NETGEAR®

Insight Managed 8-Port Gigabit Ethernet Smart Cloud Switch with 2 SFP Fiber Ports

Models GC110, GC110P, GC510P, and GC510PP

User Manual

July 2018
202-11745-04

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Support

Thank you for purchasing this NETGEAR product. You can visit *www.netgear.com/support* to register your product, get help, access the latest downloads and user manuals, and join our community. We recommend that you use only official NETGEAR support resources.

Conformity

For the current EU Declaration of Conformity, visit *http://kb.netgear.com/app/answers/detail/a_id/11621*.

Compliance

For regulatory compliance information, visit *http://www.netgear.com/about/regulatory*.

See the regulatory compliance document before connecting the power supply.

Do not use this device outdoors. If you connect cables or devices that are outdoors to this device, see *http://kb.netgear.com/000057103* for safety and warranty information.

Trademarks

Revision History

Publication Part Number	Publish Date	Comments
202-11745-04	July 2018	Removed section on using the NETGEAR Switch Discovery Tool to access the switch and made other minor changes or corrections.
202-11745-03	May 2018	Added *Chapter 4, Configuring Routing*. Made other minor changes or corrections.
202-11745-02	January 2018	Added or made major changes to the following sections: • *Switch Management Options and Default Management Mode* on page 10 • Determine the Switch IP Address Through the NETGEAR Switch Discovery Tool and Access the Switch On-Network on page 16 • *Change the Management Mode of the Switch* on page 20 • *Manage the Bonjour Settings and View Bonjour Information* on page 69 • *Control the LEDs* on page 70 Made other minor changes and corrections.
202-11745-01	September 2017	First publication

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Getting Started

1

This manual describes how you can configure and monitor the following NETGEAR Insight managed switches by using the local browser–based management interface:

- **GC110**. 8-Port Gigabit Ethernet Insight Managed Smart Cloud Switch with 2 SFP Fiber Ports
- **GC110P**. 8-Port Gigabit Ethernet PoE Insight Managed Smart Cloud Switch with 2 SFP Fiber Ports
- **GC510P**. 8-Port Gigabit Ethernet PoE+ Insight Managed Smart Cloud Switch with 2 SFP Fiber Ports
- **GC510PP**. 8-Port Gigabit Ethernet High-Power PoE+ Insight Managed Smart Cloud Switch with 2 SFP Fiber Ports

This chapter contains the following sections:

- *Switch Management Options and Default Management Mode*
- *Available Publications*
- *Web Browser Requirements and Supported Browsers*
- *User-Defined Fields*
- *Interface Naming Conventions*
- *Access the Switch*
- *Change the Management Mode of the Switch*
- *Register the Switch*
- *How to Configure Interface Settings*
- *Local Browser Interface Device View*

In this manual, we refer to all switch models as *the switch*. Unless noted otherwise, all information applies to all switch models.

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

Firmware updates with new features and bug fixes are automatically made available through the Insight app and, if selected, pushed straight from the cloud to the device. If you are not using the Insight app to manage your device, you can manually download and install the latest firmware by visiting *downloadcenter.netgear.com*. If the features or behavior of your product does not match what is described in this manual, you might need to update your firmware.

Switch Management Options and Default Management Mode

If you prefer, you can use the switch as a plug-and-play device, so you do not need to set up a custom configuration. Just connect power, connect to your network and to your other devices, and you’re done.

The switch is designed for management by the NETGEAR Insight app on a smartphone or tablet. Alternatively, you can manage the switch from the Insight Cloud portal that is available from a web browser on your Windows-based computer, Mac, or tablet. By default, the local browser interface is disabled and you cannot use it while the switch is managed by the NETGEAR Insight app or Insight Cloud portal.

The switch provides management options that let you discover the switch on the network and configure, monitor, and control the switch:

- **NETGEAR Insight app**. Using the NETGEAR Insight app, you can discover the switch on the network and add the switch to the NETGEAR Insight app so that you can set up the switch in the network and manage and monitor the switch remotely from your smartphone.You can choose from four methods to add the switch to the NETGEAR Insight app: You can scan your network for the switch, scan the QR code or the barcode of the switch, or add the serial number of the switch. For more information, visit *netgear.com/insight* and see the NETGEAR knowledge base articles at *netgear.com/support*.
- **Insight Cloud portal**. Using the NETGEAR Insight Cloud portal, you can set up the switch in the network, perform advanced remote setup, configuration, and management, monitor the switch, analyze the switch and network usage, and, if necessary, troubleshoot the switch and the network.
- **Local browser interface**. By default, the management mode of the switch is set to NETGEAR Insight Mobile App and Insight Cloud Portal. With this setting you can manage the switch using the Insight app or the Insight Cloud portal. For complex tasks such as integrating with an existing network of devices that are not managed through Insight, and for debugging purposes, you can change the management mode of the switch to Direct Connect Web-browser Interface and access the local browser interface. In this mode, you can change the settings of the specific device, but we recommend that you do not use this mode to change settings that are Insight manageable because they would not be synchronized with Insight or to the network location and other devices to which you assigned the switch.

Note: Changes to Insight-manageable settings from the local browser interface might also create conflicts with the rest of the Insight-managed network to which the device is connected. While you manage the switch with the local browser interface, you cannot use the Insight app or Insight Cloud portal. To reenable management of the device remotely or through the cloud, you can return the management mode to NETGEAR Insight Mobile App and Insight Cloud Portal at any time so that you can manage the switch with the Insight app or Insight Cloud portal.

To use the local browser interface method, after you connect the switch to your network, you must change the management method to Direct Connect Web-browser Interface (see *Change the Management Mode of the Switch* on page 20).

Available Publications

The following guides are available at *downloadcenter.netgear.com*:

- *Installation Guide*
- *Hardware Installation Guide*

For information about the NETGEAR Insight app, visit *netgear.com/insight* and see the NETGEAR knowledge base articles at *netgear.com/support*.

Web Browser Requirements and Supported Browsers

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

- HTML version 4.0, or later
- HTTP version 1.1, or later

The following browsers were tested and support the local browser interface. Later browser versions might function fine but were not tested. The following web browsers are supported:

- Microsoft Internet Explorer (IE) version 11
- Microsoft Edge
- Mozilla Firefox versions 59.0.3
- Chrome version 66.0.3359.139
- Safari on Mac OS 10.1.2 (12603.3.8)

User-Defined Fields

In the local browser interface, user-defined fields can contain 1 to 159 characters, unless otherwise noted in the field label on the configuration page. All alphanumeric and special characters can be used except for the following (unless specifically noted for that feature):

Table 1. Disallowed characters in user-defined fields

Character	Definition	Character	Definition
\	Backslash	<	Less than
/	Forward slash	>	Greater than
*	Asterisk	|	Pipe
?	Question mark		

Interface Naming Conventions

The switch supports physical and logical interfaces. Interfaces are identified by their type and the interface number. For all models, the physical ports include eight Gigabit Ethernet ports and two SFP fiber ports. The ports 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 2. Naming conventions for interfaces

Interface	Description	Example
Physical	The physical ports include gigabit ports and are numbered sequentially starting from 1 using the following format: gY. g is for a 1G port and Y is the port number.	g1, g2, g8
Link aggregation group (LAG)	LAG interfaces are logical interfaces that are used only for bridging functions.	l1, l2, l4
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.	CPU

Access the Switch

When you use the local browser interface, for easiest access, we recommend that you cable the switch to a network with a router or DHCP server that assigns IP addresses, power on the switch, and then use a computer that is connected to the same network as the switch (on-network, see *Access the Switch On-Network* on page 13).

It is also possible to configure the switch connected directly only to the computer that you are using to configure it, and not connected to the network (off-network, see *Access the Switch Off-Network* on page 19).

Access the Switch On-Network

The DHCP client on the switch is enabled by default, allowing a DHCP server on the network (or router that functions as a DHCP server) to assign an IP address to the switch.

If the switch is connected to a network, you can use *one* of the following methods to determine the IP address of the switch and access the switch:

- **Use a Windows-based computer**. See *Access the Switch On-Network from a Windows-Based Computer* on page 13.
- **Use a Mac**. See *Access the Switch On-Network from a Mac Using Bonjour* on page 14.
- **Use the NETGEAR Insight app**. See *Determine the Switch IP Address Using the NETGEAR Insight App and Access the Switch On-Network* on page 17.
- **Access the DHCP server**. See *Determine the Switch IP Address From the DHCP Server and Access the Switch On-Network* on page 15.
- **Use an IP scanner utility**. See *Determine the Switch IP Address Through an IP Scanner and Access the Switch On-Network* on page 18.

Access the Switch On-Network from a Windows-Based Computer

➢ **To use a Windows-based computer and web browser to access the switch that is connected to a network:**

1. Cable the switch to a network with a router or DHCP server that manages IP addresses.
2. Power on the switch.

   The DHCP server assigns the switch an IP address.
3. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection.
4. Open Windows Explorer.
5. Click the **Network** link.
6. If prompted, enable the Network Discovery feature.
7. Under Network Infrastructure, locate the switch model number.

   The model number can be GC110, GC110P, GC510P, or GC510PP.

8. Double-click **GCmodel (xx:xx:xx:xx:xx:xx)** (where GCmodel is the model number of your switch and xx:xx:xx:xx:xx:xx is the MAC address of the switch).

   The login page of the local browser interface opens.

9. Enter the password.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

10. Click the **Login** button.

    A notification displays.

11. Click the **OK** button to close the notification.

    The System Information page displays. The IP address of the switch displays on the System Information page.

12. Write down the IP address for future use.
13. Select the **Direct Connect Web-browser Interface** radio button.
14. Click the **Apply** button.

    Your settings are saved.

    The System Information page closes, any current Insight-manageable device settings are saved to the cloud server, and the login window displays again.

15. When prompted, enter the password.

    The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

    The System Information page displays and the full local browser interface is now available.

Access the Switch On-Network from a Mac Using Bonjour

If your Mac supports Bonjour, you can use the following procedure.

➢ **To use a Mac and web browser to access the switch that is connected to a network:**

1. Cable the switch to a network with a router or DHCP server that manages IP addresses.
2. Power on the switch.

   The DHCP server assigns the switch an IP address.

3. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection.

4. Open the Safari browser.
5. Select **Safari > Preferences**.

The General page displays.

6. Click the **Advanced** tab.

   The Advanced page displays.

7. Select the **Include Bonjour in the Bookmarks Menu** check box.
8. Close the Advanced page.
9. Select **Bookmarks > Bonjour > GCmodel (xx:xx:xx:xx:xx:xx)** (where GCmodel is the model number of your switch and xx:xx:xx:xx:xx:xx is the MAC address of the switch), or **Bookmarks > Bonjour > Webpages *GCmodel* (xx:xx:xx:xx:xx:xx)** depending on your Mac OS version.

   The login page of the local browser interface opens.

10. Enter the password.

    The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

11. Click the **Login** button.

    A notification displays.

12. Click the **OK** button to close the notification.

    The System Information page displays. The IP address of the switch displays on the System Information page.

13. Write down the IP address for future use.
14. Select the **Direct Connect Web-browser Interface** radio button.
15. Click the **Apply** button.

    Your settings are saved.

    The System Information page closes, any current Insight-manageable device settings are saved to the cloud server, and the login window displays again.

16. When prompted, enter the password.

    The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

    The System Information page displays and the full local browser interface is now available.

Determine the Switch IP Address From the DHCP Server and Access the Switch On-Network

For information about how to access the DHCP server (or router that functions as a DHCP server) in your network, see the documentation for your DHCP server (or router).

➢ **To access the DHCP server and use a web browser to access the switch that is connected to a network:**

1. Cable the switch to a network with a router or DHCP server that manages IP addresses.
2. Power on the switch.

   The DHCP server assigns the switch an IP address.

3. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection.

4. Access the DHCP server and view the IP address assigned to the switch.
5. Write down the IP address for future use.
6. Launch a web browser.
7. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

8. When prompted, enter the password.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

9. Click the **Login** button.

   A notification displays.

10. Click the **OK** button to close the notification.

    The System Information page displays.

11. Select the **Direct Connect Web-browser Interface** radio button.
12. Click the **Apply** button.

    Your settings are saved.

    The System Information page closes, any current Insight-manageable device settings are saved to the cloud server, and the login window displays again.

13. When prompted, enter the password.

    The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

    The System Information page displays and the full local browser interface is now available.

Determine the Switch IP Address Using the NETGEAR Insight App and Access the Switch On-Network

➢ **To use the NETGEAR Insight app and a web browser to access the switch that is connected to a network:**

1. On your iOS or Android mobile device, go to the app store, search for NETGEAR Insight, and download the app.
2. If the switch is directly connected to a WiFi router or access point, connect your mobile device to the WiFi network of the router or access point.
3. Open the NETGEAR Insight app.
4. Select **LOG IN** to log in to your existing NETGEAR account or tap the **CREATE NETGEAR ACCOUNT** button to create a new account.
5. After you log in to your account, name your network and specify a device admin password that applies to all devices that you add to this network.

   When you are done, tap the **NEXT** button.
6. You can now add the switch. Choose one of the following options:
   - Tap **Switch** as the device type and follow the prompts to scan the network.
   - Scan the QR code.
   - Scan the serial number bar code.
   - Type in the serial number.

   Note: Screens might display and suggest that you connect the switch to power and to an uplink. Since the switch is already connected to your network, on these screens, tap the **NEXT** button.
7. If the switch is not yet connected to the same WiFi network as your mobile device, connect it now to the same WiFi network, wait two minutes, and then tap the **NEXT** button.

   The IP address of the switch displays in the device list.
8. Write down the IP address for future use.
9. Launch a web browser.
10. In the address field of your web browser, enter the IP address of the switch.

    The login window opens.
11. When prompted, enter the password.

    The default password is **password**. Because you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.
12. Click the **Login** button.

    A notification displays.
13. Click the **OK** button to close the notification.

The System Information page displays.

14. Select the **Direct Connect Web-browser Interface** radio button.
15. Click the **Apply** button.

    Your settings are saved.

    The System Information page closes, any current Insight-manageable device settings are saved to the cloud server, and the login window displays again.

16. When prompted, enter the password.

    Because you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

    The System Information page displays and the full local browser interface is now available.

Determine the Switch IP Address Through an IP Scanner and Access the Switch On-Network

IP scanner utilities are available free of charge on the Internet.

➢ **To use an IP scanner utility and web browser to access the switch that is connected to a network:**

1. Cable the switch to a network with a router or DHCP server that manages IP addresses.
2. Power on the switch.

   The DHCP server assigns the switch an IP address.

3. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection.

4. Using the IP scanner utility, scan your network for the IP address assigned to the switch.
5. Write down the IP address for future use.
6. Launch a web browser.
7. In the address field of your web browser, enter the IP address of the switch.

   The login window opens.

8. When prompted, enter the password.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

9. Click the **Login** button.

   A notification displays.

10. Click the **OK** button to close the notification.

The System Information page displays.

11. Select the **Direct Connect Web-browser Interface** radio button.
12. Click the **Apply** button.

    Your settings are saved.

    The System Information page closes, any current Insight-manageable device settings are saved to the cloud server, and the login window displays again.

13. When prompted, enter the password.

    The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

    The System Information page displays and the full local browser interface is now available.

Access the Switch Off-Network

The default IP address of the switch is 192.168.0.239. The IP address of the computer that you use to access the switch off-network must in the same subnet as the default IP address of the switch.

➢ **To use your web browser to configure a switch that is not connected to a network:**

1. Record your computer’s TCP/IP configuration settings, and then configure the computer with a static IP address of 192.168.0.210 and 255.255.255.0 as the subnet mask.

    Note: If you are unsure how to do this, visit *netgear.com/search-support.aspx* and search for the following:
    How to set a static IP address in Windows
    or
    Setting a static IP address on your network adapter in Mac OS

2. Plug the switch into a power outlet and then connect your computer to the switch using an Ethernet cable.

    You can connect the Ethernet cable to any Ethernet port on the switch.

3. Open a web browser, and enter **http://192.168.0.239**.

    This is the default address of the switch.

4. When prompted, enter the password.

    The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

5. Click the **Login** button.

    A notification displays.

6. Click the **OK** button to close the notification.

   The System Information page displays.

7. Select the **Direct Connect Web-browser Interface** radio button.
8. Click the **Apply** button.

   Your settings are saved.

   The System Information page closes, any current Insight-manageable device settings are saved to the cloud server, and the login window displays again.

9. When prompted, enter the password.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays and the full local browser interface is now available.

10. After you complete the configuration of the switch, reconfigure the computer that you used for this process to its original TCP/IP settings.

    You can now connect your switch to your network using an Ethernet cable.

Change the Management Mode of the Switch

By default, the management mode on the switch is NETGEAR Insight Mobile App and Insight Cloud Portal. With this setting you can manage the switch using the Insight app or the Insight Cloud portal. The first time that you log in to the switch's local browser interface, you must change the management mode to Direct Connect Web-browser Interface (which is the same as the local browser interface). You can also change the management mode back to NETGEAR Insight Mobile App and Insight Cloud Portal, which also reenables supports for the Insight Cloud portal.

Note the following about changing the management mode:

- **Changing to Direct Connect Web-browser Interface**. The NETGEAR Insight app management mode becomes disabled and the current Insight-manageable device settings are saved to the cloud server. Any changes that you make using the Direct Connect Web-browser Interface management mode are not saved to the cloud server.
- **Changing back to NETGEAR Insight Mobile App and Insight Cloud Portal**. If you added the switch to a network on the Insight app before, all Insight-manageable device settings are returned to the last configuration saved on the cloud server, including the switch password (that is, the password is reset to the Insight network password).

Change the Management Mode to Direct Connect Web-browser Interface

Note: If you already accessed the local browser interface (see *Access the Switch* on page 13), you can skip this section.

➢ **To change the management mode of the switch to Direct Connect Web-browser Interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **Password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select the **Direct Connect Web-browser Interface** radio button.
6. Click the **Apply** button.

   Your settings are saved. The System Information page closes and the login window displays again.

   Any current Insight-manageable device settings are saved to the cloud server.

7. Enter the switch’s password in the **Password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays and the full local browser interface is now available.

Change the Management Mode Back to NETGEAR Insight Mobile App and Insight Cloud Portal

➢ **To change the management mode of the switch back to NETGEAR Insight Mobile App and Insight Cloud Portal:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **Password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select the **NETGEAR Insight Mobile App and Insight Cloud Portal** radio button.
6. Click the **Apply** button.

   Your settings are saved. The System Information page closes and the login page displays again. (You can close the login page.)

   The switch connects to the cloud server. If you added the switch to a network on the Insight app before, all Insight-manageable device settings are returned to the last configuration saved on the cloud server, including the switch password (that is, the password is reset to the Insight network password)

Register the Switch

To qualify for product updates and product warranty, we encourage you to register your product. The first time you log in to the switch, you are given the option of registering with NETGEAR. 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 any time.

If you use the Insight app, after the app discovers the switch and you add it to a network using the NETGEAR Insight app, the switch is automatically registered to your MyNETGEAR account. This registration process is also referred to as claiming. For information about the NETGEAR Insight app, see the NETGEAR knowledge base articles at *netgear.com/support*.

If you do not claim (register) the device and add it to an Insight network using the Insight app, you can manually register the switch using the local browser interface as described in the following procedure or you can visit he NETGEAR website for registration at *https://my.netgear.com/register/register.aspx*.

➢ **To register the switch through the local browser interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

5. Select **Help > Registration**.

   The Product Registration page displays.

6. Click the **Register** button.

   A NETGEAR web page opens.

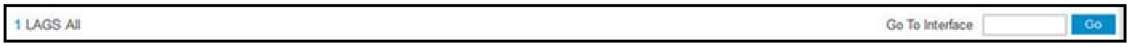
7. Follow the prompts online.

How to Configure Interface Settings

For some features you can apply the same settings simultaneously to any of the following:

- A single port
- Multiple ports
- All ports
- A single LAG
- Multiple LAGs
- All LAGs
- Multiple ports and LAGs
- All ports and LAGs

Many of the pages that allow you to configure or view interface settings include links to display all ports, all LAGs, or all ports and LAGs on the page.



Use these links as follows:

- To display all ports, click the **1** link. The LAGs are not displayed.
- To display all LAGs, click the **LAGS** link. The ports are not displayed.
- To display all ports and LAGs, click the **All** link.

The procedures in this section describe how to select the ports and LAGs to configure. The procedures assume that you are already logged in to the switch. If you do not know how to log in to the switch, see *Access the Switch* on page 13.

➢ To configure a single port or LAG:

1. Click the **All** link to display the all ports and LAGs.
2. Do one of the following:
   - **a.** In the **Go To Interface** field, type the port number and click the **Go** button.

     For example, type **g4** for a port or type **l3** for a LAG. For more information, see *Interface Naming Conventions* on page 12.

     The check box for the interface is selected, the row for the selected interface is highlighted, and the interface number displays in the heading row.
   - **b.** Select the check box for the port or LAG.

     The row for the selected interface is highlighted, and the interface number displays in the heading row.
3. Configure the desired settings.
4. Click the **Apply** button.

   Your settings are saved.

➢ To configure multiple ports and LAGs:

1. Click the **All** link to display all ports and LAGs.
2. Select the check box next to each port and LAG to configure.

   The row for each selected interface is highlighted.
3. Configure the desired settings.
4. Click the **Apply** button.

   Your settings are saved.

➢ To configure all ports and LAGs:

1. Click the **All** link to display all ports and LAGs.
2. Select the check box in the heading row.

   The check boxes for all ports and LAGs are selected and the rows for all ports and LAGs are highlighted.

3. Configure the desired settings.
4. Click the **Apply** button.

   Your settings are saved.

Local Browser Interface Device View

The Device View page in the local-only mode browser interface displays the ports and system LEDs 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, feature components, and LED status.

➢ **To use the Device View:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

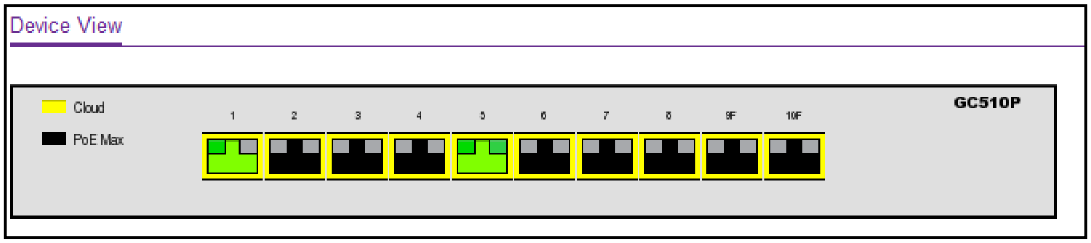
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Device View**.



The previous figure shows the Device View page for model GC510P.

The port color indicates the port status:

- **Green**. The port is linking up.
- **Red**. An error occurred on the port or the port is administratively disabled.
- **Black**. No link is present.

The left port LED indicates the connection, speed, and traffic status:

- **Solid gray**. The port is not connected. This is the default state.
- **Solid green**. The port is operating at its maximum speed.
- **Blinking green**. The port is transmitting or receiving traffic at its maximum speed
- **Solid amber** The port is operating at below its maximum speed.
- **Blinking amber**. The port is transmitting or receiving traffic below its maximum speed.

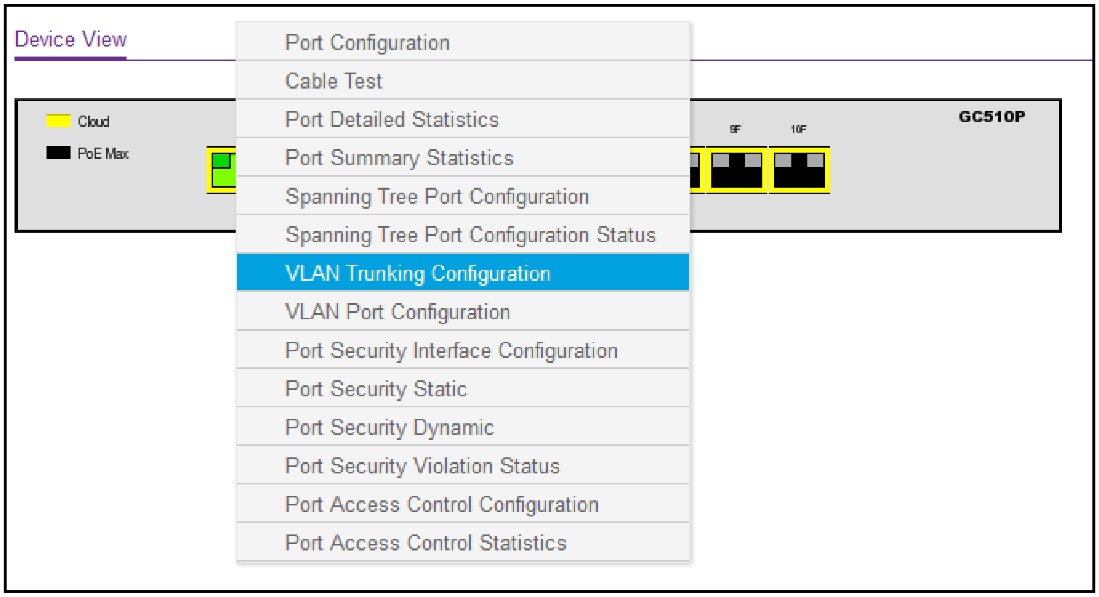
The right port LED indicates the PoE status (does not apply to model GC110):

- **Off**. The port is not delivering PoE power.
- **Solid green**. The port is delivering PoE power.
- **Solid amber**. A PoE fault occurred.

The system LEDs indicate the following status:

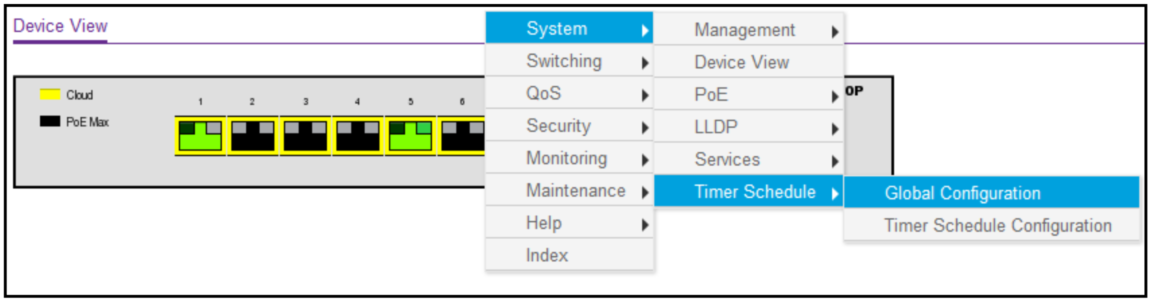
- Cloud LED:
  - **Solid blue**. The switch is connected to the cloud server and is set up to be managed by the NETGEAR Insight app.
  - **Off**. The switch is not connected to the cloud server or is set up to be managed by the local browser interface.
- PoE Max LED (does not apply to model GC110):
  - **Off**. Sufficient (more than 7W of) PoE power is available.
  - **Solid amber**. Less than 7W of PoE power is available.
  - **Blinking amber**. At least once during the previous two minutes, less than 7W of PoE power was available.
- Fan LED (model GC510PP only):
  - **Solid green**. The fan is operating normally.
  - **Solid amber**. A problem occurred with the fan.

6. To see a menu that displays statistics and configuration options, right-click on a port.


Device View
Cloud
PoE Max
9F
10F
GC510P
Port Configuration
Cable Test
Port Detailed Statistics
Port Summary Statistics
Spanning Tree Port Configuration
Spanning Tree Port Configuration Status
VLAN Trunking Configuration
VLAN Port Configuration
Port Security Interface Configuration
Port Security Static
Port Security Dynamic
Port Security Violation Status
Port Access Control Configuration
Port Access Control Statistics

The previous figure shows the Device View page for model GC510P.

7. To display the main menu that contains the same options as the navigation menu at the top of the page, right-click the graphic without clicking a specific port.



The previous figure shows the Device View page for model GC510P.

8. To return to the Device View page, select **System > Device View** from the System Information page.

Configure System Information

2

This chapter covers the following topics:

- *View and Configure the Switch Management Settings*
- *Manage the Bonjour Settings and View Bonjour Information*
- *Control the LEDs*
- *Use the Device View*
- *Configure Power over Ethernet*
- *Configure Link Layer Discovery Protocol*
- *Configure DHCP L2 Relay and DHCP Snooping*
- *Set Up PoE Timer Schedules*

View and Configure the Switch Management Settings

This section describes how to display the switch status and specify some basic switch information, such as the management interface IP address, system clock settings, and DNS information. The following sections describe how you can configure the switch management settings:

- *View or Define System Information* on page 29
- *View the Switch CPU Status* on page 34
- *Configure the IPv4 Address for the Network Interface and Management VLAN* on page 37
- *Configure the IPv6 Address for the Network Interface* on page 38
- *View the IPv6 Network Neighbor* on page 40
- *Configure the Time Settings* on page 41
- *Configure Denial of Service Settings* on page 55
- *Configure DNS Settings* on page 57
- *Configure Green Ethernet Settings* on page 61

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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

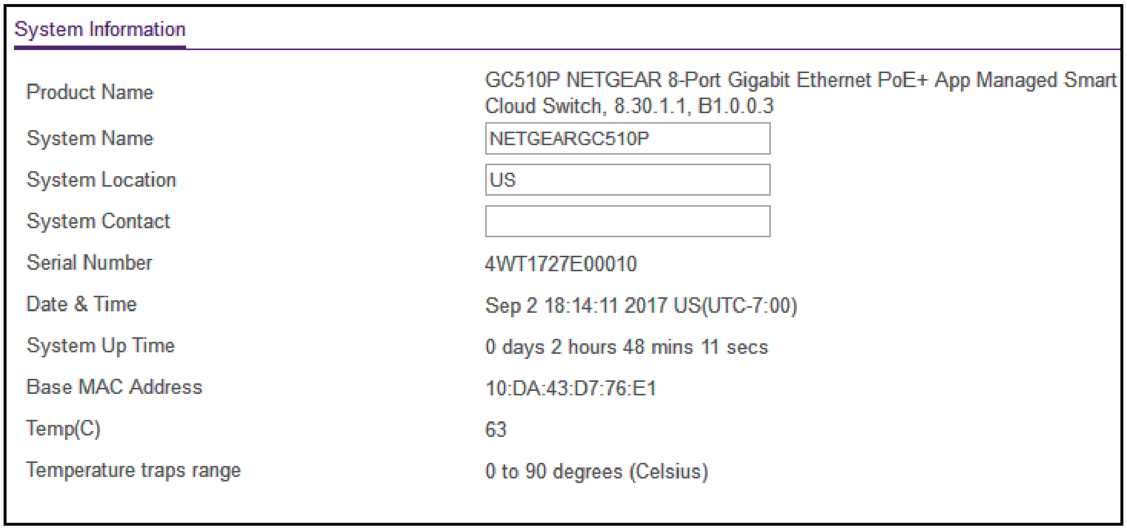
   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.



System Information

Product Name	GC510P NETGEAR 8-Port Gigabit Ethernet PoE+ App Managed Smart Cloud Switch, 8.30.1.1, B1.0.0.3
System Name	NETGEARGC510P
System Location	US
System Contact	
Serial Number	4WT1727E00010
Date & Time	Sep 2 18:14:11 2017 US(UTC-7:00)
System Up Time	0 days 2 hours 48 mins 11 secs
Base MAC Address	10:DA:43:D7:76:E1
Temp(C)	63
Temperature traps range	0 to 90 degrees (Celsius)

5. Define the following fields:
   - **System Name**. Enter the name to identify this switch. You can use up to 255 alphanumeric characters.
   - **System Location**. Enter the location of this switch. You can use up to 255 alphanumeric characters.
   - **System Contact**. Enter the contact person for this switch. You can use up to 255 alphanumeric characters.
6. Click the **Apply** button.

   Your settings are saved.

The following table describes the status information that the System Information page displays.

Table 3. System Information

Field	Description
Product Name	The product name of this switch.
Serial Number	The serial number of the switch.
Date & Time	The current date and time.
System Up Time	The time in days, hours, and minutes since the last switch reboot.
Base Mac Address	Universally assigned hardware address of the switch.
Temp (C)	The general temperature of the switch in degrees Centigrade.
Temperature traps range	Identifies the minimum and maximum traps range.

View the Temperature Sensor Information

You can view the current temperature of the temperature sensors. The temperature is instant and can be updated with the latest information about the switch when you click the **Refresh** button. The maximum temperature of the temperature sensors depends on the actual hardware.

➢ **To view temperature information:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

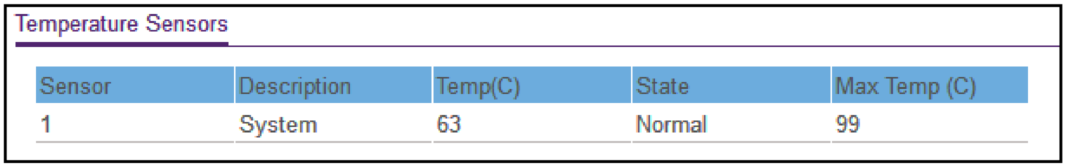
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Scroll down to the Temperature Sensors section.



Temperature Sensors

Sensor	Description	Temp(C)	State	Max Temp (C)
1	System	63	Normal	99

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

The following table describes the nonconfigurable Temperature Sensors information.

Table 4. Temperature Sensors information

Field	Description
Sensor	The temperature sensor for the switch.
Description	The description of the temperature sensor.
Temp(C)	The temperature of the switch in degrees Centigrade.
State	The switch temperature state.
Max Temp (C)	The maximum temperature value of CPU. If the switch exceeds this limit, it shuts down.

View the Fan Status

Note: The fan status information is available for model GC510PP only.

You can view the status of the fans. These fans remove the heat generated by the power, CPU, and other components, and allow the switch to function normally.

➢ **To view the fan status:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Scroll down to the Fans section.

   The fan information displays.

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

The following table describes the nonconfigurable fan status information.

Table 5. Fan status

Field	Description
FAN	The fan index used to identify the fan for the switch. (The index is 1.)
Description	The description of the temperature sensor.
Type	Specifies whether the fan module is fixed or removable.
Speed	The fan speed.
Duty level(%)	The duty level of the fan.
State	Specifies whether the fan is operational.

View the Power Supplies

You can view s the status of the power supplies.

- **To view the power supplies status:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

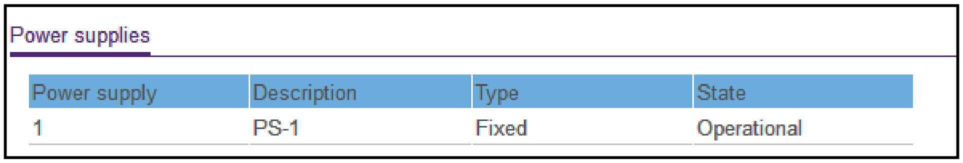
   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Scroll down to the Power supplies section.



Power supplies

Power supply	Description	Type	State
1	PS-1	Fixed	Operational

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

The following table describes the nonconfigurable Power supplies information.

Table 6. Power supplies status

Field	Description
Power supply	The power supply index used for the switch.
Description	The description of the power supply.
Type	Specifies whether the power module is fixed or removable.
State	Specifies the state of the power module.

View the Software Versions

You can view the software versions that are running on the switch.

- **To view the software versions:**

1. Connect your computer to the same network as the switch.

You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

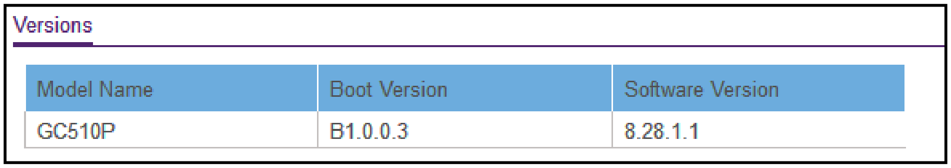
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Scroll down to the Versions section.



Versions

Model Name	Boot Version	Software Version
GC510P	B1.0.0.3	8.28.1.1

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

The following table describes the nonconfigurable information displayed in the Versions section of the System Information page.

Table 7. Versions information

Field	Description
Model Name	The model name of the switch.
Boot Version	The version of the bootloader software of the switch.
Software Version	The version number of the code currently running on the switch.

View the Switch CPU Status

You can monitor the CPU, memory resources, and utilization patterns across various intervals to assess the performance, load, and stability parameters.

➢ **To view the switch CPU status:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

If you do not know the IP address of the switch, see *Access the Switch* on page 13.

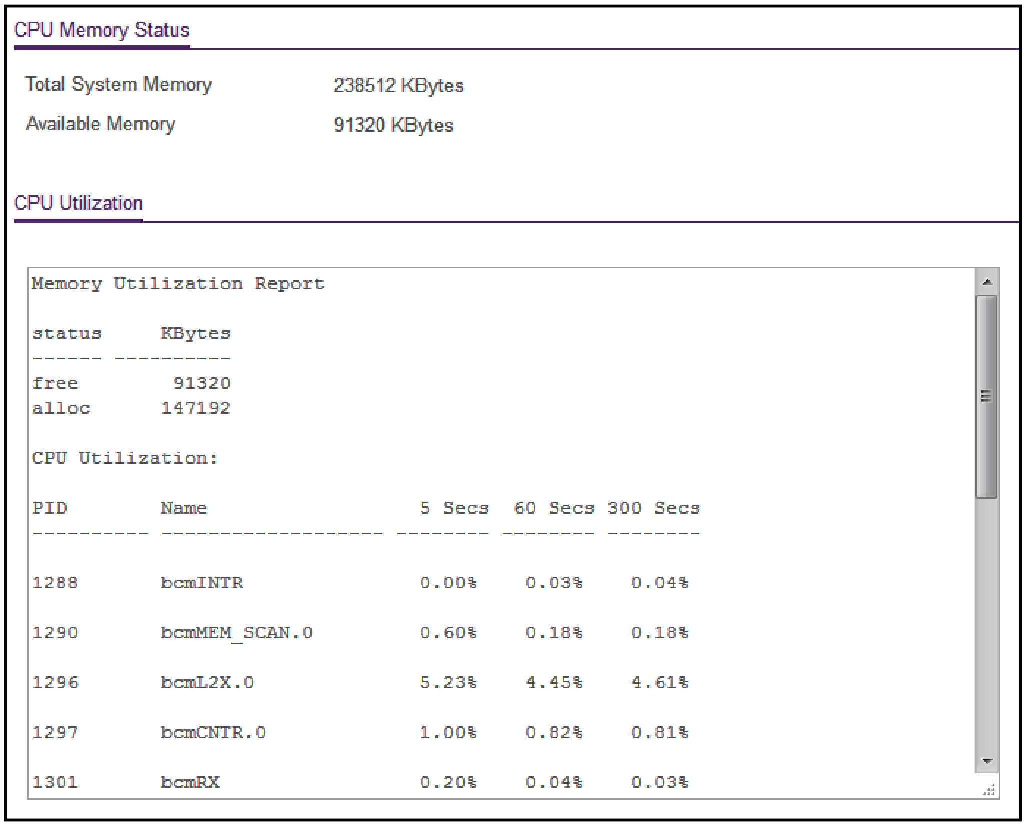
The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > System CPU Status > System CPU Status**.



CPU Memory Status

Total System Memory	238512 KBytes
Available Memory	91320 KBytes

CPU Utilization

```
Memory Utilization Report

status      KBytes
------ ----------
free         91320
alloc       147192

CPU Utilization:

PID         Name                    5 Secs   60 Secs 300 Secs
---------- -------------------- --------- --------- ---------

1288        bcmINTR                 0.00%    0.03%    0.04%

1290        bcmMEM_SCAN.0           0.60%    0.18%    0.18%

1296        bcmL2X.0                5.23%    4.45%    4.61%

1297        bcmCNTR.0               1.00%    0.82%    0.81%

1301        bcmRX                   0.20%    0.04%    0.03%
```

The CPU Utilization section shows the memory information, task-related information, and percentage of CPU utilization per task.

The following table describes CPU Memory Status information.

Table 8. 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 exceeded, trigger a notification. The notification occurs through SNMP trap and syslog messages.

➢ **To configure the CPU thresholds:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > System CPU Status > CPU Threshold**.

   The CPU Threshold page displays.

6. Specify the thresholds:
   - **Rising Threshold**. Notification is generated when the total CPU utilization exceeds this threshold value over the configured time period. The range is 1 to 100.
   - **Rising Interval**. This utilization monitoring time period can be configured from 5 to 86400 seconds in multiples of 5 seconds.
   - **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 sent only if a rising threshold notification was sent previously. Configuring the falling utilization threshold and time period is optional. If the Falling CPU utilization parameters are not configured, the parameters automatically get the same values as the Rising CPU utilization parameters. The range is 1 to 100.
   - **Falling Interval**. The utilization monitoring time period can be configured from 5 seconds to 86400 seconds in multiples of 5 seconds.
   - **Free Memory Threshold**. The free memory threshold value for the CPU in KB.
7. Click the **Apply** button.

   Your settings are saved.

Configure the IPv4 Address for the Network Interface and Management VLAN

You can configure network information for the network interface, which is the logical interface used for in-band connectivity with the switch through any of the switch's ports. You also use the IPv4 address of the network interface to connect to the switch through the local browser interface. The configuration parameters that is associated with the switch's network interface do not affect the configuration of the ports through which traffic is switched.

➢ **To configure the IPv4 address for the network interface and the management VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. **Select System > Management > IP Configuration**.

   The IP Configuration page displays.

6. Select a radio button to specify how the network information for the switch management interface must be configured:
   - **Static IP Address**. Specifies that the IP address, subnet mask, and default gateway must be manually configured. Enter this information in the fields below this radio button.
   - **Dynamic IP Address (BOOTP)**. Specifies that the switch must obtain the IP address through a BootP server.
   - **Dynamic IP Address**. Specifies that the switch must obtain the IP address through a DHCP server. This is the default setting. By default, the DHCP client is enabled.
7. If you select the **Static IP Address** radio button, configure the following network information:
   - **IP Address**. The IP address of the network interface. The default is 192.168.0.239. Each part of the IP address must start with a number other than zero. For example, IP addresses 001.100.192.6 and 192.001.10.3 are not valid.
   - **Subnet Mask**. The IP subnet mask for the interface. The default value is 255.255.255.0.

- **Default Gateway**. The default gateway for the IP interface. The default value is 192.168.0.254.

8. Specify the VLAN ID for the management VLAN.

   The management VLAN is used to establish an IP connection to the switch from a computer that is connected to a port in the same VLAN. If not specified, the active management VLAN ID is 1 (default), which allows an IP connection to be established through any port.

   When the management VLAN is set to a different value, an IP connection can be made only through a port that is part of the management VLAN. Also, the port VLAN ID (PVID) of the port to be connected in that management VLAN must be the same as the management VLAN ID.

   Note: Make sure that the VLAN that you want to assign as the management VLAN exists. Also make sure that the PVID of at least one port in the VLAN is the same as the management VLAN ID. For information about creating VLANs and configuring the PVID for a port, see *Configure VLANs* on page 103.

   The following requirements apply to the management VLAN:

   - Only one management VLAN can be active at a time.
   - When a new management VLAN is configured, connectivity through the existing management VLAN is lost.
   - The management station must be reconnected to the port in the new management VLAN.

9. Click the **Apply** button.

   Your settings are saved.

Configure the IPv6 Address for the Network Interface

You can configure the IPv6 address for the network interface, which is the logical interface used for in-band connectivity with the switch through any of the switch's front-panel ports. You also use the IPv6 address of the network interface to connect to the switch through the local browser interface. The configuration parameters that is associated with the switch's network interface do not affect the configuration of the ports through which traffic is switched.

To access the switch over an IPv6 network, you must initially configure the switch with IPv6 information (IPv6 prefix, prefix length, and default gateway). IPv6 can be configured using any of the following options:

- IPv6 auto-configuration
- DHCPv6

When in-band connectivity is established, you can change the IPv6 information through the local browser interface.

➢ **To configure the IPv6 address for the network interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > IPv6 Network Configuration**.

   The IPv6 Network Global Configuration page displays.

6. Ensure that the Admin Mode **Enable** radio button is selected.
7. Determine how the switch acquires an IPv6 address:
   - **IPv6 Address Auto Configuration Mode**. When this mode is enabled, the network interface can acquire an IPv6 address through IPv6 Neighbor Discovery Protocol (NDP) and through the use of router advertisement messages. When this mode is disabled, the network interface does not use the native IPv6 address autoconfiguration feature to acquire an IPv6 address. Autoconfiguration can be enabled only when DHCPv6 is not enabled on any of the management interfaces.
   - **DHCPv6**. Next to Current Network Configuration Protocol, select the **DHCPv6** radio button to enable the DHCPv6 client on the interface. The switch attempts to acquire network information from a DHCPv6 server. Selecting the **None** radio button disables the DHCPv6 client on the network interface. When DHCPv6 is enabled, the DHCPv6 Client DUID field displays the client identifier used by the DHCPv6 client (if enabled) when sending messages to the DHCPv6 server.
8. In the **IPv6 Gateway** field, specify the IPv6 address for the default gateway for the network interface.

   The gateway address is in IPv6 global or link-local address format.

9. To configure one or more static IPv6 addresses for the network interface, do the following:

   a. In the **IPv6 Prefix/Prefix Length** field, specify the static IPv6 prefix and prefix to the IPv6 network interface.

      The address is in the global address format.

b. In the **EUI64** menu, select **True** to enable the Extended Universal Identifier (EUI) flag for IPv6 address, or select **False** to omit the EUI flag.

c. Click the **Add** button.

10. Click the **Apply** button.

    Your settings are saved.

View the IPv6 Network Neighbor

You can view information about the IPv6 neighbors that the switch discovers through the Neighbor Discovery Protocol (NDP).

➢ **To view the IPv6 neighbor table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > IPv6 Network Neighbor**.

   The IPv6 Network Interface Neighbor Table page displays.

The following table describes the information the IPv6 Network Neighbor page displays about each IPv6 neighbor that the switch discovered.

Table 9. IPv6 network interface neighbor table information

Field	Description
IPv6 address	The IPv6 address of a neighbor switch visible to the network interface.
MAC address	The MAC address of a neighbor switch.
IsRtr	• **true (1)**. The neighbor machine is a router. • **false (2)**. The neighbor machine is not a router.

Table 9. IPv6 network interface neighbor table information (continued)

Field	Description
Neighbor State	The state of the neighboring switch: • **reachable (1)**. The neighbor is reachable from the switch. • **stale (2)**. Information about the neighbor is scheduled for deletion. • **delay (3)**. No information was received from the neighbor during the delay period. • **probe (4)**. The switch is attempting to probe the neighbor. • **unknown (5)**. Unknown status.
Last Updated	The last time that the neighbor information was updated.

Configure the Time Settings

The switch 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. You can also set the system time manually.

Configure the Time Setting Manually

You can view and adjust date and time settings.

➤ **To manually configure the time setting:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Time > Time Configuration**.

   The Time Configuration page displays.

6. Select the Clock Source **Local** radio button.
7. In the **Date** field, specify the current date in months, days, and years (MM/DD/YYYY).
8. In the **Time** field, specify the current time in hours, minutes, and seconds (HH:MM:SS).

Note: If you do not enter a date and time, the switch calculates the date and time using the CPU’s clock cycle.

9. Click the **Apply** button.

   Your settings are saved.

Configure the Time Settings With SNTP

➤ **To configure the time by using SNTP:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Time > Time Configuration**.

   The Time Configuration page displays.

6. Select the Clock Source **SNTP** radio button.

   The page refreshes and displays the SNTP Global Configuration section and the SNTP Global Status section.

   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.

7. Next to Client Mode, select the mode of operation of the SNTP client:
   - **Disable**. SNTP is not operational. No SNTP requests are sent from the client nor are any incoming SNTP messages 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 provides a single-subnet scope while a multicast address provides an Internet-wide scope.

The default value is Disable.

8. If the SNTP client mode is **Unicast**, use the SNTP Server Configuration page to add the IP address or DNS name of one or more SNTP servers for the switch to poll.

   For more information, see *Configure an SNTP Server* on page 47.

9. 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 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.

10. In the **Unicast Poll Interval** field, specify the number of seconds between unicast poll requests expressed as a power of 2. to The allowed range is 6 to 10. The default value is 6.
11. In the **Broadcast Poll Interval** field, specify the number of seconds between broadcast poll requests expressed as a power of 2.

    Broadcasts received prior to the expiry of this interval are discarded. The allowed range is 6 to 10. The default value is 6.

12. In the **Unicast Poll Timeout** field, specify the number of seconds to wait for an SNTP response to a unicast poll request.

    The allowed range is 1 to 30. The default value is 5.

13. In the **Unicast Poll Retry** field, specify the number of times to retry a unicast poll request to an SNTP server after the first time-out before the switch attempts to use the next configured server.

    The allowed range is 0 to 10. The default value is 1.

14. In the **Time Zone Name** field, specify a time zone.

    You can also specify the number of hours and number of minutes that the time zone is different from the Coordinated Universal Time (UTC). The time zone can affect the display of the current system time. The default value is UTC.

    Note: When using SNTP/NTP time servers to update the switch’s clock, the time data received from the server is based on the UTC, which is the same as Greenwich Mean Time (GMT). This might not be the time zone in which the switch is located.

15. In the **Offset Hours** field, specify the number of hours that the time zone is different from UTC.

    See the description for Time Zone Name in *Step 14* for more information. The allowed range is –12 to 13. The default value is 0.

16. In the **Offset Minutes** field, specify the number of minutes that the time zone is different from UTC.

See the description for Time Zone Name in *Step 14* for more information. The allowed range is 0 to 59. The default value is 0.

17. Click the **Apply** button.

    Your settings are saved.

Modify the Global SNTP Settings

➢ **To modify the global SNTP settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Time > Time Configuration**.

   The Time Configuration page displays.

   If the clock source is SNTP, the SNTP Global Configuration section displays below the Time Configuration section.

6. 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 provides a single-subnet scope while a multicast address provides an Internet-wide scope.

   The default value is Unicast.

7. 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.

8. In the **Unicast Poll Interval** field, specify the number of seconds between unicast poll requests expressed as a power of 2.

   The allowed range is 6 to 10. The default value is 6.

9. In the **Broadcast Poll Interval** field, specify the number of seconds between broadcast poll requests expressed as a power of 2.

   Broadcasts received prior to the expiry of this interval are discarded. The allowed range is 6 to 10. The default value is 6.

10. In the **Unicast Poll Timeout** field, specify the number of seconds to wait for an SNTP response to a unicast poll request.

    The allowed range is 1 to 30. The default value is 5.

11. In the **Unicast Poll Retry** field, specify the number of times to retry a unicast poll request to an SNTP server after the first time-out before the switch attempts to use the next configured server.

    The allowed range is 0 to 10. The default value is 1.

12. In the **Time Zone Name** field, specify a time zone.

    You can also specify the number of hours and number of minutes that the time zone is different from the Coordinated Universal Time (UTC). The time zone can affect the display of the current system time. The default value is UTC.

    Note: When using SNTP/NTP time servers to update the switch’s clock, the time data received from the server is based on the UTC, which is the same as Greenwich Mean Time (GMT). This might not be the time zone in which the switch is located.

13. In the **Offset Hours** field, specify the number of hours that the time zone is different from UTC.

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

14. In the **Offset Minutes** field, specify the number of minutes that the time zone is different from UTC.

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

15. Click the **Apply** button.

    Your settings are saved.

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

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. The SNTP Global Status table displays information about the system’s SNTP client.

➢ **To view SNTP global status:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. **Select System > Management > Time > Time Configuration**.

   The Time Configuration page displays.

   If the clock source is SNTP, the SNTP Global Status section displays below the SNTP Global Configuration section.

6. Click the **Refresh** button to update the page with the latest information about the switch.

The following table displays the nonconfigurable SNTP Global Status information.

Table 10. SNTP Global Status information

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.

Table 10. SNTP Global Status information (continued)

Field	Description
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**. The status of the last request is unknown. • **Success**. The SNTP operation was successful and the system time was updated. • **Request Timed Out**. After an SNTP request was sent to an SNTP server, the response timer expired before a response from the server was received. • **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 by the leap indicator field in 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 operates only as an SNTP client and cannot provide time services to other systems.

Time sources are established by strata. Strata 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 strata:

- **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.

Add an SNTP Server

➤ **To add an SNTP server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

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

   The SNTP Server Configuration page displays.

6. From the **Server Type** menu, select the type of SNTP address to enter in the address field.

   The address can be either an IP address (IPv4, IPv6) or a host name (DNS). The default value is IPv4.

7. In the **Address** field, specify the IP address or the host name 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.

8. If the UDP port on the SNTP server to which SNTP requests are sent is not the standard port (123), specify the port number in the **Port** field.

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

9. In **Priority** field, specify the priority order which to query the servers.

   The SNTP client on the device continues sending SNTP 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. The request is sent to an SNTP server with a priority value of 1 first, then to a server with a priority value of 2, and so on. If any servers are assigned the same priority, the SNTP client contacts the servers in the order that they appear in the table. The valid range is 1 to 3. The default value is 1.

10. In the **Version** field, specify the NTP version running on the server.

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

11. Click the **Add** button.

    The SNTP server entry is added.

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

    You can configure up to three SNTP servers.

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

Table 11. SNTP Server Status information

Field	Description
Address	All the existing server addresses. If no server configuration exists, a message stating that no SNTP server exists displays on the page.
Last Update Time	The local date and time (UTC) that the response from the server was used to update the system clock.
Last Attempt Time	The local date and time (UTC) that the SNTP server was last queried.
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**. The status of the last request is unknown, or no SNTP responses were received. • **Success**. The SNTP operation was successful and the system time was updated. • **Request Timed Out**. After an SNTP request was sent to an SNTP server, the response timer expired before a response from the server was received. • **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 by 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 the server since the last reboot.
Failed Requests	The number of failed SNTP requests made to the server since the last reboot.

