Moxa TN-5916 Industrial Secure Router User's Manual

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MOXA®

Moxa TN-5916 Industrial Secure Router User's Manual

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Technical Support Contact Information

www.moxa.com/support

Moxa Americas

Toll-free:	1-888-669-2872
Tel:	+1-714-528-6777
Fax:	+1-714-528-6778

Moxa Europe

Tel:	+49-89-3 70 03 99-0
Fax:	+49-89-3 70 03 99-99

Moxa India

Tel:	+91-80-4172-9088
Fax:	+91-80-4132-1045

Moxa China (Shanghai office)

Toll-free:	800-820-5036
Tel:	+86-21-5258-9955
Fax:	+86-21-5258-5505

Moxa Asia-Pacific

Tel:	+886-2-8919-1230
Fax:	+886-2-8919-1231

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Introduction

Welcome to the Moxa TN-5916 ToughNet Secure Router Series. The ToughNet Secure Router is designed for connecting Ethernet-enabled devices with network IP security.

The following topics are covered in this chapter:

- ❐ **Overview**
- ❐ **Package Checklist**
- ❐ **Features**
  - ➢ Industrial Networking Capability
  - ➢ Designed for Industrial Applications
  - ➢ Useful Utility and Remote Configuration

Overview

As the world's network and information technology becomes more mature, the trend is to use Ethernet as the major communications interface in many industrial communications and automation applications. In fact, a entirely new industry has sprung up to provide Ethernet products that comply with the requirements of demanding industrial applications.

The ToughNet TN-5916, designed for rolling stock backbone networks, is a high performance M12 router. It supports NAT, Firewall and routing functionality to facilitate the deployment of applications across networks. The TN-5916 router uses M12 and other circular connectors to ensure tight, robust connections and guarantee reliable resilience against environmental disturbances, such as vibration and shock. In addition, wide temperature models are available that operate reliably in hazardous, -40 to 75°C environments.

Package Checklist

The ToughNet Secure Routers are shipped with the following items. If any of these items are missing or damaged, please contact your customer service representative for assistance.

- 1 Moxa ToughNet Secure Router
- RJ45 to DB9 console port cable
- Protective caps for unused ports
- Quick installation guide (printed)
- CD-ROM with user's manual and Windows utility
- Warranty card

Features

Industrial Networking Capability

- Unicast and Multicast routing
- Network Redundancy (Layer 2 and Layer 3)
- Network address translation (N-to-1, 1-to-1, and port forwarding)
- Firewall and Denial of Service (DoS) Defense

Designed for Industrial Applications

- Bypass relay ensures non-stop data communication in the event the router stops working due to a power failure
- EN 50155/50121-3-2 compliant. See specs for details about compliance with specific parts of these standards
- -40 to 75°C operating temperature (T models)
- Dual 24 to 110 VDC power inputs
- IP54, rugged high-strength metal case
- DIN rail or panel mounting ability

Useful Utility and Remote Configuration

- Configurable using a Web browser and Telnet/Serial console
- Send ping commands to identify network segment integrity

This chapter explains how to access the ToughNet Secure Router for the first time. There are three ways to access the router: (1) serial console, (2) Telnet console, and (3) web browser. The serial console connection method, which requires using a short serial cable to connect the ToughNet Secure Router to a PC's COM port, can be used if you do not know the ToughNet Secure Router's IP address. The Telnet console and web browser connection methods can be used to access the ToughNet Secure Router over an Ethernet LAN, or over the Internet. A web browser can be used to perform all monitoring and administration functions, but the serial console and Telnet console only provide basic functions.

The following topics are covered in this chapter:

- ❒ **RS-232 Console Configuration (115200, None, 8, 1, VT100)**
- ❒ **Using Telnet to Access the ToughNet Secure Router's Console**
- ❒ **Using a Web Browser to Configure the ToughNet Secure Router**

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Getting Started

The following topics are covered in this chapter:

❒ **RS-232 Console Configuration (115200, None, 8, 1, VT100)**

❒ **Using Telnet to Access the ToughNet Secure Router's Console**

❒ **Using a Web Browser to Configure the ToughNet Secure Router**

RS-232 Console Configuration (115200, None, 8, 1, VT100)

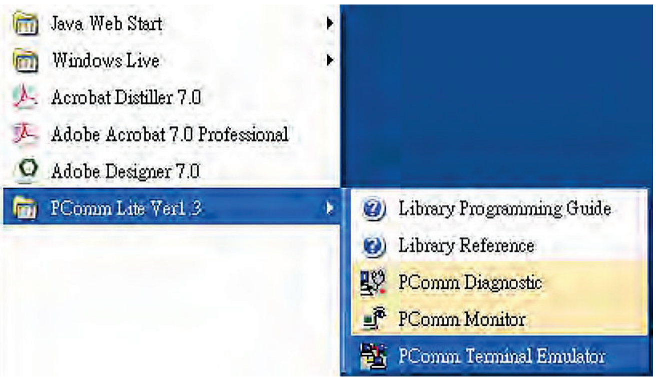
NOTE **Connection Caution!**
We strongly suggest that you do NOT use more than one connection method at the same time. Following this advice will allow you to maintain better control over the configuration of your ToughNet Secure Router

NOTE We recommend using Moxa PComm Terminal Emulator, which can be downloaded free of charge from Moxa's website.

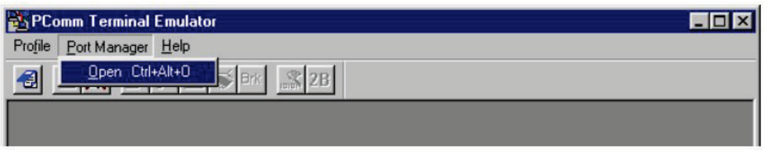
Before running PComm Terminal Emulator, use an RJ45 to DB9-F (or RJ45 to DB25-F) cable to connect the ToughNet Secure Router's RS-232 console port to your PC's COM port (generally COM1 or COM2, depending on how your system is set up).

After installing PComm Terminal Emulator, perform the following steps to access the RS-232 console utility.

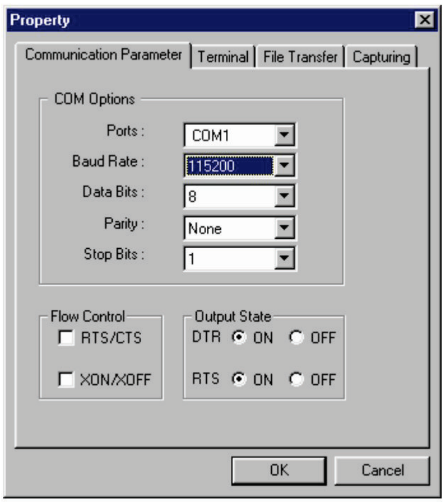
1. From the Windows desktop, click **Start** → **Programs** → **PCommLite1.3** → **Terminal Emulator**.



2. Select **Open** in the Port Manager menu to open a new connection.



3. The **Communication Parameter** page of the **Property** window will appear. Select the appropriate COM port from the **Ports** drop-down list, 115200 for Baud Rate, 8 for Data Bits, None for Parity, and 1 for Stop Bits.



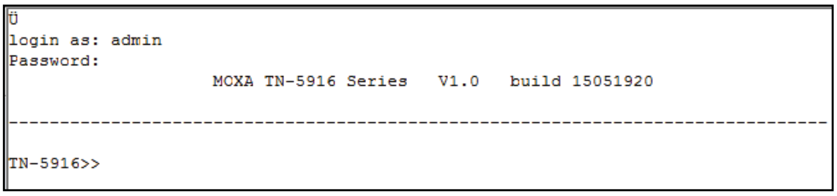
COM Options
Ports : COM1
Baud Rate : 115200
Data Bits : 8
Parity : None
Stop Bits : 1

Flow Control
□ RTS/CTS
□ XON/XOFF

Output State
DTR ● ON ○ OFF
RTS ● ON ○ OFF

4. Click the **Terminal** tab, select VT100 for Terminal Type, and then click **OK** to continue.

5. The **Console** login screen will appear. Use the keyboard to enter the login account (**admin** or **user**), and then press **Enter** to jump to the **Password** field. Enter the console Password (the same as the Web Browser password; leave the Password field blank if a console password has not been set), and then press **Enter**.



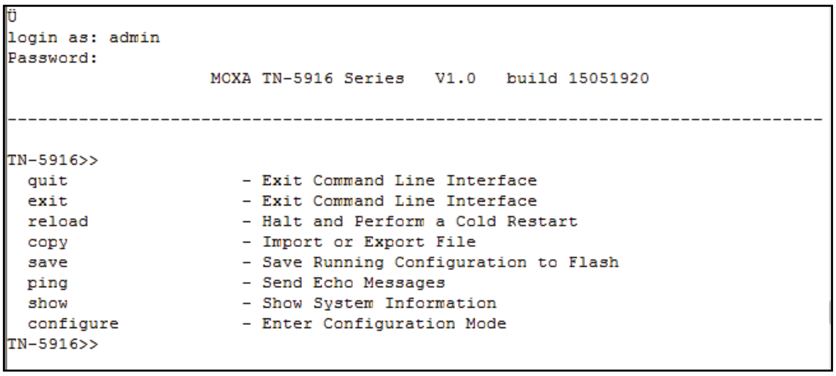
```
Ü
login as: admin
Password:
                        MOXA TN-5916 Series   V1.0   build 15051920

--------------------------------------------------------------------------------

TN-5916>>
```

NOTE The default password is moxa. For greater security, please change the default password after the first log in.

6. Enter a question mark (**?**) to display the command list in the console.



```
Ü
login as: admin
Password:
                        MOXA TN-5916 Series   V1.0   build 15051920

--------------------------------------------------------------------------------

TN-5916>>
  quit                    - Exit Command Line Interface
  exit                    - Exit Command Line Interface
  reload                  - Halt and Perform a Cold Restart
  copy                    - Import or Export File
  save                    - Save Running Configuration to Flash
  ping                    - Send Echo Messages
  show                    - Show System Information
  configure               - Enter Configuration Mode
TN-5916>>
```

The following table lists commands that can be used when the ToughNet Secure Router is in console (serial or Telnet) mode:

Login by Admin Account

Command	Description
quit	Exit Command Line Interface
exit	Exit Command Line Interface
reload	Halt and Perform a Cold Restart
terminal	Configure Terminal Page Length
copy	Import or Export File
save	Save Running Configuration to Flash
ping	Send Echo Messages
clear	Clear Information
show	Show System Information
configure	Enter Configuration Mode

Using Telnet to Access the ToughNet Secure Router's Console

You may use Telnet to access the ToughNet Secure Router's console utility over a network. To access the TN's functions over the network (by either Telnet or a web browser) from a PC host that is connected to the same LAN as the ToughNet Secure Router, you need to make sure that the PC host and the ToughNet Secure Router are on the same logical subnet. To do this, check your PC host's IP address and subnet mask. By default, the LAN IP address is 192.168.127.254 and the Industrial subnet mask is 255.255.255.0 (for a Class C subnet). If you do not change these values, and your PC host's subnet mask is 255.255.0.0, then its IP address must have the form 192.168.xxx.xxx. On the other hand, if your PC host's subnet mask is 255.255.255.0, then its IP address must have the form, 192.168.127.xxx.

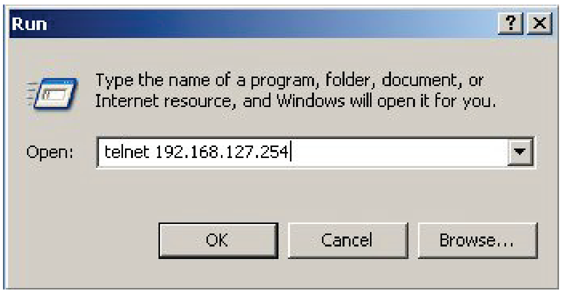
NOTE To use the ToughNet Secure Router's management and monitoring functions from a PC host connected to the same LAN as the ToughNet Secure Router, you must make sure that the PC host and the ToughNet Secure Router are connected to the same logical subnet.

NOTE Before accessing the console utility via Telnet, first connect the ToughNet Secure Router's RJ45 Ethernet LAN ports to your Ethernet LAN, or directly to your PC's Ethernet card (NIC). You can use either a straight-through or cross-over Ethernet cable.

NOTE The ToughNet Secure Router's default LAN IP address is 192.168.127.254.

Perform the following steps to access the console utility via Telnet.

1. Click **Start** → **Run**, and then telnet to the ToughNet Secure Router's IP address from the Windows Run window. (You may also issue the Telnet command from the MS-DOS prompt.)



Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: telnet 192.168.127.254

2. Refer to instructions 6 and 7 in the **RS-232 Console Configuration (115200, None, 8, 1, VT100)** section on page 2-2.

Using a Web Browser to Configure the ToughNet Secure Router

The ToughNet Secure Router's web browser interface provides a convenient way to modify the router's configuration and access the built-in monitoring and network administration functions. The recommended web browser is Microsoft Internet Explorer 6.0 with JVM (Java Virtual Machine) installed.

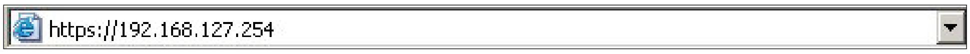
NOTE To use the ToughNet Secure Router's management and monitoring functions from a PC host connected to the same LAN as the ToughNet Secure Router, you must make sure that the PC host and the ToughNet Secure Router are connected to the same logical subnet.

NOTE Before accessing the ToughNet Secure Router's web browser, first connect the ToughNet Secure Router's M12 Ethernet LAN ports to your Ethernet LAN, or directly to your PC's Ethernet card (NIC). You can use either a straight-through or cross-over Ethernet cable.

NOTE The ToughNet Secure Router's default LAN IP address is 192.168.127.254.

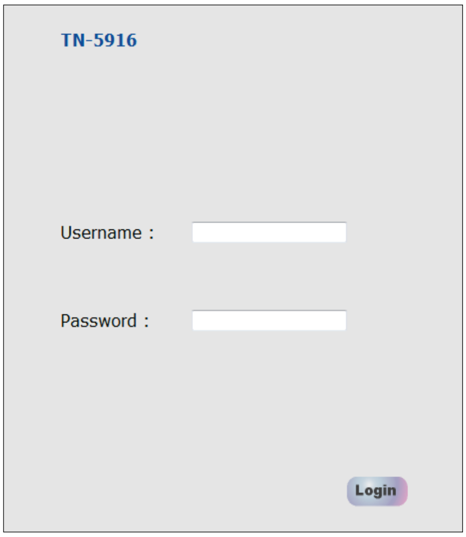
Perform the following steps to access the ToughNet Secure Router's web browser interface.

1. Start Internet Explorer and type the ToughNet Secure Router's LAN IP address in the Address field. Press Enter to establish the connection.



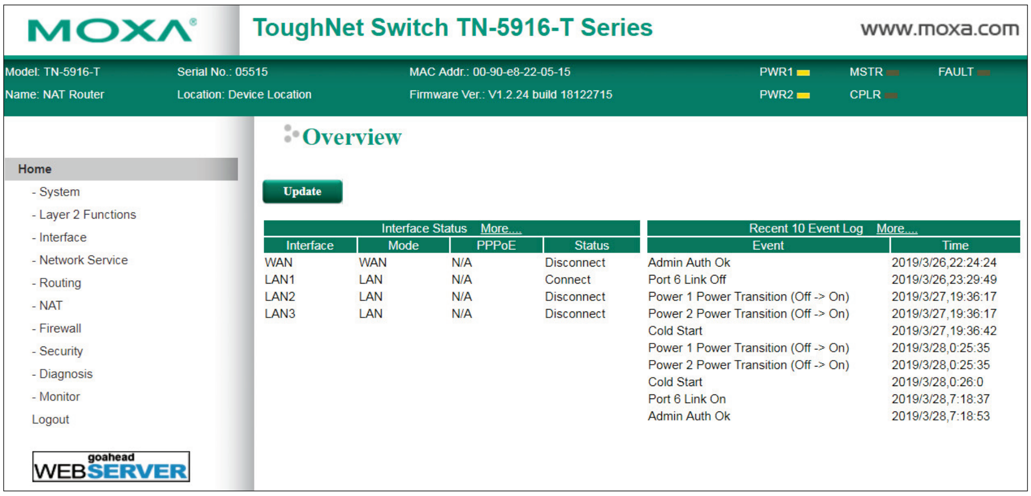
https://192.168.127.254

2. The web login page will open. Select the login account (Admin or User) and enter the **Password** (the same as the Console password), and then click Login to continue. Leave the **Password** field blank if a password has not been set.



NOTE The default password is moxa. For greater security, please change the default password after the first log in.

You may need to wait a few moments for the web page to be downloaded to your computer. Use the menu tree on the left side of the window to open the function pages to access each of the router's functions.



Model: TN-5916-T Serial No.: 05515 MAC Addr.: 00-90-e8-22-05-15

Name: NAT Router Location: Device Location Firmware Ver.: V1.2.24 build 18122715

Interface Status More....

Interface	Mode	PPPoE	Status
WAN	WAN	N/A	Disconnect
LAN1	LAN	N/A	Connect
LAN2	LAN	N/A	Disconnect
LAN3	LAN	N/A	Disconnect

Recent 10 Event Log More....

Event	Time
Admin Auth Ok	2019/3/26,22:24:24
Port 6 Link Off	2019/3/26,23:29:49
Power 1 Power Transition (Off -> On)	2019/3/27,19:36:17
Power 2 Power Transition (Off -> On)	2019/3/27,19:36:17
Cold Start	2019/3/27,19:36:42
Power 1 Power Transition (Off -> On)	2019/3/28,0:25:35
Power 2 Power Transition (Off -> On)	2019/3/28,0:25:35
Cold Start	2019/3/28,0:26:0
Port 6 Link On	2019/3/28,7:18:37
Admin Auth Ok	2019/3/28,7:18:53

3

TN-5916 Series Features and Functions

The web browser is the most user-friendly way to configure the ToughNet Secure Router, since you can both monitor the ToughNet Secure Router and use administration functions from the web browser. An RS-232 or Telnet console connection only provides basic functions. In this chapter, we use the web browser to introduce the ToughNet Secure Router's configuration and monitoring functions.

The following topics are covered in this chapter:

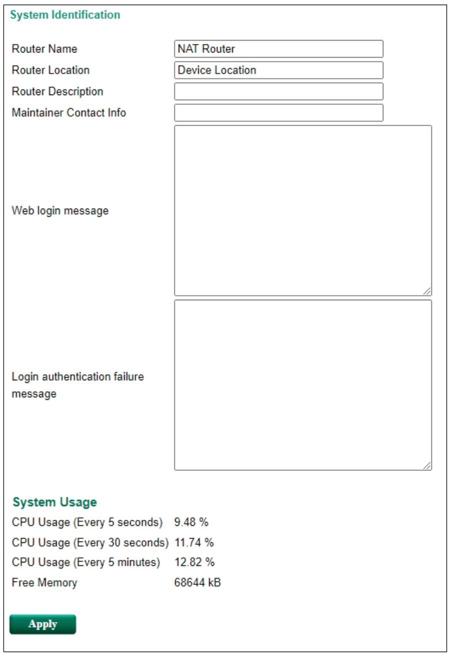
- **System**
  - System Information
  - User Account
  - Account Password Policy
  - Date and Time
  - Warning Notification
  - System File Update—by Remote TFTP
  - System File Update—by Local Import/Export
  - Back Up Media
  - Restart
  - Reset to Factory Default
- **Port**
  - Port Settings
  - Port Status
  - Link Aggregation
  - The Port Trunking Concept
  - Port Mirror
- **Using Virtual LAN**
  - The VLAN Concept
  - Configuring Virtual LAN
- **Multicast**
  - The Concept of Multicast Filtering
  - IGMP Snooping
  - IGMP Snooping Settings
  - IGMP Table
  - Stream Table
  - Static Multicast MAC
- **QoS**
  - ToS/DSCP Mapping
  - Rate Limit
- **MAC Address Table**
- **Interface**
  - WAN
  - LAN
  - Bridge Configuration
- **DHCP**
  - DHCP Server Mode
  - DHCP
  - DHCP Leases
  - IP-MAC Binding
  - IP-Port Binding
  - Configuring DHCP Relay Agent
- **SNMP**
- **DNS Server**
  - DNS Global Setting
  - DNS Zone Setting
  - DNS Zone Forwarding Setting
  - DNS ACL Setting
  - DNS Security Setting
  - DNS Root Hints
- **Monitor**
  - Statistics
  - Bandwidth Utilization
  - Packet Counter
  - Event Log

System

The **System** section includes the most common settings required by administrators to maintain and control a Moxa switch.

System Information

Defining System Information items to make different switches easier to identify that are connected to your network.



System Identification

Router Name: NAT Router
Router Location: Device Location
Router Description:
Maintainer Contact Info:
Web login message:
Login authentication failure message:

System Usage

CPU Usage (Every 5 seconds) 9.48 %
CPU Usage (Every 30 seconds) 11.74 %
CPU Usage (Every 5 minutes) 12.82 %
Free Memory 68644 kB

Router Name

Setting	Description	Factory Default
Max. 30 characters	This option is useful for differentiating between the roles or applications of different units. Example: Factory Switch 1.	NAT Router

Router Location

Setting	Description	Factory Default
Max. 80 characters	This option is useful for differentiating between the locations of different units. Example: production line 1.	Device Location

Router Description

Setting	Description	Factory Default
Max. 30 characters	This option is useful for recording a more detailed description of the unit.	None

Maintainer Contact Info

Setting	Description	Factory Default
Max. 30 characters	This option is useful for providing information about who is responsible for maintaining this unit and how to contact this person.	None

Web Login Message

Setting	Description	Factory Default
Max. 512 characters	This option is useful for providing a welcome message when a user has logged in successfully.	None

Login Authentication Failure Message

Setting	Description	Factory Default
Max. 512 characters	This option is useful for providing a message when a user has failed to log in.	None

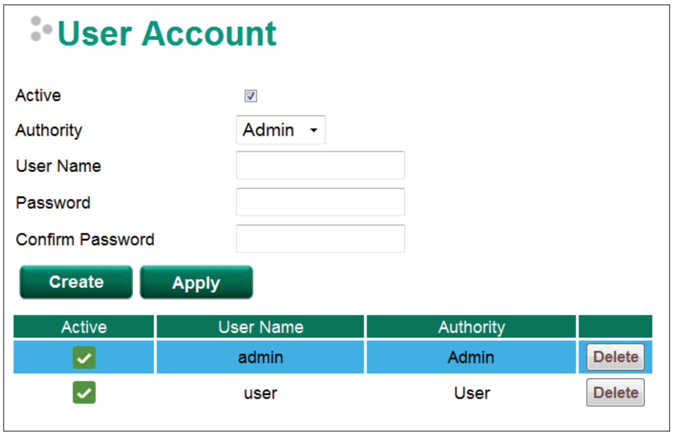
System Usage

Setting	Description	Factory Default
CPU usage	The CPU usage over different time periods (5 sec, 30 sec, or 5 min).	None
Free memory	The available memory size of the system.	None

User Account

The Moxa ToughNet Secure Router supports the management of accounts, including establishing, activating, modifying, disabling and removing accounts. There are two levels of configuration access, admin and user. The account belongs to **admin** privilege has read/write access of all configuration parameters, while the account belongs to **user** authority has read access to view the configuration only.

NOTE
1. In consideration of higher security level, strongly suggest to change the default password after first log in
2. The user with 'admin' account name can't be deleted and disabled by default



User Account

Active ☑
Authority Admin
User Name
Password
Confirm Password

Active	User Name	Authority	
✓	admin	Admin	Delete
✓	user	User	Delete

Active

Setting	Description	Factory Default
Checked	The Moxa switch can be accessed by the activated user name	Enabled
Unchecked	The Moxa switch can't be accessed by the non-activated user	

Authority

Setting	Description	Factory Default
admin	The account has read/write access of all configuration parameters.	admin
user	The account can only read configuration but without any modification.	

Create New Account

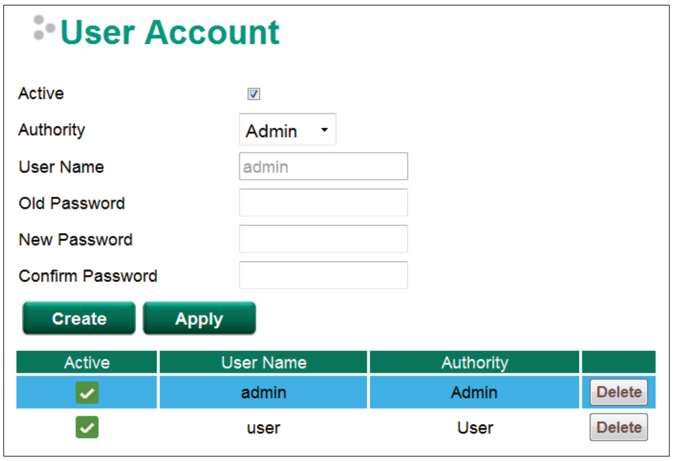
Input the user name, password and assign the authority to the new account. Once apply the new setting, the new account will be shown under the Account List table.

Setting	Description	Factory Default

User Name (Max. of 30 characters)	User Name	None
Password	Password for the user account. Minimum requirement is 4 characters, maximum of 16 characters	None

Modify Existing Account

Select the existing account from the Account List table. Modify the details accordingly then apply the setting to save the configuration.



User Account

Active ☑

Authority: Admin

User Name: admin

Old Password:

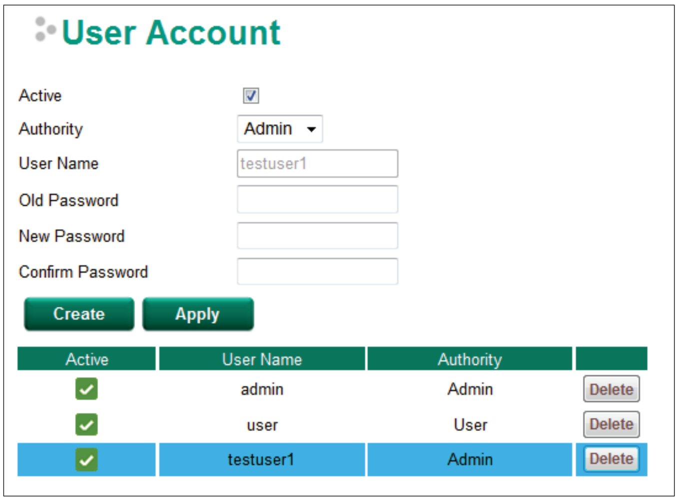
New Password:

Confirm Password:

Active	User Name	Authority	
✓	admin	Admin	Delete
✓	user	User	Delete

Delete Existing Account

Select the existing account from the Account List table. Press delete button to delete the account.



User Account

Active ☑

Authority: Admin

User Name: testuser1

Old Password:

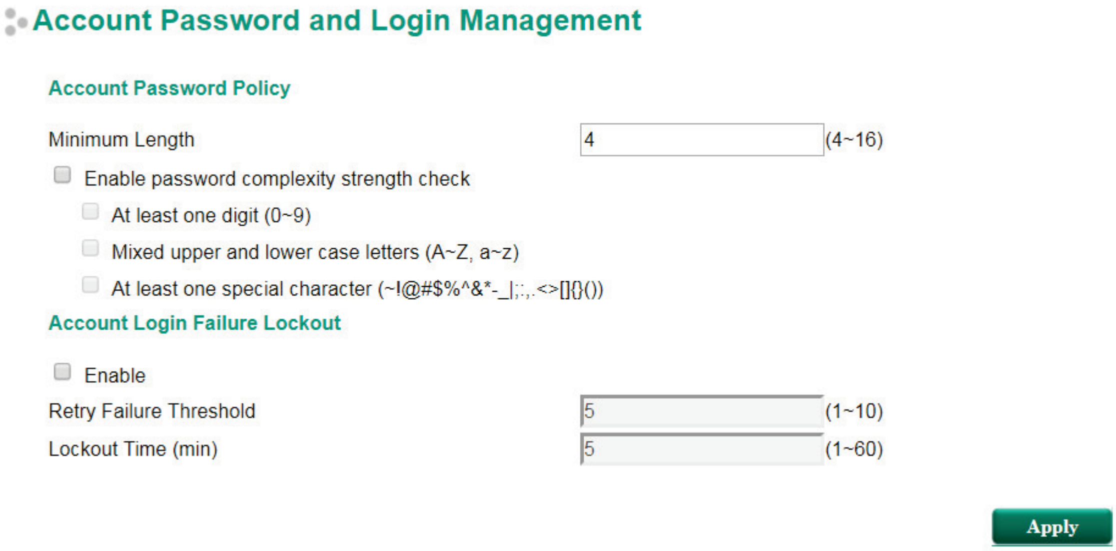
New Password:

Confirm Password:

Active	User Name	Authority	
✓	admin	Admin	Delete
✓	user	User	Delete
✓	testuser1	Admin	Delete

Account Password Policy

To prevent hackers from obtaining switch account passwords, Moxa switches allow users to configure a password policy and lock the account in the event that the wrong password is entered too many times. The account password policy can require passwords to be of a minimum length and complexity with a strength check. If **Account Login Failure Lockout** is enabled, you can configure the **Retry Failure Threshold** and **Lockout Time** parameters to determine the number of failed attempts before the account is locked and the duration of the lockout.



Account Password and Login Management

Account Password Policy

Minimum Length 4 (4~16)

□ Enable password complexity strength check

□ At least one digit (0~9)

□ Mixed upper and lower case letters (A~Z, a~z)

□ At least one special character (~!@#$%^&*-_|;:,.<>[]{}())

Account Login Failure Lockout

□ Enable

Retry Failure Threshold 5 (1~10)

Lockout Time (min) 5 (1~60)

Account Password Policy

Setting	Description	Factory Default
User-specified password length	Specify the minimum and maximum character length of user passwords.	4
Password complexity check	Enable additional password complexity requirements for passwords.	None

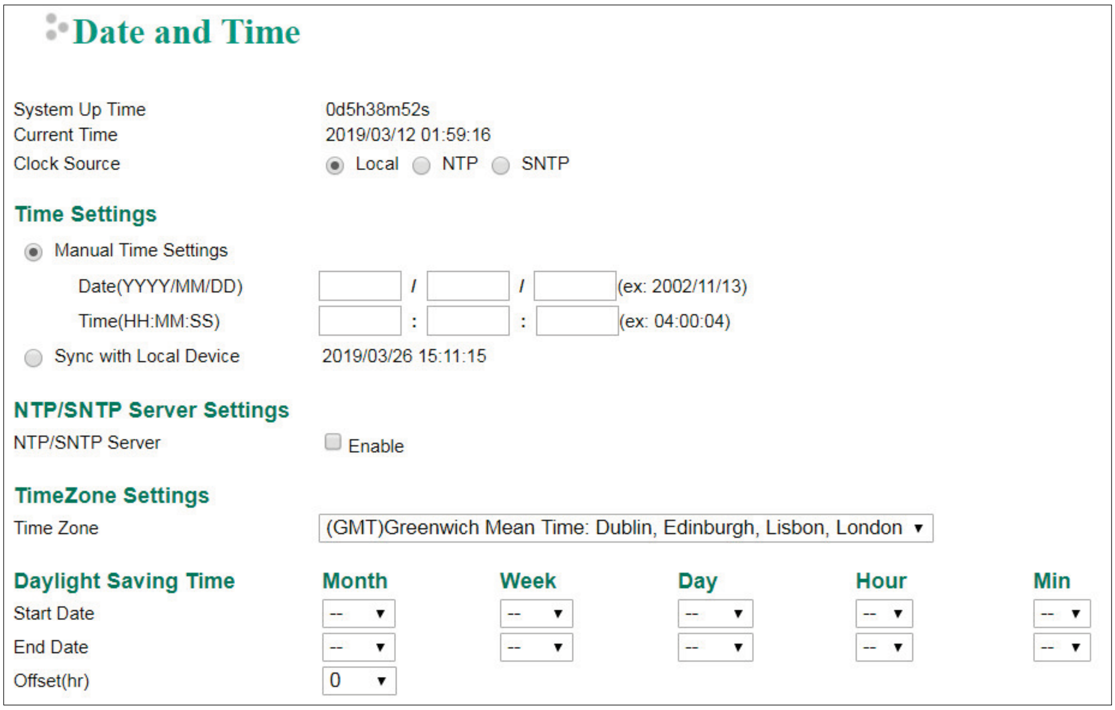
Account Login Failure Lockout

Setting	Description	Factory Default
Enable/Disable	Enable account lockout to prevent a user from logging in for a specified duration if the wrong password is entered too many times.	4
Retry threshold	Specify the maximum number of login retries before the account is locked out.	5
Lockout duration	Specify the lockout duration (in minutes) during which a locked out account will be unable to log in.	5

Date and Time

The Moxa ToughNet Secure Router has a time calibration function based on information from an NTP server or user specified time and date. Functions such as automatic warning emails can therefore include time and date stamp.

NOTE The Moxa ToughNet Secure Router does not have a real time clock. The user must update the Current Time and Current Date to set the initial time for the Moxa switch after each reboot, especially when there is no NTP server on the LAN or Internet connection.



Date and Time

System Up Time 0d5h38m52s
Current Time 2019/03/12 01:59:16
Clock Source ● Local ○ NTP ○ SNTP

Time Settings

● Manual Time Settings
Date(YYYY/MM/DD) __ / __ / __ (ex: 2002/11/13)
Time(HH:MM:SS) __ : __ : __ (ex: 04:00:04)
○ Sync with Local Device 2019/03/26 15:11:15

NTP/SNTP Server Settings

NTP/SNTP Server □ Enable

TimeZone Settings

Time Zone (GMT)Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London ▼

Daylight Saving Time	Month	Week	Day	Hour	Min
Start Date	-- ▼	-- ▼	-- ▼	-- ▼	-- ▼
End Date	-- ▼	-- ▼	-- ▼	-- ▼	-- ▼
Offset(hr)	0 ▼				

System Up Time

Indicates how long the Moxa ToughNet Secure Router remained up since the last cold start.

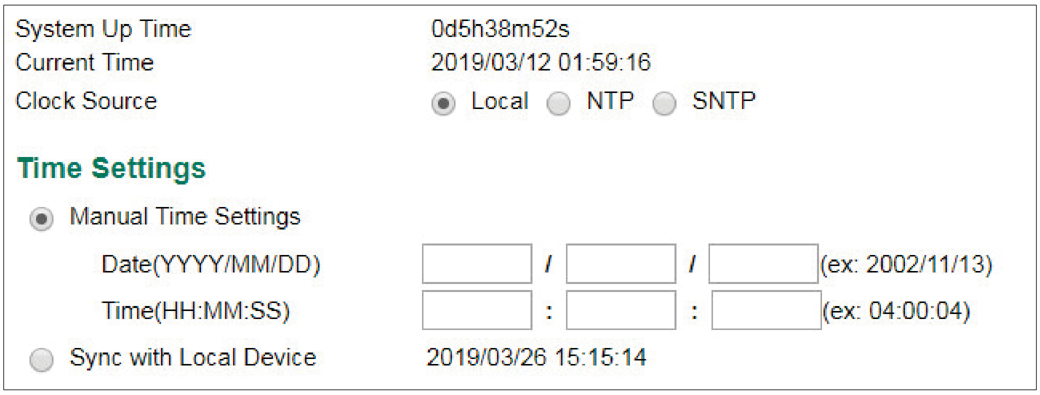
Current Time

Indicate current time using the yyyy-mm-dd format.

Clock Source

Setting	Description	Factory Default
Local	Configure clock source from local time	Local
NTP	Configure clock source from NTP	
SNTP	Configure clock source from SNTP	

The ToughNet Secure Router supports Local Clock Source, and user can set up time manually or synchronize with local devices.



System Up Time 0d5h38m52s
Current Time 2019/03/12 01:59:16
Clock Source ● Local ○ NTP ○ SNTP

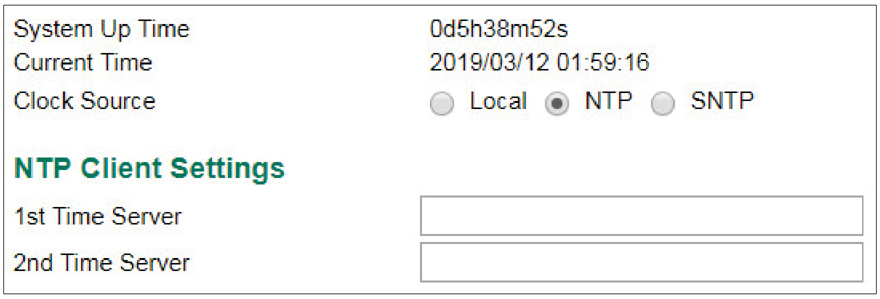
Time Settings

● Manual Time Settings
Date(YYYY/MM/DD) __ / __ / __ (ex: 2002/11/13)
Time(HH:MM:SS) __ : __ : __ (ex: 04:00:04)
○ Sync with Local Device 2019/03/26 15:15:14

Time Setting

Setting	Description	Factory Default
Manual Time Setting	Manual setup time with the format: Date (YYYY/MM/DD) Time (HH:MM:SS)	None
Sync with Local Device	Synchronize time with local device	Current time in the local device

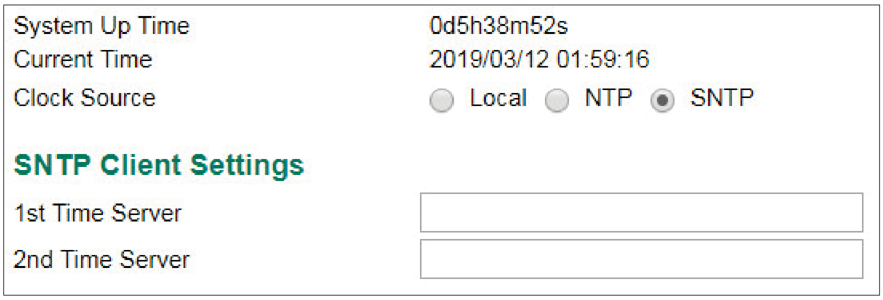
The ToughNet Secure Router supports NTP/SNTP client function for time synchronization. Two NTP/SNTP servers can be set.



System Up Time	0d5h38m52s
Current Time	2019/03/12 01:59:16
Clock Source	○ Local ● NTP ○ SNTP

NTP Client Settings

1st Time Server	
2nd Time Server	



System Up Time	0d5h38m52s
Current Time	2019/03/12 01:59:16
Clock Source	○ Local ○ NTP ● SNTP

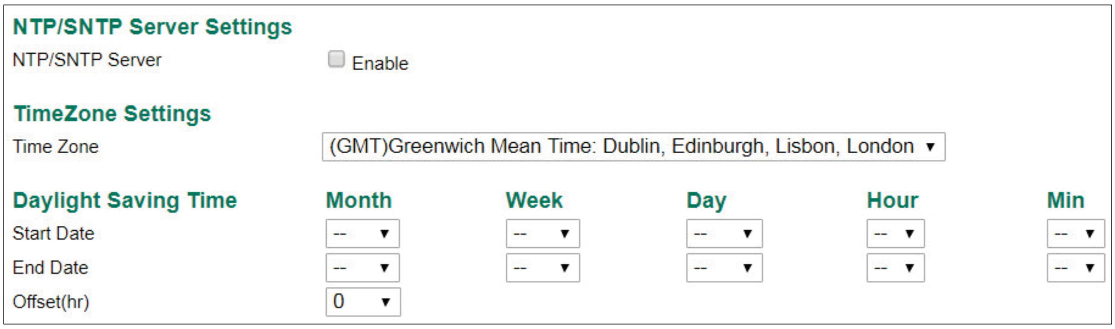
SNTP Client Settings

1st Time Server	
2nd Time Server	

NTP/SNTP Client Settings

Setting	Description	Factory Default
IP address or name of time server	The IP or domain address (e.g. 192.168.1.1, time.stdtime.gov.tw, or time.nist.gov)	None
IP address or name of secondary time server	The ToughNet Secure Router will try to locate the secondary NTP/SNTP server if the first server fails to connect.	

The ToughNet Secure Router supports NTP/SNTP Server, Time Zone Setting, and Daylight Saving functions.



NTP/SNTP Server Settings

NTP/SNTP Server □ Enable

TimeZone Settings

Time Zone (GMT)Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London

Daylight Saving Time	Month	Week	Day	Hour	Min
Start Date	--	--	--	--	--
End Date	--	--	--	--	--
Offset(hr)	0				

NTP/SNTP Server

Setting	Description	Factory Default
Enable/Disable	Enable NTP/SNTP server functionality for clients	Disable

Time Zone

Setting	Description	Factory Default
Time zone	Specifies the time zone, which is used to determine the local time offset from GMT (Greenwich Mean Time).	GMT (Greenwich Mean Time)

NOTE Changing the time zone will automatically correct the current time. Be sure to set the time zone before setting the time.

The Daylight Saving Time settings are used to automatically set the ToughNet Secure Router's time according to national standards.

Start Date

Setting	Description	Factory Default
User-specified date	Specifies the date that Daylight Saving Time begins.	None

End Date

Setting	Description	Factory Default
User-specified date	Specifies the date that Daylight Saving Time ends.	None

Offset

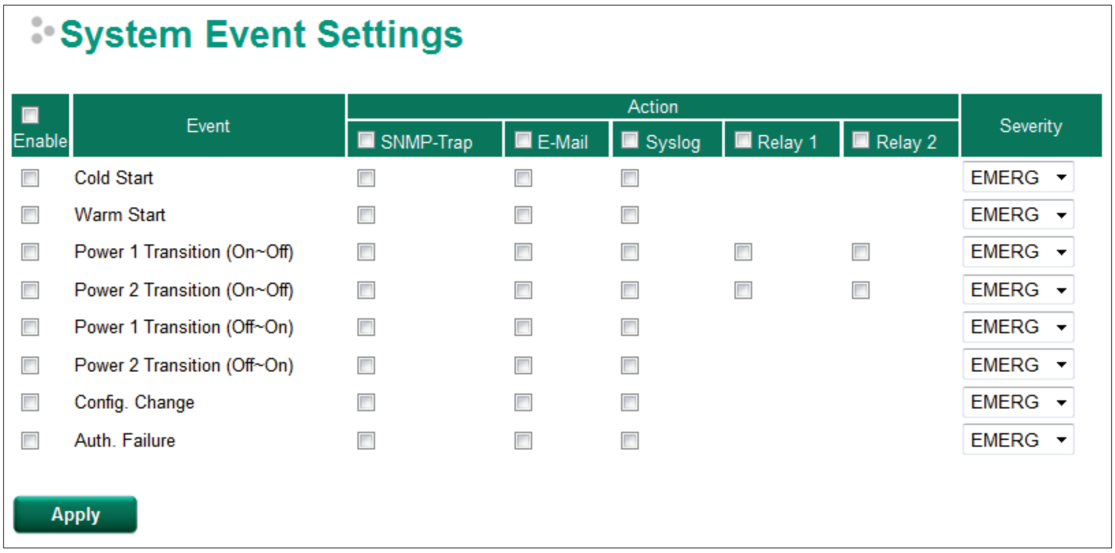
Setting	Description	Factory Default
User-specified hour	Specifies the number of hours that the time should be set forward during Daylight Saving Time.	None

Warning Notification

Since industrial Ethernet devices are often located at the endpoints of a system, these devices will not always know what is happening elsewhere on the network. This means that an ToughNet Secure Router that connects to these devices must provide system maintainers with real-time alarm messages. Even when control engineers are out of the control room for an extended period of time, they can still be informed of the status of devices almost instantaneously when exceptions occur. The Moxa ToughNet Secure Router supports different approaches to warn engineers automatically, such as email, trap, syslog and relay output. It also supports one digital input to integrate sensors into your system to automate alarms by email and relay output.

System Event Settings

System Events are related to the overall function of the switch. Each event can be activated independently with different warning approaches. Administrator also can decide the severity of each system event.



System Event Settings

☐ Enable	Event	Action					Severity
		☐ SNMP-Trap	☐ E-Mail	☐ Syslog	☐ Relay 1	☐ Relay 2	
☐	Cold Start	☐	☐	☐			EMERG
☐	Warm Start	☐	☐	☐			EMERG
☐	Power 1 Transition (On~Off)	☐	☐	☐	☐	☐	EMERG
☐	Power 2 Transition (On~Off)	☐	☐	☐	☐	☐	EMERG
☐	Power 1 Transition (Off~On)	☐	☐	☐			EMERG
☐	Power 2 Transition (Off~On)	☐	☐	☐			EMERG
☐	Config. Change	☐	☐	☐			EMERG
☐	Auth. Failure	☐	☐	☐			EMERG

System Events	Description
Cold Start	Power is cut off and then reconnected.
Warm Start	Moxa ToughNet Secure Router is rebooted, such as when network parameters are changed (IP address, subnet mask, etc.).
Power Transition (On→Off)	Moxa ToughNet Secure Router is powered down.
Power Transition (Off→On)	Moxa ToughNet Secure Router is powered up.
Configuration Change	Any configuration item has been changed

Authentication Failure	An incorrect password was entered.

There are four response actions available on the EDS E series when events are triggered.

