BiPAC 8900X *R3*

3G/4G LTE VDSL2/ADSL2+ VPN Firewall Router

User Manual

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Chapter 1: Introduction

Introduction to your Router

The Billion BiPAC 8900X *R3*, a multi service VDSL2 (17a) Router. It features fibre-ready triple-WAN VDSL2 supports backward compatibility to ADSL2+ for a longer reach distance, an all-in-one advanced device including Gigabit Ethernet, 3G/4G LTE, and NAS (Network Attached Storage) in one unit. As well as being IPv6-capable, the BiPAC 8900X *R3* VDSL2 router supports super-fast fibre connections via a Gigabit Ethernet WAN port. It also has one USB port, allowing the device to act as a print server as well as a NAS (Network Attached Storage) device with DLNA (Digital Living Network Alliance) and FTP (File Transfer Protocol) access. Moreover, the USB port can host a 3G/4G LTE modem connecting to the 3G/4G LTE network for Internet access. With an array of advanced features, the Billion BiPAC 8900X *R3* delivers a future-proof solution for VDSL2 connections, super-fast FTTC and ultra-speed FTTH (Fibre-To-The-Home) network deployment and services.

Very High-speed Connectivity for Internet Access

The BiPAC 8900X *R3* complies with VDSL2 and ADSL2+ worldwide standards and it can support the downlink data rate of up to 100Mbps and uplink data rate of up to 50Mbps in VDSL2. It's also integrated with 4-port 10/100/1000Mbps switch, 1-port Gigabit switch, and 802.11n wireless AP, enabling users to connect to multiple computers or devices easily.

3G/4G LTE Mobility and Always-on Connectivity

With 3G/LTE-based Internet connection (requires an additional 3G/LTE USB modem), communication via the BiPAC 8900X *R3* is becoming more convenient and widely available - allowing you to watch movies, download music on the road, or access e-mail no matter where you are. You can even share your Internet connection with others, no matter if you're in a meeting, or speeding across the country on a train. The auto fail-over feature ensures optimum connectivity and minimum interruption by quickly and smoothly connecting to a 3G/4G LTE network in the event that you xDSL/Fibre/Cable line fails. The BiPAC 8900X *R3* will then automatically reconnect to the ADSL/Fibre/Cable connection when it is restored, reducing connection costs. These features are perfect for office situations when a constant and smooth WAN connection is critical.

Secure VPN Connections

The BiPAC 8900X *R3* supports all currently popular secure VPNs, including embedded IPSec VPN, PPTP, L2TP, OpenVPN, GRE, which satisfies different users' needs, allowing users to establish encrypted private connections over the Internet with your optimum VPN options. You can access your corporate Intranet and transmit sensitive data between branch offices and remote sites anytime; even when you are out of office, thus enhancing productivity.

IPv6 supported

Internet Protocol version 6 (IPv6) is a version of the Internet Protocol that is designed to succeed IPv4. IPv6 has a vastly larger address space than IPv4. This results from the use of a 128-bit address, whereas IPv4 uses only 32 bits. The new address space thus supports 2^{128} (about 3.4×10^{38}) addresses. This expansion provides flexibility in allocating addresses and routing traffic and eliminates the primary need for network address translation (NAT), which gained widespread

deployment as an effort to alleviate IPv4 address exhaustion.

IPv6 also implements new features that simplify aspects of address assignment (stateless address autoconfiguration) and network renumbering (prefix and router announcements) when changing Internet connectivity providers. The IPv6 subnet size has been standardized by fixing the size of the host identifier portion of an address to 64 bits to facilitate an automatic mechanism for forming the host identifier from Link Layer media addressing information (MAC address).

Web Based GUI

It supports web based GUI for configuration and management. It is user-friendly and comes with online help. It also supports remote management capability for remote users to configure and manage this product.

Firmware Upgradeable

Device can be upgraded to the latest firmware through the WEB based GUI.

Features

- IPv6 ready (IPv4/IPv6 dual stack)
- Flexible WAN approach – VDSL2/ADSL2+, 3G/4G LTE mobile connection, and Ethernet WAN for Broadband Connectivity
- High-speed Internet Access via VDSL2/ADSL2 / 2+; Backward Compatible with ADSL
- Fibre (FTTC/FTTP/FTTH) ready with high WAN throughput
- Gigabit Ethernet WAN and LAN
- NBN (National Broadband Network) ready
- Auto fail-over
- USB port for print server, NAS, DLNA media server, and 3G/4G LTE USB modem
- SNR adjustments to achieve highest sync speeds
- Monitoring of individual LAN ports
- QoS for traffic prioritization and bandwidth management
- SOHO Firewall Security with DoS Preventing and Packet Filtering
- Quality of Service Control for traffic prioritization and Bandwidth management
- 16 Secured IPSec VPN tunnels with powerful DES/ 3DES/ AES
- PPTP VPN with Pap/ Chap/ MS-CHAPv2 authentication
- Pure L2TP and L2TP over IPSec
- OpenVPN with CA authentication and extensive OpenSSL encryption
- GRE tunnel
- Universal Plug and Play (UPnP) Compliance
- Supports IPTV Application*2
- Ease of Use with Quick Installation Wizard (EZSO)
- Ideal for SOHO and office users

VDSl2/ADSL2+ Compliance

- Compliant with xDSL Standard
  - ITU-T G.993.2 (VDSL2)
  - ITU-T G.998.4 (G.inp)
  - ITU-T G.993.5 (G.vector)
  - ITU-T G.992.5 (G.dmt.bis plus, Annex M)
  - ITU-T G.992.3 (G.dmt.bis, Annex M)
  - Full-rate ANSI T1.413 Issue 2
  - ITU-T G.992.1 (G.dmt)
  - ITU-T G.992.2 (G.lite)
  - ITU-T G.994.1 (G.hs)

- Supports VDSL2 band plan: 997 and 998
- Supports VDSL2 profiles: 8a, 8b, 8c, 8d, 12a, 12b, and 17a
- ADSL/2/2+ fallback modes
- Supports ATM and PTM modes

Network Protocols and Features

- IPv4 or IPv4 / IPv6 Dual Stack
- NAT, static (v4/v6) routing and RIP-1 / 2
- IPv6 Stateless / Stateful Address Auto-configuration
- IPv6 Router Advertisement
- IPv6 over PPP
- DHCPv6
- IP Tunnel IPv6 in IPv4(6RD)
- IP Tunnel IPv4 in IPv6(DS-Lite)
- Universal Plug and Play (UPnP) Compliant
- Dynamic Domain Name System (DDNS)
- Virtual Server, DMZ and one-to-one NAT
- SNTP, DNS relay, IGMP snooping and IGMP proxy for video service
- MLD snooping and MLD proxy for video service
- Management based-on IP protocol, port number and address
- SMTP client with SSL/TLS
- Supports port-based interface grouping (VLAN)

Firewall

- Built-in NAT Firewall
- Stateful Packet Inspection (SPI)
- DoS attack prevention
- Packet Filtering (v4/v6) - port, source IP address, destination IP address
- URL Content Filtering (v4/v6) – string or domain name detection in URL string
- MAC Filtering
- Remote access control for web-based access
- Password protection for system management

Quality of Service Control

- Supports the DiffServ approach
- Traffic prioritization and bandwidth management based-on IPv4/IPv6 protocol, port number and address

ATM, PTM and PPP Protocols

- ATM Adaptation Layer Type 5 (AAL5)
- Multiple Protocol over ALL5 (RFC 268, formerly RFC 1483)
- Bridged or routed Ethernet encapsulation
- VC and LLC based multiplexing
- PPP over Ethernet (PPPoE)
- PPP over ATM (RFC 2364)
- Classical IP over ATM (RFC 1577)
- MAC Encapsulated Routing (RFC 1483 MER)
- OAM F4 / F5

IPTV Applications*2

- IGMP Snooping and IGMP Proxy
- MLD Snooping and MLD Proxy
- Interface Grouping (VLAN)
- Quality of Service (QoS)

USB Application Server

- 3G/4G LTE dongle support
- Storage: FTP server, Samba server，DLNA
- Printer Server

Virtual Private Network (VPN)

- 16 IPSec VPN tunnels
- IKE key management
- DES, 3DES and AES encryption for IPSec
- L2TP over IPSec
- Pap/ Chap/ MS-CHAPv2 authentication for PPTP
- IPSec pass-through
- GRE tunnel

Management

- Easy Sign-on (EZSO)
- Web-based GUI for remote and local management (IPv4/IPv6)
- Firmware upgrades and configuration data upload and download via web-based GUI
- Embedded Telnet server for remote and local management
- Supports DHCP server / client / relay
- Supports SNMP v1,v2, MIB-I and MIB-II

- TR-069*[1] supports remote management
- Available Syslog
- Mail alert for WAN IP changed
- Wake on LAN
- Auto failover and fallback
- Push Service

	1. On request for Telco / ISP projects 2. IPTV application may require subscription to IPTV services from a Telco / ISP. 3. Specifications on this manual are subject to change without prior notice.

Hardware Specifications

Physical Interface

- DSL: VDSL/ADSL port
- USB 2.0 port for storage service and printer server, FTP, DLNA and 3G/4G LTE modem
- Ethernet: 4-port 10 / 100 / 1000Mbps auto-crossover (MDI / MDI-X) Switch
- EWAN: 1 Ethernet port (port#5) can be configured as a WAN interface for Broadband connectivity.
- Factory default reset button
- Power jack
- Power switch

Power Requirements

- Input: 15V DC, 2.0A

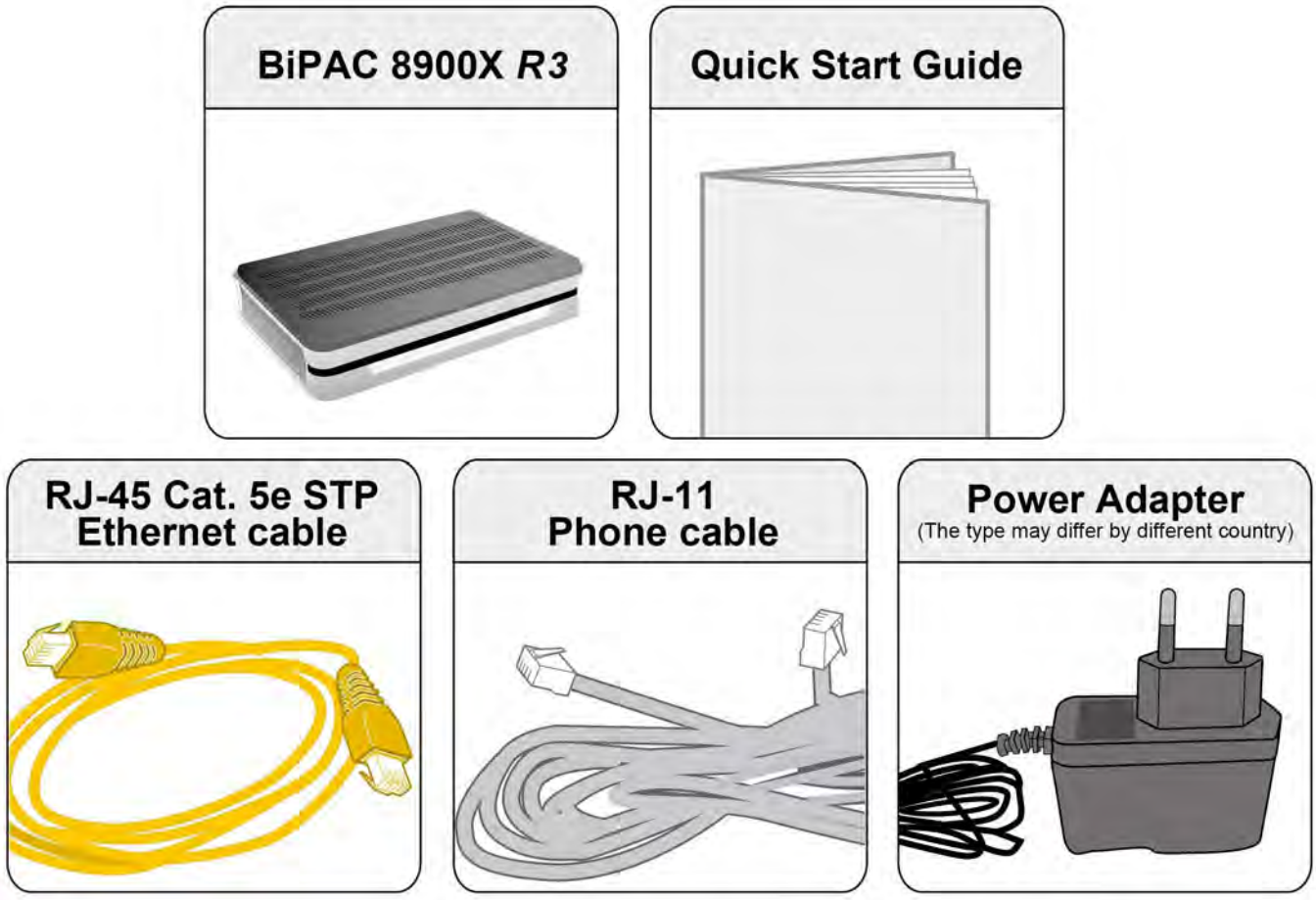
Operating Environment

- Operating temperature: 0 ~ 40℃
- Storage temperature: -20 ~ 70℃
- Humidity: 20 ~ 95% non-condensing

Chapter 2: Installing the Router

Package Contents

- **BiPAC 8900X *R3* 3G/4G LTE VDSL2/ADSL2+ VPN Firewall Router**
- **Quick Start Guide**
- **RJ-45 Cat. 5e STP Ethernet cable**
- **RJ-11 xDSL/ telephone cable**
- **Power adapter**
- **Splitter / Micro-filter (Optional)**



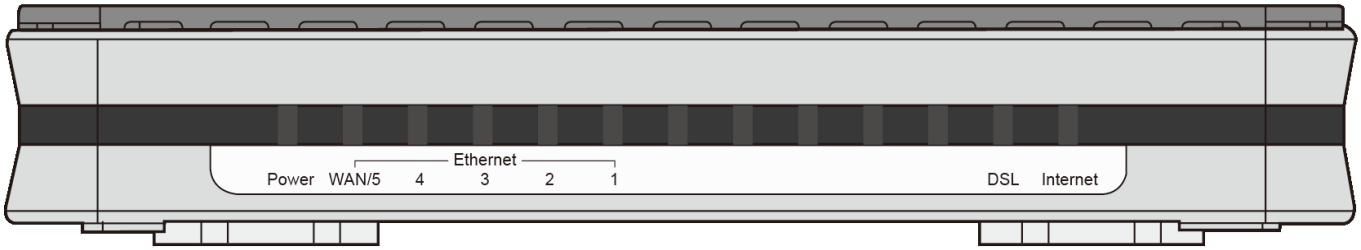
Important note for using this router

 ***Warning***	1. Do not use the router in high humidity or high temperatures. 2. Do not use the same power source for the router as other equipment. 3. Do not open or repair the case yourself. If the router is too hot, turn off the power immediately and have it repaired at a qualified service center. 4. Avoid using this product and all accessories outdoors.

 ***Attention***	1. Place the router on a stable surface. 2. Only use the power adapter that comes with the package. Using a different voltage rating power adapter may damage the router. 3. This equipment should be installed and operated with minimum distance 20cm away from your body.

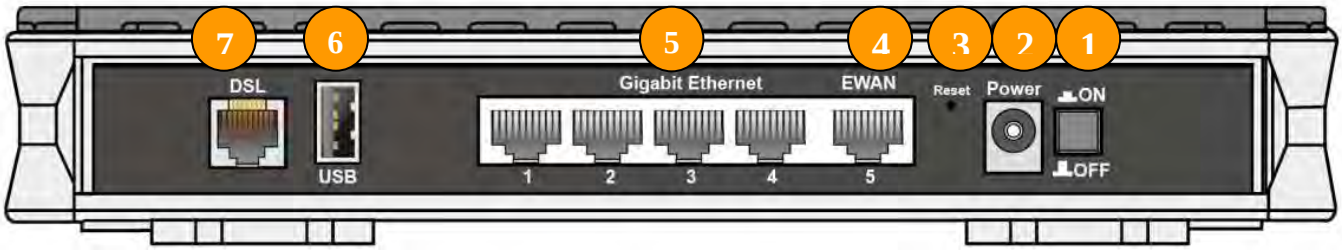
Device Description

The Front LEDs



LED	Status	Meaning
Power	Red	Boot failure or in emergency mode
	Green	System ready
Gigabit Ethernet Port 5 (EWAN)	Green	Connected to a Gigabit Ethernet device or to a broadband connection device.
	Orange	Connect to an 10/100Mbps Ethernet device
	Blinking	Data being transmitted / received
Gigabit Ethernet Port 1-4	Green	Successfully connected to a 1000Mbos LAN device
	Orange	Successfully connected to a 10/100Mbos LAN device
	Blinking	Data being transmitted / received
DSL	Green	Successfully connected to an xDSL DSLAM (Line Synced)
	Green Blinking	DSL synchronizing or waiting for DSL synchronizing
	Off	DSL cable unplugged
Internet	Green	IP connected and traffic is passing through the device
	Blinking	Data being transmitted / received
	Red	BiPAC 8900X *R3* fails to obtain and IP.
	Off	BiPAC 8900X *R3* is either in bridged mode or WAN/DSL connection is not ready

The Rear Ports



Port		Meaning
1	**ON/OFF**	Power ON/ OFF switch.
2	**Power Jack**	Connect the supplied power adapter to this jack.
3	**Reset**	Push and hold the reset button for five (5) seconds to restore to its factory default settings (this is used when you cannot login to the router, e.g. forgot your password)
4	**EWAN (Gb EWAN)**	Connect to Fiber/ Cable/ xDSL Modem with a RJ-45 cable, for broadband connectivity. ***Note:*** ***1). LAN 5 automatically becomes an EWAN port when EWAN internet interface is being selected in the GUI.*** ***2). If you need port 5 to be used as a LAN port again, please remove the EWAN interface, See EWAN Interface Removal.***
5	**Gb Ethernet (1-5)**	Connect PCs, Laptops or any other office/home LAN devices with the supplied RJ-45 Ethernet cable (Cat-5 or Cat-5e) to any of the five LAN ports. ***Note: Port 5 is a LAN / WAN Configurable Port.***
6	**USB**	Connect with a 3G or 4G/LTE USB adaptor/ dongle or hard driver for mobile connectivity.
7	**DSL**	Connect the device to an ADSL/VDSL telephone jack or splitter using a RJ-11 telephone cable.

Cabling

One of the most common causes of problems is bad cabling or DSL line(s). Make sure that all connected devices are turned on. On the front panel of your router is a bank of LEDs. Verify that the LAN Link and DSL line LEDs are all lit. If they are not, verify if you are using the proper cables. If the error persists, you may have a hardware problem. In this case, you should contact technical support.

Make sure you have a line filter with all devices (e.g. telephones, fax machines, analogue modems) connected to the same telephone line and the wall socket (unless you are using a Central Splitter or Central Filter installed by a qualified and licensed electrician), and ensure that all line filters are correctly installed and the right way around. Missing line filters or line filters installed the wrong way around can cause problems with your DSL connection, including causing frequent disconnections. If you have a back-to-base alarm system you should contact your security provider for a technician to make any necessary changes.

Chapter 3: Basic Installation

The router can be configured through your web browser. A web browser is included as a standard application in the following operating systems: Linux, Mac OS, Windows 10/ 8/ 7 / XP / Vista, etc. The product provides an easy and user-friendly interface for configuration.

Please check your PC network components. The TCP/IP protocol stack and Ethernet network adapter must be installed. If not, please refer to your Windows-related or other operating system manuals.

There are ways to connect the router, either through an external repeater hub or connect directly to your PCs. However, make sure that your PCs have an Ethernet interface installed properly prior to connecting the router device. You ought to configure your PCs to obtain an IP address through a DHCP server or a fixed IP address that must be in the same subnet as the router. The default IP address of the router is 192.168.1.254 and the subnet mask is 255.255.255.0 (i.e. any attached PC must be in the same subnet, and have an IP address in the range of 192.168.1.1 to 192.168.1.253). The best and easiest way is to configure the PC to get an IP address automatically from the router using DHCP. If you encounter any problem accessing the router web interface it is advisable to uninstall your firewall program on your PCs, as they can cause problems accessing the IP address of the router. Users should make their own decisions on what is best to protect their network.

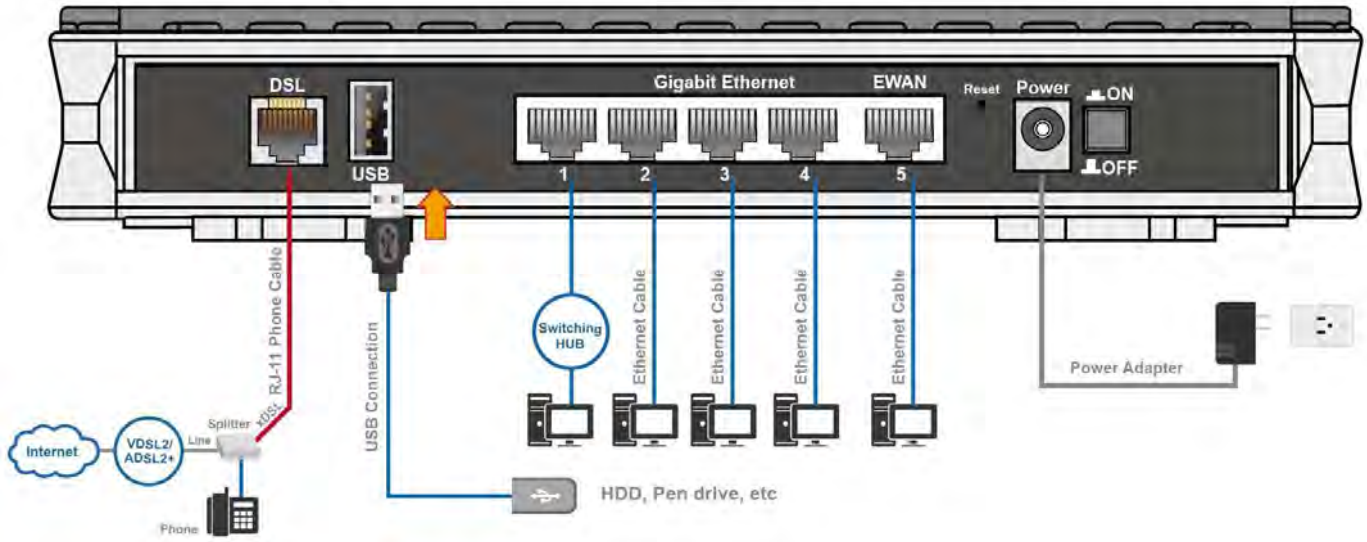
Please follow the following steps to configure your PC network environment.

Any TCP/IP capable workstation can be used to communicate with or through this router. To configure other types of workstations, please consult your manufacturer documentation.

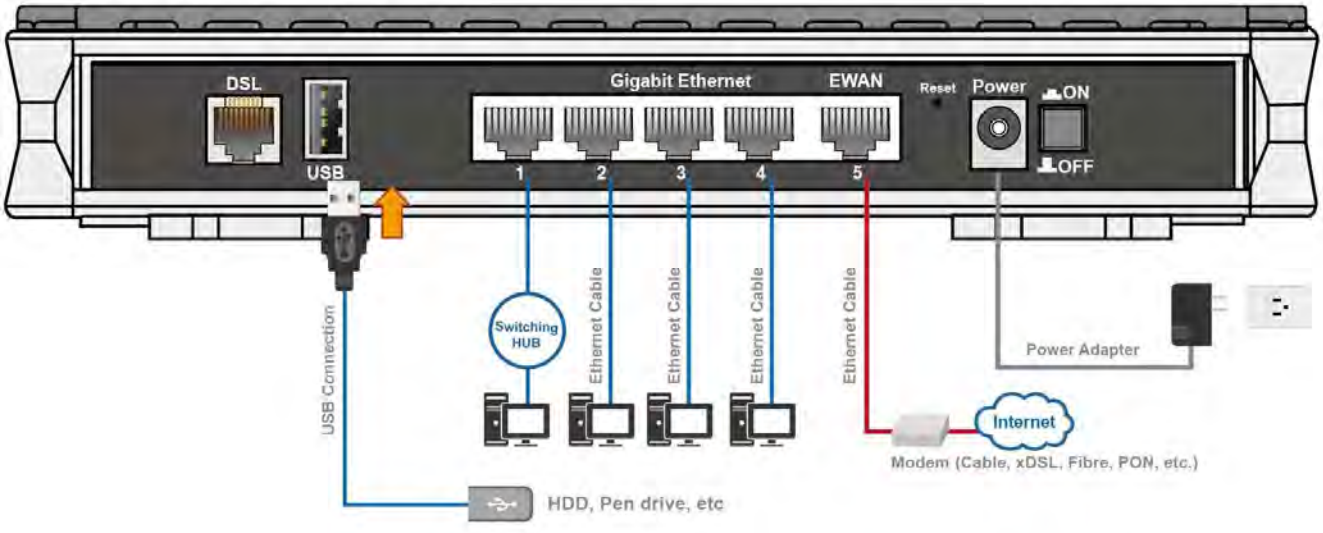
Connecting Your Router

Users can connect the VDSL2/ADSL2+ router as the following.

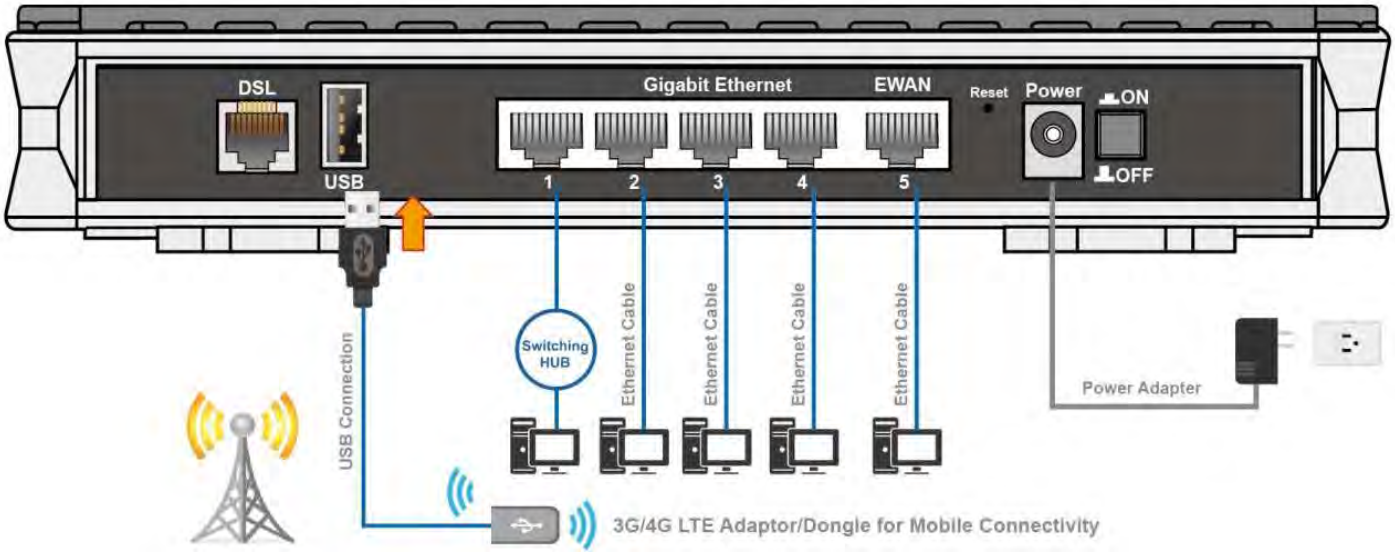
DSL Router mode:



Broadband Router mode:



3G/LTE Router mode



Network Configuration

Configuring a PC in Windows 7/ 8/ 10

1. For Windows 7/8, go to **Start**. Click on **Control Panel**.

2. For Windows 10, Users can click **Start** then click on **Settings**; or right click the mouse when it points at Windows ICON (**Start**), then click **Control Panel.**

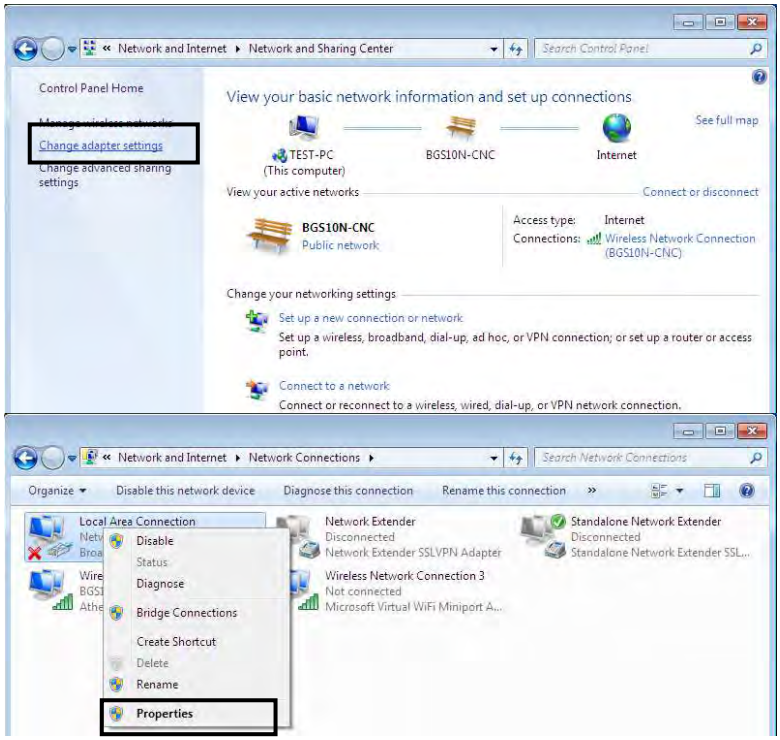
Settings of Windows 10

3. Click on **Network and Internet**.

Control Panel

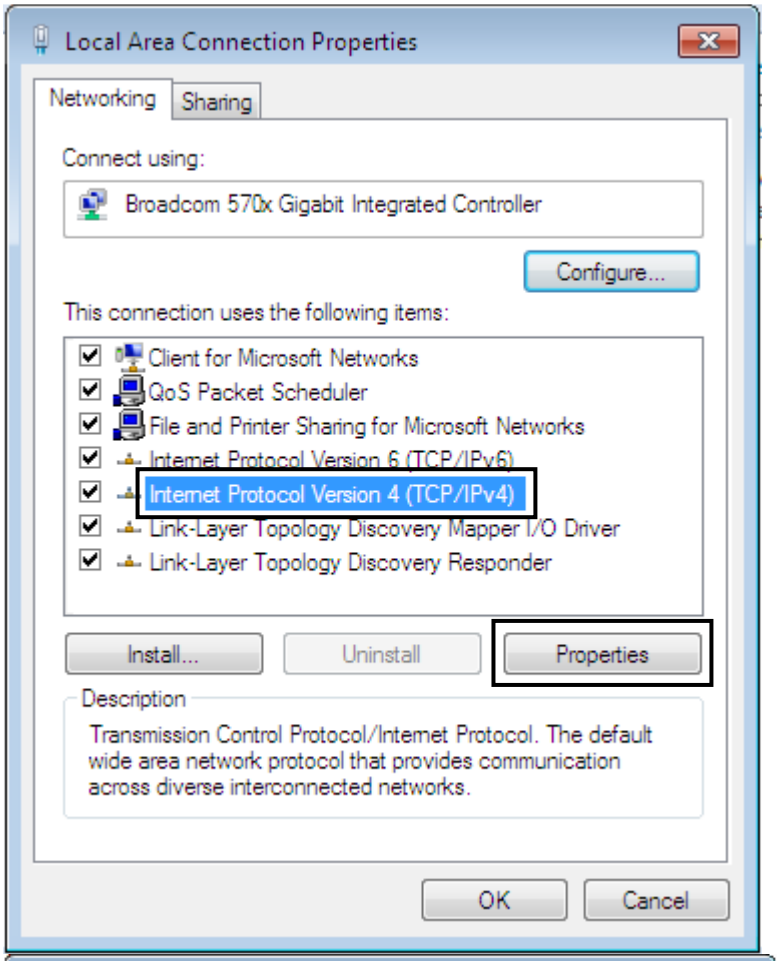
4. When the **Network and Sharing Center** window pops up, select and click on **Change adapter settings** on the left window panel.

5. Select the **Local Area Connection**, and right click the icon to select **Properties**.



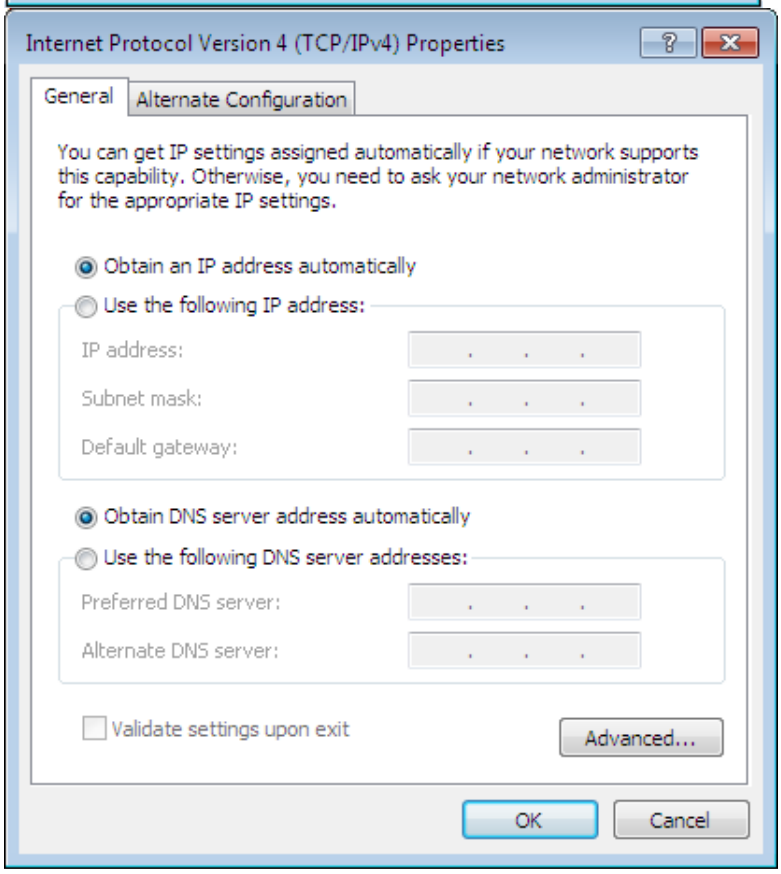
IPv4:

6. Select **Internet Protocol Version 4 (TCP/IPv4)** then click **Properties**



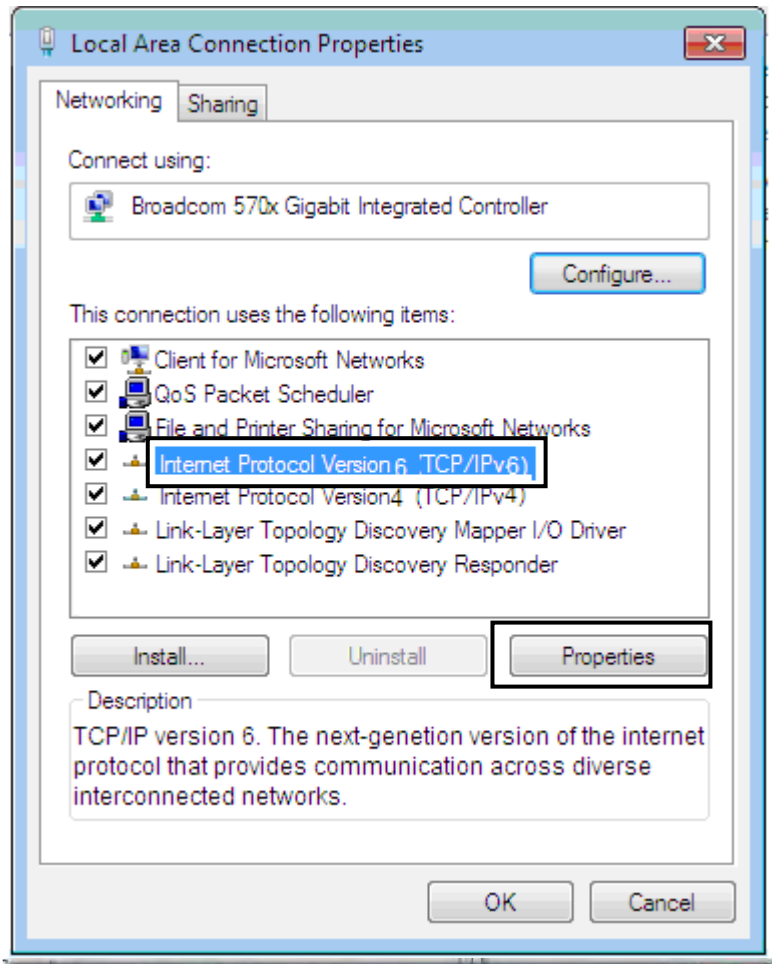
7. In the **TCP/IPv4 properties** window, select the **Obtain an IP address automatically** and **Obtain DNS Server address automatically** radio buttons. Then click **OK** to exit the setting.

8. Click **OK** again in the **Local Area Connection Properties** window to apply the new configuration.



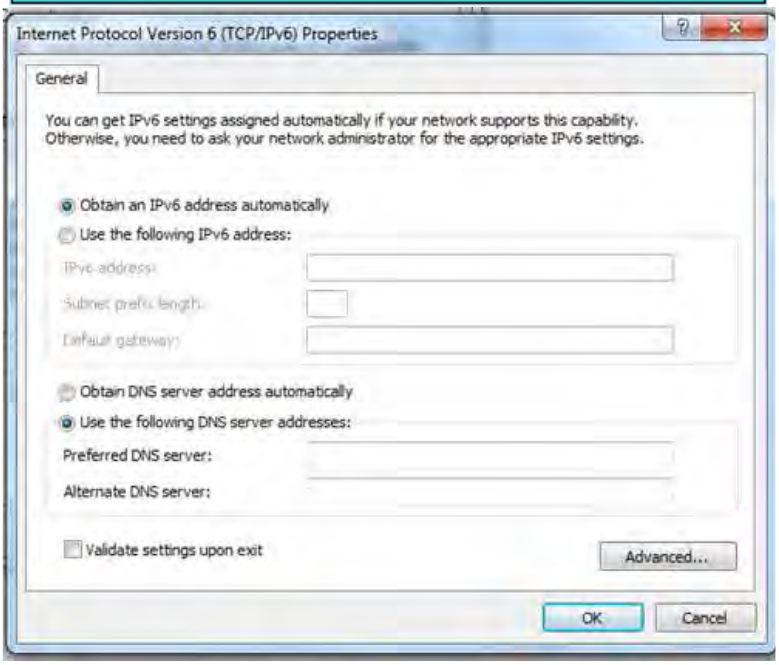
IPv6:

6. Select **Internet Protocol Version 6 (TCP/IPv6)** then click **Properties**



7. In the **TCP/IPv6 properties** window, select the **Obtain an IPv6 address automatically** and **Obtain DNS Server address automatically** radio buttons. Then click **OK** to exit the setting.

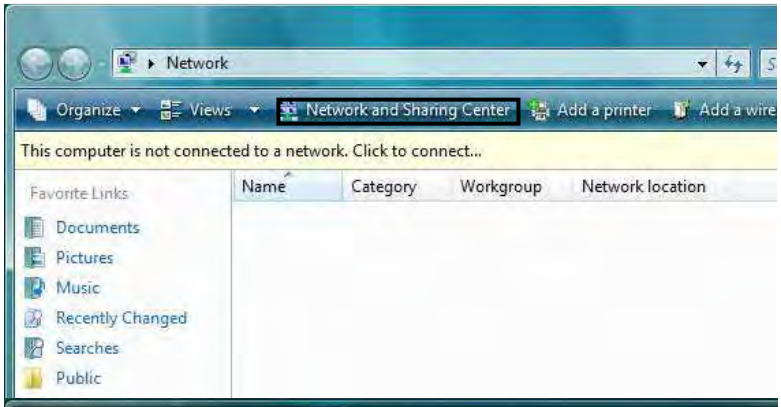
8. Click **OK** again in the **Local Area Connection Properties** window to apply the new configuration.



Configuring a PC in Windows Vista

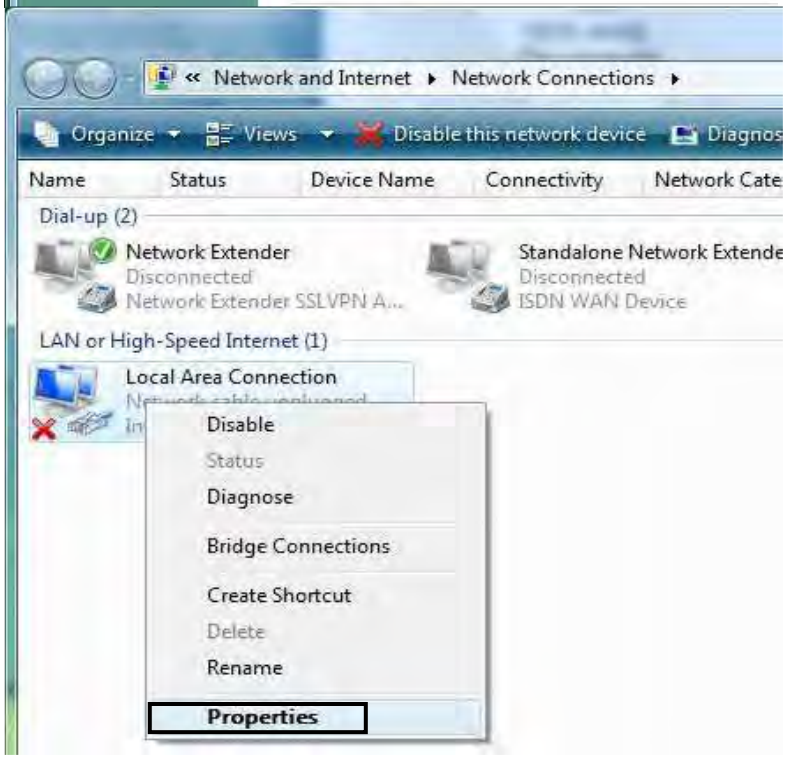
1. Go to **Start**. Click on **Network**.

2. Then click on **Network and Sharing Center** at the top bar.



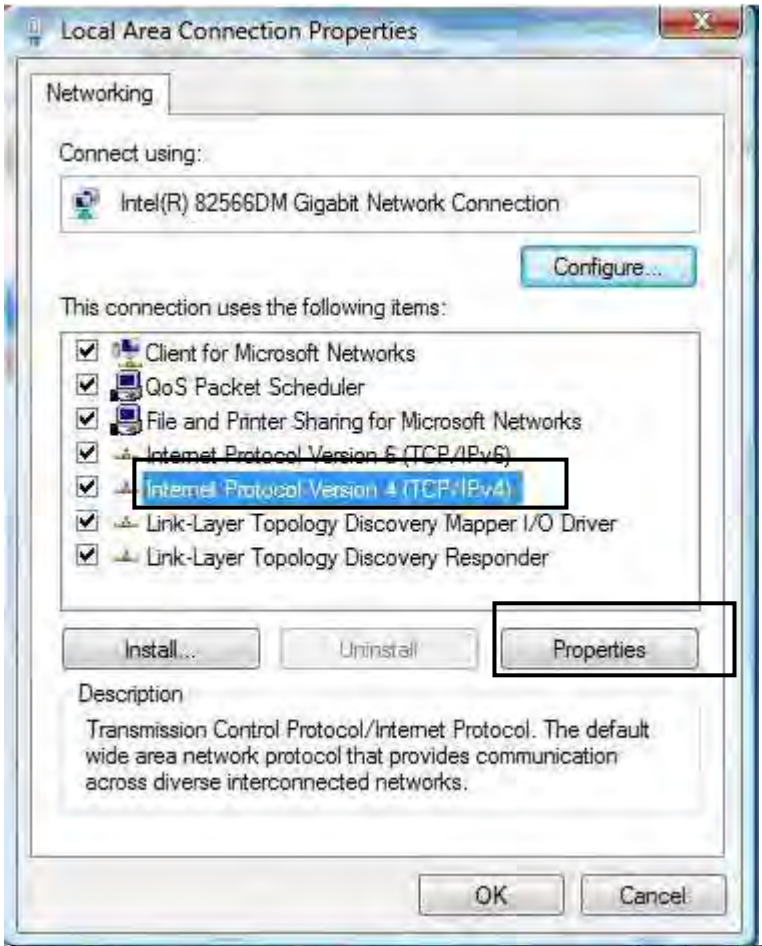
3. When the **Network and Sharing Center** window pops up, select and click on **Manage network connections** on the left window pane.

4. Select the **Local Area Connection**, and right click the icon to select **Properties**.



IPv4:

5. Select **Internet Protocol Version 4 (TCP/IPv4)** then click **Properties**.

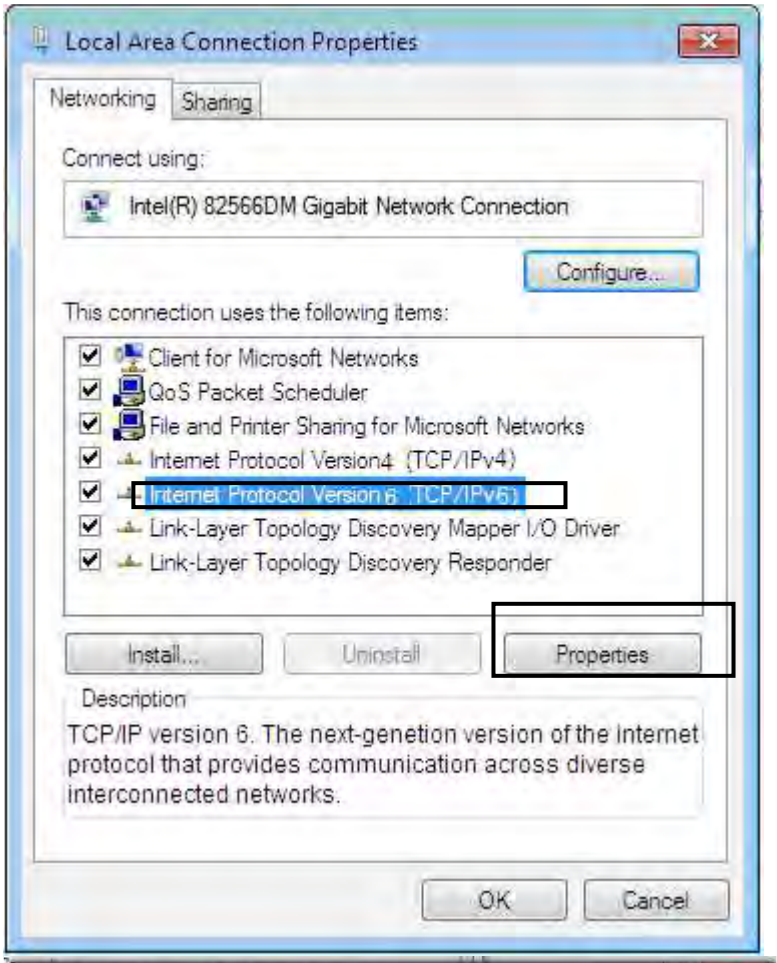


6. In the **TCP/IPv4 properties** window, select the Obtain an **IP address automatically** and **Obtain DNS Server address automatically** radio buttons. Then click **OK** to exit the setting.

7. Click **OK** again in the **Local Area Connection Properties** window to apply the new configuration.

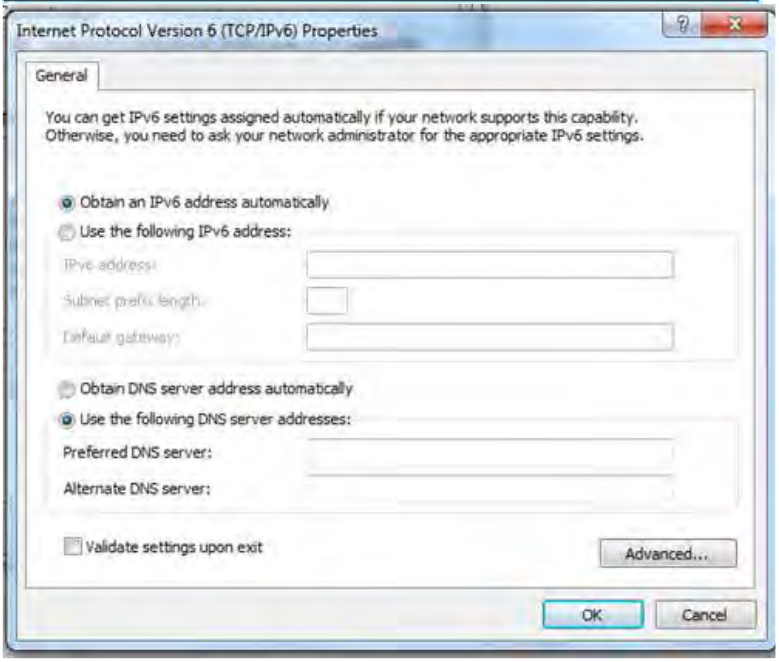
IPv6:

5. Select **Internet Protocol Version 6 (TCP/IPv6)** then click **Properties**.



6. In the **TCP/IPv6 properties** window, select the Obtain an **IPv6 address automatically** and **Obtain DNS Server address automatically** radio buttons. Then click **OK** to exit the setting.

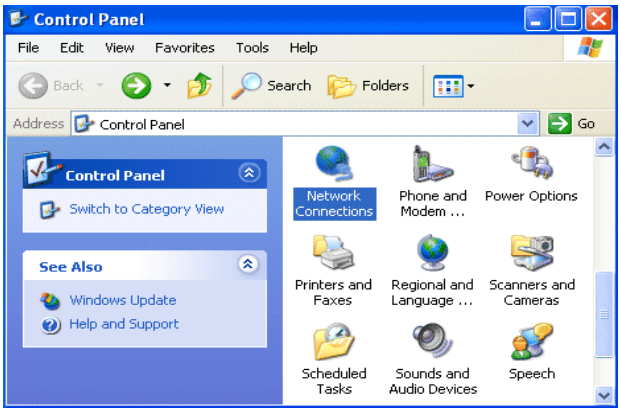
7. Click **OK** again in the **Local Area Connection Properties** window to apply the new configuration.



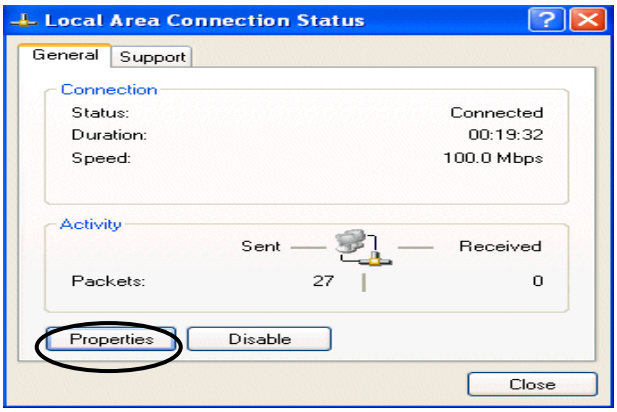
Configuring a PC in Windows XP

IPv4:

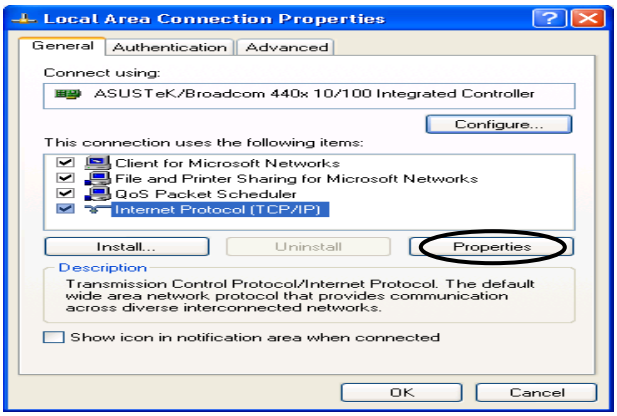
1. Go to **Start / Control Panel (in Classic View)**. In the Control Panel, double-click on **Network Connections**
2. Double-click **Local Area Connection**.



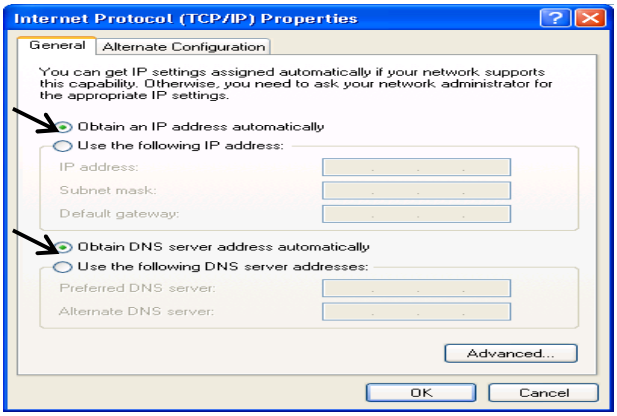
3. In the **Local Area Connection Status** window, click **Properties**.



4. Select **Internet Protocol (TCP/IP)** and click **Properties**.

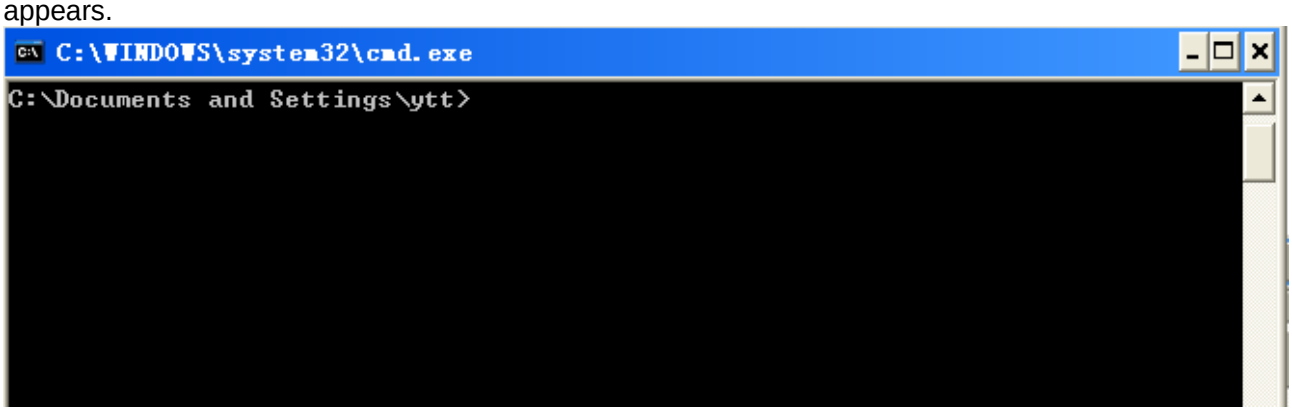


5. Select the **Obtain an IP address automatically** and the **Obtain DNS server address automatically** radio buttons.
6. Click **OK** to finish the configuration.

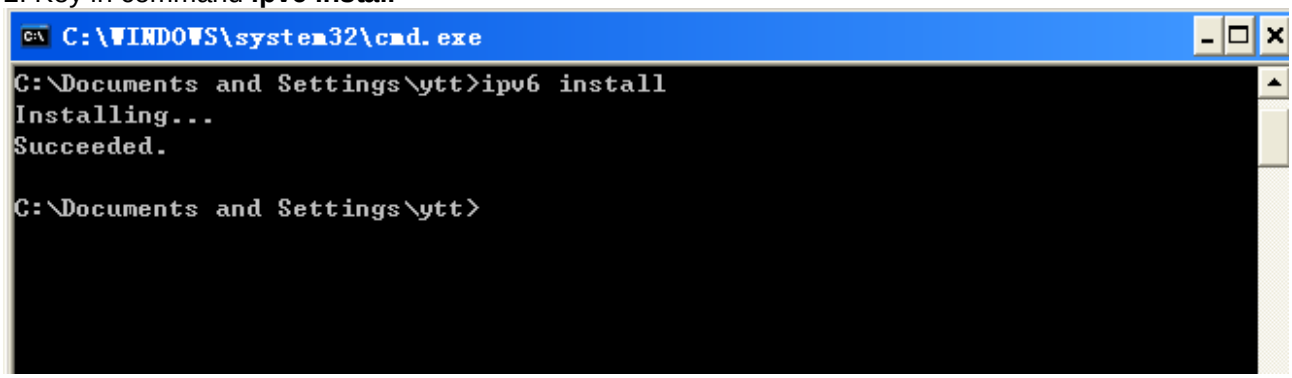


IPv6:

IPv6 is supported by Windows XP, but you should install it first.
Act as shown below:
1. On the desktop, Click Start > Run, type cmd, then press Enter key in the keyboard, the following screen appears.



2. Key in command **ipv6 install**



Configuration is OK now, you can test whether it works ok.

Factory Default Settings

Before configuring your router, you need to know the following default settings.

Web Interface (Username and Password)

Three user levels are provided by this router, namely **Administrator**, **Remote** and **Local** respectively. See Access Control .

Administrator

- Username: admin
- Password: admin

Local

- Username: user
- Password: user

Remote

- Username: support
- Password: support

 Attention	If you have forgotten the username and/or password of the router, you can restore the device to its default setting by pressing the ***Reset Button*** more than ***5*** seconds.

Device LAN IPv4 settings

- IPv4 Address: 192.168.1.254
- Subnet Mask: 255.255.255.0

Device LAN IPv6 settings

- IPv6 Address / prefix: Default is a link-local address and is different from each other as MAC address is different from one to one. For example: fe80:0000:0000:0000:0204:edff:fe01:0001 / 64, the prefix initiates by fe80::

DHCP server for IPv4

- DHCP server is enabled.
- Start IP Address: 192.168.1.100
- IP pool counts: 100

LAN and WAN Port Addresses

The parameters of LAN and WAN ports are pre-set in the factory. The default values are shown in the table.

IPv4

LAN Port		WAN Port
IPv4 address	192.168.1.254	The PPPoE function is enabled to automatically get the WAN port configuration from the ISP.
Subnet Mask	255.255.255.0	
DHCP server function	Enabled	
IP addresses for distribution to PCs	100 IP addresses continuing from 192.168.1.100 through 192.168.1.199	

IPv6

LAN Port		WAN Port
IPv6 address/prefix	Default is a link-local address and is different from each other as MAC address is different from one to one. For example : fe80::204:edff:fe01:1/64, the prefix initiates by fe80::	The PPPoE function is enabled to automatically get the WAN port configuration from the ISP.
DHCP server function	Enabled	

Information from your ISP

Before configuring this device, you have to check with your ISP (Internet Service Provider) to find out what kind of service is provided.

Gather the information as illustrated in the following table and keep it for reference.

PPPoE(RFC2516)	VPI/VCI, VC / LLC-based multiplexing, Username, Password, Service Name, and Domain Name System (DNS) IP address (it can be automatically assigned by your ISP when you connect or be set manually).
PPPoA(RFC2364)	VPI/VCI, VC / LLC-based multiplexing, Username, Password and Domain Name System (DNS) IP address (it can be automatically assigned by your ISP when you connect or be set manually).
DHCP Client	VPI/VCI, VC / LLC-based multiplexing, Domain Name System (DNS) IP address (it can be automatically assigned by your ISP when you connect or be set manually).
IPoA(RFC1577)	VPI/VCI, VC / LLC-based multiplexing, IP address, Subnet mask, Gateway address, and Domain Name System (DNS) IP address (it is a fixed IP address).
Pure Bridge	VPI/VCI, VC / LLC-based multiplexing to use Bridged Mode.

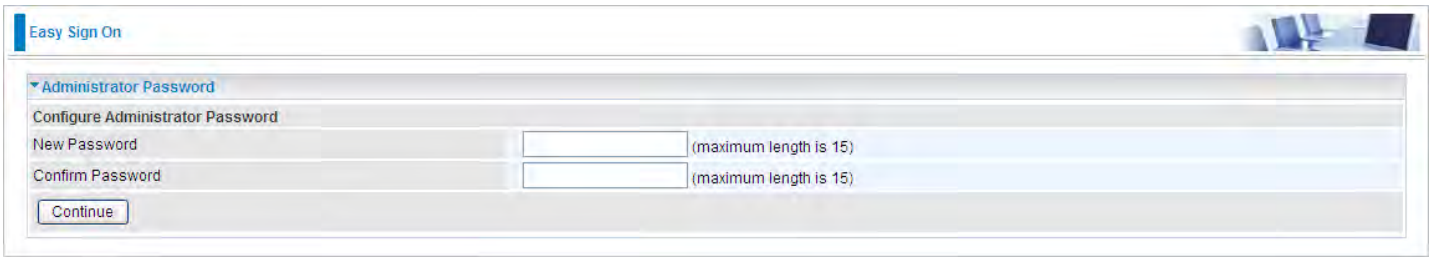
Easy Sign On (EZSO)

This special feature makes it easier for you to configure your router so that you can connect to the internet in a matter of seconds without having to logon to the router GUI for any detail configuration. This configuration method is usually auto initiated if user is to connect to the internet via Billion's router for the first time.

After setting up the router with all the appropriate cables plugged-in, open up your IE browser, the EZSO WEB GUI will automatically pop up and request that you enter some basic information that you have obtained from your ISP. By following the instructions given carefully and through the information you provide, the router will be configured in no time and you will find yourself surfing the internet sooner than you realize.

EZSO window pops up:

Step1: Set the administration password.



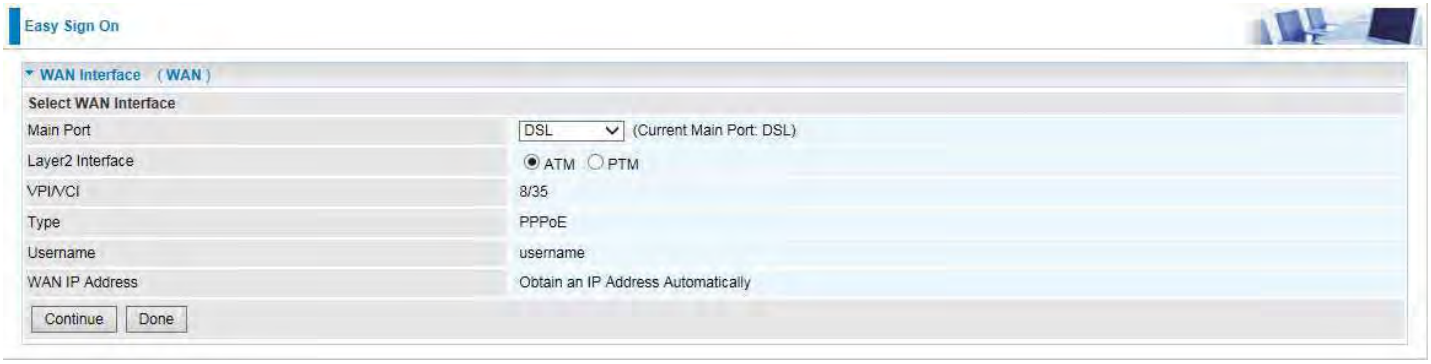
Step 2: Set the Time Zone.

Step 3: Configure the WAN interface.

DSL mode (ADSL mode, please choose ATM; VDSL, please choose PTM)

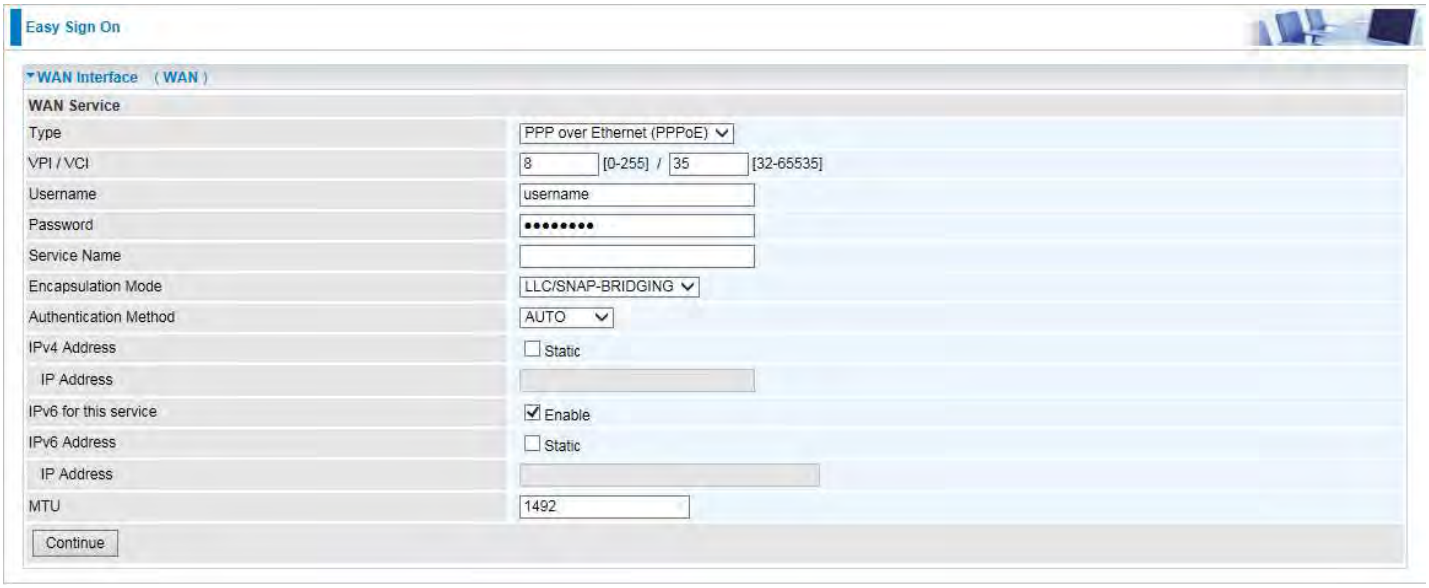
Here take ADSL for example.

Before configuring with DSL mode, please confirm you have correctly connected the DSL line, and it is now synchronized.



1. Select DSL, press **Continue** to go on to next step, press “Done” to quit the setting.

2. Enter the username, password from your ISP, for IP and DNS settings; also refer to your ISP. Here IPv6 service is enabled by default.



If the DSL line doesn't synchronize, the page will pop up warning of the DSL connection failure.

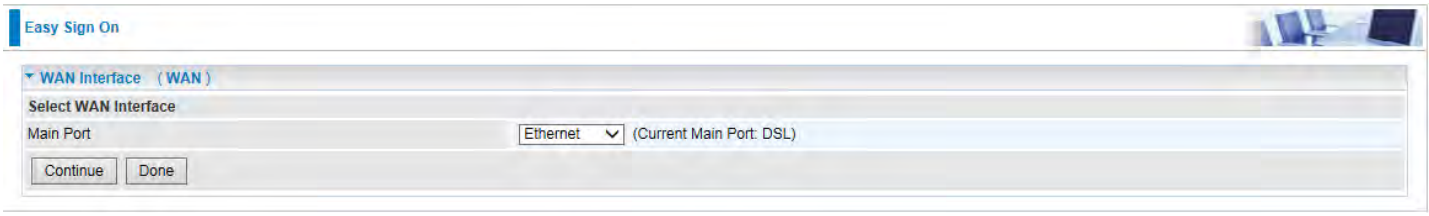
3. Wait while the device is configured (DSL synchronized).

4. Success in configuring the EZSO.

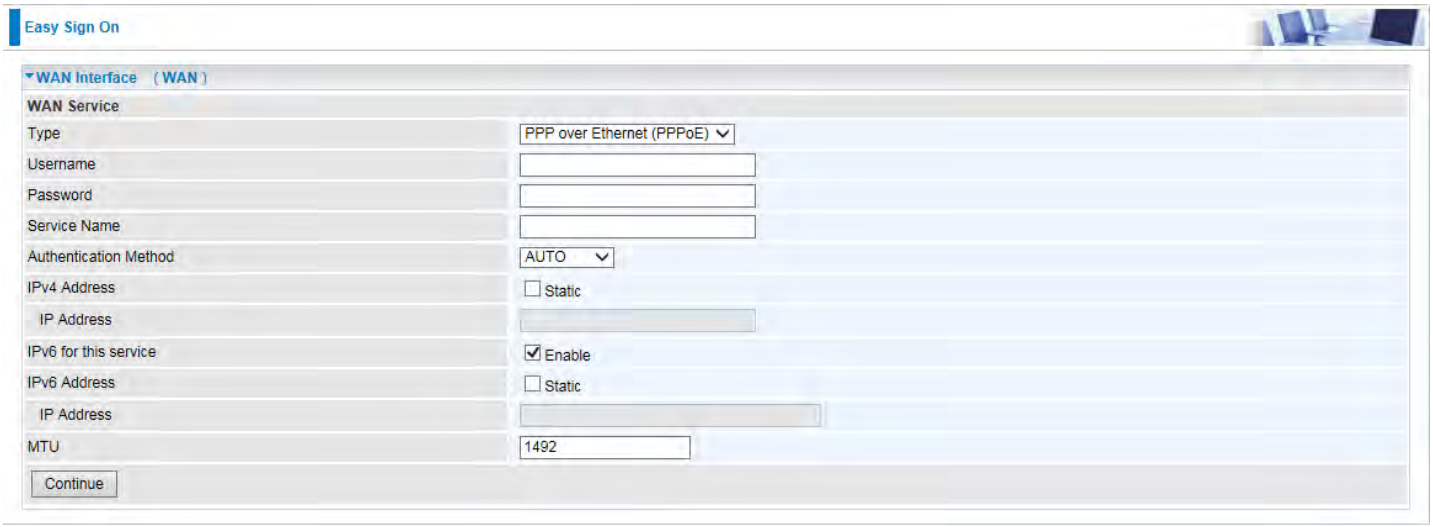
Click link ***192.168.1.254***, it will lead you to the following page.

Ethernet mode

1. Select **Ethernet,** press **Continue** to go on to next step.



2. Enter the username, password from your ISP, for IP and DNS settings, also refer to your ISP. Here IPv6 service is enabled by default.

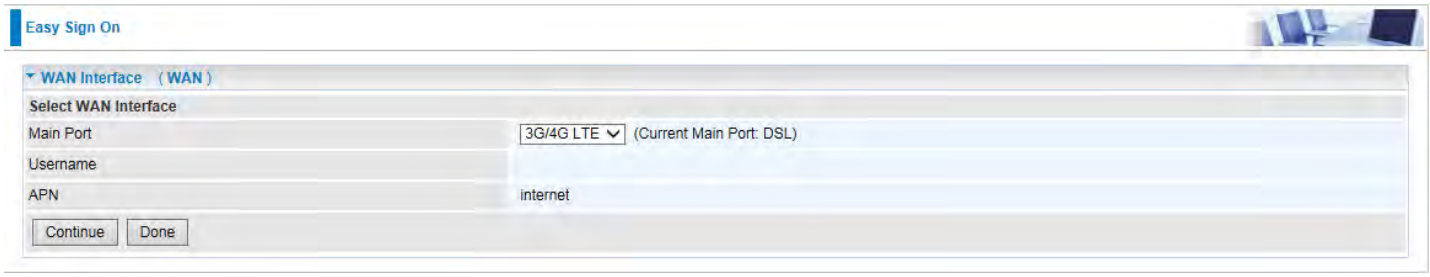


3. Wait while the device is configured.

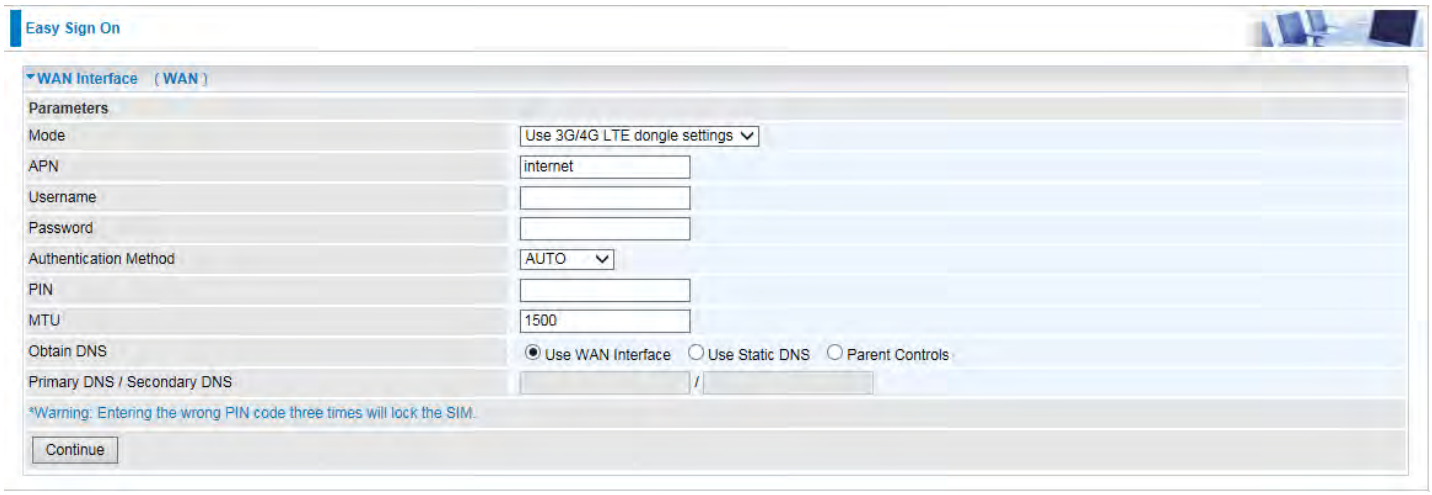
4. Success in configuring the EZSO.

3G/4G LTE

1. Select **3G/4G LTE,** press **Continue** to go on to next step.



2. Enter the APN, username, password from your ISP, for settings about Authentication method, PIN, etc, also refer to your ISP.



3. Wait while the device is configured.

4. Success in configuring the EZSO.

Chapter 4: Configuration

Configuration via Web Interface

Open your web browser; enter the IP address of your router, which by default is 192.168.1.254, and click or press ‘Enter’ key on the keyboard, a login prompt window will appear. The default root username and password are “admin” and “admin” respectively.

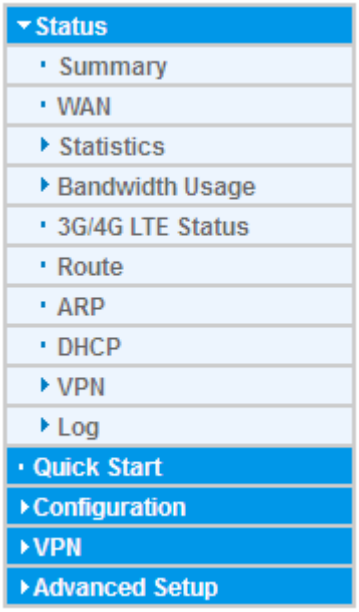
Congratulations! You are now successfully logged in to the VDSL2/ADSL2+ Router!

Once you have logged on to your BiPAC 8900X *R3* Router via your web browser, you can begin to set it up according to your requirements. On the configuration homepage, the left navigation pane links you directly to the setup pages, which include:

- **Status** (Summary, WAN, Statistics, Bandwidth Usage, 3G/4G LTE Status, Route, ARP, DHCP, VPN, Log)
- **Quick Start**
- **Configuration** (LAN, WAN, System, USB, IP Tunnel, Security, Quality of Service, NAT, Wake On LAN)
- **VPN** (IPSec, VPN Account, Exceptional Rule Group, PPTP, L2TP, GRE)
- **Advanced Setup** (Routing, DNS, Static ARP, UPnP, Certificate, Multicast, Management, Diagnostics)

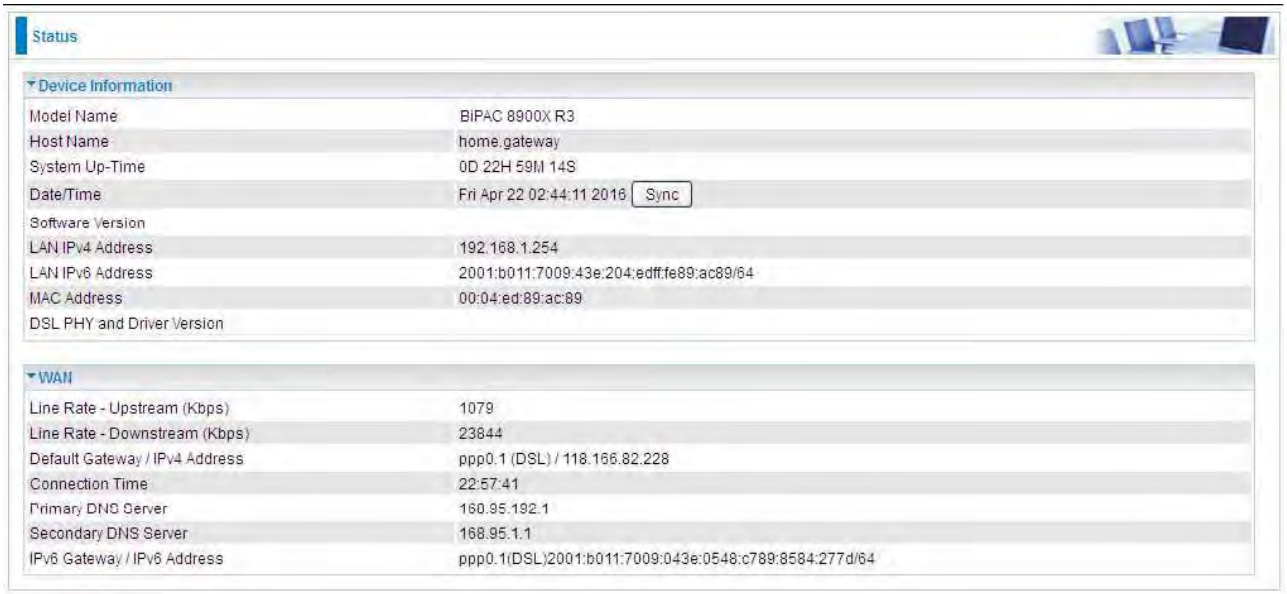
Status

This Section gives users an easy access to the information about the working router and access to view the current status of the router. Here **Summary**, **WAN**, **Statistics**, **Bandwidth Usage**, **3G/4G LTE Status**, **Route**, **ARP**, **DHCP**, **VPN**, and **Log** subsections are included.



Summary

The basic information about the device is provided here (the following is a configured screenshots to let users understand clearly).



Device Information

Model Name: Displays the model name.

Host Name: Displays the name of the router.

System Up-Time: Displays the elapsed time since the device is on.

Date/Time: Displays the current exact date and time. Sync button is to synchronize the Date/Time with your PC time without regard to connecting to internet or not.

Software Version: Firmware version.

LAN IPv4 Address: Displays the LAN IPv4 address.

LAN IPv6 Address: Displays the LAN IPv6 address. Default is a Link-Local address, but when connects to ISP, it will display the Global Address, like above figure.

MAC Address: Displays the MAC address.

DSL PHY and Driver Version: Display DSL PHY and Driver version.

WAN

Line Rate – Upstream (Kbps): Display Upstream line Rate in Kbps.

Line Rate – Downstream (Kbps): Display Downstream line Rate in Kbps.

Default Gateway/IP4 Address: Display Default Gateway and the IPv4 address.

Connection Time: Display the elapsed time since ADSL connection is up.

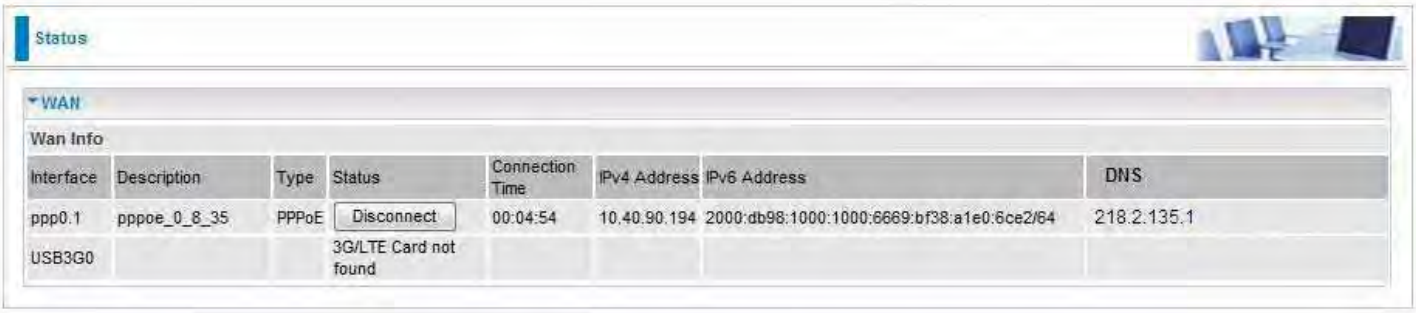
Primary DNS Server: Display IPV4 address of Primary DNS Server.

Secondary DNS Server: Display IPV4 address of Secondary DNS Server.

Default IPv6 Gateway/IPv6 Address: Display the IPv6 Gateway and the obtained IPv6 address.

WAN

This table displays the information of the WAN connections, users can turn here for WAN connection information.



Interface: The WAN connection interface.

Description: The description of this connection.

Type: The protocol used by this connection.

Status: To disconnect or connect the link.

Connection Time: The WAN connection time since WAN is up.

IPv4 Address: The WAN IPv4 Address the device obtained.

IPv6 Address: The WAN IPv6 Address the device obtained.

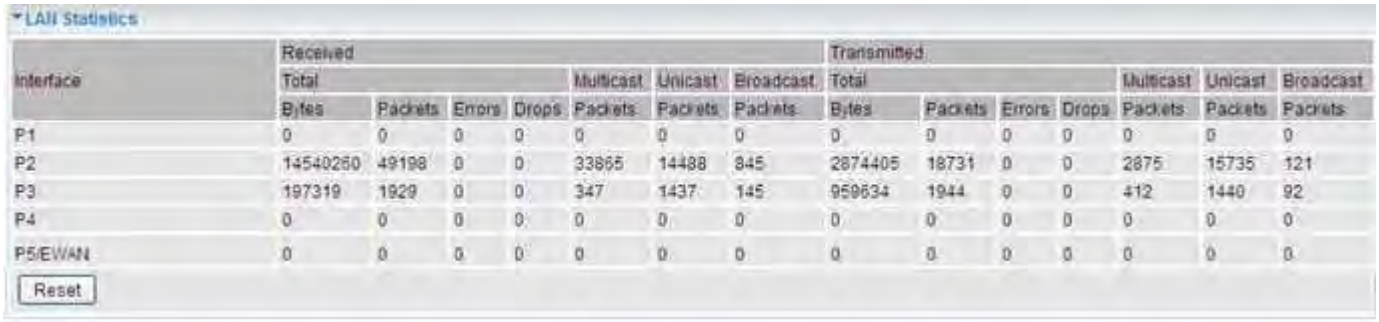
DNS: The DNS address the device obtained.

Statistics

LAN

The table shows the statistics of LAN.

Note: P5 can be configured as EWAN, and when the device is in EWAN profile, there is no P5/EWAN interface as P5 is working as a WAN port. If you need P5, please remove EWAN interface, see EWAN Interface Removal.

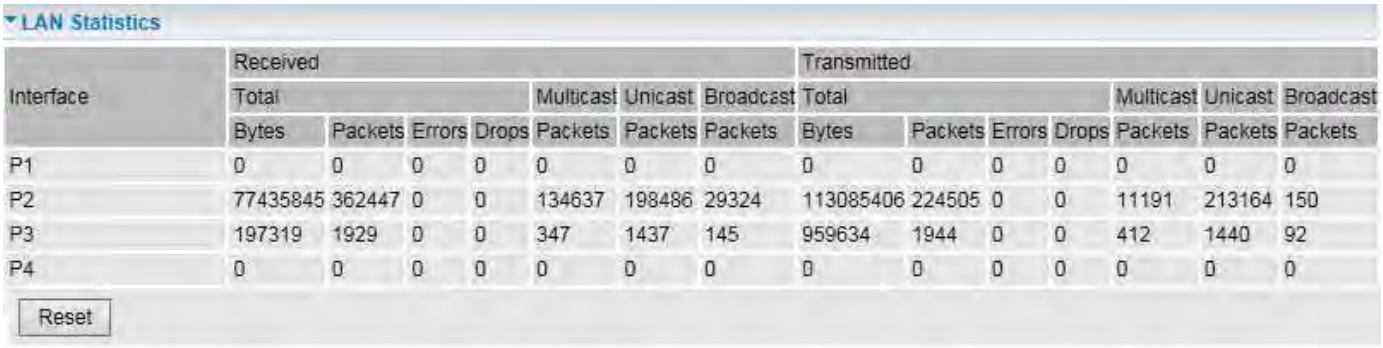


LAN Statistics

Interface	Received							Transmitted						
	Total				Multicast	Unicast	Broadcast	Total				Multicast	Unicast	Broadcast
	Bytes	Packets	Errors	Drops	Packets	Packets	Packets	Bytes	Packets	Errors	Drops	Packets	Packets	Packets
P1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P2	14540260	49198	0	0	33865	14488	845	2874405	18731	0	0	2875	15735	121
P3	197319	1929	0	0	347	1437	145	959634	1944	0	0	412	1440	92
P4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P5/EWAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Reset

(DSL)



LAN Statistics

Interface	Received							Transmitted						
	Total				Multicast	Unicast	Broadcast	Total				Multicast	Unicast	Broadcast
	Bytes	Packets	Errors	Drops	Packets	Packets	Packets	Bytes	Packets	Errors	Drops	Packets	Packets	Packets
P1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P2	77435845	362447	0	0	134637	198486	29324	113085406	224505	0	0	11191	213164	150
P3	197319	1929	0	0	347	1437	145	959634	1944	0	0	412	1440	92
P4	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Reset

(EWAN)

Interface: List each LAN interface. P1-P5 indicates the LAN interfaces (P5 can be configured as EWAN).

Bytes: Display the total Received and Transmitted traffic statistics in Bytes for each interface.

Packets: Display the total Received and Transmitted traffic statistics in Packets for each interface.

Errors: Display the total statistics of errors arising in Receiving or Transmitting data for each interface.

Drops: Display the total statistics of drops arising in Receiving or Transmitting data for each interface.

Multicast (packets): Display the Received and Transmitted multicast Packets for each interface.

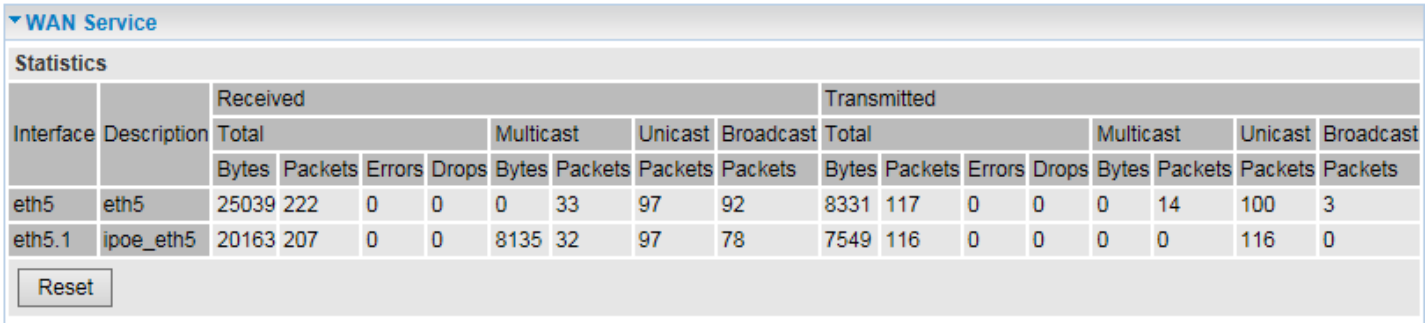
Unicast (packets): Display the Received and Transmitted unicast Packets for each interface.

Broadcast (packets): Display the Received and Transmitted broadcast Packets for each interface.

Reset: Press this button to refresh the statistics.

WAN Service

The table shows the statistics of WAN.



WAN Service

Statistics

Interface	Description	Received								Transmitted							
		Total				Multicast		Unicast	Broadcast	Total				Multicast		Unicast	Broadcast
		Bytes	Packets	Errors	Drops	Bytes	Packets	Packets	Packets	Bytes	Packets	Errors	Drops	Bytes	Packets	Packets	Packets
eth5	eth5	25039	222	0	0	0	33	97	92	8331	117	0	0	0	14	100	3
eth5.1	ipoe_eth5	20163	207	0	0	8135	32	97	78	7549	116	0	0	0	0	116	0

Reset

Interface: Display the connection interface.

Description: The description for the connection.

Bytes: Display the Received and Transmitted traffic statistics in Bytes for every WAN interface.

Packets: Display the Received and Transmitted traffic statistics in Packests for every WAN interface.

Errors: Display the statistics of errors arising in Receiving or Transmitting data for every WAN interface.

Drops: Display the statistics of drops arising in Receiving or Transmitting data for every WAN interface.

Multicast (packets): Display the Received and Transmitted multicast Packets for every WAN interface.

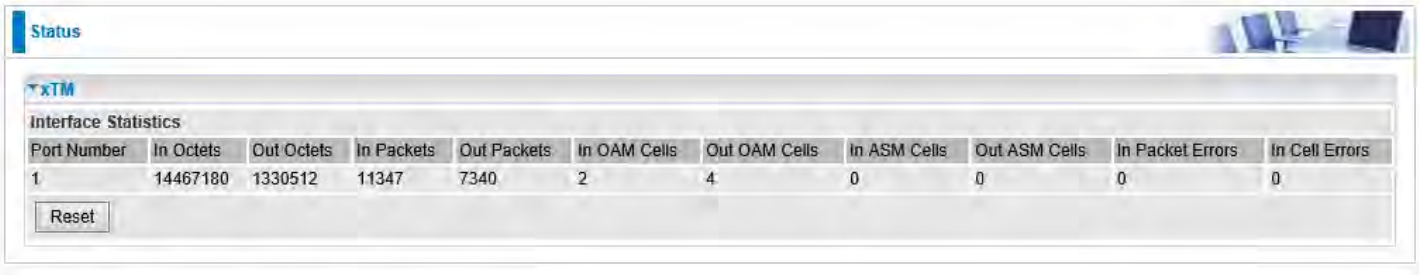
Unicast (packets): Display the Received and Transmitted unicast Packets for every WAN interface.

Broadcast (packets): Display the Received and Transmitted broadcast Packets for every WAN interface.

Reset: Press this button to refresh the statistics.

xTM

The Statistics-xTM screen displays all the xTM statistics



Port Number: Shows number of the port for xTM.

In Octets: Number of received octets over the interface.

Out Octets: Number of transmitted octets over the interface.

In Packets: Number of received packets over the interface.

Out Packets: Number of transmitted packets over the interface.

In OAM Cells: Number of OAM cells received.

Out OAM Cells: Number of OAM cells transmitted.

In ASM Cells: Number of ASM cells received.

Out ASM Cells: Number of ASM cells transmitted.

In Packet Errors: Number of received packets with errors.

In Cell Errors: Number of received cells with errors.

Reset: Click to reset the statistics.

xDSL

Status

xDSL

xDSL		
Mode	ADSL_2plus	
Traffic Type	ATM	
Status	Up	
Link Power State	L0	
	Downstream	Upstream
Line Coding (Trellis)	On	On
SNR Margin (dB)	7.2	7.2
Attenuation (dB)	0.0	1.3
Output Power (dBm)	7.2	9.3
Attainable Rate (Kbps)	28388	1335
Rate (Kbps)	27447	1299
MSGc (# of bytes in overhead channel message)	51	27
B (# of bytes in Mux Data Frame)	244	81
M (# of Mux Data Frames in FEC Data Frame)	1	1
T (Mux Data Frames over sync bytes)	4	1
R (# of check bytes in FEC Data Frame)	0	0
S (ratio of FEC over PMD Data Frame length)	0.2853	1.9939
L (# of bits in PMD Data Frame)	6869	329
D (interleaver depth)	1	1
Delay (msec)	0.7	0.49
INP (DMT symbol)	0.0	0.0
Super Frames	0	0
Super Frame Errors	0	0
RS Words	0	3255787
RS Correctable Errors	0	0
RS Uncorrectable Errors	0	0
HEC Errors	0	0
OCD Errors	0	0
LCD Errors	0	0
Total Cells	246668876	11669357
Data Cells	174531	18211
Bit Errors	0	0
Total ES	0	0
Total SES	0	0
Total UAS	25	25

xDSL BER Test | Reset

Mode: Modulation protocol, including G.dmt, G.lite, T1.413, ADSL2, AnnexL, ADSL2+ and AnnexM.