Change the Settings for an Existing SNTP Server

➢ **To change the settings for an existing SNTP server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

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

   The SNTP Server Configuration page displays.

6. Select the check box next to the configured server.
7. Specify new values in the available fields.
8. Click the **Apply** button.

   Your settings are saved.

Remove an SNTP Server

➢ **To remove an SNTP server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

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

   The SNTP Server Configuration page displays.

6. Select the check box next to the configured server to remove.
7. Click the **Delete** button.

   The entry is removed, and the device is updated.

Configure Daylight Saving Time Settings

You can configure settings for summer time, which is also known as daylight saving time. Used in some countries around the world, summer time is the practice of temporarily advancing clocks during the summer months. Typically clocks are adjusted forward one or more hours near the start of spring and are adjusted backward in autumn.

➢ **To configure the daylight saving time settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Time > DayLight Saving Configuration**.

   The DayLight Saving (DST) Configuration page displays.

6. Select a Daylight Saving (DST) radio button:
   - **Disable**. Disable daylight saving time.
   - **Recurring**. Daylight saving time occurs at the same time every year. The start and end times and dates for the time shift must be manually configured.
   - **Recurring EU**. The system clock uses the standard recurring summer time settings used in countries in the European Union. When this option is selected, the rest of the applicable fields on the page are automatically populated and cannot be edited.
   - **Recurring USA**. The system clock uses the standard recurring daylight saving time settings used in the United States. When this option is selected, the rest of the applicable fields on the page are automatically populated and cannot be edited.
   - **Non Recurring**. Daylight saving time settings are in effect only between the start date and end date of the specified year. When this option is selected, the summer time settings do not repeat on an annual basis.
7. Configure the settings for the selected daylight saving method by doing the following:

- If you select the DayLight Saving (DST) **Recurring**, **Recurring EU**, or **Recurring USA** radio button, configure the settings that are shown in the following table.

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 hour. • **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 hour. • **Minutes**. Configure the end minutes.
Offset	Configure recurring offset in minutes. The valid range is 1–1440 minutes.
Zone	Configure the time zone.

- If you select the DayLight Saving (DST) **Non Recurring** radio button, configure the settings that are shown in the following table.

Field	Description
Begins At	These fields are used to configure the start values of the date and time. • **Month**. Configure the start month. • **Date**. Configure the start date. • **Year**. Configure the start year. • **Hours**. Configure the start hour. • **Minutes**. Configure the start minutes.
Ends At	These fields are used to configure the end values of date and time. • **Month**. Configure the end month. • **Date**. Configure the end date. • **Year**. Configure the end year. • **Hours**. Configure the end hour. • **Minutes**. Configure the end minutes.
Offset	Specify the number of minutes to shift the summer time from the standard time. The valid range is 1–1440 minutes.
Zone	Specify the acronym associated with the time zone when summer time is in effect. This field is not validated against an official list of time zone acronyms.

8. Click the **Apply** button.

   Your settings are saved.

View the DayLight Saving Time Status

The Daylight Saving (DST) Status section shows information about the summer time settings and whether the time shift for summer time is currently in effect.

➢ **To view the daylight saving time status:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Time > DayLight Saving Configuration**.

   The DayLight Saving (DST) Configuration page displays.

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

The following table displays the nonconfigurable daylight saving status information.

Table 12. Daylight Saving (DST) Status information

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	The start date of daylight saving time. This field is not displayed when daylight saving time is disabled.
Ends At	The end date of daylight saving time. 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.

Table 12. Daylight Saving (DST) Status information (continued)

Field	Description
Zone	The zone acronym. This field is not displayed when daylight saving time is disabled.
Daylight Saving (DST) in Effect	Indicates whether daylight saving time is in effect.

Configure Denial of Service Settings

You can configure the Denial of Service (DoS) settings for the switch. The switch provides support for classifying and blocking specific types of DoS attacks.

Configure Auto-DoS

You can automatically enable all the DoS features available on the switch, except for the L4 Port attack. For information about the types of DoS attacks the switch can monitor and block, see *Configure Denial of Service* on page 56.

➢ **To enable the Auto-DoS feature:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Denial of Service > Auto-DoS Configuration**.

   The Auto-DoS Configuration page displays.

6. Select the Auto-DoS Mode **Enable** radio button.

   When an attack is detected, a warning message is logged to the buffered log and is sent to the syslog server. At the same time, the port is shut down and can be enabled only manually by the admin user.

7. Click the **Apply** button.

   Your settings are saved.

Configure Denial of Service

The Denial of Service Configuration page allows you to select which types of DoS attacks the switch monitors and blocks.

➢ **To configure individual DoS settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Denial of Service > Denial of Service Configuration**.

   The Denial of Service Configuration page displays.

6. Select the types of DoS attacks for the switch to monitor and block and configure any associated values:
   - **Denial of Service Min TCP Header Size**. Specify the minimum TCP header size allowed. If DoS TCP Fragment is enabled, the switch drops packets with a TCP header smaller than the configured value.
   - **Denial of Service ICMPv4**. 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.
   - **Denial of Service Max ICMPv4 Packet Size**. Specify the maximum ICMPv4 packet size allowed. If ICMPv4 DoS prevention is enabled, the switch drops IPv4 ICMP ping packets with a size greater than the configured value.
   - **Denial of Service ICMPv6**. Enabling ICMPv6 DoS prevention causes the switch to drop ICMPv6 packets with a type set to ECHO_REQ (ping) and a size greater than the configured ICMPv6 packet size.
   - **Denial of Service Max ICMPv6 Packet Size**. 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.
   - **Denial of Service First Fragment**. Enabling First Fragment DoS prevention causes the switch to check DoS options on first fragment IP packets when the switch receives fragmented IP packets. Otherwise, the switch ignores the first fragment IP packages.

- **Denial of Service ICMP Fragment**. Enabling ICMP Fragment DoS prevention causes the switch to drop ICMP fragmented packets.
- **Denial of Service SIP=DIP**. Enabling SIP=DIP DoS prevention causes the switch to drop packets with a source IP address equal to the destination IP address.
- **Denial of Service SMAC=DMAC**. Enabling SMAC=DMAC DoS prevention causes the switch to drop packets with a source MAC address equal to the destination MAC address.
- **Denial of Service TCP FIN&URG&PSH**. 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 equal to 0.
- **Denial of Service TCP Flag&Sequence**. 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.
- **Denial of Service TCP Fragment**. Enabling TCP Fragment DoS prevention causes the switch to drop packets with a TCP payload for which the IP payload length minus the IP header size is less than the minimum allowed TCP header size.
- **Denial of Service TCP Offset**. Enabling TCP Offset DoS prevention causes the switch to drop packets with a TCP header offset set to 1.
- **Denial of Service TCP Port**. Enabling TCP Port DoS prevention causes the switch to drop packets for which the TCP source port is equal to the TCP destination port.
- **Denial of Service TCP SYN**. Enabling TCP SYN DoS prevention causes the switch to drop packets with TCP flags SYN set.
- **Denial of Service TCP SYN&FIN**. Enabling TCP SYN & FIN DoS prevention causes the switch to drop packets with TCP flags SYN and FIN set.
- **Denial of Service UDP Port**. Enabling UDP Port DoS prevention causes the switch to drop packets for which the UDP source port is equal to the UDP destination port.

7. Click the **Apply** button.

   Your settings are saved.

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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

2. Launch a web browser.

3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > DNS > DNS Configuration**.

   The DNS Configuration page displays.

6. Select the **Disable** or **Enable** radio button to specify whether to disable or enable the administrative status of the DNS client.

   - **Enable**. Allow the switch to send DNS queries to a DNS server to resolve a DNS domain name. The DNS is enabled by default.
   - **Disable**. Prevent the switch from sending DNS queries.

7. In the **DNS Default Name** field, enter the default DNS 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 name must not be longer than 255 characters.

8. In the **DNS Server** field, specify the IPv4 address to which the switch sends DNS queries.
9. Click the **Add** button.

   The server is added to the list. You can specify up to eight DNS servers. The Preference field displays the server preference order. The preference is set in the order in which preferences were entered.

10. To remove a DNS server from the list, select its check box and click the **Delete** button.

    If you click the **Delete** button without selecting a DNS server, all the DNS servers are deleted.

11. Click the **Apply** button.

    Your settings are saved.

The following table displays DNS Server Configuration information.

Table 13. DNS Server Configuration information

Field	Description
ID	The identification of the DNS Server.
Preference	Shows the preference of the DNS server. The preferences are determined by the order in which they were entered.

Configure and View Host Name-to-IP Address Information

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

Add a Static Entry to the Dynamic Host Mapping Table

- **To add a static entry to the local dynamic host mapping table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

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

   The Host Configuration page displays.

6. 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 required field.

7. In the **IPv4/IPv6 Address** field, enter the IP address to associate with the host name.
8. Click the **Add** button.

   The entry displays in the list on the page.

Remove an Entry From the Dynamic Host Mapping Table

➢ **To remove an entry from the dynamic host mapping table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

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

   The DNS Host Configuration page displays.

6. Select the check box next to the entry to remove.
7. Click the **Delete** button.

Change the Host Name or IP Address in an Entry of the Dynamic Host Mapping Table and View All Entries

➢ **To change the host name or IP address in an entry of the dynamic host mapping table and view all entries:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

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

   The DNS Host Configuration page display.

6. Select the check box next to the entry to update.
7. Enter the new information in the appropriate field.
8. Click the **Apply** button.

   Your settings are saved.

9. To clear all the dynamic host name entries from the list, click the **Clear** button.

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 14. Dynamic Host Mapping information

Field	Description
Host	Lists the host name that you assign to the specified IP address.
Total	Time since the dynamic entry was first added to the table.
Elapsed	Time since the dynamic entry was last updated.
Type	The type of the dynamic entry.
IPv4/IPv6 Address	Lists the IP address that is associated with the host name.

Configure Green Ethernet Settings

You can configure the green Ethernet features to reduce power consumption.

➢ **To configure the Green Ethernet settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Green Ethernet > Green Ethernet Configuration**.

The Green Ethernet Configuration page displays.

6. Select the Auto Power Down Mode **Disable** or **Enable** radio button.

   By default, this mode is disabled. When a port link is down, the underlying physical layer goes down for a short period and then checks for port link pulses again so that autonegotiation remains possible. In this way, the switch saves power when no link partner is present for the port.

7. Select the EEE Mode **Disable** or **Enable** radio button.

   By default, this mode is disabled. Energy Efficient Ethernet (EEE) combines the MAC with a family of physical layers that support operation in a low power mode. It is defined by the IEEE 802.3az standard. 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.

8. Click the **Apply** button.

   Your settings are saved.

Configure Green Ethernet Interface Settings

You can configure per-port Green Ethernet settings.

➢ **To configure the Green Ethernet interface settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Green Ethernet > Green Ethernet Interface Configuration**.

   The Green Ethernet Interface Configuration page displays.

6. Do one of the following:
   - In the **Go To Interface** field, enter the port using the respective naming convention (for example, g1 or l1), and click the **Go** button.

     The entry corresponding to the specified interface is selected.

     For more information about naming conventions, see *Interface Naming Conventions* on page 12.
   - Select the port.
7. Select the Auto Power Down Mode **Disable** or **Enable** radio button.

   By default, this mode is disabled. When a port link is down, the underlying physical layer goes down for a short period and then checks for port link pulses again so that autonegotiation remains possible. In this way, the switch saves power when no link partner is present for the port.
8. Select the EEE Mode **Disable** or **Enable** radio button.

   By default, this mode is disabled. Energy Efficient Ethernet (EEE) combines the MAC with a family of physical layers that support operation in a low power mode. It is defined by the IEEE 802.3az standard. 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.
9. Click the **Apply** button.

   Your settings are saved.

Configure Green Ethernet Local and Remote Devices

You can view detailed per-port green Ethernet information and enable or disable green Ethernet settings on a single port. Using the green Ethernet features allows for power consumption savings.

➢ **To configure green Ethernet local and remote devices:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

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

   The Green Ethernet Details page displays.

6. From the **Interface** menu, select the interface.
7. From the **EEE Admin mode** menu, select **Enable** or **Disable**.

   With the EEE mode enabled, the port transitions to low power mode during a link idle condition. The default value is Disabled. If the EEE Admin Mode is not supported, N/A is displayed.

8. In the **EEE Transmit Idle Time** field, enter the time after which switch transitions to the LPI state.

   The range is 600 to 4294967295. The default value is 600.

9. In the **EEE Transmit Wake Time** field, enter the time that the switch must wait before it transitions to the active state after it receives a packet for transmission.

   The range is 8 to 65535. The default value is 17.

10. Click the **Apply** button.

    Your settings are saved.

11. To refresh the page, click the **Refresh** button.
12. To clear the configuration, resetting all statistics for the selected interface to default values, click the **Clear** button.

The following table describes the nonconfigurable fields.

Table 15. 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.

Table 15. Green Ethernet Local Device Information (continued)

Field	Description
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.
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).

View Green Ethernet Remote Device Details

➢ **To view green Ethernet remote device information:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

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

   The Green Ethernet Details page displays.

6. Scroll down to the Remote Device Information section.
7. Select the interface.

The following table describes the nonconfigurable fields.

Table 16. 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

This page summarizes the green Ethernet settings currently in use.

➢ **To view the green Ethernet statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Green Ethernet > Green Ethernet Summary**.

   The Green Ethernet Statistics Summary page displays.

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

The following table describes the nonconfigurable fields.

Table 17. Green Ethernet Statistics Summary information

Field	Description
Current Power Consumption (mW)	Estimated power consumption by all ports of the switch in mWatts.
Percentage Power Saving (%)	Estimated percentage of power saved on all ports of the switch if the green modes are enabled.
Cumulative Energy Saving (W * H)	Estimated cumulative energy saved on the switch in watts multiplied by hours if all green modes are enabled.
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: Energy-Detect (Energy Detect), Short-Reach (Short Reach), EEE (Energy Efficient Ethernet), LPI-History (EEE Low Power Idle History), LLDP-Cap-Exchg (EEE LLDP Capability Exchange), Pwr-Usg-Est (Power Usage Estimates).
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.
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.

Configure the Green Ethernet EEE LPI History

You can configure and view the Green Ethernet low power idle (LPI) history.

➢ **To configure the port Green Ethernet EEE LPI history:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Green Ethernet > Green Ethernet LPI History**.

   The Green Ethernet LPI History page displays.

6. Select the interface.
7. 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.

8. 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.

9. Click the **Apply** button.

   Your settings are saved.

   The Percentage LPI time field shows the time spent in LPI mode the since EEE counters were last cleared.

The following table describes the nonconfigurable fields.

Table 18. Interface Green Mode EEE LPI History information

Field	Description
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 between current time and time at which the sample was recorded.
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.

Manage the Bonjour Settings and View Bonjour Information

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 interface of the switch. Bonjour is enabled by default on the switch. You can disable Bonjour for security reasons.

Manage the Bonjour Settings

➢ **To manage the Bonjour settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > Bonjour > Bonjour Configuration**.

   The Bonjour Global Configuration page displays.

6. Select one of the following radio buttons:
   - **Disable**. Bonjour is disabled.
   - **Enable**. Bonjour is enabled. This is the default setting.
7. Click the **Apply** button.

   Your settings are saved.

View Bonjour Information

➢ **To view Bonjour information:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

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

   The Bonjour Information page displays. The page also shows the Published Services section.

   The Bonjour Information section shows whether Bonjour is enabled on the switch.

The following table describes the nonconfigurable fields.

Table 19. Published Services information

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.

Control the LEDs

You can turn the system LEDs and port LEDs on the switch on and off. By default, a port LED lights when you connect a powered-on device to the port. When the switch functions with its LEDs off, we refer to it as Quiet mode.

➢ **To control the LEDs:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Management > LED Control**.
6. Select the System LEDs **On** or **Off** radio button.

   By default, the **On** radio button is selected and the system LEDs are enabled. When you select the **Off** radio button, the Cloud LED is disabled, and for all models except for GC110, the Max PoE LED is disabled.

7. Select the Port LEDs **On** or **Off** radio button.

   By default, the **On** radio button is selected and the port LEDs are enabled. When you select the **Off** radio button, the port LEDs are disabled.

8. Click the **Apply** button.

   Your settings are saved.

Use the Device View

For information about the device view, see *Local Browser Interface Device View* on page 25.

Configure Power over Ethernet

For information about Power over Ethernet (PoE), see *Chapter 8, Manage Power over Ethernet*.

Configure Link Layer Discovery Protocol

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.

The following sections describe how you can configure LLDP:

- *Configure LLDP Global Settings* on page 72
- *Configure LLDP Port Settings* on page 73
- *View the LLDP-MED Network Policy* on page 74
- *Configure the LLDP-MED Port Settings* on page 76
- *LLDP-MED Neighbors Information* on page 77

- *View Local LLDP Information* on page 79
- *View LLDP Neighbors Information* on page 81

LLDP is a one-way protocol without any 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 or 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:

- Autodiscovery 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 the global LLDP and LLDP-MED parameters that are applied to the switch.

➢ **To configure global LLDP settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > LLDP > Basic > LLDP Configuration**.

   The LLDP Properties pager displays.

6. To configure nondefault values for the following LLDP properties, specify the following options:

- **TLV Advertised Interval**. The number of seconds between transmissions of LLDP advertisements.
- **Hold Multiplier**. The transmit interval multiplier value, in which the transmit hold multiplier multiplied by the transmit interval is the time to live (TTL) value that the switch advertises to its neighbors.
- **Reinitializing Delay**. The number of seconds that the switch waits before attempting to reinitialize LLDP on a port after the LLDP operating mode on the port changes.
- **Transmit Delay**. The number of seconds that the switch waits between transmissions of remote data change notifications to one or more SNMP trap receivers configured on the switch.

7. To configure a nondefault value for LLDP-MED, enter a value in the **Fast Start Duration** field.

   This value sets the number of LLDP packets sent when the LLDP-MED fast start mechanism is initialized, which occurs when a new endpoint device links with the LLDP-MED network connectivity device.

8. Click the **Apply** button.

   Your settings are saved.

Configure LLDP Port Settings

You can specify per-interface LLDP settings.

➢ **To configure the LLDP interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > LLDP > Advanced > LLDP Port Settings**.

   The LLDP Port Settings page displays.

6. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
7. Use the following menus to configure the LLDP settings for the selected ports:
   - **Admin Status**. Select the status for transmitting and receiving LLDP packets:
     - **Tx Only**. Enable only transmitting LLDP PDUs on the selected ports.
     - **Rx Only**. Enable only receiving LLDP PDUs on the selected ports.
     - **Tx and Rx**. Enable both transmitting and receiving LLDP PDUs on the selected ports.
     - **Disabled**. Do not transmit or receive LLDP PDUs on the selected ports.

     The default is Tx and Rx.
   - **Management IP Address**. Choose whether to advertise the management IP address from the interface. The possible field values are as follows:
     - **Stop Advertise**. Do not advertise the management IP address from the interface.
     - **Auto Advertise**. Advertise the current IP address of the device as the management IP address.

     The default is Auto Advertise.
   - **Notification**. When notifications are enabled, LLDP interacts with the trap manager to notify subscribers of remote data change statistics. The default is Disable.
   - **Optional TLV(s)**. Enable or disable the transmission of optional type-length value (TLV) information from the interface. The default is Enable. The TLV information includes the system name, system description, system capabilities, and port description.

     For information about how to configure the system name, see *View and Configure the Switch Management Settings* on page 29. For information about how to configure the port description, see *Configure Port Settings* on page 96.
8. Click the **Apply** button.

   Your settings are saved.

View the LLDP-MED Network Policy

This page displays information about the LLPD-MED network policy TLV transmitted in the LLDP frames on the selected local interface.

➢ **To view LLDP-MED network policy information for an interface:**

1. Connect your computer to the same network as the switch.

You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **System > LLDP > Advanced > LLDP-MED Network Policy**.

   The LLDP-MED Network Policy page displays.
6. From the **Interface** menu, select the interface for which you want to view the information.

   Note: The menu includes only the interfaces on which LLDP is enabled. If no interfaces are enabled for LLDP, the **Interface** menu does not display.

   The page refreshes and displays the data transmitted in the network policy TLVs for the interface.

The following table describes the LLDP-MED network policy information that displays on the page.

Table 20. LLDP-MED network policy information

Field	Description
Network Policy Number	The policy number.
Application	The media application type associated with the policy, which can be one of the following: • Unknown • Voice • Guest Voice • Guest Voice Signaling • Softphone Voice • Video Conferencing • Streaming Video • Video Signaling A port can receive multiple application types. The application information is displayed only if a network policy TLV was transmitted from the port.
VLAN ID	The VLAN ID associated with the policy.
VLAN Type	Indicates whether the VLAN associated with the policy is tagged or untagged.

Table 20. LLDP-MED network policy information (continued)

Field	Description
User Priority	The priority associated with the policy.
DSCP	The DSCP associated with a particular policy type.

Configure the LLDP-MED Port Settings

You can enable LLDP-MED mode on an interface and configure its properties.

➢ **To configure LLDP-MED settings for a port:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > LLDP > Advanced > LLDP-MED Port Settings**.

   The LLDP-MED Port Settings page displays.

6. From the **Port** menu, select the port to configure.
7. Use the following menus to enable or disable the following LLDP-MED settings for the selected port:
   - **LLDP-MED Status**. The administrative status of LLDP-MED on the interface. When LLDP-MED is enabled, the transmit and receive function of LLDP is effectively enabled on the interface.
   - **Notification**. When notifications are enabled, the port sends a topology change notification if a device is connected or removed.
   - **MED Capabilities**. When MED capabilities are enabled, the port transmits the capabilities type length values (TLVs) in the LLDP PDU frames.
   - **Network Policy.** When the network policy is enabled, the port transmits the network policy TLV in LLDP frames.
   - **Extended MDI-PSE**. When the extended MDI-PSE is enabled, the port transmits the extended PSE TLV in LLDP frames.

8. Click the **Apply** button.

   Your settings are saved.

LLDP-MED Neighbors Information

You can display the LLDP-MED neighbor or remote device information for an interface.

➢ **To view LLDP-MED Neighbor Information:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > LLDP > Advanced > LLDP-MED Neighbors Information**.

   The page that displays shows multiple sections with information about LLDP-MED neighbors.

6. From the **Interface** menu, select an interface.

   The menu includes only the interfaces for which LLDP is enabled.

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

   The following table describes the non-configurable LLDP-MED Neighbors Information that displays for the selected interface.

Field	Description
LLDP-MED Interface Selection	
Remote ID	Specifies the remote client identifier assigned to the remote system.
Capability Information	
This section of the page specifies the supported and enabled capabilities that are received in MED TLV on this port.	
Supported Capabilities	Specifies supported capabilities that are received in MED TLV on this port.
Enabled Capabilities	Specifies enabled capabilities that are received in MED TLV on this port.

Field	Description
Device Class	Specifies device class as advertised by the device remotely connected to the port.
Network Policies Information	
This section of the page specifies if network policy TLV is received in the LLDP frames on this port.	
Media Application Type	Specifies the application type: unknown, voicesignaling, guestvoice, guestvoicesignalling, softphonevoice, videoconferencing, streamingvideo, or videosignaling. Information for each application type includes the VLAN ID, priority, DSCP, tagged bit status and unknown bit status. A port can receive information about one or many of such application types. The application type is displayed only if a network policy TLV is received on a port.
VLAN ID	Specifies the VLAN ID associated with a particular policy type.
Priority	Specifies the priority associated with a particular policy type.
DSCP	Specifies the DSCP associated with a particular policy type.
Unknown Bit Status	Specifies the unknown bit associated with a particular policy type.
Tagged Bit Status	Specifies the tagged bit associated with a particular policy type.
Inventory Information	
This section of the page specifies if inventory TLV is received in LLDP frames on this port.	
Hardware Revision	Specifies the hardware version of the remote device.
Firmware Revision	Specifies the firmware version of the remote device.
Software Revision	Specifies software version of the remote device.
Serial Number	Specifies the serial number of the remote device.
Manufacturer Name	Specifies the manufacturer’s name of the remote device.
Model Name	Specifies the model name of the remote device.
Asset Id	Specifies the asset ID of the remote device.
Location Information	
This section of the page specifies if location TLV is received in LLDP frames on this port.	
Sub Type	Specifies the type of location information.
Location Information	Specifies the location information as a string for a given type of location ID.
Extended PoE	
This section of the page specifies if the remote device is a PoE device.	
Device Type	Specifies the remote device’s PoE device type connected to this port.
Extended PoE PSE	

Field	Description
This section of the page specifies if extended PSE TLV is received in LLDP frame on this port.	
Device Type	Specifies the remote device’s PoE device type connected to this port.
Power Source	Specifies the remote port’s PSE power source.
Power Priority	Specifies the remote port’s PSE power priority.
Power Value	Specifies the remote port’s PSE power value in tenths of watts.
Extended PoE PD	
This section of the page specifies if extended PD TLV is received in LLDP frame on this port.	
Device Type	Specifies the remote device’s PoE device type connected to this port.
Power Source	Specifies the remote port’s PD power source.
Power Priority	Specifies the remote port's PD power priority.
Power Value	Specifies the remote port's PD power requirement.

View Local LLDP Information

You can view the data that each port advertises through LLDP.

➤ **To view local LLDP information:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Advanced > LLDP > Local Information**.

   The page that displays shows the Device Information section and the Port Information section.

   The page includes only the interfaces on which LLDP is enabled.

The following table describes the LLDP device information and port summary information.

Field	Description
Device Information	
Chassis ID Subtype	The type of information used to identify the switch in the Chassis ID field.
Chassis ID	The hardware platform identifier for the switch.
System Name	The user-configured system name for the switch.
System Description	The switch description, which includes information about the product model and platform.
System Capabilities	The primary functions that the switch supports.
Interface Information	
Interface	The interface associated with the LLDP data.
Port ID Subtype	The type of information used to identify the interface in the Port ID field.
Port ID	The port number.
Port Description	The user-defined description of the port. For information about how to configure the port description, see *Configure Port Settings* on page 96.
Advertisement	The TLV advertisement status of the port.

6. To view additional details about a port, click the name of the port in the Interface column of the Port Information table.

   The following table describes the detailed local information that displays for the selected port.

Field	Description
Managed Address	
Address SubType	The type of address the management interface uses, such as an IPv4 address.
Address	The address used to manage the device.
Interface SubType	The port subtype.
Interface Number	The number that identifies the port.
MAC/PHY Details	
Auto Negotiation Supported	Indicates whether the interface supports port speed autonegotiation. The possible values are True and False.
Auto Negotiation Enabled	The port speed autonegotiation support status. The possible values are True (enabled) or False (disabled).
Auto Negotiation Advertised Capabilities	The port speed autonegotiation capabilities such as 1000BASE-T half-duplex mode or 100BASE-TX full-duplex mode.

Field	Description
Operational MAU Type	The Medium Attachment Unit (MAU) type. The MAU performs physical layer functions, including digital data conversion from the Ethernet interface collision detection and bit injection into the network.
MED Details	
Capabilities Supported	The MED capabilities enabled on the port.
Current Capabilities	The TLVs advertised by the port.
Device Class	Network Connectivity indicates that the device is a network connectivity device.
Network Policies	
Application Type	The media application type associated with the policy.
VLAN ID	The VLAN ID associated with the policy.
VLAN Type	Specifies whether the VLAN associated with the policy is tagged or untagged.
User Priority	The priority associated with the policy.
DSCP	The DSCP associated with a particular policy type.

View LLDP Neighbors Information

You can view the data that a specified interface received from other LLDP-enabled systems.

➢ **To view LLDP information received from a neighbor device:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Advanced > LLDP > Neighbor Information**.

   The Neighbor Information page displays.

If no information was received from a neighbor device, or if the link partner is not LLDP-enabled, no information displays.

The following table describes the information that displays for all LLDP neighbors that were discovered.

Field	Description
MSAP Entry	The Media Service Access Point (MSAP) entry number for the remote device.
Local Port	The interface on the local system that received LLDP information from a remote system.
Chassis ID Subtype	The type of data displayed in the Chassis ID field on the remote system.
Chassis ID	The remote 802 LAN device's chassis.
Port ID Subtype	The type of data displayed in the remote system's Port ID field.
Port ID	The physical address of the port on the remote system from which the data was sent.
System Name	The system name associated with the remote device. If the field is blank, the name might not be configured on the remote system.

6. To view additional information about the remote device, click the link in the MSAP Entry column.

   A pop-up window displays information for the selected port.

   The following table describes the information transmitted by the neighbor.

Field	Description
Port Details	
Local Port	The interface on the local system that received LLDP information from a remote system.
MSAP Entry	The Media Service Access Point (MSAP) entry number for the remote device.
Basic Details	
Chassis ID Subtype	The type of data displayed in the Chassis ID field on the remote system.
Chassis ID	The remote 802 LAN device's chassis.
Port ID Subtype	The type of data displayed in the remote system's Port ID field.
Port ID	The physical address of the port on the remote system from which the data was sent.
Port Description	The user-defined description of the port.
System Name	The system name associated with the remote device.
System Description	The description of the selected port associated with the remote system.

Field	Description
System Capabilities	The system capabilities of the remote system.
Managed Addresses	
Address SubType	The type of the management address.
Address	The advertised management address of the remote system.
Interface SubType	The port subtype.
Interface Number	The port on the remote device that sent the information.
MAC/PHY Details	
Auto-Negotiation Supported	Specifies whether the remote device supports port-speed autonegotiation. The possible values are True or False.
Auto-Negotiation Enabled	The port speed autonegotiation support status. The possible values are True and False.
Auto Negotiation Advertised Capabilities	The port speed autonegotiation capabilities.
Operational MAU Type	The Medium Attachment Unit (MAU) type. The MAU performs physical layer functions, including digital data conversion from the Ethernet interface collision detection and bit injection into the network.
MED Details	
Capabilities Supported	The supported capabilities that were received in MED TLV from the device.
Current Capabilities	The advertised capabilities that were received in MED TLV from the device.
Device Class	The LLDP-MED endpoint device class. The possible device classes are as follows: • Endpoint Class 1 Indicates a generic endpoint class, offering basic LLDP services. • Endpoint Class 2 Indicates a media endpoint class, offering media streaming capabilities as well as all Class 1 features. • Endpoint Class 3 Indicates a communications device class, offering all Class 1 and Class 2 features plus location, 911, Layer 2 switch support, and device information management capabilities.
PoE Device Type	The PoE device type advertised by the remote device.
PoE Power Source	The PoE power type advertised by the remote device.
PoE Power Priority	The PoE power priority advertised by the remote device.
PoE Power Value	The PoE power value advertised by the remote device.
Hardware Revision	The hardware version advertised by the remote device.
Firmware Revision	The firmware version advertised by the remote device.
Software Revision	The software version advertised by the remote device.
Serial Number	The serial number advertised by the remote device.

Field	Description
Model Name	The model name advertised by the remote device.
Asset ID	The asset ID advertised by the remote device.
Location Information	
Civic	The physical location, such as the street address, that the remote device advertised in the location TLV, for example, 123 45th St. E. The field value length range is 6–160 characters.
Coordinates	The location map coordinates that the remote device advertised in the location TLV, including latitude, longitude, and altitude.
ECS ELIN	The Emergency Call Service (ECS) Emergency Location Identification Number (ELIN) that the remote device advertised in the location TLV. The field range is 10–25.
Unknown	The unknown location information for the remote device.
Network Policies	
Application Type	The media application type associated with the policy advertised by the remote device.
VLAN ID	The VLAN ID associated with the policy.
VLAN Type	Specifies whether the VLAN associated with the policy is tagged or untagged.
User Priority	The priority associated with the policy.
DSCP	The DSCP associated with a particular policy type.
LLDP Unknown TLVs	
Type	The unknown TLV type field.
Value	The unknown TLV value field.

Configure DHCP L2 Relay and DHCP Snooping

The switch supports DHCP L2 Relay, DHCP snooping, and Dynamic ARP Inspection (DAI). DHCP snooping and DAI are Layer 2 security features that examine traffic to help prevent accidental and malicious attacks on the switch or network.

The following sections describe how to configure DHCP L2 Relay, DHCP snooping, and Dynamic ARP Inspection (DAI):

- *Configure a DHCP L2 Relay* on page 85
- *Configure DHCP Snooping* on page 88

Configure a DHCP L2 Relay

DHCP relay agents eliminate the need to connect to a DHCP server on each physical network. Relay agents populate the giaddr field and also append the Relay Agent Information option to the DHCP messages. DHCP servers use this option for IP addresses and other parameter assignment policies. These DHCP relay agents are typically IP routing-aware devices and are referred to as Layer 3 relay agents. In some network configurations, a need might exist for Layer 2 devices to append the Relay Agent Information option as they are closer to the end hosts.

These Layer 2 devices typically operate only as bridges for the network and might not include an IPv4 address on the network. Lacking a valid IPv4 source address, they cannot relay packets directly to a DHCP server located on another network. These Layer 2 devices append the Relay Agent Information option and broadcast the DHCP message.

Enable the Global DHCP L2 Relay Settings

You can enable the global DHCP L2 relay settings for the switch.

➢ **To enable DHCP L2 relay global settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

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

   The DHCP L2 Relay Global Configuration page displays.

6. Select the Admin Mode **Enable** radio button.

   The default admin mode is disabled.

7. Click the **Apply** button.

   Your settings are saved.

Configure the DHCP L2 Relay Settings for a VLAN

You can configure the DHCP L2 relay settings for a VLAN.

➢ **To configure the DHCP L2 relay settings for a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

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

   The DHCP L2 Relay Global Configuration page displays.

6. Select one or more VLANs, or select all VLANs by selecting the check box in the table heading.
7. From the **Admin Mode** menu, select to enable or disable the DHCP L2 relay on the selected VLAN or VLANs.

   The default is Disable.

8. From the **Circuit ID Mode** menu, select to enable the interface number to be added as the circuit ID in DHCP option 82 or to disable the interface number from being added as the circuit ID in DHCP option 82.

   The default is Disable.

9. In the **Remote ID String** field, enter a remote ID description of up to 32 characters.
10. Click the **Apply** button.

    Your settings are saved.

Configure the DHCP L2 Relay Interface Settings

You can configure the DHCP L2 relay interface settings.

➢ **To configure the DHCP L2 relay interface settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

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

   The DHCP L2 Relay Interface Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Admin Mode** menu, select to enable or disable the DHCP L2 relay on the selected interface.

   The default is Disable.

9. From the **82 Option Trust Mode** menu, select to enable or disable an interface to be trusted for DHCP L2 Relay (Option-82) received.

   The default is Disable.

10. Click the **Apply** button.

    Your settings are saved.

View or Clear the DHCP L2 Relay Interface Statistics

You can view information about the DHCP L2 relay interfaces.

➢ **To view or clear the DHCP L2 relay interface statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

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

   The DHCP L2 Relay Interface Statistics page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.

   The following table describes the nonconfigurable data that is displayed.

Field	Description
Interface	The interface from which the DHCP message is received.
Untrusted Server Messages With Opt82	The number of DHCP message with option82 received from an untrusted server.
Untrusted Client Messages With Opt82	The number of DHCP message with option82 received from an untrusted client.
Trusted Server Messages Without Opt82	The number of DHCP message without option82 received from a trusted server.
Trusted Client Messages Without Opt82	The number of DHCP message without option82 received from a trusted client.

8. To refresh the page with the latest information about the switch, click the **Refresh** button.
9. To clear all interfaces statistics, click the **Clear** button.

Configure DHCP Snooping

DHCP snooping is a useful feature that provides security by filtering untrusted DHCP messages and by building and maintaining a DHCP snooping binding table. An untrusted message is a message that is received from outside the network or firewall and that can cause traffic attacks within your network. The DHCP snooping binding table contains the MAC address, IP address, lease time, binding type, VLAN number, and interface information that corresponds to the local untrusted interfaces of a switch. An untrusted interface is an interface that is configured to receive messages from outside the network or firewall. A trusted interface is an interface that is configured to receive only messages from within the network.

DHCP snooping acts like a firewall between untrusted hosts and DHCP servers. It also provides way to differentiate between untrusted interfaces connected to the end user and trusted interfaces connected to the DHCP server or another switch.

Enable the Global DHCP Snooping Settings

You can view and configure the global settings for DHCP snooping.

➢ **To enable the global DHCP snooping settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Services > DHCP Snooping > Global Configuration**.

   The DHCP Snooping Global Configuration page displays.

6. Select the DHCP Snooping Mode **Enable** radio button.
7. To enable the verification of the sender’s MAC address for DHCP snooping, select the MAC Address Validation **Enable** radio button.

   When MAC address validation is enabled, the device checks packets that are received on an untrusted interface to verify that the MAC address and the DHCP client hardware address match. If the addresses do not match, the device drops the packet.

8. Click the **Apply** button.

   Your settings are saved.

Enable DHCP for All Interfaces in a VLAN

➢ **To enable DHCP snooping for all interfaces that are members of a VLAN:**

1. Connect your computer to the same network as the switch.

You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **System > Services > DHCP Snooping > Global Configuration**.

   The DHCP Snooping Global Configuration page displays.
6. In the **VLAN ID** field, enter the VLAN on which DHCP snooping must be enabled.
7. From the **DHCP Snooping Mode** menu, select **Enable**.
8. Click the **Apply** button.

   Your settings are saved.

Configure DHCP Snooping Interface Settings

You can view and configure each port as a trusted or untrusted port. Any DHCP responses received on a trusted port are forwarded. If a port is configured as untrusted, any DHCP (or BootP) responses received on that port are discarded.

➢ **To configure DHCP snooping interface settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Services > DHCP Snooping > Interface Configuration**.

   The DHCP Snooping Interface Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Trust Mode** menu, select the desired trust mode:
   - **Disabled**. The interface is considered to be untrusted and could potentially be used to launch a network attack. DHCP server messages are checked against the bindings database. On untrusted ports, DHCP snooping enforces the following security rules:
     - DHCP packets from a DHCP server (DHCPOFFER, DHCPACK, DHCPNAK, DHCPRELEASEQUERY) are dropped.
     - DHCPRELEASE and DHCPDECLINE messages are dropped if the MAC address is in the snooping database but the binding’s interface is other than the interface where the message was received.
     - DHCP packets are dropped when the source MAC address does not match the client hardware address if MAC address validation is globally enabled.
   - **Enabled**. The interface is considered to be trusted and forwards DHCP server messages without validation.
9. From the **Invalid Packets** menu, select the packet logging mode.

   When enabled, the DHCP snooping feature generates a log message when an invalid packet is received and dropped by the interface.

10. In the **Rate Limit(pps)** field, specify the rate limit value for DHCP snooping purposes.

    If the incoming rate of DHCP packets per second exceeds the configured burst interval per second, the port shuts down. If the rate limit value is N/A, then the burst interval is also nonapplicable, and rate limiting is disabled.

11. In the **Burst Interval(secs)** field, specify the burst interval value for rate limiting purposes on this interface.

    If the rate limit is N/A, then the burst interval is also nonapplicable, and the field displays N/A.

12. Click the **Apply** button.

    Your settings are saved.

Configure Static DHCP Bindings

You can view, add, and remove static bindings in the DHCP snooping bindings database and to view or clear the dynamic bindings in the bindings table.

➢ To configure static DHCP bindings:

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Services > DHCP Snooping > Binding Configuration**.

   The Static Binding Configuration page displays.

6. From the **Interface** menu, select the interface on which the DHCP client is authorized.
7. In the **MAC Address** field, specify the MAC address for the binding to be added.

   This is the key to the binding database.

8. From the **VLAN ID** menu, select the ID of the VLAN the client is authorized to use.
9. In the **IP Address** field, specify the IP address of the client.
10. Click the **Add** button.

    The DHCP snooping binding entry is added to the database.

The Dynamic Binding Configuration table shows information about the DHCP bindings that were dynamically (that is, automatically) learned on each interface on which DHCP snooping is enabled. The following table describes the dynamic bindings information.

Table 21. DHCP Dynamic Configuration information

Field	Description
Interface	The interface on which the DHCP client message was received.
MAC Address	The MAC address associated with the DHCP client that sent the message. This is the key to the binding database.
VLAN ID	The VLAN ID of the client interface.
IP Address	The IP address assigned to the client by the DHCP server.
Lease Time	The remaining IP address lease time for the client.

Configure the Persistent Location of the DHCP Snooping Bindings Database

You can configure the persistent location of the DHCP snooping bindings database. The bindings database can be stored locally on the device or on a remote system somewhere else in the network. The device must be able to reach the IP address of the remote system to send bindings to a remote database.

➢ **To configure the persistent location of the DHCP snooping bindings database:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Services > DHCP Snooping > Persistent Configuration**.

   The DHCP Snooping Persistent Configuration page displays.

6. Specify where the DHCP snooping bindings database is located:
   - **Local**. The binding table is stored locally on the switch.
   - **Remote**. The binding table is stored on a remote TFTP server.

     If the database is stored on a remote server, specify the following information:

     a. In the **Remote IP Address** field, enter the IP address of the TFTP server.
     b. In the **Remote File Name** field, enter the file name of the DHCP snooping bindings database in which the bindings are stored.
7. In the **Write Delay** field, specify the time to wait between writing bindings information to persistent storage.

   The delay allows the device to collect as many entries as possible (new and removed) before writing them to the persistent file.

8. Click the **Apply** button.

   Your settings are saved.

View or Clear the DHCP Snooping Statistics

You can view and clear per-interface statistics about the DHCP messages filtered by the DHCP snooping feature on untrusted interfaces.

➢ **To view or clear the DHCP snooping statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Services > DHCP Snooping > Statistics**.

   The DHCP Snooping Statistics page displays.

6. To refresh the information on the page, click the **Refresh** button.
7. To clear all interfaces statistics, click the **Clear** button.

The following table describes the DHCP snooping statistics.

Table 22. DHCP Snooping Statistics information

Field	Description
Interface	The interface associated with the rest of the data in the row.
MAC Verify Failures	The number of DHCP messages that were dropped because the source MAC address and client hardware address did not match. MAC address verification is performed only if it is globally enabled.
Client Ifc Mismatch	The number of packets that were dropped by DHCP snooping because the interface and VLAN on which the packet was received do not match the client's interface and VLAN information stored in the binding database.
DHCP Server Msgs Received	The number of DHCP server messages ((DHCPOFFER, DHCPACK, DHCPNAK, DHCPRELEASEQUERY) that were dropped on an untrusted port.

Set Up PoE Timer Schedules

For information about PoE timer schedules, see *Chapter 8, Manage Power over Ethernet*.

Configure Switching

3

This chapter covers the following topics:

- *Configure Port Settings*
- *Configure Link Aggregation Groups*
- *Configure VLANs*
- *Configure a Voice VLAN*
- *Configure Auto-VoIP*
- *Configure Spanning Tree Protocol*
- *Configure Multicast*
- *View, Search, and Configure the MAC Address Table*
- *Configure Layer 2 Loop Protection*

Configure Port Settings

You can view, configure, and monitor the physical port information for the ports (that is, the physical interfaces) on the switch.

➢ **To configure port settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Ports > Port Configuration**.

   The Port Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces (ports, LAGs, or both) by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. In the **Description** field, enter the description string to be attached to a port.

   The string can be up to 64 characters in length.

9. From the **Admin Mode** menu, select **Enable** or **Disable**.

   This sets the port control administrative mode. You must select **Enable** in order for the port to participate in the network. The default is Enable.

10. From the **Auto-negotiation** menu, select **Enable** or **Disable**.

    This specifies the autonegotiation mode for this port. The default is Enable.

Note: After you change the autonegotiation mode, the switch might be inaccessible for a number of seconds while the new settings take effect.

11. In the **Speed** field, specify the speed value for the selected port.
    - Auto. All supported speeds. If you select **Auto**, the duplex mode and speed are set by the autonegotiation process. The port's maximum capability (full duplex and 1000 Mbps) are advertised. Otherwise, your selection determines the port's duplex mode and transmission rate. The default setting is Auto.
    - **10**. 10 Mbits/sec.
    - **100**. 100 Mbits/sec.
    - **1000**. 1000 Mbits/sec. This selection is available only if autonegotiation is enabled.

    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 autonegotiation mode must be set to **Enable**. The default is Auto.

    Note: After you change the speed settings, the switch might be inaccessible for a number of seconds while the new settings take effect.

12. From the **Duplex Mode** menu, select the duplex mode for the selected port.

    Possible values are as follows:

    - **Auto**. Indicates that speed is set by the auto-negotiation process.
    - **Full**. Indicates that the interface supports transmission between the devices in both directions simultaneously.
    - **Half**. Indicates that the interface supports transmission between the devices 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.

13. Use the **Link Trap** menu to specify whether or not to send a trap when link status changes.

    The **Link Trap** menu is enabled by default. However, for LAG interfaces, the menu is disabled.

14. In the **Frame Size** field, specify the maximum Ethernet frame size the interface supports or is configured to use, including Ethernet header, CRC, and payload.

    The range is 1500 to 9198. The default maximum frame size is 1500.

15. From the **Flow Control** menu, select the configuration for IEEE 802.3 flow control.
    - **Disable**. If the port buffers become full, the switch does not send pause frames, and data loss could occur. This is the default setting.
    - **Symmetric**. If the port buffers become full, the switch sends pause frames to stop traffic.

Flow control helps to prevent data loss when the port cannot keep up with the number of frames being switched. When you enable flow control, the switch can send a pause frame to stop traffic on the 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 time that is 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. The switch also honors incoming pause frames by temporarily halting transmission.

- **Asymmetric**. If the port buffers become full, the switch does not send pause frames, and data loss could occur. However, the switch does honor incoming pause frames by temporarily halting transmission.

Note: For LAG interfaces, flow control mode is displayed as a blank field because flow control is not applicable.

16. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable data that is displayed.

Table 23. Port Configuration information

Field	Description
Port Type	For normal ports this field is blank. 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.
Physical Status	The port speed and duplex mode.
Link Status	Indicates whether the link is up or down.
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 ifIndex of the interface table entry associated with this port.

Configure 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 default management VLAN (that is, VLAN 1).

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.

The switch supports static LAGs. When a port is added to a LAG as a static member, the port 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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > LAG > Basic > LAG Configuration**.

   The LAG Configuration page displays.

6. In the **LAG Name** field, enter a name for 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. In the **Description** field, enter the description string to be attached to a LAG.

   The description can be up to 64 characters in length.

8. From the **Admin Mode** menu, 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 default is Enable.

9. From the **Hash Mode** menu, select the load-balancing mode for a port channel (LAG):
   - **1 Src MAC, VLAN, EType, incoming port**. This mode uses the source MAC address, VLAN, EtherType, and incoming port that are associated with the packet.

- **2 Dest MAC, VLAN, EType, incoming port**. This mode uses the destination MAC address, VLAN, EtherType, and incoming port that are associated with the packet.
- **3 Src/Dest MAC, VLAN, EType, incoming port**. This mode uses the source and destination MAC addresses, VLAN, EtherType, and incoming port that are associated with the packet. This is the default mode.
- **4 Src IP and Src TCP/UDP Port fields**. This mode uses the source IP address and source TCP or UDP port value that are associated with the packet.
- **5 Dest IP and Dest TCP/UDP Port fields**. This mode uses the destination IP address and destination TCP or UDP port value that are associated with the packet.
- **6 Src/Dest IP and TCP/UDP Port fields**. This mode uses the source and destination IP addresses and source and destination TCP or UDP port values that are associated with the packet.

Note: The switch balances traffic on a port channel (LAG) by selecting one of the links in the channel over which packets must be transmitted. The switch selects the link by creating a binary pattern from selected fields in a packet and associating that pattern with a particular link.

10. From the **STP Mode** menu, select the Spanning Tree Protocol (STP) 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. From the **Link Trap** menu, select **Enable** or **Disable** to specify whether to send a trap when the link status changes.

    The default is Enable, which causes the trap to be sent.
12. From the **LAG Type** menu, select **Static** or **LACP**:
    - **Static**. Disables Link Aggregation Control Protocol (LACP) on the selected LAG. The LAG is configured manually. The default is Static.
    - **LACP**. Disables LACP on the selected LA. The LAG is configured automatically.
13. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 24. LAG Configuration information

Field	Description
LAG ID	Identifier of the LAG.
Active Ports	The ports that are actively participating in the LAG.
LAG State	Indicates whether the link is up or down.

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 a single link.

➢ **To configure LAG membership:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > LAG > Basic > LAG Membership**.

   The LAG Membership page displays.

6. From the **LAG ID** menu, select the LAG ID.
7. In the **LAG Name** field, 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.

8. In the Ports table, click each port that you want to include as a member of the selected LAG.

   A selected port is displayed by a check mark.

9. Click the **Apply** button.

   Your settings are saved.

10. To view the members of the LAG, click the **Current members** button.

    A pop-up window opens and displays the list of current members.

Set the LACP System Priority

The LACP configuration page is used to set the LACP system priority.

➢ **To configure LACP:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > LAG > Advanced > LACP Configuration**.

   The LACP Configuration page displays.

6. In the **LACP System Priority** field, specify the device's link aggregation priority relative to the devices at the other ends of the links on which link aggregation is enabled.

   A higher value indicates a lower priority. You can change the value of the parameter globally by specifying a priority from 1 to 65535. The default value is 32768.

7. Click the **Apply** button.

   Your settings are saved.

Set the LACP Port Priority Settings

The LACP port configuration page is used to configure the LACP priority value for the selected port and the administrative LACP time-out value.

➢ **To configure LACP port priority settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > LAG > Advanced > LACP Port Configuration**.

   The LACP Port Priority page displays.

6. Select one or more interfaces (ports only, no LAGs) by taking one of the following actions:
   - To configure a single interface, select the check box associated with the interface, or type the interface number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.

7. In the **LACP Priority** field, specify the LACP priority value for the selected interfaces.

   This value specifies the device’s link aggregation priority relative to the devices at the other ends of the links on which link aggregation is enabled. A higher value indicates a lower priority. The range is 1 to 65535. The default value is 128.

8. In the **Timeout** field, configure the administrative LACP time-out value:
   - **Long**. Specifies a long time-out value. This is the default setting.
   - **Short**. Specifies a short time-out value.

9. Click the **Apply** button.

   Your settings are saved.

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. The switch supports up to 256 VLANs. VLAN 1 is created by default and is the default VLAN of which all ports are members. VLAN 4089 is also created by default and is the Auto-Video VLAN. By default, the Auto-Video VLAN does not include any members.

Manage Basic VLANs

You can add, change, and delete VLANs. For information about adding members to a VLAN, see *Configure VLAN Membership* on page 108.

Add a VLAN

➢ **To add a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Basic > VLAN Configuration**.

   The VLAN Configuration page displays.

6. In the **VLAN ID** field, specify the VLAN identifier for the new VLAN.

   The range of the VLAN ID can be from 1 to 4093.

7. In the **VLAN Name** field, 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.

8. The **VLAN Type** field displays the type of the VLAN that 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.

9. Click the **Add** button.

The VLAN is added to the switch.

10. Click the **Apply** button.

    Your settings are saved.

Delete a VLAN

➢ **To delete a VLAN from the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Basic > VLAN Configuration**.

   The VLAN Configuration page displays.

6. In the **VLAN ID** field, specify the VLAN identifier.

   The range of the VLAN ID can be from 1 to 4093.

   Note: You cannot delete VLANs 1 and VLAN 4089, which are created by default.

7. Click the **Delete** button.

   The VLAN is removed.

Reset a VLAN to Its Default Settings

➢ **To reset a VLAN to its default settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

2. Launch a web browser.

3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Basic > VLAN Configuration**.

   You can also select **Switching > VLAN > Advanced > VLAN Configuration**.

   The VLAN Configuration page displays.

6. Select the **Reset Configuration** check box.
7. Click the **Apply** button.

   Your settings are saved.

   The 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.

   All VLANs, except for the default VLAN, are deleted.

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 correct switchport mode simplifies VLAN configuration and minimizes errors.

➢ **To configure VLAN trunking:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Advanced > VLAN Trunking Configuration**.

   The Switchport Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Switchport Mode** menu, select one of the following modes.
   - **Access**. Access 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.
   - **General**. General mode enables a custom configuration of a port. You can configure the general port VLAN attributes such as the membership, PVID, tagging, ingress filter, and so on. For more information, see *Configure Port Settings* on page 96. By default, all ports are initially configured in General mode.
   - **Trunk**. Trunk 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.
9. From the **Access VLAN ID** menu, select the VLAN ID for the port, which is valid only when the selection from the **Switchport Mode** menu **Access**.

   By default, the access VLAN ID is 1.

10. From the **Native VLAN ID** menu, select the VLAN ID for the port, which is valid only when the selection from the **Switchport Mode** menu **Trunk**.

    By default, the native VLAN ID is 1.

11. In the **Trunk Allowed VLANs** field, enter the set of VLANs of which the port can be a member if configured in Trunk mode.

    By default, all possible VLANs in range from 1 to 4093 are listed, even if you did not yet create any VLANs.

Note the following:

- Use a dash (–) to specify a range.
- Use a comma (,) to separate VLANs in a list. Spaces are not permitted.
- A zero value means that you want to clear the allowed VLANs.
- The All value means that you want to set all VLANs to the range (1 to 4093).

12. Click the **Apply** button.

    Your settings are saved.

The following table shows the nonconfigurable information on the page.

