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**10-port L2 Managed Industrial PoE Gigabit
Ethernet Switch**

Network Management

User's Manual

Version 1.0

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1. INTRODUCTION

Thank you for using the 8 10/100/1000Base-T up to 30W PoE ports plus 2 10/100/1000Mbps combo ports Managed Industrial PoE Gigabit Ethernet Switch that is specifically designed for FTTx applications. The Managed Industrial Switch provides a built-in management module that enables users to configure and monitor the operational status both locally and remotely. This User's Manual will explain how to use command-line interface and Web Management to configure your Managed Industrial PoE Switch. The readers of this manual should have knowledge about their network typologies and about basic networking concepts so as to make the best of this user's manual and maximize the Managed Industrial PoE Switch's performance for your personalized networking environment.

1.1 Management Options

Switch management options available are listed below:

- Local Console Management
- Telnet Management
- SNMP Management
- WEB Management
- SSH Management

Local Console Management

Local Console Management is done through the RS-232 RJ-45 Console port located on the front panel of the Managed Industrial PoE Ethernet Switch. Direct RS-232 cable connection between the PC and the Managed Industrial PoE Ethernet Switch is required for this type of management.

Telnet Management

Telnet runs over TCP/IP and allows you to establish a management session through the network. Once the Managed Industrial PoE Ethernet Switch is on the network with proper IP configurations, you can use Telnet to login and monitor its status remotely.

SSH Management

SSH Management supports encrypted data transfer to prevent the data from being "stolen" for remote management. You can use PuTTY, a free and open source terminal emulator application which can act as a client for the SSH, to gain access to the Managed Industrial PoE Ethernet Switch.

SNMP Management

SNMP is also done over the network. Apart from standard MIB (Management Information Bases), an additional private MIB is also provided for SNMP-based network management system to compile and control.

Web Management

Web Management is done over the network and can be accessed via a standard web browser, such as Microsoft Internet Explorer. Once the Managed Industrial PoE Ethernet Switch is available on the network, you can login and monitor the status of it through a web browser remotely or locally. Local Console-type Web management, especially for the first time use of the Managed

Industrial PoE Ethernet Switch to set up the needed IP, can be done through one of the 10/100/1000Base-TX 8-pin RJ-45 ports located at the front panel of the Managed Industrial PoE Ethernet Switch. Direct RJ-45 LAN cable connection between a PC and the Managed Industrial PoE Ethernet Switch is required for Web Management.

1.2 Management Software

The following is a list of management software options provided by this Managed Industrial PoE Ethernet Switch:

- Managed Industrial PoE Ethernet Switch CLI interface
- SNMP-based Management Software
- Web Browser Application

Console Program

The Managed Industrial PoE Ethernet Switch has a built-in Command Line Interface called the CLI which you can use to:

- Configure the system
- Monitor the status
- Reset the system

You can use CLI as the only management system. However, other network management options, SNMP-based management system, are also available.

You can access the text-mode Console Program locally by connecting a VT-100 terminal - or a workstation running VT100 emulation software - to the Managed Industrial PoE Ethernet Switch RS-232 RJ-45 Console port directly. Or, you can use Telnet to login and access the CLI through network connection remotely.

SNMP Management System

Standard SNMP-based network management system is used to manage the Managed Industrial PoE Ethernet Switch through the network remotely. When you use a SNMP-based network management system, the Managed Industrial PoE Ethernet Switch becomes one of the managed devices (network elements) in that system. The Managed Industrial PoE Ethernet Switch management module contains an SNMP agent that will respond to the requests from the SNMP-based network management system. These requests, which you can control, can vary from getting system information to setting the device attribute values.

The Managed Industrial PoE Ethernet Switch's private MIB is provided for you to be installed in your SNMP-based network management system.

Web Browser Application

You can manage the Managed Industrial PoE Ethernet Switch through a web browser, such as Internet Explorer or Google Chrome, etc.. (The default IP address of the Managed Industrial PoE Ethernet Switch port can be reached at "**http://192.168.0.1**".) For your convenience, you can use either this Web-based Management Browser Application program or other network management options, for example SNMP-based management system as your management system.

1.3 Management Preparations

After you have decided how to manage your Managed Industrial PoE Ethernet Switch, you are required to connect cables properly, determine the Managed Industrial PoE Ethernet Switch IP address and, in some cases, install MIB shipped with your Managed Industrial PoE Ethernet Switch.

Connecting the Managed Industrial PoE Ethernet Switch

It is very important that the proper cables with the correct pin arrangement are used when connecting the Managed Industrial PoE Ethernet Switch to other switches, hubs, workstations, etc..

1000Base-X / 100Base-FX SFP Port

The small form-factor pluggable (SFP) is a compact optical transceiver used in optical data communication applications. It interfaces a network device mother board (for a switch, router or similar device) to a fiber optic or unshielded twisted pair networking cable. It is a popular industry format supported by several fiber optic component vendors.

SFP transceivers are available with a variety of different transmitter and receiver types, allowing users to select the appropriate transceiver for each link to provide the required optical reach over the available optical fiber type.

SFP slot for 3.3V mini GBIC module supports hot swappable SFP fiber transceiver. Before connecting the other switches, workstation or Media Converter, make sure both side of the SFP transfer are with the same media type, for example, 1000Base-SX to 1000Base-SX, 1000Bas-LX to 1000Base-LX, and check the fiber-optic cable type matches the SFP transfer model. To connect to 1000Base-SX transceiver, use the multi-mode fiber cable with male duplex LC connector type for one side. To connect to 1000Base-LX transfer, use the single-mode fiber cable with male duplex LC connector type for one side.

10/100/1000Base-T RJ-45 Auto-MDI/MDIX Port

10/100/1000Base-T RJ-45 Auto-MDI/MDIX ports are located at the front of the Managed Industrial PoE Ethernet Switch. These RJ-45 ports allow user to connect their traditional copper-based Ethernet/Fast Ethernet devices to the network. All these ports support auto-negotiation and MDI/MDIX auto-crossover, i.e. either crossover or straight through CAT-5 UTP or STP cable may be used.

RS-232 RJ-45 Port

The RS-232 RJ-45 port is located at the front of the Managed Industrial PoE Ethernet Switch. This RJ-45 port is used for local, out-of-band management. Since this RJ-45 port of the Managed Industrial PoE Ethernet Switch is DTE, a null modem is also required to be connected to the Managed Industrial PoE Ethernet Switch and the PC. By connecting this RJ-45 port, it allows you to configure & check the status of Managed Industrial PoE Ethernet Switch even when the network is down.

IP Addresses

IP addresses have the format n.n.n.n, (The default factory setting is 192.168.0.1).

IP addresses are made up of two parts:

- The first part (for example 192.168.n.n) refers to network address that identifies the network where the device resides. Network addresses are assigned by three allocation organizations. Depending on your location, each allocation organization assigns a globally unique network number to each network which intends to connect to the Internet.
- The second part (for example n.n.0.1) identifies the device within the network. Assigning unique device numbers is your responsibility. If you are unsure of the IP addresses allocated to you, consult with the allocation organization where your IP addresses were obtained.

Remember that an address can be assigned to only one device on a network. If you connect to the outside network, you must change all the arbitrary IP addresses to comply with those you have been allocated by the allocation organization. If you do not do this, your outside communications will not be performed.

A subnet mask is a filtering system for IP addresses. It allows you to further subdivide your network. You must use the proper subnet mask for the proper operation of a network with subnets defined.

MIB for Network Management Systems

Private MIB (Management Information Bases) is provided for managing the Managed Industrial PoE Ethernet Switch through the SNMP-based network management system. You must install the private MIB into your SNMP-based network management system first.

The MIB file is shipped together with the Managed Industrial PoE Ethernet Switch. The file name extension is “.mib” that allows SNMP-based compiler can read and compile.

2. Command Line Interface (CLI)

This chapter introduces you how to use Command Line Interface CLI, specifically in:

- Local Console
- Telnet
- Configuring the system
- Resetting the system

The interface and options in Local Console and Telnet are the same. The major difference is the type of connection and the port that is used to manage the Managed Industrial PoE Ethernet Switch.

2.1 Using the Local Console

Local Console is always done through the RS-232 RJ-45 port and requires a direct connection between the switch and a PC. This type of management is useful especially when the network is down and the switch cannot be reached by any other means.

You also need the Local Console Management to setup the Switch network configuration for the first time. You can setup the IP address and change the default configuration to the desired settings to enable Telnet or SNMP services.

Follow these steps to begin a management session using Local Console Management:

Step 1. Attach the serial cable to the RS-232 RJ-45 port located at the front of the Switch.

Step 2. Attach the other end to the serial port of a PC or workstation.

Step 3. Run a terminal emulation program using the following settings:

- | | |
|-----------------------|------------------------|
| • Emulation | VT-100/ANSI compatible |
| • BPS | 9600 |
| • Data bits | 8 |
| • Parity | None |
| • Stop bits | 1 |
| • Flow Control | None |
| • Enable | Terminal keys |

Step 4. Press Enter to access the CLI (Command Line Interface) mode.

2.2 Remote Console Management - Telnet

You can manage the Managed Industrial PoE Ethernet Switch via Telnet session. However, you must first assign a unique IP address to the Switch before doing so. Use the Local Console to login the Managed Industrial PoE Ethernet Switch and assign the IP address for the first time.

Follow these steps to manage the Managed Industrial PoE Ethernet Switch through Telnet session:

Step 1. Use Local Console to assign an IP address to the Managed Industrial PoE Switch

- IP address
- Subnet Mask
- Default gateway IP address, if required

Step 2. Run Telnet

Step 3. Log into the Switch CLI

Limitations: When using Telnet, keep the following in mind:

Only two active Telnet sessions can access the Managed Industrial PoE Ethernet Switch at the same time.

2.3 Navigating CLI

When you successfully access the Managed Industrial PoE Ethernet Switch, you will be asked for a login username. Enter your authorized username and password, and then you will be directed to User mode. In CLI management, the User mode only provides users with basic functions to operate the Managed Industrial PoE Ethernet Switch. If you would like to configure advanced features of the Managed Industrial PoE Ethernet Switch, such as, VLAN, QoS, Rate limit control, you must enter the Configuration mode. The following table provides an overview of modes available in this Managed Industrial PoE Ethernet Switch.

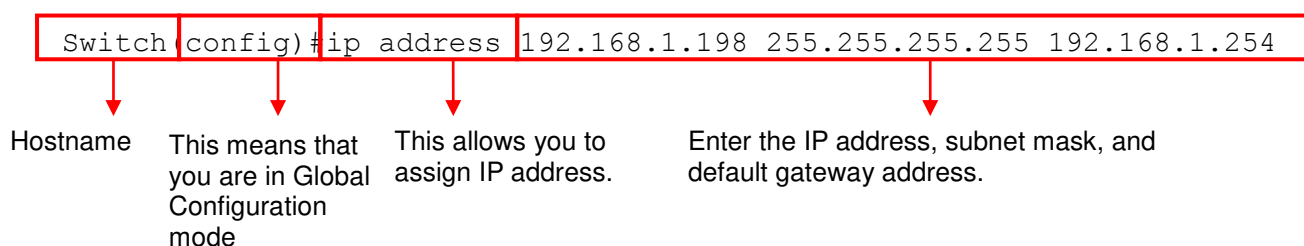
Command Mode	Access Method	Prompt Displayed	Exit Method
User mode	Login username & password	Switch>	logout, exit
Privileged mode	From User mode, enter the <i>enable</i> command	Switch#	disable, exit, logout
Configuration mode	From Privileged mode, enter the <i>config</i> or <i>configure</i> command	Switch(config)#	exit, Ctrl + Z

NOTE: By default, the model name will be used for the prompt display. You can change the prompt display to the one that is ideal for your network environment using the *hostname* command. However, for convenience, the prompt display “Switch” will be used throughout this user’s manual.

2.3.3 Command Format

While in CLI, you will see several symbols very often. As mentioned above, you might already know what “>”, “#” and (config)# represent. However, to perform what you intend the device to do, you have to enter a string of complete command correctly. For example, if you want to assign IP address for the Managed Industrial PoE Ethernet Switch, you need to enter the following command with the required parameter and IP, subnet mask and default gateway:

IP command syntax: Switch(config)#ip address [A.B.C.D] [255.X.X.X] [A.B.C.D]



The following table lists common symbols and syntax that you will see very frequently in this User's Manual for your reference:

Symbols	Brief Description
>	Currently, the device is in User mode.
#	Currently, the device is in Privileged mode.
(config)#	Currently, the device is in Global Configuration mode.
Syntax	Brief Description
[]	Reference parameter.
[-s size] [-r repeat] [-t timeout]	These three parameters are used in ping command and are optional, which means that you can ignore these three parameters if they are unnecessary when executing ping command.
[A.B.C.D]	Brackets represent that this is a required field. Enter an IP address or gateway address.
[255.X.X.X]	Brackets represent that this is a required field. Enter the subnet mask.
[port]	Enter one port number. See Section 2.6.26 for detailed explanations.
[port_list]	Enter a range of port numbers or several discontinuous port numbers. See Section 2.6.26 for detailed explanations.
[forced_true forced_false auto]	There are three options that you can choose. Specify one of them.
[1-8191]	Specify a value between 1 and 8191.
[0-7] 802.1p_list [0-63] dscp_list	Specify one value, more than one value or a range of values. Example 1: specifying one value Switch(config)#qos 802.1p-map <u>1</u> 0 Switch(config)#qos dscp-map <u>10</u> 3

	<p>Example 2: specifying three values (separated by commas)</p> <pre>Switch(config)#qos 802.1p-map <u>1,3</u> 0</pre> <pre>Switch(config)#qos dscp-map <u>10,13,15</u> 3</pre> <p>Example 3: specifying a range of values (separated by a hyphen)</p> <pre>Switch(config)#qos 802.1p-map <u>1-3</u> 0</pre> <pre>Switch(config)#qos dscp-map <u>10-15</u> 3</pre>
--	---

2.3.4 Login Username & Password

Default Login

When you enter Console session, a login prompt for username and password will appear to request a valid and authorized username and password combination. For first-time users, enter the default login username “**admin**” and “**press Enter key**” in password field (no password is required for default setting). When system prompt shows “Switch>”, it means that the user has successfully entered the User mode.

For security reasons, it is strongly recommended that you add a new login username and password using User command in Configuration mode. When you create your own login username and password, you can delete the default username (admin) to prevent unauthorized accesses.

Privileged Mode Password

Privileged mode is password-protected. When you try to enter Privileged mode, a password prompt will appear to request the user to provide the legitimate passwords. Privileged mode password is the same as the one entered after login password prompt. By default, no password is required. Therefore, press **Enter** key in password prompt.

Forgot Your Login Username & Password

If you forgot your login username and password, you can use the “reset button” on the front panel to set all configurations back to factory defaults. Once you have performed system reset to defaults, you can login with default username and password. Please note that if you use this method to gain access to the Managed Industrial PoE Ethernet Switch, all configurations saved in Flash will be lost. It is strongly recommended that a copy of configurations is backed up in your local hard-drive or file server from time to time so that previously-configured settings can be reloaded to the Managed Industrial PoE Ethernet Switch for use when you gain access again to the device.

2.4 User Mode

In User mode, only a limited set of commands are provided. Please note that in User mode, you have no authority to configure advanced settings. You need to enter Privileged mode and Configuration mode to set up advanced functions of the Switch. For a list of commands available in User mode, enter the question mark (?) or “help” command after the system prompt displays Switch>.

Command	Description
exit	Quit the User mode or close the terminal connection.
help	Display a list of available commands in User mode.
history	Display the command history.
logout	Logout from the Managed Industrial PoE Ethernet Switch.
enable	Enter the Privileged mode.

2.5 Privileged Mode

The only place where you can enter the Privileged mode is in User mode. When you successfully enter the Privileged mode (this mode is password protected), the prompt will be changed to Switch# (the model name of your device together with a pound sign). Enter the question mark (?) or help command to view a list of commands available for use.

Command	Description
copy-cfg	Restore or backup configuration file via FTP or TFTP server.
disable	Exit Privileged mode and return to User Mode.
exit	Exit Privileged mode and return to User Mode.
firmware	Allow users to update firmware via FTP or TFTP.
help	Display a list of available commands in Privileged mode.
history	Show commands that have been used.
logout	Logout from the Managed Industrial PoE Ethernet Switch.
reload	Restart the Managed Industrial PoE Ethernet Switch.
write	Save your configurations to Flash.
configure	Enter Global Configuration mode.
show	Show a list of commands or show the current setting of each listed command.

2.5.1 Copy-cfg Command

Use “copy-cfg” command to backup a configuration file via FTP or TFTP server and restore the Managed Industrial PoE Ethernet Switch back to the defaults or to the defaults but keep IP configurations.

1. Restore a configuration file via FTP or TFTP server.

Command	Parameter	Description
Switch# copy-cfg from ftp [A.B.C.D] [file name] [user_name] [password]	[A.B.C.D]	Enter the IP address of your FTP server.
	[file name]	Enter the configuration file name that you would like to restore.
	[user_name]	Enter the username for FTP server login.
	[password]	Enter the password for FTP server login.
Switch# copy-cfg from tftp [A.B.C.D] [file_name]	[A.B.C.D]	Enter the IP address of your TFTP server.
	[file name]	Enter the configuration file name that you would like to restore.

Example

```
Switch# copy-cfg from ftp 192.168.1.198 HS_0600_file.conf misadmin1 abcxyz  
Switch# copy-cfg from tftp 192.168.1.198 HS_0600_file.conf
```

2. Backup configuration file to FTP or TFTP server.

Command	Parameter	Description
Switch# copy-cfg to ftp [A.B.C.D] [file name] [running default startup] [user_name] [password]	[A.B.C.D]	Enter the IP address of your FTP server.
	[file name]	Enter the configuration file name that you want to backup.
	[running default startup]	Specify backup config to be running, default or startup
	[user_name]	Enter the username for FTP server login.
	[password]	Enter the password for FTP server login.
Switch# copy-cfg to tftp [A.B.C.D] [file_name] [running default startup]	[A.B.C.D]	Enter the IP address of your TFTP server.
	[file name]	Enter the configuration file name that you want to backup.
	[running default startup]	Specify backup config to be running, default or startup

Example

```
Switch# copy-cfg to ftp 192.168.1.198 HS_0600_file.conf running misadmin1 abcxyz  
Switch# copy-cfg to tftp 192.168.1.198 HS_0600_file.conf startup
```

3. Restore the Managed Industrial PoE Ethernet Switch back to default settings.

Command / Example

```
Switch# copy-cfg from default  
Switch# reload
```

4. Restore the Managed Industrial PoE Ethernet Switch back to default settings but keep IP configurations.

Command / Example

```
Switch# copy-cfg from default keep-ip  
Switch# reload
```

2.5.2 Firmware Command

To upgrade firmware via TFTP or FTP server.

Command	Parameter	Description
Switch# firmware upgrade ftp [A.B.C.D] [file_name] [Image-1 Image-2] [user_name] [password]	[A.B.C.D]	Enter the IP address of your FTP server.
	[file name]	Enter the firmware file name that you want to upgrade.
	[Image-1 Image-2]	Choose image-1 or image-2 for the firmware to be upgraded to.
	[user_name]	Enter the username for FTP server login.
	[password]	Enter the password for FTP server login.
Switch# firmware upgrade tftp	[A.B.C.D]	Enter the IP address of your TFTP server.

[A.B.C.D] [file_name] [Image-1 Image-2]	[file_name]	Enter the firmware file name that you want to upgrade.
	[Image-1 Image-2]	Choose image-1 or image-2 for the firmware to be upgraded to.
Example		
Switch# firmware upgrade ftp 192.168.1.198 HS_0600_file.bin Image-1 edgswitch10 abcxyz		
Switch# firmware upgrade tftp 192.168.1.198 HS_0600_file.bin Image-2		

2.5.3 Reload Command

1. To restart the Managed Industrial PoE Ethernet Switch.

Command / Example
Switch# reload

2. To specify the image for the next restart before restarting.

Command / Example
Switch# reload Image-2 OK! Switch# reload

2.5.4 Write Command

To save running configurations to startup configurations, enter the write command. All unsaved configurations will be lost when you restart the Managed Industrial PoE Ethernet Switch.

Command / Example
Switch# write Save Config Succeeded!

2.5.5 Configure Command

The only place where you can enter the Global Configuration mode is in Privileged mode. You can type in “configure” or “config” for short to enter the Global Configuration mode. The display prompt will change from “Switch#” to “Switch(config)#” once you successfully enter the Global Configuration mode.

Command / Example
Switch#config Switch(config)#
Switch#configure Switch(config)#

2.5.6 Show Command

The “show” command is very important for network administrators to get information about the device, receive outputs to verify a command’s configurations or troubleshoot a network

configuration error. It can be used in Privileged or Configuration mode. The following describes different uses of “show” command.

1. Display system information

Enter “show switch-info” command in Privileged or Configuration mode, and then the following information will appear.

Company Name: Display a company name for this Managed Industrial PoE Ethernet Switch. Use “switch-info company-name [company_name]” command to edit this field.

System Object ID: Display the predefined System OID.

System Contact: Display the contact information for this Managed Industrial PoE Ethernet Switch. Use “switch-info system-contact [sys_contact]” command to edit this field.

System Name: Display a descriptive system name for this Managed Industrial PoE Ethernet Switch. Use “switch-info system-name [sys_name]” command to edit this field.

System Location: Display a brief location description for this Managed Industrial PoE Ethernet Switch. Use “switch-info system-location [sys_location]” command to edit this field.

Model Name: Display the product’s model name.

Host Name: Display the product’s host name. Use “switch-info host-name [host_name]” command to edit this field.

DHCP Vendor ID: Display the Vendor Class Identifier used for DHCP relay agent function. Use “switch-info dhcp-vendor-id [dhcp_vendor_id]” command to edit this field.

Current Boot Image: The image that is currently using.

Configured Boot Image: The image you would like to use after rebooting.

Image-1 Version: Display the firmware version 1 (image-1) used in this device.

Image-2 Version: Display the firmware version 2 (image-2) used in this device.

M/B Version: Display the main board version.

1000M Port Number: The number of ports supporting 1000Mbps transmission speed.

100M Port Number: The number of ports supporting 100Mbps transmission speed.

WAN Fiber Type: The information about the slide-in SFP Transceiver type in SFP ports.

WAN Fiber Vendor: Vendor name of the slide-in SFP Transceiver in SFP ports.

WAN Fiber PN: Vendor PN of the slide-in SFP Transceiver in SFP ports.

Fiber 2 Type: The information about the slide-in SFP Transceiver type in SFP ports.

Fiber 2 Vendor: Vendor name of the slide-in SFP Transceiver in SFP ports.

Fiber 2 PN: Vendor PN of the slide-in SFP Transceiver in SFP ports.

Serial Number: Display the serial number of this Managed Industrial PoE Ethernet Switch.

Date Code: Display the date code of the Managed Industrial PoE Ethernet Switch firmware.

Up Time: Display the up time since last restarting.

Local Time: Display the local time of the system.

CPU Temperature: Display the current CPU temperature of this device.

Switch Temperature: Display the current temperature of this device.

Power Temperature: Display the current power 1/2 temperature of this device.

Power 1/2: Display the installation status of Power 1 and Power 2.

2. Display or verify currently-configured settings

Refer to the following sub-sections. “Interface command”, “IP command”, “MAC command”, “QoS command”, “Security command”, “SNMP-Server command”, “User command”, “VLAN command” sections, etc.

3. Display interface information or statistics

Refer to “Show interface statistics command” and “Show sfp information command” sections.

4. Show default, running and startup configurations

Refer to “show default-config command”, “show running-config command” and “show start-up-config command” sections.

2.6 Configuration Mode

When you enter “configure” or “config” and press “Enter” in Privileged mode, you will be directed to the Global Configuration mode where you can set up advanced switching functions, such as QoS, VLAN and storm control security globally. All commands entered will apply to running-configuration and the device’s operation. From this level, you can also enter different sub-configuration modes to set up specific configurations for VLAN, QoS, security or interfaces.

Command	Description
archive	Manage archive configuration files.
channel-group	Configure static link aggregation groups or enable LACP function.
dot1x	IEEE 802.1X global configuration commands.
exit	Exit the global configuration mode.
help	Display a list of available commands in the global configuration mode.
history	Show commands that have been used.
ip	Set up the IPv4 address and enable DHCP mode & IGMP snooping.
lldp	LLDP global configuration mode.
loop-detection	Configure loop-detection to prevent loop between switch ports by locking them.
mac	Create MAC address table for each port.
management	Set up console/telnet/web/SSH access control and timeout value.
mirror	Set up the destination port for mirroring.
ntp	Set up required configurations for Network Time Protocol.
poe	Power over Ethernet configuration commands
qos	Set up the priority of packets within the Managed Industrial PoE Ethernet Switch.
ring-detection	Ring detection configuration commands.
security	Configure broadcast storm control settings.
snmp-server	Create a new SNMP community and trap destination and specify the trap types.
spanning-tree	Set up RSTP status of each port and aggregated ports.
switch	Set up SFP polling and statistics polling, etc.
switch-info	Edit the system information.
syslog	Set up required configurations for Syslog server.
time-range	Time Range management.
user	Create a new user account.
vlan	Set up VLAN mode and VLAN configuration.
no	Disable a command or reset it back to its default setting.
interface	Select a single interface or a range of interfaces.
show	Show a list of commands or show the current setting of each listed command.

2.6.1 Entering Interface Numbers

In the Global Configuration mode, you can configure a command that only applies to interfaces specified. For example, you can set up each interface’s VLAN assignment, speeds, or duplex modes. To configure, you must first enter the interface number. There are four ways to enter your interface numbers to signify the combination of different interfaces that apply a command or commands.

Commands	Description
Switch(config)# interface 1 Switch(config-if-1)#	Enter a single interface. Only interface 1 will apply commands entered.
Switch(config)# interface 1,3,5 Switch(config-if-1,3,5)#	Enter three discontinuous interfaces, separated by commas. Interface 1, 3, 5 will apply commands entered.

Switch(config)# interface 1-3 Switch(config-if-1-3)#	Enter three continuous interfaces. Use a hyphen to signify a range of interface numbers. In this example, interface 1, 2, and 3 will apply commands entered.
Switch(config)# interface 1,3-5 Switch(config-if-1,3-5)#	Enter a single interface number together with a range of interface numbers. Use both comma and hyphen to signify the combination of different interface numbers. In this example, interface 1, 3, 4, 5 will apply commands entered.

2.6.2 No Command

Almost every command that you enter in Configuration mode can be negated using “no” command followed by the original or similar command. The purpose of “no” command is to disable a function, remove a command, or reset the setting back to the default value. In each sub-section below, the use of no command to fulfill different purposes will be introduced.

2.6.3 Show Command

The “show” command is very important for network administrators to get information about the device, receive outputs to verify a command’s configurations or troubleshoot a network configuration error. It can be used in Privileged or Configuration mode. The following describes different uses of “show” command.

1. Display system information

Enter “show switch-info” command in Privileged or Configuration mode, and then the following information will appear.

Company Name: Display a company name for this Managed Industrial PoE Ethernet Switch. Use “switch-info company-name [company_name]” command to edit this field.

System Object ID: Display the predefined System OID.

System Contact: Display the contact information for this Managed Industrial PoE Ethernet Switch. Use “switch-info system-contact [sys_contact]” command to edit this field.

System Name: Display a descriptive system name for this Managed Industrial PoE Ethernet Switch. Use “switch-info system-name [sys_name]” command to edit this field.

System Location: Display a brief location description for this Managed Industrial PoE Ethernet Switch. Use “switch-info system-location [sys_location]” command to edit this field.

Model Name: Display the product’s model name.

Host Name: Display the product’s host name. Use “switch-info host-name [host_name]” command to edit this field.

DHCP Vendor ID: Display the Vendor Class Identifier used for DHCP relay agent function. Use “switch-info dhcp-vendor-id [dhcp_vendor_id]” command to edit this field.

Current Boot Image: The image that is currently using.

Configured Boot Image: The image you would like to use after rebooting.

Image-1 Version: Display the firmware version 1 (image-1) used in this device.

Image-2 Version: Display the firmware version 2 (image-2) used in this device.

M/B Version: Display the main board version.

1000M Port Number: The number of ports supporting 1000Mbps transmission speed.

100M Port Number: The number of ports supporting 100Mbps transmission speed.

WAN Fiber Type: The information about the slide-in SFP Transceiver type in SFP ports.

WAN Fiber Vendor: Vendor name of the slide-in SFP Transceiver in SFP ports.

WAN Fiber PN: Vendor PN of the slide-in SFP Transceiver in SFP ports.

Fiber 2 Type: The information about the slide-in SFP Transceiver type in SFP ports.

Fiber 2 Vendor: Vendor name of the slide-in SFP Transceiver in SFP ports.

Fiber 2 PN: Vendor PN of the slide-in SFP Transceiver in SFP ports.

Serial Number: Display the serial number of this Managed Industrial PoE Ethernet Switch.

Date Code: Display the date code of the Managed Industrial PoE Ethernet Switch firmware.

Up Time: Display the up time since last restarting.

Local Time: Display the local time of the system.

CPU Temperature: Display the current CPU temperature of this device.

Switch Temperature: Display the current temperature of this device.

Power Temperature: Display the current power 1/2 temperature of this device.

Power 1/2: Display the installation status of Power 1 and Power 2.

2. Display or verify currently-configured settings

Refer to the following sub-sections. “Interface command”, “IP command”, “MAC command”, “QoS command”, “Security command”, “SNMP-Server command”, “User command”, “VLAN command” sections, etc.

3. Display interface information or statistics

Refer to “Show interface statistics command” and “Show sfp information command” sections.

4. Show default, running and startup configurations

Refer to “show default-config command”, “show running-config command” and “show start-up-config command” sections.

2.6.4 Archive Command

Command	Parameter	Description
Switch(config)# archive auto-backup		Enable the auto-backup configuration files function.
Switch(config)# archive auto-backup path ftp [A.B.C.D] [file_directory] [user_name] [password]	[A.B.C.D]	Specify the IP address of the FTP server.
	[file_directory]	Specify the file directory of the FTP server to save the start-up configuration files.
	[user_name]	Specify the user name to login the FTP server.
	[password]	Specify the password for FTP server's authentication.
Switch(config)# archive auto-backup path tftp [A.B.C.D] [file_directory]	[A.B.C.D]	Specify the IP address of the TFTP server.
	[file_directory]	Specify the file directory of the TFTP server to save the start-up configuration files.
Switch(config)# archive auto-backup time [0-23]	[0-23]	Specify the time to begin the automatic backup of the start-up configuration files everyday.
No command		
Switch(config)# no archive auto-backup		Disable the auto-backup function.
Switch(config)# no archive auto-backup path		Remove TFTP / FTP server settings.
Switch(config)# no archive auto-backup time		Reset the Auto-backup time back to the default (0 o'clock).
Show command		Description
Switch# show archive auto-backup		Display the auto-backup configuration.
Switch(config)# show archive auto-backup		Display the auto-backup configuration.

2.6.5 Channel-group Command

1. Configure a static link aggregation group (LAG).

Command	Parameter	Description
Switch(config)# channel-group trunking [group_name]	[group_name]	Specify a name for this link aggregation group.
Switch(config)# interface [port_list] Switch(config-if-PORT-PORT)# channel-group trunking [group_name]	[port_list] [group_name]	Use “interface” command to configure a group of ports’ link aggregation link membership. Assign the selected ports to the specified link aggregation group.
Switch(config)# channel-group type mac-quotient		Enable load-balancing and forwarding methods depending on mac address quotient.
No command		
Switch(config)# no channel-group trunking [group_name]	[group_name]	Delete a link aggregation group.
Switch(config)# interface [port_list] Switch(config-if-PORT-PORT)# no channel-group trunking	[port_list]	Remove the selected ports from a link aggregation group.
Switch(config)# no channel-group type mac-quotient		Disable load-balancing and forwarding methods depending on mac address quotient.
Show command		
Switch(config)# show channel-group trunking		Show link aggregation settings.
Switch(config)# show channel-group trunking [trunk_name]	[trunk_name]	Show a specific link aggregation group’s settings, including aggregated port numbers and the distribution rule status.

Below is an example of creating a static link aggregation group (port trunking group) using Channel-group commands for IPS-3110-PB PoE Managed Switch to have the users realize the commands we mentioned above in this section.

	Command	Purpose
STEP1	configure Example: IPS-3110-PB# config IPS-3110-PB(config)#	Enter the global configuration mode.
STEP2 (Optional)	channel-group type mac-quotient Example: IPS-3110-PB(config)# channel-group type mac-quotient OK !	Enable mac address quotient in Distribution Rule.
STEP3	channel-group trunking <i>group_name</i> Example: IPS-3110-PB(config)# channel-group trunking CTSGROUP OK !	In this example, it configures the name of the Trunking Group as "CTSGROUP".
STEP4	interface <i>port_list</i> Example: IPS-3110-PB(config)# interface 1,3 IPS-3110-PB(config-if-1,3)#	Specify the interface that you would like to set to Trunking Group.
STEP5	channel-group trunking <i>group_name</i> Example: IPS-3110-PB(config-if-1,3)# channel-group trunking CTSGROUP OK !	In this example, it configures Port 1 and Port 3 as the link membership of "CTSGROUP" Trunking Group
STEP6	exit Example: IPS-3110-PB(config-if-1,3)# exit IPS-3110-PB(config)#	Return to the global configuration mode.
STEP7	exit Example: IPS-3110-PB(config)# exit IPS-3110-PB#	Return to the Privileged mode.
STEP8	write Example: IPS-3110-PB# write Save Config Succeeded! OK !	Save the running configuration into the startup configuration.

2. Use “Interface” command to configure link aggregation groups dynamically (LACP).

Channel-group & Interface command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4
Switch(config-if-PORT-PORT)# channel-group lacp		Enable LACP on the selected interfaces.
Switch(config-if-PORT-PORT)# channel-group lacp key [0-255]	[0-255]	Specify a key to the selected interfaces. (0: auto)
Switch(config-if-PORT-PORT)# channel-group lacp type [active]	[active]	Specify the selected interfaces as active LACP role type.
No command		
Switch(config-if-PORT-PORT)# no channel-group lacp		Disable LACP on the selected interfaces.
Switch(config-if-PORT-PORT)# no channel-group lacp key		Reset the key value of the selected interfaces back to the default.
Switch(config-if-PORT-PORT)# no channel-group lacp type		Reset the LACP role type of the selected interfaces back to the default (passive mode).
Show command		
Switch(config)# show channel-group lacp		Show each interface's LACP settings including current mode, key value and LACP role type.
Switch(config)# show channel-group lacp [port_list]	[port_list]	Show the selected interfaces' LACP settings.
Switch(config)# show channel-group lacp status		Show each interface's current LACP status.
Switch(config)# show channel-group lacp status [port_list]	[port_list]	Show the selected interfaces' current LACP status.
Switch(config)# show channel-group lacp statistics		Show each interface's current LACP traffic statistics.
Switch(config)# show channel-group lacp statistics [port_list]	[port_list]	Show the selected interfaces' current LACP traffic statistics.
Switch(config)# show channel-group lacp statistics clear		Clear all LACP statistics.

Below is an example of creating a dynamic link aggregation group using Channel-group commands for IPS-3110-PB PoE Managed Switch to have the users realize the commands we mentioned above in this section.

	Command	Purpose
STEP1	configure Example: IPS-3110-PB# config IPS-3110-PB(config)#	Enter the global configuration mode.
STEP2 (Optional)	channel-group type mac-quotient Example: IPS-3110-PB(config)# channel-group type mac-quotient OK !	Enable mac address quotient in Distribution Rule.
STEP3	interface <i>port_list</i> Example: IPS-3110-PB(config)# interface 2-4 IPS-3110-PB(config-if-2-4)#	Speciy the interfaces that you would like to set to LACP Group.
STEP4	channel-group lacp Example: IPS-3110-PB(config-if-2-4)# channel-group lacp OK !	Enable Port 2~Port 4 to LACP Port.
STEP5	channel-group lacp type active [no channel-group lacp type] Example 1: IPS-3110-PB(config-if-2-4)# channel-group lacp type active OK ! Example 2: IPS-3110-PB(config-if-2-4)# no channel-group lacp type OK !	In the Example 1, it configures LACP Port 2~4 as “Active” in LACP role type. In the Example 2, it configures LACP Port 2~4 as “Passive” in LACP role type.
STEP6	channel-group lacp key <i>LACP_key</i> [no channel-group lacp key] Example 1: IPS-3110-PB(config-if-2-4)# channel-group lacp key 10 OK ! Example 2: IPS-3110-PB(config-if-2-4)# no channel-group lacp key OK !	In the Example 1, it configures a key value “10” as the LACP Key of LACP Port 2~4. In the Example 2, it configures a key value “0” (default value) as the LACP Key of LACP Port 2~4.
STEP7	exit Example: IPS-3110-PB(config-if-2-4)# exit IPS-3110-PB(config)#	Return to the global configuration mode.

STEP8	exit Example: IPS-3110-PB(config)# exit IPS-3110-PB#	Return to the Privileged mode.
STEP9	write Example: IPS-3110-PB# write Save Config Succeeded!	Save the running configuration into the startup configuration.

2.6.6 Dot1x Command

Command	Parameter	Description
Switch(config)# dot1x		Enable IEEE 802.1X function. When enabled, the Managed Switch acts as a proxy between the 802.1X-enabled client and the authentication server. In other words, the Managed Switch requests identifying information from the client, verifies that information with the authentication server, and relays the response to the client.
Switch(config)# dot1x reauth-period [1-3600]	[1-3600] secs	Specify a period of reauthentication time that a client authenticates with the authentication server. The allowable value is between 1 and 3600 seconds.
Switch(config)# dot1x reauthentication		Enable auto reauthentication function of the system.
Switch(config)# dot1x secret [shared_secret]	[shared_secret]	Specify a shared secret of up to 30 characters. This is the identification word or number assigned to each RADIUS authentication server with which the client shares a secret.
Switch(config)# dot1x server [A.B.C.D]	[A.B.C.D]	Specify the RADIUS authentication server IP address.
Switch(config)# dot1x timeout [1-255]	[1-255] secs	Specify EAP authentication timeout value in seconds. The Managed Switch will wait for a period of time for the response from the authentication server to an authentication request before it times out. The allowable value is between 1 and 255 seconds.
No command		
Switch(config)# no dot1x		Disable IEEE 802.1X function.
Switch(config)# no dot1x reauth-period		Reset EAP reauthentication period back to the default. (60 seconds).
Switch(config)# no dot1x reauthentication		Disable auto reauthentication function of the system.
Switch(config)# no dot1x secret		Remove the configured shared secret.
Switch(config)# no dot1x server		Remove the configured RADIUS authentication server IP address.
Switch(config)# no dot1x timeout		Reset EAP authentication timeout value back to the default. (10 seconds).

Show command		
Switch(config)# show dot1x		Show 802.1X system configuration.
Switch(config)# show dot1x interface		Show each interface's 802.1X configuration.
Switch(config)# show dot1x interface [port_list]	[port_list]	Show the specified interfaces' 802.1X configuration.
Switch(config)# show dot1x statistics		Show each port's 802.1X statistics.
Switch(config)# show dot1x statistics [port_list]	[port_list]	Show the specified interfaces' 802.1X statistics.
Switch(config)# show dot1x status		Show all ports' 802.1X status.
Switch(config)# show dot1x status [port_list]	[port_list]	Show the specified interfaces' 802.1X status.
Examples of Dot1x command		
Switch(config)# dot1x		Enable IEEE 802.1X function.
Switch(config)# dot1x reauthentication		Enable auto reauthentication function of the system.
Switch(config)# dot1x secret agagabcxyz		Set up the shared secret to "agagabcxyz".
Switch(config)# dot1x server 192.168.1.10		Set up the RADIUS authentication server IP address to 192.168.1.10.

Use "Interface" command to configure a group of ports' IEEE 802.1x settings.

Dot1x & Interface command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4.
Switch(config-if-PORT-PORT)# dot1x port-control [auto unauthorized]	[auto unauthorized]	<p>Specify the 802.1X port type "auto", "authorized" or "unauthorized" to the selected ports.</p> <p>"auto": This requires 802.1X-aware clients to be authorized by the authentication server. Accesses from clients that are not dot1x aware will be denied.</p> <p>"authorized": This forces the Managed Switch to grant access to all clients, both 802.1X-aware and 802.1x-unaware. No authentication exchange is required. By default, all ports are set to "authorized".</p> <p>"unauthorized": This forces the Managed Switch to deny access to all clients, neither 802.1X-aware nor 802.1X-unaware.</p>

Switch(config-if-PORT-PORT)# dot1x reauthenticate		Re-authenticate the selected interfaces right now.
No command		
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1, 3 or 2-4.
Switch(config-if-PORT-PORT)# no dot1x port-control		Reset the selected interfaces' 802.1X port type back to the default (authorized state).
Show command		
Switch(config)# show dot1x		Show 802.1X system configuration.
Switch(config)# show dot1x interface		Show each interface's 802.1x settings including authentication status.
Switch(config)# show dot1x interface [port_list]	[port_list]	Show the specified interfaces' 802.1x settings including authentication status.
Switch(config)# show dot1x statistics		Show 802.1x statistics.
Switch(config)# show dot1x statistics [port_list]	[port_list]	Show the specified interfaces' statistics.
Switch(config)# show dot1x status		Show 802.1x status.
Switch(config)# show dot1x status [port_list]	[port_list]	Show the specified interfaces' 802.1x status.
Examples of Dot1x & interface command		
Switch(config)# interface 1-3		Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4
Switch(config-if-1-3)# dot1x port-control auto		Set up the selected ports to "auto" state.
Switch(config-if-1-3)# dot1x reauthenticate		Re-authenticate the selected interfaces immediately.

2.6.7 IP Command

1. Set up an IP address of the Managed Industrial PoE Ethernet Switch or configure the Managed Industrial PoE Ethernet Switch to get an IP address automatically from DHCP server.

IP command	Parameter	Description
Switch(config)# ip address [A.B.C.D] [255.X.X.X] [A.B.C.D]	[A.B.C.D]	Enter the desired IP address for your Managed Industrial PoE Ethernet Switch.
	[255.X.X.X]	Enter subnet mask of your IP address.
	[A.B.C.D]	Enter the default gateway IP address.
Switch(config)# ip address dhcp		Enable DHCP mode.
No command		
Switch(config)# no ip address		Reset the Managed Industrial PoE Ethernet Switch's IP address back to the default.(192.168.0.1)
Switch(config)# no ip address dhcp		Disable DHCP mode.
Show command		
Switch(config)# show ip address		Show the IP configuration and the current status of the system.
IP command Example		
Switch(config)# ip address 192.168.1.198 255.255.255.0 192.168.1.254		Set up the Managed Industrial PoE Ethernet Switch's IP to 192.168.1.198, subnet mask to 255.255.255.0, and default gateway IP address to 192.168.1.254.
Switch(config)# ip address dhcp		The Managed Industrial PoE Ethernet Switch will obtain an IP address automatically.

2. Enable DHCP relay function.

IP DHCP Snooping Command	Parameter	Description
Switch(config)# ip dhcp snooping		Enable DHCP snooping function.
Switch(config)# ip dhcp snooping dhcp-server [port_list]	[port_list]	Specify the specific port(s) as DHCP server trust port(s).
No command		
Switch(config)# no ip dhcp snooping		Disable DHCP snooping function.
Switch(config)# no ip dhcp snooping dhcp-server		Disable DHCP server trust port(s).
Show command		
Switch(config)# show ip dhcp snooping		Show DHCP snooping configuration.
Examples of IP DHCP Snooping		
Switch(config)# ip dhcp snooping		Enable DHCP snooping function.
Switch(config)# ip dhcp snooping dhcp-server 2-5		Configure Port 2-5 as DHCP server trust ports.

3. Enable or disable IGMP snooping globally.

IGMP, Internet Group Management Protocol, is a communication protocol used to manage the membership of Internet Protocol multicast groups. IGMP is used by IP hosts and adjacent multicast routers to establish multicast group memberships. It can be used for online streaming video and gaming, and allows more efficient use of resources when supporting these uses.

IGMP Snooping is the process of listening to IGMP traffic. IGMP snooping, as implied by the name, is a feature that allows the switch to "listen in" on the IGMP conversation between hosts and routers by processing the layer 3 packets IGMP packets sent in a multicast network.

When IGMP snooping is enabled in a switch it analyses all the IGMP packets between hosts connected to the switch and multicast routers in the network. When a switch hears an IGMP report from a host for a given multicast group, the switch adds the host's port number to the multicast list for that group. And, when the switch hears an IGMP Leave, it removes the host's port from the table entry.

IGMP snooping can very effectively reduce multicast traffic from streaming and other bandwidth intensive IP applications. A switch using IGMP snooping will only forward multicast traffic to the hosts interested in that traffic. This reduction of multicast traffic reduces the packet processing at the switch (at the cost of needing additional memory to handle the multicast tables) and also reduces the workload at the end hosts since their network cards (or operating system) will not have to receive and filter all the multicast traffic generated in the network.

Command / Example	Parameter	Description
Switch(config)# ip igmp snooping		Enable IGMP snooping function. When enabled, the Managed Industrial PoE Ethernet Switch will monitor network traffic and determine which hosts to receive multicast traffic. This is for IGMPv1 and IGMPv2 only.
Switch(config)# ip igmp snooping aging-time [1-3000]	[1-3000] (Unit:1/10secs)	Specify IGMP querier aging time between 1 and 3000 (Unit: 1/10 sec.). Please note that this time setting can be changed only when IGMP immediate leave is disabled, and IGMP aging time is fixed to 300 seconds when IGMP immediate leave is enabled.
Switch(config)# ip igmp snooping immediate-leave		Enable immediate leave function.
Switch(config)# ip igmp snooping mcast-router [port_list]	[port_list]	Specify multicast router ports.
No command		
Switch(config)# no ip igmp snooping		Disable IGMP snooping function.
Switch(config)# no ip igmp snooping aging-time		Reset IGMP querier aging time back to the default.(3000 (Unit: 1/10 sec.))
Switch(config)# no ip igmp snooping immediate-leave		Disable immediate leave function.
Switch(config)# no ip igmp snooping mcast-router [port_list]	[port_list]	Remove the selected port(s) from the router port list.

Show command		
Switch(config)# show ip igmp snooping		Show the current IGMP snooping configuration.
Switch(config)# show ip igmp snooping groups		Show IGMP multicast groups table.

2.6.8 LLDP Command

LLDP stands for Link Layer Discovery Protocol and runs over data link layer. It is used for network devices to send information about themselves to other directly connected devices on the network. By using LLDP, two devices running different network layer protocols can learn information about each other. A set of attributes are used to discover neighbor devices. These attributes contains type, length, and value descriptions and are referred to as TLVs. Details such as port description, system name, system description, system capabilities, and management address can be sent and received on this Managed Industrial PoE Ethernet Switch. Use Spacebar to select “ON” if you would like to receive and send the TLV.

LLDP command	Parameter	Description
Switch(config)# lldp hold-time [1-3600]	[1-3600]	Specify the amount of time in seconds. A receiving device will keep the information sent by your device for a period of time you specify here before discarding it. The allowable hold-time value is between 1 and 3600 seconds.
Switch(config)# lldp interval [1-180]	[1-180]	Specify the time interval for updated LLDP packets to be sent. The allowable interval value is between 1 and 180 seconds.
Switch(config)# lldp packets [1-16]	[1-16]	Specify the amount of packets that are sent in each discovery. The allowable packet value is between 1 and 16 packets.
Switch(config)# lldp tlv-select capability		Enable Capability attribute to be sent.
Switch(config)# lldp tlv-select management-address		Enable Management Address attribute to be sent.
Switch(config)# lldp tlv-select port-description		Enable Port Description attribute to be sent.
Switch(config)# lldp tlv-select system-description		Enable System Description attribute to be sent.
Switch(config)# lldp tlv-select system-name		Enable System Name attribute to be sent.
No command		
Switch(config)# no lldp hold-time		Reset the hold-time value back to the default. (120 seconds)
Switch(config)# no lldp interval		Reset the time interval value of sending updated LLDP packets back to the default.(5 seconds)
Switch(config)# no lldp packets		Reset the amount of packets that are sent in each discover back to the default.(1 packet)
Switch(config)# no lldp tlv-select capability		Disable Capability attribute to be sent.
Switch(config)# no lldp tlv-select management-address		Disable Management Address attribute to be sent.
Switch(config)# no lldp tlv-select port-description		Disable Port Description attribute to be sent.
Switch(config)# no lldp tlv-select system-description		Disable System Description attribute to be sent.
Switch(config)# no lldp tlv-select system-name		Disable System Name attribute to be sent.

Show command	
Switch# show lldp	Show LLDP settings.
Switch# show lldp interface	Show each interface's LLDP configuration.
Switch# show lldp interface [port_list]	Show the selected interfaces' LLDP configuration.
Switch# show lldp status	Show the current LLDP status.
Switch(config)# show lldp	Show LLDP settings.
Switch(config)# show lldp interface	Show each interface's LLDP configuration.
Switch(config)# show lldp interface [port_list]	Show the selected interfaces' LLDP configuration.
Switch(config)# show lldp status	Show the current LLDP status.
Examples of LLDP command	Description
Switch(config)# lldp hold-time 60	Set the hold-time value to 60 seconds.
Switch(config)# lldp interval 10	Set the updated LLDP packets to be sent in every 10 seconds.
Switch(config)# lldp packets 2	Set the number of packets to be sent in each discovery to 2.
Switch(config)# lldp tlv-select capability	Enable Capability attribute to be sent.
Switch(config)# lldp tlv-select management-address	Enable Management Address attribute to be sent.
Switch(config)# lldp tlv-select port-description	Enable Port Description attribute to be sent.
Switch(config)# lldp tlv-select system-description	Enable System Description to be sent.
Switch(config)# lldp tlv-select system-name	Enable System Name to be sent.

Use “Interface” command to configure a group of ports’ LLDP settings.

LLDP & Interface command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4
Switch(config-if-PORT-PORT)# lldp		Enable LLDP on the selected interfaces.
No command		
Switch(config-if-PORT-PORT)# no lldp		Disable LLDP on the selected interfaces.

2.6.9 Loop Detection Command

In a real network, it is possible the people misconnect the network cable to incur loop condition. In a worst case, the network is out of service thereafter. This section gives a guide to configure the Loop Detection function of the system to prevent the system from loop.

After a proper setting of Loop Detection function, the system detects loop condition by periodically sending loop detection packet. Once the system receives the loop detection packet from itself, it is claimed that it detects loop condition. Then, the system takes the following 3 actions

1. It blocks the relevant port to prevent broadcast storms. In other words, the system stops forwarding all the traffic via the looped port. However, the system will process the loop detection packet received on the looped port.
2. It slowly blinks the LED of looped port in orange.
3. It periodically sends loop detection packet to detect the existence of loop condition.