Traffic Type: Transfer mode, here supports ATM and PTM.

Status: Show the status of DSL link.

Link Power State: Show link output power state.

Line Coding (Trellis): Trellis on/off.

SNR Margin (dB): Show the Signal to Noise Ratio(SNR) margin.

Attenuation (dB): This is estimate of average loop attenuation of signal.

Output Power (dBm): Show the output power.

Attainable Rate (Kbps): The sync rate you would obtain.

Rate (Kbps): Show the downstream and upstream rate in Kbps.

MSGc (#of bytes in overhead channel message): The number of bytes in overhead channel message.

B (# of bytes in Mux Data Frame): The number of bytes in Mux Data frame.

M (# of Mux Data Frames in FEC Data Frame): The number of Mux Data frames in FEC frame.

T (Mux Data Frames over sync bytes): The number of Mux Data frames over all the sync bytes.

R (# of check bytes in FEC Data Frame): The number of check bytes in FEC frame.

S (ratio of FEC over PMD Data Frame length): The ratio of FEC over PMD Data frame length

L (# of bits in PMD Data Frame): The number of bit in PMD Data frame

D (interleaver depth): Show the interleaver depth.

Delay (msec): Show the delay time in msec.

INP (DMT symbol): Show the DMT symbol.

Super Frames: The total number of super frames.

Super Frame Errors: the total number of super frame errors.

RS Words: Total number of Reed-Solomon code errors.

RS Correctable Errors: Total number of RS with correctable errors.

RS Uncorrectable Errors: Total number of RS words with uncorrectable errors.

HEC Errors: Total number of Header Error Checksum errors.

OCD Errors: Total number of out-of-cell Delineation errors.

LCD Errors: Total number of Loss of Cell Delineation.

Total Cells: Total number of cells.

Data Cells: Total number of data cells.

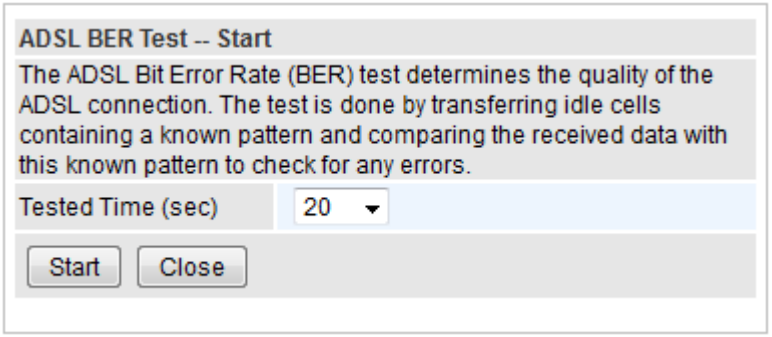
Bit Errors: Total number of bit errors.

Total ES: Total Number of Errored Seconds.

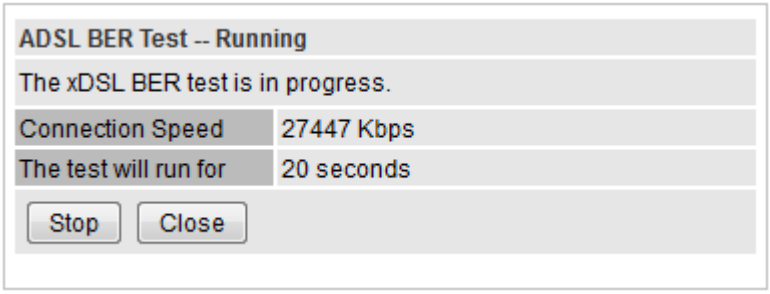
Total SES: Total Number of Severely Errored Seconds.

Total UAS: Total Number of Unavailable Seconds.

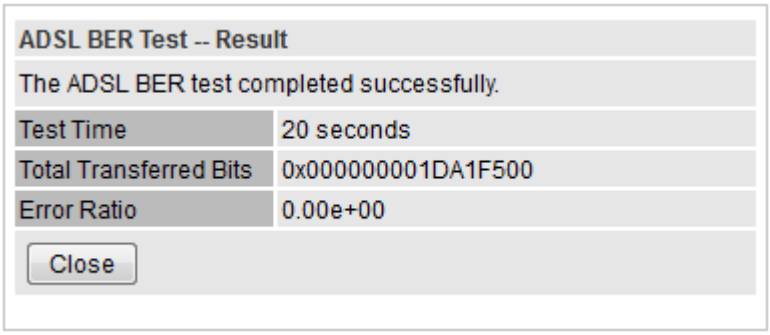
xDSL BER Test: Click this button to start a bit Error Rate Test. The ADSL Bit Error Rate (BER) test determines the quality of the ADSL connection. The test is done by transferring idle cells containing a known pattern and comparing the received data with this known pattern to check for any errors.



Select the Tested Time(sec), press **Start** to start test.



When it is OK, the following test result window will appear. You can view the quality of ADSL connection. Here the connection is OK.



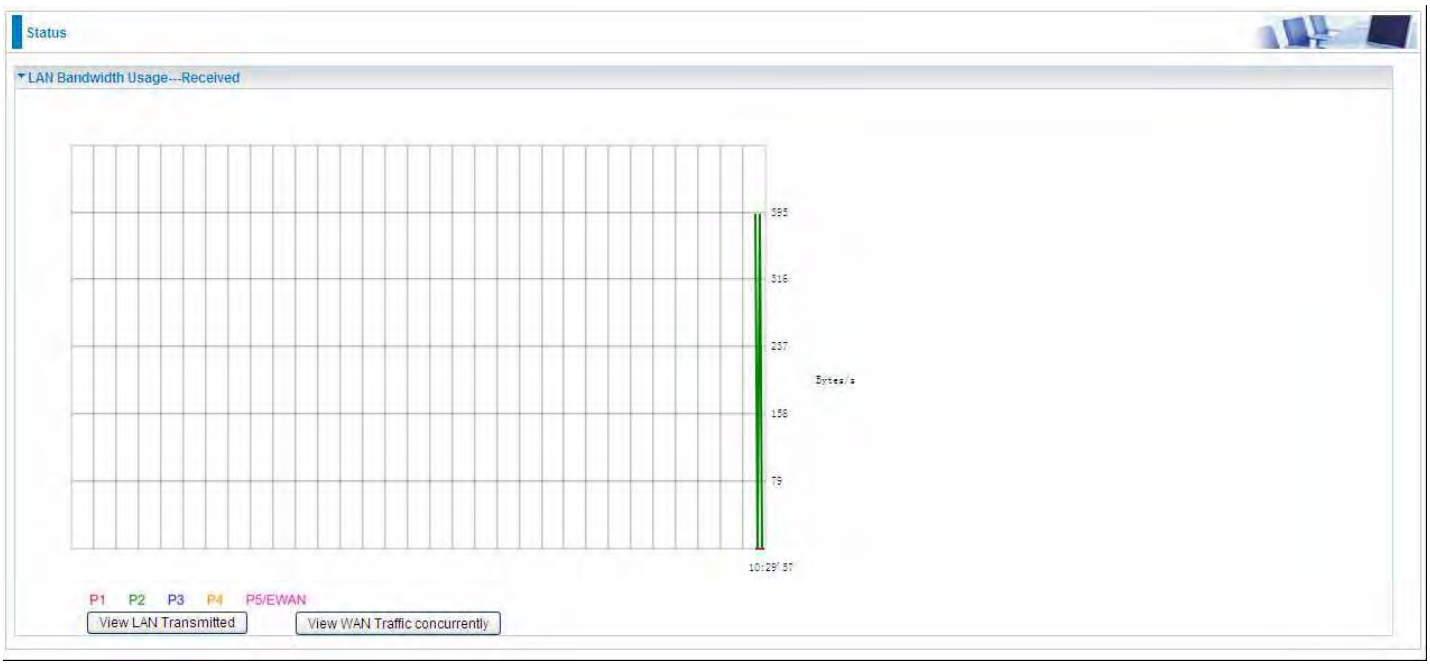
Reset: Click this button to reset the statistics.

Bandwidth Usage

Bandwidth Usage provides users direct view of bandwidth usage with simple diagram. Bandwidth usage shows the use of the bandwidth from two angles: Transmitted and Received, giving users a clear idea of the usage.

LAN

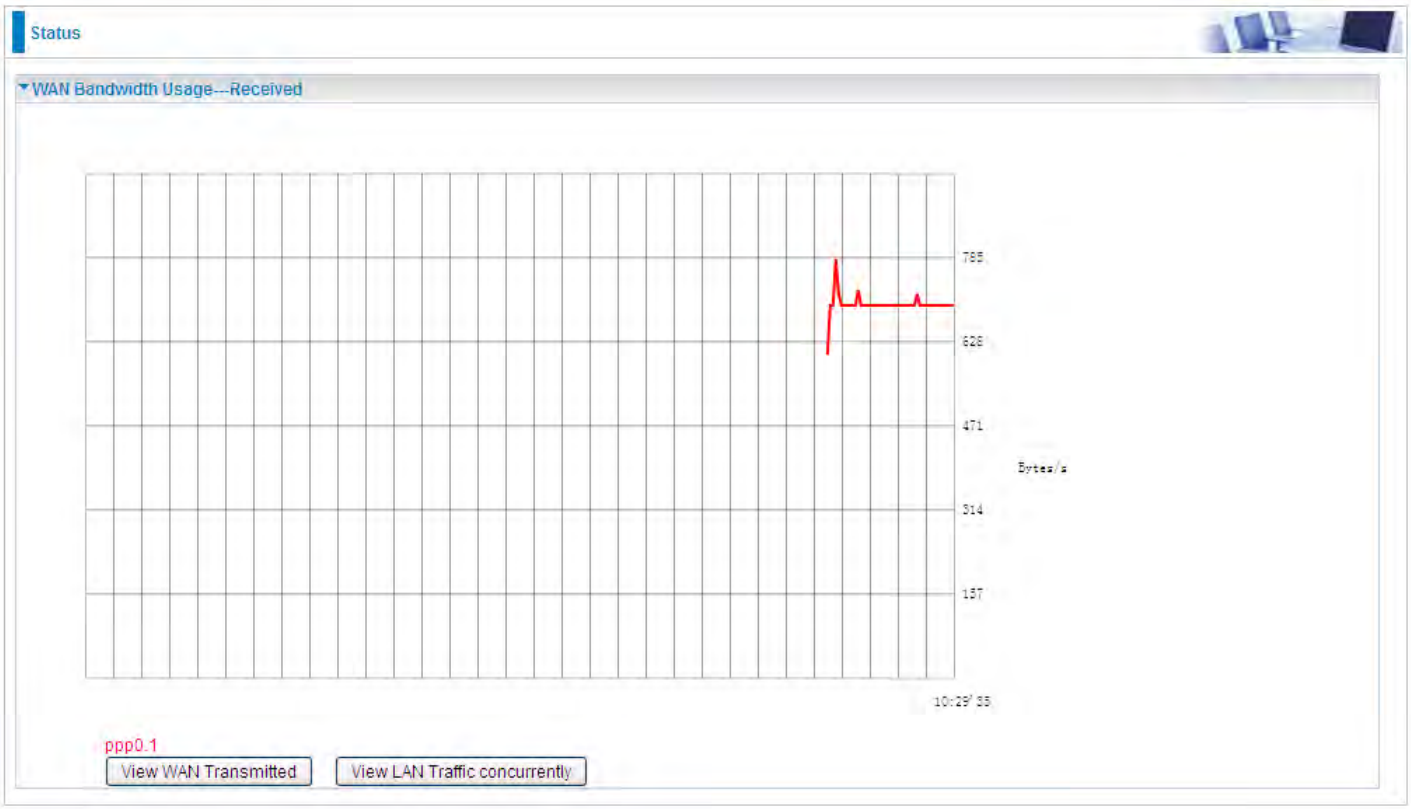
Note: P5 can be configured as EWAN, and when the device is in EWAN profile, there is no P5/EWAN interface as P5 is working as a WAN port. If you need P5, please remove EWAN interface in WAN Interface section.



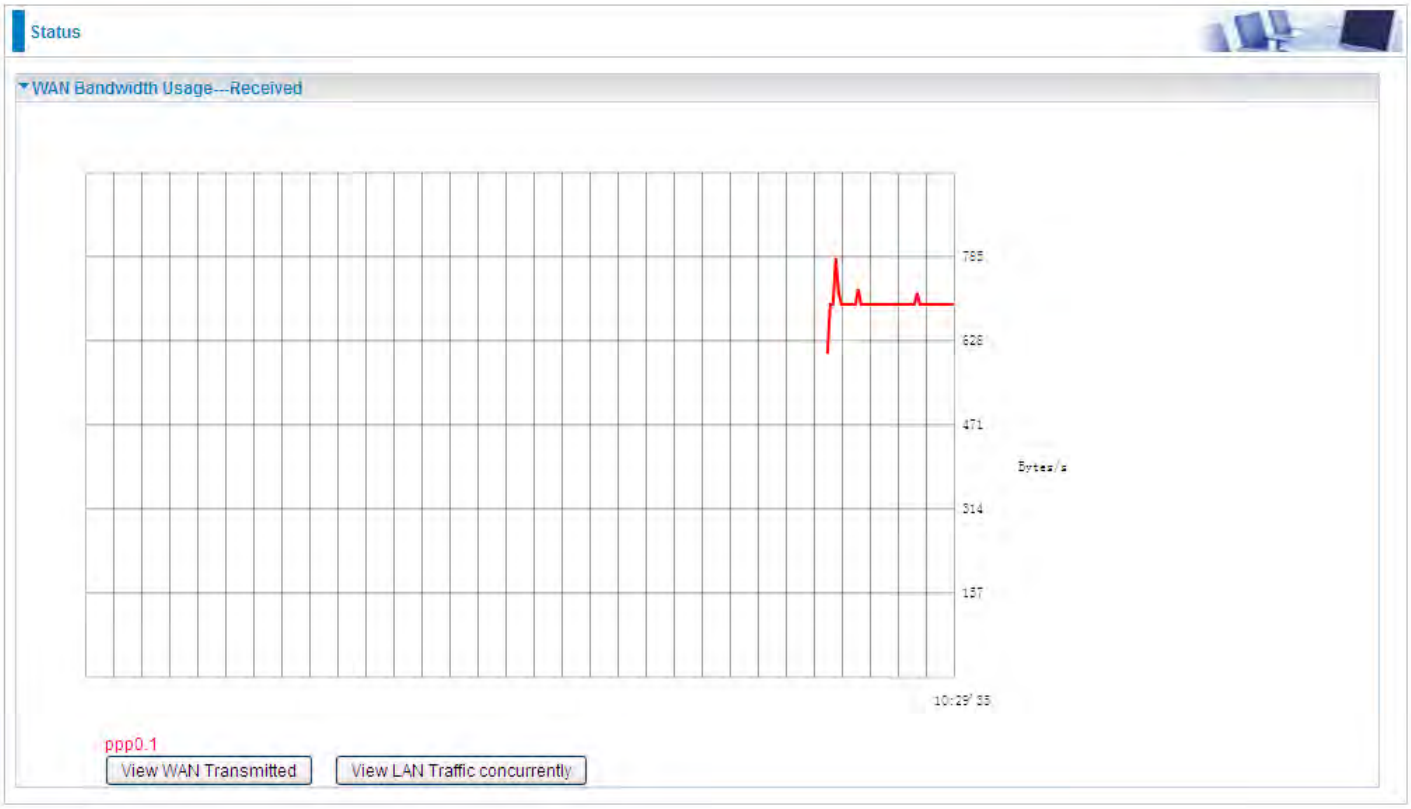
(EWAN)

Press **View LAN Transmitted** button to change the diagram to the statistics from a Received Bytes of view. (**Note:** P2 means Ethernet port #2, and the traffic information of the port #2 is identified with green, the same color with eth1 in the diagram; other ports all take the same mechanism.)

When you press **View WAN Traffic concurrently** button, the WAN Bandwidth Usage pops up so that users can view the WAN traffic concurrently.



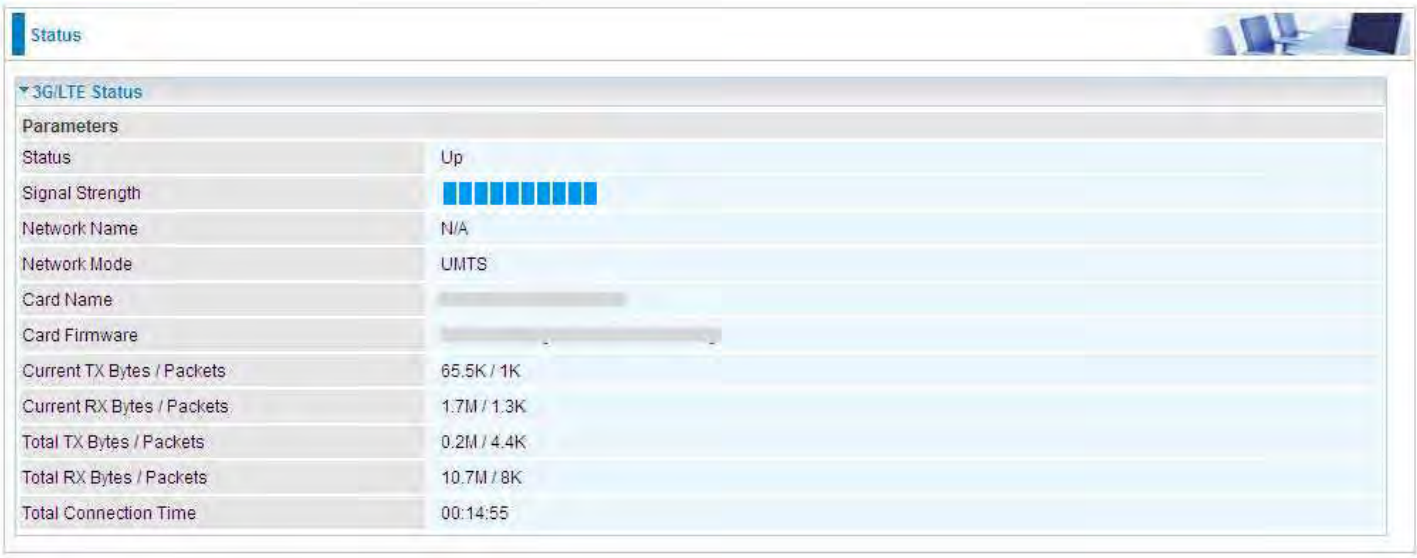
WAN Service



Press **View WAN Transmitted** button to change the diagram to the statistics from a Received Bytes of view.

Press **View LAN Traffic concurrently** button to directly switch to the LAN Bandwidth Usage page to view the LAN traffic concurrently.

3G/4G LTE Status



Status: The current status of the 3G/4G LTE card.

Signal Strength: The signal strength bar indicates current 3G/4G signal strength.

Network Name: The network name that the device is connected to.

Network Mode: The current operation mode for 3G/4G LTE card, it depends on service provider and card's limitation, GSM or UMTS.

Card Name: The name of the 3G/4G LTE card.

Card Firmware: The current firmware for the 3G/4G LTE card.

Current TX Bytes / Packets: The statistics of transmission, count for this call.

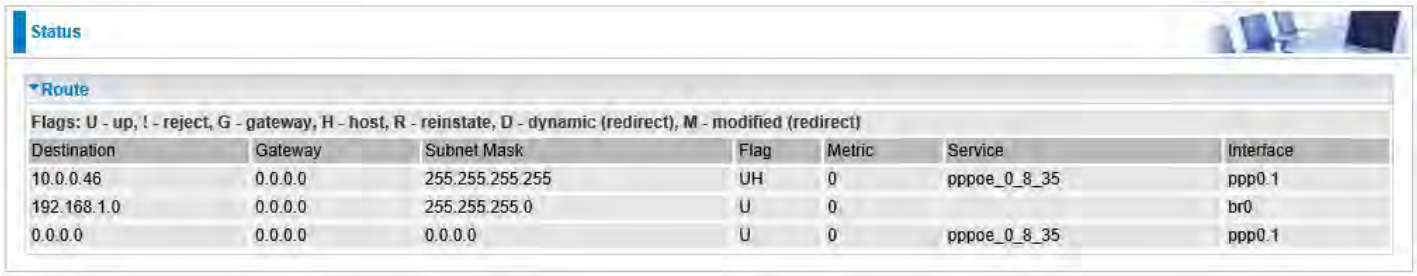
Current RX Bytes / Packets: The statistics of receive, count for this call.

Total TX Bytes / Packets: The statistics of transmission, count from system ready.

Total RX Bytes / Packets: The statistics of receive, count from system ready.

Total Connection Time: The statistics of the connection time since system is ready.

Route



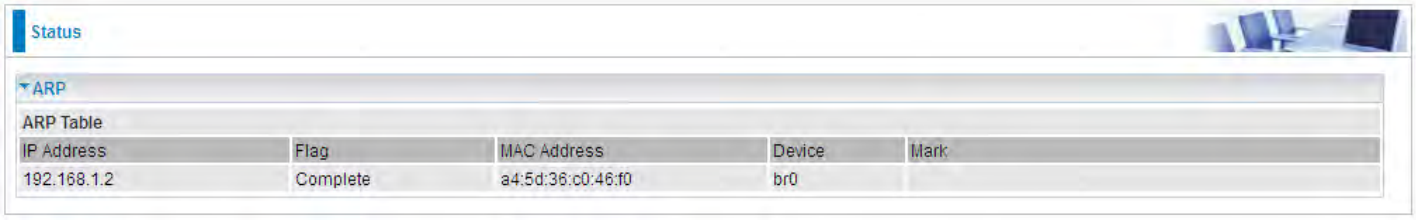
Destination: The IP address of destination network.
Gateway: The IP address of the gateway this route uses.
Subnet Mask: The destination subnet mask.
Flag: Show the status of the route.

- **U:** Show the route is activated or enabled.
- **H (host):** destination is host not the subnet.
- **G:** Show that the outside gateway is needed to forward packets in this route.
- **R:** Show that the route is reinstated from dynamic routing.
- **D:** Show that the route is dynamically installed by daemon or redirecting.
- **M:** Show the route is modified from routing daemon or redirect.

Metric: Display the number of hops counted as the Metric of the route.
Service: Display the service that this route uses.
Interface: Display the existing interface this route uses.

ARP

This section displays the router's ARP (Address Resolution Protocol) Table, which shows the mapping of Internet (IP) addresses to Ethernet (MAC) addresses. This is useful as a quick way of determining the MAC address of the network interface of your PCs to use with the router's ***Security – MAC Filtering*** function. Here IPv6 Neighbor Table, listed with IPv6 address-MAC mapping, is supported.



ARP table

IP Address: Shows the IP Address of the device that the MAC address maps to.

Flag: Shows the current status of the ARP entries.

- Complete: the route resolving is processing well.
- M(Marked as permanent entry): the route is permanent.
- P (publish entry): publish this route item.

MAC Address: Shows the MAC address that is corresponded to the IP address of the device it is mapped to.

Device: here refers to the physical interface, it is a concept to identify Clients from LAN or WAN. For example, the Clients in LAN, here displays "br0".

Mark: Show clearly the SSID (WLAN) the device is in.

IPv6 Address

IPv6 address: Shows the IPv6 Address of the device that the MAC address maps to.

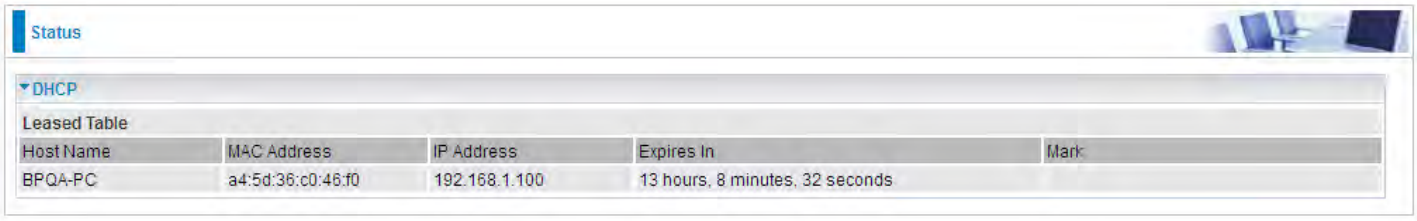
MAC Address: Shows the MAC address that is corresponded to the IPv6 address of the device it is mapped to.

Device: here refers to the physical interface, it is a concept to identify Clients from LAN or WAN. For example, the Clients in LAN, here displays "br0".

Mark: Show clearly the SSID (WLAN) the device is in.

DHCP

The DHCP Table lists the DHCP lease information for all IP addresses assigned by the DHCP server in the device.



Host Name: The Host Name of DHCP client.

MAC Address: The MAC Address of internal DHCP client host.

IP Address: The IP address which is assigned to the host with this MAC address.

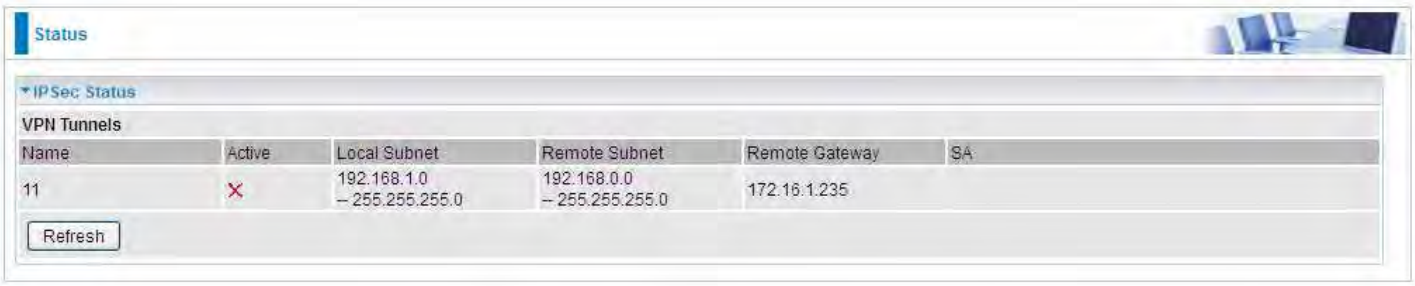
Expires in: Show the remaining time after registration.

Mark: Show clearly the SSID (WLAN) the device is in.

VPN

VPN status viewing section provides users IPSec, PPTP, L2TP， OpenVPN and GRE VPN status.

IPSec



Name: The IPSec connection name.

Active: Display the connection status.

Local Subnet: Display the local network.

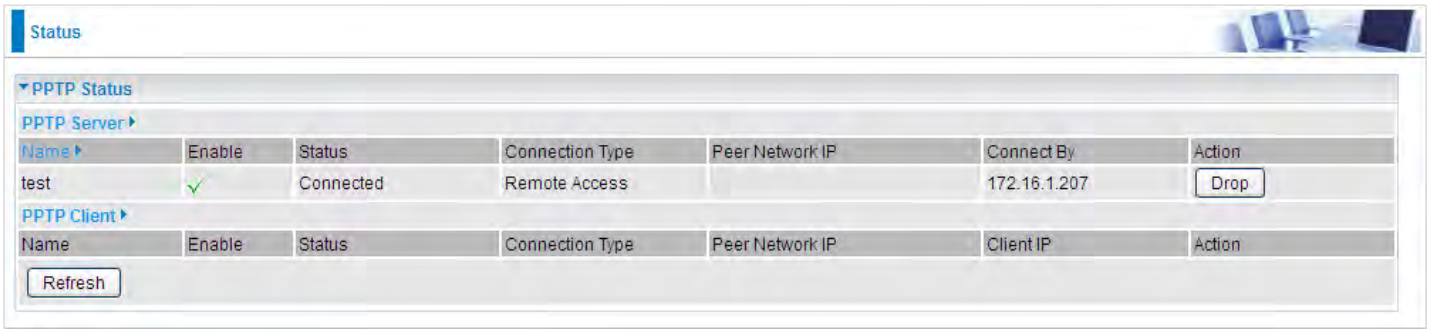
Remote Subnet: Display the remote network.

Remote Gateway: The remote gateway address.

SA: The Security Association for this IPSec entry.

Refresh: Click this button to refresh the tunnel status.

PPTP



PPTP Server

Name: The PPTP connection name.

Enable: Display the connection status with icons.

Status: The connection status.

Connection Type: Remote Access or LAN to LAN.

Peer Network IP: Display the remote network and subnet mask in LAN to LAN PPTP connection.

Connected By: Display the IP of remote connected client.

Action: Act to the connection. Click Drop button to disconnect the tunnel connection.

PPTP Client

Name: The PPTP connection name.

Enable: Display the connection status with icons.

Status: The connection status.

Connection Type: Remote Access or LAN to LAN.

Peer Network IP: Display the remote network and subnet mask in LAN to LAN PPTP connection.

Client: Assigned IP by PPTP server.

Action: Act to the connection. Click Drop button to disconnect the tunnel connection.

Refresh: Click this button to refresh the connection status.

L2TP

L2TP Server

Name: The L2TP connection name.

Enable: Display the connection status with icons.

Status: The connection status.

Connection Type: Remote Access or LAN to LAN.

Peer Network IP: Display the remote network and subnet mask in LAN to LAN L2TP connection.

Connected By: Display the IP of remote connected client.

Action: Act to the connection. Click Drop button to disconnect the tunnel connection.

L2TP Client

Name: The L2TP connection name.

Enable: Display the connection status with icons.

Status: The connection status.

Connection Type: Remote Access or LAN to LAN.

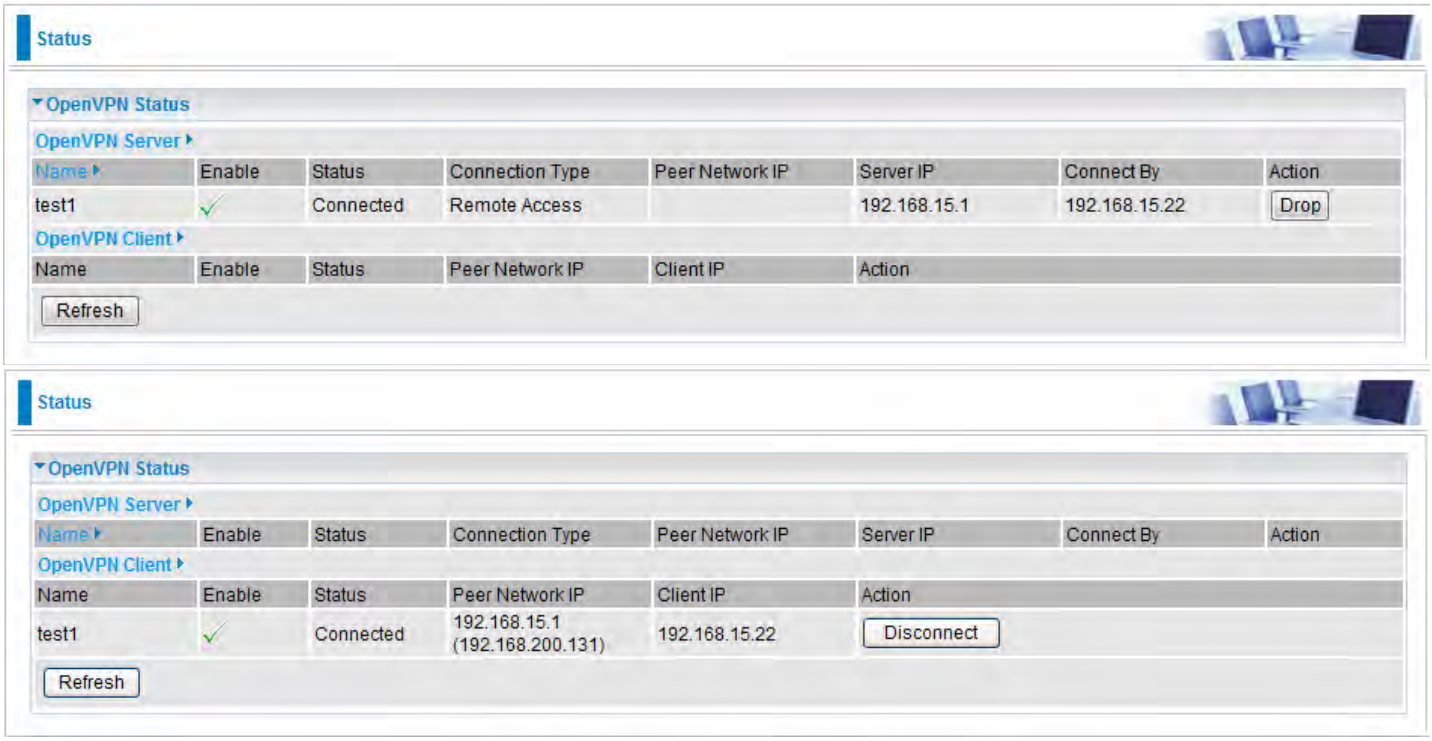
Peer Network IP: Display the remote network and subnet mask in LAN to LAN L2TP connection.

Client: Assigned IP by L2TP server.

Action: Act to the connection. Click Drop button to disconnect the tunnel connection.

Refresh: Click this button to refresh the connection status.

OpenVPN



OpenVPN Server

Name: The OpenVPN connection name.

Enable: Display the connection status with icon.

Status: The connection status.

Connection Type: Remote Access or LAN to LAN.

Peer Network IP: Display the subnet address of client side in LAN to LAN mode.

Server IP: The tunnel virtual IP of server side assigned by server itself.

Connected By: The assigned tunnel virtual IP to remotely connected OpenVPN client.

Action: Act to the connection. Click Drop button to disconnect the tunnel connection.

OpenVPN Client

Name: The OpenVPN connection name.

Enable: Display the connection status with icon.

Status: The connection status.

Connection Type: Remote Access or LAN to LAN.

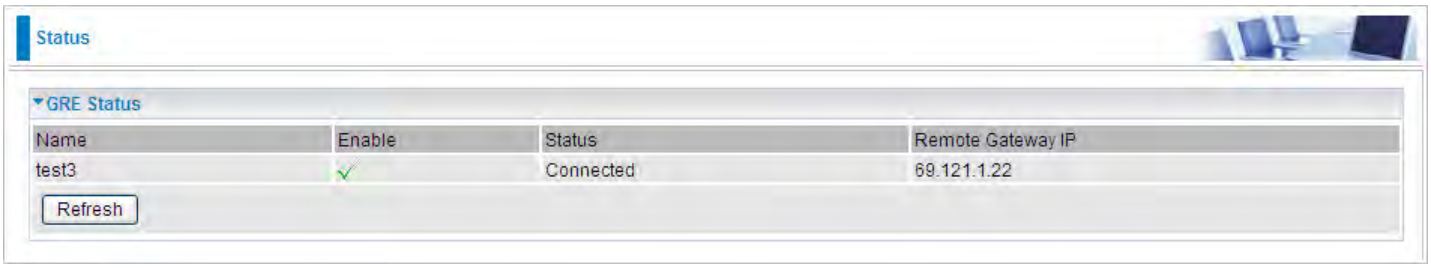
Peer Network IP: Display the tunnel virtual address (WAN address) of server side.

Client: Assigned tunnel virtual IP by OpenVPN server.

Action: Act to the connection. Click Disconnect button to disconnect the tunnel connection.

Refresh: Click this button to refresh the connection status.

GRE



Name: The GRE connection name.

Enable: Display the connection status with icons.

Status: The connection status, connected or disable.

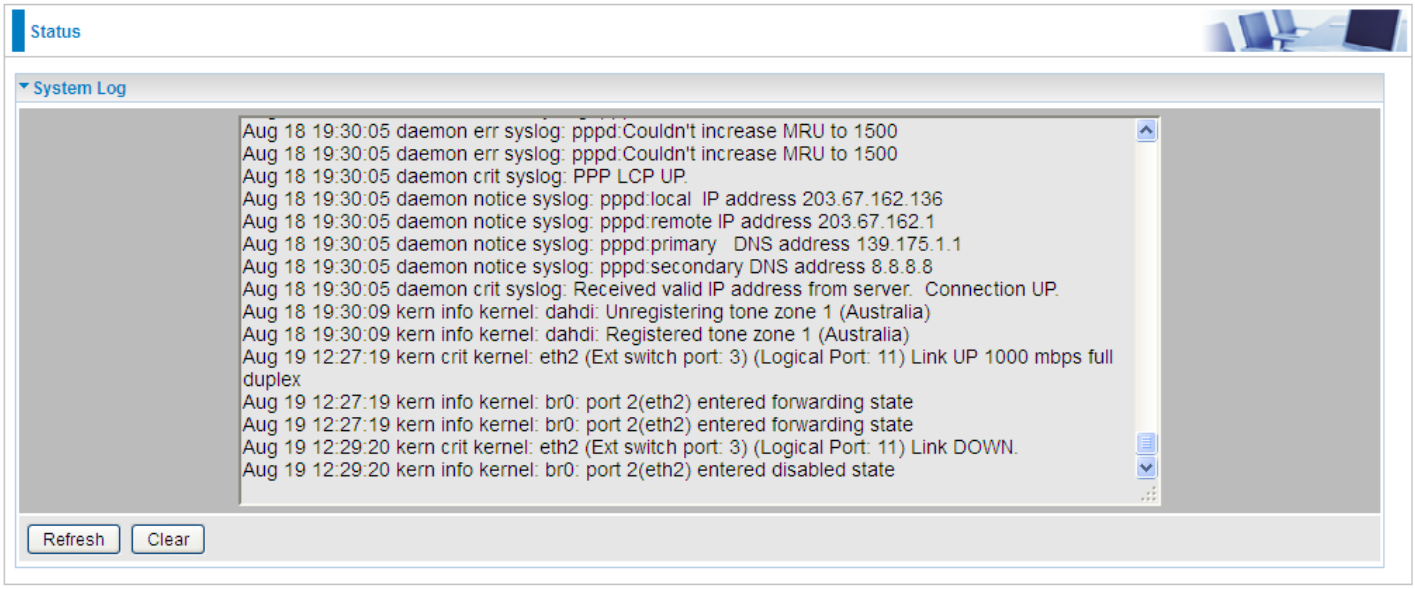
Remote Gateway: The IP of remote gateway.

Refresh: Click this button to refresh the connection status.

Log

System Log

Display system logs accumulated up to the present time. You can trace historical information with this function. And the log policy can be configured in Configure Log section.



Refresh: Click to update the system log.
Clear: Click to clear the current log from the screen.

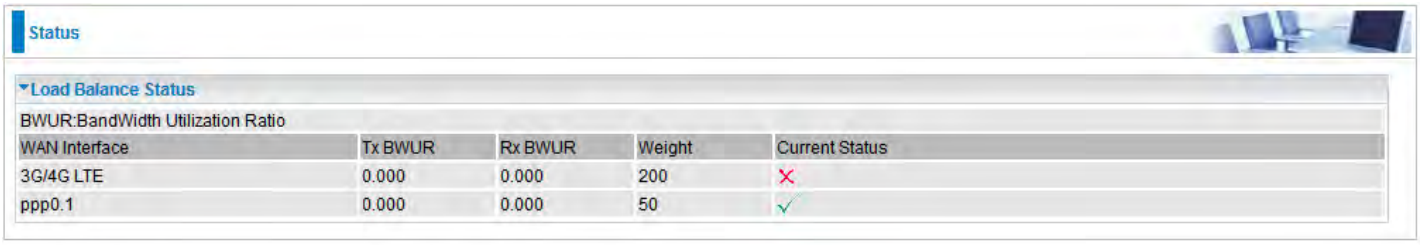
Security Log

Security log displays the message logged about security, like filter messages and some firewall message. You can turn to IP Filtering Outgoing, IP Filtering Incoming, URL Filter to determine if you want to log this information. Also you can turn to Configure Log section below to determine the level to log the message. You can use this to track potential threats to your system and network.

Refresh: Click to update the security log.

Clear: Click to clear the current log from the screen.

Load Balance Status



WAN Interface: Show wan interface of join.

TxBWUR: Upstream BandWidth Utilization Ration.

RxBWUR: Downstream BandWidth Utilization Ration

Weight : Sisplay weight value when using WRR method.

Current Status: green check means L2 link is work, red cross means L2 link is failure. If L3 Health check option is used, status will display L3 status word as above figure, otherwise, only show L2 link status.

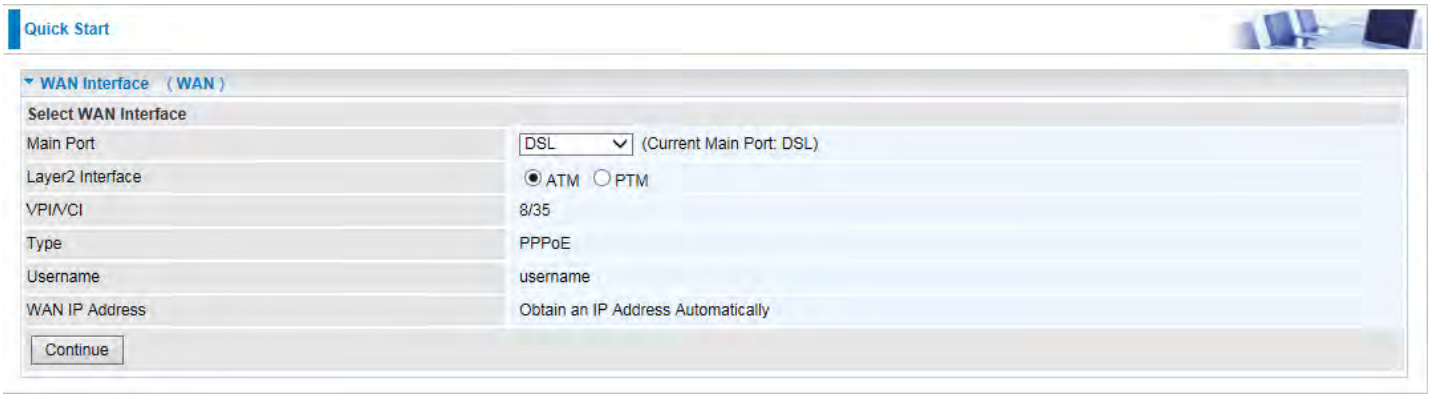
Quick Start

Quick Start

This part allows you to quickly configure and connect your router to internet.

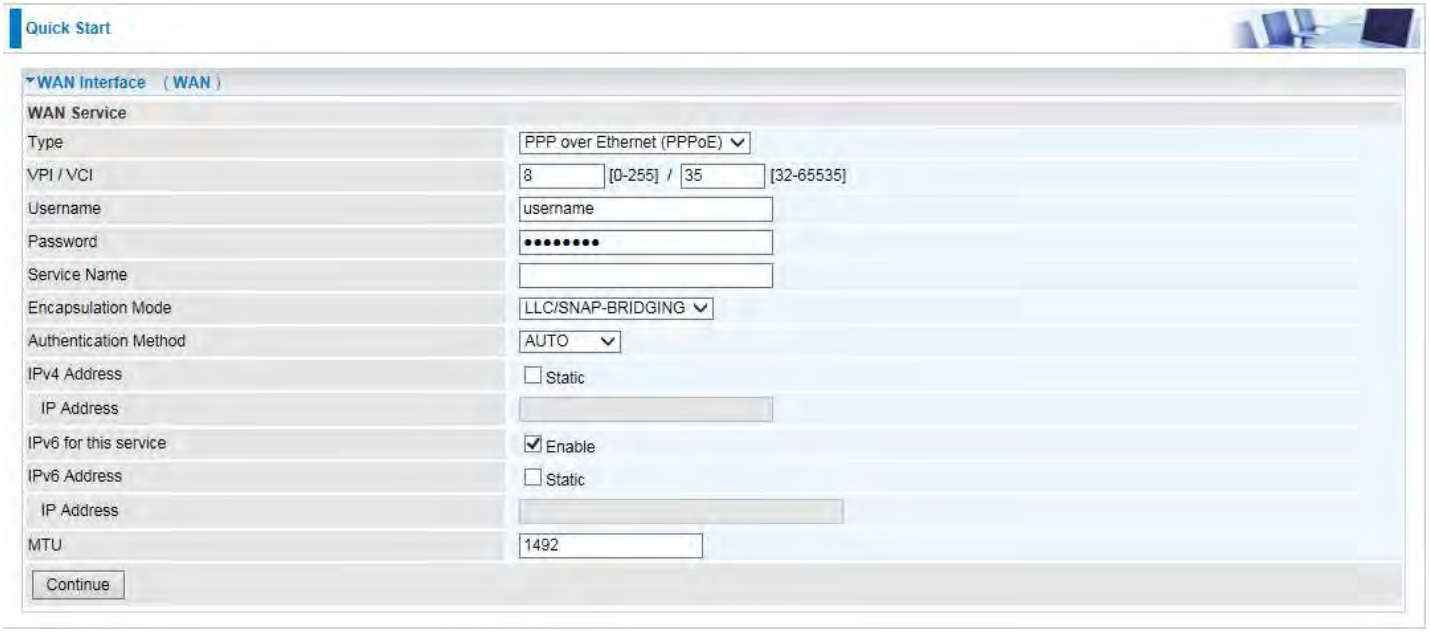
DSL mode (ADSL mode, please choose ATM; VDSL, please choose PTM)

Here take ADSL for example.

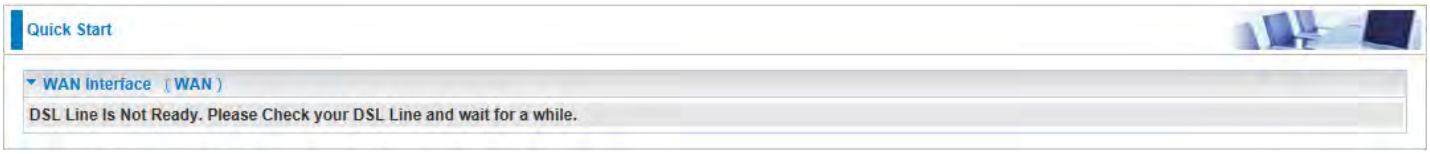


1. Select DSL, press **Continue** to go on to next step.

2. Enter the username, password from your ISP, for IP and DNS settings; also refer to your ISP. Here IPv6 service is enabled by default.



If the DSL line is not synchronized, the page will pop up warning of the DSL connection failure.

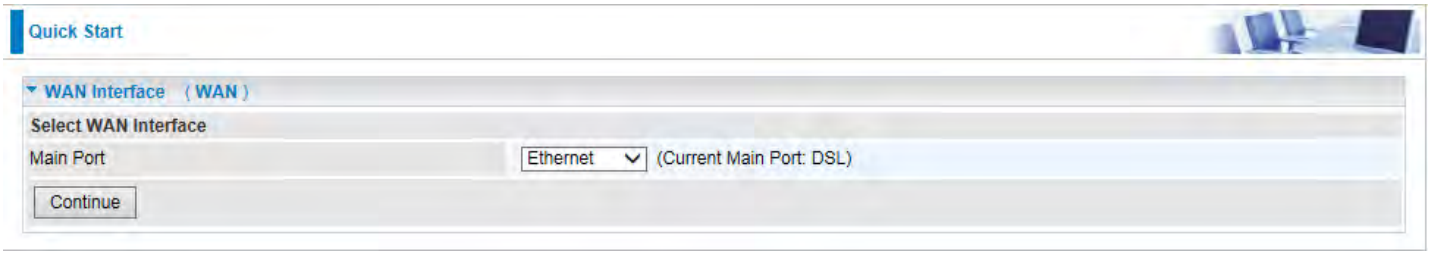


3. Wait while the device is configured.

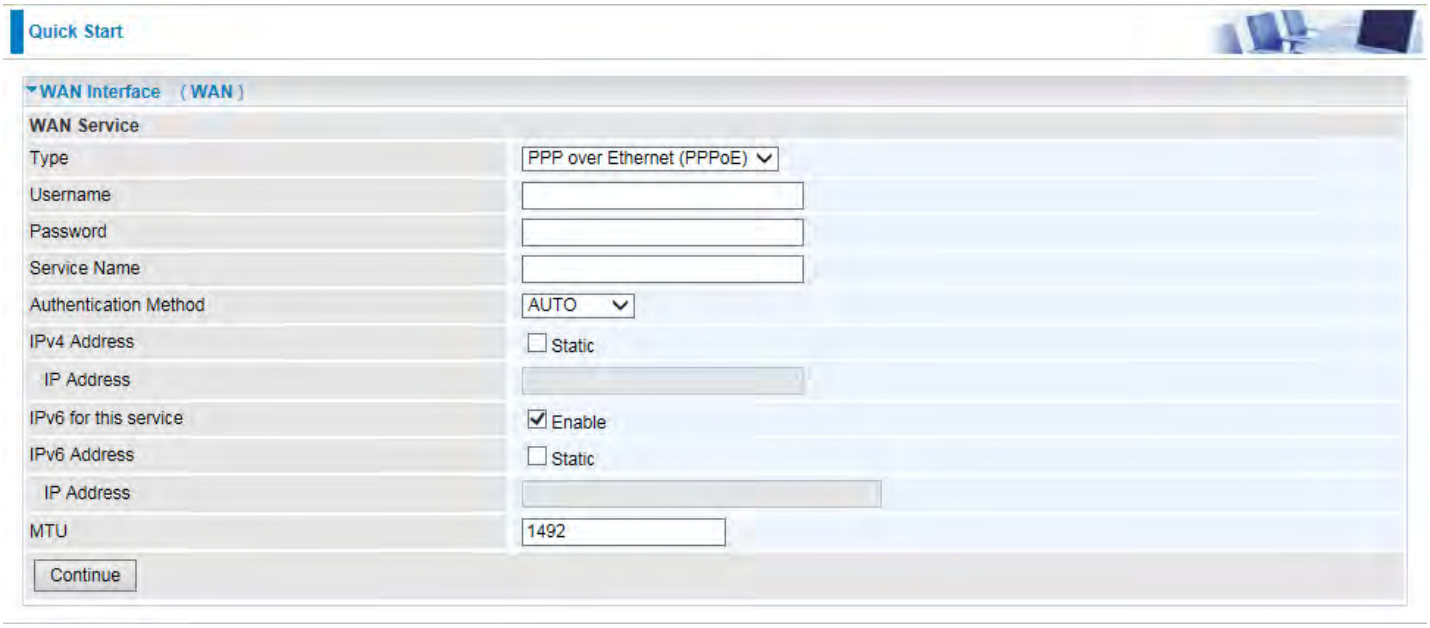
4. Success.

Ethernet mode

1. Select **Ethernet,** press **Continue** to go on to next step.

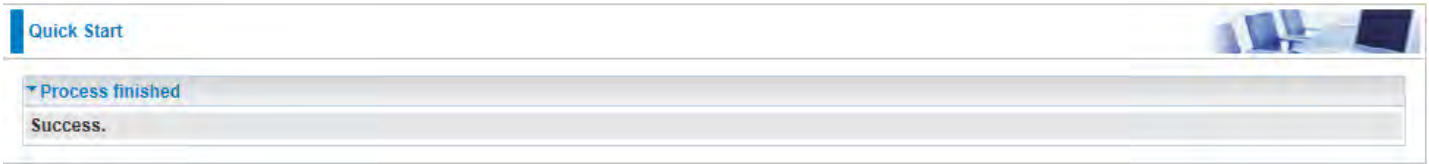


2. Enter the username, password from your ISP, for IP and DNS settings; also refer to your ISP. Here IPv6 service is enabled by default.



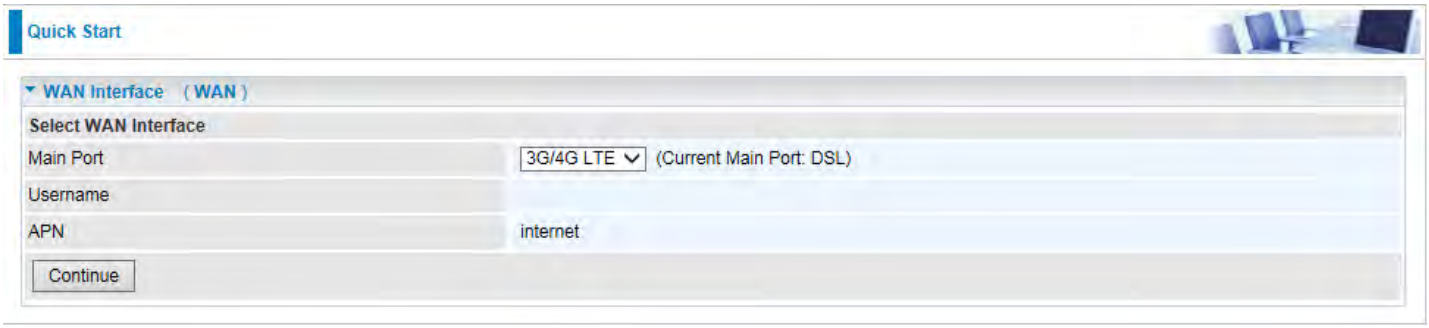
3. Wait while the device is configured.

4. Success.

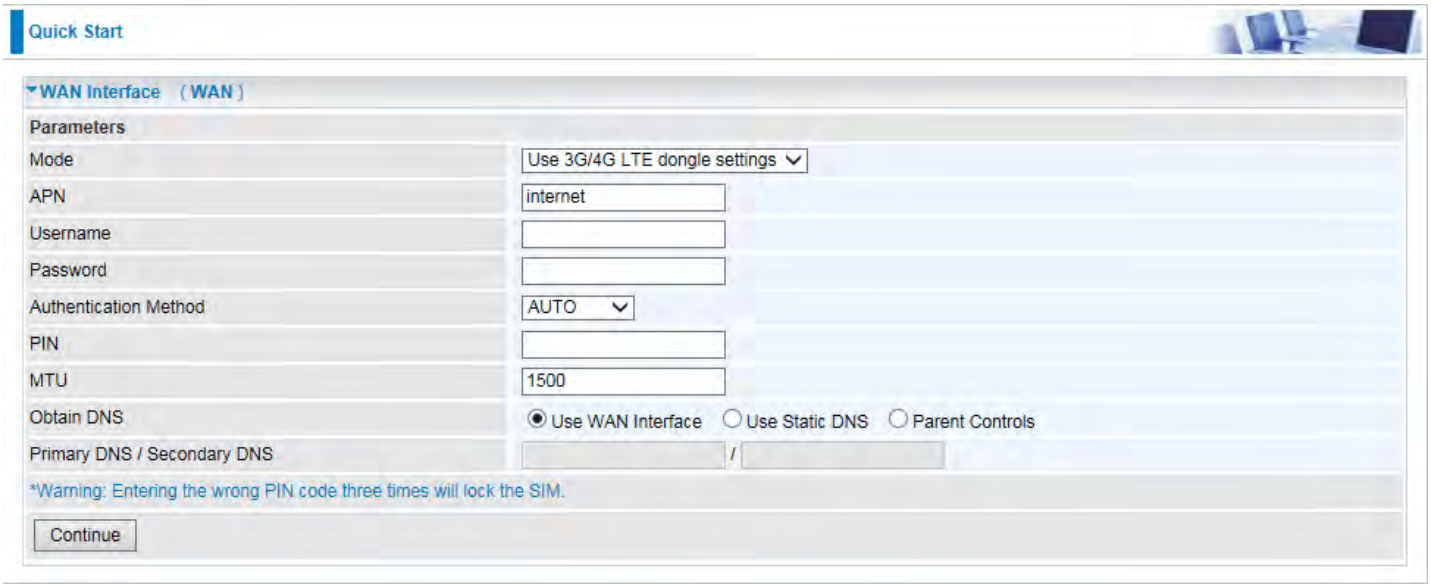


3G/4G LTE

1. Select **3G/4G LTE,** press **Continue** to go on to next step.



2. Select the 3G mode, and enter the APN, username, password from your ISP; and check with your ISP with the authentication method setting.



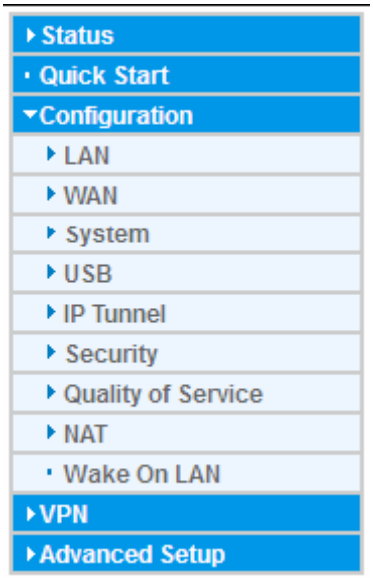
3. Wait while the device is configured.

4. Success.

Configuration

When you click this item, the column will expand to display the sub-items that will allow you to further configure your router.

LAN, **WAN**, **System**, **USB**, **IP Tunnel**, **Security**, **Quality of Service**, **NAT** and **Wake On LAN**.

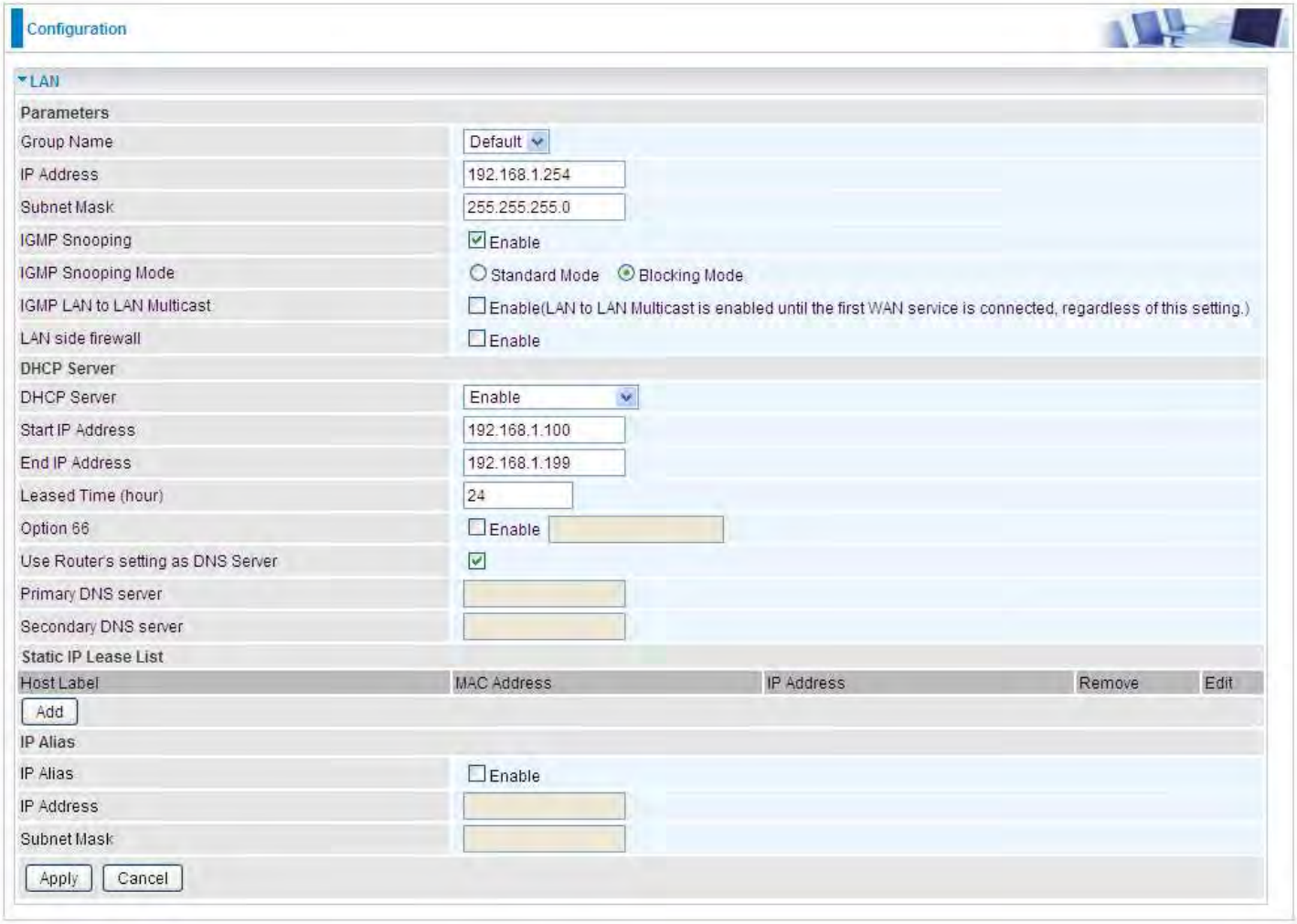


The function of each configuration sub-item is described in the following sections.

LAN - Local Area Network

A Local Area Network (LAN) is a shared communication system network where many computers are connected. This type of network is area defined and is usually limited to a confined region within a building.

Ethernet



Parameters

Group Name: This refers to the group you set in **Interface Grouping** section; you can set the parameters for the specific group. Select the group via the drop-down box. For more information please refer to Interface Grouping of this manual.

IP address: the IP address of the router. Default is 192.168.1.254.

Subnet Mask: the default Subnet mask on the router.

IGMP Snooping: Enable or disable the IGMP Snooping function. Without IGMP snooping, multicast traffic is treated in the same manner as broadcast traffic - that is, it is forwarded to all ports. With IGMP snooping, multicast traffic of a group is only forwarded to ports that have members of that group."

When enabled, you will see two modes:

- **Standard Mode:** In standard mode, multicast traffic will flood to all bridge ports when no client subscribes to a multicast group.
- **Blocking Mode:** In blocking mode, the multicast data will be blocked when there are no client subscribes to a multicast group, it won't flood to the bridge ports.

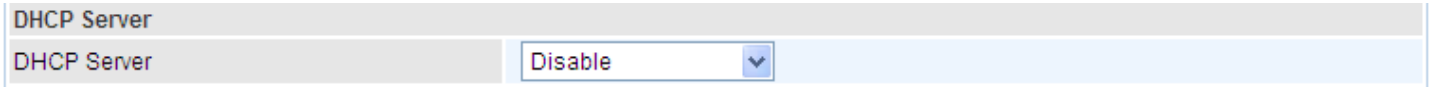
IGMP LAN to LAN Multicast: Check to determine whether to support LAN to LAN (Intra LAN) Multicast. If user want to have a multicast data source on LAN side and he wants to get IGMP snooping enabled, then this LAN-to-LAN multicast feature should be enabled.

LAN side firewall: Enable to drop all traffic from the specified LAN group interface. After activating it, all incoming packets by default will be dropped, and the user on the specified LAN group interface can't access CPE anymore. But, you can still access the internet service. If user wants to manage the CPE, please turn to IP Filtering Incoming to add the allowing rules. **Note** that all incoming packets by default will be dropped if the LAN side firewall is enabled and user cannot manage this CPE from the specified LAN group.

DHCP Server

You can disable or enable the DHCP (Dynamic Host Configuration Protocol) server or enable the router's DHCP relay functions. The DHCP protocol allows your router to dynamically assign IP addresses to PCs on your network if they are configured to obtain IP addresses automatically.

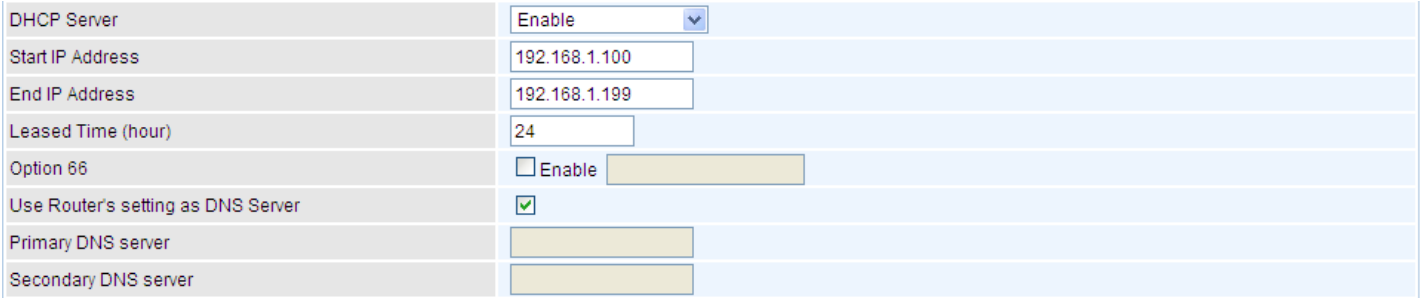
ⓘ Disable



Disable the DHCP Server function.

ⓘ Enable

Enable the DHCP function, enter the information wanted. Here as default.



Start IP Address: The start IP address of the range the DHCP Server used to assign to the Clients.

End IP Address: The end IP address f the range the DHCP Server used to assign to the Clients.

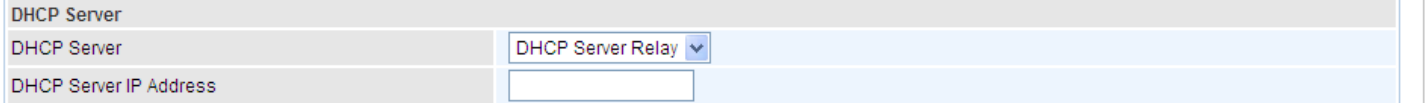
Leased Time (hour): The leased time for each DHCP Client.

Option 66: Click Enable to activate DHCP option 66 for some special devices, like IPTV Set Box. The devices can get firmware or some special service from the TFTP server. User needs to set the IP or hostname of the TFTP server.

User Router's setting as DNS server: Select whether to enable use router's setting as DNS server to allow different LAN group with different DNS server settings.
If enabled, the PCs on the LAN side obtain the router's setting as DNS server. If disabled, please specify exactly the primary/secondary DNS server.

Primary/Secondary DNS server: Specify your primary/secondary DNS server for your LAN devices.

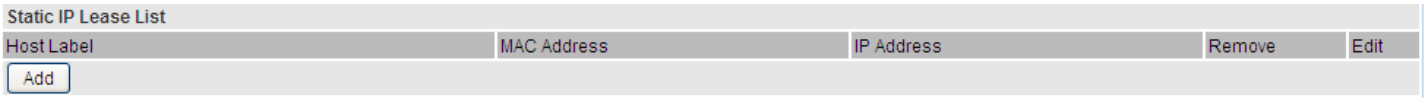
ⓘ DHCP Server Relay



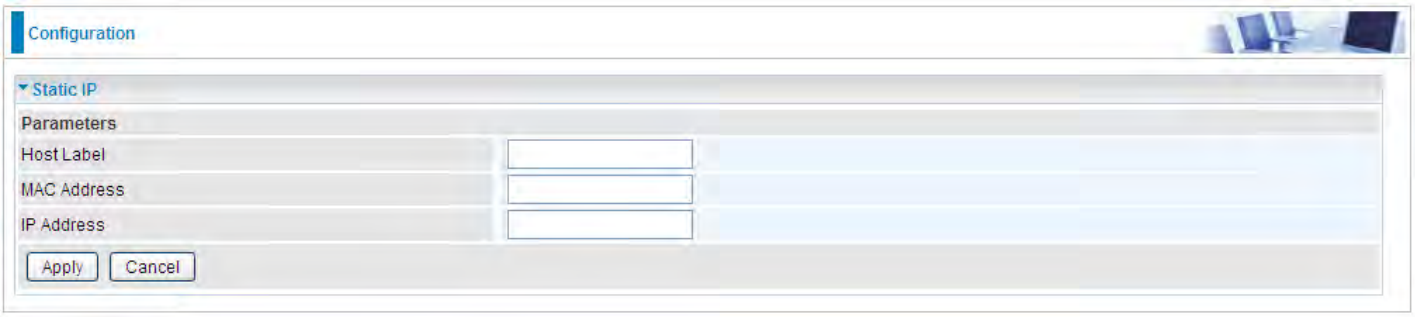
DHCP Server IP Address: Please enter the DHCP Server IP address.

Static IP List

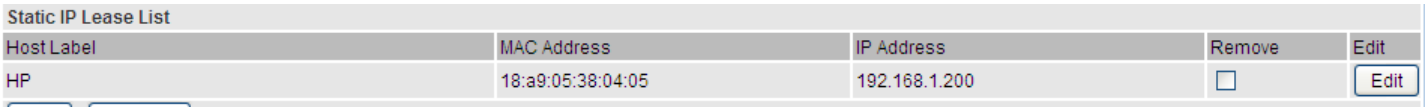
The specified IP will be assigned to the corresponding MAC Address listed in the following table when DHCP Server assigns IP Addresses to Clients.



Press **Add** to the Static IP List.

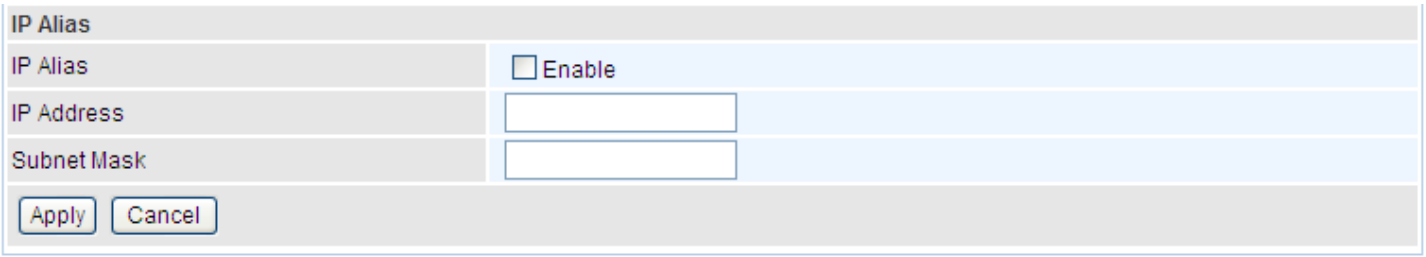


Enter the MAC Address, IP Address, and then click Apply to confirm your settings. But the IP assigned should be outside the range of 192.168.1.100-192.168.1.199.



IP Alias

This function allows the creation of multiple virtual IP interfaces on this router. It helps to connect two or more local networks to the ISP or remote node.



IP Alias: Check whether to enable this function.

IP Address: Specify an IP address on this virtual interface.

Subnet Mask: Specify a subnet mask on this virtual interface.

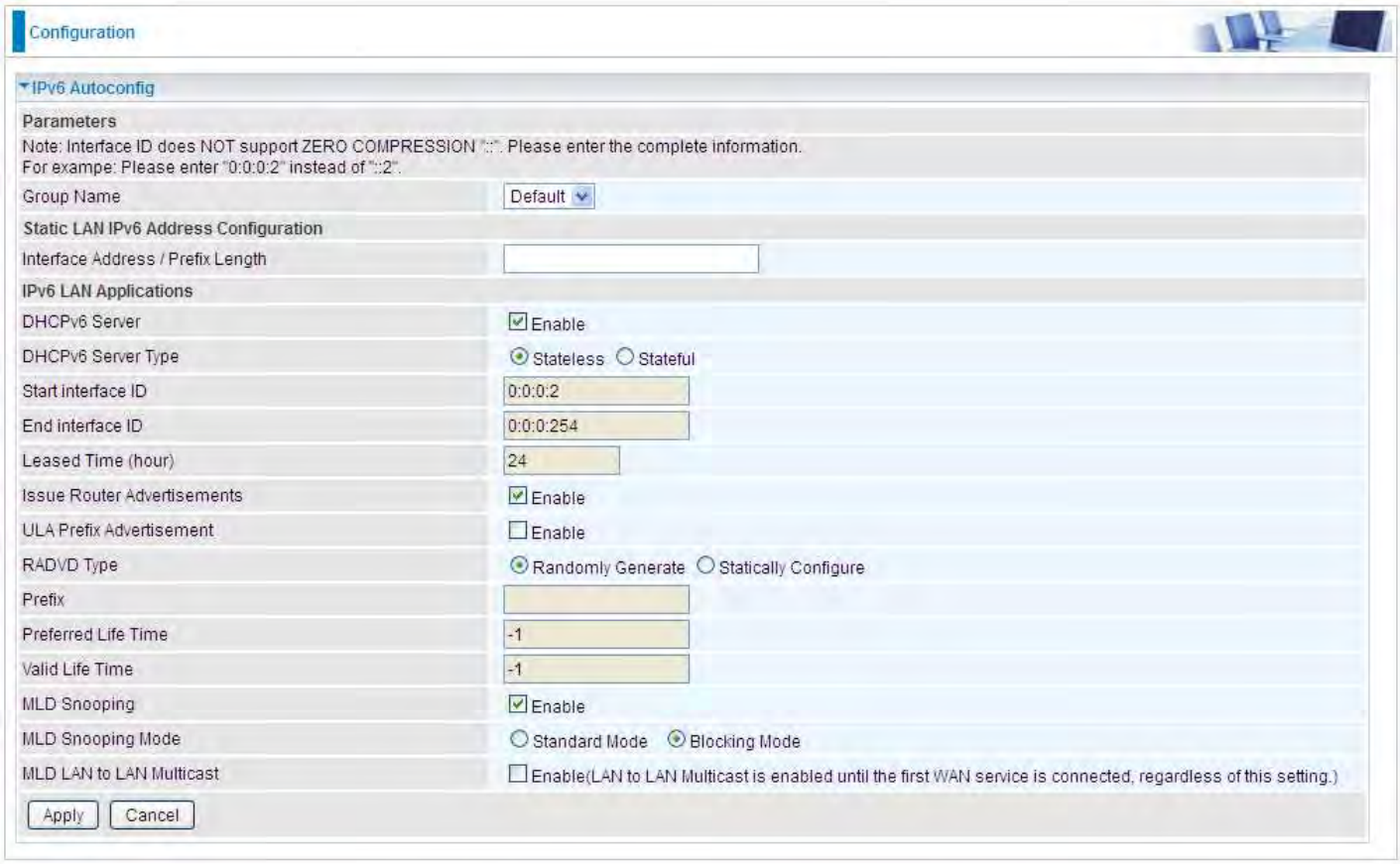
Click **Apply** to apply your settings.

IPv6 Autoconfig

The IPv6 address composes of two parts, the prefix and the interface ID.

There are two ways to dynamically configure IPv6 address on hosts. One is “stateful” configuration, for example using DHCPv6 (which resembles its counterpart DHCP in IPv4.) In the stateful auto-configuration model, hosts obtain interface addresses and/or configuration information and parameters from a DHCPv6 server. The Server maintains a database that keeps track of which addresses have been assigned to which hosts.

The second way is “stateless” configuration. Stateless auto-configuration requires no manual configuration of hosts, minimal (if any) configuration of routers, and no additional servers. The stateless mechanism allows a host to generate its own addresses using a combination of locally available information (MAC address) and information (prefix) advertised by routers. Routers advertise prefixes that identify the subnet(s) associated with a link, while hosts generate an "interface identifier" that uniquely identifies an interface on a subnet. An address is formed by combining the two. When using stateless configuration, you needn’t configure anything on the client.



Group Name: Here group refers to the group you set in **Interface Grouping** section, you can set the parameters for the specific group. Select the group by the drop-down box. For more information please refer to **Interface Grouping** of this manual.

Static LAN IPv6 Address Configuration

Interface Address / Prefix Length: Enter the static LAN IPv6 address.

IPv6 LAN application

DHCPv6 Server: Check whether to enable DHCPv6 server.

DHCPv6 Server Type: Select Stateless or Stateful. When DHCPv6 is enabled, this parameter is available. **Stateless:** If selected, the PCs in LAN are configured through RA mode, thus, the PCs in LAN are configured through RA mode, to obtain the prefix message and generate an address using a combination of locally available information (MAC address) and information (prefix) advertised by routers, but they can obtain such information like DNS from DHCPv6 Server. **Stateful:** if selected, the PCs in LAN will be configured like in IPv4 mode, thus obtain addresses and DNS information from DHCPv6 server.

Start interface ID: Enter the start interface ID. The IPv6 address composed of two parts, thus, the prefix and the interface ID. Interface is like the Host ID compared to IPv4.

End interface ID: Enter the end interface ID.

Note: Interface ID does NOT support ZERO COMPRESSION "::". Please enter the complete information.
For example: Please enter "0:0:0:2" instead of "::2".

Leased Time (hour): The leased time, similar to leased time in DHCPv4, is a time limit assigned to clients, when expires, the assigned ID will be recycled and reassigned.

Issue Router Advertisement: Check whether to enable issue Router Advertisement feature. It is to send Router Advertisement messages periodically.

ULA Prefix Advertisement: Enable this parameter to include the ipv6 ULA address in the RA messages. ULA, unique local address, is an IPv6 address in the block fc00::/7. It is approximately the IPv6 counterpart of the IPv4 private address. They are not routable in the global IPv6 Internet.

RADVD Type: The way that ULA prefix is generated.

- Randomly Generated
- Statically Configured: select to set manually in the following parameters.

Prefix: Set the prefix manually.

Preferred Life Time: The ULA prefix life time. When the time is over, the ULA prefix is invalid any more, -1 means no limit.

Valid Life Time: It is a time threshold, when the time is over, clients should obtain new IPv6 address from the router through RA; -1 means to be limitless.

MLD snooping: Similar to IGMP snooping, listens in on the MLD conversation between hosts and routers by processing MLD packets sent in a multicast network, and it analyzes all MLD packets between hosts and the connected multicast routers in the network. Without MLD snooping, multicast traffic is treated in the same manner as broadcast traffic - that is, it is forwarded to all ports. With MLD snooping, multicast traffic of a group is only forwarded to ports that have members of that group.

- **Standard Mode:** In standard mode, multicast traffic will flood to all bridge ports when no client subscribes to a multicast group.
- **Blocking Mode:** In blocking mode, the multicast data will be blocked when there is no client subscribes to a multicast group, it won't flood to the bridge ports.

MLD LAN to LAN Multicast: Check to determine whether to support LAN to LAN (Intra LAN) Multicast. If user want to have a multicast data source on LAN side and he want to get MLD snooping enabled, then this LAN-to-LAN multicast feature should be enabled

Stateless and Stateful IPv6 address Configuration

Stateless: Two methods can be carried.

ⓘ With DHCPv6 disabled, but Issue Router Advertisement Enabled

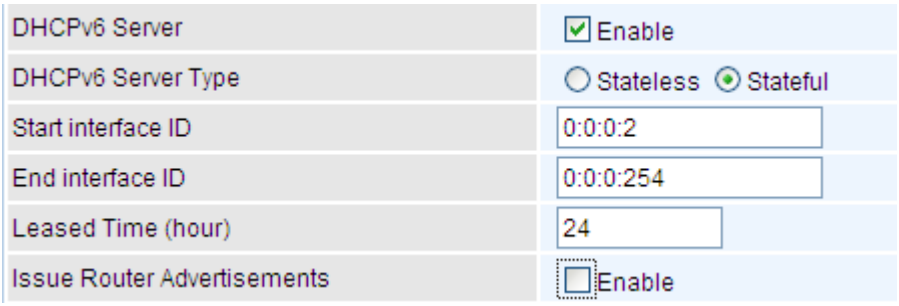
With this method, the PCs in LAN are configured through RA mode, thus, the PCs in LAN are configured through RA mode, to obtain the prefix message and generate an address using a combination of locally available information (MAC address) and information (prefix) advertised by routers.

ⓘ With both DHCPv6 and Issue Router Advertisement Enabled

With this method, the PCs' addresses in LAN are configured like above method, but they can obtain such information like DNS from DHCPv6 Server.

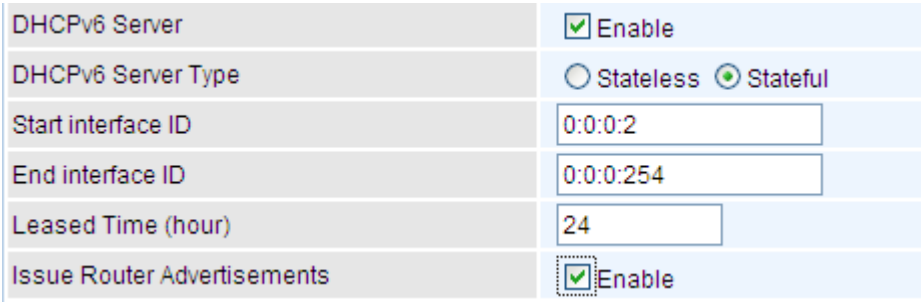
Stateful: two methods can be adopted.

ⓘ With only DHCPv6 enabled



With this method, the PCs' addresses are configured the same as in IPv4, that is addresses are assigned by DHCPv6 server.

ⓘ With both DHCPv6 and Issue Router Advertisement Enabled



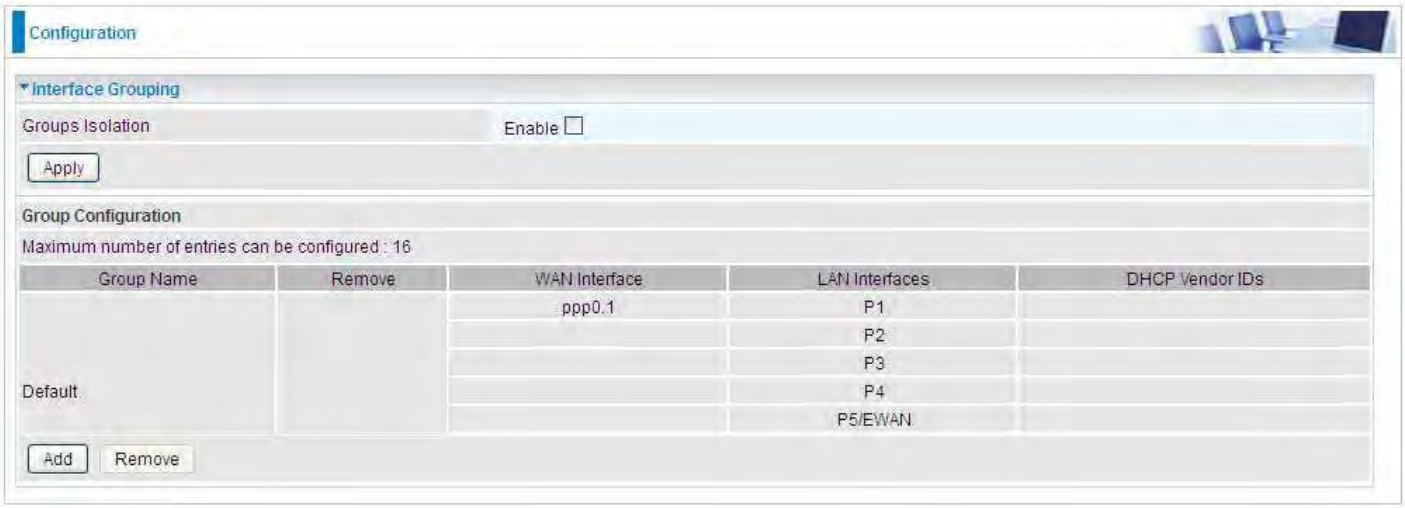
With this method, the PCs' addresses are configured the same like above, and the address information in RA packets will be neglected.

Interface Grouping

Interface grouping is a function to group interfaces, known as VLAN. A Virtual LAN, commonly known as a VLAN, is a group of hosts with the common set of requirements that communicate as if they were attached to the same broadcast domain, regardless of the physical location. A VLAN has the same attributes as a physical LAN, but it allows for end stations to be grouped together even if they are not located on the same network switch.

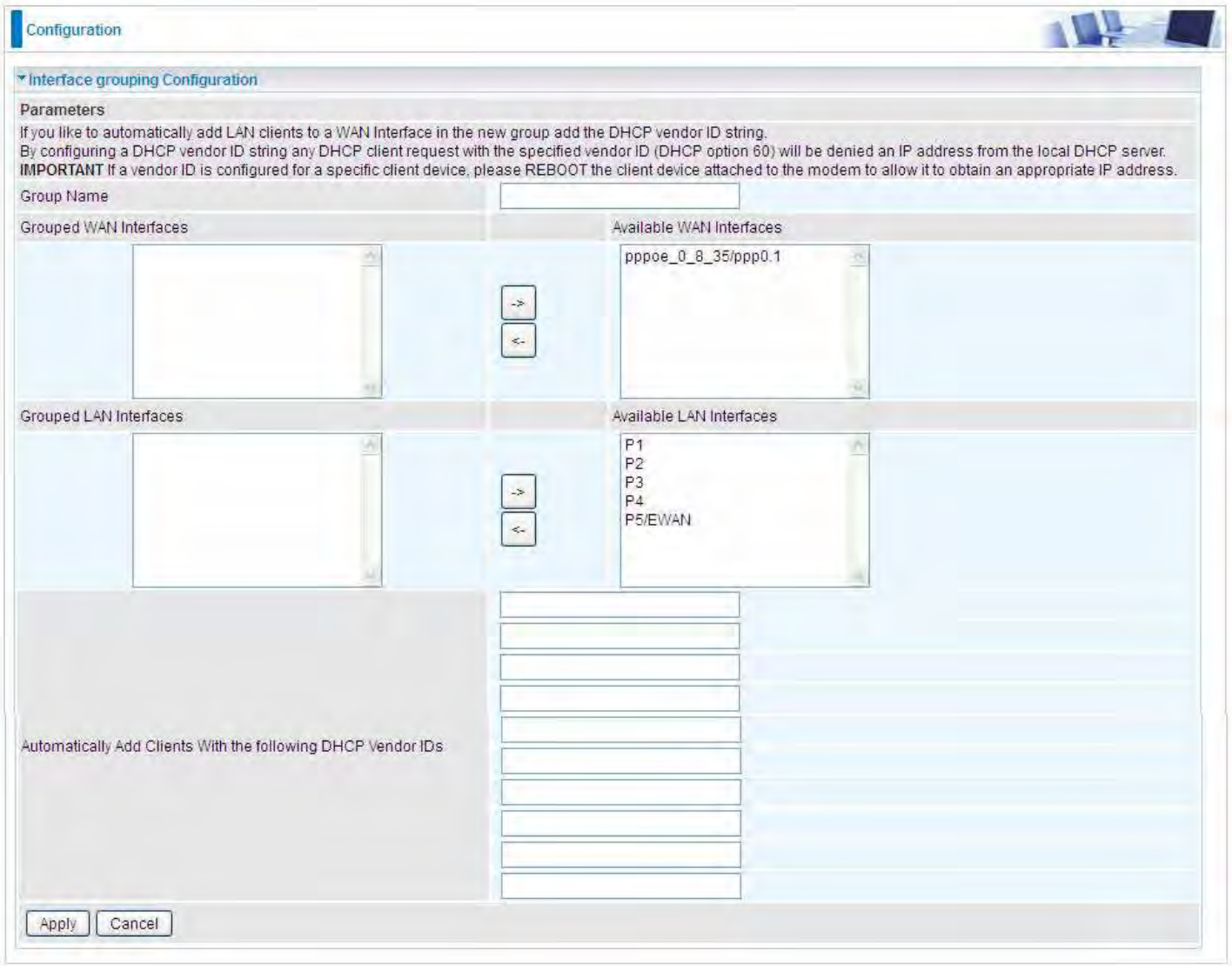
Each group will perform as an independent network. To support this feature, you must create mapping groups with appropriate LAN and WAN interfaces using the Add button.

(Please **Note:** P5 can be configured as EWAN, and when the device is in EWAN profile, there is no P5/EWAN interface as P5 is working as a WAN port. If you need P5, please remove EWAN interface in WAN Interface section.)



Groups Isolation: If enabled, devices in one group are not able to access those in the other group.

Click **Add** to add groups.



Group Name: Type a group name.

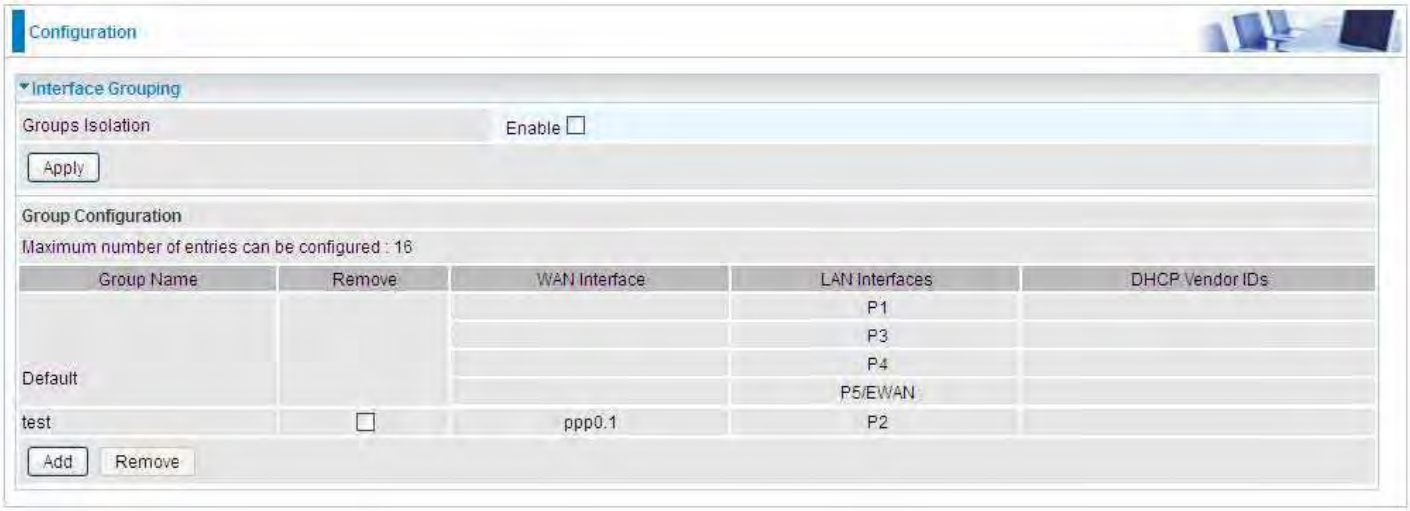
Grouped WAN Interfaces: Select from the box the WAN interface you want to applied in the group.

Grouped LAN Interfaces: Select the LAN interfaces you want to group as a single group from ***Available LAN Interfaces***.

Automatically Add Clients with following DHCP Vendor IDs: Enter the DHCP Vendor IDs for which you want the Clients automatically added into the group. DHCP vendor ID (DHCP 60) is an Authentication for DHCP Messages.

Click **Apply** to confirm your settings and your added group will be listed in the Interface Grouping table below.

In group "test", P2 and PPP0.1 are grouped in one group, they have their only network , see **LAN**.



If you want to remove the group, check the box as the following and press **Remove**.

Note: If you like to automatically add LAN clients to a WAN Interface in the new group add the DHCP vendor ID string.

By configuring a DHCP vendor ID string any DHCP client request with the specified vendor ID (DHCP option 60) will be denied an IP address from the local DHCP server.

If a vendor ID is configured for a specific client device, please REBOOT the client device attached to the modem to allow it to obtain an appropriate IP address.

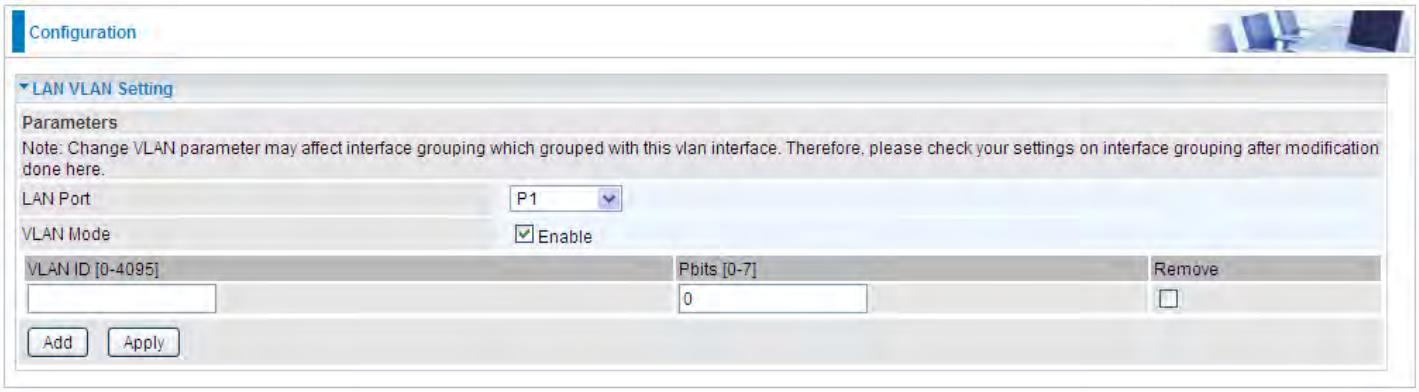
Each LAN interface can only be added into one group and one WAN interface can only be used in one group

LAN VLAN Setting

When LAN VLAN is opened on a LAN port, outgoing packets from the port will be tagged with the specific VLAN ID user set.

