

Industrial LoRa Gateway

IOP851-00L41

User Manual

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Industrial LoRa Gateway

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Chapter 1 Introduction

1.1 Introduction

Congratulations on your purchase of this outstanding product: Industrial LoRa Gateway. For wireless M2M (Machine-to-Machine) applications, AMIT Industrial LoRa Gateway is absolutely the right choice. With built-in 8-channel LoRa interface, your deployed LoRa end-nodes can easily connected to the LoRa gateway, and even network server/application server as well. Your customer application server can access to the data transferred from the end-nodes, and further make adequate control on your needs.

Main Features:

- Built-in 802.11ac/n WiFi uplink for wireless M2M application.
- Embedded an 8-channel LoRa gateway module for connecting with multiple LoRa nodes.
- LoRaWAN Compliance gateway, forward received LoRa packets to external public network server, or internal private network server.
- Equip 802.11n/ac 2T2R 2.4G/5GHz selectable WiFi access point.
- Equip gigabit Ethernet ports to connect other IP-based devices.
- RS232 serial port for controlling legacy serial devices or Modbus devices.
- Digital I/O ports for integrating sensors, switch, or other alarm devices.
- Designed by solid and easy-to-mount metal body for industrial environment to work with a variety M2M (Machine-to-Machine) applications.





Before you install and use this product, please read this manual in detail for fully exploiting the functions of this product.

Industrial LoRa Gateway

1.2 Contents List

1.2.1 Package Contents

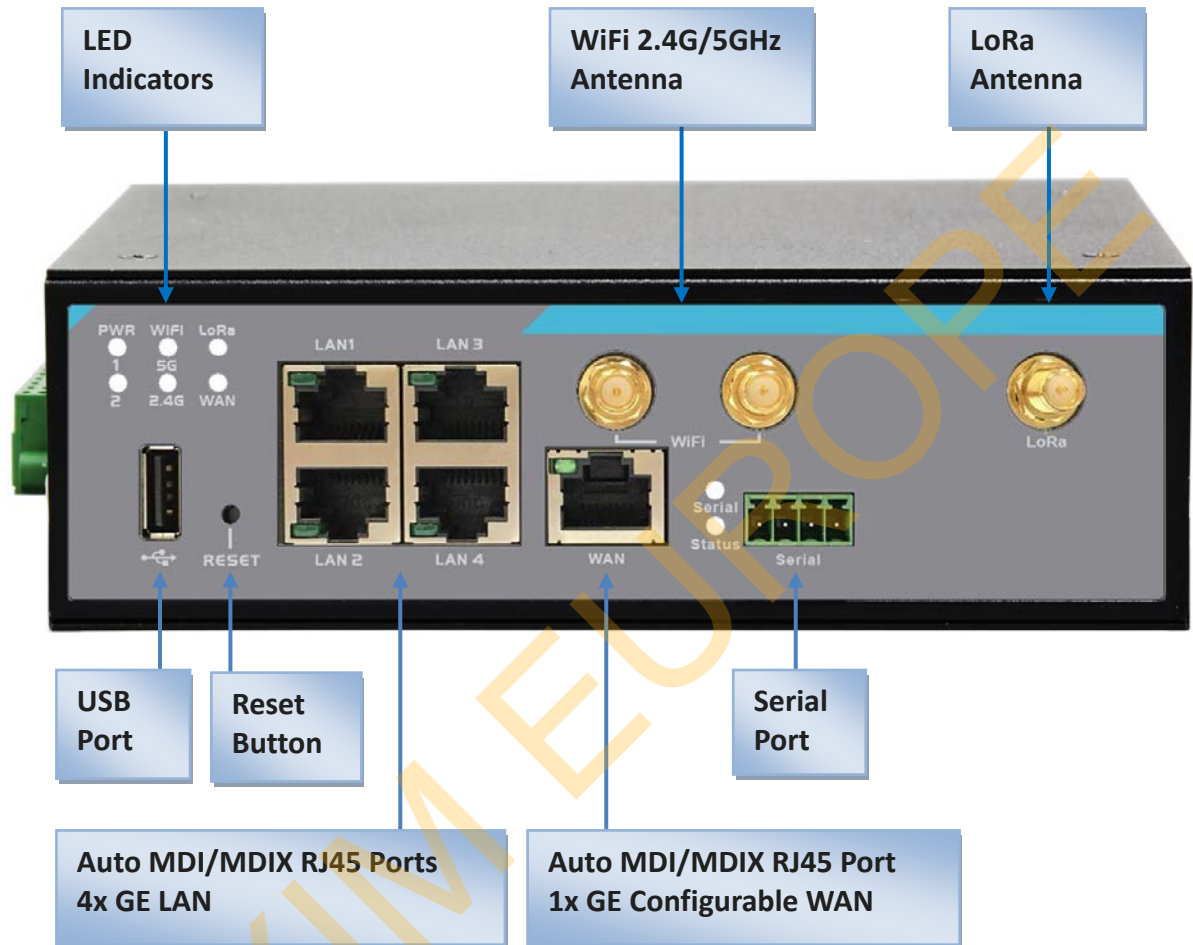
#Standard Package

| Items | Description | Contents | Quantity |
|-------|---|---|----------|
| 1 | IOP851-00L41 Industrial LoRa Gateway |  | 1pcs |
| 2 | 8 pin Terminal Block |  | 1pcs |
| 3 | 4 pin Terminal Block |  | 1pcs |
| 4 | DIN-Rail Bracket |  | 1pcs |
| 5 | CABLE-RJ45 |  | 1pcs |

Industrial LoRa Gateway

1.3 Hardware Configuration

➤ Front View



✂ Reset Button

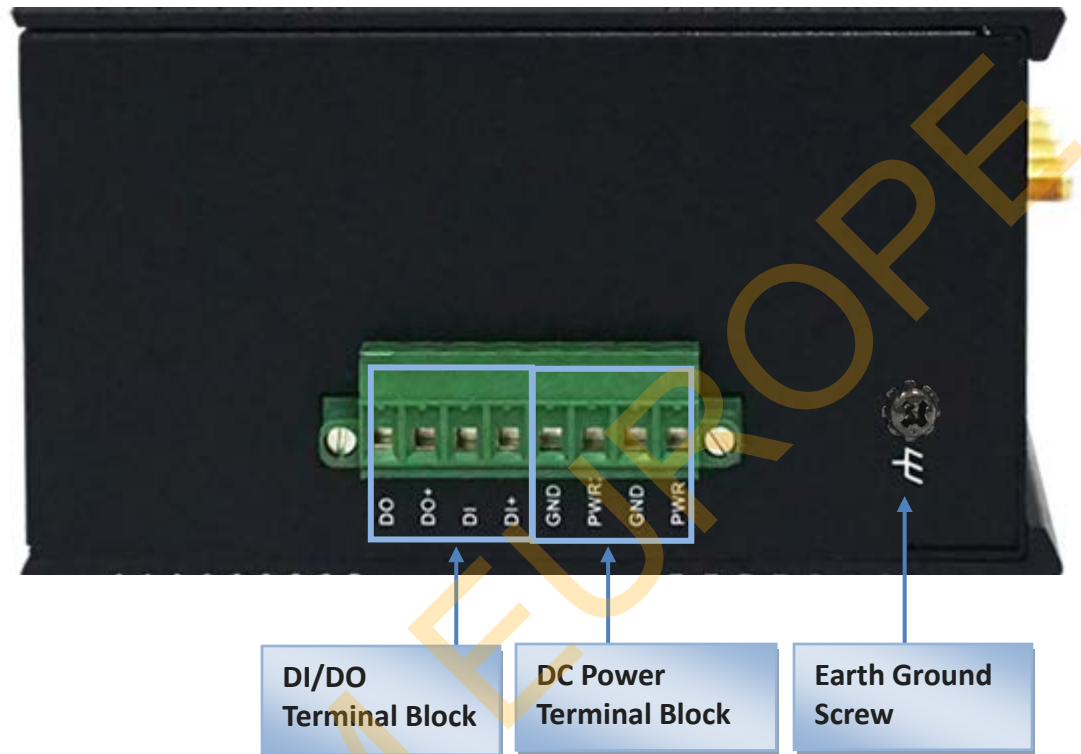
The RESET button provides user with a quick and easy way to resort the default setting. Press the RESET button continuously for 6 seconds, and then release it. The device will restore to factory default settings.

✂ WiFi, LoRa Antenna

All the WiFi and LoRa antennas are optional accessory, and not included in the standard package. You need to purchase the suitable antennas and required RF cables to fit your application.

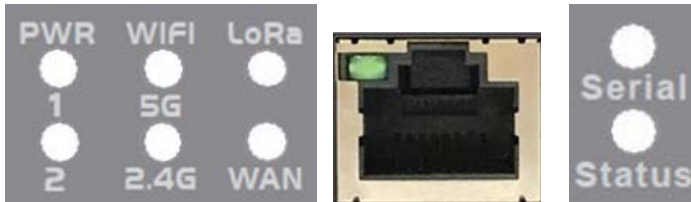
Industrial LoRa Gateway



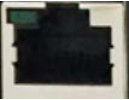
➤ Left View



Industrial LoRa Gateway

1.4 LED Indication



| LED Icon | Indication | LED Color | Description |
|---|--------------------|-----------|---|
|  | Power Source 1 | Blue | Steady ON: Device is powered on by power source 1 |
|  | Power Source 2 | Blue | Steady ON: Device is powered on by power source 2 |
| WiFi | WiFi 2.4G/5GHz | Blue | OFF: WiFi is disabled Steady ON: WiFi is enabled |
| LoRa | LoRa | Blue | OFF: LoRa is disabled Steady ON: LoRa is enabled In Flashing : while data packet transferred via LoRa connection |
| WAN | WAN (Cellular) | Blue | OFF : No data packet transferred via Cellular interface In Flashing : while data packet transferred via Cellular interface |
|  | LAN 1 ~ LAN 4, WAN | Green | OFF: No Ethernet cable attached or Device not linked. Steady ON: Ethernet connection of LAN or WAN is established. In Flashing: Data packets are transferring. |
| Serial | Serial | Blue | OFF : No Serial data transferred via serial port In Flashing : while data packet transferred via Serial port |
| Status | Status | Blue | Slow Flash(per Second) : Device works normally Very Fast Flash : Device is in Recovery Mode or abnormal |

Industrial LoRa Gateway

1.5 Installation & Maintenance Notice

1.5.1 SYSTEM REQUIREMENTS

| | |
|---|---|
| Network Requirements | <ul style="list-style-type: none">• An gigabit Ethernet RJ45 cable• IEEE 802.11a/b/g/n/ac wireless network• IEEE 802.11a/b/g/n/ac wireless clients• 10/100/1000 Ethernet adapter on PC |
| Web-based Configuration Utility Requirements | <p>Computer with the following:</p> <ul style="list-style-type: none">• Windows®, Macintosh, or Linux-based operating system• An installed Ethernet adapter <p>Browser Requirements:</p> <ul style="list-style-type: none">• Internet Explorer 6.0 or higher• Chrome 2.0 or higher• Firefox 3.0 or higher• Safari 3.0 or higher |

1.5.2 WARNING



Attention

- Only use the power supply that complies with the power specification of the gateway. Using an out-of-spec voltage rating power source is dangerous and may damage the product.
- Do not open or repair the case yourself. If the product is too hot, turn off the power immediately and have it repaired at a qualified service center.

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Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

FOR PORTABLE DEVICE USAGE (<20m from body/SAR needed)

Radiation Exposure Statement:

The product comply with the FCC portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

FOR MOBILE DEVICE USAGE (>20cm/low power)

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

FOR COUNTRY CODE SELECTION USAGE (WLAN DEVICES)

Note: The country code selection is for non-US model only and is not available to all US model. Per FCC regulation, all WiFi product marketed in US must fixed to US operation channels only.

1.5.3 HOT SURFACE CAUTION



CAUTION: The surface temperature for the metallic enclosure can be very high! Especially after operating for a long time, installed at a closed cabinet without air conditioning support, or in a high ambient temperature space.

DO NOT touch the hot surface with your fingers while servicing!!

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1.5.4 Product Information for CE RED Requirements

The following product information is required to be presented in product User Manual for latest CE RED requirements.¹

(1) Frequency Band & Maximum Power

1.a Frequency Band for WiFi Connection


| Band | Operating Frequency | Max. Output Power (EIRP) |
|------|---------------------|--------------------------|
| 868M | 863 - 870MHz | 100 mW |
| 2.4G | 2.4 – 2.4835 GHz | 100 mW |
| 5G | 5.15 – 5.25 GHz | 200 mW |

(2) 5150 ~ 5350MHz In Door Use Statements

This product equips the IEEE 802.11ac compliance 5GHz wireless radio module. According to the RED requirement, the channels covered in the 5150 ~ 5350 MHz frequency band are In Door Use Only.

(3) Countries List for Restrictions (for products with 5GHz radio)

For EU/EFTA, this product can be used in all EU member states and EFTA countries.



| | | | | | | |
|----|----|----|----|----|----|----|
| AT | BE | BG | CH | CY | CY | DK |
| DE | EE | EL | ES | FI | FR | HR |
| HU | IE | IT | LT | LU | LV | MT |
| NL | NO | PL | PT | RO | SI | SK |
| SE | TR | UK | | | | |

(4) DoC Information

You can get the DoC information of this product from the following URL:

<http://www.amit.com.tw/products-doc/>

(5) RF Exposure Statements

The antenna of the product, under normal use condition, is at least 20 cm away from the body of user.

¹ The information presented in this section is ONLY valid for the EU/EFTA regional version. For those non-CE/EFTA versions, please refer to the corresponding product specification.

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(6) Unit Mounting Notice

The product is suitable for mounting at heights $\leq 2\text{m}$ (approx. 6 ft), or in a cabinet.

Ensure the unit is fixed tightly to reduce the likelihood of injury due to exposure to mechanical hazards if dropped.

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1.6 Hardware Installation

This chapter describes how to install and configure the hardware

1.6.1 Mount the Unit

The IOP851 series product can be mounted on a wall, horizontal plane, or DIN Rail in a cabinet with the mounting accessories (DIN-rail kit or optional brackets). The mounting accessories are not screwed on the product when out of factory. Please screw the DIN-rail bracket or wall-mount kits on the product first.

1.6.2 Install the External RF Cable and Antenna

As illustrated in Section 1.3, there are several SMA antenna Jacks for you to install the required RF cables and antennas for the RF signal transmission and receiving. You have to purchase required RF cables and antennas separately for a specific project or installation site to get excellent RF performance.

Since there is limited spacing for allocating all SMA antenna Jacks around the enclosure, the separation among SMA Jacks (or direct-attached antennas) could be not the optimized arrangement. **It is not recommended to attach the SMA antennas directly to the SMA Jacks.** It is very likely to get degraded RF performance at specific circumstances. It depends heavily on the environment.

However, there are well-known rules of thumb for solving the antenna separation issue.

- 1: The horizontal distance between antennas should be greater than 1/4 of its wavelength, and there will be best separation at 1/2 of its wavelength.**
- 2. If multiple frequency antennas are near each other, then use spacing distance of the lower frequency antenna, or even better try to satisfy the rule for both frequencies.**

Wavelength Table for Major RF Category

| RF Category | Frequency | Wavelength | 1/2 Wave Length (Best Separation) | 1/4 Wave Length (Good Separation) |
|--------------|-----------|------------|--------------------------------------|--------------------------------------|
| WiFi 802.11 | 5.8GHz | 5.2cm | 2.6cm | 1.3cm |
| WiFi 802.11 | 2.4GHz | 12.5cm | 6.2cm | 3.1cm |
| Cellular LTE | 2600MHz | 11.5cm | 5.8cm | 2.9cm |
| Cellular LTE | 2100MHz | 14.3cm | 7.1cm | 3.7cm |

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| | | | | |
|--------------|---------|--------|--------|--------|
| Cellular LTE | 900MHz | 33.3cm | 16.6cm | 8.3cm |
| Cellular LTE | 700MHz | 42.8cm | 21.4cm | 10.7cm |
| GPS | 1.57GHz | 19.0cm | 9.5cm | 4.7cm |

For example, if you have a 900MHz LTE antenna and a WiFi 2.4GHz antenna, you would want them to be separated by at least 8.3cm to get good antenna separation.

So, it is recommended to use some external RF cables to extend and separate the adjacent antennas and get better antenna separation and RF performance, if required.

1.6.3 Connecting Serial Devices

The IOP851 series products provide 4-pin Terminal Block serial port for connecting to your serial device. Connect the serial device to the terminal block with the right pin assignments of RS-232/485 are shown as below.



Pin 1 2 3 4

| | Pin1 | Pin2 | Pin3 | Pin4 |
|--------|------|-------|-------|------|
| RS-232 | GND | RXD | TXD | GND |
| RS-485 | GND | DATA- | DATA+ | GND |

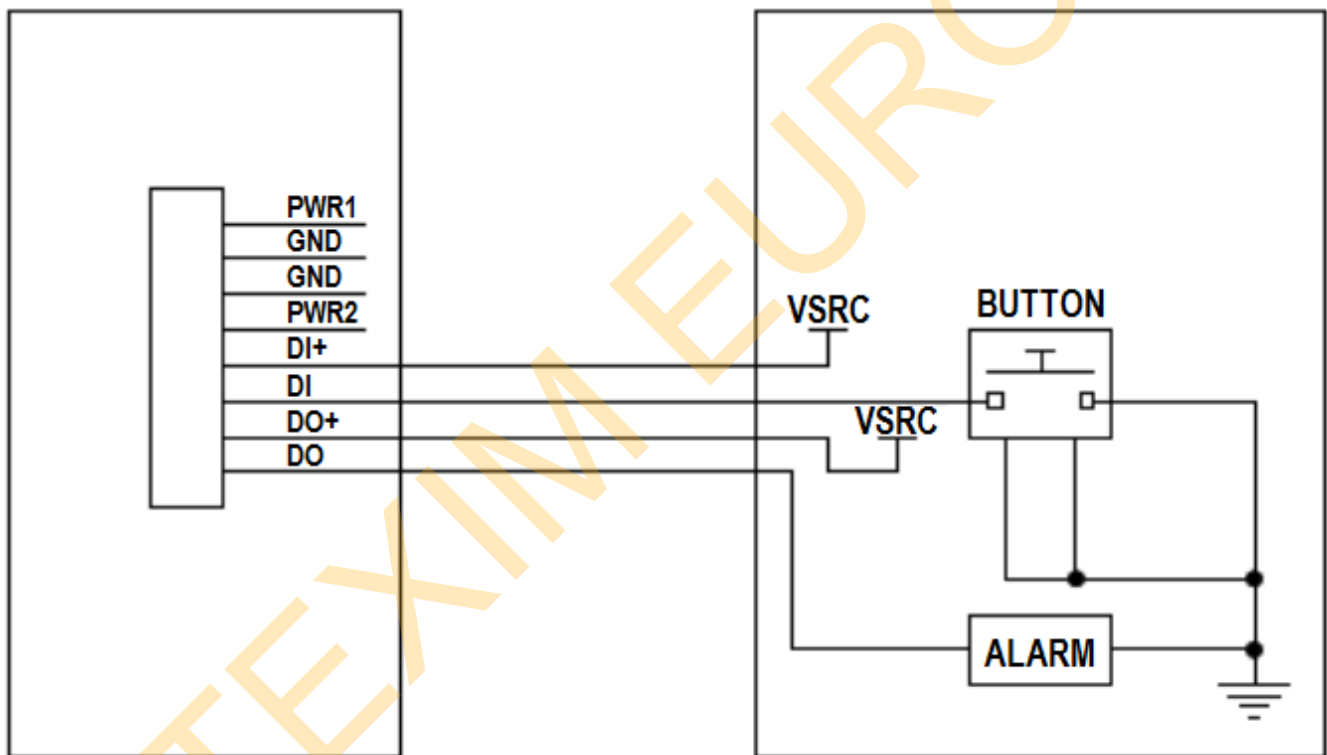
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1.6.4 Connecting DI/DO Devices

There are one DI and one DO ports together with power terminal block. Please refer to following specification to connect DI and DO devices.

| Mode | Specification | |
|----------------|------------------------|---|
| Digital Input | Trigger Voltage (high) | Logic level 1: 5V~30V |
| | Normal Voltage (low) | Logic level 0: 0V~2V |
| Digital Output | Voltage (Relay Mode) | Depends on external device maximum voltage is 30V |
| | Maximum Current | 1A |

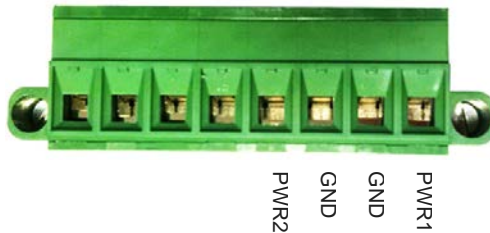
Example of Connection Diagram



Industrial LoRa Gateway

1.6.5 Connecting Power

The IOP851 series product can be powered by connecting one or two power sources to the terminal block. **It supports dual 12 to 48V DC power inputs.** Following picture indicates the power terminal block pin assignments. Please check carefully and connect to the right power requirements and polarity.



For the dual power supply design on PWR1 and PWR2, the power supply mode can be either primary/backup or concurrent modes. It depends on the voltage for PWR1 and PWR2.

If the voltage difference between PWR1 and PWR2 is greater than 5.0 volt (this is the case for using two power supplies with the different external spec., such as 48V and 24V), the power control circuit works in primary / backup power mode. The one with higher voltage is treated the primary power, and the other one is regarded as a backup power. Normally, only the primary power supplies the required power to the gateway and connected PoE devices; the backup power supply will supply the power to the gateway and connected PoE devices only when the primary power fails.

If the voltage difference between PWR1 and PWR2 is less than 0.5 volt (this is the case for using two power supply with the same external spec., such as 48V), the power control circuit works in concurrent mode. Both PWR1 and PWR2 supply required power to the gateway and connected PoE devices simultaneously.

Note: There may be an ambiguous situation for the voltage difference is less than 5.0 volt, but greater than 0.5 volt. Please be assure that the external power supply can supply enough power that the system required, or you may encounter the ambiguous situation that for some times, one on the power is the primary power, and some times if the loading increased, the power control circuit may switch to concurrent mode that PWR1 and PWR2 supplies power at the same time.

1.6.6 Power Supply Installation

The power supply is an optional unit, is not included in the standard package. You have to purchase or prepare external power supply unit for providing power to the gateway. Hereunder is an example for the Industrial power supply installation.

➤ AC Power Cable Installation

The power supply unit power requirement is 100-240V AC, 50/60Hz with power input lines. AWG 18 power cable is recommended.

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The terminal pin number assignment as below

| Pin No. | Assignment |
|---------|-------------|
| 1 | FG \oplus |
| 2 | AC/N |
| 3 | AC/L |

Please connect the live line, neutral line and earth line to the corresponding location.

➤ DC Power Terminal Block Installation

The Power Supply unit may consist of one set or two sets of DC power output contacts.

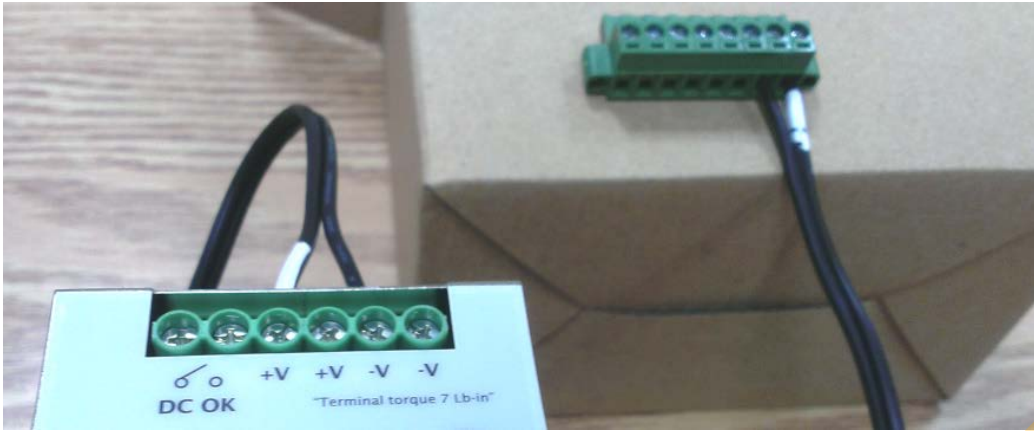


You can connect the DC power supply and the terminal block power pins, as shown below, of the gateway with a power cable. AWG 18 power cable is recommended.



Insert DC power wires into the contacts PWR1 or PWR2. The +V connect to PWR and then -V connect to GND. After that, plug in the terminal block to the socket at the side of the gateway.

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Finally, connect the power plug of the power supply cable to an outlet, then the power supply units will turn on and provide DC power to the connected device.

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1.6.7 Connecting to the Network or a Host

The IOP851 series provides RJ45 ports to connect 10/100/1000Mbps Ethernet. It can auto detect the transmission speed on the network and configure itself automatically. Connect one Ethernet cable to the RJ45 port (LAN) of the device and plug another end of the Ethernet cable into your computer's network port. In this way, you can use the RJ45 Ethernet cable to connect to the host PC's Ethernet port for configuring the device.

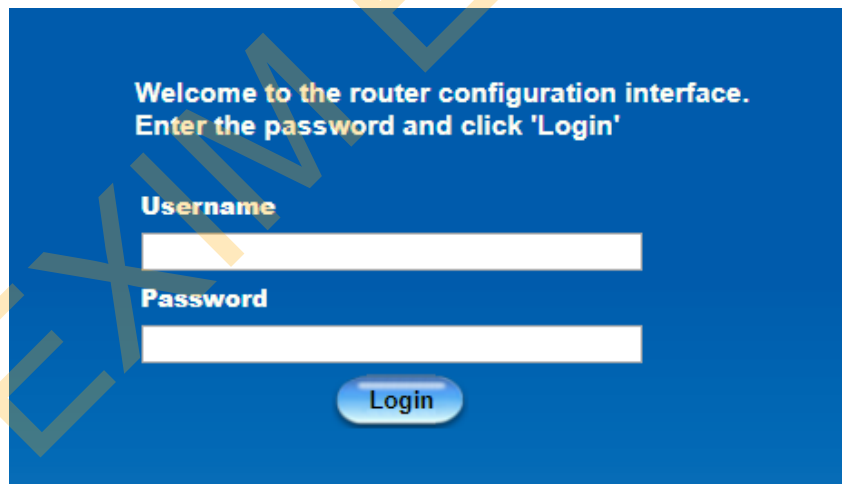
1.6.8 Setup by Configuring WEB UI

You can browse web UI to configure the device.

Type in the IP Address (<http://192.168.123.254>)²



When you see the login page, enter the user name and password and then click **'Login'** button. The default setting for both username and password is **'admin'**³.



² The default LAN IP address of this gateway is 192.168.123.254. If you change it, you need to login by using the new IP address.

³ For security consideration, you are strongly recommended to change the login username and password from default values. Refer to Section 6.1.2 for how to change the setting.

Chapter 2 Basic Network

2.1 WAN & Uplink

The navigation menu on the left consists of the following steps: Basic Network, WAN & Uplink, Physical Interface, Internet Setup, Loading Balance, and End.

The screenshot shows the 'Physical Interface' tab selected. It contains two tables:

| Physical Interface List | | | |
|-------------------------|--------------------|----------------|-------------------------------------|
| Interface Name | Physical Interface | Operation Mode | Action |
| WAN-1 | WiFi Module One | Always on | <input type="button" value="Edit"/> |
| WAN-2 | - | Disable | <input type="button" value="Edit"/> |
| WAN-3 | - | Disable | <input type="button" value="Edit"/> |

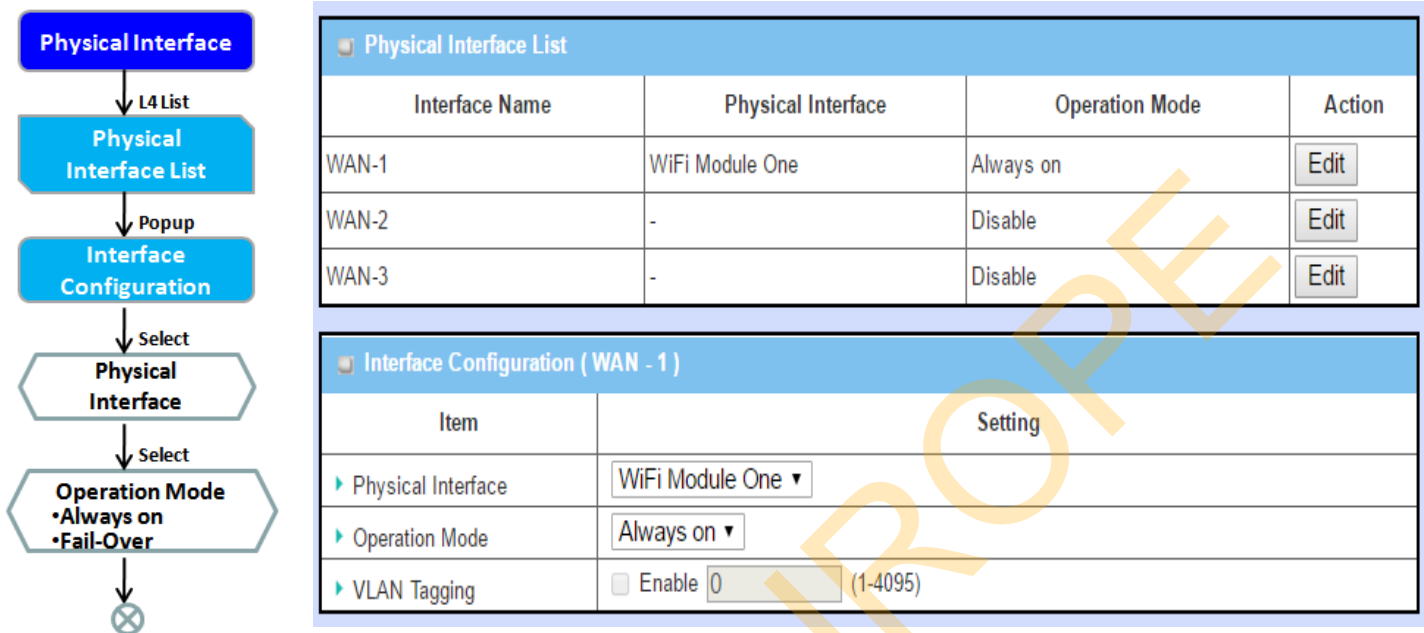
| Interface Configuration (WAN - 1) | |
|-------------------------------------|-------------------|
| Item | Setting |
| Physical Interface | WiFi Module One ▾ |

The gateway provides multiple WAN interfaces to let all client hosts in Intranet of the gateway access the the uplink network or Internet. But ISPs in the world apply various connection protocols to let gateways or user's devices dial in ISPs and then link to the Internet via different kinds of transmit media.

So, the WAN Connection lets you specify the WAN Physical Interface, and WAN Internet Setup for Intranet to access Internet. For each WAN interface, you must specify its physical interface first and then its Internet setup to connect to uplink network or Internet.

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2.1.1 Physical Interface



M2M gateways are usually equipped with various WAN interfaces to support different WAN connection scenario for requirement. You can configure the WAN interface one by one to get proper internet connection setup. **Refer to the product specification for the available WAN interfaces in the product you purchased.**

The first step to configure one WAN interface is to specify which kind of connection media to be used for the WAN connection, as shown in "Physical Interface" page.

In "Physical Interface" page, there are two configuration windows, "Physical Interface List" and "Interface Configuration". "Physical Interface List" window shows all the available physical interfaces. After clicking on the "Edit" button for the interface in "Physical Interface List" window the "Interface Configuration" window will appear to let you configure a WAN interface.

Physical Interface:

- **Ethernet WAN:** The gateway has one RJ45 WAN port that can be configured to be WAN connections. You can directly connect to external DSL modem or setup behind a firewall device.
- **WiFi Uplink WAN:** For the product with WiFi Uplink function, one or two WiFi modules can be configured to be WAN connections. For the WiFi module with Uplink function activated, you can further create some uplink profiles for ease of connecting to an uplink network.

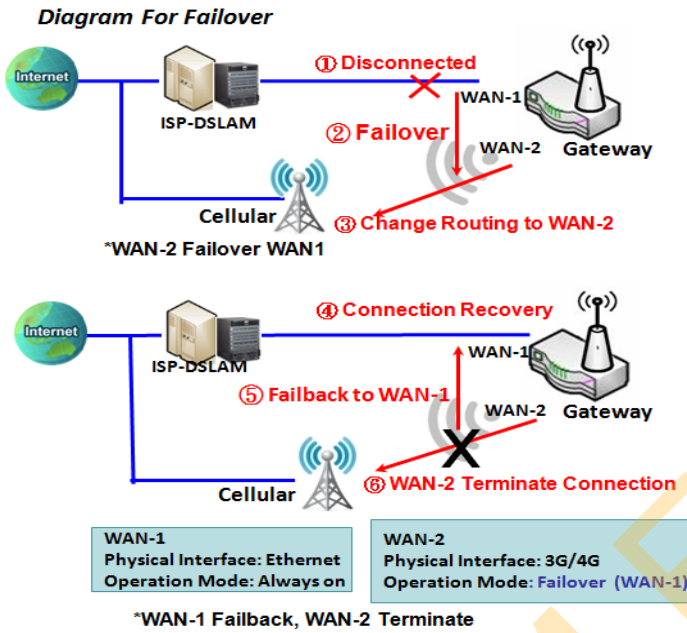
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Operation Mode:

There are three option items “Always on”, “Failover”, and “Disable” for the operation mode setting.

Always on: Set this WAN interface to be active all the time. When two or more WAN are established at "Always on" mode, outgoing data will through these WAN connections base on load balance policies.

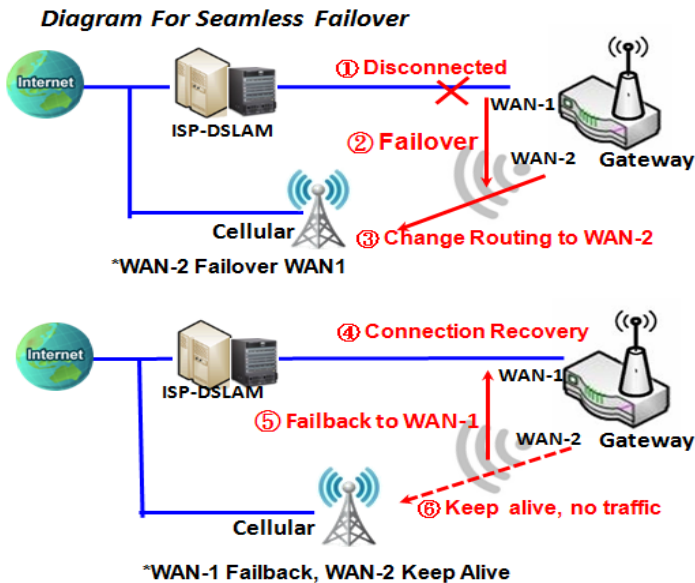
Failover:



A failover interface is a backup connection to the primary. That means only when its primary WAN connection is broken, the backup connection will be started up to substitute the primary connection. As shown in the diagram, WAN-2 is backup WAN for WAN-1. WAN-1 serves as the primary connection with operation mode "Always on". WAN-2 won't be activated until WAN-1 disconnected. When WAN-1 connection is recovered back with a connection, it will take over data traffic again. At that time, WAN-2 connection will be terminated.

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Seamless Failover:



In addition, there is a "Seamless" option for Failover operation mode. When seamless option is activated by checking on the "Seamless" box in configuration window, both the primary connection and the failover connection are started up after system rebooting. But only the primary connection executes the data transfer, while the failover one just keeps alive of connection line. As soon as the primary connection is broken, the system will switch, meaning failover, the routing path to the failover connection to save the dial up time of failover connection since it has been alive.

When the "Seamless" enable checkbox is activated, it can allow the Failover interface to be connected continuously from system booting up. Failover WAN interface just keeps connecting without data traffic.

The purpose is to shorten the switch time during failover process. So, when primary connection is disconnected, failover interface will take over the data transfer mission instantly by only changing routing path to the failover interface. The dialing-up time of failover connection is saved since it has been connected beforehand.

VLAN Tagging

Sometimes, your ISP required a VLAN tag to be inserted into the WAN packets from Gateway for specific services. Please enable VLAN tagging and specify tag in the WAN physical interface. Please be noted that only Ethernet and ADSL physical interfaces support the feature. For the device with 3G/4G WAN only, it is disabled.

Industrial LoRa Gateway

Physical Interface Setting

Go to **Basic Network > WAN > Physical Interface** tab.

The Physical Interface allows user to setup the physical WAN interface and to adjust WAN's behavior.

Note: Numbers of available WAN Interfaces can be different for the purchased gateway.

| Physical Interface List | | | |
|-------------------------|--------------------|----------------|-------------------------------------|
| Interface Name | Physical Interface | Operation Mode | Action |
| WAN-1 | WiFi Module One | Always on | <input type="button" value="Edit"/> |
| WAN-2 | - | Disable | <input type="button" value="Edit"/> |
| WAN-3 | - | Disable | <input type="button" value="Edit"/> |

When **Edit** button is applied, an **Interface Configuration** screen will appear. WAN-1 interface is used in this example.

Interface Configuration:

| Interface Configuration (WAN - 1) | |
|-------------------------------------|---|
| Item | Setting |
| ▶ Physical Interface | WiFi Module One ▾ |
| ▶ Operation Band | 5G ▾ |
| ▶ Operation Mode | Always on ▾ |
| ▶ VLAN Tagging | <input type="checkbox"/> Enable <input type="text" value="0"/> (1-4095) |

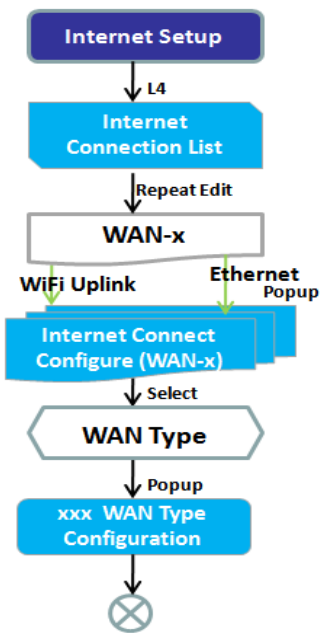
| Interface Configuration | | |
|---------------------------|--|--|
| Item | Value setting | Description |
| Physical Interface | 1. A Must fill setting 2. WAN-1 is the primary interface and is factory set to Always on. | Select one expected interface from the available interface dropdown list. It can be Ethernet or WiFi Module . Depending on the gateway model, Disable and Failover options will be available only to multiple WAN gateways. |
| Operation Band | 1. A Must fill setting | If WiFi Module is specified as the physical interface, the Operation Band |

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| | | |
|-----------------------|--------------------------------------|--|
| | 2. 5G is selected by default. | item will be displayed for radio band selection. Specify the radio band for WiFi uplink connection. If the WiFi module in use is a 2.4G/5GHz selectable module, please select one band for uplink connection. Note : This is only available for 2.4G/5GHz selectable module. |
| Operation Mode | A Must fill setting | Define the operation mode of the interface. Select Always on to make this WAN always active. Select Disable to disable this WAN interface. Select Failover to make this WAN a Failover WAN when the primary or the secondary WAN link failed. Then select the primary or the existed secondary WAN interface to switch Failover from. Note: for WAN-1, only Always on option is available. |
| VLAN Tagging | Optional setting | Check Enable box to enter tag value provided by your ISP. Otherwise uncheck the box. <u>Value Range: 1 ~ 4096.</u> Note: This feature is NOT available for 3G/4G WAN connection. |

Industrial LoRa Gateway

2.1.2 Internet Setup



| Internet Connection List | | | | |
|--------------------------|--------------------|----------------|----------|-------------------------------------|
| Interface Name | Physical Interface | Operation Mode | WAN Type | Action |
| WAN-1 | WiFi Module One | Always on | Uplink | <input type="button" value="Edit"/> |
| WAN-2 | - | Disable | - | <input type="button" value="Edit"/> |
| WAN-3 | - | Disable | - | <input type="button" value="Edit"/> |

| Internet Connection Configuration (WAN - 1) | |
|---|-------------------------------------|
| Item | Setting |
| ▶ WAN Type | <input type="text" value="Uplink"/> |

| WiFi Uplink WAN Type Configuration | |
|------------------------------------|--|
| Item | Setting |
| ▶ Connect to AP | default-Ch#44-Open (None) <input type="button" value="Scan"/> |
| ▶ Network Type | <input type="text" value="NAT Mode"/> |
| ▶ IP Mode | <input type="text" value="Dynamic IP"/> |
| ▶ Connection Control | <input type="text" value="Connect-on-demand"/> |
| ▶ Maximum Idle Time | <input type="text" value="600"/> (seconds) |
| ▶ Fast Roaming | <input type="checkbox"/> Enable Signal Threshold <input type="text" value="40"/> % |

After specifying the physical interface for each WAN connection, administrator must configure their connection profile to meet the dial in process of ISP, so that all client hosts in the Intranet of the gateway can access the Internet.

In "Internet Setup" page, there are some configuration windows: "Internet Connection List", "Internet Connection Configuration", "WAN Type Configuration" and related configuration windows for each WAN type. For the Internet setup of each WAN interface, you must specify its WAN type of physical interface first and then its related parameter configuration for that WAN type.

After clicking on the "Edit" button of a physical interface in "Internet Setup List" window, the "Internet Connection Configuration" window will appear to let you specify which kind of WAN type that you will use for that physical interface to make an Internet connection. Based on your chosen WAN type, you can configure necessary parameters in each corresponding configuration window.

Industrial LoRa Gateway

Internet Connection – WiFi Uplink WAN

If the device connects to Internet through WiFi Uplink, this section will help you to complete WiFi Uplink connection setup.

Go to **Basic Network > WAN & Uplink > Internet Setup** tab.

WiFi Uplink interface: The Uplink network is a wireless network, and the gateway can connect to the Uplink network through WiFi connection.

If you have the access permission to a certain wireless network, you can setup a WiFi Uplink connection by using the gateway device. This gateway can support 802.11ac/n/g/b data connection, and it can connect to a wireless network (access point) under the regular infrastructure mode.

| Internet Connection List | | | | |
|--------------------------|--------------------|----------------|------------|-------------------------------------|
| Interface Name | Physical Interface | Operation Mode | WAN Type | Action |
| WAN-1 | Ethernet | Always on | Dynamic IP | <input type="button" value="Edit"/> |
| WAN-2 | WiFi Module One | Always on | Uplink | <input type="button" value="Edit"/> |
| WAN-3 | - | Disable | - | <input type="button" value="Edit"/> |
| WAN-4 | - | Disable | - | <input type="button" value="Edit"/> |

Configure WiFi Uplink Setting

When **Edit** button is applied, **Internet Connection Configuration** screen will appear. WAN-2 interface is used in this example.

| Internet Connection Configuration (WAN - 2) | |
|---|-------------------------------------|
| Item | Setting |
| ▶ WAN Type | <input type="text" value="Uplink"/> |

| Internet Connection Configuration | | |
|-----------------------------------|---|---|
| Item | Value setting | Description |
| WAN Type | 1. A Must filled setting. 2. Uplink is selected by default. | From the dropdown box, select Internet connection method for WiFi Uplink Connection. Only Uplink is available. |

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WiFi Uplink

| WiFi Uplink WAN Type Configuration | |
|------------------------------------|--|
| Item | Setting |
| ▶ Connect to AP | default-Ch#161-Open (None) <input type="button" value="Scan"/> |
| ▶ Network Type | NAT Mode ▾ |
| ▶ IP Mode | Dynamic IP ▾ |
| ▶ Connection Control | Auto-reconnect ▾ |
| ▶ Fast Roaming | <input type="checkbox"/> Enable Signal Threshold <input type="text" value="40"/> % |

| WiFi Uplink WAN Type Configuration | | |
|------------------------------------|--|---|
| Item | Value setting | Description |
| Connect to AP | N/A | Display the information of AP for connecting. You can Click the Scan button and select a AP for the uplink network. Besides, you can also create uplink profile(s) for ease of connecting to an available Uplink network. Refer to Basic Network > WiFi > Uplink Profile tab. |
| Network Type | 1. A Must filled setting 2. NAT Mode is selected by default. | Select the expected network type for the WiFi Uplink connection. It can be NAT Mode , Bridge Mode , or NAT Disable . When NAT Mode is selected, the NAT function is activated on the Wireless Uplink connection; When Bridge Mode is selected, the bridge function is activated on the Wireless Uplink connection; The supporting of bridge mode depends on the product specification, if the purchased device doesn't support the bridge mode, it will be greyed out from selection. When NAT Disable is selected, the NAT function is deactivated on the Wireless Uplink connection, and it can function as a router with manually configured routing setting. |
| IP Mode | 1. A Must filled setting 2. Dynamic IP is selected by default. | Specify the IP mode for the wireless uplink Interface. It can be Dynamic IP or Static IP . When Dynamic IP is selected, the device will request a IP from the Uplink Network as the IP for the uplink interface ; When Static IP is selected, you have to manually configure the IP address settings for the uplink interface. The settings include IP address, subnet mask, gateway, and primary/secondary DNS. |
| Connection Control | A Must filled setting | There are three connection modes. <ul style="list-style-type: none"> • Auto-reconnect (Always on) enables the router to always keep the Internet connection on. • Connect-on-demand enables the router to automatically re-establish Internet connection as soon as user attempts to access the Internet. Internet connection will be disconnected when it has been inactive for a specified idle time. • Connect Manually allows user to connect to Internet manually. Internet connection will be inactive after it has been inactive for specified idle time. |
| Maximum Idle Time | 1. An Optional setting 2. By default 600 | Specify the maximum Idle time setting to disconnect the internet connection when the connection idle timed out. |

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| | | |
|---------------------|---|--|
| | seconds is filled-in | Value Range: 300 ~ 86400. Note: This field is available only when Connect-on-demand or Connect Manually is selected as the connection control scheme. |
| Fast Roaming | 1. An Optional setting 2. Unchecked is selected by default. | Click the Enable checkbox to activate the fast roaming function. In addition, you can also specify a threshold value for changing from one AP to another near-by AP. The default threshold value is 40%. Value Range: 30 ~ 60%. |

Network Monitoring

| Network Monitoring Configuration | |
|------------------------------------|--|
| Item | Setting |
| ▶ Network Monitoring Configuration | <input checked="" type="checkbox"/> Enable |
| ▶ Checking Method | DNS Query ▼ |
| ▶ Loading Check | <input checked="" type="checkbox"/> Enable |
| ▶ Query Interval | 5 (seconds) |
| ▶ Latency Threshold | 3000 (ms) |
| ▶ Fail Threshold | 5 (Times) |
| ▶ Target1 | DNS1 ▼ |
| ▶ Target2 | None ▼ |

| Network Monitoring Configuration | | |
|---|---|--|
| Item | Value setting | Description |
| Network Monitoring Configuration | 1. An Optional setting 2. The box is checked by default. | Click the Enable checkbox to activate the function. |
| Checking Method | 1. An Optional setting 2. DNS Query is selected by default. | Choose either DNS Query or ICMP Checking method and specify a Query/Check Interval to detect WAN link. With such configuration, the gateway will use DNS Query or ICMP Checking to periodically check Internet connection –connected or disconnected. |
| Load Checking | 1. An optional setting 2. Enabled by default. | Click the Enable checkbox to activate the function. Enable Loading Check allows the gateway to ignore unreturned DNS Queries or ICMP requests when WAN bandwidth is fully occupied. This is to prevent false link-down status. Latency Threshold defines the tolerance threshold of responding time. Fail Threshold specifies the detected disconnection before the router recognize the WAN link down status. Enter a number of detecting disconnection times to be the threshold before disconnection is acknowledged. |
| Query Interval | 1. An Optional setting 2. 5 seconds is selected | Specify a time interval as the DNS Query Interval . Query Interval defines the transmitting interval between two DNS Query or |

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| | | |
|--------------------------|---|--|
| | by default. | ICMP checking packets. With DNS Query , the system checks the connection by sending DNS Query packets to the destination specified in Target 1 and Target 2. Value Range: 2 ~ 14400. |
| Check Interval | 1. An Optional setting 2. 5 seconds is selected by default. | Specify a time interval as the ICMP Checking Interval . Query Interval defines the transmitting interval between two DNS Query or ICMP checking packets. With ICMP Checking , the system will check connection by sending ICMP request packets to the destination specified in Target 1 and Target 2. Value Range: 2 ~ 14400. |
| Latency Threshold | 1. An Optional setting 2. 3000 ms is selected by default. | Specify a time interval as the Latency Threshold . Latency Threshold defines the tolerance threshold of responding time. |
| Fail Threshold | 1. An Optional setting 2. 5 times is selected by default. | Enter a number of detecting disconnection times to be the threshold before disconnection is acknowledged. Fail Threshold specifies the detected disconnection before the router recognize the WAN link down status. Value Range: 1 ~ 10. |
| Target 1 | 1. An Optional setting 2. DNS1 is selected by default. | Target1 (DNS1 set by default) specifies the first target of sending DNS query/ICMP request. <ul style="list-style-type: none"> ■ DNS1: set the primary DNS to be the target. ■ DNS2: set the secondary DNS to be the target. ■ Gateway: set the Current gateway to be the target. ■ Other Host: enter an IP address to be the target. |
| Target 2 | 1. An Optional setting 2. None is selected by default. | Target2 (None set by default) specifies the second target of sending DNS query/ICMP request. <ul style="list-style-type: none"> ■ None: to disable Target2. ■ DNS1: set the primary DNS to be the target. ■ DNS2: set the secondary DNS to be the target. ■ Gateway: set the Current gateway to be the target. ■ Other Host: enter an IP address to be the target. |
| Save | N/A | Click Save to save the settings. |
| Undo | N/A | Click Undo to cancel the settings. |

Industrial LoRa Gateway

Internet Connection List - Ethernet WAN

The flowchart on the left illustrates the configuration process: **Edit** → **Internet Connection List Physical Interface= Ethernet** → **Pop up Internet Connect Configure** → **Select one WAN Type=** (options: Dynamic IP, Static IP, PPPoE, L2TP, PPTP) → **L4 Setup XXX WAN Type Configuration** → **L4 Setup Ethernet Connection Common Configure** → **⊗**.

The screenshot on the right shows the **Internet Connection Configuration (WAN - 1)** screen. The **WAN Type** dropdown menu is open, showing options: **Dynamic IP** (selected), **Static IP**, **PPPoE**, **PPTP**, and **L2TP**. Below, the **Dynamic IP WAN Type Configuration** section includes fields for **Host Name** (Optional), **ISP Registered MAC Address** (with a **Clone** button, Optional), **Connection Control** (set to **Auto-reconnect (Always on)**), **MTU** (0, 0 is Auto), **NAT** (checked **Enable**), and **Network Monitoring** (checked **Enable**, with sub-options for **DNS Query**, **ICMP Checking**, and **Loading Check**, plus **Check Interval** (5 seconds), **Check Timeout** (3 seconds), and **Latency** (3000 ms)).

WAN Type for Ethernet Interface:

Ethernet is the most common WAN and uplink interface for M2M gateways. Usually it is connected with xDSL or cable modem for you to setup the WAN connection. There are various WAN types to connect with ISP.

- **Static IP:** Select this option if ISP provides a fixed IP to you when you subscribe the service. Usually is more expensive but very important for cooperate requirement.
- **Dynamic IP:** The assigned IP address for the WAN by a DHCP server is different every time. It is cheaper and usually for consumer use.
- **PPP over Ethernet:** As known as PPPoE. This WAN type is widely used for ADSL connection. IP is usually different for every dial up.
- **PPTP:** This WAN type is popular in some countries, like Russia.
- **L2TP :** This WAN type is popular in some countries, like Israel.

Configure Ethernet WAN Setting

When **Edit** button is applied, **Internet Connection Configuration** screen will appear. WAN-1 interface is used in this example.

Industrial LoRa Gateway

WAN Type = Dynamic IP

| Internet Connection Configuration (WAN - 1) | |
|---|--------------|
| Item | Setting |
| ▶ WAN Type | Dynamic IP ▼ |

When you select it, "Dynamic IP WAN Type Configuration" will appear. Items and setting is explained below

| Dynamic IP WAN Type Configuration | |
|-----------------------------------|--|
| Item | Setting |
| ▶ Host Name | <input type="text"/> (Optional) |
| ▶ ISP Registered MAC Address | <input type="text"/> <input type="button" value="Clone"/> (Optional) |

| Dynamic IP WAN Type Configuration | | |
|-----------------------------------|---------------------|--|
| Item | Value setting | Description |
| Host Name | An optional setting | Enter the host name provided by your Service Provider. |
| ISP Registered MAC Address | An optional setting | Enter the MAC address that you have registered with your service provider. Or Click the Clone button to clone your PC's MAC to this field. Usually this is the PC's MAC address assigned to allow you to connect to Internet. |

WAN Type= Static IP

| Internet Connection Configuration (WAN - 1) | |
|---|-------------|
| Item | Setting |
| ▶ WAN Type | Static IP ▼ |

When you select it, "Static IP WAN Type Configuration" will appear. Items and setting is explained below

| Static IP WAN Type Configuration | |
|----------------------------------|---------------------------------|
| Item | Setting |
| ▶ WAN IP Address | <input type="text"/> |
| ▶ WAN Subnet Mask | 255.255.255.0 (/24) ▼ |
| ▶ WAN Gateway | <input type="text"/> |
| ▶ Primary DNS | <input type="text"/> |
| ▶ Secondary DNS | <input type="text"/> (Optional) |

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| Static IP WAN Type Configuration | | |
|----------------------------------|-----------------------|---|
| Item | Value setting | Description |
| WAN IP Address | A Must filled setting | Enter the WAN IP address given by your Service Provider |
| WAN Subnet Mask | A Must filled setting | Enter the WAN subnet mask given by your Service Provider |
| WAN Gateway | A Must filled setting | Enter the WAN gateway IP address given by your Service Provider |
| Primary DNS | A Must filled setting | Enter the primary WAN DNS IP address given by your Service Provider |
| Secondary DNS | An optional setting | Enter the secondary WAN DNS IP address given by your Service Provider |

WAN Type= PPPoE

| Internet Connection Configuration (WAN - 1) | |
|---|---------|
| Item | Setting |
| ▶ WAN Type | PPPoE ▼ |

When you select it, "PPPoE WAN Type Configuration" will appear. Items and setting is explained below

| PPPoE WAN Type Configuration | |
|------------------------------|---------------------------------|
| Item | Setting |
| ▶ IPv6 Dual Stack | <input type="checkbox"/> Enable |
| ▶ PPPoE Account | <input type="text"/> |
| ▶ PPPoE Password | <input type="text"/> |
| ▶ Primary DNS | <input type="text"/> (Optional) |
| ▶ Secondary DNS | <input type="text"/> (Optional) |
| ▶ Service Name | <input type="text"/> (Optional) |
| ▶ Assigned IP Address | <input type="text"/> (Optional) |

| PPPoE WAN Type Configuration | | |
|------------------------------|-----------------------|--|
| Item | Value setting | Description |
| PPPoE Account | A Must filled setting | Enter the PPPoE User Name provided by your Service Provider. |
| PPPoE Password | A Must filled setting | Enter the PPPoE password provided by your Service Provider. |
| Primary DNS | An optional setting | Enter the IP address of Primary DNS server. |
| Secondary DNS | An optional setting | Enter the IP address of Secondary DNS server. |
| Service Name | An optional setting | Enter the service name if your ISP requires it |
| Assigned IP Address | An optional setting | Enter the IP address assigned by your Service Provider. |

Industrial LoRa Gateway

WAN Type= PPTP

| Internet Connection Configuration (WAN - 1) | |
|---|---------|
| Item | Setting |
| ▶ WAN Type | PPTP ▼ |

When you select it, "PPTP WAN Type Configuration" will appear. Items and setting is explained below

| PPTP WAN Type Configuration | |
|-----------------------------|---------------------------------|
| Item | Setting |
| ▶ IP Mode | Dynamic IP Address ▼ |
| ▶ Server IP Address / Name | <input type="text"/> |
| ▶ PPTP Account | <input type="text"/> |
| ▶ PPTP Password | <input type="text"/> |
| ▶ Connection ID | <input type="text"/> (Optional) |
| ▶ MPPE | <input type="checkbox"/> Enable |

| PPTP WAN Type Configuration | | |
|-----------------------------|-----------------------|---|
| Item | Value setting | Description |
| IP Mode | A Must filled setting | <p>Select either Static or Dynamic IP address for PPTP Internet connection.</p> <ul style="list-style-type: none"> When Static IP Address is selected, you will need to enter the WAN IP Address, WAN Subnet Mask, and WAN Gateway. <ul style="list-style-type: none"> WAN IP Address (A Must filled setting): Enter the WAN IP address given by your Service Provider. WAN Subnet Mask (A Must filled setting): Enter the WAN subnet mask given by your Service Provider. WAN Gateway (A Must filled setting): Enter the WAN gateway IP address given by your Service Provider. When Dynamic IP is selected, there are no above settings required. |
| Server IP Address/Name | A Must filled setting | Enter the PPTP server name or IP Address. |
| PPTP Account | A Must filled setting | Enter the PPTP username provided by your Service Provider. |
| PPTP Password | A Must filled setting | Enter the PPTP connection password provided by your Service Provider. |
| Connection ID | An optional setting | Enter a name to identify the PPTP connection. |
| MPPE | An optional setting | Select Enable to enable MPPE (Microsoft Point-to-Point Encryption) security for PPTP connection. |

Industrial LoRa Gateway

WAN Type= L2TP

| Internet Connection Configuration (WAN - 1) | |
|---|---------|
| Item | Setting |
| ▶ WAN Type | L2TP ▼ |

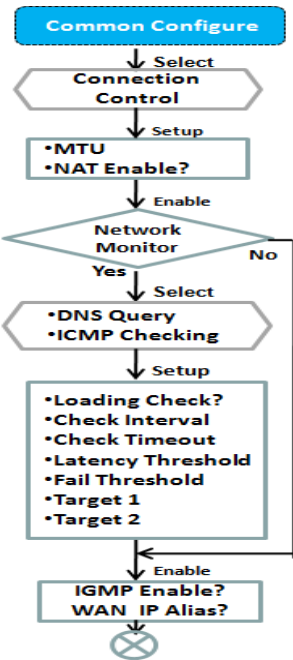
When you select it, "L2TP WAN Type Configuration" will appear. Items and setting is explained below

| L2TP WAN Type Configuration | |
|-----------------------------|--|
| Item | Setting |
| ▶ IP Mode | Dynamic IP Address ▼ |
| ▶ Server IP Address / Name | <input type="text"/> |
| ▶ L2TP Account | <input type="text"/> |
| ▶ L2TP Password | <input type="text"/> |
| ▶ Service Port | User-defined ▼ <input type="text" value="1702"/> |
| ▶ MPPE | <input type="checkbox"/> Enable |

| L2TP WAN Type Configuration | | |
|-------------------------------|-----------------------|---|
| Item | Value setting | Description |
| IP Mode | A Must filled setting | <p>Select either Static or Dynamic IP address for L2TP Internet connection.</p> <ul style="list-style-type: none"> ● When Static IP Address is selected, you will need to enter the WAN IP Address, WAN Subnet Mask, and WAN Gateway. <ul style="list-style-type: none"> ■ WAN IP Address (A Must filled setting): Enter the WAN IP address given by your Service Provider. ■ WAN Subnet Mask (A Must filled setting): Enter the WAN subnet mask given by your Service Provider. ■ WAN Gateway (A Must filled setting): Enter the WAN gateway IP address given by your Service Provider. ● When Dynamic IP is selected, there are no above settings required. |
| Server IP Address/Name | A Must filled setting | Enter the L2TP server name or IP Address. |
| L2TP Account | A Must filled setting | Enter the L2TP username provided by your Service Provider. |
| L2TP Password | A Must filled setting | Enter the L2TP connection password provided by your Service Provider. |
| Service Port | A Must filled setting | <p>Enter the service port that the Internet service.</p> <p>There are three options can be selected :</p> <ul style="list-style-type: none"> ● Auto: Port will be automatically assigned. ● 1701 (For Cisco): Set service port to port 1701 to connect to CISCO server. ● User-defined: enter a service port provided by your Service Provider. |
| MPPE | An optional setting | Select Enable to enable MPPE (Microsoft Point-to-Point Encryption) security for PPTP connection. |

Industrial LoRa Gateway

Ethernet Connection Common Configuration

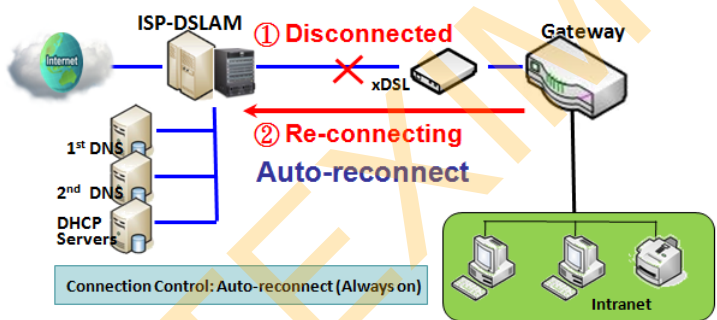


| | |
|----------------------|--|
| ▶ Connection Control | Auto-reconnect ▼ |
| ▶ MTU Setup | <input type="checkbox"/> Enable |
| ▶ NAT | <input checked="" type="checkbox"/> Enable |
| ▶ IGMP | Disable ▼ |
| ▶ WAN IP Alias | <input type="checkbox"/> Enable 10.0.0.1 |

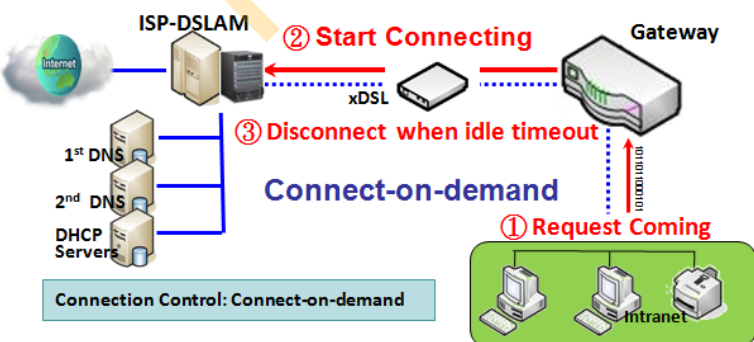
| Network Monitoring Configuration | |
|------------------------------------|--|
| Item | Setting |
| ▶ Network Monitoring Configuration | <input checked="" type="checkbox"/> Enable |
| ▶ Checking Method | DNS Query ▼ |
| ▶ Loading Check | <input checked="" type="checkbox"/> Enable |
| ▶ Query Interval | 5 (seconds) |
| ▶ Latency Threshold | 3000 (ms) |
| ▶ Fail Threshold | 5 (Times) |
| ▶ Target1 | DNS1 ▼ |
| ▶ Target2 | None ▼ |

There are some important parameters to be setup no matter which Ethernet WAN type is selected. You should follow up the rule to configure.

Connection Control.

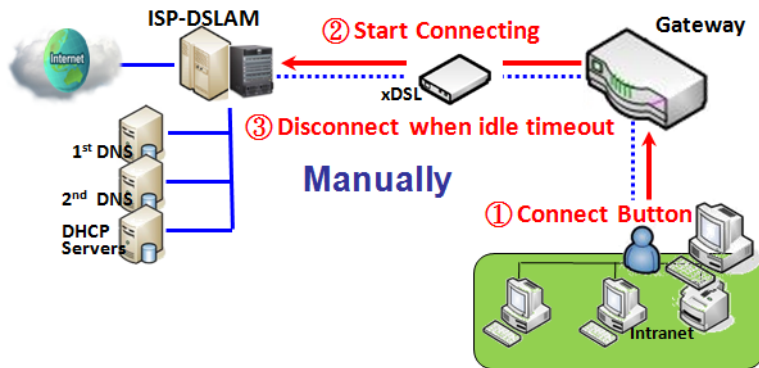


Auto-reconnect: This gateway will establish Internet connection automatically once it has been booted up, and try to reconnect once the connection is down. It's recommended to choose this scheme if for mission critical applications to ensure full-time Internet connection.



Connect-on-demand: This gateway won't start to establish Internet connection until local data is going to be sent to WAN side. After normal data transferring between LAN and WAN sides, this gateway will disconnect WAN connection if idle time reaches value of Maximum Idle Time.

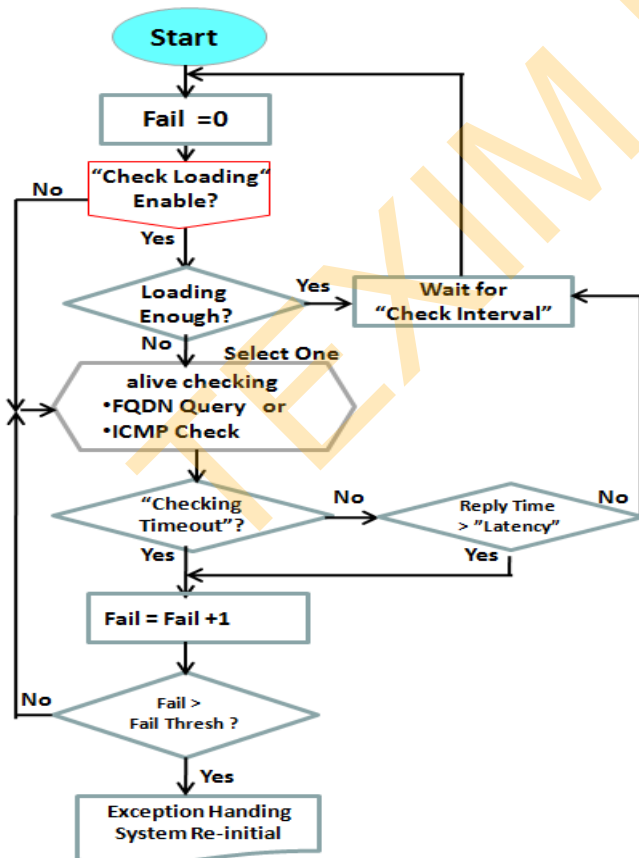
Industrial LoRa Gateway



Manually: This gateway won't start to establish WAN connection until you press "Connect" button on web UI. After normal data transferring between LAN and WAN sides, this gateway will disconnect WAN connection if idle time reaches value of Maximum Idle Time.

Please be noted, if the WAN interface serves as the primary one for another WAN interface in Failover role, the Connection Control parameter will not be available to you to configure as the system must set it to "Auto-reconnect (Always on)".

Network Monitoring



It is necessary to monitor connection status continuous. To do it, "ICMP Check" and "FQDN Query" are used to check. When there is traffic of connection, checking packet will waste bandwidth. Response time of replied packets may also increase. To avoid "Network Monitoring" work abnormally, enabling "Checking Loading" option will stop connection check when there is traffic. It will wait for another "Check Interval" and then check loading again.

When you do "Network Monitoring", if reply time longer than "Latency" or even no response longer than "Checking Timeout", "Fail" count will be increased. If it is continuous and "Fail" count is more than "Fail Threshold", gateway will do exception handling process and re-initial this connection again. Otherwise, network monitoring process will be start again.

Industrial LoRa Gateway

Set up “Ethernet Common Configuration”

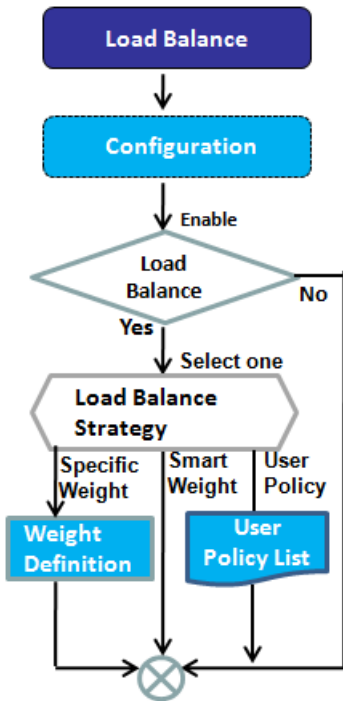
| Ethernet WAN Common Configuration | | |
|-----------------------------------|--|--|
| Item | Value setting | Description |
| Connection Control | A Must filled setting | <p>There are three connection modes.</p> <ul style="list-style-type: none"> ● Auto-reconnect enables the router to always keep the Internet connection on. ● Connect-on-demand enables the router to automatically re-establish Internet connection as soon as user attempts to access the Internet. Internet connection will be disconnected when it has been inactive for a specified idle time. ● Connect Manually allows user to connect to Internet manually. Internet connection will be inactive after it has been inactive for specified idle time. |
| Maximum Idle Time | <ol style="list-style-type: none"> 1. An Optional setting 2. By default 600 seconds is filled-in | <p>Specify the maximum Idle time setting to disconnect the internet connection when the connection idle timed out.</p> <p>Value Range: 300 ~ 86400.</p> <p>Note: This field is available only when Connect-on-demand or Connect Manually is selected as the connection control scheme.</p> |
| MTU Setup | <ol style="list-style-type: none"> 1. An Optional setting 2. Uncheck by default | <p>Check the Enable box to enable the MTU (Maximum Transmission Unit) limit, and specify the MTU for the 3G/4G connection.</p> <p>MTU refers to Maximum Transmission Unit. It specifies the largest packet size permitted for Internet transmission.</p> <p>Value Range: 1200 ~ 1500.</p> |
| MTU Setup | <ol style="list-style-type: none"> 1. A Must filled setting 2. Auto (value zero) is set by default 3. Manual set range 1200~1500 | <p>MTU refers to Maximum Transmission Unit. It specifies the largest packet size permitted for Internet transmission.</p> <p>When set to Auto (value '0'), the router selects the best MTU for best Internet connection performance.</p> |
| NAT | <ol style="list-style-type: none"> 1. An optional setting 2. NAT is enabled by default | <p>Enable NAT to apply NAT on the WAN connection. Uncheck the box to disable NAT function.</p> |
| Network Monitoring | <ol style="list-style-type: none"> 1. An optional setting 2. Enabled by default | <p>When the Network Monitoring feature is enabled, the gateway will use DNS Query or ICMP to periodically check Internet connection –connected or disconnected.</p> <ul style="list-style-type: none"> ● Choose either DNS Query or ICMP Checking to detect WAN link. With DNS Query, the system checks the connection by sending DNS Query packets to the destination specified in Target 1 and Target 2. With ICMP Checking, the system will check connection by sending ICMP request packets to the destination specified in Target 1 and Target 2. ● Loading Check Enable Loading Check allows the router to ignore unreturned DNS Queries or ICMP requests when WAN bandwidth is fully occupied. This is to prevent false link-down status. ● Check Interval defines the transmitting interval between two DNS Query or ICMP checking packets. ● Check Timeout defines the timeout of each DNS query/ICMP. ● Latency Threshold defines the tolerance threshold of responding time. ● Fail Threshold specifies the detected disconnection before the router recognize the WAN link down status. Enter a number of detecting |

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| | | |
|---------------------|--|---|
| | | <p>disconnection times to be the threshold before disconnection is acknowledged.</p> <ul style="list-style-type: none"> ● Target1 (DNS1 set by default) specifies the first target of sending DNS query/ICMP request. <ul style="list-style-type: none"> ■ DNS1: set the primary DNS to be the target. ■ DNS2: set the secondary DNS to be the target. ■ Gateway: set the Current gateway to be the target. ■ Other Host: enter an IP address to be the target. ● Target2 (None set by default) specifies the second target of sending DNS query/ICMP request. <ul style="list-style-type: none"> ■ None: to disable Target2. ■ DNS1: set the primary DNS to be the target. ■ DNS2: set the secondary DNS to be the target. ■ Gateway: set the Current gateway to be the target. ■ Other Host: enter an IP address to be the target. |
| IGMP | <ol style="list-style-type: none"> 1. A Must filled setting 2. Disable is set by default | <p>Enable IGMP (Internet Group Management Protocol) would enable the router to listen to IGMP packets to discover which interfaces are connected to which device. The router uses the interface information generated by IGMP to reduce bandwidth consumption in a multi-access network environment to avoid flooding the entire network.</p> |
| WAN IP Alias | <ol style="list-style-type: none"> 1. An optional setting 2. Uncheck by default | <p>Enable WAN IP Alias then enter the IP address provided by your service provider. WAN IP Alias is used by the device router and is treated as a second set of WAN IP to provide dual WAN IP address to your LAN network.</p> |
| Save | N/A | Click Save to save the settings. |
| Undo | N/A | Click Undo to cancel the settings. |

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2.1.3 Load Balance



| Configuration | |
|-----------------------|--|
| Item | Setting |
| Load Balance | <input checked="" type="checkbox"/> Enable |
| Load Balance Strategy | By Specific Weight ▾ |
| | By Smart Weight |
| | By Specific Weight |
| | By User Policy |

| Weight Definition | | | |
|-------------------|--------|--|--------|
| WAN ID | Weight | | Action |
| WAN - 1 | 86 % | | Edit |
| WAN - 2 | 13 % | | Edit |

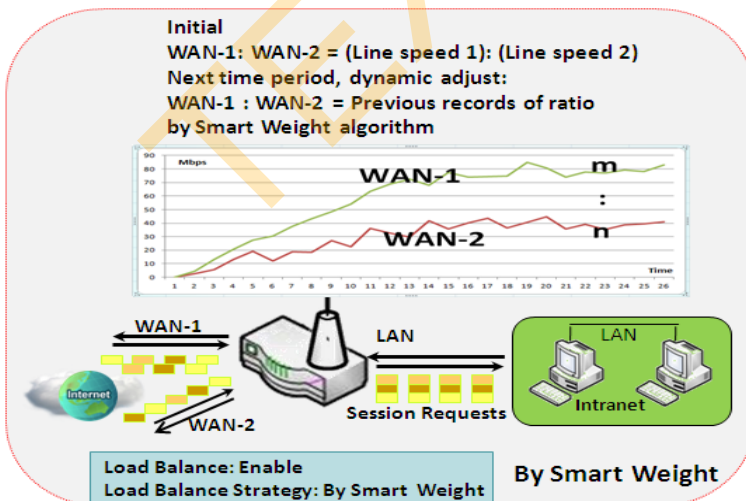
| User Policy List | | | | | | |
|------------------|-------------------|------------------------|------------------|---------------|--------|---------|
| ID | Source IP Address | Destination IP Address | Destination Port | WAN Interface | Enable | Actions |
| | | | | | | |

| User Policy Configuration | |
|---------------------------|---------|
| Item | Setting |
| | |

When there are multiple WAN interfaces, and when the bandwidth of one WAN connection is not enough for the traffic loads from the Intranet to the Internet, the WAN load balance function can be considered to enlarge the total WAN bandwidth.

Load Balance Strategy

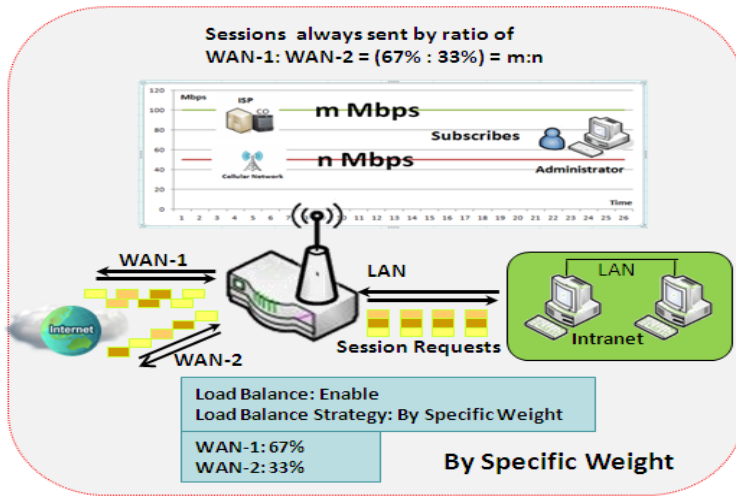
There are three optional strategies for load balance: **“By Smart Weight”**, **“By Specific Weight”**, and **“By User Policy”**. Administrator can select strategy according to application requirement and environment status. The strategies are explained as below.



By Smart Weight

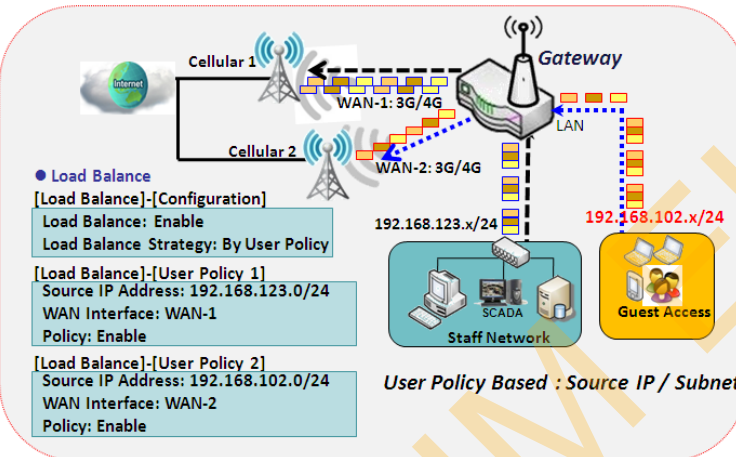
If based on "By Smart Weight" strategy, gateway will take the line speed settings of all WAN interfaces specified in "Physical Interface" configuration page as default ratio for data transfer. Based on the ratio of packet bytes via these WAN interfaces in past period (maybe 5 minutes), system decides how many sessions will be transferred via each WAN interface for next period. Administrator may take it as a fast approach to maximize the bandwidth utilization of multiple WAN interfaces in gateway

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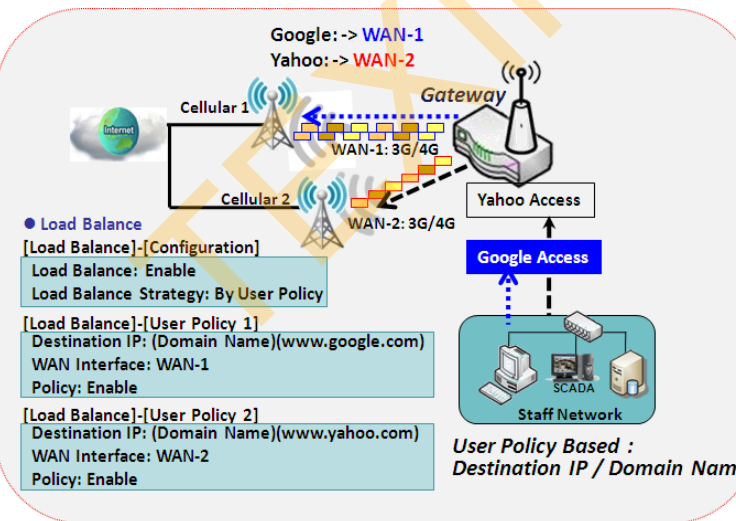
By Specific Weight

When you select "By Specific Weight", you need to set up ratio of WAN-1/WAN-2 to decide sessions sent ratio. Total ratio should be 100%. Ratio is usually defined based on practical WAN speed of environment. Gateway's traffic control process will operate routing adequately based on the dedicated weights ratio on all WAN interfaces.



By User Policy

If "By User Policy" load balance strategy is selected, it can allow you to mapping Source IP, Destination IP, or Destination Port to assigned WAN interface. This IP address is not only a single IP but also a subnet or IP range. Destination port can be a single port or port range. You can select one target for one mapping to setup IP address and leave others just left as "any"/ "All". Besides this, you can also set protocol as TCP, UDP or both.



Diagrams shown on left side are examples user policy. The first diagram illustrates example for mapping various source IP subnets to different WAN interface. All packets from different subnet will be routed to the assigned WAN interface. Administrator can manage and balance the loading among available WAN interfaces accordingly.

The second diagram illustrates another example for routing packets with designated destination IP or domain name to a certain WAN interface. If packets no belong to user policy rule, the gateway just routes those packets based on smart weight algorithm.

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Load Balance Setting

Go to **Basic Network > WAN & Uplink > Load Balance** Tab.

The **Load Balance** function is used to manage balance bandwidth usage among multiple WAN connections. When you choose "By Smart Weight" strategy, system will operate load balance function automatically based on the embedded Smart Weight algorithm. However, when you choose "By Specific Weight" strategy, the further "Weight Definition" configuration window will let you define the ratio of transferred sessions between all WAN interfaces for data transfer. At last, when you choose "By User Policy" strategy, the further "User Policy List" shows all defined user policy entries, and the "User Policy Configuration" window will let you create and define one user policy for routing dedicated packet flow via one WAN interface.

Enable/Select Load Balance Strategy

| Configuration | |
|-------------------------|---------------------------------|
| Item | Setting |
| ▶ Load Balance | <input type="checkbox"/> Enable |
| ▶ Load Balance Strategy | By Smart Weight ▼ |

| Configuration | | |
|------------------------------|---|--|
| Item | Value setting | Description |
| Load Balance | Unchecked by default | Check the Enable box to activate Load Balance function. |
| Load Balance Strategy | 1. A Must filled setting 2. By Smart Weight is selected by default. | There are up to three load balance strategies. Select the preferred one. By Smart Weight: System will operate load balance function automatically based on the embedded Smart Weight algorithm. By Specific Weight: System will adjust the ratio of transferred sessions among all WANs based on the specified weights for each WAN. By User Policy: System will route traffics through available WAN interface based on user defined rules. Note: The number of available strategies depends on the model you purchased. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

When **By Specific Weight** is selected, user needs to adjust the percentage of WAN loading. System will give a value according to the bandwidth ratio of each WAN at first time and keep the value after clicking **Save** button.

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| Weight Definition | | |
|-------------------|-----------------------------------|-------------------------------------|
| WAN ID | Weight | Action |
| WAN - 1 | <input type="text" value="86"/> % | <input type="button" value="Edit"/> |
| WAN - 2 | <input type="text" value="13"/> % | <input type="button" value="Edit"/> |

| Weight Definition | | |
|-------------------|---|---|
| Item | Value setting | Description |
| WAN ID | NA | The Identifier for each available WAN interface.. |
| Weight | 1. A Must filled setting 2. Set with bandwidth ratio of each WAN by default. | Enter the weight ratio for each WAN interface. Initially, the bandwidth ratio of each WAN is set by default. <u>Value Range: 1 ~ 99.</u> Note: The sum of all weights can't be greater than 100%. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

When **By User Policy** is selected, a **User Policy List** screen will appear. With properly configured your policy rules, system will route traffics through available WAN interface based on user defined rules

Create User Policy

| User Policy List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | |
|---|-------------------|------------------------|------------------|---------------|--------|---------|
| ID | Source IP Address | Destination IP Address | Destination Port | WAN Interface | Enable | Actions |

When **Add** button is applied, **User Policy Configuration** screen will appear.

| User Policy Configuration | |
|---------------------------|--------------------------------------|
| Item | Setting |
| ▶ Source IP Address | <input type="text" value="Any"/> |
| ▶ Destination IP Address | <input type="text" value="Any"/> |
| ▶ Destination Port | <input type="text" value="All"/> |
| ▶ Protocol | <input type="text" value="Both"/> |
| ▶ WAN Interface | <input type="text" value="WAN - 1"/> |
| ▶ Policy | <input type="checkbox"/> Enable |

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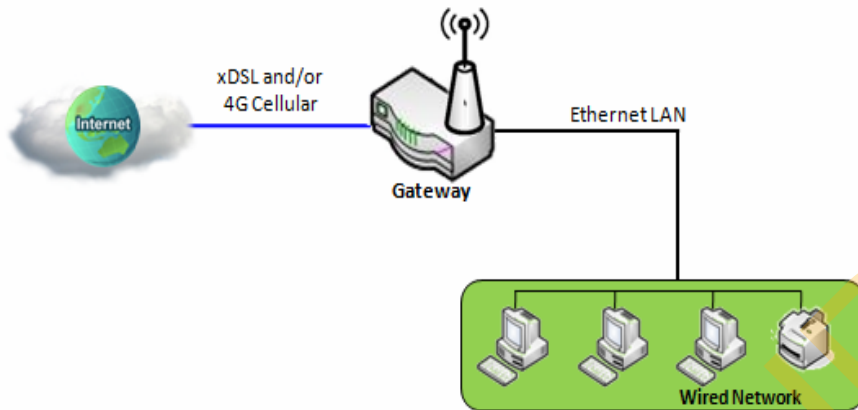
| User Policy Configuration | | |
|-------------------------------|---|--|
| Item | Value setting | Description |
| Source IP Address | <ol style="list-style-type: none"> 1. A Must filled setting 2. Any is selected by default. | <p>There are four options can be selected :</p> <p>Any: No specific Source IP is provided. The traffic may come from any source</p> <p>Subnet: Specify the Subnet for the traffics come from the subnet. Input format is : xxx.xxx.xxx.xxx/xx e.g. 192.168.123.0/24.</p> <p>IP Range: Specify the IP Range for the traffics come from the IPs</p> <p>Single IP: Specify a unique IP Address for the traffics come from the IP. Input format is : xxx.xxx.xxx.xxx e.g. 192.168.123.101.</p> |
| Destination IP Address | <ol style="list-style-type: none"> 1. A Must filled setting 2. Any is selected by default. | <p>There are five options can be selected :</p> <p>Any: No specific destination IP is provided. The traffic may come to any destination.</p> <p>Subnet: Specify the Subnet for the traffics come to the subnet. Input format is : xxx.xxx.xxx.xxx/xx e.g. 192.168.123.0/24.</p> <p>IP Range: Specify the IP Range for the traffics come to the IPs</p> <p>Single IP: Specify a unique IP Address for the traffics come to the IP. Input format is : xxx.xxx.xxx.xxx e.g. 192.168.123.101.</p> <p>Domain Name: Specify the domain name for the traffics come to the domain</p> |
| Destination Port | <ol style="list-style-type: none"> 1. A Must filled setting 2. All is selected by default. | <p>There are four options can be selected :</p> <p>All: No specific destination port is provided.</p> <p>Port Range: Specify the Destination Port Range for the traffics</p> <p>Single Port: Specify a unique destination Port for the traffics</p> <p>Well-known Applications: Select the service port of well-known application defined in dropdown list.</p> |
| Protocol | <ol style="list-style-type: none"> 1. A Must filled setting 2. Both is selected by default. | <p>There are three options can be selected. They are Both, TCP, and UDP.</p> |
| WAN Interface | <ol style="list-style-type: none"> 1. A Must filled setting 2. WAN-1 is selected by default. | <p>User can select the interface that traffic should go.</p> <p>Note that the WAN interface dropdown list will only show the available WAN interfaces.</p> |
| Policy | Unchecked by default | Check the Enable checkbox to activate the policy rule. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

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2.2 LAN & VLAN

This section provides the configuration of LAN and VLAN. VLAN is an optional feature, and it depends on the product specification of the purchased gateway.

