G.SHDSL.BIS
VPN ROUTER

USER MANUAL

VERSION 1.00

1 Introduction

1.1 Descriptions

IP62xF series G.SHDSL.bis VPN Router is a high performance 4-port Security Gateway providing Internet access and LAN-to-LAN application over existing copper line for small/medium office. Complying with the latest G.SHDSL.bis technology, ITU-T G.991.2 (2004) standard, IP62xF series offer data transmission rates of up to 5.696Mbps in 2-wire mode, 11.392Mbps in 4-wire mode and 22.784Mbps in 8-wire mode.

IP62xF series VPN Router is integrated high-end Bridging/Routing capabilities with advanced functions of Multi-DMZ, Virtual Server mapping, and VPN pass-through. Because of rapid growth of network, virtual LAN has become one of the major new areas in internetworking industry. IP62xF support port-based VLAN and IEEE 802.1q VLAN over ATM network.

With always on connection that DSL features, IP62xF series VPN routers provide advanced firewall with Stateful Packet Inspection (SPI) and Denial of Service (DoS) protection, serving as a powerful firewall to protect from outside intruders of secure connection. It also supports IP precedence to classify and prioritize types of IP traffic. In additional, its VPN feature supports data transmission over the Internet by data encryption/decryption between two sites. VPNs feature allows replacing a private leased line to minimize the expense among global inter-connection.

Not only the much higher bandwidth than convention symmetric digital subscriber loop, IP62xF series also provide the network administrators tool of Quality of Service (QoS) to allocate network resources effectively. By classify the priority of services, the functions of bandwidth management increases efficiency and productivity on specific demands such as VoIP, video streaming, video-conferencing or interactive game applications to guarantee all the application get the deserved service quality.

1.2 Features

- Easy configuration and management with password control for various application environments
- Efficient IP routing and transparent learning bridge to support Internet broadband services
- Virtual LANs (VLANs) offer significant benefit in terms of efficient use of bandwidth, flexibility, performance and security
- VPN for safeguarded connections
- Built-in advanced SPI firewall
- IP precedence to partition the traffic into multiple classes of service
- Four 10/100M Base-T Auto-sensing, Auto-negotiation and Auto-MDI/MDIX switching port for flexible local area network connectivity
- USB ports for 3.5G USB dangle modem for Internet access backup(For USB models only)
- Fully ATM protocol stack implementation over SHDSL.bis
- PPPoA and PPPoE support user authentication with PAP/CHAP/MS-CHAP/MS-CHAPv2
- SNMP management with SNMPv1/v2c/v3 agent and MIB II
- Getting enhancements and new features via Internet software upgrade

1.3 Specifications

- **Hardware Interface**
  - ***WAN Port:***
    - SHDSL.bis: ITU-T G.991.2 (2004) Annex A/B/F/G supported
    - Encoding scheme: TC-PAM 16/ TC-PAM 32
    - Data Rate: N x 64kbps (N= 3 ~ 89, 89 as default) (For IP622F and IP622F/U)
    - Data Rate: N x 128kbps (N= 3 ~ 89, 89 as default) (For IP624F and IP624F/U)
    - Data Rate: N x 256kbps (N= 3 ~ 89, 89 as default) (For IP628F and IP628F/U)
    - Impedance: 135 ohms
  - ***LAN Port:*** 4-Ports 10/100M Switch supports
    - Auto-negotiation for 10/100Base-TX and Half/Full Duplex
    - Auto-MDIX
  - ***USB Port:*** 2-ports **USB** (For IP622F/U, IP624F/U and IP628F/U)
    - USB 2.0
  - ***Serial Console Port:*** RJ45 connector
  - ***Factory Default Reset:*** Push Button
  - ***LED:***
    - Power (Green)
    - WAN LINK/ACT(Green), one LED per pair
    - LAN (Port 1~port 4) LINK/ACT (Green)

- ALARM (Red)

- **Bridging and VLAN**
  - IEEE 802.1D Transparent Learning Bridge
  - IEEE 802.1Q and Port Based VLAN
  - Spanning Tree Protocol (STP)
  - Up to 2K Mac Address

- **Routing**
  - Static routing and RIP v1/v2(RFC 1058/2453)
  - NAT/PAT (RFC1631)
  - NAT Application Level Gateways
  - Skype/MSN/Yahoo Messenger (RFC2933)
  - VoIP(SIP) pass through
  - VPN PPTP/L2TP pass through
  - Virtual Server

- **Network Protocol**
  - IPv4 (ARP/RARP, TCP/UDP,ICMP)
  - DHCP Client/Server, Relay
  - DNS Relay/Proxy, Dynamic DNS(DDNS)
  - IGMP v1/v2/v3, IGMP Proxy, IGMP Snooping
  - SNTP and UPnP

- **ATM**
  - 8 PVC
  - OAM F4/F5 Loopback
  - AAL5
  - VC Multiplexing and SNAP/LLC
  - Ethernet over ATM (RFC 2684/RFC1483)
  - Multiple protocol over ATM AAL5(MPOA, REF1483/2684)
  - PPP over ATM (RFC 2364)
  - Classic IP over ATM (RFC 1577)
  - QoS(UBR/CBR/VBR/VBR-RT)

- **PPP**
  - PPPoE
  - PAP/CHAP/MS-CHAP/MS-CHAPv2
  - Configurable timer to auto-reconnect,

- Configurable Idle times for timeout

- **QoS**
  - 802.1P Tag
  - IPv4 TOS/DiffServ
  - Class-based Prioritization
  - Class-based Traffic Shaping
  - Class-based DSCP Mark
  - Up to 8 priority queues
  - IP Precedence Alternation

- **VPN**
  - IPSec (RFC2411) up to 4 Tunnels
  - DES/3DES/AES
  - MD5/SHA-1
  - IKE/Manual Key
  - ISAKMP (RFC 2407/2408/4306)
  - IKE v1 (RFC 2409/4109)
  - PSK
  - L2TP/PPTP

- **Firewall**
  - SPI (Stateful Packet Inspection)
  - Intrusion Detection/DoS (Denial of Service)
  - DMZ
  - Content Filtering
  - URL Blocking
  - Packet Filtering/Access Control List (ACL)

- **Management**
  - Web and Telnet management via LAN ports
  - CLI via serial console port
  - Support SSH (RFC4250/4251/4252/4253/4254/4255/4256)
  - SNMP v1/v2c/v3 (RFC 1157/1901//1905)
  - MIB II (RFC 1213/1493)
  - Syslog with Remote Logging support
  - Firmware Upgrade via TFTP
  - Configuration Data Import/Export
  - Multiple Levels of Administration Privilege
  - Support TR-069 WAN management protocol

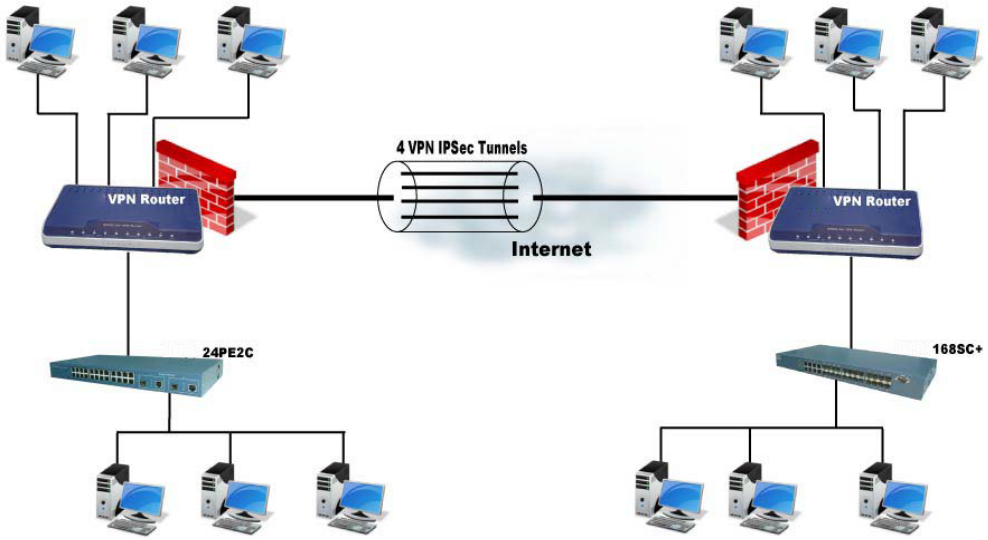
- **Physical / Electrical**
  - Dimensions: 18.7 x 3.3 x 14.5cm (WxHxD)
  - Power: 100~240VAC (via power adapter)
  - Power Consumption: 9 watts Max
  - Temperature: 0~45ºC
  - Humidity: 0%~95%RH (non-condensing)

Model Number list:

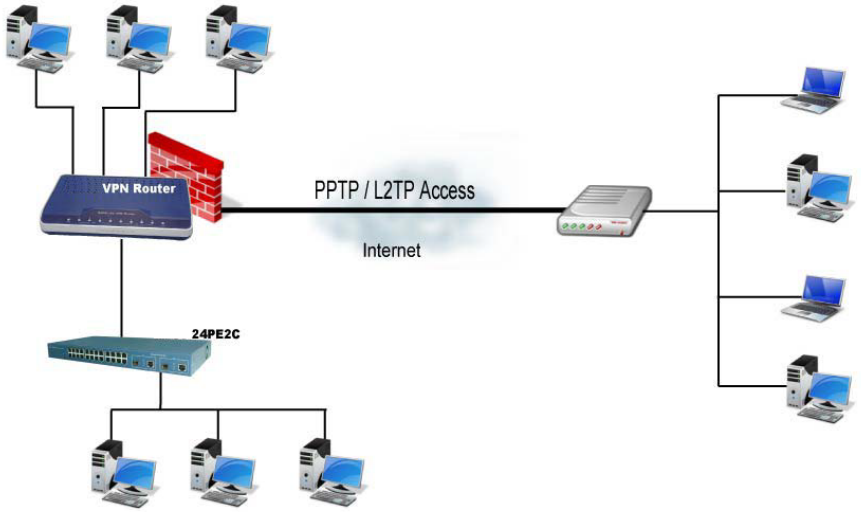
Model Number / Specification	IP622F	IP624F	IP628F	IP622F/U	IP624F/U	IP628F /U
Maximum DSL wires	2-wires	4 -wires	8-wires	2-wires	4 -wires	8-wires
Maximum data rate	5.696 Mbps	11.392 Mbps	22.784 Mbps	5.696 Mbps	11.392 Mbps	22.784 Mbps
USB port				USB port for 3.5G Dongle Modem with Internet access backup		

1.4 Applications

1.4.1 VPN Access

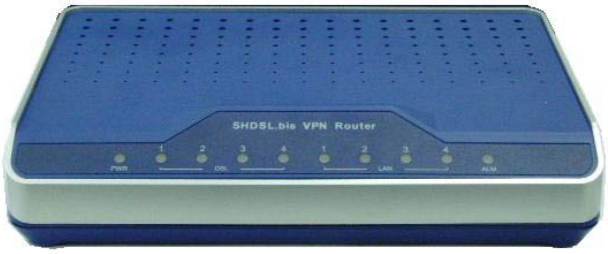


1.4.2 PPTP/ L2TP Access



2 Getting to know about the VPN Router

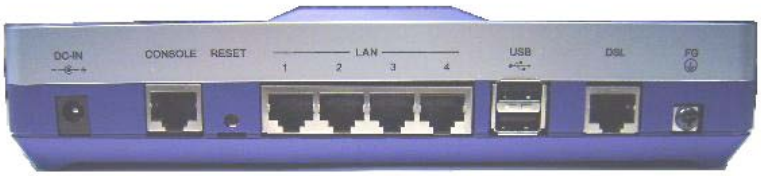
2.1 Front Panel



LED status of VPN Router:

LEDs		Active	Description
PWR		On	The power adaptor is connected to this device
DSL	LINK 1	On	SHDSL.bis line 1 connection is established
		Blink	SHDSL.bis line 1 handshake Transmit or received data over SHDSL.bis link 1
	LINK 2	On	SHDSL.bis line 2 connection is established
		Blink	SHDSL.bis line 2 handshake Transmit or received data over SHDSL.bis link 2
	LINK 3	On	SHDSL.bis line 3 connection is established
		Blink	SHDSL.bis line 3 handshake Transmit or received data over SHDSL.bis link 3
	LINK 4	On	SHDSL.bis line 4 connection is established
		Blink	SHDSL.bis line 4 handshake Transmit or received data over SHDSL.bis link 4
LAN	LINK/ACT1	On	Ethernet cable is connected to LAN 1
		Blink	Transmit or received data over LAN 1
	LINK/ACT2	On	Ethernet cable is connected to LAN 2
		Blink	Transmit or received data over LAN 2
	LINK/ACT3	On	Ethernet cable is connected to LAN 3
		Blink	Transmit or received data over LAN 3
	LINK/ACT4	On	Ethernet cable is connected to LAN 4
		Blink	Transmit or received data over LAN 4
ALM		On	SHDSL.bis line connection is dropped
		Blink	SHDSL.bis self test
		Off	No Alarm

2.2 Rear Panel

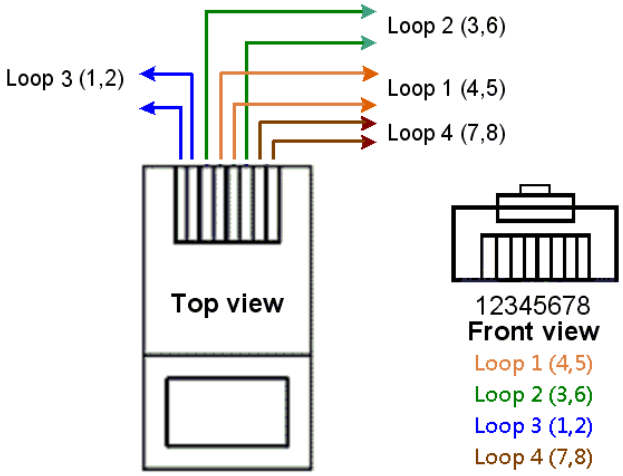


Connector	Description
DC-IN	Power adaptor inlet: Input voltage from 9V to 12VDC
CONSOLE	RJ-45 for system configuration and maintenance
RST	Reset button for reboot or load factory default
LAN (1,2,3,4)	10/100BaseT auto-sensing and auto-MDIX for LAN port (RJ-45)
USB	USB ports (for IP62F/U, IP62F/U and IP62F/U only)
DSL	G.SHDSL .Bis interface for WAN port (RJ-45)
⏚	Frame Ground / Protective earth

2.3 WAN Port

The VPN Router have one port for WAN port connection, this is a G.SHDSL .Bis interface.

The pin assignments for SHDSL line cable are:



For 2-wire (one pair) model , Loop1 has been used.

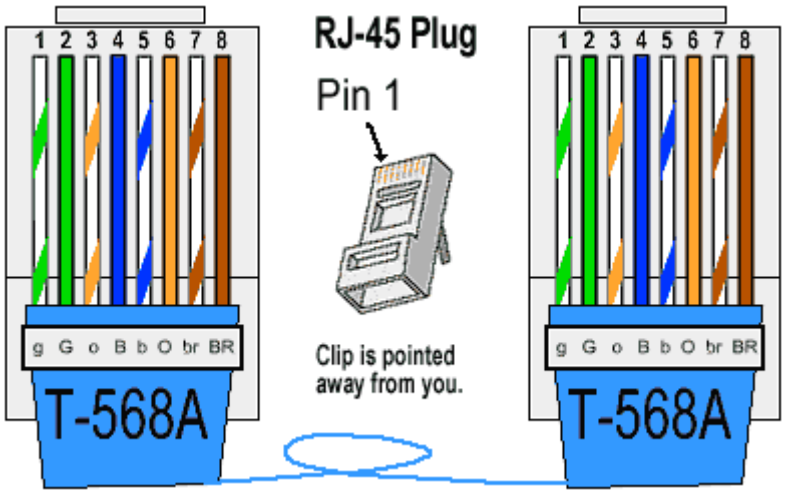
For 4-wire (two pair) model, Loop1 and 2 have been used.

For 8-wire (four pair)model, Loop1, 2, 3 and 4 have been used.

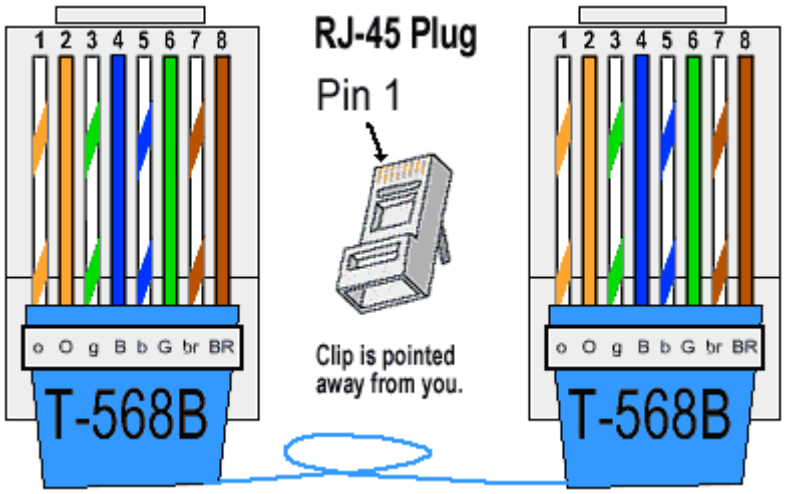
	Channel A	Channel B	Channel C	Channel D
2-wire model (IP622F , IP622/U)				
2-wire mode	Loop1 (4,5)			
4-wire model (IP624F , IP624F/U)				
2-wire mode	Loop1 (4,5)			
4-wire mode	Loop1 (4,5)	Loop2 (3,6)		
8-wire model (IP628F , IP628F/U)				
2-wire mode	Loop1 (4,5)			
4-wire mode	Loop1 (4,5)	Loop2 (3,6)		
8-wire mode	Loop1 (4,5)	Loop3 (1,2)	Loop4 (7,8)	Loop2 (3,6)

For test on point to point connection purpose, you can use the Straight-Through Ethernet Cable for SHDSL.bis link as the following.

T-568A Straight-Through Ethernet Cable



T-568B Straight-Through Ethernet Cable



Both the T-568A and the T-568B standard Straight-Through cables are been used.

2.4 LAN ports

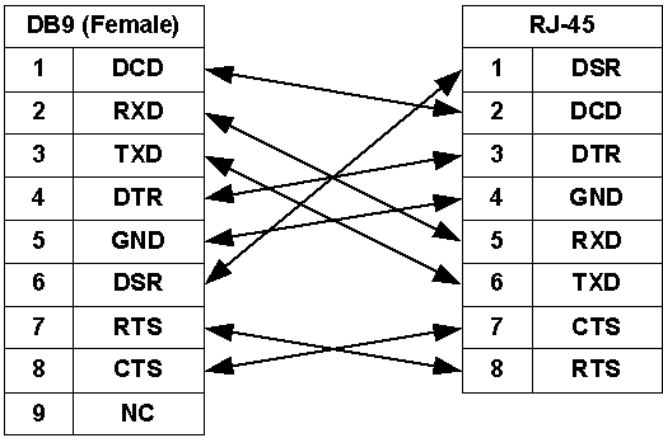
The VPN Router have four LAN ports. Those ports are auto-negotiating, auto-crossover. In 10/100Mbps Fast Ethernet, the speed can be 10Mbps or 100Mbps and the duplex mode can be half duplex or duplex.

