a prefix external to the autonomous system and is originated by an autonomous system border router. • **Link LSA**. A router originates a separate Link LSA for each attached link. It provides router's link local address to routers attached to the link and also inform them of a list of IPv6 prefixes to associate with the link. • **Intra-Area-Prefix LSA**. A link's designated router originates one or more intra-area prefix lsas to advertise the link's prefixes throughout the area. A router can originate multiple intra-area-prefix lsas for a given area to advertise its own prefixes and those of its attached stub links.
LS ID	The link state ID identifies the piece of the routing domain that is being described by the advertisement. The value of the LS ID depends on the advertisement's LS type.

Table 148. Advanced OSPFv3 Link State Database (continued)

Field	Description
Age	The time since the link state advertisement was first originated, in seconds.
Sequence	The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The larger the sequence number, the more recent the advertisement.
Checksum	The checksum is used to detect data corruption of an advertisement. This corruption can occur while an advertisement is being flooded, or while it is being held in a router's memory. This field is the checksum of the complete contents of the advertisement, except the LS age field.
Options	The Options field in the link state advertisement header indicates which optional capabilities are associated with the advertisement. The options are as follows: • **Q**. This enables support for QoS traffic engineering. • **E**. This describes the way AS-external LSAs are flooded. • **MC**. This describes the way IP multicast datagrams are forwarded according to the standard specifications. • **O**. This describes whether opaque LSAs are supported. • **V**. This describes whether OSPF++ extensions for VPN/COS are supported.
Router Options	The router-specific options.

The following table describes the nonconfigurable information that is displayed in the External Link State Database (LSDB) table.

Table 149. Advanced OSPFv3 External Link State Database Table

Field	Description
Router ID	The 32-bit integer in dotted-decimal format that uniquely identifies the router within the autonomous system (AS). The router ID is set on the OSPFv3 Configuration page. To change the router ID you must first disable OSPFv3. After you set the new router ID, you must reenable OSPFv3 for the change to take effect. The default value is 0.0.0.0, although this is not a valid router ID.

Table 149. Advanced OSPFv3 External Link State Database Table (continued)

Field	Description
LSA Type	The format and function of the link state advertisement. LSA Type is one of the following: • **Router LSA**. A router can originate one or more router LSAs for a given area. Each router LSA originated in an area describes the collected states of all the router's interfaces to the area. • **Network LSA**. A network LSA is originated for every link having two or more attached routers, by the designated router. It lists all the routers attached to the link. • **Inter-Area Router LSA**. This type describes a prefix external to the area, yet internal to the autonomous system. It is originated by an area border router. • **AS-External LSA**. This LSA type describes a path to a prefix external to the autonomous system and is originated by an autonomous system border router. • **Link LSA**. A router originates a separate link LSA for each attached link. It provides router's link local address to routers attached to the link and also inform them of a list of IPv6 prefixes to associate with the link. • **Intra-Area-Prefix LSA**. A link's designated router originates one or more intraarea-prefix LSAs to advertise the link's prefixes throughout the area. A router can originate multiple intra-area-prefix LSAs for a given area to advertise its own prefixes and those of its attached stub links.
LS ID	The link state ID identifies the piece of the routing domain that is being described by the advertisement. The value of the LS ID depends on the advertisement's LS type.
Age	The time since the link state advertisement was first originated, in seconds.
Sequence	The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The larger the sequence number, the more recent the advertisement.
Checksum	The checksum is used to detect data corruption of an advertisement. This corruption can occur while an advertisement is being flooded, or while it is being held in a router's memory. This field is the checksum of the complete contents of the advertisement, except the LS age field.

Configure the OSPFv3 Virtual Link

To configure the OSPFv3 virtual link:

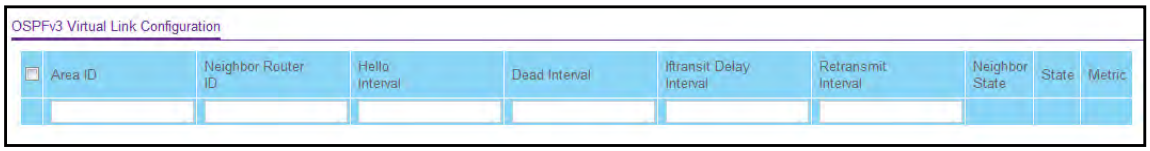
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > OSPFv3 > Advanced > Virtual Link Configuration**.



5. Enter the **Area ID** of the OSPF area.

   An area ID is a 32-bit integer in dotted-decimal format that uniquely identifies the area to which a router interface connects. Virtual links can be configured between any pair of area border routers with interfaces to a common (non-backbone) area.

6. Configure the **Neighbor Router ID** by entering the neighbor portion of a virtual link specification.

   Virtual links can be configured between any pair of area border routers having interfaces to a common (non-backbone) area.

7. In the **Hello Interval** field, enter the OSPFv3 hello interval for the specified interface in seconds.

   This parameter must be the same for all routers attached to a network. The valid values range from 1 to 65,535. The default is 10 seconds.

8. In the **Dead Interval** field, enter the OSPFv3 dead interval for the specified interface in seconds.

   This specifies how long a router waits to see a neighbor router's hello packets before declaring that the router is down. This parameter must be the same for all routers attached to a network. This value is a multiple of the hello interval (for example, 4). The valid values range from 1 to 65,535. The default is 40.

9. In the **Iftransit Delay Interval** field, enter the OSPFv3 transit delay for the specified interface.

   This specifies the estimated number of seconds it takes to transmit a link state update packet over the selected interface. The valid values range from 1 to 3600 seconds (1 hour). The default value is 1 second.

10. In the **Retransmit Interval** field, enter the OSPFv3 retransmit interval for the specified interface.

    This is the number of seconds between link state advertisements for adjacencies belonging to this router interface. This value is also used when retransmitting database descriptions and link state request packets. The valid values range from 1 to 3600 seconds (1 hour). The default is 5 seconds.

11. Click the **Add** button

    The new virtual link is added to the switch.

12. Click the **Apply** button.

Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 150. Advanced OSPFv3 Virtual Link Configuration

Field	Description
Neighbor State	The state of the virtual neighbor relationship. The OSPFv3 interface state can be any of these values: • **Down**. This is the initial interface state.The lower-level protocols indicated that the interface is unusable. Interface parameters are set to their initial values. All interface timers are disabled, and there are no adjacencies associated with the interface. • **Waiting**. The router is trying to determine the identity of the (backup) designated router by monitoring received hello packets. The router is not allowed to elect a backup designated router or a designated router until it transitions out of the waiting state. This prevents unnecessary changes of the (backup) designated router. • **Point-to-Point**. The interface is operational, and is connected to the virtual link. On entering this state the router attempts to form an adjacency with the neighboring router. The interface sends hello packets to the neighbor at every hello interval seconds. • **Designated Router**. This router is the designated router on the attached network. adjacencies are established to all other routers attached to the network. The router must also originate a network LSA for the network node. The network- LSA contains links to all routers (including the designated router) attached to the network. • **Backup Designated Router**. This router is the backup designated router on the attached network. It is promoted to designated router if the present designated router fails. The router establishes adjacencies to all other routers attached to the network. The backup designated router performs slightly different functions during the flooding procedure, compared to the designated router. • **Other Designated Router**. The interface is connected to a broadcast or NBMA network on which other routers were selected to be the designated router and backup designated router. The router attempts to form adjacencies to both the designated router and the backup designated router.

Table 150. Advanced OSPFv3 Virtual Link Configuration (continued)

Field	Description
State	The state of the interface. It takes one the following values: • **Down**. This is the initial interface state. The lower-level protocols indicated that the interface is unusable. Interface parameters are set to their initial values. All interface timers are disabled, and there are no adjacencies associated with the interface. • **Waiting**. The router is trying to determine the identity of the backup designated router by monitoring received hello packets. The router is not allowed to elect a backup designated router or a designated router until it transitions out of waiting state. This prevents unnecessary changes of backup designated router. • **Point-to-Point**. The interface is operational, and is connected either to the virtual link. On entering this state the router attempts to form an adjacency with the neighboring router. hello packets are sent to the neighbor every hello interval seconds. • **Designated Router.** This router is the designated router on the attached network. Adjacencies are established to all other routers attached to the network. The router must also originate a network-LSA for the network node. The network- LSA contains links to all routers (including the designated router) attached to the network. • **Backup Designated Router**. This router is the backup designated router on the attached network. It is promoted to designated router if the present designated router fails. The router establishes adjacencies to all other routers attached to the network. The backup designated router performs slightly different functions during the flooding procedure, as compared to the designated router. • **Other Designated Router**. The interface is connected to a broadcast or NBMA network on which other routers were selected to be the designated router and backup designated router either. The router attempts to form adjacencies to both the designated router and the backup designated router.
Metric	The metric value used by the virtual link.

Configure OSPFv3 Route Redistribution

You can configure the OSPFv3 Route Redistribution parameters. The allowable values for each field are displayed next to the field. If any invalid values are entered, an alert message is displayed with the list of all the valid values.

To configure the OSPFv3 route redistribution:

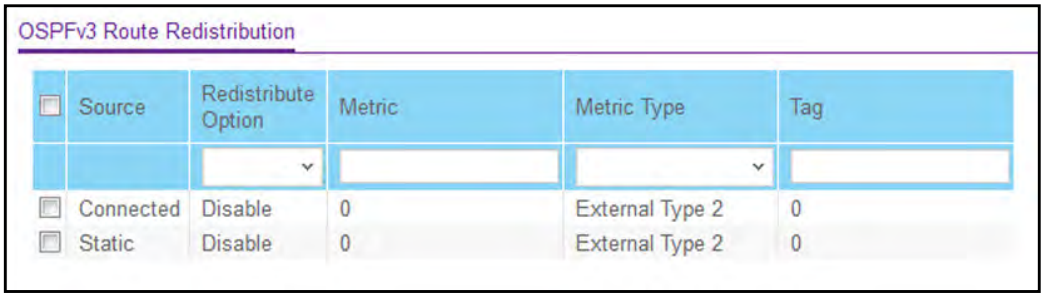
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > OSPFv3 > Advanced > Route Redistribution**.



5. From the **Source** menu, select from the list of available source routes that were not previously configured for redistribution by OSPFv3. The valid values are as follows:
   - Connected
   - Static
6. In the **Redistribute Option** list, select to **Enable** or **Disable** the redistribution for the selected source protocol.
7. Set the **Metric** value to be used as the metric of redistributed routes.

   This fields displays the metric if the source was preconfigured; otherwise, the tag is 0 and can be modified. The valid values are 0 to 16777214.
8. From the **Metric Type** list, select the OSPFv3 metric type of redistributed routes.
9. Set the **Tag** field in routes redistributed.

   This field displays the tag if the source was preconfigured; otherwise, the tag is 0 and can be modified. The valid values are 0 to 4294967295.
10. Click the **Apply** button.

    Your settings are saved.

View the NSF OSPFv3 Summary

You can view the NSF OSPFv3 summary. The allowable values for each field are displayed next to the field. If any invalid values are entered, an alert message is displayed with the list of all the valid values.

To view the NSF OSPF summary:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > OSPFv3 > Advanced > NSF OSPFv3 Summary**.

5. From the **Support mode** list, select one of the following values:
   - **Always**. OSPF performs a graceful restart for all planned and unplanned warm restart events.
   - **Disabled**. Prevents OSPF from performing graceful restarts.
   - **Planned**. OSPF performs a graceful restart only when a restart is planned (for example, due to an **initiate failover** command).

   The default is Disabled. This setting configure how the unit performs graceful restarts.

6. Configure the **Restart Interval**.

   The valid values are 0 to 1800 in seconds. The default is 120 seconds.

7. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 151. Advanced NSF OSPFv3 Summary

Field	Description
Restart Status	The restart status of OSPF helper feature. The possible values are as follows: • Not Restarting • Planned Restart • Unplanned Restart
Restart Age (seconds)	The amount of time since the last restart occurred.

Table 151. Advanced NSF OSPFv3 Summary (continued)

Field	Description
Restart Exit Reason	Displays how the master unit on the switch last started up. The possible values are as follows: • **Not Attempted**. Graceful restart was not been attempted. • **In Progress**. Restart is in progress. • **Completed**. The previous graceful restart completed successfully. • **Timed Out**. The previous graceful restart timed out. • **Topology Changed**. The previous graceful restart terminated prematurely because of a topology change.

7

Configure Multicast Routing

This chapter covers the following topics:

Multicast Overview

Multicast is best suited for video and audio traffic requiring multicast packet control for optimal operation. Multicast includes support for IGMPv2 and IGMPv3. Communication from point to multipoint is called multicasting. The source host (point) transmits a message to a group of zero or more hosts (multipoint) that are identified by a single IP destination address. Although the task can be accomplished by sending unicast (point-to-point) messages to each of the destination hosts, multicasting is the more desirable method for this type of transmission. A multicast message is delivered to all members of its destination host group with the same best-efforts reliability as regular unicast IP messages. The message is not guaranteed to arrive intact at all members of the destination group or in the same order relative to other messages.

View the Multicast Mroute Table

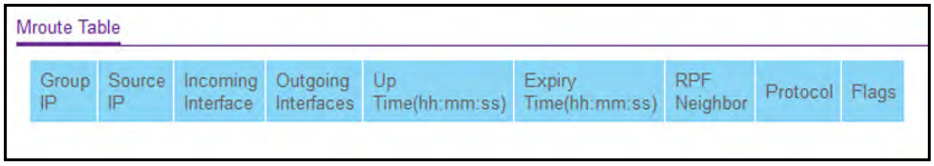
To view the multicast route (Mroute) Table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > Mroute Table**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 152. Multicast Mroute Table

Field	Description
Group IP	The destination group IP address.
Source IP	The IP address of the multicast packet source to be combined with the group IP to fully identify a single route whose Mroute table entry.

Table 152. Multicast Mroute Table (continued)

Field	Description
Incoming Interface	The incoming interface on which multicast packets for this source/group arrive.
Outgoing Interfaces	The list of outgoing interfaces on which multicast packets for this source/group are forwarded.
Up Time (hh:mm:ss)	The time in seconds since the entry was created.
Expiry Time (hh:mm:ss)	The time in seconds before this entry ages out and is removed from the table.
RPF Neighbor	The IP address of the reverse path forwarding (RPF) neighbor.
Protocol	The multicast routing protocol which created this entry. The possible values are as follows: • PIM-DM • PIM-SM • DVMRP
Flags	The value displayed in this field is valid if the multicast routing protocol running is PIM-SM. The possible values are **RPT** or **SPT**. For other protocols a "------" is displayed.

Add Mroute Static Multicast Entries

You can add static multicast route (Mroute) entries to the Mroute table.

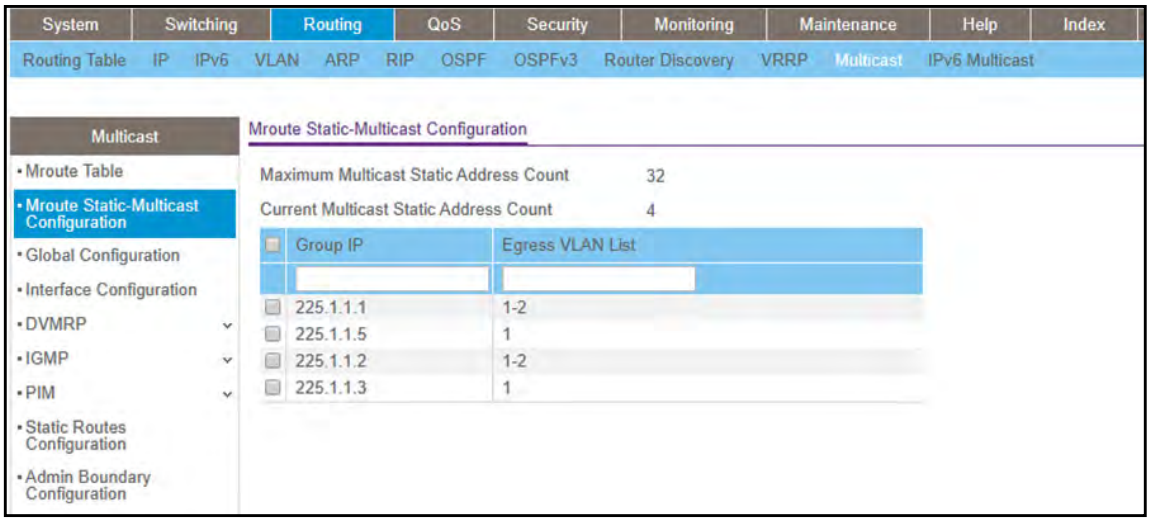
To add static multicast entries to the Mroute table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > Mroute Static-Multicast Configuration**.



5. In the **Group IP** field, enter multicast group IP address.
6. In the **Egress VLAN** List field, enter the VLAN or VLANs to which the multicast group IP address belongs.
7. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 153. Mroute Static-Multicast Configuration

Field	Description
Maximum Multicast Static Address Count	The maximum number of static multicast addresses that the Mroute table can contain.
Current Multicast Static Address Count	The number of static multicast addresses that were added to the Mroute table.

Configure Global Multicast Settings

To configure global multicast settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > Multicast > Global Configuration**.

5. In the **Admin Mode** field, select the **Enable** or **Disable** option to set the administrative status of multicast forwarding in the router.

   The default is **Disable**.

6. Click the **Apply** button.

   Your settings are saved.

The following describes the nonconfigurable information that is displayed.

Table 154. Multicast Global Configuration

Field	Description
Protocol State	The operational state of the multicast forwarding module.
Table Maximum Entry Count	The maximum number of entries in the IP multicast routing table.
Protocol	The multicast routing protocol presently activated on the router, if any.
Table Entry Count	The number of multicast route entries currently present in the multicast route table.

Configure the Multicast Interface

To configure the multicast interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

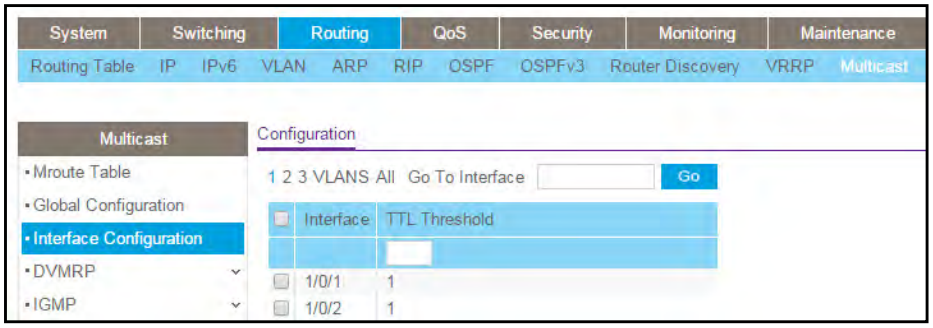
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > Multicast > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. Enter the **TTL Threshold** below which a multicast data packet is not forwarded from the selected interface.

   Enter a number between 0 and 255. The default is 1. If you enter **0**, all multicast packets for the selected interface are forwarded. You must configure at least one router interface before you see this field.
7. Click the **Apply** button.

   Your settings are saved.

Configure Global Multicast DVMRP Settings

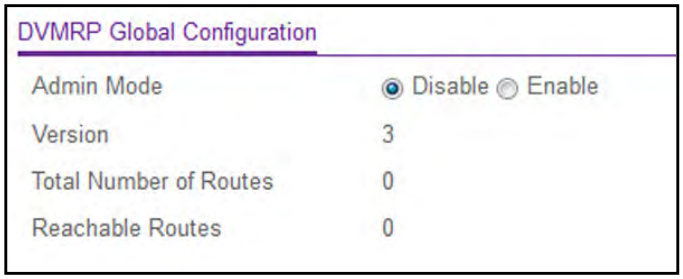
To configure global multicast DVMRP settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > DVMRP > Global Configuration**.



5. Select the **Admin Mode Disable** or **Enable** radio button.

   This sets the administrative status of DVMRP to active or inactive. The default is Disable.

6. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 155. DVMRP Global Configuration

Field	Description
Version	The current value of the DVMRP version string.
Total Number of Routes	The number of routes in the DVMRP routing table.
Reachable Routes	The number of routes in the DVMRP routing table that use a non-infinite metric.

Configure the DVMRP Interface

To configure the multicast DVMRP interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

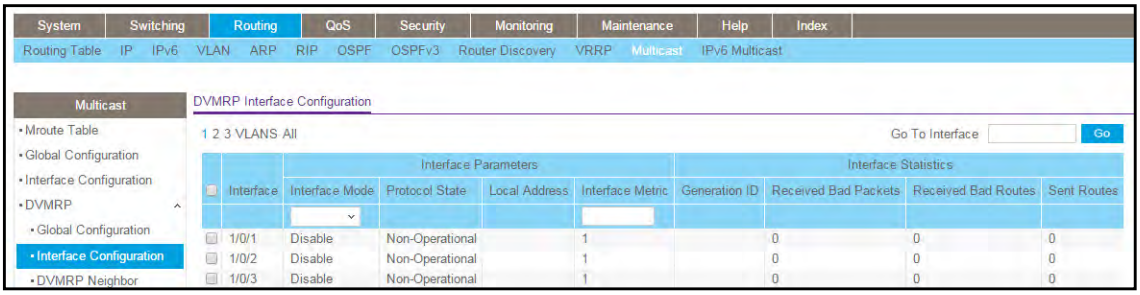
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > Multicast > DVMRP > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. In the **Interface Mode** field, select the **Enable** or **Disable** option to set the administrative mode of the selected DVMRP routing interface.

   The default is Disable.
7. In the **Interface Metric** field, enter the DVMRP metric for the selected interface.

   This value is sent in DVMRP messages as the cost to reach this network. Valid values are 1 to 31. The default value is 1.
8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 156. DVMRP Interface Configuration

Field	Description
Protocol State	The operational state of the DVMRP protocol on the selected interface, either Operational or Non-Operational.
Local Address	The IP address used as a source address in packets sent from the selected interface.
Generation ID	The DVMRP generation ID used by the router for the selected interface. This value is reset every time an interface is started and is placed in prune messages. A change in generation ID informs the neighbor routers to discard any previous information about this router.
Received Bad Packets	The number of invalid packets received on the selected interface.
Received Bad Routes	The number of invalid routes received on the selected interface.
Sent Routes	The number of routes sent on the selected interface.

Search for DVMRP Neighbors

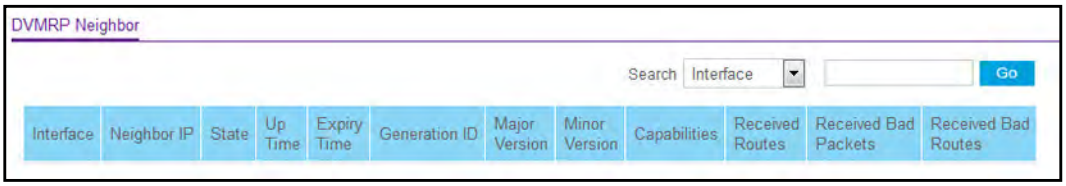
To search for DVMRP neighbors:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > DVMRP > DVMRP Neighbor**.



5. Use the **Search** menu to search for neighbor entries by MAC interface or neighbor IP address:
   - Select **Interface** from the menu, enter the interface in unit/slot/port format (for example 1/0/13), and click the **Go** button.

     If the neighbor entry exists, the entry is displayed as the first entry, followed by the remaining entries.
   - Select **Neighbor IP** from the menu, enter the neighbor IP address, and click the **Go** button.

     If the entry with the matching neighbor IP exists, the entry is displayed as the first entry, followed by the remaining entries. An exact match is required.

The following table describes the nonconfigurable information that is displayed.

Table 157. DVMRP Neighbor

Field	Description
Interface	Select the interface for which data is to be displayed, or all the interfaces are displayed.
Neighbor IP	The IP address of the neighbor whose information is displayed
State	The state of the specified neighbor router on the selected interface, either active or down.
Up Time	The DVMRP uptime for the specified neighbor on the selected interface. This is the time since the neighbor entry was learned.

Table 157. DVMRP Neighbor (continued)

Field	Description
Expiry Time	The DVMRP expiry time for the specified neighbor on the selected interface. This is the time left before this neighbor entry ages out, and is not applicable if the neighbor router's state is down.
Generation ID	The DVMRP generation ID for the specified neighbor on the selected interface.
Major Version	The DVMRP major version for the specified neighbor on the selected interface.
Minor Version	The DVMRP minor version for the specified neighbor on the selected interface.
Capabilities	The DVMRP capabilities of the specified neighbor on the selected interface.
Received Routes	The number of routes received for the specified neighbor on the selected interface.
Received Bad Packets	The number of invalid packets received for the specified neighbor on the selected interface.
Received Bad Routes	The number of invalid routes received for the specified neighbor on the selected interface.

View the DVMRP Next Hop Settings

To view the multicast DVMRP Next Hop settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > DVMRP > DVMRP Next Hop**.

5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 158. DVMRP Next Hop

Field	Description
Source IP	The IP address used with the source mask to identify the source network for this table entry.
Source Mask	The network mask used with the source IP address.
Next Hop Interface	The outgoing interface for this next hop.
Type	The next hop type. **Leaf** means that no downstream dependent neighbors exist on the outgoing interface. Otherwise, the type is **branch**.

View the Multicast DVMRP Prune

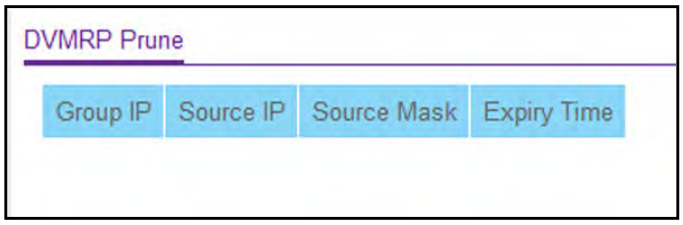
To view the multicast DVMRP prune:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > DVMRP > DVMRP Prune**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 159. DVMRP Prune

Field	Description
Group IP	The group address that was pruned.
Source IP	The IP address used with the source mask to identify the source network for this table entry.

Table 159. DVMRP Prune (continued)

Field	Description
Source Mask	The network mask used with the source IP address.
Expiry Time	The amount of time remaining before this prune will expire at the upstream neighbor. If no prune messages were received from downstream neighbors, this is set to the value of the default prune lifetime timer; otherwise, it is set to the smallest received value or the default timer, whichever is less.

View the DVMRP Route

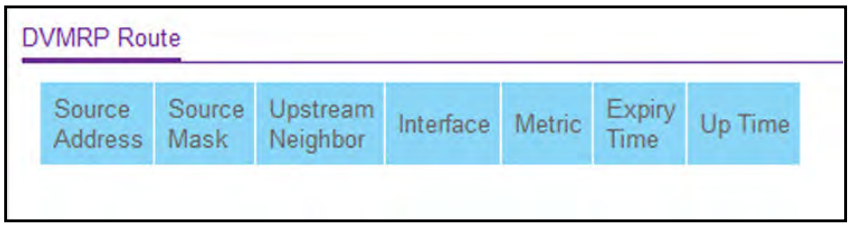
To view the multicast DVMRP route:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > DVMRP > DVMRP Route**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 160. DVMRP Route

Field	Description
Source Address	The network address that is combined with the source mask to identify the sources for this entry.
Source Mask	The network subnet mask used with the source IP address to identify the sources for this entry.
Upstream Neighbor	The address of the upstream neighbor (for example, RPF neighbor) from which IP datagrams from these sources are received.

Table 160. DVMRP Route (continued)

Field	Description
Interface	The interface on which IP datagrams sent by these sources are received. A value of 0 typically means the route is an aggregate for which no next-hop interface exists.
Metric	The distance in hops to the source subnet.
Expiry Time	The amount of time remaining before this prune expires at the upstream neighbor. If no prune messages were received from downstream neighbors, this is set to value of the default prune lifetime timer, otherwise it is set to the smallest received value or the default timer, whichever is less.
Up Time	The time since the route represented by this entry was learned by the router.

Configure Multicast IGMP Settings

You can configure IGMP settings and view IGMP statistics.

Configure IGMP Global Settings

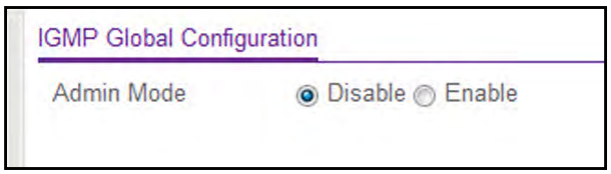
To configure the IGMP global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > IGMP > Global Configuration**.



5. In the **Admin Mode** field, select the **Enable** or **Disable** option.

   This sets the administrative status of IGMP in the router to active or inactive. The default is Disable.

6. Click the **Apply** button.

   Your settings are saved.

Configure the IGMP Routing Interface

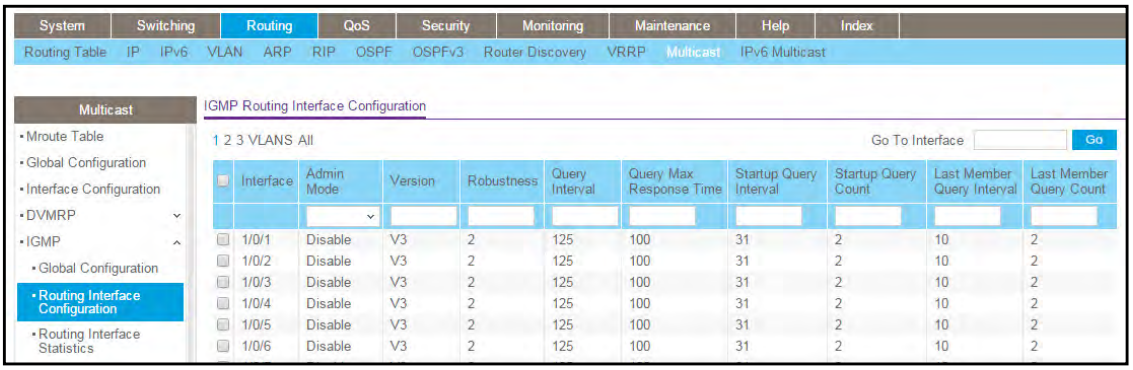
To configure the IGMP routing interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select the **Routing > Multicast > IGMP > Routing Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. In the **Admin Mode** field, select the **Enable** or **Disable** option to set the administrative status of IGMP on the selected routing interface.

   The default is Disable.
7. In the **Version** field, enter the version of IGMP to configure for the selected interface.

   Valid values are 1 to 3. The default value is 3. This field is configurable only when IGMP Interface mode is enabled.
8. In the **Robustness** field, enter the robustness value.

This variable allows tuning for the expected packet loss on a subnet. If you expect the subnet to be lossy, enter a higher number for this parameter. IGMP is robust to robustness variable –1 packet losses. Valid values are 1 to 255. The default value is 2.

9. In the **Query Interval** field, enter the frequency in seconds at which IGMP host-query packets are to be transmitted on this interface.

   Valid values are 1 to 3600. The default value is 125.

10. In the **Query Max Response Time** field, enter the maximum query response time, in tenths of a second, to be advertised in IGMPv2 queries on this interface.

    The default value is 100. Valid values are 0 to 255.

11. In the **Startup Query Interval** field, enter the number of seconds between the transmission of startup queries on the selected interface.

    Valid values are 1 to 300. The default value is 31.

12. In the **Startup Query Count** field, enter the number of queries to be sent on startup.

    The valid values are 1 to 20. The default value is 2.

13. In the **Last Member Query Interval** field, enter the last member query interval in tenths of a second.

    This is the maximum response time to be inserted into group-specific queries sent in response to leave group messages, and is also the amount of time between group-specific query messages. Valid values are from 0 to 255. The default value is 10. This value is not used for IGMP version 1.

14. In the **Last Member Query Count** field, enter the number of queries to be sent on receiving a leave group report.

    Valid values are from 1 to 20. The default value is 2.

15. Click the **Apply** button.

    Your settings are saved.

View IGMP Routing Interface Statistics

To view the IGMP routing interface statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

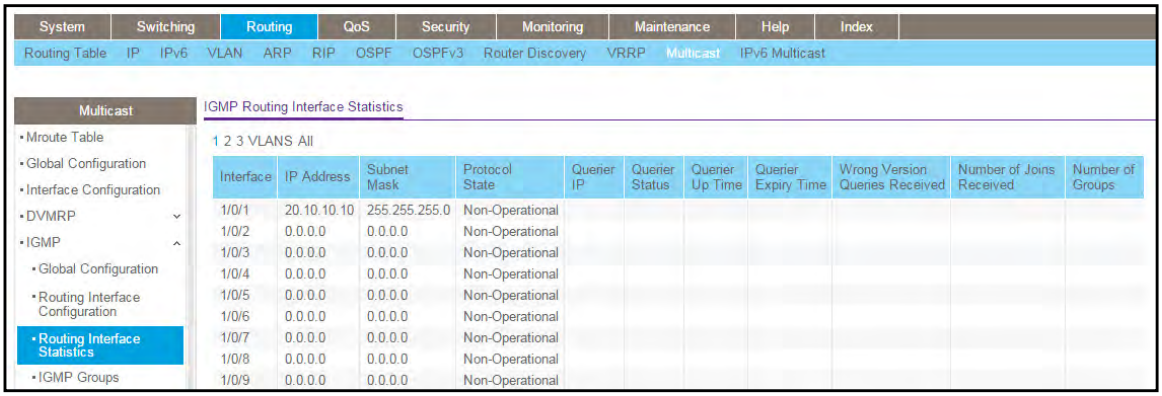
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > Multicast > IGMP > Routing Interface Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 161. Multicast IGMP Routing Interface Statistics

Field	Description
Interface	The interface on which the IGMP is enabled.
IP Address	The IP address of the selected interface.
Subnet Mask	The subnet mask for the IP address of the selected interface.
Protocol State	The operational state of IGMP on the selected interface, either Operational or Non-Operational.
Querier IP	The address of the IGMP querier on the IP subnet to which the selected interface is attached.
Querier Status	Indicates whether the selected interface is in querier or non-querier mode.
Querier Up Time	The time in seconds since the IGMP interface querier was last changed.
Querier Expiry Time	The time in seconds remaining before the other querier present timer expires. If the local system is the querier, this is zero.
Wrong Version Queries Received	The number of queries that were received on the selected interface with an IGMP version that does not match the IGMP version configured for the interface, over the lifetime of the entry. IGMP requires that all routers on a LAN be configured to run the same version of IGMP. Therefore, a configuration error is indicated if any queries are received with the wrong version number.
Number of Joins Received	The number of times a group membership was added on the selected interface; that is, the number of times an entry for this interface was added to the cache table. This gives an indication of the amount of IGMP activity on the interface.
Number of Groups	The current number of entries for the selected interface in the cache table.

View IGMP Groups

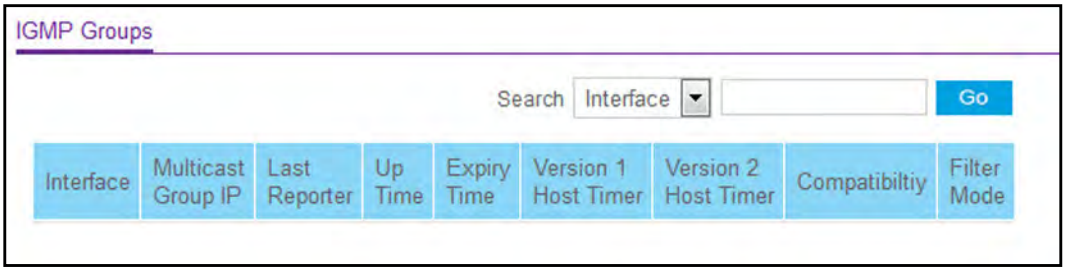
To view the IGMP groups:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > IGMP > IGMP Groups**.



5. Use the **Search** menu to search for multicast entries by interface or group:
   - Select **Interface** from the menu, enter the interface in unit/slot/port format (for example 1/0/13), and click the **Go** button.

     If the entry exists, the entry is displayed as the first entry, followed by the remaining entries.
   - Select **Group** from the menu, enter the multicast group IP address, and click the **Go** button.

     If the entry exists, that entry with the matching group is displayed as the first entry, followed by the remaining entries. An exact match is required.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 162. Multicast IGMP Groups

Field	Description
Interface	The interface for which data is to be displayed.
Multicast Group IP	The IP multicast group address for which data is to be displayed.
Last Reporter	The IP address of the source of the last membership report received for the IP multicast group address on the selected interface.

Table 162. Multicast IGMP Groups (continued)

Field	Description
Up Time	The time elapsed since this entry was created.
Expiry Time	The minimum amount of time remaining before this entry is aged out.
Version 1 Host Timer	The time remaining until the local router assumes that no IGMP version 1 members are on the IP subnet attached to this interface. When an IGMPv1 membership report is received, this timer is reset to the group membership timer. While this timer is non-zero, the local router ignores any IGMPv2 leave messages for this group that it receives on the selected interface. This field is displayed only if the interface is configured for IGMP version 1.
Version 2 Host Timer	The time remaining until the local router assumes that no IGMP version 2 members are on the IP subnet attached to this interface. When an IGMPv2 membership report is received, this timer is reset to the group membership timer. While this timer is non-zero, the local router ignores any IGMPv1 and IGMPv3 leave messages for this group that it receives on the selected interface. This field is displayed only if the interface is configured for IGMP version 2.
Compatibility	This parameter shows group compatibility mode (v1, v2, and v3) for this group on the specified interface.
Filter Mode	The source filter mode (**Include**, **Exclude**, or **NA**) for the specified group on this interface. When NA mode is active, the field is blank.

View the IGMP Membership

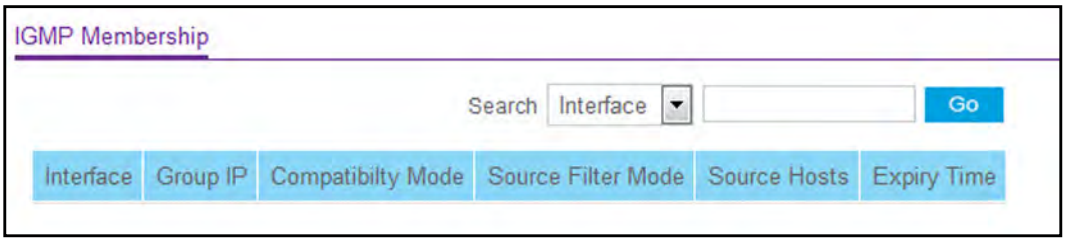
To view the IGMP membership:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > IGMP > IGMP Membership**.



5. Use the **Search** menu to search for multicast entries by interface or group IP address.
   - Select **Interface** from the menu, enter the interface in unit/slot/port format (for example, 1/0/13), and click the **Go** button.

     If the entry exists, the entry is displayed as the first entry, followed by the remaining entries.
   - Select **Group IP** from the menu, enter the multicast group IP, and click the **Go** button.

     If the entry exists, that entry with the matching group IP address is displayed as the first entry, followed by the remaining entries. An exact match is required.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 163. Multicast IGMP Membership

Field	Description
Interface	The interface on which multicast packets are forwarded.
Group IP	The IP multicast group address for which data is to be displayed.
Compatibility Mode	This parameter shows group compatibility mode (v1, v2, and v3) for this group on the specified interface.
Source Filter Mode	The source filter mode (**Include**, **Exclude**, or **NA**) for the specified group on this interface. When NA mode is active, the field is blank.
Source Hosts	This parameter shows source addresses that are members of this multicast address.
Expiry Time	This parameter shows expiry time interval against each source address that are members of this multicast group. This is the amount of time after which the specified source entry is aged out.

Configure the IGMP Proxy Interface

To configure the IGMP proxy interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

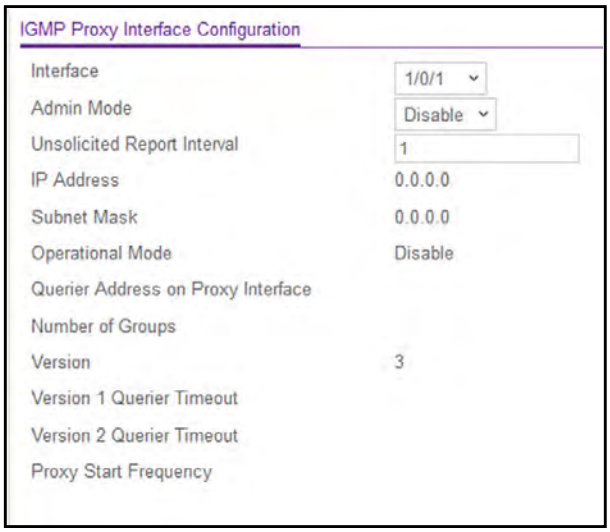
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > Multicast > IGMP > Proxy Interface Configuration**.



5. Use the **Interface** list to select the port.

   At least one router interface must be configured before you configure or display data for an IGMP proxy interface, and it must not be an IGMP routing interface.

6. Select **Enable** or **Disable** from the Admin Mode list.

   This sets the administrative status of IGMP proxy on the selected interface. The default is Disable. Routing, IGMP and Multicast global admin modes must be enabled to enable IGMP proxy interface mode.

7. In the **Unsolicited Report Interval** field, enter the unsolicited time interval value in seconds.

   The unsolicited report interval is the time between repetitions of a host's initial report of membership in a group. Valid values are from 1 to 260. The default value is 1.

8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 164. Multicast IGMP Proxy Interface Configuration

Field	Description
IP Address	The IP address of the IGMP proxy interface.
Subnet Mask	The subnet mask for the IP address of the IGMP proxy interface.

Table 164. Multicast IGMP Proxy Interface Configuration (continued)

Field	Description
Operational Mode	The operational state of IGMP proxy interface.
Querier Address on Proxy Interface	The querier address on the proxy interface.
Number of Groups	The current number of multicast group entries for the IGMP proxy interface in the cache table.
Version	Enter the version of IGMP to configure on the selected interface. Valid values are 1 to 3; the default value is 3. This field is configurable only when IGMP proxy Interface mode is enabled.
Version 1 Querier Timeout	The older IGMP version 1 querier time-out value in seconds. The older version querier Interval is the time-out for transitioning a host back to IGMPv3 mode, once an older version query is heard. When an older version query is received, hosts set their older version querier present timer to older version querier Interval.
Version 2 Querier Timeout	The older IGMP version 2 querier time-out value in seconds.
Proxy Start Frequency	The number of times the proxy was brought up.

View the IGMP Proxy Interface Statistics

To view the IGMP proxy interface statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > IGMP > Proxy Interface Statistics**.

5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following describes the nonconfigurable information that is displayed.

Table 165. Multicast IGMP Proxy Interface Statistics

Field	Description
Proxy Interface	The interface on which IGMP packets are received.
Version	The version of IGMP packets received.
Queries Received	The number of IGMP queries received.
Report Received	The number of IGMP reports received.
Reports Sent	The number of IGMP reports sent.
Leaves Received	The number of IGMP leaves received.
Leaves Sent	The number of IGMP leaves sent.

View the IGMP Proxy Membership

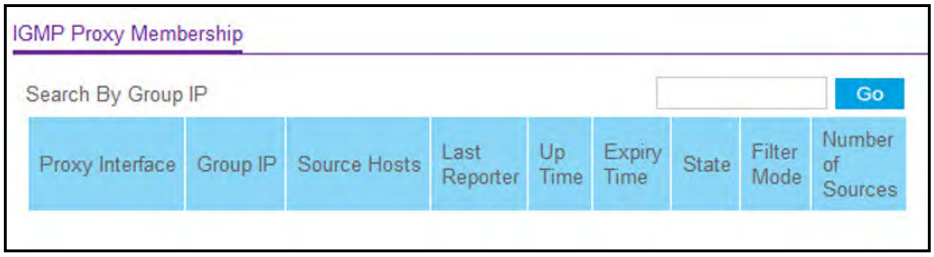
To view the IGMP proxy membership:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > IGMP > Proxy Membership**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 166. Multicast IGMP Proxy Membership

Field	Description
Proxy Interface	The interface on which IGMP proxy is enabled.
Group IP	The IP multicast group address.
Source Hosts	This parameter shows source addresses that are members of this multicast address.
Last Reporter	The IP address of the source of the last membership report received for the IP multicast group address on the IGMP proxy interface.
Up Time	The time elapsed since this entry was created.
Expiry Time	This parameter shows expiry time interval against each source address that is a member of this multicast group. This is the amount of time after which the specified source entry is aged out.
State	The state of the host entry. A host can be in one of the state. Non-member state - does not belong to the group on the interface. Delaying member state - host belongs to the group on the interface and report timer running. The report timer is used to send out the reports. Idle member state - host belongs to the group on the interface and no report timer running.
Filter Mode	The group filter mode (Include/Exclude/None) for the specified group on the IGMP proxy interface.
Number of Sources	The number of source hosts present in the selected multicast group.

Configure PIM Settings

You can configure PIM settings and view PIM statistics.

Configure the Multicast PIM Global Settings

Protocol-Independent Multicast (PIM) is a standard multicast routing protocol that provides scalable interdomain multicast routing across the Internet, independent of the mechanisms provided by any particular unicast routing protocol.

To configure the PIM global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > Multicast > PIM > Global Configuration**.

5. In the **Admin Mode** field, select the protocol of PIM in the router.

   Possible values are **Disable**, **PIM-SM**, or **PIM-DM**. The default is **Disable**.

6. Click the **Apply** button.

   Your settings are saved.

Configure PIM SSM Settings

While PIM employs a specially configured rendezvous point (RP) router that serves as a meeting junction for multicast senders and listeners, Protocol-Independent Multicast Single-Source Multicast (PIM-SSM) does not use an RP. It supports only source route delivery trees. It is used between routers so that they can track which multicast packets to forward to each other and to their directly connected LANs. The SSM service model can be implemented with a strict subset of the PIM protocol mechanisms. Both regular IP multicast and SSM semantics can coexist on a single router, and both can be implemented using the PIM protocol. A range of multicast addresses, currently 232.0.0.0/8 in IPv4 and FF3x::/32 in IPv6, is reserved for SSM.

To configure PIM SSM settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

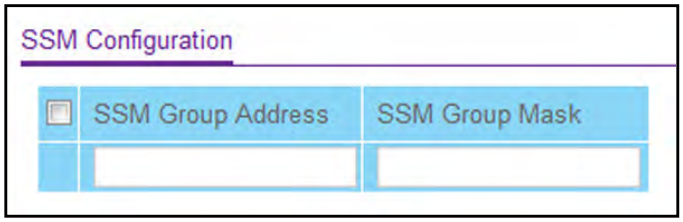
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > Multicast > PIM > SSM Configuration**.



5. In the **SSM Group Address** field, enter the source-specific multicast group IP address.
6. In the **SSM Group Mask** field, enter the source-specific multicast group IP address mask.
7. Click the **Add** button.

   The source-specific group is added.

Configure PIM Interface

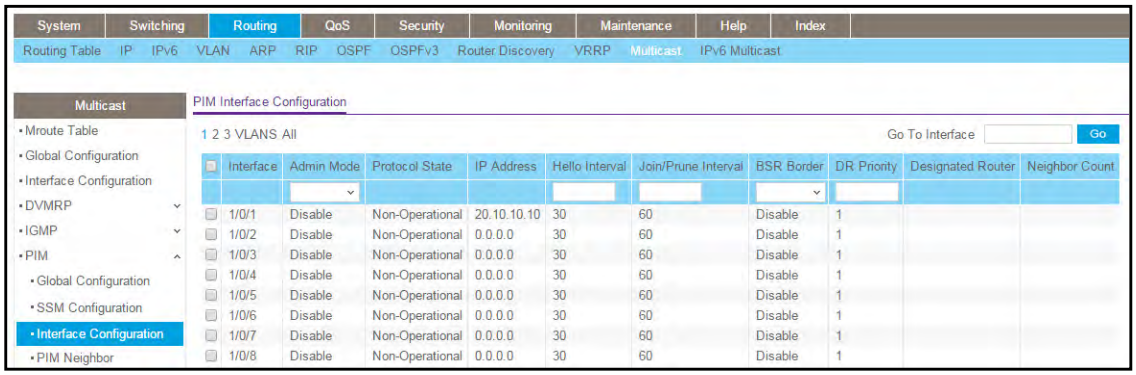
To configure the multicast PIM interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > PIM > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.

- Next to the Interface column, select the check box for the interface that you want to configure.

6. In the **Admin Mode** field, select the **Enable** or **Disable** option to set the administrative status of PIM in the router.

   The default is Disable.

7. In the **Hello Interval** field, enter the time in seconds between the transmission of PIM hello messages on this interface.

   The valid values are from 0 to 18000. The default value is 30.

8. In the **Join/Prune Interval**, enter the time in seconds at which PIM Join/Prune messages are transmitted on this PIM interface. The valid values are from 0 to 18000. The default value is 60.
9. In the **BSR Border** field, select the **Enable** or **Disable** option to set the bootstrap router (BSR) border status on the selected interface.
10. Enter the **DR Priority** for the selected interface.

    The valid values are from 0 to 2147483647. The default value is 1.

11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 167. Multicast PIM Interface Configuration

Field	Description
Protocol State	The state of PIM in the router. either Operational or Non-Operational.
IP Address	The IP address of the selected PIM interface. If you enter an IPv6 address, the format is prefix/prefix length.
Designated Router	The designated router on the selected PIM interface.
Neighbor Count	The number of PIM neighbors on the selected interface.

View the PIM Neighbor

To view the PIM neighbor:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

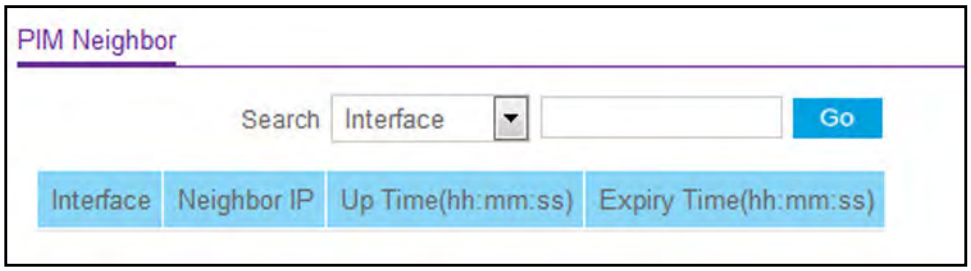
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > Multicast > PIM > PIM Neighbor**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 168. Multicast PIM Neighbor

Field	Description
Interface	The interface on which the neighbor is displayed.
Neighbor IP	The IP address of the PIM neighbor for this entry.
Up Time (hh:mm:ss)	The time since this PIM neighbor (last) became a neighbor of the local router.
Expiry Time (hh:mm:ss)	The minimum time remaining before this PIM neighbor is aged out.

View the PIM Candidate Rendezvous Point

To view the multicast PIM candidate rendezvous point (RP):

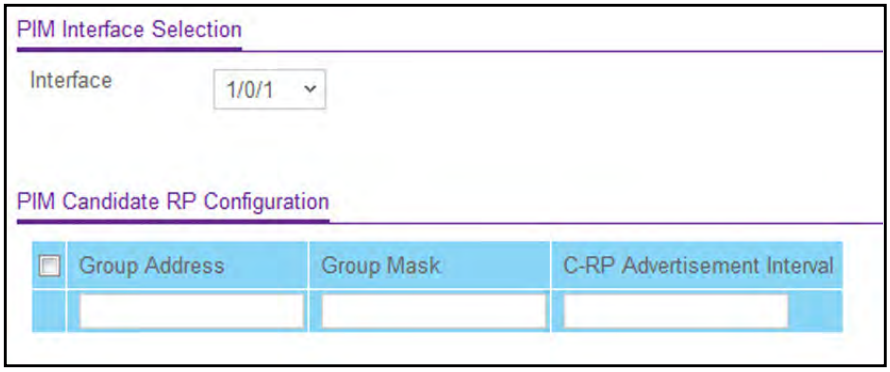
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > Multicast > PIM > Candidate RP Configuration**.



The following table describes the nonconfigurable information that is displayed.

Table 169. Multicast PIM Neighbor

Field	Description
Field	**Description**
Interface	The interface on which the neighbor is displayed.
Neighbor IP	The IP address of the PIM neighbor for this entry.
Up Time (hh:mm:ss)	The time since this PIM neighbor (last) became a neighbor of the local router.
Expiry Time (hh:mm:ss)	The minimum time remaining before this PIM neighbor is aged out.

View the PIM Neighbor

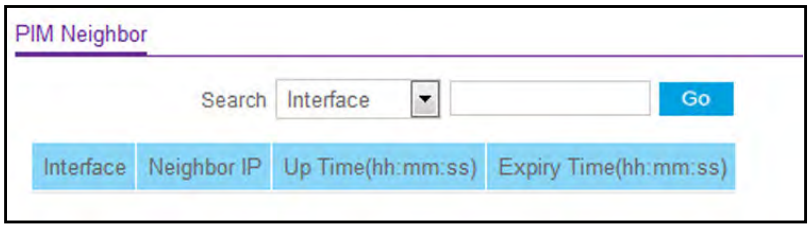
To view the multicast PIM neighbor:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > PIM > PIM Neighbor**.



To refresh the page with the latest information on the switch, click the **Refresh** button.

Table 170. Multicast PIM Neighbor

Field	Description
Interface	The interface on which the neighbor is displayed.
Neighbor IP	The IP address of the PIM neighbor for this entry.
Up Time (hh:mm:ss)	The time since this PIM neighbor (last) became a neighbor of the local router.
Expiry Time (hh:mm:ss)	The minimum time remaining before this PIM neighbor is aged out.

Configure the PIM Candidate Rendezvous Point

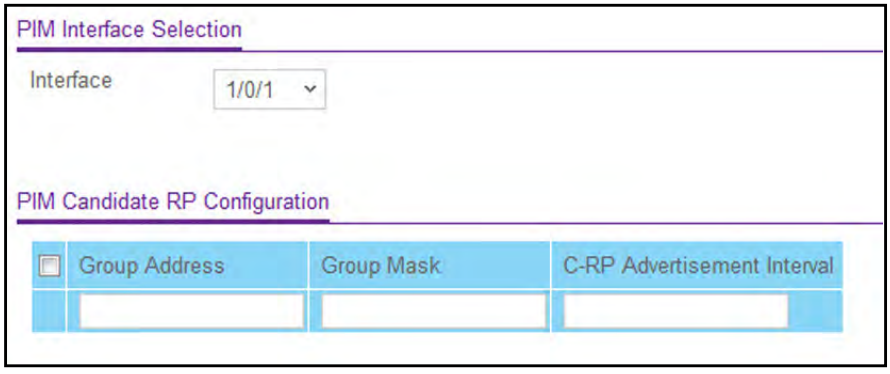
To configure the PIM candidate rendezvous point (RP):

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > PIM > Candidate RP Configuration**.



5. From the list of interfaces, select the **Interface**.
6. Enter the **Group Address** transmitted in candidate-RP-advertisements.

   If you enter an IPv6 address, the format is prefix/prefix length.
7. In the **Group Mask** field, enter the group address mask transmitted in candidate-RP-advertisements
8. In the **C-RP Advertisement Interval** field, specify the duration in seconds at which the C-RP messages are unicast to the bootstrap router (BSR).

   The range is from 1 to 16383 seconds. The default value is 60 seconds. If this field is submitted without any value, the default value is used.
9. Click the **Add** button.

   The candidate-RP address is added for the PIM router.

Configure the PIM Bootstrap Router Candidate

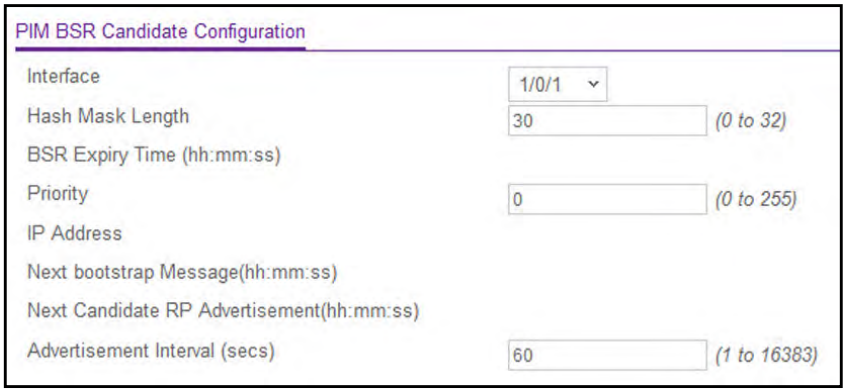
To configure the multicast PIM bootstrap router (BSR) candidate:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > PIM > BSR Candidate Configuration**.



5. From the list of interfaces, select the **Interface**.
6. Enter the C-BSR **Hash Mask Length** to be advertised in bootstrap messages.

   This hash mask length is used in the hash algorithm for selecting the RP for a particular group. The valid values are from 0 to 32. The default value is 30.

7. In the **Priority** field, enter the priority of C-BSR.
8. Enter the **Advertisement Interval** value of the C-BSR in seconds.

   The default value is 60.
9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 171. Multicast BSR Candidate Configuration

Field	Description
BSR Expiry Time (hh:mm:ss)	Time (in hours, minutes and seconds) in which the learned elected bootstrap router (BSR) expires.
IP Address	The IP address of the elected BSR.
Next bootstrap Message (hh:mm:ss)	Time (in hours, minutes, and seconds) in which the next bootstrap message is due from this BSR.
Next Candidate RP Advertisement (hh:mm:ss)	Time (in hours, minutes, and seconds) in which the next candidate RP advertisement is sent.

Configure the PIM Static Rendezvous Point

You can statically configure the rendezvous point (RP) address for one or more multicast groups.

To configure the PIM static RP:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > PIM > Static RP Configuration**.

5. In the **RP Address** field, enter the IP address for one or more multicast groups.
6. In the **Group Address** field, enter the group address of the RP.
7. Enter the **Group Mask** of the RP to be created or deleted.
8. In the **Override** field, select **Enable** or **Disable**.

   Enable indicates that, if there is a conflict, the RP configured with this option prevails over the RP learned by BSR.
9. Click the **Add** button.

   The static RP address is added for one or more multicast groups
10. Click the **Apply** button.

    Your settings are saved.

Configure Multicast Static Routes

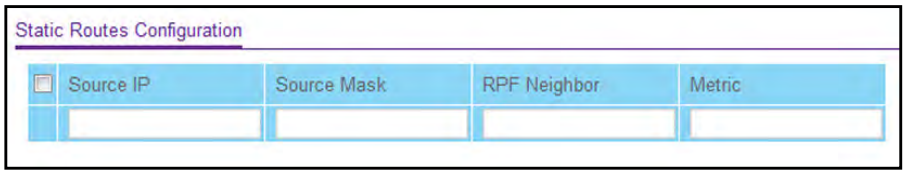
To configure multicast static routes:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > Multicast > Static Routes Configuration**.



5. In the **Source IP** field, enter the IP address that identifies the multicast packet source for the entry you are creating.
6. In the **Source Mask** field, enter the subnet mask to be applied to the source IP address.
7. In **RPF Neighbor** field, enter the IP address of the neighbor router on the path to the source.
8. In the **Metric** field, enter the link state cost of the path to the multicast source.

   The range is 0 to 255, the default is 1. You can change the metric for a configured route by selecting the static route and editing this field.

9. Click the **Add** button.

   The static route is added to the switch.

10. Click the **Apply** button.

    Your settings are saved.

Configure the Multicast Admin Boundary

The definition of an administratively scoped boundary is a mechanism to stop the ingress and egress of multicast traffic for a given range of multicast addresses on a given routing interface.

To configure the multicast admin boundary:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

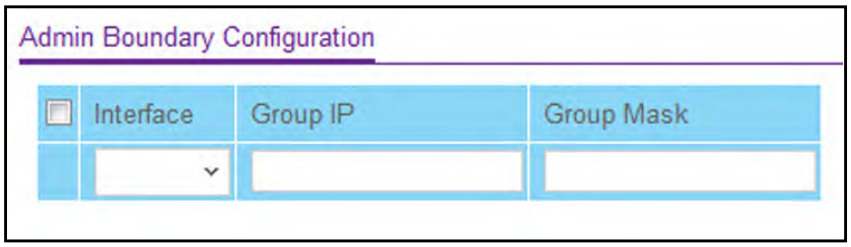
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > Multicast > Admin Boundary Configuration**.



5. In the **Interface** list, select the router interface for which the administratively-scoped boundary is to be configured.
6. In the **Group IP** field, enter the multicast group address for the start of the range of addresses to be excluded.

   The address must be in the range of 239.0.0.0 through 239.255.255.255.

7. In the **Group Mask** field, enter the mask to be applied to the multicast group address.

   The combination of the mask and the group IP gives the range of administratively scoped addresses for the selected interface.

8. Click the **Add** button.

   The administratively scoped boundary is added.

Configure IPv6 Multicast Settings

View the IPv6 Multicast Mroute Table

You can view the contents of the Mroute Table in tabular format.

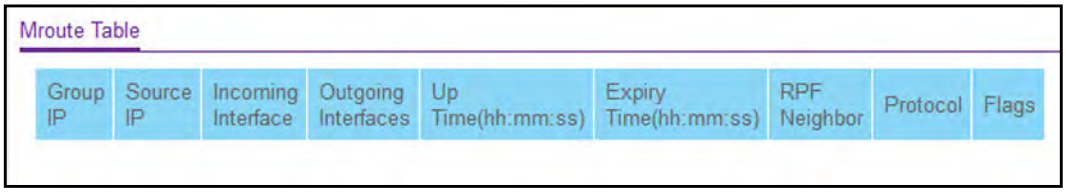
To view the Mroute Table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > Mroute Table**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 172. Multicast Mroute Table

Field	Description
Group IP	The destination group IP address.
Source IP	The IP address of the multicast packet source to be combined with the group IP to fully identify a single route whose Mroute table entry.
Incoming Interface	The incoming interface on which multicast packets for this source/group arrive.
Outgoing Interfaces	The list of outgoing interfaces on which multicast packets for this source/group are forwarded.
Up Time (hh:mm:ss)	The time in seconds since the entry was created.
Expiry Time (hh:mm:ss)	The time in seconds before this entry ages out and is removed from the table.
RPF Neighbor	The IP address of the reverse path forwarding (RPF) neighbor.

Table 172. Multicast Mroute Table (continued)

Field	Description
Protocol	The multicast routing protocol which created this entry. The possible values are as follows: • PIM-DM • PIM-SM
Flags	The value displayed in this field is valid if the multicast routing protocol running is PIM-SM. The possible values are **RPT** or **SPT**. For other protocols a – (hyphen) is displayed.

Configure the IPv6 PIM Global Settings

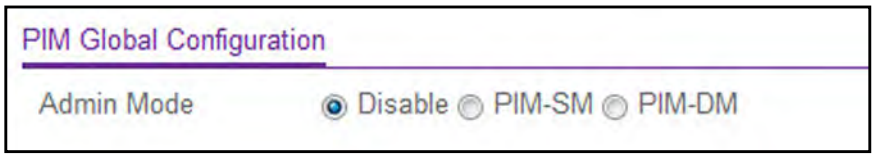
To configure the IPv6 PIM global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > IPv6 PIM > Global Configuration**.



5. Select an Admin Mode radio button.

   The options are **Disable**, or the protocol variant of PIM option, dense mode (**PIM-DM**) or sparse mode (**PIM-SM**).

   By default, this setting is disabled. The **Disable** option sets the administrative status of PM in the router to active or inactive.
6. Click the **Apply** button.

   Your settings are saved.

Configure IPv6 PIM SSM

While PIM employs a specially-configured rendezvous point (RP) router that serves as a meeting junction for multicast senders and listeners, Protocol-Independent Multicast Single-Source Multicast (PIM-SSM) does not use an RP. It supports only source route delivery trees. It is used between routers so that they can track which multicast packets to forward to each other and to their directly connected LANs. The SSM service model can be implemented with a strict subset of the PIM protocol mechanisms. Both regular IP multicast and SSM semantics can coexist on a single router, and both can be implemented using the PIM protocol. A range of multicast addresses, currently 232.0.0.0/8 in IPv4 and FF3x::/32 in IPv6, is reserved for SSM.

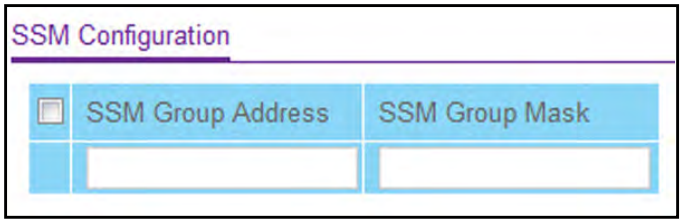
To configure the IPv6 PIM SSM settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > IPv6 PIM > SSM Configuration**.



5. In the **SSM Group Address** field, enter the source-specific multicast group IP address.
6. In the **SSM Group Mask** field, enter the source-specific multicast group IP address mask.
7. Click the **Add** button.

   The source-specific group is added.

Configure the IPv6 PIM Interface

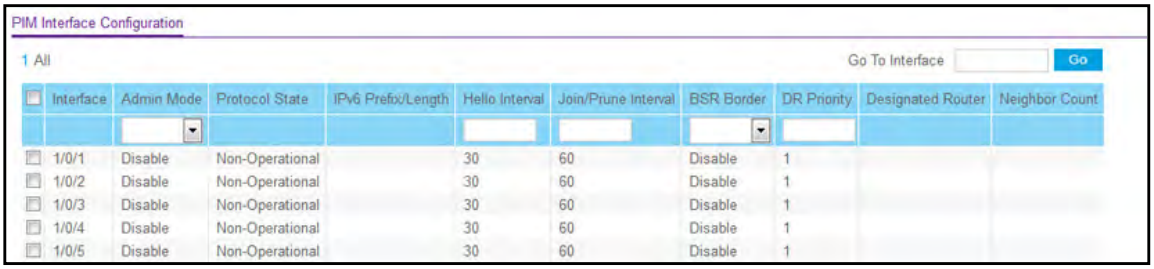
To configure the IPv6 PIM interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > IPv6 PIM > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. In the **Admin Mode** field, select **Enable** or **Disable**.

   This sets the administrative status of PIM-SM in the router. The default is Disable.
7. In the **Hello Interval** field, enter the time in seconds between the transmission of PIM hello messages on this interface.

   The valid values are from 0 to 18000. The default value is 30.
8. In the **Join/Prune Interval** field, enter the frequency at which PIM Join/Prune messages are transmitted on this PIM interface.

   The valid values are from 0 to 18000. The default value is 60.
9. In the **BSR Border** field, select the **Enable** or **Disable** option to set the bootstrap router (BSR) border status on the selected interface.
10. Enter the **DR Priority** for the selected interface.

    The valid values are from 0 to 2147483647. The default value is 1.

11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 173. IPv6 PIM Interface Configuration

Field	Description
Protocol State	The state of PIM in the router. either Operational or Non-Operational.
IPv6 Prefix/Length	The IPv6 address prefix and the length of the selected interface.
Designated Router	The designated router on the selected PIM interface.
Neighbor Count	The number of PIM neighbors on the selected interface.

View the IPv6 PIM Neighbor

To view the IPv6 PIM neighbor:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > IPv6 PIM > PIM Neighbor**.