When the system does not receive any loop detection packet from itself for a period of configured **Looped port unlock-interval**. The system claims the loop condition disappears. Then, the system takes the following 3 actions

1. It un-blocks the relevant port. In other words, the system normally forwards all the traffic via the relevant port.
2. It stops slowly blinking the LED of looped port in orange.
3. It periodically sends loop detection packet to detect the existence of loop condition.

Note: Under loop condition, the LED of looped port continues to slowly blink orange even the connected network cable is unplugged out of looped port.

Command	Parameter	Description
Switch(config)# loop-detection		Enable Loop Detection function globally.
Switch(config)# loop-detection all-vlan		Check All VLAN box to enable loop detection on all trunk-VLAN-vids configured in VLAN Command (See Section 2.6.25). NOTE: When All VLAN checkbox is checked, it invalidates the configured "Specific VLAN".
Switch(config)# loop-detection interval [1-180]	[1-180]	This is the time interval (in seconds) that the device will periodically send loop detection packets to detect the presence of looped network. The valid range is from 1 to 180 seconds. The default setting is 1 seconds.
Switch(config)# loop-detection unlock-interval [1-1440]	[1-1440]	This is the time interval for the system to detect the existence of loop condition. System un-blocks the looped port if it does not receive any loop-detection packet during the configured unlock-interval. The unlock-interval can be set from 1 to 1440 minutes. The default setting is 1440 minutes.

		<p>NOTE:</p> <p>1. Be aware that Looped port unlock-interval converted into seconds should be greater than or equal to Detection Interval seconds multiplied by 10. The '10' is a magic number which is for the system to claims the loop detection disappears when the system does not receive the loop-detection packet from itself at least 10 times. In general, it can be summarized by a formula below:</p> $60 * \text{"Looped port unlock-interval"} \geq 10 * \text{"Detection Interval"}$ <p>2. When a port is detected as a looped port, the system keeps the looped port in blocking status until loop situation is gone. In other words, the system stops forwarding all the traffic via the looped port. However, the system will process the loop-detection packet received on the looped port.</p>
Switch(config)# loop-detection vlan-id [1-4094]	[1-4094]	<p>Enable loop detection on specified VLAN. Up to 4 sets of VLAN ID can be assigned.</p> <p>NOTE: The configured "Specific VLAN" takes effect when All VLAN check-box is unchecked.</p>
No command		
Switch(config)# no loop-detection		Disable Loop Detection function.
Switch(config)# no loop-detection all-vlan		Disable loop detection on all trunk-VLAN-vids.
Switch(config)# no loop-detection interval		Reset Loop Detection time interval back to the default.
Switch(config)# no loop-detection unlock-interval		Reset Loop Detection unlock time interval back to the default.
Switch(config)# no loop-detection vlan-id [1-4094]	[1-4094]	Disable loop detection on a specified VLAN.
Show command		
Switch# show loop-detection		Show Loop Detection configuration.
Switch# show loop-detection status		Show Loop Detection status of all ports.
Switch# show loop-detection status [port_list]	[port_list]	Show Loop Detection status of the specified port(s).
Switch(config)# show loop-detection		Show Loop Detection configuration.
Switch(config)# show loop-detection status		Show Loop Detection status of all ports.

Switch(config)# show loop-detection status [port_list]	[port_list]	Show Loop Detection status of the specified port(s).
Examples of Loop Detection command		
Switch(config)# loop-detection interval 60		Set the Loop Detection time interval to 60 seconds.
Switch(config)# loop-detection unlock-interval 120		Set the Loop Detection unlock time interval to 120 minutes.
Switch(config)# loop-detection vlan-id 100		Enable the Loop Detection on VLAN ID 100.

Use “Interface” command to configure a group of ports’ Loop Detection settings.

Dot1x & Interface command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4
Switch(config-if-PORT-PORT)# loop-detection		Enable Loop Detection function on the selected port(s).
No command		
Switch(config-if-PORT-PORT)# no loop-detection		Disable Loop Detection function on the selected port(s).

2.6.10 MAC Command

Set up MAC address table aging time. Entries in the MAC address table containing source MAC addresses and their associated ports will be deleted if they are not accessed within aging time.

MAC Command	Parameter	Description
Switch(config)# mac address-table aging-time [4-900]	[4-900] secs	Specify the aging time for MAC address table in seconds.
No command		
Switch(config)# no mac address-table aging-time		Reset MAC address table aging time back to the default. (300 seconds).
Show command		
Switch(config)# show mac address-table		Show MAC addresses learned by the Managed Industrial PoE Ethernet Switch.
Switch(config)# show mac address-table interface [port]	[port]	Show MAC addresses learned by the specified port.
Switch(config)# show mac address-table top		Show MAC address table from the first entry.
Switch(config)# show mac address-table vlan-id [1-4094]	[1-4094]	Show the MAC status of specified VLAN ID.
Switch(config)# show mac static-mac		Show the static MAC address table.
Switch(config)# show mac aging-time		Show the current MAC address aging time.
Examples of MAC command		
Switch(config)# mac address-table aging-time 200		Set MAC address table aging time to 200 seconds.

Use “Interface” command to configure a group of ports’ MAC Table settings.

MAC & Interface command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4
Switch(config-if-PORT)# mac address-table static-mac [xx:xx:xx:xx:xx:xx] vlan [1-4094]	[xx:xx:xx:xx:xx:xx]	Specify a MAC address to the VLAN entry. Note: Only one port could be set at a time.
	[1-4094]	Specify the VLAN where the packets with the Destination MAC address can be forwarded to the selected port.
No command		
Switch(config-if-PORT)# no mac address-table static-mac [xx:xx:xx:xx:xx:xx] vlan [1-4094]	[xx:xx:xx:xx:xx:xx]	Remove the specified MAC address from the MAC address table. Note: Only one port could be set at a time.
	[1-4094]	Remove the VLAN to which the specified MAC belongs.

2.6.11 Management Command

Command	Parameter	Description
Switch(config)# management console timeout [1-1440]	[1-1440]	To disconnect the Managed Industrial PoE Ethernet Switch when console management is inactive for a certain period of time. The allowable value is from 1 to 1440 (seconds).
Switch(config)# management console timeout [1-1440] min	[1-1440]	To disconnect the Managed Industrial PoE Ethernet Switch when console management is inactive for a certain period of time. The allowable value is from 1 to 1440 (minutes).
Switch(config)# management ssh		Enable SSH management. To manage the Managed Industrial PoE Ethernet Switch via SSH.
Switch(config)# management telnet		Enable Telnet Management. To manage the Managed Industrial PoE Ethernet Switch via Telnet.
Switch(config)# management telnet port [1-65535]	[1-65535]	When telnet is enabled, you can set up the port number that allows telnet access. The default port number is set to 23. However, you can also identify a port number between 1 and 65535.
Switch(config)# management web		Enable Web Management. To manage the Managed Industrial PoE Ethernet Switch via Web management.
Switch(config)# management web timeout [1-1440]	[1-1440]	To disconnect the Managed Industrial PoE Ethernet Switch when web management is inactive for a certain period of time. The allowable value is from 1 to 1440(minutes).
No command		
Switch(config)# no management console timeout		Reset console timeout back to the default (300 seconds).
Switch(config)# no management ssh		Disable SSH management.
Switch(config)# no management telnet		Disable Telnet management.
Switch(config)# no management telnet port		Reset Telnet port back to the default. The default port number is 23.
Switch(config)# no management web		Disable Web management.
Switch(config)# no management web timeout		Reset web timeout value back to the default (20 minutes).
Show command		
Switch(config)# show management		Show the current management configuration of the Managed Industrial PoE Ethernet Switch.

Examples of Management command	
Switch(config)# management console timeout 300	The console management will timeout (logout automatically) when it is inactive for 300 seconds.
Switch(config)# management telnet	Enable Telnet management.
Switch(config)# management telnet port 23	Set Telnet port to port 23.
Switch(config)# management web	Enable Web management.

2.6.12 Mirror Command

Command	Parameter	Description
Switch(config)# mirror destination [port]	[port]	Specify the preferred destination port (1~10) for port mirroring.
Switch(config)# mirror mode [by-port]	[by-port]	Enable the mirroring configuration function.
Switch(config)# mirror source [port_list]	[port_list]	Specify a source port number or several source port numbers for port mirroring. NOTE: The port selected as the destination port cannot be the source port.
No command		
Switch(config)# no mirror destination		Reset the mirroring destination port back to the default.
Switch(config)# no mirror mode		Disable the mirroring configuration function.
Switch(config)# no mirror source		Disable the mirroring source ports.
Show command		
Switch(config)# show mirror		Show the current port mirroring configuration.
Example of Mirror command		
Switch(config)# mirror destination 3		The selected source ports' data will mirror to port 3.
Switch(config)# mirror source 1-5		Port 1 to 5's data will mirror to the destination port.

2.6.13 NTP Command

Command	Parameter	Description
Switch(config)# ntp		Enable Network Time Protocol to have Managed Industrial PoE Ethernet Switch's system time synchronize with NTP time server.
Switch(config)# ntp daylight-saving [recurring date]	[recurring]	Enable daylight saving function with recurring mode.
	[date]	Enable daylight saving function with date mode.
Switch(config)# ntp offset [Mm,w,d,hh:mm-Mm,w,d,hh:mm]	[Mm,w,d,hh:mm-Mm,w,d,hh:mm]	Specify the offset of daylight saving in recurring mode. Mm=1-12, w=1-5, d=0-6(0=Sun, 6=Sat) Hh=0-23, mm=0-59, Days=1-365
Switch(config)# ntp offset [Days,hh:mm-Days,hh:mm]	[Days,hh:mm-Days,hh:mm]	Specify the offset of daylight saving in date mode. Mm=1-12, w=1-5, d=0-6(0=Sun, 6=Sat) Hh=0-23, mm=0-59, Days=1-365
Switch(config)# ntp server1 [A.B.C.D]	[A.B.C.D]	Specify the primary NTP time server IP address.
Switch(config)# ntp server2 [A.B.C.D]	[A.B.C.D]	Specify the secondary NTP time server IP address.
Switch(config)# ntp syn-interval [1-8]	[1-8]	Specify the time interval to have Managed Industrial PoE Ethernet Switch synchronize with NTP time server. 1=1hour, 2=2hours, 3=3hours, 4=4hours, 5=6hours, 6=8hours, 7=12hours, 8=24hours
Switch(config)# ntp time-zone [0-135]	[0-135]	Specify the time zone to which the Managed Industrial PoE Ethernet Switch belongs. Use space and a question mark to view the complete code list of 136 time zones. For example, "Switch(config)# ntp time-zone ?"
No command		
Switch(config)# no ntp		Disable Network Time Protocol to stop Managed Industrial PoE Ethernet Switch's system time synchronizing with NTP time server.
Switch(config)# no ntp daylight-saving		Disable the daylight saving function.
Switch(config)# no ntp offset		Reset the offset value back to the default.
Switch(config)# no ntp server1		Delete the primary time server IP address.
Switch(config)# no ntp server2		Delete the secondary time server IP address.
Switch(config)# no ntp syn-interval		Reset the synchronization time interval back to the default.

Switch(config)# no ntp time-zone	Reset the time-zone setting back to the default.
Show command	
Switch# show ntp	Show the current NTP time server configuration.
Switch(config)# show ntp	Show the current NTP time server configuration.
Examples of NTP command	
Switch(config)# ntp	Enable NTP function for the Managed Industrial PoE Ethernet Switch.
Switch(config)# ntp daylight-saving date	Enable the daylight saving function in date mode.
Switch(config)# ntp offset [100,12:00-101,12:00]	Daylight saving time date start from the 100 th day of the year to the 101 th day of the year.
Switch(config)# ntp server1 192.180.0.12	Set the primary NTP time server IP address to 192.180.0.12.
Switch(config)# ntp server2 192.180.0.13	Set the secondary NTP time server IP address to 192.180.0.13.
Switch(config)# ntp syn-interval 4	Set the synchronization interval to 4 hours.
Switch(config)# ntp time-zone 3	Set the time zone to GMT-8:00 Vancouver.

2.6.14 PoE Command

PoE (Power Over Ethernet) is the technology that a data-carrying LAN cable can play a role in power supplier. Typically, a PoE switch is deployed at the center of the network for power transmission and supplies electricity to PDs (powered devices) up to 100 meters away through TP ports. PDs can be installed wherever there is a LAN cable rather than AC power source. The user need not be present at powered devices location, which greatly reduces truck rolls. The Managed Industrial PoE Switch even supports time-based PoE, defining the time interval when powered devices are desired to be automatically powered on a daily or weekly basis, for budget-conscious users to be more efficient power management.

1. Set up PoE power budget

Command	Parameter	Description
Switch(config)# poe total-budget [30-240]	[30-240]	Specify the total PoE power budget in watts for the system. (This command is for IPS-3110-PB Only.) Note: <ul style="list-style-type: none">— Max.120W for total powered devices' consumption @ 24-50 VDC input— Max. 240W for total powered devices' consumption @ 50-54 VDC input
No command		
Switch(config)# no poe total-budget		Reset the total PoE power budget back to the default.(240 Watts)
Show command		
Switch# show poe		Show the current PoE system configuration.
Switch# show poe status		Show the current total PoE power consumption and PoE status of all PoE ports.
Switch# show poe interface		Show the current PoE configuration of all PoE ports.
Switch# show poe interface [port_list]	[port_list]	Show the current PoE configuration of the specific PoE port.
Switch# show poe interface schedule		Show the current PoE Schedule Time Range configuration and schedule status of all PoE ports.
Switch# show poe interface schedule [port_list]	[port_list]	Show the current PoE Schedule Time Range configuration and schedule status of the specific PoE port.
Switch(config)# show poe		Show the current PoE system configuration.
Switch(config)# show poe status		Show the current total PoE power consumption and PoE status of all PoE ports.
Switch(config)# show poe interface		Show the current PoE configuration of all PoE ports.
Switch(config)# show poe interface [port_list]	[port_list]	Show the current PoE configuration of the specific PoE port.
Switch(config)# show poe interface schedule		Show the current PoE Schedule Time Range configuration and schedule status

		of all PoE ports.
Switch(config)# show poe interface schedule [port_list]	[port_list]	Show the current PoE Schedule Time Range configuration and schedule status of the specific PoE port.

2. Use “interface” command to configure PoE parameters per TP port for PDs.

Interface Command	Parameter	Description
Switch(config-if-PORT-PORT)# poe operation [shutdown injector-30watt auto-af/at]	[shutdown injector-30watt auto-af/at]	Set up PoE operation mode for the selected PoE port(s).
Switch(config-if-PORT)# poe pdname [device_name]	[device_name]	Specify a name to the PD connected with the selected port. Up to 32 alphanumeric characters can be accepted.
Switch(config-if-PORT-PORT)# poe priority [critical high low]	[critical high low]	<p>Specify the power management priority to the the selected PoE port(s). (This command is for IPS-3110-PB Only.)</p> <p>“low” priority: It indicates the port(s) with this priority will be the first port(s) to get power cut off.</p> <p>“high” priority: It indicates the port(s) with this priority will terminate the power supply after all ports assigned with the “Low” priority get power cut off.</p> <p>“critical” priority: It indicates the port(s) with this priority will be the last port(s) to get power cut off.</p> <p>NOTE: Power will be cut off upon the order of port number (Port4→Port3→Port2→Port1) if ports are assigned with the same priority. For example, in case Port2 and Port4 are both the low-priority ports, power supplied by Port4 will be cut off earlier than Port2.</p>
Switch(config-if-PORT-PORT)# poe schedule		Enable PoE schedule function on the selected ports. It defines which previously-configured time interval the port should follow. One set of time interval can be accepted at a time.
Switch(config-if-PORT-PORT)# poe schedule [time-range-name]	[time-range-name]	Specify PoE schedule a time-range for the selected port(s).
No command		
Switch(config-if-PORT-PORT)# no poe operation		Reset the operation mode back to the default. (auto-af/at)

Switch(config-if-PORT-PORT)# no poe pdname		Remove the powered device name from the selected port(s).
Switch(config-if-PORT-PORT)# no poe priority		Reset the power management priority back to the default.(low)
Switch(config-if-PORT-PORT)# no poe schedule		Disable PoE schedule function on the selected port(s).
Switch(config-if-PORT-PORT)# no poe schedule [time-range-name]	[time-range-name]	Remove PoE schedule setting from the selected port(s).

2.6.15 QoS Command

1. Set up Qos

QoS command	Parameter	Description
Switch(config)# qos [802.1p dscp]	[802.1p dscp]	Specify QoS mode. NOTE: 802.1p priority mode only can be applied under 802.1q VLAN mode. For more details on 802.1q Tag VLAN mode settings, please refer to Section 2.6.25.
Switch(config)# qos dscp-map [0-63] [0-7]	[0-63]	Specify a DSCP bit value.
	[0-7]	Specify a queue value.
Switch(config)# qos management-priority [0-7]	[0-7]	Specify management default 802.1p bit.
Switch(config)# qos queuing-mode [weight]	[weight]	Specify QoS queuing mode as weight mode.
Switch(config)# qos queue-weighted [1:2:3:4:5:6:7:8]	[1:2:3:4:5:6:7:8]	Specify the queue weighted.
Switch(config)# qos remarking dscp		Globally enable DSCP bit remarking.
Switch(config)# qos remarking dscp [by-dscp]	[by-dscp]	Specify DSCP bit remarking mode.
Switch(config)# qos remarking dscp-map [1-8]	[1-8]	Specify the DSCP and priority mapping ID.
Switch (config-dscp-map-ID)# active		Enable the mapping entry for the selected priority mapping ID.
Switch (config-dscp-map-ID)# new-dscp [0-63]	[0-63]	Specify the new DSCP bit value for the selected priority mapping ID.
Switch (config-dscp-map-ID)# rx-dscp [0-63]	[0-63]	Specify the received DSCP bit value for the selected priority mapping ID.
Switch(config)# qos remarking 802.1p		Globally enable 802.1p bit remarking.
Switch(config)# qos remarking 802.1p-map [1-8]	[1-8]	Specify the 802.1p and priority mapping ID.
Switch (config-802.1p-map-ID)# active		Enable the mapping entry for the selected priority mapping ID.
Switch (config-802.1p-map-ID)# 802.1p [0-7]	[0-7]	Specify the received 802.1p bit value for the selected priority mapping ID.
Switch (config-802.1p-map-ID)# priority [0-7]	[0-7]	Specify the new 802.1p bit value for the selected priority mapping ID.
Switch(config)# qos 802.1p-map [0-7] [0-7]	[0-7]	Specify an 802.1p bit value.
	[0-7]	Specify a queue value.

No command		
Switch(config)# no qos		Disable QoS function.
Switch(config)# no qos dscp-map [0-63]	[0-63]	Reset the specified DSCP bit value back to the default queue value (Q(0)).
Switch(config)# no qos management-priority		Reset management 802.1p bit back to the default (0).
Switch(config)# no qos queuing-mode		Specify QoS queuing mode as strict mode.
Switch(config)# no qos queue-weighted		Reset the queue weighted value back to the default.
Switch(config)# no qos remarking dscp		Globally disable DSCP bit remarking.
Switch(config)# no qos remarking dscp-map [1-8]	[1-8]	Reset the DSCP remarking for the specified priority mapping ID back to the default.
Switch (config-dscp-map-ID)# no active		Disable the mapping entry for the selected priority mapping ID.
Switch (config-dscp-map-ID)# no new-dscp		Reset the new DSCP bit value for the selected priority mapping ID back to the default.
Switch (config-dscp-map-ID)# no rx-dscp		Reset the received DSCP bit value for the selected priority mapping ID back to the default.
Switch(config)# no qos remarking 802.1p		Globally disable 802.1p bit remarking.
Switch(config)# no qos remarking 802.1p-map [1-8]	[1-8]	Reset the 802.1p remarking for the specified priority mapping ID back to the default.
Switch (config-802.1p-map-ID)# no active		Disable the mapping entry for the selected priority mapping ID.
Switch (config-802.1p-map-ID)# no 802.1p		Reset the received 802.1p bit value for the selected priority mapping ID back to the default.
Switch (config-802.1p-map-ID)# no priority		Reset the new 802.1p bit value for the selected priority mapping ID back to the default.
Switch(config)# no qos 802.1p-map [0-7]	[0-7]	Reset the specified 802.1p bit value back to the default queue value (Q(0)).
Show command		
Switch(config)# show qos		Show QoS configuration.
Switch(config)# show qos interface		Show QoS interface overall information.
Switch(config)# show qos interface [port-list]	[port-list]	Show the selected QoS interface information.
Switch(config)# show qos remarking		Show QoS remarking information.
Switch (config-dscp-map-ID)# show		Show the DSCP mapping configuration for the selected priority mapping ID.

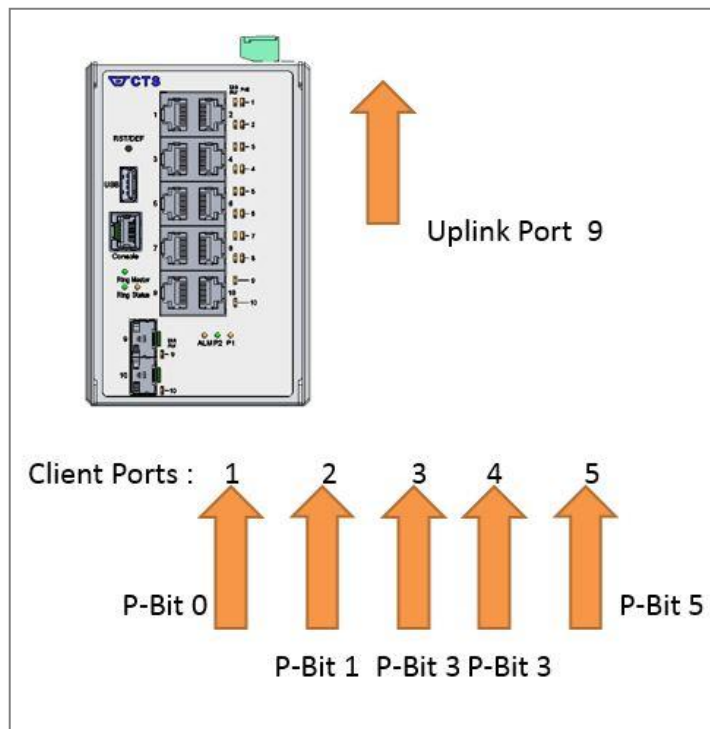
Switch(config-802.1p-map-ID)# show		Show the 802.1p mapping configuration for the selected priority mapping ID.
---------------------------------------	--	---

2. Use “interface” command to configure a group of ports’ QoS settings.

QoS & Interface command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4
Switch(config-if-PORT-PORT)# qos rate-limit ingress [0 64-1000000]	[0 64-1000000]kbps	Specify the ingress rate limit value and enable the ingress rate function. 0:Disable
Switch(config-if-PORT-PORT)# qos rate-limit egress [0 64-1000000]	[0 64-1000000] kbps	Specify the egress rate limit value and enable the egress rate function. 0:Disable
Switch(config-if-PORT-PORT)# qos user-priority [0-7]	[0-7]	Specify the default priority bit to the selected interfaces.
No command		
Switch(config-if-PORT-PORT)# no qos rate-limit ingress		Reset QoS ingress rate limit back to the default.
Switch(config-if-PORT-PORT)# no qos rate-limit egress		Reset QoS egress rate limit back to the default.
Switch(config-if-PORT-PORT)# no qos user-priority		Reset the user priority value setting back to the default.

For QoS configuration via CLI, we take an IPS-3110-PB Managed Industrial PoE Ethernet Switch for example to let the users have a clear understanding of these QoS commands.

Under this network environment, IPS-3110-PB will be configured as Table 2-1. Port 1-5 are client ports and Port 9 is the uplink port of the device. Client ports will receive the data traffic with different VLAN P-bit value. Port 3, Port 4 and Port 5 are also limited to specified bandwidth in the different rate limit in ingress and egress.



QoS Mode: 802.1p; Egress Mode: Weight; Port 9: Uplink Port.
Queue-Weighted: 1(Q0):2(Q1):3(Q2):4(Q3):5(Q4):6(Q5):7(Q6):8(Q7)

802.1p Priority Map	P-Bit	Queue Mapping	Ingress Rate	Egress Rate	Remark
Port 1	0	Q0	Default	Default	The rest of P-Bits are default value.
Port 2	1	Q1	Default	Default	
Port 3	3	Q2	10000	10000	
Port 4	3	Q2	10000	10000	
Port 5	5	Q3	1G	1G	

Table 2-1

Below is the complete CLI commands applied to IPS-3110-PB Managed Industrial PoE Ethernet Switch.

	Command	Purpose
STEP1	configure Example: IPS-3110-PB# config IPS-3110-PB(config)#	Enter the global configuration mode.

STEP2	<p>qos 802.1p</p> <p>Example: IPS-3110-PB(config)# qos 802.1p OK !</p>	In this example, it configures the QoS Mode to 802.1p.
STEP3	<p>qos queuing-mode weight</p> <p>Example: IPS-3110-PB(config)# qos queuing-mode weight OK !</p>	In this example, it configures Configure Egress Mode as "Weight".
STEP4	<p>qos queue-weighted <i>weighted</i></p> <p>Example: IPS-3110-PB(config)# qos queue-weighted 1:2:3:4:5:6:7:8 OK !</p>	In this example, it configures the Queue Weighted to : 1(Q0):2(Q1):3(Q2):4(Q3):5(Q4):6(Q5):7(Q6):8(Q7).
STEP5	<p>qos 802.1p-map <i>802.1p_list queue_value</i></p> <p>Example: IPS-3110-PB(config)# qos 802.1p-map 0 0 IPS-3110-PB(config)# qos 802.1p-map 1 1 IPS-3110-PB(config)# qos 802.1p-map 3 2 IPS-3110-PB(config)# qos 802.1p-map 5 3</p>	In this example, it configures the P-Bit 0 with Queue Mapping to Q0, the P-Bits 1 with Queue Mapping to Q1, the P-Bits 3 with Queue Mapping to Q2, and the P-Bit 5 with Queue Mapping to Q3.
STEP6	<p>interface <i>port_list</i></p> <p>Example: IPS-3110-PB(config)# interface 3, 4 IPS-3110-PB(config-if-3,4)#</p>	Specify Port 3 and Port 4 that you would like to configure QoS Rate limit.
STEP7	<p>qos rate-limit ingress <i>limit_rate(kbps)</i></p> <p>Example: IPS-3110-PB(config-if-3,4)# qos rate-limit ingress 10000 OK !</p>	In this example, it configures Port 3 and Port 4 with 10M Ingress Rate.
STEP8	<p>qos rate-limit egress <i>limit_rate(kbps)</i></p> <p>Example: IPS-3110-PB(config-if-3,4)# qos rate-limit egress 10000 OK !</p>	In this example, it configures Port 3 and Port 4 with 10M Egress Rate.
STEP9	<p>exit</p> <p>Example: IPS-3110-PB(config-if-3,4)# exit IPS-3110-PB(config)#</p>	Return to the global configuration mode.
STEP10	<p>interface <i>port_list</i></p> <p>Example: IPS-3110-PB(config)# interface 5 IPS-3110-PB(config-if-5)#</p>	Specify Port 5 that you would like to configure QoS Rate limit.
STEP11	<p>qos rate-limit ingress <i>limit_rate(kbps)</i></p> <p>Example: IPS-3110-PB(config-if-5)# qos rate-limit ingress 1000000 OK !</p>	In this example, it configures Port 5 with 1G Ingress Rate.
STEP12	<p>qos rate-limit egress <i>limit_rate(kbps)</i></p> <p>Example: IPS-3110-PB(config-if-5)# qos rate-limit egress 1000000 OK !</p>	In this example, it configures Port 5 with 1G Egress Rate.

STEP13	exit Example: IPS-3110-PB(config-if-5)# exit IPS-3110-PB(config)#	Return to the global configuration mode.
STEP14	exit Example: IPS-3110-PB(config)# exit IPS-3110-PB#	Return to the Privileged mode.
STEP15	write Example: IPS-3110-PB# write Save Config Succeeded!	Save the running configuration into the startup configuration.

After completing the QoS settings for your IPS-3110-PB switches, you can issue the commands listed below for checking your configuration

Example 1,

IPS-3110-PB(config)# show qos

```
=====
QoS Information
=====
```

```
QoS Mode   : 802.1p
Egress Mode : weight
Weight      : 1:2:3:4:5:6:7:8
```

Press Ctrl-C to exit or any key to continue!

```
Tag  Priority
```

```
-----
0    Q0
1    Q1
2    Q0
3    Q2
4    Q0
5    Q3
6    Q0
7    Q0
```

Press Ctrl-C to exit or any key to continue!

```
DSCP  Priority  DSCP  Priority  DSCP  Priority  DSCP  Priority
```

```
-----
0    Q0    1    Q0    2    Q0    3    Q0
4    Q0    5    Q0    6    Q0    7    Q0
8    Q0    9    Q0    10   Q0    11   Q0
12   Q0    13   Q0    14   Q0    15   Q0
16   Q0    17   Q0    18   Q0    19   Q0
20   Q0    21   Q0    22   Q0    23   Q0
24   Q0    25   Q0    26   Q0    27   Q0
28   Q0    29   Q0    30   Q0    31   Q0
```

Press Ctrl-C to exit or any key to continue!

```
32   Q0    33   Q0    34   Q0    35   Q0
36   Q0    37   Q0    38   Q0    39   Q0
40   Q0    41   Q0    42   Q0    43   Q0
44   Q0    45   Q0    46   Q0    47   Q0
48   Q0    49   Q0    50   Q0    51   Q0
52   Q0    53   Q0    54   Q0    55   Q0
56   Q0    57   Q0    58   Q0    59   Q0
60   Q0    61   Q0    62   Q0    63   Q0
```

Example 2,

IPS-3110-PB(config)# show vlan interface

=====

IEEE 802.1q Tag VLAN Interface :

=====

Port	Access-vlan	User Priority	Port VLAN Mode	Trunk-vlan
1	1	0	access	1
2	1	0	access	1
3	1	0	access	1
4	1	0	access	1
5	1	0	access	1
6	1	0	access	1
7	1	0	access	1
8	1	0	access	1
9	1	0	access	1
10	1	0	access	1

Example 3,

IPS-3110-PB(config)# show qos interface

=====

QoS port Information :

=====

Port	Ingress Rate Limiter	Ingress Rate Bandwidth	Egress Rate Limiter	Egress Rate Bandwidth
1	disable	disable	disable	disable
2	disable	disable	disable	disable
3	10 Mbps	9.9 Mbps	10 Mbps	9.9 Mbps
4	10 Mbps	9.9 Mbps	10 Mbps	9.9 Mbps
5	1000 Mbps	1.0 Gbps	1000 Mbps	1.0 Gbps
6	disable	disable	disable	disable
7	disable	disable	disable	disable
8	disable	disable	disable	disable
9	disable	disable	disable	disable
10	disable	disable	disable	disable

2.6.16 Ring-detection Command

The Ring Detection function used in the ring topology is helpful for the network recovery, preventing from the disconnection resulting from any unexpected link down. The main advantages of Ring Detection are lower cost for cabling and installation, and high-speed recovery time.

Command	Parameter	Description
Switch(config)# ring-detection		Enable the ring detection function.
Switch(config)# ring-detection role [master slave]	[master slave]	Specify the ring role of the switch as master or slave.
Switch(config)# ring-detection port [port_list]	[port_list]	Specify the specific two ports as the ring ports.
No command		
Switch(config)# no ring-detection		Disable the ring detection function.
Switch(config)# no ring-detection role		Reset the ring role of the switch back to the default (Slave).
Switch(config)# no ring-detection port		Disable the specific two ring ports.
Show command		
Switch# show ring-detection		Show the Ring Detection information and Ring Detection configuration of each port.
Switch# show ring-detection status		Show the Ring Detection status of each port.
Switch(config)# show ring-detection		Show the Ring Detection information and the Ring Detection configuration of each port.
Switch(config)# show ring-detection status		Show the Ring Detection status of each port.

2.6.17 Security Command

When a device on the network is malfunctioning or application programs are not well designed or properly configured, broadcast storms may occur, network performance may be degraded or, in the worst situation, a complete halt may happen. The Managed PoE Switch allows users to set a threshold rate for broadcast traffic on a per switch basis so as to protect network from broadcast storms. Any broadcast packets exceeding the specified value will then be dropped.

Enable or disable broadcast storm control.

Security command	Parameter	Description
Switch(config)# security storm-protection		Globally enable the storm control function.
Switch(config)# security storm-protection rates [64-1000000]	[64-1000000] kbps	To set up the maximum packet rate of each port. The allowable value is between 64 and 1000000 kbps.

No command		
Switch(config)# no security storm-protection		Globally disable the storm control function.
Switch(config)# no security storm-protection rates		Reset the maximum packet rate of each port back to the default. (256 kbps)
Show command		
Switch# show security storm-protection		Show the current storm control configuration.
Switch(config)# show security storm-protection		Show the current storm control configuration.

2.6.18 SNMP-Server Command

1. Create a SNMP community and set up detailed configurations for this community.

Snmp-server command	Parameter	Description
Switch(config)# snmp-server		Enable SNMP server function globally.
Switch(config)# snmp-server community [community]	[community]	Create/modify a SNMP community name. Up to 20 alphanumeric characters can be accepted.
Switch(config-community-NAME)# active		Enable the specified SNMP community account.
Switch(config-community-NAME)# description [Description]	[Description]	Enter the description for the specified SNMP community. Up to 35 alphanumeric characters can be accepted.
Switch(config-community-NAME)# level [admin rw ro]	[admin rw ro]	Specify the access privilege level for the specified SNMP account. admin: Own the full-access right, including maintaining user account, system information, loading factory settings, etc.. rw: Read & Write access privilege. Own the partial-access right, unable to modify user account, system information and load factory settings. ro: Allow to view only.
No command		
Switch(config)# no snmp-server		Disable SNMP server function globally.
Switch(config)# no snmp-server community [community]	[community]	Delete the specified community.
Switch(config-community-NAME)# no active		Disable the specified SNMP community account.
Switch(config-community-NAME)# no description		Remove the description of SNMP community.
Switch(config-community-NAME)# no level		Reset the access privilege level back to the default. (Read Only)
Show command		
Switch(config)# show snmp-server		Show SNMP server configuration.
Switch(config)# show snmp-server community		Show SNMP server community configuration.
Switch(config)# show snmp-server community [community]		Show the specified SNMP server community's configuration.
Switch(config-community-NAME)# show		Show the selected community's settings.

Exit command	
Switch(config-community-NAME)# exit	Return to the global configuration mode.
Example of Snmp-server	
Switch(config)# snmp-server community mycomm	Create a new community “mycomm” and edit the details of this community account.
Switch(config-community-mycomm)# active	Activate the SNMP community “mycomm”.
Switch(config-community-mycomm)# description rddeptcomm	Add a description for “mycomm” community.
Switch(config-community-mycomm)# level admin	Set the access privilege level of “mycomm” community to admin (full-access privilege).

2. Set up a SNMP trap destination.

Trap-destination command	Parameter	Description
Switch(config)# snmp-server trap-destination [1-3]	[1-3]	Specify the trap destination you would like to modify.
Switch(config-trap-ID)# active		Enable the specified SNMP trap destination.
Switch(config-trap-ID)# community [community]	[community]	Enter the description for the specified trap destination.
Switch(config-trap-ID)# destination [A.B.C.D]	[A.B.C.D]	Specify SNMP server IP address for the specified trap destination.
No command		
Switch(config)# no snmp-server trap-destination [1-3]	[1-3]	Reset the specified trap destination configuration back to the default.
Switch(config-trap-ID)# no active		Disable the specified SNMP trap destination.
Switch(config-trap-ID)# no community		Delete the description for the specified trap destination.
Switch(config-trap-ID)# no destination		Delete SNMP server IP address for the specified trap destination.
Show command		
Switch(config)# show snmp-server trap-destination		Show all of SNMP trap destination configurations.
Switch(config)# show snmp-server trap-destination [1-3]	[1-3]	Show the specified SNMP trap destination configuration.
Switch(config-trap-ID)# show		Show the configuration of the selected trap destination.
Exit command		
Switch(config-trap-ID)# exit		Return to the global configuration mode.
Examples of Trap-destination		
Switch(config)# snmp-server trap-destination 1		Specify the trap destination 1 to do the modification.
Switch(config-trap-1)# active		Activate the trap destination ID 1.

Switch(config-trap-1)# community mycomm	Add the description "mycomm" to this trap destination.
Switch(config-trap-1)# destination 192.168.1.254	Set SNMP server IP address as "192.168.1.254" for this trap destination.

3. Set up SNMP trap types that will be sent.

Trap-type command	Parameter	Description
Switch(config)# snmp-server trap-type [all auth-fail auto-backup cold-start port-link power-failure warm-start]	[all auth-fail auto-backup cold-start port-link power-failure warm-start]	<p>Specify a trap type that will be sent when a certain situation occurs.</p> <p>all: A trap will be sent when authentication fails, auto-backup succeeds or fails, the cold/warm starts of the Managed Industrial PoE Ethernet Switch, port link is up or down, power1/2 failure occurs, and so on.</p> <p>auth-fail: A trap will be sent when any unauthorized user attempts to login.</p> <p>auto-backup: A trap will be sent when the auto backup succeeds or fails.</p> <p>cold-start: A trap will be sent when the Managed Industrial PoE Ethernet Switch boots up.</p> <p>port-link: A trap will be sent when the link is up or down.</p> <p>power-failure: Enable or disable the Managed Industrial PoE Ethernet Switch to send a trap when the power 1/2 failure occurs or power it/them on again.</p> <p>warm-start: A trap will be sent when the Managed Industrial PoE Ethernet Switch restarts.</p>
No command		
Switch(config)# no snmp-server trap-type [all auth-fail auto-backup cold-start port-link power-failure warm-start]	[all auth-fail auto-backup cold-start port-link power-failure warm-start]	Specify a trap type that will not be sent when a certain situation occurs.

Show command	
Switch(config)# show snmp-server trap-type	Show the current enable/disable status of each type of trap.
Examples of Trap-type	
Switch(config)# snmp-server trap-type all	All types of SNMP traps will be sent.

4. Set up detailed configurations for SNMPv3 USM User

Simple Network Management Protocol Version 3, SNMPv3 in short, features stronger security mechanism, including authentication and encryption that helps ensure that the message is from a valid source and scramble the content of a packet, to prevent from being learned by an unauthorized source.

Note: The SNMPv3 community user account is generated from “User Command” (See [Section 2.6.24](#))

Snmp-server command	Parameter	Description
Switch(config)# snmp-server user [user_name]	[user_name]	Modify an existing username generated in CLI of “User Command” for a SNMPv3 user.
Switch (config-v3-user-user_name)# authentication [md5 sha]	[md5 sha]	Specify the authentication method for the specified SNMPv3 user. md5(message-digest algorithm): A widely used cryptographic hash function producing a 128-bit (16-byte) hash value , typically expressed in text format as a 32 digit hexadecimal number. sha(Secure Hash Algorithm): A 160-bit hash function which resembles the said MD5 algorithm.
Switch (config-v3-user-user_name)# authentication password [password]	[password]	Specify the authentication password for the specified SNMPv3 user. Up to 20 alphanumeric characters can be accepted.
Switch (config-v3-user-user_name)# private [des]	[des]	Specify the method to ensure confidentiality of data. des(data encryption standard): An algorithm to encrypt critical information such as message text message signatures...etc.
Switch (config-v3-user-user_name)# private password [password]	[password]	Specify the private password for the specified SNMPv3 user. Up to 20 alphanumeric characters can be accepted.
No Command		
Switch (config-v3-user-user_name)# no authentication		Disable the authentication function for the specified SNMPv3 user.
Switch (config-v3-user-user_name)# no authentication password		Delete the configured authentication password.

Switch (config-v3-user-user_name)# no private	Disable data encryption function.
Switch (config-v3-community- user_name)# no private password	Delete the configured private password.
Show Command	
Switch(config)# show snmp-server user	Show SNMPv3 user configuration.
Switch(config)# show snmp-server user [user_name]	Show the specified SNMPv3 user configuration.
Switch(config-v3-user- user_name)# show	Show the specified SNMPv3 user configuration.

A combination of a security event as below indicates which security mechanism is used when handling an SNMP packet.

Authentication	Private	Result
None	None	Uses a username match for authentication
Message Digest Algorithm(MD5) or Secure Hash Algorithm(SHA)	None	Enables authentication based on the Hashed Message Authentication Code(HMAC)-MD5 or HMAC-SHA algorithms.
MD5 or SHA	Data Encryption Standard(DES)	Enables authentication based on the Hashed Message Authentication Code(HMAC)-MD5 or HMAC-SHA algorithms. What's more, enables DES 56-bit encryption based on the Cipher Block Chaining (CBC)-DES standard.

2.6.19 Spanning-tree Command

The Spanning Tree Protocol (STP), defined in the IEEE Standard 802.1D, creates a spanning tree within a mesh network of connected layer-2 bridges (typically Ethernet switches) and disables the links which are not part of that tree, leaving a single active path between any two network nodes.

Multiple active paths between network nodes cause a bridge loop. Bridge loops create several problems. First, the MAC address table used by the switch or bridge can fail, since the same MAC addresses (and hence the same network hosts) are seen on multiple ports. Second, a broadcast storm occurs. This is caused by broadcast packets being forwarded in an endless loop between switches. A broadcast storm can consume all available CPU resources and bandwidth.

Spanning tree allows a network design to include spare (redundant) links to provide automatic backup paths if an active link fails, without the danger of bridge loops, or the need for manually enabling/disabling these backup links.

To provide faster spanning tree convergence after a topology change, an evolution of the Spanning Tree Protocol: Rapid Spanning Tree Protocol (RSTP), introduced by IEEE with document 802.1w. RSTP is a refinement of STP; therefore, it shares most of its basic operation characteristics. This essentially creates a cascading effect away from the root bridge where each designated bridge proposes to its neighbors to determine if it can make a rapid transition. This is one of the major elements which allow RSTP to achieve faster convergence times than STP.

Spanning-tree command	Parameter	Description
Switch(config)# spanning-tree aggregated-port		Enable Spanning Tree Protocol function on aggregated ports.
Switch(config)# spanning-tree aggregated-port cost [0-2000000000]	[0-2000000000]	Specify aggregated ports' path cost.
Switch(config)# spanning-tree aggregated-port priority [0-15]	[0-15]	Specify aggregated ports' priority. 0=0, 1=16, 2=32, 3=48, 4=64, 5=80 6=96, 7=112, 8=128, 9=144, 10=160 11=176, 12=192, 13=208, 14=224, 15=240
Switch(config)# spanning-tree aggregated-port edge		Enable aggregated ports to shift to forwarding state when the link is up. If you know a port is directly connected to an end device (that doesn't support RSTP) then set it as an edge port to ensure maximum performance. This will tell the switch to immediately start forwarding traffic on the port and not bother trying to establish a RSTP connection. Otherwise, turn it off.
Switch(config)# spanning-tree aggregated-port p2p [forced_true forced_false auto]	[forced_true forced_false auto]	Set the aggregated ports to point to point ports (forced_true), non-point to point ports (forced_false) or allow the Managed Industrial PoE Ethernet Switch to detect point to point status automatically (auto). By default, aggregated ports are set to non-point to point ports (forced_false).

Switch(config)# spanning-tree delay-time [4-30]	[4-30]secs	Specify the forward delay time value in seconds. The allowable value is between 4 and 30 seconds.
Switch(config)# spanning-tree hello-time [1-10]	[1-10]secs	Specify the hello interval value in seconds. The allowable value is between 1 and 10 seconds.
Switch(config)# spanning-tree max-age [6-200]	[6-200]secs	Specify the maximum age time value in seconds. The allowable value is between 6 and 200 seconds.
Switch(config)# spanning-tree priority [0-15]	[0-15]	Specify a priority value on a per switch basis. The allowable value is between 0 and 15. 0=0, 1=4096, 2=8192, 3=12288, 4=16384, 5=20480, 6=24576, 7=28672, 8=32768, 9=36864, 10=40960, 11=45056, 12=49152, 13=53248, 14=57344, 15=61440
Switch(config)# spanning-tree version [compatible normal]	[compatible normal]	Set up RSTP version. “ compatible ” means that the Managed Industrial PoE Ethernet Switch is compatible with STP. “ normal ” means that the Managed Industrial PoE Ethernet Switch uses RSTP.
No command		
Switch(config)# no spanning-tree aggregated-port		Disable STP on aggregated ports.
Switch(config)# no spanning-tree aggregated-port cost		Reset aggregated ports’ cost back to the default.
Switch(config)# no spanning-tree aggregated-port priority		Reset aggregated ports’ priority back to the default.
Switch(config)# no spanning-tree aggregated-port edge		Disable aggregated ports’ edge ports status.
Switch(config)# no spanning-tree aggregated-port p2p		Reset aggregated ports back to non-point to point ports (forced_ false).
Switch(config)# no spanning-tree delay-time		Reset the Forward Delay time back to the default.
Switch(config)# no spanning-tree hello-time		Reset the Hello Time back to the default.
Switch(config)# no spanning-tree max-age		Reset the Maximum Age back to the default.
Switch(config)# no spanning-tree priority		Reset the priority value on a per switch basis back to the default.
Switch(config)# no spanning-tree version		Reset the RSTP version back to the default.
Show command		
Switch(config)# show spanning-tree		Show RSTP settings on the per switch basis.
Switch(config)# show spanning-tree aggregated-		Show RSTP settings on aggregated ports.

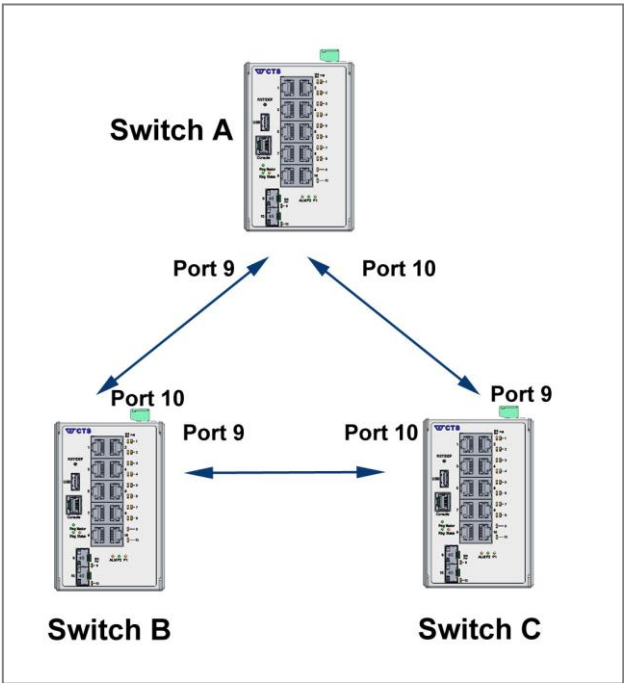
port		
Switch(config)# show spanning-tree interface		Show each interface's RSTP information, including port state, path cost, priority, edge port state, and p2p port state.
Switch(config)# show spanning-tree interface [port_list]	[port_list]	Show the specified interfaces' RSTP information, including port state, path cost, priority, edge port state, and p2p port state.
Switch(config)# show spanning-tree statistic		Show each interface and each link aggregation group's statistics information, including the total RSTP packets received, RSTP packets transmitted, STP packets received, STP packets transmitted, TCN (Topology Change Notification) packets received, TCN packets transmitted, illegal packets received, and unknown packets received.
Switch(config)# show spanning-tree statistic [port_list llag]	[port_list llag]	Show the specified interfaces or link aggregation groups' statistics information, including the total RSTP packets received, RSTP packets transmitted, STP packets received, STP packets transmitted, TCN (Topology Change Notification) packets received, TCN packets transmitted, illegal packets received, and unknown packets received.
Switch(config)# show spanning-tree status		Show the current RSTP port status.
Switch(config)# show spanning-tree status [port_list llag]	[port_list llag]	Show the specified interfaces or link aggregation groups' status.
Switch(config)# show spanning-tree overview		Show the current root-related information.
Examples of Spanning-tree command		Description
Switch(config)# spanning-tree aggregated-port		Enable Spanning Tree on aggregated ports.
Switch(config)# spanning-tree aggregated-port cost 100		Set the aggregated ports' cost to 100.
Switch(config)# spanning-tree aggregated-port priority 0		Set the aggregated ports' priority to 0
Switch(config)# spanning-tree aggregated-port edge		Set the aggregated ports to edge ports.
Switch(config)# spanning-tree aggregated-port p2p forced_true		Set the aggregated ports to P2P ports.
Switch(config)# spanning-tree delay-time 10		Set the Forward Delay time value to 10 seconds.
Switch(config)# spanning-tree hello-time 2		Set the Hello Time value to 2 seconds.
Switch(config)# spanning-tree max-age 15		Set the Maximum Age value to 15 seconds.

Use “Interface” command to configure a group of ports’ Spanning Tree settings.

Spanning tree & Interface command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4
Switch(config-if-PORT-PORT)# spanning-tree		Enable spanning-tree protocol on the selected interfaces.
Switch(config-if-PORT-PORT)# spanning-tree cost [0-200000000]	[0-200000000]	Specify the path cost value on the selected interfaces.
Switch(config-if-PORT-PORT)# spanning-tree priority [0-15]	[0-15]	Specify priority value on the selected interfaces. 0=0, 1=16, 2=32, 3=48, 4=64 5=80, 6=96, 7=112, 8=128 9=144, 10=160, 11=176,12=192 13=208, 14=224, 15=240
Switch(config-if-PORT-PORT)# spanning-tree edge		Set the selected interfaces to edge ports.
Switch(config-if-PORT-PORT)# spanning-tree p2p [forced_true forced_fasle auto]	[forced_true forced_fasle auto]	Set the selected interfaces to non-point to point ports (forced_false) or allow the Managed Industrial PoE Ethernet Switch to detect point to point status automatically (auto). By default, physical ports are set to point to point ports (forced_true).
No command		
Switch(config-if-PORT-PORT)# no spanning-tree		Disable spanning-tree protocol on the selected interfaces.
Switch(config-if-PORT-PORT)# no spanning-tree cost		Reset the cost value back to the default.
Switch(config-if-PORT-PORT)# no spanning-tree priority		Reset the priority value back to the default.
Switch(config-if-PORT-PORT)# no spanning-tree edge		Reset the selected interfaces back to non-edge ports.
Switch(config-if-PORT-PORT)# no spanning-tree p2p		Reset the selected interfaces back to point to point ports (forced_true).
Show command		
Switch(config)# show spanning-tree		Show RSTP settings on the per switch basis.
Switch(config)# show spanning-tree interface		Show each interface’s RSTP information, including port state, path cost, priority, edge port state, and p2p port state.
Switch(config)# show spanning-tree interface [port_list]	[port_list]	Show the selected interfaces’ RSTP information, including port state, path cost, priority, edge port state, and p2p port state.
Switch(config)# show spanning-tree statistic		Show each interface and each link aggregation group’s statistics

		information, including the total RSTP packets received, RSTP packets transmitted, STP packets received, STP packets transmitted, TCN (Topology Change Notification) packets received, TCN packets transmitted, illegal packets received, and unknown packets received.
Switch(config)# show spanning-tree statistic [port_list llag]	[port_list llag]	Show the selected interfaces or link aggregation groups' statistics information, including the total RSTP packets received, RSTP packets transmitted, STP packets received, STP packets transmitted, TCN (Topology Change Notification) packets received, TCN packets transmitted, illegal packets received, and unknown packets received.
Switch(config)# show spanning-tree status		Show the current RSTP port status.
Switch(config)# show spanning-tree status [port_list llag]	[port_list llag]	Show the selected interfaces or link aggregation groups' status.
Switch(config)# show spanning-tree overview		Show the current root-related information.