The auto-negotiating ports can detect and adjust to the optimum Ethernet speed (10/100 Mbps) and duplex mode (full duplex or half duplex) of the connected device. The auto-crossover (auto-MDI/MDI-X) ports automatically works with a straight-through or crossover Ethernet cable.

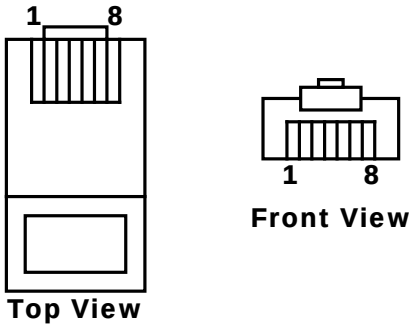
2.5 Console Port

Connect the RJ-45 jack of the console cable to the console port of the VPN Router. Connect the DB-9 female end to a serial port(COM1 , COM2 or other COM port) of your computer.

The wiring diagram of console cable is as following:



The pin assignment of RJ-45 modular jack on the Console cable:

Pin Number	Abbrev.	Description	Figure
1	DSR	DCE ready	
2	DCD	Received Line Signal Detector	
3	DTR	DTE ready	
4	GND	Signal Ground	
5	RXD	Received Data	
6	TXD	Transmitted Data	
7	CTS	Clear to Send	
8	RTS	Request to Send	

2.6 USB Port

Only for with USB ports models. This is using for connection of 3G/3.5G USB modem.

2.7 Power connection

Make sure you are using the correct power source as the AC/DC adaptor. Inset the female end of power adaptor's cord into the power receptacle on the rear panel. Connect the power adaptor to an appropriate power source.

2.8 Reset Button

The reset button can be used only in one of two ways.

(1) Press the Reset Button for two second will cause system reboot.

(2) Pressing the Reset Button for eight seconds will cause the product loading the factory default setting and losing all of yours configuration. When you want to change its configuration but forget the user name or password, or if the product is having problems connecting to the Internet and you want to configure it again clearing all configurations, press the Reset Button for eight seconds with a paper clip or sharp pencil.

2.9 Protective Earth (Frame Ground) terminal

The marked lug or terminal should be connected to the building protective earth bus. The function of protective earth does not serve the purpose of providing protection against electrical shock, but instead enhances surge suppression on the DSL lines for installations where suitable bonding facilities exist. The connector type is M3 machine screw.

3 Configuration

3.1 Configuration Methods

There are three methods to configure the VPN Router: serial console, Telnet and Web Browser. Users have to choose one method to configure the VPN Router.

3.1.1 Installation

This following guide is designed to lead users through Web Configuration of G.shdsl.bis VPN Router in the easiest and quickest way possible. Please follow the instructions carefully.

Step 1. Connect the power adapter to the port labeled “DC-IN” on the rear panel of the VPN Router.

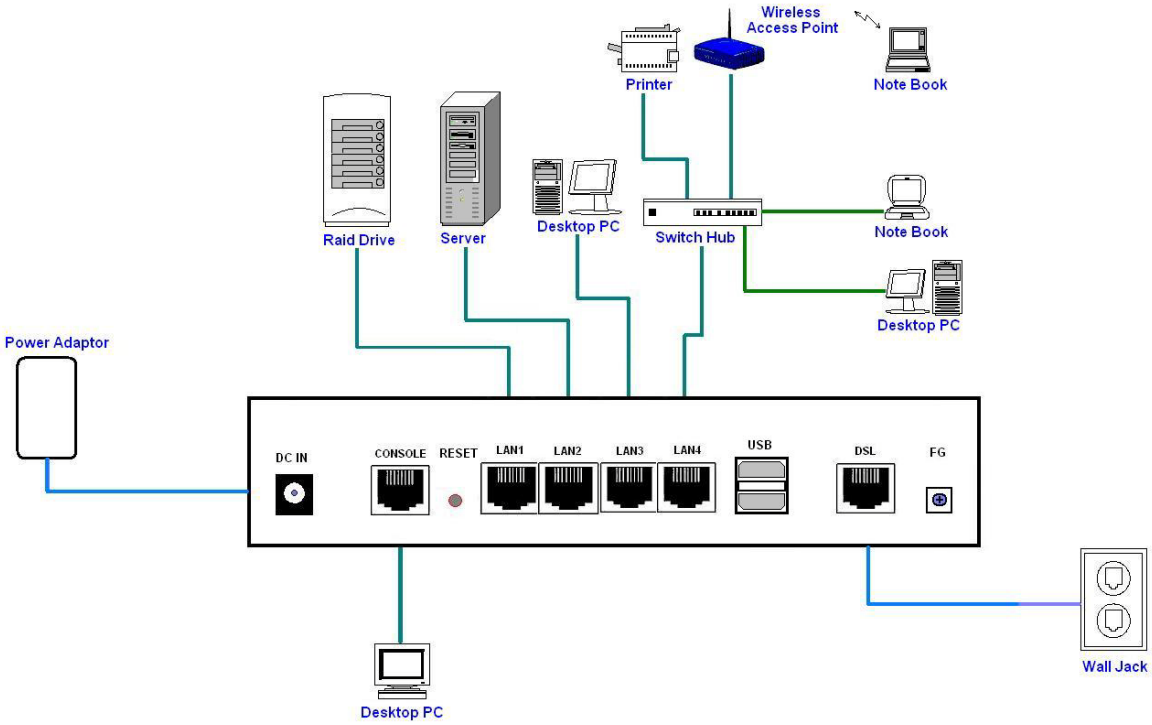
Step 2. Connect the Ethernet cable to LAN ports. (Note: The VPN Router support**s** auto-MDIX switching hub so both straight through and cross-over Ethernet cables can be used.)

Step 3. Connect the phone cable to the VPN Router and the other side of phone cable to wall jack.

Step 4. Connect the power adapter to power source.

Step 5. Turn on the PC or NB, which is used for configuration the VPN Router.

To avoid possible damage to this VPN Router, DO NOT turn on this device before Hardware Installation.



Connection with VPN Router

3.1.2 Web Configuration

Make sure that Ethernet Adapter had been installed in PC or NB used for configuration of the modem. TCP/IP protocol is necessary for web configuration, so please check the TCP/IP protocol whether it has been installed.

The VPN Router provides a browser interface that allows you to configure and manage this device. After you set up your IP address for the VPN Router, you can access the VPN Router's Web interface applications directly in your browser by entering the IP address of the VPN Router. You can then use your Web browser to list and manage configuration parameters from PC.

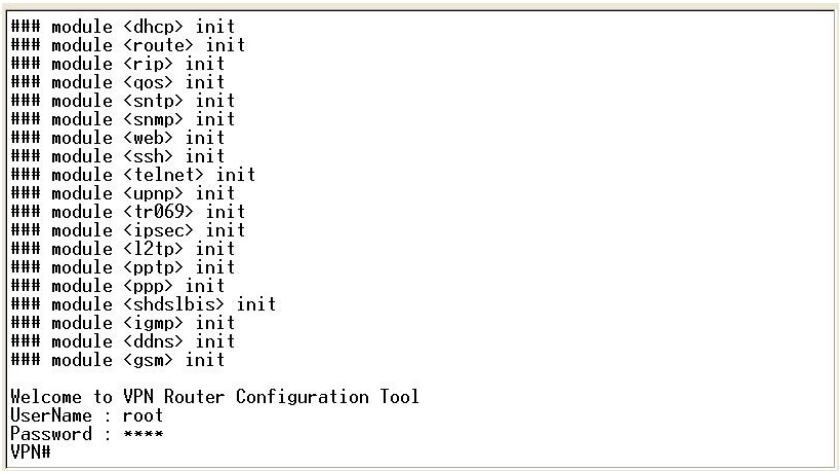
Web Configuration requires Internet Explorer 5.0 or later or Netscape Navigator 6.0 and later versions. The recommended screen resolution is 1024 by 768 pixels.

3.1.3 Serial Console Configuration

The console port is a RJ-45 connector that enables a connection to a PC for monitoring and configuring the VPN Router. Use the supplied serial cable with a female DB-9 connector to serial port of PC and RJ-45 module jack connector to VPN Router's console port. Start your terminal access program by terminal emulation program or Hyper Terminal and configure its communication parameters to match the following default characteristics of the console port:

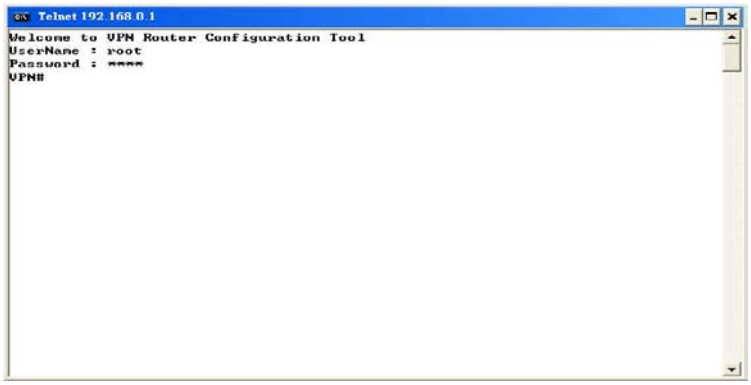
Parameter	Value
Baud Rate	115200
Data Bits	8
Parity Check	None
Stop Bits	1
Flow Control	None

It will ask for user name and password in order to remote login when using telnet, please use "root" for username and "root" for password. Please check the following screen shot for what you will see in your terminal window.



3.1.4 Telnet Configuration

The VPN Router also supports telnet for remote management. Please make sure the correct Ethernet cable connected the LAN ports of device to your computer. The LAN indicator on the front panel shall light on if a correct cable is used. Start your telnet client with a command window or VT100 terminal emulation by key in "192.168.0.1", which is the management IP address of IP62xF series VPN router, and wait for the login page prompts up. Then, key in the user name and the password once the login page shows. The login page is shown as the following screen shot. (The default user name and password are "root" and "root".)



All display screens are as same as serial console configuration. The default IP address is "192.168.0.1" and you can customerize the IP address for you application. In addition, the default Telnet function is disable. Therefore, before using this Telnet function, please enable Telnet with using Web management .

3.2 Login via Web Browser

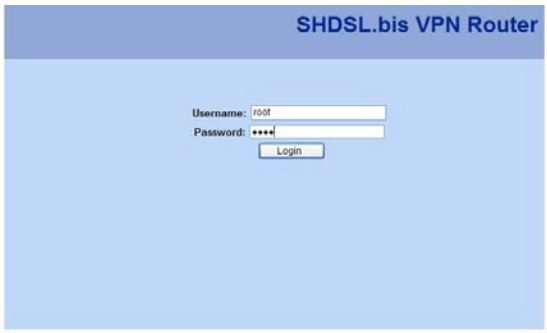
This section introduces the configuration and functions of the web-based management. It is an HTML-based management interface that allows users to setup and manage IP62xF VPN routers. This configuration system offers all monitoring and management features which allow users to access VPN routers from anywhere on the network with a standard browser, such as, Internet Explorer or Firefox.

Step 1. User can use any common browsers, such as, Internet Explorer, on your computer to connect the VPN Router. Then, please type "http://192.168.0.1" in the address bar of the browser you just open.

Step 2. The default IP address and sub net-mask of the management port of VPN Router are "192.168.0.1" and "255.255.255.0".

Step 3. If DHCP function is Disable, your computer can set the same net-mask such as 192.168.0.X which X is from 2 to 254, so you are able to connect to the VPN router.

Step 4. Key in user name, "root", and password, "root"; then, click on "Login" button to login the web configuration.



Note: Both the default user name and password are "root". It is suggested to change the user name and the password for security reason.

Note: For safety purpose, the password will be prompt as star symbol.

Note: Once you change the user name and password, please login with the new user name and password in the next login process.

3.3 Menu Tree

<table>
<tr><td rowspan="19">Quick Setup</td><td rowspan="14">System Mode</td><td colspan="5">Bridge</td></tr>
<tr><td rowspan="13">Router</td><td colspan="4">WAN IP</td></tr>
<tr><td colspan="4">WAN Netmask</td></tr>
<tr><td rowspan="8">Protocol</td><td colspan="3">Disable</td></tr>
<tr><td colspan="3">EoA</td></tr>
<tr><td colspan="3">EoA + NAT</td></tr>
<tr><td colspan="3">IPoA</td></tr>
<tr><td colspan="3">IPoA + NAT</td></tr>
<tr><td>PPPoA</td><td rowspan="4">PPP User
PPP Password
Confirm Password
PPP Connection Type</td></tr>
<tr><td>PPPoA + NAT</td></tr>
<tr><td>PPPoE</td></tr>
<tr><td>PPPoE + NAT</td></tr>
<tr><td colspan="4">Primary DNS</td></tr>
<tr><td colspan="4">Secondary DNS</td></tr>
<tr><td rowspan="3">DHCP mode</td><td colspan="3">Disable</td></tr>
<tr><td colspan="3">Server</td></tr>
<tr><td colspan="3">Relay</td></tr>
<tr><td rowspan="2">SHDSL.bis Mode</td><td colspan="5">STU-R</td></tr>
<tr><td colspan="5">STU-C</td></tr>
<tr><td colspan="6">WAN ENCAP</td></tr>
<tr><td colspan="6">WAN VPI/VCI</td></tr>
<tr><td colspan="6">Default Gateway</td></tr>
<tr><td rowspan="8">Network</td><td rowspan="5">SHDSL</td><td colspan="5">Mode</td></tr>
<tr><td colspan="5">Pair Mode</td></tr>
<tr><td colspan="5">Annex</td></tr>
<tr><td colspan="5">TCPAM</td></tr>
<tr><td colspan="5">Line Probe</td></tr>
<tr><td colspan="6">Max Base Rate</td></tr>
<tr><td rowspan="3">Interfaces</td><td rowspan="2">LAN</td><td colspan="4">IP</td></tr>
<tr><td colspan="4">Netmask</td></tr>
<tr><td rowspan="2">WAN</td><td rowspan="2">Protocol</td><td>Bridge Mode</td><td>Disable</td></tr>
<tr><td>Ethernet over ATM</td></tr>
<tr><td>Router Mode</td><td>Disable</td></tr>
</table>

					IPoA	
					PPPoA	PPP User, PPP Password, PPP Connection type
					PPPoE	
			ENCAP			
			VPI-VCI			
			QoS Class			
			QoS PCR			
			QoS SCR			
		Gateway				
	3.5G Backup	Mode				
		Location				
		ISP				
		Manufacture				
		Dial Number				
		APN				
		Keep-alive Interval				
		Keep-alive Server				
	DNS	Primary				
		Secondary				
	DHCP	Mode	Disable			
			Server			
			Relay			
		DHCP Server	Mode			
			Subnet			
			Netmask			
			IP Range			
			Gateway			
			DNS			
			Lease Time			
		DHCP Relay	IP			
			Interface			
	NAT	Mode				
		Entry (1~16)	Enable			
			Source IP			
			Source Netmask			
			Output Interface			
Advance	STP	Router Mode	Not available			

		Bridge Mode	Mode		
			Aging Time		
	VLAN	Router Mode	Not available		
		Bridge Mode	Mode	Disable	
				802.1Q Tag-Based VLAN	
				Port-Based VLAN	
	Static Route	Destination			
		Netmask			
		Gateway			
		Interface			
	QoS	Mode			
		Traffic Classify	Mode		
			Class ID		
			Protocol		
			Src IP		
			Src Netmask		
			Src Port		
			Dst IP		
			Dst Netmask		
			Dst Port		
		802.1P	Class ID		
		IP DSCP	DSCP		
			Class ID		
		Class Shaping	Mark Mode		
			DSCP		
			TOS		
			Min Rate		
			Max Rate		
	RIP	Mode			
		RIP Version			
		LAN	Mode		
			Passive		
		WAN1~WAN8	Mode		
			Passive		
	Virtual Server	Router Mode	Mode		
			Entry (1~16)	Enable	
				Description	
				Interface	

				Protocol
				Public Port
				Private IP/Port
		Bridge Mode	Not available	
	DMZ	Router Mode	Mode	
			WAN I/F	
			Host IP	
		Bridge Mode	Not available	
	DDNS	Mode		
		Provider		
		Host Name		
		User Name		
		Password		
	IGMP	IGMP Proxy / Snooping		
Security	Firewall	Router Mode	Mode	
		Bridge Mode	Not available	
	VPN	Router Mode	IPSEC	Mode
				Name
				WAN
				Perfect Forward Secrecy
				Local Subnet
				Local Netmask
				Remote Public IP
				Remote Local LAN Subnet
				Remote Local LAN Netmask
				Pre-shared Key
			L2TP	Mode
				Authentication
				Virtual IP
				L2TP/IPSec Mode
				IPSec Interface
				IPSec PSK
				User
			PPTP	Mode
				Authentication
				Virtual IP
				User
		Bridge Mode	Not available	

	Filter	IP Filter	Mode	
			Default Policy	
			Entry(1~16)	Mode
				Action
				Protocol
				Source IP/ Mask
				Source Start/ End Port
				Destination IP/ Mask
				Destination Start/ End Port
		MAC Filter	Mode	
			Default Policy	
			Entry(1~16)	Mode
				MAC
				Action
Management	SNTP	Sync With PC		
		SNTP	Mode	
			Time Server	
			Time Zone	
	SNMP	SNMPv3	Mode	
			V3 User Name	
			V3 Auth. Password	
			V3 Priv. Password	
			V3 Auth. Mode	
			V3 Auth. Type	
			V3 Priv. Type	
			V3 Access	
		Trap	Mode	
			Community	
			Trap Host IP	
	TR069	Mode		
		ACS URL		
		ACS Username		
		ACS Password		
		Periodic Inform Enable		
		Periodic Inform Interval		
		Periodic Inform Time		
		Connection Request IP		
		Connection Request Port		

		Connection Request Username	
		Connection Request Password	
		Retry Times	
	UPnP	Mode	
	Sys Log	Remote Server Mode	
		Remote Server Address	
		Remote Server Port	
	Telnet	Mode	
		Port	
	SSH	Mode	
		Port	
	Web	Refresh Time	
		Service Port	
Show	Information	Hardware MCSV	
		Software MCSV	
		Software Version	
		DSL Chip Name	
		DSL Phy Firmware Version	
		DSL IDC Firmware Version	
		MAC	
		Serial No	
		Present Time	
		System Uptime	
	Sys Log		
	Script		
Status	SHDSL		
	WAN		
	Route Table		
	Interfaces		
	STP (not available in router mode)		
Utilities	Upgrade		
	Config Tool	Default	
		Backup	
		Restore	
	Users	User 1~4	Name
			Level
			Password
			Confirm

	Ping	IP Address
		Size
		Count
		Update
	Trace Route	Host name or IP
		Packet Datagram
		Update Interval

3.4 Quick Setup

"Quick Setup" function guides users to setup their VPN routers step by step. This VPN Router can be set as a bridge or a router. The following sections show how to setup a bridge mode or a router mode.