5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 174. IPv6 PIM Neighbor

Field	Description
Interface	The interface on which the neighbor is displayed.
Neighbor IP	The IP address of the PIM neighbor for this entry.

Table 174. IPv6 PIM Neighbor

Field	Description
Up Time (hh:mm:ss)	The time since this PIM neighbor (last) became a neighbor of the local router.
Expiry Time (hh:mm:ss)	The minimum time remaining before this PIM neighbor is aged out.

Configure the IPv6 PIM Candidate Rendezvous Point

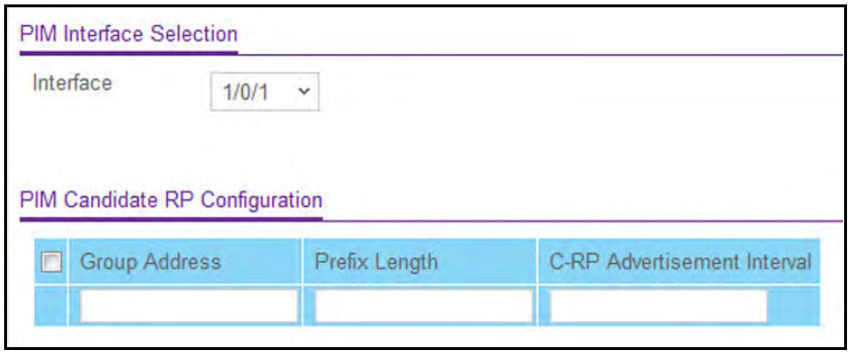
To configure the IPv6 PIM candidate rendezvous point:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > IPv6 PIM > Candidate RP Configuration**.



5. From the list of interfaces, select the **Interface**.
6. In the **Group Address** field, enter the group IPv6 address prefix transmitted in candidate-RP-advertisements.
7. In the **Prefix Length** field, enter the group IPv6 Prefix Length transmitted in candidate-RP-advertisements
8. In the **C-RP Advertisement Interval**, specify the duration in seconds at which the C-RP messages are unicast to the bootstrap router (BSR).

   The range is from 1 to 16383 seconds. The default value is 60 seconds. If this field is submitted without any value, the default value is used.
9. Click the **Add** button.

   The candidate-RP address is added for the PIM router.

Configure the IPv6 PIM Bootstrap Router Candidate Settings

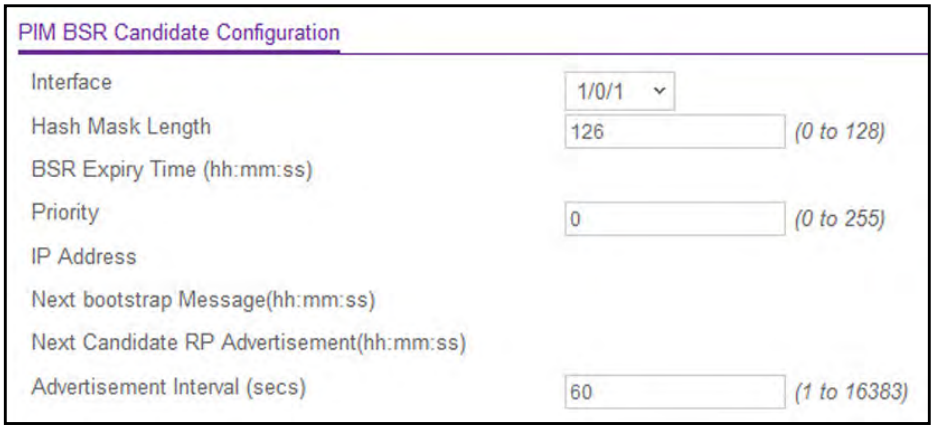
To configure the IPv6 PIM BSR Candidate settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > IPv6 PIM > BSR Candidate Configuration**.



5. From the list of interfaces, select the **Interface**.
6. Enter the C-BSR **Hash Mask Length** to be advertised in bootstrap messages.

   This hash mask length is used in the hash algorithm for selecting the RP for a particular group. The valid values are from 0 to 128. The default value is 126.
7. In the **Priority** field, enter the priority of the C-BSR.
8. Enter the **Advertisement Interval** value of the C-BSR in seconds.

   The default value is 60.

   To remove the configured Hash Mask Length, and Priority values and restore them to the default values, click the **Delete** button.
9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 175. IPv6 PIM BSR Candidate Configuration

Field	Description
BSR Expiry Time (hh:mm:ss)	Time (in hours, minutes and seconds) in which the learned elected bootstrap router (BSR) expires.
IP Address	The IP address of the elected BSR.
Next bootstrap Message (hh:mm:ss)	Time (in hours, minutes, and seconds) in which the next bootstrap message is due from this BSR.
Next Candidate RP Advertisement (hh:mm:ss)	Time (in hours, minutes, and seconds) in which the next candidate RP advertisement is sent.

Configure the IPv6 PIM Static Rendezvous Point

You can statically configure the rendezvous point (RP) address for one or more multicast groups.

To configure the IPv6 PIM static RP:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > IPv6 PIM > Static RP Configuration**.

5. In the **RP Address** field, enter the IP address of the RP.
6. In the **Group Address** field, enter the address of the RP.
7. In the **Prefix Length** field, enter the group address prefix length.
8. In the **Override** field, select **Enable** or **Disable**.

   Enable indicates that, if there is a conflict, the RP configured with this option prevails over the RP learned by BSR.

9. Click the **Add** button.

   The static RP address is added for one or more multicast groups.

10. Click the **Apply** button.

    Your settings are saved.

Configure IPv6 MLD Global Settings

To configure the IPv6 PIM global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

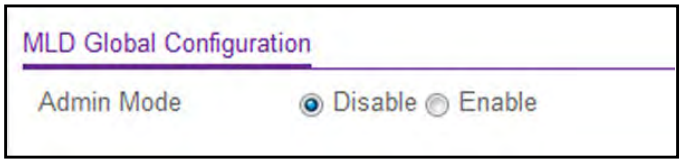
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > IPv6 Multicast > MLD > Global Configuration**.



5. Select the Admin Mode **Disable** or **Enable** radio button.

   This sets the administrative status of MLD in the router to active or inactive. The default is Disable.

6. Click the **Apply** button.

   Your settings are saved.

Configure the IPv6 MLD Routing Interface

To configure the IPv6 MLD routing interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

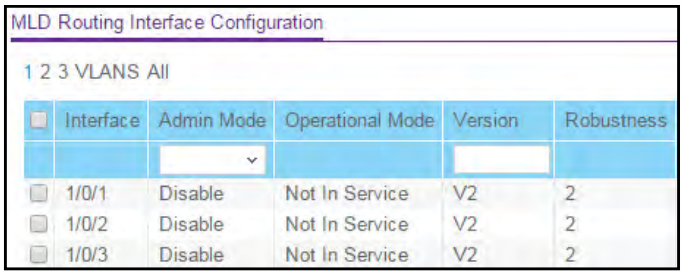
   The login window opens.

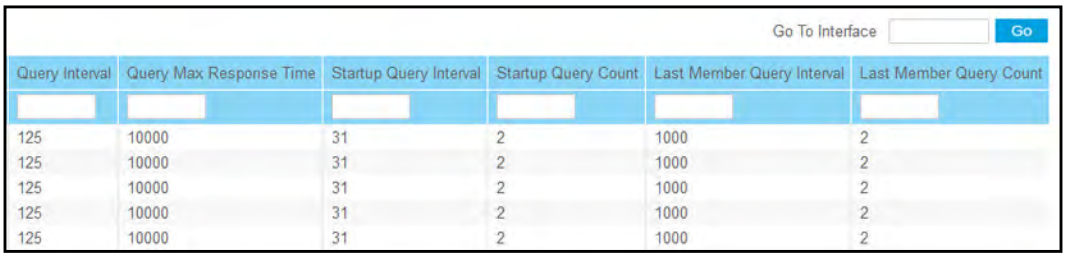
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > IPv6 Multicast > MLD > Routing Interface Configuration**.





5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. In the **Admin Mode** field, select **Enable** or **Disable**.

   This sets the administrative status of MLD on the selected routing interface. The default is Disable.
7. In the **Version** field, enter the version to configure for the selected interface.

   Valid values are 1 to 2. The default value is 2.
8. In the **Query Interval** field, enter the frequency in seconds at which MLD host-query packets are to be transmitted on this interface.

   Valid values are 1 to 3600. The default value is 125.
9. In the **Query Max Response Time** field, enter the maximum query response time, in milliseconds, to be advertised in MLDv2 queries on this interface.

   Valid values are 0 to 65535. The default value is 10000 milliseconds.
10. In the **Startup Query Interval** field, enter the configured interval in seconds between general queries sent by a querier on startup.

    The default value is 31.

11. Enter the **Startup Query Count** value to indicate the configured number of queries sent out on startup, separated by the startup query interval.

    The default value is 2.

12. In the **Last Member Query Interval** field, enter the last member query interval in milliseconds.

    This is the maximum response time to be inserted into group-specific queries sent in response to leave group messages, and is also the amount of time between group-specific query messages. Valid values are from 0 to 655355. The default value is 1000 milliseconds.

13. In the **Last Member Query Count** field, enter the number of queries to be sent on receiving a leave group report.

    Valid values are from 1 to 20. The default value is 2.

14. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 176. IPv6 MLD Routing Interface Configuration

Field	Description
Operational Mode	The operational status of MLD on the Interface.
Robustness	The robustness parameter for the selected interface. This variable allows tuning for the expected packet loss on a subnet. If a subnet is expected to be lossy, the robustness variable can be increased. MLD is robust to robustness variable –1 packet losses. The default value is 2.

View IPv6 MLD Routing Interface Statistics

To view the IPv6 multicast MLD routing interface statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

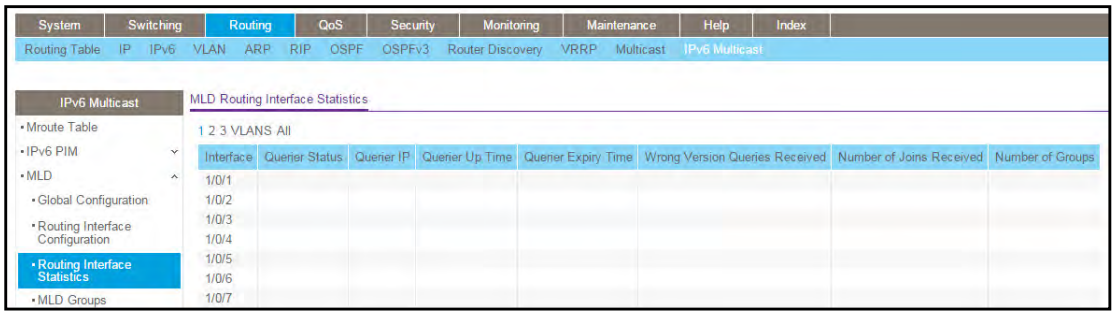
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > IPv6 Multicast > MLD > Routing Interface Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 177. IPv6 MLD Routing Interface Statistics

Field	Description
Interface	The interface for which data is to be displayed.
Querier Status	Indicates whether the selected interface is an MLD querier or non-querier on the subnet it is associated with.
Querier IP	The address of the MLD querier on the IP subnet to which the selected interface is attached.
Querier Up Time	The time in seconds since the MLD interface querier was last changed.
Querier Expiry Time	The time in seconds remaining before the other querier present timer expires. If the local system is the querier, this is zero.
Wrong Version Queries Received	The number of queries received whose MLD version does not match the MLD version of the interface.
Number of Joins Received	The number of times a group membership was added on the selected interface.
Number of Groups	The current number of membership entries for the selected interface in the cache table.

View the IPv6 MLD Groups

To view the IPv6 MLD groups:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Routing > IPv6 Multicast > MLD > MLD Groups**.

5. Use the **Search** menu to search for multicast entries by interface or group:
   - Select **Interface** from menu, enter the interface in unit/slot/port format (for example 1/0/13), and click the **Go** button.

     If the entry exists, it is displayed as the first entry, followed by the remaining entries.
   - Select **Group** from the menu, enter the MLD group IP address, and click the **Go** button.

     If the entry exists, it is displayed as the first entry, followed by the remaining entries. An exact match is required.
6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 178. IPv6 Multicast MLD Groups

Field	Description
Interface	The interface for which data is to be displayed.
Group IP	The address of the MLD members.
Last Reporter	The IP address of the source of the last membership report received for this multicast group address on the selected interface.
Up Time	The time elapsed in seconds since the multicast group was known.
Expiry Time	Time left in seconds before the entry is removed from the MLD membership table of this interface.
Filter Mode	The filter mode of the multicast group on this interface. Possible values are **Include** and **Exclude**.
Version 1 Host Timer	The time remaining until the router assumes that there are no longer any MLD version 1 hosts on the specified interface.
Group Compat Mode	The compatibility mode of the multicast group on the interface. The values it can take are MLDv1 and MLDv2.
Source Hosts	This parameter shows source addresses that are members of this multicast address.
Source Address (Expiry Time)	This parameter shows expiry time interval against each source address that is a member of this multicast group. This is the amount of time after which the specified source entry is aged out.

View and Clear IPv6 MLD Traffic

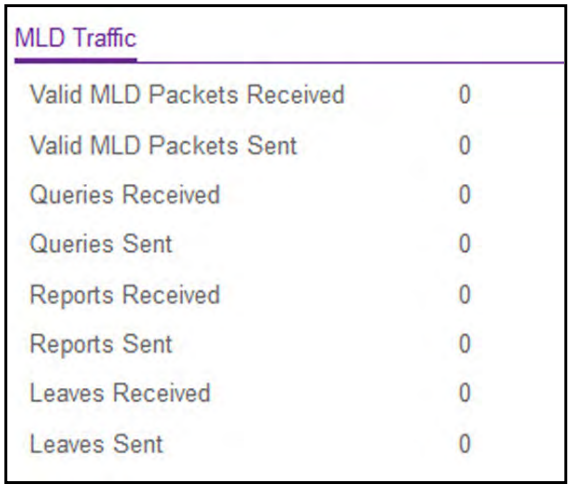
To view and clear IPv6 MLD traffic:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > MLD > MLD Traffic**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.
6. To clear all IPv6 MLD traffic, click the **Clear** button.

The following table describes the nonconfigurable information that is displayed.

Table 179. IPv6 Multicast MLD Traffic

Field	Description
Valid MLD Packets Received	The number of valid MLD packets received by the router.
Valid MLD Packets Sent	The number of valid MLD packets sent by the router.
Queries Received	The number of valid MLD queries received by the router.
Queries Sent	The number of valid MLD queries sent by the router.
Reports Received	The number of valid MLD reports received by the router.
Reports Sent	The number of valid MLD reports sent by the router.

Table 179. IPv6 Multicast MLD Traffic (continued)

Field	Description
Leaves Received	The number of valid MLD leaves received by the router.
Leaves Sent	The number of valid MLD leaves sent by the router.

Configure the IPv6 MLD Proxy Interface

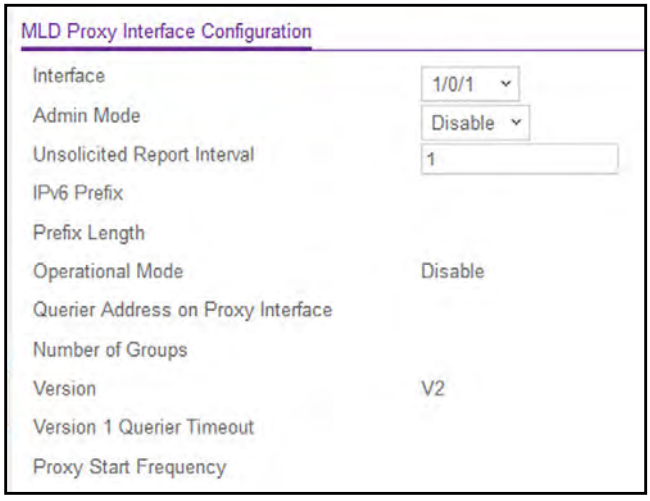
To configure the IPv6 multicast MLD proxy interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > MLD > Proxy Interface Configuration**.



5. In the **Interface** list, select the interface.
6. In the **Admin Mode** list, select **Enable** or **Disable**.

   This sets the administrative status of MLD proxy on the selected interface. The default is Disable. Routing, MLD, and Multicast global admin modes must be enabled to enable MLD proxy interface mode.
7. In the **Unsolicited Report Interval** field, enter the unsolicited time interval value in seconds.

The unsolicited report interval is the time between repetitions of a host's initial report of membership in a group. Valid values are 1 to 260. The default value is 1.

8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 180. IPv6 Multicast MLD Proxy Interface Configuration

Field	Description
IPv6 Prefix	The IPv6 address of the MLD proxy interface.
Prefix Length	The prefix length for the IPv6 address of the MLD proxy interface.
Operational Mode	The operational state of MLD proxy interface.
Querier Address on Proxy Interface	The querier address on the proxy interface.
Number of Groups	The current number of multicast group entries for the MLD proxy interface in the cache table.
Version	This field is configurable only when MLD proxy interface mode is enabled. Enter the version of MLD to configure on the selected interface. Valid values are 1 to 2. The default version is 3.
Version 1 Querier Timeout	The older MLD version 1 querier time-out value in seconds. The older version querier Interval is the time-out for transitioning a host back to MLDv2 mode once an older version query is heard. When an older version query is received, hosts set their older version querier present timer to Older Version querier Interval.
Proxy Start Frequency	The number of times the proxy was brought up.

View IPv6 MLD Proxy Interface Statistics

To view the IPv6 multicast MLD proxy interface statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

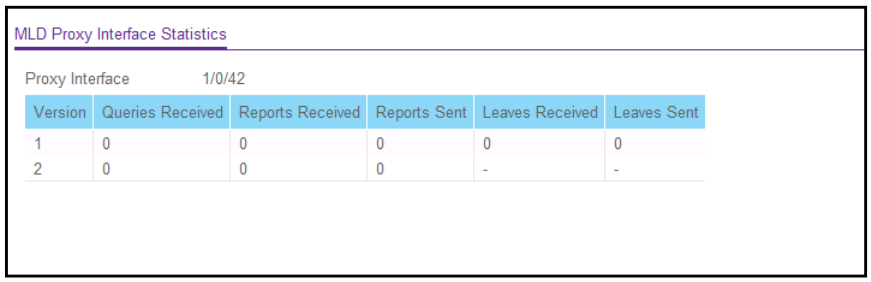
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > IPv6 Multicast > MLD > Proxy Interface Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 181. IPv6 Multicast MLD Proxy Interface Statistics

Field	Description
Proxy Interface	The interface on which MLD proxy packets received.
Version	The version of MLD proxy packets received.
Queries Received	The number of MLD proxy queries received.
Reports Received	The number of MLD proxy reports received.
Reports Sent	The number of MLD proxy reports sent.
Leaves Received	The number of MLD proxy leaves received.
Leaves Sent	The number of MLD proxy leaves sent.

View the IPv6 MLD Proxy Membership

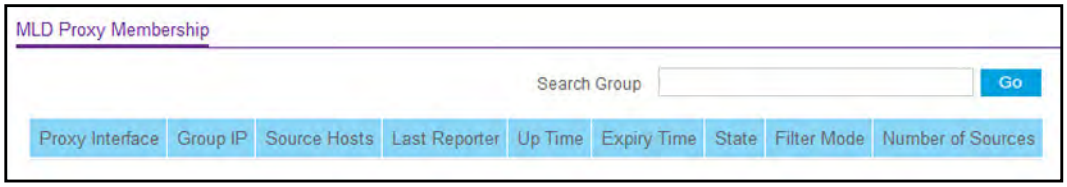
To view the IPv6 multicast MLD proxy membership:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Routing > IPv6 Multicast > MLD > Proxy Membership**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 182. IPv6 Multicast MLD Proxy Membership

Field	Description
Proxy Interface	The interface on which the MLD proxy is enabled.
Group IP	The IPv6 multicast group address.
Source Hosts	Source addresses that are members of this multicast address.
Last Reporter	The IPv6 address of the source of the last membership report received for the IPv6 multicast group address on the MLD proxy interface.
Up Time	The time elapsed since this entry was created.
Expiry Time	The expiry time interval against each source address that is a member of this multicast group. This is the amount of time after which the specified source entry is aged out.
State	The state of the host entry. A host can be in one of the following states: • Non-member state. Does not belong to the group on the interface. • Delaying member state. Host belongs to the group on the interface and report timer running. The report timer is used to send out the reports. • Idle member state. Host belongs to the group on the interface and no report timer is running.
Filter Mode	The group filter mode (Include/Exclude/None) for the specified group on the MLD proxy interface. Possible modes are as follows: • Include • Exclude • None
Number of Sources	The number of source hosts present in the selected multicast group.

Configure IPv6 Multicast Static Routes

To configure IPv6 multicast static routes settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

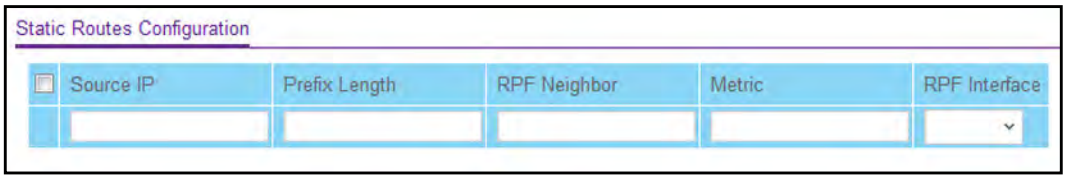
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Routing > IPv6 Multicast > Static Routes Configuration**.



5. In the **Source IP** field, enter the IP address that identifies the multicast packet source for the entry you are creating.
6. In the **Prefix Length** field, enter the prefix length to be applied to the Source IPv6 address.
7. In the **RPF Neighbor** field, enter the IP address of the neighbor router on the path to the source.
8. In the **Metric** field, enter the link state cost of the path to the multicast source.

   The range is 0 to 255; the default is 1. You can change the metric for a configured route by selecting the static route and editing this field.

9. Select the interface number from the **RPF Interface** list.

   This is the interface that connects to the neighbor router for the given source IP address.

10. Click the **Add** button.

    The static route is added to the switch.

11. Click the **Apply** button.

    Your settings are saved.

8

Configure Quality of Service

This chapter covers the following topics:

- Quality of Service Overview
- Manage Class of Service
- Manage Differentiated Services

Quality of Service Overview

In a typical switch, each physical port consists of one or more queues for transmitting packets on the attached network. Multiple queues per port are often provided to give preference to certain packets over others based on user-defined criteria. When a packet is queued for transmission in a port, the rate at which it is serviced depends on how the queue is configured and possibly the amount of traffic present in the other queues of the port. If a delay is necessary, packets get held in the queue until the scheduler authorizes the queue for transmission. As queues become full, packets cannot be held for transmission and get dropped by the switch.

QoS is a means of providing consistent, predictable data delivery by distinguishing between packets with strict timing requirements from those that are more tolerant of delay. Packets with strict timing requirements are given special treatment in a QoS-capable network. With this in mind, all elements of the network must be QoS capable. The presence of at least one node that is not QoS capable creates a deficiency in the network path and the performance of the entire packet flow is compromised.

Manage Class of Service

The Class of Service (CoS) queueing feature lets you directly configure certain aspects of switch queueing. This provides the desired QoS behavior for different types of network traffic when the complexities of DiffServ are not required. The priority of a packet arriving at an interface can be used to steer the packet to the appropriate outbound CoS queue through a mapping table. CoS queue characteristics that affect queue mapping, such as minimum guaranteed bandwidth or transmission rate shaping, are user-configurable at the queue (or port) level.

Eight queues per port are supported.

Use CoS to set the Class of Service trust mode of an interface. Each port in the switch can be configured to trust one of the packet fields (802.1p or IP DSCP), or to not trust any packet's priority designation (untrusted mode). If the port is set to a trusted mode, it uses a mapping table appropriate for the trusted field being used. This mapping table indicates the CoS queue to which the packet is forwarded on the appropriate egress ports. Of course, the trusted field must exist in the packet for the mapping table to be of any use, so there are default actions performed when this is not the case. These actions involve directing the packet to a specific CoS level configured for the ingress port as a whole, based on the existing port default priority as mapped to a traffic class by the current 802.1p mapping table.

Alternatively, when a port is configured as untrusted, it does not trust any incoming packet priority designation and uses the port default priority value instead. All packets arriving at the ingress of an untrusted port are directed to a specific CoS queue on the appropriate egress port(s), in accordance with the configured default priority of the ingress port. This process is also used for cases where a trusted port mapping cannot be honored, such as when a non-IP packet arrives at a port configured to trust the IP DSCP value.

Configure Global CoS Settings

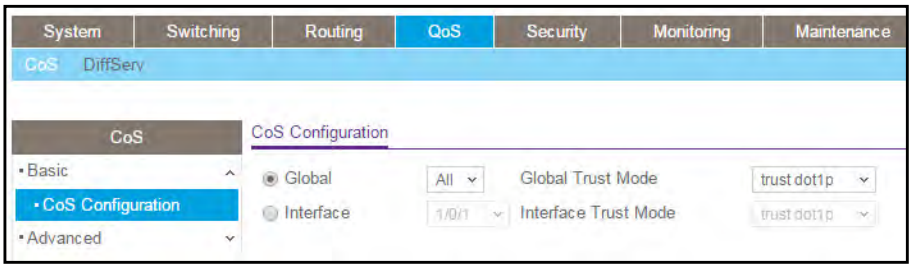
To configure global CoS settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > CoS > Basic > CoS Configuration**.



   Note: You can also navigate to this page by selecting **QoS > CoS > Advanced > CoS Configuration**.
5. Use **Global** to specify all CoS configurable interfaces.

   The option Global represents the most recent global configuration settings.
6. Use **Interface** to specify CoS configuration settings based per-interface.
7. Use **Global Trust Mode** to specify whether to trust a particular packet marking at ingress.

   Global Trust Mode can be one of the following:

   - untrusted
   - trust dot1p
   - trust ip-dscp

   The default value is trust dot1p.
8. Use **Interface Trust Mode** to specify whether to trust a particular packet marking at ingress.

   Interface Trust mode can be one of the following:

   - untrusted
   - trust dot1p
   - trust ip-dscp

The default value is untrusted.

9. Click the **Apply** button.

   Your settings are saved.

Map 802.1p Priorities to Queues

The 802.1p to Queue Mapping page also displays the Current 802.1p Priority Mapping table.

To map 802.1p priorities to queues:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > CoS > Advanced > 802.1p to Queue Mapping**.

5. Use **Interface** to select interfaces.

   You can specify CoS configuration settings per-interface or for all CoS configurable interfaces.
6. Specify which internal traffic class to map the corresponding 802.1p value.

   The queue number depends on the specific hardware. The 802.1p Priority row contains traffic class selectors for each of the eight 802.1p priorities to be mapped. The priority goes from low (0) to high (3). For example, traffic with a priority of 0 is for most data traffic and is sent using best effort. Traffic with a higher priority, such as 3, might be time-sensitive traffic, such as voice or video.

   The values in each list represent the traffic class. The traffic class is the hardware queue for a port. Higher traffic class values indicate a higher queue position. Before traffic in a lower queue is sent, it must wait for traffic in higher queues to be sent.

7. Click the **Apply** button.

   Your settings are saved.

Map DSCP Values to Queues

You can specify which internal traffic class to map the corresponding DSCP value.

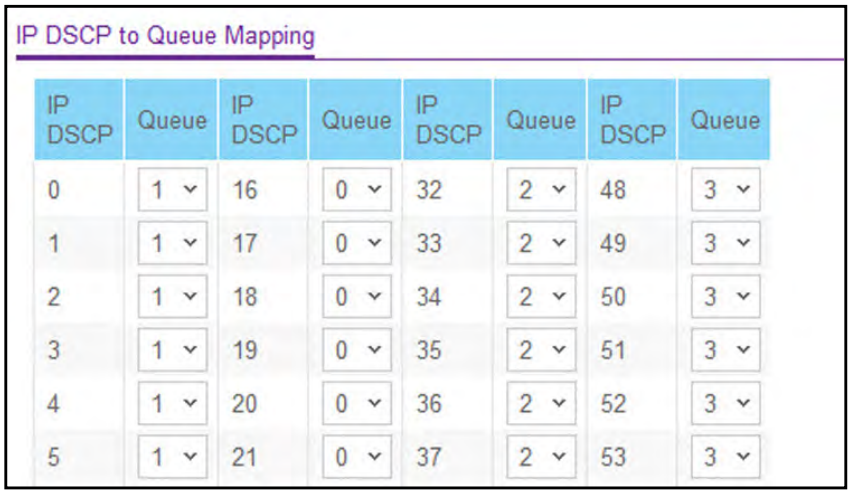
To map DSCP values to queues:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > CoS > Advanced > IP DSCP to Queue Mapping**.



   The **IP DSCP** field displays an IP DSCP value from 0 to 63.
5. For each DSCP value, specify which internal traffic class to map the corresponding IP DSCP value.

   The queue number depends on specific hardware.
6. Click the **Apply** button.

   Your settings are saved.

Configure CoS Interface Settings for an Interface

You can apply an interface shaping rate to all interfaces or to a specific interface.

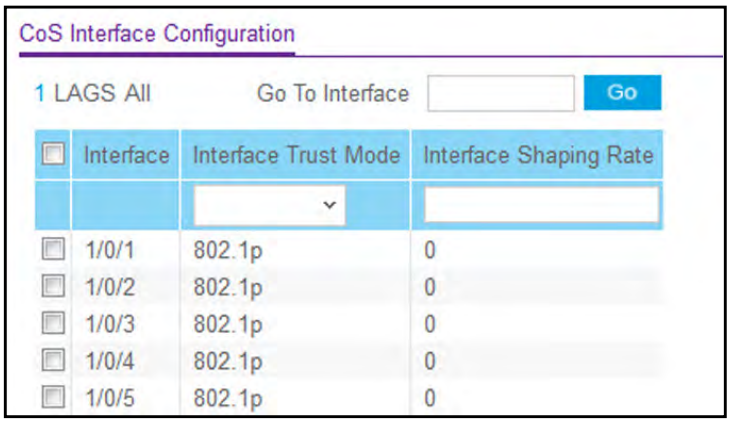
To configure CoS settings for an interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > CoS> Advanced > CoS Interface Configuration**.



5. Select one of the following options to specify which interfaces are displayed on the page:
   - Select **LAG** to show the list of all LAG interfaces.
   - Select **All** to show the list of all physical as well as LAG interfaces.
6. Use one of the following methods to select an interface:
   - Use the **Go To Interface** field to enter the interface in unit/slot/port format and click the **Go** button.

     The entry corresponding the specified interface is selected.
   - Select an interface from the **Interface** list of all CoS configurable interfaces.
7. Use **Interface Trust Mode** to specify whether or not to trust a particular packet marking at ingress.

   Interface Trust Mode can be one of the following:

   - Untrusted
   - 802.1p
   - IP DSCP

The default value is 802.1p.

8. Use **Interface Shaping Rate** to specify the maximum bandwidth allowed.

   This is typically used to shape the outbound transmission rate.This value is controlled independently of any per-queue maximum bandwidth configuration. It is effectively a second-level shaping mechanism. The default value is 0. Valid Range is 0 to 100 in increments of 1. The value 0 means that the maximum is unlimited.

9. Click the **Apply** button.

   Your settings are saved.

Configure CoS Queue Settings for an Interface

You can define what a particular queue does by configuring switch egress queues. User-configurable parameters control the amount of bandwidth used by the queue, the queue depth during times of congestion, and the scheduling of packet transmission from the set of all queues on a port. Each port has its own CoS queue-related configuration.

The configuration process is simplified by allowing each CoS queue parameter to be configured globally or per port. A global configuration change is automatically applied to all ports in the system.

To configure CoS queue settings for an interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

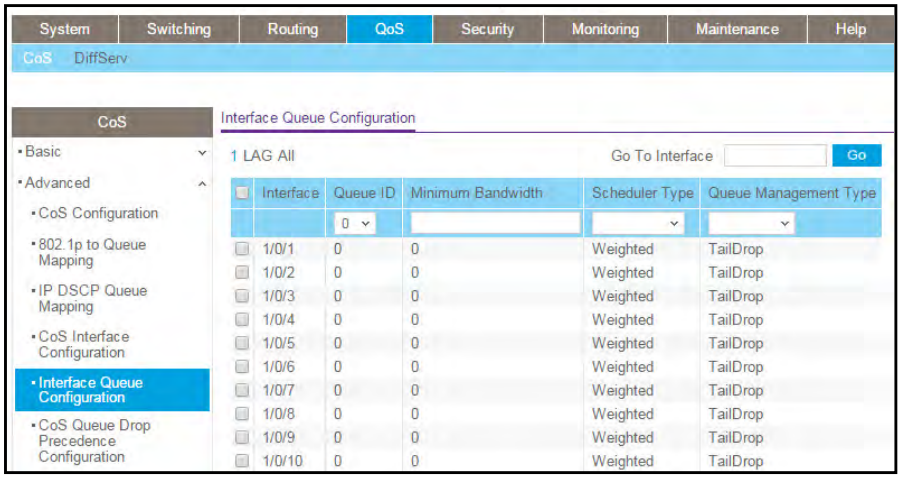
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **QoS > CoS >Advanced > Interface Queue Configuration**.



5. Select the check box next to the port or LAG to configure.

   You can select multiple ports and LAGs to apply the same setting to the selected interfaces. Select the check box in the heading row to apply a trust mode or rate to all interfaces.

6. Use the **Queue ID** menu to select the queue to be configured (platform based).
7. Use **Minimum Bandwidth** to specify the minimum guaranteed bandwidth allotted to this queue.

   Setting this value higher than its corresponding maximum bandwidth automatically increases the maximum to the same value. The default value is 0. Valid Range is 0 to 100 in increments of 1. The value 0 means no guaranteed minimum. Sum of individual Minimum Bandwidth values for all queues in the selected interface cannot exceed defined maximum (100).

8. **Queue Management Type** displays the queue depth management technique used for queues on this interface.

   This is used only if the device supports independent settings per queue. From the Queue Management Type menu, select either **TailDrop** or **WRED**. The default value is **TailDrop**.

9. Click the **Apply** button.

   Your settings are saved.

Configure CoS Drop Precedence Settings

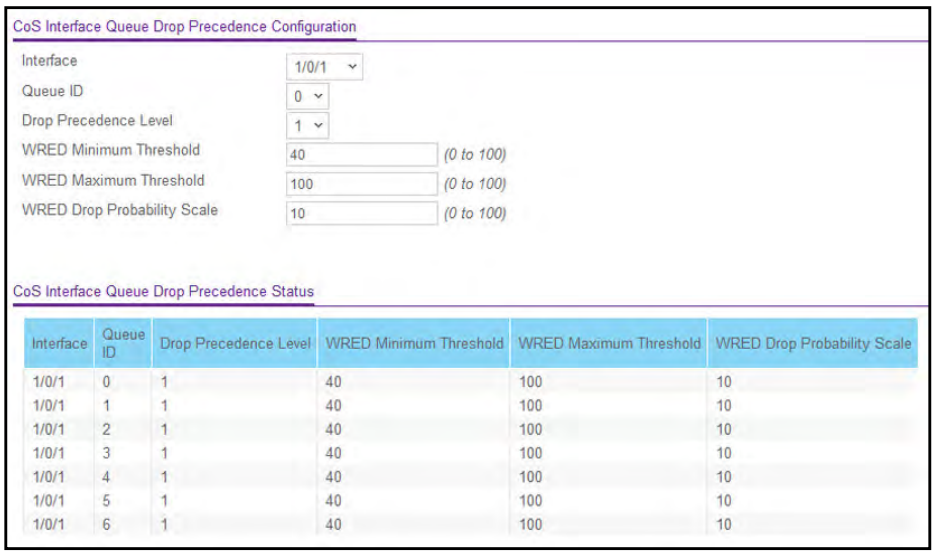
To configure CoS Drop Precedence settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > CoS> Advanced > CoS Queue Drop Precedence Configuration.**



5. Use **Interface** to specify all CoS configurable interfaces.
6. Use **Queue ID** to specify all the available queues.

   Valid values are 0 to 6. The default is 0.
7. Use **Drop Precedence Level** to specify all the available drop precedence levels.

   Valid values are 1 to 4. The default is 1.
8. Use **WRED Minimum Threshold** to specify the weighted RED minimum queue threshold below which no packets are dropped for the current drop precedence level.

   The range is 0 to 100. The default is 40.
9. Use **WRED Maximum Threshold** to specify the weighted RED maximum queue threshold above which all packets are dropped for the current drop precedence level.

   The range is 0 to 100. The default is 100.

10. Use **WRED Drop Probability Scale** to determine the packet drop probability for the current drop precedence level.

    The range is 0 to 100. The default is 10.

11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 183. CoS Interface Queue Drop Precedence Status

Field	Description
Interface	The CoS configurable interface.
Queue ID	The queue ID.
Drop Precedence Level	The drop precedence level.
WRED Minimum Threshold	The weighted RED minimum queue threshold value.
WRED Maximum Threshold	The weighted RED maximum queue threshold value.
WRED Drop Probability Scale	The packet drop probability value.

Manage 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.

Standard IP-based networks are designed to provide best effort data delivery service. Best effort service implies that the network delivers the data in a timely fashion, although there is no guarantee. During times of congestion, packets might be delayed, sent sporadically, or dropped. For typical Internet applications, such as e-mail and file transfer, a slight degradation in service is acceptable and in many cases unnoticeable. Conversely, any degradation of service has undesirable effects on applications with strict timing requirements, such as voice or multimedia.

To use DiffServ for QoS, you must first define the following categories and their criteria:

1. **Class**. Create classes and define class criteria.
2. **Policy**. Create policies, associate classes with policies, and define policy statements.
3. **Service**. Add a policy to an inbound interface.

Packets are classified and processed based on defined criteria. The classification criteria are defined by a class. The processing is defined by a policy's attributes. Policy attributes can be defined on a per–class instance basis, and it is these attributes that are applied when a match occurs. A policy can contain multiples classes. When the policy is active, the actions taken depend on which class matches the packet.

Packet processing begins by testing the class match criteria for a packet. A policy is applied to a packet when a class match within that policy is found.

DiffServ Wizard Overview

The DiffServ wizard enables DiffServ on the switch by creating a traffic class, adding the traffic class to a policy, and then adding the policy to the ports that you select. The DiffServ wizard does the following:

- Creates a DiffServ class and defines match criteria used as a filter to determine if incoming traffic meets the requirements to be a member of the class.
- Sets the DiffServ class match criteria based on traffic type selection as follows:
  - **VOIP**. Sets the match criteria to UDP protocol.
  - **HTTP**. Sets the match criteria to HTTP destination port.
  - **FTP**. Sets match criteria to FTP destination port.
  - **Telnet**. Sets the match criteria to Telnet destination port.
  - **Every**. Sets the match criteria for all traffic.
- Create a Diffserv policy and add it to the DiffServ class created.
- If policing is enabled (that is, it is set to YES), the DiffServ policy style is set to simple. Traffic that conforms to the class match criteria is processed according to the outbound priority selection. The outbound priority configures the handling of conforming traffic as follows:
  - **High**. Sets the policing action to markdscp ef.
  - **Med**. Sets the policing action to markdscp af31.
  - **Low**. Sets the policing action to send.
- If policing is disabled (that is, it is set to NO), all traffic is marked as follows:
  - **High**. Sets the policy mark to ipdscp ef.
  - **Med**. Sets the policy mark to ipdscp af31.
  - **Low**. Sets the policy mark to ipdscp be.
- Each port selected is added to the policy created.

Use the DiffServ Wizard

To use the DiffServ Wizard:

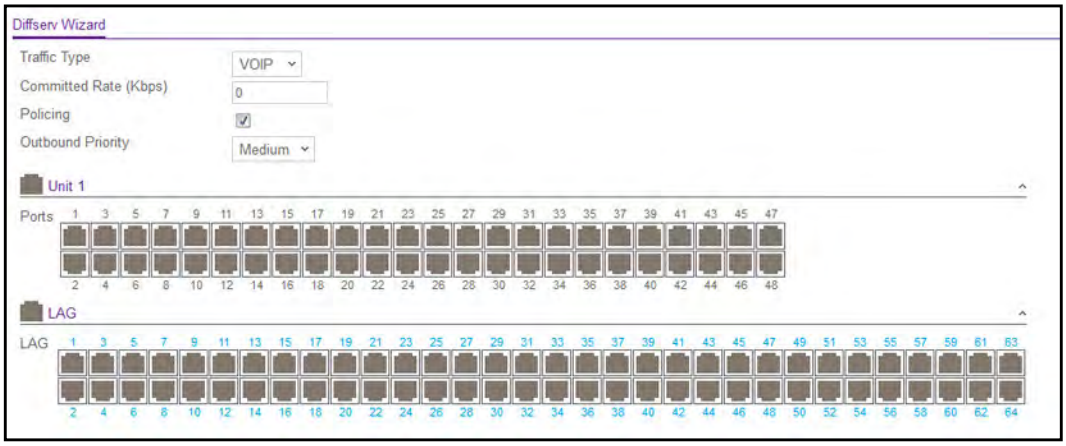
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **QoS > DiffServ > DiffServ Wizard**.



5. Use **Traffic Type** to define the **DiffServ Class**.

   Traffic type options are: **VOIP**, **HTTP**, **FTP**, **Telnet**, and **Every**.

6. Ports displays the ports which can be configured to support a **DiffServ policy**.

   The **DiffServ policy** is added to selected ports.

7. Use **Enable Policing** to add policing to the **DiffServ p**olicy.

   The policing rate to be applied.

8. Specify the Committed Rate:
   - When **Policing** is enabled, the committed rate is applied to the policy and the policing action is set to conform.
   - When **Policing** is disabled, the committed rate is not applied and the policy is set to markdscp.
9. Specify the Outbound Priority:
   - When **Policing** is enabled, **Outbound Priority** defines the type of policing conform action where: **High** sets action to markdscp ef, **Med** sets the action to markdscp af31, and **Low** sets the action to send.
   - When **Policing** is disabled, **Outbound Priority** defines the policy where: **High** sets the policy to mark ipdscp ef, **Med** sets policy to mark ipdscp af31, and **Low** sets the policy to mark ipdscp be.
10. Click the **Apply** button.

    Your settings are saved.

Configure Basic DiffServ Settings

Packets are filtered and processed based on defined criteria. The filtering criteria is defined by a class. The processing is defined by a policy's attributes. Policy attributes can be defined on a per–class instance basis, and it is these attributes that are applied when a match occurs.

The configuration process begins with defining one or more match criteria for a class. Then one or more classes are added to a policy. Policies are then added to interfaces.

Packet processing begins by testing the match criteria for a packet. The all class type option specifies that each match criteria within a class must evaluate to true for a packet to match that class. The *any* class type option specifies that at least one match criteria must evaluate to true for a packet to match that class. Classes are tested in the order in which they were added to the policy. A policy is applied to a packet when a class match within that policy is found.

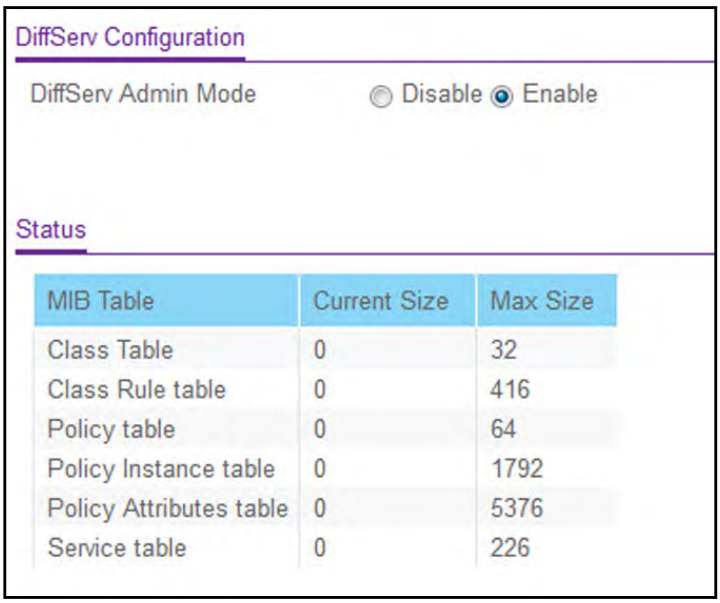
To configure the basic DiffServ settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > DiffServ > Basic > DiffServ Configuration**.



5. Select the administrative mode for DiffServ:
   - **Enable**. Differentiated Services are active. This the default mode.
   - **Disable**. The DiffServ configuration is retained and can be changed but it is not active.
6. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 184. DiffServ Configuration

Field	Description
Class Table	The current and maximum number of classifier entries in the table. DiffServ classifiers differentiate among traffic types.
Class Rule Table	The current and maximum number of class rule entries in the table. Class rules specify the match criteria that belong to a class definition.
Policy Table	The current and maximum number of policy entries in the table. The policy determines the traffic conditioning or service provisioning actions applied to a traffic class.
Policy Instance Table	The current and maximum number of policy-class instance entries in the table. A policy-class instance is a policy that is associated with an existing DiffServ class.
Policy Attributes Table	The current and maximum number of policy attribute entries in the table. A policy attribute entry attaches various policy attributes to a policy-class instance.
Service Table	The current and maximum number of service entries in the table. A service entry associates a DiffServ policy with an interface and inbound or outbound direction.

Configure the Global DiffServ Settings

Packets are filtered and processed based on defined criteria. The filtering criteria are defined by a class. The processing is defined by a policy's attributes. Policy attributes can be defined on a per-class instance basis, and it is these attributes that are applied when a match occurs.

The configuration process begins with defining one or more match criteria for a class. Then one or more classes are added to a policy. Policies are then added to interfaces.

Packet processing begins by testing the match criteria for a packet. The *all* class type option specifies that each match criteria within a class must evaluate to true for a packet to match that class. The *any* class type option specifies that at least one match criteria must evaluate to true for a packet to match that class. Classes are tested in the order in which they were added to the policy. A policy is applied to a packet when a class match within that policy is found.

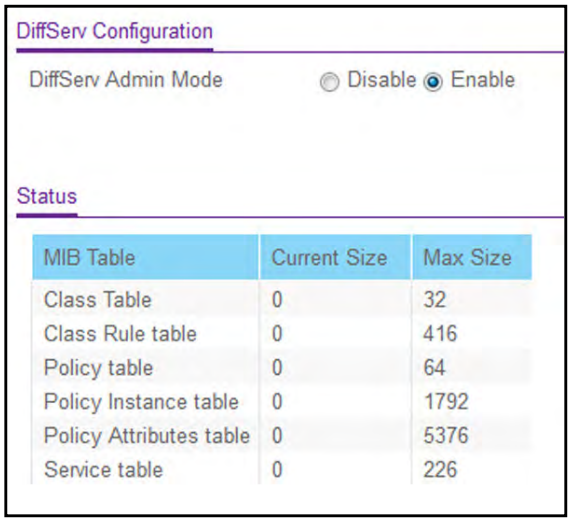
To configure the global DiffServ mode:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > DiffServ > Advanced > Diffserv Configuration**.



5. Select the administrative mode for DiffServ:
   - **Enable**. Differentiated Services are active.
   - **Disable**. The DiffServ configuration is retained and can be changed, but it is not active.
6. Click the **Apply** button.

   Your settings are saved.

The following table describes the information displayed in the Status table on the DiffServ Configuration page.

Table 185. DiffServ Status

Field	Description
Class Table	The number of configured DiffServ classes out of the total allowed on the switch.
Class Rule table	The number of configured class rules out of the total allowed on the switch.

Table 185. DiffServ Status (continued)

Field	Description
Policy table	The number of configured policies out of the total allowed on the switch.
Policy Instance table	The number of configured policy class instances out of the total allowed on the switch.
Policy Attributes table	The number of configured policy attributes (attached to the policy class instances) out of the total allowed on the switch.
Service table	The number of configured services (attached to the policies on specified interfaces) out of the total allowed on the switch.

Configure a DiffServ Class

You can add a new DiffServ class name or rename or delete an existing class. You can also define the criteria to associate with a DiffServ class. As packets are received, these DiffServ classes are used to prioritize packets. You can use multiple match criteria in a class. The logic is a Boolean logical-AND for this criteria. After creating a class, click the class link to the Class page.

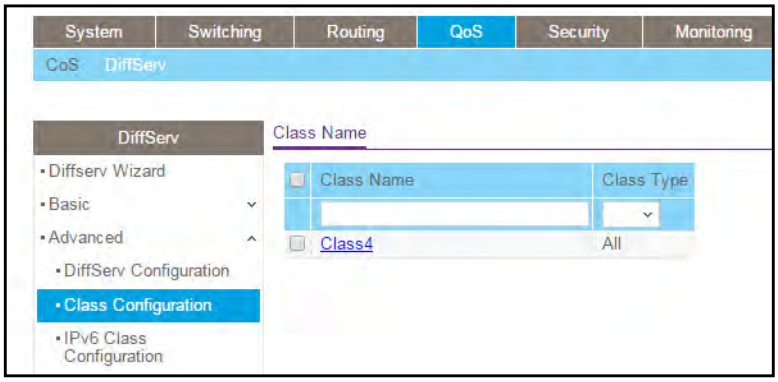
To configure a DiffServ class:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > DiffServ > Advanced > Class Configuration**.



5. To create a new class, enter a **class name**, select the **class type**, and click the **Add** button.

   This field also lists all the existing DiffServ class names, from which one can be selected. The switch supports only the **Class Type** value **All**, which means all the various match criteria defined for the class is satisfied for a packet match. All signifies the logical AND of all the match criteria. You can select the class type only when you are creating a new class. After the class is created, the Class Type field becomes nonconfigurable.

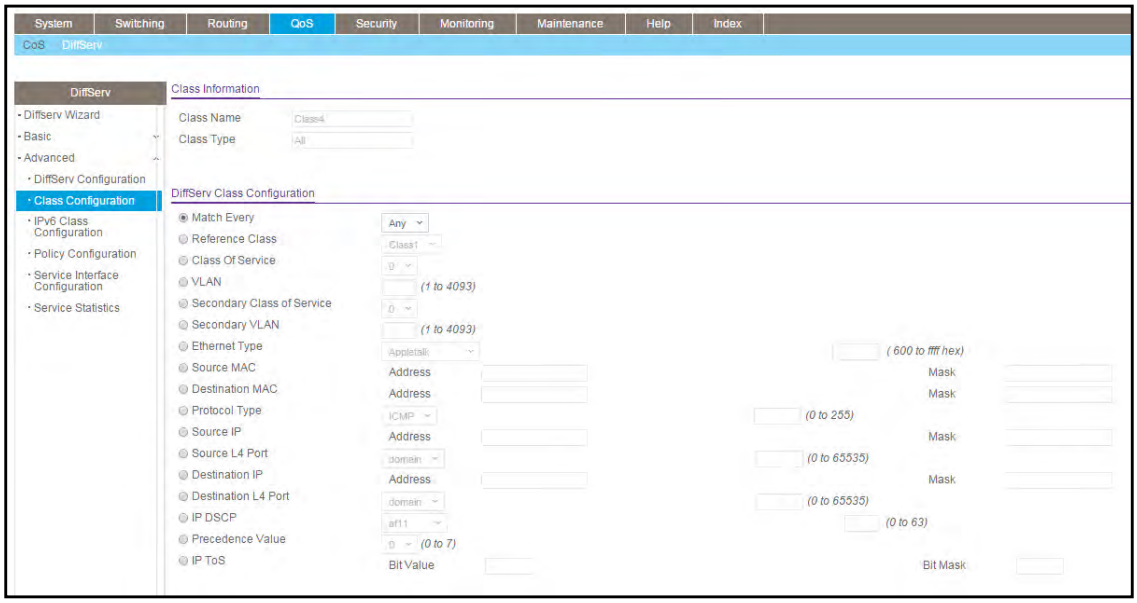
6. To rename an existing class, select the check box next to the configured class, update the name.
7. Click the **Apply** button.

   Your settings are saved.

8. After creating a class, click the **class name** for an existing class.

   The class name is a hyperlink.

   The Class Configuration page displays, showing the configuration fields for the class.



9. To configure the class details, complete the fields:
   - **Class Name**. The name for the configured DiffServ class.
   - **Class Type**. The DiffServ class type.

You can select the class type only when you are creating a new class. After you create the class, this field displays the class type, but you cannot change it.

10. Define the criteria to associate with a DiffServ class:

- **Match Every**. This adds to the specified class definition a match condition whereby all packets are considered to belong to the class.
- **Reference Class**. Select this option to reference another class for criteria. The match criteria defined in the reference class is as match criteria in addition to the match criteria you define for the selected class. After selecting this option, the classes that can be referenced are displayed. Select the class to reference. A class can reference at most one other class of the same type.
- **Class of Service**. Select this option to require the Class of Service (CoS) value in an Ethernet frame header to match the specified CoS value. This option lists all the values for the Class of Service match criterion in the range 0 to 7 from which one can be selected.
- **VLAN**. Select this option to require a packet's VLAN ID to match a VLAN ID or a VLAN ID within a continuous range. If you configure a range, a match occurs if a packet's VLAN ID is the same as any VLAN ID within the range. The VLAN value is in the range of 0–4093.
- **Secondary Class of Service**. Select this option to require the secondary Class of Service (CoS) value in an Ethernet frame header to match the specified secondary CoS value.
- **Secondary VLAN**. Select this option to require a packet's VLAN ID to match a secondary VLAN ID or a secondary VLAN ID within a continuous range. If you configure a range, a match occurs if a packet's secondary VLAN ID is the same as any secondary VLAN ID within the range. After you select this option, use the following fields to configure the secondary VLAN match criteria:
  - **Secondary VLAN ID Start**. The secondary VLAN ID to match or the secondary VLAN ID with the lowest value within a range of VLANs.
  - **Secondary VLAN ID End**. The secondary VLAN ID with the highest value within the range of VLANs. This field is not required if the match criteria is a single VLAN ID.
- **Ethernet Type**. Select this option to require the EtherType value in the Ethernet frame header to match the specified EtherType value. After you select this option, specify the EtherType Keyword from the list of common protocols that are mapped to their Ethertype value.
- **Source MAC Address**. Select this option to required a packet's source MAC address to match the specified MAC address. After you select this option, use the following fields to configure the source MAC address match criteria:
  - **MAC Address**. The source MAC address to match.
  - **MAC Mask**. The MAC mask, which specifies the bits in the source MAC address to compare against the Ethernet frame. Use F's and zeros to configure the MAC mask. An F means that the bit is checked, and a zero in a bit position means that the data is not significant. For example, if the MAC address is aa:bb:cc:dd:ee:ff, and the mask is ff:ff:00:00:00:00, all MAC addresses with aa:bb:xx:xx:xx:xx result

in a match (where x is any hexadecimal number). Note that this is not a wildcard mask, which ACLs use.

- **Source MAC Mask**. This is a bit mask in the same format as a MAC address indicating which part(s) of the source MAC address to use for matching against packet content.
- **Destination MAC Address**. Select this option to require a packet's destination MAC address to match the specified MAC address. After you select this option, use the following fields to configure the destination MAC address match criteria:
  - **MAC Address**. The destination MAC address to match.
  - **MAC Mask**. The MAC mask, which specifies the bits in the destination MAC address to compare against an Ethernet frame. Use F's and zeros to configure the MAC mask. An F means that the bit is checked, and a zero in a bit position means that the data is not significant. For example, if the MAC address is aa:bb:cc:dd:ee:ff, and the mask is ff:ff:00:00:00:00, all MAC addresses with aa:bb:xx:xx:xx:xx result in a match (where x is any hexidecimal number). Note that this is not a wildcard mask, which ACLs use.
- **Destination MAC Mask**. This is a bit mask in the same format as a MAC address indicating which part(s) of the destination MAC address to use for matching against packet content.
- **Protocol Type**. This lists the keywords for the Layer 4 protocols from which one can be selected. The list includes 'other' as an option for the remaining values.
- **Source IP Address**. This is a valid source IP address in the dotted-decimal format.
- **Source Mask**. This is a bit mask in IP dotted-decimal format indicating which part(s) of the source IP address to use for matching against packet content.
- **Source L4 Port**. Select this option to require a packet's TCP/UDP source port to match the specified port or the port number within a range of port numbers. If you configure a range, a match occurs if a packet's source port number is the same as any source port number within the range. After you select this option, use the following fields to configure a source port keyword, source port number, or source port range for the match criteria:
  - **Protocol**. Select the desired L4 keyword from the list on which the match is based. If you select a keyword, the other source port configuration fields are not available.
  - **Port End**. A user-defined L4 source port number to match or the source port number with the lowest value within a range of ports.
  - **Port Start**. The source port with the highest value within the range of ports. This field is not required if the match criteria is a single port.
- **Destination IP Address**. This is a valid destination IP address in the dotted-decimal format.
- **DestinationMask**. This is a bit mask in IP dotted-decimal format indicating which part(s) of the destination IP address to use for matching against packet content.
- **Destination L4 Port**. Select this option to require a packet's TCP/UDP destination port to match the specified port or the port number within a range of port numbers. If you

configure a range, a match occurs if a packet's destination port number is the same as any destination port number within the range. After you select this option, use the following fields to configure a destination port keyword, destination port number, or destination port range for the match criteria:

  - **Protocol**. Select the desired L4 keyword from the list on which the match is based. If you select a keyword, the other destination port configuration fields are not available.
  - **Port End**. A user-defined L4 destination port number to match or the destination port number with the lowest value within a range of ports.
  - **Port Start**. The destination port with the highest value within the range of ports. This field is not required if the match criteria is a single port.

- **IP DSCP**. Select this option to require the packet's IP DiffServ Code Point (DSCP) value to match the specified value. The DSCP value is defined as the high-order six bits of the Service Type octet in the IP header. After you select this option, use one of the following fields to configure the IP DSCP match criteria.
  - **IP DSCP Keyword**. The IP DSCP keyword code that corresponds to the IP DSCP value to match. If you select a keyword, you cannot configure an IP DSCP value.
  - **IP DSCP Value**. The IP DSCP value to match.
- **Precedence Value**. Select this option to require the packet's IP Precedence value to match the number configured in the IP Precedence Value field. The IP Precedence field in a packet is defined as the high-order three bits of the Service Type octet in the IP header.
- **IP ToS**. Select this option to require the packet's Type of Service (ToS) bits in the IP header to match the specified value. The IP ToS field in a packet is defined as all eight bits of the Service Type octet in the IP header. After you select this option, use the following fields to configure the ToS match criteria:
  - **ToS Bits**. Enter a two-digit hexadecimal number octet value in the range 00 to ff to match the bits in a packet’s ToS field.
  - **ToS Mask**. Specify the bit positions that are used for comparison against the IP ToS field in a packet.

11. Click the **Apply** button.

Your settings are saved.

The following table describes the nonconfigurable information displayed in the Class Summary at the bottom of the DiffServ Advanced Class Configuration page.

Table 186. DiffServ Class Configuration - Class Summary

Field	Description
Match Criteria	The configured match criteria for the specified class.
Values	The values of the configured match criteria.

Configure DiffServ IPv6 Class Settings

You can add a new IPv6 DiffServ class name, or to rename or delete an existing class. You can also define the criteria to associate with a DiffServ class. As packets are received, these DiffServ classes are used to prioritize packets. You can use multiple match criteria in a class. The logic is a Boolean logical-AND for this criteria. After creating a class, click the class link to the Class page.

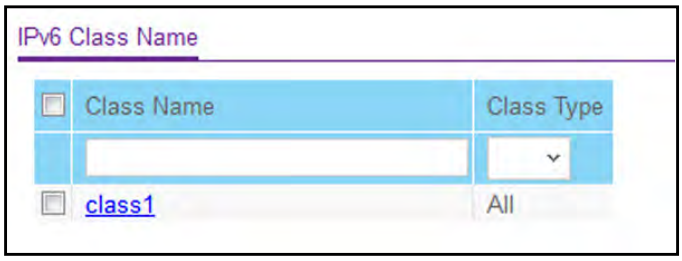
To configure DiffServ IPv6 class settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > DiffServ > Advanced > IPv6 Class Configuration**.



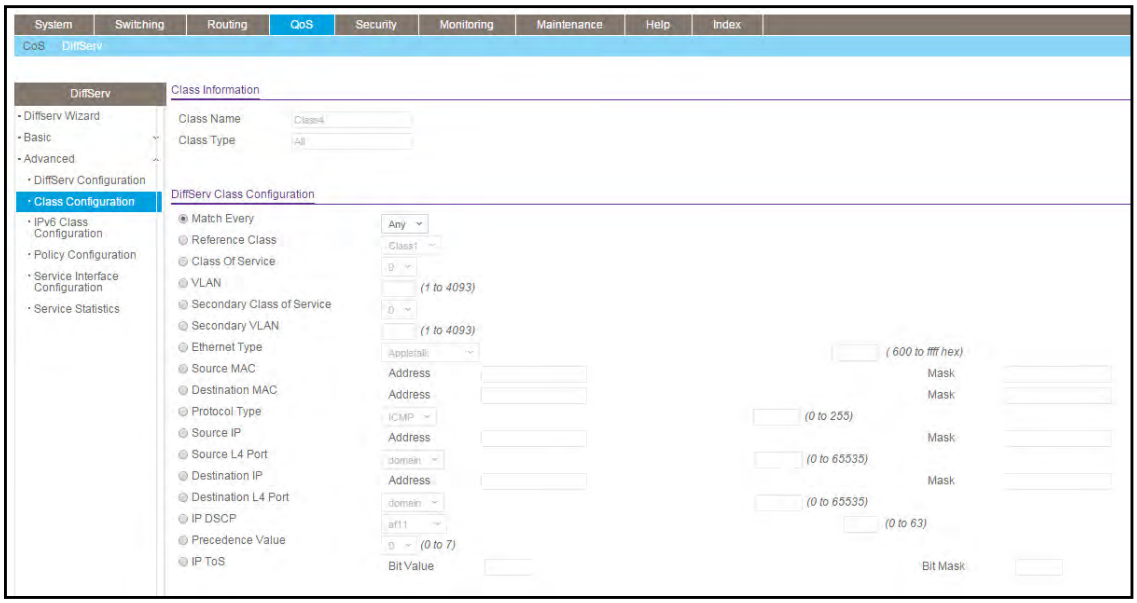
5. To create a new class, enter a **class name**, select the **class type**, and click the **Add** button.

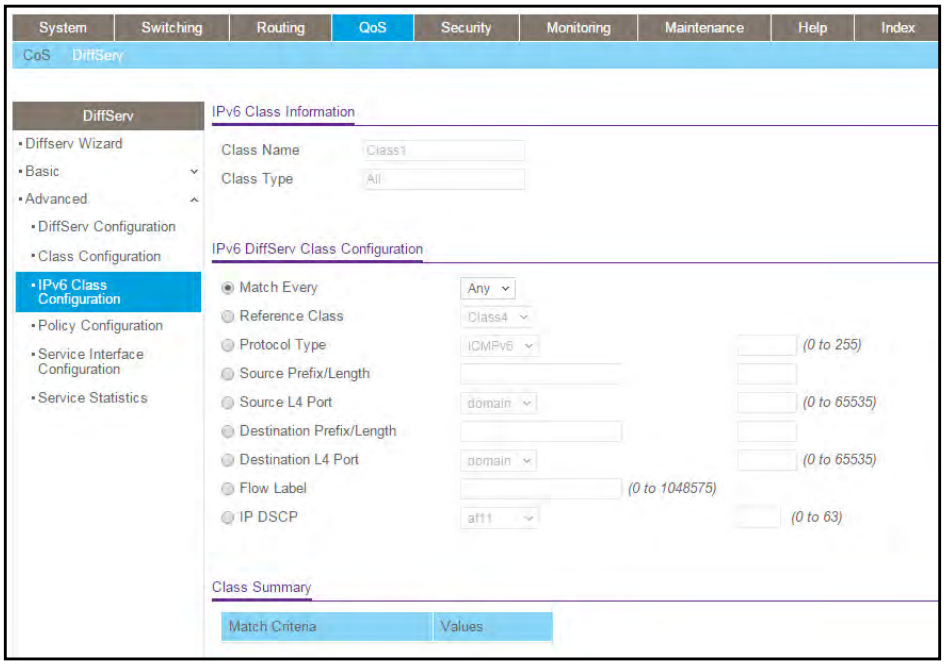
   This field also lists all the existing DiffServ class names, from which one can be selected. The switch supports only the **Class Type** value **All**, which means all the various match criteria defined for the class is satisfied for a packet match. All signifies the logical AND of all the match criteria. Only when a new class is created, this field is a selector field. After class creation this becomes a nonconfigurable field displaying the configured class type.
6. To rename an existing class, select the check box next to the configured class, and update the name
7. Click the **Apply** button.

   Your settings are saved.
8. After creating a class, click the **class name** for an existing class.

   The class name is a hyperlink.

The Class Configuration page displays, showing the configuration fields for the class.





9. **To configure the IPv6 class, complete the fields:**
   - **Class Name**. The name for the configured DiffServ class.
   - **Class Type**. The DiffServ class type.

   You can specify the class type only when you are creating a new class. After the class is created, this field displays the class type, but you cannot change it.
10. Define the criteria to associate with a DiffServ class:
    - **Match Every**. This adds to the specified class definition a match condition whereby all packets are considered to belong to the class.
    - **Reference Class**. This lists the class(es) that can be assigned as reference class(es) to the current class.
    - **Protocol Type**. This lists the keywords for the Layer 4 protocols from which one can be selected. The list includes 'other' as an option for the remaining values.
    - **Source Prefix Length**. This is a valid source IPv6 prefix to compare against an IPv6 Packet. Prefix is always specified with the prefix length. The prefix can be entered in the range of 0 to FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF and the prefix length can be entered in the range of 0 to 128.
    - **Source L4 Port**. This lists the keywords for the known source Layer 4 ports from which one can be selected. The list includes 'other' as an option for the unnamed ports.
    - **Destination Prefix/Length**. This is a valid destination IPv6 prefix to compare against an IPv6 packet. The prefix is always specified with the prefix length. The prefix can be entered in the range of 0 to FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF and the prefix length can be entered in the range of 0 to 128.
    - **Destination L4 Port**. This lists the keywords for the known destination Layer 4 ports from which one can be selected. The list includes 'other' as an option for the unnamed ports.
    - **Flow Label**. This is a 20-bit number that is unique to an IPv6 packet, used by end stations to signify Quality of Service handling in routers. The flow label can be specified in the range of 0 to 1048575.
    - **IP DSCP**. You can select a keyword for the known DSCP values. The list includes Other as an option for the remaining values.
11. **Match Criteria**. Displays the configured match criteria for the specified class.
12. **Values**. Displays the values of the configured match criteria.
13. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed in the Class Summary at the bottom of the DiffServ Advanced IPv6 Class Configuration page.

Table 187. DiffServ IPv6 Class Configuration - Class Summary

Field	Description
Match Criteria	The configured match criteria for the specified class.
Values	The values of the configured match criteria.

Configure DiffServ Policy

You can associate a collection of classes with one or more policy statements. After creating a policy, click the policy link to the Policy page.

