

# MX-NOS Rail Version V1

## User Manual

**Version 1.1**

October 2024



# Table of Contents

- Overview ..... 8**
  - Introduction ..... 9**
  - About MX-NOS and MX-NOS Rail Version ..... 10**
  - What's in This Document ..... 12**
  - Supported Series and Firmware Versions ..... 13**
- Quick Start ..... 14**
  - Using a Web Browser to Configure the Industrial Ethernet Switch ..... 15**
- UI Reference ..... 17**
  - UI Reference Overview ..... 18**
  - The MX-NOS Rail Version User Interface ..... 19**
  - Options Menu ..... 20**
    - Change Mode .....20
    - Disable/Enable Auto Save .....20
    - Locator .....21
    - Reboot .....22
    - Reset to Default Settings .....22
    - Save Custom Default .....22
    - Log Out .....23
  - Device Summary ..... 24**
    - System Information .....24
    - Panel Status .....25
      - Panel View* ..... 26
    - Event Summary (Last 3 days) .....27
    - CPU Usage History (%) .....27
  - System ..... 29**

System Management .....	29
<i>Information Settings</i> .....	29
<i>Firmware Upgrade</i> .....	30
<i>Configuration Backup and Restore</i> .....	35
Account Management.....	49
<i>User Accounts</i> .....	49
<i>Online Accounts</i> .....	55
<i>Password Policy</i> .....	56
Management Interface .....	58
<i>User Interface</i> .....	58
<i>Hardware Interfaces</i> .....	61
<i>Configuring Simple Network Management Protocol</i> .....	62
Time .....	68
<i>About System Time</i> .....	68
<i>NTP Server</i> .....	74
<i>Configuring NTP Server</i> .....	75
<b>Provisioning .....</b>	<b>77</b>
Auto Configuration.....	77
<i>How Auto Configuration Works</i> .....	77
<i>Using Auto Configuration for Single Device Deployment</i> .....	79
<i>Deploying Multiple Devices Using Auto Configuration</i> .....	81
<i>Auto Configuration</i> .....	91
<b>Port .....</b>	<b>94</b>
Port Interface.....	94
<i>Port Settings</i> .....	94
<i>Linkup Delay</i> .....	98
Link Aggregation .....	100

<i>Link Aggregation Settings</i> .....	102
PoE .....	107
<i>PoE Settings</i> .....	107
<b>Layer 2 Switching</b> .....	<b>122</b>
VLAN .....	122
<i>Assigning VLANs to Ports</i> .....	122
<i>Creating VLANs</i> .....	123
<i>VLANs in Depth</i> .....	124
<i>VLAN Settings</i> .....	127
GARP .....	133
<i>GARP Settings</i> .....	133
MAC .....	135
<i>Static Unicast</i> .....	135
<i>MAC Address Table</i> .....	137
QoS .....	139
<i>How each QoS feature works</i> .....	139
<i>QoS</i> .....	140
Multicast .....	172
<i>How Multicast Works</i> .....	173
<i>Multicast</i> .....	174
<b>IP Configuration</b> .....	<b>191</b>
IP Configuration .....	191
<i>IP Status</i> .....	191
<i>IP Settings - Manual</i> .....	192
<i>IP Settings - DHCP</i> .....	193
<b>Redundancy</b> .....	<b>195</b>
Layer 2 Redundancy .....	195

<i>Selecting a Layer 2 Redundancy Protocol</i> .....	195
<i>About Spanning Tree</i> .....	198
<i>About Turbo Ring v2</i> .....	223
<i>About MRP (Media Redundancy Protocol)</i> .....	238
<b>Network Service</b> .....	<b>245</b>
Configuring DHCP Server Functions .....	245
<i>Introduction to DHCP</i> .....	245
<i>Overview of DHCP Server Configuration</i> .....	245
<i>Configuring Dynamic IP Address Assignment (DHCP Server Pool)</i> .....	246
<i>Reserving IP Addresses for Specific Devices (MAC-based IP Assignment)</i> ..	248
<i>Configuring Port-based IP Assignment</i> .....	250
<i>DHCP Server</i> .....	253
Configuring DHCP Relay Agent .....	263
<i>About DHCP Relay Agents</i> .....	263
<i>Configuring DHCP Relay Agent</i> .....	264
<i>Configuring Option 82</i> .....	265
<i>DHCP Relay Agent</i> .....	266
About DNS Server .....	271
<i>Example: Configuring DNS Server for a Consist Door</i> .....	276
<i>DNS Server</i> .....	277
<b>Security</b> .....	<b>284</b>
Device Security .....	284
<i>Login Policy</i> .....	284
<i>About Trusted Access</i> .....	286
<i>SSH &amp; SSL</i> .....	289
Network Security .....	292
<i>IEEE 802.1X</i> .....	293

<i>About MAC Authentication Bypass</i> .....	306
<i>Port Security</i> .....	314
<i>Traffic Storm Control</i> .....	324
<i>Access Control List</i> .....	327
<i>Network Loop Protection</i> .....	340
<i>Binding Database</i> .....	343
<i>DHCP Snooping</i> .....	349
<i>IP Source Guard</i> .....	353
<i>Dynamic ARP Inspection</i> .....	357
Authentication .....	360
<i>Login Authentication</i> .....	361
<i>RADIUS</i> .....	363
<i>TACACS+</i> .....	365
<b>Diagnostics</b> .....	<b>368</b>
System Status .....	368
<i>Resource Utilization</i> .....	368
Network Status .....	371
<i>Network Statistics</i> .....	371
<i>LLDP</i> .....	375
Tools .....	384
<i>Port Mirroring</i> .....	384
<i>Ping</i> .....	404
Event Logs and Notifications .....	404
<i>Event Logs</i> .....	405
<i>Event Notifications</i> .....	410
<i>Syslog</i> .....	415
<i>SNMP Trap/Inform</i> .....	419

<i>Email Settings</i> .....	425
<b>Appendix Topics</b> .....	<b>427</b>
<b>Account Privileges List</b> .....	<b>428</b>
System .....	428
Port .....	429
Layer 2 Switching .....	429
IP Configuration .....	430
Redundancy .....	430
<i>Layer 2 Redundancy</i> .....	430
Network Service .....	431
Security .....	431
Diagnostics .....	432
<b>Configuration Types</b> .....	<b>434</b>
<b>Event Log Descriptions</b> .....	<b>435</b>
<b>SNMP MIB Files</b> .....	<b>439</b>
The structure of the Moxa MIB group package .....	439
Standard MIBs Installation Order .....	442
MIB tree .....	443
<b>Severity Level List</b> .....	<b>446</b>

# Chapter 1

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# Overview



# Introduction

Welcome to the MX-NOS Rail Version user manual. This comprehensive guide is designed to help you understand and navigate the UI features, technical concepts, and tasks you may encounter while using your device. Our goal is to simplify your experience and make the setup process easier.

# About MX-NOS and MX-NOS Rail

## Version

### MX-NOS

Moxa's next-generation Ethernet switches are powered by MX-NOS, a tailored firmware platform that seamlessly integrates with your Moxa devices. This unlocks their full potential, transforming your switches into powerful tools with consistent functionality and a user-friendly interface.

How does Moxa achieve this? By providing a platform-based management OS, Moxa offers several key advantages, including:

- **Streamlined software management with regular updates:** Moxa keeps your switches up-to-date with the latest technologies throughout their lifetime. Continuous bug fixes and vulnerability synchronization ensure high software quality and improved network security.
- **Robust security by design:** Moxa adheres to IEC 62443-4-1 for software development lifecycles. As a result, MX-NOS provides a solid foundation for the switches running on it to build security features based on IEC 62443-4-2.
- **Consistent user experience:** MX-NOS features an intuitive UI that provides a consistent user experience across different browsing devices, minimizing training time and maximizing efficiency.

MX-NOS is more than just a firmware platform; it's a significant leap towards a superior user experience.

### MX-NOS Rail Version

Built on the robust foundation of MX-NOS, MX-NOS Rail Version caters specifically to the unique needs and demands of onboard railway networks. It addresses the growing demand for reliable communications and faster response times.

MX-NOS Rail Version offers a comprehensive suite of features that prioritize unwavering reliability to achieve smooth operation of critical railway systems such as TCMS. Furthermore, MX-NOS Rail Version simplifies network design, installation, and maintenance with features designed for onboard networks. This significantly reduces deployment time and ongoing management costs, which translates to a streamlined workflow for railway personnel, allowing them to focus on core operational tasks.

In essence, MX-NOS Rail Version represents a game-changer for onboard railway communications. Its innovative approach streamlines network management and fosters a more agile and responsive railway ecosystem.

# What's in This Document

This document includes the following sections:

- **Overview:** This section introduces this document and how to use it.
- **Quick Start:** This section tells you how to connect to your device so you can start using and configuring it.
- **UI Reference:** This section goes through the web user interface (UI) of your device to help you quickly understand what settings are available. This section also shows you the valid ranges and defaults for settings, and any limitations there may be when configuring your device.
- **Appendix:** This section provides additional reference information for your device.

# Supported Series and Firmware Versions

Moxa Switch Series	Firmware Version
TN-4500B Series	v1.0

**Note**

We are continually improving and developing our software. Check regularly to see if there is an updated version of the software that provides you with additional benefits. You can find information and software downloads on the Moxa product pages at <https://www.moxa.com/en/support/product-support/software-and-documentation>.

## Chapter 2

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# Quick Start

# Using a Web Browser to Configure the Industrial Ethernet Switch

The device's web interface provides a convenient way to modify the switch's configuration and access the built-in monitoring and network administration functions.

## Note

When using the device's web interface, we recommend using the following browsers and versions. Please note that Internet Explorer (IE) is not supported.

- Chrome: 2 most recent versions
- Firefox: Latest version and the Extended Support Release (ESR)
- Edge: 2 most recent major versions
- Safari: 2 most recent major versions
- iOS: 2 most recent major versions
- Android: 2 most recent major versions

Perform the following steps to access the device's web interface:

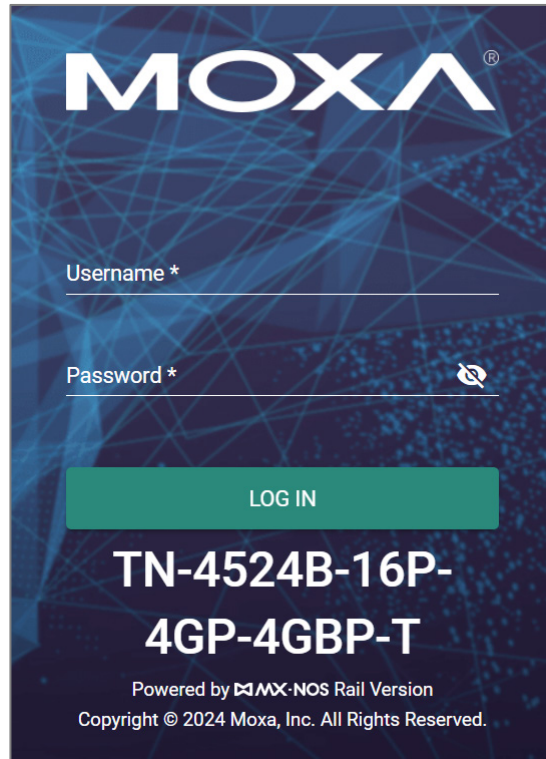
1. Make sure your PC host is connected to your device's LAN port, and is on the same subnet as your device.
2. Open a web browser and type the device's LAN IP address (**192.168.127.254** by default) into the address bar and press Enter.



3. The web login page will open. Enter the username (**admin** or **user**) and password (the same as the Console password) and click **LOG IN** to continue.

## Note

The default username is admin and the default password is moxa. We strongly recommend changing the password as soon as possible to ensure the security of your device.



You may need to wait a few moments for the web interface to appear.

4. After successfully connecting to the switch, the **Device Summary** screen will automatically appear. Use the menu tree on the left side of the window to open the function pages to access each of the switch's functions.



## Chapter 3

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# UI Reference

# UI Reference Overview

This section provides you with a quick reference to the different settings and options of your device.

To help you understand how to use the user interface, the following sections are included:

- The MX-NOS Rail Version User Interface
- Options Menu

The rest of this section follows the order of the menu areas in the user interface:

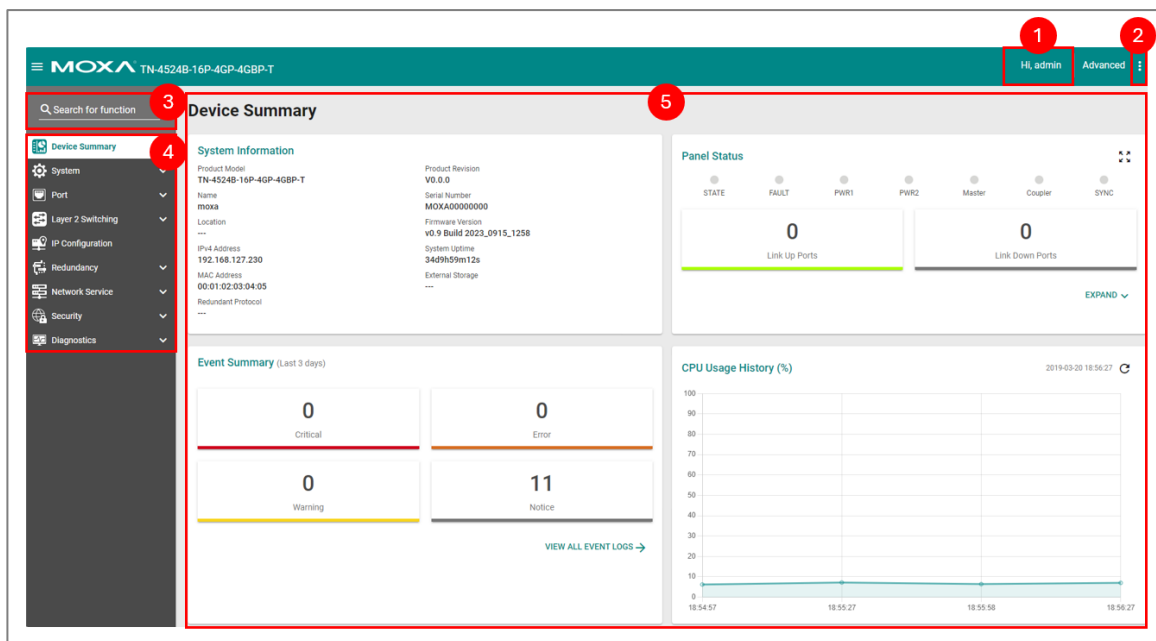
- Device Summary
- System
- Provisioning
- Port
- Layer 2 Switching
- Network Interface
- IP Configuration
- Redundancy
- Network Service
- Security
- Diagnostics

# The MX-NOS Rail Version User Interface

Moxa's managed switches offer a user-friendly web interface for easy configuration, reducing system maintenance and configuration effort.

This section describes how the web interface is laid out to make it easier for you to find and access the different function pages.

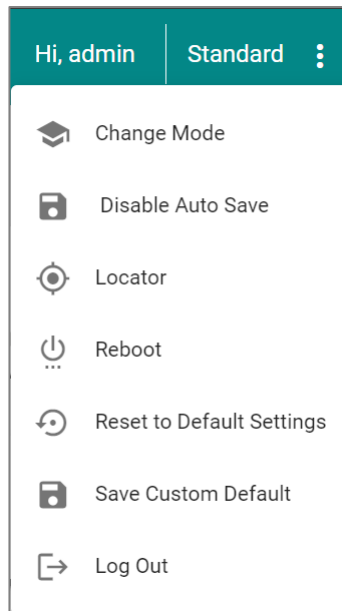
Here is an overview of the MX-NOS Rail Version user interface:



1. **Login Name:** Shows the name of the currently logged in user.
2. **Configuration Mode:** Shows which configuration mode is being used:
  - **Standard Mode:** Some features and parameters will be hidden to make configuration simpler (enabled by default).
  - **Advanced Mode:** More features and parameters will be shown to allow for more detailed configuration.
3. **Search Bar:** Type in a function name to filter to the function menu.
4. **Function Menu:** All functions of the switch are shown here. Click the function you want to view or configure.
5. **Device Summary:** Shows device information and settings for the selected function.

# Options Menu

Clicking the **Options** ( ⋮ ) icon in the upper-right corner of the page will open the options menu.



## Change Mode

There are two configuration modes available for users: **Standard Mode** and **Advanced Mode**.

- In **Standard Mode**, some of the features/parameters will be hidden to make it easier to perform configurations. This is the default setting.
- In **Advanced Mode**, advanced features/parameters will be available for users to adjust these settings.

To switch between modes, click the **Options** ( ⋮ ) icon in the upper-right corner of the page, and select **Change Mode**.

## Disable/Enable Auto Save

Auto Save allows users to save all changes to the device's running configuration to the startup configuration immediately and automatically, so all changes will persist even after

the device has restarted. Refer to [Configuration Types](#) for more information about the different configurations your device uses.

**Note**

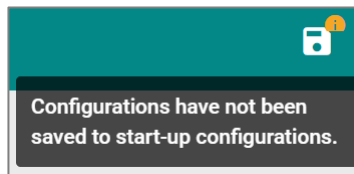
Auto Save is enabled by default.

To disable Auto Save, click the **Options ( ⋮ )** icon in the upper-right corner of the page, and select **Disable Auto Save**.

To save configuration changes to the startup configuration, click the **Save ( 💾 )** icon.

**Note**

When auto save is disabled, if changes have not been saved and the device is restarted, all changes will be lost and the device will revert to its startup configuration.

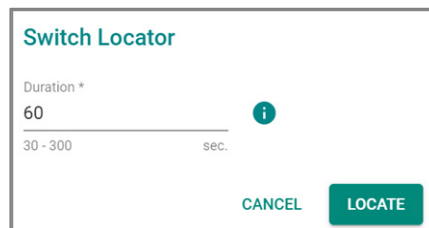


To re-enable Auto Save, click the **Options ( ⋮ )** icon in the upper-right corner of the page, and select **Enable Auto Save**.

## Locator

The Locator feature will cause the LED indicators on the device to flash, making it easier to locate and identify the specific device when installed at a field site.

To trigger the device locator, click the **Options ( ⋮ )** icon in the upper-right corner of the page, and select **Locator**. Select how long in seconds the LEDs should flash for, then click **LOCATE**.



## Reboot

To manually reboot the device, click the **Options** ( ⋮ ) icon in the upper-right corner of the page, and select **Reboot**.

## Reset to Default Settings

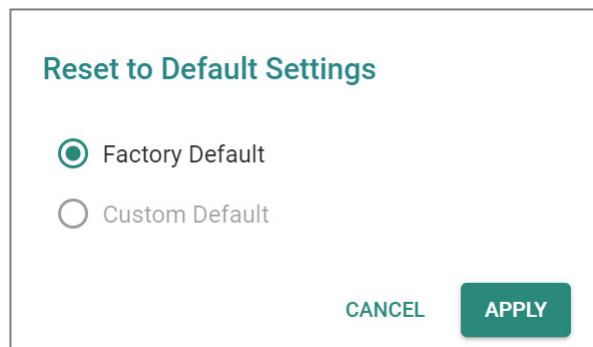
To rest the device to its default settings, click the **Options** ( ⋮ ) icon in the upper-right corner of the page, and select **Reset to Default Settings**.

Select whether to reset to **Factory Default** settings, or the saved **Custom Default** settings, then click **APPLY**.

Refer to Save Custom Default for more information about custom default settings.

### **Note**


Custom Default can only be selected if custom default settings have been saved on the device.



The dialog box titled "Reset to Default Settings" contains two radio button options: "Factory Default" (which is selected) and "Custom Default". At the bottom right of the dialog are two buttons: "CANCEL" and "APPLY".

## Save Custom Default

You can save a custom default configuration for your device. This allows you to reset the device to a trusted configuration without uploading a configuration file to restore from. Refer to [Reset to Default Settings](#) for more information.

 **Note**

- Ensure that the current startup configuration works as expected and that the user account settings are correct before saving the configuration as a custom default.
- The configuration name can be modified on the Config Backup and Restore page. We recommend including the configuration name for better file differentiation. Please note that each configuration must be unique and not repetitive.
- Each device can only have one set of custom default settings.
- Custom default settings can only save and restore configuration settings. They do not include other uploaded files, such as SSL certificate files, SSH keys, etc.
- Refer to Configuration Types for more information about the different configurations your device uses.

To save the current startup configuration as a custom default, click the **Options ( ⋮ )** icon in the upper-right corner of the page, and select **Save Custom Default**.

## Log Out

To log out of the device, click the **Options ( ⋮ )** icon in the upper-right corner of the page, and select **Log Out**.

# Device Summary

## Menu Path: Device Summary

This page lets you see the current status of your device through a variety of display panels.

## System Information

This display shows basic information about your device and its current status.

System Information	
Product Model	Product Revision
TN-4516B-T	V1.0.0
Name	Serial Number
moxa	MOXA00000000
Location	Firmware Version
---	v1.0 Build 2024_0801_1211
IPv4 Address	System Uptime
192.168.127.253	39d6h39m30s
MAC Address	External Storage
00:00:00:00:00:00	---
Redundant Protocol	
STP/RSTP	

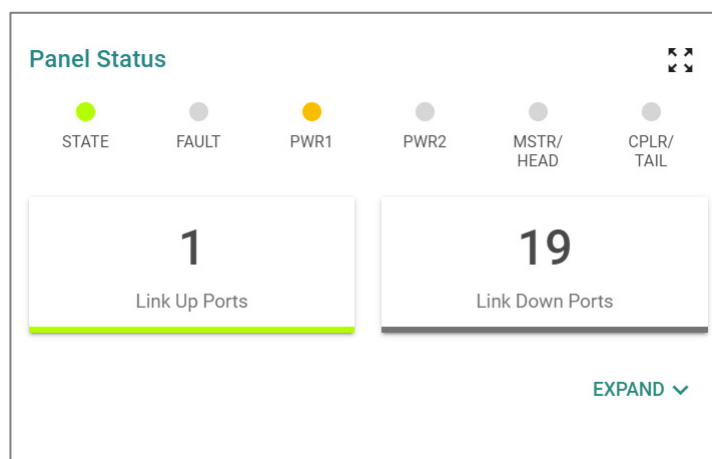
UI Setting	Description
<b>Product Model</b>	Shows the product model of the device.
<b>Name</b>	Shows the name of the device. Refer to <a href="#">System &gt; System Management &gt; Information Settings</a> for more information.
<b>Location</b>	Shows the location of the device. Refer to <a href="#">System &gt; System Management &gt; Information Settings</a> for more information.
<b>IPv4 Address</b>	Shows the IPv4 address of the device.
<b>MAC Address</b>	Shows the MAC address of your device.



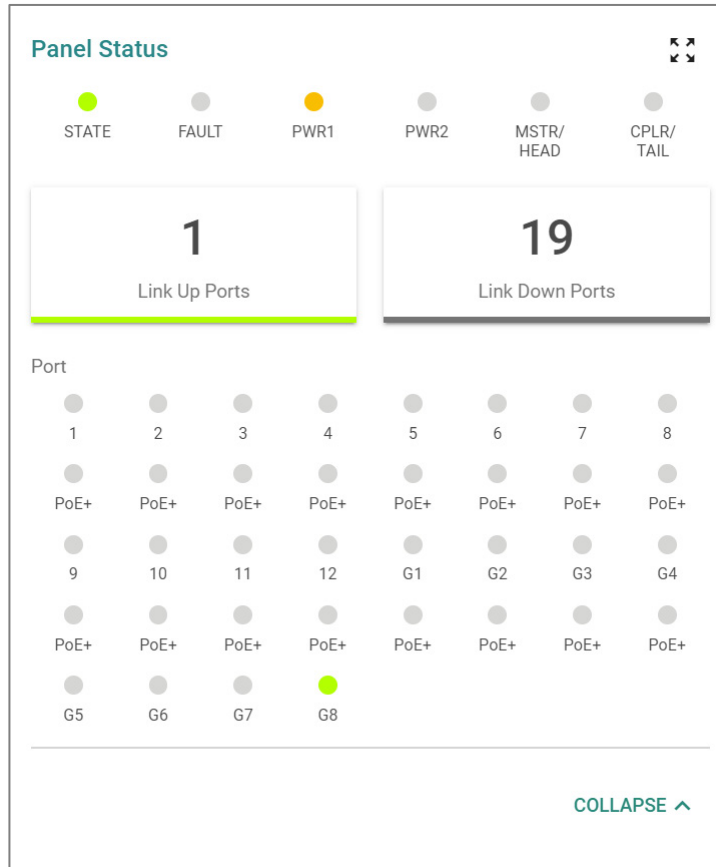
UI Setting	Description
<b>Redundant Protocol</b>	Shows the current redundancy protocol for this switch.
<b>Product Revision</b>	Shows the product revision of the device.
<b>Serial Number</b>	Shows the serial number of your device.
<b>Firmware Version</b>	Shows the firmware version of your device.
<b>System Uptime</b>	Shows the amount of time your device has been continuously running for.
<b>External Storage</b>	Shows the external storage device currently connected to your device, if applicable.

## Panel Status

This display reflects the current status of the physical LEDs on your device, and shows how many ports currently have a link up or link down status. Grey is used to indicate an LED is off. For more information about status LEDs and their behavior, please refer to the QIG.



Click **EXPAND** to view more detailed information, or click **COLLAPSE** to return to the compact view.



## Panel View

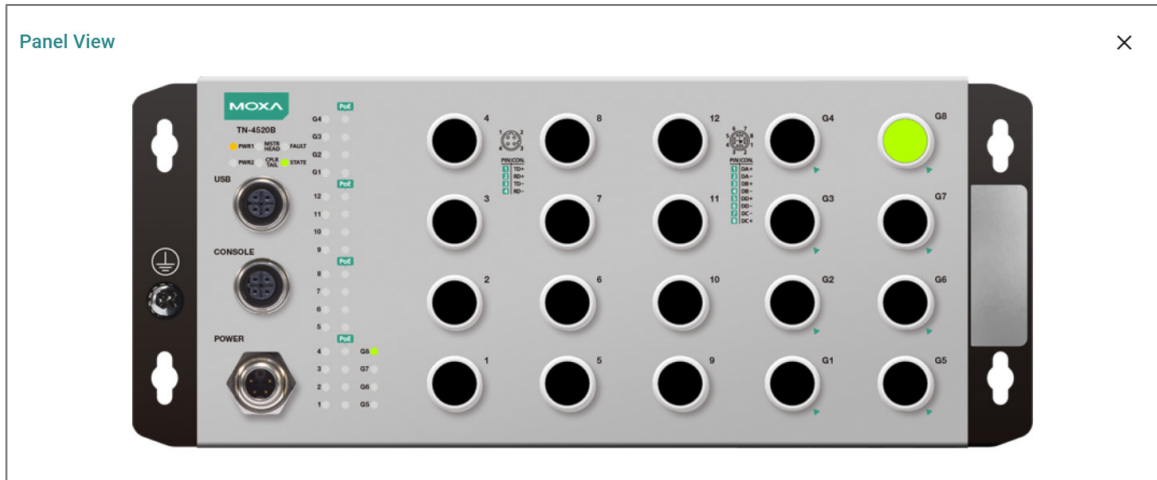
By clicking the **Expand** (↔) icon in **Panel Status**, you can see a visual representation of your device's ports.

Green ports have an active link. You can move your cursor over a port to show a mouseover with more information about that port.

Click the **Close** (✕) icon to close the **Panel View** and show **Panel Status** again.

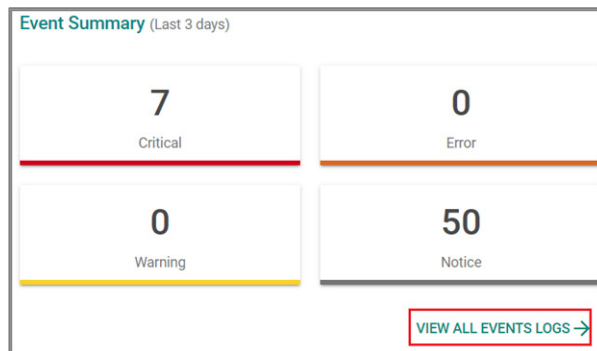
**Note**

The Panel View figure may vary depending on the device and the modules installed in it.



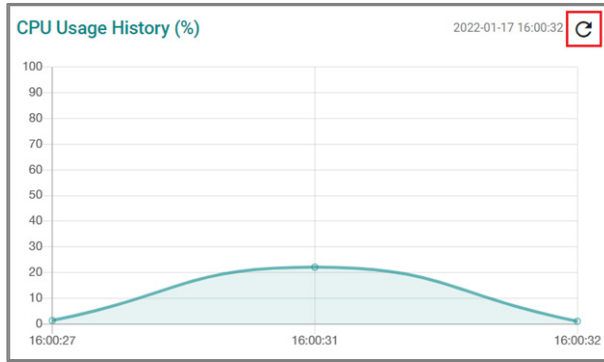
## Event Summary (Last 3 days)

This display shows an event summary for the past three days. Click **VIEW ALL EVENT LOGS** to go to the Diagnostics > Event Logs and Notifications > Event Logs page to view more detailed information.



## CPU Usage History (%)

This display shows the device's CPU usage shown as a percentage over time. Click the **Refresh** (🔄) icon to refresh the graph.



# System

## Menu Path: System

This section lets you adjust various system settings.

This section includes these pages:

- System Management
- Account Management
- Management Interface
- Time

## System Management

### Menu Path: System > System Management

This section lets you adjust various system management related settings.

This section includes these pages:

- Information Settings
- Firmware Upgrade
- Config Backup and Restore

## Information Settings

### Menu Path: System > System Management > Information Settings

This page lets you add additional information about the device to make it easier to identify different switches that are connected to your network. When finished, click APPLY to save your changes.

### Information Settings

Device Name \*  
 4 / 64

Location  
 0 / 255

Description  
 0 / 255

Contact Information  
 0 / 255

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Device Name</b>	Specify a name for the device. This helps you differentiate between the roles or applications of different devices.	1 to 64 characters	moxa
<b>Location</b>	Specify a location for the device. This helps you differentiate between different locations or sites for different devices.	0 to 255 characters	N/A
<b>Description</b>	Specify a description for the device. This helps you keep a more detailed description of the device.	0 to 255 characters	N/A
<b>Contact Information</b>	Specify the contact information of the person in charge of the device. You can enter information such as an email address or telephone number for a person to contact if problems occur.	0 to 255 characters	N/A

## Firmware Upgrade

**Menu Path:** [System](#) > [System Management](#) > [Firmware Upgrade](#)

You can upgrade the firmware through the following methods:

- Local
- TFTP
- SFTP
- USB

 **Note**

It is highly recommended that you back up your device's configuration before upgrading the firmware. Refer to System > System Management > Configuration Backup and Restore for more information.

 **Note**

If it is necessary to verify the integrity and signature of the application when the system is running, the administrator can use the show integrity check CLI command.

 **Warning**

Upgrading the firmware should be only be done by qualified personnel, as it is possible to render the device inoperable if the upgrade is not done properly. If you are not familiar with the process, please request the assistance of qualified personnel. You can also consult with Moxa support and we will provide you with the necessary assistance.

Before performing a firmware upgrade, make sure you take the following precautions:

- Back up your configuration before upgrading the firmware
- Ensure that the device has power during the entire process
- Ensure that your computer stays connected to the device you are upgrading the firmware on
- Make sure the connection to the firmware source is not interrupted during the upgrade process

## Firmware Upgrade - Local

If you select **Local** as your **Method**, these settings will appear. The Local method lets you upload firmware directly from local storage on the host device.

 **Note**

Before performing a firmware upgrade, download the updated firmware (\*.rom) file first from Moxa's website ([www.moxa.com](http://www.moxa.com)).

### Firmware Upgrade

Method \*  
Local

Select File \*

UPGRADE

UI Setting	Description	Valid Range	Default Value
<b>Select File</b>	Select the new firmware file (*.rom) to use from your computer.	Select a file from your computer	N/A

### Firmware Upgrade - TFTP

If you select **TFTP** as your **Method**, these settings will appear. The TFTP method lets you upload and install firmware stored on a remote TFTP server.

### Firmware Upgrade

Method  
TFTP

Server IP Address \*      File Name \*

UPGRADE

UI Setting	Description	Valid Range	Default Value
<b>Server IP Address</b>	Specify the IP address of the TFTP server where the new firmware file (*.rom) is located.	Valid IP address	N/A



UI Setting	Description	Valid Range	Default Value
<b>File Name</b>	Specify the filename of the new firmware.	File name	N/A

## Firmware Upgrade - SFTP

If you select **SFTP** as your **Method**, these settings will appear. The SFTP method lets you upload and install firmware stored on a remote SFTP server.

### Firmware Upgrade

Method \*  
SFTP

Server IP Address \*

File Name \*

Account \*

Password \*

UPGRADE

UI Setting	Description	Valid Range	Default Value
<b>Server IP Address</b>	Specify the IP address of the SFTP server where the new firmware file (*.rom) is located.	Valid IP address	N/A
<b>File Name</b>	Specify the filename of the new firmware.	File name can only contain A-Z, a-z, 0-9 or the symbols -._().	N/A
<b>Account</b>	Enter the SFTP server account name to use to connect to the SFTP server.	Account	N/A
<b>Password</b>	Enter the SFTP server account password to use to connect to the SFTP server.	Password	N/A

## Firmware Upgrade - USB

If you select **USB** as your **Method**, these settings will appear. The USB method allows you to upgrade the firmware via Moxa's USB-based ABC-02 configuration tool.

**Note**

To use this feature, USB Function must be enabled in System > Management Interface > Hardware Interface.

## Firmware Upgrade

Method \*

USB

Select File \*

UPGRADE

UI Setting	Description	Valid Range	Default Value
<b>Select File</b>	Select the new firmware file (*.rom) to use from your USB device.	Select a file from the USB device	N/A

### Firmware Upgrade - microSD

If you select **microSD** as your **Method**, these settings will appear. The microSD method allows you to upgrade the firmware via Moxa's USB-based ABC-03 configuration tool.

**Note**

To use this feature, microSD Function must be enabled in System > Management Interface > Hardware Interfaces.

UI Setting	Description	Valid Range	Default Value
<b>Select File</b>	Select the new firmware file (*.rom) to use from your USB device.	Select a file from the microSD device	N/A

## Configuration Backup and Restore

**Menu Path:** [System](#) > [System Management](#) > [Configuration Backup and Restore](#)

This page helps you back up and restore your device configuration.

This page includes these tabs:

- Backup
- Restore
- File Encryption
- File Signature

### Configuration Backup and Restore - Backup

**Menu Path:** [System](#) > [System Management](#) > [Configuration Backup and Restore - Backup](#)

This section lets you create a backup of the current device configuration.

There are multiple methods of backing up the device configuration:

- Local
- TFTP

- SFTP
- USB

**Note**

For security reasons, we strongly recommend that you back up the system configuration to a secure storage location periodically.

**Note**

To export your custom settings, select "Startup Configuration" when exporting the configuration. Since saving custom default will also copy the settings into startup configuration.

## Configuration Name

You can specify a configuration name to easily identify the configuration during backup or restore.

**Note**

The configuration name alone cannot ensure the integrity and consistency of the configuration file. You can have multiple backups with the same configuration name, but the settings in the configuration files may be different.

### Configuration Backup and Restore

Backup	Restore	File Encryption	File Signature
--------	---------	-----------------	----------------

Configuration Name  
test123  
7 / 32

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>Configuration Name</b>	Specify the configuration name to use for the backup.	1 to 32 characters	moxa

### Configuration Backup - Local

If you select **Local** as your **Method**, these settings will appear. The Local method will export the configuration backup file to the local host.

Method \*

Local

Select Configuration \*

Running Configuration

Default Configuration \*

Not Included

**BACK UP**

UI Setting	Description	Valid Range	Default Value
<b>Select Configuration</b>	Choose to back up the running configuration or the startup configuration of the switch.	Running Configuration / Startup Configuration	Running Configuration
<b>Default Configuration</b>	Choose to back up the configuration without or with default settings.	Not Included / Included	Not Included

### Configuration Backup - TFTP

If you select **TFTP** as your **Method**, these settings will appear. The TFTP method lets you upload the configuration backup file to a remote TFTP server.

Method \*

TFTP

Server IP Address \*

File Name \*

BACK UP

UI Setting	Description	Valid Range	Default Value
<b>Server IP Address</b>	Specify the IP address of the TFTP server to upload the backup to.	Valid IP address	N/A
<b>File Name</b>	Specify a filename for the backup.	N/A	N/A

### Configuration Backup - SFTP

If you select **SFTP** as your **Method**, these settings will appear. The SFTP method lets you upload the configuration backup file to a remote SFTP server.

Method \*

SFTP

Server IP Address \*

File Name \*

Account \*

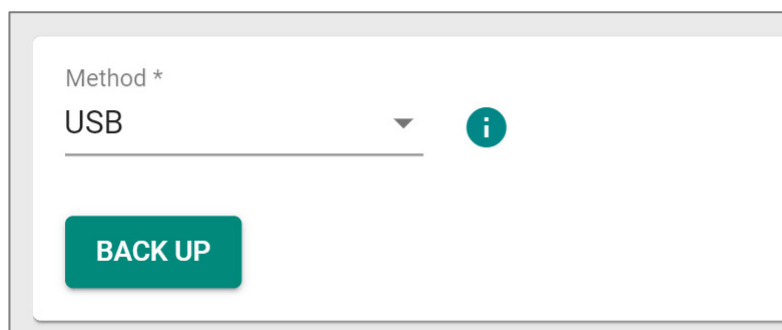
Password \*

BACK UP

UI Setting	Description	Valid Range	Default Value
<b>Server IP Address</b>	Specify the IP address of the SFTP server to upload the backup to.	Valid IP address	N/A
<b>File Name</b>	Specify a filename for the backup.		N/A
<b>Account</b>	Enter the SFTP server account name to use to connect to the SFTP server.		N/A
<b>Password</b>	Enter the SFTP server account password to use to connect to the SFTP server.		N/A

### Configuration Backup - USB

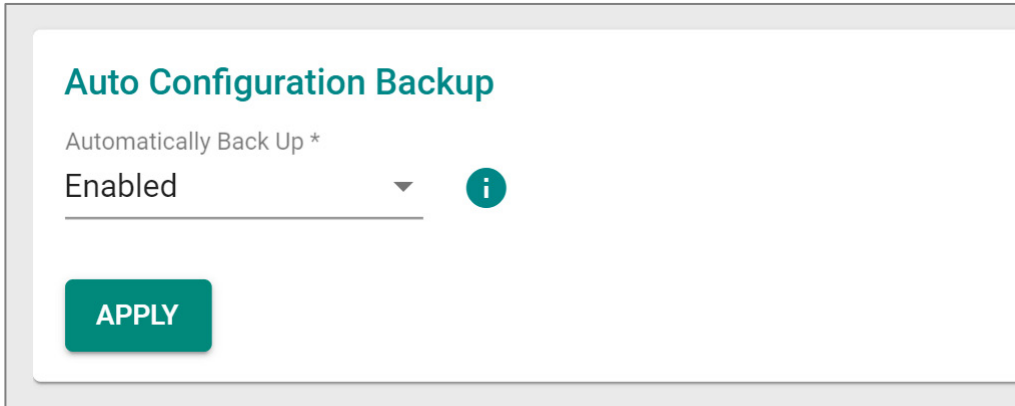
If you select **USB** as your **Method**, these settings will appear. The USB method allows you to export the configuration backup file to a Moxa ABC-02 configuration tool connected to the device. Insert a Moxa ABC-02 configuration tool into the USB port of the switch, then click **BACK UP** to back up the system configuration file.



### Auto Configuration Backup

Auto configuration backup lets you automatically back up the configuration file to an ABC-02 configuration tool whenever the configuration is changed.

To enable automatic backup, select **Enabled** from the drop-down list, then click **APPLY**.



UI Setting	Description	Valid Range	Default Value
<b>Automatically Back Up</b>	When enabled, this will back up the current configuration to an inserted ABC-02 configuration tool.	Enabled / Disabled	Enabled
<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p><b>Note</b></p> <p>To use this feature, <b>USB Function</b> must be enabled in <b>System &gt; Management Interface &gt; Hardware Interface</b>.</p> </div>			

## Configuration Backup and Restore - Restore

### Menu Path: System > System Management > Configuration Backup and Restore - Restore

This page lets you restore a previously backed up configuration.

There are multiple methods of restoring the device configuration:

- Local
- TFTP
- SFTP
- USB



**Note**

To import your custom settings, select the "Restore" option. Choose the previously exported custom configuration file you wish to apply.

### Configuration Restore - Local

If you select **Local** as your **Method**, these settings will appear. The Local method will restore from a configuration file on the local host.

The screenshot shows a web interface titled "Configuration Backup and Restore". It has four tabs: "Backup", "Restore" (which is active), "File Encryption", and "File Signature". Below the tabs, there is a "Method \*" dropdown menu with "Local" selected. Below that is a "Select File \*" field with a folder icon to its right. At the bottom left of the form is a green "RESTORE" button.

UI Setting	Description	Valid Range	Default Value
Select File	Select the configuration file to use from your computer.	Select a file from your computer	N/A

### Configuration Restore - TFTP

If you select **TFTP** as your **Method**, these settings will appear. The TFTP method lets you download and install a configuration stored on a remote TFTP server.

## Configuration Backup and Restore

Backup	Restore	File Encryption	File Signature
--------	---------	-----------------	----------------

Method *
TFTP

Server IP Address *	File Name *
---------------------	-------------

**RESTORE**

UI Setting	Description	Valid Range	Default Value
<b>Server IP Address</b>	Specify the IP address of the TFTP server.	Valid IP address	N/A
<b>File Name</b>	Specify the file name of the configuration file to restore from.	Up to 54 characters, including file extension	N/A

### Configuration Restore - SFTP

If you select **SFTP** as your **Method**, these settings will appear. The SFTP method lets you download and install a configuration stored on a remote SFTP server.

## Configuration Backup and Restore

Backup
Restore
File Encryption
File Signature

Method \*  
SFTP ▼

Server IP Address \*

File Name \*

Account \*

Password \*

RESTORE

UI Setting	Description	Valid Range	Default Value
<b>Server IP Address</b>	Specify the IP address of the SFTP server.	Valid IP address	N/A
<b>File Name</b>	Specify the file name of the configuration file to restore from.	File name can only contain A-Z, a-z, 0-9 and special character -._().	N/A
<b>Account</b>	Enter the SFTP server account name to use to connect to the SFTP server.	Account	N/A
<b>Password</b>	Enter the SFTP server account password to use to connect to the SFTP server.	Password	N/A

### Configuration Restore - USB


If you select USB as your **Method**, these settings will appear. The USB method allows you to restore the configuration from a file via Moxa's USB-based ABC-02 configuration tool.


**Note**

To use this feature, USB Function must be enabled in System > Management Interface > Hardware Interface.

## Configuration Backup and Restore

Backup   **Restore**   File Encryption   File Signature

Method \*  
USB 

Select File \* 

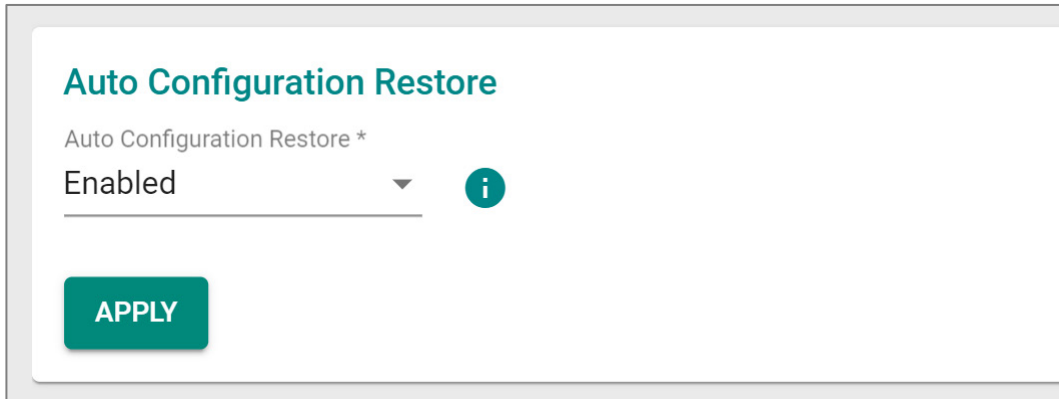
**RESTORE**

UI Setting	Description	Valid Range	Default Value
<b>Select File</b>	Select the configuration file to use from your USB device.	Select a file from the USB device	N/A

### Auto Configuration Restore

Auto configuration restore lets you restore the device's configuration from an inserted ABC-02 configuration tool whenever the device is rebooted.

To enable automatic restore, select **Enabled** from the drop-down list, then click **APPLY**.



UI Setting	Description	Valid Range	Default Value
<b>Automatically Restore</b>	When enabled, this will restore the device's configuration from an inserted ABC-02 configuration tool whenever the device is rebooted.	Enabled / Disabled	Enabled
<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p><b>Note</b></p> <p>To use this feature, <b>USB Function</b> must be enabled in <b>System &gt; Management Interface &gt; Hardware Interface</b>.</p> </div>			

## Configuration Backup and Restore - File Encryption

**Menu Path: System > System Management > Configuration Backup and Restore - File Encryption**

This page lets you configure data encryption settings for exported configuration files.

## Configuration Backup and Restore

Backup
Restore
File Encryption
File Signature

Configuration File Encryption \*

Encrypt sensitive information only ▾

---

Password

0 / 60

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Configuration File Encryption</b>	<p>Select which file encryption mode to use.</p> <p><b>Encrypt sensitive information only:</b> Only sensitive information will be encrypted in the configuration file.</p> <p><b>Encrypt the entire file:</b> The entire configuration file will be encrypted.</p> <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <p> <b>Note</b></p> <p>Sensitive information includes passwords used for authentication and the encryption key used to encrypt data.</p> </div>	Encrypt sensitive information only / Encrypt whole file	Encrypt sensitive information only
<b>Encryption Key</b>	<p>Specify an encryption key to use for configuration files.</p> <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <p> <b>Note</b></p> <p>If no encryption key is specified, then the Moxa encryption key will be used.</p> </div>	0 to 60 characters	Blank (the Moxa encryption key will be used)

## File Signature

### Menu Path: System > System Management > Configuration Backup and Restore - File Signature

This page lets you enable use of file signatures to help ensure the file integrity and authenticity of your configuration files.

#### Note

Before enabling file signatures, you will need to add a private/public key to the table on this page.


#### Limitations

You can add up to 1 key to use for file signatures.


## Signed Configuration



### Configuration Backup and Restore

Backup   Restore   File Encryption   **File Signature**

Signed Configuration \*  
Disabled 

**APPLY**



Key	Label	Algorithm	Length
Max. 1			
0 of 0  			

UI Setting	Description	Valid Range	Default Value
<b>Signed Configuration</b>	Enables or disables the use of a digital signature to check the integrity of configuration files.  <div style="border: 1px solid #ccc; padding: 5px; background-color: #f9f9f9;"> <p><b>Note</b></p> <p>To enable this feature, a private/public key must be installed first. Refer to <a href="#">Adding a Custom Key</a> for more information.</p> </div>	Enabled / Disabled	Disabled

## File Signature Key List

Key	Label	Algorithm	Length
Private/Certificate	Test	RSA	2048

UI Setting	Description
<b>Key</b>	Shows whether the key is a public or private key.
<b>Label</b>	Shows the label used to help identify the key.
<b>Algorithm</b>	Shows the algorithm used for the key, such as RSA or ECDSA.
<b>Length</b>	Shows the length of the key in bits.

## Adding a Custom Key

### Menu Path: System > System Management > Configuration Backup and Restore - File Signature

Clicking the **Add (+)** icon on the **System > System Management > Configuration Backup and Restore - File Signature** page will open this dialog box. This dialog lets you add a custom key to use for file signatures.

Click **CREATE** to save your changes and add the new key.



UI Setting	Description	Valid Range	Default Value
<b>Label</b>	Specify a label to help describe the certificate and the key.	0 to 16 characters	N/A
<b>Certificate</b>	Select a certificate file to import from your computer.	Select a certificate file from your computer	N/A
<b>Key</b>	Select a key file to import from your computer.	Select a key file from your computer	N/A

## Account Management

### Menu Path: [System](#) > [Account Management](#)

This section lets you manage user accounts for your device. You can enable different accounts with different roles to facilitate convenient management and safe access.

This section includes these pages:

- User Accounts
- Online Accounts
- Password Policy

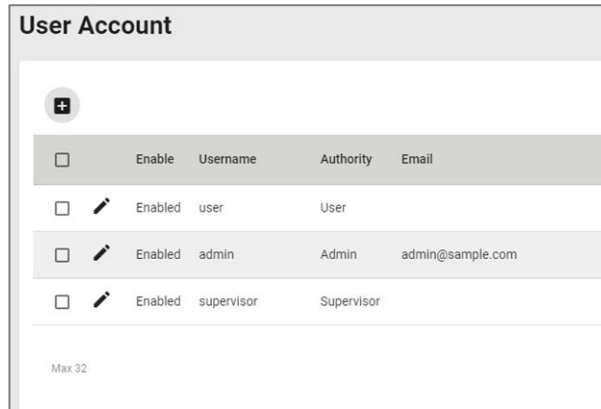
## User Accounts

### Menu Path: [System](#) > [Account Management](#) > [User Accounts](#)

This page lets you manage the user accounts for your device.

**Note**

By default, there is only one account: admin



UI Setting	Description
<b>Enable</b>	Shows whether the account is enabled or disabled.
<b>Username</b>	Shows the username of the account.
<b>Authority</b>	Shows the authority level of the account.
<b>Email</b>	Shows the email address of the account.

### User Accounts - Create a New Account

#### Menu Path: System > Account Management > User Accounts



Clicking the **Add (+)** icon on the **System > Account Management > User Accounts** page will open this dialog box. This dialog lets you create a new user account. Click **CREATE** to save your changes and add the new account.

### Create a New Account

Enable \*  
 Enabled ▾


Username \*  
 Minimum 4 characters 0 / 32

Authority \* ▾

New Password \*  Confirm Password \*   
 Minimum 4 characters 0 / 63 Minimum 4 characters 0 / 63

Email  
 0 / 63

CANCEL CREATE

UI Setting	Description	Valid Range	Default Value
<b>Enable</b>	Enable or disable the user account.	Enabled / Disabled	Enabled
<b>Username</b>	Specify a username for this account.	4 to 32 characters	N/A
<b>Authority</b>	<p>Specify the authority level of the account. Refer to the <a href="#">Account Privileges List</a> for a list of what read/write access privileges are granted for the different authority levels.</p> <ul style="list-style-type: none"> <li>• <b>Admin:</b> This account has read/write access of all configuration parameters.</li> <li>• <b>Supervisor:</b> This account has read/write access for a limited set of configuration parameters.</li> <li>• <b>User:</b> This account can only view a limited set of configuration parameters.</li> </ul>	Admin / Supervisor / User	N/A
	<p> <b>Note</b></p> <p>In order to enhance security, we suggest you create a new account with the User authority.</p>		

UI Setting	Description	Valid Range	Default Value
<b>New Password</b>	Specify the new password for this account.	4 to 63 characters, additional requirements are based on settings in <b>System &gt; Account Management &gt; Password Policy</b>	N/A
<b>Confirm Password</b>	Reenter the password to confirm.	4 to 63 characters, must match <b>New Password</b>	N/A
<b>Email</b>	Specify an email address for the account (optional).	Valid email address, 0 to 63 characters	N/A

## User Accounts - Edit This Account

### Menu Path: System > Account Management > User Accounts

Clicking the **Edit** (✎) icon on the **System > Account Management > User Accounts** page will open this dialog box. This dialog lets you edit an existing user account. Click **APPLY** to save your changes.


### Edit This Account

Enable \*

Username  
 CHANGE PASSWORD  
Minimum 4 characters 5 / 32

Authority \*

Email  
 16 / 63


UI Setting	Description	Valid Range	Default Value
<b>Enable</b>	Enable or disable the user account.	Enabled / Disabled	Enabled
<b>Username</b>	Shows the username of the account.	N/A	N/A
	<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p> <b>Note</b></p> <p>The username cannot be edited after creating an account.</p> </div>		
<b>Authority</b>	<p>Specify the authority level of the account. Refer to the <a href="#">Account Privileges List</a> for a list of what read/write access privileges are granted for the different authority levels.</p> <ul style="list-style-type: none"> <li>• <b>Admin:</b> This account has read/write access of all configuration parameters.</li> <li>• <b>Supervisor:</b> This account has read/write access for a limited set of configuration parameters.</li> <li>• <b>User:</b> This account can only view a limited set of configuration parameters.</li> </ul>	Admin / Supervisor / User	N/A
<b>Change Password</b>	Click <b>CHANGE PASSWORD</b> to change the account password. Refer to <a href="#">Edit the Account Password</a> for more information.	N/A	N/A
<b>Email</b>	Specify an email address for the account (optional).	Valid email address, 0 to 63 characters	N/A


### Edit the Account Password

Clicking **CHANGE PASSWORD** in the **Edit This Account** dialog will open this dialog box. This dialog lets you change the password for an account. Click **APPLY** to save your changes.


### Edit the Account Password

Username  
Test  
Minimum 4 characters 4 / 32

New Password \*   
Minimum 4 characters 0 / 63


Confirm Password \*   
Minimum 4 characters 0 / 63

[BACK](#)
[APPLY](#)

UI Setting	Description	Valid Range	Default Value
<b>Username</b>	Shows the username of the account.	N/A	N/A
<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p> <b>Note</b></p> <p>The username cannot be edited after creating an account.</p> </div>			
<b>New Password</b>	Specify the new password for this account.	4 to 63 characters, additional requirements are based on settings in <b>System &gt; Account Management &gt; Password Policy</b>	N/A
<b>Confirm Password</b>	Reenter the password to confirm.	4 to 63 characters, must match <b>New Password</b>	N/A

## User Accounts - Delete Account

### Menu Path: System > Account Management > User Accounts

You can delete an account by using the checkboxes to select the entries you want to delete, then clicking the **Delete** (  ) icon.

**User Account**

Enable	Username	Authority	Email
<input checked="" type="checkbox"/>	user	User	
<input type="checkbox"/>	admin	Admin	admin@sample.com
<input type="checkbox"/>	supervisor	Supervisor	

## Online Accounts

**Menu Path: System > Account Management > Online Accounts**

This page lets you view a list of connected user and also lets you disconnect users.

**Online Accounts**

Username	Authority	IP Address	Interface	Idle Time (sec.)
admin	Admin	192.168.127.254	HTTP(S)	0

1 - 1 of 1

UI Setting	Description
<b>Username</b>	Shows the username of the online account.
<b>Authority</b>	Shows the authority level of the online account.
<b>IP Address</b>	Shows the IP address of the online account.
<b>Interface</b>	Shows the interface that the online account is using.
<b>Idle Time (sec.)</b>	Show the idle time is seconds for the online account.

## Online Accounts - Remove This Online Account

**Menu Path:** [System](#) > [Account Management](#) > [Online Accounts](#)

You can disconnect a user by clicking its **Remove** (🗑️) icon. Click **REMOVE** to save your changes and remove the online account.

## Password Policy

**Menu Path:** [System](#) > [Account Management](#) > [Password Policy](#)

This page lets you create a robust password policy to safeguard your system against hackers. By enforcing minimum length and complexity requirements, you can empower users to choose strong passwords that are difficult to crack. Additionally, you can set a maximum password lifetime to ensure regular password changes, further enhancing security. Click **APPLY** to save your changes.

### **Note**

To improve the security of your device and network, we recommend that you:

- Set the Minimum Length for passwords to 16
- Enable the Password complexity strength check and enable all the requirements
- Set a Maximum Password Lifetime to ensure that users change their password regularly



## Password Policy

Minimum Password Length \*

4

4 - 63

### Password Complexity Strength Check

- Must contain at least one digit (0-9)
- Must contain at least one uppercase letter (A-Z)
- Must contain at least one lowercase letter (a-z)
- Must contain at least one special character ({ } [ ] ( ) | ; ~ ! @ # % ^ \* \_ + = , .)

Maximum Password Lifetime \*

0

0 - 365 day

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Minimum Password Length</b>	Specify the minimum required password length.	4 to 16 characters	4
<b>Password Complexity Strength Check</b>	Select the complexity requirements that will apply to new passwords. <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>New requirements will only apply when creating or changing a password. They will not apply to existing passwords.</p> </div>	Must contain at least one digit (0-9) / Must contain at least one uppercase letter (A-Z) / Must contain at least one lowercase letter (a-z) / Must contain at least one special character ({ } [ ] ( )   ; ~ ! @ # % ^ * _ + = , .)	N/A
<b>Maximum Password Lifetime</b>	Specify how long in days passwords will be valid for. When the password expires, the system will require the user to change their password. <p>If this is set to 0, passwords will not expire.</p>	0 to 365 days	0

# Management Interface

**Menu Path:** [System](#) > [Management Interface](#)

This section lets you configure the interfaces used to manage the device.

This section includes these pages:

- User Interface
- Hardware Interfaces
- SNMP

## User Interface

**Menu Path:** [System](#) > [Management Interface](#) > [User Interface](#)

This page lets you configure which interfaces can be used to access the device. Click **APPLY** to save your changes.

**Note**



For security reasons, users should access the device using secure HTTPS and SSH interfaces.

### User Interface

HTTP *	Enabled	▼	HTTP - TCP Port *	80
				80, 1024 - 65535
HTTPS *	Enabled	▼	HTTPS - TCP Port *	443
				443, 1024 - 65535
Telnet *	Disabled	▼	Telnet - TCP Port *	23
				23, 1024 - 65535
SSH *	Enabled	▼	SSH - TCP Port *	22
				22, 1024 - 65535
SNMP *	Disabled	▼	SNMP - UDP Port *	161
				161, 1024 - 65535
Maximum Number of Login Sessions for HTTP+HTTPS *				5
				1 - 10
Maximum Number of Login Sessions for Telnet+SSH *				1
				1 - 5

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>HTTP</b>	Enable or disable HTTP connections.	Enabled / Disabled	Enabled
<b>HTTP - TCP Port</b>	Specify the TCP port to use for HTTP connections.	80, 1024 to 65535	80

UI Setting	Description	Valid Range	Default Value
<b>HTTPS</b>	<p>Enable or disable HTTPS connections.</p> <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <p> <b>Note</b></p> <p>The administrator can manually import a self-signed certificate (in .p12 format) for web server (HTTPS) services. However, the administrator should check the root certificate and validity of the signature before importing, according to the organization's security procedures and requirements. After importing a certificate, the administrator should check if the certificate has been revoked and if so, the certificate must be replaced. When a browser verifies the signature and accesses the device, it will return a subject name which the administrator can use to confirm the connected device is authorized.</p> </div> <div style="background-color: #f0f0f0; padding: 10px; margin-top: 20px;"> <p> <b>Note</b></p> <p>The encryption algorithm of keys should be selected based on internationally recognized and proven security practices and recommendations.</p> <p>The lifetime of certificates generated for web server (HTTPS) services should be short and in accordance with the organization's security procedures and requirements.</p> </div>	Enabled / Disabled	Enabled
<b>HTTPS - TCP Port</b>	Specify the TCP port to use for HTTPS connections.	443, 1024 to 65535	443
<b>Telnet</b>	Enable or disable Telnet connections.	Enabled / Disabled	Disabled
<b>Telnet - TCP Port</b>	Specify the TCP port to use for Telnet connections.	23, 1024 to 65535	23
<b>SSH</b>	Enable or disable SSH connections.	Enabled / Disabled	Enabled
<b>SSH - TCP Port</b>	Specify the TCP port to use for SSH connections.	22, 1024 to 65535	22
<b>SNMP</b>	Enable or disable SNMP connections.	Enabled / Disabled	Disabled
<b>SNMP - UDP Port</b>	Specify the UDP port to use for SNMP connections.	161, 1024 - 65535	161

UI Setting	Description	Valid Range	Default Value
<b>Maximum Number of Login Sessions for HTTP+HTTPS</b>	Specify the maximum combined number of users that can be logged in using HTTP and HTTPS.	1 to 10	5
<b>Maximum Number of Login Sessions for Telnet+SSH</b>	Specify the maximum combined number of users that can be logged in using Telnet and SSH.	1 to 5	1

## Hardware Interfaces

**Menu Path:** [System](#) > [Management Interface](#) > [Hardware Interfaces](#)

This page lets you enable or disable the USB interface on the device for use with an ABC-02 backup configurator tool.

Click **APPLY** to save your changes.

### Hardware Interfaces Settings

UI Setting	Description	Valid Range	Default Value
<b>USB Interface</b>	Enable or disable the USB interface on the device.	Enabled / Disabled	Enabled

## Configuring Simple Network Management Protocol

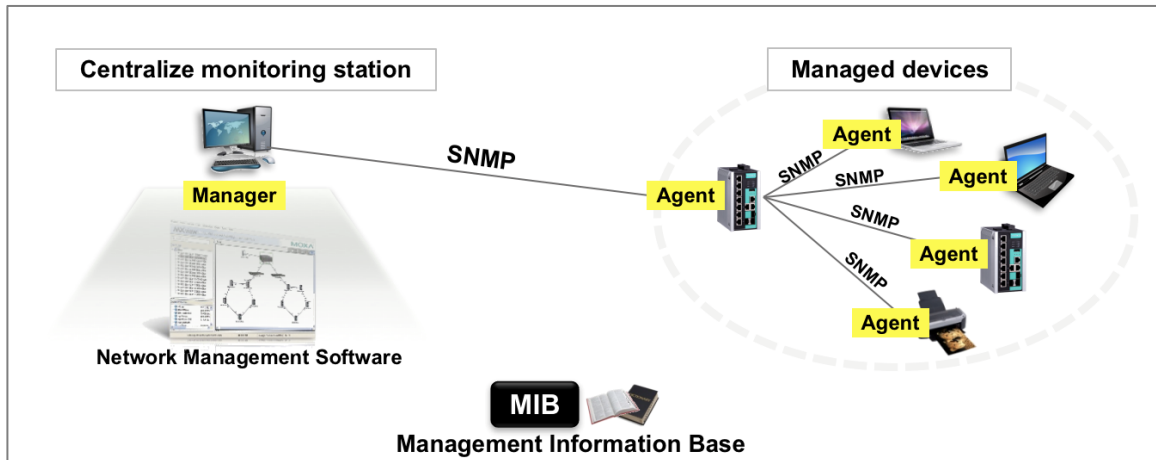
Simple Network Management Protocol (SNMP) be used to manage and monitor network devices.

It is an application-layer protocol that allows administrators to manage network performance, diagnose network problems, and gather information about network devices such as routers, switches, servers, printers, and other network equipment. SNMP works by using agents installed on network devices, which provide information to a central management system known as an SNMP manager. The manager sends requests to the agent to retrieve information about the device, such as CPU utilization, memory usage, network traffic, and other metrics.

### About SNMP

An SNMP deployment consists of Managers, Agents, and Management Information Bases (MIBs).

- **Management Information Base (MIB):** A database of information about network devices and their performance metrics. The MIB is organized hierarchically and uses a tree-like structure.
- **SNMP Manager:** The central management system that monitors and manages network devices. It sends requests to the SNMP agents to gather information and configure network devices.
- **SNMP Agent:** A software module installed on network devices that provides information about the device to the SNMP manager. The agent responds to requests from the manager and sends notifications to the manager when certain events occur, such as a device failure.



SNMP agents expose management data on the managed systems as variables. The protocol also permits active management tasks, such as configuration changes, through remote modification of these variables. The variables accessible via SNMP are organized in hierarchies. SNMP itself does not define which variables a managed system should offer. Rather, SNMP uses an extensible design that allows applications to define their own hierarchies. These hierarchies are described as a management information base (MIB). MIBs describe the structure of the management data of a device subsystem; they use a hierarchical namespace containing object identifiers (OID). Each OID identifies a variable that can be read or set via SNMP.

## Creating an SNMP Account

You must configure an SNMP account on each of your devices to manage them.

Some account settings are contingent on SNMP account settings. Protocol versions earlier than v3 do not support authentication or encryption, and require shared community keys. Go to **System > Management Interface > SNMP**, click **General**, and choose an SNMP Version. For insecure versions, also specify community strings.

### Note

SNMP versions earlier than v3 do not support authentication or encryption, and provide no security. It is strongly recommended to choose V3 Only unless compatibility absolutely requires earlier versions and security risks have been thoroughly evaluated.

To configure SNMP accounts:



1. Sign in to the device using administrator credentials.

2. Go to **System > Management Interface > SNMP**, and then click **SNMP Account**.

3. Click  **[Add]**.



The Create an SNMP Account screen appears.

4. Specify all of the following, and then click **Create**:

Option	Value
<b>Username</b>	Specify a username for the account with up to 32 characters
<b>Authority</b>	Choose from: <ul style="list-style-type: none"><li>• <b>Read/Write</b></li><li>• <b>Read</b></li></ul>
<b>Authentication Type</b>	Choose from: <ul style="list-style-type: none"><li>• <b>None</b></li><li>• <b>MD5</b></li><li>• <b>SHA</b></li><li>• <b>SHA-256</b></li><li>• <b>SHA-512</b></li></ul> <div data-bbox="906 1167 1326 1339"><p> <b>Note</b> Authentication requires SNMP v3.</p></div>
<b>Authentication Password</b>	If an authentication type has been specified, specify a password for the account between 8 and 64 characters long.
<b>Encryption Key</b>	<ul style="list-style-type: none"><li>• <b>Disabled</b></li><li>• <b>DES</b></li><li>• <b>AES</b></li></ul> <div data-bbox="906 1704 1326 1850"><p> <b>Note</b> Encryption requires SNMP v3.</p></div>
<b>Encryption Key</b>	If an encryption method has been chosen, specify an Encryption Key between 8 and 64 characters long.



The account appears in the **SNMP Account** table.

You can Edit or Delete from the list by clicking the corresponding  **[Edit]** or  **[Delete]**.

## SNMP

**Menu Path: System > Management Interface > SNMP**

This page lets you configure SNMP settings for your device.

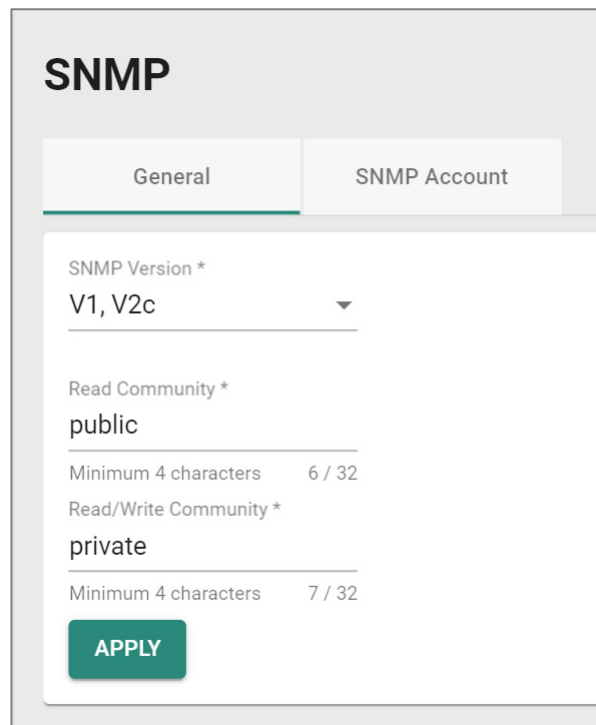
This page includes these tabs:

- General
- SNMP Account

### SNMP - General

**Menu Path: System > Management Interface > SNMP - General**

This page lets you specify the SNMP versions used to manage your device.



The screenshot shows the 'SNMP' configuration page with two tabs: 'General' and 'SNMP Account'. The 'General' tab is active. The configuration fields are as follows:

Field	Value	Character Count
SNMP Version *	V1, V2c	
Read Community *	public	6 / 32
Read/Write Community *	private	7 / 32

An 'APPLY' button is located at the bottom of the form.



UI Setting	Description	Valid Range	Default Value
<b>SNMP Version</b>	Specify the SNMP protocol version used to manage your device. <ul style="list-style-type: none"> <li><b>V1, V2c, V3</b>: Enable SNMP V1, V2c, and V3.</li> <li><b>V1, V2c</b>: Enable SNMP V1 and V2c only.</li> <li><b>V3 only</b>: Enable SNMP V3 only.</li> </ul>	V1, V2c, V3 / V1, V2c / V3 only	V1, V2C / V3
<b>Read Community</b>	Specify a string name for the SNMP Read Community.	4 to 32 characters	public
<b>Read/Write Community</b>	Specify a string name for the SNMP Read/Write Community.	4 to 32 characters	private

## SNMP Account

### Menu Path: System > Management Interface > SNMP - SNMP Account

This page lets you configure the SNMP management accounts for the device. SNMP management accounts are provided for Admin and User-level authority.

### SNMP Account List

	Username	Authority	Authentication Type	Authentication Password	Encryption Method	Encryption Key
 	admin	Read/Write	MD5	*****	DES	*****

UI Setting	Description
<b>Username</b>	Shows the username of the SNMP account.
<b>Authority</b>	Shows the authority level of the management account.
<b>Authentication Type</b>	Shows the authentication type used for the account.
<b>Authentication Password</b>	Shows the authentication password if MD5 / SHA / SHA-256 / SHA-512 is selected for the authentication type.

UI Setting	Description
<b>Encryption Method</b>	Shows the encryption method used for the account.
<b>Encryption Key</b>	Shows the encryption password for the account if DES / AES is selected for the encryption method.

## Creating an SNMP Account

### Menu Path: System > Management Interface > SNMP - SNMP Account

Clicking the **Add (+)** icon on the **System > Management Interface > SNMP - SNMP Account** page will open this dialog box. This dialog lets you create an SNMP account.

Click **CREATE** to save your changes and add the new account.

### Create an SNMP Account

Username \*

Minimum 4 characters 0 / 32

Authority \*

Read/Write ▼

Authentication Type \*

None ▼ ⓘ

Encryption Method

Disabled ▼

CANCEL
CREATE

UI Setting	Description	Valid Range	Default Value
<b>Username</b>	Specify a username for the SNMP account.	0 to 32 characters	N/A
<b>Authority</b>	Specify the authority level of the management account. <ul style="list-style-type: none"> <li><b>Read/Write:</b> Can read/write configuration settings</li> <li><b>Read:</b> Can only read configuration settings</li> </ul>	Read/Write / Read	Read/Write

UI Setting	Description	Valid Range	Default Value
<b>Authentication Type</b>	Specify the authentication type to use for the account.	None / MD5 / SHA / SHA-256 / SHA-512	N/A
<b>Authentication Password</b>	Specify the authentication password if MD5 / SHA / SHA-256 / SHA-512 is selected for the authentication type.	8 to 64 characters	N/A
<b>Encryption Method</b>	Specify encryption method to use for the account.	Disabled / DES / AES	Disabled
<b>Encryption Key</b>	Specify encryption password for the account if DES / AES is selected for the encryption method.	8 to 64 characters	N/A

## Time

### Menu Path: System > Time

This page lets you configure the time related settings.

This page includes these tabs:

- System Time
- NTP Server

### About System Time

Correct system time is required for automatic warning emails to include a time and date stamp.

#### Note

Make sure to update the Current Time and Current Date after the switch has been powered off for three days or more. This is particularly important when no NTP server or Internet connection are available.

This section describes how to configure the **System Time**, **NTP Server**, and **Time Synchronization** settings for the switch. The switch has a time calibration function based on information from an NTP server or a user-specified time and date, allowing functions such as automatic warning emails to include a time and date stamp.

## Configuring System Time

To configure System Time, do the following:

1. Sign in to the device using administrator credentials.
2. Go to **System > Time > System Time**, and then click on the **Time** tab.
3. Set **Clock Source** to **Enabled**.
4. Configure the **Date**, **Time**, and **Time Zone**. Specify **Daylight Savings** details if appropriate for your region.
5. Click **Apply** to save your settings.

## System Time

**Menu Path: System > Time > System Time**

This page lets you configure the system time.

This page includes these tabs:

- Time
- NTP Authentication

## System Time - Time

**Menu Path: System > Time > System Time - Time**

This page lets you configure your device's system time.

### System Time

Time

NTP Authentication

Current Time  
2024-07-30 02:10:43 UTC+00:00

---

Clock Source \*  
Local

Date \*  
2024-07-30

Time \*  
上午 02:10

Time Zone \*  
UTC+00:00

Daylight Saving  
Daylight Saving \*  
Enabled

Offset  
01:00

Start

Month *	Week *	Day *	Hour *	Minute *
Mar	last	Sun	01	00


End

Month *	Week *	Day *	Hour *	Minute *
Oct	last	Sun	01	00

APPLY

SYNC FROM BROWSER

UI Setting	Description	Valid Range	Default Value
<b>Current Time</b>	Show the current time according to your local default settings.	N/A	N/A
<b>Clock Source</b>	Specify whether to set the time manually (Local), from an SNTP server, or from an NTP server.	Local / SNTP / NTP	Local
<b>Date</b> <b>(If Clock Source is Local)</b>	Select the current date from the calendar.	Calendar	Local Date
<b>Time</b> <b>(If Clock Source is Local)</b>	Specify the current time. You can manually input the time, or you can click <b>SYNC FROM BROWSER</b> to set the time based on the time used by your web browser.	Timestamp	N/A

UI Setting	Description	Valid Range	Default Value
<b>Time Zone</b> (If Clock Source is Local)	Specify the time zone used for the device.	Drop-down list of time zones	UTC+00:00
<b>1st Time Server: IP Address/Domain Name</b> (If Clock Source is SNTP or NTP)	Specify the IP or domain address of the 1st SNTP/NTP server to use (e.g., 192.168.1.1, <a href="http://time.stdtime.gov.tw">time.stdtime.gov.tw</a> , or <a href="http://time.nist.gov">time.nist.gov</a> ).	Valid IP address or domain name	<a href="http://time.nist.gov">time.nist.gov</a>
<b>2nd Time Server: IP Address/Domain Name</b> (If Clock Source is SNTP or NTP)	Specify the IP or domain address of the 2nd SNTP/NTP server to use if the first SNTP/NTP server fails to connect.	Valid IP address or domain name	N/A
<b>Query Interval</b> (If Clock Source is SNTP)	Specify the query interval time.	Drop-down list of intervals	9 (512 sec.)
<b>Authentication</b> (If Clock Source is NTP)	Select an NTP authentication key to use, or disable authentication for the time server.  <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p> <b>Note</b></p> <p>To use authentication, you need to create an NTP authentication entry first. Refer to <a href="#">NTP Authentication</a> for more information.</p> </div>	Disabled / Drop-down list of NTP key IDs	Disabled

### Daylight Saving

UI Setting	Description	Valid Range	Default Value
<b>Daylight Saving</b>	Enable or disable use of daylight saving time adjustment.	Enabled / Disabled	Disabled
<b>Offset</b>	Specify the number of hours and minutes to add during the daylight saving time period.	01:00	N/A

UI Setting	Description	Valid Range	Default Value
<b>Start</b> <b>Month/Week/Day/Hour/Minute</b>	Specify the start time for the daylight seaving period.	Month: Drop-down list of months  Week: 1st / 2nd / 3rd / 4th / last  Day: Drop-down list of days of the week  Hour: Drop-down list of hours  Minute: Drop-down list of minutes	Mar/last/Sun/01/00
<b>End</b> <b>Month/Week/Day/Hour/Minute</b>	Specify the end time of the daylight saving period.	Month: Drop-down list of months  Week: 1st / 2nd / 3rd / 4th / last  Day: Drop-down list of days of the week  Hour: Drop-down list of hours  Minute: Drop-down list of minutes	Oct/last/Sun/01/00

## NTP Authentication

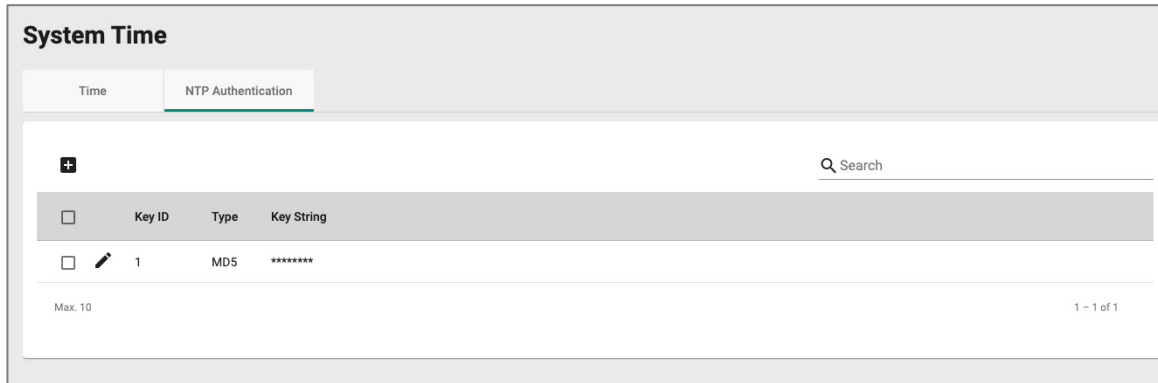
### Menu Path: [System](#) > [Time](#) > [System Time](#) > [NTP Authentication](#)

This page lets you configure NTP authentication for when the device is acting as an NTP client. This helps ensure that received NTP responses are from the NTP server and have not been modified in transit.