LAN Port: Select the LAN port users want to set LAN VLAN.

VLAN Mode: Check if to enable LAN VLAN for the selected port.



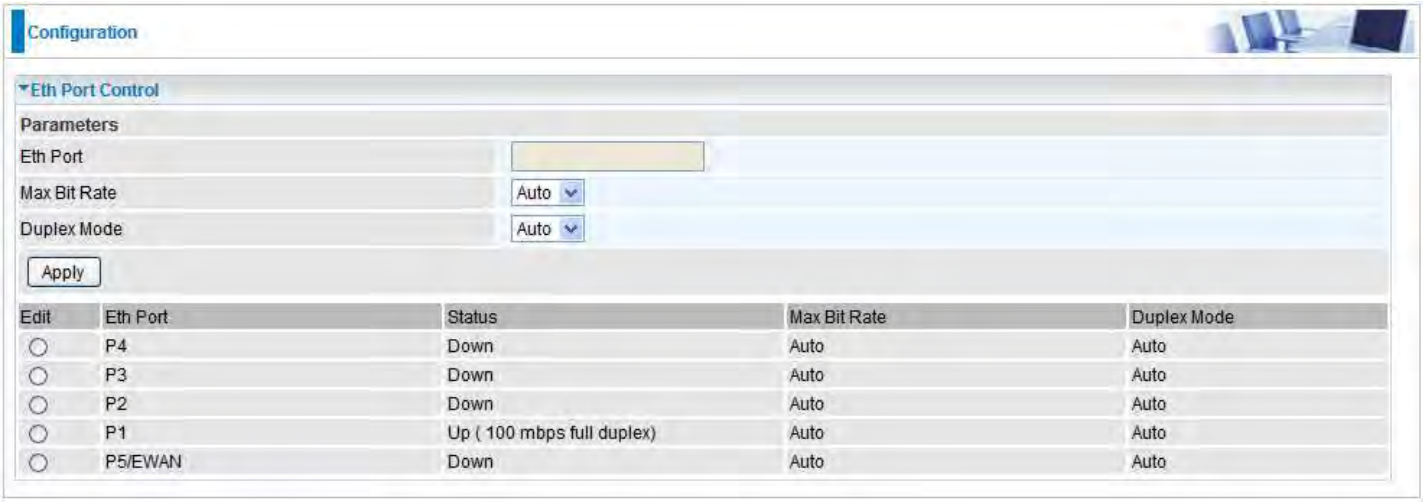
Click Add to set the VLAN ID, Pbits for the port.

VLAN ID: a parameter to specify the VLAN which the frame belongs. Enter the VLAN ID identification, tagged: 1-4094

Pbits: The parameter indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc).

Eth Port Control

Eth port control features the control of Ethernet port working patterns like Max Bit Rate and Duplex Mode.



Select to change the port working patterns in the Edit vertical column.

Eth Port: Select the port, P1-P5/EWAN.

Max Bit Rate: Manually specify the max bit rate for the Ethernet port, 10 or 100Mbps.

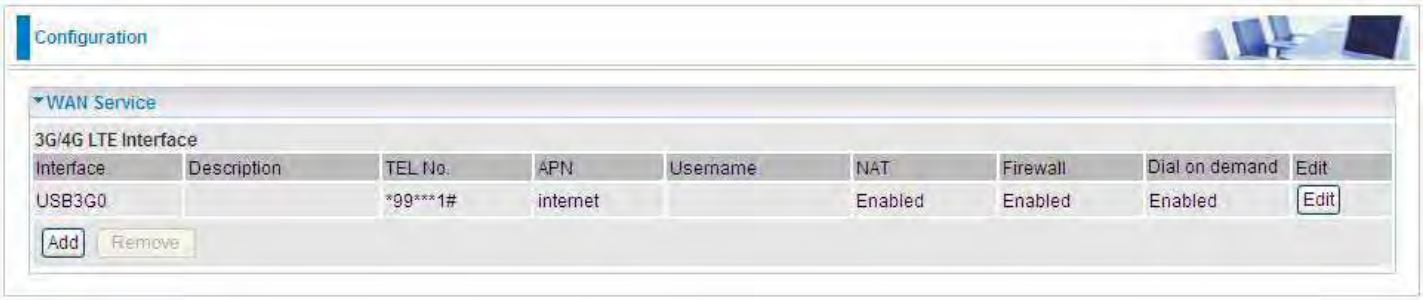
Duplex Mode: Manually specify the duplex mode for the Ethernet port, half or full duplex.

WAN-Wide Area Network

A WAN (Wide Area Network) is a computer network that covers a broad geographical area (eg. Internet) used to connect LAN and other types of network systems.

WAN Service

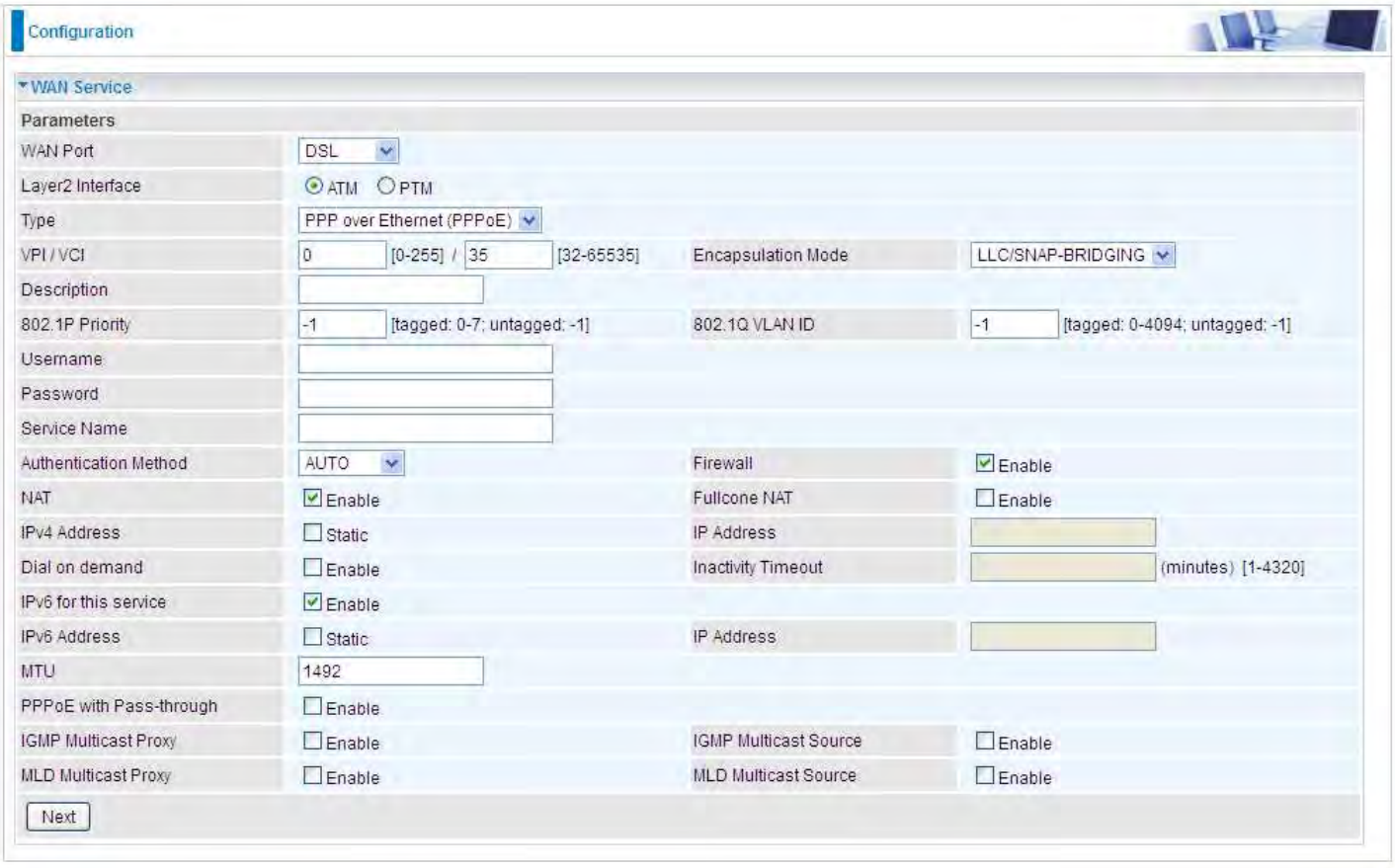
Three WAN interfaces are provided for WAN connection: DSL (VDSL/ADSL), Ethernet and 3G/4GLTE.



Click **Add** to add new WAN connections.

ⓘ DSL

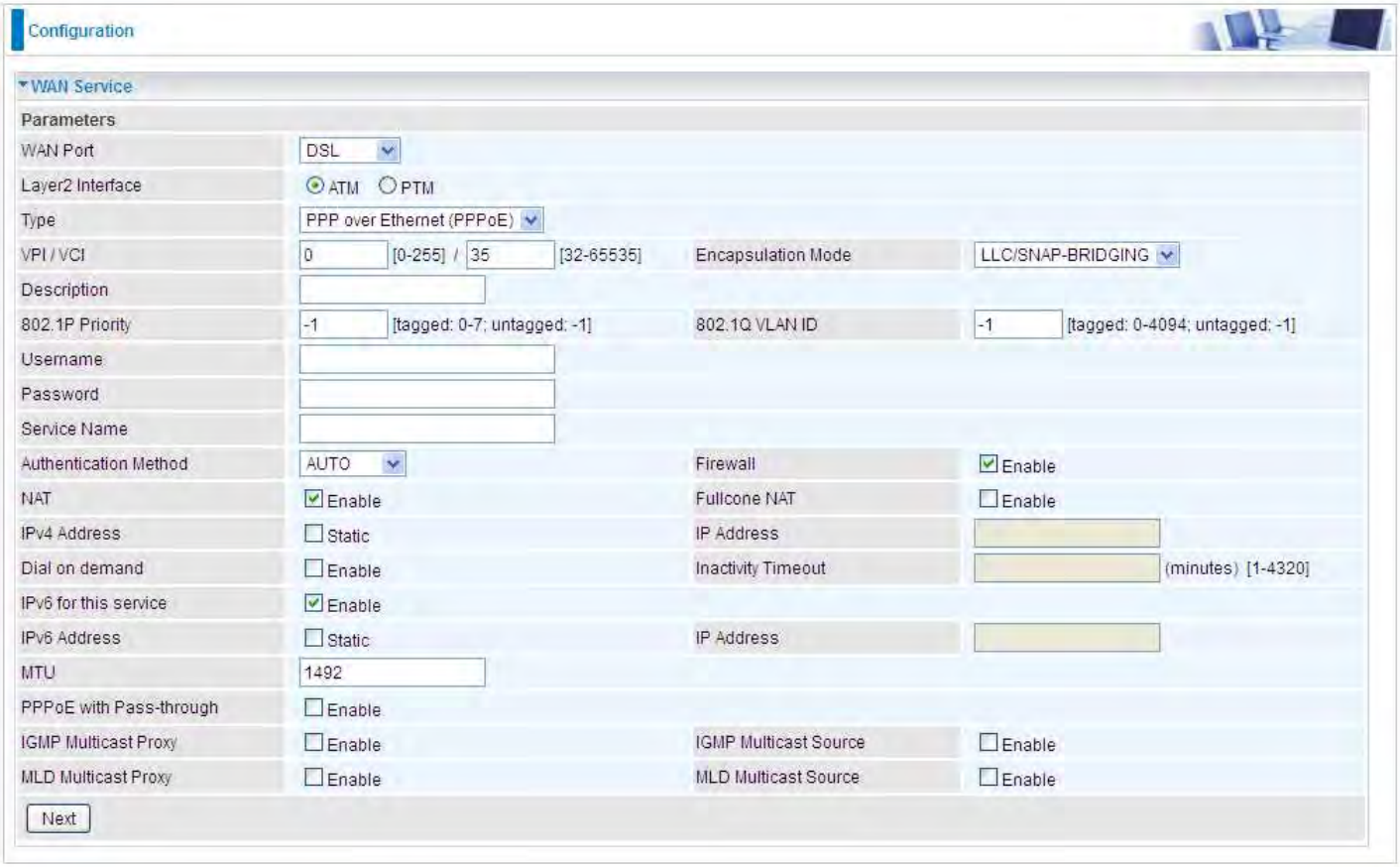
In DSL mode, there are two transfer modes for you to configure for WAN connection, namely **ATM (ADSL)** and **PTM (VDSL)** configuration of PTM mode is similar as ATM mode, here take ATM mode WAN configuration for example.



Layer2 Interface: 2 transfer mode, **ATM (ADSL)** or **PTM (VDSL)**.

PPPoE

PPPoE (PPP over Ethernet) provides access control in a manner which is similar to dial-up services using PPP.



VPI/VCI: Enter the VPI/VCI combination from you ISP.

Encapsulation Mode: Select the encapsulation mode, LLC/SNAP-BRIDGING, or VC/MUX.

Description: User-defined description for the connection, commonly for friendly use.

802.1P Priority: The parameter indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc). Enter the priority identification, tagged: 0-1, untagged: -1.

802.1Q VLAN ID: It is a parameter to specify the VLAN which the frame belongs. Enter the VLAN ID identification, tagged: 0-4094, untagged : -1.

Username: Enter the account obtained from the ISP.

Password: Enter the password obtained from the ISP.

Service Name: The item is for identification purposes, user can define this.

Authentication Method: Default is ***Auto***. Or else your ISP will advise you the appropriate mode.

Firewall: Enable to drop all traffic from WAN side. If enabled, all incoming packets by default would be dropped, and please turn to IP Filtering Incoming to add allowing rules.

NAT: The NAT (Network Address Translation) feature allows multiple users to access the Internet through a single IP account by sharing the single IP address. If users on your LAN have their own public IP addresses to access the Internet, NAT function can be disabled. When enabled, a Fullcone NAT parameter will appear, you can determine whether to enable Fullcone NAT. While only NAT enabled, the default NAT type Port-Restricted cone NAT will be used.

Fullcone NAT: Enable or disable fullcone NAT. Fullcone is a kind of NAT, in this mode, all requests from the same internal IP address and port are mapped to the same external IP address and port. Furthermore, any external host can send a packet to the internal host, by sending a packet to the mapped external address.

Note: In PPPoE connection, NAT is enabled by default, you can determine whether to enable Fullcone NAT or disable Fullcone NAT and only use NAT, the default NAT type is Port Restricted cone NAT. Of Port-Restricted cone NAT, the restriction includes port numbers. Specifically, an external host can send a packet, with source IP address X and source port P, to the internal host only if the internal host had previously sent a packet to IP address X and port P

IPv4 Address: Select whether to set static IPv4 address or obtain automatically.

IP Address: If ***Static*** is enabled in the above field, enter the static IPv4 address get from the ISP.

Dial on demand: It is a parameter to let users to dial for connection to internet themselves. It is useful when saving internet fees.

Inactivity Timeout: The set Inactivity timeout period, unit: minutes. It is combined use with Dial on Demand, users should specify the concrete time interval for dial on demand.

IPv6 for this service: Enable to use IPv6 service.

IPv6 Address: Select whether to set static IPv6 address or obtain automatically.

IP Address: If ***Static*** is enabled in the above field, enter the static IPv4 address.

MTU: Maximum Transmission Unit, the size of the largest datagram (excluding media-specific headers) that IP will attempt to send through the interface.

PPPoE with Pass-through: Enable or disable PPPoE pass-through. If it is enabled, PCs behind the router can dial itself.

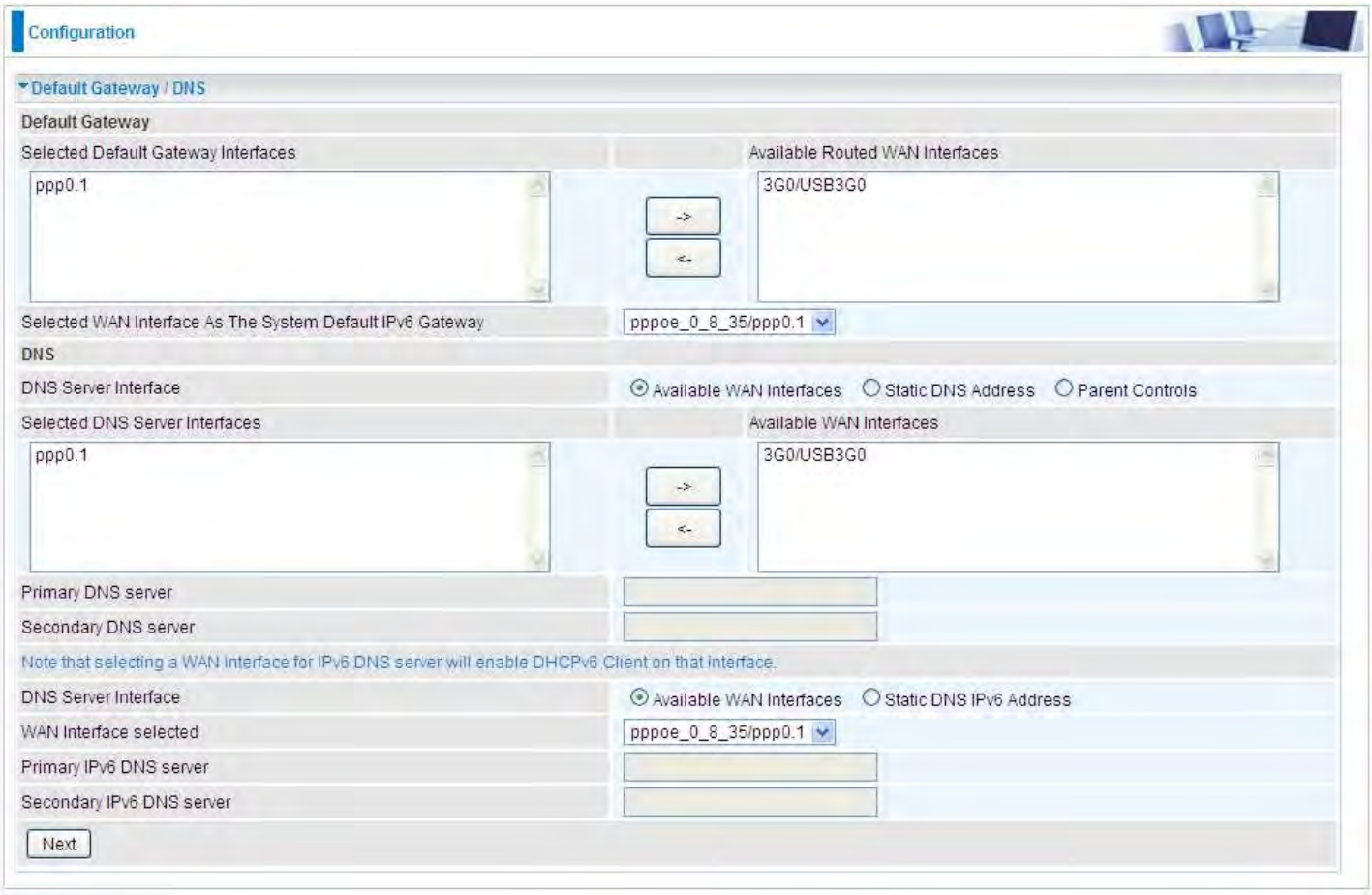
IGMP Multicast Proxy: Check whether to enable this feature. IGMP (**Internet Group Management Protocol**) Proxy intercepts the IGMP request from Clients and set up the multicast-forwarding table, it takes over some of the router's job, simplifying the router's job and multicast communication.

IGMP Multicast Source: Enable to support the "source filtering" which is the ability for a system to report interest in receiving packets "only " from specific source address(es), or "all but" specific source address(es), sent to a particular multicast address. **Note:** It works only on IGMP version 3.

MLD Multicast Proxy: check whether to enable this function. MLD (**Multicast Listener Discovery** Protocol) Proxy intercepts the MLD request from Clients a set up the multicast-forwarding table. it takes over some of the router's job, simplifying the router's job and multicast communication. Support MLDv1 and MLDv2.

MLD Multicast Source: Used in a similar way by IPv6 system as IGMP Multicast source in IPv4 system. Enable it to support the source filtering functionality for IPv6 system. **Note:** It works only on MLD version 2.

Click **Next** to continue to set the default gateway and DNS for IPv4 and IPv6.



Default Gateway

Select default gateway for you connection (IPv4 and IPv6).

DNS

- **IPv4**

Three ways to set an IPv4 DNS server

- **Available WAN interfaces:** Select a desirable WAN interface as the IPv4 DNS server.
- **Static DNS Address:** To specify DNS server manually by entering your primary and secondary DNS server addresses.
- **Parent Controls:** If user registers and gets a DNS account in the parental control provider website, expecting to enjoy a more reliable and safer internet surfing environment, please select this option (need to configure at Parental Control Provider).

- **IPv6**

Obtain IPv6 DNS info from a WAN interface

WAN Interface selected: Select one configured IPv6 WAN connection from the menu to be as an IPv6 DNS.

Static DNS IPv6 Address

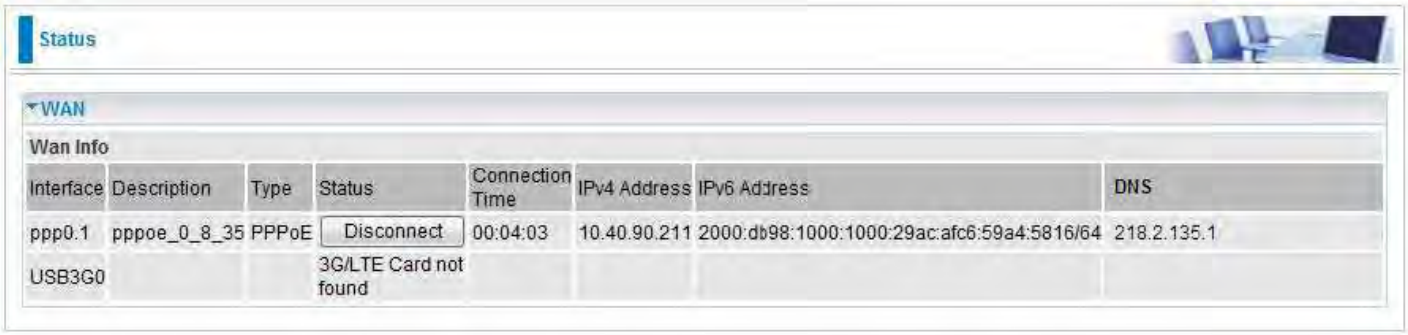
Primary IPv6 DNS Server / Secondary IPv6 DNS Server: Type the specific primary and secondary IPv6 DNS Server address.

If you don’t need a service, select the item you want to remove, check the checkbox, then press **Remove**.

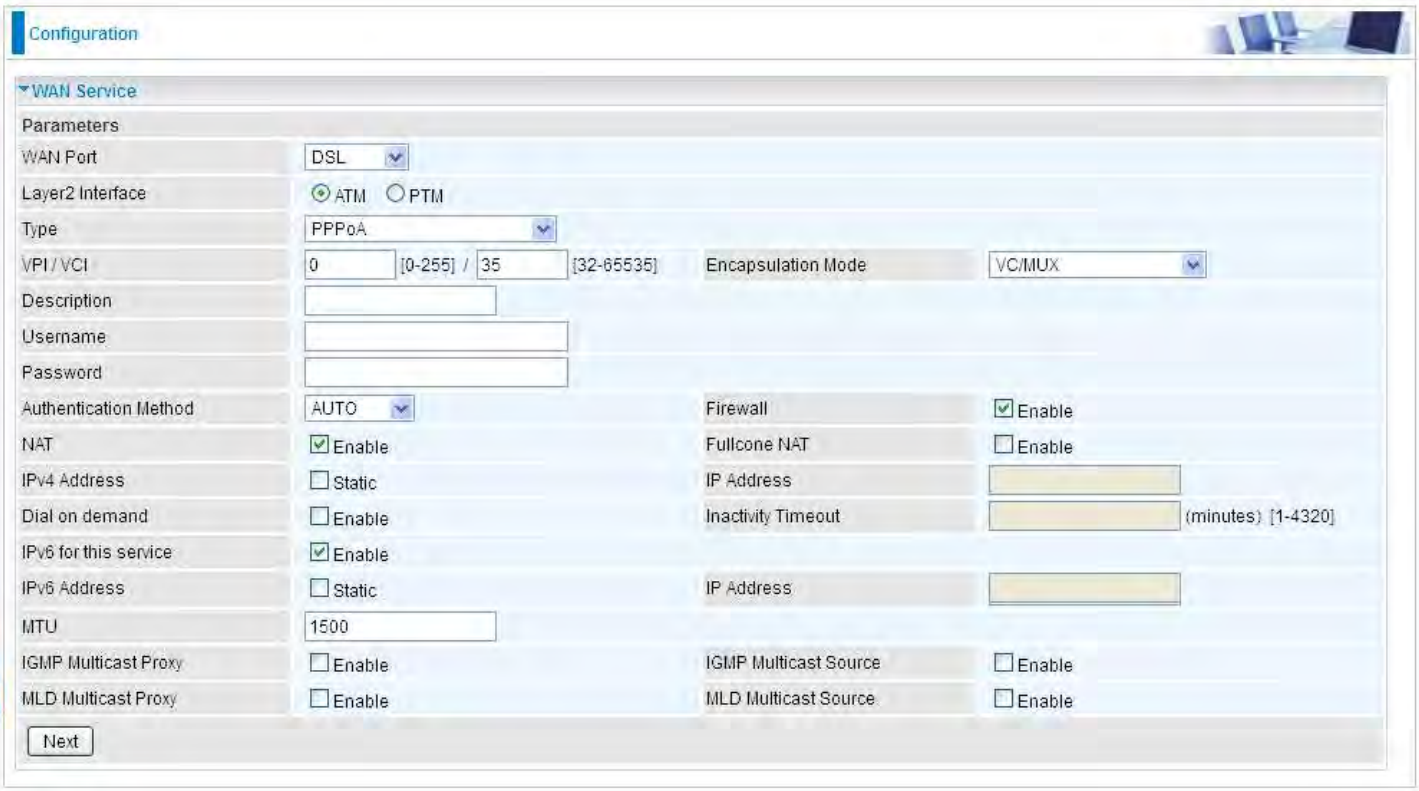
Press **Edit** button to re-edit this service settings.

Here you can configure WAN Service, if it is OK, you can access the internet. You can go to **Status >WAN** or **Summary** to view the WAN connection information (if your ISP provides IPv6 service, then you will obtain an IPv6 address).

(IPv4 or IPv6)



PPPoA



VPI/VCI: Enter the VPI/VCI combination from you ISP.

Encapsulation Mode: Select the encapsulation mode, LLC/SNAP-BRIDGING, or VC/MUX.

Description: User-defined description for the connection.

Username: Enter the account obtained from the ISP.

Password: Enter the password obtained from the ISP.

Authentication Method: Default is ***Auto***. Or else your ISP will advise you the appropriate mode.

Firewall: Enable to drop all traffic from WAN side. If enabled, all incoming packets by default would be dropped, and please turn to IP Filtering Incoming to add allowing rules.

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Note: In this connection, NAT is enabled by default, you can determine whether to enable Fullcone NAT or disable Fullcone NAT and only use NAT, the default NAT type is Port Restricted cone NAT. With Port-Restricted cone NAT, the restriction includes port numbers. Specifically, an external host can send a packet, with source IP address X and source port P, to the internal host only if the internal host had previously sent a packet to IP address X and port P

IPv4 Address: Select whether to set static IPv4 address or obtain automatically.

IP Address: If ***Static*** is enabled in the above field, enter the static IPv4 address get from the ISP.

Dial on demand: It is a parameter to let users to dial for connection to internet themselves. It is

useful when saving internet fees.

Inactivity Timeout: The set Inactivity timeout period, unit: minutes. It is combined use with Dial on Demand, users should specify the concrete time interval for dial on demand.

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IPv6 Address: Select whether to set static IPv6 address or obtain automatically.

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IGMP Multicast Proxy: Check whether to enable this feature. IGMP (**Internet Group Management Protocol**) Proxy intercepts the IGMP request from Clients and set up the multicast-forwarding table, it takes over some of the router's job, simplifying the router's job and multicast communication.

IGMP Multicast Source: Enable to support the "source filtering" which is the ability for a system to report interest in receiving packets "only " from specific source address(es), or "all but" specific source address(es), sent to a particular multicast address. **Note:** It works only on IGMP version 3.

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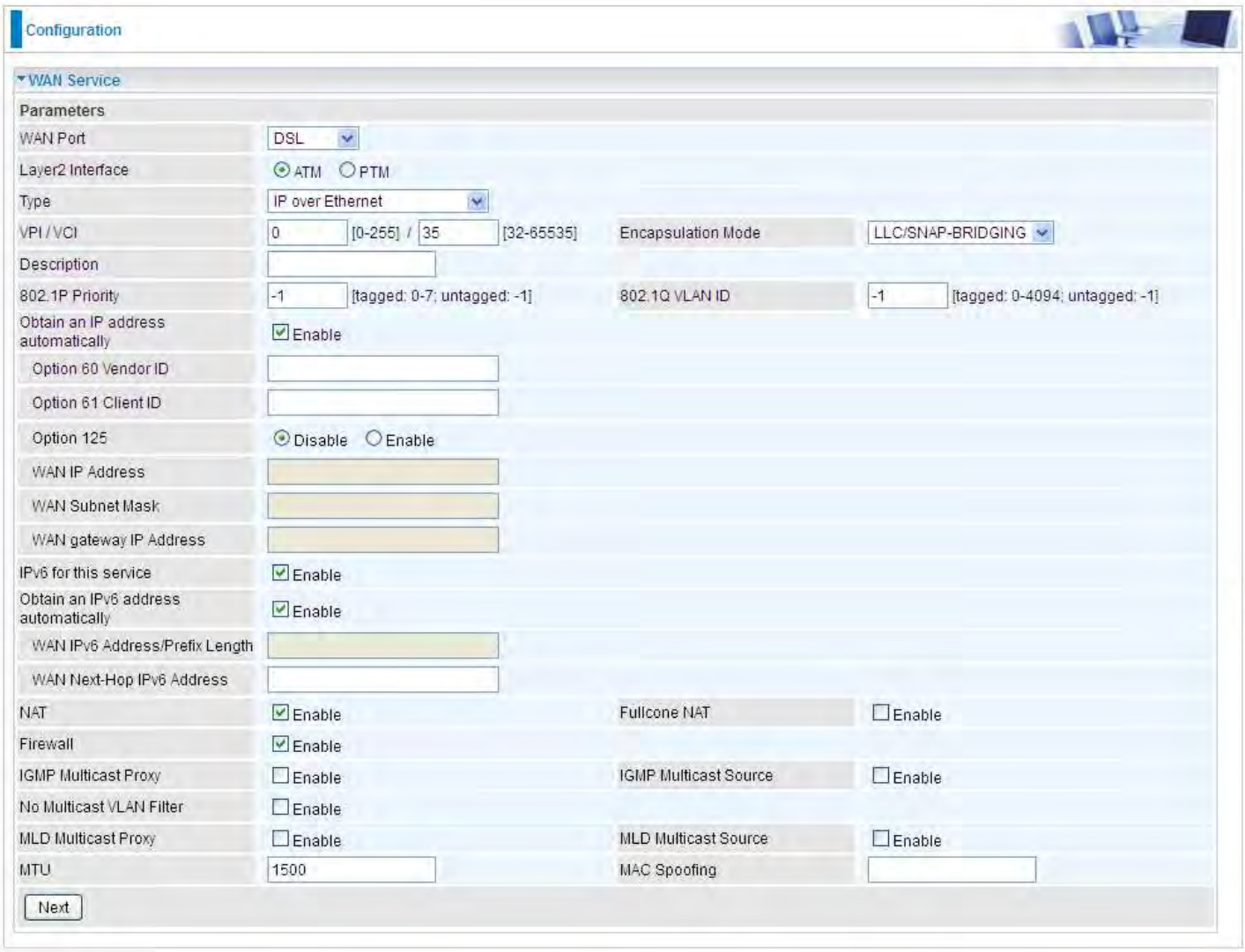
Click **Next** to continue to set the default gateway and DNS for IPv4 and IPv6.

IP over Ethernet



VPI/VCI: Enter the VPI/VCI combination from you ISP.

Encapsulation Mode: Select the encapsulation mode, LLC/SNAP-BRIDGING, or VC/MUX.

Description: User-defined description for the connection, commonly for friendly use.

Authentication Method: Default is ***Auto***. Or else your ISP will advise you the appropriate mode.

802.1P Priority: The parameter indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc). Enter the priority identification, tagged: 0-1, untagged: -1.

802.1Q VLAN ID: It is a parameter to specify the VLAN which the frame belongs. Enter the VLAN ID identification, tagged: 0-4094, untagged : -1.

Here two modes are supported for users to deal with the IP and DNS. You can select obtain automatically or manually input the information according to your ISP.

Obtain an IP address automatically: Check whether to enable this function.

Option 60 Vendor ID: Enter the associated information by your ISP. This option is used by DHCP clients to optionally identify the vendor type and configuration of a DHCP client. The information is a string of n octets, interpreted by servers. Vendors may choose to define specific vendor class identifiers to convey particular configuration or other identification information about a client.

Option 61 ClientID: Enter the associated information provided by your ISP.

Option 125: Option 125 is a complementary standard of DHCP protocol, it is used to encapsulate

option 125 message into DHCP offer packet before forward it to clients. After the clients receive the packet, it check the option 125 field in the packet with the prestored message, if it is matched, then the client accepts this offer, otherwise it will be abandoned. Check Enable or Disable this function. Default setting is ***Disable***.

WAN IP Address: Enter your IPv4 address to the device provided by your ISP.

WAN Subnet Mask: Enter your submask to the device provided by your ISP.

WAN gateway IP Address: Enter your gateway IP address to the device provided by your ISP.

IPv6 for this service: Enable to use IPv6 service.

Obtain an IPv6 address automatically: check whether to enable or disable this feature.

WAN IPv6 Address/Prefix Length: Enter the WAN IPv6 Address/Prefix Length from your ISP.

WAN Next-Hop IPv6 Address: Enter the WAN Next-Hop IPv6 Address from your ISP.

Note: If you don't know well about the DHCP Option, you can leave it empty or leave it as default.

NAT: The NAT (Network Address Translation) feature allows multiple users to access the Internet through a single IP account by sharing the single IP address. If users on your LAN have their own public IP addresses to access the Internet, NAT function can be disabled. When enabled, a Fullcone NAT parameter will appear, you can determine whether to enable Fullcone NAT. While only NAT enabled, the default NAT type Port-Restricted cone NAT will be used.

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Firewall: Enable to drop all traffic from WAN side. If enabled, all incoming packets by default would be dropped, and please turn to IP Filtering Incoming to add allowing rules.

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No Multicast VLAN Filter: Enable to deactivate the multicast VLAN filter which allows users to filter on all multicast packets or on specific multicast groups.

MLD Multicast Proxy: check whether to enable this function. MLD (**Multicast Listener Discovery**

Protocol) Proxy intercepts the MLD request from Clients a set up the multicast-forwarding table. it takes over some of the router's job, simplifying the router's job and multicast communication. Support MLDv1 and MLDv2. **Note:** It works only on MLD version 2.

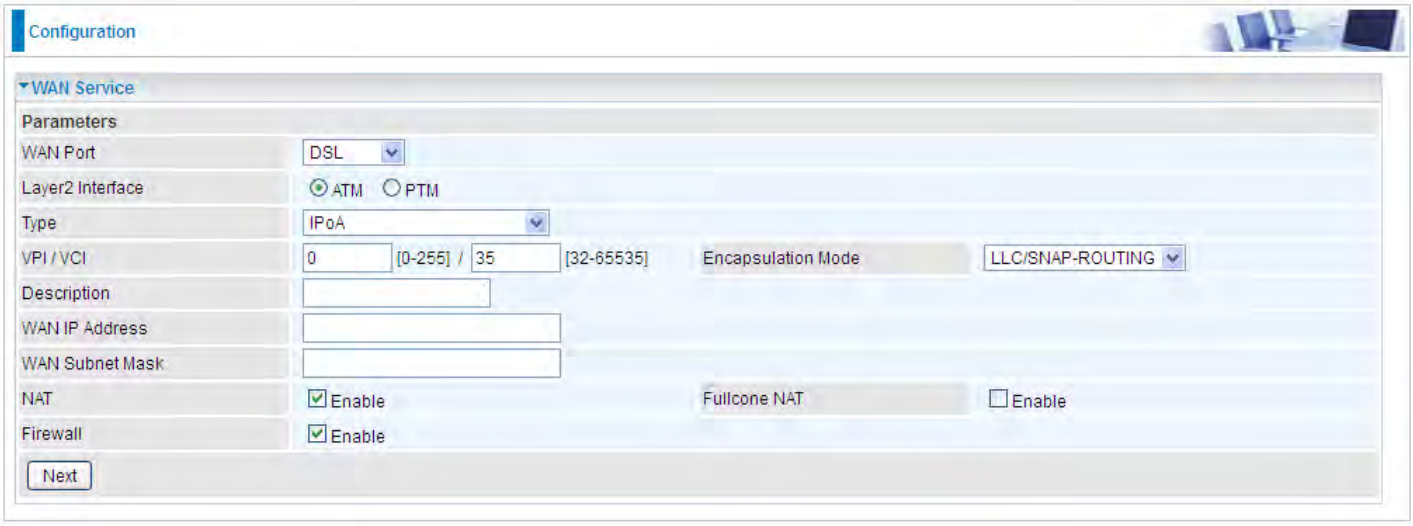
MLD Multicast Source: Used in a similar way by IPv6 system as IGMP Multicast source in IPv4 system. Enable it to support the source filtering functionality for IPv6 system.

MTU: Maximum Transmission Unit, the size of the largest datagram (excluding media-specific headers) that IP will attempt to send through the interface.

MAC Spoofing: This option is required by some service providers specifying some specific MAC allowed for joining network. You must fill in the MAC address specified by your service provider when this information is required.

Click **Next** to continue to set the default gateway and DNS for IPv4 and IPv6.

IPoA



VPI/VCI: Enter the VPI/VCI combination from you ISP.

Encapsulation Mode: Select the encapsulation mode, LLC/SNAP-BRIDGING, or VC/MUX.

Description: User-defined description for the connection, commonly for friendly use.

WAN IP: Enter the WAN IP from the ISP.

WAN Subnet Mask: Enter the WAN Subnet Mask from the ISP.

NAT: The NAT (Network Address Translation) feature allows multiple users to access the Internet through a single IP account by sharing the single IP address. If users on your LAN have their own public IP addresses to access the Internet, NAT function can be disabled. When enabled, a Fullcone NAT parameter will appear, you can determine whether to enable Fullcone NAT. While only NAT enabled, the default NAT type Port-Restricted cone NAT will be used.

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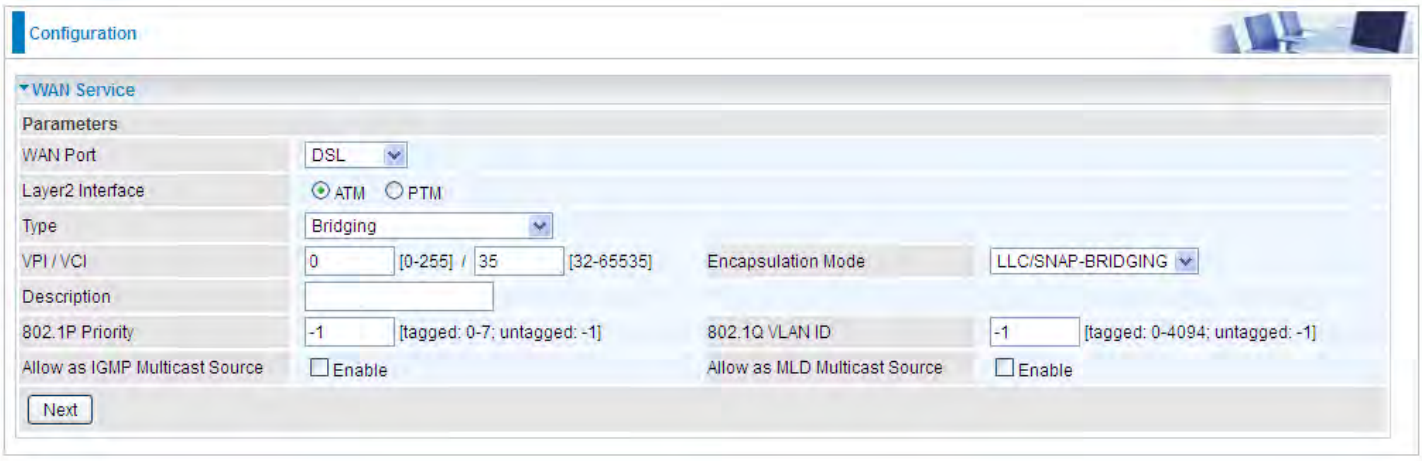
Firewall: Enable to drop all traffic from WAN side. If enabled, all incoming packets by default would be dropped, and please turn to IP Filtering Incoming to add allowing rules.

Bridging



VPI/VCI: Enter the VPI/VCI combination from you ISP.

Encapsulation Mode: Select the encapsulation mode, LLC/SNAP-BRIDGING, or VC/MUX.

Description: User-defined description for the connection, commonly for friendly use.

802.1P Priority: The parameter indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc). Enter the priority identification, tagged: 0-1, untagged: -1.

802.1Q VLAN ID: It is a parameter to specify the VLAN which the frame belongs. Enter the VLAN ID identification, tagged: 0-4094, untagged : -1.

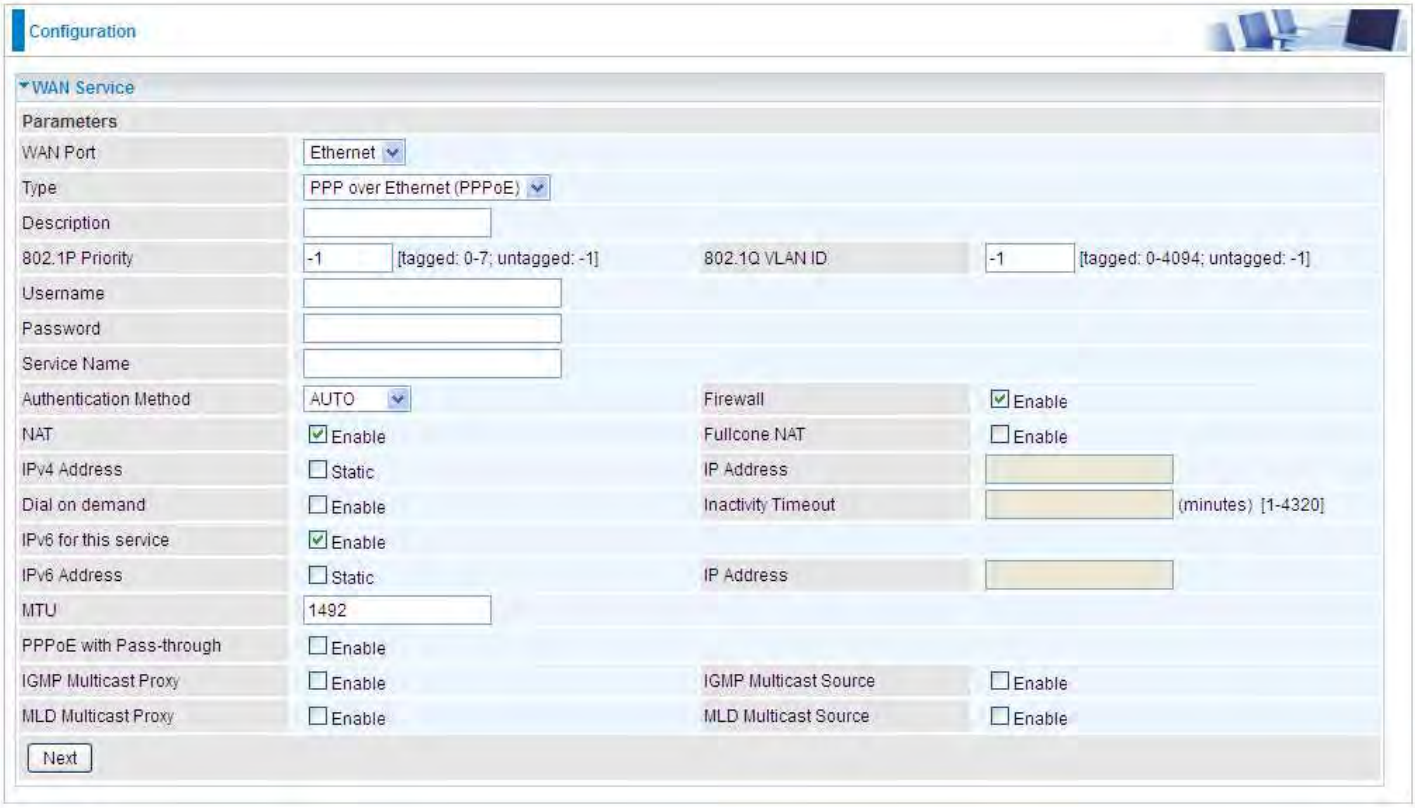
Allow as IGMP Multicast Source: Enable to support the “source filtering” which is the ability for a system to report interest in receiving packets “only ” from specific source address(es), or “all but” specific source address(es), sent to a particular multicast address. **Note:** It works only on IGMP version 3.

Allow as MLD Multicast Source: Used in a similar way by IPv6 system as IGMP Multicast source in IPv4 system. Enable it to support the source filtering functionality for IPv6 system. **Note:** It works only on MLD version 2.

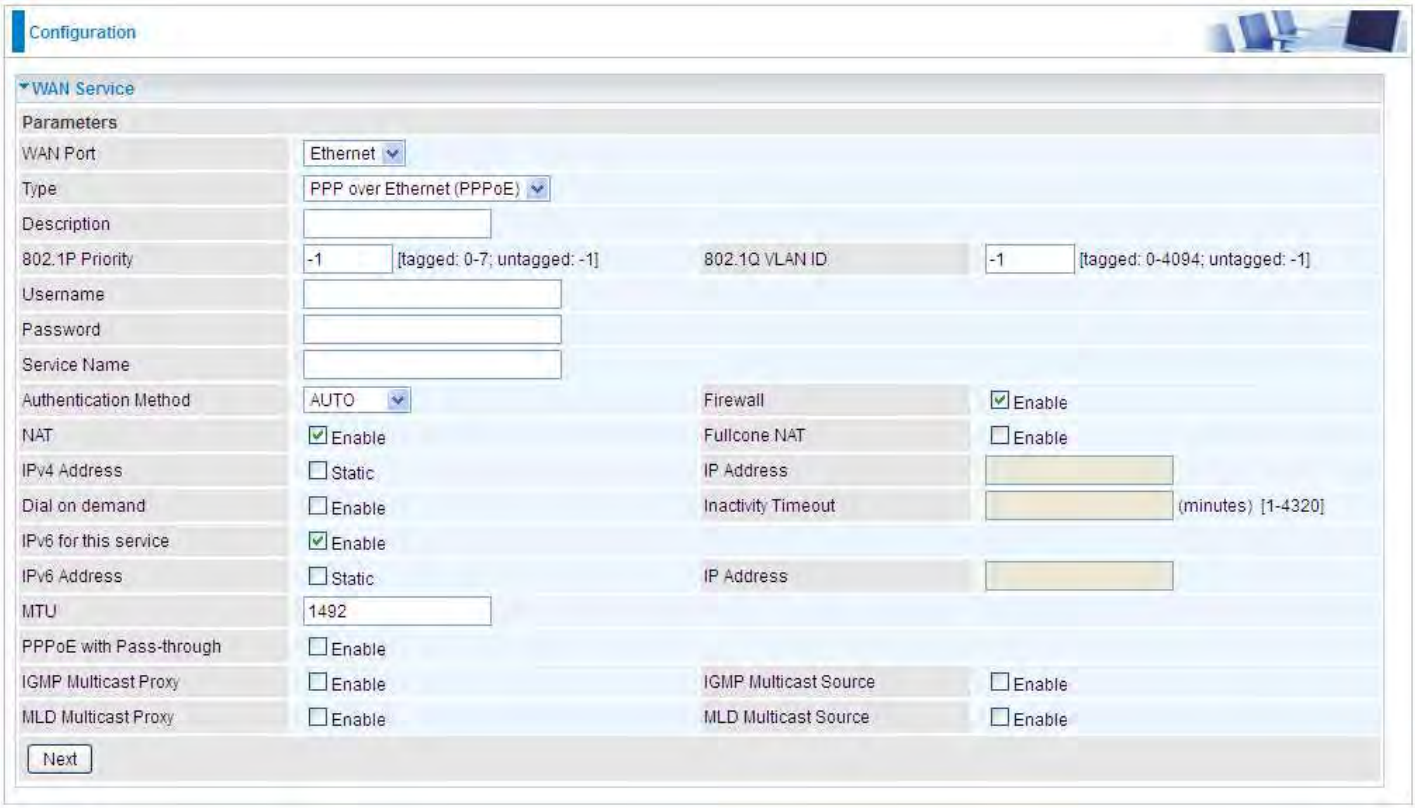
ⓘ Ethernet

Ethernet WAN connection is well known as directly broadband WAN connection.

Note: P5 can be configured as EWAN, and when the device is in EWAN profile, there is no P5/EWAN interface as P5 is working as a WAN port. If you need P5, please remove EWAN interface.



PPPoE



Description: User-defined description for the connection, commonly for friendly use.

802.1P Priority: The parameter indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc). Enter the priority

identification, tagged: 0-1, untagged: -1.

802.1Q VLAN ID: It is a parameter to specify the VLAN which the frame belongs. Enter the VLAN ID identification, tagged: 0-4094, untagged : -1.

Username: Enter the account obtained from the ISP.

Password: Enter the password obtained from the ISP.

Service Name: The item is for identification purpose, user can define it yourselfe.

Authentication Method: Default is ***Auto***. Or else your ISP will advise you the appropriate mode.

Firewall: Enable to drop all traffic from WAN side. If enabled, all incoming packets by default would be dropped, and please turn to IP Filtering Incoming to add allowing rules.

NAT: The NAT (Network Address Translation) feature allows multiple users to access the Internet through a single IP account by sharing the single IP address. If users on your LAN have their own public IP addresses to access the Internet, NAT function can be disabled. When enabled, a Fullcone NAT parameter will appear, you can determine whether to enable Fullcone NAT. While only NAT enabled, the default NAT type Port-Restricted cone NAT will be used.

Fullcone NAT: Enable or disable fullcone NAT. Fullcone is a kind of NAT, in this mode, all requests from the same internal IP address and port are mapped to the same external IP address and port. Furthermore, any external host can send a packet to the internal host, by sending a packet to the mapped external address.

Note: In PPPoE connection, NAT is enabled by default, you can determine whether to enable Fullcone NAT. and while you disable Fullcone NAT and only use NAT, the default NAT type is Port Restricted or Port-Restricted cone NAT, the restriction includes port numbers. Specifically, an external host can send a packet, with source IP address X and source port P, to the internal host only if the internal host had previously sent a packet to IP address X and port P.

IPv4 Address: Select whether to set static IPv4 address or obtain automatically.

IP Address: If ***Static*** is enabled in the above field, enter the static IPv4 address get from the ISP.

Dial on demand: It is a parameter to let users to dial for connection to internet themselves. It is useful when saving internet fees.

Inactivity Timeout: The set Inactivity timeout period, unit: minutes. It is combined use with Dial on Demand, users should specify the concrete time interval for dial on demand.

IPv6 for this service: Enable to use IPv6 service.

IPv6 Address: Select whether to set static IPv6 address or obtain automatically.

IP Address: If ***Static*** is enabled in the above field, enter the static IPv4 address.

MTU: Maximum Transmission Unit, the size of the largest datagram (excluding media-specific headers) that IP will attempt to send through the interface.

PPPoE with Pass-through: Enable or disable PPPoE pass-through. If it is enabled, PCs behind the router can dial itself.

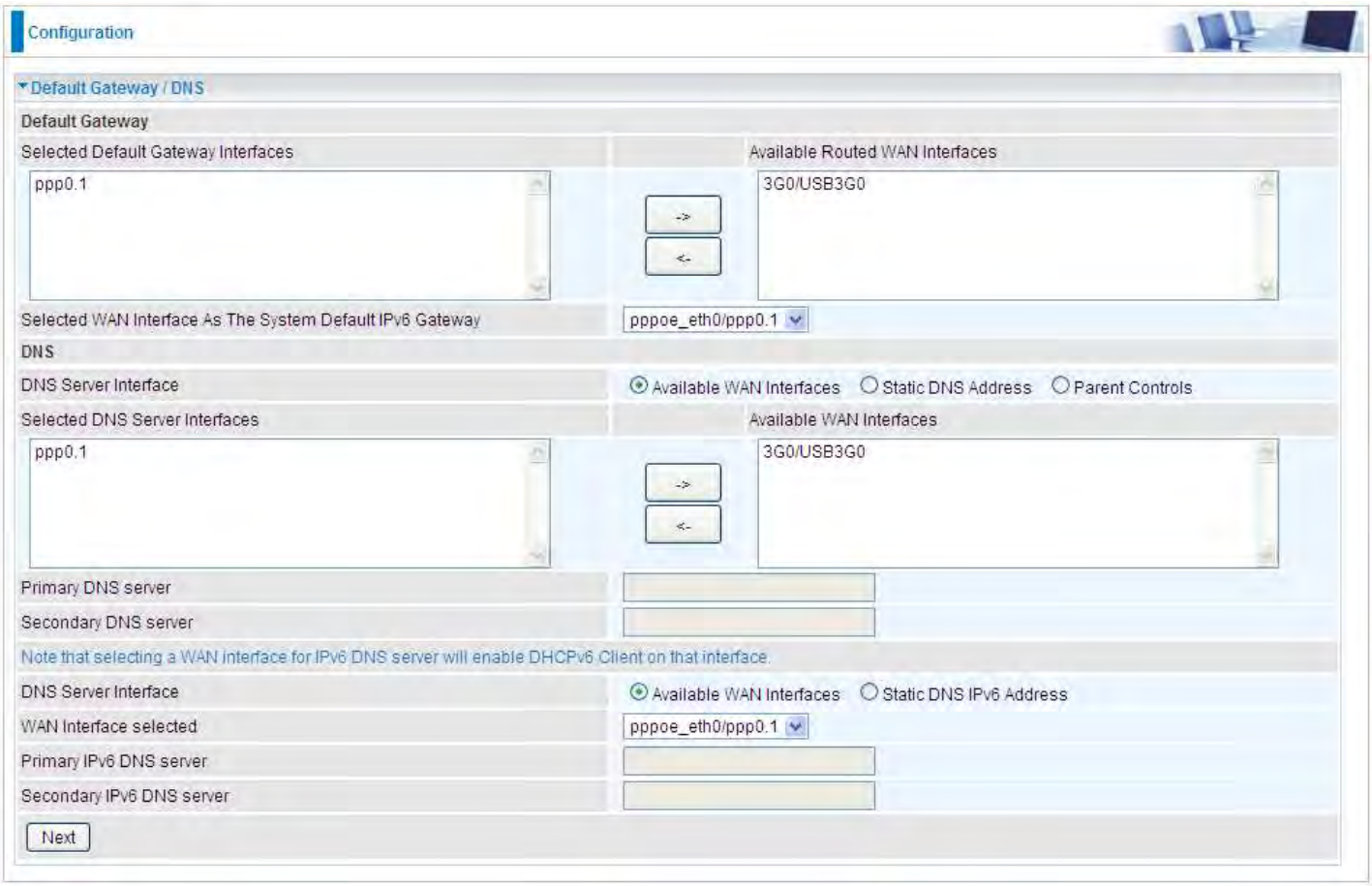
IGMP Multicast Proxy: Check whether to enable this feature. IGMP (**Internet Group Management Protocol**) Proxy intercepts the IGMP request from Clients and set up the multicast-forwarding table, it takes over some of the router's job, simplifying the router's job and multicast communication.

IGMP Multicast Source: Enable to support the "source filtering" which is the ability for a system to report interest in receiving packets "only " from specific source address(es), or "all but" specific source address(es), sent to a particular multicast address. **Note:** It works only on IGMP version 3.

MLD Multicast Proxy: check whether to enable this function. MLD (**Multicast Listener Discovery** Protocol) Proxy intercepts the MLD request from Clients a set up the multicast-forwarding table. it takes over some of the router's job, simplifying the router's job and multicast communication. Support MLDv1 and MLDv2.

MLD Multicast Source: Used in a similar way by IPv6 system as IGMP Multicast source in IPv4 system. Enable it to support the source filtering functionality for IPv6 system. **Note:** It works only on MLD version 2.

Click **Next** to continue to set the default gateway and DNS for IPv4 and IPv6.



Default Gateway

Select default gateway for you connection (IPv4 and IPv6).

DNS

- **IPv4**

Three ways to set an IPv4 DNS server

- **Available WAN interfaces:** Select a desirable WAN interface as the IPv4 DNS server.
- **Static DNS Address:** To specify DNS server manually by entering your primary and secondary DNS server addresses.
- **Parent Controls:** If user registers and gets a DNS account in the parental control provider website, expecting to enjoy a more reliable and safer internet surfing environment, please select this option (need to configure at Parental Control Provider).

- **IPv6**

Obtain IPv6 DNS info from a WAN interface

WAN Interface selected: Select one configured IPv6 WAN connection from the menu to be as an IPv6 DNS.

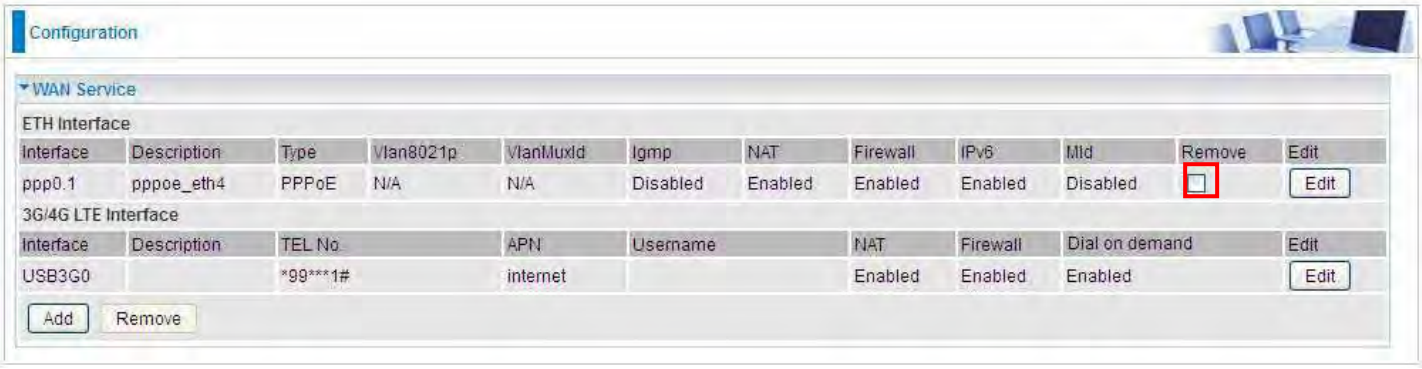
Static DNS IPv6 Address

Primary IPv6 DNS Server / Secondary IPv6 DNS Server: Type the specific primary and secondary

IPv6 DNS Server address.

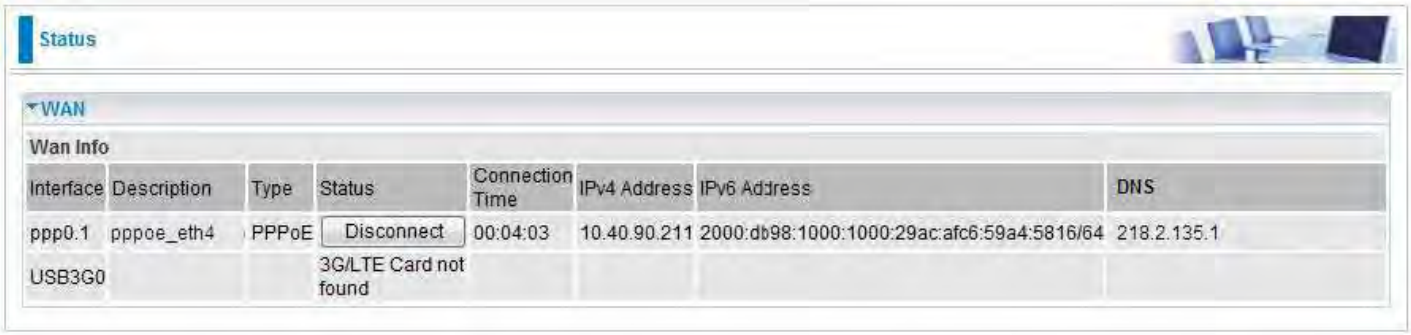
If you don't need the EWAN service, select the item you want to remove, check the checkbox, then press **Remove**, it will be OK. (Remove all the EWAN rules to release EWAN port to become a LAN port.)

Press **Edit** button to re-edit this service settings.

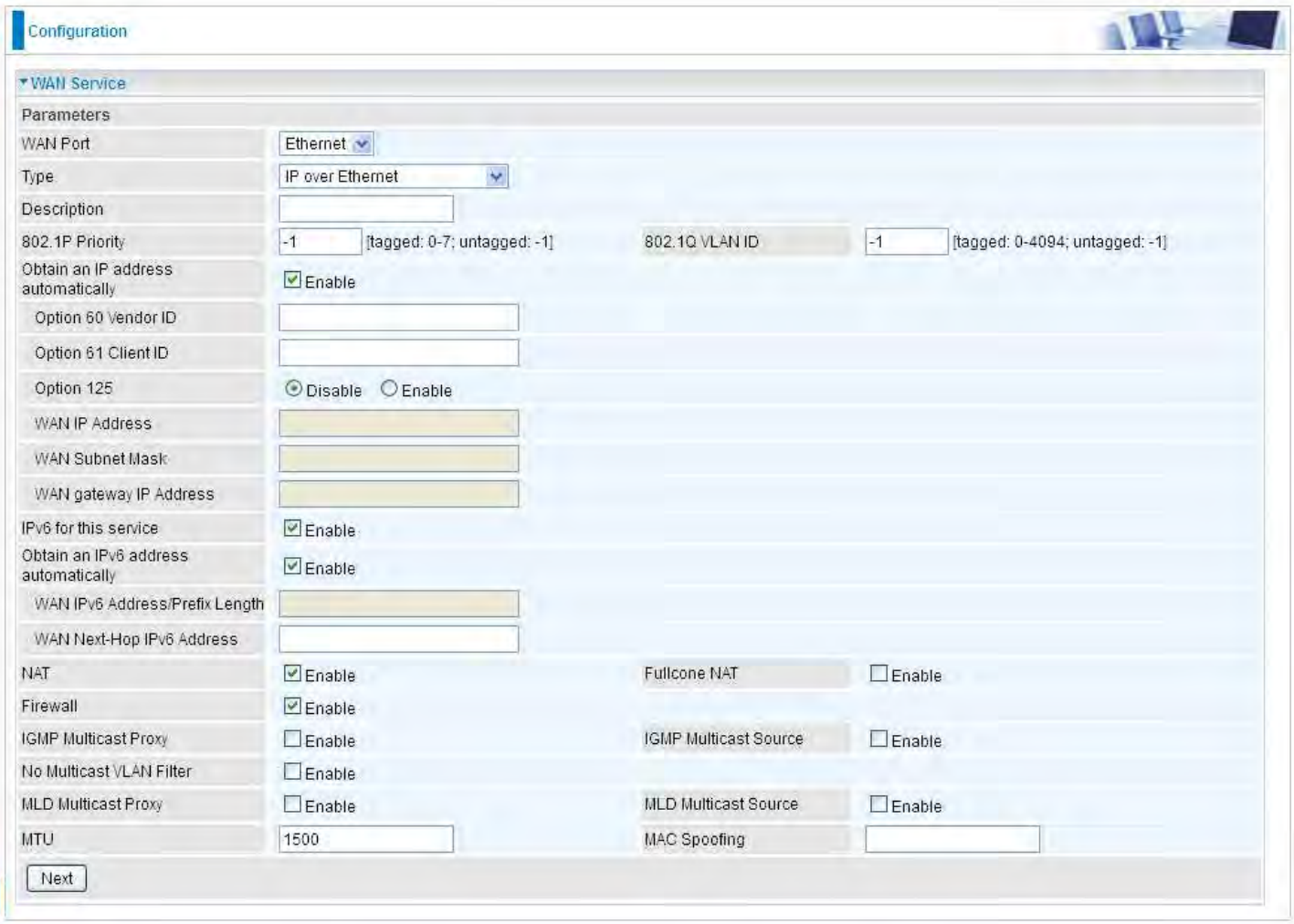


Here the corresponding WAN Service have been configured, if it is OK, you can access the internet. You can go to **Status>WAN** or **Summary** to view the WAN connection information (if your ISP provides IPv6 service, then you will obtain an IPv6 address).

(IPv4 or IPv6)



IP over Ethernet



Description: User-defined description for the connection, commonly for friendly use.

802.1P Priority: The parameter indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc). Enter the priority identification, tagged: 0-1, untagged: -1.

802.1Q VLAN ID: It is a parameter to specify the VLAN which the frame belongs. Enter the VLAN ID identification, tagged: 0-4094, untagged : -1.

Here two modes are supported for users to deal with the IP and DNS. You can select obtain automatically or manually input the information according to your ISP.

Obtain an IP address automatically: Check whether to enable this function.

Option 60 Vendor ID: Enter the associated information by your ISP. This option is used by DHCP clients to optionally identify the vendor type and configuration of a DHCP client. The information is a string of n octets, interpreted by servers. Vendors may choose to define specific vendor class identifiers to convey particular configuration or other identification information about a client.

Option 61 ClientID: Enter the associated information provided by your ISP.

Option 125: Option 125 is a complementary standard of DHCP protocol, it is used to encapsulate option 125 message into DHCP offer packet before forward it to clients. After the clients receive the packet, it check the option 125 field in the packet with the pre-stored message, if it is matched, then the client accepts this offer, otherwise it will be abandoned. Check Enable or Disable this function. Default setting is ***Disable***.

WAN IP Address: Enter your IPv4 address to the device provided by your ISP.

WAN Subnet Mask: Enter your submask to the device provided by your ISP.

WAN gateway IP Address: Enter your gateway IP address to the device provided by your ISP.

IPv6 for this service: Enable to use IPv6 service.

Obtain an IPv6 address automatically: check whether to enable or disable this feature.

WAN IPv6 Address/Prefix Length: Enter the WAN IPv6 Address/Prefix Length from your ISP.

WAN Next-Hop IPv6 Address: Enter the WAN Next-Hop IPv6 Address from your ISP.

Note: If you don't know well about the DHCP Option, you can leave it empty or leave it as default.

NAT: The NAT (Network Address Translation) feature allows multiple users to access the Internet through a single IP account by sharing the single IP address. If users on your LAN have their own public IP addresses to access the Internet, NAT function can be disabled. When enabled, a Fullcone NAT parameter will appear, you can determine whether to enable Fullcone NAT. While only NAT enabled, the default NAT type Port-Restricted cone NAT will be used.

Fullcone NAT: Enable or disable fullcone NAT. Fullcone is a kind of NAT, in this mode, all requests from the same internal IP address and port are mapped to the same external IP address and port. Furthermore, any external host can send a packet to the internal host, by sending a packet to the mapped external address.

Firewall: Enable to drop all traffic from WAN side. If enabled, all incoming packets by default would be dropped, and please turn to IP Filtering Incoming to add allowing rules.

IGMP Multicast: IGMP (**Internet Group Membership** Protocol) is a protocol used by IP hosts to report their multicast group memberships to any immediately neighboring multicast routers. Check this item to enable IGMP multicast on that WAN interface for multicast forwarding.

IGMP Multicast Source: Enable to support the "source filtering" which is the ability for a system to report interest in receiving packets "only " from specific source address(es), or "all but" specific source address(es), sent to a particular multicast address. **Note:** It works only on IGMP version 3.

No Multicast VLAN Filter: Enable to deactivate the multicast VLAN filter which allows users to filter on all multicast packets or on specific multicast groups.

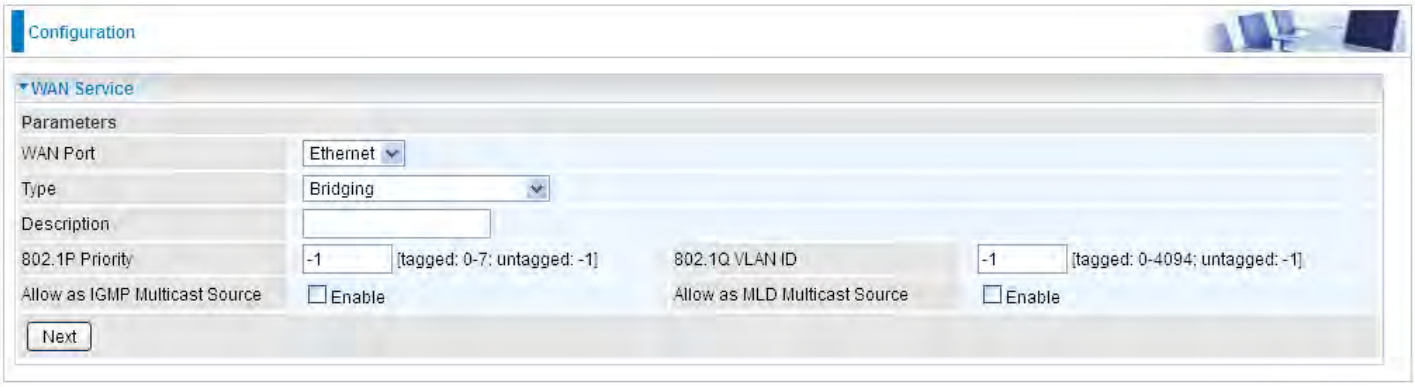
MLD Multicast Proxy: check whether to enable this function. MLD (**Multicast Listener Discovery** Protocol) Proxy intercepts the MLD request from Clients a set up the multicast-forwarding table. it takes over some of the router's job, simplifying the router's job and multicast communication. Support MLDv1 and MLDv2.

MLD Multicast Source: Used in a similar way by IPv6 system as IGMP Multicast source in IPv4 system. Enable it to support the source filtering functionality for IPv6 system. **Note:** It works only on MLD version 2.

MTU: Maximum Transmission Unit, the size of the largest datagram (excluding media-specific headers) that IP will attempt to send through the interface.

MAC Spoofing: This option is required by some service providers specifying some specific MAC allowed to join in network. You must fill in the MAC address specified by your service provider when this information is required.

Bridging



Description: User-defined description for the connection, commonly for friendly use.

802.1P Priority: The parameter indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc). Enter the priority identification, tagged: 0-1, untagged: -1.

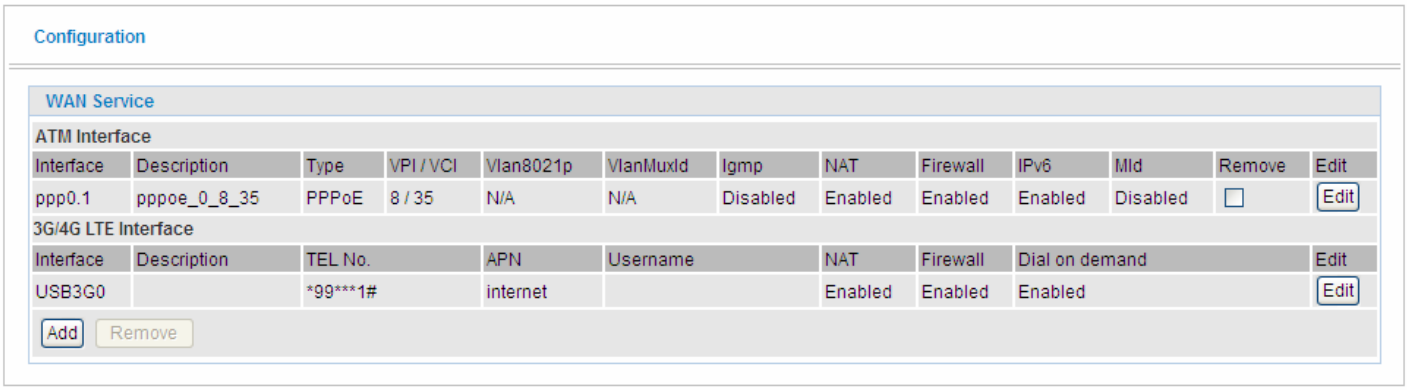
802.1Q VLAN ID: It is a parameter to specify the VLAN which the frame belongs. Enter the VLAN ID identification, tagged: 0-4094, untagged : -1.

Allow as IGMP Multicast Source: Enable to support the “source filtering” which is the ability for a system to report interest in receiving packets “only ” from specific source address(es), or “all but” specific source address(es), sent to a particular multicast address. **Note:** It works only on IGMP version 3.

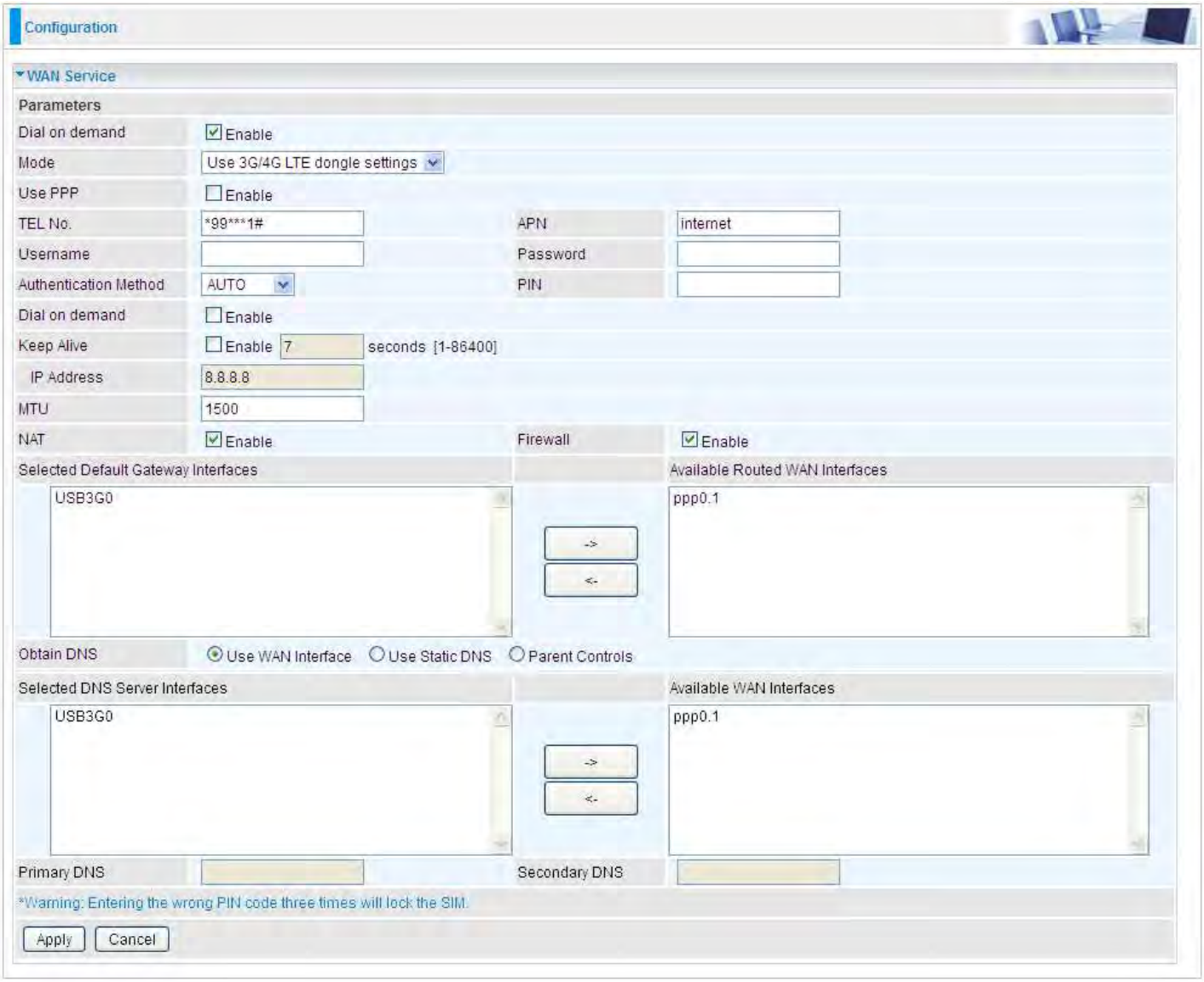
Allow as MLD Multicast Source: Used in a similar way by IPv6 system as IGMP Multicast source in IPv4 system. Enable it to support the source filtering functionality for IPv6 system. **Note:** It works only on MLD version 2.

ⓘ 3G/4G LTE

Select 3G/4G LTE to configure the route to enjoy the mobility. By default the 3G/LTE interface is on, user can edit the parameters to meet your own requirements.



Click **Edit** button to enter the 3G/4G LTE configuration page.



Dial on demand: If enabled, the 3G/4G LTE will work in dial on demand and be brought up only when there is no active default route. In this mode, 3G/LTE work as a backup for the WAN connectivity. While if disabled, 3G/4G LTE serves as a normal interface, and can only be brought up when it has been configured to achieve a mobile connectivity.

Mode: There are 6 options of phone service standards: GSM 2G only, UTMS 3G only, GSM 2G

preferred, UMTS 3G preferred, Automatic, and Use 3G/4G LTE dongle settings. If you are uncertain what services are available to you, and then please select Automatic.

TEL No.: The dial string to make a 3G/LTE user internetworking call. It may provide by your mobile service provider.

APN: An APN is similar to a URL on the WWW, it is what the unit makes a GPRS / UMTS call. The service provider is able to attach anything to an APN to create a data connection, requirements for APNs varies between different service providers. Most service providers have an internet portal which they use to connect to a DHCP Server, thus giving you access to the internet i.e. some 3G operators use the APN 'internet' for their portal. The default value is "internet".

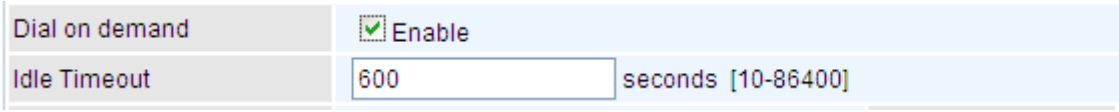
Username/Password: Enter the username and password provided by your service provider. The username and password are case sensitive.

Authentication Protocol: Default is Auto. Please consult your service provider on whether to use PAP, CHAP or MSCHAP.

PIN: PIN stands for Personal Identification Number. A PIN code is a numeric value used in certain systems as a password to gain access, and authenticate. In mobile phones a PIN code locks the SIM card until you enter the correct code. If you enter the PIN code incorrectly into the phone 3 times in a row, then the SIM card will be blocked and you will require a PUK code from your network/ service provider.

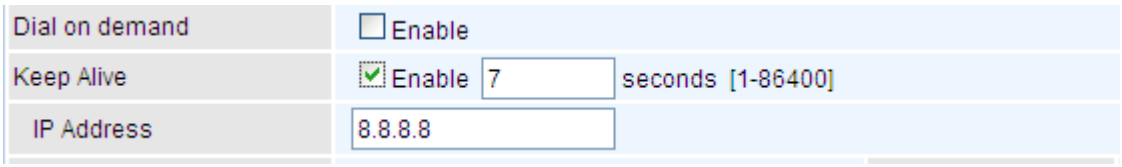
- **Dial on Demand:** If you want to make UMTS/GPRS call only when there is a packet requesting access to the Internet (i.e. when a program on your computer attempts to access the Internet). In this mode, you must set Idle Timeout value at same time. Click on Connect on Demand, the Idle Timeout field will display.

  Idle Timeout: Auto-disconnect the broadband firewall gateway when there is no activity on the line for a predetermined period of time. Default is 600 seconds.



- **Keep Alive:** Check Enable to allow the router to send message out every 7 seconds (can be changed base on need) to prevent the connection being dropped by ISP.

  IP Address: The IP address is used to "ping", and router will ping the IP to find whether the connection is still on.



NAT: Check to enable the NAT function.

Firewall: Enable to drop all traffic from WAN side. If enabled, all incoming packets by default would be dropped, and please turn to IP Filtering Incoming to add allowing rules.

MTU: MTU (Maximum Transmission Unit) is the size of the largest datagram that IP will attempt to send through the interface.

Select default gateway interfaces: Select from the interfaces the default gateway, here commonly we select USB3G0.

Selected DNS Server Interfaces: Three ways to set a DNS server.

- **Available WAN interfaces:** Select a desirable WAN interface as the DNS server.
- **Static DNS Address:** To specify DNS server manually by entering your primary and

secondary DNS server addresses.

- **Parent Controls:** If user registers and gets a DNS account in the parental control provider website, expecting to enjoy a more reliable and safer internet surfing environment, please select this option (need to configure at Parental Control Provider).

Click **Apply** to confirm the settings.

Here you can configure WAN Service, if it is OK, you can access the internet. You can go to **Status >WAN** or **Summary** to view the WAN connection information (Here user can see the 3G/LTE failover).

DSL

This screen allows you to set DSL parameters. DSL knowledge is required to configure these settings. Contact your ISP to make sure that these parameters are correct.

Modulation: There are 8 modes “G.Dmt”, “G.lite”, “T1.413”, “ADSL2”, “AnnexL”, ”ADSL2+”, “AnnexM”, “VDSL2” that user can select for this connection.

Profile: VDSL profiles up to 17a.

US0: Select to enable US0. In VDSL mode, profiles like 8a, 8b, 8c, 8d and 12a need users to enable US0 band.

Phone line pair: This is for reserved only. You can choose "Inner Pair" or "Outer Pair".

Capability: There are 2 options “Bitswap Enable” and “SRA Enable” that user can select for this connection.

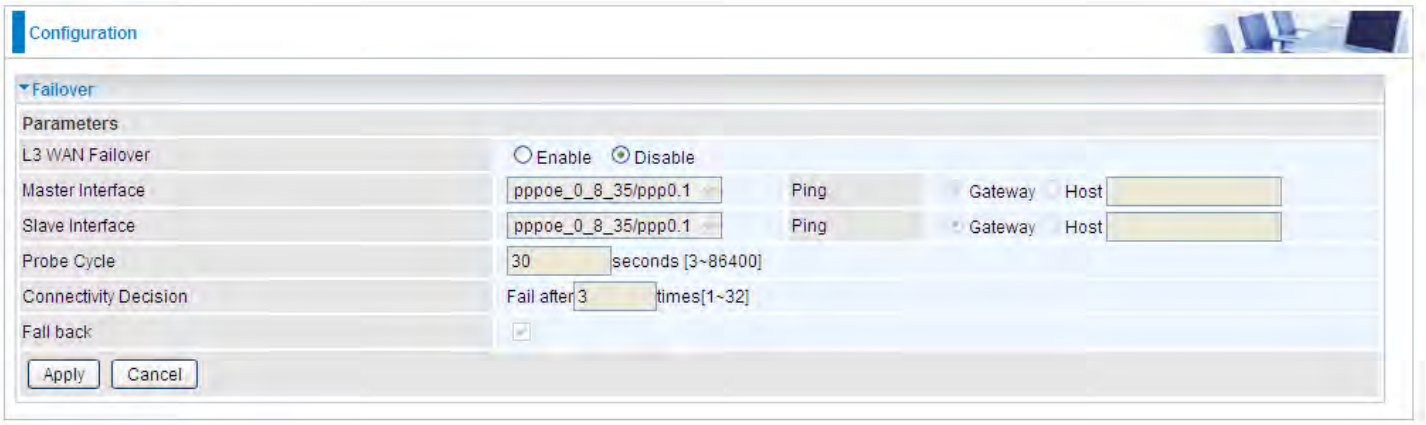
- Bitswap Enable: Allows bitswaping function.
- SRA Enable: Allows seamless rate adaptation.

PhyR: A new technology to control impulse and noise to improve the BER and DSL data quality.

Click **Apply** to confirm the settings.

Failover

Auto failover/failback is to ensure an always-on internet connection. Users can set a Master WAN interface (main WAN) and a slave interface (backup WAN), and when Master WAN fails, it will switch to slave WAN, and when master WAN restores, it will switch to master WAN interface again.



L3 WAN Failover: Check Enable to activate L3 WAN failover.

Master Interface: Select a master WAN interface.

Ping: To ping to check the master WAN interface's connectivity.

- **Gateway:** It will send ping packets to gateway of master interface and wait for response from it in every "Probe Cycle" to check the connectivity of the gateway of master interface.
- **Host:** It will send ping packets to specific host and wait for response in every "Probe Cycle".

Slave Interface: Select a slave WAN interface as backup port.

Ping: To ping to check the slave WAN interface's connectivity.

- **Gateway:** It will send ping packets to gateway of slave interface and wait for response from it in every "Probe Cycle" to check the connectivity of the gateway of slave interface.
- **Host:** It will send ping packets to specific host and wait for response in every "Probe Cycle".

Probe Cycle: Set the time duration for the **Probe Cycle** to determine when the router will switch to the backup connection once the main connection (main port) fails. For example, when set to 30 seconds, the probe will be conducted every 30 seconds.

Connectivity Decision: Set how many times of probing failure to switch to backup port.

Fallback: Enable to reconnect to the master interface when master interface connection recovers.

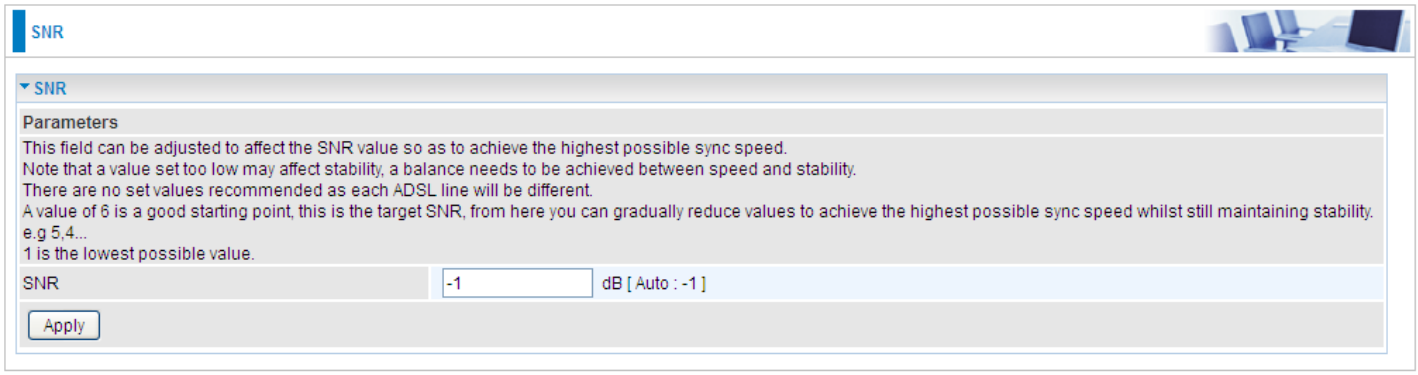
Note:

1) The time set is for each probe cycle, but the decision to change to the backup port is determined by **Probe Cycle** multiplied by **connection Decision amount** (e.g. From the image above it will be 30 seconds multiplied by 3 consecutive fails, the router will determine failover to slave interface.

2).The failback setting follow the same decision policy as the failover. For example, according to settings above in the screenshot, the connection probe will be carried out every 30 seconds, and 3 consecutive times of probe success is found, the router will determine failback to master interface

SNR

Signal-to-noise ratio (often abbreviated **SNR** or **S/N**) is a measure used in science and engineering that compares the level of a desired signal to the level of background noise. It is defined as the ratio of signal power to the noise power.



SNR: Change the value to adjust the DSL link rate, more suitable for an advanced user.

System

Internet Time

The router does not have a real time clock on board; instead, it uses the Network Time Protocol (NTP) to get the most current time from an NTP server.

NTP is a protocol for synchronization of computers. It can enable computers synchronize to the NTP server or clock source with a high accuracy.

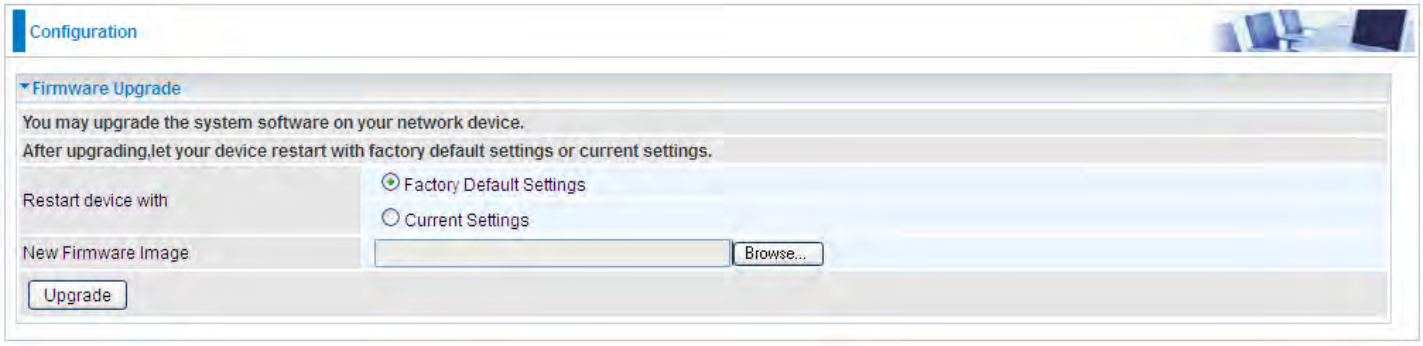
Choose the NTP time server from the drop-down menu, if you prefer to specify an NTP server other than those in the drop-down list, simply enter its IP address in their appropriate blanks provided as shown above. Your ISP may also provide an SNTP server for you to use.

Choose your local time zone from the drop-down menu. After a successful connection to the Internet, the router will retrieve the correct local time from the NTP server you have specified. If you prefer to specify an NTP server other than those in the drop-down list, simply enter its IP address in their appropriate blanks provided as shown above. Your ISP may also provide an NTP server for you to use.

Click **Apply** to apply your settings.

Firmware Upgrade

Software upgrading lets you experience new and integral functions of your router.



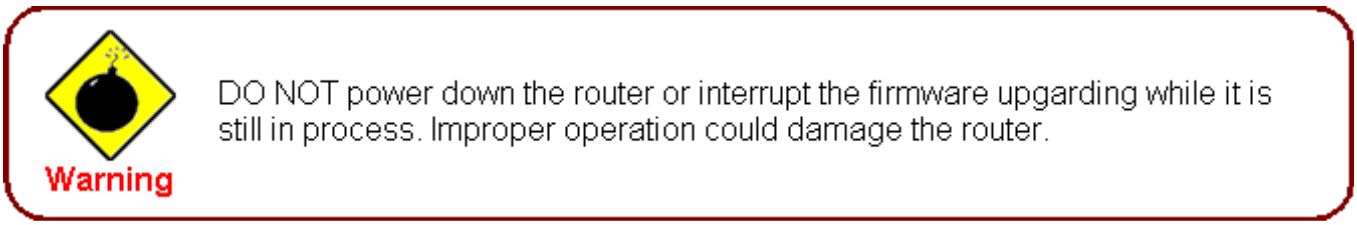
Restart device with:

- **Factory Default Settings:** Restart the device with factory default settings automatically when finishing upgrading.
- **Current Settings:** Restart the device with the current settings automatically when finishing upgrading.

Your router's "firmware" is the software that allows it to operate and provides all its functionality.