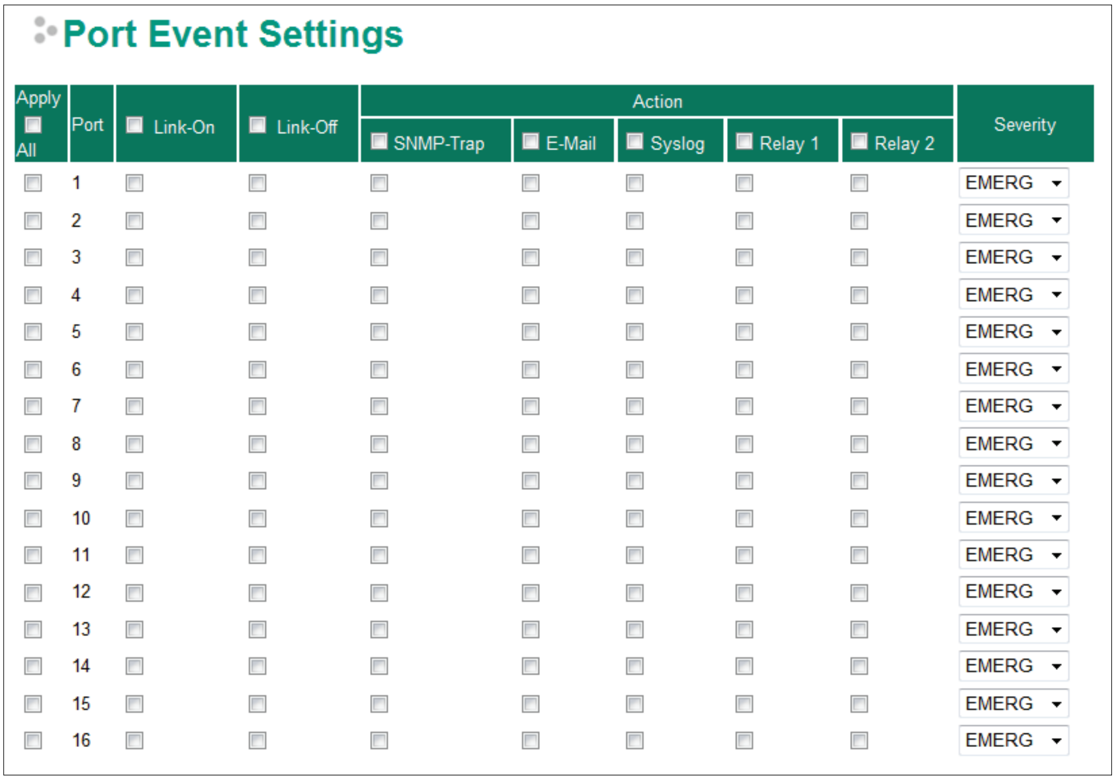
Action	Description
Trap	The ToughNet Secure Router will send notification to the trap server when event is triggered
E-Mail	The ToughNet Secure Router will send notification to the email server defined in the Email Setting
Syslog	The ToughNet Secure Router will record a syslog to syslog server defined in Syslog Server Setting
Relay	The ToughNet Secure Router supports digital inputs to integrate sensors. When event is triggered, the device will automate alarms by relay output

Severity

Severity	Description
Emergency	System is unusable
Alert	Action must be taken immediately
Critical	Critical conditions
Error	Error conditions
Warning	Warning conditions
Notice	Normal but significant condition
Information	Informational messages
Debug	Debug-level messages

Port Event Settings

Port Events are related to the activity of a specific port.



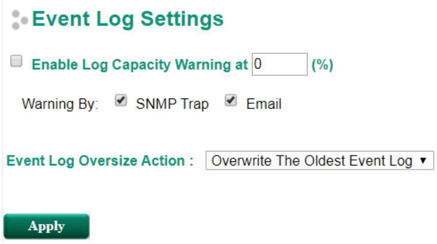
Port Event Settings

Apply □ All	Port	□ Link-On	□ Link-Off	Action					Severity
				□ SNMP-Trap	□ E-Mail	□ Syslog	□ Relay 1	□ Relay 2	
□	1	□	□	□	□	□	□	□	EMERG
□	2	□	□	□	□	□	□	□	EMERG
□	3	□	□	□	□	□	□	□	EMERG
□	4	□	□	□	□	□	□	□	EMERG
□	5	□	□	□	□	□	□	□	EMERG
□	6	□	□	□	□	□	□	□	EMERG
□	7	□	□	□	□	□	□	□	EMERG
□	8	□	□	□	□	□	□	□	EMERG
□	9	□	□	□	□	□	□	□	EMERG
□	10	□	□	□	□	□	□	□	EMERG
□	11	□	□	□	□	□	□	□	EMERG
□	12	□	□	□	□	□	□	□	EMERG
□	13	□	□	□	□	□	□	□	EMERG
□	14	□	□	□	□	□	□	□	EMERG
□	15	□	□	□	□	□	□	□	EMERG
□	16	□	□	□	□	□	□	□	EMERG

Port Events	Warning e-mail is sent when…
Link-ON	The port is connected to another device.
Link-OFF	The port is disconnected (e.g., the cable is pulled out, or the opposing device shuts down).

Event Log Settings

This window lets you configure the event log capacity warnings and decide what action to take when an event log has exceeded its storage threshold.



Event Log Settings

☐ Enable Log Capacity Warning at 0 (%)

Warning By: ☑ SNMP Trap ☑ Email

Event Log Oversize Action : Overwrite The Oldest Event Log ▾

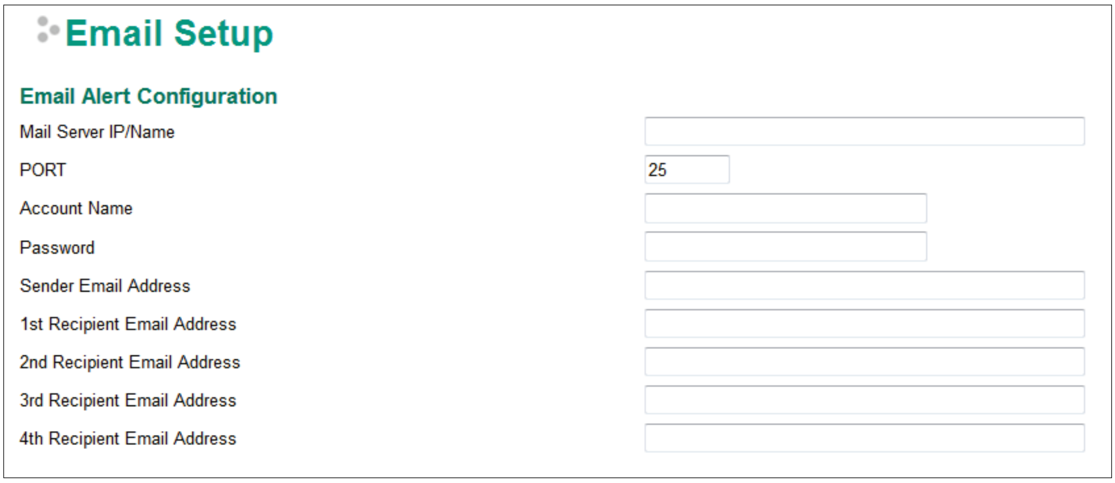
Enable Log Capacity Warning

Setting	Description	Factory Default
Log warning threshold	Specify the log capacity warning threshold (in %), based on the total log capacity. When this threshold is exceeded, the system will send a log capacity warning notification.	None

Event Log Oversize Action

Setting	Description	Factory Default
Overwrite The Oldest Event Log	The oldest event log will be overwritten when the event log exceeds 1,000 records.	Overwrite The Oldest Event Log
Stop Recording Event Log	Additional events will not be recorded when the event log exceeds 1,000 records.	

Email Setup



Email Setup

Email Alert Configuration

Mail Server IP/Name	
PORT	25
Account Name	
Password	
Sender Email Address	
1st Recipient Email Address	
2nd Recipient Email Address	
3rd Recipient Email Address	
4th Recipient Email Address	

Mail Server IP/Name

Setting	Description	Factory Default
IP address	The IP Address of your email server.	None

Account Name

Setting	Description	Factory Default
Max. 45 of charters	Your email account.	None

Password Setting

Setting	Description	Factory Default
Password	The email account password.	None

Email Address

Setting	Description	Factory Default
Max. of 30 characters	You can set up to 4 email addresses to receive alarm emails from the Moxa switch.	None

Send Test Email

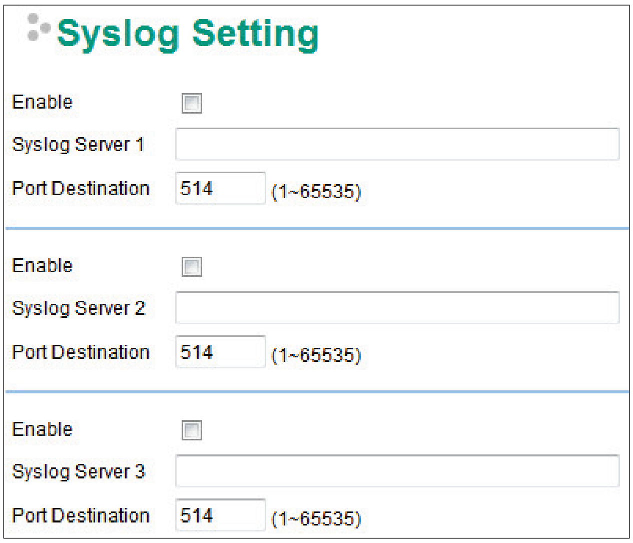
After you complete the email settings, you should first click **Apply** to activate those settings, and then press the **Test** button to verify that the settings are correct.

NOTE Auto warning e-mail messages will be sent through an authentication protected SMTP server that supports the CRAM-MD5, LOGIN, and PAIN methods of SASL (Simple Authentication and Security Layer) authentication mechanism.

We strongly recommend not entering your Account Name and Account Password if auto warning e-mail messages can be delivered without using an authentication mechanism.

Syslog Server Settings

The Syslog function provides the event logs for the syslog server. The function supports 3 configurable syslog servers and syslog server UDP port numbers. When an event occurs, the event will be sent as a syslog UDP packet to the specified syslog servers. Each Syslog server can be activated separately by selecting the check box and enable it.



Syslog Setting

Enable □
Syslog Server 1
Port Destination 514 (1~65535)

Enable □
Syslog Server 2
Port Destination 514 (1~65535)

Enable □
Syslog Server 3
Port Destination 514 (1~65535)

Syslog Server 1/2/3

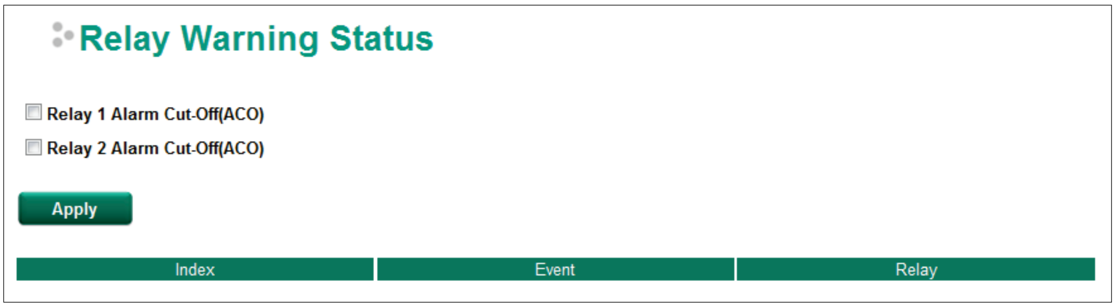
Setting	Description	Factory Default
IP Address	Enter the IP address of Syslog server 1/2/3, used by your network.	None
Port Destination (1 to 65535)	Enter the UDP port of Syslog server 1/2/3.	514

NOTE The following events will be recorded into the Moxa ToughNet Secure Router's Event Log table, and will then be sent to the specified Syslog Server:

- Cold start
- Warm start
- Configuration change activated
- Power 1/2 transition (Off (On), Power 1/2 transition (On (Off))
- Authentication fail
- Port link off/on

Relay Warning Status

When relay warning triggered by either system or port events, administrator can decide to shut down the hardware warning buzzer by clicking **Apply** button. The event still be recorded in the event list.



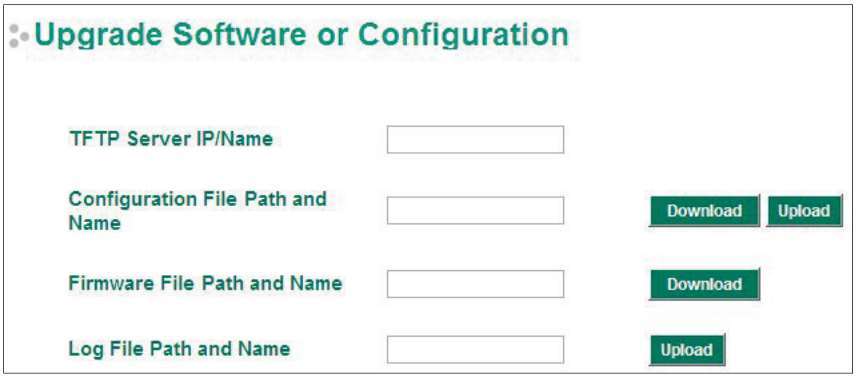
Relay Warning Status

□ Relay 1 Alarm Cut-Off(ACO)
□ Relay 2 Alarm Cut-Off(ACO)

Index	Event	Relay

System File Update—by Remote TFTP

The ToughNet Secure Router supports saving your configuration file to a remote TFTP server or local host to allow other ToughNet Secure Routers to use the same configuration at a later time, or saving the Log file for future reference. Loading pre-saved firmware or a configuration file from the TFTP server or local host is also supported to make it easier to upgrade or configure the ToughNet Secure Router.



Upgrade Software or Configuration

TFTP Server IP/Name

Configuration File Path and Name

Firmware File Path and Name

Log File Path and Name

TFTP Server IP/Name

Setting	Description	Factory Default
IP Address of TFTP Server	The IP or name of the remote TFTP server. Must be configured before downloading or uploading files.	None

Configuration File Path and Name

Setting	Description	Factory Default
Max. 40 Characters	The path and filename of the ToughNet Secure Router's configuration file in the TFTP server.	None

Firmware File Path and Name

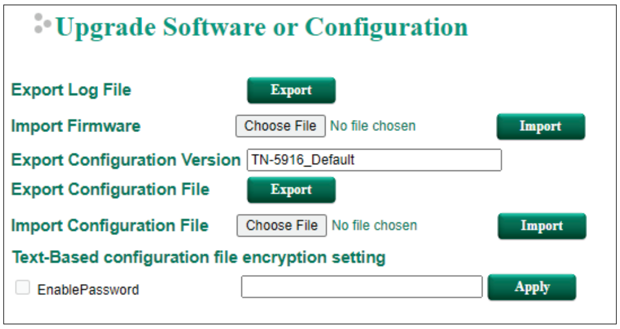
Setting	Description	Factory Default
Max. 40 Characters	The path and filename of the ToughNet Secure Router's firmware file	None

Log File Path and Name

Setting	Description	Factory Default
Max. 40 Characters	The path and filename of the ToughNet Secure Router's log file	None

After setting up the desired path and filename, click **Activate** to save the setting. Next, click **Download** to download the file from the remote TFTP server, or click **Upload** to upload a file to the remote TFTP server.

System File Update—by Local Import/Export



Upgrade Software or Configuration

Export Log File

Import Firmware — Choose File No file chosen

Export Configuration Version — TN-5916_Default

Export Configuration File

Import Configuration File — Choose File No file chosen

Text-Based configuration file encryption setting

□ EnablePassword

NOTE Some operating systems will open the configuration file and log file directly in the web page. In such cases, right-click the **Export** button and then save as a file.

Export Log File

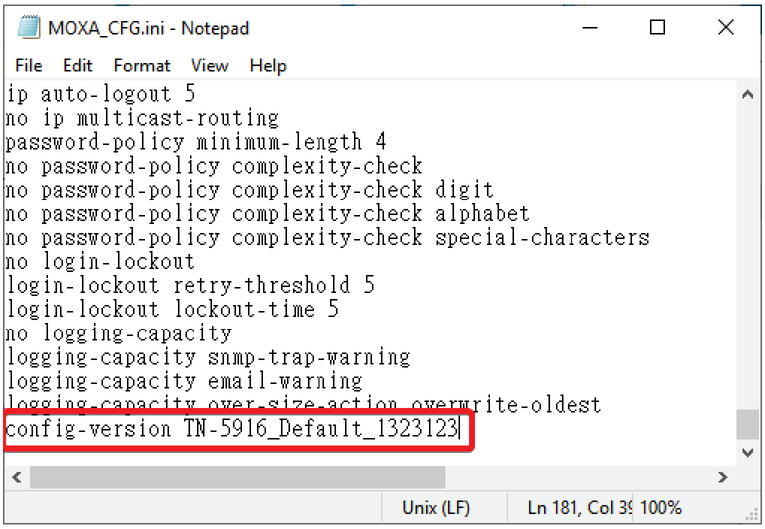
Click **Export** to export the log file of the ToughNet Secure Router to the local host.

Import Firmware

Click **Choose File** to select a firmware file on the computer's local storage. The upgrade procedure will proceed automatically after clicking **Import**. This upgrade procedure will take several minutes to complete, including boot-up time.

Export Configuration Version

Enter a name for the exported configuration file for version control purposes. This name will be written into the exported configuration file, as shown in the image below.



MOXA_CFG.ini - Notepad

```
ip auto-logout 5
no ip multicast-routing
password-policy minimum-length 4
no password-policy complexity-check
no password-policy complexity-check digit
no password-policy complexity-check alphabet
no password-policy complexity-check special-characters
no login-lockout
login-lockout retry-threshold 5
login-lockout lockout-time 5
no logging-capacity
logging-capacity snmp-trap-warning
logging-capacity email-warning
logging-capacity over-size-action overwrite-oldest
config-version TN-5916_Default_1323123
```

Export Configuration File

Click **Export** to export the configuration file of the ToughNet Secure Router to the local host.

Import Configuration File

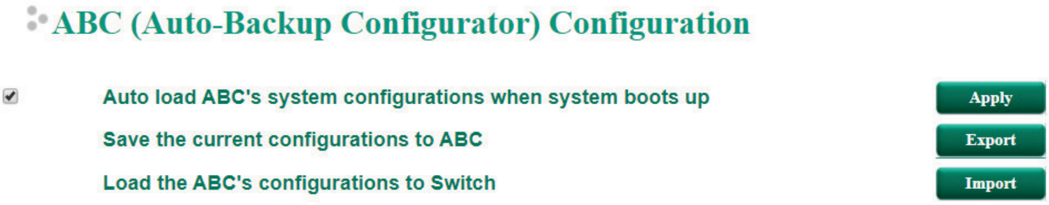
Click **Choose File** to select a configuration file on the computer's local storage. The upgrade procedure will proceed automatically after clicking **Import**.

Text-Based configuration file encryption setting

Check **EnablePassword**, enter an encryption password, and click **Apply**. When exporting configuration file, the file will be encrypted with this password. Leaving this field blank will not apply any encryption.

Back Up Media

You can use the Moxa Auto-Backup Configurator (ABC) to quickly save and load ToughNet Secure Router configurations through the router's RS-232 console port.



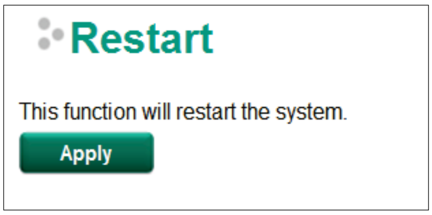
ABC (Auto-Backup Configurator) Configuration

☑ Auto load ABC's system configurations when system boots up

Save the current configurations to ABC

Load the ABC's configurations to Switch

Restart

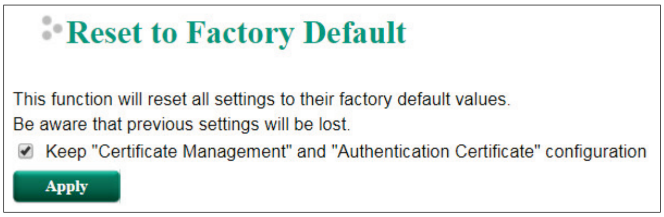


Restart

This function will restart the system.

This function is used to restart the ToughNet Secure Router.

Reset to Factory Default



Reset to Factory Default

This function will reset all settings to their factory default values.
Be aware that previous settings will be lost.

☑ Keep "Certificate Management" and "Authentication Certificate" configuration

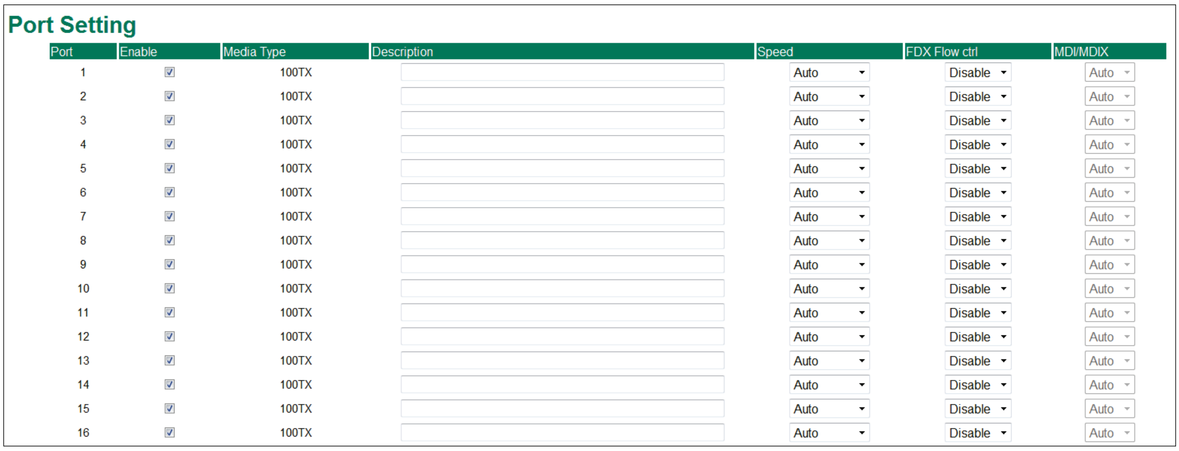
The **Reset to Factory Default** option gives users a quick way of restoring the ToughNet Secure Router's configuration settings to the factory default values. This function is available in the console utility (serial or Telnet), and web browser interface.

NOTE After activating the Factory Default function, you will need to use the default network settings to re-establish a web-browser or Telnet connection with your ToughNet Secure Router. Optionally, check **Keep "Certificate Management" and "Authentication Certificate" configuration** to keep these configuration settings when resetting the router to default settings.

Port

Port Settings

Port settings are included to give the user control over port access, port transmission speed, flow control, and port type (MDI or MDIX).



Port Setting

Port	Enable	Media Type	Description	Speed	FDX Flow ctrl	MDI/MDIX
1	☑	100TX		Auto	Disable	Auto
2	☑	100TX		Auto	Disable	Auto
3	☑	100TX		Auto	Disable	Auto
4	☑	100TX		Auto	Disable	Auto
5	☑	100TX		Auto	Disable	Auto
6	☑	100TX		Auto	Disable	Auto
7	☑	100TX		Auto	Disable	Auto
8	☑	100TX		Auto	Disable	Auto
9	☑	100TX		Auto	Disable	Auto
10	☑	100TX		Auto	Disable	Auto
11	☑	100TX		Auto	Disable	Auto
12	☑	100TX		Auto	Disable	Auto
13	☑	100TX		Auto	Disable	Auto
14	☑	100TX		Auto	Disable	Auto
15	☑	100TX		Auto	Disable	Auto
16	☑	100TX		Auto	Disable	Auto

Enable

Setting	Description	Factory Default
Checked	Allows data transmission through the port.	Enabled
Unchecked	Immediately shuts off port access.	

Media Type

Setting	Description	Factory Default
Media type	Displays the media type for each module's port	N/A

Description

Setting	Description	Factory Default
Max. 63 characters	Specifies an alias for the port to help administrators differentiate between different ports. Example: PLC 1	None

Speed

Setting	Description	Factory Default
Auto	Allows the port to use the IEEE 802.3u protocol to negotiate with connected devices. The port and connected devices will determine the best speed for that connection.	Auto
100M-Full	Choose one of these fixed speed options if the connected Ethernet device has trouble auto-negotiating for line speed.	
100M-Half		
10M-Full		
10M-Half		

FDX Flow Ctrl

This setting enables or disables flow control for the port when the port's Speed is set to Auto. The final result will be determined by the Auto process between the Moxa switch and connected devices.

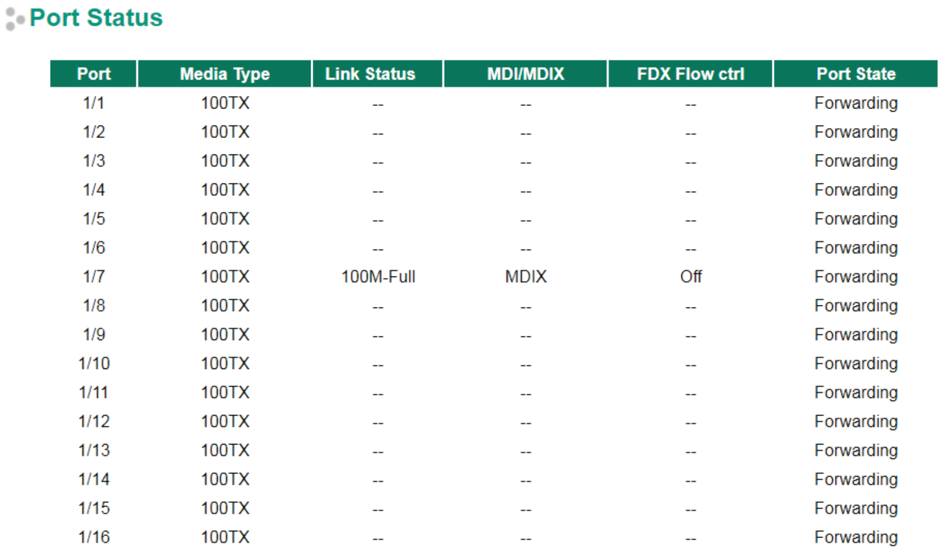
Setting	Description	Factory Default
Enable	Enables flow control for this port when the port's Speed is set to Auto.	Disabled
Disable	Disables flow control for this port when the port's Speed is set to Auto.	

MDI/MDIX

Setting	Description	Factory Default
Auto	Allows the port to auto-detect the port type of the connected Ethernet device and change the port type accordingly.	Auto
MDI	Choose MDI or MDIX if the connected Ethernet device has trouble auto-negotiating for port type.	
MDIX		

Port Status

From the **Port Status** window, you can view detailed port status information including the port number, media type, link status, MDI/MDIX mode, FDX Flow Control status, and the current port state.



Port Status

Port	Media Type	Link Status	MDI/MDIX	FDX Flow ctrl	Port State
1/1	100TX	--	--	--	Forwarding
1/2	100TX	--	--	--	Forwarding
1/3	100TX	--	--	--	Forwarding
1/4	100TX	--	--	--	Forwarding
1/5	100TX	--	--	--	Forwarding
1/6	100TX	--	--	--	Forwarding
1/7	100TX	100M-Full	MDIX	Off	Forwarding
1/8	100TX	--	--	--	Forwarding
1/9	100TX	--	--	--	Forwarding
1/10	100TX	--	--	--	Forwarding
1/11	100TX	--	--	--	Forwarding
1/12	100TX	--	--	--	Forwarding
1/13	100TX	--	--	--	Forwarding
1/14	100TX	--	--	--	Forwarding
1/15	100TX	--	--	--	Forwarding
1/16	100TX	--	--	--	Forwarding

Link Aggregation

Link aggregation involves grouping links into a link aggregation group. A MAC client can treat link aggregation groups as if they were a single link.

The Moxa ToughNet Secure Router's port trunking feature allows devices to communicate by aggregating up to 2 trunk groups, with a maximum of 8 ports for each group. If one of the 8 ports fails, the other seven ports will automatically provide backup and share the traffic.

Port trunking can be used to combine up to 8 ports between two Moxa switches or ToughNet Secure Routers. If all ports on both switches are configured as 100BaseTX and they are operating in full duplex, the potential bandwidth of the connection will be 1600 Mbps.

The Port Trunking Concept

Moxa has developed a port trunking protocol that provides the following benefits:

- Greater flexibility in setting up your network connections, since the bandwidth of a link can be doubled, tripled, or quadrupled.
- Redundancy—if one link is broken, the remaining trunked ports share the traffic within this trunk group.
- Load sharing—MAC client traffic can be distributed across multiple links.

To avoid broadcast storms or loops in your network while configuring a trunk, first disable or disconnect all ports that you want to add to the trunk or remove from the trunk. After you finish configuring the trunk, enable or re-connect the ports.

If all ports on both switch units are configured as 100BaseTX and they are operating in full duplex mode, the potential bandwidth of the connection will be up to 1.6 Gbps. This means that users can double, triple, or quadruple the bandwidth of the connection by port trunking between two Moxa switches.

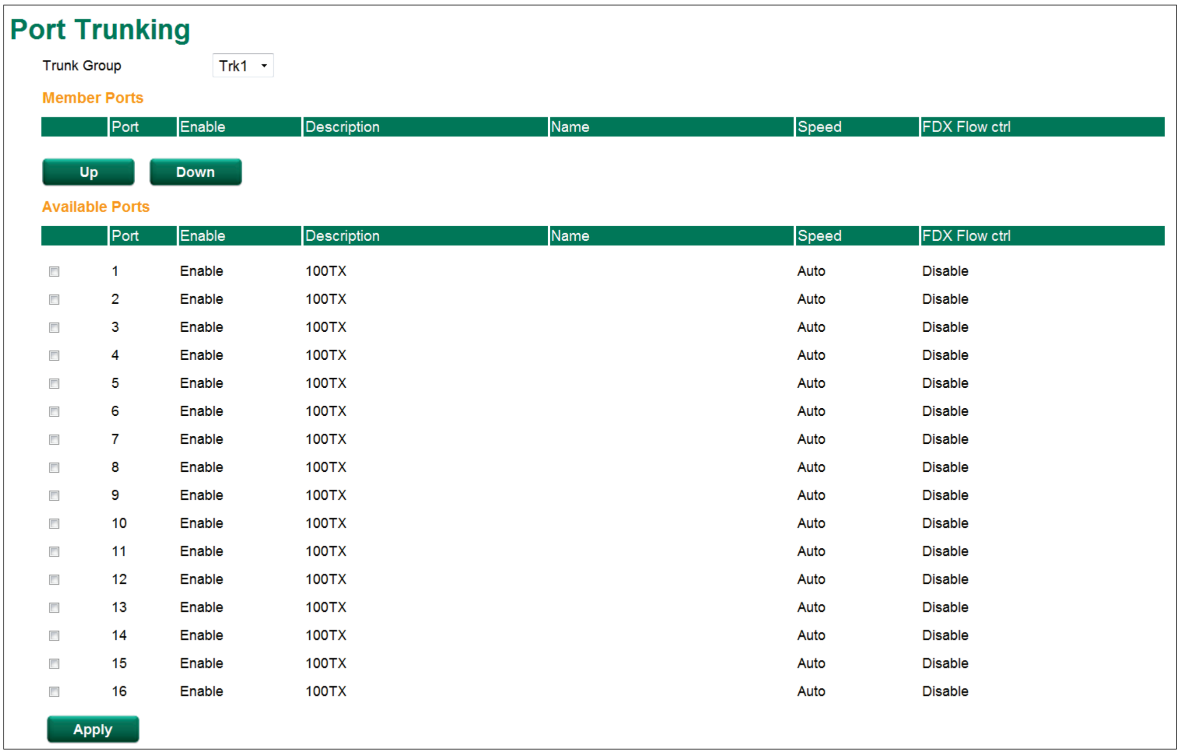
Each Moxa ToughNet Secure Router can set a maximum of 2 port trunking groups. When you activate port trunking, certain settings on each port will be reset to factory default values or disabled:

- Communication redundancy will be reset
- 802.1Q VLAN will be reset
- Multicast Filtering will be reset
- Port Lock will be reset and disabled.
- Set Device IP will be reset
- Mirror will be reset

After port trunking has been activated, you can configure these items again for each trunking port.

Port Trunking

The **Port Trunking Settings** page is where ports are assigned to a trunk group.



Port Trunking

Trunk Group: Trk1

Member Ports

	Port	Enable	Description	Name	Speed	FDX Flow ctrl

Available Ports

	Port	Enable	Description	Name	Speed	FDX Flow ctrl
□	1	Enable	100TX		Auto	Disable
□	2	Enable	100TX		Auto	Disable
□	3	Enable	100TX		Auto	Disable
□	4	Enable	100TX		Auto	Disable
□	5	Enable	100TX		Auto	Disable
□	6	Enable	100TX		Auto	Disable
□	7	Enable	100TX		Auto	Disable
□	8	Enable	100TX		Auto	Disable
□	9	Enable	100TX		Auto	Disable
□	10	Enable	100TX		Auto	Disable
□	11	Enable	100TX		Auto	Disable
□	12	Enable	100TX		Auto	Disable
□	13	Enable	100TX		Auto	Disable
□	14	Enable	100TX		Auto	Disable
□	15	Enable	100TX		Auto	Disable
□	16	Enable	100TX		Auto	Disable

Step 1: Select the desired **Trunk Group**

Step 2: Select the desired **Member Ports** or **Available Ports**

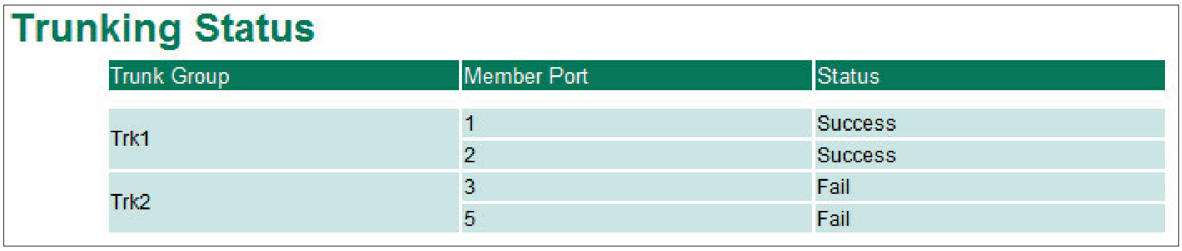
Step 3: Use **Up** and **Down** to modify the Group Members

Trunk Group (maximum of 2 trunk groups)

Setting	Description	Factory Default
Trk1, Trk2 (depends on switching chip capability)	Specifies the current trunk group.	Trk1

Trunking Status

The **Trunking Status table** shows the Trunk Group configuration status.

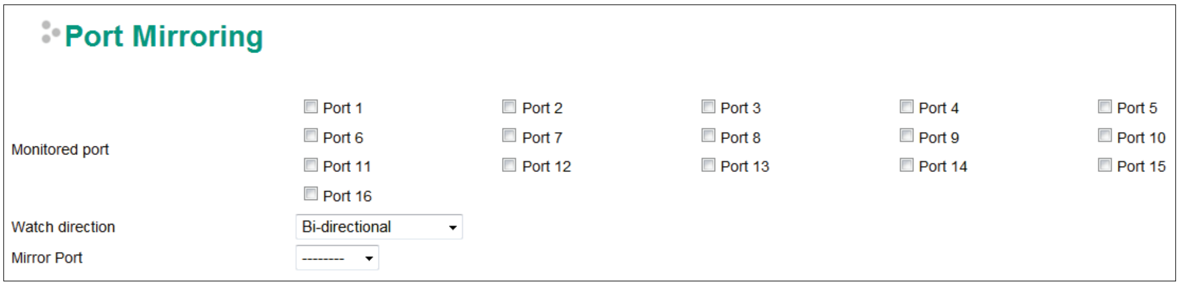


Trunking Status

Trunk Group	Member Port	Status
Trk1	1	Success
	2	Success
Trk2	3	Fail
	5	Fail

Port Mirror

The **Port Mirror** function can be used to monitor data being transmitted through a specific port. This is done by setting up another port (the mirror port) to receive the same data being transmitted from, or both to and from, the port under observation. Using a mirror port allows the network administrator to **sniff** the observed port to keep tabs on network activity.



Port Mirroring

Monitored port ☐ Port 1 ☐ Port 2 ☐ Port 3 ☐ Port 4 ☐ Port 5 ☐ Port 6 ☐ Port 7 ☐ Port 8 ☐ Port 9 ☐ Port 10 ☐ Port 11 ☐ Port 12 ☐ Port 13 ☐ Port 14 ☐ Port 15 ☐ Port 16

Watch direction: Bi-directional

Mirror Port: --------

Port Mirroring Settings

Setting	Description
Monitored Port	Select the number of the ports whose network activity will be monitored. Multiple port selection is acceptable.
Watch Direction	Select one of the following two watch direction options: • Input data stream: Select this option to monitor only those data packets coming into the Moxa ToughNet Secure Router's port. • Output data stream: Select this option to monitor only those data packets being sent out through the Moxa ToughNet Secure Router's port. • Bi-directional: Select this option to monitor data packets both coming into, and being sent out through, the Moxa ToughNet Secure Router's port.
Mirror Port	Select the number of the port that will be used to monitor the activity of the monitored port.

Using Virtual LAN

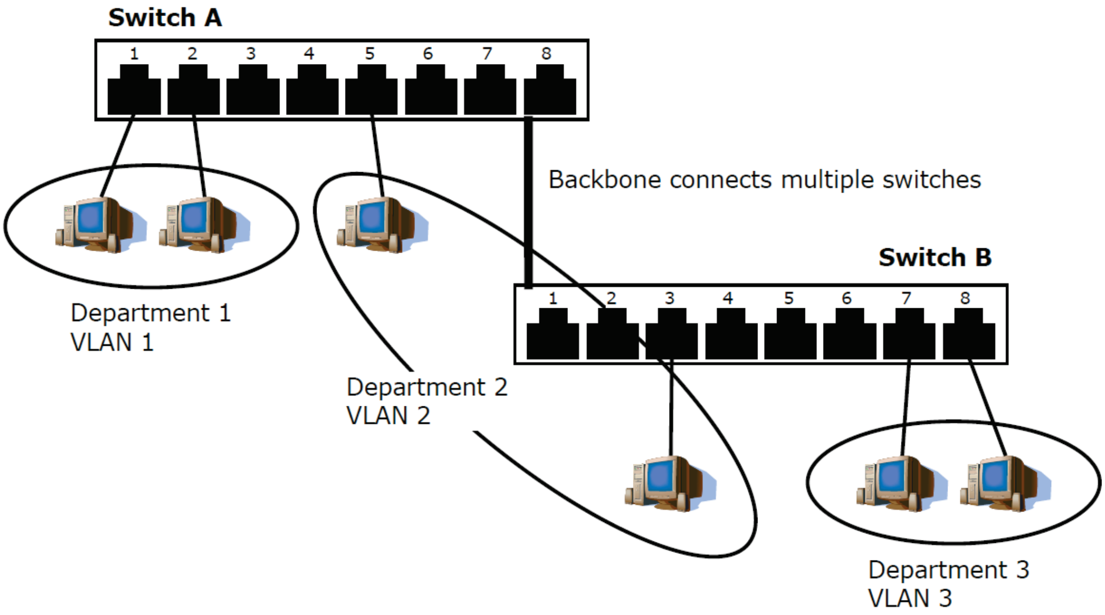
Setting up Virtual LANs (VLANs) on your Moxa ToughNet Secure Router increases the efficiency of your network by dividing the LAN into logical segments, as opposed to physical segments. In general, VLANs are easier to manage.

The VLAN Concept

What is a VLAN?

A VLAN is a group of devices that can be located anywhere on a network, but which communicate as if they are on the same physical segment. With VLANs, you can segment your network without being restricted by physical connections—a limitation of traditional network design. With VLANs you can segment your network into:

- **Departmental groups**—you could have one VLAN for the marketing department, another for the finance department, and another for the product development department.
- **Hierarchical groups**—you could have one VLAN for directors, another for managers, and another for general staff.
- **Usage groups**—you could have one VLAN for email users and another for multimedia users.



Benefits of VLANs

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

- **VLANs ease the relocation of devices on networks:** With traditional networks, network administrators spend much of their time dealing with moves and changes. If users move to a different sub-network, the addresses of each host must be updated manually. With a VLAN setup, if a host originally on VLAN Marketing, for example, is moved to a port on another part of the network, and retains its original subnet membership, you only need to specify that the new port is on VLAN Marketing. You do not need to do any re-cabling.
- **VLANs provide extra security:** Devices within each VLAN can only communicate with other devices on the same VLAN. If a device on VLAN Marketing needs to communicate with devices on VLAN Finance, the traffic must pass through a routing device or Layer 3 switch.
- **VLANs help control traffic:** With traditional networks, congestion can be caused by broadcast traffic that is directed to all network devices, regardless of whether or not they need it. VLANs increase the efficiency of your network because each VLAN can be set up to contain only those devices that need to communicate with each other.

Managing a VLAN

A new or initialized Moxa ToughNet Secure Router contains a single VLAN—the Default VLAN. This VLAN has the following definition:

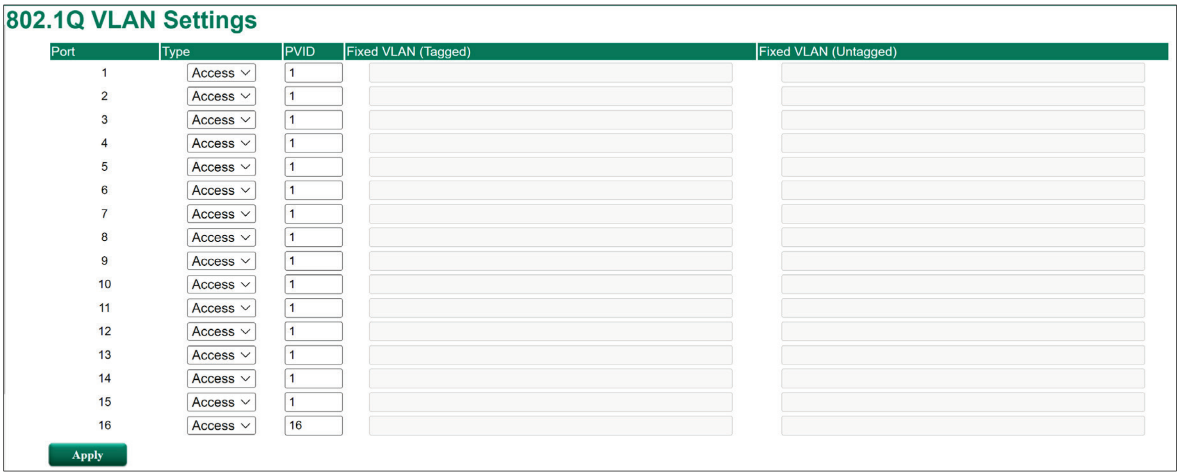
- **VLAN Name**—Management VLAN
- **802.1Q VLAN ID**—1 (if tagging is required)

All of the ports are initially placed on this VLAN, and it is the only VLAN that allows you to access the management software of the Moxa switch over the network.

Configuring Virtual LAN

To configure **802.1Q VLAN** on the Moxa switch, use the **802.1Q VLAN Settings** page to configure the ports.

802.1Q VLAN Settings



802.1Q VLAN Settings

Port	Type	PVID	Fixed VLAN (Tagged)	Fixed VLAN (Untagged)
1	Access	1		
2	Access	1		
3	Access	1		
4	Access	1		
5	Access	1		
6	Access	1		
7	Access	1		
8	Access	1		
9	Access	1		
10	Access	1		
11	Access	1		
12	Access	1		
13	Access	1		
14	Access	1		
15	Access	1		
16	Access	16		

Management VLAN ID

Setting	Description	Factory Default
VLAN ID from 1-4094	Assigns the VLAN ID of this Moxa switch.	1

Port Type

Setting	Description	Factory Default
Access	Port type is used to connect single devices without tags.	Access
Trunk	Select Trunk port type to connect another 802.1Q VLAN aware switch.	
Hybrid	Select Hybrid port to connect another Access 802.1Q VLAN aware switch or another LAN that combines tagged and/or untagged devices and/or other switches/hubs.	

PVID

Setting	Description	Factory Default
VLAN ID from 1-4094	Sets the default VLAN ID for untagged devices that connect to the port.	1

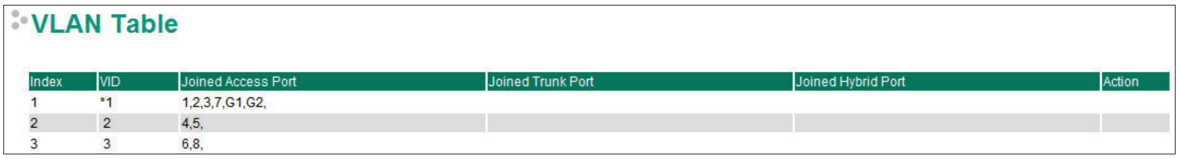
Tagged VLAN

Setting	Description	Factory Default
VLAN ID from 1-4094	This field will be active only when selecting the Trunk or Hybrid port type. Set the other VLAN ID for tagged devices that connect to the port. Use commas to separate different VIDs.	None

Untagged VLAN

Setting	Description	Factory Default
VLAN ID from 1-4094	This field will be active only when selecting the Trunk or Hybrid port type. Set the other VLAN ID for tagged devices that connect to the port and tags that need to be removed in egress packets. Use commas to separate different VIDs.	None

VLAN Table



VLAN Table

Index	VID	Joined Access Port	Joined Trunk Port	Joined Hybrid Port	Action
1	*1	1,2,3,7,G1,G2,			
2	2	4,5,			
3	3	6,8,			

Use the **802.1Q VLAN Table** to review the VLAN groups that were created, Joined Access Ports, Trunk Ports, and Hybrid Ports, and also Action for deleting VLANs which have no member ports in the list.

Multicast

Multicast filtering improves the performance of networks that carry multicast traffic. This section explains multicasts, multicast filtering, and how multicast filtering can be implemented on your Moxa ToughNet Secure Router.

The Concept of Multicast Filtering

What is an IP Multicast?

A *multicast* is a packet sent by one host to multiple hosts. Only those hosts that belong to a specific multicast group will receive the multicast. If the network is set up correctly, a multicast can only be sent to an end-station or a subset of end-stations on a LAN or VLAN that belong to the multicast group. Multicast group members can be distributed across multiple subnets, so that multicast transmissions can occur within a campus LAN or over a WAN. In addition, networks that support IP multicast send only *one* copy of the desired information across the network until the delivery path that reaches group members diverges. To make more efficient use of network bandwidth, it is only at these points that multicast packets are duplicated and forwarded. A multicast packet has a multicast group address in the destination address field of the packet's IP header.

Benefits of Multicast

The benefits of using IP multicast are:

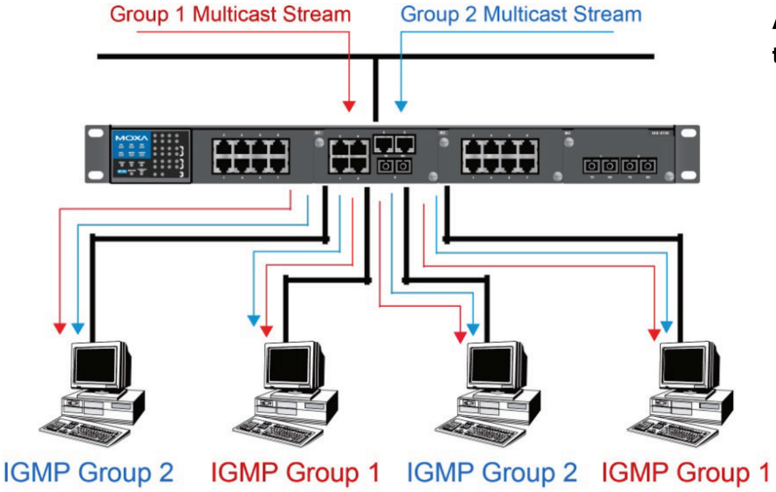
- It uses the most efficient, sensible method to deliver the same information to many receivers with only one transmission.
- It reduces the load on the source (for example, a server) since it will not need to produce several copies of the same data.
- It makes efficient use of network bandwidth and scales well as the number of multicast group members increases.
- Works with other IP protocols and services, such as Quality of Service (QoS).