2.2.1 Ethernet LAN



The Local Area Network (LAN) can be used to share data or files among computers attached to a network. Following diagram illustrates the network that wired and interconnects computers.

Please follow the following instructions to do IPv4 Ethernet LAN Setup.

| Configuration | |
|------------------|--|
| Item | Setting |
| ▶ IP Mode | Static IP |
| ▶ LAN IP Address | <input type="text" value="192.168.123.254"/> |
| ▶ Subnet Mask | <input type="text" value="255.255.255.0 (/24)"/> |

| Configuration Item | Value setting | Description |
|--------------------|--|--|
| IP Mode | N/A | It shows the LAN IP mode for the gateway according the related configuration. Static IP: If there is at least one WAN interface activated, the LAN IP mode is fixed in Static IP mode. Dynamic IP: If all the available WAN interfaces are disabled, the LAN IP mode can be Dynamic IP mode. |
| LAN IP Address | 1. A Must filled setting 2. 192.168.123.254 is set by default | Enter the local IP address of this device. The network device(s) on your network must use the LAN IP address of this device as their Default Gateway. You can change it if necessary. Note: It's also the IP address of web UI. If you change it, you need to type new IP address in the browser to see web UI. |
| Subnet Mask | 1. A Must filled setting 2. 255.255.255.0 (/24) is set | Select the subnet mask for this gateway from the dropdown list. Subnet mask defines how many clients are allowed in one network or subnet. |

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| | | |
|-------------|------------|---|
| | by default | The default subnet mask is 255.255.255.0 (/24), and it means maximum 254 IP addresses are allowed in this subnet. However, one of them is occupied by LAN IP address of this gateway, so there are maximum 253 clients allowed in LAN network. Value Range: 255.0.0.0 (/8) ~ 255.255.255.252 (/30). |
| Save | N/A | Click the Save button to save the configuration |
| Undo | N/A | Click the Undo button to restore what you just configured back to the previous setting. |

Create / Edit Additional IP

This gateway provides the LAN IP alias function for some special management consideration. You can add additional LAN IP for this gateway, and access to this gateway with the additional IP.

| Additional IP <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | |
|--|------|-----------|------------|-------------|--------|--------|
| ID | Name | Interface | IP Address | Subnet Mask | Enable | Action |

When **Add** button is applied, **Additional IP Configuration** screen will appear.

| Additional IP Configuration | |
|-------------------------------------|--------------------------|
| Item | Setting |
| ▶ Name | <input type="text"/> |
| ▶ Interface | lo ▼ |
| ▶ IP Address | <input type="text"/> |
| ▶ Subnet Mask | 255.255.255.0 (/24) ▼ |
| ▶ Enable | <input type="checkbox"/> |
| <input type="button" value="Save"/> | |

| Configuration Item | Value setting | Description |
|--------------------|--|--|
| Name | .1 An Optional Setting | Enter the name for the alias IP address. |
| Interface | 1. A Must filled setting 2. lo is set by default | Specify the Interface type. It can be lo or br0. |
| IP Address | 1. An Optional setting 2. 192.168.123.254 is set by default | Enter the addition IP address for this device. |
| Subnet Mask | 1. A Must filled setting 2. 255.255.255.0 (/24) is set by default | Select the subnet mask for this gateway from the dropdown list. Subnet mask defines how many clients are allowed in one network or subnet. The default subnet mask is 255.255.255.0 (/24), and it means maximum 254 IP addresses are allowed in this subnet. However, one of them is occupied by LAN IP address of this gateway, so there are maximum 253 clients allowed in LAN |

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| | | |
|-------------|----|--|
| | | network. <i>Value Range:</i> 255.0.0.0 (/8) ~ 255.255.255.255 (/32). |
| Save | NA | Click the Save button to save the configuration |

TEXIM EUROPE

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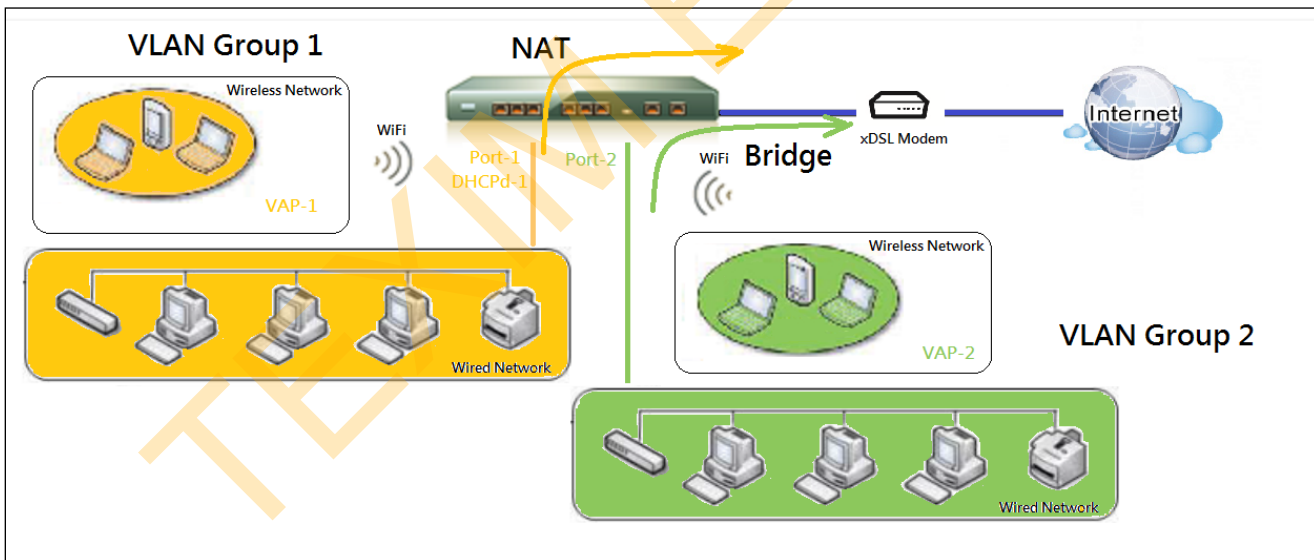
2.2.2 VLAN

VLAN (Virtual LAN) is a logical network under a certain switch or router device to group client hosts with a specific VLAN ID. This gateway supports both Port-based VLAN and Tag-based VLAN. These functions allow you to divide local network into different “virtual LANs”. It is common requirement for some application scenario. For example, there are various departments within SMB. All client hosts in the same department should own common access privilege and QoS property. You can assign departments either by port-based VLAN or tag-based VLAN as a group, and then configure it by your plan. In some cases, ISP may need router to support “VLAN tag” for certain kinds of services (e.g. IPTV). You can group all devices required this service as one tag-based VLAN.

If the gateway has only one physical Ethernet LAN port, only very limited configuration is available if you enable the Port-based VLAN.

➤ Port-based VLAN

Port-based VLAN function can group Ethernet ports, Port-1 ~ Port-4, and WiFi Virtual Access Points, VAP-1 ~ VAP-8, together for differentiated services like Internet surfing, multimedia enjoyment, VoIP talking, and so on. Two operation modes, NAT and Bridge, can be applied to each VLAN group. One DHCP server can be allocated for a NAT VLAN group to let group host member get its IP address. Thus, each host can surf Internet via the NAT mechanism of business access gateway. In bridge mode, Intranet packet flow is delivered out WAN trunk port with VLAN tag to upper link for different services.

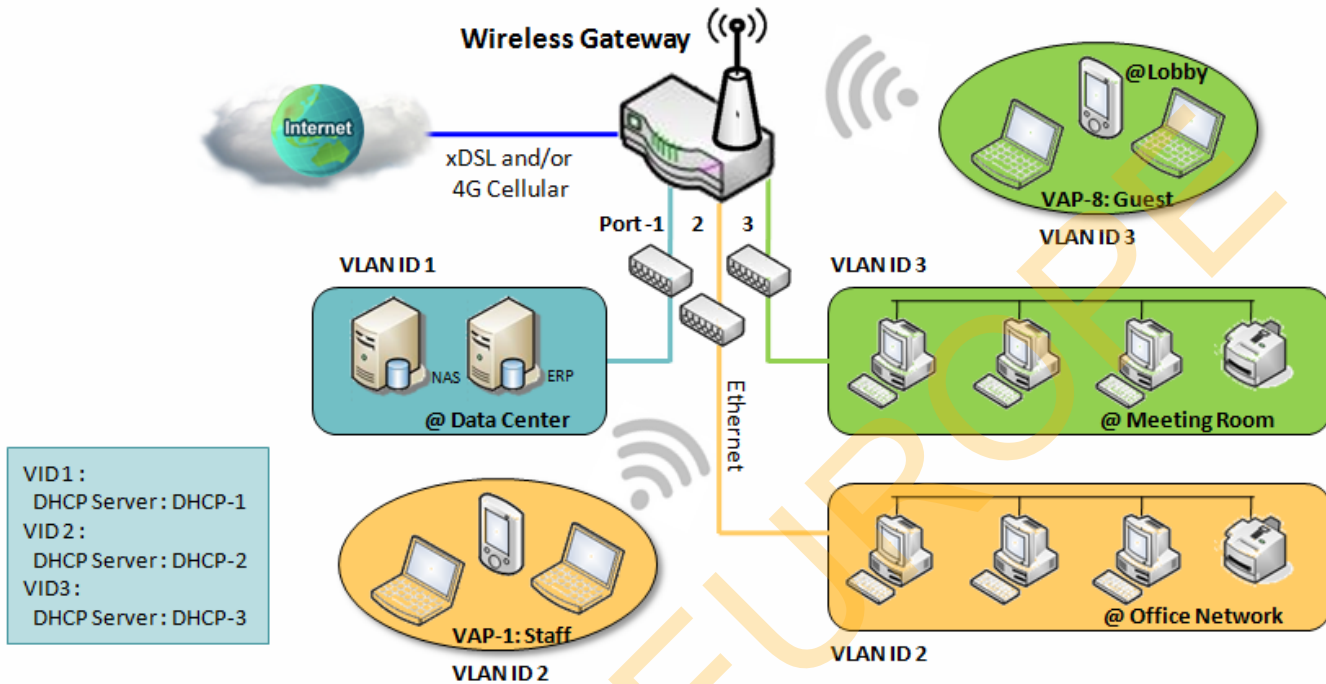


A port-based VLAN is a group of ports on an Ethernet or Virtual APs of Wired or Wireless Gateway that form a logical LAN segment. Following is an example.

For example, in a company, administrator schemes out 3 network segments, Lobby/Meeting Room, Office, and Data Center. In a Wireless Gateway, administrator can configure Lobby/Meeting Room segment with VLAN ID 3. The VLAN group includes Port-3 and VAP-8 (SSID: Guest) with NAT mode and DHCP-3 server equipped. He also configure Office segment with VLAN ID 2. The VLAN group includes Port-2 and VAP-1 (SSID:

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Staff) with NAT mode and DHCP-2 server equipped. At last, administrator also configure Data Center segment with VLAN ID 1. The VLAN group includes Port-1 with NAT mode to WAN interface as shown in following diagram.



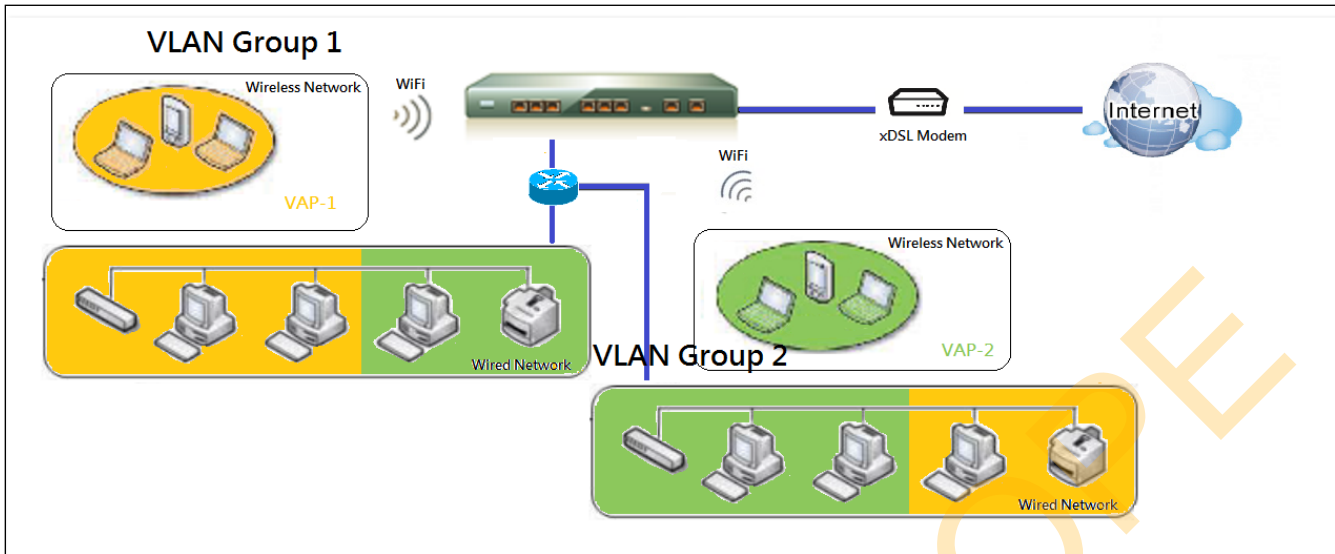
Above is the general case for 3 Ethernet LAN ports in the gateway. But if the device just has one Ethernet LAN port, there will be only one VLAN group for the device. Under such situation, it still supports both the NAT and Bridge mode for the Port-based VLAN configuration.

➤ Tag-based VLAN

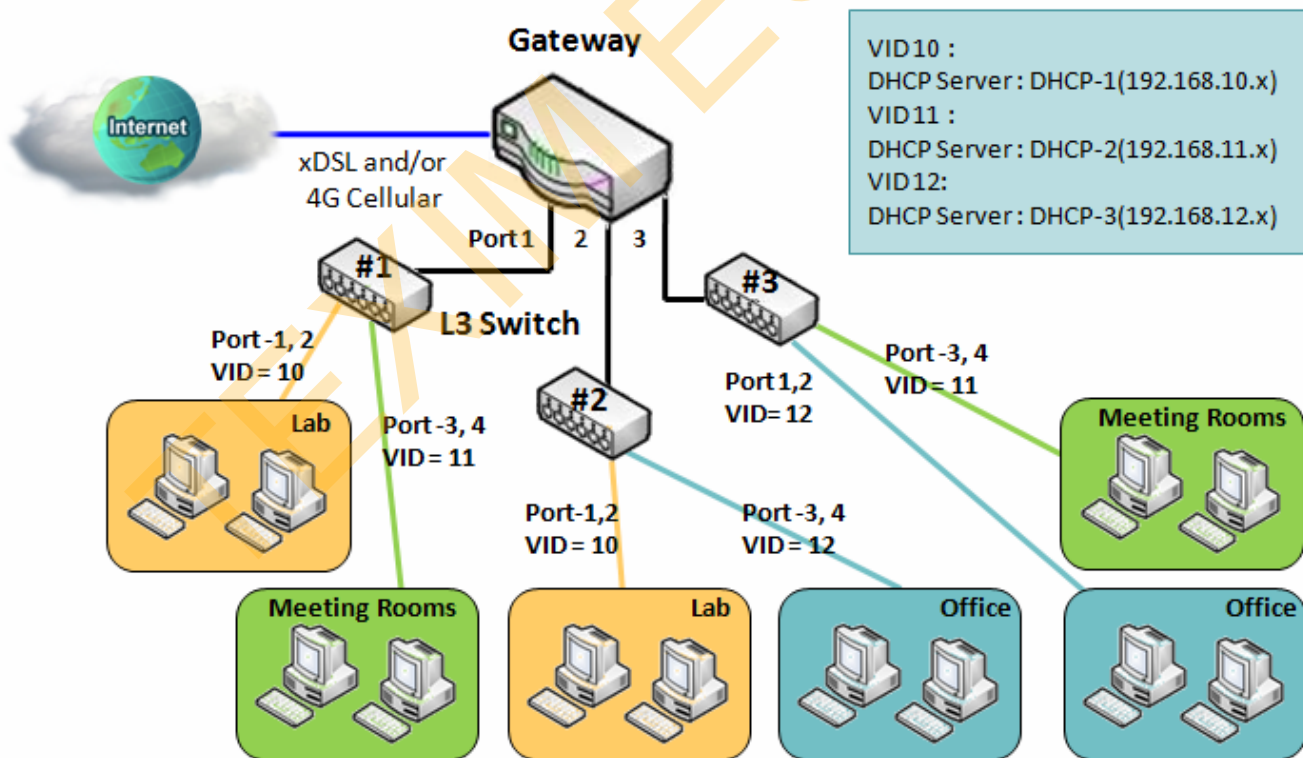
Tag-based VLAN function can group Ethernet ports, Port-1 ~ Port-4, and WiFi Virtual Access Points, VAP-1 ~ VAP-8, together with different VLAN tags for deploying subnets in Intranet. All packet flows can carry with different VLAN tags even at the same physical Ethernet port for Intranet. These flows can be directed to different destination because they have differentiated tags. The approach is very useful to group some hosts at different geographic location to be in the same workgroup.

Tag-based VLAN is also called a VLAN Trunk. The VLAN Trunk collects all packet flows with different VLAN IDs from Router device and delivers them in the Intranet. VLAN membership in a tagged VLAN is determined by VLAN ID information within the packet frames that are received on a port. Administrator can further use a VLAN switch to separate the VLAN trunk to different groups based on VLAN ID. Following is an example.

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For example, in a company, administrator schemes out 3 network segments, Lab, Meeting Rooms, and Office. In a Security VPN Gateway, administrator can configure Office segment with VLAN ID 12. The VLAN group is equipped with DHCP-3 server to construct a 192.168.12.x subnet. He also configure Meeting Rooms segment with VLAN ID 11. The VLAN group is equipped with DHCP-2 server to construct a 192.168.11.x subnet for Intranet only. That is, any client host in VLAN 11 group can't access the Internet. At last, he configures Lab segment with VLAN ID 10. The VLAN group is equipped with DHCP-1 server to construct a 192.168.10.x subnet.



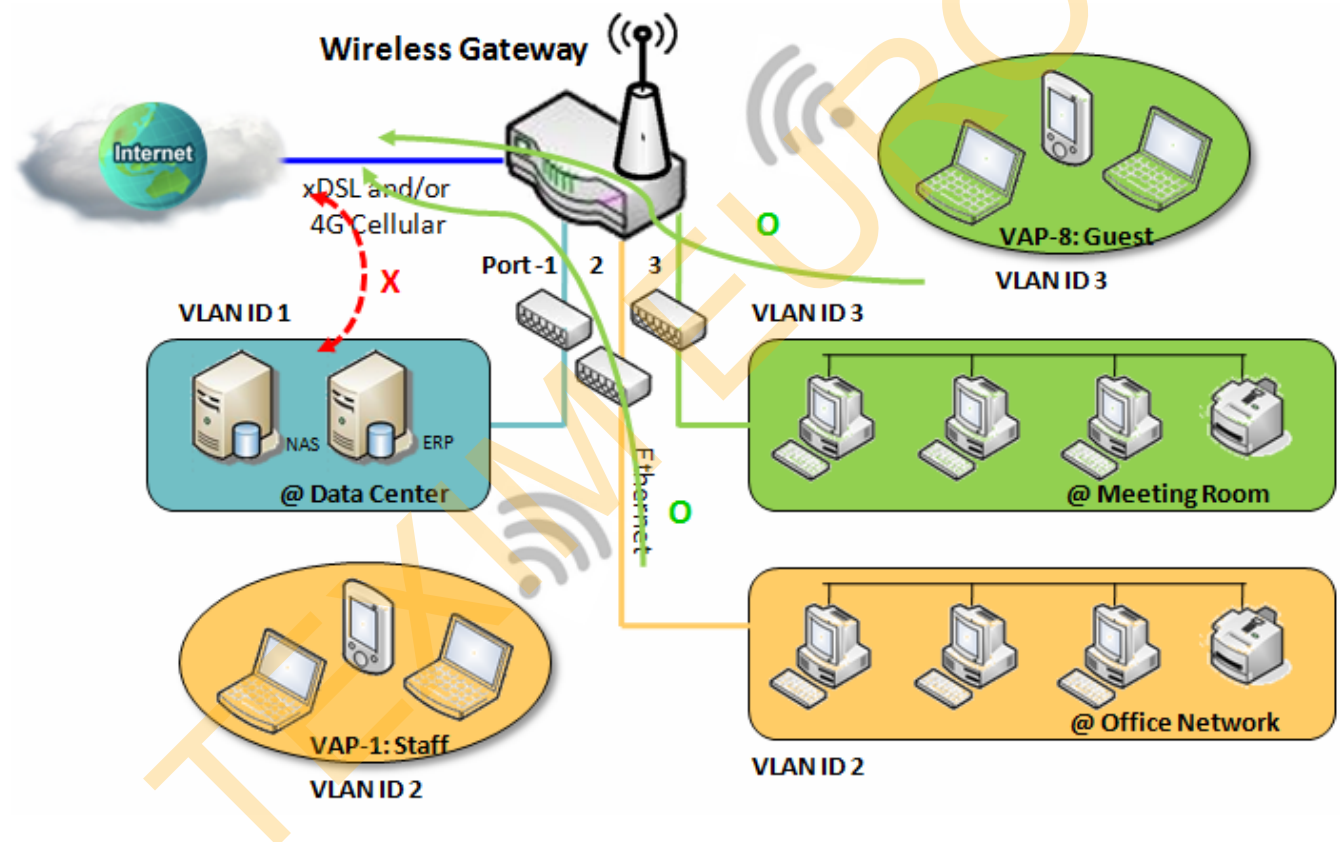
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➤ VLAN Groups Access Control

Administrator can specify the Internet access permission for all VLAN groups. He can also configure which VLAN groups are allowed to communicate with each other.

VLAN Group Internet Access

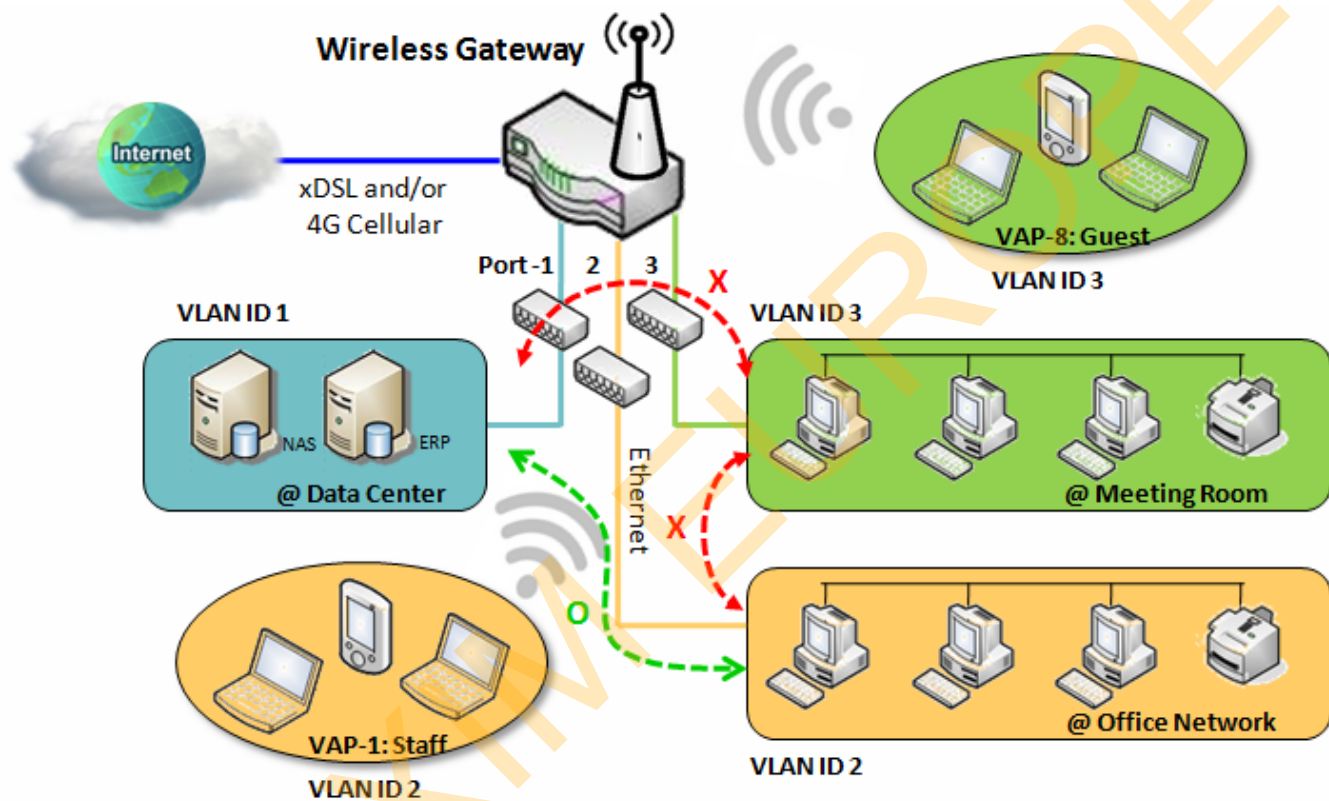
Administrator can specify members of one VLAN group to be able to access Internet or not. Following is an example that VLAN groups of VID is 2 and 3 can access Internet but the one with VID is 1 cannot access Internet. That is, visitors in meeting room and staffs in office network can access Internet. But the computers/servers in data center cannot access Internet since security consideration. Servers in data center only for trusted staffs or are accessed in secure tunnels.



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Inter VLAN Group Routing:

In Port-based tagging, administrator can specify member hosts of one VLAN group to be able to communicate with the ones of another VLAN group or not. This is a communication pair, and one VLAN group can join many communication pairs. But communication pair doesn't have the transitive property. That is, A can communicate with B, and B can communicate with C, it doesn't imply that A can communicate with C. An example is shown at following diagram. VLAN groups of VID is 1 and 2 can access each other but the ones between VID 1 and VID 3 and between VID 2 and VID 3 can't.



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VLAN Setting

Go to **Basic Network > LAN & VLAN > VLAN** Tab.

The VLAN function allows you to divide local network into different virtual LANs. There are Port-based and Tag-based VLAN types. Select one that applies.

| Configuration [Help] | |
|---------------------------|--|
| Item | Setting |
| ▶ VLAN Types | Port-based ▼ |
| ▶ System Reserved VLAN ID | Start ID <input type="text" value="1"/> (1-4091) ~ End ID <input type="text" value="5"/> |

| Item | Value setting | Description |
|--------------------------------|--|--|
| VLAN Type | Port-based is selected by default | Select the VLAN type that you want to adopt for organizing you local subnets. Port-based: Port-based VLAN allows you to add rule for each LAN port, and you can do advanced control with its VLAN ID. Tag-based: Tag-based VLAN allows you to add VLAN ID, and select member and DHCP Server for this VLAN ID. Go to Tag-based VLAN List table. |
| System Reserved VLAN ID | 1 ~ 5 is reserved by default | Specify the VLAN ID range that is reserved for the system operation. For the Port-based/Tag-based VLAN grouping, only use the ID outside the reserved range. Value Range: 1 ~ 4091. |
| Save | NA | Click the Save button to save the configuration |

Port-based VLAN – Create/Edit VLAN Rules

The port-based VLAN allows you to custom each LAN port. There is a default rule shows the configuration of all LAN ports. Also, if your device has a DMZ port, you will see DMZ configuration, too. The maxima rule numbers is based on LAN port numbers.

| Port-based VLAN List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | | | |
|---|-------------|--------------|--------------|---------------------------------------|-----------------|---------------|------------|---------|-------------------------------------|-------------------------------------|
| Name | VLAN ID | VLAN Tagging | NAT / Bridge | Port Members | LAN IP Address | Subnet Mask | Joined WAN | WAN VID | Enable | Actions |
| DMZ | 4094 | X | NAT | DMZ Port | 192.168.6.254 | 255.255.255.0 | WAN - 1 | 0 | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> |
| LAN | Native VLAN | X | NAT | <input type="button" value="Detail"/> | 192.168.123.254 | 255.255.255.0 | All WANs | 0 | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> |

When **Add** button is applied, Port-based VLAN Configuration screen will appear, which is including 3 sections: **Port-based VLAN Configuration**, **IP Fixed Mapping Rule List**, and **Inter VLAN Group Routing** (enter through a

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button)

Port-based VLAN - Configuration

| Port-based VLAN Configuration | |
|-------------------------------|--|
| Item | Setting |
| ▶ Name | VLAN - 1 |
| ▶ VLAN ID | |
| ▶ VLAN Tagging | Disable ▾ |
| ▶ NAT / Bridge | NAT ▾ |
| ▶ Port Members | Port: <input type="checkbox"/> PORT-1 <input type="checkbox"/> PORT-2 <input type="checkbox"/> PORT-3 <input type="checkbox"/> PORT-4 2.4G: <input type="checkbox"/> VAP-1 <input type="checkbox"/> VAP-2 <input type="checkbox"/> VAP-3 <input type="checkbox"/> VAP-4 <input type="checkbox"/> VAP-5 <input type="checkbox"/> VAP-6 <input type="checkbox"/> VAP-7 <input type="checkbox"/> VAP-8 |
| ▶ LAN to Join | <input type="checkbox"/> Enable <input type="text" value="DHCP 1"/> ▾ |

| Port-based VLAN Configuration (part-I) | | |
|--|--|---|
| Item | Value setting | Description |
| Name | 1. A Must filled setting 2. String format: already have default texts | Define the Name of this rule. It has a default text and cannot be modified. |
| VLAN ID | A Must filled setting | Define the VLAN ID number, range is 1~4094. |
| VLAN Tagging | Disable is selected by default. | The rule is activated according to VLAN ID and Port Members configuration when Enable is selected. The rule is activated according Port Members configuration when Disable is selected. |
| NAT / Bridge | NAT is selected by default. | Select NAT mode or Bridge mode for the rule. |
| Port Members | These boxes are unchecked by default. | Select which LAN port(s) and VAP(s) that you want to add to the rule. Note: The available member list can be different for the purchased product. |
| LAN to Join | The box is unchecked by default. | Check the Enable box and select one of the defined DHCP Server for the List to define the DHCP server for the VLAN group. If you enabled this function, all the rest settings will be greyed out, not required to configured manually. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

If you didn't decide to bind the VLAN group to a pre-defined DHCP server, you have to further specify the following settings.

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| | |
|-------------------------|--|
| ▶ WAN & WAN VID to Join | All WANs ▾ <input type="button" value="None"/> |
| ▶ LAN IP Address | <input type="text" value="192.168.2.254"/> |
| ▶ Subnet Mask | <input type="text" value="255.255.255.0 (/24)"/> ▾ |
| ▶ DHCP Server / Relay | Server ▾ |
| ▶ DHCP Server Name | <input type="text"/> |
| ▶ IP Pool | Starting Address: <input type="text" value="192.168.2.100"/> Ending Address: <input type="text" value="192.168.2.200"/> |
| ▶ Lease Time | <input type="text" value="86400"/> seconds |
| ▶ Domain Name | <input type="text"/> (Optional) |
| ▶ Primary DNS | <input type="text"/> (Optional) |
| ▶ Secondary DNS | <input type="text"/> (Optional) |
| ▶ Primary WINS | <input type="text"/> (Optional) |
| ▶ Secondary WINS | <input type="text"/> (Optional) |
| ▶ Gateway | <input type="text"/> (Optional) |
| ▶ Enable | <input type="checkbox"/> |

| Port-based VLAN Configuration (part-II) | | |
|---|--|--|
| Item | Value setting | Description |
| WAN & WAN VID to Join | All WANs is selected by default. | Select which WAN or All WANs that allow accessing Internet. Note: If Bridge mode is selected, you need to select a WAN and enter a VID. |
| LAN IP Address | A Must filled setting | Assign an IP Address for the DHCP Server that the rule used, this IP address is a gateway IP. |
| Subnet Mask | 255.255.255.0(/24) is selected by default. | Select a Subnet Mask for the DHCP Server. |
| DHCP Server /Relay | Server is selected by default. | Define the DHCP Server type. There are three types you can select: Server , Relay , and Disable . Relay : Select Relay to enable DHCP Relay function for the VLAN group, and you only need to fill the DHCP Server IP Address field. Server : Select Server to enable DHCP Server function for the VLAN group, and you need to specify the DHCP Server settings. Disable : Select Disable to disable the DHCP Server function for the VLAN group. |
| DHCP Server IP Address (for DHCP Relay only) | A Must filled setting | If you select Relay type of DHCP Server, assign a DHCP Server IP Address that the gateway will relay the DHCP requests to the assigned DHCP server. |
| DHCP Option 82 (for DHCP Relay only) | An Optional filled setting | If you select Relay type of DHCP Server, you can further enable the DHCP Option 82 setting if the DHCP server support it. |
| DHCP Server Name | A Must filled setting | Define name of the DHCP Server for the specified VLAN group. |
| IP Pool | A Must filled setting | Define the IP Pool range. |

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| | | |
|-----------------------|----------------------------------|---|
| | | There are Starting Address and Ending Address fields. If a client requests an IP address from this DHCP Server, it will assign an IP address in the range of IP pool . |
| Lease Time | A Must filled setting | Define a period of time for an IP Address that the DHCP Server leases to a new device. By default, the lease time is 86400 seconds. |
| Domain Name | String format can be any text | The Domain Name of this DHCP Server. Value Range: 0 ~ 31 characters. |
| Primary DNS | IPv4 format | The Primary DNS of this DHCP Server. |
| Secondary DNS | IPv4 format | The Secondary DNS of this DHCP Server. |
| Primary WINS | IPv4 format | The Primary WINS of this DHCP Server. |
| Secondary WINS | IPv4 format | The Secondary WINS of this DHCP Server. |
| Gateway | IPv4 format | The Gateway of this DHCP Server. |
| Enable | The box is unchecked by default. | Click Enable box to activate this rule. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

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Besides, you can add some IP rules in the **IP Fixed Mapping Rule List** if DHCP Server for the VLAN groups is required.

IP Fixed Mapping Rule List
Add
Delete

| MAC Address | IP Address | Enable | Actions |
|-------------|------------|--------|---------|
|-------------|------------|--------|---------|

Mapping Rule Configuration

| Item | Setting |
|---------------|--|
| ▶ MAC Address | <input style="width: 90%;" type="text"/> |
| ▶ IP Address | <input style="width: 90%;" type="text"/> |
| ▶ Enable | <input type="checkbox"/> |

Save

When **Add** button is applied, **Mapping Rule Configuration** screen will appear.

| Mapping Rule Configuration | | |
|----------------------------|----------------------------------|---|
| Item | Value setting | Description |
| MAC Address | A Must filled setting | Define the MAC Address target that the DHCP Server wants to match. |
| IP Address | A Must filled setting | Define the IP Address that the DHCP Server will assign. If there is a request from the MAC Address filled in the above field, the DHCP Server will assign this IP Address to the client whose MAC Address matched the rule. |
| Enable | The box is unchecked by default. | Click Enable box to activate this rule. |
| Save | NA | Click the Save button to save the configuration |

Note: ensure to always click on **Apply** button to apply the changes after the web browser refreshed taken you back to the VLAN page.

Port-based VLAN List
Add
Delete

| Name | VLAN ID | VLAN Tagging | NAT / Bridge | Port Members | LAN IP Address | Subnet Mask | Joined WAN | WAN VID | Enable | Actions |
|--------|-------------|--------------|--------------|--------------|-----------------|---------------|------------|---------|-------------------------------------|----------------|
| DMZ | 4094 | X | NAT | DMZ Port | 192.168.6.254 | 255.255.255.0 | WAN - 1 | 0 | <input checked="" type="checkbox"/> | Edit |
| LAN | Native VLAN | X | NAT | Detail | 192.168.123.254 | 255.255.255.0 | All WANs | 0 | <input checked="" type="checkbox"/> | Edit |
| VLAN-1 | 2 | X | NAT | Detail | 192.168.2.254 | 255.255.255.0 | All WANs | 0 | <input checked="" type="checkbox"/> | Edit Select |

Apply Inter VLAN Group Routing

Please Click Apply button to take effect.

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Port-based VLAN – Inter VLAN Group Routing

Click **VLAN Group Routing** button, the **VLAN Group Internet Access Definition** and **Inter VLAN Group Routing** screen will appear.

| VLAN Group Internet Access Definition | | |
|---------------------------------------|--------------------------------------|---|
| VLAN IDs | Members | Internet Access(WAN) |
| 1 | Port : 2,3,4 ; VAP : 1,2,3,4,5,6,7,8 | Allow <input type="button" value="Edit"/> |

| Inter VLAN Group Routing | | |
|--------------------------|---------|-------------------------------------|
| VLAN IDs | Members | Action |
| | | <input type="button" value="Edit"/> |
| | | <input type="button" value="Edit"/> |
| | | <input type="button" value="Edit"/> |
| | | <input type="button" value="Edit"/> |

When **Edit** button is applied, a screen similar to this will appear.

| VLAN Group Internet Access Definition | | |
|--|--------------------------------------|---|
| VLAN IDs | Members | Internet Access(WAN) |
| <input checked="" type="checkbox"/> 1, <input checked="" type="checkbox"/> 2 | Port : 2,3,4 ; VAP : 1,2,3,4,5,6,7,8 | Allow <input type="button" value="Edit"/> |

| Inter VLAN Group Routing | | |
|--|---------|-------------------------------------|
| VLAN IDs | Members | Action |
| <input type="checkbox"/> 1, <input type="checkbox"/> 2 | | <input type="button" value="Edit"/> |

| Inter VLAN Group Routing | | |
|--|-----------------------------------|---|
| Item | Value setting | Description |
| VALN Group Internet Access Definition | All boxes are checked by default. | By default, all boxes are checked means all VLAN ID members are allow to access WAN interface. If uncheck a certain VLAN ID box, it means the VLAN ID member can't access Internet anymore. Note: VLAN ID 1 is available always; it is the default VLAN ID of LAN rule. The other VLAN IDs are available only when they are enabled. |
| Inter VLAN Group Routing | The box is unchecked by default. | Click the expected VLAN IDs box to enable the Inter VLAN access function. By default, members in different VLAN IDs can't access each other. The gateway supports up to 4 rules for Inter VLAN Group Routing . For example, if ID_1 and ID_2 are checked, it means members in VLAN ID_1 can access members of VLAN ID_2, and vice versa. |
| Save | N/A | Click the Save button to save the configuration |

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Tag-based VLAN – Create/Edit VLAN Rules

The **Tag-based VLAN** allows you to customize each LAN port according to VLAN ID. There is a default rule shows the configuration of all LAN ports and all VAPs. Also, if your device has a DMZ port, you will see DMZ configuration, too. The router supports up to a maximum of 128 tag-based VLAN rule sets.

| Tag-based VLAN List | | | | |
|---------------------|-------------------------------------|---|---|---|
| VLAN ID | Internet | Port | VAP | DHCP Server |
| Native VLAN | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 | <input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input checked="" type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 | DHCP 1 |
| | | | | <input type="button" value="Edit"/> <input type="button" value="Select"/> |

When **Add** button is applied, **Tag-based VLAN Configuration** screen will appear.

| Tag-based VLAN Configuration | |
|-------------------------------------|--|
| Item | Setting |
| VLAN ID | <input type="text" value="0"/> |
| Internet Access | <input checked="" type="checkbox"/> Enable |
| Port Members | Port: <input type="checkbox"/> Port-1 <input type="checkbox"/> Port-2 <input type="checkbox"/> Port-3 <input type="checkbox"/> Port-4 2.4G: <input type="checkbox"/> VAP-1 <input type="checkbox"/> VAP-2 <input type="checkbox"/> VAP-3 <input type="checkbox"/> VAP-4 <input type="checkbox"/> VAP-5 <input type="checkbox"/> VAP-6 <input type="checkbox"/> VAP-7 <input type="checkbox"/> VAP-8 |
| Bridge Interface | <input type="text" value="DHCP 1"/> |
| <input type="button" value="Save"/> | |

| Tag-based VLAN Configuration (Part-I) | | |
|---------------------------------------|---------------------------------------|--|
| Item | Value setting | Description |
| VALN ID | A Must filled setting | Define the VLAN ID number, that is outside the system reserved range. Value Range: 1 ~ 4095. |
| Internet Access | The box is checked by default. | Click Enable box to allow the members in the VLAN group access to internet. |
| Port Members | The boxes are unchecked by default. | Check the LAN port box(es) to join the VLAN group. Check the VAP box(es) to join the VLAN group. Note: Only the wireless gateway has the VAP list. |
| Bridge Interface | DHCP 1 is selected by default. | Select a predefined DHCP Server , a New to defined a new DHCP server for these members of this VLAN group. |
| Save | N/A | Click Save button to save the configuration Note: After clicking Save button, always click Apply button to apply the settings. |

If you select New to create a new DHCP server setting for the VLAN group, you have to further specify the following configuration.

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| | |
|-------------------------------------|--|
| ▶ IP Address | <input type="text"/> |
| ▶ Subnet Mask | 255.255.255.0 (/24) ▼ |
| ▶ DHCP Relay | <input type="checkbox"/> Enable & Server IP : <input type="text"/> |
| ▶ WAN Interface | WAN - 1 ▼ |
| ▶ DHCP Relay Option 82 | <input type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| Tag-based VLAN Configuration (part-II) | | |
|--|---|--|
| Item | Value setting | Description |
| IP Address | A Must filled setting | Assign an IP Address for the DHCP Server that the rule used, this IP address is a gateway IP. |
| Subnet Mask | 255.255.255.0(/24) is selected by default. | Select a Subnet Mask for the DHCP Server. |
| DHCP Relay | The box is unchecked by default. | Check the box to enable the DHCP Relay function for the VLAN group, and you only need to fill the DHCP Server IP Address field. |
| WAN Interface | WAN-1 is selected by default. | Select which WAN interface that allow accessing Internet. |
| DHCP Option 82 | An Optional filled setting | If you select Relay type of DHCP Server, you can further enable the DHCP Option 82 setting if the DHCP server support it. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

Tag-based VLAN Summary

The configured tag-based VLAN group information will be displayed in the following screen.

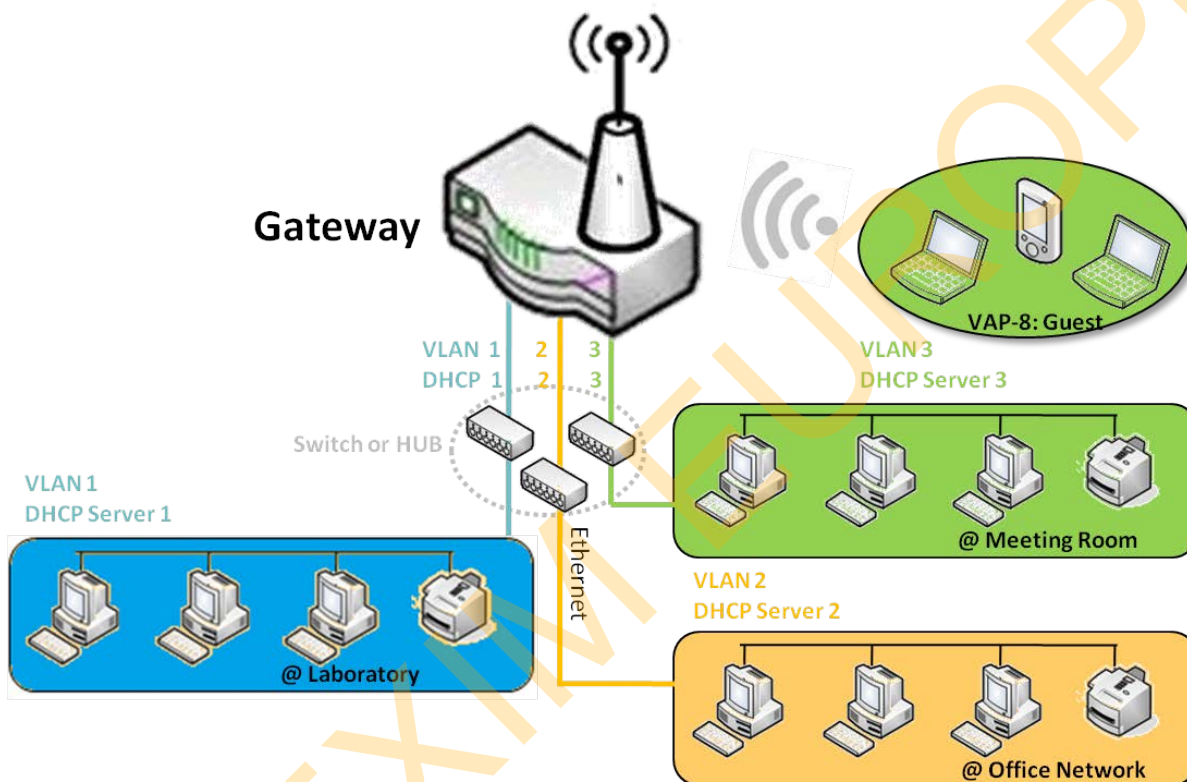
| Tag-based VLAN Summary | |
|------------------------|-------------|
| Port | VLAN IDs |
| Port1 | Native VLAN |
| Port2 | Native VLAN |
| Port3 | Native VLAN |
| Port4 | Native VLAN |

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2.2.3 DHCP Server

➤ DHCP Server

The gateway supports up to 4 DHCP servers to fulfill the DHCP requests from different VLAN groups (please refer to VLAN section for getting more usage details). And there is one default setting for whose LAN IP Address is the same one of gateway LAN interface, with its default Subnet Mask setting as “255.255.255.0”, and its default IP Pool ranges is from “.100” to “.200” as shown at the DHCP Server List page on gateway’s WEB UI.

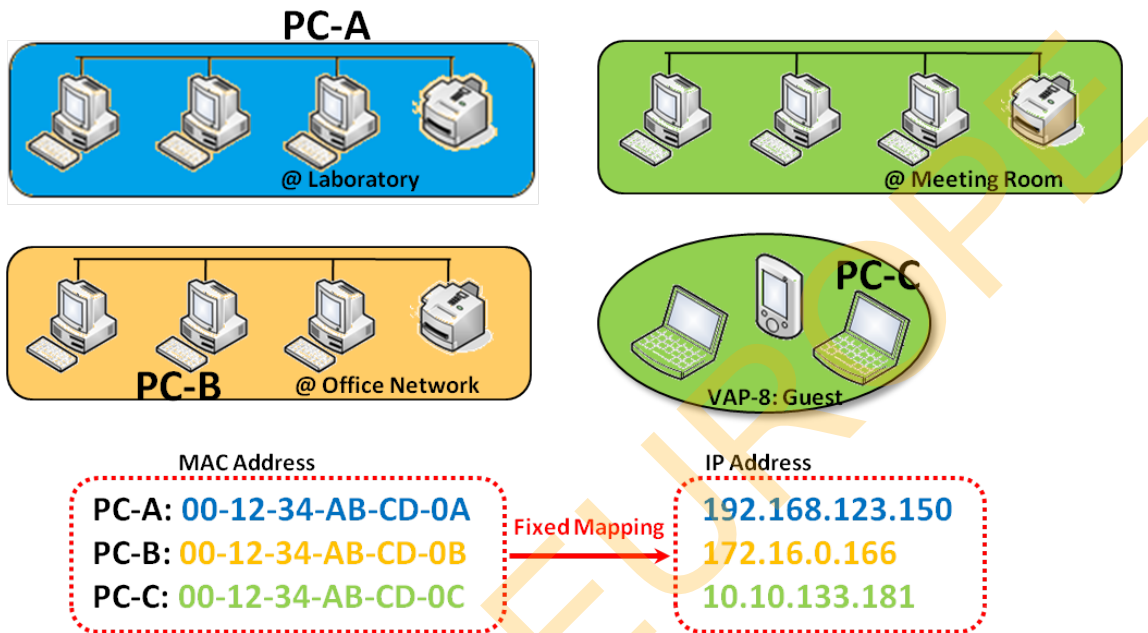


User can add more DHCP server configurations by clicking on the “Add” button behind “DHCP Server List”, or clicking on the “Edit” button at the end of each DHCP Server on list to edit its current settings. Besides, user can select a DHCP Server and delete it by clicking on the “Select” check-box and the “Delete” button.

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➤ Fixed Mapping

User can assign fixed IP address to map the specific client MAC address by select them then copy, when targets were already existed in the *DHCP Client List*, or to add some other Mapping Rules by manually in advance, once the target's MAC address was not ready to connect.



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DHCP Server Setting

Go to **Basic Network > LAN & VLAN > DHCP Server** Tab.

The DHCP Server setting allows user to create and customize DHCP Server policies to assign IP Addresses to the devices on the local area network (LAN).

Create / Edit DHCP Server Policy

The gateway allows you to custom your DHCP Server Policy. If multiple LAN ports are available, you can define one policy for each LAN (or VLAN group), and it supports up to a maximum of 4 policy sets.

| DHCP Server List <input type="button" value="Add"/> <input type="button" value="Delete"/> DHCP Client List [Help] | | | | | | | | | | | | |
|--|-----------------|---------------|---------------------------------|------------|-------------|-------------|---------------|--------------|----------------|---------|-------------------------------------|---|
| DHCP Server Name | LAN IP Address | Subnet Mask | IP Pool | Lease Time | Domain Name | Primary DNS | Secondary DNS | Primary WINS | Secondary WINS | Gateway | Enable | Actions |
| DHCP 1 | 192.168.123.254 | 255.255.255.0 | 192.168.123.100-192.168.123.200 | 3600 | | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="button" value="Fixed Mapping"/> |

When **Add** button is applied, **DHCP Server Configuration** screen will appear.

| DHCP Server Configuration | |
|---------------------------|--|
| Item | Setting |
| ▶ DHCP Server Name | <input type="text" value="DHCP 2"/> |
| ▶ LAN IP Address | <input type="text" value="192.168.2.254"/> |
| ▶ Subnet Mask | <input type="text" value="255.0.0.0 (/8)"/> |
| ▶ IP Pool | Starting Address: <input type="text"/> Ending Address: <input type="text"/> |
| ▶ Lease Time | <input type="text" value="86400"/> seconds |
| ▶ Domain Name | <input type="text"/> (Optional) |
| ▶ Primary DNS | <input type="text"/> (Optional) |
| ▶ Secondary DNS | <input type="text"/> (Optional) |
| ▶ Primary WINS | <input type="text"/> (Optional) |
| ▶ Secondary WINS | <input type="text"/> (Optional) |
| ▶ Gateway | <input type="text"/> (Optional) |
| ▶ Server | <input type="checkbox"/> Enable |

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| DHCP Server Configuration | | |
|---------------------------|--|--|
| Item | Value setting | Description |
| DHCP Server Name | 1. String format can be any text 2. A Must filled setting | Enter a DHCP Server name. Enter a name that is easy for you to understand. |
| LAN IP Address | 1. IPv4 format. 2. A Must filled setting | The LAN IP Address of this DHCP Server. |
| Subnet Mask | 255.0.0.0 (/8) is set by default | The Subnet Mask of this DHCP Server. |
| IP Pool | 1. IPv4 format. 2. A Must filled setting | The IP Pool of this DHCP Server. It composed of Starting Address entered in this field and Ending Address entered in this field. |
| Lease Time | 1. Numeric string format. 2. A Must filled setting | The Lease Time of this DHCP Server. Value Range: 300 ~ 604800 seconds. |
| Domain Name | String format can be any text | The Domain Name of this DHCP Server. |
| Primary DNS | IPv4 format | The Primary DNS of this DHCP Server. |
| Secondary DNS | IPv4 format | The Secondary DNS of this DHCP Server. |
| Primary WINS | IPv4 format | The Primary WINS of this DHCP Server. |
| Secondary WINS | IPv4 format | The Secondary WINS of this DHCP Server. |
| Gateway | IPv4 format | The Gateway of this DHCP Server. |
| Server | The box is unchecked by default. | Click Enable box to activate this DHCP Server. |
| Save | N/A | Click the Save button to save the configuration |
| Undo | N/A | Click the Undo button to restore what you just configured back to the previous setting. |
| Back | N/A | When the Back button is clicked the screen will return to the DHCP Server Configuration page. |

Create / Edit Mapping Rule List on DHCP Server

The gateway allows you to custom your Mapping Rule List on DHCP Server. It supports up to a maximum of 64 rule sets. When **Fix Mapping** button is applied, the **Mapping Rule List** screen will appear.

| Mapping Rule List Add Delete [Help] | | | |
|--|------------|--------|---------|
| MAC Address | IP Address | Enable | Actions |
| | | | |

When **Add** button is applied, **Mapping Rule Configuration** screen will appear.

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| Mapping Rule Configuration | |
|----------------------------|---------------------------------|
| Item | Setting |
| ▶ MAC Address | <input type="text"/> |
| ▶ IP Address | <input type="text"/> |
| ▶ Rule | <input type="checkbox"/> Enable |

| Mapping Rule Configuration | | |
|----------------------------|--|---|
| Item | Value setting | Description |
| MAC Address | 1. MAC Address string format 2. A Must filled setting | The MAC Address of this mapping rule. |
| IP Address | 1. IPv4 format. 2. A Must filled setting | The IP Address of this mapping rule. |
| Rule | The box is unchecked by default. | Click Enable box to activate this rule. |
| Save | N/A | Click the Save button to save the configuration |
| Undo | N/A | Click the Undo button to restore what you just configured back to the previous setting. |
| Back | N/A | When the Back button is clicked the screen will return to the DHCP Server Configuration page. |

View / Copy DHCP Client List

When **DHCP Client List** button is applied, **DHCP Client List** screen will appear.

| DHCP Client List Copy to Fixed Mapping | | | | | |
|---|--------------------------|------------|-------------------|----------------------|---------------------------------|
| LAN Interface | IP Address | Host Name | MAC Address | Remaining Lease Time | Actions |
| Ethernet | Dynamic /192.168.123.100 | James-P45V | 74:D0:2B:62:8D:42 | 00:49:07 | <input type="checkbox"/> Select |

When the DHCP Client is selected and **Copy to Fixed Mapping** button is applied. The IP and MAC address of DHCP Client will apply to the Mapping Rule List on specific DHCP Server automatically.

Enable / Disable DHCP Server Options

The **DHCP Server Options** setting allows user to set **DHCP OPTIONS 66, 72, or 114**. Click the **Enable** button to activate the DHCP option function, and the DHCP Server will add the expected options in its sending out DHCPOFFER DHCPACK packages.

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| Option | Meaning | RFC |
|--------|-------------------------------|----------------------------|
| 66 | TFTP server name | [RFC 2132] |
| 72 | Default World Wide Web Server | [RFC 2132] |
| 114 | URL | [RFC 3679] |

| Configuration | |
|---------------------|---------------------------------|
| Item | Setting |
| DHCP Server Options | <input type="checkbox"/> Enable |

Create / Edit DHCP Server Options

The gateway supports up to a maximum of 99 option settings.

| DHCP Server Option List Add Delete | | | | | | | |
|--|-------------|-------------------|---------------|------|-------|--------|---------|
| ID | Option Name | DHCP Sever Select | Option Select | Type | Value | Enable | Actions |

When **Add/Edit** button is applied, **DHCP Server Option Configuration** screen will appear.

| DHCP Server Option Configuration Save Undo | |
|--|--|
| Item | Setting |
| Option Name | <input type="text" value="Option 1"/> |
| DHCP Sever Select | <input type="text" value="DHCP 1"/> |
| Option Select | <input type="text" value="DHCP OPTION 66"/> |
| Type | <input type="text" value="Single IP Address"/> |
| Value | <input type="text"/> |
| Enable | <input type="checkbox"/> Enable |

| DHCP Server Option Configuration | | |
|----------------------------------|--|--|
| Item | Value setting | Description |
| Option Name | <ol style="list-style-type: none"> String format can be any text A Must filled setting. | Enter a DHCP Server Option name. Enter a name that is easy for you to understand. |
| DHCP Server Select | Dropdown list of all available DHCP servers. | Choose the DHCP server this option should apply to. |
| Option Select | <ol style="list-style-type: none"> A Must filled setting. Option 66 is selected by default. | Choose the specific option from the dropdown list. It can be Option 66, Option 72, Option 144, Option 42, Option 150, or Option 160. Option 42 for ntp server; Option 66 for tftp; Option 72 for www; |

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| | | | | |
|---------------|---|--|-------------------------------------|-------------------------------|
| | | Option 144 for url; | | |
| Type | Dropdown list of DHCP server option value's type | Each different options has different value types. | | |
| | | 66 | Single IP Address | |
| | | | Single FQDN | |
| | | 72 | IP Addresses List, separated by “,” | |
| | | 114 | Single URL | |
| | | 42 | IP Addresses List, separated by “,” | |
| | | 150 | IP Addresses List, separated by “,” | |
| | | 160 | Single IP Address | |
| | | Single FQDN | | |
| Value | <ol style="list-style-type: none"> 1. IPv4 format 2. FQDN format 3. IP list 4. URL format 5. A Must filled setting | Should conform to Type : | | |
| | | Type | Value | |
| | | 66 | Single IP Address | IPv4 format |
| | | | Single FQDN | FQDN format |
| | | 72 | IP Addresses List, separated by “,” | IPv4 format, separated by “,” |
| | 114 | Single URL | URL format | |
| Enable | The box is unchecked by default. | Click Enable box to activate this setting. | | |
| Save | NA | Click the Save button to save the setting. | | |
| Undo | NA | When the Undo button is clicked the screen will return back with nothing changed. | | |

Create / Edit DHCP Relay

The gateway supports up to a maximum of 6 DHCP Relay configurations.

| DHCP Relay Configuration List | | | | | | | Add | Delete |
|-------------------------------|------------|---------------|---------------|-----------|--------|---------|-----|--------|
| ID | Agent Name | LAN interface | WAN interface | Server IP | Enable | Actions | | |

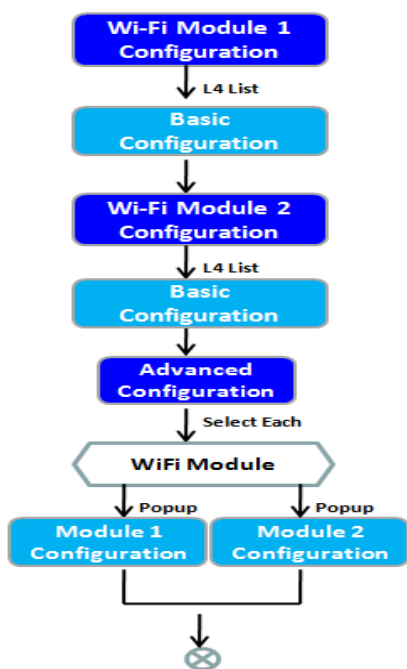
When **Add/Edit** button is applied, **DHCP Relay Configuration** screen will appear.

| DHCP Relay Configuration | | Save | Undo |
|--------------------------|--------------------------|------|------|
| Item | Setting | | |
| Agent Name | <input type="text"/> | | |
| LAN interface | LAN ▼ | | |
| WAN interface | WAN - 1 ▼ | | |
| Server IP | <input type="text"/> | | |
| DHCP OPTION 82 | <input type="checkbox"/> | | |
| Enable | <input type="checkbox"/> | | |

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| DHCP Relay Configuration | | |
|--------------------------|--|---|
| Item | Value setting | Description |
| Agent Name | 1. String format can be any text 2. A Must filled setting. | Enter a DHCP Relay name. Enter a name that is easy for you to understand. <u>Value Range:</u> 1~64 characters. |
| LAN Interface | 1. A Must filled setting. 2. LAN is selected by default. | Choose a LAN Interface for the dropdown list to apply with the DHCP Relay function. |
| WAN Interface | 1. A Must filled setting. 2. WAN-1 is selected by default. | Choose a WAN Interface for the dropdown list to apply with the DHCP Relay function. It can be the available WAN interface(s), and L2TP connection. |
| Server IP | 1. A Must filled setting. 2. null by default. | Assign a DHCP Server IP Address that the gateway will relay the DHCP requests to the assigned DHCP server via specified WAN interface. |
| DHCP OPTION 82 | The box is unchecked by default. | Click Enable box to activate DHCP OPTION 82 function. Option 82 is organized as a single DHCP option that contains circuit-ID information known by the relay agent. If the relayed DHCP server required the such information, you have to enable it, otherwise, just leave it as unchecked. |
| Enable | The box is unchecked by default. | Click Enable box to activate this setting. |
| Save | NA | Click the Save button to save the setting. |
| Undo | NA | When the Undo button is clicked the screen will return back with nothing changed. |

2.3 WiFi



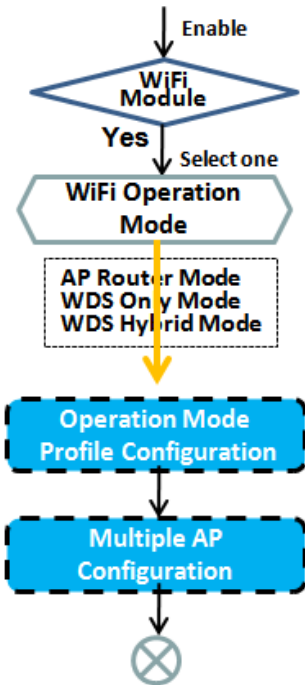
| Basic Configuration [Help] | | | | | | | | |
|--|--|------|----------------|------------|---------------|----------------|--------|---------|
| Item | Setting | | | | | | | |
| ▶ Operation Band | 2.4G Single Band ▼ | | | | | | | |
| 2.4G WiFi Configuration | | | | | | | | |
| Item | Setting | | | | | | | |
| ▶ WiFi Module | <input checked="" type="checkbox"/> Enable | | | | | | | |
| ▶ Channel | Auto ▼ <input checked="" type="radio"/> By AP Numbers <input type="radio"/> By Less Interference | | | | | | | |
| ▶ WiFi System | 802.11b/g/n Mixed ▼ | | | | | | | |
| ▶ WiFi Operation Mode | AP Router Mode ▼ | | | | | | | |
| ▶ Green AP | <input type="checkbox"/> Enable | | | | | | | |
| ▶ VAP Isolation | <input checked="" type="checkbox"/> Enable | | | | | | | |
| ▶ Time Schedule | (0) Always ▼ | | | | | | | |
| 2.4G VAP List Add Delete | | | | | | | | |
| ID | VAP | SSID | Authentication | Encryption | STA Isolation | Broadcast SSID | Enable | Actions |

The gateway provides WiFi interface for mobile devices or BYOD devices to connect for Internet/Intranet accessing. WiFi function is usually modularized design in a gateway, and there can be single or dual modules within a gateway. The WiFi system in the gateway complies with IEEE 802.11ac/11n/11g/11b standard in 2.4GHz or 5GHz single band or 2.4G/5GHz concurrent dual bands of operation. There are several wireless operation modes provided by this device. They are: **“AP Router Mode”**, **“WDS Only Mode”**, and **“WDS Hybrid Mode”**. You can choose the expected mode from the wireless operation mode list.

There are some sub-sections for you to configure the WiFi function, including “Basic Configuration” and “Advanced Configuration”. In Basic Configuration section, you have to finish almost all the settings for using the WiFi function. And the Advanced Configuration section provides more parameters for advanced user to fine tune the connectivity performance for the WiFi function.

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2.3.1 WiFi Configuration



| 2.4G WiFi Configuration | |
|-------------------------|---|
| Item | Setting |
| WiFi Module | <input checked="" type="checkbox"/> Enable |
| Channel | Auto <input type="radio"/> By AP Numbers <input type="radio"/> By Less Interference |
| WiFi System | 802.11b/g/n Mixed |
| WiFi Operation Mode | AP Router Mode |
| Green AP | <input type="checkbox"/> Enable |
| VAP Isolation | <input checked="" type="checkbox"/> Enable |
| Time Schedule | (0) Always |

| 2.4G VAP List | | Add | Delete | | | | | | |
|---------------|-------|------------|----------------|------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------|--|
| ID | VAP | SSID | Authentication | Encryption | STA Isolation | Broadcast SSID | Enable | Actions | |
| 1 | VAP 1 | Staff_2.4G | WPA2-PSK | AES | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Edit Select | |

| VAP Configuration | |
|-------------------|-------------------------------------|
| Item | Setting |
| VAP | VAP1 |
| SSID | Staff_2.4G |
| Max. STA | <input type="checkbox"/> Enable |
| Authentication | WPA2-PSK |
| Encryption | AES |
| Preshared Key | 8gHC2p0hwZl1d |
| STA Isolation | <input checked="" type="checkbox"/> |
| Broadcast SSID | <input checked="" type="checkbox"/> |
| Enable | <input checked="" type="checkbox"/> |

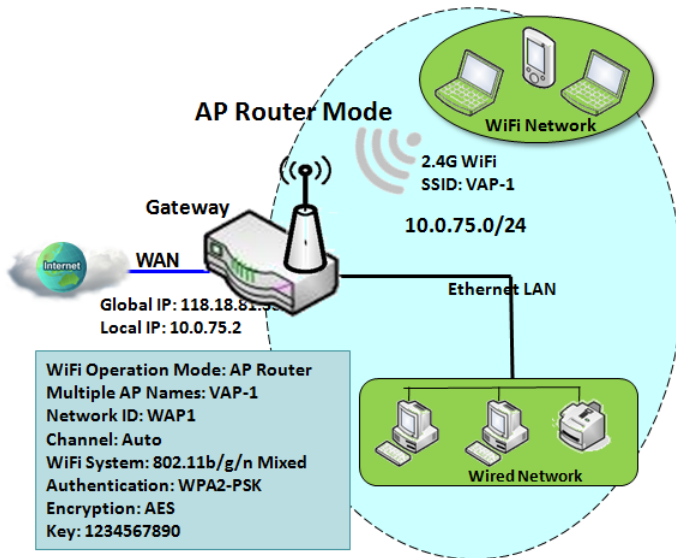
Due to optional module(s) and frequency band, you need to setup module one by one. For each module, you need to specify the operation mode, and then setup the virtual APs for wireless access.

In addition, if you configured the WiFi Uplink function in the **Basic Network > WAN & Uplink > Physical Interface** tab, the WiFi uplink function is activated. However, for the wireless LAN function of the module worked under WiFi uplink operation, it also provides AP Router function for local wireless clients to connect to wireless uplink network via the gateway.

Hereunder are the scenarios for each wireless operation mode, you can get how it works, and what is the difference among them. To connect your wireless devices with the wireless gateway, make sure your application scenario for WiFi network and choose the most adequate operation mode.

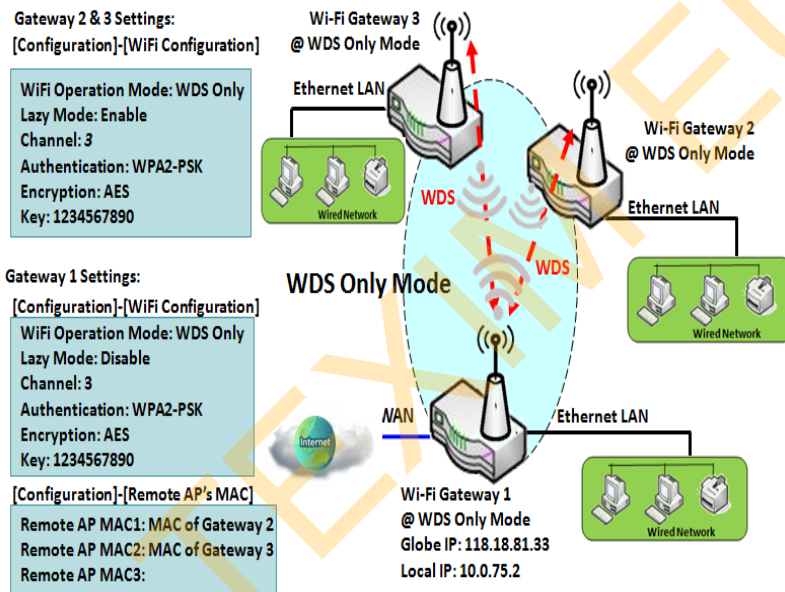
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AP Router Mode



This mode allows you to get your wired and wireless devices connected to form the Intranet of the wireless gateway, and the Intranet will link to the Internet with NAT mechanism of the gateway. So, this gateway is working as a WiFi AP, but also a WiFi hotspot for Internet accessing service. It means local WiFi clients can associate to it, and go to Internet. With its NAT mechanism, all of wireless clients don't need to get public IP addresses from ISP.

WDS Only Mode



WDS (Wireless Distributed System) Only mode drives a WiFi gateway to be a bridge for its wired Intranet and a repeater to extend distance. You can use multiple WiFi gateways as a WiFi repeater chain with all gateways setup as "WDS Only" mode. All gateways can communicate with each other through WiFi. All wired client hosts within each gateway can also communicate each other in the scenario. Only one gateway within repeater chain can be DHCP server to provide IP for all wired client hosts of every gateway which being disabled DHCP server. This gateway can be NAT router to provide internet access

The diagram illustrates that there are two wireless gateways 2, 3 running at "WDS Only" mode.

They both use channel 3 to link to local Gateway 1 through WDS. Both gateways connected by WDS need to setup the remote AP MAC for each other. All client hosts under gateway 2, 3 can request IP address from the DHCP server at gateway 1. Besides, wireless Gateway 1 also execute the NAT mechanism for all client hosts Internet accessing.

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WDS Hybrid Mode

Gateway 2 / AP 1 Settings:
[Configuration]-[WiFi Configuration]

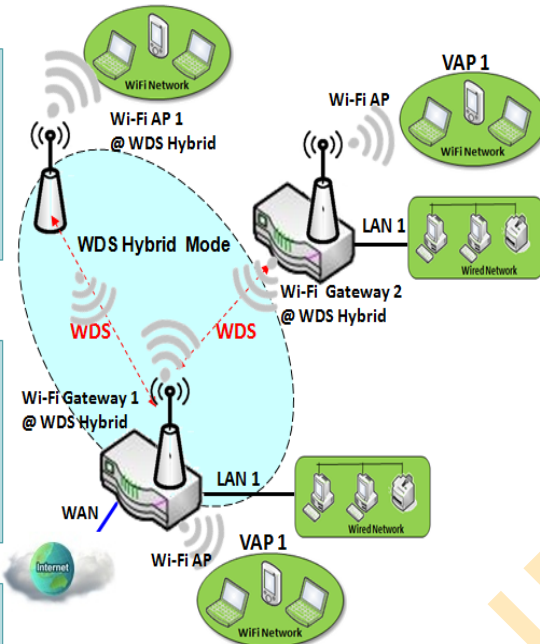
WiFi Operation Mode: WDS Hybrid
 Lazy Mode: Enable
 Multiple AP Names: VAP1
 Network ID: Extended-WiFi
 Channel: same as Router 1
 Authentication: same as Router 1
 Encryption: same as Router 1
 Key: same as Router 1

Gateway 1 Settings:
[Configuration]-[WiFi Configuration]

WiFi Operation Mode: WDS Hybrid
 Lazy Mode: Disable
 Multiple AP Names: VAP1
 Network ID: Extended-WiFi
 Channel: 3
 Authentication: WPA2-PSK
 Encryption: AES
 Key: 1234567890

[Configuration]-[Remote AP's MAC]

Remote AP MAC1: MAC of Router 2
 Remote AP MAC2: MAC of AP 1
 Remote AP MAC3:



WDS hybrid mode includes both WDS and AP Router mode. WDS Hybrid mode can act as an access point for its WiFi Intranet and a WiFi bridge for its wired and WiFi Intranets at the same time. Users can thus use the features to build up a large wireless network in a large space like airports, hotels or campus.

The diagram illustrates Gateway 1, Gateway 2 and AP 1 connected by WDS. Each gateway has access point function for WiFi client access. Gateway 1 has DHCP server to assign IP to each client hosts. All gateways and AP are under WDS hybrid mode. To setup WDS hybrid mode, it need to fill all configuration items similar to that of AP-router and WDS modes.

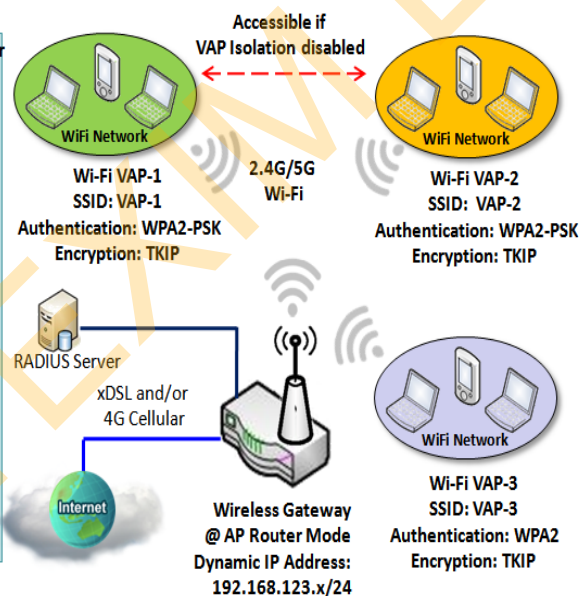
Multiple VAPs

Gateway Settings:

WiFi Operation Mode: AP Router
 VAP1
 SSID: VAP-1
 Authentication: WPA2-PSK
 Encryption: TKIP
 Key: 1234567890

VAP2
 SSID: VAP-2
 Authentication: WPA2-PSK
 Encryption: TKIP
 Key: 1234567890

VAP3
 SSID: VAP-3
 Authentication: WPA2
 Encryption: TKIP
 RADIUS Server IP: 192.168.168.
 RADIUS Server Port: 1812
 RADIUS Shared Key

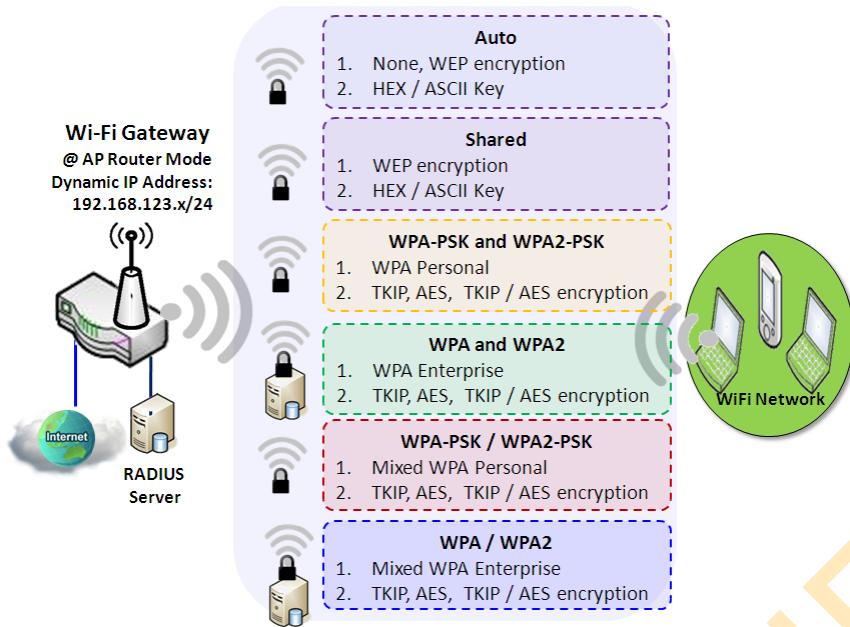


VAP (Virtual Access Point) is function to partition wireless network into multiple broadcast domains. It can simulate multiple APs in one physical AP. This wireless gateway supports up to 8 VAPs. For each VAP, you need to setup SSID, authentication and encryption to control Wi-Fi client access.

Besides, there is a VAP isolation option to manage the access among VAPs. You can allow or blocks communication for the wireless clients connected to different VAPs. As shown in the diagram, the clients in VAP-1 and VAP-2 can communicate to each other when VAP Isolation is disabled.

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Wi-Fi Security - Authentication & Encryption



Wi-Fi security provides complete authentication and encryption mechanisms to enhance the data security while your data is transferred wirelessly over the air. The wireless gateway supports Shared, WPA-PSK / WPA2-PSK and WPA / WPA2 authentication. You can select one authentication scheme to validate the wireless clients while they are connecting to the AP. As to the data encryption, the gateway supports WEP, TKIP and AES. The selected encryption algorithm will be applied to the data while the wireless connection is established.

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WiFi Configuration Setting

The WiFi configuration allows user to configure 2.4GHz or 5GHz WiFi settings.

Go to **Basic Network > WiFi > WiFi Module One** Tab. If the gateway is equipped with two WiFi modules, there will be another **WiFi Module Two**. You can do the similar configurations on both WiFi modules.

Basic Configuration

| Basic Configuration [Help] | |
|------------------------------|--------------------|
| Item | Setting |
| ▶ Operation Band | 2.4G Single Band ▼ |

| Basic Configuration | | |
|-----------------------|-----------------------|---|
| Item | Value setting | Description |
| Operation Band | A Must filled setting | Specify the intended operation band for the WiFi module. Basically, this setting is fixed and cannot be changed once the module is integrated into the product. However, there is some module with selectable band for user to choose according to his network environment. Under such situation, you can specify which operation band is suitable for the application. |

Configure WiFi Setting

| 2.4G WiFi Configuration | |
|-------------------------|--|
| Item | Setting |
| ▶ WiFi Module | <input checked="" type="checkbox"/> Enable |
| ▶ Channel | Auto ▼ <input checked="" type="radio"/> By AP Numbers <input type="radio"/> By Less Interference |
| ▶ WiFi System | 802.11b/g/n Mixed ▼ |
| ▶ WiFi Operation Mode | AP Router Mode ▼ |

| Configuring Wi-Fi Settings | | |
|----------------------------|---|--|
| Item | Value setting | Description |
| WiFi Module | The box is checked by default | Check the Enable box to activate Wi-Fi function. |
| Channel | 1. A Must filled setting. 2. Auto is selected be default. | Select a radio channel for the VAP. Each channel is corresponding to different radio band. The permissible channels depend on the Regulatory Domain . There are two available options when Auto is selected: ● By AP Numbers |

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| | | |
|----------------------------|-----------------------|--|
| | | <p>The channel will be selected according to AP numbers (The less, the better).</p> <ul style="list-style-type: none"> ● By Less Interference <p>The channel will be selected according to interference. (The lower, the better).</p> |
| WiFi System | A Must filled setting | <p>Specify the preferred WiFi System. The dropdown list of WiFi system is based on IEEE 802.11 standard.</p> <ul style="list-style-type: none"> ● 2.4G WiFi can select b, g and n only or mixed with each other. ● 5G WiFi can select a, n and ac only or mixed with each other. |
| WiFi Operation Mode | | <p>Specify the WiFi Operation Mode according to your application. Go to the following table for AP Router Mode, WDS Only Mode, and WDS Hybrid Mode settings.</p> <p>Note: The available operation modes depend on the product specification.</p> |

In the following, the specific configuration description for each WiFi operation mode is given.

AP Router Mode & VAPs Configuration

For the AP Router mode, the device not only supports **stations connection** but also the **router function**. The **WAN** port and the **NAT** function are **enabled**.

| | |
|-----------------------|--|
| ▶ WiFi Operation Mode | AP Router Mode ▼ |
| ▶ Green AP | <input type="checkbox"/> Enable |
| ▶ VAP Isolation | <input checked="" type="checkbox"/> Enable |
| ▶ Time Schedule | (0) Always ▼ |

| AP Router Mode | | |
|----------------------|----------------------------------|--|
| Item | Value setting | Description |
| Green AP | The box is unchecked by default. | Check the Enable box to activate Green AP function. |
| VAP Isolation | The box is checked by default. | Check the Enable box to activate this function. By default, the box is checked; it means that stations which associated to different VAPs cannot communicate with each other. |
| Time Schedule | A Must filled setting | Apply a specific Time Schedule to this rule; otherwise leave it as (0) Always . If the dropdown list is empty ensure Time Schedule is pre-configured. Refer to Object Definition > Scheduling > Configuration tab. |

| 2.4G VAP List | | | | | | | | |
|---------------|-------|------------|----------------|------------|-------------------------------------|-------------------------------------|-------------------------------------|---|
| ID | VAP | SSID | Authentication | Encryption | STA Isolation | Broadcast SSID | Enable | Actions |
| 1 | VAP 1 | Staff_2.4G | WPA2-PSK | AES | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="checkbox"/> Select |

By default, VAP 1 is enabled and security key is required to connect to the gateway wirelessly to enhance the security level and prevent unexpected access of un-authorized devices.

The default wifi key is printed on both the device label and the Security Card. It is created randomly and

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differs from devices. So, you can connected to the VAP1 (SSID: Staff_2.4G) with the provided key. However, it is strongly recommended that you have to change the security key to a easy-to-remember one by clicking the Edit button.

Click **Add / Edit** button in the VAP List screen to create or edit the settings for a VAP. A VAP Configuration screen will appear.