## 🔒 Limitations

You can create up to 10 NTP authentication entries.



UI Setting	Description
<b>Key ID</b>	Shows the key ID for NTP authentication.
<b>Type</b>	Shows the authentication type.
<b>Key String</b>	Shows the password used for authentication.

## Creating an NTP Authentication Entry

### Menu Path: System > Time > System Time > NTP Authentication

Clicking the **Add (+)** icon on the **System > Time > System Time > NTP Authentication** page will open this dialog box. This dialog lets you create an NTP authentication entry.

Click **CREATE** to save your changes and add the new account.

**Create Entry**

Key ID \*  
1 - 65535

Type \*  
MD5

Key String \* 0 / 32

CANCEL CREATE

UI Setting	Description	Valid Range	Default Value
<b>Key ID</b>	Specify the Key ID to use for NTP authentication.	1 to 65535	N/A
<b>Type</b>	Specify the authentication type.	MD5	MD5
<b>Key String</b>	Specify the password to use for the authentication key.	0 to 32 characters	N/A

## NTP Server

Network Time Protocol (NTP) is used to synchronize the clocks of computers and other devices on a network, and is widely used on the Internet and in local networks to ensure accurate timekeeping. NTP operates by exchanging time information between servers and clients.

### How NTP Servers Work

Typically, there are several hierarchical strata of NTP servers.

- **Stratum 1 servers** are directly connected to highly accurate time sources, such as atomic clocks or GPS receivers.
- **Stratum 2 servers** synchronize their time with Stratum 1 servers.
- **Client devices** synchronize their clocks with NTP servers, which helps maintain accurate time across the network.

You can configure your device to act as an NTP client to sync the system time with a specified NTP server.

You can also configure your device to act as an NTP server to provide time sync service to end devices on the network. When enabling the NTP server function, the device will answer the NTP queries sent from NTP client and provide the device's time to the client.

## NTP Server

**Menu Path:** System > Time > NTP Server

This page lets you configure your device to act as an NTP server.

UI Setting	Description	Valid Range	Default Value
<b>NTP Server</b>	Enable or disable the NTP server.	Enabled / Disabled	Disabled
<b>Client Authentication</b>	Enable or disable NTP client authentication.	Enabled / Disabled	Disabled

## Configuring NTP Server

Moxa devices can serve as network time protocol (NTP) servers to allow other devices to synchronize their clocks over the network.

NTP operates by exchanging time information between servers and clients.

Typically, there are several hierarchical strata of NTP servers. Stratum 1 servers are directly connected to highly accurate time sources, such as atomic clocks or GPS receivers. Stratum 2 servers synchronize their time with Stratum 1 servers, and so on.

Client devices synchronize their clocks with NTP servers, which helps maintain accurate time across the network.

NTP is widely used on the internet and in local networks to ensure accurate timekeeping, and it has been a critical component of network infrastructure for decades.

Our switch can act as NTP client to sync the system time with the configured NTP server (Stratum 1). Our switch can also act as an NTP server (Stratum 2) to propagate the synchronized time to other clients on the network.

## Enabling NTP Server

1. Sign in to the device using administrator credentials.
2. Go to **System > Time > NTP Server**.
3. Set **NTP Server** to **Enabled**.
4. To Enable Client Authentication and create keys, do the following:
5. Set **Client Authentication** to **Enabled**.
6. Go to **System > Time > System Time > NTP Authentication**, and then click **Add**.

The **Create Entry** screen appears.

7. Key ID Type Key String Configure all of the following, and then click **Create**:

Option	Value
<b>Key ID</b>	Specify a number to identity the key
<b>Type</b>	<b>MD5</b>
<b>Key String</b>	Specify a key at least one character long.

# Provisioning

## Auto Configuration

This is a Moxa-proprietary feature that enables zero-touch deployment and configuration management for network devices. It leverages the Dynamic Host Configuration Protocol (DHCP) service to automate the provisioning process during device boot-up.

Benefits of Auto Configuration include:

- **Reduced Manual Work:** Eliminates the need to manually configure each device individually, saving significant time and effort.
- **Faster Deployment:** Streamlines the configuration process for quicker network setup, especially for large deployments.

## How Auto Configuration Works

Auto Configuration can be broken down into several distinct stages. Here's a breakdown of the key stages.

### Stage 1: Device Initialization

- The device boots up and acquires an IP address from the DHCP server.

### Stage 2: DHCP Server Guidance

- The DHCP server transmits crucial information to the device using DHCP options:
  - **Option 66:** Specifies the address of the file server where the configuration files are stored.
  - **Option 67:** Identifies the specific configuration file on the file server that the device should download.

### Stage 3: Retrieving and Applying the Configuration

- Based on the information received from the DHCP options, the device contacts the file server to request the specified configuration file.
- If a matching configuration file is found, the device downloads it from the file server and automatically applies the settings.

Once the configuration is imported, Auto Configuration is complete.

**Note**

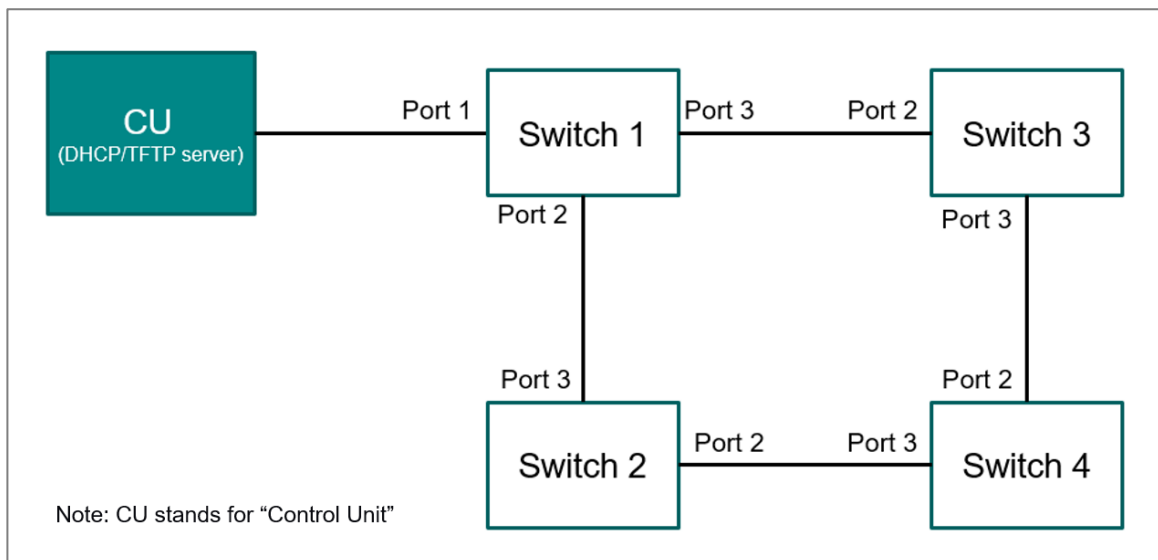
The process of Auto Configuration uses DHCP Option 61 Client-Identifier and LLDP information to determine who should offer the IP and related configuration. The device sends DHCP discover/request packets with Option 61 only through the control unit port connected to the DHCP/file server. DHCP discover/request packets sent through other ports will not contain Option 61.

With Auto Configuration, you can set up larger networks with multiple switches, connect the server to a ring network, and have the switches get the corresponding configuration and be automatically configured one by one.

Here is an example of 4 switches connected in a ring and 1 server with DHCP and file transfer functionality.

**Note**

Please make sure the initial network is loop-free by opening a ring or using a configuration with ring protocol enabled. Here, we suggest using Turbo Ring v2 as a redundant protocol. Refer to Redundancy for more information.



**Step 1: Auto Configuration on Switch 1**

- After device initialization, switch 1 will follow the auto configuration stages to retrieve and apply the corresponding configuration file.

**Step 2: Auto Configuration on Switch 2 and 3**

- After Switch 1 applies the configuration successfully, the switch can be configured as a DHCP server to give Switch 2 and Switch 3 offers.
- Switch 2 and 3 will follow the Auto Configuration stages to retrieve and apply the configuration.

**Note**

Currently, setting up a DHCP server with Option 66 and 67 is not supported on MX-NOS switches. They will automatically propagate the Option 66 value from the server and use an offered IP address as Option 67. Therefore, please make sure the configuration filenames for the switches match and are stored in the corresponding file server.

### Step 3: Auto Configuration on Switch 4

- After Switch 2 finishes, it can be configured as a DHCP server to provide an offer to Switch 4.

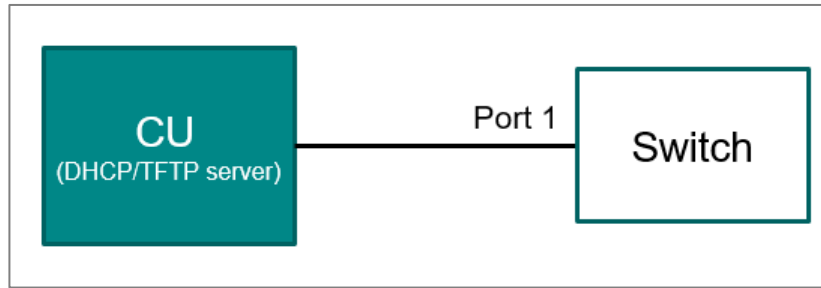
Here are tips for network design and configuration preparation for Moxa network devices:

1. To have a better zero-touch and massive deployment, using a **custom default** configuration is useful. With a custom default, the switches can have the same default configuration with Auto Configuration enabled, and with the same redundant protocol and VLAN settings. Once the switches reboot, the devices will start get the configuration automatically. Please refer to [Deploying Multiple Devices Using Auto Configuration](#) or [Maintenance and Tools](#) for more information.
2. There can be multiple file servers in a network for faster file transfers and load balancing.
3. To avoid conflicting offers, please make sure each device will only get their offer from a single source. Please refer to the DHCP server settings for port-based offers.
4. The amount of time needed for the Auto Configuration process depends on the size of the network, file transfer time, and LLDP/DHCP timer.

## Using Auto Configuration for Single Device Deployment

This section is going to explain the steps about how to update the configuration via auto configuration. The expected result is to deploy the configuration into the device after boot up automatically.

The example topology is shown as follow.



**Before you begin:**

- The availability of DHCP server with option 61, 66, and 67. Make sure there is an entry for Client-ID "MOXA".
- The availability of TFTP server and the device's configuration file
- The DHCP server can be reachable via control unit port

The modes of auto configuration are Disabled, Import and Propagate. The **import** mode means it will import the configuration and IP offer via the control unit port from DHCP server. In this mode, please make sure the Client-ID and Bootfile options is configured properly.

1. Boot Device up.
2. Enable Auto Configuration with **Import** mode and **Control Unit Port** set as 1.

The screenshot shows a configuration interface with the following fields:
 

- Mode \*: Import (dropdown menu)
- Timeout \*: 1800 (text input)
- 1 - 3600 sec. (range indicator)
- Control Unit Port \*: 1 (dropdown menu)
- APPLY (button)

3. Click APPLY
4. Set IP Configuration about IP Settings. Get IP From **DHCP** with **DHCP Bootfile** enabled and **DHCP Client-Identifier**. Here we use "MOXA" as example for DHCP Client-Identifier.



**IP Settings**

Get IP From \*  
DHCP

DHCP Bootfile \*  
Enabled

DHCP Client-Identifier \*  
Enabled

DHCP Client-Identifier Type  
User-defined

DHCP Client-Identifier Value \*  
MOXA

4 / 64

**APPLY**

5. Click APPLY
6. Reboot Device

**Results:** The device will automatically get the configuration from DHCP and file server and applied to itself. There are logs, *Auto Configuration process start*, *receive IP Address*, *Download Configuration file* and *Import Configuration file* in the Event Logs.

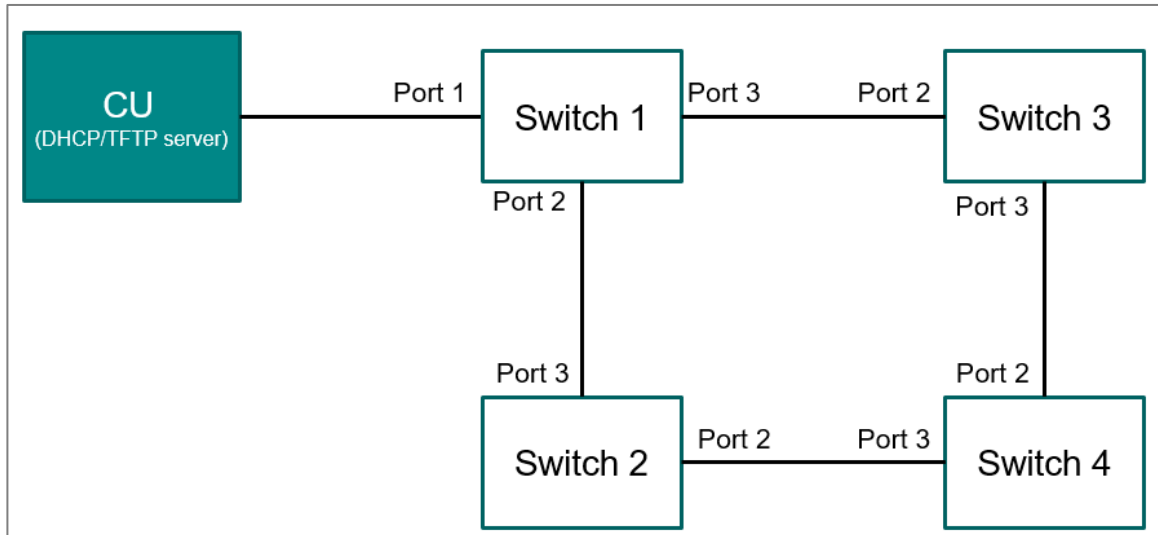
**Note**

The auto configuration status displays the current situation of the device, once the auto configuration is finished. It may change to different status depends on the new configuration.

## Deploying Multiple Devices Using Auto Configuration

Here is an example of how to deploy a configuration on multiple devices with auto configuration.

The example topology is shown as follows.



### Before you begin:

- The availability of DHCP server with option 61, 66, and 67. Make sure there is an entry for Client-ID "MOXA".
- The availability of TFTP server and the devices' configuration files
- The DHCP server can be reachable via the control unit port
- The network is loop-free by opening a ring or using Turbo Ring v2.

### Operational configuration preparation

The steps list here will help you to prepare the corresponding configuration for deployment.

1. Enable Auto Configuration with **Propagate** mode.

### Auto Configuration

Settings
Status

---

Mode \*  
Propagate

Timeout \*  
1800  
1 - 3600 sec.

CDU Port \*  
1

**APPLY**

2. Click APPLY
3. Set IP Configuration. Get IP From **Manual** and IP address accordingly
4. Click APPLY
5. Set the Turbo Ring v2 as **Enabled** with Ring Port as **Port 2** and **Port 3** in Ring 1 on Redundancy

### Turbo Ring V2

Settings
Status

---

Turbo Ring V2 \*  
Enabled

**APPLY**

#### Ring Settings

	Ring ID	Enabled	Master	Ring Port 1	Ring Port 2
	Ring 1	Enabled	Disabled	2	3

6. Click APPLY
7. Set the LLDP as **Enabled**, Chassis ID Subtype as **MAC-Address**.

## LLDP

Settings
Status

LLDP \*  
Enabled ▼

LLDP Version \*  
v1(2005) ▼

<p>Transmit Interval *  <span style="border-bottom: 1px solid #ccc; display: inline-block; width: 80px;">30</span></p> <p><small>5 - 32768 sec.</small></p>	<p>Notification Interval *  <span style="border-bottom: 1px solid #ccc; display: inline-block; width: 80px;">5</span></p> <p><small>5 - 3600 sec.</small></p>	<p>Tx Delay *  <span style="border-bottom: 1px solid #ccc; display: inline-block; width: 80px;">2</span></p> <p><small>1 - 8192 sec.</small></p>
<p>Reinitialization Delay *  <span style="border-bottom: 1px solid #ccc; display: inline-block; width: 80px;">2</span></p> <p><small>1 - 10 sec.</small></p>	<p>Holdtime Multiplier *  <span style="border-bottom: 1px solid #ccc; display: inline-block; width: 80px;">4</span></p> <p><small>2 - 10 times</small></p>	

Chassis ID Subtype \*  
MAC-Address ▼

APPLY

**Note**

The LLDP Transmit Interval in Propagate mode will not take affect on the Auto Configuration waiting time.

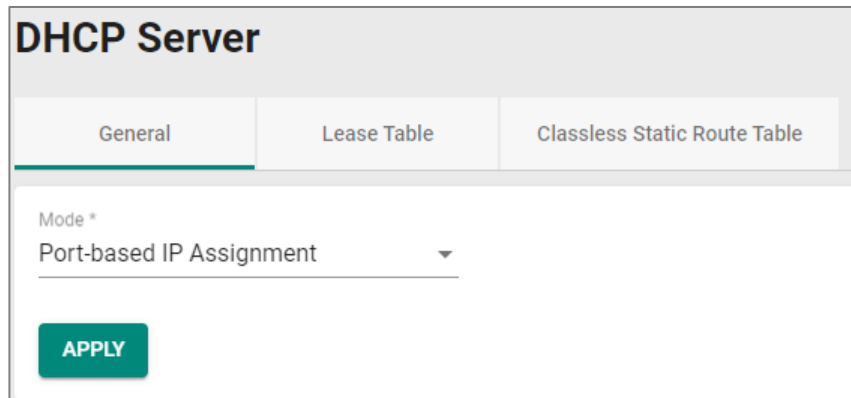
8. Click APPLY
9. Enable the LLDP Port Status as **Tx and Rx** on Port 1, 2 and 3

**Edit Port 1 Settings**

Port Status \*  
Tx and Rx ▼

10. Click APPLY

11. Enable the DHCP Server with Mode **Port-based IP Assignment**



The screenshot shows the 'DHCP Server' configuration page. It has three tabs: 'General', 'Lease Table', and 'Classless Static Route Table'. The 'General' tab is selected. Under the 'Mode \*' label, a dropdown menu is set to 'Port-based IP Assignment'. Below the dropdown is a green 'APPLY' button.

12. Create corresponding entries on DHCP Server

Here, we use IP 192.168.127.1, 192.168.127.2, 192.168.127.3, 192.168.127.4 as example for Switch 1, 2, 3 and 4 accordingly.

### Create Entry

Enable \*  
Enabled

Port \*  
2

IP Address \*  
192.168.127.2

Subnet Mask \*  
24 (255.255.255.0)

Lease Time \*  
86400  
1 - 31622340 sec.

Default Gateway

DNS Server IP Address1  
DNS Server IP Address2

NTP Server IP Address

Hostname  
0 / 63

Domain Name  
0 / 63

CANCEL CREATE

	Enable	Port	IP Address	Subnet Mask	Lease Time
<b>Switch 1</b>	Enabled	2	192.168.127.2	24 (255.255.255.0)	86400
<b>Switch 1</b>	Enabled	3	192.168.127.3	24 (255.255.255.0)	86400
<b>Switch 2</b>	Enabled	2	192.168.127.4	24 (255.255.255.0)	86400
<b>Switch 2</b>	Enabled	3	192.168.127.1	24 (255.255.255.0)	86400
<b>Switch 3</b>	Enabled	2	192.168.127.1	24 (255.255.255.0)	86400
<b>Switch 3</b>	Enabled	3	192.168.127.4	24 (255.255.255.0)	86400

	Enable	Port	IP Address	Subnet Mask	Lease Time
<b>Switch 4</b>	Enabled	2	192.168.127.3	24 (255.255.255.0)	86400
<b>Switch 4</b>	Enabled	3	192.168.127.2	24 (255.255.255.0)	86400

13. Click APPLY

14. Export configuration on Configuration Backup and Restore page and set Configuration Name as switch IP address (For example, the configuration for switch 1, the filename will be the IP address of switch 1)

**Configuration Backup and Restore**

Backup | Restore | File Encryption | File Signature

Configuration Name  
192.168.127.1  
13 / 32

APPLY

## Initial switch setting preparation

The steps listed here will guide you how to use the customer default for creating an Auto Configuration environment.

1. Enable Auto Configuration with **Import** mode and **Control Unit Port** set as 1.

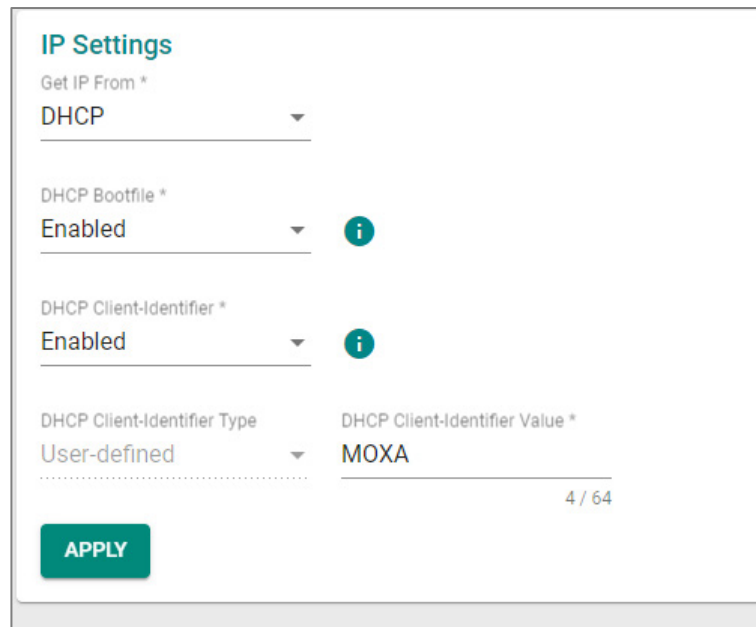
Mode \*  
Import

Timeout \*  
1800  
1 - 3600 sec.

Control Unit Port \*  
1

APPLY

2. Click APPLY
3. Set IP Configuration about IP Settings. Get IP From **DHCP** with **DHCP Bootfile** enabled and **DHCP Client-Identifier**. Here we use "MOXA" as example for DHCP Client-Identifier.



The screenshot shows the 'IP Settings' configuration page. It includes the following fields and options:

- Get IP From \***: A dropdown menu set to 'DHCP'.
- DHCP Bootfile \***: A dropdown menu set to 'Enabled', accompanied by an information icon (i).
- DHCP Client-Identifier \***: A dropdown menu set to 'Enabled', accompanied by an information icon (i).
- DHCP Client-Identifier Type**: A dropdown menu set to 'User-defined'.
- DHCP Client-Identifier Value \***: A text input field containing 'MOXA'.

At the bottom left of the form is a green 'APPLY' button. At the bottom right, there is a character count '4 / 64'.

4. Click APPLY
5. Set the Turbo Ring v2 as **Enabled** with Ring Port as **Port 2** and **Port 3** in Ring 1 on Redundancy



## Turbo Ring V2

Settings
Status

Turbo Ring V2 \*

Enabled ▼

APPLY

### Ring Settings

	Ring ID	Enabled	Master	Ring Port 1	Ring Port 2
Ring 1	Ring 1	Enabled	Disabled	2	3

6. Click APPLY
7. Set the LLDP as **Enabled**, Chassis ID Subtype as **MAC-Address** and Transmit Interval as **10** seconds.

## LLDP

Settings
Status

LLDP \*  
Enabled ▼

LLDP Version \*  
v1(2005) ▼

Transmit Interval * <b>10</b>	Notification Interval * <b>5</b>	Tx Delay * <b>2</b>
5 - 32768 sec.	5 - 3600 sec.	1 - 8192 sec.
Reinitialization Delay * <b>2</b>	Holdtime Multiplier * <b>4</b>	
1 - 10 sec.	2 - 10 times	

Chassis ID Subtype \*  
MAC-Address ▼

**APPLY**

**Note**

The LLDP information will be used to make sure the adjacent devices and provide the Auto Configuration details. Here we suggest to set the LLDP transmit interval from default 30 seconds into 10 seconds to reduce the waiting time for multiple devices configuration deployment.

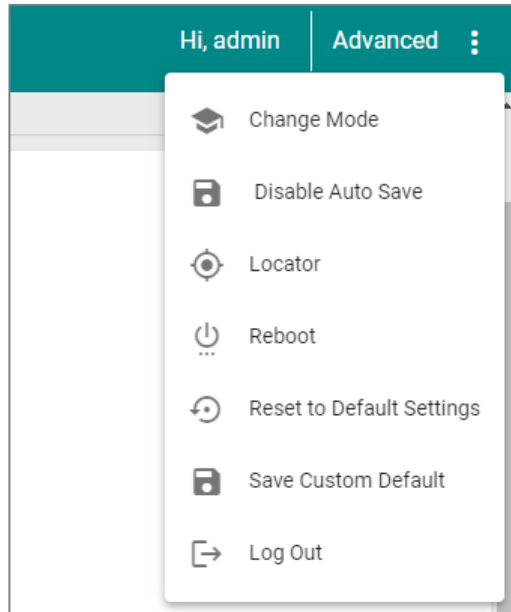
8. Click APPLY
9. Enable the LLDP Port Status as **Tx and Rx** on Port 1, 2 and 3

**Edit Port 1 Settings**

Port Status \*

Tx and Rx ▼

10. Click APPLY
11. Save the configuration into Custom Default



Those settings list above are applied to all switches 1, 2, 3, and 4.

## Auto Configuration

1. Restart all the switches
2. Wait the certain time for devices boot up and the operation of Auto Configuration
3. Configuration imported successfully
4. Check the Auto Configuration status and logs

**Results:** The device will automatically get the configuration from DHCP and file server and applied to itself. There are logs, *Auto Configuration process start, receive IP Address, Download Configuration file and Import Configuration file* in the Event Logs. Once the auto configuration is done, the auto configuration status shall display the DHCP server, File server and File Name on the UIs.

## Auto Configuration

**Menu Path:** [Provisioning](#) > [Auto Configuration](#)

This page lets you configure the Auto Configuration feature for your device.

## Auto Configuration Settings

### Auto Configuration

Settings
Status

Mode \*

Import ▼

Timeout \*

1800

1 - 3600 sec.

Control Unit Port \*

1 ▼

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Mode</b>	<p>Select the operational mode to use.</p> <p><b>Disabled:</b> Auto Configuration will be disabled.</p> <p><b>Import:</b> In this mode, Auto Configuration only sends Option 61 packets over the control unit port. This requires DHCP Client to be enabled, and the boot file and client ID must be preconfigured in <a href="#">IP Configuration</a>.</p> <p><b>Propagate:</b> In this mode, the DHCP server assigns IP addresses based on LLDP information. This requires <a href="#">IP Configuration</a> to be set to manual and <a href="#">LLDP</a> to be enabled.</p>	Disabled / Import / Propagate	Disabled
<b>Timeout (If Mode is Import)</b>	<p>Specify the Auto Configuration timeout value in seconds. This parameter defines the maximum time (in seconds) your device will wait for a DHCP offer during the bootup process. If the device fails to receive a DHCP offer within the specified timeout period, the Automatic Configuration process ceases. A log message is recorded to indicate this event for troubleshooting purposes.</p> <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>The overall duration of the Auto Configuration process can be influenced by various factors, including the network size, file transfer times, and other network-related conditions.</p> </div>	1 - 3600	1800 sec.
<b>Control Unit Port</b>	Select the control unit port from the drop-down list. This is the port that connects to the DHCP/file server.	Drop-down list of ports	1

## Auto Configuration Information

### Auto Configuration Information

Status  
**Propagating information to the DHCP Server**

DHCP Server  
**192.168.127.94**

File Server  
**192.168.127.90**

File Name  
**192.168.127.253**

UI Setting	Description
<b>Status</b>	<p>Shows the current status of Auto Configuration.</p> <p>The status may be one of the following:</p> <ul style="list-style-type: none"><li>• Auto Configuration process started</li><li>• Received IP address</li><li>• Downloaded the configuration</li><li>• Imported the configuration</li><li>• Propagating information to the DHCP Server</li><li>• Auto Configuration is disabled</li><li>• Insufficient information to propagate</li><li>• Auto Configuration timed out</li><li>• Failed to download the configuration</li><li>• Failed to import the configuration</li><li>• Auto Configuration will be triggered after the reboot</li></ul>
<b>DHCP Server</b>	Shows the server information if the device successfully receives an offer from a DHCP server.
<b>File Server</b>	Shows the file server information retrieved from a DHCP Option 66 offer.
<b>File Name</b>	Shows the file name information retrieved from a DHCP Option 67 offer.

# Port

## Menu Path: Port

This section lets you configure various port-specific functions for the switch.

This section includes these pages:

- Port Interface
- Link Aggregation
- PoE

## Port Interface

### Menu Path: Port > Port Interface

This section lets you configure the port interface functions.

This section includes these pages:

- Port Settings
- Linkup Delay

## Port Settings

Port Settings allows you to manage and configure the various parameters of your device's individual network ports. By letting you adjust settings such as speed, duplex, and flow control, it helps you optimize the performance of your network connections.

## Port Settings

### Menu Path: Port > Port Interface > Port Settings

This page lets you configure the port settings.

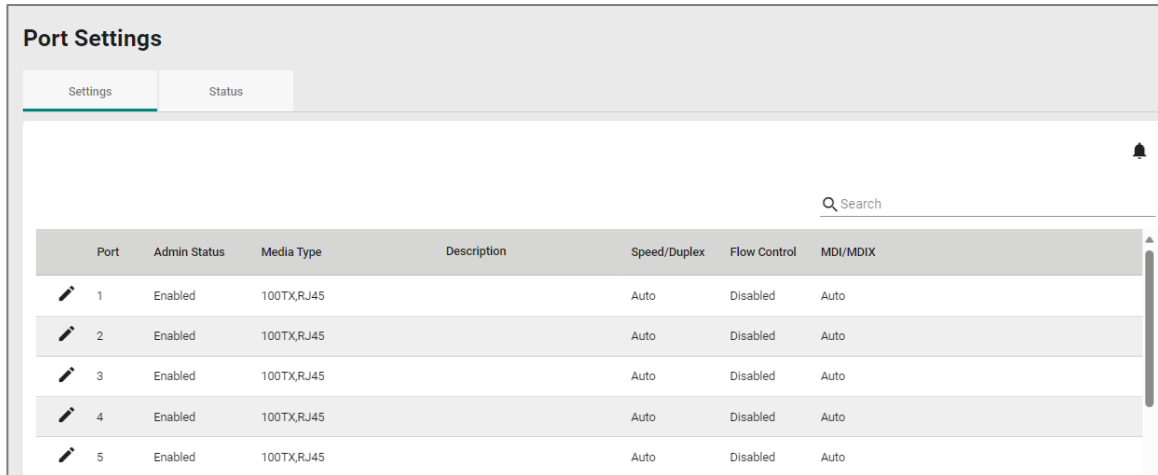
This page includes these tabs:

- Settings
- Status






## Port Settings - Settings

### Menu Path: Port > Port Interface > Port Settings - Settings

This page lets you configure basic port settings.




The screenshot shows the 'Port Settings' page with two tabs: 'Settings' (selected) and 'Status'. Below the tabs is a search bar and a table with the following columns: Port, Admin Status, Media Type, Description, Speed/Duplex, Flow Control, and MDI/MDIX. The table contains five rows of data, each with an edit icon to its left.

Port	Admin Status	Media Type	Description	Speed/Duplex	Flow Control	MDI/MDIX
 1	Enabled	100TX,RJ45		Auto	Disabled	Auto
 2	Enabled	100TX,RJ45		Auto	Disabled	Auto
 3	Enabled	100TX,RJ45		Auto	Disabled	Auto
 4	Enabled	100TX,RJ45		Auto	Disabled	Auto
 5	Enabled	100TX,RJ45		Auto	Disabled	Auto

UI Setting	Description
<b>Port</b>	Shows which port the entry describes.
<b>Admin Status</b>	Shows whether admin status is enabled for data transmission through the port.
<b>Media Type</b>	Shows the detected media type for the port.
<b>Description</b>	Shows the description used to help identify the port.
<b>Speed/Duplex</b>	Shows the port speed and duplex option selected for the port.
<b>Flow Control</b>	Shows whether flow control is enabled for the port.
<b>MDI/MDIX</b>	Shows the MDI/MDIX option used for the port.

## Editing Port Settings





### Menu Path: Port > Port Interface > Port Settings - Settings

Clicking the **Edit** () icon for the desired port on the **Port > Port Interface > Port Settings - Settings** page will open this dialog box. This dialog lets you configure the port settings parameters.

Click **APPLY** to save your changes.

UI Setting	Description	Valid Range	Default Value
<b>Admin Status</b>	Enable or disable data transmission through the port.	Enabled / Disabled	Enabled
<b>Media Type</b>	Displays the detected media type for each port. This setting cannot be changed.	Detected media type	N/A
<b>Description</b>	Specify a description to help identify the port.	0 to 127 characters	N/A
<b>Speed/Duplex</b>	<p>Select the speed/duplex mode to use for the port.</p> <p>Select <b>Auto</b> to enable the port to negotiate the optimal speed using the IEEE 802.3u protocol with connected devices. The port and connected devices will determine the most suitable speed for the connection.</p> <p>Alternatively, choose a fixed speed and duplex option if the connected Ethernet device has trouble with auto-negotiation. This can be useful for connecting legacy devices without auto-negotiation support.</p> <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>Speed/Duplex cannot be set for fiber ports.</p> </div>	Auto / 10M Half / 10M Full / 100M Half / 100M Full	Auto





UI Setting	Description	Valid Range	Default Value
<b>Flow Control</b>	<p>Enable or disable flow control for the port.</p> <p> <b>Note</b> The switch and connected device will automatically determine the final result.</p> <p> <b>Note</b> Flow control can be enabled, but it is only effective at full duplex. Back pressure is automatically enabled, but it is only effective at half duplex.</p>	Enabled / Disabled	Disabled
<b>MDI/MDIX</b>	<p>Select the MDI/MDIX mode to use for the port.</p> <p>Select <b>Auto</b> to allow the port to auto-detect the port type of the connected Ethernet device, and change the port type accordingly.</p> <p>Alternatively, manually select <b>MDI</b> or <b>MDIX</b> if the device has trouble auto-detecting the port type.</p> <p> <b>Note</b> MDI/MDIX cannot be set for fiber ports.</p>	Auto / MDI / MDIX	Auto
<b>Copy configurations to ports</b>	<p>Select the ports you want to copy this configuration to.</p> <p> <b>Note</b> The copy configuration feature cannot be used with fiber ports.</p>	Drop-down list of ports	N/A

## Port Settings - Status

**Menu Path:** Port > Port Interface > Port Settings - Status

This page lets you view the status and configuration of the device's ports.

Port Settings						
Settings		Status				
 		<input type="text" value="Search"/>				
Port	Media Type	Link Status	Description	Flow Control	MDI/MDIX	Port State
1/1	1000TX,RJ45	Link Down		Disabled	Invalid	Blocking
1/2	1000TX,RJ45	1G, Full (Auto)		Disabled	MDI (Auto)	Forwarding
1/3	1000TX,RJ45	Link Down		Disabled	Invalid	Blocking
1/4	1000TX,RJ45	Link Down		Disabled	Invalid	Blocking

UI Setting	Description
<b>Admin Status</b>	Shows whether admin status is enabled for data transmission through the port.
<b>Media Type</b>	Shows the detected media type for the port.
<b>Link Status</b>	Shows the port's link status. <b>Link Down</b> will be shown If the link is down. Otherwise, the port's speed and duplex will be shown.
<b>Description</b>	Shows the description used to help identify the port.
<b>Flow Control</b>	Shows whether flow control is enabled for the port.
<b>MDI/MDIX</b>	Shows the MDI/MDIX option used for the port.
<b>Port State</b>	Shows whether the port status is blocking or forwarding.

## Linkup Delay

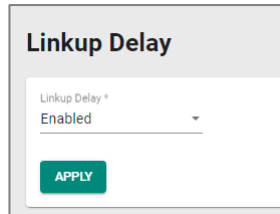
Linkup delay, also known as link flap prevention, is used to prevent a port alternating between link up and link down statuses, and is useful when a link connection is unstable. An unstable connection might be caused by situations such as a faulty cable, faulty fiber transceiver, duplex mismatch, etc. Linkup delay helps you mitigate the risk of an unstable network, particularly when the topology changes frequently.

## Linkup Delay

**Menu Path:** Port > Port Interface > Linkup Delay

This page lets you configure the linkup delay for device's ports.






### Linkup Delay Settings - All Ports



The screenshot shows a configuration window titled "Linkup Delay". Inside, there is a label "Linkup Delay \*" followed by a dropdown menu currently showing "Enabled". Below the dropdown is a green button labeled "APPLY".

UI Setting	Description	Valid Range	Default Value
<b>Linkup Delay</b>	Enable or disable linkup delay for all ports.	Enabled / Disabled	Disabled

### Linkup Delay - Port List

Port	Enable	Delay Time	Remaining Time
 1	Disabled	2	0
 2	Disabled	2	0
 3	Disabled	2	0
 4	Disabled	2	0
 5	Disabled	2	0

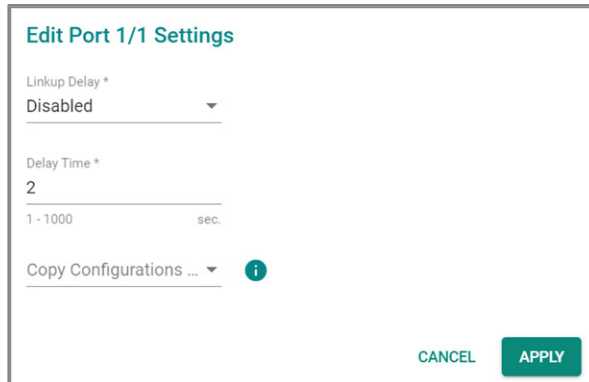
UI Setting	Description
<b>Enable</b>	Shows whether linkup delay is enabled or disabled for the port.
<b>Delay Time</b>	Shows the delay time in seconds for the port.
<b>Remaining Time</b>	Shows the remaining time in seconds for the port to alternate between link up and link down.

## Linkup Delay - Edit Port Settings

### Menu Path: Port > Port Interface > Linkup Delay

To configure linkup delay for a port, click the **Edit** (✎) icon on the desired port on the **Port > Port Interface > Linkup Delay** page will open this dialog box. This dialog lets you configure the linkup delay parameters for the port.

Click **APPLY** to save your changes.



**Edit Port 1/1 Settings**

Linkup Delay \*  
Disabled

Delay Time \*  
2  
1 - 1000 sec.

Copy Configurations ... ⓘ

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Linkup Delay</b>	Enable or disable linkup delay for the port.	Enabled / Disabled	Disabled
<b>Delay Time</b>	Specify the delay time in seconds before the port alternates between link up and link down.	1 to 1000	2
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Link Aggregation

Link aggregation, also known as port channels or port trunking, helps balance, optimize, and facilitate a device's throughput. This method combines multiple network communication interfaces in parallel to maximize data throughput, increasing data communication efficiency for each port. In addition, it also acts as a useful method for network redundancy when a link fails. In general, link aggregation supports combining

multiple physical switch ports into a single, bandwidth-efficient data communication route. This can improve network load sharing and increase network reliability.

## Static Trunk

For some networking applications, a situation can arise where traffic from multiple ports is required to be filtered through a single port. For example, if there are 30 UHD IP surveillance cameras deployed and connected in a ring, traffic can reach up to 1 Gbps, causing a surge in traffic that can increase network loading by up to 50%. Hence, the uplink port needs to use static trunking to provide additional bandwidth and redundancy protection.

## LACP

Link Aggregation Control Protocol (LACP) is a protocol defined by IEEE 802.3ad that allows a network device to negotiate automatic bundling of several ports by sending LACP packets to the peer, a directly connected device that also uses LACP.

## Link Aggregation Algorithms

In link aggregation, three load-sharing hash algorithms can be used to optimize packet forwarding:

- **SMAC:** Source MAC (SMAC) uses the source MAC address for a packet to optimize packet forwarding to ensure that packets from the same source address follow the same path consistently to optimize connection stability and reduce the chance of out-of-order packet delivery.
- **DMAC:** Destination MAC (DMAC) uses the destination MAC address for a packet to optimize packet forwarding to ensure that packets being sent to the same destination address are consistently sent over the same link to optimize connection stability and traffic distribution.
- **SMAC + DMAC:** SMAC and DMAC can be used together for more complex hash algorithms, but tends to be used only when a network has few clients and servers.

# Link Aggregation Settings

## Menu Path: Port > Link Aggregation

This page lets you configure link aggregation groups for each port. A link aggregation group combines multiple physical ports into a single logical link.

### ⚠ Limitations

You can create up to 10 link aggregation groups.

## Link Aggregation List

<input type="checkbox"/>	Port Channel (Trunk)	Enable	Type	Algorithm	Configure Member	Active Member
<input type="checkbox"/>	1	Enabled	Manual	SMAC + DMAC	1, 2	2
<input type="checkbox"/>	2	Enabled	LACP	SMAC + DMAC	3, 4	

Max. 10

UI Setting	Description
<b>Port Channel (Trunk)</b>	Shows the Port Channel (Trunk) number of the link aggregation group.
<b>Enable</b>	Shows whether the link aggregation group is enabled.
<b>Type</b>	Shows the method for configuring the link aggregation group.
<b>Algorithm (Only in Advanced Mode)</b>	Shows the load-sharing hash algorithms being used for the link aggregation group.
<b>Configure Member</b>	Shows the configured member ports in the link aggregation group.
<b>Active Member</b>	Shows the active member ports in the link aggregation group.

## Creating a Link Aggregation Group

### Menu Path: Port > Link Aggregation

Clicking the **Add (+)** icon on the **Port > Link Aggregation** page will open this dialog box. This dialog lets you create a link aggregation group.

Click **CREATE** to save your changes and add the new link aggregation group.

UI Setting	Description	Valid Range	Default Value
<b>LA Group Status</b>	Enable or disable the link aggregation group.	Enabled/ Disabled	Enabled
<b>Type</b>	Select the method to use for configuring the link aggregation group.  <b>Manual:</b> This allows you to specify the ports to be included in the LA Group.  <b>LACP:</b> LACP protocol will be used to automatically negotiate link aggregation configuration between devices.	Manual / LACP	N/A
<b>Config Member Port</b>	Select the ports to add to the link aggregation group.  <b>Note</b> A port cannot be assigned to multiple link aggregation groups. This is because each port can only be a member of a single link aggregation group at a time.  A link aggregation group (Port-channel) cannot be created when selected ports are operating at different speeds.	Device ports	N/A
<b>Algorithm (Only in Advanced Mode)</b>	Select the load-sharing hash algorithms to be used for configuring link aggregation.	SMAC / DMAC / SMAC+DMAC	SMAC+DMAC

## Editing a Link Aggregation Group

### Menu Path: Port > Link Aggregation

Clicking the **Edit** (✎) icon on the **Port > Link Aggregation** page will open this dialog box. This dialog lets you edit Link Aggregation group settings.

Click **APPLY** to save your changes.







UI Setting	Description	Valid Range	Default Value
<b>LA Group Status</b>	Enable or disable the link aggregation group.	Enabled/ Disabled	Enabled
<b>Type</b>	Select the method to use for configuring the link aggregation group.  <b>Manual:</b> This allows you to specify the ports to be included in the LA Group.  <b>LACP:</b> LACP protocol will be used to automatically negotiate link aggregation configuration between devices.	Manual / LACP	N/A
<b>Config Member Port</b>	Select the ports to add to the link aggregation group.  <b>Note</b> A port cannot be assigned to multiple link aggregation groups. This is because each port can only be a member of a single link aggregation group at a time.  A link aggregation group (Port-channel) cannot be created when selected ports are operating at different speeds.	Device ports	N/A



UI Setting	Description	Valid Range	Default Value
<b>Algorithm</b> (Only in Advanced Mode)	Select the load-sharing hash algorithms to be used for configuring link aggregation.	SMAC / DDMAC / SMAC+DMAC	SMAC+DMAC

## Link Aggregation - Port Settings for LACP


This table lets you see the LACP settings for each port.

Port	Mode	Timeout (sec.)	Wait Time (sec.)	Port Channel (Trunk)
 1	Active	90	2	1
 2	Active	90	2	1
 3	Active	90	2	2
 4	Active	90	2	2
 5	Active	90	2	
 6	Active	90	2	

UI Setting	Description
<b>Port</b>	Shows which port the entry describes.
<b>Mode</b>	Shows the LACP mode for the port.
<b>Timeout (sec.)</b>	Shows the LACP inactivity timeout in seconds for the port.
<b>Wait Time (sec.)</b>	Shows the LACP wait time in seconds for the port.
<b>Port Channel (Trunk)</b>	Shows the link aggregation group (Port channel) number for the port.

## Editing Port Settings for LACP

### Menu Path: [Port](#) > [Link Aggregation](#)


Clicking the **Edit** () icon by a port on the **Port > Link Aggregation** page will open this dialog box. This dialog lets you edit the port settings for LACP parameters if your link aggregation type is set to LACP.

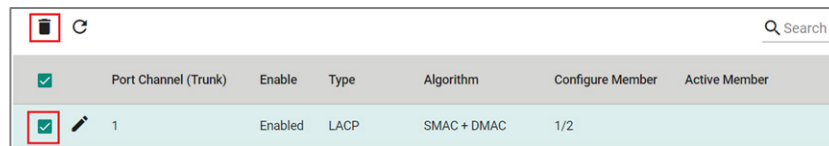
Click **APPLY** to save your changes.



UI Setting	Description	Valid Range	Default Value
<b>Port Channel (Trunk)</b>	Shows the link aggregation group (Port channel) number of the port. This setting cannot be changed.	Port Channel Number	N/A
<b>Mode</b>	<p>Select the LACP mode to decide how the ports establish LACP links.</p> <ul style="list-style-type: none"> <li>• <b>Active:</b> Ports will actively query link partners for LACP by sending LACP PDUs. If the partner is also LACP-enabled, the ports will establish an LACP link.</li> <li>• <b>Passive:</b> Ports can respond to LACP queries from active ports and passively establish LACP links. They will not initiate any LACP negotiation on their own.</li> </ul> <p>For LACP to establish a link, at least one port for the link must use active mode. If both ports are passive, no LACP PDUs will be sent, and no link will be established.</p>	Active / Passive	Active
<b>Timeout</b>	Specify the LACP inactivity timeout in seconds. This is the amount of time that must elapse without receiving any LACP PDUs before a link is considered to have failed.	3 / 90	90
<b>Wait Time</b>	Specify the LACP wait time in seconds. This is the amount of time that must elapse after a LACP link comes up before it is added to the link aggregation group.	0 to 10	2
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Deleting a Link Aggregation Group (Port Channel)

### Menu Path: Port > Link Aggregation

You can delete a link aggregation group by using the checkboxes to select the entries you want to delete, then clicking the **Delete** (  ) icon.



<input checked="" type="checkbox"/>		Port Channel (Trunk)	Enable	Type	Algorithm	Configure Member	Active Member
<input checked="" type="checkbox"/>		1	Enabled	LACP	SMAC + DMAC	1/2	

## PoE

Power over Ethernet (PoE) provides power along with network connectivity to PoE network devices (PDs), allowing them to be powered and connected to the network using a single network cable. This can greatly simplify installation, maintenance, and troubleshooting of these PoE devices, especially when they are installed in areas that are difficult to reach or do not have power outlets nearby.

PoE is frequently used with a variety of devices:

- Surveillance cameras
- Security I/O sensors
- Industrial wireless access points
- Emergency IP phones

Moxa devices also support the high-power PoE+ standard and advanced PoE management functions such as PD failure check, legacy PD detection, and auto power cutting. These work together to provide critical security systems with a convenient and reliable Ethernet network that is easier to manage.


## PoE Settings

### Menu Path: Port > PoE

This page lets you configure your device's Power over Ethernet (PoE) settings. PoE allows your Moxa device to power other connected PoE Ethernet devices—such as security cameras, wireless access points, and sensors—through the Ethernet cable.

This page includes these tabs:

- General
- PD Failure Check
- Scheduling
- Status

 **Note**

PoE functionality is only available on specific PoE-enabled Moxa device models. Connected PoE devices must support the IEEE 802.3af/at standard in order to use this feature.

 **Limitations**

Only PoE Type 1 (802.3af) and Type 2 (802.3at) are supported, with a maximum of Class 4 and 30 W per port.

## PoE - General

**Menu Path:** [Port](#) > [PoE - General](#)

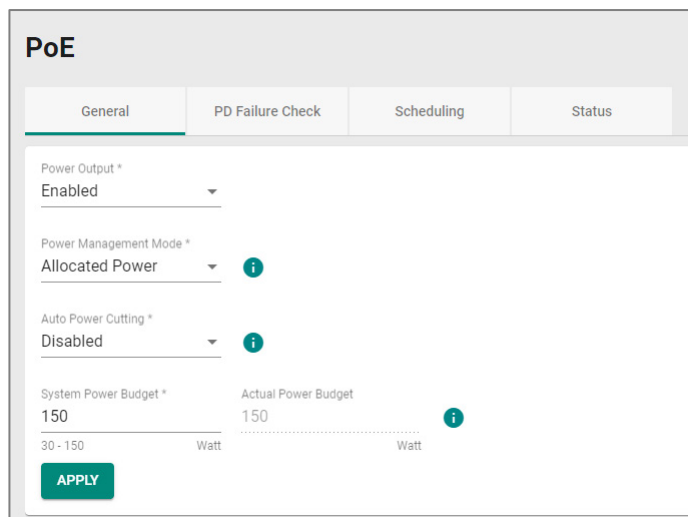
This page lets you enable PoE power output and configure system-level PoE settings.

**Note**

When the PoE function is activated, PoE-enabled ports should only be connected to standard/legacy powered devices.

If there is a need to connect non-powered devices to a PoE-enabled port, it is recommended to disable PoE for the port to prevent unnecessary PoE detection behavior.

## PoE Settings



UI Setting	Description	Valid Range	Default Value
<b>Power Output</b>	Enable or disable PoE.	Enabled / Disabled	Enabled
<b>Power Management Mode</b>	Specify whether the power budget for all ports should be calculated. <ul style="list-style-type: none"><li><b>Allocated Power</b>: This calculates the power budget based on the Power Allocation settings of all ports. For more information on per-port power allocation, refer to <a href="#">PoE - Edit Port Settings</a>.</li><li><b>Consumed Power</b>: This calculates the power budget based on actual power consumed by all ports.</li></ul>	Allocated Power / Consumed Power	Allocated Power
<b>Auto Power Cutting</b>	Enable or disable auto power cutting, which allows PoE to be disabled for ports when total power consumption exceeds the system power budget threshold. Ports with lower priority will be disabled before ports with higher priority.	Enabled / Disabled	Disabled









UI Setting	Description	Valid Range	Default Value
<b>System Power Budget</b>	Specify the "total measured power" limit in watts to use for all PoE ports combined.	<i>(Depends on your device model)</i>	<i>(Depends on your device model)</i>
<b>Actual Power Budget</b>	Show the system power budget in watts. This setting cannot be changed.	N/A	150

## PoE - Port List

### Note

For the TN-4500B PSE chip:

- Standard PD: Resistance: 17 ~ 29 kΩ and Capacitance: 0~1 μF
- Legacy PD: Resistance: 0.86 ~17 kΩ or Resistance: 29~100 kΩ or Capacitance: 1 ~ 12 μF

		Q Search				
	Port	PoE Supported	Power Output	Output Mode	Power Allocation	Priority
	1	Yes	Enabled	Auto	0	Low
	2	Yes	Enabled	Auto	0	Low
	3	Yes	Enabled	Auto	0	Low
	4	Yes	Enabled	Auto	0	Low
	5	Yes	Enabled	Auto	0	Low
	6	Yes	Enabled	Auto	0	Low
	7	Yes	Enabled	Auto	0	Low
	8	Yes	Enabled	Auto	0	Low

1 - 24 of 24

UI Setting	Description
<b>Port</b>	Shows which port the entry describes.

UI Setting	Description
<b>PoE Supported</b>	Shows whether the port supports PoE.
<b>Power Output</b>	Shows whether PoE is enabled for the port.
<b>Output Mode</b>	Shows the output mode for the port.
<b>Power Allocation</b>	Shows the power allocation value for the port. When the output mode is <b>Auto</b> , this value is fixed as 0.
<b>Priority</b>	Shows the port priority: Critical (highest) / High / Low.

## PoE - Edit Port Settings

### Menu Path: Port > PoE - General

Clicking the **Edit** (✎) icon for a port on the **Port > PoE - General** page will open this dialog box. This dialog lets you edit PoE settings for the port.

Click **APPLY** to save your changes.

### Edit Port 1 Settings

Power Output \*

Output Mode \*

Power Allocation  
  
 .....  
 0 - 30 Watt

Priority \*

Copy configurations to ports  ⓘ







UI Setting	Description	Valid Range	Default Value
<b>Power Output</b>	Enable/disable PoE for this port.	Enabled / Disabled	Enabled
<b>Output Mode</b>	Specify whether to set the PoE output mode to Auto or Force. <b>Auto:</b> Power output will be determined by using 802.3at auto-detection. <b>Force:</b> Power output will be determined by the <b>Power Allocation</b> setting for the port. This may be necessary for PDs that do not follow 802.3af/at standards.	Auto / Force	Auto
<b>Power Allocation</b>	Specify the power in watts to allocate to a connected PD when the <b>Output Mode</b> is set to <b>Force</b> . <ul style="list-style-type: none"> <li>When the output mode is <b>Auto</b>, the value is fixed as 0.</li> <li>When the output mode is set to <b>Force</b>, input a value from 0 to 30.</li> </ul>	0 to 30	N/A
<b>Priority</b>	Specify the priority of the port to use with the <b>Auto Power Cutting</b> feature. If Auto Power Cutting is enabled, PoE will be disabled for ports with lower priority when total power consumption exceeds the system power budget threshold. Ports with lower priority will be disabled before ports with higher priority. Refer to <a href="#">PoE - General</a> for more information.	Critical / High / Low	Low
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## PD Failure Check

### Menu Path: Port > PoE - PD Failure Check

This tab lets you monitor the status of a powered device (PD) through its IP address. If the PD fails, the switch will not receive a PD response after the defined period, and the PoE powering process will be restarted. This function is extremely useful for ensuring network reliability and simplifying management.




PoE							
General		PD Failure Check			Status		
		Q Search					
Port	PoE Supported	Enable	Device IP	Check Frequency (sec.)	No Response Times	Action	
 1	Yes	Disabled	0.0.0.0	10	3	No Action	
 2	Yes	Disabled	0.0.0.0	10	3	No Action	
 3	Yes	Disabled	0.0.0.0	10	3	No Action	
 4	Yes	Disabled	0.0.0.0	10	3	No Action	
 5	Yes	Disabled	0.0.0.0	10	3	No Action	

UI Setting	Description
<b>Port</b>	Shows which port this row describes.
<b>PoE Supported</b>	Shows whether the port supports PoE.
<b>Enable</b>	Shows whether PD failure checking is enabled or disabled for the port.
<b>Device IP</b>	Shows what IP will be monitored for PD failure checking for the port.
<b>Check Frequency (sec.)</b>	Shows how often PD failure checks will be performed for the port.
<b>No Response Times</b>	Shows how many IP checking cycles will be tried before determining a PD is not responding.
<b>Action</b>	Shows what action will be taken if a PD failure is detected for the port.

## PD Failure Check - Edit Port Settings

### Menu Path: Port > PoE - PD Failure Check

Clicking the **Edit** () icon for an port on the **Port > PoE - PD Failure Check** page will open this dialog box. This dialog lets you configure the PD failure check settings for each port.

Click **APPLY** to save your changes.

## Edit Port 1 Settings

Enable \*  
 Disabled ▼

Device IP \*  
 0.0.0.0

Check Frequency \*  
 10  
 5 - 300 sec.

No Response Times \*  
 3  
 1 - 10 times

Action \*  
 No Action ▼

Copy configurations to ports ▼ ⓘ

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Enable</b>	Enable or disable PD failure checks for the port to check the status of PDs via ICMP.	Enabled / Disabled	Disabled
<b>Device IP</b>	Specify the IP address of the PD connected to the port to send ping packets to check for PD connection failure.	Valid IP address	0.0.0.0
<b>Check Frequency</b>	Specify how frequently in seconds ping packets will be sent to to the <b>Device IP</b> . If there is no reply, a "no response" will be detected.	5 to 300	10
<b>No Response Times</b>	Specify the number of consecutive "no response" events required to detect a PD connection failure and execute the specified <b>Action</b> .	1 to 10	3

UI Setting	Description	Valid Range	Default Value
<b>Action</b>	Specify the action to take when the number of <b>No Response Times</b> is reached. <ul style="list-style-type: none"> <li><b>No Action:</b> No action will be taken.</li> <li><b>Restart PD:</b> PoE power to the PD will be stopped, then started again to restart the PD.</li> <li><b>Shut Down PD:</b> PoE power to the PD will be stopped.</li> </ul>	No Action / Restart PD / Shut Down PD	No Action
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## PoE - Scheduling

### Menu Path: Port > PoE - Scheduling

This page lets you create PoE scheduling rules that can be applied to individual ports or multiple ports.

#### 🔗 Limitations


You can create up to 20 PoE scheduling rules

## PoE - System Time Status

System Time Status		
System Time	Local TimeZone	Daylight Saving Time
04:01	UTC+00:00	Off

UI Setting	Description
<b>System Time</b>	Shows the current system time of the device.
<b>Local Time Zone</b>	Shows the time zone of the device.
<b>Daylight Saving Time</b>	Shows whether the daylight saving time is on.

## PoE Scheduling - Rule List

<input type="checkbox"/>	Rule Name	Enable	Start Date	Schedule Time	Apply the rule to the port
<input type="checkbox"/>	 poerule1	Disabled	2024-5-13	18:00 - 21:00, Daily	1

Max. 20

UI Setting	Description
<b>Rule Name</b>	Shows the name of the scheduling rule.
<b>Enable</b>	Shows whether the rule is enabled or disabled.
<b>Start Date</b>	Shows when this rule will become active.
<b>Schedule Time</b>	Shows when the PoE will supply power for the specified ports. The system will not supply PoE power outside the scheduled time.
<b>Apply the rule to the port</b>	Shows which ports will use this rule.

## PoE Scheduling - Create Rule

### Menu Path: [Port](#) > [PoE - Scheduling](#)

Clicking the **Add (+)** icon on the **Port > PoE - Scheduling** page will open this dialog box. This dialog lets you create a PoE scheduling rule.

Click **CREATE** to save your changes.

**Create Rule**

Rule Name \* 0 / 63

Rule \* ▼

Start Date \* 📅

Start Time \* 🕒      End Time \* 🕒

Repeat Execution \* ▼

Apply the rule to the ... ▼

CANCEL    CREATE

UI Setting	Description	Valid Range	Default Value
<b>Rule Name</b>	Specify a name for the scheduling rule.	1 to 63 characters	None
<b>Rule</b>	Enable or disable the scheduling rule.	Enable / Disable	Disable
<b>Start Date</b>	Specify a start date for the rule to become active.	mm/dd/yyyy	None
<b>Start Time</b>	Specify a start time to enable PoE.	AM/PM hh/mm	None
<b>End Time</b>	Specify an end time to disable PoE.	AM/PM hh/mm	None
<b>Repeat Execution</b>	Specify whether to repeat execution of the rule on a daily or weekly basis.	None / Daily / Weekly	None
<b>Apply the rule to port</b>	Specify which ports should use this rule.	Select port(s) from the drop-down list	None

## PoE Scheduling - Edit Rule

### Menu Path: Port > PoE - Scheduling

Clicking the **Edit** (✎) icon for a rule on the **Port > PoE - Scheduling** page will open this dialog box. This dialog lets you edit an existing PoE scheduling rule.

Click **APPLY** to save your changes.

### Edit Rule

Rule Name \*  
poerule1 8 / 63

Rule \*  
Disabled

Start Date \*  
2024-05-13

Start Time \*      End Time \*  
下午 06:00      下午 09:00

Repeat Execution \*  
Daily

Apply the rule to the port \*  
1

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Rule Name</b>	Specify a name for the scheduling rule.	1 to 63 characters	None
<b>Rule</b>	Enable or disable the scheduling rule.	Enable / Disable	Disable
<b>Start Date</b>	Specify a start date for the rule to become active.	mm/dd/yyyy	None
<b>Start Time</b>	Specify a start time to enable PoE.	AM/PM hh/mm	None
<b>End Time</b>	Specify an end time to disable PoE.	AM/PM hh/mm	None
<b>Repeat Execution</b>	Specify whether to repeat execution of the rule on a daily or weekly basis.	None / Daily / Weekly	None
<b>Apply the rule to port</b>	Specify which ports should use this rule.	Select port(s) from the drop-down list	None

## PoE Scheduling - Delete Rule

### Menu Path: Port > PoE - Scheduling

You can delete a rule by using the checkboxes to select the entries you want to delete, then clicking the **Delete** (🗑️) icon.

## PoE - Status

Menu Path: Port > PoE - Status


This page lets you view PoE system and port status.


### PoE - System Status

## PoE

- General
- PD Failure Check
- Status**

### System Status

Power Budget Limit	Allocated Power	Consumed Power	Remaining Power Available	
150 Watts	0 Watts	0 Watts	150 Watts	

UI Setting	Description
<b>Power Budget Limit</b>	Shows the PoE power budget limit.
<b>Allocated Power</b>	Shows the total allocated PoE power.
<b>Consumed Power</b>	Shows the total consumed PoE power.
<b>Remaining Power Available</b>	Shows the remaining power available for the device.
	 <b>Note</b> Remaining Power Available is Maximum Input Power minus Allocated Power.

## PoE Status - Port List

### Note

When a higher-power 802.3bt (Class 5~8) PD is connected to a lower-power 802.3at or 802.3af PSE, the PD will simply operate at a lower power state, which is known as downgrading. In this case, the classification and the device type of the PD will appear as Class 4 and 802.3at because of inherent device limitations.

Port	PoE Supported	Power Output	Classification	Current (mA)	Voltage (V)	Consumption (W)	Device Type	Configuration suggestion	PD Failure Check Status
1	Yes	Off	Unknown	0.00	0.00	0.00	N/A	Enable PoE power output	Not alive
2	Yes	Off	Unknown	0.00	0.00	0.00	N/A	Enable PoE power output	Not alive
3	Yes	Off	Unknown	0.00	0.00	0.00	N/A	Enable PoE power output	Not alive
4	Yes	Off	Unknown	0.00	0.00	0.00	N/A	Enable PoE power output	Not alive
5	Yes	Off	Unknown	0.00	0.00	0.00	N/A	Enable PoE power output	Not alive

UI Setting	Description
<b>Port</b>	Shows the number of the PoE port.
<b>PoE Supported</b>	Shows whether the port supports PoE.
<b>Power Output</b>	Shows whether PoE power output is on or off for the port.
<b>Classification</b>	Shows the PoE power classification of the port. Each PoE power classification has a different maximum power (in watts) by PSE output as follows: <ul style="list-style-type: none"> <li>• <b>0</b>: 15.4 watts</li> <li>• <b>1</b>: 4 watts</li> <li>• <b>2</b>: 7 watts</li> <li>• <b>3</b>: 15.4 watts</li> <li>• <b>4</b>: 30 watts</li> </ul>
<b>Current (mA)</b>	Shows the amount of current (in mA) being supplied to the port.
<b>Voltage (V)</b>	Shows the voltage (in V) being used for the port.
<b>Consumption (W)</b>	Shows the power consumption (in W) of the device connected to the port.



UI Setting	Description
<b>Device Type</b>	<p>Shows the device type of the device currently connected to the port.</p> <ul style="list-style-type: none"> <li>• <b>Not Present:</b> There are no active connections to the port.</li> <li>• <b>Legacy PoE Device:</b> A legacy PD is connected to the port, and the device has detected that the voltage is too low or high, or the PD's detected capacitance is too high.</li> <li>• <b>802.3at:</b> An IEEE 802.3at PD is connected to the port.</li> <li>• <b>802.3af:</b> An IEEE 802.3af PD is connected to the port.</li> <li>• <b>NIC:</b> A NIC is connected to the port.</li> <li>• <b>Unknown:</b> An unknown PD is connected to the port.</li> <li>• <b>N/A:</b> The PoE function is disabled.</li> </ul>
<b>Configuration Suggestion</b>	<p>Shows configuration suggestions based on detected conditions.</p> <ul style="list-style-type: none"> <li>• <b>Disable PoE power output:</b> A NIC or unknown PD was detected; you may want to disable PoE power output for the port.</li> <li>• <b>Select Force Mode:</b> A higher/lower resistance or higher capacitance was detected; you may want to select <b>Force Mode</b> for the port.</li> <li>• <b>Select high power output:</b> An unknown classification was detected; you may want to select <b>High Power</b> output.</li> <li>• <b>Raise the external power supply voltage to greater than 46 VDC:</b> When the external supply voltage is detected at less than 46 V, the system suggests raising the voltage.</li> <li>• <b>Enable PoE function for detection:</b> The system suggests enabling the PoE function.</li> <li>• <b>Select IEEE 802.3at auto mode:</b> When detecting an IEEE 802.3at PD, the system suggests selecting 802.3at Auto mode.</li> <li>• <b>Select IEEE 802.3af auto mode:</b> When detecting an IEEE 802.3af PD, the system suggests selecting 802.3af Auto mode.</li> </ul>
<b>PD Failure Check</b>	<p>Shows the results of the last PD failure check, if checking is enabled. Refer to <a href="#">PD Failure Check</a> for more information.</p> <ul style="list-style-type: none"> <li>• <b>Disable:</b> PD failure checking is not enabled for the port.</li> <li>• <b>Alive:</b> The port is alive, and passed the last PD failure check.</li> <li>• <b>Not Alive:</b> The port is not alive, and failed the last PD failure check.</li> </ul>

# Layer 2 Switching

## Menu Path: Layer 2 Switching

This section lets you configure your device's Layer 2 switching features.

This section includes these pages:


- VLAN
- GARP
- MAC
- QoS
- Multicast

## VLAN

A VLAN, or Virtual Local Area Network, is a logical grouping of devices on a network.

### Assigning VLANs to Ports

VLANs must be assigned to ports to route traffic correctly. Now that you've created the VLANs, they need to be assigned to ports so that traffic from those ports will be routed over the correct VLAN. A similar procedure must be performed on each switch or router on the network.


1. Sign in to the device using administrator credentials.
2. Go to **Layer 2 Switching**→**VLAN**→**Settings**.
3. To assign the newly created VLAN ID to a port, find the port on the **Port Table** on the lower part of the page, and then click  **[Edit]**.  
**Result:** The **Edit Port Settings** panel appears.
4. Specify the **Mode** and **PVID** that will be assigned to the port, and then click **Apply**.

#### Tutorial Info:

**Access mode** is used when connecting single devices without tags. These are usually end-user devices that belong to a single VLAN, and do not need to communicate with devices in other VLANs.

**Trunk mode** allows a port to carry traffic for multiple VLANs over a single physical connection. This is useful for linking switches together that may have many different VLANs.

**Hybrid mode** is similar to a Trunk port, except users can explicitly assign tags to be removed from egress packets.

 **Note**


The port VID (PVID) setting will apply a VLAN tag only for untagged traffic coming through that port. If traffic going through the port has already been tagged with a VLAN ID, the PVID setting will not change the existing tag.

**Result:** The **Port Table** will show the new port configuration.

## Creating VLANs

Create VLANs in preparation for assigning them to ports.

To create a VLAN, do the following:

1. Sign in to the device using administrator credentials.
2. Go to **Layer 2 Switching > VLAN > Settings**.
3. To add a VLAN ID, click  **[Add]**.

**Result:** The **Create VLAN** screen appears.

4. Specify the VLAN to create in the **VID**, and then click **Create**.

Optionally:


- Type a human-readable identifier in the **Name** field
- Assign the VLAN to a **Member Port**. You also assign VLANs to ports later.

**Result:** The VLAN will appear on the VLAN table at the top of the page.

5. Repeat this process to create VLANs needed for the network topology.

**What to do next:** After you have created the VLANs needed for your topology, you can assign VLANs to ports if you have not done so already.

 **Note**

You can delete VLANs by choosing a VLAN ID from the VLAN table at the top of the page, clicking the checkbox, and then clicking  [Delete].

## VLANs in Depth

This technology allows network administrators to divide a large network into smaller, more manageable segments without the need for additional physical hardware. Devices within a VLAN can be located anywhere on the network but communicate as though they are on the same physical segment. This facilitates traffic management, as administrators can ensure traffic is directed only to devices within the same VLAN by assigning a VLAN tag to each Ethernet frame. Consequently, VLANs provide a means to segment a network beyond the constraints of physical connections, a limitation inherent in traditional network design. VLANs can be utilized to segment your network into various groups, such as:

- **Departmental groups**—One VLAN for the R&D department, another for Office Automation, etc.
- **Hierarchical groups**—One VLAN for directors, another for managers, and another for general staff.
- **Usage groups**—One VLAN for email users and another for multimedia users.

## VLAN Standards and Implementation

The functioning of VLANs is guided by IEEE 802.1Q, often referred to as Dot1q. This standard outlines the protocol for VLAN tagging on Ethernet frames within an IEEE 802.3 Ethernet network. During the transmission of data between switches, VLAN tags identify the VLAN ownership of frames. Networking equipment reads these tags and ensures that tagged frames are delivered to devices within that VLAN, maintaining the network's logical segmentation.

A VLAN tag is a specific piece of data embedded in the header of an Ethernet frame. It comprises a 4-byte field carrying key information, such as the VLAN ID (VID) and priority level. The VID is a numerical identifier that uniquely links the frame to a specific VLAN.

The priority field within the tag plays a critical role in prioritizing certain types of traffic within a VLAN. This structure contributes to effective network traffic management by giving precedence to certain data when necessary.

## **Benefits of VLANs**

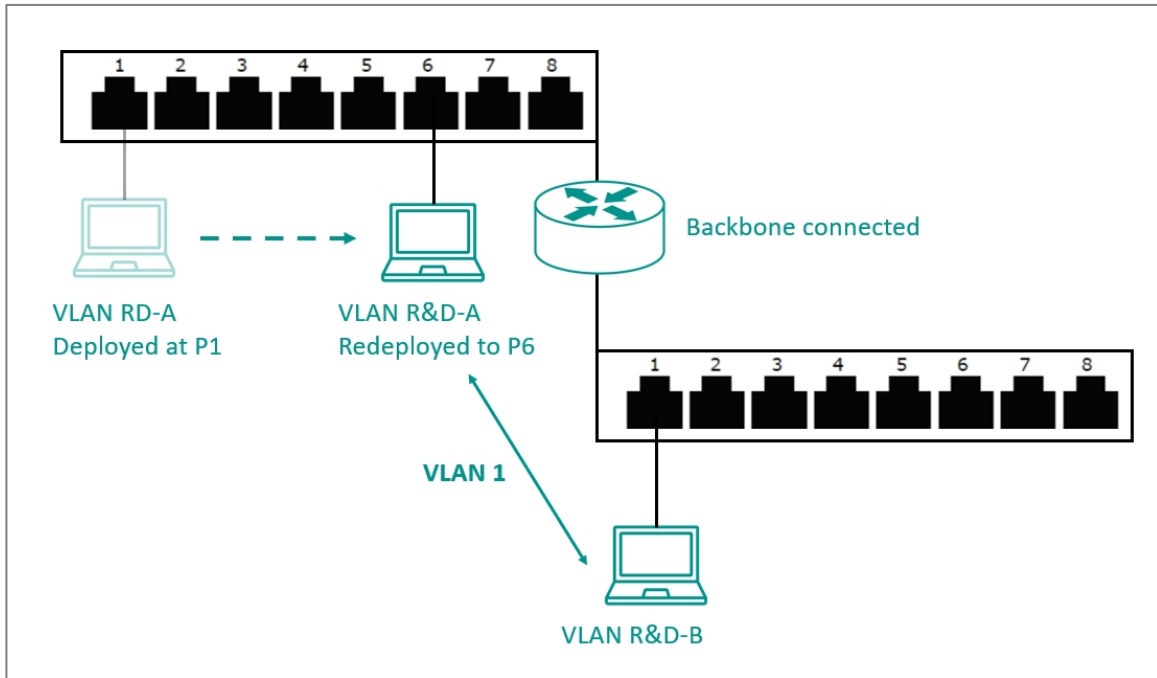
The main benefit of VLANs is that they provide a network segmentation system that is far more flexible than traditional networks. Using VLANs also provides you with three other benefits:

### **VLANs help control traffic**

With traditional networks, congestion can be caused by broadcast traffic that is directed to all network devices, regardless of whether or not they need it. VLANs increase the efficiency of your network because each VLAN can be set up to contain only those devices that need to communicate with each other.