Table 25. VLAN Trunking Configuration

Field	Description
Native VLAN Tagging	• **Enable**. If VLAN tagging is enabled and the trunk port receives untagged frames, it forwards them to the native VLAN with no VLAN tag. • **Disable**. If VLAN Tagging is disabled, and the port receives untagged frames, it includes the native VLAN ID in the VLAN tag when forwarding. By default, VLAN Tagging is disabled.

Configure VLAN Membership

➢ **To configure VLAN membership:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

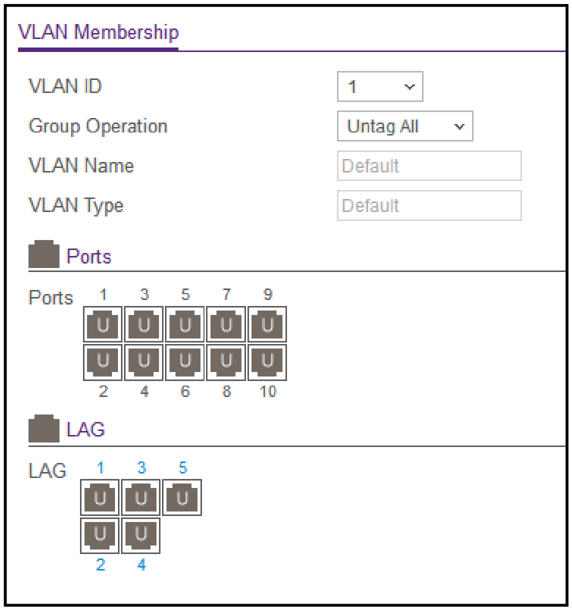
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Advanced > VLAN Membership**.

   The VLAN Membership page displays.



VLAN Membership

VLAN ID	1
Group Operation	Untag All
VLAN Name	Default
VLAN Type	Default

Ports

Ports	1	3	5	7	9
	U	U	U	U	U
	U	U	U	U	U
	2	4	6	8	10

LAG

LAG	1	3	5
	U	U	U
	U	U	
	2	4	

6. In the **VLAN ID** menu, select the VLAN ID.
7. In the **Group Operation** menu, select one of the following options, which applies to all ports in the VLAN:
   - **Untag All**. For all ports that are members of the VLAN, tags are removed from all egress packets.
   - **Tag All**. For all ports that are members of the VLAN, all egress packets are tagged.
   - **Remove All**. All ports are removed from the VLAN.
8. In the Ports table, click each port once, twice, or three times to configure one of the following modes or reset the port to the default settings:
   - **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.

   By default, the selection is blank, which means that the port is excluded from the VLAN.
9. In the LAG table, click each LAG once, twice, or three times to configure one of the following modes or reset the LAG to the default settings:
   - **T (Tagged)**. Select the LAGs on which all frames transmitted for this VLAN are tagged. The LAGs that are selected are included in the VLAN.
   - **U (Untagged)**. Select the LAGs on which all frames transmitted for this VLAN are untagged. The LAGs that are selected are included in the VLAN.

   By default, the selection is blank, which means that the LAG is excluded from the VLAN.
10. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 26. 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.

View the VLAN Status

You can view the status of all currently configured VLANs.

➢ **To view the VLAN status:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Advanced > VLAN Status**.

   The VLAN Status page displays.

The following table describes the nonconfigurable information displayed on the page.

Table 27. 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 4089 is always named Auto-Video.

Table 27. VLAN status (continued)

Field	Definition
VLAN Type	The VLAN type: • **Default** (VLAN ID = 1). Always present. • **Static**. A VLAN that you added. • **Auto-Video**. (VLAN ID = 4089). Always present.
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. The following requirements apply to 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 (see *Configure VLAN Membership* on page 108).

➢ **To configure PVID settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Advanced > Port PVID Configuration**.

   The PVID Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces (ports, LAGs, or both) by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.

- To configure all interfaces with the same settings, select the check box in the heading row.

8. In the **PVID** field, specify the VLAN ID to assign to untagged or priority-tagged frames received on this port.

   The default is 1.

9. 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 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.

10. 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.

11. From the **Acceptable Frame** menu, specify the types of frames that can be received on this port:
    - **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.
    - **VLAN only**. Untagged frames or priority-tagged frames received on this port are discarded.
    - **Admit Untagged Only**. Untagged frames received on this port are accepted and assigned the value of the port VLAN ID for this port. VLAN-tagged frames are discarded.

12. From the **Ingress Filtering** menu, select one of the following options:
    - **Enable**. 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.
    - **Disable**. All frames are forwarded in accordance with the 802.1Q VLAN bridge specification. The default is Disable.

13. 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.

14. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable fields.

Table 28. Nonconfigurable fields on the PVID Configuration page

Field	Description
Current Ingress Filtering	Indicates whether ingress filtering is enabled for the interface.
Untagged VLANs	The number of untagged VLANs for the interface.
Tagged VLANs	The number of tagged VLANs for the interface.
Forbidden VLANs	The number of forbidden VLANs for the interface.
Dynamic VLANs	Indicates None because the switch does not support dynamic VLANs.

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, a system-wide table exists 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.

Add a MAC-Based VLAN

➢ **To add a MAC-based VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Switching > VLAN > Advanced > MAC Based VLAN**.

   The MAC Based VLAN Configuration page displays.

6. In the **MAC Address** field, enter a valid MAC address to be bound to a VLAN ID.

   This field is configurable only when a MAC-based VLAN is created.

7. In the **VLAN ID** field, specify a VLAN ID in the range of 1 to 4093.
8. Click the **Add** button.

   The MAC address is added to the VLAN mapping table.

Delete a MAC Address From VLAN Mapping

➢ **To delete a MAC address from VLAN mapping:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Advanced > MAC Based VLAN**.

   The MAC Based VLAN Configuration page displays.

6. In the **MAC Address** field, enter a valid MAC address.

   This field is configurable only when a MAC-based VLAN exists.

7. In the **VLAN ID** field, specify a VLAN ID in the range of 1 to 4093.
8. Click the **Delete** button.

   The MAC address is removed from the VLAN mapping.

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 forms 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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Advanced > Protocol Based VLAN Group Configuration**.

   The Protocol Based VLAN Group Configuration page displays.

6. In the **Group ID** field, type a number for the new group.

   You can enter a number in the range from 1–128.

7. In the **Group Name** field, type a name for the new group.

   You can enter up to 16 characters.

8. In the **Protocol** field, enter one or more protocols that must be associated with the group.

   You can enter keywords such as arp, ip, and ipx. Separate keywords with a comma. You can also enter hexadecimal or decimal values in the range of 0x0600 (1536) to 0xFFFF (65535).

9. In the **VLAN ID** field, enter the VLAN ID.

The ID can be any number in the range of 1 to 4093. All the ports in the group assign this VLAN ID to untagged packets received for the protocols that you included in this group.

10. Click the **Add** button.

    The protocol-based VLAN group is added to the switch.

11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 29. Protocol Based VLAN Group Configuration information

Field	Description
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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Advanced > Protocol Based VLAN Group Membership**.

   The protocol Based VLAN Group Membership page displays.

6. From the **Group ID** menu, select the protocol-based VLAN group ID.

   The Group Name field shows the name that is associated with the group.

7. In the Ports table and LAG table, click each port and LAG that you want to include in the protocol-based VLAN group.

   A protocol-based VLAN group can include both port and LAGs. A selected port or LAG is displayed by a check mark.

8. Click the **Apply** button

Your settings are saved.

9. To view the members of the group, click the **Current members** button.

   A pop-up window opens and displays the list of current members.

Configure a Voice VLAN

You can configure the parameters for a voice VLAN configuration.

➢ **To configure a voice VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > VLAN > Advanced > Voice VLAN Configuration**.

   The page that displays shows the Voice VLAN Global Admin section and Voice VLAN Configuration section.

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

   This enables or disables the voice VLAN for the switch. The default is Disable.

7. Select the interface by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Interface Mode** menu, select the voice VLAN mode for selected interfaces:
   - **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. With this selection, you can enter a Dot1p value in the **Value** field.
- **Dot1p**. Configure voice VLAN 802.1p priority tagging for voice traffic. With this selection, you must enter a dot1p value in the **Value** field.
- **Untagged**. Configure the phone to send untagged voice traffic.

9. In the **Value** field, enter the VLAN ID or dot1p value.

   This field is enabled only when VLAN ID or dot1p is selected as the interface mode.

10. In the **CoS Override Mode** field, select **Disable** or **Enable**.

    The default is Disable.

11. 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.

12. 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.

13. Click the **Apply** button.

    Your settings are saved.

Configure Auto-VoIP

Voice over Internet Protocol (VoIP) enables telephone calls over a data network. Because voice traffic is typically more time-sensitive than data traffic, the Auto-VoIP feature helps provide a classification mechanism for voice packets so that they can be prioritized above data packets in order to provide better Quality of Service (QoS). With the Auto-VoIP feature, voice prioritization is provided based on call-control protocols (SIP, SCCP, H.323) or OUI bits.

Configure Protocol-Based Port Settings

To prioritize time-sensitive voice traffic over data traffic, protocol-based Auto-VoIP checks for packets carrying the following VoIP protocols:

- Session Initiation Protocol (SIP)
- H.323
- Signalling Connection Control Part (SCCP)

VoIP frames that are received on ports that for which the Auto-VoIP feature is enabled are marked with the specified CoS traffic class value.

➢ **To configure protocol-based port settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Auto-VoIP > Protocol-based > Port Settings**.

   The page displays the Protocol Based Global Settings section and the Protocol Based Port Settings section.

6. From the **Prioritization Type** menu, select **Traffic Class** or **Remark**.

   This specifies the type of prioritization.

7. From the **Class Value** menu, specify the CoS tag value to be reassigned for packets received on the voice VLAN when Remark CoS is enabled.
8. To display information for all ports and LAGs, click the **All** link.
9. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
10. From the **Auto VoIP Mode** menu, select **Disable** or **Enable**.

    Auto-VoIP is disabled by default.

    The **Operational Status** field displays the current operational status of each interface.

11. Click the **Apply** button.

    Your settings are saved.

Configure Auto-VoIP OUI-Based Properties

With Organizationally Unique Identifier (OUI)–based Auto-VoIP, voice prioritization is provided based on OUI bits.

➢ **To configure Auto-VoIP OUI-based properties:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Auto-VoIP > OUI-based > Properties**.

   The OUI-based Properties page displays.

6. In the **Auto-VoIP VLAN ID** field, enter the VoIP VLAN ID of the switch.

   No default VLAN exists for Auto-VoIP, you must create a VLAN for Auto-VoIP.

7. From the **OUI-based priority** menu, select the OUI-based priority of the switch.

   The default value is 7.

8. Click the **Apply** button.

   Your settings are saved.

Configure OUI-Based Port Settings

The port settings page allows you to configure the OUI port settings.

➢ **To configure OUI-based port settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Auto-VoIP > OUI-based > Port Settings**.

   The OUI Port Settings page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Auto VoIP Mode** menu, select **Disable** or **Enable**.

   Auto-VoIP is disabled by default.

   The **Operational Status** field displays the current operational status of each interface.

9. Click the **Apply** button.

   Your settings are saved.

Manage the OUI Table

Device hardware manufacturers can include an OUI in a network adapter to help identify a hardware device. The OUI is a unique 24-bit number assigned by the IEEE registration authority. The switch comes preconfigured with the following OUIs that identify the IP phone manufacturer:

- 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
- 00:04:13: SNOM

You can select an existing OUI or add a new OUI and description to identify the IP phones on the network.

Configure the OUI Table

➢ **To configure the OUI Table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Auto-VoIP > OUI-based > OUI Table**.

   The OUI Table page displays.

6. 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.

7. 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

8. Click the **Add** button.

   The telephony OUI entry is added.

Delete One or More OUI Prefixes From the OUI Table

➢ **To delete one or more OUI prefixes from the OUI table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Auto-VoIP > OUI-based > OUI Table**.

   The OUI Table page displays.

6. Select the check box next to each OUI prefix to be removed.

7. Click the **Delete** button.

   The telephony OUI entries are removed.

Display the Auto-VoIP Status

You can display the Auto-VoIP status.

➢ **To view the Auto-VoIP status:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Auto-VoIP > Auto-VoIP Status**.

   The Auto-VoIP Status page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the nonconfigurable Auto-VoIP status information.

Table 30. 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 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.

Spanning Tree Protocol Overview

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 128.

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 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 with both RSTP and STP. It behaves in a way that is appropriate for STP and RSTP bridges. An MSTP bridge can be configured to behave entirely as an RSTP bridge or an STP bridge.

Note: For two bridges to be in the same region, the force version must be 802.1s and their configuration names, digest keys, and revision levels must match. For additional information about regions and their effect on network topology, refer to the IEEE 802.1Q standard.

Configure STP Settings

The STP Configuration page contains fields for enabling STP on the switch.

➢ **To configure STP settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > STP > Basic > STP Configuration**.

   The Global Settings page displays.

6. Configure the following options:
   - **Spanning Tree State**. Enable or disable the spanning tree operation on the switch.
   - **STP Operation Mode**. Specify the STP version for the switch. The options are **STP**, **RSTP**, and **MSTP**.

     For more information, see *Spanning Tree Protocol Overview* on page 125.
   - **Configuration Name**. Specify an identifier used to identify the configuration currently being used.

     The name can be up to 32 alphanumeric characters.
   - **Configuration Revision Level**. Specify an identifier used to identify the configuration currently being used.

     The values allowed are between 0 and 65535. The default value is 0.
   - **Forward BPDU while STP Disabled**. Enable or disable the BPDU Flood.

     The BPDU flood option specifies whether spanning tree BPDUs are forwarded while spanning tree is disabled on the switch.
7. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable STP Status fields displayed on the page.

Table 31. STP configuration status

Field	Description
Configuration Digest Key	Identifier used to identify the configuration currently being used.
STP Status	
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 day-hour-minute-second format since the topology of the CST last changed.
Topology Change Count	The number of times that the topology changed for the CST.
Topology Change	The value of the topology change parameter for the switch indicating whether a topology change is in progress on any port assigned to the CST. Possible values are True and 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	Port to access the designated root for the CST.
Max Age (secs)	The maximum age timer controls the maximum length of time in seconds that passes before a bridge port saves its configuration BPDU information.

Table 31. STP configuration status (continued)

Field	Description
Forward Delay (secs)	The derived value of the Root Port Bridge Forward Delay parameter.
Hold Time (secs)	Minimum time in seconds between the 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 Settings

You can configure a Common Spanning Tree (CST) and Internal Spanning Tree on the switch.

➢ **To configure CST settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > STP > Advanced > CST Configuration**.

   The CST Configuration page displays.

6. Specify the CST options:
   - **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. Specify 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 you set the priority to any value between 0 and 4095, the switch automatically sets the value to 0. The default value is 32768.
   - **Bridge Max Age (secs)**. The bridge maximum age time for the Common and Internal Spanning Tree (CST), which indicates the time in seconds a bridge must wait 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 time in seconds a root bridge must wait 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 time in seconds a bridge must 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.

7. Click the **Apply** button.

   Your settings are saved.

The following table describes the MSTP Status information that is displayed.

Table 32. STP advanced CST configuration, MSTP status

Field	Description
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 Port Settings

You can configure a common spanning tree (CST) and internal spanning tree on a specific port on the switch.

A port can become diagnostically disabled if as error condition occurs such as severe BPDU flooding with more than 15 BPDUs in a 3-second interval.

➢ **To configure CST port settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

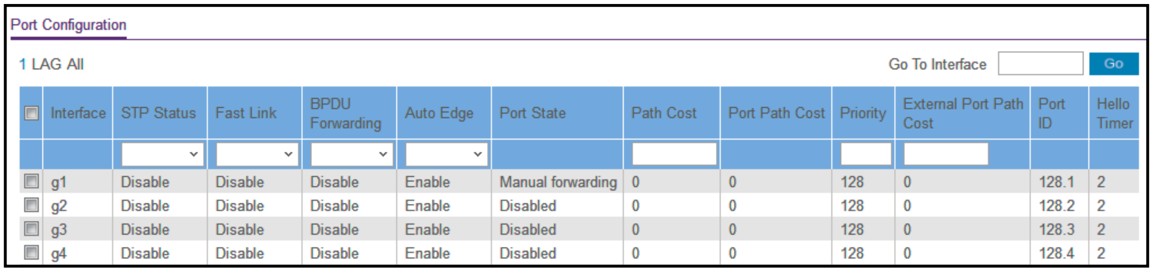
The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > STP > Advanced > CST Port Configuration**.



Port Configuration

1 LAG All

Go To Interface □ Go

☐	Interface	STP Status	Fast Link	BPDU Forwarding	Auto Edge	Port State	Path Cost	Port Path Cost	Priority	External Port Path Cost	Port ID	Hello Timer
☐	g1	Disable	Disable	Disable	Enable	Manual forwarding	0	0	128	0	128.1	2
☐	g2	Disable	Disable	Disable	Enable	Disabled	0	0	128	0	128.2	2
☐	g3	Disable	Disable	Disable	Enable	Disabled	0	0	128	0	128.3	2
☐	g4	Disable	Disable	Disable	Enable	Disabled	0	0	128	0	128.4	2

6. To display information for all ports and LAGs, click the **All** link.

7. Select one or more interfaces by taking one of the following actions:

   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.

8. From the **STP Status** menu, select the option to enable or disable the spanning tree administrative mode associated with the port or port channel.

   The possible values are **Enable** and **Disable**. The default value is Disable.

9. From the **Fast Link** menu, select whether the specified port is an edge port within the CST.

   The possible values are **Enable** and **Disable**. The default value is Disable.

10. From the **BPDU Forwarding** menu, configure BPDU forwarding.

    The possible values are **Enable** and **Disable**. The default value is Disable. When BPDU forwarding is enabled, the switch forwards the BPDU traffic arriving on this port when STP is disabled on this port.

11. From the **Auto Edge menu**, specify if the port is allowed to become an edge port if it does not detect BPDUs for some duration.

    The possible values are **Enable** and **Disable**. The default value is Enable.

12. In the **Path Cost** field, set the path cost to a new value for the specified port in the common and internal spanning tree.

    Specify a value in the range of 0 to 200000000. The default is 0. When the path cost is set to 0, the value is updated with the external path cost from a received STP packet.

13. In the **Priority** field, specify the priority for a particular port within the CST.

    The port priority is set in multiples of 16. For example if you attempt to set the priority to any value between 0 and 15, it is set to 0. If you try to set it to any value between 16 and (2*16 – 1), it is set to 16, and so on. The range is 0 to 240. The default value is 128.

14. In the **External Port Path Cost** field, set the external path cost to a new value for the specified port in the spanning tree.

    The value range is 0 to 200000000. The default is 0.

15. Click the **Apply** button.

    Your settings are saved.

16. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the nonconfigurable information displayed on the page.

Table 33. CST port configuration

Field	Description
Port State	The forwarding state of this port. The default is Disabled.
Port ID	The port identifier for the specified port within the CST. It is made up of the port priority and the interface number of the port.
Port Path Cost	The path cost for the port. The default is 0.
Hello Timer	The value of the parameter for the CST. The default is 2 seconds.

View CST Port Status

You can to display the common spanning tree (CST) and internal spanning tree for a specific port on the switch.

➢ **To view the CST port status:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Switching > STP > Advanced > CST Port Status**.

   The CST Port Status page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the CST Status information displayed on the page.

Table 34. CST port status

Field	Description
Interface	Identify the physical or port channel interfaces associated with VLANs associated with the CST.
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.
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 is either 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 Forwarding State	The forwarding state of this port.

View Rapid STP Information

You can view information about the Rapid Spanning Tree (RSTP) port status.

➢ **To view information about RSTP:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > STP > Advanced > RSTP**.

   The Rapid STP page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the Rapid STP Status information displayed on the page.

Table 35. Rapid STP status information

Field	**Description**
Interface	The physical or port channel interfaces associated with VLANs associated with the CST.
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: Root Port, Designated Port, Alternate Port, Backup Port, Master Port, or Disabled Port.
Mode	Specifies the spanning tree operation mode. Different modes are STP, RSTP, and MSTP.
Fast Link	Indicates whether the port is enabled as an edge port.
Status	The forwarding state of this port.

Manage MST Settings

You can configure a multiple spanning tree (MST) on the switch.

Configure an MST Instance

➢ **To configure an MST instance:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > STP > Advanced > MST Configuration**.

   The MST Configuration page displays.

6. 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 visible only 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 you set the priority to any value between 0 and 4095, the switch automatically sets the value to 0. The default value is 32768. The valid range is 0–61440.
   - **Vlan Id**. The menu includes all VLANs that are configured on the switch. You can select VLANs that must be associated with the MST instance or clear VLANs that are already associated with the MST instance.
7. Click the **Add** button.

   The MST is added.

For each configured instance, the information described in the following table displays on the page.

Table 36. 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.
Last TCN	The time in day:hour:minute:second format since the topology of the selected MST instance last changed.
Topology Change Count	Number of times that the 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 is either 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 this MST instance.
Root Port	Port to access the designated root for this MST instance.

Modify an MST Instance

➢ **To modify an MST instance:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > STP > Advanced > MST Configuration**.

   The MST Configuration page displays.

6. Select the check box next to the instance.

   You can select multiple check boxes to apply the same setting to all selected ports.

7. Update the values.
8. Click the **Apply** button.

   Your settings are saved.

Delete an MST Instance

➢ **To delete an MST instance:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Switching > STP > Advanced > MST Configuration**.

   The MST Configuration page displays.
6. Select the check box for the instance.
7. Click the **Delete** button.

   The MST instance is removed.

Configure MST Port Settings

You can configure and display the 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 configure MST port settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Switching > STP > Advanced > MST Port Configuration**.

   The Status section and MST Port Configuration section display.

Note: If no MST instances are configured on the switch, the page displays a “No MSTs Available” message.

6. From the **Select MST** menu, select the MST for which you want to configure the port settings.
7. To display information for all ports and LAGs, click the **All** link.
8. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
9. Configure the MST values for the selected interfaces:
   - **Port Priority**. The priority for a particular port within the selected MST instance. The port priority is set in multiples of 16. If you specify a value that is not a multiple of 16, the priority is set to the priority is automatically set to the next lowest priority that is a multiple of 16. For example, if you set a value between 0 and 15, the priority is set to 0. If you specify a number between 16 and 31, the priority is set to 16. Specify a value in the range of 0–240. By default, the value is 128.
   - **Port Path Cost**. Set the path cost to a new value for the specified port in the selected MST instance. Specify a value in the range of 0–200000000. By default, the value is 0.
10. Click the **Apply** button.

    Your settings are saved.
11. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the read-only MST port configuration information displayed on the Spanning Tree CST Configuration page.

Table 37. MST port status information

Field	Description
Operational Port Path Cost	The operational path cost for the port in the MST instance.
Auto-calculated Port Path Cost	Indicates whether the path cost is automatically calculated (Enabled) or not (Disabled). If the configured value for the port path cost is zero, the path cost is calculated based on the link speed of the port.
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 Up Time Since Counters Last Cleared	The time since the counters were last cleared, displayed in days, hours, minutes, and seconds.
Port Mode	The Spanning Tree Protocol administrative mode that is associated with the port or port channel. The possible values are Enable and Disable.
Port Forwarding State	Indicates the current STP state of a port. If enabled, the port state determines what forwarding action is taken on traffic. Possible port states are as follows: • **Disabled**. STP is currently disabled on the port. The port forwards traffic while learning MAC addresses. • **Blocking**. The port is currently blocked and cannot be used to forward traffic or learn MAC addresses. • **Listening**. The port is currently in the listening mode. The port cannot forward traffic nor can it learn MAC addresses. • **Learning**. The port is currently in the learning mode. The port cannot forward traffic. However, it can learn new MAC addresses. • **Forwarding**. The port is currently in the forwarding mode. The port can forward traffic and learn new MAC addresses
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: Root Port, Designated Port, Alternate Port, Backup Port, Master Port, or Disabled Port.
Designated Root	The 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	The cost of the port participating in the STP topology. Ports with a lower cost are less likely to be blocked if STP detects loops.
Designated Bridge	The 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	The 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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > STP > Advanced > STP Statistics**.

   The STP Statistics page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the information available about the STP Statistics page.

Table 38. STP Statistics

Field	Description
Interface	The physical or port channel interfaces of the switch.
STP BPDUs Received	The number of STP BPDUs received at the port.
STP BPDUs Transmitted	The number of STP BPDUs transmitted from the port.
RSTP BPDUs Received	The number of RSTP BPDUs received at the port.
RSTP BPDUs Transmitted	The number of RSTP BPDUs transmitted from the port.
MSTP BPDUs Received	The number of MSTP BPDUs received at the port.
MSTP BPDUs Transmitted	The number of MSTP BPDUs transmitted from the port.

Configure Multicast

Multicast IP traffic is traffic that is destined to a host group. Host groups for IPv4 multicast are identified by class D addresses, which range from 224.0.0.0 to 239.255.255.255. Host groups for IPv6 multicast are identified by the prefix ff00::/8.

View or Clear 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 or clear the MFDB Table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > MFDB > MFDB Table**.

   The MFDB Table page displays.

6. In the **Search by MAC Address** field, enter a MAC address.

   Enter six two-digit hexadecimal numbers separated by colons, for example 00:01:23:43:45:67.

7. Click the **Go** button.

   If the address exists, the entry is displayed. An exact match is required.

8. To refresh the page with the latest information about the switch, click the **Refresh** button.
9. To clear the information, click the **Clear** button.

The following table describes the information in the MFDB table.

Table 39. MFDB table information

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.
Component	The component that is responsible for this entry in the Multicast Forwarding Database. Possible values are IGMP snooping, GMRP, Static Filtering and MLD snooping.
Type	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.
Description	The text description of this multicast table entry. Possible values are Management Configured, Network Configured, and Network Assisted.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:) for the selected address.
Forwarding Interfaces	The list of forwarding interfaces. This list is derived from combining all forwarding interfaces and removing the interfaces that are listed as static filtering interfaces.

View the MFDB Statistics

➢ **To view the MFDB statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > MFDB > MFDB Statistics**.

   The MFDB Statistics page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the MFDB Statistics fields.

Table 40. MFDB Statistics information

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.

Configure the Auto-Video Settings

You can configure the auto-video settings for multicast traffic.

➢ **To the configure auto-video settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > Auto-Video**.

   The Auto-Video Configuration page displays.

6. Select one of the following radio buttons:
   - Select the **Disable** radio button to globally disable the Auto-Video mode for the switch.
   - Select the **Enable** radio button to globally enable the Auto-Video mode for the switch.

   The Auto-Video VLAN field shows the ID for the Auto-Video VLAN. By default, the VLAN ID is 4089.

7. Click the **Apply** button.

   Your settings are saved.

Configure IGMP Snooping

Internet Group Management Protocol (IGMP) snooping is a feature that allows a switch to forward multicast traffic intelligently. 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. Based on the IGMP query and report 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.

IGMP Snooping Overview

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 to 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.

In addition to building and maintaining lists of multicast group memberships, the IGMP snooping switch also maintains a list of multicast routers. Multicast packets are forwarded on ports to which multicast routers are connected. With IGMP snooping, only one querier can be active in the network. All other routers in the network are suppressed and are not detectable by the switch. If a query is not received on an interface within a specified period, the interface is removed from the list of interfaces to which multicast routers are attached. However, by default, the multicast router expiration time is zero, that is, the multicast router does not expire.

A statically configured router that is connected to an interface or VLAN on the switch is automatically added to the list with learned multicast routers. The interface must be active or must be both active and a member of the VLAN.

Configure IGMP Snooping Globally

You can configure the parameters for IGMP snooping, which is used to build forwarding lists for multicast traffic.

➢ **To configure IGMP snooping globally:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping > IGMP Snooping Configuration**.

   The IGMP Snooping Configuration page displays.

6. Select the IGMP Snooping Status **Enable** or **Disable** radio button.

   This specifies whether IGMP snooping is enabled for the switch. The default is Enable.

7. Select the Validate IGMP IP header **Enable** or **Disable** radio button.

   When IGMP IP header validation is enabled, any IGMP IP header must include the Router Alert, ToS, and TTL information. Otherwise, the IGMP packet is discarded. The default value is Enable.

8. Click the **Apply** button.

   Your settings are saved.

9. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table displays information about the global IGMP snooping status and statistics on the page.

Table 41. IGMP Snooping Configuration information

Field	Description
Multicast Control Frame Count	The number of multicast control frames that are processed by the CPU.
Interfaces Enabled for IGMP Snooping	The interfaces that are enabled for IGMP snooping.

Table 41. IGMP Snooping Configuration information (continued)

Field	Description
VLAN IDs Enabled For IGMP Snooping	The IDs of the VLANs that are enabled for IGMP snooping.
VLAN IDs Enabled For IGMP Snooping Querier	The IDs of the VLANs that are enabled for IGMP snooping querier.

Configure IGMP Snooping for Interfaces

➢ **To configure IGMP snooping for interfaces:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping > IGMP Snooping Interface Configuration**.

   The IGMP Snooping Interface Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Admin Mode** menu, select **Disable** or **Enable**.

   This specifies the interface mode for the selected interface for IGMP snooping for the switch. The default is Disable.

9. In the **Host Timeout** field, specify the time that the switch must wait for a report for a particular group on a particular interface before it deletes that interface from the group.

Enter a value between 1 and 3600 seconds. The default is 260 seconds.

10. In the **Max Response Time** field, specify the time that the switch must 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 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.

11. In the **MRouter Timeout** field, specify the time that the switch must 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.

12. From the **Fast Leave Mode** menu, select whether fast leave mode is enabled.

    The option are **Enable** and **Disable**. The default is Disable.

13. Click the **Apply** button.

    Your settings are saved.

View the IGMP Snooping Table

You can view all of the entries in the Multicast Forwarding Database that were created for IGMP snooping.

➢ **To view the entries in the IGMP snooping table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping > IGMP Snooping Table**.

   The IGMP Snooping Table page displays.

6. In the **Search By MAC Address** field, specify the MAC address whose MFDB table entry you want to view.

Enter six two-digit hexadecimal numbers separated by colons, for example 00:01:23:43:45:67.

7. Click the **Go** button.

   If the address exists, the entry is displayed. An exact match is required.

8. To refresh the page with the latest information about the switch, click the **Refresh** button.
9. To clear the information, click the **Clear** button.

The following table describes the information in the IGMP snooping table.

Table 42. IGMP Snooping Table information

Field	Description
MAC Address	The multicast MAC address for which the switch holds forwarding and/or filtering information. The format is six two-digit hexadecimal numbers that are separated by colons, for example, 01:00:5e:45:67:89.
VLAN ID	The VLAN ID for which the switch holds forwarding and filtering information.
Type	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.
Description	The text description of this multicast table entry. Possible values are Management Configured, Network Configured, and Network Assisted.
Interface	The interfaces that are designated for forwarding (Fwd) and filtering (Flt) for the associated address.

Configure IGMP Snooping for VLANs

➢ **To configure IGMP snooping settings for VLANs:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping > IGMP Snooping VLAN Configuration**.

The IGMP Snooping VLAN Configuration page displays.

6. To enable IGMP snooping on a VLAN, in the **VLAN ID** field, enter the VLAN ID.
7. Configure the IGMP snooping values:
   - **Admin Mode**. Enable or disable IGMP snooping for the specified VLAN ID. The default is Disable.
   - **Fast Leave Mode**. Enable or disable the IGMP snooping fast leave mode for the specified VLAN ID. The default is Disable.
   - **Host Timeout**. Set the value for group membership interval of IGMP snooping for the specified VLAN ID. The valid range is Maximum Response Time + 1 to 3600 seconds.
   - **Maximum Response Time**. Set the value for the maximum response time of IGMP snooping for the specified VLAN ID. The valid range is 1 to Group Membership Interval –1. This value must be greater than group membership interval value.
   - **MRouter Timeout**. Set the value for multicast router expiry time of IGMP snooping for the specified VLAN ID. The valid range is 0 to 3600 seconds.
   - **Report Suppression Mode**. Enable or disable IGMP snooping report suppression mode for the specified VLAN ID. IGMP snooping report suppression allows the suppression of the IGMP reports sent by the multicast hosts by building a Layer 3 membership table. The results is that only the most essential reports are sent to the IGMP routers so that the routers can continue to receive the multicast traffic.The default is Disable.
   - **Querier Mode**. Enable or disable the IGMP querier mode. If proxy querier mode is disabled, then an IGMP proxy query with source IP 0.0.0.0 is not sent in response to an IGMP leave packet. The default is Disable.
   - **Query Interval**. Set the IGMP query interval for the specified VLAN ID. The valid range is 1 to 1800 seconds. The default is 60 seconds.
8. Click the **Apply** button.

   Your settings are saved.

Modify IGMP Snooping Settings for a VLAN

➢ **To modify IGMP snooping settings for a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping > IGMP Snooping VLAN Configuration**.

   The IGMP Snooping VLAN Configuration page displays.

6. Select the check box next to the VLAN ID.
7. Update the values.
8. Click the **Apply** button.

   Your settings are saved.

Disable IGMP Snooping on a VLAN

➢ **To disable IGMP snooping on a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping > IGMP Snooping VLAN Configuration**.

   The IGMP Snooping VLAN Configuration page displays.

6. Select the check box next to the VLAN ID.
7. Click the **Delete** button.

   Snooping is disabled on the VLAN and the VLAN is removed from the table.

Configure Multicast Router Interfaces for IGMP Snooping

You can configure an interface as the designated interface to which a multicast router is attached. All IGMP packets snooped by the switch are forwarded to the multicast router reachable from this interface. Configuring a multicast router interface is usually not required because the switch automatically detects the multicast router and forwards IGMP packets accordingly. It is required only if you want to make sure that the multicast router always receives IGMP packets from the switch in a complex network.

➢ **To configure multicast router interfaces:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping > Multicast Router Configuration**.

   The Multicast Router Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. In the **Multicast Router** field, select **Enable** or **Disable**.
9. Click the **Apply** button.

   Your settings are saved.

Configure a Multicast Router VLAN for IGMP Snooping

You can configure an interface to forward snooped IGMP packets only from a specific VLAN to the multicast router that is attached to the interface. This configuration is usually not required because the switch automatically detects a multicast router and forwards the IGMP packets accordingly. However, in a complex network, it might be required if you want to make sure that the multicast router always receives IGMP packets from the switch.

➢ **To configure a multicast router VLAN:**

1. Connect your computer to the same network as the switch.

You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Switching > Multicast > IGMP Snooping > Multicast Router VLAN Configuration**.

   The Multicast Router VLAN Configuration page displays.
6. From the **Interface** menu, select the interface.
7. In the **VLAN ID** field, enter the VLAN ID.
8. From the **Multicast Router** menu, select **Enable** or **Disable**.
9. Click the **Apply** button.

   Your settings are saved.

Configure an IGMP Snooping Querier

An IGMP snooping querier is a device that queries devices on the network for multicast membership.

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 about IGMP snooping queriers on the network and, separately, on VLANs.

Configure the Global IGMP Snooping Querier Settings

You can configure the global settings for an IGMP snooping querier.

➢ **To configure the global IGMP snooping querier settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping Querier > Querier Configuration**.

   The Querier Configuration page displays.

6. Configure the following settings:
   - **Querier Admin Mode**. Enable or disable IGMP snooping for the switch. The default is Enable.
   - **Snooping Querier Address**. Enter the snooping querier IP 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 a query is being sent.
   - **IGMP Version**. Specify the IGMP protocol version used in periodic IGMP queries. The range is 1 to 2. The default value is 2.
   - **Query Interval(secs)**. 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.
   - **Querier Expiry Interval(secs)**. 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.
7. Click the **Apply** button.

   Your settings are saved.

8. To refresh the page with the latest information about the switch, click the **Refresh** button.

   The page lists the VLAN IDs for the VLANs on which the IGMP snooping querier feature is enabled.

Configure an IGMP Snooping Querier for a VLAN

You can configure an IGMP snooping querier for use with a VLAN on the network.

➢ **To configure an IGMP querier snooping for a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping Querier > Querier VLAN Configuration**.

   The Querier VLAN Configuration page displays.

6. From the **VLAN ID** menu, select **New Entry**.
7. Configure the following settings:
   - **VLAN ID**. The VLAN ID for which the IGMP snooping querier is to be enabled.
   - **Querier Election Participate Mode**. Enable or disable querier this mode:
     - **Disable**. Upon seeing another querier of the same version in the VLAN, the snooping querier moves to the non-querier state.
     - **Enable**. The snooping querier participates in querier election, in which the lowest 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.
8. Click the **Apply** button.

   Your settings are saved.

Remove an IGMP Snooping Querier From a VLAN

You can remove an IGMP snooping querier from a VLAN.

➢ **To remove an IGMP snooping querier from a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping Querier > Querier VLAN Configuration**.

   The Querier VLAN Configuration page displays.

6. From the **VLAN ID** menu, select the VLAN ID.
7. Click the **Delete** button.

   Your settings are saved. The IGMP snooping querier is no longer supported on the VLAN. The VLAN itself is not deleted.

Display the IGMP Snooping Querier Status for VLANs

➢ **To display the IGMP snooping querier status for VLANs:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Switching > Multicast > IGMP Snooping Querier > Querier VLAN Status**.

   The Querier VLAN Status page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the nonconfigurable information displayed on the page.

Table 43. Querier VLAN Status information

Field	Description
VLAN ID	The VLAN ID on which IGMP snooping querier is enabled.
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 in non-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	The maximum response time to be used in the queries that are sent by the snooping querier.

Configure MLD Snooping

In IPv4, Layer 2 switches can use IGMP snooping to limit the flooding of multicast traffic by dynamically configuring Layer 2 interfaces so that multicast traffic is forwarded to only those interfaces associated with IP multicast address. In IPv6, MLD snooping performs a similar function. With MLD snooping, IPv6 multicast data is selectively forwarded to a list of ports that want to receive the data, instead of being flooded to all ports in a VLAN. This list is constructed by snooping IPv6 multicast control packets.

MLD Snooping Overview

Multicast Listener Discovery (MLD) is a protocol used by IPv6 multicast routers to discover the presence of multicast listeners (nodes that must receive IPv6 multicast packets) on its directly attached links and to discover which multicast packets are of interest to neighboring nodes. MLD is derived from IGMP; MLD version 1 (MLDv1) is equivalent to IGMPv2 and MLD version 2 (MLDv2) is equivalent to IGMPv3. MLD is a subprotocol of Internet Control Message Protocol version 6 (ICMPv6), and MLD messages are a subset of ICMPv6 messages, identified in IPv6 packets by a preceding Next Header value of 58.

The switch can snoop on both MLDv1 and MLDv2 protocol packets and bridge IPv6 multicast data based on destination IPv6 Multicast MAC Addresses. The switch can be configured to perform MLD snooping and IGMP snooping simultaneously.

In addition to building and maintaining lists of multicast group memberships, the MLD snooping switch also maintains a list of multicast routers. Multicast packets are forwarded on ports to which multicast routers are connected. With MLD snooping, only one querier can be active in the network. All other routers in the network are suppressed and are not detectable by the switch. If a query is not received on an interface within a specified period, the interface is removed from the list of interfaces to which multicast routers are attached. However, by default, the multicast router expiration time is zero, that is, the multicast router does not expire.

A statically configured router that is connected to an interface or VLAN on the switch is automatically added to the list with learned multicast routers. The interface must be active or must be both active and a member of the VLAN.

Enable MLD Snooping

You can enable MLD snooping.

➢ **To enable MLD snooping:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > Configuration**.

   The MLD Snooping Configuration page displays.

6. Select the MLD Snooping Admin Mode **Enable** radio button.

   By default, the **Enable** radio button is selected.

7. Click the **Apply** button.

   Your settings are saved.

8. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the nonconfigurable MLD Snooping Configuration fields.

Table 44. MLD Snooping Configuration information

Field	Definition
Multicast Control Frame Count	The number of multicast control frames that were processed by the CPU.
Interfaces Enabled for MLD Snooping	The 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 must receive multicast packets directed to the group address.
VLAN IDs Enabled For MLD Snooping	The VLANs on which MLD snooping is administratively enabled.

Configure an MLD Snooping Interface

➢ **To configure an MLD snooping interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > Interface Configuration**.

   The MLD Snooping Interface Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.

- To configure all interfaces with the same settings, select the check box in the heading row.

8. From the **Admin Mode** menu, select to enable or disable the interface mode for the selected interface for MLD snooping for the switch.

   The default is Disable.

9. In the **Membership Interval** field, specify the time that the switch must 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 the maximum response time. The default is 260 seconds.

10. In the **Max Response Time in seconds** field, specify the time that the switch must 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.

11. In the **Expiration Time** field, specify the time that the switch must wait to receive a query on an interface before removing the interface 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.

12. From the **Fast Leave** menu, select to enable or disable Fast Leave on the interface.

    If Fast Leave is enabled, the interface can be immediately removed from the Layer 2 forwarding table when the switch receives an MLD leave message for a multicast group without first sending MAC-based general queries. The default is Disable.

13. Click the **Apply** button.

    Your settings are saved.

Configure MLD Snooping for VLANs

➢ **To configure MLD snooping for a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > MLD VLAN Configuration**.

   The MLD VLAN Configuration page displays.

6. In the **VLAN ID** field, specify the VLAN IDs for which MLD snooping must be enabled.
7. From the **Fast Leave** menu, select to enable or disable the MLD snooping Fast Leave mode for the specified VLAN ID.
8. In the **Membership Interval** field, set 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.

9. In the **Maximum Response Time** field, set 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. This value must be less than the group membership interval value.

10. In the **Multicast Router Expiry Time** field, set the value for the multicast router expiry time of MLD snooping for the specified VLAN ID.

    The valid range is 0 to 3600.

11. Click the **Add** button.

    MLD snooping is enabled on the specified VLAN.

Remove MLD Snooping From a VLAN

You can remove MLD snooping from a VLAN.

➢ **To remove MLD snooping from a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > MLD VLAN Configuration**.

   The MLD VLAN Configuration page displays.

6. Select the check box for the VLAN ID.
7. Click the **Delete** button.

   Your settings are saved. MLD snooping is no longer supported on the VLAN. The VLAN itself is not deleted.

Configure a Multicast Router Interface for MLD Snooping

➢ **To configure a multicast router interface for MLD snooping:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > Multicast Router Configuration**.

   The Multicast Router Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Multicast Router** menu, select to enable or disable the multicast router for the selected interfaces.
9. Click the **Apply** button.

   Your settings are saved.

Configure a Multicast Router VLAN for MLD Snooping

➢ **To configure a multicast router VLAN for MLD snooping:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > Multicast Router VLAN Configuration**.

   The Multicast Router VLAN Configuration page displays.

6. From the **Interface** menu, select the interface for which you want the multicast router to be enabled.
7. In the **VLAN ID** field, specify the VLAN ID.
8. From the **Multicast Router** menu, select to enable or disable the multicast router for the VLAN.
9. Click the **Apply** button.

   Your settings are saved.

Configure an MLD Snooping Querier

You can configure the settings for an MLD snooping querier.

➢ **To configure an MLD snooping querier:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > Querier Configuration**.

   The MLD Snooping Querier Configuration page displays.

6. Configure the following settings:
   - **Querier Admin Mode**. Enable or disable MLD snooping for the switch. The default is Disable.
   - **Querier Address**. Enter an IP address. This specifies the snooping querier address to be used as the source address in periodic MLD queries. This address is used when no address is configured on the VLAN on which a query is being sent. The supported IPv6 formats are x:x:x:x:x:x:x:x and x::x.
   - **MLD Version**. The MLD protocol used in periodic MLD queries is version 1. This value is not configurable.
   - **Query Interval (secs)**. Specify the 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.
   - **Querier Expiry Interval (secs)**. Specify the 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.
7. Click the **Apply** button.

   Your settings are saved.

   The page displays the IDs of the VLANS for which the MLD snooping querier is enabled.

Configure an MLD Snooping Querier for a VLAN

You can configure an MLD snooping querier for use with a VLAN on the network.

➢ **To configure an MLD snooping querier for a VLAN**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > Querier VLAN Configuration**.

   The MLD Snooping Querier VLAN Configuration page displays.

6. In the **VLAN ID** field, specify the VLAN ID on which the MLD snooping querier must be enabled and for which a VLAN exists in the VLAN database.
7. From the **Querier Election Participate Mode** menu, select to enable or disable the querier participation election mode for MLD snooping.

   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.

8. In the **Querier VLAN Address** field, specify the snooping querier address to be used as the source address in periodic MLD queries sent on the specified VLAN.
9. Click the **Add** button.

   Your settings are saved and the MLD snooping querier is added on the VLAN.

The following table describes the nonconfigurable information displayed on the page.

Table 45. MLD Snooping Querier VLAN Configuration information

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	The maximum response time to be used in the queries that are sent by the snooping querier.

Remove an MLD Snooping Querier From a VLAN

You can remove an MLD snooping querier from a VLAN.

➢ **To remove an MLD snooping querier from a VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Multicast > MLD Snooping > Querier VLAN Configuration**.

   The MLD Snooping Querier VLAN Configuration page displays.

6. Select the check box for the VLAN ID.
7. Click the **Delete** button.

   Your settings are saved. The MLD snooping querier is no longer supported on the VLAN. The VLAN itself is not deleted.

View, Search, and Configure the MAC Address Table

You can view or configure the MAC address table. This table contains information about unicast entries for which the switch holds forwarding or filtering information. The transparent bridging function uses the forwarding database entries to determine how to forward an incoming frame.

View and Search the MAC Address Table

You can use the search function for the MAC address table to display information about the entries in the table.

➢ **To view and search the MAC address table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Address Table > Basic > Address Table**.

   The MAC Address Table page displays.

6. Use the **Search** menu and field to search for a MAC address, VLAN ID, or interface number and display the information:
   - **Search by MAC Address**. From the **Search** menu, select **MAC Address**, and 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 (higher) MAC addresses. An exact match is required.

   - **Search by VLAN ID**. From the **Search** menu, select **VLAN ID**, and enter the VLAN ID, for example, 100. Then click the **Go** button.
   - **Search by Interface**. From the **Search** menu, select **Interface**, and enter the interface ID using the respective interface naming convention (for example, g1 or l1). Then click the **Go** button.

7. To refresh the information on the page, click the **Refresh** button.

The following table describes the nonconfigurable information displayed on the page.

Table 46. MAC Address Table information

Field	Description
Total MAC Address	The number of total MAC addresses learned or configured.
VLAN ID	The VLAN ID associated with the MAC address.
MAC Address	The unicast MAC address for which the switch holds forwarding, filtering information, or both. The format is a 6-byte MAC address that is separated by colons, for example 01:23:45:67:89:AB.

Table 46. MAC Address Table information (continued)

Field	Description
Interface	The interface on which the address was learned.
Status	The status of this entry, which can be one of the following: • **Static**. The instance was added by the system or a user and cannot be relearned. • **Learned**. The instance was learned, and is being used. • **Management**. The value of the corresponding instance for the system MAC address is also the value of an existing instance for 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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Address Table > Advanced > Dynamic Address**.

   The Dynamic Address page displays.

6. In the **Address Aging Timeout (seconds)** field, specify the time-out period in seconds for aging out dynamically learned forwarding information.

   The value can be any number between 10 and 1000000 seconds. The default is 300.

7. Click the **Apply** button.

   Your settings are saved.

Add a Static MAC Address

You can manually add MAC addresses to the MAC address table. Such MAC addresses are static MAC addresses.

➢ **To add a static MAC address:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Address Table > Advanced > Static MAC Address**.

   The page displays the Port List section and the Static MAC ADdress Table section.

6. From the **Interface** menu, select the interface.
7. In the **Static MAC Address** field, enter the MAC address.
8. From the **VLAN ID** menu, select the VLAN ID that must be associated with the MAC address.
9. Click the **Add** button.

   The static MAC address is added to the MAC address table.

Remove a Static MAC Address

You can manually remove static MAC addresses from the MAC address table.

➢ **To add a static MAC address:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > Address Table > Advanced > Static MAC Address**.

   The page displays the Port List section and the Static MAC ADdress Table section.

6. From the **Interface** menu, select the interface.
7. Select the check box for the static MAC address.

   You can select multiple MAC addresses.

8. Click the **Delete** button.

   The static MAC address is removed from the MAC address table.

Configure Layer 2 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 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. It is intended for unmanaged switches that drop spanning tree BPDUs. Loop protection detects physical and logical loops between Ethernet ports on a device. You must enable loop protection globally before you can enable and configure it at the interface level. Loop protection is supported on physical interfaces and static LAG interfaces, but not on dynamic LAG interfaces.

Configure Global Layer 2 Loop Protection

➢ **To configure global Layer 2 loop protection:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

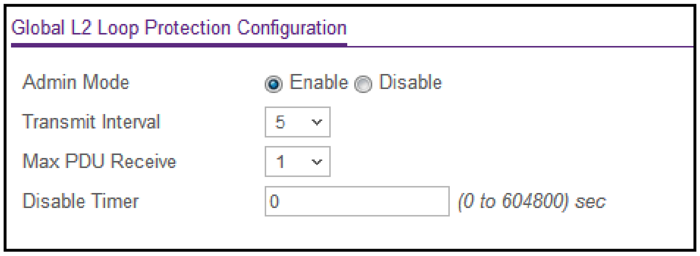
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Switching > L2 Loop Protection > L2 Loop Protection Configuration**.



Global L2 Loop Protection Configuration

Admin Mode	● Enable ○ Disable
Transmit Interval	5
Max PDU Receive	1
Disable Timer	0 *(0 to 604800) sec*

6. To enable or disable loop protection, select the Admin Mode **Enable** or **Disable** radio button.

   The default is Enable.

7. From the **Transmit Interval** menu, select the time in seconds between transmission of loop packets.

   The default transmit interval is 5 seconds.

8. From the **Max PDU Receive** menu, select the maximum number of packets to be received before an action is taken.

   The default is 1.

9. In the **Disable Timer** field, enter the time in seconds after which a port is disabled when a loop is detected.

   The range is from 0 to 604800 seconds. The default is 0 seconds.

10. Click the **Apply** button.

    Your settings are saved.

Configure Layer 2 Loop Protection on a Port

➢ **To configure Layer 2 loop protection on a port:**

1. Connect your computer to the same network as the switch.

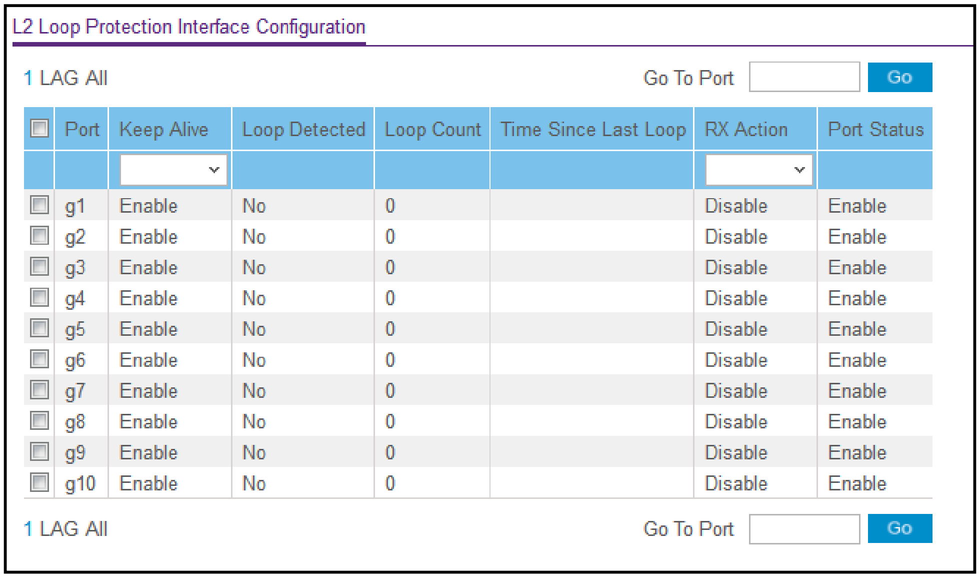
   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Switching > L2 Loop Protection > L2 Loop Protection Configuration**.



L2 Loop Protection Interface Configuration

1 LAG All — Go To Port [ ] Go

□	Port	Keep Alive	Loop Detected	Loop Count	Time Since Last Loop	RX Action	Port Status
		⌄				⌄	
□	g1	Enable	No	0		Disable	Enable
□	g2	Enable	No	0		Disable	Enable
□	g3	Enable	No	0		Disable	Enable
□	g4	Enable	No	0		Disable	Enable
□	g5	Enable	No	0		Disable	Enable
□	g6	Enable	No	0		Disable	Enable
□	g7	Enable	No	0		Disable	Enable
□	g8	Enable	No	0		Disable	Enable
□	g9	Enable	No	0		Disable	Enable
□	g10	Enable	No	0		Disable	Enable

1 LAG All — Go To Port [ ] Go

6. Use one of the following methods to narrow down the ports that are displayed:
   - To display all the physical ports, click the **1** link.
   - To display all LAGs only, click the **LAG** link.
   - To display all ports and LAGs, click the **All** link.

- In the **Go To Port** field, type the port number, for example g18, and click the **Go** button.

7. In the **Port** field, select the port for which data is to be displayed or configured.
8. From the **Keep Alive** menu, select **Enable** or **Disable** to specify whether keep-alives are enabled on an interface.

   The default is Disable.
9. From the **RX Action** menu, select the action that occurs when the switch detects a loop on an interface:
   - **Log**. The switch logs a message.
   - **Disable**. The switch disables the interface. This is the default action.
   - **Both**. The switch both logs a message and disables the interface.
10. Click the **Apply** button.

    Your settings are saved.
11. To show the latest information on the page, click the **Refresh** button.
12. To clear all the statistics in the table, click the **Clear** button.