For VAP 1:

| VAP Configuration | |
|-------------------|-------------------------------------|
| Item | Setting |
| ▶ VAP | VAP1 ▾ |
| ▶ SSID | Staff_2.4G |
| ▶ Max. STA | <input type="checkbox"/> Enable |
| ▶ Authentication | WPA2-PSK ▾ |
| ▶ Encryption | AES ▾ |
| ▶ Preshared Key | 8gHC2p0hwZI1d |
| ▶ STA Isolation | <input checked="" type="checkbox"/> |
| ▶ Broadcast SSID | <input checked="" type="checkbox"/> |
| ▶ Enable | <input checked="" type="checkbox"/> |

For others:

| VAP Configuration | |
|-------------------|---|
| Item | Setting |
| ▶ VAP | VAP2 ▾ |
| ▶ SSID | default |
| ▶ Max. STA | <input type="checkbox"/> Enable |
| ▶ Authentication | Open ▾ 802.1x <input type="checkbox"/> Enable |
| ▶ Encryption | None ▾ |
| ▶ STA Isolation | <input type="checkbox"/> |
| ▶ Broadcast SSID | <input type="checkbox"/> |
| ▶ Enable | <input type="checkbox"/> |

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| VAP Configuration | | |
|-----------------------|--|--|
| Item | Value setting | Description |
| SS ID | 1. String format : Any text | Enter the SSID for the VAP, and decide whether to broadcast the SSID or not. The SSID is used for identifying from another AP, and client stations will associate with AP according to SSID. |
| Max. STA | The box is unchecked by default. | Check this box and enter a limitation to limit the maximum number of client station. The box is unchecked by default. It means no special limitation on the number of connected STAs. |
| Authentication | 1. A Must filled setting 2. VAP1: WPA2-PSK is selected be default; Others: Open is selected be default. | For security, there are several authentication methods supported. Client stations should provide the key when associate with this device. |
| | | When Open is selected The check box named 802.1x shows up next to the dropdown list. <ul style="list-style-type: none"> ● 802.1x (The box is unchecked by default) When 802.1x is enabled, it means the client stations will be authenticated by RADIUS server. RADIUS Server IP (The default IP is 0.0.0.0) RADIUS Server Port (The default value is 1812) RADIUS Shared Key |
| | | When Shared is selected The pre-shared WEP key should be set for authenticating. |
| | | When Auto is selected The device will select Open or Shared by requesting of client automatically. The check box named 802.1x shows up next to the dropdown list. <ul style="list-style-type: none"> ● 802.1x (The box is unchecked by default) When 802.1x is enabled, it means the client stations will be authenticated by RADIUS server. RADIUS Server IP (The default IP is 0.0.0.0) RADIUS Server Port (The default value is 1812) RADIUS Shared Key |
| | | When WPA or WPA2 is selected They are implementation of IEEE 802.11i. WPA only had implemented part of IEEE 802.11i, but owns the better compatibility . WPA2 had fully implemented 802.11i standard, and owns the highest security . <ul style="list-style-type: none"> ● RADIUS Server The client stations will be authenticated by RADIUS server. RADIUS Server IP (The default IP is 0.0.0.0) RADIUS Server Port (The default value is 1812) RADIUS Shared Key |
| | | When WPA / WPA2 is selected It owns the same setting as WPA or WPA2 . The client stations can associate with this device via WPA or WPA2 . |
| | | When WPA-PSK or WPA2-PSK is selected It owns the same encryption system as WPA or WPA2. The authentication uses pre-shared key instead of RADIUS server. |
| | When WPA-PSK / WPA2-PSK is selected It owns the same setting as WPA-PSK or WPA2-PSK . The client stations can associate with this device via WPA-PSK or WPA2-PSK . | |
| Encryption | 1. A Must filled setting. 2. VAP1: AES is selected be default; | Select a suitable encryption method and enter the required key(s). The available method in the dropdown list depends on the Authentication you selected. |

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| | | |
|-----------------------|---|---|
| | Others: None is selected by default. | <p>None It means that the device is open system without encrypting.</p> <p>WEP Up to 4 WEP keys can be set, and you have to select one as current key. The key type can be set to HEX or ASCII. If HEX is selected, the key should consist of (0 to 9) and (A to F). If ASCII is selected, the key should consist of ASCII table.</p> <p>TKIP TKIP was proposed instead of WEP without upgrading hardware. Enter a Pre-shared Key for it. The length of key is from 8 to 63 characters.</p> <p>AES The newest encryption system in WiFi, it also designed for the fast 802.11n high bitrates schemes. Enter a Pre-shared Key for it. The length of key is from 8 to 63 characters. You are recommended to use AES encryption instead of any others for security.</p> <p>TKIP / AES TKIP / AES mixed mode. It means that the client stations can associate with this device via TKIP or AES. Enter a Pre-shared Key for it. The length of key is from 8 to 63 characters.</p> |
| STA Isolation | VAP1: The box is checked by default; Others: unchecked by default. | Check the Enable box to activate this function. By default, the box is checked; it means that stations which associated to the same VAP cannot communicate with each other. |
| Broadcast SSID | VAP1: The box is checked by default; Others: unchecked by default. | Check the Enable box to activate this function. If the broadcast SSID option is enabled, it means the SSID will be broadcasted, and the stations can associate with this device by scanning SSID. |
| Enable | VAP1: The box is checked by default; Others: unchecked by default. | Check the Enable box to activate this VAP. |
| Save | N/A | Click the Save button to save the current configuration. |
| Undo | N/A | Click the Undo button to restore configuration to previous setting before saving. |
| Apply | N/A | Click the Apply button to apply the saved configuration. |

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WDS Only Mode

For the WDS Only mode, the device only bridges the connected wired clients to another WDS-enabled WiFi device which the device associated with. That is, it also means the no wireless clients stat can connect to this device while WDS Only Mode is selected.

| | |
|-----------------------------|-------------------------------------|
| ▶ WiFi Operation Mode | WDS Only Mode ▾ |
| ▶ Green AP | <input type="checkbox"/> Enable |
| ▶ Time Schedule | (0) Always ▾ |
| ▶ Scan Remote AP's MAC List | <input type="button" value="Scan"/> |
| Remote AP MAC 1 | <input type="text"/> |
| Remote AP MAC 2 | <input type="text"/> |
| Remote AP MAC 3 | <input type="text"/> |
| Remote AP MAC 4 | <input type="text"/> |

| WDS Only Mode Item | Value setting | Description |
|----------------------------------|----------------------------------|--|
| Green AP | The box is unchecked by default. | Check the Enable box to activate Green AP function. |
| Time Schedule | A Must filled setting | Apply a specific Time Schedule to this rule; otherwise leave it as (0) Always . If the dropdown list is empty ensure Time Schedule is pre-configured. Refer to Object Definition > Scheduling > Configuration tab. |
| Scan Remote AP's MAC List | N/A | Press the Scan button to scan the spatial AP information, and then select one from the AP list, the MAC of selected AP will be auto filled in the following Remote AP MAC table. |
| Remote AP MAC 1~4 | A Must filled setting | Enter the remote AP's MAC manually, or via auto-scan approach, The device will bridge the traffic to the remote AP when associated successfully. |

| 2.4G VAP List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | |
|--|-------|------------|----------------|------------|-------------------------------------|-------------------------------------|-------------------------------------|---|
| ID | VAP | SSID | Authentication | Encryption | STA Isolation | Broadcast SSID | Enable | Actions |
| 1 | VAP 1 | Staff_2.4G | WPA2-PSK | AES | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="checkbox"/> Select |

By default, VAP 1 is enabled and security key is required to connect to the gateway wirelessly to enhance the security level and prevent unexpected access of un-authorized devices.

The default wifi key is printed on both the device label and the Security Card. It is created randomly and differs from devices. So, you can connected to the VAP1 (SSID: Staff_2.4G) with the provided key.

However, it is strongly recommended that you have to change the security key to a easy-to-remember one by clicking the Edit button.

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Under **WDS Only** mode, only VAP1 is available for further specifying the required authentication and Encryption settings. Click **Edit** button in the VAP List screen and a VAP Configuration screen will appear for you to configure the required settings

| VAP Configuration | |
|-------------------|-------------------------------------|
| Item | Setting |
| ▶ VAP | VAP1 ▼ |
| ▶ SSID | Staff_2.4G |
| ▶ Max. STA | <input type="checkbox"/> Enable |
| ▶ Authentication | WPA2-PSK ▼ |
| ▶ Encryption | AES ▼ |
| ▶ Preshared Key | 8gHC2p0hwZI1d |
| ▶ STA Isolation | <input checked="" type="checkbox"/> |
| ▶ Broadcast SSID | <input checked="" type="checkbox"/> |
| ▶ Enable | <input checked="" type="checkbox"/> |

For the detail description about VAP configuration, please refer to the description stated in AP-Router section.

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WDS Hybrid Mode

For the WDS Hybrid mode, the device bridges all the wired **LAN** and **WLAN** clients to another WDS or WDS hybrid enabled WiFi devices which the device associated with.

| | |
|-----------------------------|--|
| ▶ WiFi Operation Mode | WDS Hybrid Mode ▾ |
| ▶ Lazy Mode | <input type="checkbox"/> Enable |
| ▶ Green AP | <input type="checkbox"/> Enable |
| ▶ VAP Isolation | <input checked="" type="checkbox"/> Enable |
| ▶ Time Schedule | (0) Always ▾ |
| ▶ Scan Remote AP's MAC List | <input type="button" value="Scan"/> |
| Remote AP MAC 1 | <input type="text"/> |
| Remote AP MAC 2 | <input type="text"/> |
| Remote AP MAC 3 | <input type="text"/> |
| Remote AP MAC 4 | <input type="text"/> |

| WDS Hybrid Mode | | |
|----------------------------------|------------------------------------|---|
| Item | Value setting | Description |
| Lazy Mode | The box is checked by default. | Check the Enable box to activate this function. With the function been enabled, the device can auto-learn WDS peers without manually entering other AP's MAC address. But at least one of the APs has to fill remote AP MAC addresses. |
| Green AP | The box is unchecked by default. | Check the Enable box to activate Green AP function. |
| VAP Isolation | The box is checked by default. | Check the Enable box to activate this function. By default, the box is checked; it means that stations which associated to different VAPs cannot communicate with each other. |
| Time Schedule | A Must filled setting | Apply a specific Time Schedule to this rule; otherwise leave it as (0) Always . If the dropdown list is empty ensure Time Schedule is pre-configured. Refer to Object Definition > Scheduling > Configuration tab. |
| Scan Remote AP's MAC List | Available when Lazy Mode disabled. | Press the Scan button to scan the spatial AP information, and then select one from the AP list, the MAC of selected AP will be auto filled in the following Remote AP MAC table. |
| Remote AP MAC 1~4 | Available when Lazy Mode disabled. | Enter the remote AP's MAC manually, or via auto-scan approach, The device will bridge the traffic to the remote AP when associated successfully. |

| 2.4G VAP List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | |
|--|-------|------------|----------------|------------|-------------------------------------|-------------------------------------|-------------------------------------|---|
| ID | VAP | SSID | Authentication | Encryption | STA Isolation | Broadcast SSID | Enable | Actions |
| 1 | VAP 1 | Staff_2.4G | WPA2-PSK | AES | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="checkbox"/> Select |

By default, VAP 1 is enabled and security key is required to connect to the gateway wirelessly to enhance the

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security level and prevent unexpected access of un-authorized devices.

The default wifi key is printed on both the device label and the Security Card. It is created randomly and differs from devices. So, you can connected to the VAP1 (SSID: Staff_2.4G) with the provided key.

However, it is strongly recommended that you have to change the security key to a easy-to-remember one by clicking the Edit button.

Under **WDS Hybrid** mode, the VAP function is available and you can further specifying the required VAP settings for connecting with wireless client devices.

Click **Add / Edit** button in the VAP List screen to create or edit the settings for a VAP. A VAP Configuration screen will appear.

For VAP 1:

| VAP Configuration | |
|-------------------|-------------------------------------|
| Item | Setting |
| ▶ VAP | VAP1 ▾ |
| ▶ SSID | Staff_2.4G |
| ▶ Max. STA | <input type="checkbox"/> Enable |
| ▶ Authentication | WPA2-PSK ▾ |
| ▶ Encryption | AES ▾ |
| ▶ Preshared Key | 8gHC2p0hwZI1d |
| ▶ STA Isolation | <input checked="" type="checkbox"/> |
| ▶ Broadcast SSID | <input checked="" type="checkbox"/> |
| ▶ Enable | <input checked="" type="checkbox"/> |

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For others:

| VAP Configuration | |
|-------------------|---|
| Item | Setting |
| ▶ VAP | VAP2 ▾ |
| ▶ SSID | default |
| ▶ Max. STA | <input type="checkbox"/> Enable |
| ▶ Authentication | Open ▾ 802.1x <input type="checkbox"/> Enable |
| ▶ Encryption | None ▾ |
| ▶ STA Isolation | <input type="checkbox"/> |
| ▶ Broadcast SSID | <input type="checkbox"/> |
| ▶ Enable | <input type="checkbox"/> |

For the detail description about VAP configuration, please refer to the description stated in AP-Router section.

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2.3.2 Wireless Client List

The **Wireless Client List** page shows the information of wireless clients which are associated with this device.

Go to **Basic Network > WiFi > Wireless Client List** Tab.

Select Target WiFi

| Target WiFi [Help] | |
|----------------------|---------|
| Item | Setting |
| ▶ Module Select | One ▼ |
| ▶ Operation Band | 2.4G ▼ |
| ▶ Multiple AP Names | All ▼ |

| Target Configuration | | |
|--------------------------|---|---|
| Item | Value setting | Description |
| Module Select | A Must filled setting. | Select the WiFi module to check the information of connected clients. For those single WiFi module products, this option is hidden. |
| Operation Band | A Must filled setting. | Specify the intended operation band for the WiFi module. Basically, this setting is fixed and cannot be changed once the module is integrated into the product. However, there is some module with selectable band for user to choose according to his network environment. Under such situation, you can specify which operation band is suitable for the application. |
| Multiple AP Names | 1. A Must filled setting. 2. All is selected by default. | Specify the VAP to show the associated clients information in the following Client List. By default, All VAP is selected. |

Show Client List

The following Client List shows the information for wireless clients that is associated with the selected VAP(s).

| Client List | | | | | | | | |
|------------------------------------|-----------|-------------|------|------|-------|-------|--------|-----------|
| IP Address Configuration & Address | Host Name | MAC Address | Mode | Rate | RSSI0 | RSSI1 | Signal | Interface |

| Target Configuration | | |
|---|---------------|---|
| Item | Value setting | Description |
| IP Address Configuration & Address | N/A | It shows the Client's IP address and the deriving method. Dynamic means the IP address is derived from a DHCP server. Static means the IP address is a fixed one that is self-filled by client. |
| Host Name | N/A | It shows the host name of client. |
| MAC Address | N/A | It shows the MAC address of client. |

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| | | |
|---------------------|-----|--|
| Mode | N/A | It shows what kind of Wi-Fi system the client used to associate with this device. |
| Rate | N/A | It shows the data rate between client and this device. |
| RSSI0, RSSI1 | N/A | It shows the RX sensitivity (RSSI) value for each radio path. |
| Signal | N/A | The signal strength between client and this device. |
| Interface | N/A | It shows the VAP ID that the client associated with. |
| Refresh | N/A | Click the Refresh button to update the Client List immediately. |

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2.3.3 Advanced Configuration

This device provides advanced wireless configuration for professional user to optimize the wireless performance under the specific installation environment. Please note that if you are not familiar with the WiFi technology, just leave the advanced configuration with its default values, or the connectivity and performance may get worse with improper settings.

Go to **Basic Network > WiFi > Advanced Configuration** Tab.

Select Target WiFi

| Target WiFi [Help] | |
|----------------------|---------|
| Item | Setting |
| ▶ Module Select | One ▼ |
| ▶ Operation Band | 2.4G ▼ |

| Target Configuration | | |
|-----------------------|------------------------|---|
| Item | Value setting | Description |
| Module Select | A Must filled setting. | Select the WiFi module to check the information of connected clients. For those single WiFi module products, this option is hidden. |
| Operation Band | A Must filled setting. | Specify the intended operation band for the WiFi module. Basically, this setting is fixed and cannot be changed once the module is integrated into the product. However, there is some module with selectable band for user to choose according to his network environment. |

Setup Advanced Configuration

| Advanced Configuration | |
|------------------------|---|
| Item | Setting |
| ▶ Regulatory Domain | (1-11) |
| ▶ Beacon Interval | <input type="text" value="100"/> Range: (1~1000 msec) |
| ▶ DTIM Interval | <input type="text" value="3"/> Range: (1~255) |
| ▶ RTS Threshold | <input type="text" value="2347"/> Range: (1~2347) |
| ▶ Fragmentation | <input type="text" value="2346"/> Range: (256~2346) |
| ▶ WMM | <input checked="" type="checkbox"/> Enable |
| ▶ Short GI | 400ns ▼ |
| ▶ TX Rate | Best ▼ |
| ▶ RF Bandwidth | Auto ▼ |
| ▶ Transmit Power | 100% ▼ |
| ▶ WIDS | <input type="checkbox"/> Enable |

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| Advanced Configuration | | |
|--------------------------|---|--|
| Item | Value setting | Description |
| Regulatory Domain | The default setting is according to where the product sale to | It limits the available radio channel of this device. The permissible channels depend on the Regulatory Domain . |
| Beacon Interval | 100 | It shows the time interval between each beacon packet broadcasted. The beacon packet contains SSID , Channel ID and Security setting . |
| DTIM Interval | 3 | A DTIM (Delivery Traffic Indication Message) is a countdown informing clients of the next window for listening to broadcast message. When the device has buffered broadcast message for associated client, it sends the next DTIM with a DTIM value. |
| RTS Threshold | 2347 | RTS (Request to send) Threshold means when the packet size is over the setting value, then active RTS technique. RTS/CTS is a collision avoidance technique. It means RTS never activated when the threshold is set to 2347 . |
| Fragmentation | 2346 | Wireless frames can be divided into smaller units (fragments) to improve performance in the presence of RF interference at the limits of RF coverage. |
| WMM | The box is checked by default | WMM (Wi-Fi Multimedia) can help control latency and jitter when transmitting multimedia content over a wireless connection. |
| Short GI | By default 400ns is selected | Short GI (Guard Interval) is defined to set the sending interval between each packet. Note that lower Short GI could increase not only the transition rate but also error rate . |
| TX Rate | By default Best is selected | It means the data transition rate . When Best is selected, the device will choose a proper data rate according to signal strength . |
| RF Bandwidth | By default Auto is selected | The setting of RF bandwidth limits the maximum data rate. |
| Transmit Power | By default 100% is selected | Normally the wireless transmitter operates at 100% power. By setting the transmit power to control the Wi-Fi coverage . |
| 5G Band Steering | The box is unchecked by default | When the client station associate with 2.4G Wi-Fi, the device will send the client to 5G Wi-Fi automatically if the client is available on accessing this 5G Wi-Fi band. This option is only available on the module that supports 5GHz band. |
| WIDS | The box is unchecked by default | The WIDS (Wireless Intrusion Detection System) will analyze all packets and make a statistic table in WiFi status. Go to Status > Basic Network > WiFi tab for detailed WIDS status. |
| Save | N/A | Click the Save button to save the current configuration. |
| Undo | N/A | Click the Undo button to restore configuration to previous setting before saving. |

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2.3.4 Uplink Profile

This device provides WiFi Uplink function for connecting to a wireless access point just like connected to a wired WAN or cellular WAN connection. It can operate as a NAT gateway and link the devices wirelessly to the uplink network or hosts.

To connect to the wireless access point, user has to enable the wireless Uplink function for a certain WiFi Module (refer to **Basic Network > WAN & Uplink > Physical Interface, Internet Setup** tabs) first, and then configure the Uplink profile(s) for the access point to be connected to in the **Uplink Profile** page.

Go to **Basic Network > WiFi > Uplink Profile** tab for configuring the Uplink Profile page.

Uplink Profile Setting

| Setting | |
|-------------------|---|
| Item | Setting |
| ▶ Profile | <input type="checkbox"/> Enable |
| ▶ Module Select | One ▼ |
| ▶ Operation Band | 2.4G ▼ |
| ▶ Priority | <input checked="" type="radio"/> By Signal Strength <input type="radio"/> By User-defined |
| ▶ Current Profile | |

| Setting Item | Value setting | Description |
|-----------------------|---|---|
| Profile | <ol style="list-style-type: none"> 1. A Must filled setting. 2. Unchecked by default. | <p>Check the Enable box to activate the profile function. It is available only when the selected WiFi module is configured at WiFi Uplink mode.</p> |
| Module Select | A Must filled setting. | <p>Select the WiFi module to check or configure the expected uplink profile(s). For those single WiFi module products, this option is hidden.</p> |
| Operation Band | A Must filled setting. | <p>Specify the intended operation band for the WiFi module. Basically, this setting is fixed and cannot be changed once the module is integrated into the gateway product. However, there are some module with selectable band for user to choose according to his network environment. Under such situation, you can specify which operation band is suitable for the application.</p> |
| Priority | <ol style="list-style-type: none"> 1. A Must filled setting. 2. By Signal Strength is selected by default. | <p>Specify the network selection methodology for connectin to an available wireless uplink network. It can be By Signal Strength or By User-defined priority. When By Signal Strength is selected, the gateway will try to connect to the available uplink network whose wireless signal strength is the strongest. When By User-defined is selected, the gateway will try to connect to the available uplink network whose priority is the highest (1 is the highest priority, and 16 is the lowest priority).</p> |

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Note: to apply the defined Uplink profile(s) for the gateway to find a best fit profile for connecting to a certain uplink network, user has to **Enable** the Profile auto-connect function (Refer to **Basic Network > WiFi > (Module 1/ Module 2) WiFi Configuration** tab).

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Create/Edit Uplink Profile

| Profile List <input type="button" value="Add"/> <input type="button" value="Delete"/> <input type="button" value="Get Signal Strength"/> | | | | | | | | | | |
|--|--------------|------|---------|----------------|------------|-------------|-----------------|----------|--------|---------|
| ID | Profile Name | SSID | Channel | Authentication | Encryption | MAC Address | Signal Strength | Priority | Enable | Actions |

The Profile List shows the settings for the created uplink profiles. The information includes Profile Name, SSID, Channel, Authentication, Encryption, MAC Address, Signal Strength, Priority, and Enable.

When **Add** button is applied, **Profile Configuration** screen will appear.

| Profile Configuration | |
|-----------------------|--|
| Item | Setting |
| ▶ Profile Name | <input type="text"/> |
| ▶ Network ID (SSID) | <input type="text"/> <input type="button" value="Scan"/> |
| ▶ Channel | Auto ▼ |
| ▶ Authentication | Open ▼ |
| ▶ Encryption | None ▼ |
| ▶ MAC Address | <input type="text"/> |
| ▶ Priority | 16 ▼ |
| ▶ Enable | <input checked="" type="checkbox"/> |

| Profile Configuration | | |
|--------------------------|---|--|
| Item | Value setting | Description |
| Profile Name | <ol style="list-style-type: none"> String format can be any text A Must filled setting | Enter a profile name for the uplink network specified below. It is a name that is easy for you to understand. Value Range: 1 ~ 64 characters. |
| Network ID (SSID) | <ol style="list-style-type: none"> String format : Any text The box is checked by default. | Enter the SSID for the VAP, and decide whether to broadcast the SSID or not. The SSID is used for identifying from another AP, and client stations will associate with AP according to SSID. If the broadcast SSID option is enabled, it means the SSID will be broadcasted, and the stations can associate with this device by scanning SSID. |
| Channel | <ol style="list-style-type: none"> A Must filled setting. Auto is selected by default. | Select a radio channel for the VAP. Each channel is corresponding to different radio band. The permissible channels depend on the Regulatory Domain . There are two available options when Auto is selected: <ul style="list-style-type: none"> ● By AP Numbers The channel will be selected according to AP numbers (The less, the better). ● By Less Interference The channel will be selected according to interference. (The lower, the better). |
| Authentication | <ol style="list-style-type: none"> A Must filled setting | Specify the authentication method for connecting with the uplink network. It |

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| | | |
|--------------------|---|---|
| | 2. Open is selected by default. | can be Open, Shared, WPA-SPK, or WPA2-PSK . When Open is selected, the preshared WEP key could be set for authentication; When Shared is selected, the preshared WEP key should be set for authentication; When WPA-PSK or WPA2-PSK is selected, The the TKIP or AES preshared key should be set for authentication; |
| Encryption | 1. A Must filled setting. 2. None is selected by default. | Select a suitable encryption method and enter the required key(s). The available method in the dropdown list depends on the Authentication you selected. None It means that the device is open system without encrypting. WEP Up to 4 WEP keys can be set, and you have to select one as current key. The key type can set to HEX or ASCII . If HEX is selected, the key should consist of (0 to 9) and (A to F). If ASCII is selected, the key should consist of ASCII table. TKIP TKIP was proposed instead of WEP without upgrading hardware. Enter a Preshared Key for it. The length of key is from 8 to 63 characters. AES The newest encryption system in WiFi, it also designed for the fast 802.11n high bitrates schemes. Enter a Preshared Key for it. The length of key is from 8 to 63 characters. You are recommended to use AES encryption instead of any others for security. |
| MAC Address | 1. MAC Address string Format 2. A Must fill setting | Specify the MAC Address of the access point (with the Network ID) to be connected to. |
| Priority | 1. An Optional filled setting. 2. 16 is set by default. | Specify a priority setting for the uplink profile when the By User-defined methodology is selected. The priority value can be 1 ~ 16. 1 is the highest priority, and 16 is the lowest priority). |
| Enable | The box is checked by default. | Click the Enable box to activate this profile. |
| Save | N/A | Click the Save button to save the configuration. |
| Undo | N/A | Click the Undo button to restore what you just configured back to the previous setting. |
| Back | N/A | When the Back button is clicked, the screen will return to the Profile List page. |

Instead of manually enter the information for the uplink network, you can also click the **Scan** button to get the available wireless networks around the device, and select one as the uplink network.

When the **Scan** button is applied, **Wireless AP List** will appear after few seconds.

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| Wireless AP List | | | | | | |
|------------------|---------|---------|----------------|------------|-------------------|-----------------------|
| SSID | Channel | Quality | Authentication | Encryption | MAC Address | Select |
| Guest_2.4G | 1 | 86% | | None | 02:50:78:56:79:15 | <input type="radio"/> |
| WIN | 1 | 100% | WPA2-PSK | AES | 00:60:64:cb:f5:f6 | <input type="radio"/> |
| amit02 | 1 | 63% | WPA2-PSK | AES | 00:50:18:21:e2:17 | <input type="radio"/> |
| Guest_2.4G | 1 | 5% | | None | 1a:50:18:33:55:66 | <input type="radio"/> |
| Ian test_24_1 | 1 | 86% | WPA2-PSK | AES | 00:50:18:56:79:15 | <input type="radio"/> |
| Ian test_24_3 | 1 | 89% | WPA2-PSK | AES | 02:50:28:56:79:15 | <input type="radio"/> |
| Ian test_24_5 | 1 | 86% | WPA2-PSK | AES | 02:50:48:56:79:15 | <input type="radio"/> |
| Ian test_24_7 | 1 | 86% | WPA2-PSK | AES | 02:50:68:56:79:15 | <input type="radio"/> |

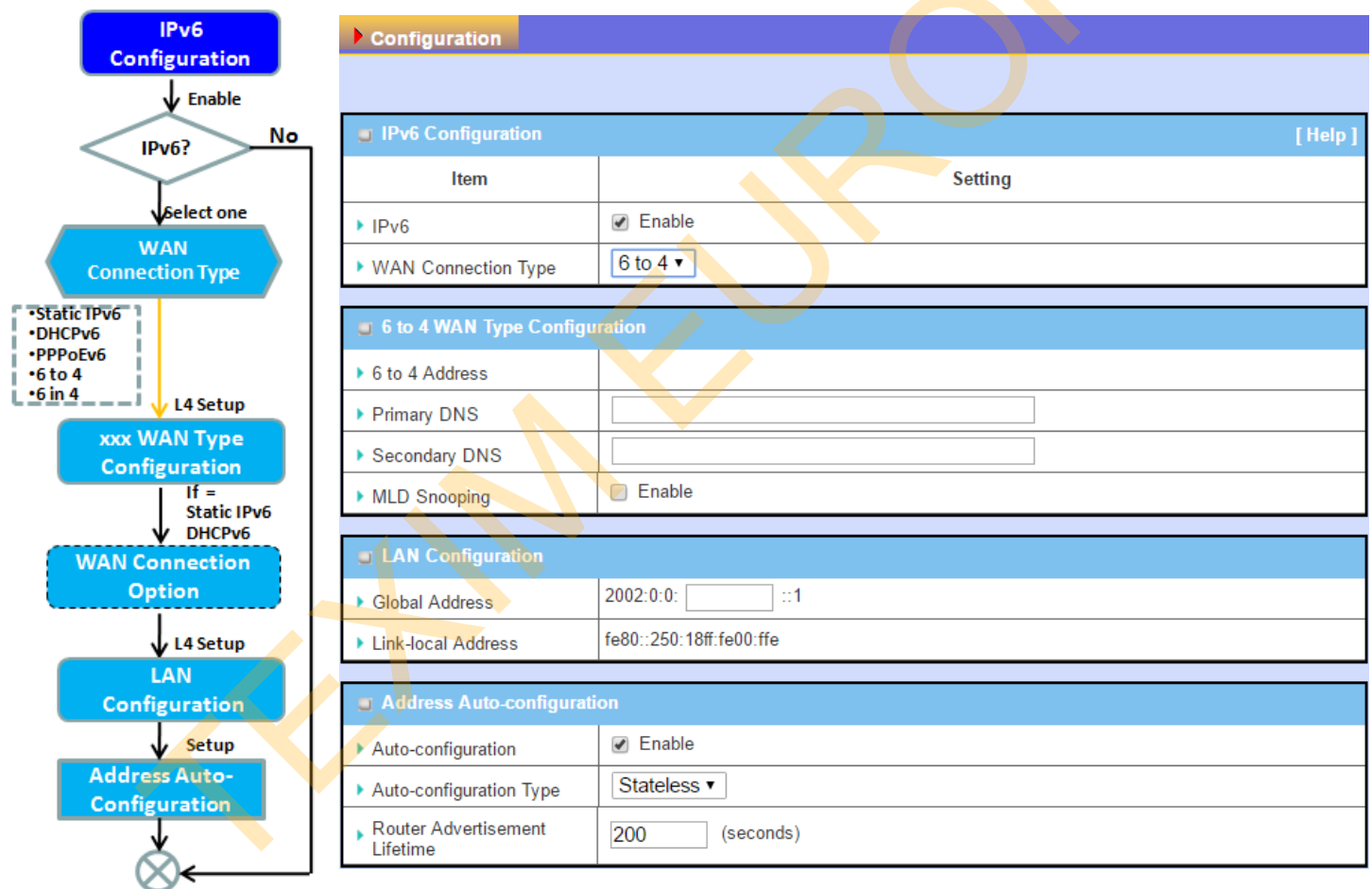
Once you selected an AP from the AP list, the channel, SSID, Authentication, Encryption, and MAC address will be automatically filled into the profile, you just have to enter a key for the uplink connection, if required.

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2.4 IPv6

The growth of the Internet has created a need for more addresses than are possible with IPv4. IPv6 (Internet Protocol version 6) is a version of the Internet Protocol (IP) intended to succeed IPv4, which is the protocol currently used to direct almost all Internet traffic. IPv6 also implements additional features not present in IPv4. It simplifies aspects of address assignment (stateless address auto-configuration), network renumbering and router announcements when changing Internet connectivity providers.

2.4.1 IPv6 Configuration



The **IPv6 Configuration** setting allows user to set the IPv6 connection type to access the IPv6 network. This gateway supports various types of IPv6 connection, including **Static IPv6**, **DHCPv6**, and **PPPoEv6**

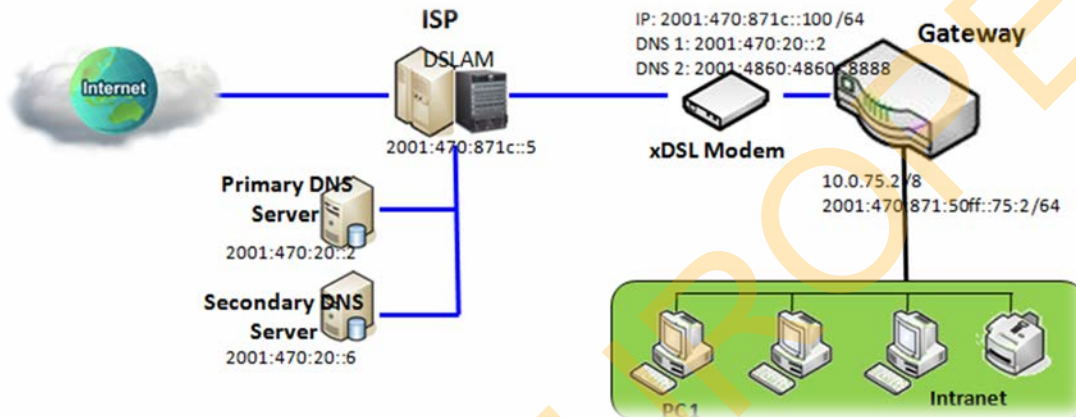
Note: For the products just having 3G/4G WAN interface, only **IPv6** is supported. Please contact your ISP for the IPv6 supports before you proceed with IPv6 setup.

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IPv6 WAN Connection Type

Static IPv6

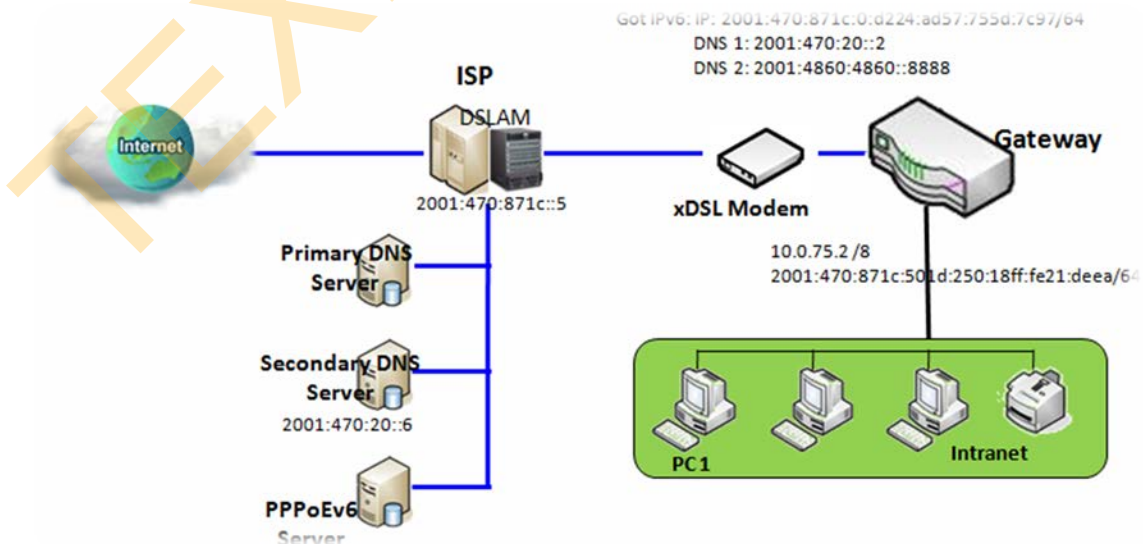
Static IPv6 does the same function as static IPv4. The static IPv6 provides manual setting of IPv6 address, IPv6 default gateway address, and IPv6 DNS.



Above diagram depicts the IPv6 IP addressing, type in the information provided by your ISP to setup the IPv6 network.

DHCPv6

DHCP in IPv6 does the same function as DHCP in IPv4. The DHCP server sends IP address, DNS server addresses and other possible data to the DHCP client to configure automatically. The server also sends a lease time of the address and time to re-contact the server for IPv6 address renewal. The client has then to resend a request to renew the IPv6 address.

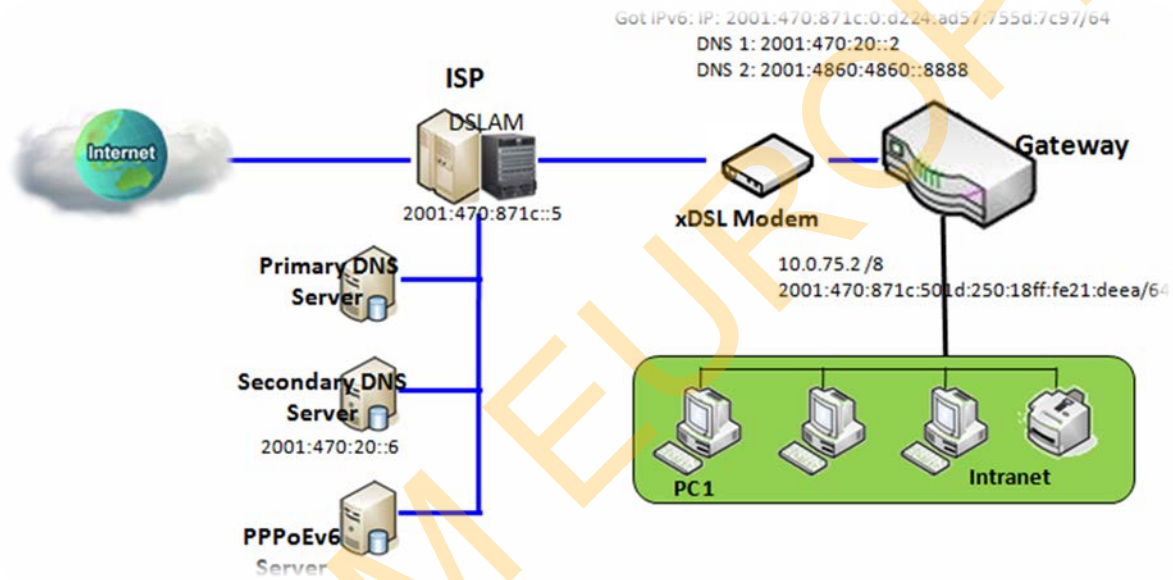


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Above diagram depicts DHCP IPv6 IP addressing, the DHCPv6 server on the ISP side assigns IPv6 address, IPv6 default gateway address, and IPv6 DNS to client host's automatically.

PPPoEv6

PPPoEv6 in IPv6 does the same function as PPPoE in IPv4. The PPPoEv6 server provides configuration parameters based on PPPoEv6 client request. When PPPoEv6 server gets client request and successfully authenticates it, the server sends IP address, DNS server addresses and other required parameters to automatically configure the client.



The diagram above depicts the IPv6 addressing through PPPoE, PPPoEv6 server (DSLAM) on the ISP side provides IPv6 configuration upon receiving PPPoEv6 client request. When PPPoEv6 server gets client request and successfully authenticates it, the server sends IP address, DNS server addresses and other required parameters to automatically configure the client.

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IPv6 Configuration Setting

Go to **Basic Network > IPv6 > Configuration** Tab.

The **IPv6 Configuration** setting allows user to set the IPv6 connection type to access the IPv6 network.

| IPv6 Configuration [Help] | |
|-----------------------------|--|
| Item | Setting |
| ▶ IPv6 | <input checked="" type="checkbox"/> Enable |
| ▶ WAN Connection Type | DHCPv6 ▼ |

| Item | Value setting | Description |
|----------------------------|---|---|
| IPv6 | The box is unchecked by default, | Check the Enable box to activate the IPv6 function. |
| WAN Connection Type | <ol style="list-style-type: none">1. Only can be selected when IPv6 Enable2. A Must filled setting | <p>Define the selected IPv6 WAN Connection Type to establish the IPv6 connectivity.</p> <p>Select Static IPv6 when your ISP provides you with a set IPv6 addresses. Then go to Static IPv6 WAN Type Configuration.</p> <p>Select DHCPv6 when your ISP provides you with DHCPv6 services.</p> <p>Select PPPoEv6 when your ISP provides you with PPPoEv6 account settings.</p> <p>Select IPv6 when you want to use IPv6 connection.</p> <p>Note: For the products just having 3G/4G WAN interface, only IPv6 is supported.</p> |

Static IPv6 WAN Type Configuration

| Static IPv6 WAN Type Configuration | |
|------------------------------------|---------------------------------|
| ▶ IPv6 Address | <input type="text"/> |
| ▶ Subnet Prefix Length | <input type="text"/> |
| ▶ Default Gateway | <input type="text"/> |
| ▶ Primary DNS | <input type="text"/> |
| ▶ Secondary DNS | <input type="text"/> |
| ▶ MLD Snooping | <input type="checkbox"/> Enable |

Static IPv6 WAN Type Configuration

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| Item | Value setting | Description |
|-----------------------------|---------------------------------|---|
| IPv6 Address | A Must filled setting | Enter the WAN IPv6 Address for the router. |
| Subnet Prefix Length | A Must filled setting | Enter the WAN Subnet Prefix Length for the router. |
| Default Gateway | A Must filled setting | Enter the WAN Default Gateway IPv6 address. |
| Primary DNS | An optional setting | Enter the WAN primary DNS Server . |
| Secondary DNS | An optional setting | Enter the WAN secondary DNS Server . |
| MLD Snooping | The box is unchecked by default | Enable/Disable the MLD Snooping function |

LAN Configuration

| LAN Configuration | |
|----------------------|--------------------------|
| ▶ Global Address | <input type="text"/> /64 |
| ▶ Link-local Address | fe80::250:18ff:fe16:1123 |

| LAN Configuration | | |
|---------------------------|-----------------------|--|
| Item | Value setting | Description |
| Global Address | A Must filled setting | Enter the LAN IPv6 Address for the router. |
| Link-local Address | Value auto-created | Show the link-local address for LAN interface of router. |

Then go to **Address Auto-configuration (summary)** for setting LAN environment.

If above setting is configured, click the **Save** button to save the configuration, and click the **Reboot** button to reboot the router.

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DHCPv6 WAN Type Configuration

| DHCPv6 WAN Type Configuration | |
|-------------------------------|---|
| ▶ DNS | <input checked="" type="radio"/> From Server <input type="radio"/> Specific DNS |
| ▶ Primary DNS | <input type="text"/> |
| ▶ Secondary DNS | <input type="text"/> |
| ▶ MLD Snooping | <input type="checkbox"/> Enable |

| Item | Value setting | Description |
|----------------------|---|--|
| DNS | The option [From Server] is selected by default | Select the [Specific DNS] option to active Primary DNS and Secondary DNS. Then fill the DNS information. |
| Primary DNS | Can not modified by default | Enter the WAN primary DNS Server . |
| Secondary DNS | Can not modified by default | Enter the WAN secondary DNS Server . |
| MLD | The box is unchecked by default | Enable/Disable the MLD Snooping function |

LAN Configuration

| LAN Configuration | |
|----------------------|--------------------------|
| ▶ Global Address | |
| ▶ Link-local Address | fe80::250:18ff:fe16:1123 |

| Item | Value setting | Description |
|---------------------------|--------------------|--|
| Global Address | Value auto-created | Enter the LAN IPv6 Address for the router. |
| Link-local Address | Value auto-created | Show the link-local address for LAN interface of router. |

Then go to **Address Auto-configuration (summary)** for setting LAN environment.

If above setting is configured, click the **Save** button to save the configuration, and click **Reboot** button to reboot the router.

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PPPoEv6 WAN Type Configuration

| PPPoEv6 WAN Type Configuration | |
|--------------------------------|---------------------------------|
| ▶ Account | <input type="text"/> |
| ▶ Password | <input type="text"/> |
| ▶ Service Name | <input type="text"/> |
| ▶ Connection Control | Auto-reconnect (Always on) |
| ▶ MTU | <input type="text"/> |
| ▶ MLD Snooping | <input type="checkbox"/> Enable |

| PPPoEv6 WAN Type Configuration | | |
|--------------------------------|---------------------------------|--|
| Item | Value setting | Description |
| Account | A Must filled setting | Enter the Account for setting up PPPoEv6 connection. If you want more information, please contact your ISP. Value Range: 0 ~ 45 characters. |
| Password | A Must filled setting | Enter the Password for setting up PPPoEv6 connection. If you want more information, please contact your ISP. |
| Service Name | A Must filled setting/Option | Enter the Service Name for setting up PPPoEv6 connection. If you want more information, please contact your ISP. Value Range: 0 ~ 45 characters. |
| Connection Control | Fixed value | The value is Auto-reconnect(Always on) . |
| MTU | A Must filled setting | Enter the MTU for setting up PPPoEv6 connection. If you want more information, please contact your ISP. Value Range: 1280 ~ 1492. |
| MLD Snooping | The box is unchecked by default | Enable/Disable the MLD Snooping function |

LAN Configuration

| LAN Configuration | |
|----------------------|--------------------------|
| ▶ Global Address | |
| ▶ Link-local Address | fe80::250:18ff:fe16:1123 |

| LAN Configuration | | |
|--------------------|--------------------|--|
| Item | Value setting | Description |
| Global Address | Value auto-created | The LAN IPv6 Address for the router. |
| Link-local Address | Value auto-created | Show the link-local address for LAN interface of router. |

Then go to **Address Auto-configuration (summary)** for setting LAN environment.

If above setting is configured, click the **save button** to save the configuration and click **reboot button** to reboot

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the router.

Then go to **Address Auto-configuration (summary)** for setting LAN environment.

If above setting is configured, click the **save button** to save the configuration and click **reboot button** to reboot the router.

Address Auto-configuration

| Address Auto-configuration | |
|---------------------------------|--|
| ▶ Auto-configuration | <input checked="" type="checkbox"/> Enable |
| ▶ Auto-configuration Type | Stateless ▾ |
| ▶ Router Advertisement Lifetime | 200 (seconds) |

| Address Auto-configuration | |
|-----------------------------|--|
| ▶ Auto-configuration | <input checked="" type="checkbox"/> Enable |
| ▶ Auto-configuration Type | Stateful ▾ |
| ▶ IPv6 Address Range(Start) | XXX:: <input type="text"/> /64 |
| ▶ IPv6 Address Range(End) | XXX:: <input type="text"/> /64 |
| ▶ IPv6 Address Lifetime | <input type="text"/> (seconds) |

| Address Auto-configuration | | |
|--------------------------------|---|---|
| Item | Value setting | Description |
| Auto-configuration | The box is unchecked by default | Check to enable the Auto configuration feature. |
| Auto-configuration Type | <ol style="list-style-type: none"> Only can be selected when Auto-configuration enabled Stateless is selected by default | <p>Define the selected IPv6 WAN Connection Type to establish the IPv6 connectivity.</p> <p>Select Stateless to manage the Local Area Network to be SLAAC + RDNSS</p> <p>Router Advertisement Lifetime (A Must filled setting): Enter the Router Advertisement Lifetime (in seconds). 200 is set by default. <i>Value Range:</i> 0 ~ 65535.</p> <p>Select Stateful to manage the Local Area Network to be Stateful (DHCPv6).</p> <p>IPv6 Address Range (Start) (A Must filled setting): Enter the start IPv6 Address for the DHCPv6 range for your local computers. 0100 is set by default. <i>Value Range:</i> 0001 ~ FFFF.</p> <p>IPv6 Address Range (End) (A Must filled setting): Enter the end IPv6 Address for the DHCPv6 range for your local computers. 0200 is set by default. <i>Value Range:</i> 0001 ~ FFFF.</p> |

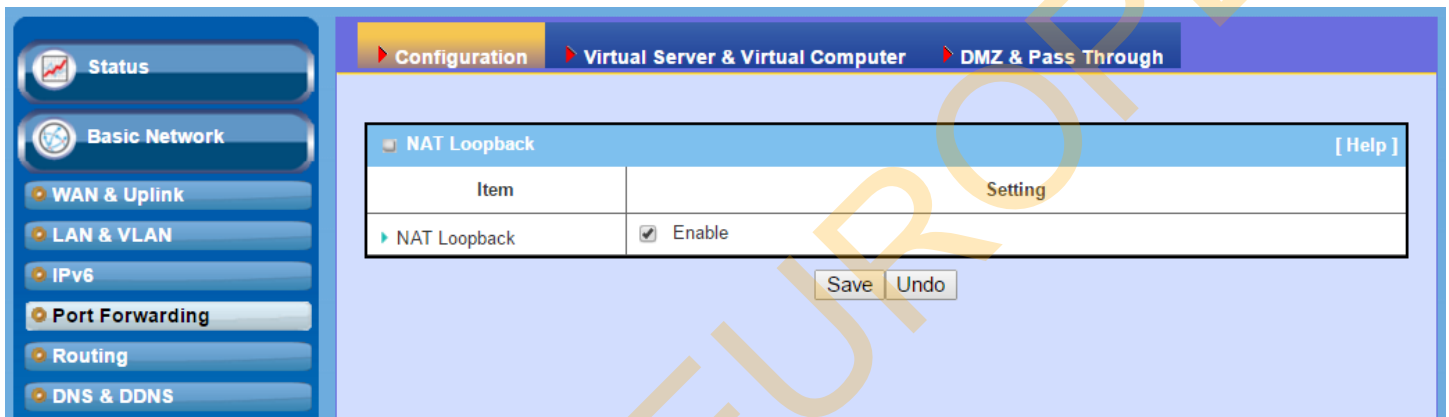
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IPv6 Address Lifetime (A Must filled setting): Enter the DHCPv6 lifetime for your local computers. 36000 is set by default.
Value Range: 0 ~ 65535.

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2.5 Port Forwarding

Network address translation (NAT) is a methodology of remapping one IP address space into another by modifying network address information in Internet Protocol (IP) datagram packet headers while they are in transit across a traffic routing device. The technique was originally used for ease of rerouting traffic in IP networks without renumbering every host. It has become a popular and essential tool in conserving global address space allocations in face of IPv4 address exhaustion. The product you purchased embeds and activates the NAT function. You also can disable the NAT function in **[Basic Network]-[WAN & Uplink]-[Internet Setup]-[WAN Type Configuration]** page.



Usually all local hosts or servers behind corporate gateway are protected by NAT firewall. NAT firewall will filter out unrecognized packets to protect your Intranet. So, all local hosts are invisible to the outside world. Port forwarding or port mapping is function that redirects a communication request from one address and port number combination to assigned one. This technique is most commonly used to make services on a host residing on a protected or masqueraded (internal) network available to hosts on the opposite side of the gateway (external network), by remapping the destination IP address and port number

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2.5.1 Configuration

NAT Loopback

This feature allows you to access the WAN global IP address from your inside NAT local network. It is useful when you run a server inside your network. For example, if you set a mail server at LAN side, your local devices can access this mail server through gateway's global IP address when enable NAT loopback feature. On either side are you in accessing the email server, at the LAN side or at the WAN side, you don't need to change the IP address of the mail server.

Configuration Setting

Go to **Basic Network > Port Forwarding > Configuration** tab.

The NAT Loopback allows user to access the WAN IP address from inside your local network.

Enable NAT Loopback

| NAT Loopback [Help] | |
|-----------------------|--|
| Item | Setting |
| ▶ NAT Loopback | <input checked="" type="checkbox"/> Enable |

| Configuration Item | Value setting | Description |
|---------------------|-------------------------------|---|
| NAT Loopback | The box is checked by default | Check the Enable box to activate this NAT function |
| Save | N/A | Click the Save button to save the settings. |
| Undo | N/A | Click the Undo button to cancel the settings |

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2.5.2 Virtual Server & Virtual Computer

| Configuration | | | | | | | | |
|--------------------|--|--|--|--|--|--|--|--|
| Item | Setting | | | | | | | |
| ▶ Virtual Server | <input checked="" type="checkbox"/> Enable | | | | | | | |
| ▶ Virtual Computer | <input checked="" type="checkbox"/> Enable | | | | | | | |

| Virtual Server List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | |
|--|---------------|-------------|------------------|-------------|--------------|---------------|-------------------------------------|---|
| ID | WAN Interface | Server IP | Protocol | Public Port | Private Port | Time Schedule | Enable | Actions |
| 1 | All | 10.0.75.101 | TCP(6) & UDP(17) | 25 | 25 | (0) Always | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="checkbox"/> Select |
| 2 | All | 10.0.75.101 | TCP(6) & UDP(17) | 110 | 110 | (0) Always | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="checkbox"/> Select |

| Virtual Computer List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | |
|--|--------------|-------------|-------------------------------------|---|
| ID | Global IP | Local IP | Enable | Actions |
| 1 | 118.18.81.44 | 10.0.75.102 | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="checkbox"/> Select |

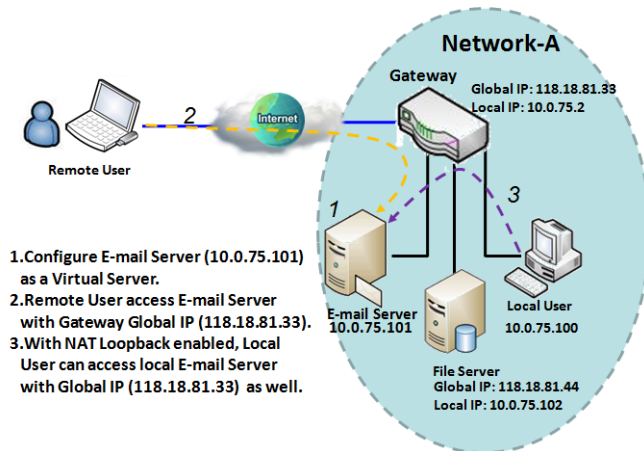
There are some important Port Forwarding functions implemented within the gateway, including "Virtual Server", "NAT loopback" and "Virtual Computer".

It is necessary for cooperate staffs who travel outside and want to access various servers behind office gateway. You can set up those servers by using "Virtual Server" feature. After trip, if want to access those servers from LAN side by global IP, without change original setting, NAT Loopback can achieve it.

"Virtual computer" is a host behind NAT gateway whose IP address is a global one and is visible to the outside world. Since it is behind NAT, it is protected by gateway firewall. To configure Virtual Computer, you just have to map the local IP of the virtual computer to a global IP.

Industrial LoRa Gateway

Virtual Server & NAT Loopback

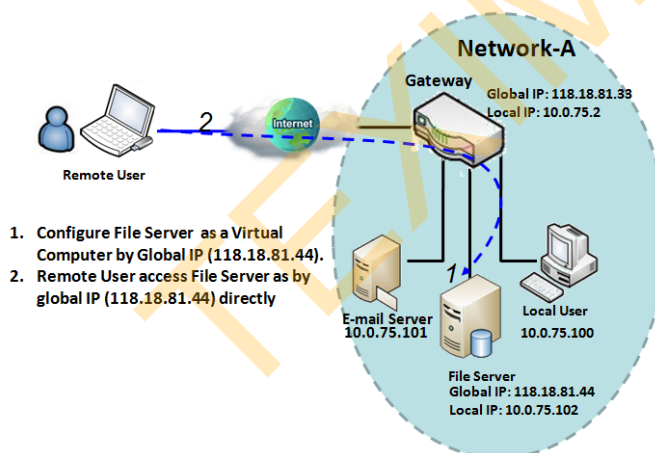


"Virtual Server" allows you to access servers with the global IP address or FQDN of the gateway as if they are servers existed in the Internet. But in fact, these servers are located in the Intranet and are physically behind the gateway. The gateway serves the service requests by port forwarding the requests to the LAN servers and transfers the replies from LAN servers to the requester on the WAN side. As shown in example, an E-mail virtual server is defined to be located at a server with IP address 10.0.75.101 in the Intranet of Network-A, including SMTP service port 25 and POP3 service port 110. So, the remote user can access the E-mail server with the

gateway's global IP 118.18.81.33 from its WAN side. But the real E-mail server is located at LAN side and the gateway is the port forwarder for E-mail service.

NAT Loopback allows you to access the WAN global IP address from your inside NAT local network. It is useful when you run a server inside your network. For example, if you set a mail server at LAN side, your local devices can access this mail server through gateway's global IP address when enable NAT loopback feature. On either side are you in accessing the email server, at the LAN side or at the WAN side, you don't need to change the IP address of the mail server.

Virtual Computer



"Virtual Computer" allows you to assign LAN hosts to global IP addresses, so that they can be visible to outside world. While so, they are also protected by the gateway firewall as being client hosts in the Intranet. For example, if you set a FTP file server at LAN side with local IP address 10.0.75.102 and global IP address 118.18.82.44, a remote user can access the file server while it is hidden behind the NAT gateway. That is because the gateway takes care of all accessing to the IP address 118.18.82.44, including to forward the access requests to the file server and to send the replies from the server to outside world.

Industrial LoRa Gateway

Virtual Server & Virtual Computer Setting

Go to **Basic Network > Port Forwarding > Virtual Server & Virtual Computer** tab.

Enable Virtual Server and Virtual Computer

| Configuration | |
|--------------------|--|
| Item | Setting |
| ▶ Virtual Server | <input checked="" type="checkbox"/> Enable |
| ▶ Virtual Computer | <input checked="" type="checkbox"/> Enable |

| Configuration Item | Value setting | Description |
|-------------------------|---------------------------------|---|
| Virtual Server | The box is unchecked by default | Check the Enable box to activate this port forwarding function |
| Virtual Computer | The box is checked by default | Check the Enable box to activate this port forwarding function |
| Save | N/A | Click the Save button to save the settings. |
| Undo | N/A | Click the Undo button to cancel the settings. |

Create / Edit Virtual Server

The gateway allows you to custom your Virtual Server rules. It supports up to a maximum of 20 rule-based Virtual Server sets.

| Virtual Server List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | |
|--|---------------|-----------|----------|-------------|--------------|---------------|--------|---------|
| ID | WAN Interface | Server IP | Protocol | Public Port | Private Port | Time Schedule | Enable | Actions |

When **Add** button is applied, **Virtual Server Rule Configuration** screen will appear.

Industrial LoRa Gateway

| Virtual Server Rule Configuration | |
|-----------------------------------|---|
| Item | Setting |
| ▶ WAN Interface | <input checked="" type="checkbox"/> All <input type="checkbox"/> WAN-1 <input type="checkbox"/> WAN-2 <input type="checkbox"/> WAN-3 <input type="checkbox"/> WAN-4 |
| ▶ Server IP | <input type="text"/> |
| ▶ Protocol | TCP(6) & UDP(17) ▼ |
| ▶ Public Port | Single Port ▼ <input type="text"/> |
| ▶ Private Port | Single Port ▼ <input type="text"/> |
| ▶ Time Schedule | (0) Always ▼ |
| ▶ Rule | <input type="checkbox"/> Enable |

| Virtual Server Rule Configuration | | |
|-----------------------------------|--|--|
| Item | Value setting | Description |
| WAN Interface | 1. A Must filled setting 2. Default is ALL . | <p>Define the selected interface to be the packet-entering interface of the gateway.</p> <p>If the packets to be filtered are coming from WAN-x then select WAN-x for this field.</p> <p>Select ALL for packets coming into the gateway from any interface. It can be selected WAN-x box when WAN-x enabled.</p> <p>Note: The available check boxes (WAN-1 ~ WAN-4) depend on the number of WAN interfaces for the product.</p> |
| Server IP | A Must filled setting | <p>This field is to specify the IP address of the interface selected in the WAN Interface setting above.</p> |
| Protocol | A Must filled setting | <p>When "ICMPv4" is selected It means the option "Protocol" of packet filter rule is ICMPv4. Apply Time Schedule to this rule, otherwise leave it as Always. (refer to Scheduling setting under Object Definition) Then check Enable box to enable this rule.</p> <p>When "TCP" is selected It means the option "Protocol" of packet filter rule is TCP. Public Port selected a predefined port from Well-known Service, and Private Port is the same with Public Port number. Public Port is selected Single Port and specify a port number, and Private Port can be set a Single Port number. Public Port is selected Port Range and specify a port range, and Private Port can be selected Single Port or Port Range. <u>Value Range:</u> 1 ~ 65535 for Public Port, Private Port.</p> <p>When "UDP" is selected It means the option "Protocol" of packet filter rule is UDP. Public Port selected a predefined port from Well-known Service, and Private</p> |

Industrial LoRa Gateway

Port is the same with **Public Port** number.

Public Port is selected **Single Port** and specify a port number, and **Private Port** can be set a **Single Port** number.

Public Port is selected **Port Range** and specify a port range, and **Private Port** can be selected **Single Port** or **Port Range**.

Value Range: 1 ~ 65535 for Public Port, Private Port.

When **“TCP & UDP”** is selected

It means the option **“Protocol”** of packet filter rule is TCP and UDP.

Public Port selected a predefined port from **Well-known Service**, and **Private Port** is the same with **Public Port** number.

Public Port is selected **Single Port** and specify a port number, and **Private Port** can be set a **Single Port** number.

Public Port is selected **Port Range** and specify a port range, and **Private Port** can be selected **Single Port** or **Port Range**.

Value Range: 1 ~ 65535 for Public Port, Private Port.

When **“GRE”** is selected

It means the option **“Protocol”** of packet filter rule is GRE.

When **“ESP”** is selected

It means the option **“Protocol”** of packet filter rule is ESP.

When **“SCTP”** is selected

It means the option **“Protocol”** of packet filter rule is SCTP.

When **“User-defined”** is selected

It means the option **“Protocol”** of packet filter rule is User-defined.

For **Protocol Number**, enter a port number.

| | | |
|----------------------|--|--|
| Time Schedule | 1. An optional filled setting 2. (0)Always Is selected by default. | Apply Time Schedule to this rule; otherwise leave it as (0)Always. (refer to Scheduling setting under Object Definition) |
| Rule | 1. An optional filled setting 2. The box is unchecked by default. | Check the Enable box to activate the rule. |
| Save | N/A | Click the Save button to save the settings. |
| Undo | N/A | Click the Undo button to cancel the settings. |
| Back | N/A | When the Back button is clicked the screen will return to previous page. |

Industrial LoRa Gateway

Create / Edit Virtual Computer

The gateway allows you to custom your Virtual Computer rules. It supports up to a maximum of 20 rule-based Virtual Computer sets.

| Virtual Computer List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | |
|--|-----------|----------|--------|---------|
| ID | Global IP | Local IP | Enable | Actions |

When **Add** button is applied, **Virtual Computer Rule Configuration** screen will appear.

| Virtual Computer Rule Configuration [Help] | | |
|---|----------------------|--------------------------|
| Global IP | Local IP | Enable |
| <input type="text"/> | <input type="text"/> | <input type="checkbox"/> |
| <input type="button" value="Save"/> | | |

| Virtual Computer Rule Configuration | | |
|-------------------------------------|-----------------------|--|
| Item | Value setting | Description |
| Global IP | A Must filled setting | This field is to specify the IP address of the WAN IP. |
| Local IP | A Must filled setting | This field is to specify the IP address of the LAN IP. |
| Enable | N/A | Then check Enable box to enable this rule. |
| Save | N/A | Click the Save button to save the settings. |

Industrial LoRa Gateway

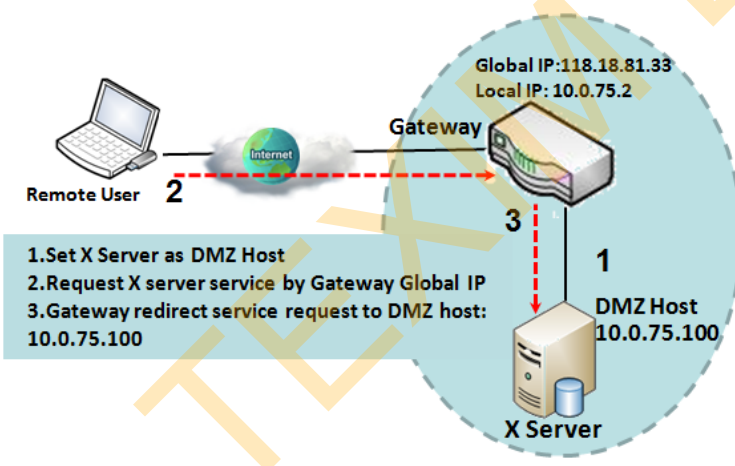
2.5.3 DMZ & Pass Through

DMZ (De Militarized Zone) Host is a host that is exposed to the Internet cyberspace but still within the protection of firewall by gateway device. So, the function allows a computer to execute 2-way communication for Internet games, Video conferencing, Internet telephony and other special applications. In some cases when a specific application is blocked by NAT mechanism, you can indicate that LAN computer as a DMZ host to solve this problem.

The DMZ function allows you to ask the gateway pass through all normal packets to the DMZ host behind the NAT gateway only when these packets are not expected to receive by applications in the gateway or by other client hosts in the Intranet. Certainly, the DMZ host is also protected by the gateway firewall. Activate the feature and specify the DMZ host with a host in the Intranet when needed.

| Configuration [Help] | |
|------------------------|---|
| Item | Setting |
| DMZ | <input checked="" type="checkbox"/> Enable <input checked="" type="checkbox"/> All <input type="checkbox"/> WAN-1 <input type="checkbox"/> WAN-2 DMZ Host : <input type="text" value="10.0.75.100"/> |
| Pass Through Enable | <input checked="" type="checkbox"/> IPSec <input checked="" type="checkbox"/> PPTP <input checked="" type="checkbox"/> L2TP |

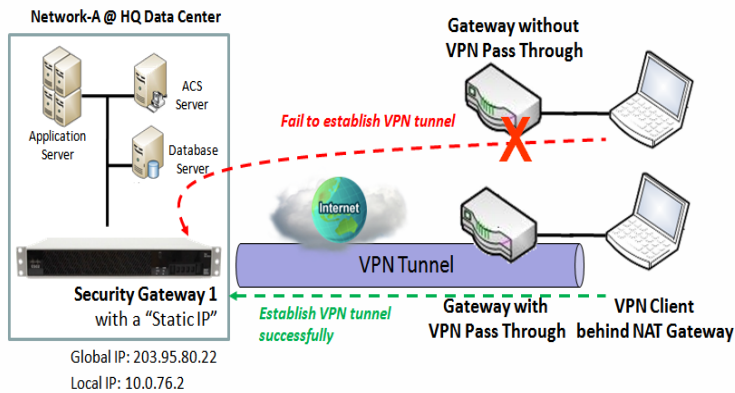
DMZ Scenario



When the network administrator wants to set up some service daemons in a host behind NAT gateway to allow remote users request for services from server actively, you just have to configure this host as DMZ Host. As shown in the diagram, there is an X server installed as DMZ host, whose IP address is 10.0.75.100. Then, remote user can request services from X server just as it is provided by the gateway whose global IP address is 118.18.81.33. The gateway will forward those packets, not belonging to any configured virtual server or applications, directly to the DMZ host.

Industrial LoRa Gateway

VPN Pass through Scenario



Since VPN traffic is different from that of TCP or UDP connection, it will be blocked by NAT gateway. To support the pass through function for the VPN connections initiating from VPN clients behind NAT gateway, the gateway must implement some kind of VPN pass through function for such application. The gateway support the pass through function for IPSec, PPTP, and L2TP connections, you just have to check the corresponding checkbox to activate it.

DMZ & Pass Through Setting

Go to **Basic Network > Port Forwarding > DMZ & Pass Through** tab.

The DMZ host is a host that is exposed to the Internet cyberspace but still within the protection of firewall by gateway device.

Enable DMZ and Pass Through

| Configuration [Help] | |
|------------------------|--|
| Item | Setting |
| ▶ DMZ | <input type="checkbox"/> Enable <input checked="" type="checkbox"/> All <input type="checkbox"/> WAN-1 <input type="checkbox"/> WAN-2 <input type="checkbox"/> WAN-3 <input type="checkbox"/> WAN-4 DMZ Host : <input type="text"/> |
| ▶ Pass Through Enable | <input checked="" type="checkbox"/> IPSec <input checked="" type="checkbox"/> PPTP <input checked="" type="checkbox"/> L2TP |

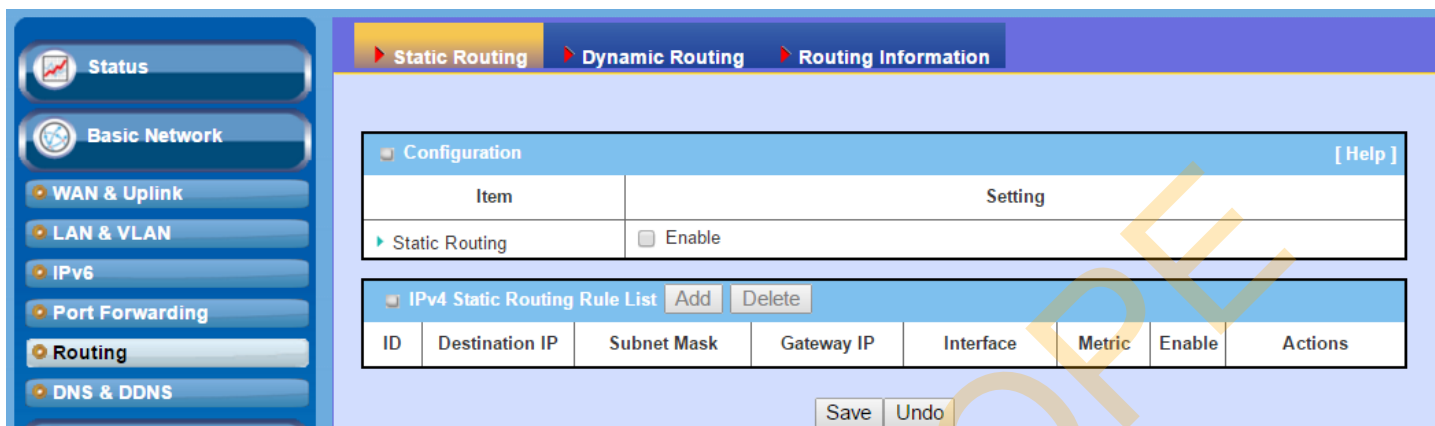
| Configuration Item | Value setting | Description |
|--------------------|--|---|
| DMZ | 1. A Must filled setting 2. Default is ALL . | Check the Enable box to activate the DMZ function Define the selected interface to be the packet-entering interface of the gateway, and fill in the IP address of Host LAN IP in DMZ Host field . If the packets to be filtered are coming from WAN-x then select WAN-x for this field. Select ALL for packets coming into the router from any interfaces. |

Industrial LoRa Gateway

| | | |
|---------------------|----------------------------------|---|
| | | <p>It can be selected WAN-x box when WAN-x enabled.</p> <p>Note: The available check boxes (WAN-1 ~ WAN-4) depend on the number of WAN interfaces for the product.</p> |
| Pass Through Enable | The boxes are checked by default | <p>Check the box to enable the pass through function for the IPSec, PPTP, and L2TP.</p> <p>With the pass through function enabled, the VPN hosts behind the gateway still can connect to remote VPN servers.</p> |
| Save | N/A | Click the Save button to save the settings. |
| Undo | N/A | Click the Undo button to cancel the settings |

TEXIM EUROPE

2.6 Routing

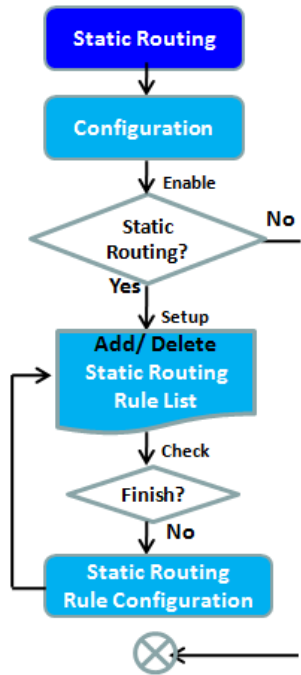


If you have more than one router and subnet, you will need to enable routing function to allow packets to find proper routing path and allow different subnets to communicate with each other. Routing is the process of selecting best paths in a network. It is performed for many kinds of networks, like electronic data networks (such as the Internet), by using packet switching technology. The routing process usually directs forwarding on the basis of routing tables which maintain a record of the routes to various network destinations. Thus, constructing routing tables, which are held in the router's memory, is very important for efficient routing. Most routing algorithms use only one network path at a time.

The routing tables record your pre-defined routing paths for some specific destination subnets. It is **static routing**. However, if the contents of routing tables record the obtained routing paths from neighbor routers by using some protocols, such as RIP, OSPF and BGP. It is **dynamic routing**. These both routing approaches will be illustrated one after one. In addition, the gateway also built in one advanced configurable routing software Quagga for more complex routing applications, you can configure it if required via Telnet CLI.

Industrial LoRa Gateway

2.6.1 Static Routing

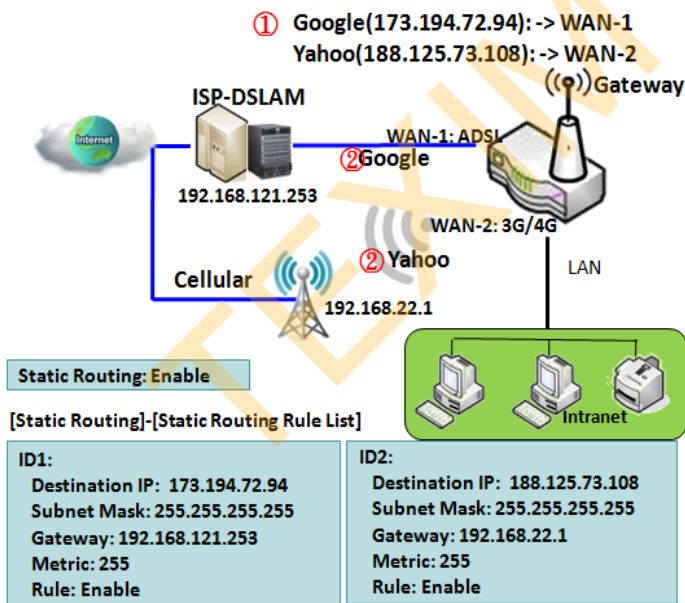


| Configuration [Help] | |
|------------------------|--|
| Item | Setting |
| Static Routing | <input checked="" type="checkbox"/> Enable |

| IPv4 Static Routing Rule List [Add] [Delete] | | | | | | | |
|--|----------------|-------------|------------|-----------|--------|--------|---------|
| ID | Destination IP | Subnet Mask | Gateway IP | Interface | Metric | Enable | Actions |
| | | | | | | | |

| IPv4 Static Routing Rule Configuration | |
|--|---------------------------------|
| Item | Setting |
| Destination IP | <input type="text"/> |
| Subnet Mask | 255.255.255.0 (/24) ▾ |
| Gateway IP | <input type="text"/> |
| Interface | Auto ▾ |
| Metric | <input type="text"/> |
| Rule | <input type="checkbox"/> Enable |

"Static Routing" function lets you define the routing paths for some dedicated hosts/servers or subnets to store in the routing table of the gateway. The gateway routes incoming packets to different peer gateways based on the routing table. You need to define the static routing information in gateway routing rule list.



When the administrator of the gateway wants to specify what kinds of packets to be transferred via which gateway interface and which peer gateway to their destination. It can be carried out by the "Static Routing" feature. Dedicated packet flows from the Intranet will be routed to their destination via the pre-defined peer gateway and corresponding gateway interface that are defined in the system routing table by manual.

As shown in the diagram, when the destination is Google access, rule 1 set interface as ADSL, routing gateway as IP-DSLAM gateway 192.168.121.253. All the packets to Google will go through WAN-1. And the same way applied to rule 2 of access Yahoo. Rule 2 sets 3G/4G as interface.

Industrial LoRa Gateway

Static Routing Setting

Go to **Basic Network > Routing > Static Routing** Tab.

There are three configuration windows for static routing feature, including "Configuration", "Static Routing Rule List" and "Static Routing Rule Configuration" windows. "Configuration" window lets you activate the global static routing feature. Even there are already routing rules, if you want to disable routing temporarily, just uncheck the Enable box to disable it. "Static Routing Rule List" window lists all your defined static routing rule entries. Using "Add" or "Edit" button to add and create one new static routing rule or to modify an existed one.

When "**Add**" or "**Edit**" button is applied, the "Static Routing Rule Configuration" window will appear to let you define a static routing rule.

Enable Static Routing

Just check the **Enable** box to activate the "Static Routing" feature.

| Configuration [Help] | |
|------------------------|--|
| Item | Setting |
| Static Routing | <input checked="" type="checkbox"/> Enable |

| Static Routing Item | Value setting | Description |
|---------------------|---------------------------------|---|
| Static Routing | The box is unchecked by default | Check the Enable box to activate this function |

Create / Edit Static Routing Rules

The Static Routing Rule List shows the setup parameters of all static routing rule entries. To configure a static routing rule, you must specify related parameters including the destination IP address and subnet mask of dedicated host/server or subnet, the IP address of peer gateway, the metric and the rule activation.

| IPv4 Static Routing Rule List [Add] [Delete] | | | | | | | |
|--|----------------|-------------|------------|-----------|--------|--------|---------|
| ID | Destination IP | Subnet Mask | Gateway IP | Interface | Metric | Enable | Actions |

The gateway allows you to custom your static routing rules. It supports up to a maximum of 64 rule sets. When **Add** button is applied, **Static Routing Rule Configuration** screen will appear, while the **Edit** button at the end

Industrial LoRa Gateway

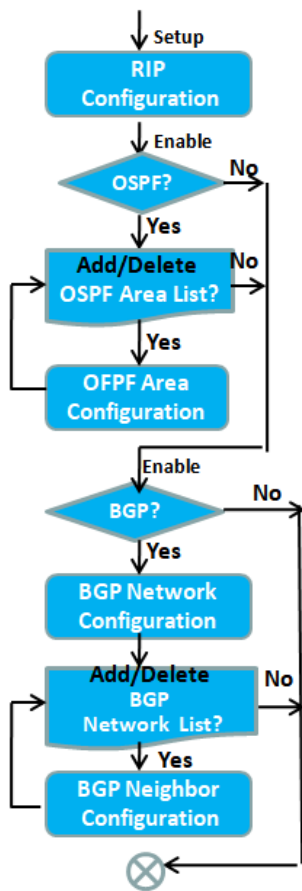
of each static routing rule can let you modify the rule.

| IPv4 Static Routing Rule Configuration | |
|--|---------------------------------|
| Item | Setting |
| ▶ Destination IP | <input type="text"/> |
| ▶ Subnet Mask | 255.255.255.0 (/24) ▼ |
| ▶ Gateway IP | <input type="text"/> |
| ▶ Interface | Auto ▼ |
| ▶ Metric | <input type="text"/> |
| ▶ Rule | <input type="checkbox"/> Enable |

| IPv4 Static Routing | | |
|---------------------|--|--|
| Item | Value setting | Description |
| Destination IP | 1. IPv4 Format 2. A Must filled setting | Specify the Destination IP of this static routing rule. |
| Subnet Mask | 255.255.255.0 (/24) is set by default | Specify the Subnet Mask of this static routing rule. |
| Gateway IP | 1. IPv4 Format 2. A Must filled setting | Specify the Gateway IP of this static routing rule. |
| Interface | Auto is set by default | Select the Interface of this static routing rule. It can be Auto , or the available WAN / LAN interfaces. |
| Metric | 1. Numeric String Format 2. A Must filled setting | The Metric of this static routing rule. <i>Value Range: 0 ~ 255.</i> |
| Rule | The box is unchecked by default. | Click Enable box to activate this rule. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |
| Back | NA | When the Back button is clicked the screen will return to the Static Routing Configuration page. |

Industrial LoRa Gateway

2.6.2 Dynamic Routing



| | | | | |
|-----------------------------|---------------------------------|----------------------|-----------------------|---------|
| RIP Configuration [Help] | | | | |
| Item | Setting | | | |
| RIP Enable | Disable ▾ | | | |
| OSPF Configuration | | | | |
| Item | Setting | | | |
| OSPF | <input type="checkbox"/> Enable | | | |
| OSPF Area List Add Delete | | | | |
| ID | Area Subnet | Area ID | Enable | Actions |
| OSPF Area Configuration | | | | |
| Item | Setting | | | |
| Area Subnet | <input type="text"/> | | | |
| BGP Configuration | | | | |
| Item | Setting | | | |
| BGP | <input type="checkbox"/> Enable | | | |
| BGP Network Configuration | | | | |
| Item | Setting | | | |
| Network Subnet | IP : | <input type="text"/> | 255.255.255.0 (/24) ▾ | |
| BGP Network List Add Delete | | | | |
| ID | Network Subnet | Enable | Actions | |
| BGP Neighbor Configuration | | | | |
| Item | Setting | | | |
| Neighbor IP | <input type="text"/> | | | |

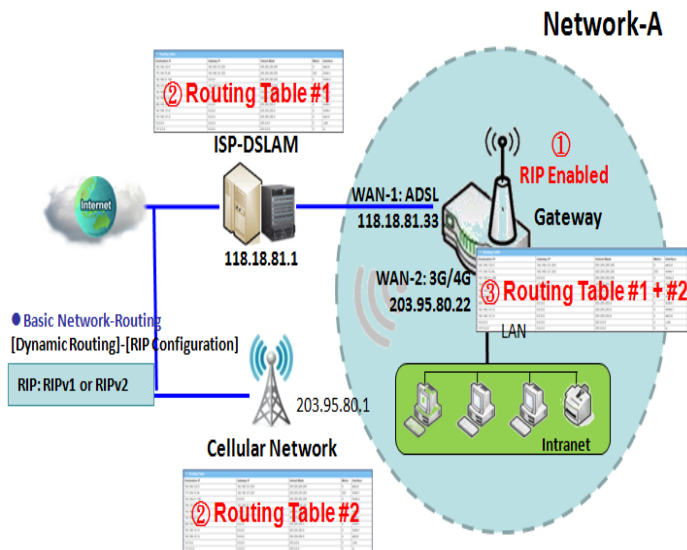
Dynamic Routing, also called adaptive routing, describes the capability of a system, through which routes are characterized by their destination, to alter the path that the route takes through the system in response to a change in network conditions.

This gateway supports dynamic routing protocols, including RIPv1/RIPv2 (Routing Information Protocol), OSPF (Open Shortest Path First), and BGP (Border Gateway Protocol), for you to establish routing table automatically. The feature of dynamic routing will be very useful when there are lots of subnets in your network. Generally speaking, RIP is suitable for small network. OSPF is more suitable for medium network. BGP is more used for big network infrastructure.

The supported dynamic routing protocols are described as follows.

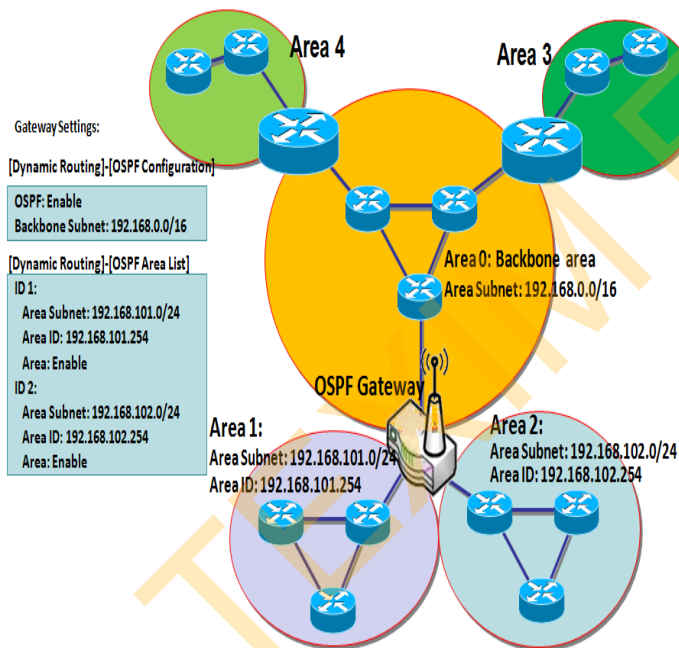
Industrial LoRa Gateway

RIP Scenario



The Routing Information Protocol (RIP) is one of the oldest distance-vector routing protocols, which employs the hop count as a routing metric. RIP prevents routing loops by implementing a limit on the number of hops allowed in a path from the source to a destination. The maximum number of hops allowed for RIP is 15. This hop limit, however, also limits the size of networks that RIP can support. A hop count of 16 is considered an infinite distance, in other words the route is considered unreachable. RIP implements the split horizon, route poisoning and hold-down mechanisms to prevent incorrect routing information from being propagated.

OSPF Scenario



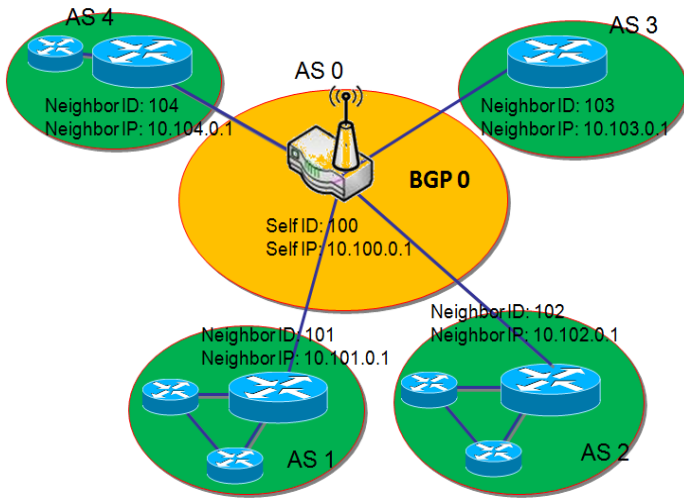
Open Shortest Path First (OSPF) is a routing protocol that uses link state routing algorithm. It is the most widely used interior gateway protocol (IGP) in large enterprise networks. It gathers link state information from available routers and constructs a topology map of the network. The topology is presented as a routing table which routes datagrams based solely on the destination IP address.

Network administrator can deploy OSPF gateway in large enterprise network to get its routing table from the enterprise backbone, and forward routing information to other routers, which are no linked to the enterprise backbone. Usually, an OSPF network is subdivided into routing areas to simplify administration and optimize traffic and resource utilization.