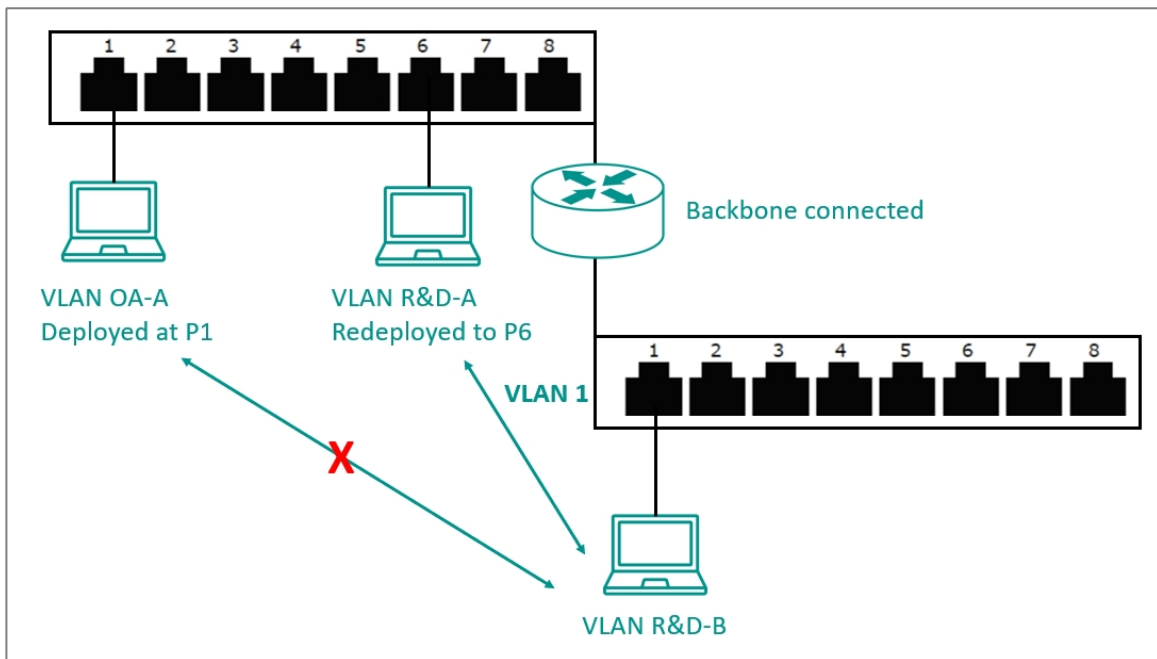
### **VLANs simplify device relocation**

In traditional networks, administrators spend significant time managing moves and changes, requiring manual updates of host addresses when users switch sub-networks. In contrast, VLANs simplify this process. For example, when relocating a host from Port 1 to Port 6 in a different network section, simply assign Port 6 to the relevant VLAN (e.g., VLAN R&D A). This enables seamless communication between VLANs, eliminating the need for re-cabling.



### VLANs provide extra security

Devices within each VLAN can only communicate with other devices on the same VLAN. If VLAN R&D B needs to communicate with VLAN OA(Office Automation) A, the traffic must pass through a routing device or Layer 3 switch.



**Note**

Network segmentation is not a substitute for network security. While network segmentation can provide a degree of isolation that contributes to the overall security environment, the primary benefit of VLANs is improved performance by ensuring minimal crosstalk between unrelated systems. Network segmentation should be complimented with network security procedures.

## VLAN Settings

### Menu Path: Layer 2 Switching > VLAN

This page lets you view and configure your device's VLAN settings.

This page includes these tabs:

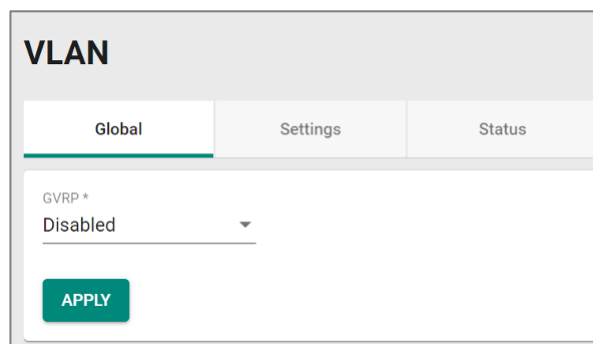
- Global
- Settings
- Status

### VLAN - Global

#### Menu Path: Layer 2 Switching > VLAN - Global

This page lets you configure the global VLAN settings.

### GVRP Settings



The screenshot shows a web interface for VLAN configuration. At the top, there is a header 'VLAN' and three tabs: 'Global', 'Settings', and 'Status'. The 'Global' tab is currently selected. Below the tabs, there is a dropdown menu for 'GVRP \*' with the value 'Disabled' selected. At the bottom of the configuration area, there is a green 'APPLY' button.

UI Setting	Description	Valid Range	Default Value
<b>GVRP</b>	Enable or disable GVRP for the device.	Enabled / Disabled	Disabled
<p><b>Note</b></p> <p>MSTP and GVRP are both VLAN-related functions. When VLAN changes dynamically, MSTP needs to re-converge, which can make the system unstable due to running complex operations. When both MSTP and GVRP are used together, this can result in network instability.</p> <p>Therefore, it is recommended that network administrators avoid enabling both MSTP and GVRP.</p>			

## Management VLAN Settings

### Management VLAN Settings

Management VLAN \*

1 ▼

---

Management Port ▼ i

---

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Management VLAN</b>	Specify the management VLAN.	Drop-down list of VLANs	1
<b>Management Port</b>	Specify a management port for this device to allow for quick and easy configuration of VLAN settings.	Drop-down list of ports	N/A
<p><b>Warning</b></p> <p>Make sure the computer you are using to configure the device is connected to the selected management port, or you may become disconnected from your device.</p>			

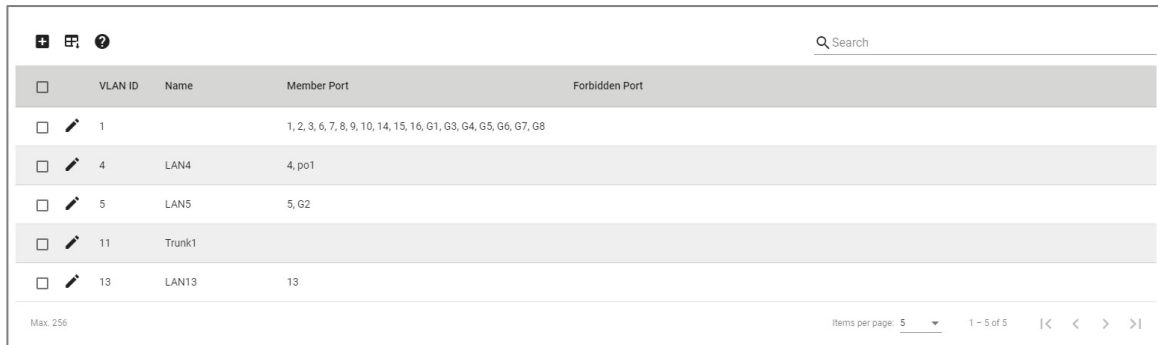


## VLAN - Settings

### Menu Path: Layer 2 Switching > VLAN - Settings

This page lets you configure VLANs and which ports they include.

### VLAN List



The screenshot shows a table with the following columns: VLAN ID, Name, Member Port, and Forbidden Port. There are five rows of data. Each row has a checkbox and an edit icon on the left. The table is part of a larger interface with a search bar and pagination controls.

<input type="checkbox"/>	VLAN ID	Name	Member Port	Forbidden Port
<input type="checkbox"/>	1		1, 2, 3, 6, 7, 8, 9, 10, 14, 15, 16, G1, G3, G4, G5, G6, G7, G8	
<input type="checkbox"/>	4	LAN4	4, po1	
<input type="checkbox"/>	5	LAN5	5, G2	
<input type="checkbox"/>	11	Trunk1		
<input type="checkbox"/>	13	LAN13	13	

UI Setting	Description
<b>VLAN ID</b>	Shows the ID of the VLAN.
<b>Name</b>	Shows the name of the VLAN.
<b>Member Port</b>	Shows the member port(s) of the VLAN.
<b>Forbidden Port</b>	Shows the forbidden port(s) of the VLAN.

### VLAN - Create VLAN

### Menu Path: Layer 2 Switching > VLAN - Settings

Clicking the **Add (+)** icon for port on the **Layer 2 Switching > VLAN - Settings** page will open this dialog box. This dialog lets you to create VLAN.

Click **CREATE** to save your changes.

## Create VLAN

### Create VLAN

VLAN ID \* i  
Max. 10 VLANs

Name 0 / 32

Member Port ▼

Forbidden Port ▼

CANCEL
CREATE

UI Setting	Description	Valid Range	Default Value
<b>VLAN ID</b>	Specify the VLAN ID.	1 to 4094	N/A
<b>Name</b>	Specify the name of the VLAN.	0 to 32 characters	N/A
<b>Member Port</b>	Specify the member port(s) of the specific VLAN.	Drop-down list of ports	N/A
<b>Forbidden Port</b>	Specify the forbidden port(s) of the specific VLAN.	Drop-down list of ports	N/A

## VLAN Port Status List

⌂
🔍 Search

Port	Mode	PVID	GVRP	Untagged VLAN	Tagged VLAN
1	Access	1	Disabled	1	
2	Access	1	Disabled	1	
3	Access	1	Disabled	1	
4	Access	4	Disabled	4	
5	Access	5	Disabled	5	

UI Setting	Description
<b>Port</b>	Shows the port number.

UI Setting	Description
<b>Mode</b>	Shows the mode of the port. <ul style="list-style-type: none"> <li>• <b>Access:</b> The port is connected to a single device, without tags.</li> <li>• <b>Trunk:</b> The port is connected to another 802.1Q VLAN aware switch.</li> <li>• <b>Hybrid:</b> The port is connected to another Access 802.1Q VLAN aware switch or another LAN that combines tagged and/or untagged devices.</li> </ul>
<b>PVID</b>	Shows the default VLAN ID for untagged devices connected to the port. The PVID will be added for ingress traffic, and will be removed for egress traffic for the access port only.
<b>GVRP</b>	Shows whether GVRP is enabled for the port.
<b>Untagged VLAN</b>	When the port is using <b>Hybrid</b> VLAN mode, this shows all VLAN IDs that will be removed from egress packets.
<b>Tagged VLAN</b>	When the port is using <b>Trunk</b> or <b>Hybrid</b> VLAN mode, this shows all VLAN IDs will be carried to connected devices.

## VLAN - Status

**Menu Path:** Layer 2 Switching > VLAN - Status

This page lets you monitor the status of the VLANs on your device.

### VLAN Switchport Mode Table

VLAN ID	Name	Status	Hybrid Port	Trunk Port	Access Port
1		Permanent			1, 2, 3, 6, 7, 8, 9, 10, 14, 15, 16, G1, G3, G4, G5, G6, G7, G8
4	LAN4	Permanent			4, po1
5	LAN5	Permanent			5, G2
11	Trunk1	Permanent			
13	LAN13	Permanent			13

Items per page: 5 | 1 - 5 of 5 | < > >>

UI Setting	Description
<b>VLAN ID</b>	Shows the ID of the VLAN.
<b>Name</b>	Shows the name of the VLAN.

UI Setting	Description
<b>Status</b>	Shows the status of the VLAN.
<b>Hybrid Port</b>	Shows ports acting as a Hybrid Port for the VLAN.
<b>Trunk Port</b>	Shows ports acting as a Trunk Port for the VLAN.
<b>Access Port</b>	Shows ports acting as an Access Port for the VLAN.

## VLAN Membership Table

VLAN Membership Table

🔄 🗒️ 🔍 Search

VLAN ID	Name	Status	Untagged Port	Tagged Port	Forbidden Port
1		Permanent	1, 2, 3, 6, 7, 8, 9, 10, 14, 15, 16, G1, G3, G4, G5, G6, G7, G8		
4	LAN4	Permanent	4, po1		
5	LAN5	Permanent	5, G2		
11	Trunk1	Permanent			
13	LAN13	Permanent	13		

Items per page: 5 | 1 - 5 of 5 | < > >> <<

UI Setting	Description
<b>VLAN ID</b>	Shows the ID of the VLAN.
<b>Name</b>	Shows the name of the VLAN.
<b>Status</b>	Shows the status of the VLAN.
<b>Untagged Port</b>	Shows the untagged port(s) for the VLAN.
<b>Tagged Port</b>	Shows the tagged port(s) for the VLAN.
<b>Forbidden Port</b>	Shows the forbidden port(s) for the VLAN.

# GARP

Generic Attribute Registration Protocol (GARP) is a communication protocol defined by IEEE 802.1 that offers a generic framework for bridges to register and de-register an attribute value.

In a VLAN structure, two GARP applications can be applied:

- **GARP VLAN Registration Protocol (GVRP)** is used to register VLAN trunking between multilayer switches.
- **GARP Multicast Registration Protocol (GMRP)** provides a constrained multicast flooding facility.

## GARP Settings

**Menu Path: Layer 2 Switching > GARP**

This page lets you configure GARP settings on each port.

### GARP List

	Port	Join Time	Leave Time	Leave All Time
	1	200	600	10000
	2	200	600	10000
	3	200	600	10000
	4	200	600	10000
	5	200	600	10000
	6	200	600	10000

UI Setting	Description
<b>Port</b>	Shows which port the entry is for.
<b>Join Time (sec.)</b>	Shows the join time for the port.
<b>Leave Time (sec.)</b>	Shows the leave time for the port.
<b>Leave All time (sec.)</b>	Shows the leave all time for the port.

## GARP - Edit Port Settings

### Menu Path: Layer 2 Switching > GARP

Clicking the **Edit** (✎) icon for a port on the **Layer 2 Switching > GARP** page will open this dialog box. This dialog lets you configure the GARP parameters for each port.

Click **APPLY** to save your changes.

### Edit Port 1 Settings

Join Time \*

200

---

10 - 1073741810

Leave Time \*

600

---

30 - 2147483630

Leave All Time \*

10000

---

40 - 2147483640

Copy configurations to ports ▼ ⓘ

---

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Join Time (sec.)</b>	Specify the join time in seconds.	10 to 499999980	200
<b>Leave Time (sec.)</b>	Specify the leave time in seconds.	30 to 499999980	600
<b>Leave All time (sec.)</b>	Specify the leave all time in seconds.	30 to 499999990	10000
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## MAC

### Menu Path: Layer 2 Switching > MAC

This section lets you configure **Static Unicast** and the **MAC Address Table**.

This section includes these pages:

- Static Unicast
- MAC Address Table

## Static Unicast

Static Unicast lets you manually define specific forwarding paths for data packets destined for particular devices on the network.

### Static Unicast

#### Menu Path: Layer 2 Switching > MAC > Static Unicast

This page lets you manage your device's static unicast entries.

### 🔒 Limitations

You can create up to 256 static unicast entries.

## Unicast Table

	VLAN ID	MAC Address	Port
<input type="checkbox"/>	4	00:11:22:33:44:55	po1

Max. 256

UI Setting	Description
<b>VLAN ID</b>	Shows the VLAN ID used for the static unicast entry.
<b>MAC Address</b>	Shows the MAC address used for the static unicast entry.
<b>Port</b>	Shows which ports are included for the static unicast entry.

## Add a Static Unicast Entry

### Menu Path: Layer 2 Switching > MAC > Static Unicast

Clicking the **Add (+)** icon on the **Layer 2 Switching > MAC > Static Unicast** page will open this dialog box. This dialog lets you add a new static unicast entry.

Click **CREATE** to save your changes and add the new entry.

**Add a Static Unicast Entry**

VLAN ID \*      MAC Address \*

Port \*

CANCEL      CREATE



UI Setting	Description	Valid Range	Default Value
<b>VLAN ID</b>	Specify the VLAN ID.	Drop-down list of VLAN IDs	N/A
<b>MAC Address</b>	Specify the static unicast MAC address of the port.	Valid unicast MAC address	N/A
<b>Port</b>	Specify which ports you want to include in the static unicast group	Drop-down list of ports	N/A

## MAC Address Table

The MAC address table is a database maintained on your device that acts like a directory to keep track of all the devices currently connected to the network. Each entry in the table includes a device's unique identifier, known as its Media Access Control (MAC) address, and the specific switch port it is connected to.

### Note

Moxa devices manage MAC address learning for VLANs using IVL (Independent VLAN Learning), which uses separate MAC address tables for each VLAN so that MAC address learning for different VLANs do not interfere with each other.

A MAC table will be stored in the format of MAC + VID. This allows the same MAC address to be used in multiple VLANs without causing forwarding issues.

This may lead to a larger MAC address table size, as each VLAN maintains its own individual address table, and the number of MAC address entries will increase based on the number of VLAN member ports used.

## MAC Address Table

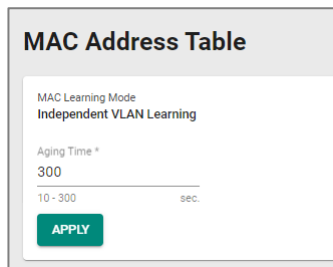
**Menu Path:** [Layer 2 Switching](#) > [MAC](#) > [MAC Address Table](#)

This page lets you view your device's MAC address table and set the aging time for MAC address entries.

## 🔔 Limitations

The MAC address table can hold up to 16384 entries.

## MAC Address Settings



MAC Address Table

MAC Learning Mode  
Independent VLAN Learning

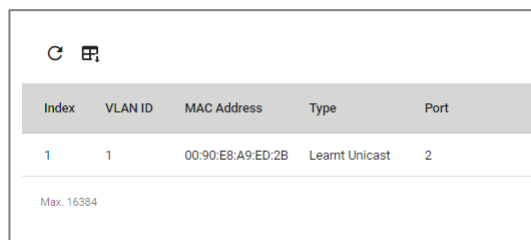
Aging Time \*  
300  
10 - 300 sec.

APPLY

UI Setting	Description	Valid Range	Default Value
<b>MAC Learning Mode</b>	Shows the current MAC learning mode.	N/A	Independent VLAN Learning
<b>Aging Time</b>	Specify the aging time for MAC address entries in seconds. The aging time determines how long entries will be kept in the MAC address table in the device's memory before expiring.	10 to 300	300

Click APPLY to save your changes.

## MAC Address Table List



Index	VLAN ID	MAC Address	Type	Port
1	1	00:90:E8:A9:ED:2B	Learnt Unicast	2

Max. 16384

UI Setting	Description
<b>Index</b>	Shows the index number of the MAC address.
<b>VLAN ID</b>	Shows which VLAN ID is being used for the MAC address.

UI Setting	Description
<b>MAC Address</b>	Shows the MAC address of the device.
<b>Type</b>	Shows what kind of MAC address entry this is: <b>Learnt Unicast:</b> Used for all learnt unicast MAC addresses. <b>Learnt Multicast:</b> Used for all learnt multicast MAC addresses. <b>Static Unicast:</b> Used for all static unicast MAC addresses. <b>Static Multicast:</b> Used for all static multicast MAC addresses.
<b>Port</b>	Shows which port on the device the MAC address is connected to.

## QoS

Quality of Service (QoS) is a set of techniques and mechanisms used in computer networks to prioritize certain types of traffic, ensure reliable delivery of data, and optimize network performance. QoS mechanisms allow network administrators to define policies and rules for managing network resources and controlling the flow of traffic based on factors such as traffic type, application requirements.

Moxa's switches offer the following features to accomplish QoS objectives:

- Classification
- Ingress Rate Limit
- Scheduler
- Egress Shaper

### How each QoS feature works

The switch provides Quality of Service (QoS) to your network by making data delivery more reliable. The traffic can be classified by applying IEEE 802.1p/1Q layer 2 CoS (Class of Service) tags, and even layer 3 DSCP (Differentiated Services Code Point) information and the switch can inspect both IEEE 802.1p/1Q layer 2 CoS tags, and DSCP information and prioritize traffic on your network to ensure that high priority data is transmitted with minimum delay. Traffic can be controlled by a set of rules to obtain the required Quality of Service for your network. The rules define different types of traffic and specify how

each type should be treated as it passes through the switch. For more detailed explanation to the feature of **Classification**, please refer to feature-map Classification.

Two scheduling algorithms, Strict Priority and Weighted Round Robin, are available to empower network administrators to choose the most suitable method for packet transmission in their field applications. For more detailed explanation to the feature of **Scheduler**, please refer to feature-map Scheduler.

In addition to packet classification for incoming packets and scheduling for outgoing packets, users can also establish a threshold for incoming data rates. When this limit is exceeded, they can choose to either drop or remark the packet. For more detailed explanation of the feature of **Ingress Rate Limit**, please refer to feature-map Ingress Rate Limit.

Or leveraging the egress shaper feature to optimize outbound traffic, maintain network stability, and ensure efficient utilization of available bandwidth resources. For more detailed explanation of the feature of **Egress Shaper**, please refer to feature-map Egress Shaper.

The switch's QoS capability improves the performance and determinism of industrial networks for mission-critical applications.

## QoS

### Menu Path: Layer 2 Switching > QoS

This section lets you enable and configure your device's QoS settings.

This section includes these pages:

- Classification
- Ingress Rate Limit
- Scheduler
- Egress Shaper

 **Note**

For MX-NOS platform devices, QoS behavior will be consistent as long as the chipset solutions are the same. Therefore, RKS/MDS/TN devices will exhibit identical QoS behavior.

## Classification

Traffic classification allows you to classify data for prioritization so that time-sensitive and system-critical data can be transferred smoothly and with minimal delay over a network.

Benefits of using traffic classification and prioritization include:

- Improving network performance by controlling a wide variety of traffic and managing congestion
- Assigning priorities to different categories of traffic, such as setting higher priorities for time-critical or mission-critical applications
- Providing predictable throughput to improve the performance of multimedia applications—such as video conferencing or voice over IP—to minimize traffic delay and jitter
- Optimizing network utilization depending on application usage and usage needs, allowing the amount of traffic to increase without requiring increases in backbone bandwidth

Traffic classification/prioritization uses eight traffic queues to ensure that higher priority traffic can be forwarded separately from lower priority traffic to help guarantee quality of service (QoS) for your network.

Traffic classification/prioritization for your Moxa device is based on two standards:

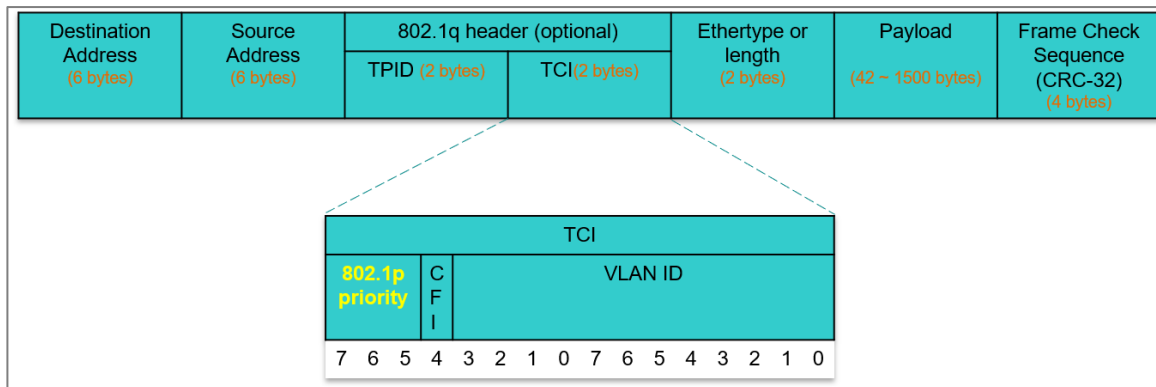
- **IEEE 802.1p Class of Service:** A Layer 2 QoS marking scheme
- **Differentiated Services (DiffServ) Traffic Marking:** A Layer 3 QoS marking scheme

### How IEEE 802.1p Class of Service (CoS) works

The IEEE Std 802.1D 2005 Edition marking scheme, which is an enhancement to IEEE Std 802.1D, enables Quality of Service on the LAN. Traffic service levels are defined in the IEEE 802.1Q 4-byte tag, which is used to carry VLAN identification as well as IEEE 802.1p priority information. If the 802.1q header presents and the Tag Protocol Identifier

(TPID) value is 0x8100, then it means the frame is tagged. The TPID is followed by a 2-byte field Tag Control Information (TCI) which contains a 3-bit 802.1p priority field as shown in below figure.

The IEEE Std 802.1D 2005 Edition priority marking scheme assigns an IEEE 802.1p priority level between 0 and 7 to each frame, which specifies the level of service that the associated packets shall be handled.



The table below shows an example of how different traffic types can be mapped to the eight IEEE 802.1p priority levels.

IEEE 802.1p Priority (decimal)	IEEE 802.1p Priority (binary)	IEEE 802.1D Traffic Type
0	0 0 0	Best Effort
1	0 0 1	Background (lowest priority)
2	0 1 0	Reserved
3	0 1 1	Excellent Effort (business critical)
4	1 0 0	Controlled Load (streaming multimedia)
5	1 0 1	Video (interactive media)
6	1 1 0	Voice (interactive voice)
7	1 1 1	Network Control Reserved traffic

Even though the IEEE 802.1p standard is the most widely used prioritization scheme for LAN environments, it still has some restrictions:

- It requires an additional 4-byte tag in the frame, which is normally optional for Ethernet networks. Without this tag, the scheme cannot work.
- The tag is part of the IEEE 802.1Q header, so to implement QoS at layer 2, the entire network must implement IEEE 802.1Q VLAN tagging.
- It is only supported within a LAN and does not cross the WAN boundaries, since the IEEE 802.1Q tags will be removed when the packets pass through a router.

### How Differentiated Services (DiffServ) Traffic Marking works

DiffServ is a Layer 3 marking scheme that uses the DiffServ Code Point (DSCP) field in the IP header to specify the packet priority. DSCP is an advanced intelligent method of traffic marking that allows you to choose how your network prioritizes different types of traffic. The DSCP field can be set from 0 to 63 to map to user-defined service levels, enabling users to regulate and categorize traffic by applications with different service levels.

The advantages of DiffServ over IEEE 802.1Q are as follows:

- You can prioritize and assign different traffic with appropriate latency, throughput, or reliability by each port.
- No extra tags are required.
- The DSCP priority tags are carried in the IP header, which can pass the WAN boundaries and through the Internet.
- DSCP is backwards compatible with IPv4 ToS (Type of Service), which allows operation with legacy devices that use IPv4 layer 3.

Default mapping of DSCP and CoS values:

DSCP values	Mapped CoS value
<b>0 to 7</b>	0
<b>8 to 15</b>	1
<b>16 to 23</b>	2
<b>24 to 31</b>	3
<b>32 to 39</b>	4

DSCP values	Mapped CoS value
<b>40 to 47</b>	5
<b>48 to 55</b>	6
<b>56 to 63</b>	7

## Traffic Prioritization

Moxa switches classify traffic based on layer 2 of the OSI 7 layer model, and the switch prioritizes outbound traffic according to the priority information defined in the received packet. Incoming traffic is classified based upon the IEEE 802.1p service level field and is assigned to the appropriate egress priority queue. The traffic flow through the switch is as follows:

- A packet received by the Moxa switch may or may not have an 802.1p tag associated with it. If it does not, then it is given a default CoS value (according to the port settings in the classification section).
- Each egress queue has associated 802.1p priority levels, and can be defined by users, the packet will be placed in the appropriate priority queue. When the packet reaches the head of its queue and is about to be transmitted, the device determines whether or not the egress port belongs to the VLAN group. If it is, then the new 802.1p tag is used in the extended 802.1D header.

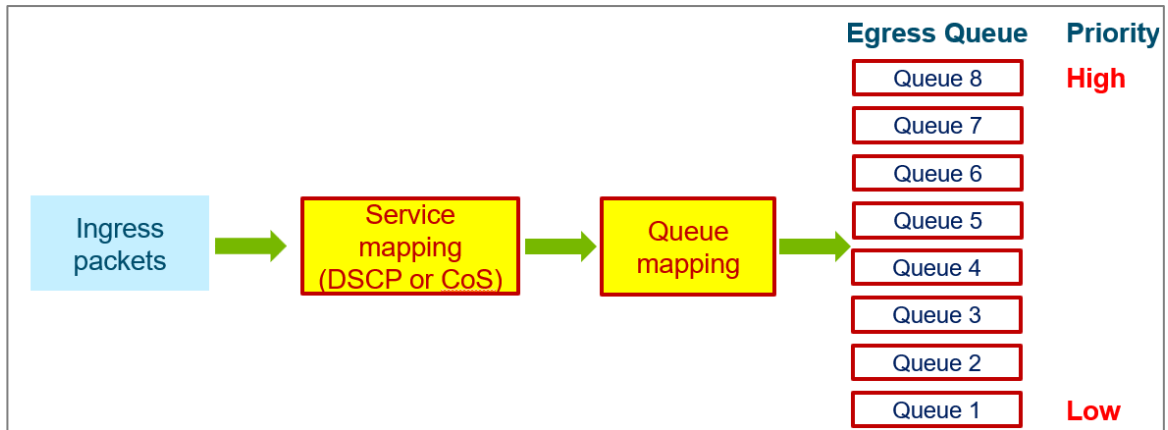
Please be aware that the priority of redundancy protocol control packets is determined by the switch and is not influenced by the user's QoS settings. The prioritization of traffic is determined by the QoS policies configured on network devices, and it remains consistent regardless of whether the interface is a single port or a trunk port.

## Traffic Queues

The hardware of Moxa switches has eight different traffic queues that allow packet prioritization to occur. The priority of these queues ranges from 1 (lowest priority) to 8 (highest priority). Higher priority traffic can pass through the Moxa switch without being delayed by lower priority traffic. Ingress packets containing DSCP or CoS fields require classification and mapping to a priority queue. Incoming packets with a specified DSCP



value at layer 3 are remapped to a CoS value at layer 2 before being directed to the egress traffic queue. The corresponding mapping of DSCP to CoS and the CoS to the egress priority queue priority should be preconfigured on a Moxa switch. As each packet arrives in the Moxa switch, it undergoes ingress processing (which includes classification, marking/re-marking), and is then sorted into the appropriate egress queue.



Packets lacking DSCP or CoS values will be directed to the appropriate egress queue based on the settings of "Untag Default Priority" configured in "Port Settings." (menu-reference Port Classification - Edit Port Setting).


### Mark egress packets with a CoS value when the ingress is an untagged packet

For devices connected to a switch lacking the ability to insert the priority code into the 802.1q tagged packet, the switch can be configured to mark egress packets with a specified CoS value, thus ensuring priority along the subsequent transmission path.





In this task, we will instruct how to configure the switch to assign a CoS value of 7 to egress packets on port 2 when ingress packets from port 1 are untagged.

#### Before you begin:

- Create a new VLAN ID = 10.
  - Configure Port 1 with PVID = 10 and "Access" mode is enabled.
  - Configure Port 2 with PVID = 1 and "Trunk" mode is enabled, tagged VLAN = 10.
1. Sign in to the switch using administrator credentials.
  2. Go to **Layer 2 Switching** → **QoS** → **Classification**
  3. Go to **Port Settings** tab.

4. Click  adjacent to Port 1 to open a dialog to edit Port 1 settings.
5. Click a drop-down list of field **Untag Default Priority** and select **7**.
6. Click **Apply** to take effect.

**Result:**

	Port	Trust Type	Priority
	1	CoS	7
	2	CoS	3
	3	CoS	3
	4	CoS	3

**Results:**

When a device connected to port 1 sends out untagged packets, the switch will mark a CoS value of 7 to egress packets on port 2.

**Classification**

**Menu Path: Layer 2 Switching > QoS > Classification**

This page lets you configure your device's QoS classifications.

This page includes these tabs:

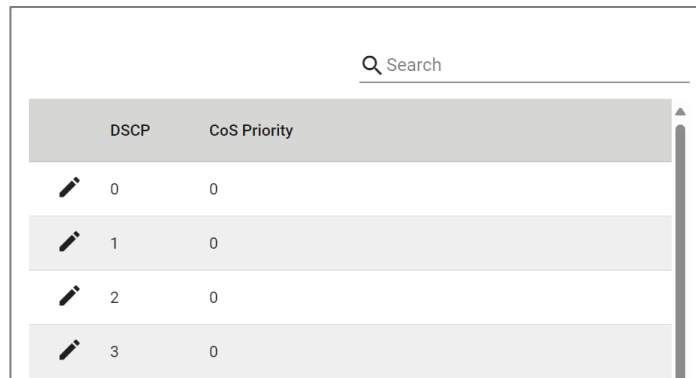
- DSCP Mapping
- CoS Mapping
- Port Settings





**DSCP Mapping**

**Menu Path: Layer 2 Switching > QoS > Classification - DSCP Mapping**

This page lets you view and edit your DSCP CoS mappings.

## DSCP Mapping List




	DSCP	CoS Priority
	0	0
	1	0
	2	0
	3	0

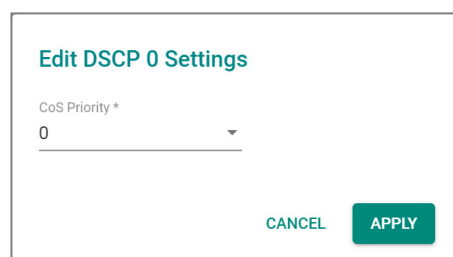
UI Setting	Description
<b>DSCP</b>	Shows the DSCP value for the entry.
<b>CoS Priority</b>	Shows the CoS priority mapped to the DSCP value.

## Edit DSCP Settings

### Menu Path: Layer 2 Switching > QoS > Classification - DSCP Mapping

Clicking the **Edit** () icon for an entry on the **Layer 2 Switching > QoS > Classification - DSCP Mapping** page will open this dialog box. This dialog lets you edit CoS priority for a DSCP value.

Click **APPLY** to save your changes.



**Edit DSCP 0 Settings**

CoS Priority \*

0

CANCEL APPLY







UI Setting	Description	Valid Range	Default Value
<b>CoS Priority</b>	Specify the CoS priority to assign to the DSCP value. Higher numbers have higher priority.	0 to 7	DSCP 0 to 7: 0 DSCP 8 to 15: 1 DSCP 16 to 23: 2 DSCP 24 to 31: 3 DSCP 32 to 39: 4 DSCP 40 to 47: 5 DSCP 48 to 55: 6 DSCP 56 to 63: 7

## CoS Mapping

### Menu Path: Layer 2 Switching > QoS > Classification - CoS Mapping

This page lets you view and edit your CoS Queue mappings.

## CoS Mapping List

		Q Search
CoS	Queue	
 0	1	
 1	2	
 2	3	
 3	8	
 4	5	
 5	6	

UI Setting	Description
CoS	Shows the CoS value for the entry.
Queue	Shows the queue mapped to the CoS value.

## Edit CoS Settings

### Menu Path: Layer 2 Switching > QoS > Classification - CoS Mapping

Clicking the **Edit** (✎) icon for a CoS value on the **Layer 2 Switching > QoS > Classification - CoS Mapping** page will open this dialog box. This dialog lets you map a queue to a CoS value.

Click **APPLY** to save your changes.






UI Setting	Description	Valid Range	Default Value
Queue	Select a queue to map to the CoS value. Queues with higher numbers have higher priority.	1 to 8	CoS 0: 1 CoS 1: 2 CoS 2: 3 CoS 3: 4 CoS 4: 5 CoS 5: 6 CoS 6: 7 CoS 7: 8

## QoS - Port Settings

### Menu Path: Layer 2 Switching > QoS > Classification - Port Settings

This page lets you manage the trust type and CoS value for untagged packets on a per-port basis.


## Port Settings List

Search			
	Port	Trust Type	Priority
	1	CoS	0
	2	CoS	3
	3	CoS	3
	4	CoS	3
	5	CoS	3

UI Setting	Description
<b>Port</b>	Shows the port number for the entry.
<b>Trust Type</b>	Shows the trust type used to classify traffic for the port.
<b>Priority</b>	Shows the CoS value to use for untagged packets for the port.

## QoS - Edit Port Settings

### Menu Path: Layer 2 Switching > QoS > Classification - Port Settings

Clicking the **Edit** () icon for a port on the **Layer 2 Switching > QoS > Classification - Port Settings** page will open this dialog box. This dialog lets you edit the trust type and priority for a specific port.

Click **APPLY** to save your changes.

### Edit Port 1 Settings

Trust Type \*  
CoS

Untag Default Priority \*  
3

Copy configurations to ports i

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Trust Type</b>	Select the trust type used to classify traffic for the port.	CoS / DSCP	CoS
<b>Untag Default Priority</b>	Specify a CoS value to use for untagged packets for the port. Higher values will have higher priority.	0 to 7	3
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Configuring Ingress Rate Limits

Ingress rate limits drop—or "mark"—network traffic when it exceeds user-defined thresholds.

### Introduction to Ingress Rate Limits

There are two elements to this process:

- **Meter** - An algorithm in the switch that monitors and limits traffic by applying QoS markers to data packets or dropping them entirely
- **Marker** - The DSCP/802.1p field of data packets is assigned a value or "marked" by the QoS policies, determining their handling in the network

Meter algorithms include simple token bucket and SrTCM (Single Rate Three Color Marker) (RFC2697).

In addition to ingress rate management, the switch also offers an option for the administrators to configure the shutdown of an Ethernet port that may be under attack from an excess of incoming packets, such as a Denial-of-Service attack.

### **About Port Shutdown**

Ports can be shutdown to avoid broadcast storms.

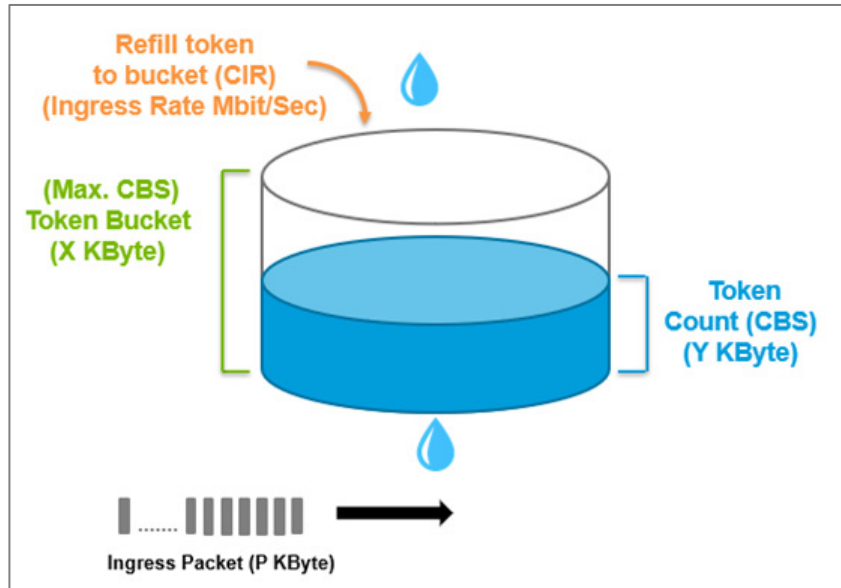
In general, any user shall not consume unlimited bandwidth and influence others' access. One particular scenario is that a malfunctioning switch or mis-configured network might cause "broadcast storms". Moxa industrial Ethernet switches not only prevent broadcast storms, but can also regulate ingress packet rates, giving administrators full control of their limited bandwidth to prevent undesirable effects caused by unpredictable faults.

The network administrator has the option to establish a maximum throughput threshold (in Mbps) for incoming packets on a designated port and activate this function. If unexpected ingress packets are detected on that port, the physical Ethernet port will be disabled, preventing further packet transmission. Re-activation of the port can be done manually or left to occur automatically after the pre-defined release interval, specified in minutes, has elapsed.

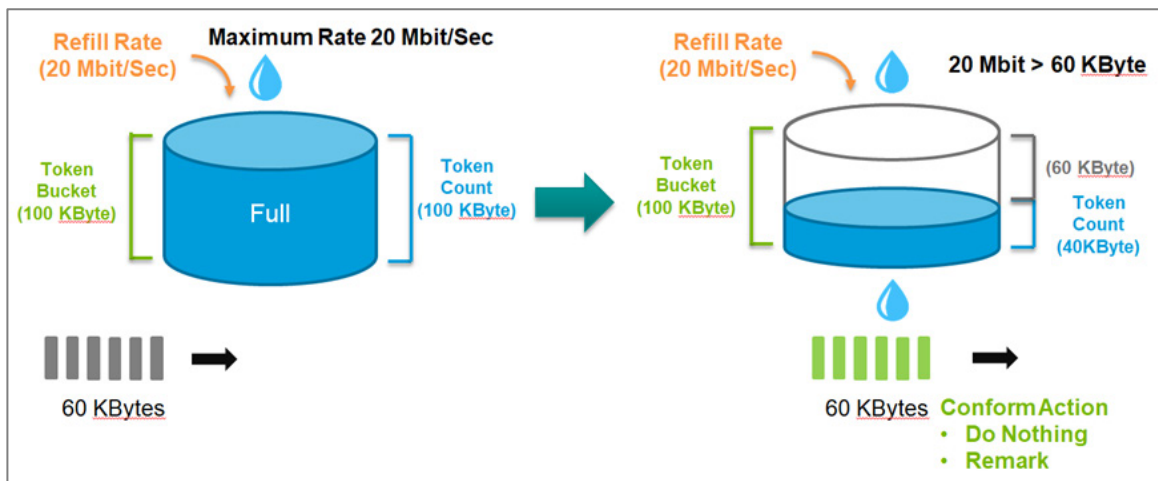
### **About Token Buckets**

Token Bucket is an algorithm used to achieve an efficient network flow control and manage bandwidth. This algorithm is based on a token bucket that allows for a traffic surge for short periods. When a token is unavailable, no burst of packets can be sent. Under this concept, the number of tokens will be refilled in the bucket at specific intervals. Users need to configure these settings so that the tokens in the bucket are always available to ensure packets can be sent when necessary.





**CAR (Committed Access Rate)** is a traffic control mechanism used to ensure that packets meet the network rules before they enter the network. CAR can guarantee the traffic flow is under user-defined control; the packets exceeding the rule will be either dropped or remarked and transmitted again. When network traffic is jammed, these packets will be dropped first.



Token Bucket is an algorithm that is demonstrated as a container in the image below. The token can be seen as a marker to mark a packet that is allowed to be transmitted through this switch. When the token is flowing into the bucket, the length of the bucket will be consumed as the volume of the bucket is limited. When the volume of the bucket is insufficient, some packets will be dropped or remarked and transmitted again. This

algorithm can control the speed of the traffic flow by consuming the speed of the token in the bucket.

### **About Single Rate Three Color Markers**

Single Rate Three Color Markers (SrTCM) is a policing scheme for ingress rate limits. Traffic marking is based on a Committed Information Rate (CIR) and two associated burst sizes:

- Committed Burst Size (CBS)
- Excess Burst Size (EBS)

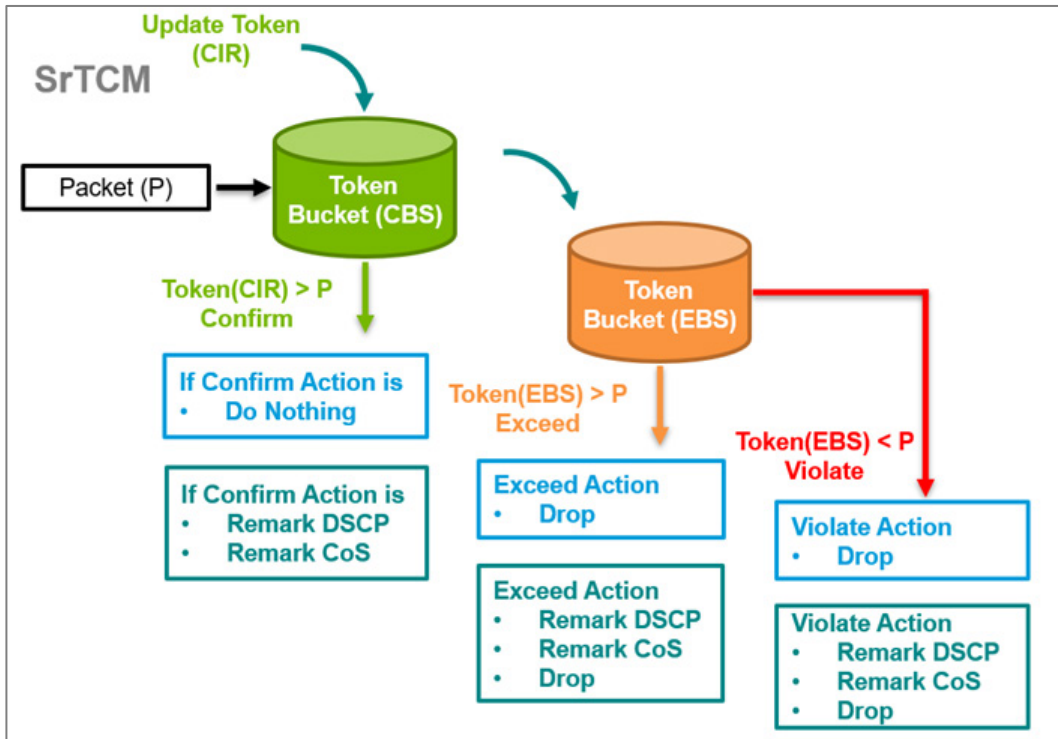
A packet is marked green if it does not exceed the CBS, yellow if it does exceed the CBS, but not the EBS, and red otherwise.

SrTCM will categorize the ingress packet by its length, and mark it as one of three colors:

- **Green:** performs the "conform" action. It could be "Do nothing", "Remark DSCP" or "Remark CoS". The Token Bucket (CBS) will deduct corresponding tokens.
- **Yellow:** performs the "exceed" action. It could be "Drop", "Remark DSCP" or "Remark CoS". The Token Bucket (EBS) will deduct corresponding tokens.
- **Red:** performs the "violate" action. It could be "Drop", "Remark DSCP" or "Remark CoS".

If you select "Do nothing" as the conform action, then "Drop" will be the only action when it enters the Exceed or Violate state.

The SrTCM is useful for ingress policing of a service, where only the length, not the peak rate, of the burst determines service eligibility.



## Dropping Limit-exceeding Incoming Packets

You can setup the ingress rate limits that will automatically drop packets exceeding limits you specify.

In this example, we will prevent the switch from being overwhelmed by unexpected large amount of ingress packets through port 1, set an ingress rate limit of 5 Mbps on port 1. Then, verify that the device connected to port 2 receives packets at no more than 5 Mbps.

### Before you begin:

- Change the configuration mode to **Advanced** mode by selecting the mode in the upper right corner of the UI.
  - Create a new **VLAN ID** with a value of **10**
  - Configure Port 1 with a **PVID** of 10 and with **Access mode** enabled
  - Configure Port 2 with a **PVID** of 10 and with **Access mode** enabled
1. Sign in to the device using administrator credentials.
  2. Go to **Layer 2 Switching**→**QoS**→**Ingress Rate Limit**→**General**.

3. Click **[Edit]** corresponding to **Port 1**.

**Result:** The **Edit Port Settings** dialogue appears.

4. In the **Ingress Rate (CIR)** field, specify 5 Mbps, and then click **Apply**.

**Result:** The new Ingress Rate (CIR) will appear in the table.

### **Results:**

When a device connected to port 1 sends out a large number of packets (for example, at a rate exceeding 10 Mbps), the switch will throttle the incoming packets to match the configured limit (5 Mbps in this example) before forwarding them to port 2.

## **Remarking Limit-exceeding Incoming Packets**

### **Abstract:**

**Short Description:** You can setup the ingress rate limits that will automatically remark packets exceeding limits you specify.

In this example, we will limit incoming packets to 5 Mbps on Port 1—maintaining a consistent ingress rate. To avoid dropping data caused by a sudden influx of packets from Port 1, the outgoing packets will be remarked with a DSCP value (0x07) before sending over Port 2.

### **Before you begin:**

- Change the configuration mode to **Advanced** mode by selecting the mode in the upper right corner of the UI.
- Create a new **VLAN ID** with a value of **10**
- Configure Port 1 with a **PVID** of 10 and with **Access mode** enabled
- Configure Port 2 with a **PVID** of 10 and with **Access mode** enabled

1. Sign in to the device using administrator credentials.
2. Go to **Layer 2 Switching**→**QoS**→**Ingress Rate Limit**→**General**.
3. Click **[Edit]** corresponding to **Port 1**.

**Result:** The **Edit Port Settings** dialogue appears.

4. Specify the following:

Value	Option
<b>Type</b>	<b>Simple Token Bucket</b>
<b>Ingress Rate (CIR)</b>	5 Mbps
<b>Conform Action</b>	<b>Remark DSCP</b>
<b>Conform Action &gt; Remark Value</b>	<b>0</b>
<b>Violate Action</b>	<b>Remark DSCP</b>
<b>Violate Action &gt; Remark Value</b>	<b>7</b>

5. Click **Apply** to save changes.

### Results:

When a device connected to port 1 sends out a large number of packets (for example, at a rate exceeding 10 Mbps), the switch will throttle the incoming packets to match the configured limit (5 Mbps in this example) and remark DSCP value (0x07) without dropping the packets. This ensures the timely transmission of data to the device connected on port 2.

### Ingress Rate Limit

#### Menu Path: [Layer 2 Switching](#) > [QoS](#) > [Ingress Rate Limit](#)

This page lets you configure your device's QoS ingress rate limit.

This page includes these tabs:


- General
- Port Shutdown

### Ingress Rate Limit - General







#### Menu Path: [Layer 2 Switching](#) > [QoS](#) > [Ingress Rate Limit - General](#)


This page lets you view and edit the ingress rate limit for each port.

### Ingress Rate Limit List

 **Note**

Some fields are only visible when using Advanced Mode.

🔍 Search									
Port	Type	Ingress Rate (CIR)	CBS	EBS	Mode	Conform Action	Exceed Action	Violate Action	
 1	Simple Token Bucket	100	1024	---	---	Do Nothing	---	Drop	
 2	Simple Token Bucket	100	1024	---	---	Do Nothing	---	Drop	
 3	Simple Token Bucket	100	1024	---	---	Do Nothing	---	Drop	
 4	Simple Token Bucket	100	1024	---	---	Do Nothing	---	Drop	
 5	Simple Token Bucket	100	1024	---	---	Do Nothing	---	Drop	
 6	Simple Token Bucket	100	1024	---	---	Do Nothing	---	Drop	

UI Setting	Description
<b>Port</b>	Shows the port number for the entry.
<b>Type</b>	Shows the ingress limit type for the port.
<b>Ingress Rate (CIR)</b>	Shows the ingress Committed Information Rate (CIR) value for the port.
<b>CBS</b>	Shows the ingress Committed Burst Size (CBS) value for the port.
<b>EBS</b>	Shows the ingress Excess Burst Size (EBS) value for the port.
<b>Mode</b>	Shows the meter mode for the port. <div data-bbox="470 1417 1390 1565" style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;"><p> <b>Note</b> Currently, only color-blind mode is supported for metering.</p></div>
<b>Conform Action</b>	Shows the conform action for the port.
<b>Exceed Action</b>	Shows the exceed action for the port.
<b>Violate Action</b>	Shows the violate action for the port.

## Ingress Rate Limit - Edit Port Settings

### Menu Path: Layer 2 Switching > QoS > Ingress Rate Limit - General

Clicking the **Edit** (✎) icon for a port on the **Layer 2 Switching > QoS > Ingress Rate Limit - General** page will open this dialog box. This dialog lets you select the traffic policy and configure associated actions for specific conditions on a per-port basis.

Click **APPLY** to save your changes.

**Edit Port 1 Settings**

Type \*  
SrTCM

Ingress Rate (CIR) \*  
100  
1 - 100 Mbps

CBS \*  
1024  
10 - 10240 Kbyte

EBS \*  
1024  
10 - 10240 Kbyte

Conform Action \*  
Remark CoS

Remark Value \*  
0

Exceed Action \*  
Drop

Violate Action \*  
Drop

Copy configurations to ports

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Type</b>	Specify the ingress limit type to use.	Simple Token Bucket / SrTCM	Simple Token Bucket
<b>Ingress Rate (CIR)</b>	Specify the maximum bandwidth allowed for ingress through the port in Mbps.	1 to 1000	100 for Fast Ethernet ports, 1000 for Gigabit Ethernet ports

UI Setting	Description	Valid Range	Default Value
<b>CBS (Committed Burst Size)</b>	Specify the data buffer size in KB for the port that can be used when the data rate exceeds the CIR rate. Data that exceeds the CIR rate will be saved in this buffer, and will be sent when bandwidth is available.	0 to 10240	1024
<b>EBS (Excess Burst Size) (if Type is SrTCM)</b>	Specify the data buffer size in KB for the port when the data rate exceeds the CIR rate. Data that exceeds the CIR rate will be saved in the CBS buffer, and if the CBS buffer is full, data will be stored in the EBS buffer and will be sent when bandwidth is available.	0 to 10240	1024
<b>Conform Action</b>	Select a conform action for the port to take. If <b>Remark CoS</b> or <b>Remark DSCP</b> is selected, an additional input field will appear where a Remark value must be specified.	Do Nothing / Remark CoS / Remark DSCP	Do Nothing
<b>Exceed Action (if Type is SrTCM)</b>	Select an action to take if the amount of data exceeds both the CBS and EBS buffers. <ul style="list-style-type: none"> <li><b>Drop:</b> Packets marked as yellow will be dropped.</li> <li><b>Remark CoS:</b> Specify a CoS Remark value to use if a packet is marked as yellow. This is only available if <b>Remark CoS</b> is selected for the <b>Conform Action</b>.</li> <li><b>Remark DSCP:</b> Specify a DSCP Remark value to use if a packet is marked as yellow. This is only available if <b>Remark DSCP</b> is selected for the <b>Conform Action</b>.</li> </ul>	Drop / Remark CoS / Remark DSCP	Drop
<b>Violate Action</b>	Select an action to take if a packet violates CIR and CBS. <ul style="list-style-type: none"> <li>Drop: Packets marked as violated will be dropped.</li> <li><b>Remark CoS:</b> Specify a CoS Remark value to use if a packet is marked as violated. This is only available if <b>Remark CoS</b> is selected for the <b>Conform Action</b>.</li> <li><b>Remark DSCP:</b> Specify a DSCP Remark value to use if a packet is marked as violated. This is only available if <b>Remark DSCP</b> is selected for the <b>Conform Action</b>.</li> </ul>	Drop / Remark CoS / Remark DSCP	Drop
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

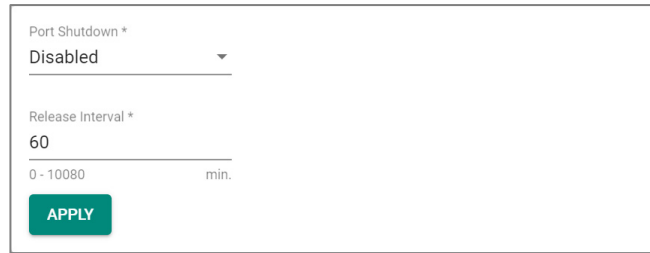


## Port Shutdown

### Menu Path: Layer 2 Switching > QoS > Ingress Rate Limit - Port Shutdown

This page lets you enable the port shutdown feature and configure its settings for each port.

### Port Shutdown Settings








Port Shutdown \*  
Disabled

Release Interval \*  
60  
0 - 10080 min.

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Port Shutdown</b>	Enable or disable the port shutdown feature for the device.  <b>Note</b> After enabling this, you will still need to configure port shutdown for each port you want to use the feature with.	Enabled / Disabled	Disabled
<b>Release Interval</b>	Specify how long in minutes to wait before a shut down port is enabled again. 0 means if this port is shut down, it will remain shut down until manually enabled.	0 to 10080	60


## Port Shutdown List

Q Search			
	Port	Port Shutdown	Threshold (Mbps)
	1	Disabled	100
	2	Disabled	100
	3	Disabled	100
	4	Disabled	100
	5	Disabled	100

UI Setting	Description
<b>Port</b>	Shows the port number for the entry.
<b>Port Shutdown</b>	Shows if port shutdown is enabled or disabled for the port.
<b>Threshold (Mbps)</b>	Shows the threshold in Mbps required to trigger port shutdown for the port.

### Port Shutdown - Edit Port Settings

#### Menu Path: Layer 2 Switching > QoS > Ingress Rate Limit - Port Shutdown

Clicking the **Edit** () icon for an port on the **Layer 2 Switching > QoS > Ingress Rate Limit - Port Shutdown** page will open this dialog box. This dialog lets you configure the threshold to trigger port shutdown.

Click **APPLY** to save your changes.

UI Setting	Description	Valid Range	Default Value
<b>Port Shutdown</b>	Enable or disable port shutdown for this port.	Enabled / Disabled	Disabled
<b>Threshold</b>	Specify the threshold (Mbps) required to trigger a port shutdown.	Fast Ethernet ports: 1 to 100  Gigabit Ethernet ports: 1 to 1000	Fast Ethernet ports: 100  Gigabit Ethernet ports: 1000
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## About Scheduler

The Scheduler functions as an arbiter within the switching forwarding paths, prioritizing traffic flows based on user-defined criteria. This mechanism enhances data transmission efficiency and ensures that critical packets are transmitted with priority. Moxa devices support two scheduling algorithms: Strict Priority and Weighted Round Robin.

- Weighted Round Robin:** The Weighted Round Robin type allows users to give priority to specific packets in the higher weighted queue to ensure those packets will be sent first. Moxa switches now have 8 queues, and the weights from highest to lowest are 8:8:4:4:2:2:1:1.
- Strict:** The Strict Priority type allows users to determine to transmit packets in the highest priority queue first, while packets with lower priority will be transmitted later. This guarantees that traffic with the highest level of priority for data transmission will go first.

Moxa network devices are equipped with multiple traffic queues that enable packet prioritization. This allows higher-priority traffic to pass through the network devices without being delayed by lower-priority traffic. As each packet enters the network devices, it undergoes ingress processing, including classification and marking/re-marking, before being placed into the appropriate egress queue. The network device then forwards packets based on their assigned queue.

### **Scenario: Configuring 3 Devices with Strict Priority**

In this scenario, we will configure three attached devices on the network device with strict priority.

Specifically, we will focus on how packets are managed as they leave (egress) the network device on a particular port. In this case, the setup involves three devices:

- **Device A:** Connected to port 1 on the network device.
- **Device B:** Connected to port 2 on the network device.
- **Device C:** Connected to port 3 on the network device.

### **Objective**

The goal is to configure a "Strict Priority" scheduler on port 3 of the switch. This scheduler will control how packets are prioritized when they exit the switch from this port (which is connected to Device C).

### **Key Components**

#### **1. DSCP (Differentiated Services Code Point) Value:**

- This is a field in the IP header that indicates the level of priority a packet should have.
- In this scenario, packets from Device A have a DSCP value of 0x48, which signifies they should be treated with higher priority.

#### **2. Egress Queues:**

- Network switches typically have multiple egress queues per port. Each queue can be assigned different levels of priority.
- In this case, queue 7 is configured as a high-priority queue, while queue 1 is a lower-priority queue.

## Configuration Details

- **Device A (port 1)** is sending packets with a DSCP value of 0x48. These packets are mapped to egress queue 7 on port 3. Queue 7 is given a higher priority.
- **Device B (port 2)** is sending normal packets without any special DSCP value, so these packets are mapped to egress queue 1 on port 3. Queue 1 has a lower priority.

## "Strict Priority" Scheduler

- **Strict Priority Scheduling** is a mechanism used to determine how packets are sent out when multiple queues have packets waiting to be transmitted.
- In a strict priority setup, the switch will always service higher-priority queues first. This means that as long as there are packets in queue 7 (the high-priority queue), they will be sent out before any packets in queue 1 (the lower-priority queue) are even considered.

## Expected Behavior

- When **Device A and Device B** both send packets to **Device C** at the same time:
  - Packets from **Device A** (with DSCP 0x48) will be placed in the high-priority egress queue 7 and will be transmitted first.
  - Packets from **Device B** will be placed in the low-priority egress queue 1. These packets will only be transmitted once queue 7 is empty.
- As a result, packets from **Device A** will reach **Device C** quickly, without being delayed by the packets from **Device B**.

## Summary

By configuring the scheduler with "Strict Priority" on port 3, we're ensuring that high-priority traffic (from Device A) is not delayed by lower-priority traffic (from Device B). This setup is crucial in scenarios where certain types of data, such as real-time communications or critical control signals, must be delivered promptly without delay.

## Example: Configuring A Sample Environment for Strict Priority Scheduler (TN\_Series)


The QoS scheduler example relies on this configuration.

1. Sign in to the device using administrator credentials.
2. Go to **Layer 2 Switching > VLAN > Settings**, and then click  **[Add]**.

The Create VLAN screen appears.

3. In **VLAN**, type 10, and then click **Create**.

The specified VLAN appears in the list.


4. In the table on the second half of the page, find **1** and click  **[Edit]**.

The Edit Port Settings screen appears.

5. Specify **Mode** as **Access**, and then specify a **PVID** of **10**.
6. Under **Copy configurations to ports**, choose ports **2** and **3**, and then click **Apply** to save changes.
7. Go to **Layer 2 Switching > QoS > Classification**, and under **DSCP Mapping**, locate **DSCP 48** and verify that it is set to **6**.

If the value is different, click  **[Edit]**, set **CoS Priority** to **6**, and then click **Apply**.

8. Click **CoS Mapping** at the top of the screen, locate **CoS 6**, and verify that **Queue** is set to **7**.

If the value is different, click  **[Edit]**, set **Queue** to **7**, and then click **Apply**.

The device on Port **3** needs to be configured to set its outgoing packets with a QoS DSCP value of 0x48.

### **Example: Configuring Scheduler for Strict Priority (TN Series)**


Strict Priority switching ensures that higher priority packets always preempt loc

This example assumes the following configuration, outlined in the preceding section:

- VLAN of 10
- Ports **1**, **2**, and **3** in **Access** mode assigned to **PVID 10**
- **DSCP 48** set to **6**
- **CoS 6** with a **Queue** of **7**

Additionally, the device on Port **3** needs to be configured to set its outgoing packets with a QoS DSCP value of 0x48.

If your environment does not match the above configuration, the example may not function properly.

1. Sign in to the devices using administrator credentials.
2. Go to **Layer 2 Switching > QoS > Scheduler**.
3. Locate Port **3**, and then click  **[Edit]**.

The Edit Port Settings screen appears.

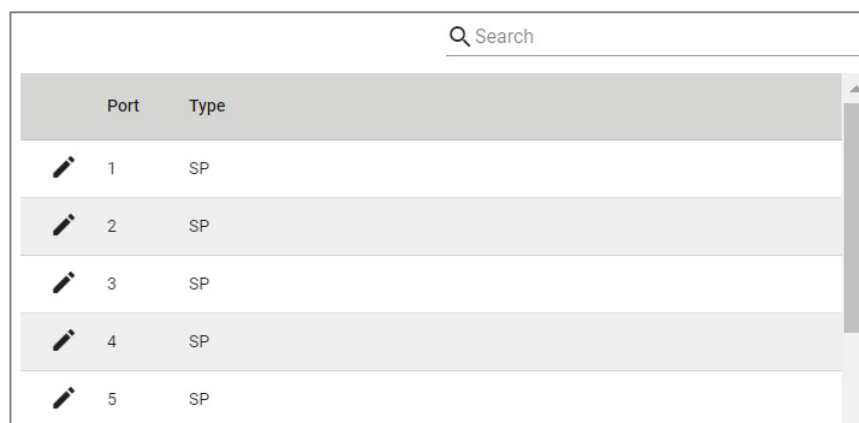
4. Make sure **Type** is set to **Strict Priority**, and then click **Apply**.






## Scheduler

### Menu Path: Layer 2 Switching > QoS > Scheduler

This page lets you configure your device's QoS scheduler on a per-port basis.

### Scheduler List



Q Search		
Port	Type	
 1	SP	
 2	SP	
 3	SP	
 4	SP	
 5	SP	

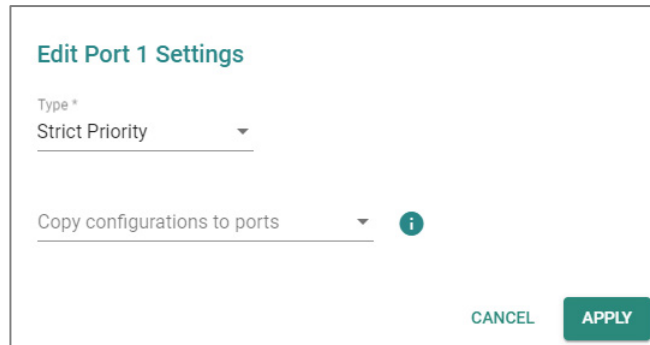
UI Setting	Description
<b>Port</b>	Shows the port number for the entry.
<b>Type</b>	Shows the scheduling algorithm selected for the port.

## Scheduler - Edit Port Settings

### Menu Path: Layer 2 Switching > QoS > Scheduler

Clicking the **Edit** (✎) icon for a port on the **Layer 2 Switching > QoS > Scheduler** page will open this dialog box. This dialog lets you select the scheduling algorithm for the port.

Click **APPLY** to save your changes.



UI Setting	Description	Valid Range	Default Value
<b>Type</b>	Select the scheduler algorithm to use for the port. <ul style="list-style-type: none"><li>• <b>Strict Priority:</b> Strict priority will be used.</li><li>• <b>Weighted Round Robin:</b> Queued packets will be forwarded based on their associated weight.</li></ul>	Strict Priority / Weighted Round Robin	Strict Priority
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Configuring Egress Shaper

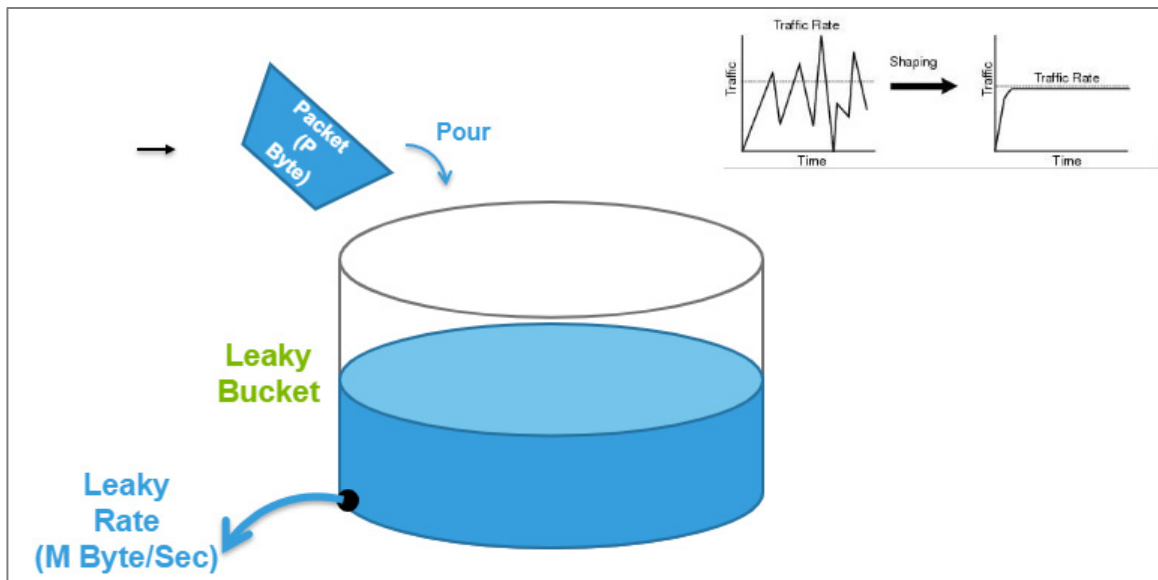
A shaper for egress traffic buffers or queues excess traffic to hold packets and shape traffic flow when source data rates are higher than expected.

### About Egress Shaper

The Egress Shaper uses a meter algorithm known as a leaky bucket. Like its physical counterpart, the leaky bucket collects incoming traffic up to a maximum capacity. Data



stored in the bucket is released at a steady rate. When the bucket is empty, the flow stops.



If incoming packets would exceed the capacity the bucket, those packets would be non-conforming, and are not added to the bucket (dropped). Data will be added to the bucket as space becomes available for conforming packets. To setup Egress Shaper on a specific port, you will need to provide CIR (Committed Information Rate) and CBS (Committed Burst Rate) values.


### Configuring Rate Limits for Outgoing Traffic

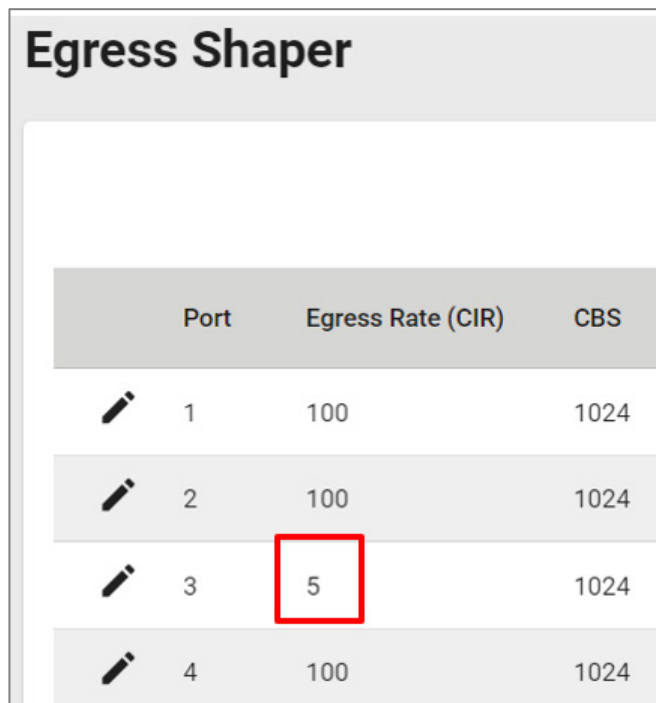
You can use egress rate limits to ensure steady flow of traffic to ports you specify. In this scenario, we have 3 devices:





- Device A, connected to the switch at Port 1
- Device B, connected to the switch at Port 2
- Device C, connected to the switch at Port 3

When both Device A and Device B send packets simultaneously to Device C, and there are no rate limits set on ports 1 and 2, Configuring the Committed Information Rate (CIR) to 5 Mbps on port 3 ensures that the outgoing packets maintain a steady packet rate to reach Device C as expected.

#### Before you begin:

- Change the configuration mode to **Advanced** mode by selecting the mode in the upper right corner of the UI.
  - Create a new **VLAN ID** with a value of **10**
  - Configure Port 1 with a **PVID** of 10 and with **Access mode** enabled
  - Configure Port 2 with a **PVID** of 10 and with **Access mode** enabled
  - Configure Port 3 with a **PVID** of 10 and with **Access mode** enabled
1. Sign in to the device using administrator credentials.
  2. Go to **Layer 2 Switching > QoS > Egress Shaper**.
  3. Click  **[Edit]** corresponding to **Port 3**.  
**Result:** The **Edit Port Settings** dialogue appears.
  4. In the **CIR** field, specify 5 Mbps, and then click **Apply**.  
**Result:** The new Egress Rate (CIR) will appear in the table.








Egress Shaper			
	Port	Egress Rate (CIR)	CBS
	1	100	1024
	2	100	1024
	3	5	1024
	4	100	1024

## Egress Shaper

**Menu Path:** [Layer 2 Switching > QoS > Egress Shaper](#)


This page lets you configure QoS egress shaper settings on a per-port basis.

Search			
	Port	Egress Rate (CIR)	CBS
	1	100	1024
	2	100	1024
	3	100	1024
	4	100	1024
	5	100	1024

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Egress Rate (CIR)</b>	Shows the egress Committed Information Rate (CIR) value for the port.
<b>CBS</b>	Shows the egress Committed Burst Size (CBS) value for the port.

## Egress Shaper - Edit Port Settings

### Menu Path: Layer 2 Switching > QoS > Egress Shaper

Clicking the **Edit** () icon for a port on the **Layer 2 Switching > QoS > Egress Shaper** page will open this dialog box. This dialog lets you configure the egress shaping settings for the port.

Click **APPLY** to save your changes.

### Edit Port 1 Settings

CIR \*  
100

1 - 100 Mbps

CBS \*  
1024

10 - 10240 Kbyte

Copy configurations to ports ▼ ⓘ

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>CIR (Committed Information Rate)</b>	Specify the committed data transmission rate.	Fast Ethernet ports: 1 to 100 Gigabit Ethernet ports: 1 to 1000	Fast Ethernet ports: 100 Gigabit Ethernet ports: 1000
<b>CBS (Committed Burst Size)</b>	Specify the maximum amount of data in KB that is allowed to be transmitted in a burst, even if it would cause the CIR rate to be exceeded.	10 to 10240	1024
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Multicast

**Multicast** is a one-to-many communication method that sends data to a specific group of receivers. Those who wish to receive multicast packets must register for the multicast service; unregistered recipients will not receive the packets. Multicast is an "on-demand" service typically used for audio and video applications. For example, IP cameras (commonly used in CCTV systems) may need to transmit video streams to three different security guard rooms in a building simultaneously. Multicast is also used for protocol exchanges, as L3 protocols (VRRP, OSPF, RIP, etc) communicate with each other using multicast.

### Benefits of Multicast:

- **Efficient bandwidth utilization:** Multicast reduces network congestion by sending data to only interested recipients.
- **Reduced server load:** Multicast servers only need to send data once, rather than multiple times for individual recipients.
- **Scalability:** Multicast can effectively handle large groups of receivers without affecting network performance.

Overall, multicast is a valuable tool for efficient and scalable one-to-many communication, particularly in applications involving audio, video, and protocol exchanges.

## How Multicast Works

As mentioned, multicast is a network communication method designed for efficient one-to-many data transmission. Imagine you have a presentation you want to deliver to a specific group of people in a large conference hall. Instead of emailing it to everyone individually, multicast allows you to send it to a single "group" that only the intended recipients can access.

Here's a breakdown of how it works:

- **Groups and Membership:**
  - Devices interested in receiving the same data stream form a multicast group identified by a unique multicast address.
  - Devices join or leave the group dynamically using protocols like IGMP (Internet Group Management Protocol).
- **Source and Data:**
  - A single source device transmits the data (e.g., a video stream, a software update).
  - The data is encapsulated with the specific multicast address of the target group.
- **Network Routing:**
  - Network switches and routers play a crucial role in directing the data.
  - They recognize the multicast address and replicate the data packet only for the ports connected to devices that are members of the target group.
  - Devices not in the group will not receive the data, reducing unnecessary network traffic.

There are three primary methods for controlling multicast traffic on a switch:

- **Static multicast** is for configuring the multicast forwarding entries in the switch in a manual or predetermined manner. (e.g., forward 01:00:5E:05:06:07 to ports 1, 2, and 3). This method suits static networks where you want to control all the multicast flow. Another scenario is that the end device cannot communicate with IGMP protocol.
- **GMRP** allows bridges and the devices at the edge of the network to perform dynamic group membership information registration with the MAC bridges

connected to the same LAN section. This method lets bridges communicate with each other to register the static multicast table dynamically.

- **IGMP snooping** allows a device to listen in on the IGMP conversation between hosts and routers. By listening to these conversations, the device maintains an association mapping table between port(s) and multicast groups. This method suits dynamic networks where end devices use IGMP to register the multicast group.

In summary, here are key considerations when selecting a multicast traffic control method:

- For static networks with predetermined multicast destinations, **static multicast** offers a simple solution.
- If you have a network with multiple bridges and static multicast tables on edge devices, **GMRP** can help maintain consistency.
- In dynamic networks where end devices use IGMP, **IGMP snooping** provides efficient management of multicast traffic.

## Multicast

### Menu Path: [Layer 2 Switching](#) > [Multicast](#)

This section lets you configure the Multicast settings.