The following table describes the nonconfigurable information displayed on the page.

Table 47. L2 Loop Protection Interface Information

Field	Description
Loop Detected	Shows whether a loop is detected on the interface. If the interface is disabled and then reenabled, the status changes back to No.
Loop Count	The number of packets that were received after the loop was detected.
Time Since Last Loop	The time that elapsed since the loop was detected.
Port Status	The status of the interface (Enabled, Disabled, or D-Disabled, which stands for diagnostically disabled).

4. Configuring Routing

4

This chapter covers the following topics.

- *How the Switch Handles Routing*
- *Enable the Routing Mode*
- *View the IP Statistics*
- *Configure IPv6 Routing*
- *Configure Router Discovery*
- *Configure Routes and View Routes*
- *Configure ARP*

How the Switch Handles Routing

For each incoming packet, the switch uses the destination MAC address to determine if the address matches a configured routing interface. If it does, the switch searches the host table for a matching destination IP address:

- **The host table contains a matching IP address**.The packet is routed to the host.
- **The host table does not contain a matching IP address**. The switch searches for the longest prefix match on the destination IP address:
  - **A match occurs**. The packet is routed to the next hop.
  - **No match occurs but a default route exists**. The packet is routed to the next hop that is specified in the default route.
  - **No match occurs and no default route exists**. The packet is dropped.

The routing table can include entries that were manually added. The host table can include entries that were manually added or dynamically added through ARP.

Enable the Routing Mode

By default, the routing mode is disabled on the switch. You can enable the routing mode to let the switch route traffic through its interfaces.

You can also enable routing for a VLAN interface (see *Configure Routing VLANs* on page 194) and use the VLAN routing wizard to create a VLAN routing interface (see *Configure VLAN Routing With the VLAN Routing Wizard* on page 194).

➢ **To enable routing on the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IP > IP Configuration**.

   The IP Configuration page displays.

6. Select the Routing Mode **Enable** radio button.
7. Click the **Apply** button.

The following table describes the nonconfigurable information displayed on the page.

Table 48. IP Configuration information

Field	Description
Default Time to Live	The default value that is 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. The default value is 64.
Maximum Next Hops	The maximum number of hops supported by the switch. The default value is 1.

View the IP Statistics

The IP Statistics page displays the IP statistics conform RFC 1213.

➢ **To display the IP statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IP > Statistics**.

   The IP Statistics page displays.

The following table describes the nonconfigurable information displayed on the page.

Table 49. IP routing statistics information

Field	Description
IpInReceives	The total number of input datagrams received from interfaces, including those received in error.
IpInHdrErrors	The number of input datagrams discarded because of errors in 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 the 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 (for example, 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 the final IP destination, which caused the switch to attempt to forward them to the final destination. In entities that do not act as IP gateways, this counter includes only those packets that were source-routed via 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 example, for lack of buffer space). This counter does not include any datagrams discarded while awaiting reassembly.
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 which were discarded (for example, for lack of buffer space). This counter includes 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 that 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.

Table 49. IP routing statistics information (continued)

Field	Description
IpReasmFails	The number of failures detected by the IP reassembly algorithm (for example, because of timing out, errors, and so on). This is not necessarily a count of discarded IP fragments because 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 successfully 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, 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 were valid. One possible reason for discarding such an entry could be to free 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 that included 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 because of 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 resulting datagram.
IcmpOutDestUnreachs	The number of ICMP Destination Unreachable messages sent.
IcmpOutTimeExcds	The number of ICMP Time Exceeded messages sent.

Table 49. IP routing statistics information (continued)

Field	Description
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. Because hosts do not send redirects, this counter is always zero for a host.
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 IPv6 Routing

Note: IPv6 is supported on VLAN interfaces only, not on physical ports.

Configure the IPv6 Global Routing Settings

You can configure IPv6 the global routing settings for the switch (as opposed to the IPv6 settings for an interface).

➢ **To configure the IPv6 global routing settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Basic > Global Configuration**.

The IPv6 Global Configuration page displays.

6. To globally enable IPv6 unicast routing, select the IPv6 Unicast Routing **Enable** radio button.

   By default, IPv6 unicast routing is disabled and the **Disable** radio button is selected.

7. In the **Hop Limit** field, enter the number for the unicast hop count that is used in IPv6 packets that originate in the switch.

   The value is also included in router advertisements. The valid values for hops are 1 through 255. The default is 64.

8. In the **ICMPv6 Rate Limit Error Interval** field, enter the number of ICMP error packets that are 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, enter **0**. The valid rate interval must be in the range from 0 to 2147483647 mseconds.

9. In the **ICMPv6 Rate Limit Burst Size** field, enter the number of ICMP error packets that are allowed per burst interval.

   This value controls the ICMP error packets. The default burst size is 100 packets. The valid burst size is 1 to 200. (Do not enter 0.)

10. Click the **Apply** button.

    Your settings are saved.

View the IPv6 Route Table

➢ **To view the IPv6 Route Table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Basic > Route Table**.

   The IPv6 Routing Table page displays.

6. From the **Routes Displayed** menu, select one of the following options:

- **All Routes**. Show all active IPv6 routes.
- **Best Routes Only**. Show only the best active routes.
- **Configured Routes Only**. Show only the manually configured routes.

7. To refresh the page with the latest information about the switch, click the **Update** button.

The following table describes the nonconfigurable information displayed on the page.

Table 50. IPv6 Route Table information

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.
Next Hop IP Address	The next hop IPv6 address for the active route.
Preference	The route preference of the configured route.

Configure IPv6 VLAN Interface Settings

For you to be able to configure IPv6 VLAN interface setting, IPv6 must be configured for the network interface, IPv6 global routing must be enabled, and a routing VLAN must exist. For more information, see the following sections:

- *Configure the IPv6 Address for the Network Interface* on page 38
- *Configure the IPv6 Global Routing Settings* on page 176
- *Configure Routing VLANs* on page 194.

IPv6 is supported on VLAN interfaces only, not on physical ports.

➢ **Configure IPv6 VLAN interface settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Routing > IPv6 > Advanced > VLAN Configuration**.

   The IPv6 Global Configuration page displays.

6. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.

7. From the **IPv6 Mode** menu, select **Enable** or **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. The default value is Disable.

8. From the **DHCPv6 Client Mode** menu, select to enable or disable the DHCPv6 client mode on an interface.

   Only one interface can function as a client. The default value is Disable.

9. From the **Stateless Address AutoConfig Mode** menu, select to enable or disable the stateless address autoconfiguration mode on an interface.

   The default value is Disable.

10. From the **Admin Mode** menu, select to enable or disable the IPv6 mode.

    The default is **Disable**. When the 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 (MTU) for 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 9198. The default is 1800.

12. In the **Duplicate Address Detection Transmits** field, specify the number of duplicate address detection (DAD) transmits on an interface.

    The DAD transmits value must be in the range 0 to 600. The default is 1.

13. In the **Life Time Interval** field, specify the router advertisement life time interval that is sent from the interface.

    This value must be greater than or equal to the maximum advertisement interval.
    0 means do not use the VLAN interface as the default routing interface. 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 of router advertisements that are sent from the interface.

    A value of 0 means the interval is not specified. 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 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. From the **Adv Managed Config Flag** menu, specify the setting for the router advertisement managed address configuration flag.

    When the selection is **Enable**, end nodes use DHCPv6. When the selection is **Disable**, end nodes autoconfigure addresses. The default value is Disable.

18. From the **Adv Other Config Flag** menu, select to enable or disable the router advertisement other stateful configuration flag.

    The default value is Disable.

19. From the **Router Preference** menu, specify the router preference advertisement on an interface.

    The default value is Medium.

20. From the **Adv Suppress Flag** menu, select to enable or disable the router advertisement suppression on an interface.

    The default value is Disable.

21. From the **Destination Unreachables** menu, select to enable or disable the mode for sending ICMPv6 destination unreachable messages on this interface.

    If this mode is disabled, the interface does not send ICMPv6 destination unreachable messages. The default value is Enable.

22. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 51. IPv6 VLAN Configuration information

Field	Description
Routing Mode	Displays the routing mode of an interface. The default is Disable.
Operational Mode	Specifies the operational state of an interface. The default value is Disable.
Link State	Indicates whether the link is up or down.

Manage IPv6 Prefixes for Advertisement on an IPv6 VLAN

When you add an IPv6 prefix for advertisement on an IPv6 VLAN, the prefix is advertised on all interfaces that are members of the VLAN. You can change and remove existing IPv6 prefixes.

Add an IPv6 Prefix for Advertisement on an IPv6 VLAN

➢ **To add an IPv6 prefix for advertisement on an IPv6 VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Prefix Configuration**.

   The IPv6 Interface Selection page displays. The page also shows the IPv6 Interface Configuration table.

6. From the **Interface** menu, select the interface to be configured.

   When the selection is changed, the page refreshes, causing all fields to be updated for the newly selected interface.

7. In the **Ipv6 Prefix** field, specify the IPv6 prefix for an interface.
8. In the **Prefix Length** field, specify the IPv6 prefix length for an interface.
9. From the **EUI64** menu, select **Enable** or **Disable** to indicate whether the specified 64-bit unicast prefix is enabled.
10. In the **Valid Life Time** field, specify the router advertisement per prefix time.

    This is the time allowed to consider the prefix valid for the purpose of on-link determination. The valid life time is 0 to 4294967295.

11. 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.

12. From the **Onlink Flag** menu, select **Enable** or **Disable** to specify whether the selected prefix can be used for on-link determination.

    The default is **Enable**.

13. From the **Autonomous Flag** menu, select **Enable** or **Disable** to specify whether the selected prefix can be used for autonomous address configuration.

    The default value is Enable.

    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.

14. Click the **Add** button.

    The IPv6 address prefix is added to the interface.

Change the Settings for an IPv6 Prefix for Advertisement on an IPv6 VLAN

You can change the settings for a prefix for advertisement on an IPv6 VLAN.

➢ **To change the settings for an IPv6 prefix for advertisement on an IPv6 VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Prefix Configuration**.

   The IPv6 Interface Selection page displays. The page also shows the IPv6 Interface Configuration table.

6. From the **Interface** menu, select the VLAN.
7. Select the check box for the IPv6 prefix.

   The settings display in the fields in the table heading.

8. Change the settings as needed.

9. Click the **Apply** button.

   Your settings are saved.

Remove an IPv6 Prefix From an IPv6 VLAN

You can remove one or more IPv6 prefixes from an IPv6 VLAN. You cannot remove the default IPv6 prefix.

➢ **To remove one or more IPv6 prefixes from an IPv6 VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Prefix Configuration**.

   The IPv6 Interface Selection page displays. The page also shows the IPv6 Interface Configuration table.

6. From the **Interface** menu, select the VLAN.
7. Select the check boxes for the IPv6 prefixes.
8. Click the **Delete** button.

   The IPv6 prefixes are removed from the IPv6 VLAN.

View IPv6 Statistics

➢ **To display the IPv6 statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Statistics**.

   The IPv6 Statistics page displays.

6. From the **Interface** menu, select the interface.

   When the selection is changed, the page refreshes, causing all fields to be updated for the newly selected interface.

7. To refresh the page with the latest information about the switch, click the **Update** button.

The following table describes the nonconfigurable information displayed on the page.

Table 52. IPv6 Statistics information

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.
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.

Table 52. IPv6 Statistics information (continued)

Field	Description
Received Datagrams Discarded Due To Truncated Data	The number of input datagrams discarded because datagram frame did not 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 reassembly.
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.
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 ICMPv6 information displayed on the page.

Table 53. ICMPv6 Statistics information

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.
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.

Table 53. ICMPv6 Statistics information (continued)

Field	Description
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.
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.

Table 53. ICMPv6 Statistics information (continued)

Field	Description
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

➢ **To view or clear the IPv6 Neighbor Table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Neighbor Table**.

   The IPv6 Neighbor Table page displays.

6. Use the **Search** menu and field to search for IPv6 routes by IPv6 address or interface number:
   - **Search by IPv6 address**. Select **IPv6 Address** from the **Search** menu. 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, the entry is displayed. An exact match is required.

   - **Search by Interface**. Select **Interface** from the **Search** menu. Enter the interface using the respective naming convention (for example, g1 or l1). Then click the **Go** button.

     If the address exists, the entry is displayed.

7. To clear the IPv6 neighbors on a selected interface or on all interfaces, click the **Clear** button.
8. To refresh the page with the latest information about the switch, click the **Update** button.

The following table describes the nonconfigurable information displayed on the page.

Table 54. IPv6 Neighbor Table information

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	The 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 is not yet 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 Reachable Time 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 Reachable Time 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**. Seeks a reachability confirmation by resending neighbor solicitation messages every Retrans Timer milliseconds until a reachability confirmation is received.
Last Updated	Time since the address was confirmed to be reachable.

Manage Static IPv6 Routes

You can configure static and default routes with a single next hop to any destination. You can also delete an individual next hop from a static route or an entire static route.

The switch supports a maximum of 32 static routes. The cost of a static route is always 0.

On the switch, routing provides a preference option for the configuration of default routes. A configured default route is treated exactly a a static route. Therefore, default routes and static routes contain the same default preference.

The platform supports up to 16 IPv6 static routes and up to 16 VLAN routing interfaces. The network ports are logical management interfaces. The IP stack’s routing table contains both

IPv6 routes associated with these management interfaces and IPv6 routes associated with routing interfaces. Configuration of 127-bit IPv6 prefixes on the routing/host IPv6 interfaces is supported. You can distinguishes between static routes by specifying a route preference value. A static route with a lower preference value is a more preferred static route. On a VLAN routing interface, for example, vlan 10), you can enable IPv4 routing and IPv6 routing independently.

Add a Static IPV6 Route

➢ **To add a static IPv6 route:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Static Route Configuration**.

   The Configure Routes page displays.

6. In the **IPv6 Prefix** field, specify the IPv6 network prefix for the configured route.
7. In the **Prefix Length** field, specify the IPv6 prefix length for the configured route.
8. From the **Next Hop IPv6 Address Type** menu, select one of the following options:
   - **Global**. Select this option if the IPv6 address is a global IPv6 address.
   - **Link-Local**. Select this option if the next hop IPv6 address is a link-local IPv6 address. You must specify a next hop IPv6 address in the **Next Hop IPv6 Address** field.
   - **Static-Reject**. Select this option to create a static-reject route for a destination prefix. You do not need to specify a next hop IPv6 address.
9. If the selection from the **Next Hop IPv6 Address Type** menu is **Global** or **Link-Local**, enter the next hop IPv6 address in the **Next Hop IPv6 Address** field.
10. If the selection from the **Next Hop IPv6 Address Type** menu is **Link-Local**, from the **Interface** menu, select the interface that connects to the IPv6 next hop.
11. In the **Preference** field, specify the router preference.

12. Click the **Add** button.

    The route is added.

Change the Preference for a Static IPv6 Route

➢ **To change the preference for a static IPv6 route:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Static Route Configuration**.

   The Configure Routes page displays.

6. Select the check box for the static IPv6 route.
7. In the **Preference** field, specify another router preference.
8. Click the **Apply** button.

   Your settings are saved.

Remove Static IPv6 Routes

➢ **To remove one or more static IPv6 routes:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Static Route Configuration**.

   The Configure Routes page displays.

6. Select one or more check boxes for static IPv6 routes.
7. Click the **Delete** button.

   The route or routes are removed from the switch.

View the IPv6 Route Table

➢ **To view the IPv6 Route Table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Route Table**.

   The IPv6 Route Table displays.

6. From the **Routes Displayed** menu, select one of the following options:
   - **All Routes**. Show all active IPv6 routes.
   - **Best Routes Only**. Show only the best active routes.
   - **Configured Routes Only**. Show only the manually configured routes.
7. To refresh the page with the latest information about the switch, click the **Update** button.

The following table describes the nonconfigurable information displayed on the page.

Table 55. IPv6v Route Table information

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.
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

You can 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 switch selects the route with the lowest preference value as the best route to a destination. When multiple routes to a destination exist, the preference values are used to determine the preferred route. If these preference values routes are equal, 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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > IPv6 > Advanced > Route Preference**.

The IPv6 Route Preference page displays.

6. In the **Static** field, specify the static route preference value for the switch.

   The range is 1 to 255. The default value is **1**.

7. Click the **Apply** button.

   Your settings are saved.

   The Local field displays the local preference.

Configure Routing VLANs

You can configure the switch software with some ports supporting VLANs and some supporting 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 switch software 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 itself a router port.

Configure VLAN Routing With the VLAN Routing Wizard

The VLAN Routing Wizard creates a VLAN routing interface, configure the IP address and subnet mask for the interface, and add selected ports or LAGs to the VLAN. With this wizard, you can:

- Create a VLAN.
- Add selected ports to the newly created VLAN and remove selected ports from the default VLAN.
- Optionally, you can create a LAG, add selected ports to a LAG, then add the LAG to the newly created VLAN.
- Enable tagging on selected ports if the port is in another VLAN. Disable tagging if a selected port does not exist in another VLAN.
- Exclude ports not selected from the VLAN.
- Enable routing on the VLAN using the IP address and subnet mask entered.

➢ **To configure VLAN routing using the VLAN routing wizard:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

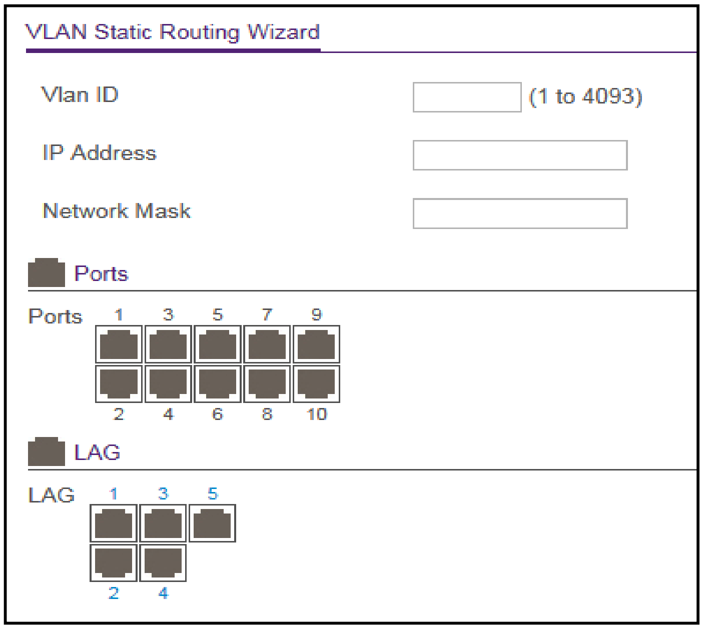
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the NETGEAR Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > VLAN > VLAN Routing Wizard**.



VLAN Static Routing Wizard

Vlan ID (1 to 4093)

IP Address

Network Mask

Ports

LAG

6. In the **Vlan ID** field, specify the VLAN Identifier (VID) associated with this VLAN. The VID is 1 to 4093 characters in length.
7. In the **IP Address** field, define the IP address of the VLAN interface.
8. In the **Network Mask** field, define the subnet mask of the VLAN interface.
9. In the Ports table, click each port once, twice, or three times to configure one of the following modes or reset the port to the default settings:
   - **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.

By default, the selection is blank, which means that the port is excluded from the VLAN.

10. In the LAG table, click each LAG once, twice, or three times to configure one of the following modes or reset the LAG to the default settings:
    - **T (Tagged)**. Select the LAGs on which all frames transmitted for this VLAN are tagged. The LAGs that are selected are included in the VLAN.
    - **U (Untagged)**. Select the LAGs on which all frames transmitted for this VLAN are untagged. The LAGs that are selected are included in the VLAN.

    By default, the selection is blank, which means that the LAG is excluded from the VLAN.
11. Click the **Apply** button.

    Your settings are saved.

Manually Manage Routing VLANs

You can view information about existing VLAN routing interfaces on the switch, change the settings for an existing routing VLAN, change a regular VLAN into a routing VLAN, and delete a routing VLAN.

View the Existing Routing VLANs and Manually Add a Routing VLAN

You can view the routing VLANs that you added through the VLAN Routing Wizard and manually add a routing VLAN. You do so by changing a regular VLAN that already exists on the switch into a routing VLAN.

➢ **To view the exiting routing VLANs or manually add a routing VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Routing > VLAN > VLAN Routing Configuration**.

The VLAN Routing Configuration page displays. The table displays any existing routing VLANs.

6. To add a routing VLAN by changing a regular VLAN into a routing VLAN, do the following:
   a. From the **VLAN** menu, select the VLAN that you want to configure for VLAN routing.

      The **VLAN** menu display all IDs of the VLANs that are configured on the switch.

   b. In the **IP Address** field, enter an IP address for the VLAN routing interface.
   c. In the **Subnet Mask** field, enter a subnet mask for the VLAN routing interface.
   d. In the **IP MTU** field, specify the maximum size of IP packets sent on an interface.

      A valid range is from 68 bytes to the link MTU. The default value is 1500. A value of 0 specifies that the value in the **IP MTU** must be ignored. In that situation, the VLAN interface uses the link MTU as the IP MTU. The link MTU is the maximum frame size minus the length of the layer 2 header.

   e. Click the **Add** button.

      The VLAN becomes a routing VLAN.

The following table describes the VLAN routing interface status information on the page.

Table 56. VLAN routing interface information

Field	Description
Port	The port number assigned to the VLAN Routing Interface.
MAC Address	The MAC Address assigned to the VLAN Routing Interface.
Routing Mode	Shows whether the routing mode is enabled (Enable or Disable).

Change an Existing Routing VLAN

➢ **To change the settings for an existing routing VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > VLAN > VLAN Routing Configuration**.

   The VLAN Routing Configuration page displays.

6. From the VLAN list, select the VLAN.
7. Change the settings as needed.
8. Click the **Apply** button.

   Your settings are saved.

Remove a Routing VLAN

When you remove a routing VLAN, the VLAN becomes a regular VLAN.

➢ **To remove a routing VLAN:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > VLAN > VLAN Routing Configuration**.

   The VLAN Routing Configuration page displays.

6. From the VLAN list, select the VLAN.
7. Click the **Delete** button.

   The routing VLAN is removed and the VLAN becomes a regular VLAN.

Configure Router Discovery

The Router Discovery protocol is used by hosts to identify operational routers (or routing interfaces) on the subnet. Router discovery messages can be of two types: router advertisements and router solicitations. The protocol requires each router to periodically advertise the IP addresses that it is associated with. Hosts listen for these advertisements and discover the IP addresses of neighboring routers.

➢ **To configure the router discovery parameters:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > Router Discovery**.

   The Router Discovery Configuration page displays.

6. Select the check box for the routing interface.

   To configure all routing interfaces, select the check box in the heading row. To configure a single interface, select the check box associated with the interface. The interface number displays in the Interface field in the table heading row.

7. From the **Advertise Mode** menu, select **Enable**.

   Router advertisements are transmitted from the selected interface.

8. In the **Advertise Address** field. specify the IP address to be used to advertise the switch.
9. In the **Maximum Advertise Interval** field, specify the maximum time (in seconds) allowed between router advertisements sent from the interface.

   The default is 600 seconds.

10. In the **Minimum Advertise Interval** field, specify the minimum time (in seconds) allowed between router advertisements sent from the interface.

    The default is 450 seconds.

11. In the **Advertise Lifetime** field, specify 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. The default is 1800 seconds.

12. In the **Preference Level** field, specify the preference level of the router as a default router relative to other routers on the same subnet.

    Higher numbered addresses are preferred. The default is 0.

13. Click the **Apply** button.

Your settings are saved.

Configure Routes and View Routes

You can configure static and default routes and view the routes that the switch learned.

➢ **To configure a static or default route:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > Routing Table > Route Configuration**.

   The Configure Routes page displays. The page also shows the Route Status section.

6. From the **Route Type** menu, select one of the following types of routes:
   - **Static**. For a static route, you must specify all fields.
   - **DefaultRoute**. For a default route, you cannot specify the **Network Address** and **Subnet Mask** fields.
7. For a static route only, in the **Network Address** field, specify the IP route prefix for the destination.

   To create a route, a valid routing interface must exist, and the next hop IP Address must be on the same network as the routing interface.

8. For a static route only, in the **Subnet Mask** field, specify the subnet mask.

   Also referred to as the network mask, the mask indicates the portion of the IP address that identifies the attached network.

9. In the **Next Hop IP Address** field, specify the next hop IP address.

   This is the outgoing router IP address to use when forwarding traffic to the next router (if any) in the path towards 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. When creating a route, the next hop IP must be on the same network as the routing interface. Valid next hop IP addresses are listed in the Route Status table.

10. In the **Preference** field, specify the preference value for the 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, you can control whether a static route is more preferred or less preferred. The preference also controls whether a static route is more preferred or less preferred than other static routes to the same destination.

11. As an option, in the **Description** field, specify a description to help identify the route.
12. Click the **Add** button.

    The route is added.

The Route Status table provides information about the static routes that you manually configured on the switch and the routes the switch learned dynamically.

Table 57. Routing table information

Field	Description
Network Address	The IP route prefix for the destination.
Subnet Mask	Also referred to as the network mask, the portion of the IP interface address that identifies the attached network.
Protocol	The protocol that created the route. The protocol can be Local or Static.
Route Type	Based on the protocol, Connected, Static, or Dynamic.
Next Hop Interface	The outgoing router interface that must be used when the switch forwards traffic to the destination.
Next Hop IP Address	The outgoing router IP address that must be used when the switch forwards traffic to the next router (if any) in the path towards 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.
Preference	A value from 1 to 255.
Metric	The administrative cost of the path to the destination.

Delete Routes

➢ **To delete one or more static routes:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > Routing Table > Route Configuration**.

   The Configure Routes page displays. The page also shows the Route Status section.

6. Select the check box next to each route to remove.
7. Click the **Delete** button.

   The static route is deleted.

Configure ARP

The address resolution protocol (ARP) associates a layer 2 MAC address with a layer 3 IPv4 address. The switch support both dynamic and manual ARP configuration. With manual ARP configuration, you can statically add entries into the ARP table.

ARP is a required 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 an Ethernet network. A device that must send an IP packet must learn the MAC address of the IP destination, or if the destination is not on the same subnet, of the next hop router. The device achieves this by broadcasting an ARP request packet, to which the intended recipient responds by sending an ARP unicast reply that contains 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 device on the 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. In this way, when an ARP request is broadcast to all stations on a LAN segment or virtual LAN (VLAN), each recipient can store the sender’s IP address and MAC address in its ARP cache. The ARP response, which is a unicast reply, is normally detected only by the device that sends the ARP request. That device stores the sender’s information in its ARP cache. Newer information always replaces existing content in the ARP cache.

If you move a device in the network, the device’s MAC address can become associated with another IP address. Or if you reconfigure, disconnect, or power off the device, the device’s IP address can disappear from the network altogether. To prevent such situations from causing information in the ARP cache to become outdated, each device on the network periodically updates the entries in its ARP cache with new information from the network. On the switch, you can set the ageout interval for ARP entries from 15 to 21600 seconds. When the ageout interval is reached, ARP entries for which the switch did not receive an ARP reply are removed form the switch ARP cache.

The switch supports 512 ARP entries, which include dynamic and static ARP entries.

To configure and display ARP details, see the following sections:

- *View Entries in the ARP Cache* on page 203
- *Create a Static ARP Entry* on page 204
- *Configure the Global ARP Settings* on page 205
- *Remove ARP Entries From the ARP Cache* on page 206

View Entries in the ARP Cache

You can view entries in the ARP table.

➢ **To display entries in the ARP table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > ARP > Basic > ARP Cache**.

   The Management VLAN ARP Cache page displays. The page also shows the Routing VLANs ARP Cache section.

The following table provides information included in the management VLAN ARP cache section.

Table 58. ARP cache information

Field	Description
IP Address	The associated IP address of a device on a subnet attached to one of the switch’s existing routing interfaces.
Port	The associated interface of the connection.
MAC Address	The MAC address of the device.

The following table provides information included in the routing VLANs ARP cache section.

Table 59. ARP cache information for routing VLANs

Field	Description
IP Address	The associated IP address of a device on a subnet attached to one of the switch's existing routing interfaces.
Interface	The routing interface associated with the ARP entry.
MAC Address	The unicast MAC address of the device.
Type	The type of the ARP entry. Possible values are: • **Local.** An ARP entry associated with one of the switch’s routing interface’s MAC addresses. • **Gateway.** A dynamic ARP entry for which the IP address is that of a router. • **Static.** An ARP entry configured by the user. • **Dynamic.** An ARP entry which was learned by the switch
Age	Age since the entry was last refreshed in the ARP Table. The format is hh:mm:ss.

Create a Static ARP Entry

You can add a static entry to the ARP table.

➢ **To add an entry to the ARP table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > ARP > Advanced > ARP Create**.

   The Static ARP Configuration page displays. The page also shows the Routing VLANs ARP Cache section.

6. In the IP Address field, specify the IP address to add.

The address must be the IP address of a device on a subnet attached to one of the switch’s existing routing interfaces.

7. In the MAC Address field, specify the unicast MAC address of the device.

   The format is six 2-digit hexadecimal numbers separated by colons, for example 00:06:29:32:81:40.

8. Click the **Add** button.

   The entry is added to the table.

For information about the information in the Routing VLANs ARP Cache table, see *Table 59, ARP cache information for routing VLANs* on page 204.

Configure the Global ARP Settings

You can display and change the configuration settings for the ARP table.

➢ **To display or change the setting for the ARP table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Routing > ARP > Advanced > Global ARP Configuration**.

   The Global ARP Configuration page displays.

6. In the **Age Time** field, specify the number of seconds for an ARP entry to age out.
7. In the **Response Time** field, specify the number of seconds that the switch must wait for a response to an ARP request.
8. In the **Retries** field, specify the maximum number of times that the switch retries an ARP request.
9. In the **Cache Size** field, specify the maximum number of entries for the ARP cache.
10. Next to Dynamic Renew, select **Enable** to allow the ARP component to automatically attempt to renew dynamic ARP entries when they age out.
11. Click the **Apply** button.

Your settings are saved.

Remove ARP Entries From the ARP Cache

You can remove certain types of entries from the ARP table.

➢ **To remove entries from the ARP table:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Routing > ARP > Advanced > ARP Entry Management**.

   The ARP Entry Management page displays.
6. From the **Remove From Table** menu, select the type of ARP entry to be removed.
   - **All Dynamic Entries**
   - **All Dynamic and Gateway Entries**
   - **Specific Dynamic/Gateway Entry**
   - **Specific Static Entry**
   - **None**. This is the default selection.
7. If you select **Specific Dynamic/Gateway Entry** or **Specific Static Entry** from the **Remove From Table** menu, enter the IP address of the entry that must be removed from the ARP table.
8. Click the **Apply** button.

   Your settings are saved.

5. Configure Quality of Service 5

In a 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 can no longer be held for transmission and are dropped by the switch.

Quality of Service (QoS) is a means of providing consistent, predictable data delivery by distinguishing 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.

This chapter covers the following topics:

- *Manage Class of Service*
- *Manage Differentiated Services*

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.

Overview of CoS Configuration

You can set the Class of Service trust mode for 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 must be forwarded on the appropriate egress port. Of course, the trusted field must exist in the packet for the mapping table to be of any use. If this is not the case, default actions are performed. 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 ports, 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 CoS trust mode settings on all interfaces:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

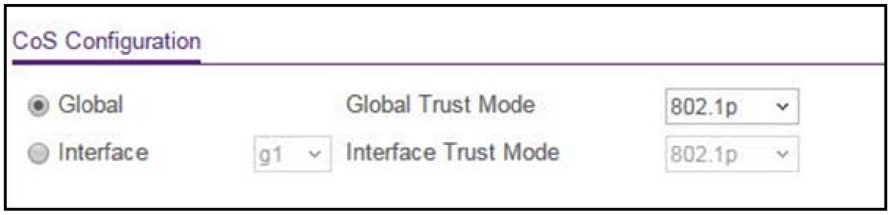
   The login window opens.

4. Enter the switch's password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **QoS > CoS > Basic > CoS Configuration**.



CoS Configuration

● Global — Global Trust Mode: 802.1p

○ Interface — g1 — Interface Trust Mode: 802.1p

6. Either configure the same CoS trust mode settings for all CoS-configurable interfaces or configure CoS settings per interface.

   The default is Global.

   - To configure the same CoS trust mode settings for all CoS configurable interfaces, do the following:
     a. Select the **Global** radio button.
     b. From the **Global Trust Mode** menu, select one of the following trust mode options for ingress traffic on the switch:
        - **Untrusted**. Do not trust any CoS packet marking at ingress.
        - **802.1p**. The eight priority tags that are specified in IEEE 802.1p are p0 to p7. The QoS setting lets you map each of the eight priority levels to one of seven internal hardware priority queues. The default mode is 802.1p.
        - **DSCP**. The six most significant bits of the DiffServ field are called the Differentiated Services Code Point (DSCP) bits.
   - To configure CoS settings per interface, do the following:
     a. Select the **Interface** radio button.
     b. From the **Interface Trust Mode** menu, select one of the following trust mode options:
        - **Untrusted**. Do not trust any CoS packet marking at ingress.
        - **802.1p**. The eight priority tags that are specified in IEEE 802.1p are p0 to p7. The QoS setting lets you map each of the eight priority levels to one of seven internal hardware priority queues. The default mode is 802.1p.
        - **DSCP**. The six most significant bits of the DiffServ field are called the Differentiated Services Code Point (DSCP) bits.

7. Click the **Apply** button.

   Your settings are saved.

Configure CoS Interface Settings for an Interface

You can configure the trust mode for one or more interfaces and apply an interface shaping rate to all interfaces or to a specific interface.

➢ **To configure CoS settings for an interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

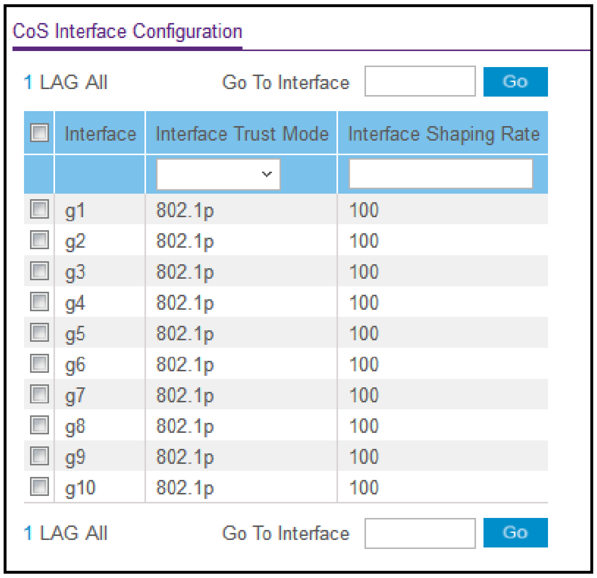
   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

5. Select **QoS > CoS > Advanced > CoS Interface Configuration.**



CoS Interface Configuration

1 LAG All　　Go To Interface ____ Go

☐	Interface	Interface Trust Mode	Interface Shaping Rate
		⌄	
☐	g1	802.1p	100
☐	g2	802.1p	100
☐	g3	802.1p	100
☐	g4	802.1p	100
☐	g5	802.1p	100
☐	g6	802.1p	100
☐	g7	802.1p	100
☐	g8	802.1p	100
☐	g9	802.1p	100
☐	g10	802.1p	100

1 LAG All　　Go To Interface ____ Go

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.

- To configure all interfaces with the same settings, select the check box in the heading row.

8. From the **Interface Trust Mode** menu, select one of the following trust mode options for ingress traffic on the selected interfaces:
   - **Untrusted**. Do not trust any CoS packet marking at ingress.
   - **802.1p**. The eight priority tags that are specified in IEEE 802.1p are p0 to p7. The QoS setting lets you map each of the eight priority levels to one of seven internal hardware priority queues. The default value is 802.1p.
   - **DSCP**. The six most significant bits of the DiffServ field are called the Differentiated Services Code Point (DSCP) bits.
9. In the **Interface Shaping Rate** field, specify the maximum allowed bandwidth.

   The maximum allowed bandwidth 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, which means that the maximum is unlimited. You can enter values from 0 to 100 in increments of 1.
10. 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 contains 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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

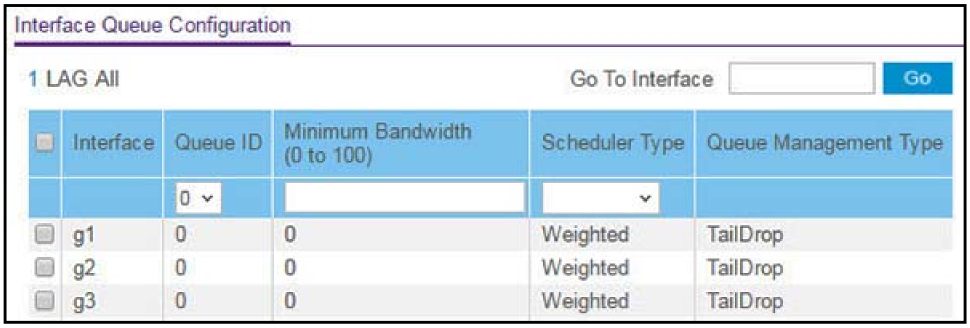
   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **QoS > CoS > Advanced > Interface Queue Configuration**.



Interface Queue Configuration

1 LAG All

Go To Interface

□	Interface	Queue ID	Minimum Bandwidth (0 to 100)	Scheduler Type	Queue Management Type
		0			
□	g1	0	0	Weighted	TailDrop
□	g2	0	0	Weighted	TailDrop
□	g3	0	0	Weighted	TailDrop

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Queue ID** menu, select the queue to be configured.
9. In the **Minimum Bandwidth** field, specify the minimum guaranteed bandwidth allotted to the queue.

   Setting this value higher than its corresponding maximum bandwidth automatically increases the maximum to the same value. The default value is 0. The valid range is 0 to 100 in increments of 1. The value 0 means no guaranteed minimum. The sum of the individual minimum bandwidth values for all queues for the interface cannot exceed the defined maximum (100).

10. From the **Scheduler Type** menu, select one of the following options:
    - **Strict**. The interface services traffic with the highest priority on a queue first.
    - **Weighted**. The interface uses weighted round robin to associate a weight to each queue. This is the default setting.

    The Queue Management Type field displays the queue depth management technique that is used for queues on the interface. By default, this method is Taildrop, irrespective of your selection from the **Scheduler Type** menu.

11. Click the **Apply** button.

    Your settings are saved.

Map 802.1p Priorities to Queues

You can view or change which internal traffic classes are mapped to the 802.1p priority class values in Ethernet frames that the device receives. The priority-to-traffic class mappings can be applied globally or per interface. The mapping allows the switch to group various traffic types (for example, data or voice) based on their latency requirements and give preference to time-sensitive traffic.

➢ **To map 802.1p priorities to queues:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

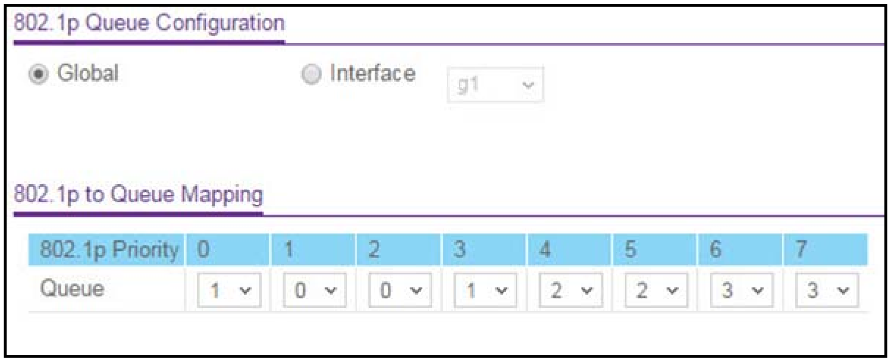
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > CoS > Advanced > 802.1p to Queue Mapping**.



802.1p Queue Configuration

● Global ○ Interface g1

802.1p to Queue Mapping

802.1p Priority	0	1	2	3	4	5	6	7
Queue	1	0	0	1	2	2	3	3

6. Select the **Global** radio button to specify all interfaces (that can be configured for CoS) or select the **Interface** radio button to select individual interfaces.
7. In the 802.1p to Queue Mapping table, map each of the eight 802.1p priorities to a queue (internal traffic class).

   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 (7). 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 7, might be time-sensitive traffic, such as voice or video.

The values in the menu under each priority 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.

8. Click the **Apply** button.

   Your settings are saved.

Map DSCP Values to Queues

You can map an internal traffic class to a DSCP value.

➢ **To map DSCP values to queues:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

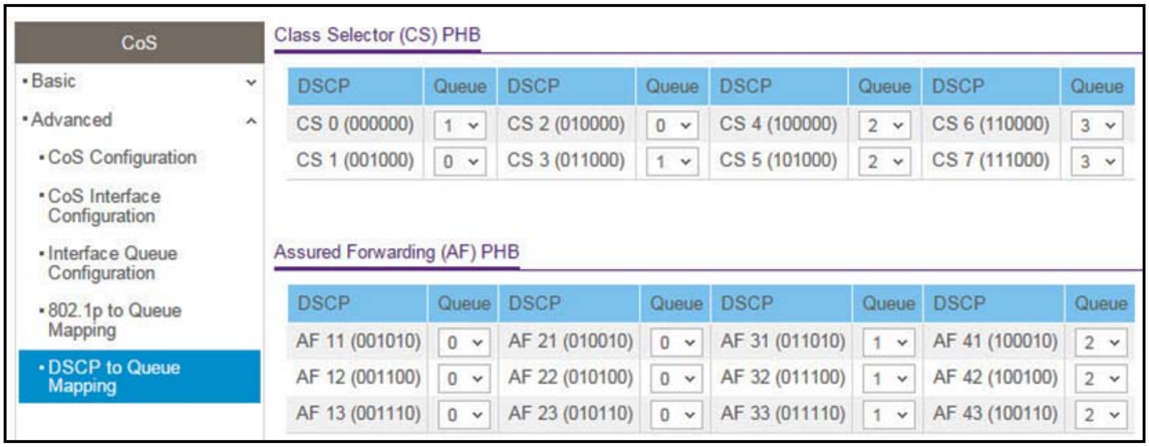
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > CoS > Advanced > DSCP to Queue Mapping**.


CoS
• Basic
• Advanced
• CoS Configuration
• CoS Interface Configuration
• Interface Queue Configuration
• 802.1p to Queue Mapping
• DSCP to Queue Mapping

Class Selector (CS) PHB

DSCP	Queue	DSCP	Queue	DSCP	Queue	DSCP	Queue
CS 0 (000000)	1	CS 2 (010000)	0	CS 4 (100000)	2	CS 6 (110000)	3
CS 1 (001000)	0	CS 3 (011000)	1	CS 5 (101000)	2	CS 7 (111000)	3

Assured Forwarding (AF) PHB

DSCP	Queue	DSCP	Queue	DSCP	Queue	DSCP	Queue
AF 11 (001010)	0	AF 21 (010010)	0	AF 31 (011010)	1	AF 41 (100010)	2
AF 12 (001100)	0	AF 22 (010100)	0	AF 32 (011100)	1	AF 42 (100100)	2
AF 13 (001110)	0	AF 23 (010110)	0	AF 33 (011110)	1	AF 43 (100110)	2

6. For each DSCP value, select from the corresponding **Queue** menu which internal traffic class must be mapped to the DSCP value.

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.

The allowed Per Hop Behavior (PHBs) values, apart from other DSCP experimental values, are as follows:

- **Class Selector (CS) PHB**. These values are based on IP precedence.
- **Assured Forwarding (AF) PHB**. These values define four main levels to sort and manipulate some flows within the network.
- **Expedited Forwarding (EF) PHB**. These values are used to prioritize traffic for real-time applications. In many situations, if the network exceeded traffic and you need some bandwidth guaranteed for an application, the EF traffic must receive this rate independently of the intensity of any other traffic attempting to transit the node.

7. Click the **Apply** button.

   Your settings are saved.

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 it is not guaranteed. During times of congestion, packets might be delayed, sent sporadically, or dropped. For typical Internet applications, such as email and file transfer, a slight degradation in service is acceptable and in many cases unnoticeable. Conversely, any degradation of service can negatively affect applications with strict timing requirements, such as voice or multimedia.

Overview of Defining DiffServ

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.

Configure 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.

Configure the Global DiffServ Mode

You can display DiffServ general status group information, which includes the current administrative mode setting as well as the current and maximum number of rows in each of the main DiffServ private MIB tables.

➢ **To configure the global DiffServ mode:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

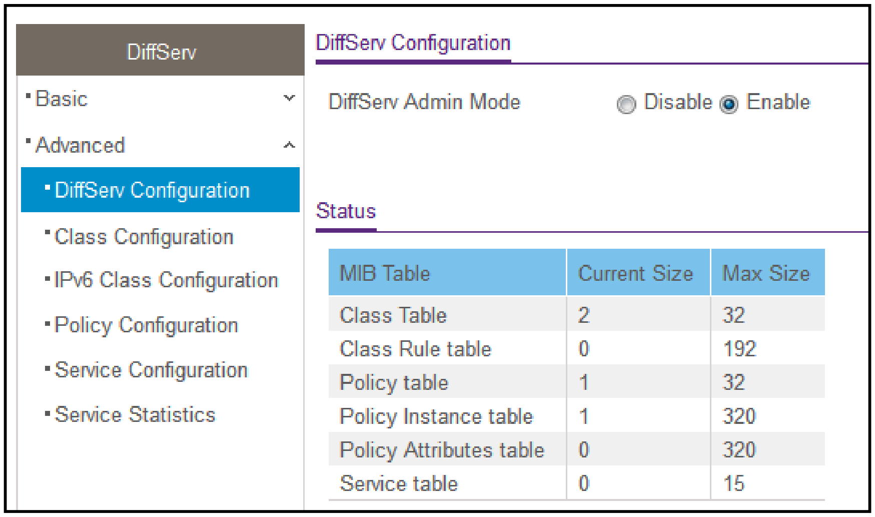
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > DiffServ Configuration**.



DiffServ Configuration

DiffServ Admin Mode ○ Disable ● Enable

Status

MIB Table	Current Size	Max Size
Class Table	2	32
Class Rule table	0	192
Policy table	1	32
Policy Instance table	1	320
Policy Attributes table	0	320
Service table	0	15

6. Select the administrative mode for DiffServ:
   - **Enable**. Differentiated services are active. This is the default setting.
   - **Disable**. The DiffServ configuration is retained and can be changed but is not active.
7. 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 60. DiffServ Status information

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.
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 set up 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.

Create and Configure a DiffServ Class

➢ **To create and configure a DiffServ class:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

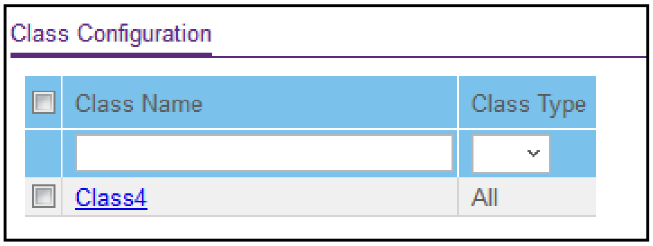
   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Class Configuration**.



Class Configuration

□	Class Name	Class Type
□	Class4	All

6. In the **Class Name** field, enter a class name.

   The **Class Name** field also lists all the existing DiffServ class names, from which you can select one for modification or deletion. The class name can be 1 to 31 alphanumeric characters in length.

7. From the **Class Type** menu, select the class type.

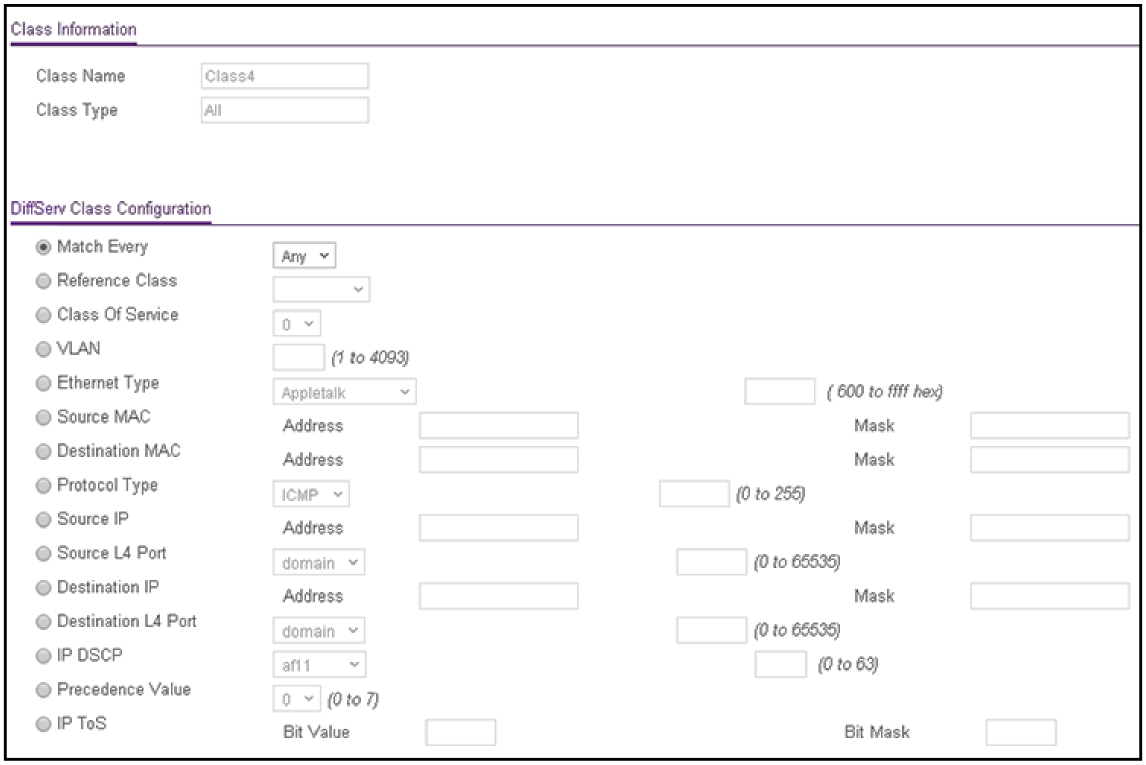
   The switch supports only the class type value **All**, which means that all the various match criteria defined for the class are satisfied for a packet match. **All** signifies the logical AND statement of all the match criteria. You can select the class type only when you are creating a new class. After the class is created, the **Class Type** field becomes nonconfigurable.

8. Click the **Add** button.

   The new class is added.

9. After creating the class, click the class name.

   The class name is a hyperlink to the page on which you can define the class configuration.



Class Information

Class Name	Class4
Class Type	All

DiffServ Class Configuration

● Match Every	Any		
○ Reference Class			
○ Class Of Service	0		
○ VLAN	(1 to 4093)		
○ Ethernet Type	Appletalk	(600 to ffff hex)	
○ Source MAC	Address	Mask	
○ Destination MAC	Address	Mask	
○ Protocol Type	ICMP	(0 to 255)	
○ Source IP	Address	Mask	
○ Source L4 Port	domain	(0 to 65535)	
○ Destination IP	Address	Mask	
○ Destination L4 Port	domain	(0 to 65535)	
○ IP DSCP	af11	(0 to 63)	
○ Precedence Value	0 (0 to 7)		
○ IP ToS	Bit Value	Bit Mask	

10. Define the criteria that must be associated the DiffServ class:

    - **Match Every**. Select this radio button to add a match condition that considers all packets to belong to the class. The only selection from the **Match Every** menu is **Any**.
    - **Reference Class**. Select this radio button to reference another class for criteria. The match criteria defined in the reference class function as match criteria in addition to the match criteria that you define for the selected class. After you select the radio button, 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 radio button 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 radio button 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 1–4093.
    - **Ethernet Type**. Select this radio button to require the EtherType value in the Ethernet frame header to match the specified EtherType value. After you select the radio button, specify the EtherType keyword from the list of common protocols that are mapped to their Ethertype value.

- **Source MAC**. Select this radio button to require a packet's source MAC address to match the specified MAC address. After you select this radio button, use the following fields to configure the source MAC address match criteria:
  - **Address**. The source MAC address to match. The source MAC address is specified as six two-digit hexadecimal numbers separated by colons.
  - **Mask**. The MAC mask, which specifies the bits in the source MAC address to compare against the Ethernet frame. Use Fs 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.
- **Destination MAC**. Select this radio button to require a packet's destination MAC address to match the specified MAC address. After you select the radio button, use the following fields to configure the destination MAC address match criteria:
  - **Address**. The destination MAC address to match. The destination MAC address is specified as six two-digit hexadecimal numbers separated by colons.
  - **Mask**. The MAC mask, which specifies the bits in the destination MAC address to compare against an Ethernet frame. Use Fs 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.
- **Protocol Type**. Select this radio button to require a packet's Layer 4 protocol to match the specified protocol, which you must select from the menu. The menu includes **Other** as a selection, which lets you enter a protocol number from 0 to 255.
- **Source IP**. Select this radio button to require a packet's source IP address to match the specified IP address. After you select the radio button, use the following fields to configure the source IP address match criteria:
  - **Address**. The source IP address format to match in dotted-decimal.
  - **Mask**. The bit mask in IP dotted-decimal format indicating which parts of the source IP address to use for matching against packet content.
- **Source L4 Port**. Select this radio button to require a packet's TCP/UDP source port to match the specified protocol, which you must select from the menu. The range is 0 to 65535. The menu includes **Other** as an option for unnamed ports.
- **Destination IP**. Select this radio button to require a packet's destination IP address to match the specified IP address. After you select the radio button, use the following fields to configure the destination IP address match criteria:
  - **Address**. The destination IP address format to match in dotted-decimal.
  - **Mask**. The bit mask in IP dotted-decimal format indicating which parts of the destination IP address to use for matching against packet content.