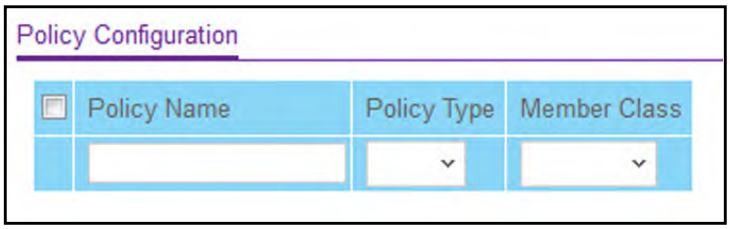
To configure DiffServ policy:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > DiffServ > Advanced > Policy Configuration**.



5. Use **Policy Name** to uniquely identify a DiffServ policy using a case-sensitive alphanumeric string from 1 to 31 characters.
6. **In the Member Class** list, select a DiffServ class.

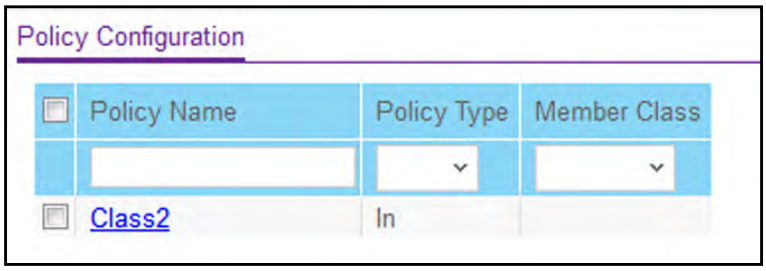
   This lists all existing DiffServ classes currently defined as members of the specified policy. This list is automatically updated as a new class is added to or removed from the policy. This field is a selector field only when an existing policy class instance is to be removed. After removal of the policy class instance this becomes a nonconfigurable field.
7. **Policy Type**. The traffic flow direction to which the policy is applied.
   - **In** indicates the type is specific to inbound traffic direction.
   - **Out** indicates the type is specific to outbound traffic direction.

8. Click the **Add** button.

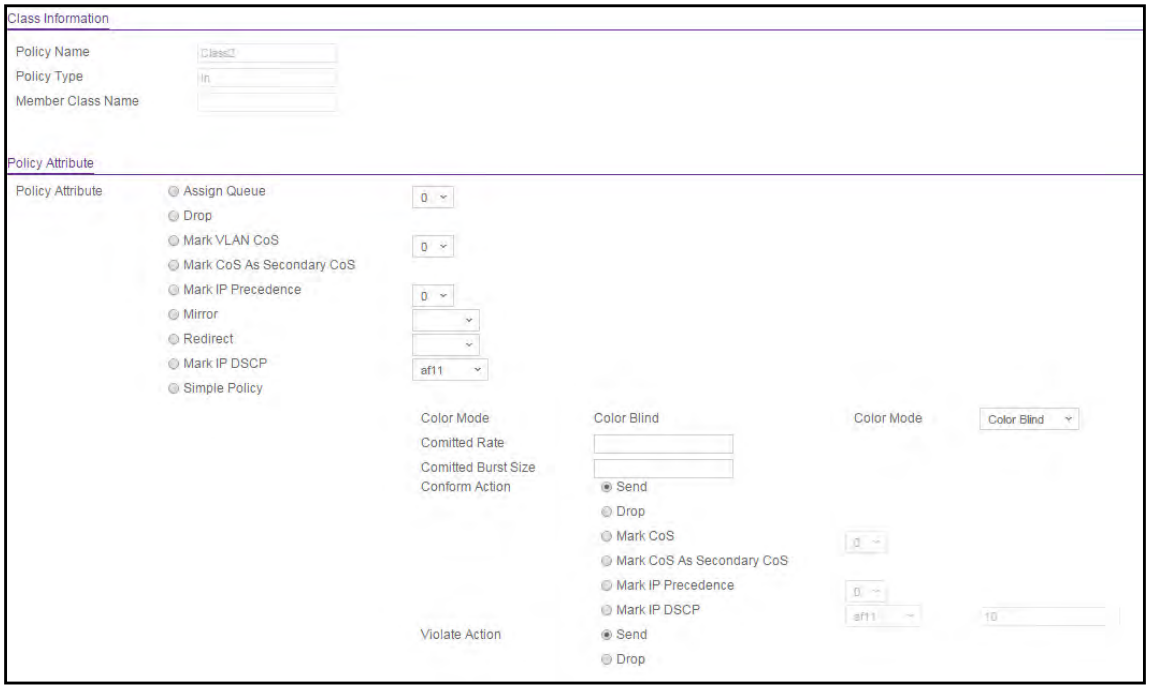
   The new policy is added to the switch.

9. To configure the policy attributes, click the name of the policy.

   The policy name is a hyperlink.



   The Policy Configuration page displays, showing the configuration fields for the policy.



10. Select the **Assign Queue** to which packets of this policy-class are assigned.

    This is an integer value in the range 0 to 6.

11. Configure the policy attributes:

    - **Drop**. Select the drop radio button. This flag indicates that the policy attribute is defined to drop every inbound packet.
    - **Mark VLAN CoS**. This is an integer value in the range from 0 to 7 for setting the VLAN priority.
    - **Mark CoS as Secondary Cos**. This option marks outer VLAN tag priority bits of all packets as the inner VLAN tag priority. This essentially means that the inner VLAN tag CoS is copied to the outer VLAN tag CoS.

- **Mark IP Precedence**. This is an IP precedence value in the range from 0 to 7.
- **Mirror**
- **Redirect**
- **Two Rate Policy**. With the two-rate policer, you can enforce traffic policing according to two separate rates: Committed Rate and Peak Rate.
- **Mark IP DSCP**. This lists the keywords for the known DSCP values from which one can be selected. The list includes 'other' as an option for the remaining values.
- **Simple Policy**. Use this attribute to establish the traffic policing style for the specified class. This command uses single data rate and burst size resulting in two outcomes (conform and violate).

12. If you select the **Simple Policy** attribute, you can configure the following fields:

- **Color Mode**. This lists the color mode. The default is **Color Blind**.
  - **Color Blind**
  - **Color Aware**

    Color Aware mode requires the existence of one or more color classes that are valid for use with this policy instance. A valid color class contains a single, non-excluded match criterion for one of the following fields (provided the field does not conflict with the classifier of the policy instance itself):

  - **CoS**
  - **IP DSCP**
  - **IP Precedence**
- **Committed Rate**. This value is specified in the range 1 to 4294967295 kilobits-per-second (Kbps).
- **Committed Burst Size**. This value is specified in the range 1 to 128 KBytes. The committed burst size is used to determine the amount of conforming traffic allowed.
- **Conform Action**. This lists the actions to be taken on conforming packets according to the policing metrics, from which one can be selected. The default is send.
- **Violate Action**. This lists the actions to be taken on violating packets according to the policing metrics, from which one can be selected. The default is send.
- For each of the action selectors one of the following actions can be taken:
  - **Drop**. These packets are immediately dropped.
  - **Mark IP DSCP**. These packets are marked by DiffServ with the specified DSCP value before being presented to the system forwarding element. This selection requires that the DSCP field be set.
  - **Mark CoS**. These packets are marked by DiffServ with the specified CoS value before being presented to the system forwarding element. This selection requires that the Mark CoS field be set.
  - **Mark CoS As Secondary CoS**. Select this option to mark all packets in a traffic stream with the specified secondary CoS queue number. Use the Class of Service field to select the CoS value to mark in the priority field of the 802.1p header in the

secondary (inner) 802.1Q tag of a double VLAN tagged packet. If the packet does not already contain this header, one is inserted.

- **Send**. These packets are presented unmodified by DiffServ to the system forwarding element.
- **Mark IP Precedence**. These packets are marked by DiffServ with the specified IP Precedence value before being presented to the system forwarding element. This selection requires that the Mark IP Precedence field be set.

13. If you select **Two Rate**, you can configure additional fields (same fields as for a simple policy).
14. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 188. DiffServ Policy Configuration - Policy Attribute

Field	Description
Policy Name	Displays name of the DiffServ policy.
Policy Type	Displays type of the policy as In.
Member Class Name	Displays name of each class instance within the policy.

Configure the DiffServ Service Interface

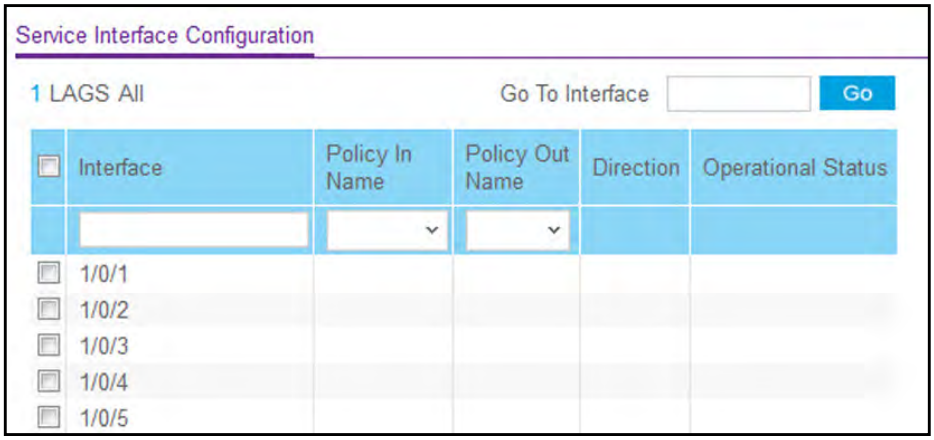
To configure the DiffServ service interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **QoS > DiffServ > Advanced > Service Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to configure.
6. **Policy Name**. Lists all the policy names from which one can be selected.

   This field is not shown for read/write users where the inbound service policy attachment is not supported by the platform.
7. Click the **Apply** button.

   Your settings are saved.

Table 189. Service Interface Configuration

Field	Description
Direction	Shows that the traffic direction of this service interface is In.
Operational Status	Shows the operational status of this service interface, either Up or Down.

View DiffServ Service Statistics

This page displays class-oriented statistical information for the policy, which is specified by the interface and direction. The Member Class list is populated on the basis of the specified interface and direction and hence the attached policy (if any). Highlighting a member class name displays the statistical information for the policy-class instance for the specified interface and direction.

To view the DiffServ service statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

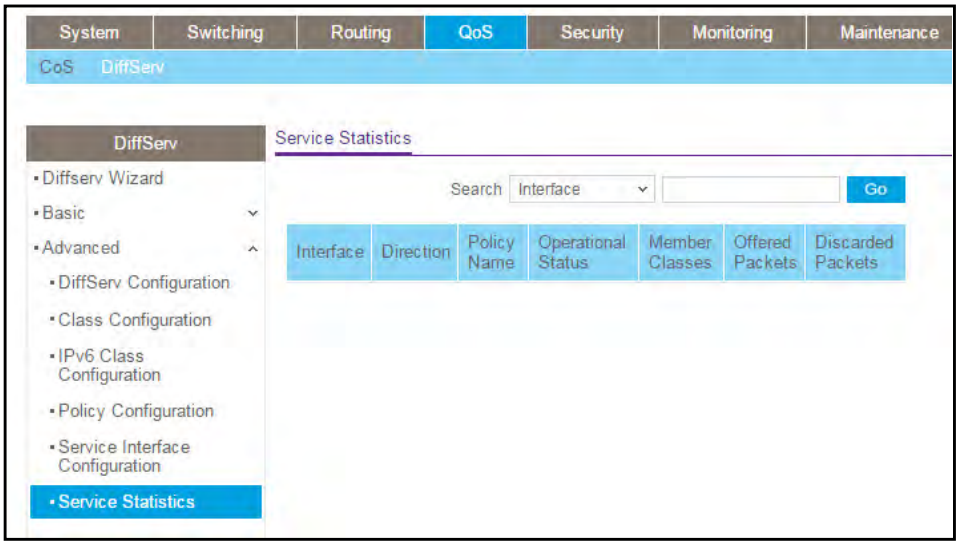
The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **QoS > DiffServ > Advanced > Service Statistics**.



5. Use the **Search** menu to search for DiffServ statistics by interface or member class:
   - To search by interface, select **Interface**, enter the interface in unit/slot/port format (for example, 1/0/13), and click the **Go** button.

     If the entry exists, the entry is displayed as the first entry, followed by the remaining entries.
   - To search by member class, select **Member Class**, enter the member class, and click the **Go** button.

     If an entry with a matching member class exists, the entry is displayed as the first entry, followed by the remaining entries. An exact match is required.

6. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the information available on the Service Statistics page.

Table 190. DiffServ Service Statistics

Field	Description
Interface	List of all valid slot number and port number combinations in the system with a DiffServ policy currently attached in In direction.
Direction	List of the traffic direction of interface as In. Shows only the direction(s) for which a DiffServ policy is currently attached.

Table 190. DiffServ Service Statistics (continued)

Field	Description
Policy Name	Name of the policy currently attached to the specified interface and direction.
Operational Status	Operational status of the policy currently attached to the specified interface and direction. The value is either Up or Down.
Member Classes	List of all DiffServ classes currently defined as members of the selected policy name. Select a member class name to display its statistics. If no class is associated with the selected policy, then nothing is populated in the list.
Offered Packets	A count of the total number of packets offered to all class instances in this service policy before their defined DiffServ treatment is applied. This is the overall count per interface, per direction.
Discarded Packets	A count of the total number of packets discarded for all class instances in this service policy for any reason due to DiffServ treatment. This is the overall count per interface, per direction. The discarded packets are supported in the inbound direction but not in the outbound direction.

9

Manage Switch Security

You can configure the login password, Remote Authorization Dial-In User Service (RADIUS) settings, Terminal Access Controller Access Control System (TACACS) settings, and authentication lists.

The chapter covers the following topics:

Manage User Accounts and Passwords

You can configure user accounts and login passwords.

Configure User Accounts

By default, two user accounts exist:

- admin, with read/write privileges
- guest, with read-only privileges

The account names are not case-sensitive.

The first time that you log in as an admin user to the local browser UI, no password is required (that is, the password is blank). As of software version 12.0.9.3, after you log in for the first time, you are required to specify a local device password that you must use each subsequent time that you log in.

A guest user cannot log in until the admin user specifies a password for the guest user.

If you log in as an admin user with read/write privileges, you can assign passwords and set security parameters for the default accounts and add and delete accounts (other than the admin account), up to a maximum of six accounts. As an admin user with read/write privileges you modify data on the local browser UI pages.

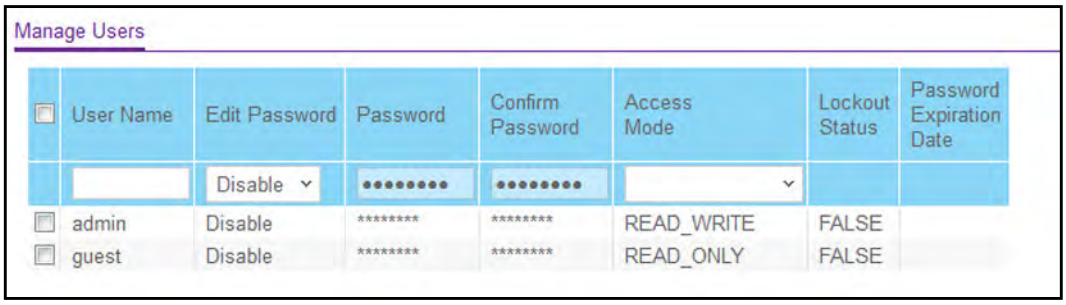
To add a user account:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Management Security > Local User > User Management**.



5. In the **User Name** field, enter the name for the new account.

   You can enter a new user name only when you are creating an account. User names are up to 64 characters in length and are not case-sensitive. Valid characters include all the alphanumeric characters as well as the hyphen (-) and underscore (_) characters. The user name default is not valid. User names once created cannot be changed or modified.

6. Set the **Edit Password** field to **Enable** only when you are changing the password.

   The default value is **Disable**.

7. In the **Password** field, enter the password for the account.

   The characters do not display as they are typed; only asterisks (*) show. Passwords are up to eight alphanumeric characters in length, and are case-sensitive.

8. In the **Confirm Password** field, enter the password again, to confirm that you entered it correctly.

   This field does not display the password as it is typed, but shows asterisks (*).

   The **Access Mode** field displays the user's access mode. The admin account always has read/write access, and all other accounts are assigned read-only access. The default value is read-only.

   The **Lockout Status** field indicates whether the user account is locked out (TRUE or FALSE).

   The **Password Expiration Date** field indicates the current password expiration date.

9. Click the **Add** button.

   The user account is added.

Configure a User Password

To configure a user password:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Management Security > Local User > User Password Configuration**.

5. In the **Password Minimum Length** field, type the minimum character length of all new local user passwords.
6. In the **Password Aging (days)** field, type the maximum time for which the user passwords are valid in days, from the time the password is set.

   Once a password expires, the user must enter a new password following the first login after password expiration. A value of 0 indicates that passwords never expire.
7. In the **Password History** field, type the number of previous passwords to store for prevention of password reuse.

   This ensures that each user does not reuse passwords often.

   A value of 0 indicates that no previous passwords are stored.
8. In the **Lockout Attempts** field, specify the number of allowable failed local authentication attempts before the user's account is locked.

   A value of 0 indicates that user accounts are never locked.
9. Click the **Apply** button.

   Your settings are saved.

Enable Password Configuration

You can change the privileged EXEC password. Passwords are a maximum of 64 alphanumeric characters. The password is case-sensitive.

To enable password configuration:

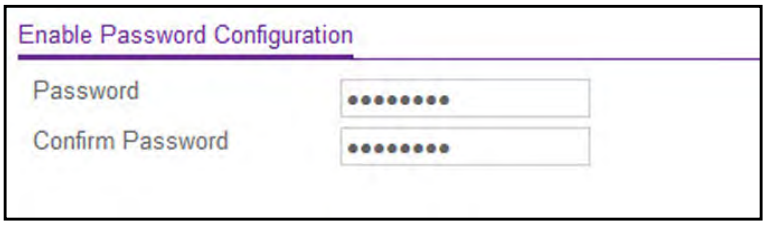
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Management Security > Enable Password**.



5. In the **Password** field, type the password.

   Passwords are a maximum of 64 alphanumeric characters.

6. In the **Confirm Password** field, type the password again, to confirm that you entered it correctly.
7. Click the **Apply** button.

   Your settings are saved.

Configure a Line Password

To configure a line password:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

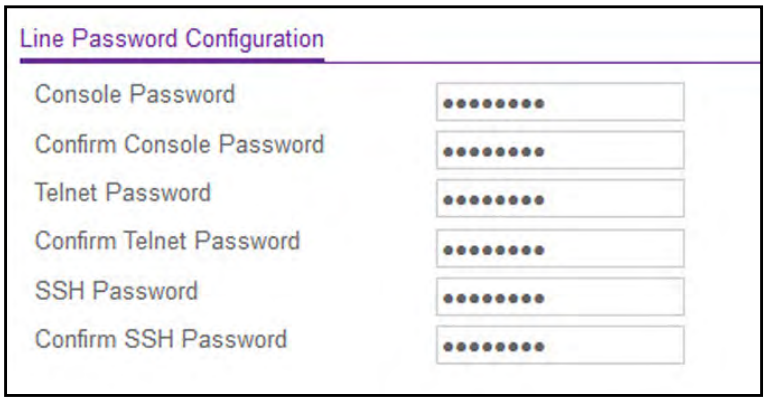
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Management Security > Line Password**.



5. In the **Console Password** field, enter the console password.

Passwords are a maximum of 64 alphanumeric characters.

6. In the **Confirm Console Password** field, type the password again to confirm that you typed it correctly.
7. In the **Telnet Password** field, type the Telnet password.

   Passwords are a maximum of 64 alphanumeric characters.
8. In the **Confirm Telnet Password** field, type the password again to confirm that you entered it correctly.
9. In the **SSH Password** field, type the SSH password.

   Passwords are a maximum of 64 alphanumeric characters.
10. In the **Confirm SSH Password** field, type the password again, to confirm that you entered it correctly.
11. Click the **Apply** button.

    Your settings are saved.

Manage the RADIUS Server Settings

RADIUS servers provide additional security for networks. The RADIUS server maintains a user database, which contains per-user authentication information. The switch passes information to the configured RADIUS server, which can authenticate a user name and password before authorizing use of the network. RADIUS servers provide a centralized authentication method for the following:

- Web access
- Access control port (802.1X)

Configure Global RADIUS Server Settings

You can add information about one or more RADIUS servers on the network.

To configure global RADIUS server settings:

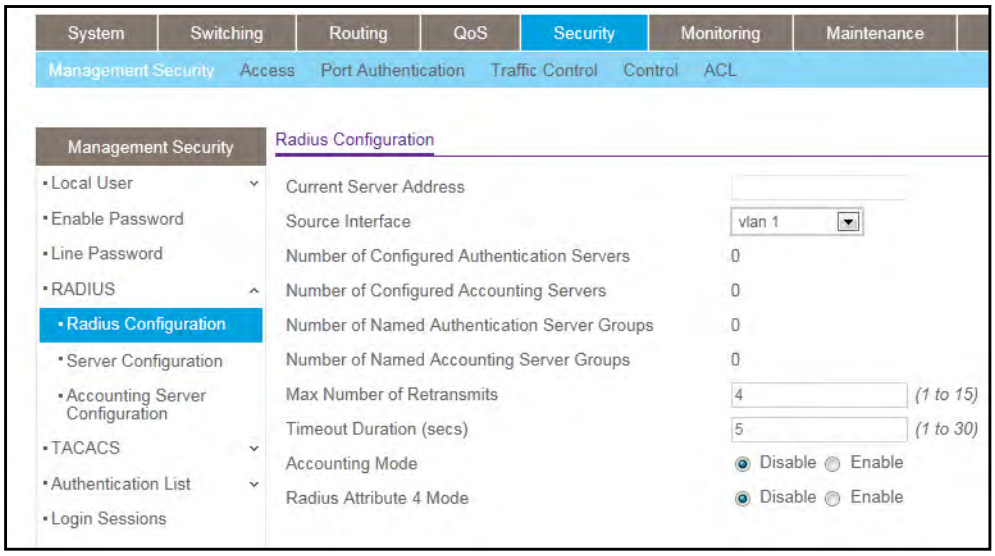
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Management Security > RADIUS > Radius Configuration.**



The **Current Server IP Address** field is blank if no servers are configured (see Configure a RADIUS Server on page 508). The switch supports up to three configured RADIUS servers. If more than one RADIUS servers is configured, the current server is the primary server. If no servers are configured as the primary server, the current server is the most recently added RADIUS server.

5. In the **Source Interface** list, select the interface to use for RADIUS.

   Possible values are as follows:

   - None
   - Routing interface
   - Routing VLAN
   - Routing loopback interface
   - Service Port

   By default, VLAN 1 is used as source interface.

6. In the **Max Number of Retransmits** field, specify the maximum number of times a request packet is retransmitted to the RADIUS server.

   The valid range is 1– 15. The default value is 4.

   Consider the maximum delay time when you configure the RADIUS maximum retransmit and RADIUS time-out. If multiple RADIUS servers are configured, the maximum retransmit value on each is exhausted before the next server is attempted. A retransmit does not occur until the configured time-out value on that server passed without a response from the RADIUS server. Therefore, the maximum delay in receiving a response from the RADIUS application equals the retransmit times the time-out for all configured servers. If the RADIUS request was generated by a user login attempt, all user interfaces are blocked until the RADIUS application returns a response.

7. In the **Timeout Duration** field, specify the time-out value, in seconds, for request retransmissions.

   The valid range is 1–30. The default value is 5.

   Consider the maximum delay time when you configure RADIUS maximum retransmit and RADIUS time-out. If multiple RADIUS servers are configured, the maximum retransmit value on each is exhausted before the next server is attempted. A retransmit does not occur until the configured time-out value on that server passed without a response from the RADIUS server. Therefore, the maximum delay in receiving a response from the RADIUS application equals the retransmit times the time-out for all configured servers. If the RADIUS request was generated by a user login attempt, all user interfaces are blocked until the RADIUS application returns a response.

8. Select the Accounting Mode **Disable** or **Enable** radio button.

   This specifies whether the RADIUS accounting mode is enabled or disabled on the current server.

9. Select the **RADIUS Attribute 4 Disable** or **Enable** radio button.

   This enables or disables RADIUS attribute 4. The default value is Disable. The **Radius Attribute 4 Value** is an optional field and can be seen only when RADIUS attribute 4 mode is enabled. It takes an IP address value in the format xx.xx.xx.xx.

10. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable RADIUS fields that display on the page.

Table 191. Radius Configuration

Field	Description
Current Server Address	The address of the current server. This field is blank if no servers are configured.
Number of Configured Authentication Servers	The number of configured authentication RADIUS servers. The value can range from 0 to 32.
Number of Configured Accounting Servers	The number of RADIUS accounting servers configured. The value can range from 0 to 32.
Number of Named Authentication Server Groups	The number of Named RADIUS server authentication groups configured.
Number of Named Accounting Server Groups	The number of named RADIUS server accounting groups configured.

Configure a RADIUS Server

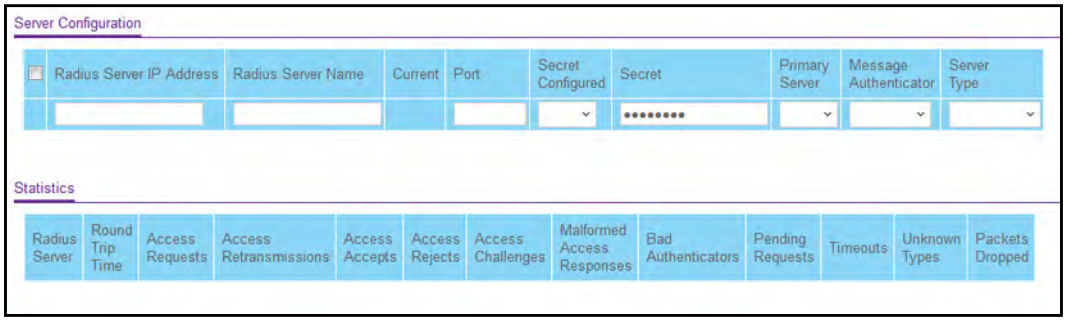
To configure a RADIUS server:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Management Security> RADIUS > Server Configuration**.



5. To add a RADIUS server, specify the following settings:
   - In the **Radius Server IP Address** field, specify the IP address of the RADIUS server.
   - In the **Radius Server Name** field, specify the name of the server.
   - Use **Port** to specify the UDP port used by this server. The valid range is 0–65535.
   - **Secret Configured**. The secret is applied only if this option is **Yes**. If the option is **No**, anything entered in the secret field has no effect and is not retained.
   - Use **Secret** to specify the shared secret for this server.
   - Use **Primary Server** to set the selected server as a primary or secondary server.
   - Use **Message Authenticator** to enable or disable the message authenticator attribute for the selected server.
6. Click the **Add** button.

   The server is added to the switch.

   The **Current** field indicates if the server is currently in use as the authentication server.

The following table describes the RADIUS server statistics displayed on the page.

Table 192. RADIUS statistics

Field	Description
Radius Server	The address of the RADIUS server or the name of the RADIUS server for which the statistics are displayed.
Round Trip Time	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.
Access Requests	The number of RADIUS access-request packets sent to this server. This number does not include retransmissions.
Access Retransmissions	The number of RADIUS access-request packets retransmitted to this server.
Access Accepts	The number of RADIUS access-accept packets, including both valid and invalid packets, that were received from this server.
Access Rejects	The number of RADIUS access-reject packets, including both valid and invalid packets, that were received from this server.
Access Challenges	The number of RADIUS access-challenge packets, including both valid and invalid packets, that were received from this server.
Malformed Access Responses	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 unknown types are not included in malformed access-responses.
Bad Authenticators	The number of RADIUS access-response packets containing invalid authenticators or signature attributes received from this server.
Pending Requests	The number of RADIUS access-request packets destined for this server that did not yet time out or receive a response.
Timeouts	The number of authentication time-outs to this server.
Unknown Types	The number of RADIUS packets of unknown type that were received from this server on the authentication port.
Packets Dropped	The number of RADIUS packets received from this server on the authentication port and dropped for some other reason.

Configure RADIUS Accounting Servers

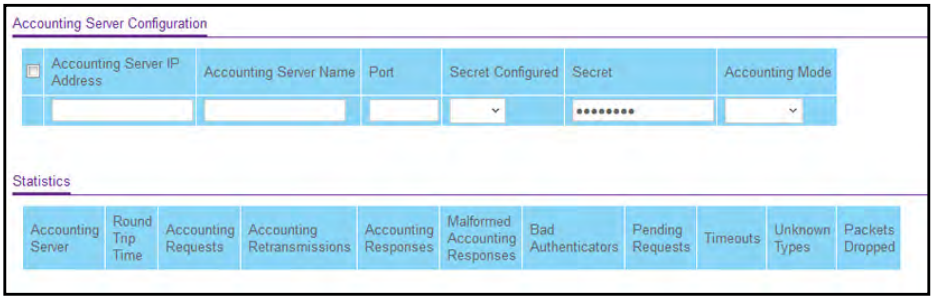
To configure a RADIUS accounting server:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Management Security > RADIUS > Accounting Server Configuration**.



5. In the **Accounting Server IP Address** field, specify the IP address of the RADIUS accounting server.
6. In the **Accounting Server Name** field, enter the name of the accounting server.
7. In the **Port** field, specify the UDP port number the server uses to verify the RADIUS accounting server.

   The valid range is 0–65535. If the user has read-only access, the value is displayed but cannot be changed.
8. From the **Secret Configured** list, select **Yes** to add a RADIUS secret in the next field.

   After you add the RADIUS accounting server, this field indicates whether the shared secret for this server is configured.
9. In the **Secret** field, type the shared secret to use with the specified accounting server.
10. From the **Accounting Mode** list, enable or disable the RADIUS accounting mode.
11. Click the **Apply** button.

    Your settings are saved.

The following table describes RADIUS accounting server statistics available on the page.

Table 193. RADIUS Accounting Server Statistics

Field	Description
Accounting Server Address	The accounting server associated with the statistics.
Round Trip Time(secs)	The time interval, in hundredths of a second, between the most recent accounting-response and the accounting-request that matched it from this RADIUS accounting server.
Accounting Requests	The number of RADIUS accounting-request packets sent not including retransmissions.
Accounting Retransmissions	The number of RADIUS accounting-request packets retransmitted to this RADIUS accounting server.
Accounting Responses	The number of RADIUS packets received on the accounting port from this server.
Malformed Accounting Responses	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.
Bad Authenticators	The number of RADIUS accounting-response packets that contained invalid authenticators received from this accounting server.
Pending Requests	The number of RADIUS accounting-request packets sent to this server that did not yet time out or receive a response.
Timeouts	The number of accounting time-outs to this server.
Unknown Types	The number of RADIUS packets of unknown type that were received from this server on the accounting port.
Packets Dropped	The number of RADIUS packets that were received from this server on the accounting port and dropped for some other reason.

Manage the TACACS Settings

TACACS provides a centralized user management system, while still retaining consistency with RADIUS and other authentication processes. TACACS provides the following services:

- **Authentication**. Provides authentication during login and through user names and user-defined passwords.
- **Authorization**. Performed at login. When the authentication session is completed, an authorization session starts using the authenticated user name. The TACACS server checks the user privileges.

The TACACS protocol ensures network security through encrypted protocol exchanges between the device and TACACS server.

Configure Global TACACS Settings

You can configure the TACACS settings for communication between the switch and the TACACS server you configure through the inband management port.

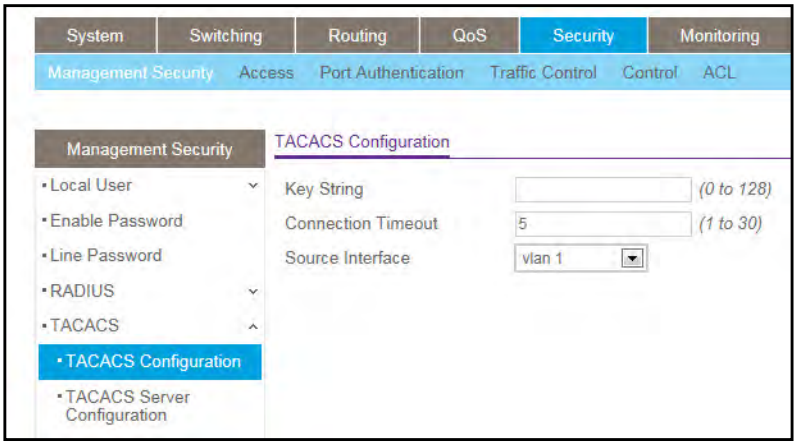
To configure global TACACS settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Management Security > TACACS > TACACS Configuration**.



5. In the **Key String** field, specify the authentication and encryption key for TACACS communications between the switch and the TACACS server.

   The valid range is 0–128. The key must match the key configured on the TACACS server.
6. In the **Connection Timeout** field, specify the maximum number of seconds allowed to establish a TCP connection between the switch and the TACACS server.
7. In the **Source Interface** list, select the source interface which will be used for TACACS.

   Possible values are as follows:

   - None. The primary IP address of the originating (outbound) interface is used as the source address.
   - Routing interface. The primary IP address of a physical port is used as the source address.

- Routing VLAN. The primary IP address of a VLAN routing interface is used as the source address.
- Routing loopback interface. The primary IP address of a routing loopback interface is used as the source address.
- Service port. The management port source IP is used as the source address.

By default VLAN 1 is used as source interface. When the None value is displayed, it means that the configured routing interface has become nonrouting.

8. Click the **Apply** button.

   Your settings are saved.

Configure TACACS Server Settings

You can configure up to five TACACS servers with which the switch can communicate.

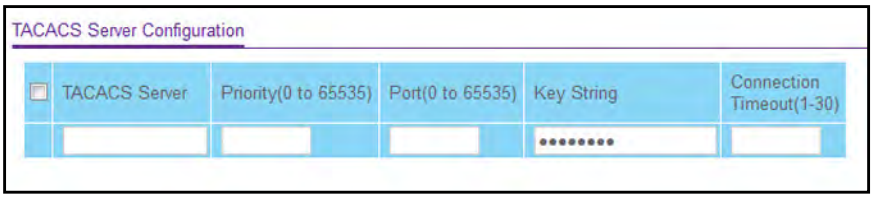
To configure TACACS server settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Management Security> TACACS > TACACS Server Configuration**.



5. Use **TACACS Server** to configure the TACACS server IP address.
6. Use **Priority** to specify the order in which the TACACS servers are used.

   The valid range is 0–65535.
7. Use **Port** to specify the authentication port. It must be within the range 0–65535.
8. Use **Key String** to specify the authentication and encryption key for TACACS communications between the device and the TACACS server.

   The valid range is 0–128. The key must match the key used on the TACACS server.
9. Use **Connection Timeout** to specify the amount of time that passes before the connection between the device and the TACACS server time-out.

The range is 1–30.

10. Click the **Add** button.

    The server is added to the switch.

Configure Authentication Lists

The switch supports various authentication lists.

Configure a Login Authentication List

A login list specifies the authentication methods to be used to validate switch or port access for the users associated with the list. The preconfigured users, admin and guest, are assigned to a preconfigured list named defaultList, which you cannot delete. All newly created users are also assigned to the defaultList until you specifically assign them to a different list.

Two default lists are present: DefaultList and networkList.

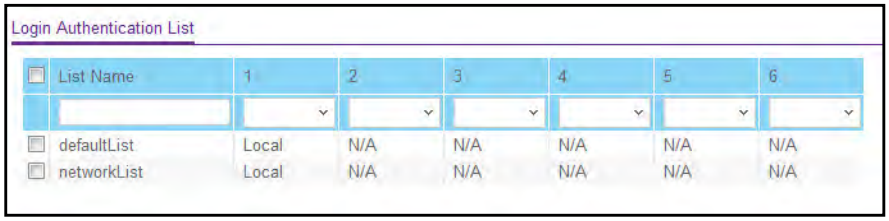
To configure a login authentication list:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Management Security > Authentication List > Login Authentication List**.



5. To create a new login list, enter the name in the **List Name** field.

   The name can be up to 15 alphanumeric characters long and is not case-sensitive.
6. In the columns in table header (1, 2, 3, 4, 5, 6), select the method to appear first in the selected authentication enable list.

The options are as follows:

- **Enable**. The privileged EXEC password is used for authentication.
- **Line**. The line password is used for authentication.
- **None**. The user cannot be authenticated.
- **RADIUS**. The user's name and password are authenticated using the RADIUS server instead of local server.
- **TACACS**. The user's name and password are authenticated using the TACACS server.
- **Deny**. Authentication always fails.

7. Click the **Add** button.

   The login list is added to the switch.

Configure an Enable Authentication List

An enable list specifies the authentication methods to validate privileged EXEC access for the users associated with the list. The preconfigured users, admin and guest, are assigned to a preconfigured list named defaultList, which you cannot delete. All newly created users are also assigned to the defaultList until you specifically assign them to a different list. Two default lists are present: enableList and enableNetList.

To configure an enable authentication list:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

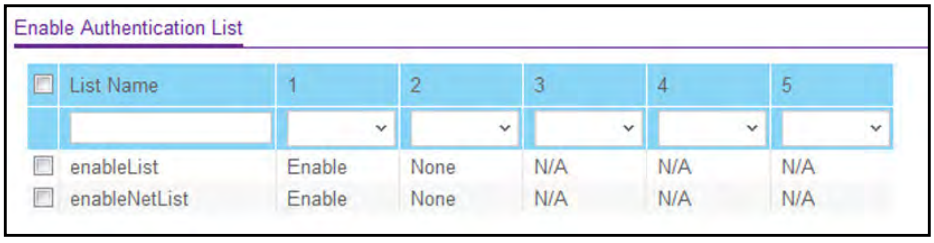
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Management Security > Authentication List > Enable Authentication List**.



5. To create a new enable list, enter the name in the **List Name** field.

   It can be up to 15 alphanumeric characters long and is not case-sensitive.

6. In the columns in table header (1, 2, 3, 4, 5, 6), select the method to appear first in the selected authentication enable list.

   The options are as follows:

   - **Enable**. The privileged EXEC password is used for authentication.
   - **Line**. The line password is used for authentication.
   - **None**. The user cannot be authenticated.
   - **RADIUS**. The user's name and password are authenticated using the RADIUS server instead of local server.
   - **TACACS**. The user's name and password are authenticated using the TACACS server.
   - **Deny**. Authentication always fails.

7. Click the **Add** button.

   The login list is added to the switch.

Configure the Dot1x Authentication List

You can configure a dot1x list. A dot1x list specifies the authentication methods to validate port access for the users associated with the list. Only one dot1x method can be supported.

The default list is dot1xList.

To configure the dot1x authentication list:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

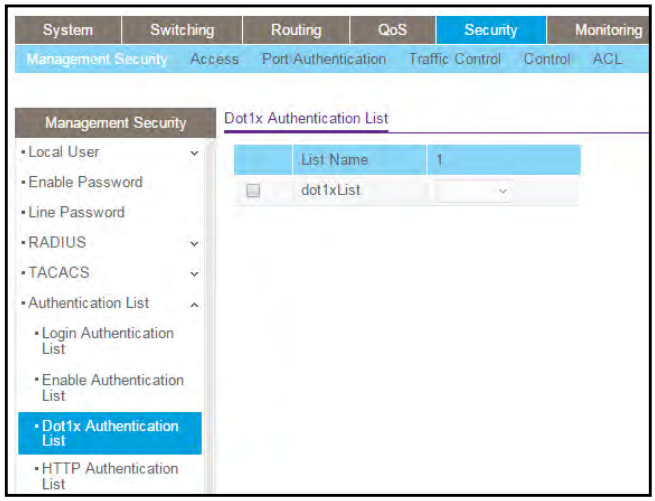
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Management Security > Authentication List > Dot1x Authentication List**.



5. Select the check box for the dot1x list name.
6. Select the method to appear first in the selected authentication login list.

   The options are as follows:

   - **IAS**. The user's ID and password in internal authentication server database is used for authentication.
   - **Local**. The user's locally stored ID and password are used for authentication.
   - **RADIUS**. The user's ID and password are authenticated using the RADIUS server instead of locally.
   - **None**. The user authenticated without a user name and password.
7. Click the **Apply** button.

   Your settings are saved.

Configure an HTTP Authentication List

You can configure an HTTP list. An HTTP list specifies the authentication methods to validate the switch or port access through HTTP.

To configure an HTTP authentication list:

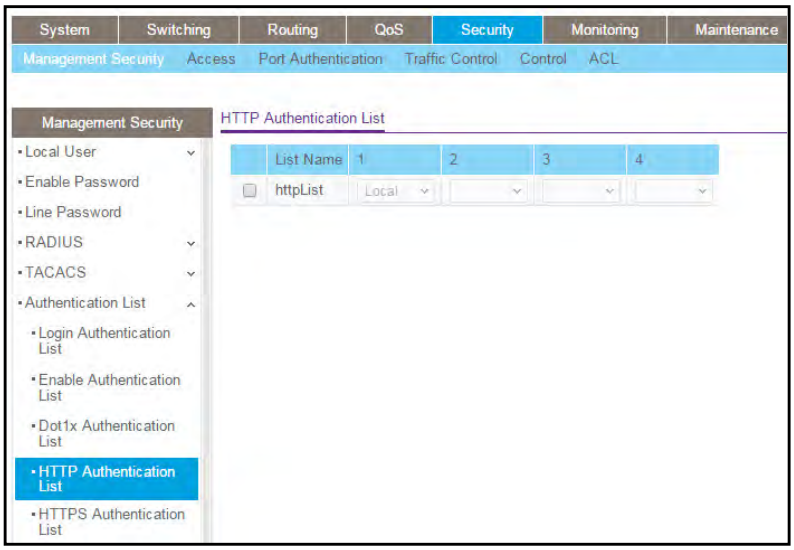
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Management Security > Authentication List > HTTP Authentication List**.



5. Select the check box for the HTTP list name.
6. In the columns in table header (1, 2, 3, 4, 5, 6), select the method to appear first in the selected authentication enable list.

   The options are as follows:

   - **Enable**. The privileged EXEC password is used for authentication.
   - **None**. The user cannot be authenticated.
   - **RADIUS**. The user's name and password are authenticated using the RADIUS server instead of local server.
   - **TACACS**. The user's name and password are authenticated using the TACACS server.
7. Click the **Apply** button.

   Your settings are saved.

Configure an HTTPS Authentication List

You can configure an HTTPS list. A login list specifies the authentication methods to validate the switch or port access through HTTPS for the users associated with the list. The default list is httpsList.

To configure an HTTPS authentication list:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

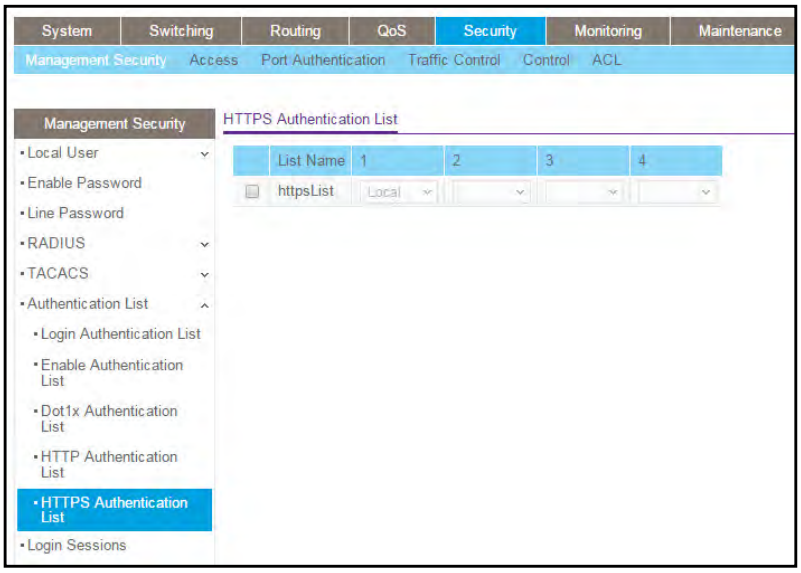
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Management Security > Authentication List > HTTPS Authentication List**.



5. Select the check box for the HTTPS list name.
6. In the columns in table header (1, 2, 3, 4, 5, 6), select the method to appear first in the selected authentication enable list.

   The options are as follows:

   - **Enable**. The privileged EXEC password is used for authentication.
   - **None**. The user cannot be authenticated.
   - **RADIUS**. The user's name and password are authenticated using the RADIUS server instead of local server.
   - **TACACS**. The user's name and password are authenticated using the TACACS server.

7. Click the **Apply** button.

   Your settings are saved.

View Login Sessions

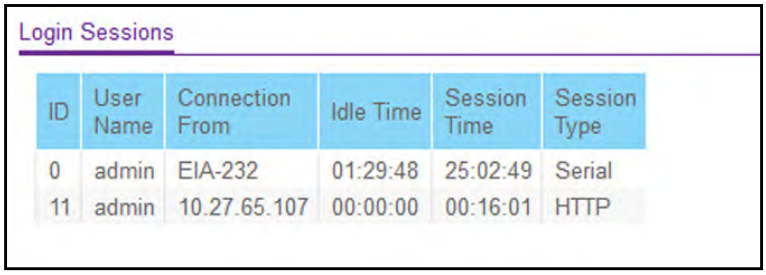
To view login sessions:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Management Security > Login Sessions**.



The following table describes the fields that are shown in the table.

Table 194. Login Sessions

Field	Description
ID	Identifies the ID of this row.
User Name	The user's name whose session is open.
Connection From	The machine from which the user is connected.
Idle Time	The idle session time.
Session Time	The total session time.
Session Type	The type of session: Telnet, Serial, or SSH

Manage HHTP, HTTPS, and SSH Access

You can configure HTTP and Secure HTTP access to the switch's management interface.

Configure HTTP Server Settings

To access the switch using a web browser, you must first configure it with IP information (IP address, subnet mask, and default gateway). You can configure the IP information using any of the following:

- BOOTP
- DHCP
- Terminal interface through the EIA-232 port

Once you establish in-band connectivity, you can change the IP information using a web-based management.

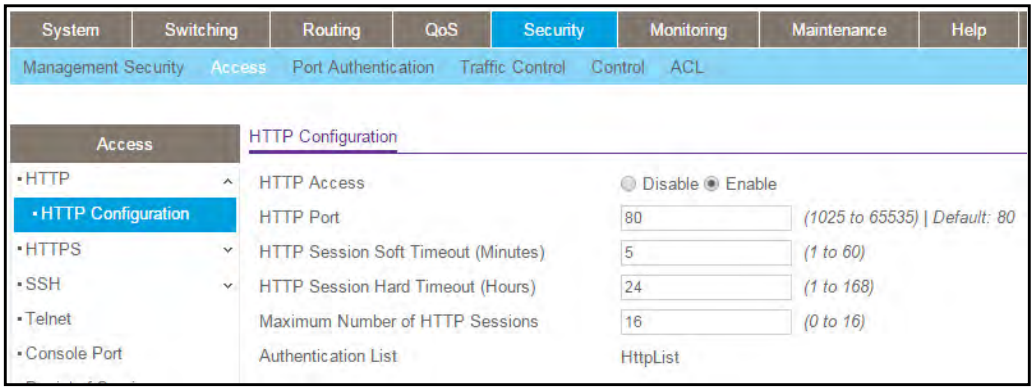
To configure the HTTP server settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access> HTTP > HTTP Configuration**.



5. Select the **HTTP Access Disable** or **Enable** radio button.

This specifies whether the switch can be accessed from a web browser. If you enable web mode, you can manage the switch from a web browser. The factory default is Enable.

6. In the **HTTP Port** field, enter the HTTP port number.

   The valid range is 80 and 1025 to 65535. The default value is 80.

7. In the **HTTP Session Soft Timeout (Minutes)** field, set the inactivity time-out for HTTP sessions.

   The value must be in the range of 1 to 60 minutes. The default value is 5 minutes. The currently configured value displays.

8. In the **HTTP Session Hard Timeout (Hours)** field, set the hard time-out for HTTP sessions.

   This time-out is unaffected by the activity level of the session. The value must be in the range of 1 to 168 hours. The default value is 24 hours. The currently configured value is displayed.

9. In the **Maximum Number of HTTP Sessions** field, set the maximum allowable number of HTTP sessions.

   The value must be in the range of 0 to 16. The default value is 16. The currently configured value is displayed.

10. Click the **Apply** button.

    Your settings are saved.

    The **Authentication List** field displays the list that HTTP is using.

Configure the HTTPS Settings

Secure HTTP (HTTPS) enables the transmission of HTTP over an encrypted Secure Sockets Layer (SSL) or Transport Layer Security (TLS) connection. When you manage the switch by using the local browser UI, HTTPS can help ensure that communication between the management system and the switch is protected from eavesdroppers and man-in-the-middle attacks.

You can to configure the settings for HTTPS communication between the management station and the switch.

To configure HTTPS settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

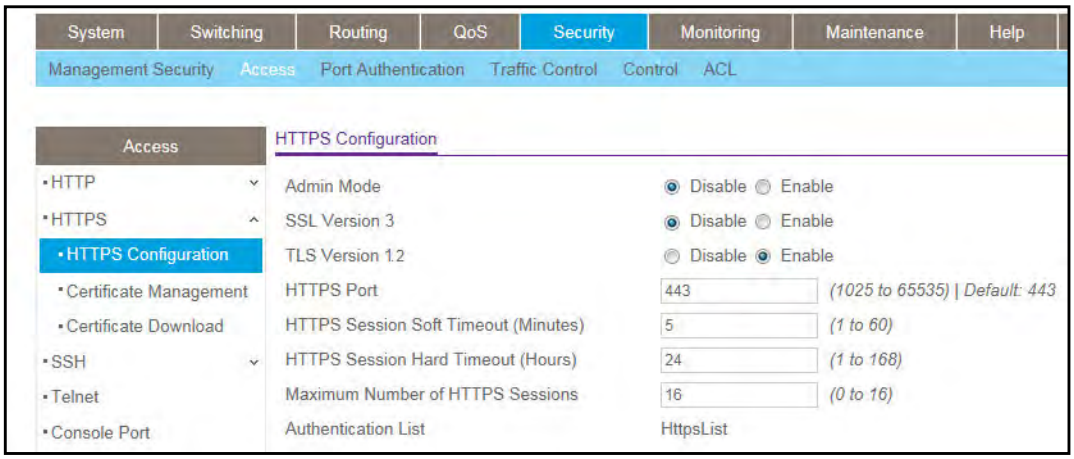
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Security > Access > HTTPS > HTTPS Configuration**.



5. Select the **Admin Mode Disable** or **Enable** radio button.

   This enables or disables the administrative mode of Secure HTTPS. The currently configured value is displayed. The default value is Disable. You can download SSL certificates only when the HTTPS admin mode is disabled. HTTPS admin mode can be enabled only if a certificate is present on the device.

6. Select the **SSL Version 3 Disable** or **Enable** radio button.

   This enables or disables Secure Sockets Layer version 3.0. The currently configured value is displayed. The default value is Enable.

7. Select the **TLS Version 1.2 Disable** or **Enable** radio button

   This enables or disables Transport Layer Security version 1.2. The currently configured value is displayed. The default value is Enable.

8. In the **HTTPS Port** field, type the HTTPS port number.

   The value must be in the range of 1025 to 65535. Port 443 is the default value. The currently configured value is displayed.

9. In the **HTTPS Session Soft Timeout (Minutes)** field, enter the inactivity time-out for HTTPS sessions.

   The value must be in the range of 1 to 60 minutes. The default value is 5 minutes. The currently configured value is displayed.

10. In the **HTTPS Session Hard Timeout (Hours)** field, set the hard time-out for HTTPS sessions.

    This time-out is unaffected by the activity level of the session. The value must be in the range of 1 to 168 hours. The default value is 24 hours. The currently configured value is displayed.

11. In the **Maximum Number of HTTPS Sessions** field, enter the maximum allowable number of HTTPS sessions.

The value must be in the range of 0 to 16. The default value is 16. The currently configured value is displayed.

12. Click the **Apply** button.

    Your settings are saved.

    The **Authentication List** field displays the authentication list for HTTPS.

Manage Certificates

You can generate or delete certificates.

To manage certificates:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > HTTPS > Certificate Management**.

   The **Certificate Present** field displays whether there is a certificate present on the device.
5. Select one of the following radio buttons:
   - **None**. There is nothing to be done with respect to certificate management. This is the default selection.
   - **Generate Certificates**. Begin generating the certificate files.
   - **Delete Certificates**. Delete the corresponding certificate files, if present.

6. Click the **Apply** button.

   Your settings are saved.

   The **Certificate Generation Status** field displays the SSL certificate generation status.

Download Certificates

You can transfer a certificate file to the switch.

For the web server on the switch to accept HTTPS connections from a management station, the web server needs a public key certificate. You can generate a certificate externally (for example, offline) and download it to the switch.

Before you download a file to the switch, the following conditions must be true:

- The file to download from the TFTP server is on the server in the appropriate directory.
- The file is in the correct format.
- The switch has a path to the TFTP server.

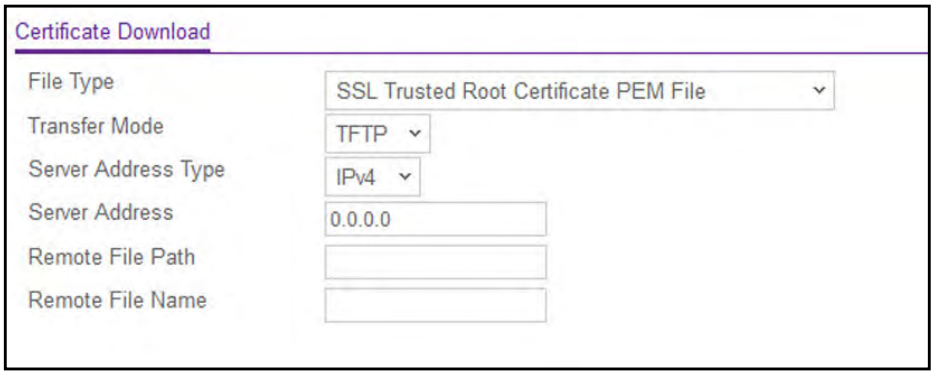
To download certificates:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > HTTPS > Certificate Download**.



5. In the **File Type** list, specify the type of file to transfer:
   - **SSL Trusted Root Certificate PEM File.** SSL Trusted Root Certificate file (PEM Encoded)
   - **SSL Server Certificate PEM File**. SSL Server Certificate File (PEM Encoded)

- **SSL DH Weak Encryption Parameter PEM File**. SSL Diffie-Hellman Weak Encryption Parameter file (PEM Encoded)
- **SSL DH Strong Encryption Parameter PEM File**. SSL Diffie-Hellman Strong Encryption Parameter File (PEM Encoded)

6. In the **Transfer Mode** list, specify the protocol to use to transfer the file:
   - **TFTP**. Trivial File Transfer Protocol
   - **SFTP**. Secure File Transfer Protocol
   - **SCP**. Secure Copy Protocol
7. In the **Server Address Type** list, specify either IPv4, IPv6, or DNS to indicate the format of the TFTP/SFTP/SCP Server Address field.

   The factory default is IPv4.
8. In the **Server Address** field, type the IP address or DNS host name of the server in accordance with the format indicated by the server address type.

   The factory default is the IPv4 address 0.0.0.0.
9. In the **Remote File Path** field, enter the path of the file to download.

   You can enter up to 96 characters. The factory default is blank.
10. In the **Remote File Name** field, enter the name of the file on the TFTP server to download.

    You can enter up to 32 characters. The factory default is blank.
11. Click the **Apply** button.

    Your settings are saved.

Configure SSH Settings

You can view and modify the Secure Shell (SSH) server settings on the device. SSH is a network protocol that enables access to the CLI management interface by using an SSH client on a remote administrative system. SSH is a more secure access method than Telnet because it encrypts communication between the administrative system and the device. You can download or generate SSH host keys for secure CLI-based management.

To configure SSH settings:

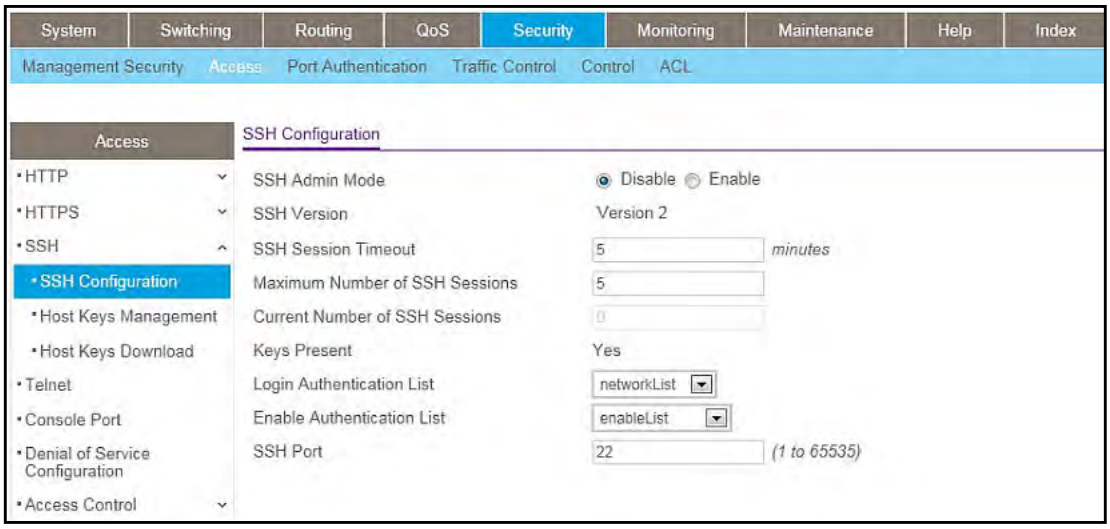
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Access > SSH > SSH Configuration**.



5. Select the **SSH Admin Mode Disable** or **Enable** radio button.

   This enables or disables the SSH server administrative mode. When this mode is enabled, the device can be accessed by using an SSH client on a remote system. The currently configured value is displayed. The default value is Disable.

6. Use **SSH Session Timeout** to configure the SSH session inactivity time-out value for incoming SSH sessions to the switch.

   A connected user that does not exhibit any SSH activity for this amount of time is automatically disconnected from the device. The acceptable range for this field is 1-5 minutes.

7. Use **Maximum Number of SSH Sessions** to configure the maximum number of inbound SSH sessions that can be connected to the device simultaneously.

   The currently configured value is displayed. The acceptable range for this field is 0–5.

8. Use **Login Authentication List** to select an authentication list.

   This list is used to authenticate users who try to login to the switch.

9. Use **Enable Authentication List** to select an authentication list.

   This list is used to authenticate users who try to get *enable* level privilege.

10. Use **SSH Port** to enter the port range from 1 to 65535.

    The default value is 22.

11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable fields that display on the page.

Table 195. SSH Configuration

Field	Description
SSH Version	The SSH server on the device can accept connections from an SSH client using Protocol Level 2 for SSH (SSH-2). Protocol Level 2 for SSH is enabled by default.
Current Number of SSH Sessions	The number of active SSH sessions between remote SSH clients and the SSH server on the device.
Keys Present	Displays **Yes** or **No** whether one or both (if any) of the following keys are present on the device: • SSH-2 Rivest-Shamir-Adelman (RSA) key file (PEM encoded) • SSH-2 Digital Signature Algorithm (DSA) key file (PEM encoded)

Manage Host Keys

You can generate or delete RSA and DSA keys.

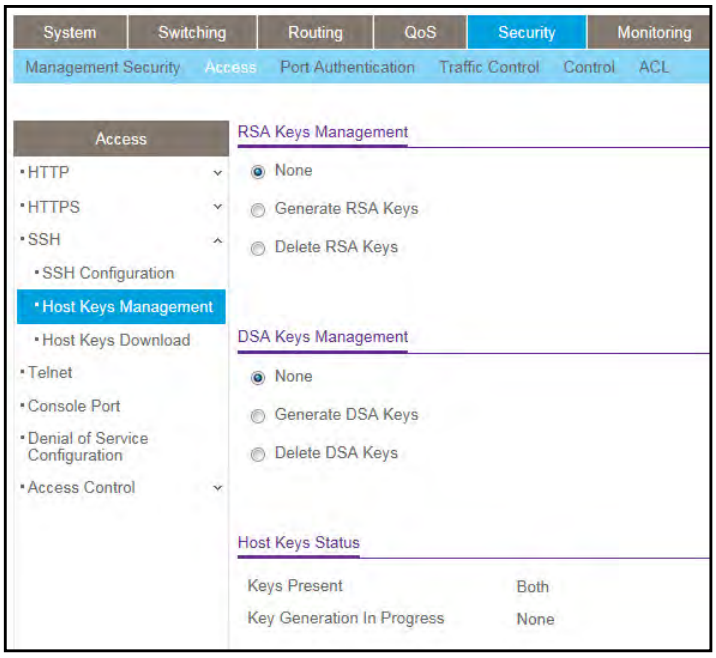
To manage host keys:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > SSH > Host Keys Management**.



5. Select an RSA Keys Management radio button:
   - **None**. This is the default selection.
   - **Generate RSA Keys**. Begin generating the RSA host keys. To generate SSH key files SSH must be administratively disabled and there can be no active SSH sessions.
   - **Delete RSA Keys**. Delete the corresponding RSA key file, if it is present.
6. Select a DSA Keys Management radio button:
   - **None**. This is the default selection.
   - **Generate DSA Keys**. Begin generating the DSA host keys.

     To generate SSH key files SSH must be administratively disabled and there can be no active SSH sessions.
   - **Delete DSA Keys**. Delete the corresponding DSA key file, if it is present.
7. Click the **Apply** button.

   The host key file starts downloading.

Note: To download SSH key files, SSH must be administratively disabled and there can be no active SSH sessions.

The following table describes the nonconfigurable fields that display on the page.

Table 196. RSA Key Management

Field	Description
Keys Present	Displays which of the following keys or both (if any) are present on the device: • SSH-2 Rivest-Shamir-Adelman (RSA) key file (PEM Encoded) • SSH-2 Digital Signature Algorithm (DSA) key file (PEM Encoded)
Key Generation In Progress	Displays which key is being generated (if any), RSA, DSA, or None.

Download Host Keys

You can download an SSH-2 RSA or SSH-2 DSA key file from a remote system to the device.

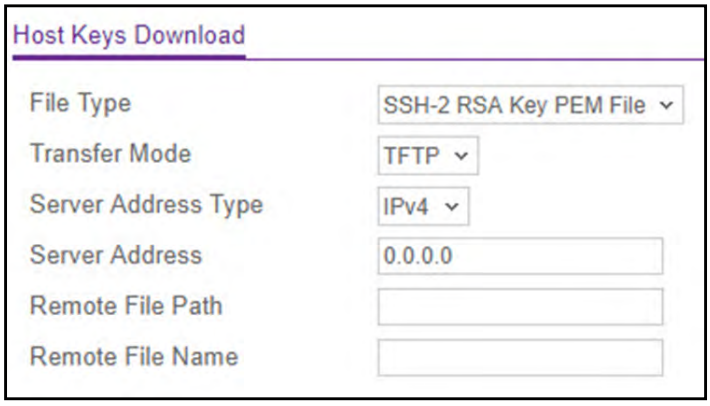
To download host keys:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > SSH > Host Keys Download**.



5. In the **File Type** list, select the type of file to transfer:
   - **SSH-2 RSA Key PEM File**. SSH-2 Rivest-Shamir-Adelman (RSA) key file (PEM Encoded)

- **SSH-2 DSA Key PEM File**. SSH-2 Digital Signature Algorithm (DSA) key file (PEM Encoded)

6. In the **Transfer Mode** list, select the protocol to use to transfer the file:
   - **TFTP**. Trivial File Transfer Protocol
   - **SFTP**. Secure File Transfer Protocol
   - **SCP**. Secure Copy Protocol
7. In the **Server Address Type** field, specify either **IPv4**, **IPv6**, or **DNS**.

   This specifies the format of the TFTP/SFTP/SCP Server Address field. The factory default is IPv4.
8. In the **Server Address** field, enter the IP address or DNS host name of the server in accordance with the format indicated by the server address type.

   The factory default is the IPv4 address 0.0.0.0.
9. In the **Remote File Path** field, enter the path of the file to download.

   You can enter up to 96 characters. The factory default is blank.
10. In the **Remote File Name** field, enter the name of the file on the TFTP server to download.

    You can enter up to 32 characters. The factory default is blank.
11. Click the **Apply** button.

    The host key file starts downloading.

Note: To download SSH key files SSH must be administratively disabled and there can be no active SSH sessions.

Configure Telnet Access

You can configure a Telnet authentication list and manage outbound and inbound Telnet.

Configure a Telnet Authentication List

You can select the Login Authentication List and the Enable Authentication List:

- **Login Authentication List**. The login list specifies the authentication methods used to validate switch or port access for the users associated with the list.

  For information about creating a login authentication list, see Configure a Login Authentication List on page 514.
- **Enable Authentication List**. The enable list specifies the authentication methods used to validate privileged EXEC access for the users associated with the list.

For information about creating an enable authentication list, see Configure a Login Authentication List on page 514.

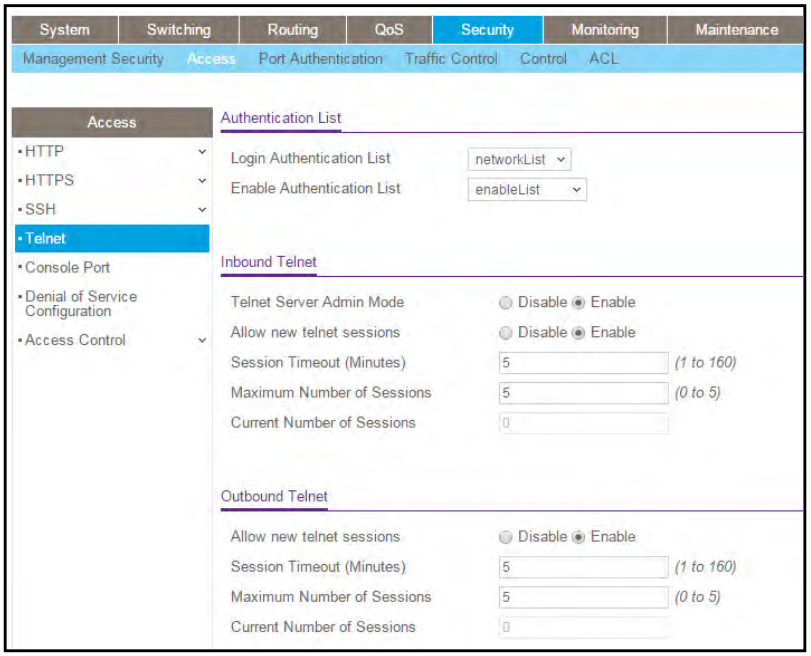
To configure the Telnet authentication list:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > Telnet**.



5. From the **Login Authentication List** menu, select which authentication list must be used to log in through Telnet.

   The default value is networkList.
6. From the **Enable Authentication List** menu, select which authentication list must be used to log in through Telnet for the privileged EXEC mode.

   The default value is enableList.
7. Click the **Apply** button.

   Your settings are saved.