This section includes these pages:

- IGMP Snooping
- GMRP
- Static Multicast

### About IGMP Snooping

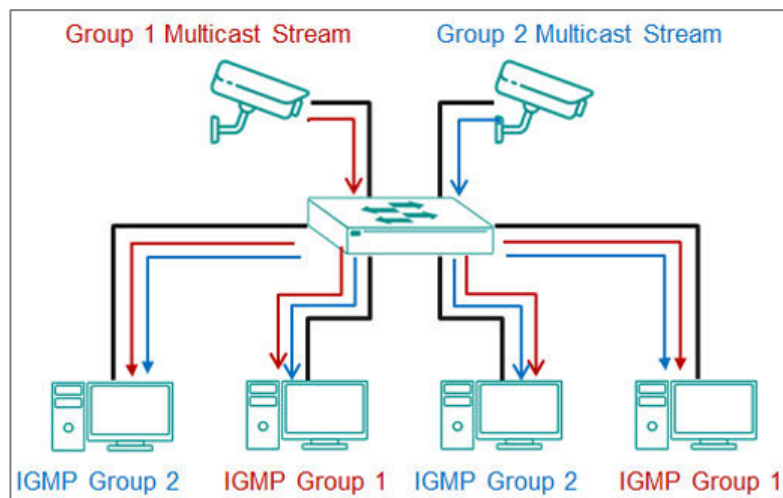
IGMP snooping allows switches to reduce the amount of unwanted multicast traffic on a network by maintaining maps of multicast group members, ensuring that multicast packets are only delivered to devices that have explicitly asked to receive them. Internet Group Management Protocol (IGMP) is a network protocol that hosts nearby routers on networks to construct multicast group memberships. IGMP snooping allows a network switch to listen in on the IGMP conversation between hosts and routers. By listening to

these conversations, the switch maintains an association mapping table between port(s) and multicast group.

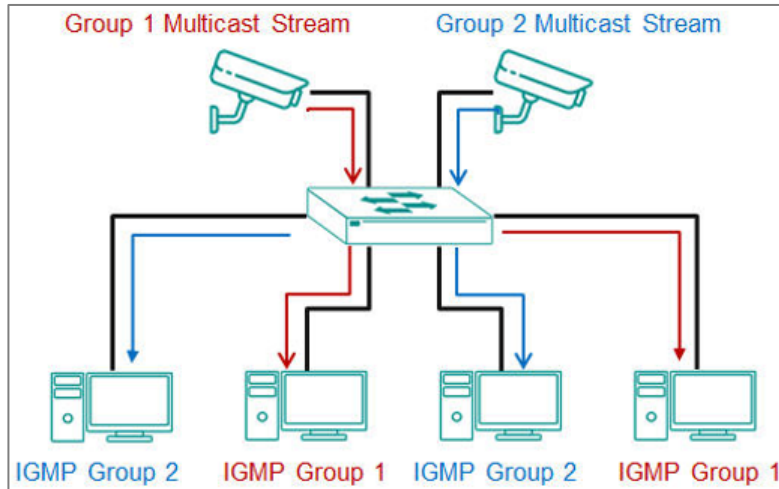
### How IGMP Snooping Works

Without IGMP snooping, a switch will flood multicast traffic to all other non-ingress ports within a broadcast domain (or VLAN). This can cause unnecessary loading for host devices by requiring them to process packets they have not solicited. IGMP snooping can help prevent host devices on a local network from receiving traffic for a multicast group they have not explicitly joined. It provides switches with a mechanism to forward multicast traffic to specific ports that receive IGMP hosts, resulting in more efficient network bandwidth utilization.

#### Without IGMP Snooping:



#### With IGMP Snooping:



### Enabling IGMP Snooping

IGMP Snooping must be enabled before it can be configured on specific interfaces.

To enable IGMP snooping, do the following:

1. Sign in to the device using administrator credentials.
2. Go to **Layer 2 Switching > Multicast > IGMP Snooping** and click **General**.
3. Set **IGMP Snooping** to **Enabled**.
4. Click **Apply**.

IGMP snooping is now enabled. Existing IGMP snooping configurations will now be active.

### Configuring IGMP Snooping

IGMP snooping is configured at the VLAN level.

- VLAN IDs must be created and assigned before IGMP snooping can be configured.
- IGMP Snooping must be enabled before it can be configured on specific interfaces.

To configure IGMP snooping, do the following:

1. Sign in to the device using administrator credentials.
2. Go to **Layer 2 Switching > Multicast > IGMP Snooping**, and click **VLAN Settings**.

The **IGMP Snooping** list of **VLAN IDs** appears.



3. Click  **[Edit]** corresponding to the VLANs on which to configure IGMP snooping.

**Note:** If you do not see the VLANs you expect, make sure they are correctly assigned.

The Edit VLAN Settings screen appears.

4. Configure all of the following:

Option	Value
<b>IGMP Snooping</b>	<b>Enabled</b>
<b>Version</b>	Choose a version corresponding to device support and feature needs.
<b>Query Interval</b>	125
<b>Static Router Port</b>	This is optional.
<b>Config Role</b>	<b>Querier</b>

5. Click **Apply**.

### About IGMP Versions

IGMP protocols regulate the communication mechanism between querier and listener.

For IGMP-related settings, ensure that you have chosen the correct protocol version.

Consult the table below for guidelines on choosing a version.

IGMP Version	Features	Reference
v1	<p>Features:</p> <ul style="list-style-type: none"> <li>• <b>Multicast Group Membership:</b> Host devices can join multicast groups, but there is no explicit leave message. The host will simply stop responding to membership queries.</li> <li>• <b>Membership Query:</b> Network devices periodically send membership queries to determine if any host devices are still interested in receiving multicast traffic.</li> <li>• <b>Membership Report:</b> When a host device wants to join a multicast group, it sends a membership report. If no reports are received for a multicast group, the network device assumes there are no interested hosts and stops forwarding traffic to that group.</li> </ul> <p>Limitations: No Leave Group Message: Hosts cannot explicitly leave a multicast group, which can lead to inefficient use of resources as routers have to rely on timeouts to determine if there are no more members.</p>	RFC-1112
v2	<p>Additional features:</p> <ul style="list-style-type: none"> <li>• <b>Leave Group Message:</b> Host devices can send a leave group message to notify the network device they are no longer interested in a multicast group, improving the efficiency of multicast traffic management.</li> <li>• <b>Group-Specific Queries:</b> Network devices can send group-specific queries to confirm if any members of a particular multicast group still exist, reducing overall network traffic compared to general queries.</li> <li>• <b>Query Election:</b> Introduces a mechanism to elect a single query router on a subnet to avoid redundant queries, thereby optimizing network bandwidth.</li> </ul>	RFC-2236
v3	<p>Additional Features:</p> <ul style="list-style-type: none"> <li>• <b>Source-Specific Multicast (SSM):</b> Supports source filtering, allowing host devices to specify from which sources they receive multicast traffic. This is useful for applications that need to filter out unwanted traffic from certain sources.</li> <li>• <b>Include/Exclude Mode:</b> Host devices can explicitly include or exclude traffic from specified sources, providing more granular control over multicast group membership.</li> <li>• <b>Membership Report Enhancements:</b> The membership report format is enhanced to support the new source filtering capabilities.</li> </ul>	RFC-3376

**Note**

Although most modern devices should support v3, there may be regulatory concerns or legacy deployments to consider.

## IGMP Snooping

### Menu Path: Layer 2 Switching > Multicast > IGMP Snooping

This page lets you configure IGMP snooping for your device.

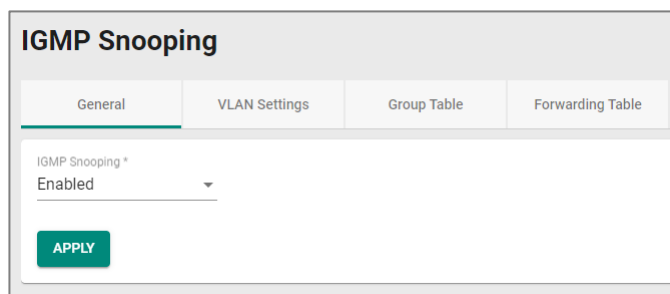
This page includes these tabs:

- General
- VLAN Settings
- Group Table
- Forwarding Table

## IGMP Snooping - General

### Menu Path: Layer 2 Switching > Multicast > IGMP Snooping - General

This page lets you configure IGMP snooping general settings.





UI Setting	Description	Valid Range	Default Value
<b>IGMP Snooping</b>	Enable or disable IGMP snooping for the device. <b>Note</b> IGMP Snooping cannot be enabled when GMRP is enabled.	Enabled / Disabled	Enabled

## IGMP Snooping - VLAN Settings

### Menu Path: Layer 2 Switching > Multicast > IGMP Snooping - VLAN Settings

This page lets you configure IGMP snooping VLAN settings.

General	VLAN Settings	Group Table	Forwarding Table				
							
VLAN ID	Enable	Version	Query Interval	Config Role	Active Role	Static Router Port	Dynamic Router Port
 1	Disabled	2	125	Querier	Non-Querier	--	--
Max. 256							

UI Setting	Description
<b>VLAN ID</b>	Shows the ID of the VLAN ID the entry is for.
<b>Enable</b>	Shows whether IGMP snooping is enabled for the VLAN.
<b>Version</b>	Shows the IGMP version of the packets the VLAN will listen to and send queries for.
<b>Query Interval</b>	Shows the query interval for the Querier function globally for the VLAN, if the Querier is enabled.
<b>Config Role</b>	Shows the config role of the VLAN.
<b>Active Role</b>	Shows the active role of the VLAN.
<b>Static Router Port</b>	Shows the static router port for the VLAN. This is the port that connects to the upper level router (or IGMP querier), or to the upper level router of downstream multicast streams. All received IGMP signaling packets and multicast streams will be forwarded to the static router ports.
<b>Dynamic Router Port</b>	Shows the dynamic router port for the VLAN.

## IGMP Snooping - Edit VLAN Settings

### Menu Path: Layer 2 Switching > Multicast > IGMP Snooping - VLAN Settings

Clicking the **Edit** (✎) icon for a VLAN on the **Layer 2 Switching > Multicast > IGMP Snooping - VLAN Settings** page will open this dialog box. This dialog lets you edit the IGMP snooping settings for the VLAN.

Click **APPLY** to save your changes.

**Edit VLAN 1 Settings**

IGMP Snooping \*  
Disabled

Version \*  
2

Query Interval \*  
125  
20 - 600 sec.

Static Router Port

Config Role \*  
Querier

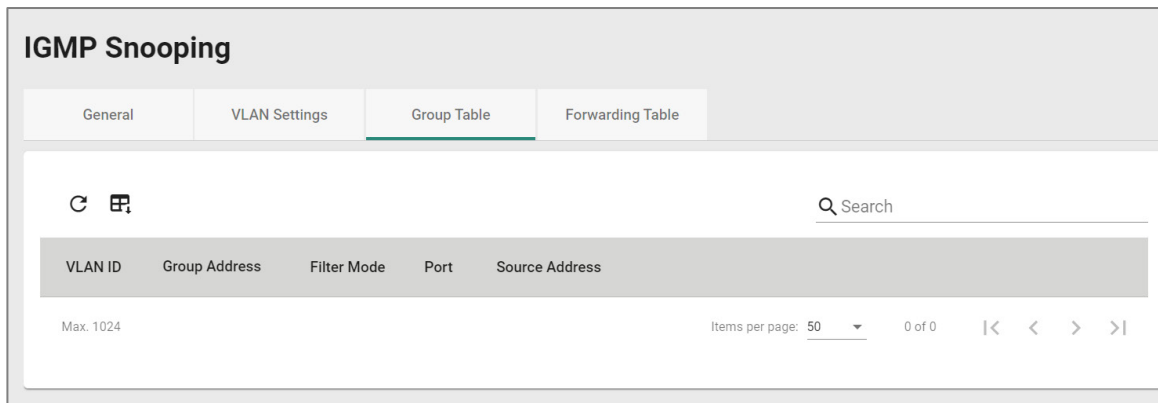
CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>IGMP Snooping</b>	Enable or disable IGMP snooping for the VLAN.	Enabled / Disabled	Disabled
<b>Version</b>	Specify the IGMP version of the packets to listen to and send queries for.	1 / 2 / 3	2
<b>Query Interval</b>	Specify the query interval for the Querier function globally, if the Querier is enabled.	20 to 600 sec.	125 sec.
<b>Static Router Port</b>	Select a static router port for the VLAN. This is the port that connects to the upper level router (or IGMP querier), or to the upper level router of downstream multicast streams. All received IGMP signaling packets and multicast streams will be forwarded to the static router ports.	Drop-down list of ports	N/A
<b>Config Role</b>	Select the config role for the VLAN.	Querier / Non-Querier	Querier

## Group Table

### Menu Path: Layer 2 Switching > Multicast > IGMP Snooping - Group Table

This page lets you view the IGMP snooping group table.

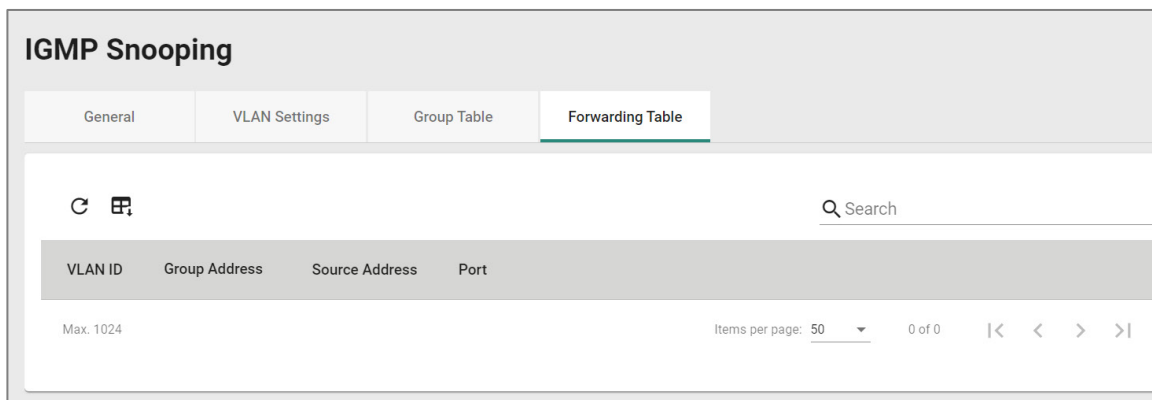


Item	Description
<b>VLAN</b>	Shows the ID of the VLAN the entry is for.
<b>Group Address</b>	Shows the registered multicast group address for the VLAN.
<b>Filter Mode</b>	Shows the filter mode for the VLAN. This is only applicable for IGMPv3. <ul style="list-style-type: none"><li>• <b>Include:</b> Source-specific multicast address group</li><li>• <b>Exclude:</b> Source-specific exclusive multicast address group</li></ul>
<b>Port</b>	Shows the forwarding port for the VLAN.
<b>Source Address</b>	Shows the source address for the VLAN. This is only applicable for IGMPv3.

## IGMP Snooping - Forwarding Table

### Menu Path: Layer 2 Switching > Multicast > IGMP Snooping - Forwarding Table

This page lets you view the IGMP snooping forwarding table.



Item	Description
<b>VLAN</b>	Shows the ID of the VLAN the entry is for.
<b>Group Address</b>	Shows the associated multicast group address for streaming data for the VLAN.
<b>Source Address</b>	Shows the source address for streaming data for the VLAN.
<b>Port</b>	Shows the forwarding port of the VLAN.

## About GMRP


GMRP stands for GARP Multicast Registration Protocol, which is a Generic Attribute Registration Protocol (GARP) application that can be used to prevent multicast from data flooding.

Both GMRP and GARP are defined by IEEE 802.1P, and widely used as a standard protocol in various industrial-related applications. GMRP allows bridges and the devices at the edge of the network to perform a dynamic group membership information registration with the MAC bridges connected to the same LAN section. The information can be transmitted among all bridges in the Bridge LAN that is implemented with extended filtering features. To operate GMRP, the GARP service must be established first.

GARP stands for **Generic Attribute Registration Protocol**, which is a communication protocol defined by IEEE 802.1, offering a generic framework for bridges to register and de-register an attribute value. In a LAN structure, two applications can be applied: **GARP VLAN Registration Protocol (GVRP)** is used to register VLAN trunking between multilayer switches, and **GARP Multicast Registration Protocol (GMRP)** for providing a constrained multicast flooding facility.

L2 switches exchange GMRP packets with each other to know the multicast entries on other switches so that it can also register the multicast entry on its own table. After exchanging the information, the multicast traffic will only be forwarded to the corresponding ports.

### Configuring GMRP

1. Sign in to the device using administrator credentials.
2. Go to **Layer 2 Switching > Multicast > GMRP**.
3. Set **GMRP** to **Enabled**, and then click **Apply**.
4. Locate the port on which you want to enable GMRP, and then click the corresponding  **[Edit]** button.

The Edit Port Settings screen appears.

5. Set **GMRP** to **Enabled**, and then click **Apply** to save your settings.

GMRP is now enabled.

### GMRP


#### Menu Path: [Layer 2 Switching > Multicast > GMRP](#)

This page lets you configure the GMRP settings of your device.




## GMRP Settings

GMRP \*










Disabled 

---

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>GMRP</b>	Enable or disable GMRP for the device.   <b>Note</b> GMRP cannot be enabled when IGMP Snooping is enabled.	Enabled / Disabled	Disabled

## GMRP Port List


Q Search			
Port	Enable	Group Restrict	
 1	Enabled	Disabled	
 2	Enabled	Disabled	
 3	Enabled	Disabled	
 4	Enabled	Disabled	
 5	Enabled	Disabled	
 6	Enabled	Disabled	
 7	Enabled	Disabled	
 8	Enabled	Disabled	
 9	Enabled	Disabled	

1 - 23 of 23

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Enable</b>	Shows whether GMRP is enabled for the port.
<b>Group Restrict</b>	Shows whether group restrict is enabled for the port.

### GMRP - Edit Port Settings

#### Menu Path: Layer 2 Switching > Multicast > GMRP

Clicking the **Edit** () icon for a port on the **Layer 2 Switching > Multicast > GMRP** page will open this dialog box. This dialog lets you edit the GMRP settings for the port.

Click **APPLY** to save your changes.

### Edit Port 1/1 Settings

GMRP \*  
Disabled ▼

Group Restrict \*  
Disabled ▼

Copy configurations to ports  ▼ i

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>GMRP</b>	Enable or disable GMRP for the port.	Enabled / Disabled	Disabled
<b>Group Restrict</b>	Enable or disable group restrict for the port.	Enabled / Disabled	Disabled
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## About Static Multicast

Static multicast is for configuring the multicast forwarding entries in the switch in a manual or predetermined manner.

In multicast networking, data packets are sent from one sender to multiple receivers efficiently, rather than sending individual packets to each receiver separately, as in unicast communication.

Network administrators manually configure the multicast forwarding entries in the device's multicast forwarding table. This involves specifying the multicast group addresses and the corresponding outbound interfaces or ports through which multicast traffic should be forwarded.

Benefits:


1. **Predictable Behavior:** Static multicast provides predictable behavior, as the forwarding paths for multicast traffic are predetermined by the administrator. This can be advantageous in certain network environments where stability and control are prioritized over flexibility and adaptability.
2. **Resource Efficiency:** Since static multicast entries are manually configured and do not involve the overhead of dynamic routing protocols, they can be more resource-efficient in terms of processing power and network bandwidth, especially in small-scale deployments with relatively stable multicast group memberships.

### How Static Multicast works

If the user wants to restrict some of the multicast groups to be forwarded to specific ports for devices that don't support IGMP, users can use static multicast setting.

Users can manually register the multicast forwarding entries, including multicast MAC address and forwarding/forbidden port on the table, and the switch will forward the multicast traffic following the table rather than flooding.

### Configuring Static Multicast Tables

1. Sign in to the device using administrator credentials.
2. Go to **Layer 2 Switching > Multicast > Static Multicast**
3. To add a static multicast entry, click the  **[Add]**.
4. Configure the following, and then click **Create**:

Option	Value
<b>VLAN ID</b>	Specify the VLAN ID
<b>MAC Address</b>	Specify the multicast MAC address. <ul style="list-style-type: none"> <li>• IPv4 Multicast Range: 01:00:5E:00:00:00 to 01:00:5E:7F:FF (last 23 bits used for the multicast group address)</li> <li>• IPv6 Multicast Range: 33:33:00:00:00:00 to 33:33:FF:FF:FF:FF (last 32 bits used for multicast group address)</li> </ul>
<b>Port</b>	Choose one or more egress ports.

Option	Value
<b>Forbidden Ports</b>	Specify a device port that will never forward multicast packets, even if it would otherwise be covered.

## Static Multicast

### Menu Path: Layer 2 Switching > Multicast > Static Multicast

This page lets you view and manage your device's static multicast table.

#### 🔔 Limitations

You can create up to 1024 static multicast entries.

**Static Multicast Table**

	VLAN ID	MAC Address	Port	Forbidden Port
<input type="checkbox"/>	1	01:00:5E:00:00:01	3	---

Max. 1024      Items per page: 50      1 - 1 of 1

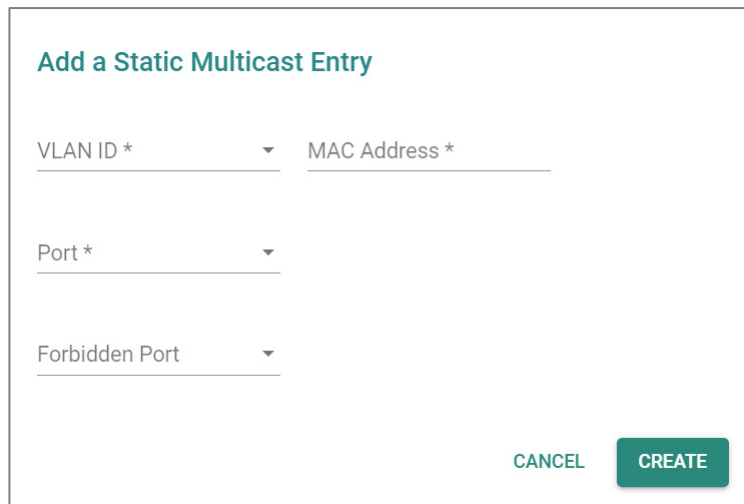
UI Setting	Description
<b>VLAN ID</b>	Shows the ID of the VLAN used for the multicast group entry.
<b>MAC Address</b>	Shows the MAC address for the multicast group entry.
<b>Port</b>	Shows the egress ports that multicast streams will forward to for the multicast group entry.
<b>Forbidden Port</b>	Show the forbidden ports that packets will not be forwarded to for the multicast group entry.

## Add a Static Multicast Entry

### Menu Path: Layer 2 Switching > Multicast > Static Multicast

Clicking the **Add (+)** icon on the **Layer 2 Switching > Multicast > Static Multicast** page will open this dialog box. This dialog lets you add a static multicast entry.

Click **CREATE** to save your changes and add the new entry.



UI Setting	Description	Valid Range	Default Value
<b>VLAN ID</b>	Select a VLAN ID for the multicast entry.	Drop-down list of VLAN IDs	N/A
<b>MAC Address</b>	Specify the MAC address for the multicast entry.	Valid multicast MAC address	N/A
<b>Port</b>	Select the ports to use as egress ports for multicast streams to be forwarded to.	Drop-down list of ports	N/A
<b>Forbidden Port</b>	Select which ports are forbidden so packets cannot be forwarded to them.	Drop-down list of ports	N/A

# IP Configuration

The IP Configuration feature allows you to assign an IP address and related settings to the device itself. This essentially gives the device its own unique identity on the network, enabling it to communicate and manage other network devices, be accessible remotely, and facilitate specific functions such as DHCP Relay Agent.

The IP address can be set manually to a static IP address, using user-entered values, or automatically obtained from an external DHCP server.

## IP Configuration

### Menu Path: IP Configuration

This page lets you view and manage the device's IP address.

## IP Status

IP Status			
Get IP From <b>Manual</b>			
IP Address	Subnet Mask	Default Gateway	DNS Server IP Address
192.168.127.252	255.255.255.0	---	---

UI Setting	Description
<b>Get IP From</b>	Shows where the device gets its IP address from. <b>Manual</b> means that the IP address is manually assigned.
<b>IP Address</b>	Shows the IP address for the device.
<b>Subnet Mask</b>	Shows the subnet mask used for the device.
<b>Default Gateway</b>	Shows the IP address of the gateway that connects the LAN to a WAN or another network.
<b>DNS Server IP Address</b>	Shows the IP address of the DNS server used by the device.

## IP Settings - Manual

If **Get IP From** is set to **Manual**, the following settings will appear.

### IP Settings

Get IP From \*  
Manual ▼

---

IP Address \*      Subnet Mask \*      Default Gateway

192.168.127.252      24 (255.255.255.0) ▼      \_\_\_\_\_

---

DNS Server IP Address 1      DNS Server IP Address 2

\_\_\_\_\_      \_\_\_\_\_

---

#### IPv6

IPv6 Global Unicast Address Prefix

\_\_\_\_\_

---

IPv6 DNS Server 1      IPv6 DNS Server 2

\_\_\_\_\_      \_\_\_\_\_

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Get IP From</b>	Specify where the device will get its IP from. <ul style="list-style-type: none"> <li><b>Manual:</b> Set the IP address manually.</li> <li><b>DHCP:</b> Assign the IP address automatically through a DHCP server.</li> </ul>	Manual / DHCP	Manual
<b>IP Address</b>	Specify the IP address to use for the device.	Valid IP address	192.168.127.252
<b>Subnet Mask</b>	Select the subnet mask to use for the device.	Drop-down list of subnet masks	24(255.255.255.0)
<b>Default Gateway</b>	Specify the IP address of the gateway that connects the LAN to a WAN or another network.	Valid IP address	N/A



UI Setting	Description	Valid Range	Default Value
<b>DNS Server IP Address 1/2</b>	Specify the IP address of the 1st and 2nd DNS server used by your network. After specifying the DNS server's IP address, you can use the device's URL (e.g., www.mymoxaswitch.com) to open the web console instead of entering the device's IP address.	Valid IP address	N/A
<b>IPv6 Global Unicast Address Prefix</b>	Specify the IPv6 global unicast address prefix to use for your network.	Valid IPv6 address	N/A
<b>IPv6 DNS Server 1/2</b>	Specify the IP address of the 1st and 2nd IPv6 DNS server used by your network.	Valid IPv6 address	N/A

## IP Settings - DHCP

If **Get IP From** is set to **DHCP**, the following settings will appear.

### IP Settings

Get IP From \* 🔔

DHCP

---

DHCP Bootfile \*

Enabled i

---

DHCP Client-Identifier \*

Enabled i

---


DHCP Client-Identifier Type

User-defined DHCP Client-Identifier V...

0 / 64

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>Get IP From</b>	Specify where the device will get its IP from. <ul style="list-style-type: none"> <li><b>Manual:</b> Set the IP address manually.</li> <li><b>DHCP:</b> Assign the IP address automatically through a DHCP server.</li> </ul>	Manual / DHCP	Manual

UI Setting	Description	Valid Range	Default Value
<b>DHCP Bootfile</b>	<p>Enable or disable use of a DHCP bootfile.</p> <p>If enabled, the system will automatically download and restore the configuration settings of the bootfile described in Option 67 and from the server described in Option 66.</p>	Enabled / Disabled	Enabled
<b>DHCP Client-Identifier</b>	<p>Enable or disable use of a DHCP client-identifier.</p> <p>If enabled, the system will send DHCP client messages with an Option 61 tag including a client ID. The DHCP server will assign the IP address associated with the client ID value, if available.</p>	Enabled / Disabled	Disabled
<b>DHCP Client-Identifier Type</b> <b>(If DHCP Client-Identifier is Enabled)</b>	<p>Shows the DHCP Client-Identifier Type.</p> <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p> <b>Note</b></p> <p>This is fixed to <b>User-defined</b> and cannot be changed.</p> </div>	User-defined	User-defined
<b>DHCP Client-Identifier Value</b> <b>(If DHCP Client-Identifier is Enabled)</b>	Specify the DHCP client-identifier value to use.	1 to 64 characters	N/A

# Redundancy

## Menu Path: Redundancy

This section lets you configure the redundancy settings for your device.

This section includes these pages:

- Layer 2 Redundancy

## Layer 2 Redundancy

### Menu Path: Redundancy > Layer 2 Redundancy

This section lets you manage the Layer 2 redundancy features of your device.

This section includes these pages:

- Spanning Tree
- Turbo Ring V2
- MRP

## Selecting a Layer 2 Redundancy Protocol

Selecting the appropriate Layer 2 redundancy protocol for your network depends on several factors, including:

- The topology and size of your network
- The applications and services you are running
- Your availability and performance requirements

Suggestions for protocol selection will be mentioned in later chapters. Here's a summary of each protocol to help you make an informed decision.

Category		RSTP	Turbo Ring v2	Turbo Chain	MRP
<b>Specification needs</b>	<b>Diameter</b>	40 pcs	250 pcs within a ring	250 pcs within a chain	50 pcs

Category	RSTP	Turbo Ring v2	Turbo Chain	MRP	
	<b>Recovery Time</b>	within 3 Hello times (default: 3 times 2 seconds)	Fast Ethernet: 20ms Gigabit Ethernet: 50ms	Fast Ethernet: 20ms Gigabit Ethernet: 50ms	200 ms
	<b>Link Health Check (Packet Detection Mechanism)</b>	2 sec/ RSTP BPDU (default)	Giga Ethernet: 10ms/ LHC pkt	Giga Ethernet: 10ms/ LHC pkt	20 ms / test frame packet
<b>Application needs</b>	<b>Multi-Vendor Support</b>	Public Standard	MOXA proprietary	MOXA proprietary	Public Standard
	<b>Easy-Deployment</b>	Mesh	Ring Topology	Chain Topology	Ring Topology
	<b>Flexible Scalability</b>	N/A	Turbo Ring + Ring Coupling	Directly connected to existing network without any changes.	MRP Ring + MRP Interconnection
<b>Supported Version</b>	MX-NOS V1.0, MX-NOS V2.0, MX-NOS V3.0, MX-NOS V4.0, MX-NOS V5.0, MX-NOS Rail V1.0	MX-NOS V1.0, MX-NOS V2.0, MX-NOS V3.0, MX-NOS V4.0, MX-NOS V5.0, MX-NOS Rail V1.0	MX-NOS V1.0, MX-NOS V2.0, MX-NOS V3.0, MX-NOS V4.0, MX-NOS V5.0	MX-NOS V4.0, MX-NOS V5.0, MX-NOS Rail V1.0	<p><b>Note</b></p> <p>Currently, MX-NOS Rail V1.0 supports MRP but does not support MRP interconnection.</p>

## How to Choose Redundancy Protocol - Task User Scenario

### User Scenario 1

A semiconductor factory plans to construct a new facility to increase chip production capacity for future electric vehicles. They require a large automated network (100+

switches) with redundant mechanisms to prevent unexpected downtime that could impact production lines. Additionally, their network must balance traffic across multiple links to prevent congestion and improve overall performance.

### **Analysis**

1. This is a new project with no existing infrastructure. Everything will start from scratch.
2. Redundancy protocol is required and supports 100+ switches network.
3. Link aggregation is needed to increase total throughput beyond what a single connection can sustain.

### **Solution: Turbo Ring v2**

I would recommend using Turbo Ring in situations where extremely fast failover times are required, such as in mission-critical industrial control systems. Turbo Ring v2 provides easy ring topology deployment and supports port trunking as well. With Moxa's **Turbo Ring** technology, networks can recover within 20 ms (Fast Ethernet/**Fiber**)/50 ms (Giga Copper) on a network with up to 250 nodes.

### **User Scenario 2**

The Phase II Metro project has commenced, encompassing 15 new stations. This project not only establishes its system with a redundant topology but also ensures compatibility with the Phase I system. The Phase I system comprises a mesh topology with RSTP protocol, consisting of over 30 switches, with cabling that is outdated and no longer replaceable. Nevertheless, Phase II must be interconnected with Phase I without any modifications to the latter.

### **Analysis**

1. This is a rebuilt project and it should be interconnected with RSTP topology.
2. Redundancy protocol is required and supports 100+ switches network.

### **Solution: Turbo Chain**

I would recommend using Turbo Chain in situations. One of the key advantages of Turbo Chain is its simplicity and ease of deployment. It can be directly interconnected to RSTP topology with any change on RSTP network.

#### **Note**

For User Scenario 2, the following two are also alternative solutions:

1. Turbo Ring v2 with Ring coupling to RSTP is also an alternate solution. It depends on network physical deployment.
2. Users still can enable RSTP and connect to the existing RSTP network.

### **User Scenario 3**

A well-known railway vehicle manufacturer needs to plan a new on-board network. The customer wishes to plan a ring network via Turbo Ring for multiple vehicles to form a consist. The consists also need to be interconnected with each other to be a train, and a redundant backup mechanism should be provided between consists.

### **Solution: Ring Coupling**

Cross Turbo Ring Network can be connected with ring coupling.

## **About Spanning Tree**

The Spanning Tree Protocol (STP) was designed to help construct a loop-free logical topology on an Ethernet network and provide an automatic means of avoiding any network loops. This is particularly important for networks that have a complicated architecture, since unintended loops in the network can cause broadcast storms. Moxa switches' STP feature is disabled by default. To be completely effective, you must enable STP/RSTP on every Moxa switch connected to your network.

STP (802.1D) is a bridge-based system that is used to implement parallel paths for network traffic. STP uses a loop-detection process to:

- Locate and then disable less efficient paths (e.g., paths that have lower bandwidth).
- Enable one of the less efficient paths if a more efficient path fails.

Rapid Spanning Tree Protocol (RSTP) is an IEEE 802.1w network protocol that enhances the speed and stability of the Spanning Tree Protocol (STP). RSTP promotes high availability and a "loop-free" topology, similar to STP, but more quickly within Ethernet networks. It provides faster convergence and is backward compatible with STP. While STP takes 30-50 seconds to converge, RSTP can achieve sub-second convergence.

For applications that require redundancy, but require use of only open-standard protocols and no proprietary protocols, RSTP is a good choice.

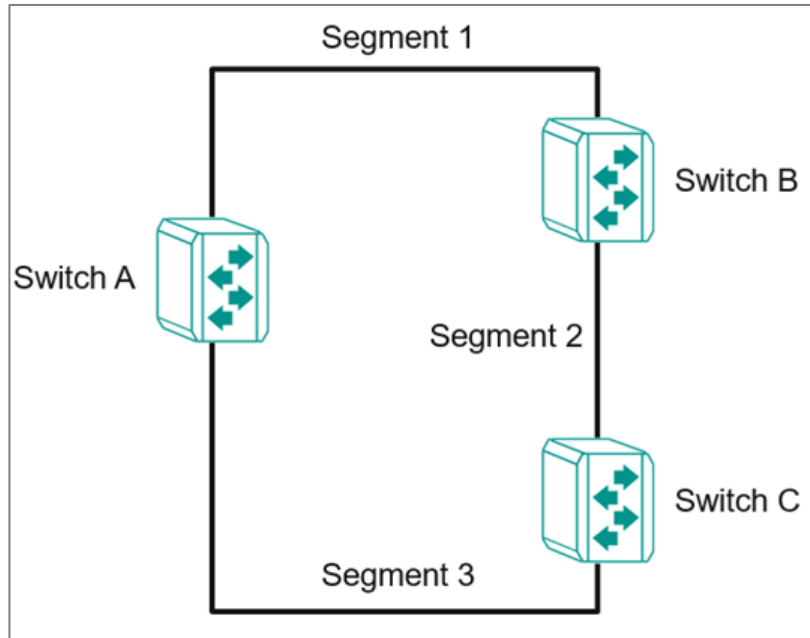
### **Difference Between STP and RSTP**

RSTP is similar to STP but includes additional information in the BPDUs that allow each bridge to confirm that it has taken action to prevent loops from forming when it decides to enable a link to a neighboring bridge. Adjacent bridges connected via point-to-point links will be able to enable a link without waiting to ensure that all other bridges in the network have had time to react to the change. The main benefit of RSTP is that the configuration decision is made locally rather than network-wide, allowing RSTP to carry out automatic configuration and restore a link faster than STP.

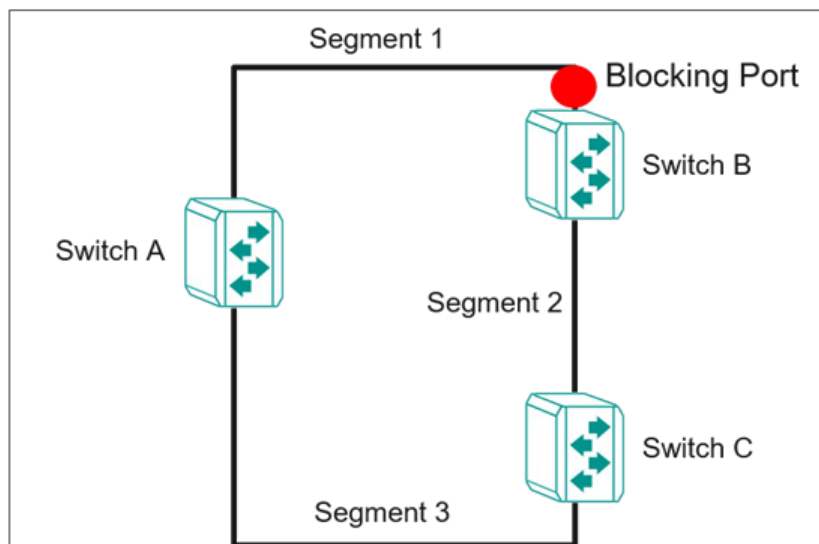
STP and RSTP spanning tree protocols operate without regard to a network's VLAN configuration and maintain one common spanning tree throughout a bridged network. Thus, these protocols map one loop-free, logical topology on a given physical topology.

### **About STP Operations**

The figure below shows a network made up of three LANs separated by three bridges. Each segment uses at most two paths to communicate with the other segments. Since this configuration can give rise to loops, the network will overload if STP is not enabled.

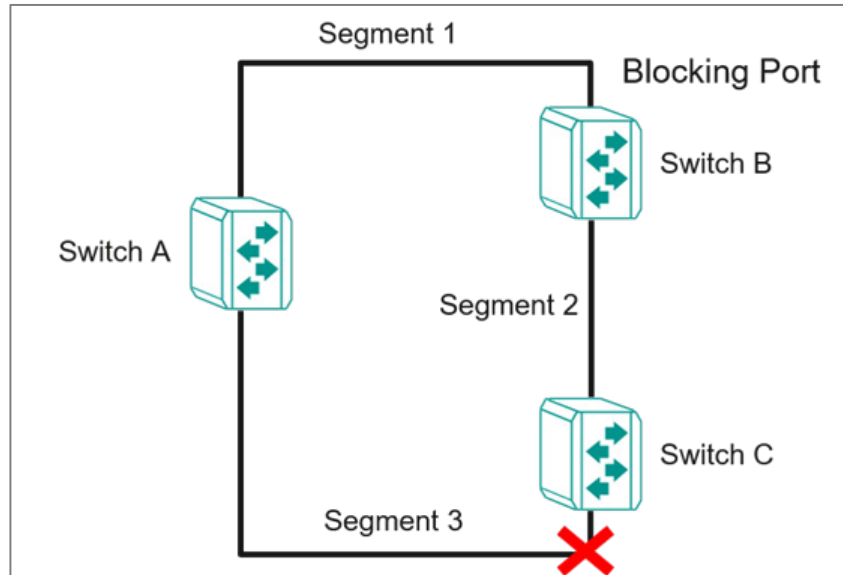


If STP is enabled, it will detect duplicate paths or block one of the paths from forwarding traffic. In the following example, STP determined that traffic from segment 2 to segment 1 flows through switches C and A since this path is in a forwarding state and is processing BPDUs. However, switch B on segment 1 is in a blocking state.



What happens if a link failure is detected? As shown in the figure below, the STP will change the blocking state to a forwarding state so that traffic from segment 2 flows through switch B to segment 1 through a redundant path.





STP will determine which path between each segment is most efficient, and then assign a specific reference point on the network. When the most efficient path has been identified, the other paths are blocked. In the previous three figures, STP first determined that the path through switch C was the most efficient, and as a result, blocked the path through switch B. After the failure of switch C, STP re-evaluated the situation and opened the path through switch B.

## About RSTP

Rapid Spanning Tree Protocol (RSTP) is an enhancement of the original Spanning Tree Protocol (STP) designed to speed up network convergence and improve overall network performance. RSTP ensures there is only one active path between devices in a network, with backup paths ready to activate if the primary path fails.

Each port is assigned a cost that indicates the efficiency of its link. Typically, this cost is determined by the link's bandwidth, with less efficient links assigned a higher cost.

The RSTP path cost default was originally calculated after detecting the bandwidth as follows.

Link Speed	RSTP/MSTP cost
100 Mbit/s	200,000
1 Gbit/s	20,000
10 Gbit/s	2,000

This can be overwritten from the UI.

### Key Features of RSTP

- **Faster Convergence:** RSTP reduces the time required to detect and respond to network topology changes compared to STP. It eliminates the lengthy listening and learning states of STP, allowing for quicker transitions to active states.
- **Localized Decision-Making:** Unlike STP, where decisions are made network-wide, RSTP enables switches to make local configuration decisions. This allows for faster automatic configuration and quicker restoration of network links.
- **Simplified Port Roles:** RSTP uses only three primary port roles—Root Port, Designated Port, and Alternate Port—streamlining the network's operation and improving convergence speed.
- **Proposal/Agreement Mechanism:** RSTP introduces the Proposal/Agreement process to quickly determine designated ports during topology changes, further accelerating convergence.

### How RSTP Works

RSTP operates in the following sequence:

1. **Root Bridge Selection:** The switch with the lowest bridge priority or MAC address is designated as the root bridge, forming the base of the spanning tree.
2. **Root Port Selection:** Non-root switches select their root port, which provides the best path to the root bridge based on path cost.
3. **Designated Ports Assignment:** Each network segment designates a port to forward traffic, ensuring optimal paths are used.
4. **Blocking State:** Non-designated or non-root ports remain in a blocking state, preventing loops.

### Benefits of RSTP

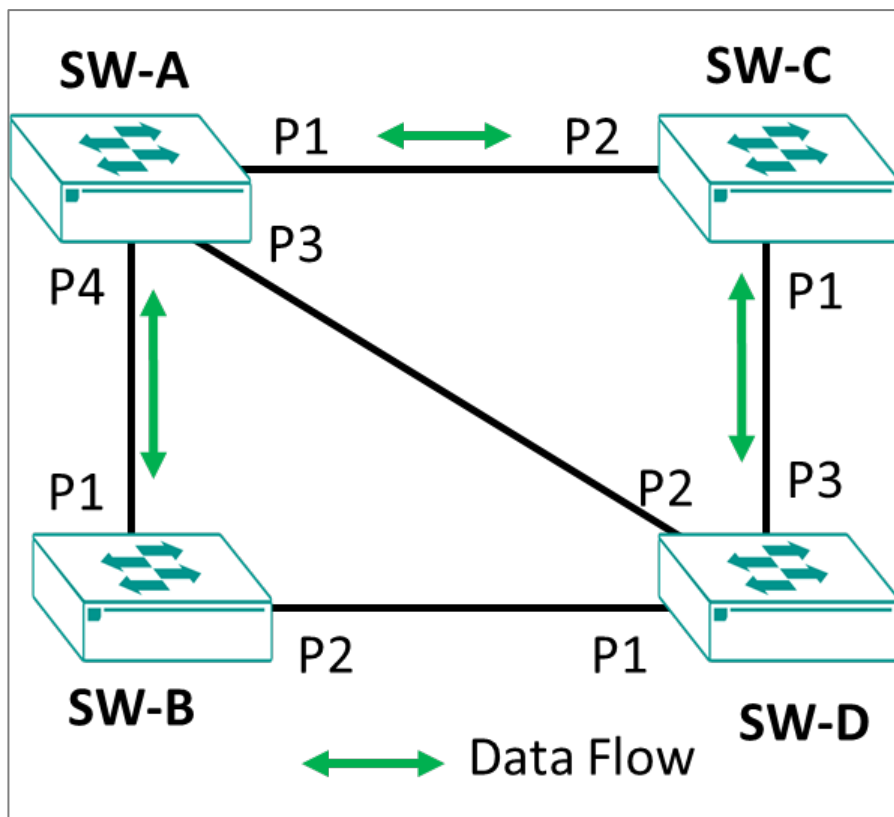
- **Improved Network Stability:** RSTP's fast convergence mechanisms reduce the risk of network outages by adapting quickly to changes in the network topology.

- **Backward Compatibility:** RSTP is fully compatible with STP, allowing a smooth transition in mixed networks where some devices still use the older protocol.

Overall, RSTP offers significant improvements over STP, making networks more resilient and responsive to changes, thereby enhancing overall reliability and performance.

### Scenario: Configuring 4 Devices with RSTP

A user wants to configure 4 network devices in an RSTP topology.



Ordinarily, data will flow from SW-A directly to SW-B and SW-C. SW-D data will transit SW-C. However, if something happens that breaks links, data flow can be rerouted without administrator intervention. Follow the subsequent examples to configure each switch.

#### Example: Configuring RSTP on SW-A

1. Sign in to the device using administrator credentials.

2. Go to **Redundancy > Layer 2 Redundancy > Spanning Tree**, and then click **General**.

3. Under **STP Mode**, select **STP/RSTP** from the drop-down list.

If this option was previously **Disabled**, numerous new features will appear.


4. Under **Compatibility**, select **RSTP**.

5. Set **Bridge Priority** to 28672.

This must be lower than other switches on the network to establish SW-A as the root of the topology.

6. Click **Apply** to save your changes.


The list of ports becomes available.

7. Find Port **1** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

8. Under **Enable**, choose **Enabled** from the drop-down menu.


9. Click **Apply** to save your changes.

10. Find Port **3** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

11. Under **Enable**, choose **Enabled** from the drop-down menu.


12. Click **Apply** to save your changes.

13. Find Port **3** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

14. Under **Enable**, choose **Enabled** from the drop-down menu.

15. Click **Apply** to save your changes.

16. Find Port **4** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

17. Under **Enable**, choose **Enabled** from the drop-down menu.

18. Click **Apply** to save your changes.

SW-A has been configured. You can now move on to configuring SW-B.


### Example: Configuring RSTP on SW-B

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Spanning Tree**, and then click **General**.
3. Under **STP Mode**, select **STP/RSTP** from the drop-down list.

If this option was previously **Disabled**, numerous new features will appear.


4. Under **Compatibility**, select **RSTP**.
5. Click **Apply** to save your changes.

The list of ports becomes available.

6. Find Port **1** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

7. Under **Enable**, choose **Enabled** from the drop-down menu.

8. Find Port **2** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

9. Under **Enable**, choose **Enabled** from the drop-down menu.
10. Click **Apply** to save your changes.

SW-B has been configured. You can now move on to configuring SW-C.



### Example: Configuring RSTP on SW-C

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Spanning Tree**, and then click **General**.
3. Under **STP Mode**, select **STP/RSTP** from the drop-down list.

If this option was previously **Disabled**, numerous new features will appear.

4. Under **Compatibility**, select **RSTP**.
5. Click **Apply** to save your changes.

The list of ports becomes available.

6. Find Port **1** on the list of ports, and then click the corresponding  **[Edit]**.
7. Under **Enable**, choose **Enabled** from the drop-down menu.
8. Find Port **2** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

9. Under **Enable**, choose **Enabled** from the drop-down menu.
10. Click **Apply** to save your changes.

SW-C has been configured. You can now move on to configuring SW-D.

### **Example: Configuring RSTP on SW-D**


SW-D requires specific configuration to ensure that the correct paths are followed.

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Spanning Tree**, and then click **General**.
3. Under **STP Mode**, select **STP/RSTP** from the drop-down list.

If this option was previously **Disabled**, numerous new features will appear.

4. Under **Compatibility**, select **RSTP**.
5. Click **Apply** to save your changes.


The list of ports becomes available.

6. Find Port **1** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

7. Under **Enable**, choose **Enabled** from the drop-down menu.
8. Verify that there is a value in the **Path Cost** field. If there is no value, enter a tentative value of 20,000.

9. Click **Apply** to save your changes.


10. Find Port **4** on the list of ports, and then click the corresponding  **[Edit]**.

The Edit Port Settings screen appears.

11. Under **Enable**, choose **Enabled** from the drop-down menu.

12. Verify that there is a value in the **Path Cost** field. If there is no value, enter a tentative value of 20,000.

13. Click **Apply** to save your changes.

14. Find Port **4** on the list of ports, and then click the corresponding  **[Edit]**.

15. Under **Enable**, choose **Enabled** from the drop-down menu.

16. Set **Path Cost** to 0.

17. Click **Apply** to save your changes.

With SW-D completed, all devices in the topology are complete.

## Spanning Tree Settings

### Menu Path: [Redundancy > Spanning Tree](#)

This page lets you configure the spanning tree settings of your device.

This page includes these tabs:

- General
- Status

### Spanning Tree - General

#### Menu Path: [Redundancy > Spanning Tree - General](#)

This page lets you configure the STP mode and its related settings.

### Spanning Tree Settings - STP/RSTP

If **STP Mode** is set to **STP/RSTP**, the following settings will appear.










STP Mode *	Compatibility *	Bridge Priority *	
STP/RSTP	RSTP	32768	
		0 - 61440, Multiples of 4096	
Forward Delay Time *	Hello Time *	Max. Age *	Error Recovery Time *
15	2	20	300
4 - 30	sec. 1 - 2	sec. 6 - 40	sec. 30 - 65535
<b>APPLY</b>			

UI Setting	Description	Valid Range	Default Value
<b>STP Mode</b>	Specify the spanning tree protocol (STP) to use.	Disabled / STP/RSTP/ MSTP	Disabled
	<div style="background-color: #f0f0f0; padding: 10px;"> <p><b>Note</b></p> <p>MSTP and GVRP are both VLAN-related functions. When VLAN changes dynamically, MSTP needs to re-converge, which can make the system unstable due to running complex operations. When both MSTP and GVRP are used together, this can result in network instability.</p> <p>Therefore, it is recommended that network administrators avoid enabling both MSTP and GVRP.</p> </div>		
<b>Compatibility</b>	Specify the compatibility mode to use.	STP / RSTP	RSTP
<b>Bridge Priority</b>	Specify the bridge priority number, which must be a multiple of 4096. Lower numbers have higher priority. A device with a higher bridge priority (e.g., a lower value) has a greater chance of being established as the root of the spanning tree topology.	Multiples of 4096 from 0 to 61440	32768
<b>Forward Delay Time</b>	Specify the amount of time in seconds the device waits before checking to see if it should change to a different state.	4 to 30	15
<b>Hello Time</b>	Specify the hello time in seconds. This is the amount of time the root waits between sending hello messages. The root of the spanning tree topology periodically sends out a "hello" message to other devices on the network to check if the topology is healthy.	1 to 2	2
<b>Max. Age</b>	Specify the max age in seconds. If this device is not the root, and it has not received a hello message from the root for longer than the max age time, then this device will reconfigure itself as a root. Once two or more devices on the network are recognized as a root, the devices will renegotiate a new spanning tree topology.	6 to 40	20
<b>Error Recovery Time</b>	Specify the error recovery time in seconds. If BPDU guard is triggered on a port, it will automatically recover to the normal state after the error recovery time.	30 to 65535	300



## STP/RSTP - Port Table

If **STP Mode** is set to **STP/RSTP**, this table will appear.


Port	Enable	Edge	Priority	Path Cost	Link Type
 1	Enabled	Auto	128	0	Auto
 2	Disabled	Auto	128	0	Auto
 3	Disabled	Auto	128	0	Auto
 4	Disabled	Auto	128	0	Auto
 5	Disabled	Auto	128	0	Auto
 6	Disabled	Auto	128	0	Auto
 7	Disabled	Auto	128	0	Auto
 8	Disabled	Auto	128	0	Auto
 9	Disabled	Auto	128	0	Auto

1 - 23 of 23

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Enable</b>	Shows whether the spanning tree protocol is enabled for the port.
<b>Edge</b>	Shows the current edge port configuration for the port.
<b>Priority</b>	Show the bridge priority number for the port.
<b>Path Cost</b>	Show the path cost value for the port.
<b>Link Type</b>	Show the link type configuration for the port.

## STP/RSTP Port Table - Edit Port Settings

### Menu Path: Redundancy > Spanning Tree - General

Clicking the **Edit** () icon for an port on the **Redundancy > Spanning Tree - General** page will open this dialog box. This dialog lets you edit the STP/RSTP settings for the port.

Click **APPLY** to save your changes.

**Edit Port 1 Settings**

Enable \*  
Enabled

Edge \*  
Auto

Priority \*  
128  
0 - 240, Multiples of 16

Path Cost \*  
0  
0 - 200000000

Link Type \*  
Auto

Copy configurations to ports

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Enable</b>	Enable or disable spanning tree protocol for the port.	Enabled / Disabled	Disabled
<b>Edge</b>	Select the edge port configuration for the port. <ul style="list-style-type: none"> <li><b>Auto:</b> Auto-detect whether to configure the port as an edge port.</li> <li><b>Yes:</b> The port will be configured as an edge port.</li> <li><b>No:</b> The port will not be configured as an edge port.</li> </ul>	Auto / Yes / No	Auto
<b>Priority</b>	Specify the priority of the port as a multiple of 16. Lower numbers have higher priority. A port with a higher priority (e.g., a lower value) has a greater chance of being a root port.	Multiples of 16 from 0 to 240	128
<b>Path Cost</b>	Specify the path cost value. If this is set to 0, the path cost value will be automatically assigned according to the port speed.	0 to 20000000	0
<b>Link Type</b>	Select the link type for the port. <ul style="list-style-type: none"> <li><b>Point-to-point:</b> Use this when the port is operating in full-duplex mode.</li> <li><b>Shared:</b> Use this when the port is operating in half-duplex mode.</li> <li><b>Auto:</b> Auto-detect which mode to use for the port.</li> </ul>	Point-to-point / Shared / Auto	Auto

UI Setting	Description	Valid Range	Default Value
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Spanning Tree Settings - MSTP

If **STP Mode** is set to **MSTP**, the following settings will appear.

STP Mode *	Compatibility *		
MSTP	MSTP		
Forward Delay Time *	Hello Time *	Max. Age *	Error Recovery Time *
15	2	20	300
4 - 30 sec.	1 - 2 sec.	6 - 40 sec.	30 - 65535 sec.
Region Name	Region Revision *	Max. Hops *	
MSTP	0	20	
	4 / 32 0 - 65535	6 - 40	
<b>APPLY</b>			

UI Setting	Description	Valid Range	Default Value
<b>STP Mode</b>	Specify the spanning tree protocol (STP) to use.	Disabled / STP/RSTP/ MSTP	Disabled
	<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p><b>Note</b></p> <p>MSTP and GVRP are both VLAN-related functions. When VLAN changes dynamically, MSTP needs to re-converge, which can make the system unstable due to running complex operations. When both MSTP and GVRP are used together, this can result in network instability.</p> <p>Therefore, it is recommended that network administrators avoid enabling both MSTP and GVRP.</p> </div>		
<b>Compatibility</b>	Specify the compatibility mode to use.	RSTP / STP / MSTP	MSTP
<b>Forward Delay Time</b>	Specify the amount of time in seconds the device waits before checking to see if it should change to a different state.	4 to 30	15
<b>Hello Time</b>	Specify the hello time in seconds. This is the amount of time the root waits between sending hello messages. The root of the spanning tree topology periodically sends out a "hello" message to other devices on the network to check if the topology is healthy.	1 to 2	2

UI Setting	Description	Valid Range	Default Value
<b>Max. Age</b>	Specify the max age in seconds. If this device is not the root, and it has not received a hello message from the root for longer than the max age time, then this device will reconfigure itself as a root. Once two or more devices on the network are recognized as a root, the devices will renegotiate a new spanning tree topology.	6 to 40	20
<b>Error Recovery Time</b>	Specify the error recovery time in seconds. If BPDU guard is triggered on a port, it will automatically recover to the normal state after the error recovery time.	30 to 65535	300
<b>Region Name</b>	Specify the MSTP region name.	0 to 32 characters	MSTP
<b>Region Revision</b>	Specify the MSTP region revision.	0 to 65535	0
<b>Max. Hops</b>	Specify the maximum number of hops allowed.	6 to 40	20

## MSTP - Instance List

If **STP Mode** is set to **MSTP**, the following table will appear.

Instance List		
Instance ID	VLAN List	Bridge Priority
<input type="checkbox"/> CIST	Other VLANs	32768

Max. 16 Except for CIST. 1 - 1 of 1

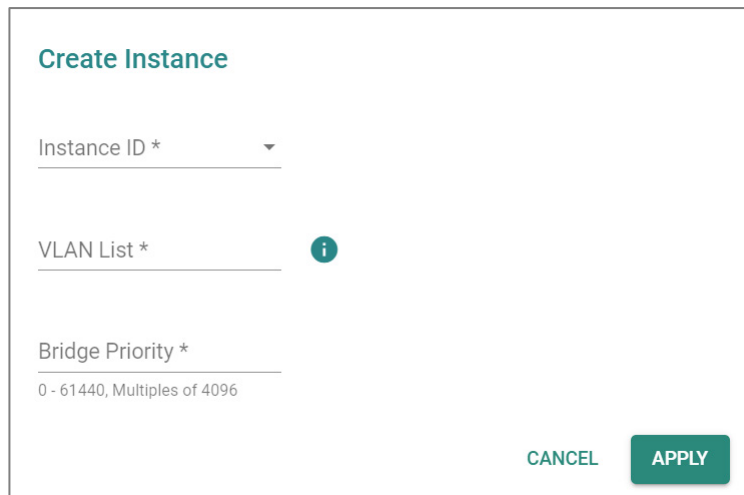
UI Setting	Description
<b>Instance ID</b>	Shows the of the instance the entry is for.
<b>VLAN List</b>	Show the VLAN list configured for the instance.
<b>Bridge Priority</b>	Show the bridge priority value for the instance.

## Instance List - Create Instance

### Menu Path: Redundancy > Spanning Tree - General

Clicking the **Add (+)** icon on the **Redundancy > Spanning Tree - General** page will open this dialog box. This dialog lets you create an MSTP instance.

Click **APPLY** to save your changes.



The 'Create Instance' dialog box contains three input fields: 'Instance ID \*' (a dropdown menu), 'VLAN List \*' (a text input field with an information icon), and 'Bridge Priority \*' (a text input field with a note '0 - 61440, Multiples of 4096'). At the bottom right, there are two buttons: 'CANCEL' and 'APPLY'.

UI Setting	Description	Valid Range	Default Value
<b>Instance ID</b>	Select an ID for the instance.	Drop-down list of ID numbers.	N/A
<b>VLAN List</b>	Specify the VLAN IDs to use for the instance. You can enter multiple VLAN IDs by separating them with commas or by using ranges (e.g., 2, 4-8, 10-13).	Valid VLAN IDs	N/A
<b>Bridge Priority</b>	Specify the bridge priority value for the instance as a multiple of 4096. Lower values have higher priority.	Multiples of 4096 from 0 - 61440	N/A

## Instance List - Edit Settings

### Menu Path: Redundancy > Spanning Tree - General

Clicking the **Edit (✎)** icon for an instance on the **Redundancy > Spanning Tree - General** page will open this dialog box. This dialog lets you edit the instance settings.

Click **APPLY** to save your changes.

### Edit CIST Settings

Bridge Priority \*

32768

0 - 61440, Multiples of 4096

CANCEL
APPLY

### Edit Instance 1 Settings

VLAN List \*

12 i

Bridge Priority \*

4096

0 - 61440, Multiples of 4096


CANCEL
APPLY










UI Setting	Description	Valid Range	Default Value
<b>VLAN List</b>	Specify the VLAN IDs to use for the instance. You can enter multiple VLAN IDs by separating them with commas or by using ranges (e.g., 2, 4-8, 10-13).	N/A	N/A
<div style="background-color: #f0f0f0; padding: 5px; border: 1px solid #ccc;"> <p style="margin: 0;"> <b>Note</b></p> <p style="margin: 0;">This setting is not available for the CIST instance.</p> </div>			
<b>Bridge Priority</b>	Specify the bridge priority value for the instance as a multiple of 4096. Lower values have higher priority.	Multiples of 4096 from 0 - 61440	32768 for CIST N/A for other instances

## Spanning Tree - Port Table

If **STP Mode** is set to **MSTP**, the following table will appear. Clicking on the drop-down list at the top left will let you select which instance's port table you want to view.

Port Table of CIST ▼

 Q Search


<input type="checkbox"/>	Port	Enable	Edge	Priority	Path Cost	Link Type
<input type="checkbox"/> 	1	Disabled	Auto	128	0	Auto
<input type="checkbox"/> 	2	Disabled	Auto	128	0	Auto
<input type="checkbox"/> 	3	Disabled	Auto	128	0	Auto
<input type="checkbox"/> 	4	Disabled	Auto	128	0	Auto
<input type="checkbox"/> 	5	Disabled	Auto	128	0	Auto
<input type="checkbox"/> 	6	Disabled	Auto	128	0	Auto
<input type="checkbox"/> 	7	Disabled	Auto	128	0	Auto
<input type="checkbox"/> 	8	Disabled	Auto	128	0	Auto
<input type="checkbox"/> 	9	Disabled	Auto	128	0	Auto

1 - 23 of 23

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Enable</b>	Shows whether the spanning tree protocol is enabled for the port.
<b>Edge</b>	Shows the current edge port configuration for the port.
<b>Priority</b>	Show the bridge priority number for the port.
<b>Path Cost</b>	Show the path cost value for the port.
<b>Link Type</b>	Show the link type configuration for the port.

## MSTP Port Table - Edit Port Settings

### Menu Path: Redundancy > Spanning Tree - General

Clicking the **Edit** () icon for an port on the **Redundancy > Spanning Tree - General** page will open this dialog box. This dialog lets you edit the port's settings for the selected instance.

Click **APPLY** to save your changes.

### Edit CIST Port 1 Settings

Enable \*  
 Disabled

Edge \*  
 Auto

Priority \*  
 128  
 0 - 240, Multiples of 16

Path Cost \*  
 0  
 0 - 200000000

Link Type \*  
 Auto

Copy configurations to ports

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Enable</b>	Enable or disable spanning tree protocol for the port.	Enabled / Disabled	Disabled
<b>Edge</b>	Select the edge port configuration for the port. <ul style="list-style-type: none"> <li><b>Auto:</b> Auto-detect whether to configure the port as an edge port.</li> <li><b>Yes:</b> The port will be configured as an edge port.</li> <li><b>No:</b> The port will not be configured as an edge port.</li> </ul>	Auto / Yes / No	Auto
<b>Priority</b>	Specify the priority of the port as a multiple of 16. Lower numbers have higher priority. A port with a higher priority (e.g., a lower value) has a greater chance of being a root port.	Multiples of 16 from 0 to 240	128
<b>Path Cost</b>	Specify the path cost value. If this is set to 0, the path cost value will be automatically assigned according to the port speed.	0 to 20000000	0



UI Setting	Description	Valid Range	Default Value
<b>Link Type</b>	Select the link type for the port. <ul style="list-style-type: none"> <li><b>Point-to-point:</b> Use this when the port is operating in full-duplex mode.</li> <li><b>Shared:</b> Use this when the port is operating in half-duplex mode.</li> <li><b>Auto:</b> Auto-detect which mode to use for the port.</li> </ul>	Point-to-point / Shared / Auto	Auto
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Spanning Tree - Status

### Menu Path: Redundancy > Spanning Tree - Status

This page lets you view the current spanning tree status of your device.

### Root Information

If **STP Mode** is set to **STP/RSTP**, this display will appear.

### Root Information ↻

Bridge ID  
32768/00:90:e8:b1:01:01

Root Path Cost  
0

Forward Delay Time  
15 (sec.)

Hello Time  
2 (sec.)

Max. Age  
20 (sec.)

UI Setting	Description
<b>Bridge ID</b>	Shows the bridge ID.

UI Setting	Description
<b>Root Path Cost</b>	Shows the root path cost.
<b>Forward Delay Time</b>	Shows the forward delay time in seconds.
<b>Hello Time</b>	Shows the hello time in seconds.
<b>Max. Age</b>	Shows the max. age time in seconds.

## Bridge Information

If **STP Mode** is set to **STP/RSTP**, this display will appear.

### Bridge Information ↻

Bridge ID  
**32768/00:90:E8:B1:01:01**

Running Protocol  
**RSTP**

Forward Delay Time  
**15 (sec.)**

Hello Time  
**2 (sec.)**

Max. Age  
**20 (sec.)**

UI Setting	Description
<b>Bridge ID</b>	Shows the bridge ID.
<b>Running Protocol</b>	Shows the current configured spanning tree protocol.
<b>Forward Delay Time</b>	Shows the forward delay time in seconds.
<b>Hello Time</b>	Shows the hello time in seconds.
<b>Max. Age</b>	Shows the max. age time in seconds.

## Spanning Tree - Port Status

If **STP Mode** is set to **STP/RSTP**, the following table will appear.

Port	Edge	Port Role	Port State	Root Path Cost	Path Cost	Link Type
1	No	Disabled	Discarding	0	20000	Point-to-point
2	No	Disabled	Forwarding	0	200000	Point-to-point
3	No	Disabled	Discarding	0	20000	Point-to-point
4	No	Disabled	Discarding	0	20000	Point-to-point
5	No	Disabled	Discarding	0	20000	Point-to-point
6	No	Disabled	Discarding	0	20000	Point-to-point
7	No	Disabled	Discarding	0	20000	Point-to-point
8	No	Disabled	Discarding	0	20000	Point-to-point
9	No	Disabled	Discarding	0	20000	Point-to-point
10	No	Disabled	Discarding	0	20000	Point-to-point
11	No	Disabled	Discarding	0	20000	Point-to-point
12	No	Disabled	Discarding	0	20000	Point-to-point
13	No	Disabled	Discarding	0	20000	Point-to-point


1 - 16 of 16

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Edge</b>	Shows whether this port is connected to an edge device.

UI Setting	Description
<b>Port Role</b>	Shows the role for the port. <ul style="list-style-type: none"> <li>• <b>Root:</b> The port is connected directly or indirectly to the root device.</li> <li>• <b>Designated:</b> The port is designated if it can send the best BPDU on the segment to which it is connected.</li> <li>• <b>Alternate:</b> The alternate port receives more useful BPDU from another bridge and is a blocked port.</li> <li>• <b>Backup:</b> The backup port receives more useful BPDU from the same bridge and is a blocked port.</li> <li>• <b>Disabled:</b> The port is disabled.</li> </ul>
<b>Port State</b>	Show the port state. <ul style="list-style-type: none"> <li>• <b>Forwarding:</b> Traffic can be forwarded through this port.</li> <li>• <b>Blocked:</b> Traffic will be blocked.</li> <li>• <b>Disabled:</b> The port is disabled.</li> </ul>
<b>Root Path Cost</b>	Shows the total path cost to the root bridge for the port.
<b>Path Cost</b>	Shows the path cost for the port.
<b>Link Type</b>	Show the link type for the port. <ul style="list-style-type: none"> <li>• <b>Edge Port:</b> The port is connected to an edge device.</li> <li>• <b>Point-to-point:</b> The port is connected to another bridge and is full duplex.</li> <li>• <b>Shared:</b> The port is connected to another bridge and is half duplex.</li> </ul>

## General Information

If **STP Mode** is set to **MSTP**, this display will appear.

General Information 			
Running Protocol	Forward Delay Time	Hello Time	Max. Age
MSTP	15 (sec.)	2 (sec.)	20 (sec.)

UI Setting	Description
<b>Running Protocol</b>	Shows the current configured spanning tree protocol.
<b>Forward Delay Time</b>	Shows the forward delay time in seconds.

UI Setting	Description
<b>Hello Time</b>	Shows the hello time in seconds.
<b>Max. Age</b>	Shows the max. age time in seconds.

## Spanning Tree - Port Status

If **STP Mode** is set to **MSTP**, the following table will appear.

You can use the drop-down list at the top-left to select which instance's status you want to view.

Information of CIST ⊞

Bridge ID: 32768/00:90:e8:b1:01:01    Regional Root ID: 32768/00:90:e8:b1:01:01    CIST Root ID: 32768/00:90:e8:b1:01:01    CIST Path Cost: 0

Port Status 🔍 Search

Port	Edge	Port Role	Port State	Root Path Cost	Path Cost	Link Type	BPDU Inconsistency	Root Inconsistency	Loop Inconsistency
1	No	Disabled	Discarding	0	20000	Point-to-point	No	No	No
2	No	Disabled	Forwarding	0	200000	Point-to-point	No	No	No
3	No	Disabled	Discarding	0	20000	Point-to-point	No	No	No
4	No	Disabled	Discarding	0	20000	Point-to-point	No	No	No
5	No	Disabled	Discarding	0	20000	Point-to-point	No	No	No
6	No	Disabled	Discarding	0	20000	Point-to-point	No	No	No
7	No	Disabled	Discarding	0	20000	Point-to-point	No	No	No
8	No	Disabled	Discarding	0	20000	Point-to-point	No	No	No

## Information of Instance

When viewing the CIST instance, this information will appear:

UI Setting	Description
<b>Bridge ID</b>	Shows the bridge ID for the CIST instance.
<b>Regional Root ID</b>	Shows the regional root ID for the CIST instance.
<b>CIST Root ID</b>	Shows the bridge ID for the CIST instance.
<b>CIST Path Cost</b>	Shows the bridge ID for the CIST instance.

When viewing an instance other than the CIST instance, this information will appear:

UI Setting	Description
<b>Bridge ID</b>	Shows the bridge ID for the instance.
<b>VLAN List</b>	Shows the VLAN IDs for the instance.
<b>Designated Root ID</b>	Shows the designated root ID for the instance.
<b>Root Path Cost</b>	Shows the root path cost for the instance.

## Port Status

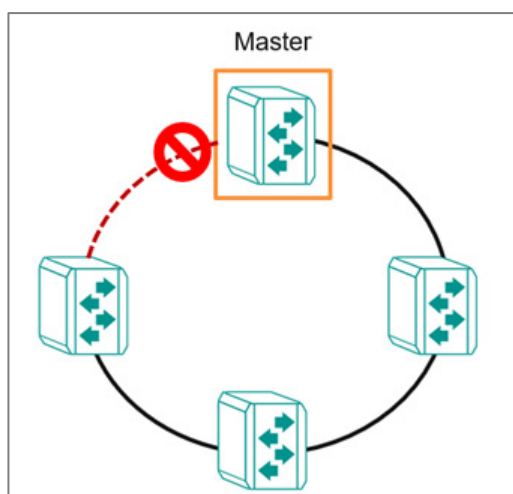
UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Edge</b>	Shows whether this port is connected to an edge device.
<b>Port Role</b>	Shows the role for the port. <ul style="list-style-type: none"> <li>• <b>Root:</b> The port is connected directly or indirectly to the root device.</li> <li>• <b>Designated:</b> The port is designated if it can send the best BPDU on the segment to which it is connected.</li> <li>• <b>Alternate:</b> The alternate port receives more useful BPDU from another bridge and is a blocked port.</li> <li>• <b>Backup:</b> The backup port receives more useful BPDU from the same bridge and is a blocked port.</li> <li>• <b>Disabled:</b> MSTP is disabled for the port.</li> </ul>
<b>Port State</b>	Show the port state. <ul style="list-style-type: none"> <li>• <b>Forwarding:</b> Traffic can be forwarded through this port.</li> <li>• <b>Blocked:</b> Traffic will be blocked.</li> <li>• <b>Disabled:</b> The port is disabled.</li> </ul>
<b>Root Path Cost</b>	Shows the total path cost to the root bridge for the port.
<b>Path Cost</b>	Shows the path cost for the port.
<b>Link Type</b>	Show the link type for the port. <ul style="list-style-type: none"> <li>• <b>Edge Port:</b> The port is connected to an edge device.</li> <li>• <b>Point-to-point:</b> The port is connected to another bridge and is full duplex.</li> <li>• <b>Shared:</b> The port is connected to another bridge and is half duplex.</li> </ul>
<b>BPDU Inconsistency</b>	Shows whether BPDU is received on a port enabled by a BPDU guard.

UI Setting	Description
<b>Root Inconsistency</b>	Shows whether the port is changed to a root port when enabled by a loop guard.
<b>Loop Inconsistency</b>	Shows whether a loop is detected on this port by a loop guard.

## About Turbo Ring v2

Turbo Ring v2 is a high-performance, redundant network topology developed by Moxa for configuring network devices in redundant loops.

In the event of a link failure, the network can automatically reconfigure itself to maintain uninterrupted communication. Recovery times are within 20 ms for Fast Ethernet and 50 ms for Gigabit Ethernet on a network of up to 250 nodes.



Turbo Ring v2 allows connected network devices to elect a "master" switch, which blocks packets from traveling through any of the network's redundant loops and manages the network. If a section breaks, the protocol adjusts the ring so that the disconnected parts of the network establish contact. This enables continuous network operations, even when there is a fault in the network.

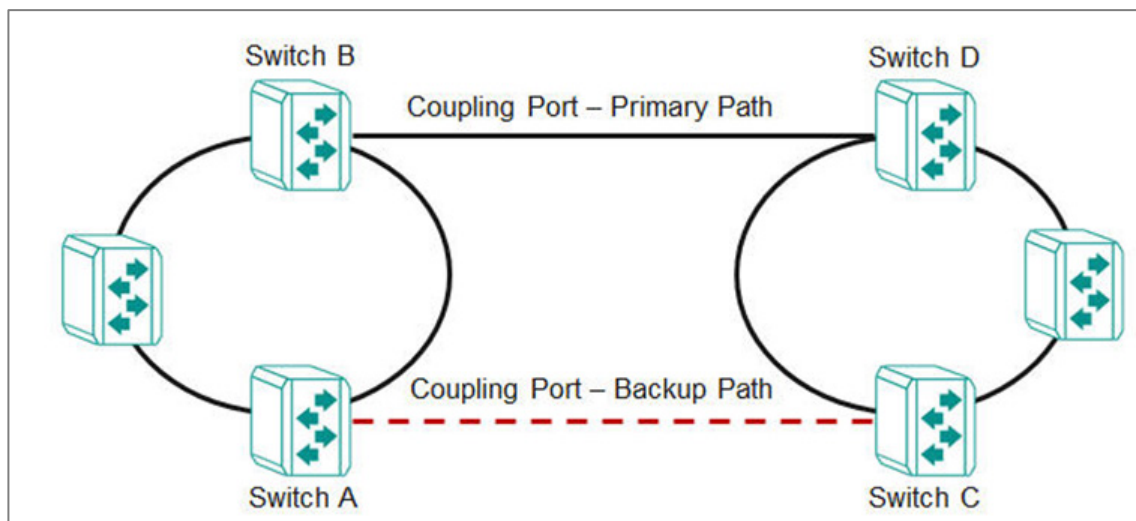
Furthermore, the election mechanism is redundant. If the "master" device itself fails, the network devices detect the failure and automatically elect another. The process occurs quickly, ensuring no interruption.

Turbo Ring v2 supports a backup segment connected to the redundant port (secondary port) on the ring "master". In this case, the backup path is easily identifiable for troubleshooting and replacement.

## About Ring Coupling

Ring Coupling refers to the practice of coupling two rings together.

This may be useful when creating a large redundant ring is inconvenient or impractical, such as for devices in remote areas. Smaller redundant rings can be coupled together for inter-ring communication while still maintaining redundancy of constituent rings and couplings.



Ring coupling uses extra ports on each pair of coupled switches. In this example, that means:

- The (Primary) coupling port on Switch B monitors the main path and connects directly to the port on Switch D.
- The (Backup) coupling port on Switch A monitors the main path and connects directly to the port on Switch C.