3.4.1 System Mode

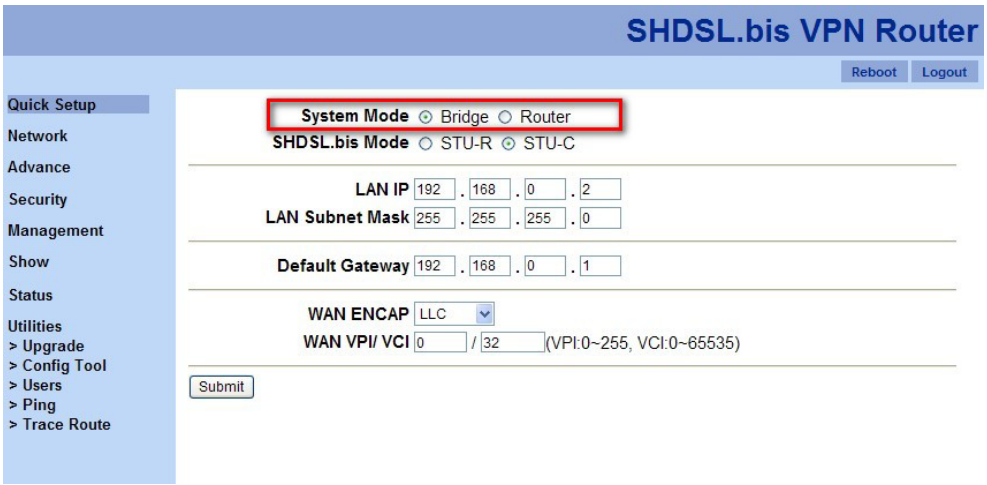
"System Mode" allows users to decide this VPN router should be a bridge device or a router device.

"Router mode" is when the DSL modem performs all the functions that allow you to connect to the Internet which include: all the technical settings (VCI, encapsulation, etc.) and the VPN router also connects to the ISP with your username and password. You can basically just connect to your computer.

"Bridge mode", on the other hand, allows some external device, for example, your computer or a separate router, to do the ISP connection, etc. In bridge mode, all the VPN router does is remembering your VCI, VPI and encapsulation settings. The ISP information and IP address assigned is controlled b your separate router or computer in PPP mode.

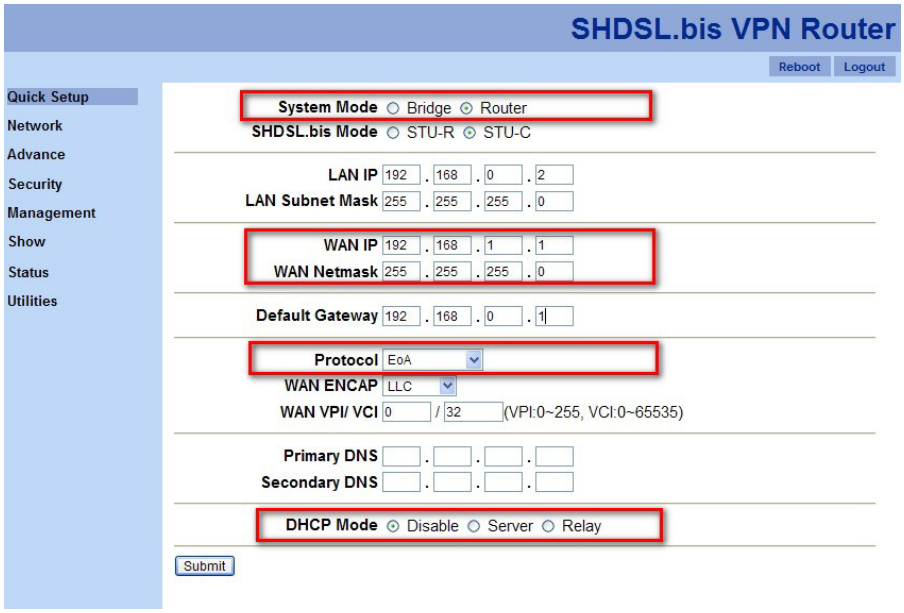
3.4.1.1 Bridge Mode

Click on "Bridge" to set this VPN router as a bridge device.



3.4.1.2 Router Mode

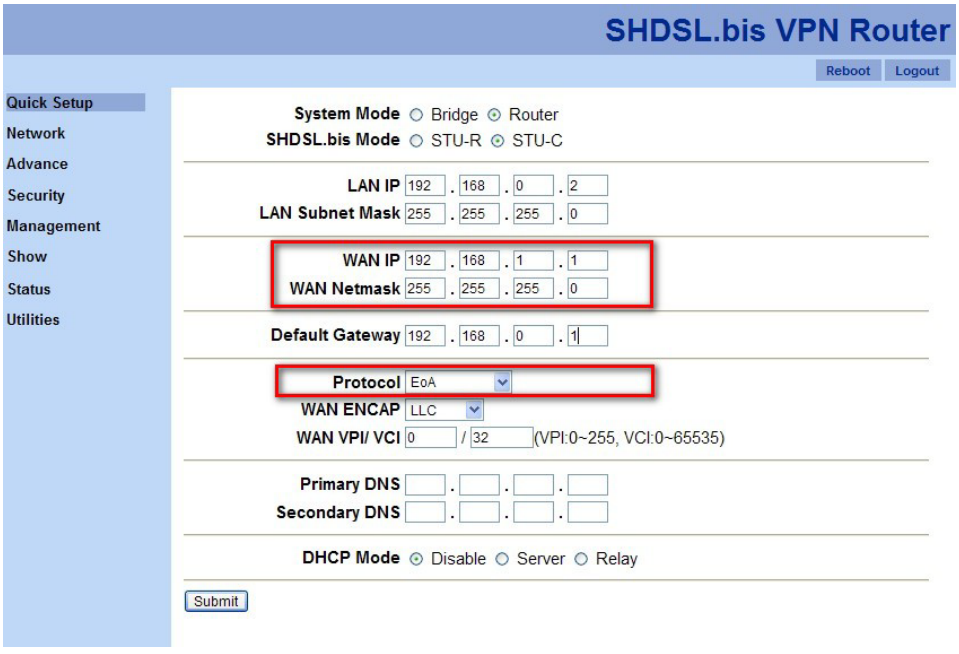
Click on “Router” to assign this VPN router to be a router device.



Once “System Mode” is set to “Router”, more setups will be shown as the screen shot above.

WAN Section

Fill up WAN port information for the VPN router as the router mode.



1. WAN IP and WAN Netmask

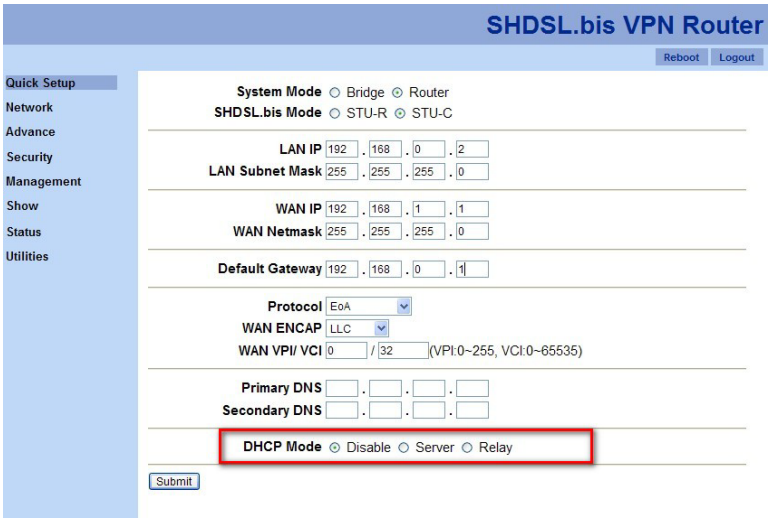
   Fill up the IP address and the netmask of WAN.

2. Protocol

   Nine options are available for this setup:

   - Disable: if protocol is “Disable”, WAN will be closed; hence, the information of WAN IP and WAN Netmask will not be effective.
   - EoA
   - EoA + NAT
   - IPoA
   - IPoA + NAT
   - PPPoA
   - PPPoA + NAT
   - PPPoE
   - PPPoE + NAT

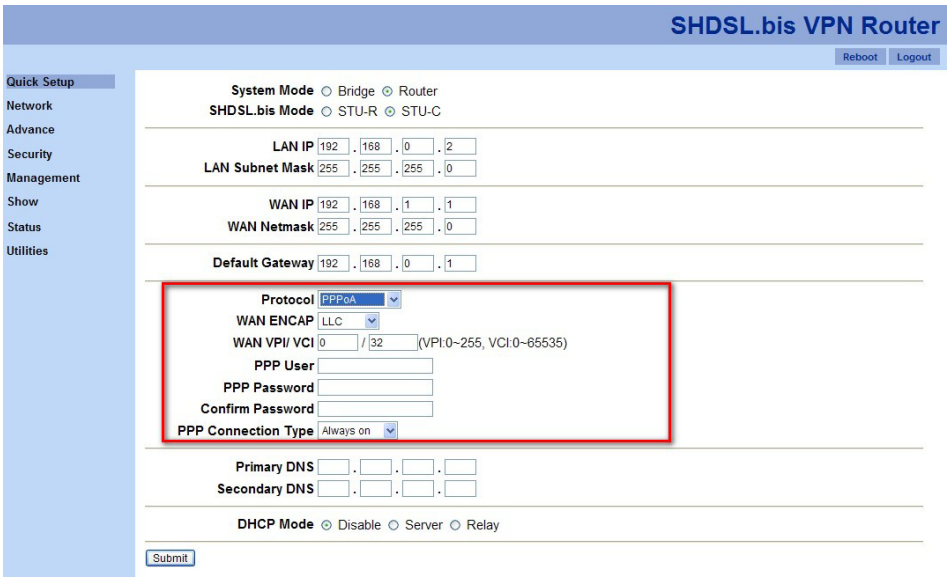
DHCP Mode



Choose whether DHCP mode should be “Disable”, “Server” or “Relay”.

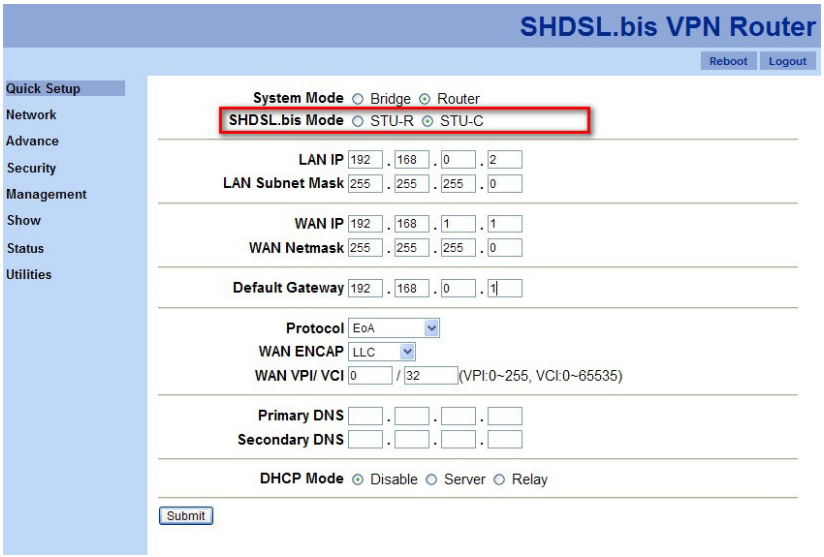
PPP Protocol

This section is only available when the protocol is “PPPoA”, “PPPoA + NAT”, “PPPoE”, or “PPPoE + NAT”.



In the circled area, you are able to set PPP user, PPP password, and PPP connection type. In addition, the connection type can be set as either “Always on” or “On demand”.

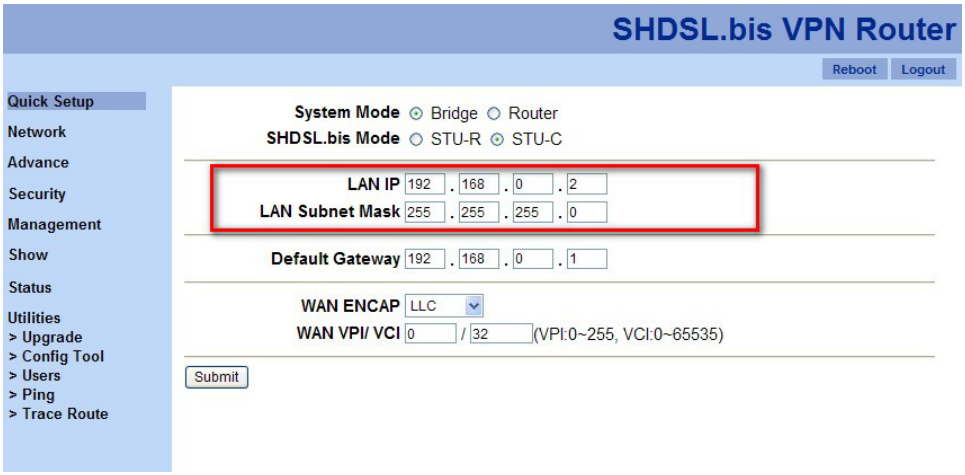
3.4.2 SHDSL.bis mode



There are two SHDSL.bis modes: STU-C and STU-R. “STU-C” means the terminal of central office (CO) and “STU-R” means customer premise equipment (CPE). Click STU-R side or STU-C side to setup the operation mode.

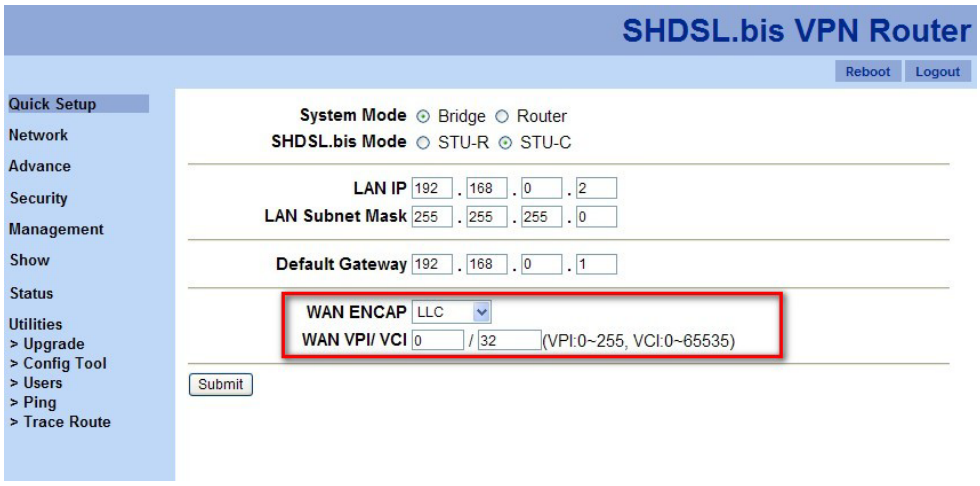
In both “Bridge” mode and “Router” mode, there are four parts of information should be provided, SHDSL.bis mode, LAN IP and subnet mask, default gateway IP address, and WAN encapsulation type and VPI/VCI values.

3.4.3 LAN IP and Subnet Mask



Please provide the information of LAN IP and subnet mask in the circled area.

3.4.4 WAN ENCAP

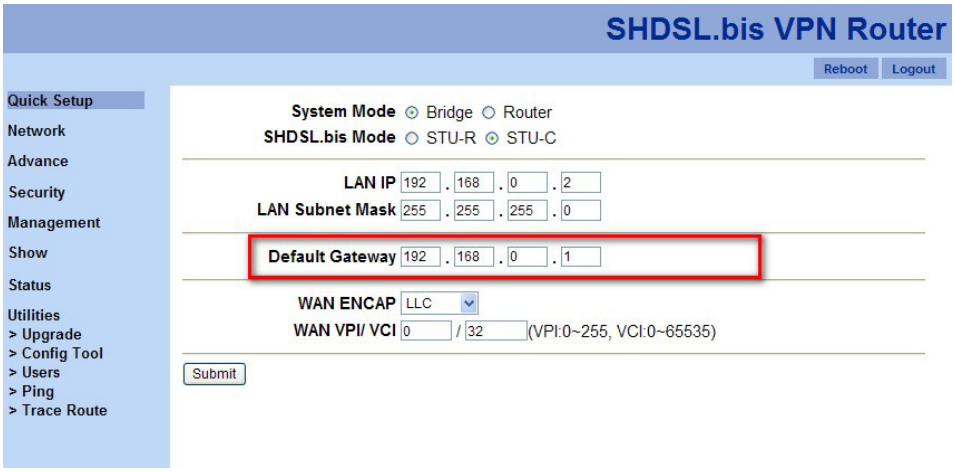


For encapsulation type, VC-Mux (Virtual Circuit Multiplexing) and LLC (Logical Link Control) are available. VC-MUX and LLC are two mechanisms for identifying the protocol carried in ATM Adaptation Layer 5 (AAL5) frames. Please choose the encapsulation type from the pull down menu.

3.4.5 WAN VPI/VIC

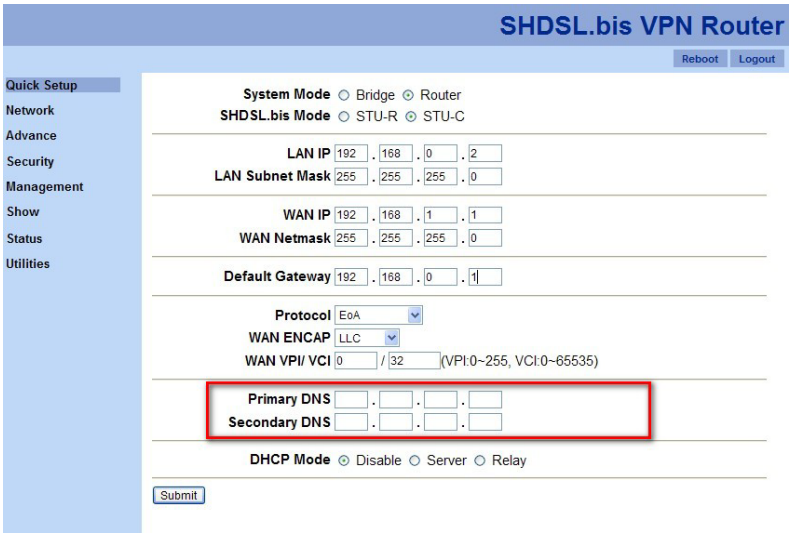
There is an unique VPI and VCI value for Internet connection supported by ISP. The range of VIP is from 0 to 255, and VCI is from 0 to 65535.