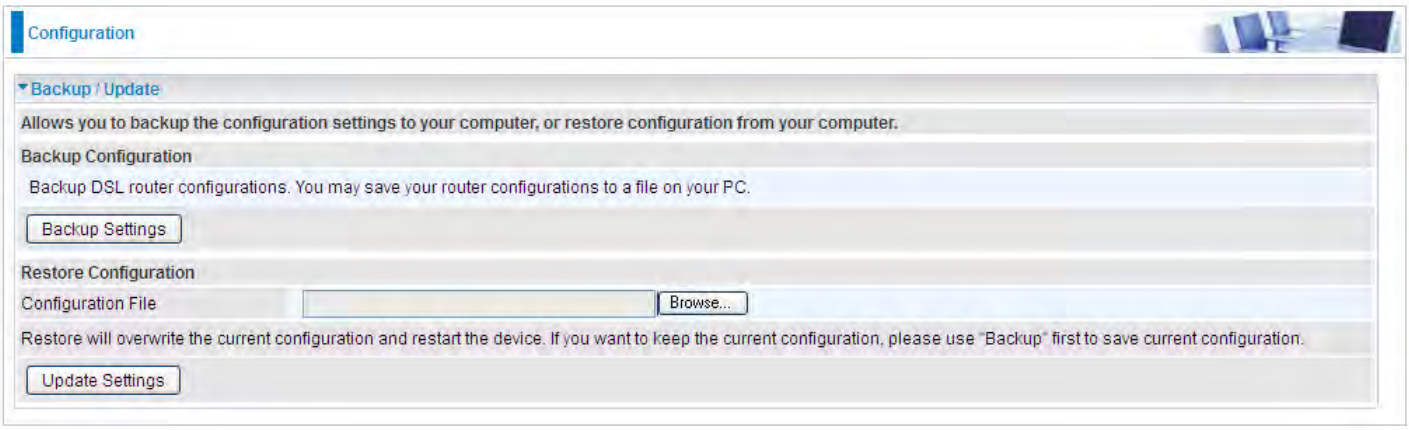
Think of your router as a dedicated computer, and the firmware as the software it runs. Over time this software may be improved and revised, and your router allows you to upgrade the software it runs to take advantage of these changes.

Clicking on **Browse** will allow you to select the new firmware image file you have downloaded to your PC. Once the correct file is selected, click **Upgrade** to update the firmware in your router.



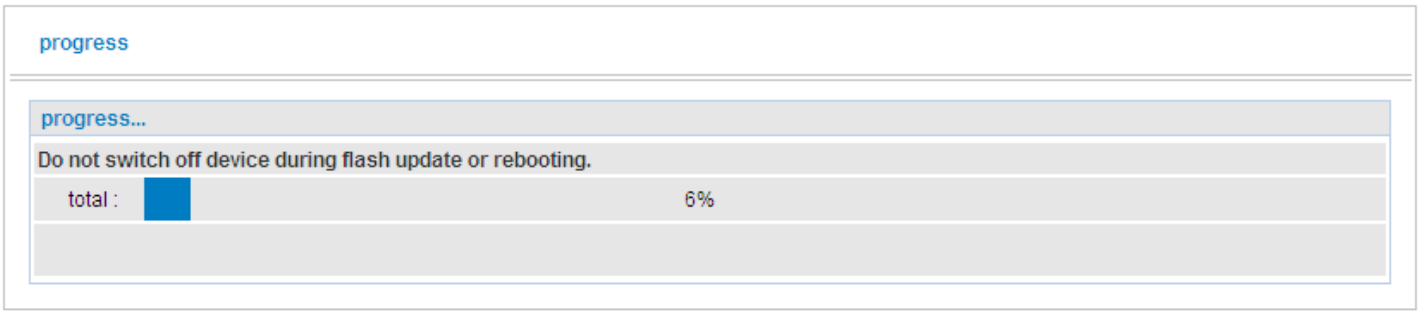
Backup / Update

These functions allow you to save and backup your router's current settings to a file on your PC, or to restore from a previously saved backup. This is useful if you wish to experiment with different settings, knowing that you have a backup handy in the case of any mistakes. It is advisable to backup your router's settings before making any significant changes to your router's configuration.



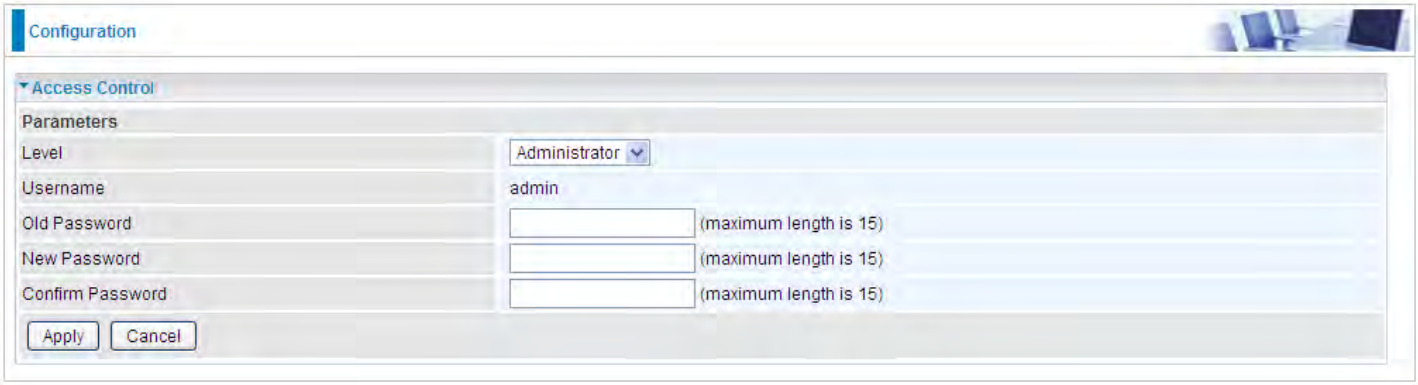
Click **Backup Settings**, a window appears, click save , then browse the location where you want to save the backup file.

Click **Browse** and browse to the location where your backup file is saved, the click **Open.** Then in the above page, click **Update Settings**, the following process indicating screen will appear. Let it update to 100%, it will automatically turn to the Device Info page.



Access Control

Access Control is used to prevent unauthorized access to the router configuration page. Here you can change the login user password. Three user levels are provided here. Each user level there's a default provided user. You must access the router with the appropriate username and password. Here the corresponding passwords are allowed to change.



Level: select which level you want to change password to. There are three default levels.

- **Administrator:** the root user, corresponding default username and password are admin and admin respectively.
- **Remote:** username for the remote user to login, corresponding default username and password are support and support respectively.
- **Local:** username for the general user, when logon to the web page, only lit items would be listed for common user, corresponding default username password are user and user respectively.

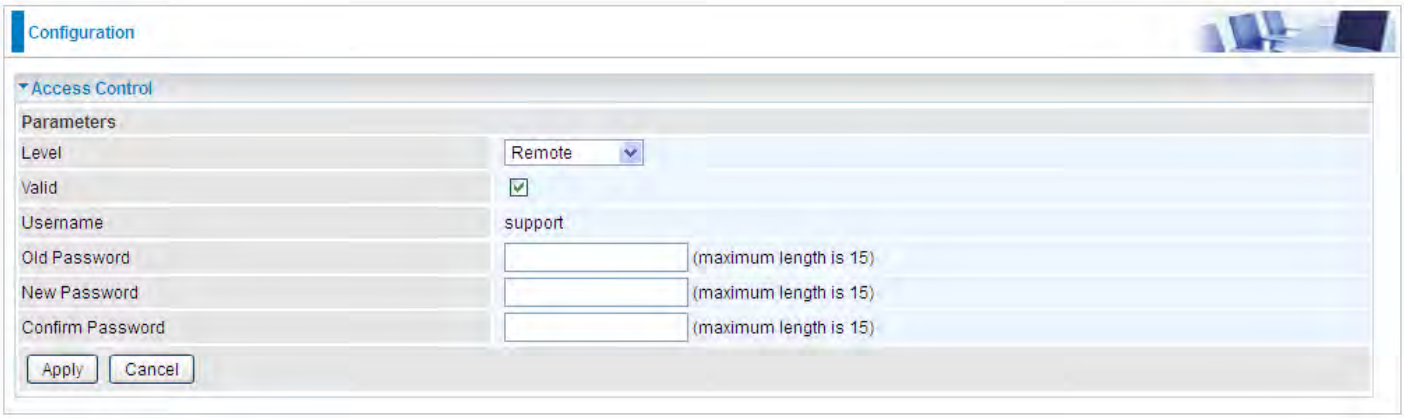
Username: the default username for each user level.

Old Password: Enter the old password.

New Password: Enter the new password.

Confirm Password: Enter again the new password to confirm.

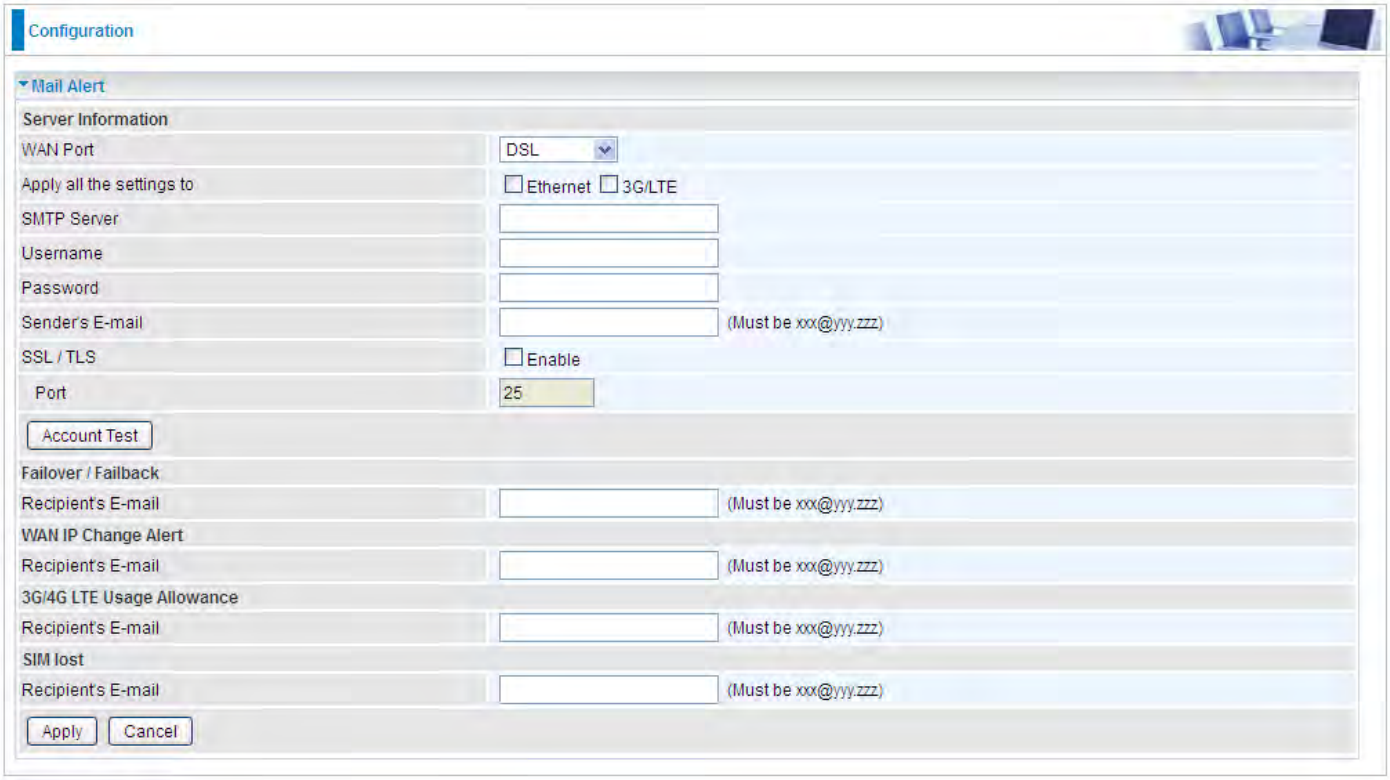
Note: By default the accounts of **Remote** and **Local** are disabled, please click **Valid** check-box to activate the accounts.



Click **Apply** to apply your new settings.

Mail Alert

Mail alert is designed to keep system administrator or other relevant personnel alerted of any unexpected events that might have occurred to the network computers or server for monitoring efficiency. With this alert system, appropriate solutions may be tackled to fix problems that may have arisen so that the server can be properly maintained.



WAN Port: Mail Alert feature can be applicable to every WAN mode: Ethernet，DSL and 3G/4G LTE. Select the port you want to use Mail Alert.

For example DSL, then when the WAN connection is in DSL mode and when there is any unexpected event, the alert message will be sent to your specified E-mail.

Apply all settings to: check whether you want to have a copy of the settings to apply to other WAN port, suppose the above Main port is DSL, then if you enable this function, then Ethernet port will have the same configuration.

SMTP Server: Enter the SMTP server that you would like to use for sending emails.

Username: Enter the username of your email account to be used by the SMTP server.

Password: Enter the password of your email account.

Sender's Email: Enter your email address.

SSL/TLS: check to whether to enable SSL encryption feature.

Port: the port, default is 25.

Account Test: Press this button to test the connectivity and feasibility to your sender's e-mail.

Recipient's Email (Failover / Fallback): Enter the email address that will receive the alert message once the WAN-interface failover or fallback occurs.

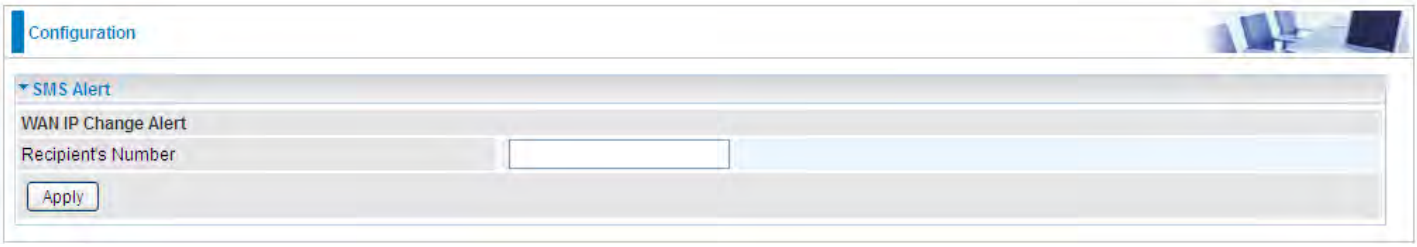
Recipient's Email (WAN IP Change Alert): Enter the email address that will receive the alert message once a WAN IP change has been detected.

Recipient's Email (3G/4G LTE Usage Allowance): Enter the email address that will receive the alert message once the 3G over Usage Allowance occurs.

Recipient's Email (SIM lost): Enter the email address that will receive the alert message once the SIM card loss has been detected.

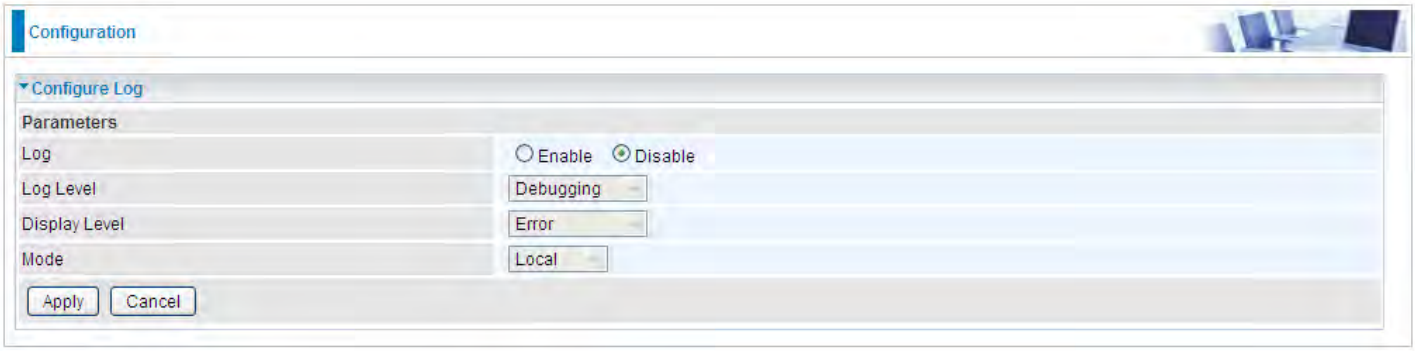
SMS Alert

SMS, Short Message Service, is to inform clients the information clients subscribe. The BiPAC 8900X *R3* offers SMS alert sending clients alert messages when a WAN IP change is detected.



Recipient's Number (WAN IP Change Alert): Enter the Recipient's number that will receive the alert message once a WAN IP change has been detected.

Configure Log



Log: Enable or disable this function.

Log level: Select your log level. The log level allows you to configure which types of events are logged. There are eight log levels from high to low are displayed below:

- **Emergency** = system is unusable
- **Alert** = action must be taken immediately
- **Critical** = critical conditions
- **Error** = error conditions
- **Warning** = warning conditions
- **Notice** = normal but significant conditions
- **Informational** = information events
- **Debugging** = debug-level messages

The gateway records all log events at the chosen level and above. For instance, if you set the log level to Critical, all critical, alert, and emergency events are logged, but none of the others are recorded

Display Level: Display the log according to the level you set when you view system log. Once you set the display level, the logs of the same or higher priority will be displayed.

Mode: Select the mode the system log adopted. Three modes: local, Remote and Both.

- **Local**: Select this mode to store the logs in the router's local memory.
- **Remote**: Select this mode to send the log information to a remote log server. Then you must assign the remote log server and port, 514 is often used.
- **Both**: Logs stored adopting above two ways.

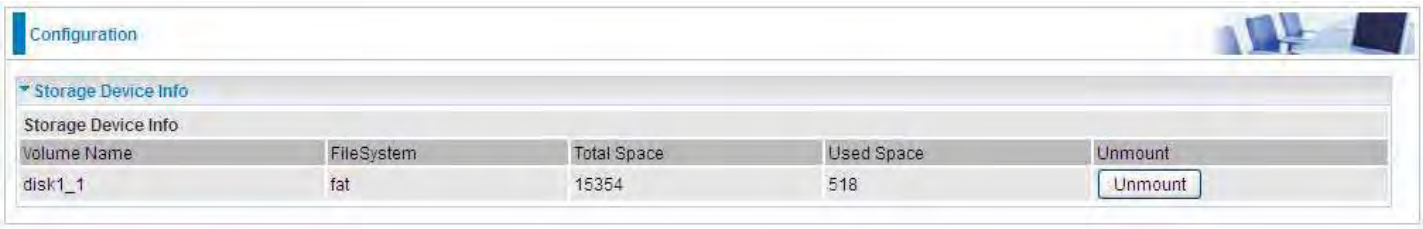
Click **Apply** to save your settings.

USB

Storage here refers to network sharing in the network environment, USB devices act as the storage carrier for DLNA, common file sharing.

Storage Device Info

This part provides users direct access to the storage information like the total volume, the used and the remaining capacity of the device.



Volume Name: Display the storage volume name

FileSystem: Display the storage device's file system format, well-known is FAT.

Total Space: Display the total space of the storage, with unit MB.

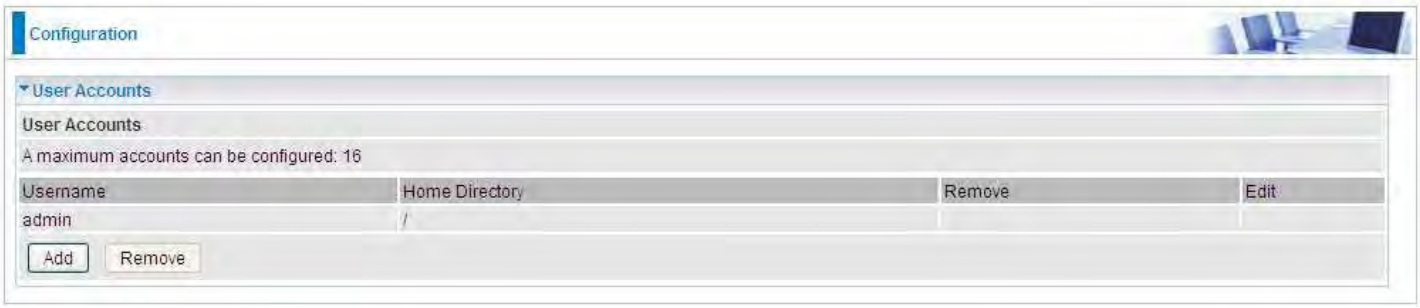
Used Space: Display the remaining space of each partition, unit MB.

Unmount: Click **Unmount** button if you want to uninstall the USB device. Please **Note** that first click **Unmount** before you uninstall your USB storage.

User Account

Users here can add user accounts for access to the storage, in this way users can access the network sharing storage with the specified account, and again protect their own data.

Default user admin.



Click **Add** button, enter the user account-adding page:

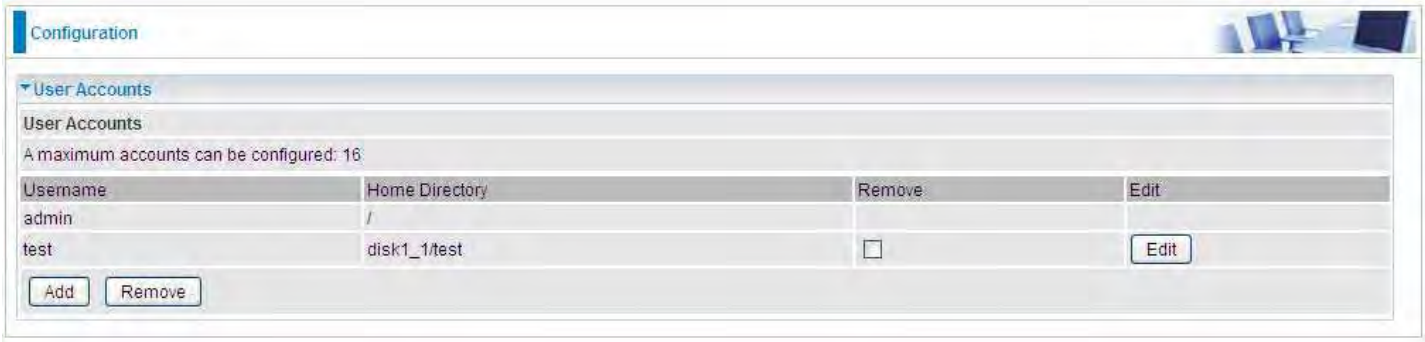
Username: user-defined name, but simpler and more convenient to remember would be favorable.

Password: Set the password.

Confirm Password: Reset the password for confirmation.

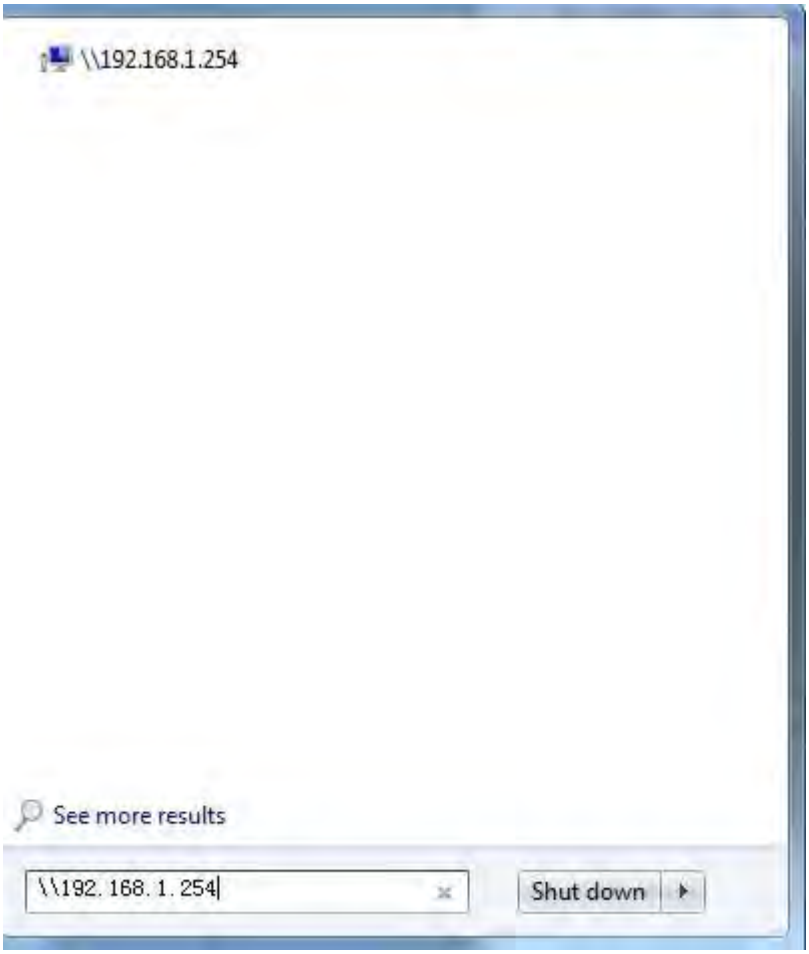
Volume Name: Select Volume name, as to create access to the volume of the specified partition of the storage.

For example, a user ***test*** is setup behind the disk1_1.



Accessing mechanism of Storage:

In your computer, Click **Start** > **Run**, enter \\192.168.1.254

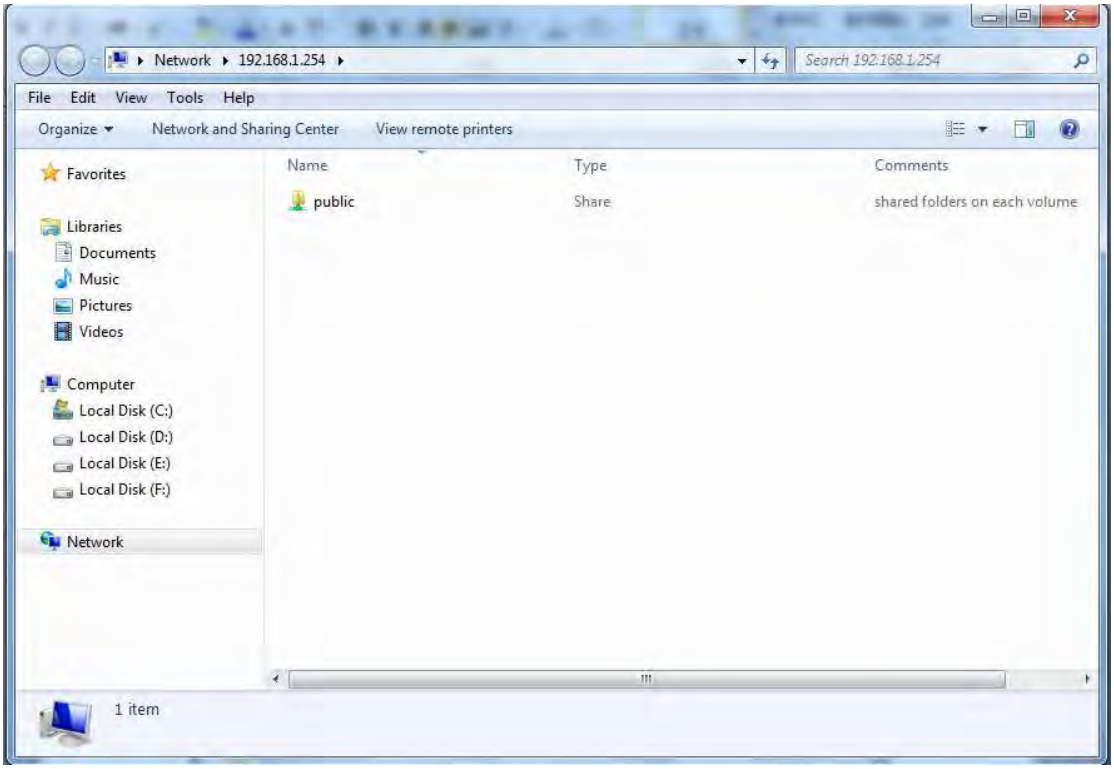


When accessing the network storage, you can see a folder named “***public***”, users should have the account to enter, and the account can be set at the User Accounts section.

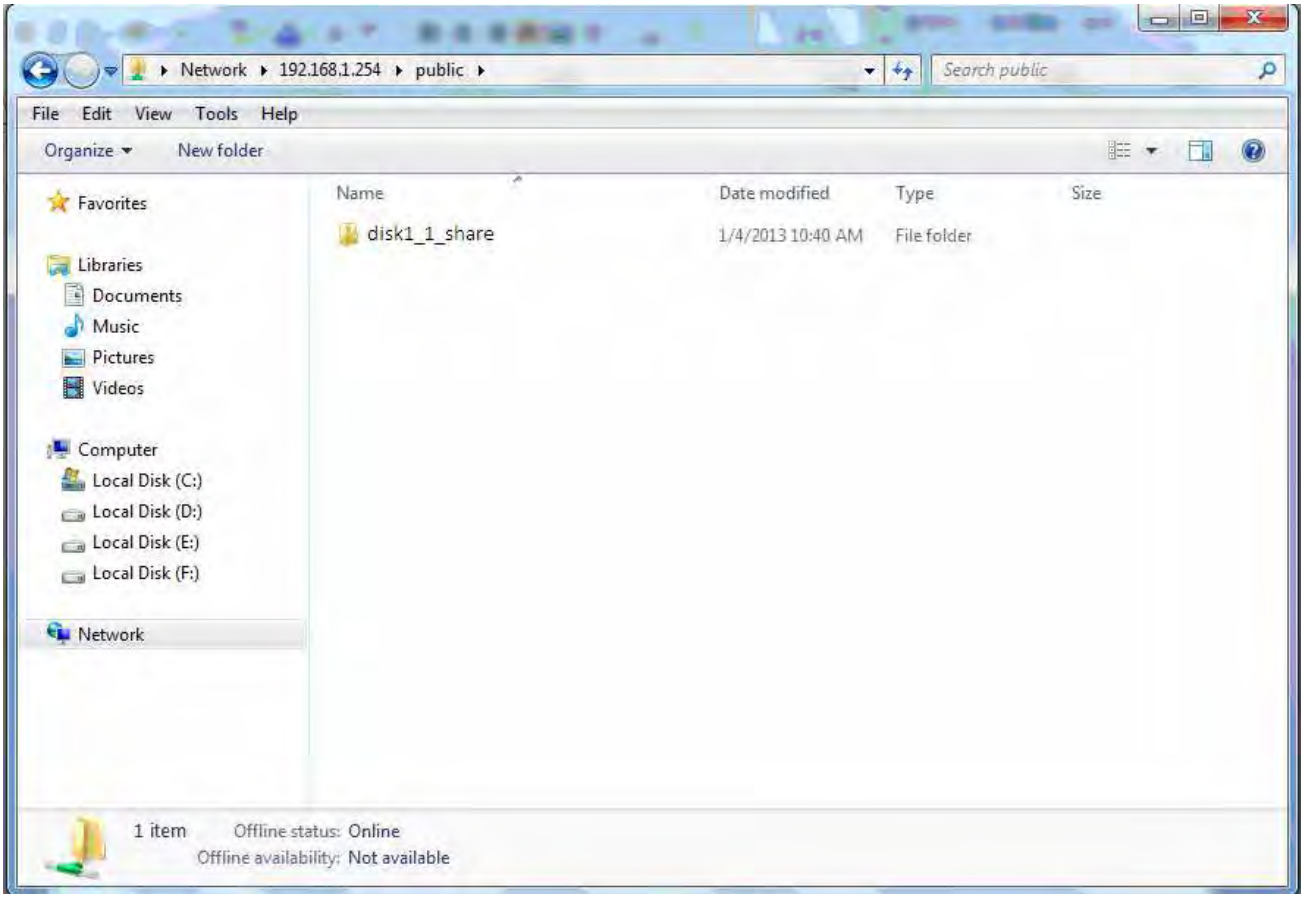
When first logged on to the network folder, you will see the “***public***” folder.

Public: The public sharing space for each user in the USB Storage.

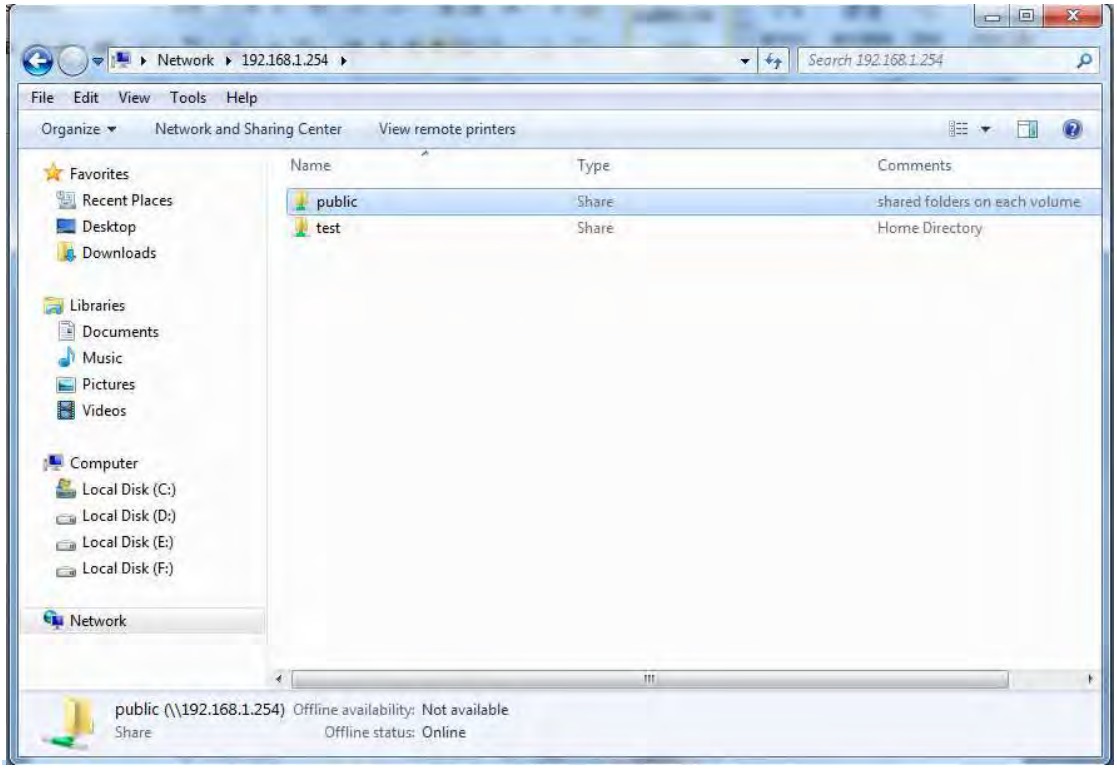
When user register a USB account and log successfully, a private folder (the same name as the user account registered) exclusive for each user is established. Go on to see the details.



Access the folder ***public***.



When successfully accessed, the private folder of each user is established, and user can see from the following picture. The ***test*** fold in the picture is the private space for each user.



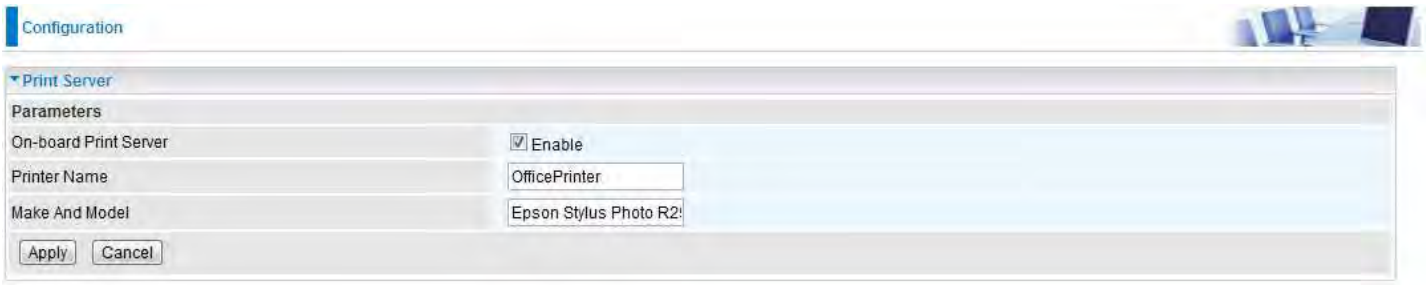
Print Server

The Print Server feature allows you to share a printer on your network by connecting a USB cable from your printer to the USB port on the 8900X *R3*. This allows you to print from any location on your network.

Note: Only USB printers are supported

Setup of the printer is a 3 step process

1. Connect the printer to the 8900X *R3*'s USB port
2. Enable the print server on the 8900X R3
3. Install the printer drivers on the PC you want to print from



On-board Print Server: Check Enable to activate the print server
Printer Name: Enter the Printer name, for example, *OfficePrinter*
Make and Model: Enter in the Make and Model information for the printer, for example, *Epson Stylus Photo R290*

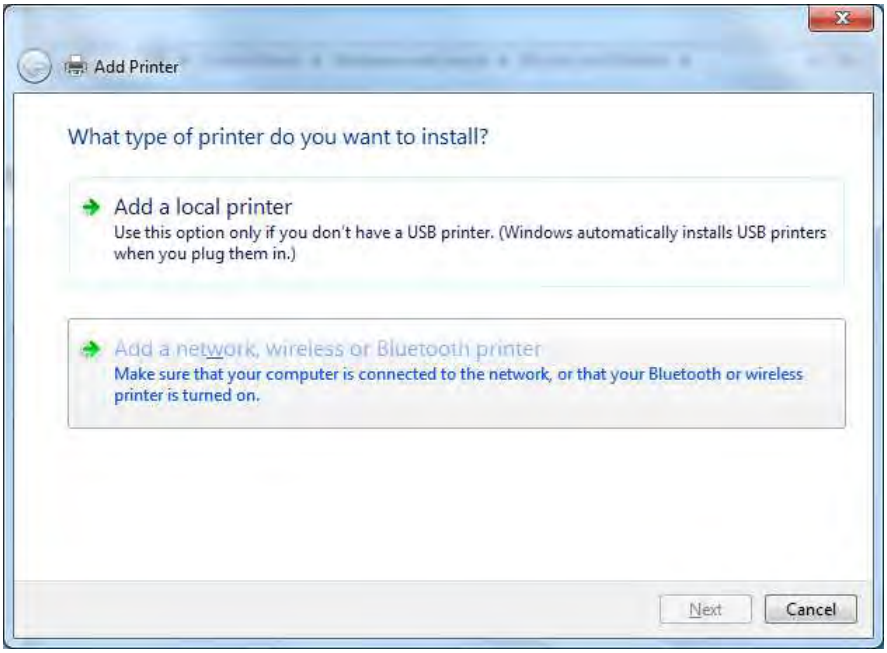
Note:
The ***Printer name*** can be any text string up to **40** characters. It cannot contain spaces.
The ***Make and Mode***l can be any text string up to **128** characters.

Set up of Printer client (Windows 7)

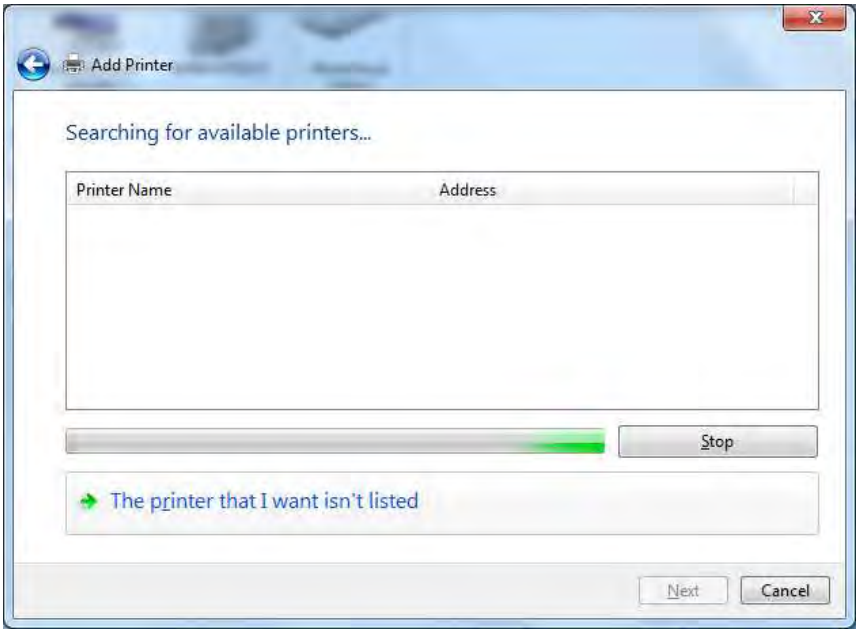
Step 1: Click **Start** and select "Devices and Printers"

Step 2: Click ‘’Add a Printer’’.

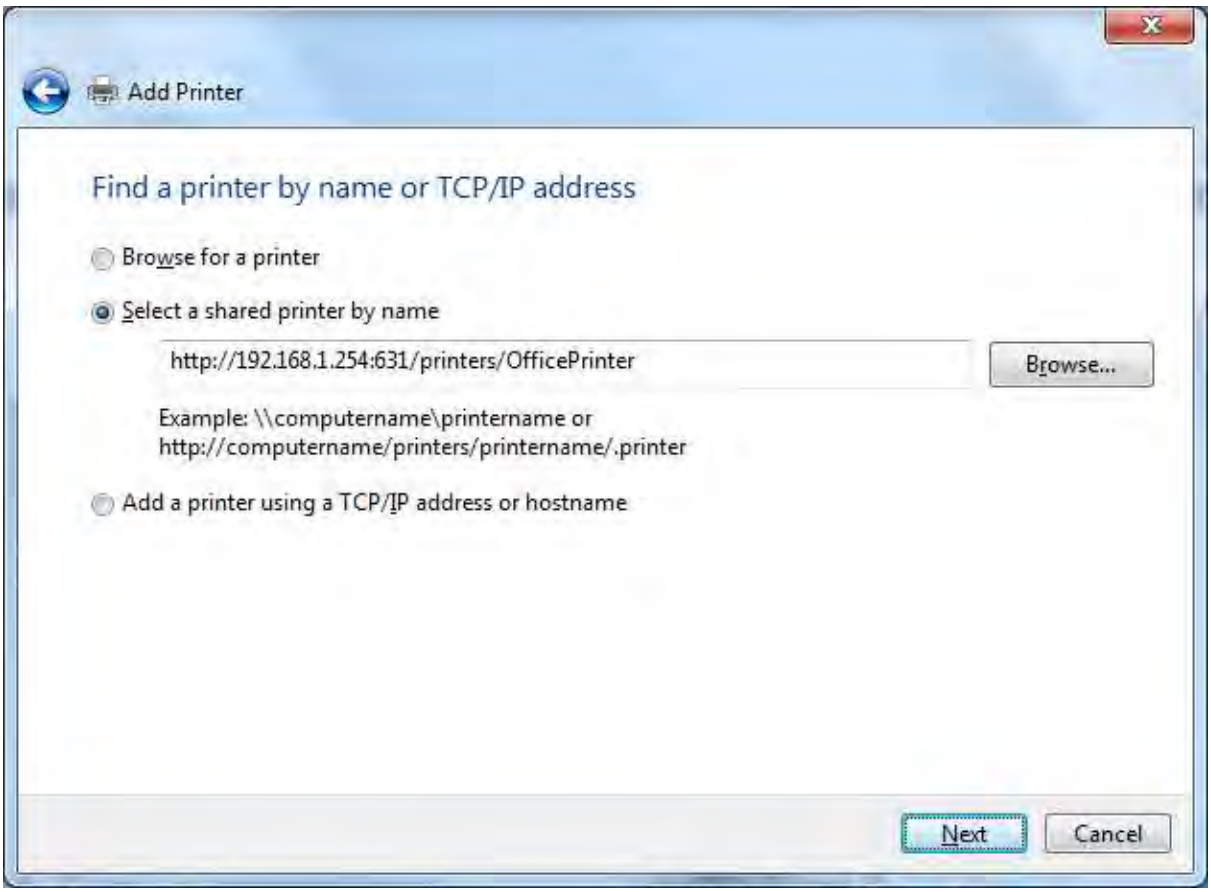
Step 3: Click “Add a network, wireless or Bluetooth printer



Step 4: Click “The printer that I want isn’t listed”

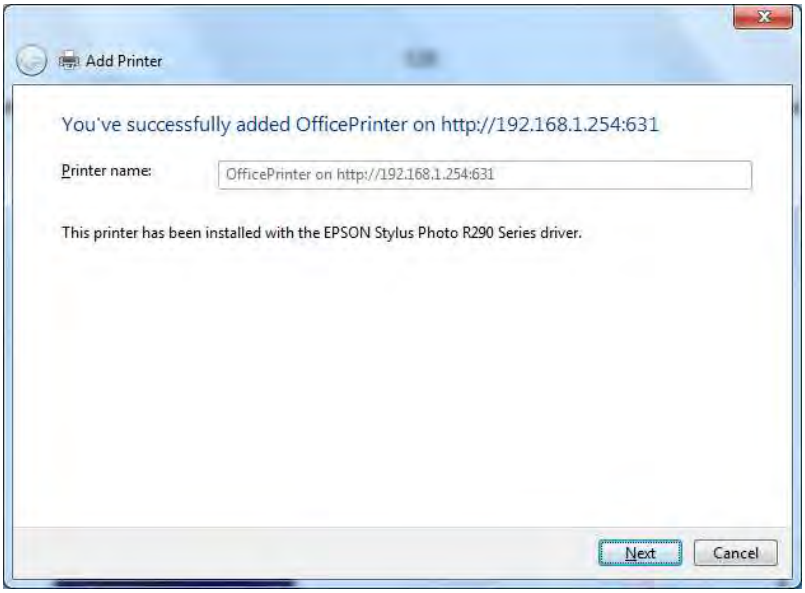


Step 5: Select “Select a shared printer by name”
Enter http://8900XR3- LAN-IP:631/printers/printer-name or. Make sure printer’s name is the same as what you set in the router earlier
For Example: *http://192.168.1.254:631/printers/OfficePrinter*
OfficePrinter is the Printer Name we setup earlier

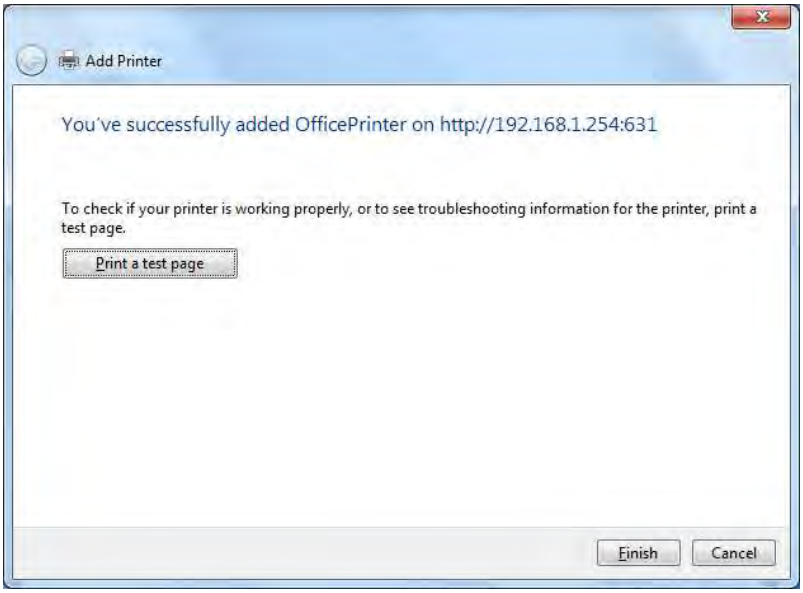


Step 6: Click “Next” to add the printer driver. If your printer is not listed and your printer came with an installation disk, click “Have Disk” find it and install the driver.

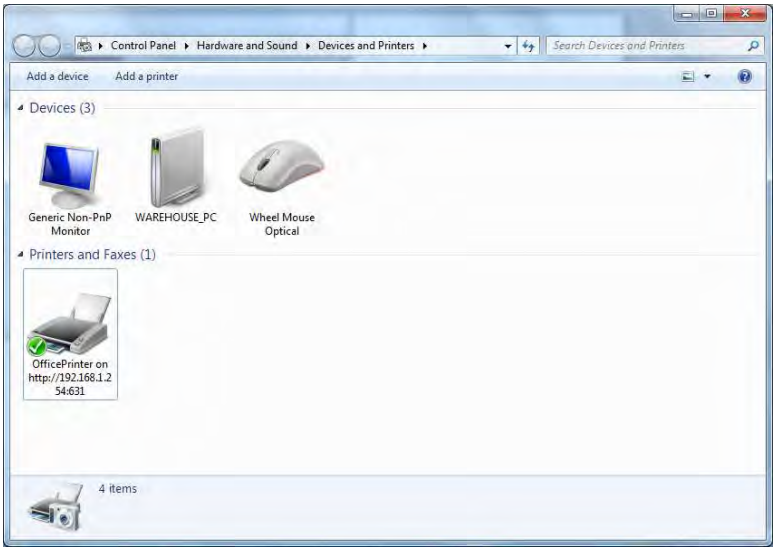
Step 7: Click “Next”



Step 8: Click “Next” and you are done



You will now be able to see your printer on the Devices and Printers Page



DLNA

The Digital Living Network Alliance (DLNA) is a non-profit collaborative trade organization established by Sony in June 2003, which is responsible for defining interoperability guidelines to enable sharing of digital media between consumer devices such as computers, printers, cameras, cell phones and other multiple devices.

DLNA uses Universal Plug and Play (UPnP) for media management, discovery and control. UPnP defines the types of devices ('server', 'renderer', 'controller') that DLNA supports and the mechanism for accessing media over a network.

Overall, DLNA allows more convenience, more choices and enjoyment of your digital content through DLNA certified devices. Any DLNA certified devices or software can access the DLNA server.

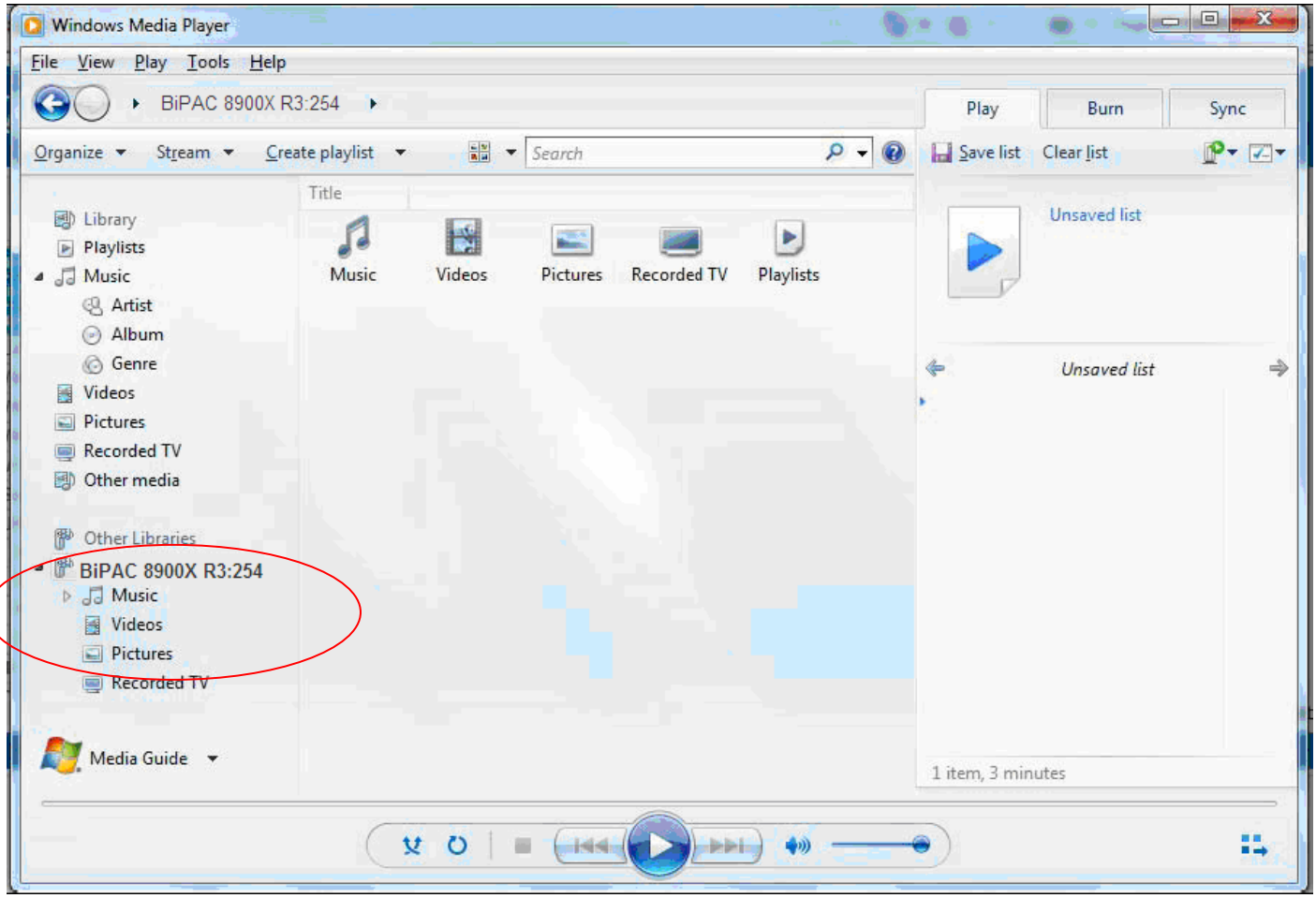
With USB storage, 8900X *R3* can serve as a DLNA server.

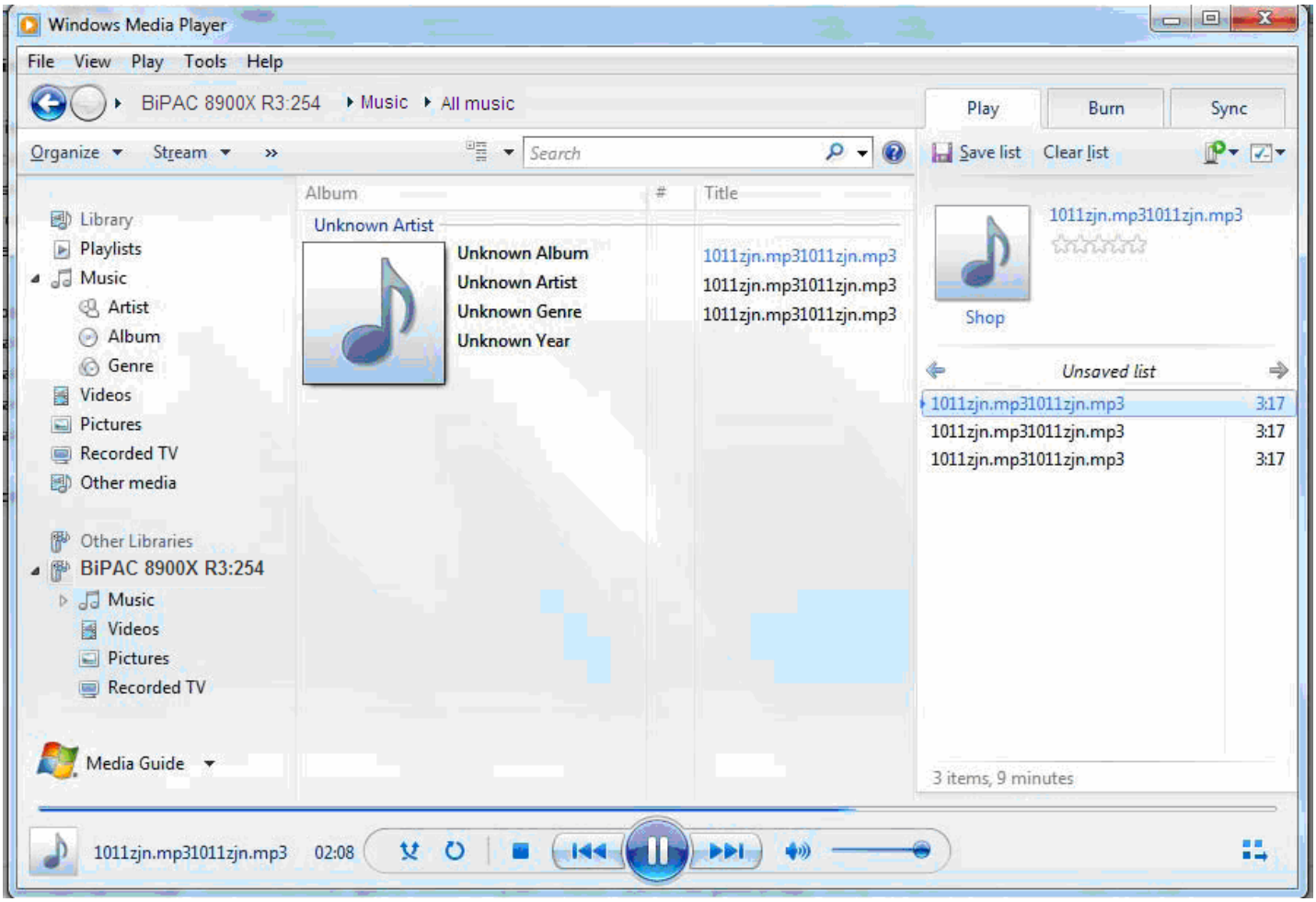
On-board digital media server: Enable to share the device as a DLNA server.

Interface: The VLAN group, it is the bound interface for DLNA server accessing.

Media Library Path: Default is usb1_1, total USB space (pictures, videos, music, etc, all can be accessed with this path).

Take Windows media player in Windows 7 accessing the DLNA server for example for usage of DLNA .





IP Tunnel

An IP Tunnel is an Internet Protocol (IP) network communication channels between two networks of different protocols. It is used to transport another network protocol by encapsulation of its packets.

IP Tunnels are often used to connect two disjoint IP networks that do not have a native routing path to each other, via an underlying routable protocol across an intermediate transport network, like VPN.

Another prominent use of IP Tunnel is to connect islands of IPv6 installations across the IPv4 internet.

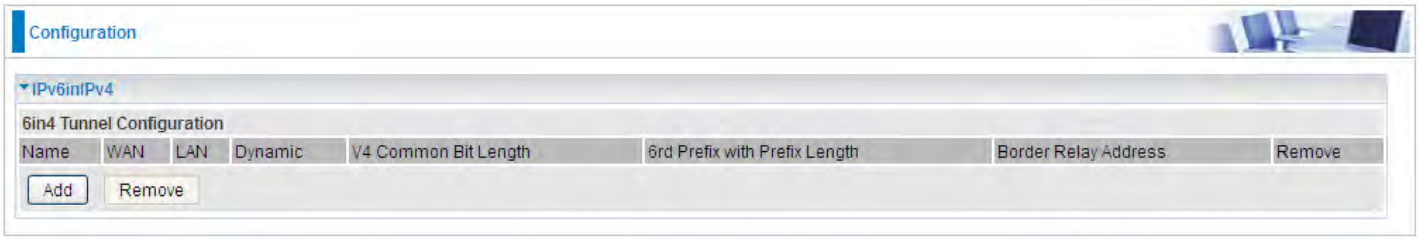
IPv6inIPv4

6in4 is an Internet transition mechanism for migrating from IPv4 to IPv6. 6in4 uses tunneling to encapsulate IPv6 traffic over explicitly configured IPv4 links. The 6in4 traffic is sent over the IPv4 Internet inside IPv4 packets whose IP headers have the IP Protocol number set to 41. This protocol number is specifically designated for IPv6 capsulation.

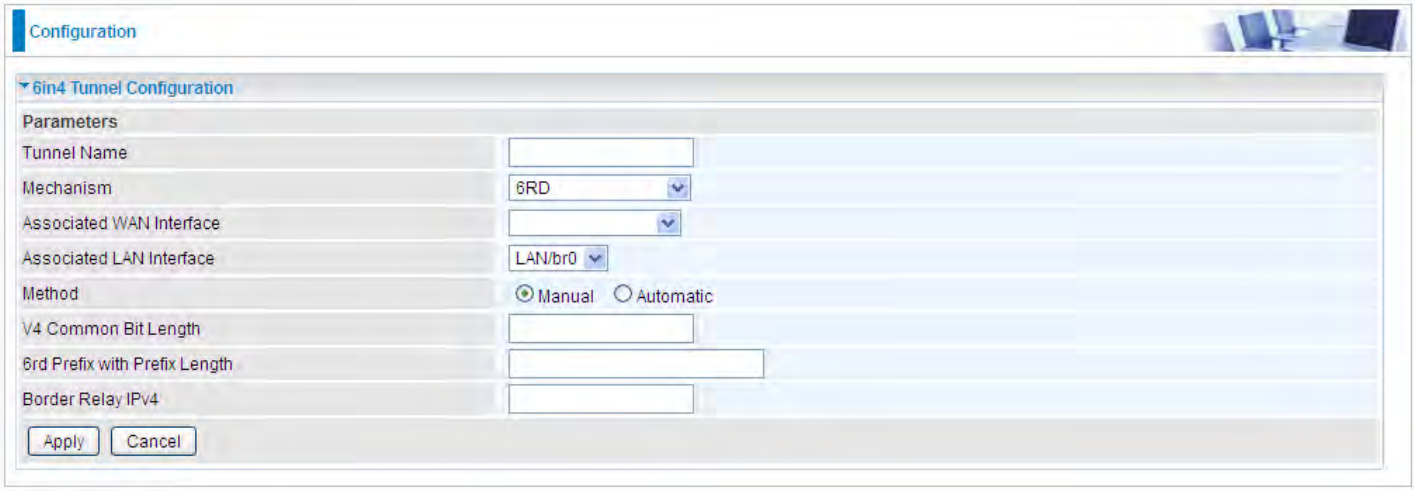
6RD:

6RD is a mechanism to facilitate IPv6 rapid deployment across IPv4 infrastructures of internet service providers (ISPs).

It is derived from 6to4, a preexisting mechanism to transporting IPv6 packets over IPv4 infrastructure network, with the significant change that it operates entirely within the enduser's ISP network, thus avoiding the major architectural problems inherent in the original design of 6to4.



Click **Add** button to manually add the 6in4 rules.



Tunnel Name: User-defined name.

Mechanism: Here only 6RD.

Associated WAN Interface: The applied WAN interface with the set tunnel, thus when there are packets from/to the WAN interface, the tunnel would be used to transport the packets.

Associated LAN Interface: Set the linked LAN interface with the tunnel.

Method: 6rd operation mechanism: manually configured or automatically configured. If manually, please fill out the following 6rd parameters.

V4 Common Bit Length: Specify the length of IPv4 address carried in IPv6 prefix, for example, 0 means to carry all the 32 bits of IPv4 address while 8 carries 24 bits of the IPv4 address.

6rd Prefix with Prefix Length: Enter the 6rd prefix and prefix length you uniquely designate to 6rd by the ISP(The 6rd prefix and prefix length are to replace the standard 6to4 prefix 2002::/16 by an IPv6 prefix that belongs to the ISP-assigned.)

Border Relay IPv4 Address: The IPv4 address of the border relay. The relay is used to unwrap capsulated IPv4 packets into IPv6 packets and send them to the IPv6 network.

IPv4inIPv6

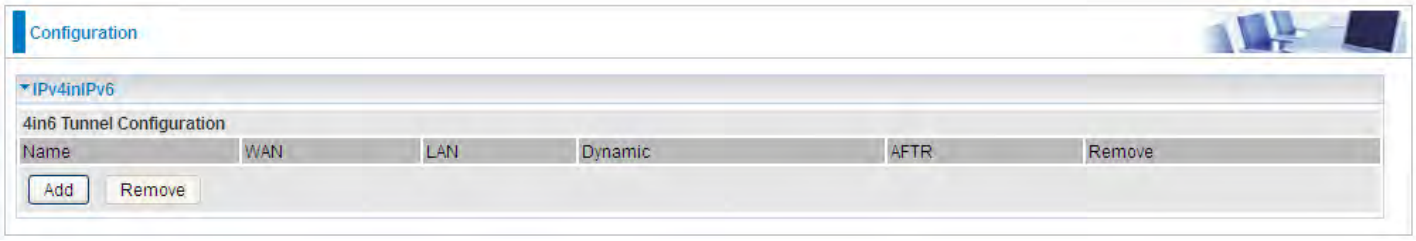
4in6 refers to tunneling of IPv4 in IPv6. It is an inherent internet interoperation mechanism allowing IPv4 to be used in an IPv6 only network.

4in6 uses tunneling to encapsulate IPv4 traffic over configured IPv6 tunnels. 4in6 tunnels are usually manually configured but they can be automated using protocols such as TSP(Tunnel Setup Protocol) to allow easy connection to a tunnel broker.

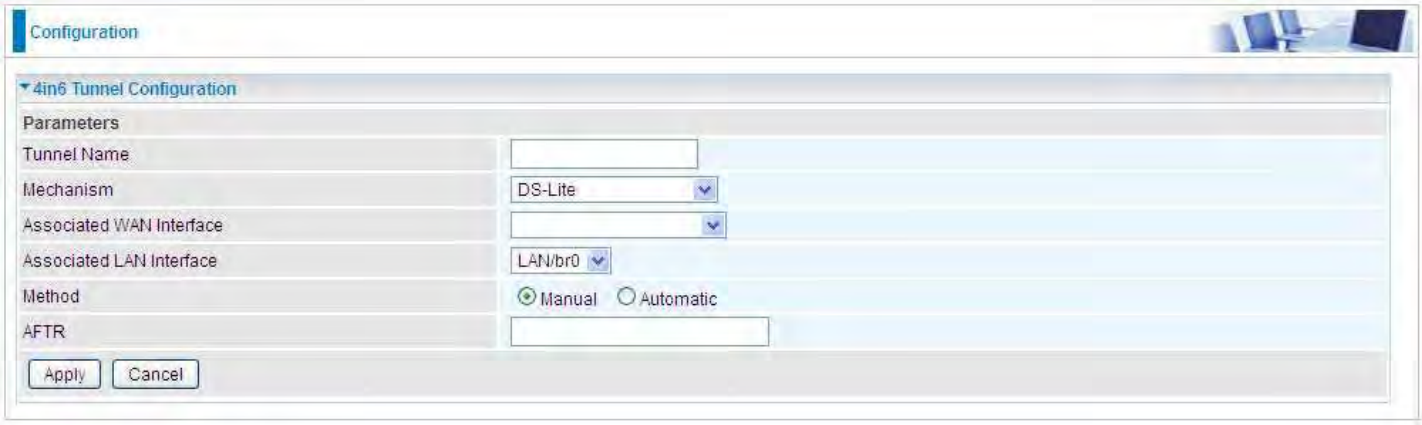
DS – Lite

DS –Lite, or Dual-Stack Lite, is designed to let an ISP omit the deployment of any IPv4 address to the customer's CPE. Instead, only global IPv6 addresses are provided (Regular Dual-Stack Lite deploys global addresses for both IPv4 and IPv6).

The CPE distributes private IPv4 addresses for the LAN clients, the same as a NAT device. The subnet information is chosen by the customer, identically to the NAT model. However, instead of performing the NAT itself, the CPE encapsulates the IPv4 packet inside an IPv6 packet.



Click **Add** button to manually add the 4in6 rules.



Tunnel Name: User-defined tunnel name.

Mechanism: It is the 4in6 tunnel operation technology. Please select DS-Lite.

Associated WAN Interface: The applied WAN interface with the set tunnel, and when there are packets from/to the WAN interface, the tunnel would be used to transport the packets.

Associated LAN Interface: Specify the linked LAN interface with the tunnel.

Method: Manually to specify the AFTP (Address Family Transition Router) address or Automatic.

AFTR: Specify the address of AFTP (Address Family Transition Router) from your ISP.

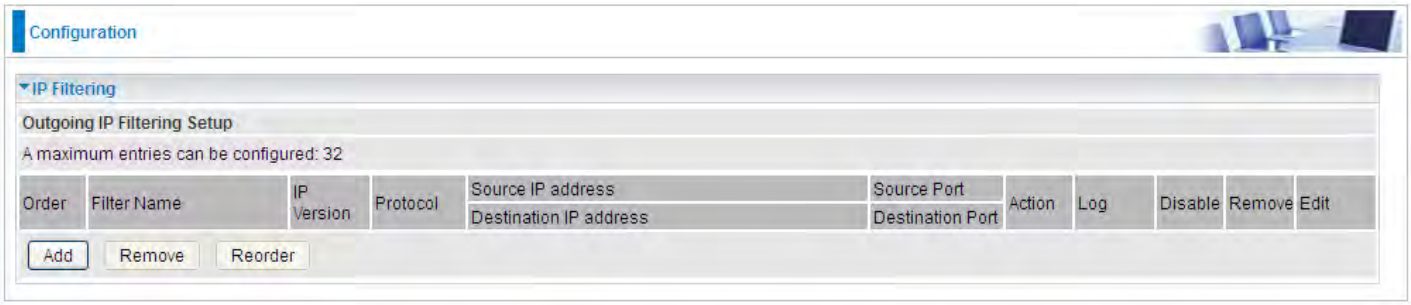
Security

IP Filtering Outgoing

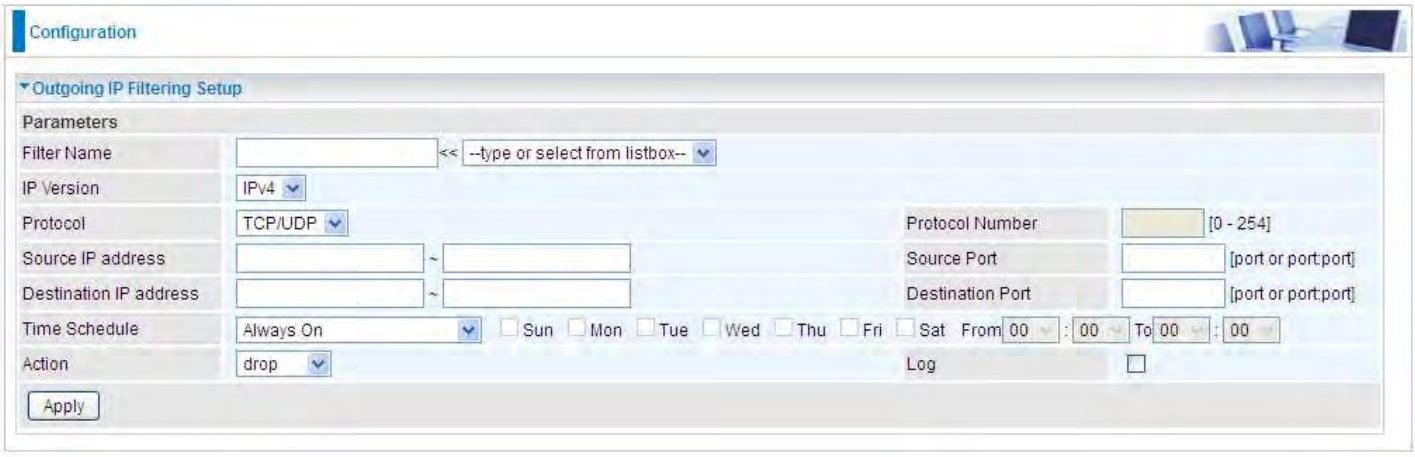
IP filtering enables you to configure your router to block specified internal/external users (**IP address**) from Internet access, or you can disable specific service requests (**Port number**) to /from Internet. The relationship among all filters is **"or"** operation, which means that the router checks these different filter rules one by one, starting from the first rule. As long as one of the rules is satisfied, the specified action will be taken.

Outbound IP Filtering by default is set to **forward** all outgoing traffic from LAN to go through the router, but user can set rules to **block** the specific outgoing traffic.

Note: The maximum number of entries: 32.



Click **Add** button to enter the exact rule setting page.



Filter Name: A user-defined rule name. User can select simply from the list box for the application for quick setup.

IP Version: Select the IP Version, IPv4 or IPv6.

Protocol: Set the traffic type (TCP/UDP, TCP, UDP, ICMP,RAW, Any) that the rule applies to.

Source IP address: This is the Address-Filter used to allow or block traffic to/from particular IP address(es) featured in the IP range. If you leave empty, it means any IP address.

Source Port [port or port:port]: The port or port range defines traffic from the port (specific application) or port in the set port range blocked to go through the router. Default is set port from range 1 – 65535.

Destination IP address: Traffic from LAN with the particular traffic destination address specified in the IP range is to be blocked from going through the router, similarly set as the Source IP address above.

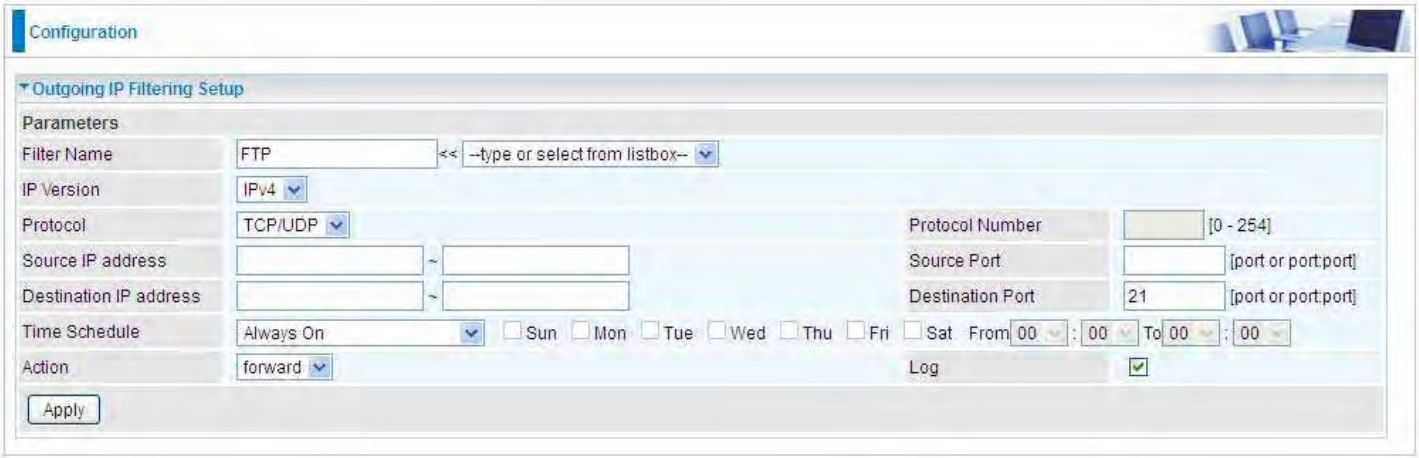
Destination Port [port or port: port]: Traffic with the particular set destination port or port in the set port range is to be blocked from going through the router. Default is set port from port range: 1 – 65535.

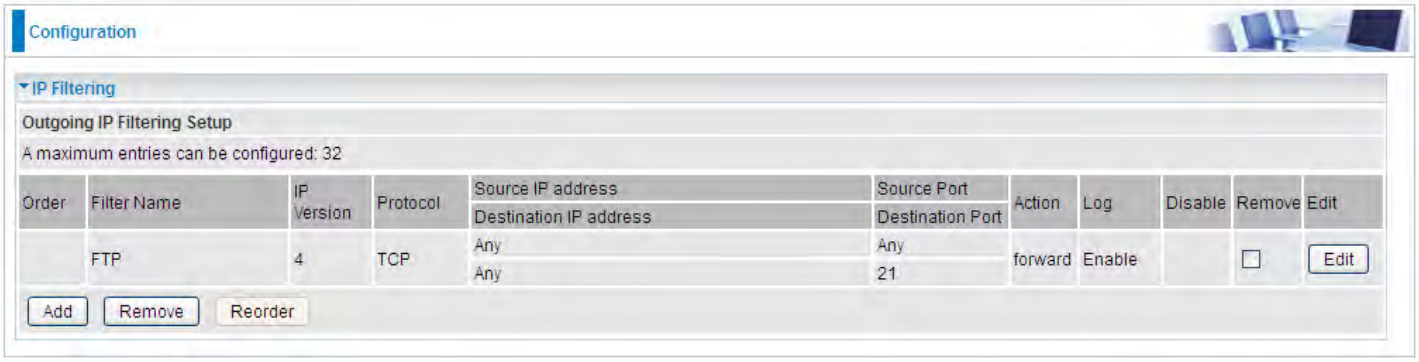
Time Schedule: Select or set exactly when the rule works. When set to “Always On”, the rule will work all time; and also you can set the precise time when the rule works, like 01:00-19:00 from Monday to Friday. Or you can select the already set timeslot in “**Time Schedule**” during which the rule works. And when set to “Disable”, the rule is disabled or inactive and there will be an icon” ✓ ” in list table indicating the rule is inactive. See Time Schedule.

Action: Select to **drop** or **forward** the packets fit the outgoing filtering rule.

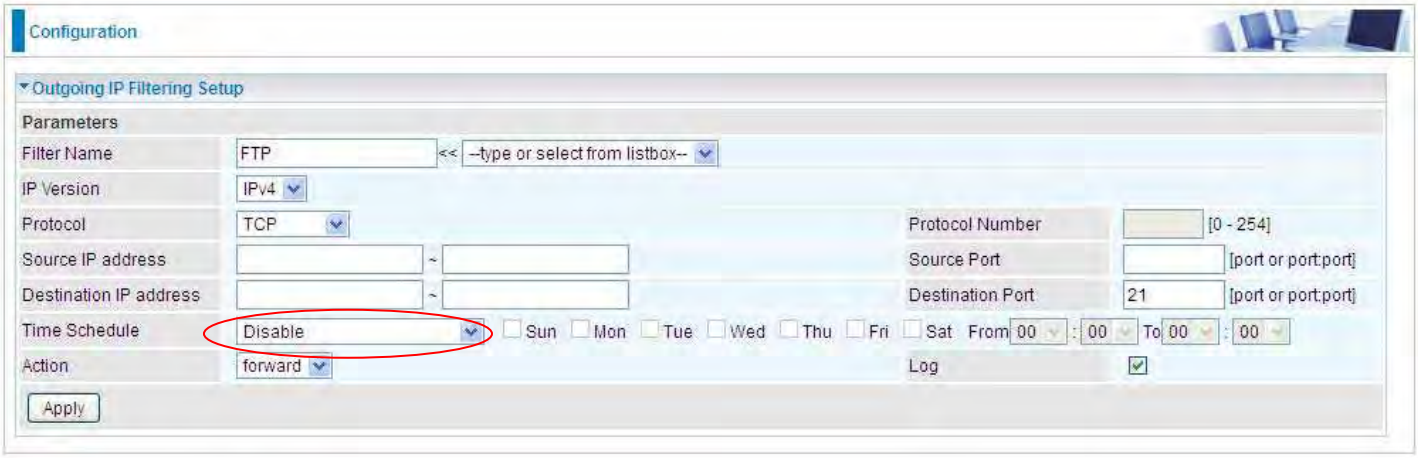
Log: check the check-box to record the security log. To check the log, users can turn to Security Log.

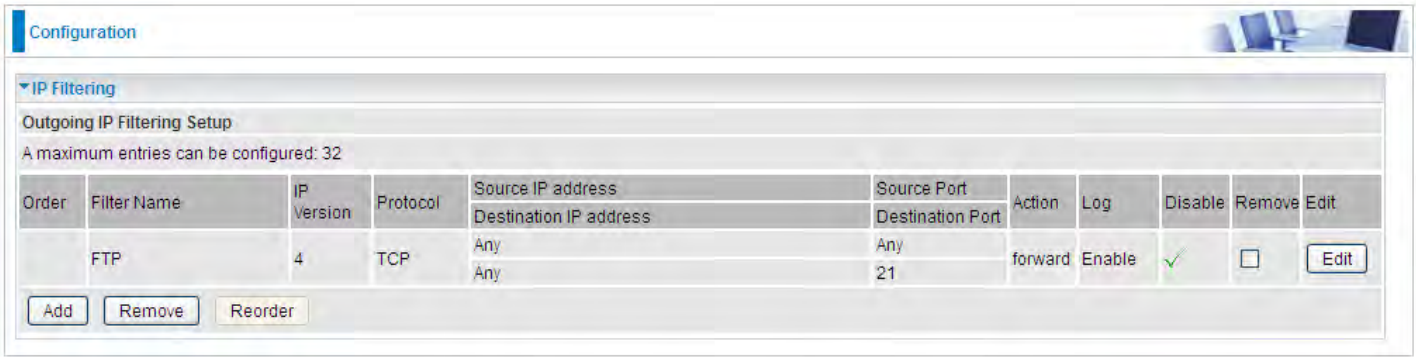
Example: For example, if there is an outgoing rule set as follows, then the 21 application between source IP and destination IP will be blocked. Or exactly in the rule below, all traffic trying to access FTP will be forwarded.





(The rule is active; disable field shows the status of the rule, active or inactive)





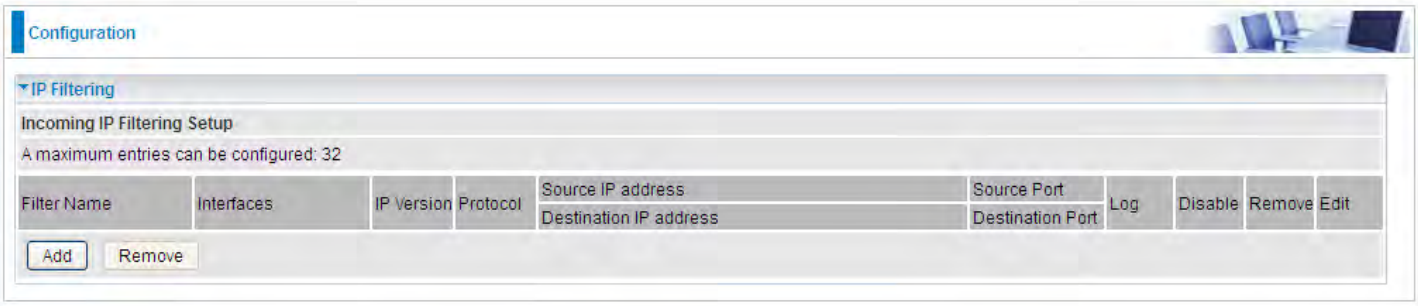
(Rule inactive)

IP Filtering Incoming

Incoming IP Filtering is set by default to **block** all incoming traffic, but user can set rules to **forward** the specific incoming traffic.

Note:

1. The maximum number of entries: 32.
2. When LAN side firewall or firewall in WAN interface(s) is enabled, user can move here to add allowing rules to pass through the firewall.



Click **Add** button to enter the exact rule setting page.

Filter Name: A user-defined rule name. User can select simply from the list box for the application for quick setup.

IP Version: Select the IP Version, IPv4 or IPv6.

Protocol: Set the traffic type (TCP/UDP, TCP, UDP, ICMP, RAW, Any) that the rule applies to.

Source IP address: This is the Address-Filter used to allow or block traffic to/from particular IP address(es) featured in the IP range.. If you leave empty, it means any IP address.

Source Port [port or port:port]: The port or port range defines traffic from the port (specific application) or port in the set port range blocked to go through the router. Default is set port from range 1 – 65535.

Destination IP address: Traffic from LAN with the particular traffic destination address specified in the IP range is to be blocked from going through the router, similarly set as the Source IP address above.

Destination Port [port or port : port]: Traffic with the particular set destination port or port in the set port range is to be blocked from going through the router. Default is set port from port range: 1 – 65535

Interfaces: Check if the filter rule applies to all interfaces. User can base on need select interfaces to make the rule take effect with those interfaces.

Time Schedule: Select or set exactly when the rule works. When set to “Always On”, the rule will work all time; and also you can set the precise time when the rule works, like 01:00-19:00 from Monday to Friday. Or you can select the already set timeslot in “**Time Schedule**” during which the rule works. And when set to “Disable”, the rule is disabled or inactive and there will be an icon”  ” in the list table indicating the rule is inactive. See Time Schedule.

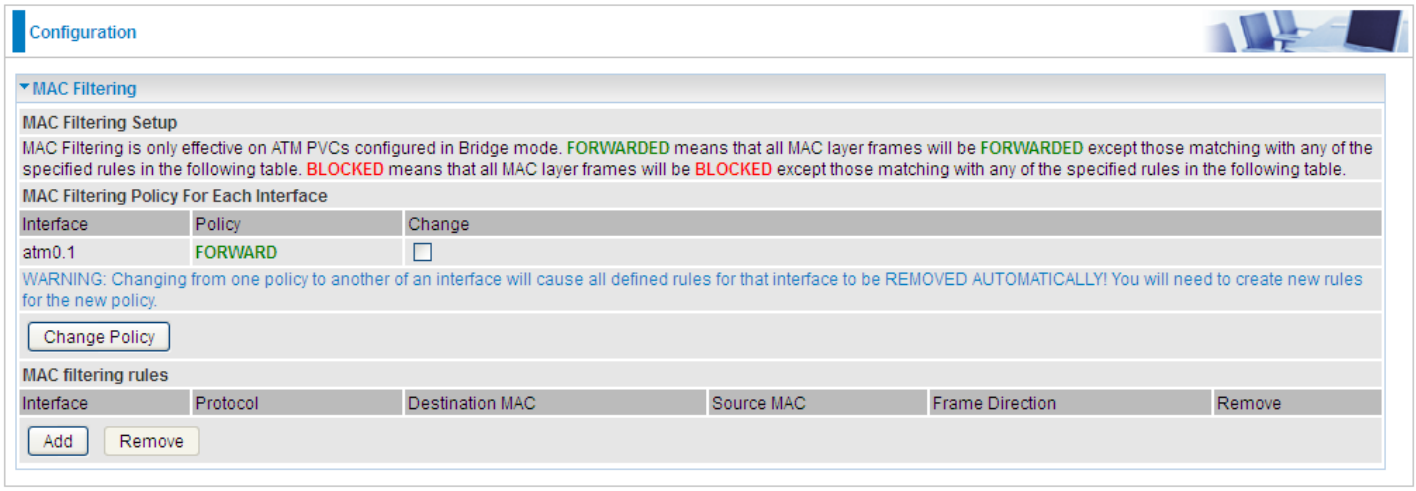
Log: check the check-box to record the security log. To check the log, users can turn to Security Log.

MAC Filtering

MAC Filtering is only effective on ATM PVCs configured in Bridged mode.

FORWARDED means that all MAC layer frames will be **forwarded** except those matching with any of the specified rules in the following table.

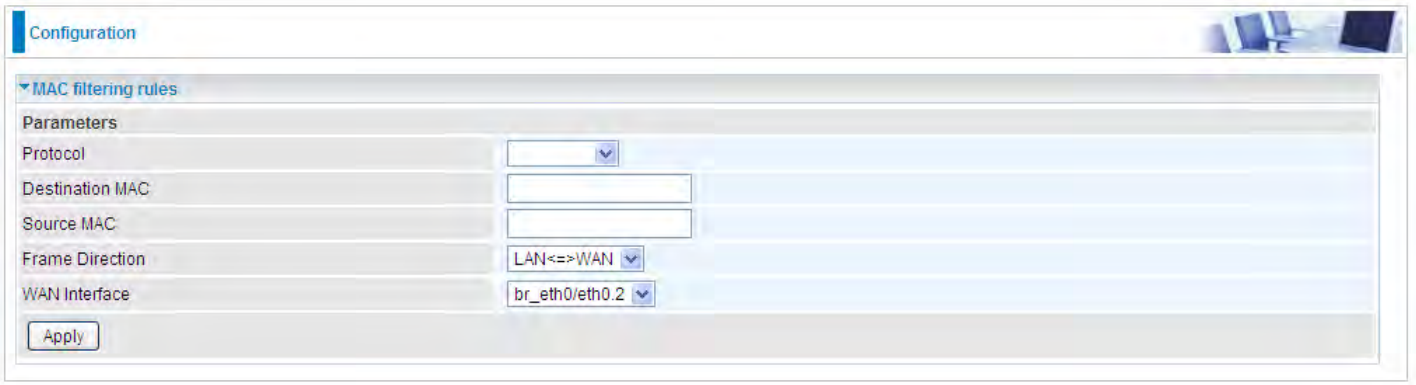
BLOCKED means that all MAC layer frames will be **blocked** except those matching with any of the specified rules in the following table.



By default, all MAC frames of the interface in Bridge Mode will be **forwarded**, you can check **Change** checkbox and then press **Change Policy** to change the settings to the interface.

For example, from above, the interface atm0.1 is of bridge mode, and all the MAC layer frames will be **forward**, but you can set some rules to let some item matched the rules to be **blocked**.

Click **Add** button to add the rules.



Protocol type: Select from the drop-down menu the protocol that applies to this rule.

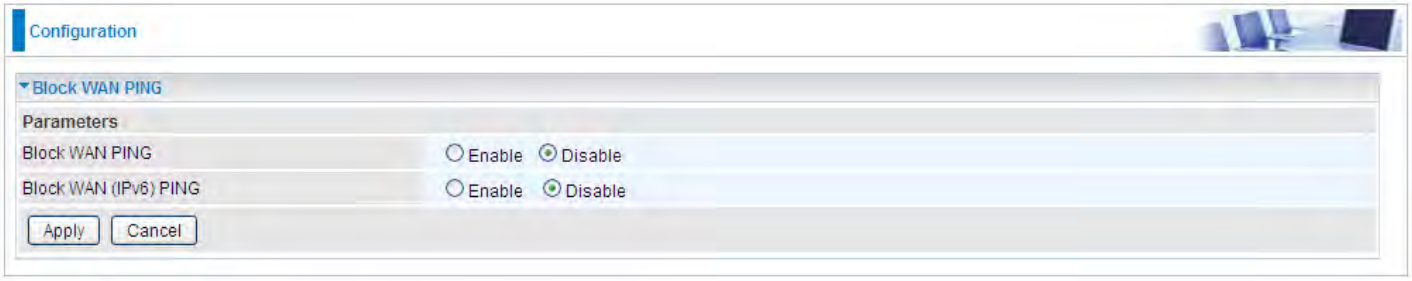
Destination /Source MAC Address: Enter the destination/source address.

Frame Direction: Select the frame direction this rule applies, both LAN and WAN: LAN <=>WAN, only LAN to WAN: LAN=>WAN, only WAN to LAN: WAN=>LAN.

WAN Interfaces: Select the interfaces configured in Bridge mode.

Blocking WAN PING

This feature is enabled to let your router not respond to any ping command when someone others “Ping” your WAN IP.

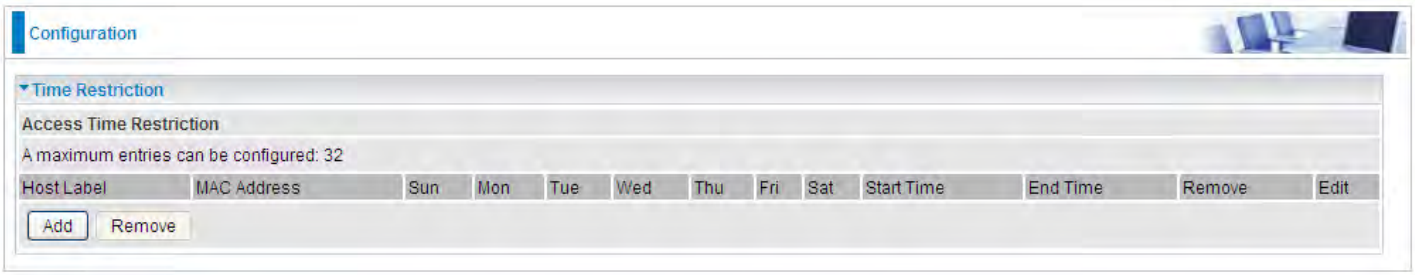


Time Restriction

A MAC (Media Access Control) address is the unique network hardware identifier for each PC on your network's interface (i.e. its Network Interface Card or Ethernet card). Using your router's MAC Address Filter function, you can configure the network to block specific machines from accessing your LAN during the specified time.

This page adds time of day restriction to a special LAN device connected to the router. To **Restrict** LAN device(s), please click Add button to add the device(s), from accessing internet under some set time. To find out the MAC address of a window based PC, go to command window, and type "ipconfig/all".

Note: The maximum entries configured: 32.



Click **Add** to add the rules.

Host Label: User-defined name.