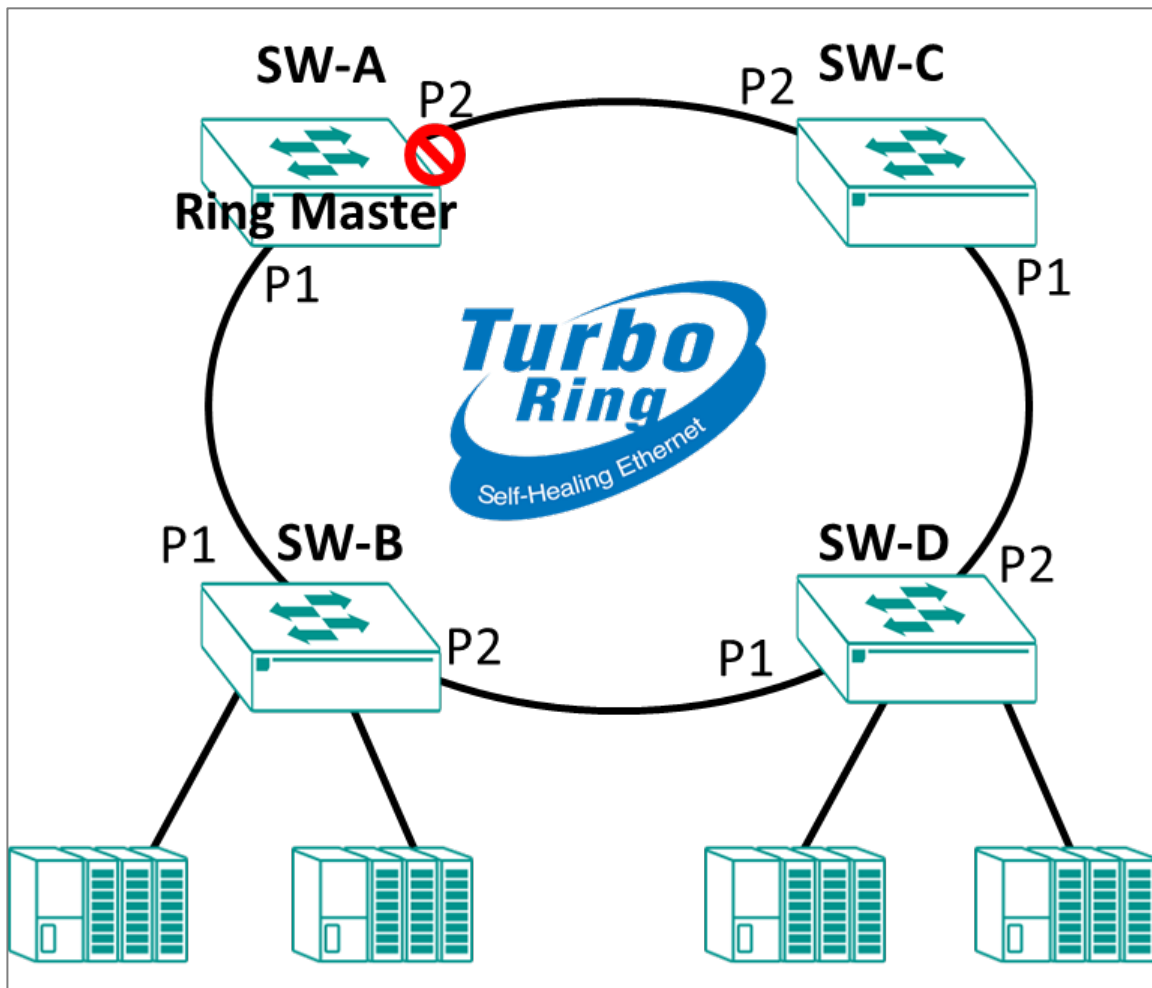
**Note**

Only one coupling (primary + backup) per ring pair.

### Scenario: Using Turbo Ring in a Manufacturing Plant

In this scenario, we describe a factory using a simple ring topology.

A manufacturing plant has a complex network of machines and devices that communicate with each other to keep the production line running smoothly. To ensure that the network remains stable and reliable, the plant needs to use Turbo Ring v2 to create a fault-tolerant network by forming a ring topology.



Set up Turbo Ring v2 to connect multiple networks of machines and devices to create a fault-tolerant network and achieve continuous operations.

Ensure that switches are installed and powered. Wait to connect them until the end.

To configure this scenario, do the following:

1. Configure the settings each network device for Turbo Ring v2.

See the subsequent sections for details about how to configure each device.


2. Connect the network devices in a ring topology, using ports 1 and 2 for ring segments.

If the master network device fails, the other devices in the ring will automatically detect the problem and initiate a new election process to select a new master switch, ensuring that there is no significant interruption in communication.

### Example: Configuring the Master for Turbo Ring v2 in a Manufacturing Plant

Configure the device labeled SW-A for Turbo Ring v2 in our factory example.

Make sure you have NOT connected the ring ports until after you configure Turbo Ring v2 settings. Our examples use ports **1** and **2** as ring ports.

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Turbo Ring V2**, and then click **Settings**.
3. Set **Turbo Ring V2** to **Enabled**.
4. Under Ring Settings, next to **Ring 1**, click  **[Edit]**.

The Ring 1 Settings screen appears.

5. Configure all of the following:

Option	Value
<b>Enabled</b>	<b>Enabled</b>
<b>Master</b>	<b>Enabled</b>
<b>Ring Port 1</b>	<b>1</b>
<b>Ring Port 2</b>	<b>2</b>

Setting **Master** on multiple devices (or no devices) will have the following effects:

Master Setting	Result
<b>Multiple devices set to Enabled</b>	Ring election based on MAC addresses of <b>Enabled</b> devices
<b>No devices set to Enabled</b>	Ring election based on MAC addresses of all devices
<b>Single device set to Enabled</b>	<b>Enabled</b> device always master, failure of <b>Enabled</b> device results in ring election


6. Click **Apply** to save your changes.

Repeat this step on devices SW-B, SW-C, and SW-D, but with the **Master** setting set to **Disabled**. This process is outlined in the subsequent section.

### Example: Configuring Non-Master Network Devices for Turbo Ring v2 in a Manufacturing Plant

Follow these steps to configure devices SW-B through SW-D in our scenario.

Make sure you have NOT connected the ring ports until after you configure Turbo Ring v2 settings. Our examples use ports **1** and **2** as ring ports.

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Turbo Ring V2**, and then click **Settings**.
3. Set **Turbo Ring V2** to **Enabled**.
4. Under Ring Settings, next to **Ring 1**, click  **[Edit]**.

The Ring 1 Settings screen appears.

5. Configure all of the following:

Option	Value
<b>Enabled</b>	<b>Enabled</b>
<b>Master</b>	<b>Disabled</b>
<b>Ring Port 1</b>	<b>1</b>
<b>Ring Port 2</b>	<b>2</b>

Setting **Master** on multiple devices (or no devices) will have the following effects:

Master Setting	Result
<b>Multiple devices set to Enabled</b>	Ring election based on MAC addresses of <b>Enabled</b> devices
<b>No devices set to Enabled</b>	Ring election based on MAC addresses of all devices
<b>Single device set to Enabled</b>	<b>Enabled</b> device always master, failure of <b>Enabled</b> device results in ring election

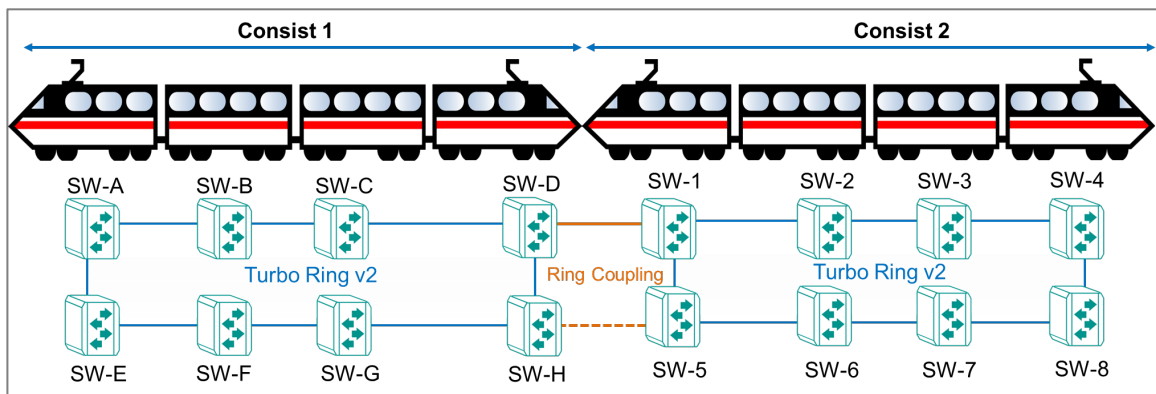
6. Click **Apply** to save your changes.

Once all devices in the ring are configured and enabled, you can connect the ring ports.

### Scenario: Using Turbo Ring in an On-board Train Application

In this scenario, we describe setting up Turbo Ring v2 with ring coupling between train consists.

A railway vehicle manufacturer needs to plan a new on-board network with redundancy and flexible inter-consist communication. The customer plans a ring network with Turbo Ring v2 between multiple vehicles to form one ring per consist. Multiple consists will then use ring coupling for inter-consist communication.



This structure allows for easy administration as consists are coupled and uncoupled.

To configure this scenario, do the following:


1. Configure the settings each network device for Turbo Ring v2.  
See the subsequent sections for details about how to configure each device.

2. Connect the network devices SW-A through SW-H in a ring topology, using ports 1 and 2 for segments of the ring. Do the same for SW-1 through SW-8. Do not connect the ring coupling yet.
3. Configure the Primary Coupling Path path on SW-D.  
See the subsequent sections for details about how to configure ring coupling.
4. Configure the Backup Ring Coupling on SW-H.  
See the subsequent sections for details about how to configure ring coupling.

Once all devices have been configured, you can connect the ring ports and coupling ports.

### Example: Configuring the Master for Turbo Ring v2 in an On-board Rail Application

Make sure you have NOT connected the ring ports until after you configure Turbo Ring v2 settings. Our examples use ports **1** and **2** as ring ports.

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Turbo Ring V2**, and then click **Settings**.
3. Set **Turbo Ring V2** to **Enabled**.
4. Under Ring Settings, next to **Ring 1**, click  **[Edit]**.

The Ring 1 Settings screen appears.

5. Configure all of the following:

Option	Value
<b>Enabled</b>	<b>Enabled</b>
<b>Master</b>	<b>Enabled</b>
<b>Ring Port 1</b>	<b>1</b>
<b>Ring Port 2</b>	<b>2</b>

Setting **Master** on multiple devices (or no devices) will have the following effects:

Master Setting	Result
<b>Multiple devices set to Enabled</b>	Ring election based on MAC addresses of <b>Enabled</b> devices
<b>No devices set to Enabled</b>	Ring election based on MAC addresses of all devices
<b>Single device set to Enabled</b>	<b>Enabled</b> device always master, failure of <b>Enabled</b> device results in ring election


6. Click **Apply** to save your changes.

Once all devices in the ring are configured and enabled, you can connect the ring ports.

Continue to the next section to see how to configure ring coupling. Do not connect coupling ports until network devices have been configured.

### Example: Configuring non-Master devices for Turbo Ring v2 in an On-board Rail Application

Make sure you have NOT connected the ring ports until after you configure Turbo Ring v2 settings. Our examples use ports **1** and **2** as ring ports.

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Turbo Ring V2**, and then click **Settings**.
3. Set **Turbo Ring V2** to **Enabled**.
4. Under Ring Settings, next to **Ring 1**, click  **[Edit]**.

The Ring 1 Settings screen appears.

5. Configure all of the following:

Option	Value
<b>Enabled</b>	<b>Enabled</b>
<b>Master</b>	<b>Disabled</b>
<b>Ring Port 1</b>	<b>1</b>
<b>Ring Port 2</b>	<b>2</b>

Setting **Master** on multiple devices (or no devices) will have the following effects:

Master Setting	Result
<b>Multiple devices set to Enabled</b>	Ring election based on MAC addresses of <b>Enabled</b> devices
<b>No devices set to Enabled</b>	Ring election based on MAC addresses of all devices
<b>Single device set to Enabled</b>	<b>Enabled</b> device always master, failure of <b>Enabled</b> device results in ring election

6. Click **Apply** to save your changes.

Once all devices in the ring are configured and enabled, you can connect the ring ports. Once all

Continue to the next section to see how to configure ring coupling. Do not connect coupling ports until network devices have been configured.


### Example: Configuring the Primary Ring Coupling Between Consists

Both network devices that make up the ring coupling must be configured as coupling devices.

- Make sure that you have configured both rings in the scenario.
- Do not connect the coupling ports until completing setup on both devices. Our scenario assumes port **5** will serve as coupling port.
- Couplers should only be configured on one ring. Our example uses SW-D as the primary and SW-H as the backup. Do not configure SW-1 or SW-5 as couplers.

To configure SW-D as the primary ring coupler:

The procedure on each device is identical. To configure each device, do the following:

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Turbo Ring V2**, and then click **Settings**.
3. Under Ring Coupling Settings, click  **[Edit]**.

The Ring Coupling Settings screen appears.

4. Configure all of the following:

Option	Value
<b>Enabled</b>	<b>Enabled</b>
<b>Coupling Mode</b>	<b>Coupling Primary Path</b>
<b>Coupling Port</b>	<b>5</b>

5. Click **Apply** to save your changes.

The device has been configured as a primary ring coupling.


Connect the ring coupling ports. Once both devices are connected, you can move on to configuring the backup coupling.

### Example: Configuring the Backup Ring Coupling Between Consists

Both network devices that make up the backup ring coupling must be configured as coupling devices.

- Make sure that you have configured both rings in the scenario.
- Do not connect the coupling ports until completing setup on both devices. Our scenario assumes port **5** will serve as coupling port.
- Couplers should only be configured on one ring. Our example uses SW-D as the primary and SW-H as the backup. Do not configure SW-1 or SW-5 as couplers.

To configure SW-H as the backup coupler:

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > Turbo Ring V2**, and then click **Settings**.
3. Under Ring Coupling Settings, click  **[Edit]**.

The Ring Coupling Settings screen appears.

4. Configure all of the following:

Option	Value
<b>Enabled</b>	<b>Enabled</b>



Option	Value
Coupling Mode	Coupling Backup Path
Coupling Port	5

5. Click **Apply** to save your changes.

The device has been configured as a backup ring coupling.

Once the device has been configured, connect the ring coupling ports. Your coupling configuration will be complete.

## Turbo Ring V2

**Menu Path: Redundancy > Turbo Ring V2**

This page lets you set up and configure Turbo Ring v2 redundancy for your device.

This page includes these tabs:

- Settings
- Status

### Turbo Ring V2 - Settings

**Menu Path: Redundancy > Turbo Ring V2 - Settings**

This page lets you configure the Turbo Ring V2 settings.

### Turbo Ring V2 Settings

Turbo Ring V2 \*



Disabled ▼

---

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>Turbo Ring V2</b>	Enable or disable Turbo Ring V2 for the device.	Enabled / Disabled	Disabled


## Ring Settings

Ring Settings					
	Ring ID	Enabled	Master	Ring Port 1	Ring Port 2
	Ring 1	Enabled	Disabled	15	16
	Ring 2	Disabled	Disabled	3	4

UI Setting	Description
<b>Ring ID</b>	Shows the ID of the ring the entry is for.
<b>Enabled</b>	Shows whether Turbo Ring V2 is enabled for the ring.
<b>Master</b>	Shows whether the device is designated as the master for the ring.
<b>Ring Port 1</b>	Shows which port will act as ring port 1. If this device is designated as the master for the ring, this will be the primary ring connection.
<b>Ring Port 2</b>	Shows which port will act as ring port 2. If this device is designated as the master for the ring, this will be the backup ring connection and will be blocked normally.

## Edit Ring Settings

### Menu Path: Redundancy > Turbo Ring V2 - Settings

Clicking the **Edit** () icon for a ring on the **Redundancy > Turbo Ring V2 - Settings** page will open this dialog box. This dialog lets you edit the Turbo Ring V2 settings for the ring.

Click **APPLY** to save your changes.

### Ring 1 Settings

Enabled \*  
Enabled ▼

Master \*  
Disabled ▼

Ring Port 1 \*  
15 ▼

Ring Port 2 \*  
16 ▼

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Enabled</b>	Enable or disable Turbo Ring V2 for the ring.	Enabled / Disabled	Disabled
<b>Master</b>	Enable or disable whether the device will be designated as the master for the ring.	Enabled / Disabled	Disabled
<b>Ring Port 1</b>	Specify which port will act as ring port 1. If this device is designated as the master for the ring, this will be the primary ring connection.	Drop-down list of ports	1
<b>Ring Port 2</b>	Specify which port will act as ring port 2. If this device is designated as the master for the ring, this will be the backup ring connection and will be blocked normally.	Drop-down list of ports	2

## Ring Coupling Settings

### Ring Coupling Settings

	Coupling Mode	Enabled	Coupling Port
	Primary Path	Disabled	5

UI Setting	Description
<b>Coupling Mode</b>	Shows coupling mode the entry is for.

UI Setting	Description
<b>Enabled</b>	Shows whether ring coupling is enabled or disabled.
<b>Coupling Port</b>	Shows the port used for ring coupling.

## Edit Ring Coupling Settings

### Menu Path: Redundancy > Turbo Ring V2 - Settings

Clicking the **Edit** (✎) icon for an entry on the **Redundancy > Turbo Ring V2 - Settings** page will open this dialog box. This dialog lets you edit the ring coupling settings for the entry.

Click **APPLY** to save your changes.

### Ring Coupling Settings

Enabled \*  
Disabled ▼

Coupling Mode \*  
Coupling Primary Path ▼

Coupling Port \*  
5 ▼

CANCEL   APPLY


UI Setting	Description	Valid Range	Default Value
<b>Enabled</b>	Enable or disable ring coupling for the device.	Enabled / Disabled	Disabled
<b>Coupling Mode</b>	Specify whether this device will be designated as primary or backup path for ring coupling.	Coupling Primary Path / Coupling Backup Path	Coupling Primary Path
<b>Coupling Port</b>	Specify the port to use for ring coupling.	Drop-down list of ports	5

## Turbo Ring V2 - Status

### Menu Path: Redundancy > Turbo Ring V2 - Status

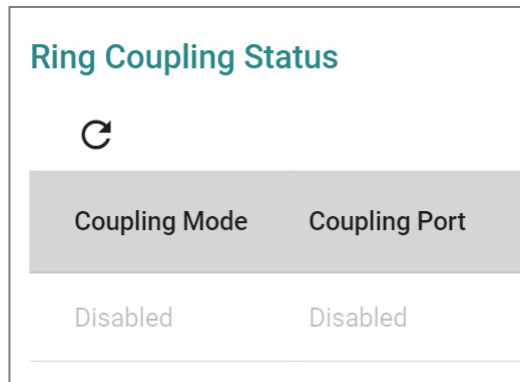
This page lets you view the Turbo Ring V2 ring and ring coupling status.

### Ring Status

Ring Status					
					
Ring ID	Master ID	Status ↑	Master	Ring Port 1	Ring Port 2
Ring 1	00:00:00:00:00:00	Disabled	Slave	Disabled	Disabled
Ring 2	00:00:00:00:00:00	Disabled	Slave	Disabled	Disabled

UI Setting	Description
<b>Ring ID</b>	Shows the ID of the ring the entry is for.
<b>Master ID</b>	Shows the MAC address of the ring master.
<b>Status</b>	Shows the status of the ring. <ul style="list-style-type: none"><li>• <b>Healthy:</b> The ring and the ports are working properly.</li><li>• <b>Break:</b> One or more rings have been broken.</li></ul>
<b>Master</b>	Shows whether the device is configured as a master or slave for the ring.
<b>Ring Port 1</b>	Shows which port will act as ring port 1. If this device is designated as the master for the ring, this will be the primary ring connection.
<b>Ring Port 2</b>	Shows which port will act as ring port 2. If this device is designated as the master for the ring, this will be the backup ring connection and will be blocked normally.

## Ring Coupling Status



UI Setting	Description
<b>Coupling Mode</b>	Shows whether the device is the primary or backup path for ring coupling.
<b>Coupling Port</b>	Shows the port used for ring coupling.

## About MRP (Media Redundancy Protocol)

MRP (Media Redundancy Protocol) is a network protocol based on the IEC 62439-2 that allows users to create a redundant ring system. With a recovery time of less than 200 ms, it can support up to 50 devices in each ring.

MRP includes the following roles:

### MRM (Media Redundancy Manager)

MRM, also known as the Ring Manager, is a node in the network topology that manages and monitors the health of the entire ring. There is only one MRM in the network. In the event of a Link Down scenario, the MRM diagnoses the issue and notifies all MRCs (Media Redundancy Clients) to flush their MAC address table and relearn the path. Additionally, the MRM changes the port status of the primary port from blocking to forwarding to restore connectivity.

### **MRC (Media Redundancy Client)**

MRC, also known as the Ring Client, is a node in the network topology that is monitored by the MRM (Media Redundancy Manager). However, the MRCs do not solely rely on the MRM to detect the health of the ring, they also automatically notify the MRM in the event of a Link Down or Recovery situation. The MRC flushes its MAC address table and relearns the path when requested by the MRM.

### **MIM (Media Redundancy Interconnection Manager)**

The function of the MIM is to observe and to control the redundant interconnection topology in order to react on interconnection faults. To cover a maximum of applications, two detection methods are provided by this international standard. The MIM can observe the interconnection topology by either:

- **LC-mode (Link check mode):** The MRP interconnection manager can observe the interconnection topology by reacting directly on interconnection port link change notification messages
- **RC-mode (Ring check mode):** The MRP interconnection manager can observe the interconnection topology by sending test frames on the interconnection port over the connected rings and receiving them over its ring ports, checking in both directions

### **MIC (Media Redundancy Interconnection Client)**

The other three nodes in the interconnection topology have the role of media redundancy interconnection clients (MIC), in addition to the role of a MRC or MRM. The MIC reacts on received reconfiguration frames from the MIM, it can detect and signal link changes of its interconnection port, and it can issue link change notification messages.

## **Configuring Ring Managers and Clients**

MRP Managers and Clients must be configured before the rings can be used.

- Determine which devices will be the Manager and the Clients. There can only be a single manager.
- Do not connect any of the devices until configuration of all devices is complete.

- Do not use any of the ring ports until configuration is completed. Do not use these ports for administration, as applying the chain configuration to these ports will disconnect you from the web GUI.

Choose a device to configure and do the following:

1. Sign in to the device using administrator credentials.
2. Go to **Redundancy > Layer 2 Redundancy > MRP**, and then click **Settings**.
3. Under Media Redundancy Protocol, choose **Enabled** from the drop-down menu.
4. Specify the following based on the **Role**:

Ring Manager Option	Ring Manager Value
<b>Role</b>	<b>Ring Manager</b>
<b>VLAN ID</b>	Specify the VLAN ID for the ring
<b>Domain UUID</b>	Choose either <b>Default</b> or <b>PROFITNET (Siemens)</b> according to your network configuration
<b>React on Link Change</b>	It is recommended to set this to <b>Enabled</b> . This setting allows the Ring Manager to quickly respond to topology changes, both when a link goes down and when the original topology is restored.
<b>Ring Port 1</b>	Specify the first redundant ring port
<b>Ring Port 2</b>	Specify the second redundant ring port

Ring Client Option	Ring Client Value
<b>Role</b>	<b>Ring Client</b>
<b>VLAN ID</b>	Specify the VLAN ID for the ring
<b>Domain UUID</b>	Choose either <b>Default</b> or <b>PROFITNET (Siemens)</b> according to your network configuration
<b>Ring Port 1</b>	Specify the first redundant ring port
<b>Ring Port 2</b>	Specify the second redundant ring port

5. Click **Apply** to save your changes.



Once all devices are configured, you can connect the ring ports.

## MRP

### Menu Path: Redundancy > MRP

This page lets you to configure the MRP parameters of the switch and view the MRP protocol operation status of the switch.

This page includes these tabs:

- Settings
- Status

### MRP - Settings

#### Menu Path: Redundancy > MRP - Settings

This page lets you to enable and configure MRP for your device.

## Media Redundancy Protocol

Settings      Status

---

Media Redundancy Protocol \*  
Enabled ▾

Role *	Ring Client ▾	VLAN ID *	1	<i>i</i>
			1 - 4094	
Domain UUID *	Default ▾	React on Link Change	Disabled ▾	<i>i</i>
			.....	
Ring Port 1 *	1 ▾	Ring Port 2 *	2 ▾	

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>Media Redundancy Protocol</b>	Enable or disable Media Redundancy Protocol (MRP) for the device.	Enabled / Disabled	Disabled
<b>Role</b>	Specify the role for the device. <ul style="list-style-type: none"> <li>• <b>Ring Client:</b> The device will act as a ring client.</li> <li>• <b>Ring Manager:</b> The device will act as a ring manager, and can manage and monitor the ring's health status.</li> </ul>	Ring Client / Ring Manager	Ring Client
<b>VLAN ID</b>	Specify the VLAN ID to use for MRP. <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p><b>Note</b> The VLAN ID should align with the ring port settings.</p> </div>	1 to 4094	1
<b>Domain UUID</b>	Select whether to use a default or PROFINET domain UUID.	Default / PROFINET	Default
<b>React on Link Change</b> <b>(If Role is Ring Manager)</b>	Enable or disable reacting on link change. Enable reaction on link change for faster recovery speeds.	Enabled / Disabled	Enabled
<b>Ring Port 1</b>	Specify the port to use as the 1st redundant port.	Drop-down list of ports	N/A
<b>Ring Port 2</b>	Specify the port to use as the 2nd redundant port.	Drop-down list of ports	N/A

## MRP - Status

### Menu Path: Redundancy > MRP - Status

This page lets you view the overall status of the MRP ring and ring ports.

## Ring Status

**Ring Status**

MRP Ring  
**Enabled**

Role  
**Ring Client**

Ring State  
**Data Exchange Idle**

React on Link Change  
**Disabled**

VLAN ID  
**1**

Domain ID  
**FFFFFFFF-FFFF-FFFF-FFFF-FFFFFFFFFFFFFF**

UI Setting	Description
<b>MRP Ring</b>	Shows whether the MRP ring is enabled.
<b>Role</b>	Shows the role of the device.
<b>Ring State</b>	Shows the current ring state.
<b>React on Link Change</b>	Shows whether reaction on link change is enabled.
<b>VLAN ID</b>	Shows the VLAN ID for the ring.
<b>Domain ID</b>	Shows the domain UUID for the ring.

**MRP Port Status List**

Interface	Port	Port Status
Ring Port 1	1	Link Down
Ring Port 2	2	Forwarding

UI Setting	Description
<b>Interface</b>	Shows the interface the entry is for.
<b>Port</b>	Shows the port used for the interface.
<b>Port Status</b>	Shows the port status of the interface.

# Network Service

## Menu Path: Network Service

This section lets you configure your device's network services.

This section includes these pages:

- DHCP Server
- DHCP Relay Agent
- DNS Server

## Configuring DHCP Server Functions

Moxa routers and L2 switches support DHCP server functionality, allowing auto-assignment of IP configurations.

### Introduction to DHCP

The Dynamic Host Configuration Protocol (DHCP) automatically provides an Internet Protocol (IP) host with an IP configuration. This can include IP address, subnet mask, DNS Configuration, and default gateway. among others.

This ensures that connected clients do not need manual IP configuration, saving time and increasing flexibility in deployments.

### Overview of DHCP Server Configuration

The integrated DHCP server of the device can operate in one of three modes.

#### DHCP Pool

This mode automatically assigns IP addresses to connected devices from a user-configured IP address pool.

## MAC-based IP Assignment (Static IP)

MAC-based IP assignment, also known as static IP assignment, assigns specified IP addresses to MAC addresses of network devices. This ensures that devices maintain the same IP address, regardless of factors like connection order or lease duration. By configuring a DHCP server with table of MAC addresses and corresponding IP addresses, administrators can have more control over IP allocation, and by extension, device management and security.

### Note

DHCP Pool and MAC-based IP Assignment can be active at the same time.

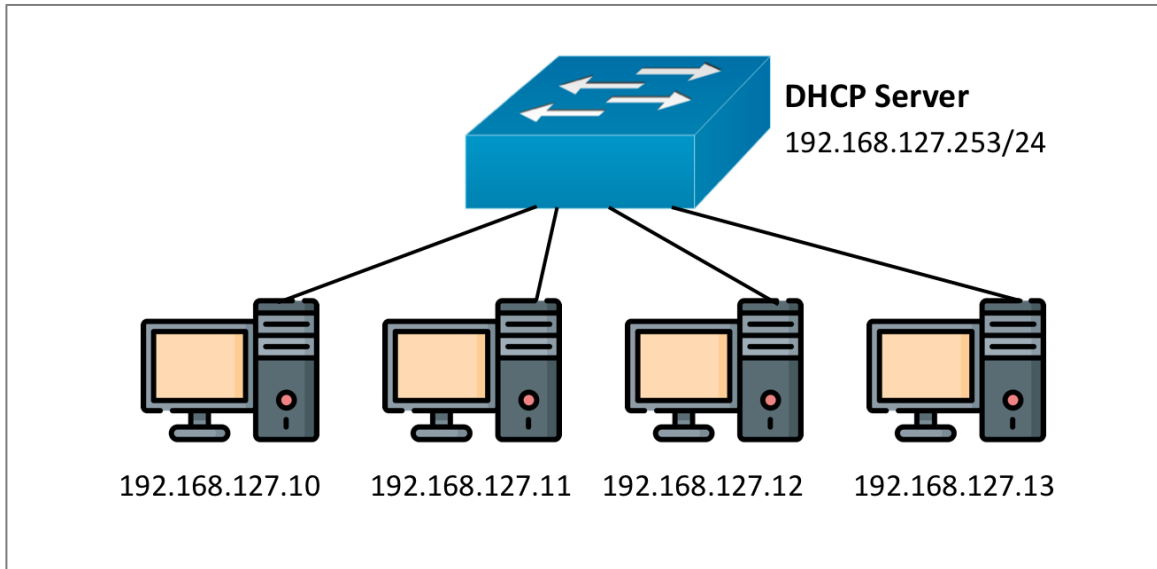
## Port-based IP Assignment

Port-based IP assignment allocates IP addresses by the physical port on the device (Port 1, 2 etc.). This allows pre-assignment based on port, ensuring the device connected to each port will always have the same IP address.

## Configuring Dynamic IP Address Assignment (DHCP Server Pool)

In this example, we configure a sample scenario with a pool of automatically-assigned IP addresses.

This scenario explains how automatically assign IP addresses to four PC clients on a subnet. We configure a switch act as DHCP server to automatically assign addresses, in this scenario, the switch acts as a DHCP server for the 192.168.127.xxx IP subnet and PCs are DHCP clients.



1. Sign in to the device using administrator credentials.
2. Go to **Network Service > DHCP Server > General**.
3. Under **Mode**, make sure **DHCP/MAC-based IP Assignment** is selected.
4. Under **DHCP Pool Settings**, select **Enabled** from the drop-down list.

The IP Address Pool configuration options appear.

5. Configure all of the following:

Option	Value
<b>Starting IP Address</b>	192.168.127.10
<b>Subnet Mask</b>	<b>24 (255.255.255.0)</b>
<b>Ending IP Address</b>	192.168.127.20
<b>Default Gateway</b>	192.168.127.253
<b>Lease Time</b>	1440
<b>DNS Server IP Address 1</b>	8.8.8.8
<b>DNS Server IP Address 2</b>	8.8.8.4
<b>NTP Server IP Address</b>	8.8.8.10

6. Click **Apply** to save your settings.

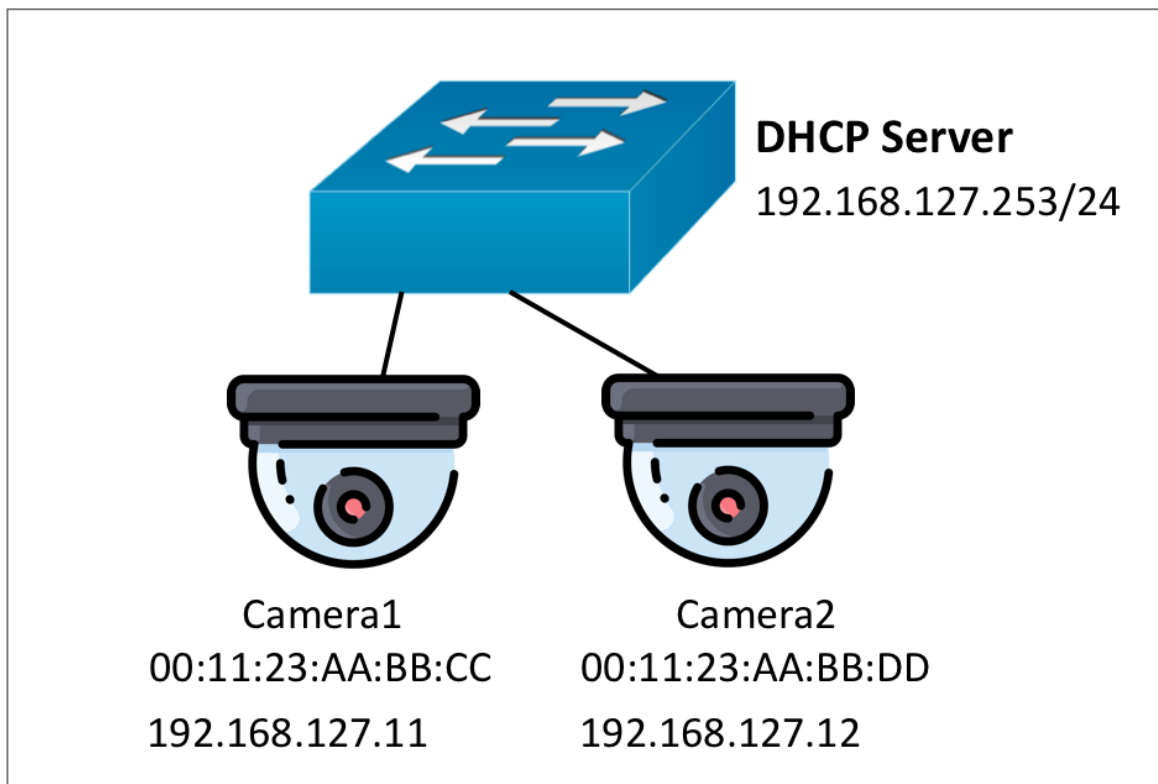
**Note**

You can delete entries by going to Network Service > DHCP Server > General, and then under DHCP Pool Settings, choose Disabled from the drop-down menu.

## Reserving IP Addresses for Specific Devices (MAC-based IP Assignment)

This scenario outlines how to reserve and automatically assign IP addresses for two cameras, ensuring that each camera always receives the same address.

We will configure the switch using MAC-based IP reservation and assignment.



1. Sign in to the device using administrator credentials.
2. Go to **Network Service > DHCP Server > General**.
3. Under **Mode**, choose **DHCP/MAC-based IP Assignment** from the drop-down list, and then click **Apply**.



4. In the table below **Mode**, click  **[Add]**.

The Create Entry screen appears.

5. Configure all of the following:

Option	Value
<b>Enable</b>	<b>Enabled</b>
<b>Hostname</b>	Camera1
<b>IP Address</b>	192.168.127.11
<b>Subnet Mask</b>	<b>24 (255.255.255.0)</b>
<b>MAC Address</b>	00:11:23:AA:BB:CC
<b>Default Gateway</b>	192.168.127.253
<b>Lease Time</b>	1440
<b>DNS Server IP Address1</b>	8.8.8.8
<b>DNS Server IP Address1</b>	8.8.8.4
<b>NTP Server IP Address</b>	8.8.8.10


The entry will appear in the table.


6. Repeat this process for the second camera, with the following settings:

Option	Value
<b>Enable</b>	<b>Enabled</b>
<b>Hostname</b>	Camera2
<b>IP Address</b>	192.168.127.12
<b>Subnet Mask</b>	<b>24 (255.255.255.0)</b>
<b>MAC Address</b>	00:11:23:AA:BB:CC

Option	Value
<b>Default Gateway</b>	192.168.127.253
<b>Lease Time</b>	1440
<b>DNS Server IP Address1</b>	8.8.8.8
<b>DNS Server IP Address1</b>	8.8.8.4
<b>NTP Server IP Address</b>	8.8.8.10

The entry will appear in the table.

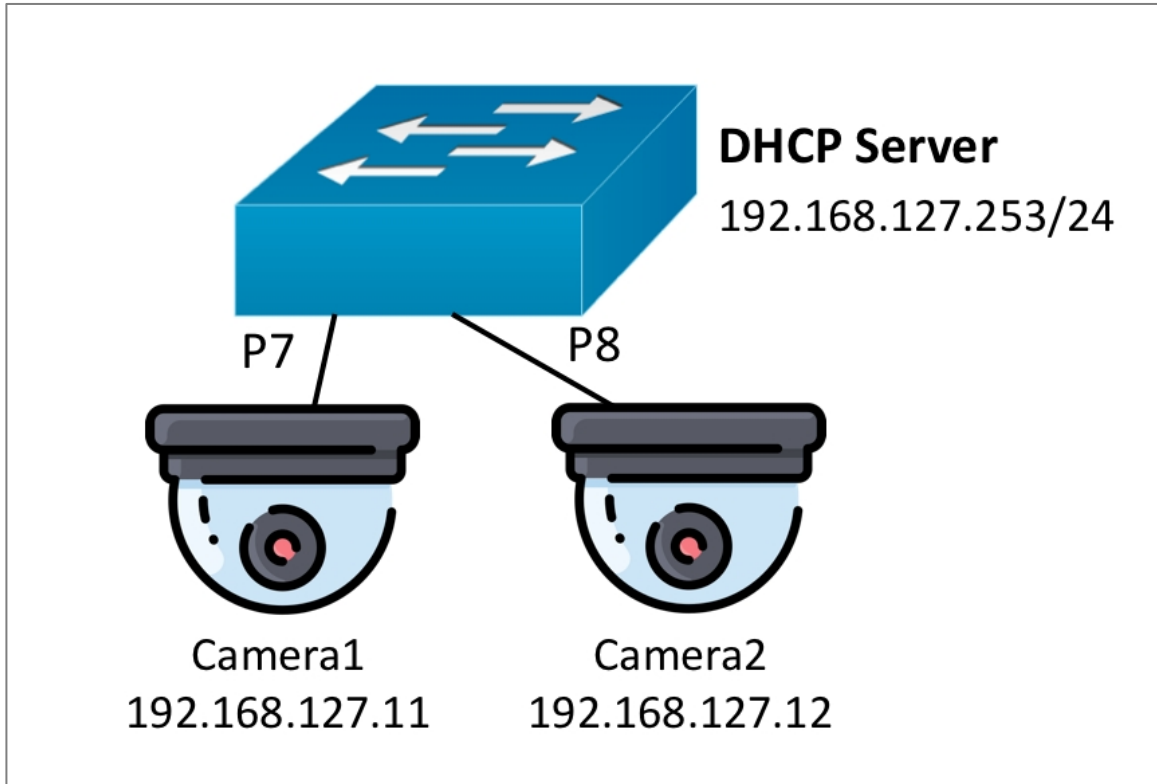
 **Note**

You can delete entries by going to Network Service > DHCP Server > General, and then in the table at the bottom of the page, selecting one or more entries by clicking the corresponding checkbox, and then clicking  [Delete].

## Configuring Port-based IP Assignment

This scenario assigns IP addresses to cameras based on their port of connection.

We will configure the switch as a DHCP server that uses port index-based IP assignments for each of the cameras. All ports will always assign the same IP addresses.



1. Sign in to the device using administrator credentials.
2. Go to **Network Service > DHCP Server > General**.
3. Under **Mode**, choose **Port-based IP Assignment** from the drop-down list, and then click **Apply**.
4. In the table below **Mode**, click **+** *[Add]*.
5. Configure all of the following:

Option	Value
<b>Enable</b>	<b>Enabled</b>
<b>Port</b>	<b>7</b>
<b>IP Address</b>	192.168.127.11
<b>Subnet Mask</b>	<b>24 (255.255.255.0)</b>
<b>Default Gateway</b>	192.168.127.253


Option	Value
<b>Lease Time</b>	1440
<b>DNS Server IP Address1</b>	8.8.8.8
<b>DNS Server IP Address1</b>	8.8.8.4
<b>NTP Server IP Address</b>	8.8.8.10
<b>Hostname</b>	Camera1


The entry will appear in the table.


6. Repeat this process for the second camera, with the following settings:


Option	Value
<b>Enable</b>	<b>Enabled</b>
<b>MAC Address</b>	00:11:23:AA:BB:CC
<b>IP Address</b>	192.168.127.12
<b>Subnet Mask</b>	<b>24 (255.255.255.0)</b>
<b>Default Gateway</b>	192.168.127.253
<b>Lease Time</b>	1440
<b>DNS Server IP Address1</b>	8.8.8.8
<b>DNS Server IP Address1</b>	8.8.8.4
<b>NTP Server IP Address</b>	8.8.8.10
<b>Hostname</b>	Camera2

The entry will appear in the table.

 **Note**

You can delete ports from the list at the bottom of the page by clicking the corresponding checkbox, and then clicking  [Delete].

 **Note**

You can delete ports from the list by clicking on Port-based IP Assignment, clicking the corresponding checkbox, and then clicking  [Delete].

## DHCP Server

### Menu Path: [Network Service](#) > [DHCP Server](#)

This page lets you configure the DHCP server settings.

This page includes these tabs:

- General
- Lease Table
- Classless Static Route Table

 **Note**

MX-NOS Rail V1.0 supports the following options:

- DHCP Client option 1/3/6/53/55/61/66/67/255
- DHCP Server option 1/3/6/7/12/15/42/51/53/54/\*55/121/255
  - \*55: The DHCP server will not include option 55 in its outgoing packets, but it will process option 55 if it is received from a DHCP client.

## DHCP Server - General

### Menu Path: [Network Service](#) > [DHCP Server - General](#)

This page lets you configure the DHCP server mode and port settings.

## 🔒 Limitations

Up to 256 DHCP/MAC-based IP assignments can be created.

## DHCP Server Settings

If **Mode** is set to **DHCP/MAC-based IP Assignment**, and **DHCP Pool Settings** is **Enabled**, these settings will appear.

The screenshot shows a configuration window for DHCP Pool Settings. At the top, there is a dropdown menu for 'Mode' set to 'DHCP/MAC-based IP Assignment'. Below this is a section titled 'DHCP Pool Settings' with an 'Enable' dropdown set to 'Enabled'. The settings include: 'Starting IP Address \*', 'Subnet Mask \*', and 'Ending IP Address \*' (all with input fields); 'Default Gateway' (with an input field); 'Lease Time \*' (with a value of '1-31622340' and a unit of 'sec'); 'DNS Server IP Address1' and 'DNS Server IP Address2' (with input fields); and 'NTP Server IP Address' (with an input field). An 'APPLY' button is located at the bottom left of the form.

UI Setting	Description	Valid Range	Default Value
<b>Mode</b>	Select a DHCP server mode.	Disabled / DHCP/MAC-based IP Assignment / Port-based IP Assignment	Disabled
<b>Enable</b>	Enable or disable use of a DHCP pool.	Enabled / Disabled	Disabled
<b>Starting IP Address</b>	Specify the starting IP address of the DHCP IP pool.	Valid unicast IP address	N/A
<b>Subnet Mask</b>	Specify the subnet mask for DHCP clients in the pool.	Valid subnet mask	N/A
<b>Ending IP Address</b>	Specify the ending IP address of the DHCP IP pool.	Valid unicast IP address	N/A
<b>Default Gateway</b>	Specify the default gateway to use for DHCP clients in the pool.	Valid IP address	N/A

UI Setting	Description	Valid Range	Default Value
<b>Lease Time</b>	Specify how long in seconds a device can keep the assigned IP address before it needs to renew the lease with the DHCP server.	1 to 31622340	N/A
<b>DNS Server IP Address1</b>	Specify the IP address of the first DNS server to use for DHCP clients in the pool.	Valid IP address	N/A
<b>DNS Server IP Address2</b>	Specify the IP address of the second DNS server to use for DHCP clients in the pool.	Valid IP address	N/A
<b>NTP Server IP Address</b>	Specify the IP address of the NTP server to use for DHCP clients in the pool.	Valid IP address	N/A

### DHCP Server List - MAC-based Assignment

If **DHCP Server Mode** is set to **DHCP/MAC-based IP Assignment**, this table will appear.

Enable	Hostname	IP Address	Subnet Mask	Lease Time (sec.)	MAC Address	Default Gateway	DNS Server IP
<input checked="" type="checkbox"/>	Test	19.126.255.5	255.255.192.0	6	00:90:E8:A9:ED:2B		

UI Setting	Description
<b>Enable</b>	Shows whether MAC-based IP assignment is enabled for the MAC address.
<b>Hostname</b>	Shows the hostname to use for clients that connect to the MAC address.
<b>IP Address</b>	Shows the IP address assigned to clients that connect to the MAC address.
<b>Subnet Mask</b>	Shows the subnet mask assigned to clients that connect to the MAC address.
<b>Lease Time</b>	Shows the lease time in seconds for IP assignments through the MAC address.
<b>MAC Address</b>	Shows the MAC address of the MAC-based IP assignment.
<b>Default Gateway</b>	Shows the default gateway for clients that connect to the MAC address.

UI Setting	Description
<b>DNS Server IP Address1</b>	Shows the IP address of the first DNS server to use for clients that connect to the MAC address.
<b>DNS Server IP Address2</b>	Shows the IP address of the second DNS server to use for clients that connect to the MAC address.
<b>NTP Server IP Address</b>	Shows the NTP server to use for clients that connect to the MAC address.

## MAC-based IP Assignment - Creating a DHCP Server Entry

### Menu Path: [Network Service](#) > [DHCP Server - General](#)


Clicking the **Add (+)** icon on the **Network Service > DHCP Server - General** page when **DHCP Server Mode** is set to **DHCP/MAC-based IP Assignment** will open this dialog box. This dialog lets you create a new MAC-based IP assignment.

Click **CREATE** to save your changes and add the new account.



### Create Entry

Enable \*  
 Enabled ▼

Hostname \*   
 \_\_\_\_\_  
 0 / 63

IP Address \*      Subnet Mask \* ▼

\_\_\_\_\_

MAC Address \*

\_\_\_\_\_

Default Gateway

\_\_\_\_\_

Lease Time \*  
 1 - 31622340      sec.

\_\_\_\_\_

DNS Server IP Address 1      DNS Server IP Address 2

\_\_\_\_\_

NTP Server IP Address

\_\_\_\_\_

CANCEL      CREATE

UI Setting	Description	Valid Range	Default Value
<b>Enable</b>	Enable or disable the MAC-based IP assignment entry.	Enabled / Disabled	Enabled
<b>Hostname</b>	Specify a hostname for the IP assignment.	Drop-down list of ports	N/A
<b>IP Address</b>	Specify the IP address for the IP assignment.	Valid IP address	N/A
<b>Subnet Mask</b>	Select the subnet mask for the IP assignment.	Drop-down list of subnet masks	N/A
<b>MAC Address</b>	Specify the MAC address that this IP assignment will apply to.	Valid MAC address	

UI Setting	Description	Valid Range	Default Value
<b>Default Gateway</b>	Specify the default gateway for the IP assignment.	Valid IP address	N/A
<b>Lease Time</b>	Specify the lease time in seconds for the IP assignment.	1 to 31622340	
<b>DNS Server IP Address1</b>	Specify the IP address of the first DNS server to use for the IP assignment.	Valid IP address	N/A
<b>DNS Server IP Address2</b>	Specify the IP address of the second DNS server to use for the IP assignment.	Valid IP address	N/A
<b>NTP Server IP Address</b>	Specify the NTP server to use for the IP assignment.	Valid IP address	N/A

## DHCP Server List - Port-based Assignment

If **DHCP Server Mode** is set to **Port-based IP Assignment**, this table will appear.

	Port	Enable	IP Address	Subnet Mask	Lease Time (sec.)	Default Gateway	DNS Server IP Address1	DNS Server IP Address2	NTP Server IP Address	Hostname	Domain Name	Log Server IP Address
<input type="checkbox"/>	7	Enabled	192.168.7.252	255.255.255.0	86400	192.168.7.254						

Max. 22 1 - 1 of 1

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Enable</b>	Shows whether port-based IP assignment is enabled for the port.
<b>IP Address</b>	Shows the IP address assigned to clients that connect to the port.
<b>Subnet Mask</b>	Shows the subnet mask assigned to clients that connect to the port.
<b>Lease Time</b>	Shows the lease time in seconds for IP assignments through the port.
<b>Default Gateway</b>	Shows the default gateway for clients that connect to the port.
<b>DNS Server IP Address1</b>	Shows the IP address of the first DNS server to use for clients that connect to the port.
<b>DNS Server IP Address2</b>	Shows the IP address of the second DNS server to use for clients that connect to the port.

UI Setting	Description
<b>NTP Server IP Address</b>	Shows the NTP server to use for clients that connect to the port.
<b>Hostname</b>	Shows the hostname to use for clients that connect to the port.
<b>Domain Name</b>	Shows the domain name to use for clients that connect to the port.
<b>Log Server IP Address</b>	Shows the IP address of the log server to use for clients that connect to the port.

## Port-based Assignment - Creating a DHCP Server Entry

### Menu Path: Network Service > DHCP Server - General

Clicking the **Add (+)** icon on the **Network Service > DHCP Server - General** page will open this dialog box. This dialog lets you create a new port-based IP assignment.

Click **CREATE** to save your changes and add the new account.

The 'Create Entry' dialog box contains the following fields and controls:

- Enable \***: A dropdown menu currently set to 'Enabled'.
- Port \***: A dropdown menu.
- IP Address \***: A text input field.
- Subnet Mask \***: A dropdown menu.
- Lease Time \***: A text input field with the value '1-31622340' and a unit selector set to 'sec'.
- Default Gateway**: A text input field.
- DNS Server IP Address1** and **DNS Server IP Address2**: Two text input fields.
- NTP Server IP Address**: A text input field.
- Hostname**: A text input field with a character count of '0 / 63'.
- Domain Name**: A text input field with a character count of '0 / 63'.
- Log Server IP Address**: A text input field.
- At the bottom right, there are two buttons: **CANCEL** and **CREATE**.

UI Setting	Description	Valid Range	Default Value
<b>Enable</b>	Enable or disable the port-based IP assignment entry.	Enabled / Disabled	Enabled

UI Setting	Description	Valid Range	Default Value
<b>Port</b>	Select which port the DHCP server will assign an IP address for.	Drop-down list of ports	N/A
<b>IP Address</b>	Specify the IP address assigned to clients that connect to the port.	Valid IP address	N/A
<b>Subnet Mask</b>	Select the subnet mask assigned to clients that connect to the port.	Drop-down list of subnet masks	N/A
<b>Lease Time</b>	Specify the lease time in seconds for IP assignments through the port.	1 to 31622340	N/A
<b>Default Gateway</b>	Specify the default gateway for clients that connect to the port.	Valid IP address	N/A
<b>DNS Server IP Address1</b>	Specify the IP address of the first DNS server to use for clients that connect to the port.	Valid IP address	N/A
<b>DNS Server IP Address2</b>	Specify the IP address of the second DNS server to use for clients that connect to the port.	Valid IP address	N/A
<b>NTP Server IP Address</b>	Specify the NTP server to use for clients that connect to the port.	Valid IP address	N/A
<b>Hostname</b>	Specify the hostname to use for clients that connect to the port.	Up to 63 characters	N/A
<b>Domain Name</b>	Specify the domain name to use for clients that connect to the port.	Up to 63 characters	N/A
<b>Log Server IP Address</b>	Specify the IP address of the log server to use for clients that connect to the port.	Valid IP address	N/A

## Lease Table

### Menu Path: [Network Service](#) > [DHCP Server - Lease Table](#)

This page lets you view the IP address lease table.

## Lease Table

Hostname	IP Address	MAC Address	Time Left
	192.168.7.252		(static)

UI Setting	Description
<b>Hostname</b>	Shows the hostname of the client.
<b>IP Address</b>	Shows the IP address leased to the client.
<b>MAC Address</b>	Shows the MAC address of the client.
<b>Time left</b>	Shows the amount of time left in seconds on the DHCP lease for the client. <b>(static)</b> means the IP address is statically assigned.

## Classless Static Route Table

### Menu Path: Network Service > DHCP Server - Classless Static Route Table

This page lets you view the classless static route table and configure related settings.

#### ⚙ Limitations

Up to 10 classless static routes can be created.

## Classless Static Route Table Settings

Mode \*  
Port-based IP Assignment

Default Gateway \*  
Enabled

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Mode</b>	Select the mode to use for classless static routing.	Disabled / Port-based IP Assignment	Disabled
<b>Default Gateway (If Mode is Port-based IP Assignment)</b>	Enable or disable use of a default gateway for classless static routes. When enabled, routes will use the default gateway address for the relevant port defined in the <b>General</b> tab.	Enabled / Disabled	Disabled

## Classless Static Route Table


	IP Address	Subnet Mask	Gateway	Member Port
<input type="checkbox"/>	192.168.7.2	255.255.255.0	10.168.7.154	6,7

Max. 10

UI Setting	Description
<b>IP Address</b>	Shows the IP address of the packet's final destination for the route.
<b>Subnet Mask</b>	Shows the subnet mask of the destination address for the route.
<b>Gateway</b>	Shows the next hop or the neighboring device's IP address to which the packet is forwarded for the route.
<b>Member Port</b>	Shows the member ports that are using the route.

## Creating a Classless Static Route Entry

### Menu Path: [Network Service](#) > [DHCP Server - Classless Static Route](#)

Clicking the **Add** () icon on the **Network Service > DHCP Server - Classless Static Route** page will open this dialog box. This dialog lets you create an entry for the classless static route.

Click **CREATE** to save your changes and add the new entry.

**Create Entry**

IP Address \*      Subnet Mask \* ▾

Gateway \*

Member Port \* ▾

CANCEL    CREATE

UI Setting	Description	Valid Range	Default Value
<b>IP Address</b>	Specify the IP address of the packet's final destination.	Valid IP address	N/A
<b>Subnet Mask</b>	Specify the subnet mask of the destination address.	Drop-down list of subnet masks	N/A
<b>Gateway</b>	Specify the next hop or the neighboring device's IP address to which the packet is forwarded.	Valid Gateway	N/A
<b>Member Port</b>	Specify the ports that are using the port-based IP assignment.	Drop-down list of ports	N/A

## Configuring DHCP Relay Agent

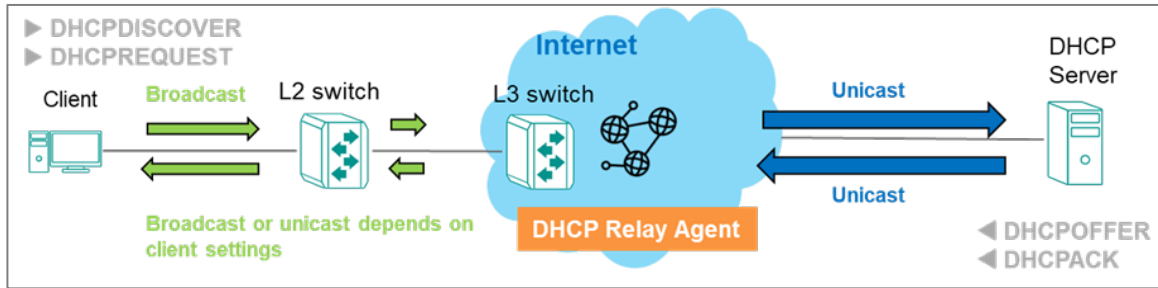
DHCP Relays can help reduce broadcast DHCP requests by relaying DHCP requests between networks.

### About DHCP Relay Agents

DHCP relay agents can provide a bridge for DHCP communication across network segments.

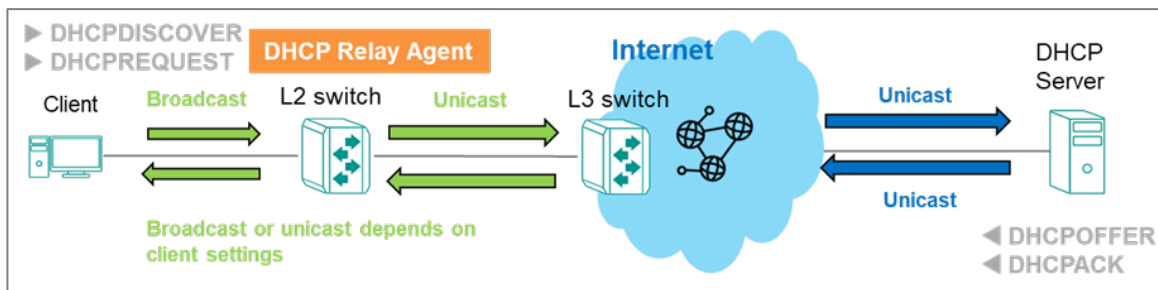
### DHCP Relays on L3 Switches

A DHCP Relay Agent on an L3 switch converts broadcast DHCP packets to unicast packets, and then routes them to the DHCP server.



## DHCP Relays on L2 Switches

On an L2 switch, the switch would convert DHCP broadcast packets to DHCP unicast packets, forward them to an L3 switch, which would then route them the DHCP server.



## Configuring DHCP Relay Agent

You can configure your switch to serve as a DHCP relay agent.

1. Sign in to the device using administrator credentials.
2. Go to **Network Service > DHCP Relay Agent > General**.
3. Under **DHCP Relay Agent**, choose **Enabled** from the drop-down menu.
4. Specify up to 4 addresses in the **DHCP Server Address** field, and then click **Apply** to save changes.

### Note

If DHCP Server Address is left blank, DHCP servers will be unable to reply to packets sent from connected clients.

5. To configure a **Port**, click the corresponding **[Edit]** button.


The **Edit Port** screen appears.



6. Specify all of the following:

Option	Value
<b>Relay</b>	To enable the relay, choose <b>Enabled</b> . To disable the relay while retaining settings, choose <b>Disabled</b> .
<b>Status</b>	To accept incoming DHCP packets from DHCP servers, choose <b>Trusted</b> from the drop-down menu.

7. Click **Apply** to save your changes.

 **Note**

You can copy your settings to other ports by selecting them from the drop-down menu.


## Configuring Option 82

Option 82 provides additional information in relayed packets that can make DHCP server address allocation more effective. If your DHCP server supports it, it can provide additional information that can facilitate context-aware address allocation, as well as more flexible tracking and management.

To configure Option 82:

1. Sign in to the device using administrator credentials.
2. Go to **Network Service > DHCP Relay Agent > General**, and then click **Option 82**.
3. Specify the ID that will be sent to the relay by clicking **Remote ID Type**, and then choosing an option from the drop-down menu.

For the **Other** option, you can specify a static value of up to 64 characters.

4. To enable **Option 82** on a given **Port**, click  **[Edit]** next to the corresponding **Port**.

 **Note**

The Edit Port screen appears.

5. Click **Option 82** and choose **Enable** from the drop-down menu.

6. Click **Apply** to save your settings.

## DHCP Relay Agent

**Menu Path:** Network Service > DHCP Relay Agent

This page lets you manage the DHCP Relay Agent feature of your device.

This page includes these tabs:

- General
- Option 82

### DHCP Relay Agent - General

**Menu Path:** Network Service > DHCP Relay Agent - General

This page lets you enable the DHCP Relay Agent feature and configure its related settings.







#### DHCP Relay Agent Settings

The screenshot shows the DHCP Relay Agent configuration interface. It features a header with the title 'DHCP Relay Agent' and two tabs: 'General' and 'Option 82'. The 'General' tab is active. Below the tabs, there is a dropdown menu for 'DHCP Relay Agent \*' with 'Disabled' selected. Underneath are four input fields for '1st Server IP Address', '2nd Server IP Address', '3rd Server IP Address', and '4th Server IP Address'. At the bottom left, there is a green 'APPLY' button.

UI Setting	Description	Valid Range	Default Value
<b>DHCP Relay Agent</b>	Enable or disable the DHCP Relay Agent feature on your device.	Enabled / Disabled	Disabled

UI Setting	Description	Valid Range	Default Value
<b>1st/2nd/3rd/4th Server IP Address</b>	Specify the 1st, 2nd, 3rd, and 4th server IP address.	Valid IP address	N/A

### DHCP Relay Agent - Port List

	Port	Relay	Status
	1	Disabled	Trusted
	2	Disabled	Trusted
	3	Disabled	Trusted
	4	Disabled	Trusted
	5	Disabled	Trusted
	6	Disabled	Trusted

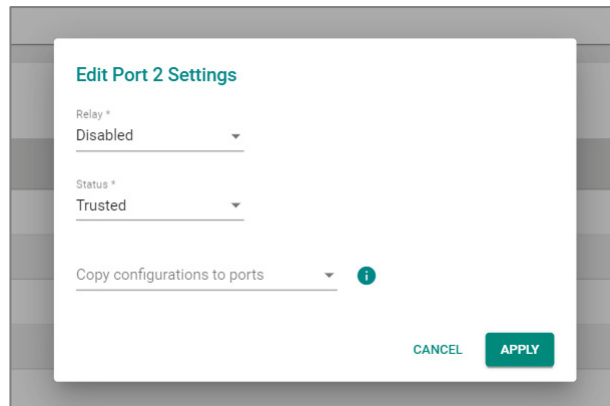
UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Relay</b>	Shows whether the relay function is enabled for the port.
<b>Status</b>	Shows the status of the relay on the port.

## DHCP Relay Agent - Edit Port Settings

### Menu Path: Network Service > DHCP Relay Agent - General

Clicking the **Edit** (✎) icon for a port on the **Network Service > DHCP Relay Agent - General** page will open this dialog box. This dialog lets you manage DHCP relay settings for the port.

Click **APPLY** to save your changes.



UI Setting	Description	Valid Range	Default Value
<b>Relay</b>	Enable or disable the relay function for the port.	Enabled / Disabled	Disabled
<b>Status</b>	Specify the relay status for the port. <ul style="list-style-type: none"><li>• <b>Trusted:</b> DHCP packets with Option 82 or with a non-zero giaddr will be accepted.</li><li>• <b>Untrusted:</b> DHCP packets with Option 82 or with a non-zero giaddr will be discarded.</li></ul>	Trusted / Untrusted	Trusted
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Option 82

### Menu Path: Network Service > DHCP Relay Agent - Option 82

This page lets you manage Option 82 and its related settings.

## Option 82 Settings

### DHCP Relay Agent

General
Option 82

Remote ID Type \*

IP ▼

Remote ID Value

192.168.127.252

.....

Remote ID Display







C0A87FFC

.....

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Remote ID Type</b>	Specify the remote ID type.	IP / MAC / Client ID / Other	IP
<b>Remote ID Value</b>	<p>If the <b>Remote ID Type</b> is <b>Other</b>, specify the remote ID value to use.</p> <p>For all other types, this shows the remote ID value for the selected remote ID type and cannot be edited.</p>	N/A	Varies depending on different options
<b>Remote ID Display</b>	Shows the remote ID. This field is read-only and cannot be changed.	N/A	Remote ID


## Option 82 - Port List

	Port	Option 82
	1	Disabled
	2	Disabled
	3	Disabled
	4	Disabled
	5	Disabled
	6	Disabled

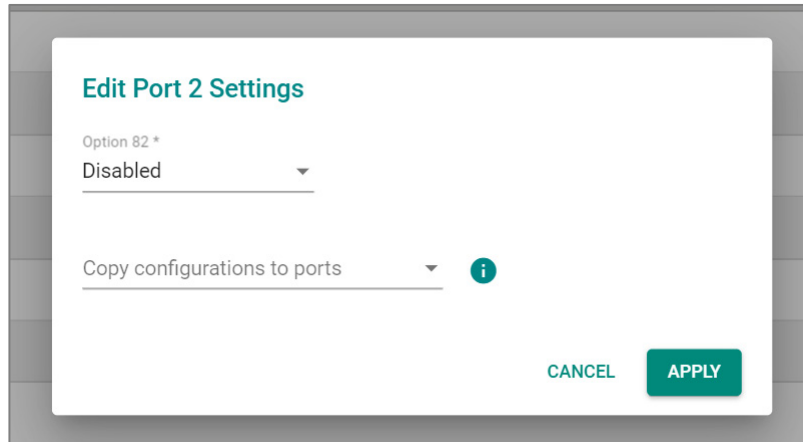
UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Option 82</b>	Shows whether Option 82 is enabled for the port.

## Option 82 - Edit Port Settings

### Menu Path: [Network Service](#) > [DHCP Relay Agent - Option 82](#)

Clicking the **Edit** () icon for an port on the **Network Service > DHCP Relay Agent - Option 82** page will open this dialog box. This dialog lets you to enable or disable Option 82 for the port.

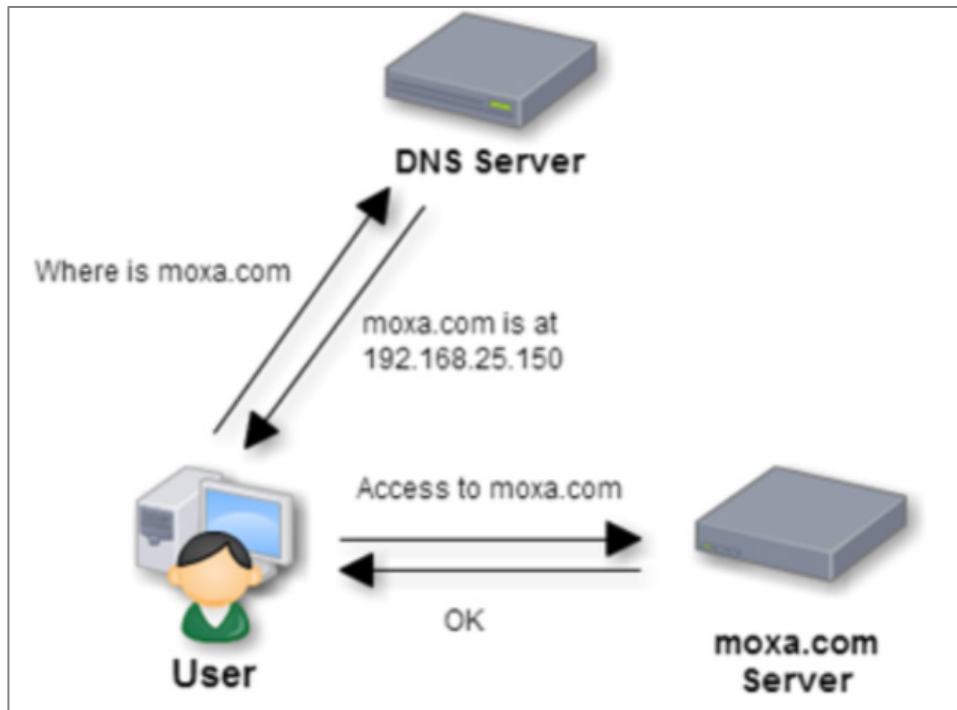
Click **APPLY** to save your changes.



UI Setting	Description	Valid Range	Default Value
<b>Option 82</b>	Enable or disable Option 82 for the port.	Enabled / Disabled	Disabled
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## About DNS Server

**DNS (Domain Name System)** is a hierarchical decentralized naming system for computers, services, or other resources connected to the Internet or a private network. It translates domain names, which are human-readable identifiers for resources, into IP addresses, which are numerical identifiers used to locate and communicate with these resources. For example, `http://www.moxa.com` is easier to remember than `http://92.115.213.11`.



While the DNS lookup translates domain names to IP addresses, **DNS Reverse Lookup** performs the opposite. It is a feature that allows the switch to identify the hostname (device name) associated with a known IP address on the network. Imagine you have an IP address on your network, like 192.168.1.100, but you don't know the corresponding device name (hostname). This is where DNS Reverse Lookup comes in. By querying a DNS server configured for reverse lookups, you can retrieve the hostname associated with that IP address. For instance, a reverse lookup for 192.168.1.100 might reveal the hostname "printer-server". This helps with network manageability by making it easier to recognize devices by their names instead of just IP addresses.

## Components of DNS

DNS has three major components:

1. **Domain Name Space and Resource Records:** A resource record is basically a single mapping between a resource and a name. These can map a domain name to an IP address; define the name servers for the domain, etc.
2. **Name Servers:** A name server is a device designated to translate domain names into IP addresses. These servers do most of the work in the DNS system. Since the total number of domain translations is too much for any one server, each



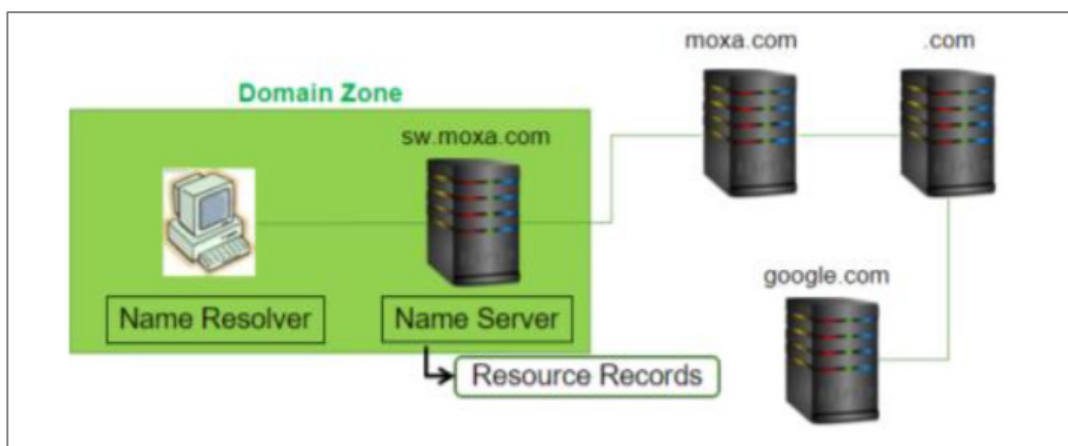
server may redirect request to other name servers or delegate responsibility for a subset of sub-domains they are responsible for.

3. **Resolvers:** Programs that extract information from name servers in response to client requests

For a Moxa "DNS Server" device feature, we will focus on the name server, the following section will further describe the name server and how it works.

## Name Servers in Depth

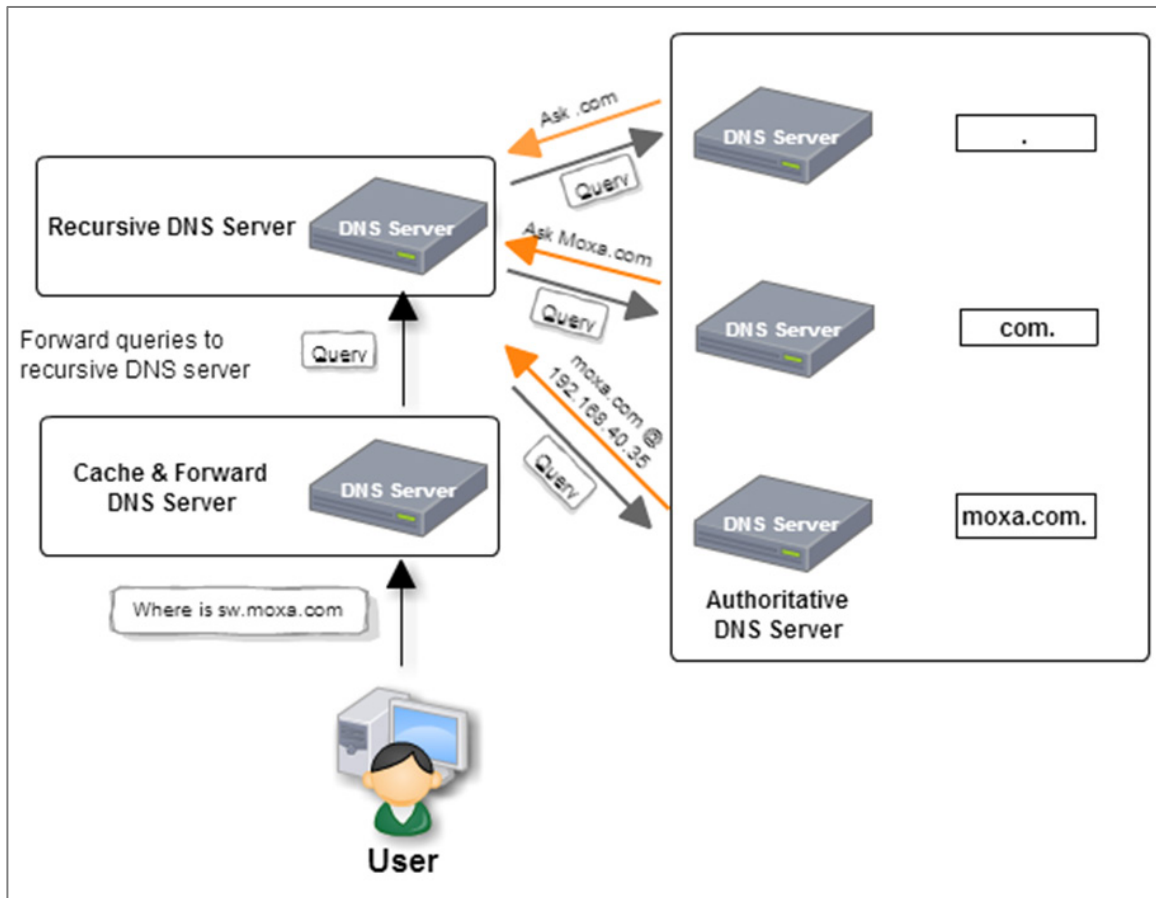
**Name servers** are the repositories of information that make up the domain database. The database is divided up into sections called **zones**, which are distributed among the name servers. While name servers can have several optional functions and sources of data, the essential task of a name server is to answer queries using data in its zones. As earlier mentioned, the database in name server is divided up into sections called zones. Each zone will be described by many different types of resource records (RRs). The DNS specifies a set of various types of resource records, which are the basic information elements of the domain name system.



A domain name identifies a node. Each node has a set of resource information, which may be empty. The set of resource information associated with a particular name is composed of separate RRs. The order of RRs in a set is not significant, and need not be preserved by name servers, resolvers, or other parts of the DNS. The basic RR formats are defined in RFC 1034.

There are three types of name servers:

- **Authoritative Name Server:** Authoritative name servers are assigned to be responsible for their supported domains, returns answers only to queries about domain names that have been specifically configured by the administrator. An authoritative name server can either be a master server or a slave server. A master server is a server that stores the original (master) copies of all zone records. A slave server uses an automatic updating mechanism of the DNS protocol in communication with its master to maintain an identical copy of the master records. The zone records can be distributed to all authoritative name servers in the same zone by many ways, the preferred method is the zone transfer of the DNS protocol.
- **Caching & Forwarding Name Server:** Caching & forwarding name server forwards queries to other authoritative or recursive name server when user queries a domain which is out of the authority of this name server. It caches the response from other DNS server to improve the efficiency of the DNS by reducing DNS traffic across the Internet, and by reducing load on authoritative name-servers, particularly root name-servers.
- **Recursive Name Server:** If the DNS queries cannot reply from either the authoritative or caching DNS information in name servers, queries might be forward to recursive DNS server. Recursive DNS server queries the root DNS server from the TLD of the domain you are trying to reach. The root DNS servers then send the information about the authoritative DNS server back to recursive server. The operation will repeat many times if needed, until the queried domain name is found.