3.4.6 Default Gateway



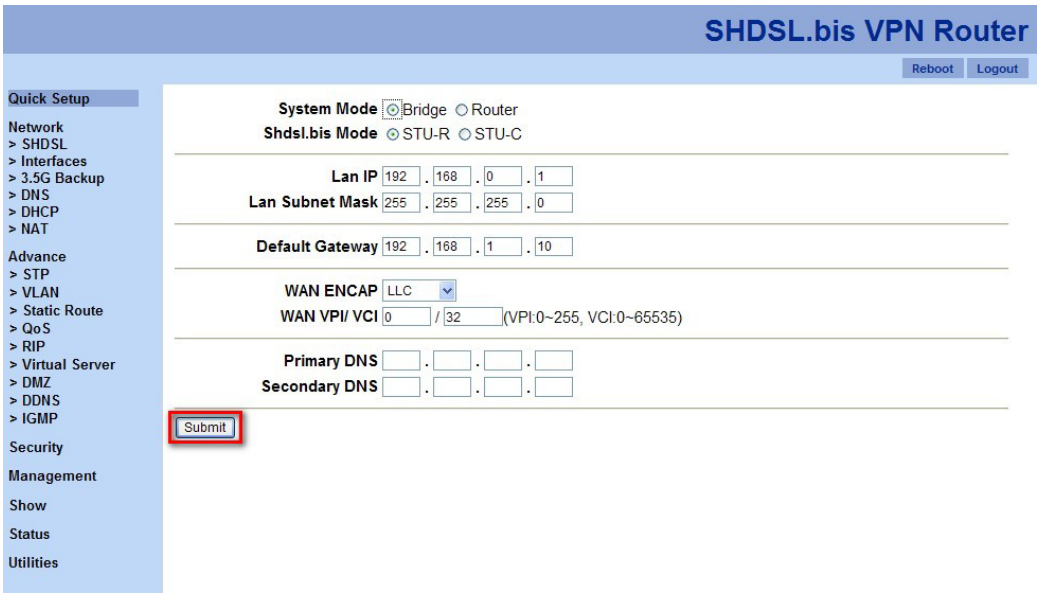
In quick setup process, fill up the default gateway IP address.

3.4.7 DNS



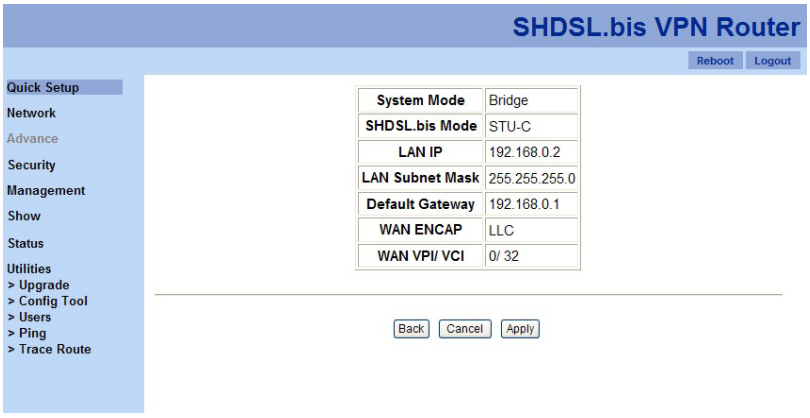
Two sets of DNS addresses can be stored in DNS section, primary DNS and secondary DNS.

3.4.8 Submit

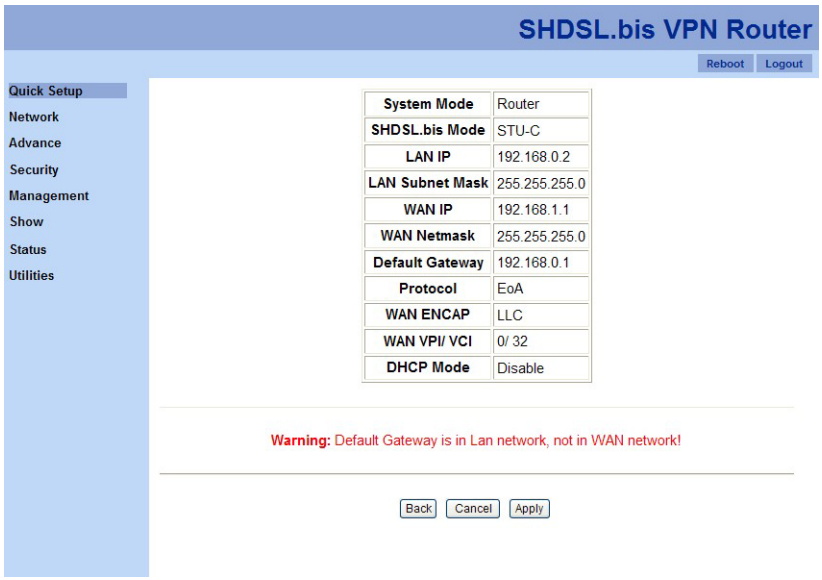


Click on “Submit” button to save all settings. After saving all settings, the following screen shots will be shown to confirm the configurations.

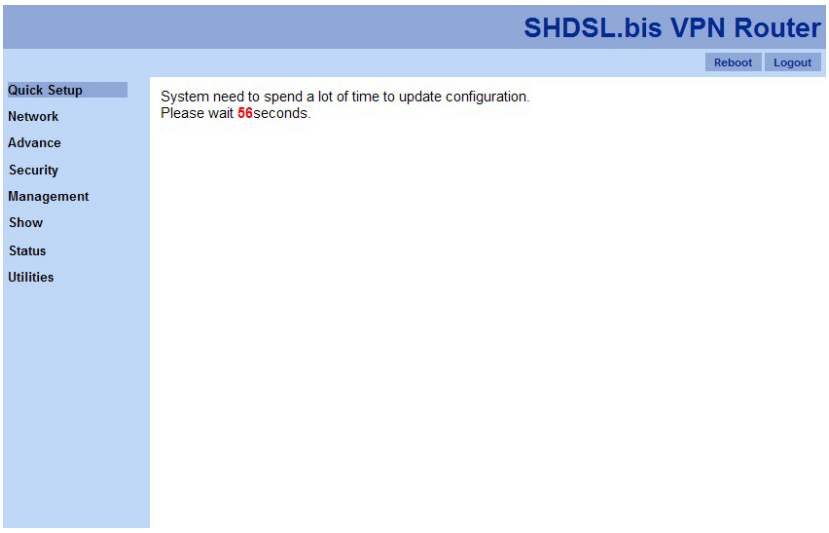
For bridge mode



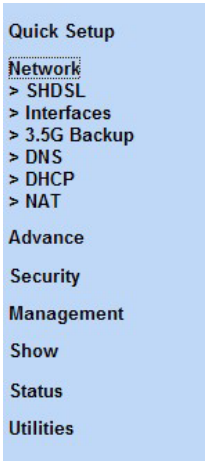
For router mode



Click on “Apply” to activate these configurations. The VPN router will be rebooted as the following screen shot.



3.5 Network



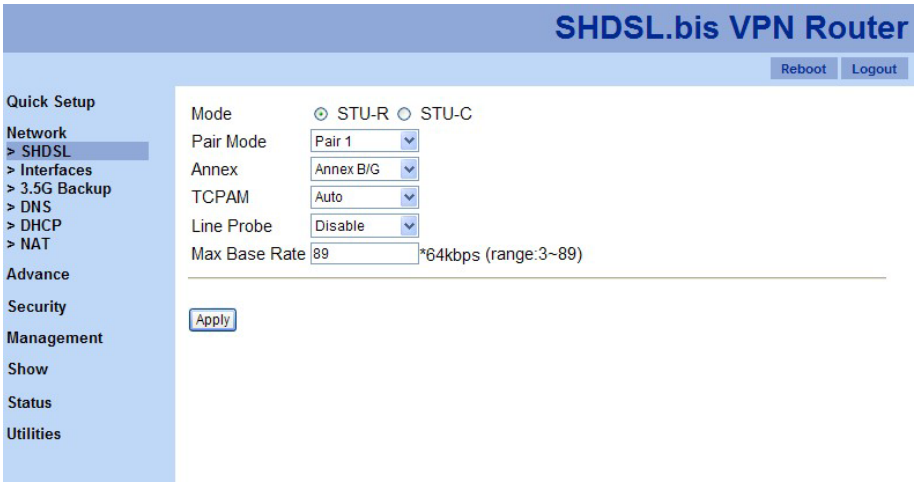
Network section allows users to setup the following functions.

1. SHDSL
2. Interfaces
3. 3.5G Backup
4. DNS
5. DHCP
6. NAT

Please check the sections for detail information on how to use these functions.

3.5.1 SHDSL

"SHDSL" function allows you to change SHDSL parameters.



1. Mode:

   You are able to change your VPN router's mode to STU-R or STU-C in here.

2. Pair Mode

   For "Pair Mode" parameter, you are able to choose how many wire you would like to use on SHDSL.bis connection.

VPN Router \ Line Type Mode		2-wire (1 pair)	4-wire (2 pair)	8-wire (4 pair)
IP622F	IP622F/U	●		
IP624F	IP624F/U	●	●	
IP628F	IP628F/U	●	●	●

The table above indicates the model number and its corresponding available wire numbers. For

example:

IP622F and IP622F/U (2-wire model) can select 2-wire line type only.

IP624F and IP624F/U (4-wire model) can select 2-wire and 4-wire line types.

IP628F and IP628F/U (8-wire model) can select 2-wire, 4-wire or 8-wire line types.

3. Annex

There are four Annex types, Annex A, Annex B, Annex A/F and Annex B/G. Please confirm with your ISP.

4. TCPAM

Three possibilities are available for TCPAM feature, “Auto”, “TCPAM-16” and “TCPAM-32”. “Auto” means the system will choose TCPAM automatically and this option is only available when the Annex type is “Annex A/F” or “Annex B/G”.

SHDSL.bis VPN Router	Annex A	Annex B	Annex A/F	Annex B/G
Auto			●	●
TCPAM-16	●	●	●	●
TCPAM-32			●	●

5. Line Probe

You are able to choose to disable or enable “Line Probe” function for data rate adpative mode. When “Line Probe” function is enabled, the system will search on the best connection based on the value of “Max Base Rate” automatically.

6. Max Base Rate

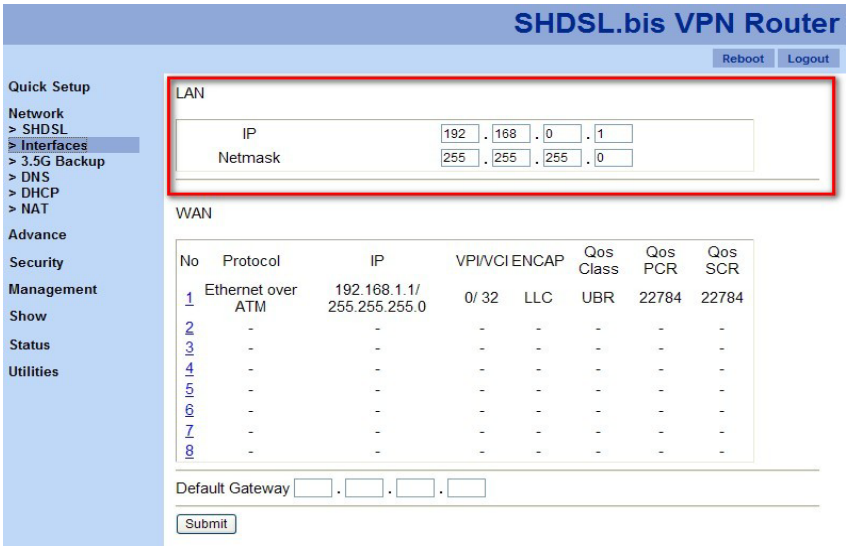
This value will be used for “Line Probe” in order to find the best connection when line probe function is enabled. In addition, the value range is differed according to Annex type.

SHDSL.bis VPN Router	Annex A	Annex B	Annex A/F	Annex B/G
Range	3 ~ 36	3 ~ 36	3 ~ 89	3 ~ 89

3.5.2 Interfaces

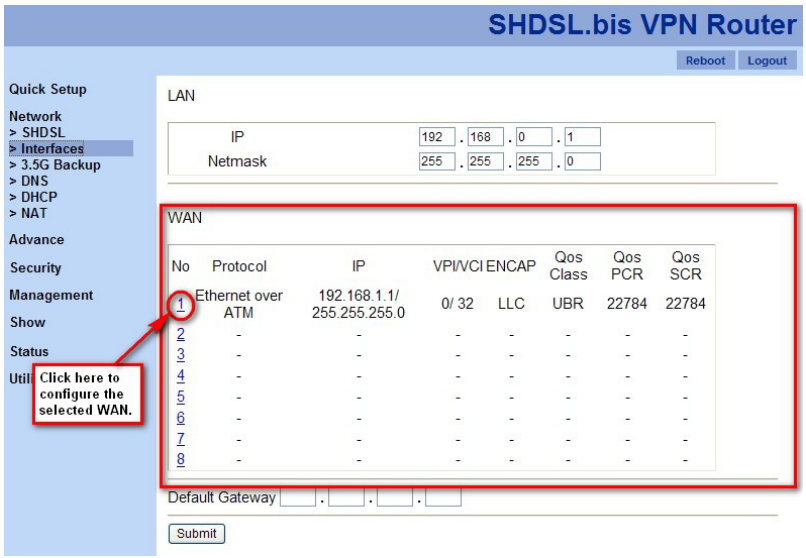
“Interfaces” function provides a tool to change LAN settings, WAN settings, and the default gateway after the initial setups were completed. Please remember to reboot your VPN router after any changes are made.

3.5.2.1 LAN

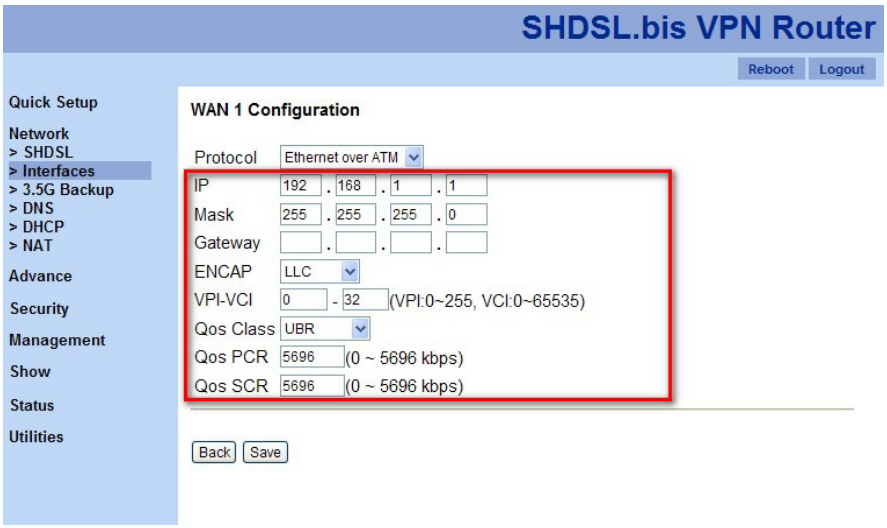


You are able to change LAN configurations in “Interfaces” function. Once you change the settings, please click on “Submit” to save the modification.

3.5.2.2 WAN

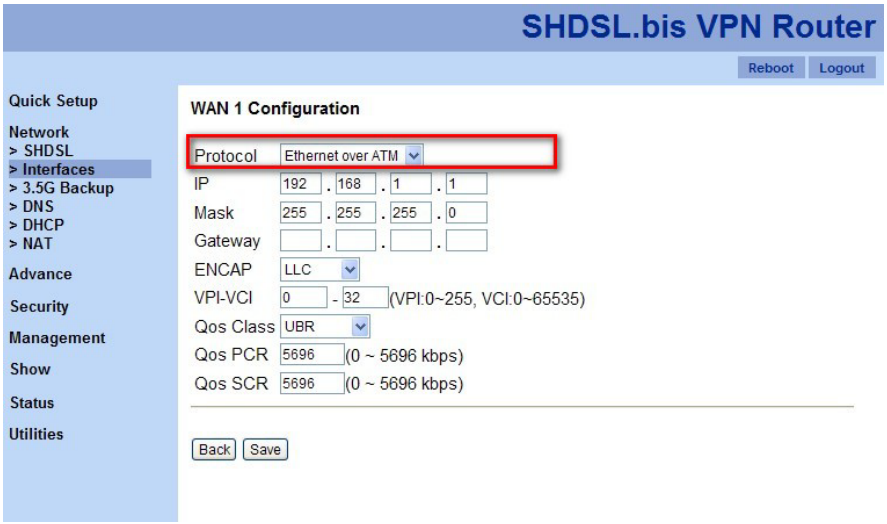


The VPN Router supports 8 VCs (virtual circuit) for WAN. Click on the number to configure each VC.

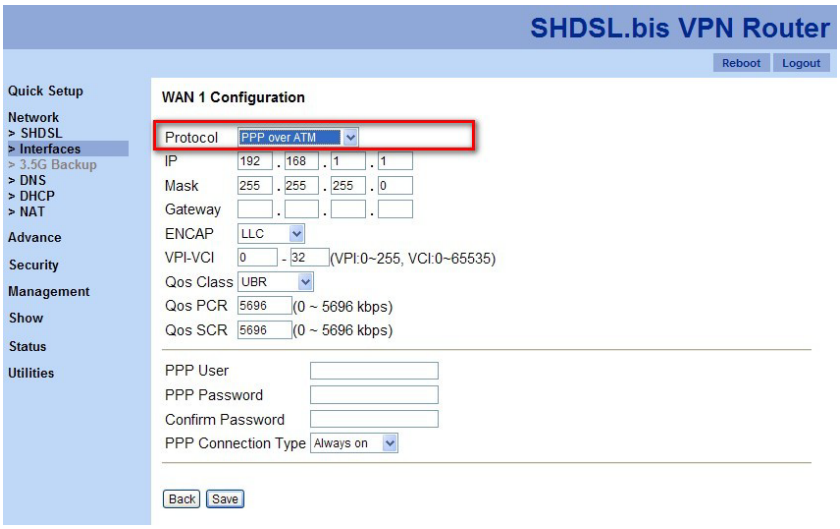


The screen shot above will be shown once you select a VC to configure. Fill up IP address, subnet mask, gateway, encapsulation type, and VPI/VCI information. Then, setup QoS class (UBR, CBR, VBR-RT and VBR-NRT), QoS PCR (Peak Cell Rate), and QoS SCR (Substained Cell Rate) information.