Multicast transmission makes more sense and is more efficient than unicast transmission for some applications. For example, multicasts are often used for video-conferencing, since high volumes of traffic must be sent to several end-stations at the same time, but where broadcasting the traffic to all end-stations would cause a substantial reduction in network performance. Furthermore, several industrial automation protocols, such as Allen-Bradley, EtherNet/IP, Siemens Profibus, and Foundation Fieldbus HSE (High Speed Ethernet), use multicast. These industrial Ethernet protocols use publisher/subscriber communications models by multicasting packets that could flood a network with heavy traffic. IGMP Snooping is used to prune multicast traffic so that it travels only to those end destinations that require the traffic, reducing the amount of traffic on the Ethernet LAN.

Multicast Filtering

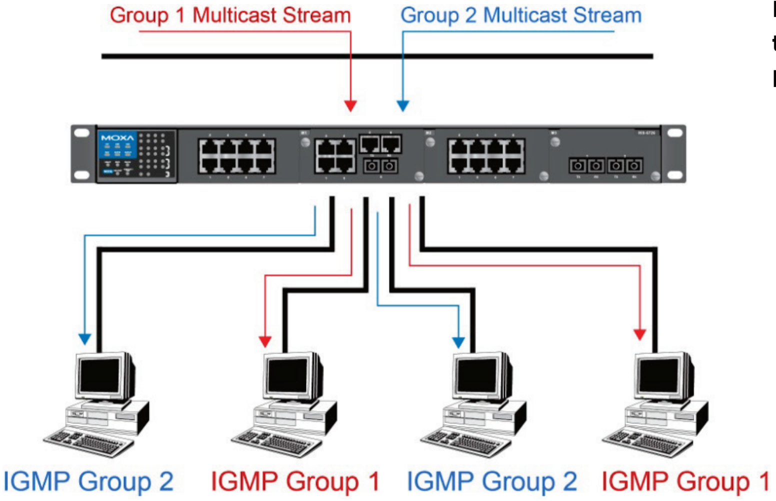
Multicast filtering ensures that only end-stations that have joined certain groups receive multicast traffic. With multicast filtering, network devices only forward multicast traffic to the ports that are connected to registered end-stations. The following two figures illustrate how a network behaves without multicast filtering, and with multicast filtering.

Network without multicast filtering



All hosts receive the multicast traffic, even if they don't need it.

Network with multicast filtering



Hosts only receive dedicated traffic from other hosts belonging to the same group.

Multicast Filtering and Moxa's ToughNet Secure Routers

The Moxa ToughNet Secure Router has two ways to achieve multicast filtering: IGMP (Internet Group Management Protocol) Snooping and adding a static multicast MAC manually to filter multicast traffic automatically.

Snooping Mode

Snooping Mode allows your ToughNet Secure Router to forward multicast packets only to the appropriate ports. The router **snoops** on exchanges between hosts and an IGMP device to find those ports that want to join a multicast group, and then configures its filters accordingly.

Query Mode

Query mode allows the Moxa router to work as the Querier if it has the lowest IP address on the subnetwork to which it belongs.

IGMP querying is enabled by default on the Moxa router to ensure proceeding query election. Enable query mode to run multicast sessions on a network that does not contain IGMP routers (or queriers). Query mode allows users to enable IGMP snooping by VLAN ID. Moxa ToughNet Secure Router support IGMP snooping version 1 and version 2. Version 2 is compatible with version 1.The default setting is IGMP V1/V2. "

IGMP Multicast Filtering

IGMP is used by IP-supporting network devices to register hosts with multicast groups. It can be used on all LANs and VLANs that contain a multicast capable IP router, and on other network devices that support multicast filtering. Moxa switches support IGMP version 1 and 2. IGMP version 1 and 2 work as follows::

- The IP router (or querier) periodically sends query packets to all end-stations on the LANs or VLANs that are connected to it. For networks with more than one IP router, the router with the lowest IP address is the querier. A switch with IP address lower than the IP address of any other IGMP queriers connected to the LAN or VLAN can become the IGMP querier.
- When an IP host receives a query packet, it sends a report packet back that identifies the multicast group that the end-station would like to join.
- When the report packet arrives at a port on a switch with IGMP Snooping enabled, the switch knows that the port should forward traffic for the multicast group, and then proceeds to forward the packet to the router.
- When the router receives the report packet, it registers that the LAN or VLAN requires traffic for the multicast groups.
- When the router forwards traffic for the multicast group to the LAN or VLAN, the switches only forward the traffic to ports that received a report packet.

IGMP version comparison

IGMP Version	Main Features	Reference
V1	a. Periodic query	RFC-1112
V2	Compatible with V1 and adds: a. Group-specific query b. Leave group messages c. Resends specific queries to verify leave message was the last one in the group d. Querier election	RFC-2236

Static Multicast MAC

Some devices may only support multicast packets, but not support either IGMP Snooping. The Moxa ToughNet Secure Router supports adding multicast groups manually to enable multicast filtering.

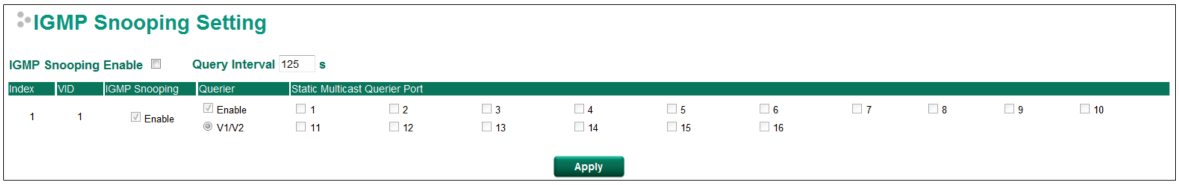
Enabling Multicast Filtering

Use the USB console or web interface to enable or disable IGMP Snooping and IGMP querying. If IGMP Snooping is not enabled, then IP multicast traffic is always forwarded, flooding the network.

IGMP Snooping

IGMP Snooping provides the ability to prune multicast traffic so that it travels only to those end destinations that require that traffic, thereby reducing the amount of traffic on the Ethernet LAN.

IGMP Snooping Settings



IGMP Snooping Setting

IGMP Snooping Enable □ Query Interval 125 s

Index	VID	IGMP Snooping	Querier	Static Multicast Querier Port									
1	1	☑ Enable	☑ Enable ● V1/V2	□ 1 □ 11	□ 2 □ 12	□ 3 □ 13	□ 4 □ 14	□ 5 □ 15	□ 6 □ 16	□ 7	□ 8	□ 9	□ 10

Enable IGMP Snooping (Global)

Setting	Description	Factory Default
Enable/Disable	Checkmark the Enable IGMP Snooping checkbox near the top of the window to enable the IGMP Snooping function globally.	Disabled

Query Interval (sec)

Setting	Description	Factory Default
Numerical value, input by the user	Sets the query interval of the Querier function globally. Valid settings are from 20 to 600 seconds.	125 seconds

Enable IGMP Snooping

Setting	Description	Factory Default
Enable/Disable	Enables or disables the IGMP Snooping function on that particular VLAN.	Enabled if IGMP Snooping is enabled globally

Querier

Setting	Description	Factory Default
Enable/Disable	Enables or disables the Moxa ToughNet Secure Router's querier function.	Disabled
V1/V2 Checkbox	V1/V2: Enables the Moxa ToughNet Secure Router to send IGMP snooping version 1 and 2 queries	V1/V2

Static Multicast Querier Port

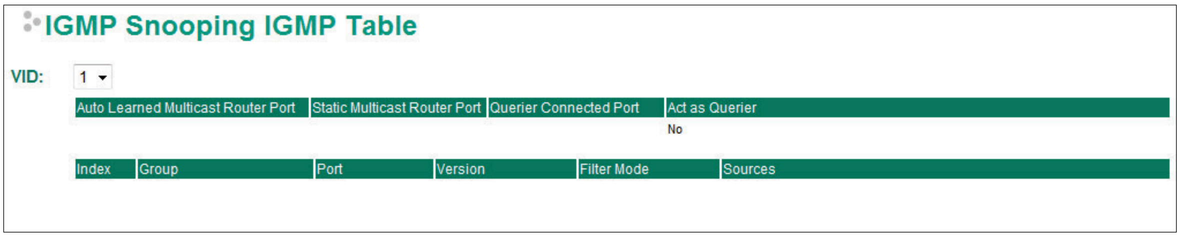
Setting	Description	Factory Default
Select/Deselect	Select the ports that will connect to the multicast routers. These ports will receive all multicast packets from the source. This option is only active when IGMP Snooping is enabled.	Disabled

NOTE If a router or layer 3 switch is connected to the network, it will act as the Querier, and consequently this Querier option will be disabled on all Moxa layer 2 switches.

If all switches on the network are Moxa layer 2 switches, then only one layer 2 switch will act as Querier.

IGMP Table

The Moxa ToughNet Secure Router displays the current active IGMP groups that were detected. View IGMP group setting per VLAN ID on this page.



IGMP Snooping IGMP Table

VID: 1

Auto Learned Multicast Router Port	Static Multicast Router Port	Querier Connected Port	Act as Querier
			No

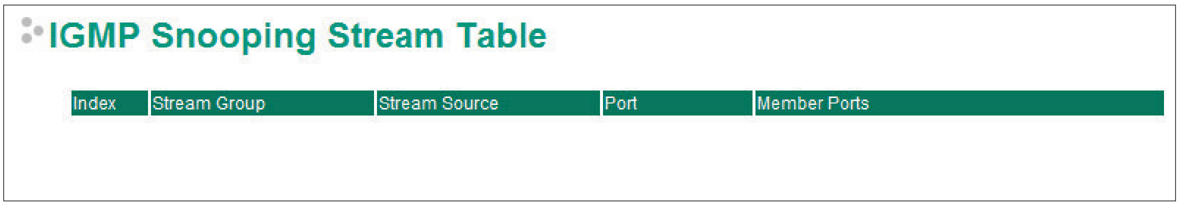
Index	Group	Port	Version	Filter Mode	Sources

The information shown in the table includes:

- Auto Learned Multicast Router Port: This indicates that a multicast router connects to/sends packets from these port(s).
- Static Multicast Router Port: Displays the static multicast querier port(s)
- Querier Connected Port: Displays the port which is connected to the querier
- Act as a Querier: Displays whether or not this VLAN is a querier (winner of an election)
- Group: Displays the multicast group addresses
- Port: Displays the port that receives the multicast stream/the port the multicast stream is forwarded to
- Version: Displays the IGMP Snooping version

Stream Table

This page displays the multicast stream forwarding status. It allows you to view the status per VLAN ID.



IGMP Snooping Stream Table

Index	Stream Group	Stream Source	Port	Member Ports

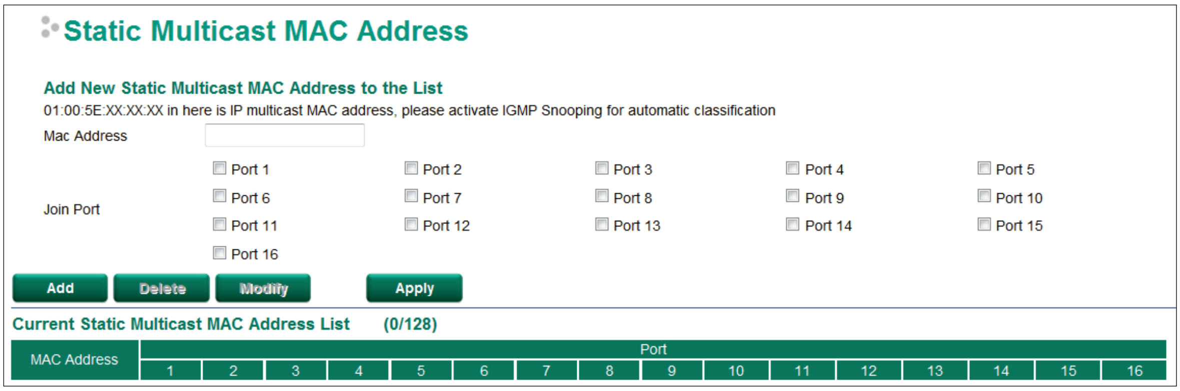
Stream Group: Multicast group IP address

Stream Source: Multicast source IP address

Port: Which port receives the multicast stream

Member ports: Ports the multicast stream is forwarded to

Static Multicast MAC



Static Multicast MAC Address

Add New Static Multicast MAC Address to the List

01:00:5E:XX:XX:XX in here is IP multicast MAC address, please activate IGMP Snooping for automatic classification

Mac Address

Join Port

□ Port 1 □ Port 2 □ Port 3 □ Port 4 □ Port 5
□ Port 6 □ Port 7 □ Port 8 □ Port 9 □ Port 10
□ Port 11 □ Port 12 □ Port 13 □ Port 14 □ Port 15
□ Port 16

Current Static Multicast MAC Address List (0/128)

MAC Address	Port															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

NOTE 01:00:5E:XX:XX:XX on this page is the IP multicast MAC address. Please activate IGMP Snooping for automatic classification.

MAC Address

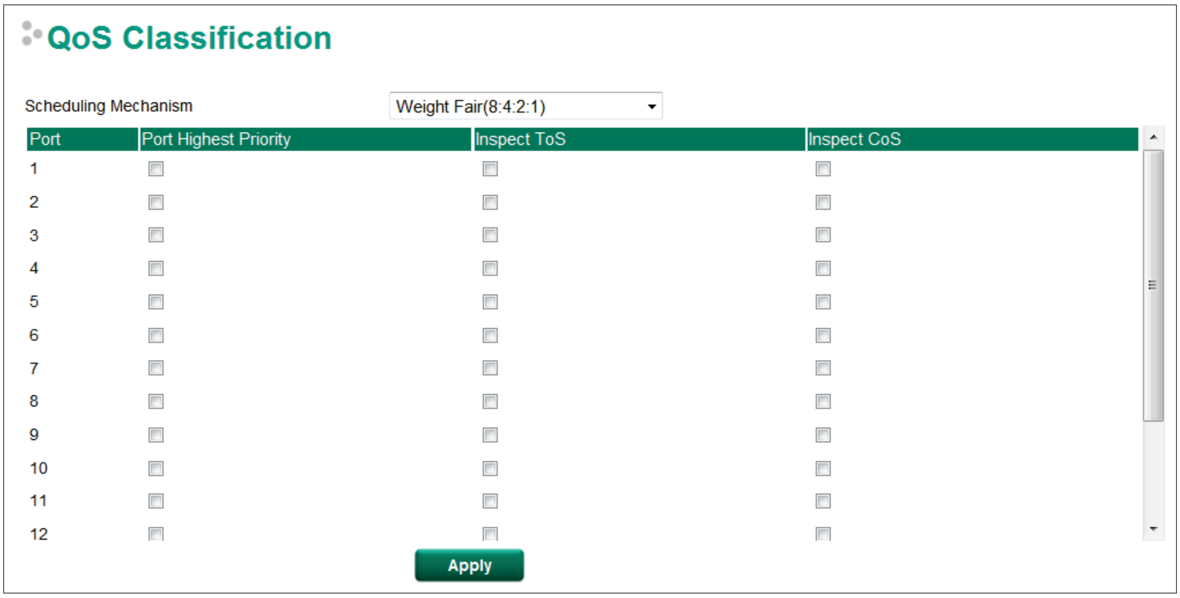
Setting	Description	Factory Default
Integer	Input the number of the VLAN that the host with this MAC address belongs to.	None

Join Port

Setting	Description	Factory Default
Select/Deselect	Checkmark the appropriate check boxes to select the join ports for this multicast group.	None

QoS

QoS Classification



QoS Classification

Scheduling Mechanism: Weight Fair(8:4:2:1)

Port	Port Highest Priority	Inspect ToS	Inspect CoS
1	□	□	□
2	□	□	□
3	□	□	□
4	□	□	□
5	□	□	□
6	□	□	□
7	□	□	□
8	□	□	□
9	□	□	□
10	□	□	□
11	□	□	□
12	□	□	□

The Moxa switch supports inspection of layer 3 ToS and/or layer 2 CoS tag information to determine how to classify traffic packets.

Scheduling Mechanism

Setting	Description	Factory Default
Weight Fair	The Moxa ToughNet Secure Router has 4 priority queues. In the weight fair scheme, an 8, 4, 2, 1 weighting is applied to the four priorities. This approach prevents the lower priority frames from being starved of opportunity for transmission with only a slight delay to the higher priority frames.	Weight Fair
Strict	In the Strict-priority scheme, all top-priority frames egress a port until that priority's queue is empty, and then the next lower priority queue's frames egress. This approach can cause the lower priorities to be starved of opportunity for transmitting any frames but ensures that all high priority frames will egress the switch as soon as possible.	

Inspect ToS

Setting	Description	Factory Default
Enable/Disable	Enables or disables the Moxa ToughNet Secure Router for inspecting Type of Service (ToS) bits in the IPV4 frame to determine the priority of each frame.	Enabled

Inspect COS

Setting	Description	Factory Default
Enable/Disable	Enables or disables the Moxa ToughNet Secure Router for inspecting 802.1p CoS tags in the MAC frame to determine the priority of each frame.	Enabled

Port Priority

Setting	Description	Factory Default

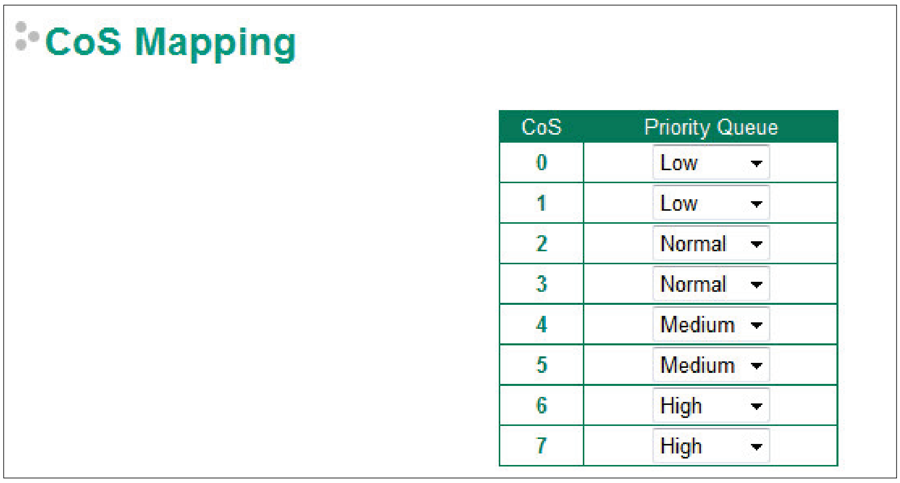
Port priority	The port priority has 4 priority queues. Low, normal, medium, high priority queue option is applied to each port.	3(Normal)

NOTE The priority of an ingress frame is determined in the following order:

1. Inspect CoS
2. Inspect ToS
3. Port Priority

NOTE The designer can enable these classifications individually or in combination. For instance, if a "hot" higher priority port is required for a network design, **Inspect TOS** and **Inspect CoS** can be disabled. This setting leaves only port default priority active, which results in all ingress frames being assigned the same priority on that port.

CoS Mapping



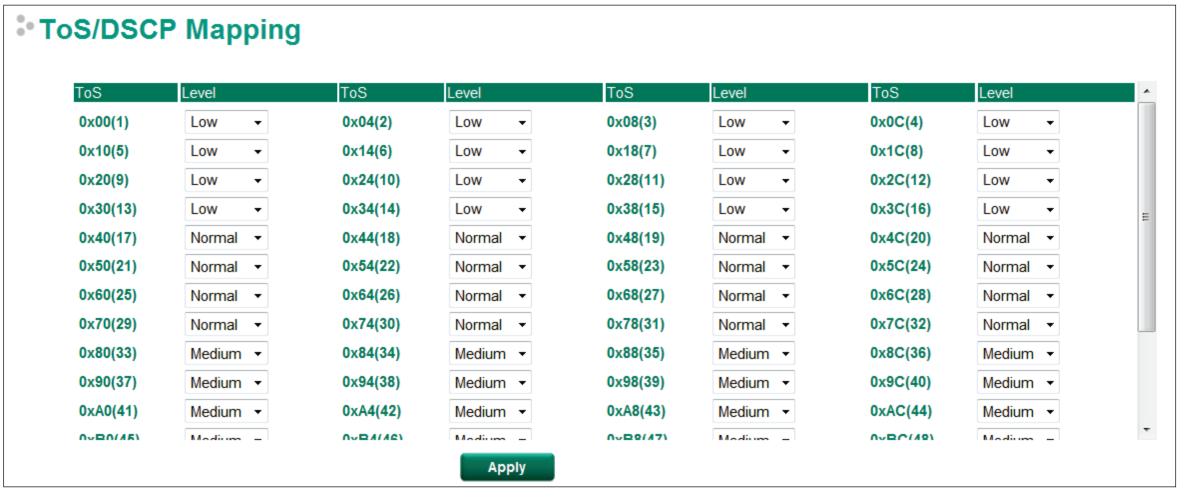
CoS Mapping

CoS	Priority Queue
0	Low
1	Low
2	Normal
3	Normal
4	Medium
5	Medium
6	High
7	High

CoS Value and Priority Queues

Setting	**Description**	**Factory Default**
Low/Normal/ Medium/High	Maps different CoS values to 4 different egress queues.	Low Normal Medium High

ToS/DSCP Mapping



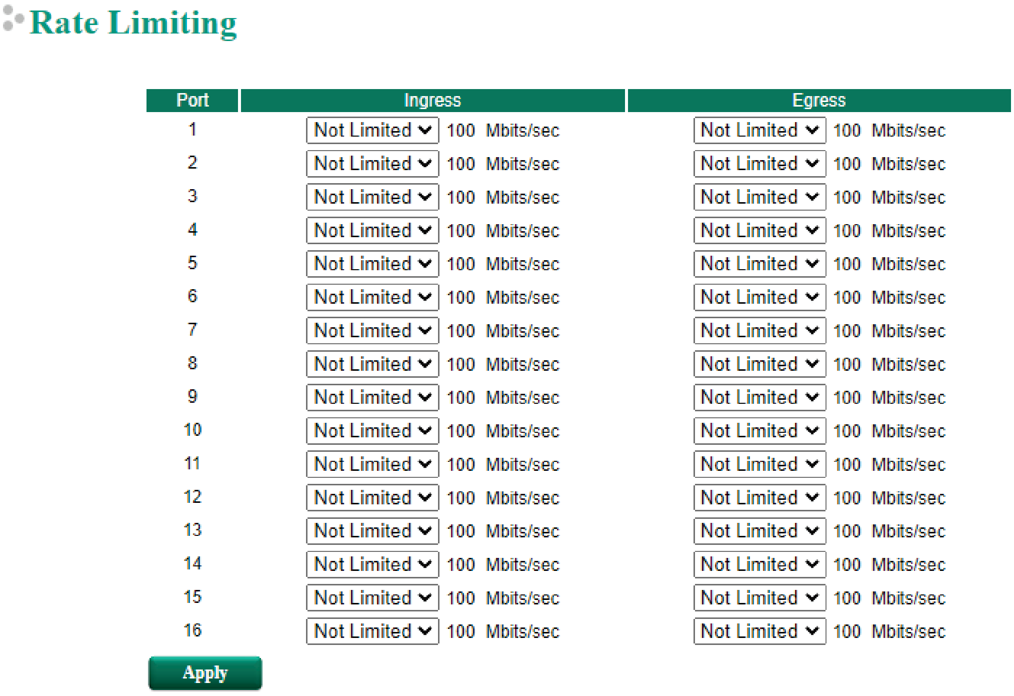
ToS/DSCP Mapping

ToS	Level	ToS	Level	ToS	Level	ToS	Level
0x00(1)	Low	0x04(2)	Low	0x08(3)	Low	0x0C(4)	Low
0x10(5)	Low	0x14(6)	Low	0x18(7)	Low	0x1C(8)	Low
0x20(9)	Low	0x24(10)	Low	0x28(11)	Low	0x2C(12)	Low
0x30(13)	Low	0x34(14)	Low	0x38(15)	Low	0x3C(16)	Low
0x40(17)	Normal	0x44(18)	Normal	0x48(19)	Normal	0x4C(20)	Normal
0x50(21)	Normal	0x54(22)	Normal	0x58(23)	Normal	0x5C(24)	Normal
0x60(25)	Normal	0x64(26)	Normal	0x68(27)	Normal	0x6C(28)	Normal
0x70(29)	Normal	0x74(30)	Normal	0x78(31)	Normal	0x7C(32)	Normal
0x80(33)	Medium	0x84(34)	Medium	0x88(35)	Medium	0x8C(36)	Medium
0x90(37)	Medium	0x94(38)	Medium	0x98(39)	Medium	0x9C(40)	Medium
0xA0(41)	Medium	0xA4(42)	Medium	0xA8(43)	Medium	0xAC(44)	Medium
0xB0(45)	Medium	0xB4(46)	Medium	0xB8(47)	Medium	0xBC(48)	Medium

ToS (DSCP) Value and Priority Queues

Setting	Description	Factory Default
Low/Normal/ Medium/High	Maps different TOS values to 4 different egress queues.	1 to 16: Low 17 to 32: Normal 33 to 48: Medium 49 to 64: High

Rate Limit



Rate Limiting

Port	Ingress	Egress
1	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
2	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
3	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
4	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
5	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
6	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
7	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
8	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
9	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
10	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
11	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
12	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
13	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
14	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
15	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec
16	Not Limited 100 Mbits/sec	Not Limited 100 Mbits/sec

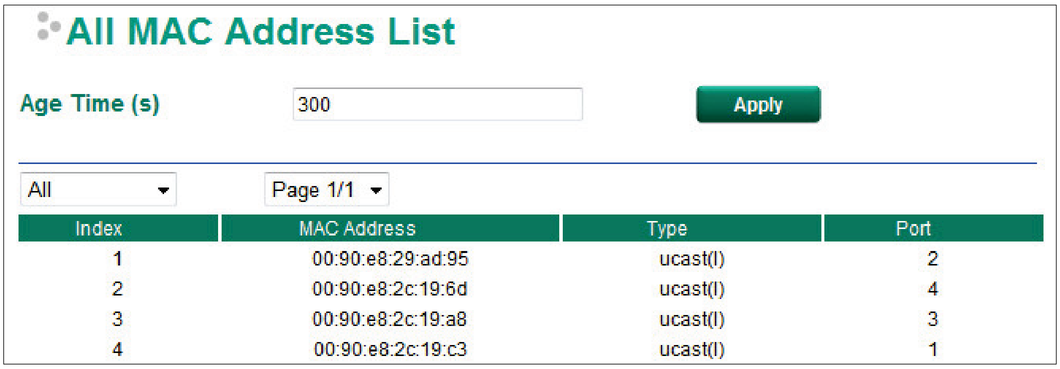
Ingress and Egress Rate Limit-Normal

Setting	Description	Factory Default
Ingress rate Egress rate	Select the ingress/egress rate limit (% of max. throughput) for all packets from the following options: Not Limited, 3%, 5%, 10%, 15%, 25%, 35%, 50%, 65%, 85%	Not Limited

MAC Address Table

The MAC address table shows the MAC address list pass through Moxa ToughNet Secure Router. The length of time(Ageing time: 15 to 3825 seconds) is the parameter defines the length of time that a MAC address entry can remain in the Moxa router. When an entry reaches its aging time, it "ages out" and is purged from the router, effectively cancelling frame forwarding to that specific port.

The MAC Address table can be configured to display the following Moxa ToughNet Secure Router MAC address groups, which are selected from the drop-down list.



All MAC Address List

Age Time (s): 300

Index	MAC Address	Type	Port
1	00:90:e8:29:ad:95	ucast(l)	2
2	00:90:e8:2c:19:6d	ucast(l)	4
3	00:90:e8:2c:19:a8	ucast(l)	3
4	00:90:e8:2c:19:c3	ucast(l)	1

Drop Down List

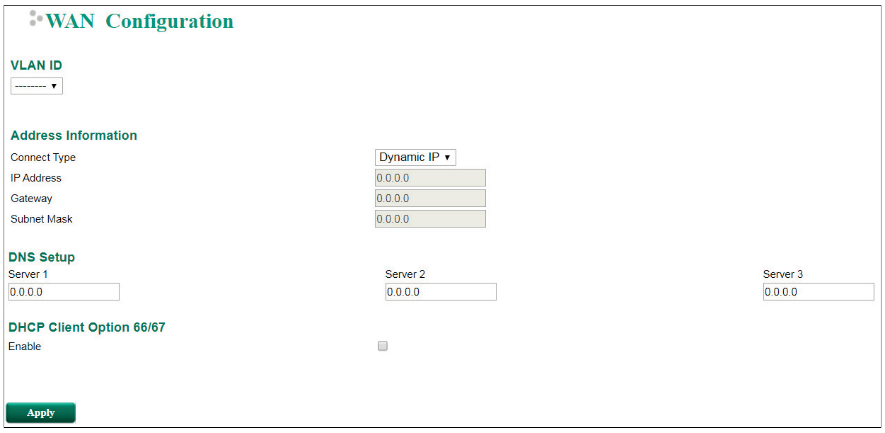
ALL	Select this item to show all of the Moxa ToughNet Secure Router's MAC addresses.
ALL Learned	Select this item to show all of the Moxa ToughNet Secure Router's Learned MAC addresses.
ALL Static	Select this item to show all of the Moxa ToughNet Secure Router's Static, Static Lock, and Static Multicast MAC addresses.
ALL Multicast	Select this item to show all of the Moxa ToughNet Secure Router's Static Multicast MAC addresses.
Port x	Select this item to show all of the MAC addresses dedicated ports.

The table displays the following information:

MAC Address	This field shows the MAC address.
Type	This field shows the type of this MAC address.
Port	This field shows the port that this MAC address belongs to.

Interface

WAN



WAN Configuration

VLAN ID: -------- ▾

Address Information

Connect Type: Dynamic IP ▾
IP Address: 0.0.0.0
Gateway: 0.0.0.0
Subnet Mask: 0.0.0.0

DNS Setup

Server 1: 0.0.0.0
Server 2: 0.0.0.0
Server 3: 0.0.0.0

DHCP Client Option 66/67

Enable ☐

VLAN ID

Setting	Description	Factory Default
VLAN ID	Moxa ToughNet Secure Router’s WAN interface is configured by VLAN groups. The ports with the same VLAN can be configured as one WAN interface.	N/A

Address Information

Connect Type

Setting	Description	Factory Default
Dynamic IP/Static IP	Select the connection type of the WAN interface	Dynamic IP

IP Address

Setting	Description	Factory Default
IP Address	The interface IP address	0.0.0.0

Gateway

Setting	Description	Factory Default
IP Address	The interface gateway IP address	0.0.0.0

Subnet Mask

Setting	Description	Factory Default
IP Address	The subnet mask	0.0.0.0

DNS Setup

Server 1/2/3

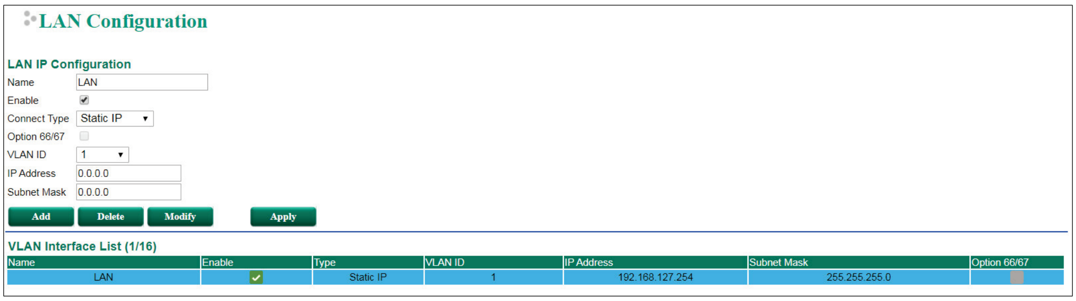
Setting	Description	Factory Default
IP Address	The IP address of DNS server 1, 2, and 3	0.0.0.0

DHCP Client Option 66/67

Enable

Setting	Description	Factory Default
Enable/Disable	Enable or disable DHCP Client Option 66/67	Disabled

LAN



LAN Configuration

LAN IP Configuration

Name: LAN

Enable: ☑

Connect Type: Static IP ▾

Option 66/67: ☐

VLAN ID: 1 ▾

IP Address: 0.0.0.0

Subnet Mask: 0.0.0.0

VLAN Interface List (1/16)

Name	Enable	Type	VLAN ID	IP Address	Subnet Mask	Option 66/67
LAN	☑	Static IP	1	192.168.127.254	255.255.255.0	☐

Create a VLAN Interface

Input a name of the LAN interface, select a VLAN ID that is already configured in VLAN Setting under the Layer 2 Function, and assign an IP address / Subnet Mask for the interface. Checkmark the **Enable** checkbox to enable this interface.

Delete a LAN Interface

Select the item in the LAN Interface List, and then click **Delete** to delete the item.

Modify a LAN Interface

Select the item in the LAN Interface List. Modify the attributes and then click **Modify** to change the configuration.

Apply the LAN Interface List

After adding/deleting/modifying any LAN interface, be sure to click **Apply**.

Name

Setting	Description	Factory Default
Max. 40 characters	The name of the LAN interface	LAN

Enable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the LAN interface	Enable

Connect Type

Setting	Description	Factory Default
Dynamic IP/Static IP	Select the connection type of the LAN interface	Static IP

Option 66/67

Setting	Description	Factory Default
Enable/Disable	Enable or disable Option 66/67 if the Connect Type is set to Dynamic IP	Disable

VLAN ID

Setting	Description	Factory Default
VLAN ID	Moxa ToughNet Secure Router's LAN interface is configured by VLAN groups. The ports with the same VLAN can be configured as one LAN interface.	VLAN ID

IP Address

Setting	Description	Factory Default
IP Address	The IP address	192.168.127.254

Subnet Mask

Setting	Description	Factory Default
IP Address	The subnet mask	255.255.255.0

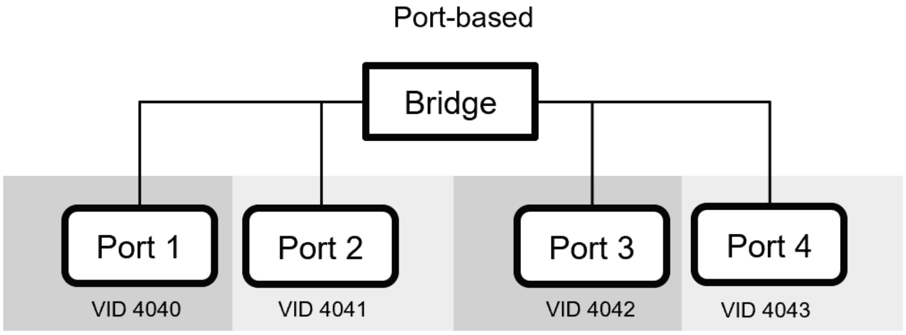
Bridge Configuration

Normally, when ports are set in the same network (same subnet/VLAN), the packets are forwarded by the switching chip without being filtered by the firewall. However, if necessary, users can apply specific rules for packets within the same network by creating a "bridge interface".

Port-based Bridge

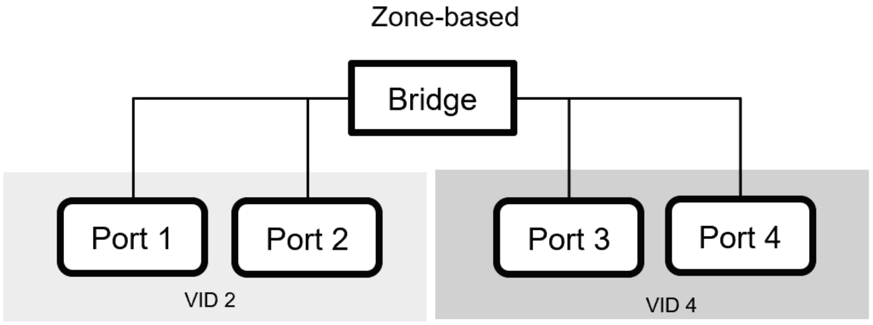
If traffic within the same network needs to be filtered by the firewall (through the CPU), users can create a port-based bridge. The system will automatically generate a VID for each port within the same network, allowing these ports to provide basic firewall functions through the same interface, also referred to as a Bridge Firewall.

Port-based bridges are less complex than zone-based bridges but are not able to have multiple ports within a VLAN similar to a zone-based bridge.

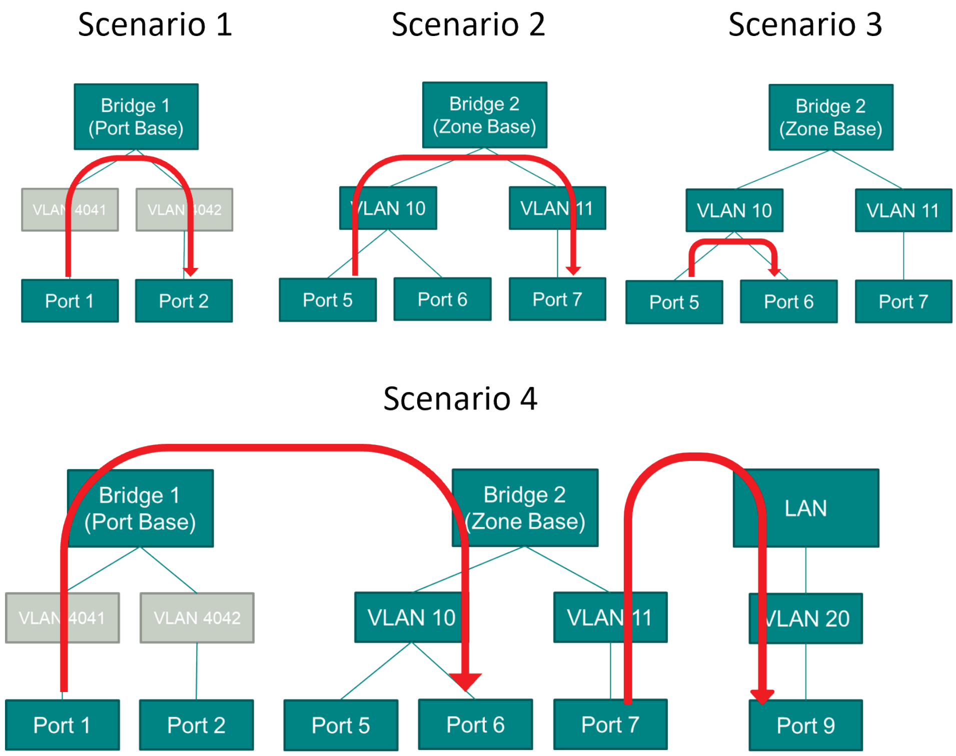


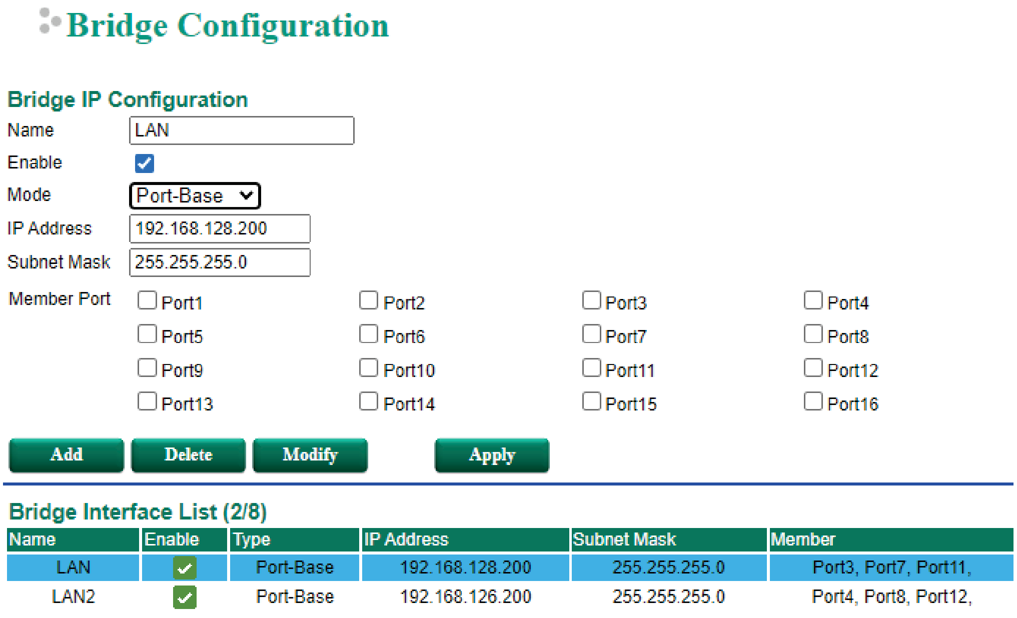
Zone-based Bridge

If traffic within the same network needs to be filtered by the firewall (through the CPU), but also needs to be switched (through chip) at the same time, users can create a zone-based bridge. Zone-based bridges allow users to combine several VLAN groups into one. As a result, zone-base bridges can have multiple ports within a VLAN, leading to a more flexible network topology compared to port-based bridges.



Refer to below graph for a summary of bridge traffic behavior. In scenario 1 and 2, traffic between different ports in a port-based bridge environment and traffic across different VLANs in a zone-based bridge environment are directed through CPU bridging. In scenario 3, traffic within the same VLAN is directed by the switching chip. In scenario 4, traffic across different interfaces is directed through CPU routing. Using zone-based bridges, users can have more control and flexibility to design the network topology.





Bridge Configuration

Bridge IP Configuration

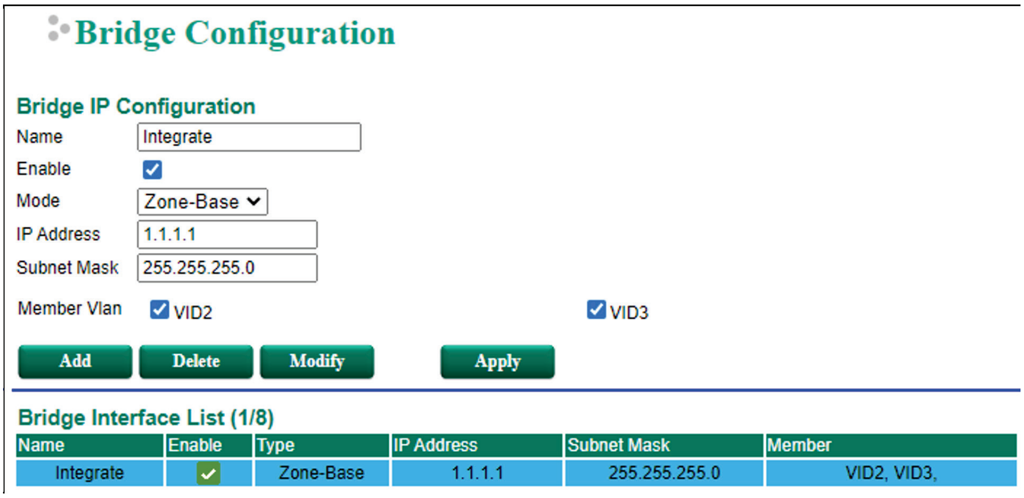
Name	LAN
Enable	☑
Mode	Port-Base
IP Address	192.168.128.200
Subnet Mask	255.255.255.0

Member Port

□ Port1 □ Port2 □ Port3 □ Port4
□ Port5 □ Port6 □ Port7 □ Port8
□ Port9 □ Port10 □ Port11 □ Port12
□ Port13 □ Port14 □ Port15 □ Port16

Bridge Interface List (2/8)

Name	Enable	Type	IP Address	Subnet Mask	Member
LAN	✓	Port-Base	192.168.128.200	255.255.255.0	Port3, Port7, Port11,
LAN2	✓	Port-Base	192.168.126.200	255.255.255.0	Port4, Port8, Port12,



Bridge Configuration

Bridge IP Configuration

Name	Integrate
Enable	☑
Mode	Zone-Base
IP Address	1.1.1.1
Subnet Mask	255.255.255.0
Member Vlan	☑ VID2 ☑ VID3

Bridge Interface List (1/8)

Name	Enable	Type	IP Address	Subnet Mask	Member
Integrate	✓	Zone-Base	1.1.1.1	255.255.255.0	VID2, VID3,

Create a Bridge Interface

Enter a name for the Bridge interface, check the Enable box, select the bridge mode, and assign an IP address/subnet mask for the interface. Select the Member VLAN port for port-based bridges or the preconfigured VLAN settings under the Layer 2 Function for zone-based bridges.

Click **Add** to add this interface.

NOTE The maximum amount of bridge interfaces is 8.

Delete a Bridge Interface

Select the interface in the Bridge interface List and click **Delete** to delete the interface.

Modify a Bridge Interface

Select the interface in the Bridge Interface List, edit the interface attributes, and click **Modify** to apply the changes.

Apply the Bridge Interface List

After adding, deleting, modifying any Bridge interfaces, click **Apply** to update the list.

Name

Setting	Description	Factory Default
Max. 40 characters	Enter a name for the bridge interface.	None

Enable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the bridge interface.	Disable

Mode

Setting	Description	Factory Default
Port-Base Zone-Base	Select the bridge mode.	Port-Base

IP Address

Setting	Description	Factory Default
IP address	Enter the IP address for the bridge interface.	0.0.0.0

Subnet Mask

Setting	Description	Factory Default
IP address	Enter the subnet mask for the bridge interface.	0.0.0.0

Member Port (Port-based mode)

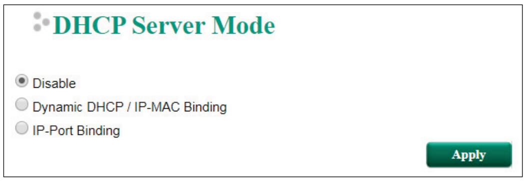
Setting	Description	Factory Default
Select/Deselect	Check the boxes next the corresponding member ports to add these ports to this bridge interface.	None

Member VLAN (Zone-based mode)

Setting	Description	Factory Default
Select/Deselect	Check the boxes next the corresponding VIDs to add these VLANs to this bridge interface.	None

DHCP

DHCP Server Mode



DHCP Server Mode

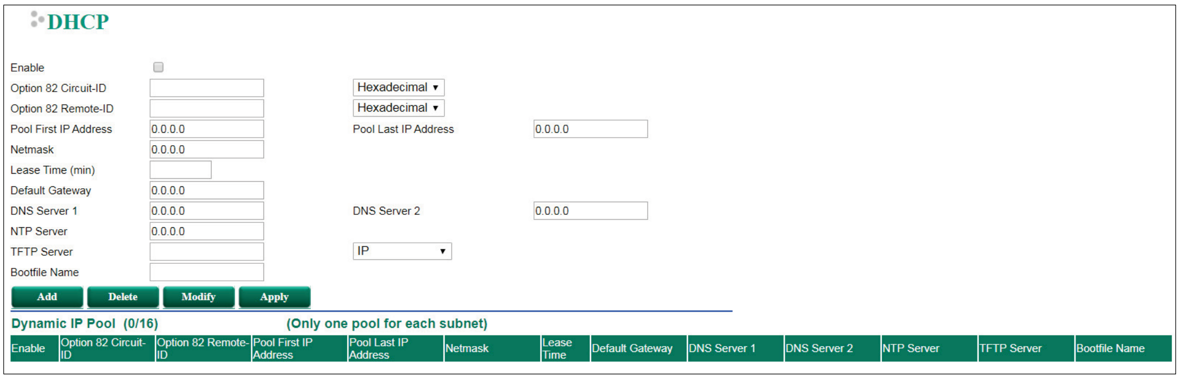
● Disable
○ Dynamic DHCP / IP-MAC Binding
○ IP-Port Binding

DHCP Server Mode

Setting	Description	Factory Default
Disable Dynamic DHCP/IP-MAC Binding IP-Port Binding	Select the DHCP Server Mode	Disabled

DHCP

The ToughNet Secure Router provides a DHCP (Dynamic Host Configuration Protocol) Server function for LAN interfaces. When configured, the ToughNet Secure Router will automatically assign an IP address to an Ethernet device from a defined IP range.