Configure Inbound Telnet

You can regulate new inbound Telnet sessions. If Allow New Telnet Sessions is enabled, new inbound Telnet sessions can be established until there are no more sessions available. If Allow New Telnet Sessions is disabled, no new inbound Telnet sessions are established. An established session remains active until the session is ended or an abnormal network error ends the session.

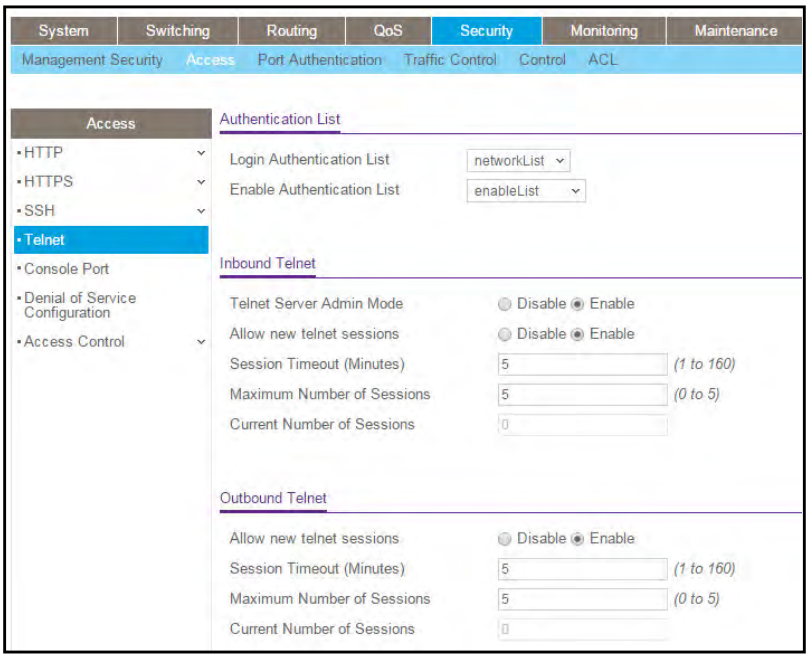
To configure inbound Telnet:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > Telnet**.



5. Next to Allow new telnet sessions, select the **Disable** or **Enable** radio button.

   This specifies whether the new inbound Telnet session is enabled or disabled. The default value is Enabled so that new inbound Telnet sessions can be established until there are no more sessions available. If it is disabled, no new inbound Telnet sessions are established. An established session remains active until the session is ended or an abnormal network error ends the session.

6. In the **Session Timeout** field, specify how many minutes of inactivity occur on an inbound Telnet session before the session is logged off.

   You can enter any number from 1 to 160. The factory default is 5 minutes.

7. In the **Maximum Number of Sessions** field, specify how many simultaneous inbound Telnet sessions are allowed.

   The maximum is 5, which is also the factory default.

8. Click the **Apply** button.

   Your settings are saved.

   The **Current Number of Sessions** field displays the number of current inbound Telnet sessions.

Configure Outbound Telnet

You can regulate new outbound Telnet sessions. If Allow New Telnet Sessions is enabled, new outbound Telnet sessions can be established until there are no more sessions available. If Allow New Telnet Sessions is disabled, no new outbound Telnet sessions are established. An established session remains active until the session is ended or an abnormal network error ends the session.

To configure outbound Telnet:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

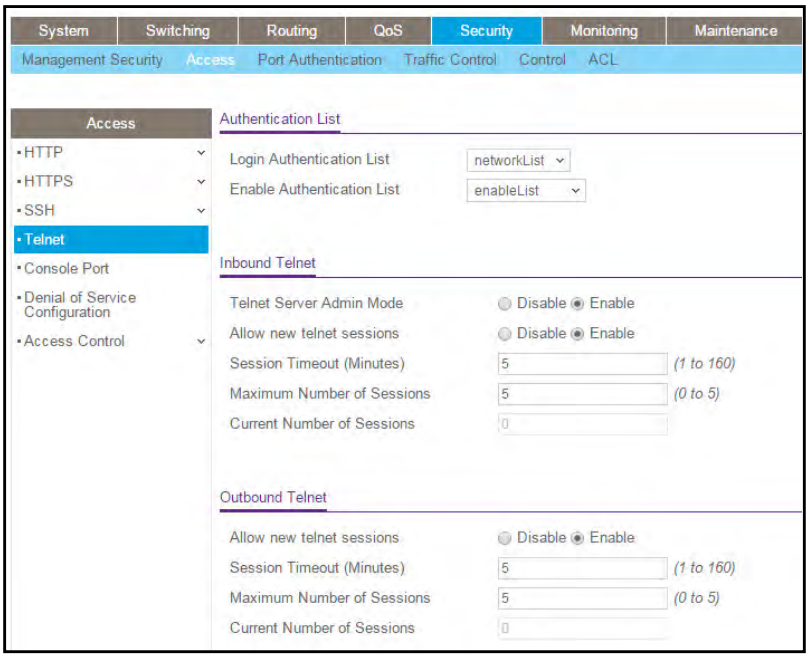
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Access > Telnet**.



5. Next to Allow new telnet sessions, select the **Disable** or **Enable** radio button.

   This specifies whether the new outbound Telnet session is enabled or disabled. The default value is Enabled so that new outbound Telnet sessions can be established until there are no more sessions available. If it is disabled, no new outbound Telnet sessions are established. An established session remains active until the session is ended or an abnormal network error ends the session.

6. In the **Session Timeout** field, specify how many minutes of inactivity occur on an inbound Telnet session before the session is logged off.

   You can enter any number from 1 to 160. The factory default is 5 minutes.

7. In the **Maximum Number of Sessions** field, specify how many simultaneous inbound Telnet sessions are allowed.

   The maximum is 5, which is also the factory default.

8. Click the **Apply** button.

   Your settings are saved.

   The **Current Number of Sessions** field displays the number of current outbound Telnet sessions.

Configure Console Port Access

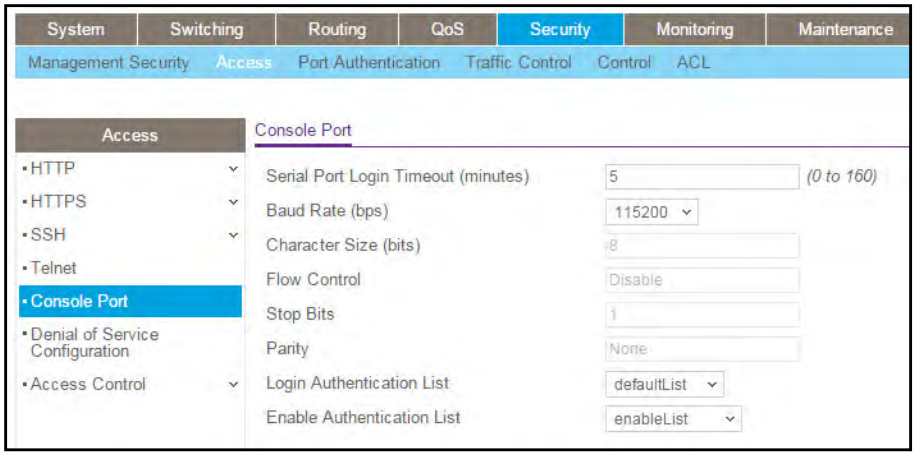
To configure the console port:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > Console Port**.



5. In the **Serial Port Login Timeout (minutes)** field, specify how many minutes of inactivity occur on a serial port connection before the switch closes the connection.

   Enter a number between 0 and 160. The factory default is 5. Entering 0 disables the time-out.
6. In the **Baud Rate (bps)** list, select the default baud rate for the serial port connection.

   You can choose from 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 baud. The factory default is 115200 baud.
7. In the **Login Authentication List** list, select which authentication list to use when you log in through Telnet.

   The default value is defaultList.
8. In the **Enable Authentication List** list, select which authentication list to use when going into the privileged EXEC mode.

   The default value is enableList.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 197. Console Port

Field	Description
Character Size (bits)	The number of bits in a character. This is always 8.
Flow Control	Whether hardware flow control is enabled or disabled. It is always disabled.
Stop Bits	The number of stop bits per character. It is always 1.
Parity	The parity method used on the serial port. It is always None.

Configure Denial of Service Settings

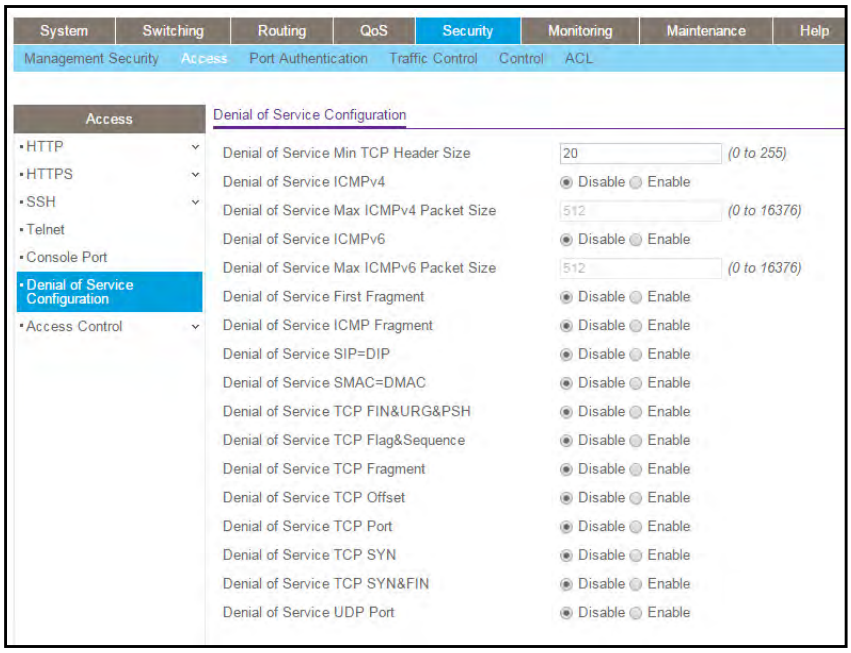
To configure Denial of Service settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > Denial of Service Configuration**.



5. In the **Denial of Service Min TCP Header Size** field, specify the minimum TCP header size allowed.

   If DoS TCP Fragment is enabled, the switch drops these packets:

   - First TCP fragments with a TCP payload: IP_Payload_Length - IP_Header_Size < Min_TCP_Header_Size.
   - Its range is 0 to 255. The default value is 20.

6. Select the **Denial of Service ICMPv4 Disable** or **Enable** radio button.

   Enabling ICMPv4 DoS prevention causes the switch to drop ICMPv4 packets with a type set to ECHO_REQ (ping) and a size greater than the configured ICMPv4 packet size. The factory default is Disable.

7. Specify the **Denial of Service Max ICMPv4 Packet Size.**

   This is the maximum ICMPv4 Pkt Size allowed. If ICMPv4 DoS prevention is enabled, the switch drops IPv4 ICMP ping packets with a size greater than the configured Max ICMPv4 packet size. Its range is 0 to 16376. The default value is 512.

8. Use **Denial of Service ICMPv6** to enable ICMPv6 DoS prevention.

   This causes the switch to drop ICMPv6 packets with a type set to ECHO_REQ (ping) and a size greater than the configured ICMPv6 Pkt Size. The factory default is Disable.

9. Use **Denial of Service Max ICMPv6 Packet Size** to specify the maximum IPv6 ICMP packet size allowed.

   If ICMPv6 DoS prevention is enabled, the switch drops IPv6 ICMP ping packets with a size greater than the configured maximum ICMPv6 packet size. Its range is 0 to 16376. The default value is 512.

10. Select the **Denial of Service First Fragment Disable** or **Enable** radio button.

    This enables First Fragment DoS prevention, which causes the switch to check DoS options on first fragment IP packets when switch are receiving fragmented IP packets. Otherwise, switch ignores the first fragment IP packages.The factory default is Disable.

11. Select the **Denial of Service ICMP Fragment Disable** or **Enable** radio button.

    Enabling ICMP Fragment DoS prevention causes the switch to drop ICMP Fragmented packets. The factory default is Disable.

12. Select the **Denial of Service SIP=DIP Disable** or **Enable** radio button.

    Enable SIP=DIP DoS prevention causes the switch to drop packets with a source IP address equal to the destination IP address. The factory default is Disable.

13. Select the **Denial of Service SMAC=DMAC Disable** or **Enable** radio button.

    Enabling SMAC=DMAC DoS prevention causes the switch to drop packets with a source MAC address equal to the destination MAC address. The factory default is Disable.

14. Select the **Denial of Service TCP FIN&URG&PSH Disable** or **Enable** radio button.

    Enabling TCP FIN & URG & PSH DoS prevention causes the switch to drop packets with TCP Flags FIN, URG, and PSH set and TCP Sequence Number=0. The factory default is Disable.

15. Select the **Denial of Service TCP Flag&Sequence Disable** or **Enable** radio button.

    Enabling TCP Flag DoS prevention causes the switch to drop packets with TCP control flags set to 0 and TCP sequence number set to 0. The factory default is Disable.

16. Select the **Denial of Service TCP Fragment** Disable or **Enable** radio button.

    Enabling TCP Fragment DoS prevention causes the switch to drop packets as follows:

    First TCP fragments with a TCP payload: IP_Payload_Length - IP_Header_Size < Min_TCP_Header_Size.

    The factory default is Disable.

17. Select the **Denial of Service TCP Offset Disable** or **Enable** radio button.

    Enabling TCP Offset DoS prevention causes the switch to drop packets with a TCP header Offset=1. The factory default is Disable.

18. Select the **Denial of Service TCP Port Disable** or **Enable** radio button.

    Enabling TCP Port DoS prevention causes the switch to drop packets with TCP source port equal to TCP destination port. The factory default is Disable.

19. Select the **Denial of Service TCP SYN Disable** or **Enable** radio button.

    Enabling TCP SYN DoS prevention causes the switch to drop packets with TCP flags SYN set. The factory default is Disable.

20. Select the **Denial of Service TCP SYN & FIN Disable** or **Enable** radio button.

    Enabling TCP SYN & FIN DoS prevention causes the switch to drop packets with TCP flags SYN and FIN set. The factory default is Disable.

21. Select the **Denial of Service UDP Port Disable** or **Enable** radio button.

    Enabling UDP Port DoS prevention causes the switch to drop packets with UDP source port equal to UDP destination port. The factory default is Disable.

22. Click the **Apply** button.

    Your settings are saved.

Configure Access Control Settings

You can configure an access control profile and associate an access control rule with the profile. The switch supports one access control profile only.

To complete set up a profile with a rule, follow the procedures that are described in the following sections:

1. Configure an Access Control Profile on page 540
2. Configure Access Rule Settings for the Access Control Profile on page 542

Configure an Access Control Profile

To configure the access profile settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

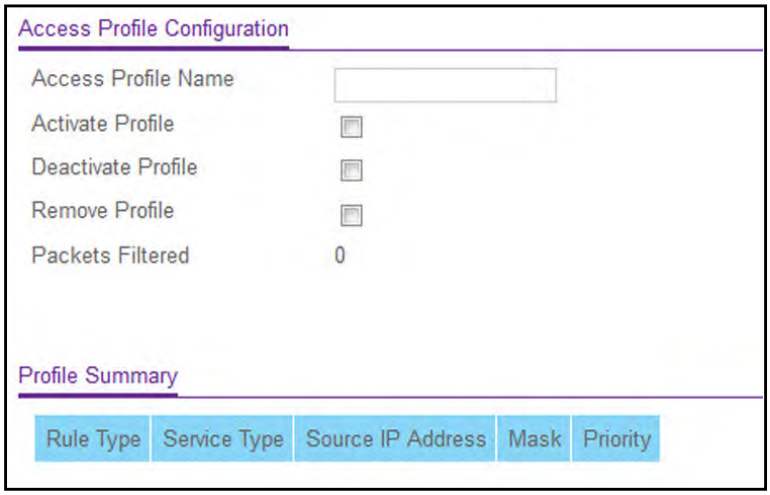
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Access > Access Control > Access Profile Configuration**.



5. In the **Access Profile Name** field, enter the name of the access profile to be added.

   The maximum length is 32 characters.

6. Take one of the following actions:
   - To activate an access profile, select the **Activate Profile** check box.
   - To deactivate an access profile, select the **Deactivate Profile** check box.
   - To remove an access profile, select the **Remove Profile** check box.

     We recommend that you deactivate the access profile before removing it.

7. Click the **Apply** button.

   Your settings are saved.

   The **Packets Filtered** field displays the number of packets filtered.

The following table describes the nonconfigurable information that is displayed.

Table 198. Access Profile Configuration Profile Summary

Field	Description
Rule Type	The action performed when the rules are matched.
Service Type	The service type chosen. The policy is restricted by the service type chosen.
Source IP Address	Source IP address of the client originating the management traffic.
Mask	The subnet mask of the IP Address.
Priority	The priority of the rule.

Configure Access Rule Settings for the Access Control Profile

After you set up an access control profile, you can configure and apply an access control rules. However, to do this, the access control profile must be in a deactivated state. AFter you added the access control rule, you can reactivate the access control profile.

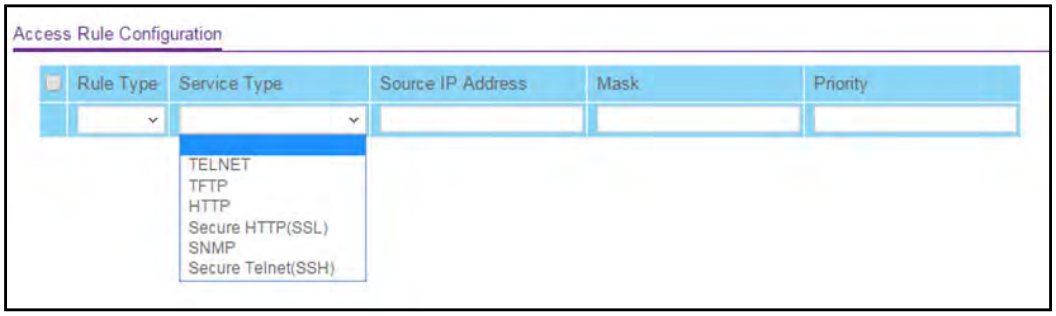
To configure the access rule settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Access > Access Control > Access Rule Configuration**.



5. From the **Rule Type** menu, select whether the traffic is permitted (**Permit**) or denied (**Deny**) when the a rule match occurs.
6. From the **Service Type** menu, select the management method to which the policy is restricted:
   - TELNET
   - TFTP
   - HTTP
   - Secure HTTP (SSL)
   - SNMP
   - Secure Telnet (SSH)
7. In the **Source IP Address** field, enter the source IP address, that is, the IP address from which management traffic originates.
8. In **Mask** field, enter the mask for the source IP address.
9. From the **Priority** menu, select the priority for the rule.

The rules are validated against the incoming management request in ascending order of their priorities. If a rule matches, the action is performed and subsequent rules below that are ignored. For example, if a source IP 10.10.10.10 is configured with priority 1 to permit, and source IP 10.10.10.10 is configured with priority 2 to deny, then access is permitted if the profile is active, and the second rule is ignored.

10. Click the **Add** button.

    The access rule is added.

11. To add another rule, repeat Step 5 through Step 10.
12. Click the **Apply** button.

    Your settings are saved.

Manage Port Authentication

In port-based authentication, when 802.1X is enabled globally and on the port, successful authentication of any one supplicant attached to the port results in all users being able to use the port without restrictions. At any given time, only one supplicant is allowed to attempt authentication on a port in this mode. Ports in this mode are under bidirectional control. This is the default authentication mode.

The 802.1X network has three components:

- **Authenticators**. The port that is authenticated before permitting system access.
- **Supplicants**. The host connected to the authenticated port requesting access to the system services.
- **Authentication Server**. The external server, for example, the RADIUS server that performs the authentication on behalf of the authenticator, and indicates whether the user is authorized to access system services.

Configure Global 802.1X Settings

To configure global 802.1X settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

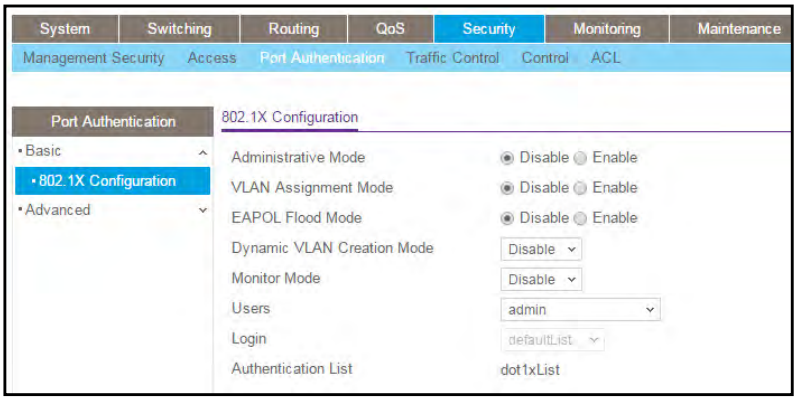
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Port Authentication > Basic > 802.1X Configuration**.



5. Select the Administrative Mode **Disable** or **Enable** radio button.

   This enables or disables 802.1X administrative mode on the switch.

   - **Enable**. Port-based authentication is permitted on the switch.

     If 802.1X is enabled, authentication is performed by a RADIUS server. This means the primary authentication method must be RADIUS. To set the method, select **Security > Management Security > Authentication List** and select RADIUS as method 1 for defaultList. For more information, see Configure a Login Authentication List on page 514.

   - **Disable**. The switch does not check for 802.1X authentication before allowing traffic on any ports, even if the ports are configured to allow only authenticated users. Default value.

6. Select the **VLAN Assignment Mode Disable** or **Enable** radio button.

   The default value is Disable.

7. Select the **EAPOL Flood Mode Disable** or **Enable** radio button.

   The default value is Disable.

8. Use **Dynamic VLAN Creation Mode** to select **Disable** or **Enable**.

   The default value is Disable.

9. Use **Monitor Mode** to select **Disable** or **Enable**.

   The default value is Disable. The feature monitors the dot1x authentication process and helps in diagnosis of the authentication failure cases.

10. Use **Users** to select the user name for the selected login list for 802.1x port security.
11. Use **Login** to select the login list to apply to the specified user.

    All configured login lists are displayed. The Authentication List field displays the authentication list that is used by 802.1X.

12. Click the **Apply** button.

    Your settings are saved.

Configure 802.1X Settings

You can enable or disable 802.1X access control on the system.

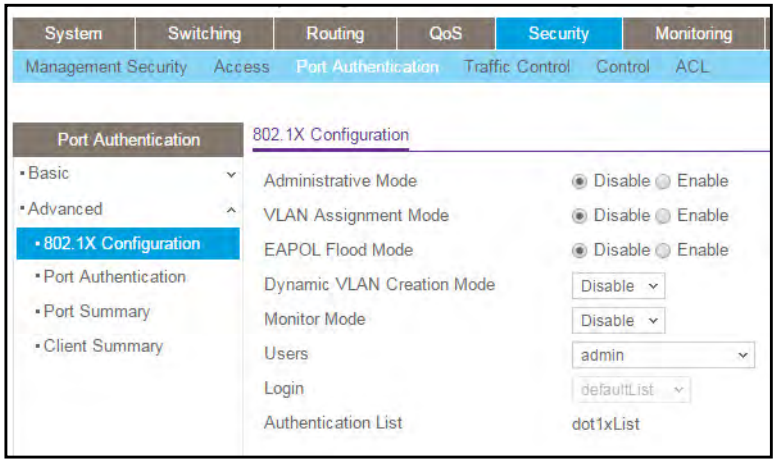
To configure 802.1X settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Port Authentication > Advanced > 802.1X Configuration**.



5. Select the Administrative Mode **Disable** or **Enable** radio button.

   The default value is Disable.
6. Select the **VLAN Assignment Mode Disable** or **Enable** radio button.

   The default value is Disable.
7. Select the **EAPOL Flood Mode Disable** or **Enable** radio button.

   The default value is Disable.
8. Use **Dynamic VLAN Creation Mode** to select **Disable** or **Enable**.

   The default value is Disable.
9. Use **Monitor Mode** to select **Disable** or **Enable**.

   The default value is Disable. The feature monitors the dot1x authentication process and helps in diagnosis of the authentication failure cases.

10. Use **Users** to select the user name for the selected login list for 802.1x port security.
11. Use **Login** to select the login list to apply to the specified user.

    All configured login lists are displayed. The **Authentication List** field displays the list that is used by 802.1X.
12. Click the **Apply** button.

    Your settings are saved.

Configure Port Authentication

You can enable and configure port access control on one or more ports.

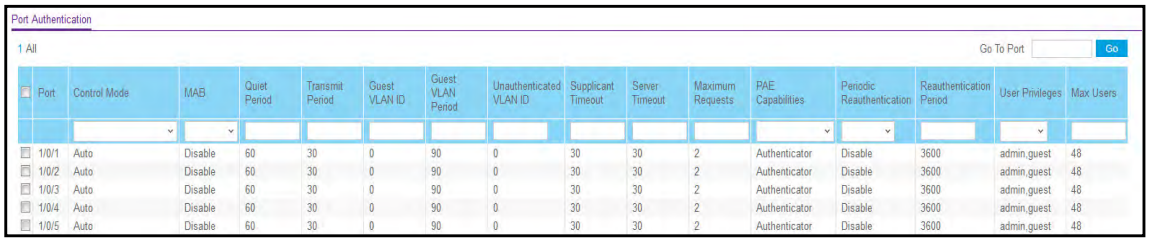
To configure 802.1X settings for the port:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Port Authentication > Advanced > Port Authentication**.



Note: Move the horizontal scroll bar at the bottom of the page to view more fields.

5. Select the check box next to the port to configure.

   You can also select multiple check boxes to apply the same settings to the selected ports, or select the check box in the heading row to apply the same settings to all ports.
6. For the selected ports, specify the following settings:
   - **Control Mode**. Select an option for the control mode. The control mode is set only if the link status of the port is Link Up. The options are as follows:
     - **Force unauthorized**. The authenticator port access entity (PAE) unconditionally sets the controlled port to unauthorized.

  - **Force authorized**. The authenticator PAE unconditionally sets the controlled port to authorized.
  - **Auto**. The authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator, and the authentication server.
  - **MAC Based**. The authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator, and the authentication server on a per supplicant basis.
  - **N/A**. The control mode is not applicable.

- Use **MAB** to enable or disable MAC-based. The default selection is Disable. The authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator, and the authentication server on a per-supplicant basis.
- **Quiet Period**. This input field allows you to configure the quiet period for the selected port. This command sets the value in seconds of the timer used by the authenticator state machine on this port to define periods of time in which it does not attempt to acquire a supplicant. The quiet period is the period for which the authenticator does not attempt to acquire a supplicant after a failed authentication exchange with the supplicant. The quiet period must be a number in the range of 0 and 65535. A quiet period value of 0 means that the authenticator state machine never acquires a supplicant. The default value is 60. Changing the value does not change the configuration until you click the **Apply** button.
- **Transmit Period**. This input field allows you to configure the transmit period for the selected port. The transmit period is the value, in seconds, of the timer used by the authenticator state machine on the specified port to determine when to send an EAPOL EAP request/identity frame to the supplicant. The transmit period must be a number in the range of 1 and 65535. The default value is 30. Changing the value does not change the configuration until the **Apply** button is clicked.
- **GuestVLAN ID**. This field allows you to configure guest VLAN ID on the interface. The valid range is 0–4093.The default value is 0. Changing the value does not change the configuration until the **Apply** button is clicked. Enter 0 to clear the guest VLAN ID on the interface.
- **Guest VLAN Period**. This input field allows the user to enter the guest VLAN period for the selected port. The guest VLAN period is the value, in seconds, of the timer for guest VLAN authentication. The guest VLAN time-out must be a value from 1 to 300. The default value is 90. Changing the value does not change the configuration until the **Apply** button is clicked.
- **Unauthenticated VLAN ID**. Enter the unauthenticated VLAN ID for the selected port. The valid range is 0–4093.The default value is 0. Changing the value does not change the configuration until the **Apply** button is clicked. Enter 0 to clear the unauthenticated VLAN ID on the interface.
- **Supplicant Timeout**. Enter the supplicant time-out for the selected port. The supplicant time-out is the value, in seconds, of the timer used by the authenticator state machine on this port to time-out the supplicant. The supplicant time-out must be

in the range of 1 to 65535. The default value is 30. Changing the value does not change the configuration until the **Apply** button is clicked.

- **Server Timeout**. Enter the server time-out for the selected port. The server time-out is the value, in seconds, of the timer used by the authenticator on this port to time-out the authentication server. The server time-out must be in the range of 1 to 65535. The default value is 30. Changing the value does not change the configuration until the **Apply** button is clicked.
- **Maximum Requests**. Enter the maximum requests for the selected port. The maximum requests value is the maximum number of times the authenticator state machine on this port retransmits an EAPOL EAP request/identity before timing out the supplicant. The maximum requests value must be in the range of 1 to 10. The default value is 2. Changing the value does not change the configuration until the **Apply** button is clicked.
- **PAE Capabilities**. Select the port access entity (PAE) functionality of the selected port. Possible values are Authenticator or Supplicant.
- **Periodic Reauthentication**. Enable or disable reauthentication of the supplicant for the specified port. The selectable values are Enable or Disable. If the value is Enable, reauthentication occurs. Otherwise, reauthentication is not allowed. The default value is Disable. Changing the selection does not change the configuration until the **Apply** button is clicked.
- **Reauthentication Period**. Enter the reauthentication period for the selected port. The reauthentication period is the value, in seconds, of the timer for the authenticator state machine on this port to determine when reauthentication of the supplicant takes place. The reauthentication period must be a value in the range of 1 to 65535. The default value is 3600. Changing the value does not change the configuration until the **Apply** button is clicked.
- **User Privileges**. Add the specified user to the list of users with access to the specified port or all ports.
- **Max Users**. Enter the limit to the number of supplicants on the specified interface.

7. To begin the initialization sequence on the selected port, click the **Initialize** button.

   The initialization sequence begins.

   You can click this button only if the control mode is auto. If the button is not available, it is grayed out. Once this button is clicked, the action is immediate. You do not need to click the **Apply** button for the action to occur.

8. Click the **Reauthentication** button.

   The reauthentication sequence begins on the selected port.

   You can click this button only if the control mode is auto. If the button is not available, it is grayed out. Once you click this button, the action is immediate. You do not need to click the **Apply** button for the action to occur.

View the Port Summary

You can view information about the port access control settings on a specific port.

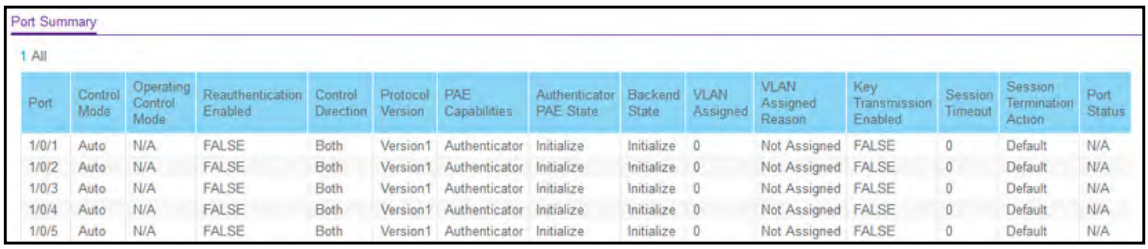
To view the port summary:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Port Authentication > Advanced > Port Summary**.



The following table describes the fields on the Port Summary page.

Table 199. Port Summary

Field	Description
Port	The port whose settings are displayed in the current table row.
Control Mode	This field indicates the configured control mode for the port. Possible values are as follows: • **Force Unauthorized**. The authenticator port access entity (PAE) unconditionally sets the controlled port to unauthorized. • **Force Authorized**. The authenticator PAE unconditionally sets the controlled port to authorized. • **Auto**. The authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator, and the authentication server. • **MAC Based**. The authenticator PAE sets the controlled port mode to reflect the outcome of authentication exchanges between a supplicant, an authenticator, and an authentication server on a per supplicant basis.

Table 199. Port Summary (continued)

Field	Description
Operating Control Mode	The control mode under which the port is actually operating. Possible values are as follows: • ForceUnauthorized • ForceAuthorized • Auto • MAC Based • N/A: If the port is in detached state, it cannot participate in port access control.
Reauthentication Enabled	This field shows whether reauthentication of the supplicant for the specified port is allowed. The possible values are True and False. If the value is True, reauthentication occurs. Otherwise, reauthentication is not allowed.
Control Direction	The control direction for the specified port. The control direction dictates the degree to which protocol exchanges take place between supplicant and authenticator. This affects whether the unauthorized controlled port exerts control over communication in both directions (disabling both incoming and outgoing frames) or just in the incoming direction (disabling only the reception of incoming frames). This field is not configurable on some platforms.
Protocol Version	The protocol version associated with the selected port. The only possible value is 1, corresponding to the first version of the 802.1x specification. This field is not configurable.
PAE Capabilities	The port access entity (PAE) functionality of the selected port. Possible values are Authenticator or Supplicant. This field is not configurable.
Authenticator PAE State	The current state of the authenticator PAE state machine. Possible values are as follows: • Initialize • Disconnected • Connecting • Authenticating • Authenticated • Aborting • Held • ForceAuthorized • ForceUnauthorized
Backend State	The current state of the backend authentication state machine. Possible values are as follows: • Request • Response • Success • Fail • Timeout • Initialize • Idle

Table 199. Port Summary (continued)

Field	Description
VLAN Assigned	The VLAN ID assigned to the selected interface by the authenticator. This field is displayed only when the port control mode of the selected interface is not MAC-based. This field is not configurable.
VLAN Assigned Reason	The reason for the VLAN ID assigned by the authenticator to the selected interface. This field is displayed only when the port control mode of the selected interface is not MAC-based. This field is not configurable. Possible values are as follows: • Radius • Unauth • Default • Not Assigned
Key Transmission Enabled	This field displays if key transmission is enabled on the selected port. This is not a configurable field. The possible values are True and False. If the value is False, key transmission does not occur. Otherwise, key transmission is supported on the selected port.
Session Timeout	The session timeout set by the RADIUS server for the selected port. This field is displayed only when the port control mode of the selected port is not MAC-based.
Session Termination Action	The termination action set by the RADIUS server for the selected port. This field is displayed only when the port control mode of the selected port is not MAC-based. Possible values are as follows: • Default • Reauthenticate If the termination action is set to default, then at the end of the session, the client details are initialized. Otherwise re-authentication is attempted.
Port Status	The authorization status of the specified port. The possible values are Authorized, Unauthorized, and N/A. If the port is in detached state, the value is N/A because the port cannot participate in port access control.

View the Client Summary

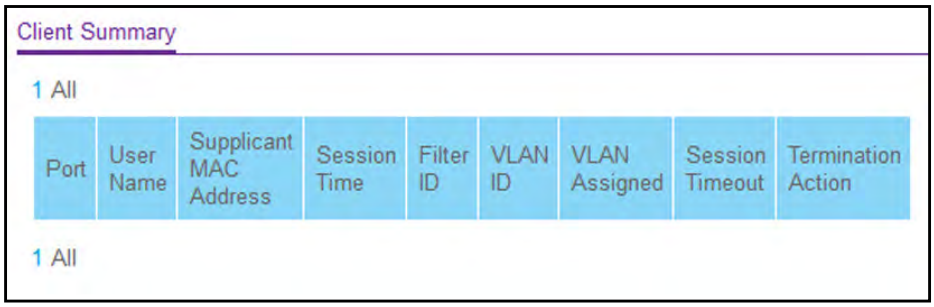
To view the client summary:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Port Authentication > Advanced > Client Summary**.



The following table describes the fields on the Client Summary page.

Table 200. Client Summary

Field	Description
Port	The port to be displayed.
User Name	The user name representing the identity of the supplicant device.
Supplicant Mac Address	The supplicant's device MAC address.
Session Time	The time since the supplicant as logged in seconds.
Filter ID	The policy filter ID assigned by the authenticator to the supplicant device.
VLAN ID	The VLAN ID assigned by the authenticator to the supplicant device.
VLAN Assigned	The reason for the VLAN ID assigned by the authenticator to the supplicant device.
Session Timeout	The session time-out set by the RADIUS server to the supplicant device.
Termination Action	The termination action set by the RADIUS server to the supplicant device.

Control Traffic With MAC Filtering

You can configure MAC filters

Configure MAC Filtering

You can create MAC filters that limit the traffic allowed into and out of specified ports on the system.

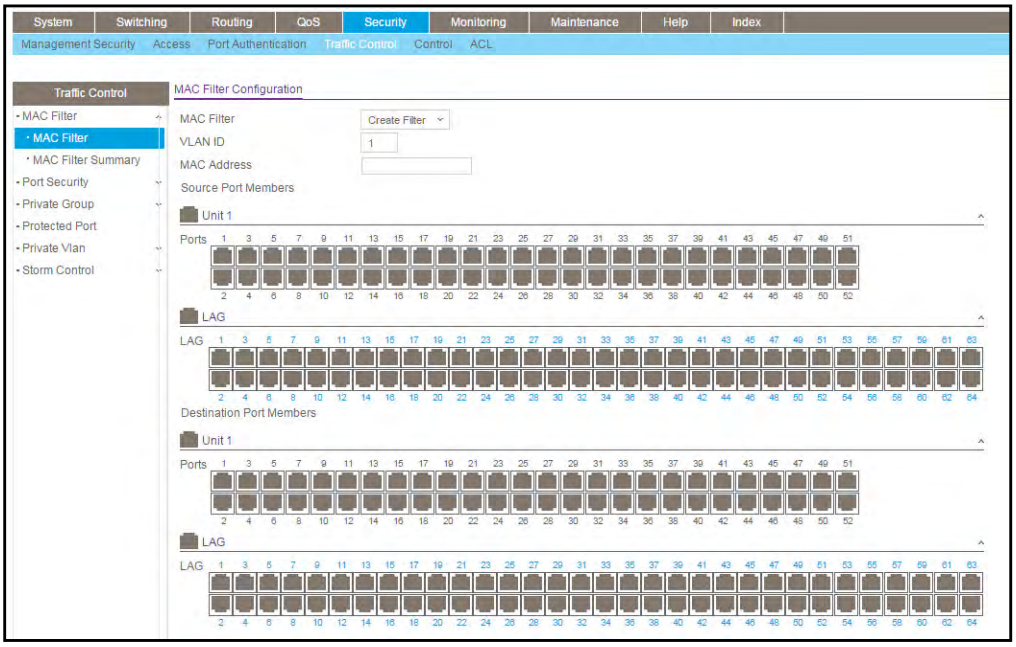
To configure MAC filter settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > MAC Filter.**



   This is the list of MAC address and VLAN ID pairings for all configured filters.
5. To change the port masks for an existing filter, select the entry.
6. To add a new filter, select **Create Filter** from the **MAC Filter** list.

7. From the **VLAN ID** list, select the VLAN to use with the MAC address to fully identify packets to be filtered.

   You can change this field only when **Create Filter** is selected from the **MAC Filter** list.

8. In the **MAC Address** field, specify the MAC address of the filter in the format 00:01:1A:B2:53:4D.

   You can change this field when you select the **Create Filte**r option.

   You cannot define filters for the following MAC addresses:

   - 00:00:00:00:00:00
   - 01:80:C2:00:00:00 to 01:80:C2:00:00:0F
   - 01:80:C2:00:00:20 to 01:80:C2:00:00:21
   - FF:FF:FF:FF:FF:FF

9. Use **Source Port Members** to list the ports to be included in the inbound filter.

   If a packet with the MAC address and VLAN ID you selected is received on a port that is not in the list, it is dropped.

10. Use **Destination Port Members** to list the ports to be included in the outbound filter.

    Packets with the MAC address and VLAN ID you selected are transmitted only from ports that are in the list. Destination ports can be included only in the multicast filter.

11. Click the **Apply** button.

    Your settings are saved.

MAC Filter Summary

To view the MAC filter summary:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

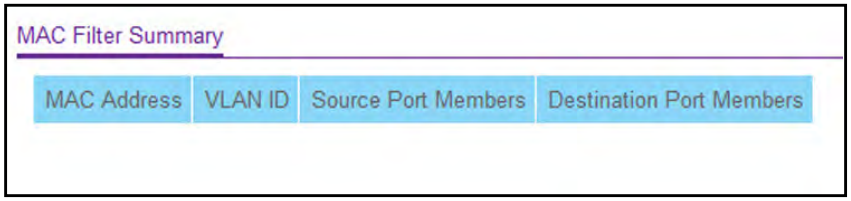
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Traffic Control > MAC Filter > MAC Filter Summary.**



The following table describes the information displayed on the page.

Table 201. MAC Filter Summary

Field	Description
MAC Address	The MAC address of the filter in the format 00:01:1A:B2:53:4D.
VLAN ID	The VLAN ID associated with the filter.
Source Port Members	A list of ports to be used for filtering inbound packets.
Destination Port Members	A list of ports to be used for filtering outbound packets.

Configure Port Security and Private Groups

You can configure port security settings and set up port private groups.

Configure the Global Port Security Mode

You can lock one or more ports on the system. When a port is locked, only packets with an allowable source MAC addresses can be forwarded. All other packets are discarded.

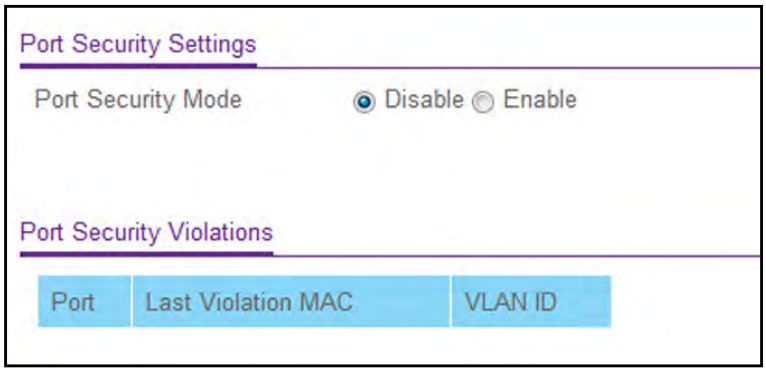
To configure the global port security mode:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Port Security > Port Administration.**



5. Select the Port Security Mode **Disable** or **Enable** radio button.

The Port Security Violations table shows information about violations that occurred on ports that are enabled for port security. The following table describes the fields in the Port Security Violations table.

Table 202. Port Security Violations

Field	Description
Port	The physical interface.
Last Violation MAC	The source MAC address of the last packet that was discarded at a locked port.
VLAN ID	The VLAN ID corresponding to the last violation MAC address.

Configure a Port Security Interface

A MAC address can be defined as allowable by one of two methods: dynamically or statically. Both methods are used concurrently when a port is locked.

Dynamic locking implements a first arrival mechanism for port security. You specify how many addresses can be learned on the locked port. If the limit was not reached, then a packet with an unknown source MAC address is learned and forwarded normally. When the limit is reached, no more addresses are learned on the port. Any packets with source MAC addresses that were not already learned are discarded. You can effectively disable dynamic locking by setting the number of allowable dynamic entries to zero.

Static locking allows you to specify a list of MAC addresses that are allowed on a port. The behavior of packets is the same as for dynamic locking: only packets with an allowable source MAC address can be forwarded.

To configure port security settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

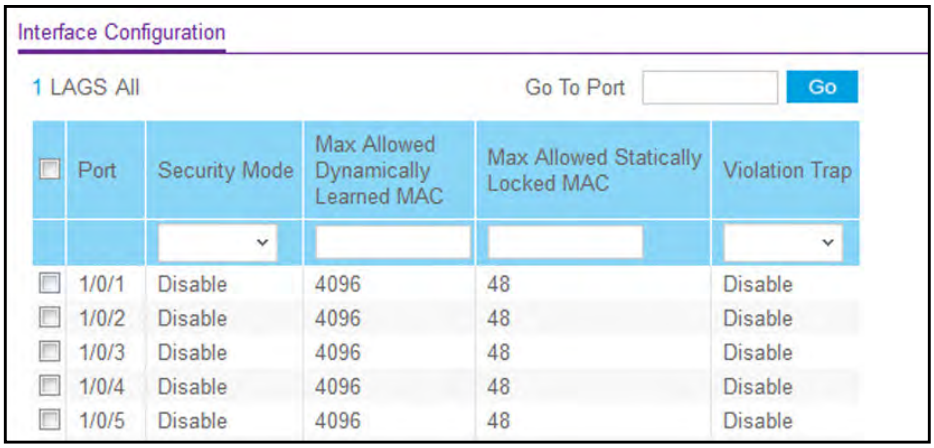
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Traffic Control > Port Security > Interface Configuration.**



5. Use one of the following methods to select a port:
   - In the **Go To Port** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Port column, select the check box for the port that you want to configure, select multiple check boxes to apply the same setting to all selected ports, or select the check box in the table heading to apply the same settings to all ports.
6. Specify the following settings:
   - **Security Mode**. Enables or disables the port security feature for the selected interface.
   - **Max Allowed Dynamically Learned MAC**. Sets the maximum number of dynamically learned MAC addresses on the selected interface.
   - **Max Allowed Statically Locked MAC**. Sets the maximum number of statically locked MAC addresses on the selected interface.
   - **Violation Traps**. Enables or disables the sending of new violation traps designating when a packet with a disallowed MAC address is received on a locked port.
7. Click the **Apply** button.

   Your settings are saved.

Convert Learned MAC Addresses to Static Addresses

You can convert a dynamically learned MAC address to a statically locked address.

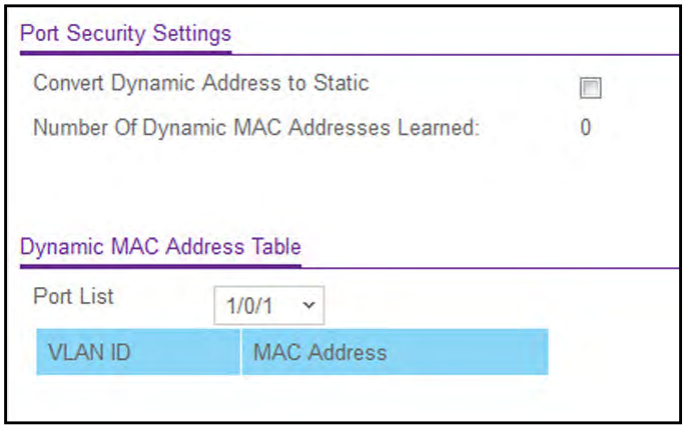
To convert learned MAC addresses and view the learned MAC addresses for an interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Port Security > Dynamic MAC Address.**



5. Select the **Convert Dynamic Address to Static** check box to convert a dynamically learned MAC address to a statically locked address.

   The dynamic MAC address entries are converted to static MAC address entries in a numerically ascending order until the static limit is reached.
6. Click the **Apply** button.

   Your settings are saved.
7. From the **Port List** menu, select the physical interface.

The following table shows the MAC addresses and their associated VLANs learned on the selected interface.

Table 203. Dynamic MAC Address

Field	Description
Number of Dynamic MAC Addresses Learned	The number of dynamically learned MAC addresses on the interface.
VLAN ID	The VLAN ID corresponding to the MAC address.
MAC Address	The MAC addresses learned on a specific port.

Configure Static MAC Addresses

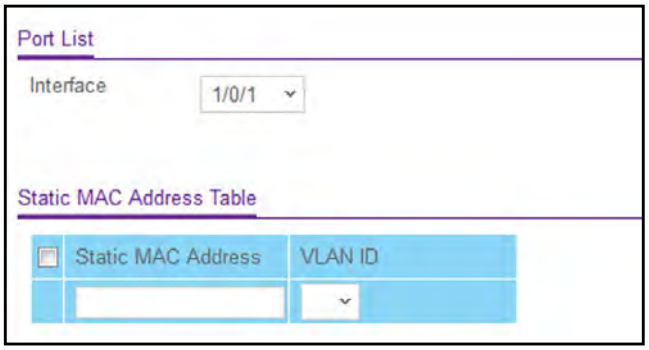
To configure a static MAC address:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Port Security > Static MAC Address.**



5. From the **Interface** menu, select the physical interface.
6. In the **Static MAC Address** field, enter the MAC address that you want to add.
7. In the **VLAN ID** field, select the VLAN ID that corresponds to the MAC address that is being added.
8. Click the **Add** button.

   The static MAC address is added to the switch.

Configure Private Groups

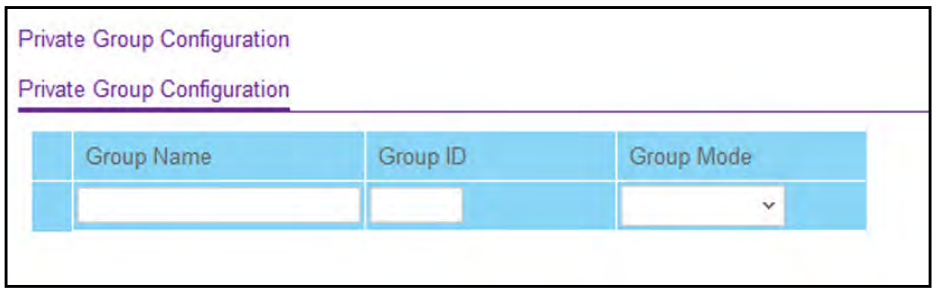
To configure a traffic control private group:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Private Group > Private Group Configuration.**



5. In the **Group Name** field, enter the private group name.

   The name can be up to 24 bytes of non-blank characters.
6. In the optional **Group ID** field, specify the private group identifier.

   The range of group ID is 1 to 192.
7. In the **Group Mode** list, select the mode of private group.

   The group mode can be either isolated or community. When in isolated mode, the member port in the group cannot forward its egress traffic to any other members in the same group. By default, the mode is community mode that each member port can forward traffic to other members in the same group, but not to members in other groups.
8. Click the **Add** button.

   The private group is created in the switch.

Configure Private Group Membership

To configure private group membership:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

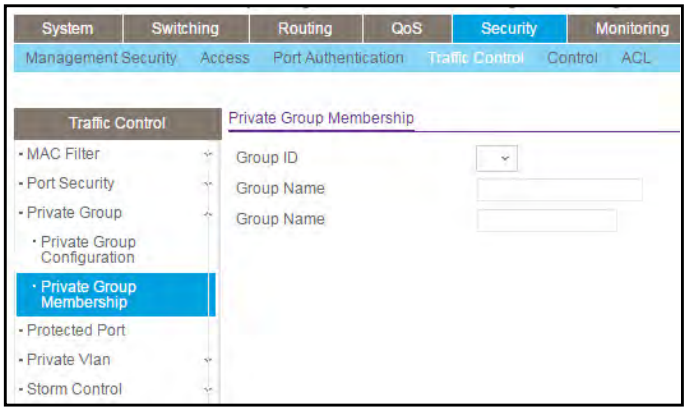
The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Traffic Control > Private Group > Private Group Membership.**



5. In the **Group ID** list, select the group ID.
6. Use **Port List** to add the ports you selected to this private group.

   The port list displays when at least one group is configured.

7. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 204. Private Group Membership

Field	Description
Group Name	The name for the private group that you selected. It can be up to 24 non-blank characters long.
Group Mode	The mode of the private group that you selected. The modes are as follows: • community • isolated When in isolated mode, the member port in the group cannot forward its egress traffic to any other members in the same group. By default, the mode is community mode. Each member port can forward traffic to other members in the same group, but not to members in other groups.

Configure Protect Ports

If a port is configured as protected, it does not forward traffic to any other protected port on the switch, but it does forward traffic to unprotected ports. You can configure the ports as protected or unprotected. You need read-write access privileges to modify the configuration.

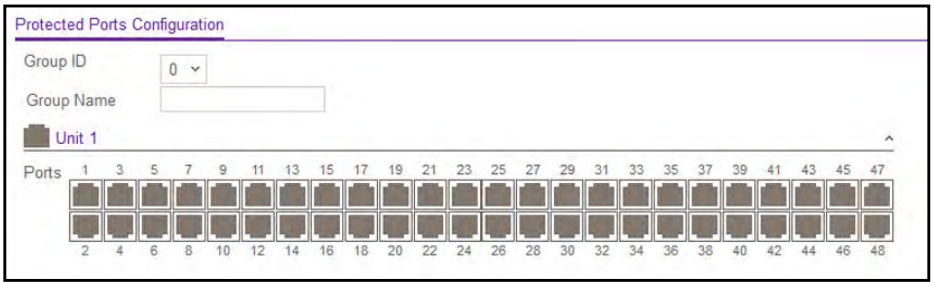
To configure protected ports:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Protected Ports.**



5. In the **Group ID** list, select a group of protected ports that can be combined into a logical group.

   Traffic can flow between protected ports belonging to different groups, but not within the same group. The list includes all the possible protected port group IDs supported for the current platform. The valid range of the gGroup ID is 0 to 2.
6. Use the optional **Group Name** field to associate a name with the protected ports group (used for identification purposes).

   It can be up to 32 alphanumeric characters long, including blanks. The default is blank. This field is optional.
7. Click the orange bar to display the available ports.
8. Select the check box below each port to configure as a protected port.

   The selection list consists of physical ports, protected as well as unprotected. The protected ports are tick-marked to differentiate between them. No traffic forwarding is possible between two protected ports. If left unconfigured, the default state is unprotected.

9. Click the **Apply** button.

   Your settings are saved.

Set Up Private VLANs

A private VLAN contains switch ports that cannot communicate with each other, but can access another network. These ports are called private ports. Each private VLAN contains one or more private ports and a single uplink port or uplink aggregation group. Note that all traffic between private ports is blocked at all Layers, not just Layer 2 traffic, but also traffic such as FTP, HTTP, and Telnet.

Configure a Private VLAN Type

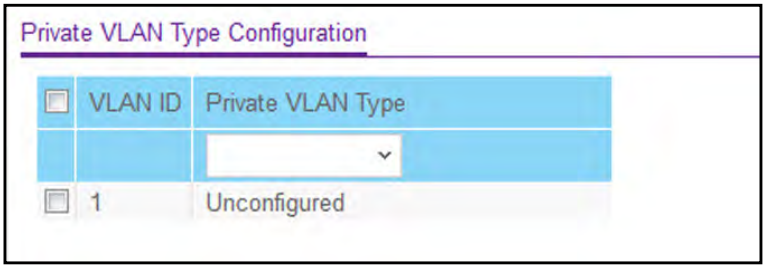
To configure a private VLAN type:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Private VLAN > Private VLAN Type Configuration.**



5. Use **Private VLAN Type** to select the type of private VLAN.

   The factory default is Unconfigured.
6. Click the **Apply** button.

   Your settings are saved.

   The VLAN ID field specifies the VLAN ID for which the private VLAN type is being set. The factory default is Unconfigured.

Configure Private VLAN Association Settings

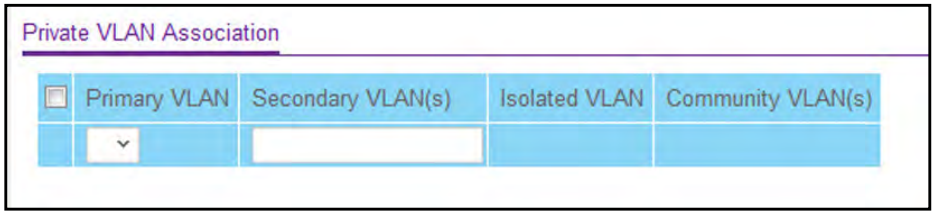
To configure private VLAN association:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Private VLAN > Private VLAN Association Configuration.**



5. Use **Primary VLAN** to select the primary VLAN ID of the domain.

   This is used to associate secondary VLANs with the domain.
6. Use **Secondary VLAN(s)** to display all the statically created VLANs (excluding the primary and default VLANs).

   This control is used to associate VLANs with the selected primary VLAN.
7. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 205. Private VLAN Association

Field	Description
Isolated VLAN	The isolated VLAN associated with the selected primary VLAN.
Community VLAN(s)	The list of community VLANs associated with the selected primary VLAN.

Configure the Private VLAN Port Mode

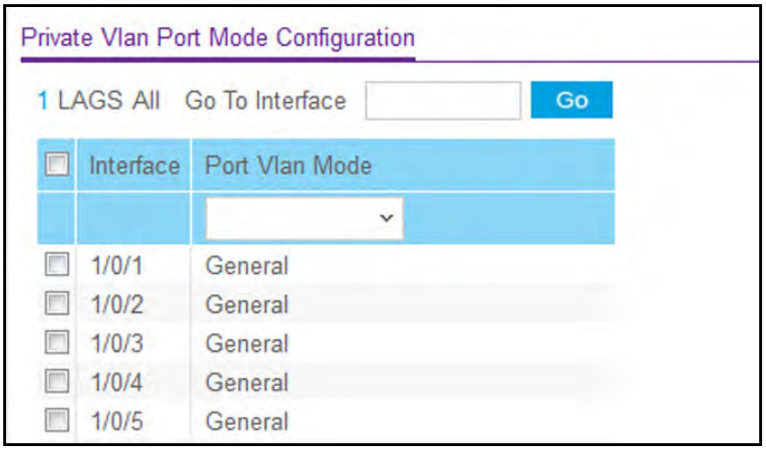
To configure the private VLAN port mode:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Private VLAN > Private VLAN Port Mode Configuration.**



5. From the **Port Vlan Mode** menu, select the private VLAN port mode:
   - **General**. Sets port in General mode.
   - **Host**. Sets port in Host mode. Used for private VLAN configuration.
   - **Promiscuous**. Sets port in Promiscuous mode. Used for private VLAN configuration.

   The factory default is General.
6. Click the **Apply** button.

   Your settings are saved.

Configure a Private VLAN Host Interface

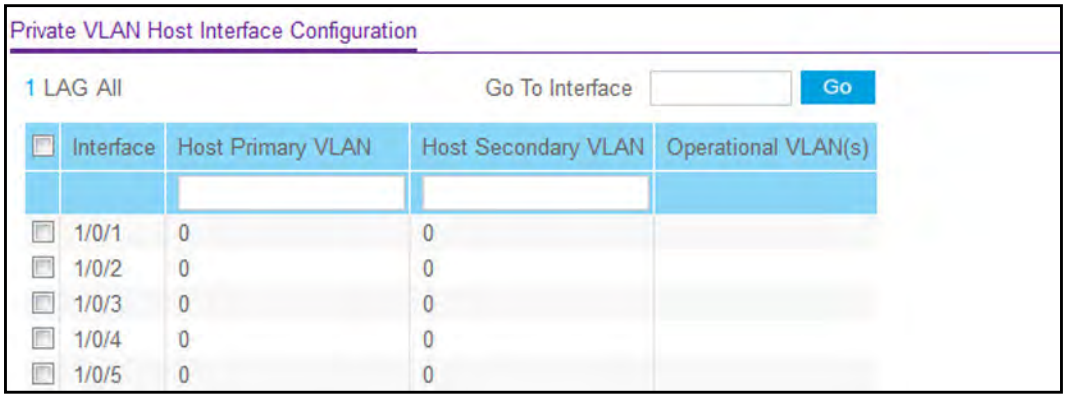
To configure a private VLAN host interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Private VLAN > Private VLAN Host Interface Configuration.**



5. In the **Host Primary VLAN** field, set the primary VLAN ID for Host Association mode.

   The range of the VLAN ID is 2–4093.
6. Use **Host Secondary VLAN** to set the secondary VLAN ID for Host Association mode.

   The range of the VLAN ID is 2–4093.
7. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 206. Private VLAN Host Interface Configuration

Field	Description
Interface	Select the physical or LAG interface.
Operational VLAN(s)	The operational VLANs.

Configure a Private VLAN Promiscuous Interface

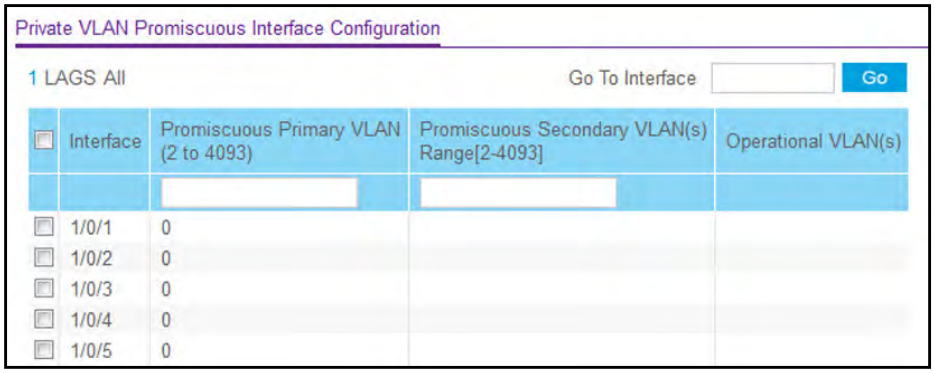
To configure a private VLAN promiscuous interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Private VLAN > Private VLAN Promiscuous Interface Configuration.**



5. Use **Promiscuous Primary VLAN** to set the primary VLAN ID for Promiscuous Association mode.

   The range of the VLAN ID is 2–4093.
6. Use **Promiscuous Secondary VLAN ID(s)** to set the secondary VLAN ID list for Promiscuous Association mode.

   This field can accept single VLAN ID or range of VLAN IDs or a combination of both in sequence separated by ','. You can specify individual VLAN ID, such as 10. You can specify the VLAN range values separated by a hyphen, for example, 10-13. You can specify the combination of both separated by commas, for example: 12,15,40–43,1000–1005, 2000. The range of the VLAN ID is 2–4093.

   Note: The VLAN ID List given in this control replaces the configured secondary VLAN list in the association.
7. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 207. Private VLAN Promiscuous Interface Configuration

Field	Description
Interface	Select the physical or LAG interface
Operational VLAN(s)	The operational VLANs.

Manage the Storm Control Settings

A broadcast storm is the result of an excessive number of broadcast messages simultaneously transmitted across a network by a single port. Forwarded message responses can overload network resources and/or cause the network to time out.

The switch measures the incoming broadcast/multicast/unknown unicast packet rate per port and discards packets when the rate exceeds the defined value. Storm control is enabled per interface, by defining the packet type and the rate at which the packets are transmitted.

Configure Global Storm Control Settings

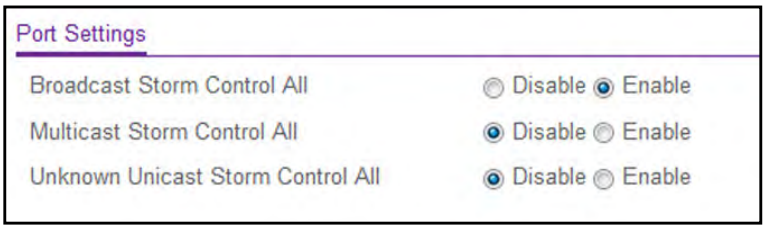
To configure global storm control settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Storm Control > Storm Control Global Configuration.**



The following three controls provide an easy way to enable or disable each type of packets to be rate-limited on every port in a global fashion. The effective storm control state of each port can be viewed by going to the port configuration page.

5. Select the storm control settings:
   - **Select the Broadcast Storm Control All Disable** or **Enable** radio button.

     This enables or disables Broadcast Storm Recovery mode on all ports. When you specify Enable and the broadcast traffic on any Ethernet port exceeds the configured threshold, the switch blocks (discards) the broadcast traffic. The factory default is Enable.
   - **Select the Multicast Storm Control All Disable** or **Enable** radio button.

     This enables or disables Multicast Storm Recovery mode on all ports. When you specify Enable, and the multicast traffic on any Ethernet port exceeds the configured threshold, the switch blocks (discards) the multicast traffic. The factory default is Disable.
   - **Select the Unknown Unicast Storm Control All Disable** or **Enable** radio button.

     This enables or disables Unicast Storm Recovery mode on all ports. When you specify Enable, and the unicast traffic on any Ethernet port exceeds the configured threshold, the switch blocks (discards) the unicast traffic. The factory default is Disable.
6. Click the **Apply** button.

   Your settings are saved.

Configure Storm Control for a Port

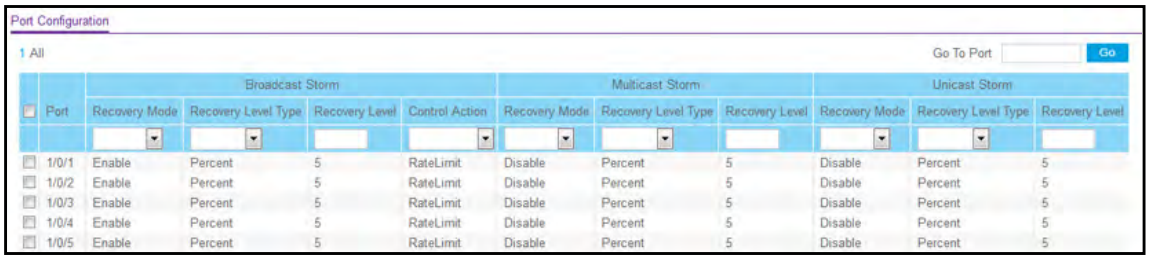
To configure storm control for a port:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Traffic Control > Storm Control > Storm Control Interface Configuration**.



5. Use one of the following methods to select a port:
   - In the **Go To Port** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Port column, select the check box for the port that you want to configure, select multiple check boxes to apply the same setting to all selected ports, or select the check box in the table heading to apply the same settings to all ports.
6. Configure broadcast storm control:
   - **Recovery Mode**. Enable or disable this option. When you specify Enable and the broadcast traffic on the specified port exceeds the configured threshold, the switch blocks (discards) the broadcast traffic. The factory default is Enable.
   - **Recovery Level Type**. Specify the recovery level as a percentage of link speed or as packets per second.
   - **Recovery Level**. Specify the threshold at which storm control activates. The factory default is 5 percent of port speed for pps type.
   - **Control Action**. Specify the action that occurs when the configured threshold for the broadcast storm is exceeded. You can select the port to be shut down or traffic on the port to be rate-limited. The default is RateLimit.
7. Configure broadcast storm control:
   - **Recovery Mode**. Enable or disable this option. When you specify Enable and the multicast traffic on the specified port exceeds the configured threshold, the switch blocks (discards) the multicast traffic. The factory default is Enable.
   - **Recovery Level Type**. Specify the recovery level as a percentage of link speed or as packets per second.
   - **Recovery Level**. Specify the threshold at which storm control activates. The factory default is 5 percent of port speed for pps type.
8. Configure broadcast storm control:
   - **Recovery Mode**. Enable or disable this option. When you specify Enable and the unicast traffic on the specified port exceeds the configured threshold, the switch blocks (discards) the unicast traffic. The factory default is Enable.
   - **Recovery Level Type**. Specify the recovery level as a percentage of link speed or as packets per second.
   - **Recovery Level**. Specify the threshold at which storm control activates. The factory default is 5 percent of port speed for pps type.

9. Click the **Apply** button.

   Your settings are saved.

Configure DHCP Snooping

You can configure DHCP snooping global and interface settings.