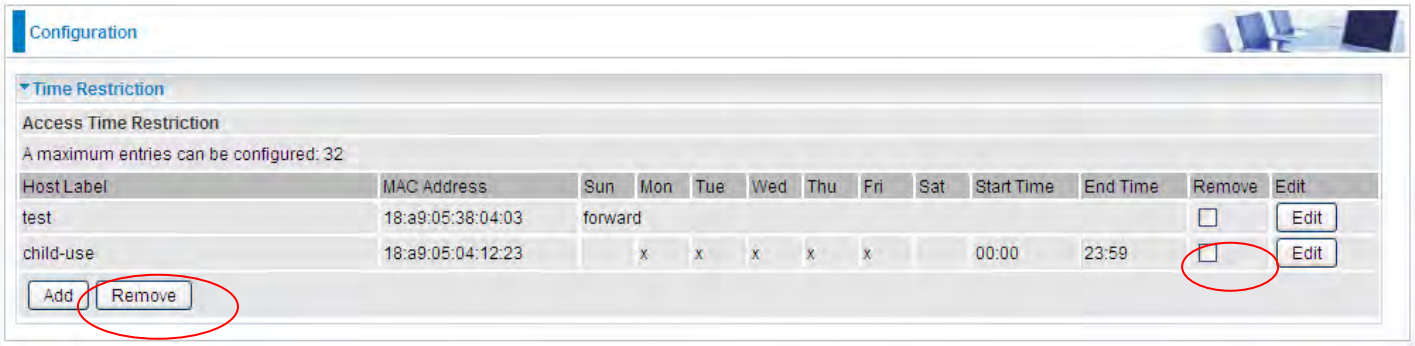
MAC Address: Enter the MAC address(es) you want to allow or block to access the router and LAN. The format of MAC address could be: xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx. For convenience, user can select from the list box.

Time Schedule: To determine when the rule works.

- **Drop:** To drop the MAC entries always; in other words, the MACs are blocked access to router and internet always.
- **Forward:** To forward the MAC entries always; in other words, the MACs are granted access to the router and internet always.
- **Check or select from listbox:** To set the time duration during which the MACs are blocked from access the router and internet. "**select from listbox**" means that you can select the already set timeslot in "**Time Schedule**" section during which the MACs are blocked from access the router and internet.

Click **Apply** to confirm your settings. The following prompt window will appear to remind you of the attention.

An example:



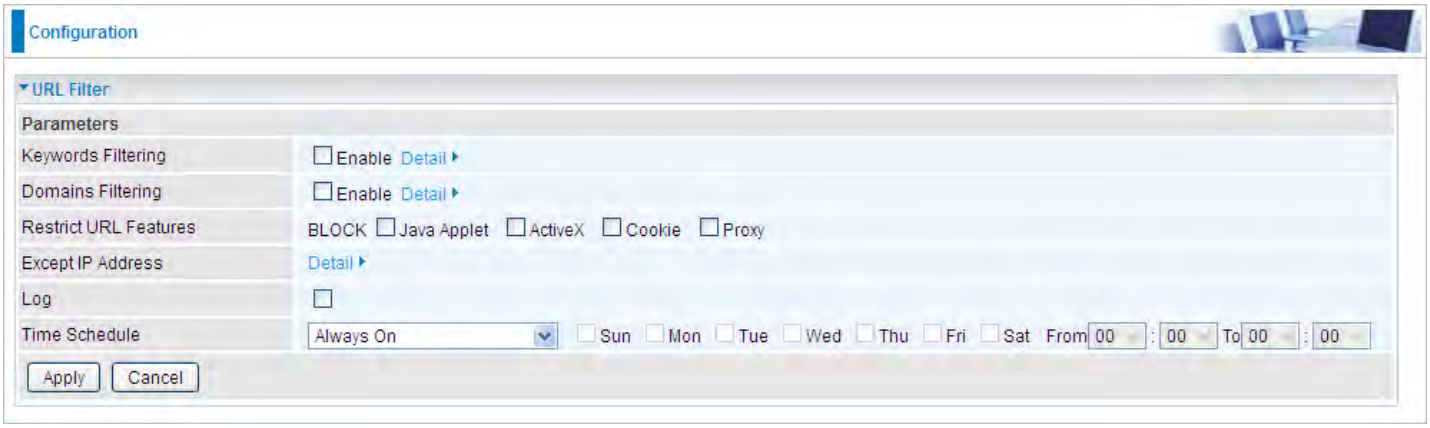
Here you can see that the user “child-use” with a MAC of 18:a9:05:04:12:23 is blocked to access the router from 00:00 to 23:59 Monday through Friday.
The “test” can access the internet always.

If you needn’t this rule, you can check the box, press Remove, it will be OK.

URL Filter

URL (Uniform Resource Locator – e.g. an address in the form of http://www.abcde.com or http://www.example.com) filter rules allow you to prevent users on your network from accessing particular websites by their URL. There are no pre-defined URL filter rules; you can add filter rules to meet your requirements.

Note:
1) URL Filter rules apply to both IPv4 and IPv6 sources.
2) But in **Exception IP Address** part, user can click Detail to set the exception IP address(es) for IPv4 and IPv6 respectively.



Keywords Filtering: Allow blocking against specific keywords within a particular URL rather than having to specify a complete URL (e.g.to block any image called “advertisement.gif”). When enabled, your specified keywords list will be checked to see if any keywords are present in URLs accessed to determine if the connection attempt should be blocked. Please note that the URL filter blocks web browser (HTTP) connection attempts using port 80 only.

Domains Filtering: This function checks the whole URL address but not the IP address against your list of domains to block or allow. If it is matched, the URL request will either be sent (Trusted) or dropped (Forbidden).

Restrict URL Features: Click Block Java Applet to filter web access with Java Applet components. Click Block ActiveX to filter web access with ActiveX components. Click Block Cookie to filter web access with Cookie components. Click Block Proxy to filter web proxy access.

Exception IP Address: You can input a list of IP addresses as the exception list for URL filtering. These IPs will not be covered by the URL rules.

Time Schedule: Select or set exactly when the rule works. When set to “Always On”, the rule will work all time; and also you can set the precise time when the rule works, like 01:00 - 19:00 from Monday to Friday. Or you can select the already set timeslot in “**Time Schedule**” during which the rule works. And when set to “Disable”, the rule is disabled. See Time Schedule.

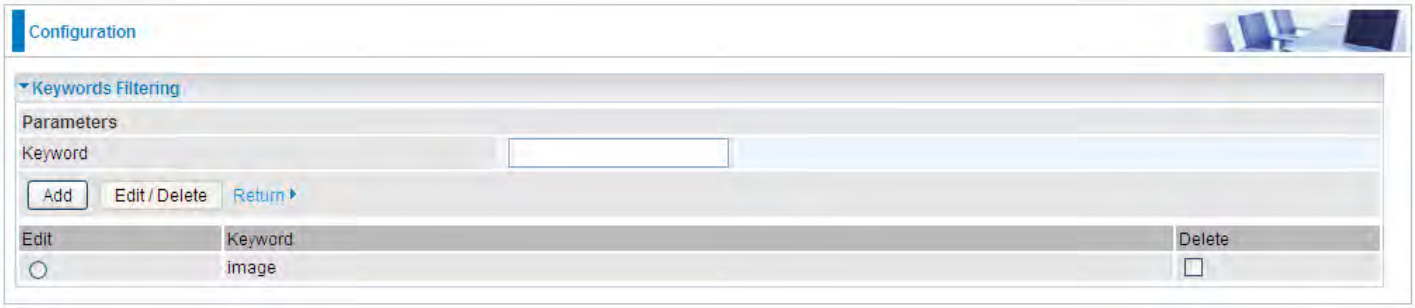
Log: Select Enable for this option if you will like to capture the logs for this URL filter policy. To check the log, users can turn to Security Log.

Keywords Filtering

Note: Maximum number of entries: 32.

Click Detail to add the keywords.

Enter the Keyword, for example image, and then click **Add.**

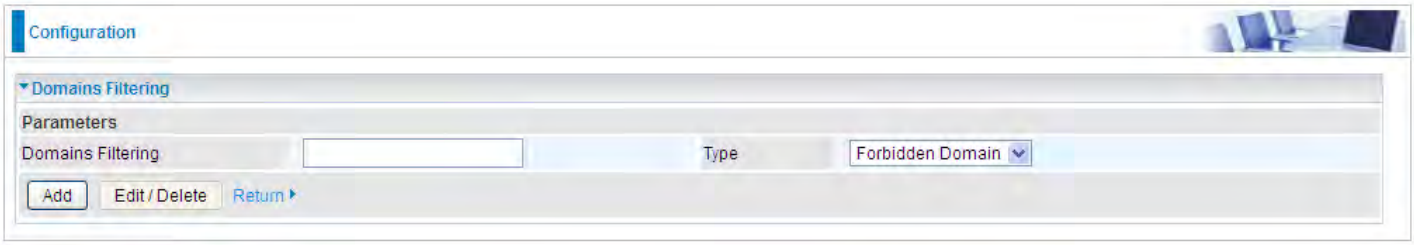


You can add other keywords like this. The keywords you add will be listed as above. If you want to reedit the keyword, press the Edit radio button left beside the item, and the word will listed in the Keyword field, edit, and then press **Edit/Delete** to confirm. If you want to delete certain keyword, check Delete checkbox right beside the item, and press **Edit/Delete**. Click **Return** to be back to the previous page.

Domain Filtering

Note: Maximum number of entries: 32.

Click Detail to add Domains.



Domain Filtering: enter the domain you want this filter to apply.

Type: select the action this filter deals with the Domain.

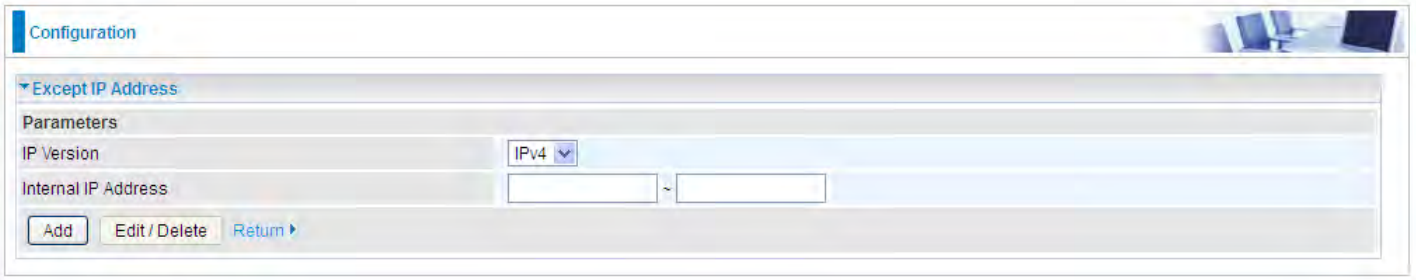
- **Forbidden Domain:** The domain is forbidden access.
- **Trusted Domain:** The domain is trusted and allowed access.

Enter a domain and select whether this domain is trusted or forbidden with the pull-down menu. Next, click **Add**. Your new domain will be added to either the Trusted Domain or Forbidden Domain listing, depending on which you selected previously. For specific process, please refer to ***Keywords Filtering.***

Except IP Address

In the section, users can set the exception IP respectively for IPv4 and IPv6.

Click Detail to add the IP Addresses.



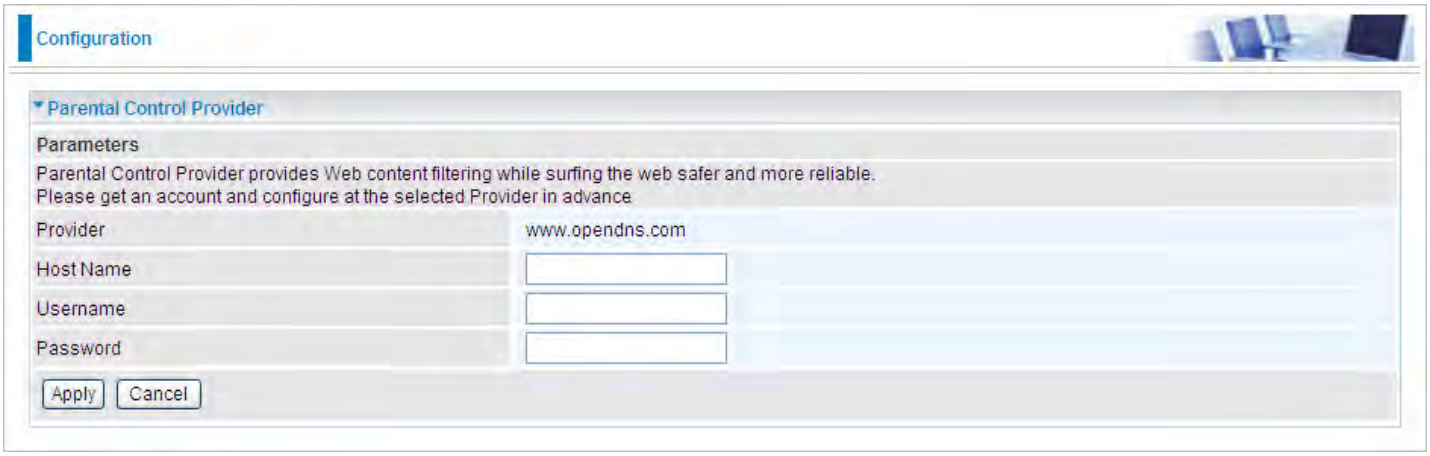
Enter the except IP address. Click **Add** to save your changes. The IP address will be entered into the ***Exception List***, and excluded from the URL filtering rules in effect. For specific process, please refer to ***Keywords Filtering*****.**

For example, users can set IPv4 client 192.168.1.103 in your network as a exception address that is not limited to the rules set in URL filter (or IPv4 clients (a range)). And also an IPv6 client (2000:1211:1002:6ba4:d160:5adb:9009:87ae) or IPv6 clients(a range) can be the exceptions from the URL rules.

At the URL Filter page, press **Apply** to confirm your settings.

Parental Control Provider

Parental Control Provider provides Web content filtering offering safer and more reliable web surfing for users. Please get an account and configure at the selected Provider “www.opendns.com” in advance. To use parental control (DNS), user needs to configure to use parental control (DNS provided by parental control provider) to access internet at WAN configuration or DNS page(See DNS).



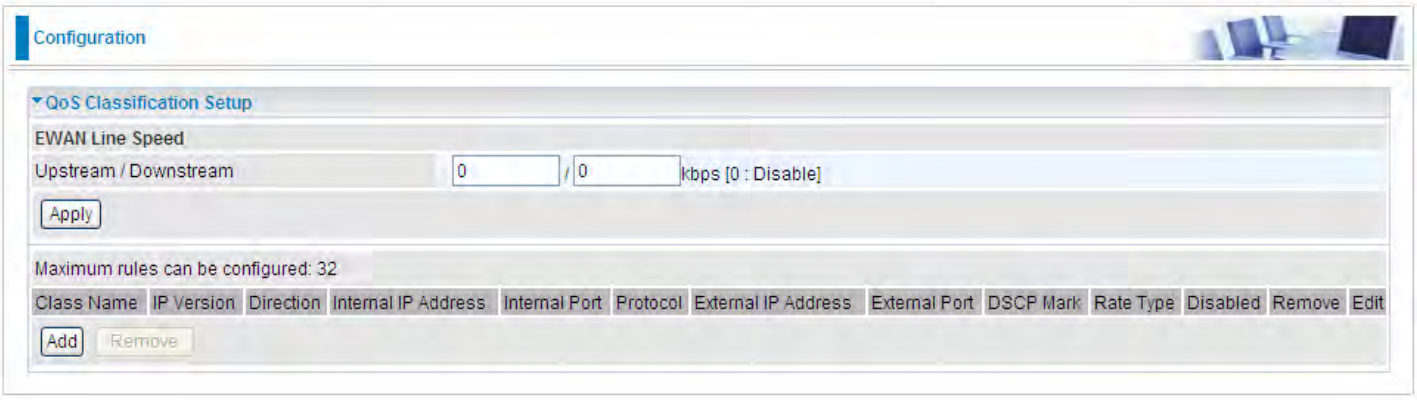
Host Name, Username and Password: Enter your registered domain name and your username and password at the provider website www.opendns.com.

QoS - Quality of Service

Quality of Service

QoS helps you to control the data upload traffic of each application from LAN (Ethernet) to WAN (Internet). This feature allows you to control the quality and speed of throughput for each application when the system is running with full upstream load.

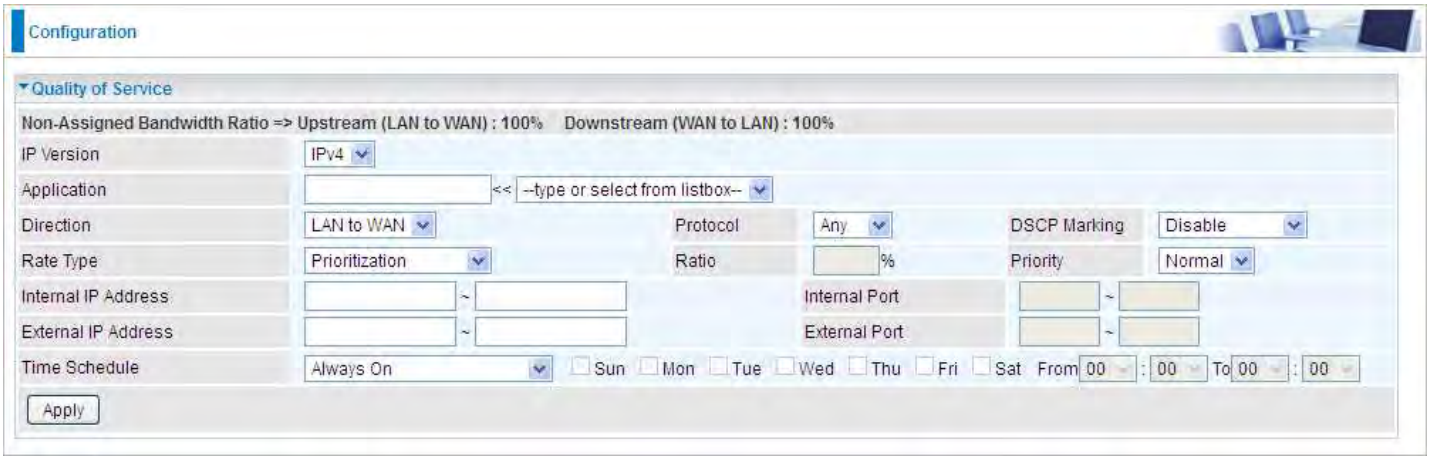
Note: VDSL/ADSL line speed is based on the VDSL/ADSL sync rate. But there is no QoS on 3G/4G LTE as the 3G/4G LTE line speed is various and can not be known exactly.



EWAN Line Speed

Upstream / Downstream: Specify the upstream and downstream rate of the EWAN interface. Click **Apply** to save the EWAN rate settings.

Click **Add** to enter QoS rules.



IP Version: Select either IPv4 or IPv6 base on need.

Application: Assign a name that identifies the new QoS application rule. Select from the list box for quick setup.

Direction: Shows the direction mode of the QoS application.

- **LAN to WAN:** You want to control the traffic from local network to the outside (Upstream). You can assign the priority for the application or you can limit the rate of the application.
  Eg: you have a FTP server inside the local network, and you want to have a limited control by the QoS policy and so you need to add a policy with LAN to WAN direction setting.
- **WAN to LAN:** Control traffic from WAN to LAN (Downstream).

Protocol: Select the supported protocol from the drop down list.

DSCP Marking: Differentiated Services Code Point (DSCP), it is the first 6 bits in the ToS byte. DSCP Marking allows users to classify the traffic of the application to be executed according to the DSCP value.

IP Precedence and DSCP Mapping Table

Mapping Table	
Default (000000)	Best Effort
EF(101110)	Expedited Forwarding
AF11 (001010)	Assured Forwarding Class1(L)
AF12 (001100)	Assured Forwarding Class1(M)
AF13 (001110)	Assured Forwarding Class1(H)
AF21 (010010)	Assured Forwarding Class1(L)
AF22 (010100)	Assured Forwarding Class1(M)
AF23 (010110)	Assured Forwarding Class1(H)
AF31 (011010)	Assured Forwarding Class1(L)
AF32 (011100)	Assured Forwarding Class1(M)
AF33 (011110)	Assured Forwarding Class1(H)
AF41 (100010)	Assured Forwarding Class1(L)
AF42 (100100)	Assured Forwarding Class1(M)
AF43 (100110)	Assured Forwarding Class1(H)
CS1(001000)	Class Selector(IP precedence)1
CS2(010000)	Class Selector(IP precedence) 2
CS3(011000)	Class Selector(IP precedence)3
CS4(100000)	Class Selector(IP precedence) 4
CS5(101000)	Class Selector(IP precedence) 5
CS6(110000)	Class Selector(IP precedence) 6
CS7(111000)	Class Selector(IP precedence) 7

DSCP offers three levels of service, Class Selector (CS), Assured Forwarding (AF) and Expedited Forwarding (EF). AF1, AF2, AF3 and AF4 are four levels of assured forwarding services. Each AF has three different packet loss priorities from high, medium, to low. Also, CS1-CS7 indicates the IP precedence.

Rate Type: You can choose ***Limited*** , ***Prioritization*** *or* ***Set DSCP Marking***.

- **Limited (Maximum):** Specify a limited data rate for this policy. It also is the maximum rate for this policy. When you choose ***Limited***, type the ***Ratio*** proportion. As above FTP server example, you may want to “throttle” the outgoing FTP speed to 20% of 256K and limit to it, you may use this type.
- **Prioritization:** Specify the rate type control for the rule to be used. If you choose ***Prioritization*** for the rule, you parameter ***Priority*** would be available, you can set the priority for this rule.
- **Set DSCP Marking:** When select ***Set DSCP Marking***, the packets matching the rule will be forwarded according to the pre-set DSCP marking.

Ratio: The rate percent of each application/policy compared to total traffic on the interface with limited rate type. For example, we want to only allow 20% of the total data for the LAN-to-WAN direction to be used for FTP server. Then we can specify here with data ratio = 20. If you have ADSL LINE with 256K/bps.rate, the estimated data rate, in kbps, for this rule is 20%*256*0.9 = 46kbps. (For 0.9 is an estimated factor for the effective data transfer rate for an ADSL LINE from LAN to WAN. For WAN-to-LAN, it is 0.85 to 0.8)

Priority: Set the priority given to each policy/application. Specify the priority for the use of bandwidth. You can specify which application can have higher priority to acquire the bandwidth. Its default setting is set to Normal. You may adjust this setting to fit your policy / application.

Internal IP Address: The IP address values for Local LAN devices you want to give control.

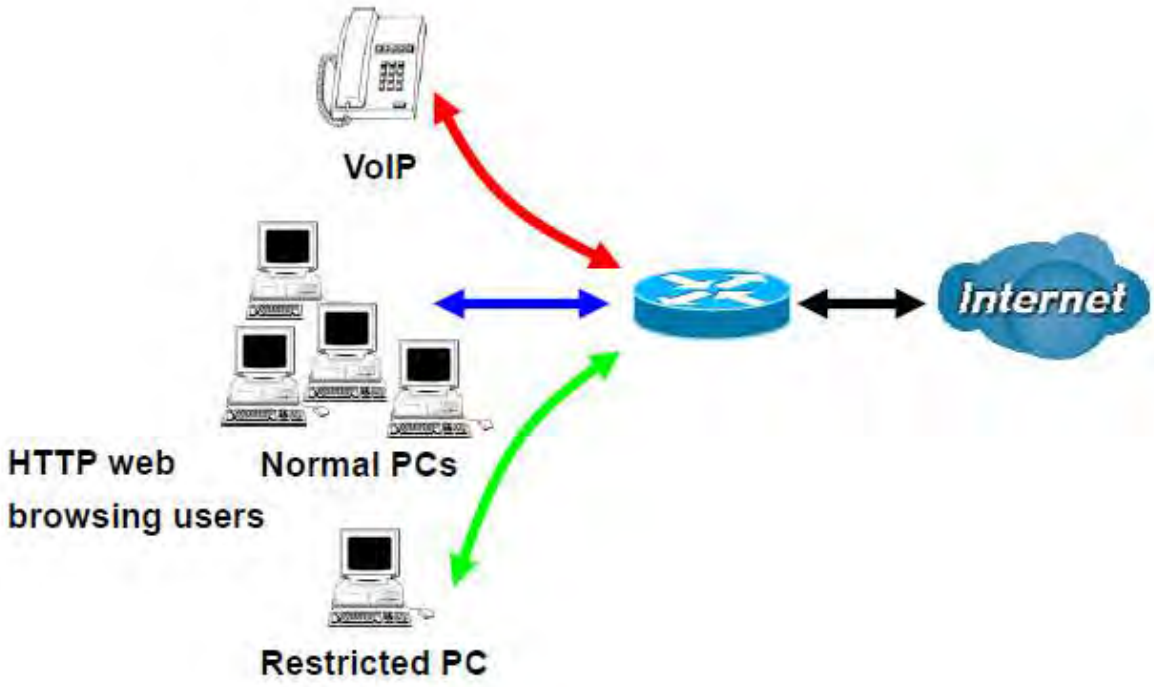
Internal Port: The Port number on the LAN side, it is used to identify an application.

External IP Address: The IP address on remote / WAN side.

External Port: The Port number on the remote / WAN side.

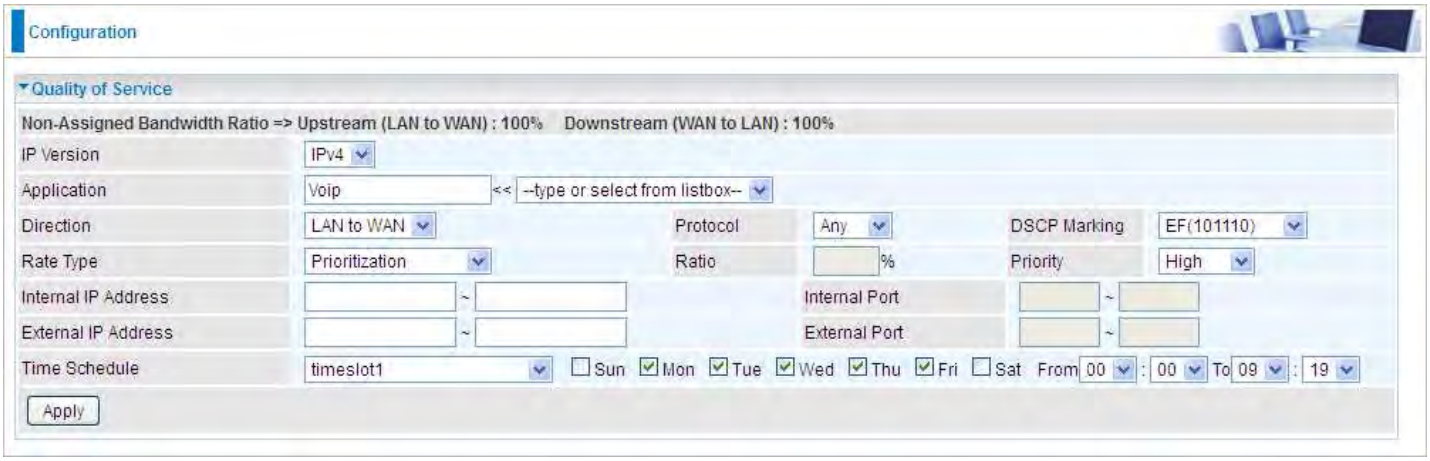
Time Schedule: Select or set exactly when the rule works. When set to “Always On”, the rule will work all time; and also you can set the precise time when the rule works, like 01:00- 19:00 from Monday to Friday. Or you can select the already set timeslot in “**Time Schedule**” during which the rule works. And when set to “Disable”, the rule is disabled or inactive and there will be an icon”  ” indicating the rule is inactive. See Time Schedule.

Examples: Common usage

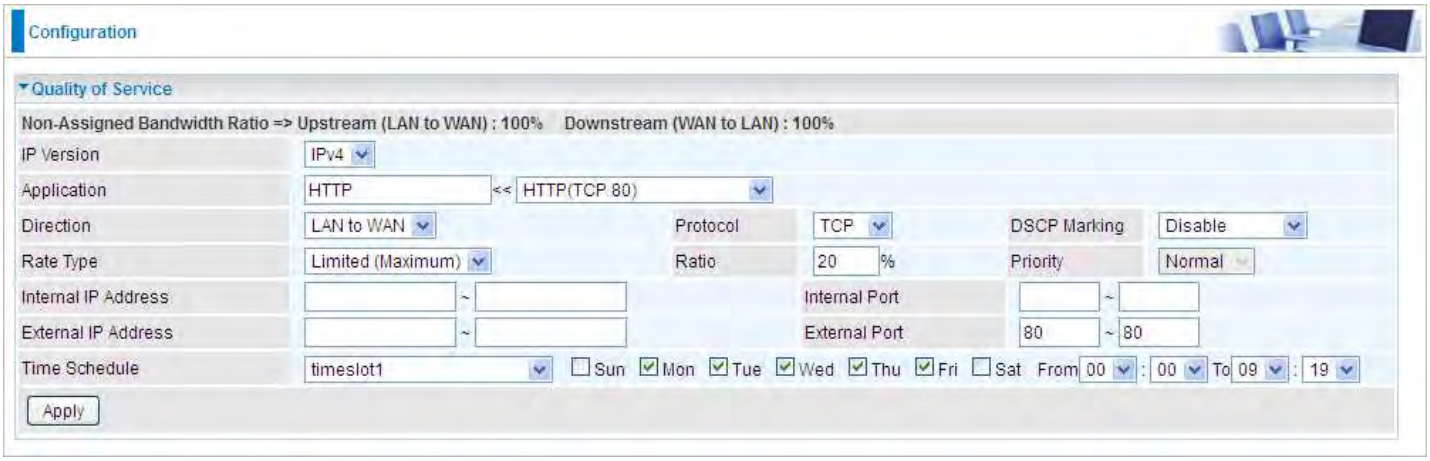


1. Give outgoing VoIP traffic more priority.

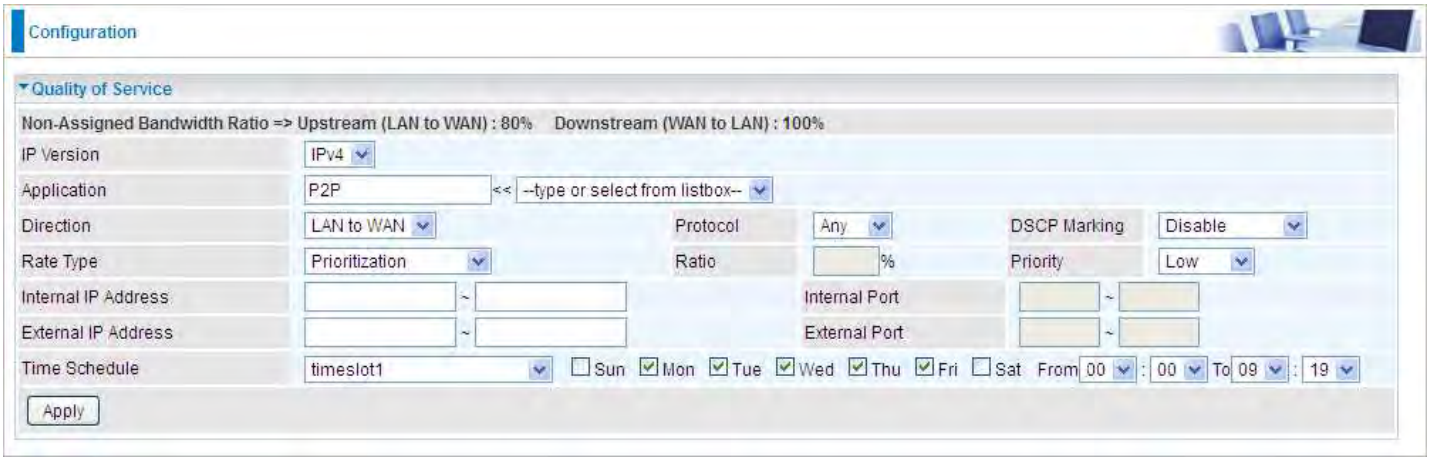
The default queue priority is normal, so if you have VoIP users in your local network, you can set a higher priority to the outgoing VoIP traffic.



2. Give regular web http access a limited rate



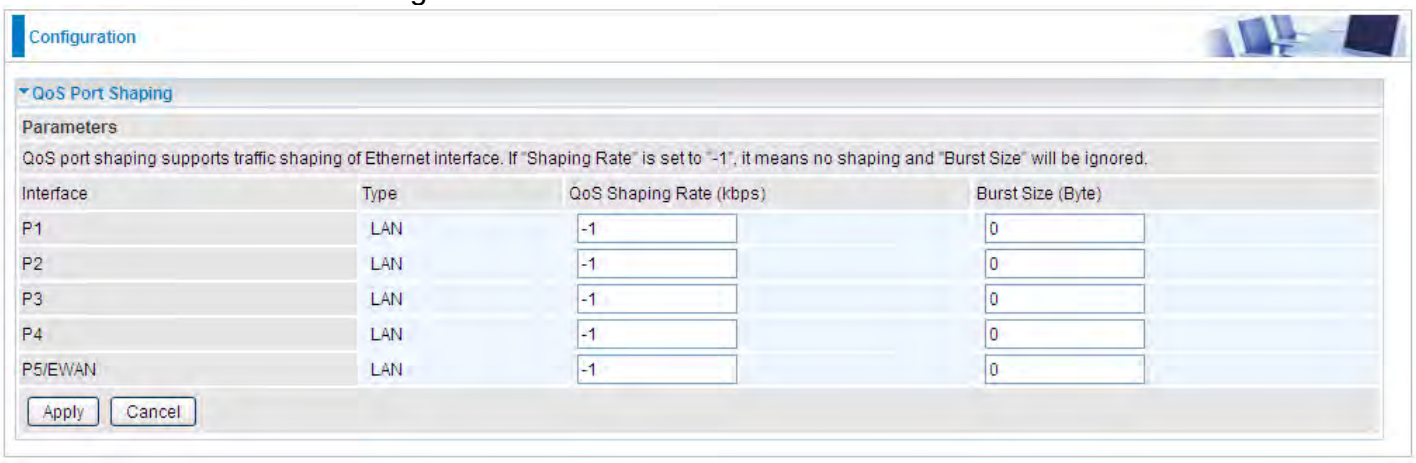
3. If you are actively engaged in P2P and are afraid of slowing down internet access for other users within your network, you can then use QoS to set a rule that has low priority. In this way, P2P application will not congest the data transmission with other applications.



Other applications, like FTP, Mail access, users can use QoS to control based on need.

QoS Port Shaping

QoS port shaping supports traffic shaping of Ethernet interfaces. It forcefully maximizes the throughput of the Ethernet interface. When “Shaping Rate” is set to “-1”, no shaping will be in place and the “Burst Size” is to be ignored.



Interface: P1-P5. P5 used as EWAN also covered.

Type: All LAN when P5 is LAN port; P5 used as EWAN, type WAN and all others LAN.

QoS Shaping Rate (Kbps): Set the forcefully maximum rate.

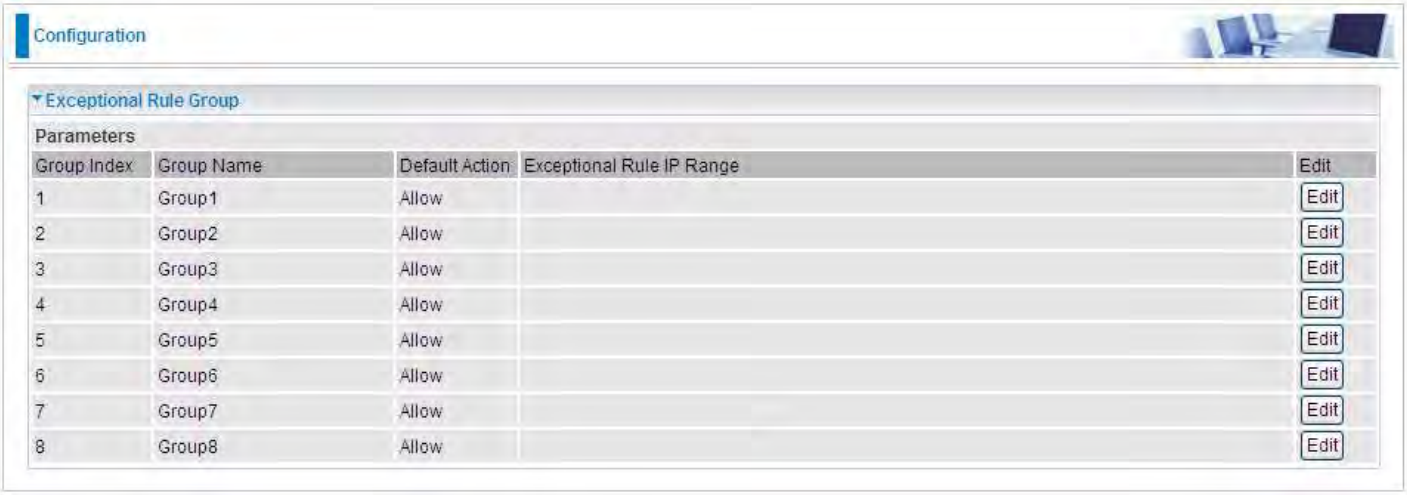
Burst Size(Bytes): Set the forcefully Burst Size.

NAT

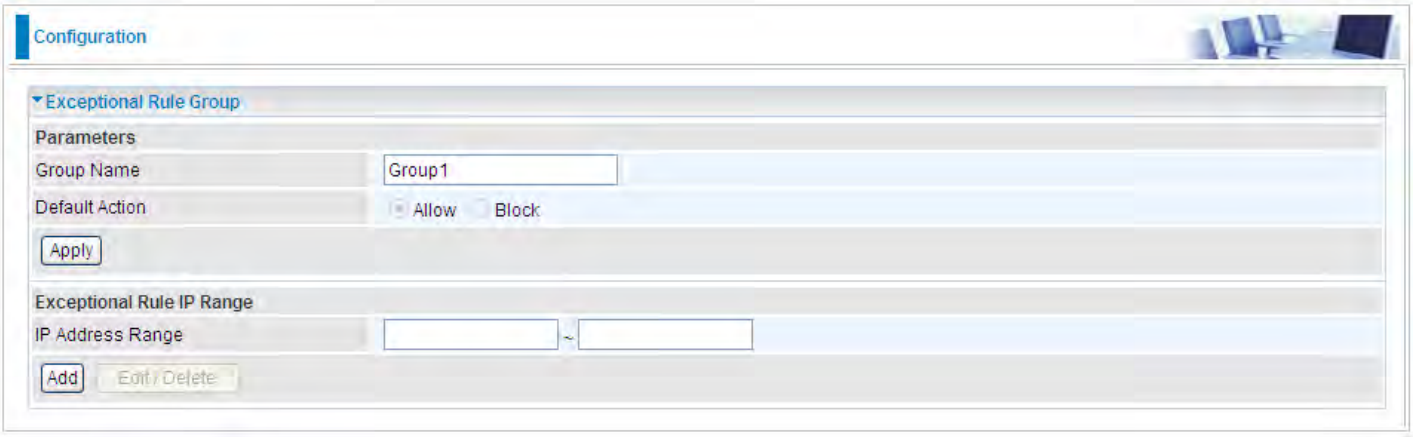
NAT (Network Address Translation) feature translates a private IP to a public IP, allowing multiple users to access the Internet through a single IP account, sharing the single IP address. It is a natural firewall for the private network.

Exceptional Rule Group

Exceptional Rule is dedicated to giving or blocking Virtual Server/ DMZ access to some specific IP or IPs(range). Users are allowed to set 8 different exceptional rule groups at most. In each group, user can add specific IP or IP range.



Press **Edit** to set the exceptional IP (IP Range).



Default Action: Please first set the range to make **"Default Action"** setting available**.** Set "Allow" to ban the listed IP or IPs to access the Virtual Server and DMZ Host

Check "Block" to grant access to the listed IP or IPs to Virtual Server and DMZ Host.

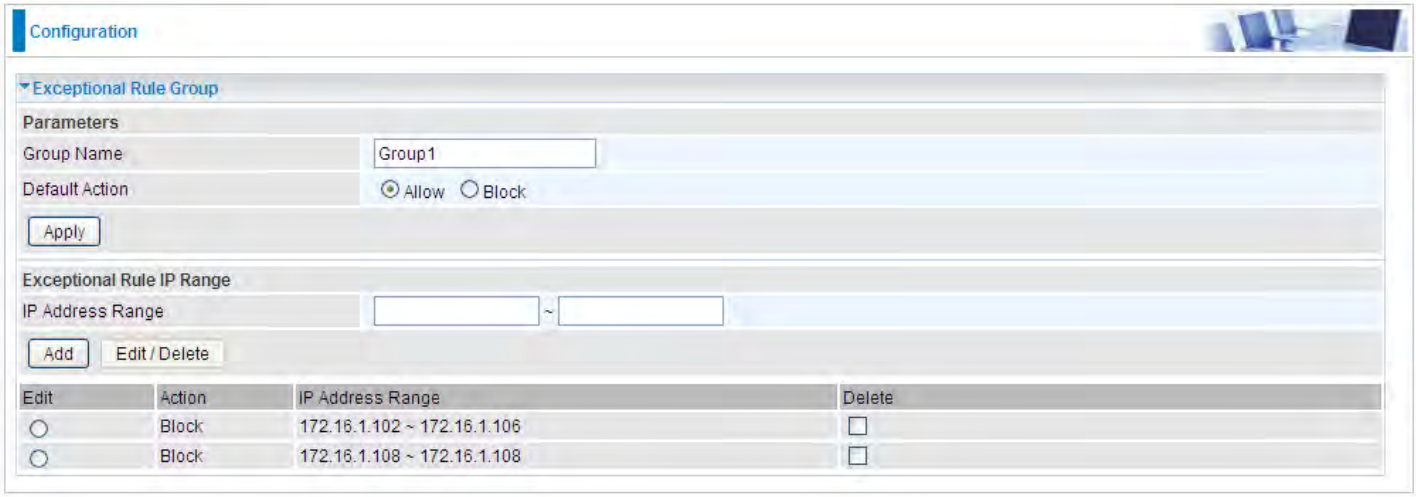
Apply: Press **Apply** button to apply the change.

Exceptional Rule Range

IP Address Range: Specify the IP address range; IPv4 address range can be supported.

Click **Add** to add the IP Range.

For instance, if user wants to block IP range of 172.16.1.102-172.16.1.106 from accessing your set virtual server and DMZ host, you can add this IP range and valid it.



Virtual Servers

In TCP/IP and UDP networks a port is a 16-bit number used to identify which application program (usually a server) incoming connections should be delivered to. Some ports have numbers that are pre-assigned to them by the IANA (the Internet Assigned Numbers Authority), and these are referred to as “well-known ports”. Servers follow the well-known port assignments so clients can locate them.

If you wish to run a server on your network that can be accessed from the WAN (i.e. from other machines on the Internet that are outside your local network), or any application that can accept incoming connections (e.g. Peer-to-peer/P2P software such as instant messaging applications and P2P file-sharing applications) and are using NAT (Network Address Translation), then you will usually need to configure your router to forward these incoming connection attempts using specific ports to the PC on your network running the application. You will also need to use port forwarding if you want to host an online game server.

The reason for this is that when using NAT, your publicly accessible IP address will be used by and point to your router, which then needs to deliver all traffic to the private IP addresses used by your PCs. Please see the **WAN** configuration section of this manual for more information on NAT.

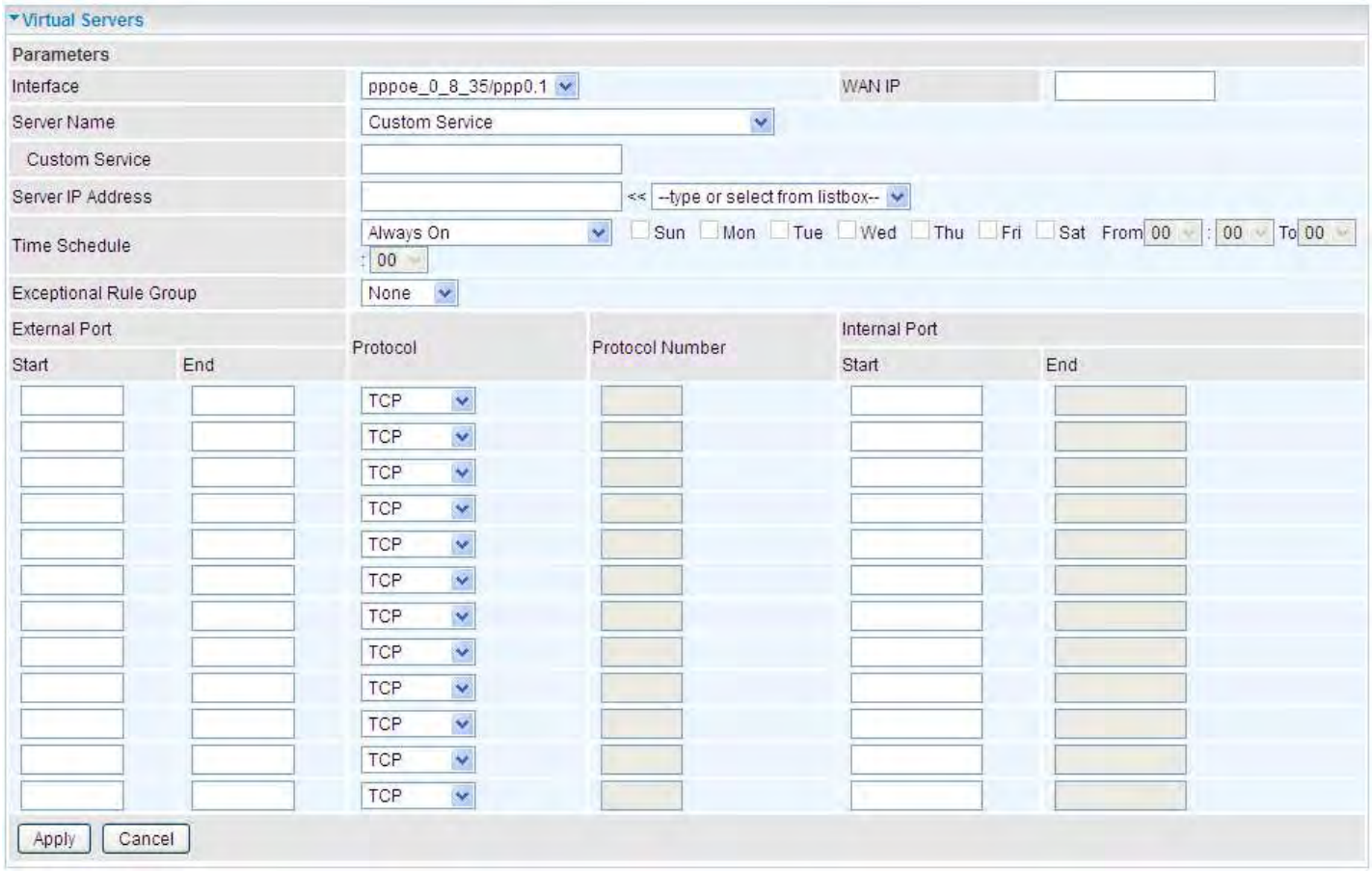
The device can be configured as a virtual server so that remote users accessing services such as Web or FTP services via the public (WAN) IP address can be automatically redirected to local servers in the LAN network. Depending on the requested service (TCP/UDP port number), the device redirects the external service request to the appropriate server within the LAN network.

This part is only available when NAT is enabled.

Note: The maximum number of entries: 64.

It is virtual server listing table as you see, Click **Add** to move on.

The following configuration page will appear to let you configure.



Interface: Select from the drop-down menu the interface you want the virtual server(s) to apply.

WAN IP: To specify the exact WAN IP address. It can be flexible while there are multiple WAN IPs on one interface. If the WAN IP field is empty, 78VDP(O)X uses the current wan IP of this interface.

Server Name: Select the server name from the drop-down menu.

Custom Service: It is a kind of service to let users customize the service they want. Enter the user-defined service name here. It is a parameter only available when users select **Custom Service** in the above parameter.

Server IP Address: Enter your server IP Address here. User can select from the list box for quick setup.

External Port

- **Start:** Enter a port number as the external starting number for the range you want to give access to internal network.
- **End:** Enter a port number as the external ending number for the range you want to give access to internal network.

Internal Port

- **Start:** Enter a port number as the internal staring number.
- **End:** Here it will generate automatically according to the End port number of External port and can't be modified.

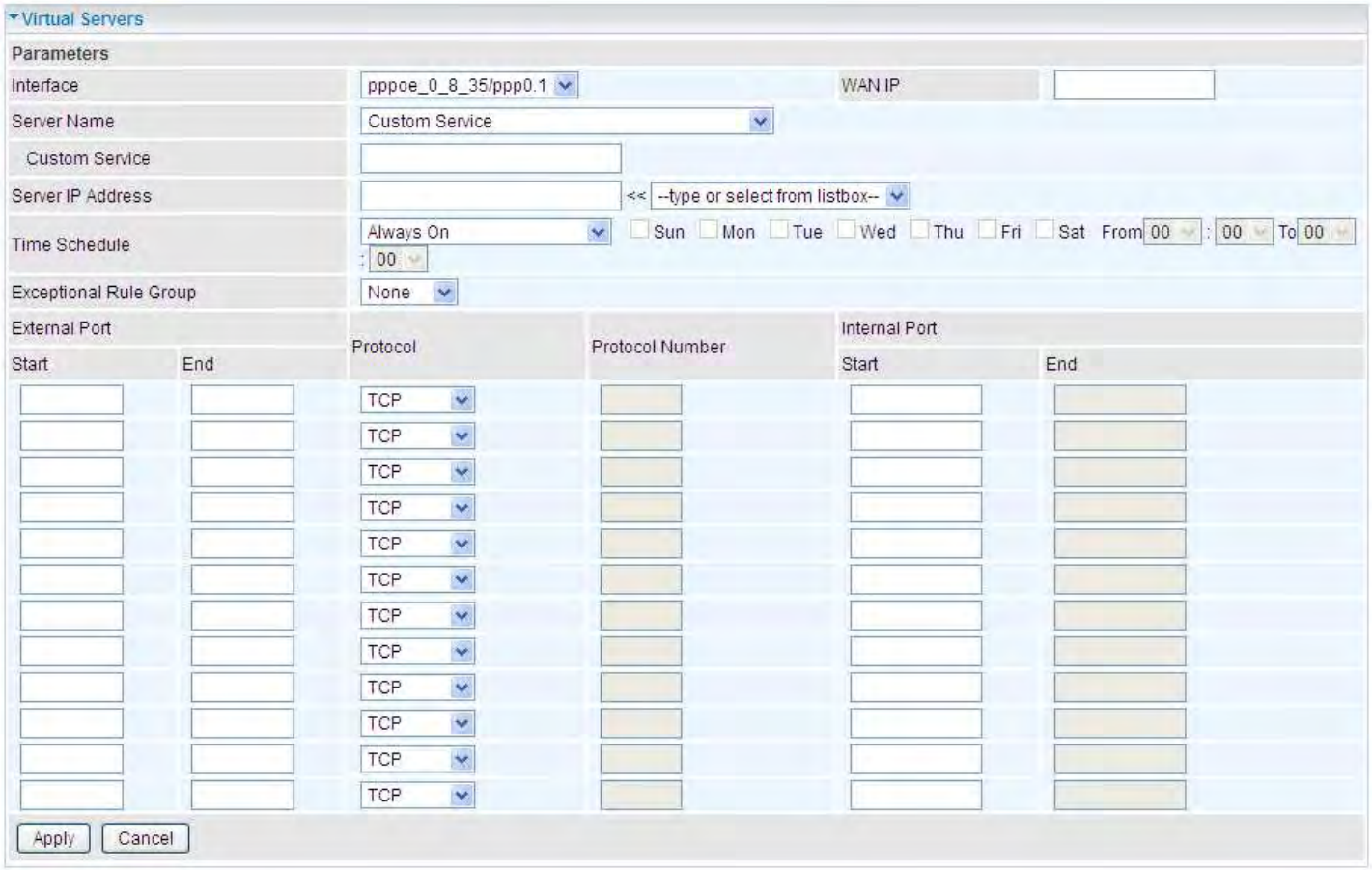
Protocol: select the protocol this service used: TCP/UDP, TCP, UDP.

Time Schedule: Select or set exactly when the Virtual Server works. When set to "Always On", the Virtual Server will work all time; and also you can set the precise time when Virtual Server works, like 01:00 - 19:00 from Monday to Friday. Or you can select the already set timeslot in **Time Schedule** during which the Virtual Server works. And when set to "Disable", the rule is disabled and there will be an icon ✓ in the list table indicating the rule is disabled. See Time Schedule.

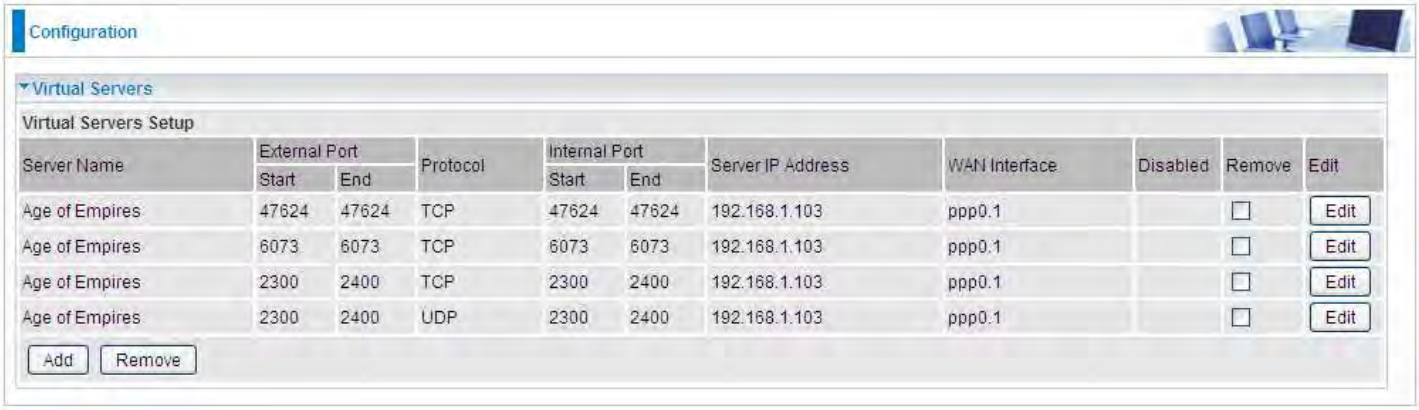
Exceptional Rule Group: Select the exceptional group listed. It is to grant or block Virtual Server access to a group of IPs. For example, as we set previously group 1 blocking access to 172.16.1.102-172.16.1.106. If here you want to block Virtual Server access to this IP range, you can select Group1.

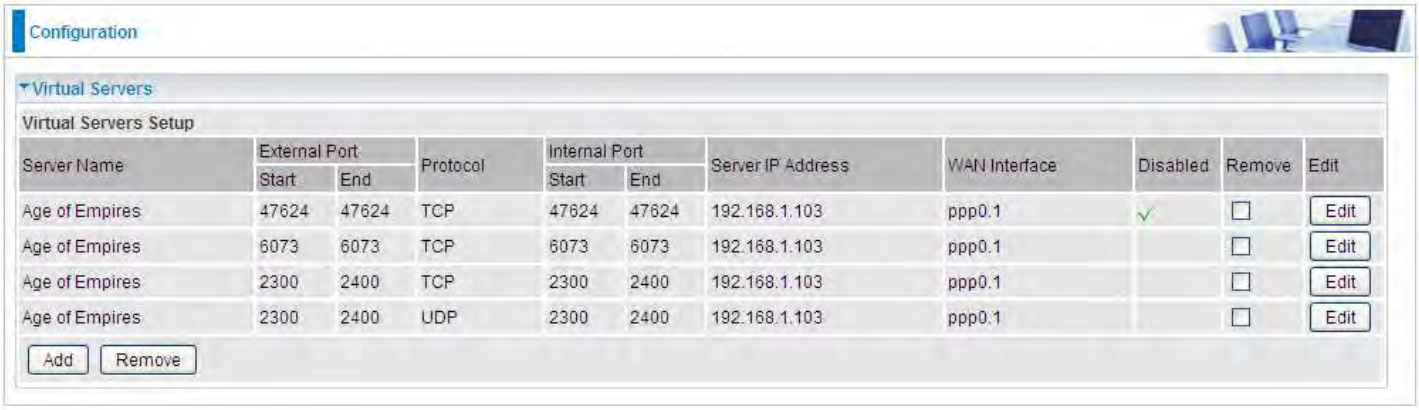
Set up

1. Select a Server Name from the drop-down menu, then the port will automatically appear, modify some as you like, or you can just leave it as default. Remember to enter your server IP Address.



2. Press **Apply** to conform, and the items will be list in the **Virtual Servers Setup** table.

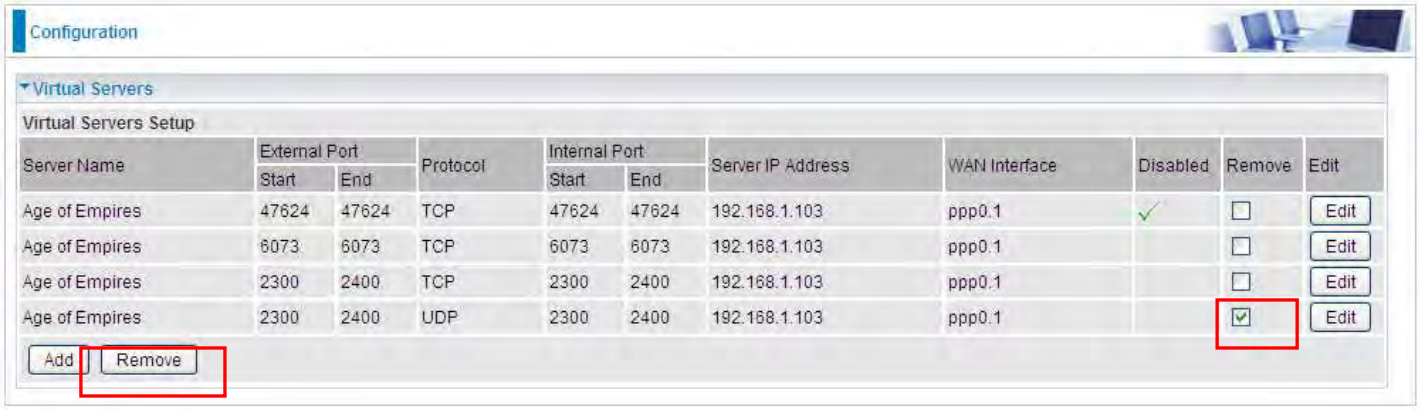




(✓ Means the rule is inactive)

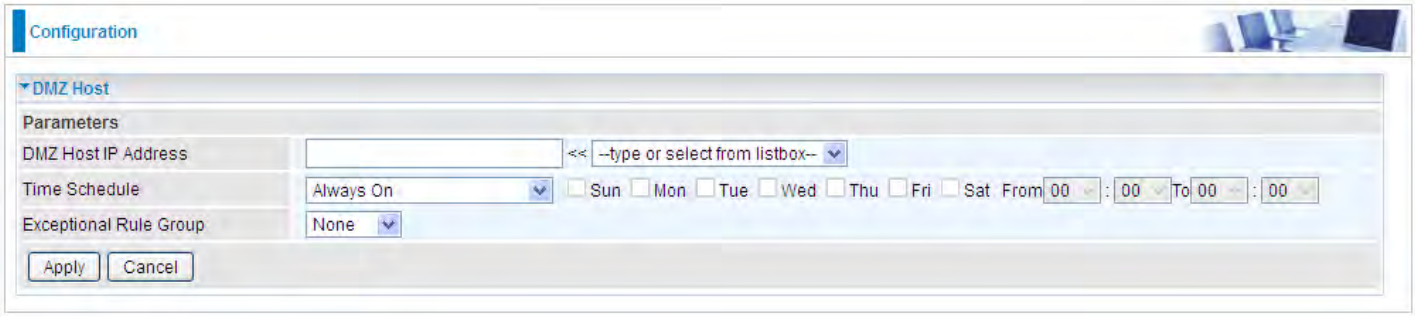
Remove

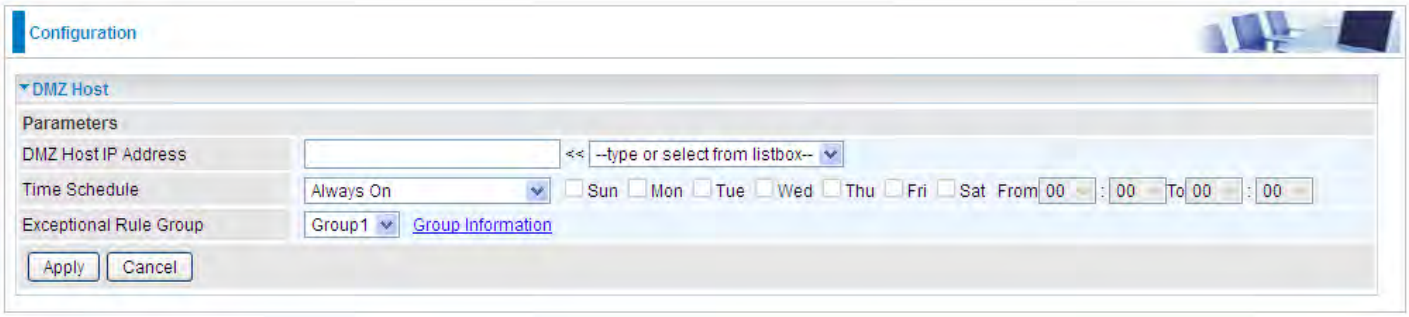
If you don't need a specified Server, you can remove it. Check the check box beside the item you want to remove, then press **Remove**, it will be OK.



DMZ Host

The DMZ Host is a local computer exposed to the Internet. When setting a particular internal IP address as the DMZ Host, all incoming packets will be checked by Firewall and NAT algorithms before being passed to the DMZ host, when a packet received does not use a port number used by any other Virtual Server entries.





Group Index	1
Group Name	Group1
Action	Block
IP Address Range	172.16.1.102~172.16.1.106
	172.16.1.108~172.16.1.108

(Group Information)

DMZ Host IP Address: Enter the IP Address of a host you want it to be a DMZ host. Select from the list box to quick set the DMZ.

Time Schedule: Select or set exactly when the DMZ works. When set to “Always On”, the DMZ will work all time; and also you can set the precise time when DMZ works, like 01:00 - 19:00 from Monday to Friday. Or you can select the already set timeslot in **Time Schedule** during which the DMZ works. And when set to “Disable”, the DMZ Host is disabled. See Time Schedule.

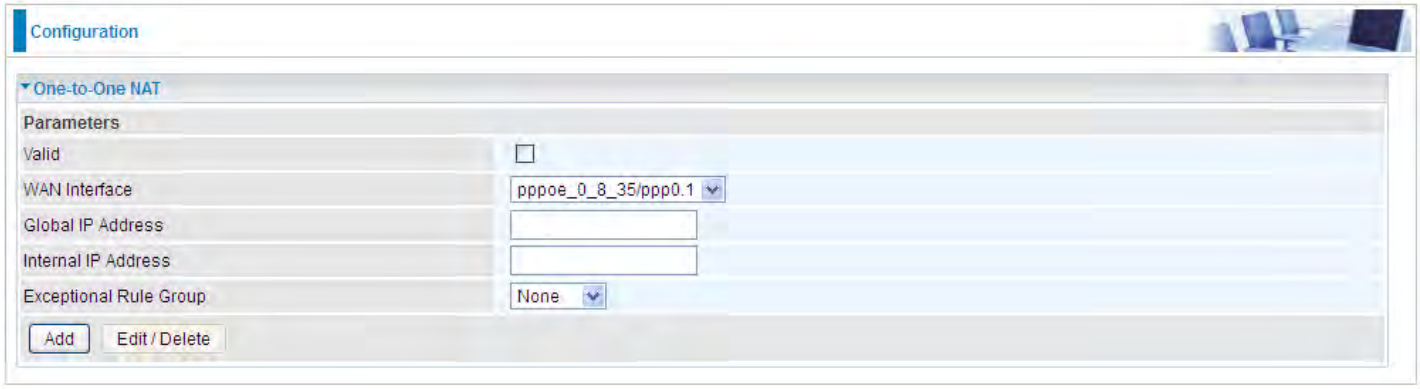
Exceptional Rule Group: Select the exceptional group listed. It is to grant or block DMZ access to a group of IPs. For example, as we set previously group 1 blocking access to 172.16.1.102-172.16.1.106. If here you want to block DMZ Access to this IP range, you can select Group1.

NOTE:	Using port mapping does have security implications, since outside users are able to connect to PCs on your network. For this reason you are advised to use specific Virtual Server entries just for the ports your application requires instead of simply using DMZ or creating a Virtual Server entry for “All” protocols, as doing so results in all connection attempts to your public IP address accessing the specified PC.

Attention	If you have disabled the NAT option in the WAN-ISP section, the Virtual Server function will hence be invalid. If the DHCP server option is enabled, you have to be very careful in assigning the IP addresses of the virtual servers in order to avoid conflicts. The easiest way of configuring Virtual Servers is to manually assign static IP address to each virtual server PC, with an address that does not fall into the range of IP addresses that are to be issued by the DHCP server. You can configure the virtual server IP address manually, but it must still be in the same subnet as the router.

One-to-One NAT

One-to-One NAT maps a specific private/local address to a global/public IP address. If user has multiple global/public IP addresses from your ISP, you are free to use one-to-one NAT to assign some specific public IP for an internal IP like a public web server mapped with a global/public IP for outside access.



Valid: Check whether to valid the one-to-one NAT mapping rule.

WAN Interface: Select one based WAN interface to configure the one-to-one NAT.

Global IP address: The Global IP mapped to an internal device. It can be left empty, and under this circumstance, it can be reached through the WAN IP of interface set in the field above.

Internal Address: The IP address of an internal device in the LAN.

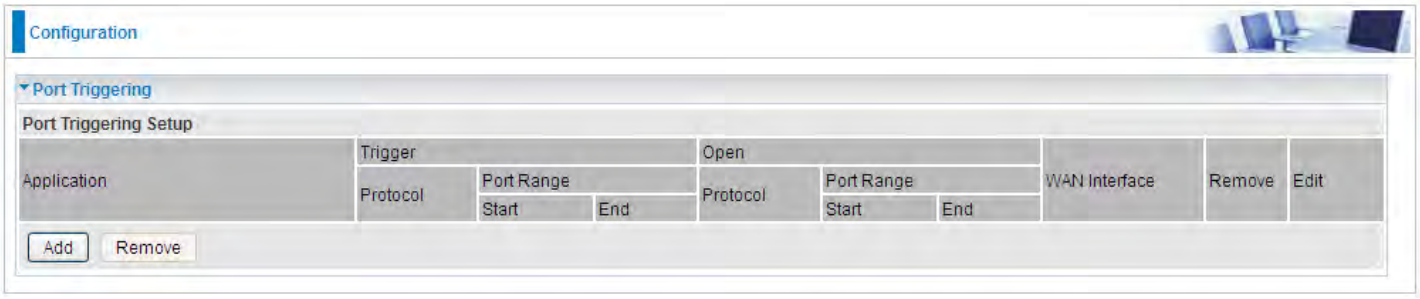
Exceptional Rule Group: Select the exceptional group listed. It is to give or block access to a group of IPs to the server after One-to-One NAT. For example, a server with 192.168.1.3 is mapped to 123.1.1.2 by One-to-One NAT, then the exceptional group can be designated to have or have not access to 123.1.1.2.

For example, you have an ADSL connection of pppoe_0_8_35/ppp0.1 interface with three fixed global IP, and you then can assign the other two global IPs to two internal devices respectively.

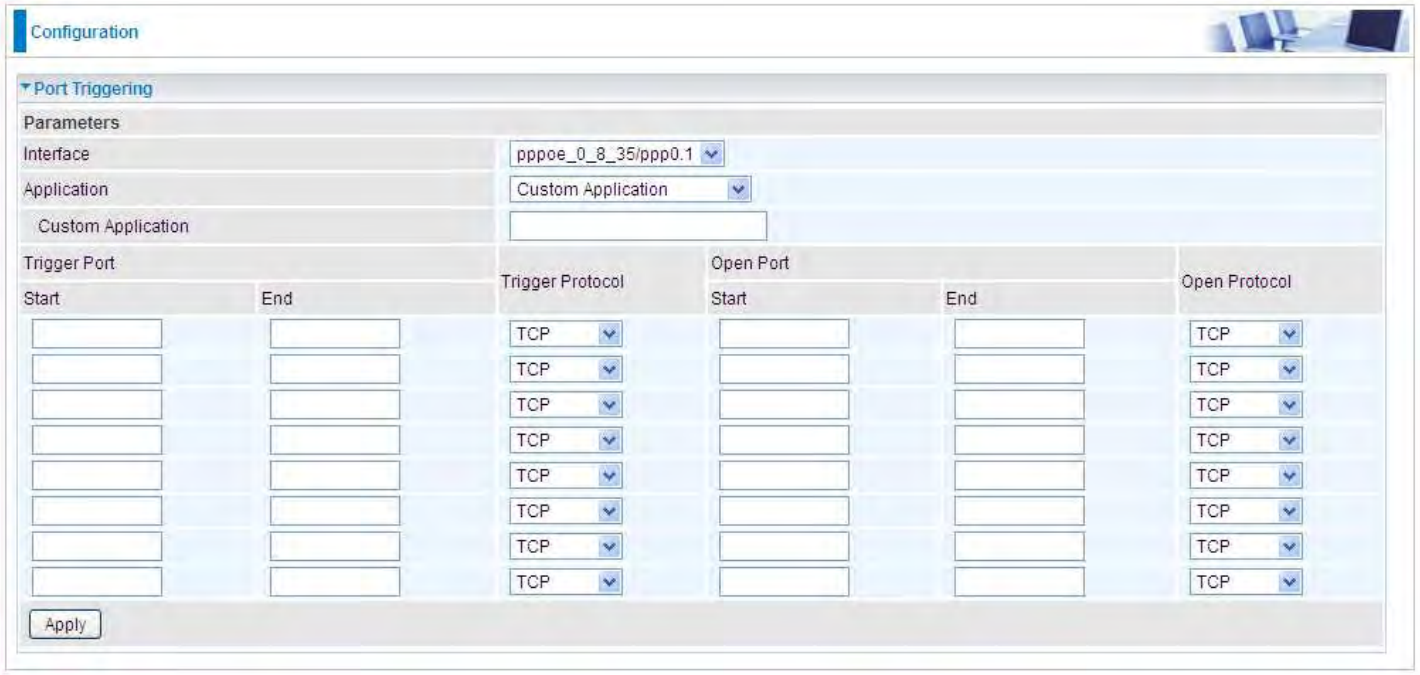
If you have a WEB server (IP address: 192.168.1.3) and a FTP server (IP address: 192.168.1.4) in local network, owning a public IP address range of 123.1.1.2 to 123.1.1.4 assigned by ISP. 123.1.1.2 is used as WAN IP address of the router, 123.1.1.3 is used for WEB server and 123.1.1.4 is used for FTP server. With One-to-One NAT, the servers with private IP addresses can be accessed at the corresponding valid public IP addresses.

Port Triggering

Port triggering is a way to automate port forwarding with outbound traffic on predetermined ports ('triggering ports'), incoming ports are dynamically forwarded to the initiating host, while the outbound ports are in use. Port triggering triggers can open an incoming port when a client on the local network makes an outgoing connection on a predetermined port or a range of ports.



Click **Add** to add a port triggering rule.



Interface: Select from the drop-down menu the interface you want the port triggering rules apply to.

Application: Preinstalled applications or Custom Application user can customize the utility yourself.

Custom Application: It is a kind of service to let users themselves customizes the service they want. Enter the user-defined service name here.

Trigger Port

- **Start:** Enter a port number as the triggering port starting number.
- **End:** Enter a port number as the triggering port ending number.

Any port in the range delimited by the 'Start' and 'End' would be the trigger port.

Open port

- **Start:** Enter a port number as the open port staring number.
- **End:** Enter a port number as the open port ending number.

Any port in the range delimited by the ‘Start’ and ‘End’ would be the preset forwarding port or open port.

Protocol: select the protocol this service used: TCP/UDP, TCP, UDP.

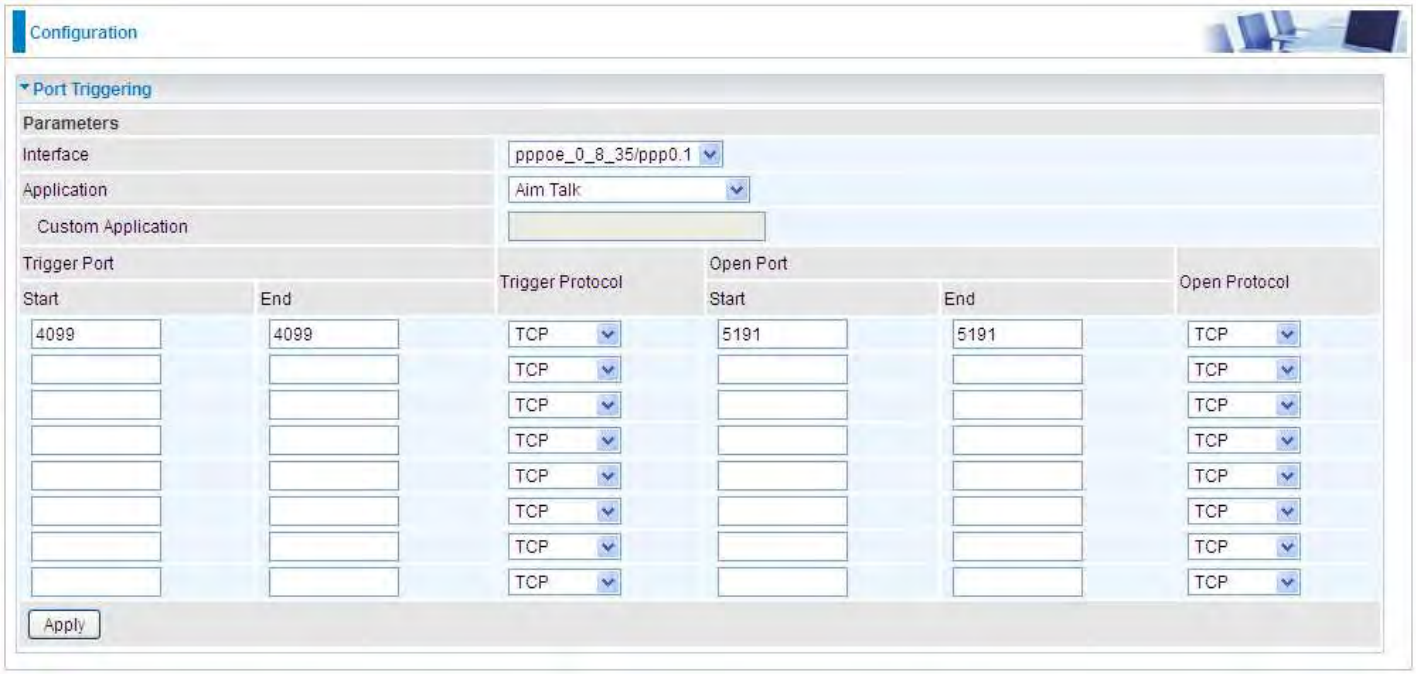
Set up

An example of how port triggering works, when a client behind a NAT router connecting to Aim Talk, it is a TCP connection with the default port 4099.

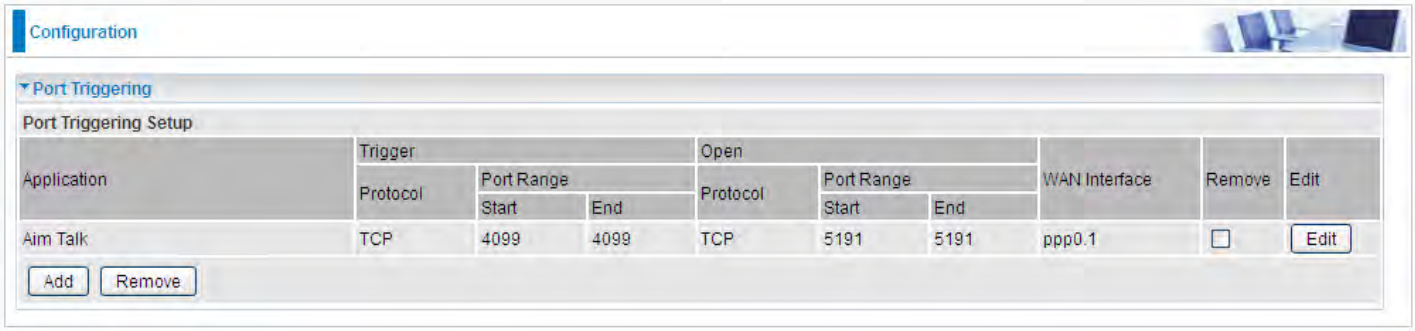
When connecting to Aim Talk, the client typically makes an outgoing connection on port 4099 to the Aim Talk server, but when the computer is behind the NAT, the NAT silently drops this connection because it does not know which computer behind the NAT to send the request to connect.

So, in this case, port triggering in the router is working, when an outbound connection is attempted on port 4099 (or any port in the range set), it should allow inbound connections to that particular computer.

1. Select a Server Name from the drop-down menu, then the port will automatically appear, modify some as you like, or you can just leave it as default. Remember to enter your server IP Address.



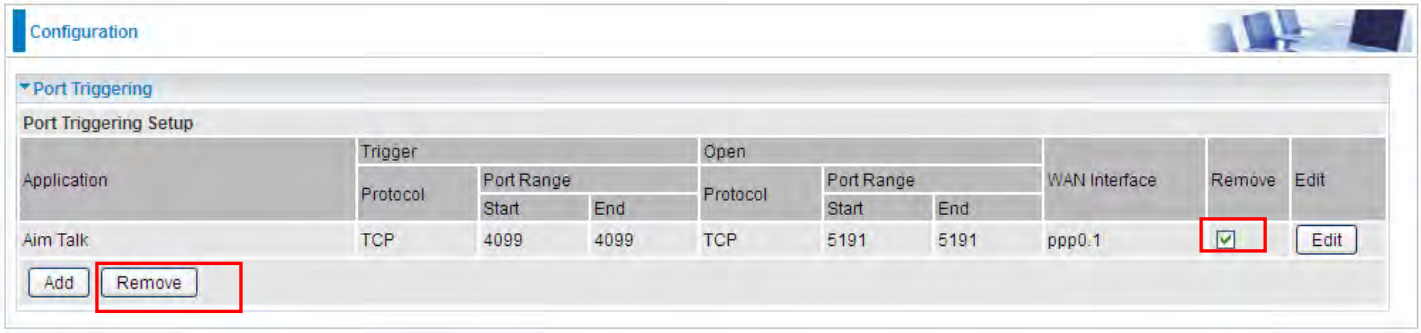
2. Press **Apply** to conform, and the items will be list in the **Port TriggeringSetup** table.



Edit/Remove

If you don’t need a specified Server, you can remove it. Check the check box beside the item you want to remove, and then press **Remove**.

Click **Edit** to re-edit your port-triggering rule.



ALG

The ALG Controls enable or disable protocols over application layer.

SIP: Enable the SIP ALG when SIP phone needs ALG to pass through the NAT. Disable the SIP when SIP phone includes NAT-Traversal algorithm.

H.323: Enable to secure the voice communication using H.323 protocol when one or both terminals are behind a NAT.

IPSec: Enable IPSec ALG to allow one or both peers to reside behind a NAT gateway (i.e., doing address- or port-translation).

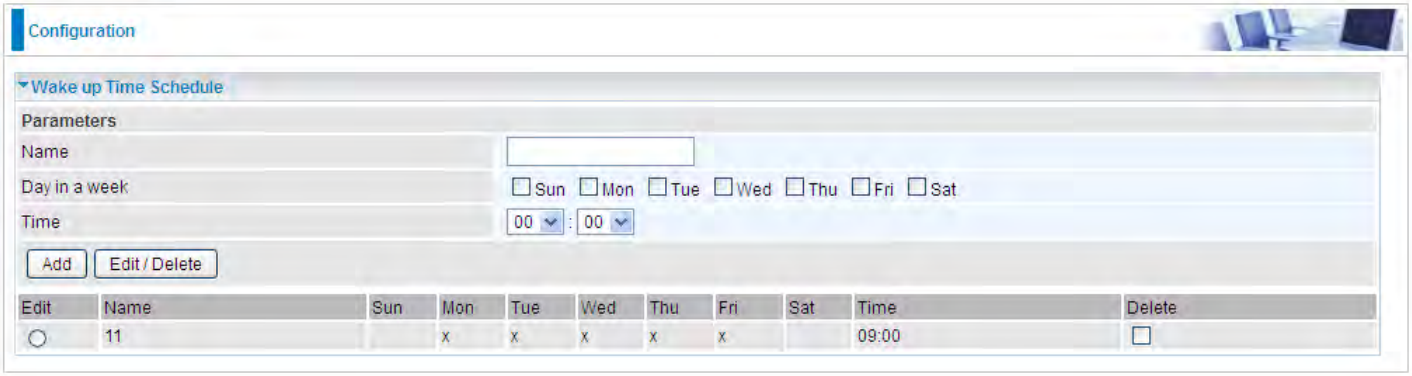
Wake On LAN

Wake on LAN (WOL, sometimes WoL) is an Ethernet computer networking standard that allows a computer to be turned on or woken up remotely by a network message.

Host Label: Enter identification for the host.

Select: Select MAC address of the computer that you want to wake up or turn on remotely.

Wake by Schedule: Enable to wake up your set device at some specific time. For instance, user can set to get some device woken up at 8:00 every weekday. Click Schedule to enter time schedule configuring page to set the exact timeline.



Add: After selecting, click Add then you can submit the Wake-up action.

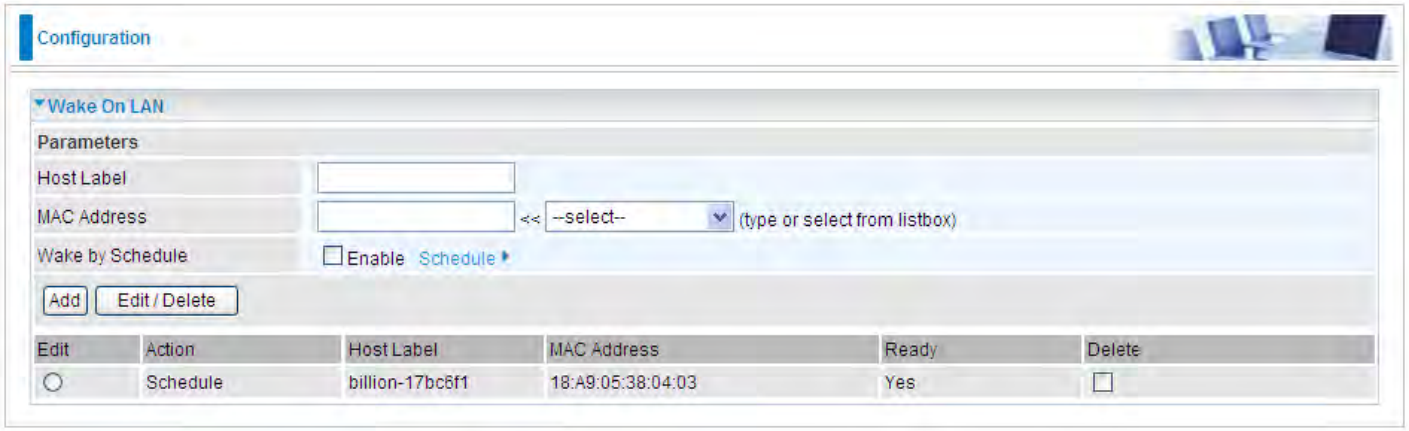
Edit/Delete: Click to edit or delete the selected MAC address.

Ready:

"Yes" indicating the remote computer is ready for your waking up.

"No" indicating the machine is not ready for your waking up.

Delete: Delete the selected MAC address.



VPN

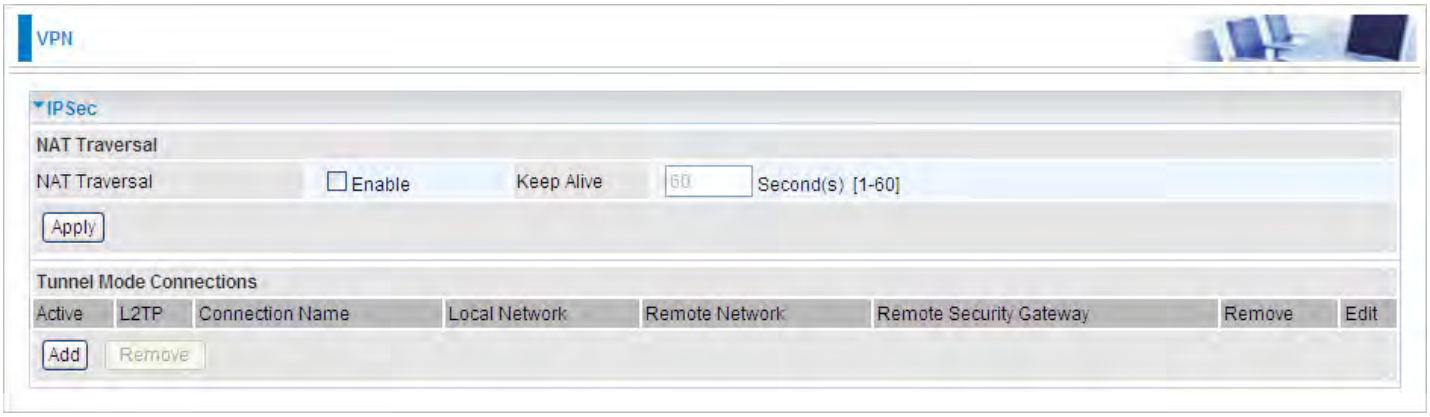
A **virtual private network** (**VPN**) is a private network that interconnects remote (and often geographically separate) networks through primarily public communication infrastructures such as the Internet. VPNs provide security through tunneling protocols and security procedures such as encryption. For example, a VPN could be used to securely connect the branch offices of an organization to a head office network through the public Internet.

IPSec

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 also 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.

IPsec is an end-to-end security scheme operating in the Internet Layer of the Internet Protocol Suite. It can be used in protecting data flows between a pair of security gateways (*network-to-network*), or between a security gateway and a host (*network-to-host*).

Note: A maximum of 16 sessions for IPSec.



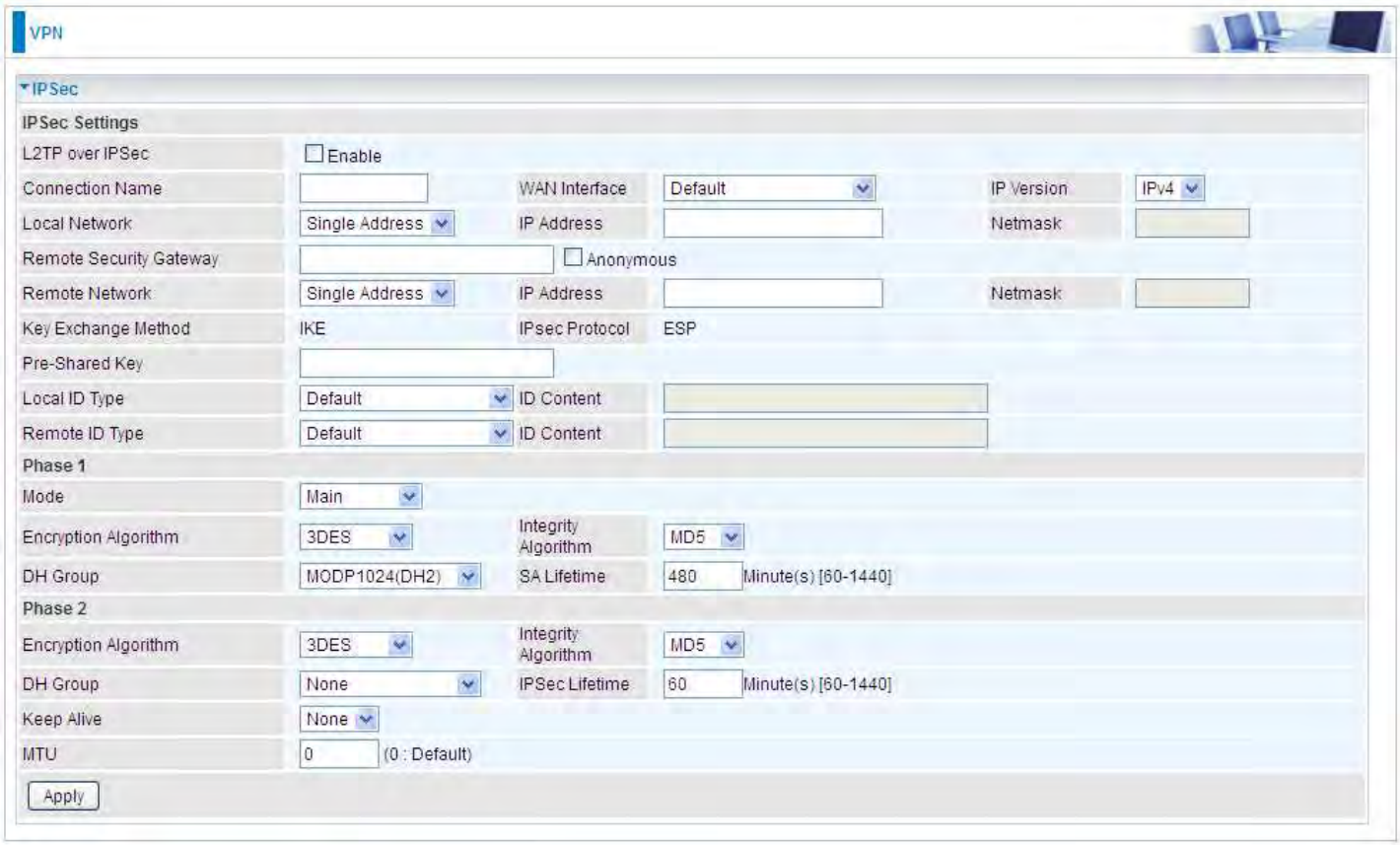
NAT Traversal

NAT Traversal: This directive enables use of the NAT-Traversal IPsec extension (NAT-T). NAT-T allows one or both peers to reside behind a NAT gateway (i.e., doing address- or port-translation).

Keep Alive: Type the interval time(sec) for sending packets to keep the NAT Traversal alive.

Click **Apply** to save and apply your settings.

Click **Add** to create IPSec connections.



IPSec Settings

L2TP over IPSec: Select Enable if user wants to use L2TP over IPSec. See L2TPover IPSec

Connection Name: A given name for the connection, but it should contain no spaces (e.g. “connection-to-office”).

WAN Interface: Select the set used interface for the IPSec connection, when you select adsl pppoe_0_0_35/ppp0.1 interface, the IPSec tunnel would transmit data via this interface to connect to the remote peer.

IP Version: Select the IP version base on your network framework.

Local Network: Set the IP address or subnet of the local network.

- **Single Address:** The IP address of the local host, for establishing an IPSec connection between a security gateway and a host (*network-to-host*).
- **Subnet:** The subnet of the local network, for establishing an IPSec tunnel between a pair of security gateways (*network-to-network*)

IP Address: The local network address.

Netmask: The local network netmask.

Remote Security Gateway: The IP address of the remote VPN device that is connected and establishes a VPN tunnel.

Anonymous: Enable any IP to connect in.

Remote Network: Set the IP address or subnet of the remote network.

- **Single Address:** The IP address of the local host, for establishing an IPSec connection between a security gateway and a host (*network-to-host*). If the remote peer is a host, select Single Address.
- **Subnet:** The subnet of the local network, for establishing an IPSec tunnel between a pair of security gateways (*network-to-network*), If the remote peer is a network, select Subnet.

Key Exchange Method: Displays key exchange method.

Pre-Shared Key: This is for the Internet Key Exchange (IKE) protocol, a string from 1 to 32 characters. Both sides should use the same key. IKE is used to establish a shared security policy and authenticated keys for services (such as IPSec) that require a key. Before any IPSec traffic can be passed, each router must be able to verify the identity of its peer. This can be done by manually entering the pre-shared key into both sides (router or hosts).