DHCP

Enable	□		
Option 82 Circuit-ID		Hexadecimal ▾	
Option 82 Remote-ID		Hexadecimal ▾	
Pool First IP Address	0.0.0.0	Pool Last IP Address	0.0.0.0
Netmask	0.0.0.0		
Lease Time (min)			
Default Gateway	0.0.0.0		
DNS Server 1	0.0.0.0	DNS Server 2	0.0.0.0
NTP Server	0.0.0.0		
TFTP Server		IP ▾	
Bootfile Name			

Dynamic IP Pool (0/16) (Only one pool for each subnet)

Enable	Option 82 Circuit-ID	Option 82 Remote-ID	Pool First IP Address	Pool Last IP Address	Netmask	Lease Time	Default Gateway	DNS Server 1	DNS Server 2	NTP Server	TFTP Server	Bootfile Name

DHCP Server Enable/Disable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DHCP server function	Disable

Option 82 Circuit-ID

Setting	Description	Factory Default
Max. 20 characters	The name of the Circuit-ID	None
Hexadecimal/String	Select the type of the Circuit-ID	Hexadecimal

Option 82 Remote-ID

Setting	Description	Factory Default
Max. 20 characters	The name of the Remote-ID	None
Hexadecimal/String	Select the type of the Remote-ID	Hexadecimal

Pool First IP Address

Setting	Description	Factory Default
IP Address	The first IP address of the offered IP address range for DHCP clients	0.0.0.0

Pool Last IP Address

Setting	Description	Factory Default
IP Address	The last IP address of the offered IP address range for DHCP clients	0.0.0.0

Netmask

Setting	Description	Factory Default
Netmask	The netmask for DHCP clients	0.0.0.0

Lease Time

Setting	Description	Factory Default
≥ 5 min.	The lease time of the DHCP server	None

Default Gateway

Setting	Description	Factory Default
IP Address	The default gateway for DHCP clients	0.0.0.0

DNS Server

Setting	Description	Factory Default
IP Address	The DNS server for DHCP clients	0.0.0.0

NTP Server

Setting	Description	Factory Default
IP Address	The NTP server for DHCP clients	0.0.0.0

TFTP Server

Setting	Description	Factory Default
IP Address	The TFTP server for DHCP clients	None
IP/Domain Name	Select the type of TFTP server	IP

Boot File Name

Setting	Description	Factory Default
Max. 20 characters	The name of boot file	None

Clickable Buttons

Add

Use the **Add** button to input a new DHCP list.

Delete

Use the **Delete** button to delete a Dynamic DHCP list. Click on a list to select it (the background color of the device will change to blue) and then click the **Delete** button.

Modify

To modify the information for a particular list, click on a list to select it (the background color of the device will change to blue), modify the information as needed using the check boxes and text input boxes near the top of the browser window, and then click **Modify**.

Apply

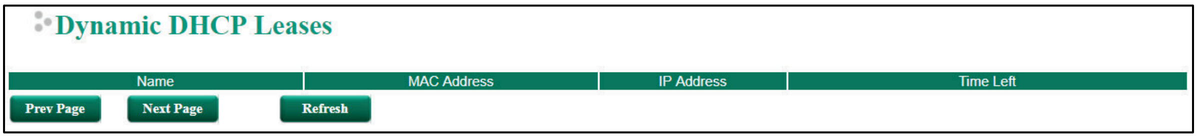
Remember to click **Apply** after adding/deleting/modifying the Static DHCP list.

NOTE

1. The DHCP Server is only available for LAN interfaces.
2. The Pool First/Last IP Address must be in the same Subnet on the LAN.

DHCP Leases

The Dynamic DHCP Leases shows the DHCP clients with Name, MAC Address, IP Address, and Time Left.

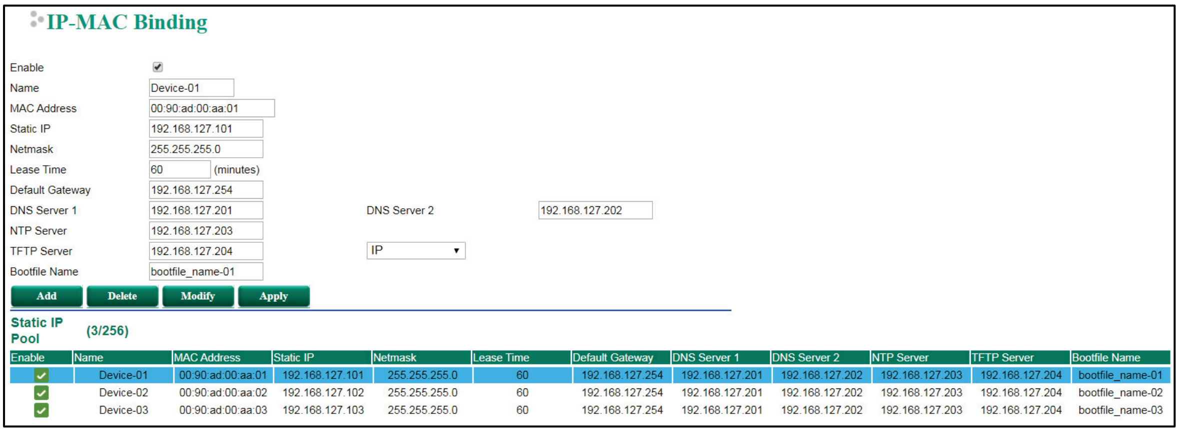


Dynamic DHCP Leases

Name	MAC Address	IP Address	Time Left

IP-MAC Binding

Use the IP-MAC Binding list to ensure that devices connected to the ToughNet Secure Router always use the same IP address. The static DHCP list matches IP addresses to MAC addresses.



IP-MAC Binding

Enable	☑		
Name	Device-01		
MAC Address	00:90:ad:00:aa:01		
Static IP	192.168.127.101		
Netmask	255.255.255.0		
Lease Time	60 (minutes)		
Default Gateway	192.168.127.254		
DNS Server 1	192.168.127.201	DNS Server 2	192.168.127.202
NTP Server	192.168.127.203		
TFTP Server	192.168.127.204	IP ▼	
Bootfile Name	bootfile_name-01		

Static IP Pool (3/256)

Enable	Name	MAC Address	Static IP	Netmask	Lease Time	Default Gateway	DNS Server 1	DNS Server 2	NTP Server	TFTP Server	Bootfile Name
✓	Device-01	00:90:ad:00:aa:01	192.168.127.101	255.255.255.0	60	192.168.127.254	192.168.127.201	192.168.127.202	192.168.127.203	192.168.127.204	bootfile_name-01
✓	Device-02	00:90:ad:00:aa:02	192.168.127.102	255.255.255.0	60	192.168.127.254	192.168.127.201	192.168.127.202	192.168.127.203	192.168.127.204	bootfile_name-02
✓	Device-03	00:90:ad:00:aa:03	192.168.127.103	255.255.255.0	60	192.168.127.254	192.168.127.201	192.168.127.202	192.168.127.203	192.168.127.204	bootfile_name-03

In the above example, a device named "Device-01" was added to the Static DHCP list, with a static IP address set to 192.168.127.101 and MAC address set to 00:09:ad:00:aa:01. When a device with a MAC address of 00:09:ad:00:aa:01 is connected to the ToughNet Secure Router, the ToughNet Secure Router will offer the IP address 192.168.127.101 to this device.

IP-MAC Binding Enable/Disable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DHCP server function.	Disable

Name

Setting	Description	Factory Default
Max. 10 characters	The name of the selected device in IP-MAC Binding list.	None

MAC Address

Setting	Description	Factory Default
MAC Address	The MAC address of the selected device	None

Static IP

Setting	Description	Factory Default
IP Address	The IP address of the selected device	0.0.0.0

Netmask

Setting	Description	Factory Default
Netmask	The netmask for the selected device	0.0.0.0

Lease Time

Setting	Description	Factory Default
≥ 5min.	The lease time of the selected device	None

Default Gateway

Setting	Description	Factory Default
IP Address	The default gateway for the selected device	0.0.0.0

DNS Server

Setting	Description	Factory Default
IP Address	The DNS server for the selected device	0.0.0.0

NTP Server

Setting	Description	Factory Default
IP Address	The NTP server for the selected device	0.0.0.0

TFTP Server

Setting	Description	Factory Default
IP Address	The TFTP server for the selected device	None
IP/ Domain Name	Select type of TFTP server description	IP

Bootfile Name

Setting	Description	Factory Default
Max. 20 characters	The name of boot file	None

Clickable Buttons

Add

Use **Add** to input a new DHCP list. The Name, Static IP, and MAC address must be different from any existing list.

Delete

Use the **Delete** button to delete a Static DHCP list. Click on a list to select it (the background color of the device will change to blue) and then click **Delete**.

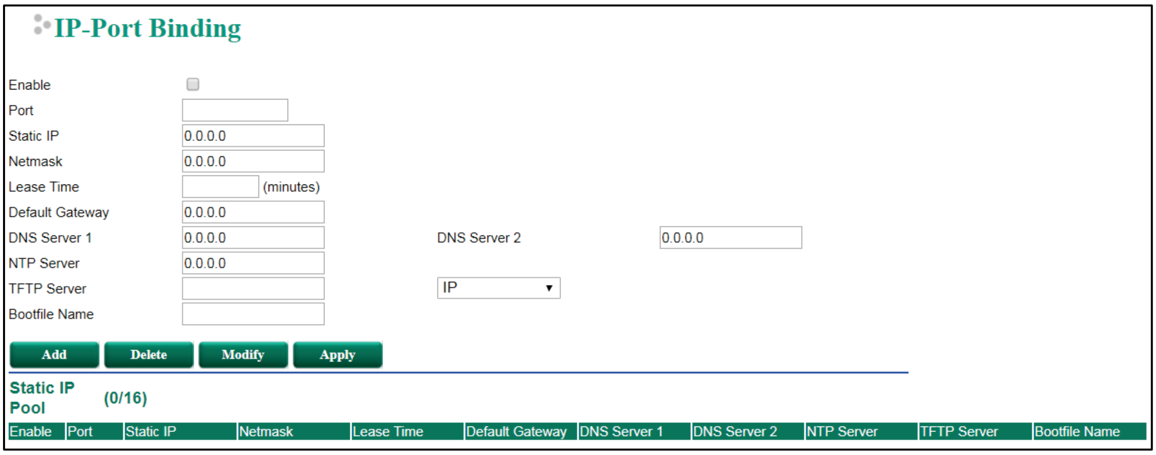
Modify

To modify the information for a particular list, click on a list to select it (the background color of the device will change to blue), modify the information as needed using the check boxes and text input boxes near the top of the browser window, and then click **Modify**.

Apply

After adding/deleting/modifying Static DHCP list, be sure to click **Apply**.

IP-Port Binding



Enable	☐		
Port			
Static IP	0.0.0.0		
Netmask	0.0.0.0		
Lease Time	(minutes)		
Default Gateway	0.0.0.0		
DNS Server 1	0.0.0.0	DNS Server 2	0.0.0.0
NTP Server	0.0.0.0		
TFTP Server		IP ▾	
Bootfile Name			

Static IP Pool (0/16)

Enable	Port	Static IP	Netmask	Lease Time	Default Gateway	DNS Server 1	DNS Server 2	NTP Server	TFTP Server	Bootfile Name

IP-Port Binding Enable/Disable

Setting	Description	Factory Default
Enable/ Disable	Enable or disable IP-Port Binding function	Disable

Port

Setting	Description	Factory Default
Port Number	Set the desired port of the connected devices	None

Static IP

Setting	Description	Factory Default
IP Address	The IP address of the connected device	0.0.0.0

Netmask

Setting	Description	Factory Default
Netmask	The netmask for the connected device	0.0.0.0

Lease Time

Setting	Description	Factory Default
≥ 5min.	The lease time of the connected device	None

Default Gateway

Setting	Description	Factory Default
IP Address	The default gateway for the connected device	0.0.0.0

DNS Server

Setting	Description	Factory Default
IP Address	The DNS server for the connected device	0.0.0.0

NTP Server

Setting	Description	Factory Default
IP Address	The NTP server for the connected device	0.0.0.0

TFTP Server

Setting	Description	Factory Default
IP Address	The TFTP server for the connected device	None
IP/ Domain Name	Select type of TFTP server description	IP

Bootfile Name

Setting	Description	Factory Default
Max. 20 characters	The name of boot file	None

Clickable Buttons

Add

Use the **Add** button to input a new IP-Port Binding list.

Delete

Use the **Delete** button to delete a IP-Port Binding list. Click on a list to select it (the background color of the device will change to blue) and then click the **Delete** button.

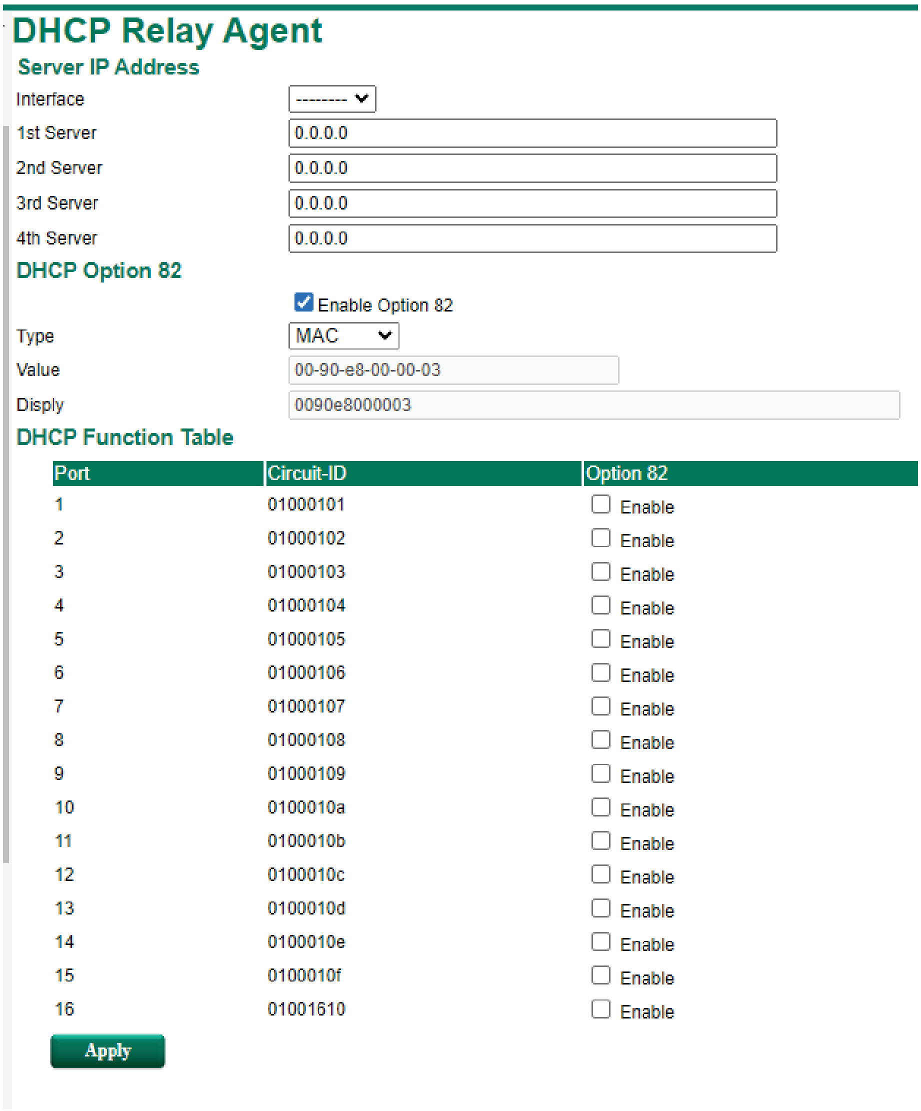
Modify

To modify the information for a particular list, click on a list to select it (the background color of the device will change to blue), modify the information as needed using the check boxes and text input boxes near the top of the browser window, and then click **Modify**.

Apply

After adding/deleting/modifying IP-Port Binding list, be sure to click **Apply**.

Configuring DHCP Relay Agent



DHCP Relay Agent

Server IP Address

Interface	--------
1st Server	0.0.0.0
2nd Server	0.0.0.0
3rd Server	0.0.0.0
4th Server	0.0.0.0

DHCP Option 82

☑ Enable Option 82

Type	MAC
Value	00-90-e8-00-00-03
Disply	0090e8000003

DHCP Function Table

Port	Circuit-ID	Option 82
1	01000101	☐ Enable
2	01000102	☐ Enable
3	01000103	☐ Enable
4	01000104	☐ Enable
5	01000105	☐ Enable
6	01000106	☐ Enable
7	01000107	☐ Enable
8	01000108	☐ Enable
9	01000109	☐ Enable
10	0100010a	☐ Enable
11	0100010b	☐ Enable
12	0100010c	☐ Enable
13	0100010d	☐ Enable
14	0100010e	☐ Enable
15	0100010f	☐ Enable
16	01001610	☐ Enable

Server IP Address

Interface

Setting	Description	Factory Default
Dependent on previously configured interface settings	Select a previously created interface.	N/A

1st Server

Setting	Description	Factory Default
IP address for the 1st DHCP server	Assigns the IP address of the 1st DHCP server that the switch tries to access.	None

2nd Server

Setting	Description	Factory Default
IP address for the 2nd DHCP server	Assigns the IP address of the 2nd DHCP server that the switch tries to access.	None

3rd Server

Setting	Description	Factory Default

IP address for the 3rd DHCP server	Assigns the IP address of the 3rd DHCP server that the switch tries to access.	None

4th Server

Setting	Description	Factory Default
IP address for the 4th DHCP server	Assigns the IP address of the 4th DHCP server that the switch tries to access.	None

DHCP Option 82

Enable Option 82

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DHCP Option 82 function.	Disable

Type

Setting	Description	Factory Default
WAN IP	Uses the switch's IP address as the remote ID sub.	IP
MAC	Uses the switch's MAC address as the remote ID sub.	IP
Client-ID	Uses a combination of the switch's MAC address and IP address as the remote ID sub.	IP
Other	Uses the user-designated ID sub.	IP

Value

Setting	Description	Factory Default
Read-only	Displays the value that was set. Complete this field if type is set to Other.	N/A

Display

Setting	Description	Factory Default
Read-only	The actual value configured in the DHCP server.	00000000

DHCP Function Table

Enable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DHCP Option 82 function for this port.	Disable

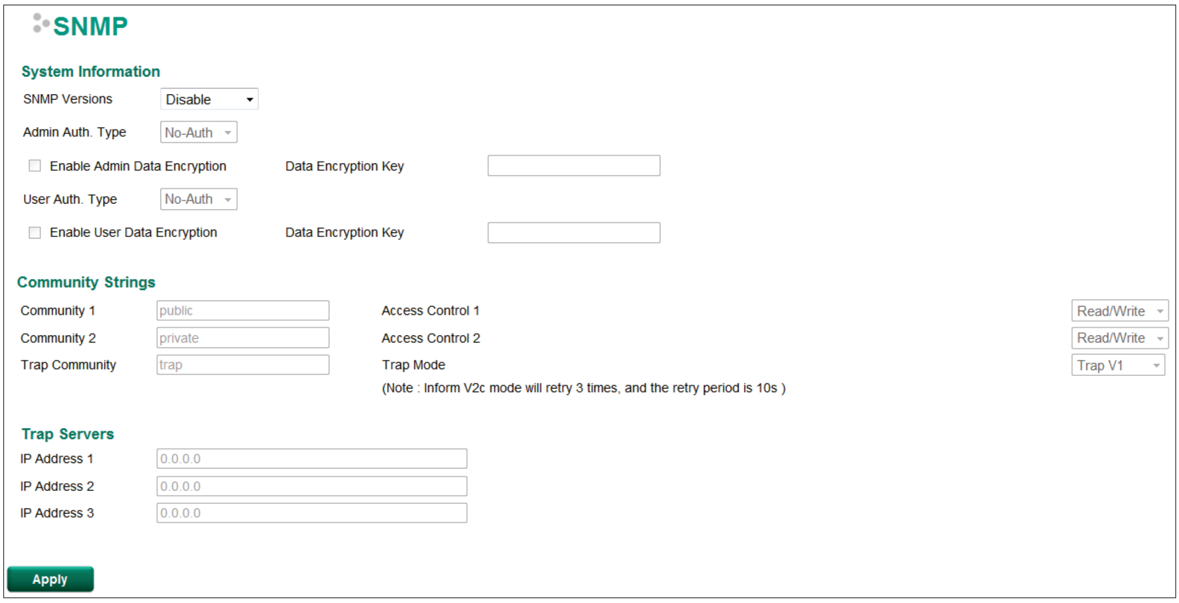
SNMP

The ToughNet Secure Router supports SNMP V1/V2c/V3. SNMP V1 and SNMP V2c use a community string match for authentication, which means that SNMP servers access all objects with read-only permissions using the community string public (default value). SNMP V3, which requires that the user selects an authentication level of MD5 or SHA, is the most secure protocol. You can also enable data encryption to enhance data security. SNMP security modes and security levels supported by the ToughNet Secure Router are shown in the following table. Select the security mode and level that will be used to communicate between the SNMP agent and manager.

Protocol Version	UI Setting	Authentication Type	Data Encryption	Method
SNMP V1, V2c	V1, V2c Read Community	Community string	No	Uses a community string match for authentication
SNMP V3	MD5 or SHA	Authentication based on MD5 or SHA	No	Provides authentication based on HMAC-MD5, or HMAC-SHA algorithms. 8-character passwords are the

				minimum requirement for authentication.
	MD5 or SHA	Authentication based on MD5 or SHA	Data encryption key	Provides authentication based onHMAC-MD5 or HMAC-SHA algorithms, and data encryption key. 8-character passwords and a data encryption key are the minimum requirements for authentication and encryption.

These parameters are configured on the SNMP page. A more detailed explanation of each parameter is given below.



SNMP

System Information

SNMP Versions: Disable

Admin Auth. Type: No-Auth

☐ Enable Admin Data Encryption — Data Encryption Key:

User Auth. Type: No-Auth

☐ Enable User Data Encryption — Data Encryption Key:

Community Strings

Community 1: public — Access Control 1: Read/Write

Community 2: private — Access Control 2: Read/Write

Trap Community: trap — Trap Mode: Trap V1

(Note : Inform V2c mode will retry 3 times, and the retry period is 10s)

Trap Servers

IP Address 1: 0.0.0.0

IP Address 2: 0.0.0.0

IP Address 3: 0.0.0.0

SNMP Versions

Setting	Description	Factory Default
Disable V1, V2c, V3, or V1, V2c, or V3 only	Select the SNMP protocol version used to manage the secure router.	Disable

Auth. Type

Setting	Description	Factory Default
MD5	Provides authentication based on the HMAC-MD5 algorithms. 8-character passwords are the minimum requirement for authentication.	MD5
SHA	Provides authentication based on the HMAC-SHA algorithms. 8-character passwords are the minimum requirement for authentication.	
No-Auth	Provides no authentication	

Data Encryption Enable/Disable

Setting	Description	Factory Default
Enable/Disable	Enable of disable the data encryption	Disable

Data Encryption Key

Setting	Description	Factory Default
Max. 30 Characters	8-character data encryption key is the minimum requirement for data encryption	None

Community Name

Setting	Description	Factory Default
Max. 30 Characters	Use a community string match for authentication	Public

Access Control

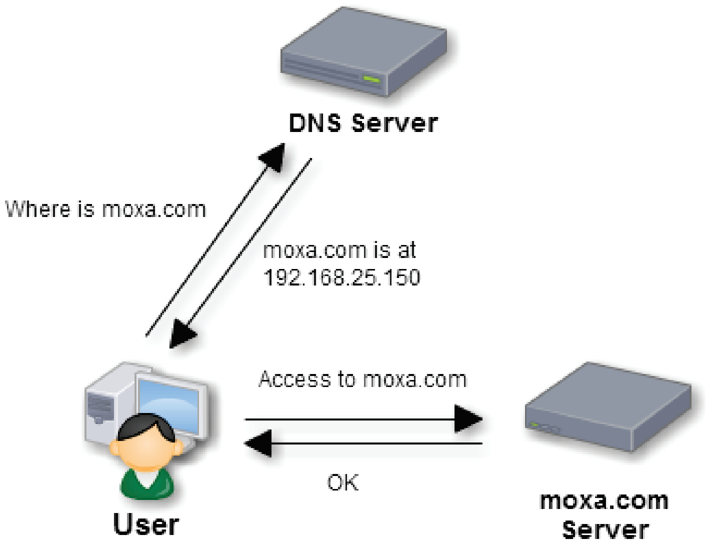
Setting	Description	Factory Default
Read/Write	Access control type after matching the community string	Read/Write
Read only (Public MIB only)		
No Access		

Trap Server IP Address

Setting	Description	Factory Default
IP Address	Enter the IP address of the Trap Server used by your network.	0.0.0.0.

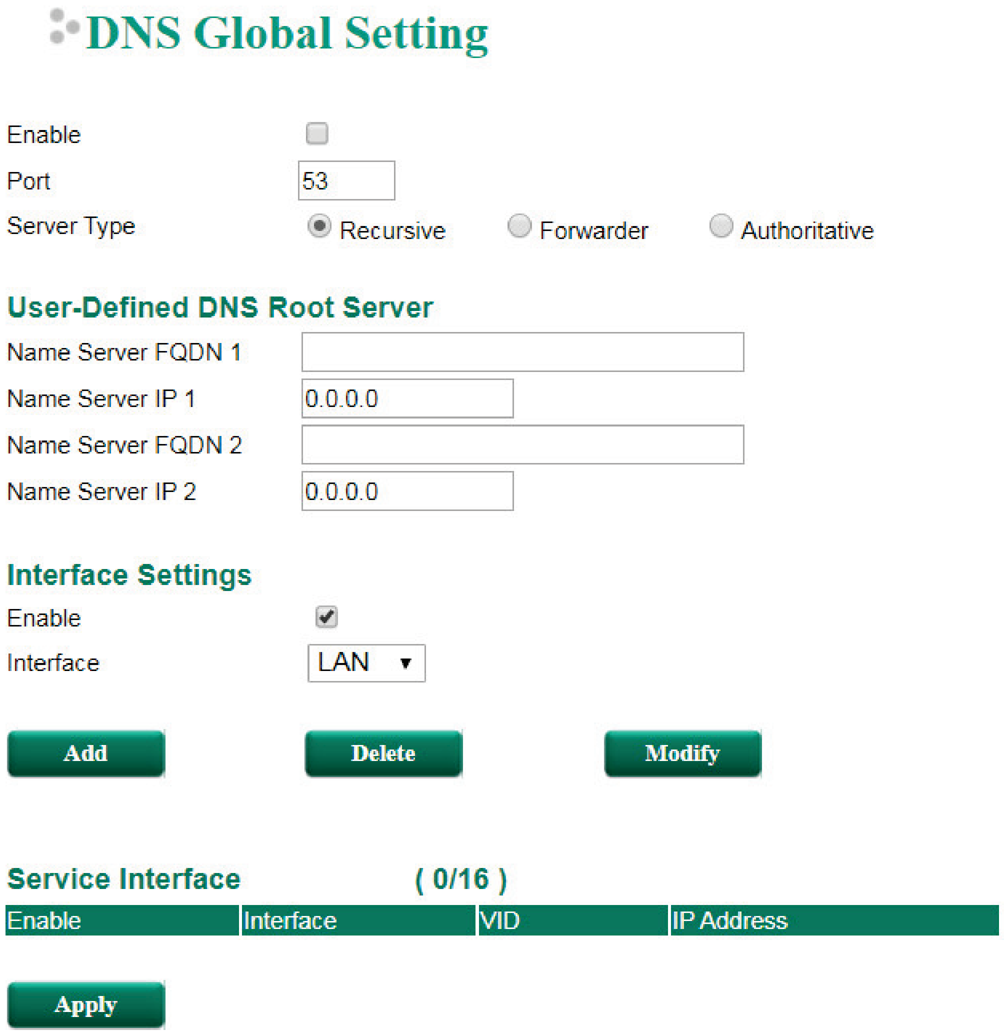
DNS Server

The DNS is a protocol which turns a user-friendly domain name such as "moxa.com" into an IP address like 192.168.25.150 that computers use to identify each other on the network. A simple illustration of the DNS operation is shown below:



From the Global Settings screen, you can configure basic DNS server functions such as the server type and service interfaces. If **Recursive** mode is selected, a built-in root hints file will be applied by default. However, user can still configure up to 2 additional user-defined root servers. If there is a conflict between the FQDNs of user-defined servers and those in the root hints file, user-defined servers have higher priority and will be adopted first.

DNS Global Setting



DNS Global Setting

Enable	□
Port	53
Server Type	● Recursive ○ Forwarder ○ Authoritative

User-Defined DNS Root Server

Name Server FQDN 1	
Name Server IP 1	0.0.0.0
Name Server FQDN 2	
Name Server IP 2	0.0.0.0

Interface Settings

Enable	☑
Interface	LAN

Service Interface (0/16)

Enable	Interface	VID	IP Address

Enable DNS Server

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DNS server	Disabled

Port

Setting	Description	Factory Default
Port number	Specify the DNS server port, ranging between 1 and 65535	53

Server Type

Setting	Description	Factory Default
Recursive/Forwarder/ Authoritative	Select the DNS server type **Recursive**: Allow DNS server to contact root server directly for recursive queries **Forwarder**: Set the DNS server to forward all queries to a global forwarder **Authoritative**: The DNS server will only process queries in the local authoritative zone	Recursive

User-defined DNS Root Server – Recursive Mode

Name Server Full Qualified Domain Name (FQDN)

Setting	Description	Factory Default

DNS Domain Name	Define the DNS server FQDN	None

Name Server IP

Setting	**Description**	**Factory Default**
Name Server IP	Specify the IP address of the DNS server FQDN	0.0.0.0

Interface Settings

Enable Interface

Setting	**Description**	**Factory Default**
Enable/Disable	Enable or disable the DNS server interface	Enabled

Interface

Setting	**Description**	**Factory Default**
LAN Interface	Select the DNS service interface	LAN

Clickable Buttons

Add

Click the **Add** button to add a new interface.

Delete

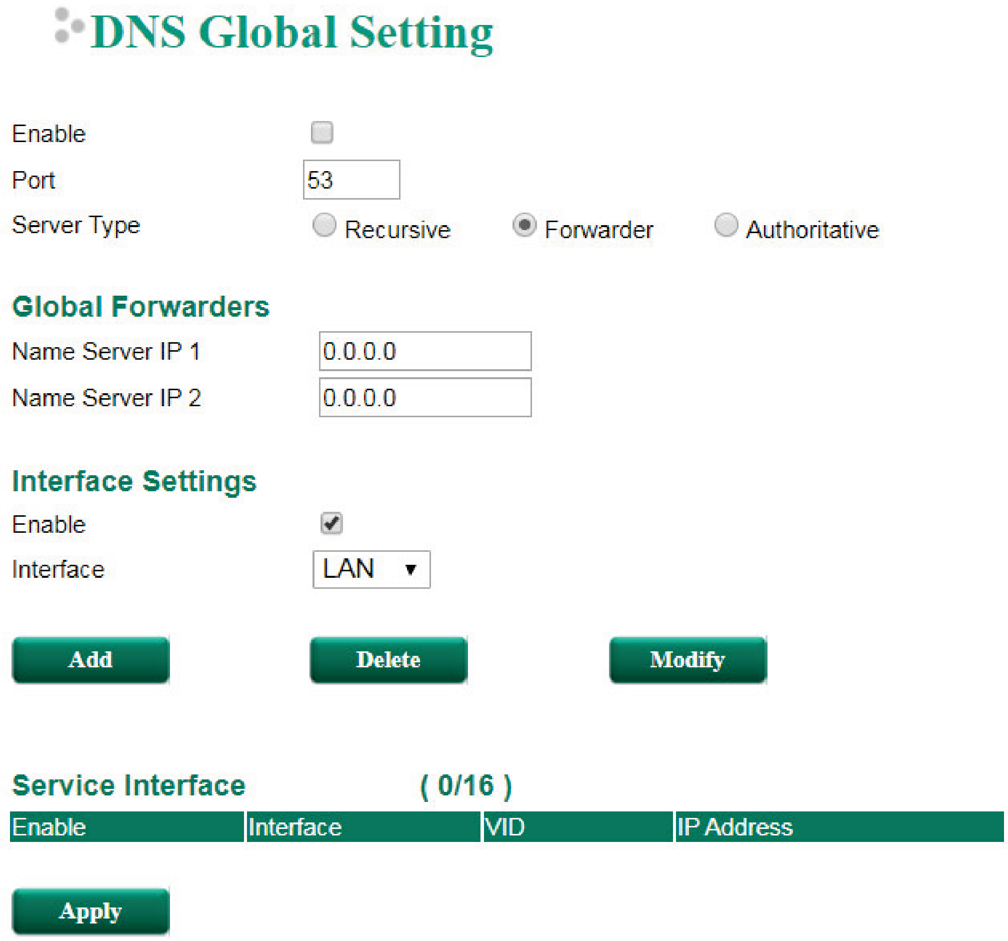
Click on a list to select it, the background color of the interface will change to blue, then click the **Delete** button.

Modify

Click on an interface to select it, the background color of the interface will change to blue, then click **Modify** to change the information of the selected interface.

Apply

Click **Apply** after adding, deleting, or modifying an interface to apply the changes.



DNS Global Setting

Enable	□
Port	53
Server Type	○ Recursive ● Forwarder ○ Authoritative

Global Forwarders

Name Server IP 1	0.0.0.0
Name Server IP 2	0.0.0.0

Interface Settings

Enable	☑
Interface	LAN

Service Interface (0/16)

Enable	Interface	VID	IP Address

User-defined DNS Root Server – Forwarder Mode

Name Server IP

Setting	Description	Factory Default
Name Server IP	Specify the IP address of the DNS server	0.0.0.0

Interface Settings

Enable Interface

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DNS server interface	Enabled

Interface

Setting	Description	Factory Default
LAN Interface	Select the DNS service interface	LAN

Clickable Buttons

Add

Click the **Add** button to add a new interface.

Delete

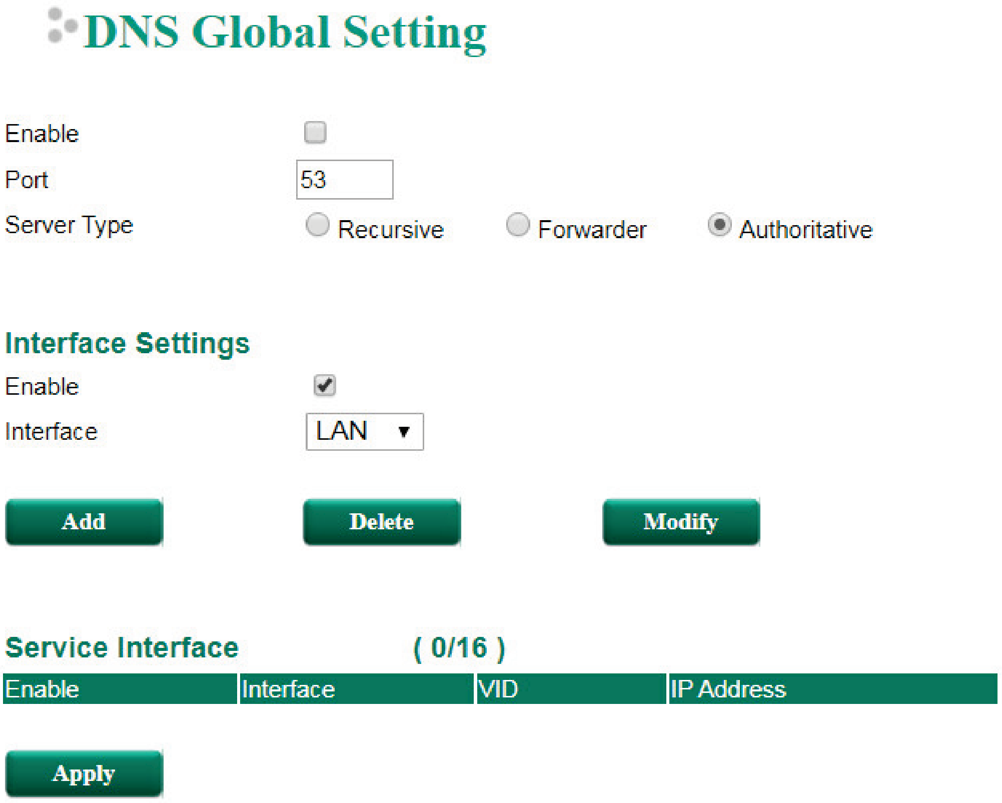
Click on a list to select it, the background color of the interface will change to blue, then click the **Delete** button.

Modify

Click on an interface to select it, the background color of the interface will change to blue, then click **Modify** to change the information of the selected interface.

Apply

Click **Apply** after adding, deleting, or modifying an interface to apply the changes.



DNS Global Setting

Enable	□		
Port	53		
Server Type	○ Recursive	○ Forwarder	● Authoritative

Interface Settings

Enable	☑
Interface	LAN ▼

Service Interface (0/16)

Enable	Interface	VID	IP Address

User-defined DNS Root Server – Authoritative Mode

Interface Settings

Enable Interface

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DNS server interface	Enabled

Interface

Setting	Description	Factory Default
LAN Interface	Select the DNS service interface	LAN

Clickable Buttons

Add

Click the **Add** button to add a new interface.

Delete

Click on a list to select it, the background color of the interface will change to blue, then click the **Delete** button.

Modify

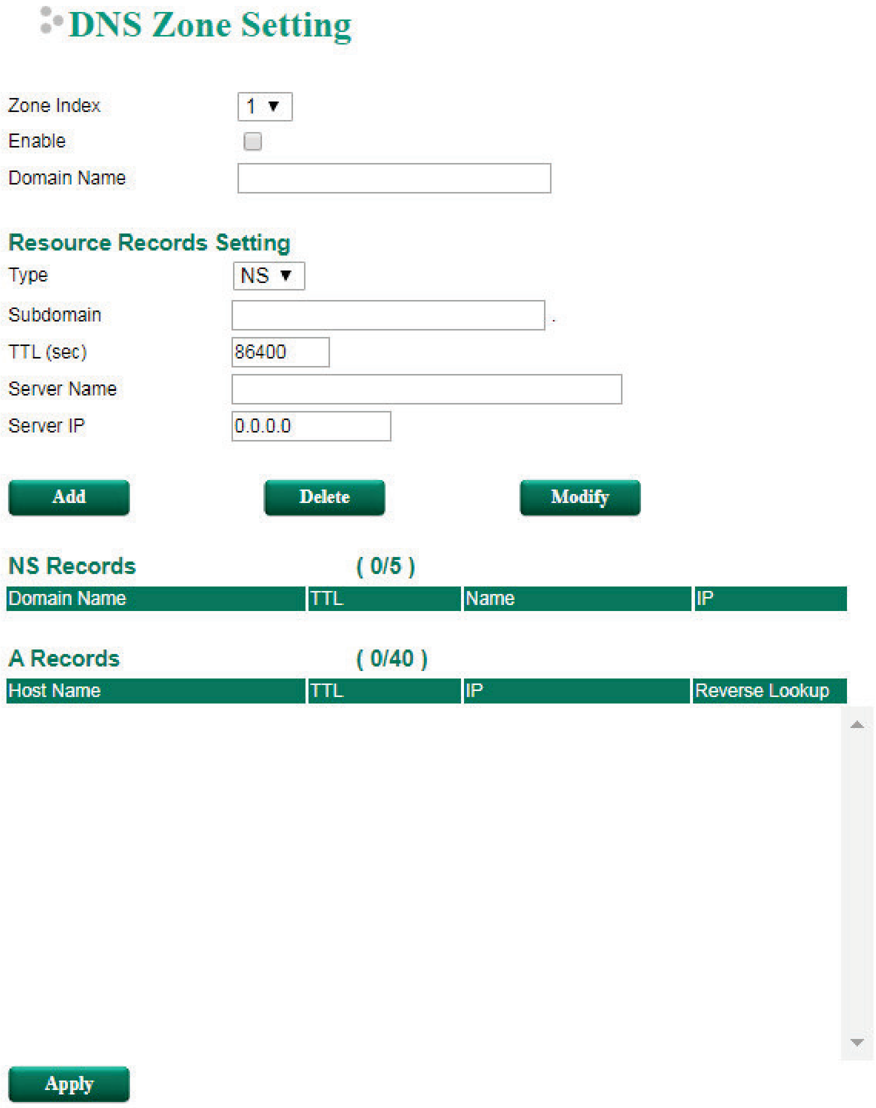
Click on an interface to select it, the background color of the interface will change to blue, then click **Modify** to change the information of the selected interface.

Apply

Click **Apply** after adding, deleting, or modifying an interface to apply the changes.

DNS Zone Setting

The DNS server can support up to 5 local authoritative zones. Each zone supports up to 5 Name Server (NS) Resource Records and up to 40 Address (A) Resource Records (RR).



DNS Zone Setting

Zone Index	1 ▼
Enable	□
Domain Name	

Resource Records Setting

Type	NS ▼
Subdomain	
TTL (sec)	86400
Server Name	
Server IP	0.0.0.0

NS Records (0/5)

Domain Name	TTL	Name	IP

A Records (0/40)

Host Name	TTL	IP	Reverse Lookup

Zone Index

Setting	Description	Factory Default
Index Number	Select the zone index, ranging from 1 to 5	1

Enable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DNS zone	Disabled

Domain Name

Setting	Description	Factory Default
Domain Name	Define the domain name of the DNS zone that will act as the local authoritative zone up to 63 characters in length	None

Resource Records Setting

Type

Setting	Description	Factory Default

Record Type	Select the Resource Records type: Address (A) or Name Server (NS)	NS

Subdomain

Setting	Description	Factory Default
Domain name	Define the subdomain of the Name Server (NS) up to 63 characters in length	None

TTL (sec)

Setting	Description	Factory Default
Time period	Specify the Time to live (TTL) period in seconds	86400

Server Name/Host name

Setting	Description	Factory Default
Server Name/Host Name	Define the DNS server name and host name up to 63 characters in length	None

Server IP

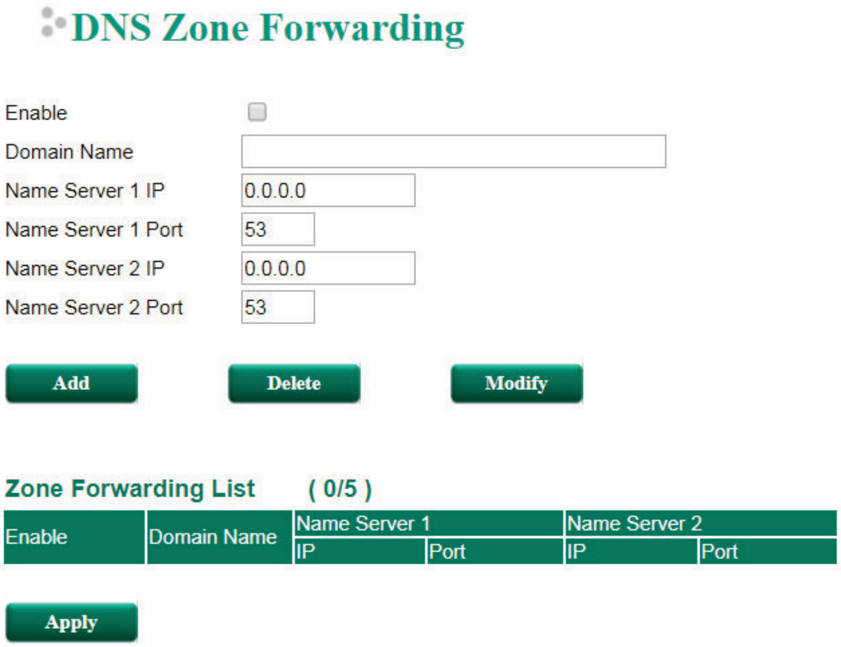
Setting	Description	Factory Default
IP Address	Specify the IP address of the DNS server	0.0.0.0

Reverse Lookup

Setting	Description	Factory Default
Enable/Disable	Enable or disable Reverse Lookup if the record type is set to Address (A)	Enabled

DNS Zone Forwarding Setting

DNS zone forwarding forwards DNS queries of a non-authoritative zone to up to two specified DNS servers. It is not possible to configure an authoritative zone of the local DNS server as the destination zone.