For RSTP configuration via CLI, we take the following ring network topology composed of 3 sets of IPS-3110-PB Managed Industrial PoE Ethernet Switches, including Switch A, Switch B and Switch C for example to let the users have a clear understanding of these RSTP commands. Under this network environment, Switch A, Switch B and Switch C will be configured as Table 2-2, and the “Root Switch” will automatically be determined by this network.



Switch	System Priority	Max Age (Secs)	Hello Time (Secs)	Forward Delay (Secs)	Force Version	State	Path Cost	Priority	Edge	P2P
A	4096	6	1	4	Normal	9, 10	default	default	default	default
B	4096	6	1	4	Normal	9, 10	default	default	default	default
C	4096	6	1	4	Normal	9, 10	default	default	default	default

Table 2-2

Below is the complete CLI commands applied to Switch A. Also issue the same commands to Switch B and Switch C accordingly.

	Command	Purpose
STEP1	configure Example: IPS-3110-PB# config IPS-3110-PB(config)#	Enter the global configuration mode.
STEP2	spanning-tree priority <i>system_priority</i> Example: IPS-3110-PB(config)# spanning-tree priority 1 OK !	In this example, it configures the System Priority of Switch A as “1”. It means the value of the real priority is 4096.
STEP3	spanning-tree max-age <i>max_age_time</i> Example: IPS-3110-PB(config)# spanning-tree max-age 6 OK !	In this example, it configures the Max. Age Time of Switch A as “6”.

STEP4	spanning-tree hello-time <i>hello_interval</i> Example: IPS-3110-PB(config)# spanning-tree hello-time 1 OK !	In this example, it configures the Hello Time of Switch A as "1".
STEP5	spanning-tree delay-time <i>forward_delay_time</i> Example: IPS-3110-PB(config)# spanning-tree delay-time 4 OK !	In this example, it configures the Forward Delay Time of Switch A as 4.
STEP6	spanning-tree version <i>stp_version</i> Example: IPS-3110-PB(config)# spanning-tree version normal OK !	In this example, it configures the STP Version of Switch A as "Normal".
STEP7	interface <i>port_list</i> Example: IPS-3110-PB(config)# interface 9-10 IPS-3110-PB(config-if-9,10)#	Specify the Port 9 and Port 10 that you would like to configure to RSTP.
STEP8	spanning-tree Example: IPS-3110-PB(config-if-9,10)# spanning-tree OK !	Enable spanning tree protocol on Port 9 and Port 10.
STEP9	spanning-tree cost <i>path_cost</i> Example: IPS-3110-PB(config-if-9,10)# spanning-tree cost 0 OK !	In this example, it configure the port path cost for Port 9 and Port 10 as 0.
STEP10	spanning-tree priority <i>bridge_priority</i> Example: IPS-3110-PB(config-if-9,10)# spanning-tree priority 0 OK !	In this example, it configure the port priority for Port 9 and Port 10 as 0. It means the value of the real priority is "0".
STEP11	spanning-tree edge Example: IPS-3110-PB(config-if-9,10)# no spanning-tree edge OK !	In this example, it configure Port 9 and Port 10 as the non-edge ports.
STEP12	spanning-tree p2p <i>type</i> Example: IPS-3110-PB(config-if-9,10)# spanning-tree p2p forced_true OK !	In this example, it configures the type of Port 9 and Port 10 as point to point ports.
STEP13	exit Example: IPS-3110-PB(config-if-5,6)# exit IPS-3110-PB(config)#	Return to the global configuration mode.

STEP14	exit Example: IPS-3110-PB(config)# exit IPS-3110-PB#	Return to the Privileged mode.
STEP15	write Example: IPS-3110-PB# write Save Config Succeeded!	Save the running configuration into the startup configuration.

After completing the RSTP Switch settings for your IPS-3110-PB switches, you can issue the commands listed below for checking your configuration

Example 1,

IPS-3110-PB(config)# show spanning-tree

```

=====
RSTP Switch Information
=====
System Priority : 4096
Max Age       : 6
Hello Time    : 1
Forward Delay : 4
Force Version : normal

IPS-3110-PB(config)#

```

Example 2,

IPS-3110-PB(config)# show spanning-tree aggregated-port

```

=====
RSTP Aggregated Port Information
=====
Aggregated State      : disable
Aggregated Path Cost : 1
Aggregated Priority    : 16
Aggregated Edge       : disable
Aggregated Point2point : forced-false

IPS-3110-PB(config)#

```

Example 3,

IPS-3110-PB(config)# show spanning-tree interface

=====

RSTP Port Information

=====

Port	State	Path-Cost	Priority	Edge	Point2point
1	disable	0	128	disable	forced-true
2	disable	0	128	disable	forced-true
3	disable	0	128	disable	forced-true
4	disable	0	128	disable	forced-true
5	disable	0	128	disable	forced-true
6	disable	0	128	disable	forced-true
7	disable	0	128	disable	forced-true
8	disable	0	128	disable	forced-true

Press Ctrl-C to exit or any key to continue!

9	enable	0	0	disable	forced-true
10	enable	0	0	disable	forced-true

Example 4,

IPS-3110-PB(config)# show spanning-tree overview

=====

RSTP overview

=====

=====

Bridge ID : 4097:00-06-19-00-03-1a
Max Age : 6
Hello Time : 1
Fwd Delay : 4
Topology : Steady
Root ID : 4097:00-06-19-00-03-1a
Root Port : 0

IPS-3110-PB(config)#

Example 5,

IPS-3110-PB(config)# show spanning-tree statistic

RSTP Port Statistics								
Port	Rx RSTP	Tx RSTP	Rx STP	Tx STP	Rx TCN	Tx TCN	Rx Ill.	Rx Unk
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
Press Ctrl-C to exit or any key to continue!								
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
LLAG1	0	0	0	0	0	0	0	0
LLAG2	0	0	0	0	0	0	0	0
LLAG3	0	0	0	0	0	0	0	0
LLAG4	0	0	0	0	0	0	0	0
LLAG5	0	0	0	0	0	0	0	0
IPS-3110-PB(config)#								

Example 6,

IPS-3110-PB(config)# show spanning-tree status

RSTP Port Status						
Port	PathCost	Edge Port	P2p Port	Protocol	Role	Port State
1	0	no	yes	RSTP	Non-STP	Non-STP
2	0	no	yes	RSTP	Non-STP	Non-STP
3	0	no	yes	RSTP	Non-STP	Non-STP
4	0	no	yes	RSTP	Non-STP	Non-STP
5	0	no	yes	RSTP	Non-STP	Non-STP
6	0	no	yes	RSTP	Non-STP	Non-STP
7	0	no	yes	RSTP	Non-STP	Non-STP
8	0	no	yes	RSTP	Non-STP	Non-STP
Press Ctrl-C to exit or any key to continue!						

9	2000000	no	yes	RSTP	Disable	Disable
10	20000	no	yes	RSTP	Designated	Forwarding

LLAG1	0	no	no	RSTP	Non-STP	Non-STP
LLAG2	0	no	no	RSTP	Non-STP	Non-STP
LLAG3	0	no	no	RSTP	Non-STP	Non-STP
LLAG4	0	no	no	RSTP	Non-STP	Non-STP
LLAG5	0	no	no	RSTP	Non-STP	Non-STP

IPS-3110-PB(config)#

2.6.20 Switch Command

Switch command	Parameter	Description
Switch(config)# switch sfp polling		Enable SFP DMI and Information Polling.
Switch(config)# switch statistics polling		Enable Interface Statistics Polling.
No command		
Switch(config)# no switch sfp polling		Disable SFP DMI and Information Polling.
Switch(config)# no switch statistics polling		Disable Interface Statistics Polling.
Show command		
Switch(config)# show switch statistics		Show the current statistics configuration.
Switch(config)# show switch sfp		Show the current SFP configuration.

2.6.21 Switch-info Command

1. Set up the Managed Industrial PoE Ethernet Switch's basic information, including company name, hostname, system name, etc..

Switch-info Command	Parameter	Description
Switch(config)# switch-info company-name [company_name]	[company_name]	Enter a company name, up to 55 alphanumeric characters, for this Managed Switch.
Switch(config)# switch-info dhcp-vendor-id [dhcp_vendor_id]	[dhcp_vendor_id]	Enter a DHCP vendor ID, up to 55 alphanumeric characters, for this Managed Switch.
Switch(config)# switch-info host-name [host_name]	[host_name]	Enter a new hostname, up to 30 alphanumeric characters, for this Managed Switch. By default, the hostname prompt shows the model name of this Managed Switch. You can change the factory-assigned hostname prompt to the one that is easy for you to identify during network configuration and maintenance.
Switch(config)# switch-info system-contact [sys_contact]	[sys_contact]	Enter the contact information, up to 55 alphanumeric characters, for this Managed switch.
Switch(config)# switch-info system-location [sys_location]	[sys_location]	Enter a brief description of the Managed Switch location, up to 55 alphanumeric characters, for this Managed Switch. Like the name, the location is for reference only, for example, "13th Floor".

Switch(config)# switch-info system-name [sys_name]	[sys_name]	Enter a unique name, up to 55 alphanumeric characters, for this Managed Switch. Use a descriptive name to identify the Managed Switch in relation to your network, for example, "Backbone 1". This name is mainly used for reference only.
No command		
Switch(config)# no switch-info company-name		Reset the entered company name back to the default.
Switch(config)# no switch-info dhcp-vendor-id		Reset the entered DHCP vendor ID information back to the default.
Switch(config)# no switch-info system-contact		Reset the entered system contact information back to the default.
Switch(config)# no switch-info system-location		Reset the entered system location information back to the default.
Switch(config)# no switch-info system-name		Reset the entered system name information back to the default.
Switch(config)# no switch-info host-name		Reset the hostname back to the default.
Show command		
Switch(config)# show switch-info		Show the switch-related information including company name, system contact, system location, system name, model name, firmware version and so on.
Examples of Switch-info		
Switch(config)# switch-info company-name telecomxyz		Set the company name to "telecomxyz".
Switch(config)# switch-info system-contact info@company.com		Set the system contact field to "info@compnay.com".
Switch(config)# switch-info system-location 13thfloor		Set the system location field to "13thfloor".
Switch(config)# switch-info system-name backbone1		Set the system name field to "backbone1".
Switch(config)# switch-info host-name edgswitch10		Change the Managed Switch's hostname into "edgswitch10".

2.6.22 Syslog Command

Syslog command	Parameter	Description
Switch(config)# syslog		Enable the system log function.
Switch(config)# syslog server1 [A.B.C.D]	[A.B.C.D]	Specify the primary system log server IP address.
Switch(config)# syslog server2 [A.B.C.D]	[A.B.C.D]	Specify the secondary system log server IP address.
Switch(config)# syslog server3 [A.B.C.D]	[A.B.C.D]	Specify the third system log server IP address.
No command		
Switch(config)# no syslog		Disable the system log function.
Switch(config)# no syslog server1		Delete the primary system log server IP address.

Switch(config)# no syslog server2	Delete the secondary system log server IP address.
Switch(config)# no syslog server3	Delete the third system log server IP address.
Show command	
Switch(config)# show syslog	Show the current system log configuration.
Switch(config)# show log	Show event logs currently stored in the Managed Industrial PoE Ethernet Switch. These event logs will be saved into the system log server you specify.
Examples of Syslog command	
Switch(config)# syslog	Enable the system log function.
Switch(config)# syslog server1 192.180.2.1	Set the primary system log server IP address to 192.168.2.1.
Switch(config)# syslog server2 192.168.2.2	Set the secondary system log server IP address to 192.168.2.2.
Switch(config)# syslog server3 192.168.2.3	Set the third system log server IP address to 192.168.2.3.

2.6.23 Time-range Command

This command defines a time interval to be activated on a daily or weekly basis. This is convenient to assign when a function should be automatically taken effect. Before using the function, make sure that gateway NTP time server is configured in **Time Server Configuration** (See [Section 2.6.13](#)). The PoE functions scheduled by Time Range will be executed when the system time of the Switch is synchronized with NTP time server.

Command	Parameter	Description
Switch(config)# time-range [time-range-name]	[time-range-name]	<p>Create a new time-range name of the time interval, or enter its Edit mode to modify the settings. Up to 32 alphanumeric characters can be accepted. 10 time-ranges can be set up at most.</p> <p>Time intervals can be classified into three types: Absolute, Periodic and Periodic List.</p> <p>Absolute: An absolute interval to enable a function.</p> <p>Periodic: An interval to enable a function on a weekly basis. The periodic interval only takes effect within the specified absolute interval.</p> <p>Periodic List: An interval to enable a function on a daily basis. The periodic list interval only takes effect within the specified absolute interval.</p>
Switch(config-timerange-name)# absolute start [hh:mm dd MMM yyyy]	[hh:mm dd MMM yyyy]	<p>Specify an absolute start time to a specific time interval. e.g. 8:00 10 jan 2018</p> <p>hh(hour):0-23 mm(minute):0-59 dd(date):1-31 MMM(month):jan,feb,mar,apr,may,jun,jul,aug,sep,oct,nov,dec yyyy(year):2000-2097</p> <p>No start time assigned refers to start immediately. One absolute start point can be set at most.</p>
Switch(config-timerange-name)# absolute end [hh:mm dd MMM yyyy]	[hh:mm dd MMM yyyy]	<p>Specify an absolute end time to a time interval. e.g. 9:00 10 jun 2018</p> <p>hh(hour):0-23 mm(minute):0-59 dd(date):1-31 MMM(month):jan,feb,mar,apr,may,jun,jul</p>

		l,aug,sep,oct,nov,dec yyyy(year):2000-2097 No end time assigned refers to run a function continuously. One absolute end point can be set at most.
Switch(config-timerange-name)# periodic [hh:mm day] to [hh:mm day]	[hh:mm day] to [hh:mm day]	Specify the weekly start and end recurring time interval. Two sets of periodic intervals can be set at most. e.g. 10:00 mon to 20:00 wed hh: 0-23 mm:0-59 day:sun, mon, tue, wed, thu, fri, sat
Switch(config-timerange-name)# periodic list [hh:mm] to [hh:mm] [days]	[hh:mm] to [hh:mm] [days]	Specify a list of days in a week for periodic time. e.g. 20:00 to 4:00 tue wed thu fri hh(hour):0-23 mm(minute):0-59 days:sun(Sunday), mon(Monday), tue(Tuesday), wed(Wednesday), thu(Thursday), fri(Friday), sat(Saturday) Cross-day setting is feasible. In other words, the second occurrence of time can be set on the following day, e.g. “22:00-2:00”. Two sets of periodic list intervals can be set at most.
No Command		
Switch(config)# no time-range [time_range_name]	[time_range_n ame]	Remove a specified time-range name.
Switch(config-timerange-name)# no absolute start [hh:mm dd MMM yyyy]		Remove the absolute start time configuration from the specified time- range name. Under a time range name, user may add one absolute start time and one absolute end time at most. Users may also add two optional time ranges at most using Periodic and Periodic List time range. For example, users may set: 1. Two Periodics in time range, or 2. One Periodic and one Periodic List in time range, or 3. Two Periodic Lists in time range.
Switch(config-timerange-name)# no absolute end [hh:mm dd MMM yyyy]		Remove the absolute end time configuration from the specified time- range name. Under a time range name, user may add one absolute start time and one absolute end time at most. Users may also add two optional time ranges at most using Periodic and

		Periodic List time range. For example, Users may set: 1. Two Periodics in time range, or 2. One Periodic and one Periodic List in time range, or 3. Two Periodic Lists in time range.
Switch(config-timerange-name)# no periodic [hh:mm day] to [hh:mm day]	[hh:mm day] to [hh:mm day]	Remove the weekly start and end recurring time interval.
Switch(config-timerange-name)# no periodic list [hh:mm] to [hh:mm] [days]	[hh:mm] to [hh:mm] [days]	Remove the periodic list time interval.
Show Command		
Switch# show time-range	Display the time-range configuration.	
Switch# show time-range [time- range-name]	Display the specified time-range configuration.	
Switch(config)# show time-range	Display the time-range configuration.	
Switch(config)# show time-range [time-range-name]	Display the specified time-range configuration.	
Examples of Time-range command		
Switch(config-timerange-name)# absolute start 8:00 10 jan 2015	Set effective time range start from 8:00, January 10 th , 2015 sharp.	
Switch(config-timerange-name)# absolute end 18:00 10 dec 2015	Set an effective time range that stops at 18:00, December 10 th , 2015 sharp.	
Switch(config-timerange-name)# periodic 10:00 mon to 20:00 wed	Set an effective time range that start from 10:00, Monday to 20:00 Wednesday.	
Switch(config-timerange-name)# periodic list 09:00 to 18:00 mon tue wed thu fri	Set an effective time range that start from 09:00 to 18:00 every weekday.	
Switch(config-timerange-name)# periodic list 20:00 to 04:00 tue wed thu fri sat	Set an effective time range that start from 20:00, Tuesday to 04:00 Saturday.	
Switch(config-timerange-name)# periodic list 08:00 to 10:00 wed thu	Set an effective time range that start from 08:00 to 10:00 every Wednesday and Thursday.	

2.6.24 User Command

1. Create a new login account.

User command	Parameter	Description
Switch(config)# user password-encryption md5		<p>Enable MD5(Message-Digest Algorithm). It is a widely used cryptographic hash function producing a 128-bit (16-byte) hash value, typically expressed in text format as a 32 digit hexadecimal number. The default setting is disabled.</p> <p>NOTE:</p> <ol style="list-style-type: none"> 1. The acquired hashed password from backup config file is not applicable for user login on CLI/Web interface. 2. We strongly recommend not to alter off-line Auth Method setting in backup configure file. 3. If Auth-Method is enabled and do firmware downgrade, users must reset default config.
Switch(config)# user name [user_name]	[user_name]	Create/modify a user account. The authorized user login name is up to 20 alphanumeric characters. Only 5 login accounts can be registered in this device at the same time.
Switch(config-user-NAME)# active		Activate the specified user account.
Switch(config-user-NAME)# description [description]	[description]	Enter the brief description for the specified user account. Up to 35 alphanumeric characters can be accepted.
Switch(config-user-NAME)# level [admin rw ro]	[admin rw ro]	<p>Specify this user's access privilege level.</p> <p>admin (administrator): Own the full-access right, including maintaining user account & system information, loading factory settings, etc..</p> <p>rw (read & write): Own the partial-access right, unable to modify user account & system information and load factory settings.</p> <p>ro (read only): Read-Only access privilege.</p>
Switch(config-user-NAME)# password [password]	[password]	Enter the password, up to 20 alphanumeric characters, for the specified user account.
No command		
Switch(config)# no user password-encryption		Disable MD5(Message-Digest Algorithm).
Switch(config)# no user name [user_name]	[user_name]	Delete the specified user account.

Switch(config-user-NAME)# no active		Deactivate the selected user account.
Switch(config-user-NAME)# no description		Remove the configured description for the specified user account.
Switch(config-user-NAME)# no password		Remove the configured password for the specified user account.
Switch(config-user-NAME)# no level		Reset the access privilege level back to the default (Read Only).
Show command		
Switch(config)# show user		Show user authentication configuration.
Switch(config)# show user name		List all user accounts.
Switch(config)# show user name [user_name]	[user_name]	Show the specific account's configuration.
Switch(config-user-NAME)# show		Show the specific account's configuration.
Examples of User command		
Switch(config)# user name miseric		Create a new login account "miseric".
Switch(config-user-miseric)# description misengineer		Add a description to this new account "miseric".
Switch(config-user-miseric)# password mis2256i		Set up a password for this new account "miseric"
Switch(config-user-miseric)# level rw		Set this user account's privilege level to "read and write".

2. Configure RADIUS server settings.

User command	Parameter	Description
Switch(config)# user radius		Enable RADIUS authentication.
Switch(config)# user radius radius-port [1025-65535]	[1025-65535]	Specify RADIUS server port number.
Switch(config)# user radius retry-time [0-2]	[0-2]	Specify the retry time value. This is the number of times that the Managed Industrial PoE Ethernet Switch will try to reconnect if the RADIUS server is not reachable.
Switch(config)# user radius secret [secret]	[secret]	Specify a secret, up to 30 alphanumeric characters, for RADIUS server. This secret key is used to validate communications between RADIUS servers.
Switch(config)# user radius server1 [A.B.C.D]	[A.B.C.D]	Specify the primary RADIUS server IP address.

Switch(config)# user radius server2 [A.B.C.D]	[A.B.C.D]	Specify the secondary RADIUS server IP address.
No command		
Switch(config)# no user radius		Disable RADIUS authentication.
Switch(config)# no user radius radius-port		Reset the radius port setting back to the default. (1812 port)
Switch(config)# no user radius retry-time		Reset the retry time setting back to the default.
Switch(config)# no user radius secret		Remove the configured secret value.
Switch(config)# no user radius server1		Delete the IP address of the primary RADIUS server.
Switch(config)# no user radius server2		Delete the IP address of the secondary RADIUS server.
Show command		
Switch(config)# show user radius		Show the current RADIUS configuration.
Examples of User command		
Switch(config)# user radius		Enable RADIUS authentication.
Switch(config)# user radius radius-port 1812		Set RADIUS server port number to 1812.
Switch(config)# user radius retry-time 2		Set the retry time value to 2. The Managed Industrial PoE Ethernet Switch will try to reconnect twice if the RADIUS server is not reachable.
Switch(config)# user radius secret abcxyzabc		Set up a secret for validating communications between RADIUS clients.
Switch(config)# user radius server1 192.180.3.1		Set the primary RADIUS server address to 192.180.3.1.
Switch(config)# user radius server2 192.180.3.2		Set the secondary RADIUS server address to 192.180.3.2.

2.6.25 VLAN Command

A Virtual Local Area Network (VLAN) is a network topology configured according to a logical scheme rather than the physical layout. VLAN can be used to combine any collections of LAN segments into a group that appears as a single LAN. VLAN also logically segments the network into different broadcast domains. All broadcast, multicast, and unknown packets entering the Switch on a particular VLAN will only be forwarded to the stations or ports that are members of that VLAN.

VLAN can enhance performance by conserving bandwidth and improve security by limiting traffic to specific domains. A VLAN is a collection of end nodes grouped by logics instead of physical locations. End nodes that frequently communicate with each other are assigned to the same VLAN, no matter where they are physically located on the network. Another benefit of VLAN is that you can change the network topology without physically moving stations or changing cable connections. Stations can be 'moved' to another VLAN and thus communicate with its members and share its resources, simply by changing the port VLAN settings from one VLAN to another. This allows VLAN to accommodate network moves, changes and additions with the greatest flexibility.

2.6.25.1 Port-Based VLAN

Port-based VLAN can effectively segment one network into several broadcast domains. Broadcast, multicast and unknown packets will be limited to within the VLAN. Port-Based VLAN is uncomplicated and fairly rigid in implementation and is useful for network administrators who wish to quickly and easily set up VLAN so as to isolate the effect of broadcast packets on their network.

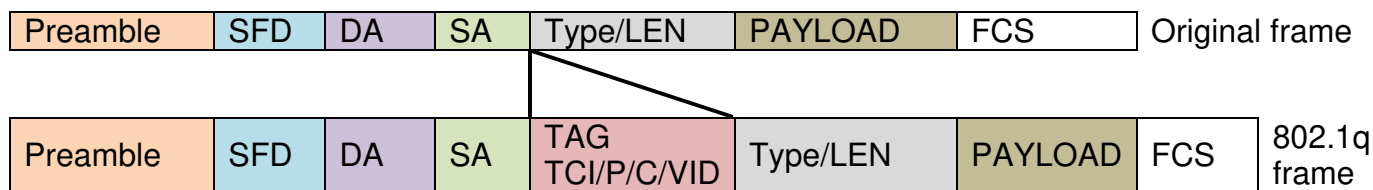
Since source addresses of the packets are listed in MAC address table of specific VLAN (except broadcast/multicast packets), in every VLAN the traffic between two ports will be two-way without restrictions.

2.6.25.2 802.1Q VLAN

802.1Q VLAN Concept

Port-Based VLAN is simple to implement and use, but it cannot be deployed cross switches VLAN. The 802.1Q protocol was developed in order to provide the solution to this problem. By tagging VLAN membership information to Ethernet frames, the IEEE 802.1Q can help network administrators break large switched networks into smaller segments so that broadcast and multicast traffic will not occupy too much available bandwidth as well as provide a higher level security between segments of internal networks.

Introduction to 802.1Q frame format:



PRE	Preamble	62 bits	Used to synchronize traffic
SFD	Start Frame Delimiter	2 bits	Marks the beginning of the header
DA	Destination Address	6 bytes	The MAC address of the destination
SA	Source Address	6 bytes	The MAC address of the source
TCI	Tag Control Info	2 bytes set to 8100 for 802.1p and Q tags	
P	Priority	3 bits	Indicates 802.1p priority level 0-7
C	Canonical Indicator	1 bit	Indicates if the MAC addresses are in Canonical format - Ethernet set to "0"
VID	VLAN Identifier	12 bits	Indicates the VLAN (0-4095)
T/L	Type/Length Field	2 bytes	Ethernet II "type" or 802.3 "length"
Payload	< or = 1500 bytes User data		
FCS	Frame Check Sequence	4 bytes	Cyclical Redundancy Check

Important VLAN Concepts for 802.1Q VLAN Configuration:

There are two key concepts to understand.

- **Access-VLAN** specifies the VLAN ID to the switch port that will assign the VLAN ID to **untagged** traffic from that port. A port can only be assigned to one Access-VLAN at a time. When the port is configured as **Access Mode**, the port is called an **Access Port**, the link to/from this port is called an **Access Link**. The VLAN ID assigned is called **PVID**.
- **Trunk-VLAN** specifies the set of VLAN IDs that a given port is allowed to receive and send **tagged** packets. A port can be assigned to multiple Trunk-VLANs at a time. When the port is configured as **Trunk Mode**, the port is called a **Trunk Port**, the link to/from this port is called a **Trunk Link**. The VLAN ID assigned is called **VID**.

A port can be configured as below 802.1q VLAN modes :

- **Access Mode :**
Access Links (the link to/from access ports) are the most common type of links on any VLAN switch. All **network hosts (such as PCs)** connect to the switch's Access Links in order to gain access to the local network. We configure only one **Access-VLAN** per port, that is, the **network hosts** will be allowed to access.

It is important to note at this point that any **network host** connected to an Access Port is totally unaware of the VLAN assigned to the port. The **network host** simply assumes it is part of a single broadcast domain, just as it happens with any normal switch. During data transfers, any VLAN information or data from other VLANs is removed so the recipient has no information about them.

- **Trunk Mode :**
Trunk Links (the link to/from trunk ports) is configured to carry packets for multiple VLANs. These types of ports are usually found in connections between switches. These links require the ability to carry packets from multiple VLANs because VLANs span over multiple switches.

- **Trunk Native Mode :**

A Trunk-native port can carry untagged packets simultaneously with the 802.1Q tagged packets. When you assign a default Access-VLAN to the trunk-native port, all untagged traffic travels on the default Access-VLAN for the trunk-native port, and all untagged traffic is assumed to belong to this Access-VLAN. This Access-VLAN is referred to as the native VLAN ID for a Trunk-native Port. The native VLAN ID is the VLAN ID that carries untagged traffic on trunk-native ports.

Example : PortX configuration

Configuration	Result
Trunk-VLAN = 10, 11, 12 Access-VLAN = 20 Mode = Access	PortX is an Access Port PortX's VID is ignored PortX's PVID is 20 PortX sends Untagged packets (PortX takes away VLAN tag if the PVID is 20) PortX receives Untagged packets only
Trunk-VLAN = 10,11,12 Access-VLAN = 20 Mode = Trunk	PortX is a Trunk Port PortX's VID is 10,11 and 12 PortX's PVID is ignored PortX sends and receives Tagged packets VID 10,11 and 12
Trunk-VLAN = 10,11,12 Access-VLAN = 20 Mode = Trunk-native	PortX is a Trunk-native Port PortX's VID is 10,11 and 12 PortX's PVID is 20 PortX sends and receives Tagged packets VID 10,11 and 12 PortX receives Untagged packets and add PVID 20

1. Use “Interface” command to configure a group of ports’ 802.1q/Port-basedVLAN settings.

VLAN & Interface command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several discontinuous port numbers separated by commas or a range of ports with a hyphen. For example:1,3 or 2-4
Switch(config-if-PORT-PORT)# vlan dot1q-vlan access-vlan [1-4094]	[1-4094]	Specify the selected ports’ Access-VLAN ID (PVID).
Switch(config-if-PORT-PORT)# vlan dot1q-vlan trunk-vlan [1-4094]	[1-4094]	Specify the selected ports’ Trunk-VLAN ID (VID).
Switch(config-if-PORT-PORT)# vlan dot1q-vlan mode access		Set the selected ports to the access mode (untagged).
Switch(config-if-PORT-PORT)# vlan dot1q-vlan mode trunk		Set the selected ports to the trunk mode (tagged).
Switch(config-if-PORT-PORT)# vlan dot1q-vlan mode trunk native		<p>Enable native VLAN for untagged traffic on the selected port. (Tagged and untagged)</p> <p>Note : When you assign a default Access-VLAN to the trunk-native port, all untagged traffic travels on the default Access-VLAN for the trunk-native port, and all untagged traffic is assumed to belong to this Access-VLAN.</p>
Switch(config-if-PORT-PORT)# vlan port-based [name]	[name]	<p>Set the selected ports to a specified port-based VLAN.</p> <p>Note : Need to create a port-based VLAN group under the VLAN global configuration mode before joining it.</p>
No command		
Switch(config-if-PORT-PORT)# no vlan dot1q-vlan access-vlan		Reset the selected ports’ PVID back to the default setting.
Switch(config-if-PORT-PORT)# no vlan dot1q-vlan mode		Reset the selected ports’ 802.1q VLAN mode back to the default setting (Access Mode).
Switch(config-if-PORT-PORT)# no vlan dot1q-vlan trunk-vlan [1-4094]	[1-4094]	Remove the specified trunk VLAN ID from the selected ports.
Switch(config-if-PORT-PORT)# no vlan port-based [name]	[name]	Remove the selected ports from the specified port-based VLAN.

2. Create/Modify an 802.1q VLAN and a management VLAN rule or create a port-based VLAN group.

VLAN dot1q command	Parameter	Description
Switch(config)# vlan dot1q-vlan		Globally enable 802.1q VLAN.
Switch(config)# vlan dot1q-vlan [1-4094]	[1-4094]	Enter a VLAN ID number to create a new 802.1q VLAN or modify an existing 802.1q VLAN.
Switch(config-vlan-ID)# name [vlan_name]	[vlan_name]	Specify a descriptive name for the created VLAN ID, maximum 15 characters.
Switch(config)# vlan management-vlan [1-4094] management-port [port_list] mode [access trunk trunk-native]	[1-4094]	Enter the management VLAN ID.
	[port_list]	Specify the management port number.
	[access trunk trunk-native]	Specify whether the management port is in trunk or access mode. “trunk” mode: Set the selected ports to tagged. “access” mode: Set the selected ports to untagged. “trunk-native” mode: Set the selected ports to tagged or untagged.
Switch(config)# vlan port-based		Globally enable Port Base VLAN.
Switch(config)# vlan port-based [name]	[name]	Specify a descriptive name for the port-based VLAN you would like to create, maximum 15 characters.
No command		
Switch(config)# no vlan dot1q-vlan		Globally disable 802.1q VLAN or enable Port Base VLAN.
Switch(config-vlan-ID)# no name		Remove the descriptive name for the specified VLAN ID.
Switch(config)# no vlan port-based		Globally disable Port Base VLAN or enable 802.1q VLAN.
Switch(config)# no vlan port-based [name]	[name]	Delete the specified port-based VLAN.
Show command		
Switch(config)# show vlan dot1q-vlan tag-vlan		Show IEEE 802.1q tag VLAN table.
Switch(config-vlan-ID)# show		Show the membership status of this VLAN ID
Switch(config)# show vlan interface		Show all ports' VLAN assignment and VLAN mode.
Switch(config)# show vlan interface [port_list]	[port_list]	Show the selected ports' VLAN assignment and VLAN mode.

Switch(config)# show vlan port-based		Show port-based VLAN table.
Exit command		
Switch(config-vlan-ID)# exit		Return to Global configuration mode.
Port-based VLAN Example		
Switch(config)# vlan port-based MKT_Office		Create a port-based VLAN "MKT_Office".
Switch(config)# vlan management-vlan 1 management-port 1-3 mode access		Set VLAN 1 to management VLAN (untagged) and port 1~3 to management ports.

For 802.1q VLAN configuration via CLI, we will demonstrate the following two examples to have the users realize the commands we mentioned above.

Example 1,

We will configure IPS-3110-PB Managed Industrial PoE Ethernet Switch via CLI as the Table 2-3 listed.



Name	Ports	Mode	PVID	VID
Sales	1-2	Trunk	Default	10,20
RD	3-4	Trunk-native	50	30,40
SQA	5-6	Access	60	N/A

Table 2-3

1. Create 802.1q VLAN IDs.

IPS-3110-PB(config)# interface 1-2	Enter port 1 to port 2's interface mode.
IPS-3110-PB(config-if-1,2)# vlan dot1q-vlan trunk-vlan 10, 20	Set port 1 to port 2's Trunk-VLAN ID (VID) to 10 and 20.
IPS-3110-PB(config-if-1,2)# vlan dot1q-vlan mode trunk	Set the selected ports to Trunk Mode (tagged).
IPS-3110-PB(config-if-1,2)# exit	Exit current ports interface mode.
IPS-3110-PB (config)# interface 3-4	Enter port 3 to 4's interface mode.
IPS-3110-PB(config-if-3,4)# vlan dot1q-vlan access-vlan 50	Set port 3 to port 4's Access-VLAN ID (PVID) to 50.
IPS-3110-PB(config-if-3,4)# vlan dot1q-vlan trunk-vlan 30,40	Set port 3 to port 4's Trunk-VLAN ID (VID) to 30 and 40.
IPS-3110-PB(config-if-3,4)# vlan dot1q-vlan mode trunk native	Set the selected ports to Trunk-native Mode (tagged and untagged).
IPS-3110-PB(config-if-3,4)# exit	Exit current ports interface mode.
IPS-3110-PB (config)# interface 5-6	Enter port 5 to port 6's interface mode.
IPS-3110-PB(config-if-5,6)# vlan dot1q-vlan access-vlan 60	Set port 5 to port 6's Access-VLAN ID (PVID) to 60.
IPS-3110-PB(config-if-5,6)# vlan dot1q-vlan mode access	Set the selected ports to Access Mode (untagged).
IPS-3110-PB(config-if-5,6)# exit	Exit current ports interface mode.

2. Modify 802.1q VLAN IDs' names.

IPS-3110-PB(config)# vlan dot1q-vlan 10	Enter VLAN 10.
IPS-3110-PB (config-vlan-10)# name Sales	Specify "Sales" as the name for VLAN 10.
IPS-3110-PB (config-vlan-10)# exit	Exit VLAN 10.
IPS-3110-PB(config)# vlan dot1q-vlan 20	Enter VLAN 20.
IPS-3110-PB(config-vlan-20)# name Sales	Specify "Sales" as the name for VLAN 20.
IPS-3110-PB(config-vlan-20)# exit	Exit VLAN 20.
IPS-3110-PB(config)# vlan dot1q-vlan 30	Enter VLAN 30.
IPS-3110-PB(config-vlan-30)# name RD	Specify "RD" as the name for VLAN 30.
IPS-3110-PB(config-vlan-30)# exit	Exit VLAN 30.
IPS-3110-PB(config)# vlan dot1q-vlan 40	Enter VLAN 40.
IPS-3110-PB(config-vlan-40)# name RD	Specify "RD" as the name for VLAN 40.
IPS-3110-PB(config-vlan-40)# exit	Exit VLAN 40.
IPS-3110-PB(config)# vlan dot1q-vlan 50	Enter VLAN 50.
IPS-3110-PB(config-vlan-50)# name RD	Specify "RD" as the name for VLAN 50.
IPS-3110-PB(config-vlan-50)# exit	Exit VLAN 50.
IPS-3110-PB(config)# vlan dot1q-vlan 60	Enter VLAN 60.
IPS-3110-PB(config-vlan-60)# name SQA	Specify "SQA" as the name for VLAN 60.
IPS-3110-PB(config-vlan-60)# exit	Exit VLAN 60.

2.6.26 Interface Command

Use “interface” command to set up configurations of several discontinuous ports or a range of ports.

1. Entering interface numbers.

Command	Parameter	Description
Switch(config)# interface [port_list]	[port_list]	Enter several port numbers separated by commas or a range of port numbers. For example: 1,3 or 2-4

Note : You need to enter interface numbers first before issuing below 2-13 commands.

2. Enable port auto-negotiation.

Command	Parameter	Description
Switch(config-if-PORTR-PORT)# auto-negotiation		Set the selected interfaces' to auto-negotiation. When auto-negotiation is enabled, speed configuration will be ignored.
No command		
Switch(config-if-PORTR-PORT)# no auto-negotiation		Reset auto-negotiation setting back to the default. (Manual)

3. Set up link aggregation or port-trunking.

Command	Parameter	Description
Switch(config-if-PORTR-PORT)# channel-group lacp		Set the selected interfaces' to be aggregated via LACP. Note : At lease 2 ports but not more than 6 ports can be aggregated.
Switch(config-if-PORTR-PORT)# channel-group lacp key [0-255]	[0-255]	Specify a key to the selected interfaces. (0: auto)
Switch(config-if-PORTR-PORT)# no channel-group lacp type		Specify the selected interfaces to passive LACP role type.
Switch(config-if-PORTR-PORT)# channel-group lacp type active	[active]	Specify the selected interfaces to active LACP role type.
Switch(config-if-PORTR-PORT)# channel-group trunking [group_name]	[group_name]	Specify the selected interfaces to the trunking group. Note1 : At lease 2 ports but not more than 6 ports can be aggregated. Note2 : Ports cannot be in LACP and port-trunking mode at the same time. Note3 : A port-trunking group need to created before assigning ports to it. (See Section 2.6.5 “channel-group”)

No command		
Switch(config-if-PORTR-PORT)# no channel-group lacp		Disable LACP on the selected interfaces.
Switch(config-if-PORTR-PORT)# no channel-group trunking		Remove the selected ports from a link aggregation group.

4. Set up port description.

Command	Parameter	Description
Switch(config-if-PORTR-PORT)# description [description]	[description]	Enter the description for the selected port(s). Up to 35 characters can be accepted.
No command		
Switch(config-if-PORTR-PORT)# no description		Clear the port description for the selected ports.

5. Set up port duplex mode.

Command	Parameter	Description
Switch(config-if-PORTR-PORT)# duplex [full]	[full]	Configure the port duplex as full .
No command		
Switch(config-if-PORTR-PORT)# no duplex		Configure the port duplex as half . Note1 : Only 1-8 copper ports can be configured as half duplex. Note2 : Auto-negotiation needs to be disabled before configuring duplex mode.

6. Enable flow control operation.

Command	Parameter	Description
Switch(config-if-PORTR-PORT)# flowcontrol		Enable flow control on the selected port(s).
No command		
Switch(config-if-PORTR-PORT)# no flowcontrol		Disable flow control on the selected port(s).

7. Enable loop-detection per port.

Command	Parameter	Description
Switch(config-if-POR-PORT)# loop-detection		Enable Loop Detection function on the selected port(s).
No command		
Switch(config-if-POR-PORT)# no loop-detection		Disable Loop Detection function on the selected port(s).

8. Configure static MAC table.

Command	Parameter	Description
Switch(config-if-POR-PORT)# mac address-table static-mac [xx:xx:xx:xx:xx:xx] vlan [1- 4094]	[xx:xx:xx:xx:xx:xx]	Specify a MAC address to the VLAN entry. Note: Only one port could be set at a time.
	[1-4094]	Specify the VLAN where the packets with the Destination MAC address can be forwarded to the selected port.
No command		
Switch(config-if-POR-PORT)# no mac address-table static-mac [xx:xx:xx:xx:xx:xx] vlan [1- 4094]	[xx:xx:xx:xx:xx:xx]	Remove the specified MAC address from the MAC address table. Note: Only one port could be set at a time.
	[1-4094]	Remove the VLAN to which the specified MAC belongs.

9. Configure QoS rate limit.

Command	Parameter	Description
Switch(config-if-POR-PORT)# qos rate-limit ingress [0 64- 1000000]	[0 64- 1000000] kbps	Enable and configure the ingress rate limit, from 64Kbps to 1000Mbps. 0:Disable
Switch(config-if-POR-PORT)# qos rate-limit egress[0 64- 1000000]	[0 64- 1000000] kbps	Enable and configure the egress rate limit, from 64Kbps to 1000Mbps. 0:Disable
No command		
Switch(config-if-POR-PORT)# no qos rate-limit ingress		Reset QoS ingress rate limit back to the default.
Switch(config-if-POR-PORT)# no qos rate-limit egress		Reset QoS egress rate limit back to the default.

10. Shutdown interface.

Command	Parameter	Description
Switch(config-if-PORT-PORT)# shutdown		Disable the selected interfaces.
No command		
Switch(config-if-PORT-PORT)# no shutdown		Enable the selected interfaces.

11. Configure RSTP parameters per port.

Command	Parameter	Description
Switch(config-if-PORT-PORT)# spanning-tree		Enable spanning-tree protocol on the selected interfaces.
Switch(config-if-PORT-PORT)# spanning-tree cost [0-2000000000]	[0-2000000000]	Specify the path cost value on the selected interfaces.
Switch(config-if-PORT-PORT)# spanning-tree priority [0-15]	[0-15]	Specify priority value on the selected interfaces. 0=0, 1=16, 2=32, 3=48, 4=64, 5=80, 6=96, 7=112, 8=128, 9=144, 10=160, 11=176, 12=192, 13=208, 14=224, 15=240
Switch(config-if-PORT-PORT)# spanning-tree edge		Set the selected interfaces to edge ports.
Switch(config-if-PORT-PORT)# spanning-tree p2p [forced_true forced_false auto]	[forced_true forced_false auto]	Set the selected interfaces to non-point to point ports (forced_false) or allow the Managed Industrial PoE Ethernet Switch to detect point to point status automatically (auto). By default, physical ports are set to point to point ports (forced_true).
No command		
Switch(config-if-PORT-PORT)# no spanning-tree		Disable spanning-tree protocol on the selected interfaces.
Switch(config-if-PORT-PORT)# no spanning-tree cost		Reset the cost value back to the default.
Switch(config-if-PORT-PORT)# no spanning-tree priority		Reset the priority value back to the default.

Switch(config-if-POR- PORT)# no spanning-tree edge		Reset the selected interfaces back to non- edge ports.
Switch(config-if-POR- PORT)# no spanning-tree p2p		Reset the selected interfaces back to point to point ports (forced_ true).

12. Set up port speed.

Command	Parameter	Description
Switch(config-if-POR-PORT)# speed [1000 100 10]	[1000 100 10]	Configure the port speed as 1000Mbps, 100Mbps or 10Mbps. Note1: Speed can only be configured when auto-negotiation is disabled. Note2: Fiber ports cannot be configured as 10Mbps.
No command		
Switch(config-if-POR-PORT)# no speed		Reset the port speed setting back to the default.

13. Set up VLAN parameters per port.

Command	Parameter	Description
Switch(config-if-POR-PORT)# vlan dot1q-vlan access-vlan [1- 4094]	[1-4094]	Specify the selected ports' Access-VLAN ID (PVID).
Switch(config-if-POR-PORT)# vlan dot1q-vlan trunk-vlan [1- 4094]	[1-4094]	Specify the selected ports' Access-VLAN ID (PVID).
Switch(config-if-POR-PORT)# vlan dot1q-vlan mode access		Set the selected ports to the access mode (untagged).
Switch(config-if-POR-PORT)# vlan dot1q-vlan mode trunk		Set the selected ports to the trunk mode (tagged).
Switch(config-if-POR-PORT)# vlan dot1q-vlan mode trunk native		Enable native VLAN for untagged traffic on the selected port. (Tagged and untagged) Note : When you assign a default Access-VLAN to the trunk-native port, all untagged traffic travels on the default Access-VLAN for the trunk- native port, and all untagged traffic is assumed to belong to this Access- VLAN.
Switch(config-if-POR-PORT)# vlan port-based [name]	[name]	Set the selected ports to a specified port- based VLAN.

		Note : Need to create a port-based VLAN group under the VLAN global configuration mode before joining it.
No command		
Switch(config-if-PORt-PORt)# no vlan dot1q-vlan access-vlan		Reset the selected ports' PVID back to the default setting.
Switch(config-if-PORt-PORt)# no vlan dot1q-vlan trunk-vlan [1-4094]	[1-4094]	Remove the specified trunk VLAN ID from the selected ports.
Switch(config-if-PORt-PORt)# no vlan dot1q-vlan mode		Reset the selected ports' 802.1q VLAN mode back to the default setting (Access Mode).
Switch(config-if-PORt-PORt)# no vlan port-based [name]	[name]	Remove the selected ports from the specified port-based VLAN.

2.6.27 Show Interface Statistics Command

The command of “show interface statistics”, displaying port traffic statistics, port packet error statistics and port analysis history, can be used either in Privileged mode or Global Configuration mode. This command is useful for network administrators to diagnose and analyze the real-time conditions of each port traffic.

Command	Parameters	Description
Switch(config)# show interface		Show the overall interface configurations.
Switch(config)# show interface [port_list]	[port_list]	Show interface configurations of selected ports.
Switch(config)# show interface statistics analysis		Display packets analysis (events) for each port.
Switch(config)# show interface statistics analysis [port_list]	[port_list]	Display packets analysis for the selected ports.
Switch(config)# show interface statistics analysis rate		Display packets analysis (rates) for each port.
Switch(config)# show interface statistics analysis rate [port_list]	[port_list]	Display packets analysis (rates) for the selected ports.
Switch(config)# show interface statistics clear		Clear all statistics counters.
Switch(config)# show interface statistics error		Display error packets statistics (events) for each port.
Switch(config)# show interface statistics error [port_list]	[port_list]	Display error packets statistics (events) for the selected ports.
Switch(config)# show interface statistics error rate		Display error packets statistics (rates) for each port.
Switch(config)# show interface statistics error rate [port_list]	[port_list]	Display error packets statistics (rates) for the selected ports.
Switch(config)# show interface statistics traffic		Display traffic statistics (events) for each port.
Switch(config)# show interface statistics traffic [port_list]	[port_list]	Display traffic statistics (events) for the selected ports.
Switch(config)# show interface statistics traffic rate		Display traffic statistics (rates) for each port.
Switch(config)# show interface statistics traffic rate [port_list]	[port_list]	Display traffic statistics (rates) for the selected ports.

2.6.28 Show sfp Command

When you slide-in SFP transceiver, detailed information about this module can be viewed by issuing this command.

Command	Description
Switch(config)# show sfp information	Display SFP information including the speed of transmission, the distance of transmission, vendor name, vendor PN, vendor SN.
Switch(config)# show sfp state	Show the slide-in SFP modules' current temperature, Tx Bias power, TX power, RX power and voltage.

2.6.29 Show running-config & start-up-config & default-config Command

Command	Parameters	Description
Switch(config)# show running-config		Show the difference between the running configuration and the default configuration.
Switch(config)# show running-config include [string]	[string]	Specify the keyword to search for the matched information from the difference between the running configuration and the default configuration.
Switch(config)# show running-config full		Show the full running configuration currently used in the Managed Switch. Please note that you must save the running configuration into your switch flash before rebooting or restarting the device.
Switch(config)# show running-config full include [string]	[string]	Specify the keyword to search for the matched information from the full running configuration.
Switch(config)# show running-config interface [port_list]	[port_list]	Show the running configuration currently used in the Managed Switch for the specific port(s).
Switch(config)# show running-config interface [port_list] include [string]	[port_list]	Specify the keyword to search for the matched information from the running configuration of the specific port(s).
	[string]	

Switch(config)# show start-up-config		Show the difference between the start up configuration and the default configuration.
Switch(config)# show start-up-config include [string]	[string]	Specify the keyword to search for the matched information from the difference between the start up configuration and the default configuration.
Switch(config)# show start-up-config full		Display the system configuration stored in flash.
Switch(config)# show start-up-config full include [string]	[string]	Specify the keyword to search for the matched information from the full start up configuration.
Switch(config)# show default-config		Display the system factory default configuration.
Switch(config)# show default-config include [string]	[string]	Specify the keyword to search for the matched information from the system factory default configuration.

3. SNMP NETWORK MANAGEMENT

The Simple Network Management Protocol (SNMP) is an application-layer protocol that facilitates the exchange of management information between network devices. It is part of the TCP/IP protocol suite. SNMP enables network administrators to manage network performance, find and solve network problems, and plan for network growth.

SNMP consists of following key components.

Managed device is a network node that contains SNMP agent. Managed devices collect and store management information and make this information available to NMS using SNMP. Managed device can be switches/Hub, etc..

MIB (Management Information Base) defines the complete manageable entries of the managed device. These MIB entries can be either read-only or read-write. For example, the System Version is read-only variables. The Port State Enable or Disable is a read-write variable and a network administrator can not only read but also set its value remotely.

SNMP Agent is a management module resides in the managed device that responds to the SNMP Manager request.

SNMP Manager/NMS executes applications that monitor and control managed devices. NMS provide the bulk of the processing and memory resources required for the complete network management. SNMP Manager is often composed by desktop computer/work station and software program such like HP OpenView.

Totally 4 types of operations are used between SNMP Agent & Manager to change the MIB information. These 4 operations all use the UDP/IP protocol to exchange packets.

GET: This command is used by an SNMP Manager to monitor managed devices. The SNMP Manager examines different variables that are maintained by managed devices.

GET Next: This command provides traversal operation and is used by the SNMP Manager to sequentially gather information in variable tables, such as a routing table.

SET: This command is used by an SNMP Manager to control managed devices. The NMS changes the values of variables stored within managed devices.

Trap: Trap is used by the managed device to report asynchronously a specified event to the SNMP Manager. When certain types of events occur, a managed device will send a trap to alert the SNMP Manager.

The system built-in management module also supports SNMP management. Users must install the MIB file before using the SNMP based network management system. The MIB file is on a disc or diskette that accompanies the system. The file name extension is .mib, which SNMP based compiler can read.

Please refer to the appropriate documentation for the instructions of installing the system private MIB.