Configure DHCP Snooping Global Settings

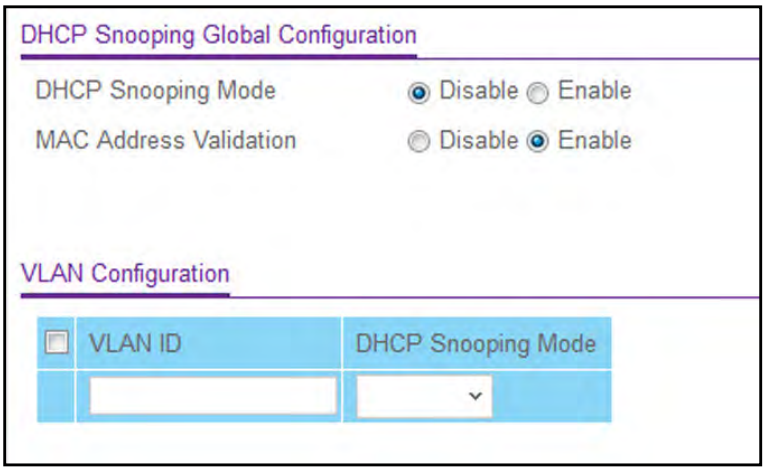
To configure DHCP snooping global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > DHCP Snooping > Global Configuration.**



5. Select the **DHCP Snooping Mode Disable** or **Enable** radio button.

   The factory default is Disable.
6. Select the **MAC Address Validation Disable** or **Enable** radio button.

   This enables or disables the validation of sender MAC address for DHCP snooping. The factory default is Enable.

7. Use **VLAN ID** to enter the VLAN for which the DHCP snooping mode is to be enabled.
8. Use **DHCP Snooping Mode** to enable or disable the DHCP snooping feature for the entered VLAN.

   The factory default is Disable.
9. Click the **Apply** button.

   Your settings are saved.

Configure a DHCP Snooping Interface

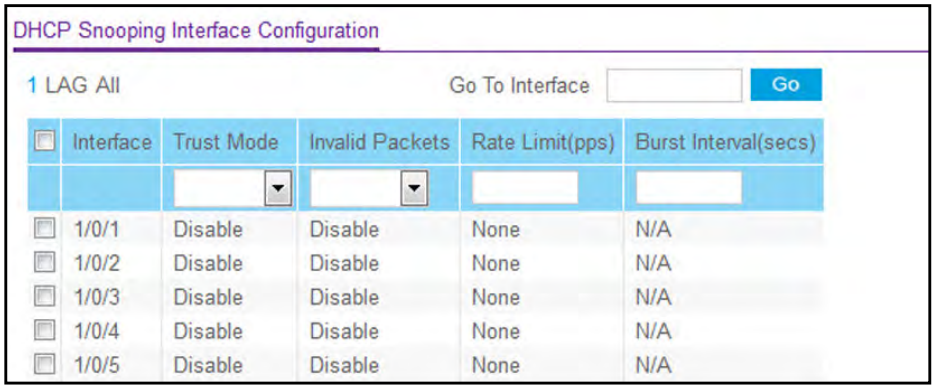
To configure a DHCP snooping interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > DHCP Snooping > Interface Configuration.**



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the port that you want to configure, select multiple check boxes to apply the same setting to all selected interfaces, or select the check box in the table heading to apply the same settings to all interfaces.
6. If **Trust Mode** is enabled, DHCP snooping application considers the port as trusted.

   The factory default is Disable.

7. If **Invalid Packets** is enabled, DHCP snooping application logs invalid packets on this interface.

   The factory default is Disable.

8. Use **Rate Limit (pps)** to specify rate limit value for DHCP snooping purposes.

   If the incoming rate of DHCP packets exceeds the value of this for consecutive burst interval seconds, the port is shut down. If this value is N/A, then burst interval has no meaning, hence it is disabled. The default value is N/A. It can be set to value –1, which means N/A. The range of rate limit is 0 to 300.

9. Use **Burst Interval (secs)** to specify the burst interval value for rate limiting purpose on this interface.

   If the rate limit is N/A, burst interval has no meaning and it is N/A. The default value is N/A. It can be set to –1, which means N/A. The range of Burst Interval is 1 to 15.

10. Click the **Apply** button.

    Your settings are saved.

Configure a Static DHCP Snooping Binding

To configure a static snooping binding:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

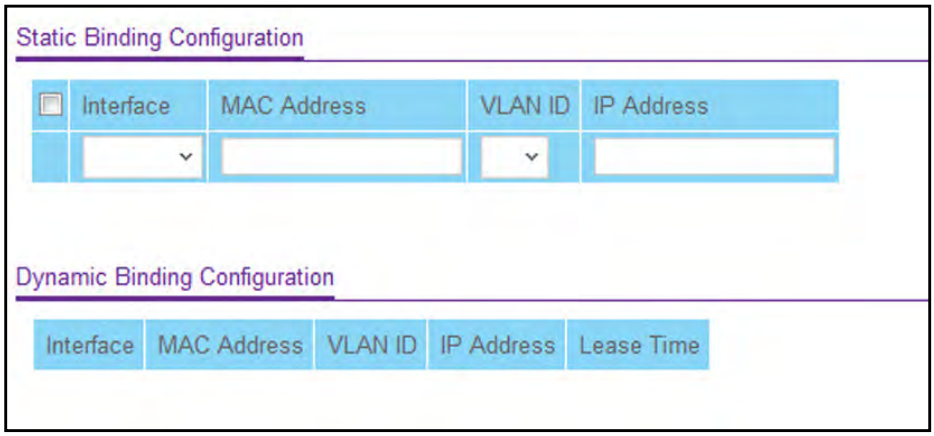
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Control > DHCP Snooping > Binding Configuration**.



5. To configure a static binding, specify the following:
   a. From the **Interface** menu, select the interface.
   b. In the **MAC Address** field, specify the MAC address that must be added for the binding entry.

      This is the key to the binding database.
   c. From the **VLAN ID** menu, select the VLAN for the binding rule.

      The range of the VLAN ID is 1 to 4093.
   d. In the **IP Address** field, specify a valid IP address for the binding rule.
   e. Click the **Add** button.

      The DHCP snooping binding entry is added into the database.

View the Dynamic DHCP Snooping Bindings

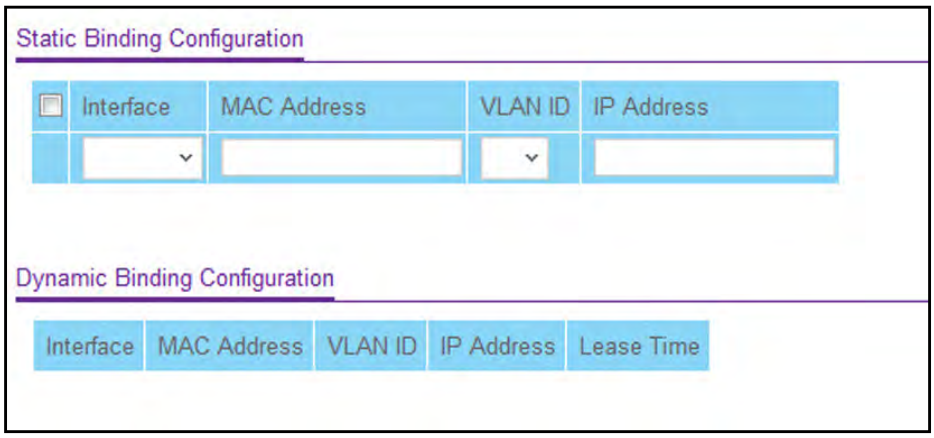
To view the dynamic DHCP snooping bindings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > DHCP Snooping > Binding Configuration**.



The following table describes the fields of the Dynamic Binding Configuration table.

Table 208. Dynamic DHCP Bindings

Field	Description
Interface	The interface on which the dynamic binding was learned.
MAC Address	The learned MAC address for the binding.
VLAN ID	The VLAN ID that corresponds to the binding.
IP Address	The IP address that corresponds to the binding.
Lease Time	The remaining lease time for the binding.

Configure Snooping Persistent Settings

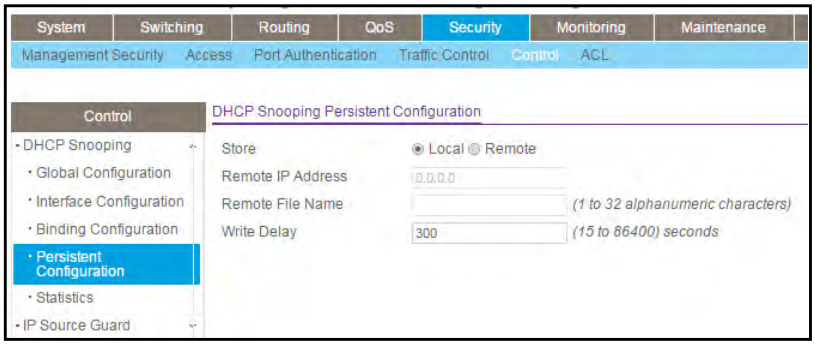
To configure snooping persistent settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > DHCP Snooping > Persistent Configuration**.



5. Select the **Store Local** or **Remote** radio button.

   Selecting **Local** disables the remote fields **Remote File Name** and **Remote IP Address**.
6. If you select the **Remote** radio button, do the following:
   a. In the **Remote IP Address** field, type the remote IP address on which the snooping database is stored.
   b. In the **Remote File Name** field, enter the remote file name to store the database.

7. In the **Write Delay** field, enter the maximum write time to write the database into local or remote.

   The range is 15 to 86400.

8. Click the **Apply** button.

   Your settings are saved.

View and Clear the DHCP Snooping Statistics

To view and clear the DHCP snooping statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

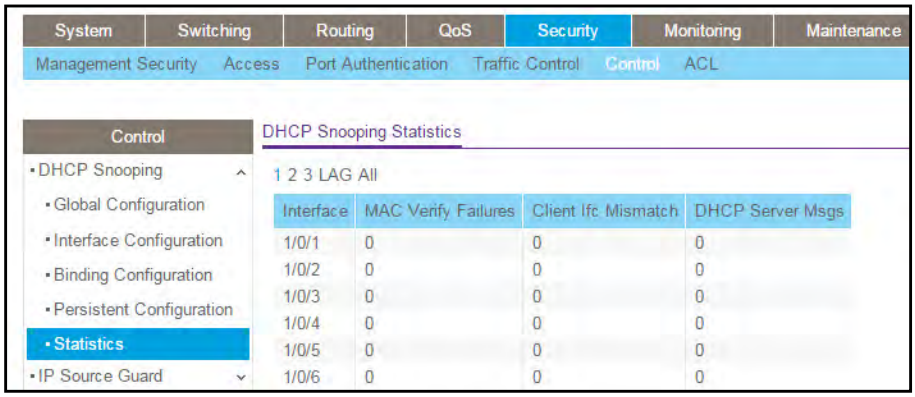
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Control > DHCP Snooping > Statistics.**



5. To refresh the page with the latest information on the switch, click the **Refresh** button.
6. To clear all interfaces statistics, click the **Clear** button.

The following table describes the DHCP snooping statistics.

Table 209. DHCP Snooping Statistics

Field	Description
Interface	The untrusted and snooping-enabled interface for which statistics are to be displayed.
MAC Verify Failures	Number of packets that were dropped by DHCP snooping because there is no matching DHCP snooping binding entry found.

Table 209. DHCP Snooping Statistics (continued)

Field	Description
Client Ifc Mismatch	The number of DHCP messages that are dropped based on source MAC address and client HW address verification.
DHCP Server Msgs	The number of server messages that are dropped on an untrusted port.

Configure IP Source Guard Interfaces

You can configure IP source guard (IPSG) on each interface. IPSG is a security feature that filters IP packets based on source ID. This feature helps protect the network from attacks that use IP address spoofing to compromise or overwhelm the network. The source ID can be either the source IP address or a source IP address and source MAC address pair. The DHCP snooping bindings database, along with IPSG entries in the database, identify authorized source IDs. If you enable IPSG on a port where DHCP snooping is disabled or where DHCP snooping is enabled but the port is trusted, all IP traffic received on that port is dropped depending on the admin-configured IPSG entries. Additionally, IPSG interacts with port security, also known as port MAC locking, to enforce the source MAC address in received packets. Port security controls source MAC address learning in the Layer 2 forwarding database (the MAC address table). When a frame is received with a previously unlearned source MAC address, port security queries the IPSG feature to determine whether the MAC address belongs to a valid binding.

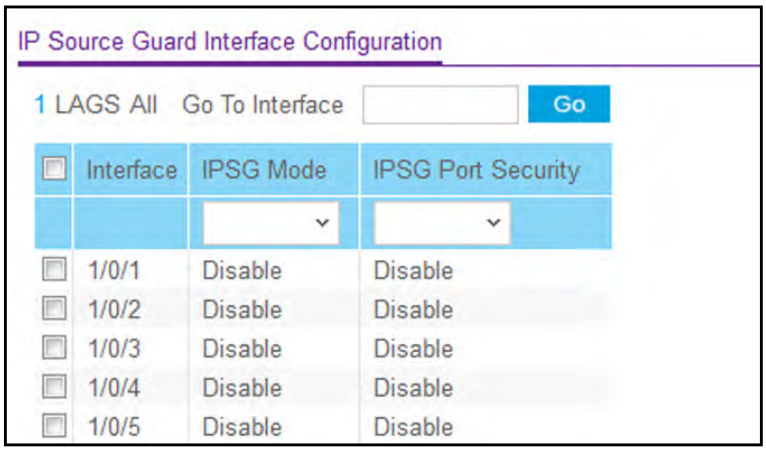
To configure IP Source Guard Interface settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > IP Source Guard > Interface Configuration.**



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the port that you want to configure, select multiple check boxes to apply the same setting to all selected interfaces, or select the check box in the table heading to apply the same settings to all interfaces.
6. In the **IPSG Mode** list, select **Disable** or **Enable**.

   This sets the administrative mode of IPSG on the interface. When **IPSG mode** is enabled, the sender IP address on this interface is validated against the DHCP snooping binding database. If IPSG is enabled, packets are not forwarded if the sender IP address is not in DHCP snooping binding database. The factory default is Disable.
7. In the **IPSG Port Security** list, select **Disable** or **Enable**.

   This enables or disables the administrative mode of IPSG port security on the selected interface. When this is enabled, the packets are not forwarded if the sender MAC address is not in forwarding database (FDB) table or the DHCP snooping binding database. To enforce filtering based on MAC address other required configurations are as follows:
   - Enable port-security globally.
   - Enable port-security on the interface level.

   IPSG port security cannot be enabled if IPSG is disabled. The factory default is Disable. Also, you cannot turn off IPv6SG port security while IPv6SG is enabled.
8. Click the **Apply** button.

   Your settings are saved.

Configure IP Source Guard Binding Settings

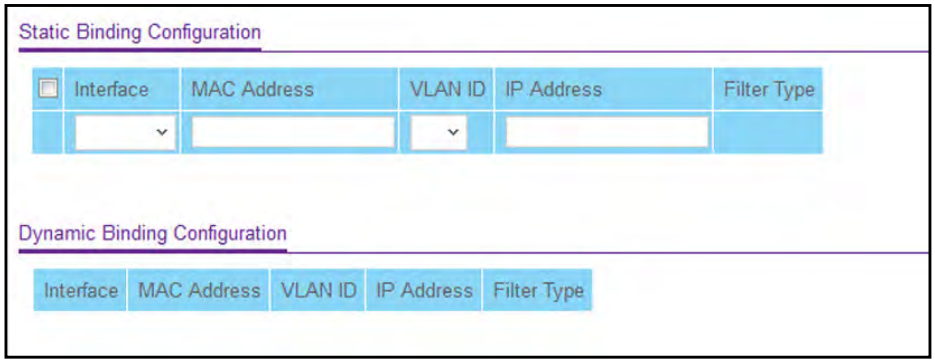
To configure IP source guard static binding settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > IP Source Guard > Binding Configuration**.



5. From the **Interface** menu, select the interface.
6. In the **MAC Address** field, type the MAC address for the binding.
7. From the **VLAN ID** menu, select the VLAN for the binding rule.
8. In the **IP Address** field, specify valid IP address for the binding rule.
9. Click the **Add** button.

   The IPSG static binding entry is added into the database.

The following table describes the nonconfigurable IP Source Guard dynamic binding configuration information that is displayed.

Table 210. IP Source Guard Dynamic Binding Configuration

Field	Description
Interface	The interface for which to add a binding into the IPSG database.
MAC Address	The MAC address for the binding entry.
VLAN ID	The VLAN for the binding entry.

Table 210. IP Source Guard Dynamic Binding Configuration (continued)

Field	Description
IP Address	Displays valid IP address for the binding entry.
Filter Type	Filter type used on the interface. One is source IP address filter type, and the other is source IP address and MAC address filter type.

Configure IPv6 Source Guard Interface Settings

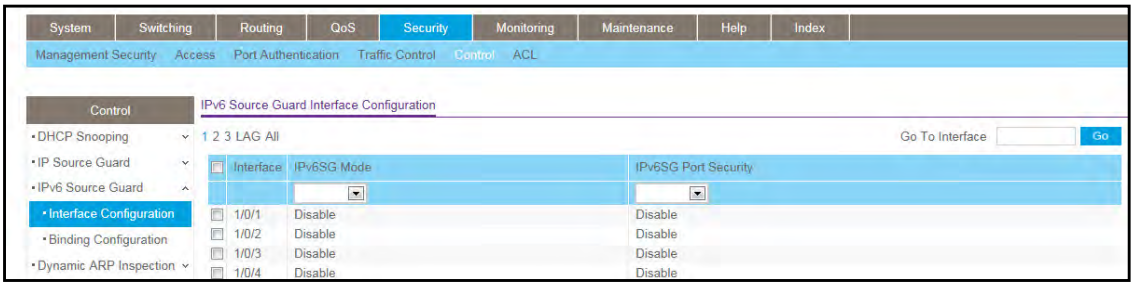
To configure IPv6 source guard Interface settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > IPv6 Source Guard > Interface Configuration**.



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the port that you want to configure, select multiple check boxes to apply the same setting to all selected interfaces, or select the check box in the table heading to apply the same settings to all interfaces.
6. Use the **IPv6SG Mode** menu to enable or disable validation of sender IPv6 address on this interface.

   If IPv6SG is enabled, packets are not forwarded if the sender IPv6 address is not in the DHCP snooping binding database. The factory default is Disable.

7. Use the **IPv6SG Port Security** menu to enable or disable the IPv6SG port security on the selected interface.

   If IPv6SG port security is enabled, then the packets are not forwarded if the sender MAC address is not in FDB table and it is not in the DHCP snooping binding database. To enforce filtering based on MAC address other required configurations are as follows:

   - Enable port-security globally.
   - Enable port-security on the interface level.

   IPv6SG port security cannot be enabled if IPv6SG is disabled. The factory default is Disable. Also, you are not allowed to turn off IPv6SG port security while IPv6SG is enabled.

8. Click the **Apply** button.

   Your settings are saved.

Configure an IPv6 Source Guard Binding

To configure an IPv6 source guard static binding:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

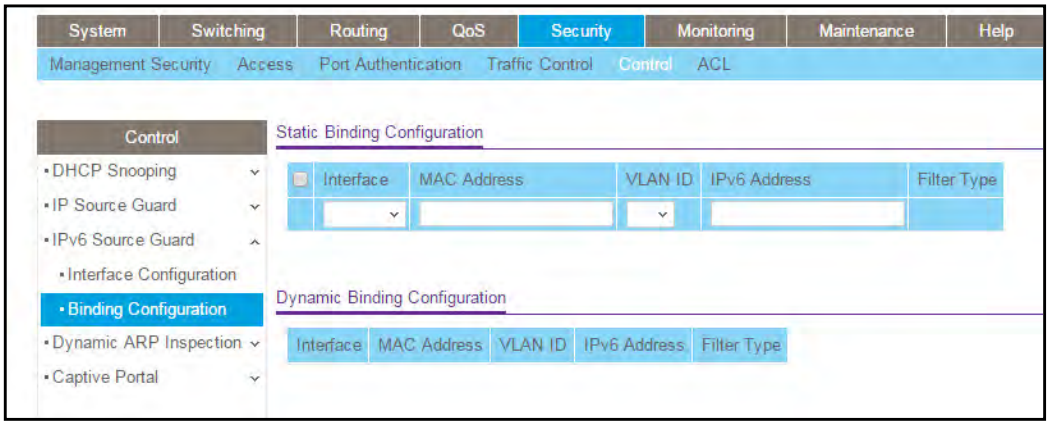
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Control > IPv6 Source Guard > Binding Configuration**.



5. From the **Interface** menu, select the interface to add a binding into the IPv6SG database.
6. In the **MAC Address** field, specify the MAC address for the binding.

7. From the **VLAN ID** menu, select the VLAN from the list for the binding rule.
8. In the **IPv6 Address** field, specify valid IP address for the binding rule.
9. Click the **Add** button.

   The IPv6SG static binding entry is added to the database.

The following table describes the nonconfigurable IPv6 Source Guard dynamic binding configuration information that is displayed.

Table 211. IPv6 Source Guard Dynamic Binding Configuration

Field	Description
Interface	The interface to add a binding into the IPSG database.
MAC Address	The MAC address for the binding entry.
VLAN ID	The VLAN for the binding entry.
IPv6 Address	Displays valid IPv6 address for the binding entry.
Filter Type	Filter type used on the interface. One is source IPv6 address filter type, and the other is source IPv6 address and MAC address filter type.

Configure Dynamic ARP Inspection

You can configure dynamic ARP inspection (DAI) VLANs, interfaces, and ACL with associated rules.

Configure the Global Dynamic ARP inspection Settings

You can configure the global dynamic ARP inspection (DAI) settings.

To configure the global DAI settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > Dynamic ARP Inspection > DAI Configuration.**

5. Select the **Validate Source MAC Disable** or **Enable** radio button.

   This specifies the DAI source MAC validation mode for the switch. If you select **Enable**, sender MAC validation for the ARP packets is enabled. The factory default is Disable.

6. Select the **Validate Destination MAC Disable** or **Enable** radio button

   This specifies the DAI destination MAC validation mode for the switch. If you select **Enable**, destination MAC validation for the ARP response packets is enabled. The factory default is Disable.

7. Select the **Validate IP Disable** or **Enable** radio button.

   This specifies the DAI IP validation mode for the switch. If you select **Enable**, IP address validation for the ARP packets is enabled. The factory default is Disable.

8. Click the **Apply** button.

   Your settings are saved.

Configure DAI VLANs

You can configure one or more dynamic ARP inspection (DAI) VLANs.

To configure one ore more DAI VLANs:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

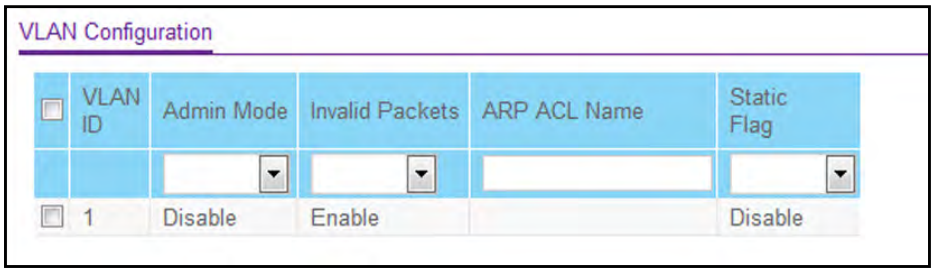
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Control > Dynamic ARP Inspection > DAI VLAN Configuration.**



5. Use the **VLAN ID** check box or boxes to select one ore more DAI-capable VLANs.
6. In the **Admin Mode** list, select **Enable** or **Disable**.

   This indicates whether the dynamic ARP inspection is enabled on this VLAN. If this is set to **Enable**, then dynamic ARP inspection is enabled. If this is set to **Disable**, then dynamic ARP inspection is disabled. The default is Disable.
7. Use **Invalid Packets** to indicate whether the dynamic ARP inspection logging is enabled on this VLAN.

   If this is set to **Enable,** invalid ARP packets information is logged. If it is set to **Disable**, dynamic ARP inspection logging is disabled. The default is **Enable.**
8. Use **ARP ACL Name** to specify a name for the ARP access list.

   A VLAN can be configured to use this ARP ACL containing rules as the filter for ARP packet validation. The name can contain up to 31 alphanumeric characters. The ARP ACL name is deleted if you specify N/A.
9. Use **Static Flag** to determine whether the ARP packet needs validation using the DHCP snooping database in case ARP ACL rules do not match.

   If the flag is enabled then the ARP packet is validated by the ARP ACL rules only. If the flag is disabled then the ARP packet needs further validation by using the DHCP snooping entries. The factory default is **Disable**.
10. Click the **Apply** button.

    Your settings are saved.

Configure DAI Interfaces

You can configure one or more dynamic ARP inspection (DAI) interfaces.

To configure one ore more DAI interfaces:

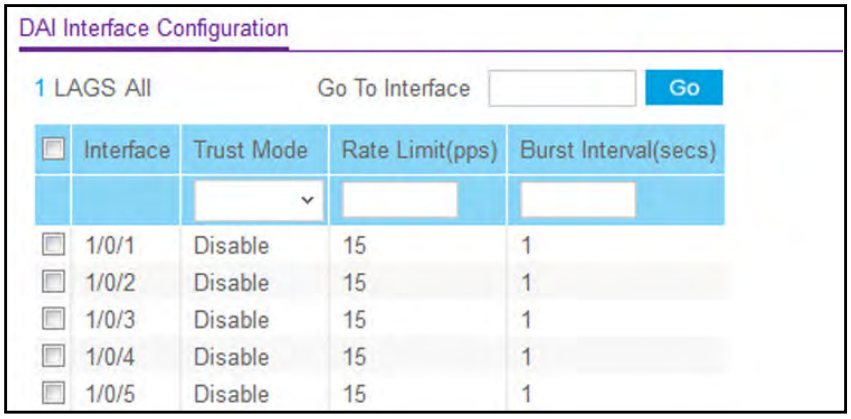
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Security > Control > Dynamic ARP Inspection > DAI Interface Configuration.**



5. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the port that you want to configure, select multiple check boxes to apply the same setting to all selected interfaces, or select the check box in the table heading to apply the same settings to all interfaces.
6. Use **Trust Mode** to indicate whether the interface is trusted for dynamic ARP inspection purposes.

   If this is set to Enable, the interface is trusted. ARP packets coming to this interface are forwarded without checking. If this is set to Disable, the interface is not trusted. ARP packets coming to this interface are subjected to ARP inspection. The factory default is Disable.
7. Use **Rate Limit (pps)** to specify rate limit value for dynamic ARP inspection purpose.

   If the incoming rate of ARP packets exceeds the value of this for consecutive burst interval seconds, ARP packets are dropped. If this value is N/A, there is no limit. The value can be set to –1, which means N/A. The range is 0– 300. The factory default is 15 pps (packets per second).
8. Use **Burst Interval (secs)** to specify the burst interval value for rate limiting purposes on this interface. If the rate limit is None, burst interval has no meaning and is displayed as N/A. The Rate Limit range is 1 to 15. The factory default is 1 second.
9. Click the **Apply** button.

   Your settings are saved.

Configure a DAI ACL

You can configure a dynamic ARP inspection (DAI) ACL.

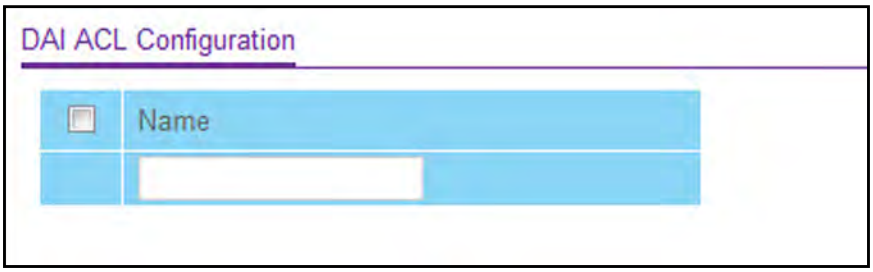
To configure a DAI ACL:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > Dynamic ARP Inspection > DAI ACL Configuration.**



5. Use **Name** to create an ARP ACL for DAI.
6. Click the **Add** button.

   The DAI ACL is added to the switch configuration.
7. To remove the currently selected DAI ACL from the switch configuration, click the **Delete** button.

Configure a DAI ACL Rule

You can configure a dynamic ARP inspection (DAI) ACL rule.

To configure a DAI ACL rule:

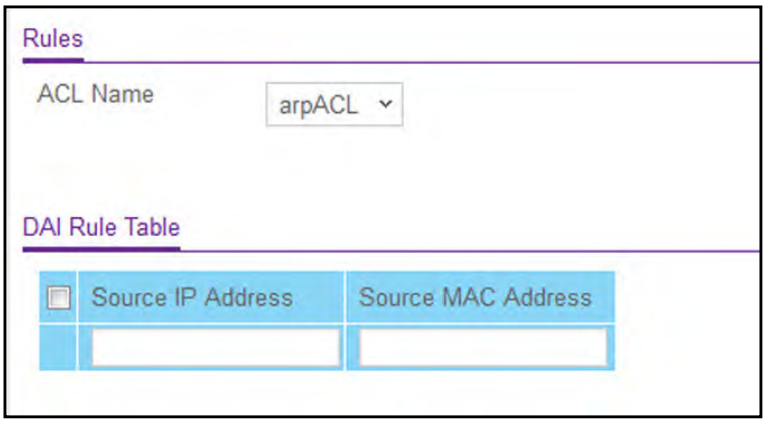
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Security > Control > Dynamic ARP Inspection > DAI ACL Rule Configuration**.



5. From the **ACL Name** menu, select the DAI ARP ACL for which you want to configure the rule.
6. In the **Source IP Address** field, enter the source IP address that must be used as a match for the rule.
7. In the **Source MAC Address** field, enter the source MAC address that must be used as a match for the rule.
8. Click the **Add** button.

   The rule is added to the selected ACL.

View DAI Statistics

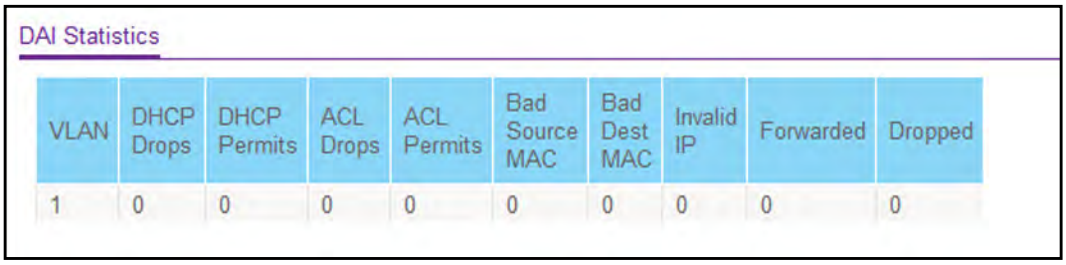
To view the DAI statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > Dynamic ARP Inspection > DAI Statistics**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.
6. To clear the DAI statistics, click the **Clear** button.

The following table describes the nonconfigurable information displayed on the page.

Table 212. DAI Statistics

Field	Description
VLAN	The enabled VLAN ID for which statistics are to be displayed.
DHCP Drops	Number of ARP packets that were dropped by DAI because there is no matching DHCP snooping binding entry found.
DHCP Permits	Number of ARP packets that were forwarded by DAI because there is a matching DHCP snooping binding entry found.
ACL Drops	Number of ARP packets that were dropped by DAI because there is no matching ARP ACL rule found for this VLAN and the static flag is set on this VLAN.
ACL Permits	Number of ARP packets that were permitted by DAI because there is a matching ARP ACL rule found for this VLAN.
Bad Source MAC	Number of ARP packets that were dropped by DAI because the sender MAC address in ARP packets didn't match the source MAC in Ethernet header.
Bad Dest MAC	Number of ARP packets that were dropped by DAI because the target MAC address in ARP reply packets didn't match the destination MAC in Ethernet header.
Invalid IP	Number of ARP packets that were dropped by DAI because the sender IP address in ARP packets or the target IP address in ARP reply packets is invalid. Invalid addresses include 0.0.0.0, 255.255.255.255, IP multicast addresses, class E addresses (240.0.0.0/4), loopback addresses (127.0.0.0/8).
Forwarded	Number of valid ARP packets forwarded by DAI.
Dropped	Number of invalid ARP packets dropped by DAI.

Set Up Captive Portals

The captive portal feature allows you to prevent clients from accessing the network until user verification is established. You can configure captive portal verification to allow access for both guest and authenticated users. Authenticated users must be validated against a database of authorized captive portal users before access is granted. The database can be stored locally on the device or on a RADIUS server.

Configure Captive Portal Global Settings

You can control the administrative state of the captive portal feature, and configure global settings that affect all captive portals configured on the switch.

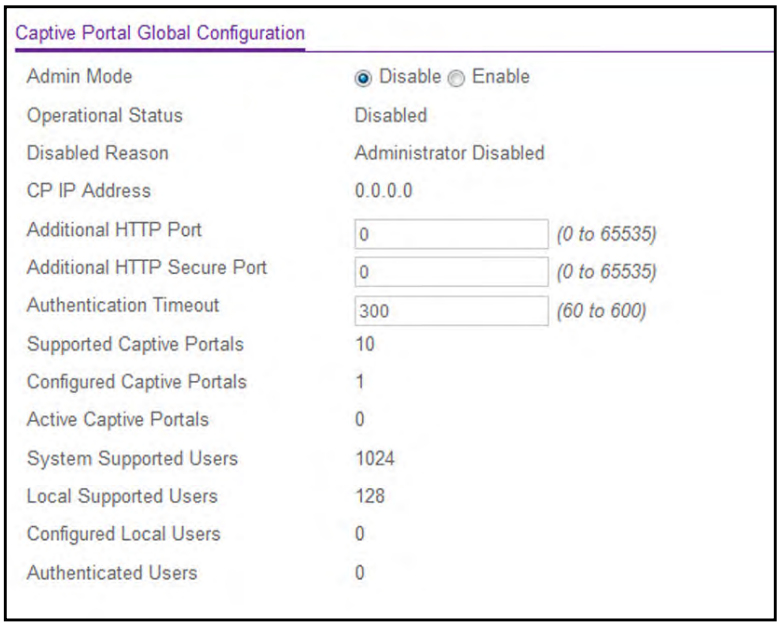
To configure captive portal global settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > Captive Portal > CP Global Configuration**.



5. Select the Admin Mode **Disable** or **Enable** radio button.

This sets the administrative mode of the captive portal feature. By default CP is disabled.

6. In the **Additional HTTP Port** field, enter a port number between 0–65535 (excluding port 80).

   HTTP traffic uses standard port 80, but you can use the **Additional HTTP Port** field to configure an additional port for HTTP traffic. Enter 0 to unconfigure the additional HTTP port. The default is 0.

7. In the **Additional HTTP Secure Port** field, enter a port number between 0–65535 (excluding port 443).

   HTTP Secure traffic uses standard port 443, but you can configure an additional port for HTTP Secure traffic using the **Additional HTTP Secure Port** field. Enter 0 to unconfigure the additional HTTP Secure port. The default is 0.

8. Use the **Authentication Timeout** field to enter the number of seconds that captive portal keeps the authentication session open with a client that is attempting to access the network through a portal.

   To access the network through a portal, the client must first enter authentication information on an authentication web page. When the time-out expires, the switch disconnects any active TCP or SSL connection with the client. The valid range is 60 to 600 seconds. The default authentication time-out is 300 seconds.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information that is displayed.

Table 213. Captive Portal Global Configuration

Field	Description
Operational Status	The operational status of the captive portal feature, which is either Enabled or Disabled. The default is Disabled.
Disabled Reason	If CP is disabled, this field displays the reason, which can be one of the following: • Administratively disabled • IP address not configured • No IP routing interface • Routing disabled
CP IP Address	The IP address that the captive portal uses.
Supported Captive Portals	The number of supported captive portals in the system.
Configured Captive Portals	Shows the number of captive portals configured on the switch.
Active Captive Portals	Shows the number of captive portal instances that are operationally enabled.
System Supported Users	Shows the number of authenticated users that the system can support.
Local Supported Users	Shows the number of entries that the local user database supports.

Table 213. Captive Portal Global Configuration (continued)

Field	Description
Configured Local Users	The number of local users configured.
Authenticated Users	Shows the number of users currently authenticated to all captive portal instances on this switch.

Add a Captive Portal Instance

By default, the switch has one captive portal. You can change the settings for that captive portal, and you can also create and configure up to nine additional portals.

To add a captive portal instance:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > Captive Portal > CP Configuration**.

5. In the **CP Name** field, enter the name of the configuration.

   The name can contain 1 to 31 alphanumeric characters.
6. In the **Admin Mode** list, select **Enable** or **Disable**.

   This sets the administrative mode of the captive portal feature. By default captive portal is disabled.

7. In the **Protocol** field, select either **HTTP** or **HTTPS** as the captive portal instances used for communication with clients during the verification process:
   - HTTP does not use encryption during verification.
   - HTTPS uses the Secure Sockets Layer (SSL), which requires a certificate to provide encryption. The certificate is presented to the user at connection time.
8. Select the type of user **Verification** that the captive portal instance performs with clients that attempt to connect:
   - **Guest**. The user does not need to be authenticated by a database.
   - **Local**. The device uses a local database to authenticate users.
   - **RADIUS**. The device uses a database on a remote RADIUS server to authenticate users.
9. Select the **Block** status.

   If the CP is blocked, users cannot gain access to the network through the CP. Use this function to temporarily protect the network during unexpected events, such as denial of service attacks.
10. If the verification mode is Local or RADIUS, use the **Group** field to assign an existing user group to the captive portal.

    All users who belong to the group are permitted to access the network through this portal. The User Group list is the same for all CP configurations on the switch.
11. In the **Idle Timeout** field, enter the number of seconds to wait before terminating a session.

    A user is logged out once the session idle time-out is reached. If you set the value to 0, then the time-out is not enforced. The valid range is 0 to 900 seconds. The default value is 0.
12. In the **User Logout** list, select the **Enable** or **Disable** option to allow an authenticated client to deauthenticate from the network.

    If this option is clear or the user does not specifically request logout, the client connection status remains authenticated until the captive portal deauthenticates the user, for example by reaching the idle time-out or session time-out values.
13. If the verification mode is RADIUS, use the **Radius Auth Server** field to enter the IP address of the RADIUS server to use for client authentication.

    The device acts as the RADIUS client and performs all RADIUS transactions on behalf of the clients.
14. Select the **Redirect Mode** to specify whether the CP redirects the newly authenticated client to the configured URL (enabled).

    If this mode is disabled, the default locale specific welcome is used.
15. Specify the **Redirect URL** to which the newly authenticated client is redirected.

    The maximum length for the URL is 512 alphanumeric characters.
16. In the **Background Color** field, specify the value of the background color.

    For example, #BFBFBF.

17. In the **Foreground Color** field, specify the value of the foreground color.

    For example, #999999.

18. In the **Separator Color** field, specify the value of the separator color.

    For example, #46008F.

19. In the **Max Bandwidth Down** field, specify the maximum rate at which a client can receive data from the network.

    The rate is in bytes per seconds. 0 indicates the limit is not enforced. The range is 0 to 536870911.

20. In the **Max Bandwidth Up** field, specify the maximum rate in bytes per second at which a client can send data into the network.

    A value of 0 indicates the limit is not enforced. The range is 0 to 536870911.

21. In the **Max Input** field, specify the maximum number of octets that the user is allowed to transmit.

    After this limit is reached, the user is disconnected. 0 indicates that the limit is not enforced. The range is 0 to 4294967295.

22. In the **Max Output** field, specify the maximum number of octets that the user is allowed to receive.

    After this limit is reached, the user is disconnected. 0 indicates the limit is not enforced. The range is 0 to 4294967295.

23. In the **Max Total** field, specify the maximum number of octets that the user is allowed to transfer, meaning the sum of octets transmitted and received.

    After this limit is reached, the user is disconnected. 0 indicates the limit is not enforced. The range is 0 to 4294967295.

24. Click the **Add** button.

    The captive portal instance is added.

Configure Captive Portals Bindings

You can associate a configured captive portal with a specific network (SSID). The CP feature runs only on the interfaces you specify. Multiple interfaces can be associated with a CP, but an interface can be associated to only one CP at a time.

To configure captive portal bindings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

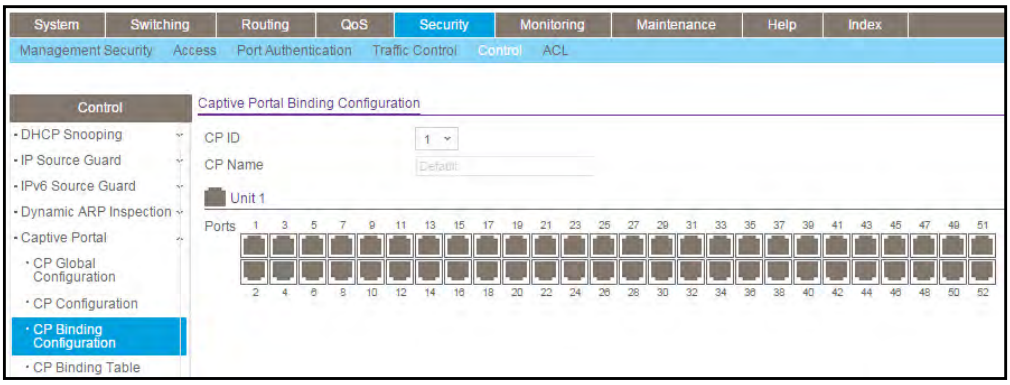
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Security > Control > Captive Portal > CP Binding Configuration**.



5. Select the **CP ID** from the list.

   The ID is a unique value that identifies the captive portal instance. This value is automatically assigned to the instance when it is created and cannot be changed.

6. In the **CP Name** field, specify the name of the configuration.

   The name can contain from 1 to 31 alphanumeric characters.

7. Click one or more interfaces.

   The interfaces are selected.

8. Click the **Apply** button.

   Your settings are saved.

View the Captive Portal Binding Table

To view the captive portal binding table:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

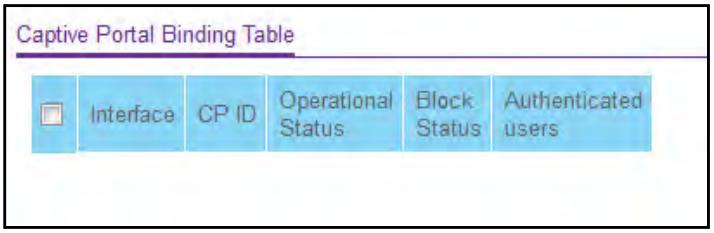
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Control > Captive Portal > CP Binding Table**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the nonconfigurable information that is displayed.

Table 214. Captive Portal Binding Table

Field	Description
Interface	The interface.
CP ID	The ID of the captive portal instance.
Operational Status	Indicates whether the portal is active on the specified interface.
Block Status	Indicates whether the captive portal is temporarily blocked for authentication.
Authenticated Users	Shows the number of authenticated users using the captive portal instance on this interface.

Configure a Captive Portal Group

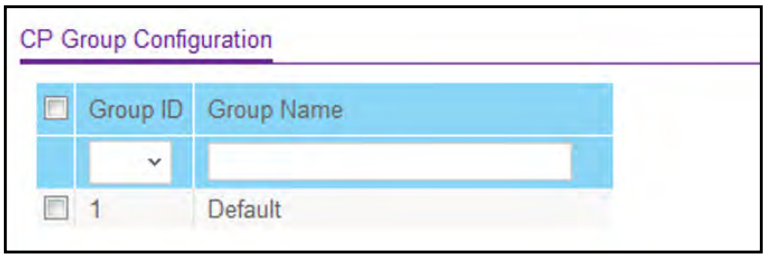
To configure a captive portal group:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > Captive Portal > CP Group Configuration**.



5. Select the **Group ID** from the list.
6. In the **Group Name** field, specify the name of the user group.

   The name can contain from 1 to 31 alphanumeric characters.
7. Click the **Add** button.

   The group is added.

Configure Captive Portal User Settings

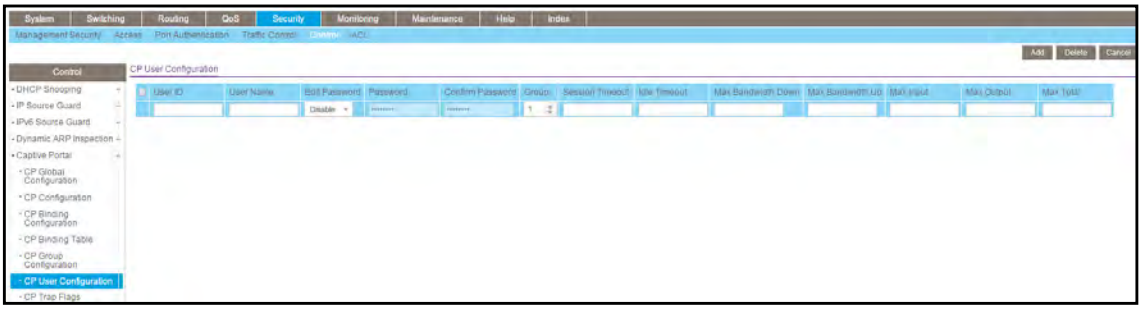
To configure captive portal user settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > Control > Captive Portal > CP User Configuration**.



5. Enter the local **User ID** to identify the name of the user.
6. In the **User Name** field, enter the name of the user.

   The name can contain 1 to 31 alphanumeric characters. Once created, user names cannot be changed or modified.
7. In the **Edit Password** list, select **Enable** only when you are changing the password.

   The default value is Disable.
8. In the **Password** field, enter a password for the user.

   The password length can be from 8 to 64 characters.
9. In the **Confirm Password** field, enter the password for the user again.
10. Use the **Group** field to assign the user to a least one user group.

To assign a user to more than one group, press the **Ctrl** key and click each group. New users are assigned to the 1-Default user group by default.

11. In the **Session Timeout** field, enter the number of seconds a user is permitted to remain connected to the network.

    Once the Session Timeout value is reached, the user is logged out automatically.

12. In the **Idle Timeout** field, enter the number of seconds to wait before terminating a session.

    A user is logged out once the session idle time-out is reached. If the attribute is 0 or not present, then use the value configured for the captive portal.

13. In the **Max Bandwidth Down** field, enter the maximum rate, in bits per second, at which a client can receive data from the network.

    A value of 0 indicates use global configuration. The range is 0 to 536870911 bps.

14. In the **Max Bandwidth Up** field, enter the maximum rate, in bits per second, at which a client can send data into the network.

    A value of 0 indicates use the global limit. The range is 0 to 536870911 bps.

15. In the **Max Input** field, enter the number of octets the user is allowed to receive.

    After this limit is reached, the user is disconnected. 0 means use the global limit. The range is 0 to 4294967295.

16. In the **Max Output** field, enter the number of octets the user is allowed to transmit.

    After this limit is reached, the user is disconnected. 0 means use the global limit. The range is 0 to 4294967295.

17. In the **Max Total** field, enter the number of bytes the user is allowed to transmit and receive.

    The maximum number of octets is the sum of octets transmitted and received. After this limit is reached, the user is disconnected. 0 means use the global limit. The range is 0 to 4294967295.

18. Click the **Add** button.

    The user is added to the Local User database.

Configure the Captive Portal Trap Flag Settings

You can specify whether or not SNMP traps are sent from the captive portal and to specify captive portal events that generate a trap. All CP SNMP traps are disabled be default.

To configure the captive portal trap flag settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

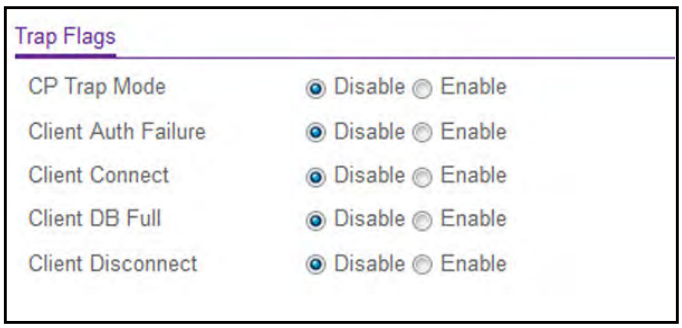
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Security > Control > Captive Portal > CP Trap Flags**.



5. Select the CP Trap Mode **Disable** or **Enable** radio button.

   This sets the option to enable or disable the captive portal trap mode.

6. Select the Client Authentication Failure **Disable** or **Enable** radio button.

   If you enable this, the SNMP agent sends a trap when a client attempts to authenticate with a captive portal but is unsuccessful.

7. Select the Client Connect Disable or **Enable** radio button.

   If you enable this, the SNMP agent sends a trap when a client authenticates with, and connects to, a captive portal.

8. Select the Client Database Full **Disable** or **Enable** radio button.

   If you enable this, the SNMP agent sends a trap each time an entry cannot be added to the client database because it is full.

9. Select the Client Disconnect **Disable** or **Enable** radio button.

   If you enable this, the SNMP agent sends a trap when a client disconnects from a captive portal.

10. Click the **Apply** button.

    Your settings are saved.

View and Clear the Captive Portal Client

You can view and clear information about the traffic a client sent or received.

To view and clear the captive portal client:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

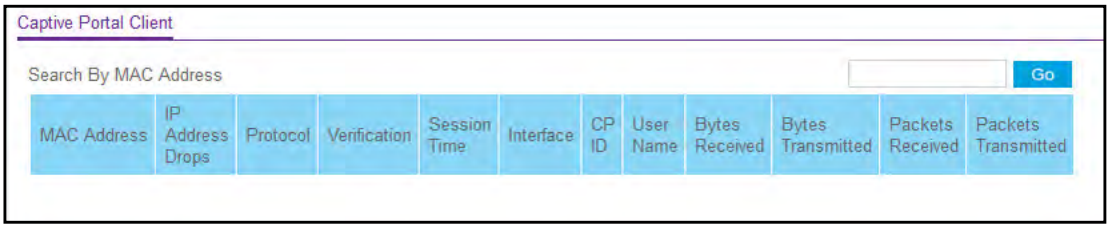
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > Control > Captive Portal > CP Client**.



5. To refresh the page with the latest information on the switch, click the **Refresh** button.
6. To clear the information in the client table, click the **Clear** button.

The following table describes the nonconfigurable information displayed on the page.t

Table 215. Captive Portal Client

Field	Description
MAC Address	Shows the client MAC address.
IP Address Drops	Identifies the IP address of the client (if applicable).
Protocol	Shows the current connection protocol, which is either HTTP or HTTPS.
Verification	Shows the current account type, which is Guest, Local, or RADIUS.
Session Time	Shows the amount of time that passed since the client was authorized.
Interface	Identifies the interface the client is using.
CP ID	The ID of the captive portal instance.
User Name	The user name (or guest ID) of the connected client.
Bytes Received	Total bytes the client received.
Bytes Transmitted	Total bytes the client transmitted.
Packets Received	Total packets the client received.
Packets Transmitted	Total packets the client transmitted.

Set Up and Manage Access Control Lists

Access control lists (ACLs) ensure that only authorized users can access specific resources while blocking off any unwarranted attempts to reach network resources. ACLs are used to

provide traffic flow control, restrict contents of routing updates, decide which types of traffic are forwarded or blocked, and above all provide security for the network. ProSafe Managed switch software supports IPv4, IPv6, and MAC ACLs.

You first create an IPv4 based or IPv6 based or MAC-based ACL ID. Then, you create a rule and assign it to a unique ACL ID. Next, you define the rules, which can identify protocols, source, and destination IP and MAC addresses, and other packet-matching criteria. Finally, use the ID number to assign the ACL to a port or to a LAG.

Use the ACL Wizard to Create a Simple ACL

The ACL Wizard helps you create a simple ACL and apply it to the selected ports easily and quickly. You must select an ACL type to use when you create an ACL. Then add an ACL rule to this ACL and apply this ACL on the selected ports. The ACL Wizard allows you to create the ACL, but does not allow you to modify it. To modify the ACL, go to the ACL Configuration page. See Configure an IP ACL on page 611.

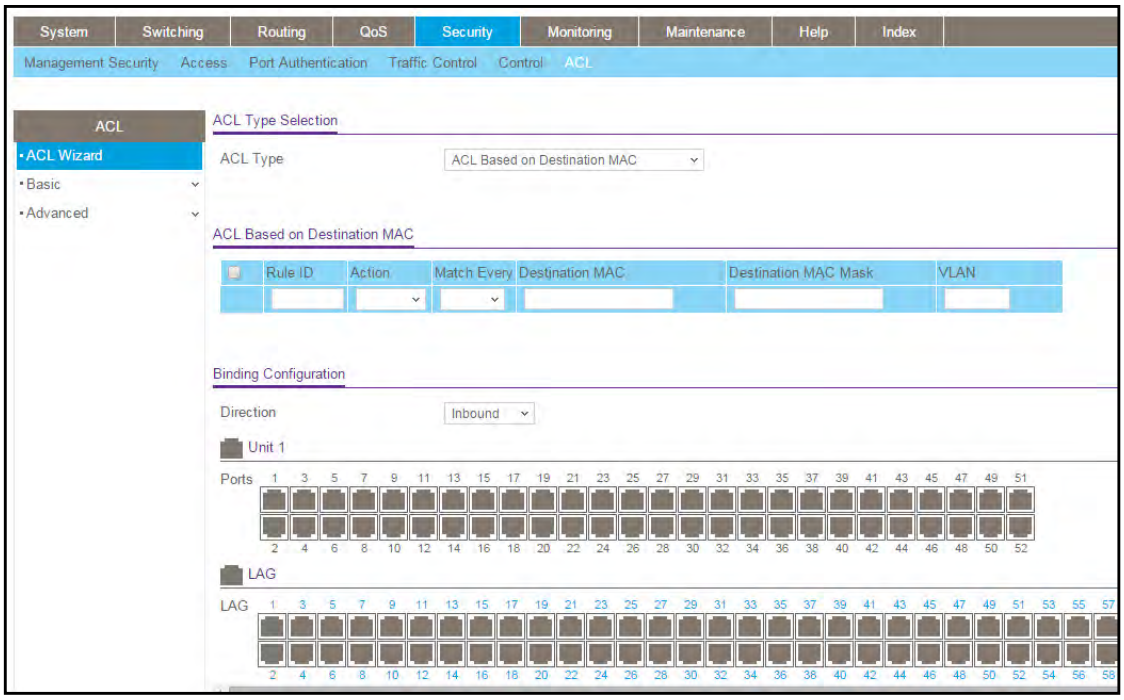
To use the ACL Wizard to create a simple ACL:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > ACL > ACL Wizard.**



Note: The steps in this procedure describe creating an ACL based on the destination MAC address. If you select a different ACL type, for example, ACL based on a source IPv4, then what is shown on this page varies, depending on the current step in the rule configuration process.

5. Use **ACL Type** to specify the ACL type you are using to create the ACL.

   You can select one type from 10 optional types:

   - **ACL Based on Destination MAC**. To create an ACL based on the destination MAC address, destination MAC mask, and VLAN.
   - **ACL Based on Source MAC**. To create an ACL based on the source MAC address, source MAC mask, and VLAN.
   - **ACL Based on Destination IPv4**. To create an ACL based on the destination IPv4 address and IPv4 address mask.
   - **ACL Based on Source IPv4**. To create an ACL based on the source IPv4 address and IPv4 address mask.
   - **ACL Based on Destination IPv6**. To create an ACL based on the destination IPv6 prefix and IPv6 prefix length.
   - **ACL Based on Source IPv6.** To create an ACL based on the source IPv6 prefix and IPv6 prefix length.
   - **ACL Based on Destination IPv4 L4 Port**. To create an ACL based on the destination IPv4 Layer 4 port number.

- **ACL Based on Source IPv4 L4 Port**. To create an ACL based on the source IPv4 Layer 4 port number.
- **ACL Based on Destination IPv6 L4 Port**. To create an ACL based on the destination IPv6 Layer 4 port number.
- **ACL Based on Source IPv6 L4 Port**. To create an ACL based on the source IPv6 Layer 4 port number.

Note: For L4 port options, two rules are created: one for TCP and one for UDP.

6. From the **Direction** menu, select **Inbound** or **Outbound**.

   Traffic rule applies either to inbound traffic only or to outbound traffic only.

7. From the **Unit 1** and **LAG** switch figures onscreen, select the ports and LAGs to which the rule must apply.

   If a port or LAG is not selected, click the port or LAG to select it. If a port or LAG is selected, click the port or LAG to clear it again.

8. Click the **Apply** button.

   Your settings are saved.

Configure an ACL Based on Destination MAC Address

Note: Binding ACLs to an interface fails if the system has no resources to bind a new ACL.

To configure a rule based on destination MAC address:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

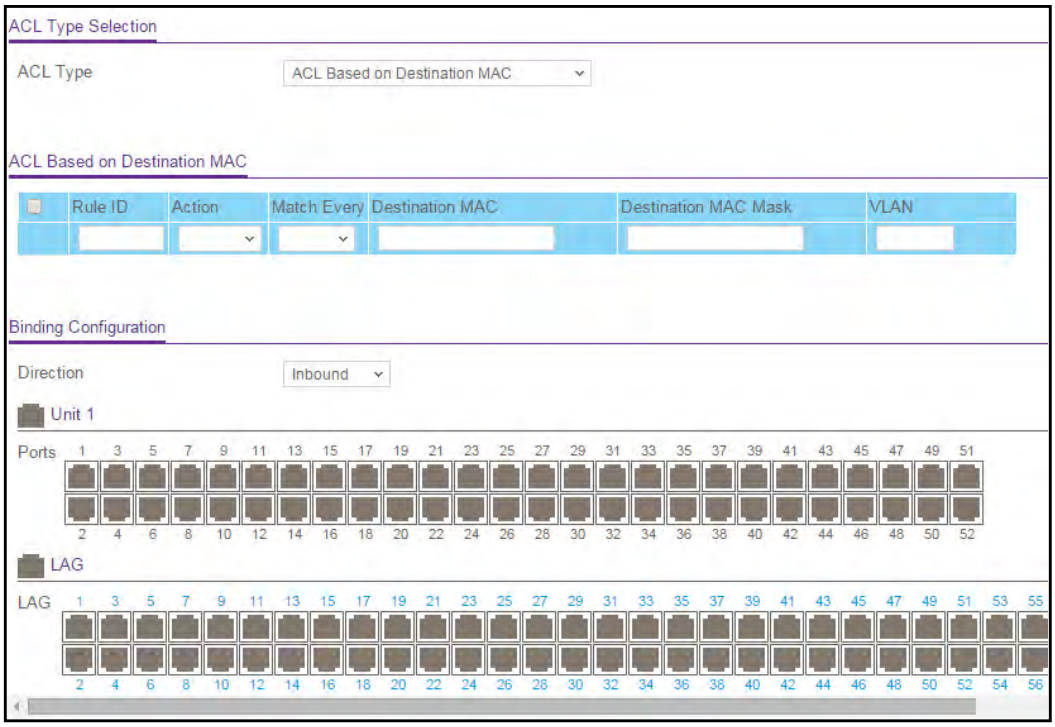
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > ACL > ACL Wizard.**



5. Use **Rule ID** to enter a whole number in the range of 1 to 1023 that is used to identify the rule.
6. Use **Action** to specify what action is taken if a packet matches the rule's criteria. The choices are Permit or Deny.
7. In the **Match Every** list, select either **True** or **False**:
   - True signifies that all packets must match the selected ACL and rule and are either permitted or denied. In this case, since all packets match the rule, the option of configuring other match criteria is not offered.
   - To configure specific match criteria for the rule, remove the rule and re-create it, or re-configure Match Every to False for the other match criteria to be visible.
8. Use **Destination MAC** to specify the destination MAC address to compare against an Ethernet frame.

   Valid format is xx:xx:xx:xx:xx:xx. The BPDU keyword can be specified using a destination MAC address of 01:80:C2:xx:xx:xx.
9. Use **Destination MAC Mask** to specify the destination MAC address mask specifying which bits in the destination MAC to compare against an Ethernet frame.

   The valid format is xx:xx:xx:xx:xx:xx. The BPDU keyword can be specified using a destination MAC mask of 00:00:00:ff:ff:ff.
10. Specify the **VLAN ID** to compare against an Ethernet frame.

    Valid range of values is 1 to 4093. Either a VLAN range or VLAN can be configured.
11. From the **Direction** menu, select **Inbound** or **Outbound**.

Traffic rule applies either to inbound traffic only or to outbound traffic only.

12. From the **Unit 1** and **LAG** switch figures onscreen, select the ports and LAGs to which the rule must apply.

    If a port or LAG is not selected, click the port or LAG to select it. If a port or LAG is selected, click the port or LAG to clear it again.

13. Click the **Add** button.

    The rule is added to the ACL based on the destination MAC address.

14. Click the **Apply** button.

    Your settings are saved.

Use the ACL Wizard to Complete the Destination MAC ACL

For information about the ACL Wizard, see Use the ACL Wizard to Create a Simple ACL on page 600.

To complete the destination MAC ACL using ACL wizard, you must do the following:

1. Select the destination MAC ACL as **ACL type.**
2. Enter the DMAC VLAN as the **ACL Rule**.
3. To select the direction and ports to bind the ACL, in the **Directions** field, select the packet filtering direction for an ACL.

   The options are Inbound or Outbound.

   The Port Selection Table specifies the list of all available valid interfaces for ACL mapping.

   All non-routing physical interfaces and interfaces participating in LAG are listed.

Configure a Basic MAC ACL

A MAC ACL consists of a set of rules which are matched sequentially against a packet. When a packet meets the match criteria of a rule, the specified rule action (Permit/Deny) is taken, and the additional rules are not checked for a match. Rules for the MAC ACL are specified/created using the MAC ACL Rule Configuration page.

Multiple steps are involved in defining a MAC ACL and applying it to the switch:

1. Create the ACL Name.
2. Create rules for the ACL.
3. Assign the ACL by its name to a port.

For information about how to view the configurations, see View and Delete MAC ACL Bindings in the MAC Binding Table on page 610.

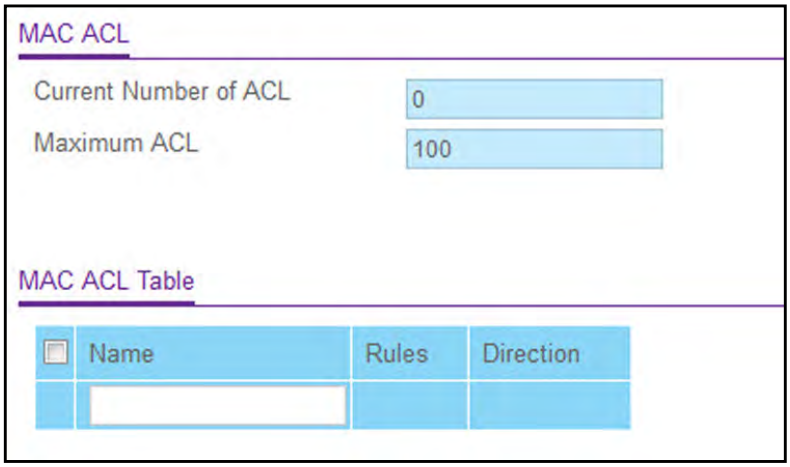
To configure a MAC ACL:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > ACL > Basic > MAC ACL.**



   The MAC ACL page displays the number of ACLs currently configured in the switch and the maximum number of ACLs that can be configured. The current number is equal to the number of configured IPv4 and IPv6 ACLs plus the number of configured MAC ACLs.
5. In the **Name** field, specify a name for the MAC ACL.

   The name string can include alphabetic, numeric, hyphen, underscore, or space characters only. The name must start with an alphabetic character.

   Each configured ACL displays the following information:

   - **Rules**. The number of rules currently configured for the MAC ACL.
   - **Direction**. The direction of packet traffic affected by the MAC ACL, which can be Inbound or blank.
6. Click the **Add** button.

   The MAC ACL is added to the switch configuration.

Configure MAC ACL Rules

You can define rules for MAC-based ACLs. The access list definition includes rules that specify whether traffic matching the criteria is forwarded normally or discarded. A default deny all rule is the last rule of every list.

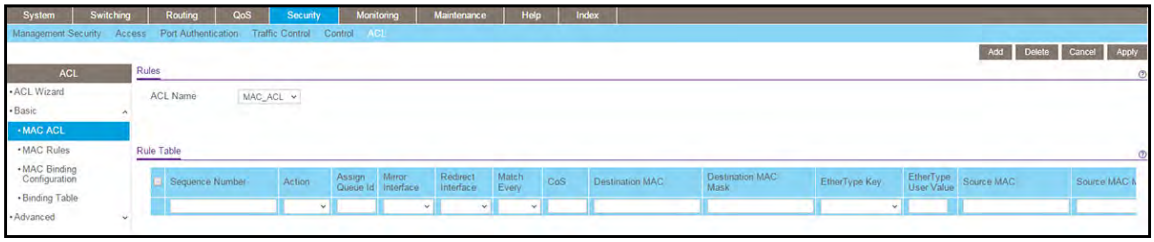
To configure MAC ACL rules:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > ACL > Basic > MAC Rules**.



5. From the **ACL Name** menu, select the MAC ACL for which you want to add or a change a rule.
6. Use **Sequence Number** to enter a whole number in the range of 1 to 2147483647.

   This number is used to identify the rule. A MAC ACL can contain up to 1023 rules.
7. Use **Action** to specify what action is taken if a packet matches the rule's criteria.

   The choices are Permit or Deny.
8. Use **Assign Queue ID** to specify the hardware egress queue identifier used to handle all packets matching this ACL rule.

   Valid range of queue IDs is 0 to 7.
9. **Mirror Interface** to specify the specific egress interface where the matching traffic stream is copied in addition to being forwarded normally by the device.

   This field cannot be set if a redirect interface is already configured for the ACL rule. This field is visible for a Permit action.
10. Use **Redirect Interface** to specify the specific egress interface where the matching traffic stream is forced, bypassing any forwarding decision normally performed by the device.

This field cannot be set if a mirror interface is already configured for the ACL rule.

11. Use **Match Every** to specify an indication to match every Layer 2 MAC packet.

    Valid values are as follows:

    - **True**. Signifies that every packet is considered to match the selected ACL rule.
    - **False**. Signifies that it is not mandatory for every packet to match the selected ACL rule.

12. Use **CoS** to specify the 802.1p user priority to compare against an Ethernet frame.

    Valid range of values is 0 to 7.

13. Use **Destination MAC** to specify the destination MAC address to compare against an Ethernet frame. Valid format is xx:xx:xx:xx:xx:xx.

    The BPDU keyword can be specified using a destination MAC address of 01:80:C2:xx:xx:xx.

14. Use **Destination MAC Mask** to specify the destination MAC address mask specifying which bits in the destination MAC to compare against an Ethernet frame.

    Valid format is xx:xx:xx:xx:xx:xx. The BPDU keyword can be specified using a destination MAC mask of 00:00:00:ff:ff:ff.

15. Use **EtherType Key** to specify the EtherType value to compare against an Ethernet frame.

    Valid values are as follows:

    - Appletalk
    - ARP
    - IBM SNA
    - IPv4
    - IPv6
    - IPX
    - MPLS multicast
    - MPLS unicast
    - NetBIOS
    - Novell
    - PPPoE
    - Reverse ARP
    - User Value

16. Use **EtherType User Value** to specify the user defined customized EtherType value to be used when you selected *User Value* as EtherType key, to compare against an Ethernet frame.