DNS Zone Forwarding

Enable	□
Domain Name	
Name Server 1 IP	0.0.0.0
Name Server 1 Port	53
Name Server 2 IP	0.0.0.0
Name Server 2 Port	53

Zone Forwarding List (0/5)

Enable	Domain Name	Name Server 1		Name Server 2	
		IP	Port	IP	Port

Enable Zone Forwarding

Setting	Description	Factory Default
Enable/Disable	Enable or disable zone forwarding	Disabled

Doman name

Setting	Description	Factory Default
Domain Name	Specify the domain name of the DNS zone where the DNS requests will be forwarded to up 63 characters in length	None

Name Server IP

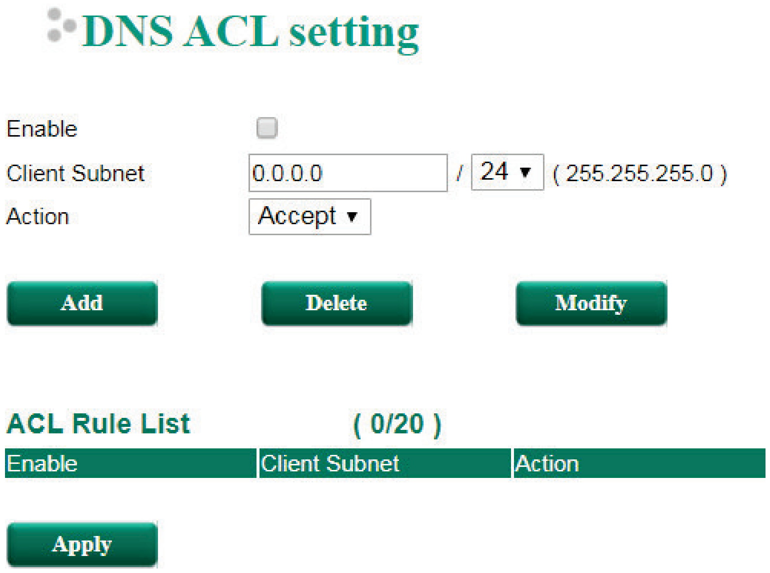
Setting	Description	Factory Default
IP Address	Specify the IP address of the name server	0.0.0.0

Name Server Port

Setting	Description	Factory Default
Port Number	Specify the port of the name server	53

DNS ACL Setting

The DNS access control list (ACL) determines if client subnets can send queries to the DNS server by either accepting or denying the client subnet. If no ACL rules are specified, the default policy is set to deny request from all subnets except the subnet of the service interfaces.



DNS ACL setting

Enable □

Client Subnet 0.0.0.0 / 24 ▾ (255.255.255.0)

Action Accept ▾

ACL Rule List (0/20)

Enable	Client Subnet	Action

Enable DNS ACL

Setting	Description	Factory Default
Domain Name	Enable or disable the DNS access control list	None

Client Subnet

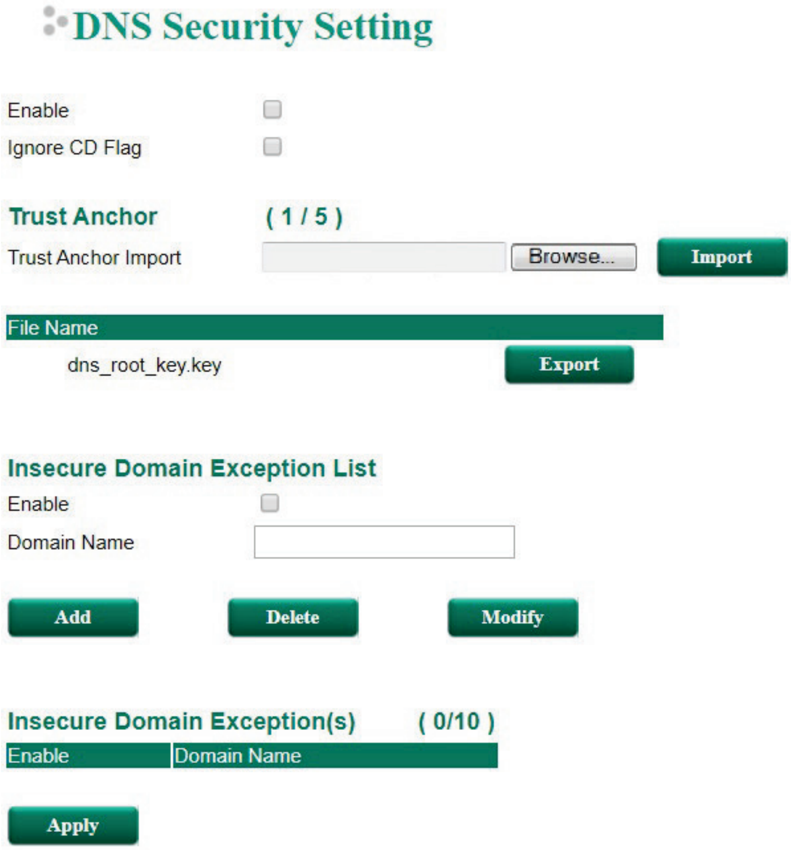
Setting	Description	Factory Default
IP Address/Subnet	Specify the IP address and subnet mask of the client subnet	0.0.0.0/24

Action

Setting	Description	Factory Default
Policy	Choose to allow or deny DNS queries coming from the specified subnet	Accept

DNS Security Setting

From the DNS security settings screen, you can import, export, or delete trust anchors files. A default trust anchor file to the root DNS server is embedded on the local DNS server.



DNS Security Setting

Enable □

Ignore CD Flag □

Trust Anchor (1 / 5)

Trust Anchor Import

File Name	
dns_root_key.key	

Insecure Domain Exception List

Enable □

Domain Name

Insecure Domain Exception(s) (0/10)

Enable	Domain Name

Enable DNS Security

Setting	**Description**	**Factory Default**
Enable/Disable	Enable or disable DNS security	Disabled

Ignore Checking Disabled (CD) Flag

Setting	**Description**	**Factory Default**
Enable/Disable	Enable or disable CD Flag	Disabled

Trust Anchor

Browse/Import

Click **Browse** to select a Trust Anchor file on the ToughNet Secure Router and click **Import**. The DNS Server will automatically update the Trust Anchor.

Delete

Click **Delete** to remove the selected Trust Anchor.

Export

Click **Export** to export the selected Trust Anchor

Insecure Domain Exception List

Enable Insecure Domain Exception

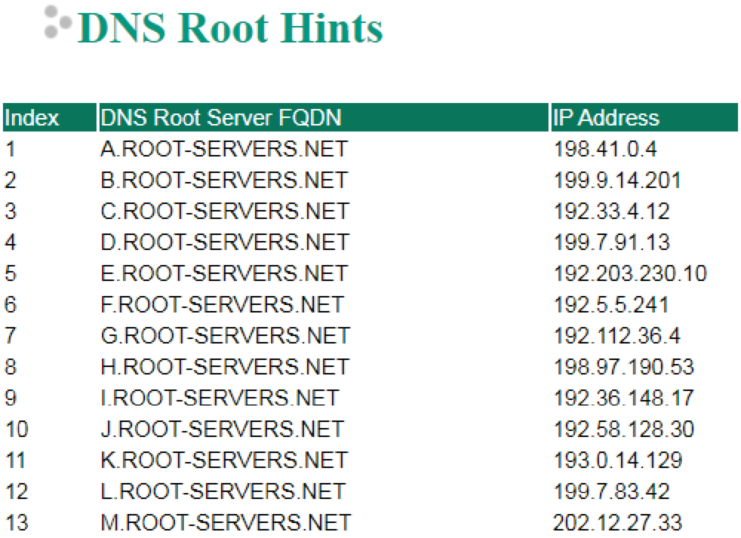
Setting	**Description**	**Factory Default**
Enable/Disable	Enable or disable Insecure Domain Exception	Disabled

Domain Name

Setting	**Description**	**Factory Default**
Domain Name	Define the domain name of the insecure list up to 63 characters in length	None

DNS Root Hints

The DNS root hints define the authoritative name servers that serve the DNS root zone, commonly known as the root servers. These form a network of hundreds of servers in different countries around the world.



DNS Root Hints

Index	DNS Root Server FQDN	IP Address
1	A.ROOT-SERVERS.NET	198.41.0.4
2	B.ROOT-SERVERS.NET	199.9.14.201
3	C.ROOT-SERVERS.NET	192.33.4.12
4	D.ROOT-SERVERS.NET	199.7.91.13
5	E.ROOT-SERVERS.NET	192.203.230.10
6	F.ROOT-SERVERS.NET	192.5.5.241
7	G.ROOT-SERVERS.NET	192.112.36.4
8	H.ROOT-SERVERS.NET	198.97.190.53
9	I.ROOT-SERVERS.NET	192.36.148.17
10	J.ROOT-SERVERS.NET	192.58.128.30
11	K.ROOT-SERVERS.NET	193.0.14.129
12	L.ROOT-SERVERS.NET	199.7.83.42
13	M.ROOT-SERVERS.NET	202.12.27.33

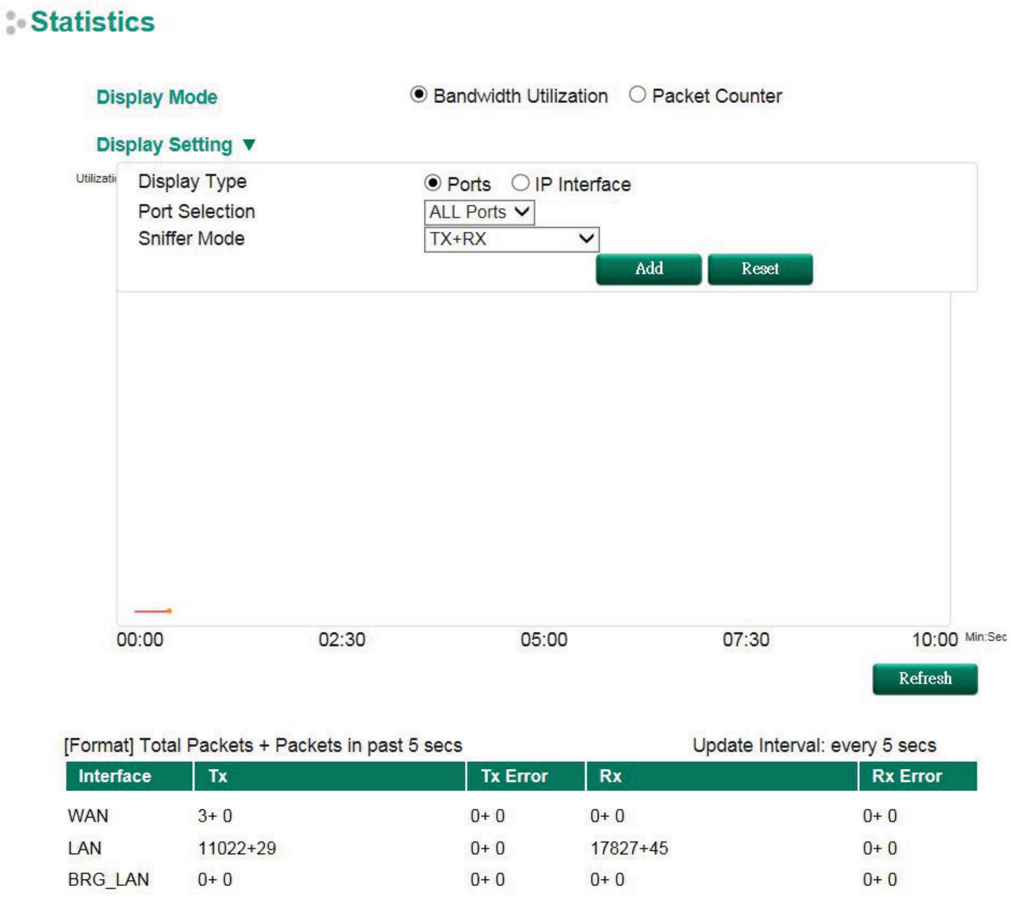
Monitor

Statistics

Users can monitor the data transmission activity of all the ToughNet Secure Router ports from two perspectives, **Bandwidth Utilization** and **Packet Counter**. The graph displays data transmission activity by showing Utilization/Sec or Packet/Sec (i.e., packets per second, or pps) versus Min:Sec. (Minutes: Seconds). The graph is updated every 5 seconds, allowing the user to analyze data transmission activity in real-time.

Bandwidth Utilization

In **Bandwidth Utilization** mode, users can monitor total bandwidth in each interface (**IP Interface)**, each port or port group (**Ports**). In addition to display type, users can configure which packet flow is monitored, **TX Packets**, **RX Packets** or both (**TX/RX**). **TX Packets** are packets sent out from the ToughNet Secure Router, and **RX Packets** are packets received from connected devices.



Statistics

Display Mode ● Bandwidth Utilization ○ Packet Counter

Display Setting ▼

Display Type ● Ports ○ IP Interface

Port Selection ALL Ports

Sniffer Mode TX+RX

[Format] Total Packets + Packets in past 5 secs

Update Interval: every 5 secs

Interface	Tx	Tx Error	Rx	Rx Error
WAN	3+ 0	0+ 0	0+ 0	0+ 0
LAN	11022+29	0+ 0	17827+45	0+ 0
BRG_LAN	0+ 0	0+ 0	0+ 0	0+ 0

Display Mode

Setting	Description	Factory Default
Bandwidth Utilization/ Packet Counter	Graph display traffic bandwidth/Graph display total packet amount per second	Packet Counter

Display Setting

Display Type

Setting	Description	Factory Default
Port (only supported in EDR-810)	Monitor total traffic per port or group port (FE Ports/ GE Ports)	IP Interface
IP Interface	Monitor total traffic per interface, e.g. LAN, WAN, Bridge	

Port Selection

Setting	Description	Factory Default
ALL Ports/ FE Ports/ GE Ports/ Port1/ Port2/ Port3/ Port4/ Port5/ Port6/ Port7/ Port8/ PortG1/ PortG2	Users can select which port or port group they want to monitor traffic from	ALL Ports

Interface Selection

Setting	Description	Factory Default
All/LAN/WAN/Bridge_LAN	Select which interface user want to monitor traffic	All

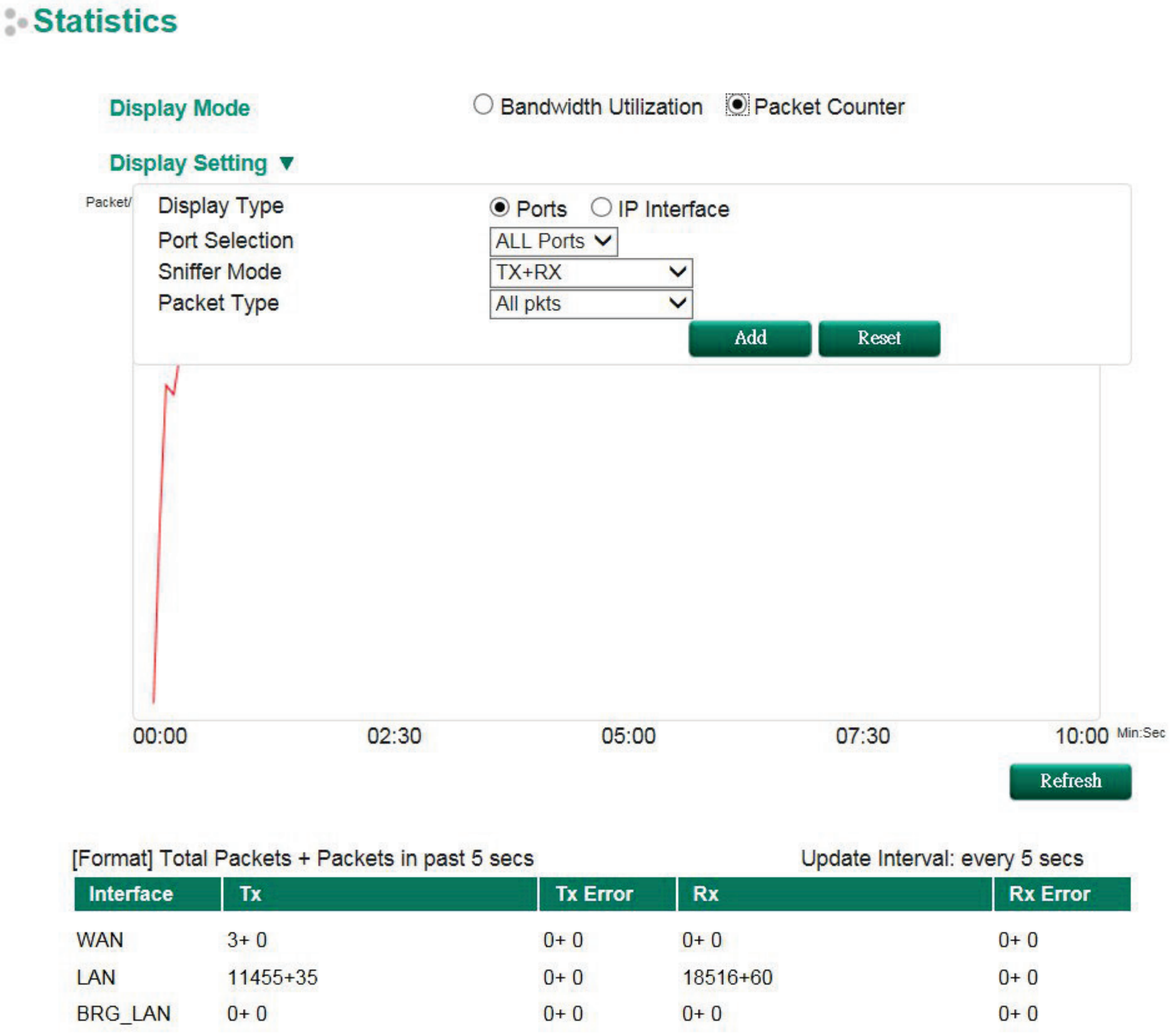
Sniffer Mode

Setting	Description	Factory Default

(TX/RX)/TX/RX	Select which packet flow is monitored	TX/RX

Packet Counter

In **Packet Counter** mode, users can monitor total packet amount per second in each interface (**IP Interface)**, each port or port group (**Ports**). In addition to display type, users can configure which packet flow is monitored, **TX Packets**, **RX Packets** or both (**TX/RX**). **TX Packets** are packets sent out from the ToughNet Secure Router, and **RX Packets** are packets received from connected devices. At the same time, users can choose to monitor different packet types, e.g. unicast, broadcast, multicast and error.



Statistics

Display Mode ○ Bandwidth Utilization ● Packet Counter

Display Setting ▼

Display Type ● Ports ○ IP Interface

Port Selection: ALL Ports

Sniffer Mode: TX+RX

Packet Type: All pkts

[Format] Total Packets + Packets in past 5 secs Update Interval: every 5 secs

Interface	Tx	Tx Error	Rx	Rx Error
WAN	3+ 0	0+ 0	0+ 0	0+ 0
LAN	11455+35	0+ 0	18516+60	0+ 0
BRG_LAN	0+ 0	0+ 0	0+ 0	0+ 0

Display Mode

Setting	Description	Factory Default
Bandwidth Utilization/ Packet Counter	Graph display traffic bandwidth/ Graph display total packet amount per second	Packet Counter

Display Setting

Display Type

Setting	Description	Factory Default

Port/ IP Interface	Monitor total traffic per port or group port (FE Ports/ GE Ports)/ Monitor total traffic per interface, e.g. LAN, WAN, Bridge	IP Interface

Port Selection

Setting	Description	Factory Default
ALL Ports/ FE Ports/ GE Ports/ Port1/ Port2/ Port3/ Port4/ Port5/ Port6/ Port7/ Port8/ PortG1/ PortG2	Users can select which port or port group they want to monitor traffic from	ALL Ports

Interface Selection

Setting	Description	Factory Default
All/WAN/LAN/ /Bridge_LAN	Select which interface user want to monitor traffic	All

Sniffer Mode

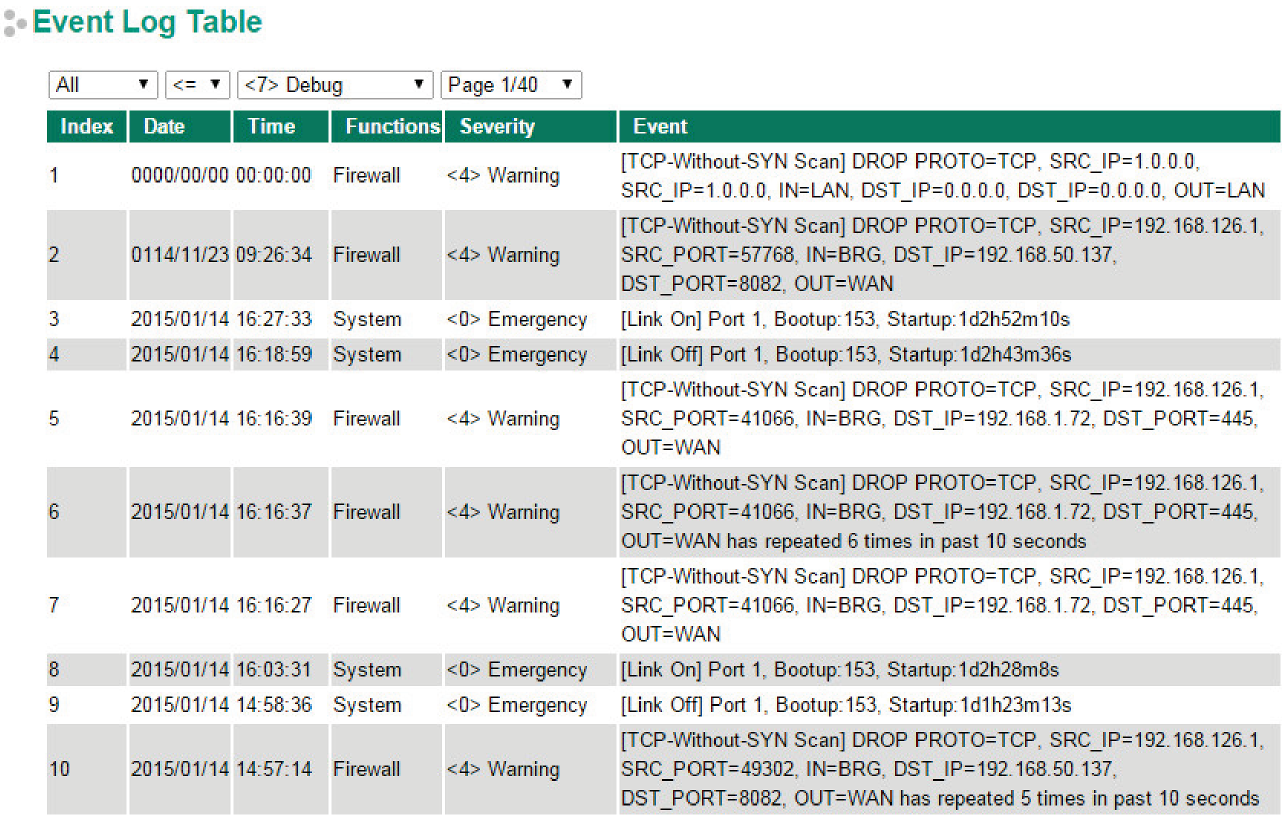
Setting	Description	Factory Default
(TX/RX)/TX/RX	Select which packet flow is monitored	TX/RX

Packet Type

Setting	Description	Factory Default
All/ Unicast/ Broadcast/Multicast/ Error	Select which packet type is monitored	All

Event Log

By default, all event logs will be displayed in the table. You can filter two types of event logs, **System** and **Firewall** combined with **severity level**.



Event Log Table

All ▼ <= ▼ <7> Debug ▼ Page 1/40 ▼

Index	Date	Time	Functions	Severity	Event
1	0000/00/00	00:00:00	Firewall	<4> Warning	[TCP-Without-SYN Scan] DROP PROTO=TCP, SRC_IP=1.0.0.0, SRC_IP=1.0.0.0, IN=LAN, DST_IP=0.0.0.0, DST_IP=0.0.0.0, OUT=LAN
2	0114/11/23	09:26:34	Firewall	<4> Warning	[TCP-Without-SYN Scan] DROP PROTO=TCP, SRC_IP=192.168.126.1, SRC_PORT=57768, IN=BRG, DST_IP=192.168.50.137, DST_PORT=8082, OUT=WAN
3	2015/01/14	16:27:33	System	<0> Emergency	[Link On] Port 1, Bootup:153, Startup:1d2h52m10s
4	2015/01/14	16:18:59	System	<0> Emergency	[Link Off] Port 1, Bootup:153, Startup:1d2h43m36s
5	2015/01/14	16:16:39	Firewall	<4> Warning	[TCP-Without-SYN Scan] DROP PROTO=TCP, SRC_IP=192.168.126.1, SRC_PORT=41066, IN=BRG, DST_IP=192.168.1.72, DST_PORT=445, OUT=WAN
6	2015/01/14	16:16:37	Firewall	<4> Warning	[TCP-Without-SYN Scan] DROP PROTO=TCP, SRC_IP=192.168.126.1, SRC_PORT=41066, IN=BRG, DST_IP=192.168.1.72, DST_PORT=445, OUT=WAN has repeated 6 times in past 10 seconds
7	2015/01/14	16:16:27	Firewall	<4> Warning	[TCP-Without-SYN Scan] DROP PROTO=TCP, SRC_IP=192.168.126.1, SRC_PORT=41066, IN=BRG, DST_IP=192.168.1.72, DST_PORT=445, OUT=WAN
8	2015/01/14	16:03:31	System	<0> Emergency	[Link On] Port 1, Bootup:153, Startup:1d2h28m8s
9	2015/01/14	14:58:36	System	<0> Emergency	[Link Off] Port 1, Bootup:153, Startup:1d1h23m13s
10	2015/01/14	14:57:14	Firewall	<4> Warning	[TCP-Without-SYN Scan] DROP PROTO=TCP, SRC_IP=192.168.126.1, SRC_PORT=49302, IN=BRG, DST_IP=192.168.50.137, DST_PORT=8082, OUT=WAN has repeated 5 times in past 10 seconds

4

Routing

The following topics are covered in this chapter:

- **Unicast Routing**
  - Static Routing
  - RIP (Routing Information Protocol)
  - Open Shortest Path First (OSPF)
  - Routing Table
- **Multicast Routing**
  - Global Setting
  - Static Multicast
  - Distance Vector Multicast Routing Protocol (DVMRP)
  - Protocol Independent Multicast Sparse Mode (PIM-SM)

Unicast Routing

The ToughNet Secure Router supports two unicast routing methods: static routing and dynamic routing. Dynamic routing makes use of RIP V1/V2. You can either choose one routing method, or combine the two methods to establish your routing table. A routing entry includes the following items: the destination address, the next hop address (which is the next router along the path to the destination address), and a metric that represents the cost we have to pay to access a different network.

Static Route

You can define the routes yourself by specifying what is the next hop (or router) that the ToughNet Secure Router forwards data for a specific subnet. The settings of the Static Route will be added to the routing table and stored in the ToughNet Secure Router.

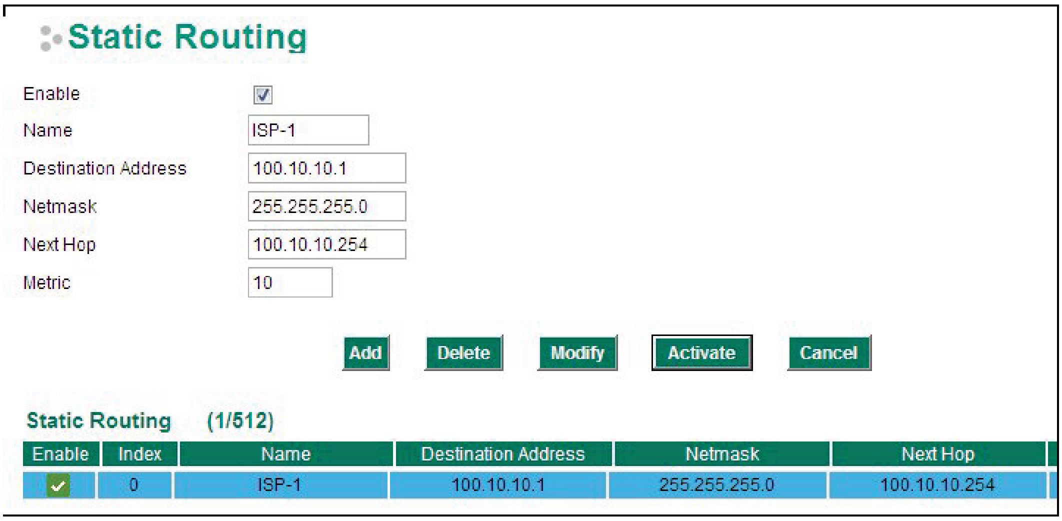
RIP (Routing Information Protocol)

RIP is a distance vector-based routing protocol that can be used to automatically build up a routing table in the ToughNet Secure Router.

The ToughNet Secure Router can efficiently update and maintain the routing table, and optimize the routing by identifying the smallest metric and most matched mask prefix.

Static Routing

The Static Routing page is used to configure the ToughNet Secure Router's static routing table.



Static Routing

Enable	☑
Name	ISP-1
Destination Address	100.10.10.1
Netmask	255.255.255.0
Next Hop	100.10.10.254
Metric	10

Static Routing (1/512)

Enable	Index	Name	Destination Address	Netmask	Next Hop
✓	0	ISP-1	100.10.10.1	255.255.255.0	100.10.10.254

Enable

Click the checkbox to enable Static Routing.

Name

The name of this Static Router list

Destination Address

You can specify the destination IP address.

Netmask

This option is used to specify the subnet mask for this IP address.

Next Hop

This option is used to specify the next router along the path to the destination.

Metric

Use this option to specify a "cost" for accessing the neighboring network.

Clickable Buttons

Add

For adding an entry to the Static Routing Table.

Delete

For removing selected entries from the Static Routing Table.

Modify

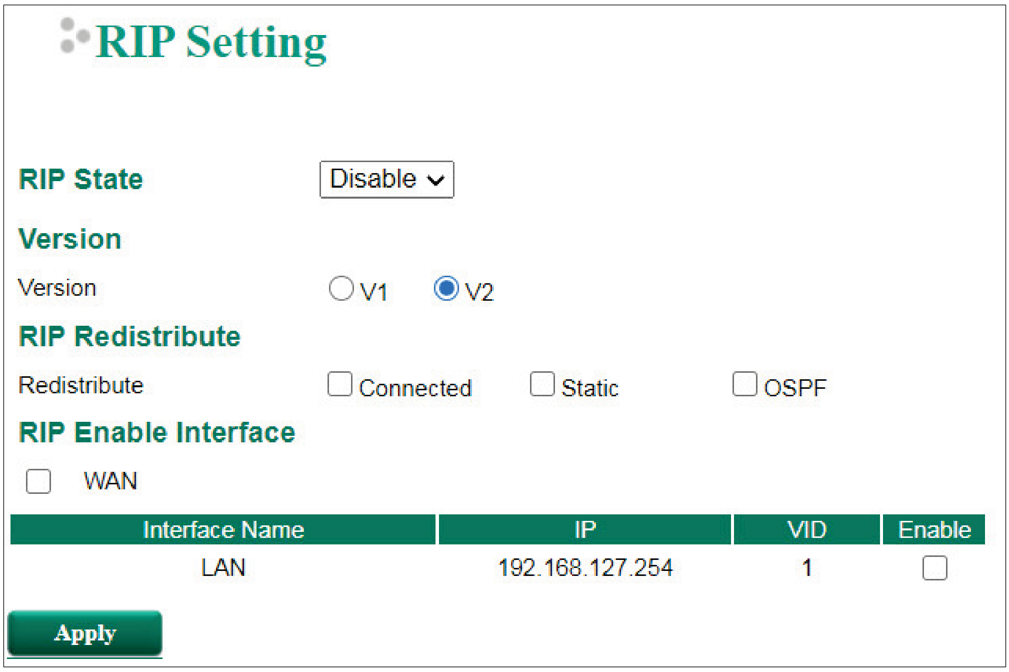
For modifying the content of a selected entry in the Static Routing Table.

NOTE The entries in the Static Routing Table will not be added to the ToughNet Secure Router's routing table until you click the Activate button.

Routing Information Protocol (RIP)

RIP is a distance-vector routing protocol that employs the hop count as a routing metric. RIP prevents routing from looping by implementing a limit on the number of hops allowed in a path from the source to a destination.

The RIP **Setting** page is used to set up the RIP parameters.



RIP Setting

RIP State: Disable

Version

Version: ○ V1 ● V2

RIP Redistribute

Redistribute: □ Connected □ Static □ OSPF

RIP Enable Interface

□ WAN

Interface Name	IP	VID	Enable
LAN	192.168.127.254	1	□

RIP State

Setting	Description	Factory Default
Enable/Disable	Enable or Disable RIP protocol	Disable

RIP Version

Setting	Description	Factory Default
V1/V2	Select RIP protocol version.	V2

RIP Distribution

Setting	Description	Factory Default

Connected/Static/ OSPF/Unchecked	Check the checkbox to enable the Redistribute function. **Connected**: Entries learned from the directly connected interfaces will be re-distributed if this option is enabled. **Static**: Entries that are set in a static route will be re-distributed if this option is enabled. **OSPF**: Entries learned from the RIP will be re-distributed if this option is enabled.	Unchecked

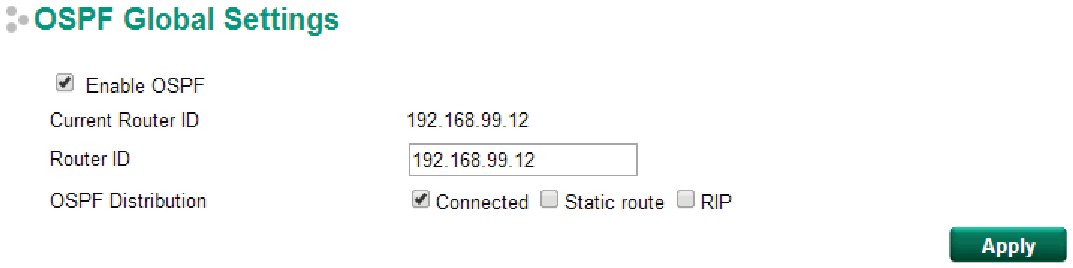
RIP Enable Interface

Setting	Description	Factory Default
WAN	Check the checkbox to enable RIP in the WAN interface.	Unchecked
LAN	Check the checkbox to enable RIP in the LAN interface.	

Open Shortest Path First (OSPF)

Open Shortest Path First (OSPF) is a dynamic routing protocol for use on Internet Protocol (IP) networks. Specifically, it is a link-state routing protocol, and falls into the group of interior gateway protocols, operating within a single autonomous system. As a link-state routing protocol, OSPF establishes and maintains neighbor relationships in order to exchange routing updates with other routers. The neighbor relationship table is called an adjacency database in OSPF. OSPF forms neighbor relationships only with the routers directly connected to it. In order to form a neighbor relationship between two routers, the interfaces used to form the relationship must be in the same area. An interface can only belong to a single area. With OSPF enabled, the ToughNet Secure Router is able to exchange routing information with other L3 switches or routers more efficiently in a large system.

OSPF Global Settings



OSPF Global Settings

☑ Enable OSPF

Current Router ID	192.168.99.12
Router ID	192.168.99.12
OSPF Distribution	☑ Connected □ Static route □ RIP

Each L3 switch/router has an OSPF router ID, customarily written in the dotted decimal format (e.g., 1.2.3.4) of an IP address. This ID must be established in every OSPF instance. If not explicitly configured, the default ID (0.0.0.0) will be regarded as the router ID. Since the router ID is an IP address, it does not need to be a part of any routable subnet on the network.

Enable OSPF

Setting	Description	Factory Default
Enable/Disable	This option is used to enable or disable the OSPF function globally.	Disable

Current Router ID

Setting	Description	Factory Default
Current Router ID	Shows the current L3 switch’s Router ID.	0.0.0.0

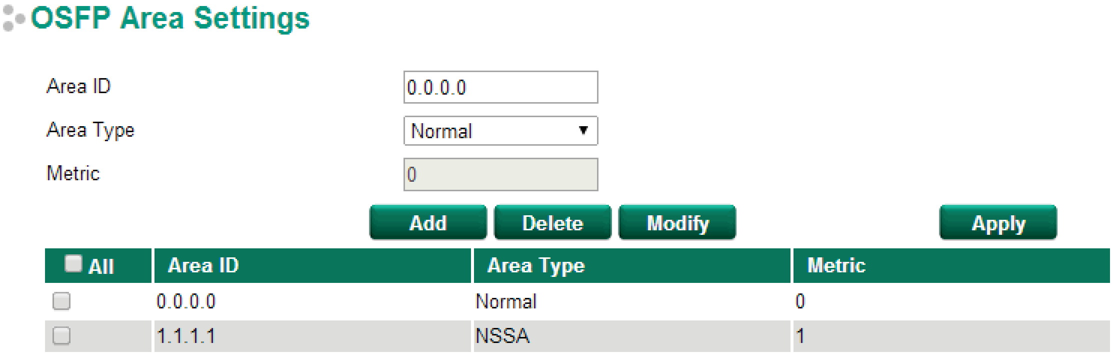
Router ID

Setting	Description	Factory Default
Router ID	Sets the L3 switch’s Router ID.	0.0.0.0

OSPF Distribution

Setting	**Description**	**Factory Default**
Connected	Entries learned from the directly connected interfaces will be re-distributed if this option is enabled.	Checked (Enable)
Static	Entries set in a static route will be re-distributed if this option is enabled.	Unchecked (disable)
RIP	Entries learned from the RIP will be re-distributed if this option is enabled.	Unchecked (disable)

OSPF Area Settings



Area ID	0.0.0.0
Area Type	Normal
Metric	0

□ All	Area ID	Area Type	Metric
□	0.0.0.0	Normal	0
□	1.1.1.1	NSSA	1

An OSPF domain is divided into areas that are labeled with 32-bit area identifiers, commonly written in the dot-decimal notation of an IPv4 address. Areas are used to divide a large network into smaller network areas. They are logical groupings of hosts and networks, including the routers connected to a particular area. Each area maintains a separate link state database whose information may be summarized towards the rest of the network by the connecting router. Thus, the topology of an area is unknown outside of the area. This reduces the amount of routing traffic between parts of an autonomous system.

Area ID

Setting	**Description**	**Factory Default**
Area ID	Defines the areas that this L3 switch/router connects to.	0.0.0.0

Area Type

Setting	**Description**	**Factory Default**
Normal/Stub/NSSA	Defines the area type.	Normal

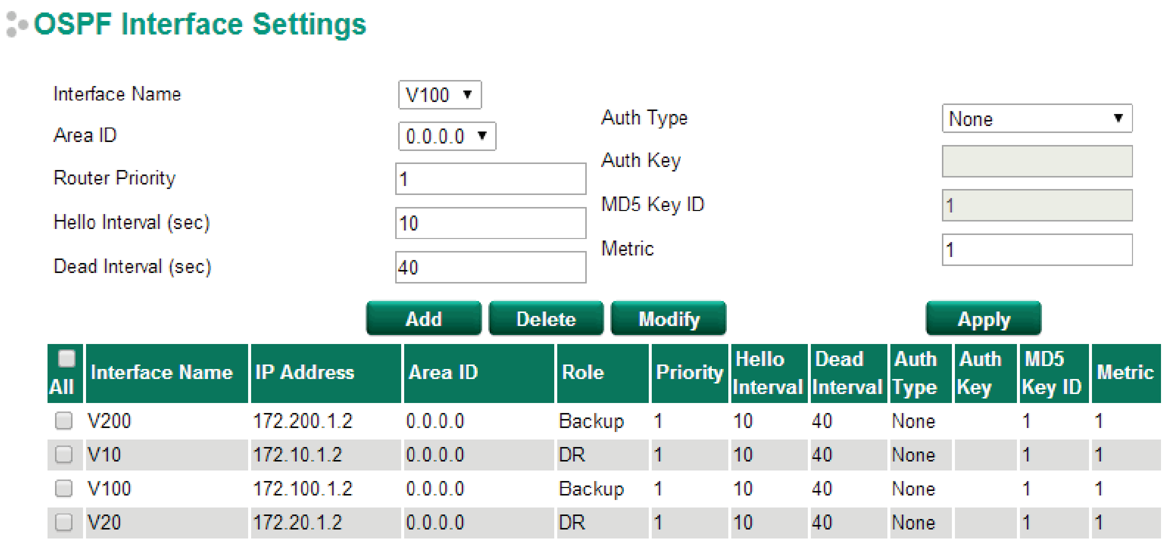
Metric

Setting	**Description**	**Factory Default**
Metric	Defines the metric value.	0

OSPF Area Table

This is a table showing the current OSPF area table.

OSPF Interface Settings



OSPF Interface Settings

Interface Name	V100 ▼	Auth Type	None ▼
Area ID	0.0.0.0 ▼	Auth Key	
Router Priority	1	MD5 Key ID	1
Hello Interval (sec)	10	Metric	1
Dead Interval (sec)	40		

□ All	Interface Name	IP Address	Area ID	Role	Priority	Hello Interval	Dead Interval	Auth Type	Auth Key	MD5 Key ID	Metric
□	V200	172.200.1.2	0.0.0.0	Backup	1	10	40	None		1	1
□	V10	172.10.1.2	0.0.0.0	DR	1	10	40	None		1	1
□	V100	172.100.1.2	0.0.0.0	Backup	1	10	40	None		1	1
□	V20	172.20.1.2	0.0.0.0	DR	1	10	40	None		1	1

Before using OSPF, you need to assign an interface for each area. Detailed information related to the interface can be defined in this section.

Interface Name

Setting	Description	Factory Default
Interface Name	Defines the interface name.	N/A

Area ID

Setting	Description	Factory Default
Area ID	Defines the Area ID.	N/A

Router Priority

Setting	Description	Factory Default
Router Priority	Defines the L3 switch/router's priority.	1

Hello Interval (sec)

Setting	Description	Factory Default
Hello Interval	Hello packets are packets that an OSPF process sends to its OSPF neighbors to maintain connectivity with those neighbors. The hello packets are sent at a configurable interval (in seconds). The value of all hello intervals must be the same within a network.	10

Dead Interval (sec)

Setting	Description	Factory Default
Dead Interval	The dead interval is also a configurable interval (in seconds), and defaults to four times the value of the hello interval.	40

Auth Type

Setting	Description	Factory Default
None/Simple/MD5	OSPF authentication provides the flexibility of authenticating OSPF neighbors. Users can enable authentication to exchange routing update information in a secure manner. OSPF authentication can either be none, simple, or MD5. However, authentication does not need to be configured. If it is configured, all L3 switches/routers on the same segment must have the same password and authentication method.	None

Auth Key

Setting	Description	Factory Default
Auth Key	• pure-text password if Auth Type = Simple • encrypted password if Auth Type = MD5	N/A

MD5 Key ID

Setting	Description	Factory Default
MD5 Key ID	MD5 authentication provides higher security than plain text authentication. This method uses the MD5 to calculate a hash value from the contents of the OSPF packet and the authentication key. This hash value is transmitted in the packet, along with a key ID.	1

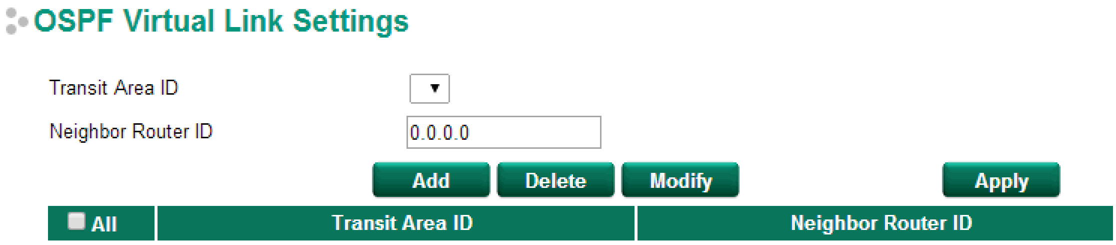
Metric

Setting	Description	Factory Default
Metric	Manually set Metric/Cost of OSPF.	1

OSPF Interface Table

This is a table showing the current OSPF interface table.

OSPF Virtual Link Settings



OSPF Virtual Link Settings

Transit Area ID ▾

Neighbor Router ID 0.0.0.0

□ All	Transit Area ID	Neighbor Router ID

All areas in an OSPF autonomous system must be physically connected to the backbone area (Area 0.0.0.0). However, this is impossible in some cases. For those cases, users can create a virtual link to connect to the backbone through a non-backbone area and also use virtual links to connect two parts of a partitioned backbone through a non-backbone area.

Transit Area ID

Setting	Description	Factory Default
Transit Area ID	Defines the areas that this L3 switch/router connect to.	N/A

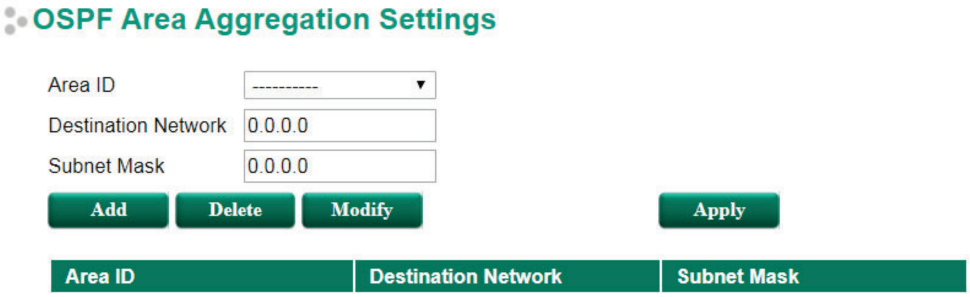
Neighbor Router ID

Setting	Description	Factory Default
Neighbor Router ID	Defines the neighbor L3 switch/route's ID.	0.0.0.0

OSPF Virtual Link Table

This is a table showing the current OSPF Virtual Link table.

OSPF Area Aggregation Settings



Area ID	Destination Network	Subnet Mask

Each OSPF area, which consists of a set of interconnected subnets and traffic, is handled by routers attached to two or more areas, known as Area Border Routers (ABRs). With the OSPF aggregation function, users can combine groups of routes with common addresses into a single routing table entry. The function is used to reduce the size of routing tables.

Area ID

Setting	Description	Factory Default
Area ID	Select the Area ID that you want to configure.	0.0.0.0

Destination Network

Setting	Description	Factory Default
Destination Network	Fill in the network address in the area.	

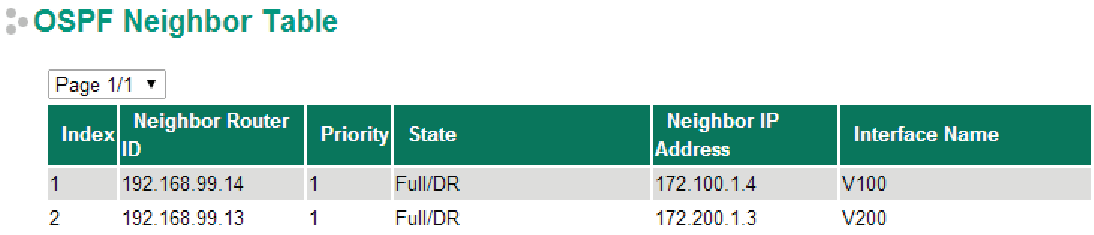
Subnet Mask

Setting	Description	Factory Default
4(240.0.0.0) to 30(255.255.255.252)	Select the network mask.	24(255.255.255.0)

OSPF Area Aggregation Table

This is a table showing the current OSPF Area Aggregation table.