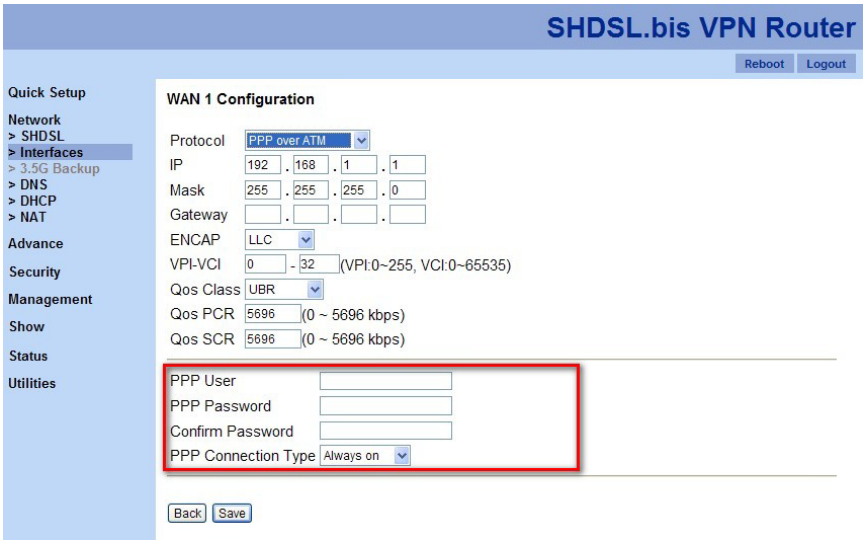
For Bridge mode, “Protocol” provides two options, “Disable” or “Ethernet over ATM”.



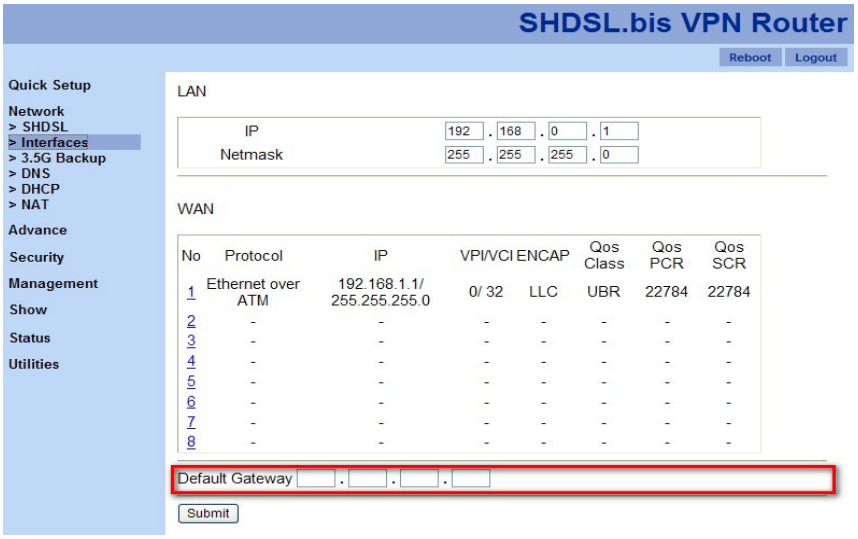
However, for Router mode, there are four options in “Protocol” menu, “Disable”, “IPoA”, “PPPoA” or “PPPoE”.



If you choose “PPPoA” or “PPPoE” type for protocol parameter, four more information fields will be needed.

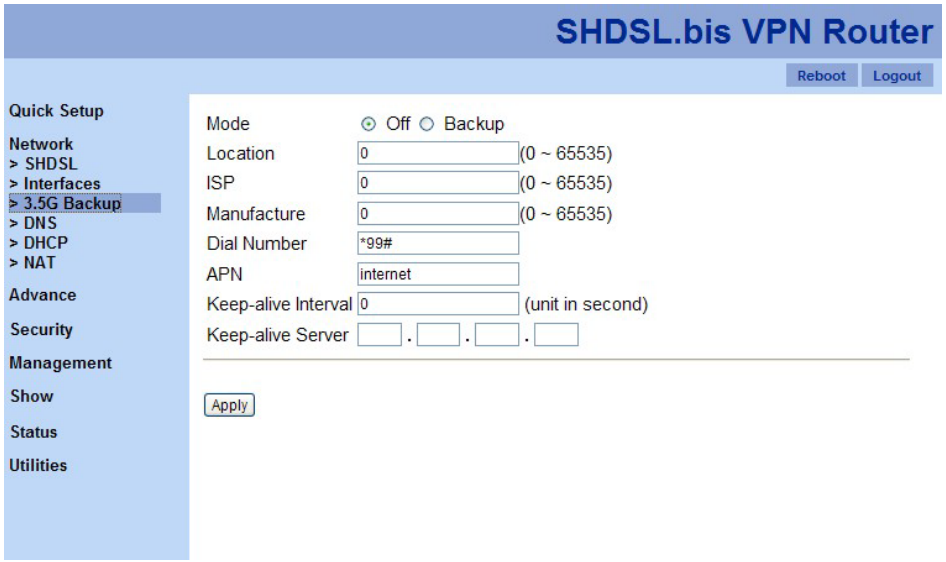


3.5.2.3 Default Gateway



Default gateway information can be changed in “Interfaces” section.

3.5.3 3.5G Backup



"3.5G Backup" function is for IP622F/U, IP624F/U and IP628F/U. VPN Router with USB models support automatic backup function. When connecting with SHDSL.bis, it will enable the 3G/3.5G broadband connection automatically when SHDSL.bis Internet connection is not available. You can surf the Internet anywhere and anytime via this device.

3.5.3.1 3G/3.5G Modem card installation

If you would love to connect with a 3G/3.5G modem card or a SIM card, please follow the following instructions.

Step 1. Connect power adapter to VPN router.

Step 2. Connect another Ethernet cable from the any LAN ports (1~4) on VPN router to the Ethernet socket on the PC.

Step 3. Insert SIM card into 3G/3.5G modem card, and connect the modem card with one of USB ports of VPN router.

3.5.3.2 3G/3.5G Internet Configuration

IP62xF/U VPN Router will recognize a 3G/3.5G modem card or SIM card automatically when a 3G/3.5G device is connected to one of VPN Router's USB ports. No additional setup procedure is required. Only one Internet connection (either 3G/3.5G wireless or DSL wired) can be used at the same time. The primary connection method is DSL wired Internet; in the other hand, 3G/3.5G wireless connection is the backup way.

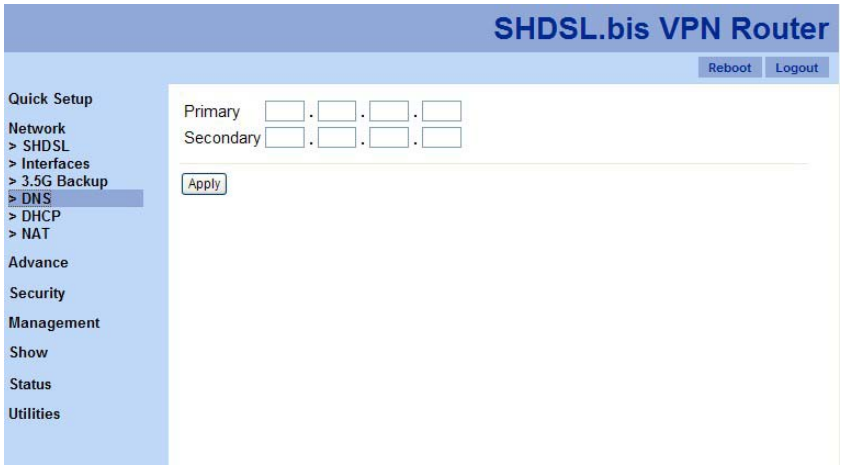
PIN code or user name / password required

Please check the authentication method you want to use. Most of telecomm service providers require you to

input Dial Number and APN (Access Point Name), please those items provided by telecomm service provider. After finish type those items, then click ‘APPLY’ button.

Note: Different ISP’s require Dial Number and APN for connecting to the Internet, please check with your ISP as to the type of connection it requires.

3.5.4 DNS

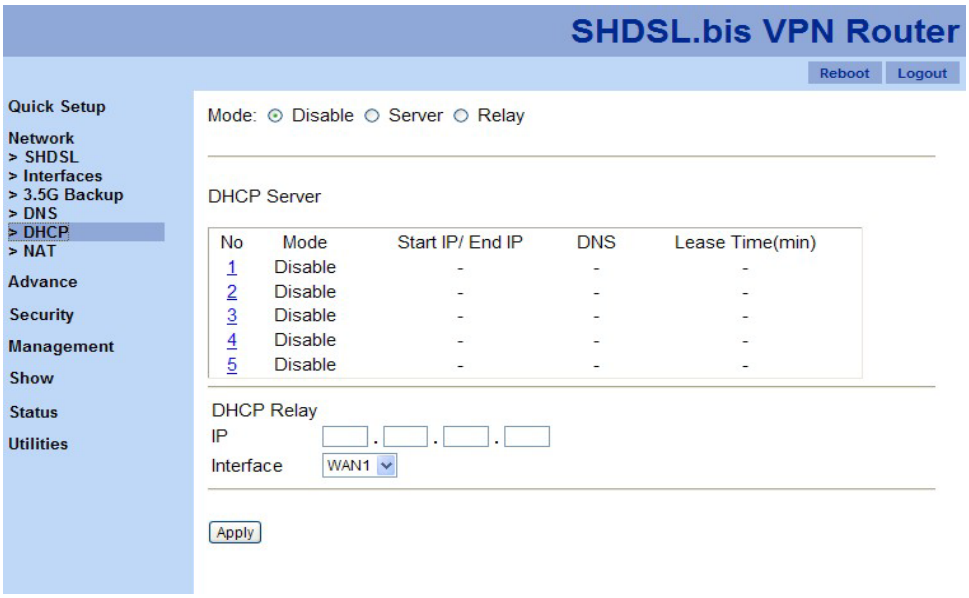


“DNS” function maintains two sets of external DNS addresses. One is for the primary usage and the other one is the secondary DNS. Since the Internet communication is based IP addresses, all names should be translated into IP addresses. DNS (Domain Name Service) allows ISPs’ identifications to be based on names rather than IP addresses.

3.5.5 DHCP

DHCP (Dynamic Host Configuration Protocol) is a communication protocol that allows network administrators to manage centrally and assigns IP addresses in an organization's network automatically.

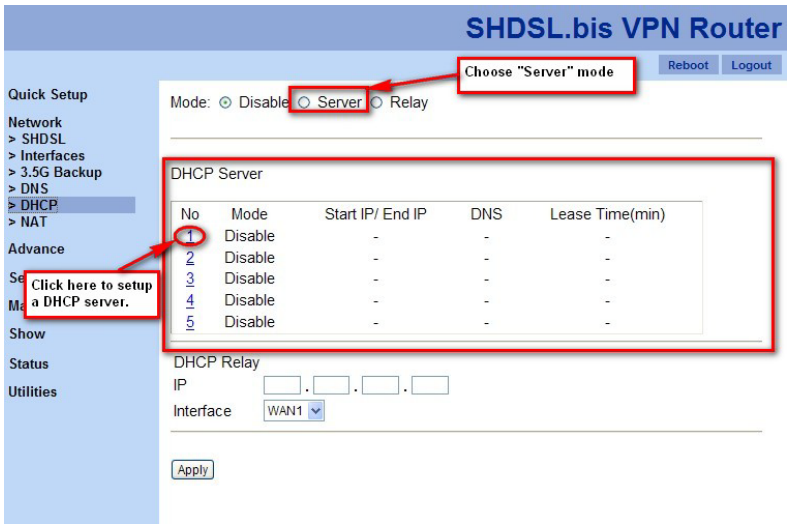
3.5.5.1 Mode



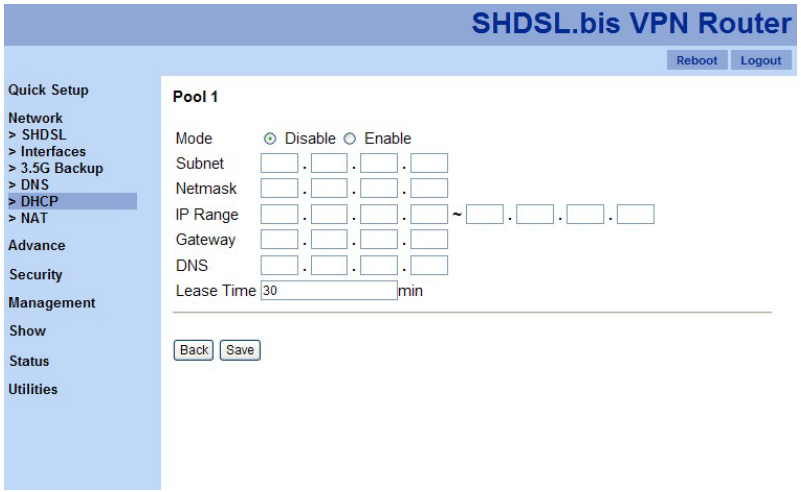
"DHCP" feature provides three DHCP modes: "Disable", "Server" and "Relay".

1. Disable: Disable DHCP Server.
2. Server: Enable DHCP Server and assign IP addresses.
3. Relay: Enable DHCP Server and pass through original IP addresses.

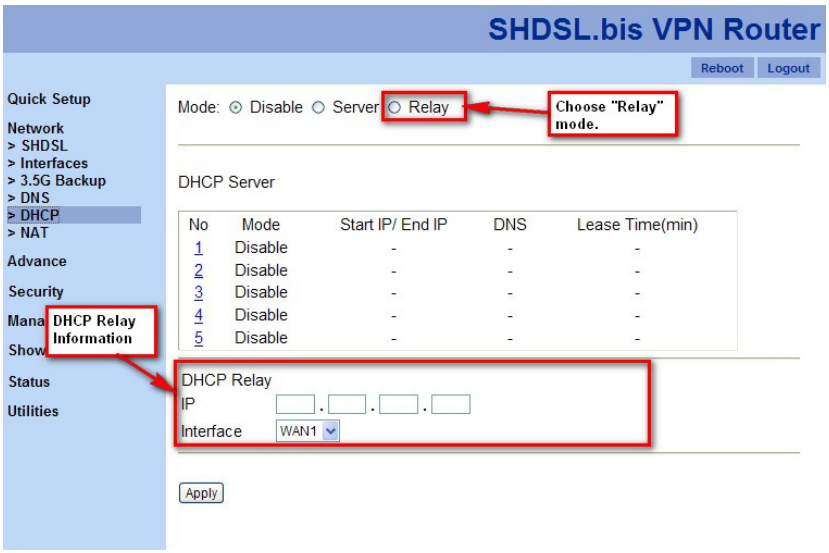
3.5.5.2 DHCP Server



First, please make sure you set “Mode” to “Server”. Then, choose a DHCP server (there are five DHCP servers available in this configuration system.) and configure its details by click on the number. The following screen shot is the detail setups of a DHCP server.



3.5.5.3 *DHCP Relay*

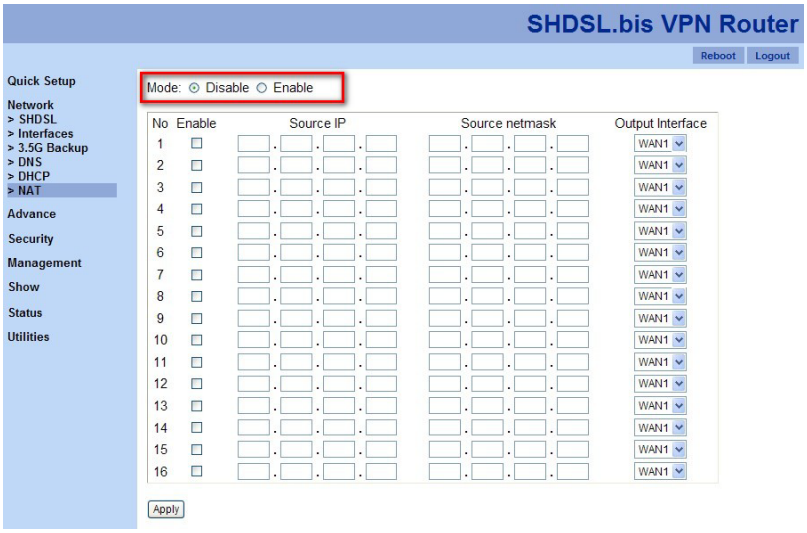


Please make sure choose “Relay” mode first. Then, please provide the information of DHCP server IP address and assign a WAN port.

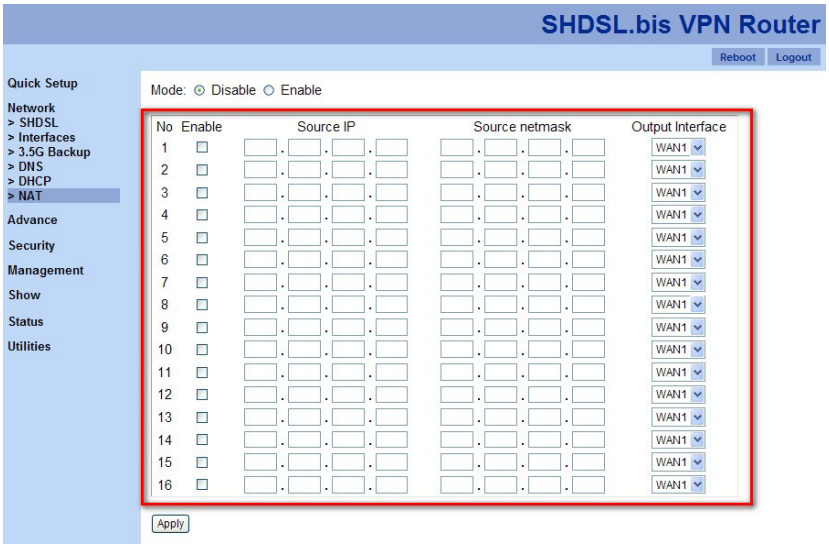
3.5.6 NAT

NAT (Network Address Translation) is a set of rules for translating an intranet IP address, such as, a company network, to a public IP address. Note: NAT is only available in “Router” mode.

First, you need to choose whether you want to enable or disable NAT.



Then, if you want to enable NAT and click on “Enable” button of “Mode” section. Please configure the circled section in the following screen shot.



There are sixteen NAT rules can be stored in IP62xF VPN router configuration system at the same time. By providing the information of IP and netmask, you are able to setup an IP group, and then, assign this group to an output WAN port. If you would love to activate one NAT rule, please check on the particular checkbox and click on “Apply” to issue the modification.