As shown in the diagram, OSPF gateway gathers routing information from the backbone gateways in area 0, and will forward its routing information to the routers in area 1 and area 2 which are not in the backbone.

Industrial LoRa Gateway

BGP Scenario



Border Gateway Protocol (BGP) is a standard exterior gateway protocol designed to exchange routing and reachability information between autonomous systems (AS) on the Internet. It usually makes routing decisions based on paths, network policies, or rule-sets.

Most ISPs use BGP to establish routing between one another (especially for multi-homed). Very large private IP networks also use BGP internally. The major BGP gateway within one AS will link with some other border gateways for exchanging routing information. It will distribute the collected data in AS to all routers in other AS.

As shown in the diagram, BGP 0 is gateway to dominate AS 0 (self IP is 10.100.0.1 and self ID is 100). It links with other BGP gateways in the Internet. The scenario is like Subnet in one ISP to be linked with the ones in other ISPs. By operating with BGP protocol, BGP 0 can gather routing information from other BGP gateways in the Internet. And then it forwards the routing data to the routers in its dominated AS. Finally, the routers resided in AS 0 know how to route packets to other AS.

Industrial LoRa Gateway

Dynamic Routing Setting

Go to **Basic Network > Routing > Dynamic Routing** Tab.

The dynamic routing setting allows user to customize RIP, OSPF, and BGP protocol through the router based on their office setting.

In the "Dynamic Routing" page, there are several configuration windows for dynamic routing feature. They are the "RIP Configuration" window, "OSPF Configuration" window, "OSPF Area List", "OSPF Area Configuration", "BGP Configuration", "BGP Neighbor List" and "BGP Neighbor Configuration" window. RIP, OSPF and BGP protocols can be configured individually.

The "RIP Configuration" window lets you choose which version of RIP protocol to be activated or disable it. The "OSPF Configuration" window can let you activate the OSPF dynamic routing protocol and specify its backbone subnet. Moreover, the "OSPF Area List" window lists all defined areas in the OSPF network. However, the "BGP Configuration" window can let you activate the BGP dynamic routing protocol and specify its self ID. The "BGP Neighbor List" window lists all defined neighbors in the BGP network.

RIP Configuration

The RIP configuration setting allows user to customize RIP protocol through the router based on their office setting.

| RIP Configuration [Help] | |
|----------------------------|-----------|
| Item | Setting |
| RIP Enable | Disable ▾ |

| RIP Configuration | | |
|-------------------|---------------------------|--|
| Item | Value setting | Description |
| RIP Enable | Disable is set by default | Select Disable will disable RIP protocol. Select RIP v1 will enable RIPv1 protocol. Select RIP v2 will enable RIPv2 protocol. |

OSPF Configuration

The OSPF configuration setting allows user to customize OSPF protocol through the router based on their office setting.

Industrial LoRa Gateway

| OSPF Configuration | |
|--------------------|---------------------------------|
| Item | Setting |
| ▶ OSPF | <input type="checkbox"/> Enable |
| ▶ Router ID | <input type="text"/> |
| ▶ Authentication | None ▾ |
| ▶ Backbone Subnet | <input type="text"/> |

| OSPF Configuration | | |
|------------------------|---|---|
| Item | Value setting | Description |
| OSPF | Disable is set by default | Click Enable box to activate the OSPF protocol. |
| Router ID | 1. IPv4 Format 2. A Must filled setting | The Router ID of this router on OSPF protocol |
| Authentication | None is set by default | The Authentication method of this router on OSPF protocol. Select None will disable Authentication on OSPF protocol. Select Text will enable Text Authentication with entered the Key in this field on OSPF protocol. Select MD5 will enable MD5 Authentication with entered the ID and Key in these fields on OSPF protocol. |
| Backbone Subnet | 1. Classless Inter Domain Routing (CIDR) Subnet Mask Notation. (Ex: 192.168.1.0/24) 2. A Must filled setting | The Backbone Subnet of this router on OSPF protocol. |

Create / Edit OSPF Area Rules

The gateway allows you to custom your OSPF Area List rules. It supports up to a maximum of 32 rule sets.

| OSPF Area List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | |
|---|-------------|---------|--------|---------|
| ID | Area Subnet | Area ID | Enable | Actions |

When **Add** button is applied, **OSPF Area Rule Configuration** screen will appear.

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| OSPF Area Configuration | |
|-------------------------------------|---------------------------------|
| Item | Setting |
| ▶ Area Subnet | <input type="text"/> |
| ▶ Area ID | <input type="text"/> |
| ▶ Area | <input type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| OSPF Area Configuration | | |
|-------------------------|---|--|
| Item | Value setting | Description |
| Area Subnet | 1. Classless Inter Domain Routing (CIDR) Subnet Mask Notation. (Ex: 192.168.1.0/24) 2. A Must filled setting | The Area Subnet of this router on OSPF Area List. |
| Area ID | 1. IPv4 Format 2. A Must filled setting | The Area ID of this router on OSPF Area List. |
| Area | The box is unchecked by default. | Click Enable box to activate this rule. |
| Save | N/A | Click the Save button to save the configuration |

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BGP Configuration

The BGP configuration setting allows user to customize BGP protocol through the router setting.

| BGP Configuration | |
|-------------------|---------------------------------|
| Item | Setting |
| ▶ BGP | <input type="checkbox"/> Enable |
| ▶ ASN | <input type="text"/> |
| ▶ Router ID | <input type="text"/> |

| Item | Value setting | Description |
|-----------|--|---|
| BGP | The box is unchecked by default | Check the Enable box to activate the BGP protocol. |
| ASN | 1. Numeric String Format 2. A Must filled setting | The ASN Number of this router on BGP protocol. Value Range: 1 ~ 4294967295. |
| Router ID | 1. IPv4 Format 2. A Must filled setting | The Router ID of this router on BGP protocol. |

Create / Edit BGP Network Rules

The gateway allows you to custom your BGP Network rules. It supports up to a maximum of 32 rule sets.

| BGP Network List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | |
|---|----------------|--------|---------|
| ID | Network Subnet | Enable | Actions |

When **Add** button is applied, **BGP Network Configuration** screen will appear.

| BGP Network Configuration | |
|---------------------------|--|
| Item | Setting |
| ▶ Network Subnet | IP : <input type="text"/> <input type="text" value="255.255.255.0 (/24)"/> ▼ |
| ▶ Network | <input type="checkbox"/> Enable |

| Item | Value setting | Description |
|-----------------------|----------------|---|
| Network Subnet | 1. IPv4 Format | The Network Subnet of this router on BGP Network List. It composes of entered |

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| | | |
|----------------|----------------------------------|--|
| | 2. A Must filled setting | the IP address in this field and the selected subnet mask. |
| Network | The box is unchecked by default. | Click Enable box to activate this rule. |
| Save | N/A | Click the Save button to save the configuration |

Create / Edit BGP Neighbor Rules

The gateway allows you to custom your BGP Neighbor rules. It supports up to a maximum of 32 rule sets.

| BGP Neighbor List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | |
|--|-------------|------------|--------|---------|
| ID | Neighbor IP | Remote ASN | Enable | Actions |

When **Add** button is applied, **BGP Neighbor Configuration** screen will appear.

| BGP Neighbor Configuration | |
|-------------------------------------|---------------------------------|
| Item | Setting |
| ▶ Neighbor IP | <input type="text"/> |
| ▶ Remote ASN | <input type="text"/> |
| ▶ Neighbor | <input type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| BGP Neighbor Configuration | | |
|----------------------------|--|---|
| Item | Value setting | Description |
| Neighbor IP | 1. IPv4 Format 2. A Must filled setting | The Neighbor IP of this router on BGP Neighbor List. |
| Remote ASN | 1. Numeric String Format 2. A Must filled setting | The Remote ASN of this router on BGP Neighbor List. <i>Value Range: 1 ~ 4294967295.</i> |
| Neighbor | The box is unchecked by default. | Click Enable box to activate this rule. |
| Save | N/A | Click the Save button to save the configuration |

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2.6.3 Routing Information

The routing information allows user to view the routing table and policy routing information. Policy Routing Information is only available when the Load Balance function is enabled and the Load Balance Strategy is By User Policy.

Go to **Basic Network > Routing > Routing Information** Tab.

| Routing Table | | | | |
|----------------|---------------|------------|--------|-----------|
| Destination IP | Subnet Mask | Gateway IP | Metric | Interface |
| 192.168.1.0 | 255.255.255.0 | 0.0.0.0 | 0 | LAN |
| 169.254.0.0 | 255.255.0.0 | 0.0.0.0 | 0 | LAN |
| 239.0.0.0 | 255.0.0.0 | 0.0.0.0 | 0 | LAN |
| 127.0.0.0 | 255.0.0.0 | 0.0.0.0 | 0 | lo |

| Routing Table | | |
|----------------|---------------|--|
| Item | Value setting | Description |
| Destination IP | N/A | Routing record of Destination IP. IPv4 Format. |
| Subnet Mask | N/A | Routing record of Subnet Mask. IPv4 Format. |
| Gateway IP | N/A | Routing record of Gateway IP. IPv4 Format. |
| Metric | N/A | Routing record of Metric. Numeric String Format. |
| Interface | N/A | Routing record of Interface Type. String Format. |

| Policy Routing Information | | | | |
|----------------------------|-----------|----------------|------------------|---------------|
| Policy Routing Source | Source IP | Destination IP | Destination Port | WAN Interface |
| Load Balance | - | - | - | - |

| Policy Routing Information | | |
|----------------------------|---------------|--|
| Item | Value setting | Description |
| Policy Routing Source | N/A | Policy Routing of Source. String Format. |
| Source IP | N/A | Policy Routing of Source IP. IPv4 Format. |
| Destination IP | N/A | Policy Routing of Destination IP. IPv4 Format. |
| Destination Port | N/A | Policy Routing of Destination Port. String Format. |
| WAN Interface | N/A | Policy Routing of WAN Interface. String Format. |

2.7 DNS & DDNS (not supported)

Not supported feature for the purchased product, leave it as blank.

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2.8 QoS

The total amount of data traffic increases nowadays as the higher demand of mobile applications, like Game / Chat / VoIP / P2P / Video / Web access. In order to pose new requirements for data transport, e.g. low latency, low data loss, the entire network must ensure them via a connection service guarantee.

The main goal of QoS (Quality of Service) is prioritizing incoming data, and preventing data loss due to factors such as jitter, delay and dropping. Another important aspect of QoS is ensuring that prioritizing one data flow doesn't interfere with other data flows. So, QoS helps to prioritize data as it enters your router. By attaching special identification marks or headers to incoming packets, QoS determines which queue the packets enter, based on priority. This is useful when there are certain types of data you want to give higher priority to, such as voice packets given higher priority than Web data packets.

To utilize your network throughput completely, administrator must define bandwidth control rules carefully to balance the utilization of network bandwidth for all users to access. It is indeed required that an access gateway satisfies the requirements of latency-critical applications, minimum access right guarantee, fair bandwidth usage for same subscribed condition and flexible bandwidth management. AMIT Security Gateway provides a Rule-based QoS to carry out the requirements.

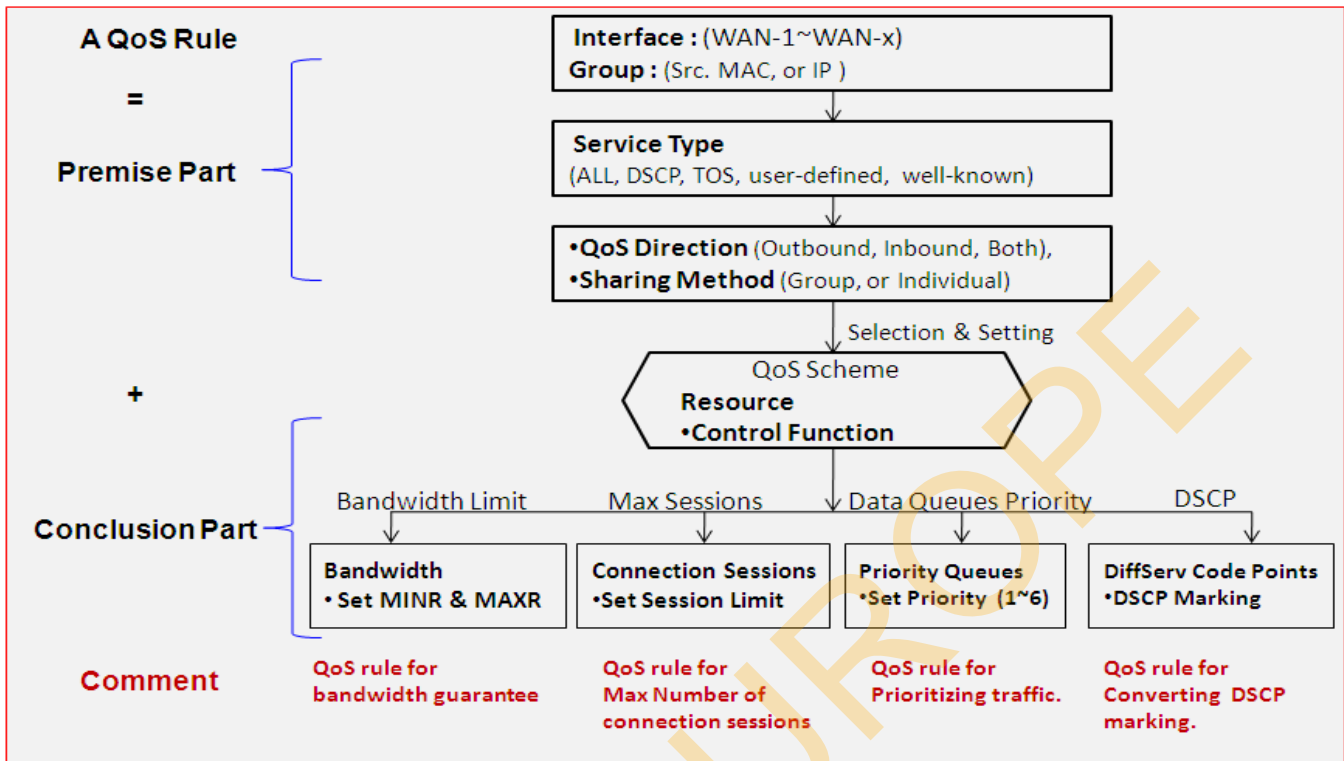
2.8.1 QoS Configuration

This gateway provides lots of flexible rules for you to set QoS policies. Basically, you need to know three parts of information before you create your own policies. First, "who" needs to be managed? Second, "what" kind of service needs to be managed? The last part is "how" you prioritize. Once you have this information, you can continue to learn functions in this section in more detail.

[QoS Rule Configuration](#)

When you want to add a new QoS rule or edit one already existed, the "QoS Rule Configuration" window shows up for you to configure. The parameters in a rule include the applied WAN interfaces, the dedicated host group based on MAC address or IP address, the dedicated kind of service packets, the system resource to be distributed, the corresponding control function for your specified resource, the packet flow direction, the sharing method for the control function, the integrated time schedule rule and the rule activation. Following diagram illustrates how to organize a QoS rule.

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In above diagram, a QoS rule is organized by the premise part and the conclusion part. In the premise part, you must specify the WAN interface, host group, service type in the packets, packet flow direction to be watched and the sharing method of group control or individual control. However, in the conclusion part, you must make sure which kind of system resource to distribute and the control function based on the chosen system resource for the rule.

The Rule-based QoS has following features.

Multiple Group Categories

Specify the group category in a QoS rule for the target objects to be applied on.

Group Category can be based on VLAN ID, MAC Address, IP Address, Host Name or Packet Length.

Differentiated Services

Specify the service type in a QoS rule for the target packets to be applied on.

Differentiated services can be based on 802.1p, DSCP, TOS, VLAN ID, User-defined Services and Well-known Services. Well-known services include FTP(21), SSH(TCP:22), Telnet(23), SMTP(25), DNS(53), TFTP(UDP:69), HTTP(TCP:80), POP3(110), Auth(113), SFTP(TCP:115), SNMP&Traps(UDP:161-162), LDAP(TCP:389), HTTPS(TCP:443), SMTPs(TCP:465), ISAKMP(500), RTSP(TCP:554), POP3s(TCP:995), NetMeeting(1720), L2TP(UDP:1701) and PPTP(TCP:1723).

Available Control Functions

There are 4 resources can be applied in a QoS rule: bandwidth, connection sessions, priority queues and DiffServ Code Point (DSCP). Control function that acts on target objects for specific services of packet flow is based on these resources.

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For bandwidth resource, control functions include guaranteeing bandwidth and limiting bandwidth. For priority queue resource, control function is setting priority. For DSCP resource, control function is DSCP marking. The last resource is Connection Sessions; the related control function is limiting connection sessions.

Individual / Group Control

One QoS rule can be applied to individual member or whole group in the target group. This feature depends on model.

Outbound / Inbound Control

One QoS rule can be applied to the outbound or inbound direction of packet flow, even them both. This feature depends on model.

Two QoS rule examples are listed as below.

QoS Rule Example #1 - Connection Sessions

| QoS Rule Configuration | |
|------------------------|---|
| Item | Setting |
| ▶ Interface | WAN - 1 ▼ |
| ▶ Group | IP ▼ 10.0.75.16 Subnet Mask : 255.255.255.240 (/28) ▼ |
| ▶ Service | All ▼ |
| ▶ Resource | Connection Sessions ▼ |
| ▶ Control Function | Set Session Limitation ▼ 20000 |
| ▶ QoS Direction | Outbound ▼ |
| ▶ Sharing Method | Group Control ▼ |
| ▶ Time Schedule | (0) Always ▼ |
| ▶ Rule | <input checked="" type="checkbox"/> Enable |

When administrator wants to limit maximum connection sessions from some client hosts (IP 10.0.75.16~31) to 20000 to avoid resource unbalanced, he can setup this rule as above configuration.

This rule defines that all client hosts, whose IP address is in the range of 10.0.75.16~31, can access the Internet via "WAN-1" interface under the limitation of the maximum 20000 connection sessions totally at any time

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QoS Rule Example #2 – DifferServ Code Points

| QoS Rule Configuration | |
|------------------------|--|
| Item | Setting |
| ▶ Interface | All WANs ▼ |
| ▶ Group | IP ▼ 10.0.75.196 Subnet Mask : 255.255.255.252 (/30) ▼ |
| ▶ Service | DSCP ▼ ▶ DiffServ CodePoint IP Precedence 4(CS4) ▼ |
| ▶ Resource | DiffServ Code Points ▼ |
| ▶ Control Function | DSCP Marking ▼ AF Class2(High Drop) ▼ |
| ▶ QoS Direction | Inbound ▼ |
| ▶ Sharing Method | Group Control ▼ |
| ▶ Time Schedule | (0) Always ▼ |
| ▶ Rule | <input checked="" type="checkbox"/> Enable |

When the administrator of the gateway wants to convert the code point value, "IP Precedence 4(CS4)", in the packets from some client hosts (IP 10.0.75.196~199) to the code value, "AF Class2(High Drop)", he can use the "Rule-based QoS" function to carry out this rule by defining an QoS rule as shown in above configuration. Under such configuration, all packets from WAN interfaces to LAN IP address 10.0.75.196 ~ 10.0.75.199 which have DiffServ code points with "IP Precedence 4(CS4)" value will be modified by "DSCP Marking" control function with "AF Class 2(High Drop)" value at any time.

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QoS Configuration Setting

Go to **Basic Network > QoS > Configuration** tab.

In "QoS Configuration" page, there are some configuration windows for QoS function. They are the "Configuration" window, "System Resource Configuration" window, "QoS Rule List" window, and "QoS Rule Configuration" window.

The "Configuration" window can let you activate the Rule-based QoS function. In addition, you can also enable the "Flexible Bandwidth Management" (FBM) feature for better utilization of system bandwidth by FBM algorithm. Second, the "System Configuration" window can let you configure the total bandwidth and session of each WAN. Third, the "QoS Rule List" window lists all your defined QoS rules. At last, the "QoS Rule Configuration" window can let you define one QoS rule.

Enable QoS Function

| Configuration | |
|---------------------------------|--|
| Item | Setting |
| ▶ QoS Types | Software ▾ <input type="checkbox"/> Enable |
| ▶ Flexible Bandwidth Management | <input type="checkbox"/> Enable |

| Configuration | | |
|--------------------------------------|---|---|
| Item | Value Setting | Description |
| QoS Type | 1. Software is selected by default. 2. The box is unchecked by default. | Select the QoS Type from the dropdown list, and then click Enable box to activate the QoS function. The default QoS type is set to Software QoS. For some models, there is another option for Hardware QoS. |
| Flexible Bandwidth Management | The box is unchecked by default | Click Enable box to activate the Flexible Bandwidth Management function. |
| Save | N/A | Click the Save button to save the settings. |

Check the "Enable" box to activate the "Rule-based QoS" function. Also enable the Flexible Bandwidth Management (FBM) feature when needed. When FBM is enabled, system adjusts the bandwidth distribution dynamically based on current bandwidth usage situation to reach maximum system network performance while transparent to all users. Certainly, the bandwidth subscription profiles of all current users are considered in system's automatic adjusting algorithm.

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Setup System Resource

| System Resource Configuration | |
|-------------------------------|---------------------------|
| Item | Setting |
| ▶ Type of System Queue | Bandwidth Queue ▼ 6 (1~6) |
| ▶ WAN Interface | WAN - 1 ▼ |

| WAN Interface Resource | |
|-----------------------------|------------------|
| Item | Setting |
| ▶ Bandwidth of Upstream | 100 Mbps ▼ |
| ▶ Bandwidth of Downstream | 100 Mbps ▼ |
| ▶ Total Connection Sessions | 30000 (1~100000) |

| System Resource Configuration | | |
|-------------------------------|--|--|
| Item | Value Setting | Description |
| Type of System Queue | 1. A Must filled setting. 2. Bandwidth Queue, and 6 are set by default. | Define the system queues that are available for the QoS settings. The supported type of system queues are Bandwidth Queue and Priority Queues . Value Range: 1 ~ 6. |
| WAN Interface | WAN-1 is selected by default. | Select the WAN interface and then the following WAN Interface Resource screen will show the related resources for configuration. <ul style="list-style-type: none"> ● Bandwidth of Upstream / Downstream Specify total upload / download bandwidth of the selected WAN. Value Range: For Gigabit Ethernet: 1~1024000Kbps, or 1~1000Mbps; For Fast Ethernet: 1~102400Kbps, or 1~100Mbps; For 3G/4G: 1~153600Kbps, or 1~150Mbps. ● Total Connection Sessions Specify total connection sessions of the selected WAN. Value Range: 1 ~ 10000. |
| Save | N/A | Click the Save button to save the settings. |

Each WAN interface should be configured carefully for its upstream bandwidth, downstream bandwidth and maximum number of connection sessions.

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Create / Edit QoS Rules

After enabled the QoS function and configured the system resources, you have to further specify some QoS rules for provide better service on the interested traffics. The gateway supports up to a maximum of 128 rule-based QoS rule sets.

| QoS Rule List | | | | | | | | | |
|---------------|-------|---------|----------|------------------|-----------|----------------|---------------|--------|---------|
| Interface | Group | Service | Resource | Control Function | Direction | Sharing Method | Time Schedule | Enable | Actions |

When **Add** button is applied, **QoS Rule Configuration** screen will appear.

| QoS Rule Configuration | |
|------------------------|--|
| Item | Setting |
| ▶ Interface | All WANs ▼ |
| ▶ Group | Src. MAC Address ▼ <input type="text"/> |
| ▶ Service | All ▼ |
| ▶ Resource | Bandwidth ▼ |
| ▶ Control Function | Set MINR & MAXR ▼ <input type="text"/> --- <input type="text"/> Mbps ▼ |
| ▶ QoS Direction | Outbound ▼ |
| ▶ Time Schedule | (0) Always ▼ |
| ▶ Rule Enable | <input type="checkbox"/> Enable |

| QoS Rule Configuration | | |
|------------------------|---|---|
| Item | Value setting | Description |
| Interface | <ol style="list-style-type: none"> 1. A Must filled setting. 2. All WANs is selected by default. | Specify the WAN interface to apply the QoS rule. Select All WANs or a certain WAN-n to filter the packets entering to or leaving from the interface(s). |
| Group | <ol style="list-style-type: none"> 1. A Must filled setting. 2. Src. MAC Address is selected by default. | <p>Specify the Group category for the QoS rule. It can be Src. MAC Address, IP, or Host Name.</p> <p>Select Src. MAC Address to prioritize packets based on MAC;</p> <p>Select IP to prioritize packets based on IP address and Subnet Mask;</p> <p>Select Host Name to prioritize packets based on a group of a pre-configured group of host from the dropdown list. If the dropdown list is empty, ensure if any group is pre-configured.</p> <p>Note: The required host groups must be created in advance and corresponding QoS checkbox in the Multiple Bound Services field is checked before the Host</p> |

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| | | |
|--|---|--|
| | | <p>Group option become available. Refer to Object Definition > Grouping > Host Grouping.</p> |
| <p>Service</p> | <p>1. A Must filled setting. 2. All is selected by default.</p> | <p>Specify the service type of traffics that have to be applied with the QoS rule. It can be All, DSCP, TOS, User-defined Service, or Well-known Service.</p> <p>Select All for all packets.</p> <p>Select DSCP for DSCP type packets only.</p> <p>Select TOS for TOS type packets only. You have to select a service type (Minimize-Cost, Maximize-Reliability, Maximize-Throughput, or Minimize-Delay) from the dropdown list as well.</p> <p>Select User-defined Service for user-defined packets only. You have to define the port range and protocol as well.</p> <p>Select Well-known Service for specific application packets only. You have to select the required service from the dropdown list as well.</p> |
| <p>Resource, and Control Function</p> | <p>A Must filled setting</p> | <p>Specify the Resource Type and corresponding Control function for the QoS rule. The available Resource options are Bandwidth, Connection Sessions, Priority Queues, and DiffServ Codepoints.</p> <p>Bandwidth: Select Bandwidth as the resource type for the QoS Rule, and you have to assign the min rate, max rate and rate unit as the bandwidth settings in the Control Function / Set MINR & MAXR field.</p> <p>Connection Sessions: Select Connection Sessions as the resource type for the QoS Rule, and you have to assign supported session number in the Control Function / Set Session Limitation field.</p> <p>Priority Queues: Select Priority Queues as the resource type for the QoS Rule, and you have to specify a priority queue in the Control Function / Set Priority field.</p> <p>DiffServ Code Points: Select DiffServ Code Points as the resource type for the QoS Rule, and you have to select a DSCP marking from the Control Function / DSCP Marking dropdown list.</p> |
| <p>QoS Direction</p> | <p>1. A Must filled setting. 2. Outbound is selected by default.</p> | <p>Specify the traffic flow direction for the packets to apply the QoS rule. It can be Outbound, Inbound, or Both.</p> <p>Outbound: Select Outbound to prioritize the traffics going to the Internet via the specified interface. Under such situation, the hosts specified in the Group field is a source group.</p> <p>Inbound: Select Inbound to prioritize the traffics coming from the Internet via the specified interface. Under such situation, the hosts specified in the Group field is a destination group.</p> <p>Both: Select both to prioritize the traffics passing through the specified interface, both Inbound and Outbound are considered. Under such situation, the hosts specified in the Group field can be a source or destination group.</p> |
| <p>Sharing Method</p> | <p>1. A Must filled</p> | <p>Specify the preferred sharing method for how to apply the QoS rule on the</p> |

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| | | |
|----------------------|---|--|
| | setting. 2. Group Control is selected by default. | selected group. It can be Individual Control or Group Control . Individual Control: If Individual Control is selected, each host in the group will have his own QoS service resource as specified in the rule. Group Control: If Group Control is selected, all the group hosts share the same QoS service resource. |
| Time Schedule | 1. A Must filled setting. 2. (0) Always is selected by default. | Apply Time Schedule to this rule; otherwise leave it as (0) Always . (refer to Object Definition > Scheduling > Configuration settings) |
| Rule Enable | The box is unchecked by default. | Click Enable box to activate this QoS rule. |
| Save | N/A | Click the Save button to save the settings. |

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Chapter 3 Object Definition

3.1 Scheduling

Scheduling provides ability of adding/deleting time schedule rules, which can be applied to other functionality.

3.1.1 Scheduling Configuration

Go to **Object Definition > Scheduling > Configuration** tab.

| Time Schedule List | | |
|------------------------------------|---------------------------------------|---------|
| <input type="button" value="Add"/> | <input type="button" value="Delete"/> | |
| ID | Rule Name | Actions |

| Button description | | |
|--------------------|---------------|---|
| Item | Value setting | Description |
| Add | N/A | Click the Add button to configure time schedule rule |
| Delete | N/A | Click the Delete button to delete selected rule(s) |

When **Add** button is applied, Time Schedule Configuration and Time Period Definition screens will appear.

| Time Schedule Configuration | |
|-----------------------------|--|
| Item | Setting |
| ▶ Rule Name | <input type="text"/> |
| ▶ Rule Policy | <input type="button" value="Inactivate"/> the Selected Days and Hours Below. |

| Time Schedule Configuration | | |
|-----------------------------|--------------------|---|
| Item | Value Setting | Description |
| Rule Name | String: any text | Set rule name |
| Rule Policy | Default Inactivate | Inactivate/activate the function been applied to in the time period below |

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| Time Period Definition | | | |
|------------------------|--------------------|----------------------|----------------------|
| ID | Week Day | Start Time (hh:mm) | End Time (hh:mm) |
| 1 | -- choose one -- ▼ | <input type="text"/> | <input type="text"/> |
| 2 | -- choose one -- ▼ | <input type="text"/> | <input type="text"/> |
| 3 | -- choose one -- ▼ | <input type="text"/> | <input type="text"/> |
| 4 | -- choose one -- ▼ | <input type="text"/> | <input type="text"/> |
| 5 | -- choose one -- ▼ | <input type="text"/> | <input type="text"/> |
| 6 | -- choose one -- ▼ | <input type="text"/> | <input type="text"/> |
| 7 | -- choose one -- ▼ | <input type="text"/> | <input type="text"/> |
| 8 | -- choose one -- ▼ | <input type="text"/> | <input type="text"/> |

| Time Period Definition | | |
|------------------------|----------------------|--|
| Item | Value Setting | Description |
| Week Day | Select from menu | Select everyday or one of weekday |
| Start Time | Time format (hh :mm) | Start time in selected weekday |
| End Time | Time format (hh :mm) | End time in selected weekday |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |
| Refresh | N/A | Click the Refresh button to refresh the time schedule list. |

3.2 User (not supported)

Not supported feature for the purchased product, leave it as blank.

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3.3 Grouping

The Grouping function allows user to make group for some services.

3.3.1 Host Grouping

Go to **Object Definition > Grouping > Host Grouping** tab.

The Host Grouping function allows user to make host group for some services, such as QoS, Firewall, and Communication Bus. The supported service types could be different for the purchased product.

| Host Group List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | |
|--|------------|------------|-------------|----------------|--------|---------|
| ID | Group Name | Group Type | Member List | Bound Services | Enable | Actions |

When **Add** button is applied, **Host Group Configuration** screen will appear.

| Host Group Configuration | |
|--------------------------|---|
| Item | Setting |
| ▶ Group Name | <input type="text"/> |
| ▶ Group Type | IP Address-based ▼ |
| ▶ Member to Join | <input type="text"/> <input type="button" value="Join"/> |
| ▶ Member List | |
| ▶ Bound Services | <input type="checkbox"/> Firewall <input type="checkbox"/> QoS <input type="checkbox"/> Field Communication |
| ▶ Group | <input type="checkbox"/> Enable |

| Host Group Configuration | | |
|--------------------------|--|---|
| Item | Value setting | Description |
| Group Name | 1. String format can be any text 2. A Must filled setting | Enter a group name for the rule. It is a name that is easy for you to understand. |
| Group Type | 1. IP Address-based is selected by default. 2. A Must filled setting | Select the group type for the host group. It can be IP Address-based , MAC Address-based , or Host Name-based . When IP Address-based is selected, only IP address can be added in Member to Join . |

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| | | |
|-----------------------|------------------------------------|--|
| | | <p>When MAC Address-based is selected, only MAC address can be added in Member to Join.</p> <p>When Host Name-based is selected, only host name can be added in Member to Join.</p> <p>Note: The available Group Type can be different for the purchased model.</p> |
| Member to Join | N/A | <p>Add the members to the group in this field.</p> <p>You can enter the member information as specified in the Member Type above, and press the Join button to add.</p> <p>Only one member can be add at a time, so you have to add the members to the group one by one.</p> |
| Member List | NA | <p>This field will indicate the hosts (members) contained in the group.</p> |
| Bound Services | The boxes are unchecked by default | <p>Binding the services that the host group can be applied. If you enable the Firewall, the produced group can be used in firewall service. Same as by enable QoS and Communication Bus.</p> <p>Note: The supported service type can be different for the purchased product.</p> |
| Group | The box is unchecked by default | <p>Check the Enable checkbox to activate the host group rule. So that the group can be bound to selected service(s) for further configuration.</p> |
| Save | N/A | <p>Click Save to save the settings</p> |
| Undo | N/A | <p>Click Undo to cancel the settings</p> |

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3.4 External Server

Go to **Object Definition > External Server > External Server** tab.

The External Server setting allows user to add external server.

Create External Server

| External Server List | | | | | | |
|----------------------|-------------|-------------|----------------|-------------|---------------|---------|
| ID | Server Name | Server Type | Server IP/FQDN | Server Port | Server Enable | Actions |

When **Add** button is applied, **External Server Configuration** screen will appear.

| External Server Configuration | |
|---|---|
| Item | Setting |
| ▶ Server Name | <input type="text"/> |
| ▶ Server Type | Email Server User Name: <input type="text"/> Password: <input type="text"/> |
| ▶ Server IP/FQDN | <input type="text"/> |
| ▶ Server Port | 25 |
| ▶ Server | <input checked="" type="checkbox"/> Enable |
| <input type="button" value="Save"/> <input type="button" value="Undo"/> | |

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External Server Configuration

| Item | Value setting | Description |
|--------------------|--|--|
| Sever Name | 1. String format can be any text 2. A Must filled setting | Enter a server name. Enter a name that is easy for you to understand. |
| Server Type | A Must filled setting | <p>Specify the Server Type of the external server, and enter the required settings for the accessing the server.</p> <hr/> <p>Email Server (A Must filled setting) : When Email Server is selected, User Name, and Password are also required. User Name (String format: any text) Password (String format: any text)</p> <hr/> <p>RADIUS Server (A Must filled setting) : When RADIUS Server is selected, the following settings are also required. Primary : Shared Key (String format: any text) Authentication Protocol (By default CHAP is selected) Session Timeout (By default 1) The values must be between 1 and 60. Idle Timeout: (By default 1) The values must be between 1 and 15. Secondary : Shared Key (String format: any text) Authentication Protocol (By default CHAP is selected) Session Timeout (By default 1) The values must be between 1 and 60. Idle Timeout: (By default 1) The values must be between 1 and 15.</p> <hr/> <p>Active Directory Server (A Must filled setting) : When Active Directory Server is selected, Domain setting is also required. Domain (String format: any text)</p> <hr/> <p>LDAP Server (A Must filled setting) : When LDAP Server is selected, the following settings are also required. Base DN (String format: any text) Identity (String format: any text) Password (String format: any text)</p> <hr/> <p>UAM Server (A Must filled setting) : When UAM Server is selected, the following settings are also required. Login URL (String format: any text) Shared Secret (String format: any text) NAS/Gateway ID (String format: any text) Location ID (String format: any text) Location Name (String format: any text)</p> |

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| | | |
|-----------------------|---|--|
| | | <p>TACACS+ Server (A Must filled setting) :</p> <p>When TACACS+ Server is selected, the following settings are also required.</p> <p>Shared Key (String format: any text)</p> <p>Session Timeout (String format: any number)</p> <p>The values must be between 1 and 60.</p> |
| | | <p>SCEP Server (A Must filled setting) :</p> <p>When SCEP Server is selected, the following settings are also required.</p> <p>Path (String format: any text, By default cgi-bin is filled)</p> <p>Application (String format: any text, By default pkiclient.exe is filled)</p> |
| | | <p>FTP(SFTP) Server (A Must filled setting) :</p> <p>When FTP(SFTP) Server is selected, the following settings are also required.</p> <p>User Name (String format: any text)</p> <p>Password (String format: any text)</p> <p>Protocol (Select FTP or SFTP)</p> <p>Encryprion (Select Plain, Explicit FTPS or Implicit FTPS)</p> <p>Transfer mode (Select Passive or Active)</p> |
| Server IP/FQDN | A Must filled setting | Specify the IP address or FQDN used for the external server. |
| Server Port | A Must filled setting | <p>Specify the Port used for the external server. If you selected a certain server type, the default server port number will be set.</p> <p>For Email Server 25 will be set by default;</p> <p>For Syslog Server, port 514 will be set by default;</p> <p>For RADIUS Server, port 1812, 1823 will be set by default;</p> <p>For Active Directory Server, port 389 will be set by default;</p> <p>For LDAP Server, port 389 will be set by default;</p> <p>For UAM Server, port 3990, 4990 will be set by default;</p> <p>For TACACS+ Server, port 49 will be set by default;</p> <p>For SCEP Server, port 80 will be set by default;</p> <p>For FTP(SFTP) Server, port 21 will be set by default;</p> <p>Value Range: 1 ~ 65535.</p> |
| Account Port | <p>1. A Must filled setting</p> <p>2. 1813 is set by default</p> | <p>Specify the accounting port used if you selected external RADIUS server.</p> <p>Value Range: 1 ~ 65535.</p> |
| Server | The box is checked by default | Click Enable to activate this External Server. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |
| Refresh | N/A | Click the Refresh button to refresh the external server list. |

3.5 Certificate

In cryptography, a public key certificate (also known as a digital certificate or identity certificate) is an electronic document used to prove ownership of a public key. The certificate includes information about the key, information about its owner's identity, and the digital signature of an entity that has verified the certificate's contents are genuine. If the signature is valid, and the person examining the certificate trusts the signer, then they know they can use that key to communicate with its owner⁴.

In a typical public-key infrastructure (PKI) scheme, the signer is a certificate authority (CA), usually a company such as VeriSign which charges customers to issue certificates for them. In a web of trust scheme, the signer is either the key's owner (a self-signed certificate) or other users ("endorsements") whom the person examining the certificate might know and trust. The device also plays as a CA role.

Certificates are an important component of Transport Layer Security (TLS, sometimes called by its older name SSL), where they prevent an attacker from impersonating a secure website or other server. They are also used in other important applications, such as email encryption and code signing. Here, it can be used in IPsec tunneling for user authentication.

3.5.1 Configuration

The configuration setting allows user to create Root Certificate Authority (CA) certificate and configure to set enable of SCEP. Root CA is the top-most certificate of the tree, the private key of which is used to "sign" other certificates.

Go to Object Definition > Certificate > Configuration tab.

Create Root CA



| ID | Name | Subject | Issuer | Valid To | Action |
|----|---------|---------|--------|----------|----------|
| | Root CA | | | | Generate |

When **Generate** button is applied, **Root CA Certificate Configuration** screen will appear. The required information to be filled for the root CA includes the name, key, subject name and validity.

⁴ http://en.wikipedia.org/wiki/Public_key_certificate.

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| Root CA Certificate Configuration | |
|-----------------------------------|---|
| Item | Setting |
| ▶ Name | <input type="text"/> |
| ▶ Key | Key Type : <input type="text" value="RSA"/> Key Length : <input type="text" value="512-bits"/> Digest Algorithm : <input type="text" value="MD5"/> |
| ▶ Subject Name | Country(C) : <input type="text"/> State(ST) : <input type="text"/> Location(L) : <input type="text"/> Organization(O) : <input type="text"/> Organization Unit(OU) : <input type="text"/> Common Name(CN) : <input type="text"/> Email : <input type="text"/> |
| ▶ Validity Period | <input type="text" value="20-years"/> |

| Root CA Certificate Configuration | | |
|-----------------------------------|--|---|
| Item | Value setting | Description |
| Name | 1. String format can be any text 2. A Must filled setting | Enter a Root CA Certificate name. It will be a certificate file name |
| Key | A Must filled setting | This field is to specify the key attribute of certificate. Key Type to set public-key cryptosystems. It only supports RSA now. Key Length to set s the size measured in bits of the key used in a cryptographic algorithm. Digest Algorithm to set identifier in the signature algorithm identifier of certificates |
| Subject Name | A Must filled setting | This field is to specify the information of certificate. Country(C) is the two-letter ISO code for the country where your organization is located. State(ST) is the state where your organization is located. Location(L) is the location where your organization is located. Organization(O) is the name of your organization. Organization Unit(OU) is the name of your organization unit. Common Name(CN) is the name of your organization. Email is the email of your organization. It has to be email address style. |
| Validity Period | A Must filled setting | This field is to specify the validity period of certificate. |

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Setup SCEP

| SCEP Configuration | |
|--|---------------------------------|
| Item | Setting |
| ▶ SCEP | <input type="checkbox"/> Enable |
| ▶ Automatically re-enroll aging certificates | <input type="checkbox"/> Enable |

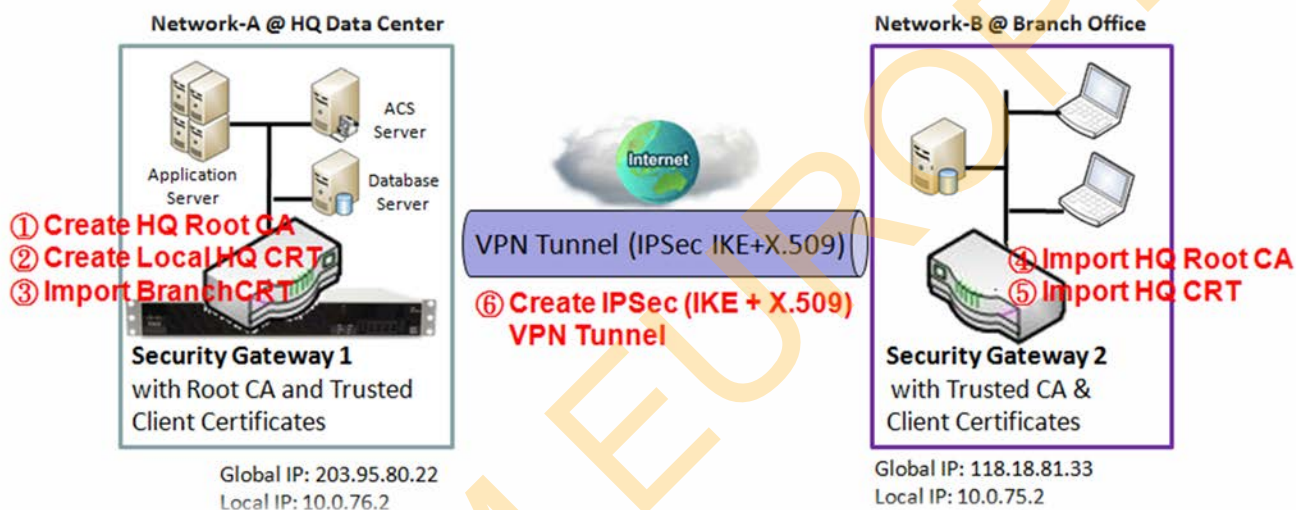
| SCEP Configuration | | |
|---|---------------------------------|--|
| Item | Value setting | Description |
| SCEP | The box is unchecked by default | Check the Enable box to activate SCEP function. |
| Automatically re-enroll aging certificates | The box is unchecked by default | When SCEP is activated, check the Enable box to activate this function. It will be automatically check which certificate is aging. If certificate is aging, it will activate SCEP function to re-enroll automatically. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

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3.5.2 My Certificate

My Certificate includes a Local Certificate List. Local Certificate List shows all generated certificates by the root CA for the gateway. And it also stores the generated Certificate Signing Requests (CSR) which will be signed by other external CAs. The signed certificates can be imported as the local ones of the gateway.

Self-signed Certificate Usage Scenario



Scenario Application Timing

When the enterprise gateway owns the root CA and VPN tunneling function, it can generate its own local certificates by being signed by itself or import any local certificates that are signed by other external CAs. Also import the trusted certificates for other CAs and Clients. In addition, since it has the root CA, it also can sign Certificate Signing Requests (CSR) to form corresponding certificates for others. These certificates can be used for two remote peers to make sure their identity during establishing a VPN tunnel.

Scenario Description

Gateway 1 generates the root CA and a local certificate (HQCRT) signed by itself. Import a trusted certificate (BranchCRT) –a BranchCSR certificate of Gateway 2 signed by root CA of Gateway 1.

Gateway 2 creates a CSR (BranchCSR) to let the root CA of the Gateway 1 sign it to be the BranchCRT certificate. Import the certificate into the Gateway 2 as a local certificate. In addition, also import the certificates of the root CA of the Gateway 1 into the Gateway 2 as the trusted ones. (Please also refer to following two sub-sections)

Establish an IPSec VPN tunnel with IKE and X.509 protocols by starting from either peer, so that all

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client hosts in these both subnets can communicate with each other.

Parameter Setup Example

For Network-A at HQ

Following tables list the parameter configuration as an example for the "My Certificate" function used in the user authentication of IPsec VPN tunnel establishing, as shown in above diagram. The configuration example must be combined with the ones in following two sections to complete the whole user scenario.

Use default value for those parameters that are not mentioned in the tables.

| | |
|---------------------------|--|
| Configuration Path | [My Certificate]-[Root CA Certificate Configuration] |
| Name | HQRootCA |
| Key | Key Type: RSA Key Length: 1024-bits |
| Subject Name | Country(C): TW State(ST): Taiwan Location(L): Tainan Organization(O): AMITHQ Organization Unit(OU): HQRD Common Name(CN): HQRootCA E-mail: hqrootca@amit.com.tw |

| | |
|---------------------------|---|
| Configuration Path | [My Certificate]-[Local Certificate Configuration] |
| Name | HQCRT Self-signed: <input checked="" type="checkbox"/> |
| Key | Key Type: RSA Key Length: 1024-bits |
| Subject Name | Country(C): TW State(ST): Taiwan Location(L): Tainan Organization(O): AMITHQ Organization Unit(OU): HQRD Common Name(CN): HQCRT E-mail: hqcert@amit.com.tw |

| | |
|---------------------------|---|
| Configuration Path | [IPSec]-[Configuration] |
| IPSec | <input checked="" type="checkbox"/> Enable |

| | |
|---------------------------|---|
| Configuration Path | [IPSec]-[Tunnel Configuration] |
| Tunnel | <input checked="" type="checkbox"/> Enable |
| Tunnel Name | s2s-101 |
| Interface | WAN 1 |
| Tunnel Scenario | Site to Site |
| Operation Mode | Always on |

| | |
|---------------------------|--|
| Configuration Path | [IPSec]-[Local & Remote Configuration] |
| Local Subnet | 10.0.76.0 |
| Local Netmask | 255.255.255.0 |
| Full Tunnel | Disable |
| Remote Subnet | 10.0.75.0 |
| Remote Netmask | 255.255.255.0 |
| Remote Gateway | 118.18.81.33 |

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| | |
|---------------------------|---|
| Configuration Path | [IPSec]-[Authentication] |
| Key Management | <i>IKE+X.509</i> Local Certificate: <i>HQCRT</i> Remote Certificate: <i>BranchCRT</i> |
| Local ID | <i>User Name Network-A</i> |
| Remote ID | <i>User Name Network-B</i> |

| | |
|---------------------------|---------------------|
| Configuration Path | [IPSec]-[IKE Phase] |
| Negotiation Mode | <i>Main Mode</i> |
| X-Auth | <i>None</i> |

For Network-B at Branch Office

Following tables list the parameter configuration as an example for the "My Certificate" function used in the user authentication of IPsec VPN tunnel establishing, as shown in above diagram. The configuration example must be combined with the ones in following two sections to complete the whole user scenario.

Use default value for those parameters that are not mentioned in the tables.

| | |
|---------------------------|--|
| Configuration Path | [My Certificate]-[Local Certificate Configuration] |
| Name | <i>BranchCRT</i> Self-signed: <input type="checkbox"/> |
| Key | Key Type: <i>RSA</i> Key Length: <i>1024-bits</i> |
| Subject Name | Country(C): <i>TW</i> State(ST): <i>Taiwan</i> Location(L): <i>Tainan</i> Organization(O): <i>AMITBranch</i> Organization Unit(OU): <i>BranchRD</i> Common Name(CN): <i>BranchCRT</i> E-mail: <i>branchcrt@amit.com.tw</i> |

| | |
|---------------------------|-------------------------|
| Configuration Path | [IPSec]-[Configuration] |
| IPSec | ■ <i>Enable</i> |

| | |
|---------------------------|--------------------------------|
| Configuration Path | [IPSec]-[Tunnel Configuration] |
| Tunnel | ■ <i>Enable</i> |
| Tunnel Name | <i>s2s-102</i> |
| Interface | <i>WAN 1</i> |
| Tunnel Scenario | <i>Site to Site</i> |
| Operation Mode | <i>Always on</i> |

| | |
|---------------------------|--|
| Configuration Path | [IPSec]-[Local & Remote Configuration] |
| Local Subnet | <i>10.0.75.0</i> |
| Local Netmask | <i>255.255.255.0</i> |
| Full Tunnel | <i>Disable</i> |
| Remote Subnet | <i>10.0.76.0</i> |

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| | |
|----------------|---------------|
| Remote Netmask | 255.255.255.0 |
| Remote Gateway | 203.95.80.22 |

| | |
|--------------------|--|
| Configuration Path | [IPSec]-[Authentication] |
| Key Management | IKE+X.509 Local Certificate: BranchCRT Remote Certificate: HQCRT |
| Local ID | User Name Network-B |
| Remote ID | User Name Network-A |

| | |
|--------------------|---------------------|
| Configuration Path | [IPSec]-[IKE Phase] |
| Negotiation Mode | Main Mode |
| X-Auth | None |

Scenario Operation Procedure

In above diagram, "Gateway 1" is the gateway of Network-A in headquarters and the subnet of its Intranet is 10.0.76.0/24. It has the IP address of 10.0.76.2 for LAN interface and 203.95.80.22 for WAN-1 interface. "Gateway 2" is the gateway of Network-B in branch office and the subnet of its Intranet is 10.0.75.0/24. It has the IP address of 10.0.75.2 for LAN interface and 118.18.81.33 for WAN-1 interface. They both serve as the NAT security gateways.

Gateway 1 generates the root CA and a local certificate (HQCRT) that is signed by itself. Import the certificates of the root CA and HQCRT into the "Trusted CA Certificate List" and "Trusted Client Certificate List" of Gateway 2.

Gateway 2 generates a Certificate Signing Request (BranchCSR) for its own certificate (BranchCRT) (Please generate one not self-signed certificate in the Gateway 2, and click on the "View" button for that CSR. Just downloads it). Take the CSR to be signed by the root CA of Gateway 1 and obtain the BranchCRT certificate (you need rename it). Import the certificate into the "Trusted Client Certificate List" of the Gateway 1 and the "Local Certificate List" of Gateway 2.

Gateway 2 can establish an IPsec VPN tunnel with "Site to Site" scenario and IKE and X.509 protocols to Gateway 1.

Finally, the client hosts in two subnets of 10.0.75.0/24 and 10.0.76.0/24 can communicate with each other.

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My Certificate Setting

Go to Object Definition > Certificate > My Certificate tab.

The My Certificate setting allows user to create local certificates. In "My Certificate" page, there are two configuration windows for the "My Certificate" function. The "Local Certificate List" window shows the stored certificates or CSRs for representing the gateway. The "Local Certificate Configuration" window can let you fill required information necessary for corresponding certificate to be generated by itself, or corresponding CSR to be signed by other CAs.

Create Local Certificate

| Local Certificate List | | | | | |
|------------------------|------|---------|--------|----------|---------|
| ID | Name | Subject | Issuer | Vaild To | Actions |

When **Add** button is applied, **Local Certificate Configuration** screen will appear. The required information to be filled for the certificate or CSR includes the name, key and subject name. It is a certificate if the "Self-signed" box is checked; otherwise, it is a CSR.

| Local Certificate Configuration | |
|---------------------------------|--|
| Item | Setting |
| ▶ Name | <input type="text"/> Self-signed : <input type="checkbox"/> |
| ▶ Key | Key Type : <input type="text" value="RSA"/> Key Length : <input type="text" value="1024-bits"/> Digest Algorithm : <input type="text" value="SHA-1"/> |
| ▶ Subject Name | Country(C) : <input type="text"/> State(ST) : <input type="text"/> Location(L) : <input type="text"/> Organization(O) : <input type="text"/> Organization Unit(OU) : <input type="text"/> Common Name(CN) : <input type="text"/> Email : <input type="text"/> |
| ▶ Extra Attributes | Challenge Password: <input type="text"/> Unstructured Name: <input type="text"/> |
| ▶ SCEP Enrollment | Enable: <input type="checkbox"/> SCEP Server: <input type="text" value="-- Option --"/> <input type="button" value="Add Object"/> CA Certificate: <input type="text"/> CA Encryption Certificate: <input type="text" value="-- Option --"/> (Optional) CA Identifier: <input type="text"/> (Optional) |

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| Local Certificate Configuration | | |
|---------------------------------|--|--|
| Item | Value setting | Description |
| Name | 1. String format can be any text 2. A Must filled setting | Enter a certificate name. It will be a certificate file name If Self-signed is checked, it will be signed by root CA. If Self-signed is not checked, it will generate a certificate signing request (CSR). |
| Key | A Must filled setting | This field is to specify the key attributes of certificate. Key Type to set public-key cryptosystems. Currently, only RSA is supported. Key Length to set the length in bits of the key used in a cryptographic algorithm. It can be 512/768/1024/1536/2048. Digest Algorithm to set identifier in the signature algorithm identifier of certificates. It can be MD5/SHA-1. |
| Subject Name | A Must filled setting | This field is to specify the information of certificate. Country(C) is the two-letter ISO code for the country where your organization is located. State(ST) is the state where your organization is located. Location(L) is the location where your organization is located. Organization(O) is the name of your organization. Organization Unit(OU) is the name of your organization unit. Common Name(CN) is the name of your organization. Email is the email of your organization. It has to be email address setting only. |
| Extra Attributes | A Must filled setting | This field is to specify the extra information for generating a certificate. Challenge Password for the password you can use to request certificate revocation in the future. Unstructured Name for additional information. |
| SCEP Enrollment | A Must filled setting | This field is to specify the information of SCEP. If user wants to generate a certificate signing request (CSR) and then signed by SCEP server online, user can check the Enable box. Select a SCEP Server to identify the SCEP server for use. The server detailed information could be specified in External Servers. Refer to Object Definition > External Server > External Server . You may click Add Object button to generate. Select a CA Certificate to identify which certificate could be accepted by SCEP server for authentication. It could be generated in Trusted Certificates. Select an optional CA Encryption Certificate , if it is required, to identify which certificate could be accepted by SCEP server for encryption data information. It could be generated in Trusted Certificates. Fill in optional CA Identifier to identify which CA could be used for signing certificates. |
| Save | N/A | Click the Save button to save the configuration. |
| Back | N/A | When the Back button is clicked, the screen will return to previous page. |

When **Import** button is applied, an Import screen will appear. You can import a certificate from an existed certificate file, or directly paste a PEM encoded string as the certificate.

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☐ Import

Choose File No file chosen

Apply
Cancel

☐ PEM Encoded

Apply
Cancel

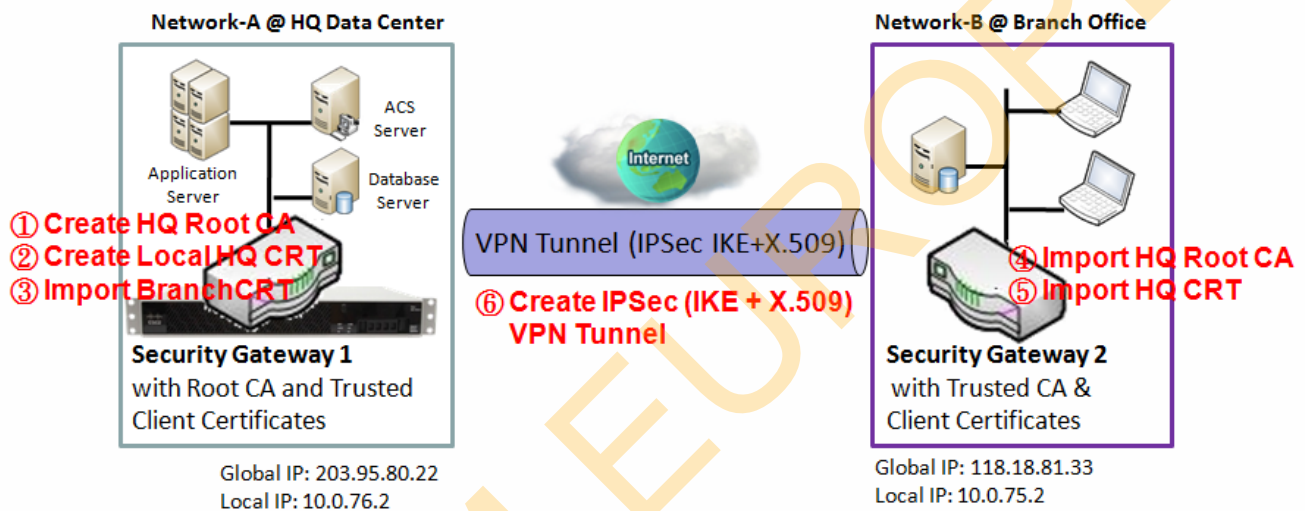
| Import Item | Value setting | Description |
|--------------------|--|--|
| Import | A Must filled setting | Select a certificate file from user's computer, and click the Apply button to import the specified certificate file to the gateway. |
| PEM Encoded | 1. String format can be any text 2. A Must filled setting | This is an alternative approach to import a certificate. You can directly fill in (Copy and Paste) the PEM encoded certificate string, and click the Apply button to import the specified certificate to the gateway. |
| Apply | N/A | Click the Apply button to import the certificate. |
| Cancel | N/A | Click the Cancel button to discard the import operation and the screen will return to the My Certificates page. |

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3.5.3 Trusted Certificate

Trusted Certificate includes Trusted CA Certificate List, Trusted Client Certificate List, and Trusted Client Key List. The Trusted CA Certificate List places the certificates of external trusted CAs. The Trusted Client Certificate List places the others' certificates what you trust. And the Trusted Client Key List places the others' keys what you trusted.

Self-signed Certificate Usage Scenario



Scenario Application Timing (same as the one described in "My Certificate" section)

When the enterprise gateway owns the root CA and VPN tunneling function, it can generate its own local certificates by being signed by itself. Also imports the trusted certificates for other CAs and Clients. These certificates can be used for two remote peers to make sure their identity during establishing a VPN tunnel.

Scenario Description (same as the one described in "My Certificate" section)

Gateway 1 generates the root CA and a local certificate (HQCRT) signed by itself. Import a trusted certificate (BranchCRT) –a BranchCSR certificate of Gateway 2 signed by root CA of Gateway 1.

Gateway 2 creates a CSR (BranchCSR) to let the root CA of the Gateway 1 sign it to be the BranchCRT certificate. Import the certificate into the Gateway 2 as a local certificate. In addition, also imports the certificates of the root CA of Gateway 1 into the Gateway 2 as the trusted ones. (Please also refer to "My Certificate" and "Issue Certificate" sections).

Establish an IPSec VPN tunnel with IKE and X.509 protocols by starting from either peer, so that all client hosts in these both subnets can communicate with each other.

Parameter Setup Example (same as the one described in "My Certificate" section)

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For Network-A at HQ

Following tables list the parameter configuration as an example for the "Trusted Certificate" function used in the user authentication of IPsec VPN tunnel establishing, as shown in above diagram. The configuration example must be combined with the ones in "My Certificate" and "Issue Certificate" sections to complete the setup for the whole user scenario.

| | |
|---------------------------|---|
| Configuration Path | [Trusted Certificate]-[Trusted Client Certificate List] |
| Command Button | <i>Import</i> |

| | |
|---------------------------|---|
| Configuration Path | [Trusted Certificate]-[Trusted Client Certificate Import from a File] |
| File | <i>BranchCRT.crt</i> |

For Network-B at Branch Office

Following tables list the parameter configuration as an example for the "Trusted Certificate" function used in the user authentication of IPsec VPN tunnel establishing, as shown in above diagram. The configuration example must be combined with the ones in "My Certificate" and "Issued Certificate" sections to complete the setup for the whole user scenario.

| | |
|---------------------------|---|
| Configuration Path | [Trusted Certificate]-[Trusted CA Certificate List] |
| Command Button | <i>Import</i> |

| | |
|---------------------------|---|
| Configuration Path | [Trusted Certificate]-[Trusted CA Certificate Import from a File] |
| File | <i>HQRootCA.crt</i> |

| | |
|---------------------------|---|
| Configuration Path | [Trusted Certificate]-[Trusted Client Certificate List] |
| Command Button | <i>Import</i> |

| | |
|---------------------------|---|
| Configuration Path | [Trusted Certificate]-[Trusted Client Certificate Import from a File] |
| File | <i>HQCRT.crt</i> |

Scenario Operation Procedure (same as the one described in "My Certificate" section)

In above diagram, the "Gateway 1" is the gateway of Network-A in headquarters and the subnet of its Intranet is 10.0.76.0/24. It has the IP address of 10.0.76.2 for LAN interface and 203.95.80.22 for WAN-1 interface. The "Gateway 2" is the gateway of Network-B in branch office and the subnet of its Intranet is 10.0.75.0/24. It has the IP address of 10.0.75.2 for LAN interface and 118.18.81.33 for WAN-1 interface. They both serve as the NAT security gateways.

In Gateway 2 import the certificates of the root CA and HQCRT that were generated and signed by Gateway 1 into the "Trusted CA Certificate List" and "Trusted Client Certificate List" of Gateway 2.

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Import the obtained BranchCRT certificate (the derived BranchCSR certificate after Gateway 1's root CA signature) into the "Trusted Client Certificate List" of the Gateway 1 and the "Local Certificate List" of the Gateway 2. For more details, refer to the Network-B operation procedure in "My Certificate" section of this manual.

Gateway 2 can establish an IPsec VPN tunnel with "Site to Site" scenario and IKE and X.509 protocols to Gateway 1.

Finally, the client hosts in two subnets of 10.0.75.0/24 and 10.0.76.0/24 can communicate with each other.

TEXIM EUROPE

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Trusted Certificate Setting

Go to Object Definition > Certificate > Trusted Certificate tab.

The Trusted Certificate setting allows user to import trusted certificates and keys.

Import Trusted CA Certificate

| Trusted CA Certificate List | | | | | |
|-----------------------------|------|---------|--------|----------|---------|
| ID | Name | Subject | Issuer | Vaild To | Actions |

When **Import** button is applied, a **Trusted CA import** screen will appear. You can import a Trusted CA certificate from an existed certificate file, or directly paste a PEM encoded string as the certificate.

Trusted CA Certificate Import from a File

Choose File No file chosen

Apply Cancel

Trusted CA Certificate Import from a PEM

Apply Cancel

| Trusted CA Certificate List | | |
|-----------------------------|--|---|
| Item | Value setting | Description |
| Import from a File | A Must filled setting | Select a CA certificate file from user's computer, and click the Apply button to import the specified CA certificate file to the gateway. |
| Import from a PEM | 1. String format can be any text 2. A Must filled setting | This is an alternative approach to import a CA certificate. You can directly fill in (Copy and Paste) the PEM encoded CA certificate string, and click the Apply button to import the specified CA certificate to the gateway. |
| Apply | N/A | Click the Apply button to import the certificate. |
| Cancel | N/A | Click the Cancel button to discard the import operation and the screen will return to the Trusted Certificates page. |

Instead of importing a Trusted CA certificate with mentioned approaches, you can also get the CA certificate from the SECP server.

If **SCEP** is enabled (Refer to **Object Definition > Certificate > Configuration**), you can click **Get CA** button, a Get CA Configuration screen will appear.

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| Get CA Configuration | |
|----------------------|--|
| Item | Setting |
| ▶ SCEP Server | --- Option --- ▼ <input type="button" value="Add Object"/> |
| ▶ CA Identifier | <input type="text"/> (Optional) |

| Get CA Configuration | | |
|----------------------|----------------------------------|--|
| Item | Value setting | Description |
| SCEP Server | A Must filled setting | Select a SCEP Server to identify the SCEP server for use. The server detailed information could be specified in External Servers. Refer to Object Definition > External Server > External Server . You may click Add Object button to generate. |
| CA Identifier | 1. String format can be any text | Fill in optional CA Identifier to identify which CA could be used for signing certificates. |
| Save | N/A | Click Save to save the settings. |
| Close | N/A | Click the Close button to return to the Trusted Certificates page. |

Import Trusted Client Certificate

| Trusted Client Certificate List <input type="button" value="Import"/> <input type="button" value="Delete"/> | | | | | |
|---|------|---------|--------|----------|---------|
| ID | Name | Subject | Issuer | Vaild To | Actions |

When **Import** button is applied, a **Trusted Client Certificate Import** screen will appear. You can import a Trusted Client Certificate from an existed certificate file, or directly paste a PEM encoded string as the certificate.

| Trusted Client Certificate Import from a File | |
|--|--|
| <input type="button" value="Choose File"/> No file chosen | |
| <input type="button" value="Apply"/> <input type="button" value="Cancel"/> | |

| Trusted Client Certificate Import from a PEM | |
|--|--|
| <input type="text"/> | |
| <input type="button" value="Apply"/> <input type="button" value="Cancel"/> | |

Trusted Client Certificate List

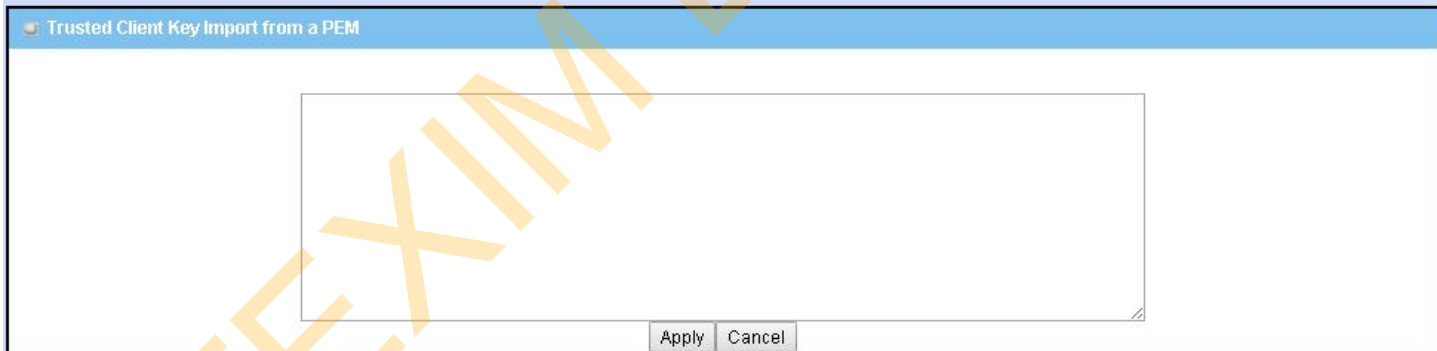
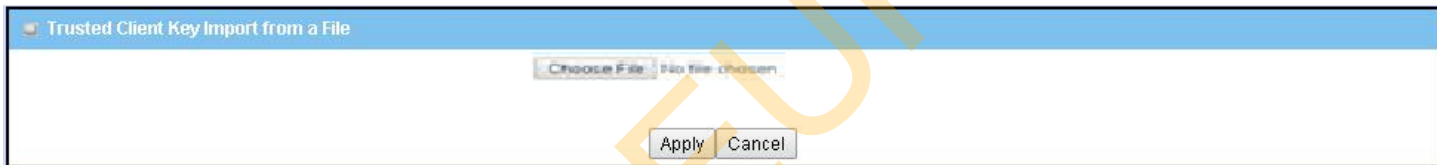
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| Item | Value setting | Description |
|---------------------------|--|--|
| Import from a File | A Must filled setting | Select a certificate file from user's computer, and click the Apply button to import the specified certificate file to the gateway. |
| Import from a PEM | 1. String format can be any text 2. A Must filled setting | This is an alternative approach to import a certificate. You can directly fill in (Copy and Paste) the PEM encoded certificate string, and click the Apply button to import the specified certificate to the gateway. |
| Apply | N/A | Click the Apply button to import certificate. |
| Cancel | N/A | Click the Cancel button to discard the import operation and the screen will return to the Trusted Certificates page. |

Import Trusted Client Key



When **Import** button is applied, a **Trusted Client Key Import** screen will appear. You can import a Trusted Client Key from an existed file, or directly paste a PEM encoded string as the key.



| Trusted Client Key List | | |
|---------------------------|--|--|
| Item | Value setting | Description |
| Import from a File | A Must filled setting | Select a certificate key file from user's computer, and click the Apply button to import the specified key file to the gateway. |
| Import from a PEM | 1. String format can be any text 2. A Must filled setting | This is an alternative approach to import a certificate key. You can directly fill in (Copy and Paste) the PEM encoded certificate key string, and click the Apply button to import the specified certificate key to the gateway. |
| Apply | N/A | Click the Apply button to import the certificate key. |
| Cancel | N/A | Click the Cancel button to discard the import operation and the screen will return to the Trusted Certificates page. |

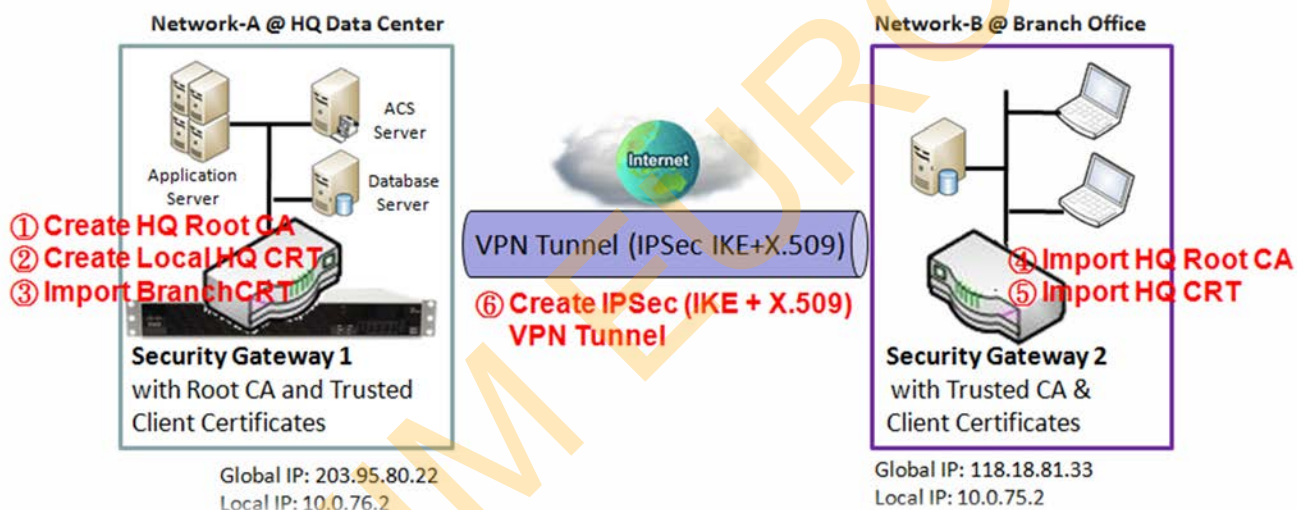
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3.5.4 Issue Certificate

When you have a Certificate Signing Request (CSR) that needs to be certificated by the root CA of the device, you can issue the request here and let Root CA sign it. There are two approaches to issue a certificate. One is from a CSR file importing from the managing PC and another is copy-paste the CSR codes in gateway's web-based utility, and then click on the "Sign" button.

If the gateway signs a CSR successfully, the "Signed Certificate View" window will show the resulted certificate contents. In addition, a "Download" button is available for you to download the certificate to a file in the managing PC.

Self-signed Certificate Usage Scenario



Scenario Application Timing (same as the one described in "My Certificate" section)

When the enterprise gateway owns the root CA and VPN tunneling function, it can generate its own local certificates by being signed by itself. Also imports the trusted certificates for other CAs and Clients. These certificates can be used for two remote peers to make sure their identity during establishing a VPN tunnel.

Scenario Description (same as the one described in "My Certificate" section)

Gateway 1 generates the root CA and a local certificate (HQCRT) signed by itself. Also imports a trusted certificate (BranchCRT) –a BranchCSR certificate of Gateway 2 signed by root CA of Gateway 1.

Gateway 2 creates a CSR (BranchCSR) to let the root CA of the Gateway 1 sign it to be the BranchCRT certificate. Import the certificate into the Gateway 2 as a local certificate. In addition,

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also imports the certificates of the root CA of the Gateway 1 into the Gateway 2 as the trusted ones. (Please also refer to "My Certificate" and "Trusted Certificate" sections).

Establish an IPSec VPN tunnel with IKE and X.509 protocols by starting from either peer, so that all client hosts in these both subnets can communicate with each other.

Parameter Setup Example (same as the one described in "My Certificate" section)

For Network-A at HQ

Following tables list the parameter configuration as an example for the "Issue Certificate" function used in the user authentication of IPSec VPN tunnel establishing, as shown in above diagram. The configuration example must be combined with the ones in "My Certificate" and "Trusted Certificate" sections to complete the setup for whole user scenario.

| | |
|---------------------------|--|
| Configuration Path | [Issue Certificate]-[Certificate Signing Request Import from a File] |
| Browse | <i>C:/BranchCSR</i> |
| Command Button | <i>Sign</i> |

| | |
|---------------------------|--|
| Configuration Path | [Issue Certificate]-[Signed Certificate View] |
| Command Button | <i>Download</i> (default name is "issued.crt") |

Scenario Operation Procedure (same as the one described in "My Certificate" section)

In above diagram, the "Gateway 1" is the gateway of Network-A in headquarters and the subnet of its Intranet is 10.0.76.0/24. It has the IP address of 10.0.76.2 for LAN interface and 203.95.80.22 for WAN-1 interface. The "Gateway 2" is the gateway of Network-B in branch office and the subnet of its Intranet is 10.0.75.0/24. It has the IP address of 10.0.75.2 for LAN interface and 118.18.81.33 for WAN-1 interface. They both serve as the NAT security gateways.

Gateway 1 generates the root CA and a local certificate (HQCRT) that is signed by itself. Import the certificates of the root CA and HQCRT into the "Trusted CA Certificate List" and "Trusted Client Certificate List" of Gateway 2.

Gateway 2 generates a Certificate Signing Request (BranchCSR) for its own certificate BranchCRT to be signed by root CA (Please generate one not self-signed certificate in the Gateway 2, and click on the "View" button for that CSR. Just downloads it). Take the CSR to be signed by the root CA of the Gateway 1 and obtain the BranchCRT certificate (you need rename it). Import the certificate into the "Trusted Client Certificate List" of the Gateway 1 and the "Local Certificate List" of the Gateway 2.

Gateway 2 can establish an IPSec VPN tunnel with "Site to Site" scenario and IKE and X.509 protocols to Gateway 1.

Finally, the client hosts in two subnets of 10.0.75.0/24 and 10.0.76.0/24 can communicate with each other.

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Issue Certificate Setting

Go to Object Definition > Certificate > Issue Certificate tab.

The Issue Certificate setting allows user to import Certificate Signing Request (CSR) to be signed by root CA.

Import and Issue Certificate

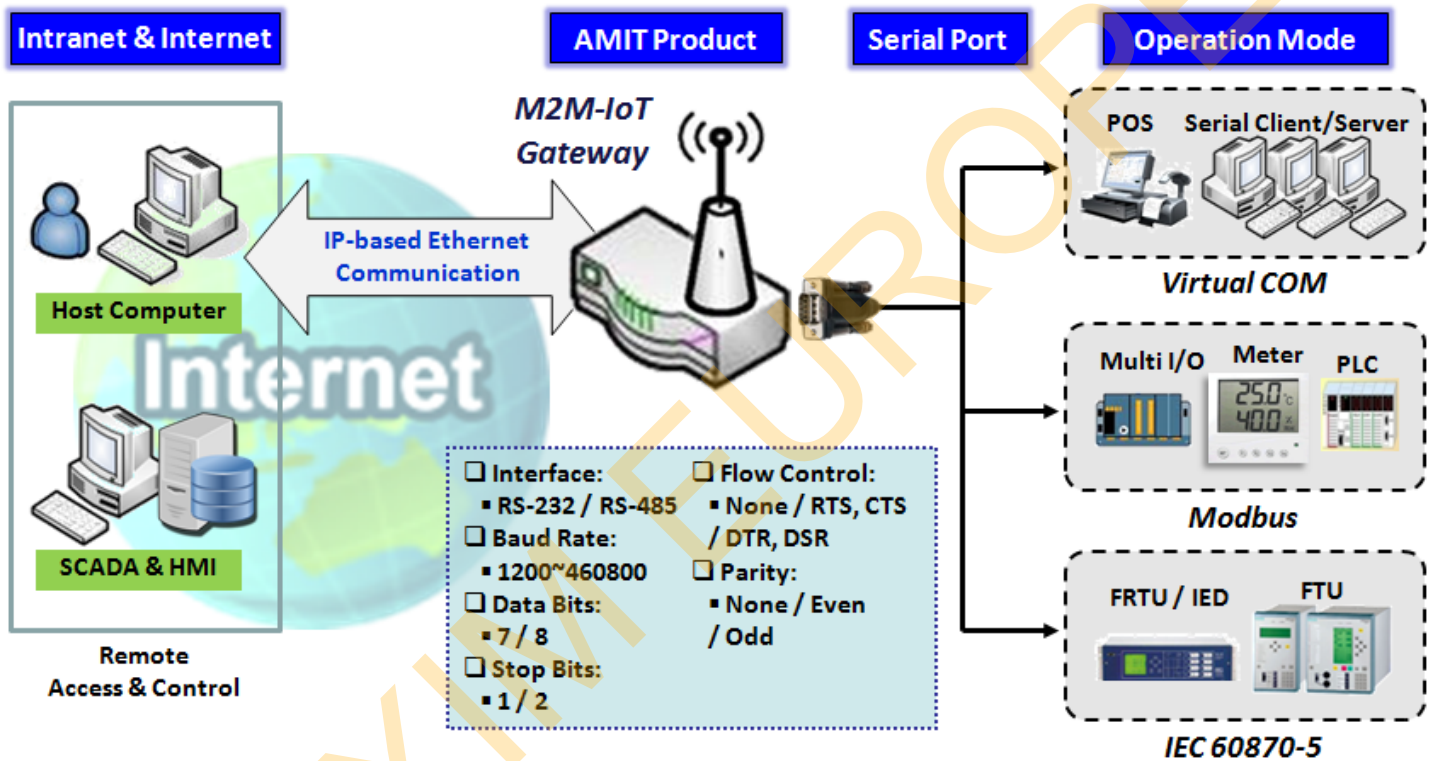
The screenshot shows two sections of the 'Issue Certificate' interface. The first section is titled 'Certificate Signing Request (CSR) Import from a File' and contains a 'Choose File' button and the text 'No file chosen'. The second section is titled 'Certificate Signing Request (CSR) Import from a PEM' and contains a large text area for pasting PEM data and a 'Sign' button.

| Certificate Signing Request (CSR) Import from a File | | |
|--|--|---|
| Item | Value setting | Description |
| Certificate Signing Request (CSR) Import from a File | A Must filled setting | Select a certificate signing request file you're your computer for importing to the gateway. |
| Certificate Signing Request (CSR) Import from a PEM | 1. String format can be any text 2. A Must filled setting | Enter (copy-paste) the certificate signing request PEM encoded certificate to the gateway. |
| Sign | N/A | When root CA is exist, click the Sign button sign and issue the imported certificate by root CA. |

Chapter 4 Field Communication

4.1 Bus & Protocol

The gateway may equip a serial port for various serial communication use through connecting the RS-232 or RS-485 serial device to an IP-based Ethernet LAN. These communication protocols make user access serial devices anywhere over a local LAN or the Internet easily. They can be "Virtual COM" and "Modbus".



4.1.1 Port Configuration

Before using the supported field communication function, like Virtual COM or Modbus, you need to configure the physical communication port first.

The port configuration screen allows user to configure the operation mode and physical layer settings for each serial interface, and also can quick switch from one communication protocol to another for the serial port. The number of ports and type of the supported protocols could be different for the purchased gateway model.

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Port Configuration Setting

Go to **Field Communication > Bus & Protocol > Port Configuration** tab.

In "Port Configuration" page, there is only one configuration window for the serial port settings. The "Configuration" window can let you specify serial port parameters including the operation mode being "Virtual COM", "Modbus" or disabled, the interface being "RS-232" or "RS-485", the baud rate, the data bit length, the stop bit length, the flow control being "RTS/CTS", "DTS/DSR" or "None", and the parity.

| Serial Port Definition | | | | | | | | |
|------------------------|----------------|-----------|-----------|-----------|-----------|--------------|--------|--------|
| Serial Port | Operation Mode | Interface | Baud Rate | Data Bits | Stop Bits | Flow Control | Parity | Action |
| SPort-0 | Disable ▼ | RS-232 ▼ | 9600 ▼ | 8 ▼ | 1 ▼ | None ▼ | None ▼ | Edit |

| Port Configuration Window | | |
|---------------------------|---------------------------|---|
| Item | Value setting | Description |
| Serial Port | N/A | It displays the serial port ID of the serial port. The number of serial ports varies from the purchased model. |
| Operation Mode | Disable is set by default | It displays the current selected operation mode for the serial interface. Depending on the purchase model, the available modes can be Virtual COM, Modbus, and IEC 60870-5. |
| Interface | RS-232 is set by default | Select RS-232 or RS-485 physical interface for connecting to the access device(s) with the same interface specification. |
| Baud Rate | 19200 is set by default | Select the appropriate baud rate for serial device communication. RS-232: 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 RS-485 can use higher baud rate for 230400 and 460800. It depends on the cable length and the installed environment. The longer cable, the lower baud rate for it. |
| Data Bits | 8 is set by default | Select 8 or 7 for data bits. |
| Stop Bits | 1 is set by default | Select 1 or 2 for stop bits. |
| Flow Control | None is set by default | Select None / RTS, CTS / DTS, DSR for Flow Control in RS-232 mode. The supporting of Flow Control depends on the purchased model. |
| Parity | None is set by default | Select None / Even / Odd for Parity bit. |
| Action | N/A | Click Edit button to change the operation mode, or modify the parameters mentioned above for the serial interface communication. |
| Save | N/A | Click Save button to save the settings. |
| Undo | N/A | Click Undo button to cancel the settings. |

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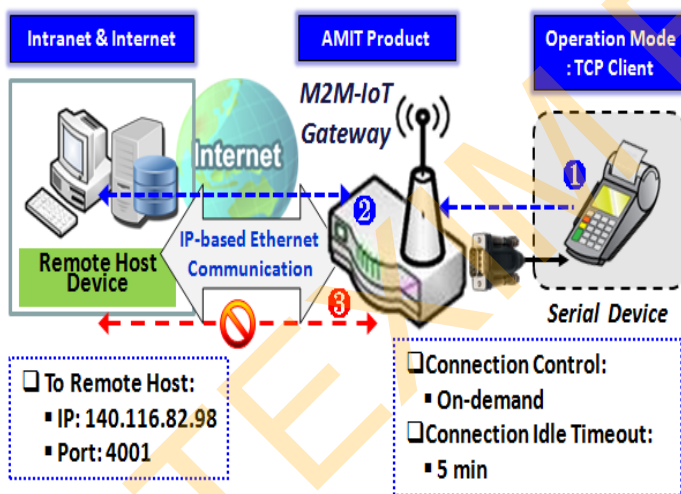
4.1.2 Virtual COM

Create a virtual COM port on user's PC/Host to provide access to serial device connected to the serial port on gateway. Therefore, users can access, control, and manage the connected serial device through Internet (fixed line, or cellular network) anywhere. This application is also known as Ethernet pass-through communication.

| Operation Mode Definition for each Serial Port | | | | | | | | | |
|--|----------------|-------------------|------------|----------------|--------------------|-------------------------|---------------------|--------------------------|--------|
| Serial Port | Operation Mode | Listen Port | Trust Type | Max Connection | Connection Control | Connection Idle Timeout | Alive Check Timeout | Enable | Action |
| SPort-0 | Disable | 4001 (1~65535) | Allow All | 1 | Always on | 0 (0-3600secs) | 0 (0-3600secs) | <input type="checkbox"/> | Edit |

Virtual COM setting screen enables user to connect a Virtual COM port based device to the Internet. It allows user to access serial data remotely. There are Disable, TCP Client, TCP Server, UDP, and RFC2217 modes for remote accessing the connected serial device. These operation modes are illustrated as below.