- **Destination L4 Port**. Select this radio button to require a packet's TCP/UDP destination port to match the specified protocol, which you must select from the menu. The range is 0 to 65535. The menu includes **Other** as an option for unnamed ports.
- **IP DSCP**. Select this radio button to require the packet's IP DiffServ Code Point (DSCP) value to match the specified IP DSCP keyword code, which you must select from the menu. The menu includes **Other** as a selection, which lets you enter an IP DSCP value from 0 to 63. The DSCP value is defined as the high-order 6 bits of the Service Type octet in the IP header.
- **Precedence Value**. Select this radio button to require the packet's IP precedence value to match the specified number from 0 to 7, which you must select from the menu. The IP Precedence field in a packet is defined as the high-order 3 bits of the Service Type octet in the IP header.
- **IP ToS**. Select this radio button 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 8 bits of the service type octet in the IP header. After you select the radio button, use the following fields to configure the ToS match criteria:
  - **Bits Value**. Enter a two-digit hexadecimal number octet value in the range from 00 to ff to match the bits in a packet's ToS field.
  - **Bit 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 section at the bottom of the DiffServ Advanced Class Configuration page.

Table 61. DiffServ Class Configuration, Class Summary information

Field	Description
Match Criteria	The configured match criteria for the specified class.
Values	The values of the configured match criteria.

Rename an Existing DiffServ Class

➢ **To rename an existing DiffServ class:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Class Configuration**.

   The Class Name page displays.

6. Select the check box next to the class name.
7. In the **Class Name** field, specify the new name.
8. Click the **Apply** button.

   Your settings are saved.

Change the Criteria for an Existing DiffServ Class

➤ **To change the criteria for an existing DiffServ class:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Class Configuration**.

   The Class Name page displays.

6. Click the class name, which is a hyperlink.

   The page on which you can change the class configuration displays.

7. Change the class configuration as needed.
8. Click the **Apply** button.

   Your settings are saved.

Delete a DiffServ Class

➢ **To delete a DiffServ class:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Class Configuration**.

   The Class Name page displays.

6. Select the check box next to the class name.
7. Click the **Delete** button.

   The class is removed.

Configure DiffServ IPv6 Class Settings

The IPv6 class configuration feature extends the existing QoS ACL and DiffServ functionality by providing support for IPv6 packet classification. An Ethernet IPv6 packet is distinguished from an IPv4 packet by its unique Ethertype value, so all IPv6 classifiers include the Ethertype field. An IPv6 access list serves the same purpose as its IPv4 counterpart.

Before the introduction of the IPv6 class feature, any DiffServ class definition was assumed to apply to an IPv4 packet. That is, any match item in a class rule was interpreted in the context of an IPv4 header. An example is a class rule that specifies an L4 port match value. With the introduction of the IPv6 match capability, you must specify if this class rule is for IPv4 or for IPv6 packets. To facilitate this distinction, a class configuration parameter is added to specify whether a class applies to IPv4 or IPv6 packet streams.

The destination and source IPv6 addresses use a prefix length value instead of an individual mask to qualify them as a subnet addresses or a host addresses. The flow label is a 20-bit number that is unique to an IPv6 packet, used by end stations to signify some form of Quality of Service (QoS) handling in routers.

Packets that match an IPv6 classifier are allowed to be marked using only the 802.1p (CoS) field or the IP DSCP field in the traffic Class octet. IP precedence is not defined for IPv6. This is not an appropriate type of packet marking.

IPv6 ACL/DiffServ assignment is appropriate for LAG interfaces. The procedures described by an ACL or DiffServ policy are equally applicable on a LAG interface.

Create and Configure an IPv6 DiffServ Class

➢ **To create and configure an IPv6 DiffServ class:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

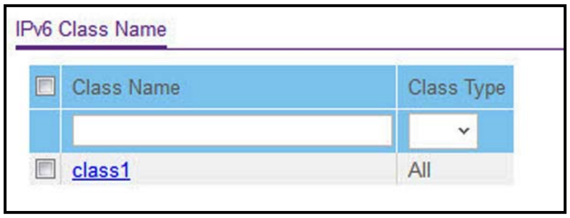
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > IPv6 Class Configuration**.



IPv6 Class Name

□	Class Name	Class Type
□	class1	All

6. Enter a class name in the **Class Name** field.

   The **Class Name** field also lists all the existing IPv6 class names, from which one can be selected for modification or deletion.

7. From the **Class Type** menu, select the class type.

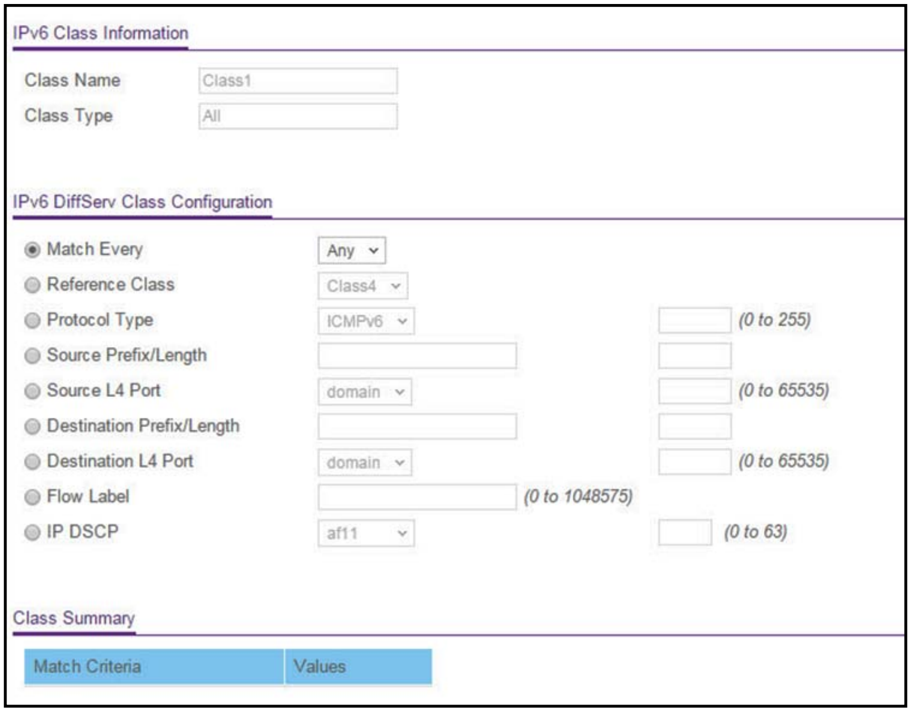
   The switch supports only the class type value **All**, which means that all the various match criteria defined for the class are satisfied for a packet match. **All** signifies the logical AND statement of all the match criteria. You can select the class type only when you are creating a new class. After the class is created, the **Class Type** field becomes nonconfigurable.

8. Click the **Add** button.

   The new class is added.

9. After creating the class, click the class name.

The class name is a hyperlink to the page on which you can define the class configuration.



IPv6 Class Information

Class Name	Class1
Class Type	All

IPv6 DiffServ Class Configuration

● Match Every	Any		
○ Reference Class	Class4		
○ Protocol Type	ICMPv6		(0 to 255)
○ Source Prefix/Length			
○ Source L4 Port	domain		(0 to 65535)
○ Destination Prefix/Length			
○ Destination L4 Port	domain		(0 to 65535)
○ Flow Label		(0 to 1048575)	
○ IP DSCP	af11		(0 to 63)

Class Summary

Match Criteria	Values

10. Define the criteria that must be associated the IPv6 DiffServ class:

- **Match Every**. Select this radio button to add a match condition that considers all packets to belong to the class. The only selection from the **Match Every** menu is **Any**.
- **Reference Class**. Select this radio button to reference another class for criteria. The match criteria defined in the reference class function as match criteria in addition to the match criteria that 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.
- **Protocol Type**. Select this radio button to require a packet's Layer 4 protocol to match the specified protocol, which you must select from the menu. The menu includes **Other** as a selection, which lets you enter a protocol number from 0 to 255.
- **Source Prefix/Length**. Select this radio button to require a packet's source prefix and prefix length to match the specified source IPv6 prefix and prefix length. Prefix must always be specified with the prefix length. The prefix can be in the hexadecimal range from 0 to FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF and the prefix length can be in the range from 0 to 128.
- **Source L4 Port**. Select this radio button to require a packet's TCP/UDP source port to match the specified protocol, which you must select from the menu. The range is 0 to 65535. The menu includes **Other** as an option for unnamed ports.
- **Destination Prefix/Length**. Select this radio button to require a packet's destination prefix and prefix length to match the specified source IPv6 prefix and prefix length. Prefix must always be specified with the prefix length. The prefix can be in the

hexadecimal range from 0 to FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF and the prefix length can be in the range from 0 to 128.

- **Destination L4 Port**. Select this radio button to require a packet's TCP/UDP destination port to match the specified protocol, which you must select from the menu. The range is 0 to 65535. The menu includes **Other** as an option for unnamed ports.
- **Flow Label**. Select this radio button to require a packet's flow label to match the specified flow label. The flow label is a 20-bit number that is unique to an IPv6 packet and that is used by end stations to signify QoS handling in routers. The flow label can be specified in the range from 0 to 1048575.
- **IP DSCP**. Select this radio button to require the packet's IP DiffServ Code Point (DSCP) value to match the specified IP DSCP keyword code, which you must select from the menu. The menu includes **Other** as a selection, which lets you enter an IP DSCP value from 0 to 63. The DSCP value is defined as the high-order 6 bits of the Service Type octet in the IP header.

11. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information that is displayed in the Class Summary section.

Table 62. IPv6 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.

Rename an Existing IPv6 DiffServ Class

➢ **To rename an existing IPv6 DiffServ class:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > IPv6 Class Configuration**.

   The Class Name page displays.

6. Select the check box next to the class name.
7. In the **Class Name** field, specify the new name.
8. Click the **Apply** button.

   Your settings are saved.

Change the Criteria for an Existing IPv6 DiffServ Class

➢ **To change the criteria for an existing IPv6 DiffServ class:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > IPv6 Class Configuration**.

   The Class Name page displays.

6. Click the class name, which is a hyperlink.

   The page on which you can change the class configuration displays.

7. Change the class configuration as needed.
8. Click the **Apply** button.

   Your settings are saved.

Delete an IPv6 DiffServ Class

➢ **To delete an IPv6 DiffServ class:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

2. Launch a web browser.

3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > IPv6 Class Configuration**.

   The Class Name page displays.

6. Select the check box next to the class name.
7. Click the **Delete** button.

   The class is removed.

Configure a DiffServ Policy

You can associate a collection of classes with one or more policies.

Create and Configure a DiffServ Policy

➢ **To create and configure a DiffServ policy:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

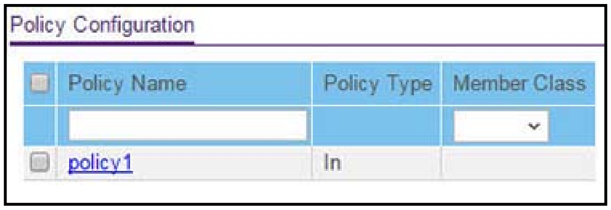
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Policy Configuration**.



Policy Configuration

□	Policy Name	Policy Type	Member Class
□	policy1	In	

6. Enter a policy name in the **Policy Name** field.

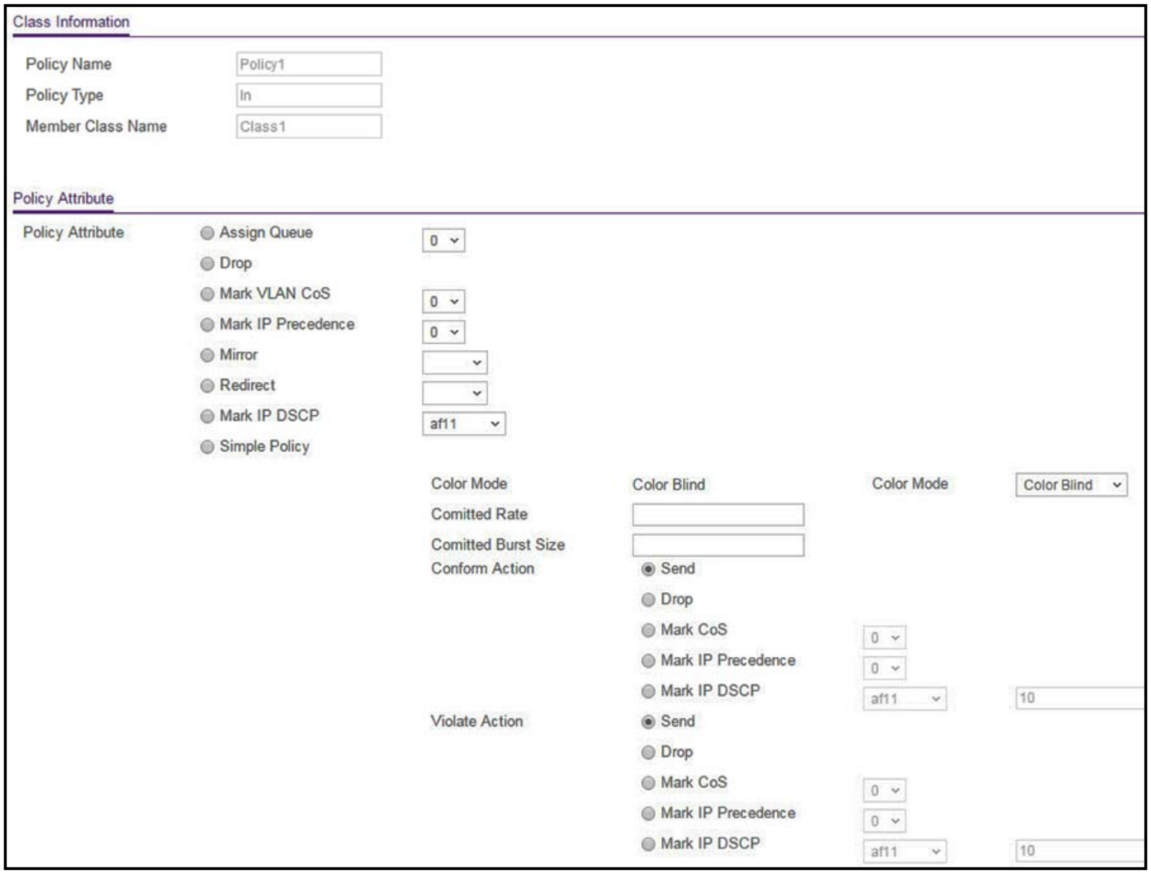
   You cannot specify the policy type. By default, the policy type is In, indicating that the policy applies to ingress packets.

7. From the **Member Class** menu, optionally select an existing class that you want to associate with the new policy.
8. Click the **Add** button.

   The new policy is added.

9. After creating the policy, click the policy name.

   The policy name is a hyperlink to the page on which you can define the policy attributes.



Class Information

Policy Name	Policy1
Policy Type	In
Member Class Name	Class1

Policy Attribute

Policy Attribute
- ○ Assign Queue 0
- ○ Drop
- ○ Mark VLAN CoS 0
- ○ Mark IP Precedence 0
- ○ Mirror
- ○ Redirect
- ○ Mark IP DSCP af11
- ○ Simple Policy

Color Mode: Color Blind — Color Mode: Color Blind

Comitted Rate

Comitted Burst Size

Conform Action
- ● Send
- ○ Drop
- ○ Mark CoS 0
- ○ Mark IP Precedence 0
- ○ Mark IP DSCP af11 10

Violate Action
- ● Send
- ○ Drop
- ○ Mark CoS 0
- ○ Mark IP Precedence 0
- ○ Mark IP DSCP af11 10

10. From the **Assign Queue** menu, select the queue to which packets of this policy class must be assigned.

    This is an integer value in the range 0 to 7.

11. Configure the policy attributes:
    - **Drop**. Select this radio button to require each inbound packet to be dropped.
    - **Mark VLAN CoS**. Select this radio button to specify the VLAN priority, which you must select from the menu. The VLAN priority is expressed as an integer value in the range from 0 to 7.
    - **Mark IP Precedence**. Select this radio button to require packets to be marked with an IP precedence value before being forwarded. You must select an IP precedence value from 0 to 7 from the menu.
    - **Mirror**. Select this radio button to require packets to be mirrored to an interface or LAG, one of which you must select from the menu.
    - **Redirect**. Select this radio button to require packets to be redirected to an interface or LAG, one of which you must select from the menu.
    - **Mark IP DSCP**. Select this radio button to require packet to be marked with an IP DSCP keyword code, which you must select from the menu. The menu includes **Other** as a selection, which lets you enter an IP DSCP value from 0 to 63. The DSCP value is defined as the high-order 6 bits of the Service Type octet in the IP header.
    - **Simple Policy**. Select this radio button to define the traffic policing style for the class. A simple policy uses a single data rate and burst size, resulting in one of two outcomes: conform or violate. You must define the policy as described in the next step.
12. If you select the **Simple Policy** radio button, you can specify the traffic policing style for the class:
    - **Color Mode**. From the menu, select one of the following options:
        - **Color Blind**. This is the default selection. Color classes do not apply.
        - **Color Aware**. Requires you to select a color class that is valid for use with this policy instance. After you select **Color Aware** from the **Color Mode** menu, the **Color Conform Class** menu displays. From this menu you must select a color class that you already created (see *Configure a DiffServ Class* on page 217) and selected as a member class for this policy instance (see *Step 7*).

    Note: A valid color class contains a single, non-excluded match criterion for the CoS, IP DSCP, or IP Precedence option. The configured option must not conflict with the classifier of the policy instance itself.

    - **Committed Rate**. Enter the committed rate that is applied to conforming packets by specifying a value in the range from 1 to 4294967295 Kbps.
    - **Committed Burst Size**. Enter the committed burst size that is applied to conforming packets by specifying a value in the range from 1 to 128 Kbps.
13. Select the conforming and violating actions.

    The Conform Action section and Violate Action section list the actions to be taken on conforming packets according to the policing metrics. By default, both conforming packets and violating packets are sent.

In both the Conform Action section and the Violate Action section, select one of the following actions:

- **Send**. Packets are forwarded unmodified. This is the default confirming action and the default violating action.
- **Drop**. Packets are dropped.
- **Mark CoS**. Packets are marked by DiffServ with the specified CoS value before being forwarded. This selection requires that the Mark CoS field is set. You must select a CoS value from 0 to 7 from the menu.
- **Mark IP Precedence**. These packets are marked by DiffServ with the specified IP Precedence value before being forwarded. This selection requires that the Mark IP Precedence field is set. You must select an IP precedence value from 0 to 7 from the menu.
- **Mark IP DSCP**. Packets are marked by DiffServ with the specified DSCP value before being forwarded. This selection requires that the DSCP field is set. You must select a DSCP code from the menu. The menu includes **Other** as a selection, which lets you enter an IP DSCP value from 0 to 63. The DSCP value is defined as the high-order six bits of the Service Type octet in the IP header.

14. Click the **Apply** button.

    Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 63. DiffServ policy configuration policy attribute

Field	Description
Policy Name	The name of the DiffServ policy.
Policy Type	The type of the policy, which is always inbound (In).
Member Class Name	The name of the class instance within the policy.

Rename an Existing DiffServ Policy

➢ **To rename an existing DiffServ policy:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Policy Configuration**.

   The Policy Configuration page displays.

6. Select the check box next to the policy name.
7. In the **Policy Name** field, specify the new name.
8. Click the **Apply** button.

   Your settings are saved.

Change the Policy Attributes for an Existing DiffServ Policy

➢ **To change the policy attributes for an existing DiffServ policy:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Policy Configuration**.

   The Policy Configuration page displays.

6. Click the policy name, which is a hyperlink.

   The page on which you can change the policy attributes displays.

7. Change the policy attributes as needed.
8. Click the **Apply** button.

   Your settings are saved.

Remove a Class From an Existing DiffServ Policy

- **To remove a class from an existing DiffServ policy:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Policy Configuration**.

   The Policy Configuration page displays.

6. Select the check box next to the policy name.
7. From the **Member Class** menu, select **None**.
8. Click the **Apply** button.

   The class is removed from the policy.

Delete a DiffServ Policy

- **To delete a DiffServ policy:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Policy Configuration**.

   The Policy Configuration page displays.

6. Select the check box next to the policy name.
7. Click the **Delete** button.

   The policy is removed.

Configure the DiffServ Service Interface

You can activate a policy on an interface.

Attach a DiffServ Policy to an Interface

➢ **To attach a DiffServ policy to an interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

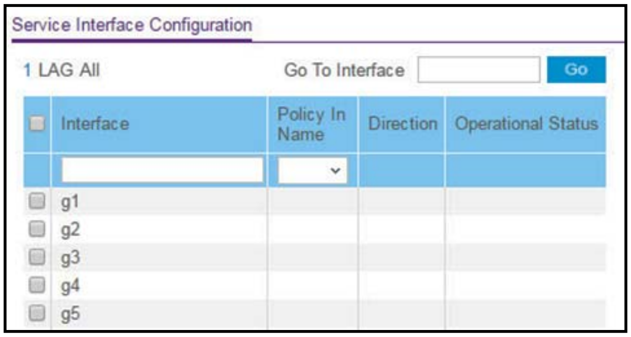
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Service Configuration**.



Service Interface Configuration

1 LAG All

Go To Interface Go

□	Interface	Policy In Name	Direction	Operational Status
□	g1			
□	g2			
□	g3			
□	g4			
□	g5			

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.

- To configure multiple interfaces with the same settings, select the check box associated with each interface.
- To configure all interfaces with the same settings, select the check box in the heading row.

8. From the **Policy Name** menu, select a policy name.
9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 64. Service Interface Configuration information

Field	Description
Direction	Shows the traffic direction of this service interface (either In or Out).
Operational Status	Shows the operational status of this service interface (either Up or Down).

Remove a DiffServ Policy From an Interface

➢ **To remove a DiffServ policy from an interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Service Configuration**.

   The Service Interface Configuration page displays.

6. Select the check boxes that are associated with the interfaces from which you want to remove the policy.
7. From the **Policy In Name** menu, select **None**.
8. Click the **Apply** button.

   Your settings are saved.

View DiffServ Service Statistics

You can display service-level statistical information about all interfaces to which DiffServ policies are attached.

➢ **To view the DiffServ service statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

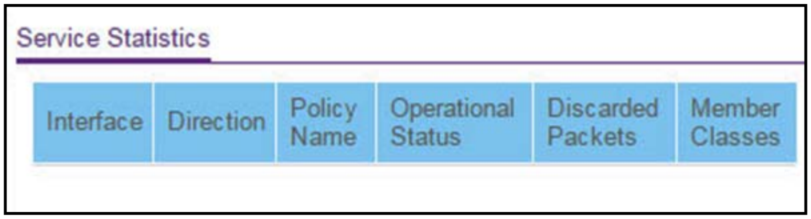
   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **QoS > DiffServ > Advanced > Service Statistics**.



Service Statistics

Interface	Direction	Policy Name	Operational Status	Discarded Packets	Member Classes

6. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the information available on the Service Statistics page.

Table 65. DiffServ Service Statistics information

Field	Description
Interface	All valid port numbers on the switch with a DiffServ policy that is attached in the inbound direction.
Direction	The traffic direction of interface is inbound (In). This field shows only the direction for which a DiffServ policy is attached.
Policy Name	The name of the policy that is currently attached to the specified interface and direction.
Operational Status	The operational status of the policy that is attached to the specified interface and direction. The value is either Up or Down.
Discarded Packets	The total number of packets that are 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.
Member Classes	All DiffServ classes that are 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 the list is empty.

Manage Device Security

6

This chapter covers the following topics:

- *Management Security Settings*
- *Configure Management Access*
- *Configure Port Authentication*
- *Set Up Traffic Control*
- *Configure Access Control Lists*

Management Security Settings

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.

Change the Password

You can change the login password.

➢ **To change the login password for the management interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Security > Management Security > User Configuration > Change Password**.

   The Change Password page displays.
6. In the **Old Password** field, specify the current password for the account created by the user.

   The entered password is displayed in dots. Passwords are up to 20 alphanumeric characters in length, and are case sensitive.
7. In the **New Password** field, specify the optional new or changed password for the account.

   The entered password is displayed in dots. Passwords are up to 20 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.

   The entered password is displayed in dots.
9. Click the **Apply** button.

   Your settings are saved.

Reset the Password to the Default Password

You can reset the password to the default password, which is **password**.

If you added the switch to a network on the Insight app before and you change the management mode back to NETGEAR Insight Mobile App and Insight Cloud Portal, all Insight-manageable device settings are returned to the last configuration saved on the cloud server, including the switch password (that is, the password is reset to the Insight network password).

If you changed the password through the local browser interface and you forget the password and are unable to log in to switch, press the multifunctional **Reset** button on the back panel of the switch for more than five seconds. The device reboots, and all switch settings, including the password, are reset to the factory default values.

➢ **To reset the password to the default password:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > User Configuration > Change Password**.

   The Change Password page displays.

6. Select the **Reset Password** check box.
7. Click the **Apply** button.

   Your settings are saved.

RADIUS Overview

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 the Global RADIUS Server Settings

Use the Global Configuration page to add information about one or more RADIUS servers on the network.

Consider the maximum delay time when you are configuring RADIUS maximum retransmit and RADIUS time-out values. If multiple RADIUS servers are configured, the maximum retransmit period on each server runs out before the next server is attempted. A retransmit does not occur until the configured time-out period on that server passes without a response from the RADIUS server. Therefore, the maximum delay in receiving a response from the RADIUS application equals the retransmit time x time-out period 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.

➢ **To configure the global RADIUS server settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > RADIUS > Global Configuration**.

   The RADIUS Configuration page displays.

   The Current Server IP Address field is blank if no servers are configured (see *Configure a RADIUS Authentication Server on the Switch* on page 243). The switch supports up to three RADIUS servers. If more than one RADIUS server is configured, the current server is the server configured as the primary server. If no servers are configured as the primary server, the current server is the most recently added RADIUS server.

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 from 1 to 15. The default value is 4.

   Consider the maximum delay time when you are configuring RADIUS maximum retransmit and RADIUS time-out values. If multiple RADIUS servers are configured, the maximum retransmit period on each server runs out before the next server is attempted. A retransmit does not occur until the configured time-out period on that server passes without a response from the RADIUS server. Therefore, the maximum delay in receiving a response from the RADIUS application equals the retransmit time x time-out period 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 from 1 to 30. The default value is 5.

   Consider the maximum delay time when you are configuring RADIUS maximum retransmit and RADIUS time-out values. If multiple RADIUS servers are configured, the maximum retransmit period on each server runs out before the next server is attempted. A retransmit does not occur until the configured time-out period on that server passes without a response from the RADIUS server. Therefore, the maximum delay in receiving a response from the RADIUS application equals the retransmit time x time-out period 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. From he **Accounting Mode** menu, select to disable or enable RADIUS accounting on the server.

   The default is Disabled.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable fields displayed on the page.

Table 66. RADIUS Configuration information

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.

Configure a RADIUS Authentication Server on the Switch

Use the RADIUS Server Configuration page to view and configure various settings for a RADIUS server configured on the switch.

Add a Primary RADIUS Authentication Server to the Switch

➢ **To add a primary RADIUS authentication server to the switch and view the RADIUS authentication server statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > RADIUS > Server Configuration**.

   The Server Configuration page displays.

6. In the **Server Address** field, specify the IP address of the RADIUS server.
7. In the **Authentication Port** field, specify the UDP port number the server uses to verify the RADIUS server authentication.

   The valid range is from 1 to 65535. The default value is 1812.

8. From the **Secret Configured** menu, select **Yes**.

   You must select **Yes** before you can configure the RADIUS secret. After you add the RADIUS server, this field indicates whether the shared secret for this server was configured.

9. In the **Secret** field, type the shared secret text string used for authenticating and encrypting all RADIUS communications between the switch and the RADIUS server.

   This secret must match the RADIUS encryption.

10. From the **Active** menu, select **Primary**.
11. From the **Message Authenticator** menu, select **Enable** or **Disable** to specify whether the message authenticator attribute for the selected server is enabled.

The message authenticator adds protection to RADIUS messages by using an MD5 hash to encrypt each message. The shared secret is used as the key, and if the message fails to be verified by the RADIUS server, it is discarded.

12. Click the **Add** button.

    The server is added to the switch.

13. Click the **Apply** button.

    Your settings are saved.

14. To reset the authentication server and RADIUS statistics to their default values, click the **Clear Counters** button.

The following table describes the RADIUS server statistics displayed on the page.

Table 67. RADIUS authentication server statistics information

Field	Description
Server Address	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.

Table 67. RADIUS authentication server statistics information (continued)

Field	Description
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.

Modify the Settings for a RADIUS Authentication Server on the Switch

➢ **To modify the settings for a RADIUS authentication server on the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > RADIUS > Server Configuration**.

   The Server Configuration page displays.

6. Select the check box next to the server IP address.
7. Modify the configuration for the selected server.
8. Click the **Apply** button.

   Your settings are saved.

Remove a RADIUS Authentication Server From the Switch

➢ **To a remove a RADIUS authentication server from the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > RADIUS > Server Configuration**.

   The Server Configuration page displays.

6. Select the check box next to the IP address of the server to remove.
7. Click the **Delete** button.

   The RADIUS server is removed.

8. Click the **Apply** button.

   Your settings are saved.

Configure a RADIUS Accounting Server

Use the Accounting Server Configuration page to view and configure various settings for a RADIUS accounting servers on the network.

Add a RADIUS Accounting Server to the Switch

➢ **To add a RADIUS accounting server to the switch and view the RADIUS accounting server statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > RADIUS > Accounting Server Configuration**.

The Accounting Server Configuration page displays.

6. In the **Accounting Server Address** field, specify the IP address of the RADIUS accounting server to add.
7. In the **Port** field, specify the UDP port number the server uses to verify the RADIUS accounting server authentication. The default UDP port number is 1813.
8. From the **Secret Configured** menu, select **Yes** to add a RADIUS secret in the next field.

   You must select **Yes** before you can configure the RADIUS secret. After you add the RADIUS accounting server, this field indicates whether the shared secret for this server was configured.
9. In the **Secret** field, type the shared secret to use with the specified accounting server.
10. From the **Accounting Mode** menu, select **Enable** to enable the RADIUS accounting mode.
11. Click the **Add** button.

    The server is added to the switch.
12. Click the **Apply** button.

    Your settings are saved.

    The following table describes the RADIUS server statistics displayed on the page.
13. To reset the accounting server and RADIUS statistics to their default values, click the **Clear Counters** button.

Table 68. RADIUS accounting server statistics information

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.

Table 68. RADIUS accounting server statistics information (continued)

Field	Description
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.

Modify the Settings for a RADIUS Accounting Server on the Switch

➢ **To modify the settings for a RADIUS accounting server on the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > RADIUS > Accounting Server Configuration**.

   The Accounting Server Configuration page displays.

6. Select the check box next to the server IP address.
7. Modify the configuration for the selected accounting server.
8. Click the **Apply** button.

   Your settings are saved.

Remove a RADIUS Accounting Server From the Switch

➢ **To a remove a RADIUS accounting server from the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > RADIUS > Accounting Server Configuration**.

   The Accounting Server Configuration page displays.

6. Select the check box next to the IP address of the server to remove.
7. Click the **Delete** button.

   The RADIUS accounting server is removed.

8. Click the **Apply** button.

   Your settings are saved.

Configure TACACS+

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 the Global TACACS+ Settings

You can configure the TACACS+ settings for communication between the switch and the TACACS+ server that you set up.

➢ **To configure the global TACACS+ settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > TACACS+ > TACACS+ Configuration**.

The TACACS+ Configuration page displays.

6. 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.

7. In the **Connection Timeout** field, specify the maximum number of seconds allowed to establish a TCP connection between the switch and the TACACS+ server.

   The valid range is 1–30 seconds. The default is 5 seconds.

8. Click the **Apply** button.

   Your settings are saved.

Configure a TACACS+ Server on the Switch

Use the TACACS+ Server Configuration page to configure up to five TACACS+ servers with which the switch can communicate.

➢ **To configure a TACACS+ server on the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security> TACACS+ > TACACS+ Server Configuration**.

   The TACACS+ Server Configuration page displays.

6. In the **TACACS+ Server** field, enter the TACACS+ server IP address.
7. In the **Priority** field, specify the priority for the TACACS+ server.

   The priority determines the order in which the TACACS+ servers are contacted when attempting to authenticate a user. A value of 0 is the highest priority. The valid range is 0–65535.

8. In the **Port** field, specify the authentication port value for TACAS+ server sessions. It must be within the range 0–65535. If you do not specify a value, the switch uses the standard TCP port 49 for sessions with the server.

9. In the **Key String** field, 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.

10. In the **Connection Timeout** field, specify the time that passes before the connection between the device and the TACACS+ server times out.

    The range is 1–30. If you do not specify a value, the switch uses a default value of 5.

11. Click the **Add** button.

    The server is added to the switch.

Configure Authentication Lists

You can configure a default login list that specifies one or more authentication methods to validate switch or port access for the admin user.

Note: The admin user is assigned to a preconfigured list that is named defaultList and that you cannot delete.

Configure an HTTP Authentication List

You can configure the default HTTP login list.

➢ **To change the HTTP authentication method for the default list:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > Authentication List > HTTP Authentication List**.

   The HTTP Authentication List page displays.

6. Select the check box next to the httpList name.

7. From the menu in the 1 column, select the authentication method that must be used first in the selected authentication login list.

   If you select a method that does not time out as the first method, such as **Local**, no other method is tried, even if you specified more than one method. User authentication occurs in the order the methods are selected. Possible methods are as follows:

   - **Local**. The user's locally stored ID and password are used for authentication. Since the Local method does not time out, if you select this option as the first method, no other method is tried, even if you specified more than one method.
   - **Radius**. The user's ID and password are authenticated using the RADIUS server. If you select **Radius** as the first method and an error occurs during the authentication, the switch uses Method 2 to authenticate the user.
   - **Tacacs+**. The user's ID and password are authenticated using the TACACS+ server. If you select **Tacacs+** as the first method and an error occurs during the authentication, the switch attempts user authentication Method 2.
   - **None**. The authentication method is unspecified. This option is available only for Method 2 and Method 3.

8. From the menu in the 2 column, select the authentication method, if any, that must be used second in the selected authentication login list.

   This is the method that is used if the first method times out. If you select a method that does not time out as the second method, the third method is not tried.

9. From the menu in the 3 column, select the authentication method, if any, that must be used third in the selected authentication login list.

10. From the menu in the 4 column, select the method, if any, that must be used fourth in the selected authentication login list.

    This is the method that is used if all previous methods time out.

11. Click the **Apply** button.

    Your settings are saved.

Configure an HTTPS Authentication List

You can configure the default login list for secure HTTP (HTTPS).

➢ **To configure an HTTPS authentication list:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

2. Launch a web browser.

3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > Authentication List > HTTPS Authentication List**.

   The HTTPS Authentication List page displays.

6. Select the check box next to the httpsList name.

7. From the menu in the 1 column, select the authentication method that must be used first in the selected authentication login list.

   If you select a method that does not time out as the first method, such as **Local**, no other method is tried, even if you specified more than one method. This setting does not display when you first create a new login list. User authentication occurs in the order the methods are selected. Possible methods are as follows:

   - **Local**. The user’s locally stored ID and password are used for authentication. Since the Local method does not time out, if you select this option as the first method, no other method is tried, even if you specified more than one method.
   - **Radius**. The user’s ID and password are authenticated using the RADIUS server. If you select **Radius** as the first method and an error occurs during the authentication, the switch uses Method 2 to authenticate the user.
   - **Tacacs+**. The user’s ID and password are authenticated using the TACACS+ server. If you select **Tacacs+** as the first method and an error occurs during the authentication, the switch attempts user authentication Method 2.
   - **None**. The authentication method is unspecified. This option is only available for Method 2 and Method 3.

8. From the menu in the 2 column, select the authentication method, if any, that must be used second in the selected authentication login list.

   This is the method that is used if the first method times out. If you select a method that does not time out as the second method, the third method is not tried.

9. From the menu in the 3 column, select the authentication method, if any, that must be used third in the selected authentication login list.

10. From the menu in the 4 column, select the method, if any, that must be used fourth in the selected authentication login list.

    This is the method that is used if all previous methods time out.

11. Click the **Apply** button.

    Your settings are saved.

Configure the Dot1x Authentication List

The Dot1x authentication list defines the IEEE 802.1X authentication method used for the default list. The default list is dot1xList.

➢ **To configure the dot1x authentication list:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Management Security > Authentication List > Dot1x Authentication List**.

   The Dot1x Authentication List page displays.

6. Select the check box next to the dot1xList name.
7. From the menu in the 1 column, select the method that must be used as the first method in the selected authentication login list.

   The options are as follows:

   - **Local**. The user’s locally stored ID and password are used for authentication.
   - **None**. The user is not authenticated.
   - **Radius**. The user’s ID and password are authenticated using the RADIUS server instead of locally.

8. Click the **Apply** button.

   Your settings are saved.

Configure Management Access

You can configure HTTP and secure HTTP access to the switch management interface. You can also configure access control profiles and access rules.

Configure HTTP Settings

You can configure the settings for HTTP access to the switch.

➢ **To configure the HTTP server settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Access > HTTP > HTTP Configuration**.

   The HTTP Configuration page displays.

6. In the **HTTP Session Soft Timeout** field, specify the number of minutes an HTTP session can be idle before a time-out occurs.

   The value must be in the range of 0–60 minutes. The default value is 5 minutes. The currently configured value is shown when the web page is displayed.

   After the session is inactive for the configured time, you are automatically logged out and must reenter the password to access the management interface. A value of zero means that the session does not time out.

7. In the **HTTP Session Hard Timeout** field, specify 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 0–168 hours. value of zero means that the session does not time out. The default value is 24 hours.

8. In the **Maximum Number of HTTP Sessions** field, specify the maximum number of HTTP sessions that can exist at the same time.
9. Click the **Apply** button.

   Your settings are saved.

HTTPS Configuration

Secure HTTP 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 a web interface, Secure HTTP can help ensure that communication between the management system and the switch is protected from eavesdroppers and man-in-the-middle attacks.

You can configure the settings for HTTPS access to the switch.

➢ **To configure HTTPS settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Access > HTTPS > HTTPS Configuration**.

   The HTTPS Configuration page displays.

6. Select the HTTPS Admin Mode **Enable** or **Disable** radio button.

   This enables or disables the administrative mode of secure HTTP (HTTPS). The 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.

7. Select the SSL Version 3 **Enable** or **Disable** radio button.

   This enables or disables Secure Sockets Layer version 3.0. The configured value is displayed. The default value is Enable.

8. Select the TLS Version 1 **Enable** or **Disable** radio button.

   This enables or disables Transport Layer Security version 1.0. The configured value is displayed. The default value is **Enable**.

9. 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 configured value is displayed.

10. 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 configured value is displayed.

    After the session is inactive for the configured time, you are automatically logged out and must reenter the password to access the management interface. A value of zero means that the session does not time out.

11. 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.

12. 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 4. The default value is 4.

13. Click the **Apply** button.

    Your settings are saved.

Manage Certificates

You can manage certificates.

Generate an SSL Certificate

➢ **To generate an SSL certificate:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Access > HTTPS > Certificate Management**.

   The Certificate Management page displays.

The Certificate Present field displays whether a certificate is present on the switch.

6. In the Certificate Management area, select **Generate Certificates**.
7. Click the **Apply** button.

   The switch generates an SSL certificate.

   The Certificate Generation Status field shows information about the progress.

Delete an SSL Certificate

➢ **To delete an SSL certificate:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security** > **Access > HTTPS** > **Certificate Management**.

   The Certificate Management page displays.

   The Certificate Present field displays Yes.

6. In the Certificate Management area, select **Delete Certificates**.
7. Click the **Apply** button.

   The certificate is removed.

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 contains a path to the TFTP server.

➤ **To configure the certificate download settings for HTTPS sessions:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Access > HTTPS > Certificate Download**.

   The Certificate Download page displays.

6. From the **File Type** menu, select the type of SSL certificate to download, which can be one of the following:
   - **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)
7. From the **Server Address Type** menu, select **IPv4** or **DNS** to indicate the format of the TFTP/SFTP/SCP Server Address field.

   The default is IPv4.

8. In the **TFTP Server IP** field, specify the address of the TFTP server.

   The address can be an IP address in standard x.x.x.x format or a host name. The host name must start with a letter of the alphabet. Make sure that the software image or other file to be downloaded is available on the TFTP server.

9. In the **Remote File Path** field, enter the path of the file to download.

   You can enter up to 96 characters. The 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 default is blank.

11. Select the **Start File Transfer** check box.
12. Click the **Apply** button.

    The file transfer starts. A status message displays during the transfer and upon successful completion of the transfer.

Access Control

Access control allows you to configure a profile and set access rules.

Configure an Access Control Profile

You can set up a security access profile.

➢ **To configure an access profile:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Access > Access Control > Access Profile Configuration**.

   The Access Profile Configuration page displays.

6. In the **Access Profile Name** field, enter the name of the access profile to be added.

   The maximum length is 32 characters.

7. Select one of the following check boxes:
   - **Activate Profile**. Activate an access profile.
   - **Deactivate Profile**. Deactivate an access profile.
   - **Remove Profile**. Remove an access profile. The access profile must be deactivated before you remove the access profile.

   The Packets Filtered field displays the number of packets filtered.

8. Click the **Apply** button.

   Your settings are saved.

9. To refresh the page with the latest information about the switch, click the **Refresh** button.

The following table describes the nonconfigurable data that is displayed.

Table 69. Access profile configuration profile summary

Field	Description
Rule Type	The action performed when the rules match.
Service Type	The selected service type. The policy is restricted by the selected service type chosen. The possible methods are HTTP, and secure HTTP (SSL).
Source IP Address	Source IP address of the client originating the management traffic.
Mask	The subnet mask of the IP Address of the client originating the management traffic.
Priority	The priority of the rule. The rules are validated against the incoming management request in the ascending order of their priorities. If a rule matches, action is performed and subsequent rules are ignored. For example, if a source IP address of 10.10.10.10 is configured with priority 1 to permit and source IP address 10.10.10.10 is configured with priority 2 to deny, access is permitted if the profile is active, and the second rule is ignored.

Configure Access Rule Settings

You can add security access rules. You can apply changes an the access rule only when the access profile is in a deactivated state.

Note: Make sure that you create the access profile before you add rules.

➢ **To configure access rules:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Access > Access Control > Access Rule Configuration**.

The Access Rule Configuration page displays.

6. From the **Rule Type** menu, select **Permit** or **Deny** to permit or deny access when the selected rules are matched.

   A Permit rule allows access by traffic that matches the rule criteria. A Deny rule blocks traffic that matches the rule criteria.

7. From the **Service Type** menu, select the access method to which the rule is applied.

   The policy is restricted by the selected access method. The possible access methods are TFTP, HTTP, and Secure HTTP (SSL).

8. In the **Source IP Address** field, enter the source IP address of the client originating the management traffic.
9. In the **Mask** field, specify the subnet mask of the client that originates the management traffic.
10. In the **Priority** field, assign a priority to 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 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, access is permitted if the profile is active, and the second rule is ignored.

11. Click the **Add** button.

    The access rule is added.

Configure Port Authentication

With 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 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.

An 802.1X network includes three components:

- **Authenticators**. The port that is authenticated before system access is permitted.
- **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

You can configure global port access control settings on the switch.

➤ **To globally enable all 802.1X features:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Port Authentication > Basic > 802.1X Configuration**.

   The 802.1X Configuration page displays.

6. Next to Port Based Authentication State, select the **Enable** radio button.

   This enables or disables 802.1X administrative mode on the switch.

   Note: If 802.1X is enabled, authentication is performed by a RADIUS server. This means that 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 Authentication Lists* on page 252.

   When port-based authentication is globally disabled, 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.

7. In the **VLAN Assignment Mode** field, select the **Enable** radio button.

   The default value is Disable.

   When enabled, this feature allows a port to be placed into a particular VLAN based on the result of the authentication or type of 802.1X authentication a client uses when it accesses the device. The authentication server can provide information to the device about which VLAN must be assigned the supplicant.

8. Next to Dynamic VLAN Creation Mode, select the **Enable** radio button.

   The default value is Disable.

If RADIUS-assigned VLANs are enabled, the RADIUS server is includes the VLAN ID in the 802.1X tunnel attributes of its response message to the device. If dynamic VLAN creation is enabled on the device and the RADIUS-assigned VLAN does not exist, then the assigned VLAN is dynamically created. This implies that the client can connect from any port and can get assigned to the appropriate VLAN. This feature gives flexibility for clients to move around the network without much additional configuration required.

9. Next to EAPOL Flood Mode, select the **Enable** radio button.

   The default value is Disable. Extensible Authentication Protocol (EAP) over LAN (EAPoL) flood support is enabled on the switch.

10. Click the **Apply** button.

    Your settings are saved.

Manage Port Authentication

You can enable and configure port access control on one or more ports.

Configure 802.1X Settings for a Port

➢ **To configure 802.1X settings for a port:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Port Authentication > Advanced > Port Authentication**.

   The Port Authentication page displays.

6. To view more fields, move the horizontal bar at the bottom of the page to the right.
7. Select the check box next to the port.

   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.

8. Specify the following settings:
   - **Port Control**. Defines the port authorization state. The control mode is set only if the link status of the port is link up. Select one of the following options:
     - **Auto**. The switch automatically detects the mode of the interface.
     - **Authorized**. The switch places the interface into an authorized state without being authenticated. The interface sends and receives normal traffic without client port-based authentication.
     - **Unauthorized**. The switch denies the selected interface access by moving the interface into unauthorized state. The switch cannot provide authentication services to the client through the interface.
     - **MAC based**. Multiple supplicants connected to the same port are allowed to be authenticated individually. Each host connected to the port must de authenticated separately to gain access to the network. The hosts are distinguished by their MAC addresses.
   - **MAB**. Specify whether to enable or disable MAC-based Authentication Bypass (MAB) for 802.1x-unaware clients at the specified port. MAB only functions if the port control mode is MAC-based. By default, MAB is disabled.
   - **Guest VLAN ID**. Specify the VLAN ID for the guest VLAN. The valid range is 0–4093. The default value is 0. Enter 0 to reset the guest VLAN ID on the interface. The guest VLAN allows the port to provide a distinguished service to unauthenticated users. This feature provides a mechanism to allow users access to hosts on the guest VLAN.
   - **Guest VLAN Period**. Specify the number of seconds that the selected port remains in the quiet state following a failed authentication exchange. The guest VLAN time-out must be a value in the range of 1–300. The default value is 90.
   - **Unauthenticated VLAN ID**. Specify the VLAN ID of the unauthenticated VLAN for the selected port. The valid range is 0–3965. The default value is 0. Hosts that fail the authentication might be denied access to the network or placed on a VLAN created for unauthenticated clients. This VLAN might be configured with limited network access.
   - **Periodic Reauthentication**. Select **Enable** to allow periodic reauthentication of the supplicant for the specified port.
   - **Reauthentication Period**. Specify the time, in seconds, after which reauthentication of the supplicant occurs. The reauthentication period must be a value in the range of 1–65535. The default value is 3600. If this field is disabled, connected clients are not forced to reauthenticate periodically.
   - **Quiet Period**. Specify the number of seconds that the port remains in the quiet state following a failed authentication exchange. While in the quite state, the port does not attempt to acquire a supplicant.
   - **Resending EAP**. Specify the EAP retransmit period for the selected port. The transmit period is the value, in seconds, after which an EAPoL EAP Request/Identify frame is resent to the supplicant.
   - **Max EAP Requests**. Specify the maximum number of EAP requests for the selected port. The value is the maximum number of times an EAPoL EAP Request/Identity message is retransmitted before the supplicant times out.

- **Supplicant Timeout**. Specify the supplicant time-out for the selected port. The supplicant time-out is the value, in seconds, after which the supplicant times out.
- **Server Timeout**. Specify the time that elapses before the switch resends a request to the authentication server.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the port authentication status information available on the page.

Table 70. Port authentication status information

Field	Description
Control Direction	The control direction for the specified port, which is always Both. The control direction dictates the degree to which protocol exchanges take place between supplicant and authenticator. The unauthorized controlled port exerts control over communication in both directions (disabling both incoming and outgoing frames).
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.
PAE Capabilities	The port access entity (PAE) functionality of the selected port. Possible values are Authenticator or Supplicant.
Authenticator PAE State	The current state of the authenticator PAE component. Possible values are as follows: Initialize Disconnected Connecting Authenticating Authenticated Aborting Held ForceAuthorized ForceUnauthorized
Backend State	The current state of the backend authentication component. Possible values are as follows: Request Response Success Fail Timeout Initialize Idle

Initialize 802.1X on a Port

➢ **To initialize 802.1X on a port**:

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Port Authentication > Advanced > Port Authentication**.

   The Port Authentication page displays.

6. Select the check box associated with the port to initialize.
7. Click the **Initialize** button.

   802.1X on the selected interface is reset to the initialization state. Traffic sent to and from the port is blocked during the authentication process. This button is available only if the control mode is auto. When you click this button, the action is immediate. You do not need to click the **Apply** button for the action to occur.

Restart the 802.1X Authentication Process on a Port

➢ **To restart the 802.1X authentication process on a port:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Security > Port Authentication > Advanced > Port Authentication**.

   The Port Authentication page displays.

6. Select the check box associated with the port to reauthenticate.
7. Click the **Reauthenticate** button.

   The selected port is forced to restart the authentication process.This button is available only if the control mode is auto. If the button is not selectable, it is grayed out. When 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 summary information about the port-based authentication settings for each port.

➢ **To view the port summary:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Port Authentication > Advanced > Port Summary**.

   The Port Summary page displays.

The following table describes the fields on the Port Summary page.

Table 71. Port summary

Field	Description
Port	The port for which the settings are displayed in the current table row.
Control Mode	Indicates the configured control mode for the port. Possible values are as follows: • **Auto**. The switch sets the port mode based on the authentication exchanges between the supplicant, authenticator, and the authentication server. • **Force Unauthorized**. The switch denies the interface access by moving the interface into the unauthorized state. The switch cannot provide authentication services to the client through the interface. • **Force Authorized**. The switch places the interface in an authorized state without the need for authentication. The interface sends and receives normal traffic without client port-based authentication. • **MAC Based**. The switch sets the port mode based on the authentication exchanges between the supplicant, authenticator, and authentication server on a per-supplicant basis.
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	Displays whether reauthentication is enabled on the selected port. The possible values are true and False. If the value is true, reauthentication occurs. Otherwise, reauthentication is not allowed.
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

You can displays information about supplicant devices that are connected to the local authenticator ports. If no active 802.1X sessions exist, the table is empty.

➢ To view the client summary:

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Port Authentication > Advanced > Client Summary**.

   The Client Summary page displays.

The following table describes the fields on the Client Summary page.

Table 72. Client Summary information

Field	Description
Port	The port to be displayed.
User Name	The name the client uses to identify itself as a supplicant to the authentication server.
Supplicant Mac Address	The MAC address of the supplicant that is connected to the port.
Session Time	The time in seconds since the supplicant was granted access.
Filter ID	The policy filter ID assigned by the authenticator to the supplicant device.
VLAN ID	The ID of the VLAN the supplicant was placed in as a result of the authentication process.
VLAN Assigned	The reason why the supplicant was placed in the VLAN.
Session Timeout	The reauthentication time-out period set by the RADIUS server to the supplicant device.
Termination Action	The termination action set by the RADIUS server that indicates the action that occurs when the supplicant session times out.

Set Up Traffic Control

You can configure MAC filters, storm control, port security, protected port, and private VLAN settings.

Manage MAC Filtering

You can create MAC filters that limit the traffic allowed into and out of specified ports on the switch.

Create a MAC Filter

➢ **To create a MAC filter:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > MAC Filter > MAC Filter Configuration**.

   The MAC Filter Configuration page displays.

6. From the **MAC Filter** menu, select **Create Filter**.

   If you did not configure any filters, this is the only option available.

7. From the **VLAN ID** menu, select the VLAN that must be used with the MAC address.
8. In the **MAC Address** field, specify the MAC address of the filter in the format XX:XX:XX:XX:XX:XX.

   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. In the Port and LAG tables in the Source Port Members section, select the ports and LAGs that must be included in the inbound filter.

   If a packet with the MAC address and VLAN ID that you specify is received on a port that is not part of the inbound filter, the packet is dropped.

10. In the Port and LAG tables in the Destination Port Members section, select the ports and LAGs that must be included in the outbound filter.

    A packet with the MAC address and VLAN ID that you specify can be transmitted only from a port that is part of the outbound filter.

    Note: Destination ports can be included only in a multicast filter.

11. Click the **Apply** button.

    Your settings are saved.

Delete a MAC FIlter

➢ **To delete a MAC filter:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > MAC Filter > MAC Filter Configuration**.

   The MAC Filter Configuration page displays.

6. From the **MAC Filter** menu, select the filter.
7. Click the **Delete** button.

   The filter is removed.

View the MAC Filter Summary

You can view the MAC filters that are configured on the switch.

➢ **To view the MAC filter summary:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > MAC Filter > MAC Filter Summary**.

   The MAC Filter Summary page displays.

The following table describes the information displayed on the page.