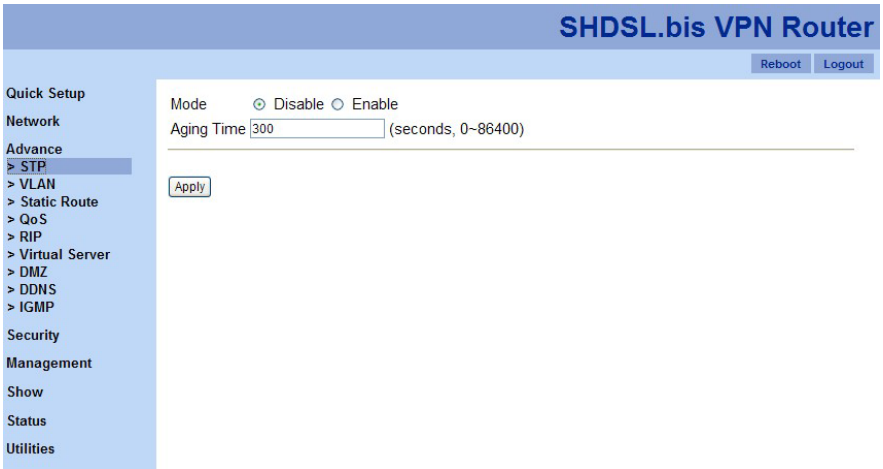
3.6 Advance

"Advance" menu provides nine functions:

1. STP
2. VLAN
3. Static Route
4. QoS
5. RIP
6. Virtual Server
7. DMZ
8. DDNS
9. IGMP

Note: The advanced functions are only for advanced users to setup advanced functions. The incorrect setting of advanced function will affect the performance or system error, even disconnection.

3.6.1 STP



STP (Spanning-Tree Protocol) defined in the IEEE 802.1D, is a link management protocol that provides path redundancy while preventing undesirable loops in the network. For an Ethernet network to function properly, only one active path can exist between two stations.

Click on "Disable" or "Enable" to setup STP mode. "Aging Time" is for how long you would like to refresh the mapping of IP address and MAC address. The default aging time is 300 seconds.

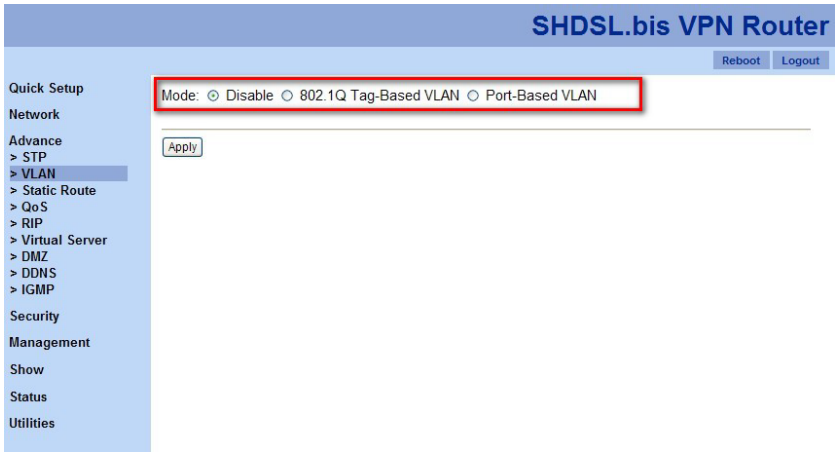
Note: STP is only available in "Bridge" mode.

3.6.2 VLAN

VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same group. When properly configured, VLAN prevents one subscriber from accessing the network resources of another on the same LAN. In addition, VLAN also increases network performance by limiting broadcasts to a smaller and more manageable logical broadcast domain.

Note: VLAN function is only available in “Bridge” mode.

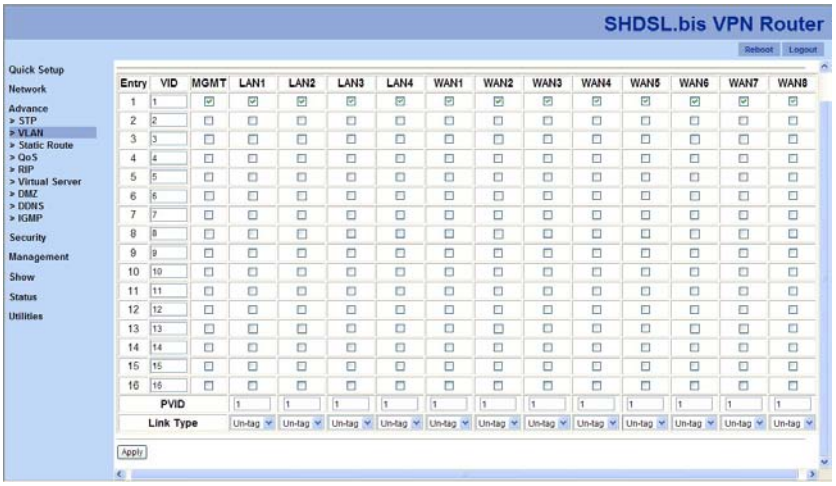
Users can choose three VLAN modes: “Disable”, “802.1Q Tag-Based VLAN” and “Port-Based VLAN”.



Click on “Disable” setup the mode and click on “Apply” to change the VPN router’s VLAN mode.

3.6.2.1 802.1Q Tag-Based VLAN

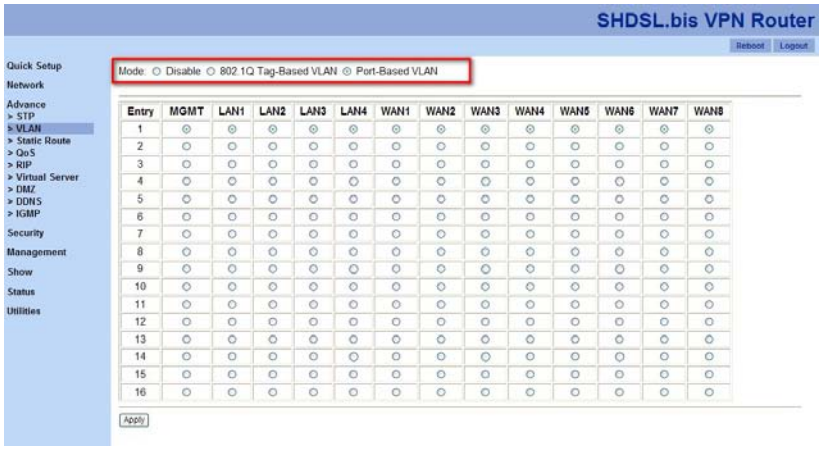
Click on “802.1Q Tag-Based VLAN” to show more configuration as the following screen shot.



Assign each group’s VID and which port should be in a group. Then, assign PVID to the port you need and its link type, un-tag or tag. Then, click on “Apply” to set your VPN router with 802.1Q Tag-Based VLAN policy.

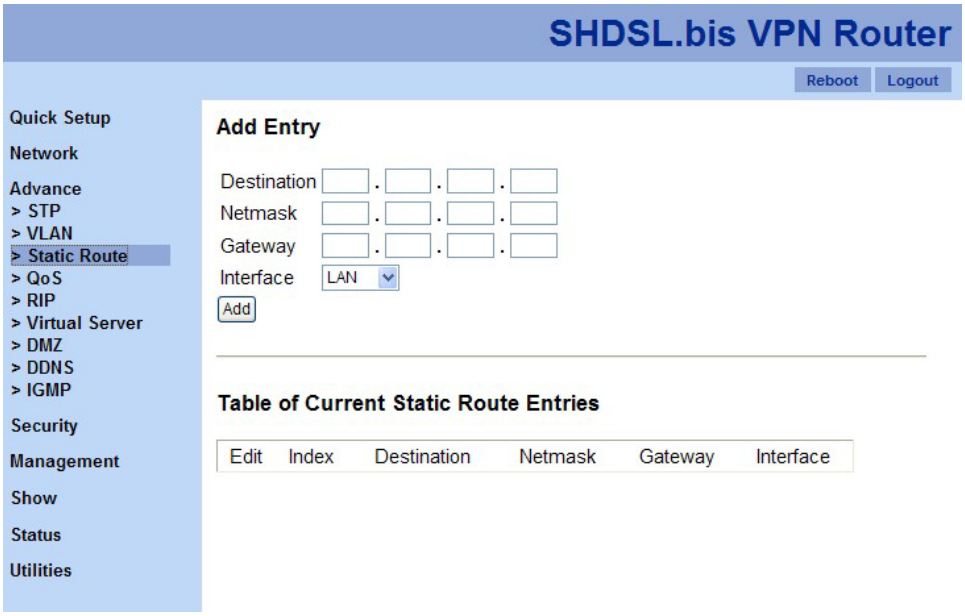
3.6.2.2 Port-Based VLAN

Click on “Port-Based VLAN” in the mode section and you will see the following configuration section as the screen shot below.



Assign which port should be in one group together by click on the corresponding radio buttons in each entry. Click on “Apply” to save this changes.

3.6.3 Static Route



"Static route" is a path in the router that indicates how it will reach a certain subnet by taking a specific path. A static route is one that is manually installed by your network administrator.

Static routes have advantages and disadvantages as compares to dynamic routes.

Advantages of Static Routes

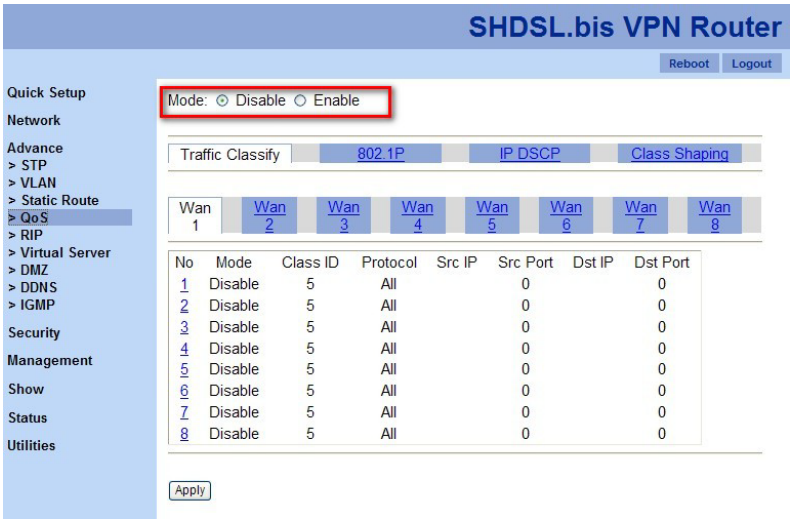
- Static routes are easier to configure
- No need for overhead on the routing protocol
- As long as you have a tight IP mask, this offers you reliable security
- Disadvantages of Static Routes
- In order to make changes in the network, you have to manually configure the route
- When network outage is experienced, it does not automatically route around
- Although this is quite easy to configure, it might not work for large and complicated networks

It is important that any network administrator have substantial knowledge about static routes. Although this type of route may not be as effective with large networks, they are quite useful in any size of networks. Meanwhile, even if you have setup a dynamic route, there are cases that still require a static route.

3.6.4 QoS

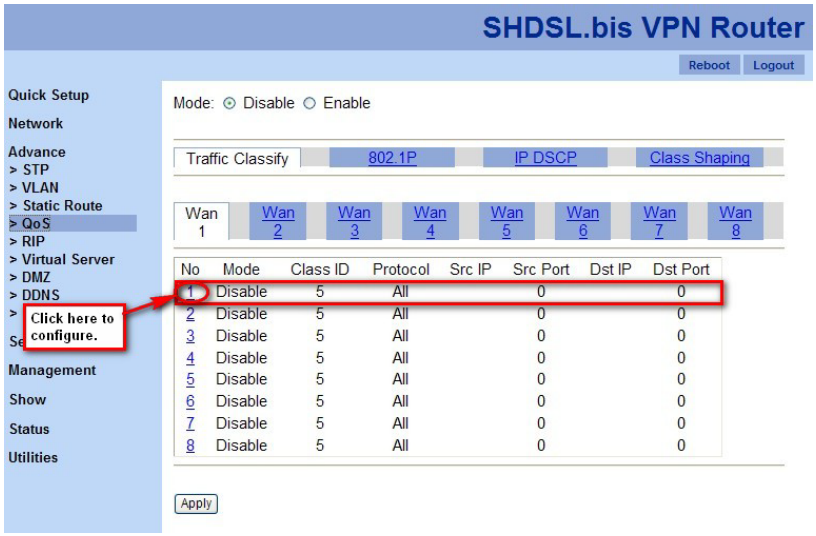
QoS(Quality of Service) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. Without QoS, all traffic date is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and mark the network inadequate for time-critical application such as video-on-demand. QoS is to decide the priorities to pass though VPN Router according to your settings once if the bandwidth is exhausted or fully saturated.

3.6.4.1 Mode

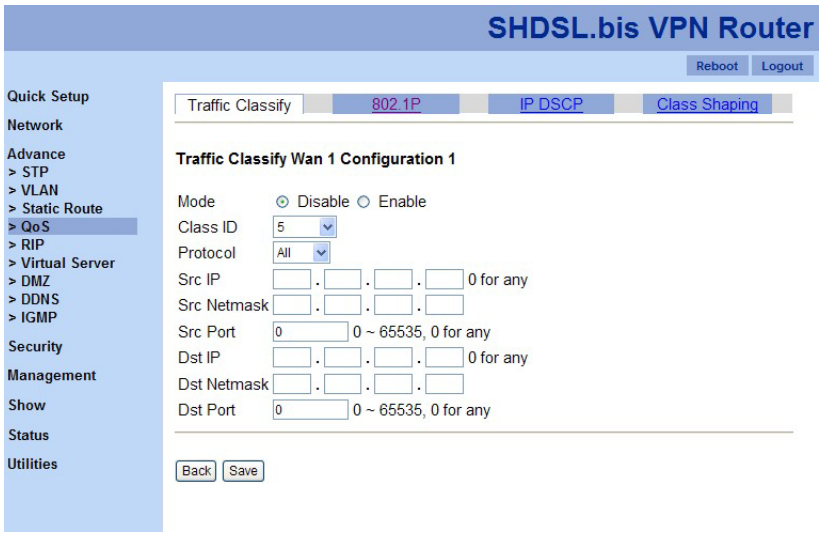


First of all, you need to decide whether you want to enable QoS policy or disable it. Only when the mode is set to "Enable", the following policies will work.

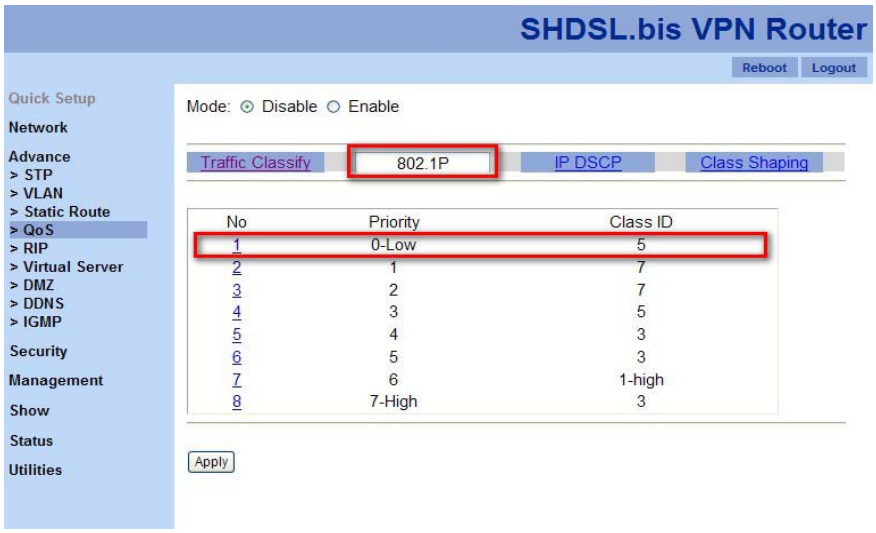
3.6.4.2 *Traffic Classify*



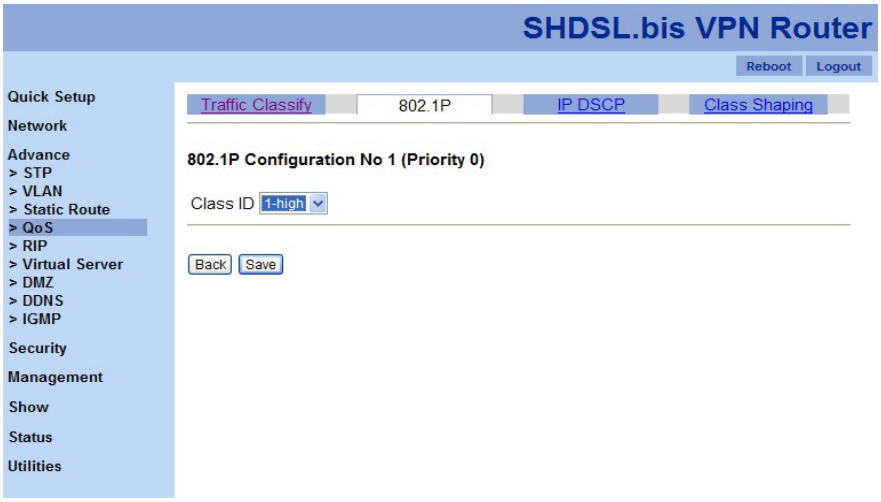
Click on the number to configure each entry's details.



3.6.4.3 802.1P



Click on “802.1P” tag and show the screen shot above. Click on the number of an entry to configure a queue’s class ID.



User priority is giving eight ($2^3 = 8$) priority levels (class IDs).

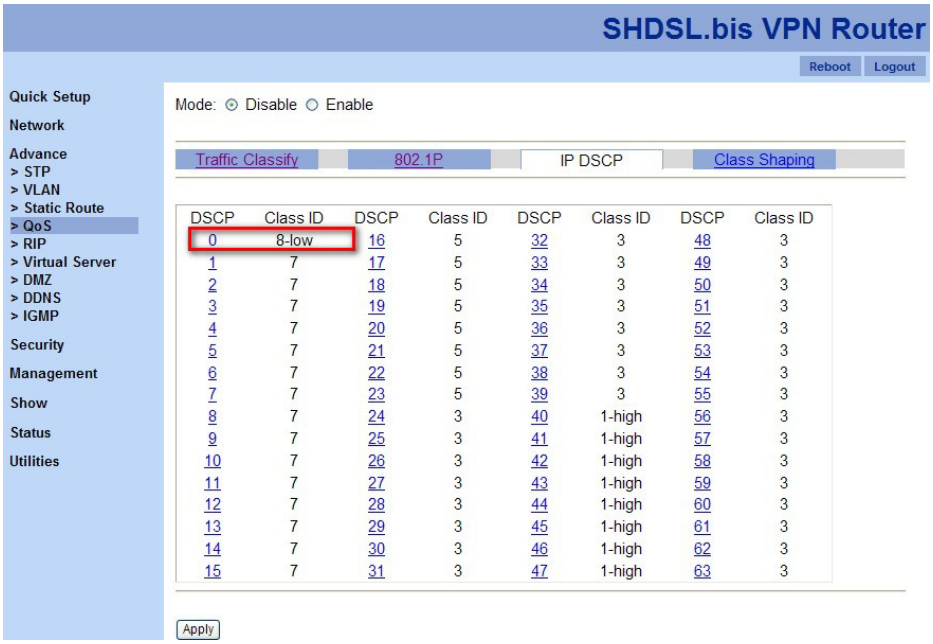
Priority Level	Traffic Type
0 (default)	Best Effort
1	Background
2	Spare
3	Excellent Effort
4	Controlled Load

5	Video, less than 100 milliseconds latency and jitter
6	Voice, less than 10 milliseconds latency and jitter
7	Network Control

3.6.4.4 IP DSCP

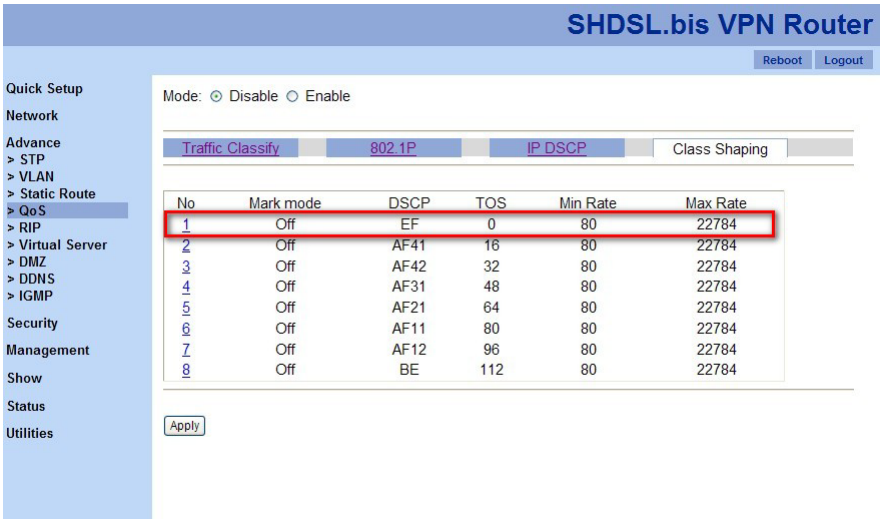
The DSCP value used to identify 64 levels (2^6=64) of service determines the forwarding behavior that each packet gets across the DiffServ network. Based on the marking rule different kinds of traffic can be marked for different priorities of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

Click on “IP DSCP” tag and the following screen shot will be shown. Click on the number of each DSCP to configure its level.