TCP Client Mode

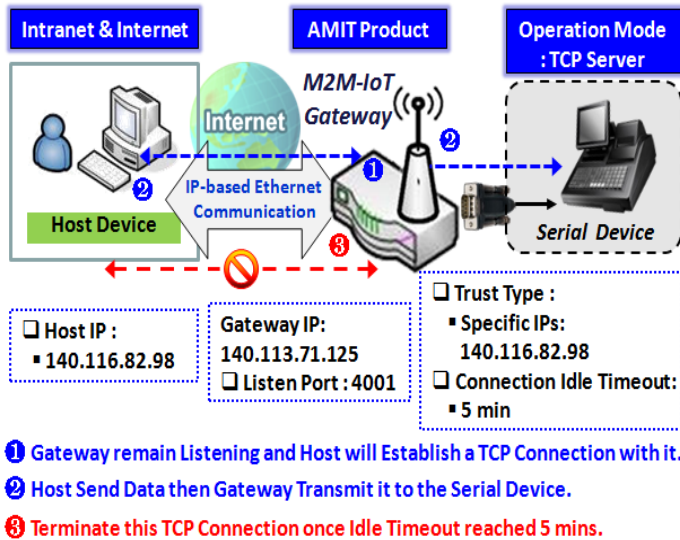


When the administrator expects the gateway to actively establish a TCP connection to a pre-defined host computer when serial data arrives, the operation mode for the "Virtual COM" function is required to be "TCP Client" and when the connection control of virtual COM is "On-demand", once the gateway receives data from the connected serial device, it will establish a TCP connection to transfer the received serial data to the remote host. Besides, after the data has been transferred, the gateway automatically disconnects the established TCP session from the host computer by using the TCP alive check timeout or idle timeout settings.

- ① Gateway get Data received from Serial Device.
- ② Establish a TCP Connection and Transmit Data to Remote Host.
- ③ Terminate this TCP Connection once Idle Timeout reached 5 mins.

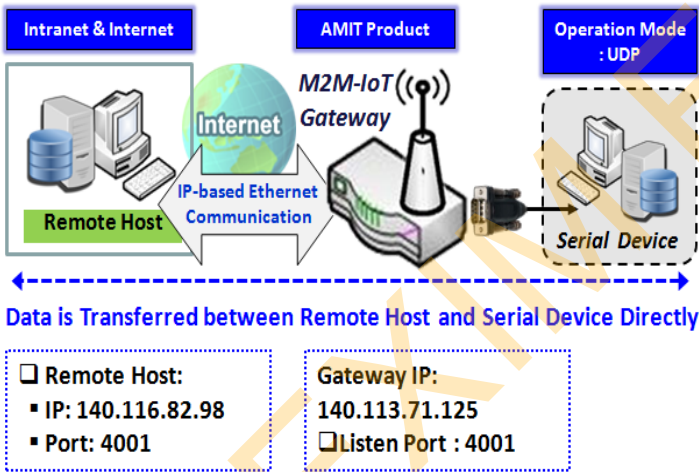
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TCP Server Mode



When the administrator expects the gateway to wait passively for the serial data requests from the Host Device (usually we use a computer to play as a Host), and the Host will establish a TCP connection to get data from the serial device, the operation mode for the "Virtual COM" function is required to be "TCP Server". In this mode, the gateway provides a unique "IP: Port" address on a TCP/IP network. It supports up to 4 simultaneous connections, so that multiple hosts can collect data from the same serial device at the same time. After the data has been transferred, the TCP connection will be automatically disconnected from the host computer by using the TCP alive check timeout or idle timeout settings.

UDP Mode

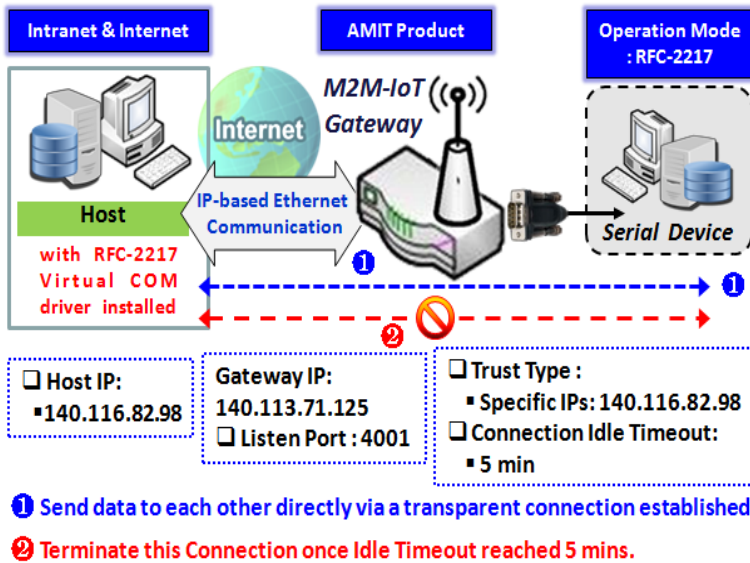


If both the Remote Host Computer and the serial device are expected to initiate a data transfer when it requires doing that, the operation mode for the "Virtual COM" function in the gateway is required to be "UDP". In this mode, the UDP data can be transferred between the gateway and multiple host computers from either peer, making this mode ideal for message display applications.

The remote host computer can directly send UDP data to the serial device via the gateway, and also receive UDP data from the serial device via the gateway at the same time. The gateway supports up to 4 legal hosts to connect simultaneously to the serial device via the gateway.

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RFC-2217 Mode



RFC-2217 defines general COM port control options based on telnet protocol. A host computer with RFC-2217 driver installed can monitor and manage the remote serial device attached to the gateway's serial port, as though they were connected to the local serial port. When a virtual serial port on the local serial device is being created, it is required to specify the IP-address of the host computers to establish connection with.

Any 3rd party driver supporting RFC2217 can be used to install in the host computer, the driver establishes a transparent connection between host and serial device by mapping the IP:Port of the gateway's serial port to a virtual local COM

port on the host computer.

The host computer can directly send data to the serial device via the gateway, and also receive data from the serial device via the gateway at the same time. The gateway supports up to 4 Internet host computers.

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Virtual COM Setting

Virtual COM setting screen enables user to connect a Virtual COM port based device to the Internet. It allows user to access serial data remotely. There are Disable, TCP Client, TCP Server, UDP, and RFC2217 modes for remote accessing the connected serial device. By default, it is configured in Disable mode.

To use the Virtual COM function, you have to specify the operation mode for the multi-function serial port first. Go to **Field Communication > Bus & Protocol > Port Configuration** tab, select the Virtual COM as expected operation mode, and finish the related port configuration as well.

After that, go to **Field Communication > Bus & Protocol > Virtual COM** tab for detailed configuration of Virtual COM setting.

Enable TCP Client Mode

Configure the gateway as the TCP (Transmission Control Protocol) Client. In TCP Client mode, device initiates a TCP connection with a TCP server when there is data to transmit. Device disconnects from the server when the connection is Idle for a specified period. You may also enable full time connection with the TCP server.

| Operation Mode Definition for each Serial Port | | | | | | | | | |
|--|----------------|-------------|------------|----------------|--------------------|-------------------------|---------------------|--------------------------|--------|
| Serial Port | Operation Mode | Listen Port | Trust Type | Max Connection | Connection Control | Connection Idle Timeout | Alive Check Timeout | Enable | Action |
| SPort-0 | TCP Client | N/A | N/A | N/A | Always on | N/A | N/A | <input type="checkbox"/> | Edit |

| Enable TCP Client Mode Window | | |
|--------------------------------|---|--|
| Item | Value setting | Description |
| Operation Mode | A Must filled setting | Select TCP Client . |
| Connection Control | Always on is set by default | Choose Always on for a TCP full time connection. Otherwise, choose On-Demand to initiate TCP connection only when required to transmit and disconnect at idle timeout. |
| Connection Idle Timeout | 1. 0 is set by default 2. Range 0 to 3600 sec. | Enter the idle timeout in minutes. The idle timeout is used to disconnect the TCP connection when idle time elapsed . Idle timeout is only available when On-Demand is selected in the Connection Control field. Value Range: 0 ~ 3600 seconds. |
| Alive Check Timeout | 1. 0 is set by default 2. Range 0 to 3600 sec. | Enter the time period of alive check timeout. The TCP connection will be terminated if it doesn't receive response of alive-check longer than this timeout setting Alive check timeout is only available when On-Demand is selected in the Connection Control field. Value Range: 0 ~ 3600 seconds. |
| Enable | The box is unchecked by default. | Check the Enable box to activate the corresponding serial port in specified operation mode. |
| Save | N/A | Click the Save button to save the configuration |

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Specify Data Packing Parameters

| Data Packing (for TCP Client, TCP Server and UDP operation mode) | | | | |
|--|---|---|---|---|
| Serial Port | Data Buffer Length | Delimiter Character 1 | Delimiter Character 2 | Data Timeout Transmit |
| SPort-0 | <input type="text" value="0"/> (0~1024) | <input type="text" value="0"/> (Hex) <input type="checkbox"/> Enable | <input type="text" value="0"/> (Hex) <input type="checkbox"/> Enable | <input type="text" value="0"/> (0~1000ms) |

| Data Packing Configuration | | |
|------------------------------|--|--|
| Item | Value setting | Description |
| Data Buffer Length | 1.An optional filled setting 2.Default value is 0 | Enter the data buffer length for the serial port. Value Range: 0 ~ 1024. |
| Delimiter Character 1 | 1.An optional filled setting 2.Default value is 0 | Check the Enable box to activate the Delimiter character 1, and enter the Hex code for it. Value Range: 0x00 ~ 0xFF. |
| Delimiter Character 2 | 1.An optional filled setting 2.Default value is 0 | Check the Enable box to activate the Delimiter character 2, and enter the Hex code for it. Value Range: 0x00 ~ 0xFF. |
| Data Timeout Transmit | 1.An optional filled setting 2.Default value is 0 | Enter the data timeout interval for transmitting serial data through the port. By default, it is set to 0 and the timeout function is disabled. Value Range: 0 ~ 1000ms. |
| Save | N/A | Click the Save button to save the configuration |

Specify Remote TCP Server

| Legal Host IP/ FQDN Definition (for TCP Client operation mode) | | | | | |
|--|----------------|-------------|-------------|--------------------------|-------------------------------------|
| ID | To Remote Host | Remote Port | Serial Port | Definition Enable | Action |
| 1 | | 4001 | SPort-0 | <input type="checkbox"/> | <input type="button" value="Edit"/> |
| 2 | | 4001 | SPort-0 | <input type="checkbox"/> | <input type="button" value="Edit"/> |
| 3 | | 4001 | SPort-0 | <input type="checkbox"/> | <input type="button" value="Edit"/> |
| 4 | | 4001 | SPort-0 | <input type="checkbox"/> | <input type="button" value="Edit"/> |

| Specify TCP Server Window | | |
|---------------------------|--|--|
| Item | Value setting | Description |
| To Remote Host | A Must filled setting | Press Edit button to enter IP address or FQDN of the remote TCP server to transmit serial data. |
| Remote Port | 1.A Must filled setting 2.Default value is 4001 | Enter the TCP port number. This is the listen port of the remote TCP server. Value Range: 1 ~ 65535. |
| Serial Port | SPort-0 is set by default | Apply the TCP server connection for a selected serial port. Up to 4 TCP servers can be configured at the same time for each serial port. |

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| | | |
|--------------------------|---------------------------------|---|
| Definition Enable | The box is unchecked by default | Check the Enable box to enable the TCP server configuration. |
| Save | N/A | Click the Save button to save the configuration |

Enable TCP Server Mode

Configure the gateway as the TCP (Transmission Control Protocol) Server. The TCP Server waits for connections to be initiated by a remote TCP client device to receive serial data. The setting allows user to specify specific TCP clients or allow any to send serial data for serial data transmission bandwidth control and access control. The TCP Server supports up to 128 simultaneous connections to receive serial data from multiple TCP clients.

| Operation Mode Definition for each Serial Port | | | | | | | | | |
|--|----------------|-------------|------------|----------------|--------------------|-------------------------|---------------------|--------------------------|--------|
| Serial Port | Operation Mode | Listen Port | Trust Type | Max Connection | Connection Control | Connection Idle Timeout | Alive Check Timeout | Enable | Action |
| SPort-0 | TCP Server | 4001 | Allow All | 1 | N/A | 0 sec(s) | 0 sec(s) | <input type="checkbox"/> | Edit |

| Enable TCP Server Mode Window | | |
|--------------------------------|---|--|
| Item | Value setting | Description |
| Operation Mode | A Must filled setting | Select TCP Server mode. |
| Listen Port | 4001 is set by default | Indicate the listening port of TCP connection. Value Range: 1 ~ 65535. |
| Trust Type | Allow All is set by default | Choose Allow All to allow any TCP clients to connect. Otherwise choose Specific IP to limit certain TCP clients. |
| Max Connection | 1. Max. 128 connections 2. 1 is set by default | Set the maximum number of concurrent TCP connections. Up to 128 simultaneous TCP connections can be established. Value Range: 1 ~ 128. |
| Connection Idle Timeout | 1. 0 is set by default 2. Range 0 to 3600 sec. | Enter the idle timeout in minutes. The idle timeout is used to disconnect the TCP connection when idle time elapsed . Idle timeout is only available when On-Demand is selected in the Connection Control field. Value Range: 0 ~ 3600 seconds. |
| Alive Check Timeout | 1. 0 is set by default 2. Range 0 to 3600 sec. | Enter the time period of alive check timeout. The TCP connection will be terminated if it doesn't receive response of alive-check longer than this timeout setting Alive check timeout is only available when On-Demand is selected in the Connection Control field. Value Range: 0 ~ 3600 seconds. |
| Enable | The box is unchecked by default. | Check the Enable box to activate the corresponding serial port in specified operation mode. |
| Save | N/A | Click Save button to save the settings. |

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Specify TCP Clients for TCP Server Access

If you selected **Specific IPs** as the trust Type, the Trusted IP Definition window appears. The settings are valid for both TCP Server and RFC-2217 modes.

| Trusted IP Definition (for TCP Server & RFC-2217 operation mode) | | | | |
|--|------|-------------|--------------------------|--------|
| ID | Host | Serial Port | Definition Enable | Action |
| 1 | | | <input type="checkbox"/> | Edit |
| 2 | | | <input type="checkbox"/> | Edit |
| 3 | | | <input type="checkbox"/> | Edit |
| 4 | | | <input type="checkbox"/> | Edit |
| 5 | | | <input type="checkbox"/> | Edit |
| 6 | | | <input type="checkbox"/> | Edit |
| 7 | | | <input type="checkbox"/> | Edit |
| 8 | | | <input type="checkbox"/> | Edit |

| Specify TCP Clients Window | | |
|----------------------------|---------------------------------|---|
| Item | Value setting | Description |
| Host | A Must filled setting | Enter the IP address range of allowed TCP clients. |
| Serial Port | The box is unchecked by default | Check the box to specify the rule for selected Serial Port. |
| Definition Enable | The box is unchecked by default | Check the Enable box to enable the rule. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

Enable UDP Mode

UDP (User Datagram Protocol) enables applications using UDP socket programs to communicate with the serial ports on the serial server. The UDP mode provides connectionless communications, which enable you to multicast data from the serial device to multiple host computers, and vice versa, making this mode ideal for message display applications.

| Operation Mode Definition for each Serial Port | | | | | | | | | |
|--|----------------|-------------|------------|----------------|--------------------|-------------------------|---------------------|--------------------------|--------|
| Serial Port | Operation Mode | Listen Port | Trust Type | Max Connection | Connection Control | Connection Idle Timeout | Alive Check Timeout | Enable | Action |
| SPort-0 | UDP | 4001 | N/A | N/A | N/A | N/A | N/A | <input type="checkbox"/> | Edit |

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| Enable UDP Mode Window | | |
|------------------------|----------------------------------|--|
| Item | Value setting | Description |
| Operation Mode | A Must filled setting | Select UDP mode. |
| Listen Port | 4001 is set by default | Indicate the listening port of UDP connection. Value Range: 1 ~ 65535 |
| Enable | The box is unchecked by default. | Check the Enable box to activate the corresponding serial port in specified operation mode. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

Specify Remote UDP

| Legal Host IP Definition (for UDP operation mode) | | | | | |
|---|-------------|-------------|-------------|--------------------------|--------|
| ID | Remote Host | Remote Port | Serial Port | Definition Enable | Action |
| 1 | | 4001 | SPort-0 | <input type="checkbox"/> | Edit |
| 2 | | 4001 | SPort-0 | <input type="checkbox"/> | Edit |
| 3 | | 4001 | SPort-0 | <input type="checkbox"/> | Edit |
| 4 | | 4001 | SPort-0 | <input type="checkbox"/> | Edit |

| Specify Remote UDP hosts Window | | |
|---------------------------------|---------------------------------|--|
| Item | Value setting | Description |
| Host | A Must filled setting | Press Edit button to enter IP address range of remote UDP hosts. |
| Remote Port | 4001 is set by default | Indicate the UDP port of peer UDP hosts. Value Range: 1 ~ 65535 |
| Serial Port | SPort-0 is set by default | Apply the UDP hosts for a selected serial port. Up to 4 UDP servers can be configured at the same time for each serial port. |
| Definition Enable | The box is unchecked by default | Check the Enable box to enable the rule. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

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Enable RFC-2217 Mode

RFC-2217 defines general COM port control options based on telnet protocol. With the RFC-2217 mode, remote host can monitor and manage remote serially attached devices, as though they were connected to the local serial port. When a virtual serial port on the local serial device is being created, it is required to specify the IP-address of the remote hosts to establish connection with.

| Operation Mode Definition for each Serial Port | | | | | | | | | |
|--|----------------|-------------|------------|----------------|--------------------|-------------------------|---------------------|--------------------------|--------|
| Serial Port | Operation Mode | Listen Port | Trust Type | Max Connection | Connection Control | Connection Idle Timeout | Alive Check Timeout | Enable | Action |
| SPort-0 | RFC-2217 | 4001 | Allow All | N/A | N/A | 0 sec(s) | 0 sec(s) | <input type="checkbox"/> | Edit |

| Enable RFC-2217 Mode Window | | |
|--------------------------------|---|--|
| Item | Value setting | Description |
| Operation Mode | A Must filled setting | Select RFC-2217 mode. |
| Listen Port | 4001 is set by default | Indicate the listening port of RFC-2217 connection. Value Range: 1 ~ 65535 |
| Trust Type | Allow All is set by default | Choose Allow All to allow any clients to connect. Otherwise choose Specific IP to limit certain clients. |
| Connection Idle Timeout | 1. 0 is set by default 2. Range 0 to 3600 sec. | Enter the idle timeout in minutes. The idle timeout is used to disconnect the TCP connection when idle time elapsed. Idle timeout is only available when On-Demand is selected in the Connection Control field. Value Range: 0 ~ 3600 seconds. |
| Alive Check Timeout | 1. 0 is set by default 2. Range 0 to 3600 sec. | Enter the time period of alive check timeout. The TCP connection will be terminated if it doesn't receive response of alive-check longer than this timeout setting Alive check timeout is only available when On-Demand is selected in the Connection Control field. Value Range: 0 ~ 3600 seconds. |
| Enable | The box is unchecked by default. | Check the Enable box to activate the corresponding serial port in specified operation mode. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

Industrial LoRa Gateway

Specify Remote Host for Access

If you selected **Specific IPs** as the trust Type, the Trusted IP Definition window appears. The settings are valid for both TCP Server and RFC-2217 modes.

| Trusted IP Definition (for TCP Server & RFC-2217 operation mode) | | | | |
|--|------|-------------|--------------------------|--------|
| ID | Host | Serial Port | Definition Enable | Action |
| 1 | | | <input type="checkbox"/> | Edit |
| 2 | | | <input type="checkbox"/> | Edit |
| 3 | | | <input type="checkbox"/> | Edit |
| 4 | | | <input type="checkbox"/> | Edit |
| 5 | | | <input type="checkbox"/> | Edit |
| 6 | | | <input type="checkbox"/> | Edit |
| 7 | | | <input type="checkbox"/> | Edit |
| 8 | | | <input type="checkbox"/> | Edit |

Specify RFC-2217 Clients for Access Window

| Item | Value setting | Description |
|--------------------------|---------------------------------|---|
| Host | A Must filled setting | Enter the IP address range of allowed clients. |
| Serial Port | The box is unchecked by default | Check the box to specify the rule for selected Serial Port. |
| Definition Enable | The box is unchecked by default | Check the Enable box to enable the rule. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

Industrial LoRa Gateway

4.1.3 Modbus

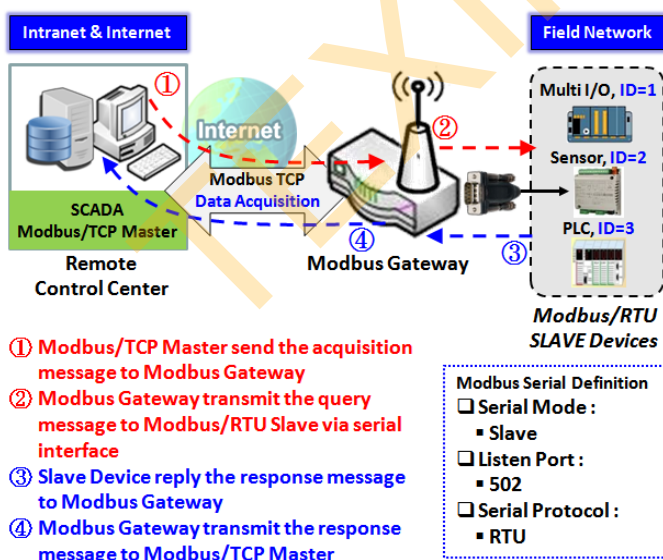
Modbus is one of the most popular automation protocols in the world, supporting traditional RS-232/422/485 devices and recently developed Ethernet devices. Many industrial devices, such as PLCs, DCSs, HMIs, instruments, and smart meters, use Modbus protocol as the communication standard. It is used to establish master-slave communication between intelligent devices.

However, the Ethernet-based Modbus protocol is so different from the original serial-based protocols. In order to integrate Modbus networks, the IoT Gateway, including one or more serial ports that support RS-232 and RS-485 communication interface, can automatically and intelligently translate between Modbus TCP (Ethernet) and Modbus RTU/ASCII (serial) protocols, allowing Ethernet-based PLCs to control instruments over RS-485 without additional programming or effort.

| Serial Port Definition | | | | | | | | |
|------------------------|----------------|-----------|-----------|-----------|-----------|--------------|--------|--------|
| Serial Port | Operation Mode | Interface | Baud Rate | Data Bits | Stop Bits | Flow Control | Parity | Action |
| SPort-0 | Modbus | RS-485 | 115200 | 8 | 1 | None | None | Edit |

NOTE: When Modbus devices are connected to/under the same serial port of IoT Modbus Gateway, those Modbus devices must use the same protocol with the same configuration (i.e., either Modbus RTU or Modbus ASCII with same Baud Rate setting).

Modbus Gateway Scenario



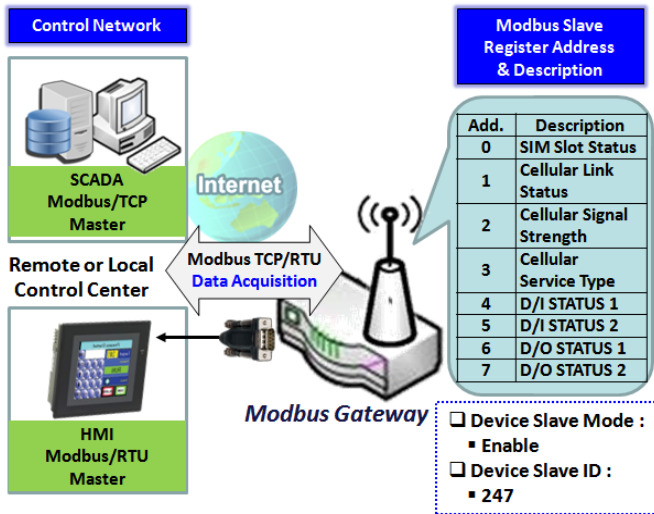
The IoT Gateway serves as a Modbus gateway to communicate with the Modbus TCP Master, the SCADA Server, located at remote control center for Modbus device accessing.

The Modbus TCP Master requests the IoT Gateway for Modbus devices' information, e.g., Data Acquisition or Register/Value Modification, via general Internet accessing, and the IoT Gateway serves as the gateway for data forwarding.

Under such configuration, the Modbus TCP Master requests the information from or sending control commands to various Modbus/RTU Slave devices that attached to the Modbus Gateway. And the Modbus gateway executes corresponding processes and replies the Modbus/TCP Master with the results.

Industrial LoRa Gateway

Modbus Slave Scenario



In addition to behave as a Modbus Gateway, there is an integrated Modbus Slave option for providing some device status, like Cellular Network Status, device DI/DO status, to remote Modbus Master via Modbus communication.

With the Slave option enabled, the Modbus Master device can request the information or sending control commands to the IoT Gateway, the Modbus TCP/RTU Slave device. And IoT Gateway executes corresponding processes and replies the Modbus Master devices.

Industrial LoRa Gateway

Modbus Setting

Go to **Field Communication > Bus & Protocol > Modbus** tab.

The Modbus setting page enables user to configure the gateway to operate as a Modbus gateway, and allow access among Modbus TCP devices (which are connected to Ethernet network) and Modbus RTU/ASCII devices (which are connected to the Serial Port of the gateway). Once completed the Modbus settings in this section, ensure to select Modbus Operation Mode in Port Configuration screen to enable Modbus communication on the serial port.

Define Modbus Gateway function for each Serial Port

| Modbus Gateway Definition | | | | | | |
|---------------------------|--------------|---------------------|-------------|-----------------|--------------------------|--------|
| Serial Port | Gateway Mode | Device Slave Mode | Listen Port | Serial Protocol | Enable | Action |
| ▶ SPort-0 | Disable | Slave Mode: Disable | 502 | RTU | <input type="checkbox"/> | Edit |

| Modbus Gateway Definition | | |
|---------------------------|--|--|
| Item | Value setting | Description |
| Serial Port | N/A | It displays the name of the serial port used. E.g. SPort-0. The number of serial ports varies from the purchased model. |
| Gateway Mode | Disable is set by default | Specify the Modbus gateway mode for the selected serial port. It can be Disable , Serial as Slave or Serial as Master . A serial port can be attached with one Modbus Master, or daisy-chained a group of Modbus Slave devices. Disable: Select this to disable the respective Modbus gateway function for the selected serial port. Serial as Slave: Select this when the attached serial device(s) are all Modbus Slave devices. Serial as Master: Select this when the attached serial device is a Modbus Master device. |
| Device Slave Mode | The box is unchecked by default. | Check the Enable box to activate the integrated Modbus Slave function, and enter the preferred ID for the integrated Modbus slave. So that, it can function as a Modbus Slave device, and can be accessed with legacy Modbus Function Code from a SCADA management system. Supported Modbus commands are listed in the following Table. Value Range: 1 ~ 247. |
| Listen Port | 1. 502 is set by default 2. Range 1 to 65535 | Specify the Listen Port number if Slave device(s) is attached to the selected serial port. It is a don't care setting if a Master device is attached. |

Industrial LoRa Gateway

| | | |
|------------------------|-----------------------|--|
| | | <p>Value Range: 1 ~ 65535.</p> <p>Note: Use different port number among the serial ports for the product with multiple serial ports.</p> |
| Serial Protocol | RTU is set by default | Select the serial protocol that is adopted by the attached Modbus device(s). It can be RTU or ASCII . |
| Enable | N/A | It displays whether the specific Modbus serial port is enabled or disabled. To enable or disable Modbus serial port, go to Field Communication > Bus & Protocol > Port Configuration tab, and set the operation mode as Modbus . |

Specify Gateway Configuration

| Gateway Mode Configuration for SPort-0 | |
|--|---------------------------------|
| Item | Setting |
| ▶ Response Timeout | 1000 ms (1~65535) |
| ▶ Timeout Retries | 0 times (0~5) |
| ▶ 0Bh Exception | <input type="checkbox"/> Enable |
| ▶ Tx Delay | <input type="checkbox"/> Enable |
| ▶ TCP Connection Idle Time | 300 sec (1~65535) |
| ▶ Maximum TCP Connections | 1 connections (1~4) |
| ▶ TCP Keep-alive | <input type="checkbox"/> Enable |
| ▶ Modbus Master IP Access | Allow All ▼ |
| ▶ Message Buffering | <input type="checkbox"/> Enable |

| Gateway Mode Configuration for SPort-n | | |
|--|---------------------------|---|
| Item | Value setting | Description |
| Response Timeout | 1000 ms is set by default | <p>This sets the response timeout of the slave after master request sent. If the slave does not response within the specified time, data would be discarded.</p> <p>This applies to the serially attached Master sent request over to the remote Slave or requests send from the remote Master sent to the serially attached Slave.</p> <p>Value Range: 1 ~ 65535.</p> |
| Timeout Retries | 0 is set by default | <p>If the slave does not respond to the Master's request, the gateway will resend the request stored in the buffer. If Timeout retries is set to null (value zero), the gateway would not buffer Master requests. If a value other than zero is specified, the gateway would store the Master request in the buffer and retries to send the request in a number of specified times.</p> <p>Once the retries are exhausted, the gateway will send a Modbus error message</p> |

Industrial LoRa Gateway

| | | |
|----------------------|----------------------------------|--|
| | | to the Master. However, if the 0Bh exception box is checked (see below), a 0Bh hex code based-error message will be send instead. Value Range: 0 ~ 5. |
| 0Bh Exception | The box is unchecked by default. | Check the Enable box to enable gateway to send a 0Bh exception code message to Modbus Master to indicate that the slave device does not respond within the timeout interval. |
| Tx Delay | The box is unchecked by default. | Check the Enable box to activate to the minimum amount of time after receiving a response before the next message can be sent out. When Tx Delay is enabled the Gateway would insert a Tx delay between Master requests. The delay gives sufficient time for the slave devices to turn their transmitters off and their receivers back on. |

Setup TCP/IP Connection for Receiving Modbus Master Request

The following Modbus TCP Configuration items allow user to set up the TCP connection settings so that the remote Modbus Master can access to the Modbus gateway. Besides, it also allows user to specify authorized masters on the TCP network.

| Item | Value setting | Description |
|---------------------------------|--|---|
| TCP Connection Idle Time | 1. 300 is set by default 2. Range 1 to 65535 | Enter the idle timeout in seconds. If the gateway does not receive another TCP request before the idle timeout elapsed, the TCP session will be terminated automatically. Value Range: 1 ~ 65535. |
| Maximum TCP Connections | 1. 4 is set by default 2. Range 1 to 4 | Enter the allowed maximum simultaneous TCP connections. Value Range: 1 ~ 4. |
| TCP Keep-alive | The box is unchecked by default. | Check the Enable box to ensure to keep the TCP session connected. |
| Modbus Master IP Access | Allow All is selected by default. | Specify authorized masters on the TCP network. Select Allow All to allow any Modbus Master to reach the attached Slave(s). Otherwise, limit only specific Master to reach the Slave(s) by selecting Specific IPs . When Specific IPs is selected, a Trusted IP Definition dialog will appear. |

Specify Trusted Modbus Masters on the TCP network

When **Specific IPs** is selected, user has to specify the Master(s) by their IP addresses to reach the serially attached Slave(s).

Industrial LoRa Gateway

| | | | | |
|---------------------------|----------------|-----------------------|--------------------------|--------|
| ▶ Modbus Master IP Access | Specific IPs ▼ | | | |
| ▶ Trusted IP Definition | ID | Source IP | Enable | Action |
| | 1 | Specific IP Address ▼ | <input type="checkbox"/> | Edit |
| | 2 | | <input type="checkbox"/> | Edit |
| | 3 | | <input type="checkbox"/> | Edit |
| | 4 | | <input type="checkbox"/> | Edit |

| Item | Value setting | Description |
|-----------|----------------------|---|
| Source IP | A Must fill setting | <p>Select Specific IP Address to only allow an IP address of the allowed Master to access the attached Slave(s).</p> <p>Select IP Range to only allow a set range of IP addresses of the allowed Master to access the attached Slave(s).</p> <p>Select IP Address-based Group to only allow pre-defined group of IP address of the allowed Master to access the attached Slave(s).</p> <p>Note: group must be pre-defined before this selection become available. Refer to Object Definition > Grouping > Host grouping. You may also access to create a group by the Add Rule shortcut button. Setting done through the Add Rule button will also appear in the Host grouping setting screen.</p> <p>Then check Enable box to enable this rule.</p> |
| Enable | Unchecked by default | Check the Enable box to enable this rule. |

Modbus Priority Definition

Message Buffering must be enabled to prioritize Master request queue to transmit to Modbus Slave as mentioned in the above. Click the **Edit** button to fill in the priority settings.

| | | | | |
|------------------------------|--|---------------|--------------------------|--------|
| ▶ Message Buffering | <input checked="" type="checkbox"/> Enable | | | |
| ▶ Modbus Priority Definition | Modbus Priority | Priority Base | Enable | Action |
| | ▶ Modbus Priority 1 | IP Address ▼ | <input type="checkbox"/> | Edit |
| | ▶ Modbus Priority 2 | | <input type="checkbox"/> | Edit |
| | ▶ Modbus Priority 3 | | <input type="checkbox"/> | Edit |
| | ▶ Modbus Priority 4 | | <input type="checkbox"/> | Edit |

Industrial LoRa Gateway

| Item | Value setting | Description |
|--------------------------|--|---|
| Message Buffering | 1. Unchecked by default 2. Buffer up to 32 requests | Check the Enable box to buffer up to 32 requests from Modbus Master. If the Enable box is checked, a Modbus Priority Definition dialog will appear consequently. So that, the buffered Master requests can further be configured to prioritize request queue to transmit to Slave based on Master's IP address if requests are coming from remote Master, or based on remote Slave ID if requests are coming from serially attached Master, or based on Function Code. |
| Modbus Priority | N/A | A Priority List for setting the priority of specified Modbus identity. Modbus Priority 1 ~ Modbus Priority 4. |
| Priority Base | IP Address by Default | User can specify a Modbus identity with IP Address , Slave ID , or Function Code . The buffered Modbus message that matched the specified identity will be handled with given priority. The Modbus Master requests can be buffered to a certain priority queue according to the Master's IP address if requests are coming from remote Master, or the remote Slave's device ID if requests are coming from serially attached Master, or the specific Function Code that issued by Master. |
| Enable | Unchecked by default | Check the Enable box to enable the priority settings. |
| Save | N/A | Click the Save button to save the settings. |

Specify Modbus TCP Slave device(s)

If there is a Modbus Master device is attached to a certain serial port of the Modbus Gateway, user has to further specify the Modbus TCP Slave device(s) to send requests to from the attached Modbus RTU/ASCII Master device.

| Modbus TCP Slave List for SPort-0 <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | |
|--|----|------|----------|--------|---------|
| ID | IP | Port | ID Range | Enable | Actions |
| | | | | | |

When the **Add** button is applied, a **Modbus TCP Slave Configuration** screen will appear.

| Modbus TCP Slave Configuration for SPort-0 | |
|--|---|
| Item | Setting |
| ▶ IP | <input type="text"/> |
| ▶ Port | <input type="text"/> (1~65535) |
| ▶ ID Range | <input type="text"/> (1~247) ~ <input type="text"/> (1~247) |
| ▶ Enable | <input type="checkbox"/> |

| Modbus Remote Slave Configuration | | |
|-----------------------------------|---|--|
| Item | Value setting | Description |
| IP | A Must fill setting | Enter the IP address of the remote Modbus TCP Slave device. |
| Port | 1. A Must fill setting 2. Range 1 to 65535 | Enter the TCP port on which the remote Modbus TCP Slave device listens (to the TCP client session request). <u>Value Range:</u> 1 ~ 65535. |

Industrial LoRa Gateway

| | | |
|-----------------|-----------------------------|--|
| ID Range | Range 1 to 247 | Enter the Modbus ID range for the Modbus TCP Slave(s) that will respond to the Master's request. In addition to specify the Slave IP and Port, for accessing those Remote Modbus RTU Slave(s) located behind another Modbus Gateway, user has to specify the Modbus ID range of the Modbus RTU Slave(s). <i>Value Range: 1 ~ 247.</i> |
| Enable | It is unchecked by default. | Check the Enable box to enable this rule. |
| Save | N/A | Click the Save button to save the settings. |

TEXIM EUROPE

Industrial LoRa Gateway

Supported Function Code for Integrated Modbus Slave

This setting can setup the Gateway as a standalone Modbus Slave Device. Local SCADA Management System can treat the Gateway as a Slave device, and hence is able to read its information for device monitoring.

Currently, the integrated Modbus Slave device supports the following commands for accessing the 3G/4G Modem Status of the Gateway.

Function Code: 0x03(/Read). 0x06(/Write)

Address: 0 ~ 9999

| Register Address | Register Name | R / W | Register Range / Description |
|------------------|--------------------------------|-------|---|
| 0 | WAN-1 Connection Status | R | 0 ~ 6, 0=Disconnected, 1=Connecting..., 2=Connected, 3=Disconnecting..., 5=Wait for Traffic..., 6=Diconnected |
| 1 | WAN-2 Connection Status | R | 0 ~ 6, 0=Disconnected, 1=Connecting..., 2=Connected, 3=Disconnecting..., 5=Wait for Traffic..., 6=Diconnected |
| 2 | WAN-3 Connection Status | R | 0 ~ 6, 0=Disconnected, 1=Connecting..., 2=Connected, 3=Disconnecting..., 5=Wait for Traffic..., 6=Diconnected |
| 3 | WAN-4 Connection Status | R | 0 ~ 6, 0=Disconnected, 1=Connecting..., 2=Connected, 3=Disconnecting..., 5=Wait for Traffic..., 6=Diconnected |
| 10 | 3G/4G_SERVICE_TYPE | R | 0 ~ 7, 0=2G, 1=none, 2=3G, 3=3.5G, 4~6=3.75G, 7=LTE |
| 11 | 3G/4G_LINK_STATUS | R | 0 ~ 6, 0=Disconnected, 1=Connecting..., 2=Connected, 3=Disconnecting..., 5=Wait for Traffic..., 6=Diconnected |
| 12 | 3G/4G_SIGNAL_STRENGTH | R | 0 ~ 100 |
| 13 | 3G/4G_SIM_STATUS | R | 0 : SIM card with PIN code insert 1 : SIM card ready 2 : No SIM card |
| 14 | 3G/4G_MCC | R | MCC Value |
| 15 | 3G/4G_MNC | R | MNC Value |
| 16 | 3G/4G_CS Register Status | R | 0 : Unregistered, 1: Registered |
| 17 | 3G/4G_PS Register Status | R | 0 : Unregistered, 1: Registered |
| 18 | 3G/4G_Roaming Status | R | 0 : Not Roaming, 1: Roaming |
| 19 | 3G/4G_RSSI | R | RSSI Value |
| 20 | 3G/4G_RSRP | R | RSRP Value |
| 21 | 3G/4G_RSRQ | R | RSRQ Value |
| 30 | 3G/4G_Module-2_SERVICE_TYPE | R | 0 ~ 7, 0=2G, 1=none, 2=3G, 3=3.5G, 4~6=3.75G, 7=LTE |
| 31 | 3G/4G_Module-2_LINK_STATUS | R | 0 ~ 6, 0=Disconnected, 1=Connecting..., 2=Connected, 3=Disconnecting..., 5=Wait for Traffic..., 6=Diconnected |
| 32 | 3G/4G_Module-2_SIGNAL_STRENGTH | R | 0 ~ 100 |

Industrial LoRa Gateway

| Register Address | Register Name | R / W | Register Range / Description |
|------------------|-----------------------------------|-------|---|
| 33 | 3G/4G_Module-2_SIM_STATUS | R | 0 : SIM card with PIN code insert 1 : SIM card ready 2 : No SIM card |
| 34 | 3G/4G_Module-2_MCC | R | MCC Value |
| 35 | 3G/4G_Module-2_MNC | R | MNC Value |
| 36 | 3G/4G_Module-2_CS Register Status | R | 0 : Unregistered, 1: Registered |
| 37 | 3G/4G_Module-2_PS Register Status | R | 0 : Unregistered, 1: Registered |
| 38 | 3G/4G_Module-2_Roaming Status | R | 0 : Not Roaming, 1: Roaming |
| 39 | 3G/4G_Module-2_RSSI | R | RSSI Value |
| 40 | 3G/4G_Module-2_RSRP | R | RSRP Value |
| 41 | 3G/4G_Module-2_RSRQ | R | RSRQ Value |
| | | | |
| 70 | ADSL_Download_Data rate | R | ADSL Download Data rate value (kbps) |
| 71 | ADSL_Upload_Data rate | R | ADSL Upload Data rate value (kbps) |
| 72 | ADSL SNR_Download | R | ADSL SNR Download value (dB) |
| 73 | ADSL SNR_Upload | R | ADSL SNR Upload value (dB) |
| 74 | ADSL modem link status | R | 0 : Disconnected, 1: Connected |
| | | | |
| 101 | VPN IPSec tunnel 1 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 102 | VPN IPSec tunnel 2 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 103 | VPN IPSec tunnel 3 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 104 | VPN IPSec tunnel 4 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 105 | VPN IPSec tunnel 5 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 106 | VPN IPSec tunnel 6 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 107 | VPN IPSec tunnel 7 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 108 | VPN IPSec tunnel 8 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 109 | VPN IPSec tunnel 9 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 110 | VPN IPSec tunnel 10 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 111 | VPN IPSec tunnel 11 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 112 | VPN IPSec tunnel 12 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 113 | VPN IPSec tunnel 13 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 114 | VPN IPSec tunnel 14 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 115 | VPN IPSec tunnel 15 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| 116 | VPN IPSec tunnel 16 status | R | 1 : Connected, 2 : Wait for traffic , 3 : Disconnected , 9 : Connecting |
| | | | |

Industrial LoRa Gateway

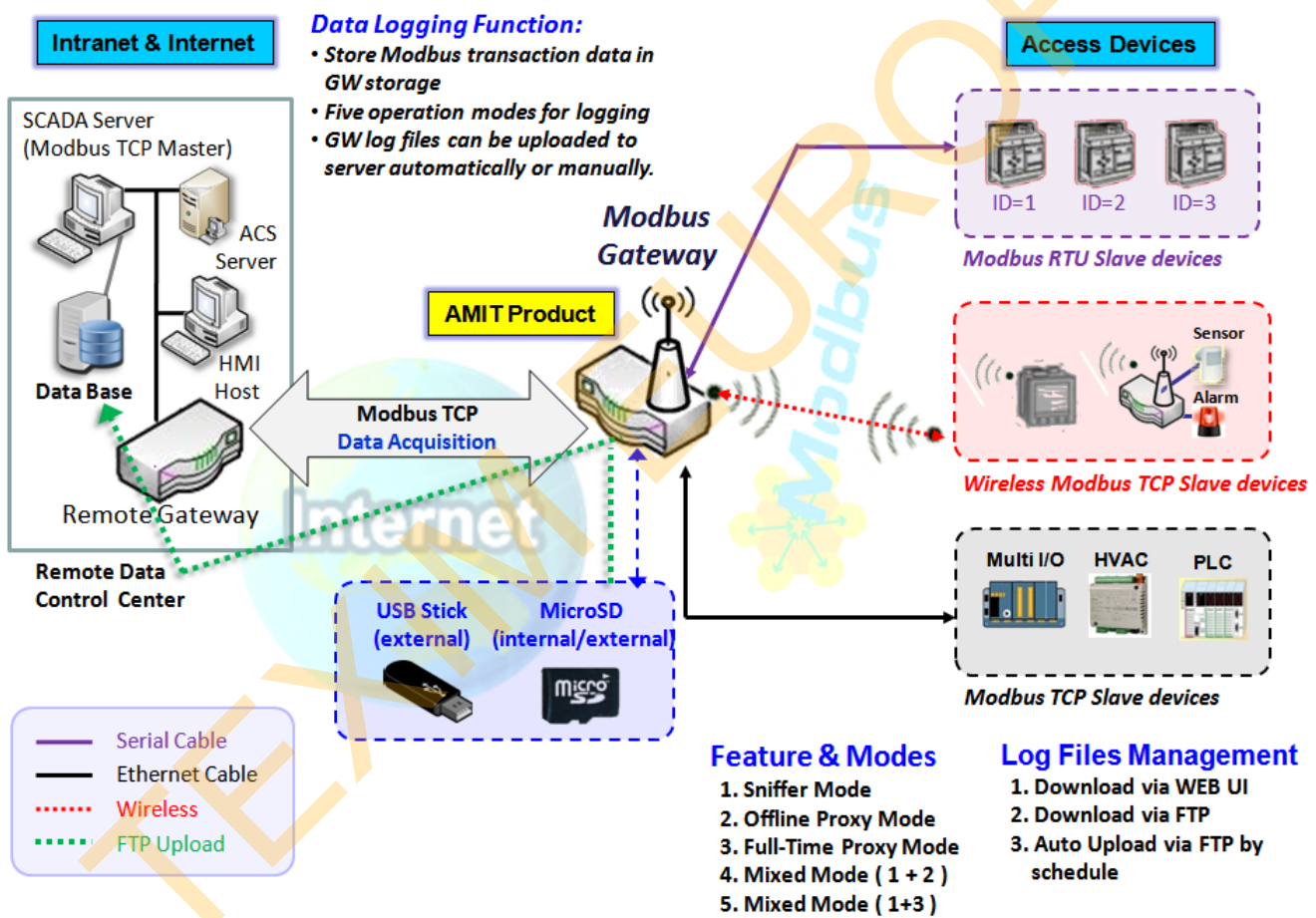
| Register Address | Register Name | R / W | Register Range / Description |
|------------------|----------------------------|-------|------------------------------------|
| 150 | DI_STATUS_1 | R | 0 : OFF, 1 : ON |
| 151 | DO_STATUS_1 | R/W | 0 : OFF, 1 : ON |
| 152 | DI_STATUS_2 | R | 0 : OFF, 1 : ON |
| 153 | DO_STATUS_2 | R/W | 0 : OFF, 1 : ON |
| 154 | DI_STATUS_3 | R | 0 : OFF, 1 : ON |
| 155 | DO_STATUS_3 | R/W | 0 : OFF, 1 : ON |
| 156 | DI_STATUS_4 | R | 0 : OFF, 1 : ON |
| 157 | DO_STATUS_4 | R/W | 0 : OFF, 1 : ON |
| | | | |
| 201 | Serial Port-0_Interface | R | 1 : RS-232, 3 : RS-485 |
| 202 | Serial Port-0_Baud Rate | R | Baud Rate Value |
| 203 | Serial Port-0_Data Bits | R | 7 or 8 |
| 204 | Serial Port-0_Stop Bits | R | 1 or 2 |
| 205 | Serial Port-0_Flow Control | R | 0 : None, 2 : RTS,CTS, 3 : DTR,DSR |
| 206 | Serial Port-0_Parity | R | 0 : None, 1 : Odd, 2 : Even |
| | | | |
| 211 | Serial Port-1_Interface | R | 1 : RS-232, 3 : RS-485 |
| 212 | Serial Port-1_Baud Rate | R | Baud Rate Value |
| 213 | Serial Port-1_Data Bits | R | 7 or 8 |
| 214 | Serial Port-1_Stop Bits | R | 1 or 2 |
| 215 | Serial Port-1_Flow Control | R | 0 : None, 2 : RTS,CTS, 3 : DTR,DSR |
| 216 | Serial Port-1_Parity | R | 0 : None, 1 : Odd, 2 : Even |
| | | | |
| 221 | Serial Port-2_Interface | R | 1 : RS-232, 3 : RS-485 |
| 222 | Serial Port-2_Baud Rate | R | Baud Rate Value |
| 223 | Serial Port-2_Data Bits | R | 7 or 8 |
| 224 | Serial Port-2_Stop Bits | R | 1 or 2 |
| 225 | Serial Port-2_Flow Control | R | 0 : None, 2 : RTS,CTS, 3 : DTR,DSR |
| 226 | Serial Port-2_Parity | R | 0 : None, 1 : Odd, 2 : Even |
| | | | |
| 231 | Serial Port-3_Interface | R | 1 : RS-232, 3 : RS-485 |
| 232 | Serial Port-3_Baud Rate | R | Baud Rate Value |
| 233 | Serial Port-3_Data Bits | R | 7 or 8 |
| 234 | Serial Port-3_Stop Bits | R | 1 or 2 |
| 235 | Serial Port-3_Flow Control | R | 0 : None, 2 : RTS,CTS, 3 : DTR,DSR |
| 236 | Serial Port-3_Parity | R | 0 : None, 1 : Odd, 2 : Even |
| | | | |
| 9999 | System_Reboot | W | Set 1 for System reboot. |

Industrial LoRa Gateway

4.2 Data Logging

Data logging is the process of collecting and storing data over a period of time in order to analyze specific trends or record the data-based events/actions of a system, or connected devices. Data logging function is a very useful and also important feature for SCADA telemetry; it makes the monitoring and analyzing tasks easier by checking the status and historical data during whole data acquisition period.

Even facing the network connection problems with remote NOC/SCADA side, you can also enable the data logging proxy function provided by the purchased gateway and keep doing the data acquisition and storing the collected data in local storage (in .CSV file format). When the network connection recovered, admin/user can download the data log files manually via FTP or web UI for further reference and maintenance.



The Modbus Cellular Gateway provides a complete data logging function for collecting the Modbus transaction data for application requirements. There are some data logging schemes to meet different management requirements. They are the Sniffer Mode, Offline Proxy Mode, Full-Time Proxy Mode, and the mixed modes for sniffer and proxy combinations.

With the Sniffer mode enabled, the gateway will monitor and record the communication among a specific Modbus Master and related slaves. It will store the Modbus communication as log files and administrator can check what Modbus communication went over the Modbus gateway, and if there is any communication loss

Industrial LoRa Gateway

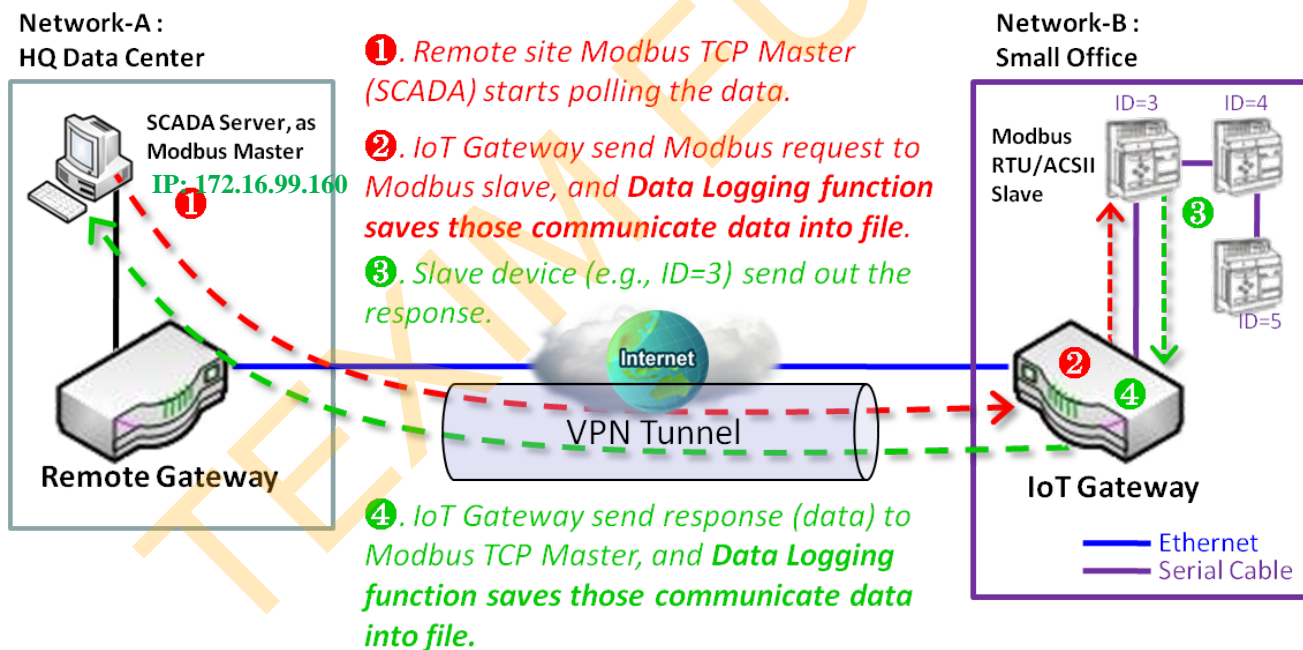
among the Master and Slave sides or not.

However, if there is any network connection problem between the Modbus gateway and remote NOC/SCADA, the remote Modbus server can't reach the Slave devices attached to the Modbus gateway, and consequently, nothing can be monitored and stored under such situation.

With the Proxy mode option enabled, when the Modbus gateway lost the connection with specified Modbus server, it will take over the data acquisition task and keep collecting the required data from Slave devices automatically. Once the connection is recovered, the Modbus gateway may stop the data log proxy function. Remote Modbus server can keep its data acquisition process, and if required, the administrator can also get the stored data log files to tell if everything goes well or not.

Under the Data Logging Proxy mode, user has to create some data acquisition rules via "Proxy Mode Rule Configuration" for collecting the Slave devices data by the Gateway when required. Once the network connection to remote SCADA was lost unexpectedly, the Data Logging Proxy function will be triggered and begin to do the data polling tasks by those pre-defined rules running in background.

➤ Scenario for Sniffer Mode Data Logging



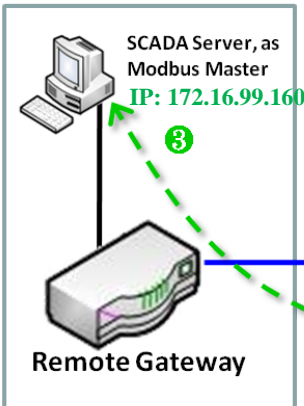
As Illustrated in the diagram, the Modbus gateway will store the following Modbus activities into a log file.

- The Modbus request sent from Remote Modbus TCP Master.
- The response (data) that sent out from the polled Slave device (ID=3)

➤ Scenario for Off-Line Proxy Mode Data Logging

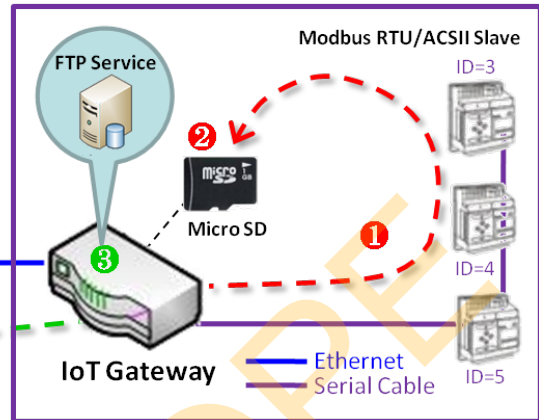
Industrial LoRa Gateway

Network-A:
HQ Data Center



- 1 To do the Data-Acquisition by IoT Gateway itself automatically.
- 2 Save those data as files to internal or external storage unit (e.g., Micro-SD card).
- 3 Data Logging Files Downloading via FTP or WEB UI.

Network-B:
Small Office



As illustrated, when the connection to a remote Modbus Master broken, the Modbus Gateway will activate the data logging proxy function and execute the pre-defined data acquisition task by itself.

- The Modbus request issued by the Modbus Gateway (Data Logging Proxy).
- The response (data) that sent out from the polled Slave device (ID=3)

Repeat above data acquisition and data logging activities on every 5 sec interval until the connection recovered.

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4.2.1 Data Logging Configuration

Data Logging is commonly used in monitoring systems to collect and analyze the field data. With proper configuration, the Gateway will record Modbus messages according to the specified rule list.

Go to **Field Communication > Data Logging > Configuration** tab.

Enable Data Logging

| Configuration | |
|------------------|---------------------------------|
| Item | Setting |
| ▶ Data Logging | <input type="checkbox"/> Enable |
| ▶ Storage Device | External ▾ |

| Configuration Item | Value setting | Description |
|-----------------------|-----------------------------------|--|
| Data Logging | The box is unchecked by default. | Check the Enable box to activate to data logging function. |
| Storage Device | External is set by default | Choose the sotrage device to store the log files. It can be External or Internal , depends on the product specification. |
| Save | NA | Click the Save button to save the settings. |

Note:

1. If there is no available storage device, the Enable checkbox will be grayed, and you can't enable it for the data logging. That is, if you selected External Storage, plug-in the storage first, and then enable the function and also make the required configuration.
2. Make sure the Modbus Operation Mode is selected and enabled, or there will be no Modbus transactions to be logged. Please refer to **Field Communication > Bus & Protocol > Port Configuration** and **Modbus** tabs.

Create/Edit Modbus Proxy Rules

The Gateway allows you to customize your proxy mode rule list. It supports up to a maximum of 20 rules.

| Modbus Proxy Rule List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | |
|---|------|-------------------|----------|---------------|---------------|---------------------------|-------------------|---------|
| ID | Name | Modbus Slave Type | Slave ID | Function Code | Start Address | Number of Coils/Registers | Polling Rate (ms) | Actions |

When the **Add** button is applied, **Modbus Proxy Rule Configuration** screen will appear.

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| Modbus Proxy Rule List Configuration | |
|--------------------------------------|--|
| | <input type="button" value="Save"/> <input type="button" value="Undo"/> |
| Item | Setting |
| ▶ Name | <input type="text"/> |
| ▶ Modbus Slave Type | <input type="text" value="IP Address:Port"/> <input type="text"/> : <input type="text"/> |
| ▶ Slave ID | <input type="text"/> (1~247) - <input type="text"/> (1~247) |
| ▶ Function Code | <input type="text" value="Read Coils (0x01)"/> |
| ▶ Start Address | <input type="text"/> (0~65535) |
| ▶ Number of Coils/Registers | <input type="text"/> (1~125) |
| ▶ Polling Rate (ms) | <input type="text" value="1000"/> (500~99999) |

| Modbus Proxy Rule Configuration | | |
|----------------------------------|--|---|
| Item | Value setting | Description |
| Name | A Must filled setting. | Specify a name as the identifier of the Modbus proxy rule. Value Range: 1 ~ 32 characters. |
| Modbus Slave Type | IP Address :Port is selected by default. | Specify the Modbus Slave devices to apply with the Modbus proxy rule. It can be IP Address:Port for Modbus TCP slaves or Local Serial Port for local attached Modbus RTU/ASCII slaves. Value Range: 1 ~ 65535 for port number |
| Slave ID | 1. A Must filled setting. 2. Range 1 to 247 | Specify the ID range for the slave device(s) to apply with the Modbus proxy rule. Value Range: 1 ~ 247. |
| Function Code | Read Coils (0x01) is selected by default. | Specify a certain read function for the Data Logging Proxy to issue and record the responses from device(s). |
| Start Address | 1. A Must filled setting. 2. Range 0 to 65535 | Specify the Start Address of registers to apply with the specified function code. Value Range: 0 ~ 65535. |
| Number of Coils/Registers | 1. A Must filled setting. 2. Range 1 to 125 | Specify the number of coils/registers to apply with the specified function code. Value Range: 1 ~ 125. Note: Start Address plus Number must be smaller than 65536. |
| Polling Rate (ms) | 1. A Must filled setting. 2. 1000 ms is set by default | Enter the poll time in milliseconds to apply the Proxy Mode Rule. Once the proxy mode is activated, the Modbus Gateway will issue pre-defined Modbus message on each Poll Time interval accordingly. Value Range: 500 ~ 99999. |
| Save | N/A | Click the Save button to save the settings. |
| Undo | N/A | Click the Undo button to cancel the changes. |

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4.2.2 Scheme Setup

There are five data logging schemes to meet different management requirements. They are the Sniffer Mode, Offline Proxy Mode, Full-Time Proxy Mode, and the mixed modes for sniffer and proxy combinations. User has to configure the required data logging rules with selected scheme in this Scheme Setup page.

Go to **Field Communication > Data Logging > Scheme Setup** tab.

Create/Edit Data Logging Rules

| Scheme List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | |
|--|------|------|-------------|----------------------------|-------------|--------|---------|
| ID | Name | Mode | Master Type | Master Query Timeout (sec) | Proxy Rules | Enable | Actions |

When the **Add** button is applied, **Scheme Configuration** screen will appear.

| Scheme Configuration <input type="button" value="Save"/> <input type="button" value="Undo"/> | |
|--|-----------------------------------|
| Item | Setting |
| ▶ Name | <input type="text"/> |
| ▶ Mode | Sniffer ▼ |
| ▶ Master Type | IP Address ▼ <input type="text"/> |
| ▶ Enable | <input type="checkbox"/> |

| Scheme Configuration | | |
|----------------------|--|--|
| Item | Value setting | Description |
| Name | A Must filled setting. | Specify a name as the identifier of the data logging rule. Value Range: 1 ~ 16 characters. |
| Mode | Sniffer is selected by default. | Select an expected data logging scheme for the data logging rule. There are five available schemes : Sniffer : The Modbus gateway will record all the Modbus transactions between the Master and Slave devices. Off-Line Proxy : When the connection between the Modbus gateway and Master is lost, the pre-defined proxy rule will be triggered and the Modbus gateway will issue specified function code to collect and record the data / status from the slave devices Full-Time Proxy : The pre-defined proxy rule will be triggered all the time and the Modbus gateway will issue specified function code to collect and record the data / status from the slave devices Sniffer & Off-Line Proxy : This is a mixed mode for both Sniffer and Off-Line Proxy modes. |

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| | | |
|------------------------------------|--|--|
| | | Sniffer & Full-Time Proxy: This is a mixed mode for both Sniffer and Full-Time Proxy modes. |
| Master Type | IP Address is selected by default. | Specify the Modbus master device to apply with the data logging rule. It can be IP Address for Modbus TCP master, or Local Serial Port for local attached Modbus RTU/ASCII master. |
| Master Query Timeout (sec.) | <ol style="list-style-type: none"> 1. An Optional setting. 2. 60 sec is set by default 3. Range 1 to 99999 | Specify the timeout value for querying Modbus Master. If no response from the master for the specified timeout setting, selected proxy rule will be triggered and applied with the data logging rule. Note: If Off-Line proxy scheme is selected, the timeout setting will be used to check. Otherwise, it is a don't care value. |
| Proxy Rules | An Optional setting. | Select the Proxy rule to be applied with the data logging rule. Note: If any proxy scheme is selected, please create the required Proxy rules in advance, and select from the list. |
| Enable | The box is unchecked by default. | Check the box to activate the data logging rule. |
| Save | N/A | Click the Save button to save the settings. |
| Undo | N/A | Click the Undo button to cancel the changes. |

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4.2.3 Log File Management

There are five data logging schemes to meet different management requirements. They are the Sniffer Mode, Off-Line Proxy Mode, Full-Time Proxy Mode, and the mixed modes for sniffer and proxy combinations. User has to configure the required data logging rules with selected scheme in this Scheme Setup page.

Go to **Field Communication > Data Logging > Log File Management** tab.

If user had created data log rules in the **Field Communication > Data Logging > Scheme Setup** tab, there will be a log file list shown in the following Log File list screen. The default Log File management settings will be applied if user didn't change it via the **Edit** button.

| Log File List | | | | | | | | |
|---------------|-------------|---------------------|---------------|-------------|----------------------|--------------------------|-------------------|--|
| ID | Name | File Content Format | Split File by | Auto Upload | Log File Compression | Delete File After Upload | When Storage Full | Actions |
| 1 | Sniffer Log | Raw Data | 200 KB | Disabled | N/A | N/A | Remove the Oldest | <input type="button" value="Edit"/> <input type="button" value="Download Log"/> |

When the **Edit** button is applied, **Log File Configuration** screen will appear.

| Log File List Configuration | |
|-----------------------------|--|
| Item | Setting |
| File Content Format | Raw Data |
| Split File by | Size 200 KB |
| Auto Upload | <input checked="" type="checkbox"/> Enable --- Option --- Add Object |
| Log File Compression | <input type="checkbox"/> Enable |
| Delete File After Upload | <input type="checkbox"/> Enable |
| When Storage Full | Remove the Oldest |

| Log File Configuration | | |
|----------------------------|--|--|
| Item | Value setting | Description |
| Name | N/A | The name of corresponding data log rule will be displayed. The default log file name will be named as ' Name_YYYYMMddHHmmSS.csv '. |
| File Content Format | Raw Data is selected by default | Select the data format for the log files. It can be Raw Data , or Modbus Type . |
| Split File by | Size and 200 KB are set by default | Specify the split file methodology. It can be by Size , or by Time Interval . User has to specify a certain file size or time interval for splitting the data logs into a series of files. Value Range: 1 ~ 99999. |

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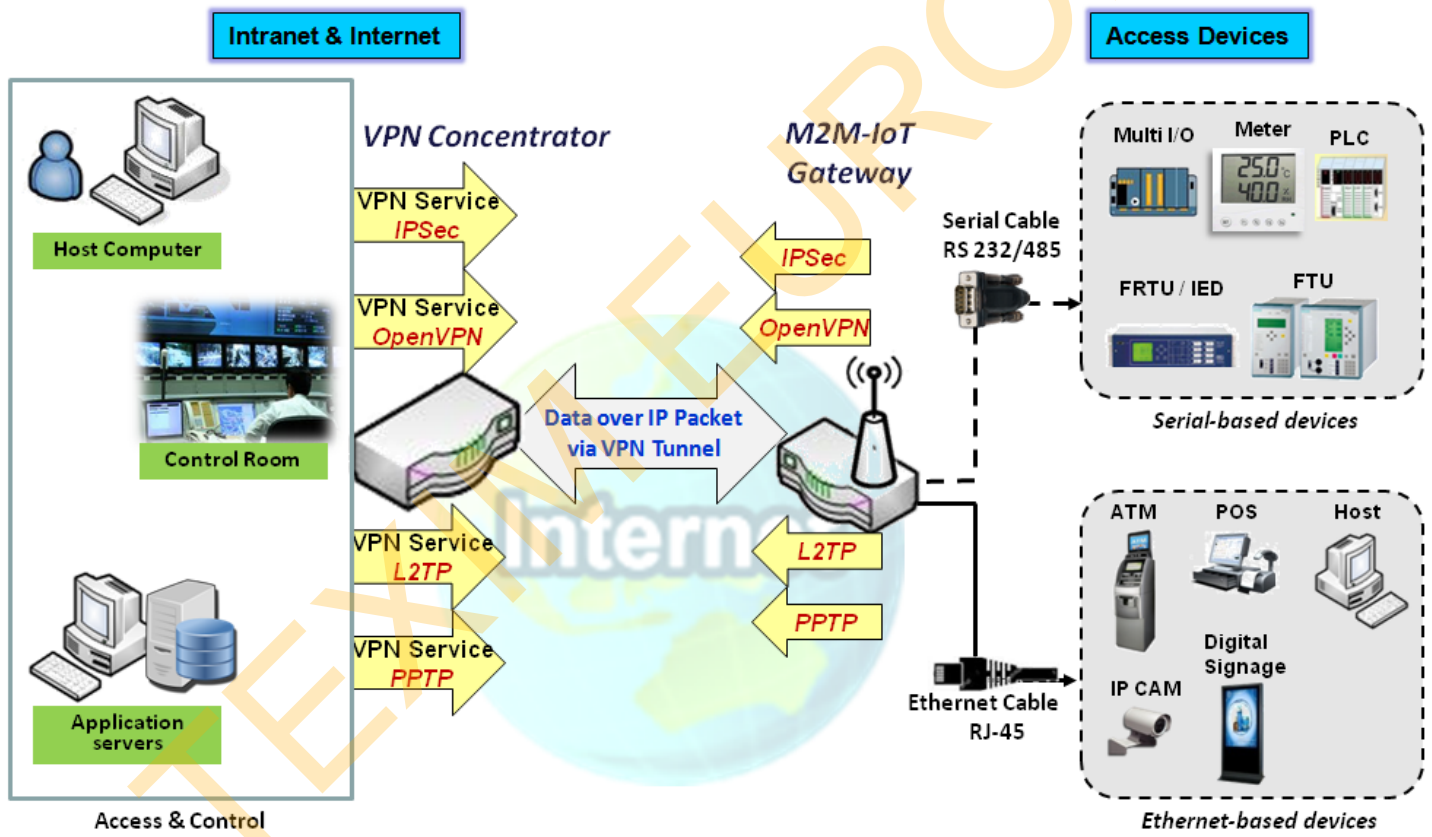
| | | |
|---------------------------------|--|---|
| Auto Upload | <ol style="list-style-type: none"> 1. An Optional filled setting 2. The box is unchecked by default. | <p>Check the Enable box to activate the auto upload function for logged files. Once been enabled, user has to specify an external FTP server from the dropdown list for auto uploading the log files to the server. Refer to Object Definition > External Server > External Server tab, or create the FTP server with the Add Object button.</p> |
| Log File Compression | <ol style="list-style-type: none"> 1. An Optional filled setting 2. The box is unchecked by default | <p>If Auto Upload is activated, user can further specify whether to compress the log file prior it is uploaded or not. Check the Enable button to activate the Log File Compression function...</p> |
| Delete File After Upload | <ol style="list-style-type: none"> 1. An Optional filled setting 2. The box is unchecked by default | <p>If Auto Upload is activated, user can further specify whether to delete the transferred log from the gateway storage or not. Check the Enable button to activate the function.</p> |
| When Storage Full | Remove the Oldest is selected by default | <p>Specify the operation to take when the storage is full. It can be Remove the Oldest log file, or Stop Recording. When Remove the Oldest is selected, the gateway will delete the oldest file once the storage is full, and keep on the data logging activity; When Stop Recording is selected, the gateway will stop the data logging activity once the storage is full.</p> |
| Save | NA | Click the Save button to save the settings. |
| Undo | NA | Click the Undo button to cancel the changes. |

When the **Download Log** button is applied, the web browser will download a file named as 'log.tar' to the managing host computer.

Chapter 5 Security

5.1 VPN

A virtual private network (VPN) extends a private network across a public network, such as the Internet. It enables a computer to send and receive data across shared or public networks as if it were directly connected to the private network, while benefitting from the functionality, security and management policies of the private network. This is done by establishing a virtual point-to-point connection through the use of dedicated connections, encryption, or a combination of the two. The tunnel technology supports data confidentiality, data origin authentication and data integrity of network information by utilizing encapsulation protocols, encryption algorithms, and hashing algorithms.



The product series supports different tunneling technologies to establish secure tunnels between multiple sites for data transferring, such as IPSec, OpenVPN, L2TP (over IPSec), PPTP and GRE. Besides, some advanced functions, like Full Tunnel, Tunnel Failover, Tunnel Load Balance, NetBIOS over IPSec, NAT Traversal and Dynamic VPN, are also supported.

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5.1.1 IPsec

| Configuration [Help] | |
|---------------------------------|--|
| Item | Setting |
| ▶ IPsec | <input type="checkbox"/> Enable |
| ▶ NetBIOS over IPsec | <input type="checkbox"/> Enable |
| ▶ NAT Traversal | <input checked="" type="checkbox"/> Enable |
| ▶ Max. Concurrent IPsec Tunnels | 3 |

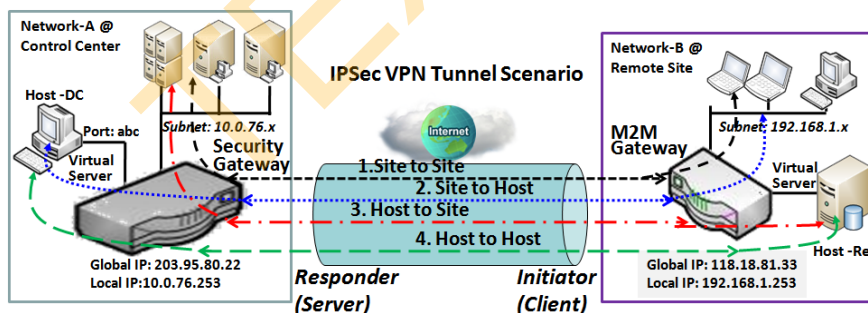
| Dynamic VPN List [Add] [Delete] [Refresh] | | | | | |
|---|-------------|-----------|------------------|--------|---------|
| ID | Tunnel Name | Interface | Connected Client | Enable | Actions |
| | | | | | |

| IPsec Tunnel List [Add] [Delete] [Refresh] | | | | | | | | |
|--|-------------|-----------|-----------------|----------------|---------------|--------|--------|---------|
| ID | Tunnel Name | Interface | Tunnel Scenario | Remote Gateway | Remote Subnet | Status | Enable | Actions |
| | | | | | | | | |

Internet Protocol Security (IPsec) is a protocol suite for securing Internet Protocol (IP) communications by authenticating and encrypting each IP packet of a communication session. IPsec includes protocols for establishing mutual authentication between agents at the beginning of the session and negotiation of cryptographic keys to be used during the session.

An IPsec VPN tunnel is established between IPsec client and server. Sometimes, we call the IPsec VPN client as the initiator and the IPsec VPN server as the responder. This gateway can be configured as different roles and establish number of tunnels with various remote devices. Before going to setup the VPN connections, you may need to decide the scenario for the tunneling.

IPsec Tunnel Scenarios



- ← - - - - - → Site to Site: Tunnel between M2M gateway /w 192.168.1.x subnet and UTM /w 10.0.76.x subnet
- ← ········ → Site to Host: Tunnel between M2M gateway /w 192.168.1.x subnet and Host-DC under UTM
- ← · - - - - - → Host to Site: Tunnel between Host-Re under M2M Gateway and UTM /w 10.0.76.x subnet
- ← - - - - - → Host to Host: Tunnel between Host-Re under M2M Gateway and Host-DC under UTM

To build IPsec tunnel, you need to fill in remote gateway global IP, and optional subnet if the hosts behind IPsec peer can access to remote site or hosts. Under such configuration, there are four scenarios:

Site to Site: You need to setup remote gateway IP and subnet of both gateways. After the IPsec tunnel established, hosts behind both gateways can communication each other through the tunnel.

Site to Host: Site to Host is suitable for tunneling between clients in a subnet and an application server (host).

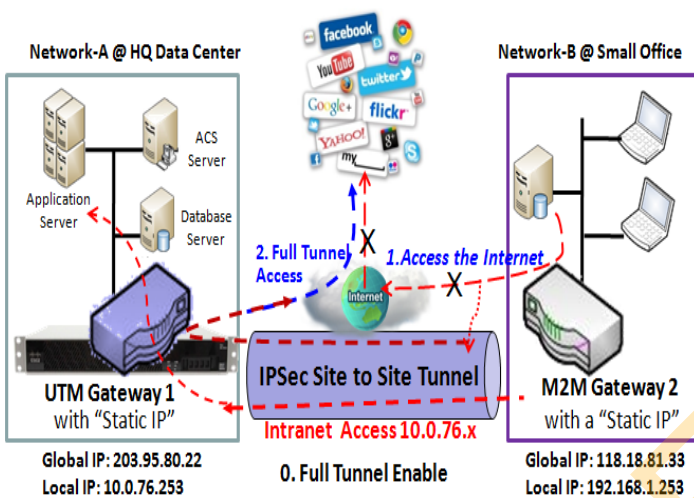
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As in the diagram, the clients behind the M2M gateway can access to the host "Host-DC" located in the control center through Site to Host VPN tunnel.

Host to Site: On the contrast, for a single host (or mobile user to) to access the resources located in an intranet, the Host to Site scenario can be applied.

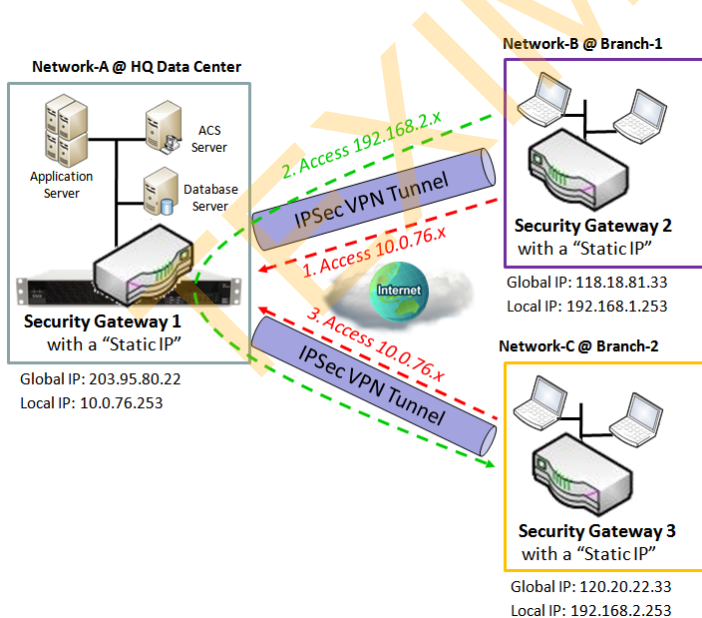
Host to Host: Host to Host is a special configuration for building a VPN tunnel between two single hosts.

Site to Site with "Full Tunnel" enabled



In "Site to Site" scenario, client hosts in remote site can access the enterprise resources in the Intranet of HQ gateway via an established IPSec tunnel, as described above. However, Internet access originates from remote site still go through its regular WAN connection. If you want all packets from remote site to be routed via this IPSec tunnel, including HQ server access and Internet access, you can just enable the "Full Tunnel" setting. As a result, every time users surfs web or searching data on Internet, checking personal emails, or HQ server access, all traffics will go through the secure IPSec tunnel and route by the Security Gateway in control center.

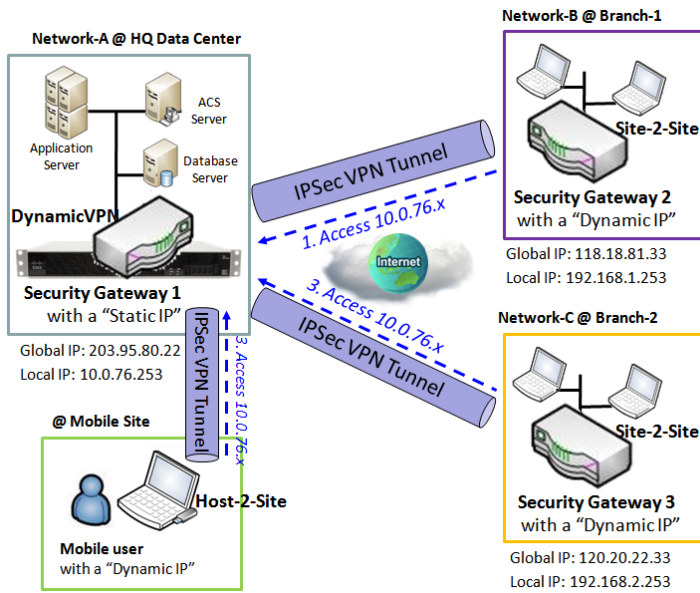
Site to Site with "Hub and Spoke" mechanism



For a control center to manage the secure Intranet among all its remote sites, there is a simple configuration, called **Hub and Spoke**, for the whole VPN network. A Hub and Spoke VPN Network is set up in organizations with centralized control center over all its remote sites, like shops or offices. The control center acts as the Hub role and the remote shops or Offices act as Spokes. All VPN tunnels from remote sites terminate at this Hub, which acts as a concentrator. Site-to-site connections between spokes do not exist. Traffic originating from one spoke and destined for another spoke has to go via the Hub. Under such configuration, you don't need to maintain VPN tunnels between each two remote clients.

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Dynamic VPN Server Scenario



Dynamic VPN Server Scenario is an efficient way to build multiple tunnels with remote sites, especially for mobile clients with dynamic IP. In this scenario, gateway can only be role of server (responder), and it must have a "Static IP" or "FQDN". It can allow many VPN clients (initiators) to connect to with various tunnel scenarios. In short, with a simple Dynamic VPN server setting, many VPN clients can connect to the server. But, in comparison to the Hub and Spoke mechanism, it is not allowed to directly communicate between any two clients via the Dynamic VPN server.

For the purchased gateway, you can configure one Dynamic VPN server for each WAN interface.

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IPSec Setting

Go to **Security > VPN > IPSec** tab.

The IPSec Setting allows user to create and configure IPSec tunnels.

Enable IPSec

| Configuration [Help] | |
|---------------------------------|--|
| Item | Setting |
| ▶ IPSec | <input type="checkbox"/> Enable |
| ▶ NetBIOS over IPSec | <input type="checkbox"/> Enable |
| ▶ NAT Traversal | <input checked="" type="checkbox"/> Enable |
| ▶ Max. Concurrent IPSec Tunnels | 3 |

| Configuration Window | | |
|--------------------------------------|-----------------------------------|--|
| Item | Value setting | Description |
| IPsec | Unchecked by default | Click the Enable box to enable IPSec function. |
| NetBIOS over IPSec | Unchecked by default | Click the Enable box to enable NetBIOS over IPSec function. |
| NAT Traversal | Checked by default | Click the Enable box to enable NAT Traversal function. |
| Max. Concurrent IPSec Tunnels | Depends on Product specification. | The specified value will limit the maximum number of simultaneous IPSec tunnel connection. The default value can be different for the purchased model. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

Create/Edit IPSec tunnel

Ensure that the IPSec enable box is checked to enable before further configuring the IPSec tunnel settings.

| IPSec Tunnel List <input type="button" value="Add"/> <input type="button" value="Delete"/> <input type="button" value="Refresh"/> | | | | | | | | |
|---|-------------|-----------|-----------------|----------------|---------------|--------|--------|---------|
| ID | Tunnel Name | Interface | Tunnel Scenario | Remote Gateway | Remote Subnet | Status | Enable | Actions |

When **Add/Edit** button is applied, a series of configuration screens will appear. They are Tunnel Configuration, Local & Remote Configuration, Authentication, IKE Phase, IKE Proposal Definition, IPSec Phase, and IPSec Proposal Definition. You have to configure the tunnel details for both local and remote VPN devices.