    Valid range of values is 0x0600 to 0xFFFF.

17. Use **Source MAC** to specify the source MAC address to compare against an Ethernet frame.

Valid format is xx:xx:xx:xx:xx:xx.

18. Use **Source MAC Mask** to specify the Source MAC address mask specifying which bits in the Source MAC to compare against an Ethernet frame.

    Valid format is xx:xx:xx:xx:xx:xx.

19. Use **VLAN** to specify the VLAN ID to compare against an Ethernet frame.

    Valid range of values is 1 to 4095. Either VLAN range or VLAN can be configured.

20. **Use Logging** to enable or disable logging.

    When set to Enable, logging is enabled for this ACL rule (subject to resource availability in the device). If the access list trap flag is also enabled, this causes periodic traps to be generated indicating the number of times this rule was hit during the current report interval. A fixed 5 minute report interval is used for the entire system. A trap is not issued if the ACL rule hit count is zero for the current interval. This field is only supported for a Deny action.

21. **Use Rate Limit Conform Data Rate** to specify the value of the conforming data rate of MAC ACL rule.

    Valid values are 1 to 4294967295 in Kbps.

22. **Use Rate Limit Burst Size** to specify the burst size of MAC ACL rule.

    Valid values are 1 to 128 in Kbytes.

23. **Use Time Range** to enter the name of the time range associated with the MAC ACL rule.

    The **Rule Status** displays if the ACL rule is active or inactive. If this field is blank, no timer schedules are assigned to the rule.

24. Click the **Apply** button.

    Your settings are saved.

Configure MAC Binding

When an ACL is bound to an interface, all the rules that are defined are applied to the selected interface. Use the MAC Binding Configuration page to assign MAC ACL lists to ACL priorities and interfaces.

To configure MAC binding:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

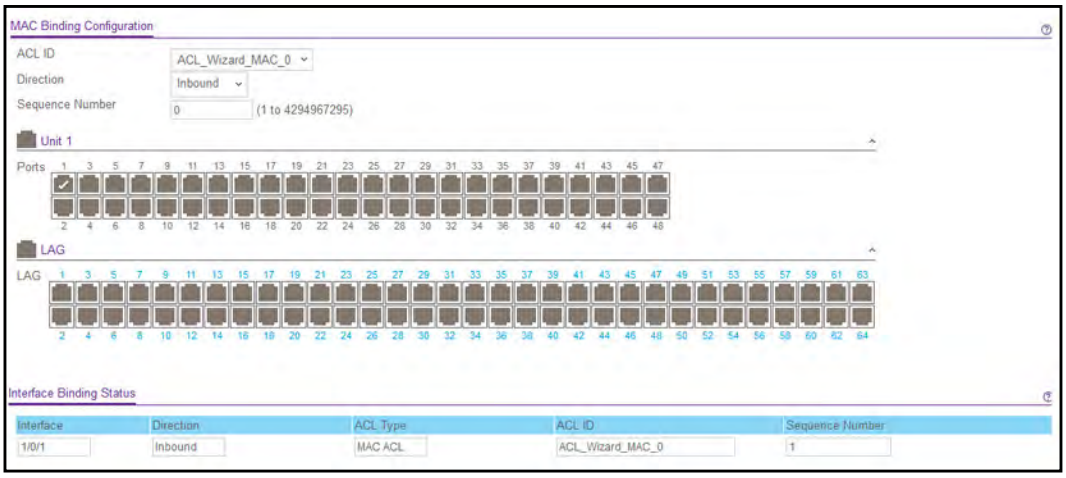
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Security > ACL > Basic > MAC Binding Configuration**.



5. Select a MAC ACL from the **ACL ID** list.

   You can select one and bind it to the interfaces.

   The packet filtering **Direction** for ACL is Inbound, which means the MAC ACL rules are applied to traffic entering the port.

6. Specify an optional **Sequence Number** to indicate the order of this access list relative to other access lists already assigned to this interface and direction.

   A low number indicates high precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached access list using that sequence number. If you do not specify the sequence number, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used. The valid range is 1–4294967295.

7. The **Port Selection Table** provides a list of all available valid interfaces for ACL binding. All nonrouting physical interfaces VLAN interface and interfaces participating in LAGs are listed.
   - To add the selected ACL to a port or LAG, click the box directly below the port or LAG number so that an X appears in the box.
   - To remove the selected ACL from a port or LAG, click the box directly below the port or LAG number to clear the selection. An X in the box indicates that the ACL is applied to the interface.

8. Click the **Apply** button.

   Your settings are saved.

The following table describes the information that is displayed in the **Interface Binding Status** section.

Table 216. Interface Binding Status

Field	Description
Interface	The interface of the ACL assigned.
Direction	Displays selected packet filtering direction for ACL.
ACL Type	The type of ACL assigned to selected interface and direction.
ACL ID	The ACL number (in case of IP ACL) or ACL name (in case of MAC ACL) identifying the ACL assigned to selected interface and direction.
Sequence Number	The sequence number signifying the order of the specified ACL relative to other ACLs assigned to selected interface and direction.

View and Delete MAC ACL Bindings in the MAC Binding Table

You can view and delete the MAC ACL bindings in the MAC Binding Table.

To view and delete MAC ACL bindings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > ACL > Basic > MAC Binding Table**.

5. To delete a MAC ACL-to-interface binding, select the check box next to the interface and click the **Delete** button.

The following table describes the information displayed in the MAC Binding Table.

Table 217. MAC Binding Table

Field	Description
Interface	The interface of the ACL assigned.
Direction	The selected packet filtering direction for the ACL.
ACL Type	The type of ACL assigned to selected interface and direction.
ACL ID	The ACL name identifying the ACL assigned to selected interface and direction.
Sequence Number	The sequence number signifying the order of the specified ACL relative to other ACLs assigned to selected interface and direction.

Configure an IP ACL

An IP or IPv6 ACL consists of a set of rules that are matched sequentially against a packet. When a packet meets the match criteria of a rule, the specified rule action (Permit/Deny) is taken, and the additional rules are not checked for a match. You must specify the interfaces to which an IP ACL applies, as well as whether it applies to inbound or outbound traffic. Rules for the IP ACL are specified or created using the IPv6 ACL Rule Configuration page.

To configure an IP ACL:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > ACL > Advanced > IP ACL**.

The IP ACL page shows the current size of the ACL table and the maximum size of the ACL table. The current size is equal to the number of configured IPv4 and IPv6 ACLs plus the number of configured MAC ACLs. The maximum size is 100.

The **Current Number of ACL** field displays the current number of the all ACLs configured on the switch.

The **Maximum ACL** displays the maximum number of IP ACL can be configured on the switch, depending on the hardware.

5. In the **IP ACL** field, specify the ACL ID or IP ACL name, which depends on the IP ACL type. The IP ACL ID is an integer in the following range:
   - **1–99**: Creates an IP basic ACL, which allows you to permit or deny traffic from a source IP address.
   - **100–199**: Creates an IP extended ACL, which allows you to permit or deny specific types of Layer 3 or Layer 4 traffic from a source IP address to a destination IP address. This type of ACL provides more granularity and filtering capabilities than the standard IP ACL.
   - **IP ACL Name**: Create an IPv4 ACL name string that includes up to 31 alphanumeric characters in length. The name must start with an alphabetic character.

   Each configured ACL displays the following information:

   - **Rules**. The number of rules currently configured for the IP ACL.
   - **Type**. Identifies the ACL as a basic IP ACL (with ID from 1 to 99), extended IP ACL (with ID from 100 to 199), or for named IP ACL.
6. Click the **Add** button.

   The IP ACL is added to the switch configuration.

Configure Rules for an IP ACL

You can display the rules for the IP access control lists (ACL) that you created.

Note: An implicit *deny all* default rule exists as the last rule of an ACL list. This means that if an ACL is applied to a packet and if none of the explicit rules match, the final implicit *deny all* rule applies and the packet is dropped.

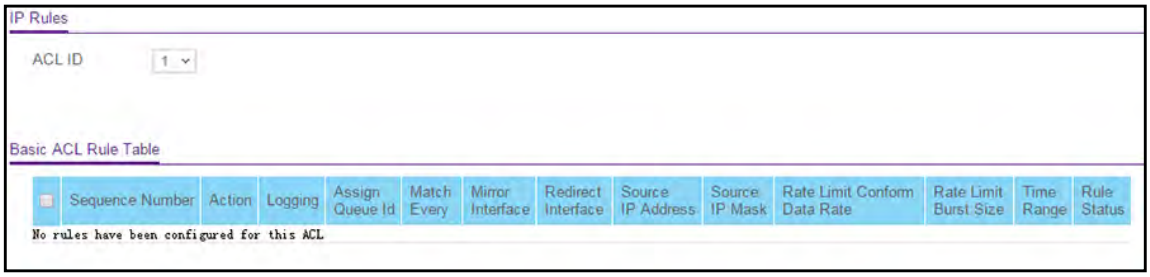
To configure rules for an IP ACL:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

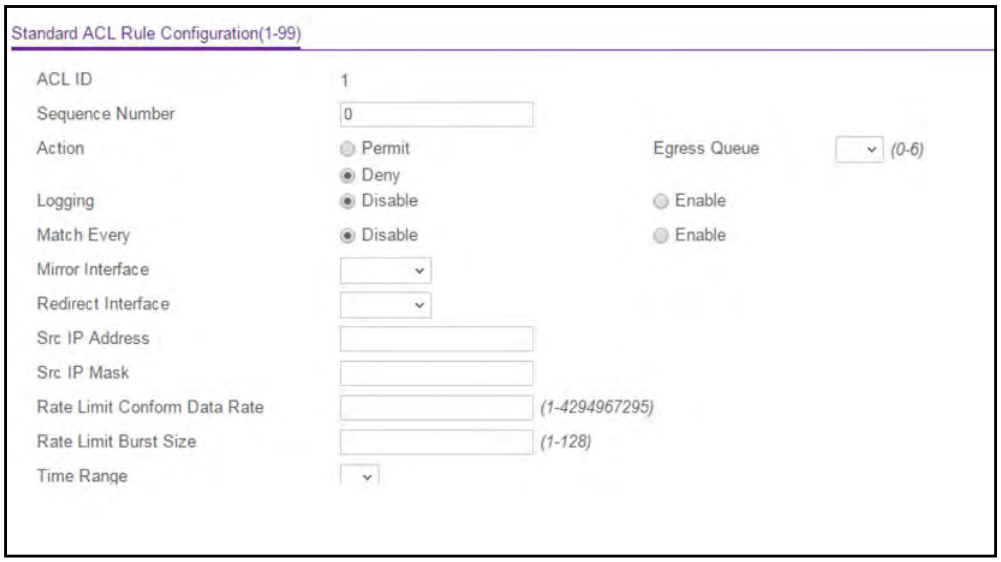
   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > ACL > Advanced > IP Rules**.



   If no rules exists, the Basic ACL Rule Table shows the message *No rules have been configured for this ACL*. If one or more rule exists for the ACL, the rules display in the Basic ACL Rule Table.
5. From the **ACL ID** menu, select the IP ACL for which you want to add or a change a rule.

   For basic IP ACLs, this must be an ID in the range from 1 to 99.
6. Take one of the following actions:
   - To add an IP ACL rule, click the **Add** button.
   - To change an existing rule, click the rule hyperlink in the Sequence Number column of the Basic ACL Rule Table.



7. Configure the following options for the rule:
   - **Sequence Number**. Enter a whole number in the range of 1 to 2147483647. This number is used to identify the rule. An IP ACL can contain up to 1023 rules.
   - **Action**. Specify what action is taken if a packet matches the rule's criteria. The choice is **Permit** or **Deny**.
   - **Logging**. When set to Enable, logging is enabled for this ACL rule (subject to resource availability in the device). If the access list trap flag is also enabled, this causes periodic traps to be generated indicating the number of times this rule was *hit* during the current report interval. A fixed 5-minute report interval is used for the entire system. A trap is not issued if the ACL rule hit count is zero for the current interval. This field is visible for a *Deny* action.
   - **Egress Queue**. The hardware egress queue identifier used to handle all packets matching this IP ACL rule. Valid range of queue IDs is 0 to 6. This field is visible when Permit is chosen as the action.
   - **Match Every**. Select **True** or **False**. True signifies that all packets must match the selected IP ACL and rule and are either permitted or denied. In this case, since all packets match the rule, the option of configuring other match criteria is not offered. To configure specific match criteria for the rule, remove the rule and recreate it, or reconfigure Match Every to False for the other match criteria to be visible.
   - **Mirror Interface**. The specific egress interface where the matching traffic stream is copied in addition to being forwarded normally by the device. This field cannot be set if a redirect interface is already configured for the ACL rule. This field is visible for a *Permit* action.
   - **Redirect Interface**. The specific egress interface where the matching traffic stream is forced, bypassing any forwarding decision normally performed by the device. This field cannot be set if a mirror interface is already configured for the ACL rule. This field is enabled for a Permit action.

- **Src IP Address**. Enter an IP address using dotted-decimal notation to be compared to a packet's source IP address as a match criteria for the selected IP ACL rule.
- **Src IP Mask**. Specify the IP mask in dotted-decimal notation to be used with the source IP address.
- **Rate Limit Conform Data Rate**. Value of Rate Limit Conform Data Rate specifies the conforming data rate of IP ACL Rule. Valid values are 1 to 4294967295 in Kbps.
- **Rate Limit Burst Size**. Value of Rate Limit Burst Size specifies burst size of the IP ACL rule. Valid values are 1 to 128 in Kbytes.
- **Time Range.** Name of time range associated with the IP ACL rule.

8. Click the **Apply** button.

   Your settings are saved.

   The **Rule Status** field on IP Rules page displays whether the ACL rule is active or inactive. Blank means that no timer schedules are assigned to the rule.

Configure Rules for an Extended IP ACL

You can view the rules for the IP access control lists that you created. What is shown on this page varies depending on the step in the rule configuration process.

Note: An implicit *deny all* default rule exists as the last rule of an ACL list. This means that if an ACL is applied to a packet and if none of the explicit rules match, the final implicit *deny all* rule applies and the packet is dropped.

To configure rules for an extended IP ACL:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

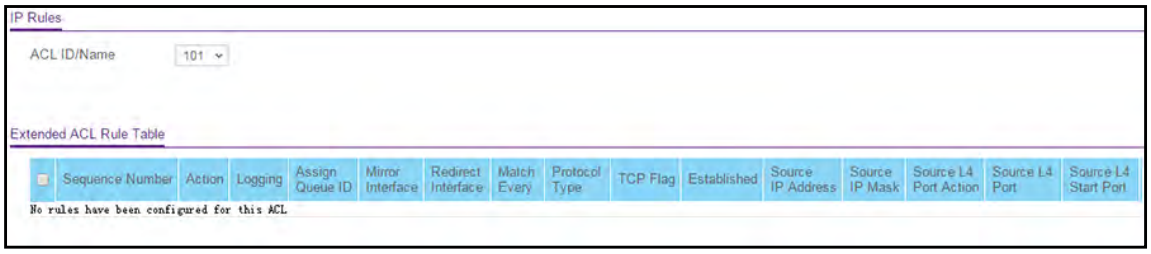
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > ACL > Advanced > IP Extended Rules**.

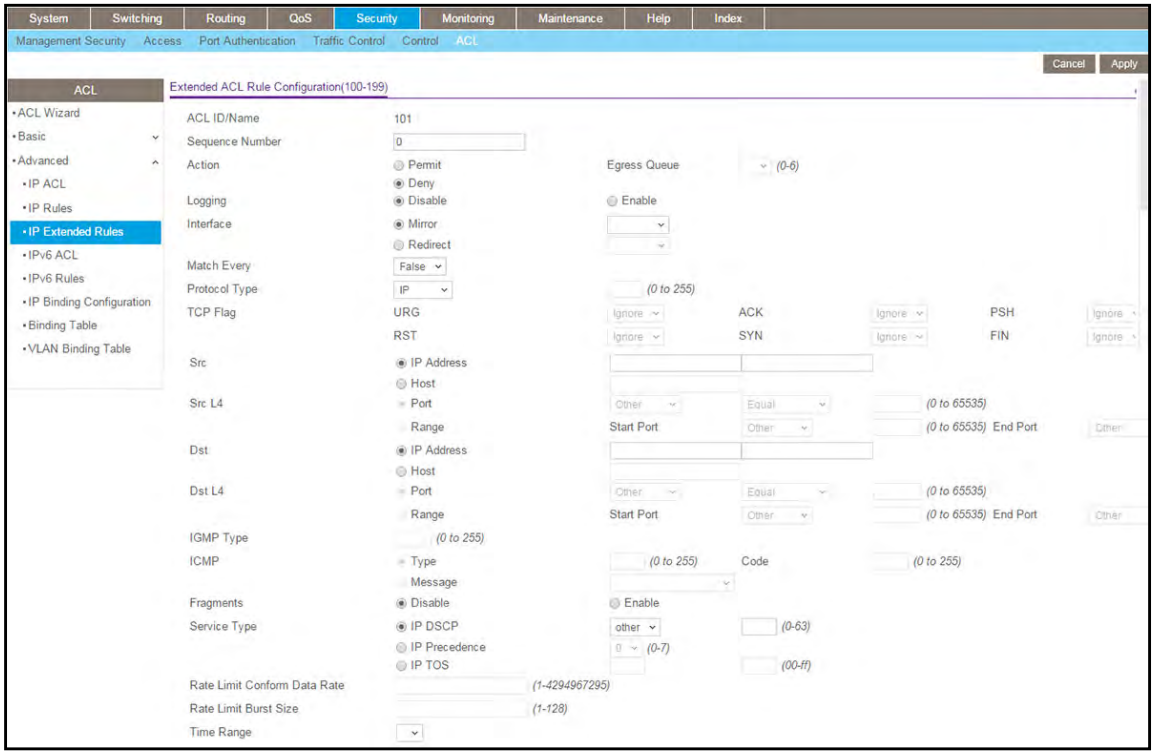


If no rules exists, the Extended ACL Rule Table shows the message *No rules have been configured for this ACL*. If one or more rule exists for the ACL, the rules display in the Extended ACL Rule Table.

5. From the **ACL ID/Name** menu, select the IP ACL for which you want to add or a change a rule.

   For extended IP ACLs, this must be an ID in the range from 101 to 199 or a name.

6. Take one of the following actions:
   - To add an IP ACL rule, click the **Add** button.
   - To change an existing rule, click the rule hyperlink in the Sequence Number column of the Extended ACL Rule Table.



7. Configure the following options for the rule:
   - **Sequence Number**. Enter a whole number in the range of 1 to 2147483647. This number is used to identify the rule. An extended IP ACL can contain up to 1023 rules.

- **Action**. Specify what action is taken if a packet matches the rule's criteria. The choice is **Permit** or **Deny**.
- **Logging**. When set to Enable, logging is enabled for this ACL rule (subject to resource availability in the device). If the access list trap flag is also enabled, this causes periodic traps to be generated indicating the number of times this rule was *hit* during the current report interval. A fixed 5-minute report interval is used for the entire system. A trap is not issued if the ACL rule hit count is zero for the current interval. This field is visible for a *Deny* action.
- **Egress Queue**. The hardware egress queue identifier used to handle all packets matching this IP ACL rule. Valid range of queue IDs is 0 to 6. This field is visible when Permit is chosen as the action.
- **Interface**. For a *Permit* action, use either a mirror interface or a redirect interface:
  - Select the **Mirror Interface** radio button and use the menu to specify the egress interface to which the matching traffic stream is copied, in addition to being forwarded normally by the device.
  - Select the **Redirect Interface** radio button and use the menu to specify the egress interface to which the matching traffic stream is forced, bypassing any forwarding decision normally performed by the device.
- **Match Every**. From the menu, select **True** or **False**.

  True signifies that all packets must match the selected IP ACL and rule and are either permitted or denied. In this case, because all packets match the rule, the option of configuring other match criteria is not available. To configure specific match criteria for the rule, remove the rule and recreate it, or select **False** from the **Match Every** menu.
- **Protocol Type**. From the menu, select a protocol that a packet's IP protocol must be matched against: **ICMP**, **IGMP**, **IP**, **TCP**, **UDP**, **EIGRP**, **GRE**, **IPINIP**, **OSPF**, or **PIM**.
- **TCP Flag**. For each TCP flag, specify whether or not a packet's TCP flag must be matched. The TCP flag values are URG, ACK, PSH, RST, SYN, and FIN. You can set each TCP flag separately to one of the following options:
  - **Ignore**. The packet's TCP flag is ignored. This is the default setting.
  - **Set (+)**. A packet matches this ACL rule if the TCP flag in this packet is set.
  - **Clear (-)**. A packet matches this ACL rule if the TCP flag in this packet is not set.

Note: If the RST and ACK flags are set, the option **Established** is available, indicating that a match occurs if either the RST- or ACK-specified bits are set in the packet's header.

- **Src**. In the **Src** field, enter a source IP address, using dotted-decimal notation, to be compared to a packet's source IP address as a match criteria for the selected IP ACL rule:
  - If you select the **IP Address** radio button, enter an IP address with a relevant wildcard mask to apply this criteria. If this field is left empty, it means *any*.

- If you select the **Host** radio button, the wildcard mask is configured as 0.0.0.0. If this field is left empty, it means *any*.

  The wildcard mask determines which bits are used and which bits are ignored. A wildcard mask of 0.0.0.0 indicates that *none* of the bits are important. A wildcard of 255.255.255.255 indicates that *all* of the bits are important.

- **Src L4**. The options are available only when protocol is set to TCP or UDP. Use the source L4 port option to specify relevant matching conditions for L4 port numbers in the extended ACL rule.

  You can select either the **Port** radio button or the **Range** radio button:

  - If you select the **Port** radio button, you can either select **port key** from the menu or enter the port number yourself.
    - The source IP TCP port names are bgp, domain, echo, ftp, ftpdata, http, smtp, snmp, Telnet, www, pop2, pop3.
    - The source IP UDP port names are domain, echo, ntp, rip, snmp, tftp, time, who.

    Each of these values translates into its equivalent port number, which is used as both the start and end of the port range.

    Select **Other** from the menu to enter a port number. If you select **Other** from the menu but leave the field blank, it means *any*.

    The relevant matching conditions for L4 port numbers are as follows:

    - **Equal**. IP ACL rule matches only if the Layer 4 source port number is equal to the specified port number or port key.
    - **Less Than**. IP ACL rule matches if the Layer 4 source port number is less than the specified port number or port key.
    - **Greater Than**. IP ACL rule matches if the Layer 4 source port number is greater than the specified port number or port key.
    - **Not Equal**. IP ACL rule matches only if the Layer 4 source port number is not equal to the specified port number or port key.
  - If you select the **Range** radio button, the IP ACL rule matches only if the Layer 4 source port number is within the specified port range. The starting port, ending port, and all ports in between are a part of the Layer 4 port range.

    The **Start Port** and **End Port** fields identify the first and last ports that are part of the port range. They values can range from 0 to 65535.

    Select **Other** from the menu to enter port numbers. If you select **Other** from the menu but leave the fields blank, it means *any*.

    The wildcard mask determines which bits are used and which bits are ignored. A wildcard mask of 0.0.0.0 indicates that *none* of the bits are important. A wildcard of 255.255.255.255 indicates that *all* of the bits are important.

- **Dst**. In the **Dst** field, enter a destination IP address, using dotted-decimal notation, to be compared to a packet's destination IP address as a match criteria for the selected IP ACL rule:
  - If you select the **IP Address** radio button, enter an IP address with a relevant wildcard mask to apply this criteria. If this field is left empty, it means *any*.
  - If you select the **Host** radio button, the wildcard mask is configured as 0.0.0.0. If this field is left empty, it means *any*.

    The wildcard mask determines which bits are used and which bits are ignored. A wildcard mask of 0.0.0.0 indicates that *none* of the bits are important. A wildcard of 255.255.255.255 indicates that *all* of the bits are important.
- **Dst L4**. The options are available only when protocol is set to TCP or UDP. Use the destination L4 port option to specify relevant matching conditions for L4 port numbers in the extended ACL rule.

  You can select either the **Port** radio button or the **Range** radio button:
  - If you select the **Port** radio button, you can either select **port key** from the menu or enter the port number yourself.
    - The destination IP TCP port names are bgp, domain, echo, ftp, ftpdata, http, smtp, snmp, Telnet, www, pop2, pop3.
    - The destination IP UDP port names are domain, echo, ntp, rip, snmp, tftp, time, who.

    Each of these values translates into its equivalent port number, which is used as both the start and end of the port range.

    Select **Other** from the menu to enter a port number. If you select **Other** from the menu but leave the field blank, it means *any*.

    The relevant matching conditions for L4 port numbers are as follows:
    - **Equal**. The IP ACL rule matches only if the Layer 4 destination port number is equal to the specified port number or port key.
    - **Less Than**. The IP ACL rule matches if the Layer 4 destination port number is less than the specified port number or port key.
    - **Greater Than**. The IP ACL rule matches if the Layer 4 destination port number is greater than the specified port number or port key.
    - **Not Equal**. The IP ACL rule matches only if the Layer 4 destination port number is not equal to the specified port number or port key.
  - If you select the **Range** radio button, the IP ACL rule matches only if the Layer 4 destination port number is within the specified port range. The starting port, ending port, and all ports in between are a part of the Layer 4 port range.

    The **Start Port** and **End Port** fields identify the first and last ports that are part of the port range. They values can range from 0 to 65535.

    Select **Other** from the menu to enter port numbers. If you select **Other** from the menu but leave the fields blank, it means *any*.

The wildcard mask determines which bits are used and which bits are ignored. A wildcard mask of 0.0.0.0 indicates that *none* of the bits are important. A wildcard of 255.255.255.255 indicates that *all* of the bits are important.

- **IGMP Type**. If you specify the IGMP type, the IP ACL rule matches the specified IGMP message type. Possible values are in the range 0 to 255. If this field is left empty, it means *any*.
- **ICMP**. Select either the **ICMP Type** or **ICMP Message** radio button:
  - If you select the **ICMP Type** radio button, note the following:
    - The **ICMP Type** and **ICMP Code** fields are enabled only if the protocol is ICMP. Use these fields to specify a match condition for ICMP packets:
    - The IP ACL rule matches the specified ICMP message type. Possible type numbers are in the range from 0 to 255.
    - If you specify information in the **ICMP Code** field, the IP ACL rule matches the specified ICMP message code. Possible values for the code can be in the range from 0 to 255.
    - If these fields are left empty, it means *any*.
  - If you select the **ICMP Message** radio button, select the type of the ICMP message to match with the selected IP ACL rule. Specifying a type of message implies that both the ICMP type and ICMP code are specified. The ICMP message is decoded into the corresponding ICMP type and ICMP code within the ICMP type.

    The IPv4 ICMP message types are: echo, echo-reply, host-redirect, mobile-redirect, net-redirect, net-unreachable, redirect, packet-too-big, port-unreachable, source-quench, router-solicitation, router-advertisement, time-exceeded, ttl-exceeded, and unreachable.
- **Fragments**. Either select **Enable** to allow initial fragments (that is, the fragment bit is asserted) or leave the default setting at **Disable** to prevent initial fragments from being used.

  This option is not valid for rules that match L4 information such as TCP port number, because that information is carried in the initial packet.
- **Service Type**. Select a service type match condition for the extended IP ACL rule.

  The possible values are **IP DSCP**, **IP precedence**, and **IP TOS**, which are alternative methods to specify a match criterion for the same service type field in the IP header. Each method uses a different user notation. After you make a selection is made, you can specify the appropriate values.

  - **IP DSCP**. This is an optional configuration. Specify the IP DiffServ Code Point (DSCP) field. The DSCP is defined as the high-order 6 bits of the service type octet in the IP header. Enter an integer from 0 to 63. To select the IP DSCP, select one of the DSCP keywords from the menu. To specify a numeric value, select **Other** and a field displays in which you can enter numeric value of the DSCP.

- **IP Precedence**. This is an optional configuration. The IP precedence field in a packet is defined as the high-order three bits of the service type octet in the IP header. Enter an integer from 0 to 7.
- **IP TOS**. This is an optional configuration. The IP ToS field in a packet is defined as all 8 bits of the service type octet in the IP header. The ToS bits value is a hexadecimal number from 00 to 09 and to aa to ff. The ToS mask value is a hexadecimal number from 00 to FF. The ToS mask denotes the bit positions in the ToS bits value that are used for comparison against the IP ToS field in a packet.

  For example, to check for an IP ToS value for which bit 7 is set and is the most significant value, for which bit 5 is set, and for which bit 1 is cleared, use a ToS bits value of 0xA0 and a ToS mask of 0xFF.

- **Rate Limit Conform Data Rate**. Specify the conforming data rate of IP ACL rule. Valid values are 1 to 4294967295 in Kbps.
- **Rate Limit Burst Size**. Specify the burst size of the IP ACL rule. Valid values are 1 to 128 in Kbytes.
- **Time Range**. Specify the name of the time range that you want to associate with the IP ACL rule.

8. Click the **Apply** button.

   Your settings are saved.

   The **Rule Status** field displays whether the ACL rule is active or inactive. Blank means that no timer schedules are assigned to the rule.

Configure an IPv6 ACL

An IPv6 ACL consists of a set of rules that are matched sequentially against a packet. When a packet meets the match criteria of a rule, the specified rule action (permitted or denied) is taken, and the additional rules are not checked for a match.

You must specify the interfaces to which an IP ACL applies and select whether the IP ACL applies to inbound or outbound traffic.

To configure an IPv6 ACL:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Security > ACL > Advanced > IPv6 ACL**.

5. In the **IPv6 ACL** field in the IPv6 ACL Table, specify the name for the IPv6 ACL.

   This is the IPv6 ACL name string, which includes up to 31 alphanumeric characters only. The name must start with an alphabetic character.

6. Click the **Add** button.

   The IPv6 ACL is added to the switch configuration.

The following table describes the nonconfigurable information displayed on the page.

Table 218. IPv6 ACL

Field	Description
Current Number of ACL	The current number of the IP ACLs configured on the switch.
Maximum ACL	The maximum number of IP ACLs that can be configured on the switch, depending on the hardware.
Rules	The number of the rules associated with the IP ACL.
Type	The type is IPv6 ACL.

Configure IPv6 Rules

Use these pages to display the rules for the IPv6 access control lists, which are created using the IPv6 Access Control List Configuration page. By default, no specific value is in effect for any of the IPv6 ACL rules.

Configure ACL IPv6 rules:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

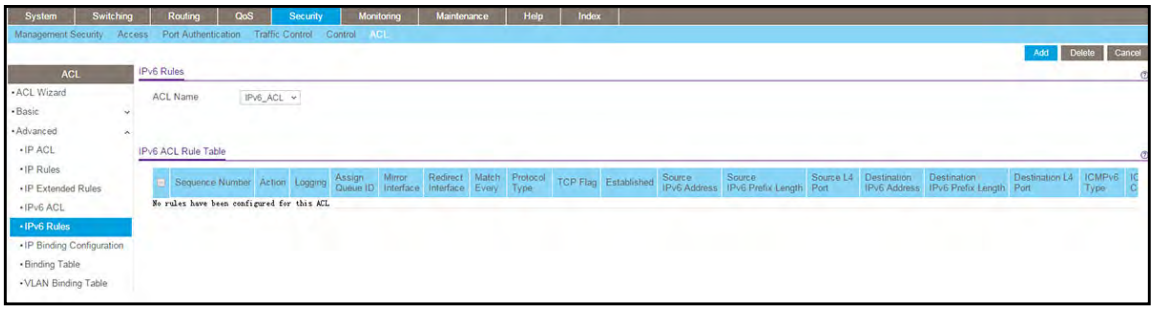
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

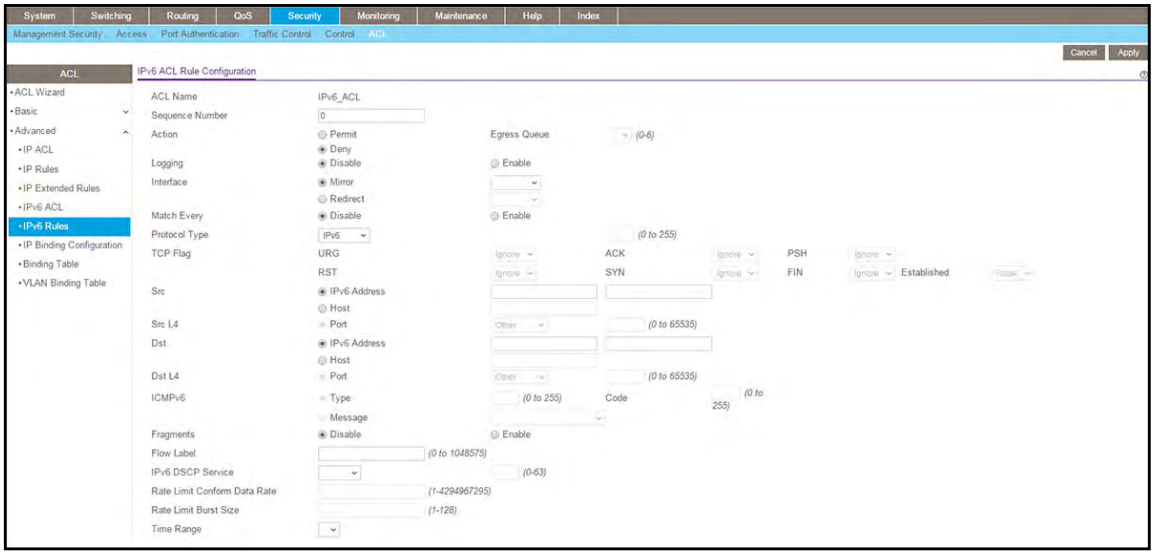
   The System Information page displays.

4. Select **Security > ACL > Advanced > IPv6 Rules**.



   If no rules exists, the IPv6 ACL Rule Table shows the message *No rules have been configured for this ACL*. If one or more rule exists for the ACL, the rules display in the IPv6 ACL Rule Table.

5. From the **ACL Name** menu, select the IPv6 ACL for which you want to add or a change a rule.
6. Take one of the following actions:
   - To add an IPv6 ACL rule, click the **Add** button.
   - To change an existing rule, click the rule hyperlink in the Sequence Number column of the IPv6 ACL Rule Table.



7. Configure the following options for the rule:
   - **Sequence Number**. Enter a whole number in the range of 1 to 2147483647. This number is used to identify the rule. An IPv6 ACL can contain up to 1023 rules.

- **Action**. Specify what action is taken if a packet matches the rule's criteria. The choice is **Permit** or **Deny**.
- **Logging**. When set to Enable, logging is enabled for this ACL rule (subject to resource availability in the device). If the access list trap flag is also enabled, this causes periodic traps to be generated indicating the number of times this rule was *hit* during the current report interval. A fixed 5-minute report interval is used for the entire system. A trap is not issued if the ACL rule hit count is zero for the current interval. This field is visible for a *Deny* action.
- **Egress Queue**. The hardware egress queue identifier used to handle all packets matching this IPv6 ACL rule. Valid range of queue IDs is 0 to 7. This field is visible when Permit is chosen as the action.
- **Interface**. For a *Permit* action, use either a mirror interface or a redirect interface:
  - Select the **Mirror Interface** radio button and use the menu to specify the egress interface to which the matching traffic stream is copied, in addition to being forwarded normally by the device.
  - Select the **Redirect Interface** radio button and use the menu to specify the egress interface to which the matching traffic stream is forced, bypassing any forwarding decision normally performed by the device.
- **Match Every**. From the menu, select **True** or **False**.

  True signifies that all packets must match the selected IPv6 ACL and rule and are either permitted or denied. In this case, because all packets match the rule, the option of configuring other match criteria is not available. To configure specific match criteria for the rule, remove the rule and recreate it, or select **False** from the **Match Every** menu.
- **Protocol Type**. Specify the IPv6 protocol Type in one of the following ways:
  - From the **Protocol Type** menu, select **IPv6**, **TCP**, **UDP**, or **ICMPv6**.
  - From the **Protocol Type** menu, select **Other**, and in the associated field, specify an integer ranging from 1 to 255. This number represents the IPv6 protocol.
- **TCP Flag**. For each TCP flag, specify whether or not a packet's TCP flag must be matched. The TCP flag values are URG, ACK, PSH, RST, SYN, and FIN. You can set each TCP flag separately to one of the following options:
  - **Ignore**. The packet's TCP flag is ignored. This is the default setting.
  - **Set (+)**. A packet matches this ACL rule if the TCP flag in this packet is set.
  - **Clear (-)**. A packet matches this ACL rule if the TCP flag in this packet is not set.

Note: If the RST and ACK flags are set, the option **Established** is available, indicating that a match occurs if either the RST- or ACK-specified bits are set in the packet's header.

- **Src**. In the **Src** field, enter a source IPv6 address to be compared to a packet's source IPv6 address as a match criteria for the selected IPv6 ACL rule:
  - If you select the **IPv6 Address** radio button, enter an IPv6 address to apply this criteria. If this field is left empty, it means *any*.

- If you select the **Host** radio button, enter a host source IPv6 address to match the specified IPv6 address. If this field is left empty, it means *any*.

The source IPv6 address argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.

- **Src L4**. The options are available only when protocol is set to TCP or UDP. Use the source L4 port option to specify relevant matching conditions for L4 port numbers in the extended ACL rule.

  You can select either the **Port** radio button or the **Range** radio button:

  - If you select the **Port** radio button, you can either select **port key** from the menu or enter the port number yourself.
    - The source IP TCP port names are bgp, domain, echo, ftp, ftpdata, http, smtp, snmp, Telnet, www, pop2, pop3.
    - The source IP UDP port names are domain, echo, ntp, rip, snmp, tftp, time, who.

    Each of these values translates into its equivalent port number, which is used as both the start and end of the port range.

    Select **Other** from the menu to enter a port number. If you select **Other** from the menu but leave the field blank, it means *any*.

    The relevant matching conditions for L4 port numbers are as follows:\

    - **Equal**. The IPv6 ACL rule matches only if the Layer 4 source port number is equal to the specified port number or port key.
    - **Less Than**. The IPv6 ACL rule matches if the Layer 4 source port number is less than the specified port number or port key.
    - **Greater Than**. The IPv6 ACL rule matches if the Layer 4 source port number is greater than the specified port number or port key.
    - **Not Equal**. The IPv6 ACL rule matches only if the Layer 4 source port number is not equal to the specified port number or port key.
  - If you select the **Range** radio button, the IPv6 ACL rule matches only if the Layer 4 source port number is within the specified port range. The starting port, ending port, and all ports in between are a part of the Layer 4 port range.

    The **Start Port** and **End Port** fields identify the first and last ports that are part of the port range. They values can range from 0 to 65535.

    Select **Other** from the menu to enter port numbers. If you select **Other** from the menu but leave the fields blank, it means *any*.

- **Dst**. In the **Dst** field, enter a destination IPv6 address to be compared to a packet's destination IPv6 address as a match criteria for the selected IPv6 ACL rule:
  - If you select the **IPv6 Address** radio button, enter an IPv6 address to apply this criteria. If this field is left empty, it means *any*.
  - If you select the **Host** radio button, enter a host source IPv6 address to match the specified IPv6 address. If this field is left empty, it means *any*.

The source IPv6 address argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.

- **Dst L4**. The options are available only when protocol is set to TCP or UDP. Use the destination L4 port option to specify relevant matching conditions for L4 port numbers in the extended ACL rule.

  You can select either the **Port** radio button or the **Range** radio button:

  - If you select the **Port** radio button, you can either select **port key** from the menu or enter the port number yourself.
    - The destination IP TCP port names are bgp, domain, echo, ftp, ftpdata, http, smtp, snmp, Telnet, www, pop2, pop3.
    - The destination IP UDP port names are domain, echo, ntp, rip, snmp, tftp, time, who.

    Each of these values translates into its equivalent port number, which is used as both the start and end of the port range.

    Select **Other** from the menu to enter a port number. If you select **Other** from the menu but leave the field blank, it means *any*.

    The relevant matching conditions for L4 port numbers are as follows:

    - **Equal**. The IPv6 ACL rule matches only if the Layer 4 destination port number is equal to the specified port number or port key.
    - **Less Than**. The IPv6 ACL rule matches if the Layer 4 destination port number is less than the specified port number or port key.
    - **Greater Than**. The IPv6 ACL rule matches if the Layer 4 destination port number is greater than the specified port number or port key.
    - **Not Equal**. The IPv6 ACL rule matches only if the Layer 4 destination port number is not equal to the specified port number or port key.
  - If you select the **Range** radio button, the IPv6 ACL rule matches only if the Layer 4 destination port number is within the specified port range. The starting port, ending port, and all ports in between are a part of the Layer 4 port range.

    The **Start Port** and **End Port** fields identify the first and last ports that are part of the port range. They values can range from 0 to 65535.

    Select **Other** from the menu to enter port numbers. If you select **Other** from the menu but leave the fields blank, it means *any*.

- **IGMPv6 Type**. If you specify the IGMPv6 type, the IPv6 ACL rule matches the specified IGMPv6 message type. Possible values are in the range 0 to 255. If this field is left empty, it means *any*.
- **ICMPv6**. Select either the **ICMP Type** or **ICMP Message** radio button:
  - If you select the **ICMP Type** radio button, note the following:
    - The **ICMP Type** and **ICMP Code** fields are enabled only if the protocol is ICMPv6. Use these fields to specify a match condition for ICMPv6 packets:

- The IPv6 ACL rule matches the specified ICMPv6 message type. Possible type numbers are in the range from 0 to 255.
- If you specify information in the **ICMP Code** field, the IPv6 ACL rule matches the specified ICMPv6 message code. Possible values for code can be in the range from 0 to 255.
- If these fields are left empty, it means *any*.

- If you select the **ICMP Message** radio button, select the type of the ICMPv6 message to match with the selected IPv6 ACL rule. Specifying a type of message implies that both the ICMPv6 type and ICMPv6 code are specified. The ICMPv6 message is decoded into the corresponding ICMPv6 type and ICMPv6 code within the ICMP type.

  The ICMPv6 message types are: destination-unreachable, echo-reply, echo-request, header, hop-limit, mld-query, mld-reduction, mld-report, nd-na, nd-ns, next-header, no-admin, no-route, packet-too-big, port-unreachable, router-solicitation, router-advertisement, router-renumbering, time-exceeded, and unreachable.

- **Fragments**. Either select **Enable** to allow initial fragments (that is, the fragment bit is asserted) or leave the default setting at **Disable** to prevent initial fragments from being used.

  This option is not valid for rules that match L4 information such as TCP port number, because that information is carried in the initial packet.

- **Flow Label**. The **Flow Label** field is enabled only if selection from the **Protocol Type** menu is ICMPv6. The flow label is 20-bit number that is unique to an IPv6 packet and that is used by end stations to signify quality-of-service handling in routers. The flow label can specified within the range 0 to 1048575.
- **IPv6 DSCP Service**. Specify the IP DiffServ Code Point (DSCP) field. This is an optional configuration.

  The DSCP is defined as the high-order six bits of the service type octet in the IPv6 header. Enter an integer from 0 to 63. To select the IPv6 DSCP, select one of the DSCP keywords. To specify a numeric value, select **Other** and enter the numeric value of the DSCP.

- **Rate Limit Conform Data Rate**. Specify the conforming data rate of IPv6 ACL rule. Valid values are 1 to 4294967295 in Kbps.
- **Rate Limit Burst Size**. Specify the burst size of the IPv6 ACL rule. Valid values are 1 to 128 in Kbytes.
- **Time Range**. Specify the name of the time range that you want to associate with the IPv6 ACL rule.

8. Click the **Apply** button.

   Your settings are saved.

   The **Rule Status** field displays whether the ACL rule is active or inactive. Blank means that no timer schedules are assigned to the rule.

Configure IP ACL Interface Bindings

When an ACL is bound to an interface, all the rules that are defined are applied to the selected interface. You can assign ACL lists to ACL priorities and interfaces.

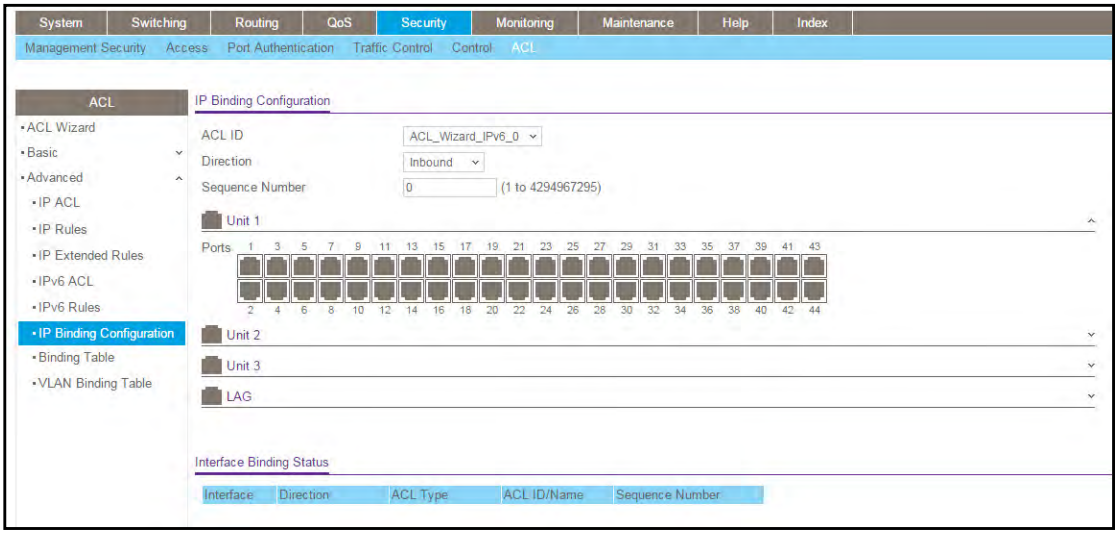
To configure IP ACL interface bindings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > ACL > Advanced > IP Binding Configuration**.



5. From the **ACL ID** menu, select an IP ACL.

Note: Binding ACLs to interface fails when the system has no resources to bind a new ACL. IPv4 ACLs and IPv6 ACLs cannot be bound at the same time to an interface.

---

6. Select the packet filtering **Direction** for ACL.

   Valid directions are Inbound or Outbound. The packet filtering direction for ACL is Inbound, which means the IP ACL rules are applied to traffic entering the port.

7. Specify an optional **Sequence Number** to indicate the order of this access list relative to other access lists already assigned to this interface and direction.

   A low number indicates high precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached access list using that sequence number. If you do not specify the sequence number (meaning that the value is 0), a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used. The valid range is 1–4294967295.

8. From the **Unit 1**, **Unit 2**, **Unit 3**, and **LAG** switch figures onscreen, select the ports and LAGs to which the rule must apply.

   If a port or LAG is not selected, click the port or LAG to select it. If a port or LAG is selected, click the port or LAG to clear it again.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 219. IP Binding Configuration

Field	Description
Interface	Displays the selected interface.
Direction	Displays the selected packet filtering direction for the ACL.
ACL Type	The type of ACL assigned to the selected interface and direction.
ACL ID/Name	The ACL number (in the case of IP ACL) or ACL name (in the case of named IP ACL and IPv6 ACL) identifying the ACL assigned to selected interface and direction.
Sequence Number	The sequence number signifying the order of specified ACL relative to other ACLs assigned to selected interface and direction.

View and Delete IP ACL Bindings in the IP ACL Binding Table

To view and delete IP ACL bindings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

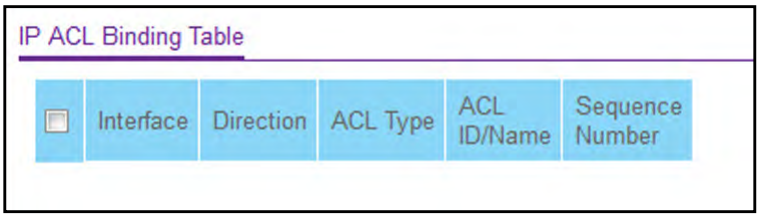
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Security > ACL > Advanced > Binding Table**.



5. To delete an IP ACL-to-interface binding, select the check box next to the interface and click the **Delete** button.

The following table describes the information displayed in the IP ACL Binding Table.

Table 220. IP ACL Binding Table

Field	Description
Interface	Displays the selected interface.
Direction	Displays the selected packet filtering direction for the ACL.
ACL Type	The type of ACL assigned to the selected interface and direction.
ACL ID/Name	The ACL number (in the case of the IP ACL) or ACL name (in the case of Named IP ACL and IPv6 ACL) identifying the ACL assigned to selected interface and direction.
Sequence Number	The sequence number signifying the order of the specified ACL relative to other ACLs assigned to selected interface and direction.

Configure VLAN ACL Bindings

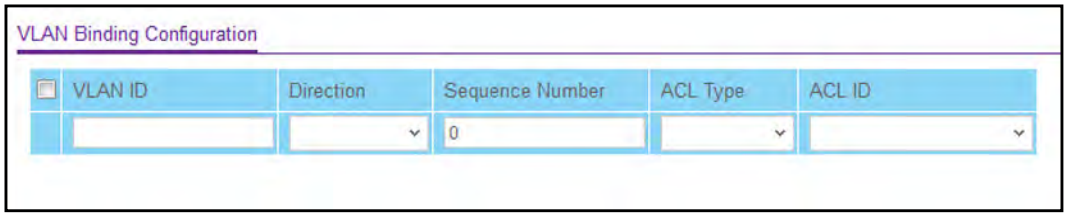
To configure VLAN ACL bindings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Security > ACL> Advanced > VLAN Binding Table**.



5. In the **VLAN ID** field, enter the VLAN ID to which the binding must apply.
6. From the **Direction** menu, select the packet filtering direction.
7. In the Sequence Number field, enter an optional sequence number.

   You can specify an optional sequence number to indicate the order of this access list relative to other access lists that are already assigned to the VLAN ID and selected direction. A lower number indicates a higher precedence order. If a sequence number is already in use for the VLAN ID and selected direction, the specified access list replaces the currently attached ACL using that sequence number. If you do not specify a sequence number (the value is 0), a sequence number that is one greater than the highest sequence number currently in use for the VLAN ID and selected direction is used. The valid range is 1 to 4294967295.
8. From the **ACL Type** menu, select the type of ACL.

   Valid ACL types include IP ACL, MAC ACL, and IPv6 ACL.
9. From the **ACL ID** menu, select to display all the ACLs configured, depending on the ACL type selected.
10. Click the **Add** button.

    The VLAN ACL binding is added to the ACL VLAN Binding Table.

10

Monitor the Switch and Network

This chapter covers the following topics:

- View Port and EAP Packet Statistics
- Manage the Buffered, Command, and Console Logs
- Configure the Syslog and Syslog Host Settings
- View and Clear the Trap Logs
- View and Clear the Event Log
- Configure Multiple Port Mirroring
- Manage an RSPAN VLAN
- Configure sFlow

View Port and EAP Packet Statistics

You can view port statistics, including detailed statistics, and Extensible Authentication Protocol (EAP) packets statistics.

View and Clear Port Statistics

You can view a summary of per-port traffic statistics on the switch and clear the statistics.

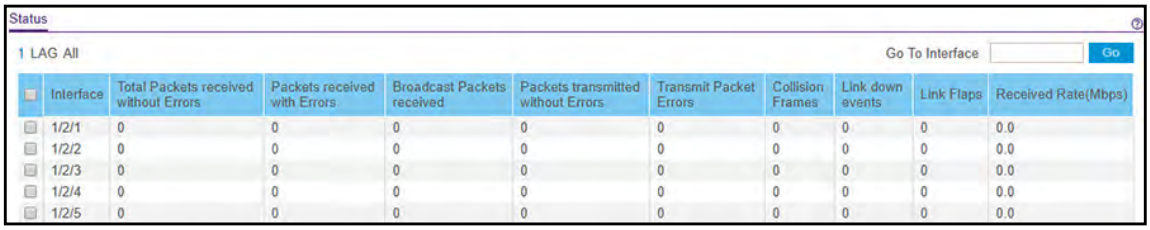
To view and clear port statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring** > **Ports > Port Statistics**.



   The previous does not show all columns.
5. Use a button at the bottom of the page to perform one of the following actions:
   - To clear all the counters for all ports on the switch, select the check box in the row heading and click the **Clear** button.
   - To clear the counters for a specific port, select the check box for the port and click the **Clear** button.
   - To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the per-port statistics displayed on the page.

Table 221. Port Statistics

Field	Description
Interface	This object indicates the interface of the interface table entry associated with this port on an adapter.
Total Packets Received Without Errors	The total number of packets received that were without errors.
Packets Received With Error	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
Broadcast Packets Received	The total number of good packets received that were directed to the broadcast address. This does not include multicast packets.
Packets Transmitted Without Errors	The number of frames that were transmitted by this port to its segment.
Transmit Packet Errors	The number of outbound packets that could not be transmitted because of errors.
Collision Frames	The best estimate of the total number of collisions on this Ethernet segment.
Number of Link Down Events	The total number of link down events on a physical port.
Link Flaps	The total number of occurrences of link down to link up events (makes one link flap) during debouncing time.
Received Rate (Mbps)	The received data rate in Mbps.
Transmitted Rate (Mbps)	The transmitted data rate in Mbps.
Received Error Rate	The received data rate with errors in Mbps.
Transmitted Error Rate	The transmitted data rate with errors in Mbps.
Packets Received Per Second	The number of received packets per second.
Packets Transmitted Per Second	The number of transmitted packets per second.
Time Since Counters Last Cleared	The elapsed time in days, hours, minutes, and seconds since the statistics for this port were last cleared.

View and Clear the Detailed Port Statistics

You can view a variety of per-port traffic statistics and clear the statistics.

To view and clear the detailed port statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

The login window opens.

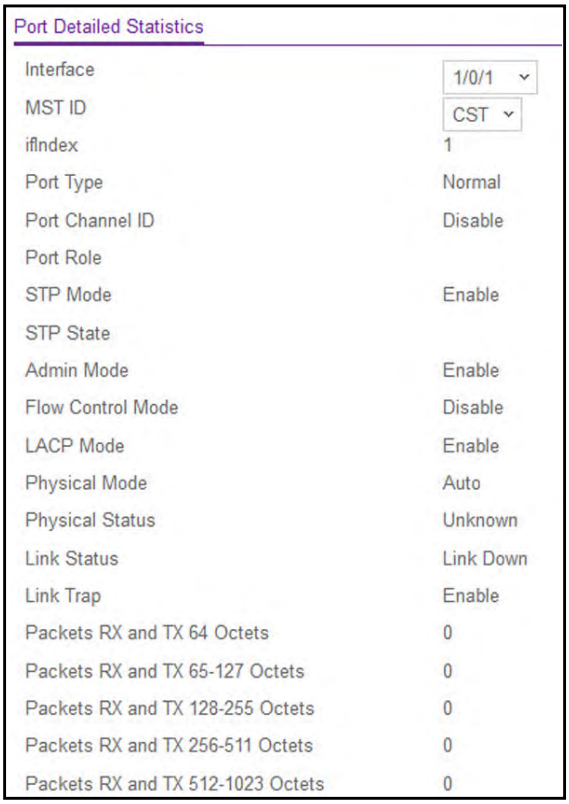
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Monitoring > Ports > Port Detailed Statistics**.

   The following figure shows some, but not all, of the fields on the Port Detailed Statistics page.



5. Use a button at the bottom of the page to perform one of the following actions:
   - To clear all the counters, click the **Clear** button. This resets all statistics for this port to the default values.
   - To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the detailed port information displayed on the page. To view information about a different port, select the port number from the Interface menu.

Table 222. Port Detailed Statistics

Field	Description
MST ID	Display the MST instances associated with the interface.
ifIndex	This object indicates the ifIndex of the interface table entry associated with this port on an adapter.
Port Type	For normal ports this field is normal. Otherwise the possible values are as follows: • **Mirrored**. This port is a participating in port mirroring as a mirrored port. Look at the Port Mirroring pages for more information. • **Probe**. This port is a participating in port mirroring as the probe port. Look at the Port Mirroring pages for more information. • **Trunk Member**. The port is a member of a link aggregation trunk. Look at the Port Channel pages for more information.
Port Channel ID	If the port is a member of a port channel, the port channel's interface ID and name are shown. Otherwise, Disable is shown.
Port Role	Each MST bridge port that is enabled is assigned a port tole for each spanning tree. The port role is one of the following values: Root, Designated, Alternate, Backup, Master, or Disabled.
STP Mode	The Spanning Tree Protocol administrative mode associated with the port or port channel. The possible values are as follows: • Enable. Spanning tree is enabled for this port. • Disable. Spanning tree is disabled for this port.
STP State	The port's current Spanning Tree state. This state controls what action a port takes on receipt of a frame. If the bridge detects a malfunctioning port it places that port into the broken state. The states are defined in IEEE 802.1D: • Disabled • Blocking • Listening • Learning • Forwarding • Broken
Admin Mode	The port control administration state. The port must be enabled in order for it to be allowed into the network. The factory default is enabled.
Flow Control Mode	Indicates whether flow control is enabled or disabled for the port. This field is not valid for LAG interfaces.
LACP Mode	Indicates the Link Aggregation Control Protocol administrative state. The mode must be enabled in order for the port to participate in link aggregation.
Physical Mode	Indicates the port speed and duplex mode. In autonegotiation mode the duplex mode and speed are set from the autonegotiation process.
Physical Status	Indicates the port speed and duplex mode.

Table 222. Port Detailed Statistics (continued)

Field	Description
Link Status	Indicates whether the link is up or down.
Link Trap	Indicates whether or not the port sends a trap when link status changes.
Packets RX and TX 64 Octets	The total number of packets (including bad packets) received or transmitted that were 64 octets in length (excluding framing bits but including FCS octets).
Packets RX and TX 65-127 Octets	The total number of packets (including bad packets) received or transmitted that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).
Packets RX and TX 128-255 Octets	The total number of packets (including bad packets) received or transmitted that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).
Packets RX and TX 256-511 Octets	The total number of packets (including bad packets) received or transmitted that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
Packets RX and TX 512-1023 Octets	The total number of packets (including bad packets) received or transmitted that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).
Packets RX and TX 1024-1518 Octets	The total number of packets (including bad packets) received or transmitted that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).
Packets RX and TX 1519-2047 Octets	The total number of packets (including bad packets) received or transmitted that were between 1519 and 2047 octets in length inclusive (excluding framing bits but including FCS octets).
Packets RX and TX 2048-4095 Octets	The total number of packets (including bad packets) received or transmitted that were between 2048 and 4095 octets in length inclusive (excluding framing bits but including FCS octets).
Packets RX and TX 4096-9216 Octets	The total number of packets (including bad packets) received or transmitted that were between 4096 and 9216 octets in length inclusive (excluding framing bits but including FCS octets).
Octets Received	The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets). This object can be used as a reasonable estimate of Ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects must be sampled before and after a common interval.
Packets Received 64 Octets	The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).
Packets Received 65-127 Octets	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).
Packets Received 128-255 Octets	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).

Table 222. Port Detailed Statistics (continued)

Field	Description
Packets Received 256-511 Octets	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).
Packets Received 512-1023 Octets	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).
Packets Received 1024-1518 Octets	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).
Packets Received > 1518 Octets	The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
Total Packets Received Without Errors	The total number of packets received that were without errors.
Unicast Packets Received	The number of subnetwork-unicast packets delivered to a higher-Layer protocol.
Multicast Packets Received	The total number of good packets received that were directed to a multicast address. This number does not include packets directed to the broadcast address.
Broadcast Packets Received	The total number of good packets received that were directed to the broadcast address. This does not include multicast packets.
Transmit Packets Discarded	The total number of outbound packets that were discarded even though no errors were detected that would prevent the packets from being delivered to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Receive Packets Discarded	The number of inbound packets that were discarded even though no errors were detected to prevent their being delivered to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Total Packets Received with MAC Errors	The total number of inbound packets that contained errors preventing them from being deliverable to a higher-Layer protocol.
Jabbers Received	The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad frame check sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a nonintegral number of octets (alignment error). This definition of jabber is different from the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition where any packet exceeds 20 ms. The allowed range to detect jabber is between 20 ms and 150 ms.
Fragments Received	The total number of packets received that were less than 64 octets in length with ERROR CRC (excluding framing bits but including FCS octets).
Undersize Received	The total number of packets received that were less than 64 octets in length with GOOD CRC (excluding framing bits but including FCS octets).

Table 222. Port Detailed Statistics (continued)

Field	Description
Alignment Errors	The total number of packets received with a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad frame check sequence (FCS) with a nonintegral number of octets.
Rx FCS Errors	The total number of packets received with a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad frame check sequence (FCS) with an integral number of octets
Overruns	The total number of frames discarded because this port was overloaded with incoming packets, and could not keep up with the inflow.
Total Received Packets Not Forwarded	A count of valid frames received that were discarded (that is, filtered) by the forwarding process.
802.3x Pause Frames Received	A count of MAC control frames received on this interface with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode.
Unacceptable Frame Type	The number of frames discarded from this port due to being an unacceptable frame type.
Total Packets Transmitted (Octets)	The total number of octets of data (including those in bad packets) transmitted on the network (excluding framing bits but including FCS octets). This object can be used as a reasonable estimate of Ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects must be sampled before and after a common interval.
Packets Transmitted 64 Octets	The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).
Packets Transmitted 65-127 Octets	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).
Packets Transmitted 128-255 Octets	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).
Packets Transmitted 256-511 Octets	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).
Packets Transmitted 512-1023 Octets	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).
Packets Transmitted 1024-1518 Octets	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).
Packets Transmitted **>** 1518 Octets	The total number of packets transmitted that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed. This counter has a max increment rate of 815 counts per sec at 10 Mb/s.

Table 222. Port Detailed Statistics (continued)

Field	Description
Maximum Frame Size	The maximum Ethernet frame size the interface supports or is configured to use, including Ethernet header, CRC, and payload. (1518 to 9216). The default maximum frame size is 1518.
Total Packets Transmitted Successfully	The number of frames that were transmitted by this port to its segment.
Unicast Packets Transmitted	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.
Multicast Packets Transmitted	The total number of packets that higher-level protocols requested be transmitted to a multicast address, including those that were discarded or not sent.
Broadcast Packets Transmitted	The total number of packets that higher-level protocols requested be transmitted to the broadcast address, including those that were discarded or not sent.
Total Transmit Errors	The sum of single, multiple, and excessive collisions.
Total Transmit Packets Discarded	The sum of single collision frames discarded, multiple collision frames discarded, and excessive frames discarded.
Single Collision Frames	A count of the number of successfully transmitted frames on a particular interface for which transmission is inhibited by exactly one collision.
Multiple Collision Frames	A count of the number of successfully transmitted frames on a particular interface for which transmission is inhibited by more than one collision.
Excessive Collision Frames	A count of frames for which transmission on a particular interface fails due to excessive collisions.
STP BPDUs Received	Number of STP BPDUs received at the selected port.
STP BPDUs Transmitted	Number of STP BPDUs transmitted from the selected port.
RSTP BPDUs Received	Number of RSTP BPDUs received at the selected port.
RSTP BPDUs Transmitted	Number of RSTP BPDUs transmitted from the selected port.
MSTP BPDUs Received	Number of MSTP BPDUs received at the selected port.
MSTP BPDUs Transmitted	Number of MSTP BPDUs transmitted from the selected port.
802.3x Pause Frames Transmitted	A count of MAC control frames transmitted on this interface with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode.
GVRP PDUs Received	The count of GVRP PDUs received in the GARP Layer.
GVRP PDUs Transmitted	The count of GVRP PDUs transmitted from the GARP Layer.
GVRP Failed Registrations	The number of times attempted GVRP registrations could not be completed.
GMRP PDUs Received	The count of GMRP PDUs received from the GARP Layer.
GMRP PDUs Transmitted	The count of GMRP PDUs transmitted from the GARP Layer.

Table 222. Port Detailed Statistics (continued)

Field	Description
GMRP Failed Registrations	The number of times attempted GMRP registrations could not be completed.
EAPOL Frames Received	The number of valid EAPOL frames of any type that were received by this authenticator.
EAPOL Frames Transmitted	The number of EAPOL frames of any type that were transmitted by this authenticator.
Load Interval	The period in seconds for which data is used to compute load statistics.
Received Rate (Mbps)	The received data rate in Mbps.
Transmitted Rate (Mbps)	The transmitted data rate in Mbps.
Received Error Rate	The received data rate with errors in Mbps.
Transmitted Error Rate	The transmitted data rate with errors in Mbps.
Packets Received Per Second	The number of received packets per second.
Packets Transmitted Per Second	The number of transmitted packets per second.
Time Since Counters Last Cleared	The elapsed time in days, hours, minutes, and seconds since the statistics for this port were last cleared.

View EAP Statistics

You can display information about EAP packets received on a specific port.

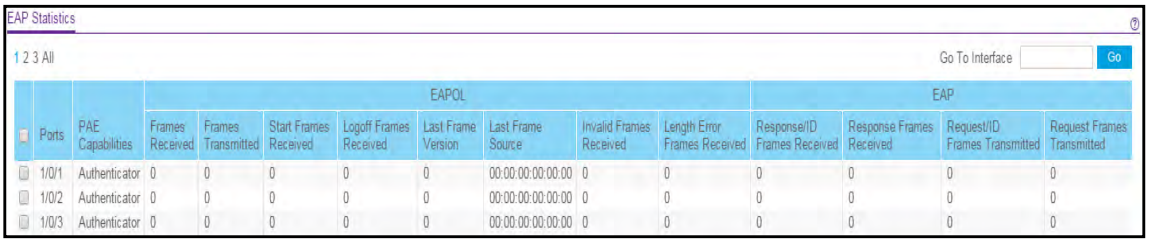
To view EAP statistics:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Ports > EAP Statistics**.



5. Use a button at the bottom of the page to perform one of the following actions:
   - To clear all the EAP counters for all ports on the switch, select the check box in the row heading and click the **Clear** button. Clicking the button resets all statistics for all ports to default values.
   - To clear the counters for a specific port, select the check box associated with the port and click the **Clear** button.
   - To refresh the page with the latest information on the switch, click the **Refresh** button.

The following table describes the EAP statistics displayed on the page.

Table 223. EAP Statistics

Field	Description
Port	Selects the port to be displayed. When the selection is changed, a page update occurs causing all fields to be updated for the newly selected port. All physical interfaces are valid.
PAE Capabilities	This displays the PAE capabilities of the selected port.
EAPOL Frames Received	This displays the number of valid EAPOL frames of any type that were received by this authenticator.
EAPOL Frames Transmitted	This displays the number of EAPOL frames of any type that were transmitted by this authenticator.
EAPOL Start Frames Received	This displays the number of EAPOL start frames that were received by this authenticator.
EAPOL Logoff Frames Received	This displays the number of EAPOL logoff frames that were received by this authenticator.
EAPOL Last Frame Version	This displays the protocol version number carried in the most recently received EAPOL frame.
EAPOL Last Frame Source	This displays the source MAC address carried in the most recently received EAPOL frame.
EAPOL Invalid Frames Received	This displays the number of EAPOL frames that were received by this authenticator in which the frame type is not recognized.
EAPOL Length Error Frames Received	This displays the number of EAPOL frames that were received by this authenticator in which the frame type is not recognized.
EAP Response/ID Frames Received	This displays the number of EAP response/identity frames that were received by this authenticator.