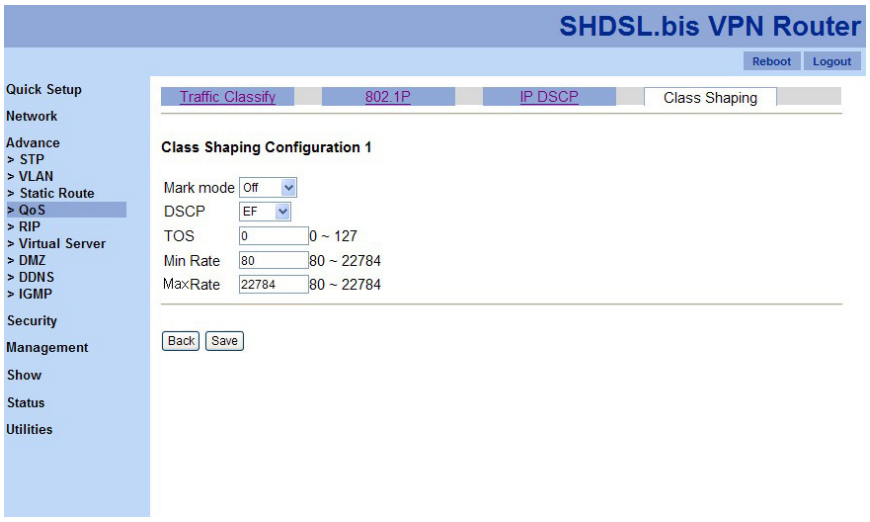


Each DSCP value (from 0 to 63) is mapped to a Queue value (from 1 to 8) from the drop-down list box. The number 1 represents the highest priority and number 8 represents the lowest priority and according various queuing strategies to tailor performance to requirements. You are easy to change the table setting. If you want to save the changes, click “Apply”.

3.6.4.5 *Class Shaping*



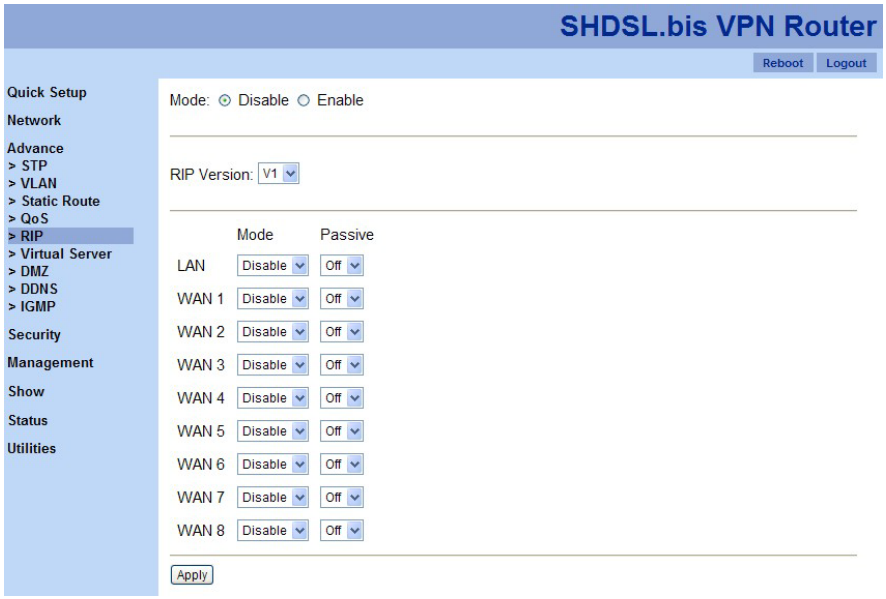
Click on the number of each entry to configure details.



Fill up the information of mark mode, DSCP type, ToS value, the minimum rate and the maximum rate for the selected entry. Then, click on “Save” to change the configurations.

Traffic policing can propagates bursts. When the traffic rate reaches the configured maximum rate, excess traffic is dropped (or remarked). The result is an output rate that appears as a saw-tooth with crests and troughs. In contrast to policing, traffic shaping retains excess packets in a queue and then schedules the excess for later transmission over increments of time. The result of traffic shaping is a smoothed packet output rate.

3.6.5 RIP



The RIP (Routing Information Protocol) is a dynamic routing protocol used in local and wide area networks. It's a very simple protocol, based on distance-vector routing algorithms. As such it is classified as an IGP (interior gateway protocol).

RIP function can be defined by the following parts.

1. Mode

   To set disable RIP mode or enable it.

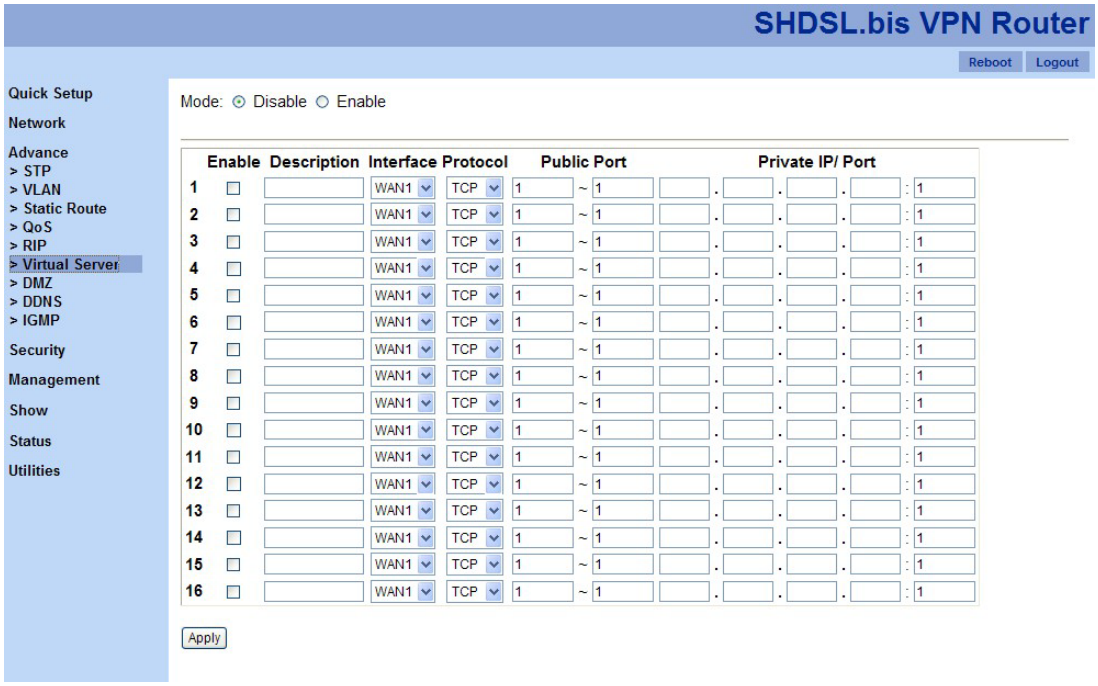
2. RIP Version

   To support V1 (RFC 1058) and V2 (RFC 2453).

3. Port Mode and Passive Mode

   It allow users to setup interfaces with their own modes and passive modes. On passive mode interfaces, all receiving packets are processed as normal and rip does not send either multicast or uni-cast RIP packets.

3.6.6 Virtual Server



This feature allows you to make servers on your LAN accessible to Internet users. Normally, Internet users would not be able to access a server on your LAN because:

(1) Your server does not have a valid external IP address.

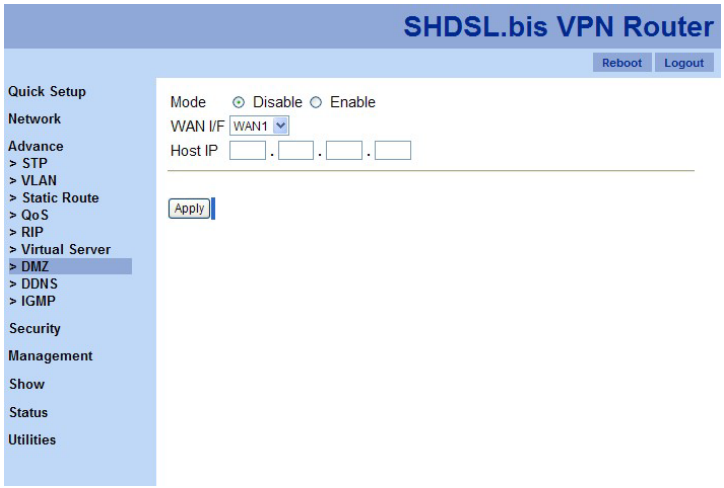
(2) Attempts to connect to devices on your LAN are blocked by the firewall in this device IP address seen by Internet users

To Internet users, all virtual servers on your LAN have the same IP address. The IP address is allocated by your ISP. This address should be static to make it easier for Internet users to connect to your Servers. Once configured, anyone on the Internet can connect your virtual servers.

First, choose “Disable” or “Enable” virtual server function. Then, if you choose enable this function, check on how many servers you would love to have (maximum: 16 servers). You need to provide the information of this server information, such as, interface (which WAN port), protocol (TCP or UDP), public port range, and private IP and its port number. Please make sure you check on the server’s check box to enable the selected virtual server. Finally, click on “Apply” to activate these virtual servers.

Note: This function is only available in “Router” mode.

3.6.7 DMZ



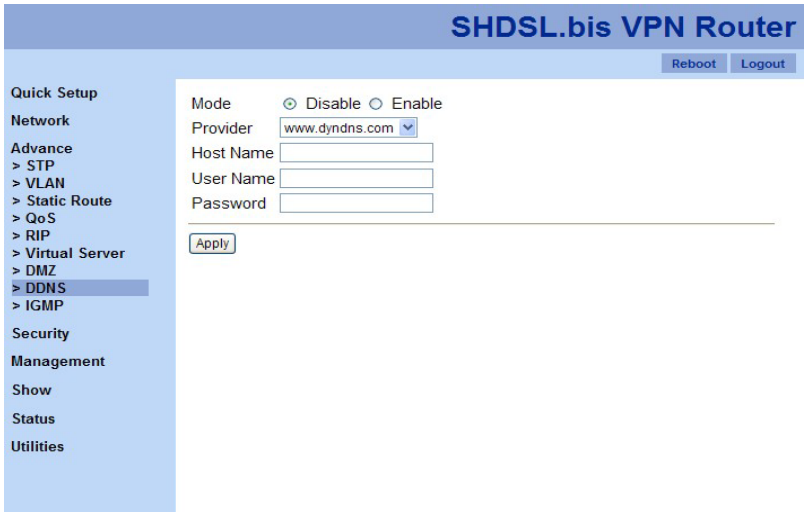
DMZ (demilitarized zone) is a physical or logical sub-network that contains and exposes an organization's external services to a larger distrusted network, usually the Internet. The purpose of a DMZ is to add an additional layer of security to an organization's LAN (Local Area Network).

In DMZ feature, three parameters needed to build up a DMZ function for a WAN port.

1. Mode:
   Choose “Disable” to disable DMZ feature and “Enable” to start this function.
2. WAN I/F
   Choose which WAN port should be applied.
3. Host IP
   Assign a host IP for the WAN port.

Note: DMZ function is only available in “Router” mode.

3.6.8 DDNS



DDNS (Dynamic DNS Free) is a method, protocol or network service that provides the capability for a networked device, such as, a router, to notify a DNS name server to change the active DNS configuration of its configured hostnames, addresses or other information.

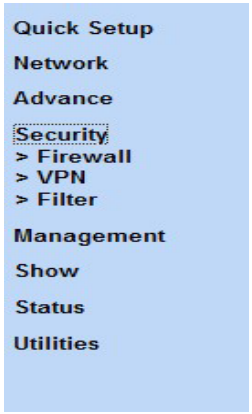
1. Mode: to disable or enable DDNS function.
2. Provider:
   IP62xF VPN Router provides three DNS name service providers. Please choose a provider from the following list.
   - www.dyndns.com
   - www.no-ip.com
   - www.tzo.com
3. Host Name: the host name you registered in the selected provider.
4. User Name: the account name you have for the selected provider.
5. Password: the password for the selected provider.

3.6.9 IGMP

IGMP (Internet Group Management Protocol) proxy can be used to implement multicast routing. It works by IGMP frame forwarding. VPN Router's IGMP proxy supports IGMP version 2 (RFC2236). IGMP proxy works in router mode (Layer 3); in the other hand, IGMP snooping works in bridge mode (Layer 2).

When IGMP function is "Enable", the received IGMP packets will be forwarded to the intranet devices which need to receive IGMP packets.

3.7 Security



"Security" section includes three features:

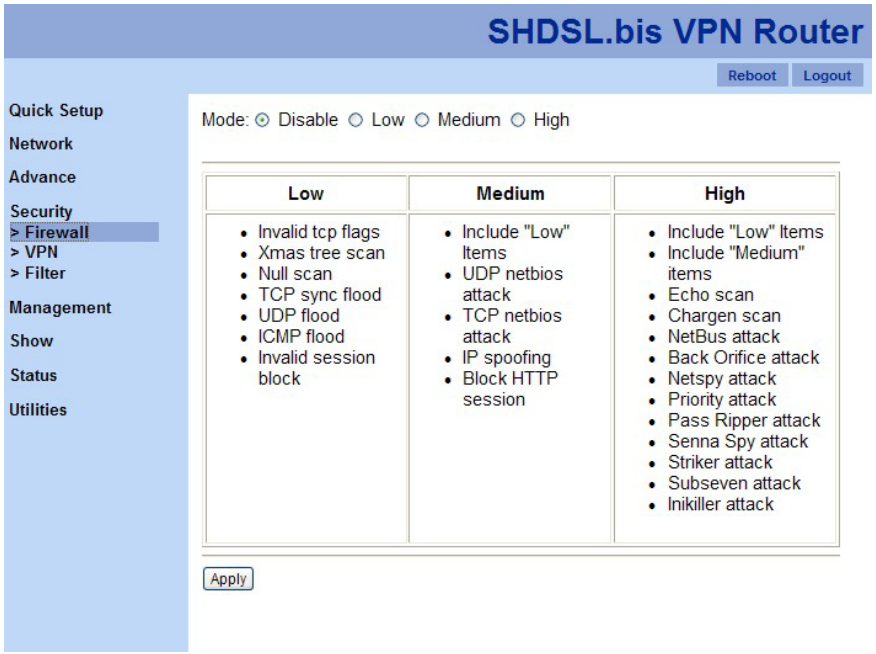
1. Firewall
2. VPN
3. Filter

The following sections will guide you some details of these features.

3.7.1 Firewall

A firewall is a set of related programs that protects the resources of a private network from other networks. It prevents hackers to access its own private data resource accidentally.

There are four firewall modes: "Disable", "Low", "Medium" and "High". The table below shows what kind of packets will be blocked in different modes.

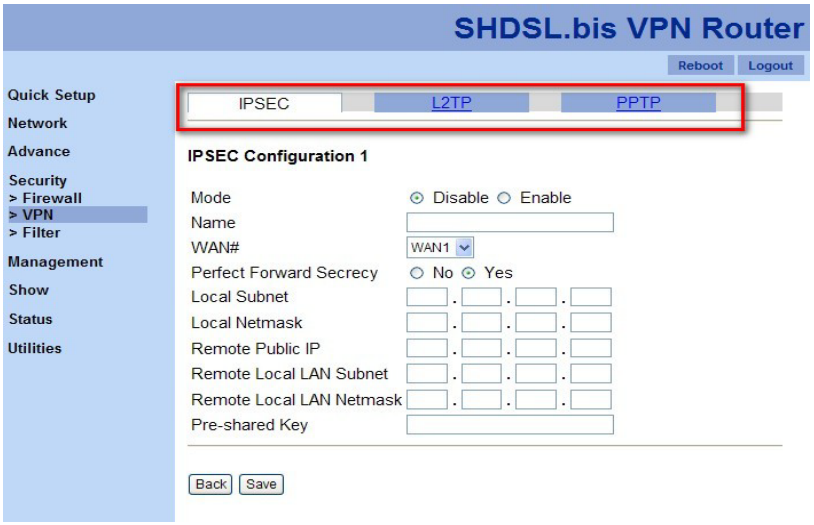


Note: "Firewall" function is only available in "Router" mode.

3.7.2 VPN

A VPN (Virtual Private Network) provides a secured connection between 2 points in an insecure network. The secured connection is called a VPN Tunnel. IP62xF VPN Router supports three main types of VPN: IPSEC, L2TP and PPTP.