Local ID Type and **Remote ID Type:** When the mode of phase 1 is aggressive, Local and Remote peers can be identified by other IDs.

ID content: Enter ID content the name you want to identify when the Local and Remote Type are Domain Name; Enter ID content IP address you want to identify when the Local and Remote Type are IP addresses (IPv4 and IPv6 supported).

Phase 1

Mode: Select IKE mode from the drop-down menu: ***Main*** or ***Aggressive***. This IKE provides secured key generation and key management.

Encryption Algorithm: Select the encryption algorithm from the drop-down menu. There are several options: 3DES and AES (128, 192 and 256). 3DES and AES are more powerful but increase latency.

- **DES:** Stands for Triple Data Encryption Standard, it uses 56 bits as an encryption method.
- **3DES:** Stands for Triple Data Encryption Standard, it uses 168 (56*3) bits as an encryption method.
- **AES:** Stands for Advanced Encryption Standards, you can use 128, 192 or 256 bits as encryption method.

Integrity Algorithm: Authentication establishes the integrity of the datagram and ensures it is not tampered with in transmit. There are 2 options: Message Digest 5 (MD5) and Secure Hash Algorithm (SHA1). SHA1 is more resistant to brute-force attacks than MD5. However, it is slower.

- **MD5:** A one-way hashing algorithm that produces a 128−bit hash.
- **SHA1:** A one-way hashing algorithm that produces a 160−bit hash.

DH Group: It is a public-key cryptography protocol that allows two parties to establish a shared secret over an unsecured communication channel (i.e. over the Internet). MODP stands for Modular Exponentiation Groups.

SA Lifetime: Specify the number of minutes that a Security Association (SA) will stay active before new encryption and authentication key will be exchanged. Enter a value to issue an initial connection request for a new VPN tunnel. Default is 480 minutes (28800 seconds). A short SA time increases security by forcing the two parties to update the keys. However, every time when the VPN tunnel re-negotiates, access through the tunnel will be temporarily disconnected.

Phase 2

Encryption Algorithm: Select the encryption algorithm from the drop-down menu. There are several options: 3DES and AES (128, 192 and 256). 3DES and AES are more powerful but increase latency.

Integrity Algorithm: Authentication establishes the integrity of the datagram and ensures it is not tampered with in transmit. There are 2 options: Message Digest 5 (MD5) and Secure Hash Algorithm (SHA1). SHA1 is more resistant to brute-force attacks than MD5. However, it is slower.

DH Group: It is a public-key cryptography protocol that allows two parties to establish a shared secret over an unsecured communication channel (i.e. over the Internet). MODP stands for Modular Exponentiation Groups.

IPSec Lifetime: Specify the number of minutes that IPSec will stay active before new encryption and authentication key will be exchanged. Enter a value to negotiate and establish secure authentication. Default is 60 minutes (3600 seconds). A short time increases security by forcing the two parties to update the keys. However, every time when the VPN tunnel re- negotiates, access through the tunnel will be temporarily disconnected.

Ping for Keep Alive: Select the operation methods:

- **None:** The default setting is “None”. To this mode, it will not detect the remote IPSec peer has been lost or not. It only follows the policy of Disconnection time after no traffic, which the remote IPSec will be disconnected after the time you set in this function.

- **DPD:** Dead peer detection (DPD) is a keeping alive mechanism that enables the router to be detected lively when the connection between the router and a remote IPSec peer has lost. Please be noted, it must be enabled on the both sites.

Detection Interval: The period cycle for dead peer detection. The interval can be 180~86400 seconds.

Idle Timeout: Auto-disconnect the IPSec connection after trying several consecutive times.

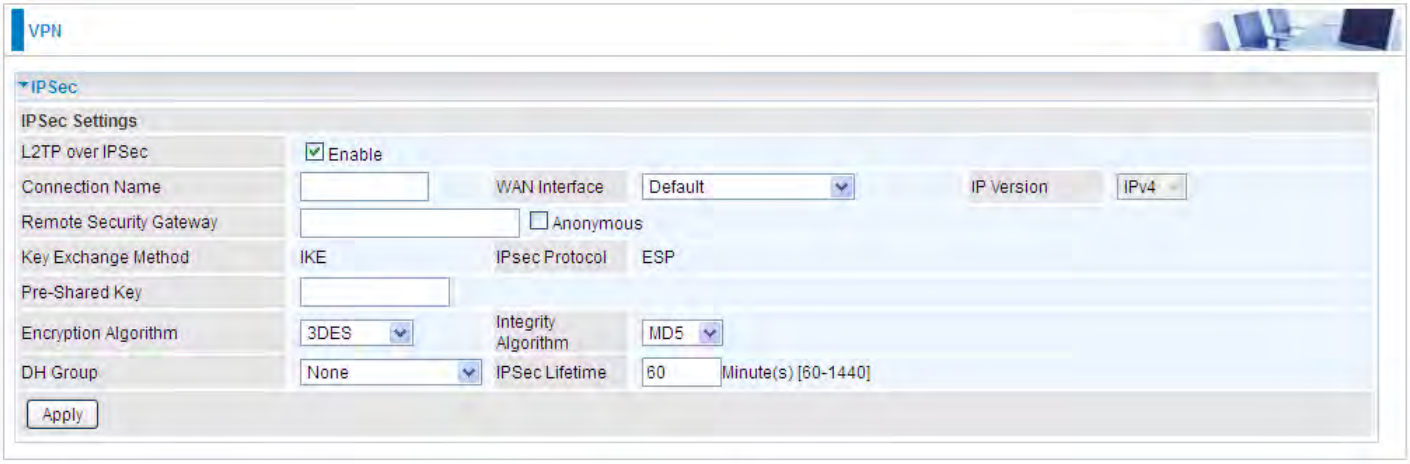
- **Ping:** This mode will detect whether the remote IPSec peer has lost or not by pinging specify IP address.

Ping IP: Type the IP for ping operation. It is able to IP Ping the remote PC with the specified IP address and alert when the connection fails. Once alter message is received, Router will drop this tunnel connection. Reestablish of this connection is required. Default setting is 0.0.0.0 which disables the function.

Interval: This sets the time interval between Pings to the IP function to monitor the connection status. Default interval setting is 10 seconds. Time interval can be set from 0 to 3600 second, 0 second disables the function.

MTU: Maximum Transmission Unit, maximum value is 1500.

IPSec for L2TP



Connection Name: A given name for the connection, but it should contain no spaces (e.g. “connection-to-office”).

WAN Interface: Select the set interface for the IPSec tunnel.

Remote Security Gateway: Input the IP of remote security gateway.

Key Exchange Method: Displays key exchange method.

Pre-Shared Key: This is for the Internet Key Exchange (IKE) protocol, a string from 1 to 32 characters. Both sides should use the same key. IKE is used to establish a shared security policy and authenticated keys for services (such as IPSec) that require a key. Before any IPSec traffic can be passed, each router must be able to verify the identity of its peer. This can be done by manually entering the pre-shared key into both sides (router or hosts).

Encryption Algorithm: Select the encryption algorithm from the drop-down menu. There are several options: 3DES and AES (128, 192 and 256). 3DES and AES are more powerful but increase latency.

- **3DES:** Stands for Triple Data Encryption Standard, it uses 168 (56*3) bits as an encryption method.
- **AES:** Stands for Advanced Encryption Standards, you can use 128, 192 or 256 bits as encryption method.

Integrity Algorithm: Authentication establishes the integrity of the datagram and ensures it is not tampered with in transmit. There are 2 options: Message Digest 5 (MD5) and Secure Hash Algorithm (SHA1). SHA1 is more resistant to brute-force attacks than MD5. However, it is slower.

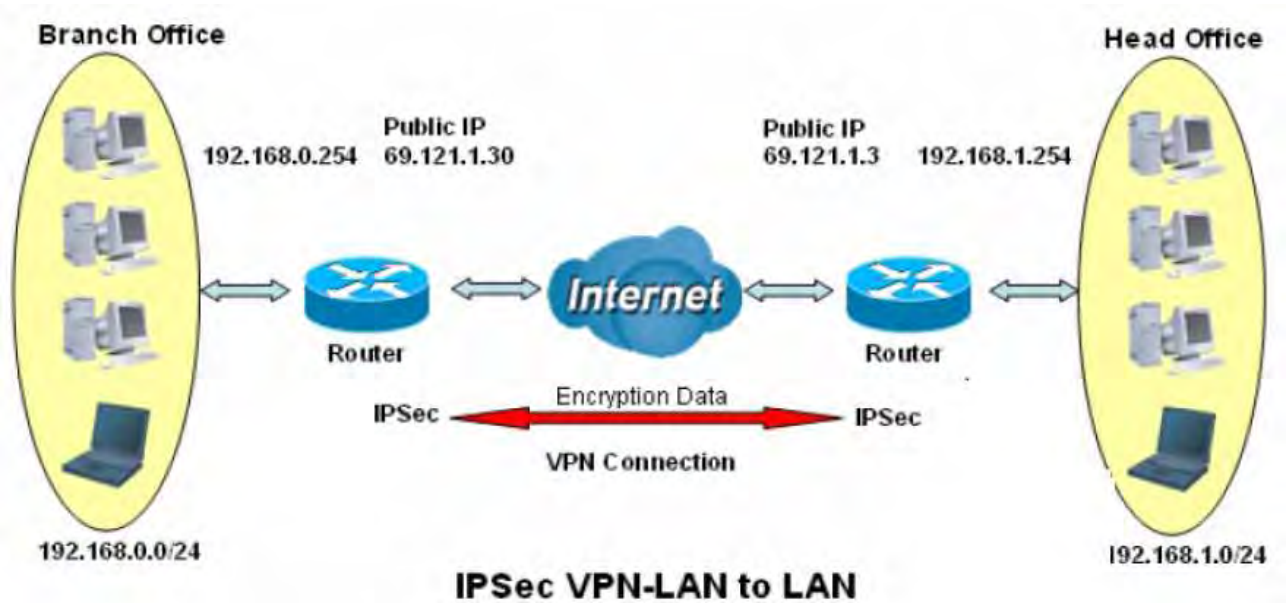
- **MD5:** A one-way hashing algorithm that produces a 128−bit hash.
- **SHA1:** A one-way hashing algorithm that produces a 160−bit hash.

DH Group: It is a public-key cryptography protocol that allows two parties to establish a shared secret over an unsecured communication channel (i.e. over the Internet). MODP stands for Modular Exponentiation Groups.

IPSec Lifetime: Specify the number of minutes that IPSec will stay active before new encryption and authentication key will be exchanged. Enter a value to negotiate and establish secure authentication. Default is 60 minutes (3600 seconds). A short time increases security by forcing the two parties to update the keys. However, every time when the VPN tunnel re- negotiates, access through the tunnel will be temporarily disconnected.

Examples:

1. **LAN-to-LAN connection**
Two BiPAC 8900X *R3*s want to setup a secure IPSec VPN tunnel
Note: The IPSec Settings shall be consistent between the two routers.



IPSec VPN-LAN to LAN

Head Office Side:
Setup details:

Item	Function		Description
1	Connection Name	H-to-B	Give a name for IPSec connection
2	Local Network		
	Subnet		Select Subnet
	IP Address	192.168.1.0	Head Office network
	Netmask	255.255.255.0	
3	Secure Gateway Address(Hostanme)	69.121.1.30	IP address of the Branch office router (on WAN side)
4	Remote Network		
	Subnet		Select Subnet
	IP Address	192.168.0.0	Branch office network
	Netmask	255.255.255.0	
5	Proposal		
	Method	ESP	Security Plan
	Authentication	MD5	
	Encryption	3DES	
	Prefer Forward Security	MODP 1024(group2)	
	Pre-shared Key	123456	

VPN

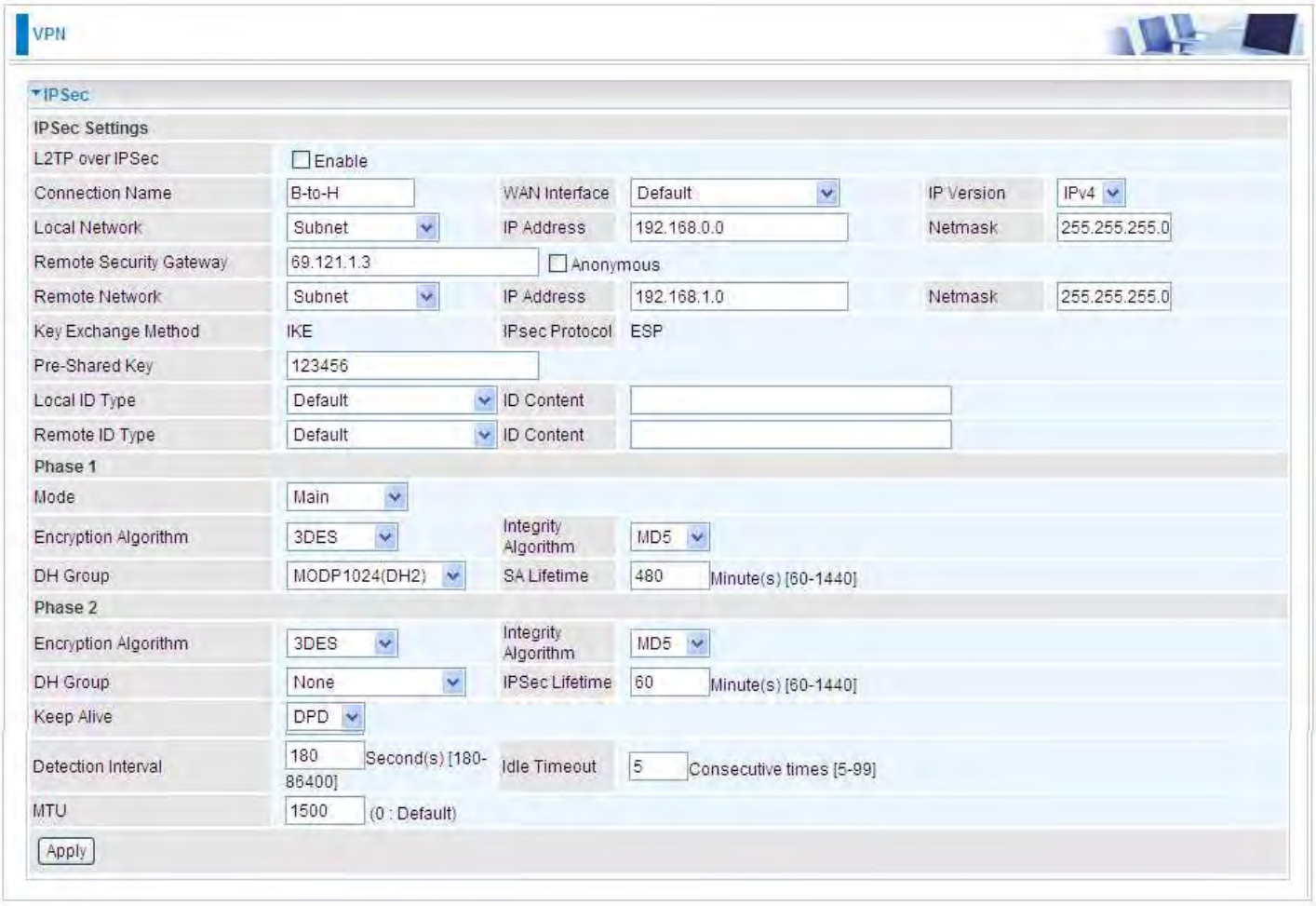
IPSec

IPSec Settings					
L2TP over IPSec	☐ Enable				
Connection Name	H-to-B	WAN Interface	Default	IP Version	IPv4
Local Network	Subnet	IP Address	192.168.1.0	Netmask	255.255.255.0
Remote Security Gateway	69.121.1.30	☐ Anonymous			
Remote Network	Subnet	IP Address	192.168.0.0	Netmask	255.255.255.0
Key Exchange Method	IKE	IPsec Protocol	ESP		
Pre-Shared Key	123456				
Local ID Type	Default	ID Content			
Remote ID Type	Default	ID Content			
Phase 1					
Mode	Main				
Encryption Algorithm	3DES	Integrity Algorithm	MD5		
DH Group	MODP1024(DH2)	SA Lifetime	480	Minute(s) [60-1440]	
Phase 2					
Encryption Algorithm	3DES	Integrity Algorithm	MD5		
DH Group	None	IPSec Lifetime	60	Minute(s) [60-1440]	
Keep Alive	DPD				
Detection Interval	180	Second(s) [180-86400]	Idle Timeout	5	Consecutive times [5-99]
MTU	1500	(0 : Default)			

Apply

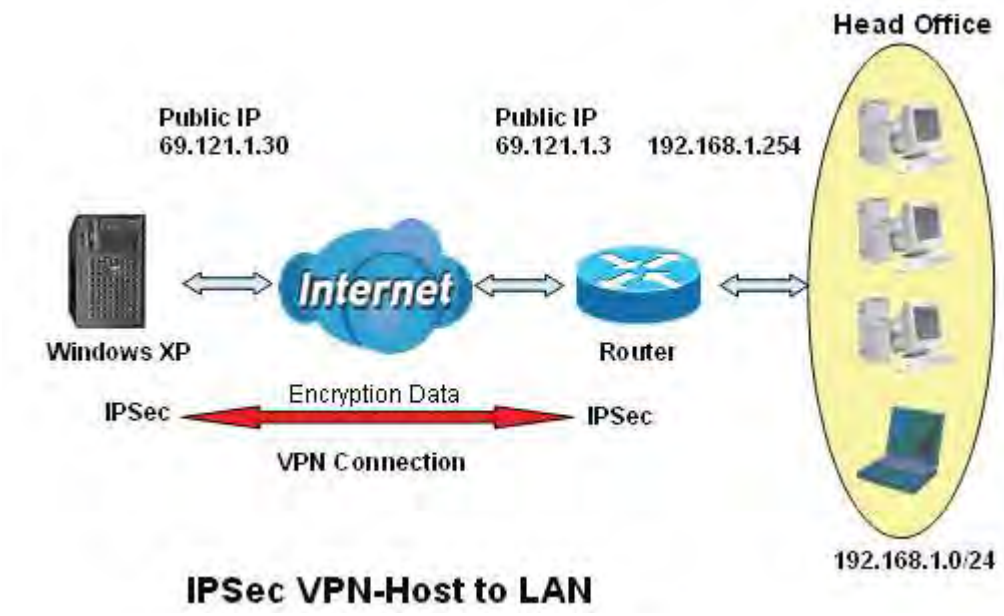
Branch Office Side:
Setup details: the same operation as done in Head Office side

Item	Function		Description
1	Connection Name	B-to-H	Give a name for IPSec connection
2	Local Network		
	Subnet		Select Subnet
	IP Address	192.168.0.0	Branch Office network
	Netmask	255.255.255.0	
3	Remote Secure Gateway Address(Hostanme)	69.121.1.3	IP address of the Head office router (on WAN side)
4	Remote Network		
	Subnet		Select Subnet
	IP Address	192.168.1.0	Head office network
	Netmask	255.255.255.0	
5	Proposal		
	Method	ESP	Security Plan
	Authentication	MD5	
	Encryption	3DES	
	Prefer Forward Security	MODP 1024(group2)	
	Pre-shared Key	123456	



2. Host to LAN

Router servers as VPN server, and host should install the IPSec client to connect to head office through IPSec VPN.



IPSec VPN-Host to LAN

Item	Function		Description
1	Connection Name	Headoffice-to-Host	Give a name for IPSec connection
2	Local Network		
	Subnet		Select Subnet
	IP Address	192.168.1.0	Head Office network
	Netmask	255.255.255.0	
3	Remote Secure Gateway (Hostanme)	69.121.1.30	IP address of the Branch office router (on WAN side)
4	Remote Network		
	Single Address	69.121.1.30	Host
5	Proposal		
	Method	ESP	Security Plan
	Authentication	MD5	
	Encryption	3DES	
	Prefer Forward Security	MODP 1024(group2)	
	Pre-shared Key	123456	

VPN

IPSec

IPSec Settings					
L2TP over IPSec	☐ Enable				
Connection Name	Headoffice-to-H	WAN Interface	Default	IP Version	IPv4
Local Network	Subnet	IP Address	192.168.1.0	Netmask	255.255.255.0
Remote Security Gateway	69.121.1.30	☐ Anonymous			
Remote Network	Single Address	IP Address	69.121.1.30	Netmask	255.255.255.0
Key Exchange Method	IKE	IPsec Protocol	ESP		
Pre-Shared Key	123456				
Local ID Type	Default	ID Content			
Remote ID Type	Default	ID Content			
Phase 1					
Mode	Main				
Encryption Algorithm	3DES	Integrity Algorithm	MD5		
DH Group	MODP1024(DH2)	SA Lifetime	480 Minute(s) [60-1440]		
Phase 2					
Encryption Algorithm	3DES	Integrity Algorithm	MD5		
DH Group	None	IPSec Lifetime	60 Minute(s) [60-1440]		
Keep Alive	DPD				
Detection Interval	180 Second(s) [180-86400]	Idle Timeout	5 Consecutive times [5-99]		
MTU	1500 (0 : Default)				

Apply

VPN Account

PPTP and L2TP server share the same account database set in VPN Account page.

Name: A user-defined name for the connection.

Tunnel: Select **Enable** to activate the account. PPTP(L2TP) server is waiting for the client to connect to this account.

Username: Please input the username for this account.

Password: Please input the password for this account.

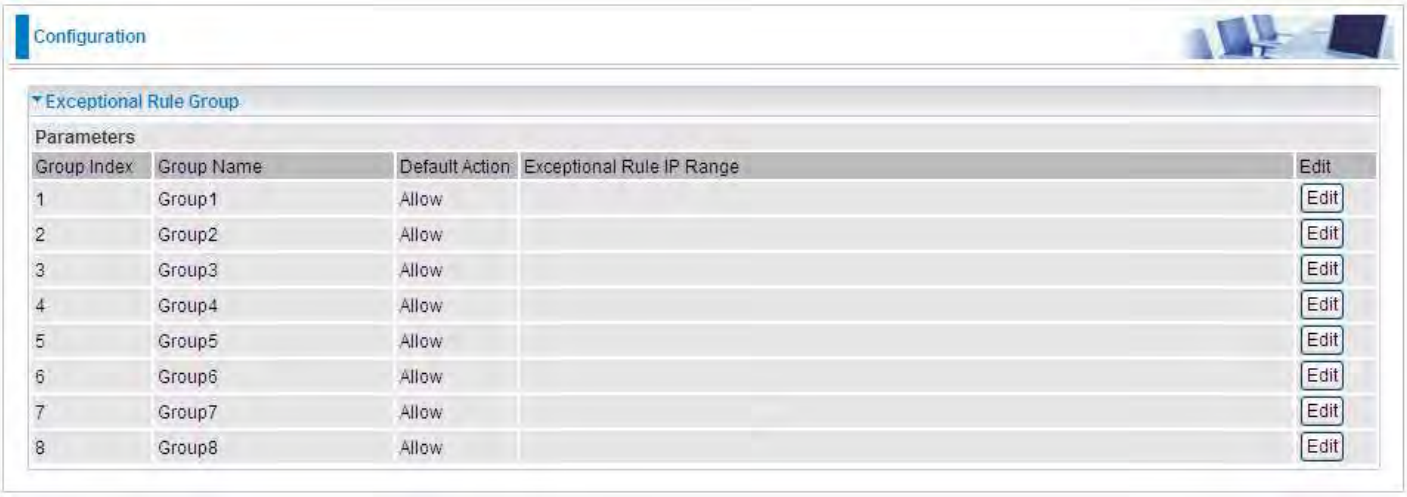
Connection Type: Select Remote Access for single user, Select LAN to LAN for remote gateway.

Peer Network IP: Please input the subnet IP for remote network.

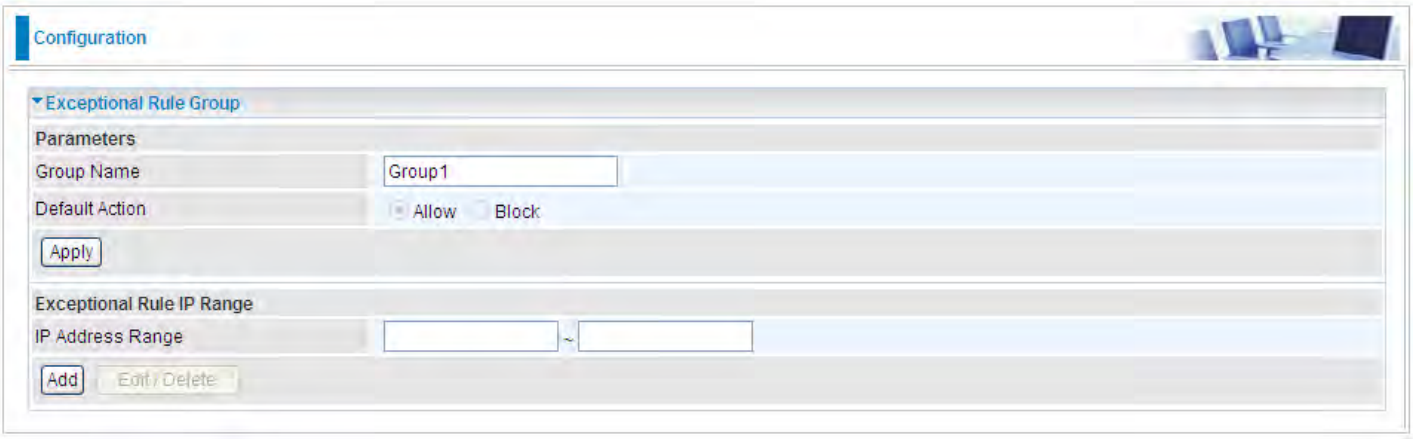
Peer Netmask: Please input the Netmask for remote network.

Exceptional Rule Group

Exceptional Rule is dedicated to giving or blocking PPTP/L2TP server access to some specific IP or IPs(range). Users are allowed to set 8 different exceptional rule groups at most. In each group, user can add specific IP or IP range.



Press **Edit** to set the exceptional IP (IP Range).



Default Action: Please first set the range to make **"Default Action"** setting available**.** Set "Allow" to ban the listed IP or IPs to access the PPTP and L2TP server.

Check "Block" to grant access to the listed IP or IPs to the PPTP and L2TP server.

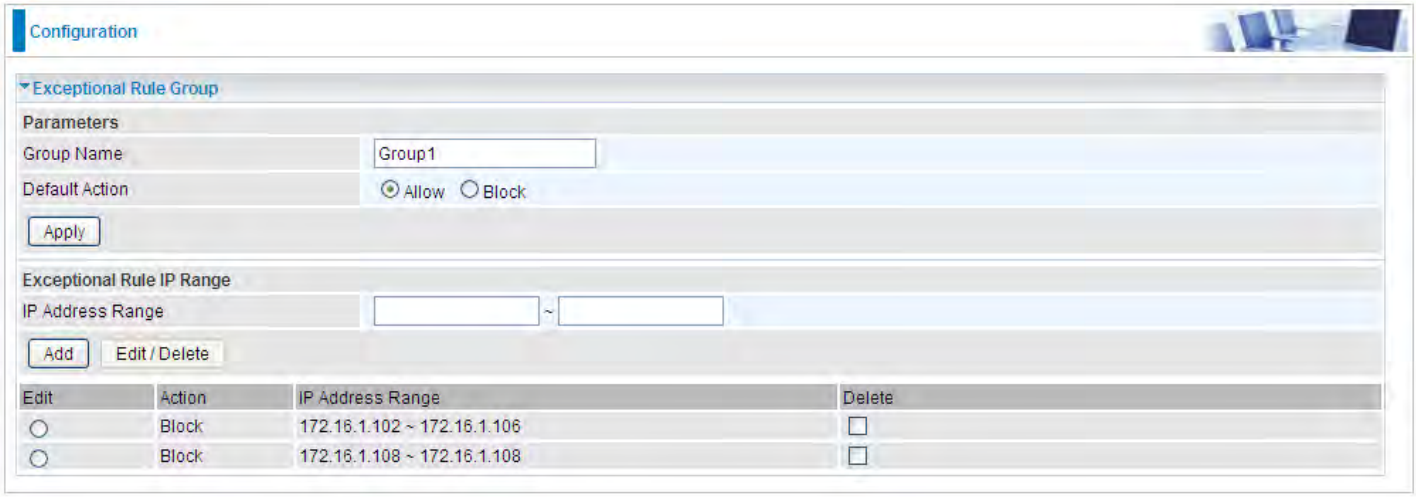
Apply: Press **Apply** button to apply the change.

Exceptional Rule Range

IP Address Range: Specify the IP address range; IPv4 address range can be supported.

Click **Add** to add the IP Range.

For instance, if user wants to block IP range of 172.16.1.102-172.16.1.106 from accessing your PPTP and L2TP server, you can add this IP range and valid it.



PPTP

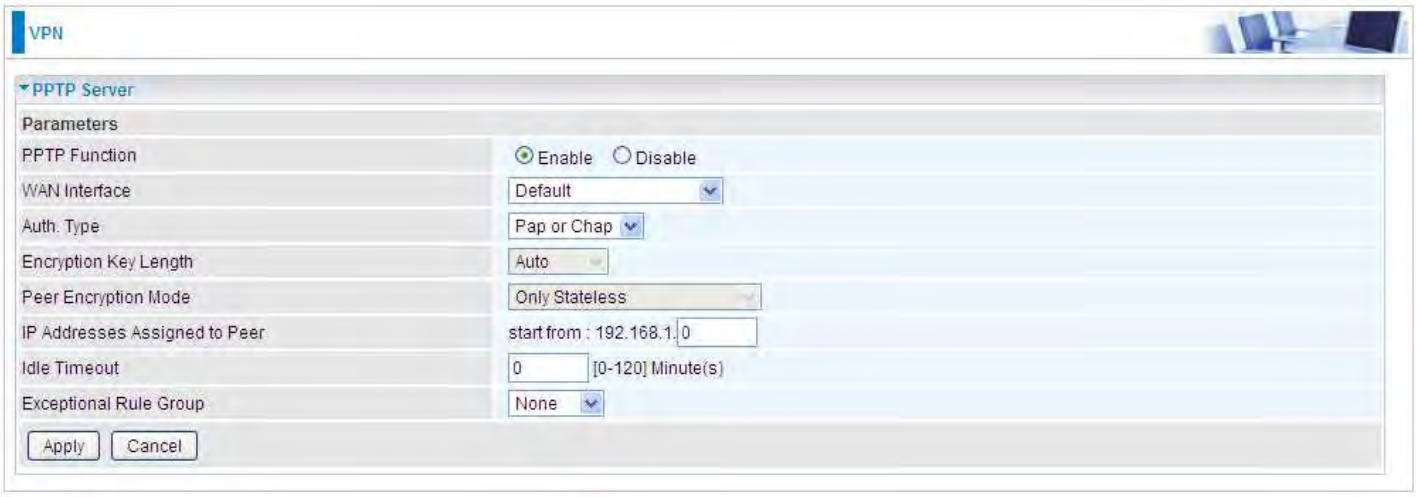
The **Point-to-Point Tunneling Protocol** (PPTP) is a Layer2 tunneling protocol for implementing virtual private networks through IP network. PPTP uses an enhanced GRE (Generic Routing Encapsulation) mechanism to provide a flow- and congestion-controlled encapsulated datagram service for carrying PPP packets.

In the Microsoft implementation, the tunneled PPP traffic can be authenticated with PAP, CHAP, Microsoft CHAP V1/V2 or EAP-TLS. The PPP payload is encrypted using Microsoft Point-to-Point Encryption (MPPE) when using MSCHAPv1/v2 or EAP-TLS.

Note: 4 sessions for Client and 4 sessions for Server respectively.

PPTP Server

In PPTP session, users can set the basaic parameters(authentication, encyption, peer address, etc) for PPTP Server, and accounts in the next page of PPTP Account. They both constitutes the PPTP Server setting.



PPTP Funtion: Select **Enable** to activate PPTP Server. **Disable** to deactivate PPTP Server function.

WAN Interface: Select the exact WAN interface configured for the tunnel. Select Default to use the now-working WAN interface for the tunnel.

Auth. Type: The authentication type, Pap or Chap, PaP, Chap and MS-CHAPv2. When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client. When passed the authentication with MS-CHAPv2, the MPPE encryption is supported.

Encryption Key Length: The data can be encrypted by MPPE algorithm with 40 bits or 128 bits. Default is Auto, it is negotiated when establishing a connection. 128 bit keys provide stronger encryption than 40 bit keys.

Peer Encryption Mode: You may select “Only Stateless” or “Allow Stateless and Stateful” mode. The key will be changed every packet when you select Stateless mode.

IP Addresses Assigned to Peer: 192.168.1.x: please input the IP assigned range from 1~ 254.

Idle Timeout: Specify the time for remote peer to be disconnected without any activities, from 0~120 minutes.

Exceptional Rule Group: Select to grant or block access to a group of IPs to the PPTP server. See Exceptional Rule Group. If there is not any restriction, select none.

Click **Apply** to submit your PPTP Server basic settings.

PPTP Client

PPTP client can help you dial-in the PPTP server to establish PPTP tunnel over Internet.

Name: user-defined name for identification.

WAN Interface: Select the exact WAN interface configured for the tunnel. Select Default to use the now-working WAN interface for the tunnel.

Username: Enter the username provided by your VPN Server.

Password: Enter the password provided by your VPN Server.

Auth. Type: Default is Auto if you want the router to determine the authentication type to use, or else manually specify CHAP (Challenge Handshake Authentication Protocol) or PAP (Password Authentication Protocol) if you know which type the server is using (when acting as a client), or else the authentication type you want clients connecting to you to use (when acting as a server). When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client.

PPTP Server Address: Enter the IP address of the PPTP server.

Connection Type: Select Remote Access for single user, Select LAN to LAN for remote gateway.

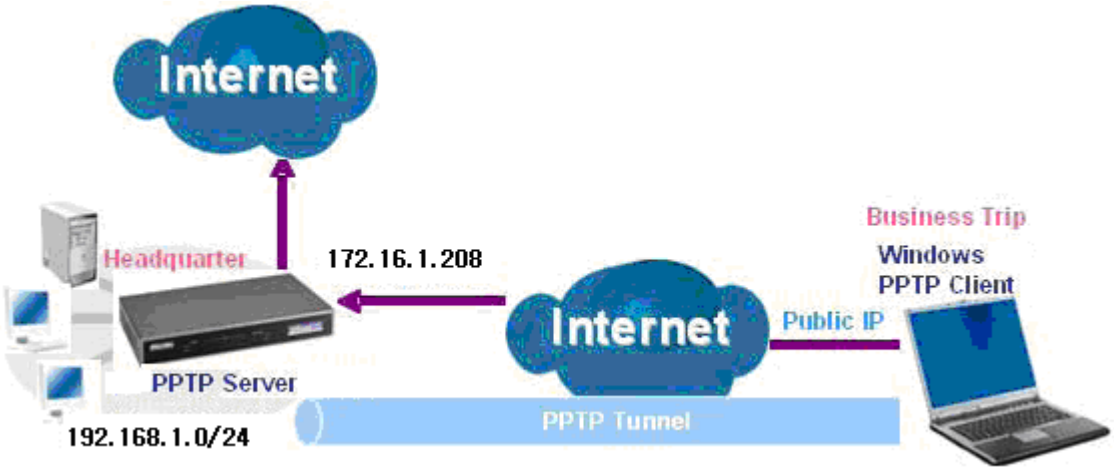
Time to Connect: Select Always to keep the connection always on, or Manual to connect manually any time.

Peer Network IP: Please input the subnet IP for Server peer.

Peer Netmask: Please input the Netmask for server peer.

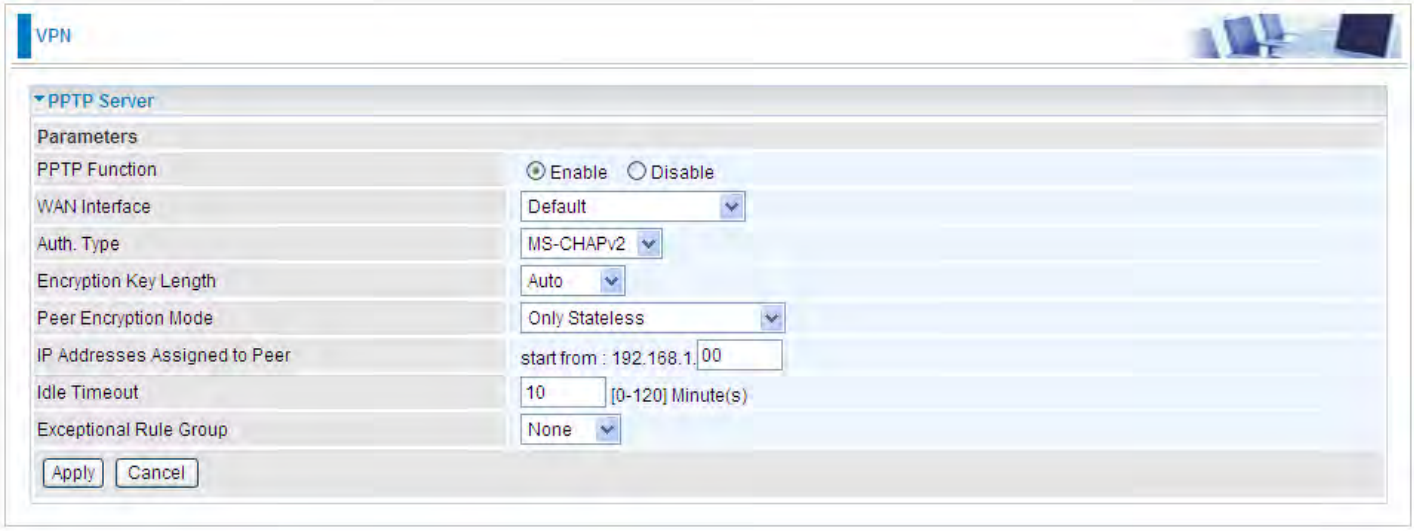
Click **Add** button to save your changes.

Example: PPTP Remote Access with Windows series
(Note: 1. inside test with 172.16.1.208, just an example for illustration
2. Here is a configuration example on Windows 7; Windows series including Windows 10/ 8/ 7 vista/ also supports the application with similar steps. **)**



Server Side:

1. Configuration > **VPN** > **PPTP** and Enable the PPTP function, Click **Apply**.

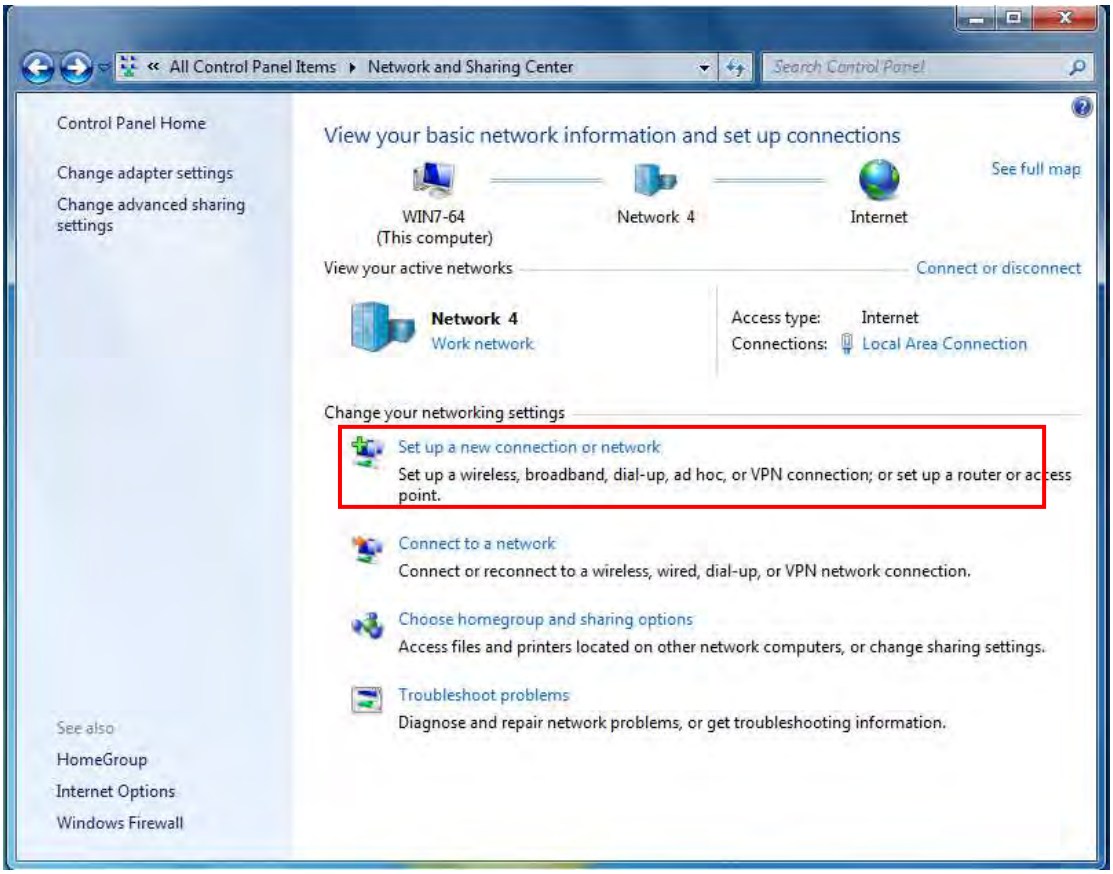


2. Create a PPTP Account “test”.

Client Side: Windows series

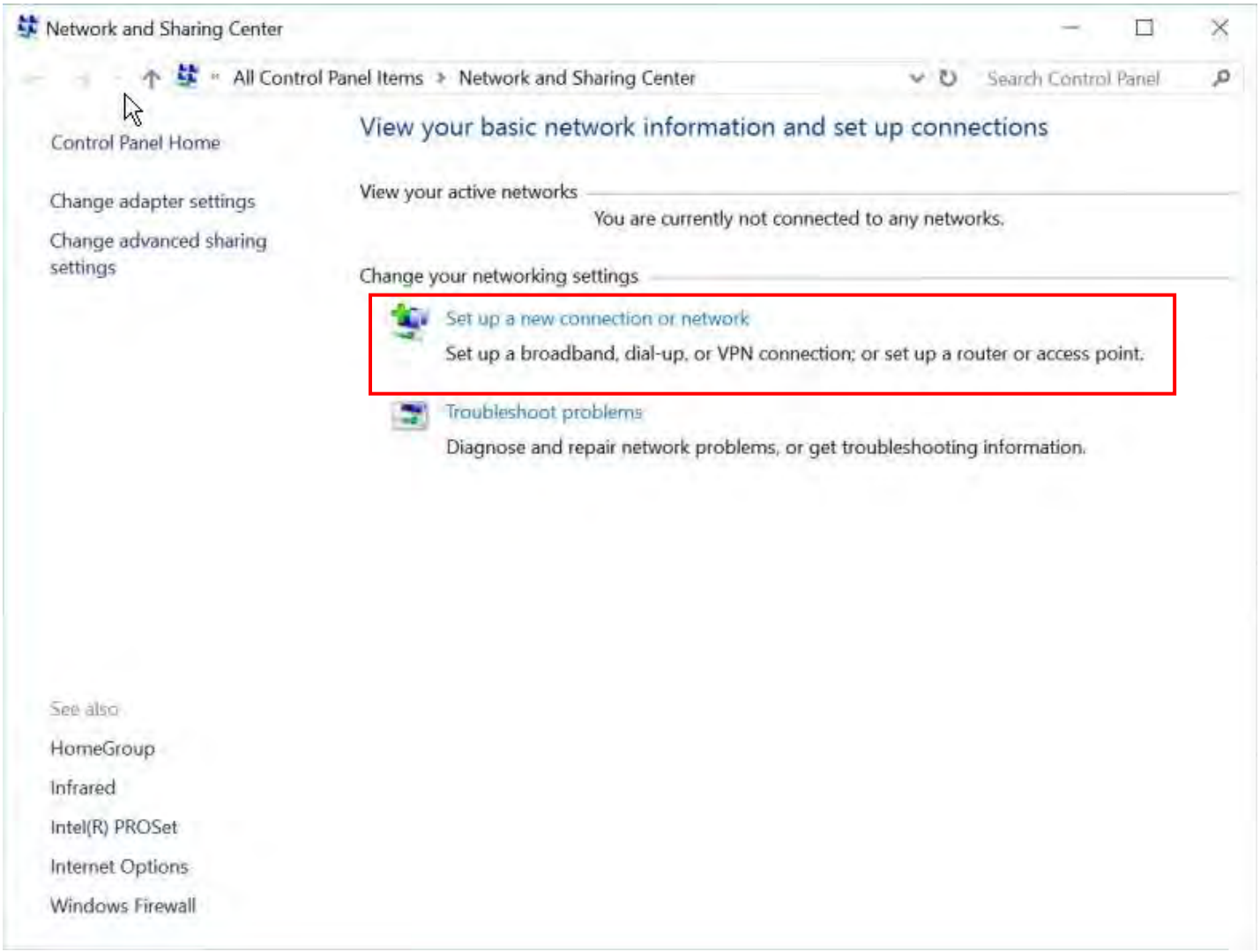
Note: Here is a configuration example on Windows 7; Windows series including Windows 10/ vista/ 8/ 7 also supports the application with similar steps.

1. In Windows7, click **Start** > **Control Panel**> **Network and Sharing Center,** Click **Set up a new connection network**.



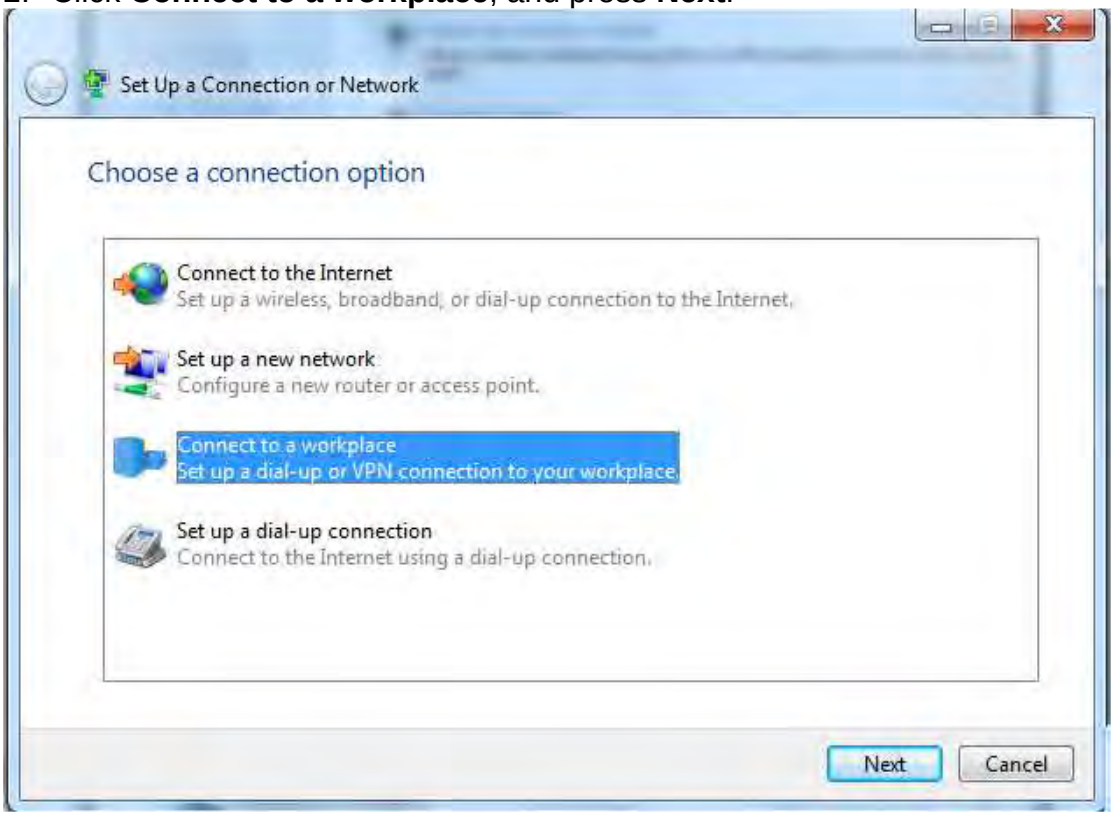
(Windows 7)

For Windows 10, Users can click **Start** > **Settings**; or right click the mouse when it points at Windows ICON (**Start**), then click **Control Panel** > **Network and Sharing Center,** then **Set up a new connection network**.



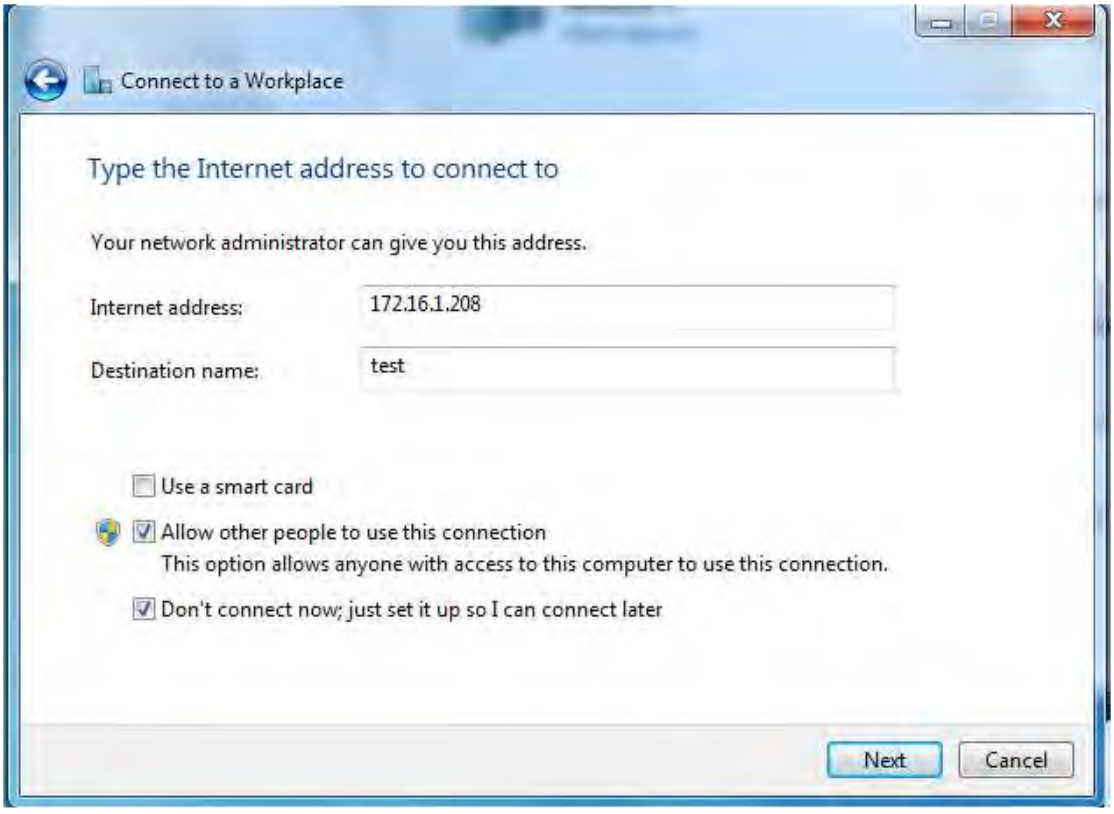
(Windows 10)

2. Click **Connect to a workplace**, and press **Next**.

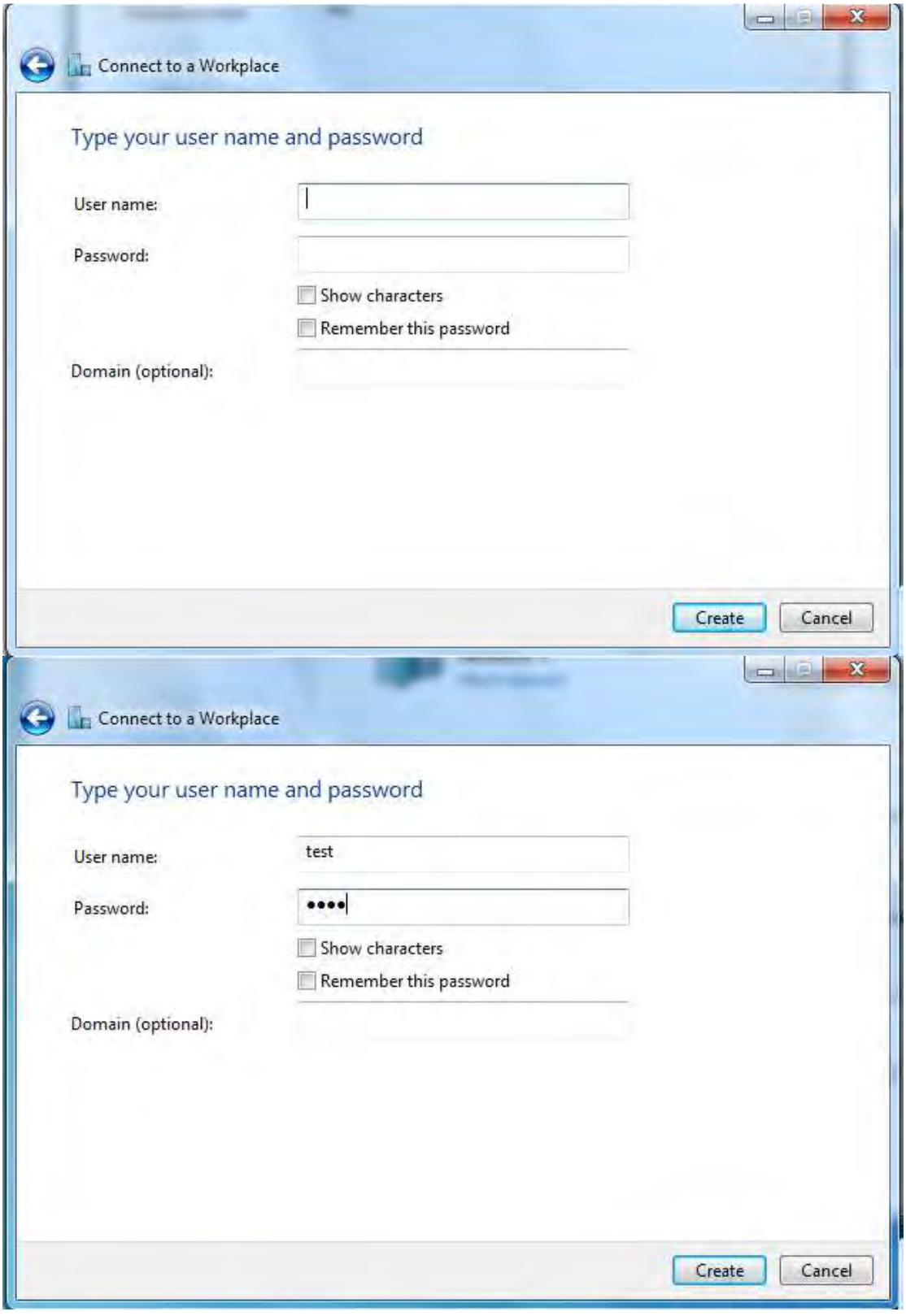


3. Select **Use my Internet connection (VPN)** and press **Next**.

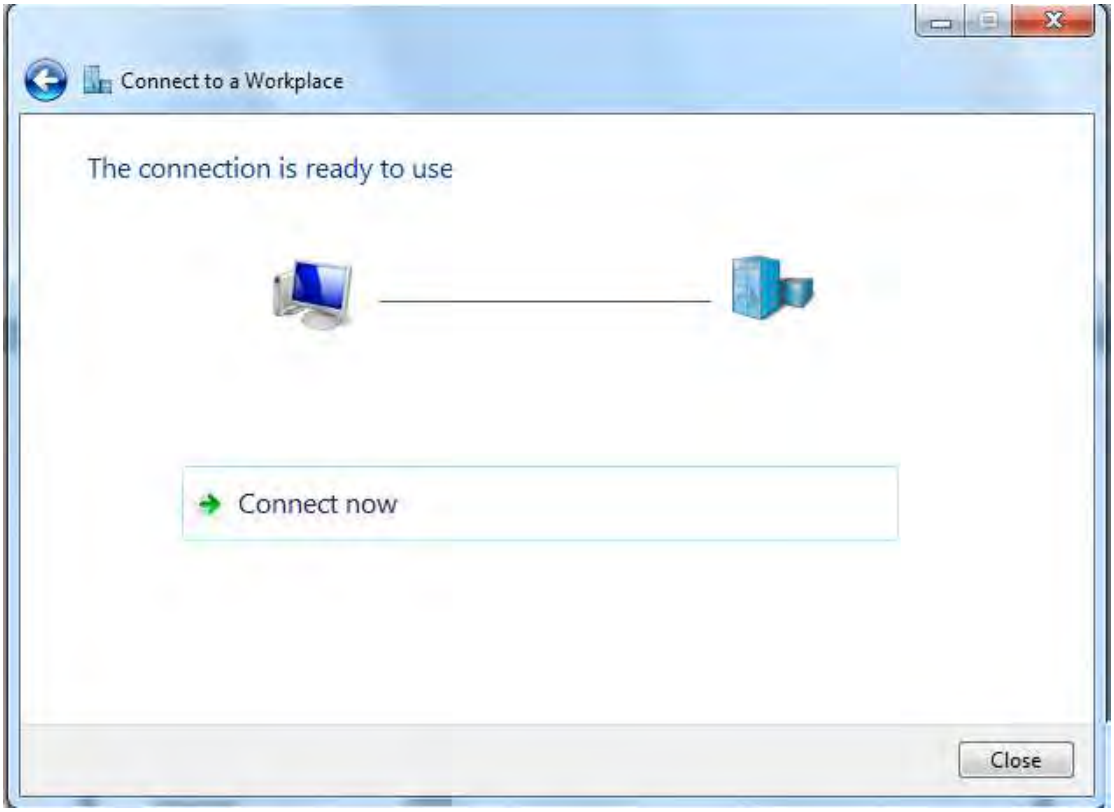
4. Input **Internet address** and **Destination name** for this connection and press **Next**.

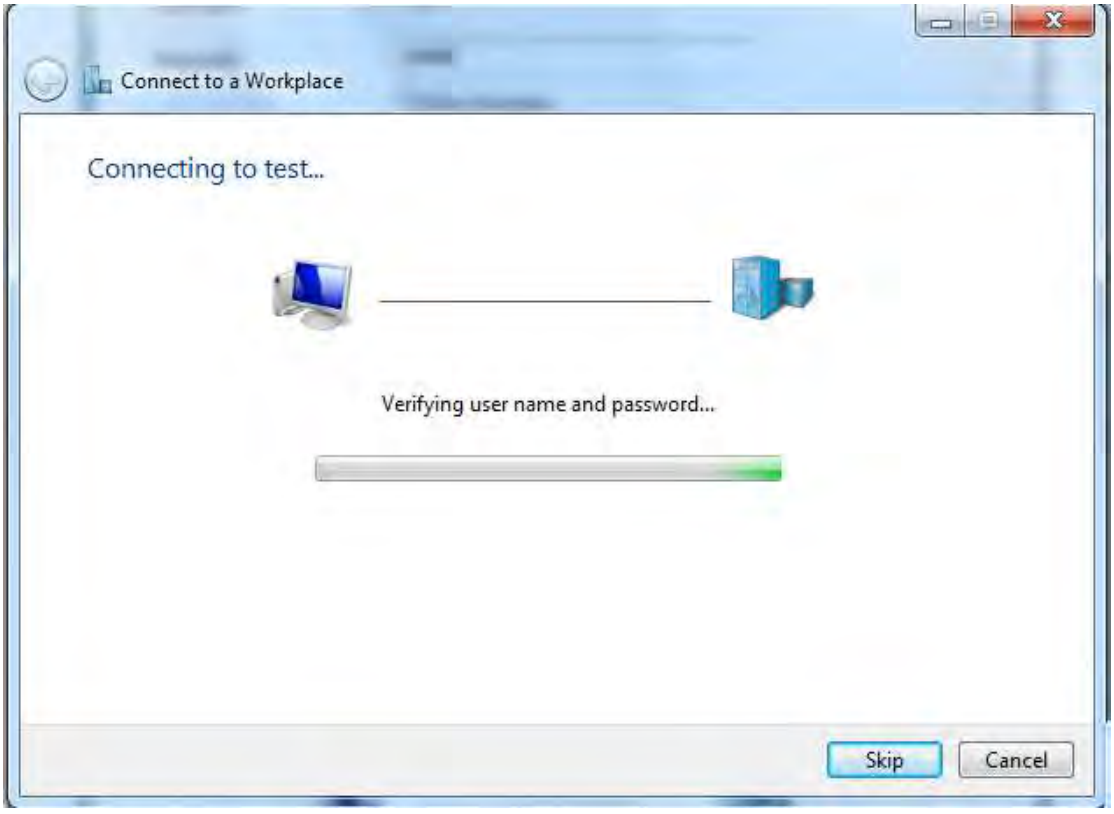


5. Input the account (**user name** and **password**) and press **Create**.

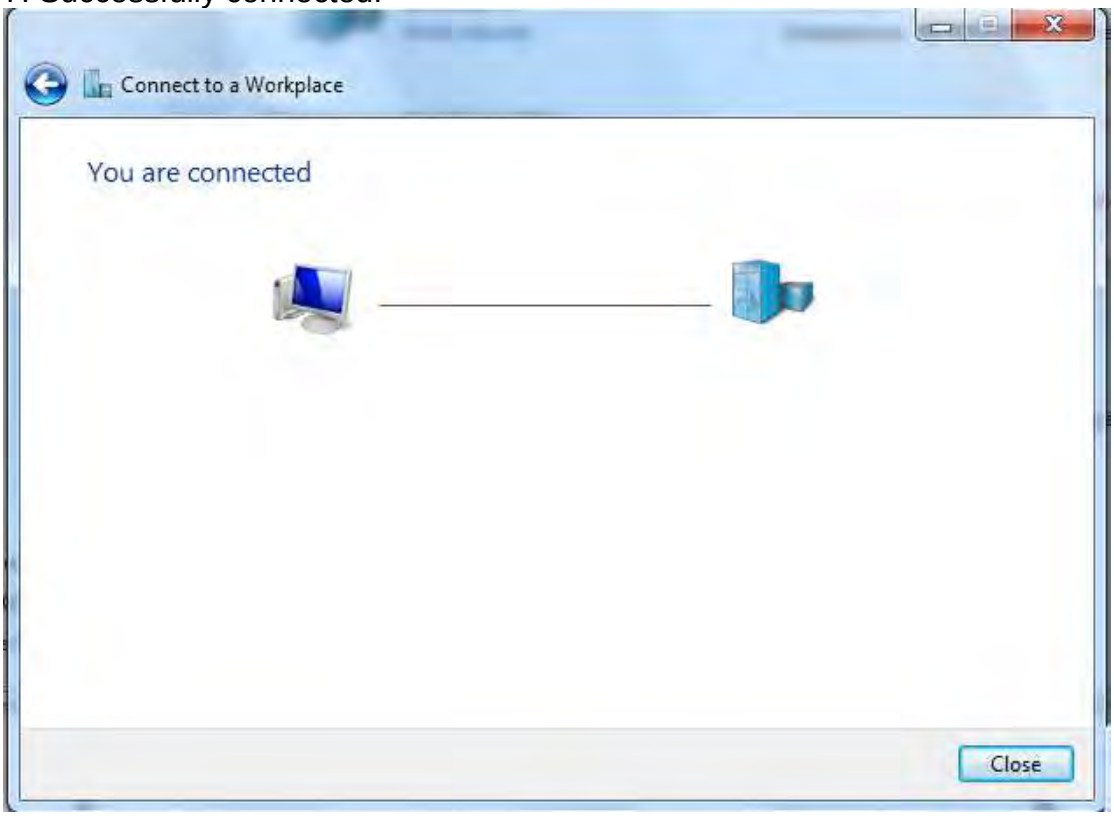


6. Connect to the server.

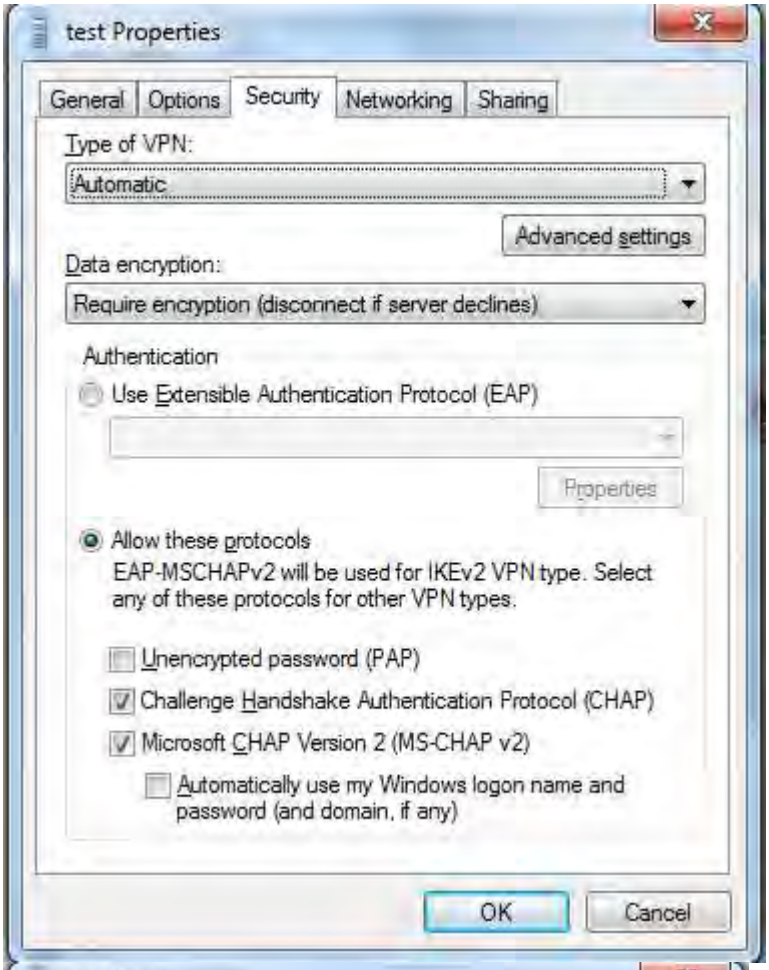


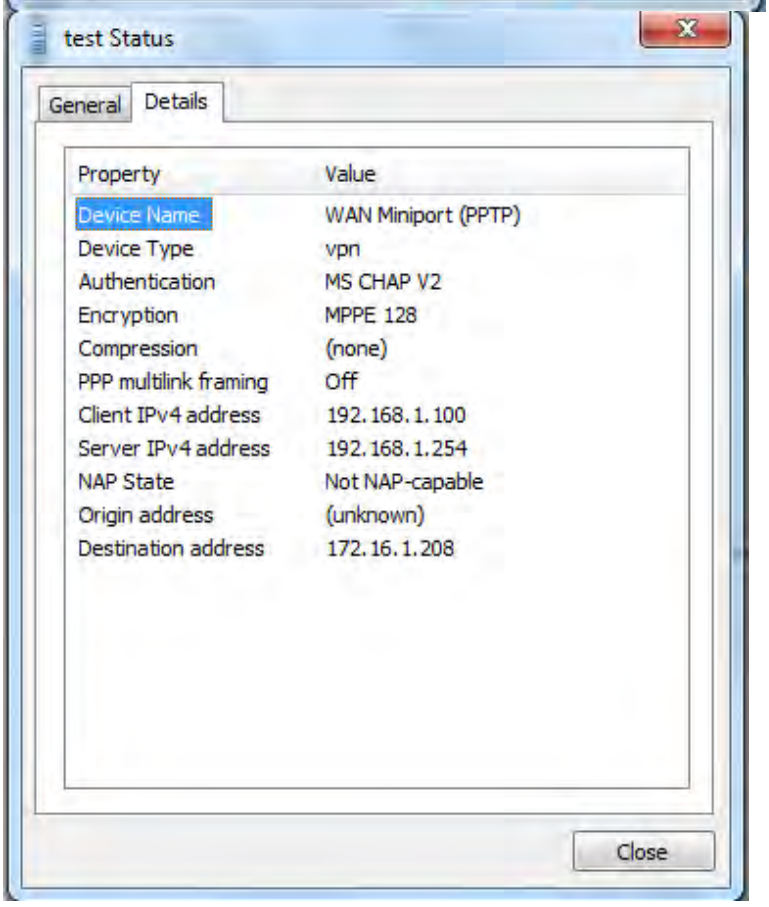


7. Successfully connected.



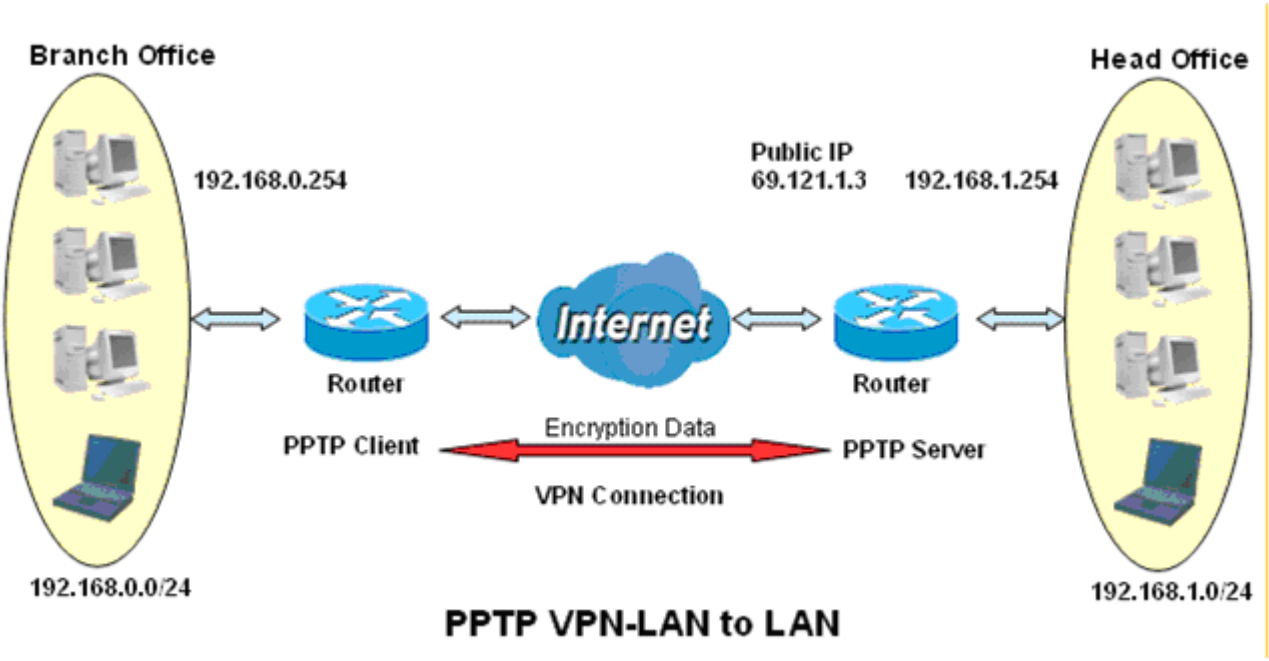
PS: You can also go to **Network Connections** shown below to check the detail of the connection. Right click “test” icon, and select “Properties” to change the security parameters (if the connection fails, users can go here to change the settings)


test Properties
General
Options
Security
Networking
Sharing
Type of VPN:
Automatic
Advanced settings
Data encryption:
Require encryption (disconnect if server declines)
Authentication
Use Extensible Authentication Protocol (EAP)
Properties
Allow these protocols
EAP-MSCHAPv2 will be used for IKEv2 VPN type. Select any of these protocols for other VPN types.
Unencrypted password (PAP)
Challenge Handshake Authentication Protocol (CHAP)
Microsoft CHAP Version 2 (MS-CHAP v2)
Automatically use my Windows logon name and password (and domain, if any)
OK
Cancel

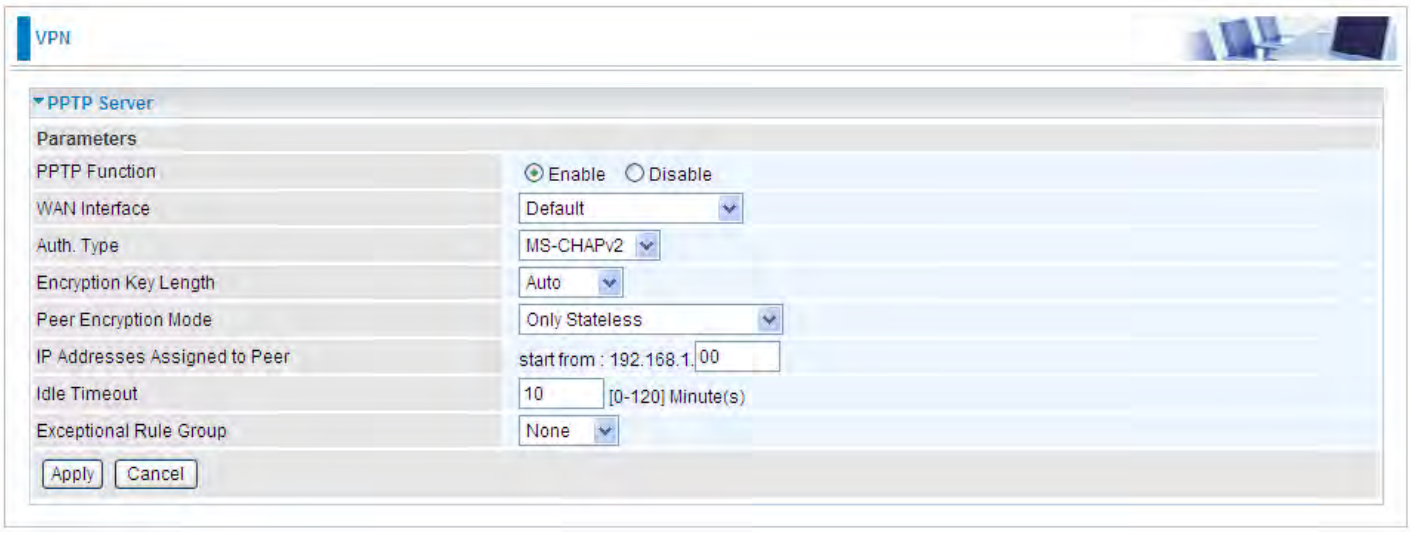

test Status
General
Details
Property
Value
Device Name
WAN Miniport (PPTP)
Device Type
vpn
Authentication
MS CHAP V2
Encryption
MPPE 128
Compression
(none)
PPP multilink framing
Off
Client IPv4 address
192.168.1.100
Server IPv4 address
192.168.1.254
NAP State
Not NAP-capable
Origin address
(unknown)
Destination address
172.16.1.208
Close

Example: Configuring a LAN-to-LAN PPTP VPN Connection

The branch office establishes a PPTP VPN tunnel with head office to connect two private networks over the Internet. The routers are installed in the head office and branch offices accordingly.



Server side: Head Office



The above is the common setting for PPTP Server, set as you like for authentication and encryption. The settings in Client side should be in accordance with settings in Server side.

Then the PPTP Account.

Client Side: Branch Office

The client user can set up a tunnel connecting to the PPTP server, and can also set the tunnel as the default route for all outgoing traffic.

Note: users can see the “Default Gateway” item in the bar, and user can check to select the tunnel as the default gateway (default route) for traffic. If selected, all outgoing traffic will be forwarded to this tunnel and routed to the next hop.

L2TP

The **Layer 2 Tunneling Protocol** (L2TP) is a Layer2 tunneling protocol for implementing virtual private networks.

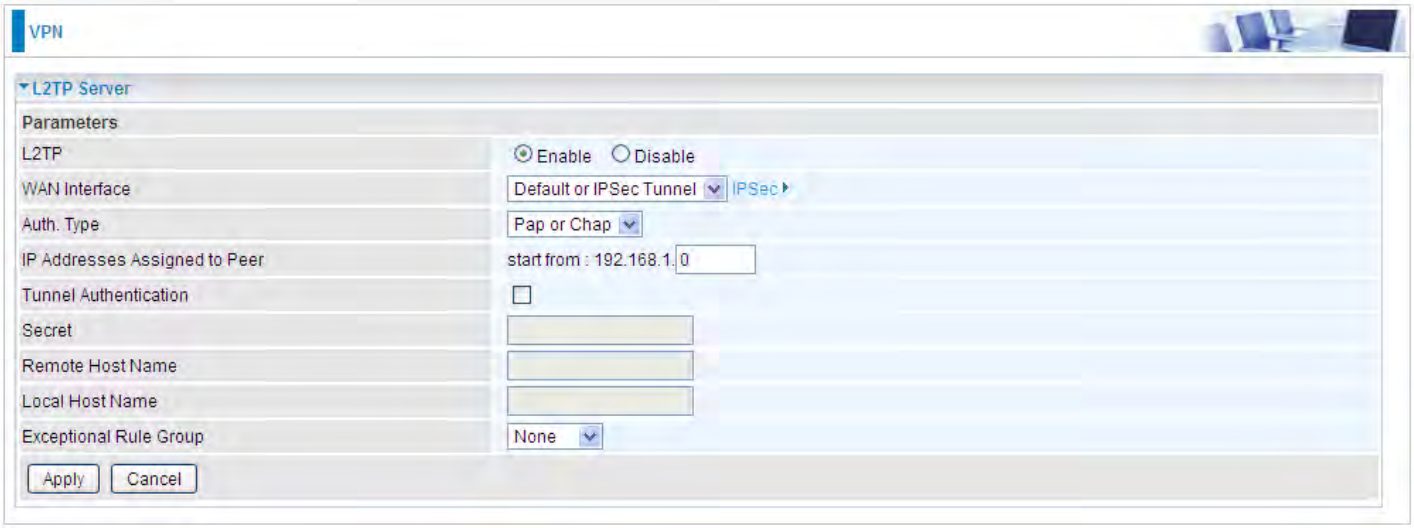
L2TP does not provide confidentiality or strong authentication by itself. IPsec is often used to secure L2TP packets by providing confidentiality, authentication and integrity. The combination of these two protocols is generally known as L2TP/IPsec.

In L2TP section, both pure L2TP and L2TP/IPSec are supported. Users can choose your preferable option for your own needs.

Note: 4 sessions for Client and only one for Server respectively.

L2TP Server

In L2TP session, users can set the bassic parameters(authentication, encyption, peer address, etc) for L2TP Server, and accounts in the page of VPN Account. They both constitutes the complete L2TP Server settings.



L2TP: Select **Enable** to activate L2TP Server. **Disable** to deactivate L2TP Server.

WAN Interface: Select the exact WAN interface configured as source for the tunnel. Select different interfaces, you will decide whether to use L2TP over IPSec or the pure L2TP.

- **L2TP over IPSec**, Select “Default or IPSec Tunnel” only when there is IPSec for L2TP rule in place.
- **Pure L2TP**, Select Default (there is no IPSec for L2TP in place) or other interface to activate the pure L2TP.

Auth. Type: The authentication type, Pap or Chap, PaP, Chap. When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client.

IP Addresses Assigned to Peer: 192.168.1.x: please input the IP assigned range from 1~ 254.

Tunnel Authentication: Select whether to enable L2TP tunnel authentication. Enable it if needed

and set the same in the client side.

Secret: Enter the secretly pre-shared password for tunnel authentication.

Remote Host Name: Enter the remote host name (of peer) featuring the destination of the L2TP tunnel.

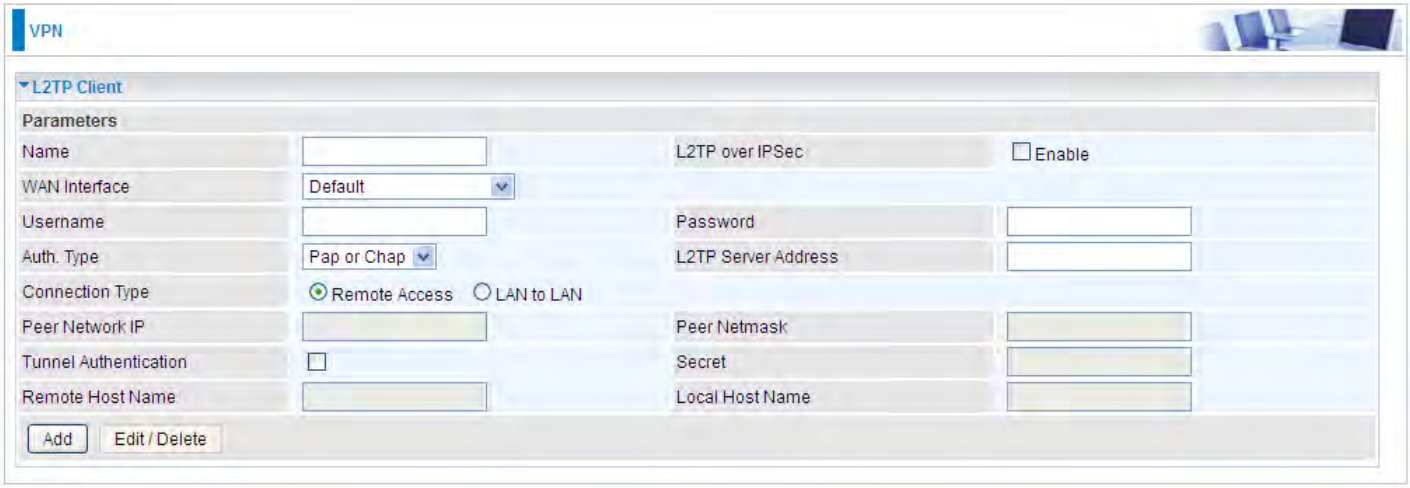
Local Host Name: Enter the local host name featuring the source of the L2TP tunnel.

Exceptional Rule Group: Select to grant or block access to a group of IPs to the L2TP server. See Exceptional Rule Group. If there is not any restriction, select none.

Click **Apply** to submit your L2TP Server basic settings.

L2TP Client

L2TP client can help you dial-in the L2TP server to establish L2TP tunnel over Internet.



Name: user-defined name for identification.

L2TP over IPSec: If your L2TP server has used L2TP over IPSec feature, please enable this item. under this circumstance, client and server communicate using L2TP over IPSec.

ⓘ **Enable**

IPSec Tunnel: Select the appropriate IPSec for L2TP rule configured for the L2TP Client.

Username: Enter the username provided by your L2TP Server.

Password: Enter the password provided by your L2TP Server.

Auth. Type: Default is Pap or CHap if you want the router to determine the authentication type to use, or else manually specify CHAP (Challenge Handshake Authentication Protocol) or PAP (Password Authentication Protocol) if you know which type the server is using. When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client.

L2TP Server Address: Enter the IP address of the L2TP server.

Connection Type: Select Remote Access for single user, Select LAN to LAN for remote gateway.

Peer Network IP: Please input the subnet IP for Server.

Peer Netmask: Please input the Netmask for Server.

Tunnel Authentication: Select whether to enable L2TP tunnel authentication, if the server side enables this feature, please follow.

Secret: Enter the set secret password in the server side.

Remote Host Name: Enter the remote host name featuring the destination of the L2TP tunnel.

Local Host Name: Enter the local host name featuring the source of the L2TP tunnel.

Click **Add** button to save your changes.

ⓘ Disable

WAN Interface: Select the exact WAN interface configured for the tunnel. Select Default to use the now-working WAN interface for the tunnel. Under this circumstance, client and server communicate through pure L2TP server.

Username: Enter the username provided by your L2TP Server.

Password: Enter the password provided by your L2TP Server.

Auth. Type: Default is Pap or CHap if you want the router to determine the authentication type to use, or else manually specify CHAP (Challenge Handshake Authentication Protocol) or PAP (Password Authentication Protocol) if you know which type the server is using. When using PAP, the password is sent unencrypted, whilst CHAP encrypts the password before sending, and also allows for challenges at different periods to ensure that an intruder has not replaced the client.

L2TP Server Address: Enter the IP address of the L2TP server.

Connection Type: Select Remote Access for single user, Select LAN to LAN for remote gateway.

Peer Network IP: Please input the subnet IP for Server.

Peer Netmask: Please input the Netmask for server.

Tunnel Authentication: Select whether to enable L2TP tunnel authentication, if the server side enables this feature, please follow.

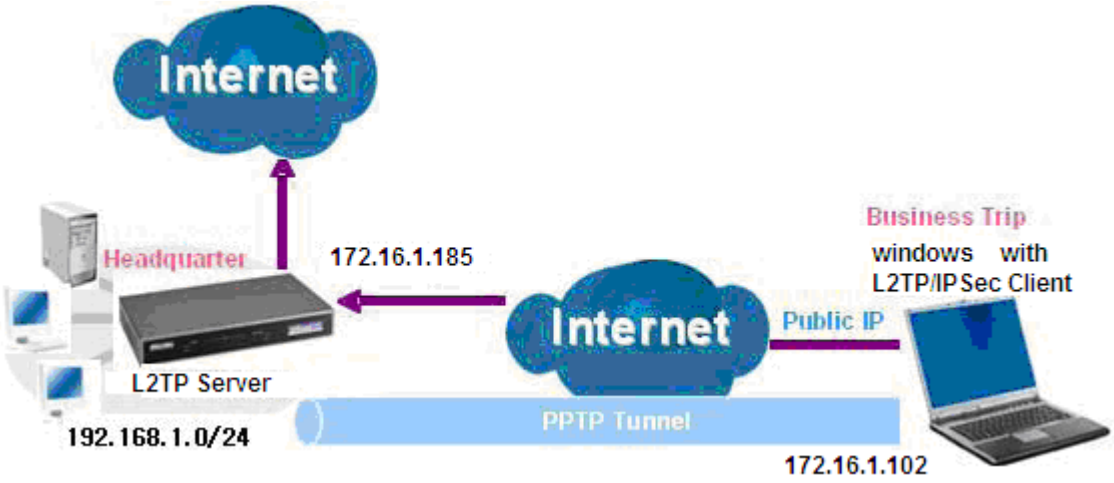
Secret: Enter the set secret password in the server side.

Remote Host Name: Enter the remote host name featuring the destination of the L2TP tunnel.

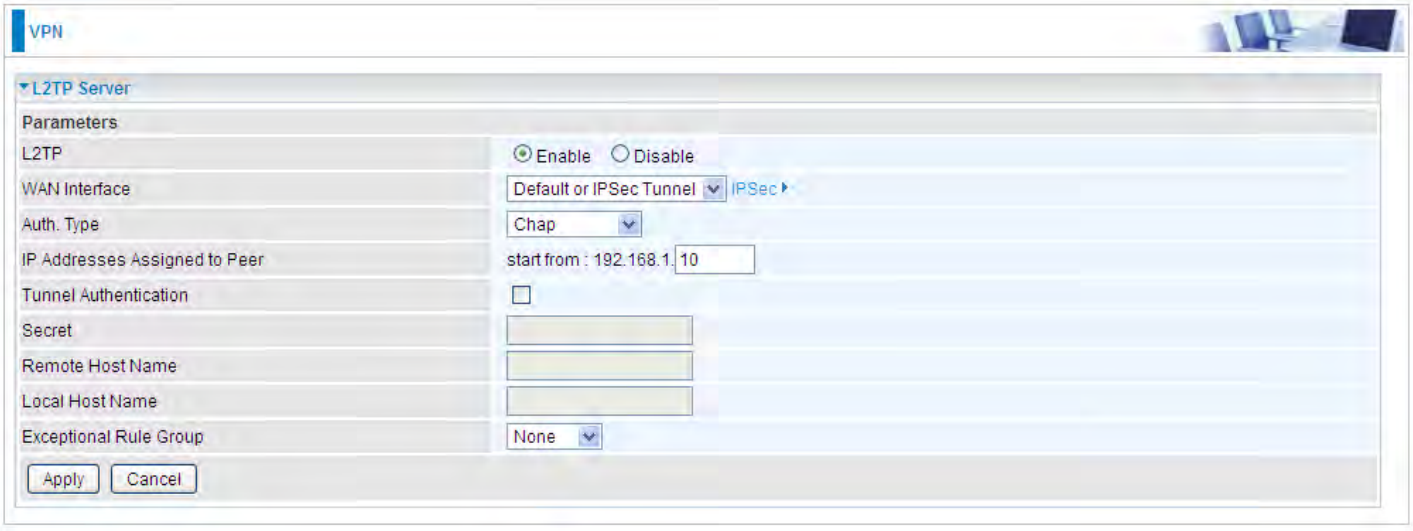
Local Host Name: Enter the local host name featuring the source of the L2TP tunnel.

Click **Add** button to save your changes.

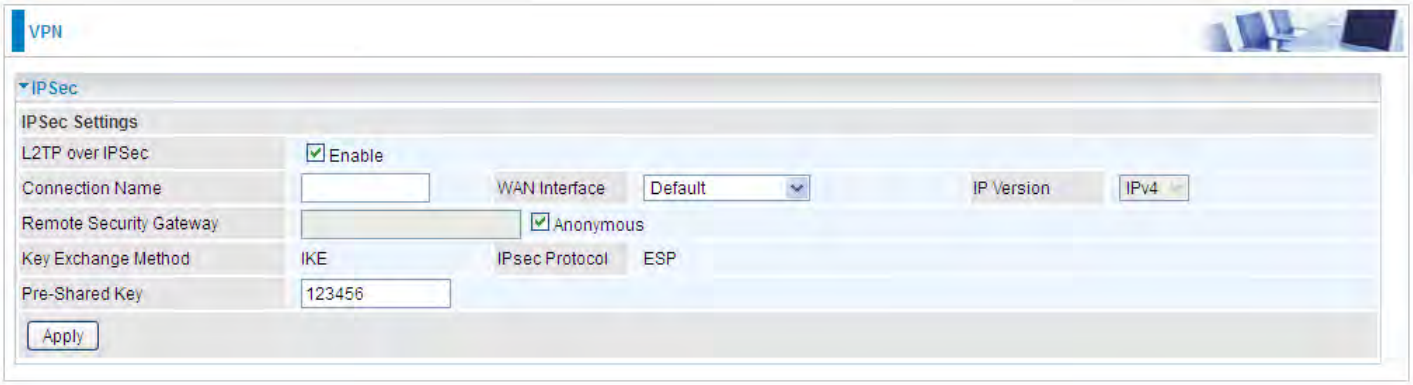
Example: L2TP over IPSec Remote Access with Windows series
(Note: 1. inside test with 172.16.1.185, just an example for illustration
2. Here is a configuration example on Windows 7; Windows series including Windows 10/ 8/ 7 vista/ also supports the application with similar steps. **)**



Server Side:
1. Configuration > **VPN** > **L2TP** and Enable the L2TP function, Click **Apply**.