Table 223. EAP Statistics

Field	Description
EAP Response Frames Received	This displays the number of valid EAP response frames (other than resp/ID frames) that were received by this authenticator.
EAP Request/ID Frames Transmitted	This displays the number of EAP request/identity frames that were transmitted by this authenticator.
EAP Request Frames Transmitted	This displays the number of EAP request frames (other than request/identity frames) that were transmitted by this authenticator.

Perform a Cable Test

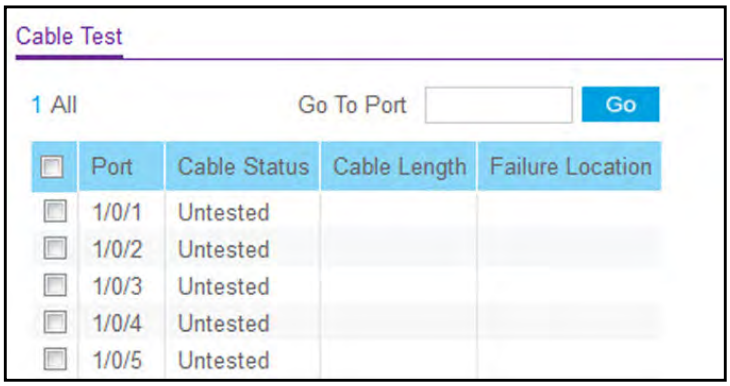
To perform a cable test:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Ports > Cable Test**.



5. Use one of the following methods to select a port:
   - In the **Go To Port** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Port column, select the check box for the port that you want to test.
6. Click the **Apply** button.

   A cable test is performed on the selected interface. The cable test might take up to two seconds to complete. If the port has an active link, the cable status is always *Normal*. The

command returns a cable length estimate if this feature is supported by the PHY for the current link speed. Note that if the link is down and a cable is attached to a 10/100 Ethernet adapter then the cable status might be *Open* or *Short* because some Ethernet adapters leave unused wire pairs unterminated or grounded.

The following table describes the nonconfigurable information displayed on the page.

Table 224. Cable Test

Field	Description
Cable Status	This displays the cable status as Normal, Open or Short. • Normal: the cable is working correctly. • Open: the cable is disconnected or there is a faulty connector. • Short: there is an electrical short in the cable. • Cable Test Failed: The cable status could not be determined. The cable might in fact be working. • Untested: The cable is not yet tested. • Invalid cable type: The cable type is unsupported.
Cable Length	The estimated length of the cable in meters. The length is displayed as a range between the shortest estimated length and the longest estimated length. Unknown is displayed if the cable length could not be determined. The Cable Length is only displayed if the cable status is Normal.
Failure Location	The estimated distance in meters from the end of the cable to the failure location. The failure location is only displayed if the cable status is Open or Short.

Manage the Buffered, Command, and Console Logs

The switch generates messages in response to events, faults, or errors occurring on the platform as well as changes in configuration or other occurrences. These messages are stored locally and can be forwarded to one or more centralized points of collection for monitoring purposes or long-term archival storage (see Configure the Syslog and Syslog Host Settings on page 649). Local and remote configuration of the logging capability includes filtering of messages logged or forwarded based on severity and generating component.

View and Clear the Buffered Logs

To view and clear the buffered logs:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

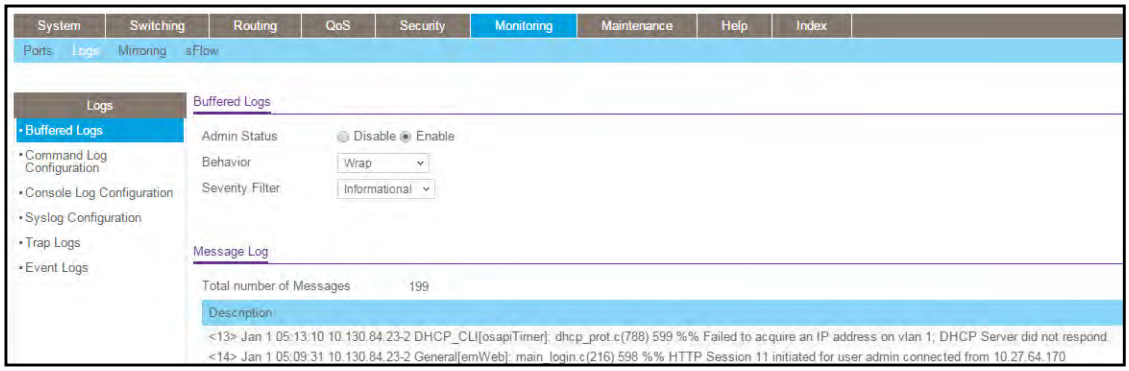
The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Monitoring > Logs > Buffered Logs**.



5. To clear the buffered log from the memory, click the **Clear** button.

Configure the Memory Log Settings

This log stores messages in memory based upon the settings for message component and severity.

To configure the memory log settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

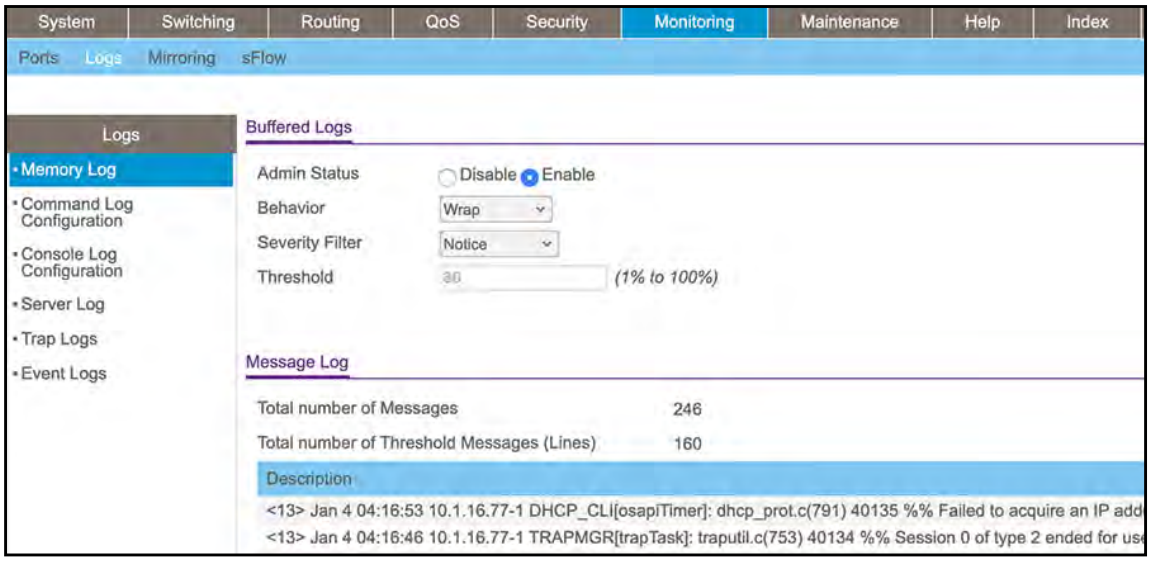
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Monitoring > Logs > Memory Log**.



5. Select the Admin Status **Enable** or **Disable** radio button.

   A log that is disabled does not log messages.

6. From the **Behavior** menu, select the action that occurs when the log is full.

   The log can either wrap around (**Wrap**, which is the default action) or logging can stop when the log is full (**Stop-on-Full**).

7. Form the **Severity Filter** menu, select the severity level:

   A log records messages equal to or above a configured severity level. The severity levels are as follows:

   - **Emergency (0)**. The system is unusable.
   - **Alert (1)**. Action must be taken immediately.
   - **Critical (2)**. Critical conditions.
   - **Error (3)**. Error conditions.
   - **Warning (4)**. Warning conditions.
   - **Notice (5)**. Normal but significant conditions.
   - **Informational (6)**. Informational messages.
   - **Debug (7)**. Debug-level messages.

8. In the **Threshold** field, enter the percentage (from 1 to 100 percent) of log space that, if exceeded, causes logging to stop.

   The threshold applies only if the selection from the **Behavior** menu is **Stop-on-Full**.

   By default, the default the selection from the **Behavior** menu is **Wrap** and the threshold does not apply.

9. Click the **Apply** button.

   Your settings are saved.

Message Log Format

This topic applies to the format of all logged messages that are displayed for the message log, persistent log, or console log.

Messages logged to a collector or relay through syslog use an identical format:

- <15>Aug 24 05:34:05 0.0.0.0-1 MSTP[2110]: mspt_api.c(318) 237%% Interface 12 transitioned to root state on message age timer expiry.

  This example indicates a message with severity 7 (15 mod 8) (debug) on a switch and generated by component MSTP running in thread ID 2110 on Aug 24 05:34:05 by line 318 of file mstp_api.c. This is the 237th message logged with system IP 0.0.0.0 and task-ID 1.

- <15>Aug 24 05:34:05 STK0 MSTP[2110]: mspt_api.c(318) 237%% Interface 12 transitioned to root state on message age timer expiry.

  This example indicates a user-level message (1) with severity 7 (debug) on a system that is not a switch and generated by component MSTP running in thread ID 2110 on Aug 24 05:34:05 by line 318 of file mstp_api.c. This is the 237th message logged. Messages logged to a collector or relay through syslog use a format identical to the previous message.

- Total number of Messages: For the message log, only the latest 200 entries are displayed on the page.

Enable or Disable the Command Log

To enable or disable the command log:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

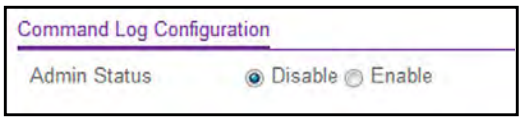
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Monitoring > Logs > Command Log Configuration**.



5. Use **Admin Mode** to enable/disable the operation of the CLI command logging by selecting the corresponding radio button.
6. Click the **Apply** button.

   Your settings are saved.

Enable or Disable Console Logging

This allows logging to any serial device attached to the host.

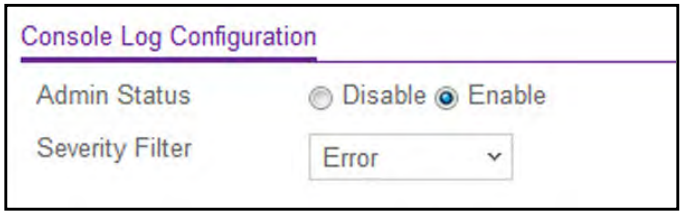
To enable or disable console logging:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Logs > Console Log Configuration**.



5. Select the Admin Status **Disable** or **Enable** radio button.

   A log that is disabled does not log messages.
6. **Severity Filter**. A log records messages equal to or above a configured severity threshold. Select the severity option by selecting the corresponding line on the drop-down entry field. These severity levels are available:
   - **Emergency (0)**. The system is unusable.
   - **Alert (1)**. Action must be taken immediately.
   - **Critical (2)**. Critical conditions.
   - **Error (3)**. Error conditions.
   - **Warning (4)**. Warning conditions.
   - **Notice (5)**. Normal but significant conditions.
   - **Informational (6)**. Informational messages.
   - **Debug (7)**. Debug-level messages.
7. Click the **Apply** button.

   Your settings are saved.

Configure the Syslog and Syslog Host Settings

You can let the switch filter the messages that are forwarded, based on severity and generating component. You can also configure the syslog host settings.

Configure the Syslog Settings

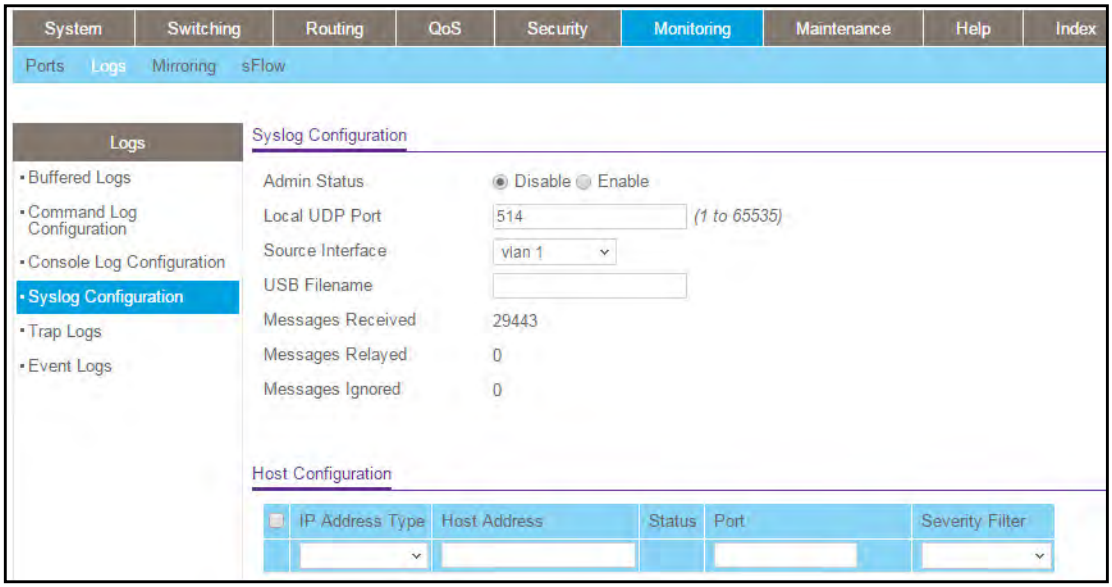
To configure the syslog settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Logs > Syslog Configuration**.



   The **Status** field displays whether the host was configure to be actively logging or not.
5. Select the Admin Status **Disable** or **Enable** radio button.

   This enables or disables logging to configured syslog hosts. When the Admin Status is disabled, the device does not relay logs to syslog hosts, and no messages are sent to

any collectors or relays. When the syslog Admin Status is enabled, messages are sent to configured collectors or relays using the values configured for each collector or relay.

6. Use **Local UDP Port** to specify the port on the local host from which syslog messages are sent. The range is 1 to 65535. The default port is 514.
7. Specify the **Source Interface** to use for syslog.

   Possible values are as follows:

   - None. When the None value is displayed, it means that the configured routing interface has become nonrouting.
   - Routing interface
   - Routing VLAN
   - Routing loopback interface
   - Tunnel interface
   - Service port

   By default, VLAN 1 is used as source interface.
8. Use the **USB Filename** field to specify the name of the USB file. The filename cannot include the following symbols: V:*?”<>!. Up to 64 characters can be entered. The 64 characters are only the filename length, the extension is automatically added. The default value is blank.
9. Click the **Apply** button.

   Your settings are saved.

   Note: Syslog can write the log messages simultaneously to a remote server and the USB storage device.

Configure the Syslog Host Settings

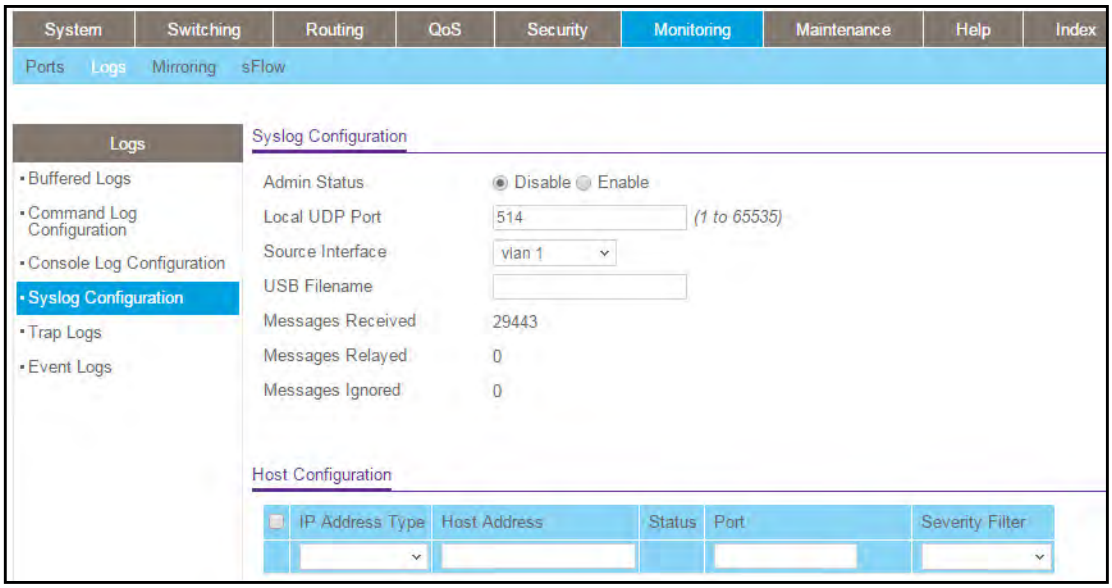
To configure the syslog host settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Logs > Syslog Configuration**.



5. In the Host Configuration section, configure the following settings:
   - From the **IP Address Type** menu, select the address type of host.
     - IPv4
     - IPv6
     - DNS
   - In the **Host Address** field, specify the address of the host configured for the syslog.
   - In the **Port** field, specify the port on the host to which syslog messages are sent.

     The default port is 514.
   - Select the severity option in the **Severity Filter** list.

     A log records messages equal to or above a configured severity threshold. These severity levels are available:

     - **Emergency (0)**. The system is unusable
     - **Alert (1)**. Action must be taken immediately
     - **Critical (2)**. Critical conditions
     - **Error (3)**. Error conditions
     - **Warning (4)**. Warning conditions
     - **Notice (5)**. Normal but significant conditions
     - **Informational (6)**. Informational messages
     - **Debug (7)**. Debug-level messages
6. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information.

Table 225. Syslog Configuration

Field	Description
Messages Received	The number of messages received by the log process. This includes messages that are dropped or ignored.
Messages Relayed	The count of syslog messages relayed.
Messages Ignored	The count of syslog messages ignored.

View and Clear the Trap Logs

You can view and clear the entries in the trap log. The information can be retrieved as a file.

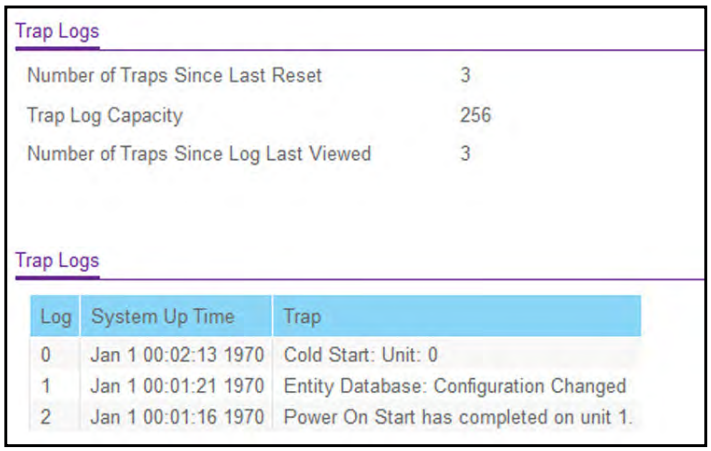
View and clear the trap logs:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Logs > Trap Logs**.



The page also displays information about the traps that were sent.

5. To clear all the counters, click the **Clear** button.

This resets all statistics for the trap logs to the default values.

The following table describes the Trap Log information displayed on the page.

Table 226. Trap Logs

Field	Description
Number of Traps Since Last Reset	The number of traps that occurred since the switch last rebooted.
Trap Log Capacity	The maximum number of traps stored in the log. If the number of traps exceeds the capacity, the entries overwrite the oldest entries.
Number of Traps since log last viewed	The number of traps that occurred since the traps were last displayed. Displaying the traps by any method (terminal interface display, web display, upload file from switch, and so on) causes this counter to be cleared to 0.
Log	The sequence number of this trap.
System Up Time	The time when this trap occurred, expressed in days, hours, minutes and seconds, since the last reboot of the switch.
Trap	Information identifying the trap.

View and Clear the Event Log

You can view and clear the event log, which contains error messages from the system. The event log is not cleared on a system reset.

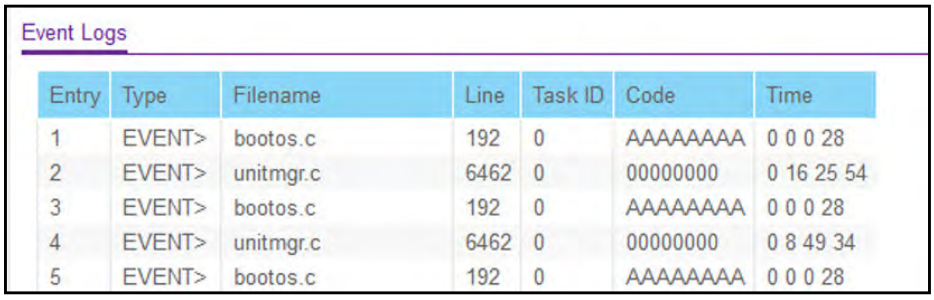
To view and clear the event log:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Logs > Event Logs**.



5. To clear the messages from the Event Log, click the **Clear** button.

The following table describes the event log information displayed on the page.

Table 227. Event Logs

Field	Description
Entry	The sequence number of the event.
Type	The type of the event.
File Name	The file in which the event originated.
Line	The line number of the event.
Task Id	The task ID of the event.
Code	The event code.
Time	The time this event occurred.

Configure Multiple Port Mirroring

Port mirroring selects the network traffic for analysis by a network analyzer. This is done for specific ports of the switch. As such, many switch ports are configured as source ports and one switch port is configured as a destination port. You can configure how traffic is mirrored on a source port. Packets that are received on the source port, that are transmitted on a port, or are both received and transmitted can be mirrored to the destination port.

The packet that is copied to the destination port is in the same format as the original packet on the wire. This means that if the mirror is copying a received packet, the copied packet is VLAN tagged or untagged as it was received on the source port. If the mirror is copying a transmitted packet, the copied packet is VLAN tagged or untagged as it is being transmitted on the source port.

Globally Configure Multiple Port Mirroring

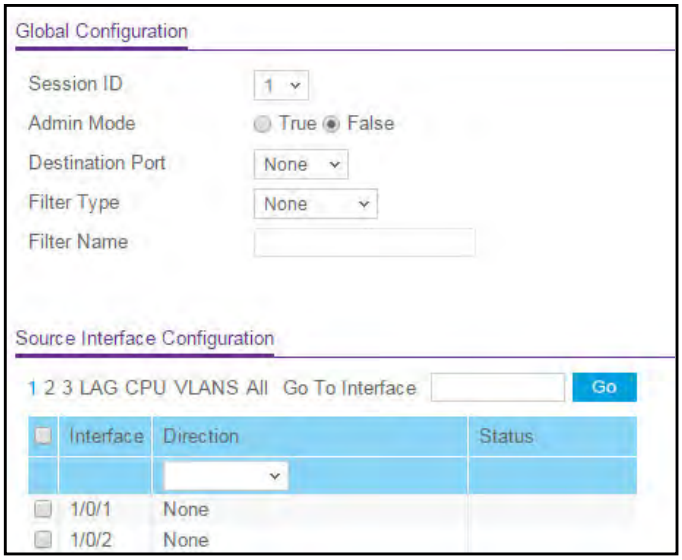
To globally configure multiple port mirroring:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Mirroring > Multiple Port Mirroring**.



5. Select the number of the port mirroring session ID from the **Session ID** list. The number of sessions allowed is platform specific.
6. Select the Administrative Mode for the selected port mirroring session using the **True** (enabled) or **False** (disabled) radio button.

   Select the **True** option to enable Admin mode for the selected session. When a particular session is enabled, any traffic entering or leaving the source ports of the session is copied (mirrored) onto the corresponding destination port or a remote switched port analyzer (RSPAN) VLAN. By default, Admin mode is disabled (**False**). If the mode is **False** (disabled), the configured source is not mirroring traffic to the destination.
7. From the **Destination Port** list, select the destination interface to which port traffic is to be copied.

   You can configure only one destination port on the system. It acts as a probe port and receives traffic from all configured source ports. If the value is not configured, it is shown as **None**. The default value is **None**.

8. From the **Filter Type** list, select the IP or MAC ACL that can mirror traffic that matches a permit rule.

   Possible values are as follows:

   - **None**. No filter is configured for the session.
   - **IP ACL**. Configure the IP access-list ID or name ACL. The ID of the IP ACL to apply to traffic from the source. Only traffic that matches the rules in the ACL is mirrored to the destination.
   - **MAC ACL**. Configure MAC ACL.The ID of the MAC ACL to apply to traffic from the source. Only traffic that matches the rules in the ACL is mirrored to the destination.

   The default value is None.

9. In the **Filter Name** field, enter the name of the filter, if it is configured for the session.
10. Click the **Apply** button.

    Your settings are saved.

Configure The Port Mirroring Source Interface

Note: If an interface participates in a VLAN and is a LAG member, the VLAN cannot be assigned as a source VLAN for a monitor session. At the same time, if an interface participates in a VLAN and this VLAN is assigned as a source VLAN for a monitor session, the interface can be assigned as a LAG member.

To configure port mirroring source interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

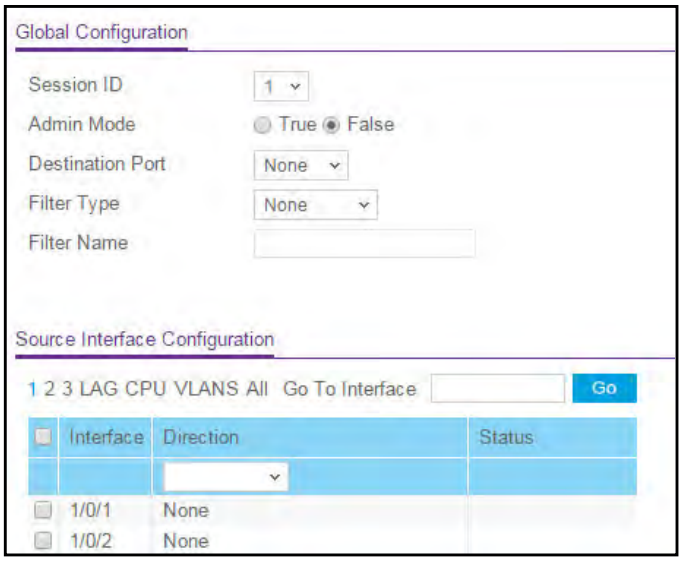
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Monitoring > Mirroring > Multiple Port Mirroring**.



5. In the Source Interface Configuration section, select which interfaces are displayed on the page:
   - Select **Unit ID** to display the physical ports of the selected unit.
   - Select **LAG** to display a list of LAGs only.
   - Select **CPU** to display a list of CPUs only.
   - Select **VLANs** to display a list of available VLANs.
   - Select **All** to display a list of all physical ports, LAG, CPU, and VLANs.
6. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface or interfaces that you want to include.
7. **In the Direction field, specify** the direction of the traffic to be mirrored from the configured mirrored ports.

   If the value is not configured, it is shown as None. The default value is None. Direction options are as follows:

   - **None**. The value is not configured.
   - **Tx and Rx**. Monitors transmitted and received packets.
   - **Rx**. Monitors received (ingress) packets only.
   - **Tx**. Monitors transmitted (egress) packets only.

   Note: For VLANs only, the **Tx and Rx** and **None** options are applicable.

   - **Tx and Rx**. Specify VLAN as the source VLAN.
   - **None**. Remove the specified source VLAN.

If the VLAN is configured as the source VLAN, its direction is displayed as a blank field.

8. Click the **Apply** button.

   Your settings are saved.

   The settings are applied to the system. If the port is configured as a source port, the **Mirroring Port** field value is Mirrored.

   The **Status** field indicates the interface status.

Note: If an error dialog includes multiple error messages, resolve the first error messages to be able to view the remaining errors messages.

Manage an RSPAN VLAN

You can configure the VLAN to use the remote switched port analyzer (RSPAN) VLAN. RSPAN allows you to mirror traffic from multiple source ports (or from all ports that are members of a VLAN) from different network devices and send the mirrored traffic to a destination port (a probe port connected to a network analyzer) on a remote device. The mirrored traffic is tagged with the RSPAN VLAN ID and transmitted over trunk ports in the RSPAN VLAN.

Configure an RSPAN VLAN

To configure an RSPAN VLAN:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

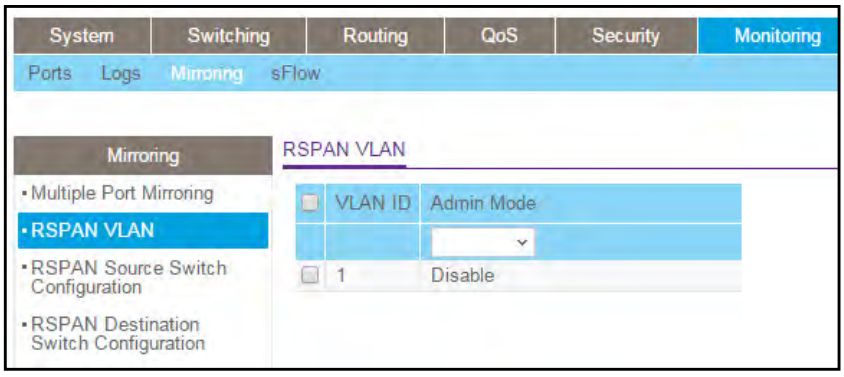
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Monitoring > Mirroring > RSPAN VLAN**.



The **VLAN ID** column lists all VLANs on the device.

5. Select the VLAN to use as the RSPAN VLAN.
6. In the **Admin Mode** list, select to **Enable** or **Disable** RSPAN support on the corresponding VLAN.

   The default value is Disable.
7. Click the **Apply** button.

   Your settings are saved.

Configure an RSPAN Source Switch

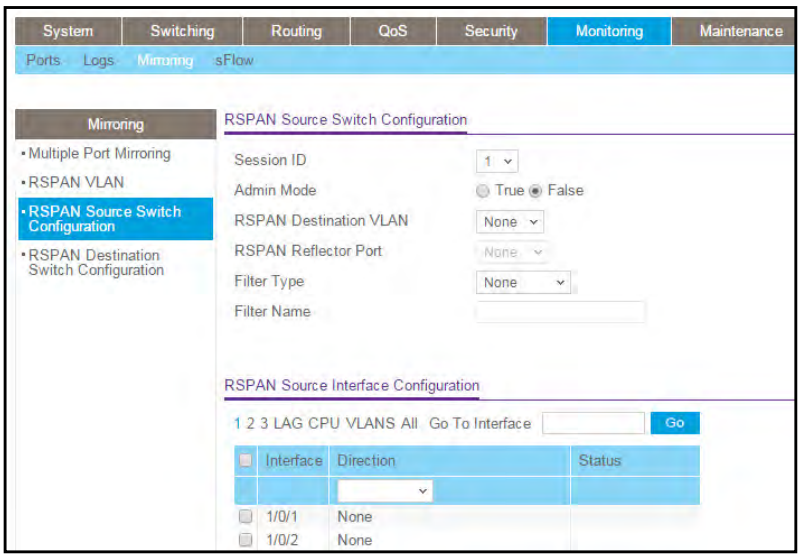
To configure an RSPAN source switch:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Mirroring > RSPAN Source Switch Configuration**.



5. Select the **Session ID** number from the list.
6. Select the Admin Mode **True** (enabled) or **False** (disabled) radio button for the selected session.

   When a particular session is enabled, any traffic entering or leaving the source ports of the session is copied (mirrored) onto the corresponding destination port or a remote switched port analyzer (RSPAN) VLAN. By default, Admin mode is False (disabled).
7. Select the **RSPAN Destination VLAN** from the list of available VLAN IDs.
8. Select the **RSPAN Reflector Port** from the list of reflector port interfaces.
9. Select from the **Filter Type** list to configure IP or MAC ACLs that can mirror traffic that matches a permit rule.

   Possible values are as follows:

   - **None**.
   - **IP ACL**. Configure IP ACL.
   - **MAC ACL**. Configure MAC ACL.
10. Enter the **Filter Name**, if a filter is configured for the session.
11. Click the **Apply** button.

    Your settings are saved.

Configure an RSPAN Source Interface

To configure an RSPAN source interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

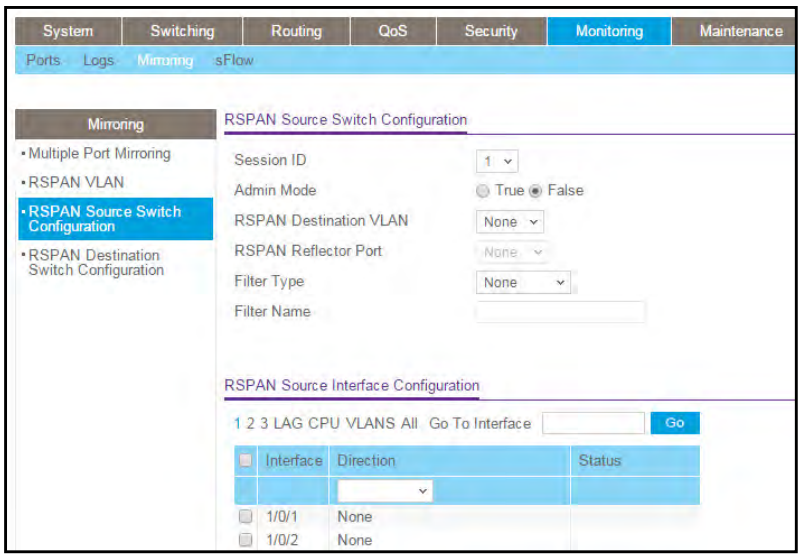
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Monitoring > Mirroring > RSPAN Source Switch Configuration**.



5. Use one of the following methods to display available interfaces on the page:
   - Select a Unit ID (**1, 2, 3**) to display a list of physical ports for the selected unit.
   - Select **LAG** to display LAGs only.
   - Select **CPU** to display CPUs only.
   - Select **VLAN** to display a list of available VLAN IDs.
   - Select **All** to display all physical ports, LAGs, CPUs, and VLANs.
6. Use one of the following methods to select an interface:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to use as the source, or select multiple check boxes to use all selected interfaces as sources.
7. Select from the **Direction** list to specify the direction of the traffic to be mirrored from the configured mirrored ports.

   If the value is not configured, None is displayed. The default value is None.

   - **None**. The value is not configured.
   - **Tx and Rx**. Monitor transmitted and received packets.
   - **Tx**. Monitor transmitted packets only.
   - **Rx**. Monitor received packets only.

8. Click the **Apply** button.

   Your settings are saved.

   Traffic of the selected interfaces is sent to the probe port.

   The **Status** field indicates the interface status.

Configure the RSPAN Destination Switch

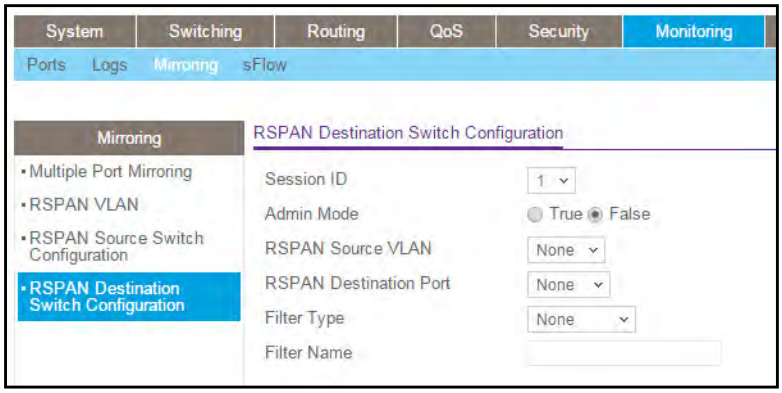
To configure the RSPAN destination switch:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > Mirroring > RSPAN Destination Switch Configuration**.



5. From the **Session ID** list, select the session ID.
6. Select the Admin Mode **True** (enabled) or **False** (disabled) radio button for the selected session.

   When a particular session is enabled, any traffic entering or leaving the source ports of the session is copied (mirrored) onto the corresponding destination port or a remote switched port analyzer (RSPAN) VLAN. By default, the Admin mode is disabled.
7. Select the **RSPAN Source VLAN** from the list of available VLAN IDs.
8. Select the **RSPAN Destination VLAN** from the list of destination interfaces.
9. Configure the **Filter Type**.

IP or MAC ACLs scan mirror traffic that matches a permit rule. Possible values are as follows:

- **None**. No filter is configured for the session.
- **IP ACL**. Configure IP ACL.
- **MAC ACL**. Configure MAC ACL.

10. Enter the **Filter Name**, if it is configured for the session.
11. Click the **Apply** button.

    Your settings are saved.

Configure sFlow

sFlow is the standard for monitoring high-speed switched and routed networks. sFlow technology is built into network equipment and gives complete visibility into network activity, enabling effective management and control of network resources.

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 sFlow Agent uses sampling technology to capture traffic statistics from the device it is monitoring. sFlow datagrams are used to immediately forward the sampled traffic statistics to an sFlow Collector for analysis.

The sFlow Agent uses two forms of sampling: statistical packet-based sampling of switched or routed Packet Flows, and time-based sampling of counters.

sFlow Agent Summary

Packet Flow Sampling and Counter Sampling are performed by sFlow Instances associated with individual Data Sources within the sFlow Agent. Packet Flow Sampling and Counter Sampling are designed as part of an integrated system. Both types of samples are combined in sFlow datagrams. Packet Flow Sampling will cause a steady, but random, stream of sFlow datagrams to be sent to the sFlow Collector. Counter samples may be taken opportunistically in order to fill these datagrams.

In order to perform Packet Flow Sampling, an sFlow Sampler Instance is configured with a Sampling Rate. The Packet Flow sampling process results in the generation of Packet Flow Records. In order to perform Counter Sampling, the sFlow Poller Instance is configured with a Polling Interval, The Counter Sampling process results in the generation of Counter Records. The sFlow Agent collects Counter Records and Packet Flow Records and sends them in the form of sFlow datagrams to sFlow Collectors.

You can configure basic or advanced sFlow settings.

Configure Basic sFlow Agent Information

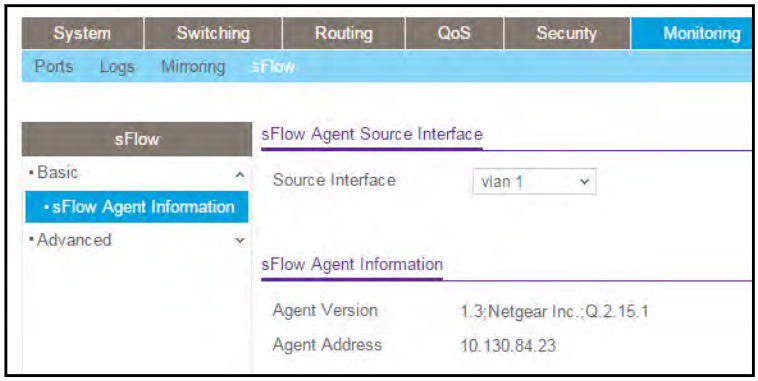
To configure basic sFlow agent information:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > sFlow > Basic > sFlow Agent Information.**



5. In the **Source Interface** list, select the management interface that is used for sFlow Agent.

   Possible values are as follows:

   - None
   - Routing interface
   - Routing VLAN
   - Routing loopback interface
   - Tunnel interface
   - Service port

   By default, VLAN 1 is used as the source interface.
6. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information.

Table 228. sFlow Basic Agent Information

Field	Description
Agent Version	Uniquely identifies the version and implementation of this MIB. The version string must use the following structure: MIB Version;Organization;Software Revision where: • MIB Version: For example, 1.3, the version of this MIB • Organization: NETGEAR, Inc. • Revision: 1.0
Agent Address	The IP address associated with this agent.

Configure sFlow Agent Advanced Settings

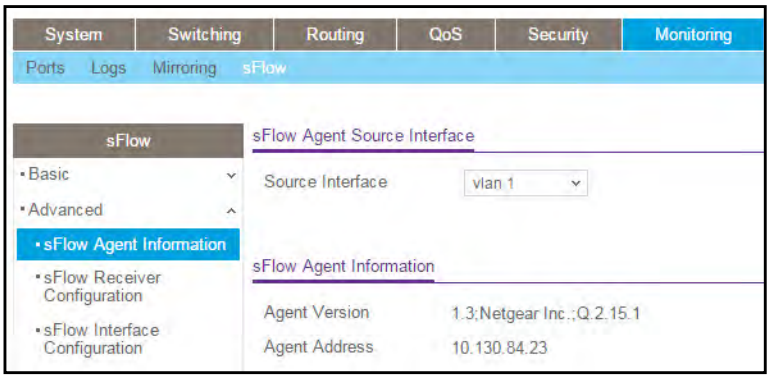
To configure sFlow agent advanced settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > sFlow > Advanced > sFlow Agent Information**.



5. In the **Source Interface** list, select the management interface to be used for sFlow Agent.

   Possible values are as follows:

   • None
   • Routing interface
   • Routing VLAN

- Routing loopback interface
- Tunnel interface
- Service port

By default, VLAN 1 is used as the source interface.

6. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information.

Table 229. sFlow Advanced Agent Information

Field	Description
Agent Version	Uniquely identifies the version and implementation of this MIB. The version string must use the following structure: MIB Version;Organization;Software Revision where: • MIB Version: '1.3', the version of this MIB • Organization: NETGEAR, Inc. • Revision: 1.0
Agent Address	The IP address associated with this agent.

Configure an sFlow Receiver

Use the sFlow Receiver Configuration page to configure the sFlow Receiver.

To configure an sFlow receiver:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

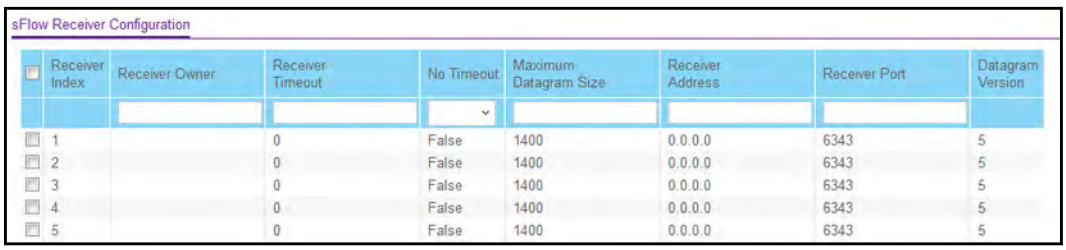
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Monitoring > sFlow > Advanced > sFlow Receiver Configuration**.



5. Next to the Receiver Index columns, select the check box for the receiver for which data must be displayed or configured.

   The allowed range to 1 to 8.

6. In the **Receiver Owner** field, specify the receiver owner.

   This is the entity making use of this sFlowRcvrTable entry. The empty string indicates that the entry is currently unclaimed and the receiver configuration is reset to the default values. An entity wishing to claim an sFlowRcvrTable entry must ensure that the entry is unclaimed before trying to claim it. The entry is claimed by setting the owner string. The entry must be claimed before any changes can be made to other sampler objects.

7. In the **Receiver Timeout** field, specify the time (in seconds) remaining before the sampler is released and stops sampling.

   A management entity wanting to maintain control of the sampler is responsible for setting a new value before the old one expires. The valid range is 0 to 2147483647. A value of zero essentially means the receiver is not configured and sets the selected receiver configuration to its default values. When configuring the sFlow receiver settings, you must select the Timeout Mode option before you can configure a Timeout Value.

8. From the **No Timeout** menu, select **True** or **False** to set the no time-out sampling for the receiver.

   Sampling is not stopped until the No Timeout selected entry is True. The default value is False.

9. In the **Maximum Datagram Size** field, specify the maximum number of data bytes that can be sent in a single sample datagram.

   Set this value to avoid fragmentation of the sFlow datagrams. The default value is 1400. The allowed range is 200 to 12188.

10. In the **Receiver Address** field, specify the IP address of the sFlow collector.

    If set to 0.0.0.0, no sFlow datagrams are sent.

11. In the **Receiver Port** field, specify the destination port for sFlow datagrams.

    The allowed range is 1 to 65535.

12. The **Receiver Datagram Version** field displays the version of sFlow datagrams to be sent.
13. Click the **Apply** button.

    Your settings are saved.

Configure the sFlow Interface

sFlow agent collects statistical packet-based sampling of switched flows and sends them to the configured receivers. A data source configured to collect flow samples is called a sampler. sFlow agent also collects time-based sampling of network interface statistics and sends them to the configured sFlow receivers. A data source configured to collect counter samples is called a poller.

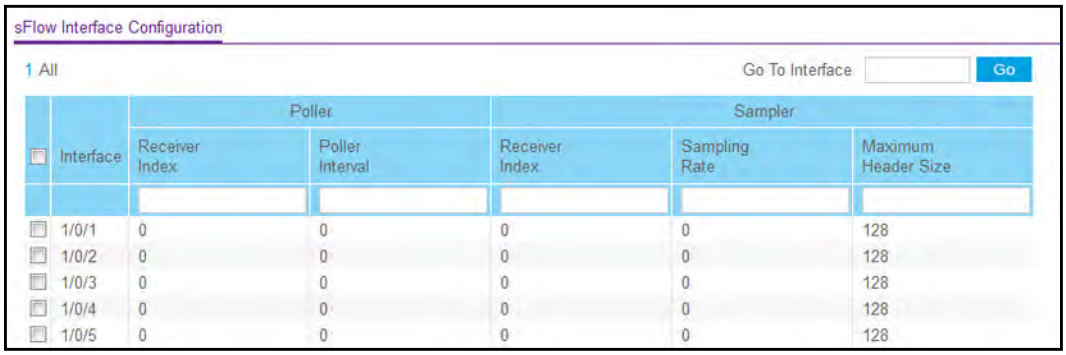
To configure the sFlow Interface:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Monitoring > sFlow > Advanced > sFlow Interface Configuration**.



5. Use one of the following methods to select an interface for the flow poller and sampler:
   - In the **Go To Interface** field, enter the interface in the unit/slot/port format and click on the **Go** button.
   - Next to the Interface column, select the check box for the interface that you want to use.

   This agent supports physical ports only.
6. The Poller Receiver Index is the sFlow Receiver associated with this counter poller.

   Use **Poller Receiver Index** to specify the allowed range for the sFlow receiver. The allowed range is 1 to 8. If set to 0, the poller configuration is set to the default and the poller is deleted.
7. Use **Poller Interval** to specify the maximum number of seconds between successive samples of the counters associated with this data source.

   A sampling interval of 0 disables counter sampling. The Allowed range is 0 to 86400 seconds.
8. Use **Sampler Receiver Index** to specify the sFlow receiver for this flow sampler.

   If set to 0, the sampler configuration is set to default and the sampler is deleted. Only active receivers can be set. If a receiver expires, then all samplers associated with the receiver also expires. The allowed range is 1 to 8.

9. Use **Sampling Rate** to specify the statistical sampling rate for packet sampling from this source.

   A sampling rate of 1 counts all packets. A sampling rate of 0 disables sampling. The allowed range is 1024 to 65536.

10. Use **Maximum Header Size** to specify the maximum number of bytes to be copied from a sampled packet.

    The allowed range is 20 to 256.

11. Click the **Apply** button.

    Your settings are saved.

11

Maintenance and Troubleshooting

This chapter covers the following topics:

- Save the Configuration
- Configure Auto Save Mode
- Reset the Switch to Its Factory Default Settings
- Reset All User Passwords to Their Default Settings
- Upload or Export a File From the Switch
- Download or Import a File to the Switch
- Manage Software Image Files
- Troubleshooting

Save the Configuration

When you save the configuration, changes that you made are retained by the switch when it is rebooted. You can manually save the configuration or you can set up autosave.

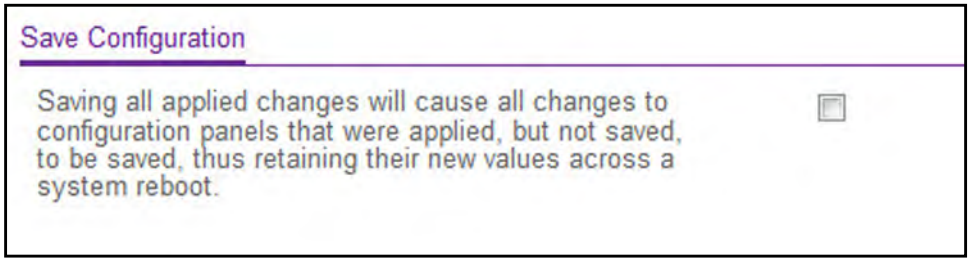
To save the configuration:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Save Config > Save Configuration**.



5. Select the check box.
6. Click the **Apply** button.

   Your settings are saved.

   If you restart the switch, the saved settings are retained.

Configure Auto Save Mode

To configure auto save mode:

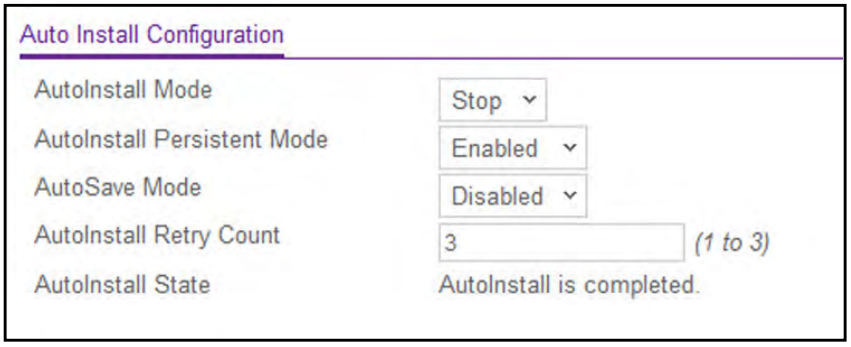
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Maintenance > Save Config > Auto Install Configuration**.



The **Autoinstall State** field displays the current status of the Autoinstall process.

5. From the **AutoInstall Mode** menu, select the start/stop auto install mode on the switch.
6. From the **AutoInstall Persistent Mode** menu, enable or disable the AutoInstall persistent mode.
7. From the **AutoSave Mode** menu, select **Enabled** or **Disabled**.
8. From the **AutoInstall Retry Count** menu, specify the number of times the unicast TFTP tries are made for the DHCP specified file before falling back for broadcast TFTP tries.
9. Click the **Apply** button.

   Your settings are saved.

   If you restart the switch, the saved settings are retained.

Reset the Switch to Its Factory Default Settings

Note: If you reset the switch to the default configuration, the IP address is reset to 169.254.100.100, and the DHCP client is enabled. The IP address of the OOB port is set to 192.168.0.239.

To reset the switch to the factory default settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

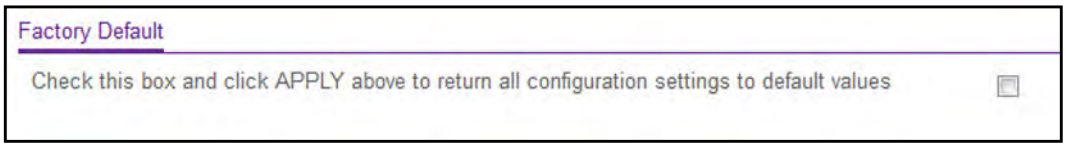
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Maintenance > Reset > Factory Default**.



5. Select the check box.
6. Click the **Apply** button.

   A confirmation pop-up window opens.

7. Click **Yes** to confirm.

   All configuration parameters are reset to their factory default values. All changes you made are, even if you issued a save.

Reset All User Passwords to Their Default Settings

To reset all user passwords to their default settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Maintenance > Reset > Password Reset**.

5. Select the check box.

6. Click the **Apply** button.

   All user passwords are reset to their factory default values.

Upload or Export a File From the Switch

You can upload configuration (ASCII), log (ASCII), and image (binary) files from the switch to the TFTP server.

Upload a File to the TFTP Server

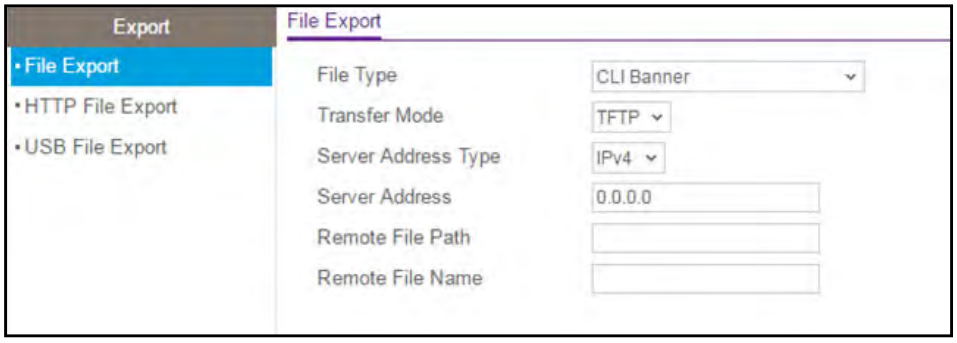
To upload a file from the switch to the TFTP server:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Export > File Export**.



5. Use **File Type** to specify what type of file to upload:
   - **CLI Banner**. Specify CLI Banner to retrieve the CLI banner file.
   - **Text Configuration**. Specify configuration in text mode to retrieve the stored configuration.
   - **Script File**. Specify Script file to retrieve the stored configuration.
   - **Error Log**. Specify Error log to retrieve the system error (persistent) log, sometimes referred to as the event log.
   - **Trap Log**. Specify Trap log to retrieve the system trap records.

- **Buffered Log**. Specify Buffered Log to retrieve the system buffered (in-memory) log.
- **Tech Support**. Specify Tech Support to retrieve the switch information needed for trouble-shooting.
- **Crash Logs**. Specify Crash Log to retrieve the crash logs.
- **Backup Configuration**. Specify Backup Configuration in text mode to retrieve the stored backup configuration.
- **CPU Packets Capture File**. Specify CPU Packets Capture File to retrieve the stored captured CPU packets.
- **Factory Default Configuration**. Specify Factory Default Configuration in text mode to retrieve the stored factory default configuration.

The factory default is CLI Banner.

6. Use **Transfer Mode** to specify what protocol to use to transfer the file:
   - **TFTP**. Trivial File Transfer Protocol
   - **SFTP**. Secure File Transfer Protocol
   - **SCP**. Secure Copy Protocol
   - **FTP**. File Transfer Protocol
7. Use **Server Address Type** to specify either IPv4, IPv6, or DNS to indicate the format of the Server Address field. The factory default is IPv4.
8. Use **Server Address** to enter the IP address of the server in accordance with the format indicated by the seer address type.

   The factory default is the IPv4 address 0.0.0.0.
9. Use **Remote File Path** to enter the path to upload the file.

   File path can include alphabetic, numeric, forward slash, dot or underscore characters only. You can enter up to 160 characters. The factory default is blank.
10. Use **Remote File Name** to enter the name of the file to download from the server. You can enter up to 32 characters.

    The factory default is blank.
11. Use **Local File Name** to specify the local script file name to upload.

    Note: This field is visible only when File Type is Script File.
12. Use **User Name** to enter the user name for remote login to the SFTP/SCP server where the file is sent.

    Note: This field is visible only when the SFTP or SCP transfer mode is selected.
13. Use **Password** to enter the password for remote login to SFTP/SCP server where the file is sent.

Note: This field is visible only when the SFTP or SCP transfer mode is selected.

14. Click the **Apply** button.

    The file is uploaded. The last row of the table displays information about the progress of the file transfer.

Upload a File Using HTTP

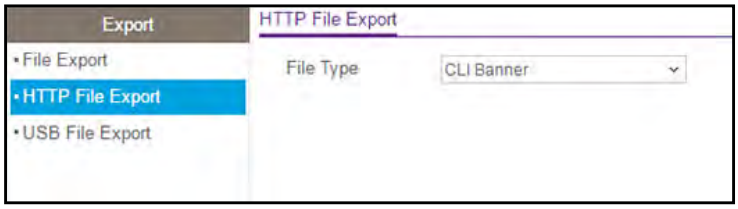
To use HTTP file upload:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Export > HTTP File Export**.



5. Use **File Type** to specify what type of file to upload:
   - **CLI Banner**. Specify CLI Banner to retrieve the CLI banner file.
   - **Text Configuration**. Specify configuration in text mode to retrieve the stored configuration.
   - **Script File**. Specify Script file to retrieve the stored configuration.
   - **Error Log**. Specify Error log to retrieve the system error (persistent) log, sometimes referred to as the event log.
   - **Trap Log**. Specify Trap log to retrieve the system trap records.
   - **Buffered Log**. Specify buffered log to retrieve the system buffered (in-memory) log.
   - **Tech Support**. Specify Tech Support to retrieve the switch information needed for troubleshooting.
   - **Crash Logs**. Specify Crash Logs to retrieve the system crash logs.
   - **Backup Configuration**. Specify Backup Configuration in text mode to retrieve the stored backup configuration.

- **CPU Packets Capture File**. Specify CPU Packets Capture File to retrieve the stored captured CPU packets.
- **Factory Default Configuration**. Specify Factory Default Configuration in text mode to retrieve the stored factory default configuration.

The factory default is CLI Banner.

6. Click the **Apply** button.

   The file is uploaded.

Upload a File from the Switch to a USB Device

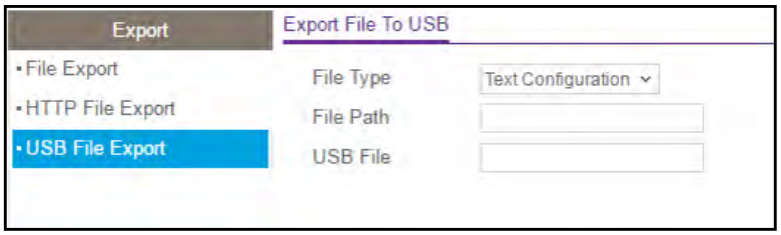
To use upload a file from the switch to a USB device:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Export > USB File Export**.



   By default, the selection from the **File Type** menu is **Text Configuration**. The stored configuration that must be retrieved is in text mode.
5. In the **File Path** field, enter the path for the file to upload.

   You can use up to 146 characters. The default is blank.
6. Use **USB File** to give a name along with path for the file to upload.

   You can enter up to 32 characters. The factory default is blank.
7. Click the **Apply** button.

   The file is uploaded.

Download or Import a File to the Switch

The switch supports system file downloads from a remote system to the switch by using either TFTP or HTTP.

Download a File

For you to be able top download SSH key files, SSH must be administratively disabled and no active SSH sessions must occur.

For you to be able to download SSL-related files, HTTPS must be administratively disabled.

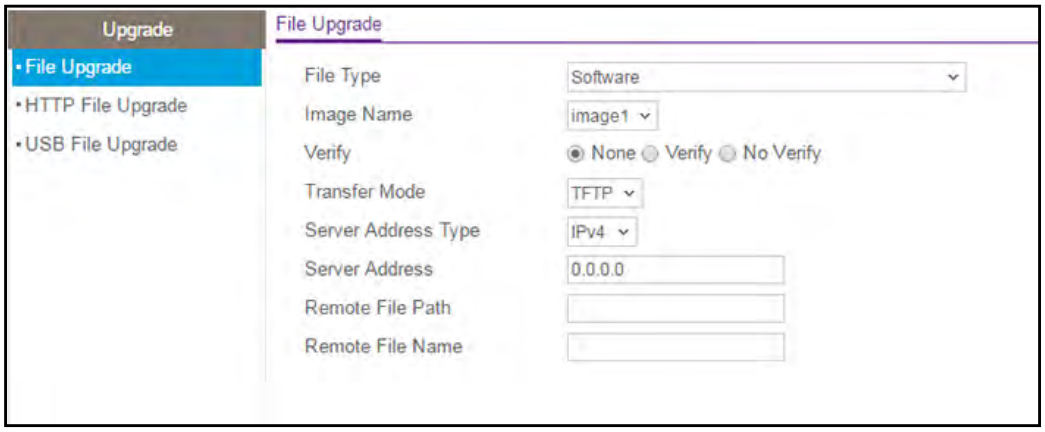
To download a file:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Upgrade > File Upgrade**.



5. Use **File Type** to specify what type of file to transfer to the device.
   - **Software**. Select this option to transfer in the device software code in order to upgrade the operational flash.
   - **Text Configuration**. Select this option to transfer to the device configuration in text mode in order to update the switch's configuration. If the file has errors, the update is stopped.

- **SSH-2 RSA Key PEM File**. Select this option to transfer an SSH-2 Rivest-Shamir-Adelman (RSA) key file (PEM Encoded) to the device.
- **SSH-2 DSA Key PEM File**. Select this option to transfer an SSH-2 Digital Signature Algorithm (DSA) key file (PEM Encoded) to the device.
- **SSL Trusted Root Certificate PEM File**. Select this option to transfer an SSL Trusted Root Certificate file (PEM Encoded) to the device. SSL files contain information to encrypt, authenticate, and validate HTTPS sessions.
- Use **SSL Server Certificate PEM File.** Select this option to transfer an SSL Server Certificate file (PEM Encoded) to the device.
- Use **SSL DH Weak Encryption Parameter PEM File**. Select this option to transfer an SSL Diffie-Hellman Weak Encryption Parameter File (PEM Encoded) to the device.
- Use **SSL DH Strong Encryption Parameter PEM File.** Select this option to transfer an SSL Diffie-Hellman Strong Encryption Parameter File (PEM Encoded) to the device.
- **Script File.** Select this option to transfer a text-based configuration script file to the device. You must use the command-line interface (CLI) to validate and activate the script.
- **CLI Banner**. Select this option to transfer the CLI Banner to the device. This file contains the text to be displayed on the CLI before the login prompt.
- **IAS Users.** Select this option to transfer an Internal Authentication Server (IAS) users database file to the device. The IAS user database stores a list of user name and (optional) password values for local port-based user authentication.
- **Factory Default Configuration**. Select this option to transfer the factory default configuration file to a remote system.
- **Public Key Configuration**. Select this option to transfer the public key file used for configuration script validation to the device.
- **Public Key Image**. Select this option to transfer the public key file used for code image validation to the device.
- **Application**. Select this option to transfer an application to the device.
- **Tech Support Commands File**. Select this option to transfer a Tech Support Commands file to the device.

The factory default is Software.

6. The **Image Name** field is visible only when File Type **Software** is selected. Use **Image Name** to select one of the images from the list:
   - **Image1**. Specify the code image1 to retrieve.
   - **Image2**. Specify the code image2 to retrieve.
7. The **Verify** field is visible when File Type **Software** and **Script File** are selected. Select one of the **Verify** options: **None**, **Verify**, **No Verify** regarding the transfer in the device software code.
8. The **Application File Name** field is visible when File Type **Application** is selected. Enter the application file name to download to the device.

9. Use **Transfer Mode** to specify what protocol to use to transfer the file:
   - **TFTP**. Trivial File Transfer Protocol
   - **SFTP**. Secure File Transfer Protocol
   - **SCP**. Secure Copy Protocol
   - **FTP**. File Transfer Protocol
10. Use **Server Address Type** to specify either IPv4, IPv6, or DNS to indicate the format of the TFTP/SFTP/SCP Server Address field.

    The factory default is IPv4.
11. Use **Server Address** to enter the IP address of the TFTP server in accordance with the format indicated by the server address type, for example an IP address in the x.x.x.x format.

    The factory default is the IPv4 address 0.0.0.0.
12. Use **Remote File Path** to enter the path of the file to download.

    The file path cannot include the following symbols: ' \:*?”<>| '. Up to 160 characters can be entered. The factory default is blank.
13. Use **Remote File Name** to enter the name of the file to download from the server.

    The file path cannot include the following symbols: ' \:*?”<>| '. You can enter up to 32 characters. The factory default is blank.
14. Use **User Name** to enter the user name for remote login to SFTP/SCP server where the file resides.

    Note: This field is visible only when the SFTP or SCP transfer mode is selected.
15. Use **Password** to enter the password for remote login to SFTP/SCP server where the file resides.

    Note: This field is visible only when the\ SFTP or SCP transfer mode is selected.
16. Click the **Apply** button.

    The file is downloaded. The last row of the table displays information about the progress of the file transfer. It is displayed only after the process starts. The page refreshes automatically until the file transfer completes.

Download a File to the Switch Using HTTP

You can download files of various types to the switch using an HTTP session (for example, through your web browser).

For you to able to download SSH key files, SSH must be administratively disabled and no active SSH sessions must occur.

For you to be able to download SSL PEM files, SSL must be administratively disabled and no active SSH sessions must occur.

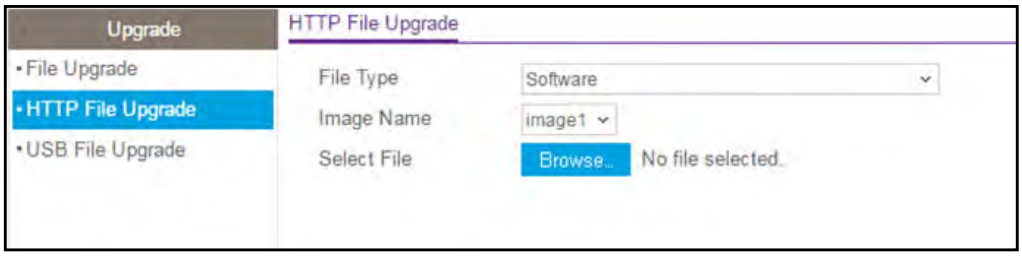
To download a file to the switch using HTTP:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Upgrade > HTTP File Upgrade**.



5. Use **File Type** to specify what type of file to transfer:
   - **Software**. Software code to upgrade the operational flash.
   - **Text Configuration**. Configuration is in text mode to update the switch's configuration. If the file has errors, the update is stopped.
   - Use **SSH-2 RSA Key PEM File** to specify SSH-2 Rivest-Shamir-Adelman (RSA) Key File (PEM Encoded).
   - Use **SSH-2 DSA Key PEM File** to specify SSH-2 Digital Signature Algorithm (DSA) Key File (PEM Encoded).
   - Use **SSL Trusted Root Certificate PEM File** to specify SSL Trusted Root Certificate File (PEM Encoded).
   - Use **SSL Server Certificate PEM File** to specify SSL Server Certificate File (PEM Encoded).
   - Use **SSL DH Weak Encryption Parameter PEM File** to specify SSL Diffie-Hellman Weak Encryption Parameter File (PEM Encoded).
   - Use **SSL DH Strong Encryption Parameter PEM File** to specify SSL Diffie-Hellman Strong Encryption Parameter File (PEM Encoded).
   - Use **Config Script** to specify script configuration file.
   - **CLI Banner**. Specify CLI Banner if a banner will be displayed before the login prompt.
   - Use **IAS Users** to specify the Internal Authentication Server Users Database File.

   The factory default is Software.

6. The **Image Name** field is visible only when File Type **Software** is selected. Use **Image Name** to select one of the images from the list:
   - **Image1**. Specify the code image1 to download.
   - **Image2**. Specify the code image2 to download.
7. Next to Select File, click the **Browse** button and navigate to the file to download.

   You can select a file of up to 80 characters.
8. Click the **Apply** button.

   The download begins.

   The Download Status field displays the status during transfer file to the switch.

Note: After a file transfer is started, wait until the page refreshes. When the page refreshes, the Select File option is blanked out. This indicates that the file transfer is done.