4. WEB MANAGEMENT

You can manage the Managed Industrial PoE Ethernet Switch via a web browser. However, you must first assign a unique IP address to the Managed Industrial PoE Ethernet Switch before doing so. Through the connection of any SFP ports using the fiber cable or any TP ports using a RJ45 cable, you will be allowed to have an access of the Managed Industrial PoE Ethernet Switch and set up the IP address for the first time. (Note: The Managed Industrial PoE Ethernet Switch can be reached with the default IP address of “**192.168.0.1**”. You can change the IP address of the switch to the desired one later in its **Network Management** menu.)

Initiate a web browser and input **http:// 192.168.0.1** to enter the Managed Industrial PoE Ethernet Switch system. Once you gain the access, the following login window will appear. Also input the default administrator username **admin** and keep the administrator password field blank (By default, no password is required.) to login into the main screen page.

Login

- Please login

Enter Administrator Name :

Enter Administrator Password :

Login

After you login successfully, the screen with the Main Menu will show up. The functions of Main Menu in the Web Management are similar to those described at the Console Management.

IPS-3110-PB

- System Information
- User Authentication
- Network Management
- Switch Management
- Switch Monitor
- System Utility
- Save Configuration
- Reset System
- Logout

System Information

Company Name	Connection Technology Systems		
System Object ID	.1.3.6.1.4.1.9304.100.3110		
System Contact	info@ctsystem.com		
System Name	IPS-3110-PB		
System Location	18F-6, No. 79, Sec. 1, Xintai 5th Rd., Xizhi Dist., Taiwan		
DHCP Vendor ID	IPS-3110-PB		
Model Name	IPS-3110-PB		
Host Name	IPS-3110-PB		
Current Boot Image	Image-1		
Configured Boot Image	Image-1		
Image-1 Version	1.00.0A		
Image-2 Version	1.00.09x		
1000M Port Number	10	100M Port Number	0
M/B Version	A03		
Fiber 1 Type	SFP 1000Mbps 20KM		
Fiber 1 Vendor	CTS INC.	Fiber 1 PN	SFP-31W2ASM-20-I
Fiber 2 Type	SFP -- --		
Fiber 2 Vendor		Fiber 2 PN	
Serial Number	ABBCDDEF0000000	Date Code	20180615
Up Time	0 day 02:30:55	Local Time	Not Available
CPU Temperature	40.50 C	Switch Temperature	43.74 C
Power Temperature	48.06 C		

Power 1

N/A

Power 2

installed

OK

In the Main Menu, there are 9 main functions, including System Information, User Authentication, Network Management, Switch Management, Switch Monitor, System Utility, Save Configuration, Reset System and Logout contained. We will respectively describe their sub-functions in the following sections of this chapter.

- **System Information:** Name the Managed Industrial PoE Ethernet Switch, specify the location and check the current version of information.
- **User Authentication:** View the registered user list. Add a new user or remove an existing user.
- **Network Management:** Set up or view the Managed Industrial PoE Ethernet Switch's IP address and related information required for network management applications.
- **Switch Management:** Set up the switch/port configuration, VLAN configuration and other functions.
- **Switch Monitor:** View the operation status and traffic statistics of the ports.
- **System Utility:** Ping, do the firmware upgrade, load the factory default settings, etc..
- **Save Configuration:** Save all changes to the system.
- **Reset System:** Reset the Managed Industrial PoE Ethernet Switch.
- **Logout:** Log out the management interface.

4.1 System Information

Select **System Information** from the **Main Menu** and then the following screen shows up.

System Information			
Company Name	Connection Technology Systems		
System Object ID	.1.3.6.1.4.1.9304.100.3110		
System Contact	info@ctsystem.com		
System Name	IPS-3110-PB		
System Location	18F-6, No.79, Sec.1, Xintai 5th Rd., Xizhi Dist., Taiwan		
DHCP Vendor ID	IPS-3110-PB		
Model Name	IPS-3110-PB		
Host Name	IPS-3110-PB		
Current Boot Image	Image-1		
Configured Boot Image	Image-1		
Image-1 Version	1.00.0A		
Image-2 Version	1.00.09x		
1000M Port Number	10	100M Port Number	0
M/B Version	A03		
Fiber 1 Type	SFP 1000Mbps 20KM		
Fiber 1 Vendor	CTS INC.	Fiber 1 PN	SFP-31W2ASM-20-I
Fiber 2 Type	SFP -- --		
Fiber 2 Vendor		Fiber 2 PN	
Serial Number	ABBCDDEF0000000	Date Code	20180615
Up Time	0 day 02:39:57	Local Time	Not Available
CPU Temperature	40.50 C	Switch Temperature	43.74 C
Power Temperature	49.14 C		
Power 1	N/A		
Power 2	installed		
OK			

Company Name: Enter a company name for this Managed Industrial PoE Ethernet Switch.

System Object ID: Display the predefined System OID.

System Contact: Enter the contact information for this Managed Industrial PoE Ethernet Switch.

System Name: Enter a descriptive system name for this Managed Industrial PoE Ethernet Switch.

System Location: Enter a brief location description for this Managed Industrial PoE Ethernet Switch.

DHCP Vendor ID: Enter the Vendor Class Identifier used for DHCP relay agent function.

Model Name: Display the product's model name.

Host Name: Enter the product's host name.

Current Boot Image: The image that is currently being used.

Configured Boot Image: The image you would like to use after rebooting.

Image-1 Version: Display the firmware version 1 (image-1) used in this device.

Image-2 Version: Display the firmware version 2 (image-2) used in this device.

1000M Port Number: The number of ports supporting 1000Mbps transmission speed.

100M Port Number: The number of ports supporting 100Mbps transmission speed.

M/B Version: Display the main board version.

Fiber 1/2 Type: The information about the slide-in SFP Transceiver type in SFP ports.

Fiber 1/2 Vendor: Vendor name of the slide-in SFP Transceiver in SFP ports.

Fiber 1/2 PN: Vendor PN of the slide-in SFP Transceiver in SFP ports.

Serial Number: Display the serial number of this Managed Industrial PoE Ethernet Switch.

Date Code: Display the date code of the Managed Industrial PoE Ethernet Switch firmware.

Up Time: Display the up time since last restarting.

Local Time: Display the local time of the system.

CPU Temperature: Display the current CPU temperature of this device.

Switch Temperature: Display the current temperature of this device.

Power Temperature: Display the current power 1/2 temperature of this device.

Power 1/2: Display the installation status of Power 1 and Power 2.

4.2 User Authentication

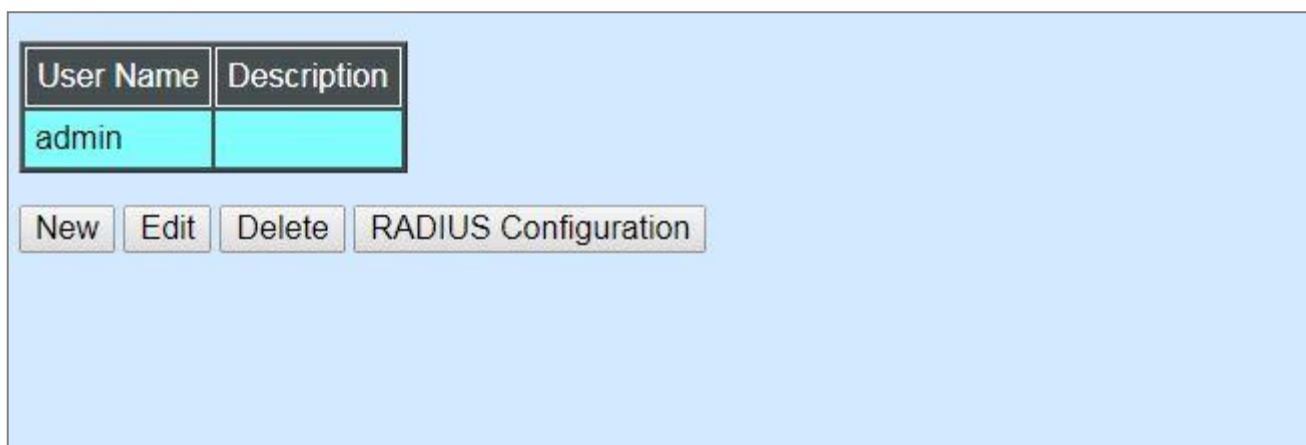
To prevent any unauthorized operations, only registered users are allowed to operate the Managed Industrial PoE Ethernet Switch. Users who would like to operate the Managed Industrial PoE Ethernet Switch need to create a user account first.

To view or change current registered users, select **User Authentication** from the **Main Menu** and then the following screen page shows up.



The screenshot shows a web interface titled "User Authentication". It features a "Password Encryption" label followed by a dropdown menu currently set to "Disabled". Below this, a note states: "Note !! When configure Password Encryption option to disabled , all existing password will be clear. Note to configure user password again otherwise all user password will be empty." At the bottom left is an "OK" button.

Password Encryption: Pull down the menu of **Password Encryption** to disable or enable MD5 (Message-Digest Algorithm). It is a widely used cryptographic hash function producing a 128-bit (16-byte) hash value, typically expressed in text format as a 32 digit hexadecimal number. The default setting is disabled.



The screenshot shows a web interface for managing users. It contains a table with two columns: "User Name" and "Description". The first row shows "admin" in the "User Name" column and an empty "Description" column. Below the table are four buttons: "New", "Edit", "Delete", and "RADIUS Configuration".

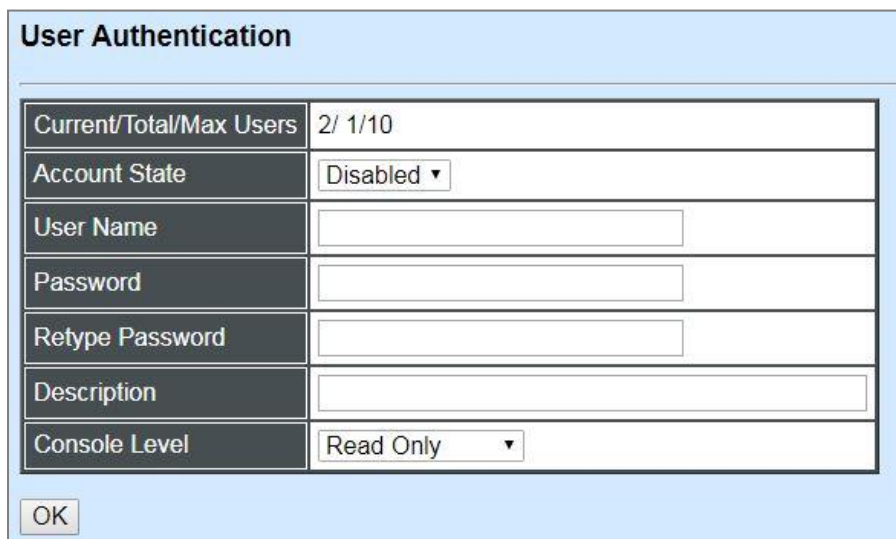
User Name	Description
admin	

Click **New** to add a new user and then the following screen page appears. Up to 10 users can be registered.

Click **Edit** to modify a registered user's settings.

Click **Delete** to remove the selected registered user from the user list.

Click **RADIUS Configuration** for authentication setting via RADIUS. For more details on these settings, please refer to Section 4.2.1.



The image shows a 'User Authentication' dialog box with a light blue header and a white body. It contains a table with the following fields:

Current/Total/Max Users	2/ 1/10
Account State	Disabled ▼
User Name	<input type="text"/>
Password	<input type="password"/>
Retype Password	<input type="password"/>
Description	<input type="text"/>
Console Level	Read Only ▼

At the bottom left of the dialog box is an 'OK' button.

Current/Total/Max Users: View-only field.

Current: This shows the number of current registered user.

Total: This shows the amount of total users who have already registered.

Max: This shows the maximum number available for registration. The maximum number is 10.

Account State: Enable or disable this user account.

User Name: Specify the authorized user login name. Up to 20 alphanumeric characters can be accepted.

Password: Enter the desired user password. Up to 20 alphanumeric characters can be accepted.

Retype Password: Enter the password again for double-checking.

Description: Enter a unique description for this user. Up to 35 alphanumeric characters can be accepted. This is mainly used for reference only.

Console Level: Select the desired privilege level for the management operation from the pull-down menu. Three operation levels of privilege are available in the Managed Industrial PoE Ethernet Switch:

Administrator: Own the full-access right. The user can maintain user account as well as system information, load the factory default settings, and so on.

Read & Write: Own the partial-access right. The user is unable to modify user account, system information and items under System Utility menu.

Read Only: Allow to view only.

NOTE:

1. To prevent incautious operations, users cannot delete their own account, modify their own user name and change their own account state.
 2. The acquired hashed password from backup config file is not applicable for user login on CLI/Web interface.
-

-
3. We strongly recommend not to alter off-line Auth Method setting in backup configure file.
 4. If Auth-Method is enabled and do firmware downgrade, users must reset default config.
-

4.2.1 RADIUS Configuration

Click **RADIUS Configuration** in the User Authentication webpage and then the following screen page appears.

The screenshot shows a web interface titled "RADIUS Configuration". It contains a table with the following fields and values:

RADIUS Authentication	Disabled ▼
RADIUS Secret Key	default
RADIUS Port	1812 (1025-65535)
Retry Times	0 ▼
RADIUS Server Address	0.0.0.0
2nd RADIUS Server Address	0.0.0.0

At the bottom left of the configuration area is an "OK" button.

RADIUS Authentication: From the **RADIUS Authentication** pull-down menu, you can choose **Enabled** or **Disabled** option to respectively activate/deactivate authentication via RADIUS.

When **Enabled** is selected, the user login will be upon those settings on the RADIUS server(s).

NOTE: For advanced RADIUS Server setup, please refer to [APPENDIX A](#) or the "free RADIUS readme.txt" file on the disc provided with this product.

RADIUS Secret Key: The word to encrypt data of being sent to RADIUS server.

RADIUS Port: The RADIUS service port on RADIUS server.

Retry Times: Times of trying to reconnect if the RADISU server is not reachable.

RADIUS Server Address: IP address of the primary RADIUS server.

2nd RADIUS Server Address: IP address of the secondary RADIUS server.

4.3 Network Management

In order to enable network management of the Managed Industrial PoE Ethernet Switch, proper network configuration is required. To do this, click the folder **Network Management** from the **Main Menu** and then the following screen page appears.

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- System Information
- User Authentication
- Network Management**
 - Network Configuration
 - System Service Configuration
 - RS232/Telnet/Console Configuration
 - Time Server Configuration
 - Time Range
 - Device Community
 - SNMPv3 USM User
 - Trap Destination
 - Trap Configuration
 - Syslog Configuration

Network Configuration

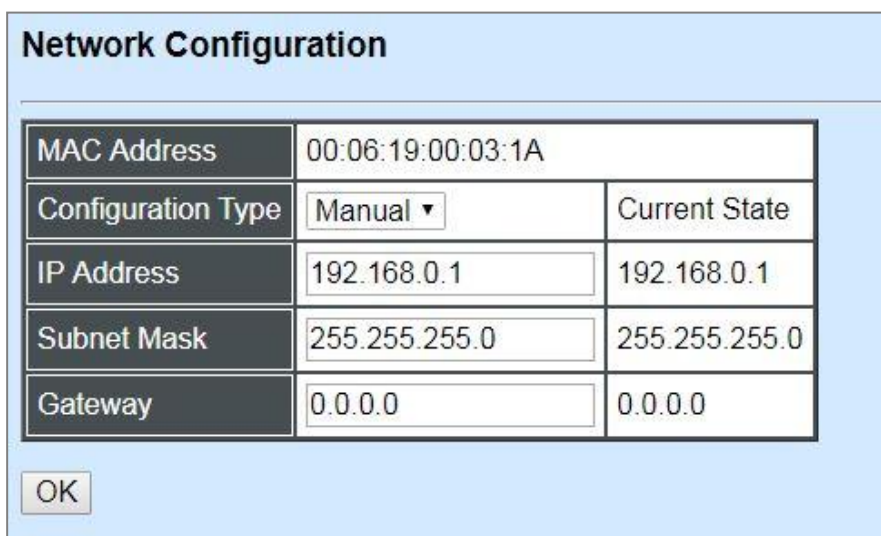
MAC Address	00:06:19:00:03:1A	
Configuration Type	Manual ▼	Current State
IP Address	192.168.0.1	192.168.0.1
Subnet Mask	255.255.255.0	255.255.255.0
Gateway	0.0.0.0	0.0.0.0

OK

1. **Network Configuration:** Set up the required IP configuration of the Managed Industrial PoE Ethernet Switch.
2. **System Service Configuration:** Enable or disable the specified network services.
3. **RS232/Telnet/Console Configuration:** View the RS-232 serial port setting, specific Telnet and Console services.
4. **Time Server Configuration:** Set up the time server's configuration.
5. **Time Range:** Set up the time interval of PSE's power supply over Ethernet to PDs (powered devices).
6. **Device Community:** View the registered SNMP community name list. Add a new community name or remove an existing community name.
7. **SNMPv3 USM User:** Allow administrator to configure password and encryption method of user accounts generated in User Authentication for SNMPv3.
8. **Trap Destination:** View the registered SNMP trap destination list. Add a new trap destination or remove an existing trap destination.
9. **Trap Configuration:** View the Managed Industrial PoE Ethernet Switch trap configuration. Enable or disable a specific trap.
10. **Syslog Configuration:** Set up the Mal-attempt Log server's configuration.

4.3.1 Network Configuration

Click the option **Network Configuration** from the **Network Management** menu and then the following screen page appears.

The image shows a 'Network Configuration' dialog box with a light blue header and a white body. Inside the body is a table with configuration details. The table has five rows: MAC Address, Configuration Type, IP Address, Subnet Mask, and Gateway. The 'Configuration Type' row includes a dropdown menu set to 'Manual' and a 'Current State' column. Below the table is an 'OK' button.

Network Configuration		
MAC Address	00:06:19:00:03:1A	
Configuration Type	Manual ▾	Current State
IP Address	192.168.0.1	192.168.0.1
Subnet Mask	255.255.255.0	255.255.255.0
Gateway	0.0.0.0	0.0.0.0

OK

MAC Address: This view-only field shows the unique and permanent MAC address assigned to the Managed Industrial PoE Ethernet Switch. You cannot change the Managed Industrial PoE Ethernet Switch's MAC address.

Configuration Type: There are two configuration types that users can select from the pull-down menu, "**DHCP**" and "**Manual**". When "**DHCP**" is selected and a DHCP server is also available on the network, the Managed Industrial PoE Ethernet Switch will automatically get the IP address from the DHCP server. If "**Manual**" is selected, users need to specify the IP address, Subnet Mask and Gateway.

IP Address: Enter the unique IP address of this Managed Industrial PoE Ethernet Switch. You can use the default IP address or specify a new one when the situation of address duplication occurs or the address does not match up with your network. (The default factory setting is 192.168.0.1.)

Subnet Mask: Specify the subnet mask. The default subnet mask values for the three Internet address classes are as follows:

- Class A: 255.0.0.0
- Class B: 255.255.0.0
- Class C: 255.255.255.0

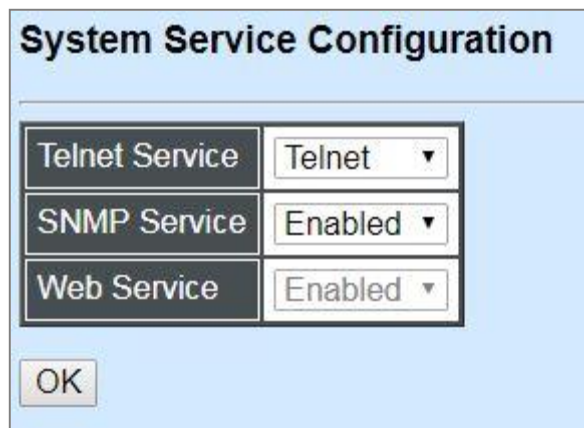
Gateway: Specify the IP address of a gateway or a router, which is responsible for the delivery of the IP packets sent by the Managed Industrial PoE Ethernet Switch. This address is required when the Managed Industrial PoE Ethernet Switch and the network management station are on different networks or subnets. The default value of this parameter is 0.0.0.0, which means no gateway exists and the network management station and Managed Industrial PoE Ethernet Switch are on the same network.

Current State: This View-only field shows currently assigned IP address (by DHCP or manual), Subnet Mask and Gateway of the Managed Industrial PoE Ethernet Switch.

NOTE: *This Managed Industrial PoE Ethernet Switch also supports auto-provisioning function that enables DHCP clients to automatically download the latest firmware and configuration image from the server. For information about how to set up a DHCP server, please refer to APPENDIX B.*

4.3.2 System Service Configuration

Click the option **System Service Configuration** from the **Network Management** menu and then the following screen page appears.



The dialog box titled "System Service Configuration" contains three rows of controls. Each row has a label on the left and a dropdown menu on the right. The first row is "Telnet Service" with a dropdown showing "Telnet". The second row is "SNMP Service" with a dropdown showing "Enabled". The third row is "Web Service" with a dropdown showing "Enabled". At the bottom left is an "OK" button.

Telnet Service	Telnet ▼
SNMP Service	Enabled ▼
Web Service	Enabled ▼

OK

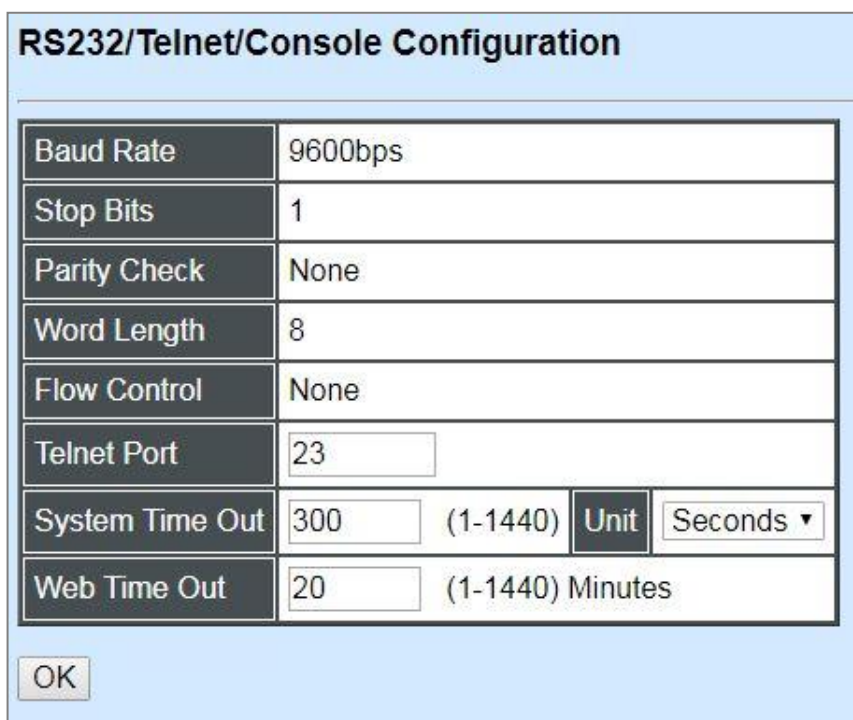
Telnet Service: From the **Telnet Service** pull-down menu, you can choose **Telnet** or **SSH** option to respectively enable the Telnet Management service or the SSH Management service. Or choose **Disabled** option to disable these Management service.

SNMP Service: To enable or disable the SNMP Management service.

Web Service: To enable or disable the Web Management service. It is a view-only field.

4.3.3 RS232/Telnet/Console Configuration

Click the option **RS232/Telnet/Console Configuration** from the **Network Management** menu and then the following screen page appears.



The dialog box titled "RS232/Telnet/Console Configuration" contains a table of configuration parameters. The parameters are: Baud Rate (9600bps), Stop Bits (1), Parity Check (None), Word Length (8), Flow Control (None), Telnet Port (23), System Time Out (300, range 1-1440, Unit Seconds), and Web Time Out (20, range 1-1440, Unit Minutes). At the bottom left is an "OK" button.

Baud Rate	9600bps		
Stop Bits	1		
Parity Check	None		
Word Length	8		
Flow Control	None		
Telnet Port	23		
System Time Out	300	(1-1440)	Unit Seconds ▼
Web Time Out	20	(1-1440) Minutes	

OK

Baud Rate: 9600 bps, RS-232 setting, view-only field.

Stop Bits: 1, RS-232 setting, view-only field.

Parity Check: None, RS-232 setting, view-only field.

Word Length: 8, RS-232 setting, view-only field.

Flow Control: None, RS-232 setting, view-only field.

Telnet Port: Specify the desired TCP port number for the Telnet console. The default TCP port number of the Telnet is 23.

System Time Out: Specify the desired time that the Managed Industrial PoE Ethernet Switch will wait before disconnecting an inactive console/telnet session. Valid range:1-1440 seconds or minutes.

Unit: Specify the unit for the **System Time Out** parameter.

Web Time Out: Specify the desired time that the Managed Industrial PoE Ethernet Switch will wait before disconnecting an inactive web session. Valid range:1-1440 minutes.

4.3.4 Time Server Configuration

Click the option **Time Server Configuration** from the **Network Management** menu and then the following screen page appears.

Time Server Configuration

Time Synchronization	Disabled ▾
Time Server Address	0.0.0.0
2nd Time Server Address	0.0.0.0
Synchronization Interval	24 Hour ▾
Time Zone	UTC-11:00 Apia ▾
Daylight Saving Time	Disabled ▾

OK

NOTE: The offset of start time and end time should be greater than 1 hour, or the effect is unpredictable.

Time Synchronization: To enable or disable the time synchronization function.

Time Server Address: Set up the IP address of the first NTP time server.

2nd Time Server Address: Set up the IP address of the secondary NTP time server. When the first NTP time server is down, the Managed Industrial PoE Ethernet Switch will automatically connect to the secondary NTP time server.

Synchronization Interval: Set up the time interval to synchronize with the NTP time server.

Time Zone: Select the appropriate time zone from the pull-down menu.

Daylight Saving Time: Include “**Disabled**”, “**recurring**” and “**date**” three options to enable or disable the daylight saving time function. It is a way of getting more daytime hour(s) by setting the time to be hour(s) ahead in the morning.

Daylight Saving Time Date Start: If the “date” option is selected in Daylight Saving Time, click the pull-down menu to select the start date of daylight saving time.

Daylight Saving Time Date End: If the “date” option is selected in Daylight Saving Time, click the pull-down menu to select the end date of daylight saving time.

Daylight Saving Time Recurring Star: If the “recurring” option is selected in Daylight Saving Time, click the pull-down menu to select the recurring start date of daylight saving time.

Daylight Saving Time Recurring End: If the “recurring” option is selected in Daylight Saving Time, click the pull-down menu to select the recurring end date of daylight saving time.

NOTE: *SNTP is used to get the time from those NTP servers. It is recommended that the time server is in the same LAN with the Managed Industrial PoE Ethernet Switch or at least not too far away. In this way, the time will be more accurate.*

4.3.5 Time Range

This command defines a time interval to be activated on a daily or weekly basis. This is convenient to assign when a function should be automatically taken effect. Before using the function, make sure that gateway NTP time server is configured in **Time Server Configuration** (See [Section 4.3.4](#)). The PoE functions scheduled by Time Range will be executed when the system time of the Switch is synchronized with NTP time server.

Time Range		
Name	Time Range	Button
		Edit Delete
		Edit Delete
		Edit Delete
		Edit Delete
		Edit Delete
		Edit Delete
		Edit Delete
		Edit Delete
		Edit Delete
		Edit Delete

This table displays the overview of each configured time range. Up to 10 time ranges can be set up.

Name: Display the name of the specific time range.

Time Range: Display the time intervals you set up for the specific time range.

Click **Edit** and then the following screen page appears for the further time interval settings

Click **Delete** to remove a specified time range and its settings.

Time Range

Name

Absolute		Hour	Minute	Date	Month	Year	Click
	Start				JAN ▾		Reset
	End				JAN ▾		Reset

Periodic

New

Periodic-1	Hour	Minute	Date		Hour	Minute	Date	Click
	00	00	Sun ▾	to	00	00	Sun ▾	Reset Delete

Periodic List

New

Periodic List-1	Hour	Minute		Hour	Minute		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Click
	00	00	to	00	00		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Reset Delete

OK

Cancel

Name: Specify a name to the time interval. Up to 32 alphanumeric characters can be accepted.

Absolute: Specify an absolute start time or end time for a time interval for a PoE function. In this time interval setup, the valid range of each parameter is as follows:

Hour: 0-23, **Minute:** 0-59, **Date:** 1-31

Month:JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC

Year: 2000-2097

Note: No start time assigned refers to start immediately. One absolute start time can be set at most. No end time assigned refers to run a function continuously. One absolute end time can be set at most.

Periodic: Click **New** below **Periodic**, you can see a list for the Periodic interval settings. Specify a time interval for a PoE function on a weekly basis. The Periodic interval only takes effect within specified absolute time interval. Specify weekly recurring time interval. The other list for the Periodic interval settings will be seen by clicking **New** below **Periodic** again, if necessary. Two periodic intervals can be set up at most. In this time interval setup, the valid range of each parameter is as follows:

Hour: 0-23, **Minute:** 0-59,

Days(7 days): including Monday(Mon), Tuesday(Tue), Wednesday(Wed), Thursday(Thu), Friday(Fri), Saturday(Sat), Sunday(Sun).

Periodic List: Click **New** below **Periodic List**, you can see a list for the Periodic List interval settings. Specify a time interval for a PoE function on a daily basis. The Periodic List interval only takes effect within specified absolute interval. Specify a list of days in a week for periodic run. The other list for the Periodic List interval settings will be seen by clicking **New** below **Periodic List** again, if necessary. In this time interval setup, the valid range of each parameter is as follows:

Hour: 0-23, **Minute:** 0-59

Days(7 days): Monday(Mon), Tuesday(Tue), Wednesday(Wed), Thursday(Thu), Friday(Fri), Saturday(Sat), Sunday(Sun).

Cross-day setting is feasible. In other words, the second occurrence of time can be set on the following day, e.g. "22:00-2:00".

Note: *Two sets of periodic list intervals can be set up at most.*


Under a time range, user may add one absolute start time and one absolute end time at most. Users may also add two optional time ranges at most using Periodic and Periodic List time range.

For example, the user may set:

1. Two Periodics in a time range, or
2. One Periodic and one Periodic List in a time range, or
3. Two Periodic Lists in a time range.

4.3.6 Device Community

Click the option **Device Community** from the **Network Management** menu and then the following screen page appears.



Community	Description
public	Default_Account
admin	Default_Account

Click **New** to add a new community and then the following screen page appears. Up to 3 Device Communities can be created.

Click **Edit** to modify the current community settings.

Click **Delete** to remove a registered community.



Current/Total/Max Agents	3/ 2/ 3
Account State	Disabled ▼
Community	<input type="text"/>
Description	<input type="text"/>
SNMP Level	Read Only ▼

Current/Total/Max Agents: View-only field.

Current: This shows the number of current registered community.

Total: This shows the amount of total registered communities.

Max Agents: This shows the maximum communities are available for registration. The maximum number is 3.

Account State: Enable or disable this Community Account.

Community: Specify the authorized SNMP community name, up to 20 alphanumeric characters.

Description: Enter a unique description for this community name. Up to 35 alphanumeric characters can be accepted. This is mainly for reference only.

SNMP Level: Click the pull-down menu to select the desired privilege for the SNMP operation.

NOTE: When the community browses the Managed Industrial PoE Ethernet Switch without proper access right, the Managed Industrial PoE Ethernet Switch will not respond. For example, if a community only has Read & Write privilege, then it cannot browse the Managed Industrial PoE Ethernet Switch's user table.

4.3.7 SNMPv3 USM User

Simple Network Management Protocol Version 3, SNMPv3 in short, features stronger security mechanism, including authentication and encryption that helps ensure that the message is from a valid source and scramble the content of a packet, to prevent from being learned by an unauthorized source. Select the option **SNMPv3 USM User** from the **Network Management** menu, then the the following screen page shows up. Click **Edit** for further settings.

Note: The SNMPv3 user account is generated from "User Authentication". (Refer to Section 4.2)

SNMPv3 USM User		
UserName	Authentication	Private
admin	None	None

Edit

SNMPv3 USM User	
Current/Total/Max Agents	1/ 1/10
Account State	Enabled
UserName	admin
Authentication	None ▼
Auth-Password	<input type="text"/>
Private	None ▼
Priv-Password	<input type="text"/>
SNMP Level	Administrator

OK

Current/Total/Max Agents: View-only field.

Current: This shows the number of current registered community.

Total: This shows the amount of total registered communities.

Max Agents: This shows the maximum number available for registration. The maximum number is 10.

Account State: View-only field that shows this user account is enabled or disabled.

User Name: View-only field that shows the authorized user login name.

Authentication: This is used to ensure the identity of users. The following is the method to perform authentication.

None: Disable authentication function. Click “None” to disable it.

MD5(Message-Digest Algorithm): A widely used [cryptographic hash function](#) producing a 128-bit (16-byte) [hash value](#), typically expressed in text format as a 32-digit [hexadecimal](#) number. Click “MD5” to enable this authentication.

SHA(Secure Hash Algorithm): A 160-bit hash function which resembles the said [MD5](#) algorithm. Click “SHA” to enable this authentication.

Auth-Password: Specify the passwords, up to 20 characters.

Private: It allows for encryption of SNMP v3 messages to ensure confidentiality of data. The following is the method to perform encryption.

None: Disable Private function. Click “None” to disable it.

DES (Data Encryption Standard): An algorithm to encrypt critical information such as message text message signatures...,etc. Click “DES” to enable it.

Priv-Password: Specify the passwords, up to 20 characters.

SNMP-Level: View-only field that shows user's authentication level.

Administrator: Own the full-access right, including maintaining user account & system information, load factory settings ...etc.

Read & Write: Own the full-access right but cannot modify user account & system information, cannot load factory settings.

Read Only: Allow to view only.

A combination of a security event shown as below indicates which security mechanism is used when handling an SNMP packet.

Authentication	Private	Result
None	None	Uses a username match for authentication
Message Digest Algorithm(MD5) or Secure Hash Algorithm(SHA)	None	Provides authentication based on the Hashed Message Authentication Code(HMAC)-MD5 or HMAC-SHA algorithms.
MD5 or SHA	Data Encryption Standard(DES)	Provides authentication based on the Hashed Message Authentication Code(HMAC)-MD5 or HMAC-SHA algorithms. What's more, provides DES 56-bit encryption based on the Cipher Block Chaining (CBC)-DES standard.

4.3.8 Trap Destination

Click the option **Trap Destination** from the **Network Management** menu and then the following screen page appears.

Trap Destination

Index	State	Destination	Community
1	Disabled ▾	0.0.0.0	
2	Disabled ▾	0.0.0.0	
3	Disabled ▾	0.0.0.0	

OK

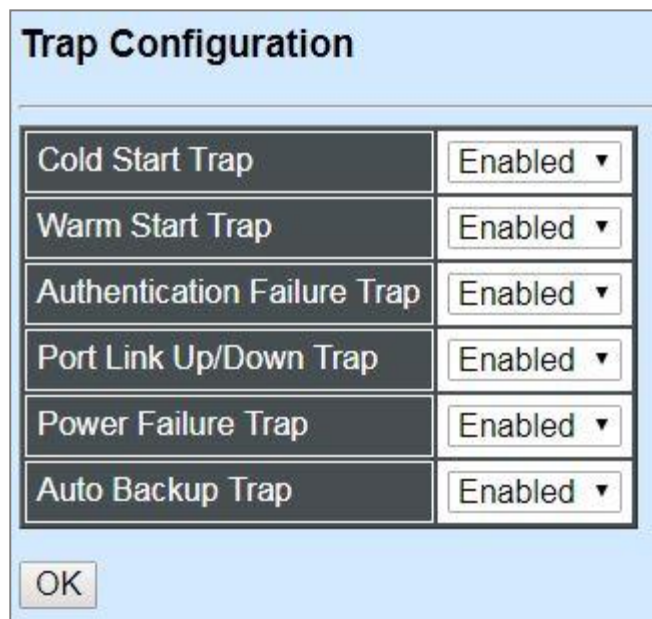
State: Enable or disable the function of sending trap to the specified destination.

Destination: Enter the specific IP address of the network management system that will receive the trap.

Community: Enter the description for the specified trap destination.

4.3.9 Trap Configuration

Click the option **Trap Configuration** from the **Network Management** menu and then the following screen page appears.



The image shows a 'Trap Configuration' dialog box with a light blue header and a white body. Inside, there is a table with six rows. Each row has a trap name on the left and a status dropdown menu on the right. All dropdown menus are currently set to 'Enabled'. At the bottom left of the dialog is an 'OK' button.

Trap Configuration	
Cold Start Trap	Enabled ▼
Warm Start Trap	Enabled ▼
Authentication Failure Trap	Enabled ▼
Port Link Up/Down Trap	Enabled ▼
Power Failure Trap	Enabled ▼
Auto Backup Trap	Enabled ▼

OK

Cold Start Trap: Enable or disable the Managed Industrial PoE Ethernet Switch to send a trap when the Managed Industrial PoE Ethernet Switch is turned on.

Warm Start Trap: Enable or disable the Managed Industrial PoE Ethernet Switch to send a trap when the Managed Industrial PoE Ethernet Switch restarts.

Authentication Failure Trap: Enable or disable the Managed Industrial PoE Ethernet Switch to send authentication failure trap after any unauthorized users attempt to login.

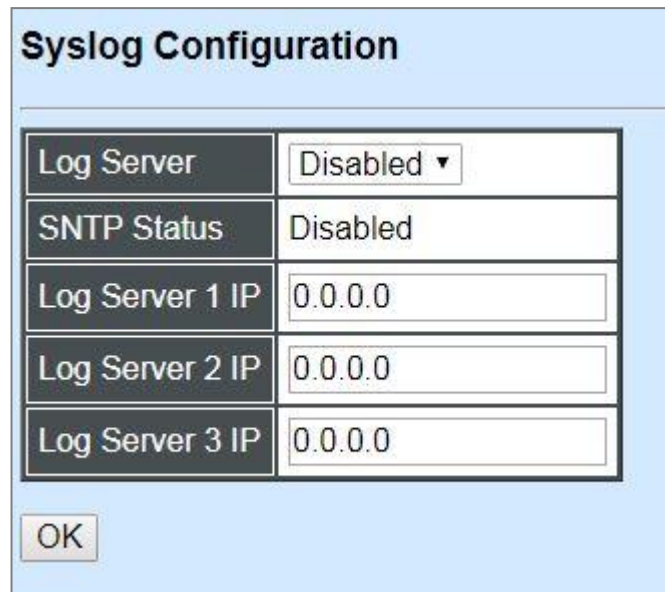
Port Link Up/Down Trap: Enable or disable the Managed Industrial PoE Ethernet Switch to send port link up/link down trap.

Power Failure Trap: Enable or disable the Managed Industrial PoE Ethernet Switch to send a trap when the power 1/2 failure occurs or power it/them on again.

Auto Backup Trap: Enable or disable the Managed Industrial PoE Ethernet Switch to send a trap when the auto backup succeeds or fails.

4.3.10 Syslog Configuration

Click the option **Syslog Configuration** from the **Network Management** menu and then the following screen page appears.



The image shows a 'Syslog Configuration' dialog box with a light blue header and a white body. Inside the body, there is a table with five rows. The first row has 'Log Server' and a dropdown menu showing 'Disabled'. The second row has 'SNTP Status' and a text field showing 'Disabled'. The third row has 'Log Server 1 IP' and a text field showing '0.0.0.0'. The fourth row has 'Log Server 2 IP' and a text field showing '0.0.0.0'. The fifth row has 'Log Server 3 IP' and a text field showing '0.0.0.0'. Below the table is an 'OK' button.

Syslog Configuration	
Log Server	Disabled ▼
SNTP Status	Disabled
Log Server 1 IP	0.0.0.0
Log Server 2 IP	0.0.0.0
Log Server 3 IP	0.0.0.0

OK

When DHCP snooping filters unauthorized DHCP packets on the network, the mal-attempt log will allow the Managed Industrial PoE Ethernet Switch to send event notification message to Log server.

Log Server: Enable or disable mal-attempt log function.

SNTP Status: View-only field that shows the SNTP server status.

Log Server 1 IP: Specify the default Log server IP address.

Log Server 2 IP: Specify the secondary Log server IP address. When the default Log Server is down, the Managed Industrial PoE Ethernet Switch will automatically contact the second or third Log server.

Log Server 3 IP: Specify the third Log server IP address. When the default Log Server is down, the Managed Industrial PoE Ethernet Switch will automatically contact the secondary or third Log server.

4.4 Switch Management

In order to manage the Managed Industrial PoE Ethernet Switch and set up required switching functions, click the folder **Switch Management** from the **Main Menu** and then several options and folders will be displayed for your selection.

IPS-3110-PB

- System Information
- User Authentication
- Network Management
 - Switch Management**
 - Switch Configuration
 - Broadcast Storm Control
 - Port Configuration
 - Rate Limit Configuration
 - QoS Priority Configuration
 - Link Aggregation
 - Rapid Spanning Tree
 - 802.1X Configuration
 - Static MAC Table Configuration
 - VLAN Configuration
 - Mirroring Configuration
 - IGMP Snooping
 - LLDP Configuration
 - Loop Detection
 - Ring Detection
 - PoE Configuration
 - DHCP Snooping

Switch Configuration

MAC Address Aging Time	300	(4-900)Secs
SFP Polling	Enabled ▼	
Statistics Polling	Enabled ▼	

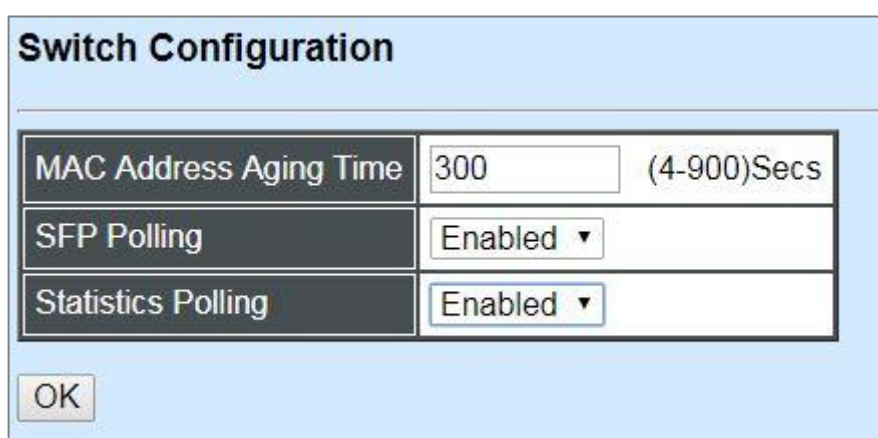
OK

1. **Switch Configuration:** Set up frame size, address learning, etc.
2. **Broadcast Storm Control:** To prevent the Managed Industrial PoE Ethernet Switch from broadcast storm.
3. **Port Configuration:** Enable or disable port speed, flow control, etc.
4. **Rate Limit Configuration:** To configure each port's Ingress and Egress Rate.
5. **QoS Priority Configuration:** Set up the priority mode, priority queuing, rate limit, and so on.
6. **Link Aggregation:** Set up port trunk and LACP port configuration.
7. **Rapid Spanning Tree:** Set up RSTP switch settings, aggregated port settings, physical port settings, etc.
8. **802.1X Configuration:** Set up the 802.1X system, port Admin state, port reauthenticate.
9. **Static MAC Table Configuration:** Create or delete Static MAC Table setting.
10. **VLAN Configuration:** Set up VLAN mode, VLAN configuration and VLAN translation.

- 11. Mirroring Configuration:** Set up the source port(s) to mirror to the destination port for traffic monitoring.
- 12. IGMP Snooping:** Configuring IGMP Snooping parameters.
- 13. LLDP Configuration:** Enable or disable LLDP on ports and set up LLDP-related attributes.
- 14. Loop Detection Configuration:** Enable or disable Loop Detection function and set up Loop Detection configuration.
- 15. Ring Detection:** CTS Fast-Ring provides ring protection and sub-50ms failover time for Ethernet traffic. At the same time, it ensures there is no loops formed within the ring at the Ethernet layer. CTS Fast-Ring supports a single ring topology.
- 16. PoE Configuration:** Set up the power supply method for PDs connected to the Managed Switch.
- 17. DHCP Snooping:** Customer port filtering setting.

4.4.1 Switch Configuration

Click the option **Switch Configuration** from the **Switch Management** menu and then the following screen page appears.



The image shows a 'Switch Configuration' dialog box with a light blue header and a white body. It contains three rows of configuration options, each with a dark grey label and a white input field. The first row is 'MAC Address Aging Time' with a text input containing '300' and a unit '(4-900)Secs'. The second row is 'SFP Polling' with a dropdown menu showing 'Enabled'. The third row is 'Statistics Polling' with a dropdown menu showing 'Enabled'. At the bottom left is an 'OK' button.

Switch Configuration	
MAC Address Aging Time	300 (4-900)Secs
SFP Polling	Enabled ▼
Statistics Polling	Enabled ▼
OK	

MAC Address Aging Time: Specify MAC Address aging time between 4 and 900 seconds.

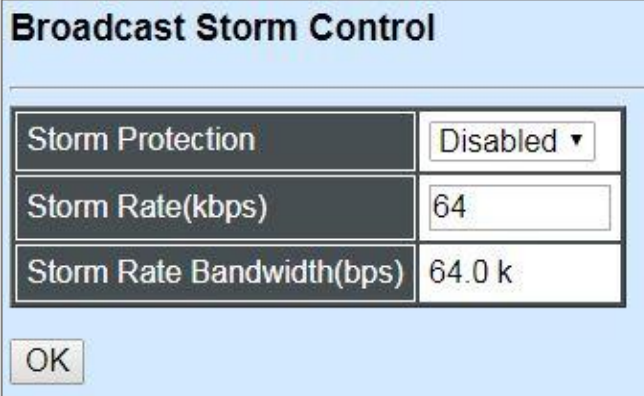
SFP Polling: Enable or disable to poll SFP information.

Statistics Polling: Enable or disable to poll the statistics of each port.

For more details on the data statistics, you may refer to Section 4.5.2 and 4.5.3 in this manual.

4.4.2 Broadcast Storm Control

Select the option **Broadcast Storm Control** from the **Switch Management** menu to set up storm control parameters for each port and then the following screen page appears.



The image shows a configuration window titled "Broadcast Storm Control". It contains three rows of settings. The first row has a label "Storm Protection" and a dropdown menu set to "Disabled". The second row has a label "Storm Rate(kbps)" and a text input field containing "64". The third row has a label "Storm Rate Bandwidth(bps)" and a text input field containing "64.0 k". At the bottom left of the window is an "OK" button.

Broadcast Storm Control	
Storm Protection	Disabled ▼
Storm Rate(kbps)	64
Storm Rate Bandwidth(bps)	64.0 k
OK	

When a device on the network is malfunctioning or application programs are not well designed or properly configured, broadcast storms may occur, network performance may be degraded or, in the worst situation, a complete halt may happen. The Managed PoE Switch allows users to set a threshold rate for broadcast traffic on a per switch basis so as to protect network from broadcast storms. Any broadcast packets exceeding the specified value will then be dropped.

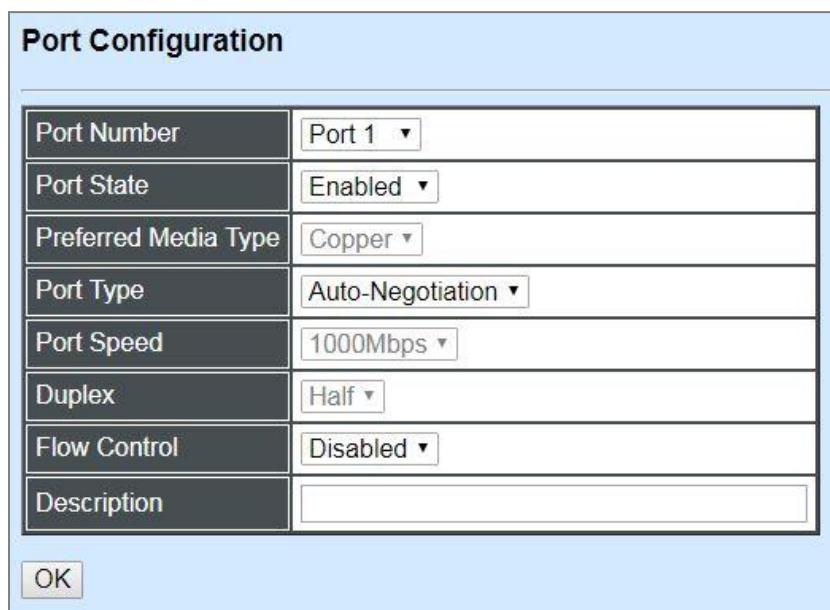
Storm Protection: Enable or disable the storm control function globally.

Storm Rate (kbps): Set up the broadcast rate in kbit per second (kbps) for each port. Valid range: 64~1000000kbps.

Storm Rate Bandwidth: View-only field. It shows the effective network bandwidth that the Managed PoE Switch currently uses in the data transmission.

4.4.3 Port Configuration

Click the option **Port Configuration** from the **Switch Management** menu and then the following screen page appears.



The image shows a 'Port Configuration' dialog box with a light blue header and a white body. It contains a table with eight rows, each with a label on the left and a control on the right. The controls are dropdown menus for the first seven rows and a text input for the last. An 'OK' button is at the bottom left.

Port Configuration	
Port Number	Port 1 ▾
Port State	Enabled ▾
Preferred Media Type	Copper ▾
Port Type	Auto-Negotiation ▾
Port Speed	1000Mbps ▾
Duplex	Half ▾
Flow Control	Disabled ▾
Description	<input type="text"/>
<input type="button" value="OK"/>	

Port Number: Click the pull-down menu to select the port number for configuration.

Port State: Enable or disable the current port state.

Preferred Media Type: Select copper or fiber as the preferred media type. Or the device will detect it automatically if “Auto-Media” is chosen for Port 9~10.

Port Type: Select Auto-Negotiation or Manual mode as the port type.

Port Speed: When you select “Manual” as port type, you can further specify the transmission speed (10Mbps/100Mbps/1000Mbps) of TP 1~8 port(s). When you select “Auto-Negotiation” as port type for these TP port(s), the devices will automatically negotiate with each other and choose the highest performance transmission mode.

In Port 9~10, you also can further specify the transmission speed (100Mbps/1000Mbps) when you select “Fiber” as the preferred media type. The devices will automatically negotiate with each other and choose the highest performance transmission mode as well if “Copper” or “Auto-Media” is selected.

Duplex: In TP 1~8 port(s) with 10Mbps/100Mbps/1000Mbps port speed and select “Manual” as port type, you can further specify the current operation Duplex mode (full or half duplex) of the port(s).

Flow Control: Enable or disable the flow control.

Description: Enter a unique description for the port. Up to 35 alphanumeric characters can be accepted.