The IPSec for L2TP rule

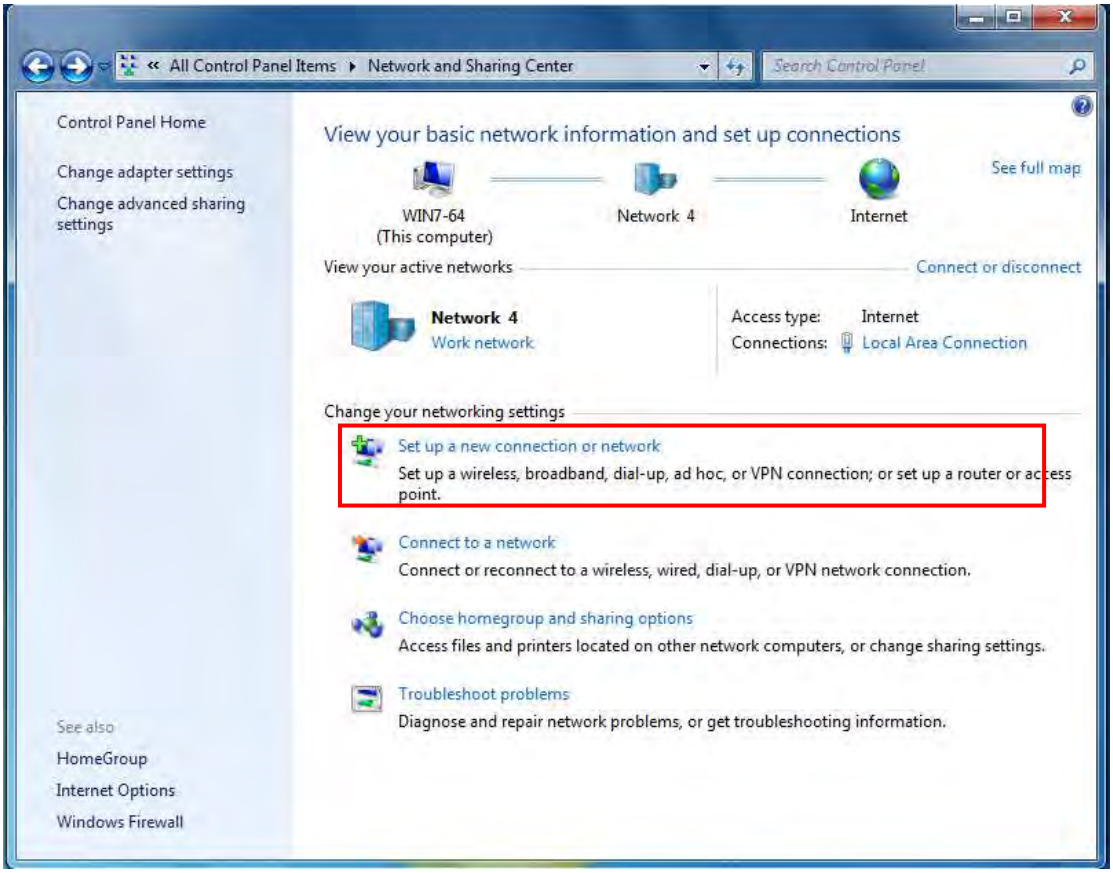


2. Create a L2TP Account “test1”.

Client Side: Windows series

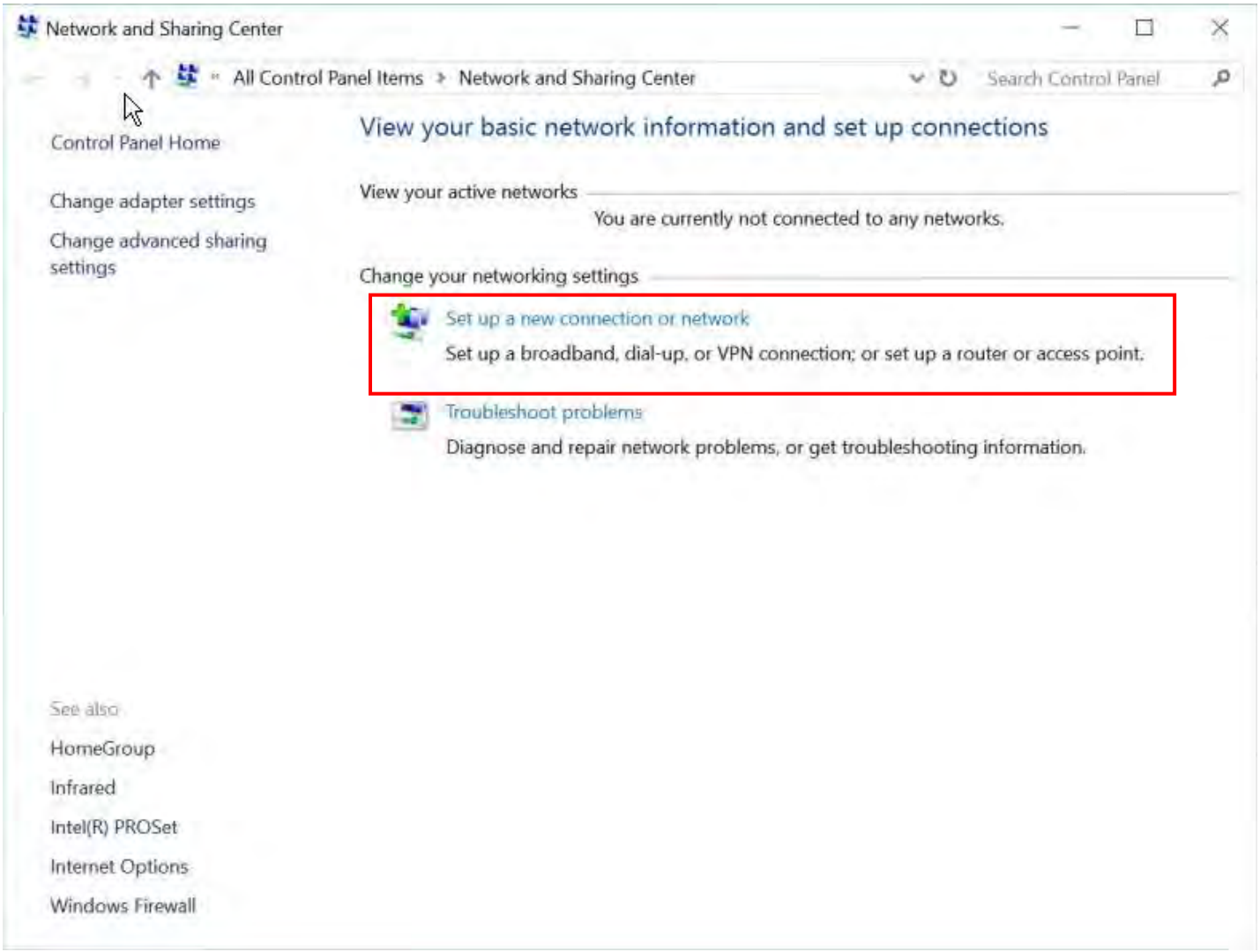
Note: Here is a configuration example on Windows 7; Windows series including Windows 10/ vista/ 8/ 7 also supports the application with similar steps.

1. In Windows7, click **Start** > **Control Panel**> **Network and Sharing Center,** Click **Set up a new connection network**.



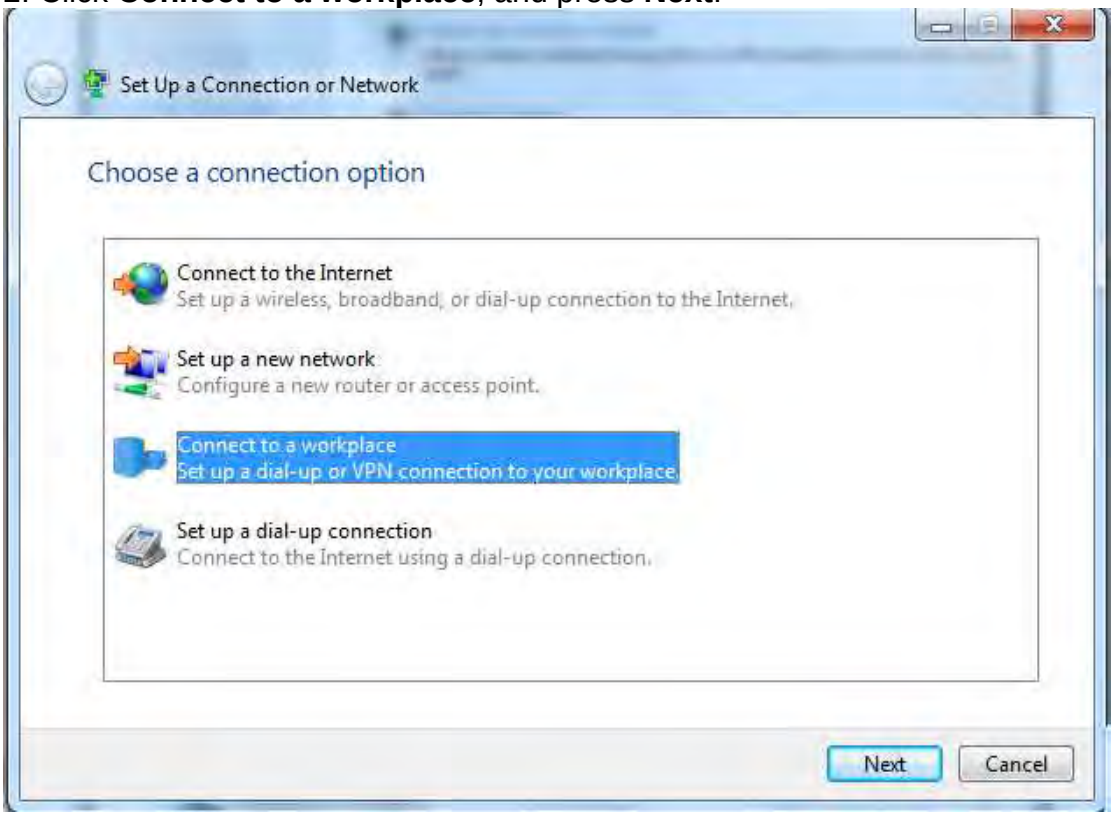
(Windows 7)

For Windows 10, Users can click **Start** > **Settings**; or right click the mouse when it points at Windows ICON (**Start**), then click **Control Panel** > **Network and Sharing Center,** then **Set up a new connection network**.

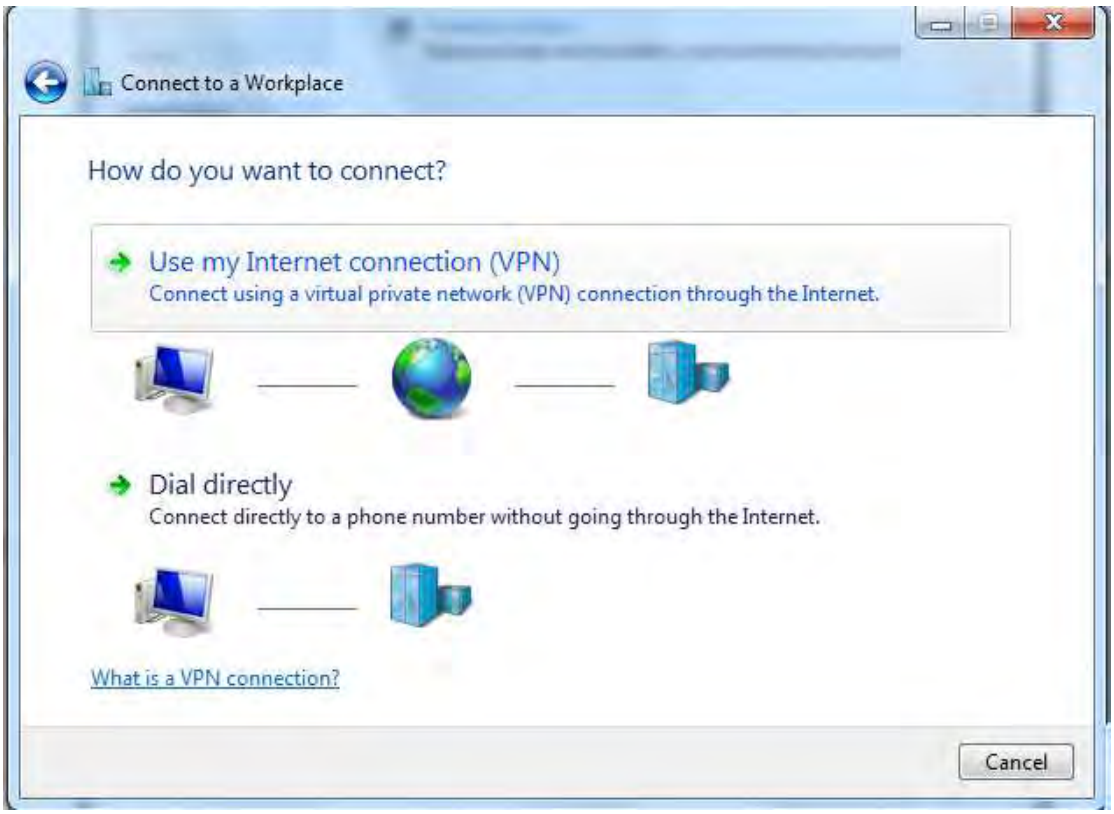


(Windows 10)

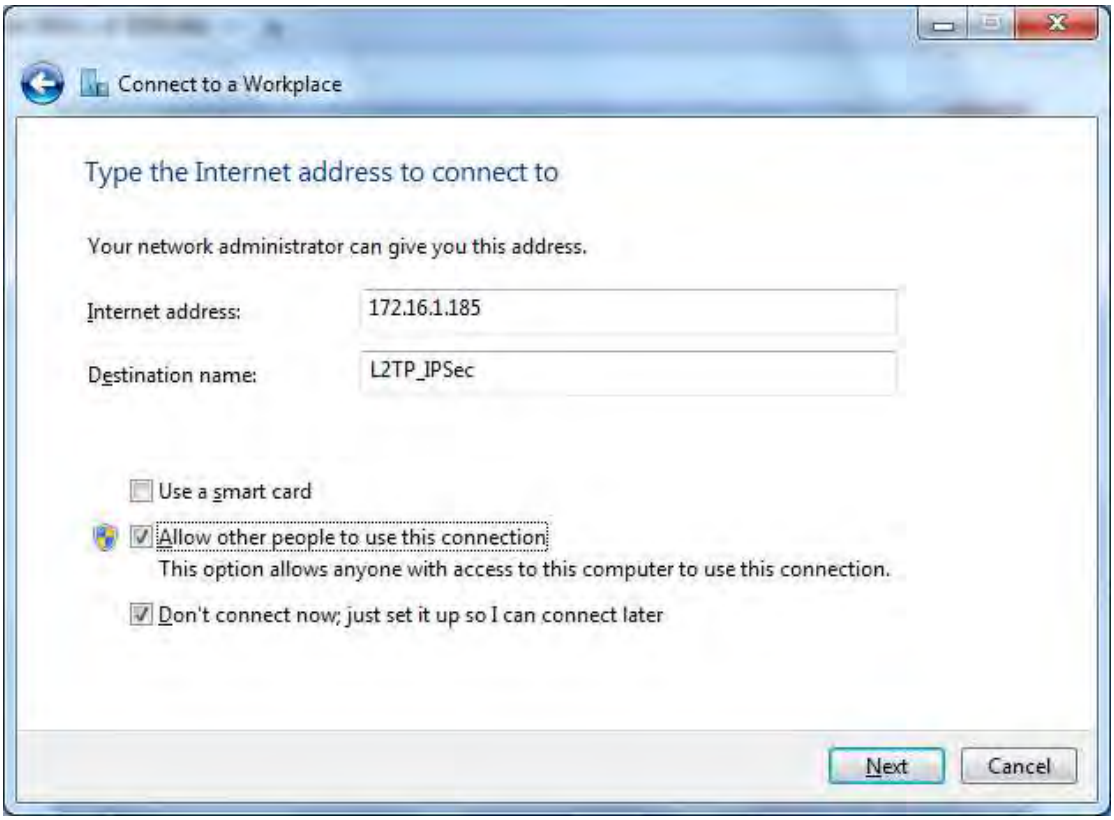
2. Click **Connect to a workplace**, and press **Next**.



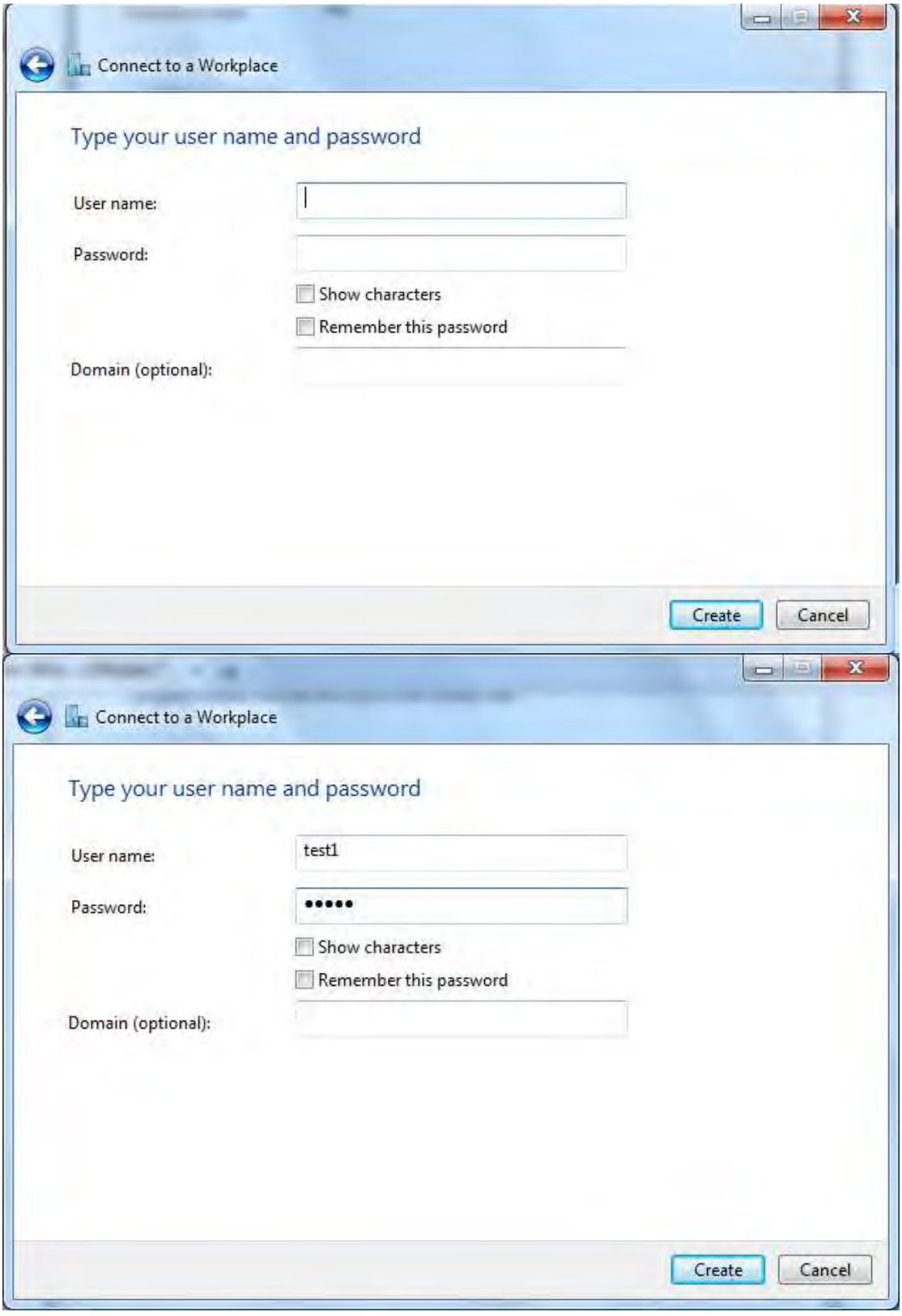
3. Select **Use my Internet connection (VPN)** and press **Next**.



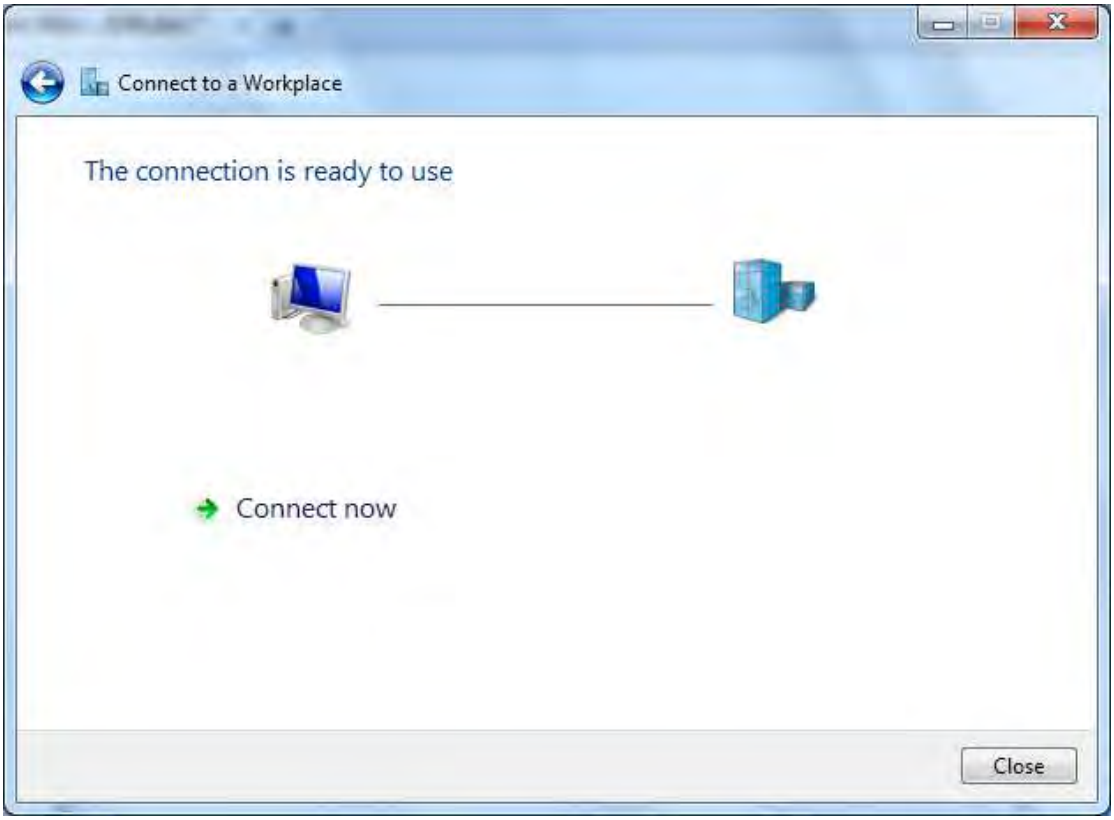
4. Input **Internet address** and **Destination name** for this connection and press **Next**.



5. Input the account (**user name** and **password**) and press **Create**.

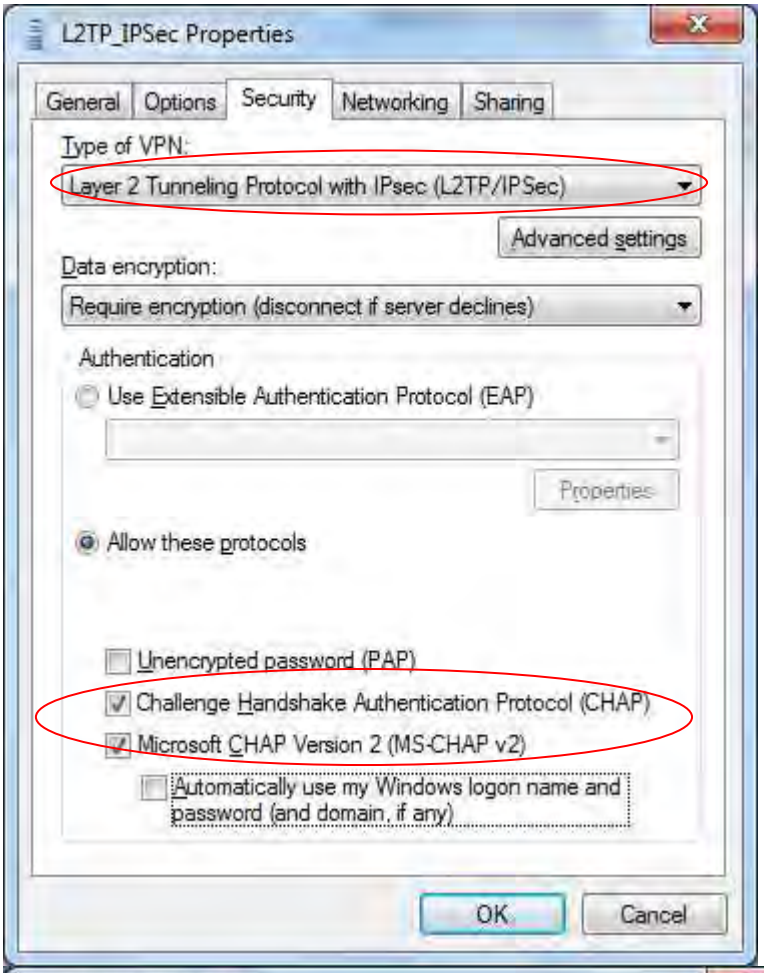


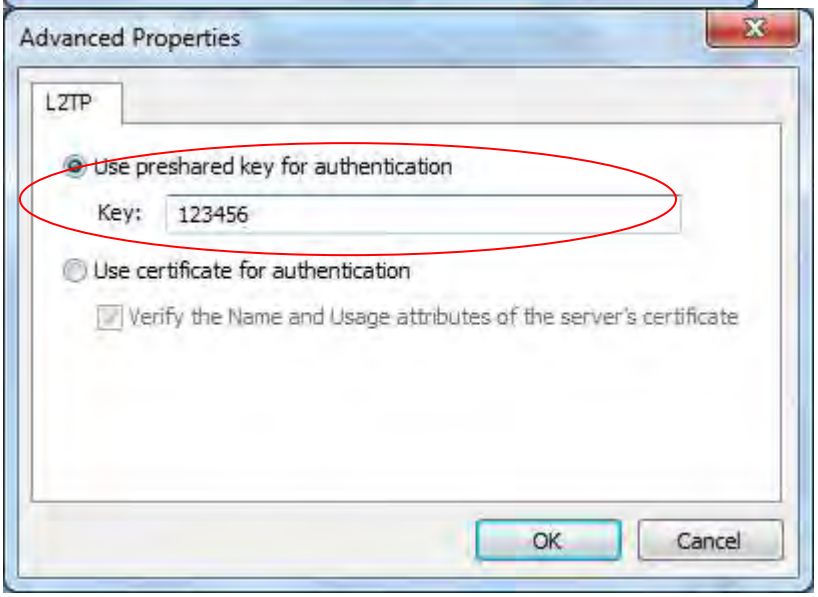
6. Connection created. Press **Close**.



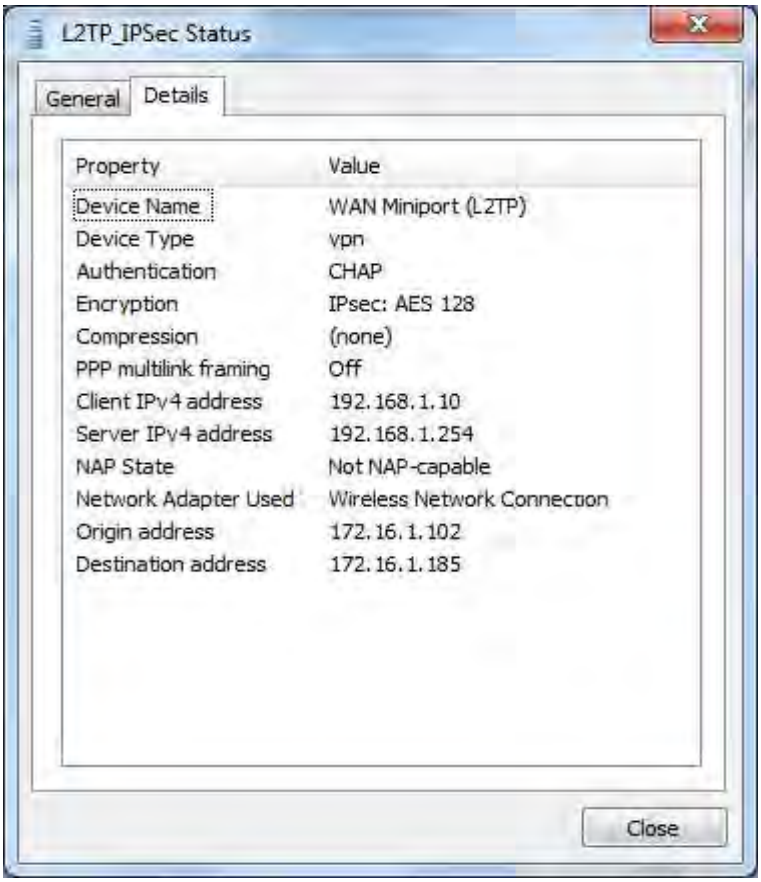
7. Go to **Network Connections** shown below to check the detail of the connection. Right click "L2TP_IPSec" icon, and select "**Properties**" to change the security parameters.

8. Chang the type of VPN to “**Layer 2 Tunneling Protocol with IPSec (L2TP/IPSec)**” and Click Advanced Settings to set the pre-shared (set in IPSec) key for authentication.





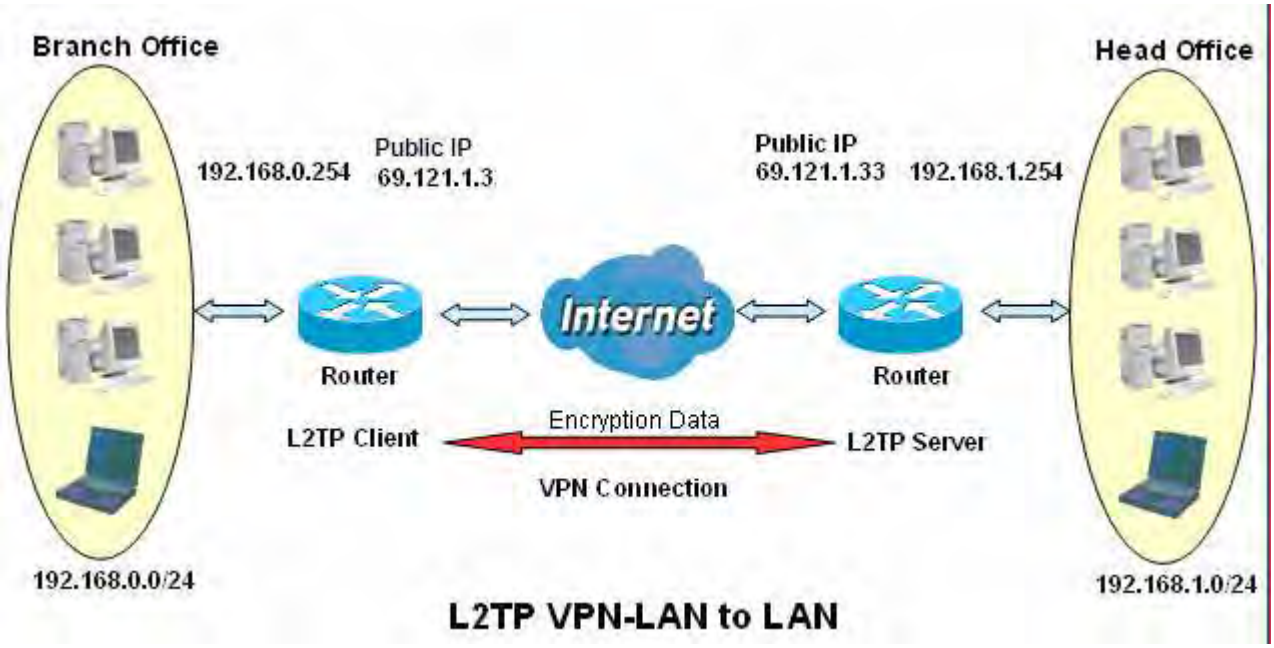
9. Go to **Network connections**, enter username and password to connect L2TP_IPSec and check the connection status.



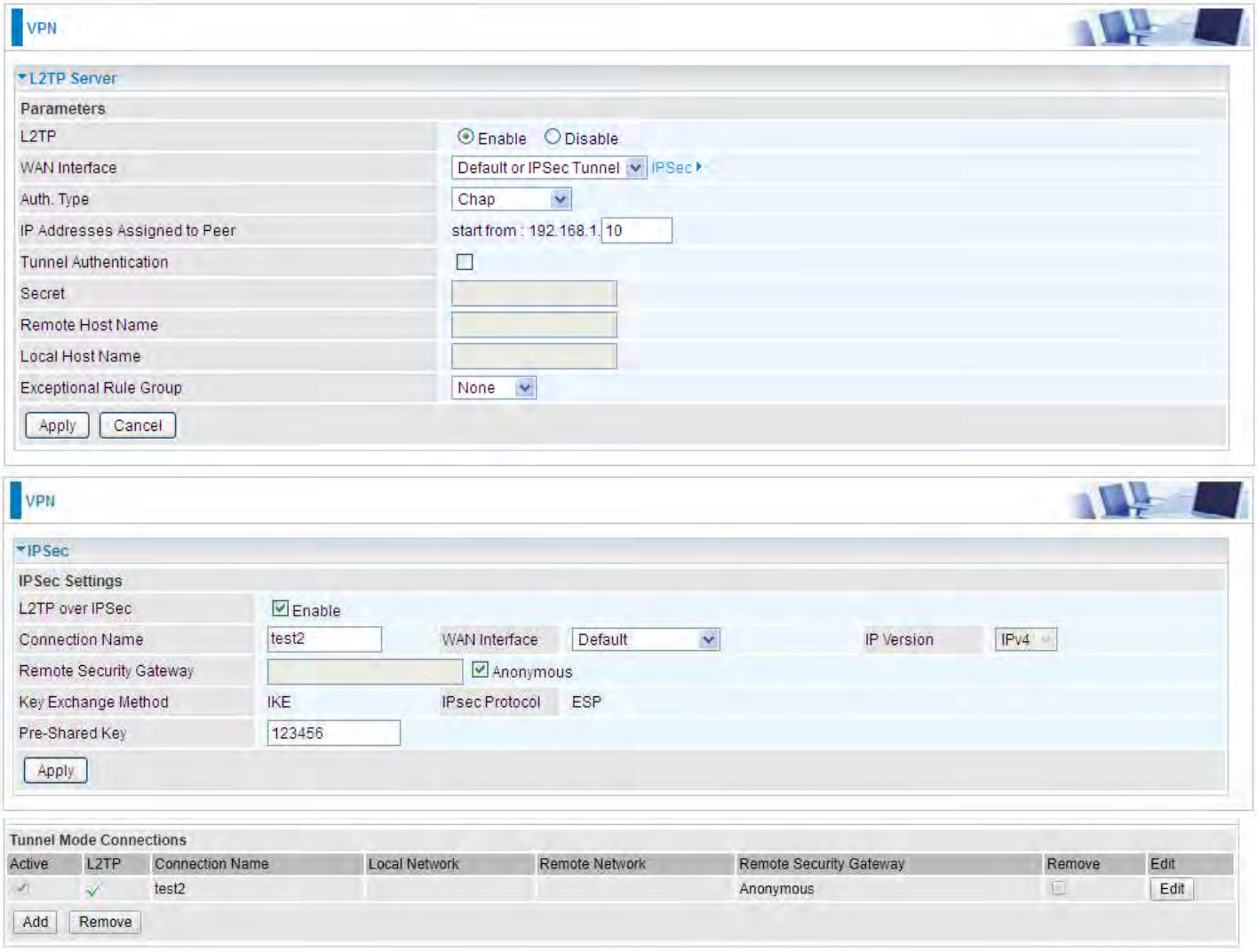
Example: Configuring L2TP LAN-to-LAN VPN Connection

The branch office establishes a L2TP VPN tunnel with head office to connect two private networks over the Internet. The routers are installed in the head office and branch office accordingly.

Note: Both office LAN networks must be in different subnets with the LAN-LAN application.



Server side: Head Office



The above is the commonly setting for L2TP Server, set as you like for authentication and encryption. The settings in Client side should be in accordance with settings in Server side.

Then account the L2TP Account.

Client Side: Branch Office

The client user can set up a tunnel connecting to the L2TP server, and can also set the tunnel as the default route for all outgoing traffic.

Note: users can see the “Default Gateway” item in the bar, and user can check to select the tunnel as the default gateway (default route) for traffic. If selected, all outgoing traffic will be forwarded to this tunnel and routed to the next hop.

OpenVPN

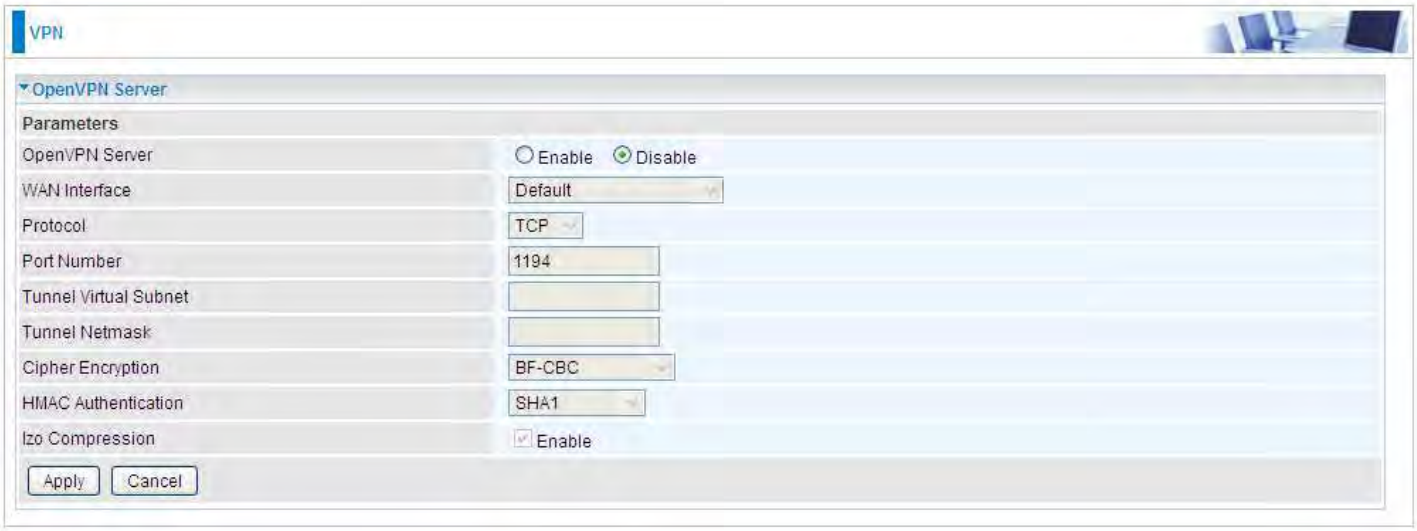
OpenVPN is an open source software application that implements virtual private network (VPN) techniques for creating secure point-to-point or site-to-site connections in routed or bridged configurations and remote access facilities. It uses a custom security protocol that utilizes SSL/TLS for key exchange. It is capable of traversing network address translation (NAT) and firewalls.

OpenVPN allows peers to authenticate each other using a pre-shared secret key, certificates, or username/password. When used in a multiclient-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 is good at portability. OpenVPN has been ported and embedded to several systems.

OpenVPN Server

Users can set the bassic parameters(source/destination address, protocl/port, authentication, encyption, etc) for OpenVPN Server.



OpenVPN Server: Select **Enable** to activate OpenVPN Server.

WAN Interface: Select the exact WAN interface configured as source for the tunnel. Select Default to use the now-working WAN interface for the tunnel.

Protocol: OpenVPN can run over User Datagram Protocol (UDP) or Transmission Control Protocol (TCP) transports. Select the protocol.

Port Number: Port 1194 is the official assigned port number for OpenVPN

Tunnel Virtual Subnet: Set the tunnel virtual subnet IP for OpenVPN server.

Tunnel Network: Set the tunnel virtual subnet mask.

Cipher Encryption: OpenVPN uses all the ciphers available in the OpenSSL package to encrypt both the data and channels. Select the encryption method.

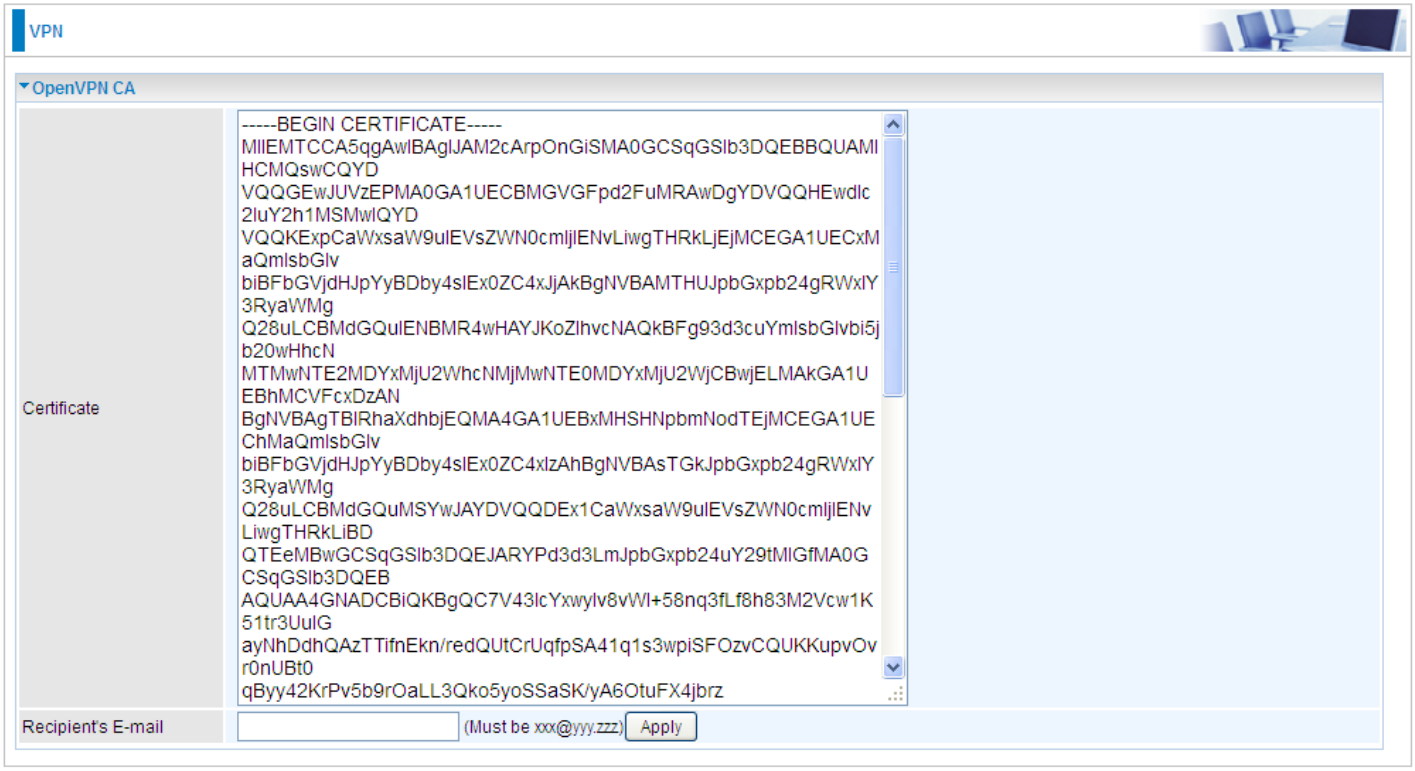
HMAC Authentication: OpenVPN support HMAC authentication, please select authentication item from the list.

lzo Compression: Enable to use the LZO compression library to compress the data stream.

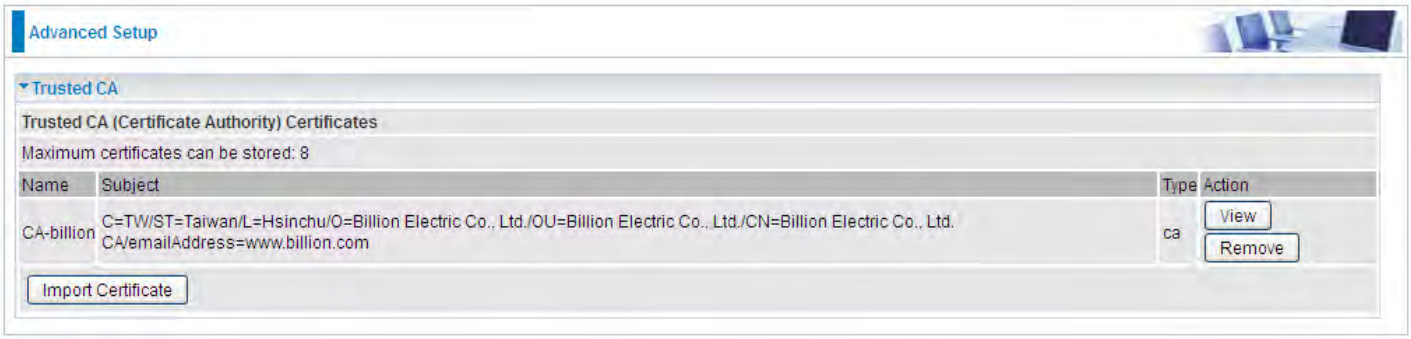
Click **Apply** to submit your OpenVPN Server basic settings.

OpenVPN CA

OpenVPN offers pre-shared keys, certificate-based, and username/password-based authentication, with certificate-based being the most robust. Generally, the part offers the billion factory-defined authentication certificate.



Recipient's Email: Set the recipient's email address to send the trusted CA to the OpenVPN client. OpenVPN server and client need matched certificate to establish trusted VPN tunnel, on client side, please import this certificate in Trusted CA.



(client side CA)

OpenVPN Client

OpenVPN client can help you dial-in the OpenVPN server to establish a trusted OpenVPN tunnel over Internet.

Name: user-defined name for identification.

WAN Interface: Select the exact WAN interface configured as source for the tunnel. Select Default to use the now-working WAN interface for the tunnel.

Username: Enter the username provided by your OpenVPN Server.

Password: Enter the password provided by your OpenVPN Server.

OpenVPN Server Address: Enter the WAN IP address of the OpenVPN server.

Protocol: The protocol, same as set in server side.

Port Number: 1194.

Cipher Encryption: Be consistent with what set on server side.

HMAC Authentication: Be consistent with what set on server side.

lzo Compression: Enable to use the LZO compression library to compress the data stream

Certificate Authority: Select your trusted CA from your server side to establish the trusted VPN tunnel with server.

Click **Add** button to save your changes.

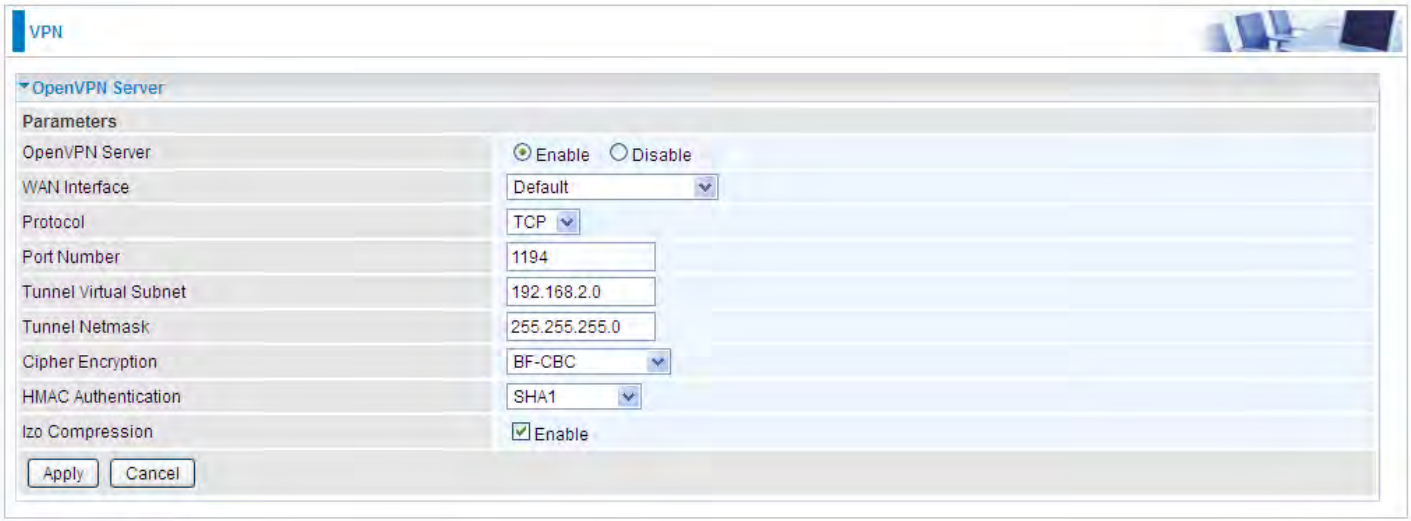
How to establish OpenVPN tunnel

1. Remote Access OpenVPN

(If the client wants to remotely access the OpenVPN Server, on client side, users had better install an OpenVPN client application/installer and connect to server accordingly. Here only give the configuration on server side.)

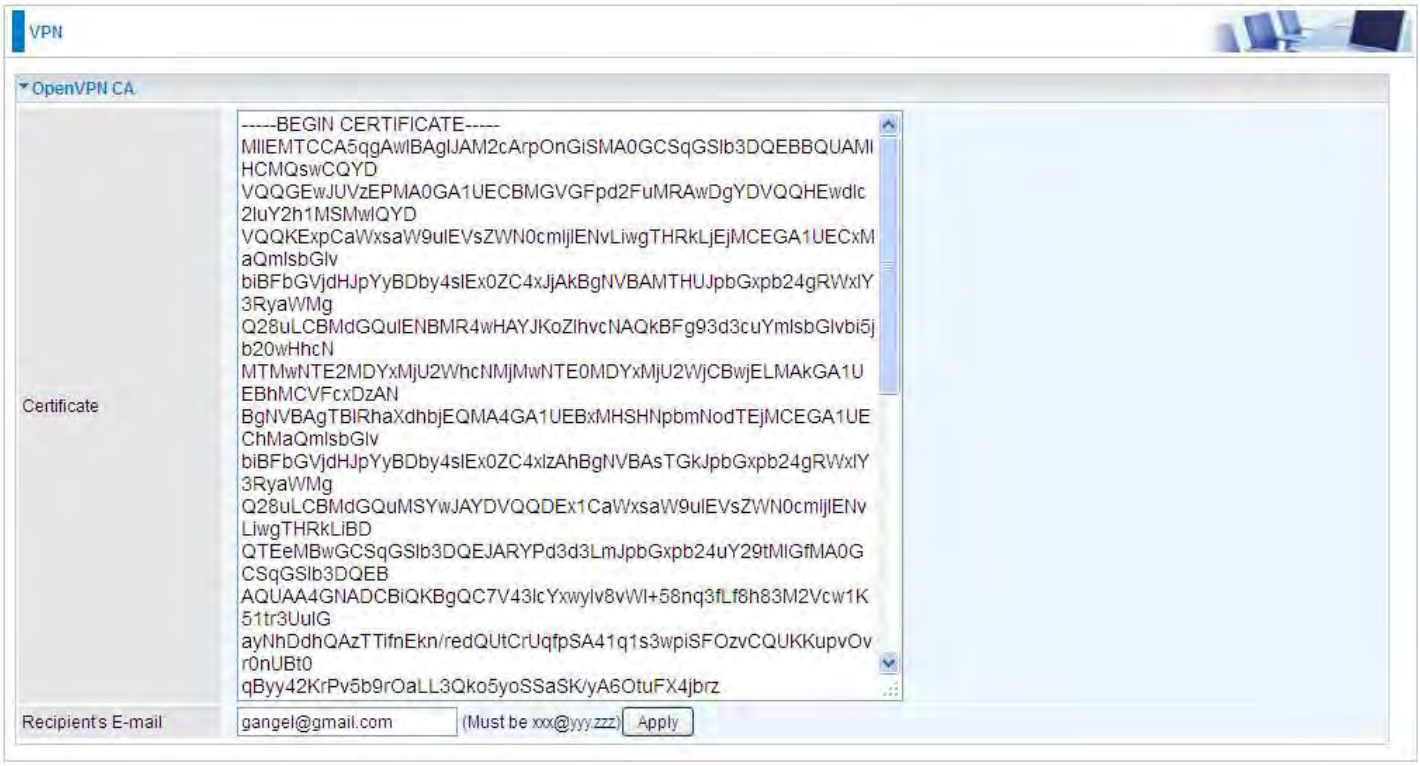
Server side on router

1. Set up parameters (WAN interface, port, tunnel virtual subnet IP/mask, encryption, authentication, etc) on OpenVPN server side.



2. Create an account for the OpenVPN tunnel for client to connect in.

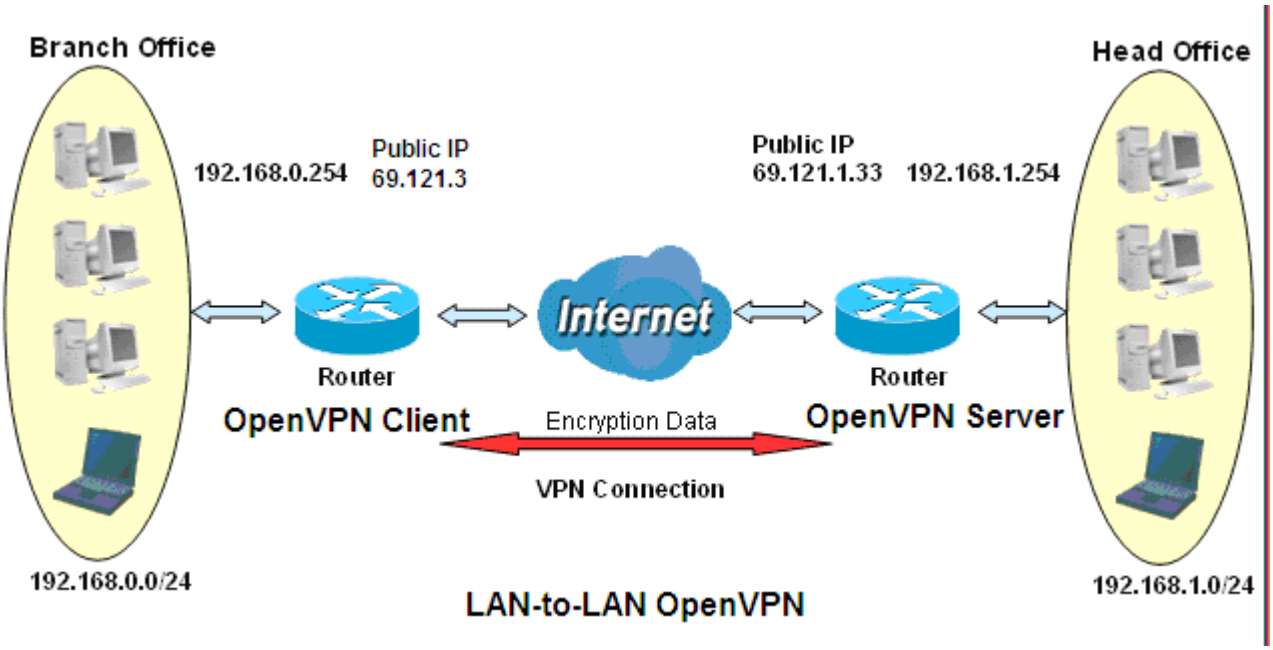
3. Set the OpenVPN client's E-mail address to receive trusted CA from server to establish a trusted OpenVPN tunnel.



2. LAN-to-LAN OpenVPN

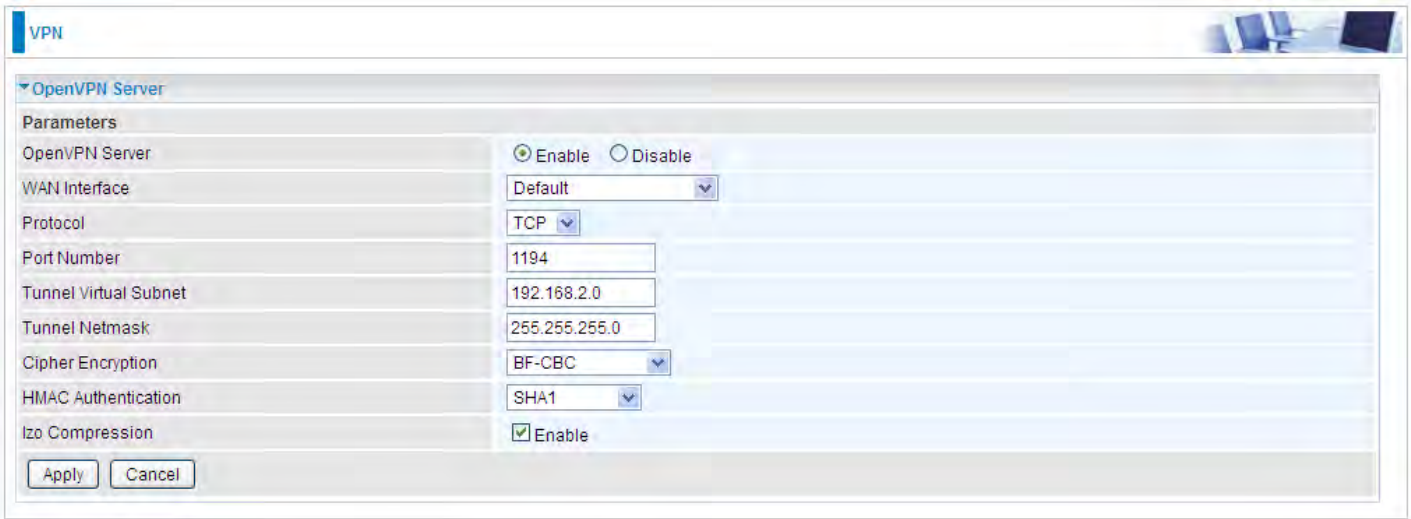
The branch office establishes a OpenVPN tunnel with head office to connect two private networks over the Internet. The routers are installed in the head office and branch office accordingly. Configured in this way, head office and branch office can access each other.

Note: Both office LAN networks must be in different subnets with the LAN-to-LAN application.



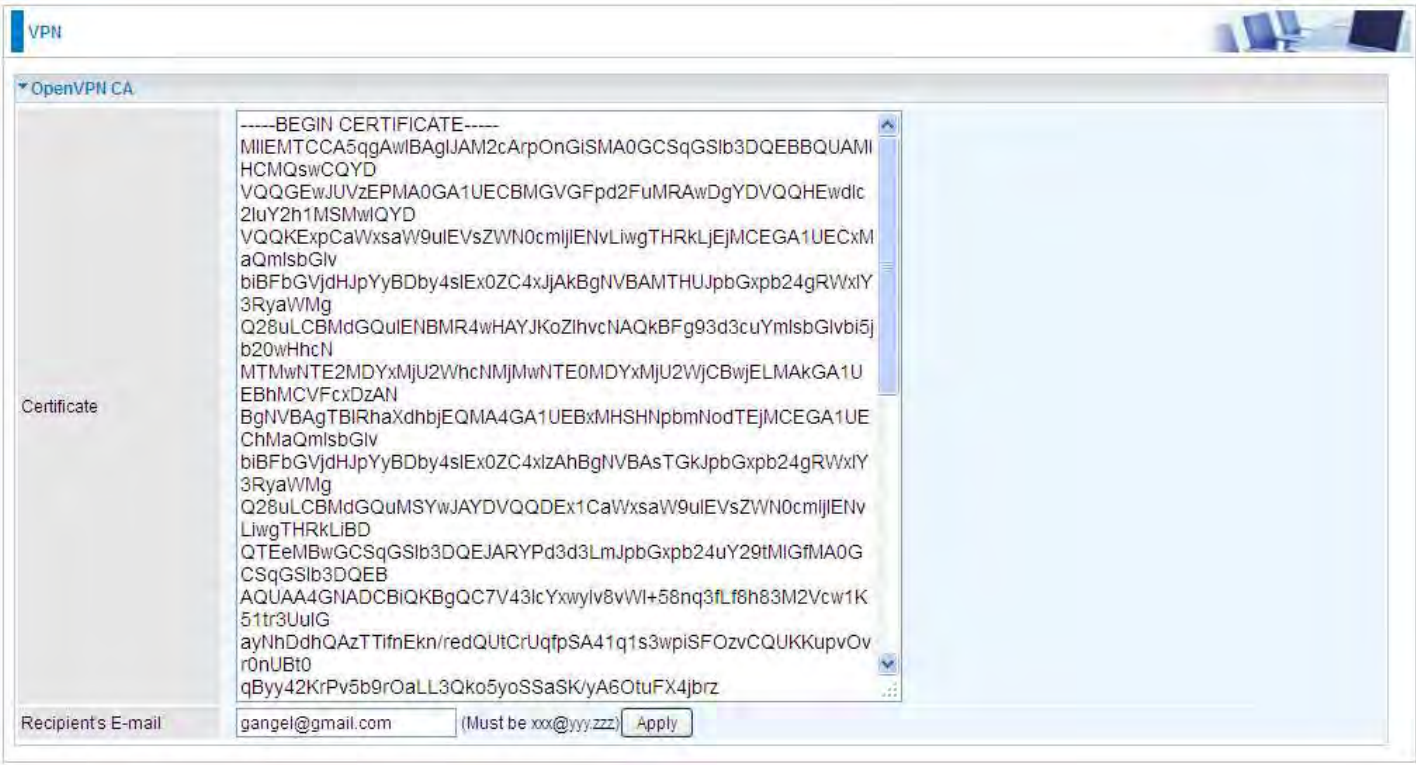
Server side: Head Office

1. Set up parameters (WAN interface, port, tunnel virtual subnet IP/mask, encryption, authentication, etc) on OpenVPN server side.



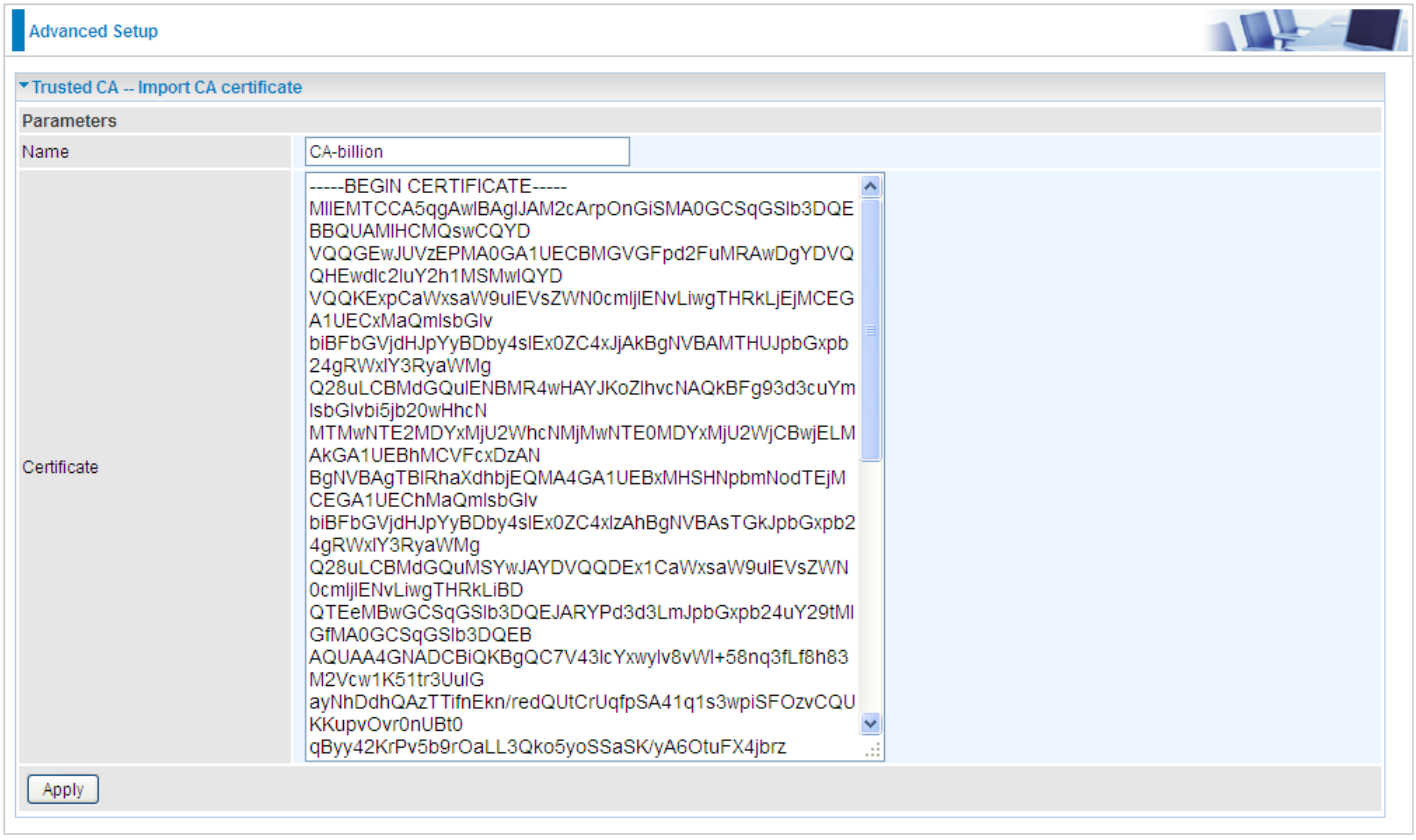
2. Create an account for client to connect in

3. Set the OpenVPN client's E-mail address to receive trusted CA from server to establish a trusted OpenVPN tunnel.

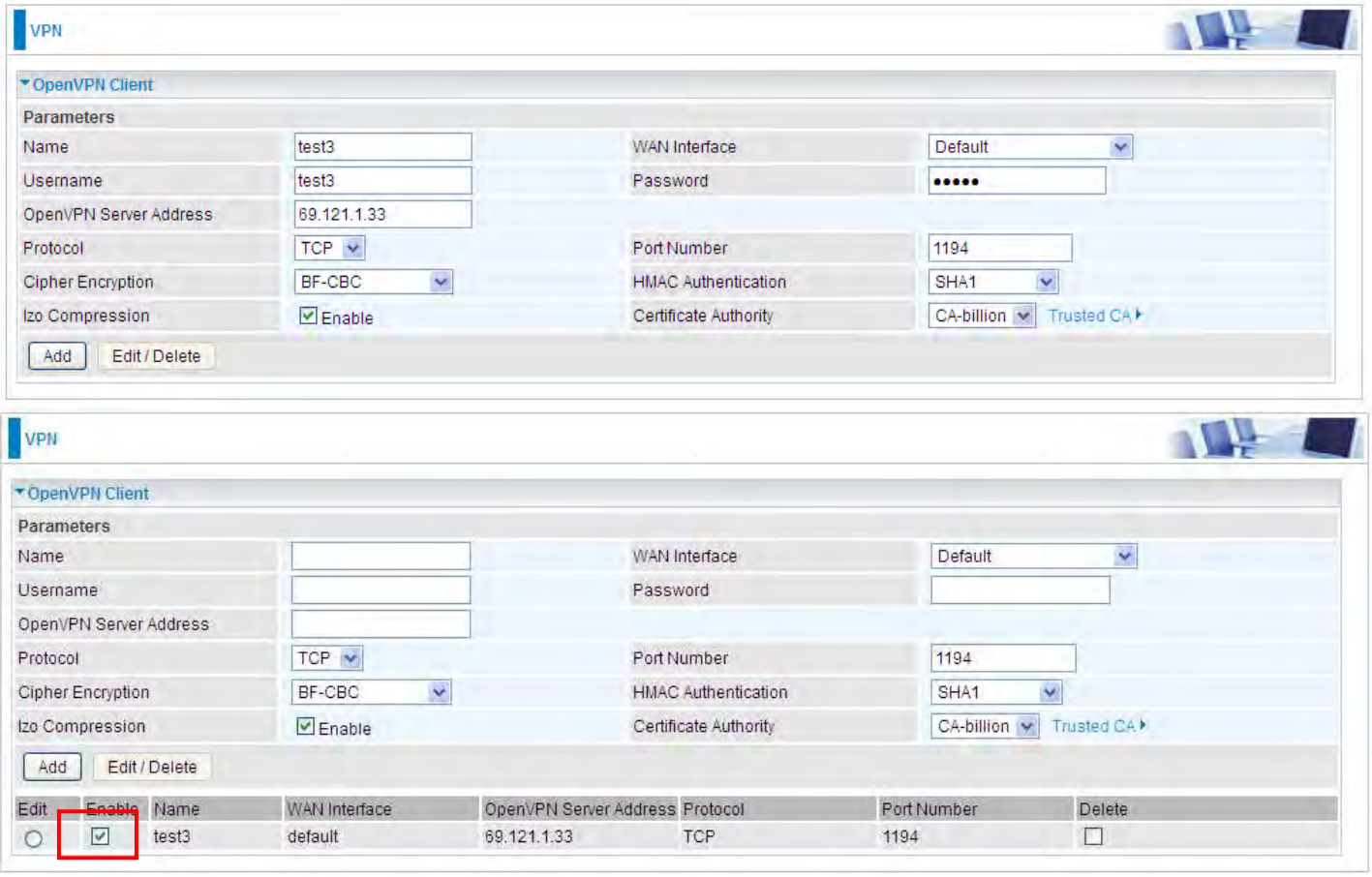


Client Side: Branch Office

1. Import your trusted certificate from server side, which is used to authenticate between client and server for establishing trusted OpenVPN tunnel.



2. On the OpenVPN client side, fill in the parameters the same as set for OpenVPN server.

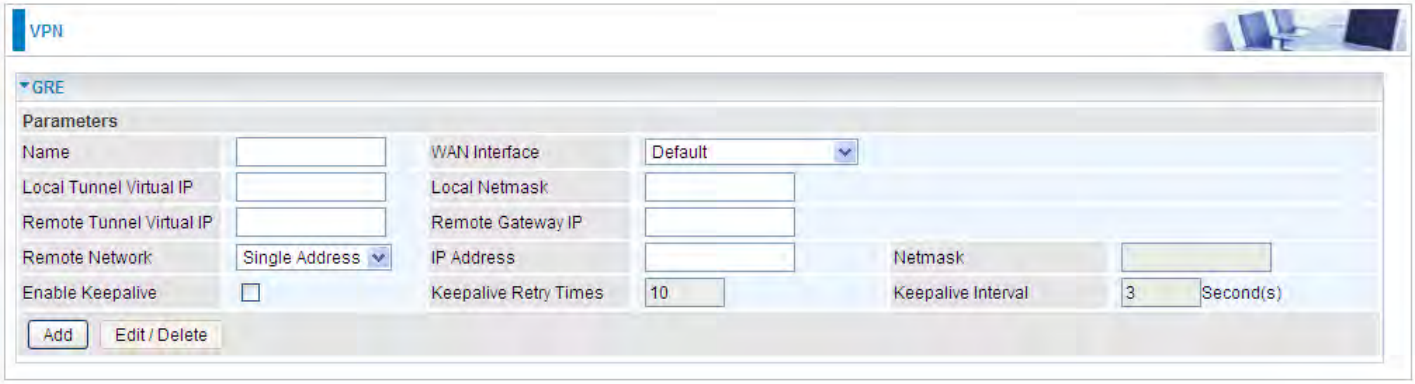


Note: users can see the “Default Gateway” item in the bar, and user can check to select the tunnel as the default gateway (default route) for traffic. If selected, all outgoing traffic will be forwarded to this tunnel and routed to the next hop.

GRE

Generic Routing Encapsulation (GRE) is a tunneling protocol that can encapsulate a wide variety of network layer protocol packets inside virtual point-to-point links over an Internet Protocol (IP) network.

Note: up to 8 tunnels can be added, but only 4 can be activated.



Name: User-defined identification.

WAN Interface: Select the exact WAN interface configured for the tunnel as the source tunnel IP. Select Default to use the now-working WAN interface for the tunnel.

Local Tunnel Virtual IP: Please input the virtual IP for the local tunnel.

Local Netmask: Input the netmask for the local tunnel.

Remote Tunnel Virtual IP: Please input the virtual destination IP for tunnel.

Remote Gateway IP: Set the destination IP for the tunnel.

Remote Network: Select the peer topology, Single address (client) or Subnet.

IP Address: Set the IP address if the peer is a client. If the peer is a subnet, please enter the IP and netmask.

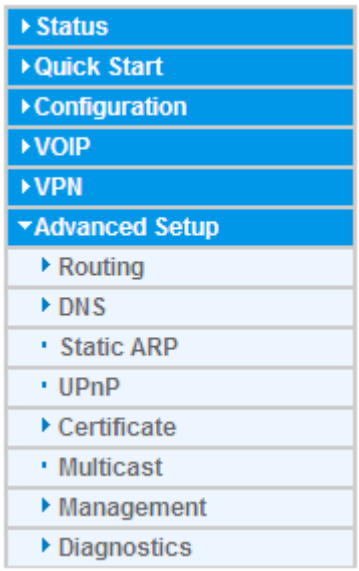
Enable Keepalive: Normally, the tunnel interface is always up. Enable keepalive to determine when the tunnel interface is to be closed. The local router sends keepalive packets to the peer router, if keepalive response is not received from peer router within the allowed time (‘retry time’ multiply ‘interval’, based on default settings, the time interval can be 30 seconds), the local router will shut up its tunnel interface.

Keepalive Retry Times: Set the keepalive retry times, default is 10.

Keepalive Interval: Set the keepalive Interval, unit in seconds. Default is 3 seconds.

Advanced Setup

There are sub-items within the System section: **Routing**, **DNS**, **Static ARP, UPnP**, **Certificate**, **Multicast**, **Management**, and **Diagnostics.**



Routing

Default Gateway

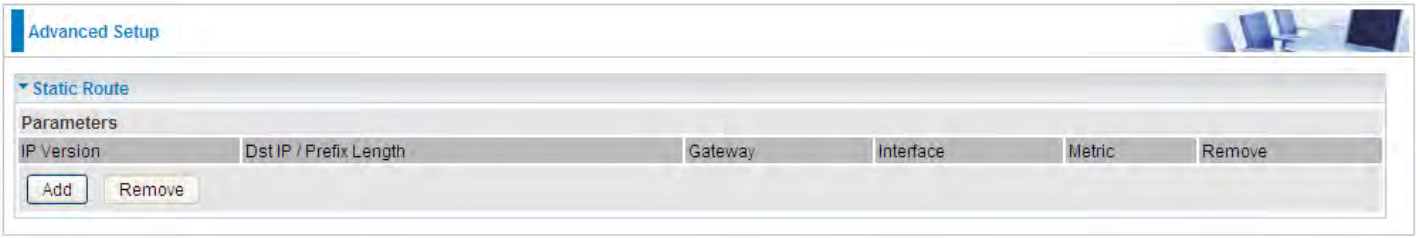
WAN port: Select the port this gateway applies to.

To set ***Default Gateway*** and ***Available Routed WAN Interface***. This interfaces are the ones you have set in WAN section, here select the one you want to be the default gateway by moving the interface via -> or <-. And select a Default IPv6 Gateway from the drop-down menu.

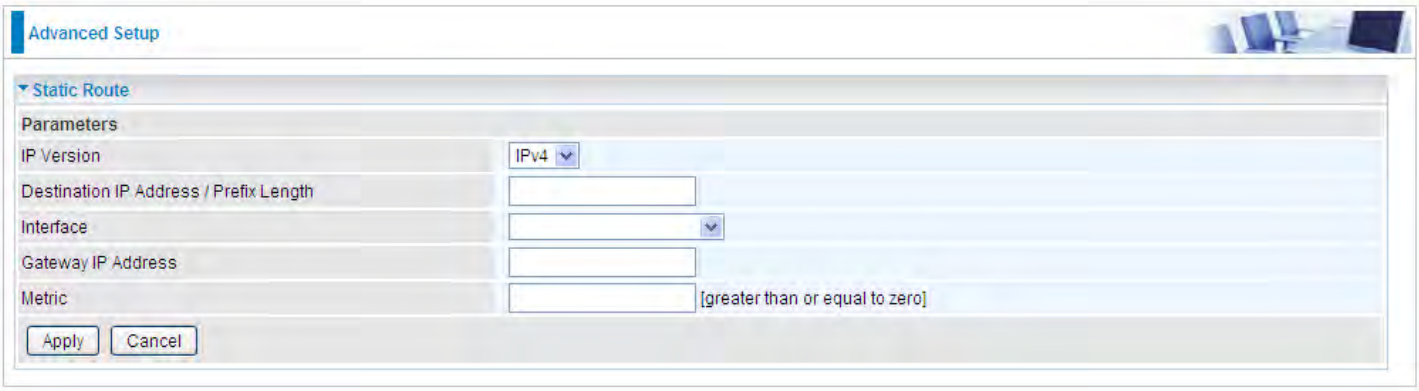
Note: Only one default gateway interface will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected.

Static Route

With static route feature, you can control the routing of all the traffic across your network. With each routing rule created, you can specifically assign the destination where the traffic will be routed.



Above is the static route listing table, click **Add** to create static routing.



IP Version: Select the IP version, IPv4 or IPv6.

Destination IP Address / Prefix Length: Enter the destination IP address and the prefix length. For IPv4, the prefix length means the number of '1' in the submask, it is another mode of presenting submask. One IPv4 address,192.168.1.0/24, submask is 255.255.255.0. While in IPv6, IPv6 address composes of two parts, thus, the prefix and the interface ID, the prefix is like the net ID in IPv4, and the interface ID is like the host ID in IPv4. The prefix length is to identify the net ID in the address. One IPv6 address, 3FFE:FFFF:0:CD30:0:0:0:0 / 64, the prefix is 3FFE:FFFF:0:CD3.

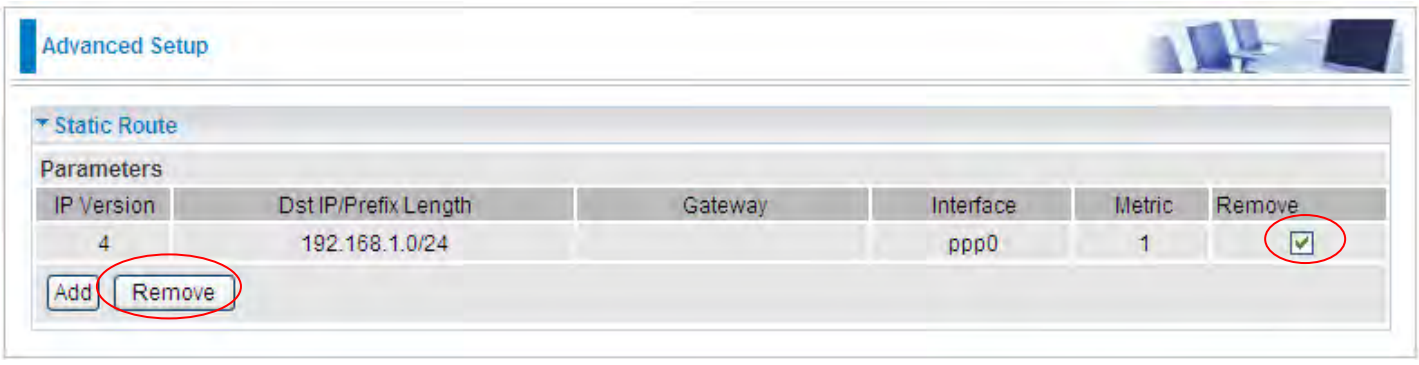
Interface: Select an interface this route associated.

Gateway IP Address: Enter the gateway IP address.

Metric: Metric is a policy for router to commit router, to determine the optimal route. Enter one number greater than or equal to 0.

Click **Apply** to apply this route and it will be listed in the route listing table.

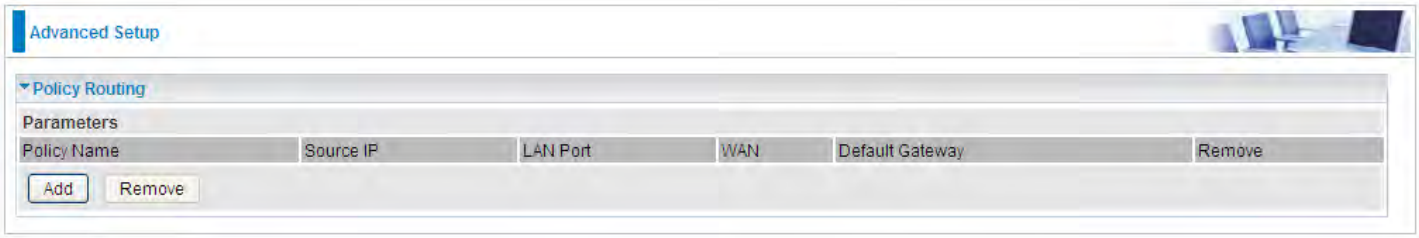
In listing table you can remove the one you don't want by checking the checking box and press **Remove** button.



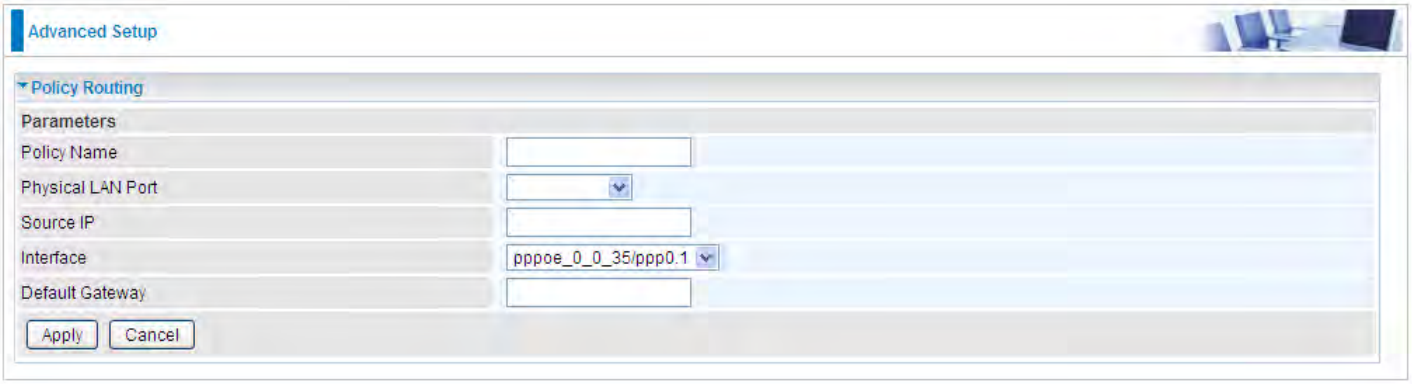
Policy Routing

Here users can set a route for the host (source IP) in a LAN interface to access outside through a specified Default Gateway or a WAN interface.

The following is the policy Routing listing table.



Click **Add** to create a policy route.



Policy Name: User-defined name.

Physical LAN Port: Select the LAN port.

Source IP: Enter the Host Source IP.

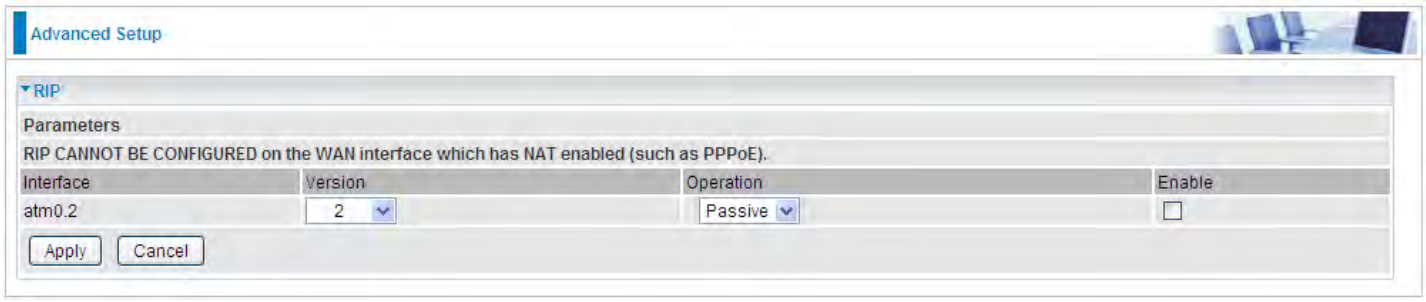
Interface: Select the WAN interface which you want the Source IP to access outside through.

Default Gateway: Enter the default gateway which you want the Source IP to access outside through.

Click **Apply** to apply your settings. And the item will be listed in the policy Routing listing table. Here if you want to remove the route, check the remove checkbox and press **Remove** to delete it.

RIP

RIP, Router Information Protocol, is a simple Interior Gateway Protocol (IGP). RIP supports RIP-1 , RIP-2 and both.



Interface: the interface the rule applies to.

Version: select the RIP version, RIP-1, RIP-2 and both.

Operation: RIP has two operation mode.

- **Passive:** only receive the routing information broadcasted by other routers and modifies its routing table according to the received information.
- **Active:** working in this mode, the router sends and receives RIP routing information and modifies routing table according to the received information.

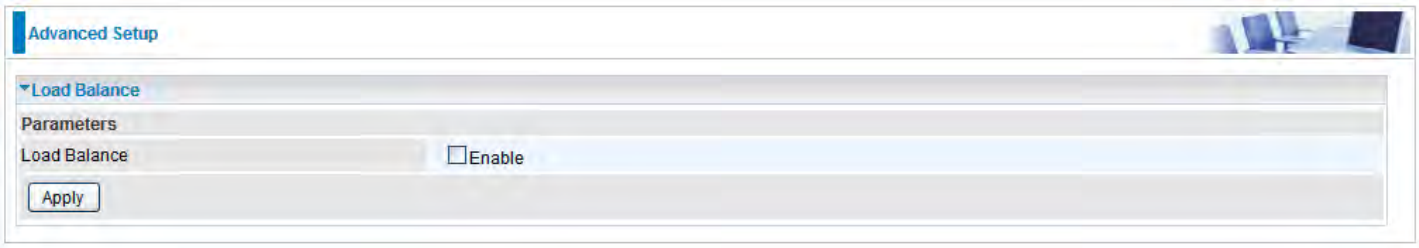
Enable: check the checkbox to enable RIP rule for the interface.

Note: RIP can't be configured on the WAN interface which has NAT enabled (such as PPPoE).

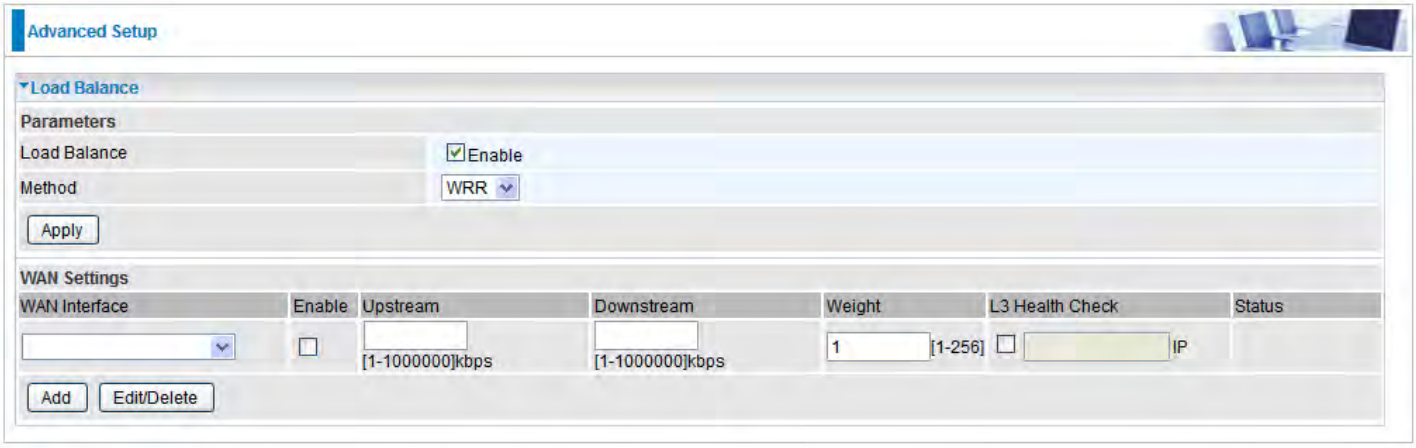
Click **Apply** to apply your settings.

Load Balance

This is outbound load balance to distribute internet traffic across multiple wan. There are two methods to choose that depends on your network Bandwidth. SDB(Smart Detecting Balancer) method can dynamic detecting the traffic status among multiple WAN and adjust the traffic pass through the proper WAN interface. In general, the more internet traffic simultaneously the more balanced. WRR(Weighted Round-Robin) method can distribute the internet traffic by weight assigned, Basically, SDB is suitable for small Bandwidth gap among WANs and WRR suitable for bigger Bandwidth gap among WANs.



Load Balance: Master switch of the load balance feature.



Method: Choose your preferable method. SDB is suitable for small Bandwidth gap among WANs and WRR suitable for bigger Bandwidth gap among WANs.

- **SDB**(Smart Detecting Balancer) method can dynamic detecting the traffic status among multiple WAN and adjust the traffic pass through the proper WAN interface.
- **WRR**(Weighted Round-Robin) method can distribute the internet traffic by weight assigned.

Click **Apply** to save your changes and set WAN Interface settings.

WAN Settings

WAN Interface: Assign a wan interface.

Enable: Select enable to join this WAN interface into load balance process or disable.

Upstream: Specify the upstream rate of the WAN interface.

Downstream: Specify the Downstream rate of the WAN interface.

Weight: Specify 1~256 value to distribute the wan traffic, only to work on WRR method.

L3 Health Check: Detecting the L3 WAN status by using icmp, if wan interface L3 link is failure, load balance will not assign traffic to the wan interface. If you don't want to use this option, just do not check the checkbox.

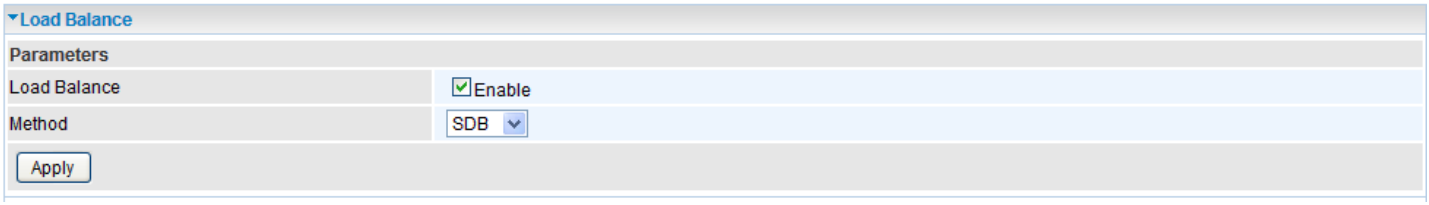
Status: Show the current WAN status, up or down.

Click **Add** to add the load balance rule but **note** Load balance needs 2 interfaces or more to join so as to start work and support maximum 3 WAN interfaces.

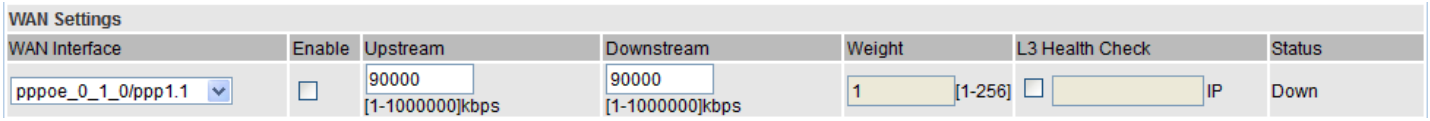
Cases on load balance

I. Similar rates between WAN interfaces or no disparity for example: **VDSL2 100/100 & LTE 100/50Mbps**

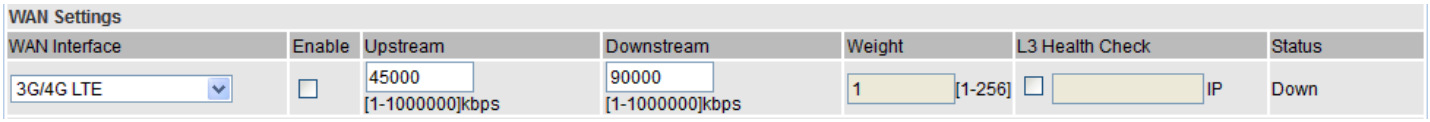
Select **SDB:**

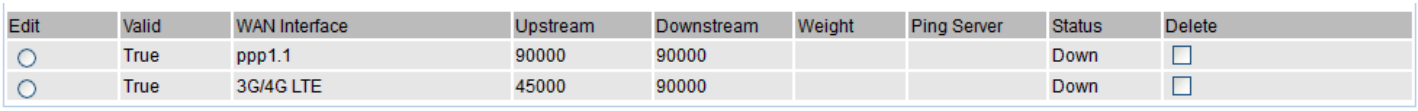


VDSL: 90% of speed on upstream/downstream



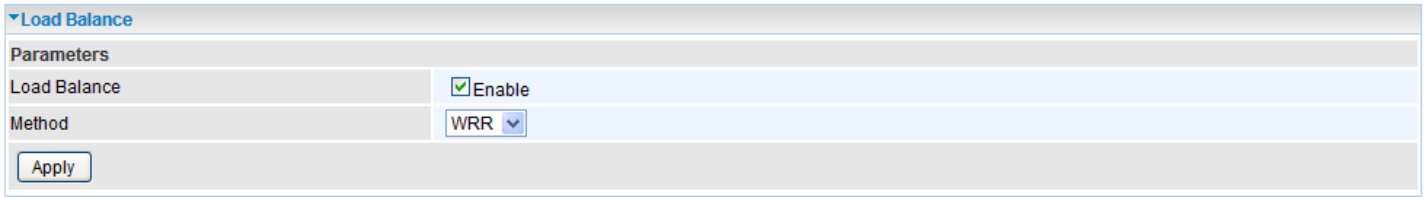
LTE: 90% of speed on upstream/downstream



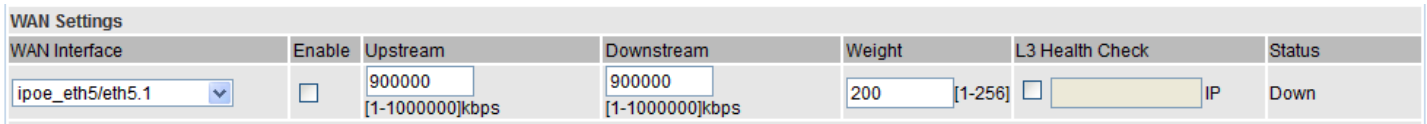


II: Huge speed disparity between WAN interfaces for example **WAN ETH 1000/1000 & LTE 100/50Mbps**

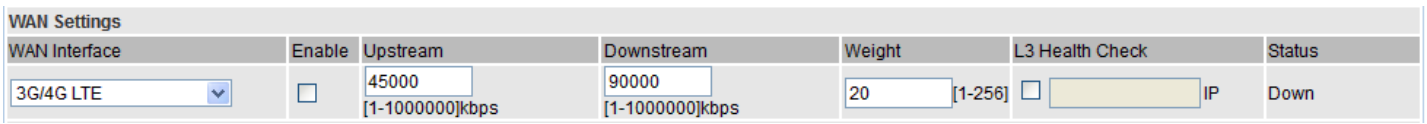
Select WRR. And the speed ratio between the interfaces is 10:1, so put WRR at 200:20.