## How the Root DNS Server Knows the Location of the ".com" DNS Server

In the Domain Name System (DNS), each domain is managed by its parent domain. For instance, the ".com" domain is delegated by the root DNS server, represented as ".". When ".com" is delegated, the root DNS server adds ".com" as an authoritative server in its database. This ensures that when a query for a ".com" domain is received, the root DNS server can direct it to the appropriate ".com" authoritative DNS server.

### Delegation Process

- Parent to Child Delegation:** The root DNS server must have up-to-date records of which DNS servers are authoritative for each sub-domain. Whenever new DNS servers are added to a child domain like ".com," they must be registered with the parent domain (in this case, the root DNS server).
- Maintaining Delegation:** Keeping this delegation accurate and up-to-date manually can be challenging. It requires that any changes in the child domain's authoritative servers are promptly reflected in the parent domain's records.

A stub zone can be a useful tool in some scenarios. It helps automate the update process for the authoritative zone data, ensuring that the delegation information between parent and child domains remains current without requiring constant manual updates.

## **DNS Server for Layer 2 Switch in Railway Field**

Generally, the DNS is the hierarchical and decentralized naming system used to identify computers reachable through the Internet or other Internet Protocol (IP) networks. The resource records contained in the DNS server in corresponding zone can provide necessary information for DNS queries.

In railway field, the DNS is a nonhierarchical and centralized naming system, and the L2 switch DNS server acts as a local authoritative DNS server. It contains a statically configured database of IP addresses and their associated hostnames, and it translates the FQDN to an IP address for DNS clients. The IP address could be either a multicast IP (may represents a service) or a unicast IP (device IP address). For example, it can translate "ext.door.consist" to "225.1.32.170", and "ext.door.train1" to "10.1.34.170".

Obviously, it is much simpler to remember a word like "door1" instead of a series of numbers. With DNS server, customers will be much easier to manage IP address allocation during the process of the communication system construction.

## **Example: Configuring DNS Server for a Consist Door**

In this procedure, we will create a Zone and a corresponding domain name, and then configure mapping between hostnames and IP addresses.

Zones allow you to create private analogues to top level domains. They allow you to reuse the same hostname without creating conflicts, for example:

- Zone 1 is named moxa1
- Zone 2 is named moxa2


Let's further suppose that you have one door on each consist in a train setup:

- consist1.door in Zone 1 moxa1 with an IP address of 192.168.1.10
- consist1.door in Zone 2 moxa2 with an IP address of 192.168.2.10

The resulting mapping will be


- consist1.door.moxa1 resolves to 192.168.1.10
- consist1.door.moxa1 resolves to 192.168.2.10

To configure the device as a DNS server, do the following:

1. Sign in to the device using administrator credentials.
2. Go to **Network Service > DNS Server** and then click **Global**.
3. Under **DNS Server**, choose **Enabled** from the dropdown menu, and then click **Apply**.
4. Create a Zone by clicking the **Settings** settings tab, and then under Zone Table, click  **[Add]**.

The Create a Zone screen appears.

5. Under **Index**, specify a Zone from the list. Type a **Domain Name** for the domain you choose, and then click **Create**.

 **Note**

Each Zone must have a unique domain name.

This Zone will be mapped to the domain name, and **DNS Table for --** will be updated with the Zone index you selected, such as **DNS Table for ZONE-1**. If multiple zones have been created, you can choose the correct zone by choosing from the drop-down menu.

6. To create a DNS host entry, under DNS Table for ZONE, click  **[Add]**.

The **Create Resource Record for ZONE** screen appears.

7. Specify the **Hostname** and corresponding **IP Address**, and then click **Create**.

If we specify a **Hostname** of consist1.door and an IP of **192.168.1.10**

The record appears in the DNS Table.

## DNS Server

**Menu Path: Network Service > DNS Server**

This page lets you configure the DNS server settings.

This page includes these tabs:

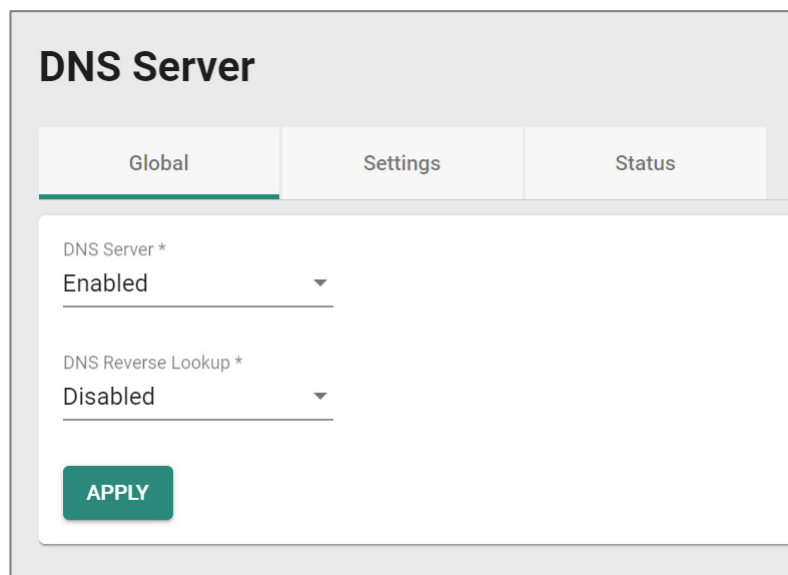
- Global
- Settings
- Status

## DNS Server - Global

**Menu Path:** Network Service > DNS Server - Global

This page lets you configure the DNS server related settings. Click **APPLY** to save your changes.

### DNS Server Settings



**DNS Server**

Global Settings Status

DNS Server \*  
Enabled

DNS Reverse Lookup \*  
Disabled

APPLY

UI Setting	Description	Valid Range	Default Value
<b>DNS Server</b>	Enable or disable the DNS server for your device.	Enabled / Disabled	Disabled
<b>DNS Reverse Lookup</b>	Enable or disable DNS reverse lookup for your device. DNS reverse lookup allows the switch to identify the hostname (device name) associated with a known IP address on the network.	Enabled / Disabled	Disabled

## DNS Server - Settings

**Menu Path: Network Service > DNS Server - Settings**

This page lets you configure the DNS server zone settings.

### Limitations

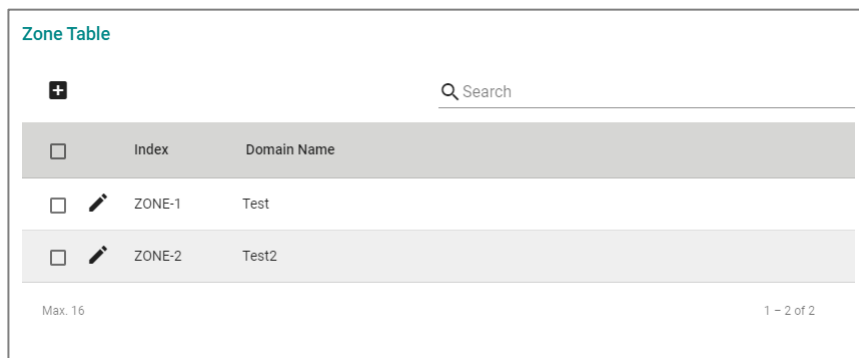
Up to 16 DNS zones can be created.

### Limitations

Up to 256 resource records can be created for each zone.

## Zone Table

Zones provide a structured way to manage and organize DNS records for a domain. They allow administrators to group related records together and apply consistent configurations across the domain.



The screenshot shows a 'Zone Table' interface. At the top left is a plus sign icon for adding a new zone. To the right is a search bar with a magnifying glass icon and the text 'Search'. Below these is a table with two columns: 'Index' and 'Domain Name'. The table contains two rows: one for 'ZONE-1' with domain 'Test' and one for 'ZONE-2' with domain 'Test2'. Each row has a checkbox on the left and a pencil icon for editing. At the bottom left of the table area, it says 'Max. 16'. At the bottom right, it says '1 - 2 of 2'.

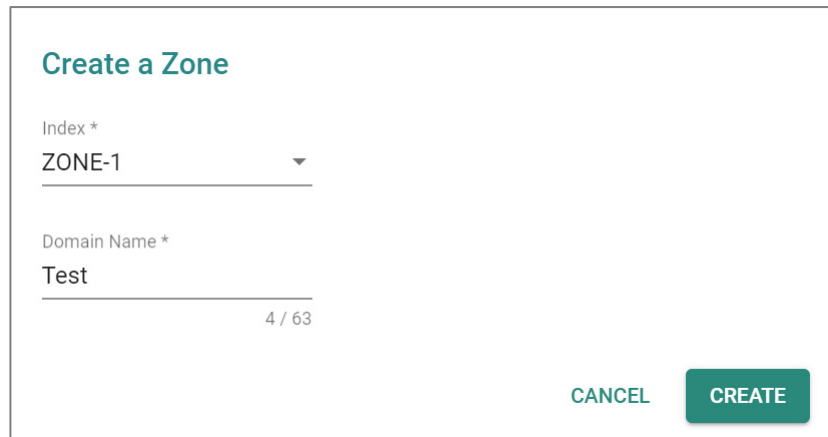
UI Setting	Description
<b>Index</b>	Shows the number of the zone the entry is for.
<b>Domain Name</b>	Shows the domain name of the zone.

## Create a Zone

### Menu Path: Network Service > DNS Server - Settings

Clicking the **Add (+)** icon on the **Network Service > DNS Server - Settings** page will open this dialog box. This dialog lets you create a zone for the DHCP server.

Click **CREATE** to save your changes and add the new zone.



UI Setting	Description	Valid Range	Default Value
<b>Index</b>	Select a zone to create.	Drop-down list of zones	N/A
<b>Domain Name</b>	Specify a domain name for the zone.	Up to 63 characters	N/A

## DNS Table

Select a zone from the drop-down list to see its DNS table.



UI Setting	Description
<b>Hostname</b>	Shows the hostname of the resource record.



UI Setting	Description
<b>IP Address</b>	Shows the IP address of the resource record.

## Create a Resource Record

### Menu Path: Network Service > DNS Server - Settings

Clicking the **Add (+)** icon in a DNS table on the **Network Service > DNS Server - Settings** page will open this dialog box. This dialog lets you create resource records for the displayed zone.

Click **CREATE** to save your changes and add the resource record for the displayed zone.

#### Note

Resource records cannot be created for a zone until the corresponding zone has been created.

**Create Resource Record for ZONE-1**

Hostname \*  
 4 / 63

IP Address \*

UI Setting	Description	Valid Range	Default Value
<b>Hostname</b>	Specify the host name for the resource record.	1 to 63 characters	N/A
<b>IP Address</b>	Specify the IP address for the resource record.	Valid IP address	N/A

## DNS Server - Status

### Menu Path: Network Service > DNS Server - Status

This page lets you see the DNS server's overall status.

## DNS Server Summary

### DNS Server Summary

DNS Server  
**Enabled**

DNS Reverse Lookup  
**Disabled**

UI Setting	Description
<b>DNS Server</b>	Shows whether the DNS server is enabled for the device.
<b>DNS Reverse Lookup</b>	Shows whether DNS reverse lookup is enabled for the device

## Status - Zone Table

Zone Table

🔍 Search

Index	Domain Name
ZONE-1	Test
ZONE-2	Test2

1 - 2 of 2

UI Setting	Description
<b>Index</b>	Shows the index of the zone the entry is for.
<b>Domain Name</b>	Shows the domain name of the zone.

**Status - DNS Table**

DNS Table for ZONE-1 ▾

🔍 Search

FQDN ▾	IP Address
Test.Test	19.126.255.5

1 - 1 of 1

UI Setting	Description
<b>FQDN</b>	Shows the full qualified domain name (FQDN) of the resource record, which is in the format "Hostname.Domain Name".  For example, if the hostname is "door1" and the domain name for the zone is "train1", the FQDN will be "door1.train1".
<b>IP Address</b>	Shows the IP address of the resource record.

# Security

## Menu Path: Security

This section lets you configure the security settings of your device.

This section includes these pages:

- Device Security
- Network Security
- Authentication

## Device Security

### Menu Path: Security > Device Security

This section lets you configure the device-level security settings of your device.

This section includes these pages:

- Login Policy
- Trusted Access
- SSH & SSL

## Login Policy

Login Policy lets you define and enforce login restrictions to improve the security of your device and protect it from unauthorized access from brute force attacks.

## Login Policy

### Menu Path: Security > Device Security > Login Policy

This page lets you configure the login policies for your device.

Click **APPLY** to save your changes.

## Login Policy Settings

### Login Policy

Login Message / 500

---

Login Authentication Failure Message / 500

---

Account Login Failure Lockout \*

Disabled ▼

Retry Failure Threshold \*

5

1 - 10 times

Lockout Duration \*

5

1 - 10 min.

Auto Logout After \*

5

0 - 1440 min.

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Login Message</b>	Specify the welcome message to display when users log in to the device.	0 to 500 characters	N/A
<b>Login Authentication Failure Message</b>	Specify the message to display if the user fails to log in.  <div style="background-color: #fff9c4; padding: 5px; border: 1px solid #ccc;"> <p><b>⚠ Warning</b></p> <p>The Login Authentication Failure Message should not include information about passwords or other sensitive information.</p> </div>	0 to 500 characters	N/A
<b>Account Login Failure Lockout</b>	Enable or disable the lockout function, which will temporarily prevent users from logging in for the <b>Lockout Duration</b> after the <b>Retry Failure Threshold</b> is exceeded. This can be useful for preventing brute force attacks.	Enabled / Disabled	Disabled
<b>Retry Failure Threshold</b>	Specify the number of login retry attempts allowed before the user is locked out for the <b>Lockout Duration</b> .	1 to 10	5
<b>Lockout Duration</b>	Specify the lockout duration in minutes during which a locked-out user will be unable to log in.	1 to 10	5
<b>Auto Logout After</b>	Specify the amount of time in minutes a user can be idle before they will be automatically logged out from the device.	0 to 1440	5

## About Trusted Access

Trusted Access is a feature that allows device management only from trusted IP addresses that you specify.

Trusted access is a crucial mechanism for maintaining the security and integrity of your network infrastructure. It ensures that only authorized devices can connect to sensitive network resources, reducing the risk of unauthorized access and potential security breaches.

### Why Trusted Access Matters

- **Security:** By allowlisting IP addresses, administrators ensure that only devices with approved IP addresses can access the network configuration, helping to prevent unauthorized connections.
- **Access Control:** Trusted access enables administrators to define which IP addresses can connect to sensitive resources, ensuring that only trusted devices interact with critical areas of the network.

### How Trusted Access Works


Enabling trusted access on a device involves configuring IP allowlists. Once an IP address is allowlisted, the device treats it as trusted, allowing access to device management functions. Devices not on the allowlist are denied access, helping to maintain a secure and controlled network environment.

### Example: Configuring and Enabling Trusted Access

Enable trusted IP address settings to only allow users to access network device management features from IP addresses you choose. Only IPv4 addresses are supported.

Make sure you add all management devices to the allowlist before enabling Trusted Access, otherwise you may lose access to the management console.

To configure trusted access, do the following:

1. Sign in to the device using administrator credentials.
2. Go to **Security > Device Security > Trusted Access**, and then click  **[Add]**.

The Create Entry screen appears.

3. Specify the **IP Address** and **Subnet Mask** of the device to add the device IP to the allowlist, and then click **Create**.

The specified **IP Address** and **Netmask** appear on the Trusted Access list.

4. Once you have created entries for all devices, under **Trusted Access**, choose **Enabled**, and then click **Apply**.

Trusted access will now be enabled, and only devices on the allowlist will be able to access management features.

## Trusted Access

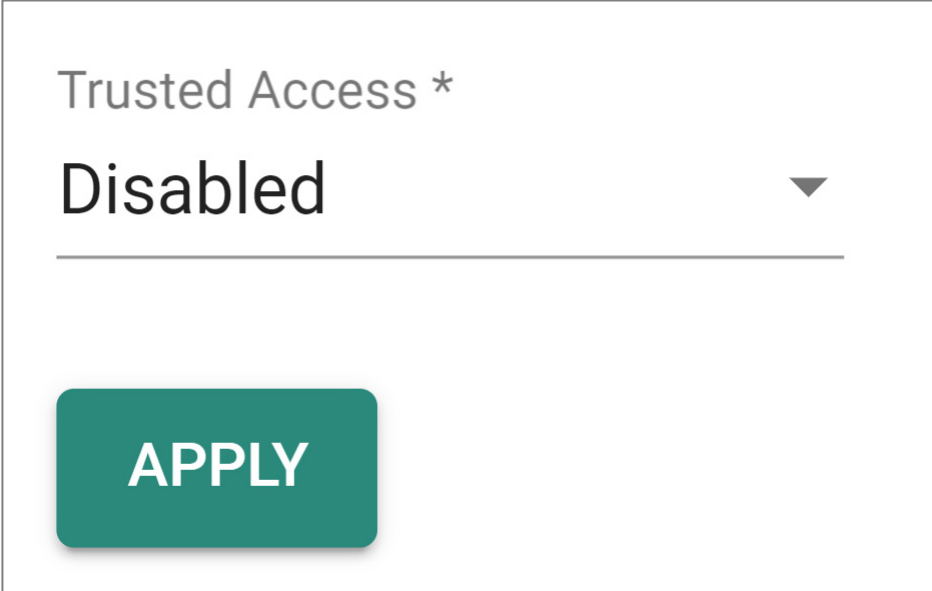
**Menu Path: Security > Device Security > Trusted Access**

This page lets you limit access to the device to trusted IP addresses you specify. You can also limit access to the device to LAN connections only.

### ⓘ Limitations

You can create up to 20 trusted IP entries.

## Trusted Access Settings



Trusted Access \*

Disabled

APPLY

UI Setting	Description	Valid Range	Default Value
<b>Trusted Access</b>	<p>Enable or disable the Trusted IP List.</p> <p><b>Enabled:</b> Only IP addresses in the Trusted IP List can access the device.</p> <p><b>Disabled:</b> Any IP address can access the device.</p> <div style="background-color: #f0f0f0; padding: 10px; margin: 10px 0;"> <p><b>Note</b></p> <p>Trusted Access cannot be enabled if there are no entries in the Trusted Access List.</p> </div> <div style="background-color: #fff9c4; padding: 10px; margin: 10px 0;"> <p><b>Warning</b></p> <p>Depending on the features you enable, you may lose access to your device if the computer you are using to configure the device is not in the Trusted Access List or connected through a LAN connection.</p> </div>	Enabled / Disabled	Disabled

## Trusted Access List

		Search
<input type="checkbox"/>	IP Address	Netmask
<input type="checkbox"/>	196.122.23.23	255.255.255.0
Max. 20		1 - 1 of 1

UI Setting	Description
<b>IP Address</b>	Shows the IP address of the Trusted IP entry.
<b>Subnet Mask</b>	Shows the netmask of the Trusted IP entry.

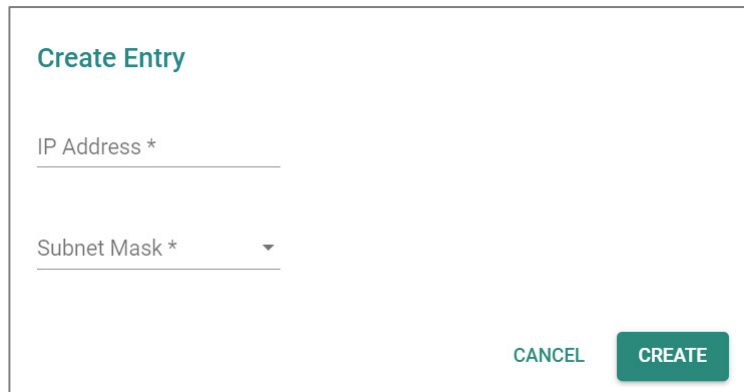


## Trusted Access - Create Entry

### Menu Path: Security > Device Security > Trusted Access

Clicking the **Add (+)** icon on the **Security > Device Security > Trusted Access** page will open this dialog box. This dialog lets you create a trusted IP entry.

Click **CREATE** to save your changes and add the new entry.



The image shows a 'Create Entry' dialog box with a white background and a thin border. At the top left, the title 'Create Entry' is displayed in a teal color. Below the title, there are two input fields: 'IP Address \*' and 'Subnet Mask \*'. The 'IP Address \*' field is a text input, and the 'Subnet Mask \*' field is a dropdown menu. At the bottom right of the dialog, there are two buttons: a light teal 'CANCEL' button and a darker teal 'CREATE' button.

UI Setting	Description	Valid Range	Default Value
<b>IP Address</b>	Specify the IP address of the trusted host(s).	Valid IP Address	N/A
<b>Subnet Mask</b>	Select a netmask for the trusted host(s).	Drop-down list of subnet masks	N/A

## SSH & SSL

SSH and SSL are security protocols.

- **Secure Shell (SSH):** SSH is the recommended protocol for secure command-line access. This protocol encrypts the communication channel between a user and a device's management interface. This helps ensure that any data exchanged—like usernames, passwords, or configuration commands—remains hidden from eavesdroppers on the network.
- **Secure Sockets Layer (SSL):** While functionally similar to SSH, SSL is often used for web-based applications. Though The term "Secure Sockets Layer (SSL)" is still commonly used, it's important to note that it's been deprecated in favor of the more secure Transport Layer Security (TLS) protocol. In the context of

Ethernet switches, some may offer a web interface for management tasks. Moxa switches support TLS versions 1.2 and 1.3. TLS encrypts the communication channel between a user's web browser and a device's web interface. This ensures the security of sensitive data during remote configuration tasks performed through the web interface.

**Note**

Certificates: Self-signed vs. Trusted

There are two main types of certificates used for TLS connections: self-signed certificates and trusted certificates.

- Self-signed certificates: These certificates are issued by the device itself and are not verified by a third-party Certificate Authority (CA). While they provide basic encryption, they may generate warnings in web browsers due to the lack of trust verification.
- Trusted certificates: These certificates are issued by a trusted CA and are generally considered more secure. Web browsers readily accept connections secured with trusted certificates.

The choice between self-signed and trusted certificates depends on your specific security requirements.

## SSH & SSL

**Menu Path: Security > Device Security > SSH & SSL**

This page lets you manage your SSH key and SSL certificate.

This page includes these tabs:

- SSH
- SSL

### SSH

**Menu Path: Security > Device Security > SSH & SSL - SSH**

This page lets you manage your device's SSH key.

**Note**

Regenerating your SSH key regularly strengthens SSH security by invalidating potentially compromised keys and adding another layer of defense against unauthorized access. There's no one-size-fits-all answer for how often to regenerate keys; it depends on security risk factors like server importance, access frequency, and potential exposure. Consider regenerating them every few months or every year, especially for critical servers.

## Regenerate SSH Key

Created on  
Aug 10 07:23:59 2023 GMT

---

Regenerate SSH Key

**REGENERATE**

UI Setting	Description	Valid Range	Default Value
<b>Created on</b>	Shows the date and time the current SSH key was created.	N/A	N/A
<b>Regenerate SSH Key</b>	Click <b>REGENERATE</b> to regenerate the SSH key.  <b>Warning</b> Regenerating the SSH key will restart the device's system services and will make the device temporarily unavailable.	N/A	N/A

## SSL

### Menu Path: Security > Device Security > SSH & SSL - SSL

This page lets you manage your device's SSL certificate. Click **APPLY** to save your changes.

## Certificate Information

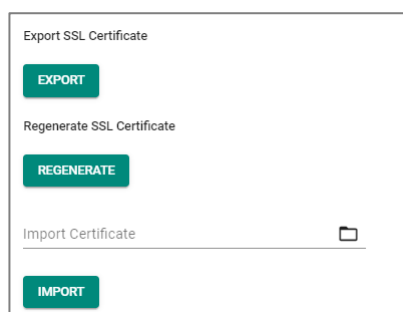
Certificate Information	
CA Name	Expiration Date
Moxa Networking Co., Ltd.	2034-01-18 18:53:53

UI Setting	Description
<b>CA Name</b>	Shows the CA name of the SSL certificate.
<b>Expiration Date</b>	Shows when the current certificate will expire.

## SSL Settings

To import a customer certificate, follow the steps below:

1. Import root CA generated by customer's CA server to a PC.
2. 'Export' the CSR file from the switch and use the customer's CA server to generate a certificate.
3. 'Import' the certificate to the switch.



UI Setting	Description	Valid Range	Default Value
<b>Export SSL Certificate Request</b>	Click <b>EXPORT</b> to export the SSL certificate to your local computer.	N/A	N/A
<b>Regenerate SSL Certificate</b>	Click <b>REGENERATE</b> to regenerate the SSL certificate.	N/A	N/A
<b>Import Certificate</b>	Select an SSL certificate from your computer, then click <b>IMPORT</b> to import the certificate to your device.	N/A	N/A

## Network Security

### Menu Path: Security > Network Security

This section lets you configure the network-level security settings of your device.

This section includes these pages:

- IEEE 802.1X
- MAC Authentication Bypass
- Port Security
- Traffic Storm Control
- Access Control List
- Network Loop Protection
- Binding Database
- DHCP Snooping
- IP Source Guard
- Dynamic ARP Inspection

## **IEEE 802.1X**

IEEE 802.1X is a standard for managing access control, ensuring that devices seeking to access network resources are what they claim to be.

### **About IEEE 802.1X**

802.1X is a standard for port-based Network Access Control (NAC) that provides an authentication framework for devices trying to connect to a network.

Part of the IEEE 802.1 group of networking protocols, the primary purpose of 802.1X is to enhance the security of wired and wireless networks by requiring users and devices to authenticate themselves before gaining access to network resources.

### **Topology**

An 802.1X topology has three roles:

- Supplicant: The client device (e.g., laptop, smartphone) seeking network access.
- Authenticator: The network device (e.g., switch, wireless access point) that controls access to the network ports.

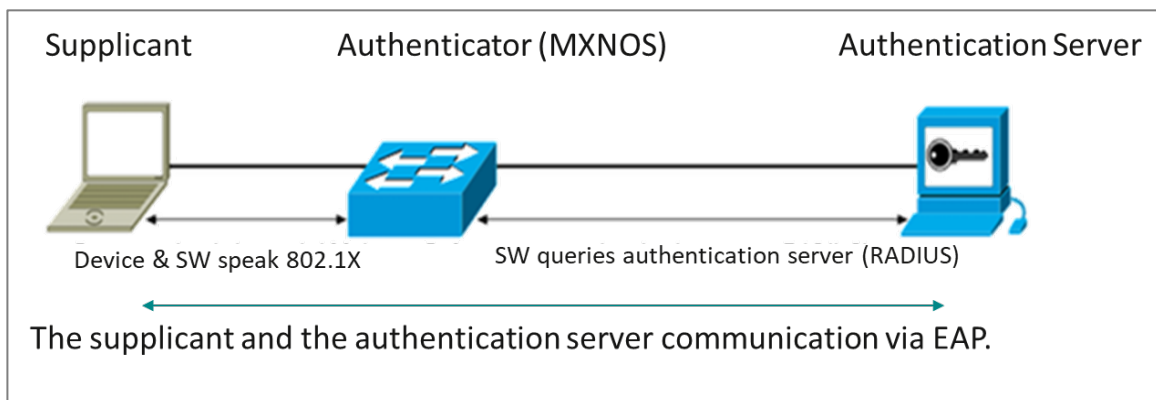
- **Authentication Server:** A server that performs the actual authentication of the supplicant. It could be a RADIUS (Remote Authentication Dial-In User Service) server or another centralized authentication service.

**Note**

In an 802.1X environment, Moxa switches primarily function as authenticators. However, they can also be optionally configured to act as authentication servers.

In an 802.1X authentication system, the supplicant (client), authenticator device (Switch or Wi-Fi AP), and authentication server exchange information using the Extensible Authentication Protocol (EAP).

A supplicant and an authenticator exchange EAPOL (Extensible Authentication Protocol over LAN) frames with each other. We can either use an external RADIUS server as the authentication server or implement the authentication server in the Moxa switch by using a Local User Database as the authentication look-up table. When using an external RADIUS server as the authentication server, the authenticator and the authentication server exchange EAP frames.

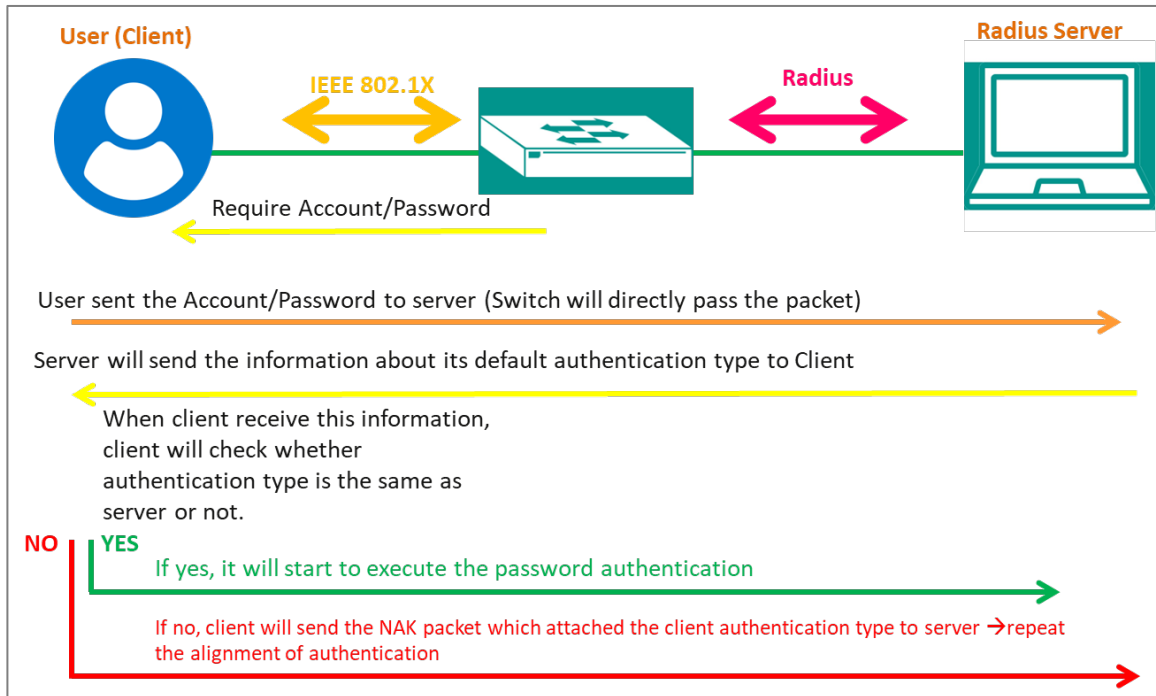


**Note**

It is possible to use 802.1X authentication without a separate authentication server using local authentication. The Authenticator can be configured to determine client access rights.

### Authentication Process

When a device connects to a network port configured for 802.1X, the following process occurs:



1. Initialization: The supplicant sends an EAPOL (Extensible Authentication Protocol Over LAN) start message to the authenticator.
2. Authentication Request: The authenticator replies with an EAP Request/Identity message, prompting the supplicant to provide its identity.
3. Identity Response: The supplicant responds with its identity, typically a username.
4. Authentication Exchange: The authenticator relays the identity to the authentication server, which then initiates an authentication exchange with the supplicant using EAP (Extensible Authentication Protocol).
5. Authentication Result: Based on the outcome of the authentication process (which could involve methods like username/password, digital certificates, or other credentials), the authentication server sends an Accept or Reject message to the authenticator.
6. Access Granted/Denied: If authentication is successful, the authenticator allows the supplicant access to the network. If authentication fails, access is denied.

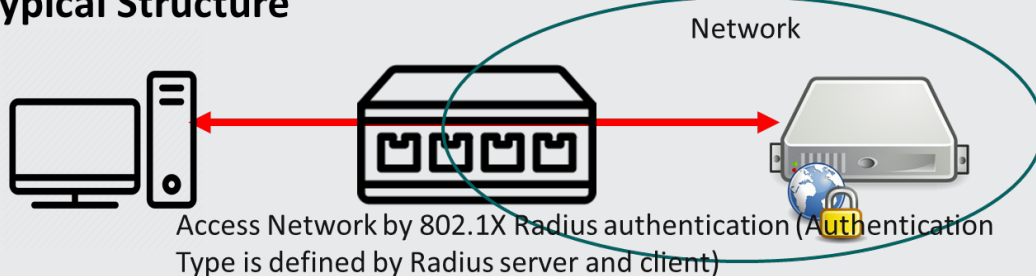
802.1X provides a robust mechanism for controlling network access, ensuring that only authorized users and devices can connect to the network. It's widely used in enterprise environments to enforce security policies and protect against unauthorized access. The following diagram illustrates the process of a client establishing 802.1X communication with the authentication server through the MXNOS switch.

**Note**

Authentication can also be initiated by the authenticator. Ordinarily, supplicants initiate the authentication process, with an EAPOL-Start frame sent to the authenticator. When the authenticator initiates the authentication process (either on its own, or on receipt of an EAPOL-Start frame), it sends an EAP Request/Identity frame to ask for the username of the supplicant.

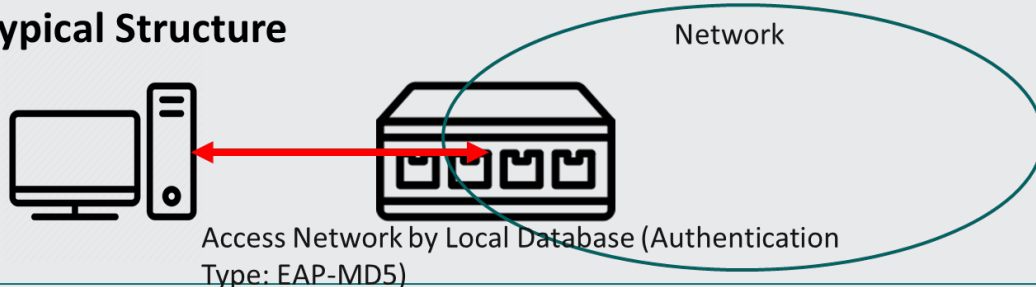
**802.1X Radius**

**Typical Structure**



**802.1X Local**

**Typical Structure**

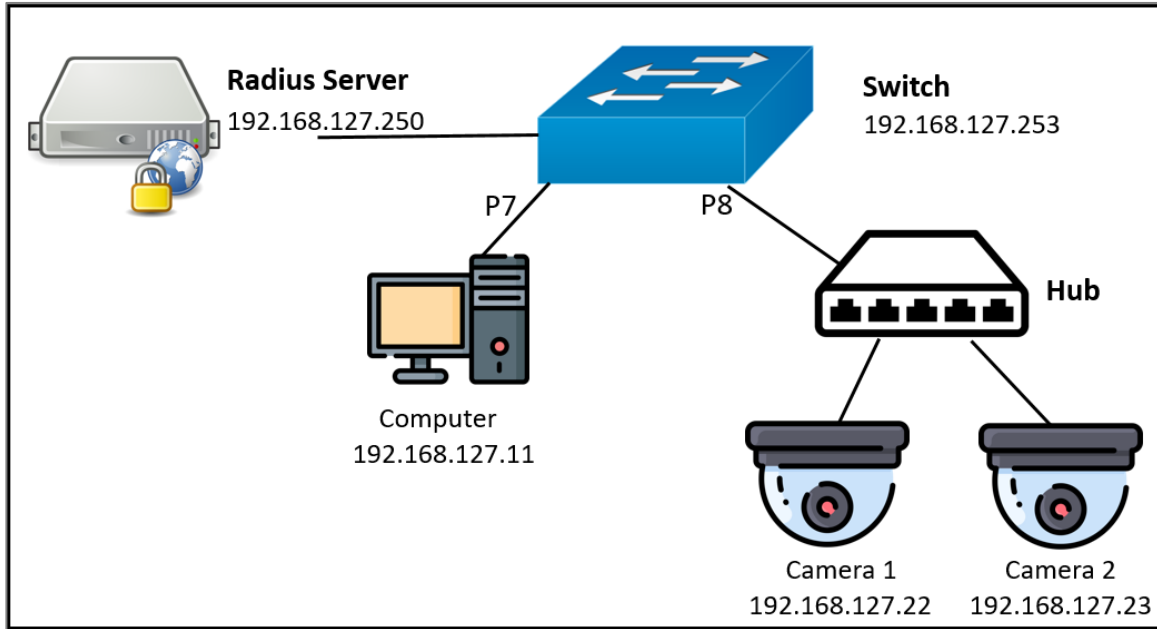


**Example: Configuring a Switch as an Authenticator**

In this example, we configure a Moxa switch as an authenticator, connecting supplicant devices (2 cameras and a computer) to a RADIUS server.

Our sample topology should look like the following:






The topology uses the following roles:

- Supplicants:
  - Cameras 1 and 2, connected to the switch with a hub on port 8
  - Computer, connected on Port 7
- Authenticator: Switch
- Server: RADIUS server

**Before you begin:** This task uses sample values and assumes that a RADIUS server is already configured.


To configure the switch as an authenticator, do the following:

1. Sign in to the device using administrator credentials.
2. Got to **Security > Network Security > IEEE 802.1X**→**General**.
3. Click **IEEE 802.1X** and choose **Enabled** from the drop-down menu.
4. Click **Authentication Mode**, choose **RADIUS** from the drop-down menu, and then click **Apply** to save your settings.
5. To configure the example computer, click  **[Edit]** corresponding to **Port 7**.  
**Result:** The **Port Settings** screen appears.
6. Configure the following:

7.

Option	Value
Enabled	Enabled
Port Control	Auto
Authentication Session Type	Port-Based
Max. Request	2
Quiet Period	60
Reauthentication	Disabled

8. Click **Apply**.

9. To configure the example cameras, click  **[Edit]** corresponding to **Port 8**.

**Result:** The **Port Settings** screen appears.

10. Configure the following:

Option	Value
Enabled	Enabled
Port Control	Auto
Authentication Session Type	MAC-based
Max. Request	2
Quiet Period	60
Reauthentication	Disabled

11. Click **Apply**.

**What to do next:** You must configure RADIUS server settings before the switch can function as an authenticator.

### Example: Configuring RADIUS Server Settings

The switch must be configured with the RADIUS server settings before it can serve as an authenticator.

1. Sign in to the device using administrator credentials.
2. Go to **Security > Network Security > IEEE 802.1X > RADIUS**.
3. Specify all of the following:

Option	Value
<b>Server IP Address 1</b>	192.168.127.11
<b>Auth Port</b>	1812
<b>Share Key</b>	Type your key here
<b>Timeout</b>	5
<b>Retransmit</b>	5

4. Click **Apply** to save changes.

**What to do next:** Once configured, status information will be available under **Security > Network Security > IEEE 802.1X > Status**.

## IEEE 802.1X

**Menu Path:** [Security > Network Security > IEEE 802.1X](#)

This page lets you manage your device's IEEE 802.1X authentication feature.

This page includes these tabs:

- General
- RADIUS
- Local Database

### IEEE 802.1X - General

**Menu Path:** [Security > Network Security > IEEE 802.1X - General](#)

This page lets you configure your device's IEEE 802.1X settings.

## IEEE 802.1X Settings

IEEE 802.1X \*  
 Disabled ▼

---

Authentication Mode \*  
 Local Database ▼

---

APPLY

UI Setting	Description	Valid Range	Default Value
<b>IEEE 802.1X</b>	Enable or disable IEEE 802.1X authentication.  <div style="background-color: #f0f0f0; padding: 5px; border: 1px solid #ccc;"> <p><b>Note</b></p> <p>Enabling IEEE 802.1X allows VLAN assignment through a RADIUS server, but the VLAN must already exist.</p> </div>	Enabled / Disabled	Disabled
<b>Authentication Mode</b>	Specify the authentication mode to use. <ul style="list-style-type: none"> <li><b>RADIUS:</b> Use a RADIUS server for authentication.</li> <li><b>Local Database:</b> Use the local database for authentication.</li> </ul>	RADIUS / Local Database	Local Database

## IEEE 802.1X List

Port	Enable	Port Control	Max. Request	Quiet Period	Reauthentication	Reauthentication Period	Server Timeout	Supp Timeout	Tx Period	Port Status
1	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
2	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
3	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
4	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
5	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
6	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
7	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
8	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
9	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
10	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized
11	Disabled	Auto	2	60	Disabled	3600	30	30	30	Authorized

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Enable</b>	Shows whether IEEE 802.1X is enabled for the port.
<b>Port Control</b>	Shows the port control method used for the port.
<b>Max. Request</b>	Shows the maximum number of re-authentication requests allowed for the port.
<b>Quiet Period</b>	Shows the amount of time in seconds the device will remain in a quiet state following a failed authentication exchange with a client through the port.
<b>Reauthentication</b>	Shows whether IEEE 802.1X reauthentication is enabled for the port.
<b>Reauthentication Period</b>	Shows the amount of time in seconds to wait in between reauthentication attempts for the port.
<b>Server Timeout</b>	Shows the amount of time in seconds the device will try to retransmit packets to an authentication server.
<b>Supp Timeout</b>	Shows the amount of time in seconds the device will try to retransmit packets to a supplicant, such as a client PC.
<b>Tx Period</b>	Shows the amount of time in seconds the device will try to retransmit the data to a client.

## IEEE 802.1X - Edit Port Settings

**Menu Path:** Security > Network Security > IEEE 802.1X - General

Clicking the **Edit** (✎) icon for a port on the **Security > Network Security > IEEE 802.1X - General** page will open this dialog box. This dialog lets you edit the IEEE 802.1X settings for the port.

Click **APPLY** to save your changes.

### Port 1 Settings

Enabled\*  
Disabled ▼

Port Control\*  
Auto ▼

Max. Request\* Quiet Period\*  
2 60

1 - 10 times 0 - 65535 sec.

Reauthentication\* Reauthentication Period\*  
Disabled 3600

1 - 65535 sec.

Server Timeout\*  
30

1 - 65535 sec.

Supp Timeout\*  
30

1 - 65535 sec.

Tx Period\*  
30

1 - 65535 sec.

Copy configurations to ports ▼ ⓘ

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Enabled</b>	Enable or disable IEEE 802.1X authentication for the port.	Enabled / Disabled	Disabled
<b>Port Control</b>	Select the port control method to use for the port. <ul style="list-style-type: none"> <li><b>Force Unauthorized:</b> The controlled port will stay in the unauthorized state.</li> <li><b>Auto:</b> The controlled port will be set to the authorized or unauthorized state based on the outcome of an authentication exchange between the supplicant and the authentication server.</li> <li><b>Force Authorized:</b> The controlled port will stay in the authorized state.</li> </ul>	Force Unauthorized / Auto / Force Authorized	Auto
<b>Max. Request</b>	Specify how many times to attempt reauthentication for the port.	1 to 10	2
<b>Quiet Period</b>	Specify the amount of time in seconds the device will remain in a quiet state following a failed authentication exchange with a client through the port.	0 to 65535	60

UI Setting	Description	Valid Range	Default Value
<b>Reauthentication</b>	Enable/disable IEEE 802.1X reauthentication for the port.	Enabled / Disabled	Disabled
<b>Reauthentication Period</b>	Specify the amount of time in seconds to wait in between reauthentication attempts for the port.	1 to 65535	3600
<b>Server Timeout</b>	Specify the amount of time in seconds the device will try to retransmit packets to an authentication server.	1 to 65535	30
<b>Supp Timeout</b>	Specify the amount of time in seconds the device will try to retransmit packets to a supplicant, such as a client PC.	1 to 65535	30
<b>Tx Period</b>	Specify the amount of time in seconds the device will try to retransmit the data to a client.	1 to 65535	30
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## IEEE 802.1X - RADIUS

### Menu Path: Security > Network Security > IEEE 802.1X - RADIUS

This page lets you specify a RADIUS server to use for IEEE 802.1X authentication. Click **APPLY** to save your changes.

#### Note

The system will use the primary RADIUS server by default. If the primary RADIUS server is unavailable, it will use the secondary RADIUS server.

## IEEE 802.1X RADIUS Settings

#### Note

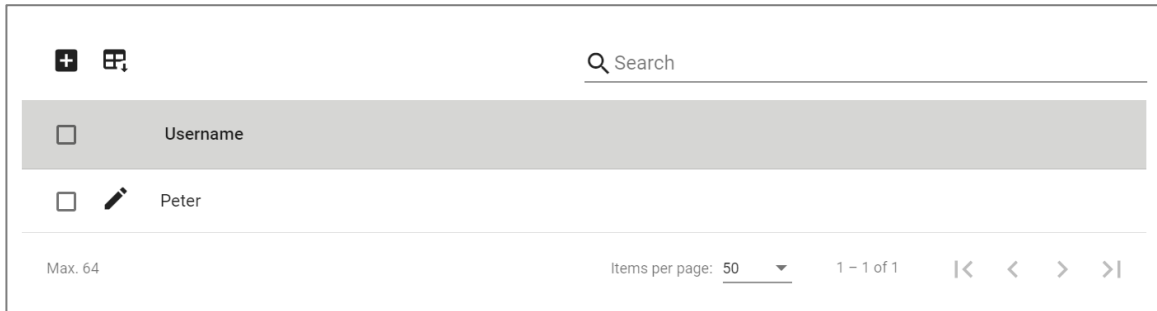
802.1X and MAC authentication bypass share the same RADIUS server settings; changes made here will also affect the other feature.





### **🔔 Limitations**

You can create up to 64 IEEE 802.1X local database accounts.



UI Setting	Description
<b>Username</b>	Shows the username of the account.

## **IEEE 802.1X - Local Database - Account Settings**

### **Menu Path: Security > Network Security > IEEE 802.1X - Local Database**

Clicking the **Add (⊕)** icon on the **Security > Network Security > IEEE 802.1X - Local Database** page will open this dialog box. This dialog lets you create a new user account for IEEE 802.1X authentication.

Click **CREATE** to save your changes and add the new account.

### Account Settings

Username \*

0 / 20

Password \*

Minimum 4 characters 0 / 20

Confirm Password \*

Minimum 4 characters 0 / 20

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Username</b>	Specify the username for this account.	1 to 20 characters	N/A
<b>Password</b>	Specify the password for this user account.	4 to 20 characters	N/A
<b>Confirm Password</b>	Re-enter the password for this user account.	4 to 20 characters	N/A

## About MAC Authentication Bypass

MAC Authentication Bypass (MAB) allows network access based on a device's Media Access Control (MAC) address, bypassing traditional username/password authentication methods like 802.1X. This feature is particularly useful for granting access to devices that cannot support more advanced authentication protocols.

### How MAC Authentication Bypass Works

MAB operates like a VIP list for your network. When a device connects, the network checks its MAC address against an approved list. If the MAC address is recognized, the device is granted access without needing additional authentication. If the MAC address isn't on the list, access is denied.

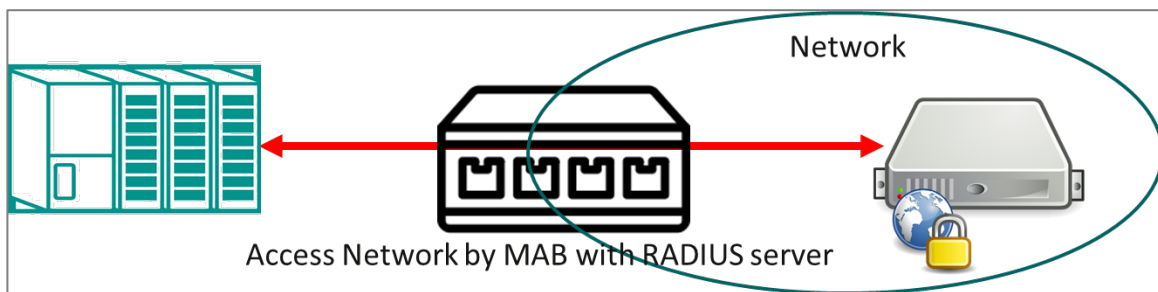
## When to Use MAB

- **Legacy Devices:** Some older devices may not support advanced authentication methods like 802.1X. MAB provides a way to allow these devices to connect using their MAC address.

While MAB is convenient, it's important to note that MAC addresses can be spoofed, making this method less secure compared to more robust authentication techniques. Therefore, MAB should be used in scenarios where ease of access is prioritized over stringent security measures.

## Configuring MAC Authentication Bypass

To add a device to MAC Authentication Bypass, first add the MAC address of the bypass device to the **Local Database**, then enable **MAC Authentication Bypass** on the Port the bypass device is attached to.




This procedure assumes that devices on your network are authenticated using either a RADIUS server or a local database.

### **Note**

MAC addresses are easily spoofed, and are not generally accepted as adequate means of authentication without other forms of security. Make sure that you have fully evaluated the security risks associated with this feature before use in a sensitive environment.


To configure MAC Authentication Bypass, do the following:

1. Sign in to the device using administrator credentials.
2. Go to **Security > Network Security > MAC Authentication Bypass**, click on the **Local Database** tab, and then click  **[Add]**.

The Create Entry screen appears.

3. Specify the **MAC Address** of the device to be added to the local database, and then click **Create**.

The MAC address appears in the table.

4. Click the **General** tab at the top of the screen, and verify that **MAC Authentication Bypass** is **Enabled**.
5. Locate the port the bypass device is attached to, and then click the corresponding  **[Edit]** button.

The Edit Port Settings screen appears.

6. Set **MAC Authentication Bypass** to **Enabled**, and then click **Apply**.

The bypass device will now be authenticated for network access.

## MAC Authentication Bypass

**Menu Path:** [Security](#) > [Network Security](#) > [MAC Authentication Bypass](#)

This page lets you configure the MAC Authentication Bypass settings.

This page includes these tabs:

- General
- RADIUS
- Local Database

### MAC Authentication Bypass - General

**Menu Path:** [Security](#) > [Network Security](#) > [MAC Authentication Bypass - General](#)

This page lets you configure general settings for MAC authentication bypass.

## MAC Authentication Bypass Settings

MAC Authentication Bypass \*

Disabled ▼

---

Authentication Mode \*

Local Database ▼

APPLY
CLEAR

UI Setting	Description	Valid Range	Default Value
<b>MAC Authentication Bypass</b>	Enable or disable MAC authentication bypass.	Enabled / Disabled	Disabled
<b>Authentication Mode</b>	Specify the authentication mode for MAC authentication bypass.	RADIUS / Local Database	Local Database

## MAC Authentication Bypass List

	Port	MAB	Quiet Period (sec.)	Reauthentication	Reauth Period (sec.)
✎	1	Disabled	60	Disabled	3600
✎	2	Disabled	60	Disabled	3600
✎	3	Disabled	60	Disabled	3600
✎	4	Disabled	60	Disabled	3600
✎	5	Disabled	60	Disabled	3600
✎	6	Disabled	60	Disabled	3600
✎	7	Disabled	60	Disabled	3600
✎	8	Disabled	60	Disabled	3600

1 - 24 of 24

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>MAB</b>	Shows whether MAC Authentication Bypass is enabled for the port.
<b>Quiet Period</b>	Show the amount of time in seconds the device will remain in a quiet state following a failed authentication exchange with a client through the port.
<b>Reauthentication</b>	Shows whether IEEE 802.1X reauthentication is enabled for the port.
<b>Reauthentication Period</b>	Shows the amount of time in seconds to wait in between reauthentication attempts for the port.

## MAC Authentication Bypass - Edit Port Settings

**Menu Path: Security > Network Security > MAC Authentication Bypass - General**

Clicking the **Edit** (✎) icon for a port on the **Security > Network Security > MAC Authentication Bypass - General** page will open this dialog box. This dialog lets you edit the MAC Authentication Bypass settings for the port.

Click **APPLY** to save your changes.

### Edit Port 1 Settings

MAC Authentication Bypass \*

Disabled ▾

---

Quiet Period \*

60

5 - 300 sec.

Reauthentication \*      Reauth Period \*

Disabled ▾      3600

60 - 65535 sec.

Copy configurations to ports ▾ ⓘ

CANCEL    APPLY

UI Setting	Description	Valid Range	Default Value
<b>MAC Authentication Bypass</b>	Enable or disable MAC Authentication Bypass for the port.	Enabled / Disabled	Disabled
<b>Quiet Period</b>	Specify the amount of time in seconds the device will remain in a quiet state following a failed authentication exchange with a client through the port.	5 to 300	60 sec.
<b>Reauthentication</b>	Enable or disable IEEE 802.1X reauthentication for the port.	Enabled / Disabled	Disabled
<b>Reauthentication Period</b>	Specify the amount of time in seconds to wait in between reauthentication attempts for the port.	60 to 65535	3600 sec.
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## MAC Authentication Bypass - RADIUS

**Menu Path: Security > Network Security > MAC Authentication Bypass - RADIUS**

This page lets you configure the RADIUS settings for MAC authentication bypass.

### Note

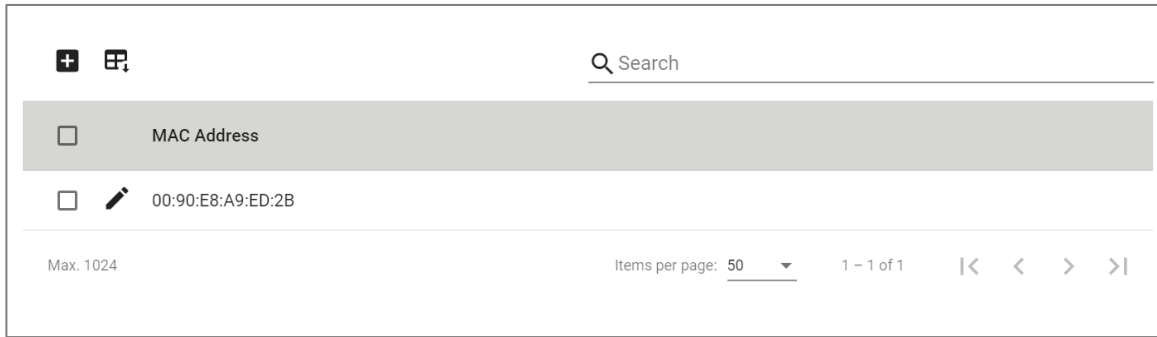
Enabling MAC Authentication Bypass allows VLAN assignment through a RADIUS server, but the VLAN must already exist.

### Note

802.1X and MAC authentication bypass share the same RADIUS server settings; changes made here will also affect the other feature.







UI Setting	Description
<b>MAC Address</b>	Shows the MAC address used for MAC authentication bypass.

### MAC Authentication Bypass - Local Database - Create Entry

**Menu Path:** Security > Network Security > MAC Authentication Bypass - Local Database

Clicking the **Add (+)** icon on the **Security > Network Security > MAC Authentication Bypass - Local Database** page will open this dialog box. This dialog lets you create a new MAC authentication bypass entry.

Click **CREATE** to save your changes and add the new entry.



UI Setting	Description	Valid Range	Default Value
<b>MAC Address</b>	Specify the MAC address to use for MAC authentication bypass.	Valid unicast MAC address	N/A

## Port Security

**Menu Path:** Security > Network Security > Port Security

This page lets you enable and configure a port security mode for your device.

This page includes these tabs:

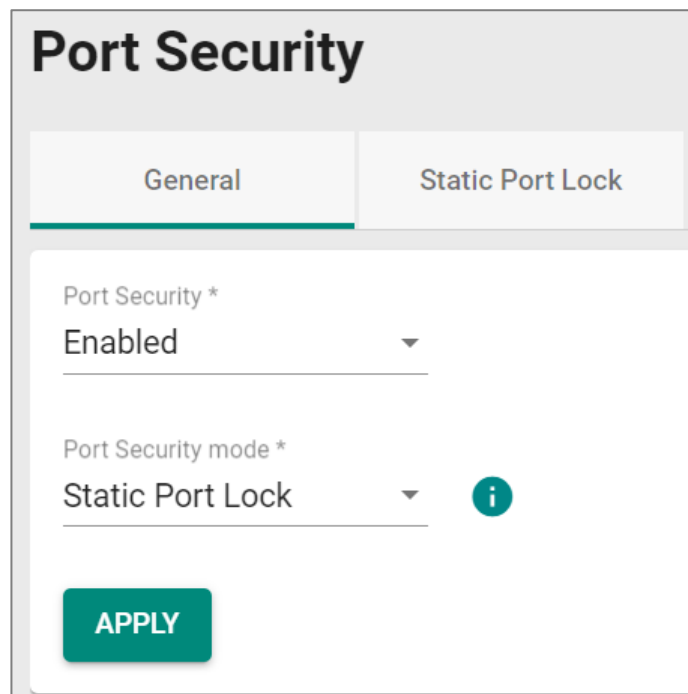
- General
- Static Port Lock (if **Static Port Lock** is selected for **Port Security Mode**)
- MAC Sticky (if **MAC Sticky** is selected for **Port Security Mode**)

### Port Security - General

**Menu Path:** Security > Network Security > Port Security - General

This page lets you enable port security and select a port security mode.

### Port Security Settings



The screenshot shows the 'Port Security' configuration page. At the top, there are two tabs: 'General' (which is active) and 'Static Port Lock'. Below the tabs, there are two dropdown menus. The first is labeled 'Port Security \*' and is set to 'Enabled'. The second is labeled 'Port Security mode \*' and is set to 'Static Port Lock'. There is a green information icon to the right of the second dropdown. At the bottom left, there is a green 'APPLY' button.

UI Setting	Description	Valid Range	Default Value
<b>Port Security</b>	Enable or disable port security.	Enabled / Disabled	Enabled
<b>Port Security Mode</b>	Select a port security mode.  <b>⚠ Warning</b> When changing the port security mode, all configured port security entries in the <b>Static Port Lock/MAC Sticky</b> tab will be deleted.	Static Port Lock / MAC Sticky	Static Port Lock

### Port Security List - Static Port Lock





If **Port Security Mode** is set to **Static Port Lock**, the following table will appear.

<span style="float: right;">Q Search</span>			
Port	Static Port Lock	Manually Configured Address	
1/1	Disabled	0	
1/2	Enabled	1	
1/3	Disabled	0	

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Static Port Lock</b>	Shows whether static port lock is enabled for the port.
<b>Manually Configured Address</b>	Shows the number of MAC addresses manually configured for the port.

### Port Security List - MAC Sticky


If **Port Security Mode** is set to **MAC Sticky**, the following table will appear.

Port	MAC Sticky	Address Limit	Secure Action	Current Address	Manually Configured Address	Violation
 1/1	Disabled	1	Packet Drop	0	0	No
 1/2	Enabled	20	Packet Drop	1	1	No
 1/3	Disabled	1	Packet Drop	0	0	No
 1/4	Disabled	1	Packet Drop	0	0	No

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>MAC Sticky</b>	Shows whether MAC Sticky mode is enabled for the port.
<b>Address Limit</b>	Shows the maximum number of MAC addresses to learn for the port.
<b>Secure Action</b>	Shows the action the device will take when the number of MAC addresses exceeds the address limit.
<b>Current Address</b>	Shows the current number of MAC addresses learned for the port.
<b>Manually Configured Address</b>	Shows the number of manually configured MAC addresses for the port.
<b>Violation</b>	Shows whether there have been any violations for the port.

## Port Security - Edit Port Settings

### Menu Path: Security > Network Security > Port Security - General

Clicking the **Edit** () icon for a port on the **Security > Network Security > Port Security - General** page will open this dialog box. This dialog lets you configure port security settings for the port.

Click **APPLY** to save your changes.

If **Port Security Mode** is set to **Static Port Lock**, the following dialog will appear when editing port security settings.

### Edit Port 1 Settings

Static Port Lock \*

Disabled ▼

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Static Port Lock</b>	Enable or disable Static Port Lock for the port.	Enabled / Disabled	Disabled

If **Port Security Mode** is set to **MAC Sticky**, the following dialog will appear when editing port security settings.

### Edit Port 1 Settings

MAC Sticky \*

Disabled ▼

Address Limit \*

1 ⓘ


1 - 1001

Secure Action \*

Packet Drop ▼

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>MAC Sticky</b>	Enable or disable MAC Sticky for the port.	Enabled / Disabled	Disabled

UI Setting	Description	Valid Range	Default Value
<b>Address Limit</b>	Specify the maximum number of the learned and configured MAC addresses allowed for the port.  <div style="background-color: #f0f0f0; padding: 5px;"> <p> <b>Note</b> Changing the address limit will clear all currently configured MAC addresses for the port.</p> </div>	1 to 1001	1
<b>Secure Action</b>	Specify the action to take when a violation occurs. <ul style="list-style-type: none"> <li>• <b>Port Shutdown:</b> The port will be shut down.</li> <li>• <b>Packet Drop:</b> Packets for the additional MAC addresses will be dropped.</li> </ul>	Port Shutdown / Packet Drop	Packet Drop

## Static Port Lock

Static Port Lock function provides port-based security by letting you specify which device MAC addresses are allowed to access the network through a specific port. Packets sent from unknown devices or from configured devices with mismatching ports will be dropped. In other words, only packets from devices with allowed MAC addresses can be sent to the specific port, helping secure network data transmissions.

## Static Port Lock

**Menu Path:** [Security](#) > [Network Security](#) > [Port Security - Static Port Lock](#)

This page lets you configure Static Port Lock.

 **Note**

This tab will only appear when Port Security Mode is set to Static Port Lock.

### 🔔 Limitations

You can create up to 1024 static port lock entries.

## Static Port Lock - Port Security Info

# Port Security

General    **Static Port Lock**

### Port Security Info

Port Security mode	Total Trust Hosts	The max. number of addresses in the system
Static Port Lock	0	1024

UI Setting	Description
<b>Port Security mode</b>	Shows the port security mode being used.
<b>Total Trust Hosts</b>	Shows the number of trusted hosts allowed to access the network.
<b>The max. number of address in the system</b>	Show the maximum number of MAC address allowed to be learned or specified for port security.


## Static Port Lock - Port List

🔍 Search

<input type="checkbox"/>	Port	VLAN ID	MAC Address	Type	Effective
<input type="checkbox"/>	1/2	1	00:B0:D0:63:C2:26	Lock Configured	Yes

Max. 1024      Items per page: 50      1 - 1 of 1

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.

UI Setting	Description
<b>VLAN ID</b>	Show the VLAN applied to the port.
<b>MAC Address</b>	Show the MAC address of the device which is used as a reliable source for network access.
<b>Type</b>	Shows how the entry was created.
<b>Effective</b>	Shows whether the entry is effective.
<p> <b>Note</b></p> <p>If an entry is not effective, it may have an invalid interface set for it.</p>	

### Static Port Lock - Add Entry Settings

**Menu Path:** Security > Network Security > Port Security - Static Port Lock

Clicking the **Add** (➕) icon on the **Security > Network Security > Port Security - Static Port Lock** page will open this dialog box. This dialog lets you configure static port lock settings for a port.

Click **CREATE** to save your changes and add the new account.

### Edit Entry Settings

Port \* ▼

---

VLAN ID \*

---

MAC Address \* i

---

CANCEL
APPLY



UI Setting	Description	Valid Range	Default Value
<b>Port</b>	Select the port to add an entry for.	Drop-down list of ports	N/A
<b>VLAN ID</b>	Specify the VLAN ID to use with the port.	Valid VLAN ID	N/A
<b>MAC Address</b>	Specify the MAC address of the device that will be used as the reliable source for network access.	Valid MAC address	N/A

## MAC Sticky

MAC Sticky is a function that allows you to configure the maximum number of MAC addresses that a port can "learn." You can also configure what action should be taken when a new MAC address tries to access a port after the maximum number of MAC addresses have already been learned.

### How MAC Sticky Works

In MAC Sticky mode, you can set a proper limit number and then configure trusted devices manually, or let the device configure trusted devices automatically. Aside from dropping packets as a response to any violations, you can also configure ports to enter "port shutdown" and achieve a strict security guarantee. When a violation is registered on a port, the port will shut down and an administrator will receive a notification to perform a check.

## MAC Sticky

### Menu Path: [Security](#) > [Network Security](#) > [Port Security - MAC Sticky](#)

This page lets you configure MAC Sticky.

#### Note

This tab will only appear when Port Security Mode is set to MAC Sticky.

### 🔔 Limitations

You can create up to 1024 MAC Sticky entries.

## MAC Sticky - Port Security Info

### Port Security

General    **MAC Sticky**

#### Port Security Info

Port Security mode	Total Trust Hosts	The max. number of addresses in the system
MAC Sticky	0	1024

UI Setting	Description
<b>Port Security mode</b>	Shows the port security mode being used.
<b>Total Trust Hosts</b>	Shows the number of trusted hosts allowed to access the network.
<b>The max. number of address in the system</b>	Show the maximum number of MAC address allowed to be learned or specified for port security.


## MAC Sticky - Port List

⊕ ↻ 🗪    🔍 Search

<input type="checkbox"/>	Port	VLAN ID	MAC Address	Type	Effective
<input type="checkbox"/> ✎	1/2	1	00:B0:D0:63:C2:26	Sticky Configured	Yes


Max. 1024    Items per page: 50    1 - 1 of 1

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.

UI Setting	Description
<b>VLAN ID</b>	Show the VLAN applied to the port.
<b>MAC Address</b>	Show the MAC address of the device which is used as a reliable source for network access.
<b>Type</b>	Shows how the entry was created.
<b>Effective</b>	Shows whether the entry is effective.
<p> <b>Note</b></p> <p>If an entry is not effective, it may have an invalid interface set for it.</p>	


## MAC Sticky - Create Entry Settings

**Menu Path:** Security > Network Security > Port Security - MAC Sticky

Clicking the **Add** () icon on the **Security > Network Security > Port Security - MAC Sticky** page will open this dialog box. This dialog lets you configure MAC Sticky settings for a port.

Click **CREATE** to save your changes and add the new account.


### Edit Entry Settings

Port \* 

---

VLAN ID \*

---

MAC Address \* 

---

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Port</b>	Select the port to add an entry for.	Drop-down list of ports	N/A
<b>VLAN ID</b>	Specify the VLAN ID to use with the port.	Valid VLAN ID	N/A
<b>MAC Address</b>	Specify the MAC address of the device that will be used as the reliable source for network access.	Valid MAC address	N/A

## Traffic Storm Control








A traffic storm can happen when packets flood the network and cause excessive traffic, slowing down network performance. To counter this, Traffic Storm Control provides an efficient design to prevent the network from flooding caused by a broadcast, multicast, or unicast traffic storm on a physical network layer. Traffic Storm Control can handle packets from both ingress and egress data.

### Traffic Storm Control

**Menu Path:** [Security](#) > [Network Security](#) > [Traffic Storm Control](#)

This page lets you configure traffic storm control for each port.

## Traffic Storm Control

	Port	Broadcast	Multicast	DLF	Threshold (fps)
	1	Enabled	Disabled	Disabled	12700
	2	Enabled	Disabled	Disabled	12700
	3	Enabled	Disabled	Disabled	12700
	4	Enabled	Disabled	Disabled	12700
	5	Enabled	Disabled	Disabled	12700
	6	Enabled	Disabled	Disabled	12700
	7	Enabled	Disabled	Disabled	12700

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Broadcast</b>	Shows whether traffic storm control is enabled for broadcast packets for the port.
<b>Multicast</b>	Shows whether traffic storm control is enabled for multicast packets for the port.
<b>DLF</b>	Shows whether traffic storm control is enabled for DLF for the port.
<b>Threshold</b>	Shows the traffic storm threshold value in fps for the port.

## Traffic Storm Control - Edit Port Settings

**Menu Path:** Security > Network Security > Traffic Storm Control

Clicking the **Edit** (✎) icon for a port on the **Security > Network Security > Traffic Storm Control** page will open this dialog box. This dialog lets you configure traffic storm control for the port.

Click **APPLY** to save your changes.

### Edit Port 1 Settings

Broadcast \*  
Enabled ▼

Multicast \*  
Disabled ▼

DLF \*  
Disabled ▼

Threshold \*  
12700 ⓘ  
625 - 148810 fps

Copy configurations to ports ▼ ⓘ

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Broadcast</b>	Enable or disable traffic storm control for broadcast packets for the port.	Enabled / Disabled	Disabled

UI Setting	Description	Valid Range	Default Value
<b>Multicast</b>	Enable or disable traffic storm control for multicast packets for the port.	Enabled / Disabled	Disabled
<b>DLF</b>	Enable or disable traffic storm control for DLF packets for the port.	Enabled / Disabled	Disabled
<b>Threshold</b>	Specify the threshold in frames per second to reach before detecting a traffic storm for the port.	625 to 14881000	12700 fps
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Access Control List

Access Control Lists (ACLs) helps you control network traffic based on specific criteria.

Here's an overview of some different kinds of ACLs:

- **Security:** ACLs provide a means to control access to network resources based on specific criteria such as source or destination IP addresses, MAC addresses, protocols, or port numbers. By implementing ACLs, you can enforce security policies and restrict unauthorized access to sensitive resources.
- **Traffic Management:** ACLs allow you to manage network traffic by selectively permitting or denying certain types of traffic. This helps optimize network performance by prioritizing critical traffic and controlling bandwidth usage.
- **Compliance:** In many industries, organizations are required to comply with security regulations and standards that mandate access control measures. By enabling ACLs, you can implement and demonstrate compliance with these requirements and mitigate security risks.
- **Protection Against Attacks:** ACLs can help protect networks against various types of attacks by blocking malicious traffic before it reaches its intended destination.
- **Preventing Unauthorized Access:** By implementing ACLs, you can prevent unauthorized users or devices from accessing network resources, reducing the risk of data breaches and unauthorized activities.

Overall, enabling ACLs enhances network security, improves traffic management, helps ensure compliance with regulations, and protects against various threats and attacks.

## How Access Control Lists Works

In an Ethernet switch, Access Control Lists (ACLs) work by examining incoming or outgoing packets and making decisions based on predefined rules. Each access list is a filter. When a packet enters into or exits from a switch, ACL will compare the packet to the rules in the access lists, starting from the first rule. If a packet is rejected or accepted by the first rule, the switch will drop or pass this packet directly without checking the rest of the lower-priority rules.

Here's how it typically works:

1. **Packet Inspection:** When a packet arrives at a switch port, the switch inspects the packet headers, including source and destination MAC addresses, IP addresses, and port numbers.
2. **ACL Lookup:** The switch compares the packet's header information against the ACL rules configured on the switch. These rules define which types of traffic are allowed or denied based on specific criteria such as MAC addresses, IP addresses, protocols, or port numbers.
3. **Decision Making:** Based on the ACL rules, the switch decides whether to permit or deny the packet. If the packet matches an ACL rule that permits the traffic, it is forwarded according to the switch's normal forwarding behavior. If the packet matches an ACL rule that denies the traffic, it is either dropped or forwarded to a specified destination, depending on the ACL configuration.
4. **Logging and Statistics:** Some switches may also provide logging and statistical features for ACLs, allowing administrators to monitor and analyze network traffic and ACL rule matches.

Overall, ACLs in Ethernet switches provide a mechanism for controlling access to network resources based on specific criteria, helping to enforce security policies and manage network traffic.

## Managing Inter-line Communication

**Scenario:** You are the network administrator for a manufacturing plant that utilizes Moxa Layer 2 switches to manage its network infrastructure. The plant has multiple production



lines, each with its own set of devices, and you want to restrict inter-line communication based on MAC addresses.

**Requirements:**

1. Devices on Production Line A should only communicate with each other and with specific servers.
2. Devices on Production Line B should communicate with each other, with devices on Production Line A, and with specific servers, but should not communicate with devices from other production lines.
3. The maintenance team should have unrestricted communication with all devices on all production lines.

**Implementation Steps:**

Identify MAC Addresses: Collect MAC addresses of devices on each production line, servers, maintenance team devices, and guest devices.

Define MAC-based ACLs:

Production Line A MAC ACL: Allow communication between devices on Production Line A and specified servers. Deny communication to all other MAC addresses.

Production Line B MAC ACL: Allow communication between devices on Production Line B, Production Line A devices, and specified servers. Deny communication to all other MAC addresses.

Maintenance MAC ACL: Allow communication between maintenance team devices and all other MAC addresses.

**Configure MAC-based ACLs on the MOXA Switch:**

1. **Access the MOXA switch's CLI or web interface.**
2. Define MAC ACLs

**Test Connectivity:** Verify that the MAC ACLs are working as expected by testing connectivity between devices on different production lines, maintenance team devices, and guest devices.

**Monitor and Adjust:** Regularly monitor network traffic and access patterns. Adjust MAC ACL rules as needed to accommodate changes in the plant's requirements or network topology.

By implementing MAC-based ACLs on the MOXA Layer 2 switch, you can control inter-line communication and guest access to the network according to the plant's security and access policies.

## Access Control List

**Menu Path: Security > Network Security > Access Control List**

This page lets you configure the access control list and its related settings.

This page includes these tabs:

- Settings
- Status

### Access Control List - Settings

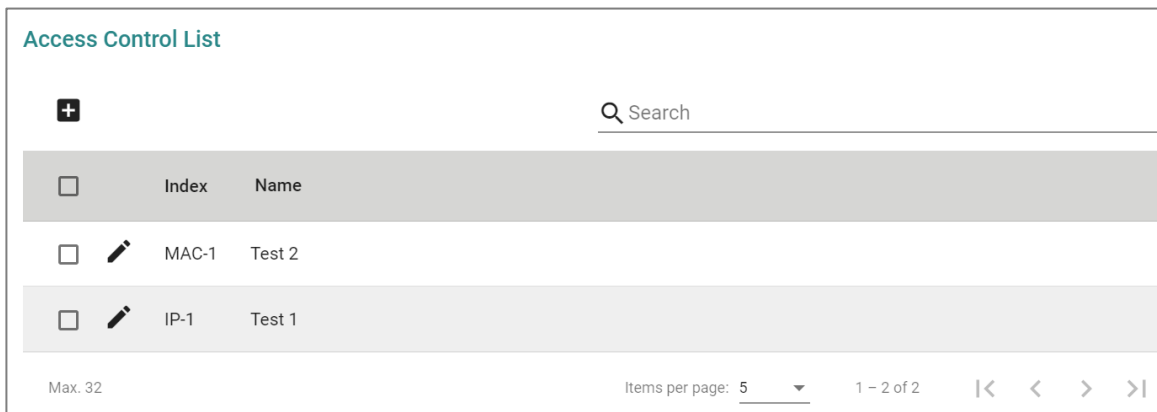
**Menu Path: Security > Network Security > Access Control List - Settings**



This page lets you configure your device's access control lists.

#### Limitations

You can create up to 32 access lists.

## Access Control List



<input type="checkbox"/>	Index	Name
<input type="checkbox"/> 	MAC-1	Test 2
<input type="checkbox"/> 	IP-1	Test 1

Max. 32

Items per page: 5 1 - 2 of 2 |< < > >|

UI Setting	Description
<b>Index</b>	Shows the access list type and its index value.
<b>Name</b>	Shows the name of the access list.

## Create an Access List

### Menu Path: Security > Network Security > Access Control List - Settings

Clicking the **Add (+)** icon on the **Security > Network Security > Access Control List - Settings** page will open this dialog box. This dialog lets you create an access list.

Click **CREATE** to save your changes and add the new list.

### Create an Access List

Access List Type \* i

---

Index \* i

---

Name

---

0 / 127

CANCEL
CREATE

UI Setting	Description	Valid Range	Default Value
<b>Access List Type</b>	Specify the access list type to determine how it should control access.	IP-based / MAC-based	N/A
<b>Index</b>	Specify an index value for the access list.	Drop-down list of index values	N/A
	<p><b>Note</b></p> <p>Priority is determined by two factors: index value and address type.</p> <p>Lower index values indicate higher priority. In cases where entries share the same index, MAC addresses take precedence over IP addresses.</p>		

UI Setting	Description	Valid Range	Default Value
<b>Name</b>	Specify a name for the access list.	0 to 127 characters	N/A

## ACL Table Settings

You can switch between ACL tables by using the drop-down menu.