4.4.4 Rate Limit Configuration

Select the option **Rate Limit Configuration** from the **Switch Management** menu and then the following screen page appears. From this function, you are allowed to configure each port's Ingress and Egress Rate.

Rate Limit Configuration										
Port Number	1	2	3	4	5	6	7	8	9	10
Ingress Rate	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼
Ingress Limiter(kbps)	64	64	64	64	64	64	64	64	64	64
Ingress Bandwidth(bps)	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k
Egress Rate	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼	Off ▼
Egress Limiter(kbps)	64	64	64	64	64	64	64	64	64	64
Egress Bandwidth(bps)	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k	64.0 k

Note: 10M = 10000, 100M = 100000, 1G = 1000000

OK

Ingress Rate: Activate or deactivate the Ingress Rate function of each port.

Ingress Limiter (kbps)Rate:

This allows users to specify each port's inbound rate limit. The excess traffic will be dropped. Specifying "0" is to disable this function. Valid range: 64~1000000kbps.

Ingress Bandwidth(bps): View-only field. It shows each port's effective inbound bandwidth that the Managed PoE Switch currently uses in the data transmission.

Egress Rate: Activate or deactivate the Egress Rate function of each port.

Egress Limiter (kbps)Rate:

This allows users to specify each port's outbound rate limit. The excess traffic will be dropped. Specifying "0" is to disable this function. Valid range: 64~1000000kbps.

Egress Bandwidth(bps): View-only field. It shows each port's effective outbound bandwidth that the Managed PoE Switch currently uses in the data transmission.

4.4.5 QoS Priority Configuration

Network traffic is always unpredictable and the only basic assurance that can be offered is the best effort traffic delivery. To overcome this challenge, Quality of Service (QoS) is applied throughout the network. This ensures that network traffic is prioritized according to specified criteria and receives preferential treatments.

QoS enables you to assign various grades of network service to different types of traffic, such as multi-media, video, protocol-specific, time critical, and file-backup traffic. To set up each port's QoS default class, Priority, Queuing Mode, Queue Weighted and Remarking in the Managed Industrial PoE Ethernet Switch, click the option **QoS Priority Configuration** from the **Switch Management** menu and then the following screen page appears.

QoS Priority Configuration

QoS Priority:

Priority Mode	Disable ▾							
Queue Mode	Strict ▾							
Queue Weight(Q0:Q1:Q2:Q3:Q4:Q5:Q6:Q7)	1	2	3	4	5	6	7	8
802.1p Priority Map	0 ▾						Q0 ▾	
DSCP Priority Map	DSCP(0) ▾						Q0 ▾	

Note: Uses 802.1p priority mode must select 802.1Q vlan mode.

User Priority:

Port Number	1	2	3	4	5	6	7	8
Port Priority	0	0	0	0	0	0	0	0
Port Number	9		10		CPU			
Port Priority	0		0		0			

Remarking:

Remarking Mode	Disable ▾
----------------	-----------

Note: Remarking rule won't affect priority map rule.

OK

Priority Mode: Select the QoS priority mode of the Managed Industrial PoE Ethernet Switch.

IEEE 802.1p: IEEE 802.1p mode utilizes p-bits in VLAN tag for differential service.

DSCP: DSCP mode utilizes TOS field in IPv4 header for differential service.

Disable: Disable QoS.

NOTE: 802.1p priority mode only can be applied under 802.1q VLAN mode. For more details on 802.1q Tag VLAN Mode settings, please refer to Section [4.4.10.3.2](#).

Queue Mode: Specify the queue mode as Strict or Weight.

Strict: This indicates that services to the egress queues are offered in the sequential order and all traffic with higher priority queues is transmitted first before lower priority queues are serviced.

Weight: Weighted Round-Robin shares bandwidth at the egress ports by using scheduling weights 1, 2, 4, 8 for queues 1 through 4 respectively.

Queue Weight: Specify the Queue weight for each Queue.

802.1p Priority Map: Assign a value (0~7) to 8 different levels.

DSCP Priority Map: Assign a value (0~63) to 64 different levels.

User Priority:

User Priority:								
Port Number	1	2	3	4	5	6	7	8
Port Priority	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>
Port Number	9		10		CPU			
Port Priority	<input type="text" value="0"/>		<input type="text" value="0"/>		<input type="text" value="0"/>			

There are eight priority levels that you can choose to classify data packets. Specify one of the listed options for CoS (Class of Service) priority tag values. The default value is “0”.

The default 802.1p settings are shown in the following table:

Priority Level	normal	low	low	normal	medium	Medium	High	high
802.1p Value	0	1	2	3	4	5	6	7

Remarking Mode: Include Disable, 802.1p Remarking and DSCP Remarking 3 remarking modes.

Configure 802.1p Remarking:

From the **Remarking Mode** pull-down menu and select **802.1p Remarking** to enable 802.1p remarking for the Managed PoE Switch.

Remarking Mode	802.1p Remarking ▼							
802.1p Remarking Map	Index	State	Rx-802.1p	New-802.1p	Index	State	Rx-802.1p	New-802.1p
	1	Disabled ▼	0	0 ▼	2	Disabled ▼	1	0 ▼
	3	Disabled ▼	2	0 ▼	4	Disabled ▼	3	0 ▼
	5	Disabled ▼	4	0 ▼	6	Disabled ▼	5	0 ▼
	7	Disabled ▼	6	0 ▼	8	Disabled ▼	7	0 ▼
Note: Remarking rule won't affect priority map rule.								

Configure DSCP Remarking:

From the **Remarking Mode** pull-down menu and select **DSCP Remarking** to enable DSCP remarking for the Managed PoE Switch.

Remarking Mode	DSCP Remarking ▼							
DSCP Remarking Map	Index	State	Rx-DSCP	New-DSCP	Index	State	Rx-DSCP	New-DSCP
	1	Disabled ▼	0	DSCP(0) ▼	2	Disabled ▼	1	DSCP(0) ▼
	3	Disabled ▼	2	DSCP(0) ▼	4	Disabled ▼	3	DSCP(0) ▼
	5	Disabled ▼	4	DSCP(0) ▼	6	Disabled ▼	5	DSCP(0) ▼
	7	Disabled ▼	6	DSCP(0) ▼	8	Disabled ▼	7	DSCP(0) ▼
Note: Remarking rule won't affect priority map rule.								

4.4.6 Link Aggregation

Link aggregation is an inexpensive way to set up a high-speed backbone network that transfers much more data than any one single port or device can deliver without replacing everything and buying new hardware.

For most backbone installations, it is common to install more cabling or fiber optic pairs than initially necessary, even if there is no immediate need for the additional cabling. This action is taken because labor costs are higher than the cost of the cable and running extra cable reduces future labor costs if networking needs changes. Link aggregation can allow the use of these extra cables to increase backbone speeds with little or no extra cost if ports are available.

This Managed Industrial PoE Ethernet Switch supports 2 link aggregation modes: static **Port Trunk** and dynamic **Link Aggregation Control Protocol (LACP)** using the IEEE 802.3ad standard. These allow several devices to communicate simultaneously at their full single-port speed while not allowing any one single device to occupy all available backbone capacities.

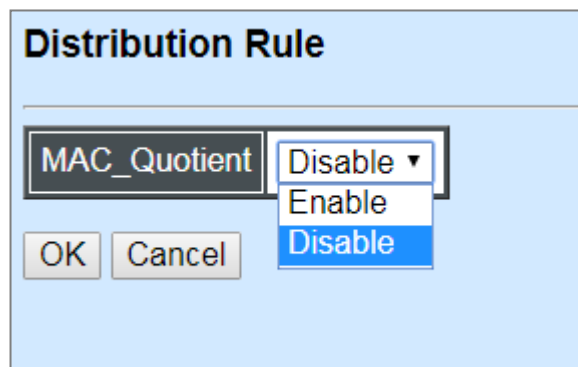
Click **Link Aggregation** folder from the **Switch Management** menu and then three options within this folder will be displayed.



1. **Distribution Rule:** Configure the distribution rule of Port Trunking group(s).
2. **Port Trunking:** Create, edit or delete port trunking group(s).
3. **LACP Port Configuration:** Set up the configuration of LACP on all or some ports.

4.4.6.1 Distribution Rule

Click the option **Distribution Rule** from the **Link Aggregation** menu, the following screen page appears.



MAC_Quotient: Enable or disable distributing packets according to the MAC address by clicking the pull-down menu of **MAC_Quotient**. Click **OK**, the new settings will be taken effect immediately.

1. Identifying MAC

It checks the last three bits of Source MAC and Dst. MAC and XOR algorithm distributes them.

XOR Algorithm:

$0 \& 0 = 0$

$0 \& 1 = 1$

$1 \& 0 = 1$

$1 \& 1 = 0$

Three bits results in eight combinations (0~7), it is used to determine which packet should be sent to.

Example:

Source MAC 11:22:33:44:55:66

⤴ The last digit 6 occupies 4 bits (Use the last three bits \Rightarrow 0100)

Dst. MAC 33:44:55:66:77:88

⤴ The last digit 8 occupies 4 bits (Use the last three bits \Rightarrow 1000)

XOR Algorithm:

Src. MAC – 1 1 0

Dst. MAC – 0 0 0

Result – 1 1 0 = 6

2. MAC Quotient Distribution

Example 1:

Assume that 2 ports are aggregated,

$8(\text{bit})/2(\text{port}) = 4$ (Integer) \Rightarrow each port is evenly distributed 4 types of bit

$8(\text{bit})/2(\text{port}) = 0$ (Remainder) \Rightarrow The first ports will be distributed extra bits, if any

If enabled:

Port 1 will get 4 bits \Rightarrow 0, 1, 2, 3

Port 2 will get 4 bits \Rightarrow 4, 5, 6, 7

Example 2:

Assume that 3 ports are aggregated,

$8(\text{bit})/2(\text{port}) = 2$ (Integer) \Rightarrow each port is distributed 2 types of bit at least

$8(\text{bit})/2(\text{port}) = 2$ (Remainder) \Rightarrow The first two ports will be additionally gotten 1 bit respectively

If enabled:

Port 1 will get 3 bits \Rightarrow 0, 1, 2

Port 2 will get 3 bits \Rightarrow 3, 4, 5

Port 3 will get 2 bits \Rightarrow 6, 7

Example 3:

Assume that 6 ports are aggregated,

$8(\text{bit})/6(\text{port}) = 1 \text{ (Integer)} \Rightarrow$ each port is distributed 1 type of bit at least

$8(\text{bit})/6(\text{port}) = 2 \text{ (Remainder)} \Rightarrow$ The first two ports will be additionally gotten 1 bit respectively

If enabled:

Port 1 will get 2 bits \Rightarrow 0, 1

Port 2 will get 2 bits \Rightarrow 2, 3

Port 3 will get 1 bit \Rightarrow 4

Port 4 will get 1 bit \Rightarrow 5

Port 5 will get 1 bit \Rightarrow 6

Port 6 will get 1 bit \Rightarrow 7

3. Disabling MAC Quotient

If MAC Quotient is disabled, 8 types of bit are distributed in another way.

Example 1:

Assume that 2 ports are aggregated,

Port 1 will get 4 bits \Rightarrow 0, 2, 4, 6

Port 2 will get 4 bits \Rightarrow 1, 3, 5, 7

Example 2:

Assume that 3 ports are aggregated,

Port 1 will get 3 bits \Rightarrow 0, 3, 6

Port 2 will get 3 bits \Rightarrow 1, 4, 7

Port 3 will get 2 bits \Rightarrow 2, 5

4.4.6.2 Port Trunking

Click the option **Port Trunking** from the **Link Aggregation** menu and then the following screen page appears.



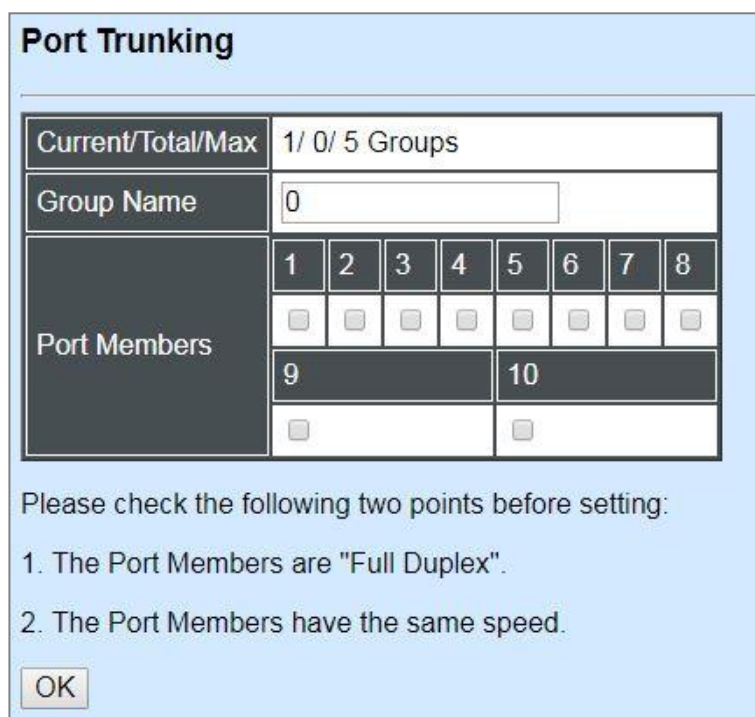
The screenshot shows a window titled "Port Trunking". Inside, there is a header "Group Name" followed by ten numbered buttons (1 through 10). Below these buttons are three buttons: "Edit", "New", and "Delete".

The Managed Industrial PoE Ethernet Switch allows users to create 5 trunking groups. Each group consists of 2 to 6 links (ports).

Click **New** to add a new trunking group and then the following screen page appears.

Click **Edit** to modify a registered trunking group's settings.

Click **Delete** to remove a specified registered trunking group and its settings.



The screenshot shows a window titled "Port Trunking" with a configuration form. The form has the following fields:

- Current/Total/Max**: 1/ 0/ 5 Groups
- Group Name**: 0
- Port Members**: A grid of 10 checkboxes, numbered 1 through 10. The first row contains checkboxes 1 through 8, and the second row contains checkboxes 9 and 10.

Below the form, there is a text box with the following instructions:

Please check the following two points before setting:

1. The Port Members are "Full Duplex".
2. The Port Members have the same speed.

At the bottom of the form is an "OK" button.

Current/Total/Max Groups: View-only field.

Current: This shows the number of current registered group.

Total: This shows the amount of total registered groups.

Max: This shows the maximum number available for registration. The maximum number is 5.

Group Name: Specify the trunking group name, up to 15 alphanumeric characters.

Port Members: Select ports that belong to the specified trunking group. Please keep the rules below in mind when assigning ports to a trunking group.

- Must have 2 to 6 ports in each trunking group.
- Each port can only be grouped in one group.
- If the port is already enabled in LACP Port Configuration, it cannot be grouped anymore.

Click **OK** and return to **Link Aggregation** menu.

NOTE: All trunking ports in the group must be members of the same VLAN, and their Spanning Tree Protocol (STP) status and QoS default priority configurations must be identical. Port locking, port mirroring and 802.1X cannot be enabled on the trunk group. Furthermore, the LACP aggregated links must all be of the same speed and should be configured as full duplex.

4.4.6.3 LACP Port Configuration

The Managed Industrial PoE Ethernet Switch supports dynamic Link Aggregation Control Protocol (LACP) which is specified in IEEE 802.3ad. Static trunks have to be manually configured at both ends of the link. In other words, LACP configured ports can automatically negotiate a trunked link with LACP configured ports on other devices. You can configure any number of ports on the Managed Industrial PoE Ethernet Switch as LACP, as long as they are not already configured as part of a static trunk. If ports on other devices are also configured as LACP, the Managed Industrial PoE Ethernet Switch and the other devices will negotiate a trunk link between them. If an LACP trunk consists of more than four ports, all other ports will be placed in a standby mode. Should one link in the trunk fail, one of the standby ports will automatically be activated to replace it.

Click the option **LACP Port Configuration** from the **Link Aggregation** menu and then the screen page is shown below. It is necessary to set up both “Key Value” and “Role” two options from the pull-down menu of Select Setting for the designated ports when creating a LACP(dynamic Link Aggregation) group. For more details on these settings, please refer to the following description in this section.

LACP Port Configuration

Select Setting: Key Value ▼

Port Key Value: Key Value

Role: Role

1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0
9				10			
0				0			

OK

Configure Key Value:

Select “Key Value” from the pull-down menu of Select Setting.

The dialog box is titled "LACP Port Configuration". It features a "Select Setting" dropdown menu with "Key Value" selected. Below this is a section labeled "Port Key Value" containing a table with 10 columns (numbered 1-10) and two rows of input fields. Each input field contains the value "0". At the bottom left is an "OK" button.

1	2	3	4	5	6	7	8	
0	0	0	0	0	0	0	0	
9				10				
0				0				

Ports in an aggregated link group must have the same LACP port key. In order to allow a port to join an aggregated group, the port key must be set to the same value. The range of key value is between 0 and 255. When key value is set to 0, the port key is automatically set by the Managed Industrial PoE Ethernet Switch.

Configure Port Role:

Select “Role” from the pull-down menu of Select Setting. This allows LACP to be enabled (active or passive) or disabled on each port.

The dialog box is titled "LACP Port Configuration". It features a "Select Setting" dropdown menu with "Role" selected. Below this is a section labeled "Port Role" containing a table with 10 columns (numbered 1-10) and two rows of dropdown menus. Each dropdown menu is set to "Disable". At the bottom left is an "OK" button.

1	2	3	4	5	6	7	8	
Disable	Disable	Disable	Disable	Disable	Disable	Disable	Disable	
9				10				
Disable				Disable				

“Disable” Port Role: Disable LACP on specified port(s).

“Active” Port Role: Active LACP ports are capable of processing and sending LACP control frames. This allows LACP compliant devices to negotiate the aggregated link so that the group may be changed dynamically as required. In order to utilize the ability to change an aggregated port group, that is, to add or remove ports from the group, at least one of the participating devices must designate LACP ports as active. Both devices must support LACP.

“Passive” Port Role: LACP ports that are designated as passive cannot initially send LACP control frames. In order to allow the linked port group to negotiate adjustments and make changes dynamically, one end of the connection must have “active” LACP ports.

4.4.7 Rapid Spanning Tree

The Spanning Tree Protocol (STP), defined in the IEEE Standard 802.1D, creates a spanning tree within a mesh network of connected layer-2 bridges (typically Ethernet switches) and disables the links which are not part of that tree, leaving a single active path between any two network nodes.

Multiple active paths between network nodes cause a bridge loop. Bridge loops create several problems. First, the MAC address table used by the switch or bridge can fail, since the same MAC addresses (and hence the same network hosts) are seen on multiple ports. Second, a broadcast storm occurs. This is caused by broadcast packets being forwarded in an endless loop between switches. A broadcast storm can consume all available CPU resources and bandwidth.

Spanning tree allows a network design to include spare (redundant) links to provide automatic backup paths if an active link fails, without the danger of bridge loops, or the need for manually enabling/disabling these backup links.

To provide faster spanning tree convergence after a topology change, an evolution of the Spanning Tree Protocol: Rapid Spanning Tree Protocol (RSTP), introduced by IEEE with document 802.1w. RSTP, is a refinement of STP; therefore, it shares most of its basic operation characteristics. This essentially creates a cascading effect away from the root bridge where each designated bridge proposes to its neighbors to determine if it can make a rapid transition. This is one of the major elements which allows RSTP to achieve faster convergence times than STP.

Click the folder **Rapid Spanning Tree** from the **Switch Management** menu and then three options within this folder will be displayed as follows.

The screenshot displays a network management interface for a device labeled "IPS-3110-PB". On the left, a tree view shows the configuration hierarchy: "System Information", "User Authentication", "Network Management", "Switch Management", "Switch Configuration", "Broadcast Storm Control", "Port Configuration", "Rate Limit Configuration", "QoS Priority Configuration", "Link Aggregation", "Rapid Spanning Tree" (highlighted), "RSTP Switch Settings", "RSTP Aggregated Port Settings", "RSTP Physical Port Settings", "802.1X Configuration", and "Static MAC Table Configuration". On the right, the "RSTP Switch Settings" configuration window is open, showing a table of settings:

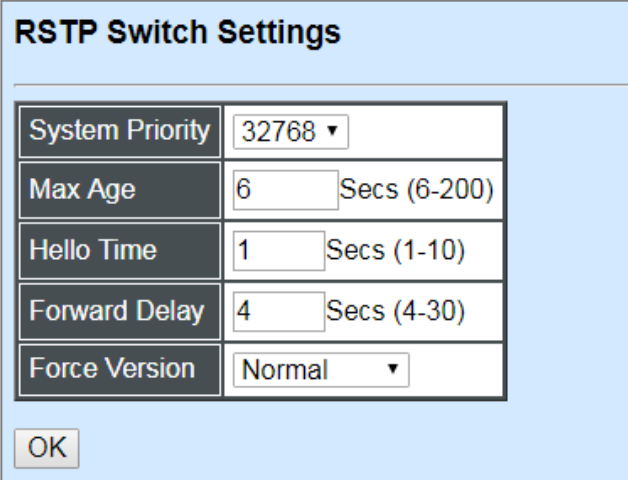
System Priority	32768 ▼
Max Age	6 Secs (6-200)
Hello Time	1 Secs (1-10)
Forward Delay	4 Secs (4-30)
Force Version	Normal ▼

Below the table is an "OK" button.

1. **RSTP Switch Settings:** Set up the system priority, max Age, hello time, forward delay time and force version.
2. **RSTP Aggregated Port Settings:** Set up the RSTP state, path cost, priority, edge status, and point to point setting of aggregated groups.
3. **RSTP Physical Port Settings:** Set up the RSTP state, path cost, priority, edge status, and point to point setting of each physical port.

4.4.7.1 RSTP Switch Settings

Click the option **RSTP Switch Settings** from the **Rapid Spanning Tree** menu and then the following screen page appears.



The screenshot shows a configuration window titled "RSTP Switch Settings". It contains a table with five rows of settings, each with a label, a value field, and a range in parentheses. Below the table is an "OK" button.

RSTP Switch Settings		
System Priority	32768 ▼	
Max Age	6	Secs (6-200)
Hello Time	1	Secs (1-10)
Forward Delay	4	Secs (4-30)
Force Version	Normal ▼	

OK

System Priority: Each interface is associated with a port (number) in the STP code. And, each switch has a relative priority and cost that is used to decide what the shortest path is to forward a packet. The lowest cost path is always used unless the other path is down. If you have multiple bridges and interfaces then you may need to adjust the priority to achieve optimized performance.

The Managed Industrial PoE Ethernet Switch with the lowest priority will be selected as the root bridge. The root bridge is the “central” bridge in the spanning tree.

Max Age: If another switch in the spanning tree does not send out a hello packet for a long period of time, it is assumed to be disconnected. The default Max. Age is 6 seconds.

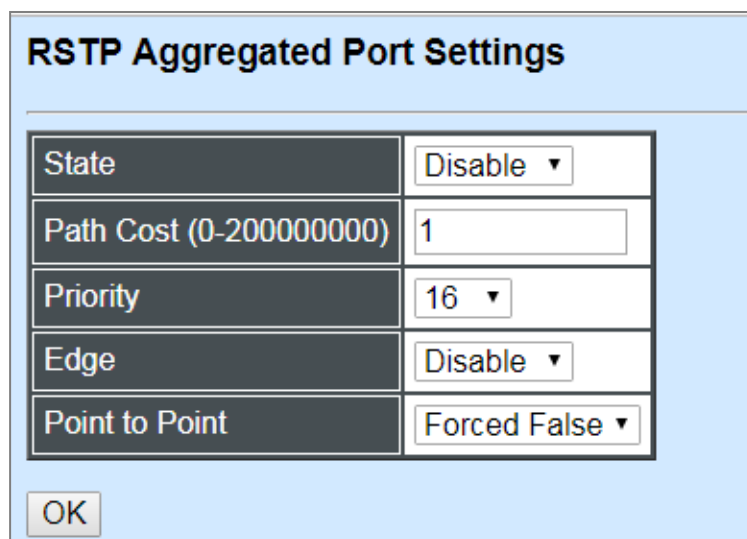
Hello Time: Periodically, a hello packet is sent out by the Root Bridge and the Designated Bridges that are used to communicate information about the topology throughout the entire Bridged Local Area Network.

Forward Delay: It is the time spent in each Listening and Learning state before the Forwarding state is entered. This delay occurs when a new bridge comes onto a busy network.

Force Version: Set and show the RSTP protocol to be used. Normal - use RSTP, Compatible - compatible with STP.

4.4.7.2 RSTP Aggregated Port Settings

Click the option **RSTP Aggregated Port Settings** from the **Rapid Spanning Tree** menu and then the following screen page appears.



RSTP Aggregated Port Settings	
State	Disable ▾
Path Cost (0-200000000)	1
Priority	16 ▾
Edge	Disable ▾
Point to Point	Forced False ▾
<input type="button" value="OK"/>	

State: Enable or disable configured trunking groups in RSTP mode.

Path Cost: This parameter is used by the RSTP to determine the best path between devices. Therefore, lower values should be assigned to ports attached to faster media, and higher values assigned to ports with slower media. “0” means auto-generated path cost.

Priority: Choose a value between 0 and 240 to set the priority for the port interface. A higher priority will designate the interface to forward packets first. A lower number denotes a higher priority.

Edge: If you know a port is directly connected to an end device (that doesn't support RSTP) then set it as an edge port to ensure maximum performance. This will tell the switch to immediately start forwarding traffic on the port and not bother trying to establish a RSTP connection. Otherwise, turn it off.

Point to Point:

Forced True: indicates a point-to-point (P2P) shared link. P2P ports are similar to edge ports; however, they are restricted in that a P2P port must operate in full duplex. Similar to edge ports, P2P ports transit to a forwarding state rapidly thus benefiting from RSTP.

Forced False: the port cannot have P2P status.

Auto: allows the port to have P2P status whenever possible and operates as if the P2P status were true. If the port cannot maintain this status, (for example if the port is forced to half-duplex operation) the P2P status changes to operate as if the P2P value were false. The default setting for this parameter is true.

4.4.7.3 RSTP Physical Port Settings

Click the option **RSTP Physical Port Settings** from the **Rapid Spanning Tree** menu and then the following screen page appears.

Configure Port State:

Select “State” from the pull-down menu of Select Setting.

The dialog box is titled "RSTP Physical Port Settings". It contains a "Select Setting" button and a pull-down menu currently set to "State". Below this is a section labeled "Port State" containing a table of 10 ports. Ports 1 through 8 are in a single row, and ports 9 and 10 are in a second row. Each port has a checkbox below its number. At the bottom of the dialog is an "OK" button.

1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9				10			
<input type="checkbox"/>				<input type="checkbox"/>			

This allows ports to be enabled or disabled. When clicking on the checkbox of the corresponding port number, RSTP will be enabled.

Configure Port Path Cost:

Select “Path Cost” from the pull-down menu of Select Setting.

The dialog box is titled "RSTP Physical Port Settings". It contains a "Select Setting" button and a pull-down menu currently set to "Path Cost". Below this is a section labeled "Port Path Cost(0-200000000)" containing a table of 10 ports. Ports 1 through 8 are in a single row, and ports 9 and 10 are in a second row. Each port has a text input field below its number, all containing the value "0". At the bottom of the dialog is an "OK" button.

1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0
9				10			
0				0			

This sets up the path cost of each port. The default value is “0”. “0” means auto-generated port path cost.

Configure Port Priority:

Select “Priority” from the pull-down menu of Select Setting.

The dialog box is titled "RSTP Physical Port Settings". It features a "Select Setting" button and a pull-down menu currently set to "Priority". Below this, the "Port Priority" section contains a table for configuring ports 1 through 10. Each port has a corresponding pull-down menu, all of which are currently set to "128". An "OK" button is located at the bottom left of the dialog.

1	2	3	4	5	6	7	8
128 ▼	128 ▼	128 ▼	128 ▼	128 ▼	128 ▼	128 ▼	128 ▼
9				10			
128 ▼				128 ▼			

You can choose Port Priority value between 0 and 240. The default value is “128”.

Configure Port Edge:

Select “Edge” from the pull-down menu of Select Setting.

The dialog box is titled "RSTP Physical Port Settings". It features a "Select Setting" button and a pull-down menu currently set to "Edge". Below this, the "Port Edge" section contains a table for configuring ports 1 through 10. Each port has a corresponding checkbox, all of which are currently unchecked. An "OK" button is located at the bottom left of the dialog.

1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9				10			
<input type="checkbox"/>				<input type="checkbox"/>			

Set the port to “enabled” or “disabled”. When clicking on the checkbox of the corresponding port number, Port Edge will be enabled.

Configure Port Point2point:

Select “Point2point” from the pull-down menu of Select Setting.

RSTP Physical Port Settings

Select Setting Point2point ▾

Port Point2point

1	2	3	4	5	6	7	8
Forced True ▾	Forced True ▾	Forced True ▾	Forced True ▾	Forced True ▾	Forced True ▾	Forced True ▾	Forced True ▾
9	10						
Forced True ▾	Forced True ▾						

OK

Set up the Point to Point setting of each port. The default setting is “Forced True”.

4.4.8 802.1X Configuration

The IEEE 802.1X standard provides a port-based network access control and authentication protocol that prevents unauthorized devices from connecting to a LAN through accessible switch ports. Before services are made available to clients connecting to a VLAN, clients that are 802.1X-complaint should successfully authenticate with the authentication server.

Initially, ports are in the authorized state which means that ingress and egress traffic are not allowed to pass through except 802.1X protocol traffic. When the authentication is successful with the authentication server, traffic from clients can flow normally through a port. If authentication fails, ports remain in unauthorized state but retries can be made until access is granted.

Click the folder **802.1X Configuration** from the **Switch Management** menu and then three options will be displayed as follows.

IPS-3110-PB

- System Information
- User Authentication
- Network Management
 - Switch Management
 - Switch Configuration
 - Broadcast Storm Control
 - Port Configuration
 - Rate Limit Configuration
 - QoS Priority Configuration
 - Link Aggregation
 - Rapid Spanning Tree
 - 802.1X Configuration**
 - 802.1X System Settings
 - 802.1X Port Admin State
 - 802.1X Port Reauthentication
 - Static MAC Table Configuration
 - VLAN Configuration
 - Mirroring Configuration
 - IGMP Snooping
 - LLDP Configuration
 - Loop Detection
 - Ring Detection
 - PoE Configuration
 - DHCP Snooping

802.1X System Configuration

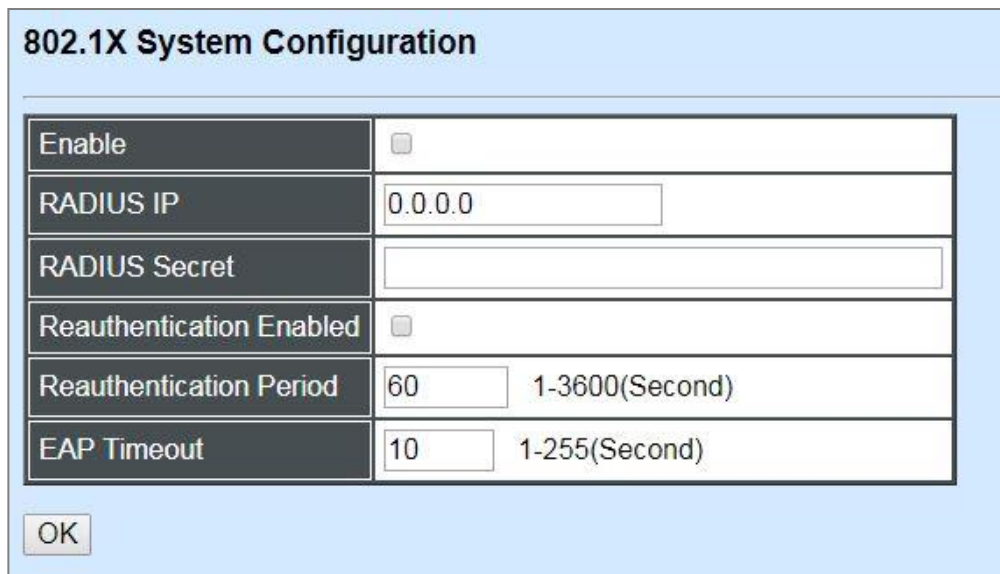
Enable	<input type="checkbox"/>
RADIUS IP	<input type="text" value="0.0.0.0"/>
RADIUS Secret	<input type="text"/>
Reauthentication Enabled	<input type="checkbox"/>
Reauthentication Period	<input type="text" value="60"/> 1-3600(Second)
EAP Timeout	<input type="text" value="10"/> 1-255(Second)

OK

1. **802.1X System Settings:** Set up system 802.1X RADIUS IP, RADIUS Secret, Reauthentication, EAP Timeout, and so on.
2. **802.1X Port Admin State:** Set up the port authorization state.
3. **802.1X Port Reauthenticate:** Set up the port reatentication.

4.4.8.1 802.1X System Settings

Click the option **802.1X System Settings** from the **802.1X Configuration** folder and then the following screen page appears.



The image shows a dialog box titled "802.1X System Configuration". It contains a table with the following settings:

Enable	<input type="checkbox"/>
RADIUS IP	0.0.0.0
RADIUS Secret	
Reauthentication Enabled	<input type="checkbox"/>
Reauthentication Period	60 1-3600(Second)
EAP Timeout	10 1-255(Second)

At the bottom left of the dialog box is an "OK" button.

Enable: Enable or disable 802.1X on the Managed Switch. When enabled, the Managed Switch acts as a proxy between the 802.1X-enabled client and the authentication server. In other words, the Managed Switch requests identifying information from the client, verifies that information with the authentication server, and relays the response to the client.

RADIUS IP: Specify RADIUS Authentication server address.

RADIUS Secret: The identification number assigned to each RADIUS authentication server with which the client shares a secret.

Reauthentication Enabled: Enable or disable Reauthentication.

Reauthentication Period(seconds): Specify a period of reauthentication time that a client authenticates with the authentication server.

EAP Timeout(seconds): Specify the time value in seconds that the Managed Switch will wait for a response from the authentication server to an authentication request.

4.4.8.2 802.1X Port Admin State

Click the option **802.1X Port Admin State** from the **802.1X Configuration** menu and then the following screen page appears.

1	2	3	4	5	6	7	8
Authorized ▾	Authorized ▾	Authorized ▾	Authorized ▾	Authorized ▾	Authorized ▾	Authorized ▾	Authorized ▾
9				10			
Authorized ▾				Authorized ▾			

OK

Admin state: Include Authorized, Unauthorized and Auto 3 options for the user to set up the port authorization state for each port. Each state is described as below.

Authorized: This forces the Managed Switch to grant access to all clients, either 802.1X-aware or 802.1x-unaware. No authentication exchange is required. By default, all ports are set to “Authorized”.

Unauthorized: This forces the Managed Switch to deny access to all clients, either 802.1X-aware or 802.1X-unaware.

Auto: This requires 802.1X-aware clients to be authorized by the authentication server. Accesses from clients that are not 802.1X-aware will be denied.

4.4.8.3 802.1X Port Reauthenticate

Click the option **802.1X Port Reauthenticate** from the **802.1X Configuration** menu and then the following screen page appears.

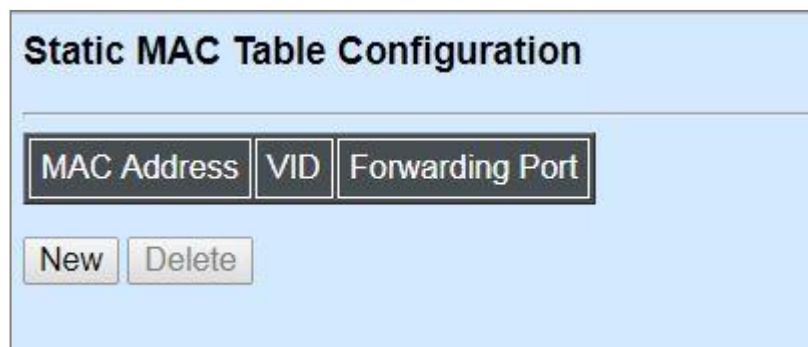
1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9				10			
<input type="checkbox"/>				<input type="checkbox"/>			

OK

By clicking on the checkbox of the corresponding port number, it will allow to re-authenticate the selected ports right now. When enabled, the authentication message will be sent immediately after you click the **OK** button.

4.4.9 Static MAC Table Configuration

Click the option **Static MAC Table Configuration** from the **Switch Management** menu and then the following screen page appears.

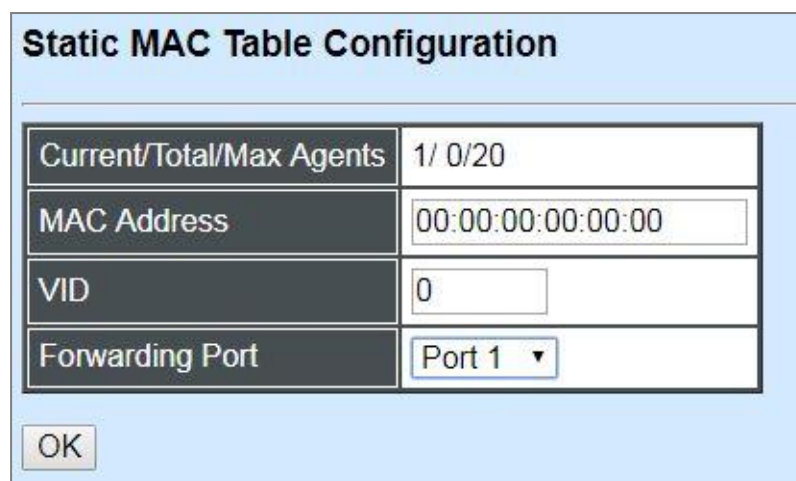


The screenshot shows a window titled "Static MAC Table Configuration". Inside, there is a table with three columns: "MAC Address", "VID", and "Forwarding Port". Below the table, there are two buttons: "New" and "Delete".

NOTE: The Managed Industrial PoE Ethernet Switch only supports switch-based MAC security and does not support port-based MAC security. The Managed Industrial PoE Ethernet Switch can support up to 20 entries of MAC security list.

Click **New** to add a new MAC address entity and then the following screen page appears.

Click **Delete** to remove a MAC address entry.



The screenshot shows a window titled "Static MAC Table Configuration". Inside, there is a form with four fields: "Current/Total/Max Agents" with the value "1/ 0/20", "MAC Address" with the value "00:00:00:00:00:00", "VID" with the value "0", and "Forwarding Port" with a dropdown menu showing "Port 1". Below the form, there is an "OK" button.

Current/Total/Max Agents: The number of current, total and maximum MAC address entry or entries.

MAC Address: Specify a destination MAC address in the packet with the 00:00:00:00:00:00 format.

VID: Specify the VLAN where the packets with the Destination MAC address can be forwarded.

Forwarding Port: If the incoming packet has the same destination MAC address as the one specified in VID, it will be forwarded to the selected port directly.

4.4.10 VLAN Configuration

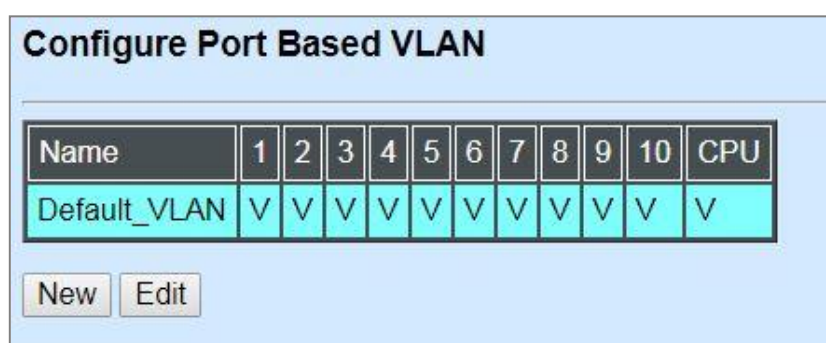
A Virtual Local Area Network (VLAN) is a network topology configured according to a logical scheme rather than the physical layout. VLAN can be used to combine any collections of LAN segments into a group that appears as a single LAN. VLAN also logically segments the network into different broadcast domains. All broadcast, multicast, and unknown packets entering the Switch on a particular VLAN will only be forwarded to the stations or ports that are members of that VLAN.

VLAN can enhance performance by conserving bandwidth and improve security by limiting traffic to specific domains. A VLAN is a collection of end nodes grouped by logics instead of physical locations. End nodes that frequently communicate with each other are assigned to the same VLAN, no matter where they are physically located on the network. Another benefit of VLAN is that you can change the network topology without physically moving stations or changing cable connections. Stations can be 'moved' to another VLAN and thus communicate with its members and share its resources, simply by changing the port VLAN settings from one VLAN to another. This allows VLAN to accommodate network moves, changes and additions with the greatest flexibility.

4.4.10.1 Port-Based VLAN

Port-based VLAN can effectively segment one network into several broadcast domains. Broadcast, multicast and unknown packets will be limited to within the VLAN. Port-Based VLAN is uncomplicated and fairly rigid in implementation and is useful for network administrators who wish to quickly and easily set up VLAN so as to isolate the effect of broadcast packets on their network.

The following screen page appears when you choose **Port Based VLAN** mode from the **VLAN Configuration** menu and then select **Configure VLAN** function.



Name	1	2	3	4	5	6	7	8	9	10	CPU
Default_VLAN	V	V	V	V	V	V	V	V	V	V	V

New Edit

Since source addresses of the packets are listed in MAC address table of specific VLAN (except broadcast/multicast packets), in every VLAN the traffic between two ports will be two-way without restrictions.

Click **New** to add a new VLAN entry and then the following screen page appears.

Use **Edit** to modify the current VLAN setting.

Configure Port Based VLAN

Current/Total/Max	2/ 1/10										
Name											
Port Number	1	2	3	4	5	6	7	8	9	10	CPU
VLAN Members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

OK

Current/Total/Max: The number of current, total and maximum Port-Based VLAN entry or entries.

Port Name: Use the default name or specify a name for your Port-Based VLAN.

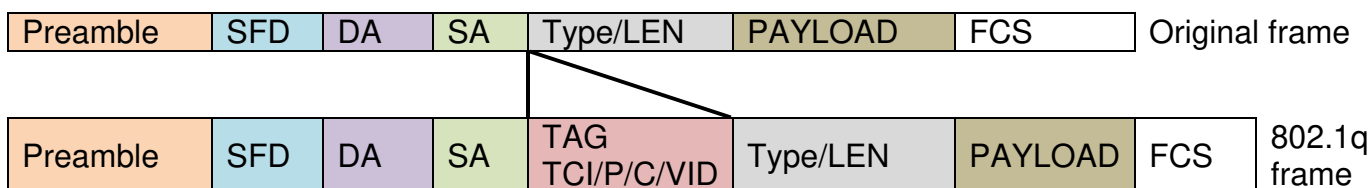
Port Number: By clicking on the checkbox in the field of **VLAN Members** for the corresponding ports, it denotes that the selected ports belong to the specified Port-Based VLAN.

4.4.10.2 802.1Q VLAN

802.1Q VLAN Concept

Port-Based VLAN is simple to implement and use, but it cannot be deployed cross switches VLAN. The 802.1Q protocol was developed in order to provide the solution to this problem. By tagging VLAN membership information to Ethernet frames, the IEEE 802.1Q can help network administrators break large switched networks into smaller segments so that broadcast and multicast traffic will not occupy too much available bandwidth as well as provide a higher level security between segments of internal networks.

Introduction to 802.1Q Frame Format:



PRE	Preamble	62 bits	Used to synchronize traffic
SFD	Start Frame Delimiter	2 bits	Marks the beginning of the header
DA	Destination Address	6 bytes	The MAC address of the destination
SA	Source Address	6 bytes	The MAC address of the source
TCI	Tag Control Info	2 bytes set to 8100 for 802.1p and Q tags	
P	Priority	3 bits	Indicates 802.1p priority level 0-7
C	Canonical Indicator	1 bit	Indicates if the MAC addresses are in Canonical format - Ethernet set to "0"
VID	VLAN Identifier	12 bits	Indicates the VLAN (0-4095)
T/L	Type/Length Field	2 bytes	Ethernet II "type" or 802.3 "length"
Payload	< or = 1500 bytes User data		
FCS	Frame Check Sequence	4 bytes	Cyclical Redundancy Check

Important VLAN Concepts for 802.1Q VLAN Configuration:

There are two key concepts to understand.

- **Access-VLAN** specifies the VLAN ID to the switch port that will assign the VLAN ID to **untagged** traffic from that port. A port can only be assigned to one Access-VLAN at a time. When the port is configured as **Access Mode**, the port is called an **Access Port**, the link to/from this port is called an **Access Link**. The VLAN ID assigned is called **PVID**.
- **Trunk-VLAN** specifies the set of VLAN IDs that a given port is allowed to receive and send **tagged** packets. A port can be assigned to multiple Trunk-VLANs at a time. When the port is configured as **Trunk Mode**, the port is called a **Trunk Port**, the link to/from this port is called a **Trunk Link**. The VLAN ID assigned is called **VID**.

A port can be configured as below 802.1q VLAN modes :

- **Access Mode :**
Access Links (the link to/from access ports) are the most common type of links on any VLAN switch. All **network hosts (such as PCs)** connect to the switch's Access Links in order to gain access to the local network. We configure only one **Access-VLAN** per port, that is, **the network hosts** will be allowed to access.

It is important to note at this point that any **network host** connected to an Access Port is totally unaware of the VLAN assigned to the port. The **network host** simply assumes it is part of a single broadcast domain, just as it happens with any normal switch. During data transfers, any VLAN information or data from other VLANs is removed so the recipient has no information about them.

- **Trunk Mode :**
Trunk Links (the link to/from trunk ports) is configured to carry packets for multiple VLANs. These types of ports are usually found in connections between switches. These links require the ability to carry packets from multiple VLANs because VLANs span over multiple switches.
- **Trunk Native Mode :**
A Trunk-native port can carry untagged packets simultaneously with the 802.1Q tagged packets. When you assign a default Access-VLAN to the trunk-native port, all untagged traffic travels on the default Access-VLAN for the trunk-native port, and all untagged traffic is assumed to belong to this Access-VLAN. This Access-VLAN is referred to as the native VLAN ID for a Trunk-native Port. The native VLAN ID is the VLAN ID that carries untagged traffic on trunk-native ports.

Example : PortX configuration

Configuration	Result
Trunk-VLAN = 10, 11, 12 Access-VLAN = 20 Mode = Access	PortX is an Access Port PortX's VID is ignored PortX's PVID is 20 PortX sends Untagged packets (PortX takes away VLAN tag if the PVID is 20) PortX receives Untagged packets only

Trunk-VLAN = 10,11,12 Access-VLAN = 20 Mode = Trunk	PortX is a Trunk Port PortX's VID is 10,11 and 12 PortX's PVID is ignored PortX sends and receives Tagged packets VID 10,11 and 12
Trunk-VLAN = 10,11,12 Access-VLAN = 20 Mode = Trunk-native	PortX is a Trunk-native Port PortX's VID is 10,11 and 12 PortX's PVID is 20 PortX sends and receives Tagged packets VID 10,11 and 12 PortX receives Untagged packets and add PVID 20

4.4.10.3 IEEE 802.1q Tag VLAN

The following screen page appears when you choose **IEEE 802.1q Tag VLAN** mode from the **VLAN Configuration** menu and then select **VLAN interface** function.

IPS-3110-PB

- System Information
- User Authentication
- Network Management
- Switch Management
 - Switch Configuration
 - Broadcast Storm Control
 - Port Configuration
 - Rate Limit Configuration
 - QoS Priority Configuration
 - Link Aggregation
 - Rapid Spanning Tree
 - 802.1X Configuration
 - Static MAC Table Configuration
 - VLAN Configuration
 - Port Based VLAN
 - IEEE 802.1q Tag VLAN**
 - Trunk VLAN table
 - VLAN Interface
 - Management VLAN
 - Mirroring Configuration
 - IGMP Snooping
 - LLDP Configuration
 - Loop Detection
 - Ring Detection
 - PoE Configuration
 - DHCP Snooping

VLAN Interface

802.1q Tag VLAN Mode: Port Based VLAN

Port	Mode	Access-vlan (PVID)	Trunk-vlan
Port1	ACCESS	1	1
Port2	ACCESS	1	1
Port3	ACCESS	1	1
Port4	ACCESS	1	1
Port5	ACCESS	1	1
Port6	ACCESS	1	1
Port7	ACCESS	1	1
Port8	ACCESS	1	1
Port9	ACCESS	1	1
Port10	ACCESS	1	1

OK

1. **Trunk VLAN table:** To create, modify or remove 802.1Q Tag VLAN settings.
2. **VLAN Interface:** To set up VLAN mode and create 802.1Q VLAN on the selected port(s).
3. **Management VLAN:** To set up management VLAN and management ports.

4.4.10.3.1 Trunk VLAN Table

The following screen page appears if you choose **Trunk VLAN table**.

Trunk VLAN table

VLAN Name	VID	1	2	3	4	5	6	7	8	9	10	CPU
Default_VLAN	1	V	V	V	V	V	V	V	V	V	V	V

V :Member - :Not Member

New

Edit

Delete

When CPU VLAN is changed, the port VLAN ID of all member ports in the new CPU VLAN will be changed to CPU's VID.

Click **New** to add a new VLAN and then the following screen page appears.

Click **Edit** to modify the selected IEEE 802.1Q Tag VLAN setting.

Click **Delete** to remove an existing VLAN you select.

Configure VLAN

Current/Total/Max VLANs	2/ 1/128							
VLAN ID	0 (1-4094)							
VLAN Name								
Port Number	1	2	3	4	5	6	7	8
VLAN Members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	9		10		CPU			
VLAN Members	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>			

V :Member - :Not Member

OK

VLAN ID: View-only field shows the VLAN ID of this VLAN group.

VLAN Name: Use the default name or specify a VLAN name.

VLAN Members: If you check the ports, it denotes that the ports selected belong to the specified VLAN group.

4.4.10.3.2 VLAN Interface

The following screen page appears if you choose **VLAN Interface**.

VLAN Interface

802.1q Tag VLAN Mode Port Based VLAN ▼

Port	Mode	Access-vlan (PVID)	Trunk-vlan
Port1	ACCESS ▼	1	1
Port2	ACCESS ▼	1	1
Port3	ACCESS ▼	1	1
Port4	ACCESS ▼	1	1
Port5	ACCESS ▼	1	1
Port6	ACCESS ▼	1	1
Port7	ACCESS ▼	1	1
Port8	ACCESS ▼	1	1
Port9	ACCESS ▼	1	1
Port10	ACCESS ▼	1	1

OK

802.1q Tag VLAN Mode: There are two options, including Port Based VLAN and IEEE 802.1q VLAN available for the user's selection.

Mode: Pull down the list in the **Mode** field and select the appropriate mode for each port. The port behavior of each mode is listed as the following table.

Access: Set the selected port to the access mode (untagged).

Trunk: Set the selected port to the trunk mode (tagged).

Trunk-Native: Enable native VLAN for untagged traffic on the selected port.