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| Tunnel Configuration | |
|--------------------------|---------------------------------|
| Item | Setting |
| ▶ Tunnel | <input type="checkbox"/> Enable |
| ▶ Tunnel Name | IPSec #1 |
| ▶ Interface | WAN1 ▼ |
| ▶ Tunnel Scenario | Site to Site ▼ |
| ▶ Tunnel TCP MSS | Auto ▼ 0 (64~1500 Bytes) |
| ▶ Hub and Spoke | None ▼ |
| ▶ Operation Mode | Always on ▼ |
| ▶ Encapsulation Protocol | ESP ▼ |

| Tunnel Configuration Window | | |
|-----------------------------|---|--|
| Item | Value setting | Description |
| Tunnel | Unchecked by default | Check the Enable box to activate the IPSec tunnel |
| Tunnel Name | 1. A Must fill setting 2. String format can be any text | Enter a tunnel name. Enter a name that is easy for you to identify. Value Range: 1 ~ 19 characters. |
| Interface | 1. A Must fill setting 2. WAN 1 is selected by default | Select the interface on which IPSec tunnel is to be established. It can be the available WAN and LAN interfaces. |
| Tunnel Scenario | 1. A Must fill setting 2. Site to site is selected by default | Select an IPSec tunneling scenario from the dropdown box for your application. Select Site-to-Site , Site-to-Host , Host-to-Site , or Host-to-Host . If LAN interface is selected, only Host-to-Host scenario is available. With Site-to-Site or Site-to-Host or Host-to-Site , IPSec operates in tunnel mode. The difference among them is the number of subnets. With Host-to-Host , IPSec operates in transport mode. |
| Tunnel TCP MSS | 1. An optional setting 2. Auto is set by default | Select from the dropdown box to define the size of Tunnel TCP MSS. Select Auto , and all devices will adjust this parameter automatically. Select Manual , and specify an expected value for Tunnel TCP MSS. Value Range: 64 ~ 1500 bytes. |
| Hub and Spoke | 1. An optional setting 2. None is set by default | Select from the dropdown box to setup your gateway for Hub-and-Spoke IPSec VPN Deployments. Select None if your deployments will not support Hub or Spoke encryption. Select Hub for a Hub role in the IPSec design. Select Spoke for a Spoke role in the IPSec design. Note: Hub and Spoke are available only for Site-to-Site VPN tunneling specified in Tunnel Scenario. It is not available for Dynamic VPN tunneling application. |
| Operation Mode | 1. A Must fill setting 2. Always on is selected | Define operation mode for the IPSec Tunnel. It can be Always On , or Failover . If this tunnel is set as a failover tunnel, you need to further select a primary |

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| | | |
|-------------------------------|--|---|
| | by default | tunnel from which to failover to. Note: Failover mode is not available for the gateway with single WAN. |
| Encapsulation Protocol | 1. A Must fill setting 2. ESP is selected by default | Select the Encapsulation Protocol from the dropdown box for this IPsec tunnel. Available encapsulations are ESP and AH . |

Local & Remote Configuration

| Item | Setting | | |
|------------------------------------|--|--|---|
| ▶ Local Subnet List | ID | Subnet IP Address | Subnet Mask |
| | 1 | <input type="text" value="192.168.123.0"/> | <input type="text" value="255.255.255.0(/24)"/> ▼ |
| | <input type="button" value="Delete"/> | | |
| <input type="button" value="Add"/> | | | |
| ▶ Redirect Traffic | <input type="checkbox"/> Enable | | |
| ▶ Full Tunnel | <input type="checkbox"/> Enable | | |
| ▶ Remote Subnet List | ID | Subnet IP Address | Subnet Mask |
| | 1 | <input type="text"/> | <input type="text" value="255.255.255.0(/24)"/> ▼ |
| | <input type="button" value="Delete"/> | | |
| <input type="button" value="Add"/> | | | |
| ▶ Remote Gateway | <input type="text"/> (IP Address/FQDN) | | |

| Local & Remote Configuration Window | | |
|-------------------------------------|----------------------|---|
| Item | Value setting | Description |
| Local Subnet List | A Must fill setting | Specify the Local Subnet IP address and Subnet Mask. Click the Add or Delete button to add or delete a Local Subnet. Note_1: When Dynamic VPN option in Tunnel Scenario is selected, there will be only one subnet available. Note_2: When Host-to-Site or Host-to-Host option in Tunnel Scenario is selected, Local Subnet will not be available. Note_3: When Hub and Spoke option in Hub and Spoke is selected, there will be only one subnet available. |
| Redirect Traffic | Unchecked by default | Click Enable box to activate the Redirect Traffic function. Note: Redirect Traffic is available only for Host-to-Site specified in Tunnel Scenario. By default, it is disabled, so it can prevent the un-expected and dangerous access to the peer subnet. If you enable such function, all the network devices behind the VPN host (actually, it is a NAT gateway) can access to the peer subnet with the host IP. |
| Full Tunnel | Unchecked by default | Click Enable box to enable Full Tunnel. Note: Full tunnel is available only for Site-to-Site specified in Tunnel Scenario. |

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| | | |
|---------------------------|--|---|
| Remote Subnet List | A Must fill setting | Specify the Remote Subnet IP address and Subnet Mask. Click the Add or Delete button to add or delete Remote Subnet setting. |
| Remote Gateway | 1. A Must fill setting. 2. Format can be a ipv4 address or FQDN | Specify the Remote Gateway. |

| Authentication | |
|------------------|---|
| Item | Setting |
| ▶ Key Management | IKE+Pre-shared Key ▼ <input type="text"/> (Min. 8 characters) |
| ▶ Local ID | Type: User Name ▼ ID: <input type="text"/> (Optional) |
| ▶ Remote ID | Type: User Name ▼ ID: <input type="text"/> |

| Authentication Configuration Window | | |
|-------------------------------------|---|--|
| Item | Value setting | Description |
| Key Management | 1. A Must fill setting 2. Pre-shared Key 8 to 32 characters. | Select Key Management from the dropdown box for this IPsec tunnel. IKE+Pre-shared Key: user needs to set a key (8 ~ 32 characters). IKE+X.509: user needs Certificate to authenticate. IKE+X.509 will be available only when Certificate has been configured properly. Refer to Certificate section of this manual and also Object Definition > Certificate in web-based utility. Manually: user needs to enter key ID to authenticate. Manual key configuration will be explained in the following Manual Key Management section. |
| Local ID | An optional setting | Specify the Local ID for this IPsec tunnel to authenticate. Select User Name for Local ID and enter the username. The username may include but can't be all numbers. Select FQDN for Local ID and enter the FQDN. Select User@FQDN for Local ID and enter the User@FQDN. Select Key ID for Local ID and enter the Key ID (English alphabet or number). |
| Remote ID | An optional setting | Specify the Remote ID for this IPsec tunnel to authenticate. Select User Name for Remote ID and enter the username. The username may include but can't be all numbers. Select FQDN for Local ID and enter the FQDN. Select User@FQDN for Remote ID and enter the User@FQDN. Select Key ID for Remote ID and enter the Key ID (English alphabet or number). Note: Remote ID will be not available when Dynamic VPN option in Tunnel Scenario is selected. |

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| IKE Phase | |
|-----------------------------|--|
| Item | Setting |
| ▶ IKE Version | v1 ▼ |
| ▶ Negotiation Mode | Main Mode ▼ |
| ▶ X-Auth | None ▼ <input type="button" value="X-Auth Account"/> (Optional) User Name : <input type="text"/> Password : <input type="text"/> |
| ▶ Dead Peer Detection (DPD) | <input checked="" type="checkbox"/> Enable Timeout : <input type="text" value="180"/> (seconds) Delay : <input type="text" value="30"/> (seconds) |
| ▶ Phase1 Key Life Time | <input type="text" value="3600"/> (seconds) (Max. 86400) |

| IKE Phase Window | | |
|----------------------------------|--|--|
| Item | Value setting | Description |
| IKE Version | <ol style="list-style-type: none"> 1. A must fill setting 2. v1 is selected by default | <p>Specify the IKE version for this IPsec tunnel. Select v1 or v2</p> <p>Note: IKE versions will not be available when Dynamic VPN option in Tunnel Scenario is selected, or AH option in Encapsulation Protocol is selected.</p> |
| Negotiation Mode | Main Mode is set by default default | Specify the Negotiation Mode for this IPsec tunnel. Select Main Mode or Aggressive Mode. |
| X-Auth | None is selected by default | <p>Specify the X-Auth role for this IPsec tunnel. Select Server, Client, or None. Selected None no X-Auth authentication is required.</p> <p>Selected Server this gateway will be an X-Auth server. Click on the X-Auth Account button to create remote X-Auth client account.</p> <p>Selected Client this gateway will be an X-Auth client. Enter User name and Password to be authenticated by the X-Auth server gateway.</p> <p>Note: X-Auth Client will not be available for Dynamic VPN option selected in Tunnel Scenario.</p> |
| Dead Peer Detection (DPD) | <ol style="list-style-type: none"> 1. Checked by default 2. Default Timeout 180s and Delay 30s | <p>Click Enable box to enable DPD function. Specify the Timeout and Delay time in seconds.</p> <p>Value Range: 0 ~ 999 seconds for Timeout and Delay.</p> |
| Phase1 Key Life Time | <ol style="list-style-type: none"> 1. A Must fill setting 2. Default 3600s 3. Max. 86400s | <p>Specify the Phase1 Key Life Time.</p> <p>Value Range: 30 ~ 86400.</p> |

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| IKE Proposal Definition | | | | |
|-------------------------|------------|----------------|-----------|--|
| ID | Encryption | Authentication | DH Group | Definition |
| 1 | AES-auto ▼ | SHA1 ▼ | Group 2 ▼ | <input checked="" type="checkbox"/> Enable |
| 2 | AES-auto ▼ | MD5 ▼ | Group 2 ▼ | <input checked="" type="checkbox"/> Enable |
| 3 | DES ▼ | SHA1 ▼ | Group 2 ▼ | <input checked="" type="checkbox"/> Enable |
| 4 | 3DES ▼ | SHA1 ▼ | Group 2 ▼ | <input checked="" type="checkbox"/> Enable |

| IKE Proposal Definition Window | | |
|--------------------------------|---------------------|--|
| Item | Value setting | Description |
| IKE Proposal Definition | A Must fill setting | <p>Specify the Phase 1 Encryption method. It can be DES / 3DES / AES-auto / AES-128 / AES-192 / AES-256.</p> <p>Specify the Authentication method. It can be None / MD5 / SHA1 / SHA2-256.</p> <p>Specify the DH Group. It can be None / Group1 / Group2 / Group5 / Group14 / Group15 / Group16 / Group17 / Group18.</p> <p>Check Enable box to enable this setting</p> |

| IPSec Phase | |
|------------------------|------------------------------|
| Item | Setting |
| ▶ Phase2 Key Life Time | 28800 (seconds) (Max. 86400) |

| IPSec Phase Window | | |
|----------------------|--|--|
| Item | Value setting | Description |
| Phase2 Key Life Time | <ol style="list-style-type: none"> A Must fill setting 28800s is set by default Max. 86400s | <p>Specify the Phase2 Key Life Time in second.</p> <p><u>Value Range:</u> 30 ~ 86400.</p> |

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| IPSec Proposal Definition | | | | |
|---------------------------|------------|----------------|-----------|--|
| ID | Encryption | Authentication | PFS Group | Definition |
| 1 | AES-auto ▼ | SHA1 ▼ | Group 2 ▼ | <input checked="" type="checkbox"/> Enable |
| 2 | AES-auto ▼ | MD5 ▼ | | <input checked="" type="checkbox"/> Enable |
| 3 | DES ▼ | SHA1 ▼ | | <input checked="" type="checkbox"/> Enable |
| 4 | 3DES ▼ | SHA1 ▼ | | <input checked="" type="checkbox"/> Enable |

| IPSec Proposal Definition Window | | |
|----------------------------------|---------------------|---|
| Item | Value setting | Description |
| IPSec Proposal Definition | A Must fill setting | <p>Specify the Encryption method. It can be None / DES / 3DES / AES-auto / AES-128 / AES-192 / AES-256. Note: None is available only when Encapsulation Protocol is set as AH; it is not available for ESP Encapsulation.</p> <p>Specify the Authentication method. It can be None / MD5 / SHA1 / SHA2-256. Note: None and SHA2-256 are available only when Encapsulation Protocol is set as ESP; they are not available for AH Encapsulation.</p> <p>Specify the PFS Group. It can be None / Group1 / Group2 / Group5 / Group14 / Group15 / Group16 / Group17 / Group18.</p> <p>Click Enable to enable this setting</p> |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |
| Back | N/A | Click Back to return to the previous page. |

Manual Key Management

When the Manually option is selected for Key Management as described in Authentication Configuration Window, a series of configuration windows for Manual IPsec Tunnel configuration will appear. The configuration windows are the Local & Remote Configuration, the Authentication, and the Manual Proposal.

| Authentication | |
|------------------|--|
| Item | Setting |
| ▶ Key Management | Manually ▼ |
| ▶ Local ID | Type: KEY ID ▼ ID: <input type="text"/> (Optional) |
| ▶ Remote ID | Type: KEY ID ▼ ID: <input type="text"/> |

| Authentication Window | | |
|-----------------------|---------------|-------------|
| Item | Value setting | Description |

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| | | |
|-----------------------|---------------------|---|
| Key Management | A Must fill setting | Select Key Management from the dropdown box for this IPSec tunnel. In this section Manually is the option selected. |
| Local ID | An optional setting | Specify the Local ID for this IPSec tunnel to authenticate. Select the Key ID for Local ID and enter the Key ID (English alphabet or number). |
| Remote ID | An optional setting | Specify the Remote ID for this IPSec tunnel to authenticate. Select Key ID for Remote ID and enter the Key ID (English alphabet or number). |

| Local & Remote Configuration | |
|------------------------------|--|
| Item | Setting |
| ▶ Local Subnet | <input type="text"/> |
| ▶ Local Netmask | <input type="text" value="255.255.255.0"/> |
| ▶ Remote Subnet | <input type="text"/> |
| ▶ Remote Netmask | <input type="text"/> |
| ▶ Remote Gateway | <input type="text"/> (IP Address/FQDN) |

| Local & Remote Configuration Window | | |
|-------------------------------------|---|--|
| Item | Value setting | Description |
| Local Subnet | A Must fill setting | Specify the Local Subnet IP address and Subnet Mask. |
| Local Netmask | A Must fill setting | Specify the Local Subnet Mask. |
| Remote Subnet | A Must fill setting | Specify the Remote Subnet IP address |
| Remote Netmask | A Must fill setting | Specify the Remote Subnet Mask. |
| Remote Gateway | 1. A Must fill setting 2. An IPv4 address or FQDN format | Specify the Remote Gateway. The Remote Gateway |

Under the Manually Key Management authentication configuration, only one subnet is supported for both Local and Remote IPSec peer.

| Manual Proposal | |
|------------------|---------------------------|
| Item | Setting |
| ▶ Outbound SPI | 0x <input type="text"/> |
| ▶ Inbound SPI | 0x <input type="text"/> |
| ▶ Encryption | DES <input type="text"/> |
| ▶ Authentication | None <input type="text"/> |

| Manual Proposal Window | | |
|------------------------|--------------------|---|
| Item | Value setting | Description |
| Outbound SPI | Hexadecimal format | Specify the Outbound SPI for this IPSec tunnel. |

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| | | |
|-----------------------|---|--|
| | | <i>Value Range: 0 ~ FFFF.</i> |
| Inbound SPI | Hexadecimal format | Specify the Inbound SPI for this IPsec tunnel. <i>Value Range: 0 ~ FFFF.</i> |
| Encryption | 1. A Must fill setting 2. Hexadecimal format | Specify the Encryption Method and Encryption key. Available encryption methods are DES/3DES/AES-128/AES-192/AES-256. The key length for DES is 16, 3DES is 48, AES-128 is 32, AES-192 is 48, and AES-256 is 64. Note: When AH option in Encapsulation is selected, encryption will not be available. |
| Authentication | 1. A Must fill setting 2. Hexadecimal format | Specify the Authentication Method and Authentication key. Available encryptions are None/MD5/SHA1/SHA2-256. The key length for MD5 is 32, SHA1 is 40, and SHA2-256 is 64. Note: When AH option in Encapsulation Protocol is selected, None option in Authentication will not be available. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |
| Back | N/A | Click Back to return to the previous page. |

Create/Edit Dynamic VPN Server List

| Dynamic server List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | |
|--|-------------|-----------|------------------|--------|---------|
| ID | Tunnel Name | Interface | Connected Client | Enable | Actions |

Similar to create an IPsec VPN Tunnel for site/host to site/host scenario, when **Edit** button is applied a series of configuration screen will appear. They are Tunnel Configuration, Local & Remote Configuration, Authentication, IKE Phase, IKE Proposal Definition, IPsec Phase, and IPsec Proposal Definition. You have to configure the tunnel details for the gateway as a Dynamic VPN server.

Note: For the purchased gateway, you can configure one Dynamic VPN server for each WAN interface.

| Tunnel Configuration | |
|--------------------------|---|
| Item | Setting |
| ▶ Tunnel | <input type="checkbox"/> Enable |
| ▶ Tunnel Name | <input type="text" value="Dynamic IPsec1"/> |
| ▶ Interface | <input type="text" value="WAN1"/> |
| ▶ Tunnel Scenario | <input type="text" value="Dynamic VPN"/> |
| ▶ Operation Mode | <input type="text" value="Always on"/> |
| ▶ Encapsulation Protocol | <input type="text" value="ESP"/> |

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| Tunnel Configuration Window | | |
|-------------------------------|--|--|
| Item | Value setting | Description |
| Tunnel | Unchecked by default | Check the Enable box to activate the Dynamic IPsec VPN tunnel. |
| Tunnel Name | 1. A Must fill setting 2. String format can be any text | Enter a tunnel name. Enter a name that is easy for you to identify. Value Range: 1 ~ 19 characters. |
| Interface | 1. A Must fill setting 2. WAN 1 is selected by default | Select WAN interface on which IPsec tunnel is to be established. |
| Tunnel Scenario | 1. A Must fill setting 2. Dynamic VPN is selected by default | The IPsec tunneling scenario is fixed to Dynamic VPN. |
| Operation Mode | 1. A Must fill setting 2. Always on is selected by default | The available operation mode is Always On . Failover option is not available for the Dynamic IPsec scenario. |
| Encapsulation Protocol | 1. A Must fill setting 2. ESP is selected by default | Select the Encapsulation Protocol from the dropdown box for this IPsec tunnel. Available encapsulations are ESP and AH . |

| Local & Remote Configuration | |
|------------------------------|----------------------|
| Item | Setting |
| ▶ Local Subnet | <input type="text"/> |
| ▶ Local Netmask | <input type="text"/> |

| Local & Remote Configuration Window | | |
|-------------------------------------|---------------------|--------------------------------------|
| Item | Value setting | Description |
| Local Subnet | A Must fill setting | Specify the Local Subnet IP address. |
| Local Netmask | A Must fill setting | Specify the Local Subnet Mask. |

| Authentication | |
|------------------|---|
| Item | Setting |
| ▶ Key Management | IKE+Pre-shared Key ▼ <input type="text"/> (Min. 8 characters) |
| ▶ Local ID | Type: User Name ▼ ID: <input type="text"/> (Optional) |
| ▶ Remote ID | Type: User Name ▼ ID: <input type="text"/> |

| Authentication Configuration Window | | |
|-------------------------------------|------------------------|--|
| Item | Value setting | Description |
| Key Management | 1. A Must fill setting | Select Key Management from the dropdown box for this IPsec tunnel. |

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| | | |
|------------------|---------------------------------------|--|
| | 2. Pre-shared Key 8 to 32 characters. | IKE+Pre-shared Key: user needs to set a key (8 ~ 32 characters). |
| Local ID | An optional setting | <p>Specify the Local ID for this IPSec tunnel to authenticate.</p> <p>Select User Name for Local ID and enter the username. The username may include but can't be all numbers.</p> <p>Select FQDN for Local ID and enter the FQDN.</p> <p>Select User@FQDN for Local ID and enter the User@FQDN.</p> <p>Select Key ID for Local ID and enter the Key ID (English alphabet or number).</p> |
| Remote ID | An optional setting | <p>Specify the Remote ID for this IPSec tunnel to authenticate.</p> <p>Select User Name for Remote ID and enter the username. The username may include but can't be all numbers.</p> <p>Select FQDN for Local ID and enter the FQDN.</p> <p>Select User@FQDN for Remote ID and enter the User@FQDN.</p> <p>Select Key ID for Remote ID and enter the Key ID (English alphabet or number).</p> <p>Note: Remote ID will be not available when Dynamic VPN option in Tunnel Scenario is selected.</p> |

For the rest IKE Phase, IKE Proposal Definition, IPSec Phase, and IPSec Proposal Definition settings, they are the same as that of creating an IPSec Tunnel described in previous section. Please refer to the related description.

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5.1.2 OpenVPN

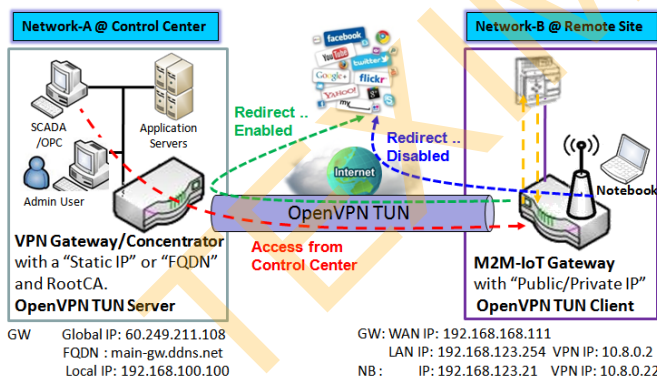
OpenVPN is an application that implements virtual private network (VPN) techniques for creating secure point-to-point or site-to-site connections in routed or bridged configurations and remote access facilities. It uses a custom security protocol that utilizes SSL/TLS for key exchange. It is capable of traversing network address translators (NATs) and firewalls.

OpenVPN allows peers to authenticate each other using a Static Key (pre-shared key) or certificates. When used in a multi-client-server configuration, it allows the server to release an authentication certificate for every client, using signature and certificate authority. It uses the OpenSSL encryption library extensively, as well as the SSLv3/TLSv1 protocol, and contains many security and control features.

OpenVPN Tunneling is a Client and Server based tunneling technology. The OpenVPN Server must have a Static IP or a FQDN, and maintain a Client list. The OpenVPN Client may be a mobile user or mobile site with public IP or private IP, and requesting the OpenVPN tunnel connection. The product supports both OpenVPN Server and OpenVPN Client features to meet different application requirements.

There are two OpenVPN connection scenarios. They are the TAP and TUN scenarios. The product can create either a layer-3 based IP tunnel (TUN), or a layer-2 based Ethernet TAP that can carry any type of Ethernet traffic. In addition to configuring the device as a Server or Client, you have to specify which type of OpenVPN connection scenario is to be adopted.

OpenVPN TUN Scenario



1. M2M-IoT Gateway (as OpenVPN TUN Client) connects to peer VPN Gateway/Concentrator (as OpenVPN TUN Server).
2. M2M-IoT Gateway will be assigned 10.8.0.2 IP Address after OpenVPN TUN Connection established. (10.8.0.x is a virtual subnet)
3. Local networked device will get a virtual IP 10.8.0.x if its traffic goes through the OpenVPN TUN connection (when NAT disabled & Redirect Internet Traffic enabled).
4. SCADA Server in Control Center can access remote attached device(s) with the assigned IP Address 10.8.0.2.

solution.

The term "TUN" mode is referred to routing mode and operates with layer 3 packets. In routing mode, the VPN client is given an IP address on a different subnet than the local LAN under the OpenVPN server. This virtual subnet is created for connecting to any remote VPN computers. In routing mode, the OpenVPN server creates a "TUN" interface with its own IP address pool which is different to the local LAN. Remote hosts that dial-in will get an IP address inside the virtual network and will have access only to the server where OpenVPN resides.

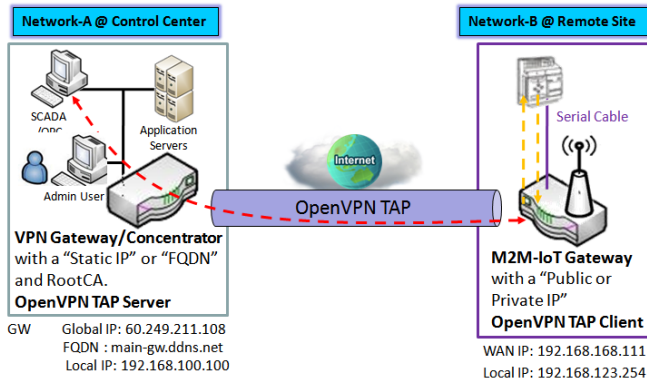
If you want to offer remote access to a VPN server from client(s), and inhibit the access to remote LAN resources under VPN server, OpenVPN TUN mode is the simplest

As shown in the diagram, the M2M-IoT Gateway is configured as an OpenVPN TUN Client, and connects to an OpenVPN TUN Server. Once the OpenVPN TUN connection is established, the connected TUN client will be

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assigned a virtual IP (10.8.0.2) which is belong to a virtual subnet that is different to the local subnet in Control Center. With such connection, the local networked devices will get a virtual IP 10.8.0.x if its traffic goes through the OpenVPN TUN connection when Redirect Internet Traffic settings is enabled; Besides, the SCADA Server in Control Center can access remote attached serial device(s) with the virtual IP address (10.8.0.2).

OpenVPN TAP Scenario



1. M2M-IoT Gateway (as OpenVPN TAP Client) connects to peer VPN Gateway/Concentrator (as OpenVPN TAP Server).
2. M2M-IoT Gateway will be assigned **192.168.100.210** IP Address after OpenVPN TAP Connection established. **(same subnet as in Control Center)**
3. SCADA Server in Control Center can access remote attached device(s) with the assigned IP Address 192.168.100.210.

The term "TAP" is referred to bridge mode and operates with layer 2 packets. In bridge mode, the VPN client is given an IP address on the same subnet as the LAN resided under the OpenVPN server. Under such configuration, the OpenVPN client can directly access to the resources in LAN. If you want to offer remote access to the entire remote LAN for VPN client(s), you have to setup OpenVPN in "TAP" bridge mode.

As shown in the diagram, the M2M-IoT Gateway is configured as an OpenVPN TAP Client, and connects to an OpenVPN TAP Server. Once the OpenVPN TAP connection is established, the connected TAP client will be assigned a virtual IP (192.168.100.210) which is the same subnet as

that of local subnet in Control Center. With such connection, the SCADA Server in Control Center can access remote attached serial device(s) with the virtual IP address (192.168.100.210).

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Open VPN Setting

Go to **Security > VPN > OpenVPN** tab.

The OpenVPN setting allows user to create and configure OpenVPN tunnels.

Enable OpenVPN

Enable OpenVPN and select an expected configuration, either server or client, for the gateway to operate.

| Configuration | |
|-------------------|---------------------------------|
| Item | Setting |
| ▶ OpenVPN | <input type="checkbox"/> Enable |
| ▶ Server / Client | Server ▼ |

| Configuration | | |
|----------------------|--|---|
| Item | Value setting | Description |
| OpenVPN | The box is unchecked by default | Check the Enable box to activate the OpenVPN function. |
| Server/Client | Server Configuration is selected by default. | When Server is selected, as the name indicated, server configuration will be displayed below for further setup. When Client is selected, you can specify the client settings in another client configuration window. |

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As an OpenVPN Server

If **Server** is selected, an OpenVPN Server Configuration screen will appear. **OpenVPN Server Configuration** window can let you enable the OpenVPN server function, specify the virtual IP address of OpenVPN server, when remote OpenVPN clients dial in, and the authentication protocol.

The OpenVPN Server supports up to 4 TUN / TAP tunnels at the same time.

| OpenVPN Server Configuration | |
|------------------------------|---|
| Item | Setting |
| ▶ OpenVPN Server | <input checked="" type="checkbox"/> Enable |
| ▶ Protocol | TCP ▼ |
| ▶ Port | 4430 |
| ▶ Tunnel Scenario | TUN ▼ |
| ▶ Authorization Mode | Static Key ▼ |
| ▶ Local Endpoint IP Address | |
| ▶ Remote Endpoint IP Address | |
| ▶ Static Key | |
| ▶ Server Virtual IP | 10.8.0.0 |
| ▶ DHCP-Proxy Mode | <input checked="" type="checkbox"/> Enable |
| ▶ IP Pool | Starting Address: <input type="text"/> ~ Ending Address: <input type="text"/> |
| ▶ Gateway | <input type="text"/> |
| ▶ Netmask | 255.255.255.0(/24) ▼ |
| ▶ Redirect Default Gateway | <input type="checkbox"/> Enable |
| ▶ Encryption Cipher | Blowfish ▼ |
| ▶ Hash Algorithm | SHA-1 ▼ |
| ▶ LZO Compression | Adaptive ▼ |
| ▶ Persist Key | <input checked="" type="checkbox"/> Enable |
| ▶ Persist Tun | <input checked="" type="checkbox"/> Enable |
| ▶ Advanced Configuration | <input type="button" value="Edit"/> |

OpenVPN Server Configuration

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| Item | Value setting | Description |
|-----------------------------------|--|---|
| OpenVPN Server | The box is unchecked by default. | Click the Enable to activate OpenVPN Server functions. |
| Protocol | <ol style="list-style-type: none"> 1. A Must filled setting 2. By default TCP is selected. | Define the selected Protocol for connecting to the OpenVPN Server. <ul style="list-style-type: none"> • Select TCP , or UDP -> The TCP protocol will be used to access the OpenVPN Server, and Port will be set as 4430 automatically. • Select UDP -> The UDP protocol will be used to access the OpenVPN Server, and Port will be set as 1194 automatically. |
| Port | <ol style="list-style-type: none"> 1. A Must filled setting 2. By default 4430 is set. | Specify the Port for connecting to the OpenVPN Server. Value Range: 1 ~ 65535. |
| Tunnel Scenario | <ol style="list-style-type: none"> 1. A Must filled setting 2. By default TUN is selected. | Specify the type of Tunnel Scenario for connecting to the OpenVPN Server. It can be TUN for TUN tunnel scenario, or TAP for TAP tunnel scenario. |
| Authorization Mode | <ol style="list-style-type: none"> 1. A Must filled setting 2. By default Static Key is selected. | Specify the authorization mode for the OpenVPN Server. <ul style="list-style-type: none"> • TLS ->The OpenVPN will use TLS authorization mode, and the following items CA Cert., Server Cert. and DH PEM will be displayed. CA Cert. could be generated in Certificate. Refer to Object Definition > Certificate > Trusted Certificate. Server Cert. could be generated in Certificate. Refer to Object Definition > Certificate > My Certificate. • Static Key ->The OpenVPN will use static key (pre-shared) authorization mode, and the following items Local Endpoint IP Address, Remote Endpoint IP Address and Static Key will be displayed. Note: Static Key will be available only when TUN is chosen in Tunnel Scenario. |
| Local Endpoint IP Address | A Must filled setting | Specify the virtual Local Endpoint IP Address of this OpenVPN gateway. Value Range: The IP format is 10.8.0.x, the range of x is 1~254. Note: Local Endpoint IP Address will be available only when Static Key is chosen in Authorization Mode. |
| Remote Endpoint IP Address | A Must filled setting | Specify the virtual Remote Endpoint IP Address of the peer OpenVPN gateway. Value Range: The IP format is 10.8.0.x, the range of x is 1~254. Note: Remote Endpoint IP Address will be available only when Static Key is chosen in Authorization Mode. |
| Static Key | A Must filled setting | Specify the Static Key . Note: Static Key will be available only when Static Key is chosen in Authorization Mode. |
| Server Virtual IP | A Must filled setting | Specify the Server Virtual IP . Value Range: The IP format is 10.y.0.0, the range of y is 1~254. Note: Server Virtual IP will be available only when TLS is chosen in Authorization Mode. |
| DHCP-Proxy Mode | <ol style="list-style-type: none"> 1. A Must filled setting 2. The box is checked by default. | Check the Enable box to activate the DHCP-Proxy Mode . Note: DHCP-Proxy Mode will be available only when TAP is chosen in Tunnel Device. |
| IP Pool | A Must filled setting | Specify the virtual IP pool setting for the OpenVPN server. You have to specify the Starting Address and Ending Address as the IP address pool for the OpenVPN clients. Note: IP Pool will be available only when TAP is chosen in Tunnel Device, and DHCP-Proxy Mode is unchecked (disabled). |

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| | | |
|---------------------------------|---|--|
| Gateway | A Must filled setting | Specify the Gateway setting for the OpenVPN server. It will be assigned to the connected OpenVPN clients. Note: Gateway will be available only when TAP is chosen in Tunnel Device, and DHCP-Proxy Mode is unchecked (disabled). |
| Netmask | By default - select one - is selected. | Specify the Netmask setting for the OpenVPN server. It will be assigned to the connected OpenVPN clients. <u>Value Range:</u> 255.255.255.0/24 (only support class C) Note_1: Netmask will be available when TAP is chosen in Tunnel Device, and DHCP-Proxy Mode is unchecked (disabled). Note_2: Netmask will also be available when TUN is chosen in Tunnel Device. |
| Redirect Default Gateway | 1. An Optional setting. 2. The box is unchecked by default. | Check the Enable box to activate the Redirect Default Gateway function. |
| Encryption Cipher | 1. A Must filled setting. 2. By default Blowfish is selected. | Specify the Encryption Cipher from the dropdown list. It can be Blowfish/AES-256/AES-192/AES-128/None. |
| Hash Algorithm | By default SHA-1 is selected. | Specify the Hash Algorithm from the dropdown list. It can be SHA-1/MD5/MD4/SHA2-256/SHA2-512/None/Disable. |
| LZO Compression | By default Adaptive is selected. | Specify the LZO Compression scheme. It can be Adaptive/YES/NO/Default. |
| Persis Key | 1. An Optional setting. 2. The box is checked by default. | Check the Enable box to activate the Persis Key function. |
| Persis Tun | 1. An Optional setting. 2. The box is checked by default. | Check the Enable box to activate the Persis Tun function. |
| Advanced Configuration | N/A | Click the Edit button to specify the Advanced Configuration setting for the OpenVPN server. If the button is clicked, Advanced Configuration will be displayed below. |
| Save | N/A | Click Save to save the settings. |
| Undo | N/A | Click Undo to cancel the changes. |

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When **Advanced Configuration** is selected, an OpenVPN Server Advanced Configuration screen will appear.

| OpenVPN Server Advanced Configuration | |
|---------------------------------------|--|
| Item | Setting |
| ▶ TLS Cipher | TLS-RSA-WITH-AES128-SHA ▼ |
| ▶ TLS Auth. Key | <input type="text"/> (Optional) |
| ▶ Client to Client | <input checked="" type="checkbox"/> Enable |
| ▶ Duplicate CN | <input checked="" type="checkbox"/> Enable |
| ▶ Tunnel MTU | <input type="text" value="1500"/> |
| ▶ Tunnel UDP Fragment | <input type="text" value="1500"/> |
| ▶ Tunnel UDP MSS-Fix | <input type="checkbox"/> Enable |
| ▶ CCD-Dir Default File | <input type="text"/> |
| ▶ Client Connection Script | <input type="text"/> |
| ▶ Additional Configuration | <input type="text"/> |

| OpenVPN Server Advanced Configuration | | |
|---------------------------------------|---|--|
| Item | Value setting | Description |
| TLS Cipher | <ol style="list-style-type: none"> A Must filled setting. TLS-RSA-WITH-AES128-SHA is selected by default | Specify the TLS Cipher from the dropdown list. It can be None / TLS-RSA-WITH-RC4-MD5 / TLS-RSA-WITH-AES128-SHA / TLS-RSA-WITH-AES256-SHA / TLS-DHE-DSS-AES128-SHA / TLS-DHE-DSS-AES256-SHA . Note: TLS Cipher will be available only when TLS is chosen in Authorization Mode. |
| TLS Auth. Key | <ol style="list-style-type: none"> An Optional setting. String format: any text | Specify the TLS Auth. Key . Note: TLS Auth. Key will be available only when TLS is chosen in Authorization Mode. |
| Client to Client | The box is checked by default | Check the Enable box to enable the traffics among different OpenVPN Clients. Note: Client to Client will be available only when TLS is chosen in Authorization Mode |
| Duplicate CN | The box is checked by default | Check the Enable box to activate the Duplicate CN function. Note: Duplicate CN will be available only when TLS is chosen in Authorization Mode |
| Tunnel MTU | <ol style="list-style-type: none"> A Must filled setting The value is 1500 by default | Specify the Tunnel MTU . <u>Value Range: 0 ~ 1500.</u> |
| Tunnel UDP Fragment | <ol style="list-style-type: none"> A Must filled setting The value is 1500 by default | Specify the Tunnel UDP Fragment . By default, it is equal to Tunnel MTU . <u>Value Range: 0 ~ 1500.</u> Note: Tunnel UDP Fragment will be available only when UDP is chosen in |

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| | | |
|---------------------------------|---|--|
| | | Protocol. |
| Tunnel UDP MSS-Fix | <ol style="list-style-type: none">1. An Optional setting.2. The box is unchecked by default. | Check the Enable box to activate the Tunnel UDP MSS-Fix Function. Note: Tunnel UDP MSS-Fix will be available only when UDP is chosen in Protocol. |
| CCD-Dir Default File | <ol style="list-style-type: none">1. An Optional setting.2. String format: any text | Specify the CCD-Dir Default File . <i>Value Range:</i> 0 ~ 256 characters. |
| Client Connection Script | <ol style="list-style-type: none">1. An Optional setting.2. String format: any text | Specify the Client Connection Script . <i>Value Range:</i> 0 ~ 256 characters. |
| Additional Configuration | <ol style="list-style-type: none">1. An Optional setting.2. String format: any text | Specify the Additional Configuration . <i>Value Range:</i> 0 ~ 256 characters. |

TEXIM EUROPE

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As an OpenVPN Client

If **Client** is selected, an OpenVPN Client List screen will appear.

| OpenVPN Client List | | | | | | | | | | | | | | |
|---------------------|-------------|-----------|----------|------|-----------------|----------------|---------------|---------------------------|-----|--------------------|-------------------|----------------|--------|---------|
| ID | Client Name | Interface | Protocol | Port | Tunnel Scenario | Remote IP/FQDN | Remote Subnet | Redirect Internet Traffic | NAT | Authorization Mode | Encryption Cipher | Hash Algorithm | Enable | Actions |

When **Add** button is applied, OpenVPN Client Configuration screen will appear. **OpenVPN Client Configuration** window let you specify the required parameters for an OpenVPN VPN client, such as "OpenVPN Client Name", "Interface", "Protocol", "Tunnel Scenario", "Remote IP/FQDN", "Remote Subnet", "Authorization Mode", "Encryption Cipher", "Hash Algorithm" and tunnel activation.

| OpenVPN Client Configuration | |
|------------------------------|--|
| Item | Setting |
| ▶ OpenVPN Client Name | OpenVPN Client #1 |
| ▶ Interface | WAN 1 ▼ |
| ▶ Protocol | TCP ▼ Port: 443 |
| ▶ Tunnel Scenario | TUN ▼ |
| ▶ Remote IP/FQDN | |
| ▶ Remote Subnet | 255.255.255.0(/24) ▼ |
| ▶ Redirect Internet Traffic | <input type="checkbox"/> Enable |
| ▶ NAT | <input type="checkbox"/> Enable |
| ▶ Authorization Mode | TLS ▼ CA Cert.: ▼ Client Cert.: ▼ Client Key.: ▼ Please set the Certificate. |
| ▶ Encryption Cipher | Blowfish ▼ |
| ▶ Hash Algorithm | SHA-1 ▼ |
| ▶ LZO Compression | Adaptive ▼ |
| ▶ Persist Key | <input checked="" type="checkbox"/> Enable |
| ▶ Persist Tun | <input checked="" type="checkbox"/> Enable |
| ▶ Advanced Configuration | Edit |
| ▶ Tunnel | <input type="checkbox"/> Enable |

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| OpenVPN Client Configuration | | |
|----------------------------------|---|--|
| Item | Value setting | Description |
| OpenVPN Client Name | A Must filled setting | The OpenVPN Client Name will be used to identify the client in the tunnel list. Value Range: 1 ~ 32 characters. |
| Interface | 1. A Must filled setting 2. By default WAN-1 is selected. | Define the physical interface to be used for this OpenVPN Client tunnel. |
| Protocol | 1. A Must filled setting 2. By default TCP is selected. | Define the Protocol for the OpenVPN Client. <ul style="list-style-type: none"> • Select TCP ->The OpenVPN will use TCP protocol, and Port will be set as 443 automatically. • Select UDP -> The OpenVPN will use UDP protocol, and Port will be set as 1194 automatically. |
| Port | 1. A Must filled setting 2. By default 443 is set. | Specify the Port for the OpenVPN Client to use. Value Range: 1 ~ 65535. |
| Tunnel Scenario | 1. A Must filled setting 2. By default TUN is selected. | Specify the type of Tunnel Scenario for the OpenVPN Client to use. It can be TUN for TUN tunnel scenario, or TAP for TAP tunnel scenario. |
| Remote IP/FQDN | A Must filled setting | Specify the Remote IP/FQDN of the peer OpenVPN Server for this OpenVPN Client tunnel. Fill in the IP address or FQDN. |
| Remote Subnet | 1. An Optional setting. 2. The box is unchecked by default. | Check the Enable box to activate remote subnet function, and specify Remote Subnet of the peer OpenVPN Server for this OpenVPN Client tunnel. Fill in the remote subnet address and remote subnet mask. |
| Redirect Internet Traffic | 1. An Optional setting. 2. The box is unchecked by default. | Check the Enable box to activate the Redirect Internet Traffic function. |
| NAT | 1. An Optional setting. 2. The box is unchecked by default. | Check the Enable box to activate the NAT function. |
| Authorization Mode | 1. A Must filled setting 2. By default TLS is selected. | Specify the authorization mode for the OpenVPN Server. <ul style="list-style-type: none"> • TLS ->The OpenVPN will use TLS authorization mode, and the following items CA Cert., Client Cert. and Client Key will be displayed. CA Cert. could be selected in Trusted CA Certificate List. Refer to Object Definition > Certificate > Trusted Certificate. Client Cert. could be selected in Local Certificate List. Refer to Object Definition > Certificate > My Certificate. Client Key could be selected in Trusted Client key List. Refer to Object Definition > Certificate > Trusted Certificate. • Static Key ->The OpenVPN will use static key authorization mode, and the following items Local Endpoint IP Address, Remote Endpoint IP Address and Static Key will be displayed. |
| Local Endpoint IP Address | A Must filled setting | Specify the virtual Local Endpoint IP Address of this OpenVPN gateway. Value Range: The IP format is 10.8.0.x, the range of x is 1~254. Note: Local Endpoint IP Address will be available only when Static Key is chosen in Authorization Mode. |

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| | | |
|-----------------------------------|--|---|
| Remote Endpoint IP Address | A Must filled setting | Specify the virtual Remote Endpoint IP Address of the peer OpenVPN gateway. Value Range: The IP format is 10.8.0.x, the range of x is 1~254. Note: Remote Endpoint IP Address will be available only when Static Key is chosen in Authorization Mode. |
| Static Key | A Must filled setting | Specify the Static Key . Note: Static Key will be available only when Static Key is chosen in Authorization Mode. |
| Encryption Cipher | By default Blowfish is selected. | Specify the Encryption Cipher . It can be Blowfish/AES-256/AES-192/AES-128/None . |
| Hash Algorithm | By default SHA-1 is selected. | Specify the Hash Algorithm . It can be SHA-1/MD5/MD4/SHA2-256/SHA2-512/None/Disable . |
| LZO Compression | By default Adaptive is selected. | Specify the LZO Compression scheme. It can be Adaptive/YES/NO/Default . |
| Persis Key | 1. An Optional setting. 2. The box is checked by default. | Check the Enable box to activate the Persis Key function. |
| Persis Tun | 1. An Optional setting. 2. The box is checked by default. | Check the Enable box to activate the Persis Tun function. |
| Advanced Configuration | N/A | Click the Edit button to specify the Advanced Configuration setting for the OpenVPN server. If the button is clicked, Advanced Configuration will be displayed below. |
| Tunnel | The box is unchecked by default | Check the Enable box to activate this OpenVPN tunnel. |
| Save | N/A | Click Save to save the settings. |
| Undo | N/A | Click Undo to cancel the changes. |
| Back | N/A | Click Back to return to last page. |

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When **Advanced Configuration** is selected, an OpenVPN Client Advanced Configuration screen will appear.

| OpenVPN Client Advanced Configuration | |
|---------------------------------------|---|
| Item | Setting |
| ▶ TLS Cipher | TLS-RSA-WITH-AES128-SHA ▼ |
| ▶ TLS Auth. Key(Optional) | <input type="text"/> (Optional) |
| ▶ User Name(Optional) | <input type="text"/> (Optional) |
| ▶ Password(Optional) | <input type="text"/> (Optional) |
| ▶ Bridge TAP to | VLAN 1 ▼ |
| ▶ Firewall Protection | <input type="checkbox"/> Enable |
| ▶ Client IP Address | Dynamic IP ▼ |
| ▶ Tunnel MTU | <input type="text" value="1500"/> |
| ▶ Tunnel UDP Fragment | <input type="text" value="1500"/> |
| ▶ Tunnel UDP MSS-Fix | <input type="checkbox"/> Enable |
| ▶ nsCertType Verification | <input type="checkbox"/> Enable |
| ▶ TLS Renegotiation Time(seconds) | <input type="text" value="3600"/> (seconds) |
| ▶ Connection Retry(seconds) | <input type="text" value="-1"/> (seconds) |
| ▶ DNS | Automatically ▼ |
| ▶ Additional Configuration | <input type="text"/> |

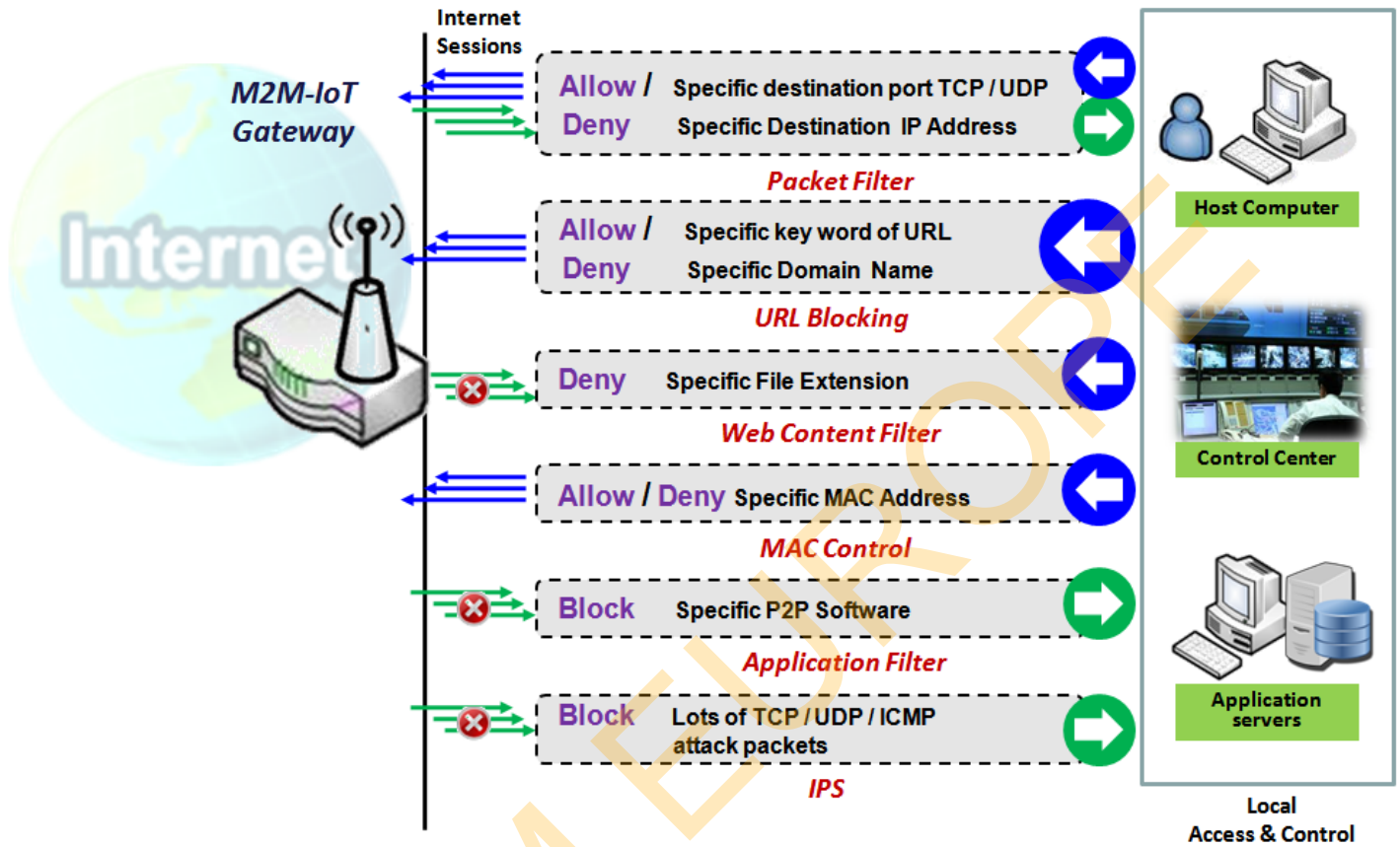
| OpenVPN Advanced Client Configuration | | |
|---------------------------------------|---|---|
| Item | Value setting | Description |
| TLS Cipher | <ol style="list-style-type: none"> 1. A Must filled setting. 2. TLS-RSA-WITH-AES128-SHA is selected by default | Specify the TLS Cipher from the dropdown list. It can be None / TLS-RSA-WITH-RC4-MD5 / TLS-RSA-WITH-AES128-SHA / TLS-RSA-WITH-AES256-SHA / TLS-DHE-DSS-AES128-SHA / TLS-DHE-DSS-AES256-SHA . Note: TLS Cipher will be available only when TLS is chosen in Authorization Mode. |
| TLS Auth. Key | <ol style="list-style-type: none"> 1. An Optional setting. 2. String format: any text | Specify the TLS Auth. Key for connecting to an OpenVPN server, if the server required it. Note: TLS Auth. Key will be available only when TLS is chosen in Authorization Mode. |

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| | | |
|---|---|---|
| User Name | An Optional setting. | Enter the User account for connecting to an OpenVPN server, if the server required it. Note: User Name will be available only when TLS is chosen in Authorization Mode. |
| Password | An Optional setting. | Enter the Password for connecting to an OpenVPN server, if the server required it. Note: User Name will be available only when TLS is chosen in Authorization Mode. |
| Bridge TAP to | By default VLAN 1 is selected | Specify the setting of “ Bridge TAP to ” to bridge the TAP interface to a certain local network interface or VLAN. Note: Bridge TAP to will be available only when TAP is chosen in Tunnel Scenario and NAT is unchecked. |
| Firewall Protection | The box is unchecked by default. | Check the box to activate the Firewall Protection function. Note: Firewall Protection will be available only when NAT is enabled. |
| Client IP Address | By default Dynamic IP is selected | Specify the virtual IP Address for the OpenVPN Client. It can be Dynamic IP/Static IP . |
| Tunnel MTU | 1.A Must filled setting 2.The value is 1500 by default | Specify the value of Tunnel MTU . Value Range: 0 ~ 1500. |
| Tunnel UDP Fragment | The value is 1500 by default | Specify the value of Tunnel UDP Fragment . Value Range: 0 ~ 1500. Note: Tunnel UDP Fragment will be available only when UDP is chosen in Protocol. |
| Tunnel UDP MSS-Fix | The box is unchecked by default. | Check the Enable box to activate the Tunnel UDP MSS-Fix function. Note: Tunnel UDP MSS-Fix will be available only when UDP is chosen in Protocol. |
| nsCerType Verification | The box is unchecked by default. | Check the Enable box to activate the nsCerType Verification function. Note: nsCerType Verification will be available only when TLS is chosen in Authorization Mode. |
| TLS Renegotiation Time (seconds) | The value is 3600 by default | Specify the time interval of TLS Renegotiation Time . Value Range: -1 ~ 86400. |
| Connection Retry(seconds) | The value is -1 by default | Specify the time interval of Connection Retry . The default -1 means that it is no need to execute connection retry. Value Range: -1 ~ 86400, and -1 means no retry is required. |
| DNS | By default Automatically is selected | Specify the setting of DNS . It can be Automatically/Manually . |
| Additional Configuration | An Optional setting. | Enter optional configuration string here. Up to 256 characters is allowable. Value Range: 0 ~ 256characters. |
| Save | N/A | Click Save to save the settings. |
| Undo | N/A | Click Undo to cancel the changes. |
| Back | N/A | Click Back to return to last page. |

Industrial LoRa Gateway

5.2 Firewall



The firewall functions include Packet Filter, URL Blocking, Content Filter, MAC Control, Application Filter, IPS and some firewall options. The supported function can be different for the purchased gateway.

5.2.1 Packet Filter (not supported)

Not supported feature for the purchased product, leave it as blank.

5.2.2 URL Blocking (not supported)

Not supported feature for the purchased product, leave it as blank.

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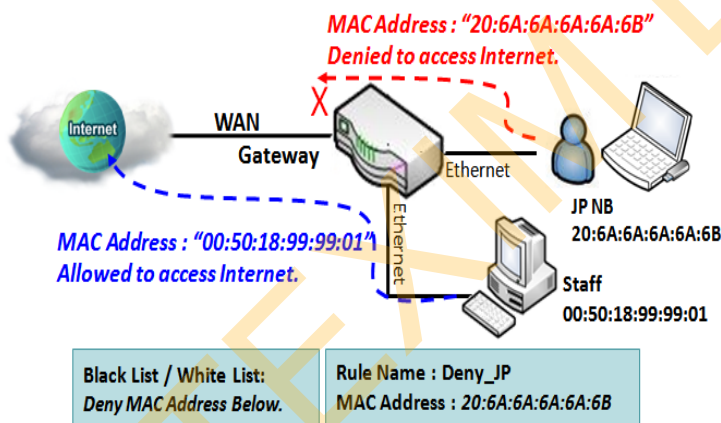
5.2.3 MAC Control

| Configuration [Help] | |
|------------------------------|--|
| Item | Setting |
| ▶ MAC Control | <input checked="" type="checkbox"/> Enable |
| ▶ Black List / White List | Deny MAC Address Below. ▼ |
| ▶ Log Alert | <input type="checkbox"/> Enable |
| ▶ Known MAC from LAN PC List | 192.168.1.100(James-P45V) ▼ <input type="button" value="Copy to"/> |

| MAC Control Rule List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | |
|--|-----------|-------------|--------------------|--------|---------|
| ID | Rule Name | MAC Address | Time Schedule Rule | Enable | Actions |
| | | | | | |

"MAC Control" function allows you to assign the accessibility to the gateway for different users based on device's MAC address. When the administrator wants to reject the traffics from some client hosts with specific MAC addresses, he can use the "MAC Control" function to reject with the black list configuration.

MAC Control with Black List Scenario



As shown in the diagram, enable the MAC control function and specify the "MAC Control Rule List" is a black list, and configure one MAC control rule for the gateway to deny the connection request from the "JP NB" with its own MAC address 20:6A:6A:6A:6A:6B.

System will block the connecting from the "JP NB" to the gateway but allow others.

Industrial LoRa Gateway

MAC Control Setting

Go to **Security > Firewall > MAC Control** Tab.

The MAC control setting allows user to create and customize MAC address policies to allow or reject packets with specific source MAC address.

Enable MAC Control

| Configuration [Help] | |
|---|--|
| Item | Setting |
| ▶ MAC Control | <input type="checkbox"/> Enable |
| ▶ Black List / White List | Deny MAC Address Below. ▾ |
| ▶ Log Alert | <input type="checkbox"/> Enable |
| ▶ Known MAC from LAN PC List | 192.168.123.100(James-P45V) ▾ <input type="button" value="Copy to"/> |

| Configuration Window | | |
|-----------------------------------|--|---|
| Item | Value setting | Description |
| MAC Control | The box is unchecked by default | Check the Enable box to activate the MAC filter function |
| Black List / White List | Deny MAC Address Below is set by default | When Deny MAC Address Below is selected, as the name suggest, packets specified in the rules will be blocked –black listed. In contrast, with Allow MAC Address Below , you can specifically white list the packets to pass and the rest will be blocked. |
| Log Alert | The box is unchecked by default | Check the Enable box to activate to activate Event Log. |
| Known MAC from LAN PC List | N/A | Select a MAC Address from LAN Client List. Click the Copy to to copy the selected MAC Address to the filter rule. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

Industrial LoRa Gateway

Create/Edit MAC Control Rules

The gateway supports up to a maximum of 20 filter rule sets. Ensure that the MAC Control is enabled before we can create control rules.

| MAC Control Rule List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | |
|--|-----------|-------------|--------------------|--------|---------|
| ID | Rule Name | MAC Address | Time Schedule Rule | Enable | Actions |

When **Add** button is applied, **Filter Rule Configuration** screen will appear.

| MAC Control Rule Configuration | | | |
|-------------------------------------|--------------------------------|---------------|--------------------------|
| Rule Name | MAC Address (Use : to Compose) | Time Schedule | Enable |
| <input type="text" value="Rule1"/> | <input type="text"/> | (0) Always ▾ | <input type="checkbox"/> |
| <input type="button" value="Save"/> | | | |

| MAC Control Rule Configuration Item | Value setting | Description |
|--------------------------------------|--|--|
| Rule Name | 1. String format can be any text 2. A Must fill setting | Enter a MAC Control rule name. Enter a name that is easy for you to remember. |
| MAC Address (Use: to Compose) | 1. MAC Address string Format 2. A Must fill setting | Specify the Source MAC Address to filter rule. |
| Time Schedule | A Must fill setting | Apply Time Schedule to this rule; otherwise leave it as (0) Always . If the dropdown list is empty, ensure Time Schedule is pre-configured. Refer to Object Definition > Scheduling > Configuration tab |
| Enable | The box is unchecked by default. | Click Enable box to activate this rule, and then save the settings. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |
| Back | N/A | Click Back to return to the MAC Control Configuration page. |

5.2.4 Content Filter (not supported)

Not supported feature for the purchased product, leave it as blank.

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5.2.5 Application Filter (not supported)

Not supported feature for the purchased product, leave it as blank.

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5.2.6 IPS

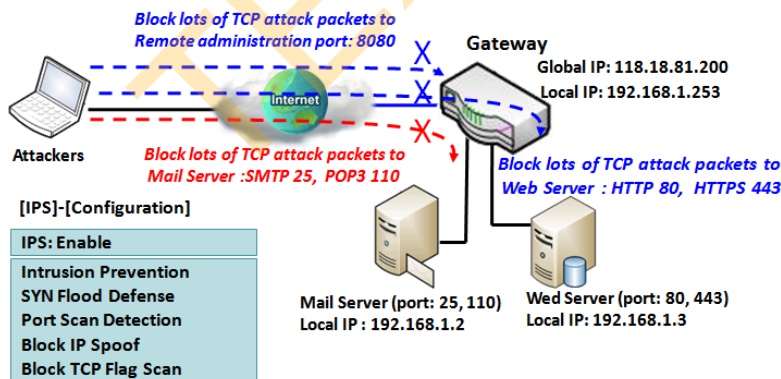
| Configuration [Help] | |
|------------------------|---------------------------------|
| Item | Setting |
| ▶ IPS | <input type="checkbox"/> Enable |
| ▶ Log Alert | <input type="checkbox"/> Enable |

| Intrusion Prevention | |
|-----------------------|--|
| Item | Setting |
| ▶ SYN Flood Defense | <input type="checkbox"/> Enable <input type="text" value="300"/> Packets/second (10~10000) |
| ▶ UDP Flood Defense | <input type="checkbox"/> Enable <input type="text" value="300"/> Packets/second (10~10000) |
| ▶ ICMP Flood Defense | <input type="checkbox"/> Enable <input type="text" value="300"/> Packets/second (10~10000) |
| ▶ Port Scan Detection | <input type="checkbox"/> Enable <input type="text" value="200"/> Packets/second (10~10000) |

To provide application servers in the Internet, administrator may need to open specific ports for the services. However, there are some risks to always open service ports in the Internet. In order to avoid such attack risks, it is important to enable IPS functions.

Intrusion Prevention System (IPS) is network security appliances that monitor network and/or system activities for malicious activity. The main functions of IPS are to identify malicious activity, log information about this activity, attempt to block/stop it and report it. You can enable the IPS function and check the listed intrusion activities when needed. You can also enable the log alerting so that system will record Intrusion events when corresponding intrusions are detected.

IPS Scenario



As shown in the diagram, the gateway serves as an E-mail server, Web Server and also provides TCP port 8080 for remote administration. So, remote users or unknown users can request those services from Internet. With IPS enabled, the gateway can detect incoming attack packets, including the TCP ports (25, 80, 110, 443 and 8080) with services. It will block the attack packets and let the normal access to pass through the gateway

Industrial LoRa Gateway

IPS Setting

Go to **Security > Firewall > IPS** Tab.

The Intrusion Prevention System (IPS) setting allows user to customize intrusion prevention rules to prevent malicious packets.

Enable IPS Firewall

| Configuration [Help] | |
|------------------------|---------------------------------|
| Item | Setting |
| ▶ IPS | <input type="checkbox"/> Enable |
| ▶ Log Alert | <input type="checkbox"/> Enable |

| Configuration Window | | |
|----------------------|---------------------------------|--|
| Item | Value setting | Description |
| IPS | The box is unchecked by default | Check the Enable box to activate IPS function |
| Log Alert | The box is unchecked by default | Check the Enable box to activate to activate Event Log. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

Setup Intrusion Prevention Rules

The router allows you to select intrusion prevention rules you may want to enable. Ensure that the IPS is enabled before we can enable the defense function.

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| Intrusion Prevention | |
|------------------------|--|
| Item | Setting |
| ▶ SYN Flood Defense | <input type="checkbox"/> Enable <input type="text" value="300"/> Packets/second (10~10000) |
| ▶ UDP Flood Defense | <input type="checkbox"/> Enable <input type="text" value="300"/> Packets/second (10~10000) |
| ▶ ICMP Flood Defense | <input type="checkbox"/> Enable <input type="text" value="300"/> Packets/second (10~10000) |
| ▶ Port Scan Detection | <input type="checkbox"/> Enable <input type="text" value="200"/> Packets/second (10~10000) |
| ▶ Block Land Attack | <input type="checkbox"/> Enable |
| ▶ Block Ping of Death | <input type="checkbox"/> Enable |
| ▶ Block IP Spoof | <input type="checkbox"/> Enable |
| ▶ Block TCP Flag Scan | <input type="checkbox"/> Enable |
| ▶ Block Smurf | <input type="checkbox"/> Enable |
| ▶ Block Traceroute | <input type="checkbox"/> Enable |
| ▶ Block Fraggle Attack | <input type="checkbox"/> Enable |
| ▶ ARP Spoofing Defence | <input type="checkbox"/> Enable <input type="text" value="300"/> Packets/second (10~10000) |

| Setup Intrusion Prevention Rules | | |
|---|---|---|
| Item Name | Value setting | Description |
| SYN Flood Defense | 1. A Must filled setting | Click Enable box to activate this intrusion prevention rule and enter the traffic threshold in this field. |
| UDP Flood Defense | 2. The box is unchecked by default. | Click Enable box to activate this intrusion prevention rule and enter the traffic threshold in this field. |
| ICMP Flood Defense | 3. Traffic threshold is set to 300 by default 4. The value range can be from 10 to 10000. | Click Enable box to activate this intrusion prevention rule and enter the traffic threshold in this field. <u>Value Range: 10 ~ 10000.</u> |
| Port Scan Defection | 1. A Must filled setting 2. The box is unchecked by default. 3. Traffic threshold is set to 200 by default 4. The value range can be from 10 to 10000. | Click Enable box to activate this intrusion prevention rule and enter the traffic threshold in this field. <u>Value Range: 10 ~ 10000.</u> |
| Block Land Attack Block Ping of Death Block IP Spoof Block TCP Flag Scan Block Smurf | The box is unchecked by default. | Click Enable box to activate this intrusion prevention rule. |

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| | | |
|--|--|---|
| Block Traceroute Block Fraggle Attack | | |
| ARP Spoofing Defence | <ol style="list-style-type: none">1. A Must filled setting2. The box is unchecked by default.3. Traffic threshold is set to 300 by default4. The value range can be from 10 to 10000. | Click Enable box to activate this intrusion prevention rule and enter the traffic threshold in this field. <u>Value Range: 10 ~ 10000.</u> |
| Save | NA | Click Save to save the settings |
| Undo | NA | Click Undo to cancel the settings |

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5.2.7 Options

| Firewall Options [Help] | | | | | | | |
|---------------------------|--|--|--|--|--|--|--|
| Item | | Setting | | | | | |
| ▶ Stealth Mode | | <input type="checkbox"/> Enable | | | | | |
| ▶ SPI | | <input checked="" type="checkbox"/> Enable | | | | | |
| ▶ Discard Ping from WAN | | <input type="checkbox"/> Enable | | | | | |

| Remote Administrator Host Definition | | | | | | | |
|--------------------------------------|-----------|----------|--------|-------------|--------------|--------------------------|--------|
| ID | Interface | Protocol | IP | Subnet Mask | Service Port | Enable | Action |
| 1 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit |
| 2 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit |
| 3 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit |
| 4 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit |
| 5 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit |

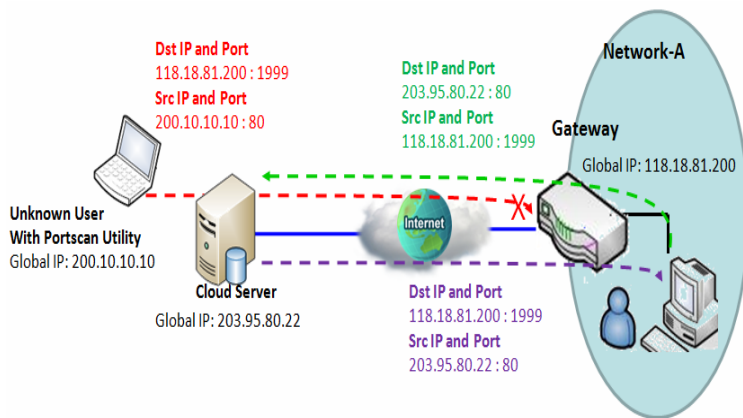
There are some additional useful firewall options in this page.

“Stealth Mode” lets gateway not to respond to port scans from the WAN so that makes it less susceptible to discovery and attacks on the Internet. “SPI” enables gateway to record the packet information like IP address, port address, ACK, SEQ number and so on while they pass through the gateway, and the gateway checks every incoming packet to detect if this packet is valid.

“Discard Ping from WAN” makes any host on the WAN side can't ping this gateway. And finally, “Remote Administrator Hosts” enables you to perform administration task from a remote host. If this feature is enabled, only specified IP address(es) can perform remote administration.

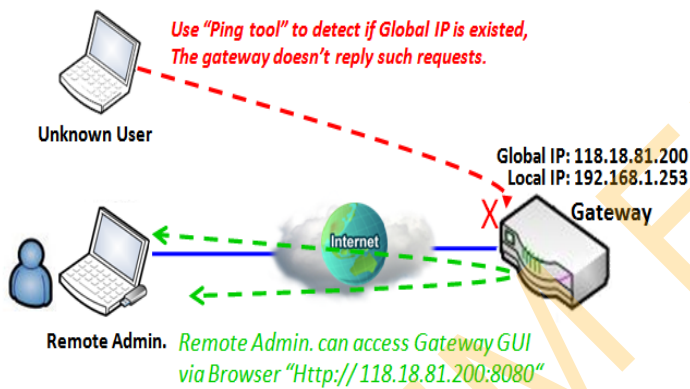
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Enable SPI Scenario



As shown in the diagram, Gateway has the IP address of 118.18.81.200 for WAN interface and 192.168.1.253 for LAN interface. It serves as a NAT gateway. Users in Network-A initiate to access cloud server through the gateway. Sometimes, unknown users will simulate the packets but use different source IP to masquerade. With the SPI feature been enabled at the gateway, it will block such packets from unknown users.

Discard Ping from WAN & Remote Administrator Hosts Scenario



“Discard Ping from WAN” makes any host on the WAN side can't ping this gateway reply any ICMP packets. Enable the Discard Ping from WAN function to prevent security leak when local users surf the internet.

Remote administrator knows the gateway's global IP, and he can access the Gateway GUI via TCP port 8080.

Firewall Options Setting

Go to **Security > Firewall > Options** Tab.

The firewall options setting allows network administrator to modify the behavior of the firewall and to enable Remote Router Access Control.

Enable Firewall Options

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| Firewall Options [Help] | |
|--|--|
| Item | Setting |
| ▶ Stealth Mode | <input type="checkbox"/> Enable |
| ▶ SPI | <input checked="" type="checkbox"/> Enable |
| ▶ Discard Ping from WAN | <input type="checkbox"/> Enable |

| Firewall Options | | |
|------------------------------|---------------------------------|--|
| Item | Value setting | Description |
| Stealth Mode | The box is unchecked by default | Check the Enable box to activate the Stealth Mode function |
| SPI | The box is checked by default | Check the Enable box to activate the SPI function |
| Discard Ping from WAN | The box is unchecked by default | Check the Enable box to activate the Discard Ping from WAN function |

Define Remote Administrator Host

The router allows network administrator to manage router remotely. The network administrator can assign specific IP address and service port to allow accessing the router.

| Remote Administrator Host Definition | | | | | | | | |
|--------------------------------------|-----------|----------|--------|-------------|--------------|--------------------------|--------|--|
| ID | Interface | Protocol | IP | Subnet Mask | Service Port | Enable | Action | |
| 1 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit | |
| 2 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit | |
| 3 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit | |
| 4 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit | |
| 5 | All WAN | HTTP | Any IP | N/A | 80 | <input type="checkbox"/> | Edit | |

| Remote Administrator Host Definition | | |
|--------------------------------------|------------------------|---|
| Item | Value setting | Description |
| Protocol | HTTP is set by default | Select HTTP or HTTPS method for router access. |
| IP | A Must filled setting | This field is to specify the remote host to assign access right for remote access. Select Any IP to allow any remote hosts Select Specific IP to allow the remote host coming from a specific subnet. An IP address entered in this field and a selected Subnet Mask to compose the subnet. |

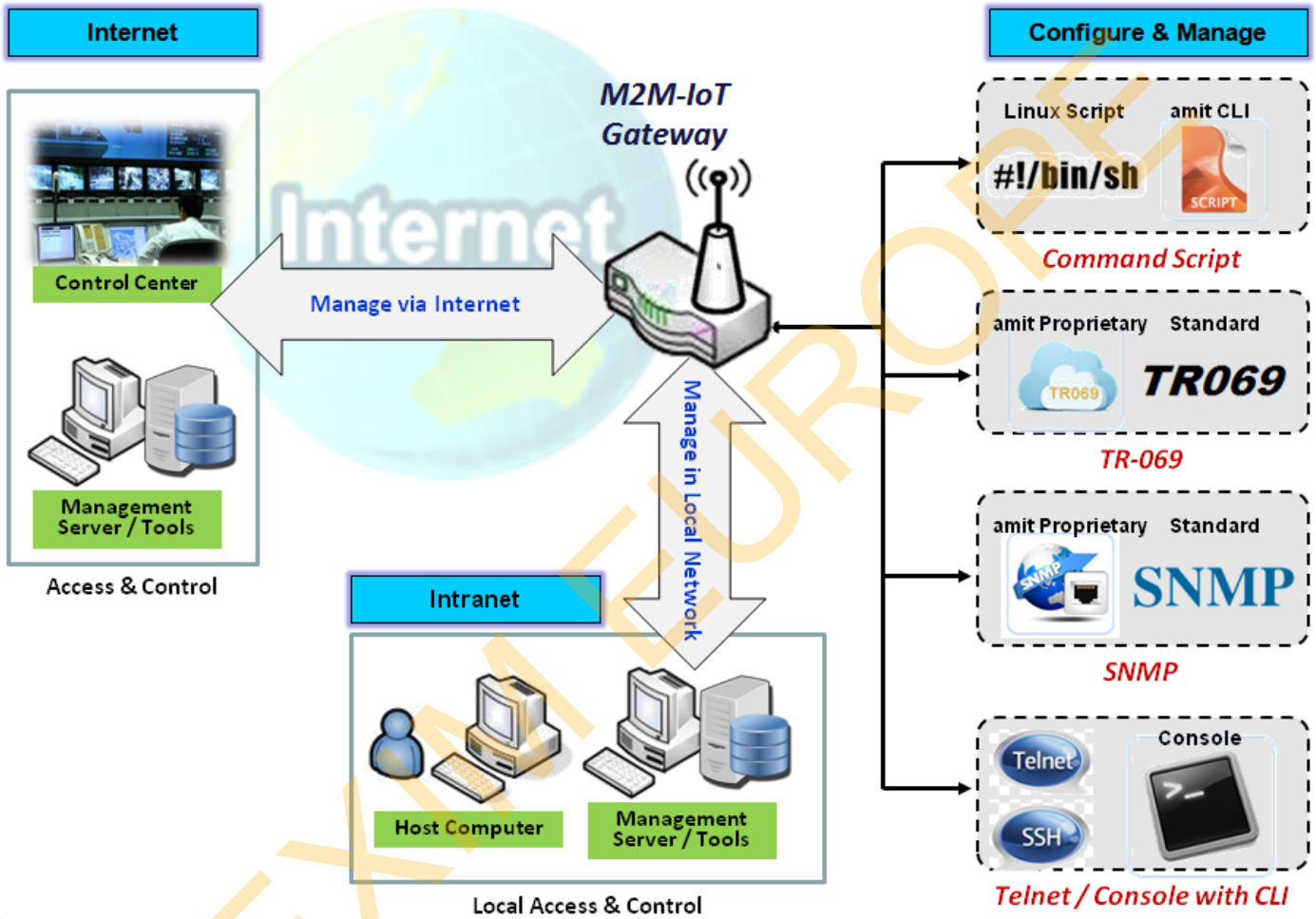
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| | | |
|--------------------------|--|---|
| Service Port | 1. 80 for HTTP by default 2. 443 for HTTPS by default | This field is to specify a Service Port to HTTP or HTTPS connection. <u>Value Range:</u> 1 ~ 65535. |
| Enabling the rule | The box is unchecked by default. | Click Enable box to activate this rule. |
| Save | N/A | Click Enable box to activate this rule then save the settings. |
| Undo | N/A | Click Undo to cancel the settings |

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Chapter 6 Administration

6.1 Configure & Manage



Configure & Manage refers to enterprise-wide administration of distributed systems including (and commonly in practice) computer systems. Centralized management has a time and effort trade-off that is related to the size of the company, the expertise of the IT staff, and the amount of technology being used. This device supports many system management protocols, such as Command Script, TR-069, SNMP, and Telnet with CLI. You can setup those configurations in the "Configure & Manage" section.

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6.1.1 Command Script

Command script configuration is the application that allows administrator to setup the pre-defined configuration in plain text style and apply configuration on startup.

Go to **Administration > Command Script > Configuration Tab**.

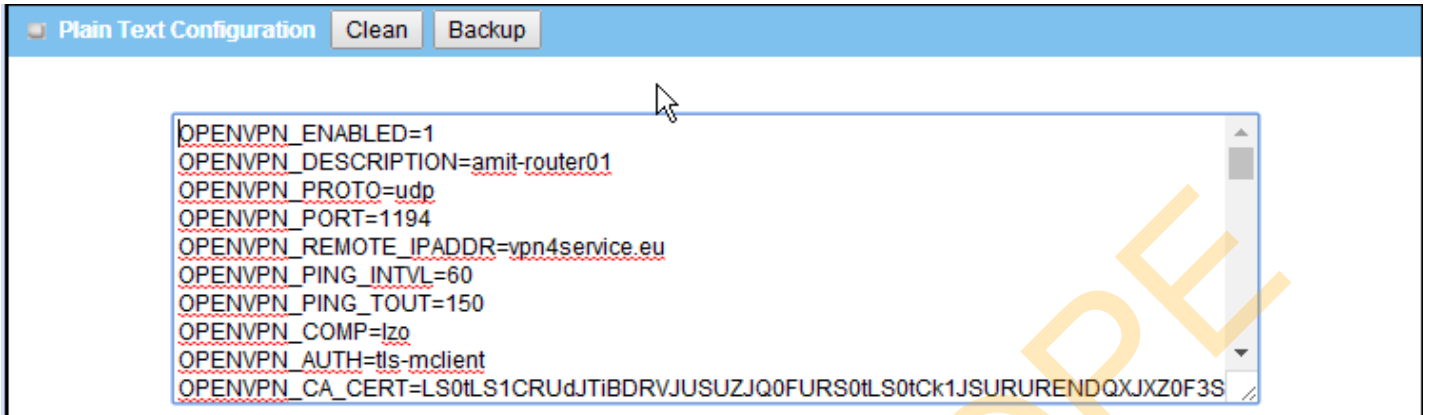
Enable Command Script Configuration

| Configuration | |
|---------------|---------------------------------|
| Item | Setting |
| Configuration | <input type="checkbox"/> Enable |
| Backup Script | Via Web UI |
| Upload Script | Via Web UI |
| Script Name | <input type="text"/> |
| Version | <input type="text"/> |
| Description | <input type="text"/> |
| Update time | |

| Configuration Item | Value setting | Description |
|----------------------|--|---|
| Configuration | The box is unchecked by default | Check the Enable box to activate the Command Script function. |
| Backup Script | N/A | Click the Via Web UI or Via Storage button to backup the existed command script in a .txt file. You can specify the script file name in Script Name below. |
| Upload Script | N/A | Click the Via Web UI or Via Storage button to Upload the existed command script from a specified .txt file. |
| Script Name | 1.An Optional setting 2.Any valid file name | Specify a script file name for script backup, or display the selected upload script file name. Value Range: 0 ~ 32 characters. |
| Version | 1.An Optional setting 2.Any string | Specify the version number for the applied Command script. Value Range: 0 ~ 32 characters. |
| Description | 1.An Optional setting 2.Any string | Enter a short description for the applied Command script. |
| Update time | N/A | It records the upload time for last commad script upload. |

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Edit/Backup Plain Text Command Script



You can edit the plain text configuration settings in the configuration screen as above.

| Plain Text Configuration | | |
|--------------------------|---------------|--|
| Item | Value setting | Description |
| Clean | NA | Clean text area. (You should click Save button to further clean the configuration already saved in the system.) |
| Backup | NA | Backup and download configuration. |
| Save | NA | Save configuration |

The supported plain text configuration items are shown in the following list. For the settings that can be executed with standard Linux commands, you can put them in a script file, and apply to the system configure with **STARTUP** command. For those configurations without corresponding Linux command set to configure, you can configure them with proprietary command set.

| Configuration Content | | |
|------------------------------|---------------------------|--|
| Key | Value setting | Description |
| OPENVPN_ENABLED | 1 : enable 0 : disable | Enable or disable OpenVPN Client function. |
| OPENVPN_DESCRIPTION | A Must filled Setting | Specify the tunnel name for the OpenVPN Client connection. |
| OPENVPN_PROTO | udp tcp | Define the Protocol for the OpenVPN Client. <ul style="list-style-type: none"> Select TCP or TCP /UDP ->The OpenVPN will use TCP protocol, and Port will be set as 443 automatically. Select UDP -> The OpenVPN will use UDP protocol, and Port will be set as 1194 automatically. |
| OPENVPN_PORT | A Must filled Setting | Specify the Port for the OpenVPN Client to use. |
| OPENVPN_REMOTE_IPADDR | IP or FQDN | Specify the Remote IP/FQDN of the peer OpenVPN Server for this OpenVPN Client tunnel. Fill in the IP address or FQDN. |
| OPENVPN_PING_INTVL | seconds | Specify the time interval for OpenVPN keep-alive checking. |
| OPENVPN_PING_TOUT | seconds | Specify the timeout value for OpenVPN Client keep-alive checking. |
| OPENVPN_COMP | Adaptive | Specify the LZO Compression algorithm for OpenVPN client. |
| OPENVPN_AUTH | Static Key/TLS | Specify the authorization mode for the OpenVPN tunnel. |

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| | | |
|---------------------------|---------------------------------|---|
| | | <ul style="list-style-type: none"> • TLS ->The OpenVPN will use TLS authorization mode, and the following items CA Cert., Client Cert. and Client Key need to specify as well. |
| OPENVPN_CA_CERT | A Must filled Setting | Specify the Trusted CA certificate for the OpenVPN client. It will go through Base64 Conversion. |
| OPENVPN_LOCAL_CERT | A Must filled Setting | Specify the local certificate for OpenVPN client. It will go through Base64 Conversion. |
| OPENVPN_LOCAL_KEY | A Must filled Setting | Specify the local key for the OpenVPN client. It will go through Base64 Conversion. |
| OPENVPN_EXTRA_OPTS | Options | Specify the extra options setting for the OpenVPN client. |
| IP_ADDR1 | Ip | Ethernet LAN IP |
| IP_NETM1 | Net mask | Ethernet LAN MASK |
| PPP_MONITORING | 1 : enable 0 : disable | When the Network Monitoring feature is enabled, the router will use DNS Query or ICMP to periodically check Internet connection – connected or disconnected. |
| PPP_PING | 0 : DNS Query 1 : ICMP Query | With DNS Query , the system checks the connection by sending DNS Query packets to the destination specified in PPP_PING_IPADDR. With ICMP Query , the system will check connection by sending ICMP request packets to the destination specified in PPP_PING_IPADDR. |
| PPP_PING_IPADDR | IP | Specify an IP address as the target for sending DNS query/ICMP request. |
| PPP_PING_INTVL | seconds | Specify the time interval for between two DNS Query or ICMP checking packets. |
| STARTUP | Script file | For the configurations that can be configured with standard Linux commands, you can put them in a script file, and apply the script file with STARTUP command. For example, STARTUP=#!/bin/sh STARTUP=echo "startup done" > /tmp/demo |

Plain Text System Configuration with Telnet

In addition to the web-style plain text configuration as mentioned above, the gateway system also allow the configuration via Telnet CLI. Administrator can use the proprietary telnet command "**txtConfig**" and related action items to perform the plain system configuration.

The command format is: `txtConfig (action) [option]`

| Action | Option | Description |
|---------------|--------------------|--|
| clone | <i>Output file</i> | Duplicate the configuration content from database and stored as a configuration file. (ex: <code>txtConfig clone /tmp/config</code>) The contents in the configuration file are the same as the plain text commands mentioned above. This action is exactly the same as performing the "Backup" plain text configuration. |
| commit | a existing file | Commit the configuration content to database. (ex: <code>txtConfig commit /tmp/config</code>) |
| enable | NA | Enable plain text system config. |

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| | | |
|------------------------|-----------------|---|
| | | (ex: <i>txtConfig enable</i>) |
| disable | <i>NA</i> | Disable plain text system config. (ex: <i>txtConfig disable</i>) |
| run_immediately | <i>NA</i> | Apply the configuration content that has been committed in database. (ex: <i>txtConfig run_immediately</i>) |
| run_immediately | a existing file | Assign a configuration file to apply. (ex: <i>txtConfig run_immediately /tmp/config</i>) |

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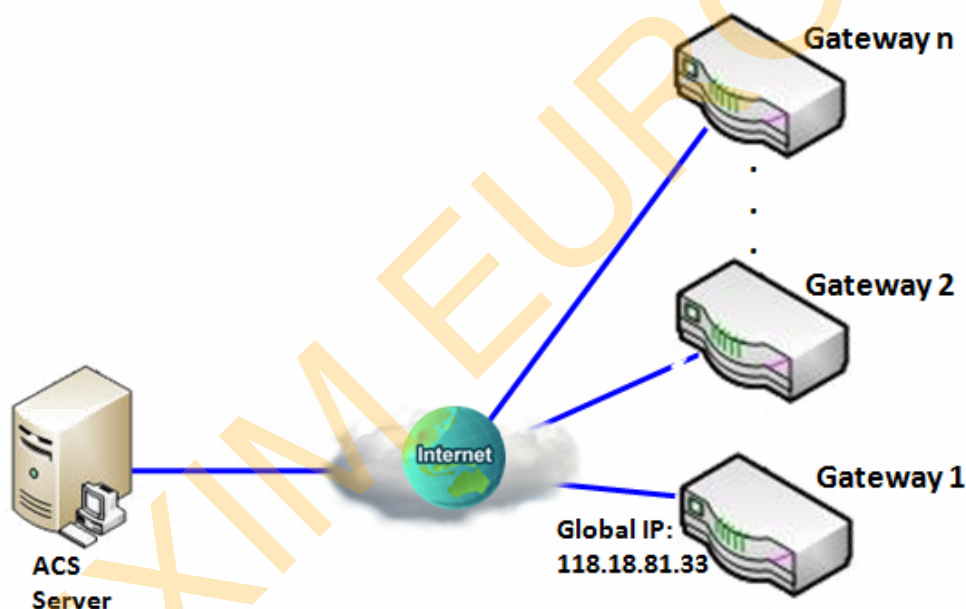
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6.1.2 TR-069

TR-069 (Technical Report 069) is a Broadband Forum technical specification entitled CPE WAN Management Protocol (CWMP). It defines an application layer protocol for remote management of end-user devices, like this gateway device. As a bidirectional SOAP/HTTP-based protocol, it provides the communication between customer-premises equipment (CPE) and Auto Configuration Servers (ACS). The Security Gateway is such CPE.

TR-069 is a customized feature for ISP. It is not recommend that you change the configuration for this. If you have any problem in using this feature for device management, please contact with your ISP or the ACS provider for help. At the right upper corner of TR-069 Setting screen, one “[Help]” command let you see the same message about that.

Scenario - Managing deployed gateways through an ACS Server



Scenario Application Timing

When the enterprise data center wants to use an ACS server to manage remote gateways geographically distributed elsewhere in the world, the gateways in all branch offices must have an embedded TR-069 agent to communicate with the ACS server. So that the ACS server can configure, FW upgrade and monitor these gateways and their corresponding Intranets.

Scenario Description

The ACS server can configure, upgrade with latest FW and monitor these gateways.

Remote gateways inquire the ACS server for jobs to do in each time period.

The ACS server can ask the gateways to execute some urgent jobs.