OSPF Neighbor Table

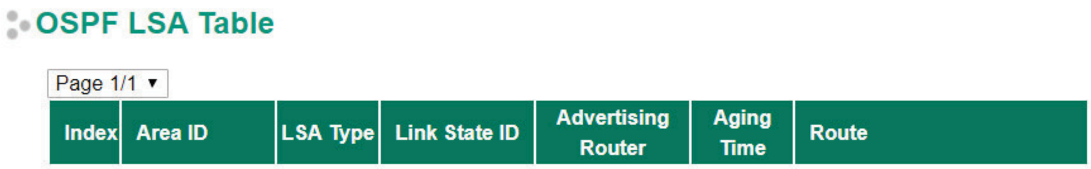


Index	Neighbor Router ID	Priority	State	Neighbor IP Address	Interface Name
1	192.168.99.14	1	Full/DR	172.100.1.4	V100
2	192.168.99.13	1	Full/DR	172.200.1.3	V200

OSPF Neighbor Table

This is a table showing the current OSPF Neighbor table.

OSPF LSA Table



OSPF LSA Table

Page 1/1 ▾

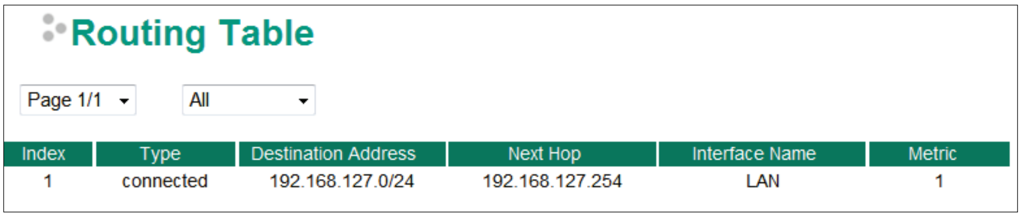
Index	Area ID	LSA Type	Link State ID	Advertising Router	Aging Time	Route

OSPF LSA Table

This is a table showing the current OSPF LSA table.

Routing Table

The **Routing Table** page shows all routing entries.



Routing Table

Page 1/1 ▾ All ▾

Index	Type	Destination Address	Next Hop	Interface Name	Metric
1	connected	192.168.127.0/24	192.168.127.254	LAN	1

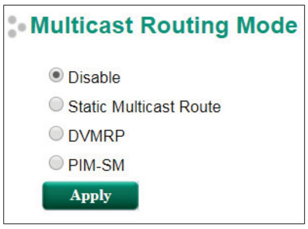
All Routing Entry List

Setting	Description	Factory Default
All	Show all routing entries	N/A
Connected	Show connected routing entries	N/A
Static	Show Static routing entries	N/A
RIP	Show RIP routing entries	N/A
Others	Show others routing entries	N/A

Multicast Routing

The ToughNet Secure Router supports Static Multicast Route, Distance Vector Multicast Route Protocol (DVMRP), and Protocol Independent Multicast Spare Mode (PIM-SIM. You can define the routes yourself by specifying the inbound and outbound interfaces that the ToughNet Secure Router forwards Multicast streams to.

Global Setting



Multicast Routing Mode

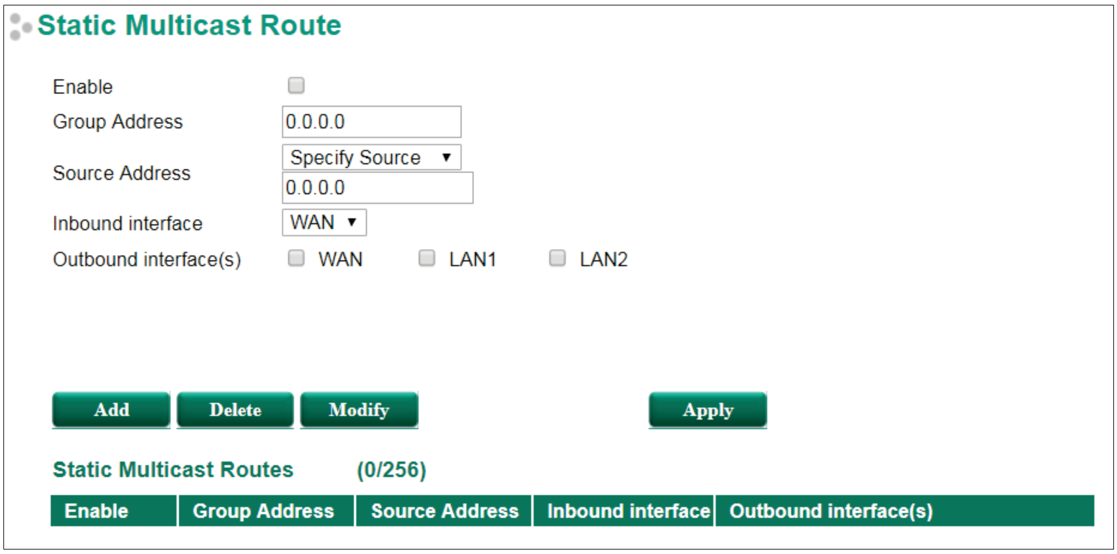
● Disable
○ Static Multicast Route
○ DVMRP
○ PIM-SM

Multicast Routing Mode

Setting	Description	Factory Default

Disable/Static Multicast Route/DVMRP/PIM-SM	Disable Multicast routing mode or enable a specific Multicast routing protocol	Disable

Static Multicast



Static Multicast Route

Enable	□
Group Address	0.0.0.0
Source Address	Specify Source ▾ 0.0.0.0
Inbound interface	WAN ▾
Outbound interface(s)	□ WAN □ LAN1 □ LAN2

Static Multicast Routes (0/256)

Enable	Group Address	Source Address	Inbound interface	Outbound interface(s)

Static Multicast Route Enable/Disable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the specific Static Multicast Route	Disable

Group Address

Setting	Description	Factory Default
IP Address	The IP address of the Multicast Group Address	0.0.0.0

Source Address

Setting	Description	Factory Default
IP Address/Any	The IP address of the Multicast Source Address. The specific IP address can be set or choose ANY for any IP address	Specify Source: 0.0.0.0

Inbound Interface

Setting	Description	Factory Default
Interfaces	Select the inbound interface of the Multicast stream	One of the interfaces

Outbound Interface

Setting	Description	Factory Default
Interfaces	Select the outbound interface of the Multicast stream	One of the interfaces

Clickable Buttons

Add

Use the **Add** button to input a new Multicast Routing list.

Delete

Use the **Delete** button to delete a Multicast Routing list. Click on a list to select it (the background color of the device will change to blue) and then click the **Delete** button.

Modify

To modify the information for a particular list, click on a list to select it (the background color of the device will change to blue), modify the information as needed using the check boxes and text input boxes near the top of the browser window, and then click **Modify**.

Apply

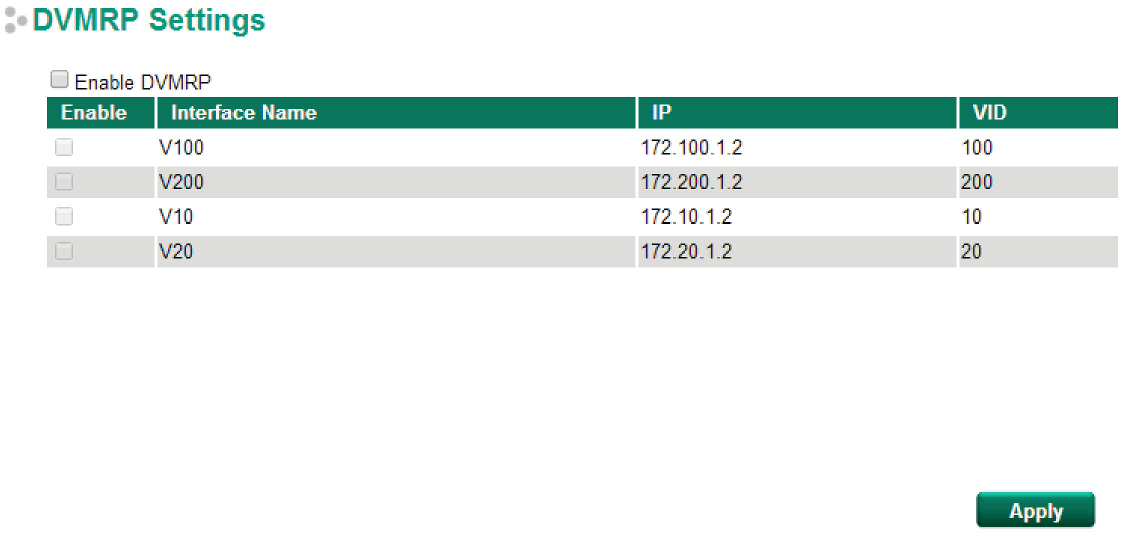
Remember to click **Apply** after adding/deleting/modifying the Multicast Routing list.

Distance Vector Multicast Routing Protocol (DVMRP)

Distance Vector Multicast Routing Protocol (DVMRP) is used to build multicast delivery trees on a network. When a Layer 3 switch receives a multicast packet, DVMRP provides a routing table for the relevant multicast group, and include distance information on the number of devices between the router and the packet destination. The multicast packet will then be forwarded through the ToughtNet Secure Router interface specified in the multicast routing table.

DVMRP Settings

This page is used to set up the DVMRP table for the ToughtNet Secure Router



DVMRP Settings

□ Enable DVMRP

Enable	Interface Name	IP	VID
□	V100	172.100.1.2	100
□	V200	172.200.1.2	200
□	V10	172.10.1.2	10
□	V20	172.20.1.2	20

Enable DVMRP

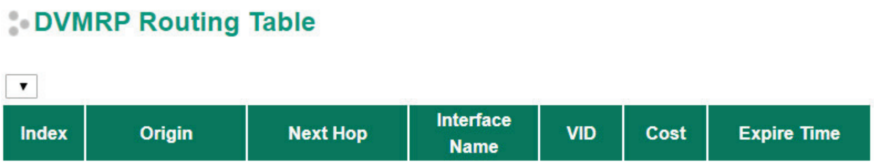
Setting	Description	Factory Default
Enable/Disable	Enable or disable DVMRP globally	Disable

Enable (individual)

Setting	Description	Factory Default
Enable/Disable	Enable or disable DVMRP by the selected interface	Disable

NOTE Only one multicast routing protocol can be enabled. DVMRP and PIM-SM can NOT be enabled simultaneously.

DVMRP Routing Table



DVMRP Routing Table

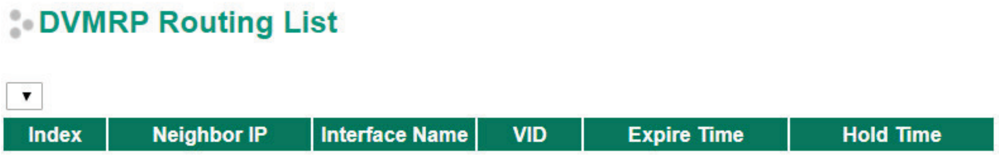
▼

Index	Origin	Next Hop	Interface Name	VID	Cost	Expire Time

DVMRP Routing Table

This is a table showing the current DVMRP Routing table.

DVMRP Neighbor Table



DVMRP Routing List

▼

Index	Neighbor IP	Interface Name	VID	Expire Time	Hold Time

DVMRP Neighbor Table

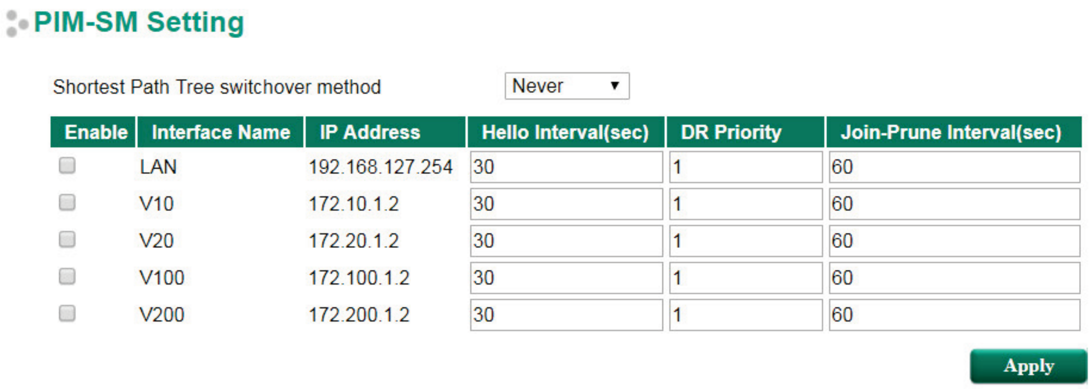
This is a table showing the current DVMRP Neighbor table.

Protocol Independent Multicast Sparse Mode (PIM-SM)

Protocol Independent Multicast (PIM) is a method of forwarding traffic to multicast groups over the network using any pre-existing unicast routing protocol, such as RIP or OSPF, set on routers within a multicast network. Protocol Independent Multicast Sparse Mode (PIM-SM) protocol builds unidirectional shared trees rooted at a Rendezvous Point (RP) per group, and optionally creates shortest-path trees per source. Protocol Independent Multicast Source-Specific Multicast (PIM-SSM) builds trees that are rooted in just one source, offering a more secure and scalable model for a limited number of applications.

PIM-SM Settings

This page is used to set up the PIM-SM table for the ToughNet Secure Router.



PIM-SM Setting

Shortest Path Tree switchover method: Never ▼

Enable	Interface Name	IP Address	Hello Interval(sec)	DR Priority	Join-Prune Interval(sec)
□	LAN	192.168.127.254	30	1	60
□	V10	172.10.1.2	30	1	60
□	V20	172.20.1.2	30	1	60
□	V100	172.100.1.2	30	1	60
□	V200	172.200.1.2	30	1	60

Shortest Path Tree Switchover Method

Setting	Description	Factory Default
Never/Immediate	Define how Shortest Path Tree switch over	Never

Enable (individual)

Setting	Description	Factory Default
Enable/Disable	Enable or disable PIM-SM by the selected interface	Disable

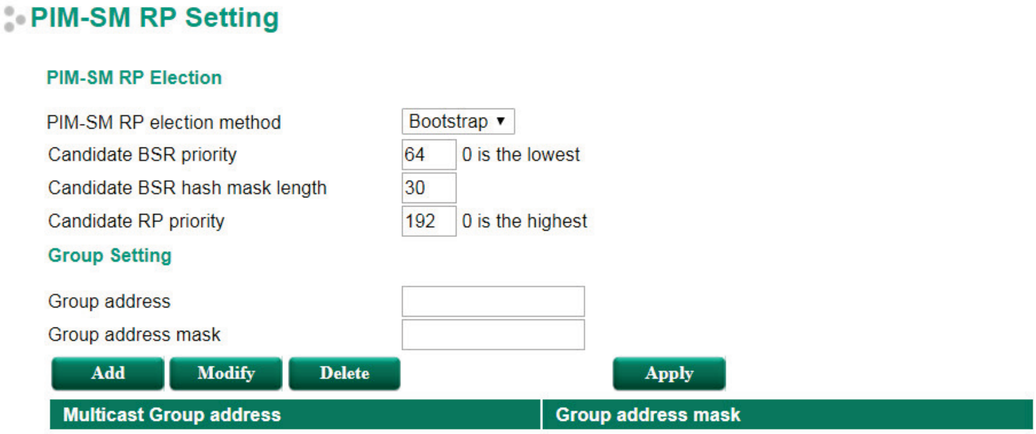
NOTE Only one multicast routing protocol can be enabled. DVMRP and PIM-SM can NOT be enabled simultaneously.

PIM-SM RP Settings

This page is used to set up the PIM-SM RP settings for the ToughNet Secure Router.

There are two RP Election Methods: Bootstrap and Static.

Bootstrap



PIM-SM RP Setting

PIM-SM RP Election

PIM-SM RP election method	Bootstrap ▾	
Candidate BSR priority	64	0 is the lowest
Candidate BSR hash mask length	30	
Candidate RP priority	192	0 is the highest

Group Setting

Group address	
Group address mask	

Multicast Group address	Group address mask

Candidate BSR Priority

Setting	Description	Factory Default
0 to 255	Define the priority of BSR election	64

Candidate BSR Hash Mask Length

Setting	Description	Factory Default
4 to 32	Define the Hash mask length of BSR election	30

Candidate RP Priority

Setting	Description	Factory Default
0 to 255	Define the priority of RP election	192

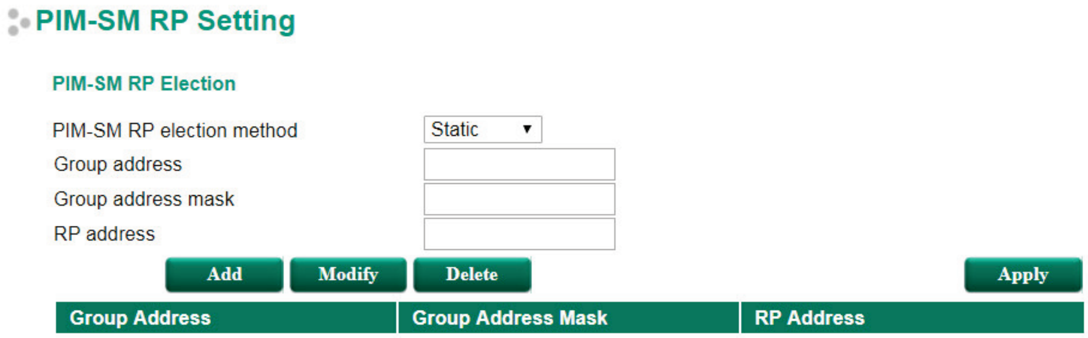
Group Address

Setting	Description	Factory Default
Group Address	Define the group address	None

Group Address Mask

Setting	Description	Factory Default
4(240.0.0.0) to 32(255.255.255.255)	Select the group address mask.	None

Static



PIM-SM RP Setting

PIM-SM RP Election

PIM-SM RP election method: Static

Group address:

Group address mask:

RP address:

Group Address	Group Address Mask	RP Address

Group Address

Setting	Description	Factory Default
Group Address	Define the group address	None

Group Address Mask

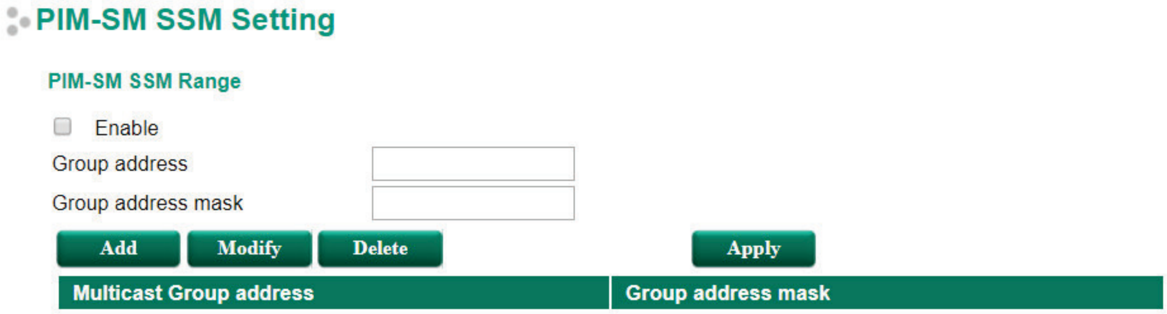
Setting	Description	Factory Default
4(240.0.0.0) to 32(255.255.255.255)	Select the group address mask.	None

RP Address

Setting	Description	Factory Default
RP Address	Define the RP address	None

PIM-SM SSM Settings

This page is used to set up the PIM-SM SSM settings for the ToughNet Secure Router.



PIM-SM SSM Setting

PIM-SM SSM Range

□ Enable

Group address:

Group address mask:

Multicast Group address	Group address mask

Enable PIM-SSM

Setting	Description	Factory Default
Enable/Disable	Enable or disable PIM-SSM	Disable

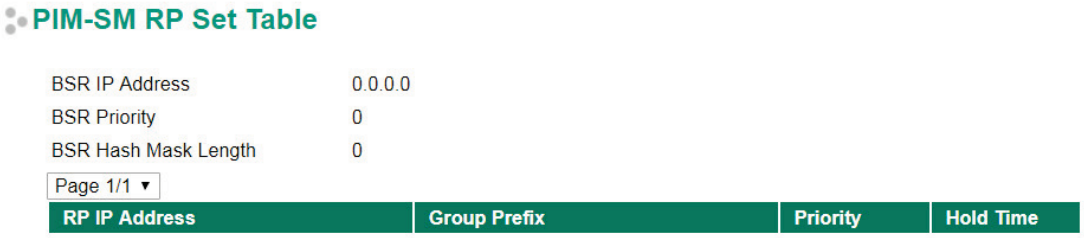
Group Address

Setting	Description	Factory Default
Group Address	Define the group address	None

Group Address Mask

Setting	Description	Factory Default
4(240.0.0.0) to 32(255.255.255.255)	Select the group address mask.	None

PIM-SM RP-Set Table



PIM-SM RP Set Table

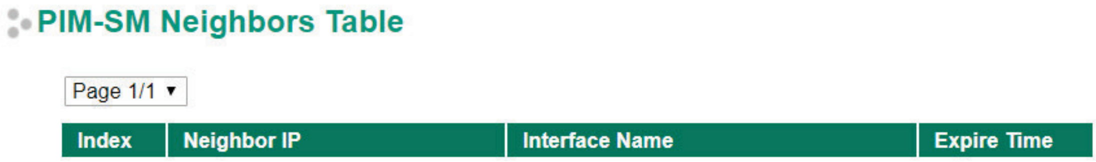
BSR IP Address	0.0.0.0
BSR Priority	0
BSR Hash Mask Length	0

RP IP Address	Group Prefix	Priority	Hold Time

PIM-SM RP-Set Table

This is a table showing the current PIM-SM RP-Set table.

PIM-SM Neighbor Table



PIM-SM Neighbors Table

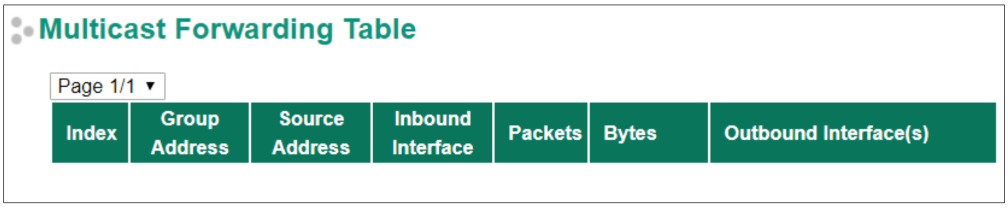
Index	Neighbor IP	Interface Name	Expire Time

PIM-SM Neighbor Table

This is a table showing the current PIM-SM Neighbor table.

Multicast Forwarding Table

The table shows the current Multicast Forwarding Status.



Multicast Forwarding Table

Index	Group Address	Source Address	Inbound Interface	Packets	Bytes	Outbound Interface(s)

5

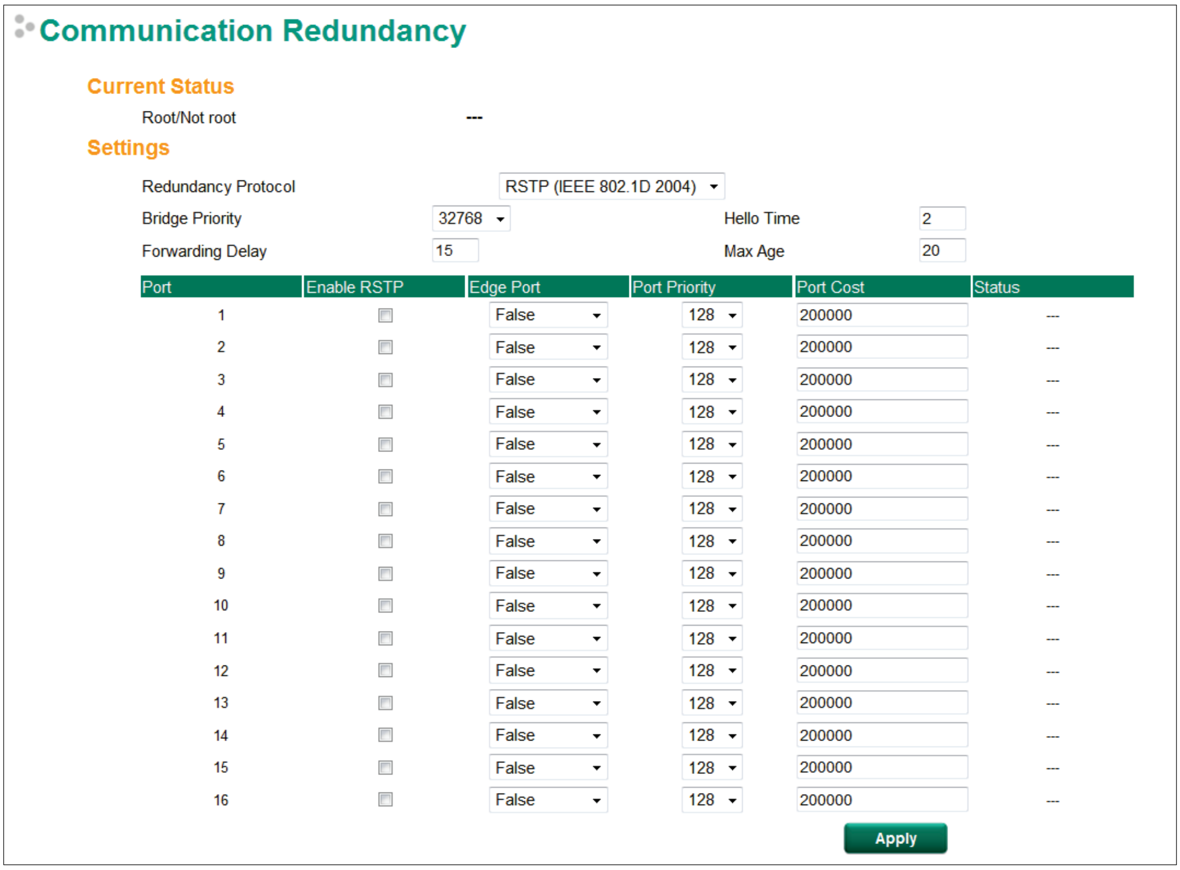
Network Redundancy

The following topics are covered in this chapter:

Layer 2 Redundant Protocols

Configuring RSTP

The following figures indicate which Rapid Spanning Tree Protocol parameters can be configured. A more detailed explanation of each parameter follows.



Communication Redundancy

Current Status

Root/Not root ---

Settings

Redundancy Protocol: RSTP (IEEE 802.1D 2004)

Bridge Priority: 32768 Hello Time: 2

Forwarding Delay: 15 Max Age: 20

Port	Enable RSTP	Edge Port	Port Priority	Port Cost	Status
1	□	False	128	200000	---
2	□	False	128	200000	---
3	□	False	128	200000	---
4	□	False	128	200000	---
5	□	False	128	200000	---
6	□	False	128	200000	---
7	□	False	128	200000	---
8	□	False	128	200000	---
9	□	False	128	200000	---
10	□	False	128	200000	---
11	□	False	128	200000	---
12	□	False	128	200000	---
13	□	False	128	200000	---
14	□	False	128	200000	---
15	□	False	128	200000	---
16	□	False	128	200000	---

At the top of this page, the user can check the **Current Status** of this function. For RSTP, you will see:

Now Active:

It shows which communication protocol is being used—Turbo Ring, RSTP, or neither.

Root/Not Root

This field only appears when RSTP mode is selected. The field indicates whether or not this switch is the Root of the Spanning Tree (the root is determined automatically).

At the bottom of this page, the user can configure the **Settings** of this function. For RSTP, you can configure:

Redundancy Protocol

Setting	Description	Factory Default
Turbo Ring V2/RSTP (IEEE 802.1D 2004)	Select the specific protocol to change to the respective configuration page	RSTP (IEEE 802.1D 2004)

Bridge priority

Setting	Description	Factory Default
Numerical value selected by user	Increase this device's bridge priority by selecting a lower number. A device with a higher bridge priority has a greater chance of being established as the root of the Spanning Tree topology.	32768

Forwarding Delay (sec.)

Setting	Description	Factory Default
Numerical value input by user	The amount of time this device waits before checking to see if it should change to a different state.	15

Hello time (sec.)

Setting	Description	Factory Default
Numerical value input by user	The root of the Spanning Tree topology periodically sends out a "hello" message to other devices on the network to check if the topology is healthy. The "hello time" is the amount of time the root waits between sending hello messages.	2

Max. Age (sec.)

Setting	Description	Factory Default
Numerical value input by user	If this device is not the root, and it has not received a hello message from the root in an amount of time equal to "Max. Age," then this device will reconfigure itself as a root. Once two or more devices on the network are recognized as a root, the devices will renegotiate to set up a new Spanning Tree topology.	20

Enable RSTP per Port

Setting	Description	Factory Default
Enable/Disable	Select to enable the port as a node on the Rapid Spanning Tree Protocol.	Disabled

NOTE We suggest not enabling the Rapid Spanning Tree Protocol once the port is connected to a device (PLC, RTU, etc.) as opposed to network equipment. The reason is that it will cause unnecessary negotiation.

Setting	Description	Factory Default
Force Edge	The port is fixed as an edge port and will always be in the forwarding state	False
False	The port is set as the normal RSTP port	

Port Priority

Setting	Description	Factory Default
Numerical value selected by user	Increase this port's priority as a node on the Spanning Tree topology by entering a lower number.	128

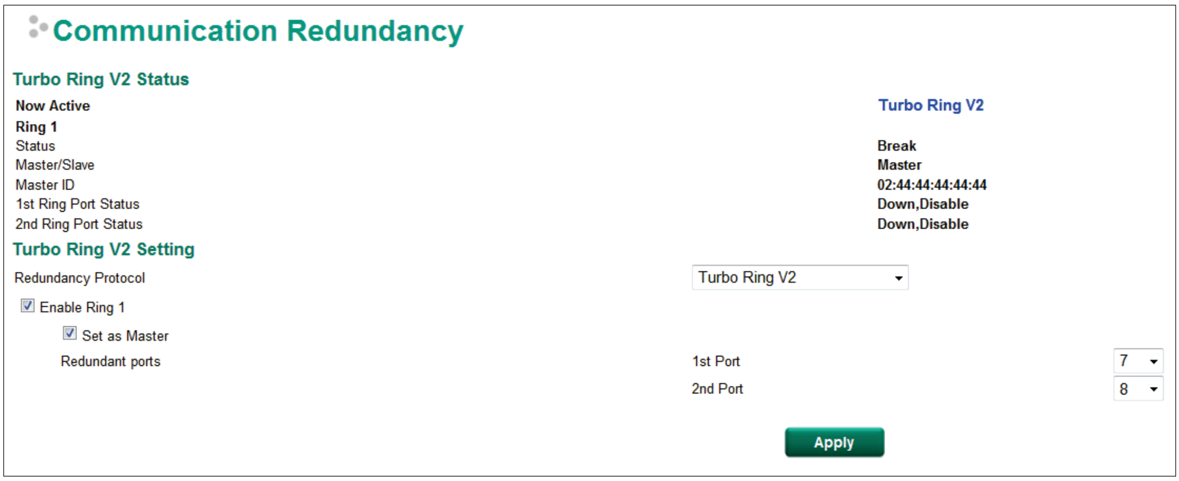
Port Cost

Setting	Description	Factory Default
Numerical value input by user	Input a higher cost to indicate that this port is less suitable as a node for the Spanning Tree topology.	200000

Port Status

Indicates the current Spanning Tree status of this port. **Forwarding** for normal transmission, or **Blocking** to block transmission.

Configuring Turbo Ring V2



Communication Redundancy

Turbo Ring V2 Status

Now Active	Turbo Ring V2
Ring 1	
Status	Break
Master/Slave	Master
Master ID	02:44:44:44:44:44
1st Ring Port Status	Down,Disable
2nd Ring Port Status	Down,Disable

Turbo Ring V2 Setting

Redundancy Protocol: Turbo Ring V2

☑ Enable Ring 1

☑ Set as Master

Redundant ports: 1st Port 7, 2nd Port 8

Explanation of "Current Status" Items

Now Active

It shows which communication protocol is in use: **Turbo Ring V2** or **RSTP**.

Ring 1—Status

It shows **Healthy** if the ring is operating normally, and shows **Break** if the ring's backup link is active.

Ring 1—Master/Slave

It indicates whether or not this ToughNet Secure Router is the Master of the Turbo Ring.

NOTE The user does not need to set the master to use Turbo Ring. If master is not set, the Turbo Ring protocol will assign master status to one of the TN units in the ring. The master is only used to determine which segment serves as the backup path.

Ring Port Status

The "Ports Status" indicators show ***Forwarding*** for normal transmission, ***Blocking*** if this port is connected to a backup path and the path is blocked, and ***Link down*** if there is no connection.

Explanation of "Settings" Items

Redundancy Protocol

Setting	Description	Factory Default
Turbo Ring V2/RSTP (IEEE 802.1D 2004)	Select the specific protocol to change to the respective configuration page	RSTP (IEEE 802.1D 2004)

Enable Ring

Setting	Description	Factory Default
Enabled	Enable the Ring 1 settings	Not checked
Disabled	Disable the Ring 1 settings	Not checked

Set as Master

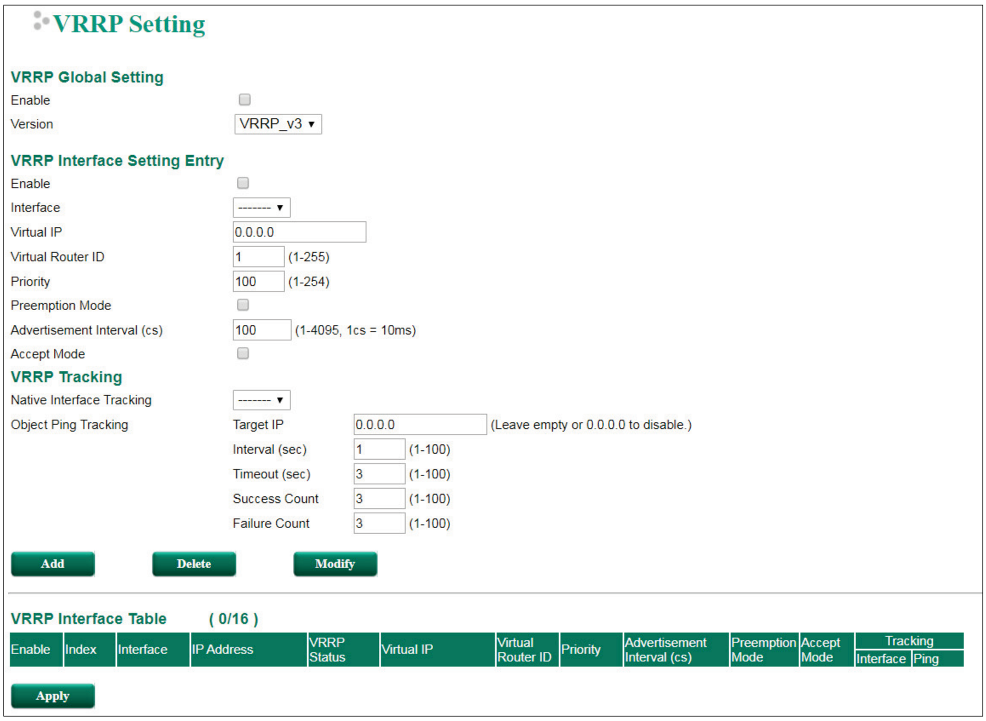
Setting	Description	Factory Default
Enabled	Select this device as Master	Not checked
Disabled	Do not select this device as Master	

Redundant Ports

Setting	Description	Factory Default
1st Port	Select any port of the device to be one of the redundant ports.	7
2nd Port	Select any port of the device to be one of the redundant ports.	8

Layer 3 Redundant Protocols

VRRP Settings



VRRP Setting

VRRP Global Setting

Enable	□
Version	VRRP_v3 ▾

VRRP Interface Setting Entry

Enable	□	
Interface	------- ▾	
Virtual IP	0.0.0.0	
Virtual Router ID	1	(1-255)
Priority	100	(1-254)
Preemption Mode	□	
Advertisement Interval (cs)	100	(1-4095, 1cs = 10ms)
Accept Mode	□	

VRRP Tracking

Native Interface Tracking	------- ▾		
Object Ping Tracking	Target IP	0.0.0.0	(Leave empty or 0.0.0.0 to disable.)
	Interval (sec)	1	(1-100)
	Timeout (sec)	3	(1-100)
	Success Count	3	(1-100)
	Failure Count	3	(1-100)

VRRP Interface Table (0/16)

Enable	Index	Interface	IP Address	VRRP Status	Virtual IP	Virtual Router ID	Priority	Advertisement Interval (cs)	Preemption Mode	Accept Mode	Tracking	
											Interface	Ping

Virtual Router Redundancy Protocol (VRRP) can solve the problem with static configuration. VRRP enables a group of routers to form a single virtual router with a virtual IP address. The LAN clients can then be configured with the virtual router's virtual IP address as their default gateway. The virtual router is the combination of a group of routers, and is also known as a VRRP group.

VRRP Global Setting

Setting	Description	Factory Default
Enable	Enables VRRP	Disable
Version	Choose to use VRRP v2 or VRRP v3	VRRP v3

VRRP Interface Setting Entry

Setting	Description	Factory Default
Enable	Enables VRRP entry	Disabled
Interface	Select a specific interface	None
Virtual IP	L3 switches / routers in the same VRRP group must be set to the same virtual IP address as the VRRP ID. This virtual IP address must belong to the same address range as the real IP address of the interface.	0.0.0.0

Setting	Description	Factory Default
Virtual Router ID	Virtual Router ID is used to assign a VRRP group. The L3 switches / routers, which operate as master / backup, should have the same ID. Moxa L3 switches / routers support one virtual router ID for each interface. IDs can range from 1 to 255.	0
Priority	Determines priority in a VRRP group. The priority value range is 1 to 255 and the 255 is the highest priority. If several L3 switches / routers have the same priority, the router with higher IP address has the higher priority. The usable range is "1 to 255".	100
Preemption Mode	Determines whether a backup L3 switch / router will take the authority of master or not.	Enabled
Advertisement Interval (cs)	Specify the VRRP Advertisement Interval time, ranging from 1 to 4095 cs. 1 cs equals 10 ms.	100
Accept Mode	Enable or disable Accept Mode.	Disabled

VRRP Tracking

VRRP interface tracking is used to track a specific interface of the router that can change the status of the virtual router for a VRRP Group. For example, the WAN interface can be tracked and if the link is down, the other backup router will become the new master of the VRRP group.

Setting	Description	Factory Default
Native Interface Tracking	Select the interface to track	None
Object Ping Tracking-Target IP	Specify the target IP address to be tracked	0.0.0.0
Object Ping Tracking-Interval (sec)	Specify the tracking interval in seconds	1
Object Ping Tracking-Timeout (sec)	Specify the timeout period in seconds	3
Object Ping Tracking-Success Count	Specify the success count	3
Object Ping Tracking-Fail Count	Specify the failure count	3

6

Network Address Translation

The following topics are covered in this chapter:

- **Network Address Translation (NAT)**
  - NAT Concept
  - 1-to-1 NAT
  - N-to-1 NAT
  - Port Forward

Network Address Translation (NAT)

NAT Concept

NAT (Network Address Translation) is a common security function for changing the IP address during Ethernet packet transmission. When the user wants to hide the internal IP address (LAN) from the external network (WAN), the NAT function will translate the internal IP address to a specific IP address, or an internal IP address range to one external IP address. The benefits of using NAT include:

- Uses the N-1 or Port forwarding NAT function to hide the Internal IP address of a critical network or device to increase the level of security of industrial network applications.
- Uses the same private IP address for different, but identical, groups of Ethernet devices. For example, 1-to-1 NAT makes it easy to duplicate or extend identical production lines.

NOTE The NAT function will check if incoming or outgoing packets match the policy. It starts by checking the packet with the first policy (Index=1); if the packet matches this policy, the ToughNet Secure Router will translate the address immediately and then start checking the next packet. If the packet does not match this policy, it will check with the next policy.

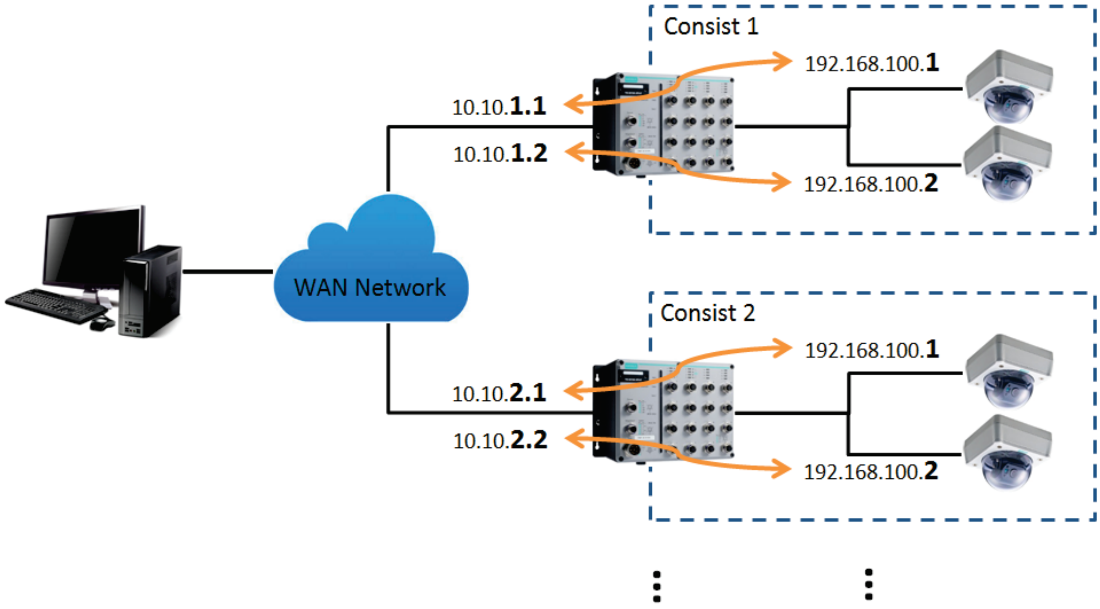
NOTE The maximum number of NAT policies for the ToughNet Secure Router is 512.

1-to-1 NAT

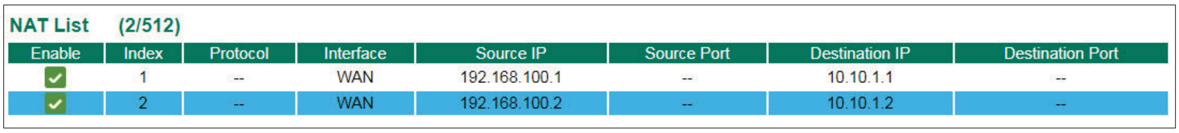
If the internal device and external device need to communicate with each other, choose 1-to-1 NAT, which offers bi-directional communication (N-to-1 and Port forwarding are both single-directional communication NAT functions).

1-to-1 NAT is usually used when you have a group of internal servers with private IP addresses that must connect to the external network. You can use 1-to-1 NAT to map the internal servers to public IP addresses. The IP address of the internal device will not change.

The figure below illustrates how a user could extend production lines, and use the same private IP addresses of internal devices in each production line. The internal private IP addresses of these devices will map to different public IP addresses. Configuring a group of devices for 1-to-1 NAT is easy and straightforward.



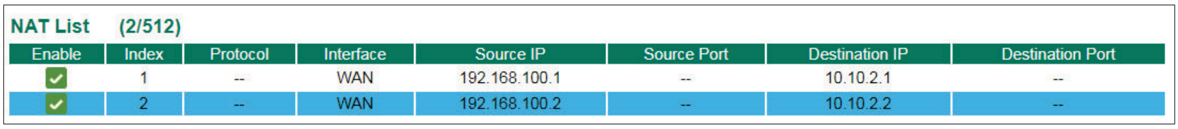
1-to-1 NAT Setting in TN-5916 for Consist 1



NAT List (2/512)

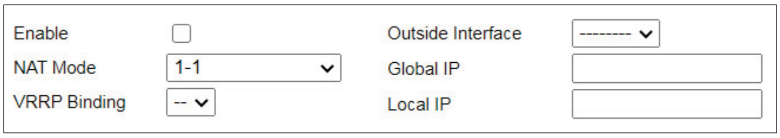
Enable	Index	Protocol	Interface	Source IP	Source Port	Destination IP	Destination Port
☑	1	--	WAN	192.168.100.1	--	10.10.1.1	--
☑	2	--	WAN	192.168.100.2	--	10.10.1.2	--

1-to-1 NAT Setting in TN-5916 for Consist 2



NAT List (2/512)

Enable	Index	Protocol	Interface	Source IP	Source Port	Destination IP	Destination Port
☑	1	--	WAN	192.168.100.1	--	10.10.2.1	--
☑	2	--	WAN	192.168.100.2	--	10.10.2.2	--



Enable	□	Outside Interface	--------
NAT Mode	1-1	Global IP	
VRRP Binding	--	Local IP	

Enable/Disable NAT policy

Setting	Description	Factory Default
Enable or Disable	Enable or disable the selected NAT policy	Disable

NAT Mode

Setting	Description	Factory Default
1-to-1 N-to-1 Port Forwarding	Select the NAT type	1-to-1

VRRP Binding

Setting	Description	Factory Default
VRRP Index	Select the VRRP rule if there are Master and Slave routers using the same NAT 1-1 setting.	None

Outside Interface

Setting	Description	Factory Default
Interface	The interface of the Global IP	None

Global IP

Setting	Description	Factory Default
IP Address	The Global IP address in the LAN network area	None

Local IP

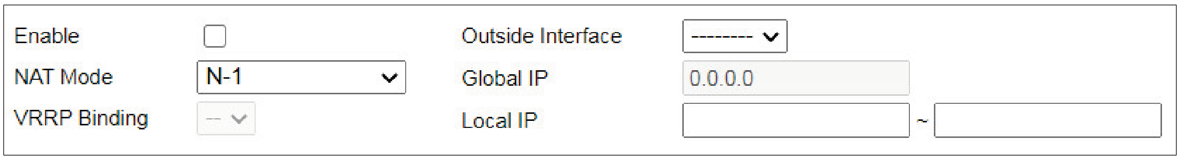
Setting	Description	Factory Default
IP Address	The Local IP address in the LAN network area	None

NOTE The ToughNet Secure Router can obtain an IP address via DHCP or PPPoE. However, if this dynamic IP address is the same as the WAN IP for 1-to-1 NAT, then the 1-to-1 NAT function will not work. For this reason, we recommend disabling the DHCP/PPPoE function when using the 1-to-1 NAT function.