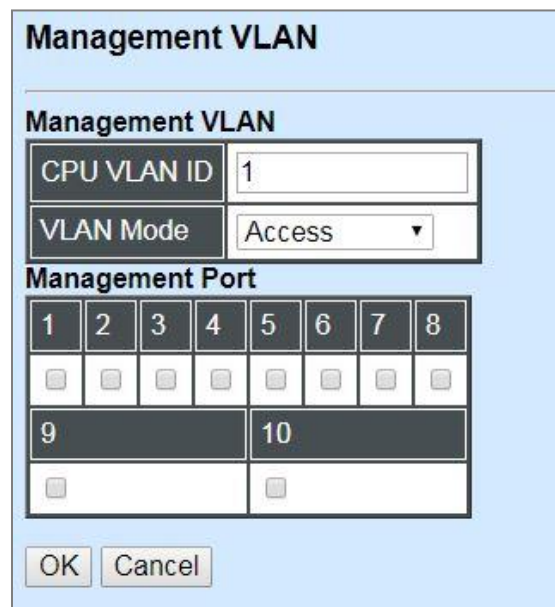
Mode	Port Behavior	
Access	Receive untagged packets only. Drop tagged packets.	
	Send untagged packets only.	
Trunk	Receive tagged packets only. Drop untagged packets.	
	Send tagged packets only.	
Trunk Native	Receive both untagged and tagged packets	Untagged packets: PVID is added
		Tagged packets: Stay intact
	When sending packets, PVID and VID will be compared. If PVID and VID are the same, PVID will be removed. If PVID and VID are different, the packets with the original tag (VID) will be sent.	

Access-VLAN (PVID): Specify the selected ports' Access-VLAN ID (PVID).

Trunk-VLAN: Specify the selected ports' Trunk-VLAN ID (VID).

4.4.10.3.3 Management VLAN

The following screen page appears if you choose **Management VLAN**.



The image shows a 'Management VLAN' configuration window. It has a title bar 'Management VLAN'. Inside, there's a section 'Management VLAN' with two fields: 'CPU VLAN ID' with a text box containing '1', and 'VLAN Mode' with a dropdown menu showing 'Access'. Below this is a section 'Management Port' with a grid of 10 checkboxes. The first row has checkboxes for ports 1 through 8. The second row has checkboxes for ports 9 and 10. At the bottom are 'OK' and 'Cancel' buttons.

Management VLAN									
Management VLAN									
CPU VLAN ID		1							
VLAN Mode		Access ▼							
Management Port									
1	2	3	4	5	6	7	8		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
9				10					
<input type="checkbox"/>				<input type="checkbox"/>					
OK Cancel									

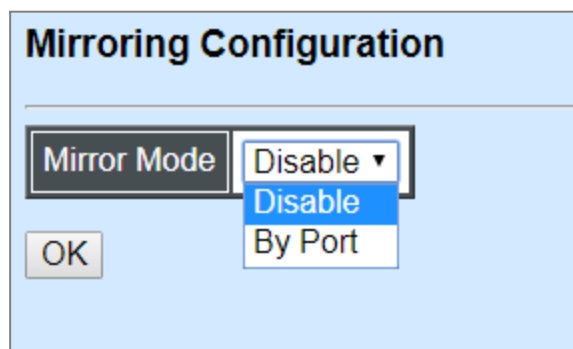
CPU VLAN ID: Specify an existing VLAN ID.

VLAN Mode: Select the VLAN mode for this Management VLAN.

Management Port: Click on the checkbox of the corresponding ports that you would like them to become Management ports.

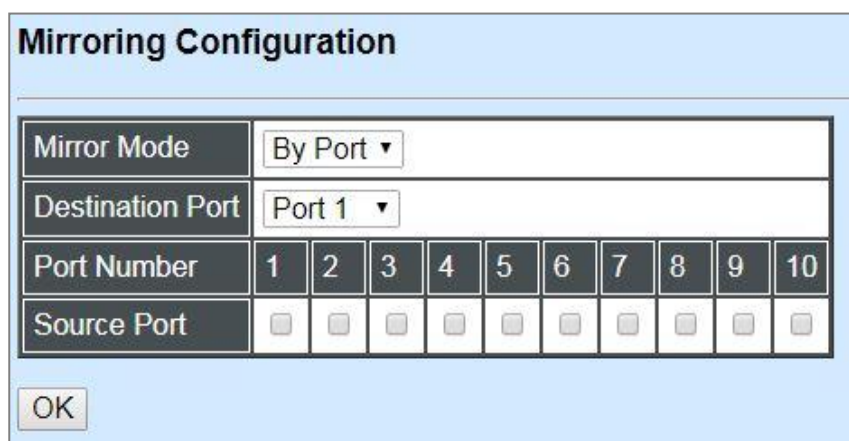
4.4.11 Mirroring Configuration

In order to allow the destination port to mirror the source port(s) and enable the traffic monitoring, select the option **Mirroring Configuration** from the **Switch Management** menu and then the following screen page appears.



The image shows a dialog box titled "Mirroring Configuration". Inside, there is a "Mirror Mode" label next to a dropdown menu. The dropdown menu is open, showing three options: "Disable", "Disable", and "By Port". The "By Port" option is highlighted in blue. Below the dropdown menu is an "OK" button.

Mirror Mode: From the **Mirror Mode** pull-down menu, you can choose **Disable** or **By Port** option to respectively activate/deactivate the mirroring configuration function.



The image shows a dialog box titled "Mirroring Configuration". It contains a table with four rows: "Mirror Mode", "Destination Port", "Port Number", and "Source Port". The "Mirror Mode" row has a dropdown menu set to "By Port". The "Destination Port" row has a dropdown menu set to "Port 1". The "Port Number" row has ten buttons labeled 1 through 10. The "Source Port" row has ten checkboxes, one for each port number. Below the table is an "OK" button.

Mirror Mode	By Port ▾									
Destination Port	Port 1 ▾									
Port Number	1	2	3	4	5	6	7	8	9	10
Source Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Destination Port: Choose from port 1 to port 10 from the pull-down menu to designate the destination port.

Source Port: Select the preferred source port(s) for mirroring by clicking on the checkbox of the corresponding port number. Please note that the port selected as the destination port cannot be the source port.

4.4.12 IGMP Snooping

The Internet Group Management Protocol (IGMP) is a communications protocol used to manage the membership of Internet Protocol multicast groups. IGMP is used by IP hosts and adjacent multicast routers to establish multicast group memberships. It can be used more efficiently when supporting activities, such as online streaming video and gaming.

IGMP Snooping is the process of listening to IGMP traffic. IGMP snooping, as implied by the name, is a feature that allows the switch to “listen in” on the IGMP conversation between hosts and routers by processing the layer 3 packets that IGMP packets sent in a multicast network.

When IGMP snooping is enabled in a switch, it analyses all the IGMP packets between hosts connected to the switch and multicast routers in the network. When a switch receives an IGMP report for a given multicast group from a host, the switch adds the host's port number to the multicast list for that group. When the switch hears an IGMP Leave, it removes the host's port from the table entry.

IGMP snooping can reduce multicast traffic from streaming and make other bandwidth intensive IP applications run more effectively. A switch using IGMP snooping will only forward multicast traffic to the hosts in that traffic. This reduction of multicast traffic reduces the packet processing at the switch (at the cost of needing additional memory to handle the multicast tables) and also decreases the workload at the end hosts since their network cards (or operating system) will not receive and filter all the multicast traffic generated in the network.

Select the option **IGMP Snooping** from the **Switch Management** menu and then the following screen page appears.

IGMP Snooping

IGMP Snooping	Disabled ▾	
Aging Time	1200	1-3000(1/10 Sec)
Immediate Leave	Disabled ▾	

Router Port	1	2	3	4	5	6	7	8
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	9				10			
	<input type="checkbox"/>				<input checked="" type="checkbox"/>			

Note: Aging time setting can be changed only when IGMP immediate leave is disabled.

Note: When IGMP Immediate leave is enabled, IGMP aging time is fixed to 300 seconds.

OK

IGMP Snooping: When enabled, the Managed Industrial PoE Ethernet Switch will monitor network traffic and determine which hosts to receive multicast traffic.

Aging Time: Specify IGMP querier aging time between 1 and 3000 (Unit: 1/10 sec.). Please note that this time setting can be changed only when IGMP immediate leave is disabled, and IGMP aging time is fixed to 300 seconds when IGMP immediate leave is enabled.

Immediate Leave: The Immediate Leave option may be enabled or disabled. When enabled, this allows an interface to be ignored without sending group-specific queries. The default setting is "Disabled".

Router Ports: When ports are connected to the IGMP administrative routers, they should be checked.

4.4.13 LLDP Configuration

LLDP stands for Link Layer Discovery Protocol and runs over data link layer which is used for network devices to send information about themselves to other directly connected devices on the network. By using LLDP, two devices running different network layer protocols can learn information about each other. A set of attributes are used to discover neighbor devices. These attributes contain type, length, and value descriptions and are referred to as TLVs. Details such as port description, system name, system description, system capabilities, management address can be sent and received on this Managed Industrial PoE Ethernet Switch. Use Spacebar to select "ON" if you want to receive and send the TLV.

Select the option **LLDP Configuration** from the **Switch Management** menu and then the following screen page appears.

LLDP Configuration								
Port Number	1	2	3	4	5	6	7	8
Port Enable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	9				10			
Port Enable	<input type="checkbox"/>				<input type="checkbox"/>			
Receiver Hold-Time(TTL)	<input type="text" value="120"/>				1-3600(Second)			
Sending LLDP Packet Interval	<input type="text" value="5"/>				1-180(Second)			
Sending LLDP Packets Per Discover	<input type="text" value="1"/>				1-16(Packet)			
Selection of LLDP TLVs to send								
Port Description	<input checked="" type="checkbox"/>							
System Name	<input checked="" type="checkbox"/>							
System Description	<input checked="" type="checkbox"/>							
System Capabilities	<input checked="" type="checkbox"/>							
Management Address	<input checked="" type="checkbox"/>							
<input type="button" value="OK"/>								

Port Number: Click on the checkbox of corresponding port number to enable LLDP function on the specific port(s).

Receiver Hold-Time (TTL): Enter the amount of time for receiver hold-time in seconds. The Managed Industrial PoE Ethernet Switch will keep the information sent by the remote device for a period of time you specify here before discarding it.

Sending LLDP Packet Interval: Enter the time interval for updated LLDP packets to be sent.

Sending LLDP Packets Per Discover: Enter the amount of packets sent in each discover.

Selection of LLDP TLVs to send: LLDP uses a set of attributes to discover neighbor devices. These attributes contain type, length, and value descriptions and are referred to as TLVs. Details such as port description, system name, system description, system capabilities, management address can be sent from this Managed Industrial PoE Ethernet Switch.

4.4.14 Loop Detection Configuration

In a real network, it is possible the people misconnect the network cable to incur loop condition. In a worst case, the network is out of service thereafter. This section gives a guide to configure the Loop Detection function of the system to prevent the system from loop.

After a proper setting of Loop Detection function, the system detects loop condition by periodically sending loop detection packet. Once the system receives the loop detection packet from itself, it is claimed that it detects loop condition. Then, the system takes the following actions

1. It blocks the relevant port to prevent broadcast storms. In other words, the system stops forwarding all the traffic via the looped port. However, the system will process the loop detection packet received on the looped port.
2. It slowly blinks the LED of looped port in orange.
3. It periodically sends loop detection packet to detect the existence of loop condition.

When the system does not receives any loop detection packet from itself for a period of configured **Looped port unlock-interval**. The system claims the loop condition disappears. Then, the system takes the following actions

1. It un-blocks the relevant port. In other words, the system normally forwards all the traffic via the relevant port.
2. It stops slowly blinking the LED of looped port in orange.
3. It periodically sends loop detection packet to detect the existence of loop condition.

Note: Under loop condition, the LED of looped port continues to slowly blink orange even the connected network cable is unplugged out of looped port.

To set up Loop Detection function, select the option **Loop Detection Configuration** from the **Switch Management** menu and then the following screen page appears.

Loop Detection

Loop Detection Enable	<input type="checkbox"/>
Detection Interval	1 (1-180)Seconds
Looped port unlock-interval	1 (1-1440)Minutes
All VLAN	<input type="checkbox"/>
Specific VLAN	0
	0
	0
	0

1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9				10			
<input type="checkbox"/>				<input type="checkbox"/>			

OK

Loop Detection Enable: Check to enable the Loop Detection function on a system basis. The default setting is disabled.

Detection Interval: This is the time interval (in seconds) that the device will periodically send loop detection packets to detect the presence of looped network. The valid range is from 1 to 180 seconds. The default setting is 1 seconds.

Looped port unlock-interval: This is the time interval for the system to detect the existence of loop condition. System un-blocks the looped port if it does not receive any loop-detection packet during the configured unlock-interval. The unlock-interval can be set from 1 to 1440 minutes. The default setting is 1440 minutes.

Note:

1. Be aware that Looped port unlock-interval converted into seconds should be greater than or equal to Detection Interval seconds multiplied by 10. The '10' is a magic number which is for the system to claim the loop detection disappears when the system does not receive the loop-detection packet from itself at least 10 times. In general, it can be summarized by a formula below:

$$60 * \text{"Looped port unlock-interval"} \geq 10 * \text{"Detection Interval"}$$

2. When a port is detected as a looped port, the system keeps the looped port in blocking status until loop situation is gone. In other words, the system stops forwarding all the traffic via the looped port. However, the system will process the loop-detection packet received on the looped port.

All VLAN: Check All VLAN box to enable loop detection on all trunk-VLAN-vid configured in the VLAN Interface under IEEE802.1q Tag VLAN (Refer to [Section 4.4.10.3.2](#))

NOTE: When All VLAN checkbox is checked, it invalidates the configured "Specific VLAN".

Specific VLAN: Set up loop detection on specified VLAN. The maximum number of VLAN ID is up to 4 sets.

NOTE: The configured "Specific VLAN" takes effect when All VLAN check-box is unchecked.

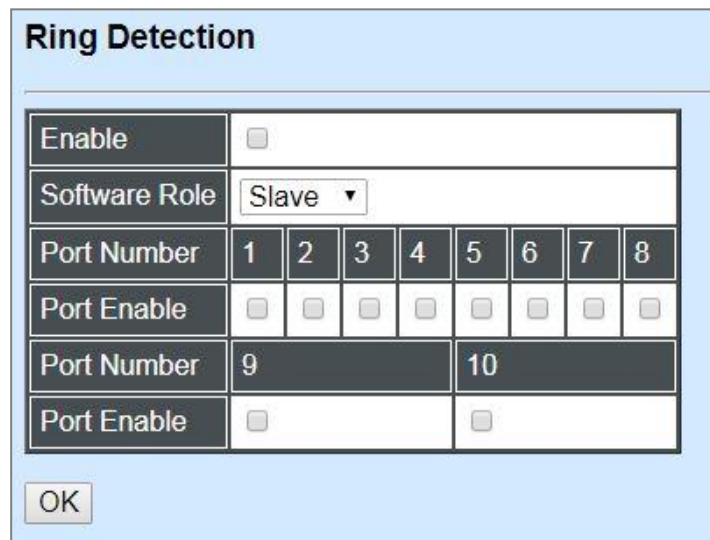
Port No.: Click on the checkbox of the corresponding port No. to enable the Loop Detection function on the specific port(s).

NOTE: Loop Detection and RSTP (Rapid Spanning Tree Protocol) is not allowed to be enabled on the same port at the same time.

4.4.15 Ring Detection

Ring Detection used in the ring topology is helpful for the network recovery, preventing from the disconnection resulting from any unexpected link down. The main advantages of Ring Detection are lower cost for cabling and installation, and high-speed recovery time.

Select the option **Ring Detection** from the **Switch Management** menu and then the following screen page appears.



The image shows a configuration window titled "Ring Detection". It contains several controls: an "Enable" checkbox, a "Software Role" dropdown menu set to "Slave", and a table for configuring individual ports. The table has two sections: ports 1-8 and ports 9-10. Each port has a "Port Number" label and a "Port Enable" checkbox. All checkboxes are currently unchecked. An "OK" button is located at the bottom left of the window.

Enable										
Software Role	Slave ▼									
Port Number	1	2	3	4	5	6	7	8		
Port Enable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Port Number	9				10					
Port Enable	<input type="checkbox"/>				<input type="checkbox"/>					

OK

Enable: Click **Enable** to activate the **Ring Detection** function globally.

Software Role: Pull down the menu of **Software Role** to assign the role of the switch as either Slave or Master.

Master: A role possesses the ability of blocking or forwarding packets.

Slave: A role possesses the ability of forwarding packets only.

Port Enable: Set the port to “enabled” or “disabled”. When clicking on the checkbox of the corresponding port number, the Ring Detection function will be enabled.

4.4.16 PoE Configuration

PoE (Power Over Ethernet) is the technology that a data-carrying LAN cable can play a role in power supplier. Typically, a PoE switch is deployed at the center of the network for power transmission and supplies electricity to PDs (powered devices) up to 100 meters away through TP ports. PDs can be installed wherever there is a LAN cable rather than AC power source. The user need not be present at powered devices location, which greatly reduces truck rolls. The Managed Industrial PoE Switch even supports time-based PoE, defining the time interval when powered devices are desired to be automatically powered on a daily or weekly basis, for budget-conscious users to be more efficient power management.

Select the option **PoE Configuration** from the **Switch Management** menu and then the following screen page appears.

PoE Configuration

PoE System Setting

Total Budget 240 (30-240)Watt

PoE Setting(Port)

Port	Operation Mode	Power Device Name	Priority	Schedule Time Range	Schedule
1	Auto AF/AT		Low		Off
2	Auto AF/AT		Low		Off
3	Auto AF/AT		Low		Off
4	Auto AF/AT		Low		Off
5	Auto AF/AT		Low		Off
6	Auto AF/AT		Low		Off
7	Auto AF/AT		Low		Off
8	Auto AF/AT		Low		Off

OK

Shutdown
Injector-30Watt
Auto AF/AT

Total Budget (For IPS-3110-PB Only): Set up total power budget in watt that Managed Industrial PoE Gigabit Ethernet Switch can provide. Valid range: 30~240 watts.

Operation Mode: In the power supply over Ethernet for PDs (powered devices), the Managed Industrial PoE Switch offers three options listed below to be chosen for TP Port 1~8.

Shutdown: Disable the PoE function on a specific port permanently.

Injector-30 Watt: Forcibly enable the PoE function on a specific port permanently at 30-Watt power level.

Auto AF/AT: Under the Auto AF/AT mode, it will automatically detect whether the PD features PoE function or not and flexibly enable the PoE function on a specific port. In case that the PD supports PoE, the proper power will be supplied upon the class of PD. Otherwise, the Managed Industrial PoE Switch will not supply the power with the PD.

Power Device Name: Specify a name to the PD connected with each TP port.

Priority (For IPS-3110-PB Only): Assign the priority to the specified ports. If there is insufficient power supply, the power supplied by the TP port would be cut off based on the priority listed below.

Low: It indicates the port(s) with this priority will be the first port(s) to get power cut off.

High: It indicates the port(s) with this priority will terminate the power supply after all ports assigned with the “Low” priority get power cut off.

Critical: It indicates the port(s) with this priority will be the last port(s) to get power cut off.

NOTE: Power will be cut off upon the order of port number (Port4→Port3→Port2→Port1) if ports are assigned with the same priority. For example, in case Port2 and Port4 are both the low-priority ports, power supplied by Port4 will be cut off earlier than Port2.

Schedule Time Range: Assign PoE schedule a time-range. It defines which previously-configured time interval the port should follow. One set of time interval can be accepted at a time.

Schedule: On or off PoE schedule function for a specific port.

4.4.17 DHCP Snooping

In this section, a Layer 2 security mechanism is provided to increase the security level of your Managed Industrial PoE Ethernet Switch. Layer 2 attacks are typically launched by or from a device that is physically connected to the network. For example, it could be a device that you trust but has been taken over by an attacker. By default, this security function available in this Managed Industrial PoE Ethernet Switch are turned off, to prevent your network from malicious attacks, it is extremely important for you to set up appropriate security configurations. This section provides a security mechanism to protect your network from unauthorized access to a network or redirect traffic for malicious purposes, such as Source IP Spoofing and ARP Spoofing.

Select the option **DHCP Snooping** from the **Switch Management** menu and then the following screen page appears.

DHCP Snooping	
DHCP Snooping	Disabled ▼
DHCP Server Trust Port	1 2 3 4 5 6 7 8
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	9 10
	<input type="checkbox"/> <input type="checkbox"/>

OK

DHCP Snooping: Enable or disable DHCP Snooping function globally.

DHCP Server Trust Port: Specify the designated port to be Trust Port that can give you “offer” from DHCP server. Check any port box to enable it.

4.5 Switch Monitor

Switch Monitor allows users to monitor the real-time operation status of the Managed Industrial PoE Ethernet Switch. Users may monitor the port link-up status or traffic counters for maintenance or diagnostic purposes. Select the folder **Switch Monitor** from the **Main Menu** and then several options and folders will be displayed.

IPS-3110-PB

System Information

User Authentication

Network Management

Switch Management

Switch Monitor

Switch Port Status

Port Counters Rates

Port Counters Events

IEEE 802.1q Tag VLAN Table

LACP Monitor

RSTP Monitor

802.1X Monitor

SFP Information

IGMP Snooping

MAC Address Table

LLDP Status

Loop Detection Status

Ring Detection Status

PoE Status

Switch Port Status

Port	Media Type	Port State	Link State	Speed (Mbps)	Duplex	Flow Control	Description
1	TX	Forwarding	down	--	--	--	
2	TX	Forwarding	down	--	--	--	
3	TX	Forwarding	down	--	--	--	
4	TX	Forwarding	down	--	--	--	
5	TX	Forwarding	down	--	--	--	
6	TX	Forwarding	down	--	--	--	
7	TX	Forwarding	down	--	--	--	
8	TX	Forwarding	down	--	--	--	
9	FX	Forwarding	up	1000	full	off	
10	FX	Forwarding	down	--	--	--	

1. **Switch Port Status:** View current port media type, port state, etc.

2. Port Counters Rates:

- **Port Traffic Statistics(Rates):** View the current rate of each port's frames and bytes received or sent, utilization, etc.
- **Port Packet Error Statistics(Rates):** View the current rate of each port's traffic condition of error packets, e.g. CRC, fragment, Jabber, etc.
- **Port Packet Analysis Statistics(Rates):** View the current rate of each port's traffic condition of error packets, e.g. RX/TX frames of Multicast and Broadcast, etc.

3. Port Counters Events:

- **Port Traffic Statistics(Events):** View the total amount of each port's frames and bytes received or sent, utilization, etc..
- **Port Packet Error Statistics(Events):** View the total amount of each port's traffic condition of error packets, e.g. CRC, fragment, Jabber, etc.
- **Port Packet Analysis Statistics(Events):** View the total amount of each port's traffic condition of error packets, e.g. RX/TX frames of Multicast and Broadcast, etc.

4. **IEEE 802.1q Tag VLAN Table:** View the IEEE802.1q Tag VLAN Table of the Managed Industrial PoE Ethernet Switch.
5. **LACP Monitor:** View the LACP port status and statistics.
6. **RSTP Monitor:** View RSTP VLAN Bridge, Port Status, and Statistics.
7. **802.1X Monitor:** View port status and Statistics.
8. **SFP Information:** View the current port's SFP information, e.g. speed, Vendor ID, Vendor S/N, etc.. SFP port state shows current DMI (Diagnostic monitoring interface) temperature, voltage, TX Bias, etc..
9. **IGMP Snooping:** View-only field that shows the IGMP multicast groups table.
10. **MAC Address Table:** List current MAC addresses learned by the Managed Industrial PoE Ethernet Switch.
11. **LLDP Status:** View the TLV information sent by the connected device with LLDP-enabled.
12. **Loop Detection Status:** View the Loop Detection status of each port.
13. **Ring Detection Status:** View the current Ring Detection status of each port and the system.
14. **PoE Status:** View the current power supply status, including Total PoE Power Consumption, and each TP port's Power(W), Voltage(V), Current(mA),PD Class, and so on.

4.5.1 Switch Port Status

In order to view the real-time port status of the Managed Industrial PoE Ethernet Switch, select **Switch Port Status** from the **Switch Monitor** menu and then the following screen page appears.

Switch Port Status							
Port	Media Type	Port State	Link State	Speed (Mbps)	Duplex	Flow Control	Description
1	TX	Forwarding	down	--	--	--	
2	TX	Forwarding	down	--	--	--	
3	TX	Forwarding	down	--	--	--	
4	TX	Forwarding	down	--	--	--	
5	TX	Forwarding	down	--	--	--	
6	TX	Forwarding	down	--	--	--	
7	TX	Forwarding	down	--	--	--	
8	TX	Forwarding	down	--	--	--	
9	FX	Forwarding	up	1000	full	off	
10	FX	Forwarding	down	--	--	--	

Port Number: The number of the port.

Media Type: The media type of the port, either TX or FX.

Port State: This shows each port's state which can be Disabled, Blocking/Listening, Learning or Forwarding.

Disabled: A port in this state does not participate in frame relay or the operation of the Spanning Tree Algorithm and Protocol if any.

Blocking: A Port in this state does not participate in frame relay; thus, it prevents frame duplication arising from multiple paths existing in the active topology of Bridged LAN.

Learning: A port in this state prepares to participate in frame relay. Frame relay is temporarily disabled in order to prevent temporary loops, which may occur in a Bridged LAN during the lifetime of this state as the active topology of the Bridged LAN changes. Learning is enabled to allow information to be acquired prior to frame relay in order to reduce the number of frames that are unnecessarily relayed.

Forwarding: A port in this state participates in frame relay. Packets can be forwarded only when port state is forwarding.

Link State: The current link status of the port, either up or down.

Speed (Mbps): The current operation speed of ports, which can be 10M, 100M or 1000M.

Duplex: The current operation Duplex mode of the port, either Full or Half.

Flow Control: The current state of Flow Control, either on or off.

Description: Display the port description you set up in Port Configuration.

4.5.2 Port Counters Rates

Click the **Port Counters Rates** folder and then three options within this folder will be displayed.

4.5.2.1 Port Traffic Statistics (Rates)

In order to view the real-time rate of port traffic statistics of the Managed Industrial PoE Ethernet Switch, select **Port Traffic Statistics (Rates)** from the **Port Counters Rates** menu and then the following screen page appears.

Port Traffic Statistics (Rates)								
Port	Bytes Received	Frames Received	Received Utilization	Bytes Sent	Frames Sent	Sent Utilization	Total Bytes	Total Utilization
1	0	0	0.00%	0	0	0.00%	0	0.00%
2	0	0	0.00%	0	0	0.00%	0	0.00%
3	0	0	0.00%	0	0	0.00%	0	0.00%
4	0	0	0.00%	0	0	0.00%	0	0.00%
5	0	0	0.00%	0	0	0.00%	0	0.00%
6	0	0	0.00%	0	0	0.00%	0	0.00%
7	0	0	0.00%	0	0	0.00%	0	0.00%
8	0	0	0.00%	0	0	0.00%	0	0.00%
9	0	0	0.00%	0	0	0.00%	0	0.00%
10	0	0	0.00%	0	0	0.00%	0	0.00%

Bytes Received: Total bytes received from each port.

Frames Received: Total frames received from each port.

Received Utilization: The ratio of each port receiving traffic and current port's total bandwidth.

Bytes Sent: The total bytes sent from current port.

Frames Sent: The total frames sent from current port.

Sent Utilization: The ratio of real sent traffic to the total bandwidth of current ports.

Total Bytes: Total bytes of receiving and sending from current port.

Total Utilization: The ratio of real received and sent traffic to the total bandwidth of current ports.

4.5.2.2 Port Packet Error Statistics (Rates)

Port Packet Error Statistics mode counters allow users to view the real-time rate of port error of the Managed Industrial PoE Ethernet Switch. The event mode counter is calculated since the last time that counter was reset or cleared. Select **Port Packet Error Statistics (Rates)** from the **Port Counters Rates** menu and then the following screen page appears.

Port Packet Error Statistics (Rates)				
Port	Rx CRC Error	Rx Undersize	Rx Fragments	Total Errors
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0

RX CRC Error: CRC Error frames received.

RX Undersize Frames: Undersize frames received.

RX Fragments Frames: Fragments frames received.

Total Errors: Total error frames received.

4.5.2.3 Port Packet Analysis Statistics (Rates)

Port Packet Analysis Statistics Mode Counters allow users to view the real-time rate of port analysis history of the Managed Industrial PoE Ethernet Switch. Event mode counters are calculated since the last time that counter was reset or cleared. Select **Port Packet Analysis Statistics (Rates)** from the **Port Counters Rates** menu and then the following screen page appears.

Port Packet Analysis Statistics (Rates)										
Port	Rx Frames 64 Bytes	Rx Frames 65-127 Bytes	Rx Frames 128-255 Bytes	Rx Frames 256-511 Bytes	Rx Frames 512-1023 Bytes	Rx Frames 1024-10240 Bytes	Rx Multicast Frames	Tx Multicast Frames	Rx Broadcast Frames	Tx Broadcast Frames
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Select: Choose the way of representing Port Packet Analysis Statistics from the pull-down menu. Either “Rate” or “Event” option can be chosen.

RX Frames 64 Bytes: 64 bytes frames received.

RX Frames 65-127 Bytes: 65-127 bytes frames received.

RX Frames 128-255 Bytes: 128-255 bytes frames received.

RX Frames 256-511 Bytes: 256-511 bytes frames received.

RX Frames 512-1023 Bytes: 512-1023 bytes frames received.

RX Frames 1024-10240 Bytes: 1024-10240 bytes frames received.

RX Multicast Frames: Good multicast frames received.

TX Multicast Frames: Good multicast packets sent.

RX Broadcast Frames: Good broadcast frames received.

TX Broadcast Frames: Good broadcast packets sent.

4.5.3 Port Counters Events

Click the **Port Counters Events** folder and then three options within this folder will be displayed.

4.5.3.1 Port Traffic Statistics (Events)

In order to view the total amount of port traffic statistics of the Managed Industrial PoE Ethernet Switch, select **Port Traffic Statistics (Events)** from the **Port Counters Events** menu and then the following screen page appears.

Port Traffic Statistics (Events)					
Port	Bytes Received	Frames Received	Bytes Sent	Frames Sent	Total Bytes
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	1124643	8324	1510271	5184	2634914
10	0	0	0	0	0
<input type="button" value="Clear All"/>					

Bytes Received: Total bytes received from each port.

Frames Received: Total frames received from each port.

Bytes Sent: The total bytes sent from current port.

Frames Sent: The total frames sent from current port.

Total Bytes: Total bytes of receiving and sending from current port.

Clear All: All port's counter values will be cleared and set back to zero.

4.5.3.2 Port Packet Error Statistics (Events)

Port Packet Error Statistics mode counters allow users to view the total amount of port error of the Managed Industrial PoE Ethernet Switch. The event mode counter is calculated since the last time that counter was reset or cleared. Select **Port Packet Error Statistics (Events)** from the **Port Counters Events** menu and then the following screen page appears.

Port Packet Error Statistics (Events)				
Port	Rx CRC Error	Rx Undersize	Rx Fragments	Total Errors
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
<input type="button" value="Clear All"/>				

RX CRC Error: CRC Error frames received.

RX Undersize Frames: Undersize frames received.

RX Fragments Frames: Fragments frames received.

Total Errors: Total error frames received.

Clear All: This will clear all port's counter values and be set back to zero.

4.5.3.3 Port Packet Analysis Statistics (Events)

Port Packet Analysis Statistics Mode Counters allow users to view the total amount of port analysis history of the Managed Industrial PoE Ethernet Switch. Event mode counters are calculated since the last time that counter was reset or cleared. Select **Port Packet Analysis Statistics (Events)** from the **Port Counters Events** menu and then the following screen page appears.

Port Packet Analysis Statistics (Events)										
Port	Rx Frames 64 Bytes	Rx Frames 65-127 Bytes	Rx Frames 128-255 Bytes	Rx Frames 256-511 Bytes	Rx Frames 512-1023 Bytes	Rx Frames 1024-10240 Bytes	Rx Multicast Frames	Tx Multicast Frames	Rx Broadcast Frames	Tx Broadcast Frames
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	5222	1735	498	938	204	0	740	0	1152	0
10	0	0	0	0	0	0	0	0	0	0

Clear All

RX Frames 64 Bytes: 64 bytes frames received.

RX Frames 65-127 Bytes: 65-127 bytes frames received.

RX Frames 128-255 Bytes: 128-255 bytes frames received.

RX Frames 256-511 Bytes: 256-511 bytes frames received.

RX Frames 512-1023 Bytes: 512-1023 bytes frames received.

RX Frames 1024-10240 Bytes: 1024-10240 bytes frames received.

RX Multicast Frames: Good multicast frames received.

TX Multicast Frames: Good multicast packets sent.

RX Broadcast Frames: Good broadcast frames received.

TX Broadcast Frames: Good broadcast packets sent.

Clear All: This will clear all port's counter values and be set back to zero.

4.5.4 IEEE 802.1q Tag VLAN Table

Select **IEEE 802.1q Tag VLAN Table** from the **Switch Monitor** menu and then the following screen page appears.

IEEE 802.1q Tag VLAN Table

U :Untagged	T :Tagged	V :Member	- :Not Member									
VLAN Name	VID	1	2	3	4	5	6	7	8	9	10	CPU
Default_VLAN	1	U	U	U	U	U	U	U	U	U	U	V

VLAN Name: View-only filed that shows the VLAN name.

VID: View-only filed that shows the VID.

4.5.5 LACP Monitor

Click the **LACP Monitor** folder and then two options within this folder will be displayed.

IPS-3110-PB	LACP Port Status					
	System Information	User Authentication	Network Management	Switch Management	Switch Monitor	Switch Port Status
<ul style="list-style-type: none">System InformationUser AuthenticationNetwork ManagementSwitch ManagementSwitch Monitor<ul style="list-style-type: none">Switch Port StatusPort Counters RatesPort Counters EventsIEEE 802.1q Tag VLAN TableLACP Monitor<ul style="list-style-type: none">LACP Port StatusLACP StatisticsRSTP Monitor802.1X MonitorSFP InformationIGMP SnoopingMAC Address TableLLDP StatusLoop Detection StatusRing Detection StatusPoE Status						
	Port	LACP Operational State	Key	Aggr ID	Partner ID	Partner Port
	1	down	1	01	00:00:00:00:00:00	0
	2	down	1	02	00:00:00:00:00:00	0
	3	down	1	03	00:00:00:00:00:00	0
	4	down	1	04	00:00:00:00:00:00	0
	5	down	1	05	00:00:00:00:00:00	0
	6	down	1	06	00:00:00:00:00:00	0
	7	down	1	07	00:00:00:00:00:00	0
	8	down	1	08	00:00:00:00:00:00	0
	9	down	3	09	00:00:00:00:00:00	0
	10	down	1	10	00:00:00:00:00:00	0

4.5.5.1 LACP Port Status

LACP Port Status allows users to view a list of all LACP ports' information. Select **LACP Port Status** from the **LACP monitor** menu and then the following screen page appears.

LACP Port Status					
Port	LACP Operational State	Key	Aggr ID	Partner ID	Partner Port
1	down	1	01	00:00:00:00:00:00	0
2	down	1	02	00:00:00:00:00:00	0
3	down	1	03	00:00:00:00:00:00	0
4	down	1	04	00:00:00:00:00:00	0
5	down	1	05	00:00:00:00:00:00	0
6	down	1	06	00:00:00:00:00:00	0
7	down	1	07	00:00:00:00:00:00	0
8	down	1	08	00:00:00:00:00:00	0
9	down	3	09	00:00:00:00:00:00	0
10	down	1	10	00:00:00:00:00:00	0

In this page, you can find the following information about LACP port status:

Port Number: The number of the port.

LACP Operational State: The current operational state of LACP

Key: The current operational key for the LACP group.

Aggr ID: The ID of the LACP group.

In LACP mode, link aggregation control protocol data unit (LACPDU) is used for exchanging information among LACP-enabled devices. After LACP is enabled on a port, the port sends LACPDUs to notify the remote system of its system LACP priority, system MAC address, port LACP priority, port number and operational key. Upon receipt of an LACPDU, the remote system compares the received information with the information received on other ports to determine the ports that can operate as selected ports. This allows the two systems to reach an agreement on the states of the related ports when aggregating ports, link aggregation control automatically assigns each port an operational key based on its rate, duplex mode and other basic configurations. In an LACP aggregation group, all ports share the same operational key; in a manual or static LACP aggregation, the selected ports share the same operational key.

Partner ID: The ID (MAC address) of the partner port

Partner Port: The corresponding port numbers that connect to the partner switch in LACP mode.

4.5.5.2 LACP Statistics

In order to view the real-time LACP statistics status of the Managed Industrial PoE Ethernet Switch, select **LACP Statistics** from the **LACP Monitor** menu and then the following screen page appears.

LACP Statistics					
<div>Clear All</div>					
Port	LACP Transmitted	LACP Received	Illegal Received	Unknown Received	Clear Counters
1	0	0	0	0	<div>Clear</div>
2	0	0	0	0	<div>Clear</div>
3	0	0	0	0	<div>Clear</div>
4	0	0	0	0	<div>Clear</div>
5	0	0	0	0	<div>Clear</div>
6	0	0	0	0	<div>Clear</div>
7	0	0	0	0	<div>Clear</div>
8	0	0	0	0	<div>Clear</div>
9	0	0	0	0	<div>Clear</div>
10	0	0	0	0	<div>Clear</div>

Port: The port that LACP packets (LACPDU) are transmitted or received.

LACP Transmitted: The current LACP packets transmitted from the port.

LACP Received: The current LACP packets received from the port.

Illegal Received: The current Illegal packets received from the port.

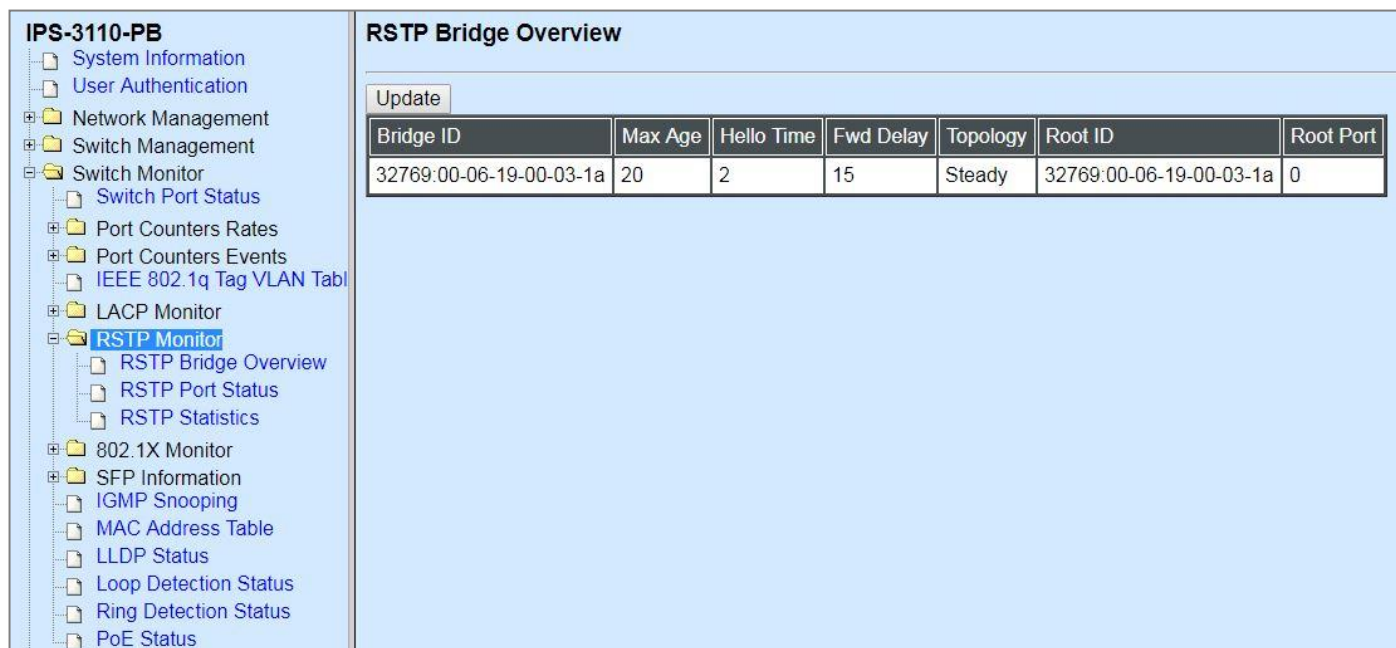
Unknown Received: The current unknown packets received from the port.

Clear button in **Clear Counters** field: Clear the statistics of the corresponding port.

Clear All: Clear the statistics of all ports.

4.5.6 RSTP Monitor

Click the **RSTP Monitor** folder and then three options within this folder will be displayed.



The screenshot shows a web interface for 'IPS-3110-PB'. On the left is a tree menu with categories like System Information, User Authentication, Network Management, Switch Management, and Switch Monitor. Under Switch Monitor, 'RSTP Monitor' is expanded, showing 'RSTP Bridge Overview', 'RSTP Port Status', and 'RSTP Statistics'. The main area displays the 'RSTP Bridge Overview' page. It features an 'Update' button and a table with the following data:

Bridge ID	Max Age	Hello Time	Fwd Delay	Topology	Root ID	Root Port
32769:00-06-19-00-03-1a	20	2	15	Steady	32769:00-06-19-00-03-1a	0

4.5.6.1 RSTP Bridge Overview

RSTP Bridge Overview allows users to view a list of RSTP brief information, such as Bridge ID, topology status and Root ID. Select **RSTP Bridge Overview** from the **RSTP Monitor** menu and then the following screen page appears.



This screenshot provides a closer view of the 'RSTP Bridge Overview' page. It includes an 'Update' button and a table with the following data:

Bridge ID	Max Age	Hello Time	Fwd Delay	Topology	Root ID	Root Port
32769:00-06-19-00-03-1a	20	2	15	Steady	32769:00-06-19-00-03-1a	0

In this webpage, you can find the following information about RSTP bridge:

Update: Update the current status.

Bridge ID: RSTP Bridge ID of the Managed Industrial PoE Ethernet Switch

Max Age: Max Age setting of the Managed Industrial PoE Ethernet Switch.

Hello Time: Hello Time setting of the Managed Industrial PoE Ethernet Switch.

Forward Delay: The Managed Industrial PoE Ethernet Switch's setting of Forward Delay Time.

Topology: The state of the topology.

Root ID: Display this Managed Industrial PoE Ethernet Switch's Root ID.

Root port: Display this Managed Industrial PoE Ethernet Switch's Root Port Number.

4.5.6.2 RSTP Port Status

RSTP Port Status allows users to view a list of all RSTP ports' information. Select **RSTP Port Status** from the **RSTP Monitor** menu and then the following screen page appears.

RSTP Port Status						
Port	Path Cost	Edge Port	P2p Port	Protocol	Role	Port State
1	0	no	yes	RSTP	Non-STP	Non-STP
2	0	no	yes	RSTP	Non-STP	Non-STP
3	0	no	yes	RSTP	Non-STP	Non-STP
4	0	no	yes	RSTP	Non-STP	Non-STP
5	0	no	yes	RSTP	Non-STP	Non-STP
6	0	no	yes	RSTP	Non-STP	Non-STP
7	0	no	yes	RSTP	Non-STP	Non-STP
8	0	no	yes	RSTP	Non-STP	Non-STP
9	0	no	yes	RSTP	Non-STP	Non-STP
10	0	no	yes	RSTP	Non-STP	Non-STP
LLAG1	0	no	no	RSTP	Non-STP	Non-STP
LLAG2	0	no	no	RSTP	Non-STP	Non-STP
LLAG3	0	no	no	RSTP	Non-STP	Non-STP
LLAG4	0	no	no	RSTP	Non-STP	Non-STP
LLAG5	0	no	no	RSTP	Non-STP	Non-STP

In this webpage, you can find the following information about RSTP status:

Port Number: The number of the port.

Path Cost: The Path Cost of the port.

Edge Port: "Yes" is displayed if the port is the Edge port connecting to an end station and does not receive BPDU.

P2p Port: "Yes" is displayed if the port link is connected to another STP device.

Protocol: Display RSTP or STP.

Role: Display the Role of the port (non-STP, forwarding or blocked).

Port State: Display the state of the port (non-STP, forwarding or blocked).

4.5.6.3 RSTP Statistics

In order to view the real-time RSTP statistics status of the Managed Industrial PoE Ethernet Switch, select **RSTP Statistics** from the **RSTP Monitor** menu and then the following screen page appears.

RSTP Statistics								
Port	RSTP Transmitted	STP Transmitted	TCN Transmitted	RSTP Received	STP Received	TCN Received	Illegal Received	Unknown Received
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
LLAG1	0	0	0	0	0	0	0	0
LLAG2	0	0	0	0	0	0	0	0
LLAG3	0	0	0	0	0	0	0	0
LLAG4	0	0	0	0	0	0	0	0
LLAG5	0	0	0	0	0	0	0	0

Port Number: The number of the port.

RSTP Transmitted: The total transmitted RSTP packets from current port.

STP Transmitted: The total transmitted STP packets from current port.

TCN Transmitted: The total transmitted TCN (Topology Change Notification) packets from current port.

RSTP Received: The total received RSTP packets from current port.

STP Received: The total received STP packets from current port.

TCN Received: The total received TCN packets from current port.

Illegal Received: The total received illegal packets from current port.

Unknown Received: The total received unknown packets from current port.

4.5.7 802.1X Monitor

Click the **802.1X Monitor** folder and then two options within this folder will be displayed.

The screenshot shows the configuration interface for an IPS-3110-PB device. On the left, a tree view under 'IPS-3110-PB' shows various configuration folders. The '802.1X Monitor' folder is selected and expanded, showing sub-items: '802.1X Port Status', '802.1X Statistics', 'SFP Information', 'IGMP Snooping', 'MAC Address Table', 'LLDP Status', 'Loop Detection Status', 'Ring Detection Status', and 'PoE Status'. The '802.1X Port Status' sub-item is highlighted. The main area on the right displays the '802.1X Port Status' table.

Port	State	Last Source	Last ID
1	Disabled		
2	Disabled		
3	Disabled		
4	Disabled		
5	Disabled		
6	Disabled		
7	Disabled		
8	Disabled		
9	Disabled		
10	Disabled		

4.5.7.1 802.1X Port Status

802.1X Port Status allows users to view a list of all 802.1x ports' information. Select **802.1X Port Status** from the **802.1x Monitor** menu and then the following screen page appears.

802.1X Port Status			
Port	State	Last Source	Last ID
1	Disabled		
2	Disabled		
3	Disabled		
4	Disabled		
5	Disabled		
6	Disabled		
7	Disabled		
8	Disabled		
9	Disabled		
10	Disabled		

In this webpage, you can find the following information about 802.1X ports:

Port: The number of the port.

Port State: Display the number of the port 802.1x link state LinkDown or LinkUp.

Last Source : Display the MAC address of the port's last Source.

Last ID: Display the username of the port's last login.

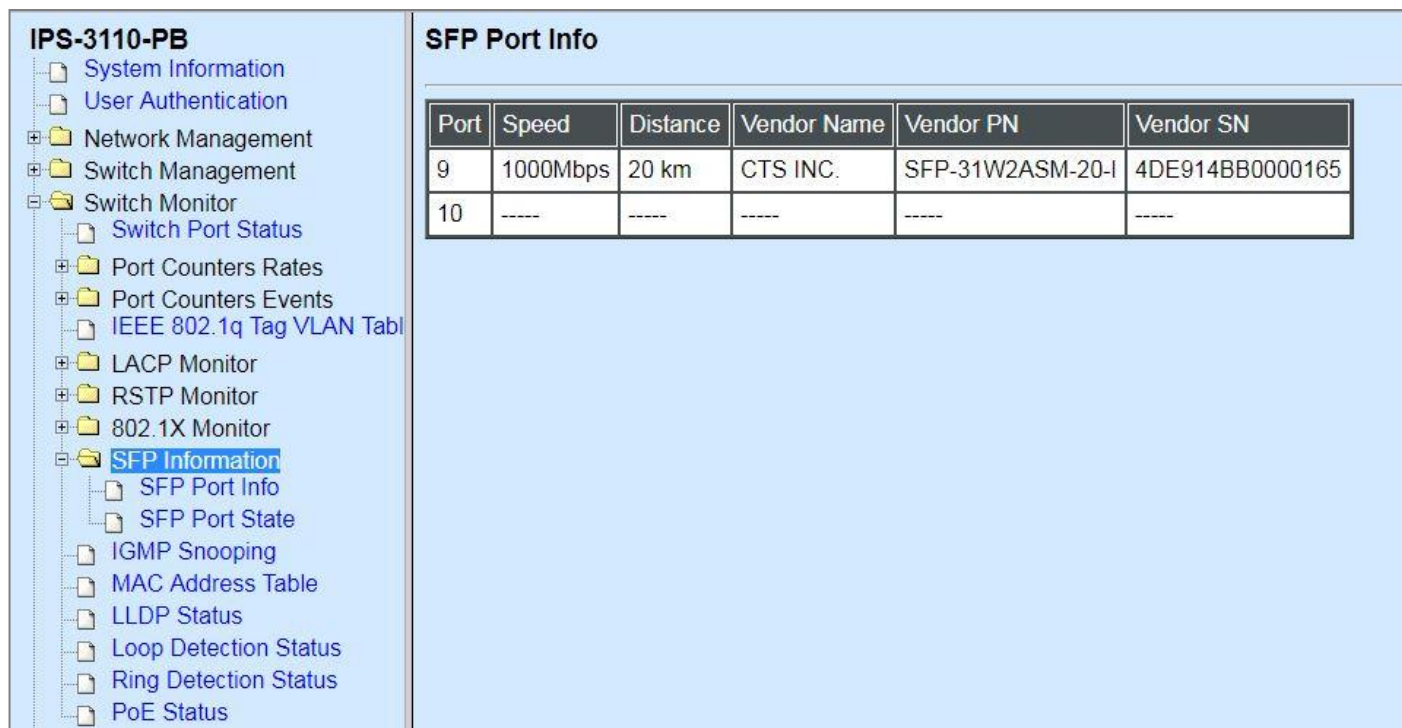
4.5.7.2 802.1X Statistics

In order to view the real-time 802.1X port statistics status of the Managed Industrial PoE Ethernet Switch, select **802.1x Statistics** from the **802.1x Monitor** menu and then the following screen page shows up.

802.1X Statistics															
Port	Rx Total	Rx Response ID	Rx Response	Rx Start	Rx Logout	Rx Invalid Type	Rx Invalid Length	Rx Access Challenges	Rx Other Requests	Rx Auth. Successes	Rx Auth. Failures	Tx Total	Tx Request ID	Tx Request	Tx Responses
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

4.5.8 SFP Information

Click the **SFP Information** folder and then two options within this folder will be displayed.