Parameter Setup Example

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Following tables list the parameter configuration as an example for the Gateway 1 in above diagram with "TR-069" enabling.

Use default value for those parameters that are not mentioned in the tables.

| Configuration Path | [TR-069]-[Configuration] |
|-----------------------------|---|
| TR-069 | ■ <i>Enable</i> |
| ACS URL | http://qa.acslite.com/cpe.php |
| ACS User Name | <i>ACSUserName</i> |
| ACS Password | <i>ACSPassword</i> |
| ConnectionRequest Port | <i>8099</i> |
| ConnectionRequest User Name | <i>ConnReqUserName</i> |
| ConnectionRequest Password | <i>ConnReqPassword</i> |
| Inform | ■ <i>Enable Interval 900</i> |

Scenario Operation Procedure

In above diagram, the ACS server can manage multiple gateways in the Internet. The "Gateway 1" is one of them and has 118.18.81.33 IP address for its WAN-1 interface.

When all remote gateways have booted up, they will try to connect to the ACS server.

Once the connections are established successfully, the ACS server can configure, upgrade with latest FW and monitor these gateways.

Remote gateways inquire the ACS server for jobs to do in each time period.

If the ACS server needs some urgent jobs to be done by the gateways, it will issue the "Connection Request" command to those gateways. And those gateways make immediate connections in response to the ACS server's immediate connection request for executing the urgent jobs.

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TR-069 Setting

Go to **Administration > Configure & Manage > TR-069** tab.

In "TR-069" page, there is only one configuration window for TR-069 function. In the window, you must specify the related information for your security gateway to connect to the ACS. Drive the function to work by specifying the URL of the ACS server, the account information to login the ACS server, the service port and the account information for connection requesting from the ACS server, and the time interval for job inquiry. Except the inquiry time, there are no activities between the ACS server and the gateways until the next inquiry cycle. But if the ACS server has new jobs that are expected to do by the gateways urgently, it will ask these gateways by using connection request related information for immediate connection for inquiring jobs and executing.

Enable TR-069

| Configuration [Help] | |
|---|--|
| Item | Setting |
| ▶ TR-069 | <input type="checkbox"/> Enable |
| ▶ Interface | WAN-1 ▼ |
| ▶ Data model | ACS Cloud Data Model ▼ |
| ▶ ACS URL | <input type="text"/> |
| ▶ ACS UserName | <input type="text"/> |
| ▶ ACS Password | <input type="text"/> |
| ▶ Connection Request Port | 8099 |
| ▶ Connection Request UserName | <input type="text"/> |
| ▶ Connection Request Password | <input type="text"/> |
| ▶ Inform | <input checked="" type="checkbox"/> Enable Interval <input type="text" value="300"/> |
| ▶ Certification Setup | <input checked="" type="radio"/> default <input type="radio"/> Select from Certificate List Certificate: ▼ |

TR-069

| Item | Value setting | Description |
|------|---------------|-------------|
|------|---------------|-------------|

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| | | |
|-----------------------------------|--|---|
| TR-069 | The box is unchecked by default | Check the Enable box to activate TR-069 function. |
| Interface | WAN-1 is selected by default. | When you finish set basic network WAN-1 ~ WAN-n, you can choose WAN-1 ~ WAN-n When you finish set Security > VPN > IPSec/OpenVPN/PPTP/L2TP/GRE, you can choose IPSec/OpenVPN/PPTP/L2TP/GRE tunnel, the interface just like "IPSec #1" |
| Data Model | ACS Cloud Data Model is selected by default. | Select the TR-069 dat model for the remote management. Standard : the ACS Server is a standard one, which is fully comply with TR-069. ACS Cloud Data Model : Select this data model if you intend to use Cloud ACS Server to managing the deployed gateways. |
| ACS URL | A Must filled setting | You can ask ACS manager provide ACS URL and manually set |
| ACS Username | A Must filled setting | You can ask ACS manager provide ACS username and manually set |
| ACS Password | A Must filled setting | You can ask ACS manager provide ACS password and manually set |
| ConnectionRequest Port | 1. A Must filled setting. 2. By default 8099 is set. | You can ask ACS manager provide ACS ConnectionRequest Port and manually set <u>Value Range</u> : 0 ~ 65535. |
| ConnectionRequest UserName | A Must filled setting | You can ask ACS manager provide ACS ConnectionRequest Username and manually set |
| ConnectionRequest Password | A Must filled setting | You can ask ACS manager provide ACS ConnectionRequest Password and manually set |
| Inform | 1. The box is checked by default. 2. The Interval value is 300 by default. | When the Enable box is checked, the gateway (CPE) will periodically send inform message to ACS Server according to the Interval setting. <u>Value Range</u> : 0 ~ 86400 for Inform Interval. |
| Certification Setup | The default box is selected by default | You can leave it as default or select an expected certificate and key from the drop down list. Refer to Object Definition > Certificate Section for the Certificate configuration. |
| Save | N/A | Click Save to save the settings. |
| Undo | N/A | Click Undo to cancel the modifications. |

When you finish set **ACS URL ACS Username ACS Password**, your gateway (CPE, Client Premium Equipment) can send inform to ACS Server.

When you finish set **ConnectionRequest Port ConnectionRequest Username ConnectionRequest Password**, ACS Server can ask the gateway (CPE) to send inform to ACS Server.

Enable STUN Server

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| STUN Settings [Help] | |
|---|---|
| Item | Setting |
| ▶ STUN | <input checked="" type="checkbox"/> Enable |
| ▶ Server Address | <input type="text"/> |
| ▶ Server Port | <input type="text" value="3478"/> (1~65535) |
| ▶ Keep Alive Period | <input type="text" value="0"/> (0~65535)second(s) |

| STUN Settings Configuration | | |
|-----------------------------|--|---|
| Item | Value setting | Description |
| STUN | The box is checked by default | Check the Enable box to activate STUN function. |
| Server Address | 1. String format: any IPv4 address 2. It is an optional item. | Specify the IP address for the expected STUN Server. |
| Server Port | 1. An optional setting 2. 3478 is set by default | Specify the port number for the expected STUN Server. <i>Value Range:</i> 1 ~ 65535. |
| Keep Alive Period | 1. An optional setting 2. 0 is set by default | Specify the keep alive time period for the connection with STUN Server. <i>Value Range:</i> 0 ~ 65535. |
| Save | N/A | Click Save to save the settings. |
| Undo | N/A | Click Undo to cancel the modifications. |

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6.1.3 SNMP

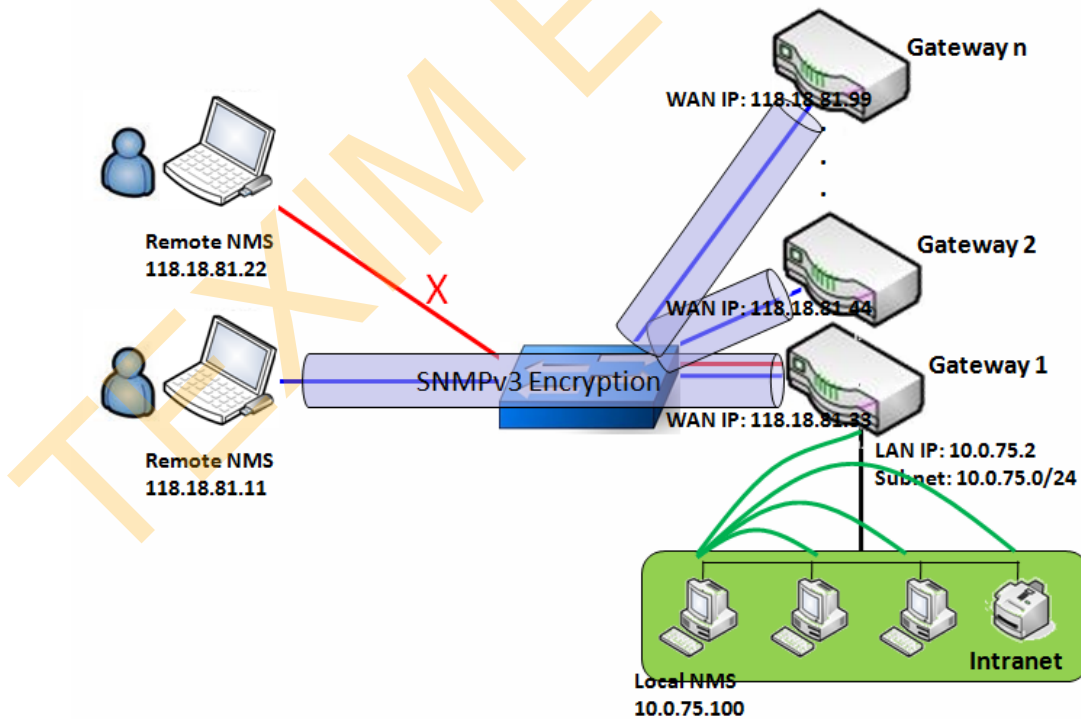
In brief, SNMP, the Simple Network Management Protocol, is a protocol designed to give a user the capability to remotely manage a computer network by polling and setting terminal values and monitoring network events.

In typical SNMP uses, one or more administrative computers, called managers, have the task of monitoring or managing a group of hosts or devices on a computer network. Each managed system executes, at all times, a software component called an agent which reports information via SNMP to the manager.

SNMP agents expose management data on the managed systems as variables. The protocol also permits active management tasks, such as modifying and applying a new configuration through remote modification of these variables. The variables accessible via SNMP are organized in hierarchies. These hierarchies, and other metadata (such as type and description of the variable), are described by Management Information Bases (MIBs).

The device supports several public MIBs and one private MIB for the SNMP agent. The supported MIBs are as follow: MIB-II (RFC 1213, Include IPv6), IF-MIB, IP-MIB, TCP-MIB, UDP-MIB, SMIv1 and SMIv2, SNMPv2-TM and SNMPv2-MIB, and AMIB (a Proprietary MIB)

SNMP Management Scenario



Scenario Application Timing

There are two application scenarios of SNMP Network Management Systems (NMS). Local NMS is in

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the Intranet and manage all devices that support SNMP protocol in the Intranet. Another one is the Remote NMS to manage some devices whose WAN interfaces are connected together by using a switch or a router with UDP forwarding. If you want to manage some devices and they all have supported SNMP protocol, use either one application scenario, especially the management of devices in the Intranet. In managing devices in the Internet, the TR-069 is the better solution. Please refer to last sub-section.

Scenario Description

The NMS server can monitor and configure the managed devices by using SNMP protocol, and those devices are located at where UDP packets can reach from NMS.

The managed devices report urgent trap events to the NMS servers.

Use SNMPv3 version of protocol can protected the transmitting of SNMP commands and responses.

The remote NMS with privilege IP address can manage the devices, but other remote NMS can't.

Parameter Setup Example

Following tables list the parameter configuration as an example for the Gateway 1 in above diagram with "SNMP" enabling at LAN and WAN interfaces.

Use default value for those parameters that are not mentioned in the tables.

| Configuration Path | [SNMP]-[Configuration] |
|-----------------------|--------------------------------|
| SNMP Enable | ■ LAN ■ WAN |
| Supported Versions | ■ v1 ■ v2c ■ v3 |
| Get / Set Community | ReadCommunity / WriteCommunity |
| Trap Event Receiver 1 | 118.18.81.11 |
| WAN Access IP Address | 118.18.81.11 |

| Configuration Path | [SNMP]-[User Privacy Definition] | | |
|--------------------|----------------------------------|------------|--------------|
| ID | 1 | 2 | 3 |
| User Name | UserName1 | UserName2 | UserName3 |
| Password | Password1 | Password2 | Disable |
| Authentication | MD5 | SHA-1 | Disable |
| Encryption | DES | Disable | Disable |
| Privacy Mode | authPriv | authNoPriv | noAuthNoPriv |
| Privacy Key | 12345678 | Disable | Disable |
| Authority | Read/Write | Read | Read |
| Enable | ■ Enable | ■ Enable | ■ Enable |

Scenario Operation Procedure

In above diagram, the NMS server can manage multiple devices in the Intranet or a UDP-reachable network. The "Gateway 1" is one of the managed devices, and it has the IP address of 10.0.75.2 for LAN interface and 118.18.81.33 for WAN-1 interface. It serves as a NAT router.

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At first stage, the NMS manager prepares related information for all managed devices and records them in the NMS system. Then NMS system gets the status of all managed devices by using SNMP get commands.

When the manager wants to configure the managed devices, the NMS system allows him to do that by using SNMP set commands. The "UserName1" account is used if the manager uses SNMPv3 protocol for configuring the "Gateway 1". Only the "UserName1" account can let the "Gateway 1" accept the configuration from the NMS since the authority of the account is "Read/Write".

Once a managed device has an urgent event to send, the device will issue a trap to the Trap Event Receivers. The NMS itself could be one among them.

If you want to secure the transmitted SNMP commands and responses between the NMS and the managed devices, use SNMPv3 version of protocol.

The remote NMS without privilege IP address can't manage the "Gateway 1", since "Gateway 1" allows only the NMS with privilege IP address can manage it via its WAN interface.

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SNMP Setting

Go to **Administration > Configure & Manage > SNMP** tab.

The SNMP allows user to configure SNMP relevant setting which includes interface, version, access control and trap receiver.

Enable SNMP

| Configuration | |
|----------------------|--|
| Item | Setting |
| ▶ SNMP Enable | <input type="checkbox"/> LAN <input type="checkbox"/> WAN |
| ▶ WAN Interface | All WANs ▼ |
| ▶ Supported Versions | <input type="checkbox"/> v1 <input type="checkbox"/> v2c <input type="checkbox"/> v3 |
| ▶ Remote Access IP | Specific IP Address ▼ <input type="text"/> (IP Address/FQDN) |
| ▶ SNMP Port | 161 <input type="text"/> |

| SNMP Item | Value setting | Description |
|---------------------------|--|--|
| SNMP Enable | 1.The boxes are unchecked by default | Select the interface for the SNMP and enable SNMP functions. When Check the LAN box, it will activate SNMP functions and you can access SNMP from LAN side; When Check the WAN box, it will activate SNMP functions and you can access SNMP from WAN side. |
| WAN Interface | 1.A Must filled setting 2. ALL WANs is selected by default | Specify the WAN interface that a remote SNMP host can access to the device. By default, All WANs is selected, and there is no limitation for the WAN interface. |
| Supported Versions | 1.A Must filled setting 2.The boxes are unchecked by default | Select the version for the SNMP When Check the v1 box. It means you can access SNMP by version 1. When Check the v2c box. It means you can access SNMP by version 2c. When Check the v3 box. It means you can access SNMP by version 3. |
| Remote Access IP | 1. String format: any IPv4 address 2. It is an optional item. | Specify the Remote Access IP for WAN. Select Specific IP Address , and fill in a certain IP address. It means only this IP address can access SNMP from LAN/WAN side. Select IP Range , and fill in a range of IP addresses. It means the IP address within specified range can access SNMP from LAN/WAN side. If you left it as blank, it means any IP address can access SNMP from WAN side. |

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| | | |
|------------------|---|---|
| SNMP Port | <ol style="list-style-type: none"> String format: any port number The default SNMP port is 161. A Must filled setting | Specify the SNMP Port . You can fill in any port number. But you must ensure the port number is not to be used. <u>Value Range: 1 ~ 65535.</u> |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

Create/Edit Multiple Community

The SNMP allows you to custom your access control for version 1 and version 2 user. The router supports up to a maximum of 10 community sets.

| Multiple Community List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | |
|--|-----------|--------|---------|
| ID | Community | Enable | Actions |

When **Add** button is applied, **Multiple Community Rule Configuration** screen will appear.

| Multiple Community Rule Configuration | |
|---------------------------------------|--|
| Item | Setting |
| ▶ Community | Read Only ▾ <input type="text"/> |
| ▶ Enable | <input checked="" type="checkbox"/> Enable |

| Multiple Community Rule Configuration | | |
|---------------------------------------|--|---|
| Item | Value setting | Description |
| Community | <ol style="list-style-type: none"> Read Only is selected by default A Must filled setting String format: any text | Specify this version 1 or version v2c user's community that will be allowed Read Only (GET and GETNEXT) or Read-Write (GET, GETNEXT and SET) access respectively. The maximum length of the community is 32. |
| Enable | 1.The box is checked by default | Click Enable to enable this version 1 or version v2c user. |
| Save | N/A | Click the Save button to save the configuration. But it does not apply to SNMP functions. When you return to the SNMP main page. It will show "Click on save button to apply your changes" remind user to click main page Save button. |
| Undo | N/A | Click the Undo button to cancel the settings. |
| Back | N/A | Click the Back button to return to last page. |

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Create/Edit User Privacy

The SNMP allows you to custom your access control for version 3 user. The router supports up to a maximum of 128 User Privacy sets.

| User Privacy List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | | | |
|--|-----------|----------|----------------|------------|--------------|-------------|-----------|-------------------|--------|---------|
| ID | User Name | Password | Authentication | Encryption | Privacy Mode | Privacy Key | Authority | OID Filter Prefix | Enable | Actions |

When **Add** button is applied, **User Privacy Rule Configuration** screen will appear.

| User Privacy Rule Configuration | |
|---------------------------------|--|
| Item | Setting |
| ▶ User Name | <input type="text"/> |
| ▶ Password | <input type="password"/> |
| ▶ Authentication | None ▾ |
| ▶ Encryption | None ▾ |
| ▶ Privacy Mode | noAuthNoPriv ▾ |
| ▶ Privacy Key | <input type="password"/> |
| ▶ Authority | Read ▾ |
| ▶ OID Filter Prefix | <input type="text" value="1"/> |
| ▶ Enable | <input checked="" type="checkbox"/> Enable |

| User Privacy Rule Configuration | | |
|---------------------------------|--|--|
| Item | Value setting | Description |
| User Name | <ol style="list-style-type: none"> A Must filled setting String format: any text | Specify the User Name for this version 3 user. Value Range: 1 ~ 32 characters. |
| Password | <ol style="list-style-type: none"> String format: any text | When your Privacy Mode is authNoPriv or authPriv , you must specify the Password for this version 3 user. Value Range: 8 ~ 64 characters. |
| Authentication | <ol style="list-style-type: none"> None is selected by default | When your Privacy Mode is authNoPriv or authPriv , you must specify the Authentication types for this version 3 user. Selected the authentication types MD5/ SHA-1 to use. |
| Encryption | <ol style="list-style-type: none"> None is selected by default | When your Privacy Mode is authPriv , you must specify the Encryption protocols for this version 3 user. Selected the encryption protocols DES / AES to use. |

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| | | |
|--------------------------|--|---|
| Privacy Mode | 1. noAuthNoPriv is selected by default | Specify the Privacy Mode for this version 3 user. Selected the noAuthNoPriv . You do not use any authentication types and encryption protocols. Selected the authNoPriv . You must specify the Authentication and Password . Selected the authPriv . You must specify the Authentication, Password, Encryption and Privacy Key. |
| Privacy Key | 1. String format: any text | When your Privacy Mode is authPriv , you must specify the Privacy Key (8 ~ 64 characters) for this version 3 user. |
| Authority | 1. Read is selected by default | Specify this version 3 user's Authority that will be allowed Read Only (GET and GETNEXT) or Read-Write (GET, GETNEXT and SET) access respectively. |
| OID Filter Prefix | 1. The default value is 1 2. A Must filled setting 3. String format: any legal OID | The OID Filter Prefix restricts access for this version 3 user to the sub-tree rooted at the given OID. Value Range: 1 ~2080768. |
| Enable | 1.The box is checked by default | Click Enable to enable this version 3 user. |
| Save | N/A | Click the Save button to save the configuration. But it does not apply to SNMP functions. When you return to the SNMP main page. It will show "Click on save button to apply your changes" remind user to click main page Save button. |
| Undo | N/A | Click the Undo button to cancel the settings |
| Back | N/A | Click the Back button to return the last page. |

Create/Edit Trap Event Receiver

The SNMP allows you to custom your trap event receiver. The router supports up to a maximum of 4 Trap Event Receiver sets.

| Trap Event Receiver List | | | | | | | | | | | | |
|--------------------------|-----------|-------------|--------------|----------------|-----------|----------|--------------|----------------|------------|-------------|--------|---------|
| ID | Server IP | Server Port | SNMP Version | Community Name | User Name | Password | Privacy Mode | Authentication | Encryption | Privacy Key | Enable | Actions |

When **Add** button is applied, **Trap Event Receiver Rule Configuration** screen will appear. The default SNMP Version is v1. The configuration screen will provide the version 1 must filled items.

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| Trap Event Receiver Rule Configuration | |
|--|--|
| Item | Setting |
| ▶ Server IP | <input type="text"/> (IP Address/FQDN) |
| ▶ Server Port | <input type="text" value="162"/> |
| ▶ SNMP Version | <input type="text" value="v1"/> |
| ▶ Community Name | <input type="text"/> |
| ▶ Enable | <input checked="" type="checkbox"/> Enable |

When you selected v2c, the configuration screen is exactly the same as that of v1, except the version.

When you selected v3, the configuration screen will provide more setting items for the version 3 Trap.

| Trap Event Receiver Rule Configuration | |
|--|--|
| Item | Setting |
| ▶ Server IP | <input type="text"/> (IP Address/FQDN) |
| ▶ Server Port | <input type="text" value="162"/> |
| ▶ SNMP Version | <input type="text" value="v3"/> |
| ▶ Community Name | <input type="text"/> |
| ▶ User Name | <input type="text"/> |
| ▶ Password | <input type="text"/> |
| ▶ Privacy Mode | <input type="text" value="noAuthNoPriv"/> |
| ▶ Authentication | <input type="text" value="None"/> |
| ▶ Encryption | <input type="text" value="None"/> |
| ▶ Privacy Key | <input type="text"/> |
| ▶ Enable | <input checked="" type="checkbox"/> Enable |

| Trap Event Receiver Rule Configuration | | |
|--|---|--|
| Item | Value setting | Description |
| Server IP | <ol style="list-style-type: none"> 1. A Must filled setting 2. String format: any IPv4 address or FQDN | Specify the trap Server IP or FQDN . The DUT will send trap to the server IP/FQDN. |
| Server Port | <ol style="list-style-type: none"> 1. String format: any port number 2. The default SNMP trap port is 162 3. A Must filled setting | Specify the trap Server Port . You can fill in any port number. But you must ensure the port number is not to be used. <i>Value Range: 1 ~ 65535.</i> |

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| | | |
|-----------------------|---|--|
| SNMP Version | <ol style="list-style-type: none"> 1. v1 is selected by default | <p>Select the version for the trap</p> <p>Selected the v1.</p> <p>The configuration screen will provide the version 1 must filled items.</p> <p>Selected the v2c.</p> <p>The configuration screen will provide the version 2c must filled items.</p> <p>Selected the v3.</p> <p>The configuration screen will provide the version 3 must filled items.</p> |
| Community Name | <ol style="list-style-type: none"> 1. A v1 and v2c Must filled setting 2. String format: any text | <p>Specify the Community Name for this version 1 or version v2c trap.</p> <p>Value Range: 1 ~ 32 characters.</p> |
| User Name | <ol style="list-style-type: none"> 1. A v3 Must filled setting 2. String format: any text | <p>Specify the User Name for this version 3 trap.</p> <p>Value Range: 1 ~ 32 characters.</p> |
| Password | <ol style="list-style-type: none"> 1. A v3 Must filled setting 2. String format: any text | <p>When your Privacy Mode is authNoPriv or authPriv, you must specify the Password for this version 3 trap.</p> <p>Value Range: 8 ~ 64 characters.</p> |
| Privacy Mode | <ol style="list-style-type: none"> 1. A v3 Must filled setting 2. noAuthNoPriv is selected by default | <p>Specify the Privacy Mode for this version 3 trap.</p> <p>Selected the noAuthNoPriv.</p> <p>You do not use any authentication types and encryption protocols.</p> <p>Selected the authNoPriv.</p> <p>You must specify the Authentication and Password.</p> <p>Selected the authPriv.</p> <p>You must specify the Authentication, Password, Encryption and Privacy Key.</p> |
| Authentication | <ol style="list-style-type: none"> 1. A v3 Must filled setting 2. None is selected by default | <p>When your Privacy Mode is authNoPriv or authPriv, you must specify the Authentication types for this version 3 trap.</p> <p>Selected the authentication types MD5/ SHA-1 to use.</p> |
| Encryption | <ol style="list-style-type: none"> 1. A v3 Must filled setting 2. None is selected by default | <p>When your Privacy Mode is authPriv, you must specify the Encryption protocols for this version 3 trap.</p> <p>Selected the encryption protocols DES / AES to use.</p> |
| Privacy Key | <ol style="list-style-type: none"> 1. A v3 Must filled setting 2. String format: any text | <p>When your Privacy Mode is authPriv, you must specify the Privacy Key (8 ~ 64 characters) for this version 3 trap.</p> |
| Enable | <ol style="list-style-type: none"> 1. The box is checked by default | <p>Click Enable to enable this trap receiver.</p> |
| Save | N/A | <p>Click the Save button to save the configuration. But it does not apply to SNMP functions. When you return to the SNMP main page. It will show "Click on save button to apply your changes" remind user to click main page Save button.</p> |
| Undo | N/A | <p>Click the Undo button to cancel the settings.</p> |
| Back | N/A | <p>Click the Back button to return the last page.</p> |

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Specify SNMP MIB-2 System

If required, you can also specify the required information for the MIB-2 System.

| SNMP MIB-2 System | |
|-------------------|----------------------|
| Item | Setting |
| ▶ sysContact | <input type="text"/> |
| ▶ sysLocation | <input type="text"/> |

| SNMP MIB-2 System Configuration | | |
|---------------------------------|---|---|
| Item | Value setting | Description |
| sysContact | 1. An Optional filled setting 2. String format: any text | Specify the contact information for MIB-2 system. <i>Value Range: 0 ~ 64 characters.</i> |
| sysLocation | 1. An Optional filled setting 2. String format: any text | Specify the location information for MIB-2 system. <i>Value Range: 0 ~ 64 characters.</i> |

Edit SNMP Options

If you use some particular private MIB, you must fill the enterprise name, number and OID.

| Options | |
|---------------------|---|
| Item | Setting |
| ▶ Enterprise Name | <input type="text" value="AMIT"/> |
| ▶ Enterprise Number | <input type="text" value="12823"/> |
| ▶ Enterprise OID | 1.3.6.1.4.1. <input type="text" value="12823.4.4.9"/> |

| Options | |
|---------------------|---|
| Item | Setting |
| ▶ Enterprise Name | <input type="text" value="Default"/> |
| ▶ Enterprise Number | <input type="text" value="12823"/> |
| ▶ Enterprise OID | 1.3.6.1.4.1. <input type="text" value="12823.4.4.9"/> |

Options

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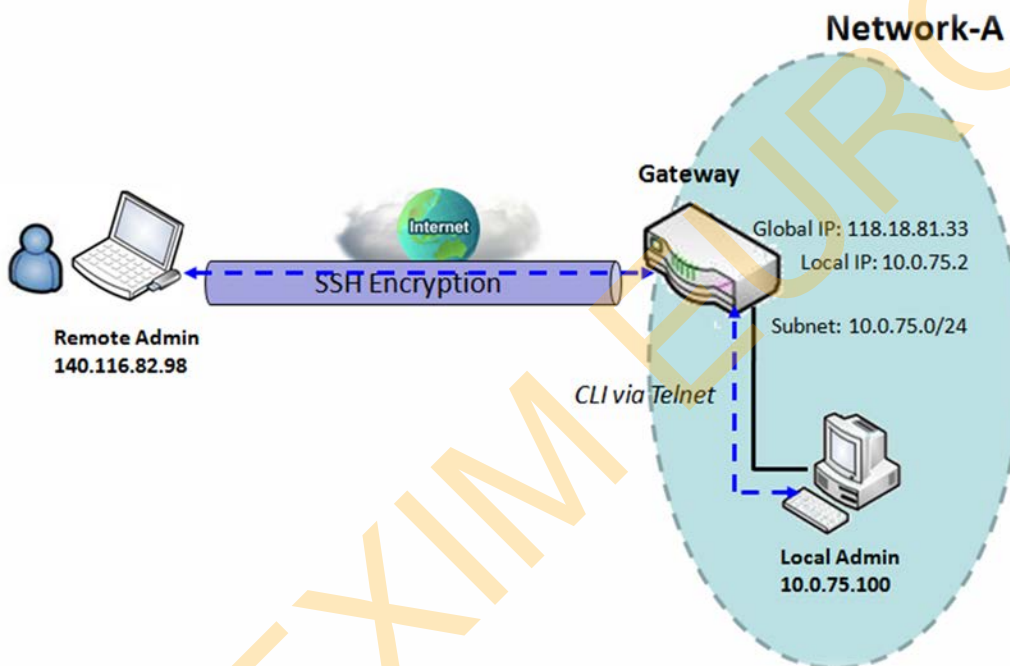
| Item | Value setting | Description |
|--------------------------|---|--|
| Enterprise Name | <ol style="list-style-type: none"> The default value is Default A Must filled setting String format: any text | Specify the Enterprise Name for the particular private MIB. <i>Value Range:</i> 1 ~ 10 characters, and only string with A~Z, a~z, 0~9, '-', '_'. |
| Enterprise Number | <ol style="list-style-type: none"> The default value is 12823 (Default Enterprise Number) A Must filled setting String format: any number | Specify the Enterprise Number for the particular private MIB. <i>Value Range:</i> 1 ~2080768. |
| Enterprise OID | <ol style="list-style-type: none"> The default value is 1.3.6.1.4.1.12823.4.4.9 (Default Enterprise OID) A Must filled setting String format: any legal OID | Specify the Enterprise OID for the particular private MIB. The range of the each OID number is 1-2080768. The maximum length of the enterprise OID is 31. The seventh number must be identical with the enterprise number. |
| Save | N/A | Click the Save button to save the configuration and apply your changes to SNMP functions. |
| Undo | N/A | Click the Undo button to cancel the settings. |

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6.1.4 Telnet & SSH

A command-line interface (CLI), also known as command-line user interface, and console user interface are means of interacting with a computer program where the user (or client) issues commands to the program in the form of successive lines of text (command lines). The interface is usually implemented with a command line shell, which is a program that accepts commands as text input and converts commands to appropriate operating system functions. Programs with command-line interfaces are generally easier to automate via scripting. The device supports both Telnet and SSH (Secure Shell) CLI with default service port 23 and 22, respectively.

Telnet & SSH Scenario



Scenario Application Timing

When the administrator of the gateway wants to manage it from remote site in the Intranet or Internet, he may use "Telnet with CLI" function to do that by using "Telnet" or "SSH" utility.

Scenario Description

The Local Admin or the Remote Admin can manage the Gateway by using "Telnet" or "SSH" utility with privileged user name and password.

The data packets between the Local Admin and the Gateway or between the Remote Admin and the Gateway can be plain texts or encrypted texts. Suggest they are plain texts in the Intranet for Local Admin to use "Telnet" utility, and encrypted texts in the Internet for Remote Admin to use "SSH" utility.

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Parameter Setup Example

Following table lists the parameter configuration as an example for the Gateway in above diagram with "Telnet with CLI" enabling at LAN and WAN interfaces.

Use default value for those parameters that are not mentioned in the table.

| Configuration Path | [Telnet & SSH]-[Configuration] |
|--------------------|--|
| Telnet | LAN: <input checked="" type="checkbox"/> <i>Enable</i> WAN: <input type="checkbox"/> <i>Enable</i> Service Port: 23 |
| SSH | LAN: <input checked="" type="checkbox"/> <i>Enable</i> WAN: <input checked="" type="checkbox"/> <i>Enable</i> Service Port: 22 |

Scenario Operation Procedure

In above diagram, "Local Admin" or "Remote Admin" can manage the "Gateway" in the Intranet or Internet. The "Gateway" is the gateway of Network-A, and the subnet of its Intranet is 10.0.75.0/24. It has the IP address of 10.0.75.2 for LAN interface and 118.18.81.33 for WAN-1 interface. It serves as a NAT gateway.

The "Local Admin" in the Intranet uses "Telnet" utility with privileged account to login the Gateway.

Or the "Remote Admin" in the Internet uses "SSH" utility with privileged account to login the Gateway.

The administrator of the gateway can control the device as like he is in front of the gateway.

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Telnet & SSH Setting

Go to **Administration > Configure & Manage > Telnet & SSH** tab.

The Telnet & SSH setting allows administrator to access this device through the traditional Telnet or SSH Telnet program. Before you can telnet (login) to the device, please configure the related settings and password with care. The password management part allows you to set root password for logging telnet and SSH.

| Configuration | |
|---------------|--|
| Item | Setting |
| ▶ Telnet | LAN <input checked="" type="checkbox"/> Enable WAN <input type="checkbox"/> Enable Service Port <input type="text" value="23"/> |
| ▶ SSH | LAN <input checked="" type="checkbox"/> Enable WAN <input type="checkbox"/> Enable Service Port <input type="text" value="22"/> |

| Configuration Item | Value setting | Description |
|--------------------|---|---|
| Telnet | <ol style="list-style-type: none">The LAN Enable box is checked by default.By default Service Port is 23. | Check the Enable box to activate the Telnet function for connecting from LAN or WAN interfaces. You can set which number of Service Port you want to provide for the corresponding service. Value Range: 1 ~65535. |
| SSH | <ol style="list-style-type: none">The LAN Enable box is checked by default.By default Service Port is 22. | Check the Enable box to activate the SSH Telnet function for connecting from LAN or WAN interfaces. You can set which number of Service Port you want to provide for the corresponding service. Value Range: 1 ~65535. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

| Password Management | |
|---------------------|--|
| Item | Setting |
| ▶ root | Old Password : <input type="text"/> New Password : <input type="text"/> New Password Confirmation : <input type="text"/> |

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| Configuration | | |
|---------------|--|---|
| Item | Value setting | Description |
| root | 1. String: any text but no blank character 2. The default password for telnet is 'wirelessm2m'. | Type old password and specify new password to change root password. Note_1: You are highly recommended to change the default telnet password with yours before the device is deployed. Note_2: If you have trouble for the default password for previous FW version, please check the corresponding User Manual to get the correct one. |
| Save | N/A | Click Save to save the settings |
| Undo | N/A | Click Undo to cancel the settings |

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6.2 System Operation

System Operation allows the network administrator to manage system, settings such as web-based utility access password change, system information, system time, system log, firmware/configuration backup & restore, and reset & reboot.

6.2.1 Password & MMI

Go to **Administration > System Operation > Password & MMI** tab.

Setup Host Name

Host Name screen allows network administrator to setup / change the host name of the gateway. Click the **Modify** button and provide the new username setting.

| Host Name | |
|-------------|----------------------|
| Item | Setting |
| ▶ Host Name | <input type="text"/> |

| Username Configuration | | |
|------------------------|---|---|
| Item | Value setting | Description |
| Host Name | 1. An Optional setting 2. It is blanked by default | Enter the host name of the gateway. |
| Save | N/A | Click Save button to save the settings |
| Undo | N/A | Click Undo button to cancel the settings |

Change UserName

Username screen allows network administrator to change the web-based MMI login account to access gateway. Click the **Modify** button and provide the new username setting.

| Username | |
|----------------|---|
| Item | Setting |
| ▶ Username | admin <input type="button" value="Modify"/> |
| ▶ New Username | <input type="text"/> |
| ▶ Password | <input type="text"/> |

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| Username Configuration | | |
|------------------------|---|---|
| Item | Value setting | Description |
| Username | 1. The default Username for web-based MMI is 'admin'. | Display the current MMI login account (Username). |
| New Username | String: any text | Enter new Username to replace the current setting. |
| Password | String: any text | Enter current password to verify if you have the permission to change the username setting. |
| Save | N/A | Click Save button to save the settings |
| Undo | N/A | Click Undo button to cancel the settings |

Change Password

Change password screen allows network administrator to change the web-based MMI login password to access gateway.

| Password [Help] | |
|--|----------------------|
| Item | Setting |
| ▶ Old Password | <input type="text"/> |
| ▶ New Password | <input type="text"/> |
| ▶ New Password Confirmation | <input type="text"/> |

| Password Configuration | | |
|----------------------------------|---|---|
| Item | Value setting | Description |
| Old Password | 1. String: any text 2. The default password for web-based MMI is 'admin'. | Enter the current password to enable you unlock to change password. |
| New Password | String: any text | Enter new password |
| New Password Confirmation | String: any text | Enter new password again to confirm |
| Save | N/A | Click Save button to save the settings |
| Undo | N/A | Click Undo button to cancel the settings |

Change MMI Setting for Accessing

This is the gateway's web-based MMI access which allows administrator to access the gateway for management. The gateway's web-based MMI will automatically logout when the idle time has elapsed. The setting allows administrator to enable automatic logout and set the logout idle time. When the login timeout

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is disabled, the system won't logout the administrator automatically.

| MMI [Help] | |
|---|---|
| Item | Setting |
| ▶ Login | Password-Guessing Attack & MAX: <input type="text" value="3"/> (times) |
| ▶ Login Timeout | <input checked="" type="checkbox"/> Enable <input type="text" value="300"/> (seconds) |
| ▶ GUI Access Protocol | <input type="text" value="http/https"/> ▼ |
| ▶ HTTPs Certificate Setup | <input checked="" type="radio"/> default <input type="radio"/> Select from Certificate List Certificate: <input type="text"/> Key: <input type="text"/> |
| ▶ HTTP Compression | <input type="checkbox"/> gzip <input type="checkbox"/> deflate |
| ▶ HTTP Binding | <input checked="" type="checkbox"/> DHCP 1 |
| ▶ System Boot Mode | <input type="text" value="Normal Mode"/> ▼ |

| MMI Configuration | | |
|--------------------------------|---|--|
| Item | Value setting | Description |
| Login | 3 times is set by default | Enter the login trial counting value. <u>Value Range:</u> 3 ~ 10. If someone tried to login the web GUI with incorrect password for more than the counting value, an warning message " Already reaching maximum Password-Guessing times, please wait a few seconds! " will be displayed and ignore the following login trials. |
| Login Timeout | The Enable box is checked, and 300 is set by default. | Check the Enable box to activate the auto logout function, and specify the maximum idle time as well. <u>Value Range:</u> 30 ~ 65535. |
| GUI Access Protocol | http/https is selected by default. | Select the protocol that will be used for GUI access. It can be http/https , http only , or https only . |
| HTTPs Certificate Setup | The default box is selected by default | If the https Access Protocol is selected, the HTTPs Certificate Setup option will be available for further configuration. You can leave it as default or select a expected certificate and key from the drop down list. Refer to Object Definition > Certificate Section for the Certificate configuration. |
| http Compression | The box is unchecked by default. | Check the box (gzip , or deflate) if any compression method is preferred. |
| http Binding | 1. An Optional setting 2. DHCP-1 is checked by default | Select the DHCP Server to bind with http access. |
| System Boot Mode | Normal Mode is selected | Select the system boot mode that will be adopted to boot up the device. |

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by default.

Normal Mode: It takes longer boot up time, about 200 seconds, with complete firmware image check during the device booting.

Fast Mode: It takes shorter boot up time, about 120 seconds, without checking the firmware image during the device booting.

Quick Mode: It takes shorter boot up time, about 90 seconds, without checking the firmware image and create the internal database for User/Group/Captive Portal functions.

Note: Use **Quick Mode** with care, once selected, the User/Group/Captive Portal function will become non-functional.

Save

N/A

Click **Save** button to save the settings

Undo

N/A

Click **Undo** button to cancel the settings

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6.2.2 System Information

System Information screen gives network administrator a quick look up on the device information for the purchased gateway.

Go to **Administration > System Operation > System Information** tab.

| System Information | |
|------------------------|---------------------------------|
| Item | Setting |
| ▶ Model Name | |
| ▶ Device Serial Number | |
| ▶ Kernel Version | 2.6.36 |
| ▶ FW Version | 0000TE0.H81_e81.0000_08021800 |
| ▶ CPU Usage | 9.80% |
| ▶ Memory Usage | 60% |
| ▶ System Time | Mon, 07 Aug 2017 15:45:25 +0800 |
| ▶ Device Up-Time | 4day 3hr 22min 24sec |

| System Information | | |
|-----------------------------|---------------|---|
| Item | Value Setting | Description |
| Model Name | N/A | It displays the model name of this product. |
| Device Serial Number | N/A | It displays the serial number of this product. |
| Kernel Version | N/A | It displays the Linux kernel version of the product |
| FW Version | N/A | It displays the firmware version of the product |
| CPU Usage | N/A | It displays the percentage of CPU utilization. |
| Memory Usage | N/A | It displays the percentage of device memory utilization. |
| System Time | N/A | It displays the current system time that you browsed this web page. |
| Device Up-Time | N/A | It displays the statistics for the device up-time since last boot up. |
| Refresh | N/A | Click the Refresh button to update the system Information immediately. |

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6.2.3 System Time

The gateway provides manually setup and auto-synchronized approaches for the administrator to setup the system time for the gateway. The time supported synchronization methods can be Time Server, Manual, PC, Cellular Module, or GPS Signal. Select the method first, and then configure rest settings.

Instead of manually configuring the system time for the gateway, there are two simple and quick solutions for you to set the correct time information and set it as the system time for the gateway.

The first one is “Sync with Timer Server”. Based on your selection of time zone and time server in above time information configuration window, system will communicate with time server by NTP Protocol to get system date and time after you click on the **Synchronize immediately** button.

The second one is “Sync with my PC”. Select the method and the system will synchronize its date and time to the time of the administration PC.

Go to **Administration > System Operation > System Time** tab.

Synchronize with Time Server

| System Time Configuration | |
|---------------------------|---|
| Item | Setting |
| ▶ Synchronization method | Time Server ▾ |
| ▶ Time Zone | (GMT+00:00) Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London ▾ |
| ▶ Auto-synchronization | Time Server: <input type="text"/> Available Time Servers (RFC-868): Auto ▾ |
| ▶ Daylight Saving Time | <input type="checkbox"/> Enable |
| ▶ NTP Service | <input type="checkbox"/> Enable |
| ▶ Synchronize immediately | Active |

| System Time Information | | |
|-------------------------------|---|--|
| Item | Value Setting | Description |
| Synchronization method | 1. A Must-filled item. 2. Time Server is selected by default. | Select the Time Server as the synchronization method for the system time. |
| Time Zone | 1. A Must-filled item. 2. GMT+00 :00 is selected by default. | Select a time zone where this device locates. |
| Auto-synchronization | 1. A Must-filled item. 2. Auto is selected by default. | Enter the IP or FQDN for the NTP time server you expected, or leave it as auto mode so that the available server will be used for time synchronization one by one. |

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| | | |
|--------------------------------|--|--|
| Daylight Saving Time | 1. It is an optional item. 2. Un-checked by default | Check the Enable button to activate the daylight saving function. When you enabled this function, you have to specify the start date and end date for the daylight saving time duration. |
| NTP Service | 1. It is an optional item. 2. Un-checked by default | Check the Enable button to activate the NTP Service function. When you enabled this function, the gateway can provide NTP server service for its local connected devices. |
| Synchronize immediately | N/A | Click the Active button to synchronize the system time with specified time server immediately. |
| Save | N/A | Click the Save button to save the settings. |
| Refresh | N/A | Click the Refresh button to update the system time immediately. |

Note: Remember to select a correct time zone for the device, otherwise, you will just get the UTC (Coordinated Universal Time) time, not the local time for the device.

Synchronize with Manually Setting

| System Time Configuration | |
|----------------------------|---|
| Item | Setting |
| ▶ Synchronization method | Manual ▾ |
| ▶ Time Zone | (GMT+00:00) Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London ▾ |
| ▶ Daylight Saving Time | <input type="checkbox"/> Enable |
| ▶ Set Date & Time Manually | 2018 ▾ / January ▾ / 09 ▾ (Year/Month/Day) 15 ▾ : 37 ▾ : 58 ▾ (Hour:Minute:Second) |
| ▶ NTP Service | <input type="checkbox"/> Enable |

| System Time Information | | |
|-------------------------------------|---|--|
| Item | Value Setting | Description |
| Synchronization method | 1. A Must-filled item. 2. Time Server is selected by default. | Select the Manual as the synchronization method for the system time. It means administrator has to set the Date & Time manually. |
| Time Zone | 1. A Must-filled item. 2. GMT+00 :00 is selected by default. | Select a time zone where this device locates. |
| Daylight Saving Time | 1. It is an optional item. 2. Un-checked by default | Check the Enable button to activate the daylight saving function. When you enabled this function, you have to specify the start date and end date for the daylight saving time duration. |
| Set Date & Time Manually | 1. It is an optional item. | Manually set the date (Year/Month/Day) and time (Hour:Minute:Second) as the system time. |
| NTP Service | 1. It is an optional item. 2. Un-checked by default | Check the Enable button to activate the NTP Service function. When you enabled this function, the gateway can provide NTP server service for |

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| | | |
|-------------|-----|--|
| | | its local connected devices. |
| Save | N/A | Click the Save button to save the settings. |

Synchronize with PC

| System Time Configuration | |
|---------------------------|---------------------------------------|
| Item | Setting |
| ▶ Synchronization method | PC ▼ |
| ▶ NTP Service | <input type="checkbox"/> Enable |
| ▶ Synchronize immediately | <input type="button" value="Active"/> |

| System Time Information | | |
|--------------------------------|---|---|
| Item | Value Setting | Description |
| Synchronization method | 1. A Must-filled item. 2. Time Server is selected by default. | Select PC as the synchronization method for the system time to let system synchronize its date and time to the time of the administration PC. |
| NTP Service | 1. It is an optional item. 2. Un-checked by default | Check the Enable button to activate the NTP Service function. When you enabled this function, the gateway can provide NTP server service for its local connected devices. |
| Synchronize immediately | N/A | Click the Active button to synchronize the system time with specified time server immediately. |
| Save | N/A | Click the Save button to save the settings. |
| Refresh | N/A | Click the Refresh button to update the system time immediately. |

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Synchronize with Cellular Time Service

| System Time Configuration | |
|---------------------------|--|
| Item | Setting |
| ▶ Synchronization method | Cellular Module ▾ |
| ▶ Time Zone | (GMT+00:00) Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London ▾ |
| ▶ NTP Service | <input type="checkbox"/> Enable |
| ▶ Synchronize immediately | Active |

| System Time Information | | |
|--------------------------------|--|---|
| Item | Value Setting | Description |
| Synchronization method | <ol style="list-style-type: none">1. A Must-filled item.2. Time Server is selected by default. | Select Cellular Module as the synchronization method for the system time to let system synchronize its date and time to the time provided from the connected mobile ISP. Note: this option is only available for the product with Cellular WAN interface. |
| Time Zone | <ol style="list-style-type: none">1. A Must-filled item.2. GMT+00 :00 is selected by default. | Select a time zone where this device locates. |
| NTP Service | <ol style="list-style-type: none">1. It is an optional item.2. Un-checked by default | Check the Enable button to activate the NTP Service function. When you enabled this function, the gateway can provide NTP server service for its local connected devices. |
| Synchronize immediately | N/A | Click the Active button to synchronize the system time with specified time server immediately. |
| Save | N/A | Click the Save button to save the settings. |
| Refresh | N/A | Click the Refresh button to update the system time immediately. |

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Synchronize with GPS Time Service

| System Time Configuration | |
|---------------------------|--|
| Item | Setting |
| ▶ Synchronization method | GPS Signal ▼ |
| ▶ Time Zone | (GMT+00:00) Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London ▼ |
| ▶ NTP Service | <input type="checkbox"/> Enable |
| ▶ Synchronize immediately | Active |

| System Time Information | | |
|--------------------------------|--|--|
| Item | Value Setting | Description |
| Synchronization method | <ol style="list-style-type: none">1. A Must-filled item.2. Time Server is selected by default. | Select GPS Signal as the synchronization method for the system time to let system synchronize its date and time to the time provided from the GNSS service. Note: this option is only available for the product with GNSS interface. |
| Time Zone | <ol style="list-style-type: none">1. A Must-filled item.2. GMT+00 :00 is selected by default. | Select a time zone where this device locates. |
| NTP Service | <ol style="list-style-type: none">1. It is an optional item.2. Un-checked by default | Check the Enable button to activate the NTP Service function. When you enabled this function, the gateway can provide NTP server service for its local connected devices. |
| Synchronize immediately | N/A | Click the Active button to synchronize the system time with specified time server immediately. |
| Save | N/A | Click the Save button to save the settings. |
| Refresh | N/A | Click the Refresh button to update the system time immediately. |

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6.2.4 System Log

System Log screen contains various event log tools facilitating network administrator to perform local event logging and remote reporting.

Go to **Administration > System Operation > System Log** tab.

| Item | Setting |
|-------------------------|--|
| ▶ Web Log Type Category | <input checked="" type="checkbox"/> System <input checked="" type="checkbox"/> Attacks <input checked="" type="checkbox"/> Drop <input checked="" type="checkbox"/> Login message <input type="checkbox"/> Debug |
| ▶ Email Alert | <input type="checkbox"/> Enable Server: --- Option --- <input type="button" value="Add Object"/> E-mail Addresses: <input type="text"/> Subject: <input type="text"/> Log type Category: <input type="checkbox"/> System <input type="checkbox"/> Attacks <input type="checkbox"/> Drop <input type="checkbox"/> Login message <input type="checkbox"/> Debug |
| ▶ Syslog | <input type="checkbox"/> Enable Server: --- Option --- <input type="button" value="Add Object"/> Log type Category: <input type="checkbox"/> System <input type="checkbox"/> Attacks <input type="checkbox"/> Drop <input type="checkbox"/> Login message <input type="checkbox"/> Debug |
| ▶ Log to Storage | <input type="checkbox"/> Enable Select Device: Internal Log file name: syslog Split file: <input type="checkbox"/> Enable Size: 200 KB <input type="button" value="Download log file"/> Log type Category: <input type="checkbox"/> System <input type="checkbox"/> Attacks <input type="checkbox"/> Drop <input type="checkbox"/> Login message <input type="checkbox"/> Debug |

View & Email Log History

View button is provided for network administrator to view log history on the gateway. **Email Now** button enables administrator to send instant Email for analysis.

| View & Email Log History | | |
|--------------------------|---------------|--|
| Item | Value setting | Description |
| View button | N/A | Click the View button to view Log History in Web Log List Window. |
| Email Now button | N/A | Click the Email Now button to send Log History via Email instantly. |

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| Web Log List | |
|---|---|
| Previous Next First Last Download Clear | |
| Time | Log |
| Dec 2 18:38:23 | kernel: klogd started: BusyBox v1.3.2 (2015-10-29 12:52:33 CST) |
| Dec 2 18:38:33 | BEID: BEID STATUS : 0 , STATUS OK! |
| Dec 2 18:38:40 | commander: NETWORK Initialization finished. Result: 0 |
| Dec 2 18:38:40 | commander: Initialize MultiWAN |
| Dec 2 18:38:40 | commander: index = 14, failover_index = 14 |
| Dec 2 18:38:40 | commander: wantype = 32, wantype index = 99, wan mode = 1, route enable = 1 |
| Dec 2 18:38:40 | commander: fo enable = 14, fo stay enable = 0, fo trigger = 1, fo time = 30, fo sequence = 0 |
| Dec 2 18:38:40 | commander: wantype = 16, wantype index = 0, wan mode = 2, route enable = 1 |
| Dec 2 18:38:40 | commander: fo enable = 14, fo stay enable = 0, fo trigger = 0, fo time = 0, fo sequence = 0 |
| Dec 2 18:38:40 | commander: LOAD BALANCE! |
| Dec 2 18:38:40 | commander: ROUTING! |
| Dec 2 18:38:42 | syslog: server_config.pool_check = 1 |
| Dec 2 18:38:42 | syslog: start = 192.168.85.100, end = 192.168.85.200, lan_ip = 192.168.85.2, interface=br0, ifindex=0 |
| Dec 2 18:38:42 | udhcpd[1413]: udhcpd (v0.9.9-pre) started |
| Dec 2 18:38:43 | syslog: Failure parsing line 13 of /etc/udhcpd_vlan0.conf |
| Page: 1/8 (Log Number: 109) | |

[Back](#)

Web Log List Window

| Item | Value Setting | Description |
|-------------|---------------|-------------------------------|
| Time column | N/A | It displays event time stamps |
| Log column | N/A | It displays Log messages |

Web Log List Button Description

| Item | Value setting | Description |
|----------|---------------|---|
| Previous | N/A | Click the Previous button to move to the previous page. |
| Next | N/A | Click the Next button to move to the next page. |
| First | N/A | Click the First button to jump to the first page. |
| Last | N/A | Click the Last button to jump to the last page. |
| Download | N/A | Click the Download button to download log to your PC in tar file format. |
| Clear | N/A | Click the Clear button to clear all log. |
| Back | N/A | Click the Back button to return to the previous page. |

Web Log Type Category

Web Log Type Category screen allows network administrator to select the type of events to log and be displayed in the Web Log List Window as described in the previous section. Click on the View button to view Log History in the Web Log List window.

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Web Log Type Category
 System
 Attacks
 Drop
 Login message
 Debug

| Web Log Type Category Setting Window | | |
|--------------------------------------|-----------------------|---|
| Item | Value Setting | Description |
| System | Checked by default | Check to log system events and to display in the Web Log List window. |
| Attacks | Checked by default | Check to log attack events and to display in the Web Log List window. |
| Drop | Checked by default | Check to log packet drop events and to display in the Web Log List window. |
| Login message | Checked by default | Check to log system login events and to display in the Web Log List window. |
| Debug | Un-checked by default | Check to log debug events and to display in the Web Log List window. |

Email Alert

Email Alert screen allows network administrator to select the type of event to log and be sent to the destined Email account.

Enable
 Server:
 E-mail Addresses:
 Subject:
 Log type Category:
 System
 Attacks
 Drop
 Login message
 Debug

| Email Alert Setting Window | | |
|----------------------------|-----------------------|---|
| Item | Value Setting | Description |
| Enable | Un-checked by default | Check Enable box to enable sending event log messages to destined Email account defined in the E-mail Addresses blank space. |
| Server | N/A | Select one email server from the Server dropdown box to send Email. If none has been available, click the Add Object button to create an outgoing Email server. You may also add an outgoing Email server from Object Definition > External Server > External Server tab. |
| E-mail address | String : email format | Enter the recipient's Email address. Separate Email addresses with comma ',' or semicolon ';'. |
| Subject | String : any text | Enter the Email address in the format of 'myemail@domain.com' |
| Log type category | Default unchecked | Enter an Email subject that is easy for you to identify on the Email client. Select the type of events to log and be sent to the designated Email account. Available events are System, Attacks, Drop, Login message, and Debug. |

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Syslogd

Syslogd screen allows network administrator to select the type of event to log and be sent to the designated Syslog server.

| | |
|----------------|--|
| Syslogd | <input type="checkbox"/> Enable Server: --- Option --- Add Object Log type Category: <input type="checkbox"/> System <input type="checkbox"/> Attacks <input type="checkbox"/> Drop <input type="checkbox"/> Login message <input type="checkbox"/> Debug |
|----------------|--|

| Syslogd Setting Window | | |
|--------------------------|-----------------------|---|
| Item | Value Setting | Description |
| Enable | Un-checked by default | Check Enable box to activate the Syslogd function, and send event logs to a syslog server |
| Server | N/A | Select one syslog server from the Server dropdown box to send event log to. If none has been available, click the Add Object button to create a system log server. You may also add an system log server from the Object Definition > External Server > External Server tab. |
| Log type category | Un-checked by default | Select the type of event to log and be sent to the destined syslog server. Available events are System, Attacks, Drop, Login message, and Debug. |

Log to Storage

Log to Storage screen allows network administrator to select the type of events to log and be stored at an internal or an external storage.

| | |
|-----------------------|--|
| Log to Storage | <input type="checkbox"/> Enable Select Device: Internal ▾ Log file name: syslog Split file: <input type="checkbox"/> Enable Size: 200 KB ▾ Download log file Log type Category: <input type="checkbox"/> System <input type="checkbox"/> Attacks <input type="checkbox"/> Drop <input type="checkbox"/> Login message <input type="checkbox"/> Debug |
|-----------------------|--|

| Log to Storage Setting Window | | |
|-------------------------------|---------------------------------|---|
| Item | Value Setting | Description |
| Enable | Un-checked by default | Check to enable sending log to storage. |
| Select Device | Internal is selected by default | Select internal or external storage. |
| Log file name | Un-checked by default | Enter log file name to save logs in designated storage. |
| Split file Enable | Un-checked by default | Check enable box to split file whenever log file reaching the specified limit. |
| Split file Size | 200 KB is set by default | Enter the file size limit for each split log file. Value Range: 10 ~1000. |
| Log type category | Un-checked by default | Check which type of logs to send: System, Attacks, Drop, Login message, Debug |

| Log to Storage Button Description | | |
|-----------------------------------|---------------|--|
| Item | Value setting | Description |
| Download log file | N/A | Click the Download log file button to download log files to a log.tar file. |

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6.2.5 Backup & Restore

In the Backup & Restore window, you can upgrade the device firmware when new firmware is available and also backup / restore the device configuration.

In addition to the factory default settings, you can also customize a special configuration setting as a customized default value. With this customized default value, you can reset the device to the expected default setting if needed.

Go to **Administration > System Operation > Backup & Restore** tab.

| FW Backup & Restore | |
|---------------------------------|--|
| Item | Setting |
| ▶ FW Upgrade | Via Web UI ▼ FW Upgrade |
| ▶ Backup Configuration Settings | Download ▼ Via Web UI |
| ▶ Auto Restore Configuration | <input type="checkbox"/> Enable Save Conf. Clean Conf. Conf. Info. |
| ▶ Self-defined Logo | Download ▼ Via Web UI |

| FW Backup & Restore | | |
|--------------------------------------|--|---|
| Item | Value Setting | Description |
| FW Upgrade | Via Web UI is selected by default | If new firmware is available, click the FW Upgrade button to upgrade the device firmware via Web UI , or Via Storage . After clicking on the “FW Upgrade” command button, you need to specify the file name of new firmware by using “Browse” button, and then click “Upgrade” button to start the FW upgrading process on this device. If you want to upgrade a firmware which is from GPL policy, please check “Accept unofficial firmware” |
| Backup Configuration Settings | Download is selected by default | You can backup or restore the device configuration settings by clicking the Via Web UI button. Download: for backup the device configuration to a config.bin file. Upload: for restore a designated configuration file to the device. Via Web UI: to retrieve the configuration file via Web GUI. |
| Auto Restore Configuration | The Enable box is unchecked by default | Click the Enable button to activate the customized default setting function. Once the function is activated, you can save the expected setting as a customized default setting by clicking the Save Conf. button, or clicking the Clean Conf. button to erase the stored customized configuration. |

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6.2.6 Reboot & Reset

For some special reason or situation, you may need to reboot the gateway or reset the device configuration to its default value. In addition to perform these operations through the Power ON/OFF, or pressing the reset button on the device panel, you can do it through the web GUI too.

Go to **Administration > System Operation > Reboot & Reset** tab.

In the Reboot & Reset window, you can reboot this device by clicking the “Reboot” button, and reset this device to default settings by clicking the “Reset” button.

| System Operation | |
|--------------------|---|
| Item | Setting |
| ▶ Reboot | Now ▼ <input type="button" value="Reboot"/> |
| ▶ Reset to Default | <input type="button" value="Reset"/> |

| System Operation Window | | |
|-------------------------|----------------------------|--|
| Item | Value Setting | Description |
| Reboot | Now is selected by default | Click the Reboot button to reboot the gateway immediately or on a pre-defined time schedule. Now: Reboot immediately Time Schedule: Select a pre-defined auto-reboot time schedule rule to reboot the auto device on a designated tim. To define a time schedule rule, go to Object Definition > Scheduling > Configuration tab. |
| Reset to Default | N/A | Click the Reset button to reset the device configuration to its default value. |

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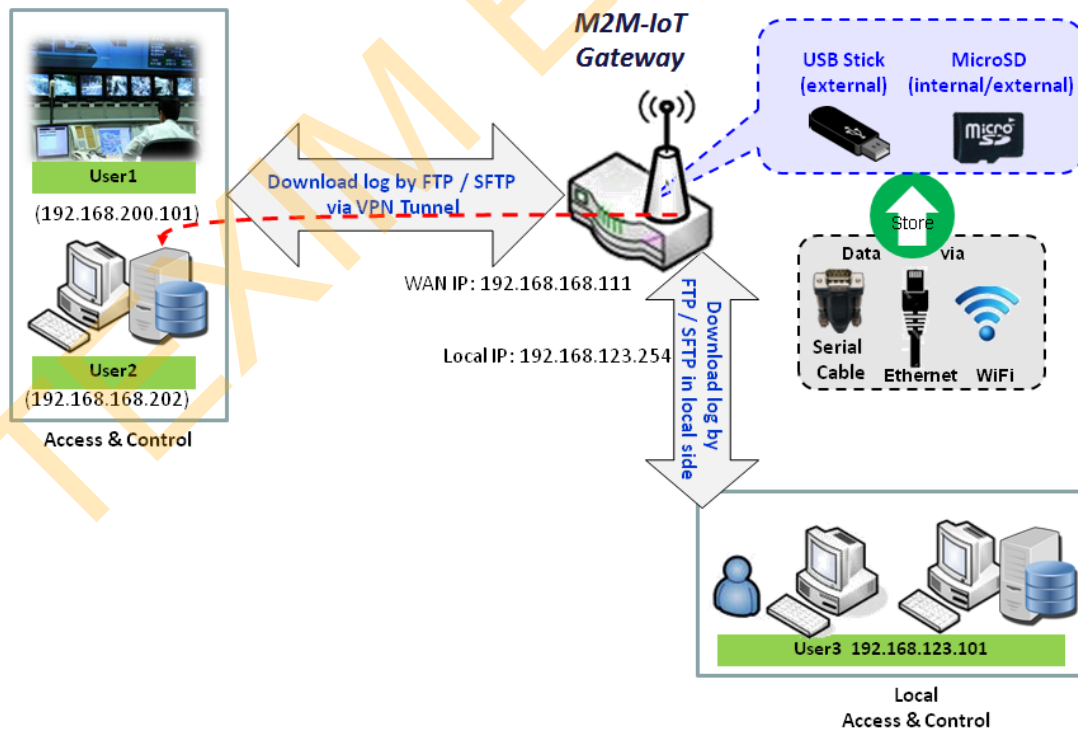
6.3 FTP

The File Transfer Protocol (FTP) is a standard network protocol used to transfer computer files between a client and server on a computer network. FTP is built on a client-server model architecture and uses separate control and data connections between the client and the server. FTP users may authenticate themselves with a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it.

For secure transmission that protects the username and password, and encrypts the content, FTP is often secured with SSL/TLS (FTPS). Besides, SSH File Transfer Protocol (SFTP) is sometimes also used instead, but is technologically different.

This gateway embedded FTP / SFTP server for administrator to download the log files to his computer or database. In the following two sections, you can configure the FTP server and create the user accounts that can login to the server. After login to the FTP server, you can browse the log directory and have the permission to download the stored log files and delete the files you have downloaded to make more storage space for further data logs.

The available log files can be system logs (refer to Administration > System Operation > System Log), Network Packets (refer to Administrator > Diagnostic > Packet Analyzer), Data Log (refer to Field Communication > Data Logging > Log File Management), and GNSS Log (refer to Service > Location Tracking > GNSS). With proper configuration for the various log functions that supported on your purchased product, you can download the log via FTP / SFTP connections.



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6.3.1 Server Configuration

This section allows user to setup the embedded FTP and SFTP server for retrieving the interested fog files.

Go to **Administration > FTP > Server Configuration** tab.

Enable FTP Server

| FTP Server Configuration Save | |
|--|---|
| Item | Setting |
| ▶ FTP | <input type="checkbox"/> Enable |
| ▶ FTP Port | <input type="text" value="21"/> |
| ▶ Timeout | <input type="text" value="300"/> second(s)(60-7200) |
| ▶ Max. Connections per IP | <input type="text" value="2"/> |
| ▶ Max. FTP Clients | <input type="text" value="5"/> |
| ▶ PASV Mode | <input type="checkbox"/> Enable |
| ▶ Port Range of PASV Mode | <input type="text" value="50000"/> ~ <input type="text" value="50031"/> |
| ▶ Auto Report External IP in PASV Mode | <input type="checkbox"/> Enable |
| ▶ ASCII Transfer Mode | <input type="checkbox"/> Enable |
| ▶ FTPS(FTP over SSL/TLS) | <input type="checkbox"/> Enable |

| Configuration Item | Value setting | Description |
|--------------------------------|---------------------------------------|--|
| FTP | The box is unchecked by default. | Check Enable box to activate the embedded FTP Server function. With the FTP Server enabled, you can retrieve or delete the stored log files via FTP connection. Note: The embedded FTP Server is only for log downloading, so no any write permission is implemented for user file upload to the storage. |
| FTP Port | Port 21 is set by default | Specify a port number for FTP connection. The gateway will listen for incoming FTP connections on the specified port. Value Range: 1 ~ 65535. |
| Timeout | 300 seconds is set by default. | Specify the maximum timeout interval for the FTP connection. Supported range is 60 to 7200 seconds. |
| Max. Connections per IP | 2 Clients are set by default. | Specify the maximum number of clients from the same IP address for the FTP connection. Up to 5 clients from the same IP address is supported. |
| Max. FTP Clients | 5 Clients are set by default. | Specify the maximum number of clients for the FTP connection. Up to 32 clients is supported. |

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| | | |
|---|--|---|
| PASV Mode | Optional setting | Check the Enable box to activate the support of PASV mode for a FTP connection from FTP clients. |
| Port Range of PASV Mode | Port 50000 ~ 50031 is set by default. | Specify the port range to allocate for PASV style data connection. Value Range: 1024 ~ 65535. |
| Auto Report External IP in PASV Mode | Optional setting | Check the Enable box to activate the support of overriding the IP address advertising in response to the PASV command. |
| ASCII Transfer Mode | Optional setting | Check the Enable box to activate the support of ASCII mode data transfers. Binary mode is supported by default. |
| FTPS (FTP over SSL/TLS) | Optional setting | Check the Enable box to activate the support of secure connections via SSL/TLS. |

Enable SFTP Server

SFTP Server Configuration
Save

| Item | Setting |
|-------------|---|
| ▶ SFTP | <input type="checkbox"/> Enable via <input type="checkbox"/> LAN via <input type="checkbox"/> WAN |
| ▶ SFTP Port | <input style="width: 50px;" type="text" value="22"/> |

| Configuration Item | Value setting | Description |
|--------------------|----------------------------------|--|
| SFTP | The box is unchecked by default. | Check Enable box to activate the embedded SFTP Server function. Furthermore, you can check the granted interface(s) for the SFTP connection, via LAN, WAN , or both. With the SFTP Server enabled, you can retrieve or delete the stored log files via secure SFTP connection. |
| SFTP Port | Default 22 | Specify a port number for SFTP connection. The gateway will listen for incoming SFTP connections on the specified port. Value Range: 1 ~ 65535. |

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6.3.2 User Account

This section allows user to setup user accounts for logging to the embedded FTP and SFTP server to retrieve the interested fog files.

Go to **Administration > FTP > User Account** tab.

Create/Edit FTP User Accounts

| User Account List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | |
|--|-----------|----------|-----------|------------|--------|---------|
| ID | User Name | Password | Directory | Permission | Enable | Actions |

When **Add** button is applied, **User Account Configuration** screen will appear.

| User Account Configuration <input type="button" value="Save"/> | |
|--|---------------------------------------|
| Item | Setting |
| ▶ User Name | <input type="text"/> |
| ▶ Password | <input type="text"/> |
| ▶ Directory | <input type="button" value="Browse"/> |
| ▶ Permission | Read/Write ▾ |
| ▶ Enable | <input checked="" type="checkbox"/> |

| Configuration | | |
|-------------------|---|---|
| Item | Value setting | Description |
| User Name | String : non-blank string | Enter the user account for login to the FTP server. Value Range: 1 ~ 15 characters. |
| Password | String : no blank | Enter the user password for login to the FTP server. |
| Directory | N/A | Select a root directory after user login. |
| Permission | Read/Write is selected by default. | Select the Read/write permission. Note: The embedded FTP Server is only for log downloading, so no any write permission is implemented for user file upload to the storage, even Read/Write option is selected. |
| Enable | The box is checked by default. | Check the box to activate the FTP user account. |

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6.4 Diagnostic

This gateway supports simple network diagnosis tools for the administrator to troubleshoot and find the root cause of the abnormal behavior or traffics passing through the gateway. There can be a Packet Analyzer to help record the packets for a designated interface or specific source/destination host, and another Ping and Tracert tools for testing the network connectivity issues.

6.4.1 Diagnostic Tools

The Diagnostic Tools provide some frequently used network connectivity diagnostic tools (approaches) for the network administrator to check the device connectivity.

Go to **Administration > Diagnostic > Diagnostic Tools** tab.

| Diagnostic Tools | |
|------------------|---|
| Item | Setting |
| ▶ Ping Test | Host IP: <input type="text"/> Outer Interface: <input type="text" value="Auto"/> LAN Source: <input type="text" value="Default"/> <input type="button" value="Ping"/> |
| ▶ Tracert Test | Host IP: <input type="text"/> Interface: <input type="text" value="Auto"/> <input type="text" value="UDP"/> <input type="button" value="Tracert"/> |
| ▶ Wake on LAN | <input type="text"/> <input type="button" value="Wake up"/> |

| Diagnostic Tools | | |
|---------------------|------------------|--|
| Item | Value setting | Description |
| Ping Test | Optional Setting | This allows you to specify an IP / FQDN, the Outer interface (auto, WAN, LAN, or VLAN), and LAN source (default, LAN, or VLAN) as well, so system will try to ping the specified device to test whether it is alive after clicking on the Ping button. A test result window will appear beneath it. |
| Tracert Test | Optional setting | Trace route (tracert) command is a network diagnostic tool for displaying the route (path) and measuring transit delays of packets across an IP network. Trace route proceeds until all (three) sent packets are lost for more than twice, then the connection is lost and the route cannot be evaluated. First, you need to specify an IP / FQDN, the test interface (LAN, WAN, or Auto) and the protocol (UDP or ICMP), and by default, it is UDP . Then, system will try to trace the specified host to test whether it is alive after clicking on Tracert button. A test result window will appear beneath it. |
| Wake on LAN | Optional setting | Wake on LAN (WOL) is an Ethernet networking standard that allows a computer to be turned on or awakened by a network message. You can specify the MAC address of the computer, in your LAN network, to be remotely turned on by clicking on the Wake up command button. |
| Save | N/A | Click the Save button to save the configuration. |

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6.4.2 Packet Analyzer

The Packet Analyzer can capture packets depend on user settings. User can specify interfaces to capture packets and filter by setting rule. Ensure the log storage is available (either embedded SD-Card or external USB Storage), otherwise **Packet Analyzer** cannot be enabled.

Go to **Administration > Diagnostic > Packet Analyzer** tab.

| Configuration | |
|---------------------|--|
| Item | Setting |
| ▶ Packet Analyzer | <input type="checkbox"/> Enable |
| ▶ File Name | <input type="text"/> |
| ▶ Split Files | <input type="checkbox"/> Enable File Size : <input type="text" value="200"/> <input type="text" value="KB"/> |
| ▶ Packet Interfaces | <input type="checkbox"/> WAN-1 <input type="checkbox"/> WAN-2 <input type="checkbox"/> ASY-1 <input type="text" value="Binary Mode"/> 2.4G : <input type="checkbox"/> VAP-1 <input type="checkbox"/> VAP-2 <input type="checkbox"/> VAP-3 <input type="checkbox"/> VAP-4 <input type="checkbox"/> VAP-5 <input type="checkbox"/> VAP-6 <input type="checkbox"/> VAP-7 <input type="checkbox"/> VAP-8 |

| Configuration | | |
|--------------------------|--|--|
| Item | Value setting | Description |
| Packet Analyzer | The box is unchecked by default. | Check Enable box to activate the Packet Analyzer function. If you cannot enable the checkbox, please check if the storage is available or not. Plug in the USB storage and then enable the Package Analyzer function. |
| File Name | 1. An optional setting 2. Blank is set by default, and the default file name is <Interface>_<Date>_<index> . | Enter the file name to save the captured packets in log storage. If Split Files option is also enabled, the file name will be appended with an index code " _<index> ". The extension file name is .pcap . |
| Split Files | 1. An optional setting 2. The default value of File Size is 200 KB. | Check enable box to split file whenever log file reaching the specified limit. If the Split Files option is enabled, you can further specify the File Size and Unit for the split files. Value Range: 10 ~ 99999. NOTE: File Size cannot be less than 10 KB |
| Packet Interfaces | An optional setting | Define the interface(s) that Packet Analyzer should work on. At least, one interface is required, but multiple selections are also accepted. The supported interfaces can be: <ul style="list-style-type: none"> ● WAN: When the WAN is enabled at Physical Interface, it can be selected here. ● ASY: This means the serial communication interface. It is used to capture packets appearing in the Field Communication. Therefore, it can only be selected when specific field communication protocol, like Modbus, is enabled. |

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| | | |
|-------------|-----|--|
| | | Select Binary mode or String mode for the serial interface. |
| | | <ul style="list-style-type: none"> ● VAP: This means the virtual AP. When WiFi and VAP are enabled, it can be selected here. |
| Save | N/A | Click the Save button to save the configuration. |
| Undo | N/A | Click the Undo button to restore what you just configured back to the previous setting. |

Once you enabled the Packet Analyzer function on specific Interface(s), you can further specify some filter rules to capture the packets which matched the rules.

☐ Capture Filters

| Item | Setting |
|---------------------|---|
| ▶ Filter | <input type="checkbox"/> Enable |
| ▶ Source MACs | <input style="width: 100%; height: 20px;" type="text"/> |
| ▶ Source IPs | <input style="width: 100%; height: 20px;" type="text"/> |
| ▶ Source Ports | <input style="width: 100%; height: 20px;" type="text"/> |
| ▶ Destination MACs | <input style="width: 100%; height: 20px;" type="text"/> |
| ▶ Destination IPs | <input style="width: 100%; height: 20px;" type="text"/> |
| ▶ Destination Ports | <input style="width: 100%; height: 20px;" type="text"/> |

| Capture Filters | | |
|--------------------|------------------|---|
| Item | Value setting | Description |
| Filter | Optional setting | Check Enable box to activate the Capture Filter function. |
| Source MACs | Optional setting | Define the filter rule with Source MACs , which means the source MAC address of packets. Packets which match the rule will be captured. Up to 10 MACs are supported, but they must be separated with “;”, e.g. AA:BB:CC:DD:EE:FF; 11:22:33:44:55:66 The packets will be captured when match any one MAC in the rule. |

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| | | |
|--------------------------|------------------|---|
| Source IPs | Optional setting | Define the filter rule with Source IPs , which means the source IP address of packets. Packets which match the rule will be captured. Up to 10 IPs are supported, but they must be separated with “;”, e.g. 192.168.1.1; 192.168.1.2 The packets will be captured when match any one IP in the rule. |
| Source Ports | Optional setting | Define the filter rule with Source Ports , which means the source port of packets. The packets will be captured when match any port in the rule. Up to 10 ports are supported, but they must be separated with “;”, e.g. 80; 53 Value Range: 1 ~ 65535. |
| Destination MACs | Optional setting | Define the filter rule with Destination MACs , which means the destination MAC address of packets. Packets which match the rule will be captured. Up to 10 MACs are supported, but they must be separated with “;”, e.g. AA:BB:CC:DD:EE:FF; 11:22:33:44:55:66 The packets will be captured when match any one MAC in the rule. |
| Destination IPs | Optional setting | Define the filter rule with Destination IPs , which means the destination IP address of packets. Packets which match the rule will be captured. Up to 10 IPs are supported, but they must be separated with “;”, e.g. 192.168.1.1; 192.168.1.2 The packets will be captured when match any one IP in the rule. |
| Destination Ports | Optional setting | Define the filter rule with Destination Ports , which means the destination port of packets. The packets will be captured when match any port in the rule. Up to 10 ports are supported, but they must be separated with “;”, e.g. 80; 53 Value Range: 1 ~ 65535. |

Chapter 7 Service

7.1 Cellular Toolkit (not supported)

Not supported feature for the purchased product, leave it as blank.

TEXIM EUROPE

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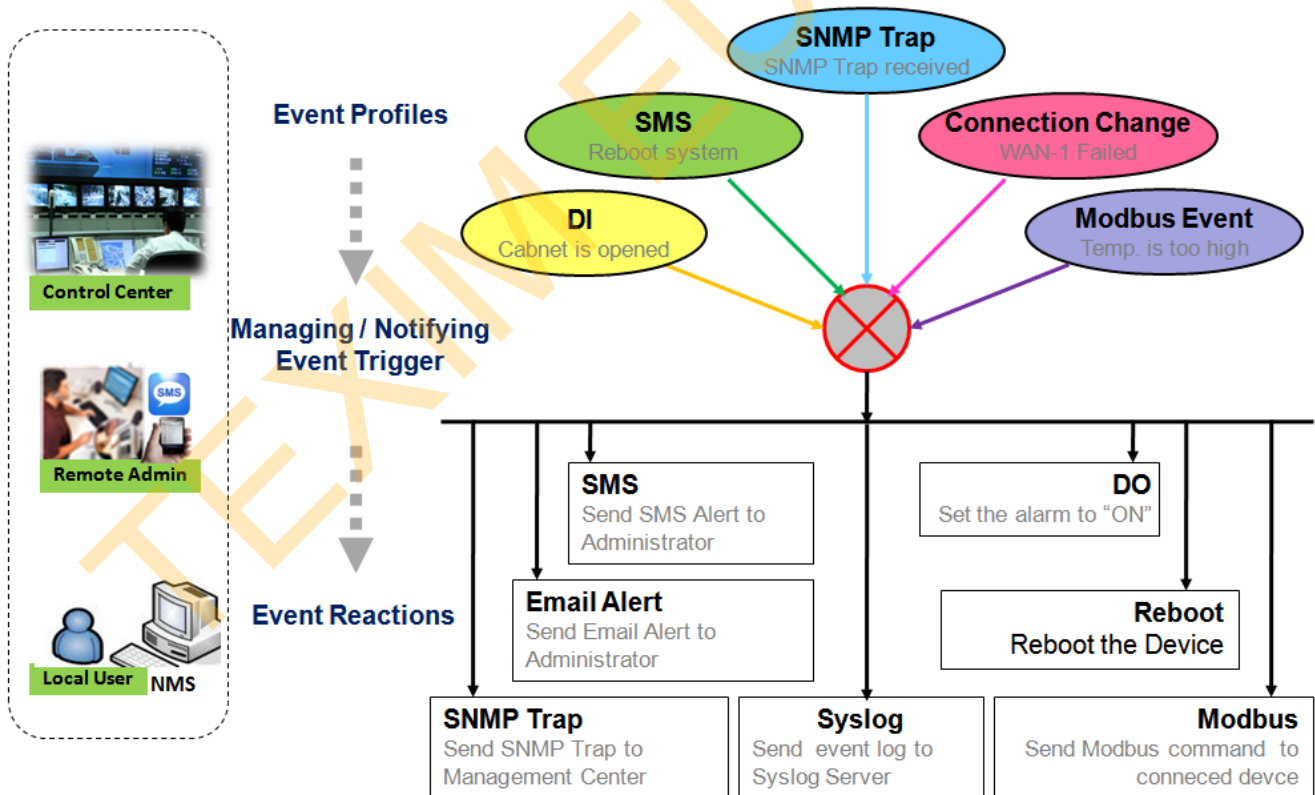
7.2 Event Handling

Event handling is the application that allows administrator to setup the pre-defined events, handlers, or response behavior with individual profiles. With properly configuring the event handling function, administrator can easily and remotely obtain the status and information via the purchased gateway. Moreover, he can also handle and manage some important system related functions, even the field bus devices and D/O devices which are already well connected to.

The supported events are categorized into two groups: the **managing events** and **notifying events**.

The **managing events** are the events that are used to manage the gateway or change the setting / status of the specific functionality of the gateway. On receiving the managing event, the gateway will take action to change the functionality, collect the required status for administration, and also change the status of a certain connected field bus device simultaneously.

The **notifying events** are the events that some related objects have been triggered and take corresponding actions on the occurrence of the events. It could be an event generated from the connected sensor, or a certain connected field bus device for alerting the administrator something happened with Email, and SNMP Trap, etc...



For ease of configuration, administrator can create and edit the common pre-defined managing / notifying event profiles for taking instant reaction on a certain event or managing the devices for some advanced useful purposes. For example, sending/receiving the field bus device status monitoring, digital sensors detection

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controlling, and so on. All of such management and notification function can be realized effectively via the Event Handling feature.

The following is the summary lists for the provided profiles, and events:

(Note: The available profiles and events could be different for the purchased product.)

- Profiles (Rules):
 - Email Accounts
 - Digital Input (DI) profiles
 - Digital Output (DO) profiles
 - Modbus Managing Event profiles
 - Modbus Notifying Event profiles
 - Remote Host profiles
- Managing Events:
 - Trigger Type: SNMP Trap, and Digital Input (DI).
 - Actions: Get the Network Status; or Configure the LAN/VLAN behavior, WIFI behavior, NAT behavior, Firewall behavior, VPN behavior, System Management, Administration, Digital Output behavior, connected Modbus devices, and Remote Host.
- Notifying Events:
 - Trigger Type: Digital Input, Power Change, Connection Change (WAN, LAN & VLAN, WiFi, DDNS), Administration, Modbus, and Data Usage.
 - Actions: Notify the administrator with Syslog, SNMP Trap or Email Alert; Change the status of connected Digital Output or Modbus devices; Sending collected information to Remote Host.

To use the event handling function, First of all, you have to enable the event management setting and configure the event details with the provided profile settings. You can create or edit pre-defined profiles for individual managing / notifying events. The profile settings are separated into several items; they are the Email Service Definition, Digital Input (DI) Profile Configuration, Digital Output (DO) Profile Configuration, Modbus Definition, and Remote Host Configuration.

Then, you have to configure each managing / notifying event with identifying the event's trigger condition, and the corresponding actions (reaction for the event) for the event. For each event, more than one action can be activated simultaneously.

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7.2.1 Configuration

Go to **Service > Event Handling > Configuration** Tab.

Event handling is the service that allows administrator to setup the pre-defined events, handlers, or response behavior with individual profiles.