Table 73. MAC Filter Summary information

Field	Description
MAC Address	The MAC address of the filter in the format XX:XX:XX:XX:XX:XX.
VLAN ID	The VLAN ID used with the MAC address to fully identify packets you want filtered.
Source Port Members	A list of ports that are used for filtering inbound packets.
Destination Port Members	A list of ports that are used for filtering outbound packets.

Configure Storm Control

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, cause the network to time out, or do both.

The switch measures the incoming packet rate per port for broadcast, multicast, unknown, and unicast packets and discards packets if the rate exceeds the defined value. You can enable storm control globally and per interface, by defining the packet type and the rate at which the packets are transmitted.

➢ **To configure storm control settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > Storm Control**.

   The Storm Control page displays.

6. In the Storm Control section, from the **Ingress Control Mode** menu, select the mode of broadcast affected by storm control:
   - **Disabled**. Storm control is disabled. This is the default setting.
   - **Unknown Unicast**. If the rate of incoming unknown Layer 2 unicast traffic (that is, traffic for which a destination lookup failure occurs) increases beyond the configured threshold on an interface, the traffic is dropped.
   - **Multicast**. If the rate of incoming Layer 2 multicast traffic increases beyond the configured threshold on an interface, the traffic is dropped.
   - **Broadcast**. If the rate of incoming Layer 2 broadcast traffic increases beyond the configured threshold on an interface, the traffic is dropped.
7. In the Storm Control section, if the selection from the **Ingress Control Mode** menu is *not* **Disabled**, specify whether the ingress control mode is enabled by selecting **Enable** or **Disable** from the **Status** menu.
8. In the Storm Control section, in the **Threshold** field, specify the maximum rate at which unknown packets are forwarded.

   The range is a percent of the total threshold between 0–100%. The default is 5%.

9. In the Storm Control section, from the **Control Action** mode menu, select one of the following options:
   - **None**. This is the default setting.
   - **Trap**. If the threshold of the configured broadcast storm is exceeded, a trap is sent.
   - **Shutdown**. If the threshold of the configured broadcast storm is exceeded, the port is shut down.
10. Click the **Apply** button.

Your settings are saved.

11. To enable or disable storm control for one or more ports or to specify different threshold and control action settings for one or more ports, do the following:
    a. In the Port Settings section, select one or more interfaces by taking one of the following actions:
        - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
        - To configure multiple interfaces with the same settings, select the check box associated with each interface.
        - To configure all interfaces with the same settings, select the check box in the heading row.

    b. In the Port Settings section, if the selection from the **Ingress Control Mode** menu is *not* **Disabled**, specify whether the ingress control mode is enabled by selecting **Enable** or **Disable** from the **Status** menu in the table heading.

    c. In the Port Settings section, in the **Threshold** field in the table heading, specify the maximum rate at which unknown packets are forwarded.

    The range is a percent of the total threshold between 0–100%. The default is 5%.

    d. In the Port Settings section, from the **Control Action** mode menu in the table heading, select one of the following options:
        - **None**. This is the default setting.
        - **Trap**. If the threshold of the configured broadcast storm is exceeded, a trap is sent.
        - **Shutdown**. If the threshold of the configured broadcast storm is exceeded, the port is shut down.

12. Click the **Apply** button.

    Your settings are saved.

Configure Port Security

Port security lets you lock one or more ports on the switch. When a port is locked, only packets with an allowable source MAC addresses can be forwarded. All other packets are discarded.

Configure the Global Port Security Mode

➢ **To configure the global port security mode:**

1. Connect your computer to the same network as the switch.

    You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > Port Security > Port Security Configuration**.

   The Port Security Configuration page displays.

6. To enable port security on the switch, select the Port Security Mode **Enable** radio button.

   The default is Disable.

7. Click the **Apply** button.

   Your settings are saved.

8. To refresh the page with the latest information about the switch, click the **Refresh** 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 74. Port Security Violations information

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 MAC address violation.

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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > Port Security > Interface Configuration**.

   The Interface Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. Specify the following settings:
   - **Port Security**. Enable or disable the port security feature for the selected interfaces The default is Disable.
   - **Max Learned MAC Address**. Specify the maximum number of dynamically learned MAC addresses on the selected interfaces.
   - **Max Static MAC Address**. Specify the maximum number of statically locked MAC addresses on the selected interfaces.
   - **Enable Violation Shutdown**. Enable or disable shutdown of the selected interfaces if a packet with a disallowed MAC address is received. The default value is No, which means that the option is disabled.
   - **Enable Violation Traps**. Enable or disable the sending of new violation traps if a packet with a disallowed MAC address is received. The default value is No, which means that the option is disabled.
9. Click the **Apply** button.

   Your settings are saved.

View Learned MAC Addresses and Convert Them to Static MAC Addresses

You can convert a dynamically learned MAC address to a statically locked address.

➢ **To view learned MAC addresses for an individual interface or LAG and convert these MAC addresses to static MAC addresses:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > Port Security > Port Security Configuration**.

   The Port Security Configuration page displays.

6. Make sure that port security is globally enabled.

   For more information, see *Configure the Global Port Security Mode* on page 276.

7. Select **Security > Traffic Control > Port Security > Interface Configuration**.

   The Interface Configuration page displays.

8. Make sure that port security is enabled for the individual interface for which you want to view the dynamically learned MAC addresses.

   For more information, see *Configure a Port Security Interface* on page 277.

9. Select **Security > Traffic Control > Port Security > Security MAC Address**.

   The Security MAC Address page displays.

10. From the **Port List** menu, select the individual interface.

    The Dynamic MAC Address Table displays the MAC addresses and their associated VLANs that were learned on the selected port.

Field	Description
VLAN ID	The VLAN ID corresponding to the MAC address.
MAC Address	The MAC addresses learned on a specific port.

11. To convert the dynamically learned MAC address to a statically locked addresses, select the **Convert Dynamic Address to Static** check box.
12. Click the **Apply** button.

    The dynamic MAC address entries are converted to static MAC address entries in a numerically ascending order until the static limit is reached.

    The Number of Dynamic MAC Addresses Learned field displays the number of dynamically learned MAC addresses on a specific port.
13. To refresh the page with the latest information about the switch, click the **Refresh** button.

Configure Protected Ports

You can configure the ports as protected or unprotected. 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.

➢ **To configure protected ports:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Security > Traffic Control > Protected Port**.

   The Protected Port page displays.
6. In the Ports table, click each port that you want to configure as a protected port.

   Protected ports are marked with a check mark. No traffic forwarding is possible between two protected ports.
7. Click the **Apply** button.

   Your settings are saved.

Configure a Private VLAN

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.

➢ **To configure a private VLAN type:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > Private VLAN > Private Vlan Type Configuration**.

   The Private VLAN Type Configuration page displays.

6. Select the check box that is associated with the VLAN ID that you want to configure.
7. From the **Private VLAN Type** menu, select the type of private VLAN. Possible values are as follows:
   - **Primary**. Sets the private VLAN type as primary.
   - **Isolated**. Sets the private VLAN type as isolated.
   - **Community**. Sets the private VLAN type as community.
   - **Unconfigured**. Sets the private VLAN type as unconfigured. The default is Unconfigured.
8. Click the **Apply** button.

   Your settings are saved.

Configure Private VLAN Association Settings

➢ **To configure private VLAN association:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > Private VLAN > Private Vlan Association Configuration**.

   The Private VLAN Association page displays.

6. From the **Primary VLAN** menu, select the primary VLAN ID of the domain.
7. In the **Secondary VLAN(s)** field, enter the VLAN that you want to associate with the primary VLAN.
8. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 75. Private VLAN Association information

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. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

2. Launch a web browser.

3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > Private VLAN > Private Vlan Port Mode Configuration**.

   The Private Vlan Port Mode Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. From the **Port VLAN Mode** menu, select the switch port mode:
   - **General**. Sets the interfaces in general mode, which is the default selection.
   - **Host**. Sets the interfaces in host mode, which is used for private VLAN configurations.
   - **Promiscuous**. Sets the interfaces in promiscuous mode, which is used for private VLAN configurations.
9. Click the **Apply** button.

   Your settings are saved.

Configure a Private VLAN Host Interface

➢ **To configure a private VLAN host interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > Traffic Control > Private VLAN > Private Vlan Host Interface Configuration**.

   The Private VLAN Host Interface Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. In the **Host Primary VLAN** field, enter the primary VLAN ID for the host association mode.

   The range of the VLAN ID is 2–4093.

9. In the **Host Secondary VLAN** field, enter the secondary VLAN ID for host association mode.

   The range of the VLAN ID is 2–4093.

10. Click the **Apply** button.

    Your settings are saved.

    The Operational VLAN(s) field displays the operational VLANs.

Configure a Private VLAN Promiscuous Interface

➢ **To configure a private VLAN promiscuous interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Security > Traffic Control > Private VLAN > Private Vlan Promiscuous Interface Configuration**.

   The Private VLAN Promiscuous Interface Configuration page displays.

6. To display information for all ports and LAGs, click the **All** link.
7. Select one or more interfaces by taking one of the following actions:
   - To configure a single interface, select the check box associated with the port, or type the port number in the **Go To Interface** field and click the **Go** button.
   - To configure multiple interfaces with the same settings, select the check box associated with each interface.
   - To configure all interfaces with the same settings, select the check box in the heading row.
8. In the **Promiscuous Primary VLAN** field, enter the primary VLAN ID for the promiscuous association mode.

   The range of the VLAN ID is 2–4093.

9. In the **Promiscuous Secondary VLAN(s)** field, enter the secondary VLAN ID for promiscuous association mode.

   This field can accept single a VLAN ID, a range of VLAN IDs, or a combination of both in sequence separated by a comma. You can specify an 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 VLAN IDs is 2–4093.

   Note: The VLAN ID list that you specify replaces the configured secondary VLAN list in the association.

10. Click the **Apply** button.

    Your settings are saved.

    The Operational VLAN(s) field displays the operational VLANs.

Configure 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. The switch’s software supports IPv4, IPv6, and MAC ACLs.

➢ **To configure an ACL:**

1. Create an IPv4-based or IPv6-based or MAC-based ACL ID.
2. Create a rule and assign it to a unique ACL ID.
3. Define the rules, which can identify protocols, source, and destination IP and MAC addresses, and other packet-matching criteria.
4. Use the ID number to assign the ACL to a port or to a LAG.

To view ACL configuration examples, see *Access Control Lists (ACLs)* on page 392.

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. First, 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. For information about modifying an ACL, see *Modify an ACL Rule* on page 290.

Note: The steps in the following procedure describe how you can create an ACL based on the destination MAC address. If you select a different type of ACL (for example, an ACL based on a source IPv4), the page displays different information.

Use the ACL Wizard to create an ACL

➢ **To use the ACL Wizard to create an ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

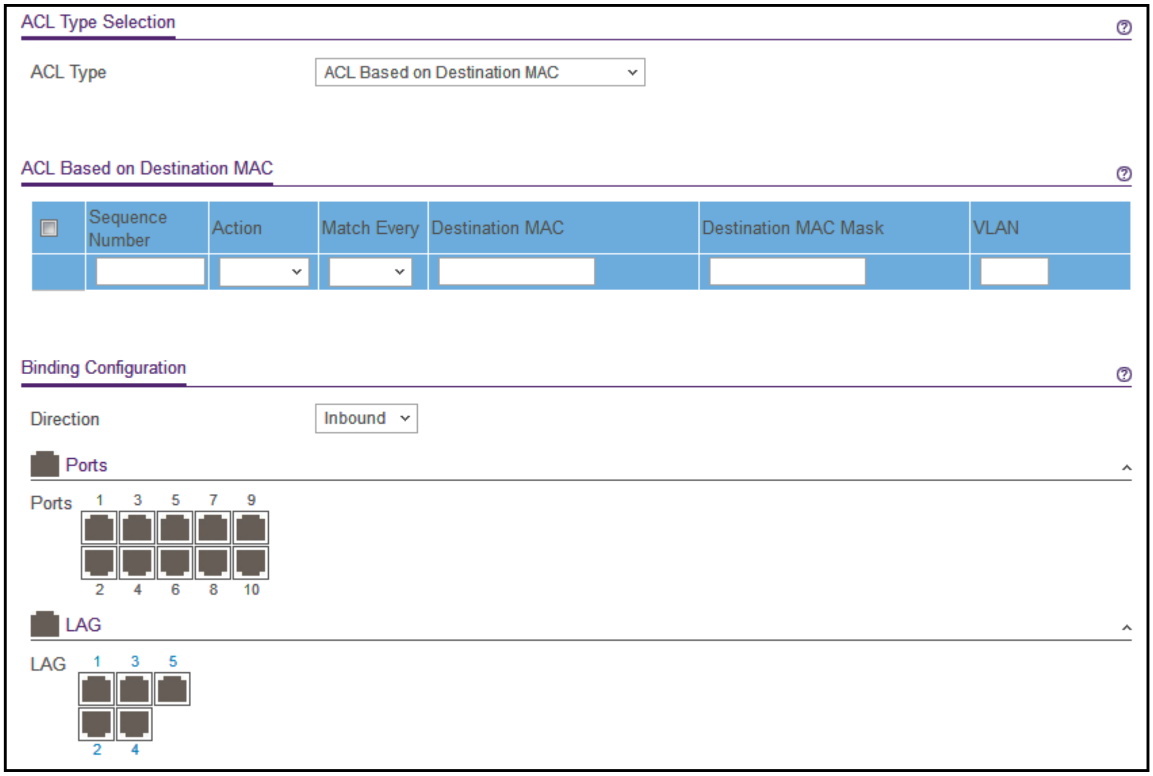
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > ACL Wizard**.



ACL Type Selection

ACL Type: ACL Based on Destination MAC

ACL Based on Destination MAC

□	Sequence Number	Action	Match Every	Destination MAC	Destination MAC Mask	VLAN

Binding Configuration

Direction: Inbound

6. From the **ACL Type** menu, select the type of ACL.

   You can select from the following ACL types:

   - **ACL Based on Destination MAC**. Creates an ACL based on the destination MAC address, destination MAC mask, and VLAN.
   - **ACL Based on Source MAC**. Creates an ACL based on the source MAC address, source MAC mask, and VLAN.
   - **ACL Based on Destination IPv4**. Creates an ACL based on the destination IPv4 address and IPv4 address mask.
   - **ACL Based on Source IPv4**. Creates an ACL based on the source IPv4 address and IPv4 address mask.
   - **ACL Based on Destination IPv6**. Creates an ACL based on the destination IPv6 prefix and IPv6 prefix length.
   - **ACL Based on Source IPv6.** Creates an ACL based on the source IPv6 prefix and IPv6 prefix length.
   - **ACL Based on Destination IPv4 L4 Port**. Creates an ACL based on the destination IPv4 Layer 4 port number.
   - **ACL Based on Source IPv4 L4 Port**. Creates an ACL based on the source IPv4 Layer 4 port number.
   - **ACL Based on Destination IPv6 L4 Port**. Creates an ACL based on the destination IPv6 Layer 4 port number.
   - **ACL Based on Source IPv6 L4 Port**. Creates 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).

7. In the **Sequence Number** field, enter a whole number in the range of 1 to 2147483647 that is used to identify the rule.
8. From the **Action** menu, select **Permit** or **Den**y to specify the action that must be taken if a packet matches the rule's criteria.

   If a packet matches a rule with a permit action, the packet is allowed to continue toward its destination. If a packet matches a rule with a deny action, the packet is dropped.
9. From the **Match Every** menu, select one of the following options:
   - **False**. Signifies that packets do not need to match the selected ACL and rule. With this selection, you can add a destination MAC address, destination MAC mask, and VLAN.
   - **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, you cannot configure other match criteria.
10. Specify the additional match criteria for the selected ACL type.

    The rest of the rule match criteria fields available for configuration depend on the selected ACL type. For information about the possible match criteria fields, see the following table.

ACL Based On	Fields
Destination MAC	• **Destination MAC**. Specify the destination MAC address to compare against an Ethernet frame. The valid format is xx:xx:xx:xx:xx:xx. The BPDU keyword might be specified using a destination MAC address of 01:80:C2:xx:xx:xx. • **Destination MAC Mask**. Specify the destination MAC address mask, which represents the bits in the destination MAC address to compare against an Ethernet frame. The valid format is xx:xx:xx:xx:xx:xx. The BPDU keyword might be specified using a destination MAC mask of 00:00:00:ff:ff:ff. • **VLAN**. Specify the VLAN ID to match within the Ethernet frame.
Source MAC	• **Source MAC**. Specify the source MAC address to compare against an Ethernet frame. The valid format is xx:xx:xx:xx:xx:xx. • **Source MAC Mask**. Specify the source MAC address mask, which represents the bits in the source MAC address to compare against an Ethernet frame. The valid format is (xx:xx:xx:xx:xx:xx). • **VLAN**. Specify the VLAN ID to match within the Ethernet frame.
Destination IPv4	• **Destination IP Address**. Specify the destination IP address. • **Destination IP Mask**. Specify the destination IP address mask.
Source IPv4	• **Source IP Address**. Specify the source IP address. • **Source IP Mask**. Specify the source IP address mask.
Destination IPv6	• **Destination Prefix**. Specify the destination prefix. • **Destination Prefix Length**. Specify the destination prefix length.
Source IPv6	• **Source Prefix**. Specify the source destination prefix. • **Source Prefix Length**. Specify the source prefix length.

ACL Based On	Fields
Destination IPv4 L4 Port	• **Destination L4 port (protocol)**. Specify the destination IPv4 L4 port protocol. • **Destination L4 port (value)**. Specify the destination IPv4 L4 port value.
Source IPv4 L4 Port	• **Source L4 port (protocol)**. Specify the source IPv4 L4 port protocol. • **Source L4 port (value)**. Specify the source IPv4 L4 port value.
Destination IPv6 L4 Port	• **Destination L4 port (protocol)**. Specify the destination IPv6 L4 port protocol. • **Destination L4 port (value)**. Specify the destination IPv6 L4 port value.
Source IPv6 L4 Port	• **Source L4 port (protocol)**. Specify the source IPv6 L4 port protocol. • **Source L4 port (value)**. Specify the source IPv6 L4 port value.

11. For this procedure (in which an ACL based on the destination MAC address is created), configure the following settings:

    a. In the **Destination MAC** field, specify the destination MAC address that must be compared against the information in an Ethernet frame.

       The 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.

    b. In the **Destination MAC Mask** field, specify the destination MAC address mask that must be compared against the information in 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.

    c. In the **VLAN ID** field, specify which VLAN must be compared against the information in an Ethernet frame.

       Valid range of values is 1 to 4093. Either a VLAN range or VLAN can be configured.

    d. In the Binding Configuration section, from the **Direction** menu, select the packet filtering direction for the ACL.

       Only the inbound direction is valid.

    e. In the Ports and LAG tables in the Binding Configuration section, select the ports and LAGs to which the ACL must be applied.

    f. Click the **Add** button.

       The rule is added to the ACL and is based on the destination MAC.

12. Click the **Apply** button.

    Your settings are saved.

Modify an ACL Rule

➢ **To modify an ACL rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > ACL Wizard**.

   The ACL Wizard page displays.

6. Select check box that is associated with the rule.
7. Update the match criteria as needed.
8. Click the **Apply** button.

   Your settings are saved.

Delete an ACL Rule

➢ **To delete an ACL rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > ACL Wizard**.

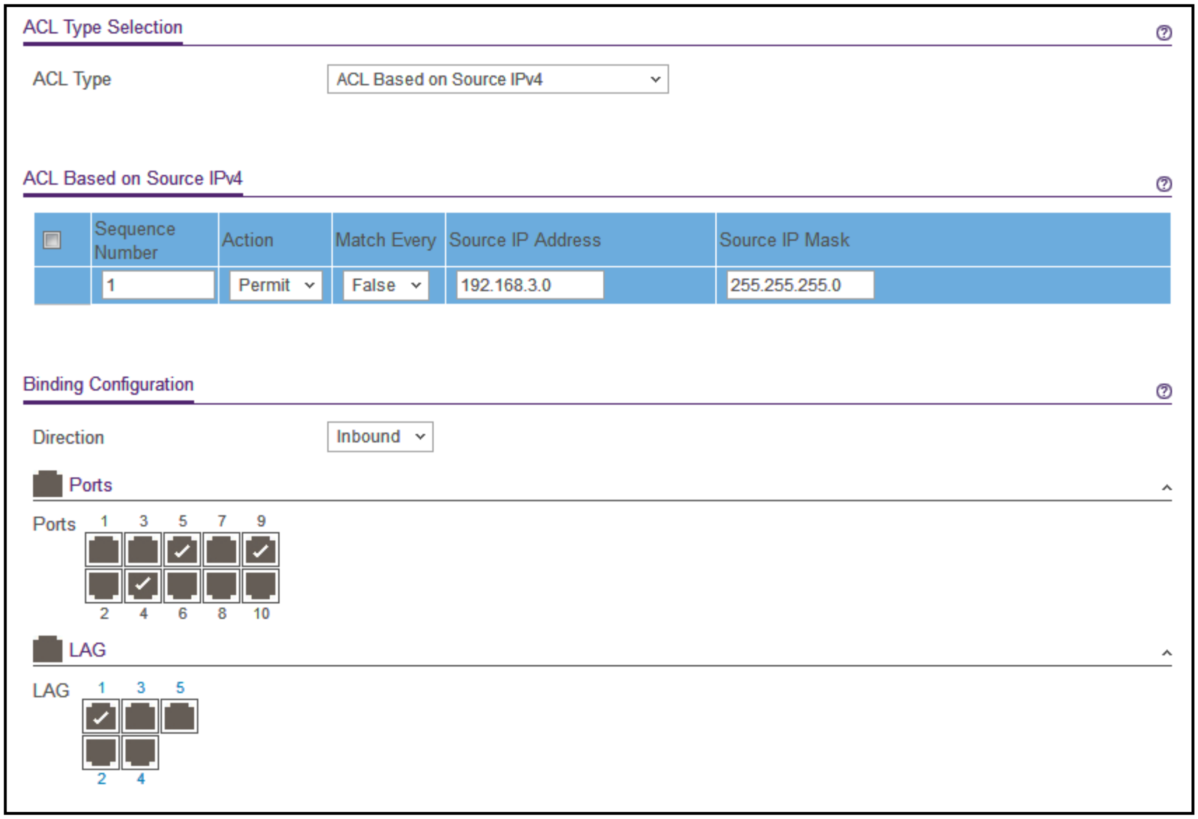
   The ACL Wizard page displays.

6. Select check box that is associated with the rule.
7. Click the **Delete** button.

   The rule is removed.

ACL Wizard Example

In the following figure, the ACL rule is configured to check for packet matches on ports 4, 5, and 9 and on LAG 1. Only the Inbound option is valid. Packets that include a source address in the 192.168.3.0/16 network are permitted to be forwarded by the interfaces. All other packets are dropped because every ACL includes an implicit *deny all* rule as the last rule.



ACL Type Selection

ACL Type: ACL Based on Source IPv4

ACL Based on Source IPv4

□	Sequence Number	Action	Match Every	Source IP Address	Source IP Mask
	1	Permit	False	192.168.3.0	255.255.255.0

Binding Configuration

Direction: Inbound

Ports

Ports	1	3	5	7	9
			✓		✓
		✓			
	2	4	6	8	10

LAG

LAG	1	3	5
	✓		
	2	4	

For information about the ACL Wizard, see *Use the ACL Wizard to Create a Simple ACL* on page 286.

Configure a Basic MAC ACL

A MAC 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 or Deny) is taken, and the additional rules are not checked for a match.

Multiple steps are involved in defining a MAC ACL and applying it to the switch:

1. Create the ACL ID.
2. Create a MAC rule.
3. Associate the MAC ACL with one or more interfaces.

You can view or delete MAC ACL configurations in the MAC Binding table (see *View or Delete MAC ACL Bindings in the MAC Binding Table* on page 300.

Add a MAC ACL

➢ **To add a MAC ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Basic > MAC ACL**.

   The MAC ACL page displays.

   The MAC ACL Table displays the number of ACLs currently configured in the switch and the maximum number of ACLs that can be configured. The current size is equal to the number of configured IPv4 and IPv6 ACLs plus the number of configured MAC ACLs.

6. 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.

7. Click the **Add** button.

   The MAC ACL is added.

   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.

Change the Name of a MAC ACL

➢ **To change the name of a MAC ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Basic > MAC ACL**.

   The MAC ACL page displays.

6. Select check box that is associated with the rule.
7. In the **Name** field, specify the new name.
8. Click the **Apply** button.

   Your settings are saved.

Delete a MAC ACL

➢ **To delete a MAC ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Basic > MAC ACL**.

   The MAC ACL page displays.

6. Select check box that is associated with the rule.
7. Click the **Delete** button.

   The rule is removed.

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.

Add a Rule to a MAC ACL

➢ **To add a rule to a MAC ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

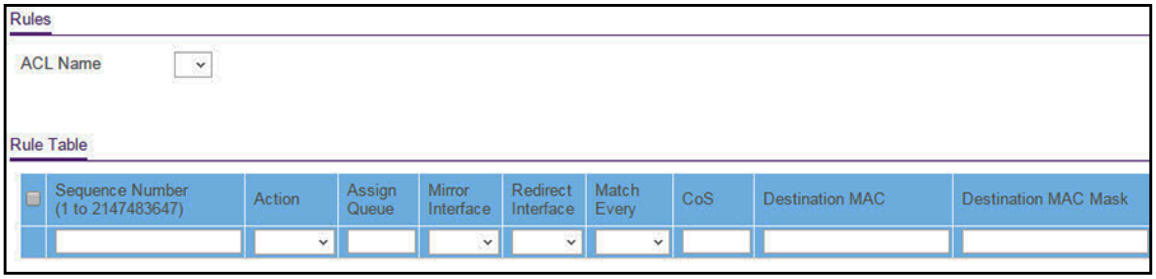
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Basic > MAC Rules**.



Rules

ACL Name

Rule Table

□	Sequence Number (1 to 2147483647)	Action	Assign Queue	Mirror Interface	Redirect Interface	Match Every	CoS	Destination MAC	Destination MAC Mask

   The previous figure does not show all columns.

6. From the **ACL Name** menu, select the MAC ACL.

7. In the **Sequence Number** field, enter a whole number in the range of 1 to 2147483647 to identify the rule.
8. From the **Action** menu, select the action that must be taken if a packet matches the rule's criteria:
   - **Permit**. Forwards packets that meet the ACL criteria.
   - **Deny**. Drops packets that meet the ACL criteria.
9. In the **Assign Queue** field, specify the hardware egress queue identifier that must be used to handle all packets matching this ACL rule.

   The valid range of queue IDs is 0 to 7.
10. From the **Mirror Interface** menu, select the specific egress interface to which the matching traffic stream must be copied, in addition to being forwarded normally by the switch.

    This field cannot be set if a redirect interface is already configured for the ACL rule. This field is visible for a Permit action.
11. From the **Redirect Interface** menu, select the egress interface to which the matching traffic stream must be redirected, bypassing any forwarding decision normally performed by the switch.

    This field cannot be set if a mirror interface is already configured for the ACL rule.
12. From the **Match Every** menu, select whether each Layer 2 MAC packet must be matched against the rule:
    - **True**. Each packet must match the selected ACL rule.
    - **False**. Not all packets need to match the selected ACL rule.
13. In the **CoS** field, specify the 802.1p user priority that must be compared against the information in an Ethernet frame.

    The valid range of values is 0 to 7.
14. In the **Destination MAC** field, specify the destination MAC address that must be compared against the information in an Ethernet frame.

    The 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.
15. In the **Destination MAC Mask** field, specify the destination MAC address mask that must be compared against the information in 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.

    The MAC mask specifies which bits in the MAC address must be compared against an Ethernet frame. You can use Fs and zeros in the MAC mask, which is in a wildcard format. An F means that the bit is not checked, and a zero in a bit position means that the data must equal the value given for that bit. For example, if the MAC address is aa:bb:cc:dd:ee:ff, and the mask is 00:00:ff:ff:ff:ff, all MAC addresses with aa:bb:xx:xx:xx:xx result in a match (where x is any hexadecimal number). A MAC mask of 00:00:00:00:00:00 matches a single MAC address.

16. From the **EtherType Key** menu, select the EtherType value that must be compared against the information in an Ethernet frame.

    The valid values are as follows:

    - **Appletalk**
    - **ARP**
    - **IBM SNA**
    - **IPv4**
    - **IPv6**
    - **IPX**
    - **MPLS multicast**
    - **MPLS unicast**
    - **NetBios**
    - **Novell**
    - **PPPoE**
    - **RARP**
    - **User Value**

17. If you select **User Value** from the **EtherType** menu, in the **EtherType User Value** field, specify the customized EtherType value that must be used when you select **User Value** from the **EtherType Key** menu.

    This value must be compared against the information in an Ethernet frame. The valid range of values is 0x0600 to 0xFFFF.

18. In the **Source MAC** field, specify the source MAC address that must be compared against the information in an Ethernet frame.

    The valid format is xx:xx:xx:xx:xx:xx.

19. In the **Source MAC Mask** field, specify the source MAC address mask that must be compared against the information in an Ethernet frame.

    The valid format is xx:xx:xx:xx:xx:xx.

    The MAC mask specifies which bits in the MAC address must be compared against an Ethernet frame. You can use Fs and zeros in the MAC mask, which is in a wildcard format. An F means that the bit is not checked, and a zero in a bit position means that the data must equal the value given for that bit. For example, if the MAC address is aa:bb:cc:dd:ee:ff, and the mask is 00:00:ff:ff:ff:ff, all MAC addresses with aa:bb:xx:xx:xx:xx result in a match (where x is any hexadecimal number). A MAC mask of 00:00:00:00:00:00 matches a single MAC address.

20. In the **VLAN** field, specify the VLAN ID that must be compared against the information in an Ethernet frame.

    The valid range of values is 1 to 4093. Either VLAN range or VLAN can be configured.

21. From the **Logging** menu, select whether to enable or disable logging.

When set to **Enable**, logging is enabled for this ACL rule (subject to resource availability on the switch). If the access list trap flag is also enabled, periodic traps are generated, indicating the number of times the rule was evoked during the report interval. A fixed five-minute report interval is used for the switch. A trap is not issued if the ACL rule hit count is zero for the interval. This field is only supported for a deny action.

22. Click the **Add** button.

    The rule is added.

Change the Match Criteria for a MAC Rule

➢ **To change the match criteria for a MAC rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Basic > MAC Rules**.

   The MAC Rules page displays.

6. Select the check box that is associated with the rule.
7. Modify the fields as needed.
8. Click the **Apply** button.

   Your settings are saved.

Delete a Rule for a MAC ACL

➢ **To delete a rule for a MAC:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Basic > MAC Rules**.

   The MAC Rules page displays.

6. Select the check box that is associated with the rule.
7. Click the **Delete** button.

   The rule is removed.

Configure MAC Bindings

When an ACL is bound to an interface, all the rules that are defined are applied to the selected interface. You can assign MAC ACL lists to ACL priorities and interfaces.

➢ **To configure MAC bindings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

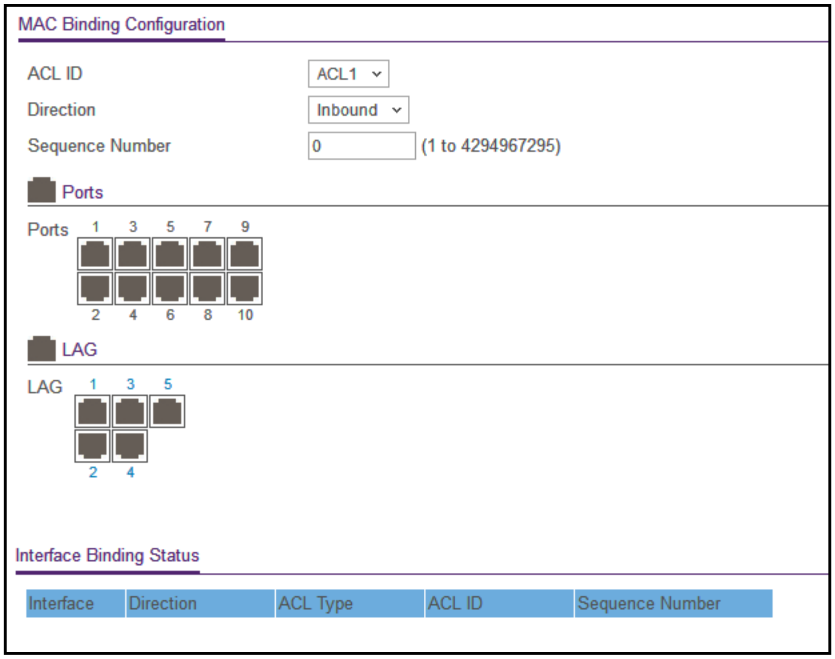
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Basic > MAC Binding Configuration**.



MAC Binding Configuration

ACL ID: ACL1

Direction: Inbound

Sequence Number: 0 (1 to 4294967295)

Interface Binding Status

Interface	Direction	ACL Type	ACL ID	Sequence Number

6. From the **ACL ID** menu, select an ACL.

   The fixed selection from the **Direction** menu is **Inbound**, which means that MAC ACL rules are applied to traffic entering the interface.

7. In the **Sequence Number** field, optionally specify a number to indicate the order of the access list relative to other access lists already assigned to the interface and direction.

   A low number indicates high precedence order. If a sequence number is already in use for the 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 number greater than the highest sequence number currently in use for this interface and direction is used. The valid range is 1–4294967295.

8. To add the selected ACL to a port or LAG, in the Ports table or LAG table, click the port or LAG so that a check mark displays.

   You can add the ACL to several ports and LAGs.

   The Ports and LAG tables display the available and valid interfaces for ACL binding. All nonrouting physical interfaces and interfaces participating in LAGs are listed.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the information displayed in the Interface Binding Status table.

Table 76. Interface Binding Status 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 the selected interface and direction.
ACL ID	The ACL number (for an IP ACL) or ACL name (for a MAC ACL) identifying the ACL assigned to the selected interface and direction.
Sequence Number	The sequence number signifying the order of the specified ACL relative to other ACLs assigned to the selected interface and direction.

View or Delete MAC ACL Bindings in the MAC Binding Table

You can view or delete the MAC ACL bindings in the MAC Binding Table.

➢ **To view or delete MAC ACL bindings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security** > **ACL > Basic** > **MAC Binding Table**.

   The MAC Binding Table displays.

6. To delete a MAC ACL-to-interface binding, do the following:

   a. Select the check box next to the interface.

   b. Click the **Delete** button.

   The binding is removed.

The following table describes the information that is displayed in the MAC Binding Table.

Table 77. 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 the selected interface and direction.
ACL ID	The ACL name identifying the ACL assigned to the selected interface and direction.
Sequence Number	The sequence number signifying the order of the specified ACL relative to other ACLs assigned to the 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 or 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.

Add an IP ACL

➢ **To add an IP ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IP ACL**.

   The IP ACL Configuration page displays.

   The IP ACL page shows the current size of the ACL table compared to 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 all ACLs configured on the switch.

The Maximum ACL field displays the maximum number of IP ACLs that can be configured on the switch.

6. In the **IP ACL ID** 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 a basic IP ACL, which allows you to permit or deny traffic from a source IP address.
   - **100–199**. Creates an extended IP 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 is 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 an ID from 1 to 99), extended IP ACL (with an ID from 100 to 199), or a named IP ACL.
7. Click the **Add** button.

   The IP ACL is added to the switch configuration.

Delete an IP ACL

➢ **To delete an IP ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Security** > **ACL > Advanced** > **IP ACL**.

   The IP ACL Configuration page displays.

6. Select the check box that is associated with the IP ACL.
7. Click the **Delete** button.

   The IP ACL is removed.

Configure Rules for a Basic IP ACL

You can define rules for IP-based standard ACLs (basic ACLs). The access list definition includes rules that specify whether traffic matching the criteria is forwarded normally or discarded.

Note: An implicit *deny all* rule is included at the end of an ACL list. This means that if an ACL is applied to a packet, and if none of the explicit rules match, then the final implicit *deny all* rule applies and the packet is dropped.

Add a Rule for a Basic IP ACL

➢ **To add a rule for a basic IP ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

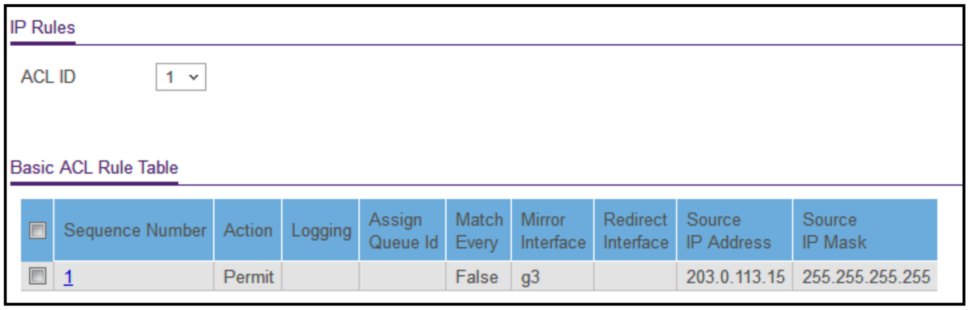
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IP Rules**.



IP Rules

ACL ID: 1

Basic ACL Rule Table

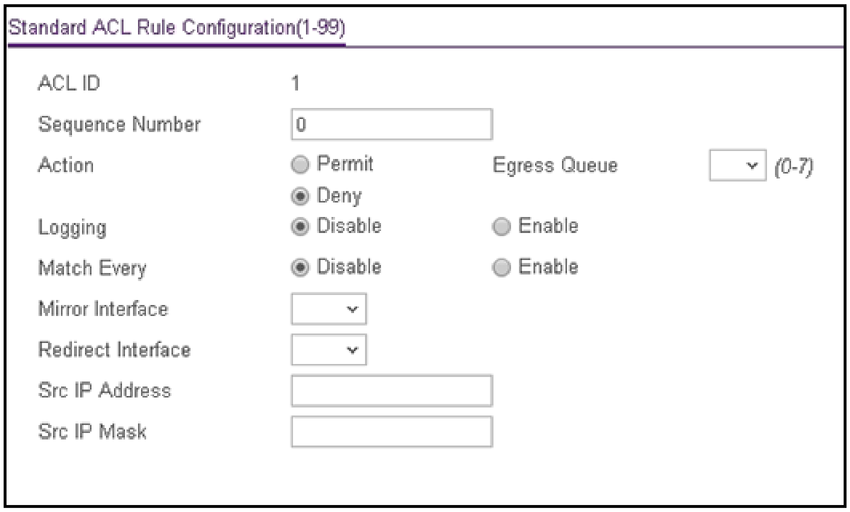
□	Sequence Number	Action	Logging	Assign Queue Id	Match Every	Mirror Interface	Redirect Interface	Source IP Address	Source IP Mask
□	1	Permit			False	g3		203.0.113.15	255.255.255.255

If no rules exist, the Basic ACL Rule Table shows the message *No rules have been configured for this ACL*. If one or more rules exist for the ACL, the rules display in the Basic ACL Rule Table.

6. From the **ACL ID** menu, select the IP ACL for which you want to add a rule.

   For basic IP ACLs, this must be an ID in the range from 1 to 99.

7. Click the **Add** button.



Standard ACL Rule Configuration(1-99)

ACL ID	1		
Sequence Number	0		
Action	○ Permit ● Deny	Egress Queue	(0-7)
Logging	● Disable	○ Enable	
Match Every	● Disable	○ Enable	
Mirror Interface			
Redirect Interface			
Src IP Address			
Src IP Mask			

8. Specify the following match criteria for the rule:
   - **Sequence Number**. Enter an ACL sequence number in the range of 1 to 2147483647 that is used to identify the rule. An IP ACL can contain up to 50 rules.
   - **Action**. Select the ACL forwarding action, which is one of the following:
     - **Permit**. Forward packets that meet the ACL criteria.
     - **Deny**. Drop packets that meet the ACL criteria.
   - **Egress Queue**. If the selection form the **Action** menu is **Permit**, you can specify the hardware egress queue identifier that is used to handle all packets matching this IP ACL rule. The range of queue IDs is 0 to 7.
   - **Logging**. If the selection form the **Action** menu is **Deny**, you can enable logging for the ACL by selecting the **Enable** radio button. (Logging is subject to resource availability in the device.)

     If the access list trap flag is also enabled, periodic traps are generated, indicating the number of times this rule was evoked during the report interval. A fixed five-minute report interval is used for the switch. A trap is not issued if the ACL rule hit count is zero for the current interval.
   - **Match Every**. From the **Match Every** menu, select whether all packets must match the selected IP ACL rule:
     - **Enable**. All packets must match the selected IP ACL rule and are either permitted or denied.
     - **Disable**. Not all packets need to match the selected IP ACL rule.

- **Mirror Interface**. From the **Mirror Interface** menu, select the specific egress interface to which the matching traffic stream must be copied, in addition to being forwarded normally by the switch.

  This field cannot be set if a redirect interface is already configured for the IP ACL rule. This field is visible for a Permit action.
- **Redirect Interface**. From the **Redirect Interface** menu, select the egress interface to which the matching traffic stream must be redirected, bypassing any forwarding decision normally performed by the switch.

  This field cannot be set if a mirror interface is already configured for the IP ACL rule.
- **Src IP Address**. Enter an IP address using dotted-decimal notation to be compared to a packet’s source IP address as a match criterion 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 value.

  Wildcard masks determine which bits are used and which bits are ignored. A wildcard masking for an ACL functions differently from a subnet mask. A wildcard mask is in essence the inverse of a subnet mask. For example, to apply the rule to all hosts in the 192.168.1.0/24 subnet, enter 0.0.0.255 in the Source IP Mask field. A wildcard mask of 255.255.255.255 indicates that no bit is important. A wildcard mask of 0.0.0.0 indicates that all of the bits are important.

9. Click the **Apply** button.

   Your settings are saved.

Modify the Match Criteria for a Basic IP ACL Rule

➢ **To modify the match criteria for a basic IP ACL rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Security > ACL > Advanced > IP Rules**.

   The IP Rules page displays.

6. From the **ACL ID** menu, select the ACL that includes the rule that you want to modify.
7. In the Basic ACL Rule Table, click the rule.

   The rule is a hyperlink. The Standard ACL Rule Configuration page displays.
8. Modify the basic IP ACL rule criteria.
9. Click the **Apply** button.

   Your settings are saved.

Delete a Basic IP ACL RUle

➢ **To delete a basic IP ACL rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Security > ACL > Advanced > IP Rules**.

   The IP Rules page displays.
6. From the **ACL ID** menu, select the ACL that includes the rule that you want to modify.
7. In the Basic ACL Rule Table, select the check box that is associated with the rule.
8. Click the **Delete** button.

   The rule is removed.

Configure Rules for an Extended IP ACL

You can define rules for IP-based extended ACLs. The access list definition includes rules that specify whether traffic matching the criteria is forwarded normally or discarded.

Note: An implicit *deny all* rule is included at the end of an ACL list. This means that if an ACL is applied to a packet and if none of the explicit rules match, then the final implicit *deny all* rule applies and the packet is dropped.

Add a Rule for an Extended IP ACL

➢ **To add a rule for an extended IP ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

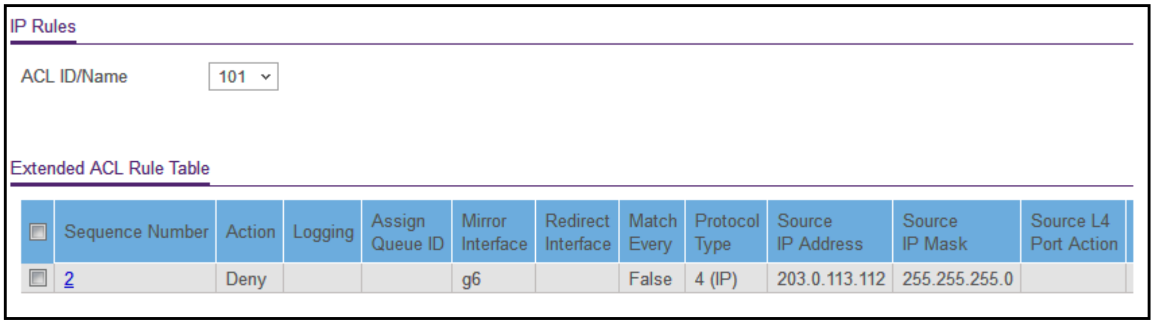
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IP Extended Rules**.



IP Rules

ACL ID/Name: 101

Extended ACL Rule Table

□	Sequence Number	Action	Logging	Assign Queue ID	Mirror Interface	Redirect Interface	Match Every	Protocol Type	Source IP Address	Source IP Mask	Source L4 Port Action
□	2	Deny			g6		False	4 (IP)	203.0.113.112	255.255.255.0	

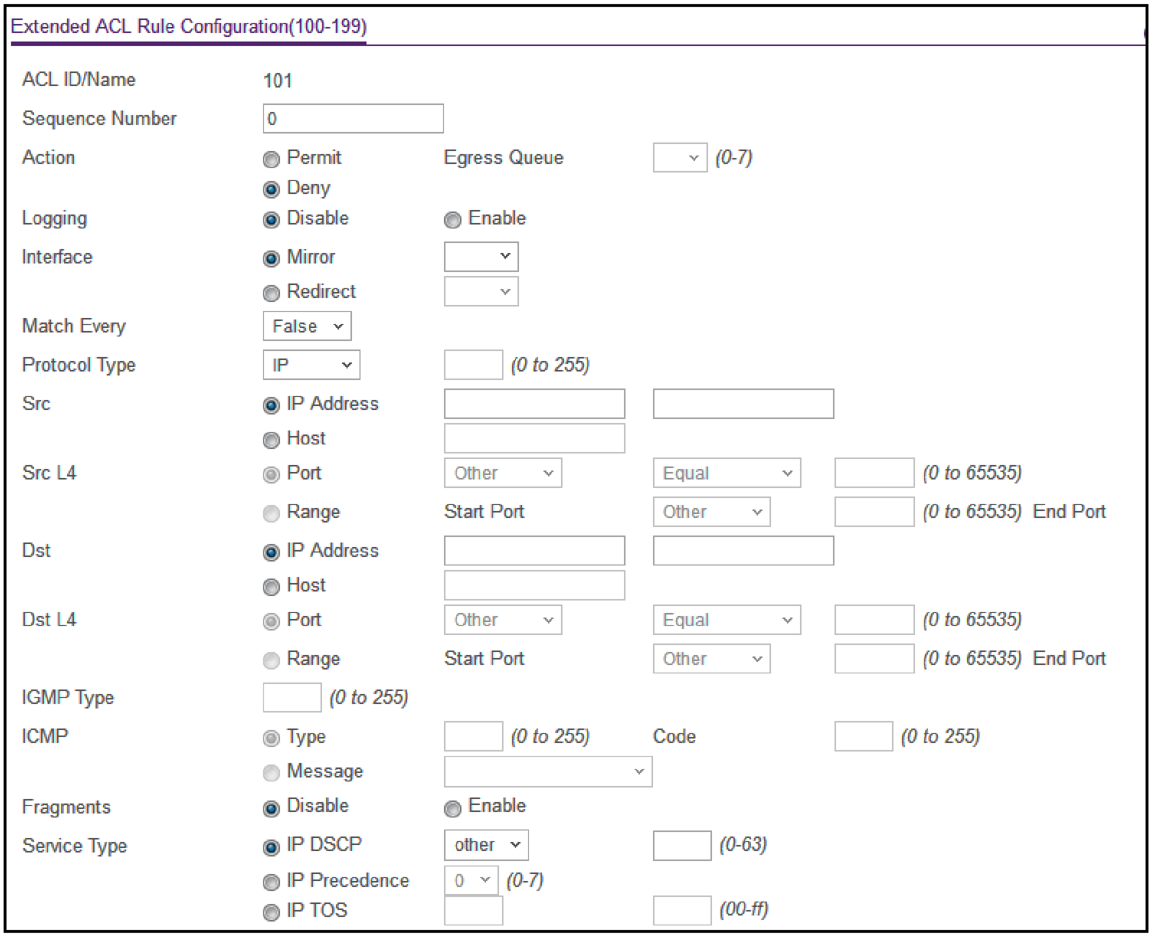
   The previous figure does not show all columns.

   If no rules exists, the Extended ACL Rule Table shows the message *No rules have been configured for this ACL*. If one or more rules exist for the ACL, the rules display in the Extended ACL Rule Table.

6. From the **ACL ID/Name** menu, select the IP ACL for which you want to add a rule.

   For extended IP ACLs, this must be an ID in the range from 101 to 199 or a name.

7. Click the **Add** button.



Extended ACL Rule Configuration(100-199)

ACL ID/Name	101				
Sequence Number	0				
Action	○ Permit	Egress Queue	(0-7)		
	● Deny				
Logging	● Disable	○ Enable			
Interface	● Mirror				
	○ Redirect				
Match Every	False				
Protocol Type	IP	(0 to 255)			
Src	● IP Address				
	○ Host				
Src L4	○ Port	Other	Equal	(0 to 65535)	
	○ Range	Start Port	Other	(0 to 65535)	End Port
Dst	● IP Address				
	○ Host				
Dst L4	○ Port	Other	Equal	(0 to 65535)	
	○ Range	Start Port	Other	(0 to 65535)	End Port
IGMP Type	(0 to 255)				
ICMP	○ Type	(0 to 255)	Code	(0 to 255)	
	○ Message				
Fragments	● Disable	○ Enable			
Service Type	● IP DSCP	other	(0-63)		
	○ IP Precedence	0 (0-7)			
	○ IP TOS		(00-ff)		

The previous figure does not show the rightmost fields.

8. Configure the following match criteria for the rule:
   - **Sequence Number**. Enter a whole number in the range of 1 to 2147483647 that is used to identify the rule. An extended IP ACL can contain up to 50 rules.
   - **Action**. Select the ACL forwarding action, which is one of the following:
     - **Permit**. Forward packets that meet the ACL criteria.
     - **Deny**. Drop packets that meet the ACL criteria.
   - **Egress Queue**. If the selection from the **Action** menu is **Permit**, select the hardware egress queue identifier that is used to handle all packets matching this IP ACL rule. The range of queue IDs is 0 to 7.
   - **Logging**. If the selection form the **Action** menu is **Deny**, you can enable logging for the ACL by selecting the **Enable** radio button. (Logging is subject to resource availability in the device.)

     If the access list trap flag is also enabled, periodic traps are generated, indicating the number of times this rule was evoked during the report interval. A fixed five-minute report interval is used for the switch. A trap is not issued if the ACL rule hit count is zero for the current interval.

- **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 **Match Every** menu, select whether all packets must match the selected IP ACL rule:
  - **False**. Not all packets need to match the selected IP ACL rule. You can configure other match criteria on the page.
  - **True**. All packets must match the selected IP ACL rule and are either permitted or denied. In this case, you cannot configure other match criteria on the page.
- **Protocol Type**. From the menu, select a protocol that a packet's IP protocol must be matched against: **IP**, **ICMP**, **IGMP**, **TCP**, **UDP**, **EIGRP**, **GRE**, **IPINIP**, **OSPF**, **PIM**, or **Other**. If you select **Other**, specify enter a protocol number from 0 to 255.
- **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 criterion for the selected IP ACL rule:
  - If you select the **IP Address** radio button, enter an IP address or an IP address range. You can enter 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 the 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:
  - **Port radio button**. If you select the **Port** radio button, you can either enter the port number yourself or select one of the following protocols from the menu:
    - The source IP TCP port protocols are **domain**, **echo**, **ftp**, **ftpdata**, **www-http**, **smtp**, **telnet**, **pop2**, **pop3**, and **bgp**.
    - The source IP UDP port protocols are **domain**, **echo**, **snmp**, **ntp**, **rip**, **time**, **who**, and **tftp**.

    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 protocol.
    - **Not Equal**. IP ACL rule matches only if the Layer 4 source port number is not equal to the specified port number or port protocol.
    - **Less Than**. IP ACL rule matches if the Layer 4 source port number is less than the specified port number.
    - **Greater Than**. IP ACL rule matches if the Layer 4 source port number is greater than the specified port number.

  - **Range radio button**. 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. The values can range from 0 to 65535.

    You can either enter the port range yourself or select one of the following protocols from the menu:

    - The destination IP TCP port protocols are **domain**, **echo**, **ftp**, **ftpdata**, **www-http**, **smtp**, **telnet**, **pop2**, **pop3**, and **bgp**.
    - The destination IP UDP port protocols are **domain**, **echo**, **snmp**, **ntp**, **rip**, **time**, **who**, and **tftp**.

    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 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 criterion 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 the 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:

  - **Port radio button**. If you select the **Port** radio button, you can either enter the port number yourself or select one of the following protocols from the menu.
    - The destination IP TCP port protocols are **domain**, **echo**, **ftp**, **ftpdata**, **www-http**, **smtp**, **telnet**, **pop2**, **pop3**, and **bgp**.
    - The destination IP UDP port protocols are **domain**, **echo**, **snmp**, **ntp**, **rip**, **time**, **who**, and **tftp**.

    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 protocol.
    - **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 protocol.
    - **Less Than**. The IP ACL rule matches if the Layer 4 destination port number is less than the specified port number.
    - **Greater Than**. The IP ACL rule matches if the Layer 4 destination port number is greater than the specified port number.
  - **Range radio button**. 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.

    You can either select the enter the port range yourself or select one of the following protocols from the menu:

    - The destination IP TCP port range names are **domain**, **echo**, **ftp**, **ftpdata**, **www-http**, **smtp**, **telnet**, **pop2**, **pop3**, and **bgp**.
    - The destination IP UDP port range names are **domain**, **echo**, **snmp**, **ntp**, **rip**, **time**, **who**, and **tftp**.