The screenshot shows a network management interface. On the left, a tree view under 'IPS-3110-PB' has 'SFP Information' selected. The main area, titled 'SFP Port Info', contains a table with the following data:

Port	Speed	Distance	Vendor Name	Vendor PN	Vendor SN
9	1000Mbps	20 km	CTS INC.	SFP-31W2ASM-20-I	4DE914BB0000165
10	----	----	----	----	----

4.5.8.1 SFP Port Info

SFP Port Info displays each port's slide-in SFP Transceiver information e.g. the speed of transmission, the distance of transmission, vendor Name, vendor PN, vendor SN, etc. Select **SFP Port Info** from the **SFP Information** menu and then the following screen page appears.

SFP Port Info					
Port	Speed	Distance	Vendor Name	Vendor PN	Vendor SN
9	1000Mbps	20 km	CTS INC.	SFP-31W2ASM-20-I	4DE914BB0000165
10	----	----	----	----	----

Port: The number of the port.

Speed: Data rate of the slide-in SFP Transceiver.

Distance: Transmission distance of the slide-in SFP Transceiver.

Vendor Name: Vendor name of the slide-in SFP Transceiver.

Vendor PN: Vendor PN of the slide-in SFP Transceiver.

Vendor SN: Vendor SN of the slide-in SFP Transceiver.

4.5.8.2 SFP Port State

SFP Port State displays each port's slide-in SFP Transceiver information e.g. the currently detected temperature, voltage, TX Bias, etc.. Select **SFP Port State** from the **SFP Information** menu and then the following screen page appears.

SFP Port State					
Port	Temperature(C)	Voltage(V)	TX Bias(mA)	TX Power(dbm)	RX Power(dbm)
9	38.0	3.35	30.92	-5.8	-8.1
10	----	----	----	----	----

Port: The number of the SFP module slide-in port.

Temperature (C): The operation temperature of slide-in SFP module currently detected.

Voltage (V): The operation voltage of slide-in SFP module currently detected.

TX Bias (mA): The operation current of slide-in SFP module currently detected.

TX Power (dbm): The optical transmission power of slide-in SFP module currently detected.

RX Power (dbm): The optical receiving power of slide-in SFP module currently detected.

4.5.9 IGMP Snooping

In order to view the real-time IGMP multicast groups table of the Managed Industrial PoE Ethernet Switch, select **IGMP Snooping** from the **Switch Monitor** menu and then the following screen page appears.

IGMP Group Table

Update

VLAN ID

Group

Port

Update: Click **Update** to update the IGMP group table.

VLAN ID: VID of the specific VLAN.

Group: The multicast IP address of IGMP querier.

Port: The port(s) grouped in the specific multicast group.

4.5.10 MAC Address Table

MAC Address Table displays MAC addresses learned when MAC Address Learning is enabled.

MAC Address Table

All ▼

VLAN

0

(0-4094)

Top

Next

Total

1

Index	Type	MAC Address	VID	LAG_ID	Ports
1	static	00:06:19:00:03:1A	1	--	CPU

The table above shows the MAC addresses learned from each port of the Managed Industrial PoE Ethernet Switch.

Click **Top** to update the MAC Address Table.

You may use **Next** to move to the next page of MAC Address table.

4.5.11 LLDP Status

Select **LLDP Status** from the **Switch Monitor** menu and then the following screen page appears.

LLDP Status										
<input type="button" value="Update"/>										
Local Port	Chassis ID	Remote Port	System Name	Port Description	System Capabilities	Management1 Address	Management2 Address	Management3 Address	Management4 Address	Management5 Address
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Click **Update** to update the LLDP Status table.

Local Port: View-only field that shows the port number on which LLDP frames are received.

Chassis ID: View-only field that shows the MAC address of the LLDP frames received (the MAC address of the neighboring device).

Remote Port: View-only field that shows the port number of the neighboring device.

System Name: View-only field that shows the system name advertised by the neighboring device.

Port Description: View-only field that shows the port description of the remote port.

System Capabilities: View-only field that shows the capability of the neighboring device.

Management Address (1~5): View-only field that shows the IP address (1~5) of the neighboring device.

4.5.12 Loop Detection Status

Select **Loop Detection Status** from the **Switch Monitor** menu and then the following screen page appears.

Loop Detection Status		
Port	Status	Lock Cause
1	Un-lock	
2	Un-lock	
3	Un-lock	
4	Un-lock	
5	Un-lock	
6	Un-lock	
7	Un-lock	
8	Un-lock	
9	Un-lock	
10	Un-lock	

Status: View-only filed that shows the loop status of each port.

Lock Cause: View-only filed that shows the cause why the port is locked.

4.5.13 Ring Detection Status

Ring Detection Table displays the Ring Detection status of each port and the system. Select **Ring Detection Status** from the **Switch Monitor** menu and then the following screen page appears.

Ring Status

Ring Detection is disabled.

Software Role is Slave

Port Number	Port Enable	Port State
1	Disable	
2	Disable	
3	Disable	
4	Disable	
5	Disable	
6	Disable	
7	Disable	
8	Disable	
9	Disable	
10	Disable	

Click **Update** to update the Ring Detection Table.

Port Enable: Shows the status of whether Ring Detection on each port is enabled or disabled.

Port State: Show the status of the ring ports are in blocking or forwarding state.

- **Blocking:** It indicates a port is temporarily blocked and stop sending packets until the link down of the forwarding port occurs.
- **Forwarding:** It indicates a port keeps sending packets.

4.5.14 PoE Status

In order to view PoE status of each TP port. Select **PoE Status** from the **Switch Monitor** menu and then the following screen page appears.

PoE Status				
Total Watts Available	240			
Total PoE Power Consumption	0.0(0.0%)			
Port	1 :	3 :	5 :	7 :
Power(W)	---	---	---	---
Voltage(V)	---	---	---	---
Current(mA)	---	---	---	---
PD Class	---	---	---	---
PoE Detection	Open Circuit	Open Circuit	Open Circuit	Open Circuit
Operation Mode	Auto AF/AT	Auto AF/AT	Auto AF/AT	Auto AF/AT
Port	2 :	4 :	6 :	8 :
Power(W)	---	---	---	---
Voltage(V)	---	---	---	---
Current(mA)	---	---	---	---
PD Class	---	---	---	---
PoE Detection	Open Circuit	Open Circuit	Open Circuit	Open Circuit
Operation Mode	Auto AF/AT	Auto AF/AT	Auto AF/AT	Auto AF/AT

Total Watts Available (For IPS-3110-PB Only): View-only field that shows the total amount of power supply available for total powered devices' consumption currently.

Total PoE Power Consumption: View-only field that shows the total power in watt and the percentage (for IPS-3110-PB only) currently used on the switch.

Port: View-only field that shows the number of each TP port.

Power(W): View-only field that shows the power in watt used on a port currently.

Voltage(V): View-only field that shows the voltage used on a port currently.

Current(mA): View-only field that shows the current in milliampere used on a port currently.

PD Class: View-only field that shows the class of PD.

PoE Detection: View-only field that shows the current PoE status on a port.

Operation Mode: View-only field that shows the method of power supply over Ethernet for the PD.

4.6 System Utility

System Utility allows users to easily operate and maintain the system. Select the folder **System Utility** from the **Main Menu** and then the following screen page appears.

IPS-3110-PB

- System Information
- User Authentication
- Network Management
- Switch Management
- Switch Monitor
- System Utility**
 - Event Log
 - HTTP Upgrade
 - FTP/TFTP Upgrade
 - Load Factory Settings
 - Load Factory Settings Except Network Configuration
 - Auto-Backup Configuration
 - Save Configuration
 - Reset System
 - Logout

Event Log

Index	Type	Time	Up Time	Description	Source	Event	Name/Community	Address
1	I		0 day 00:01:20	System cold start.	local	cold start		
2	I		0 day 00:01:23	Local port 1 copper link down.	local	link down		
3	I		0 day 00:01:23	Local port 2 copper link up.	local	link up		
4	I		0 day 00:01:23	Local port 3 copper link down.	local	link down		
5	I		0 day 00:01:23	Local port 4 copper link down.	local	link down		
6	I		0 day 00:01:23	Local port 5 copper link down.	local	link down		
7	I		0 day 00:01:23	Local port 6 copper link down.	local	link down		
8	I		0 day 00:01:23	Local port 7 copper link down.	local	link down		
9	I		0 day 00:01:23	Local port 8 copper link down.	local	link down		
10	I		0 day 00:01:23	Local port 9 fiber link down.	local	link down		
11	I		0 day 00:01:23	Local port 10 fiber link down.	local	link down		
12	W		0 day 00:01:34	System Power 1 is missing.	local	missing		
13	I		0 day 00:01:35	System Power 2 power supply up.	local	power supply up		

Clear All

- Event Log:** Event log can keep a record of system's log events such as system warm start, cold start, link up/down, user login/logout, etc. They will be kept only when your CPU version is A06 with Boot ROM version A08 or later version. If your CPU or Boot ROM version is older than the one mentioned above, all events will lose when the system is shut down or rebooted.
- HTTP/FTP/TFTP Upgrade:** This allows users to update the latest firmware, save current configuration or restore previous configuration to the Managed Industrial PoE Ethernet Switch.
- Load Factory Settings:** Load Factory Setting will set the configuration of the Managed Industrial PoE Ethernet Switch back to the factory default settings. The IP and Gateway addresses will be reset to the factory default as well.
- Load Factory Settings Except Network Configuration:** Selecting this function will also restore the configuration of the Managed Industrial PoE Ethernet Switch to its original factory default settings. However, this will not reset the IP and Gateway addresses to the factory default.
- Auto-Backup Configuration:** Periodically execute the automatic backup of the start-up configuration files based on the given time you set up.

4.6.1 Event Log

Event log keeps a record of switch-related information, such as user login, logout timestamp and so on. Select **Event Log** from the **System Utility** menu and then the following screen page appears. All event logs will be cleared when system reset occurs.

Event Log								
Index	Type	Time	Up Time	Description	Source	Event	Name/Community	Address
1	I		0 day 00:47:17	User from web login succeeded.	web	login	admin	192.168.0.79
2	I		0 day 00:49:20	User from telnet login succeeded.	telnet	login	admin	192.168.0.79
3	I		0 day 00:52:40	User from web logout.	web	logout	admin	192.168.0.79
4	I		0 day 00:52:46	User from web login succeeded.	web	login	admin	192.168.0.79
5	I		0 day 00:53:32	User from web logout.	web	logout	admin	192.168.0.79
6	I		0 day 00:53:41	User from web login succeeded.	web	login	admin	192.168.0.79
7	I		0 day 00:53:50	User from web logout.	web	logout	admin	192.168.0.79
8	W		0 day 00:53:57	User from web login failed.	web	login failed	Iris	192.168.0.79
9	W		0 day 00:54:04	User from web login failed.	web	login failed	Iris	192.168.0.79
10	W		0 day 00:54:19	User from web login failed.	web	login failed	Iris	192.168.0.79
11	W		0 day 00:54:28	User from web login failed.	web	login failed	iris	192.168.0.79
12	I		0 day 00:54:28	User from telnet disconnected.	telnet	disconnected	admin	192.168.0.79
13	I		0 day 00:54:37	User from web login succeeded.	web	login	admin	192.168.0.79

Clear All

Click **Clear All** to clear the record of all event logs.

4.6.2 HTTP Upgrade

Users may save or restore their configuration and update their firmware. Select **HTTP Upgrade** from the **System Utility** menu and then the following screen page appears.

HTTP Upgrade

Configuration Update

Backup	Config Type	Running-config ▾
	device configuration to local file	Backup
Restore	Choose File	No file chosen
		Restore

Firmware Update

Upgrade Image Option	Image-2 ▾	
Select File	Choose File	No file chosen
		Upload

The related parameter description of the configuration update is as follows:

Config Type:

There are three types of the configuration file: Running-config, Default-config and Start-up-config.

- **Running-config:** Back up the data you're processing.
- **Default-config:** Back up the data same as factory setting.
- **Start-up-config:** Back up the data same as last saved data.

Device Configuration to Local File: Click **Backup** to begin download the configuration file to your PC.

Restore: Click **Choose File** to select the designated data and then click **Restore**.

The related parameter description of the firmware update is as follows:

Upgrade Image Option: Pull down the list to choose the image you would like to upgrade.

Select File: Click **Choose File** to select the desired file and then click **Upload**.

4.6.3 FTP/TFTP Upgrade

The Managed Industrial PoE Ethernet Switch has both built-in TFTP and FTP clients. Users may save or restore their configuration and update their firmware. Select **FTP/TFTP Upgrade** from the **System Utility** menu and then the following screen page appears.

FTP/TFTP Upgrade	
Protocol	FTP ▾
File Type	Configuration ▾
Config Type	Running-config ▾
Server Address	0.0.0.0
User Name	
Password	...
File Location	
<input type="button" value="Put"/> <input type="button" value="Update"/>	
Transmitting State	

Protocol: Select the preferred protocol, either FTP or TFTP.

File Type: Select the type of file to process, either Firmware or Configuration.

Config Type: Choose the type of the configuration file that will be saved or restored among “Running-config”, “Default-config” or “Start-up-config”.

Server Address: Enter the specific IP address of the FTP/TFTP file server.

User Name: Enter the specific username to access the FTP file server.

Password: Enter the specific password to access the FTP file server.

File Location: Enter the specific path and filename within the FTP/TFTP file server.

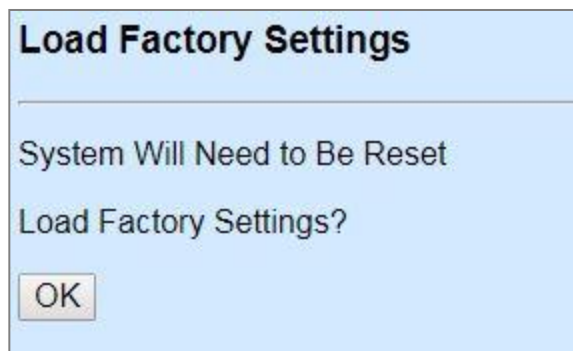
Click **Update** to start the download process and receive files from the server. A transmitting progress will be displayed during file transfer. Once completed, a process-completed message will pop up to remind the user.

Click **Put** to start the upload process and transmit files to the server. A transmitting progress will be displayed during file transfer. Once completed, a process-completed message will pop up to remind users.

4.6.4 Load Factory Settings

Load Factory Setting will set all the configurations of the Managed Industrial PoE Ethernet Switch back to the factory default settings, including the IP and Gateway address. **Load Factory Setting** is useful when network administrators would like to re-configure the system. A system reset is required to make all changes effective after Load Factory Setting.

Select **Load Factory Setting** from the **System Utility** menu and then the following screen page appears.

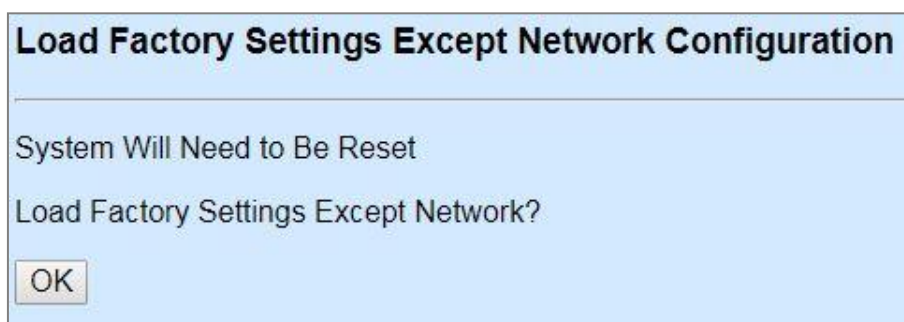


Click **OK** to start loading factory settings.

4.6.5 Load Factory Settings Except Network Configuration

Load Factory Settings Except Network Configuration will set all the configurations of the Managed Industrial PoE Ethernet Switch back to the factory default settings. However, IP and Gateway addresses will not restore to the factory default. It is very useful when network administrators need to re-configure the system "REMOTELY" because conventional Factory Reset will bring network settings back to default and lose all network connections.

Select **Load Factory Setting Except Network Configuration** from the **System Utility** menu, the following screen page shows up.



Click **OK** to start loading factory settings except network configuration.

4.6.6 Auto-Backup Configuration

In IPS-3110-PB, the forementioned **HTTP Upgrade** and **FTP/TFTP Upgrade** functions are offered for the users to do the manual backup of the start-up configuration. Alternatively, you can choose the **Auto-backup configuration** function to do this backup automatically and periodically. It is useful to prevent the loss of user's important configuration if they forget to do the backup, or help do the file comparison if any error occurs. Please note that the device's NTP function must be enabled as well in order to obtain the correct local time.

To initiate this function, please select **Auto-Backup Configuration** from the **System Utility** menu, the following screen page shows up.

Auto-Backup Configuration

Note: In order for the Auto Backup function to work properly, the NTP function must be enabled for the device to acquire local time information.

Auto Backup	Disabled ▾
Backup Time	0 ▾ o'clock
Protocol	TFTP ▾
File Type	Configuration
Server Address	0.0.0.0
User Name	anonymous
Password	
File Directory	/
File Name	
Backup State	

OK

Auto Backup: Enable/Disable the auto-backup function for the start-up configuration files of the device.

Backup Time: Set up the time when the backup of the start-up configuration files will start every day for the system.

Protocol: Either FTP or TFTP server can be selected to backup the start-up configuration files.

File Type: Display the type of files that will be backed up.

Server Address: Set up the IP address of FTP/TFTP server.

User Name and Password: Input the required username as well as password for authentication if FTP is chosen in the Protocol field.

File Directory: Assign the back-up path where the start-up configuration files will be placed on FTP or TFTP server.

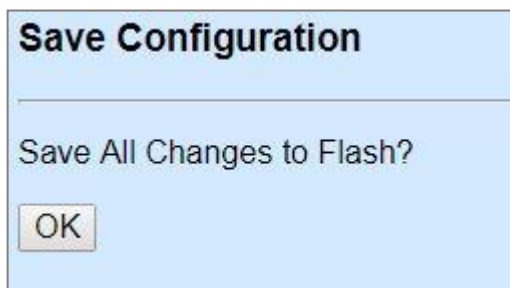
File Name: The filename assigned to the auto- backup configuration files. The format of filename generated automatically is as follows:

ip address_Device Name_Date.txt , for example, 192.168.0.3_IPS-3110-PB_20171120.txt

Backup State: Display the status of the auto-backup you execute.

4.7 Save Configuration

In order to save the configuration permanently, users need to save configuration first before resetting the Managed Industrial PoE Ethernet Switch. Select **Save Configuration** from the the Main Menu and then the following screen page appears.

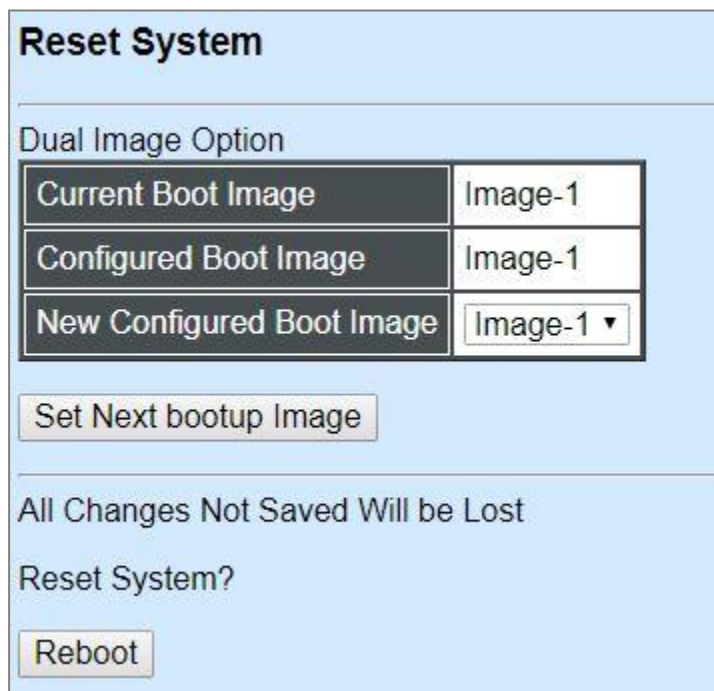


A light blue rectangular dialog box with a title bar at the top that says "Save Configuration". Below the title bar, the text "Save All Changes to Flash?" is displayed. At the bottom left of the dialog, there is a button labeled "OK".

Click **OK** to save the configuration.

4.8 Reset System

To reboot the system, please select **Reset System** from the Main Menu and then the following screen page appears. From the pull-down menu of **New Configured Boot Image**, you can choose the desired image for the next system reboot if necessary.



The "Reset System" screen has a light blue background. At the top, the title "Reset System" is in a darker blue bar. Below the title, the section "Dual Image Option" contains a table with three rows. The first two rows have labels "Current Boot Image" and "Configured Boot Image" in dark boxes, both showing "Image-1". The third row has a label "New Configured Boot Image" in a dark box and a pull-down menu showing "Image-1" with a downward arrow. Below the table is a button labeled "Set Next bootup Image". A horizontal line separates this section from the bottom section, which contains the text "All Changes Not Saved Will be Lost" and "Reset System?". At the bottom of the screen is a button labeled "Reboot".

Current Boot Image	Image-1
Configured Boot Image	Image-1
New Configured Boot Image	Image-1 ▼

Click **Set Next bootup Image** to change the image into the new boot-up image you select. Click **Reboot** to restart the Managed Industrial PoE Ethernet Switch.

APPENDIX A: Free RADIUS readme

The advanced RADIUS Server Set up for **RADIUS Authentication** is described as below.

When free RADIUS client is enabled on the device,

On the server side, it needs to put this file "**dictionary.sample**" under the directory **/raddb**, and modify these three files - "**users**", "**clients.conf**" and "**dictionary**", which are on the disc shipped with this product.

* Please use any text editing software (e.g. Notepad) to carry out the following file editing works.

In the file "**users**",

Set up user name, password, and other attributes.

In the file "**clients.conf**",

Set the valid range of RADIUS client IP address.

In the file "**dictionary**",
Add this following line -

\$INCLUDE dictionary.sample

APPENDIX B: Set Up DHCP Auto-Provisioning

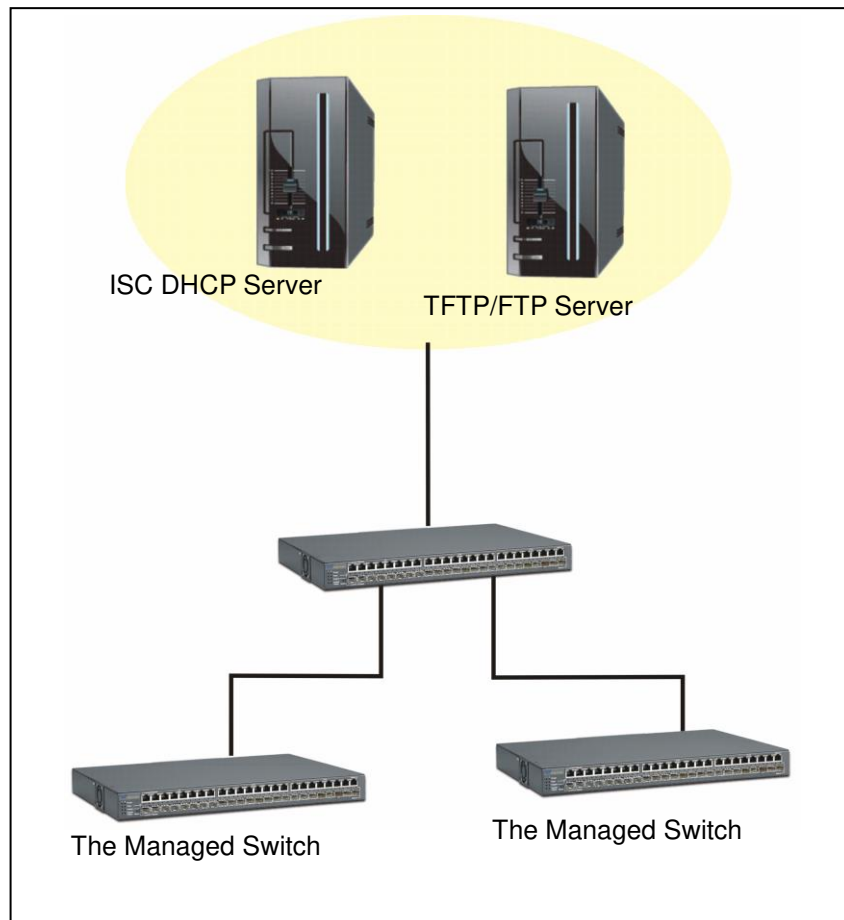
Networking devices, such as switches or gateways, with DHCP Auto-provisioning function allow you to automatically upgrade firmware and configuration at startup process. Before setting up DHCP Server for auto-upgrade of firmware and configuration, please make sure the Managed Industrial PoE Ethernet Switch that you purchased can support DHCP Auto-provisioning. Setup procedures and auto-provisioning process are described below for your reference.

A. Setup Procedures

Follow the steps below to set up Auto Provisioning server, modify dhcpd.conf file and generate a copy of configuration file.

Step 1. Set up Environment

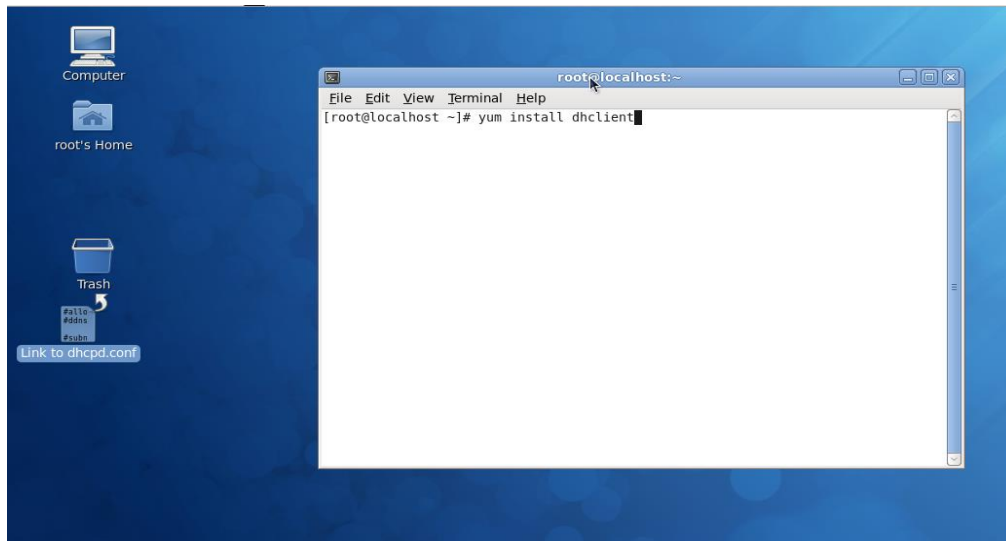
DHCP Auto-provisioning-enabled products that you purchased support the DHCP option 60 to work as a DHCP client. To make auto-provisioning function work properly, you need to prepare ISC DHCP server, File server (TFTP or FTP) and the switching device. See below for a possible network topology example.



Topology Example

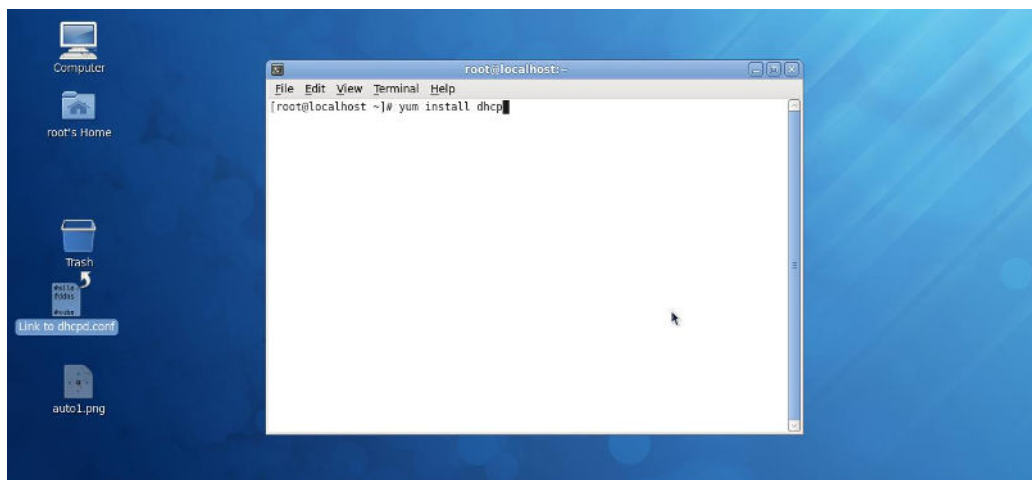
Step 2. Set up Auto Provision Server

- **Update DHCP Client**



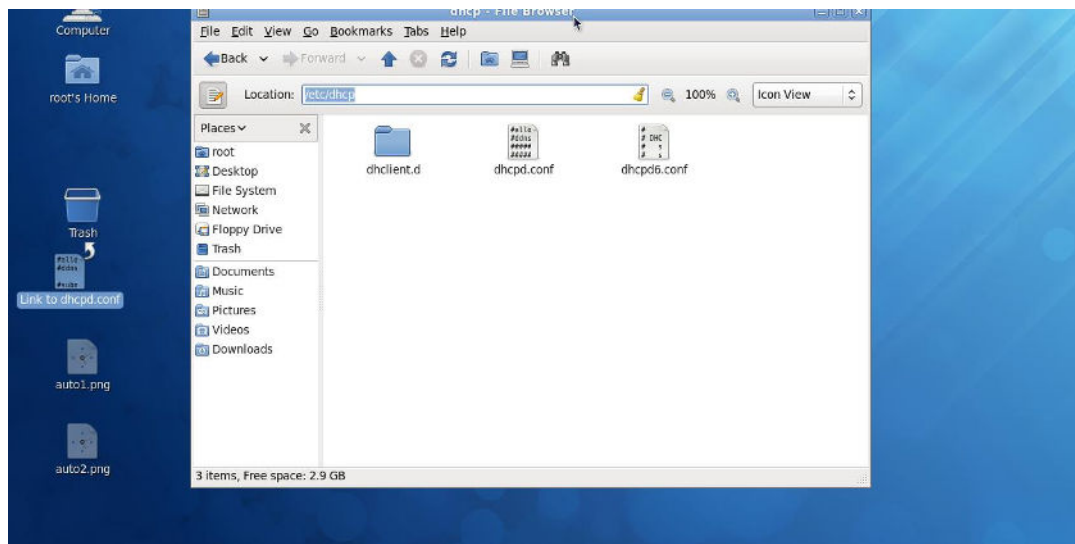
Linux Fedora 12 supports “yum” function by default. First of all, update DHCP client function by issuing “yum install dhclient” command.

- **Install DHCP Server**



Issue “yum install dhcp” command to install DHCP server.

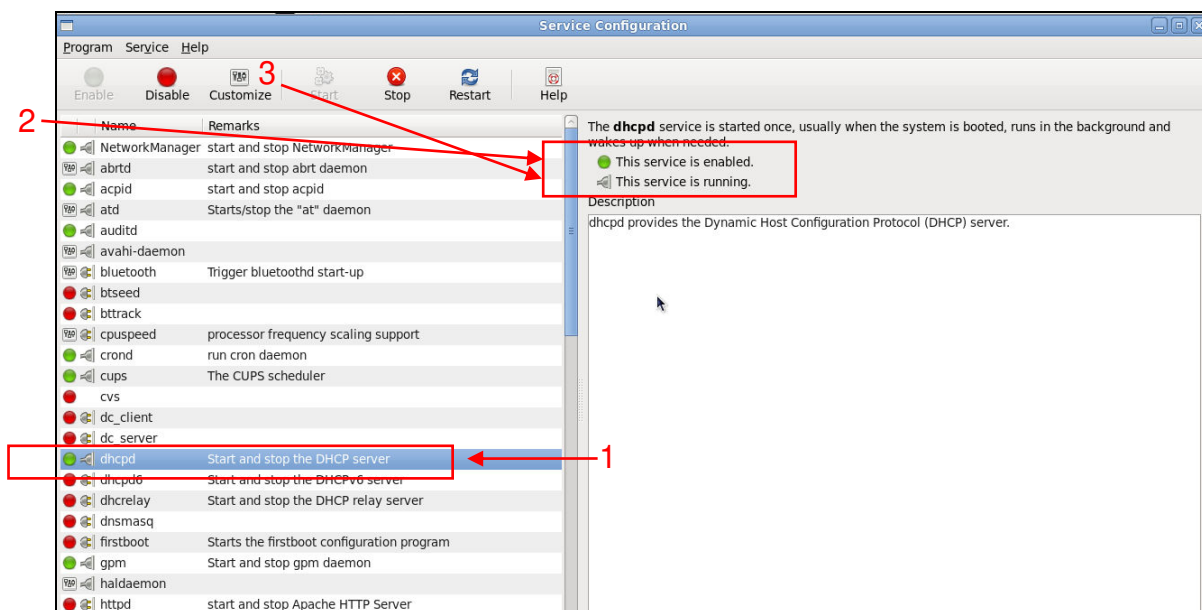
- **Copy dhcpd.conf to /etc/dhcp/ directory**



Copy dhcpd.conf file provided by the vendor to /etc/dhcp/ directory.

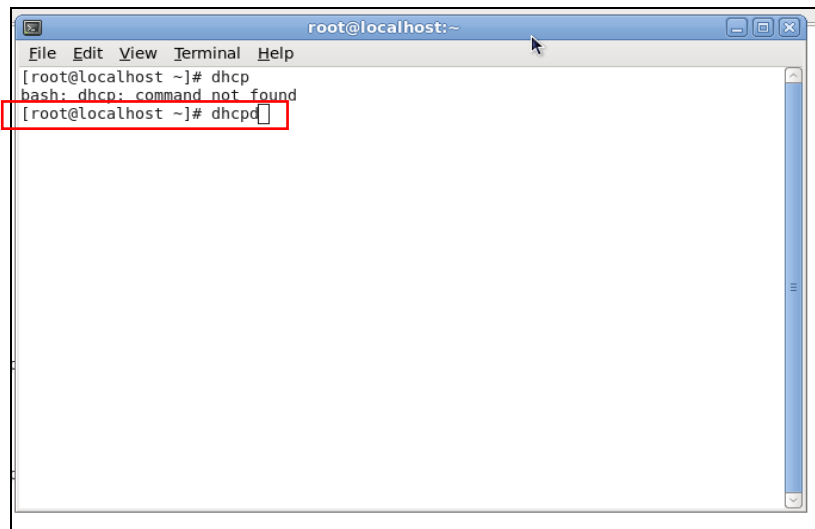
Please note that each vendor has their own way to define auto provisioning. Make sure to use the file provided by the vendor.

- **Enable and run DHCP service**



1. Choose dhcpd.
2. Enable DHCP service.
3. Start running DHCP service.

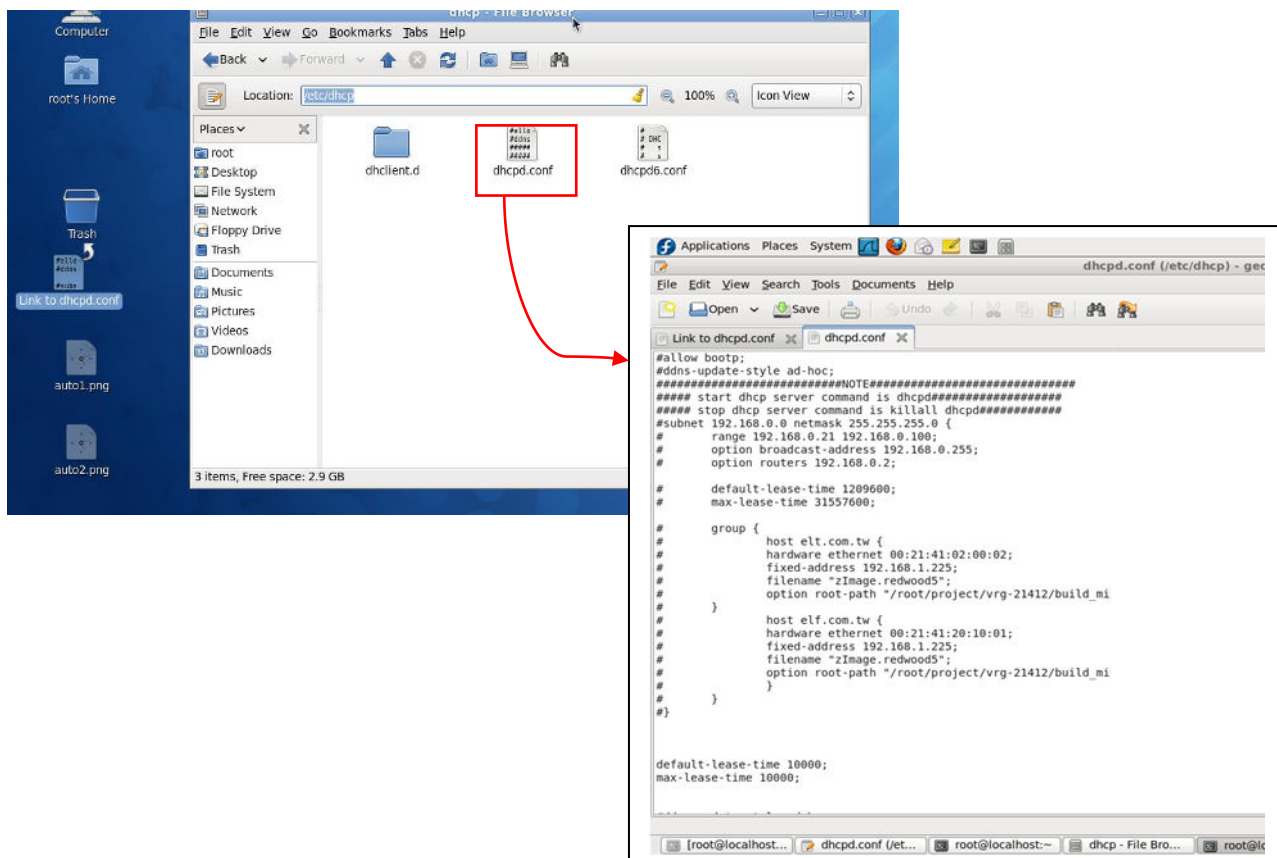
NOTE: DHCP service can also be enabled by CLI. Issue “dhcpd” command to enable DHCP service.



```
root@localhost:~  
File Edit View Terminal Help  
[root@localhost ~]# dhcp  
bash: dhcp: command not found  
[root@localhost ~]# dhcpd
```

Step 3. Modify dhcpd.conf file

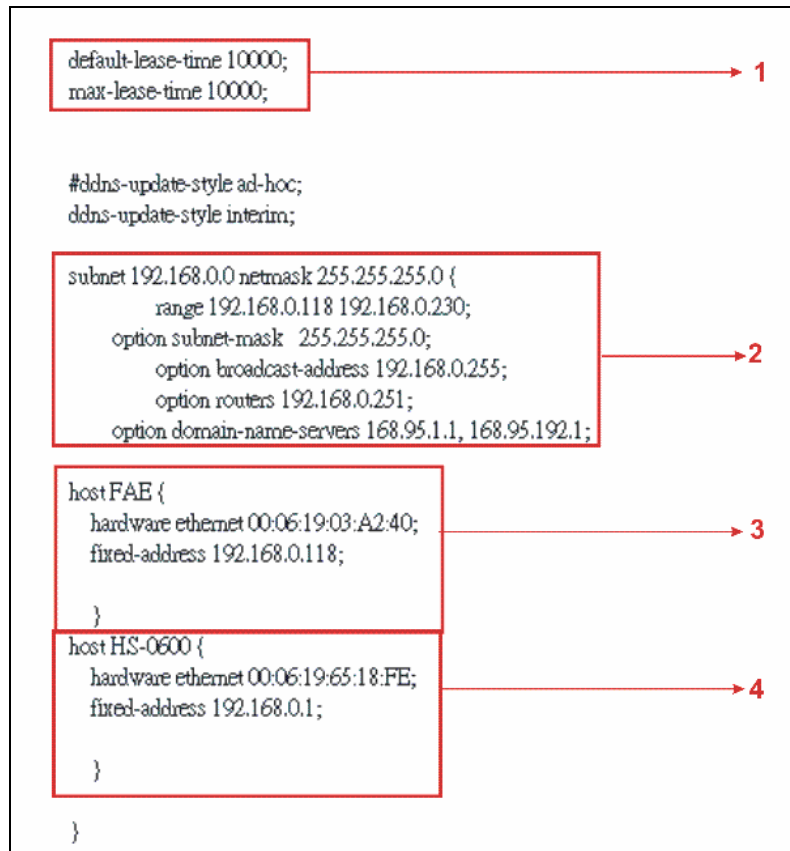
- Open dhcpd.conf file in /etc/dhcp/ directory



Double-click `dhcpd.conf` placed in `/etc/dhcp/` directory to open it.

● Modify dhcpd.conf file

The following marked areas in dhcpd.conf file can be modified with values that work with your networking environment.

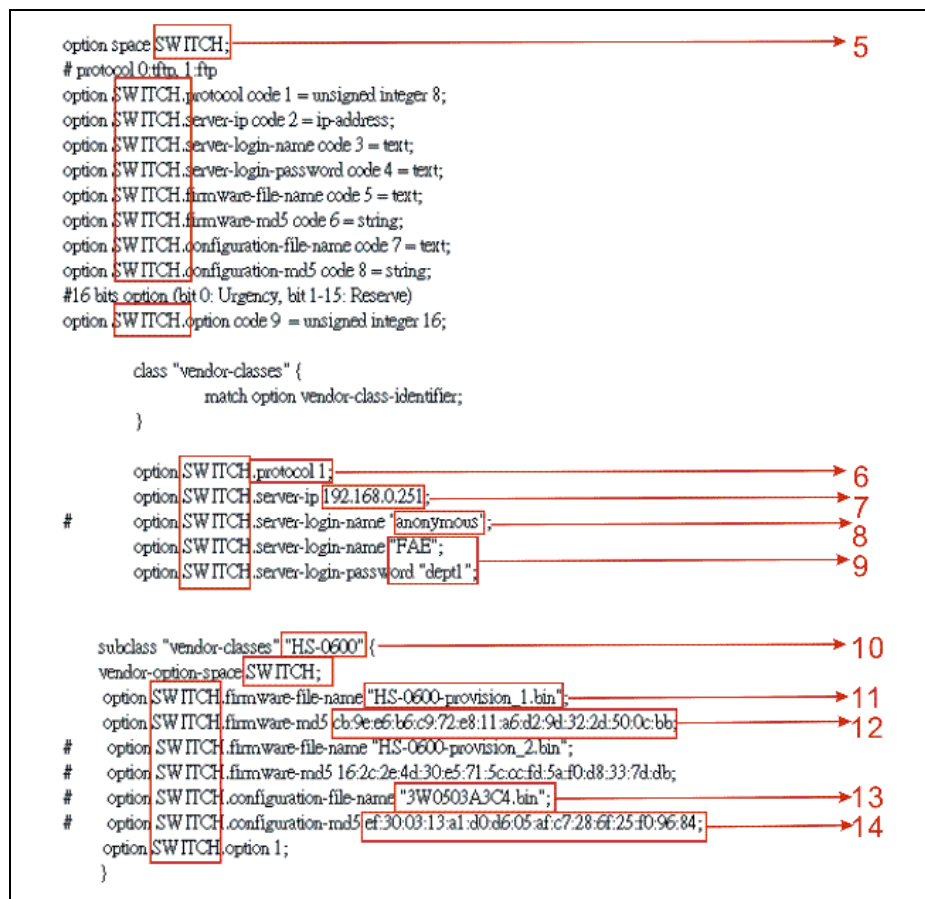


1. Define DHCP default and maximum lease time in seconds.

Default lease time: If a client does not request a specific IP lease time, the server will assign a default lease time value.

Maximum lease time: This is the maximum length of time that the server will lease for.

2. Define subnet, subnet mask, IP range, broadcast address, router address and DNS server address.
3. Map a host's MAC address to a fixed IP address.
4. Map a host's MAC address to a fixed IP address. Use the same format to create multiple MAC-to-IP address bindings.



5. This value is configurable and can be defined by users.
6. Specify the protocol used (Protocol 1: FTP; Protocol 0: TFTP).
7. Specify the FTP or TFTP IP address.
8. Login TFTP server anonymously (TFTP does not require a login name and password).
9. Specify FTP Server login name and password.
10. Specify the product model name.
11. Specify the firmware filename.
12. Specify the MD5 for firmware image.
13. Specify the configuration filename.
14. Specify the MD5 for configuration file.

NOTE 1: The text beginning with a pound sign (#) will be ignored by the DHCP server. For example, in the figure shown above, firmware-file-name “HS-0600-provision_2.bin” and firmware-md5 (line 5 & 6 from the bottom) will be ignored. If you want DHCP server to process these two lines, remove pound signs in the initial of each line.

NOTE 2: You can use either free software program or Linux default md5sum function to get MD5 checksum for firmware image and configuration file.

```
dhcpcd.conf (/etc/dhcp) - gedit
[root@localhost ~]# md5sum HS-0600-provision_2.bin
162c2e4d30e5713cctf05a7e0d8337dbd HS-0600-provision_2.bin
[root@localhost ~]#
```

● Restart DHCP service

```
dhcpcd.conf (/etc/dhcp) - gedit
[root@localhost ~]# dhcpcd
Internet Systems Consortium DHCP Server 4.1.1-P1
Copyright 2004-2010 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/
WARNING: Host declarations are global. They are not limited to the scope you
clared them in.
Not searching LDAP since ldap-server, ldap-port and ldap-base-dn were not sp
ied in the config file
Wrote 0 class decls to leases file.
Wrote 0 deleted host decls to leases file.
Wrote 0 new dynamic host decls to leases file.
Wrote 6 leases to leases file.
Listening on LPF/eth0/00:0c:29:ef:f8:4f/192.168.0.0/24
Sending on LPF/eth0/00:0c:29:ef:f8:4f/192.168.0.0/24
Sending on Socket/fallback/fallback-net
[root@localhost ~]# killall dhcpcd
[root@localhost ~]#
```

```
dhcpcd.conf (/etc/dhcp) - gedit
[root@localhost ~]# dhcpcd
Internet Systems Consortium DHCP Server 4.1.1-P1
Copyright 2004-2010 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/
WARNING: Host declarations are global. They are not limited to the scope you
clared them in.
Not searching LDAP since ldap-server, ldap-port and ldap-base-dn were not sp
ied in the config file
Wrote 0 class decls to leases file.
Wrote 0 deleted host decls to leases file.
Wrote 0 new dynamic host decls to leases file.
Wrote 6 leases to leases file.
Listening on LPF/eth0/00:0c:29:ef:f8:4f/192.168.0.0/24
Sending on LPF/eth0/00:0c:29:ef:f8:4f/192.168.0.0/24
Sending on Socket/fallback/fallback-net
[root@localhost ~]#
```

Every time when you modify `dhcpd.conf` file, DHCP service must be restarted. Issue “`killall dhcpd`” command to disable DHCP service and then issue “`dhcpd`” command to enable DHCP service.

Step 4. Backup a Configuration File

Before preparing a configuration file in TFTP/FTP Server, make sure the device generating the configuration file is set to “**Get IP address from DHCP**” assignment. This is because that DHCP Auto-provisioning is running under DHCP mode, so if the configuration file is uploaded by the network type other than DHCP mode, the downloaded configuration file has no chance to be equal to DHCP when provisioning, and it results in MD5 never matching and causing the device to reboot endless.

In order for your Managed Industrial PoE Ethernet Switch to retrieve the correct configuration image in TFTP/FTP Server, please make sure the filename of your configuration file is defined exactly the same as the one specified in in **`dhcpd.conf`**. For example, if the configuration image’s filename specified in `dhcpd.conf` is “`metafile`”, the configuration image filename should be named to “`metafile`” as well.

Step 5. Place a copy of Firmware and Configuration File in TFTP/FTP

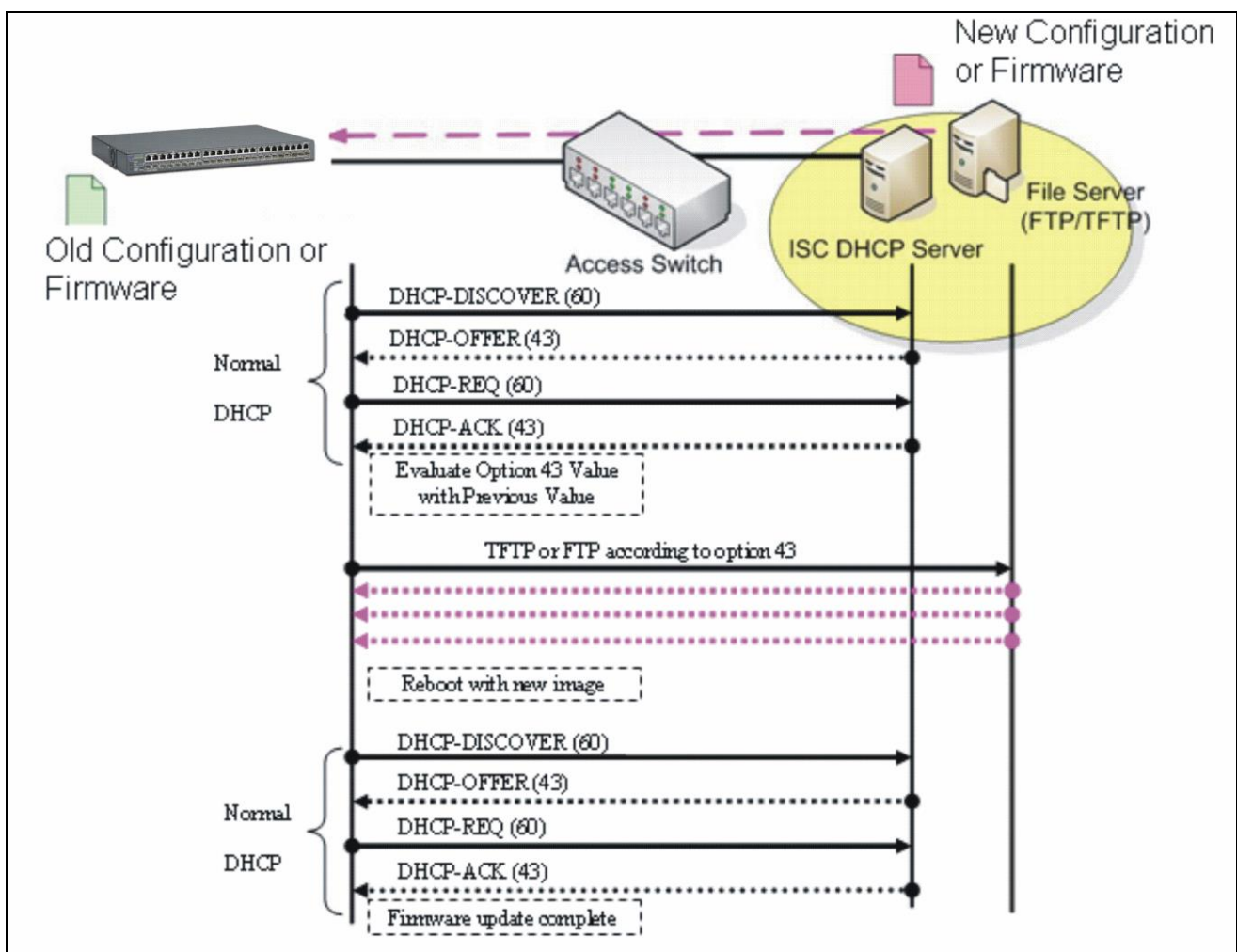
The TFTP/FTP File server should include the following items:

1. Firmware image (This file is provided by the vendor.)
2. Configuration file (This file is generally created by users.)
3. User account for your device (For FTP server only.)