**ACL Table of IP-1** ▼

Active Interface Type \*

Port-based ▼

---

Active Ingress Ports ▼ ⓘ

---

Active Egress Ports ▼ ⓘ

---

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>Active Interface Type</b>	Specify the active interface type.	Port-based / VLAN-based	Port-based
<b>Active Ingress Ports</b>	Specify the active ingress ports.	Drop-down list of ports	N/A
<b>Active Egress Ports</b>	Specify the active egress ports.	Drop-down list of ports	N/A

## ACL Rule List (IP-based)

If the currently displayed ACL table is **IP-based**, the following table will appear.

Index	ACL Rule	Rule Type	Protocol	Source	Destination	DSCP	Optional Parameter	Action
1	Enabled	Permit	IGMP	196.255.1.25/ 255.255.255.255	196.255.1.45/ 255.255.255.255	30	IGMP Type: 23	Redirect to port 2 Remark DSCP to 2

1 - 1 of 1

UI Setting	Description
<b>Index</b>	Shows the index number for the ACL rule.
<b>ACL Rule</b>	Shows whether the ACL rule is enabled.
<b>Rule Type</b>	Shows the rule type.
<b>Protocol</b>	Show the protocol used for the ACL rule.
<b>Source</b>	Shows the source IP address with subnet mask for the ACL rule.
<b>Destination</b>	Shows the destination IP address with subnet mask for the ACL rule.
<b>DSCP</b>	Shows the DSCP value used to prioritize packets for the ACL rule.
<b>Optional Parameter</b>	Show the relevant parameters for the selected protocol.
<b>Action</b>	Show whether the redirect action or DSCP remark are enabled. If enabled, their respective configuration settings will be shown.

### ACL Rule List (MAC-based)

If the currently displayed ACL table is **MAC-based**, the following table will appear.

Index	ACL Rule	Rule Type	EtherType	Source	Destination	VLAN ID	CoS	Action
1	Enabled	Permit	Any	Any	Any	Any	Any	None

UI Setting	Description
<b>Index</b>	Shows the index number for the ACL rule.
<b>ACL Rule</b>	Shows whether the ACL rule is enabled.
<b>Rule Type</b>	Shows the rule type.
<b>EtherType</b>	Shows the EtherType for the ACL rule.
<b>Source</b>	Shows the source MAC address with mask for the ACL rule.

UI Setting	Description
<b>Destination</b>	Shows the destination MAC address with mask for the ACL rule.
<b>VLAN ID</b>	Shows the VLAN ID for the ACL rule.
<b>CoS</b>	Shows the CoS value used to prioritize packets for the ACL rule.
<b>Optional Parameter</b>	Shows the relevant parameters for the selected EtherType.
<b>Action</b>	Shows whether the redirect action or CoS remark are enabled for the ACL rule. If enabled, their respective configuration settings will be shown.

## ACL Rule List - Create Rule

### Menu Path: Security > Network Security > Access Control List - Settings

Clicking the **Add (+)** icon on the **Security > Network Security > Access Control List - Settings** page will open this dialog box. This dialog lets you create a rule for the displayed ACL table.

Click **CREATE** to save your changes and add the new rule.

If the currently displayed ACL table is **IP-based**, the following table will appear.

### Create Rule Index 1 for IP-1

Rule Index 1 \*  
Enabled

Rule Type \*  
Permit

Protocol  
Any

Source IP Address  
Any

Source IP Mask

Destination IP Address  
Any

Destination IP Mask

DSCP  
Any

0 - 63

**Action**  
Redirect \*

Disabled

DSCP Remark  
Disabled

0 - 63

CANCEL CREATE

UI Setting	Description	Valid Range	Default Value
<b>Rule Index</b>	Enable or disable the rule.	Enabled / Disabled	Enabled
<b>Rule Type</b>	Specify the rule type.	Permit / Deny	N/A
<b>Protocol</b>	Specify the protocol for the ACL rule.	TCP / UDP / ICMP / IGMP / OSPF / User-defined	Any
<b>Source IP Address</b>	Specify the source IP address.	Valid IP address	Any
<b>Source IP Mask</b>	Specify the source IP subnet mask.	Drop-down list of subnet masks	N/A
<b>Destination IP Address</b>	Specify the destination IP address.	Valid IP address	Any
<b>Destination IP Mask</b>	Specify the destination IP subnet mask.	Drop-down list of subnet masks	N/A
<b>DSCP</b>	Specify a DSCP value to prioritize packets for the ACL rule.	0 to 63	Any

UI Setting	Description	Valid Range	Default Value
<b>Action - Redirect</b> <b>(If Rule Type is Permit)</b>	Enable or disable redirects.	Enabled / Disabled	Disabled
<b>Action - DSCP Remark</b> <b>(If Rule Type is Permit)</b>	Enable adding a DSCP remark by specifying a DSCP Remark value. To disable it, leave this blank.	0 to 63	Disabled

If the displayed ACL table is **MAC-based**, the following dialog will appear.

**Create Rule Index 2 for MAC-1**

Rule Index 2 \*  
Enabled ▼

Rule Type \*  
▼

EtherType  
Any ▼

Source MAC Address  
Any

Source MAC Mask  
▼

Destination MAC Address  
Any

Destination MAC Ma...  
▼

VLAN ID  
Any

1 - 4094

CoS  
Any

0 - 7

CANCEL
CREATE

UI Setting	Description	Valid Range	Default Value
<b>Rule Index</b>	Enable or disable the rule.	Enabled / Disabled	Enabled
<b>Rule Type</b>	Specify the rule type.	Permit / Deny	N/A
<b>EtherType</b>	Specify the EtherType for the ACL rule.	GOOSE / SMV / User-defined	Any



UI Setting	Description	Valid Range	Default Value
<b>Source MAC Address</b>	Specify a source MAC address.	Valid MAC address	Any
<b>Source MAC Mask</b>	Select a source MAC mask.	Drop-down list of MAC masks	N/A
<b>Destination MAC Address</b>	Specify a destination MAC address.	Valid MAC address	Any
<b>Destination MAC Mask</b>	Specify a destination MAC mask.	Drop-down list of MAC masks	N/A
<b>VLAN ID</b>	Specify the VLAN ID for the ACL rule.	1 to 4094	Any
<b>CoS</b>	Specify a CoS value to prioritize packets for the ACL rule.	0 to 7	Any
<b>Action - Redirect (If Rule Type is Permit)</b>	Enable or disable redirects.	Enabled / Disabled	Disabled
<b>Action - CoS Remark (If Rule Type is Permit)</b>	Enable adding a CoS remark by specifying a CoS Remark value. To disable it, leave this blank.	0 to 7	Disabled

## Access Control List - Status

**Menu Path:** [Security](#) > [Network Security](#) > [Access Control List - Status](#)

This page lets you view the ACL summary, access control list and the ACL table.

## ACL Summary

ACL Summary

Number of activated ACLs (Max. 16)  
1

Access Control List

Search

Index	Name	Activated	Direction
MAC-1	Test 2	Activated	Both
IP-1	test	Deactivated	--

Items per page: 5 | 1 - 2 of 2 | < > >>

UI Setting	Description
<b>Number of activated ACLs (Max. 16)</b>	Show the number of activated ACLs.
<b>Index</b>	Show the access list type and its index value.
<b>Name</b>	Show the name of the access list.
<b>Activated</b>	Show whether the ACL is enabled.
<b>Direction</b>	Show the direction of the ACL.

## ACL Table Status

If **IP-index** is selected for ACL table, the following table will appear.

ACL Table of IP-1

Name  
test

Active Ingress Ports  
---

Active Egress Ports  
---

Search

Index	ACL Rule	Rule Type	Protocol	Source	Destination	DSCP	Optional Parameter	Action	Hit Count
1	Enabled	Permit	IGMP	196.255.1.25/ 255.255.255.255	196.255.1.45/ 255.255.255.255	30	IGMP Type: 23	Redirect to port 2 Remark DSCP to 2	0

1 - 1 of 1

UI Setting	Description
<b>Name</b>	Show the name of the access list.

UI Setting	Description
<b>Active Ingress Port</b>	Show the active ingress ports configured.
<b>Active Egress Port</b>	Show the active egress ports configured.
<b>Index</b>	Show the index number for the ACL rule.
<b>ACL Rule</b>	Show whether the ACL rule is enabled.
<b>Rule Type</b>	Show the rule type.
<b>Protocol</b>	Show the protocol used for the ACL rule.
<b>Source</b>	Show the source IP address with its subnet mask.
<b>Destination</b>	Show the destination IP address with its subnet mask.
<b>DSCP</b>	Show the DSCP value specified to differentiate the prioritization of IP packets.
<b>Optional Parameter</b>	Show the relevant parameters for the selected protocol.
<b>Action</b>	Show whether the redirect action and DSCP remark are enabled. If enabled, display their respective configuration settings.
<b>Hit Count</b>	Show the hit count of the ACL rule.

If **MAC-index** is selected for ACL table, the following table will appear.

ACL Table of MAC-1 ▾

Name  
Test 2

Active Ingress Ports  
1, 3

Active Egress Ports  
4, 5

🔍 Search

Index	ACL Rule	Rule Type	EtherType	Source	Destination	VLAN ID	CoS	Action	Hit Count
1	Enabled	Permit	Any	Any	Any	Any	Any	None	0

1 - 1 of 1

UI Setting	Description
<b>Name</b>	Show the name of the access list.

UI Setting	Description
<b>Active Ingress Port</b>	Show the active ingress ports configured.
<b>Active Egress Port</b>	Show the active egress ports configured.
<b>Index</b>	Show the index number for the ACL rule.
<b>ACL Rule</b>	Show whether the ACL rule is enabled.
<b>Rule Type</b>	Show the rule type.
<b>EtherType</b>	Show the EtherType used for the ACL rule.
<b>Source</b>	Show the source MAC address with its mask.
<b>Destination</b>	Show the destination MAC address with its mask.
<b>VLAN ID</b>	Show the VLAN ID.
<b>CoS</b>	Show the CoS value specified to differentiate the prioritization of packets.
<b>Optional Parameter</b>	Show the relevant parameters for the selected EtherType.
<b>Action</b>	Show whether the redirect action and CoS remark are enabled. If enabled, display their respective configuration settings.
<b>Hit Count</b>	Show the hit count of the ACL rule.

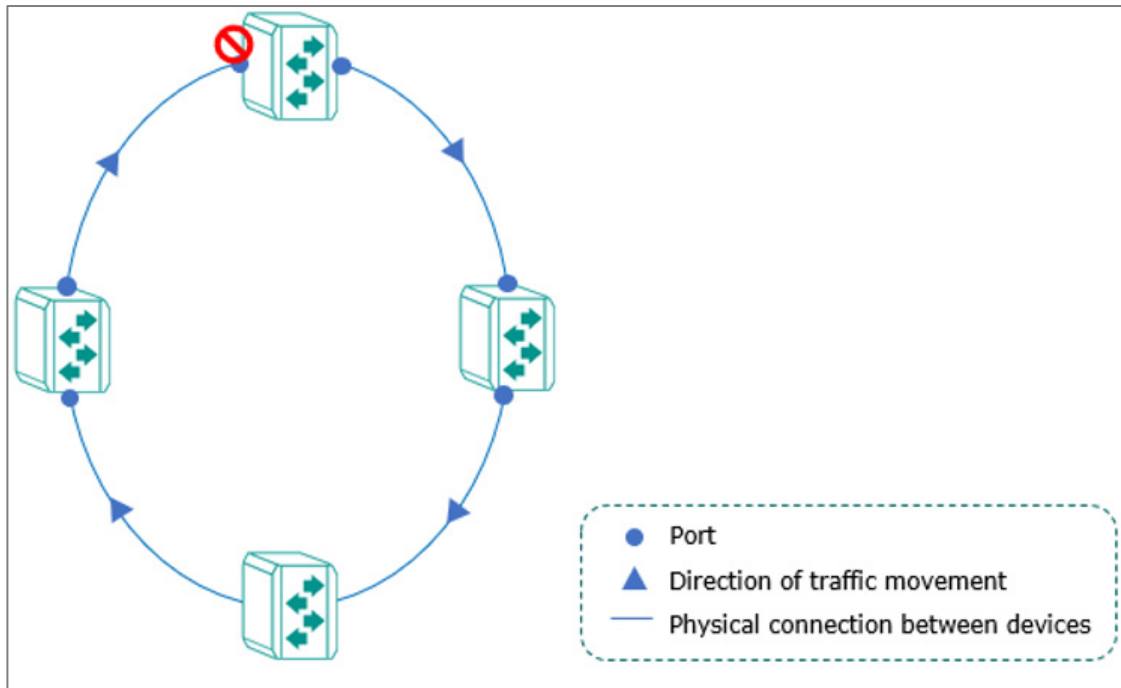
## Network Loop Protection

Network Loop Protection helps avoid network loops by disabling ports when looping is detected in the network topology. This is designed for devices that do not support redundant protocols, when redundant protocols are not configured, or if the redundant protocol fails.

### How Network Loop Protection works

Network Loop Protection prevents looping by sending the detected packet through the network topology to all ports. After receiving a packet, the port will check if the packet was sent by the device itself. If yes, the receiving port will be disabled.

Network Loop protection features cannot prevent ports activating redundant protocols, such as STP/RSTP/ MSTP/Turbo Ring/Ring Coupling/Turbo Chain/Dual Homing or Link Aggregation from looping, as these ports do not process detected packets sent by Network Loop protection.



## Network Loop Protection

**Menu Path:** [Security](#) > [Network Security](#) > [Network Loop Protection](#)

This page lets you manage network loop protection for your device.

This page includes these tabs:

- Settings
- Status

### Network Loop Protection - Settings

**Menu Path:** [Security](#) > [Network Security](#) > [Network Loop Protection - Settings](#)

This page lets you enable network loop protection settings.

## Network Loop Protection Settings

### Network Loop Protection

Settings Status

---

Network Loop Protection \*  
Disabled ▾

Detect Interval \*  
10  
1 - 30 sec.

**APPLY**

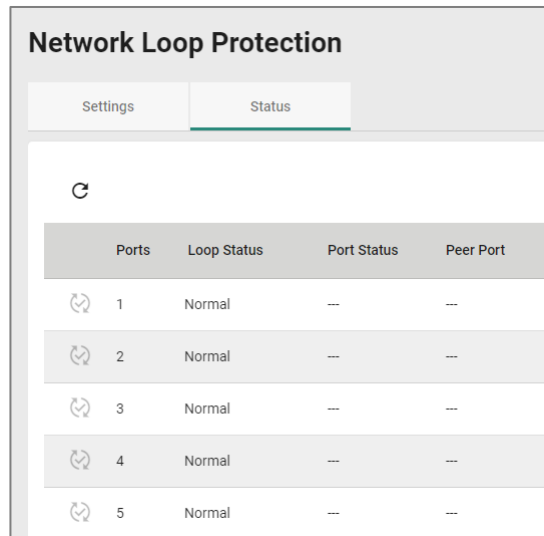
UI Setting	Description	Valid Range	Default Value
<b>Network Loop Protection</b>	Enable or disable the network loop protection.	Enabled / Disabled	Disabled
<b>Detect Interval</b>	Specify the detect interval in seconds.	1 to 30	10

## Network Loop Protection - Status

**Menu Path:** [Security](#) > [Network Security](#) > [Network Loop Protection - Status](#)

This page lets you view the status of network loop protection.

## Network Loop Protection - Port List



The screenshot shows the 'Network Loop Protection' interface with the 'Status' tab selected. It features a refresh icon and a table with the following data:

Ports	Loop Status	Port Status	Peer Port
1	Normal	--	--
2	Normal	--	--
3	Normal	--	--
4	Normal	--	--
5	Normal	--	--

UI Setting	Description
<b>Ports</b>	Shows the port number the entry is for.
<b>Loop Status</b>	Show the loop status of the port. <ul style="list-style-type: none"><li>• <b>Normal</b>: The port is not looping.</li><li>• <b>Looping</b>: The port is looping.</li></ul>
<b>Port Status</b>	Shows the port status of the specific port. <ul style="list-style-type: none"><li>• <b>Disabled</b>: The port is disabled due to a port shutdown or detected loop.</li></ul>
<b>Peer Port</b>	Shows the port where the looping frames are from when detecting a loop.

## Binding Database

A binding database acts as an allowlist for IP Source Guard and Dynamic ARP Inspection to help protect against unauthorized traffic.

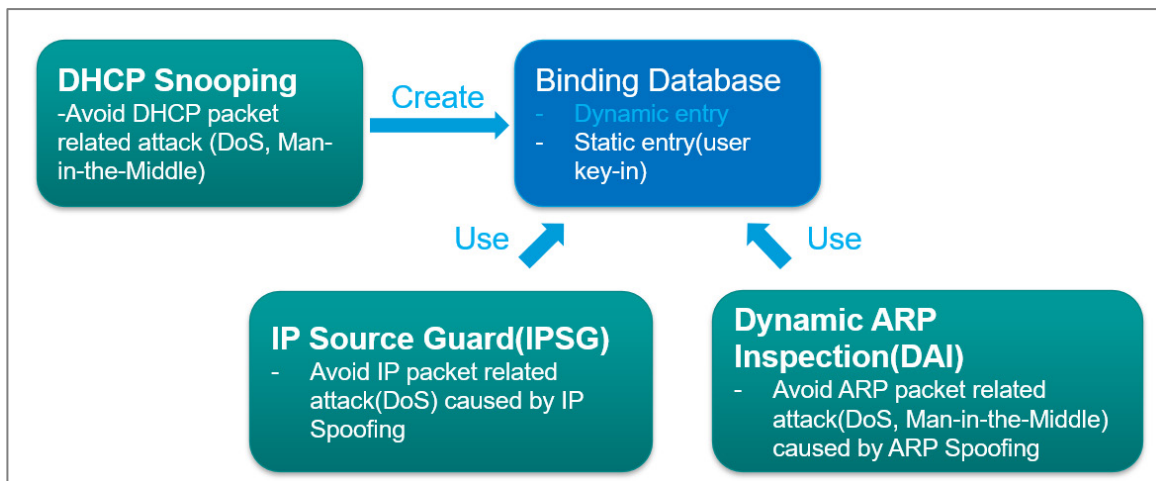
How a Binding Database Works

A binding database consists of dynamic entries and static entries.

- **Dynamic Entries**: Generated automatically after a DHCP client successfully obtains an IP while DHCP snooping is enabled. The entry will be released after exceeding the IP lease time or upon disabling DHCP snooping.

- **Static Entries:** User-generated/edited entry. The entry will be released only when a user deletes it.

Binding database entries consist of VLAN IDs, MAC addresses, ports, and IP addresses. This information forms an allowlist used by IP Source Guard to filter IP packets, and for Dynamic ARP Inspection to filter ARP packets. This helps prevent spoofing attacks such as man-in-the-middle and denial-of-service attacks.



## Configuring Binding Database

Binding Database is the base for IP Source Guard and Dynamic ARP Inspection, there are two ways to populate Binding Database entries, including entries automatically created after enabling DHCP Snooping or manually entries created by users.

### Before you begin:

- Determine which kind of Binding Database Entries to use: Static, or Dynamic. See above for guidelines to make this determination.

## Configuring Dynamic Binding Database Entries

To configure a Dynamic Binding Database entry:

1. Go to **Security > Network Security > DHCP Snooping**.
2. Click DHCP Snooping and then select Enable, optionally specify a VLAN ID, and then click Apply.



3. Under Port Settings, click **Edit** (✎) to configure the corresponding port binding settings.
4. Configure the following:
  - **Status**• **Copy configurations to ports**
5. Click **Apply**

**Results:** The Binding Database entries will be created upon a successful DHCP transaction on DHCP Snooping-enabled Untrusted ports. You can view the binding database entries by going to **Security > Network Security > Binding Database > Binding Status**.

### Configuring Static Binding Database Entries

To configure a Static Binding Database Entry:

1. Go to **Security > Network Security > Binding Database.> Binding Setting**.
2. Click (Add), and then specify all of the following:
  - **VLAN ID**• **MAC Address**• **Port**• **IP Address**
3. Click **Create** to add the entry to the database.

**Results:** The Binding Database entries will be created upon a successful DHCP transaction on DHCP Snooping-enabled Untrusted ports. You can view the binding database entries by going to **Security > Network Security > Binding Database > Binding Status**.

## Binding Database

**Menu Path:** [Security > Network Security > Binding Database](#)

This page lets you view and manage the binding database, which can be used for an allowlist for IP Source Guard or Dynamic ARP Inspection.

This page includes these tabs:

- Binding Settings
- Binding Status

### 🔔 Limitations

You can create up to 32 binding database entries, including dynamic and static entries. Entries will stop being generated or being user-addable when this limit is reached. More entries can only be added when existing entries are released, bringing the total number below 32.

## Binding Settings

**Menu Path: Security > Network Security > Binding Database - Binding Settings**

This page lets you manage the static entries you want to use for an allowlist.

### Binding Settings List

**Binding Database**

Binding Settings | Binding Status

+

<input type="checkbox"/>	VLAN ID	MAC Address	Port	IP Address
--------------------------	---------	-------------	------	------------

Max. 32 of Binding Status table

UI Setting	Description
<b>VLAN ID</b>	Shows the VLAN ID for the static entry.
<b>MAC Address</b>	Shows the MAC address for the static entry.
<b>Port</b>	Shows the port for the static entry.
<b>IP Address</b>	Shows the IP address for the static entry.

## Create a Binding Database Static Entry

**Menu Path:** Security > Network Security > Binding Database - Binding Settings

Clicking the **Add (+)** icon on the **Security > Network Security > Binding Database - Binding Settings** page will open this dialog box. This dialog lets you to configure the Static entries to be whitelist base for IP Source Guard or Dynamic ARP Inspection.

Click **CREATE** to save your changes and add the new account.

### Create a Binding Database Static Entry

VLAN ID \*       MAC Address \*

Port \*

IP Address \*

UI Setting	Description	Valid Range	Default Value
<b>VLAN ID</b>	Specify the VLAN ID as the whitelist of IP Source Guard or Dynamic ARP Inspection.	1 to 4094	N/A
<b>MAC Address</b>	Specify the the MAC address as the whitelist of IP Source Guard or Dynamic ARP Inspection.	MAC Address	N/A
<b>Port</b>	Specify the port as the whitelist of IP Source Guard or Dynamic ARP Inspection.	Drop-dwon list of ports	N/A
<b>IP Address</b>	Specify the IP address as the whitelist of IP Source Guard or Dynamic ARP Inspection.	Valid IP address	N/A

## Binding Status

**Menu Path:** Security > Network Security > Binding Database - Binding Status


This page lets you view the current binding database entries of your device.

### Binding Status List

### Binding Database

Binding Settings    **Binding Status**

Dynamic binding is learning from DHCP snooping.  
The binding status will not be updated if the VLAN ID and MAC address combination of the static entry already exists.



Type	VLAN ID	MAC Address	Port	IP Address	Lease Time	Active
Max. 32						

UI Setting	Description
<b>VLAN ID</b>	Shows the VLAN ID for a successful DHCP packet transaction on an untrusted port, or the specified VLAN ID for a user-created static entry.
<b>MAC Address</b>	Shows the MAC address for a successful DHCP packet transaction on an untrusted port, or the specified MAC address for a user-created static entry.
<b>Port</b>	Shows the untrusted port for a successful DHCP packet transaction, or the specified port for a user-created static entry.
<b>IP Address</b>	Shows the IP address for a successful DHCP packet transaction on an untrusted port, or the specified IP address for a user-created static entry.
<b>Lease Time</b>	Shows the lease time for the entry to be active. The lease time is infinite for user-created static entries.
<b>Active</b>	Shows whether the entry is active for use with IP Source Guard, Dynamic ARP Inspection, or both.

## DHCP Snooping

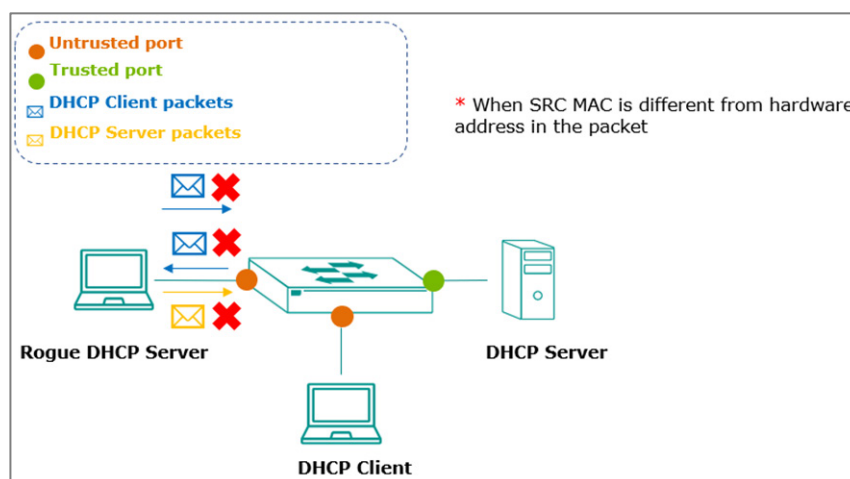
DHCP Snooping is a VLAN-specific security feature for DHCP operations. You can configure untrusted hosts and trusted DHCP servers for corresponding ports on your device, and then the feature will act like a firewall to validate DHCP messages received from untrusted sources and filter out invalid messages to exclude rogue DHCP servers and remove malicious DHCP traffic. This helps guarantee that clients obtain a legal address from the DHCP server you designate.

Enabling DHCP snooping will also set up a binding database, which will act as an allowlist for IP Source Guard and Dynamic ARP Inspection.

### How DHCP Snooping works

Configuring the designated ports connected to DHCP server ports as trusted ports and the ports connected to clients/hosts as untrusted ports:

- The trusted ports will pass all of the DHCP packets.
- The behavior for the untrusted ports are as follows:
  - a. Pass the ingress DHCP client packets and the egress DHCP server packets to complete the normal DHCP transaction.
  - b. Drop the egress DHCP client packets and the ingress DHCP server packets to avoid the rogue DHCP Server attack.
  - c. Drop DHCP client type packets with a different source MAC address and hardware address to avoid malicious DHCP client attack.



The successful DHCP transaction with DHCP Snooping enabled will create and update the Binding Database. Binding Database contains VLAN ID, MAC Address, untrusted port of DHCP clients and IP Address. Binding Database can also be used for other security functions, such as IP Source Guard and Dynamic ARP Inspection.

## Configuring DHCP Snooping on the switch

Enable DHCP Snooping on the switch to setup DHCP packet filtering mechanism to avoid DHCP related malicious attack and create a white list(Binding Database) for IP Source Guard and Dynamic ARP Inspection via successful DHCP transaction through Untrusted ports.

The following steps tells you how to configure DHCP Snooping in the switch:

1. To enable DHCP Snooping globally for a specific VLAN
2. click **Edit (✎)** on the port settings to configure the Trusted or Untrusted status for individual ports. Typically configure the ports connected to an untrusted source such as hosts as Untrusted ports (otherwise as Trusted port such as DHCP server).
3. When finished, click **APPLY** to save your changes.

### Note

The port status cannot be changed to trusted port if the port is enabled by Dynamic ARP Inspection or IP Source Guard.

## Results:

Trusted Ports	Untrusted Ports
<b>Pass all of the DHCP packets.</b>	<ol style="list-style-type: none"><li>1. Pass the ingress DHCP client packets and the egress DHCP server packets to complete the normal DHCP transaction.</li><li>2. Drop the egress DHCP client packets and the ingress DHCP server packets to avoid the rogue DHCP Server attack.</li><li>3. Drop DHCP client type packets with a different source MAC address and hardware address to avoid malicious DHCP client attack.</li></ol>

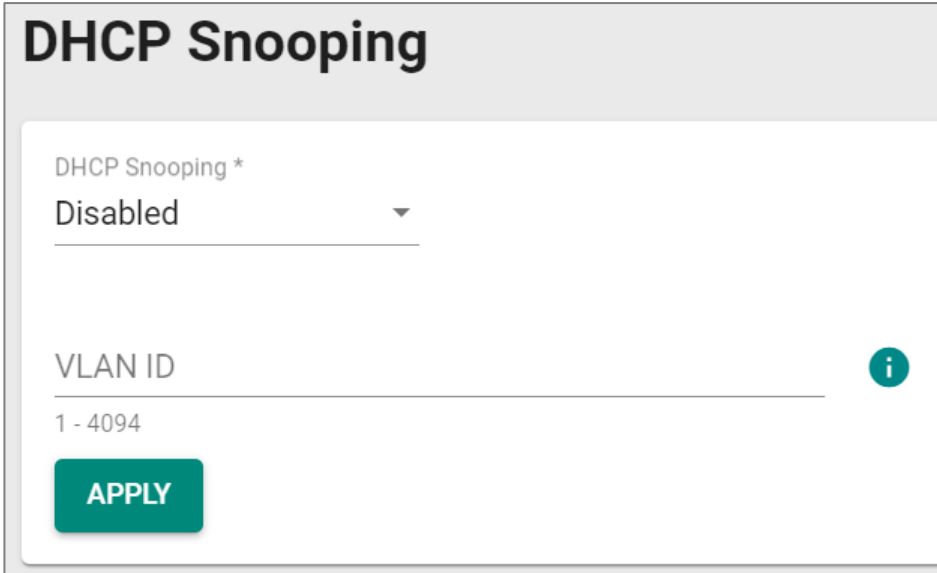
To enable DHCP Snooping will also set up Binding Database and the database will act as an allowlist for IP Source Guard and Dynamic ARP Inspection.

## DHCP Snooping

**Menu Path:** Security > Network Security > DHCP Snooping


This page lets you manage DHCP Snooping for your device.

### DHCP Snooping Settings



**DHCP Snooping**





DHCP Snooping \*  
Disabled

VLAN ID   
1 - 4094

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>DHCP Snooping</b>	Enable or disable DHCP snooping.	Enabled / Disabled	Disabled
<b>VLAN ID</b>	Specify the VLAN IDs to use for DHCP snooping. You can enter multiple VLAN IDs by separating them with commas or by using ranges (e.g., 2, 4-8, 10-13).	1 to 4094	N/A


## DHCP Snooping - Port Settings

Port Settings		
	Port	Status
	1	Untrusted
	2	Untrusted
	3	Untrusted
	4	Untrusted

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Status</b>	Shows whether the port is trusted or untrusted.

## DHCP Snooping - Edit Port Settings

### Menu Path: Security > Network Security > DHCP Snooping

Clicking the **Edit** () icon for a port on the **Security > Network Security > DHCP Snooping** page will open this dialog box. This dialog lets you configure the port as trusted or untrusted for DHCP snooping.

Click **APPLY** to save your changes.



## Edit Port 1 Settings

Status \*  
Untrusted ▼

Copy configurations to ports  ▼ i

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Status</b>	Specify the port as untrusted or trusted.	Untrusted / Trusted	Untrusted
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## IP Source Guard

IP Source Guard (IPSG) is an IP data packet filtering security feature that works on Layer 2 interfaces. It works together with DHCP Snooping and the Binding Database to filter IP data packets to defend against attacks such as denial-of-service (DoS) that are caused by forging/spoofing source IP addresses.

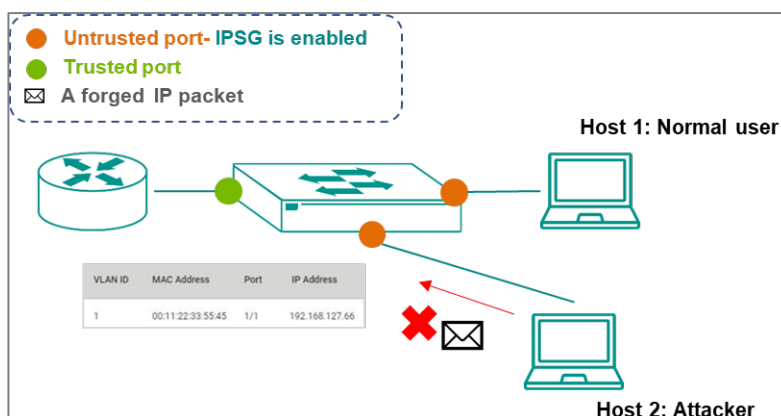
### How IP Source Guard Works

IPSG checks all traffic to make sure its host IP address, MAC address, VLAN, and port match a valid entry in the binding database. If the host does not match a valid entry in the binding database, the traffic will not be forwarded.

**Note**

IP Source Guard (IPSG) works with DHCP snooping, so DHCP snooping must be enabled to create binding database entries before enabling IPSG

IPSG can only be used on ports specified as "untrusted" for DHCP snooping.



## Enable or disable IP Source Guard for each port to filter the IP data packet.


For the ports specified as Untrusted ports in DHCP Snooping, enable IP Source Guard to filter IP data packet based on entries stored in the Binding Database.

### Before you begin:

- Make sure the related information of the ports you want to enable IP Source Guard including VLAN ID, MAC Address, Port, and IP Address exist in Binding Database, if it doesn't exist, you can enable DHCP Snooping for dynamic learning(refer to Binding Database chapter for dynamic learning), or manually key in the entry in the Binding Status.
- Specify ports you want to enable IP Source Guard as Untrusted ports in DHCP Snooping feature.

Click **Edit ( ✎ )** on the port setting to enable or disable IPSG for untrusted ports specified in the DHCP Snooping feature.

**Result:** The IP data packet will be filtered against the IP address, MAC address, VLAN, and port recorded in the Binding Data Base Entry once the IP Source Guard has been enabled.

 **Note**





Please note IPSG can only be enabled on untrusted ports specified in DHCP Snooping feature.

## IP Source Guard

**Menu Path:** Security > Network Security > IP Source Guard

This page lets you enable or disable IP Source Guard for each port.

### IP Source Guard List

IP Source Guard		
	Port	Status
	1	Disabled
	2	Disabled
	3	Disabled
	4	Disabled

UI Setting	Description
------------	-------------

<b>Port</b>	Shows the port number the entry is for.
-------------	---

UI Setting	Description
<b>Status</b>	Shows whether IP Source Guard is enabled for the port.
	<p><b>Note</b></p> <p>IP Source Guard can only be enabled on ports specified as untrusted in DHCP snooping.</p>

## IP Source Guard - Edit Port Settings

**Menu Path:** Security > Network Security > IP Source Guard

Clicking the **Edit** (✎) icon for a port on the **Security > Network Security > IP Source Guard** page will open this dialog box. This dialog lets you enable or disable IP Source Guard for the port.

Click **APPLY** to save your changes.

### Edit Port 1 Settings

Status \*


Disabled ▼

---

Copy configurations to ports ▼ ⓘ

---

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Status</b>	<p>Enable or disable IP Source Guard for the port. When enabled, only traffic with packet headers that have a source IP and MAC address that match a valid entry in the Binding Database will be forwarded.</p> <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p> <b>Note</b></p> <p>IP Source Guard can only be enabled on ports specified as untrusted in DHCP snooping.</p> </div>	Enabled / Disabled	Disabled
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

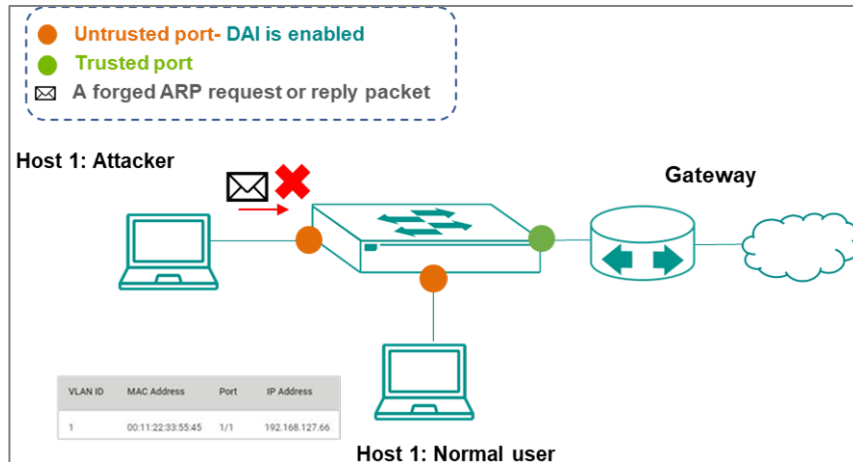
## Dynamic ARP Inspection

Dynamic ARP Inspection (DAI) is an ARP packet filtering security feature that works on Layer 2 interfaces. It works together with DHCP snooping and the binding database to help defend against attacks such as man-in-the-middle or denial-of-service (DoS) attacks caused by ARP packet spoofing (also known as ARP poisoning or ARP cache poisoning).

### How Dynamic ARP Inspection Works

Dynamic ARP Inspection (DAI) works with DHCP Snooping. Users must enable DHCP snooping to create Binding Database entries before enabling DAI, and DAI can only be used on ports specified as untrusted DHCP Snooping.

DAI inspects each ARP packet sent from a host attached to an untrusted port on the switch. The IP address, MAC address, VLAN, and port associated with the host are checked against entries stored in the Binding Database. If the host information does not match a valid entry in the Binding Database, the ARP packet will not be forwarded.



### Before you begin:

- Make sure the related information of the ports you want to enable Dynamic ARP Inspection including VLAN ID, MAC Address, Port, and IP Address exist in Binding Database, if it doesn't exist, you can enable DHCP Snooping for dynamic learning(refer to Binding Database chapter for dynamic learning), or manually key in the entry in the Binding Status.
- Specify ports you want to enable Dynamic ARP Inspection as Untrusted ports in DHCP Snooping feature.

Click **Edit** (✎) on the port setting to enable or disable DAI for untrusted ports specified in the DHCP Snooping feature.

**Result:** The ARP packet will be filtered against the IP address, MAC address, VLAN, and port recorded in the Binding Data Base Entry once the DAI has been enabled.

#### ✎ Note






Please note DAI can only be enabled on untrusted ports specified in DHCP Snooping feature.


## Dynamic ARP Inspection

**Menu Path:** Security > Network Security > Dynamic ARP Inspection

This page lets you enable or disable Dynamic ARP Inspection for each port.

### Dynamic ARP Inspection List

Dynamic ARP Inspection		
	Port	Status
	1	Disabled
	2	Disabled
	3	Disabled
	4	Disabled
	5	Disabled

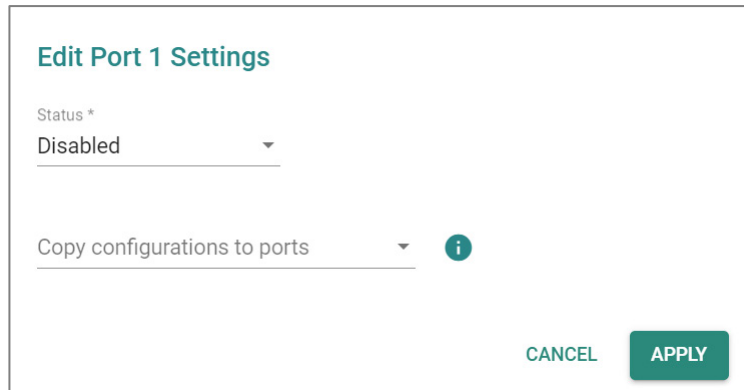
UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Status</b>	Shows whether Dynamic ARP Inspection is enabled for the port.
	 <b>Note</b> Dynamic ARP Inspection can only be enabled on ports specified as untrusted in DHCP snooping.

## Dynamic ARP Inspection - Edit Port Settings

**Menu Path:** Security > Network Security > Dynamic ARP Inspection

Clicking the **Edit** (✎) icon for a port on the **Security > Network Security > Dynamic ARP Inspection** page will open this dialog box. This dialog lets you enable or disable Dynamic ARP Inspection for the port.

Click **APPLY** to save your changes.



UI Setting	Description	Valid Range	Default Value
<b>Status</b>	Enable or disable Dynamic ARP Inspection for the port. When enabled, ARP packets are inspected, and only ARP packets that have a source IP and MAC address that match a valid entry in the Binding Database will be forwarded.  <b>Note</b> Dynamic ARP Inspection can only be enabled on ports specified as untrusted in DHCP snooping.	Enabled / Disabled	Disabled
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## Authentication

**Menu Path:** Security > Authentication

This section lets you manage the authentication features of your device.

This section includes these pages:



- Login Authentication
- RADIUS
- TACACS+

## Login Authentication

Your device can authenticate user logins to protect against unauthorized access to your device.

### How Login Authentication Works

Your device has three different methods of authenticating user logins:

- TACACS+ (Terminal Access Controller Access-Control System Plus)
- RADIUS (Remote Authentication Dial In User Service)
- Local database

TACACS+ and RADIUS are centralized “AAA” (Authentication, Authorization, and Accounting) systems for connecting to network services. The fundamental purpose of these is to provide an efficient and secure mechanism for user account management.

You can use different combinations of these authentication methods:

1. **TACACS+, Local:** Check the TACACS+ database first. If checking the TACACS+ database fails, then check the local database.
2. **RADIUS, Local:** Check the RADIUS database first. If checking the RADIUS database fails, then check the local database.
3. **TACACS+:** Only check the TACACS+ database.
4. **RADIUS:** Only check the RADIUS database.
5. **Local:** Only check the local database.

## Login Authentication

**Menu Path:** [Security](#) > [Authentication](#) > [Login Authentication](#)

This page lets you to select the login authentication protocol for your device.

## Login Authentication Settings

### Login Authentication

#### Authentication Protocol

Local  
 RADIUS  
 TACACS+  
 RADIUS, Local  
 TACACS+, Local

UI Setting	Description	Valid Range	Default Value
<b>Authentication Protocol</b>	<p>Select the login authentication protocol to use for your device.</p> <ul style="list-style-type: none"> <li>• <b>Local:</b> Only the local database will be checked for login authentication.</li> <li>• <b>RADIUS:</b> Only the RADIUS database will be checked for login authentication.</li> <li>• <b>TACACS+:</b> Only the TACACS+ database will be checked for login authentication.</li> <li>• <b>RADIUS, Local:</b> The RADIUS database will be checked first for login authentication. If checking the RADIUS database fails, then the local database will be checked.</li> <li>• <b>TACACS+, Local:</b> The TACACS+ database will be checked first for login authentication. If checking the TACACS+ database fails, then the local database will be checked.</li> </ul>	Local / RADIUS / TACACS+ / RADIUS, Local / TACACS+, Local	Local

## RADIUS


RADIUS, or Remote Authentication Dial-In User Service, acts like a central security checkpoint for your network. It verifies the identities of users and devices trying to connect, ensuring only authorized ones gain access. Imagine it as a doorman for your switch – RADIUS checks credentials and grants permission to enter the network, enhancing overall security. This centralized approach simplifies user management and eliminates the need for individual security configurations on each device. RADIUS is particularly useful for businesses with many users, devices, or remote access needs.

## RADIUS

**Menu Path: Security > Authentication > RADIUS**

This page lets you configure the RADIUS settings for your device.

### RADIUS Settings

 **Note**

After leaving this page or refreshing, the Share Key fields will automatically be cleared to enhance security.

### RADIUS Server

Server IP Address 1 *	UDP Port *
0.0.0.0	1812
	1 - 65535
Share Key <span style="float: right;"> </span>	
0 / 64	
Auth Type *	
CHAP <span style="float: right;">▼</span>	
Timeout *	
5	
5 - 180 sec.	
Retry *	
1	
0 - 5 times	
Server IP Address 2 *	UDP Port *
0.0.0.0	1812
	1 - 65535
Share Key <span style="float: right;"> </span>	
0 / 64	
Auth Type *	
CHAP <span style="float: right;">▼</span>	
Timeout *	
5	
5 - 180 sec.	
Retry *	
1	
0 - 5 times	
<b>APPLY</b>	

UI Setting	Description	Valid Range	Default Value
<b>Server Address 1/2</b>	Specify the address of the first/second RADIUS server.	Valid IP address	0.0.0.0
<b>UDP Port</b>	Specify the UDP port for the RADIUS server.	1 to 65535	1812
<b>Share Key</b>	Input the share key for server authentication verification.	0 to 64 characters	N/A
<b>Authentication Type</b>	Select the authentication type to use for the RADIUS server.	PAP / CHAP / MS-CHAPv1 / MS-CHAPv2	CHAP
<b>Timeout (sec.)</b>	Specify how long in seconds to wait for a response from the RADIUS server before timing out.	5 to 180	5

UI Setting	Description	Valid Range	Default Value
<b>Retry (sec.)</b>	Specify how many times to try reconnecting to the RADIUS server.	0 to 5	1

## TACACS+


TACACS+, Terminal Access Controller Access Control System Plus, goes beyond simple user authentication. Think of it as a set of tools for network access control. It verifies users, authorizes their actions (like read, write, or configure), and keeps a detailed log of activity. This granular control allows you to restrict what users can do on specific network devices, ensuring security and compliance. TACACS+ is especially beneficial for network administrators who need to manage user access privileges and track activity across multiple devices.

## TACACS+

**Menu Path:** [Security](#) > [Authentication](#) > [TACACS+ Server](#)





This page lets you configure the TACACS+ settings for your device.

### TACACS+ Settings

 **Note**

After leaving this page or refreshing, the Share Key fields will automatically be cleared to enhance security.

### TACACS+ Server

Server IP Address 1 *	TCP Port *
0.0.0.0	49
	1 - 65535
Share Key	 
0 / 64	
Auth Type *	
CHAP	
Timeout *	
5	
5 - 180	sec.
Retry *	
1	
0 - 5	times
Server IP Address 2 *	TCP Port *
0.0.0.0	49
	1 - 65535
Share Key	 
0 / 64	
Auth Type *	
CHAP	
Timeout *	
5	
5 - 180	sec.
Retry *	
1	
0 - 5	times

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>Server Address 1/2</b>	Specify the address of the first/second TACACS+ server.	Valid IP address	0.0.0.0
<b>TCP Port</b>	Specify the TCP port for the TACACS+ server.	1 to 65535	49
<b>Share Key</b>	Specify the share key for server authentication verification.	0 to 64 characters	N/A
<b>Authentication Type</b>	Select the authentication type to use for the TACACS+ server.	ASCII / PAP / CHAP	CHAP
<b>Timeout (sec.)</b>	Specify how long in seconds to wait for a response from the TACACS+ server before timing out.	5 to 180	5

UI Setting	Description	Valid Range	Default Value
<b>Retry</b>	Specify how many times to try reconnecting to the TACACS+ server.	0 to 5	1

# Diagnostics

## Menu Path: [Diagnostics](#)

This section lets you configure the diagnostics settings.

This section includes these pages:

- [System Status](#)
- [Network Status](#)
- [Tools](#)
- [Event Logs and Notifications](#)

## System Status

### Menu Path: [Diagnostics](#) > [System Status](#)

This section lets you view the current system status.

This section includes these pages:

- [Resource Utilization](#)

## Resource Utilization

Resource Utilization provides a set of monitoring tools to give you insights into the switch's current and historical resource usage.

These tools typically include:

- **CPU Utilization:** Percentage of CPU processing power currently being used by the device.
- **Memory History:** Historical trend of memory usage over time.
- **Power Consumption:** Current power consumption of the device.
- **Power History:** Historical trend of power consumption over time.



## Resource Utilization

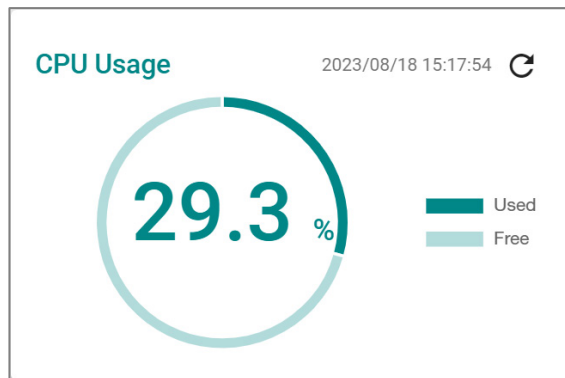
**Menu Path: Diagnostics > System Status > Resource Utilization**

This page lets you monitor current and historical system resource utilization.

### CPU Usage

This display shows the device's CPU usage.

Click the **Refresh** (🔄) icon to refresh the graph.



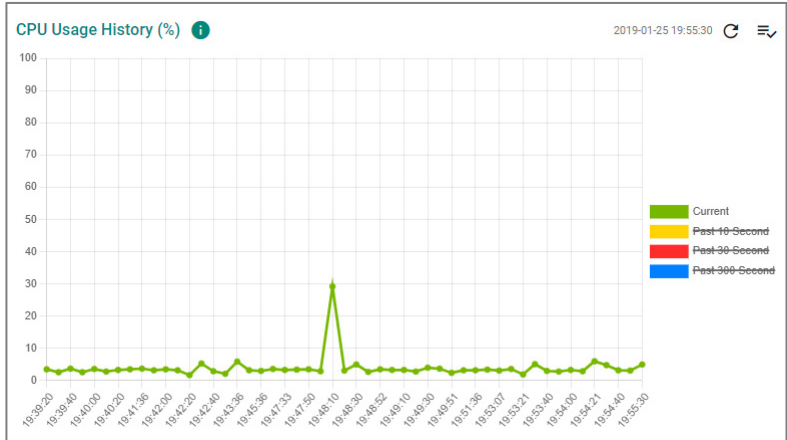
UI Setting	Description
CPU Usage	Displays the current utilization of the CPU.

### CPU Usage History (%)

The device's CPU usage will be shown as a percentage over time.

Click the **Refresh** (🔄) icon to refresh the graph.

Click the icon on the top-right corner of the widget to select which data to display.

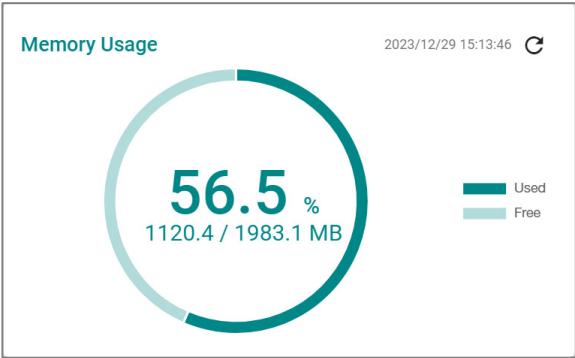


UI Setting	Description
<b>CPU Usage History</b>	Displays the CPU usage history trend in a chart.

**Memory Usage**

This display shows the device’s memory usage.

Click the **Refresh** (🔄) icon to refresh the graph.

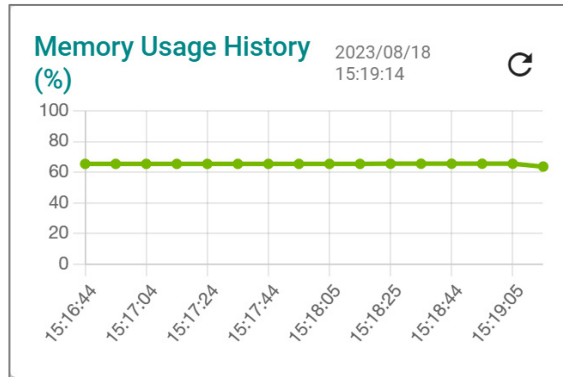


UI Setting	Description
<b>Memory Usage</b>	Displays the memory utilization status.

**Memory Usage History**

The device's memory usage will be shown as a percentage over time.

Click the **Refresh** (🔄) icon to refresh the graph.



UI Setting	Description
Memory Usage History	Displays the history of the memory usage.

## Network Status

### Menu Path: Diagnostics > Network Status

This section lets you view the network status.

This section includes these pages:

- Network Statistics
- LLDP

## Network Statistics

Network Statistics provides monitoring tools that give you a real-time view of traffic flowing through the device.

This information typically includes:

- **Packet Counter:** The number of data packets being transmitted and received within a specific period of time, providing a crucial metric for assessing the activity and load on a network's infrastructure.
- **Bandwidth Utilization:** The percentage of the total bandwidth currently being used for data transmission.

## Network Statistics

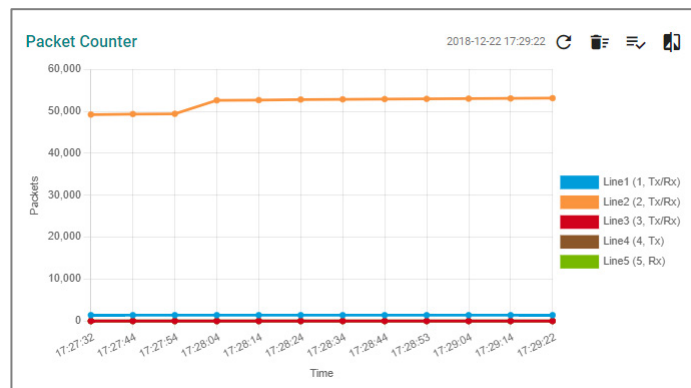
### Menu Path: Diagnostics > Network Status > Network Statistics

This page lets you see the real-time packet and bandwidth status for your device.

### Network Status Display

You can switch between **Packet Counter** and **Bandwidth Utilization** views by clicking on the **Display Settings** (☰) icon on the top-right.

- **Packet Counter:** This view shows how many packets are being handled over time. This view updates every 5 seconds.
- **Bandwidth Utilization:** This view shows bandwidth utilization over time. This view updates every 3 seconds.



UI Setting	Description
<b>Refresh</b> (↻)	Updates statistics immediately without waiting for the refresh interval.
<b>Reset the Statistics Graph</b> (🗑️) (For Packet Counter display only)	Clears the display and resets display settings back to defaults.
<b>Display Settings</b> (☰)	Opens <b>Display Settings</b> , which allows you to switch between <b>Packet Counter</b> and <b>Bandwidth Usage</b> view, and add lines based on user-defined criteria.
<b>Compare Data</b> (📏) (For Packet Counter display only)	Compare data by selecting a benchmark line and time and a comparison line and time.

## Display Settings

**Display Settings**

Display Mode \*  
 Packet Counter ▼

Line 1 Monitoring Port \*      Line 1 Sniffer \*  
 1                                      Tx/Rx ▼

Line 2 Monitoring Port \*      Line 2 Sniffer \*  
 2                                      Tx/Rx ▼

Line 3 Monitoring Port \*      Line 3 Sniffer \*  
 3                                      Tx/Rx ▼

Line 4 Monitoring Port \*      Line 4 Sniffer \*  
 4                                      Tx ▼

Line 5 Monitoring Port \*      Line 5 Sniffer \*  
 5                                      Rx ▼

CANCEL    APPLY

UI Setting	Description	Valid Range	Default Value
<b>Display Mode</b>	Select whether to show the <b>Packet Counter</b> or the <b>Bandwidth Usage</b> display.	Packet Counter / Bandwidth Usage	Packet Counter
<b>Line 1-5 Monitoring Port</b>	Select which port to monitor for the line.	Drop-down list of ports	Line 1: 1 Line 2: 2 Line 3: 3 Line 4: 4 Line 5: 5
<b>Line 1-5 Sniffer (If Display Mode is Packet Counter)</b>	Select which type of traffic to monitor for the line. <ul style="list-style-type: none"> <li><b>Tx/Rx:</b> Monitor both transmit and receive traffic.</li> <li><b>Tx:</b> Only monitor transmit traffic.</li> <li><b>Rx:</b> Only monitor receive traffic.</li> </ul>	Tx/Rx / Tx / Rx	Line 1: Tx/Rx Line 2: Tx/Rx Line 3: Tx/Rx Line 4: Tx Line 5: Rx

## Compare Data Settings

If you click on the **Compare icon** (🔍) for the **Packet Counter** display, this dialog will appear.

After making your selections, a table will appear that compares various packet statistics between the benchmark and comparison data.

- ↑ : Shows that the benchmark line number is **higher** than the comparison line.
- ⚖️ : Shows that the benchmark line number is **equal** to the comparison line.
- ↓ : Shows that the benchmark line number is **lower** than the comparison line.

**Compare Data**

Benchmark \*      Benchmark Line - Time \*

Comparison \*      Comparison Line - Time \*

[CLOSE](#)

## Comparison Table

Tx Total Octets	37755097	↑	↓
Tx Total Packets	34751	↑	↓
Tx Unicast Packets	31911	↑	↓
Tx Multicast Packets	2807	↑	↓
Tx Broadcast Packets	33	↑	↓
Rx Total Octets	2831394	↑	↓
Rx Total Packets	16518	↑	↓
Rx Unicast Packets	14055	↑	↓
Rx Multicast Packets	2525	↑	↓
Rx Broadcast Packets	-62	↓	↓
Rx Pause Packets	0	⚖️	↓
Collision Packets	0	⚖️	↓
Late Collision Packets	0	⚖️	↓
Excessive Collision Packets	0	⚖️	↓

UI Setting	Description	Valid Range	Default Value
<b>Benchmark</b>	Specify which line to use as the benchmark.	Drop-down list of monitored port and sniffer combinations	N/A
<b>Benchmark Line - Time</b>	Select a timestamp to determine which benchmark data to use.	Drop-down list of timestamps	N/A
<b>Comparison</b>	Specify which line to use as the comparison.	Drop-down list of monitored port and sniffer combinations	N/A
<b>Comparison Line - Time</b>	Select a timestamp to determine which comparison data to use.	Drop-down list of timestamps	N/A

## Network Statistics Table

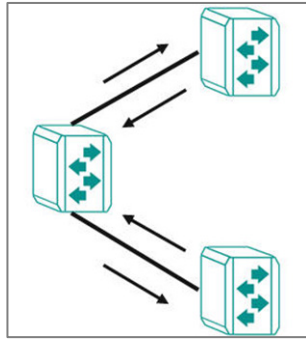
This table shows various packet statistics for each port.

Port	Tx Total Octets	Tx Total Packets	Tx Unicast Packets	Tx Multicast Packets	Tx Broadcast Packets	Rx Total Octets
1	42214	564	6	555	3	140481
2	66477293	57249	53751	3462	36	4209464
3	0	0	0	0	0	0

## LLDP

**Link Layer Discovery Protocol (LLDP)** is an OSI Layer 2 protocol defined by IEEE 802.11AB. LLDP standardizes the self-identification advertisement method, and allows each networking device to periodically send its system and configuration information to its neighbors. Because of this, all LLDP devices are kept informed of each other's status and configurations. With SNMP, this information can be transferred to Moxa's MXview for auto-topology and network visualization.

From the switch's web interface, you can enable or disable LLDP, and set the LLDP transmit interval. In addition, you can view each switch's neighbor list, which is reported by its network neighbors. Most importantly, enabling the LLDP function allows Moxa's MXview to automatically display the network's topology and system setup details, such as VLAN and Trunking for the entire network.



## LLDP

### Menu Path: [Diagnostics](#) > [Network Status](#) > [LLDP](#)

This page lets you configure Link Layer Discovery Protocol (LLDP) for your device.

This page includes these tabs:

- [Settings](#)
- [Status](#)

### LLDP - Settings

#### Menu Path: [Diagnostics](#) > [Network Status](#) > [LLDP - Settings](#)

This page lets you configure Link Layer Discovery Protocol (LLDP) settings.



## LLDP - Settings

LLDP \* 🔔

Enabled ▼

---

LLDP Version \*

v1(2005) ▼

---

Transmit Interval *	Notification Interval *	Tx Delay *
30	5	2
5 - 32768 sec.	5 - 3600 sec.	1 - 8192 sec.

---

Reinitialization Delay *	Holdtime Multiplier *
2	4
1 - 10 sec.	2 - 10 times

---

Chassis ID Subtype \*

Port-Component ▼ Chassis ID \*

APPLY

UI Setting	Description	Valid Range	Default Value
<b>LLDP</b>	Enable or disable Link Layer Discovery Protocol (LLDP).	Enabled / Disabled	Enabled
<b>LLDP Version</b>	Shows the LLDP version.	v1(2005)	v1(2005)
<b>Transmit Interval</b>	Specify how long in seconds the interval will be in between sending LLDP messages.	5 to 32768	30
<b>Notification Interval</b>	Specify how long in seconds the interval will be in between sending notifications.	5 to 3600	5
<b>Tx Delay</b>	Specify how long in seconds the interval will be in between successive LLDP frame transmissions initiated by changes.	1 to 8192	2
<b>Reinitialization Delay</b>	Specify how long in seconds the delay will be before reinitializing an LLDP packet transmission.	1 to 10	2

UI Setting	Description	Valid Range	Default Value
<b>Holdtime Multiplier</b>	Specify how long in seconds the receiving device will hold an LLDP packet before discarding it.	2 to 10	4
<b>Chassis ID Subtype</b>	Specify the Chassis ID subtype of the device.	Chassis-Component / If-Alias / Port-Component / MAC-Address / Network-Address / If-Name / Local	MAC-Address
<b>Chassis ID</b> <b>(If Chassis ID Subtype is Chassis-Component, Port-Component, or Local)</b>	Specify the Chassis ID.	MAC address of default VLAN	N/A


## LLDP Port List

Port	Port Status
1	Tx and Rx
2	Tx and Rx
3	Tx and Rx
4	Tx and Rx
5	Tx and Rx

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Port Status</b>	Show the status of what data is being transmitted for the port.

## LLDP - Edit Port Settings

### Menu Path: [Diagnostics](#) > [Network Status](#) > [LLDP - Settings](#)

Clicking the **Edit** () icon for a port on the **Diagnostics > Network Status > LLDP - Settings** page will open this dialog box. This dialog lets you configure the LLDP settings for the port.

Click **APPLY** to save your changes.

### Edit Port 1/1 Settings

Port Status \*  
Tx and Rx

Subtype \*  
If-Alias

**Basic Transmit TLVs**

Port Description  
 System Name  
 System Description

**802.1 Transmit TLVs**

Port VLAN ID:  
 VLAN Name:

**802.3 Transmit TLVs**

Link Aggregation Statistics  
 Maximum Frame Size

Copy configurations to ports ?

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Port Status</b>	Specify the port status for transmitting data.	Tx and Rx / Tx Only / Rx Only	Tx and Rx
<b>Subtype</b>	Specify the Chassis ID subtype for the port.	Chassis-Component / If-Alias / Port-Component / MAC-Address / Network-Address / If-Name / Local	If-Alias
<b>Basic Transmit TLVs</b>	Select the basic information to use for the TLV. You can select multiple options.	Port Description / System Name / System Description	Port Description, System Name
<b>802.1 Transmit TLVs</b>	Select the 802.1 information to use for the TLV. You can select multiple options.	Port VLAN ID / VLAN Name	N/A
<b>802.3 Transmit TLVs</b>	Select the 802.3 information to use for the TLV. You can select multiple options.	Link Aggregation Statistics / Maximum Frame Size	N/A
<b>Copy configurations to ports</b>	Select the ports you want to copy this configuration to.	Drop-down list of ports	N/A

## LLDP - Status

### Menu Path: [Diagnostics](#) > [Network Status](#) > [LLDP - Status](#)

This page lets you see the status list of LLDP settings.

To view the LLDP status, click the **Status** tab on the LLDP page, and the status of all LLDP will be shown on the page.

## Local Information

### Local Information

LLDP  
**Enabled**

LLDP Version  
**v1(2005)**

Chassis ID Subtype  
**MAC-Address**

Chassis ID  
**00:01:02:03:04:05**

UI Setting	Description
<b>LLDP</b>	Shows whether LLDP is enabled.
<b>LLDP Version</b>	Shows the LLDP version.
<b>Chassis ID Subtype</b>	Shows the chassis ID subtype.
<b>Chassis ID</b>	Shows the chassis ID.

**Local Timer**

**Local Timer**

Transmit Interval  
**30 (sec.)**

Notification Interval  
**5 (sec.)**

Tx Delay  
**2 (sec.)**

UI Setting	Description
<b>Transmit Interval</b>	Shows the interval between regular LLDP packet transmissions.
<b>Notification Interval</b>	Shows the interval between sending notifications.
<b>Tx Delay</b>	Shows the delay period between successive LLDP frame transmissions initiated by changes.

## Remote Table Statistics

### Remote Table Statistics

Last Change Time (ms)  
**1499300**

Inserts  
**2**

Drops  
**0**

Delete  
**1**

Ageouts  
**0**

UI Setting	Description
<b>Last Change Time (ms)</b>	Shows how long ago in milliseconds the remote table was last changed.
<b>Inserts</b>	Shows how many inserts have occurred.
<b>Drops</b>	Shows how many drops have occurred.
<b>Delete</b>	Shows how many deletes have occurred.
<b>Ageouts</b>	Shows how many ageouts have occurred.

## LLDP Port Status

To view the detailed LLDP status for a specific port, click the **detailed information (i)** icon for the port.

🔄 🏠
🔍 Search

Port	Tx Status	Rx Status	Neighbor Port ID	Neighbor Chassis ID	Port Description																																
ⓘ 1	Enabled	Enabled	---	---	---																																
<div style="border-left: 1px solid #ccc; padding-left: 10px; margin-left: 10px;"> <p><b>Port Local Interface</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Port ID SubType</td> <td style="width: 30%;">Port ID</td> <td style="width: 40%;">Port Description</td> </tr> <tr> <td>If-Alias</td> <td>Eth1/1</td> <td>Ethernet Interface Port 01 - 100TX,RJ45</td> </tr> </table> <p><b>Extended 802.1 TLV</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Port VLAN ID</td> <td style="width: 70%;">VLAN ID / Name</td> </tr> <tr> <td>10</td> <td>10 / V10</td> </tr> </table> <p><b>Extended 802.3 TLV</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Link Aggregation Status</td> <td style="width: 30%;">Aggregated Port ID</td> <td style="width: 40%;">Maximum Frame Size</td> </tr> <tr> <td>Disabled</td> <td>0</td> <td>9216</td> </tr> </table> <p><b>Port Traffic Statistics</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Total Frames Out</td> <td style="width: 25%;">Total Entries Aged</td> <td style="width: 25%;">Total Frames In</td> <td style="width: 25%;"></td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td></td> </tr> <tr> <td>Total Frames Received In Error</td> <td>Total Frames Discarded</td> <td>Total TLVs Unrecognized</td> <td>Total TLVs Discarded</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </table> </div>						Port ID SubType	Port ID	Port Description	If-Alias	Eth1/1	Ethernet Interface Port 01 - 100TX,RJ45	Port VLAN ID	VLAN ID / Name	10	10 / V10	Link Aggregation Status	Aggregated Port ID	Maximum Frame Size	Disabled	0	9216	Total Frames Out	Total Entries Aged	Total Frames In		0	0	0		Total Frames Received In Error	Total Frames Discarded	Total TLVs Unrecognized	Total TLVs Discarded	0	0	0	0
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Total Frames Received In Error	Total Frames Discarded	Total TLVs Unrecognized	Total TLVs Discarded																																		
0	0	0	0																																		
ⓘ 2	Enabled	Enabled	7	00:90:e8:a9:ed:2b	100TX																																
ⓘ 3	Enabled	Enabled	00:b5:6d:00:ea:e2	MILESWANG-TNB																																	
ⓘ 4	Enabled	Enabled	---	---	---																																
ⓘ 5	Enabled	Enabled	---	---	---																																
ⓘ 6	Enabled	Enabled	---	---	---																																
ⓘ 7	Enabled	Enabled	---	---	---																																
ⓘ 8	Enabled	Enabled	---	---	---																																

UI Setting	Description
<b>Port</b>	Shows the port number the entry is for.
<b>Tx Status</b>	Shows whether LLDP is enabled for transmit traffic.
<b>Rx Status</b>	Shows whether LLDP is enabled for receive traffic.
<b>Neighbor Port ID</b>	Shows the port number of the connected neighbor device's interface that is used to connect to this device.
<b>Neighbor Chassis ID</b>	Shows the unique ID (typically the MAC address) that identifies the neighbor device.

UI Setting	Description
<b>Port Description</b>	Shows the port description of the connected neighbor device's interface that is used to connect to this device.
<b>System Name</b>	Shows the hostname of the neighbor device.

## Tools

### Menu Path: [Diagnostics > Tools](#)

This page lets you use various tools to help troubleshoot network issues.

This page includes these tabs:

- Port Mirroring
- Ping

## Port Mirroring

The **Port Mirroring** function can be used to monitor data being transmitted through the specific ports. This is done by setting up mirror ports to receive the same data being transmitted from, or both to and from, the ports under observation. Using mirror ports allows the network administrator to sniff the observed ports to keep tabs on network activity.

The Port Mirroring function includes two features:

- **SPAN (Switched Port Analyzer):** Mirrors data from monitored ports to multiple terminal ports on the same switch. Up to five sessions can be configured in a switch.
- **RSPAN (Remote Switched Port Analyzer):** Mirrors data from monitored ports on one switch to multiple terminal ports on the other switches. Up to two sessions can be configured in a switch.

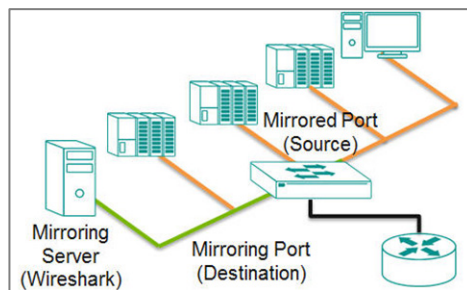


## How Port Mirroring Works

### SPAN

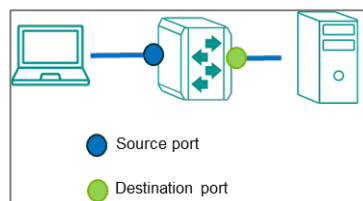
**SPAN** can be configured to copy packets from various ports to a single port or multiple ports, so that users can check if there are problems occurring in these ports.

For example, the following figure demonstrates how the packets transmitted in the four mirrored ports (marked in orange) are copied (mirrored) to a single mirroring port (marked in green). These packets will be sent to a monitoring computer and then software is used to check if there is something wrong with these packets. It is a useful function to troubleshoot or monitoring a network data transmission for debug or security purposes.

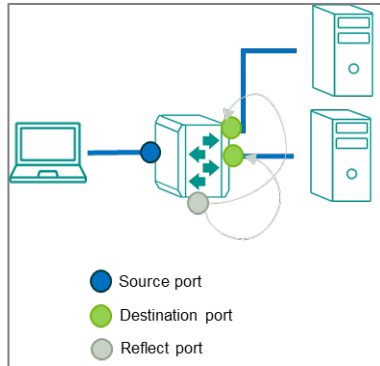


Copy traffic to single and multiple destination ports are supported.

You can specify the ingress, egress or both traffic of source port(s) to be mirrored to the single destination port.



If you want to mirror the ingress, egress or both traffic to multiple destination ports, the reflect port need to be assigned. And the destination ports need to be added to vlan which is the same as reflect port. The specified traffic from source ports will be reflected to the destination ports.

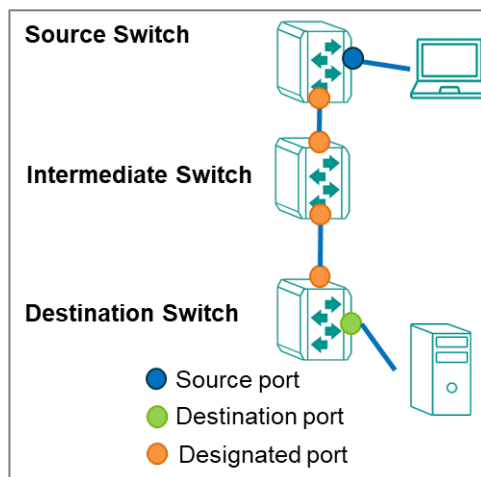


**RSPAN**

**RSPAN** can be configured to copy packets from various ports in one or more source switches through intermediate switches to a single or multiple port(s) to destination switches. The PC or monitor server can be connected to destination ports in the destination switch to receive the copy of the original monitored traffic. For example, the following figure demonstrates how the packets transmitted in mirrored ports (marked in blue) are copied (mirrored) through an intermediate switch to two mirroring ports (marked in green).

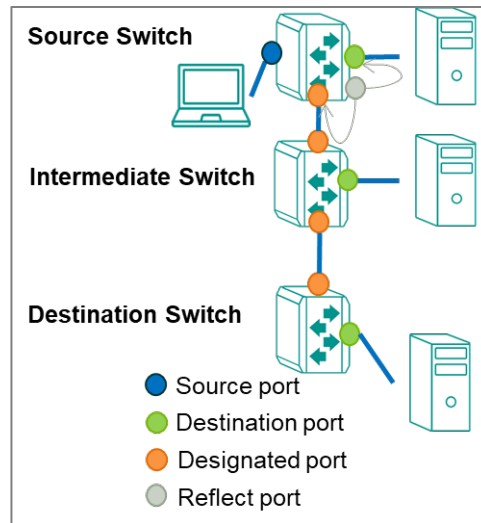
Copy traffic across multiple intermediate switches to single or multiple destination ports in the other switches are supported.

You can specify the ingress, egress or both traffic of source port(s) in the source switch to be mirrored to the destination ports in destination switches.



If you want to mirror the ingress, egress or both traffic to destination ports in source switch, the reflect port need to be assigned. Destination ports in source switch, intermediate switch and destination switch need to be added to vlan which is the same as

reflect port. The specified traffic from source ports in source switch will be copied to the destination ports.



- You can set source ports in one or more RSPAN source switches. Enable reflect port if one of the destination port(s) is in the source switch, or disable reflect port if no destination port(s) is in the source switch.
- You can configure RSPAN VLAN for monitored traffic to be labeled with a RSPAN VLAN tag and send to an RSPAN destination switch via trunk ports.
- You can configure the ports to join RSPAN vlan, these ports will be destination ports to receive the monitored traffic.
- You can connect a PC that has the server monitoring feature for the ports that are set to be the destination ports to receive the monitored traffic.

## **Enabling or disabling Port Mirroring in your switch and configuring the parameters to let the monitored traffic to be copied from source ports to destination ports.**

Configuring the source and destination parameters for traffic mirroring, the steps will be different depends on various scenarios, such as the function you use to achieve your goal, SPAN or RSPAN, your switch role in the RSPAN and if you want to mirror traffic only to multiple destination ports in SPAN or to destination port(s) also in the source switch in RSPAN.


### **Before you begin:**

- You need to decide what do you want to use for mirroring traffic to destination ports, SPAN or RSPAN.
- Regarding to SPAN, you need to decide whether you want to copy packets to a single destination port or to multiple destination ports as the configuration steps are different.
- Regarding to RSPAN, you need to decide what is your switch role in each RSPAN topology. Your switch roles can be source switch, intermediate switch or destination switch. The configuration steps are different.
- Also regarding to RSPAN, you need to decide if you want to set destination port(s) in the source switch.

The Port Mirroring function includes SPAN and RSPAN which share the same global settings.

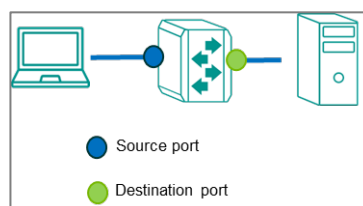
Click **General** tab to **Enable** Port Mirroring and **APPLY**.

### Configuring SPAN

To configure the SPAN settings, click the SPAN tab, and then click the  icon.