Create / Edit Email Service Account

Setup the Email Service Account for event notification. It supports up to a maximum of 5 accounts.

| Email Service List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | |
|---|--------------|-----------------|--------|---------|
| ID | Email Server | Email Addresses | Enable | Actions |

You can click the **Add / Edit** button to configure the Email account.

| Email Service Configuration | |
|-------------------------------------|---|
| Item | Setting |
| ▶ Email Server | <input type="text" value="--- Option --- ▼"/> |
| ▶ Email Addresses | <input type="text"/> |
| ▶ Enable | <input checked="" type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| Email Service Configuration | | |
|-----------------------------|---|---|
| Item | Value setting | Description |
| Email Server | --- Option --- | Select an Email Server profile from External Server setting for the email account setting. |
| Email Addresses | 1. Internet E-mail address format 2. A Must filled setting | Specify the Destination Email Addresses. |
| Enable | The box is unchecked by default. | Click Enable box to activate this account. |
| Save | NA | Click the Save button to save the configuration |

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Create / Edit Digital Input (DI) Profile Rule (DI/DO support required)

Setup the Digital Input (DI) Profile rules. It supports up to a maximum of 10 profiles.

| Digital Input (DI) Profile List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | |
|--|-----------------|-------------|-----------|-------------------------|--------------|------------------------|--------|---------|
| ID | DI Profile Name | Description | DI Source | Continues Update Status | Normal Level | Signal Active Time (s) | Enable | Actions |

When **Add** button is applied, the **Digital Input (DI) Profile Configuration** screen will appear.

| Digital Input (DI) Profile Configuration | |
|--|--|
| Item | Setting |
| ▶ DI Profile Name | <input type="text"/> |
| ▶ Description | <input type="text"/> |
| ▶ DI Source | ID1 ▼ |
| ▶ Continues Update Status | <input type="checkbox"/> Enable & Update Interval <input type="text" value="2"/> (2~86400 seconds) |
| ▶ Normal Level | Low ▼ |
| ▶ Signal Active Time | <input type="text" value="1"/> (seconds) |
| ▶ Profile | <input checked="" type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| Digital Input (DI) Profile Configuration | | |
|--|--|--|
| Item | Value setting | Description |
| DI Profile Name | 1. String format 2. A Must filled setting | Specify the DI Profile Name. Value Range: -1 ~ 32 characters. |
| Description | 1. Any text 2. An Optional setting | Specify a brief description for the profile. |
| DI Source | ID1 by default | Specify the DI Source. It could be ID1 or ID2. The number of available DI source could be different for the purchased product. |
| Contiune Update Status | The box is unchecked by default. | Click Enable box to activate this function for the DI event with designated update interval setting. If the event condition keeps active for a long time interval, the gateway will send repeated notify events for each check interval. Value Range: 2 ~ 86400 seconds. Note : To prevent receiving too much notify event for the same situation, you can adjust the check interval to a proper one for your application. |
| Normal Level | Low by default | Specify the Normal Level. It could be Low or High . |
| Signal Active Time | 1. Numeric String format 2. A Must filled setting | Specify the Signal Active Time. It could be from 1 to 10 seconds. The Signal Active Time setting will be ignored when 'Continue Update Status' function is enabled |

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| | | |
|----------------|----------------------------------|---|
| | | Value Range: 1 ~ 10 seconds. |
| Profile | The box is unchecked by default. | Click Enable box to activate this profile setting. |
| Save | NA | Click the Save button to save the configuration. |

Create / Edit Digital Output (DO) Profile Rule (DI/DO support required)

Setup the Digital Output (DO) Profile rules. It supports up to a maximum of 10 profiles.

| Digital Output (DO) Profile List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | | |
|---|-----------------|-------------|-----------|--------------|--------------------------|------------------|---------------|--------|---------|
| ID | DO Profile Name | Description | DO Source | Normal Level | Total Signal Period (ms) | Repeat & Counter | Duty Cycle(%) | Enable | Actions |

When **Add** button is applied, the **Digital Output (DO) Profile Configuration** screen will appear.

| Digital Output (DO) Profile Configuration | |
|---|---|
| Item | Setting |
| ▶ DO Profile Name | <input type="text"/> |
| ▶ Description | <input type="text"/> |
| ▶ DO Source | ID1 ▼ |
| ▶ Normal Level | Low ▼ |
| ▶ Total Signal Period | 10 <input type="text"/> (ms) |
| ▶ Repeat & Counter | <input type="checkbox"/> Enable & Counter: 0 <input type="text"/> |
| ▶ Duty Cycle | <input type="text"/> (%) |
| ▶ Profile | <input checked="" type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| Digital Output (DO) Profile Configuration | | |
|---|--|---|
| Item | Value setting | Description |
| DO Profile Name | 1. String format 2. A Must filled setting | Specify the DO Profile Name. Value Range: -1 ~ 32 characters. |
| Description | 1. Any text 2. An Optional setting | Specify a brief description for the profile. |
| DO Source | ID1 by default | Specify the DO Source. It could be ID1. |
| Normal Level | Low by default | Specify the Normal Level. It could be Low or High . |
| Total Signal Period | 1. Numeric String format 2. A Must filled setting | Specify the Total Signal Period. Value Range: 10 ~ 10000 ms. |
| Repeat & Counter | The box is unchecked by default. | Check the Enable box to activate the repeated Digital Output, and specify the Repeat times. Value Range: 0 ~ 65535. |

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| | | |
|-------------------|--|---|
| Duty Cycle | 1. Numeric String format 2. A Must filled setting | Specify the Duty Cycle for the Digital Output. Value Range: 1 ~100 %. |
| Profile | The box is unchecked by default. | Click Enable box to activate this profile setting. |
| Save | N/A | Click the Save button to save the configuration. |

Create / Edit Modbus Notifying Events Profile (Modbus support required)

Setup the Modbus Notifying Events Profile. It supports up to a maximum of 10 profiles.

| Modbus Notifying Events Profile List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | | | | | |
|---|-------------|--|-------------------------------|-------------|--------------|------|-----------|----------|------------------|-------|-------------------------------------|--|
| ID | Modbus Name | Description | Read Function | Modbus Mode | IP | Port | Device ID | Register | Logic Comparator | Value | Enable | Actions |
| 1 | co2_level | read co2 level to check if it bigger than 60 | Read Holding Registers (0x03) | TCP | 122.22.33.44 | 987 | 78 | 3 | > | 60 | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="button" value="Select"/> |

You can click the **Add / Edit** button to configure the profile.

| Modbus Notifying Events Profile Configuration | |
|---|--|
| Item | Setting |
| ▶ Modbus Name | <input type="text"/> |
| ▶ Description | <input type="text"/> |
| ▶ Read Function | Read Coils (0x01) ▼ |
| ▶ Modbus Mode | Serial ▼ |
| ▶ IP | <input type="text"/> |
| ▶ Port | <input type="text"/> |
| ▶ Device ID | <input type="text"/> |
| ▶ Register | <input type="text"/> |
| ▶ Logic Comparator | > ▼ |
| ▶ Value | <input type="text" value="0"/> |
| ▶ Enable | <input checked="" type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

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| Modbus Notifying Events Profile | | |
|---------------------------------|--|--|
| Item | Value setting | Description |
| Modbus Name | 1. String format 2. A Must filled setting | Specify the Modbus profile name. Value Range: -1 ~ 32 characters. |
| Description | 1. Any text 2. An Optional setting | Specify a brief description for the profile. |
| Read Function | Read Holding Registers by default | Specify the Read Function for Notifying Events . |
| Modbus Mode | Serial by default | Specify the Modbus Mode. It could be Serial or TCP . |
| IP | 1. NA for Serial on Modbus Mode. 2. A Must filled setting for TCP on Modbus Mode. | Specify the IP for TCP on Modbus Mode. IPv4 Format. |
| Port | 1. NA for Serial on Modbus Mode. 2. A Must filled setting for TCP on Modbus Mode. | Specify the Port for TCP on Modbus Mode. Value Range: 1 ~ 65535. |
| Device ID | 1. Numeric String format 2. A Must filled setting | Specify the Device ID of the modbus device. It could be from 1 to 247. |
| Register | 1. Numeric String format 2. A Must filled setting | Specify the Register number of the modbus device. Value Range: 0 ~ 65535. |
| Logic Comparator | Logic Comparator '>' by default. | Specify the Logic Comparator for Notifying Events . It could be '>', '<', '=', '>=', or '<='. |
| Value | 1. Numeric String format 2. A Must filled setting | Specify the Value. Value Range: 0 ~ 65535. |
| Enable | The box is unchecked by default. | Click Enable box to activate this profile setting. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

Create / Edit Modbus Managing Events Profile (Modbus support required)

Setup the Modbus Managing Events Profile. It supports up to a maximum of 10 profiles.

| Modbus Managing Events Profile List <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | | | | | |
|--|-------------|--|------------------------------|-------------|--------------|------|-----------|----------|-------|-------------------------------------|--|
| ID | Modbus Name | Description | Write Function | Modbus Mode | IP | Port | Device ID | Register | Value | Enable | Actions |
| 1 | water_pump | write water pump to control the motor speed high-low | Write Single Register (0x06) | TCP | 233.44.55.66 | 876 | 247 | 44 | 5678 | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> <input type="checkbox"/> Select |

You can click the **Add / Edit** button to configure the profile.

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| Modbus Managing Events Profile Configuration | |
|--|--|
| Item | Setting |
| ▶ Modbus Name | <input type="text"/> |
| ▶ Description | <input type="text"/> |
| ▶ Write Function | Write Single Coil (0x05) ▼ |
| ▶ Modbus Mode | Serial ▼ |
| ▶ IP | <input type="text"/> |
| ▶ Port | <input type="text"/> |
| ▶ Device ID | <input type="text"/> |
| ▶ Register | <input type="text"/> |
| ▶ Value | 0 |
| ▶ Enable | <input checked="" type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| Modbus Managing Events Profile | | |
|--------------------------------|--|--|
| Item | Value setting | Description |
| Modbus Name | 1. String format 2. A Must filled setting | Specify the Modbus profile name. Value Range: -1 ~ 32 characters. |
| Description | 1. Any text 2. An Optional setting | Specify a brief description for the profile. |
| Write Function | Write Single Registers by default | Specify the Write Function for Managing Events . |
| Modbus Mode | Serial by default | Specify the Modbus Mode. It could be Serial or TCP . |
| IP | 1. NA for Serial on Modbus Mode. 2. A Must filled setting for TCP on Modbus Mode. | Specify the IP for TCP on Modbus Mode. IPv4 Format. |
| Port | 1. NA for Serial on Modbus Mode. 2. A Must filled setting for TCP on Modbus Mode. | Specify the Port for TCP on Modbus Mode. Value Range: 1 ~ 65535. |
| Device ID | 1. Numeric String format 2. A Must filled setting | Specify the Device ID of the modbus device. Value Range: 1 ~ 247. |
| Register | 1. Numeric String format 2. A Must filled setting | Specify the Register number of the modbus device. Value Range: 0 ~ 65535. |
| Value | 1. Numeric String format 2. A Must filled setting | Specify the Value. Value Range: 0 ~ 65535. |
| Enable | The box is unchecked by default. | Click Enable box to activate this profile setting. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

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Create / Edit Remote Host Profile

Setup the Remote Host Profile. It supports up to a maximum of 10 profiles.

| Remote Host List | | | | | | | | |
|------------------|-----------|---------|---------------|-------------|----------------|----------------|--------|---------|
| ID | Host Name | Host IP | Protocol Type | Port Number | Prefix Message | Suffix Message | Enable | Actions |

You can click the **Add / Edit** button to configure the profile.

| Remote Host Configuration | |
|---------------------------|--------------------------|
| Item | Setting |
| ▶ Host Name | <input type="text"/> |
| ▶ Host IP | <input type="text"/> |
| ▶ Protocol Type | TCP ▼ |
| ▶ Port Number | <input type="text"/> |
| ▶ Prefix Message | <input type="text"/> |
| ▶ Suffix Message | <input type="text"/> |
| ▶ Enable | <input type="checkbox"/> |
| Save | |

| Remote Host Configuration | | |
|---------------------------|--|--|
| Item | Value setting | Description |
| Host Name | 1. String format 2. A Must filled setting | Specify the Remote Host profile name. Value Range: -1 ~ 64 characters. |
| Host IP | 1. A Must filled setting 2. IP Address format. | Specify the IP address for the Remote Host. IPv4 Format. |
| Protocol Type | 1. A Must filled setting 2. TCP is selected by default | Specify the protocol to access the Remote Host. It could be TCP or UDP . |
| Port Number | 1. A Must filled setting | Specify the Port number for accessing the Remote Host. Value Range: 1 ~ 65535. |
| Prefix Message | 1. String format 2. An Optional filled setting | Specify the Prefix Message string as pre-defined identification for accessing the remote host, if required. Value Range: -1 ~ 64 characters. |
| Suffix Message | 1. String format 2. An Optional filled setting | Specify the Suffix Message string as pre-defined identification for accessing the remote host, if required. Value Range: -1 ~ 64 characters. |
| Enable | The box is unchecked by default. | Click Enable box to activate this profile setting. |

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| | | |
|-------------|----|--|
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

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7.2.2 Managing Events

Managing Events allow administrator to define the relationship (rule) among event trigger, handlers and response.

Go to **Service > Event Handling > Managing Events** Tab.

Enable Managing Events

| Configuration | |
|-------------------|---------------------------------|
| Item | Setting |
| ▶ Managing Events | <input type="checkbox"/> Enable |

| Configuration | | |
|------------------------|---------------------------------|---|
| Item | Value setting | Description |
| Managing Events | The box is unchecked by default | Check the Enable box to activate the Managing Events function. |

Create / Edit Managing Event Rules

Setup the Managing Event rules. It supports up to a maximum of 128 rules.

| Managing Event List | | | | | | Add | Delete |
|---------------------|-------|--------------|-------------|--------|---------|-----|--------|
| ID | Event | Trigger Type | Description | Enable | Actions | | |

When **Add** or **Edit** button is applied, the **Managing Event Configuration** screen will appear.

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| Managing Event Configuration | |
|-------------------------------------|---|
| Item | Setting |
| ▶ Event | None ▼ None ▼ None ▼ |
| ▶ Trigger Type | Period ▼ |
| ▶ Interval | 0 (0~86400 seconds) |
| ▶ Description | |
| ▶ Action | <input type="checkbox"/> Network Status <input type="checkbox"/> LAN&VLAN <input type="checkbox"/> WiFi <input type="checkbox"/> NAT <input type="checkbox"/> Firewall <input type="checkbox"/> VPN <input type="checkbox"/> System Manage <input type="checkbox"/> Administration <input type="checkbox"/> Digital Output <input type="checkbox"/> Modbus <input type="checkbox"/> Remote Host |
| ▶ Managing Event | <input checked="" type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| Managing Event Configuration | | |
|------------------------------|--------------------------------------|--|
| Item | Value setting | Description |
| Event | None by default | Specify the Event type (SNMP Trap , or Digital Input) and an event identifier / profile. Up to 3 event conditions can be specified for defining an event, and the event will be triggered when all the conditions hold simultaneously (AND relation). The supported Event types could be: SNMP: Select SNMP Trap and fill the message in the textbox to specify SNMP Trap condition; Digital Input: Select Digital Input and a DI profile you defined to specify a certain Digital Input condition; <i>Note: The available Event types could be different for the purchased product.</i> |
| Trigger Type | Period is selected by default | Specify the type of event trigger, either Period or Once . Period: Select Period and specify a time interval, the event will be repeatedly triggered on every time interval when the specified event condition holds. Once: Select Once and the event will be just triggered just one time when the specified event condition holds. |
| Interval | 0 is set by default | Specify the repeatedly event trigger time interval. Value Range: 0 ~86400 seconds. |
| Description | String format : any text. | Enter a brief description for the Managing Event. |
| Action | All box is unchecked by | Specify Network Status , or at least one rest action to take when the expected |

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default.

event is triggered.

Network Status: Select **Network Status** Checkbox to get the network status as the action for the event;

LAN&VLAN: Select **LAN&VLAN** Checkbox and the interested sub-items (Port link On/Off), the gateway will change the settings as the action for the event;

WiFi: Select **WiFi** Checkbox and the interested sub-items (WiFi radio On/Off), the gateway will change the settings as the action for the event;

NAT: Select **NAT** Checkbox and the interested sub-items (Virtual Server Rule On/Off, DMZ On/Off), the gateway will change the settings as the action for the event;

Firewall: Select **Firewall** Checkbox and the interested sub-items (Remote Administrator Host ID On/Off), the gateway will change the settings as the action for the event;

VPN: Select **VPN** Checkbox and the interested sub-items (IPSec Tunnel ON/Off, PPTP Client On/Off, L2TP Client On/Off, OpenVPN Client On/Off), the gateway will change the settings as the action for the event;

GRE: Select **GRE** Checkbox and the interested sub-items (GRE Tunnel On/Off), the gateway will change the settings as the action for the event;

System Manage: Select **System Manage** Checkbox and the interested sub-items (WAN SSH Service On/Off, TR-069 On/Off), the gateway will change the settings as the action for the event;

Administration: Select **Administration** Checkbox and the interested sub-items (Backup Config, Restore Config, Reboot, Save Current Setting as Default), the gateway will change the settings as the action for the event;

Digital Output: Select **Digital Output** checkbox and a DO profile you defined as the action for the event;

Modbus: Select **Modbus** checkbox and a Modbus Managing Event profile you defined as the action for the event;

Remote Host: Select **Remote Host** checkbox and a Remote Host profile you defined as the action for the event;

Note: The available Event Type could be different for the purchased product.

| | | |
|-----------------------|----------------------------------|--|
| Managing Event | The box is unchecked by default. | Click Enable box to activate this Managing Event setting. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

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7.2.3 Notifying Events

Go to **Service > Event Handling > Notifying Events** Tab.

Notifying Events Setting allows administrator to define the relationship (rule) between event trigger and handlers.

Enable Notifying Events

| Configuration | |
|--------------------|--|
| Item | Setting |
| ▶ Notifying Events | <input checked="" type="checkbox"/> Enable |

| Configuration | | |
|-------------------------|---------------------------------|--|
| Item | Value setting | Description |
| Notifying Events | The box is unchecked by default | Check the Enable box to activate the Notifying Events function. |

Create / Edit Notifying Event Rules

Setup your Notifying Event rules. It supports up to a maximum of 128 rules.

| Notifying Event List | | | | | | | |
|--|-------|--------------|-------------|--------|---------------|--------|---------|
| <input type="button" value="Add"/> <input type="button" value="Delete"/> | | | | | | | |
| ID | Event | Trigger Type | Description | Action | Time Schedule | Enable | Actions |

When **Add** or **Edit** button is applied, the **Notifying Event Configuration** screen will appear.

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| Notifying Event Configuration | |
|-------------------------------------|---|
| Item | Setting |
| ▶ Event | None ▼ None ▼ None ▼ |
| ▶ Trigger Type | Period ▼ |
| ▶ Interval | 0 (0~86400 seconds) |
| ▶ Description | |
| ▶ Action | <input type="checkbox"/> Digital Output <input type="checkbox"/> Syslog <input type="checkbox"/> SNMP Trap <input type="checkbox"/> Email Alert <input type="checkbox"/> Modbus <input type="checkbox"/> Remote Host |
| ▶ Time Schedule | (0) Always ▼ |
| ▶ Notifying Events | <input checked="" type="checkbox"/> Enable |
| <input type="button" value="Save"/> | |

| Notifying Event Configuration | | |
|-------------------------------|--------------------------------------|---|
| Item | Value setting | Description |
| Event | None by default | <p>Specify the Event type and an event identifier / profile. Up to 3 event conditions can be specified for defining an event, and the event will be triggered when all the conditions hold simultaneously (AND relation).</p> <p>The supported Event types could be:</p> <p>Digital Input: Select Digital Input and a DI profile you defined to specify a certain Digital Input Event;</p> <p>Power Change: Select Power Change and a trigger condition to specify the event on a certain power source.</p> <p>WAN: Select WAN and a trigger condition to specify a certain WAN Event;</p> <p>LAN&VLAN: Select LAN&VLAN and a trigger condition to specify a certain LAN&VLAN Event;</p> <p>WiFi: Select WiFi and a trigger condition to specify a certain WiFi Event;</p> <p>DDNS: Select DDNS and a trigger condition to specify a certain DDNS Event;</p> <p>Administration: Select Administration and a trigger condition to specify a certain Administration Event;</p> <p>Modbus: Select Modbus and a Modbus Notifying Event profile you defined to specify a certain Modbus Event;</p> <p><i>Note: The available Event types could be different for the purchased product.</i></p> |
| Trigger Type | Period is selected by default | <p>Specify the type of event trigger, either Period or Once.</p> <p>Period: Select Period and specify a time interval, the event will be repeatedly triggered on every time interval when the specified event condition holds.</p> <p>Once: Select Once and the event will be just triggered just one time when the specified event condition holds.</p> |

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| | | |
|-------------------------|--|--|
| Interval | 0 is set by default | Specify the repeatedly event trigger time interval. Value Range: 0 ~86400 seconds. |
| Description | String format : any text. | Enter a brief description for the Notifying Event. |
| Action | All box is unchecked by default. | Specify at least one action to take when the expected event is triggered. Digital Output: Select Digital Output checkbox and a DO profile you defined as the action for the event; Syslog: Select Syslog and select/unselect the Enable Checkbox to as the action for the event; SNMP Trap: Select SNMP Trap , and the gateway will send out SNMP Trap to the defined SNMP Event Receivers as the action for the event; Email Alert: Select Email Alert , and the gateway will send out an Email to the defined Email accounts as the action for the event; Modbus: Select Modbus and a Modbus Notifying Event profile you defined as the action for the event; Remote Host: Select Remote Host checkbox and a Remote Host profile you defined as the action for the event; <i>Note: The available Event Type could be different for the purchased product.</i> |
| Time Schedule | (0) Always is selected by default | Select a time scheduling rule for the Notifying Event. |
| Notifying Events | The box is unchecked by default. | Click Enable box to activate this Notifying Event setting. |
| Save | NA | Click the Save button to save the configuration |
| Undo | NA | Click the Undo button to restore what you just configured back to the previous setting. |

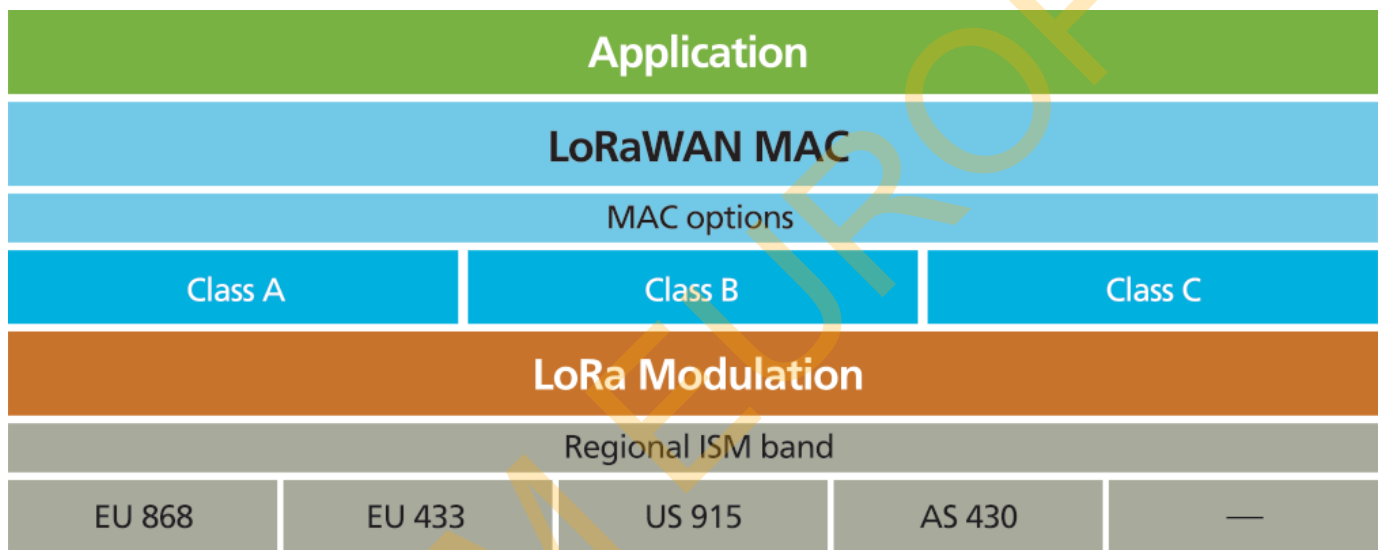
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7.3 LoRa

LoRa Technology

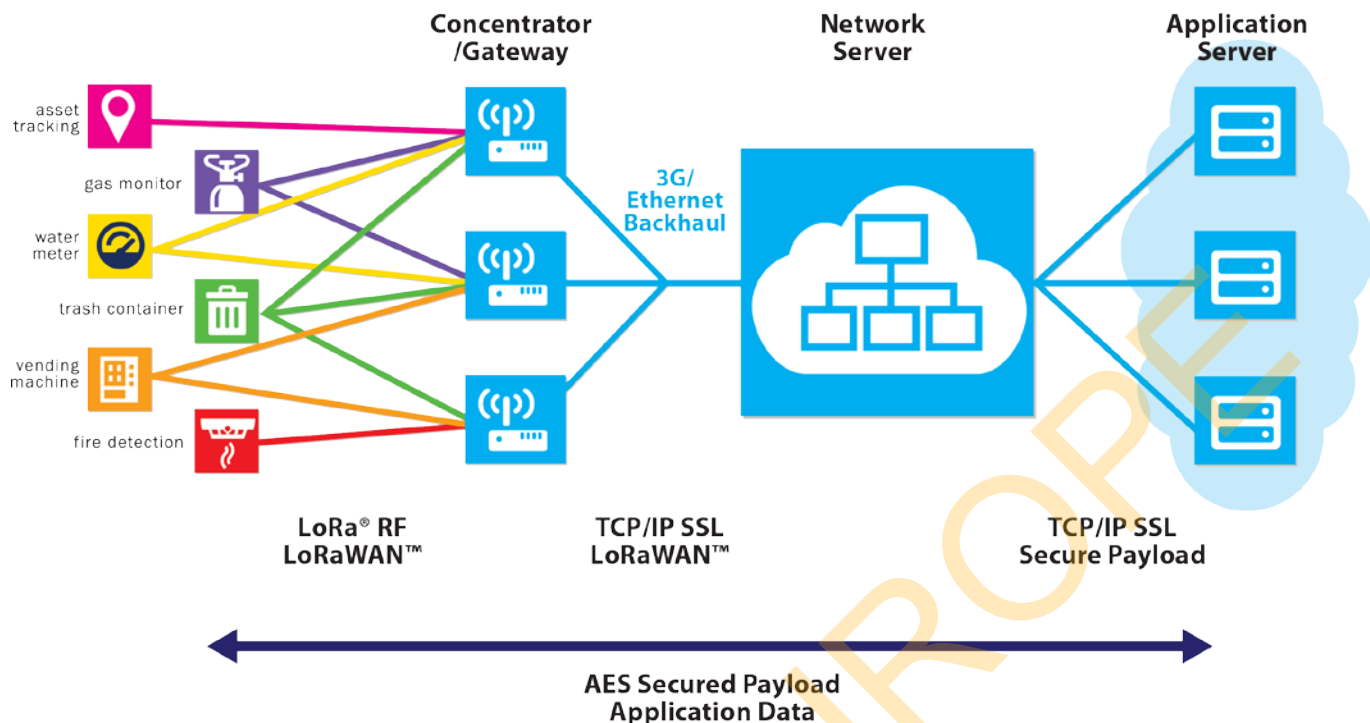
LoRa is a long range wireless data communication technology developed by Semtech. LoRa uses license-free sub-gigahertz radio frequency bands like 433 MHz, 868 MHz (Europe) and 915 MHz (North America). LoRa enables very-long-range transmissions (more than 10 km in rural areas) with low power consumption. The technology is presented in two parts — LoRa, the physical layer and LoRaWAN, the upper layers.⁵

Semtech builds LoRa Technology into its chipsets. These chipsets are then built into the commercial products, LoRa Gateway and LoRa Nodes, and integrated into LPWANs service by worldwide ISPs.



⁵ <https://www.semtech.com/technology/lora/what-is-lora>

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LoRaWAN Protocol

LoRaWAN is a protocol specification built on top of the LoRa technology developed by the LoRa Alliance. It uses unlicensed radio spectrum in the Industrial, Scientific and Medical (ISM) bands to enable low power, wide area communication between remote sensors and gateways connected to the network. This standard-based approach to building a LPWA network allows for quick set up of public or private IoT networks anywhere using hardware and software that is bi-directionally secure, interoperable and mobile, provides accurate localization, and works the way you expect.

LoRaWAN defines the communication protocol and system architecture for the network, while the LoRa physical layer enables the long-range communication link. LoRaWAN is also responsible managing the communication frequencies, data rate, and power for all devices. Devices in the network are asynchronous and transmit when they have data available to send. Data transmitted by an end-node device is received by multiple gateways, which forward the data packets to a centralized network server. The network server filters duplicate packets, performs security checks, and manages the network. Data is then forwarded to application servers.

As depicted in the LoRaWAN network diagram, all the application data between the end nodes and application server are AES-encrypted. The LoRa gateway and network server are merely responsible for data forwarding and security checks, they know nothing about the encrypted data transferred.

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7.3.1 LoRa Gateway

This product is integrated with an 8-channel LoRa Gateway module. With some basic configuration and specified an accompanied network server, the LoRa Gateway can connect with surrounding LoRa Nodes and forward the received data to Network Server for further processing.

LoRa Gateway Setting

Go to **Service > LoRa > LoRa Gateway** Tab.

The LoRa Gateway setting page enables user to configure the embedded LoRa gateway, and allow packet forwarding from LoRa nodes to Network Server, or from Network Server to LoRa Nodes.

LoRa Configuration

| LoRa Configuration | |
|--------------------|---|
| Item | Setting |
| ▶ LoRa Gateway | <input type="checkbox"/> Enable |
| ▶ MultiSF Channel | Radio0: 868.1 / 868.3 / 868.5 / 868.7 MHz <input type="button" value="Edit"/> |
| | Radio1: 867.3 / 867.5 / 867.7 / 867.9 MHz <input type="button" value="Edit"/> |
| ▶ LoRa BW | 250kHz ▾ |

| LoRa Configuration | | |
|------------------------|---------------------------------------|--|
| Item | Value setting | Description |
| LoRa Gateway | The box is unchecked by default | Check Enable box to activate the LoRa Gateway function. |
| MultiSF Channel | Some channels are selectec by default | Select the RF channels to be activated. The LoRa gateway supports up to 8 LoRa channels, defined in Radio0 and Radio1 , for connecting with LoRa Nodes. For rach Radio, you can select up to four channels to operate. Note: The supportedoperation band list is hardware dependent. It depends on the hardware version and regional regulation. EU868 Frequency Plan: 868.100/868.300/868.500/867.100/867.300/867.500/867.700/867.900 MHz US915 Frequency Plan: 902.300/902.500/902.700/902.900/903.100/903.300/903.500/903.700 MHz |
| LoRa BW | 250kHz is selected by default | Select theLoRa BW (bandwidth) for the RF channel allocation. The default setting is 250kHz for EU band, 500kHz for US band. |

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| | | |
|-------------|----|--|
| | | Value Range: 125kHz, 250kHz, or 500kHz. |
| Save | NA | Click the Save button to save the configuration |

Network Server Configuration

| Network Server | |
|-----------------------|--|
| Item | Setting |
| ▶ Gateway ID | <input type="text"/> |
| ▶ Server IP Address | <input type="text"/> |
| ▶ Port | <input type="text" value="1700"/> |
| ▶ Keep Alive Interval | <input type="text" value="5"/> (seconds) |

| Network Server Configuration | | |
|------------------------------|---|--|
| Item | Value setting | Description |
| Gateway ID | String format: MAC-like string, with eight 2-digit hex. numbers | Enter an unique ID for the LoRa Gateway. It will be used for communicating with Network Server. Please enter the WAN MAC for the device, and followed with two extra numbers. For example, WAN MAC is 00:50:18:00:08:FE, then input "00:50:18:00:08:FE:11:22" as the Gateway ID. |
| Server IP Address | A Must filled setting | Specify the IP Address or FQDN of external LoRa network server to connect. It will be use as destination IP for sending the received packets from LoRa nodes. If you enabled the internal LoRa Network Server function, introduced in Section 7.3.2 LoRa Network Server , this setting will be grayed out and ignored, no need to specify an IP address of the network server. |
| Port | A Must filled setting Port 1700 set by default | Specify a Port Number as destination port for sending packets. If you enabled the internal LoRa Network Server function, this setting will be grayed out and ignored, no need to specify an port number of the network server. Value Range: 1 ~ 65535. |
| Keep Alive Interval | A Must filled setting 5 seconds set by default | Specify the time interval (seconds) to keep the connection alive between network server and LoRa gateway even there is no LoRa traffic. Value Range: 5 ~ 999 seconds. |
| Save | NA | Click the Save button to save the configuration |

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7.3.2 LoRa Network Server

For the small scale or private applications, you don't want to use third party's public LoRaWAN network service (bind to a certain LoRa Network Server, Application Server) that is provided by local Telco or ISP. In such case, you will need a private network server for collecting all the data from your deployed LoRa nodes.

If external LoRa Network Server is to be used in your application, you can skip this section, and specify the external Network Server setting in **Section 7.3.1**.

This product is integrated with a private LoRa Network Server, and also a simplified Application Server. It supports up to 300 LoRa Nodes. If you intend to use the embedded network server for your private application, you have to proceed with following LoRa Network Server settings.

After that, the collected data from your LoRa nodes is collected and stored in an embedded SQL database. You can access to it with the LAN IP and port 9999.

Note: To customize your application with the product for two-way communication with the Class C LoRa nodes, you may need to get further SDK from the gateway vendor to link with your own application or managing platform.

LoRa Network Server

Go to **Service > LoRa > LoRa Network Server** Tab.

The LoRa Network Server setting page enables user to configure the embedded LoRa network server, and register the LoRa nodes to the embedded Network Server to get permissible access.

LoRa Network Server Configuration

| LoRa Configuration | |
|-----------------------|-----------------------------------|
| Item | Setting |
| ▶ LoRa Network Server | <input type="checkbox"/> Enable |
| ▶ Server Port | <input type="text" value="1700"/> |

| LoRa Configuration | | |
|----------------------------|--|---|
| Item | Value setting | Description |
| LoRa Network Server | The box is unchecked by default | Check Enable box to activate the embedded LoRa Network Server. |
| Server Port | A Must filled setting Port 1700 set by default | Specify a Port Number as destination port for sending packets. Value Range: 1 ~ 65535. |

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Register LoRa Nodes

If you enabled the embedded LoRa Network Server, you have to further register all the LoRa Nodes that you are going to deploy in you application sites. It supports up to 300 LoRa Nodes. For the data packets coming from un-registered LoRa nodes, it will be ignored accordingly.

If you are not familiar with the following terms or items required for registering your LoRa node, you can refer to a good article that can be foud in a Blog in NEWIE VENTURES web page⁶.

You can maintain and see all the registered LoRa nodes in the LoRa Node list.

| LoRa Node List | | | | | | |
|----------------|-------------|--------------|--------------------|-------------------|--------|---------|
| ID | Device Name | Device Class | Device Description | Activation method | Enable | Actions |
| | | | | | | |

When **Add** or **Edit** button is applied, the **LoRa Node Configuration** screen will appear.

| LoRa Node Configuration | |
|-------------------------|--------------------------|
| Item | Setting |
| ▶ Device Name | <input type="text"/> |
| ▶ Device Class | A ▼ |
| ▶ Device Description | <input type="text"/> |
| ▶ Activation method | OTAA ▼ |
| ▶ Device EUI | <input type="text"/> |
| ▶ Application EUI | <input type="text"/> |
| ▶ App Key | <input type="text"/> |
| ▶ Device Address | <input type="text"/> |
| ▶ Network Session Key | <input type="text"/> |
| ▶ APP Session Key | <input type="text"/> |
| ▶ Enable | <input type="checkbox"/> |

⁶ <https://www.newieventures.com.au/blogtext/2018/2/26/lorawan-otaa-or-abp>

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| | |
|-----------------------|--------------------------|
| ▶ Activation method | ABP ▼ |
| ▶ Device EUI | <input type="text"/> |
| ▶ Application EUI | <input type="text"/> |
| ▶ App Key | <input type="text"/> |
| ▶ Device Address | <input type="text"/> |
| ▶ Network Session Key | <input type="text"/> |
| ▶ APP Session Key | <input type="text"/> |
| ▶ Enable | <input type="checkbox"/> |

LoRa Node Configuration

| Item | Value setting | Description |
|---------------------------|---|--|
| Device Name | A Must filled setting Blanked by default | Enter an unique name / identifier of the LoRa node being registered. Please enter the WAN MAC for the device, and followed with two extra numbers. Value Range: 1~16 alphanumeric characters; '-' and '_' are valid characters. |
| Device Class | A Must filled setting Class A is selected by default | Specify the device type of the LoRa node being registered. Currently, Class A and Class C devices are supported. |
| Device Description | An Optional filled setting Blanked by default | Enter a brief description for the LoRa node be registered. |
| Activation Method | A Must filled setting OTAA is selected by default | Specify the activation method of the LoRa node being registered. OTAA (Over-the-Air Activation) and ABP (Activation by Personalization) are supported. OTAA: OTAA is the preferred and most secure way to connect with network server. Devices perform a join-procedure with the network server, during which a dynamic Device Address is assigned and security keys (Network Session Key, APP Session Key) are negotiated with the device. ABP: ABP is a simpler activation method with fixed device address and security keys. For some device, it is manufactured with a hardcode Device Address as well as the security keys in the device. This means it can't worked with OTAA method. This strategy might seem simpler, because you skip the join procedure. |
| Device EUI | A Must filled setting Blanked by default | Enter a unique Device EUI for the LoRa node being registered. The EUI is provided by the device manufacture. Value Range: 16 hexadecimal characters (0~9, A~F) |
| Application EUI | A Must filled setting Blanked by default | Enter an identifier as the Application EUI for the application you are deploying with the LoRa nodes. For using the private LoRa Network Server, you can define your own Application EUI. Value Range: 16 hexadecimal characters (0~9, A~F) |
| App Key | A Must filled setting for OTAA scheme | Enter an Application Key, if OTAA activation is selected, to generate required session keys while the LoRa node joins or re-joins to the network. For using the private LoRa Network Server, you can define your own |

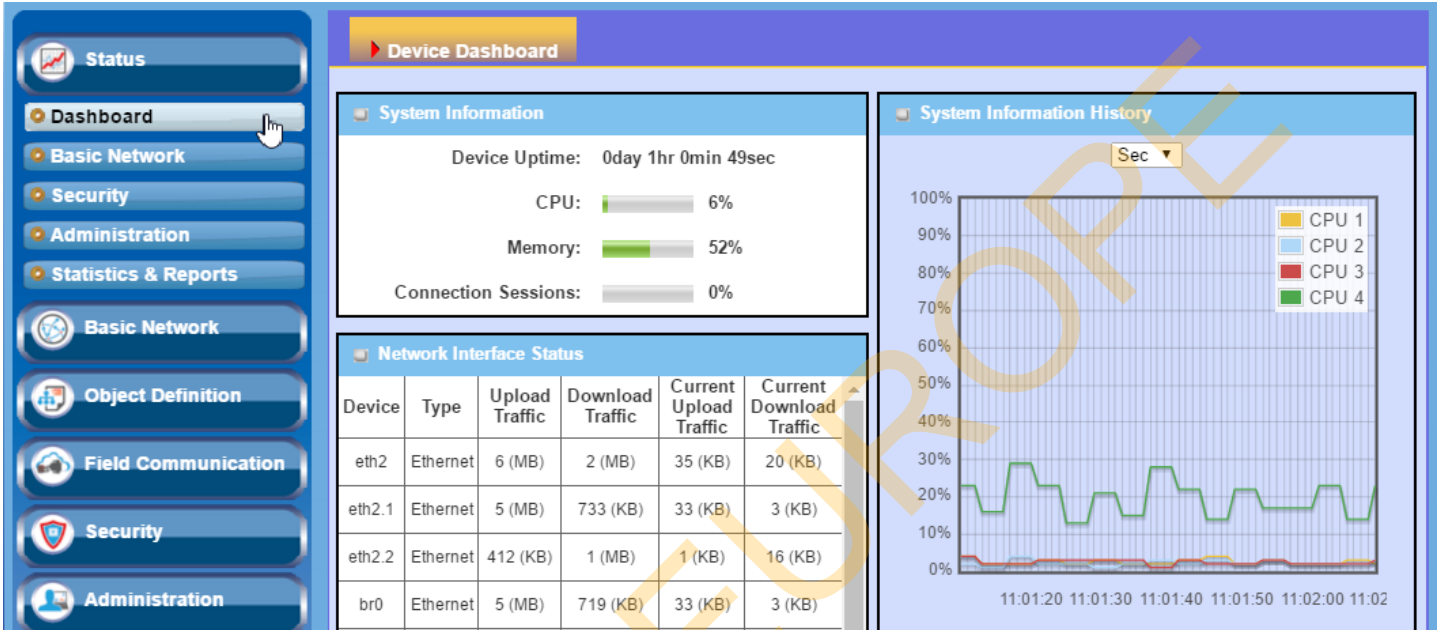
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| | | |
|----------------------------|--------------------------------------|--|
| | | Application Key. <u>Value Range:</u> 32 hexadecimal characters (0~9, A~F) |
| Device Address | A Must filled setting for ABP scheme | Enter a unique device address for the LoRa node being retered. It is required for ABP activation scheme. <u>Value Range:</u> 8 hexadecimal characters (0~9, A~F) |
| Network Session Key | A Must filled setting for ABP scheme | Enter a network session key for the LoRa node being registered. The Network Server will use this key to decrypt the meta data that is transmitted from the registered LoRa nodes. It is required for ABP activation scheme. <u>Value Range:</u> 32 hexadecimal characters (0~9, A~F) |
| APP Session Key | A Must filled setting for ABP scheme | Enter an application session key for the LoRa node being registered. The Application Server will use this key to decrypt the packet payload that is transmitted from the registered LoRa nodes. It is required for ABP activation scheme. <u>Value Range:</u> 32 hexadecimal characters (0~9, A~F) |
| Enable | Unchecked by default | Check the Enable box to activate the parameters of the LoRa node being registered. |
| Save | NA | Click the Save button to save the configuration |

TEXIM EUROPE

Chapter 8 Status

8.1 Dashboard



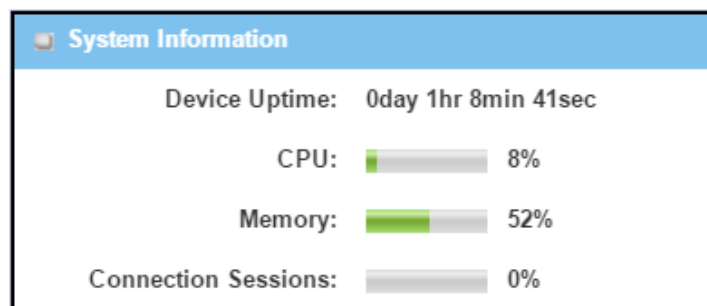
8.1.1 Device Dashboard

The **Device Dashboard** window shows the current status in graph or tables for quickly understanding the operation status for the gateway. They are the System Information, System Information History, and Network Interface Status. The display will be refreshed once per second.

From the menu on the left, select **Status > Dashboard > Device Dashboard** tab.

System Information Status

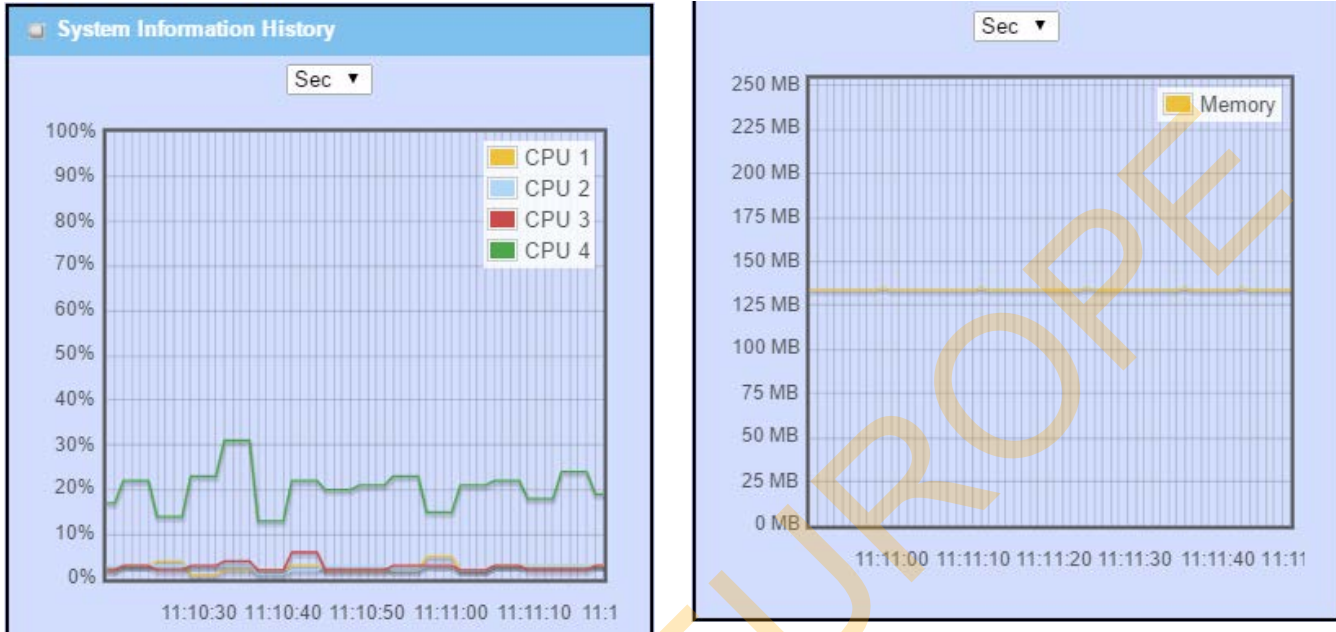
The **System Information** screen shows the device Up-time and the resource utilization for the CPU, Memory, and Connection Sessions.



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System Information History

The **System Information History** screen shows the statistic graphs for the CPU and memory.



Network Interface Status

The **Network Interface Status** screen shows the statistic information for each network interface of the gateway. The statistic information includes the Interface Type, Upload Traffic, Download Traffic, and Current Upload / Download Traffic.

| Device | Type | Upload Traffic | Download Traffic | Current Upload Traffic | Current Download Traffic |
|--------|--------------|----------------|------------------|------------------------|--------------------------|
| eth2 | Ethernet | 27 (MB) | 15 (MB) | 35 (KB) | 19 (KB) |
| eth2.1 | Ethernet | 26 (MB) | 2 (MB) | 34 (KB) | 3 (KB) |
| eth2.2 | Ethernet | 1 (MB) | 12 (MB) | 1 (KB) | 15 (KB) |
| br0 | Ethernet | 26 (MB) | 2 (MB) | 33 (KB) | 3 (KB) |
| ra0 | Wireless LAN | 0 (Bytes) | 0 (Bytes) | 0 (Bytes) | 0 (Bytes) |
| rai0 | Wireless LAN | 0 (Bytes) | 0 (Bytes) | 0 (Bytes) | 0 (Bytes) |
| ra7 | Wireless LAN | 0 (Bytes) | 0 (Bytes) | 0 (Bytes) | 0 (Bytes) |
| | Wireless | | | | |

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8.2 Basic Network

8.2.1 WAN & Uplink Status

Go to **Status > Basic Network > WAN & Uplink** tab.

The **WAN & Uplink Status** window shows the current status for different network type, including network configuration, connecting information, modem status and traffic statistics. The display will be refreshed on every five seconds.

WAN interface IPv4 Network Status

WAN interface IPv4 Network Status screen shows status information for IPv4 network.

| WAN Interface IPv4 Network Status | | | | | | | | | |
|-----------------------------------|---------------|----------|----------|-------------|---------|---------------------|-------------|---------------|--------|
| ID | Interface | WAN Type | IP Addr. | Subnet Mask | Gateway | DNS | MAC Address | Conn. Status | Action |
| WAN-1 | WiFi Module 1 | Uplink | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0, 0.0.0.0 | N/A | Connecting... | Edit |
| WAN-2 | | Disable | | | | | | | Edit |
| WAN-3 | | Disable | | | | | | | Edit |

| WAN interface IPv4 Network Status | | |
|-----------------------------------|---------------|---|
| Item | Value setting | Description |
| ID | N/A | It displays corresponding WAN interface WAN IDs. |
| Interface | N/A | It displays the type of WAN physical interface. Depending on the model purchased, it can be WiFi Module or Ethernet. |
| WAN Type | N/A | It displays the method which public IP address is obtained from your ISP. Depending on the model purchased, it can be Uplink, Static IP, Dynamic IP, PPPoE, PPTP, or L2TP. |
| Network Type | N/A | It displays the network type for the WAN interface(s). Depending on the model purchased, it can be NAT, Routing, Bridge, or IP Pass-through. |
| IP Addr. | N/A | It displays the public IP address obtained from your ISP for Internet connection. Default value is 0.0.0.0 if left unconfigured. |
| Subnet Mask | N/A | It displays the Subnet Mask for public IP address obtained from your ISP for Internet connection. Default value is 0.0.0.0 if left unconfigured. |
| Gateway | N/A | It displays the Gateway IP address obtained from your ISP for Internet connection. Default value is 0.0.0.0 if left unconfigured. |
| DNS | N/A | It displays the IP address of DNS server obtained from your ISP for Internet |

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| | | |
|---------------------|-----|---|
| | | connection. Default value is 0.0.0.0 if left unconfigured. |
| MAC Address | N/A | It displays the MAC Address for your ISP to allow you for Internet access. Note: Not all ISP may require this field. |
| Conn. Status | N/A | It displays the connection status of the device to your ISP. Status are Connected or disconnected. |
| Action | N/A | <p>This area provides functional buttons.</p> <p>Renew button allows user to force the device to request an IP address from the DHCP server. Note: Renew button is available when DHCP WAN Type is used and WAN connection is disconnected.</p> <p>Release button allows user to force the device to clear its IP address setting to disconnect from DHCP server. Note: Release button is available when DHCP WAN Type is used and WAN connection is connected.</p> <p>Connect button allows user to manually connect the device to the Internet. Note: Connect button is available when Connection Control in WAN Type setting is set to Connect Manually (Refer to Edit button in Basic Network > WAN & Uplink > Internet Setup) and WAN connection status is disconnected.</p> <p>Disconnect button allows user to manually disconnect the device from the Internet. Note: Connect button is available when Connection Control in WAN Type setting is set to Connect Manually (Refer to Edit button in Basic Network > WAN & Uplink > Internet Setup) and WAN connection status is connected.</p> |

WAN interface IPv6 Network Status

WAN interface IPv6 Network Status screen shows status information for IPv6 network.

| WAN Interface IPv6 Network Status | | | | | | |
|-----------------------------------|-----------|----------|-----------------------|-------------------|--------------|-------------------------------------|
| ID | Interface | WAN Type | Link-local IP Address | Global IP Address | Conn. Status | Action |
| WAN-1 | | Disable | | | | <input type="button" value="Edit"/> |

| WAN interface IPv6 Network Status | | |
|-----------------------------------|---------------|--|
| Item | Value setting | Description |
| ID | N/A | It displays corresponding WAN interface WAN IDs. |
| Interface | N/A | It displays the type of WAN physical interface. Depending on the model purchased, it can be WiFi Module or Ethernet. |
| WAN Type | N/A | It displays the method which public IP address is obtained from your ISP. WAN type setting can be changed from Basic Network > IPv6 > Configuration . |
| Link-local IP Address | N/A | It displays the LAN IPv6 Link-Local address. |
| Global IP Address | N/A | It displays the IPv6 global IP address assigned by your ISP for your Internet |

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| | | |
|---------------------|-----|---|
| | | connection. |
| Conn. Status | N/A | It displays the connection status. The status can be connected, disconnected and connecting. |
| Action | N/A | This area provides functional buttons. Edit Button when pressed, web-based utility will take you to the IPv6 configuration page. (Basic Network > IPv6 > Configuration.) |

LAN Interface Network Status

LAN Interface Network Status screen shows IPv4 and IPv6 information of LAN network.

| LAN Interface Network Status | | | | | |
|------------------------------|------------------|-------------------------|---------------------|-------------------|---|
| IPv4 Address | IPv4 Subnet Mask | IPv6 Link-local Address | IPv6 Global Address | MAC Address | Action |
| 192.168.123.254 | 255.255.255.0 | fe80::250:18ff:fe00:ffe | /64 | 00:50:18:00:0F:FE | <input type="button" value="Edit IPv4"/> <input type="button" value="Edit IPv6"/> |

| LAN Interface Network Status | | |
|--------------------------------|---------------|---|
| Item | Value setting | Description |
| IPv4 Address | N/A | It displays the current IPv4 IP Address of the gateway This is also the IP Address user use to access Router's Web-based Utility. |
| IPv4 Subnet Mask | N/A | It displays the current mask of the subnet. |
| IPv6 Link-local Address | N/A | It displays the current LAN IPv6 Link-Local address. This is also the IPv6 IP Address user use to access Router's Web-based Utility. |
| IPv6 Global Address | N/A | It displays the current IPv6 global IP address assigned by your ISP for your Internet connection. |
| MAC Address | N/A | It displays the LAN MAC Address of the gateway |
| Action | N/A | This area provides functional buttons. Edit IPv4 Button when press, web-based utility will take you to the Ethernet LAN configuration page. (Basic Network > LAN & VLAN > Ethernet LAN tab.) Edit IPv6 Button when press, web-based utility will take you to the IPv6 configuration page. (Basic Network > IPv6 > Configuration.) |

Interface Traffic Statistics

Interface Traffic Statistics screen displays the Interface's total transmitted packets.

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| Interface Traffic Statistics | | | |
|------------------------------|---------------|----------------------|-------------------------|
| ID | Interface | Received Packets(Mb) | Transmitted Packets(Mb) |
| WAN-1 | WIFI Module 1 | 0 | 0 |
| WAN-2 | | - | - |
| WAN-3 | | - | - |

| Interface Traffic Statistics | | |
|---------------------------------|---------------|---|
| Item | Value setting | Description |
| ID | N/A | It displays corresponding WAN interface WAN IDs. |
| Interface | N/A | It displays the type of WAN physical interface. Depending on the model purchased, it can be Ethernet, 3G/4G, etc... |
| Received Packets (Mb) | N/A | It displays the statistics of downstream packets (Mb). It is reset when the device is rebooted. |
| Transmitted Packets (Mb) | N/A | It displays the statistics of upstream packets (Mb). It is reset when the device is rebooted. |

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8.2.2 LAN & VLAN Status

Go to **Status > Basic Network > LAN & VLAN** tab.

Client List

The **Client List** shows you the LAN Interface, IP address, Host Name, MAC Address, and Remaining Lease Time of each device that is connected to this gateway.

| LAN Client List | | | | |
|-----------------|-------------------------|-----------------|-------------------|----------------------|
| LAN Interface | IP Address | Host Name | MAC Address | Remaining Lease Time |
| Ethernet | Dynamic / 192.168.1.100 | amit-25611230-1 | 00-01-0A-10-0F-17 | 23:59:51 |

| LAN Client List | | |
|----------------------|---------------|---|
| Item | Value setting | Description |
| LAN Interface | N/A | Client record of LAN Interface. String Format. |
| IP Address | N/A | Client record of IP Address Type and the IP Address. Type is String Format and the IP Address is IPv4 Format. |
| Host Name | N/A | Client record of Host Name. String Format. |
| MAC Address | N/A | Client record of MAC Address. MAC Address Format. |
| Remaining Lease Time | N/A | Client record of Remaining Lease Time. Time Format. |

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8.2.3 WiFi Status

Go to **Status > Basic Network > WiFi** tab.

The **WiFi Status** window shows the overall statistics of WiFi VAP entries.

WiFi Virtual AP List

The WiFi Virtual AP List shows all of the virtual AP information. The **Edit** button allows for quick configuration changes.

| WiFi Module One Virtual AP List | | | | | | | | | |
|---------------------------------|-------|-------------------------------------|-------------|----------|---------|--------------|-----------------|-------------------|--|
| Op. Band | ID | WiFi Enable | Op. Mode | SSID | Channel | WiFi System | Auth.& Security | MAC Address | Action |
| 5G | VAP-1 | <input checked="" type="checkbox"/> | WiFi Uplink | Staff_5G | 48 | a/n/ac Mixed | Auto(None) | 00:50:18:13:21:43 | Edit QR Code |
| 5G | VAP-2 | <input type="checkbox"/> | WiFi Uplink | default | 48 | a/n/ac Mixed | Open(None) | 02:50:18:10:21:43 | Edit QR Code |
| 5G | VAP-3 | <input type="checkbox"/> | WiFi Uplink | default | 48 | a/n/ac Mixed | Open(None) | 02:50:18:11:21:43 | Edit QR Code |
| 5G | VAP-4 | <input type="checkbox"/> | WiFi Uplink | default | 48 | a/n/ac Mixed | Open(None) | 02:50:18:12:21:43 | Edit QR Code |
| 5G | VAP-5 | <input type="checkbox"/> | WiFi Uplink | default | 48 | a/n/ac Mixed | Open(None) | 02:50:18:13:21:43 | Edit QR Code |
| 5G | VAP-6 | <input type="checkbox"/> | WiFi Uplink | default | 48 | a/n/ac Mixed | Open(None) | 02:50:18:14:21:43 | Edit QR Code |
| 5G | VAP-7 | <input type="checkbox"/> | WiFi Uplink | default | 48 | a/n/ac Mixed | Open(None) | 02:50:18:15:21:43 | Edit QR Code |

| WiFi Virtual AP List | | |
|-----------------------------|---------------|---|
| Item | Value setting | Description |
| Op. Band | N/A | It displays the Wi-Fi Operation Band (2.4G or 5G) of VAP. |
| ID | N/A | It displays the ID of VAP. |
| WiFi Enable | N/A | It displays whether the VAP wireless signal is enabled or disabled. |
| Op. Mode | N/A | The Wi-Fi Operation Mode of VAP. Depends of device model, modes are AP Router, WDS Only and WDS Hybrid, Universal Repeater and Client. |
| SSID | N/A | It displays the network ID of VAP. |
| Channel | N/A | It displays the wireless channel used. |
| WiFi System | N/A | The WiFi System of VAP. |
| Auth. & Security | N/A | It displays the authentication and encryption type used. |
| MAC Address | N/A | It displays MAC Address of VAP. |
| Action | N/A | Click the Edit button to make a quick access to the WiFi configuration page. (Basic Network > WiFi > Configuration tab) The QR Code button allow you to generate QR code for quick connect to the VAP by scanning the QR code. |

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WiFi Uplink Status

The WiFi Uplink Status shows all information of connected WiFi uplink network.

| WiFi Module One Uplink Status | | | | | | | |
|-------------------------------|-------------------|---------|---------------|-------|-------|------|----------------------|
| SSID | BSSID | Channel | Security | RSSI0 | RSSI1 | Rate | Action |
| amit03_5G | 28:6C:07:5F:1A:F1 | 149 | WPA2-PSK(AES) | -77 | -77 | 130 | Edit |

| WiFi IDS Status | | |
|-----------------|---------------|--|
| Item | Value setting | Description |
| SSID | N/A | It displays the network ID of VAP. |
| BSSID | N/A | It displays the theBSSID for the connected wireless network. |
| Channel | N/A | It displays the wireless channel used. |
| Security | N/A | It displays the authentication and encryption setting for the WiFi uplink connection. |
| RSSI0, RSSI1 | N/A | It displays the Rx sensitivity on each radio path.. |
| Rate | N/A | It displays the link rate for the WiFi uplink connection. |
| Action | N/A | Click the Edit button to make a quick access to the WiFi uplink configuration page. (Basic Network > WAN & Uplink > Internet Setup tab) |

WiFi IDS Status

The WiFi Traffic Statistic shows all the received and transmitted packets on WiFi network.

| WiFi Module One IDS Status | | | | | | | | |
|----------------------------|---------------------------|------------------------------|---------------------|----------------------|------------------------|-------------------|----------------------|-----------------------|
| Authentication Frame | Association Request Frame | Re-association Request Frame | Probe Request Frame | Disassociation Frame | Deauthentication Frame | EAP Request Frame | Malicious Data Frame | Action |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Reset |

| WiFi IDS Status | | |
|------------------------------|---------------|---|
| Item | Value setting | Description |
| Authentication Frame | N/A | It displays the receiving Authentication Frame count. |
| Association Request Frame | N/A | It displays the receiving Association Request Frame count. |
| Re-association Request Frame | N/A | It displays the receiving Re-association Request Frame count. |
| Probe Request Frame | N/A | It displays the receiving Probe Request Frame count. |
| Disassociation Frame | N/A | It displays the receiving Disassociation Frame count. |
| Deauthentication Frame | N/A | It displays the receiving Deauthentication Frame count. |
| EAP Request Frame | N/A | It displays the receiving EAP Request Frame count. |
| Malicious Data Frame | N/A | It displays the number of receiving unauthorized wireless packets. |
| Action | N/A | Click the Reset button to clear the entire statistic and reset counter to 0. |

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Ensure WIDS function is enabled

Go to **Basic Network > WiFi > Advanced Configuration tab**

Note that the WIDS of **2.4G** or **5G** should be configured **separately**.

WiFi Traffic Statistic

The WiFi Traffic Statistic shows all the received and transmitted packets on WiFi network.

| WiFi Module One Traffic Statistics <input type="button" value="Refresh"/> | | | | |
|---|-------|------------------|---------------------|--------------------------------------|
| Op. Band | ID | Received Packets | Transmitted Packets | Action |
| 5G | VAP-1 | 0 | 0 | <input type="button" value="Reset"/> |
| 5G | VAP-2 | 0 | 0 | <input type="button" value="Reset"/> |
| 5G | VAP-3 | 0 | 0 | <input type="button" value="Reset"/> |
| 5G | VAP-4 | 0 | 0 | <input type="button" value="Reset"/> |
| 5G | VAP-5 | 0 | 0 | <input type="button" value="Reset"/> |
| 5G | VAP-6 | 0 | 0 | <input type="button" value="Reset"/> |
| 5G | VAP-7 | 0 | 0 | <input type="button" value="Reset"/> |

| WiFi Traffic Statistic | | |
|---------------------------|---------------|---|
| Item | Value setting | Description |
| Op. Band | N/A | It displays the Wi-Fi Operation Band (2.4G or 5G) of VAP. |
| ID | N/A | It displays the VAP ID. |
| Received Packets | N/A | It displays the number of received packets. |
| Transmitted Packet | N/A | It displays the number of transmitted packets. |
| Action | N/A | Click the Reset button to clear individual VAP statistics. |
| Refresh Button | N/A | Click the Refresh button to update the entire VAP Traffic Statistic instantly. |

8.3 Security

8.3.1 VPN Status

Go to **Status > Security > VPN** tab.

The **VPN Status** window shows the overall VPN tunnel status. The display will be refreshed on every five seconds.

IPSec Tunnel Status

IPSec Tunnel Status windows show the configuration for establishing IPSec VPN connection and current connection status.

| IPSec Tunnel Status Edit | | | | | | |
|---------------------------------------|-----------------|---------------|----------------|----------------|------------|--------|
| Tunnel Name | Tunnel Scenario | Local Subnets | Remote IP/FQDN | Remote Subnets | Conn. Time | Status |

| Item | Value setting | Description |
|------------------------|---------------|--|
| Tunnel Name | N/A | It displays the tunnel name you have entered to identify. |
| Tunnel Scenario | N/A | It displays the Tunnel Scenario specified. |
| Local Subnets | N/A | It displays the Local Subnets specified. |
| Remote IP/FQDN | N/A | It displays the Remote IP/FQDN specified. |
| Remote Subnets | N/A | It displays the Remote Subnets specified. |
| Conn. Time | N/A | It displays the connection time for the IPSec tunnel. |
| Status | N/A | It displays the Status of the VPN connection. The status displays are Connected, Disconnected, Wait for traffic, and Connecting. |

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| | | |
|--------------------|-----|---|
| Edit Button | N/A | Click on Edit Button to change IPSec setting, web-based utility will take you to the IPSec configuration page. (Security > VPN > IPSec tab) |
|--------------------|-----|---|

OpenVPN Server Status

According to OpenVPN configuration, the **OpenVPN Server/Client Status** shows the status and statistics for the OpenVPN connection from the server side or client side.

| OpenVPN Server Status | | Edit | | |
|------------------------------|----------------|--|------------|--------|
| User Name | Remote IP/FQDN | Virtual IP/Mac | Conn. Time | Status |
| OpenVPN Server Status | | | | |
| Item | Value setting | Description | | |
| User Name | N/A | It displays the Client name you have entered for identification. | | |
| Remote IP/FQDN | N/A | It displays the public IP address (the WAN IP address) of the connected OpenVPN Client | | |
| Virtual IP/MAC | N/A | It displays the virtual IP/MAC address assigned to the connected OpenVPN client. | | |
| Conn. Time | N/A | It displays the connection time for the corresponding OpenVPN tunnel. | | |
| Status | N/A | It displays the connection status of the corresponding OpenVPN tunnel. The status can be Connected, or Disconnected. | | |

OpenVPN Client Status

| OpenVPN Client Status | | | | | | | | | | Edit |
|------------------------------|---------------|--|---------------|---------------------|----------------------|---------------------|----------------------|------------|--------------|------|
| OpenVPN Client Name | Interface | Remote IP/FQDN | Remote Subnet | TUN/TAP Read(bytes) | TUN/TAP Write(bytes) | TCP/UDP Read(bytes) | TCP/UDP Write(bytes) | Conn. Time | Conn. Status | |
| OpenVPN Client Status | | | | | | | | | | |
| Item | Value setting | Description | | | | | | | | |
| OpenVPN Client Name | N/A | It displays the Client name you have entered for identification. | | | | | | | | |
| Interface | N/A | It displays the WAN interface specified for the OpenVPN client connection. | | | | | | | | |
| Remote IP/FQDN | N/A | It displays the peer OpenVPN Server's Public IP address (the WAN IP address) or FQDN. | | | | | | | | |
| Remote Subnet | N/A | It displays the Remote Subnet specified. | | | | | | | | |
| TUN/TAP Read(bytes) | N/A | It displays the TUN/TAP Read Bytes of OpenVPN Client. | | | | | | | | |
| TUN/TAP Write(bytes) | N/A | It displays the TUN/TAP Write Bytes of OpenVPN Client. | | | | | | | | |
| TCP/UDP Read(bytes) | N/A | It displays the TCP/UDP Read Bytes of OpenVPN Client. | | | | | | | | |
| TCP/UDP Write(bytes) | N/A | It displays the TCP/UDP Write Bytes of OpenVPN Client. Connection | | | | | | | | |
| Conn. Time | N/A | It displays the connection time for the corresponding OpenVPN tunnel. | | | | | | | | |
| Conn. Status | N/A | It displays the connection status of the corresponding OpenVPN tunnel. The status can be Connected, or Disconnected. | | | | | | | | |

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8.3.2 Firewall Status

Go to **Status > Security > Firewall Status** Tab.

The **Firewall Status** provides user a quick view of the firewall status and current firewall settings. It also keeps the log history of the dropped packets by the firewall rule policies, and includes the administrator remote login settings specified in the Firewall Options. The display will be refreshed on every five seconds.

By clicking the icon [+], the status table will be expanded to display log history. Clicking the **Edit** button the screen will be switched to the configuration page.

Packet Filter Status

| Packet Filters Edit [+] | | | |
|---|-------------------|----|------|
| Activated Filter Rule | Detected Contents | IP | Time |

| Packet Filter Status | | |
|-----------------------|---------------|--|
| Item | Value setting | Description |
| Activated Filter Rule | N/A | This is the Packet Filter Rule name. |
| Detected Contents | N/A | This is the logged packet information, including the source IP, destination IP, protocol, and destination port –the TCP or UDP. String format: Source IP to Destination IP : Destination Protocol (TCP or UDP) |
| IP | N/A | The Source IP (IPv4) of the logged packet. |
| Time | N/A | The Date and Time stamp of the logged packet. Date & time format. ("Month" "Day" "Hours":"Minutes":"Seconds") |

Note: Ensure Packet Filter Log Alert is enabled.

*Refer to **Security > Firewall > Packet Filter** tab. Check Log Alert and save the setting.*

MAC Control Status

| MAC Control Edit [+] | | | |
|--|-----------------------|----|------|
| Activated Control Rule | Blocked MAC Addresses | IP | Time |

| MAC Control Status | | |
|------------------------|---------------|------------------------------------|
| Item | Value setting | Description |
| Activated Control Rule | N/A | This is the MAC Control Rule name. |

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| | | |
|------------------------------|-----|---|
| Blocked MAC Addresses | N/A | This is the MAC address of the logged packet. |
| IP | N/A | The Source IP (IPv4) of the logged packet. |
| Time | N/A | The Date and Time stamp of the logged packet. Date & time format. ("Month" "Day" "Hours":"Minutes":"Seconds") |

Note: Ensure MAC Control Log Alert is enabled.

Refer to **Security > Firewall > MAC Control** tab. Check Log Alert and save the setting.

IPS Status

| | | |
|--|----|------|
| <input type="checkbox"/> IPS Edit [+] | | |
| Detected Intrusion | IP | Time |

| IPS Firewall Status | | |
|---------------------------|---------------|---|
| Item | Value setting | Description |
| Detected Intrusion | N/A | This is the intrusion type of the packets being blocked. |
| IP | N/A | The Source IP (IPv4) of the logged packet. |
| Time | N/A | The Date and Time stamp of the logged packet. Date & time format. ("Month" "Day" "Hours":"Minutes":"Seconds") |

Note: Ensure IPS Log Alert is enabled.

Refer to **Security > Firewall > IPS** tab. Check Log Alert and save the setting.

Firewall Options Status

| | | | |
|--|-----|-----------------------|---------------------------------|
| <input type="checkbox"/> Options Edit [+] | | | |
| Stealth Mode | SPI | Discard Ping from WAN | Remote Administrator Management |

| Firewall Options Status | | |
|--|---------------|---|
| Item | Value setting | Description |
| Stealth Mode | N/A | Enable or Disable setting status of Stealth Mode on Firewall Options. String Format: Disable or Enable |
| SPI | N/A | Enable or Disable setting status of SPI on Firewall Options. String Format : Disable or Enable |
| Discard Ping from WAN | N/A | Enable or Disable setting status of Discard Ping from WAN on Firewall Options. String Format: Disable or Enable |
| Remote Administrator Management | N/A | Enable or Disable setting status of Remote Administrator. If Remote Administrator is enabled, it shows the currently logged in administrator's source IP address and login user name and the login time. |

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Format:

IP : "Source IP", User Name: "Login User Name", Time: "Date time"

Example:

IP: 192.168.127.39, User Name: admin, Time: Mar 3 01:34:13

Note: Ensure Firewall Options Log Alert is enabled.

*Refer to **Security > Firewall > Options** tab. Check Log Alert and save the setting.*

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8.4 Administration

8.4.1 Configure & Manage Status

Go to **Status > Administration > Configure & Manage** tab.

The **Configure & Manage Status** window shows the status for managing remote network devices. The type of management available in your device is depended on the device model purchased. The commonly used ones are the SNMP, TR-069, and UPnP. The display will be refreshed on every five seconds.

SNMP Linking Status

SNMP Link Status screen shows the status of current active SNMP connections.

| SNMP Linking Status | | | | | | |
|---------------------|------------|------|-----------|------------|--------------|--------------|
| User Name | IP Address | Port | Community | Auth. Mode | Privacy Mode | SNMP Version |

| SNMP Link Status | | |
|------------------|---------------|--|
| Item | Value setting | Description |
| User Name | N/A | It displays the user name for authentication. This is only available for SNMP version 3. |
| IP Address | N/A | It displays the IP address of SNMP manager. |
| Port | N/A | It displays the port number used to maintain connection with the SNMP manager. |
| Community | N/A | It displays the community for SNMP version 1 or version 2c only. |
| Auth. Mode | N/A | It displays the authentication method for SNMP version 3 only. |
| Privacy Mode | N/A | It displays the privacy mode for version 3 only. |
| SNMP Version | N/A | It displays the SNMP Version employed. |

SNMP Trap Information

SNMP Trap Information screen shows the status of current received SNMP traps.

| SNMP Trap Information | | |
|-----------------------|------|------------|
| Trap Level | Time | Trap Event |

| SNMP Trap Information | | |
|-----------------------|---------------|---|
| Item | Value setting | Description |
| Trap Level | N/A | It displays the trap level. |
| Time | N/A | It displays the timestamp of trap event. |
| Trap Event | N/A | It displays the IP address of the trap sender and event type. |

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TR-069 Status

TR-069 Status screen shows the current connection status with the TR-068 server.

| TR-069 Status | |
|---------------|--|
| Link Status | |
| Off | |

| TR-069 Status | | |
|---------------|---------------|--|
| Item | Value setting | Description |
| Link Status | N/A | It displays the current connection status with the TR-068 server. The connection status is either On when the device is connected with the TR-068 server or Off when disconnected. |

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8.4.2 Log Storage Status

Go to **Status > Administration > Log Storage** tab.

The **Log Storage Status** screen shows the status for selected device storage.

Log Storage Status

Log Storage Status screen shows the status of current the selected device storage. The status includes Device Select, Device Description, Usage, File System, Speed, and status

| Storage Information | | | | | |
|---------------------|--------------------|-------------|-------------|---------|--------|
| Device Select | Device Description | Usage | File System | Speed | Status |
| Storage 1 ▼ | USB Storage | 0 / 3788 MB | FAT/FAT32 | USB 2.0 | Ready |

8.5 Statistics & Report

8.5.1 Connection Session

Go to **Status > Statistics & Reports > Connection Session** tab.

Internet Surfing Statistic shows the connection tracks on this router.

| Internet Surfing List (33 entries) Previous Next First Last Export (.xml) Export (.csv) Refresh | | | | | | |
|---|----------|-----------------------|-----|--------------------|-------------------|--|
| User Name | Protocol | Internal IP & Port | MAC | External IP & Port | Duration Time | |
| | UDP | 192.168.123.100:51736 | | 192.168.123.254:53 | 2017/03/22 03:43~ | |
| | UDP | 192.168.123.100:55986 | | 192.168.123.254:53 | 2017/03/22 03:43~ | |
| | UDP | 192.168.123.100:49548 | | 192.168.123.254:53 | 2017/03/22 03:43~ | |
| | UDP | 192.168.123.100:60969 | | 192.168.123.254:53 | 2017/03/22 03:43~ | |
| | UDP | 192.168.123.100:56053 | | 192.168.123.254:53 | 2017/03/22 03:43~ | |

| Internet Surfing Statistic | | |
|----------------------------|---------------|---|
| Item | Value setting | Description |
| Previous | N/A | Click the Previous button; you will see the previous page of track list. |
| Next | N/A | Click the Next button; you will see the next page of track list. |
| First | N/A | Click the First button; you will see the first page of track list. |
| Last | N/A | Click the Last button; you will see the last page of track list. |
| Export (.xml) | N/A | Click the Export (.xml) button to export the list to xml file. |
| Export (.csv) | N/A | Click the Export (.csv) button to export the list to csv file. |
| Refresh | N/A | Click the Refresh button to refresh the list. |

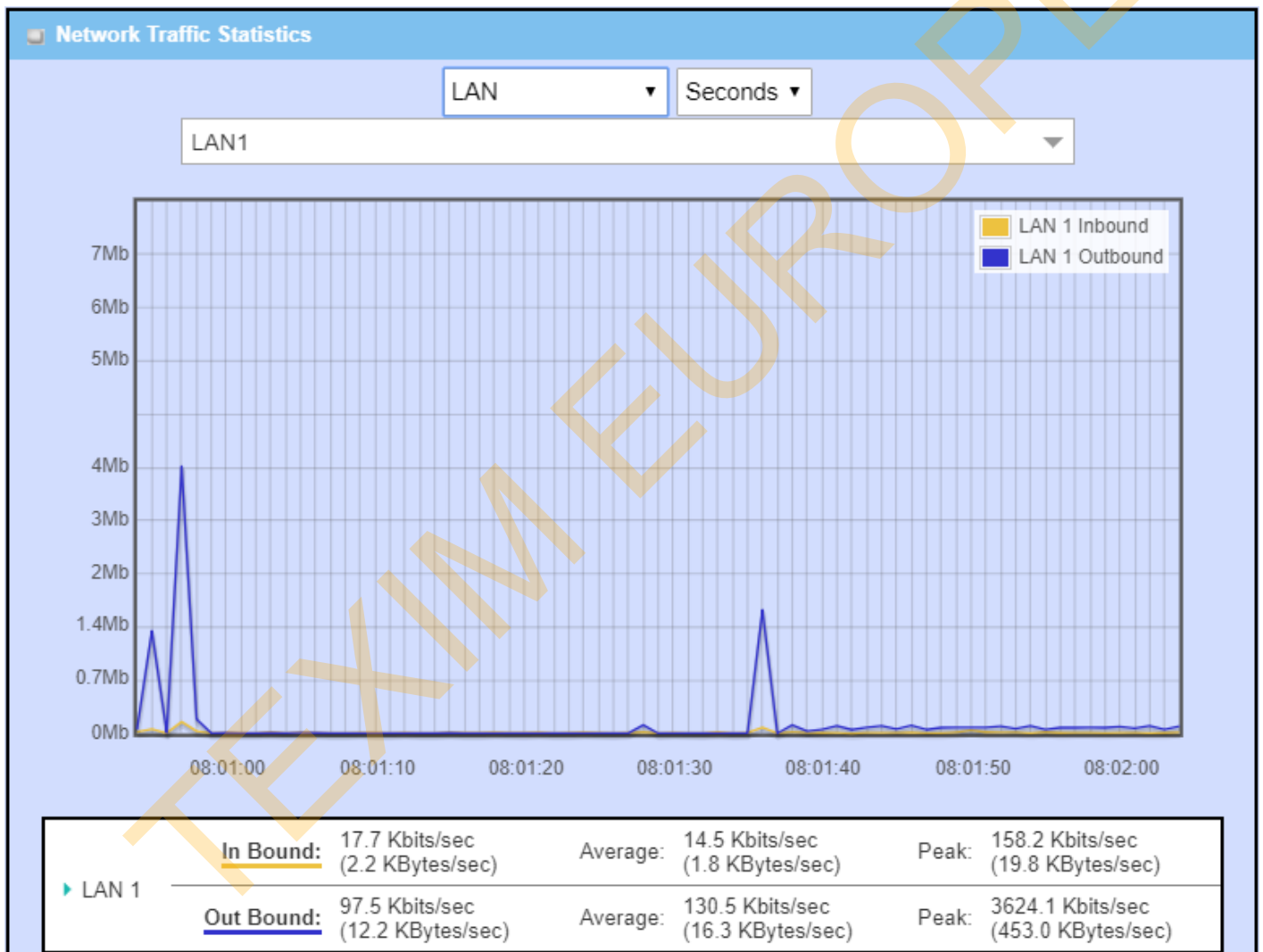
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8.5.2 Network Traffic

Go to **Status > Statistics & Reports > Network Traffic** tab.

Network Traffic Statistics screen shows the historical graph for the selected network interface.

You can change the interface drop list and select the interface and sampling time interval you want to monitor.



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8.5.3 Device Administration

Go to **Status > Statistics & Reports > Device Administration** tab.

Device Administration shows the login information.

| Device Manager Login Statistics | | | | |
|---------------------------------|---------------|-----------------|------------|-------------------|
| Previous | | | | |
| Next | | | | |
| First | | | | |
| Last | | | | |
| Export (.xml) | | | | |
| Export (.csv) | | | | |
| Refresh | | | | |
| User Name | Protocol Type | IP Address | User Level | Duration Time |
| admin | http/https | 192.168.123.100 | Admin | 2017/03/22 03:31~ |

| Device Manager Login Statistic | | |
|--------------------------------|---------------|---|
| Item | Value setting | Description |
| Previous | N/A | Click the Previous button; you will see the previous page of login statistics. |
| Next | N/A | Click the Next button; you will see the next page of login statistics. |
| First | N/A | Click the First button; you will see the first page of login statistics. |
| Last | N/A | Click the Last button; you will see the last page of login statistics. |
| Export (.xml) | N/A | Click the Export (.xml) button to export the login statistics to xml file. |
| Export (.csv) | N/A | Click the Export (.csv) button to export the login statistics to csv file. |
| Refresh | N/A | Click the Refresh button to refresh the login statistics. |

Appendix A GPL WRITTEN OFFER

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GPSTabel
Version 1.4.4
Copyright (C) 2002-2005 Robert Lipe<robertlipe@usa.net>
GPL License: <https://www.gpsbabel.org/>

Curl
Version 7.19.6
Copyright (c) 1996-2009, Daniel Stenberg, <daniel@haxx.se>.
MIT/X derivate License: <https://curl.haxx.se/>

OpenSSL
Version 1.0.2c
Copyright (C) 1995-1998 Eric Young (eay@cryptsoft.com)
GPL License: <https://www.openssl.org/>

brctl - ethernet bridge administration
Stephen Hemminger <shemminger@osdl.org>
Lennert Buytenhek <buytenh@gnu.org>
version 1.1
GNU GENERAL PUBLIC LICENSE Version 2, June 1991

tc - show / manipulate traffic control settings
Stephen Hemminger<shemminger@osdl.org>
Alexey Kuznetsov<kuznet@ms2.inr.ac.ru>
version iproute2-ss050330
GNU GENERAL PUBLIC LICENSE Version 2, June 1991

dhcp-fwd — starts the DHCP forwarding agent
Enrico Scholz <enrico.scholz@informatik.tu-chemnitz.de>
version 0.7
GNU GENERAL PUBLIC LICENSE Version 2, June 1991

lftp - Sophisticated file transfer program
Alexander V. Lukyanov <lav@yars.free.net>
version:4.5.x
Copyright (c) 1996-2014 by Alexander V. Lukyanov (lav@yars.free.net)

dnsmasq - A lightweight DHCP and caching DNS server.
Simon Kelley <simon@thekelleys.org.uk>
version:2.72
dnsmasq is Copyright (c) 2000-2014 Simon Kelley

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socat - Multipurpose relay

Version: 2.0.0-b8

GPLv2

<http://www.dest-unreach.org/socat/>

LibModbus

Version: 3.0.3

LGPL v2

<http://libmodbus.org/news/>

LibIEC60870

GPLv2

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<https://sourceforge.net/projects/mrts/>

Openswan

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<https://www.openswan.org/>

Opennhrp

Version: v0.14.1

OpenNHRP is an NHRP implementation for Linux. It has most of the RFC2332 and Cisco IOS extensions.

Project homepage: <http://sourceforge.net/projects/opennhrp>

Git repository: <git://opennhrp.git.sourceforge.net/gitroot/opennhrp>

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<https://sourceforge.net/projects/opennhrp/>

IPSec-tools

Version: v0.8

No GPL be written

<http://ipsec-tools.sourceforge.net/>

PPTP

Version: pptp-1.7.1

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<http://pptpclient.sourceforge.net/>

PPTPServ

Version: 1.3.4

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L2TP

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L2TPServ

Version: v 1.3.1 GNU GENERAL PUBLIC LICENSE Version 2, June 1991

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<http://www.xelerance.com/software/xl2tpd/>

Mpstat: from sysstat, system performance tools for Linux

Version: 10.1.6

Copyright: (C) 1999-2013 by Sebastien Godard (sysstat <at> orange.fr)

SSHD: dropbear, a SSH2 server

Version: 0.53.1

Copyright: (c) 2002-2008 Matt Johnston

Libncurses: The ncurses (new curses) library is a free software emulation of curses in System V Release 4.0 (SVr4), and more.

Version: 5.9

Copyright: (c) 1998,2000,2004,2005,2006,2008,2011,2015 Free Software Foundation, Inc., 51 Franklin Street, Boston, MA 02110-1301, USA

MiniUPnP: The miniUPnP daemon is an UPnP IGD (internet gateway device) which provide NAT traversal services to any UPnP enabled client on the network.

Version: 1.7

Copyright: (c) 2006-2011, Thomas BERNARD

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CoovaChilli is an open-source software access controller for captive portal (UAM) and 802.1X access provisioning.

Version: 1.3.0

Copyright: (C) 2007-2012 David Bird (Coova Technologies) <support@coova.com>

Krb5: Kerberos is a network authentication protocol. It is designed to provide strong authentication for client/server applications by using secret-key cryptography.

Version: 1.11.3

Copyright: (C) 1985-2013 by the Massachusetts Institute of Technology and its contributors

OpenLDAP: a suite of the Lightweight Directory Access Protocol (v3) servers, clients, utilities, and development tools.

Version: 2.4

Copyright: 1998-2014 The OpenLDAP Foundation

Samba3311: the free SMB and CIFS client and server for UNIX and other operating systems

Version: 3.3.11

Copyright: (C) 2007 Free Software Foundation, Inc. <<http://fsf.org/>>

NTPClient: an NTP (RFC-1305, RFC-4330) client for unix-alike computers

Version: 2007_365

Copyright: 1997, 1999, 2000, 2003, 2006, 2007 Larry Doolittle

exFAT: FUSE-based exFAT implementation

Version: 0.9.8

Copyright: (C) 2010-2012 Andrew Nayenko

NTFS_3G: The NTFS-3G driver is an open source, freely available read/write NTFS driver for Linux, FreeBSD, Mac OS X, NetBSD, Solaris and Haiku.

Version: 2009.4.4

Copyright: (C) 1989, 1991 Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA

mysql-5_1_72: a release of MySQL, a dual-license SQL database server

Version: 5.1.72

Copyright: (c) 2000, 2013, Oracle and/or its affiliates

FreeRadius: a high performance and highly configurable RADIUS server

Version: 2.1.12

Copyright: (C) 1999-2011 The FreeRADIUS server project and contributors

Linux IPv6 Router Advertisement Daemon – radvd

Version: V 1.15

Copyright (c) 1996,1997 by Lars Fenneberg<lf@elemental.net>

BSD License: <http://www.litech.org/radvd/>

WIDE-DHCPv6

Dynamic Host Configuration Protocol for IPv6 (DHCPv6) clients, servers, and relay agents.

Industrial LoRa Gateway

Version: 20080615

Copyright (C) 1998-2004 WIDE Project.

BSD License: <https://sourceforge.net/projects/wide-dhcpv6/>

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