    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 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 **Type** or **Message** radio button:
  - If you select the **Type** radio button, note the following:
    - The **Type** and **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 **Message** 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 **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**, **ttl-exceeded**, **time-exceeded**, and **unreachable**.
- **Fragments**. Either select the **Enable** radio button to allow initial fragments (that is, the fragment bit is asserted) or leave the default **Disable** radio button selected to prevent initial fragments from being used.

  This option is not valid for rules that match L4 information such as a 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 options 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, 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 3 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 that is composed of numbers 00 to 09 and AA to FF. The ToS mask value is a hexadecimal number that is composed of numbers 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.

9. Click the **Apply** button.

   Your settings are saved.

Modify the Match Criteria for an Extended IP ACL Rule

➢ **To modify the match criteria for an existing extended IP ACL rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IP Extended Rules**.

   The IP Rules page displays.

6. From the **ACL ID** menu, select the ACL that includes the rule that you want to modify.
7. In the Extended ACL Rule Table, click the rule.

   The rule is a hyperlink. The Extended ACL Rule Configuration page displays.

8. Modify the extended IP ACL rule criteria.
9. Click the **Apply** button.

   Your settings are saved.

Delete an Extended IP ACL Rule

➢ **To delete an extended IP ACL rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IP Extended Rules**.

   The IP Rules page displays.

6. From the **ACL ID** menu, select the ACL that includes the rule that you want to delete.
7. In the Extended ACL Rule Table, select the check box that is associated with the rule.
8. Click the **Delete** button.

   The rule is removed.

Configure an IPv6 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 or Deny) is taken, and the additional rules are not checked for a match.

Add an IPv6 ACL

➢ **To add an IPv6 ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IPv6 ACL**.

   The IPV6 Configuration page displays.

6. In the **IPv6 ACL** field, specify a name to identify 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.

7. Click the **Add** button.

   The IPv6 ACL is added.

The following table describes the nonconfigurable information displayed on the page.

Table 78. IPv6 Configuration and IPv6 ACL Table information

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.
Rules	The number of the rules associated with the IP ACL.
Type	The type is IPv6 ACL.

Delete an IPv6 ACL

➢ **To delete an IPv6 ACL:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IPv6 ACL**.

   The IPv6 Configuration page displays.

6. Select the check box that is associated with the IPv6 ACL.
7. Click the **Delete** button.

   The IPv6 ACL is removed.

Configure Rules for an IPv6 ACL

You can define rules for IPv6 ACLs. The access list definition includes rules that specify whether traffic matching the criteria is forwarded normally or discarded.

> **Note:** An implicit *deny all* rule is included at the end of an ACL list. This means that if an ACL is applied to a packet and if none of the explicit rules match, then the final implicit *deny all* rule applies and the packet is dropped.

Add a Rule for an IPv6 ACL

➢ **Add a rule for an ACL IPv6:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

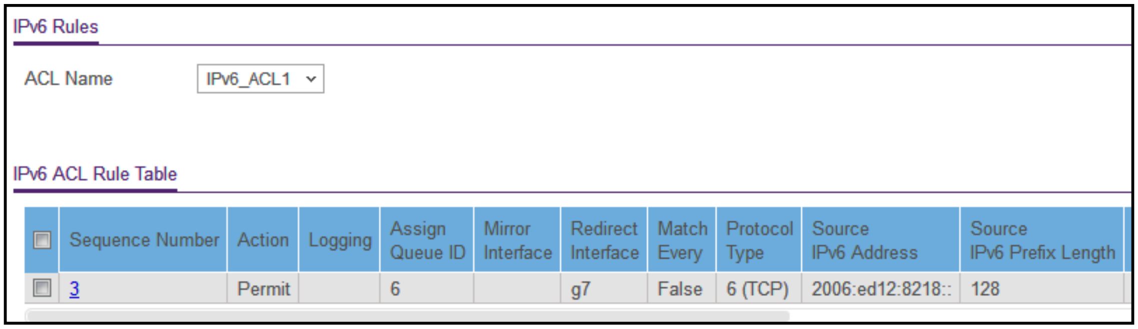
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IPv6 Rules**.



IPv6 Rules

ACL Name IPv6_ACL1

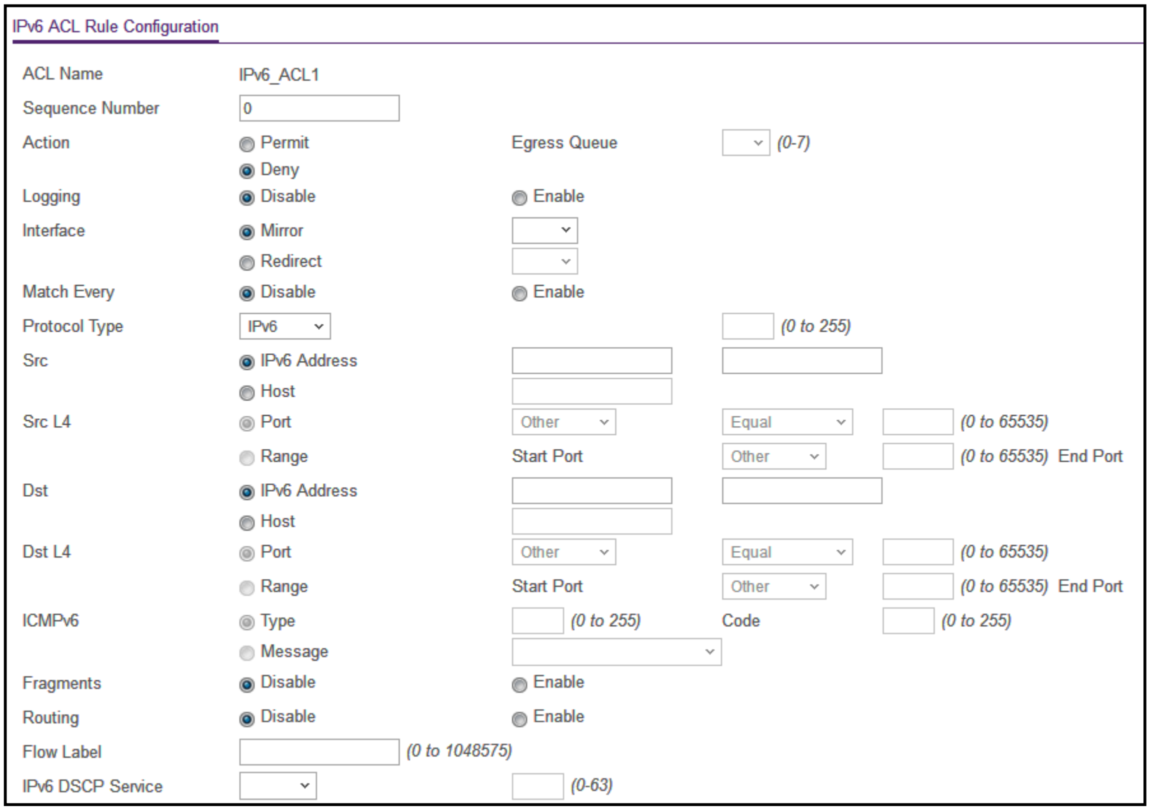
IPv6 ACL Rule Table

□	Sequence Number	Action	Logging	Assign Queue ID	Mirror Interface	Redirect Interface	Match Every	Protocol Type	Source IPv6 Address	Source IPv6 Prefix Length
□	3	Permit		6		g7	False	6 (TCP)	2006:ed12:8218::	128

The previous figure does not show all columns.

If no rules exists, the IPv6 ACL Rule Table shows the message *No rules have been configured for this ACL*. If one or more rules exist for the ACL, the rules display in the IPv6 ACL Rule Table.

6. From the **ACL Name** menu, select the IPv6 ACL for which you want to add a rule.
7. Click the **Add** button.



IPv6 ACL Rule Configuration

ACL Name	IPv6_ACL1				
Sequence Number	0				
Action	○ Permit ● Deny	Egress Queue	(0-7)		
Logging	● Disable	○ Enable			
Interface	● Mirror ○ Redirect				
Match Every	● Disable	○ Enable			
Protocol Type	IPv6		(0 to 255)		
Src	● IPv6 Address ○ Host				
Src L4	○ Port ○ Range	Other Start Port	Equal Other	(0 to 65535) (0 to 65535) End Port	
Dst	● IPv6 Address ○ Host				
Dst L4	○ Port ○ Range	Other Start Port	Equal Other	(0 to 65535) (0 to 65535) End Port	
ICMPv6	○ Type ○ Message	(0 to 255)	Code	(0 to 255)	
Fragments	● Disable	○ Enable			
Routing	● Disable	○ Enable			
Flow Label	(0 to 1048575)				
IPv6 DSCP Service		(0-63)			

The previous figure does not show the rightmost fields.

8. Configure the following match criteria for the rule:
   - **Sequence Number**. Enter a whole number in the range of 1 to 2147483647 that is used to identify the rule. An extended IP ACL can contain up to 50 rules.

- **Action**. Select the ACL forwarding action by selecting one of the following radio buttons:
  - **Permit**. Forward packets that meet the ACL criteria.
  - **Deny**. Drop packets that meet the ACL criteria.
- **Egress Queue**. If you select the **Permit** radio button, select the hardware egress queue identifier that is used to handle all packets matching this IPv6 ACL rule. The range of queue IDs is 0 to 7.
- **Logging**. If you select the **Deny** radio button, you can enable logging for the ACL by selecting the **Enable** radio button. (Logging is subject to resource availability in the device.)

  If the access list trap flag is also enabled, periodic traps are generated, indicating the number of times this rule was evoked during the report interval. A fixed five-minute report interval is used for the switch. A trap is not issued if the ACL rule hit count is zero for the current interval.
- **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**. Select whether all packet must match the selected IPv6 ACL rule:
  - **Disable**. Not all packets need to match the selected IPv6 ACL rule. You can configure other match criteria on the page.
  - **Enable**. All packets must match the selected IPv6 ACL rule and are either permitted or denied. In this case, you cannot configure other match criteria on the page.
- **Protocol Type**. Specify the IPv6 protocol type in one of the following ways:
  - From the **Protocol Type** menu, select **IPv6**, **ICMPv6**, **TCP**, or **UDP**.
  - From the **Protocol Type** menu, select **Other**, and in the associated field, specify an integer ranging from 0 to 255. This number represents the IPv6 protocol.
- **Src**. In the **Src** field, enter a source IPv6 address or source IPv6 address range to be compared to a packet's source IPv6 address as a match criterion for the selected IPv6 ACL rule:
  - If you select the **IPv6 Address** radio button, enter an IPv6 address or IPv6 range 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 numbers using 16-bit values between colons.

- **Src L4**. The options are available only when the 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:

  - **Port radio button**. If you select the **Port** radio button, you can either enter the port number yourself or select one of the following protocols from the menu:
    - The source IP TCP port protocols are **domain**, **echo**, **ftp**, **ftpdata**, **www-http**, **smtp**, **telnet**, **pop2**, **pop3**, and **bgp**.
    - The source IP UDP port protocols are **domain**, **echo**, **snmp**, **ntp**, **rip**, **time**, **who**, and **tftp**.

    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 protocol.
    - **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 protocol.
    - **Less Than**. The IPv6 ACL rule matches if the Layer 4 source port number is less than the specified port number.
    - **Greater Than**. The IPv6 ACL rule matches if the Layer 4 source port number is greater than the specified port number.
  - **Range radio button**. 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.

    You can either enter the port range yourself or select one of the following protocols from the menu:

    - The source IP TCP port protocols are **domain**, **echo**, **ftp**, **ftpdata**, **www-http**, **smtp**, **telnet**, **pop2**, **pop3**, and **bgp**.
    - The source IP UDP port protocols are **domain**, **echo**, **snmp**, **ntp**, **rip**, **time**, **who**, and **tftp**.

    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 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 criterion 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 numbers using 16-bit values between colons.

- **Dst L4**. The options are available only when the 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:

  - **Port radio button**. If you select the **Port** radio button, you can either enter the port number yourself or select one of the following protocols from the menu:
    - The destination IP TCP port protocols are **domain**, **echo**, **ftp**, **ftpdata**, **www-http**, **smtp**, **telnet**, **pop2**, **pop3**, and **bgp**.
    - The destination IP UDP port protocols are **domain**, **echo**, **snmp**, **ntp**, **rip**, **time**, **who**, and **tftp**.

    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 protocol.
    - **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 protocol.
    - **Less Than**. The IPv6 ACL rule matches if the Layer 4 destination port number is less than the specified port number.
    - **Greater Than**. The IPv6 ACL rule matches if the Layer 4 destination port number is greater than the specified port number.
  - **Range radio button**. 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.

You can either enter the port range yourself or select one of the following protocols from the menu:

- The destination IP TCP port protocols are **domain**, **echo**, **ftp**, **ftpdata**, **www-http**, **smtp**, **telnet**, **pop2**, **pop3**, and **bgp**.
- The destination IP UDP port protocols are **domain**, **echo**, **snmp**, **ntp**, **rip**, **time**, **who**, and **tftp**.

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 port numbers. If you select **Other** from the menu but leave the fields blank, it means *any*.

- **ICMPv6**. Select either the **Type** or **Message** radio button:
  - **Type radio button**. If you select the **Type** radio button, note the following:
    - The **Type** and **Message** 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 **Message** 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*.
  - **Message radio button**. If you select the **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 the **Enable** radio button to allow initial fragments (that is, the fragment bit is asserted) or leave the default **Disable** radio button selected 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.
- **Routing**. Either select the **Enable** radio button to match packets that include a routing extension header or leave the default **Disable** radio button selected to ignore the routing extension headers in packets.
- **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 6 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.

9. Click the **Apply** button.

   Your settings are saved.

Modify the Match Criteria for an IPv6 ACL Rule

➢ **To modify the match criteria for an IPv6 ACL rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IPv6 Rules**.

   The IPv6 Rules page displays.

6. From the **ACL Name** menu, select the ACL that includes the rule that you want to modify.
7. In the IPv6 ACL Rule Table, click the rule.

   The rule is a hyperlink. The IPv6 ACL Rule Configuration page displays.

8. Modify the IPv6 ACL rule criteria.
9. Click the **Apply** button.

   Your settings are saved.

Delete an IPv6 ACL Rule

- **To delete an IPv6 ACL rule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IPv6 Rules**.

   The IPv6 Rules page displays.

6. From the **ACL Name** menu, select the ACL that includes the rule that you want to delete.
7. In the IPv6 ACL Rule Table, select the check box that is associated with the rule.
8. Click the **Delete** button.

   The rule is removed.

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.

If resources on the switch are insufficient, an attempt to bind an ACL to an interface fails. You cannot bind an IPv4 ACL and an IPv6 ACL to the same interface.

- **To bind an IP ACL to one or more interfaces:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

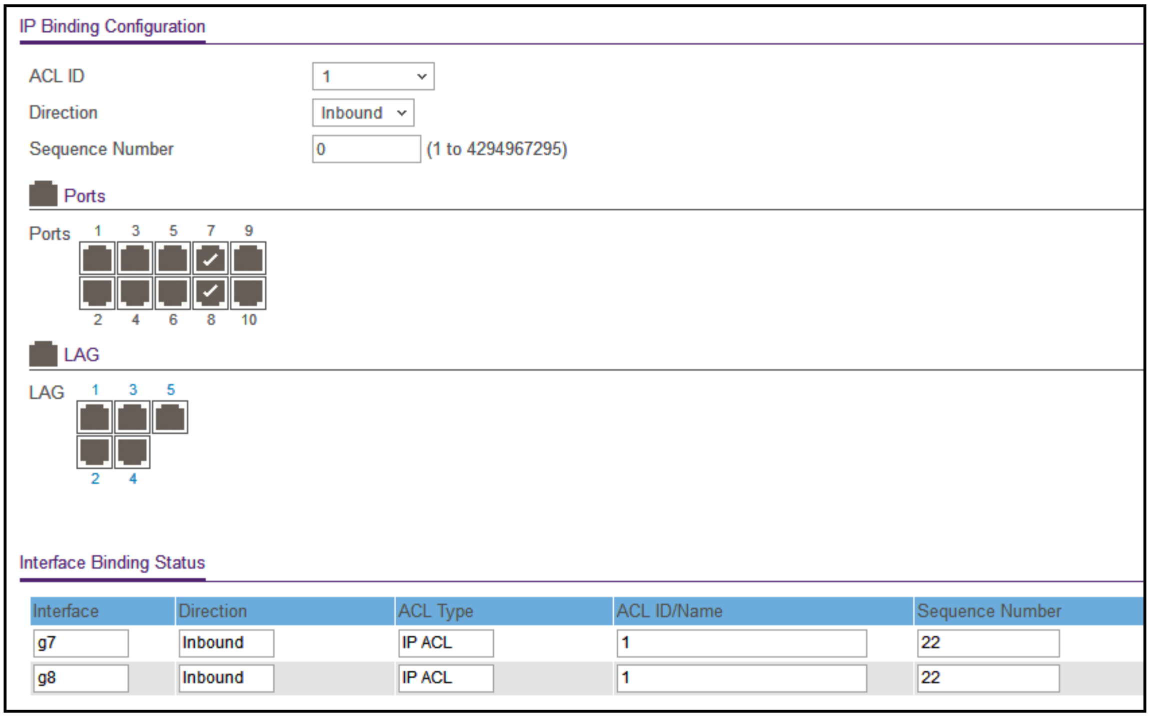
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > IP Binding Configuration**.



IP Binding Configuration

ACL ID	1
Direction	Inbound
Sequence Number	0 (1 to 4294967295)

Ports

Ports

1	3	5	7	9
□	□	□	✓	□
□	□	□	✓	□
2	4	6	8	10

LAG

LAG

1	3	5
□	□	□
□	□	
2	4	

Interface Binding Status

Interface	Direction	ACL Type	ACL ID/Name	Sequence Number
g7	Inbound	IP ACL	1	22
g8	Inbound	IP ACL	1	22

6. From the **ACL ID** menu, select an existing IP ACL for you which you want to add an IP ACL interface binding.

   The fixed selection from the **Direction** menu is **Inbound**, which means that MAC ACL rules are applied to traffic entering the interface.

7. In the **Sequence Number** field, optionally specify a number to indicate the order of the 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 number greater than the highest sequence number currently in use for this interface and direction is used. The valid range is 1–4294967295.

8. To add the selected ACL to a port or LAG, in the Ports table or LAG table, click the port or LAG so that a check mark displays.

   You can add the ACL to several ports and LAGs.

The Ports and LAG tables display the available and valid interfaces for ACL binding. All nonrouting physical interfaces, VLAN interfaces, and interfaces participating in LAGs are listed.

9. Click the **Apply** button.

   Your settings are saved.

The following table describes the nonconfigurable information displayed on the page.

Table 79. IP Binding Status table

Field	Description
Interface	The selected interface.
Direction	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 (for an IP ACL) or ACL name (for a named IP ACL or IPv6 ACL) identifying the ACL assigned to the selected interface and direction.
Sequence Number	The sequence number signifying the order of specified ACL relative to other ACLs assigned to the selected interface and direction.

View or Delete IP ACL Bindings in the IP ACL Binding Table

You can view or delete the IP ACL bindings.

➢ **To view or delete IP ACL bindings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL > Advanced > Binding Table**.

   The IP ACL Binding Table displays.

6. To delete an IP ACL-to-interface binding, do the following:

a. Select the check box next to the interface.

b. Click the **Delete** button.

The binding is removed.

The following table describes the information displayed in the IP ACL Binding Table.

Table 80. IP ACL Binding Table

Field	Description
Interface	The interface.
Direction	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 (for an IP ACL) or ACL name (for a named IP ACL or IPv6 ACL) identifying the ACL assigned to the selected interface and direction.
Sequence Number	The sequence number signifying the order of the specified ACL relative to other ACLs assigned to the selected interface and direction.

Configure VLAN ACL Bindings

You can associate an ACL with a VLAN. When an ACL is associated with a VLAN, it is applied to all interfaces that are members of the VLAN.

➢ **To configure VLAN ACL bindings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Security > ACL> Advanced > VLAN Binding Configuration**.

   The VLAN Binding Configuration page displays.

6. In the **VLAN ID** field, enter the VLAN ID to which the binding must apply.

7. From the **Direction** menu, select the packet filtering direction.
8. 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.

9. From the **ACL Type** menu, select the type of ACL.

   Valid ACL types include IP ACL, MAC ACL, and IPv6 ACL.

10. From the **ACL ID** list, select the ID or name of the ACL that must be bound to the specified VLAN.
11. Click the **Add** button.

    The VLAN ACL binding is added.

Perform Maintenance Tasks

7

This chapter covers the following topics:

- *Reboot the Switch*
- *Reset the Switch to Its Factory Default Settings*
- *Export a File From the Switch*
- *Download a File to the Switch*
- *Manage Software Images*
- *Perform Troubleshooting Tasks*

Reboot the Switch

You can reboot the switch from the local browser interface.

Note: The switch provides a recessed multi-function **Reset** button on the back panel that lets you reboot (power-cycle) the switch. To reboot the switch, press the **Reset** button for about two seconds. (Do not press the button for more than five seconds!) The switch restarts but retains its custom settings.

➢ **To reboot the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Reset > Device Reboot**.
6. The Device Reboot page displays.
7. Select the check box.
8. Click the **Apply** button.

   The switch reboots.

Reset the Switch to Its Factory Default Settings

You can reset the system configuration to the factory default values. All changes that you made are lost. If the IP address changes, your web session might disconnect.

If you added the switch to a network on the Insight app before, all Insight-manageable device settings are returned to the last configuration saved on the cloud server, including the switch password (that is, the password is reset to the Insight network password). Otherwise, the IP address is reset to 192.168.0.239, the DHCP client is enabled, and the password is reset to

password. The default management mode is reset to NETGEAR Insight Mobile App and Insight Cloud Portal.

For information about reconnecting to the switch, see *Access the Switch* on page 13.

For information about changing the management mode, see *Change the Management Mode of the Switch* on page 20.

Note: The switch provides a recessed multi-function **Reset** button on the back panel that lets you return the switch to its factory default settings, causing all custom settings to be erased. The factory default settings function of the **Reset** button is available only after you use the NETGEAR Insight app to remove the switch from your network. After you use the NETGEAR Insight app to remove the switch from your network, press the **Reset** button for at least five seconds. The switch restarts and returns to its factory default settings.

➢ **To reset the switch to the factory default settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Reset > Factory Default**.

   The Factory Default page displays.

6. Select the check box.
7. Click the **Apply** button.

   A confirmation pop-up window opens.

8. Click the **OK** button to confirm.

   All configuration settings are reset to their factory default values. All changes that you made are lost, even if you saved the configuration.

Export a File From the Switch

You can export configuration (ASCII or log ASCII) files from the switch to a file server by using TFTP or HTTP.

The following sections describe how you can export a file from the switch:

- *Export a File to the TFTP Server* on page 331
- *Use an HTTP Sessions to Export a File* on page 332

Export a File to the TFTP Server

You can upload (export) configuration (ASCII or log ASCII) files from the switch to a TFTP server on the network.

➢ **To export a file from the switch to a TFTP server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Export > TFTP File Export**.

   The TFTP File Export page displays.

6. From the **File Type** menu, select the type of file:
   - **Text Configuration**. A text-based configuration file enables you to edit a configured text file (`startup-config`) offline as needed. The most common usage of text-based configuration is to upload a working configuration from a device, edit it offline to personalize it for another similar device (for example, change the device name or IP address), and download it to that device.
   - **Error Log**. The system error (persistent) log, also referred to as the event log.
   - **Trap Log**. The trap log with the system trap records.
   - **Buffered Log**. The system buffered (in-memory) log.

- **Tech Support**. The tech support file is a text-base file that contains a variety of hardware, software, and configuration information that can assist in device and network troubleshooting.
- **Crash Logs**. Specify the crash logs to retrieve them.

7. From the **Server Address Type** menu, select the format for the **Server Address** field:
   - **IPv4**. Indicates that the TFTP server address is an IP address in dotted-decimal format. This is the default setting.
   - **DNS**. Indicates that the TFTP server address is a host name.
8. In the **Server Address** field, enter the IP address of the server in accordance with the format indicated by the server address type.

   The default is the IPv4 address 0.0.0.0.
9. In the **Transfer File Path** field, specify the path on the TFTP server where you want to save the file.

   You can enter up to 32 characters. Include the backslash at the end of the path. A path name with a space is not accepted. Leave this field blank to save the file to the root TFTP directory.
10. In the **Transfer File Name** field, specify a destination file name for the file to be uploaded.

    You can enter up to 32 characters. The transfer fails if you do not specify a file name. For an archive transfer, use a `.stk` file extension.
11. Select the **Start File Transfer** check box.
12. Click the **Apply** button.

    The file transfer begins.

    The page displays information about the file transfer progress. The page refreshes automatically when the file transfer completes (or if it fails).

Use an HTTP Sessions to Export a File

You can upload (export) files of various types from the switch to a management system through an HTTP session by using your web browser.

➢ **To export a file from the switch to another system by using HTTP:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Export > HTTP File Export**.

   The HTTP File Export page displays.

6. From the **File Type** menu, select the type of file:

   - **Text Configuration**. A text-based configuration file enables you to edit a configured text file (`startup-config`) offline as needed. The most common usage of text-based configuration is to upload a working configuration from a device, edit it offline to personalize it for another similar device (for example, change the device name or IP address), and download it to that device.
   - **Tech Support**. The tech support file is a text-base file that contains a variety of hardware, software, and configuration information that can assist in device and network troubleshooting.
   - **Crash Logs**. Specify crash logs to retrieve them.

7. Click the **Apply** button.

   The file transfer begins.

   The page displays information about the file transfer progress. The page refreshes automatically when the file transfer completes (or if it fails).

Download a File to the Switch

You can manually check for the latest firmware version through the local browser interface of the switch, download the firmware, and upload the firmware to the switch. If firmware release notes are available with new firmware, read the release notes to find out if you must reconfigure the switch after updating.

You can download system files from a remote system to the switch by using either TFTP or HTTP. This download process is referred to as an upgrade.

The following sections describe how you can download a file to the switch:

- *Download a File to the Switch Using TFTP* on page 333
- *Download a File to the Switch Using HTTP* on page 335

Download a File to the Switch Using TFTP

You can upgrade software and download the image file, the configuration files, and SSL files from a TFTP server 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 contains a path to the TFTP server.

You can also download files by using HTTP. See *Download a File to the Switch Using HTTP* on page 335 for additional information.

➢ **To download a file to the switch from a TFTP server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Upgrade > TFTP File Upgrade**.

   The TFTP File Upgrade page displays.

6. From the **File Type** menu, select the type of file:
   - **Software**. The system software image, which is saved in one of two flash sectors called images (image1 and image2). The active image stores the active copy, while the other image stores a second copy. The device boots and runs from the active image. If the active image is corrupted, the system automatically boots from the nonactive image. This is a safety feature for faults occurring during the boot upgrade process. The default setting is Archive.
   - **Text Configuration**. A text-based configuration file enables you to edit a configured text file (`startup-config`) offline as needed. The most common usage of text-based configuration is to upload a working configuration from a device, edit it offline to personalize it for another similar device (for example, change the device name or IP address), and download it to that device.
   - **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).

7. If the selection from the **File Type** menu is **Software**, the **Image Name** menu is displayed and you must select the software image that must be downloaded to the switch:
   - **image1.** Select image1 to upload image1.
   - **image2**. Select image2 to upload image2.

   Note: We recommended that you do not overwrite the active image. If you do so, the switch displays a warning that you are trying to overwrite the active image.

8. From the **Server Address Type** menu, select the format for the **TFTP Server IP** field:
   - **IPv4**. Indicates that the TFTP server address is an IP address in dotted-decimal format. This is the default setting.
   - **DNS**. Indicates that the TFTP server address is a host name.
9. In the **TFTP Server IP** field, enter the IP address of the TFTP server indicated by the server address type.

   The default is the IPv4 address 0.0.0.0.
10. In the **Transfer File Path** field, specify the path on the TFTP server where the file is located.

    Enter up to 160 characters. Include the backslash at the end of the path. A path name with a space is not accepted. Leave this field blank to save the file to the root TFTP directory.
11. In the **Remote File Name** field, specify the name of the file to download from the TFTP server.

    You can enter up to 32 characters. A file name with a space is not accepted.
12. Select the **Start File Transfer** check box to initiate the file upload.
13. Click the **Apply** button.

    The file transfer begins.

    The page displays information about the progress of the file transfer. The page refreshes automatically when the file transfer completes (or if it fails).

    To activate a software image that you downloaded to the switch, see *Manage Software Images* on page 337.

Download a File to the Switch Using HTTP

You can upgrade software and download the image file, the configuration files, and SSL files to the switch through an HTTP session by using your web browser.

➢ **To download a file to the switch using HTTP:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Maintenance > Upgrade > HTTP File Upgrade**.

   The HTTP File Upgrade page displays.
6. From the **File Type** menu, select the type of file:
   - **Software**. The system software image, which is saved in one of two flash sectors called images (image1 and image2). The active image stores the active copy, the other image stores a second copy. The device boots and runs from the active image. If the active image is corrupted, the system automatically boots from the nonactive image. This is a safety feature for faults occurring during the boot upgrade process. The default setting is Archive.
   - **Text Configuration**. A text-based configuration file enables you to edit a configured text file (`startup-config`) offline as needed. The most common usage of text-based configuration is to upload a working configuration from a device, edit it offline to personalize it for another similar device (for example, change the device name, serial number, IP address), and download it to that device.
   - **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).
7. If the selection from the **File Type** menu is **Software**, the **Image Name** menu is displayed and you must select the software image that must be downloaded to the switch:
   - **image1.** Select image1 to upload image1.
   - **image2**. Select image2 to upload image2.

   Note: We recommended that you do not overwrite the active image. If you do so, the switch displays a warning that you are trying to overwrite the active image.
8. Select the Select File **Browse** button and locate the file that you want to download.

The file name can contain up to 80 characters.

9. Click the **Apply** button.

   The file transfer begins.

   The page displays information about the progress of the file transfer. The page refreshes automatically when the file transfer completes (or if it fails).

Note: After a file transfer is started, wait until the page refreshes. When the page refreshes, the option to select a file option is no longer available, indicating that the file transfer is complete.

To activate a software image that you downloaded to the switch, see *Manage Software Images* on page 337.

Note: After a text configuration file is downloaded, the switch applies the configuration automatically.

Manage Software Images

The system maintains two versions of the switch software 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.

A legacy software version can ignore (that is, might not load) a configuration file that is created by a newer software version. When a configuration file created by the newer software version is discovered by the system running an older version of the software, the system displays an appropriate warning.

The following sections describe how you can manage the images:

- *Copy an Image* on page 337
- *Configure Dual Image Settings* on page 338

Copy an Image

You can copy an image from one location (primary or backup) to another.

➤ **To copy an image:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Maintenance > File Management > Copy**.

   The Copy page displays.
6. Select the Source Image **image1** or **image2** radio button to specify the image to be copied.
7. Select the Destination Image **image1** or **image2** radio button to specify the destination image.
8. Click the **Apply** button.

   Your settings are saved.

Configure Dual Image Settings

The Dual Image feature allows the switch to retain two images in permanent storage. You can select which image to load during the next boot cycle, configure an image description, or delete an image. This feature reduces switch down time when you are upgrading or downgrading the software image.

Change the Image That Loads During the Boot Process

➢ **To change the image that loads during the boot process:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Maintenance > File Management > Dual Image > Dual Image Configuration**.

   The Dual Image Configuration page displays.

6. From the **Image Name** menu, select the image that is *not* the image displayed in the Current-active field.

   The Current-active field displays the name of the active image.

7. To specify a name for the selected image, enter one in the **Image Description** field.
8. Select the **Activate Image** check box.
9. 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 code. The switch continues running the image shown in the Current-active field until the switch reboots.

Delete an Image

➢ **To delete an image:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > File Management > Dual Image > Dual Image Configuration**.

   The Dual Image Configuration page displays.

6. From the **Image Name** menu, select the image that is *not* the image displayed in the Current-active field.

   The Current-active field displays the name of the active image. You cannot delete the active image.

7. Select the **Delete** Image check box.
8. Click the **Apply** button.

   The image is removed.

View the Dual Image Status

You can view information about the active and backup images on the switch.

➢ **To view dual image status information:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > File Management > Dual Image > Dual Image Status**.

   The Dual Image Status page displays.

The following table describes the information available on the page.

Table 81. Dual Image Status information

Field	Description
Image1 Ver	The version of the image1 code file.
Image2 Ver	The version of the image2 code file.
Current-active	The currently active image on this switch.
Next-active	The image to be used on the next restart of this switch.
Image1 Description	The description associated with the image1 code file.
Image2 Description	The description associated with the image2 code file.

Perform Troubleshooting Tasks

You can send a ping or a traceroute.

The following sections describe how you can troubleshoot the switch and the network:

- *Send an IPv4 Ping* on page 341
- *Send an IPv6 Ping* on page 342
- *Send an IPv4 Traceroute* on page 344
- *Send an IPv6 Traceroute* on page 345
- *Enable Remote Diagnostics* on page 347

Send an IPv4 Ping

You can configure the switch to send a ping request to a specified IP address. You can use this to 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 send an IPv4 ping:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Troubleshooting > Ping IPv4**.

The Ping Details page displays.

6. In the **IP Address/Host Name** field, enter the IP address or host name of the device that must be pinged.
7. In the **Count** field, enter the number of echo requests that must be sent.

   The default value is 3. The range is 1 to 15.

8. In the **Interval** field, enter the time between ping packets in seconds.

   The default value is 3 seconds. The range is 1 to 60.

9. In the **Size** field, enter the size of the ping packet. The default value is 0 bytes. The range is 0 to 13000.
10. From the **Source** menu, select the IP address or interface that must be used to send echo request packets:
    - **None**. The source address of the ping packet is the address of the default egress interface.
    - **IP Address**. The source IP address that must be used when echo request packets are sent. With this selection, the **IP Address** field displays and you must enter the IP address that must be used as the source.
    - **Interface**. The interface that must be used when echo request packets are sent. With this selection, the **Interface** menu displays and you must select an interface as the source.
11. Click the **Apply** button.

    The specified address is pinged. The results are displayed below the configurable data in the Results field.

Send an IPv6 Ping

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 send an IPv6 ping:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Troubleshooting > Ping IPv6**.

   The Ping IPv6 page displays.

6. From the **Ping** menu, select the type of ping:
   - **Global**. Pings a global IPv6 address.
   - **Link Local**. Pings a link-local IPv6 address over a specified interface. With this selection, the **Interface** menu displays, and you must select the interface.

7. In the **IPv6 Address/Hostname** field, enter the IPv6 address or host name of the station that must be pinged.

   The format is xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx. The maximum number of characters is 255.

8. In the **Count** field, enter the number of echo requests that must be sent.

   The range is 1 to 15. The default value is 3.

9. In the **Interval** field, enter the time in seconds between ping packets.

   The range is 1 to 60. The default value is 3.

10. In the **Datagram Size** field, enter the datagram size.

    The valid range is 0 to 13000. The default value is 0 bytes.

11. From the **Source** menu, select the IP address or interface that must be used to send echo request packets:
    - **None**. The source address of the ping packet is the address of the default egress interface.
    - **IPv6 Address**. The source IP address that must be used when echo request packets are sent. With this selection, the **IPv6 Address** field displays and you must enter the IPv6 address that must be used as the source.
    - **Interface**. The interface that must be used when echo request packets are sent. With this selection, the **Interface** menu displays and you must select an interface as the source.

12. Click the **Apply** button.

    The specified address is pinged. The results are displayed below the configurable data in the Results field.

Send an IPv4 Traceroute

You can configure the switch to send a traceroute request to a specified IP address or host name. You can use this to discover the paths that 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 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 send an IPv4 traceroute:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Troubleshooting > Traceroute IPv4**.

   The Traceroute page displays.

6. In the **IP Address/Hostname** field, enter the IP address or host name of the device for which the path must be discovered.
7. In the **Probes Per Hop** field, enter the number of probes per hop.

   The default value is 3. The range is 1 to 10.

8. In the **Max TTL** field, enter the maximum time to live (TTL) for the destination.

   The default value is 30. The range is 1 to 255.

9. In the **Init TTL** field, enter the initial TTL to be used.

   The default value is 1. The range is 1 to 255.

10. In the **MaxFail** field, enter the maximum number of failures allowed in the session.

    The default value is 5. The range is 1 to 255.

11. In the **Interval** field, enter the time between probes in seconds.

    The default value is 3. The range is 1 to 60.

12. In the **Port** field, enter the UDP destination port for the probe packets.

    The default value is 33434. The range is 1–65535.

13. In the **Size** field, enter the size of the probe packets.

    The default value is 0. The range is 0 to 39936.

14. From the **Source** menu, select the IP address or interface that must be used to send echo request packets:
    - **None**. The source address for the traceroute is the address of the default egress interface.
    - **IP Address**. The source IP address that must be used for the traceroute. With this selection, the **IP Address** field displays and you must enter the IP address that must be used as the source.
    - **Interface**. The interface that must be used for the traceroute. With this selection, the **Interface** menu displays and you must select an interface as the source.

15. 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 Results field.

Send an IPv6 Traceroute

You can configure the switch to send a traceroute request to a specified IPv6 address or host name. You can use this to discover the paths that 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 send an IPv6 traceroute:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Maintenance > Troubleshooting > Traceroute IPv6**.

   The Traceroute IPv6 page displays.

6. In the **IPv6 Address/Host Name** field, enter the IPv6 address or host name of the device for which the path must be discovered.
7. In the **Probes Per Hop** field, enter the number of probes per hop.

   The default value is 3. The range is 1 to 10.

8. In the **Max TTL** field, enter the maximum time to live (TTL) for the destination.

   The default value is 30. The range is 1 to 255.

9. In the **Init TTL** field, enter the initial TTL to be used.

   The default value is 1. The range is 1 to 255.

10. In the **MaxFail** field, enter the maximum number of failures allowed in the session.

    The default value is 5. The range is 1 to 255.

11. In the **Interval** field, enter the time between probes in seconds.

    The default value is 3. The range is 1 to 60.

12. In the **Port** field, enter the UDP destination port for the probe packets.

    The default value is 33434. The range is 1–65535.

13. In the **Size** field, enter the size of the probe packets.

    The default value is 0. The range is 0 to 39936.

14. From the **Source** menu, select the IP address or interface that must be used to send echo request packets:
    - **None**. The source address for the traceroute is the address of the default egress interface.
    - **IP Address**. The source IP address that must be used for the traceroute. With this selection, the **IPv6 Address** field displays and you must enter the IPv6 address that must be used as the source.
    - **Interface**. The interface that must be used for the traceroute. With this selection, the **Interface** menu displays and you must select an interface as the source.
15. 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 Results field.

Enable Remote Diagnostics

You can enable or disable the option to access the switch remotely. When remote access is enabled, you can perform diagnostics services.

➢ **To enable remote diagnostics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Maintenance > Troubleshooting > Remote Diagnostics**.

   The Remote Diagnostics page displays.

6. Select the **Enable** radio button.
7. Click the **Apply** button.

   Your settings are saved.

8. Manage Power over Ethernet

8

This chapter covers the following topics:

- *PoE Overview*
- *Device Class Power Requirements*
- *Power Allocation and Power Budget*
- *Configure the Global PoE Settings*
- *Manage and View the PoE Port Configuration*
- *Reset One or More PoE or PoE+ Ports*
- *Set Up PoE Timer Schedules*

Note: This chapter applies to models GC110P, GC510P, and GC510PP. Model GC110 does not support Power over Ethernet.

PoE Overview

Depending on the model, the switch includes eight Power over Ethernet plus (PoE) or PoE plus (PoE+) ports.

The following table shows the capacity for each model.

Table 82. PoE capacities for each model

Model	Maximum PoE Power Per Port	Maximum Power Budget Across All Active PoE Ports
GC110	PoE is not supported	PoE is not supported
GC110P	15.4W PoE (IEEE 802.3af)	62W
GC510P	30W PoE+ (IEEE 802.3at)	124W
GC510PP	30W PoE+ (IEEE 802.3at)	195W

By default, supplied power is prioritized in ascending port order, up to the total power budget of the device. If the power requirements for the attached devices exceed the total power budget of the switch, the power to the device on the highest-numbered PoE or PoE+ port is disabled to make sure that the devices connected to the higher-priority, lower-numbered PoE or PoE+ ports are supported first.

It is important to note that although a device is listed as an 802.3at (PoE+) powered or 802.3af (PoE) powered device, it might not require the maximum power limit that is specified. Many devices require less power, allowing all eight PoE ports to be active simultaneously, when the devices correctly report their PoE class to the switch.

Device Class Power Requirements

PoE and PoE+ use Ethernet cables to supply power to PoE-capable devices on the network, such as WiFi access points, IP cameras, VoIP phones, and switches. The switch is compliant with the IEEE 802.3at standard (PoE+) and backward compatible with the IEEE 802.3af standard (PoE). The switch can pass power through to any powered device (PD) that supports these standards. PoE and PoE+ let you power such devices without the need for a separate power supply.

The switch supports a Plug-and-Play process by which it detects the type of device that is connected to one of its PoE+ ports and whether that device needs power and how much so that the switch can provide the correct power the device.

During the Plug-and-Play process, the connected device can provide its Class response to the switch in many ways, depending on how the vendor programmed the device.

The following table shows the device classes for PoE+ devices adhering to the IEEE 802.3at standard. The device classes for PoE devices adhering to the IEEE 802.3af standard are identical with the exception that Device Class 4 is not supported.

Table 83. PoE and PoE+ device class power allocation

Device Class	Standard	Range of Power Delivered to the Powered Device	Minimum Output at PoE Switch Port (Minimum Allocated)	Maximum Output at PoE Switch Port (Maximum Allocated)
0	PoE and PoE+	0.44W–12.95W	15.4W	16.2W
1	PoE and PoE+	0.44W–3.84W	4.0W	4.2W
2	PoE and PoE+	3.84W–6.49W	7.0W	7.4W
3	PoE and PoE+	6.49W–12.95W	15.4W	16.2W
4	PoE+ only	12.95W–25.5W	30.0W	31.6W

Power Allocation and Power Budget

The switch is a smart switch in that it can allocate the required power to a connected device by using a prioritization scheme: By default, power is supplied in ascending port order (that is, lower port numbers are served first) until the power budget is consumed and insufficient power remains to allocate to the next device. When less than 7W of PoE power is available on a port, the port PoE LED lights yellow, and the attached device does not receive power from the port. However, the switch continues to send data through the port connection.

The switch is also a smart switch in that it can override the IEEE power classification of a powered device (PD): If the PD consumes less power than required by its power classification, the switch provides only the power that the PD consumes instead of the power that is required by the PD’s power classification.

If some PoE+ ports are in use and deliver power, you can calculate the available power budget for the other PoE+ ports by subtracting the consumed (that is, delivered power) from the total available power budget. (For information about the total available power budget, see *PoE Overview* on page 349.)

An example for model GC510P:
Port 1 delivers 4.4W to a PD. The available power budget is 119.6W (124W–4.4W).

Another example for model GC510P:
A Class 4 PD is attached to Port 1, a Class 2 PD to Port 2, and another Class 4 PD to Port 3. However, the PDs consume less power than defined by their classes: The PD attached to Port 1 consumes 7.3W, the PD attached to Port 2 consumes 4.7W, and the PD attached to Port 3 consumes 8.9W. So even though the switch provides power to two Class 4 devices and one Class 3 device, the available power budget is 103.1W (124W–7.3–4.7–8.9W).

➢ **To determine the delivered power by PoE or PoE+ ports:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

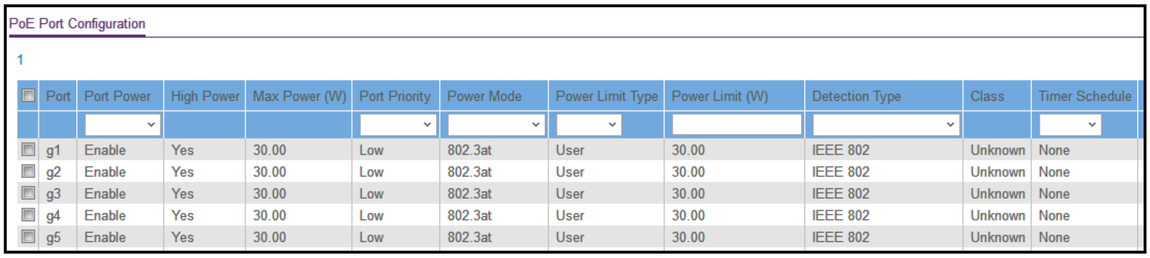
   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. **Select System > PoE > Advanced > PoE Port Configuration**.



PoE Port Configuration

1

☐	Port	Port Power	High Power	Max Power (W)	Port Priority	Power Mode	Power Limit Type	Power Limit (W)	Detection Type	Class	Timer Schedule
		⌄			⌄	⌄	⌄		⌄		⌄
☐	g1	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None
☐	g2	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None
☐	g3	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None
☐	g4	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None
☐	g5	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None

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

   The delivered power is stated in the Output Power (mW) column (which is not shown in the previous figure).

Configure the Global PoE Settings

➢ **To configure the global PoE settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

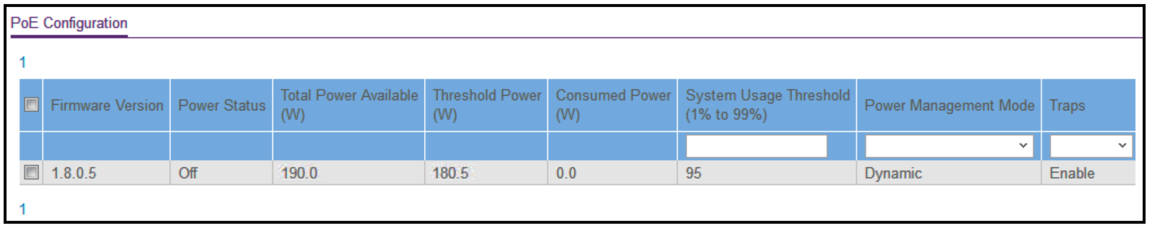
   The login window opens.

4. Enter the switch’s password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

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



PoE Configuration

1

☐	Firmware Version	Power Status	Total Power Available (W)	Threshold Power (W)	Consumed Power (W)	System Usage Threshold (1% to 99%)	Power Management Mode	Traps
☐	1.8.0.5	Off	190.0	180.5	0.0	95	Dynamic	Enable

1

6. In the **System Usage Threshold** field, enter a number from 1 to 99 to set the threshold level at which a trap is sent if the consumed power exceeds the threshold power.
7. From the **Power Management mode** menu, select the power management algorithm that the switch uses to deliver power to the requesting powered devices (PDs):
   - **Static**. Specifies that the power allocated for each port depends on the type of power threshold configured on the port.
   - **Dynamic**. Specifies that the power consumption on each port is measured and calculated in real time.
8. To active the PoE traps, from the **Traps** menu, select **Enable**.

   Selecting **Disable** deactivates the PoE traps. The default setting is Enabled.
9. Click the **Apply** button.

   Your setting are saved.

The following table describes the nonconfigurable fields on the page.

Table 84. PoE Configuration fields

Field	Description
Firmware Version	The firmware version of the PoE firmware component.
Power Status	The power status.
Total Power Available (W)	The maximum amount of power in watts that the switch can deliver to all ports.
Threshold Power (W)	If the consumed power is below the threshold power, the switch can power up another port. The consumed power can be between the nominal and threshold power. The threshold power is displayed in watts. **Note:** The threshold power value is determined by the value that you enter in the **System Usage Threshold** field.
Consumed Power (W)	The total amount of power in watts that is being delivered to all ports.

Manage and View the PoE Port Configuration

Depending on the model, the switch includes eight PoE or PoE+ ports.

➢ **To configure and view the PoE or PoE+ port settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

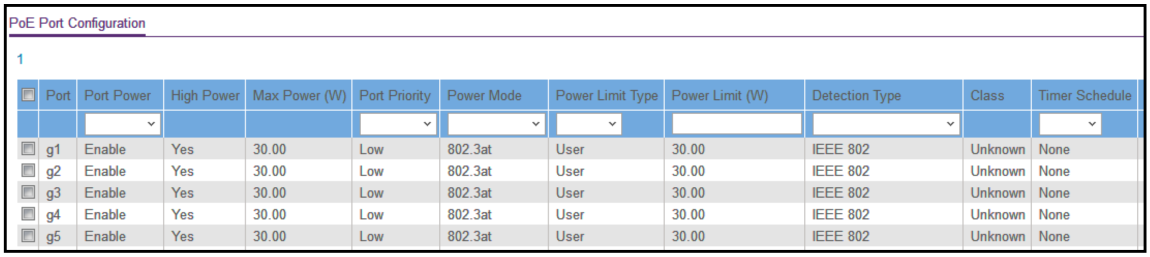
   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > PoE > Advanced > PoE Port Configuration**.



PoE Port Configuration

1

□	Port	Port Power	High Power	Max Power (W)	Port Priority	Power Mode	Power Limit Type	Power Limit (W)	Detection Type	Class	Timer Schedule
□	g1	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None
□	g2	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None
□	g3	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None
□	g4	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None
□	g5	Enable	Yes	30.00	Low	802.3at	User	30.00	IEEE 802	Unknown	None

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

6. Select the check boxes for the PoE or PoE+ ports that you want to configure or select the check box in the heading to configure all eight PoE or PoE+ ports.
7. Configure the settings as described in the following table.

The settings that you configure apply to all selected PoE or PoE+ ports.

Menu Item	Description
Port Power	Select the administrative mode of the port: • **Enable**. The port's capacity to deliver power is enabled. This is the default setting. • **Disable**. The port's capacity to deliver power is disabled.
Port Priority	The port priority determines which ports can still deliver power after the total power delivered by the switch exceeds the total power budget of 124W. (In such a situation, the switch might not be able to deliver power to all connected devices.) If the same priority applies to two ports, the lower-numbered port receives higher priority. Select one of the following priorities: • **Low**. Low priority. This is the default setting. • **Medium**. Medium priority. • **High**. High priority. • **Critical**. Critical priority.
Power Mode	Select the one of the following power modes: • **802.3af**. The port is powered in and limited to the IEEE 802.3af mode. A PD that requires IEEE 802.3at does not receive power if the port functions in IEEE 802.3af mode. • **Legacy**. The port is powered using high-inrush current, which is used by legacy PDs that require more than 15W to power up. • **Pre-802.3at**. The port is initially powered in the IEEE 802.3af mode and, before 75 msec pass, is switched to the high-power IEEE 802.3at mode. Select this mode if the PD does not perform Layer 2 classification or if switch performs 2-event Layer 1 classification. • **802.3at**. The port is powered in the IEEE 802.3at mode. This is the default mode. In this mode, if the switch detects that the attached PD is not a Class 4 device, the PD does not receive power from the switch.
Power Limit Type	The power limit type controls the maximum power that a port can deliver. Select one of the following types: • **None**. 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**. The port power limit is equal to the class of the attached PD. • **User**. The port power limit is equal to the value that is specified in the **Power Limit (W)** field. This is the default setting. **Note:** If a PD does not report its class correctly, use of these options can preserve additional PoE power by preventing the switch from delivering more power than the PD requires. However, depending on which option you select, a PD that does not report its class correctly might not power up at all.
Power Limit (W)	Enter the maximum power (in watts) that the port can deliver. The range is 3.0–30.0W, with 0.1W steps. The default is 30W.

Menu Item	Description
Detection Type	The detection type specifies how the port detects the attached PD. Select one of the following types: • **IEEE 802**. The port performs a 4-point resistive detection. This is the default setting. • **4pt 802.3af + Legacy**. The port performs a 4-point resistive detection, and if required, continues with legacy detection. • **Legacy**. The port performs legacy detection.
Timer Schedule	If you set up a PoE timer schedule, you can assign it to the port by selecting the schedule from the **Timer Schedule** menu. For information about PoE timer schedules, see *Set Up PoE Timer Schedules* on page 357. By default, the selection from the menu is None. If you want to remove a previously assigned timer schedule, select **None** from the **Timer Schedule** menu.

8. Click the **Apply** button.

   Your settings are saved.

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

Field	Description
High Power	If a port supports High Power mode, the field displays Yes.
Max Power (W)	The maximum power in watts that the port can provide.
Class	The class defines the range of power a powered device (PD) is drawing from the switch. The class definitions are as follows: • **0**: 0.44–16.2W • **1**: 0.44–4.2W • **2**: 0.44–7.4W • **3**: 0.44–16.2W • **4**: 0.44–31.6W • **Unknown**. The class cannot be detected, or no PD is attached to the port.
Output Voltage (Volts)	The voltage that is delivered to the PD in volts.
Output Current (mA)	The current that is delivered to the PD in mA.
Output Power (W)	The power that is delivered to the PD in watts.
Status	The operational status of the port. The possible values are as follows: • **Disabled**. No power is delivered. • **Delivering Power**. Power is being drawn by the PD. • **Requesting Power**. The port is requesting power. • **Fault**. A problem occurred with the power. • **Test**. The port is in test mode. • **Other Fault**. The port is idle because of an error condition. • **Searching**. The port is not in one of the other states in this list.

Field	Description
Fault Status	The error description when the PoE port is in a fault state. The possible values are as follows: • **No Error**. The port is not in any error state and can provide power. • **MPS Absent**. The port detected the absence of the main power supply, preventing the port from providing power. • **Short**. The port detected a short circuit condition, preventing the port from providing power. • **Overload**. The PD that is connected to the port attempts to draw more power than allowed by the port's settings, preventing the port from providing power at all. • **Power Denied**. The port was denied power because of a shortage of power or because of an administrative condition. In this condition, the port cannot provide power.