B. Auto-Provisioning Process

This switching device is setting-free (through auto-upgrade and configuration) and its upgrade procedures are as follows:

1. The ISC DHCP server will recognize the device whenever it sends an IP address request to it, and it will tell the device how to get a new firmware or configuration.
2. The device will compare the firmware and configuration MD5 code form of DHCP option every time when it communicates with DHCP server.
3. If MD5 code is different, the device will then upgrade the firmware or configuration. However, it will not be activated right after.
4. If the Urgency Bit is set, the device will be reset to activate the new firmware or configuration immediately.
5. The device will retry for 3 times if the file is incorrect, and then it gives up until getting another DHCP ACK packet again.



APPENDIX C: VLAN Application Note

Overview

A Virtual Local Area Network (VLAN) is a network topology configured according to a logical scheme instead of the physical layout. It can be used to combine any collection of LAN segments into a group that appears as a single LAN so as to logically segment the network into different broadcast domains. All broadcast, multicast, and unknown packets entering the Switch on a particular VLAN will only be forwarded to the stations or ports that are members of that VLAN.

Generally, end nodes that frequently communicate with each other are assigned to the same VLAN, regardless of where they are physically on the network. In this way, the use of VLANs can enhance performance by conserving bandwidth and improve security by limiting traffic to specific domains. Another benefit of VLAN is that you can change the network topology without physically moving stations or changing cable connections. Stations can be 'moved' to another VLAN and thus communicate with its members and share its resources, simply by changing the port VLAN settings from one VLAN to another VLAN. This allows VLAN to accommodate network moves, changes and additions with the utmost flexibility.

The Managed Industrial PoE Ethernet Switch supports Port-based VLAN implementation and IEEE 802.1Q standard tagging mechanism that enables the switch to differentiate frames based on a 12-bit VLAN ID (VID) field. Besides, the Managed Industrial PoE Ethernet Switch also provides double tagging function. The IEEE 802.1Q double tagging VLAN is also referred to Q-in-Q or VLAN stacking (IEEE 802.1ad). Its purpose is to expand the 802.1Q VLAN space by tagging the inner tagged packets. In this way, a "double-tagged" frame is created so as to separate customer traffic within a service provider network. Moreover, the addition of double-tagged space increases the number of available VLAN tags which allow service providers to use a single SP-VLAN (Service Provider VLAN) tag per customer over the Metro Ethernet network.

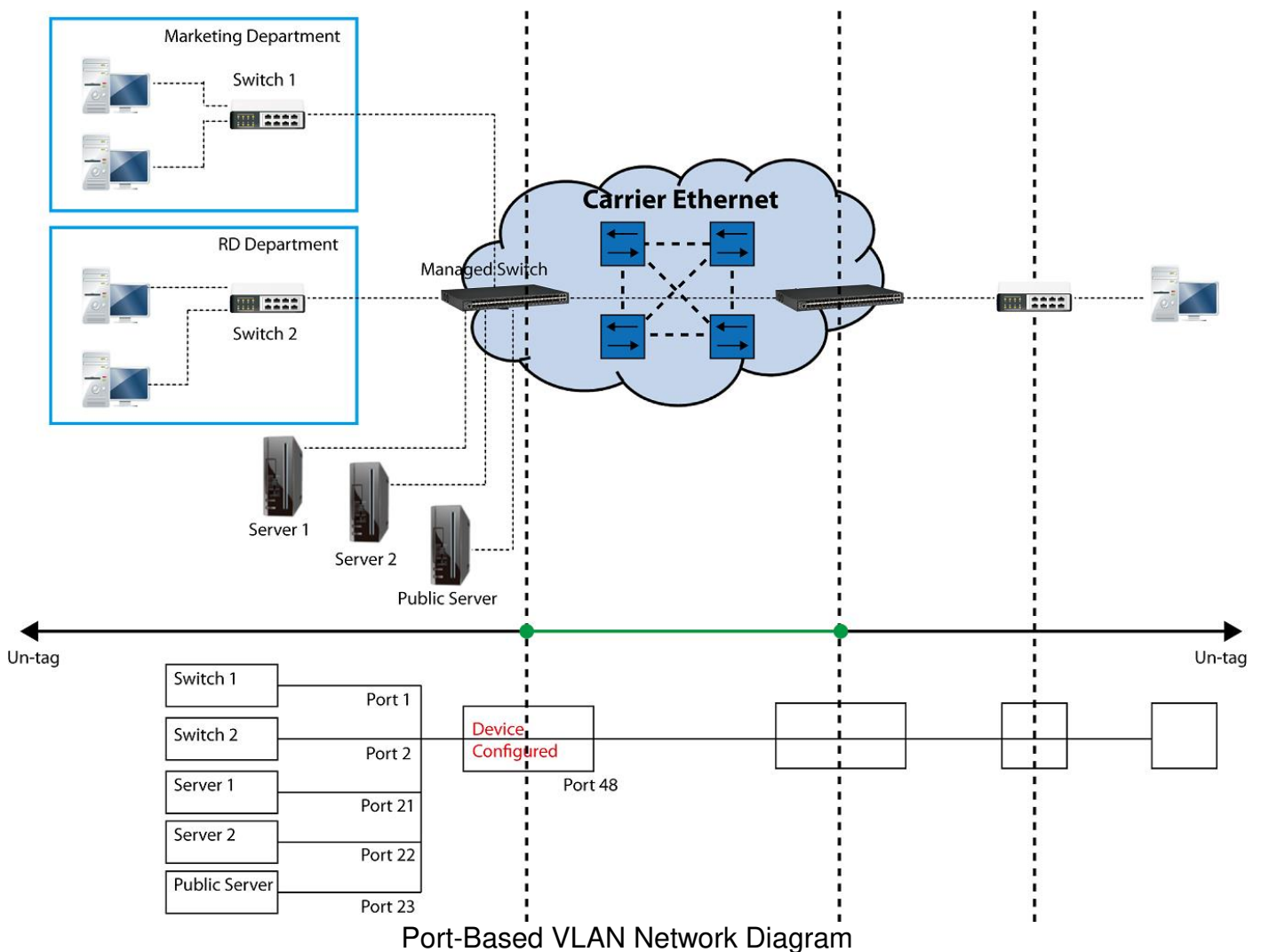
While this application note can not cover all of the real-life applications that are possible on this Managed Industrial PoE Ethernet Switch, it does provide the most common applications largely deployed in most situations. In particular, this application note provides a couple of network examples to help users implement Port-Based VLAN, Data VLAN, Management VLAN and Double-Tagged VLAN. Step-by-step configuration instructions using CLI and Web Management on setting up these examples are also explained. Examples described below include:

Examples		Configuration Procedures	
I. Port-Based VLAN		CLI	WEB
II. Data VLAN		CLI	WEB
III. Management VLAN		CLI	WEB
IV. Q-in-Q		CLI	WEB

I. Port-Based VLAN

Port-Based VLAN is uncomplicated in implementation and is useful for network administrators who wish to quickly and easily set up VLANs to isolate the effect of broadcast packets on their network. In the network diagram provided below, the network administrator is required to set up VLANs to separate traffic based on the following design conditions:

- Switch 1 is used in the Marketing Department to provide network connectivity to client PCs or other workstations. Switch 1 also connects to Port 1 in Managed Industrial PoE Ethernet Switch.
- Client PCs in the Marketing Department can access the Server 1 and Public Server.
- Switch 2 is used in the RD Department to provide network connectivity to Client PCs or other workstations. Switch 2 also connects to Port 2 in Managed Industrial PoE Ethernet Switch.
- Client PCs in the RD Department can access the Server 2 and Public Server.
- Client PCs in the Marketing and RD Department can access the Internet.



Based on design conditions described above, port-based VLAN assignments can be summarized in the table below.

VLAN Name	Member ports
Marketing	1, 21, 23, 48
RD	2, 22, 23, 48

CLI Configuration:

Steps...	Commands...
1. Enter Global Configuration mode.	SWH> enable Password: SWH# config SWH(config)#
2. Create port-based VLANs "Marketing" and "RD"	SWH(config)# vlan port-based Marketing OK ! SWH(config)# vlan port-based RD OK !
3. Select port 1, 21, 23 and 48 to configure.	SWH(config)# interface 1,21,23,48 SWH(config-if-1,21,23,48)#
4. Assign the ports to the port-based VLAN "Marketing".	SWH(config-if-1,21,23,48)# vlan port-based Marketing OK !
5. Return to Global Configuration mode, and select port 2, 22, 23 and 48 to configure.	SWH(config-if-1,21,23,48)# exit SWH(config)# interface 2,22,23,48 SWH(config-if-2,22,23,48)#
6. Assign the ports to the port-based VLAN "RD".	SWH(config-if-2,22,23,48)# vlan port-based RD OK !
7. Return to Global Configuration mode, and show currently configured port-based VLAN membership.	SWH(config-if-2,22,23,48)# exit SWH(config)# show vlan port-based When you enable Port Isolation, Port Based VLAN is automatically invalid. =====

```

Port Based VLAN :
=====
Name                Port Member
-----
Default_VLAN        1-48,CPU
Marketing            1,21,23,48
RD                   2,22,23,48

Note: By default, all ports are member ports of the
Default_VLAN. Before removing the Default_VLAN from the VLAN
table, make sure you have correct management VLAN and VLAN
mode configurations, otherwise, incorrect configurations may
disconnect your management PC to the Managed Industrial PoE
Ethernet Switch immediately when you enter the command.

```

Web Management Configuration:

1. Select "Configure VLAN" option in Port Based VLAN menu.

Switch Management>VLAN Configuration>Port Based VLAN>Configure VLAN

Configure Port Based VLAN

Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Default_VLAN	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V

Note: When you enable Port Isolation, Port Based VLAN is automatically invalid.

2. Click “New” to add a new Port-Based VLAN

Switch Management>VLAN Configuration>Port Based VLAN>Configure VLAN

Configure Port Based VLAN

Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Default_VLAN	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V

Note: When you enable Port Isolation, Port Based VLAN is automatically invalid.

3. Add Port 1, 21, 23 and 48 in a group and name it to “Marketing”.

Switch Management>VLAN Configuration>Port Based VLAN>Configure VLAN

Configure Port Based VLAN

Current/Total/Max 2/ 1/48

Name

Port Number	1	2	3	4	5	6	7	8
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	9	10	11	12	13	14	15	16
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	17	18	19	20	21	22	23	24
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	25	26	27	28	29	30	31	32
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	33	34	35	36	37	38	39	40
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	41	42	43	44	45	46	47	48
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

CPU ☐

Click “OK” to apply the settings.

4. Click “New” to add a new Port-Based VLAN

Switch Management>VLAN Configuration>Port Based VLAN>Configure VLAN

Configure Port Based VLAN

Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Default_VLAN	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Marketing	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	-	V	-	-	-	-	-	-

Note: When you enable Port Isolation, Port Based VLAN is automatically invalid.

New Edit Delete

5. Add Port 2, 22, 23 and 48 in a group and name it to “RD”.

Switch Management>VLAN Configuration>Port Based VLAN>Configure VLAN

Configure Port Based VLAN

Current/Total/Max3/ 2/48

Name

RD

Port Number

1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	10	11	12	13	14	15	16
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	18	19	20	21	22	23	24
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
25	26	27	28	29	30	31	32
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	34	35	36	37	38	39	40
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41	42	43	44	45	46	47	48
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

CPU☐

OK

Click “OK” to apply the settings.

6. Check Port-Based VLAN settings.

Switch Management>VLAN Configuration>Port Based VLAN>Configure VLAN

Configure Port Based VLAN																																																	
Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	CPU
Default VLAN	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Marketing	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	-	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	-		
RD	-	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	-		

Note: When you enable Port Isolation, Port Based VLAN is automatically invalid

New Edit Delete

NOTE: By default, all ports are member ports of the Default_VLAN. Before removing the Default_VLAN from the VLAN table, make sure you have correct management VLAN and VLAN mode configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you enter the command.

Treatments of packets:

1. A untagged packet arrives at Port 1

Untagged packets received on the Managed Industrial PoE Ethernet Switch will be forwarded out untagged. Therefore, in this example, the Managed Industrial PoE Ethernet Switch will look at the Port-Based forwarding table for Port 1 and forward untagged packets to member port 21, 23, and 48.

2. A untagged packet arrives at Port 2

Untagged packets received on the Managed Industrial PoE Ethernet Switch will be forwarded out untagged. Therefore, in this example, the Managed Industrial PoE Ethernet Switch will look at the Port-Based forwarding table for Port 2 and forward untagged packets to member port 22, 23, and 48.

3. A tagged packet with any permissible VID arrives at Port 1

Tagged packets received on the Managed Industrial PoE Ethernet Switch will be forwarded out tagged. Therefore, in this example, the Managed Industrial PoE Ethernet Switch will look at the Port-Based forwarding table for Port 1 and forward tagged packets to member port 21, 23, and 48.

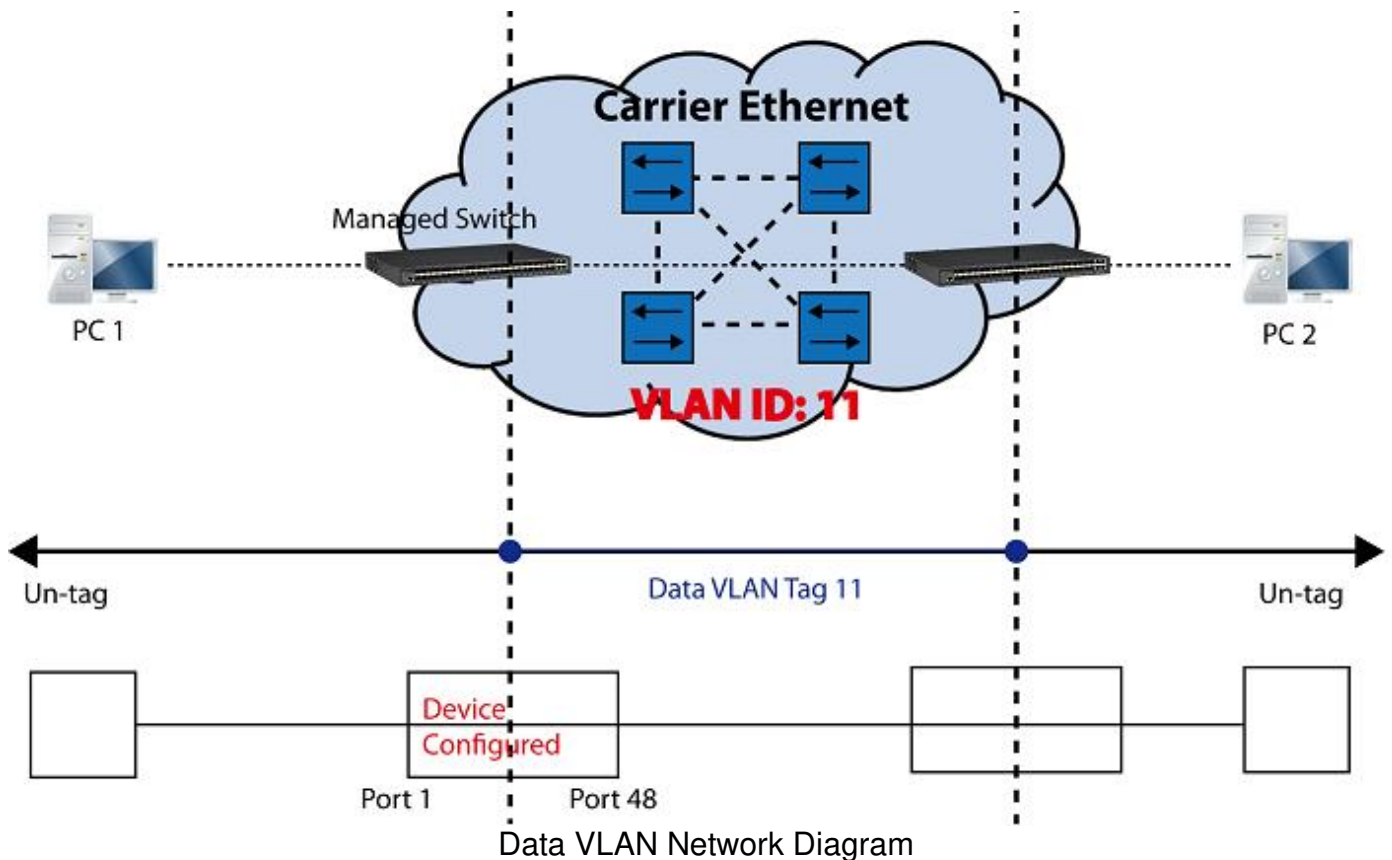
4. A tagged packet with any permissible VID arrives at Port 2

Tagged packets received on the Managed Industrial PoE Ethernet Switch will be forwarded out tagged. Therefore, in this example, the Managed Industrial PoE Ethernet Switch will look at the Port-Based forwarding table for Port 2 and forward tagged packets to member port 22, 23, and 48.

II. Data VLAN

In networking environment, VLANs can carry various types of network traffic. The most common network traffic carried in a VLAN could be voice-based traffic, management traffic and data traffic. In practice, it is common to separate voice and management traffic from data traffic such as files, emails. Data traffic only carries user-generated traffic which is sometimes referred to a user VLAN and usually untagged when received on the Managed Industrial PoE Ethernet Switch.

In the network diagram provided, it depicts a data VLAN network where PC1 wants to ping PC2 in a remote network. Thus, it sends out untagged packets to the Managed Industrial PoE Ethernet Switch to be routed in Carrier Ethernet. For this example, IEEE 802.1Q tagging mechanism can be used to forward data from the Managed Industrial PoE Ethernet Switch to the destination PC.



CLI Configuration:

Steps...	Commands...
1. Enter Global Configuration mode.	SWH> enable Password: SWH# config SWH(config)#
2. Create VLAN 11 and assign Port 1 and Port 48 to VLAN 11.	SWH(config)# interface 1,48 SWH(config-if-1,48)# vlan dot1q-vlan trunk-vlan 11 OK ! SWH(config-vlan-11)# exit
3. Name VLAN 11 to DataVLAN.	SWH(config)# vlan dot1q-vlan 11 SWH(config-vlan-11)# name DataVLAN OK ! SWH(config-vlan-11)# exit
4. Show currently configured dot1q VLAN membership.	FOS-3148-1A(config)# show vlan dot1q-vlan trunk-vlan =====

	<pre>CPU VLAN ID : 1 Management Priority : 0 VLAN Name VLAN 1 8 41 48 CPU ----- Default_VLAN 1 VVVVVVVVVV ... VVVVVVVVVV V DataVLAN 11 V----- -----V -</pre> <p>NOTE: By default, all ports are member ports of the Default_VLAN. Before removing the Default_VLAN from the VLAN table, make sure you have correct management VLAN and VLAN mode configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you enter the command.</p>																																																												
5. Set Port 48 to trunk mode.	<pre>SWH(config)# interface 48 SWH(config-if-48)# vlan dot1q-vlan mode trunk OK ! SWH(config-if-48)# exit</pre>																																																												
6. Change Port 1's Access VLAN to "11".	<pre>SWH(config)# interface 1 SWH(config-if-1)# vlan dot1q-vlan access-vlan 11 OK ! SWH(config-if-1)# exit</pre>																																																												
7. Show currently configured VLAN tag settings.	<pre>SWH(config)# show vlan interface ===== IEEE 802.1q Tag VLAN Interface : =====</pre> <table><tr><th>Port</th><th>Access-vlan</th><th>User Priority</th><th>Port</th><th>VLAN Mode</th><th>Trunk-vlan</th></tr><tr><td>1</td><td>11</td><td></td><td>0</td><td>access</td><td>1,11</td></tr><tr><td>2</td><td>1</td><td></td><td>0</td><td>access</td><td>1</td></tr><tr><td>3</td><td>1</td><td></td><td>0</td><td>access</td><td>1</td></tr><tr><td></td><td></td><td>.</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td>.</td><td></td><td></td><td></td></tr><tr><td>45</td><td>1</td><td></td><td>0</td><td>access</td><td>1</td></tr><tr><td>46</td><td>1</td><td></td><td>0</td><td>access</td><td>1</td></tr><tr><td>47</td><td>1</td><td></td><td>0</td><td>access</td><td>1</td></tr><tr><td>48</td><td>1</td><td></td><td>0</td><td>trunk</td><td>1,11</td></tr></table>	Port	Access-vlan	User Priority	Port	VLAN Mode	Trunk-vlan	1	11		0	access	1,11	2	1		0	access	1	3	1		0	access	1			.						.				45	1		0	access	1	46	1		0	access	1	47	1		0	access	1	48	1		0	trunk	1,11
Port	Access-vlan	User Priority	Port	VLAN Mode	Trunk-vlan																																																								
1	11		0	access	1,11																																																								
2	1		0	access	1																																																								
3	1		0	access	1																																																								
		.																																																											
		.																																																											
45	1		0	access	1																																																								
46	1		0	access	1																																																								
47	1		0	access	1																																																								
48	1		0	trunk	1,11																																																								

Web Management Configuration:

1. Select "VLAN Interface" option in IEEE 802.1Q Tag VLAN menu.

Switch Management>VLAN Configuration>IEEE 802.1q Tag VLAN>VLAN Interface

- System Information
- User Authentication
- Network Management
- Switch Management
 - Switch Configuration
 - Port Configuration
 - Link Aggregation
 - Rapid Spanning Tree
 - 802.1X Configuration
 - MAC Address Management
 - VLAN Configuration
 - Port Based VLAN
 - Configure VLAN
 - IEEE 802.1q Tag VLAN
 - Trunk VLAN table
 - VLAN Interface**
 - Management VLAN
 - QinQ VLAN Configuration

VLAN Interface

Port	Mode	Access-vlan	Trunk-vlan
Port1	ACCESS	1	1
Port2	ACCESS	1	1
Port3	ACCESS	1	1
Port4	ACCESS	1	1
Port5	ACCESS	1	1
Port6	ACCESS	1	1
Port7	ACCESS	1	1
Port8	ACCESS	1	1
Port9	ACCESS	1	1
Port10	ACCESS	1	1

2. **Create a new Data VLAN 11 that includes Port 1 and Port 48 as members.**
Switch Management>VLAN Configuration>IEEE 802.1q Tag VLAN>VLAN Interface

VLAN Interface

Port	Mode	Access-vlan	Trunk-vlan
Port1	ACCESS	1	1,11
Port2	ACCESS	1	1
Port3	ACCESS	1	1
Port4	ACCESS	1	1
Port5	ACCESS	1	1
Port6	ACCESS	1	1
Port7	ACCESS	1	1
Port8	ACCESS	1	1
Port9	ACCESS	1	1
Port10	ACCESS	1	1
Port11	ACCESS	1	1
Port12	ACCESS	1	1
Port13	ACCESS	1	1
Port14	ACCESS	1	1
Port15	ACCESS	1	1
Port16	ACCESS	1	1
Port17	ACCESS	1	1
Port18	ACCESS	1	1
Port19	ACCESS	1	1
Port20	ACCESS	1	1
Port21	ACCESS	1	1
Port22	ACCESS	1	1
Port23	ACCESS	1	1
Port24	ACCESS	1	1
Port25	ACCESS	1	1
Port26	ACCESS	1	1
Port27	ACCESS	1	1
Port28	ACCESS	1	1
Port29	ACCESS	1	1
Port30	ACCESS	1	1
Port31	ACCESS	1	1
Port32	ACCESS	1	1
Port33	ACCESS	1	1
Port34	ACCESS	1	1
Port35	ACCESS	1	1
Port36	ACCESS	1	1
Port37	ACCESS	1	1
Port38	ACCESS	1	1
Port39	ACCESS	1	1
Port40	ACCESS	1	1
Port41	ACCESS	1	1
Port42	ACCESS	1	1
Port43	ACCESS	1	1
Port44	ACCESS	1	1
Port45	ACCESS	1	1
Port46	ACCESS	1	1
Port47	ACCESS	1	1
Port48	ACCESS	1	1,11

OK

Click "OK" to apply the settings.

3. Edit a name for new Trunk VLAN 11 that includes Port 1 and 48 as member ports.
Switch Management>VLAN Configuration>IEEE 802.1q Tag VLAN>Trunk VLAN table

Trunk VLAN table

VLAN Name	VID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	CPU
Default_VLAN	1	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
	11	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	-

Edit

When CPU VLAN is changed, the port VLAN ID of all member ports in the new CPU VLAN will be changed to CPU's VID.

Click “Edit”, the following screen shows up. The VLAN Name is only the editable item.

Configure VLAN

Current/Total/Max VLANs	2/ 2/2048							
VLAN ID	11 (1-4094)							
VLAN Name	DataVLAN							
Port Number	1	2	3	4	5	6	7	8
VLAN Members	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	9	10	11	12	13	14	15	16
VLAN Members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	17	18	19	20	21	22	23	24
VLAN Members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	25	26	27	28	29	30	31	32
VLAN Members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	33	34	35	36	37	38	39	40
VLAN Members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	41	42	43	44	45	46	47	48
VLAN Members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Port Number	CPU							
VLAN Members	<input type="checkbox"/>							

OK

Click “OK” to apply the settings.

4. Check Trunk VLAN 11 settings.

Switch Management>VLAN Configuration>IEEE 802.1q Tag VLAN>Trunk VLAN table

Trunk VLAN table

VLAN Name	VID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	CPU
Default_VLAN	1	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V		
DataVLAN	11	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	-	

When CPU VLAN is changed, the CPU VLAN ID of all member ports in the new CPU VLAN will be changed to CPU's VID.

VLAN Name	VID	1	2	3
Default_VLAN	1	V	V	V
DataVLAN	11	V	-	-

	45	46	47	48	CPU
	V	V	V	V	V
	-	-	V	-	

5. Change Port 1's Access VLAN to 11, and set Port 48 to trunk mode.

Switch Management>VLAN Configuration>IEEE 802.1q Tag VLAN> VLAN Interface

VLAN Interface

Port	Mode	Access-vlan	Trunk-vlan
Port1	ACCESS	11	1,11
Port2	ACCESS	1	1
Port3	ACCESS	1	1
Port46	ACCESS	1	1
Port47	ACCESS	1	1
Port48	TRUNK	1	1,11

OK

Click "OK" to apply the settings.

Treatments of Packets:

1. A tagged packet arrives at Port 1

When an untagged packet arrives at Port 1, port 1's Port VLAN ID (11) will be added to the original port. Because port 48 is set as a trunk port, it will forward the packet with tag 11 out to the Carrier Ethernet.

2. A tagged packet arrives at Port 1

In most situations, data VLAN will receive untagged packets sent from the client PC or workstation. If tagged packets are received (possibly sent by malicious attackers), they will be dropped.

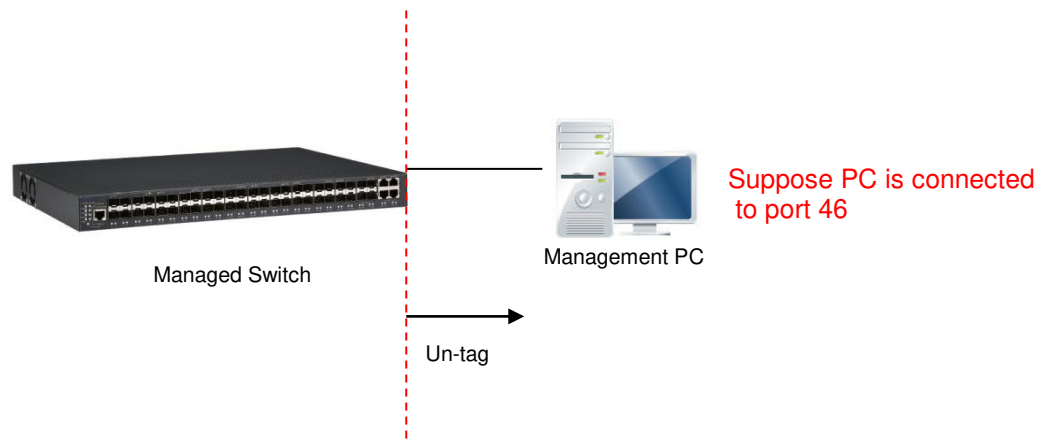
III. Management VLAN

For security and performance reasons, it is best to separate user traffic and management traffic. When Management VLAN is set up, only a host or hosts that is/are in this Management VLAN can manage the device; thus, broadcasts that the device receives or traffic (e.g. multicast) directed to the management port will be minimized.

Web Management Configuration (Access Mode):

Supposed that we have the default Management VLAN whose VLAN ID is 1 for all ports, we can create new Management VLANs as required. This example is to demonstrate how to set up Management VLAN from 15 to 20 on specified ports under Access mode.

In **Management VLAN Network Diagram**, the management PC on the right would like to manage the Managed Industrial PoE Ethernet Switch on the left directly. You can follow the steps described below to set up the Management VLAN.



Management VLAN Network Diagram

1. Change the Management default VLAN 1 into VLAN 15 that includes Port 45, 46, 47 and 48 under Access mode.

Management VLAN

Management VLAN

CPU VLAN ID: 15

VLAN Mode: Access

Management Port

1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	10	11	12	13	14	15	16
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	18	19	20	21	22	23	24
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	26	27	28	29	30	31	32
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	34	35	36	37	38	39	40
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41	42	43	44	45	46	47	48
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

OK Cancel

Click “OK” to apply the settings.

Note1: Make sure you have correct management VLAN and VLAN Mode configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you click “OK” to apply.


Note2: After clicking “OK”, the checked boxes will soon be emptied because this Management VLAN is for configuration only.
To check the current status of Management VLAN, please refer to **IEEE 802.1q Tag VLAN Table or VLAN Interface**.

[illegible]

4	45	46	47	48	CPU
-	-	-	-	-	
V	V	V	V	V	

Port	Mode	VLAN ID	PVID
Port38	ACCESS	1	1
Port39	ACCESS	1	1
Port40	ACCESS	1	1
Port41	ACCESS	1	1
Port42	ACCESS	1	1
Port43	ACCESS	1	1
Port44	ACCESS	1	1
Port45	ACCESS	15	1
Port46	ACCESS	15	1
Port47	ACCESS	15	1
Port48	ACCESS	15	1

2. Now, change the Management VLAN 15 into VLAN 20 and includes Port 45, 46 and 47 under Access mode (It's necessary to include Port 46 to prevent the disconnection.)



The image shows a configuration window titled "Management VLAN". It contains two main sections: "Management VLAN" and "Management Port".

Management VLAN Section:

- CPU VLAN ID:** A text box containing the value "20".
- VLAN Mode:** A dropdown menu set to "Access".

Management Port Section:

A grid of 48 ports, numbered 1 to 48, arranged in 6 rows and 8 columns. Each port has a checkbox below it. Ports 45, 46, and 47 are checked. The grid is as follows:

1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	10	11	12	13	14	15	16
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	18	19	20	21	22	23	24
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	26	27	28	29	30	31	32
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	34	35	36	37	38	39	40
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41	42	43	44	45	46	47	48
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

At the bottom of the window are two buttons: "OK" and "Cancel".

Click "OK" to apply the settings.

Note: To check the current status of Management VLAN, please refer to **IEEE 802.1q Tag VLAN Table or VLAN Interface**.

IEEE 802.1q Tag VLAN Table

VLAN Name	VID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	CPU
Default_VLAN	1	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Access-0015	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Access-0020	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

VLAN Name VID 1

Default_VLAN	1	V
Access-0015	15	-
Access-0020	20	-

4 45 46 47 48 CPU

-	-	-	-	-
-	-	-	V	-
V	V	V	-	V

System Information
User Authentication
Network Management
Switch Management
Switch Configuration
Port Configuration
Link Aggregation
Rapid Spanning Tree
802.1X Configuration
MAC Address Management
VLAN Configuration
Port Based VLAN
IEEE 802.1q Tag VLAN
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VLAN Interface
Management VLAN
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QoS Configuration
IGMP/MLD Snooping
Static Multicast Configuration
Port Mirroring
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Switch Monitor
CPU & Memory Statistics
Switch Port Status
Port Traffic Statistics
Port Packet Error Statistics
Port Packet Analysis Statistics
LACP Monitor
RSTP Monitor
802.1X Monitor
IGMP/MLD Monitor
SFP Information
DHCP Snooping
MAC Address Table
LLDP Status
Loop Detection Status
IEEE 802.1q Tag VLAN T

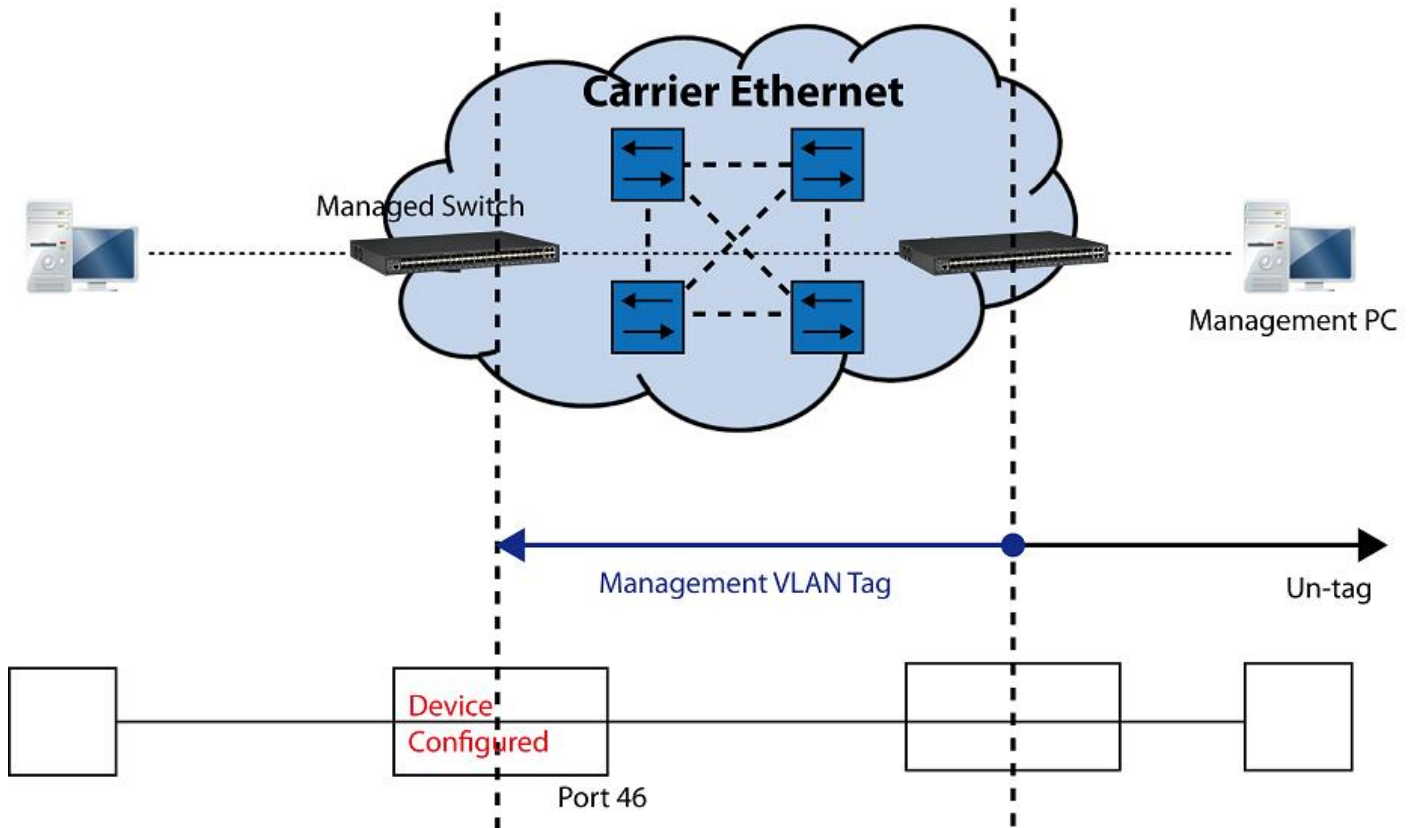
System Information
User Authentication
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Trunk VLAN table
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QoS Configuration

Port38	ACCESS	1	1
Port39	ACCESS	1	1
Port40	ACCESS	1	1
Port41	ACCESS	1	1
Port42	ACCESS	1	1
Port43	ACCESS	1	1
Port44	ACCESS	1	1
Port45	ACCESS	20	1
Port46	ACCESS	20	1
Port47	ACCESS	20	1
Port48	ACCESS	15	1

OK

Web Management Configuration (Trunk Mode):

In **Management VLAN Network Diagram** shown below, the management PC on the right would like to manage the Managed Industrial PoE Ethernet Switch on the left remotely. You can follow the steps described below to set up the Management VLAN.



Management VLAN Network Diagram

Supposed that the Management PC is remotely connected to Managed Industrial PoE Ethernet Switch Port 46 as shown above while we have a various of existing trunk vlan and the Management VLAN 15 is set on Port 45,46,47,48 and CPU as shown below. We can create new Management VLAN 20 as required. This part is to demonstrate how to set up from Management VLAN 15 to VLAN 20 on specified ports under Trunk mode.

IEEE 802.1q Tag VLAN Table

VLAN Name	VID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	CPU
Default_VLAN	1	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V		
	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	-				
	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	-	-	V	-					
	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	V	V	V	V					
	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	V	V	V	-					
	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	V	V	-						
	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	V	V	-						
	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	V	V	V	-						

IEEE 802.1q Tag VLAN Table

1. Change the Management VLAN 15 into VLAN 20 that includes Port 45, 46, 47 under Trunk mode.

Management VLAN

Management VLAN

CPU VLAN ID: 20

VLAN Mode: Trunk

Management Port

1	2	3	4	5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	10	11	12	13	14	15	16
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	18	19	20	21	22	23	24
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	26	27	28	29	30	31	32
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	34	35	36	37	38	39	40
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41	42	43	44	45	46	47	48
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

OK Cancel

Click “OK” to apply the settings.

Note1: Make sure you have correct management VLAN and VLAN Mode configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you click “OK” to apply.

Note2: After clicking “OK”, the checked boxes will soon be emptied because this Management VLAN is for configuration only.
To check the current status of Management VLAN, please refer to **IEEE 802.1q Tag VLAN Table or VLAN Interface**.

Then, Management VLAN is changing to VLAN 20.

IEEE 802.1q Tag VLAN Table

VLAN Name	VID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	CPU
Default_VLAN	1	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

IEEE 802.1q Tag VLAN Table

Port37	ACCESS	1	1
Port38	ACCESS	1	1
Port39	ACCESS	1	1
Port40	ACCESS	1	1
Port41	ACCESS	1	1
Port42	ACCESS	1	1
Port43	ACCESS	1	1
Port44	ACCESS	1	1
Port45	TRUNK	1	14-20
Port46	TRUNK	1	15-20
Port47	TRUNK	1	15-20
Port48	TRUNK	1	13-19

VLAN Interface

CLI Configuration(Access Mode):

Supposed that we have the default Management VLAN whose VLAN ID is 1 for all ports, we can create new Management VLANs as required. This example is to demonstrate how to set up Management VLAN 15 and then change VLAN 15 into VLAN 20 on specified ports under Access mode.

1. Change the Management default VLAN 1 into VLAN 15 that includes Port 45, 46, 47 and 48 under Access mode.

Steps...	Commands...
1. Enter Global Configuration mode.	Switch> enable Password: Switch# configure Switch(config)#
2. Assign VLAN 15 to Management VLAN and Port 45-48 to Management port.	Switch(config)# vlan management-vlan 15 management-port 45-48 mode access OK ! NOTE: Make sure you have correct management VLAN and VLAN mode configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you enter the command.
3. Show currently configured dot1q settings and check CPU has been a member port in Management VLAN 15.	Switch(config)# show vlan dot1q-vlan tag-vlan =====
	Configure Trunk VLAN : =====
	CPU VLAN ID : 15
	Management Priority : 0
	VLAN Name VLAN 1 8 41 48 CPU

	Default_VLAN 1 VVVVVVVV VVVVVVVV -
	Access-0015 15 ----- -----VVVV V

2. Now, change the Management VLAN 15 into VLAN 20 and includes Port 45, 46 and 47 to Access mode (It's necessary to include Port 46 to prevent the disconnection.)

Steps...	Commands...
1. Enter Global Configuration mode.	Switch> enable Password: Switch# configure Switch(config)#
2. Assign VLAN 20 to Management VLAN and Port 45-47 to Management port.	Switch(config)# vlan management-vlan 20 management-port 45-47 mode access OK ! NOTE: Make sure you have correct management VLAN and VLAN mode configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you enter the command.
3. Show currently configured dot1q settings and check CPU has been a member port in Management VLAN 15 & 20.	Switch(config)# show vlan dot1q-vlan tag-vlan =====
	Configure Trunk VLAN : =====
	CPU VLAN ID : 20
	Management Priority : 0
	VLAN Name VLAN 1 8 41 48 CPU

	Default_VLAN 1 VVVVVVVV VVVVVVVV -
	Access-0015 15 ----- -----V -
	Access-0020 20 ----- -----VVV- V

CLI Configuration(Trunk Mode):

This part is to demonstrate how to change Management VLAN 15 into VLAN 20 on specified ports under Trunk mode. Supposed that we have the existing Management VLAN 15 on Port 45,46,47,48 and CPU, we can create new Management VLAN 20 as required.

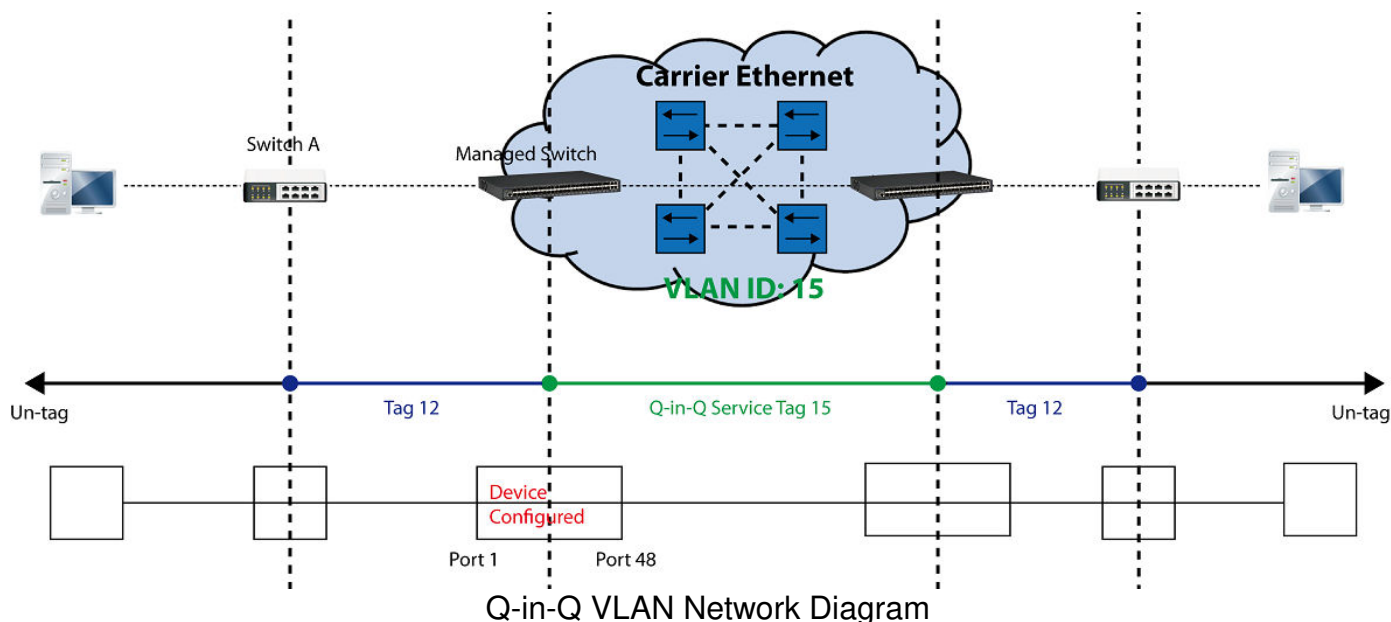
1. Change the Management VLAN 15 into VLAN 20 that includes Port 45, 46, 47 under Trunk mode.

Steps...	Commands...
1. Enter Global Configuration mode.	Switch> enable Password: Switch# configure Switch(config)#
2. Assign VLAN 20 to Management VLAN and Port 45-47 to Management port.	Switch(config)# vlan management-vlan 20 management-port 45-47 mode trunk OK ! NOTE: Make sure you have correct management VLAN and VLAN mode configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you enter the command.
3. Show currently configured dot1q settings and check CPU has been a member port in Management VLAN 20.	Switch(config)# show vlan dot1q-vlan tag-vlan =====
	Configure Trunk VLAN : =====
	CPU VLAN ID : 20
	Management Priority : 0
	VLAN Name VLAN 1 8 41 48 CPU

	Default_VLAN 1 VVVVVVVV VVVV---- -
	13 ----- -----V -
	14 ----- ----V--V -
	15 ----- ----VVVV -
	16 ----- ----VVVV -
	17 ----- ----VVVV -
	18 ----- ----VVVV -
	19 ----- ----VVVV -
	20 ----- ----VVV- V

IV. Q-in-Q

The IEEE 802.1Q double tagging VLAN is also referred to Q-in-Q or VLAN stacking (IEEE 802.1ad). Its purpose is to expand the 802.1q VLAN space by tagging the inner tagged packets. In this way, a “double-tagged” frame is created so as to separate customer traffic within a service provider network. As shown below, the network diagram depicts the Switch A (on the left) carries a Customer tag 12. When tagged packets are received on the Managed Industrial PoE Ethernet Switch, they should be tagged with an outer Service Provider tag 15. To set up the network as provided, you can follow the steps described below.



CLI Configuration:

Steps...	Commands...
1. Enter Global Configuration mode.	SWH> enable Password: SWH# config SWH(config)#
2. Enable Q-in-Q VLAN	SWH(config)# vlan qinq-vlan OK !
3. Assign Port 48 to ISP port	SWH(config)# vlan qinq-vlan isp-port 48 OK !
4. Create S-Tag 15 on Port 1.	SWH(config)# interface 1 SWH(config-if-1)# vlan qinq-vlan stag-vid 15 OK ! SWH(config-if-1)# exit
5. Show currently configured dot1q VLAN membership.	SWH(config)# show vlan qinq-vlan =====
	Q-in-Q VLAN Configuration :
	=====
	QinQ VLAN : enable
	Stag Ethertype : 0x9100
	Management Stag : 15
	Port Stag VID ISP Port

	1 15 disable
	2 1 disable
	.
	.
	46 1 disable
	47 1 disable
	48 1 enable
	NOTE: By default, all ports are member ports of the

Default_VLAN. Before removing the Default_VLAN from the VLAN table, make sure you have correct management VLAN and VLAN mode configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you enter the command.

Web Management Configuration:

1. Select “VLAN Interface” option in IEEE 802.1Q Tag VLAN menu.

Switch Management>VLAN Configuration>IEEE 802.1q Tag VLAN>VLAN Interface

VLAN Interface

Port	Mode	Access-vlan	Trunk-vlan
Port1	ACCESS	12	1
Port2	ACCESS	1	1
Port3	ACCESS	1	1
Port4	ACCESS	1	1
Port45	ACCESS	1	1
Port46	ACCESS	1	1
Port47	ACCESS	1	1
Port48	TRUNK	1	12

OK

Check the VLAN status. Supposed that Port 1 carries access VLAN 12 while Port 48 trunk VLAN 12

2. Create a new Service VLAN 15 that includes Port 1 and Port 48 as member ports.
Switch Management>VLAN Configuration>IEEE 802.1q Tag VLAN>QinQ VLAN Configuration

- System Information
- User Authentication
- Network Management
 - Switch Management
 - Switch Configuration
 - Port Configuration
 - Link Aggregation
 - Rapid Spanning Tree
 - 802.1X Configuration
 - MAC Address Management
 - VLAN Configuration
 - Port Based VLAN
 - IEEE 802.1q Tag VLAN**
 - QinQ VLAN Configuration**
 - QoS Configuration
 - IGMP/MLD Snooping
 - Static Multicast Configuration
 - Port Mirroring
 - Security Configuration
 - ACL Configuration
 - LLDP Configuration
 - Loop Detection
 - Switch Monitor
 - System Utility
 - Save Configuration
 - Reset System
 - Logout

QinQ VLAN Configuration

QinQ Mode: Disabled								
Ether Type: 8100 (0000-FFFF)								
Port Number	1	2	3	4	5	6	7	8
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	9	10	11	12	13	14	15	16
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	17	18	19	20	21	22	23	24
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	25	26	27	28	29	30	31	32
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	33	34	35	36	37	38	39	40
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	41	42	43	44	45	46	47	48
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Port Number	CPU							
Stag VID	1							
ISP Port								

QinQ VLAN Configuration

QinQ Mode: Enabled Click enable

Ether Type: 8100 (0000-FFFF)

Port Number	1	2	3	4	5	6	7	8
Stag VID	15 Specify S-tag VID	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Port Number	9	10	11	12	13	14	15	16
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Port Number	17	18	19	20	21	22	23	24
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Port Number	25	26	27	28	29	30	31	32
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Port Number	33	34	35	36	37	38	39	40
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Port Number	41	42	43	44	45	46	47	48
Stag VID	1	1	1	1	1	1	1	1
ISP Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Check ISP port

Port Number: CPU

Stag VID: 1

ISP Port:

OK

Click "OK" to apply the settings.

NOTE: By default, all ports are member ports of the Default_VLAN. Before removing the Default_VLAN from the VLAN table, make sure you have correct management VLAN and PVID configurations, otherwise, incorrect configurations may disconnect your management PC to the Managed Industrial PoE Ethernet Switch immediately when you enter the command.

Treatments of Packets:

1. A tagged packet arrives at Port 1

When a packet with a tag 12 arrives at Port 1, the original tag will be kept intact and then added an outer tag 15 by Port 1, which is set as a tunnel port. When this packet is forwarded to Port 48, two tags will be forwarded out because Port 48 is set as a trunk port.

2. A untagged packet arrives at Port 1

If an untagged packet is received, it will also be added a tag 15. However, Q-in-Q function will not work.

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