N-to-1 NAT

If the user wants to hide the Internal IP address from users outside the LAN, the easiest way is to use the N-to-1 (or N-1) NAT function. The N-1 NAT function replaces the source IP Address with an external IP address, and adds a logical port number to identify the connection of this internal/external IP address. This function is also called "Network Address Port Translation" (NAPT) or "IP Masquerading."

The N-1 NAT function is a one-way connection from an internal secure area to an external non-secure area. The user can initialize the connection from the internal to the external network, but may not be able to initialize the connection from the external to the internal network.



Enable	□	Outside Interface	--------
NAT Mode	N-1	Global IP	0.0.0.0
VRRP Binding	--	Local IP	~

Enable/Disable NAT Policy

Setting	Description	Factory Default
Enable or Disable	Enable or disable the selected NAT policy	Disable

NAT Mode

Setting	Description	Factory Default
1-to-1 N-to-1 Port Forwarding	Select the NAT type	1-to-1

Outside Interface

Setting	Description	Factory Default
Interface	The interface of the Global IP	None

Global IP

Setting	Description	Factory Default
IP Address	The IP address of the user-selected interface in this N-to-1 policy	None

Local IP

Setting	Description	Factory Default
IP Address	Specify the Local IP range for IP translation to the Global IP address	None

Add a NAT Rule

Checked the "Enable" checkbox and input the correspondent NAT parameters in the page, and then click "New/Insert" to add it into the NAT List Table. Finally, click "Apply" to activate the configuration.

Delete a NAT Rule

Select the item in the NAT List Table, then, click "Delete" to delete the item.

Modify a NAT Rule

Select the item in the NAT List Table. Modify the attributes and click "Modify" to change the configuration.

Activate NAT List Table

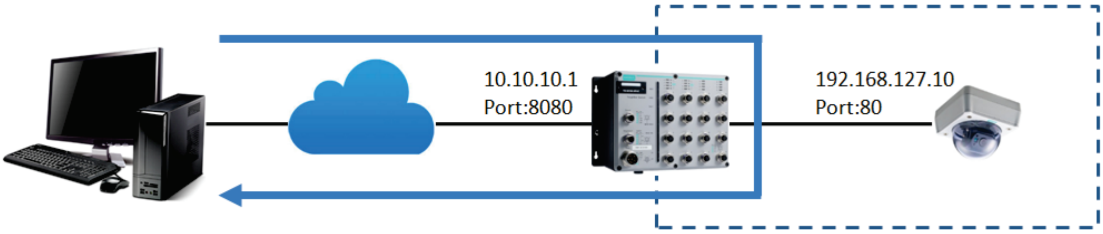
After adding/deleting/modifying any NAT Rules, be sure to click Apply.

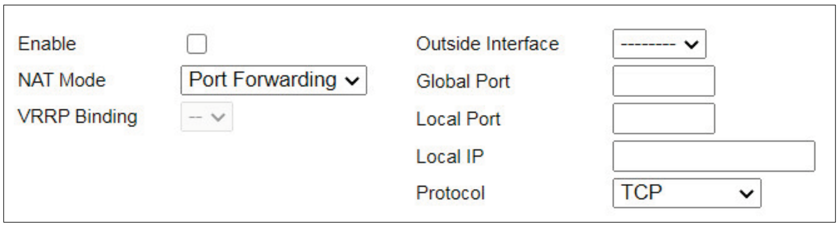
Port Forward

If the initial connection is from outside the LAN, but the user still wants to hide the Internal IP address, one way to do this is to use the Port Forwarding NAT function.

The user can specify the port number of an external IP address in the Port Forwarding policy list. For example, if the IP address of an IP camera on the internal network is 192.168.127.10 with port 80, the user can set up a port forwarding policy to let remote users connect to the internal IP camera from external IP address 10.10.10.10 through port 8080. The ToughNet Secure Router will transfer the packet to IP address 192.168.127.10 through port 80.

The Port Forwarding NAT function is one way of connecting from an external insecure area (WAN) to an internal secure area (LAN). The user can initiate the connection from the external network to the internal network, but will not able to initiate a connection from the internal network to the external network.





Enable	□	Outside Interface	-------- ⌄
NAT Mode	Port Forwarding ⌄	Global Port	
VRRP Binding	-- ⌄	Local Port	
		Local IP	
		Protocol	TCP ⌄

Enable/Disable NAT policy

Setting	Description	Factory Default
Enable or Disable	Enable or disable the selected NAT policy	Disable

NAT Mode

Setting	Description	Factory Default
1-to-1 N-to-1 Port Forwarding	Select the NAT type	1-to-1

Outside Interface

Setting	Description	Factory Default
Interface	The interface of the Global IP	None

Global Port

Setting	Description	Factory Default
1 to 65535	Specify a Global port number	None

Local Port

Setting	Description	Factory Default
1 to 65535	The translated port number in the Local network	None

Local IP

Setting	Description	Factory Default
IP address	The translated IP address in the Local network	WAN IP address

Protocol

Setting	Description	Factory Default
TCP UDP TCP & UDP	Select the protocol for the NAT policy	TCP

7

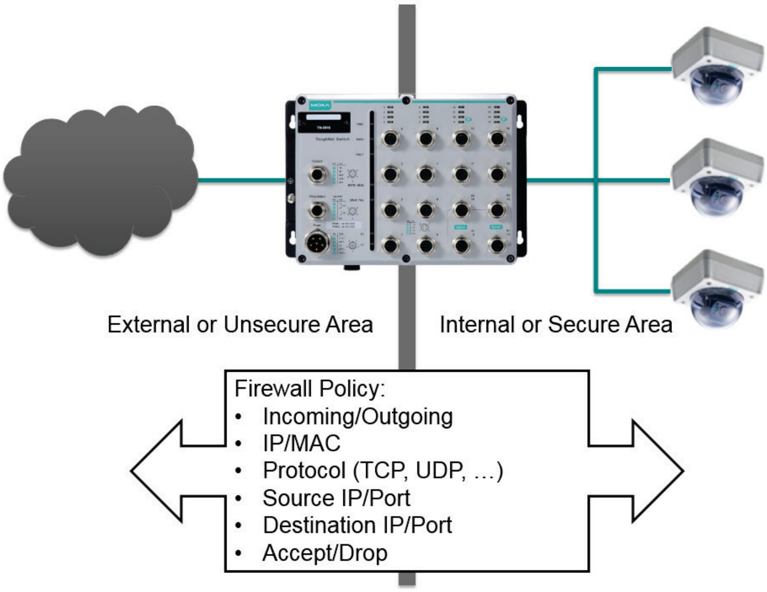
Firewall

The following topics are covered in this chapter:

- ❐ **Policy Concept**
- ❐ **Policy Overview**
- ❐ **Policy Setup**
- ❐ **Quick Automation Profile**
- ❐ **Layer 2 Policy Setup**
- ❐ **Denial of Service (DoS) Defense**

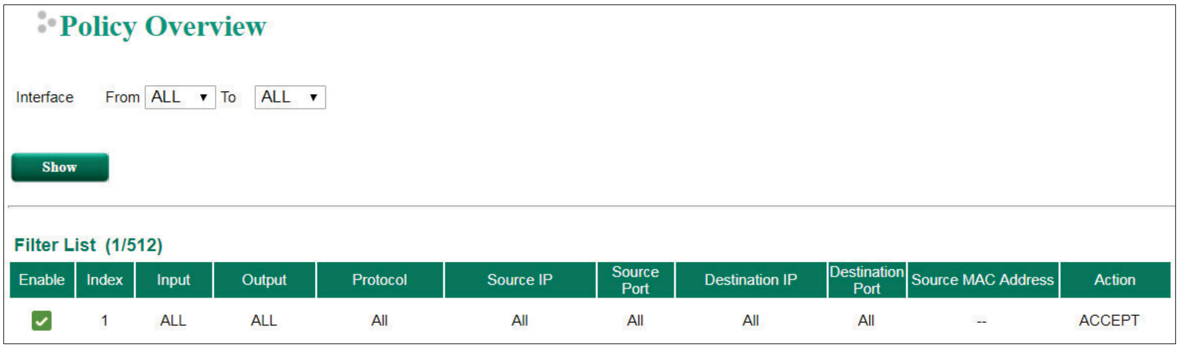
Policy Concept

The ToughNet Secure Router supports Firewall functionality. A firewall device is commonly used to provide secure traffic control over an Ethernet network, as illustrated in the figure below. Firewall devices are deployed at critical points between an external network (the non-secure part) and an internal network (the secure part).



Policy Overview

The ToughNet Secure Router has a Firewall Policy Overview that lists firewall policies by interface direction.



Policy Overview

Interface From ALL ▾ To ALL ▾

Show

Filter List (1/512)

Enable	Index	Input	Output	Protocol	Source IP	Source Port	Destination IP	Destination Port	Source MAC Address	Action
☑	1	ALL	ALL	All	All	All	All	All	--	ACCEPT

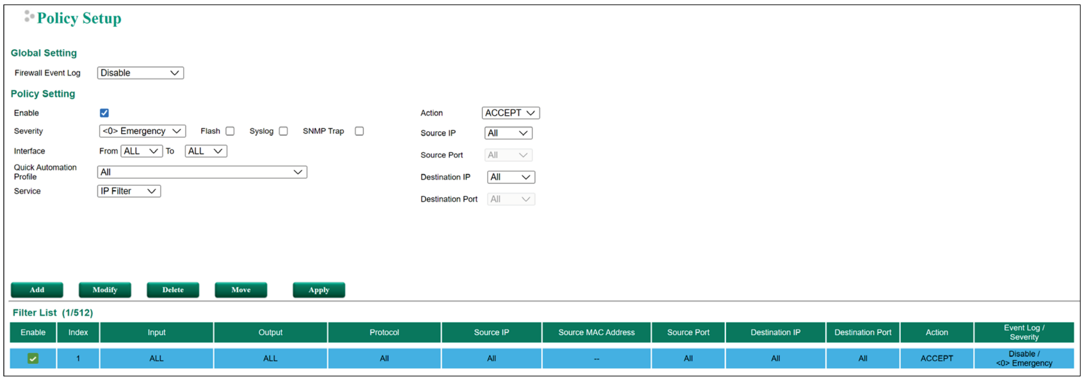
Select the **From** interface and **To** interface and then click the **Show** button. The Policy list table will show the policies that match the **From-To** interface.

Interface From/To

Setting	Description	Factory Default
Interface	Select the From Interface and To Interface	From ALL To ALL

Policy Setup

The ToughNet Secure Router’s Firewall policy provided secure traffic control, allowing users to control network traffic based on the following parameters.



Policy Setup

Global Setting

Firewall Event Log: Disable

Policy Setting

Enable ☑

Severity: <0> Emergency   Flash □   Syslog □   SNMP Trap □

Interface: From ALL To ALL

Quick Automation Profile: All

Service: IP Filter

Action: ACCEPT

Source IP: All

Source Port: All

Destination IP: All

Destination Port: All

Filter List (1/512)

Enable	Index	Input	Output	Protocol	Source IP	Source MAC Address	Source Port	Destination IP	Destination Port	Action	Event Log / Severity
✓	1	ALL	ALL	All	All	--	All	All	All	ACCEPT	Disable / <0> Emergency

Global Setting

Firewall Event Log

Setting	Description	Factory Default
Enable/Disable	Enable or disable the Firewall event log	Enable

Policy Setting

Policy Enable/Disable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the selected Firewall Policy	Enable

Severity

Setting	Description	Factory Default
<0> emergency <1> Alert <2> Critical <3> Error <4> Warning <5> Notice <6> Information <7> Debug	Select the severity level of the selected policy	<0> emergency
Flash Syslog SNMP Trap	Select the warning method for the selected policy	None

Interface From/To

Setting	Description	Factory Default
Interface	Select the From Interface and To Interface	From ALL To ALL

Quick Automation Profile

Setting	Description	Factory Default
Refer to the “Quick Automation Profile” section	Select the Protocol parameters in the Firewall policy	All

Service

Setting	Description	Factory Default
IP Filter	This Firewall policy will filter by IP address	IP Filter
MAC Filter	This Firewall policy will filter by source MAC address	

Action

Setting	Description	Factory Default
ACCEPT	The packet will be accepted by the firewall when it matches this firewall policy	ACCEPT
DROP	The packet will not be accepted by the firewall when it does not match this firewall policy	

Source IP

Setting	Description	Factory Default
All	The Firewall policy will check all Source IP addresses in the packet	All
Single	The Firewall policy will check single Source IP address in the packet	
Range	The Firewall policy will check multiple Source IP addresses in the packet	

Source MAC

Setting	Description	Factory Default
MAC Address	The Firewall policy will check the Source MAC address in the packet.	None

Source Port

Setting	Description	Factory Default
All	The Firewall policy will check all the Source port numbers in the packet	All
Single	The Firewall policy will check the single Source port numbers in the packet	
Range	The Firewall policy will check multiple Source port numbers in the packet	

Destination IP

Setting	Description	Factory Default
All	The Firewall policy will check all Destination IP addresses in the packet	All
Single	The Firewall policy will check single Destination IP address in the packet	
Range	The Firewall policy will check multiple Destination IP addresses in the packet	

Destination Port

Setting	Description	Factory Default
All	The Firewall policy will check all Destination port numbers in the packet	All
Single	The Firewall policy will check single Destination port numbers in the packet	
Range	The Firewall policy will check multiple Destination port numbers in the packet	

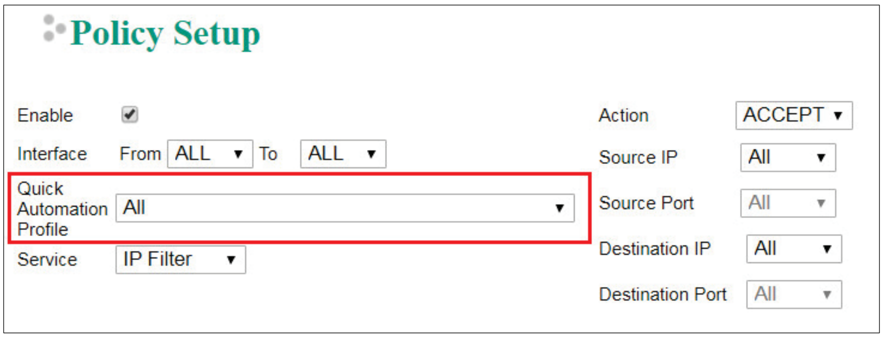
NOTE The ToughNet Secure Router's firewall function will check if incoming or outgoing packets match the firewall policy. It starts by checking the packet with the first policy (Index=1); if the packet matches this policy, it will accept the packet immediately and then check the next packet. If the packet does not match this policy it will check with the next policy.

NOTE The maximum number of Firewall policies for the ToughNet Secure Router TN-5916 is 512.

Quick Automation Profile

Ethernet Fieldbus protocols are popular in industrial automation applications. In fact, many Fieldbus protocols (e.g., EtherNet/IP and Modbus TCP/IP) can operate on an industrial Ethernet network, with the Ethernet port number defined by IANA (Internet Assigned Numbers Authority). The ToughNet Secure Router provides an easy to use function called Quick Automation Profile that includes many different pre-defined profiles (Modbus TCP/IP, Ethernet/IP, etc.), allowing users to create an industrial Ethernet Fieldbus firewall policy with a single click.

For example, if the user wants to create a Modbus TCP/IP firewall policy for an internal network, the user just needs to select the **Modbus TCP/IP (TCP)** or **Modbus TCP/IP (UDP)** protocol from the **Quick Automation Profile** drop-down menu on the Firewall Policy Setting page.



Policy Setup

Enable ☑

Interface From ALL To ALL

Quick Automation Profile All

Service IP Filter

Action ACCEPT

Source IP All

Source Port All

Destination IP All

Destination Port All

The following table shows the Quick Automation Profile for Ethernet Fieldbus Protocol and the corresponding port number.

Ethernet Fieldbus Protocol	Port Number
EtherNet/IP I/O (TCP)	2222
EtherNet/IP I/O (UDP)	2222
EtherNet/IP Messaging (TCP)	44818
EtherNet/IP Messaging (UDP)	44818
FF Annunciation (TCP)	1089
FF Annunciation (UDP)	1089
FF Fieldbus Message Specification (TCP)	1090
FF Fieldbus Message Specification (UDP)	1090
FF System Management (TCP)	1091
FF System Management (UDP)	1091
FF LAN Redundancy Port (TCP)	3622
FF LAN Redundancy Port (UDP)	3622
LonWorks (TCP)	2540
LonWorks (UDP)	2540
LonWorks2 (TCP)	2541
LonWorks2 (UDP)	2541
Modbus TCP/IP (TCP)	502
Modbus TCP/IP (UDP)	502
PROFInet RT Unicast (TCP)	34962
PROFInet RT Unicast (UDP)	34962
PROFInet RT Multicast (TCP)	34963
PROFInet RT Multicast (UDP)	34963
PROFInet Context Manager (TCP)	34964
PROFInet Context Manager (UDP)	34964
IEC 60870-5-104 process control over IP (TCP)	2404
IEC 60870-5-104 process control over IP (UDP)	2404
DNP (TCP)	20000

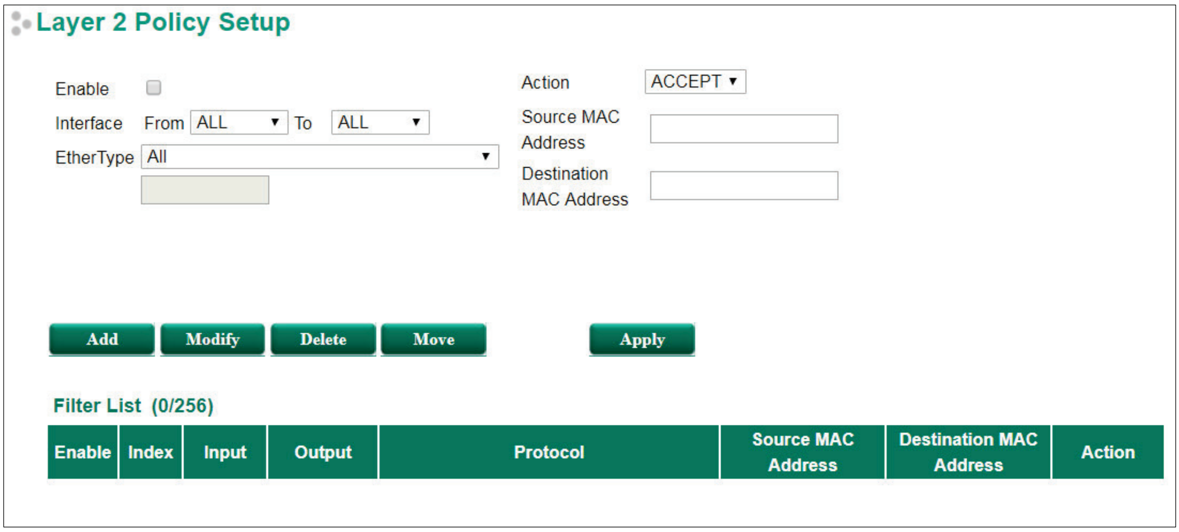
Ethernet Fieldbus Protocol	Port Number
DNP (UDP)	20000
Ethercat (TCP)	34980
Ethercat (UDP)	34980

The Quick Automation Profile also includes the commonly used Ethernet protocols listed in the following table.

Ethernet Protocol	Port Number
IPsec NAT-Traversal (TCP)	4500
IPsec NAT-Traversal (UDP)	4500
FTP-data (TCP)	20
FTP-data (UDP)	20
FTP-control (TCP)	21
FTP-control (UDP)	21
SSH (TCP)	22
SSH (UDP)	22
Telnet (TCP)	23
Telnet (UDP)	23
HTTP (TCP)	80
HTTP (UDP)	80
IPsec (TCP)	1293
IPsec (UDP)	1293
L2TP (TCP)	1701
L2TP (UDP)	1701
PPTP (TCP)	1723
PPTP (UDP)	1723
RADIUS (TCP)	1812
RADIUS (UDP)	1812
RADIUS Accounting (TCP)	1813
RADIUS Accounting (UDP)	1813
TRDP PD (UDP)	17224
TRDP MD (TCP)	17225
TRDP MD (UDP)	17225

Layer 2 Policy Setup

The ToughNet Secure Router provides an advanced Layer 2 firewall policy for secure traffic control, which depends on the following parameters. Layer 2 firewall policy can filter packets from bridge ports. Layer 2 policy priority is higher than the Layer 3 policy.



Layer 2 Policy Setup

Enable □

Interface From ALL To ALL

EtherType All

Action ACCEPT

Source MAC Address

Destination MAC Address

Filter List (0/256)

Enable	Index	Input	Output	Protocol	Source MAC Address	Destination MAC Address	Action

Policy Enable/Disable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the selected Firewall Policy	Disable

Interface From/To

Setting	Description	Factory Default
Port	Select the From Port and To Port	From ALL To ALL

EtherType

Setting	Description	Factory Default
0x0600 to 0xFFFF	Select the EtherType parameter in the Firewall policy. When the Protocol is set to "Manual" you can set up EtherType manually	All

Action

Setting	Description	Factory Default
ACCEPT	The packet will be accepted by the firewall when it matches this firewall policy	ACCEPT
DROP	The packet will not be accepted by the firewall when it does not match this firewall policy	

Source MAC Address

Setting	Description	Factory Default
MAC Address	The Firewall policy will check the Source MAC address in the packet	None

Destination MAC Address

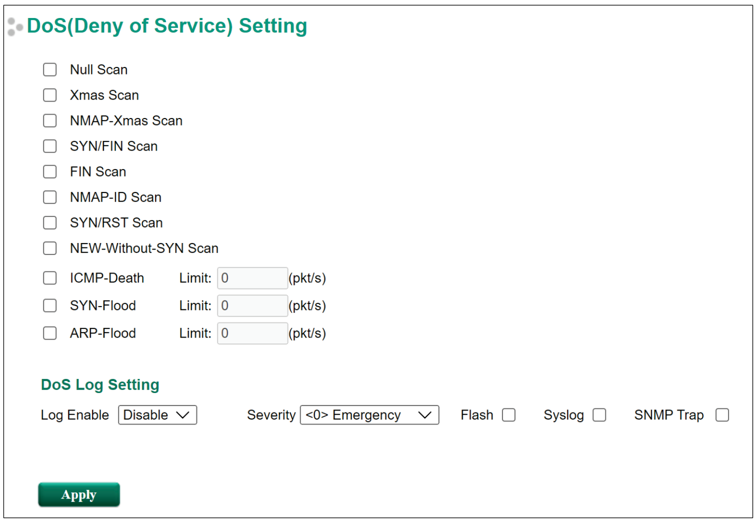
Setting	Description	Factory Default
MAC Address	The Firewall policy will check Destination MAC address in the packet	None

The following table shows the Layer 2 protocol types commonly used in Ethernet frames.

Layer 2 Protocol	Type
IPv4 (Internet Protocol version 4)	0x0800
X.25	0x0805
ARP (Address Resolution Protocol)	0x0806
Frame Relay ARP	0x0808
G8BPQ AX.25 Ethernet Packet	0x08FF
DEC Assigned proto	0x6000
DEC DNA Dump/Load	0x6001
DEC DNA Remote Console	0x6002
DEC DNA Routing	0x6003
DEC LAT	0x6004
DEC Diagnostics	0x6005
DEC Customer use	0x6006
DEC Systems Comms Arch	0x6007
Trans Ether Bridging	0x6558
Raw Frame Relay	0x6559
Appletalk AARP	0x80F3
Appletalk	0x809B
Novell IPX	0x8100
NetBEUI	0x8137
IP version 6 (Internet Protocol version 6)	0x8191
PPP	0x86DD
MultiProtocol over ATM	0x880B
PPPoE discovery messages	0x884C
PPPoE session messages	0x8863
Frame-based ATM Transport over Ethernet	0x8864
Loopback	0x8884

Denial of Service (DoS) Defense

The ToughNet Secure Router provides many different DoS functions for detecting or defining abnormal packet format or traffic flow. The ToughNet Secure Router will drop the packets when it detects an abnormal packet format. The ToughNet Secure Router will also monitor some traffic flow parameters and activate the defense process when abnormal traffic conditions are detected.



DoS(Deny of Service) Setting

□ Null Scan
□ Xmas Scan
□ NMAP-Xmas Scan
□ SYN/FIN Scan
□ FIN Scan
□ NMAP-ID Scan
□ SYN/RST Scan
□ NEW-Without-SYN Scan
□ ICMP-Death Limit: 0 (pkt/s)
□ SYN-Flood Limit: 0 (pkt/s)
□ ARP-Flood Limit: 0 (pkt/s)

DoS Log Setting

Log Enable: Disable Severity: <0> Emergency Flash □ Syslog □ SNMP Trap □

Null Scan

Setting	Description	Factory Default
Enable/Disable	Enable or disable the Null Scan	Disable

Xmas Scan

Setting	Description	Factory Default
Enable/Disable	Enable or disable the Xmas Scan	Disable

NMAP-Xmas Scan

Setting	Description	Factory Default
Enable/Disable	Enable or disable the NMAP-Xmas Scan	Disable

SYN/FIN Scan

Setting	Description	Factory Default
Enable/Disable	Enable or disable the SYN/FIN Scan	Disable

FIN Scan

Setting	Description	Factory Default
Enable/Disable	Enable or disable the FIN Scan	Disable

NMAP-ID Scan

Setting	Description	Factory Default
Enable/Disable	Enable or disable the NMAP-ID Scan	Disable

SYN/RST Scan

Setting	Description	Factory Default
Enable/Disable	Enable or disable the SYN/RST Scan	Disable

NEW-Without-SYN Scan

Setting	Description	Factory Default
Enable/Disable	Enable or disable the NEW-Without-SYN Scan	Disable

ICMP-Death

Setting	Description	Factory Default
Enable/Disable	Enable or disable the ICMP-Death defense	Disable
Limit: 50 to 4000 (Packet/Second)	The limit value to activate ICMP-Death defense	0

SYN-Flood

Setting	Description	Factory Default
Enable/Disable	Enable or disable the SYN-Flood defense	Disable
Limit: 50 to 4000 (Packet/Second)	The limit value to activate SYN-Flood defense	0

ARP-Flood

Setting	Description	Factory Default
Enable/Disable	Enable or disable the ARP-Flood defense	Disable
Limit: 50 to 4000 (Packet/Second)	The limit value to activate ARP-Flood defense	0

DoS Log Setting

Log Enable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the DoS log	Disable

Severity

Setting	Description	Factory Default
<0> emergency <1> Alert <2> Critical <3> Error <4> Warning <5> Notice <6> Information <7> Debug	Select the severity level of the DoS log	<0> emergency
Flash Syslog SNMP Trap	Select the warning method for the DoS log	None

8

Virtual Private Network (VPN)

The following topics are covered in this chapter:

Overview

In this section we describe how to use the ToughNet Secure Router to build a secure Remote Automation network with the VPN (Virtual Private Network) feature. A VPN provides a highly cost effective solution of establishing secure tunnels, so that data can be exchanged in a secure manner.

There are three several applications for secure remote communication:

IPsec (Internet Protocol Security) VPN for LAN to LAN Security: Data communication only in a pre-defined IP range between two different LANs.

L2TP (Layer 2 Tunnel Protocol) VPN for Remote roaming User: It is for a remote roaming user with a dynamic IP to create a VPN. L2TP is a popular choice for remote roaming users for VPN applications because the L2TP VPN protocol is already built in to the Microsoft Windows operating system.

IPsec uses IKE (Internet Key Exchange) protocol for Authentication, Key exchange and provides a way for the VPN gateway data to be protected by different encryption methods.

There are 2 phases for IKE for negotiating the IPsec connections between 2 VPN gateways:

Key Exchange (IPsec Phase 1): The 2 VPN gateways will negotiate how IKE should be protected. Phase 1 will also authenticate the two VPN gateways by the matched Pre-Shared Key or X.509 Certificate.

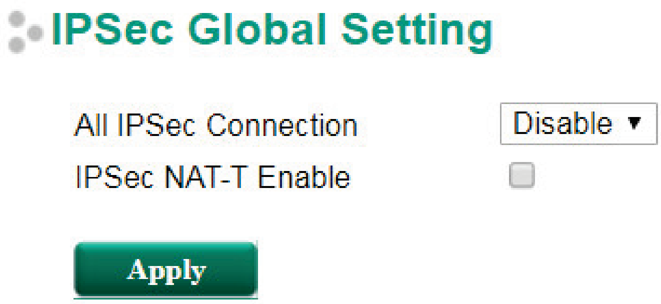
Data Exchange (IPsec Phase 2): In Phase 2, the VPN gateways negotiate to determine additional IPsec connection details, which include the data encryption algorithm.

IPsec Configuration

IPsec configuration includes 5 parts:

- **Global Setting:** Enable or Disable all IPsec Tunnels and NAT-Traversal functions
- **Tunnel Setting:** Set up the VPN Connection type and the VPN network plan
- **Key Exchange:** Authentication for 2 VPN gateways
- **Data Exchange:** Data encryption between VPN gateways
- **Dead Peer Detection:** The mechanism for VPN Tunnel maintenance

Global Settings



IPSec Global Setting

All IPSec Connection: Disable ▾

IPSec NAT-T Enable: □

The ToughNet Secure Router provides 3 Global Settings for IPsec VPN applications.

All IPsec Connection

Users can Enable or Disable all IPsec VPN services with this configuration.

NOTE The factory default setting is Disable, so when the user wants to use IPsec VPN function, make sure the setting is enabled.

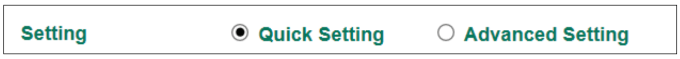
IPsec NAT-T Enable

If there is an external NAT device between VPN tunnels, the user must enable the NAT-T (NAT-Traversal) function.

IPsec Settings

IPsec Quick Setting

The ToughNet Secure Router's **Quick Setting** mode can be used to easily set up a site-to-site VPN tunnel for two Industrial Secure Router units.



Setting ● Quick Setting ○ Advanced Setting

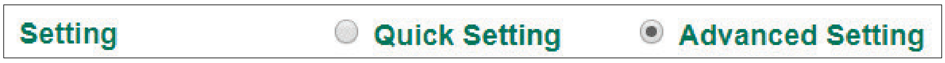
When choosing the Quick setting mode, the user just needs to configure the following:

- Tunnel Setting
- Security Setting
  - Encryption Strength: Simple (AES-128), Standard (AES-192), Strong (AES-256)
  - Password of Pre-Shared Key

NOTE The Encryption strength and Pre-Shared key should be configured identically for both ToughNet Secure Router units.

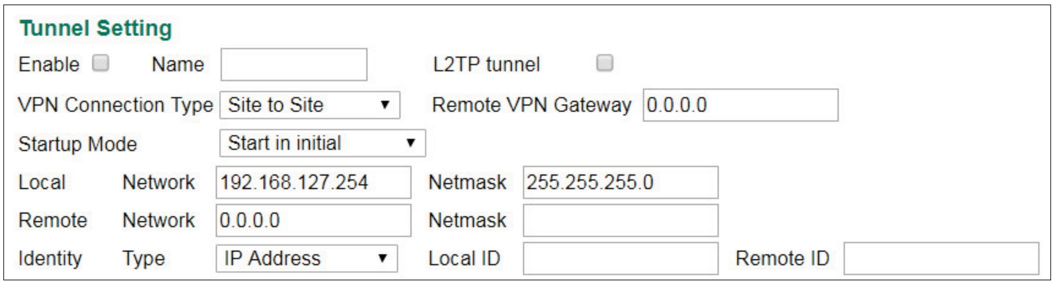
IPsec Advanced Setting

Click **Advanced Setting** to configure detailed VPN settings.



Setting ○ Quick Setting ● Advanced Setting

Tunnel Setting



Tunnel Setting

Enable □	Name		L2TP tunnel	□		
VPN Connection Type		Site to Site ▼	Remote VPN Gateway	0.0.0.0		
Startup Mode		Start in initial ▼				
Local	Network	192.168.127.254	Netmask	255.255.255.0		
Remote	Network	0.0.0.0	Netmask			
Identity	Type	IP Address ▼	Local ID		Remote ID	

Enable or Disable VPN Tunnel

Setting	Description	Factory Default
Enable or Disable	Enable or Disable this VPN Tunnel	Disable

Name of VPN Tunnel

Setting	Description	Factory Default
Max. of 16 characters	User defined name of this VPN Tunnel.	None

NOTE The first character cannot be a number.

L2TP over IPsec Enable or Disable

Setting	Description	Factory Default

Enable or Disable	Enable or Disable L2TP over IPsec	None

VPN Connection Type

Setting	Description	Factory Default
Site to Site	VPN tunnel for Local and Remote subnets are fixed	Site to Site
Site to Site (Any)	VPN tunnel for Remote subnet area is dynamic and Local subnet is fixed	

Remote VPN Gateway

Setting	Description	Factory Default
IP Address	Remote VPN Gateway's IP Address	0.0.0.0

Startup Mode

Setting	Description	Factory Default
Start in Initial	This VPN tunnel will actively initiate the connection with the Remote VPN Gateway.	Start in Initial
Wait for Connecting	This VPN tunnel will wait remote VPN gateway to initiate the connection	

NOTE The maximum number of **Starts** in the initial VPN tunnel is 30. The maximum number of **Waits** for connecting to a VPN tunnel is 100.

Local Network

Setting	Description	Factory Default
Network	The IP address of the local VPN network.	192.168.127.254

Netmask

Setting	Description	Factory Default
Netmask	The subnet mask of the local VPN network.	255.255.255.0

Remote Network

Setting	Description	Factory Default
Network	IP address of remote VPN network.	0.0.0.0

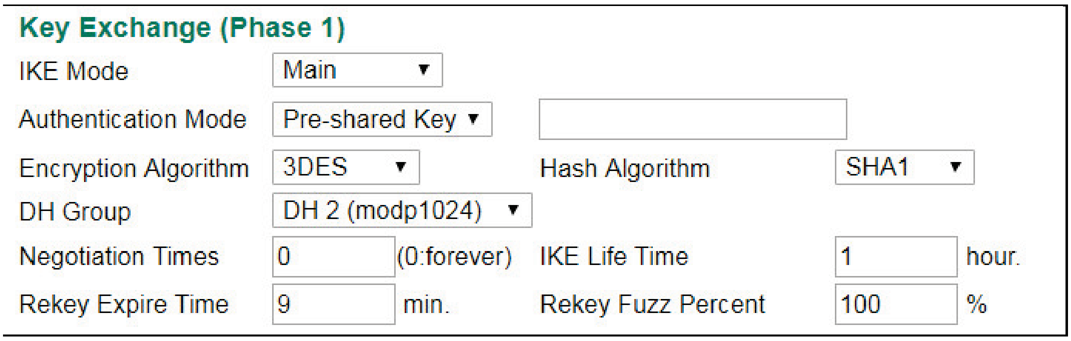
Netmask

Setting	Description	Factory Default
Netmask	The subnet mask of the remote VPN network.	None

Identity

Setting	Description	Factory Default
Type	There are four ID types for users to choose from: IP address, FQDN, Key ID, and Auto. Key ID is a string, which users can create by themselves. Auto (with Cisco) is for building connections for use with Cisco's systems.	IP address
Local ID	ID for identifying the VPN tunnel connection. The Local ID must be equal to the Remote ID of the connected VPN Gateway. Otherwise, the VPN tunnel cannot be established successfully	
Remote ID	ID for identifying the VPN tunnel connection. The Local ID must be equal to the Remote ID of the connected VPN Gateway. Otherwise, the VPN tunnel cannot be established successfully	

Key Exchange (IPsec phase 1)



Key Exchange (Phase 1)

IKE Mode	Main ▼		
Authentication Mode	Pre-shared Key ▼		
Encryption Algorithm	3DES ▼	Hash Algorithm	SHA1 ▼
DH Group	DH 2 (modp1024) ▼		
Negotiation Times	0 (0:forever)	IKE Life Time	1 hour.
Rekey Expire Time	9 min.	Rekey Fuzz Percent	100 %

IKE Mode

Setting	Description	Factory Default
Main	In 'Main' IKE Mode, both the Remote and Local VPN gateway will negotiate which Encryption/Hash algorithm and DH groups can be used in this VPN tunnel; both VPN gateways must use the same algorithm to communicate.	MAIN
Aggressive	In "Aggressive" Mode, the Remote and Local VPN gateway will not negotiate the algorithm; it will use the user's configuration only.	

Authentication Mode

Setting	Description	Factory Default
Pre-Shared Key	When two systems use a Pre-Shared Key which users define as an authentication tool to build an IPsec VPN connection.	Pre-Shared Key
X.509	In this mode, two systems use certificates that users imported in advance in "Local Certificate" as an authentication tool to build an IPsec VPN connection. For the detailed workflow, please refer to User Scenario 1 and 2 later in this chapter.	N/A
X.509 With CA	In this mode, two systems use certificates that users imported in advance in "Local Certificate", and the CA that users imported in advance in "Trusted CA Certificate" as an authentication tool to build an IPsec VPN connection. For the detailed workflow, please refer to User Scenario 3, 4, and 5 later in this chapter.	N/A

For the detailed workflow of X.509 and X.509 with CA, please refer to the user scenarios 1 to 5 below later in this chapter.

NOTE Certificates are a time related form of authentication. Before processing certificates, please ensure that the industrial secure router is synced with the local device. For more information about time sync, please refer to the Date and Time section.

Encryption Algorithm

Setting	Description	Factory Default
DES 3DES AES-128 AES-192 AES-256	Encryption Algorithm in key exchange	3DES

Hash Algorithm

Setting	Description	Factory Default
Any MD5 SHA1 SHA-256	Hash Algorithm in key exchange	SHA1

DH Group

Setting	Description	Factory Default

DH1(modp 768)
DH2(modp 1024)
DH5(modp 1536)
DH14(modp 2048)
	Diffie-Hellman groups (the Key Exchange group between the Remote and VPN Gateways)	DH2(modp 1024)

Negotiation Time

Setting	Description	Factory Default
Negotiation time	The number of allowed reconnect times when startup mode is initiated. If the number is 0, this tunnel will always try connecting to the remote gateway when the VPN tunnel is not created successfully.	0

IKE Lifetime

Setting	Description	Factory Default
IKE lifetime (hours)	Lifetime for IKE SA	1 (hr)

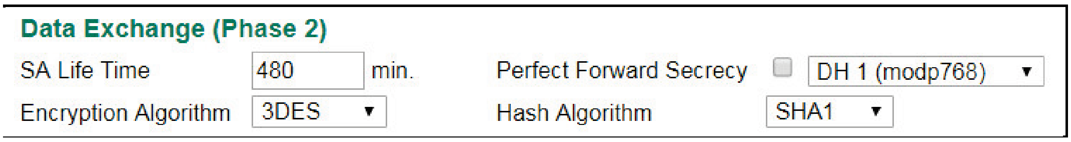
Rekey Expire Time

Setting	Description	Factory Default
Rekey expire time (minutes)	Start to Rekey before the IKE lifetime has expired	9 (min)

Rekey Fuzz Percent

Setting	Description	Factory Default
0-100 (%)	The key exchange interval will change randomly to enhance security. "Rekey Expire Time" is the baseline interval to exchange keys. Rekey fuzz percent represents the percentage of how much "Rekey Expire Time" will change. For example, the "Rekey Expire Time" is set as 9 mins, and "Rekey Fuzz Percent" is set as 50%. The key exchange interval will be 4.5 mins.	100%

Data Exchange (IPsec phase 2)



Data Exchange (Phase 2)

SA Life Time 480 min.

Perfect Forward Secrecy □ DH 1 (modp768)

Encryption Algorithm 3DES

Hash Algorithm SHA1

SA Lifetime

Setting	Description	Factory Default
SA lifetime (minutes)	Lifetime for SA in Phase 2	480 (min)

Perfect Forward Secrecy

Setting	Description	Factory Default
Enable or Disable	Uses different security keys for different IPsec phases in order to enhance security	Disable

DH1 (modp768) DH2 (modp1024) DH5 (modp1536) DH14 (modp2048)	Diffie-Hellman groups (the Key Exchange group between the Remote and VPN Gateways)	DH1 (modp768)

Encryption Algorithm

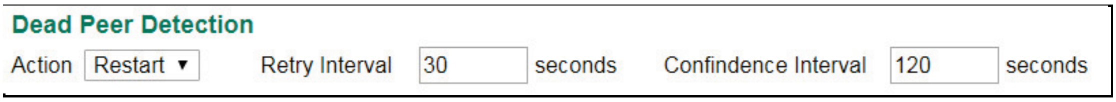
Setting	Description	Factory Default
DES 3DES AES-128 AES-192 AES-256 NULL	Encryption Algorithm in data exchange	3DES

Hash Algorithm

Setting	Description	Factory Default
Any MD5 SHA1 SHA-256	Hash Algorithm in data exchange	SHA1

Dead Peer Detection

Dead Peer Detection is a mechanism to detect whether or not the connection between a local secure router and a remote IPsec tunnel has been lost.



Dead Peer Detection

Action Restart ▼ Retry Interval 30 seconds Confindence Interval 120 seconds

Action

Action when a dead peer is detected.

Setting	Description	Factory Default
Hold	Hold this VPN tunnel	Restart
Restart	Reconnect this VPN tunnel	
Disable	Disable Dead Peer Detection	

Delay

Setting	Description	Factory Default
Delay time (seconds)	The period of dead peer detection messages	30 (sec)

Timeout

Setting	Description	Factory Default
Timeout (seconds)	Timeout to check if the connection is alive or not	120 (sec)

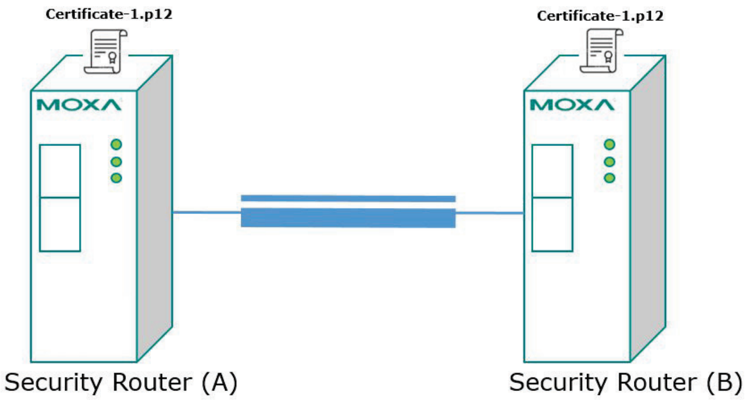
IPsec Use Case Demonstration

In the following section, we will consider five common user scenarios. The purpose of each example is to give a clearer understanding of two authentication modes 'X.509' and 'X.509 with CA'.

NOTE Certificates are a time related form of authentication. Before processing certificates, please ensure that the ToughNet Secure Router is synced with the local device. For more information about time sync, please refer to the Date and Time section.

Scenario 1: X.509 Mode-One Certificate

Users will sometimes use certificates generated from a server or from the Internet. If users only get one certificate, they can import this certificate into a system. This system can then use the same certificate to identify other certificates and then build a VPN connection. In this case, users have to import certificates (.p12) into both sides. Please follow the steps in the diagram below to learn how to install certificates and build an IPSec VPN connection.

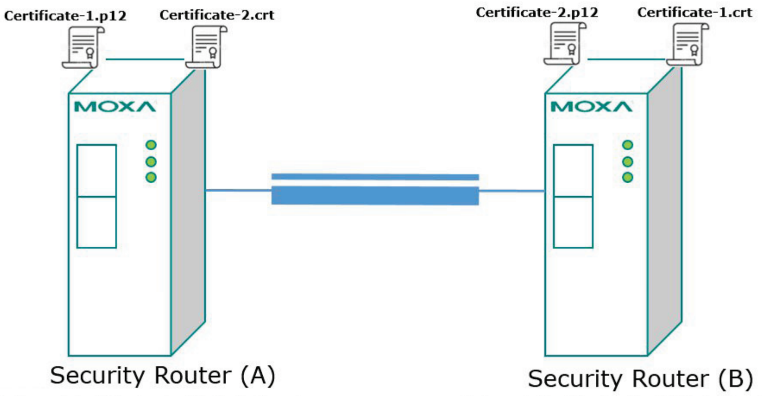


1. Import **Certificate-1.p12** file in "Local Certificate", and label it a number. Here take No.1 as an example.
2. Enter "IPSec setting", and in "Advanced Setting", select X.509 authentication mode.
3. In "Local", select No.1
4. In "Remote", select No.1

1. Import **Certificate-1.p12** file in "Local Certificate", and label it a number. Here take No.1 as an example.
2. Enter "IPSec setting", and in "Advanced Setting", select X.509 authentication mode.
3. In "Local", select No.1
4. In "Remote", select No.1

Scenario 2: X.509 Mode-Two Certificates

Users will sometimes use certificates generated from a server or from the Internet. If users get different certificates for different systems, users can import these certificates into systems accordingly. However, systems require all of these certificates to identify trusted systems before building an IPsec VPN connection. Taking two systems as an example: System A has certificate-1 (.p12) and System B has certificate-2 (.p12). To build an IPsec VPN connection, System A and B have to exchange certificates (.crt) with each other. And then Systems A and B need to install certificates (.crt) into their systems. Please follow the steps in the diagram below to learn how to install certificates and build an IPsec VPN connection.

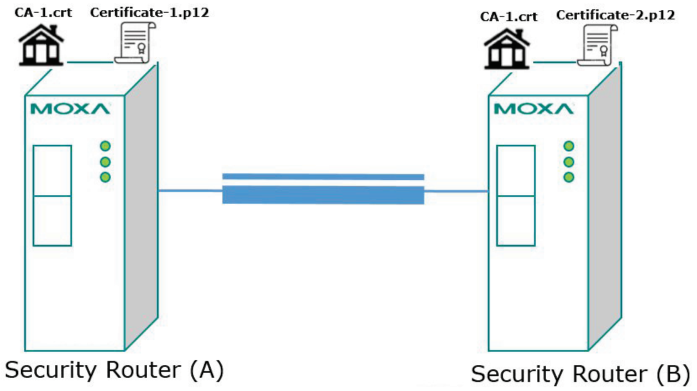


1. Import **Certificate-1.p12** file in "Local Certificate", and label it a number. Here take No.1 as an example.
2. Import **Certificate-2.crt** file or **Certificate-2.p12** file in "Local Certificate", and label it a number. Here take No.2 as an example.
3. Enter "IPSec setting", and in "Advanced Setting", select X.509 authentication mode.
4. In "Local", select No.1
5. In "Remote", select No.2

1. Import **Certificate-2.p12** file in "Local Certificate", and label it a number. Here take No.1 as an example.
2. Import **Certificate-1.crt** file or **Certificate-1.p12** file in "Local Certificate", and label it a number. Here take No.2 as an example.
3. Enter "IPSec setting", and in "Advanced Setting", select X.509 authentication mode.
4. In "Local", select No.2
5. In "Remote", select No.1

Scenario 3: X.509 with CA Mode-One CA

In X.509 mode, users have to install all certificates in all systems, which takes a lot of time and effort. To decrease users' effort, they can get the certificate from the CA (Certificate Authority). When using certificates from the CA, each system needs to install the same CA (.crt) to allow each system to identify different certificates from different systems. One condition is that every certificate should be issued by the same CA. Please follow the steps in the diagram below to learn how to install CA (.crt) and build an IPsec connection.