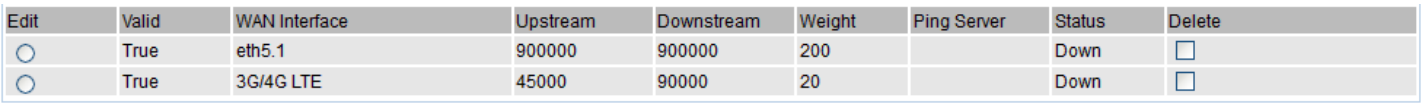


Ethernet WAN: 90% of speed on upstream/downstream



LTE: 90% of speed on upstream/downstream





III Multiple WAN interfaces **VDSL2 50/50 & WAN eth 1000 & LTE 100/50Mbps**

Please select Method: **WRR**. It's because speed between VDSL, Eth and LTE are 1:20:2. Hence, we need to use WRR to 10:200:20.

VDSL: 90% of speed on upstream/downstream

WAN Settings

WAN Interface	Enable	Upstream	Downstream	Weight	L3 Health Check	Status
pppoe_0_1_0/ppp1.1	☐	45000 [1-1000000]kbps	45000 [1-1000000]kbps	10 [1-256]	☐ IP	Down

Ethernet WAN: 90% of speed on upstream/downstream

WAN Settings

WAN Interface	Enable	Upstream	Downstream	Weight	L3 Health Check	Status
ipoe_eth5/eth5.1	☑	900000 [1-1000000]kbps	900000 [1-1000000]kbps	200 [1-256]	☐ IP	Down

LTE: 90% of speed on upstream/downstream

WAN Settings

WAN Interface	Enable	Upstream	Downstream	Weight	L3 Health Check	Status
3G/4G LTE	☑	45000 [1-1000000]kbps	90000 [1-1000000]kbps	20 [1-256]	☐ IP	Down

Edit	Valid	WAN Interface	Upstream	Downstream	Weight	Ping Server	Status	Delete
◉	True	eth5.1	900000	900000	200		Down	☐
○	True	3G/4G LTE	45000	90000	20		Down	☐
○	True	ppp1.1	45000	45000	10		Down	☐

Note: If there is a huge disparity between interfaces, please use WRR. If not, please use SDB. It depends on your test environment.

DNS

DNS, Domain Name System, is a distributed database of TCP/IP application. DNS provides translation from Domain name to IP.

DNS

➢ IPv4

Three ways to set an IPv4 DNS server

- ⓘ **Select DNS server from available WAN interfaces:** Select a desirable WAN interface as the IPv4 DNS server.
- ⓘ **User the following Static DNS IP address:** To specify DNS server manually by entering your primary and secondary DNS server addresses.
- ⓘ **Use the IP address provided by Parental Control Provider:** If user registers and gets an DNS account in the parental control provider website, expecting to enjoy a more reliable and safer internet surfing environment, please select this option (need to configure at Parental Control Provider).

➢ IPv6:

IPv6 DNS Server's operation is similar to IPv4 DNS server. There are two modes to get DNS server address: Auto and Static mode.

Obtain IPv6 DNS info from a WAN interface

WAN Interface selected: Select one configured IPv6 WAN connection from the drop-down menu to be as an IPv6 DNS.

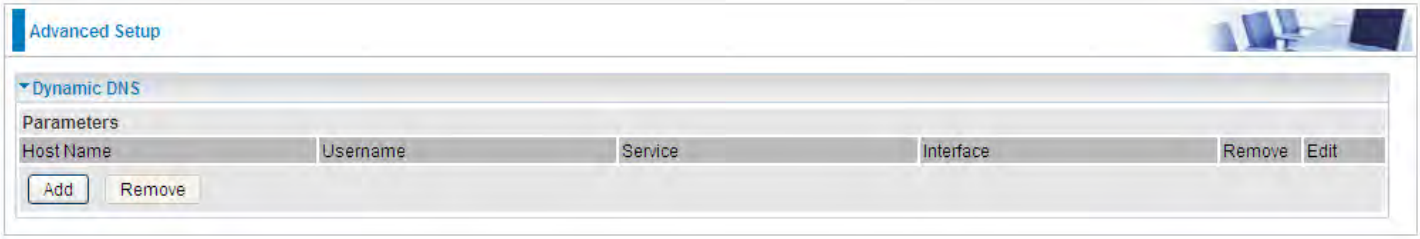
Use the following Static IPv6 DNS address

Primary IPv6 DNS Server / Secondary IPv6 DNS Server: Type the specific primary and secondary IPv6 DNS Server address.

Dynamic DNS

The Dynamic DNS function allows you to alias a dynamic IP address to a static hostname, allowing users whose ISP does not assign them a static IP address to use a domain name. This is especially useful for hosting servers via your ADSL connection, so that anyone wishing to connect to you may use your domain name, rather than having to use your dynamic IP address, which changes from time to time. This dynamic IP address is the WAN IP address of the router, which is assigned to you by your ISP.

Here users can register different WAN interfaces with different DNS(es).



Click **Add** to register a WAN interface with the exact DNS.

You will first need to register and establish an account with the Dynamic DNS provider using their website, for example **http://www.dyndns.org/**

Dynamic DNS Server: Select the DDNS service you have established an account with.

Host Name, Username and Password: Enter your registered domain name and your username and password for this service.

Period: Set the time period between updates, for the Router to exchange information with the DDNS server. In addition to updating periodically as per your settings, the router will perform an update when your dynamic IP address changes.

Selected WAN Interface: Select the Interface that is bound to the registered Domain name.

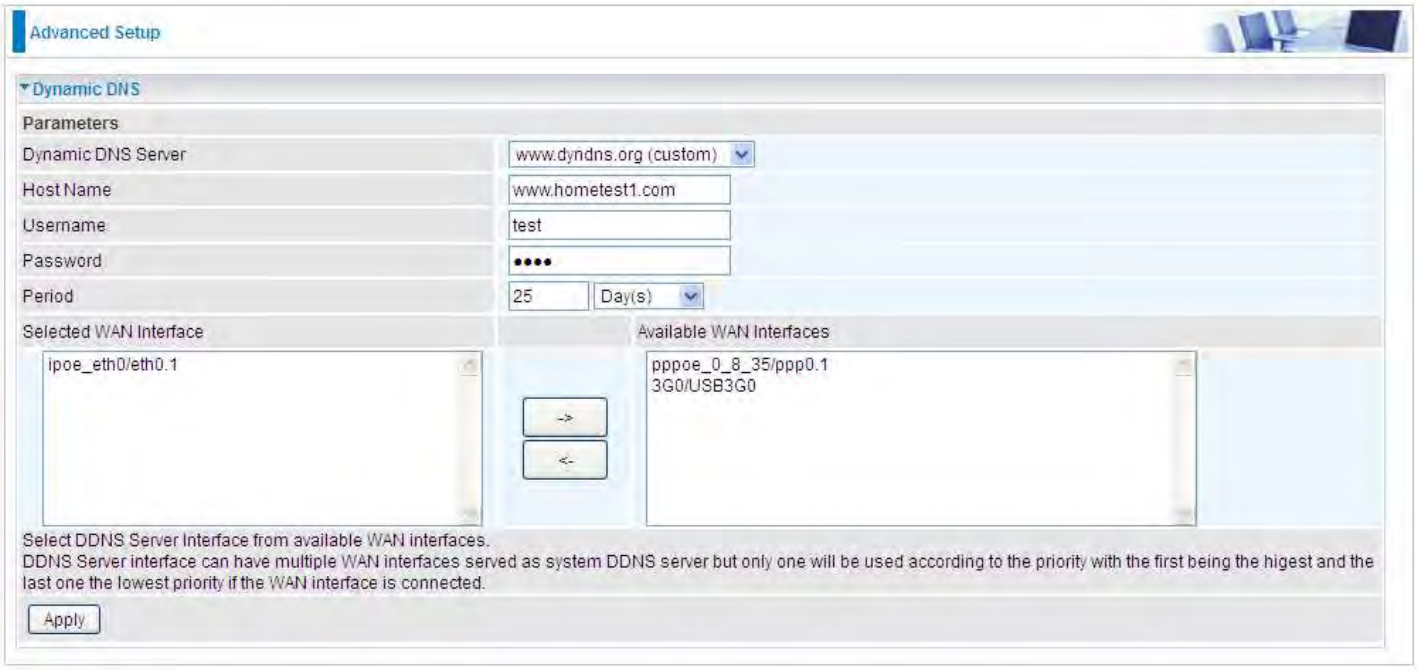
User can register different DDNS to different interfaces.

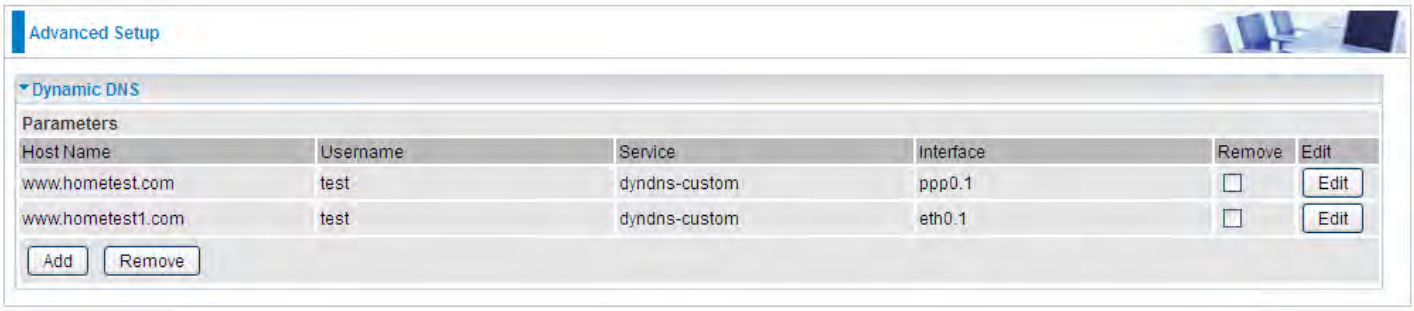
Examples: **Note** first users have to go to the Dynamic DNS registration service provider to register an account.

User ***test*** register two Dynamic Domain Names in DDNS provider **http://www.dyndns.org/** .

1. pppoe_0_8_35 with DDNS: www.hometest.com using username/password test/test

2. ipoe_eth0 with DDNS: www.hometest1.com using username/password test/test.





DNS Proxy

DNS proxy is used to forward request and response message between DNS Client and DNS Server.

Hosts in LAN can use router serving as a DNS proxy to connect to the DNS Server in public to correctly resolve Domain name to access the internet.

DNS Proxy: Select whether to enable or disable DNS Proxy function, default is enabled.

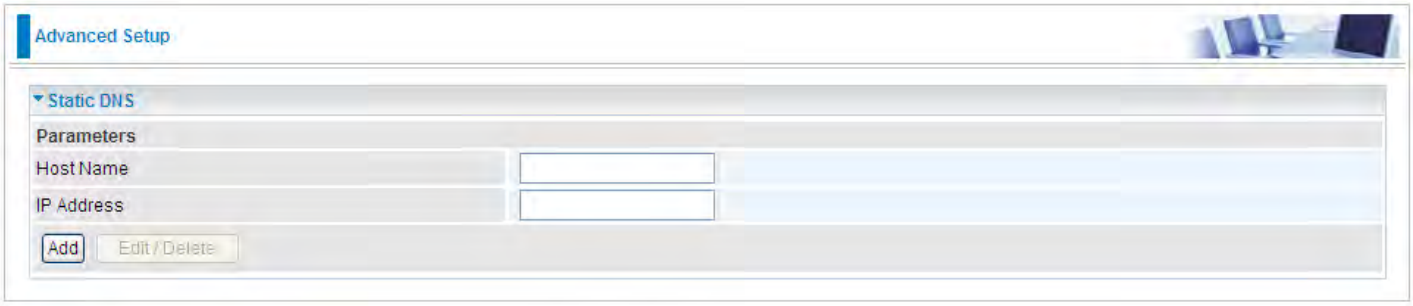
Host name of the Broadband Router: Enter the host name of the router. Default is home.gateway.

Domain name of the LAN network: Enter the domain name of the LAN network. home.gateway.

Static DNS

Static DNS is a concept relative to Dynamic DNS; in static DNS system, the IP mapped is static without change.

You can map the specific IP to a user-friendly domain name. In LAN, you can map a PC to a domain name for convenient access. Or you can set some well-known Internet IP mapping item so your router will response quickly for your DNS query instead of querying from the ISP's DNS server.



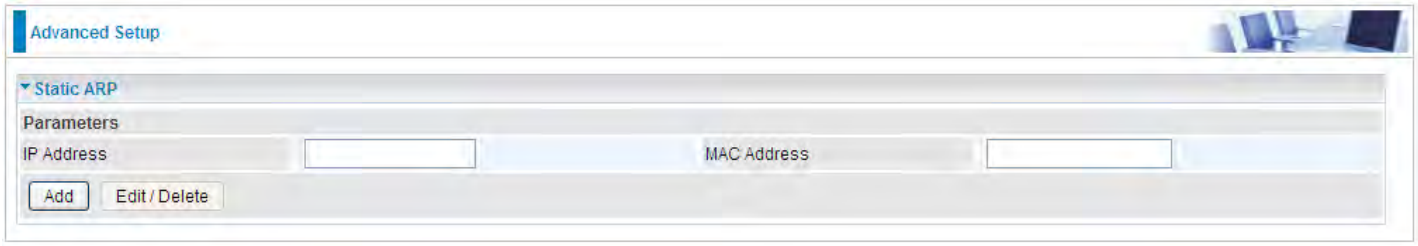
Host Name: Type the domain name (host name) for the specific IP .

IP Address: Type the IP address bound to the set host name above.

Click **Add** to save your settings.

Static ARP

ARP (Address Resolution Protocol) is a TCP/IP protocol that allows the resolution of network layer addresses into the link layer addresses. And “Static ARP” here allows user to map manually the layer-3 MAC (Media Access Control) address to the layer-2 IP address of the device.



IP Address: Enter the IP of the device that the corresponding MAC address will be mapped to.

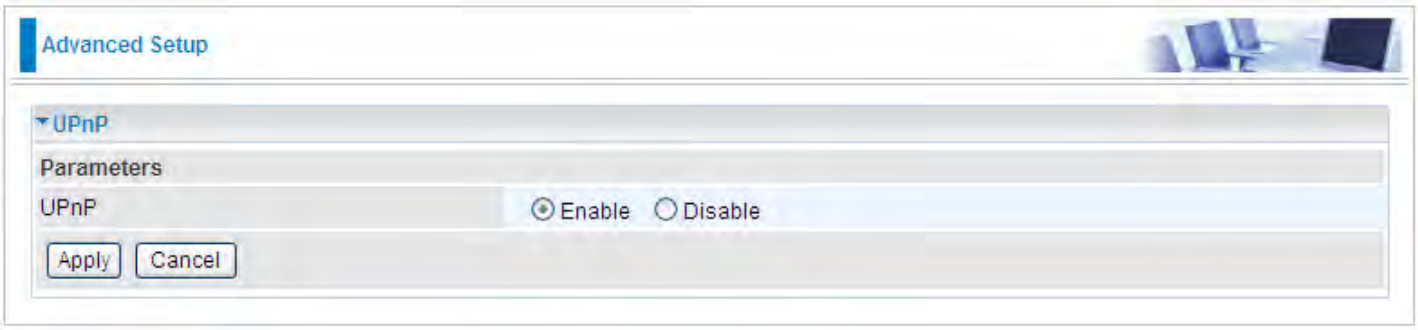
MAC Address: Enter the MAC address that corresponds to the IP address of the device.

Click **Add** to confirm the settings.

UPnP

UPnP offers peer-to-peer network connectivity for PCs and other network devices, along with control and data transfer between devices. UPnP offers many advantages for users running NAT routers through UPnP NAT Traversal, and on supported systems makes tasks such as port forwarding much easier by letting the application control the required settings, removing the need for the user to control advanced configuration of their device.

Both the user's Operating System and the relevant application must support UPnP in addition to the router. Windows XP and Windows Me natively support UPnP (when the component is installed), and Windows 98 users may install the Internet Connection Sharing client from Windows XP in order to support UPnP. Windows 2000 does not support UPnP.

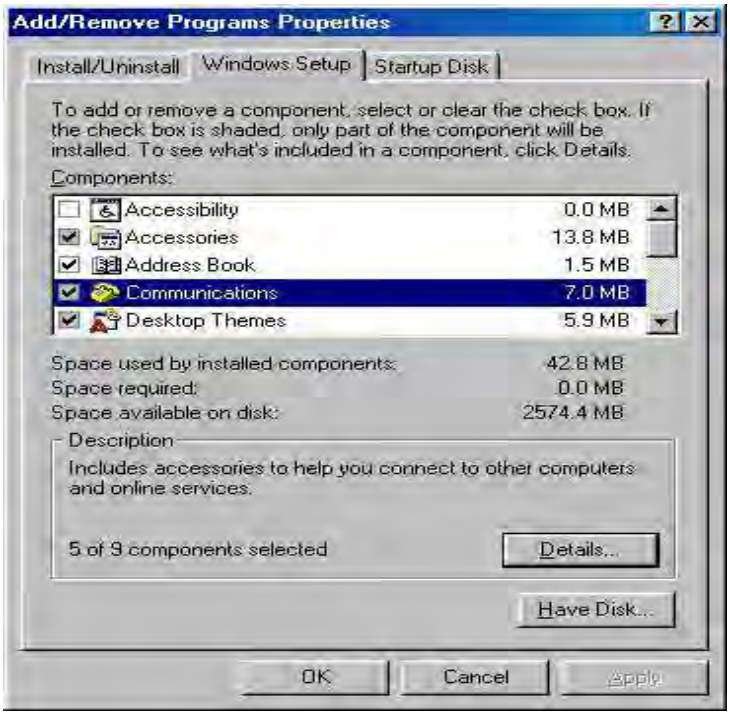


UPnP:

- **Enable:** Check to enable the router's UPnP functionality.
- **Disable:** Check to disable the router's UPnP functionality.

Installing UPnP in Windows Example

Follow the steps below to install the UPnP in Windows Me.
Step 1: Click Start and Control Panel. Double-click Add/Remove Programs.
Step 2: Click on the Windows Setup tab and select Communication in the Components selection box. Click Details.



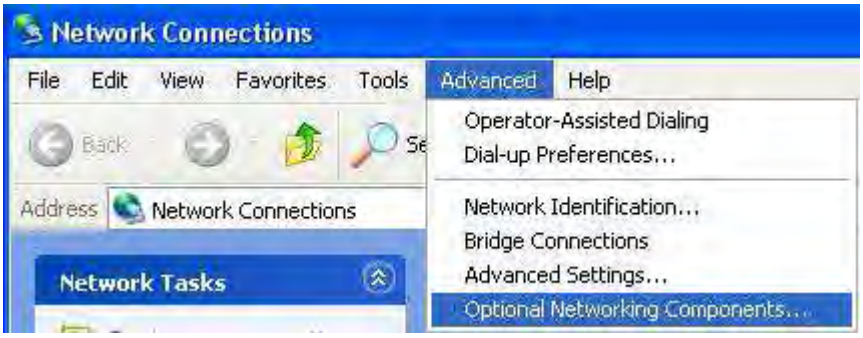
Step 3: In the Communications window, select the Universal Plug and Play check box in the Components selection box.

Step 4: Click OK to go back to the Add/Remove Programs Properties window. Click Next.

Step 5: Restart the computer when prompted.

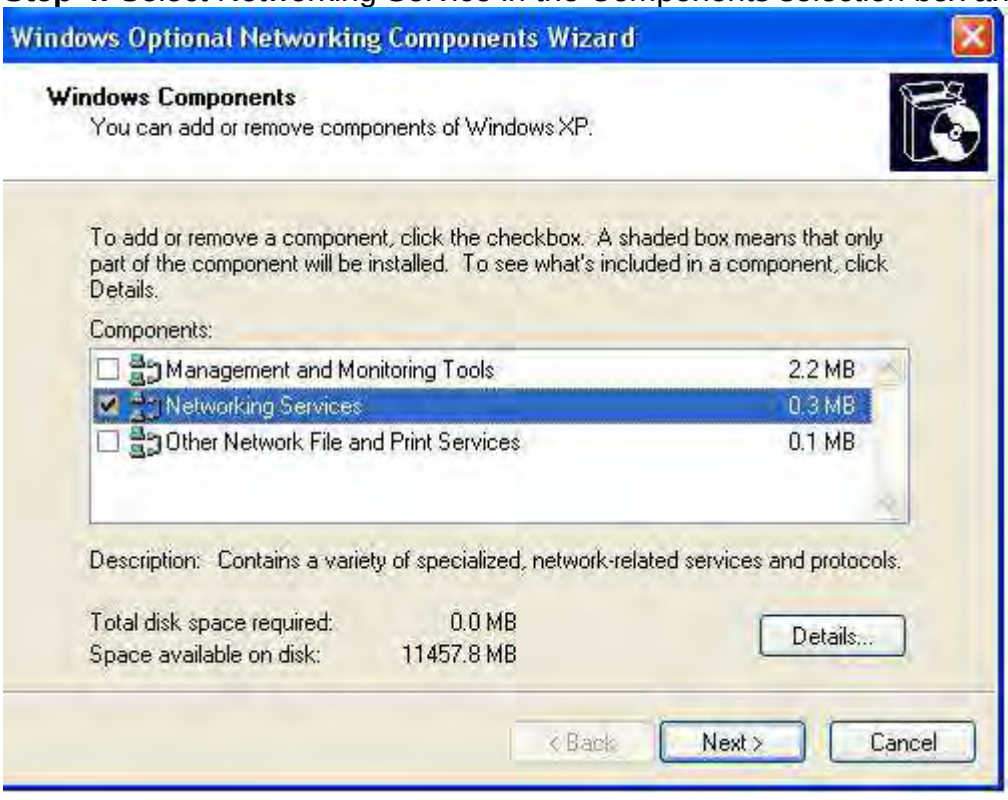
Follow the steps below to install the UPnP in Windows XP.

Step 1: Click Start and Control Panel.
Step 2: Double-click Network Connections.
Step 3: In the Network Connections window, click Advanced in the main menu and select Optional Networking Components ….

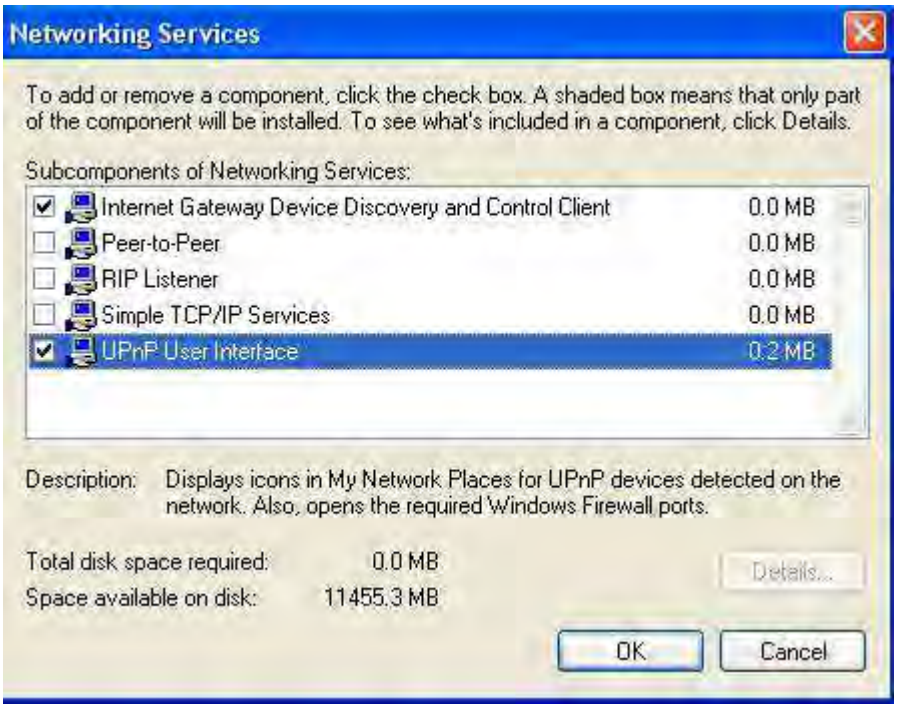


The Windows Optional Networking Components Wizard window displays.

Step 4: Select Networking Service in the Components selection box and click Details.



Step 5: In the Networking Services window, select the Universal Plug and Play check box.
Step 6: Click **OK** to go back to the Windows Optional Networking Component Wizard window and click **Next**.

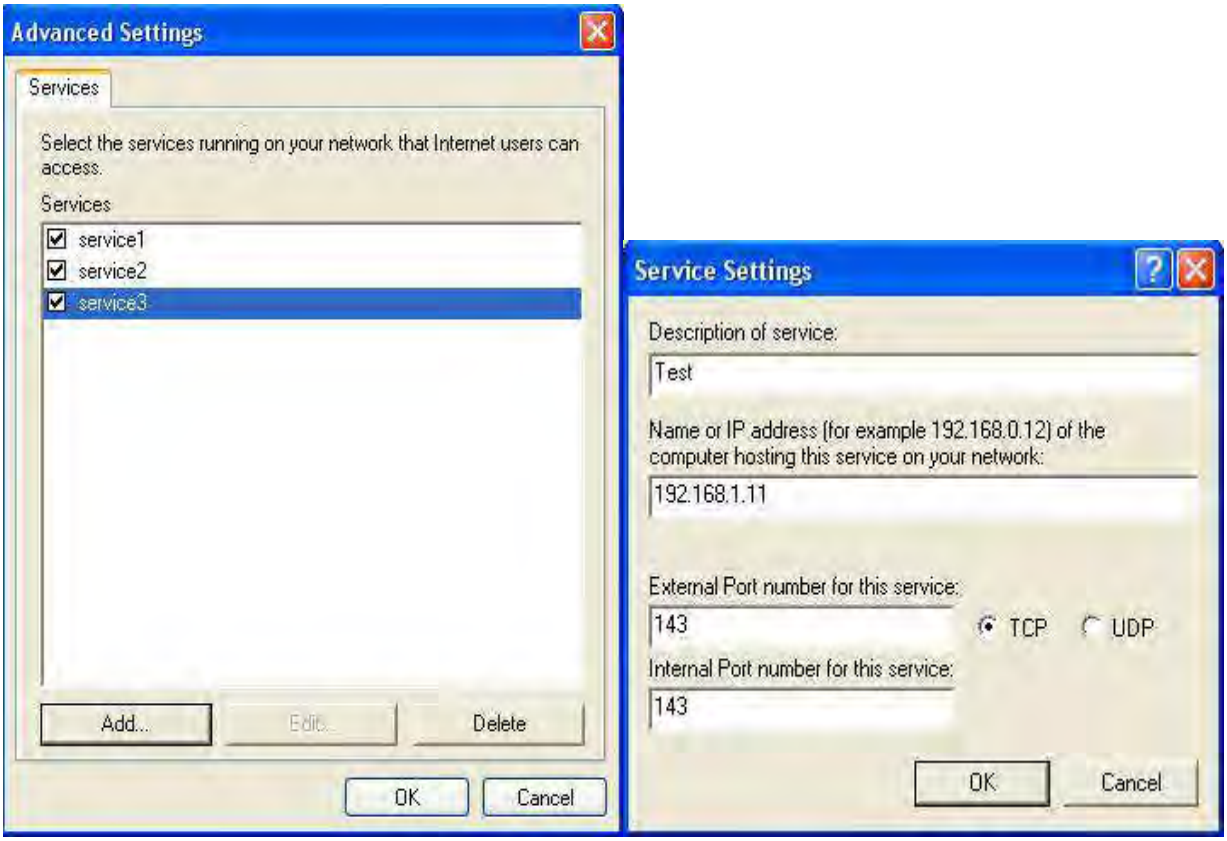


Auto-discover Your UPnP-enabled Network Device

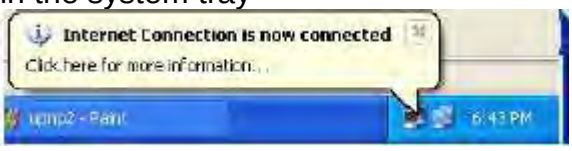
Step 1: Click start and Control Panel. Double-click Network Connections. An icon displays under Internet Gateway.
Step 2: Right-click the icon and select Properties.

Step 3: In the Internet Connection Properties window, click Settings to see the port mappings that were automatically created.

Step 4: You may edit or delete the port mappings or click Add to manually add port mappings.



Step 5: Select Show icon in notification area when connected option and click OK. An icon displays in the system tray

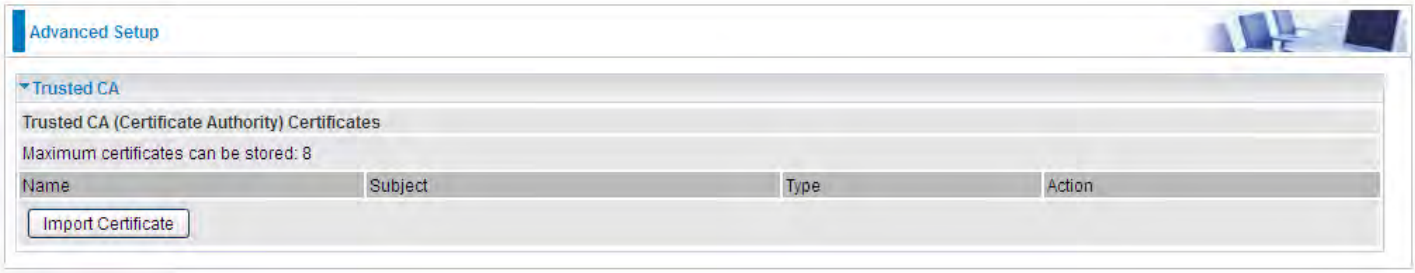


Step 6: Double-click on the icon to display your current Internet connection status.

Certificate

This feature is used for TR069 ACS Server authentication of the device using certificate, if necessary. If the imported certificate doesn't match the authorized certificate of the ACS Server, the device will have no access to the server.

Trusted CA



Certificate Name: The certificate identification name.

Subject: The certificate subject.

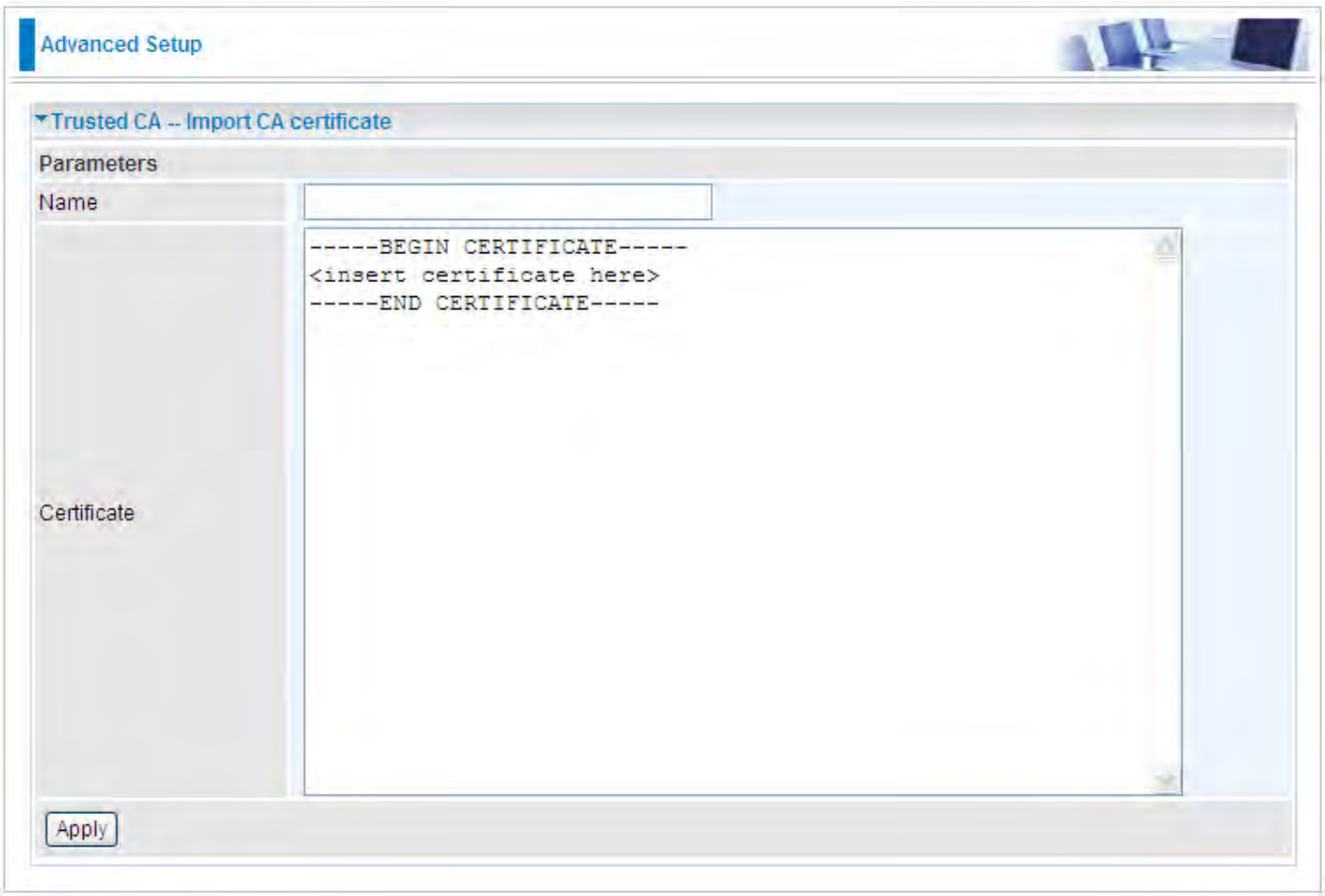
Type: The certificate type information. "ca", indicates that the certificate is a CA-signed certificate. "self", indicates that the certificate is a certificate owner signed one.

"x.509", indicates the certificate is the one created and signed according to the definition of Public-Key System suggested by x.509.

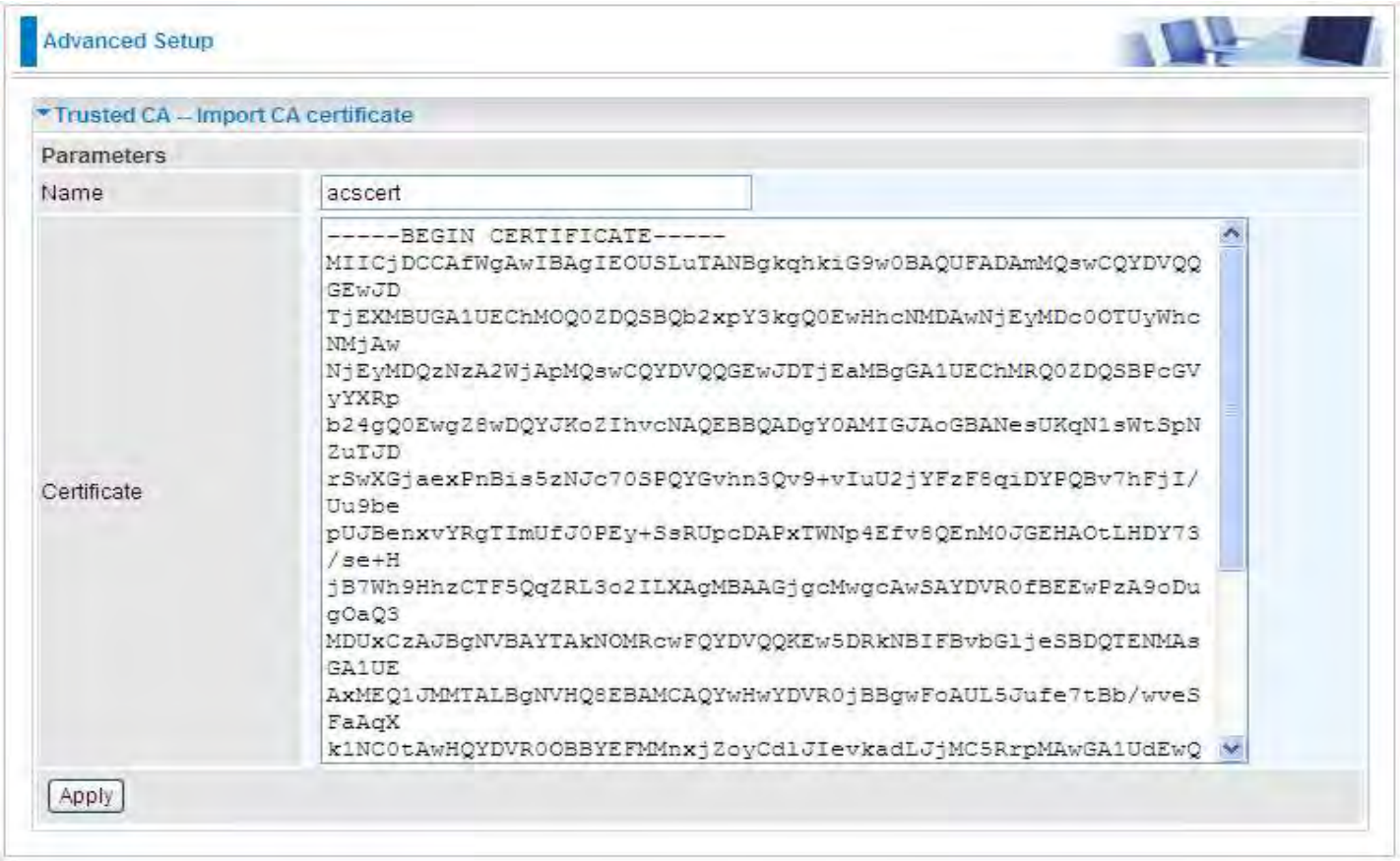
Action:

- View: view the certificate.
- Remove: remove the certificate.

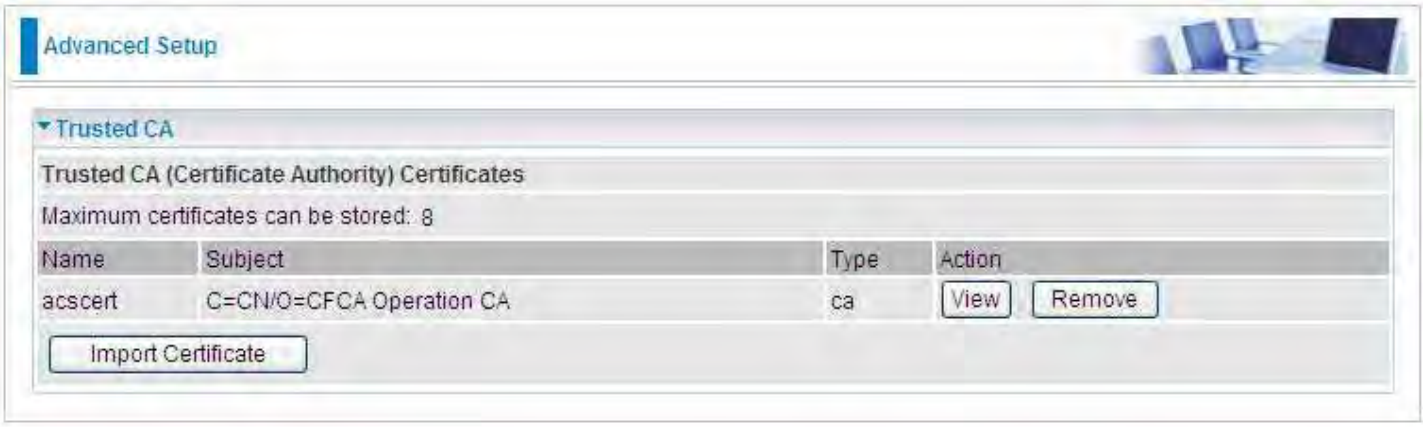
Click **Import Certificate** button to import your certificate.



Enter the certificate name and insert the certificate.



Click **Apply** to confirm your settings.

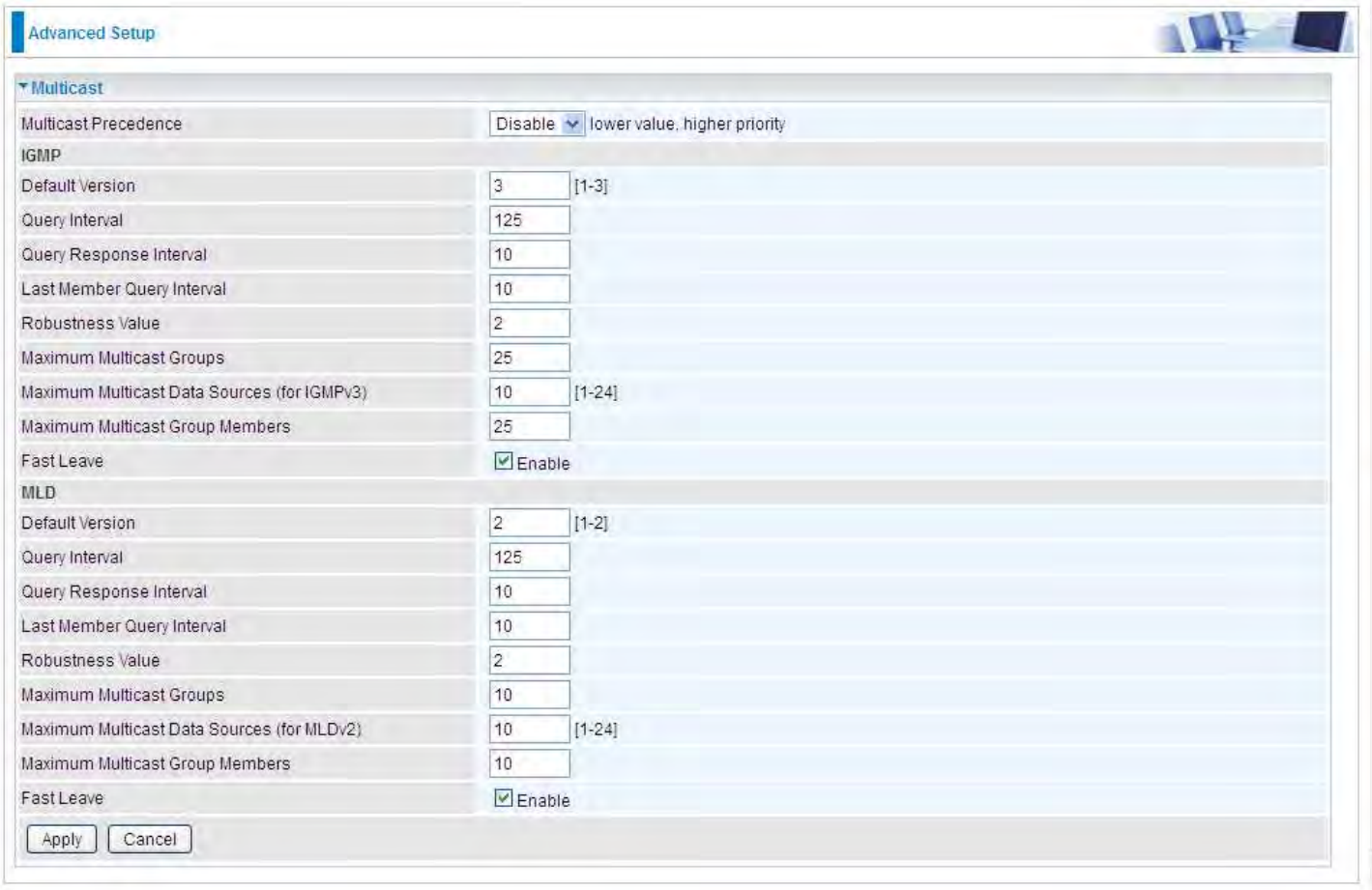


Multicast

Multicast is one of the three network transmission modes, Unicast, Multicast, Broadcast. It is a transmission mode that supports point-to-multipoint connections between the sender and the recipient. IGMP protocol is used to establish and maintain the relationship between IP host and the host directly connected multicast router.

IGMP stands for **Internet Group Management Protocol,** it is a communications protocols used to manage the membership of Internet Protocol multicast groups. IGMP is used by IP hosts and the adjacent multicast routers to establish multicast group members. There are three versions for IGMP, that is IGMPv1, IGMPv2 and IGMPv3.

MLD, short for **Multicast Listener Discovery** protocol, is a component if the Internet Protocol version 6(IPv6) suite. MLD is used by IPv6 to discover multicast listeners on a directly attached link, much as IGMP used in IPv4. The protocol is embedded in ICMPv6 instead of using a separate protocol. MLDv1 is similar to IGMPv2 and MLDv2 is similar to IGMPv3.



IGMP

Multicast Precedence: It is for multicast QoS. With lower multicast precedence, IGMP packets will be put into higher-priority queue. Default is set to disable.

Default Version: Enter the supported IGMP version, 1-3, default is IGMP v3.

Query Interval: Enter the periodic query interval time (sec) the multicast router sending the query message to hosts to understand the group membership information.

Query Response Interval: Enter the response interval time (sec).

Last Member Query Interval: Enter the interval time (sec) the multicast router query the specified group after it has received leave message.

Robustness Value: Enter the router robustness parameter, 2-7, the greater the robustness value, the more robust the Querier is.

Maximum Multicast Groups: Enter the Maximum Multicast Groups.

Maximum Multicast Data Sources(for IGMP v3): Enter the Maximum Multicast Data Sources,1-24.

Maximum Multicast Group Members: Enter the Maximum Multicast Group Members.

Fast leave: Check to determine whether to support fast leave. If this value is enabled, IGMP proxy removes the membership of a group member immediately without sending an IGMP membership query on downstream. This is very helpful if user wants fast channel (group change) changing in cases like IPTV environment.

MLD

Default Version: Enter the supported MLD version, 1-2, default is MLDv2.

Query Interval: Enter the periodic query interval time (sec) the multicast router sending the query message to hosts to understand the group membership information.

Query Response Interval: Enter the response interval time (sec).

Last Member Query Interval: Enter the interval time (sec) the multicast router query the specified group after it has received leave message.

Robustness Value: Enter the router robustness parameter, default is 2, the greater the robustness value, the more robust the Querier is.

Maximum Multicast Groups: Enter the Maximum Multicast Groups.

Maximum Multicast Data Sources(for MLDv2): Enter the Maximum Multicast Data Sources,1-24.

Maximum Multicast Group Members: Enter the Maximum Multicast Group Members.

Fast leave: Check to determine whether to support fast leave. If this value is enabled, MLD proxy removes the membership of a group member immediately without sending an MLD membership query on downstream. This is very helpful if user wants fast channel (group change) changing in cases like IPTV environment.

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Management

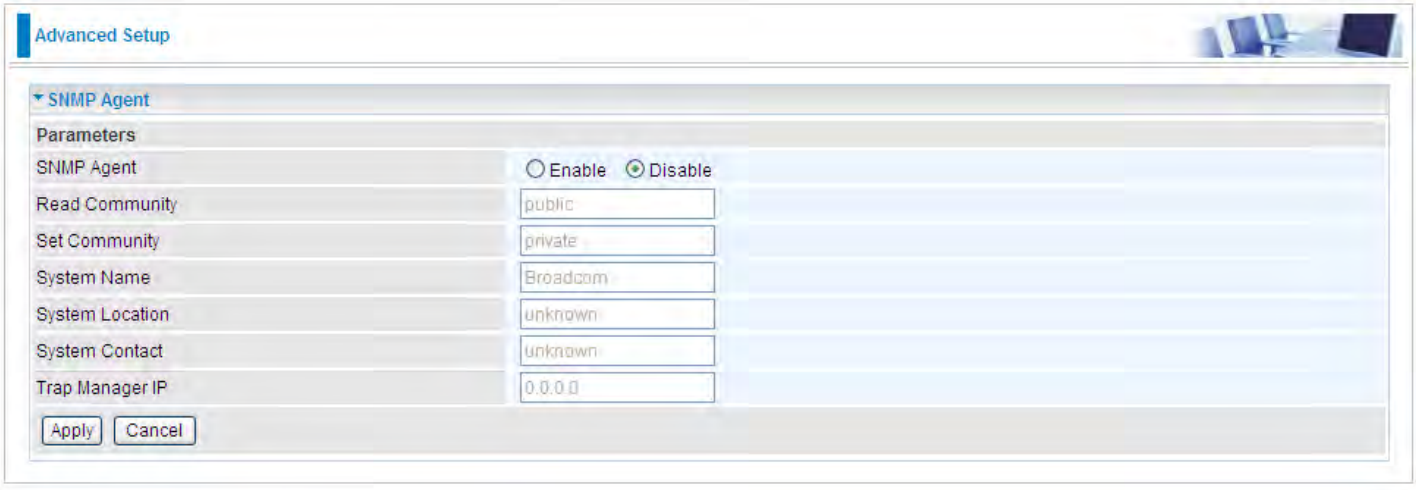
SNMP Agent

SNMP, Simple Network Management Protocol, is the most popular one in network. It consists of SNMP Manager，SNMP Agent and MIB. Every network device supporting SNMP will have a SNMP Agent which is a management software running in the device.

SNMP Manager, the management software running on the server, it uses SNMP protocol to send GetRequest、GetNextRequest, SetRequest message to Agent to view and change the information of the device.

SNMP Agents, the management software running in the device, accepts the message from the manager, Reads or Writes the management variable in MIB accordingly and then generates Response message to send it to the manager. Also, agent will send Trap message to the manager when agent finds some exceptions.

Trap message, is the message automatically sent by the managed device without request to the manager about the emergency events.



SNMP Agent: enable or disable SNMP Agent.

Read Community: Type the Get Community, which is the authentication for the incoming Get-and GetNext requests from the management station.

Set Community: Type the Set Community, which is the authentication for incoming Set requests from the management station.

System Name: here it refers to your router.

System Location: user-defined location.

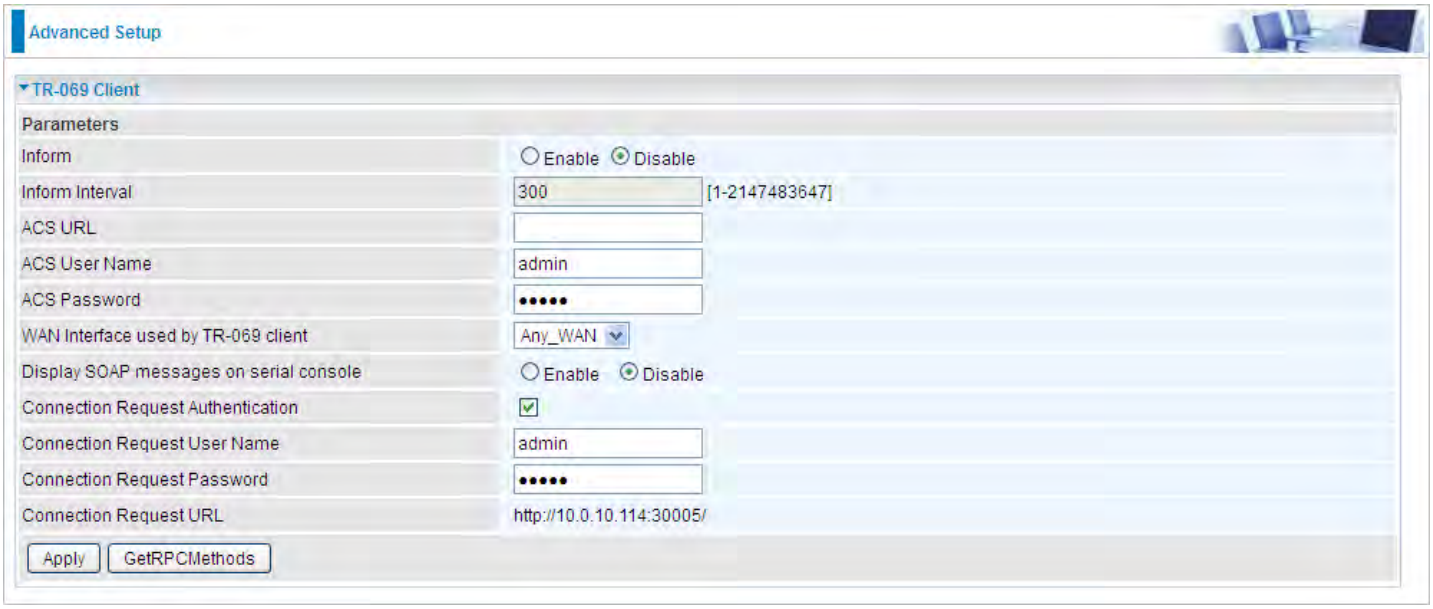
System Contact: user-defined contact message.

Trap manager IP: enter the IP address of the server receiving the trap sent by SNMP agent.

TR- 069 Client

TR-069 (short for Technical Report 069) is a DSL Forum (which was later renamed as Broadband Forum) technical specification entitled CPE WAN Management Protocol (CWMP). It defines an application layer protocol for remote management of end-user devices.

As a bidirectional SOAP/HTTP based protocol it can provides the communication between customer premises equipment (CPE) and Auto Configuration Server (ACS). It includes both a safe configuration and the control of other CPE management functions within an integrated framework. In the course of the booming broadband market, the number of different internet access possibilities grew as well (e.g. modems, routers, gateways, set-top box, VoIP-phones).At the same time the configuration of this equipment became more complicated –too complicated for end-users. For this reason, TR-069 was developed. It provides the possibility of auto configuration of the access types. Using TR-069 the terminals can get in contact with the Auto Configuration Servers (ACS) and establish the configuration automatically and let ACS configure CPE automatically.



Inform: select enable to let CPE be authorized to send Inform message to automatically connect to ACS.

Inform Interval: Specify the inform interval time (sec) which CPE used to periodically send inform message to automatically connect to ACS. When the inform interval time arrives, the CPE will send inform message to automatically connect to ACS.

ACS URL: Enter the ACS server login name.

ACS User Name: Specify the ACS User Name for ACS authentication to the connection from CPE.

ACS password: Enter the ACS server login password.

WAN interface used by TR-069: select the interface used by TR-069.

Display SOAP message on serial console: select whether to display SOAP message on serial console.

Connection Request Authentication: Check to enable connection request authentication feature.

Connection Request User Name: Enter the username for ACS server to make connection request.

Connection Request User Password: Enter the password for ACS server to make connection request.

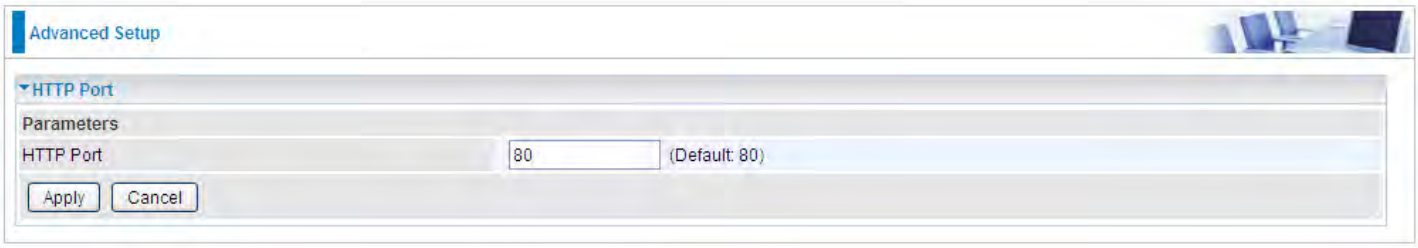
Connection Request URL: Automatically match the URL for ACS server to make connection request.

GetRPCMethods：Supported by both CPE and ACS, display the supported RFC listing methods.

Click **Apply** to apply your settings.

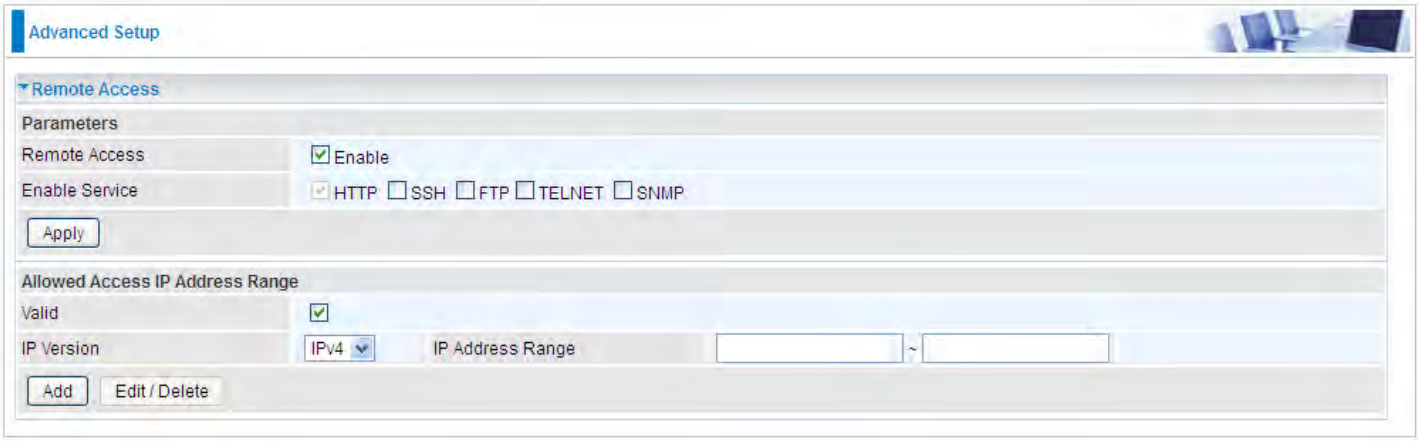
HTTP Port

The device equips user to change the embedded web server accessing port. Default is 80.



Remote Access

It is to allow remote access to the router to view or configure.



Remote Access: Select “Enable” to allow management access from remote side (mostly from internet). If disabled, no remote access is allowed for any IPs even if you set allowed access IP address. So, please note that enabling remote access is an essential step before granting remote access to IPs.

Enable Service: Select to determine which service(s) is (are) allowed for remote access when remote access is enabled. By default (on condition that remote access is enabled), the web service (HTTP) is allowed for remote access.

Click **Apply** button to submit your settings.

"**Allowed Access IP Address Range**" was used to restrict which IP address could login to access system web GUI.

Valid: Enable/Disable Allowed Access IP Address Range

IP Address Range: Specify the IP address Range, IPv4 and IPv6 address range can be supported, users can set IPv4 and IPv6 address range individually.

Click **Add** to add an IP Range to allow remote access.

Note: 1. If user wants to grant remote access to IPs, first enable **Remote Access**.

2. Remote Access enabled:

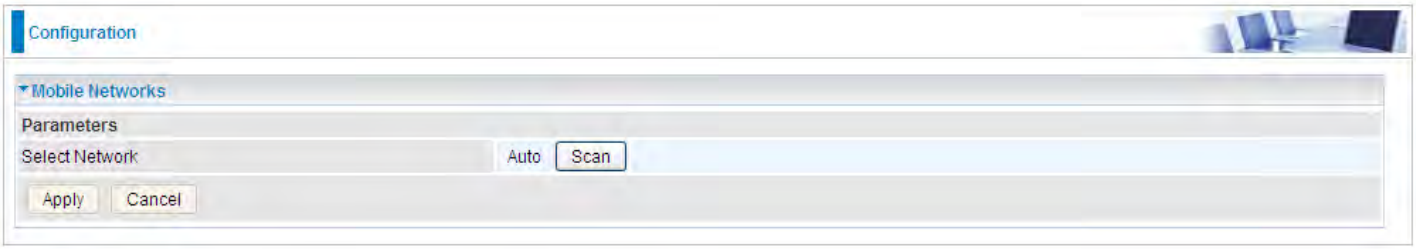
1) Enable ***Valid*** for the specific IP(s) in the IP range to allow the specific IP(s) to remote access the router.

2) Disable ***Valid*** for all specific IP(s) in the IP range to allow any IP(s) to remote access the router.

3) No listing of IP range is to allow any IP(s) to remote access the router.

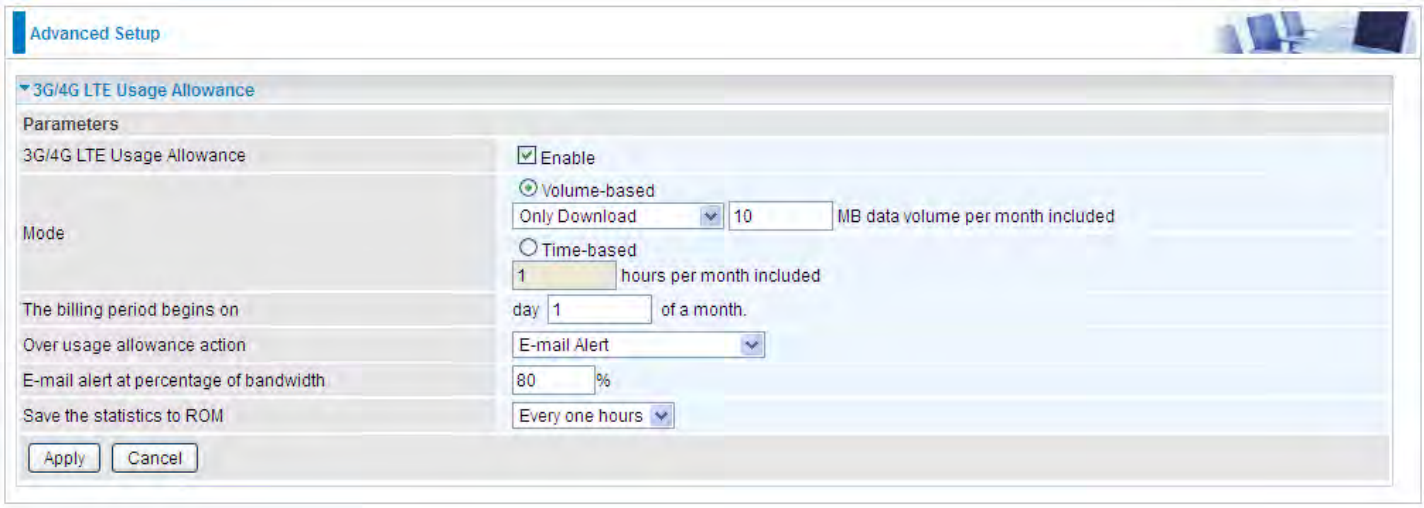
Mobile Networks

User can press **Scan** to discover available 3G/4G LTE mobile network.



3G/4G LTE Usage Allowance

3G/4G LTE usage allowance is designated for users to monitor and control the mobile flow usage.



Mode: include Volume-based and Time-based control.

- **Volume-based** include “only Download”,”only Upload” and “Download and Upload” to limit the flow.
- **Time-based** control the flow by providing specific hours per month.

The billing period begins on: The beginning day of billing each month.

Over usage allowance action: What to do when the flow is over usage allowance, the available methods are “E-mail Alert”, ”Email Alert and Disconnect” and “Disconnect”.

E-mail alert at percentage of bandwidth: When the used bandwidth exceeds the set proportion, the system will send email to alert.

Save the statistics to ROM: To save the statistics to ROM system.

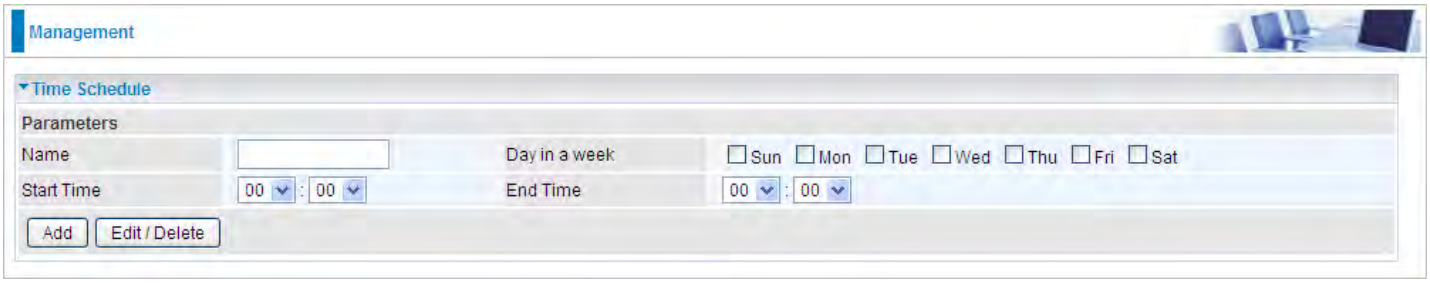
Power Management

Power management is a feature of some electrical appliances, especially computers that turn off the power or switch to a low-power state when inactive.

Five main parameters are listed for users to check to manage the performance of the router.

Time Schedule

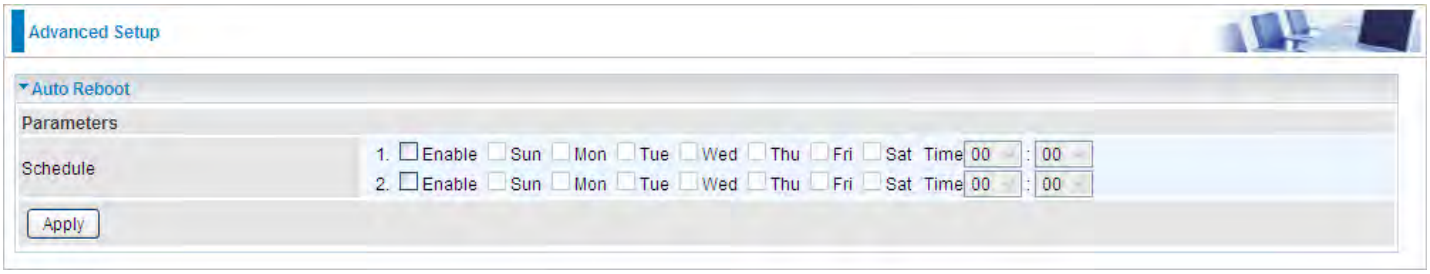
The Time Schedule supports up to **32** timeslots which helps you to manage your Internet connection. In each time profile, you may schedule specific day(s) i.e. Monday through Sunday to restrict or allowing the usage of the Internet by users or applications.
This Time Schedule correlates closely with router's time, since router does not have a real time clock on board; it uses the Simple Network Time Protocol (SNTP) to get the current time from an SNTP server from the Internet.



For example, user can add a timeslot named "timeslot1" which features a period of 9:00-19:00 on every weekday.

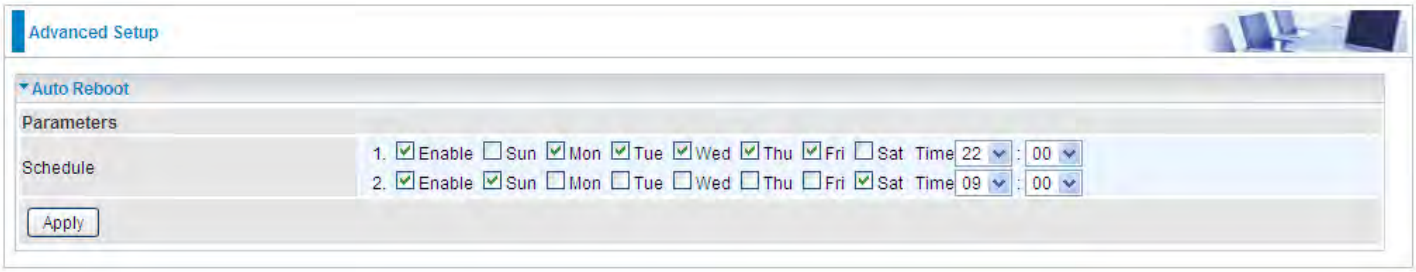
Auto Reboot

Auto reboot offers flexible rebooting service (reboot with the current configuration) of router for users in line with scheduled timetable settings.



Enable to set the time schedule for rebooting.

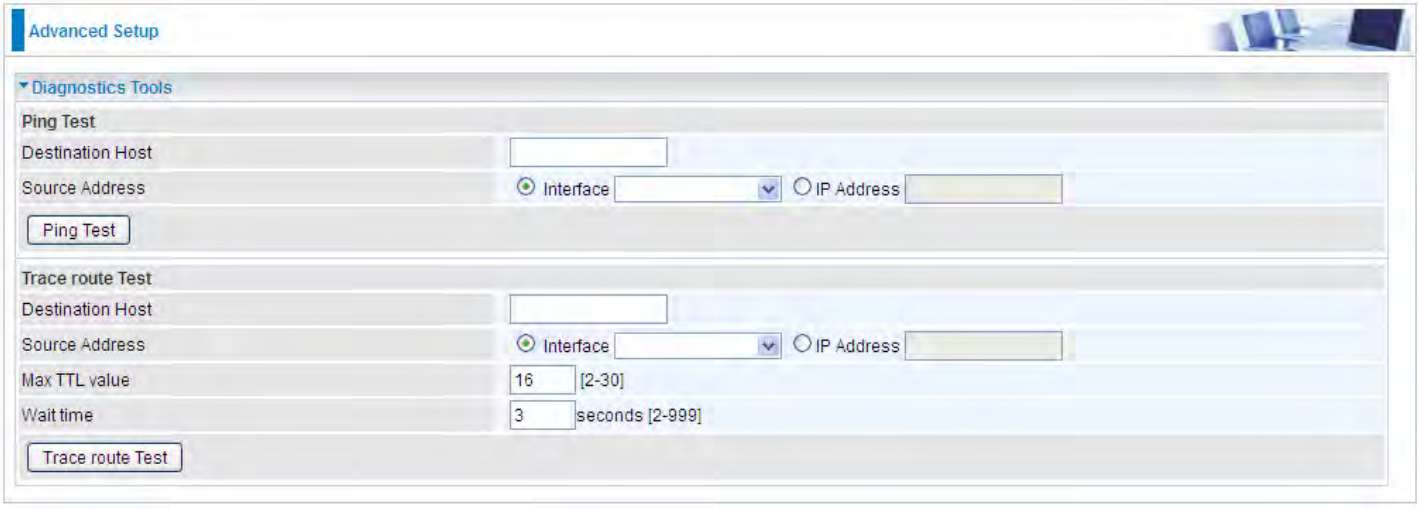
For example, the router is scheduled to reboot at 22:00 every single weekday, and to reboot at 9:00 on Saturday and Sunday. You can set as follows:



Diagnostics

Diagnostics Tools

BiPAC 8900X *R3* offers diagnostics tools including “Ping” and “Trace route test” tools to check for problems associated with network connections.



Ping Test: to verify the connectivity between source and destination.

Destination Host: Enter the destination host (IP, domain name) to be checked for connectivity.

Source Address: Select or set the source address to test the connectivity from the source to the destination.

Ping Test: Press this button to proceed ping test.

Trace route Test: to trace the route to see how many hops (also see the exact hops) the packet of data has to take to get to the destination.

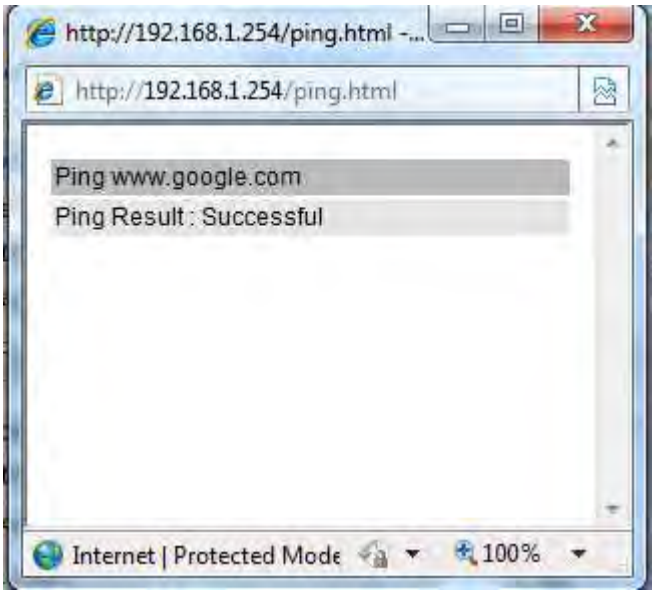
Destination Host: Set the destination host (IP, domain name) to be traced.

Source Address: Select or set the source address to trace the route from the source to the destination.

Max TTL value: Set the max Time to live (TTL) value.

Wait time: Set waiting time for each response in seconds.

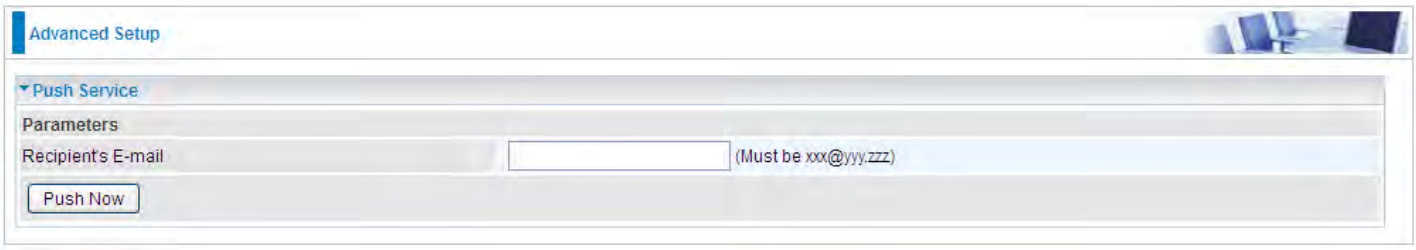
Example: Ping www.google.com



Example: “trace” www.google.com

Push Service

With push service, the system can send email messages with consumption data and system information.

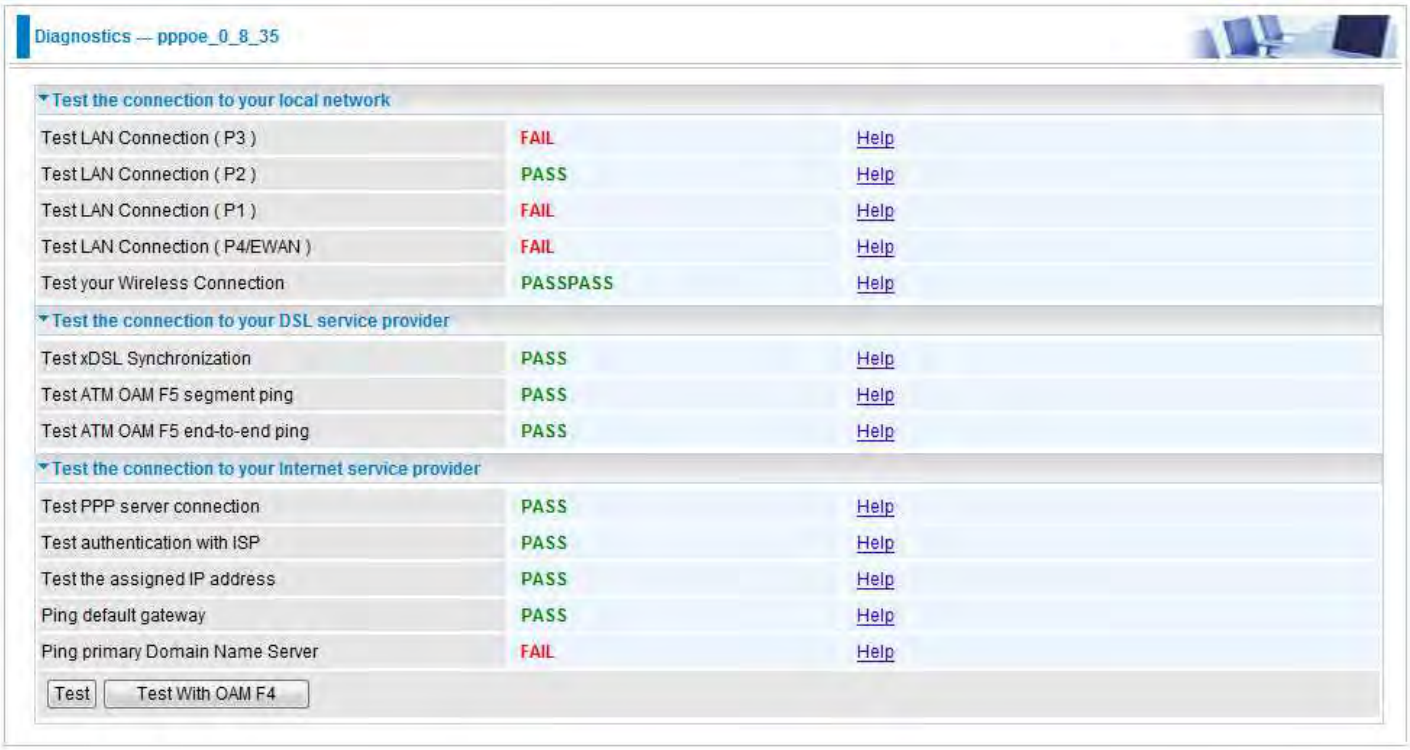


Recipient's E-mail: Enter the destination mail address. The email is used to receive ***system log*** , ***system configuration***, ***security log*** sent by the device when the **Push Now** button is pressed (information sent only when pressing the button), but the mail address is not remembered.

Note: Please first set correct the SMTP server parameters in Mail Alert.

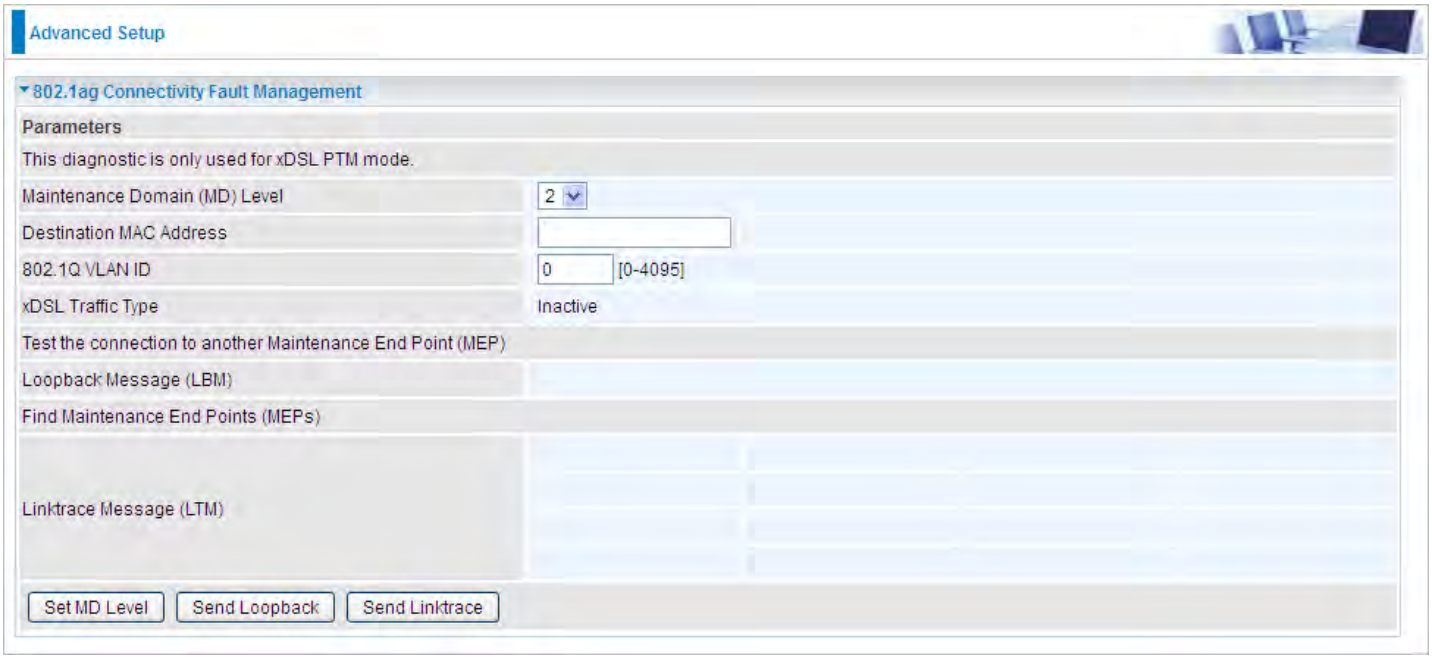
Diagnostics

Check the connections, including Ethernet connection, Internet Connection and wireless connection. Click ***Help*** link that can lead you to the interpretation of the results and the possible, simply troubleshooting.



Fault Management

IEEE 802.1ag Connectivity Fault Management (CFM) is a standard defined by IEEE. It defines protocols and practices for OAM (Operations, Administration, and Maintenance) for paths through 802.1 bridges and local area networks (LANs). Fault Management is to uniquely test the VDSL PTM connection; Push service



Maintenance Domain (MD) Level: Maintenance Domains (MDs) are management spaces on a network, typically owned and operated by a single entity. MDs are configured with Names and Levels, where the eight levels range from 0 to 7. A hierarchal relationship exists between domains based on levels. The larger the domain, the higher the level value.

Maintenance End Point: Points at the edge of the domain, define the boundary for the domain. A MEP sends and receives CFM frames through the relay function, drops all CFM frames of its level or lower that come from the wire side.

Link Trace: Link Trace messages otherwise known as Mac Trace Route are Multicast frames that a MEP transmits to track the path (hop-by-hop) to a destination MEP which is similar in concept to User Datagram Protocol (UDP) Trace Route. Each receiving MEP sends a Trace route Reply directly to the Originating MEP, and regenerates the Trace Route Message.

Loop-back: Loop-back messages otherwise known as MaC ping are Unicast frames that a MEP transmits, they are similar in concept to an Internet Control Message Protocol (ICMP) Echo (Ping) messages, sending Loopback to successive MIPs can determine the location of a fault. Sending a high volume of Loopback Messages can test bandwidth, reliability, or jitter of a service, which is similar to flood ping. A MEP can send a Loopback to any MEP or MIP in the service. Unlike CCMs, Loop back messages are administratively initiated and stopped.

Ethernet OAM

8900X *R3* offers industry standard OAM capabilities to enable network providers to provision and operate their networks with full visibility and control, simply and efficiently to minimize ongoing OPEX.

Both peers should be Ethernet-OAM-enabled.

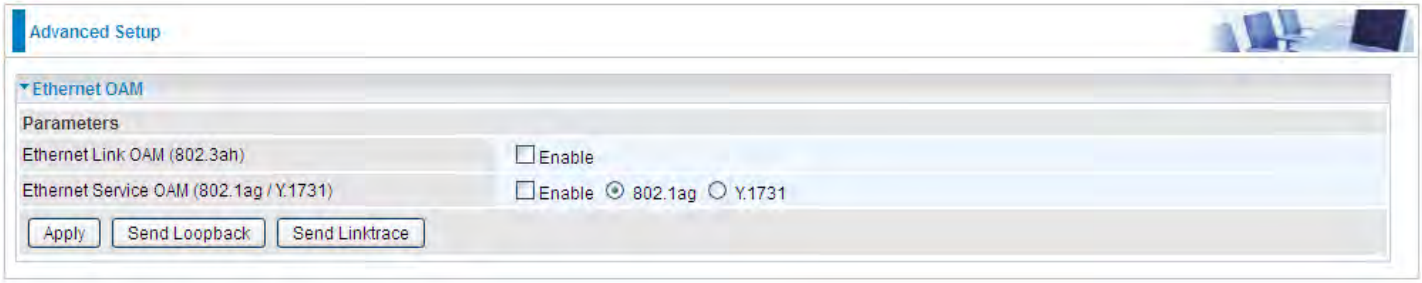
There are two phases of how Ethernet OAM is usually realized:

1.) **Ethernet Link OAM:** Ethernet in the First Mile (EFM) Link OAM as defined in IEEE 802.3ah, Designed for testing and maintaining access links between EFM-OAM-enabled devices on L2. It includes a set of discovery, link monitoring, remote failure detection and remote loop-back protocols.

2). **Ethernet Service OAM (802.1ag/Y1.1731):** designed to detect and isolate connectivity faults within the customer service path and ensure a health service end to end.

802/1ag/CFM enable Ethernet services to be partitioned into maintenance domains with maintenance endpoints (MEP) and intermediate points (MIP) across which continuity check, link trace and loopback tests can be performed as needed to validate connection integrity.

Y1.1731 extends beyond CFM (802.1ag) to support performance monitoring and testing of key Ethernet service attributes including frame loss, frame delay, and frame delay variation, which are necessary for ensuring conformance to SLAs and verifying end to end service quality.



Ethernet Link OAM(802.3ah): Enable to activate Ethernet in the First Mile (EFM) Link OAM to do link fault management.

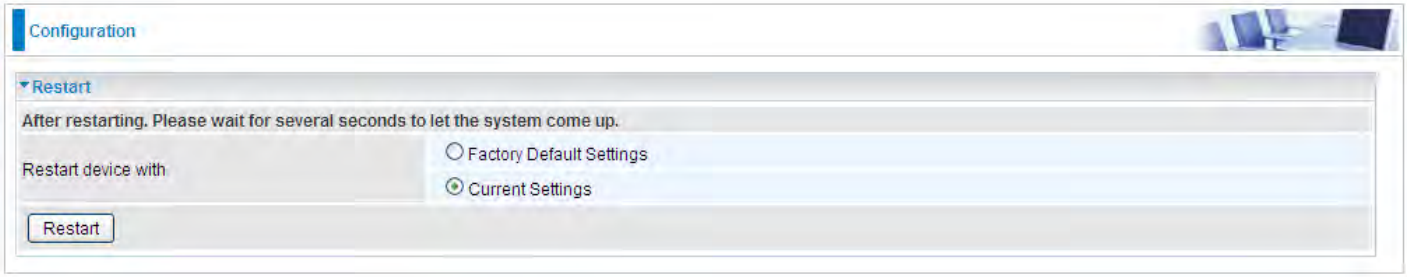
Ethernet Service OAM (802.1ag/Y1.1731): Enable to activate Ethernet Service OAM check mechanism, including connectivity fault management and performance monitoring..

Linktrace: Operators trigger linktrace protocol to perform path discovery and fault isolation in their networks.Link Trace messages otherwise known as Mac Trace Route are Multicast frames that a MEP transmits to track the path (hop-by-hop) to a destination MEP which is similar in concept to User Datagram Protocol (UDP) Trace Route. Each receiving MEP sends a Trace route Reply directly to the Originating MEP, and regenerates the Trace Route Message.

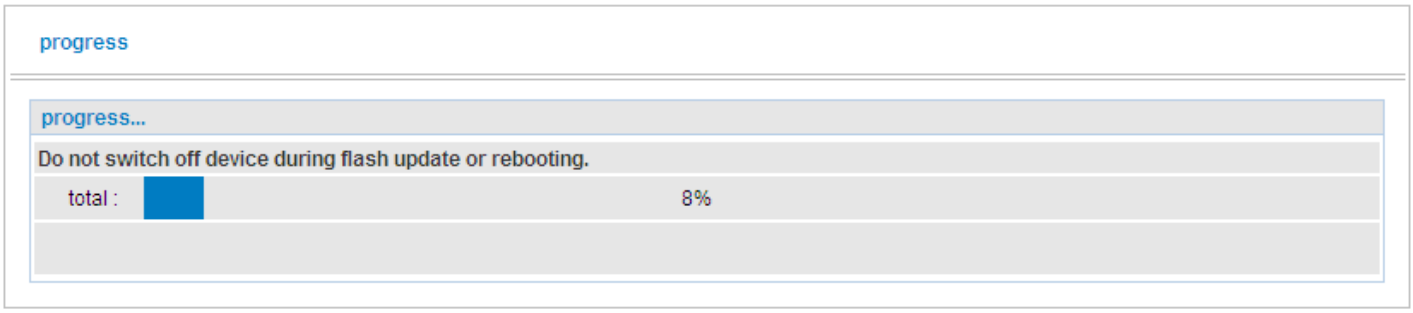
Loopback: Loopback protocol is used to verify and isolate connectivity faults. Loop-back messages otherwise known as Mac ping are Unicast frames that a MEP transmits, they are similar in concept to an Internet Control Message Protocol (ICMP) Echo (Ping) messages, sending Loop-back to successive MIPs can determine the location of a fault. Sending a high volume of Loop-back Messages can test bandwidth, reliability, or jitter of a service, which is similar to flood ping. A MEP can send a Loop-back to any MEP or MIP in the service. Unlike CCMs, Loop back messages are administratively initiated and stopped.

Restart

This section lets you restart your router if necessary. Click Restart in the low right corner of each configuration page.



If you wish to restart the router using the factory default settings (for example, after a firmware upgrade or if you have saved an incorrect configuration), select Factory Default Settings to reset to factory default settings. Or you just want to restart after the current setting, the select the Current Settings, and Click Restart.



Chapter 5: Troubleshooting

If your router is not functioning properly, please refer to the suggested solutions provided in this chapter. If your problems persist or the suggested solutions do not meet your needs, please kindly contact your service provider or Billion for support.

Problems with the router

Problem	Suggested Action
None of the LEDs is on when you turn on the router	Check the connection between the router and the adapter. If the problem persists, most likely it is due to the malfunction of your hardware. Please contact your service provider or Billion for technical support.
You have forgotten your login username or password	Try the default username "admin" and password "admin". If this fails, you can restore your router to its factory settings by pressing the reset button on the device rear side.

Problems with WAN interface

Problem	Suggested Action
Frequent loss of DSL line sync (disconnections)	Ensure that all other devices connected to the same telephone line as your router (e.g. telephones, fax machines, analogue modems) have a line filter connected between them and the wall socket (unless you are using a Central Splitter or Central Filter installed by a qualified and licensed electrician), and ensure that all line filters are correctly installed and the right way around. Missing line filters or line filters installed the wrong way around can cause problems with your DSL connection, including causing frequent disconnections. If you have a back-to-base alarm system you should contact your security provider for a technician to make any necessary changes.

Problem with LAN interface

Problem	Suggested Action
Cannot PING any PC on LAN	Check the Ethernet LEDs on the front panel. The LED should be on for the port that has a PC connected. If it does not lit, check to see if the cable between your router and the PC is properly connected. Make sure you have first uninstalled your firewall program before troubleshooting.
	Verify that the IP address and the subnet mask are consistent for both the router and the workstations.

Appendix: Product Support & Contact

If you come across any problems please contact the dealer from where you purchased your product.

Contact Billion

Worldwide:

http://www.billion.com

Federal Communication Commission Interference Statement

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 or more 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

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

(2) This device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. . This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC 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.