Reset One or More PoE or PoE+ Ports

You can forcibly reset one or more PoE or PoE+ ports on the switch. If a PoE device is attached to the port, the device restarts. Resetting a PoE or PoE+ port does not affect its data link, so if a non-PoE device is attached to the port, the device is not affected and does not restart.

➢ **To reset one or more PoE or PoE+ ports:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > PoE > Advanced > PoE Port Configuration**.

   The PoE Port Configuration page displays.

6. Select the check boxes for the PoE or PoE+ ports that you want to reset or select the check box in the heading to reset all eight PoE or PoE+ ports.
7. Click the **Power Cycle Port(s)** button.

   The ports are reset.

Set Up PoE Timer Schedules

The switch lets you define multiple timer schedules that you can use for PoE power delivery to attached PDs.

After you create a timer schedule, you can associate it with one or more PoE ports (see *Manage and View the PoE Port Configuration* on page 353). You can use a separate timer schedule for each PoE port.

After you associate a timer schedule with a PoE port, the start date and time force the PoE port to stop delivering power and the stop date and time enable the PoE port to start delivering power.

You can create absolute schedules, which apply to specific dates and times, and you can create recurring schedules.

Create a PoE Timer Schedule

The maximum number of timer schedules that you can add is 100.

➢ **To create a PoE timer schedule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Timer Schedule > Basic > Global Configuration**.

   The Timer Schedule Name page displays.

6. In the **Timer Schedule Name** field, specify the name for a timer schedule.
7. Click the **Add** button.

   The timer schedule is added to the table on the Timer Schedule Name page and is assigned an ID.

Specify the Settings for an Absolute PoE Timer Schedule

An absolute timer schedule applies to specific dates and times. The schedule is executed once only.

➢ **To specify the settings for a PoE timer schedule that uses specific dates and times:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Timer Schedule > Advanced > Timer Schedule Configuration**.

   The Timer Schedule Configuration page displays.

6. In the Timer Schedule Selection section, make your selections from the following menus:
   a. **Timer Schedule Name**. Select the name of the timer schedule that you want to configure.

      You can select only names of schedules that you created (see *Create a PoE Timer Schedule* on page 357).

   b. **Timer Schedule Type**. Select **Absolute**.

      The fields in the Timer Schedule Configuration section might adjust to let you configure a timer schedule for specific dates and times.

   c. **Timer Schedule Entry**. To add a new entry, select **new**.

      Selecting an existing entry lets you make changes to that entry.

7. In the Timer Schedule Configuration section, specify the times and dates:
   a. In the **Time Start** field, enter the time of day in the HH:MM format to specify when the timer schedule must start.
   b. In the **Time End** field, enter the time of day in the HH:MM format to specify when the timer schedule must stop.
   c. Next to the **Date Start** field, click the calendar icon and use the menus in the pop-up window to enter the date in the DD-Mon-YYYY format to specify when the timer schedule must start.

   d. Next to the **Date End** field, click the calendar icon and use the menus in the pop-up window to enter the date in the DD-Mon-YYYY format to specify when the timer schedule must stop.

8. Click the **Add** button.

   The entry for the timer schedule is added.

Specify the Settings for a Recurring PoE Timer Schedule

A recurring schedule allows you to set up a single schedule that starts at a particular date and that recurs either with a specific end date or indefinitely.

For a single recurring PoE timer schedule, you can add a daily, weekly, and monthly schedule configuration. That is, these schedule configurations are not mutually exclusive but complement each other.

➢ **To specify the settings for a PoE timer schedule that uses a recurring pattern:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Timer Schedule > Advanced > Timer Schedule Configuration**.

   The Timer Schedule Configuration page displays.

6. In the Timer Schedule Selection section, make your selections from the following menus:

   a. **Timer Schedule Name**. Select the name of the timer schedule that you want to configure.

      You can select only names of schedules that you created (see *Create a PoE Timer Schedule* on page 357).

   b. **Timer Schedule Type**. Select **Periodic**.

      The fields in the Timer Schedule Configuration section might adjust to let you configure a timer schedule with a recurrence pattern.

   c. **Timer Schedule Entry**. To add a new entry, select **new**.

Selecting an existing entry lets you make changes to that entry.

7. In the Timer Schedule Configuration section, specify the recurrence pattern:
   a. In the **Time Start** field, enter the time of day in the HH:MM format to specify when the timer schedule must start.
   b. In the **Time End** field, enter the time of day in the HH:MM format to specify when the timer schedule must stop.
   c. Next to the **Date Start** field, click the calendar icon and use the menus in the pop-up window to enter the date in the DD-Mon-YYYY format to specify when the timer schedule must start.
   d. Either select the **No End Date** radio button or select the **End Date** radio button, and next to the **End Date** field, click the calendar icon and use the menus in the pop-up window to enter the date in the DD-Mon-YYYY format to specify when the timer schedule must stop.
   e. From the **Recurrence Pattern** menu, select the pattern:
      - **Daily**. The timer schedule works with daily recurrence. The fields adjust.

        Either select the **Every Weekday** radio button to let the schedule operate from Monday through Friday or select the **Every Day(s)** radio button and enter a number from 1 to 255 in the field.

        In the latter case, the schedule is triggered every specified number of days.
      - **Weekly**. The timer schedule works with weekly recurrence. The fields adjust.

        In the **Every Week(s)** field, enter a number from 1 to 255 to specify that the schedule must be triggered every specified number of weeks.

        Select a single **Week Day** check box, multiple check boxes, or all check boxes to specify the day or days of the week that the schedule must operate.
      - **Monthly**. The timer schedule works with monthly recurrence. The fields adjust.

        In the **Day** field, enter a number from 1 to 31 to specify the day of the month when the schedule must be triggered.

        In the **Every Month(s)** field, enter a number from 1 to 255 to specify that the schedule must be triggered every specified number of months.
8. Click the **Add** button.

   The entry for the timer schedule is added.

Change the Settings for a Recurring PoE Timer Schedule Entry

You can change the settings for an existing recurring PoE timer schedule entry. (You cannot do this for an existing absolute PoE timer schedule.)

➢ **To change the settings for an existing recurring PoE timer schedule entry:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **System > Timer Schedule > Advanced > Timer Schedule Configuration**.

   The Timer Schedule Configuration page displays.
6. From the **Timer Schedule Name** menu, select the schedule name.
7. From the **Timer Schedule Type** menu, select the schedule type.
8. From the **Timer Schedule Entry** menu, select the schedule entry.
9. Make the changes to the schedule entry.

   For more information, see *Specify the Settings for a Recurring PoE Timer Schedule* on page 359.
10. Click the **Apply** button.

    Your settings are saved.

Delete a PoE Timer Schedule Entry

You can delete a PoE timer schedule entry that you no longer need.

➢ **To delete a PoE timer schedule entry:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Timer Schedule > Advanced > Timer Schedule Configuration**.

   The Timer Schedule Configuration page displays.

6. From the **Timer Schedule Name** menu, select the schedule name.
7. From the **Timer Schedule Type** menu, select the schedule type.
8. From the **Timer Schedule Entry** menu, select the schedule entry.
9. Click the **Delete** button.

   The entry is deleted.

Delete a PoE Timer Schedule

You can delete a PoE timer schedule that you no longer need. All entries that are part of the PoE timer schedule are also deleted.

➢ **To delete a PoE timer schedule:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired connection to connect your computer to the network, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **System > Timer Schedule > Basic > Global Configuration**.

   The Timer Schedule Name page displays.

6. Select the check box for the schedule that you want to delete.
7. Click the **Delete** button.

   The schedule is deleted.

9. Monitor the System

9

This chapter contains the following sections.

- *Monitor the Switch and the Ports*
- *Configure and View Logs*
- *Configure Port Mirroring*

Monitor the Switch and the Ports

The following sections describe how you can view a variety of information about the amount and type of traffic that is transmitted from and received on the switch:

- *View or Clear the Switch Statistics* on page 364
- *View or Clear Port Statistics* on page 366
- *View or Clear Detailed Port Statistics* on page 368
- *View or Clear EAP Statistics* on page 374
- *Perform a Cable Test* on page 376

View or Clear the Switch Statistics

You can view or clear detailed statistical information about the traffic that the switch handles.

➢ **To view or clear the switch statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Ports > Switch Statistics**.

   The Switch Statistics page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.
7. To clear all the statistics counters, click the **Clear** button.

   All switch summary and detailed statistics are reset to default values. However, the discarded packets counters cannot be cleared.

The following table describes the switch statistics displayed on the page.

Table 85. Switch statistics

Field	Description
ifIndex	The interface index 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.
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 the packets from being delivered to a higher-layer protocol. A possible reason for discarding a packet could be to free buffer space.
Octets Transmitted	The total number of octets transmitted from the interface, including framing characters.
Packets Transmitted Without Errors	The total number of packets transmitted from the interface.
Unicast Packets Transmitted	The total number of packets that higher-level protocols requested to be transmitted to a subnetwork-unicast address, including the packets 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 the packets 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 the packets 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 the packets from being delivered to a higher-layer protocol. A possible reason for discarding a packet could be to free buffer space.
Most Address Entries Ever Used	The highest number of Forwarding Database Address Table entries that were learned by the switch since the most recent reboot.
Address Entries in Use	The number of learned and static entries in the Forwarding Database Address Table for the switch.
Maximum VLAN Entries	The maximum number of VLANs allowed on the switch.
Most VLAN Entries Ever Used	The largest number of VLANs that were active on the switch since the last reboot.

Table 85. Switch statistics (continued)

Field	Description
Static VLAN Entries	The number of active VLAN entries that were created statically on the switch.
VLAN Deletes	The number of VLANs that were created and then deleted on the switch since the last reboot.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds, since the statistics for the switch were last cleared.

View or Clear Port Statistics

You can view a summary of per-port traffic statistics on the switch.

➢ **To view port statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Ports > Port Statistics**.

   The Status page displays.

6. Select whether to display physical interfaces, link aggregation groups (LAGs), or both by clicking one of the following links above the table heading:
   - **1** (or the unit ID of the switch). Only physical interfaces are displayed. This is the default setting.
   - **LAGS**. Only link aggregation groups are displayed.
   - **All**. Both physical interfaces and link aggregation groups are displayed.

   To locate an interface quickly, type the interface number using the respective naming convention (for example, g1 or l1) in the **Go To Interface** field above or below the table and click the **Go** button. See *Interface Naming Conventions* on page 12 for more information. The entry corresponding to the specified interface is selected.

The following table describes the per-port statistics displayed on the page.

Table 86. Port statistics

Field	Description
Interface	The interface for which the statistics are displayed.
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 delivered to a higher-layer protocol.
Broadcast Packets Received	The total number of well-formed packets received that were directed to the broadcast address. This number does not include multicast packets.
Packets Transmitted Without Errors	The number of frames that were transmitted without errors.
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.
Link Down Events	The total number of link-down events.
Time Since Counters Last Cleared	The elapsed time in days, hours, minutes, and seconds since the statistics were cleared.

Reset Counters for All Interfaces on the Switch

➢ **To reset the counters for all interfaces on the switch:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Ports > Port Statistics**.

   The Status page displays.

6. Select the check box in the heading of the table.

7. Click the **Clear** button.

   All counters are reset to 0.

Reset Counters for a Specific Interface

➢ **To reset the counters for a specific interface:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Ports > Port Statistics**.

   The Status page displays.

6. Select the check box next to the interface for which you want to clear the counters.

   You can also type the interface number using the respective naming convention (for example, g1 or l1) in the **Go To Interface** field above or below the table and click the **Go** button. See *Interface Naming Conventions* on page 12 for more information. The entry corresponding to the specified interface is selected.

7. Click the **Clear** button.

   The counters for the interface are reset to 0.

View or Clear Detailed Port Statistics

You can view a variety of per-port traffic statistics.

➢ **To view detailed port statistics or clear the statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Ports > Port Detailed Statistics**.

   The Port Detailed Statistics page displays.

6. From the **Interface** menu, select the interface for which you want to view the statistics.
7. From the **MST ID** menu, select the MST ID associated with the interface (if available).
8. To refresh the page with the latest information about the switch, click the **Refresh** button.
9. To clear all the counters, click the **Clear** button.

   This resets all statistics for this port to the default values.

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 87. Detailed port statistics

Field	Description
ifIndex	The interface index (ifIndex) for which the statistics are displayed.
Port Type	For normal ports this field displays Normal. Otherwise, the possible values are as follows: • **Mirrored**. This port is a participating in port mirroring as a mirrored port. For more information, see *Configure Port Mirroring* on page 387. • **Probe**. This port is a participating in port mirroring as the probe port. For more information, see *Configure Port Mirroring* on page 387. • **Trunk Member**. The port is a member of a link aggregation trunk, which is also referred to as a Link Aggregation Group (LAG).
Port Channel ID	If the port is a member of a port channel, which is also referred to as a Link Aggregation Group (LAG), 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 role 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 that is 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.

Table 87. Detailed port statistics (continued)

Field	Description
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: • **Enable**. The port can participate in the network (default). • **Disable**. The port is administratively down and does not participate in the network.
Flow Control Mode	Indicates whether flow control is enabled or disabled for the port. This field is not valid for LAG interfaces.
LACP Mode	The Link Aggregation Control Protocol (LACP) administration state, which is one of the following: • **Enable**. The port is allowed to participate in a LAG, which is the default mode. • **Disable**. The port cannot participate in a LAG.
Physical Mode	The port speed and duplex mode. In autonegotiation mode, the duplex mode and speed are set by the autonegotiation process.
Physical Status	The port speed and duplex mode.
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: • **Enable**. The switch sends a trap when the link status changes. • **Disable**. The switch does not send a trap when the link status changes.
Packets RX and TX 64 Octets	The total number of packets (including bad packets) received and 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 and 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 and 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 and transmitted that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).

Table 87. Detailed port statistics (continued)

Field	Description
Packets RX and TX 512-1023 Octets	The total number of packets (including bad packets) received and 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 and 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 and 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 and 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 and 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 number can be used as a reasonable estimate of Ethernet utilization. If greater precision is required, sample the etherStatsPkts and etherStatsOctets objects 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).
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.

Table 87. Detailed port statistics (continued)

Field	Description
Unicast Packets Received	The number of subnetwork-unicast packets delivered to a higher-layer protocol.
Multicast Packets Received	The total number of well-formed 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 well-formed 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 the packets from being delivered to a higher-layer protocol. A possible reason for discarding a packet could be to free buffer space.
Total Packets Received with MAC Errors	The total number of inbound packets that contained errors, preventing them from being delivered 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 included 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 a 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 in which any packet exceeds 20 ms. The allowed range to detect jabbers 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).
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 included 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 included a bad frame check sequence (FCS) with an integral number of octets.
Overruns	The total number of frames discarded because the port was overloaded with incoming packets, and could not keep up with the inflow.
Total Received Packets Not Forwarded	The number of valid frames received that were discarded (that is, filtered) by the forwarding process.
802.3x Pause Frames Received	The number of MAC control frames received 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.

Table 87. Detailed port statistics (continued)

Field	Description
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 required, sample the etherStatsPkts and etherStatsOctets objects 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 supports a maximum increment rate of 815 counts per sec at 10 Mb/s.
Maximum Frame Size	The maximum Ethernet frame size the interface supports or is configured to use, including Ethernet header, CRC, and payload. The possible range is 1518 to 9216. The default maximum frame size is 1518.
Total Packets Transmitted Successfully	The number of frames that were transmitted.
Unicast Packets Transmitted	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including the packets 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 the packets hat 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 the packets that were discarded or not sent.
Transmit Packets Discarded	The number of outbound packets that were discarded, even though no errors were detected, preventing the packets from being delivered to a higher-layer protocol. A possible reason for discarding a packet could be to free buffer space.

Table 87. Detailed port statistics (continued)

Field	Description
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	The number of successfully transmitted frames for which transmission was inhibited by exactly one collision.
Multiple Collision Frames	The number of successfully transmitted frames for which transmission was inhibited by more than one collision.
Excessive Collision Frames	The number of frames for which transmission failed because of excessive collisions.
Dropped Transmit Frames	The number of transmit frames discarded.
STP BPDUs Received	The number of STP BPDUs received.
STP BPDUs Transmitted	The number of STP BPDUs transmitted.
RSTP BPDUs Received	The number of RSTP BPDUs received.
RSTP BPDUs Transmitted	The number of RSTP BPDUs transmitted.
MSTP BPDUs Received	The number of MSTP BPDUs received.
MSTP BPDUs Transmitted	The number of MSTP BPDUs transmitted.
802.3x Pause Frames Transmitted	The number of MAC control frames transmitted with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode.
EAPOL Frames Received	The number of valid EAPoL frames of any type that were received.
EAPOL Frames Transmitted	The number of EAPoL frames of any type that were transmitted.
Time Since Counters Last Cleared	The elapsed time in days, hours, minutes, and seconds since the statistics were cleared.

View or Clear EAP Statistics

You can view information about Extensible Authentication Protocol (EAP) packets that are received on a specific port.

➢ **To view EAP statistics or clear the statistics:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Ports > EAP Statistics**.

   The EAP Statistics page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.
7. To clear the counters for a specific port, select the check box associated with the port and click the **Clear** button.
8. 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.

The following table describes the EAP statistics displayed on the page.

Table 88. EAP statistics

Field	Description
Ports	The port number for which the EAP statistics are displayed.
EAPOL Frames Received	The number of received valid EAPoL frames of any type.
EAPOL Frames Transmitted	The number of transmitted EAPoL frames of any type.
EAPOL Start Frames Received	The number of received EAPoL start frames.
EAPOL Logoff Frames Received	The number of received EAPoL logoff frames.
EAPOL Last Frame Version	The protocol version number carried in the most recently received EAPoL frame.
EAPOL Last Frame Source	The source MAC address carried in the most recently received EAPoL frame.
EAPOL Invalid Frames Received	The number of received EAPoL frames in which the frame type was not recognized.
EAPOL Length Error Frames Received	The number of received EAPoL frames in which the frame type was not recognized.
EAP Response/ID Frames Received	The number of received EAP response/identity frames.
EAP Response Frames Received	The number of received valid EAP response frames (other than resp/ID frames).

Table 88. EAP statistics

Field	Description
EAP Request/ID Frames Transmitted	The number of transmitted EAP request/identity frames.
EAP Request Frames Transmitted	The number of transmitted EAP request frames (other than request/identity frames).

Perform a Cable Test

You can test and view information about the cables that are connected to switch ports.

➢ **To perform a cable test:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Ports > Cable Test**.

   The Cable Test page displays.

6. Select the check boxes that are associated with the physical ports for which you want to test the cables.
7. Click the **Apply** button.

   A cable test is performed on all selected ports. The cable test might take up to two seconds to complete. If the port forms an active link with a device, the cable status is always Normal. The test 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 89. Cable Test information

Field	Description
Cable Status	Indicates the cable status: • **Normal**. The cable is working correctly. • **Open**. The cable is disconnected or a faulty connector exists. • **Short**. An electrical short exists 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. • **No cable**. The cable is not present.
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 displayed only 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 displayed only if the cable status is Open or Short.

Configure and View 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. Local and remote configuration of the logging capability includes filtering of messages logged or forwarded based on severity and generating component.

Manage the Memory Logs

The memory log stores messages in memory based upon the settings for message component and severity. You can set the administrative status and behavior of logs in the system buffer. These log messages are cleared when the switch reboots.

For the message log, only the latest 200 entries are displayed on the page.

➢ **To configure the memory log settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Logs > Memory Log**.

   The Memory Log Configuration page displays.

6. Select one of the following Admin Status radio buttons:
   - **Enable**. Enable system logging.
   - **Disable**. Prevent the system from logging messages.

7. From the **Behavior** menu, specify the behavior of the log when it is full.
   - **Wrap**. When the buffer is full, the oldest log messages are deleted as the system logs new messages.
   - **Stop on Full**. When the buffer is full, the system stops logging new messages and preserves all existing log messages.

8. From the **Severity Filter** menu, select one of the following severity levels:
   - **Emergency (0)**. 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.

   Note: A log records messages equal to or above a configured severity threshold.

9. Click the **Apply** button.

   Your settings are saved.

   The Memory Log table displays on the Memory Log Configuration page.

   The Total number of Messages field displays the number of messages the system logged in memory. Only the 200 most recent entries are displayed on the page.

   The rest of the page displays the Memory Log messages. The format of the log message is the same for messages that are displayed for the message log, persistent log, or console log. Messages logged to a collector or relay through syslog support the same format as well.

The following example shows the standard format for a log message:

```
<14>2017-09-02 16:35:40 10.131.12.183-1 UNKN[2176789276]:
main_login.c(179) 3855 %% HTTP Session 19 initiated for user admin
connected from 10.27.64.122
```

The number contained in the angle brackets represents the message priority, which is derived from the following values:

Priority = (facility value × 8) + severity level.

The facility value is usually 1, which means it is a user-level message. Therefore, to determine the severity level of the message, subtract 8 from the number in the angle brackets. The sample log message shows a severity level of 6 (informational). For more information about the severity of a log message, see *Manage the Server Log* on page 381.

The message was generated on September 2, 2017, at 5:35:40 p.m. by the switch with an IP address of 10.131.12.183. The component that generated the message is unknown, but it came from line 179 of the `main_login.c` file. This is the 3,855th message logged since the switch was last booted. The message indicates that the administrator logged on to the HTTP management interface from a host with an IP address of 10.27.64.122.

10. To refresh the page with the latest information about the switch, click the **Refresh** button.
11. To clear the messages from the buffered log in the memory, click the **Clear** button.

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>2017-09-02 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 September 2, 2017, at 05:34:05 a.m. 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>2017-09-02 06:24:15 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 chassis and generated by component MSTP running in thread ID 2110 on September 2, 2017, at 06:24:15 a.m. 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.

Manage the Flash Log

The flash log is a persistent log, that is, is a log that is stored in persistent storage. Persistent storage survives across platform reboots. The first log type is the system startup log. The system startup log stores the first 32 messages received after system reboot. The second log type is the system operation log. The system operation log stores messages received during system operation.

➢ **To configure flash log settings:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Logs > FLASH Log**.

   The FLASH Log Configuration page displays.

6. Select one of the following Admin Status radio buttons:
   - **Enable**. A log that is enabled logs messages.
   - **Disable**. A log that is disabled does not log messages.
7. From the **Severity Filter** menu, select the logging level for messages that must be sent to the logging host.

   Log messages with the selected severity level and all log messages of greater severity are sent to the host. For example, if you select **Error**, the logged messages include Error, Critical, Alert, and Emergency. The default severity level is Alert (1). The severity can be one of the following levels:

   - **Emergency** (0). The highest warning level. If the device is down, or not functioning properly, an emergency log message is saved to the device.
   - **Alert** (1). The second-highest warning level. An alert log message is saved if a serious device malfunction occurs, such as all device features being down. Action must be taken immediately.

  - **Critical** (2). The third-highest warning level. A critical log message is saved if a critical device malfunction occurs, for example, two device ports are not functioning, while the rest of the device ports remain functional.
  - **Error** (3). A device error occurred, such as a port being offline.
  - **Warning** (4). The lowest level of a device warning.
  - **Notice** (5). Normal but significant conditions. Provides the network administrators with device information.
  - **Informational** (6). Provides device information.
  - **Debug** (7). Provides detailed information about the device.

8. From the **Logs to be Displayed** menu, select one of the following options:
   - **Current Logs**. The log messages for the current switch sessions are displayed. This is the default setting.
   - **Previous Logs**. The previous log messages are displayed, that is, the log messages that are still in the flash memory from before the switch was rebooted.
9. Click the **Apply** button.

   Your settings are saved.

   The Total Number of Messages field shows is the total number of persistent log messages that are stored on the switch. The maximum number of persistent log messages displayed on the switch is 64.

```
Description: <15>2017-09-02 07:10:44 STK0 MSTP[2110]:
mspt_api.c(318) 237 %% Interface 12 transitioned to root state on
message age timer expiry
```

   The previous log message example indicates a user-level message (1) with severity 7 (debug) on a system that is not stacked and generated by component MSTP running in thread ID 2110 on September 2, 2017, at 07:10:44 a.m. by line 318 of file `mstp_api.c`. This is the 237th message logged. Messages logged to a collector or relay via syslog support an identical format as the previous message.

Manage the Server Log

You can let the switch send log messages to remote logging hosts configured on the system.

Configure the Local Log Server

➢ **To configure local log server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Logs > Server Log**.

   The Server Log page displays.

6. Select one of the following Admin Status radio buttons:
   - **Enable**. Send log messages to all configured hosts (syslog collectors or relays) using the values configured for each host.
   - **Disable**. Stop logging to all syslog hosts. **Disable** means no messages are sent to any collector or relay.
7. In the **Local UDP Port** field, specify the port on the switch from which syslog messages must be sent. The Local UDP port values are 1 to 65535. The default port is 514.
8. Click the **Apply** button.

   Your settings are saved.

   The Server Log Configuration section displays the following information:

   - **Messages Received**. The number of messages received by the log process. This includes messages that are dropped or ignored.
   - **Messages Relayed**. The number of messages forwarded by the syslog function to a syslog host. Messages forwarded to multiple hosts are counted once for each host.
   - **Messages Ignored**. The number of messages that were ignored.

Add a Remote Syslog Server

You can add a remote log server, which is the same as a remote syslog host.

➢ **To add a remote syslog server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

The System Information page displays.

5. Select **Monitoring > Logs > Server Log**.

   The Server Log Configuration page displays.

6. Specify the following settings:
   - **IP Address Type**. Specify the IP address type of the host, which can be **IPv4**, **IPv6**, or **DNS**.
   - **Host Address**. Specify the IP address or host name of the syslog host.
   - **Port**. Specify the port on the host to which syslog messages must be sent. The default port number is 514.
   - **Severity Filter**. Use the menu to select the severity of the logs that must be sent to the logging host. Logs with the selected severity level and all logs of greater severity are sent to the host. For example, if you select **Error**, the logged messages include Error, Critical, Alert, and Emergency. The default severity level is Alert (1). The severity can be one of the following levels:
     - **Emergency** (0). The highest warning level. If the device is down or not functioning properly, an emergency log is saved to the device.
     - **Alert** (1). The second-highest warning level. An alert log is saved if a serious device malfunction occurs, such as all device features being down.
     - **Critical** (2). The third-highest warning level. A critical log is saved if a critical device malfunction occurs, for example, two device ports are not functioning, while the rest of the device ports remain functional.
     - **Error** (3). A device error occurred, such as a port being offline.
     - **Warning** (4). The lowest level of a device warning.
     - **Notice** (5). Provides the network administrators with device information.
     - **Informational** (6). Provides device information.
     - **Debug** (7). Provides detailed information about the log.

7. Click the **Add** button.

   The remote server is added.

   The **Status** field in the Server Configuration table shows whether the remote logging host is currently active.

Modify the Settings for a Remote Syslog Server

➢ **To modify the settings for a remote syslog server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Monitoring > Logs > Server Log**.

   The Server Log Configuration page displays.
6. Select the check box that is associated with the server.
7. Change the information as needed.
8. Click the **Apply** button.

   Your settings are saved.

Delete the Settings for a Remote Syslog Server

➢ **To delete the settings for a remote syslog server:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.
2. Launch a web browser.
3. In the address field of your web browser, enter the IP address of the switch.

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.
4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.
5. Select **Monitoring > Logs > Server Log**.

   The Server Log Configuration page displays.
6. Select the check box that is associated with the server.
7. Click the **Delete** button.

   The server is removed.

View or Clear the Trap Logs

You can view information about the SNMP traps generated on the switch. The information can be retrieved as a file.

You can also display information about the traps that were sent.

➢ **View the trap logs or clear the counters:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch's password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Logs > Trap Logs**.

   The Trap Logs page displays.

6. To clear all counters, click the **Clear** button.

   All statistics for the trap logs are reset to their default values.

The following table describes the trap logs information that is displayed on the page.

Table 90. Trap Logs information

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 the trap.
System Up Time	The time when the trap occurred, expressed in days, hours, minutes, and seconds, since the last reboot of the switch.
Trap	Information identifying the trap.

View or Clear the Event Log

You can display the event log, which is used to hold error messages for catastrophic events. After the event is logged and the updated log is saved in flash memory, the switch is reset. The log can hold at least 2,000 entries and is erased when an attempt is made to add an entry after it is full. The event log is preserved across system resets.

➢ **To view the event log or clear the log:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Logs > Event Logs**.

   The Event Logs page displays.

6. To refresh the page with the latest information about the switch, click the **Refresh** button.
7. To clear the messages from the event log, click the **Clear** button.

The following table describes the event log information that is displayed on the page.

Table 91. Event Logs information

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 the event occurred.

Configure 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.

➢ **To globally enable port mirroring, specify the destination port, and specify one or more source ports:**

1. Connect your computer to the same network as the switch.

   You can use a WiFi or wired network connection, or connect directly to a switch that is off-network using an Ethernet cable.

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

   If you do not know the IP address of the switch, see *Access the Switch* on page 13.

   The login window opens.

4. Enter the switch’s password in the **password** field.

   The default password is **password**. If you added the switch to a network on the Insight app before and you did not yet change the password through the local browser interface, enter your Insight network password.

   The System Information page displays.

5. Select **Monitoring > Mirroring > Port Mirroring**.

   The Global Configuration page displays.

6. Select an Admin Mode radio button:
   - **True**. Port mirroring is enabled.
   - **False**. Port mirroring is enabled.
7. From the **Destination Port** menu, select the destination port to which port traffic must be copied.

   You can configure only one destination port on the system. The port functions as a probe port and receives traffic from all configured source ports. If no port is configured, None is displayed. The default is None.

   Perform the following steps in the Source Interface Configuration section.

8. Use one of the following methods to narrow down the ports that are displayed:
   - Select **1** 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 **All** to display a list of all physical ports, LAGs, CPUs, and VLANs.
9. Use one of the following methods to select one or more source ports:
   - Select a specific interface by specifying the interface number using the respective naming convention (for example, g1 or l1) in the **Go To Interface** field and clicking the **Go** button. See *Interface Naming Conventions* on page 12 for more information. The entry corresponding to the specified interface is selected.
   - Select one or more check boxes in the Interface column.
10. From the **Direction** menu, specify the direction of the traffic that must be mirrored from the selected source ports:
    - **None**. The value is not configured. This is the default setting.
    - **Tx and Rx**. Monitors transmitted and received packets.
    - **Rx**. Monitors received (ingress) packets only.
    - **Tx**. Monitors transmitted (egress) packets only.
11. Click the **Apply** button.

    Your settings are saved. Traffic from the selected ports is sent to the probe port.

    The Status field indicates the interface status.

A. Configuration Examples

A

This appendix contains information about how to configure the following features.

The appendix covers the following topics:

- *Virtual Local Area Networks (VLANs)*
- *Access Control Lists (ACLs)*
- *Differentiated Services (DiffServ)*
- *802.1X*
- *Multiple Spanning Tree Protocol (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 computers, 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 sets up the VLANs.

VLANs present a number of advantages:

- It is easy to do network segmentation. Users who 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 supports 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 on the Port PVID Configuration page. See *Configure Port PVID Settings* on page 111.
- 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 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. On the VLAN Configuration page (see *Add a VLAN* on page 104), create the following VLANs:
   - A VLAN with VLAN ID 10.
   - A VLAN with VLAN ID 20.
2. On the VLAN Membership page (see *Configure VLAN Membership* on page 108) 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. On the Port PVID Configuration page (see *Configure Port PVID Settings* on page 111), 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 can access 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 can access 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 can access 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 sequential collections 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 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. On the MAC ACL page (see *Configure a Basic MAC ACL* on page 291), create an ACL with the name Sales_ACL for the Sales department of your network.

   By default, this ACL is bound on the inbound direction, which means that the switch examines traffic as it enters the port.

2. On the MAC Rules page (see *Configure MAC ACL Rules* on page 294), create a rule for the Sales_ACL with the following settings:

   - **Sequence Number**. 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

3. On the MAC Binding Configuration page (see *Configure MAC Bindings* on page 298), assign the Sales_ACL to ports 6, 7, and 8, and then click the **Apply** button.

   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 (see *View or Delete MAC ACL Bindings in the MAC Binding Table* on page 300) displays the interface and MAC ACL binding information.

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. On the IP ACL page (see *Configure an IP ACL* on page 301), create a new IP ACL with an IP ACL ID of 1.
2. On the IP Rules page (see *Configure Rules for a Basic IP ACL* on page 303), create a rule for IP ACL 1 with the following settings:
   - **Sequence Number**. 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**. 255.255.0
3. Click the **Add** button.

4. On the IP Rules page (see *Configure Rules for a Basic IP ACL* on page 303), create a second rule for IP ACL 1 with the following settings:
   - **Sequence Number**. 2
   - **Action**. Permit
   - **Match Every**. True
5. Click the **Add** button.
6. On the IP Binding Configuration page (see *Configure IP ACL Interface Bindings* on page 323), assign ACL ID 1 to the interface Gigabit ports 2, 3, and 4, and assign a sequence number of 1.

   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 or Delete IP ACL Bindings in the IP ACL Binding Table* on page 325)

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 an explicit *deny all* rule exists 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 delivers the data in a timely fashion, although there is no guarantee that it does. During times of congestion, packets might be delayed, sent sporadically, or dropped. For typical Internet applications, such as email and file transfer, a slight degradation in service is acceptable and in many cases unnoticeable. However, any degradation of service can negatively affect 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.

Two basic types of QoS are supported:

- **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 switch supports DiffServ.

The DiffServ feature contains a number of conceptual QoS building blocks that you can use to construct a differentiated service network. Use these same blocks in different ways to build other types of QoS architectures.

You must configure three key QoS building blocks for 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 letting the switch inspect 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)
- IP Service Type octet (also known as: ToS bits, Precedence value, DSCP value)
- Layer 4 protocol (such as TCP or UDP)
- Layer 4 source/destination ports
- Source/destination IP address

From a DiffServ point of view, two types of classes exist:

- 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 multifield (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. You define these service levels 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, two types of policies exist:

- **Traffic Conditioning Policy**. A policy that is applied to a DiffServ traffic class.
- **Service Provisioning Policy**. A policy that is 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. Several distinct QoS actions are 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 coexist 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 3-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 that 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 nonconformant. 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.

- **Policing with 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 the switch determines 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. You can also specify the color of traffic that exceeds the threshold.
- **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. For more information, see *View DiffServ Service Statistics* on page 236.
- **Assigning QoS queue**. Directs a 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 a 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 and policy and attach them to a switch interface, follow these steps:

1. On the Class Configuration page (see *Create and Configure a DiffServ Class* on page 218), create a new class with the following settings:
   - **Class Name**. Class1
   - **Class Type**. All
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 *Create and Configure a DiffServ Class* on page 218.
4. Click the **Apply** button.

5. On the Policy Configuration page (see *Create and Configure a DiffServ Policy* on page 228), create a new policy with the following settings:
    - **Policy Selector**. Policy1
    - **Member Class**. Class1
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 *Create and Configure a DiffServ Policy* on page 228.
9. On the Service Interface Configuration page (see *Attach a DiffServ Policy to an Interface* on page 234), select the check box next to interfaces g7 and g8 to attach the policy to these interfaces, and then click the **Apply** button.

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 with point-to-point connection characteristics. If the authentication and authorization process fails, access control prevents access to that port. In this context, a port is a single point of attachment to the LAN, such as a port of a MAC bridge and an association 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 can 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 that the guest VLAN provides.

Another 802.1X feature is the ability to configure a port to enable or 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 by 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 permitted only 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, a third role exists:

3. **Authentication server**. A server that performs the authentication function necessary to check the credentials of the supplicant on behalf of the authenticator.

All three roles are required for an authentication exchange.

The switch supports 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 for the credentials to be checked, which determines 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.

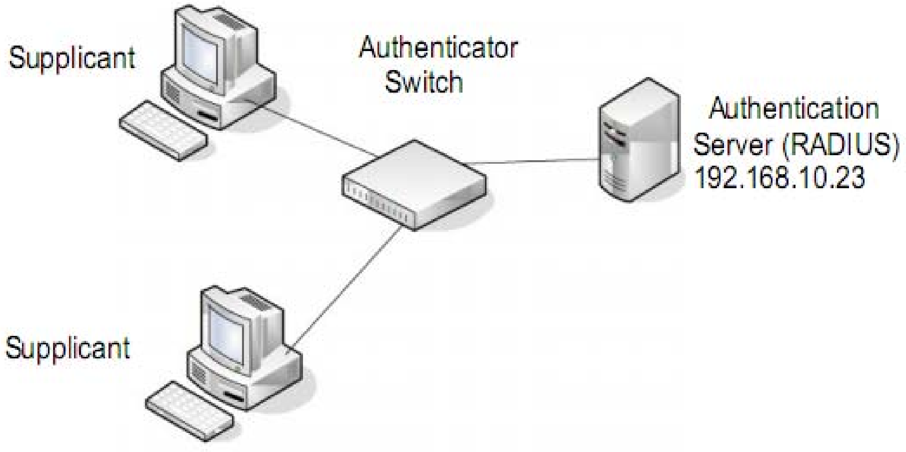


Figure 1. 802.1X authentication roles

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 access is granted 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 was configured with a VLAN ID of 150 and VLAN name of Guest.

1. On the Port Authentication page (see *Configure 802.1X Settings for a Port* on page 265), select ports **1/0/5**, **1/0/6**, **1/0/7**, and **1/0/8**.
2. From the **Port Control** menu, select **Unauthorized**.

   The selection from the **Port Control** menu for all other ports on which authentication is not needed must be **Authorized**. When the selection from the **Port Control** menu is **Authorized**, the port is unconditionally put in a force-authorized state and does not require any authentication. When the selection from the **Port Control** menu is **Auto**, the authenticator PAE sets the controlled port mode.

3. In the **Guest VLAN ID** 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 802.1X Settings for a Port* on page 265 for information about the settings.

4. Click the **Apply** button.
5. On the 802.1X Configuration page (see *Configure Global 802.1X Settings* on page 264), set the port based authentication state to **Enable**, and click the **Apply** button.

This example uses the default values for the port authentication settings, but you can configure several additional settings. 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. On the Server Configuration page (see *Configure a RADIUS Authentication Server on the Switch* on page 243), configure a RADIUS server with the following settings:
   - **Server Address**. 192.168.10.23
   - **Secret Configured**. Yes
   - **Secret**. secret123
   - **Active**. Primary
7. Click the **Add** button.
8. On the Dot1x Authentication List page (see *Configure the Dot1x Authentication List* on page 255), configure the default list to use RADIUS as the first authentication method.

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.

Multiple Spanning Tree Protocol (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 in a way that is appropriate for STP and RSTP bridges.

An MSTP bridge can be configured to behave entirely as a RSTP bridge or an STP bridge. So, an IEEE 802.1s bridge inherently also supports IEEE 802.1w and IEEE 802.1D.

The MSTP algorithm and protocol provide 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. An MSTP bridge transmits 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 includes 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)

Because multiple instances of spanning tree exist, an MSTP state is 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, configure an MSTP bridge with an unambiguous assignment of VLAN IDs (VIDs) to spanning trees. For such a configuration, ensure the following:

1. The allocation of VIDs to FIDs is unambiguous.
2. Each FID that is 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 an MSTID of 0.

VIDs might be not be allocated to an instance, 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 from 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.

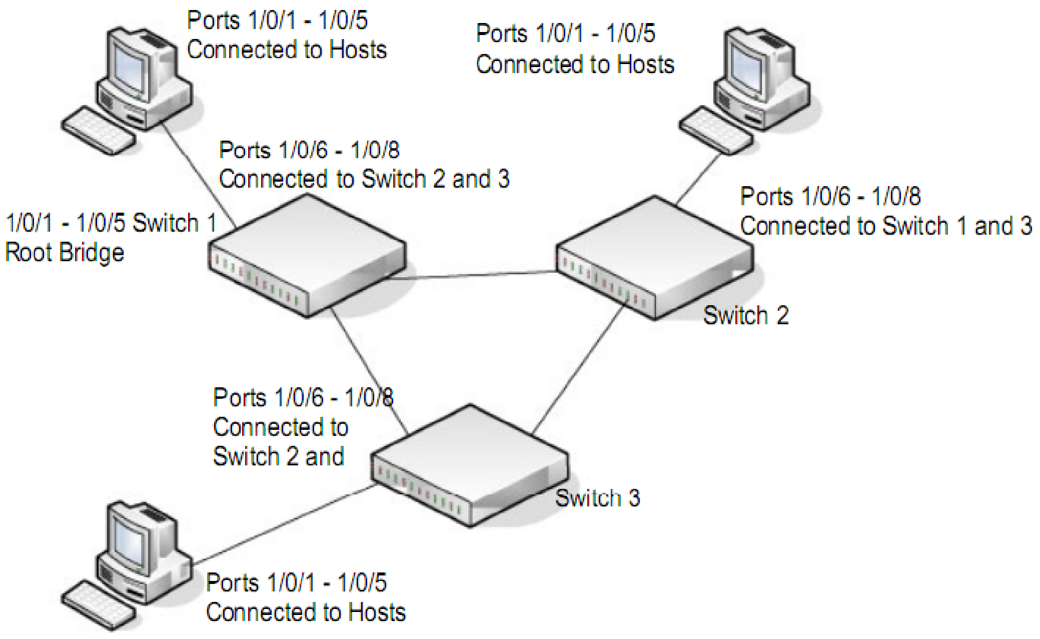


Figure 2. MSTP sample configuration

Perform the following procedures *on each* switch to configure MSTP:

1. On the VLAN Configuration page for each switch, create VLANs 300 and 500 (see *Add a VLAN* on page 104).
2. On the VLAN Membership page for each switch, include ports 1/0/1–1/0/8 as tagged (T) or untagged (U) members of VLAN 300 and VLAN 500 (see *Configure VLAN Membership* on page 108).
3. On the Global Settings page (for STP) for each switch, enable the Spanning Tree State option (see *Configure STP Settings* on page 125).

   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. On the CST Configuration page for each switch (see *Configure CST Settings* on page 127), 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.

5. On the Port Configuration page (fro CST) for each switch, select ports 1/0/1–1/0/8 and select **Enable** from the **STP Status** menu (see *Configure CST Port Settings* on page 128).
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 for each switch (see *View CST Port Status* on page 130) to view spanning tree information about each port.
9. On the MST Configuration page for each switch (see *Manage MST Settings* on page 133), create a MST instances with the following settings:
   - **MST ID**. 1
   - **Priority**. Use the default (32768)
   - **VLAN ID**. 300
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 became the root bridge for the MST instance 1, and Switch 2 became the root bridge for MST instance 2. Switch 3 supports 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 HR 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. Hardware Specifications and Default Values

B

The appendix covers the following topics:

- *Switch Specifications*
- *Switch Features and Defaults*

Switch Specifications

The switch conforms to the TCP/IP, UDP, HTTP, ICMP, TFTP, DHCP, IEEE 802.1D, IEEE 802.1p, and IEEE 802.1Q standards.

Table 92. Switch Specifications and Performance

Feature	Value
GC110	Eight 10/100/1000Mbps ports Two 10G/1G SFP+ ports
GC110P	Eight PoE 10/100/1000Mbps ports Two 10G/1G SFP+ ports
GC510P	Eight PoE+ 10/100/1000Mbps ports Two 10G/1G SFP+ ports
GC510PP	Eight High-Power PoE+ 10/100/1000Mbps ports Two 10G/1G SFP+ ports
Flash memory size	8 MB SPI, 256 MB NAND
SRAM size and type	256 MB DDR3 SDRAM
Switching capacity	Non-Blocking Full WireSpeed on all packet sizes
Forwarding method	Store and Forward
Packet forwarding rate	10M:14,880 pps 100M:148,800 pps 1G:1,488,000 pps
Total packet forwarding rate	14.9 Mpps
MAC addresses	16K

Switch Features and Defaults

The tables in this section provide information about the switch features and default values.

Table 93. Feature Default Values and Default State

Feature Name/Parameter	Default
Bonjour	Enabled
DHCP L2 Relay	
Global	
Admin Mode	Disabled

Table 93. Feature Default Values and Default State (continued)

Feature Name/Parameter	Default
VLAN	
Admin Mode	Disabled
Circuit ID Mode	Disabled
Interface	
Admin Mode	Disabled
82 Option Trust Mode	Disabled
PoE	
Global	
System Usage Threshold	95%
Power Management Mode	Dynamic
Traps	Enabled
Interface	
Admin Mode	Enabled
Port Priority	Low
Power Mode	GC110P: 802.3af GC510P: 802.3at GC510PP: 802.3at
Power Limit Type	User
Power Limit (mW)	30000 (mW)
Detection Type	IEEE 802
Timer Schedule	None
Virtual LAN (IEEE 802.1Q)	
Default VLANs	1 (Default) All ports are members of the default VLAN. 4089 (Auto-Video) No ports are members of the Auto-Video VLAN.
PVID	1
Acceptable Frame Types	Admit All
Ingress Filtering	Disabled
Port Priority	0

Table 93. Feature Default Values and Default State (continued)

Feature Name/Parameter	Default
Jumbo Frames	
Maximum Frame Size	1518
Flow Control	
Admin Mode	Disabled
802.1X	
Port Based Authentication State	Disabled
VLAN Assignment Mode	Disabled
Dynamic VLAN Creation Mode	Disabled
EAPOL Flood Mode	Disabled
Port Control	Auto
Guest VLAN ID	0
Guest VLAN Period	90
Unauthenticated VLAN ID	0
Periodic Reauthentication	Disabled
Reauthentication Period	3600
Quiet Period	60
Resending EAP	30
Max EAP Requests	2
Supplicant Timeout	30
Server Timeout	30
STP/RSTP/MSTP	
Global	
Spanning Tree State	Disabled
STP Operation Mode	RSTP
Configuration Name	<MAC address>
Configuration Revision Level	0
Forward BPDU while STP Disabled	Disabled
CST Bridge Priority	32768
CST Bridge Max Age	20

Table 93. Feature Default Values and Default State (continued)

Feature Name/Parameter	Default
CST Bridge Hello Time	2
CST Bridge Forward Delay	15
CST Spanning Tree Max Hops	20
MST Default Instance ID	0
MST Instance 0 Priority	32768
MST Instance 0 VLAN IDs	1,2,3
PV(R)STP UplinkFast Rate	150
Interface	
CST STP Status	Enabled
CST Auto Edge	Enabled
CST Fast Link	Disabled
CST BDPU Forwarding	Disabled
CST Path Cost	0
CST Priority	128
CST External Path Cost	0
Link Aggregation	
Lag Name	ch<n> where n is 1 to 5
Admin Mode	Enabled
STP Mode	Enabled
Link Trap	Enabled
LAG Type	Static
Local Link Discovery Protocol (LLDP)	
Global	
TLV Advertised Interval	30
Hold Multiplier	4
Reinitializing Delay	2
Transmit Delay	5
Fast Start Duration	3

Table 93. Feature Default Values and Default State (continued)

Feature Name/Parameter	Default
Interface	
Admin Status	Tx and Rx
Management IP Address	Auto Advertise
Notification	Disabled
Optional TLVs	Enabled
DHCP Snooping	
Global	
Admin Mode	Disabled
MAC Address Validation	Enabled
Interface	
Trust Mode	Disabled
Logging Invalid Packets	Disabled
Rate Limit	N/A
Burst Interval	N/A
Persistent Configuration	
Store	Local
Write Delay	300
Differentiated Services	
Admin Mode	Disabled
Class of Service (CoS)	
Global	
Trust Mode	802.1p

Table 93. Feature Default Values and Default State (continued)

Feature Name/Parameter	Default
802.1p to Queue Mapping (802.1p -> Queue)	0 -> 1 1 -> 0 2 -> 0 3 -> 1 4 -> 2 5 -> 2 6 -> 3 7 -> 3 Class Selector: (CS 0) 000000 -> 1 (CS 1) 001000 -> 0 (CS 2) 010000 -> 0 (CS 3) 011000 -> 1 (CS 4) 100000 -> 2 (CS 5) 101000 -> 2 (CS 6) 110000 -> 3 (CS 7) 111000 -> 3 Assured Forwarding: (AF 11) 001010 -> 0 (AF 12) 001100 -> 0 (AF 13) 001110 -> 0 (AF 21) 010010 -> 0 (AF 22) 010100 -> 0 (AF 23) 010110 -> 0 (AF 31) 011010 -> 1 (AF 32) 011100 -> 1 (AF 33) 011110 -> 1 (AF 41) 100010 -> 1 (AF 42) 100100 -> 1 (AF 43) 100110 -> 1 Expedited Forwarding: (EF) 101110 -> 2

Table 93. Feature Default Values and Default State (continued)

Feature Name/Parameter	Default
DSCP to Queue Mapping (DSCP -> Queue) (continued)	Other: (1) 000001 -> 1 (2) 000010 -> 1 (3) 000011 -> 1 (4) 000100 -> 1 (5) 000101 -> 1 (6) 000110 -> 1 (7) 000111 -> 1 (9) 001001 -> 0 (11) 001011 -> 0 (13) 001101 -> 0 (15) 001111 -> 0 (17) 010001 -> 0 (19) 010011 -> 0 (21) 010101 -> 0 (23) 010111 -> 0 (25) 011001 -> 1 (27) 011011 -> 1 (29) 011101 -> 1 (31) 011111 -> 1 (33) 100001 -> 2 (35) 100011 -> 2 (37) 100101 -> 2 (39) 100111 -> 2 (41) 101001 -> 2 (43) 101011 -> 2 (45) 101101 -> 2 (47) 101111 -> 2 (49) 110001 -> 3 (50) 110010 -> 3 (51) 110011 -> 3 (52) 110100 -> 3 (53) 110101 -> 3 (54) 110110 -> 3 (55) 110111 -> 3 (57) 111011 -> 3 (58) 111010 -> 3 (59) 111011 -> 3 (60) 111100 -> 3 (61) 111101 -> 3 (62) 111110 -> 3 (63) 111111 -> 3

Table 93. Feature Default Values and Default State (continued)

Feature Name/Parameter	Default
Interface	
Trust Mode	802.1p
Interface Shaping Rate	0
802.1p to Queue Mapping (802.1p –> Queue)	0 -> 1 1 -> 0 2 -> 0 3 -> 1 4 -> 2 5 -> 2 6 -> 3 7 -> 3
Queue Minimum Band Width	0
Queue Scheduler Type	Weighted
Auto-VoIP Protocol-based	
Admin Mode	Disabled
Prioritization Type	Traffic Class
Traffic Class	3
Auto-VoIP OUI-based	
Admin Mode	Disabled
Auto-VoIP VLAN	2
OUI-based priority	7

Table 94. Port characteristics

Feature	Sets Supported	Default
Auto negotiating speed and full/half duplex	All ports	Auto negotiation
Auto MDI/MDIX	for cross over cables on all ports	Enabled
802.3x flow control/back pressure	1 (per system)	Disabled
Port mirroring: TX, RX, Both	4	Disabled
Port trunking (aggregation)	5	Pre-configured
802.1D spanning tree	1	Disabled
802.1w RSTP	1	Enabled
802.1s spanning tree	24 and 8 MST instances	Disabled

Table 94. Port characteristics

Feature	Sets Supported	Default
Static 802.1Q tagging	256	VID = 1 Max member ports are equal to the number of ports on the switch.
Learning process	Supports static and dynamic MAC entries	Dynamic learning is enabled by default

Table 95. Traffic control

Feature	Sets Supported	Default
Storm control	All ports	Disabled
Jumbo frame	All ports	Disabled Max = 9216 bytes

Table 96. Quality of service

Feature	Sets Supported	Default
Number of queues	7	N/A
802.1p	1	Enabled
DSCP	1	Disabled
Rate limiting	All ports	Disabled

Table 97. Security

Feature	Sets Supported	Default
802.1X	All ports	Disabled
MAC ACL	100 (shared with IP and IPv6 ACLs)	All MAC addresses allowed
IP ACL	100 (shared with MAC and IPv6 ACLs)	All IP addresses allowed
IPv6 ACL	100 (shared with IP ACL and MAC ACL)	All IP addresses allowed
Password control access	1	Idle timeout = 5 mins. Password = “password”

Table 97. Security

Feature	Sets Supported	Default
Management security	1 profile with 20 rules for HTTP/HTTPS access to allow/deny an IP address/subnet	All IP addresses allowed
Port MAC lock down	All ports	Disabled

Table 98. System setup and maintenance

Feature	Sets Supported	Default
Boot code update	1	N/A
DHCP/manual IP	1	DHCP enabled/192.168.0.239
Default gateway	1	192.168.0.254
System name configuration	1	NULL
Configuration save/restore	1	N/A
Firmware upgrade	1	N/A
Restore defaults	1 (web and front-panel button)	N/A
Dual image support	1	Enabled
Factory reset	1	N/A

Table 99. System management

Feature	Sets Supported	Default
Multi-session web connections	4	Enabled
Time control	1 (Local or SNTP)	Local Time enabled
LLDP/LLDP-MED	All ports	Enabled
Logging	3 (Memory/Flash/Server)	Memory Log enabled
MIB support	1	Disabled
Statistics	N/A	N/A

Table 100. Other features

Feature	Sets Supported	Default
Timer Schedules	100	Type — Absolute

Table 100. Other features (continued)

Feature	Sets Supported	Default
IGMP snooping v1/v2/v3	All ports	Enabled on VLAN 1
Configurations upload/download	1	N/A
EAPoL flooding	All ports	Disabled
BPDU flooding	All ports	Disabled
Static multicast groups	20	Disabled
Filter multicast control	1	Disabled
Number of DHCP snooping bindings	8K	N/A
Number of DHCP static entries	1024	N/A
MLD Snooping	All ports	Enabled on VLAN 1
Protocol and MAC-based VLAN	N/A	N/A