There are two scenarios for configuring SPAN: **mirroring traffic to single destination port and mirroring traffic to multiple destination ports.**

#### Mirroring traffic to single destination port



The following steps demonstrate how to copy packets from one or more source port(s) to a single destination port :

1. Select Session ID from drop-down list (1 to 5)

**Note**

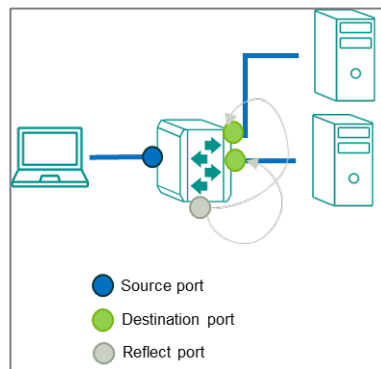
SPAN and RSPAN share 7 sessions, SPAN uses 1 to 5, and RSPAN uses 6 and 7.

2. Disable Reflect Port Mode
3. Select the monitored packet source port(s), you can select either Tx source port(s) or Rx source port(s), or both.
  - If Tx source port(s) is selected, the egress traffic on the port(s) will be mirrored to the destination port.
  - If the Rx source port(s) is selected, the ingress traffic on the port(s) will be mirrored to the destination port.
4. Select the destination port and click **CREATE** to create the SPAN session.

**Limitations**

The duplication of source port(s) configured in different sessions is not allowed. The duplication of source port(s) and destination ports in different sessions is not allowed.

**Mirroring traffic to multiple destination ports.**



The following steps demonstrate how to copy packets from one or more source port(s) to multiple destination ports:

1. Select Session ID from drop-down list (1~5)

**Note**

SPAN and RSPAN share 7 sessions, SPAN uses 1 to 5, and RSPAN uses 6 and 7.

2. Enable Reflect Port Mode

3. Select the monitored packet source port(s), you can select either Tx source port(s) or Rx source port(s), or both.
  - If the Tx source port(s) is selected, the egress traffic on the port(s) will be mirrored to the reflect port.
  - If the Rx source port(s) is selected, the ingress traffic on the port(s) will be mirrored to the reflect port.

#### Limitations

Avoid selecting source ports that are in the same VLAN as the reflect port.

4. Select the reflect port from drop-down list.

#### Limitations

The port is reserved for reflect traffic to destination ports use, please do not configure for other use.

#### Limitations

Reflect port must be the member of management VLAN.

5. When finished, click **CREATE** to create the SPAN session.
6. Go to the VLAN page, configure the port(s) required to receive the packets from source ports as the member port of the same VLAN ID as reflect port.

#### Limitations

The duplication of source port(s) configured in different sessions is not allowed. The duplication of source port(s), reflect port, and destination ports in different sessions is not allowed.

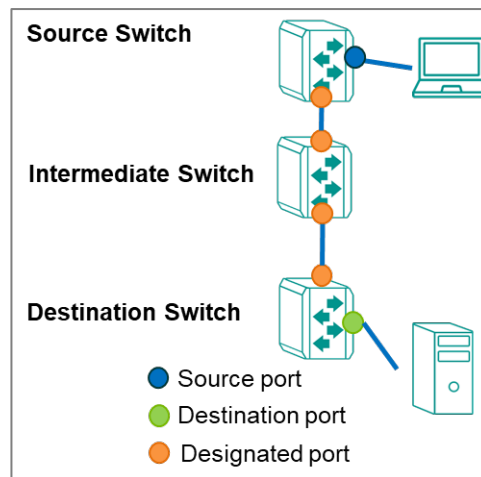
## Configure RSPAN

To configure the RSPAN settings, click RSPAN and then click the  icon.

Configure the following settings. Users need to decide the switch role for RSPAN first, the switch can be Source switch, Intermediate switch, or Destination switch. The switch can be the Source switch and Destination switch at the same time, but if the switch is not allowed to be the intermediate switch and source switch or destination switch at the same time.

The configuration steps for source switch, intermediate switch and destination switch are different. And the steps will be also different depends on if you want to specify destination port(s) in source or intermediate switch. Here are steps for configuring source switch, intermediate switch and destination switch in different scenarios.

### Scenario : The destination port(s) is only in destination switch



#### Configuring the source switch:

1. Select Session ID from drop-down list (6 and 7). The session can be different between the source switch, intermediate switch, and destination switch for the same mirroring traffic.

#### **Note**

SPAN and RSPAN share 7 sessions, SPAN uses 1 to 5, and RSPAN uses 6 and 7.

2. Disable Reflect Port Mode.
3. Select Source as RSPAN Type.

#### **Limitations**

The RSPAN type cannot be duplicated in different RSPAN sessions, for example, the switch cannot be the source switch in session 6 and the source switch in session 7.

4. Select RSPAN VLAN. The RSPAN VLAN must be the same for any traffic that travels between the source switch, the intermediate switch, and the destination switch.

#### 🔒 Limitations

Using the management VLAN or VLAN assignment-configured for RSPAN is not recommended. The VLAN cannot be duplicated in different RSPAN sessions.

5. Select the monitored packet source port(s), you can select either Tx source port(s) or Rx source port(s), or both.
  - If Tx source port(s) is selected, the egress traffic on the port(s) will be mirrored to a designated port.
  - If the Rx source port(s) is selected, the ingress traffic on the port(s) will be mirrored to a designated port.

#### 🔒 Limitations

The duplication of source port(s) configured in different sessions is not allowed. The duplication of source port(s) and destination ports in different sessions is not allowed.

#### 🔒 Limitations

Source port(s) must be not the RSPAN VLAN member.

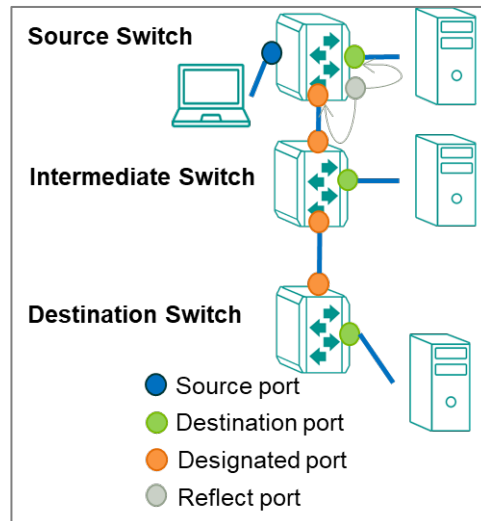
6. When finished, click **CREATE** to create the RSPAN session.

### Configuring the intermediate switch:

#### ✍ Note

SPAN and RSPAN share 7 sessions, SPAN uses 1 to 5, and RSPAN uses 6 and 7.





1. Enable the intermediate role for intermediate switch. RSPAN session can be created after enabling the intermediate role in the switch.

#### ⚠ Limitations

The switch is not allowed to be the intermediate switch and source switch or destination switch at the same time.

If you enable the RSPAN intermediate role in your switch, the RSPAN session will be cleared.

2. Select RSPAN VLAN. The RSPAN VLAN must be the same for the traffic mirrored from source switch, intermediate switch to destination switch.

#### ⚠ Limitations

Using the management VLAN or VLAN assignment-configured for RSPAN is not recommended. The VLAN cannot be duplicated in different RSPAN sessions.

3. When finished, click **APPLY** for the RSPAN intermediate role.

### Configuring the destination switch:

1. Select Session ID from drop-down list (6 and 7); the session can be different for the traffic mirrored from source switch, intermediate switch to destination switch.
2. Select Destination as RSPAN Type

#### 🔒 Limitations

The RSPAN type cannot be duplicated in different RSPAN sessions, for example, the switch cannot be the destination switch in session 6 and the destination switch in session 7.

3. Select RSPAN VLAN. The RSPAN VLAN must be the same for the traffic mirrored from source switch, intermediate switch to destination switch.

#### 🔒 Limitations

Using the management VLAN or VLAN assignment-configured for RSPAN is not recommended. The VLAN cannot be duplicated in different RSPAN sessions.

4. Select the destination port(s) and click **CREATE** to create the RSPAN session.

### Scenario: The destination port(s) is not only in destination switch

#### Configuring the source switch:

1. Select Session ID from drop-down list (6 and 7). The session can be different between source switch, intermediate switch and destination switch for the same mirroring traffic.
2. Enable Reflect Port Mode
3. Select Source as RSPAN Type

#### 🔒 Limitations

The RSPAN type cannot be duplicated in different RSPAN sessions, for example, the switch cannot be the source switch in session 6 and the source switch in session 7.

4. Select RSPAN VLAN. The RSPAN VLAN must be the same between source switch, intermediate switch to destination switch for the same mirroring traffic.

#### 🔒 Limitations

Using the management VLAN or VLAN assignment-configured for RSPAN is not recommended. The VLAN cannot be duplicated in different RSPAN sessions.

5. Select the monitored packet source port(s), you can select either Tx source port(s) or Rx source port(s), or both.

- a. If Tx source port(s) is selected, the egress traffic on the port(s) will be mirrored to the reflect port.
- b. If the Rx source port(s) is selected, the ingress traffic on the port(s) will be mirrored to the reflect port.

**🔒 Limitations**

The duplication of source port(s) configured in different sessions is not allowed. The duplication of source port(s) and destination port(s) in different sessions is not allowed.

**🔒 Limitations**

Avoid selecting source ports that are in the RSPAN VLAN.

6. Select the reflect port.

**🔒 Limitations**

The port is reserved for reflect traffic to designated ports use, please do not configure for other use.

7. When finished, click **CREATE** to create the RSPAN session.
8. Go to the VLAN page, configure the ports required to receive the packets from source ports as the member port of RSPAN VLAN.

### Configuring the intermediate switch:

1. Enable the intermediate role for intermediate switch. RSPAN session can be created after enabling the intermediate role in the switch.

**🔒 Limitations**

The switch is not allowed to be the intermediate switch and source switch or destination switch at the same time.

If you enable the RSPAN intermediate role in your switch, the RSPAN session will be cleared.

2. Select RSPAN VLAN. The RSPAN VLAN must be the same for the traffic mirrored from source switch, intermediate switch to destination switch.

#### **ⓘ Limitations**

Using the management VLAN or VLAN assignment-configured for RSPAN is not recommended. The VLAN cannot be duplicated in different RSPAN sessions.

3. When finished, click **APPLY** for the RSPAN intermediate role.
4. Go to the VLAN page, configure the ports required to receive the packets from source ports as the member port of RSPAN VLAN.

#### **Configuring the destination switch:**

1. Select Session ID from drop-down list (6 and 7); the session can be different for the traffic mirrored from source switch, intermediate switch to destination switch.
2. Select Destination as RSPAN Type

#### **ⓘ Limitations**

The RSPAN type cannot be duplicated in different RSPAN sessions, for example, the switch cannot be the destination switch in session 6 and the destination switch in session 7.

3. Select RSPAN VLAN. The RSPAN VLAN must be the same for the traffic mirrored from source switch, intermediate switch to destination switch.

#### **ⓘ Limitations**

Using the management VLAN or VLAN assignment-configured for RSPAN is not recommended. The VLAN cannot be duplicated in different RSPAN sessions.

4. Select the destination port(s) and click **CREATE** to create the RSPAN session.

**Results:** If the settings are applicable, the destination port(s) will receive the traffic copied from the source port(s) you specified.

## **Port Mirroring**

### **Menu Path: [Diagnostics](#) > [Tools](#) > [Port Mirroring](#)**

This page lets you configure port mirroring for your device.

This page includes these tabs:

- General
- SPAN

- RSPAN

## Port Mirroring - General

### Menu Path: Diagnostics > Tools > Port Mirroring - General

This page lets you enable or disable port mirroring for your device.

UI Setting	Description	Valid Range	Default Value
<b>Port Mirroring</b>	Enable or disable port mirroring to facilitate the creation of SPAN or RSPAN sessions.	Enabled / Disabled	Enabled

## SPAN

### Menu Path: Diagnostics > Tools > Port Mirroring - SPAN

This page lets you view and configure your device's SPAN settings.

#### **Limitations**

You can create up to 5 SPAN entries.

UI Setting	Description
<b>Session ID</b>	Shows the session ID the entry is for.  <div style="background-color: #f0f0f0; padding: 5px;"> <p><b>Note</b> SPAN and RSPAN share 7 sessions, SPAN uses 1 to 5, and RSPAN uses 6 and 7.</p> </div>
<b>Reflect Port Mode</b>	Shows whether Reflect Port Mode is enabled.
<b>Tx Source Port(s)</b>	Shows the Tx source ports for the session.
<b>Rx Source Port(s)</b>	Shows the Rx source ports for the session.
<b>Destination Port</b>	Shows the destination port for the session.
<b>Reflect Port</b>	Shows the reflect port for the session.

## Creating a SPAN Session

### Menu Path: Diagnostics > Tools > Port Mirroring - SPAN

Clicking the **Add (+)** icon on the **Diagnosis > Port Mirroring - SPAN** page will open this dialog box. This dialog lets you to create, edit or delete SPAN sessions.

Click **CREATE** to save your changes and add the new session.

### Create Session






Session ID \*

Reflect Port Mode \*

Tx Source Port(s)  Rx Source Port(s)

Destination Port \*

Either the TX or RX source ports need to be selected.

UI Setting	Description	Valid Range	Default Value
<b>Session ID</b>	Select the session ID to use for the session.  <div style="background-color: #f0f0f0; padding: 5px;"> <p> <b>Note</b></p> <p>SPAN and RSPAN share 7 sessions, SPAN uses 1 to 5, and RSPAN uses 6 and 7.</p> </div>	1 to 5	N/A
<b>Reflect Port Mode</b>	Enable or disable Reflect Port Mode. <ul style="list-style-type: none"> <li><b>Enable:</b> You can configure a reflect port to mirror packets to multiple destination ports.</li> <li><b>Disable:</b> Packets will be mirrored to a single destination port.</li> </ul>	Enable / Disable	N/A
<b>Tx Source Port</b>	Specify a port to monitor data packets being sent through it.  <div style="background-color: #f0f0f0; padding: 5px;"> <p> <b>Note</b></p> <p>Avoid selecting source ports that are in the same VLAN as the reflect port.</p> </div>	Drop-down list of ports	N/A
<b>Rx Source Port</b>	Specify a port to monitor data packets being received through it.  <div style="background-color: #f0f0f0; padding: 5px;"> <p> <b>Note</b></p> <p>Avoid selecting source ports that are in the same VLAN as the reflect port.</p> </div>	Drop-down list of ports	N/A
<b>Reflect Port</b>	Specify this port as the reflect port for Reflect Port Mode to mirror packets to multiple destination ports.  <div style="background-color: #f0f0f0; padding: 5px;"> <p> <b>Note</b></p> <p>This port will be specifically reserved for reflect port use, please do not configure it for other uses.</p> </div> <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p> <b>Note</b></p> <p>Avoid selecting reflect ports that are in the management VLAN.</p> </div>	Drop-down list of ports	N/A
<b>Destination Port</b>	Specify the destination port to use for the session.	Drop-down list of ports	N/A

## RSPAN

### Menu Path: Diagnostics > Tools > Port Mirroring - RSPAN

This page lets you to view and configure your device's RSPAN settings.

#### 🔔 Limitations

You can create up to 2 RSPAN entries.

### RSPAN Intermediate Settings

## Port Mirroring

- General
- SPAN
- RSPAN**

### RSPAN Intermediate Settings

Make sure that any ports used for RSPAN communication are added to the appropriate RSPAN VLAN.

RSPAN Intermediate Role \*  
Disabled ▼

RSPAN Intermediate 1st VLAN ID ▼ RSPAN Intermediate 2nd VLAN ID ▼

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>RSPAN Intermediate Role</b>	Enable this if the device is in an intermediate role. Disable this if the device is in a source or destination role.	Enabled / Disabled	Disabled



UI Setting	Description	Valid Range	Default Value
<b>RSPAN Intermediate 1st/2nd VLAN ID</b>	Specify the VLAN ID to use as the RSPAN intermediate VLAN ID.  <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>The management VLAN ID cannot be used as an RSPAN intermediate VLAN ID.</p> </div>	Drop-down list of VLAN IDs	N/A

## RSPAN Session List

									Search
<input type="checkbox"/>	Session ID	Reflect Port Mode	RSPAN Type	RSPAN VLAN ID	Tx Source Port(s)	Rx Source Port(s)	Destination Port(s) or Designated Port	Reflect Port	
<input type="checkbox"/>	6	Disabled	Source	5	--	--	Designated Port: G2	--	
Max. 2									1 - 1 of 1

UI Setting	Description
<b>Session ID</b>	Shows the session ID the entry is for.  <div style="border: 1px solid #ccc; background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p><b>Note</b></p> <p>SPAN and RSPAN share 7 sessions, SPAN uses 1 to 5, and RSPAN uses 6 and 7.</p> </div>
<b>Reflect Port Mode</b>	Shows whether Reflect Port Mode is enabled for the session.
<b>RSPAN Type</b>	Shows Source if the device role is an RSPAN source switch. Shows Destination if the device role is an RSPAN destination switch.
<b>RSPAN VLAN ID</b>	Shows the VLAN ID used for the RSPAN.
<b>Tx Source Port</b>	Shows the ports being monitored for Tx packets being sent out.
<b>Rx Source Port</b>	Shows the ports being monitored for Rx packets coming in.
<b>Designated Port</b>	Shows the port set as the designated port.
<b>Reflect Port</b>	Shows the port set as the Reflect Port for Reflect Port Mode to mirror packets to the designated ports.

## Creating an RSPAN Session

### Menu Path: Diagnostics > Tools > Port Mirroring - RSPAN

Clicking the **Add (+)** icon on the **Diagnostics > Tools > Port Mirroring - RSPAN** page will open this dialog box. This dialog lets you to create, edit or delete RSPAN sessions.


Click **CREATE** to save your changes and add the new session.

### Create Session

Session ID \*

Reflect Port Mode \*


RSPAN Type \*





RSPAN VLAN ID \*  

Tx Source Port(s)  Rx Source Port(s)

Designated Port \*

Either the TX or RX source ports need to be selected.

UI Setting	Description	Valid Range	Default Value
<b>Session ID</b>	Select the session ID to use for the session.   <b>Note</b> SPAN and RSPAN share 7 sessions, SPAN uses 1 to 5, and RSPAN uses 6 and 7.	6 / 7	N/A

UI Setting	Description	Valid Range	Default Value
<b>Reflect Port Mode</b>	<p>Enable or disable Reflect Port Mode.</p> <ul style="list-style-type: none"> <li><b>Enable:</b> You can configure a reflect port to mirror packets to destination port(s) in source switch.</li> <li><b>Disable:</b> Packets will be only mirrored to designated port.</li> </ul>	Enabled / Disabled	N/A
<b>RSPAN Type</b>	<p>Select the RSPAN type to use for the session.</p> <ul style="list-style-type: none"> <li><b>Source:</b> The device will act as an RSPAN source switch.</li> <li><b>Destination:</b> The device will act as an RSPAN destination switch.</li> </ul>	Source / Destination	N/A
<b>RSPAN VLAN ID</b>	<p>Select the VLAN ID to use as the RSPAN VLAN ID. Only existing VLAN IDs can be selected.</p> <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p> <b>Note</b></p> <p>Using the management VLAN or VLAN assignment-configured for RSPAN is not recommended.</p> </div>	Drop-down list of VLAN IDs	N/A
<b>Tx Source Port</b>	<p>Select the ports you want to monitor for Tx packets being sent out.</p> <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p> <b>Note</b></p> <p>Avoid selecting source ports that are in the RSPAN VLAN.</p> </div>	Drop-down list of ports	N/A
<b>Rx Source Port</b>	<p>Select the ports you want to monitor for Rx packets coming in.</p> <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p> <b>Note</b></p> <p>Avoid selecting source ports that are in the RSPAN VLAN.</p> </div>	Drop-down list of ports	N/A
<b>Designated Port</b>	<p>Select the port to use as the designated port.</p>	Drop-down list of ports	N/A
<b>Reflect Port</b>	<p>Select the port to use as the reflect port for Reflect Port Mode to mirror packets to multiple designated ports.</p> <div style="background-color: #f0f0f0; padding: 5px; margin-top: 10px;"> <p> <b>Note</b></p> <p>This port is specifically reserved for reflect port use, please do not configure it for other use.</p> </div>	Drop-down list of ports	N/A

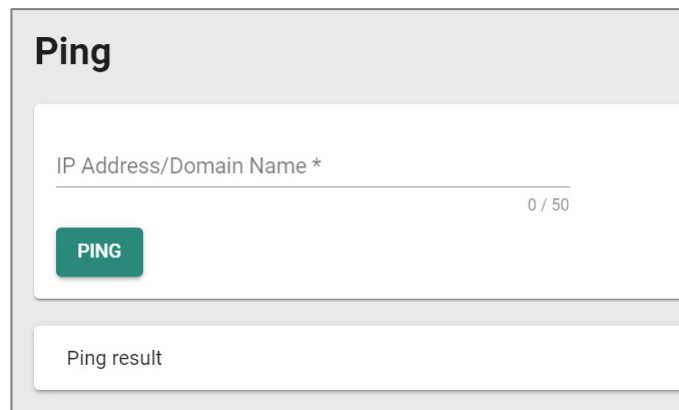
## Ping

Ping lets you use the ping command through the device for a simple, but powerful tool for troubleshooting network problems. The unique feature of this is that even though the ping command is entered in your browser window, the actual ping command will be sent from the Moxa device itself.

## Ping

### Menu Path: [Diagnostics](#) > [Tools](#) > [Ping](#)

This page lets you use the ping function, which is useful for troubleshooting network problems.



UI Setting	Description	Valid Range	Default Value
<b>IP Address/Domain Name</b>	Specify the IP address or domain name you want to ping, then click the <b>PING</b> button. The ping result will be displayed below.	Valid IP address or domain name up to 50 characters	N/A

## Event Logs and Notifications

### Menu Path: [Diagnostics](#) > [Event Logs and Notifications](#)

This section lets you set up and view your device's event logs and notifications.

This section includes these pages:

- Event Logs
- Event Notifications

- Syslog
- SNMP Trap/Inform
- Email Settings

## Event Logs

An Ethernet switch's "Event logs" feature is like a digital diary for the switch. It automatically records important events that happen on the network connected to the switch. It is useful when troubleshooting network issues.

These events can include:

- **Changes in connection status:** This could be a cable being plugged in or unplugged, a device joining or leaving the network, or a port going up or down.
- **Errors:** The switch might detect issues like data corruption, excessive traffic, or problems with specific ports.
- **Security events:** Some switches can log attempts to access the switch itself or suspicious activity on the network.

## Event Logs

**Menu Path: [Diagnostics > Event Logs and Notifications > Event Logs](#)**

This page lets you browse and export your device's various event logs.

This page includes these tabs:

- Event Logs
- Oversize Action
- Backup

## Event Logs - Event Logs

**Menu Path: [Diagnostics > Event Logs and Notifications > Event Logs - Event Logs](#)**

This page lets you view your device's event logs.

## 🔔 Limitations

The system log can record up to 10000 events.

## Actions

- Click the **Refresh icon** (🔄) to refresh the logs.
- Click the **Clear System Log icon** (🗑️) to delete all logs.
- Click the **Export icon** (📄) to export all logs to a file.

Event Logs						
Event Logs	Oversize Action	Backup				
🔄	🗑️	📄	🔍 Search			
Index	Bootup Number	Severity	Timestamp	Uptime	Message	
1	461	Notice	2024-04-10 03:51:21	9d6h34m42s	[Account:admin] logged out.	
2	461	Notice	2024-04-10 03:51:21	9d6h34m42s	[Account:admin] successfully logged in via local.	
3	461	Notice	2024-04-10 03:48:13	9d6h31m34s	[Account:admin] successfully logged in via local.	
4	461	Notice	2024-04-10 03:30:57	9d6h14m18s	[Account:admin] logged out.	
5	461	Notice	2024-04-10 03:27:26	9d6h10m47s	[Account:admin] logged out.	
6	461	Notice	2024-04-10 03:27:26	9d6h10m47s	[Account:admin] successfully logged in via local.	
7	461	Notice	2024-04-10 03:01:06	9d5h44m28s	[Account:admin] successfully logged in via local.	
8	461	Notice	2024-04-10 02:49:16	9d5h32m38s	[Account:admin] logged out.	
9	461	Notice	2024-04-10 02:28:57	9d5h12m19s	Configuration [dhcpRelay] changed by admin.	
10	461	Notice	2024-04-10 02:28:03	9d5h11m24s	Configuration [mlexport] changed by admin.	

UI Setting	Description
------------	-------------

<b>Index</b>	Shows the index of the event.
--------------	-------------------------------

<b>Bootup Number</b>	Shows the total number of times the device has been powered on. The number increases by 1 every time the device is powered on.
----------------------	--

<b>Severity</b>	Shows the severity categorization of the event.
-----------------	---

<b>Timestamp</b>	Shows the time of the event, including the date, time, and UTC time zone adjustment.
------------------	--

<b>Uptime</b>	Shows the uptime of the device after it is powered on.
---------------	--

<b>Message</b>	Shows additional information about the event, based on the type of event. The username of the account will also be recorded for the following events: <b>Login Success</b> , <b>Login Fail</b> , <b>User Logout</b> .
----------------	---

## Event Logs - Oversize Action

### Menu Path: Diagnostics > Event Logs and Notifications > Event Logs - Oversize Action

This page lets you configure the system's oversize action when the event log reaches its maximum number of entries.

### Oversize Action

The screenshot shows the 'Event Logs' configuration page with the 'Oversize Action' tab selected. The settings are as follows:

- Oversize Action \***: Overwrite the oldest event log
- Capacity Warning \***: Disabled
- Warning Threshold \***: 80 (range: 50 - 100 %)

An 'APPLY' button is located at the bottom of the configuration area.

UI Setting	Description	Valid Range	Default Value
<b>Oversize Action</b>	Select the action to take when the event log reaches its maximum number of entries. <ul style="list-style-type: none"><li>• <b>Overwrite the oldest event log:</b> New events will overwrite the oldest events.</li><li>• <b>Stop recording event log:</b> No new events will be recorded. This will also disable port monitoring.</li></ul>	Overwrite the oldest event log / Stop recording event log	Overwrite the oldest event log
<b>Capacity Warning</b>	Enable or disable capacity warnings.	Enabled / Disabled	Disabled
<b>Warning Threshold</b>	Set the warning threshold as a percentage. When <b>Capacity Warning</b> is enabled, a warning event log will be triggered when the event log reaches this threshold.	50% to 100%	80%

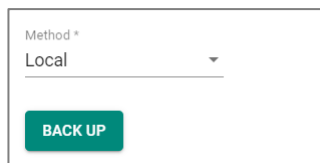
## Event Logs - Backup

**Menu Path:** [Diagnostics > Event Logs and Notifications > Event Logs - Backup](#)

This page lets you back up the event logs through various methods.

### Event Logs - Backup Settings - Local

If **Method** is set to **Local**, these settings will appear. Click **BACK UP** to save the event logs to your local computer.



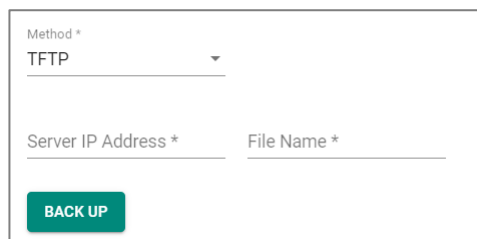
Method \*  
Local

BACK UP

UI Setting	Description	Valid Range	Default Value
<b>Method</b>	Select a method for backing up event logs.	Local / TFTP / SFTP / USB	Local

### Event Logs - Backup Settings - TFTP

If **Method** is set to **TFTP**, these settings will appear. Click **BACK UP** to save the event log to the specified TFTP server.



Method \*  
TFTP

Server IP Address \*      File Name \*

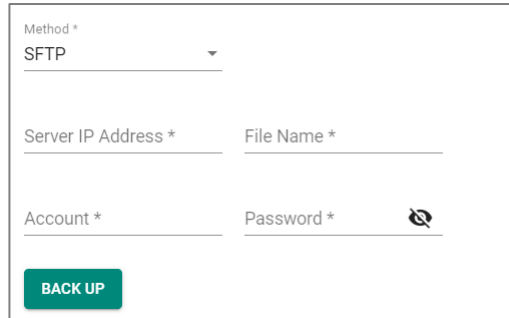
BACK UP

UI Setting	Description	Valid Range	Default Value
<b>Method</b>	Select a method for backing up event logs.	Local / TFTP / SFTP / USB	Local
<b>Server IP Address</b>	Specify the IP address of the TFTP server to upload the event logs to.	Valid IP address	N/A
<b>File Name</b>	Specify a file name to use for the event logs file.	File name can only contain A-Z, a-z, 0-9 or the symbols -. _().	N/A



## Event Logs - Backup Settings - SFTP

If **Method** is set to **SFTP**, these settings will appear. Click **BACK UP** to save the event log to the specified SFTP server.



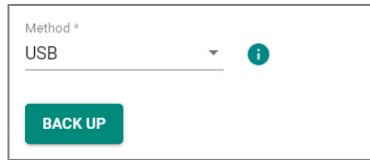
UI Setting	Description	Valid Range	Default Value
<b>Method</b>	Select a method for backing up event logs.	Local / TFTP / SFTP / USB	Local
<b>Server IP Address</b>	Specify the IP address of the SFTP server to upload the event logs to.	Valid IP address	N/A
<b>File Name</b>	Specify a file name to use for the event logs file.	File name can only contain A-Z, a-z, 0-9 or the symbols -_().	N/A
<b>Account</b>	Enter the SFTP server account name to use to connect to the SFTP server.	N/A	N/A
<b>Password</b>	Enter the SFTP server account password to use to connect to the SFTP server.	N/A	N/A

## Event Logs - Backup Settings - USB

If **Method** is set to **USB**, these settings will appear. Click **BACK UP** to save the event log to an ABC-02 configuration tool connected to your device's USB port.

### Note

To use this feature, USB Function must be enabled in System > Management Interface > Hardware Interface.



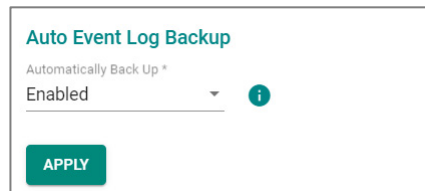
UI Setting	Description	Valid Range	Default Value
<b>Method</b>	Select a method for backing up event logs.	Local / TFTP / SFTP / USB	Local

### Auto Event Log Backup

When **Automatically Back Up** is enabled, when the event log is full, the earliest 1000 event logs will be backed up to an inserted ABC-02 configuration tool and then deleted from the device.

#### Note

To use this feature, USB Function must be enabled in System > Management Interface > Hardware Interface.



UI Setting	Description	Valid Range	Default Value
<b>Automatically Back Up</b>	Enable or disable automatic backup of your event logs.	Enabled / Disabled	Enabled

## Event Notifications

Event Notifications act like an alert system for the network. It allows you to be proactively notified when important events occur on the device or for other network devices connected to it.

## Event Notifications

**Menu Path: Diagnostics > Event Logs and Notifications > Event Notifications**

This page lets you configure notifications for various kinds of events.

This page includes these tabs:

- System and Functions
- Port

### Event Notifications - System and Functions

**Menu Path: Diagnostics > Event Logs and Notifications > Event Notifications - System and Functions**

This page lets you configure notification settings for various system events related to the overall functions of the device. Each event can be configured independently with different warning methods and severity classifications.

### Event Notifications List

Group	Event Name	Enabled	Severity	Registered Action	
	General	Cold start	Enabled	Critical	Trap, Email
	General	Warm start	Enabled	Notice	Trap, Email
	General	Configuration changed	Enabled	Notice	Trap, Email
	General	Login success	Enabled	Notice	Trap, Email
	General	Login failed	Enabled	Warning	Trap, Email
	General	Login lockout	Enabled	Warning	Trap, Email
	General	Account settings changed	Enabled	Notice	Trap, Email
	General	Configuration imported	Enabled	Notice	Trap, Email
	General	SSL certification changed	Enabled	Notice	Trap, Email
	General	Log capacity threshold	Enabled	Warning	Trap, Email
	General	Password changed	Enabled	Notice	Trap, Email
	General	Power On->Off	Enabled	Notice	Trap, Email
	General	Power Off->On	Enabled	Notice	Trap, Email
	Switching	Topology changed	Enabled	Warning	Trap, Email
	Switching	Coupling changed	Enabled	Warning	Trap, Email
	Switching	Master changed	Enabled	Warning	Trap, Email
	Switching	Master mismatch	Enabled	Warning	Trap, Email

UI Setting	Description
<b>Group</b>	Shows which group this event belongs to.
<b>Event Name</b>	Shows the name of the event. Refer to <a href="#">Event Log Descriptions</a> for more details.
<b>Enabled</b>	Shows whether event notifications are enabled for this kind of event.
<b>Severity</b>	Shows the severity assigned to the event. Refer to the <a href="#">Severity Level List</a> for more details.
<b>Registered Action</b>	Shows which action will be taken for this kind of event. <b>Trap:</b> A notification is sent to the Trap server when the event is triggered. <b>Email:</b> A notification is sent to the email server defined in the <a href="#">Email Settings</a> section. <b>Relay:</b> A notification is sent through the relay interface, if the device has one, when the event is triggered.

**Note**

The types of actions available may vary depending on the event type and the device model.

## Editing an Event Notification

**Menu Path: Diagnostics > Event Logs and Notifications > Event Notifications - System and Functions**

Clicking the **Edit** (✎) icon for an entry on the **Diagnostics > Event Logs and Notifications > Event Notifications - System and Functions** page will open this dialog box. This dialog lets you change the notification settings for the selected event.

Click **APPLY** to save your changes.

**Edit This Event Notification**

Event Name  
Cold start

---

Enabled \*  
Enabled ▾

Registered Action  
Trap, Email ▾

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Event Name (View-only)</b>	Shows the name of the event. Refer to <a href="#">Event Log Descriptions</a> for more information.	(Fixed)	(Fixed)
<b>Enabled</b>	Enable or disable notifications for this event.	Enabled / Disabled	Enabled
<b>Registered Action</b>	Select which actions to take when the event occurs. Multiple actions may be selected. <ul style="list-style-type: none"> <li><b>Trap:</b> A notification will be sent to the Trap server.</li> <li><b>Email:</b> A notification email will be sent to the email server defined in the <a href="#">Email Settings</a> section.</li> </ul>	Trap / Email / Relay	Trap, Email

## Event Notifications - Port

### Menu Path: [Diagnostics](#) > [Event Logs and Notifications](#) > [Event Notifications - Port](#)

This page lets you configure notification settings for various events related to your device's physical ports. Each port can be configured independently with different warning methods and severity classifications.

When a port event is triggered, the FAULT LED on your device will also light up if your device has one.

Event Name	Enable	Severity	Registered Action	Registered Port
Port On	Enabled	Notice	Trap, Email	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, G1, G2, G3, G4, G5, G6, G7, G8
Port Off	Enabled	Notice	Trap, Email	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, G1, G2, G3, G4, G5, G6, G7, G8
Port shut down by Port Security	Enabled	Warning	Trap, Email	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, G1, G2, G3, G4, G5, G6, G7, G8
Port shut down by Rate Limit	Enabled	Warning	Trap, Email	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, G1, G2, G3, G4, G5, G6, G7, G8
Port recovered by Rate Limit	Enabled	Warning	Trap, Email	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, G1, G2, G3, G4, G5, G6, G7, G8

UI Setting	Description
<b>Event Name</b>	Shows the name of the port event.
<b>Enable</b>	Shows whether event notifications are enabled for this kind of event.
<b>Severity</b>	Shows the severity assigned to the event. Refer to the <a href="#">Severity Level List</a> for more details.
<b>Registered Action</b>	Shows which action will be taken for this kind of event. <b>Trap:</b> A notification is sent to the Trap server when the event is triggered. <b>Email:</b> A notification is sent to the email server defined in the <a href="#">Email Settings</a> section. <b>Syslog:</b> An event log is recorded to the Syslog server defined in the <a href="#">Syslog</a> section.
<b>Registered Port</b>	Shows the ports that use the registered action.

## Editing a Port Event Notification

**Menu Path: Diagnostics > Event Logs and Notifications > Event Notifications - Port**

Clicking the **Edit** (✎) icon for a port on the **Diagnostics > Event Logs and Notifications > Event Notifications - Port** page will open this dialog box. This dialog lets you change the notification settings for the selected port.

Click **APPLY** to save your changes.

**Edit This Event Notification**

Event Name  
Port On

---

Enabled \*  
Enabled ▾

Registered Action  
Trap, Email ▾

Registered Port  
All Ports ▾

CANCEL
APPLY

UI Setting	Description	Valid Range	Default Value
<b>Event Name (View-only)</b>	Shows the name of the port event.	(Fixed)	(Fixed)
<b>Enabled</b>	Enable or disable notifications for this event.	Enabled / Disabled	Enabled
<b>Registered Action</b>	Select which actions to take when the event occurs. Multiple actions may be selected. <ul style="list-style-type: none"> <li><b>Trap:</b> A notification will be sent to the Trap server.</li> <li><b>Email:</b> A notification email will be sent to the email server defined in the <a href="#">Email Settings</a> section.</li> </ul>	Trap / Email / Relay	Trap, Email
<b>Registered Port</b>	Specify the ports that will use the registered action.	Drop-down list of ports	All Ports

## Syslog

Syslog allows you to centralize event logs on a dedicated server. This provides a more comprehensive record of network activity compared to the limited storage on an individual device, aiding in troubleshooting and security analysis.

When an event occurs, an event notification can be sent as a syslog UDP packet to specified syslog servers. Each syslog server can be enabled individually.

Administrators can manually import self-signed certificates for syslog client services. However, they should check the root certificate and validity of the signature before importing, according to the organization's security procedures and requirements. After importing a certificate, the administrator should check if the certificate has been revoked and if so, the certificate must be replaced. When the device sends an imported certificate to the syslog server, the syslog server will attempt to verify the certificate against the approved certificate pool on the server.

## Syslog


**Menu Path: [Diagnostics](#) > [Event Logs and Notifications](#) > [Syslog](#)**

This page lets you manage your device's Syslog.

This page includes these tabs:

- General

- Authentication

 **Note**

In order to ensure the security of your network, we recommend the following:


- The encryption algorithm of keys should be selected based on internationally recognized and proven security practices and recommendations.
- The lifetime of certificates generated for syslog client services should be short and in accordance with the organization's security procedures and requirements.
- For security reasons, it is recommended to send event logs to a centralized syslog server for continuous network event monitoring.

## Syslog - General

**Menu Path: [Diagnostics](#) > [Event Logs and Notifications](#) > [Syslog - General](#)**

This page lets you configure the Syslog server settings.

## Syslog Settings

 **Note**

If the syslog server cannot receive previous logs, it is possible that the receiving port of the syslog server is not ready. We suggest you enable the Linkup Delay function to delay the log delivery time.



## Syslog

General

Authentication

Syslog \*  
Disabled ▼

Syslog Server 1 \*  
Disabled ▼

Authentication \*  
Disabled ▼

IP Address/ Domain Na...

UDP Port  
514

1 - 65535

Syslog Server 2 \*  
Disabled ▼

Authentication \*  
Disabled ▼

IP Address/ Domain Na...

UDP Port  
514

1 - 65535

Syslog Server 3 \*  
Disabled ▼

Authentication \*  
Disabled ▼

IP Address/ Domain Na...

UDP Port  
514

1 - 65535

APPLY

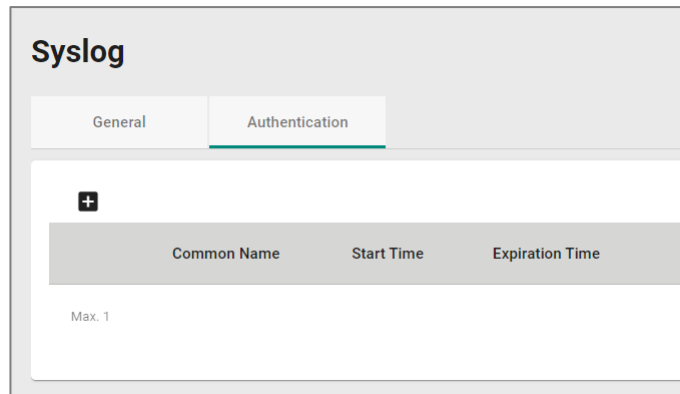
UI Setting	Description	Valid Range	Default Value
<b>Syslog</b>	Enable or disable the syslog logging for your device.	Enabled / Disabled	Disabled
<b>Syslog Server 1/2/3</b>	Enable or disable the specified syslog server.	Enabled / Disabled	Disabled
<b>Authentication</b>	Select whether to authenticate via TLS or disable authentication. <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>To enable TLS, a certificate and key set must be created first on the "Authentication" tab.</p> </div>	Disabled / TLS	Disabled
<b>IP Address/ Domain Name</b>	Enter the IP address or domain name of the related syslog server.	Valid IP address or domain name	N/A
<b>UDP Port</b>	Specify the UDP port of the related syslog server.	1 to 65535	514

## Syslog - Authentication

### Menu Path: [Diagnostics > Event Logs and Notifications > Syslog - Authentication](#)

This page lets you manually import self-signed certificates for syslog client services.

### Syslog Certificate List



UI Setting	Description
<b>Common Name</b>	Shows the name of the imported certificate and keys.
<b>Start Time</b>	Shows the start time of the imported certificate and keys.
<b>Expiration Time</b>	Shows the expiration time of the imported certificate and keys.

### Adding a Syslog Certificate and Key Set

### Menu Path: [Diagnostics > Event Logs and Notifications > Syslog - Authentication](#)

This page lets you add a client certificate and key for Syslog authentication.




Click **CREATE** to save your changes.

**Add a Certificate and Key Set**

Client Certificate \*

Client Key \*

CA Key \*

UI Setting	Description	Valid Range	Default Value
<b>Client Certificate</b>	Click the folder  icon and select a client certificate file from your computer to import.	N/A	N/A
<b>Client Key</b>	Click the folder  icon and select a client key file from your computer to import.	N/A	N/A
<b>CA Key</b>	Click the folder  icon and select a CA certificate file from your computer to import.	N/A	N/A

## SNMP Trap/Inform

SNMP Trap allows an SNMP agent to notify the NMS of a significant event.

Your device supports two SNMP modes: **Trap** mode and **Inform** mode.

SNMP Trap/Inform allows your switch to actively send real-time notifications about critical events to network management systems. This proactive alerting can help identify and address network issues faster, improving overall network health and uptime.

### SNMP Trap/Inform

**Menu Path: Diagnostics > Event Logs and Notifications > SNMP Trap/Inform**

This page lets you configure the SNMP Trap/Inform notification feature.

This page includes these tabs:

- General
- SNMP Trap/Inform Accounts

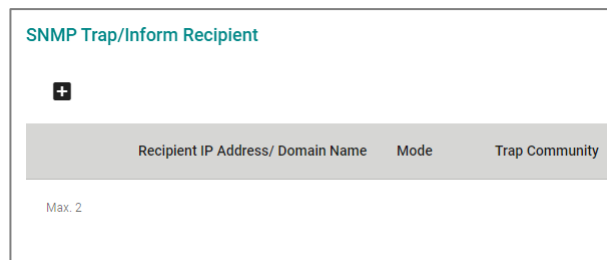
## SNMP Trap/Inform - General

### Menu Path: [Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - General](#)

This page lets you configure the SNMP Trap/Inform settings of your device.

Click **APPLY** to save your changes.

## SNMP Trap/Inform Recipients



Recipient IP Address/ Domain Name	Mode	Trap Community
Max. 2		

UI Setting	Description
<b>Recipient IP Address/ Domain Name</b>	Shows the IP address or the name of the recipient trap server that will receive notifications.
<b>Mode</b>	Shows the mode used for SNMP notifications.
<b>Trap Community</b>	Shows the community string used for authentication.

## Creating an SNMP Trap/Inform Host

### Menu Path: [Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - General](#)

Clicking the **Add (+)** icon on the **Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - General** page will open this dialog box. This dialog lets you add an SNMP Trap/Inform server.

Click **CREATE** to save your changes and add the new server.

**Create a Host**

Recipient IP Address/ Domain Name \*  
0 / 32

Mode \*  
▼

Trap Community \*  
Minimum 4 characters 0 / 32

CANCEL CREATE

UI Setting	Description	Valid Range	Default Value
<b>Recipient IP Address/ Domain Name</b>	Specify the IP address or the name of the recipient trap server that will receive notifications.	Valid IP address or domain name, 0 to 32 characters	N/A
<b>Mode</b>	<p>Select a mode to use for SNMP notifications. Trap notifications are sent without requesting an acknowledgement from the recipient. Inform notifications will request an acknowledgement from the recipient, and will retry sending the notification if the acknowledgement is not received.</p> <p><b>Trap V1:</b> Use Trap V1 for SNMP notifications.</p> <p><b>Trap V2c:</b> Use Trap V2 for SNMP notifications.</p> <p><b>Inform V2c:</b> Use Inform V2 for SNMP notifications.</p> <p><b>Trap V3:</b> Use Trap V3 for SNMP notifications.</p> <p><b>Inform V3:</b> Use Inform V3 for SNMP notifications.</p>	Trap V1 / Trap V2 / Inform V2 / Trap V3 / Inform V3	N/A
<b>Trap Community</b>	Specify the community string that will be used for authentication.	4 to 32 characters	N/A

## SNMP Inform Settings

### Note

These settings only apply to SNMP Trap/Inform entries that have Trap Mode set to Inform V2c or Inform V3.

**SNMP Inform Settings**

Inform Retries \*  
3  
1 - 99 times

Inform Timeout \*  
10  
1 - 300 sec.

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>Inform Retries</b>	Specify the number of times to retry sending an inform notification.	1 to 99	3
<b>Inform Timeout</b>	Specify the amount of time in seconds to wait to wait for an acknowledgement before trying to resend an inform notification.	1 to 300	10

## SNMP Trap/Inform Accounts

**Menu Path: Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - SNMP Trap/Inform Accounts**

This page lets you configure an SNMP trap account for your device.

### 🔔 Limitations

You can configure up to 1 SNMP trap account.

General | **SNMP Trap/Inform Accounts**

+

Username	Authentication Type	Encryption Method
User1	MD5	DES

Max. 1

UI Setting	Description
<b>Username</b>	Shows the username for the SNMP trap account.

UI Setting	Description
<b>Authentication Type</b>	Shows which authentication method is used for the account.
<b>Encryption Method</b>	Shows which encryption method is used for the account.

## Creating an SNMP Trap Account

### Menu Path: Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - SNMP Trap/Inform Accounts

Clicking the **Add (+)** icon on the **Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - SNMP Trap/Inform Accounts** page will open this dialog box. This dialog lets you add an SNMP trap account for your device.

Click **CREATE** to save your changes and add the new account.

**Create an SNMP Trap Account**

Username \*  
Minimum 4 characters 0 / 32

Authentication Type \*  
MD5 Authentication Password \* Minimum 8 characters 0 / 64

Encryption Method \*  
DES Encryption Key \* Minimum 8 characters 0 / 64

CANCEL CREATE

UI Setting	Description	Valid Range	Default Value
<b>Username</b>	Specify a username for the SNMP Trap account.	4 to 32 characters	N/A
<b>Authentication Type</b>	Select which authentication method to use for the account.	None / MD5 / SHA / SHA-256 / SHA-512	None
<b>Authentication Key (if Authentication Type is MD5 or SHA)</b>	Specify an authentication key to use for the account.	8 to 64 characters	N/A
<b>Encryption Method</b>	Disable encryption or select which encryption method to use for the account.	Disabled / DES / AES	Disabled

UI Setting	Description	Valid Range	Default Value
<b>Encryption Key</b> (if Encryption Method is DES or AES)	Specify an encryption password for the account.	8 to 64 characters	N/A

## Deleting an SNMP Trap Account

**Menu Path: Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - SNMP Trap/Inform Accounts**

You can delete an account by clicking its **Delete** (🗑️) icon.

## Editing an SNMP Trap Account

**Menu Path: Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - SNMP Trap/Inform Accounts**

Clicking the **Edit** (✎) icon for an account on the **Diagnostics > Event Logs and Notifications > SNMP Trap/Inform - SNMP Trap/Inform Accounts** page will open this dialog box. This dialog lets you edit the account's settings.

Click **APPLY** to save your changes.

**Edit This SNMP Trap Account**

Username \*  
User1  
Minimum 4 characters 5 / 32

Authentication Type \*  
MD5 CHANGE PASSWORD ⓘ

Encryption Method \*  
DES CHANGE ENCRYPTION KEY

CANCEL APPLY

UI Setting	Description	Valid Range	Default Value
<b>Username</b>	Specify a username for the SNMP Trap account.	4 to 32 characters	N/A



UI Setting	Description	Valid Range	Default Value
<b>Authentication Type</b>	Select which authentication method to use for the account.  Click <b>CHANGE PASSWORD</b> to specify a new authentication password for the account.	None / MD5 / SHA / SHA-256 / SHA-512	None
<b>Encryption Method</b>	Disable encryption or select which encryption method to use for the account.  Click <b>CHANGE ENCRYPTION KEY</b> to specify a new encryption key for the account.	Disabled / DES / AES	Disabled

## Email Settings

Email Settings lets you configure email notifications for important events. This lets you receive alerts directly in your inbox, providing a convenient way to stay informed about critical network issues.

### Email Settings

**Menu Path:** [Diagnostics](#) > [Event Logs and Notifications](#) > [Email Settings](#)


This page lets you configure your device's email notification settings. You can specify which mail server and account to use, and which email addresses to send email notifications to.

Click **APPLY** to save your changes.

### Email Settings

Server IP Address \*  
0.0.0.0

TCP Port \*  
25  
1 - 65535

Username Password   
0 / 60 0 / 60

TLS \*  
Disabled ▼

Sender Address \*  
admin@localhost.com  
19 / 63

1st Recipient Email Add... 2nd Recipient Email Ad... 3rd Recipient Email Add...  
0 / 63 0 / 63 0 / 63

4th Recipient Email Add... 5th Recipient Email Add...  
0 / 63 0 / 63

**APPLY**

UI Setting	Description	Valid Range	Default Value
<b>Server IP Address</b>	Specify the IP address of the email server.	Valid IP address	N/A
<b>TCP Port</b>	Specify the TCP port of the email server.	1 to 65535	25
<b>Username</b>	Specify the username used to log in to the email server.	0 to 60 characters	N/A
<b>Password</b>	Specify the password used to log in to the email server.	0 to 60 characters	N/A
<b>TLS</b>	Enable or disable TLS (Transport Layer Security).	Enabled / Disabled	Disabled
<b>Sender Address</b>	Specify the sender email address to use for email notifications.	1 to 63 characters	N/A
<b>1st/2nd/3rd/4th/5th Recipient Email Address</b>	Enter an email address to send email notifications to. You can set up to 5 email addresses to send email notifications to.	0 to 63 characters	N/A

## Chapter 4

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# Appendix Topics

# Account Privileges List

This page shows the privilege levels granted to the different authority levels: Admin, Supervisor, and User on Moxa's Managed Ethernet Series switches. Refer to [System > Account Management > User Accounts](#) for more information on user accounts.

Privileges are indicated as follows:

- **R/W**: Read and write access granted for the relevant settings. Please note that **R** stands for **Read** and **W** stands for **Write**.
- **R**: Read-only access granted for the relevant settings
- **-**: No access granted for the relevant settings

## Note

Available settings and options will vary depending on the product model.

## System

Settings	Admin	Supervisor	User
<b>System Management</b>			
<b>Information Settings</b>	R/W	R/W	R
<b>Firmware Upgrade</b>	Execute	-	-
<b>Configuration Backup and Restore</b>	Execute	-	-
<b>Account Management</b>			
<b>User Accounts</b>	R/W	-	-
<b>Online Accounts</b>	R/W	-	-
<b>Password Policy</b>	R/W	-	-
<b>Management Interface</b>			
<b>User Interface</b>	R/W	R	R

Settings	Admin	Supervisor	User
<b>Hardware Interfaces</b>	R/W	R/W	R
<b>SNMP</b>	R/W	R	R
<b>RMON1 (CLI only)</b>	R/W	R/W	R
<b>Time</b>			
<b>System Time</b>	R/W	R/W	R
<b>NTP Server</b>	R/W	R/W	-

## Port

Settings	Admin	Supervisor	User
<b>Port Interface</b>			
<b>Port Settings</b>	R/W	R/W	R
<b>Linkup Delay</b>	R/W	R/W	R
<b>Link Aggregation (Port Channel)</b>	R/W	R/W	R
<b>PoE</b>	R/W	R/W	R

## Layer 2 Switching

Settings	Admin	Supervisor	User
<b>VLAN</b>	R/W	R/W	R
<b>GARP</b>	R/W	R/W	R
<b>MAC</b>			
<b>Static Unicast</b>	R/W	R/W	R

Settings	Admin	Supervisor	User
<b>MAC Address Table</b>	R/W	R/W	R
<b>QoS</b>			
<b>Classification</b>	R/W	R/W	R
<b>Ingress Rate Limit</b>	R/W	R/W	R
<b>Scheduler</b>	R/W	R/W	R
<b>Egress Shaper</b>	R/W	R/W	R
<b>Multicast</b>			
<b>IGMP Snooping</b>	R/W	R/W	R
<b>GMRP</b>	R/W	R/W	R
<b>Static Multicast</b>	R/W	R/W	R

## IP Configuration

Settings	Admin	Supervisor	User
<b>IP Configuration</b>	R/W	R/W	R

## Redundancy

### Layer 2 Redundancy

Settings	Admin	Supervisor	User
<b>Spanning Tree</b>	R/W	R/W	R
<b>Turbo Ring v2</b>	R/W	R/W	R
<b>MRP</b>	R/W	R/W	R

## Network Service

Settings	Admin	Supervisor	User
<b>DHCP Server</b>	R/W	R/W	R
<b>DHCP Relay Agent</b>	R/W	R/W	R
<b>DNS Server</b>	R/W	R/W	R

## Security

Settings	Admin	Supervisor	User
<b>Device Security</b>			
<b>Login Policy</b>	R/W	R	R
<b>Trusted Access</b>	R/W	R	R
<b>SSH &amp; SSL</b>	Execute	Execute	-
<b>Network Security</b>			
<b>IEEE 802.1X</b>	R/W	R/W	R
<b>MAC Authentication Bypass</b>	R/W	R/W	R
<b>Port Security</b>	R/W	R/W	R
<b>Traffic Storm Control</b>	R/W	R/W	R
<b>Access Control List</b>	R/W	R/W	R
<b>Network Loop Protection</b>	R/W	R/W	R
<b>Binding Database</b>	R/W	R/W	R
<b>DHCP Snooping</b>	R/W	R/W	R
<b>IP Source Guard</b>	R/W	R/W	R

Settings	Admin	Supervisor	User
<b>Dynamic ARP Inspection</b>	R/W	R/W	R
<b>Authentication</b>			
<b>Login Authentication</b>	R/W	-	-
<b>RADIUS</b>	R/W	-	-
<b>TACACS+</b>	R/W	-	-

## Diagnositics

Settings	Admin	Supervisor	User
<b>System Status</b>			
<b>Resource Utilization</b>	R	R	R
<b>Network Status</b>			
<b>Network Statistics</b>	R	R	R
<b>LLDP</b>	R/W	R/W	R
<b>Tools</b>			
<b>Port Mirroring</b>	R/W	R/W	R
<b>Ping</b>	Execute	Execute	Execute
<b>Event Logs and Notifications</b>			
<b>Event Logs</b>	R/W	R/W	R
<b>Event Notifications</b>	R/W	R/W	R
<b>Syslog</b>	R/W	R	R
<b>SNMP Trap/Inform</b>	R/W	-	-
<b>Email Settings</b>	R/W	R/W	R



Settings	Admin	Supervisor	User
<b>Maintenance and Tool</b>			
<b>Change Mode: Standard/Advance Mode</b>	Execute	Execute	Execute
<b>Disable Auto Save</b>	R/W	R/W	-
<b>Locator</b>	R/W	R/W	Execute
<b>Reboot</b>	Execute	Execute	-
<b>Reset to Default Settings</b>	R/W	-	-
<b>Save Custom Default</b>	Execute	-	-
<b>Log Out</b>	R/W	R/W	R/W

# Configuration Types

This table describes the different types of configurations that your device uses.

Configuration Type	Description
<b>Startup Config</b>	The configuration that is loaded when the device boots up. These settings persist even when the device is powered off.
<b>Running Config</b>	<p>The configuration that is currently in use by the device.</p> <ul style="list-style-type: none"><li>• <b>If auto-save is enabled</b>, all changes will be saved to the startup config, and will be retained when the device powers off.</li><li>• <b>If auto-save is disabled</b>, any unsaved changes will be lost when the device powers off.</li></ul> <p>Refer to <a href="#">Disable/Enable Auto Save</a> for more information.</p>
<b>Factory Default Config</b>	The pre-defined factory default configuration of your device. This configuration cannot be changed.
<b>Custom Default Config</b>	<p>A user-defined default configuration saved on the device.</p> <ul style="list-style-type: none"><li>• Users can define a custom default configuration by saving the current startup configuration as a custom default. Refer to <a href="#">Save Custom Default</a> for more information.</li></ul>

# Event Log Descriptions

This appendix describes the different events that can be recorded in the event log files.

Event name	Severity	Event Description
<b>802.1X auth fail</b>	Warning	802.1x authentication failed on port {{index}}/{{number}} with {{buffer}}
<b>Account settings changed</b>	Notice	Account settings of [Account: {{user_name}}] has been updated. Account settings of [Account: {{user_name}}] has been deleted. Account settings of [Account: {{user_name}}] has been created.
<b>Auto Config (Disable)</b>	Notice	Auto Configuration is disabled
<b>Auto Config (Download Config)</b>	Notice	Downloaded the configuration
<b>Auto Config (Fail_Download)</b>	Warning	Failed to download the configuration
<b>Auto Config (Fail_Import)</b>	Warning	Failed to import the configuration
<b>Auto Config (Fail_Propagate)</b>	Warning	Insufficient information to propagate
<b>Auto Config (Fail_Timeout)</b>	Warning	Auto Configuration timed out
<b>Auto Config (Got IP)</b>	Notice	Received IP address
<b>Auto Config (Propagate)</b>	Notice	Propagating information to the DHCP Server
<b>Auto Config (Start)</b>	Notice	Auto Configuration process started
<b>Auto Config (Warn_Need_Reboot)</b>	Notice	Auto Configuration will be triggered after the reboot
<b>Cold start</b>	Critical	System has performed a cold start
<b>Configuration changed</b>	Notice	Configuration {{modules}} changed by {{username}}.
<b>Configuration imported</b>	Notice	Configuration import {{successful /failed}} by {{username}} via {{method}}.
<b>Coupling changed</b>	Warning	Turbo Ring v2 coupling path status has changed.

Event name	Severity	Event Description
<b>DHCP Bootfile Failed</b>	Notice	The TFTP server name is not a valid IPv4 address or domain name. The bootfile name is invalid. The TFTP request has timed out.
<b>DHCP client ingress discards packets due to the DHCP Snooping rule</b>	Warning	VLAN <vlan-id> dropped DHCP client ingress packets due to a violation of the DHCP Snooping rule. Total packets discarded: <number>
<b>DHCP server discards packets due to the DHCP Snooping rule</b>	Warning	VLAN <vlan-id> dropped DHCP server packets due to a violation of the DHCP Snooping rule. Total packets discarded: <number>
<b>LLDP table changed</b>	Info	LLDP remote table changed
<b>Log capacity threshold</b>	Warning	Number of event log entries {{logEntryNum}} has reached the threshold.
<b>Login failed</b>	Warning	[Account: {{user_name}}] log in failed via {{interface}}
<b>Login lockout</b>	Warning	[Account: {{user_name}}] locked due to {{failed_times}} failed login attempts
<b>Login success</b>	Notice	[Account: {{user_name}}] successfully logged in via {{interface}}
<b>Low input voltage</b>	Warning	The input voltage of the power supply has dropped below 46 VDC. Please adjust the voltage to between 46 and 57 VDC to fit the PoE voltage requirement.
<b>Master changed</b>	Warning	Ring {{Index}} master has changed
<b>Master mismatch</b>	Warning	Ring {{Index}} master setting does not match
<b>MSTP new port role</b>	Warning	MSTP (MST{{Index}}) port {{number}} role changed from {{role}} to {{role}}.
<b>MSTP root changed</b>	Warning	MSTP (MST{{Index}}) new root has been elected in topology.
<b>MSTP topology changed</b>	Warning	Topology (MST{{Index}}) has been changed by MSTP.
<b>Non-PD or PD short circuit</b>	Warning	The connected device on Port {{number}} has been detected as a non-PD or the PD has short circuited. Please check the device status.
<b>Over power budget limit</b>	Warning	The consumed power {{power_value}} of all the PDs have exceeded the maximum input power {{input_power_value}}
<b>Password changed</b>	Notice	Password of [Account: {{user_name}}] has been changed.

Event name	Severity	Event Description
<b>PD no response</b>	Error	Port {{number}} device is not responding to the PD failure check. Please check the device status.
<b>PD over-current</b>	Error	Current of port {{number}} has exceeded the safety limit. Please check the device status.
<b>PD power off</b>	Notice	Port {{number}} PD power off
<b>PD power on</b>	Notice	Port {{number}} PD power on
<b>Port Off</b>	Notice	Port {{index}}/{{number}} link down.
<b>Port On</b>	Notice	Port {{index}}/{{number}} link up.
<b>Port recovered by Rate Limit</b>	Warning	Port {{index}}/{{number}} has recovered by rate limit.
<b>Port shut down by Port Security</b>	Warning	Port {{index}}/{{number}} has shutdown due to violation of Port Security rule.
<b>Port shut down by Rate Limit</b>	Warning	Port {{index}}/{{number}} has excessive traffic and shutdown.
<b>Power detection failure</b>	Warning	Port {{number}} device is {{Not present/Legacy PD/802.3 af/802.3 at/802.3 bt/NIC/Unknown}}. Please {{No suggestion/enable PoE power output/disable PoE power output/select PoE output mode to High power/select PoE output mode to Force/enable legacy PD detection/raise external power supply voltage greater than 46 VDC}}
<b>Power Off-&gt;On</b>	Notice	Power {{index}} has turned off
<b>Power On-&gt;Off</b>	Notice	Power {{index}} has turned on
<b>Redundant port health check failed</b>	Error	Redundant port {{index}}/{{number}} health check fail.
<b>RMON failing alarm</b>	Warning	{{user defined}}
<b>RMON raising alarm</b>	Warning	{{user defined}}
<b>RSTP invalid BPDU</b>	Warning	RSTP Port-Channel {{channel id}} received an invalid BPDU (type:{{type}}, value:{{value}}). RSTP port {{index}}/{{number}} received an invalid BPDU (type:{{type}}, value:{{value}}).
<b>RSTP migration</b>	Warning	Port-Channel {{channel id}} changed to {{rstp/stp}}. Port {{index}}/{{number}} changed to {{rstp/stp}}.

Event name	Severity	Event Description
<b>RSTP new port role</b>	Warning	RSTP Port-Channel {{channel id}} role changed from {{role}} to {{role}}. RSTP port {{index}}/{{number}} role changed from {{role}} to {{role}}.
<b>RSTP root changed</b>	Warning	RSTP new root has been elected in topology
<b>RSTP topology changed</b>	Warning	Topology has been changed by RSTP
<b>SSL certification changed</b>	Notice	SSL certificate has been changed SSL certificate has been regenerated
<b>Topology Changed (MRP)</b>	Warning	Topology change has been detected, MRP {{strMRMState}}.
<b>Topology Changed (RSTP)</b>	Warning	Topology has been changed by RSTP
<b>Topology Changed (Turbo Ring)</b>	Warning	Topology change has been detected on Ring {{RingIndex}} of Turbo Ring v2
<b>Warm start</b>	Notice	System has performed a warm start

# SNMP MIB Files

This appendix contains the SNMP MIB file for the managed switch.

You can download the MIB file via the product site. Please note the MIB file varies by model.

## The structure of the Moxa MIB group package

Moxa support standard MIB and properties MIB. Below are all of folder and related MIB files. Please note that the applicable MIB files may vary across different models.

<Package File Lists>

E.g. MOXA\_MIB\_XXX-XXXX\_v1.0\_YYYY\_MMDD\_HHMM.zip //XXX-XXXX means model name

```
├── Private // MOXA properties MIB
│   │
│   ├── General // General group
│   │   ├── mx1588.mib
│   │   ├── mxDeviceIo.mib
│   │   ├── mxDhcpRelay.mib
│   │   ├── mxDhcpSvr.mib
│   │   ├── mxEip.mib
│   │   ├── mxEmailC.mib
│   │   ├── mxEventLog.mib
│   │   ├── mxGene.mib
│   │   ├── mxGeneral.mib
│   │   ├── mxIec6185093Profile.mib
│   │   ├── mxIeeeC37238Profile.mib
│   │   ├── mxLocator.mib
│   │   ├── mxManagementIp.mib
│   │   ├── mxMms.mib
│   │   ├── mxModbusTcp.mib
│   │   ├── mxPoe.mib
│   │   ├── mxPorte.mib
│   │   └── mxProfinet.mib
```

```

|   |   |— mxPtp.mib
|   |   |— mxRelayC.mib
|   |   |— mxSnmp.mib
|   |   |— mxSwe.mib
|   |   |— mxSysLoginPolicySvr.mib
|   |   |— mxSyslogSvr.mib
|   |   |— mxSysPasswordPolicySvr.mib
|   |   |— mxSystemInfo.mib
|   |   |— mxSysTrustAccessSvr.mib
|   |   |— mxSysUtilSvr.mib
|   |   |— mxTimeSetting.mib
|   |   |— mxTimeZone.mib
|   |   |— mxTrackinge.mib
|   |   |— mxTrapC.mib
|   |   |— mxUiServiceMgmt.mib
|   |— PoE // PoE group
|   |   |— mxPoe.mib
|   |   |— mxPoeBt.mib
|   |— Product_Information // Product group
|   |   |— mxGeneralInfo.mib
|   |   |— mxProductInfo.mib
|   |— Switching // Switching group
|   |   |— mxDai.mib
|   |   |— mxDhcpSnp.mib
|   |   |— mxDot1x.mib
|   |   |— mxDualHoming.mib
|   |   |— mxFiberCheck.mib
|   |   |— mxIgmPsnP.mib
|   |   |— mxIpsg.mib
|   |   |— mxLa.mib
|   |   |— mxLhc.mib
|   |   |— mxLldp.mib
|   |   |— mxLp.mib
|   |   |— mxMab.mib
|   |   |— mxMacsec.mib
|   |   |— mxPort.mib

```



```

|   |   |— mxPortMirror.mib
|   |   |— mxPsms.mib
|   |   |— mxPssp.mib
|   |   |— mxQos.mib
|   |   |— mxRadius.mib
|   |   |— mxRlps.mib
|   |   |— mxRmon.mib
|   |   |— mxRstp.mib
|   |   |— mxStcl.mib
|   |   |— mxSwitching.mib
|   |   |— mxTc.mib
|   |   |— mxTcst.mib
|   |   |— mxTrv2.mib
|   |   |— mxVlan.mib
|   |— Routing // Routing group
|   |   |— mxArp.mib
|   |   |— mxIpIf.mib
|   |   |— mxMulticastRouting.mib
|   |   |— mxOspf.mib
|   |   |— mxPimSm.mib
|   |   |— mxRte.mib
|   |   |— mxStaticRoute.mib
|   |   |— mxUnicastRoutingTable.mib
|   |   |— mxVrrp.mib
|
|— Standard // Standard MIB
|   |— BRIDGE-MIB.mib
|   |— EtherLike-MIB.mib
|   |— IANA-ADDRESS-FAMILY-NUMBERS.mib
|   |— IANAifType-MIB.mib
|   |— IEC-62439-2.mib
|   |— IEEE8021-PAE-MIB.mib
|   |— IEEE8021-SPANNING-TREE-MIB.mib
|   |— IEEE8021-TC-MIB.mib
|   |— IEEE8023-LAG-MIB.mib
|   |— IEEE8023-MSTP-MIB.mib

```

```
| └─ IF-MIB.mib
| └─ INET-ADDRESS-MIB.mib
| └─ LLDP-EXT-DOT1-MIB.mib
| └─ LLDP-EXT-DOT3-MIB.mib
| └─ LLDP-EXT-ODVA-MIB.mib
| └─ LLDP-MIB.mib
| └─ P-BRIDGE-MIB.mib
| └─ Q-BRIDGE-MIB.mib
| └─ RFC1213-MIB.mib
| └─ RFC1271-MIB.mib
| └─ RMON2-MIB.mib
| └─ RMON-MIB.mib
| └─ SNMP-FRAMEWORK-MIB.mib
| └─ SNMPv2-CONF.mib
| └─ SNMPv2-MIB.mib
| └─ SNMPv2-SMI.mib
| └─ SNMPv2-TC.mib
| └─ OSPF-MIB.mib
| └─ PTPBASE-MIB.mib
| └─ TOKEN-RING-RMON-MIB.mib
| └─ IEEE8021-AS-MIB.mib
| └─ IEEE8021-BRIDGE-MIB.mib
| └─ IEEE8021-Q-BRIDGE-MIB.mib
| └─ IEEE8021-ST-MIB.mib
└─ README.txt // this file
```

## Standard MIBs Installation Order

If your tool need to import MIB one-by-one, please refer to the Standard MIBs Installation Order.

- 1.RFC1213-MIB.mib
- 2.SNMP-FRAMEWORK-MIB.mib
- 3.SNMPv2-SMI.mib
- 4.SNMPv2-TC.mib
- 5.SNMPv2-CONF.mib

- 6.SNMPv2-MIB.mib
- 7.IANAifType-MIB.mib
- 8.IEEE8023-LAG-MIB.mib
- 9.IF-MIB.mib
- 10.EtherLike-MIB.mib
- 11.IEEE8021-PAE-MIB.mib
- 12.BRIDGE-MIB.mib
- 13.P-BRIDGE-MIB.mib
- 14.RFC1271-MIB.mib
- 15.RMON-MIB.mib
- 16.TOKEN-RING-RMON-MIB.mib
- 17.RMON2-MIB.mib
- 18.Q-BRIDGE-MIB.mib
- 19.INET-ADDRESS-MIB.mib
- 20.IEEE8021-TC-MIB.mib
- 21.IEEE8021-SPANNING-TREE-MIB.mib
- 22.IEEE8021-MSTP-MIB.mib
- 23.IANA-ADDRESS-FAMILY-NUMBERS-MIB.mib
- 24.LLDP-MIB.mib
- 25.LLDP-EXT-DOT1-MIB.mib
- 26.LLDP-EXT-DOT3-MIB.mib
- 27.LLDP-EXT-ODVA-MIB.mib
- 28.OSPF-MIB.mib
- 29.PTPBASE-MIB.mib
- 30.IEEE8021-AS-MIB.mib
- 31.IEEE8021-BRIDGE-MIB.mib
- 32.IEEE8021-ST-MIB.mib
- 33.IEEE8021-Q-BRIDGE-MIB.mib

## MIB tree

```

iso(1)
  |-std(0)-iso8802(8802)-ieee802dot1(1)-ieee802dot1mibs(1)
    |
    |-----|-ieee8021paeMIB(1) : IEEE8021-
    PAE-MIB.mib
    |
    |-----|-ieee8021SpanningTreeMib(3) : IEEE8021-
  
```

SPANNING-TREE-MIB.mib

|-org(3)

|-dod(6)-internet(1)

	-mgmt(2)-mib-2(1)	: SNMPv2-MIB.mib
		-system(1) : RFC1213-MIB.mib
		-interface(2) : RFC1213-MIB.mib
		-at(3) : RFC1213-MIB.mib
		-snmp(11) : RFC1213-MIB.mib
		-ospf(14) : OSPF-MIB.mib
		-rmon(16) : RMON-MIB.mib
		-dot1dBridge(17) : BRIDGE-MIB.mib, P-

BRIDGE-MIB.mib, Q-BRIDGE-MIB.mib

		-ifMIB(31) : IF-MIB.mib
		-etherMIB(35) : EtherLike-MIB.mib
		-private(4)-moxa(8691)
		-product(600) : mxGeneralInfo.mib,

mxProductInfo.mib,

		-general(602) : mxGeneral.mib,
--	--	--------------------------------

mxDeviceIo.mib, mxDhcpRelay.mib, mxDhcpSvr.mib, mxEmailC.mib,

			: mxEventLog.mib,
--	--	--	-------------------

mxGene.mib, mxLocator.mib, mxManagementIp.mib, mxPoe.mib,

			: mxPorte.mib,
--	--	--	----------------

mxRelayC.mib, mxSnmp.mib, mxSwe.mib, mxSysLoginPolicySvr.mib,

			: mxSyslogSvr.mib,
--	--	--	--------------------

mxSysPasswordPolicySvr.mib, mxSystemInfo.mib,

			: mxSysTrustAccessSvr.mib,
--	--	--	----------------------------

mxSysUtilSvr.mib, mxTimeSetting.mib,

			: mxTimeZone.mib,
--	--	--	-------------------

mxTrapC.mib, mxUiServiceMgmt.mib, mxRte.mib, mxMms.mib,

			: mxPtp.mib, mx1588.mib,
--	--	--	--------------------------

mxIec6185093Profile.mib, mxIeeeC37238Profile.mib mxModbusTcp.mib,

			: mxEip.mib,
--	--	--	--------------

mxProfinet.mib, mxTrackinge.mib

		-switching(603) : mxSwitching.mib	
			- portInterfacce : mxPort.mib, mxLa.mib
			- basicLayer2 : mxLhc.mib, mxQos,

```

mxVlan.mib
|           |           |           |- layer2Redundancy   : mxRstp.mib,
mxTrv2.mib, mxTurboChain.mib, mxDualHoming.mib
|           |           |           |- layer2Security     : mxStcl.mib,
mxRlps.mib, mxPssp.mib, mxPsms.mib, mxDot1x.mib, mxRadius.mib, mxLp.mib,
mxDhcpSnp.mib, mxIpchg.mib, mxMab.mib, mxDai.mib, mxMacsec.mib
|           |           |           |- layer2Diagnostic  : mxLldp.mib,
mxTcst.mib, mxPortMirror.mib, mxRmon.mib, mxFiberCheck.mib, mxTracking.mib
|           |           |           |- layer3Diagnostic
|           |           |           |- layer2Multicast   : mxIcmpSnp.mib
|           |           |           |- layer3Multicast
|           |           |           |-routing(605)
|           |           |           |- I3General       : mxIpIf.mib, mxArp.mib
|           |           |           |- unicastRouting   :
mxUnicastRoutingTable.mib, mxStaticRoute.mib, mxOspf.mib
|           |           |           |- multicastRouting  :
mxMulticastRouting.mib, mxPimSm.mib
|           |           |           |- I3Redundant      : mxVrrp.mib
|           |           |           |-poe(608)          : mxPoe.mib
|           |           |           |-snmpV2(6)-snmpModules(3)
|           |           |           |-snmpFrameworkMIB(10) : SNMP-
FRAMEWORK.mib
|
|           |-ieee(111)-standards-association-numbers-series-standards(2)-lan-man-
stds(802)-ieee802dot1(1)-ieee802dot1mibs(1)-ieee8021SpanningTreeMib(3)
|           : IEEE8021-SPANNING-TREE-
MIB.mib

```

# Severity Level List

This is a list of severity levels and descriptions, which are based on CVSS vulnerability classifications.

Severity	Description
<b>Emergency</b>	System is unusable
<b>Alert</b>	Action must be taken immediately
<b>Critical</b>	Critical conditions
<b>Error</b>	Error conditions
<b>Warning</b>	Warning conditions
<b>Notice</b>	Normal but significant condition
<b>Infomational</b>	Informational messages
<b>Debug</b>	Debug-level messages



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