Download a File from a USB Device

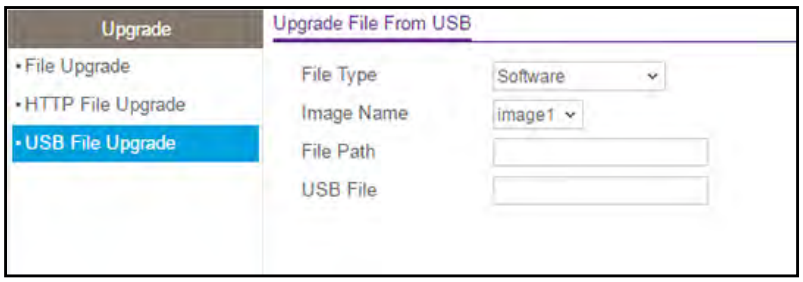
To download a file from a USB device:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Upgrade> USB File Upgrade**.



5. Use **File Type** to specify what type of file to download:
   - **Software**. Software code to download to the operational flash.
   - **Text Configuration**. Configuration s in text mode to update the switch's configuration (Startup-config).

If the file has errors, the update is stopped. The factory default is **Software**.

6. Use **Image Name** to select one of the images from the list:
   - **Image1**. Select image1 to download to image1.
   - **Image2**. Select image2 to download to image2.

   Only when File Type **Software** is selected is the **Image Name** field visible.
7. Use the **File Path** field to give a path for the file to download.

   You can enter up to 146 characters. The default is blank.
8. Use **USB File** to give a name along with path for the file to download.

   You can enter up to 32 characters. The factory default is blank.
9. Click the **Apply** button.

   The download begins. The Download Status field displays the status of the file transfer to the switch. The last row of the table is used to display information about the progress of the file transfer. It is displayed only after the process starts. The page refreshes automatically until the file transfer completes.

Manage Software Image Files

The system maintains two versions of the switch software image in permanent storage. One image is the active image, and the second image is the backup image. The active image is loaded during subsequent switch restarts. This feature reduces switch down time when you are upgrading or downgrading the switch software.

Copy an Image

To copy an image:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > File Management > Copy**.

5. Use **Source Image** to select the image1 or image2 as the source image (the image to be copied).
6. Use **Switch Member** to select the destination unit to which you are going to copy from the supervisor.
7. Use **Destination Image** to select the image1 or image2 as the destination image.
8. Click the **Apply** button.

   The image is copied.

Configure Dual Image Settings

The Dual Image feature allows the switch to retain two images in permanent storage. The administrator can designate image1 or image2 as the active image to be loaded during subsequent switch restarts. This feature reduces switch down time when you are upgrading or downgrading the software image.

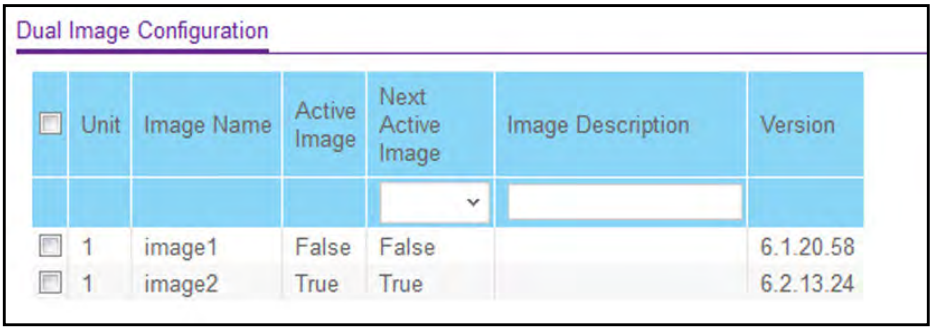
To configure dual image settings:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > File Management > Dual Image Configuration**.



5. Use **Unit** to select the unit ID whose code image to activate, update, or delete.
6. Use **Next Active Image** to make the selected image the next active image for subsequent reboots of this unit.
7. Use **Image Description** to specify the description for the image that you selected.
8. Click the **Apply** button.

   Your settings are saved.

Note: After activating an image, you must perform a system reset of the switch to run the new image.

The following table describes the nonconfigurable information displayed on the page.

Table 230. Dual Image Configuration

Field	Description
Image Name	This displays the image name for the selected unit.
Active Image	The current active image of the selected unit.
Version	The version of the image1 code file.

Troubleshooting

You can send a ping, trace a route, and perform a memory dump.

Ping an IPv4 Address

You can tell the switch to send a ping request to a specified IP address. You can check whether the switch can communicate with a particular IP station. When you click the **Apply** button, the switch sends a specified number of ping requests and the results are displayed.

If a reply to the ping is not received, the following message displays:

```
Tx = Count, Rx = 0 Min/Max/Avg RTT = 0/0/0 msec
```

If a reply to the ping is received, the following message displays:

```
Reply From a.b.c.d: icmp_seq = 0. time= xyz usec.
Reply From a.b.c.d: icmp_seq = 1. time= abc usec.
Reply From a.b.c.d: icmp_seq = 2. time= def usec.
Tx = count, Rx = count Min/Max/Avg RTT = xyz/abc/def msec
```

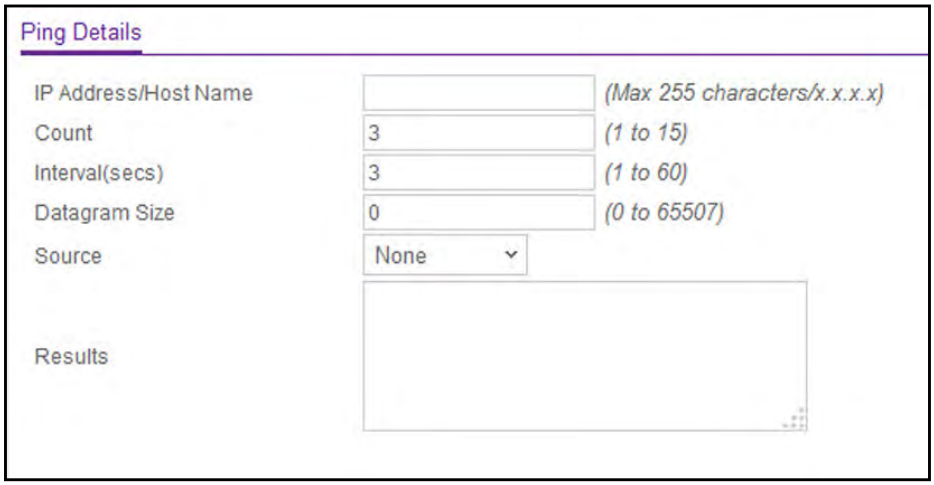
To configure the settings and ping a host on the network:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Troubleshooting > Ping IPv4**.



5. Use **IP Address/Host Name** to enter the IP address or host name of the station for the switch to ping.

   The initial value is blank.
6. In the **Count field**, enter the number of echo requests to send.

   The default value is 3. The range is 1 to 15.
7. Enter the **Interval** between ping packets in seconds.

   The default value is 3 seconds. The range is 1 to 60.

8. Enter the **Datagram Size** of ping packet.

   The default value is 0 bytes. The range is 0 to 65507.

9. Enter the **Source** IP address or interface to use when sending the echo request packets.

   If source is not required, select **None** as the source option. Possible values are as follows:

   - **None**. The source address of the ping packet would be the address of the default outgoing interface.
   - **IP Address**. The source IP address to use when sending the echo request packets. This field is shown when **IP Address** is selected as the source option.
   - **Interface**. The interface to use when sending the echo request packets. This field is shown when **Interface** is selected as the source option.

   Note: Values configured in the fields on this page are not saved to the switch. As a result, refreshing the page sets these fields to the default values.

10. Click the **Apply button.**

    The pings are sent to the specified address. The switch sends the number of pings specified in the **Count** field, and the results are displayed below the configurable data in the **Results** area.

Ping an IPv6 Address

This page is used to send a ping request to a specified host name or IPv6 address. You can use this to check whether the switch can communicate with a particular IPv6 station. When you click the **Apply** button, the switch sends a specified number of ping requests and the results are displayed below the configurable data. The output displays the following:

```
Send count=n, Receive count=n from (IPv6 Address). Average round trip
time = n ms.
```

To use Ping IPv6:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

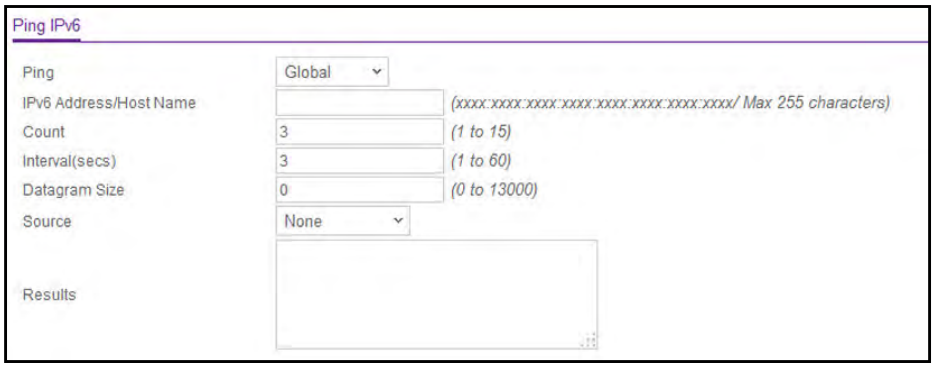
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Maintenance > Troubleshooting > Ping IPv6**.



5. Select the **Ping** type from the list.

   Possible values are as follows:

   - **Globa**l. Ping a global IPv6 address.
   - **Link Local**. Ping a link-local IPv6 address over the specified interface. This field is shown when Interface is selected as the ping option.

6. Use **IPv6 Address/Hostname** to enter the IPv6 address or host name of the station for the switch to ping.

   The initial value is blank. The format is xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx. The maximum number of characters is 255.

7. Use **Count** to enter the number of echo requests send.

   The range is 1 to 15. The default value is 3.

8. Enter the **Interval** in seconds between ping packets.

   The range is 1 to 60. The default value is 3.

9. Use **Datagram Size** to enter the datagram size.

   The valid range is 0 to 13000. The default value is 0 bytes.

10. Enter the **Source** IP address or interface to use when sending the echo request packets.

    If the source is not required, select None as the source option. Possible values are as follows:

    - **None**. The source address of the ping packet would be the address of the default outgoing interface.
    - **IPv6 Address**. The source IPv6 address to use when sending the echo request packets. This field is shown when **IPv6 Address** is selected as the source option.
    - **Interface**. The interface to use when sending the echo request packets. This field is shown when **Interface** is selected as the source option.

    Note: Values configured in the fields on this page are not saved to the switch. As a result, refreshing the page sets these fields to the default values.

11. Click the **Apply button**.

    Pings are sent to the specified IPv6 address or host name. The switch sends the number of pings specified in the **Count** field, and the results are displayed below the configurable data in the **Results** area.

Send a Traceroute to an IPv4 Address

Use this page to tell the switch to send a traceroute request to a specified IP address or host name. You can use this to discover the paths packets take to a remote destination. Once you click the **Apply** button, the switch sends traceroute and the results are displayed below the configurable data.

If a reply to the traceroute is received, the following message displays:

```
1 e.f.g.h 9869 usec 9775 usec 10584 usec
2 0.0.0.0 0 usec * 0 usec * 0 usec *
3 0.0.0.0 0 usec * 0 usec * 0 usec *
Hop Count = j Last TTL = k Test attempt = m Test Success = n.
```

To configure the traceroute settings and send probe packets to discover the route to a host on the network:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

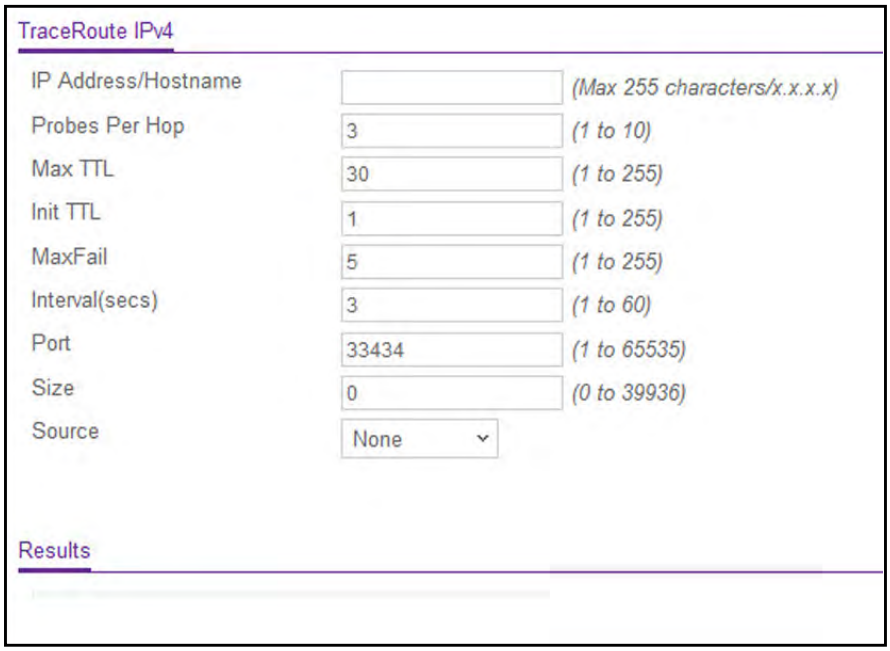
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Maintenance > Troubleshooting > Traceroute IPv4**.



5. Use **IP Address/Hostname** to enter the IP address or host name of the station to which you want to discover a path.

   The default value is blank.

6. Enter the number of **Probes Per Hop**.

   The default value is 3. The range is 1 to 10.

7. Enter the **Maximum TTL** for the destination.

   The default value is 30. The range is 1 to 255.

8. Enter the **Initial TTL** to be used.

   The default value is 1. The range is 1 to 255.

9. Enter the **Maximum Failures** allowed in the session.

   The default value is 5. The range is 1 to 255.

10. **Interval (secs)**. Enter the time between probes in seconds.

    The default value is 3. The range is 1 to 60.

11. Enter the UDP Destination **Port** in probe packets.

    The default value is 33434. The range is 1- 65535.

12. Enter the **Size** of the probe packets.

    The default value is 0. The range is 0 to 39936.

13. Enter the **Source** IP address or interface to use when sending the echo request packets.

If source is not required, select None as the source option. Possible values are as follows:

- **None**. The source address of the ping packet would be the address of the default outgoing interface.
- **IP Address**. The source IP address to use when sending the echo request packets. This field is shown when **IP Address** is selected as the source option.
- **Interface**. The interface to use when sending the echo request packets. This field is shown when **Interface** is selected as the source option.

Note: Values configured in the fields on this page are not saved to the switch. As a result, refreshing the page sets these fields to the default values.

14. Click the **Apply** button.

A traceroute request is sent to the specified IP address or host name. The results are displayed below the configurable data in the TraceRoute Results area.

The Results field displays the traceroute IPv4 result after the switch sends a traceroute request to the specified IP address or host name.

Send a Traceroute to an IPv6 Address

Use this page to tell the switch to send a traceroute request to a specified IPv6 address or host name. You can use this to discover the paths packets take to a remote destination. Once you click the **Apply** button, the switch sends a traceroute and the results are displayed below the configurable data.

If a reply to the traceroute is received, the following message displays:

```
1 a:b:c:d:e:f:g 9869 usec 9775 usec 10584 usec
2 0:0:0:0:0:0:0:0 0 usec * 0 usec * 0 usec *
Hop Count = p Last TTL = q Test attempt = r Test Success = s.
```

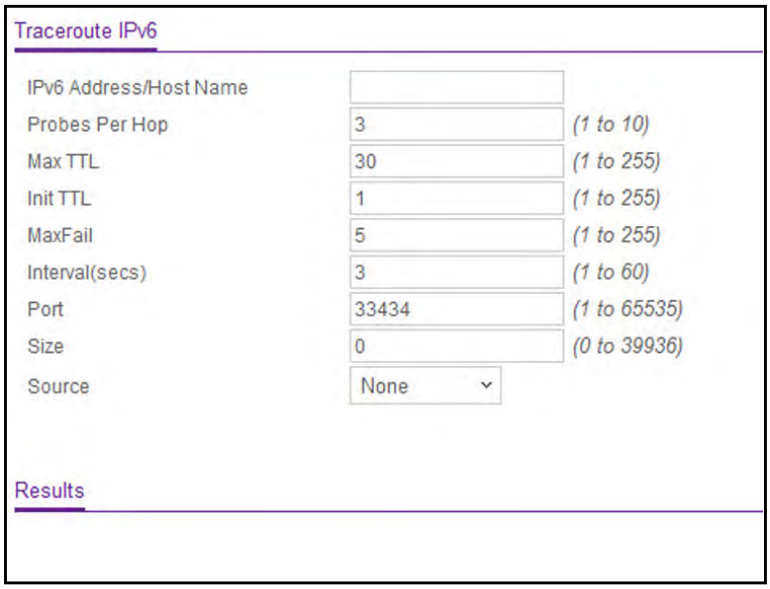
To use traceroute IPv6:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.
4. Select **Maintenance > Troubleshooting > Traceroute IPv6**.



5. In the **IPv6 Address/Hostname** field, enter the IPv6 address or host name of the station to which you want the switch to discover a path.

   The initial value is blank. The IPv6 address or host name you enter is not retained across a power cycle.

6. Enter the **Probes Per Hop**.

   The default value is 3. The range is 1 to 10.

7. Enter the **Maximum TTL** for the destination.

   The default value is 30. The range is 1 to 255. The MaxTTL you enter is not retained across a power cycle.

8. Enter the **Initial TTL** to be used.

   The default value is 1. The range is 1 to 255. The InitTTL you enter is not retained across a power cycle.

9. Enter the **Maximum Failures** allowed in the session.

   The default value is 5. The range is 1 to 255. The MaxFail you enter is not retained across a power cycle.

10. **Interval (secs)** - Enter the time between probes in seconds.

    The default value is 3. The range is 1 to 60. The interval that you enter is not retained across a power cycle.

11. Enter the UDP Destination **Port** in probe packets.

    The default value is 33434. The range is 1- 65535. The port you enter is not retained across a power cycle.

12. Enter the **Size** of the probe packets.

The default value is 0. The range is 0 to 39936. The size you enter is not retained across a power cycle.

13. Enter the **Source** IP address or interface to use when sending the echo request packets.

    If source is not required, select **None** as the source option. Possible values are as follows:

    - **None**. The source address of the ping packet would be the address of the default outgoing interface.
    - **IP Address**. The source IP address to use when sending the echo request packets. This field is shown when **IP Address** is selected as the source option.
    - **Interface**. The interface to use when sending the echo request packets. This field is shown when **Interface** is selected as the source option.

    Note: Values configured in the fields on this page are not saved to the switch. As a result, refreshing the page sets these fields to the default values.

14. Click the **Apply** button.

    The traceroute begins. The results display in the TraceRoute area.

    The Results field displays the traceroute IPv6 result after the switch sends a traceroute request to the specified IP address or host name.

Capture Packets

You can capture and store packets on a USB flash storage device.

To initiate packet capturing:

1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

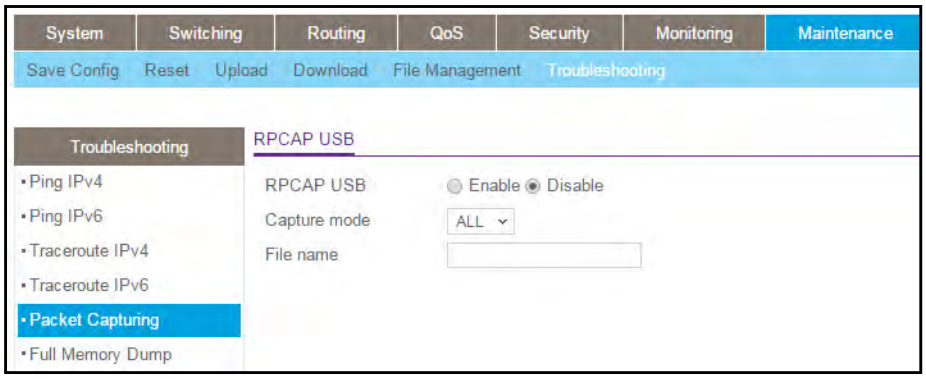
   The login window opens.

3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

   The System Information page displays.

4. Select **Maintenance > Troubleshooting > Packet Capturing**.



5. Next to RPCAP USB, select the **Enable** radio button.
6. From the **Capture Mode** menu, select the CPU traffic type:
   - **All**. Capture all traffic. This option is the default setting.
   - **TX**. Capture transmitted traffic only.
   - **RX**. Capture received traffic only.
7. In the **File Name** field, enter the name of the USB file.

   The file name cannot include the following symbols: '\/:*?”<>|'. You can enter up to 64 characters can be entered, which refers only to the filename length. That is, the extension is added automatically. The factory default is blank.
8. To start the packet capture process, click the **Apply** button.

   Packets are captured until you stop the process.
9. The stop the packet capture process, do the following:
   a. Next to RPCAP USB, select the **Disable** radio button.
   b. Click the **Apply** button.

   The packet capture process stops.

Perform a Full Memory Dump

You can perform a full memory dump to retrieve the core dump for troubleshooting.

To perform a full memory dump:

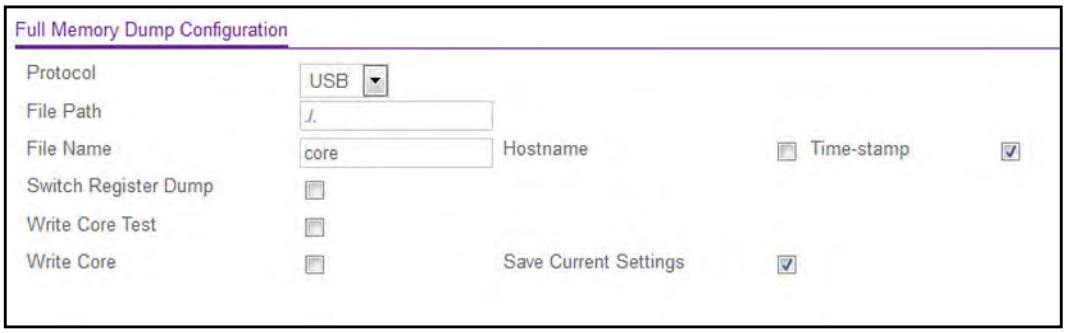
1. Launch a web browser.
2. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.
3. Enter **admin** as the user name, enter your local device password, and click the **Login** button.

   The first time that you log in, no password is required. However, you then must specify a local device password to use each subsequent time that you log in.

The System Information page displays.

4. Select **Maintenance > Troubleshooting > Full Memory Dump**.



5. From the **Protocol** menu, select the protocol used to store the core dump file.

   Possible values are as follows:

   - **None**. Disable core dump.
   - **TFTP**. Set TFTP protocol.
   - **NFS**. Set NFS protocol.
   - **USB**. Set USB protocol.

6. In the **File Path** field, enter the path to the location to store the core dump file.
7. In the **File Name** field, enter the core dump file name.
8. Select the **Hostname** option to append the host name to the core dump file name.
9. Select the **Time-stamp** option to append a time-stamp to the core dump file name.
10. Select the **Switch Register Dump** option to dump the switch chip register in case of an exception.
11. Select the **Write Core Test** option to test the core dump setup.
12. Select the **Write Core** option to create a core dump and store it to the previously configured external server.

    Executing this procedure causes a reload of the device.

13. Select the **Save Current Settings** option to save the current settings of the system.
14. Click the **Apply** button.

    The memory dump is sent to the specified location.

A

Configuration Examples

This appendix contains information about how to configure the following features:

- Virtual Local Area Networks (VLANs)
- Access Control Lists (ACLs)
- Differentiated Services (DiffServ)
- 802.1X
- MSTP

Virtual Local Area Networks (VLANs)

A local area network (LAN) can generally be defined as a broadcast domain. Hubs, bridges, or switches in the same physical segment or segments connect all end node devices. End nodes can communicate with each other without the need for a router. Routers connect LANs together, routing the traffic to the appropriate port.

A virtual LAN (VLAN) is a local area network with a definition that maps workstations on some basis other than geographic location (for example, by department, type of user, or primary application). To enable traffic to flow between VLANs, traffic must go through a router, just as if the VLANs were on two separate LANs.

A VLAN is a group of PCs, servers, and other network resources that behave as if they were connected to a single network segment—even though they might not be. For example, all marketing personnel might be spread throughout a building. Yet if they are all assigned to a single VLAN, they can share resources and bandwidth as if they were connected to the same segment. The resources of other departments can be invisible to the marketing VLAN members, accessible to all, or accessible only to specified individuals, depending on how the IT manager has set up the VLANs.

VLANs present a number of advantages:

- It is easy to do network segmentation. Users that communicate most frequently with each other can be grouped into common VLANs, regardless of physical location. Each group's traffic is contained largely within the VLAN, reducing extraneous traffic and improving the efficiency of the whole network.
- They are easy to manage. The addition of nodes, as well as moves and other changes, can be dealt with quickly and conveniently from a management interface rather than from the wiring closet.
- They provide increased performance. VLANs free up bandwidth by limiting node-to-node and broadcast traffic throughout the network.
- They ensure enhanced network security. VLANs create virtual boundaries that can be crossed only through a router. So standard, router-based security measures can be used to restrict access to each VLAN.

Packets received by the switch are treated in the following way:

- When an untagged packet enters a port, it is automatically tagged with the port's default VLAN ID tag number. Each port has a default VLAN ID setting that is user configurable (the default setting is 1). The default VLAN ID setting for each port can be changed in the Port PVID Configuration page. See Configure Port PVID Settings on page 190.
- When a tagged packet enters a port, the tag for that packet is unaffected by the default VLAN ID setting. The packet proceeds to the VLAN specified by its VLAN ID tag number.
- If the port through which the packet entered does not is not a member of the VLAN as specified by the VLAN ID tag, the packet is dropped.
- If the port is a member of the VLAN specified by the packet's VLAN ID, the packet can be sent to other ports with the same VLAN ID.

- Packets leaving the switch are either tagged or untagged, depending on the setting for that port's VLAN membership properties. A U for a given port means that packets leaving the switch from that port are untagged. Inversely, a T for a given port means that packets leaving the switch from that port are tagged with the VLAN ID that is associated with the port.

The example given in this section comprises numerous steps to illustrate a wide range of configurations to help provide an understanding of tagged VLANs.

VLAN Configuration Examples

This example demonstrates several scenarios of VLAN use and describes how the switch handles tagged and untagged traffic.

In this example, you create two new VLANs, change the port membership for default VLAN 1, and assign port members to the two new VLANs:

1. In the Basic VLAN Configuration page (see Configure VLANs on page 181), create the following VLANs:
   - A VLAN with VLAN ID 10.
   - A VLAN with VLAN ID 20.
2. In the VLAN Membership page (see Configure VLAN Membership on page 187) specify the VLAN membership as follows:
   - For the default VLAN with VLAN ID 1, specify the following members: port 7 (U) and port 8 (U).
   - For the VLAN with VLAN ID 10, specify the following members: port 1 (U), port 2 (U), and port 3 (T).
   - For the VLAN with VLAN ID 20, specify the following members: port 4 (U), port 5 (T), and port 6 (U).
3. In the Port PVID Configuration page (see Configure Port PVID Settings on page 190), specify the PVID for ports g1 and g4 so that packets entering these ports are tagged with the port VLAN ID:
   - Port g1: PVID 10
   - Port g4: PVID 20
4. With the VLAN configuration that you set up, the following situations produce results as described:
   - If an untagged packet enters port 1, the switch tags it with VLAN ID 10. The packet has access to port 2 and port 3. The outgoing packet is stripped of its tag to leave port 2 as an untagged packet. For port 3, the outgoing packet leaves as a tagged packet with VLAN ID 10.
   - If a tagged packet with VLAN ID 10 enters port 3, the packet has access to port 1 and port 2. If the packet leaves port 1 or port 2, it is stripped of its tag to leave the switch as an untagged packet.
   - If an untagged packet enters port 4, the switch tags it with VLAN ID 20. The packet has access to port 5 and port 6. The outgoing packet is stripped of its tag to become

an untagged packet as it leaves port 6. For port 5, the outgoing packet leaves as a tagged packet with VLAN ID 20.

Access Control Lists (ACLs)

ACLs ensure that only authorized users can access specific resources while blocking off any unwarranted attempts to reach network resources.

ACLs are used to provide traffic flow control, restrict contents of routing updates, decide which types of traffic are forwarded or blocked, and provide security for the network. ACLs are normally used in firewall routers that are positioned between the internal network and an external network, such as the Internet. They can also be used on a router positioned between two parts of the network to control the traffic entering or exiting a specific part of the internal network. The added packet processing required by the ACL feature does not affect switch performance. That is, ACL processing occurs at wire speed.

Access lists are a sequential collection of permit and deny conditions. This collection of conditions, known as the filtering criteria, is applied to each packet that is processed by the switch or the router. The forwarding or dropping of a packet is based on whether or not the packet matches the specified criteria.

Traffic filtering requires the following two basic steps:

1. Create an access list definition.

   The access list definition includes rules that specify whether traffic matching the criteria is forwarded normally or discarded. Additionally, you can assign traffic that matches the criteria to a particular queue or redirect the traffic to a particular port. A default *deny all* rule is the last rule of every list.

2. Apply the access list to an interface in the inbound direction.

The switch software allow ACLs to be bound to physical ports and LAGs. The switch software supports MAC ACLs and IP ACLs.

MAC ACL Sample Configuration

The following example shows how to create a MAC-based ACL that permits Ethernet traffic from the Sales department on specified ports and denies all other traffic on those ports.

1. From the MAC ACL page, create an ACL with the name Sales_ACL for the Sales department of your network (See Configure a Basic MAC ACL on page 604).

   By default, this ACL is bound on the inbound direction, which means the switch will examine traffic as it enters the port.

2. From the MAC Rules page, create a rule for the Sales_ACL with the following settings:
   - ID: 1
   - Action: Permit

- Assign Queue ID: 0
- Match Every: False
- CoS: 0
- Destination MAC: 01:02:1A:BC:DE:EF
- Destination MAC Mask: 00:00:00:00:FF:FF
- EtherType User Value:
- Source MAC: 02:02:1A:BC:DE:EF
- Source MAC Mask: 00:00:00:00:FF:FF
- VLAN ID: 2

For more information about MAC ACL rules, see Configure MAC ACL Rules on page 606.

3. From the MAC Binding Configuration page, assign the Sales_ACL to the interface gigabit ports 6, 7, and 8, and then click the **Apply** button. (See Configure MAC Binding on page 608.)

   You can assign an optional sequence number to indicate the order of this access list relative to other access lists if any are already assigned to this interface and direction.

4. The MAC Binding Table displays the interface and MAC ACL binding information (See View and Delete MAC ACL Bindings in the MAC Binding Table on page 610).

The ACL named Sales_ACL looks for Ethernet frames with destination and source MAC addresses and MAC masks defined in the rule. Also, the frame must be tagged with VLAN ID 2, which is the Sales department VLAN. The CoS value of the frame must be 0, which is the default value for Ethernet frames. Frames that match this criteria are permitted on interfaces 6, 7, and 8 and are assigned to the hardware egress queue 0, which is the default queue. All other traffic is explicitly denied on these interfaces. To allow additional traffic to enter these ports, you must add a new *permit* rule with the desired match criteria and bind the rule to interfaces 6, 7, and 8.

Standard IP ACL Sample Configuration

The following example shows how to create an IP-based ACL that prevents any IP traffic from the Finance department from being allowed on the ports that are associated with other departments. Traffic from the Finance department is identified by each packet's network IP address.

1. From the IP ACL page, create a new IP ACL with an IP ACL ID of 1 (See Configure an IP ACL on page 611).
2. From the IP Rules page, create a rule for IP ACL 1 with the following settings:
   - Rule ID: 1
   - Action: Deny
   - Assign Queue ID: 0 (optional: 0 is the default value)
   - Match Every: False

- Source IP Address: 192.168.187.0
- Source IP Mask: 255.255.255.0

For additional information about IP ACL rules, see Configure Rules for an IP ACL on page 613.

3. Click the **Add** button.
4. From the IP Rules page, create a second rule for IP ACL 1 with the following settings:
   - Rule ID: 2
   - Action: Permit
   - Match Every: True
5. Click the **Add** button.
6. From the IP Binding Configuration page, assign ACL ID 1 to the interface gigabit ports 2, 3, and 4, and assign a sequence number of 1 (See Configure IP ACL Interface Bindings on page 628).

   By default, this IP ACL is bound on the inbound direction, so it examines traffic as it enters the switch.
7. Click the **Apply** button.
8. Use the IP Binding Table page to view the interfaces and IP ACL binding information (See View and Delete IP ACL Bindings in the IP ACL Binding Table on page 629).

The IP ACL in this example matches all packets with the source IP address and subnet mask of the Finance department's network and deny it on the Ethernet interfaces 2, 3, and 4 of the switch. The second rule permits all non-Finance traffic on the ports. The second rule is required because there is an explicit *deny all* rule as the lowest priority rule.

Differentiated Services (DiffServ)

Standard IP-based networks are designed to provide *best effort* data delivery service. *Best effort* service implies that the network deliver the data in a timely fashion, although there is no guarantee that it will. During times of congestion, packets might be delayed, sent sporadically, or dropped. For typical Internet applications, such as e-mail and file transfer, a slight degradation in service is acceptable and in many cases unnoticeable. However, any degradation of service has undesirable effects on applications with strict timing requirements, such as voice or multimedia.

Quality of Service (QoS) can provide consistent, predictable data delivery by distinguishing between packets with strict timing requirements from those that are more tolerant of delay. Packets with strict timing requirements are given special treatment in a QoS-capable network. With this in mind, all elements of the network must be QoS-capable. If one node cannot meet the necessary timing requirements, this creates a deficiency in the network path and the performance of the entire packet flow is compromised.

There are two basic types of QoS:

- **Integrated Services**: network resources are apportioned based on request and are reserved (resource reservation) according to network management policy (RSVP, for example).
- **Differentiated Services**: network resources are apportioned based on traffic classification and priority, giving preferential treatment to data with strict timing requirements.

The DiffServ feature contains a number of conceptual QoS building blocks you can use to construct a differentiated service network. Use these same blocks in different ways to build other types of QoS architectures.

There are 3 key QoS building blocks needed to configure DiffServ:

- Class
- Policy
- Service (the assignment of a policy to a directional interface)

Class

You can classify incoming packets at Layers 2, 3 and 4 by inspecting the following information for a packet:

- Source/destination MAC address
- EtherType
- Class of Service (802.1p priority) value (first/only VLAN tag)
- VLAN ID range (first/only VLAN tag)
- Secondary 802.1p priority value (second/inner VLAN tag)
- Secondary VLAN ID range (second/inner VLAN tag)
- IP Service Type octet (also known as: ToS bits, Precedence value, DSCP value)
- Layer 4 protocol (TCP, UDP and so on)
- Layer 4 source/destination ports
- Source/destination IP address

From a DiffServ point of view, there are two types of classes:

- DiffServ traffic classes
- DiffServ service levels/forwarding classes

DiffServ Traffic Classes

With DiffServ, you define which traffic classes to track on an ingress interface. You can define simple BA classifiers (DSCP) and a wide variety of multi-field (MF) classifiers:

- Layer 2; Layers 3, 4 (IP only)
- Protocol-based
- Address-based

You can combine these classifiers with logical AND or OR operations to build complex MF-classifiers (by specifying a class type of *all* or *any*, respectively). That is, within a single class, multiple match criteria are grouped together as an AND expression or a sequential OR expression, depending on the defined class type. Only classes of the same type can be nested; class nesting does not allow for the negation (*exclude* option) of the referenced class.

To configure DiffServ, you must define service levels, namely the forwarding classes/PHBs identified by a given DSCP value, on the egress interface. These service levels are defined by configuring BA classes for each.

Creating Policies

Use DiffServ policies to associate a collection of classes that you configure with one or more QoS policy statements. The result of this association is referred to as a policy.

From a DiffServ perspective, there are two types of policies:

- **Traffic Conditioning Policy**: a policy applied to a DiffServ traffic class
- **Service Provisioning Policy**: a policy applied to a DiffServ service level

You must manually configure the various statements and rules used in the traffic conditioning and service provisioning policies to achieve the desired Traffic Conditioning Specification (TCS) and the Service Level Specification (SLS) operation, respectively.

Traffic Conditioning Policy

Traffic conditioning pertains to actions performed on incoming traffic. There are several distinct QoS actions associated with traffic conditioning:

- **Dropping**. Drop a packet upon arrival. This is useful for emulating access control list operation using DiffServ, especially when DiffServ and ACL cannot co-exist on the same interface.
- **Marking IP DSCP or IP Precedence**. Marking/re-marking the DiffServ code point in a packet with the DSCP value representing the service level associated with a particular DiffServ traffic class. Alternatively, the IP Precedence value of the packet can be marked/re-marked.
- **Marking CoS (802.1p)**. Sets the three-bit priority field in the first/only 802.1p header to a specified value when packets are transmitted for the traffic class. An 802.1p header is inserted if it does not already exist. This is useful for assigning a Layer 2 priority level based on a DiffServ forwarding class (such as the DSCP or IP precedence value) definition to convey some QoS characteristics to downstream switches which do not routinely look at the DSCP value in the IP header.
- **Policing**. A method of constraining incoming traffic associated with a particular class so that it conforms to the terms of the TCS. Special treatment can be applied to out-of-profile packets that are either in excess of the conformance specification or are non-conformant.

The DiffServ feature supports the following types of traffic policing treatments (actions):

- drop. The packet is dropped
- mark cos. The 802.1p user priority bits are (re)marked and forwarded
- mark dscp. The packet DSCP is (re)marked and forwarded
- mark prec. The packet IP Precedence is (re)marked and forwarded
- send: the packet is forwarded without DiffServ modification

Color Mode Awareness. Policing in the DiffServ feature uses either *color blind* or *color aware* mode. Color blind mode ignores the coloration (marking) of the incoming packet. Color aware mode takes into consideration the current packet marking when determining the policing outcome. An auxiliary traffic class is used in conjunction with the policing definition to specify a value for one of the 802.1p, secondary 802.1p, IP DSCP, or IP Precedence fields designating the incoming color value to be used as the conforming color. The color of exceeding traffic can be optionally specified as well.

- **Counting**. Updating octet and packet statistics to keep track of data handling along traffic paths within DiffServ. In this DiffServ feature, counters are not explicitly configured by the user, but are designed into the system based on the DiffServ policy being created. See the Statistics section of this document for more details.
- **Assigning QoS Queue**. Directs traffic stream to the specified QoS queue. This allows a traffic classifier to specify which one of the supported hardware queues are used for handling packets belonging to the class.
- **Redirecting**. Forces classified traffic stream to a specified egress port (physical or LAG). This can occur in addition to any marking or policing action. It can also be specified along with a QoS queue assignment.

DiffServ Example Configuration

To create a DiffServ Class/Policy and attach it to a switch interface, follow these steps:

1. From the QoS Class Configuration page, create a new class with the following settings:
   - Class Name: Class1
   - Class Type: All

   For more information about this page, see Configure a DiffServ Class on page 485.
2. Click the Class1 hyperlink to view the DiffServ Class Configuration page for this class.
3. Configure the following settings for Class1:
   - Protocol Type: UDP
   - Source IP Address: 192.12.1.0
   - Source Mask: 255.255.255.0
   - Source L4 Port: Other, and enter 4567 as the source port value
   - Destination IP Address: 192.12.2.0

- Destination Mask: 255.255.255.0
- Destination L4 Port: Other, and enter 4568 as the destination port value

For more information about this page, see Configure a DiffServ Class on page 485.

4. Click the **Apply** button.
5. From the Policy Configuration page, create a new policy with the following settings:
   - Policy Selector: Policy1
   - Member Class: Class1

   For more information about this page, see Configure DiffServ Policy on page 493.
6. Click the **Add** button.

   The policy is added.
7. Click the **Policy1** hyperlink to view the Policy Class Configuration page for this policy.
8. Configure the Policy attributes as follows:
   - Assign Queue: 3
   - Policy Attribute: Simple Policy
   - Color Mode: Color Blind
   - Committed Rate: 1000000 Kbps
   - Committed Burst Size: 128 KB
   - Confirm Action: Send
   - Violate Action: Drop

   For more information about this page, see Configure DiffServ Policy on page 493.
9. From the Service Configuration page, select the check box next to interfaces g7 and g8 to attach the policy to these interfaces, and then click the **Apply** button. (See Configure the DiffServ Service Interface on page 496.)

All UDP packet flows destined to the 192.12.2.0 network with an IP source address from the 192.12.1.0 network that include a Layer 4 Source port of 4567 and Destination port of 4568 from this switch on ports 7 and 8 are assigned to hardware queue 3.

On this network, traffic from streaming applications uses UDP port 4567 as the source and 4568 as the destination. This real-time traffic is time sensitive, so it is assigned to a high-priority hardware queue. By default, data traffic uses hardware queue 0, which is designated as a best-effort queue.

Also the *confirmed action* on this flow is to send the packets with a committed rate of 1000000 Kbps and burst size of 128 KB. Packets that violate the committed rate and burst size are dropped.

802.1X

Local Area Networks (LANs) are often deployed in environments that permit unauthorized devices to be physically attached to the LAN infrastructure, or permit unauthorized users to attempt to access the LAN through equipment already attached. In such environments you might want to restrict access to the services offered by the LAN to those users and devices that are permitted to use those services.

Port-based network access control makes use of the physical characteristics of LAN infrastructures to provide a means of authenticating and authorizing devices attached to a LAN port that has point-to-point connection characteristics and of preventing access to that port in cases in which the authentication and authorization process fails. In this context, a port is a single point of attachment to the LAN, such as ports of MAC bridges and associations between stations or access points in IEEE 802.11 Wireless LANs.

The IEEE 802.11 standard describes an architectural framework within which authentication and consequent actions take place. It also establishes the requirements for a protocol between the authenticator (the system that passes an authentication request to the authentication server) and the supplicant (the system that requests authentication), as well as between the authenticator and the authentication server.

The switch support a guest VLAN, which allows unauthenticated users limited access to the network resources.

Note: You can use QoS features to provide rate limiting on the guest VLAN to limit the network resources the guest VLAN provides.

Another 802.1X feature is the ability to configure a port to Enable/Disable EAPoL packet forwarding support. You can disable or enable the forwarding of EAPoL when 802.1X is disabled on the device.

The ports of an 802.1X authenticator switch provide the means in which it can offer services to other systems reachable through the LAN. Port-based network access control allows the operation of a switch’s ports to be controlled to ensure that access to its services is only permitted by systems that are authorized to do so.

Port access control provides a means of preventing unauthorized access by supplicants to the services offered by a system. Control over the access to a switch and the LAN to which it is connected can be desirable when you restrict access to publicly accessible bridge ports or to restrict access to departmental LANs.

Access control is achieved by enforcing authentication of supplicants that are attached to an authenticator's controlled ports. The result of the authentication process determines whether the supplicant is authorized to access services on that controlled port.

A Port Access Entity (PAE) is able to adopt one of two distinct roles within an access control interaction:

1. **Authenticator**: A Port that enforces authentication before allowing access to services available through that Port.
2. **Supplicant**: A Port that attempts to access services offered by the Authenticator.

Additionally, there exists a third role:

3. **Authentication server**: Performs the authentication function necessary to check the credentials of the Supplicant on behalf of the Authenticator.

All three roles are required for you to complete an authentication exchange.

The switch support the Authenticator role only, in which the PAE is responsible for communicating with the Supplicant. The Authenticator PAE is also responsible for submitting the information received from the Supplicant to the Authentication Server in order for the credentials to be checked, which will determine the authorization state of the Port. The Authenticator PAE controls the authorized/unauthorized state of the controlled Port depending on the outcome of the RADIUS-based authentication process.

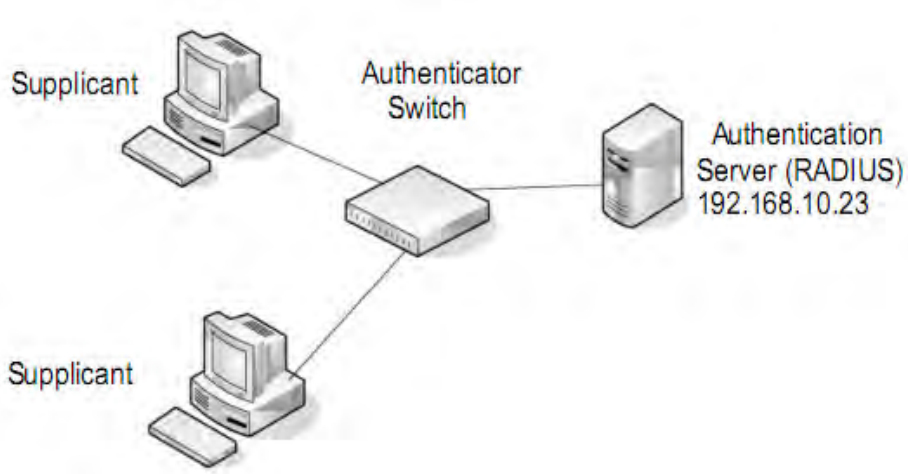


Figure 1. 802.1X Authentication Roles

802.1X Example Configuration

This example shows how to configure the switch so that 802.1X-based authentication is required on the ports in a corporate conference room (1/0/5– 1/0/8). These ports are available to visitors and must be authenticated before granting access to the network. The authentication is handled by an external RADIUS server. When the visitor is successfully authenticated, traffic is automatically assigned to the guest VLAN. This example assumes that a VLAN has been configured with a VLAN ID of 150 and VLAN Name of Guest.

1. From the Port Authentication page, select ports 1/0/5, 1/0/6, 1/0/7 and 1/0/8.
2. From the Port Control menu, select Unauthorized.

The Port Control setting for all other ports where authentication is not needed should be Authorized. When the Port Control setting is Authorized, the port is unconditionally put in a force-Authorized state and does not require any authentication. When the Port Control setting is Auto, the authenticator PAE sets the controlled port mode

3. In the Guest VLAN field for ports 1/0/5– 1/0/8, enter 150 to assign these ports to the guest VLAN.

   You can configure additional settings to control access to the network through the ports. See Configure a Port Security Interface on page 556 for information about the settings.

4. Click the **Apply** button.
5. From the 802.1X Configuration page, set the Port Based Authentication State and Guest VLAN mode to Enable, and then the **Apply** button (See Configure the Global Port Security Mode on page 555).

   This example uses the default values for the port authentication settings, but there are several additional settings that you can configure. For example, the EAPOL Flood Mode field allows you to enable the forwarding of EAPoL frames when 802.1X is disabled on the device.

6. From the RADIUS Server Configuration page, configure a RADIUS server with the following settings:
   - Server Address: 192.168.10.23
   - Secret Configured: Yes
   - Secret: secret123
   - Active: Primary

   For more information, see Manage the RADIUS Server Settings on page 505.

7. Click the **Add** button.
8. From the Authentication List page, configure the default List to use RADIUS as the first authentication method (See Configure a Login Authentication List on page 514).

This example enables 802.1X-based port security on the switch and prompts the hosts connected on ports g5-g8 for an 802.1X-based authentication. The switch passes the authentication information to the configured RADIUS server.

MSTP

Spanning Tree Protocol (STP) runs on bridged networks to help eliminate loops. If a bridge loop occurs, the network can become flooded with traffic. IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) supports multiple instances of Spanning Tree to efficiently channel VLAN traffic over different interfaces. Each instance of the Spanning Tree behaves in the manner specified in IEEE 802.1w, Rapid Spanning Tree, with slight modifications in the working but not the end effect (chief among the effects is the rapid transitioning of the port to the Forwarding state).

The difference between the RSTP and the traditional STP (IEEE 802.1D) is the ability to configure and recognize full duplex connectivity and ports that are connected to end stations, resulting in rapid transitioning of the port to the Forwarding state and the suppression of Topology Change Notification. These features are represented by the parameters *pointtopoint* and *edgeport*. MSTP is compatible to both RSTP and STP. It behaves appropriately to STP and RSTP bridges.

A MSTP bridge can be configured to behave entirely as a RSTP bridge or a STP bridge. So, an IEEE 802.1s bridge inherently also supports IEEE 802.1w and IEEE 802.1D.

The MSTP algorithm and protocol provides simple and full connectivity for frames assigned to any given VLAN throughout a Bridged LAN comprising arbitrarily interconnected networking devices, each operating MSTP, STP or RSTP. MSTP allows frames assigned to different VLANs to follow separate paths, each based on an independent Multiple Spanning Tree Instance (MSTI), within Multiple Spanning Tree (MST) Regions composed of LANs and or MSTP Bridges. These Regions and the other Bridges and LANs are connected into a single Common Spanning Tree (CST). [IEEE DRAFT P802.1s/D13]

MSTP connects all Bridges and LANs with a single Common and Internal Spanning Tree (CIST). The CIST supports the automatic determination of each MST region, choosing its maximum possible extent. The connectivity calculated for the CIST provides the CST for interconnecting these Regions, and an Internal Spanning Tree (IST) within each Region. MSTP ensures that frames with a given VLAN ID are assigned to one and only one of the MSTIs or the IST within the Region, that the assignment is consistent among all the networking devices in the Region and that the stable connectivity of each MSTI and IST at the boundary of the Region matches that of the CST. The stable active topology of the Bridged LAN with respect to frames consistently classified as belonging to any given VLAN thus simply and fully connects all LANs and networking devices throughout the network, though frames belonging to different VLANs can take different paths within any Region, per IEEE DRAFT P802.1s/D13.

All bridges, whether they use STP, RSTP or MSTP, send information in configuration messages through Bridge Protocol Data Units (BPDUs) to assign port roles that determine each port’s participation in a fully and simply connected active topology based on one or more spanning trees. The information communicated is known as the spanning tree priority vector. The BPDU structure for each of these different protocols is different. A MSTP bridge will transmit the appropriate BPDU depending on the received type of BPDU from a particular port.

An MST Region comprises of one or more MSTP Bridges with the same MST Configuration Identifier, using the same MSTIs, and without any bridges attached that cannot receive and transmit MSTP BPDUs. The MST Configuration Identifier has the following components:

1. Configuration Identifier Format Selector
2. Configuration Name
3. Configuration Revision Level
4. Configuration Digest: 16-byte signature of type HMAC-MD5 created from the MST Configuration Table (a VLAN ID to MSTID mapping)

As there are Multiple Instances of Spanning Tree, there is a MSTP state maintained on a per-port, per-instance basis (or on a per port per VLAN basis: as any VLAN can be in one

and only one MSTI or CIST). For example, port A can be forwarding for instance 1 while discarding for instance 2. The port states changed since IEEE 802.1D specification.

To support multiple spanning trees, a MSTP bridge must be configured with an unambiguous assignment of VLAN IDs (VIDs) to spanning trees. This is achieved by:

1. Ensuring that the allocation of VIDs to FIDs is unambiguous.
2. Ensuring that each FID supported by the Bridge is allocated to exactly one Spanning Tree Instance.

The combination of VID to FID and then FID to MSTI allocation defines a mapping of VIDs to spanning tree instances, represented by the MST Configuration Table.

With this allocation we ensure that every VLAN is assigned to one and only one MSTI. The CIST is also an instance of spanning tree with a MSTID of 0.

An instance might occur that has no VIDs allocated to it, but every VLAN must be allocated to one of the other instances of spanning tree.

The portion of the active topology of the network that connects any two bridges in the same MST Region traverses only MST bridges and LANs in that region, and never Bridges of any kind outside the Region, in other words connectivity within the region is independent of external connectivity.

MSTP Example Configuration

This example shows how to create an MSTP instance on the switch. The example network includes three different switches that serve different locations in the network. In this example, ports 1/0/1-1/0/5 are connected to host stations, so those links are not subject to network loops. Ports 1/0/6–1/0/8 are connected across switches 1, 2 and 3.

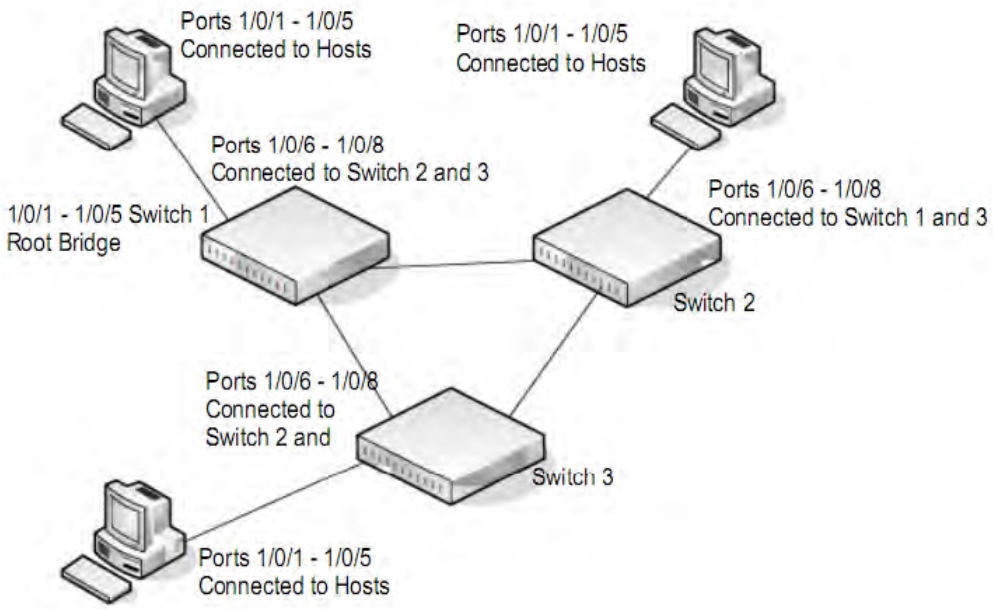


Figure 2. MSTP sample configuration

Perform the following procedures on each switch to configure MSTP:

1. Use the VLAN Configuration page to create VLANs 300 and 500 (see Configure Basic VLAN Settings on page 181).
2. Use the VLAN Membership page to include ports 1/0/1–1/0/8 as tagged (T) or untagged (U) members of VLAN 300 and VLAN 500 (see Configure Basic VLAN Settings on page 181).
3. From the STP Configuration page, enable the Spanning Tree State option (see Configure Advanced STP Settings on page 216).

   Use the default values for the rest of the STP configuration settings. By default, the STP Operation mode is MSTP and the Configuration Name is the switch MAC address.
4. From the CST Configuration page, set the Bridge Priority value for each of the three switches to force Switch 1 to be the root bridge:
   - Switch 1: 4096
   - Switch 2: 12288
   - Switch 3: 20480

   Note: Bridge priority values are multiples of 4096.

   If you do not specify a root bridge and all switches are assigned the same bridge priority value, the switch with the lowest MAC address is elected as the root bridge (see Configure CST Settings on page 219).
5. From the CST Port Configuration page, select ports 1/0/1–1/0/8 and select **Enable** from the **STP Status** menu (see Configure CST Port Settings on page 221).
6. Click the **Apply** button.
7. Select ports 1/0/1–1/0/5 (edge ports), and select **Enable** from the **Fast Link** menu.

   Since the edge ports are not at risk for network loops, ports with Fast Link enabled transition directly to the Forwarding state.
8. Click the **Apply** button.

   You can use the CST Port Status page to view spanning tree information about each port.
9. From the MST Configuration page, create a MST instances with the following settings:
   - MST ID: 1
   - Priority: Use the default (32768)
   - VLAN ID: 300

   For more information, see Configure MST Settings on page 225.
10. Click the **Add** button.

11. Create a second MST instance with the following settings

- MST ID: 2
- Priority: 49152
- VLAN ID: 500

12. Click the **Add** button.

In this example, assume that Switch 1 has become the Root bridge for the MST instance 1, and Switch 2 has become the Root bridge for MST instance 2. Switch 3 has hosts in the Sales department (ports 1/0/1, 1/0/2, and 1/0/3) and in the HR department (ports 1/0/4 and 1/0/5). Switches 1 and 2 also include hosts in the Sales and Human Resources departments. The hosts connected from Switch 2 use VLAN 500, MST instance 2 to communicate with the hosts on Switch 3 directly. Likewise, hosts of Switch 1 use VLAN 300, MST instance 1 to communicate with the hosts on Switch 3 directly.

The hosts use different instances of MSTP to effectively use the links across the switch. The same concept can be extended to other switches and more instances of MSTP.

B

Default Settings

This appendix describes the default settings for many of the NETGEAR switch software features.

Table 231. Default Settings

Feature	Default
IP address for management VLAN	169.254.100.100
Service port IP address	192.168.0.239
Subnet mask	255.255.0.0
Default gateway	0.0.0.0
Protocol	DHCP
Management VLAN ID	1
Minimum password length	Eight characters
IPv6 management Mode	None
SNTP client	Enabled
SNTP server	Not configured
Global logging	Enabled
CLI command logging	Disabled
Console logging	Enabled (Severity level: debug and above)
RAM logging	Enabled (Severity level: debug and above)
Persistent (FLASH) logging	Disabled
DNS	Enabled (No servers configured)
SNMP	Enabled (SNMPv1/SNMPv2, SNMPv3)
SNMP Traps	Enabled

Table 231. Default Settings (continued)

Feature	Default
Auto Install	Enabled
Auto Save	Disabled
sFlow	Enabled
ISDP	Enabled (Versions 1 and 2)
RMON	Enabled
TACACS	Not configured
RADIUS	Not configured
SSH/SSL	Disabled
Telnet	Enabled
Denial of Service Protection	Disabled
Captive Portal	Disabled
Dot1x Authentication (IEEE 802.1X)	Disabled
MAC-based port security	All ports are unlocked
Access control lists (ACL)	None configured
IP source guard (IPSG)	Disabled
DHCP snooping	Disabled
Dynamic ARP inspection	Disabled
Protected ports	None
Private groups	None
Flow control support (IEEE 802.3x)	Disabled
Head of line blocking prevention	Disabled
Maximum frame size	1518 bytes
Auto-MDI/MDIX support	Enabled
Auto-negotiation	Enabled
Advertised port speed	Maximum Capacity
Broadcast storm control	Enabled
Port mirroring	Disabled
LLDP	Enabled

Table 231. Default Settings (continued)

Feature	Default
LLDP-MED	Enabled
MAC table address aging	300 seconds (dynamic addresses)
DHCP Layer 2 relay	Disabled
Default VLAN ID	1
Default VLAN name	Default
GVRP	Disabled
GARP timers	Leave: 60 centiseconds Leave All: 1000 centiseconds Join: 20 centiseconds
Voice VLAN	Disabled
Guest VLAN	Disabled
RADIUS-assigned VLANs	Disabled
Double VLANs	Disabled
Spanning Tree Protocol (STP)	Enabled
STP operation mode	IEEE 802.1s RSTP
Optional STP features	Disabled
STP bridge priority	32768
Multiple Spanning Tree	Disabled
Link aggregation	No Link Aggregation Groups (LAGs) configured
LACP system priority	1
Routing mode	Disabled
IP helper and UDP relay	Disabled
Tunnel and loopback interfaces	None
DiffServ	Enabled
Auto VoIP	Disabled
Auto VoIP traffic class	6
MLD snooping	Disabled
IGMP snooping	Enabled
IGMP snooping querier	Enabled
GMRP	Disabled

C

Acronyms and Abbreviations

In most cases, acronyms and abbreviations are defined on first use in this document. Acronyms and abbreviations are also defined in the following table.

Table 232. Acronyms and Abbreviations

Acronym	Definition
100BASE-TX	Fast Ethernet at 100 Mbps (12.5 MBps) with auto-negotiation
1000BASE-T	Gbps Ethernet over twisted pair a 1 Gbps (125 Mbps)
10GBASE-T	Or IEEE 802.3an. A standard by the IEEE 802.3 committee to provide 10 Gigabits per second (Gbps) (1,250 Megabit per Second (Mbps)) Ethernet connections over conventional shielded or unshielded twisted pair (UTP) cables.
802.1x	IEEE 802.1x Authentication Protocol Standard
ACE	Access Control Entry
ACL	Access Control List
API	Application Programming Interface
ARP	Address Resolution Protocol
AVB	Audio Video Broadcast, Audio Video Bridging
BFD	Bidirectional Forwarding Detection
BGP	Border Gateway Protocol
Boot file	The software image (typically a `.stk` file), which is intended to download and run on the target NETGEAR ProSafe Managed device.
BSP	Board Support Package
CDP	Cisco Discovery Protocol
CE	Control Element
CLI	Command Line Interface

Table 232. Acronyms and Abbreviations (continued)

Acronym	Definition
CoS	Class of Service. An indication of how an upper-layer protocol requires a lower-layer protocol to treat its messages. A CoS definition comprises a virtual route number and a transmission priority field (ToS)
DAPI	Destination Access Point Identifier
DCVPN	Data Center Virtual Private Network
Default Gateway	The IP address of a router that a host can use as its first hop when the host does not know a more specific route to a given destination.
Default Route	A manually configured (*static*) route whose destination is 0.0.0.0/0.0.0.0 and therefore matches every packet's destination. A router uses a default route to forward packets that do not match a more specific route.
DHCP	Dynamic Host Configuration Protocol (RFC 2131, RFC3315). A mechanism for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them.
DHCP Server	Dynamic Host Configuration Protocol Servers are servers that grant the address and do parameter assignment to requested clients in the network. Current interest is that these servers provide TFTP server and boot file information.
DLL	Data Link Layer
DNS Server	Domain Name System servers that provide the IP address mapping to the name of the hosts.
DSCP	Differentiated Services Code Point
DTL	Device Transformation Layer
DTP	Dynamic Trunking Protocol
EAP	Extensible Authentication Protocol
EAPOL	Extensible Authentication Protocol over LAN
ECMP	Equal Cost Multiple Paths
EEE	Energy Efficient Ethernet (from the IEEE 802.3az Energy Efficient Ethernet Task Force and IEEE 802.3az Energy Efficient Ethernet Study Group).
EFP	Egress Filter Processor
FDB	Forwarding Database
HAPI	Hardware Application Programming Interface
Host Interface	An IP interface that is not a routing interface. Only locally-originated packets are sent on a host interface. Only packets with a local destination are received. Host interfaces do not participate in dynamic routing protocols.
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure

Table 232. Acronyms and Abbreviations (continued)

Acronym	Definition
IAS	Internal Authentication Server
IFP	Ingress Filter Processor
IGMP	Internet Group Management Protocol
In-band Interface	An IP interface that could be used for in-band management. Any IP interface other than the Out-of-Band port.
IP	Internet Protocol
IP Address Owner	The VRRP router that has the virtual router's IP address(es) as real interface address(es). This is the router that, when up, will respond to packets addressed to one of these IP addresses for ICMP pings, TCP connections, and so on
IP Interface	An interface configured as an IP interface rather than a Layer 2 switching interface. An IP interface must be assigned one or more IP addresses. Also called a *Layer 3 interface*.
IP MAP	The NETGEAR ProSafe Managed component that manages global and per-interface IPv4 configuration. IP MAP manages the configuration of static and default routes. IP MAP adds and removes local, static, and default routes from RTO.
IP6MAP	The IPv6 equivalent of IP MAP.
IPv4	Internet Protocol Version 4
IPv6	Internet Protocol Version 6
ISDP	Industry Standard Discovery Protocol
ISID	Initiator-defined session identifier
L2	Layer 2 (networking)
L3	Layer 3 (networking)
LAG	Link Aggregation Group (IEEE standard)
LLDP	Link Layer Discovery Protocol
LLPF	Link Local Protocol Filtering
Local Route	A route to an attached subnet. A router creates a local route for each active, locally-configured IP address and uses the local route to reach other stations on the attached subnet.
LPI	Low-power Idle
MAB	MAC Authentication Bypass
MAC	Media Access Control
Management Interface	An external IP interface used to send and receive IP packets to configure and monitor the device.
Management VLAN	A VLAN configured to be used for management rather than control or data traffic.

Table 232. Acronyms and Abbreviations (continued)

Acronym	Definition
MFDB	Multicast Forwarding Database
MIB	Management Information Base
MLAG	Multi-switch Link Aggregation
MMU	Memory Management Unit
MPLS	Multiprotocol Label Switching: A standard involving IP quality.
MUA	Message User Agent
MVR	Multicast VLAN Registration
N/A	not applicable
N_IDLE	Normal IDLE
NAS	Network Access Server, Network Application Support
NMS	Network Management System
NSF	Nonstop Forwarding
OTP	One-Time Password
PA	Policy Assisted
PAE	Port Access Entity
PD	Powered Device
PDU	Protocol Data Unit
PIM-DM	Protocol-Independent Multicast Dense mode
PIM-SM	Protocol-Independent Multicast Sparse mode
Primary IP Address	An IP address selected from the set of real interface addresses. One possible selection algorithm is to always select the first address. VRRP advertisements are always sent using the primary IP address as the source of the IP packet.
PoE	Power over Ethernet. Corresponds to the IEEE 802.3AF standard which supports power delivery of up to 15.4W per port.
PoE+	Power over Ethernet Plus. Corresponds to the IEEE 802.3AT standard which supports power delivery of up to 30.0W per port.
PSE	Power Sourcing Equipment
PVST+	Per VLAN Spanning Tree Plus
PVSTP	Per VLAN Rapid Spanning Tree Protocol
QoS	Quality of Service
RADIUS	Remote Authentication Dial-in User Service

Table 232. Acronyms and Abbreviations (continued)

Acronym	Definition
RED	Random Early Discard
Routing Interface	An IP interface whose physical ports are front panel ports and associated with a VLAN. Packets received on a routing interface can be transmitted on a different VLAN than they were received on.
RTC	Real-time Clock
RTO	NETGEAR ProSafe Managed routing table manager
SDM	Switch Database Management
Service Port	An IP interface on an Ethernet interface that is separate from the front panel ports. The service port is dedicated to management. The service port has its own independent interface to the IP stack. The service port is a host interface.
SM	state machine
SMTP	Simple Mail Transfer Protocol
SNTP	Simple Network Time Protocol
SP	Strict Priority
SSTP	Shared Spanning Tree Protocol
TFTP	Trivial File Transfer Protocol
TFTP Server	Trivial File Transfer Protocol Servers are servers that hold the requested configuration and/or image files for requested clients.
TLV	Type-Length-Value
UDLD	Uni-Directional Link Detection
UI	User Interface
UPoE	Universal Power over Ethernet. No IEEE standard exists yet for UPoE. NETGEAR UPoE supports power delivery of up to 60W per port.
USB	Universal Serial Bus
Virtual Router	An abstract object managed by VRRP that acts as a default router for hosts on a shared LAN. It consists of a virtual router identifier and a set of associated IP address(es) across a common LAN. A VRRP router can backup one or more virtual routers
Virtual Router Backup	The set of VRRP routers available to assume forwarding responsibility for a virtual router if the current Master fails.
Virtual Router Master	The VRRP router that is assuming the responsibility of forwarding packets sent to the IP address(es) associated with the virtual router, and answering ARP requests for these IP addresses. Note that if the IP address owner is available, then it will always become the Master.
VLAN	Virtual Local Area Network

Table 232. Acronyms and Abbreviations (continued)

Acronym	Definition
VRRP Router	A router running the Virtual Router Redundancy Protocol. It can participate in one or more virtual routers.
VTP	VLAN Trunking Protocol