Security Router (A)

1. Import **Certificate-1.p12** file in “Local Certificate”, and label it a number. Here take No.1 as an example.

2. Import **CA-1.crt** file in “Trusted CA Certificate”.

3. Enter “IPSec setting”, and in “Advanced Setting”, select X.509 With CA authentication mode.

4. In “Local”, select No.1

Security Router (B)

1. Import **Certificate-2.p12** file in “Local Certificate”, and label it a number. Here take No.2 as an example.

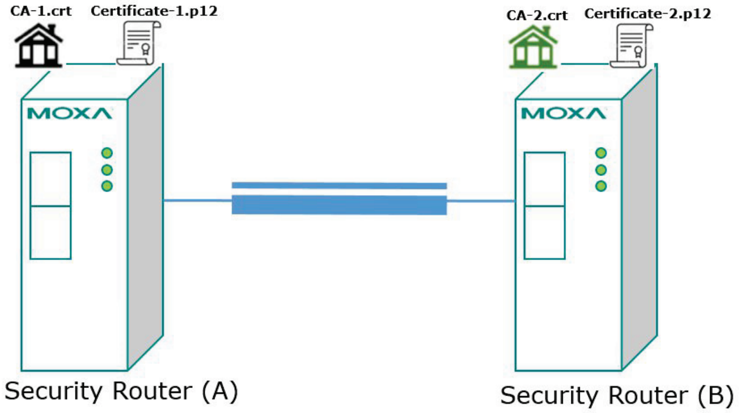
2. Import **CA-1.crt** file in “Trusted CA Certificate”.

3. Enter “IPSec setting”, and in “Advanced Setting”, select X.509 With CA authentication mode.

4. In “Local”, select No.2

Scenario 4: X.509 with CA Mode-Two CAs

In some large-scale systems, users may find it difficult to get certificates from one CA and therefore need to get certificates from different CAs. This scenario applies to the X.509 CA mode. The users have to install all CAs (.crt) into all systems. This means that every system can recognize certificates from different CAs, which allows identification of all the different systems. Please follow the steps in the diagram below to learn how to install CA (.crt) and certificate (.p12) in order to build an IPsec connection.



Security Router (A)

1. Import **Certificate-1.p12** file in “Local Certificate”, and label it a number. Here take No.1 as an example.

2. Import **Import CA-1.crt file and CA-2.crt file** in “Trusted CA Certificate”.

3. Enter “IPSec setting”, and in “Advanced Setting”, select X.509 With CA authentication mode.

4. In “Local”, select No.1

Security Router (B)

1. Import **Certificate-2.p12** file in “Local Certificate”, and label it a number. Here take No.2 as an example.

2. **Import CA-1.crt file and CA-2.crt file** in “Trusted CA Certificate”.

3. Enter “IPSec setting”, and in “Advanced Setting”, select X.509 With CA authentication mode.

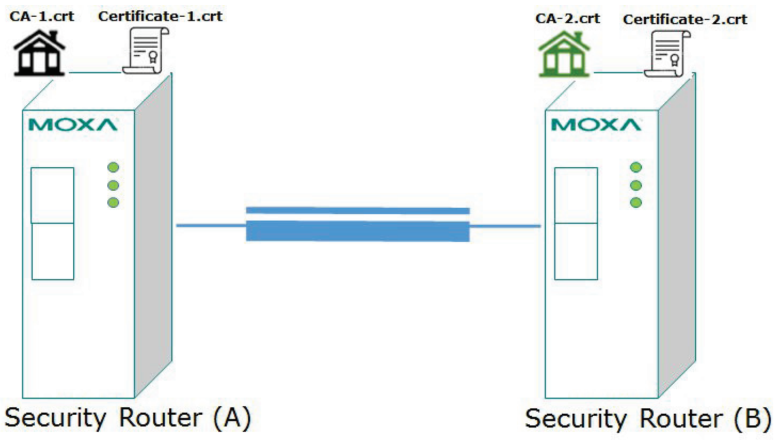
4. In “Local”, select No.2

Scenario 5: X.509 with CA Mode-Certificate from CSR

For the previous four user scenarios, even when systems use certificates to identify each other before building a VPN connection, there is still a risk that someone can steal the certificate and pretend to be part of the trusted system.

To minimize this risk, there is a function called Certificate Signing Request (CSR) in X.509 with CA mode. CSR is a request issued by a single system for certificates issued by the CA. Through CSR, the certificate belongs only to one system and cannot be installed in other systems. By following this method, CSR significantly reduces the risk of certificates being used illegitimately.

We will now consider an example using System A and System B. The CSR working model is System A or B issues a CSR (.csr) to the CA and then the CA updates the system with the certificate (.crt) and the CA file (.crt). Then, system A or B updates the other system with the CA file (.crt). System A or B installs certificates and the CA file in the system in order to build a VPN connection. Please follow the steps in the diagram below to learn how to install a CA file (.crt) and certificate (.crt) in order to build IPsec connections.



Security Router (A)

1. Generate Key in “Key Pair Generate”, and give it a name. Here take One as an example.

2. Generate CSR in “CSR Generate”. Select One in “Private Key”. Name this CSR in “Common Name”. Here name this CSR as Certificate-1 as an example.

3. Export **Certificate-1.csr** file and send it to CA-1.

4. Download **Certificate-1.crt** and **CA-1.crt** from CA-1.

5. Import **Certificate-1.crt** file in “Local Certificate. In “Import Identity Certificate” select “Certificate From CSR”. In “CSR Common Name” select **Certificate-1.csr**.

6. Import **CA-2.crt** file in “Trusted CA Certificate.

7. Enter “IPSec setting”, and in “Advanced Setting”, select X.509 With CA authentication mode.

8. In “Local”, select No.1

Security Router (B)

1. Generate Key in “Key Pair Generate”, and give it a name. Here take Two as an example.

2. Generate CSR in “CSR Generate”. Select Two in “Private Key”. Name this CSR in “Common Name”. Here name this CSR as Certificate-2 as an example.

3. Export **Certificate-2.csr** file and send it to CA-2.

4. Download **Certificate-2.crt** and **CA-2.crt** from CA-1.

5. Import **Certificate-2.crt** file in “Local Certificate. In “Import Identity Certificate” select “Certificate From CSR”. In “CSR Common Name” select **Certificate-2.csr**.

6. Import **CA-1.crt** file in “Trusted CA Certificate.

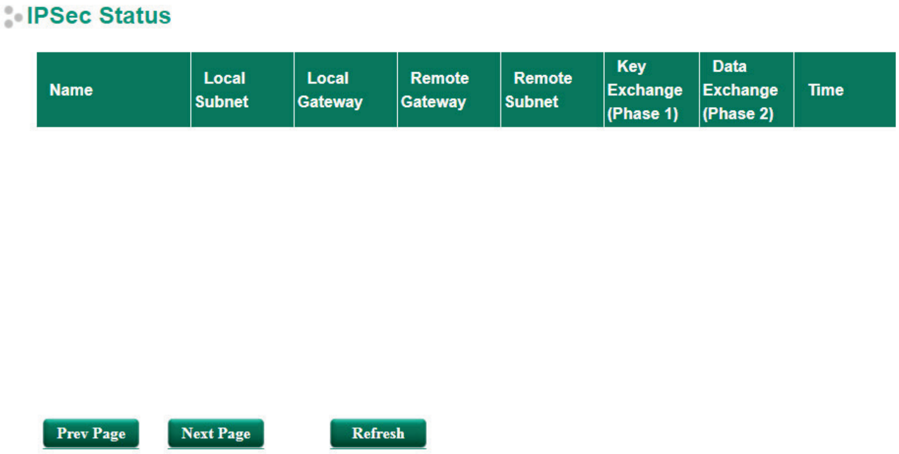
7. Enter “IPSec setting”, and in “Advanced Setting”, select X.509 With CA authentication mode.

8. In “Local”, select No.2

IPsec Status

The user can check the VPN tunnel status in the **IPsec Connection List**.

This list shows the Name of the IPSec tunnel, IP address of Local and Remote Subnet/Gateway, and the established status of the Key exchange phase and Data exchange phase.



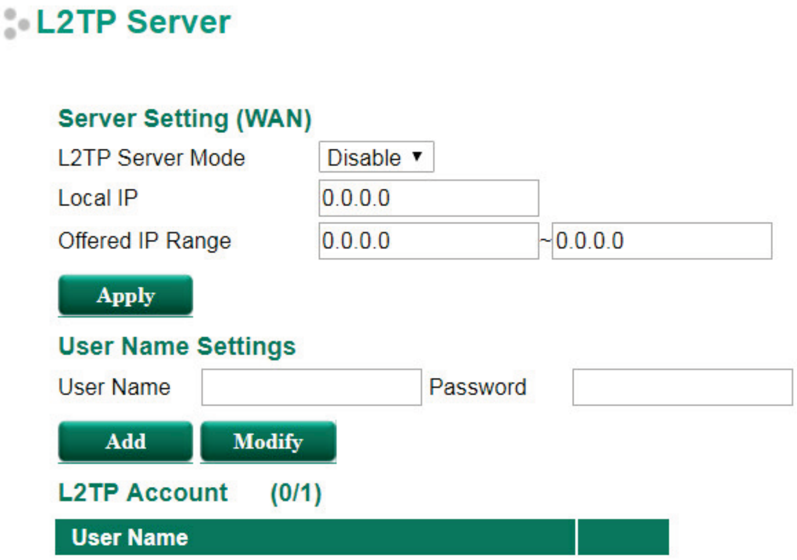
IPSec Status

Name	Local Subnet	Local Gateway	Remote Gateway	Remote Subnet	Key Exchange (Phase 1)	Data Exchange (Phase 2)	Time

L2TP Server (Layer 2 Tunnel Protocol)

L2TP is a popular choice for remote roaming users for VPN applications since an L2TP client is built in to the Microsoft Windows operating system. Since L2TP does not provide an encryption function, it is usually combined with IPsec to provide data encryption.

L2TP Configuration



L2TP Server

Server Setting (WAN)

L2TP Server Mode: Disable ▾

Local IP: 0.0.0.0

Offered IP Range: 0.0.0.0 ~ 0.0.0.0

User Name Settings

User Name: Password:

L2TP Account (0/1)

User Name	

The Industrial Secure Router supports up to 10 accounts with different user names and passwords.

L2TP Server Mode

Setting	Description	Factory Default
Enable / Disable	Enable or Disable the L2TP function on the WAN1 or WAN 2 interface	Disable

Local IP

Setting	Description	Factory Default
IP Address	The IP address of the Local Subnet	0.0.0.0

Offered IP Range

Setting	Description	Factory Default
IP Address	Offered IP range is for the L2TP clients	0.0.0.0

Login User Name

Setting	Description	Factory Default
Max. 32 characters.	User Name for L2TP connection	None

Login Password

Setting	Description	Factory Default
Max. 32 characters.	Password for L2TP connection	None

9

Certificate Management

For the purposes of this document, certificate management refers to the X.509 SSL certificate. X.509 is a digital certificate method commonly used for IPsec and HTTPS authentication. The ToughNet Secure Router can act as a Root CA (Certificate Authority) and issue a trusted Root Certificate. Alternatively, users can import certificates from other CAs into the ToughNet Secure Router.

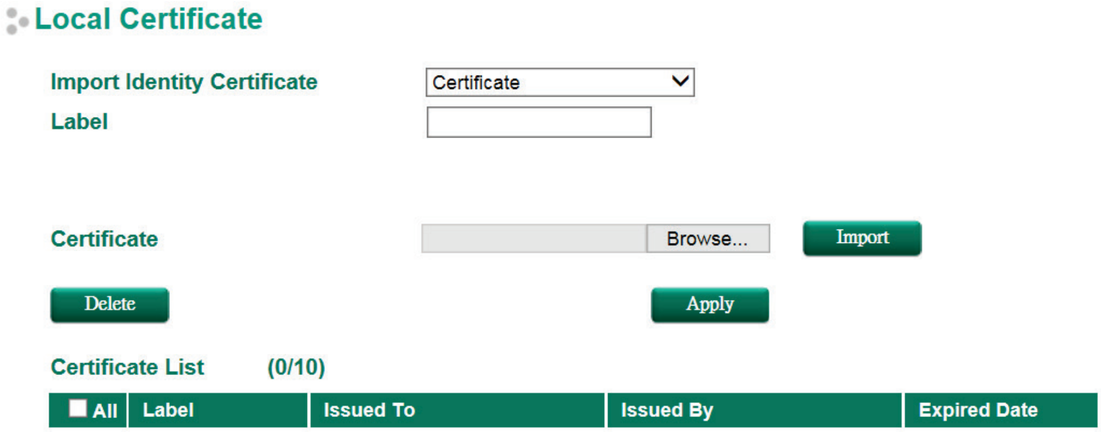
Certificates are a time related authentication mechanism. Before processing certificate management, please make ensure the ToughNet secure router is synced with the local device. For more details regarding time sync, please refer to section Date and Time.

The following topics are covered in this chapter:

- ❒ **Local Certificate**
  - ➢ Local Certificate
- ❒ **Trusted CA Certificates**
- ❒ **Certificate Signing Request**
- ❒ **CA Server**

Local Certificate

For Local Certificates, users can import certificates issued by the CA into the ToughNet Secure Router.



Local Certificate

Import Identity Certificate: Certificate

Label:

Certificate:

Certificate List (0/10)

□ All	Label	Issued To	Issued By	Expired Date

Local Certificate

Import Identity Certificate

Setting	Description	Factory Default
Certificate/ Certificate from CSR/ Certificate from PKCS#12	Select the type of certificate the user has. Certificate uses the file extension .crt The certificate from CSR is a certificate issued by other CA Certificate from PKCS#12 uses the file extension .p12	Certificate

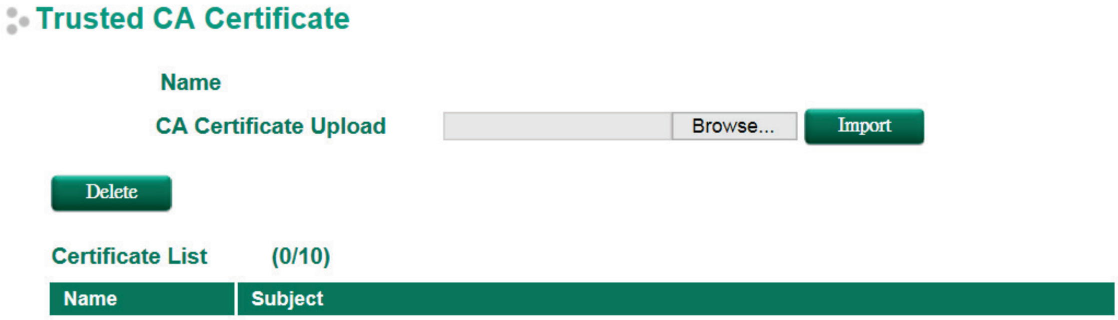
Label

Setting	Description	Factory Default
Label	No. of certificates	N/A

NOTE When importing the Certificate from PKCS#12, the user has to browse the certificate before typing Import Password

Trusted CA Certificates

In Trusted CA Certificates, users can import a CA that the user trusts into the ToughNet Secure Router. It is recommended that the user imports a trusted CA in advance. Otherwise, the ToughNet Secure Router may not recognize the certificate and reject the connection.



Trusted CA Certificate

Name

CA Certificate Upload

Certificate List (0/10)

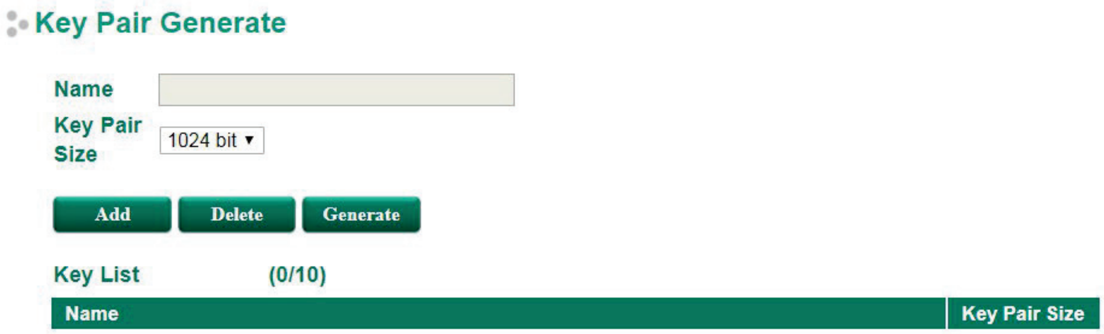
Name	Subject

Certificate Signing Request

If the user wants to get a certificate from the CA for connection purposes, then the two steps below need to be followed in order to generate a private key and certificate signing request.

Step1: Generate Private Key

Before sending the Certificate Signing Request (CSR) to the CA, the CSR must include a public key that can be generated with a private key simultaneously. The user can use a private key to encrypt data and the receiver can use a public key to decrypt the data.


Key Pair Generate

Name

Key Pair Size: 1024 bit ▾

Key List (0/10)

Name	Key Pair Size

Key Pair Generate

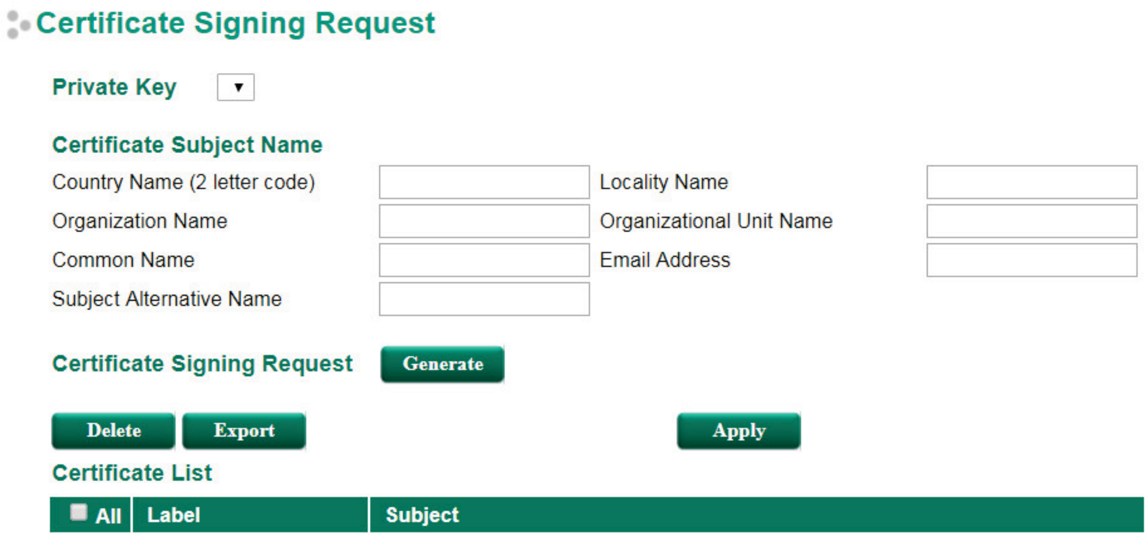
Name

Setting	Description	Factory Default
Name	Naming each private key	N/A

NOTE The user has to click Add before entering the name of each key.

Step2: Generate CSR

After generating the private key, the user can choose the key in Private Key and then must fill in all the information under **Certificate Subject Name**. After that, the user can click **Generate** to create the CSR and the CSR will be displayed in the **Certificate List**. To export the CSR, the user can simply choose the CSR in **Certificate List** and click **Export**.


Certificate Signing Request

Private Key ▾

Certificate Subject Name

Country Name (2 letter code)		Locality Name	
Organization Name		Organizational Unit Name	
Common Name		Email Address	
Subject Alternative Name			

Certificate Signing Request

Certificate List

□ All	Label	Subject

Certificate Signing Request

Private Key

Setting	Description	Factory Default
Private Key	Choose the key generated in Key Pair Generate	N/A

CA Server

Aside from getting the certificate from other CAs, the ToughNet Secure Router can act as a RootCA to issue a certificate for each connection. After the RootCA has been set up, the ToughNet Secure Router can send requests to ask for a certificate from the RootCA.

Certificate Request

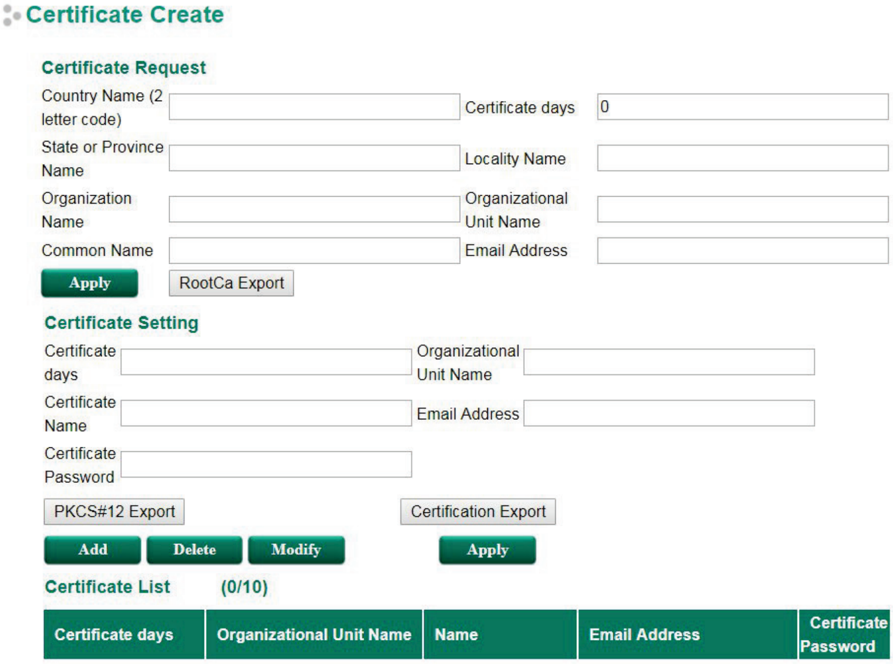
If a system only has their own certificate on hand, and do not have other systems' certificates, how can the system recognize other systems? The answer to this problem is Trust CA. As mentioned in the section Trust CA certificate, users can import a CA (.cer) that they trust into the ToughNet Secure Router. When the user does this, the system will accept the certificate that was issued by a trusted CA.

If users want to use a certificate issued by the ToughNet Secure Router functioning as a RootCA, the receiver must import this RootCA settings (.cer) as a trusted CA and recognize then it will recognize the RootCA certificate during connection. Otherwise, this connection will be rejected by the receiver. Users can create RootCA via Certificate Request and export the RootCA settings by clicking RootCA Export.

The user has to fill in all the RootCA information in the Certificate Request in order to create the RootCA.

Certificate Setting

After creating the RootCA successfully, users can issue a request for a certificate from the RootCA in the Certificate Setting. After filling in the information, users can generate two kinds of certificate: PKCS#12 (.p12) and certificate (.crt). A PKCS#12 request includes a private key but a certificate does not. To export a PKCS#12 certificate, please click PKCS#12 Export. To export a certificate request, please click Certification Export.



Certificate Create

Certificate Request

Country Name (2 letter code)		Certificate days	0
State or Province Name		Locality Name	
Organization Name		Organizational Unit Name	
Common Name		Email Address	

Certificate Setting

Certificate days		Organizational Unit Name	
Certificate Name		Email Address	
Certificate Password			

Certificate List (0/10)

Certificate days	Organizational Unit Name	Name	Email Address	Certificate Password

10

Security

Type page 1 content here.

The following topics are covered in this chapter:

❒ **User Interface Management**

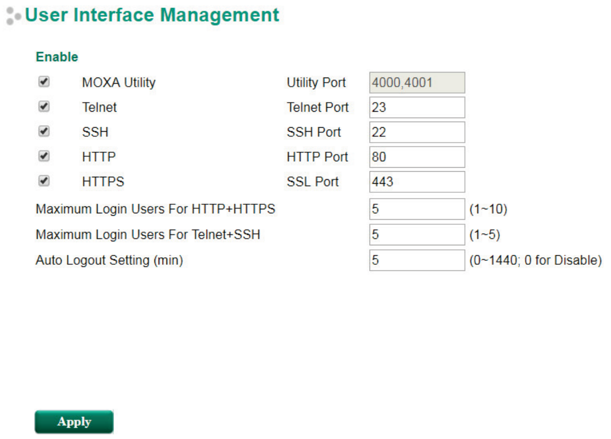
❒ **Authentication Certificate**

❒ **Trusted Access**

❒ **Port Access Control**

- IEEE 802.1X Setting
- IEEE 802.1X Information
- RADIUS Server Setting
- Local User Database

User Interface Management



User Interface Management

Enable

☑	MOXA Utility	Utility Port	4000,4001	
☑	Telnet	Telnet Port	23	
☑	SSH	SSH Port	22	
☑	HTTP	HTTP Port	80	
☑	HTTPS	SSL Port	443	
	Maximum Login Users For HTTP+HTTPS		5	(1~10)
	Maximum Login Users For Telnet+SSH		5	(1~5)
	Auto Logout Setting (min)		5	(0~1440; 0 for Disable)

Enable MOXA Utility

Setting	Description	Factory Default
Select/Deselect	Select the appropriate checkboxes to enable MOXA Utility	Selected

Enable Telnet

Setting	Description	Factory Default
Select/Deselect	Select the appropriate checkboxes to enable Telnet	Selected Port: 23

Enable SSH

Setting	Description	Factory Default
Select/Deselect	Select the appropriate checkboxes to enable SSH	Selected Port: 22

Enable HTTP

Setting	Description	Factory Default
Select/Deselect	Select the appropriate checkboxes to enable HTTP	Selected Port: 80

Enable HTTPS

Setting	Description	Factory Default
Select/Deselect	Select the appropriate checkboxes to enable HTTPS	Selected Port: 443

Maximum Login Users For HTTP+HTTPS

Setting	Description	Factory Default
Maximum Login Users For HTTP+HTTPS	Set a limit for the amount of users who can be logged in using HTTP and HTTPS. The maximum number of users using HTTP and HTTPS is 10.	5

Maximum Login Users For Telnet+SSH

Setting	Description	Factory Default
Maximum Login Users For Telnet+SSH	Set a limit for the amount of users who can be logged in using HTTP and HTTPS. The maximum supported user numbers of Telnet+SSH is 5.	5

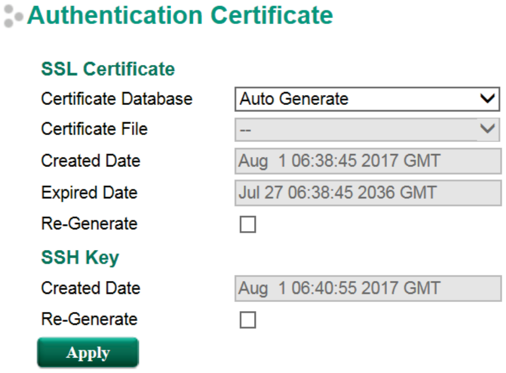
Auto Logout Setting (min)

Setting	Description	Factory Default

Auto Logout Setting (min)	When the user does not touch the ToughNet Secure Router management interface for a defined period of time, the management interface will logout automatically.	5

Authentication Certificate

Authentication certificate refers to certificates that use HTTPS. The web console certificate can be generated by the ToughNet Secure Router automatically or users can choose the certificate imported in Local certificate.



Authentication Certificate

SSL Certificate

Certificate Database: Auto Generate

Certificate File: --

Created Date: Aug 1 06:38:45 2017 GMT

Expired Date: Jul 27 06:38:45 2036 GMT

Re-Generate: □

SSH Key

Created Date: Aug 1 06:40:55 2017 GMT

Re-Generate: □

Certificate Database

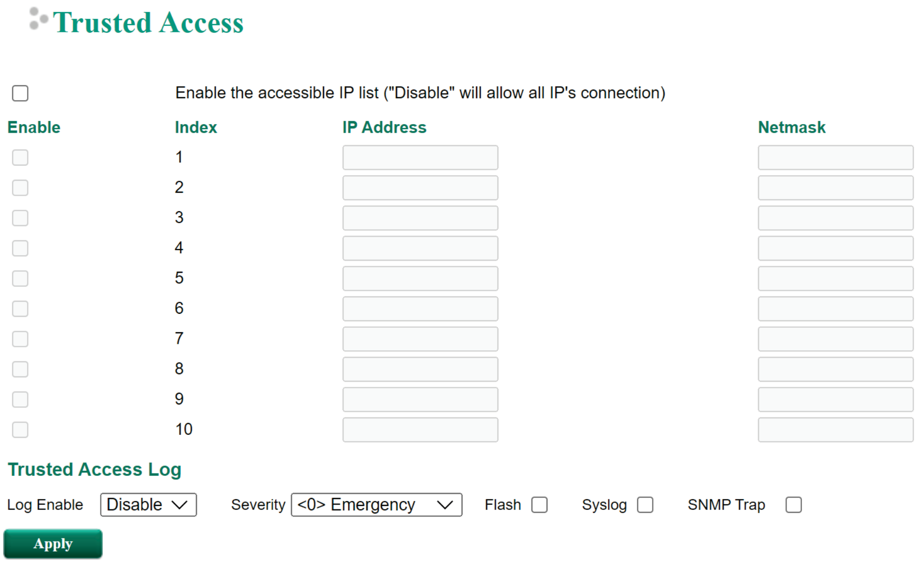
Setting	Description	Factory Default
Auto Generate	The ToughNet Secure Router will generate a certificate automatically. If not, please select "Re-Generate" to generate a certificate. Auto Generate is the default setting.	Auto Generate
Local Certificate Database	Select the certificate you import into Local Certificate. The certificate that is loaded here is limited to "Certificate from CSR" and "Certificate From PKCS#12".	

SSH Key Re-generate

Setting	Description	Factory Default
Select/Deselect	Enable the SSH Key Re-generate	Deselect

Trusted Access

The ToughNet Secure Router uses an IP address-based filtering method to control access.



Trusted Access

□ Enable the accessible IP list ("Disable" will allow all IP's connection)

Enable	Index	IP Address	Netmask
□	1		
□	2		
□	3		
□	4		
□	5		
□	6		
□	7		
□	8		
□	9		
□	10		

Trusted Access Log

Log Enable: Disable   Severity: <0> Emergency   Flash □   Syslog □   SNMP Trap □

Apply

Trusted IP List

You may add or remove IP addresses to limit access to the Moxa ToughNet Secure Router. When the accessible IP list is enabled, only addresses on the list will be allowed access to the Moxa ToughNet Secure Router. Each IP address and netmask entry can be tailored for different situations:

- **Grant access to one host with a specific IP address**
  For example, enter IP address 192.168.1.1 with netmask 255.255.255.255 to allow access to 192.168.1.1 only.
- **Grant access to any host on a specific subnetwork**
  For example, enter IP address 192.168.1.0 with netmask 255.255.255.0 to allow access to all IPs on the subnet defined by this IP address/subnet mask combination.
- **Grant access to all hosts**
  Make sure the accessible IP list is not enabled. Remove the checkmark from **Enable the accessible IP list**.

The following table shows additional configuration examples:

Hosts That Need Access	Input Format
Any host	Disable
192.168.1.120	192.168.1.120 / 255.255.255.255
192.168.1.1 to 192.168.1.254	192.168.1.0 / 255.255.255.0
192.168.0.1 to 192.168.255.254	192.168.0.0 / 255.255.0.0
192.168.1.1 to 192.168.1.126	192.168.1.0 / 255.255.255.128
192.168.1.129 to 192.168.1.254	192.168.1.128 / 255.255.255.128

Trusted Access Log

Log Enable

Setting	Description	Factory Default
Enable/Disable	Enable or disable the Trusted Access log	Disable

Severity

Setting	Description	Factory Default
<0> emergency <1> Alert <2> Critical <3> Error <4> Warning <5> Notice <6> Information	Select the severity level of the Trusted Access log	<0> emergency

<7> Debug		
Flash Syslog SNMP Trap	Select the warning method for the Trusted Access log	None

Port Access Control

The Moxa ToughNet Secure Router provides IEEE 802.1X port-based access control.

The IEEE 802.1X standard defines a protocol for client/server-based access control and authentication. The protocol restricts unauthorized clients from connecting to a LAN through ports that are open to the Internet, and which otherwise would be readily accessible. The purpose of the authentication server is to check each client that requests access to the port. The client is only allowed access to the port if the client's permission is authenticated.

Three components are used to create an authentication mechanism based on 802.1X standards: Client/Supplicant, Authentication Server, and Authenticator.

Client/Supplicant: The end station that requests access to the LAN and switch services and responds to the requests from the switch.

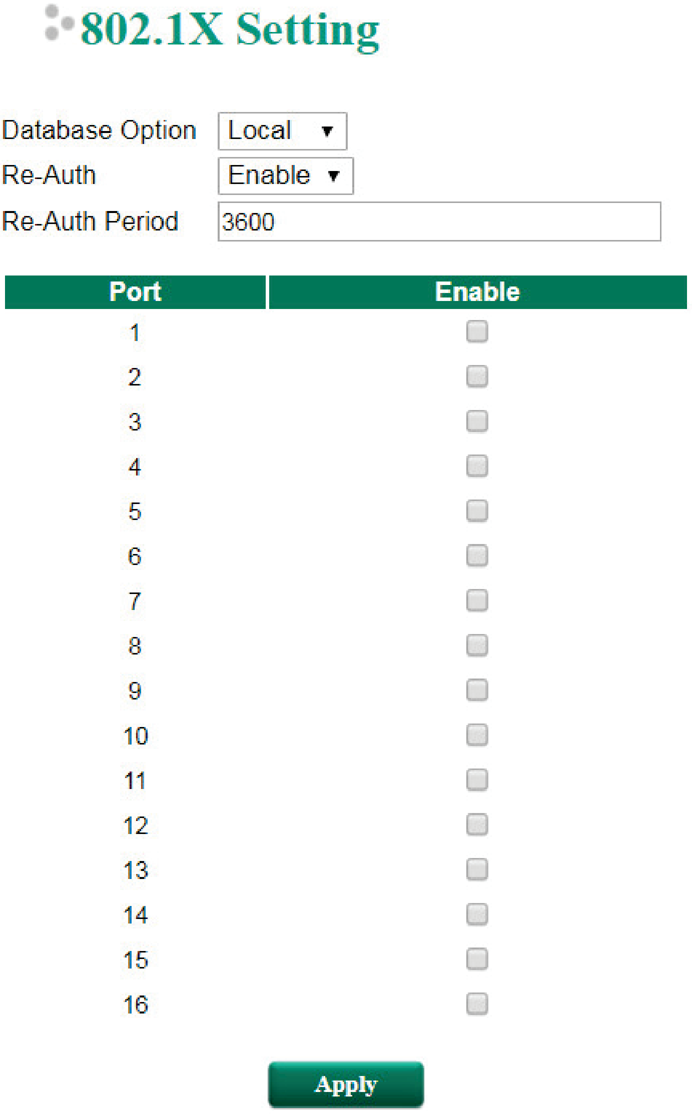
Authentication Server: The server that performs the actual authentication of the supplicant.

Authenticator: Edge switch or wireless access point that acts as a proxy between the supplicant and the authentication server, requesting identity information from the supplicant, verifying the information with the authentication server, and relaying a response to the supplicant.

The Moxa ToughNet Secure Router acts as an authenticator in the 802.1X environment. A supplicant and an authenticator exchange EAPOL (Extensible Authentication Protocol over LAN) frames with each other. We can either use an external RADIUS server as the authentication server, or implement the authentication server in the Moxa ToughNet Secure Router by using a Local User Database as the authentication look-up table. When we use an external RADIUS server as the authentication server, the authenticator and the authentication server exchange EAP frames between each other.

Authentication can be initiated either by the supplicant or the authenticator. When the supplicant initiates the authentication process, it sends an **EAPOL-Start** frame to the authenticator. When the authenticator initiates the authentication process or when it receives an **EAPOL-Start** frame, it sends an **EAP-Request/Identity** frame to ask for the username of the supplicant.

IEEE 802.1X Setting



802.1X Setting

Database Option	Local ▾
Re-Auth	Enable ▾
Re-Auth Period	3600

Port	Enable
1	□
2	□
3	□
4	□
5	□
6	□
7	□
8	□
9	□
10	□
11	□
12	□
13	□
14	□
15	□
16	□

Database Option

Setting	Description	Factory Default
Local	Select this option to use the Local User Database as the authentication database, which supports up to 32 users.	Local
Radius	Select this option to set up an external RADIUS authentication database using EAP-MD5 authentication.	

Re-Auth

Setting	Description	Factory Default
Enable/Disable	Enable or disable the requirement for clients to be re-authenticated after a specified duration of no activity.	Disable

Re-Auth Period

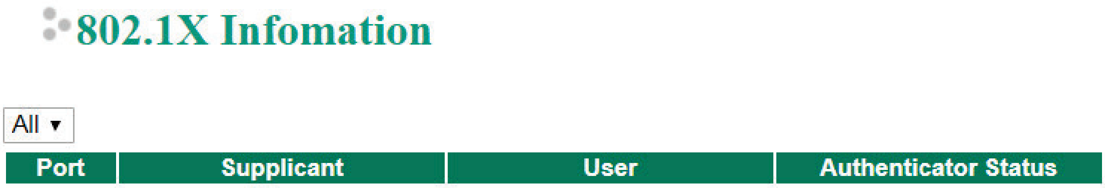
Setting	Description	Factory Default
Time period	Specify the duration (in seconds) before clients are required to enter their username and password again. The range is between 60 and 65535.	3600

802.1X

Setting	**Description**	**Factory Default**
Enable/Disable	Check the box for a port under the 802.1X column to enable IEEE 802.1X for that port. All end stations must enter usernames and passwords before access to these ports is allowed.	Disabled

IEEE 802.1X Information

This page shows detailed IEEE 802.1X information including port, supplicant, user, and authenticator status.

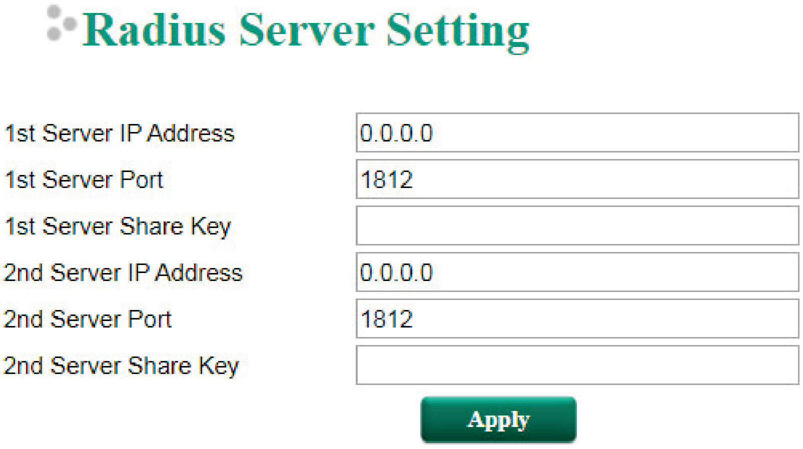


802.1X Infomation

All ▾

Port	Supplicant	User	Authenticator Status

RADIUS Server Setting



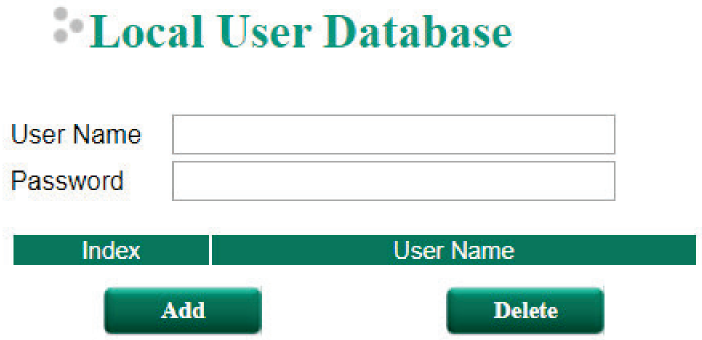
Radius Server Setting

1st Server IP Address	0.0.0.0
1st Server Port	1812
1st Server Share Key	
2nd Server IP Address	0.0.0.0
2nd Server Port	1812
2nd Server Share Key	

Server Setting

Setting	**Description**	**Factory Default**
Server IP Address	The IP address of the RADIUS server.	0.0.0.0
Server Port	The port of the RADIUS server	1812
Server Share key	The shared key of the RADIUS server	None

Local User Database



Local User Database

User Name

Password

Index	User Name

Local User

Setting	Description	Factory Default
User Name	The user name of the local user account	None
Password	The password of the local user account	None

11

Diagnosis

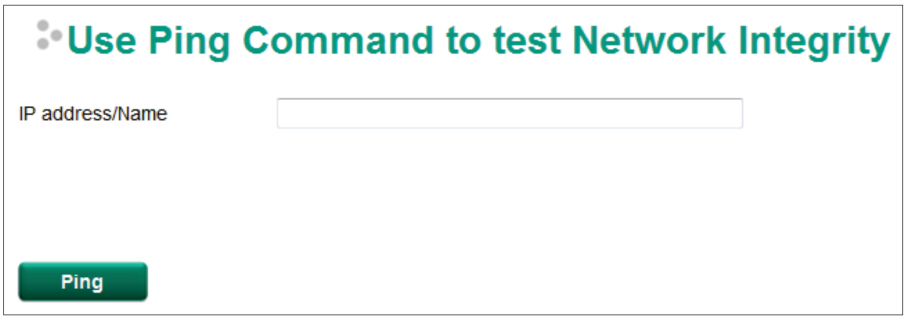
The ToughNet Secure Router provides **Ping** tools and **LLDP** for administrators to diagnose network systems.

The following topics are covered in this chapter:

❒ **Ping**

❒ **LLDP**

Ping



Use Ping Command to test Network Integrity

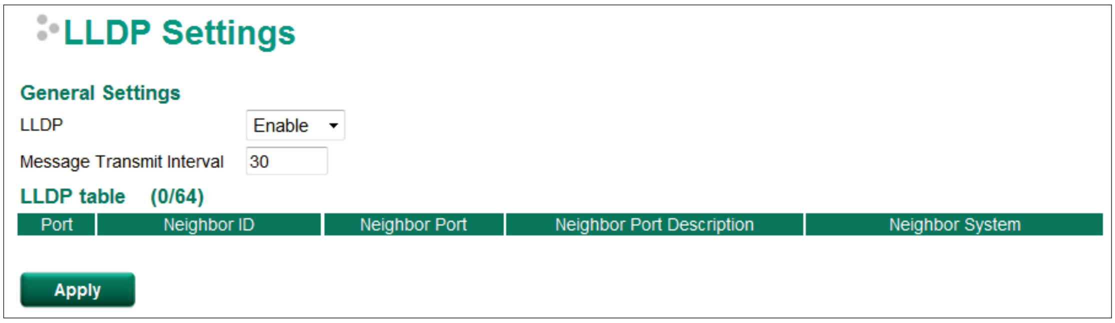
IP address/Name

The Ping function uses the ping command to give users a simple but powerful tool for troubleshooting network problems. The function's most unique feature is that even though the ping command is entered from the user's PC keyboard, the actual ping command originates from the ToughNet Secure Router itself. In this way, the user can essentially control the ToughNet Secure Router and send ping commands out through its ports. Just type in the desired IP address and click **Ping**, the router will send out the ping command to test the integrity of the network.

LLDP

LLDP Function Overview

Defined by IEEE 802.11AB, Link Layer Discovery Protocol (LLDP) is an OSI Layer 2 Protocol that standardizes the methodology of self-identity advertisement. It allows each networking device, such as a Moxa managed switch/router, to periodically inform its neighbors about itself and its configuration. In this way, all devices will be aware of each other.



LLDP Settings

General Settings

LLDP: Enable

Message Transmit Interval: 30

LLDP table (0/64)

Port	Neighbor ID	Neighbor Port	Neighbor Port Description	Neighbor System

The router's web interface can be used to enable or disable LLDP, and to set the LLDP **Message Transmit Interval**. Users can view each switch's neighbor-list, which is reported by its network neighbors.

LLDP Setting

Enable LLDP

Setting	Description	Factory Default
Enable/Disable	Enable or disable the LLDP function.	Enable

Message Transmit Interval

Setting	Description	Factory Default
5 to 32768 sec.	Set the transmit interval of LLDP messages. Unit is in seconds.	30 (sec.)

LLDP Table

Port: The port number that connects to the neighbor device.
Neighbor ID: A unique entity that identifies a neighbor device; this is typically the MAC address.
Neighbor Port: The port number of the neighbor device.
Neighbor Port Description: A textual description of the neighbor device's interface.
Neighbor System: Hostname of the neighbor device.

A

MIB Groups

The ToughNet Secure Router comes with built-in SNMP (Simple Network Management Protocol) agent software that supports cold start trap, line up/down trap, and RFC 1213 MIB-II. The standard MIB groups that the ToughNet Secure Router series support are:

MIB II.1 – System Group

sysORTable

MIB II.2 – Interfaces Group

ifTable

MIB II.4 – IP Group

ipAddrTable
ipNetToMediaTable
IpGroup
IpBasicStatsGroup
IpStatsGroup

MIB II.5 – ICMP Group

IcmpGroup
IcmpInputStatus
IcmpOutputStats

MIB II.6 – TCP Group

tcpConnTable
TcpGroup
TcpStats

MIB II.7 – UDP Group

udpTable
UdpStats

MIB II.11 – SNMP Group

SnmpBasicGroup
SnmpInputStats
SnmpOutputStats

Public Traps

1. Cold Start
2. Link Up
3. Link Down
4. Authentication Failure

Private Traps:

1. Configuration Changed
2. Power On
3. Power Off

The ToughNet Secure Router also provides a MIB file, located in the file "Moxa-TN5916-MIB.my" on the ToughNet Secure Router Series utility CD-ROM for SNMP trap message interpretation.