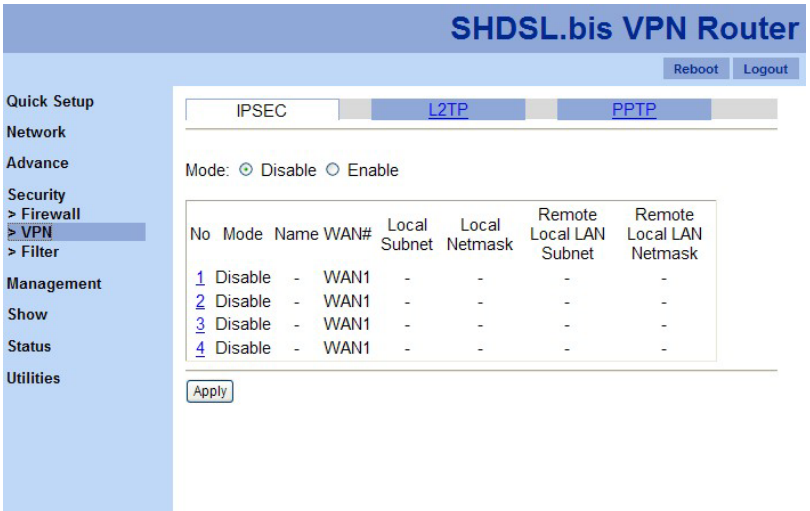
Note: “VPN” function is only available in “Router” mode.



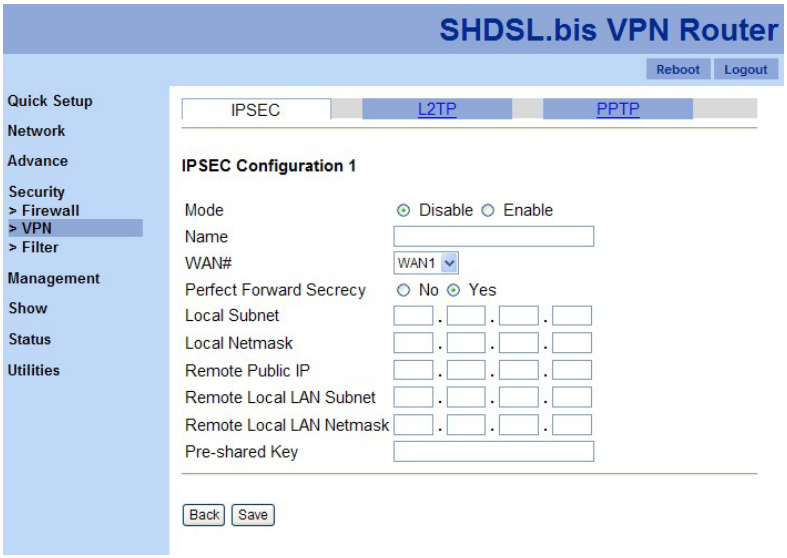
3.7.2.1 IPSEC

IPSEC is a near-ubiquitous VPN security standard, designed for use with TCP/IP networks. It works at the packet level, and authenticates and encrypts all packets traveling over the VPN Tunnel.

IPSEC VPNs exchange information through logical connections called SAs(Security Associations). An SA is simply a definition of the protocols, algorithms and keys used between the two VPN devices (endpoints).



Click on the number of each entry and the configuration page will be shown as below.

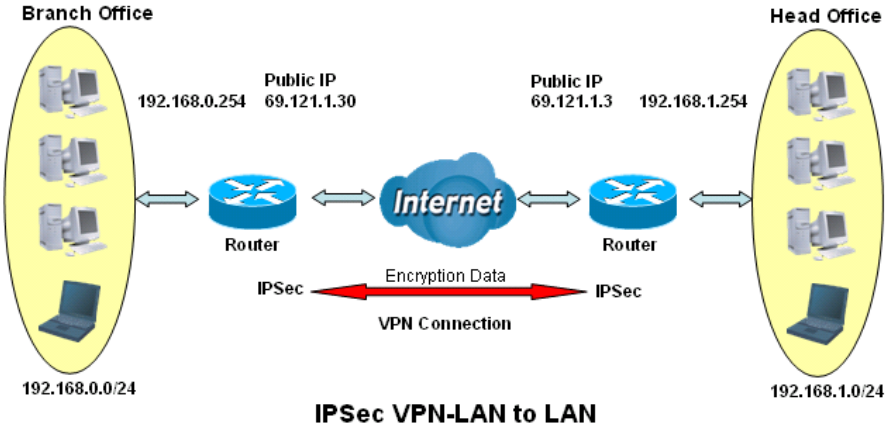


IPSec configuration parameters:

1. Mode: to disable or enable the selected IPSEC policy.
2. Name: IPSEC policy name.
3. WAN: to select a WAN port to apply this policy.
4. Perfect Forward Secrecy:

   Perfect forward secrecy is the property that ensures a session key derived from a set of long-term public and private keys will not be compromised if one of the private keys is compromised in the future. Choose either “Disable” or “Enable” this property.
5. Local Subnet
6. Local Netmask
7. Remote Public IP
8. Remote Local LAN Subnet
9. Remote Local LAN Netmask
10. Pre-shared Key

Example: Configuring a IPSec LAN-to-LAN VPN Connection



IPSec VPN-LAN to LAN

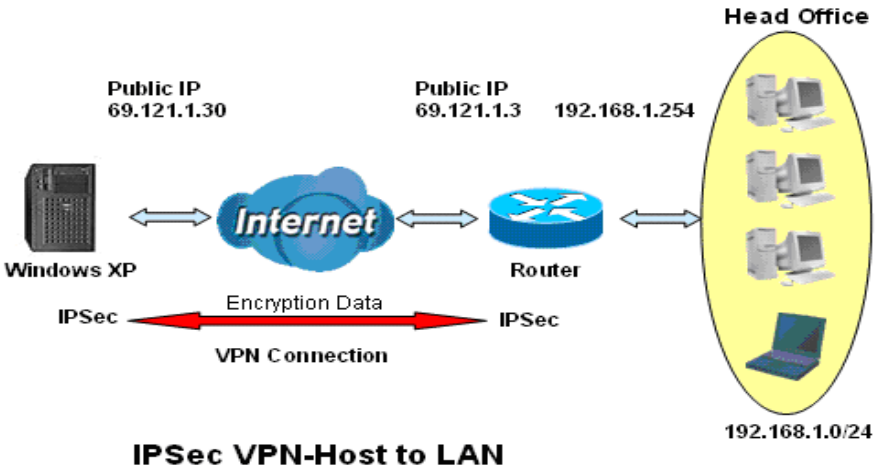
Network Configuration and Security Plan

	Branch Office	Head Office
Local Network ID	192.168.0.0/24	192.168.1.0/24
Local Router IP	69.1.121.30	69.1.121.3
Remote Network ID	192.168.1.0/24	192.168.0.0/24
Remote Router IP	69.1.121.3	69.1.121.30
IKE Pre-shared Key	12345678	12345678
VPN Connection Type	Tunnel mode	Tunnel mode
Security Algorithm	ESP:MD5 with AES	ESP:MD5 with AES

Both office LAN networks must in different subnet with LAN to LAN application.

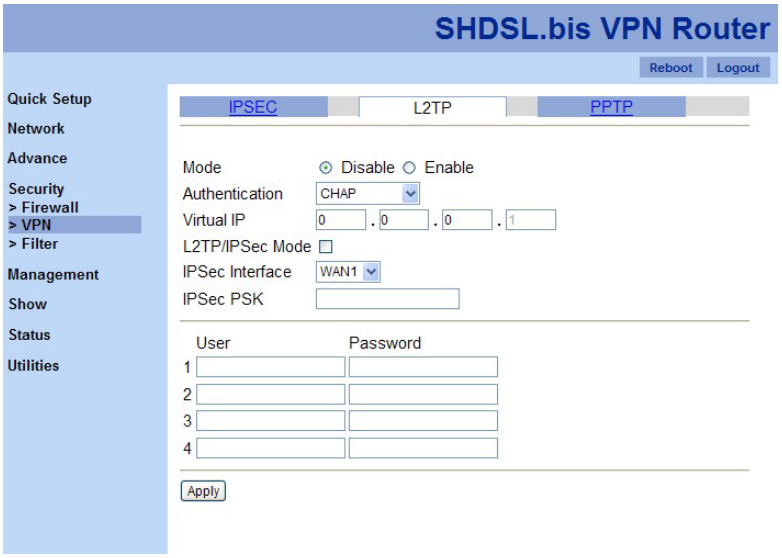
Functions of Pre-shared Key, VPN Connection, type and Security Algorithm must be identically set up on both sides.

Example: Configuring a IPSec Host-to-LAN VPN Connection



IPSec VPN-Host to LAN

3.7.2.2 L2TP



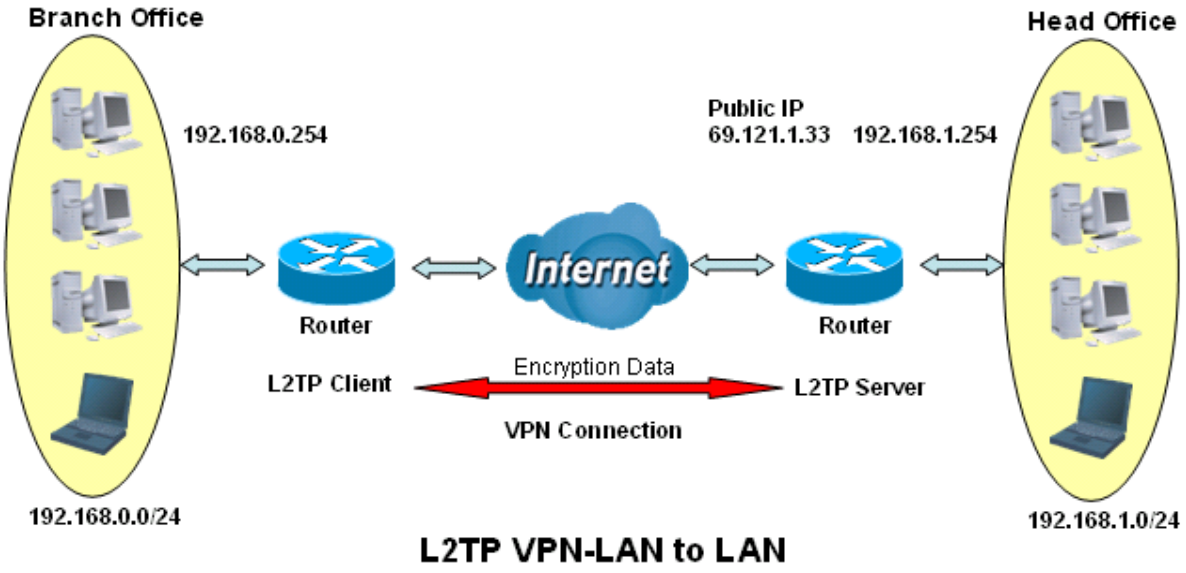
L2TP (Layer 2 Tunneling Protocol) is a tunneling protocol used to support VPNs. It doesn't provide any encryption or confidentiality by itself; it relies on an encryption protocol that it passes within the tunnel to provide privacy.

L2TP configuration parameters:

1. Mode: to disable or enable L2TP policy.
2. Authentication: choose authentication type, PAP, CHAP, MS-CHAP, and MS-CHAPv2.
3. Virtual IP
4. L2TP/IPSec Mode: check this checkbox if devices requires for L2TP/IPSec connection.
5. IPSec Interface
6. IPSec PSK: IPSec Pre-Shared Key.
7. User and Password sets

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.

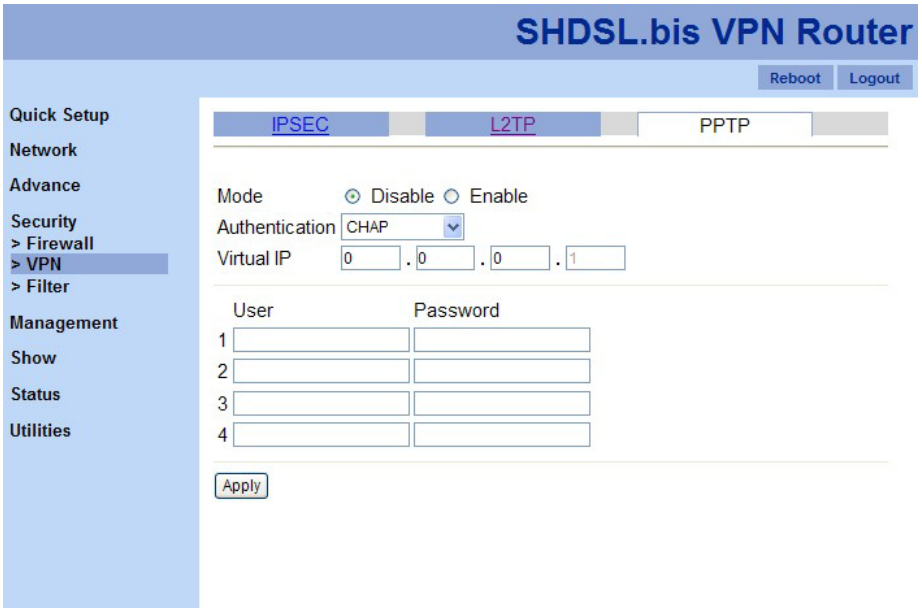


L2TP VPN-LAN to LAN

Both office LAN networks must in different subnet with LAN to LAN application.

Functions of Pre-shared Key, VPN Connection Type and Security Algorithm must be identically set up on both sides.

3.7.2.3 PPTP



PPTP (Point-to-Point Tunneling Protocol) is a private network of computers that uses the public Internet to connect some nodes. Because the Internet is essentially an open network, the PPTP is used to ensure that messages transmitted from one VPN node to another are secured. With PPTP, users can dial in to their corporate network via the Internet. In "PPTP" function, there are three basic parameters to setup.

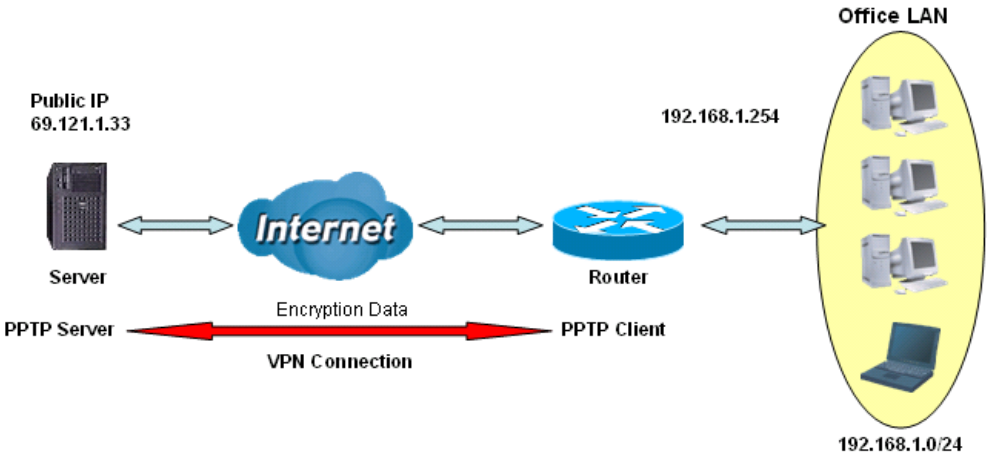
1. Mode: to enable or disable PPTP feature.
2. Authentication: four authentication modes can be chosen, PAP, CHAP, MS-CHAP, and MS-PAP.
3. Virtual IP

In addition, you are able to store four sets of user names and passwords in "PPTP" function.

There are two types of PPTP VPN supported; **Remote Access** and **LAN-to-LAN.**

Example: Configuring a Remote Access PPTP VPN Dial-out Connection

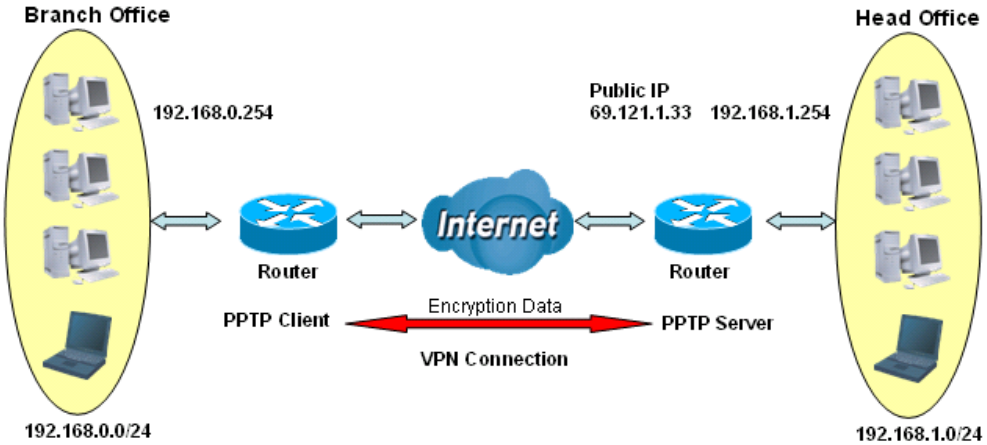
A company's office establishes a PPTP VPN connection with a file server located at a separate location. The router is installed in the office, connected to a couple of PCs and Servers.



PPTP VPN-Remote Access (Dial-out)

Example: Configuring a PPTP LAN-to-LAN 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 office accordingly.



PPTP VPN-LAN to LAN

Both office LAN networks MUST in different subnet with LAN to LAN application.

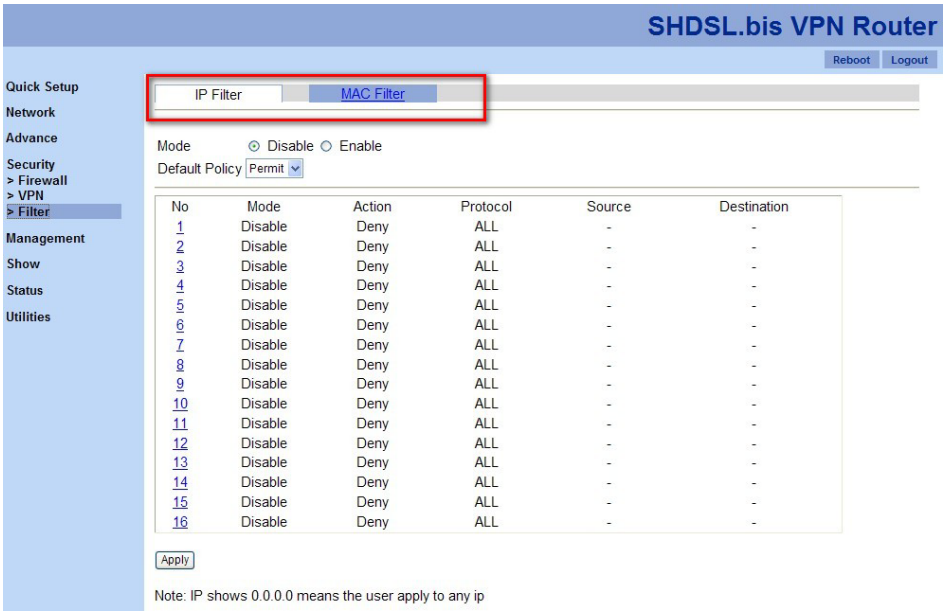
Configuring PPTP VPN in the Head Office

The IP address 192.168.1.254 will be assigned to the router located in the branch office. Please make sure this IP is not used in the head office LAN.

Configuring PPTP VPN in the Branch Office

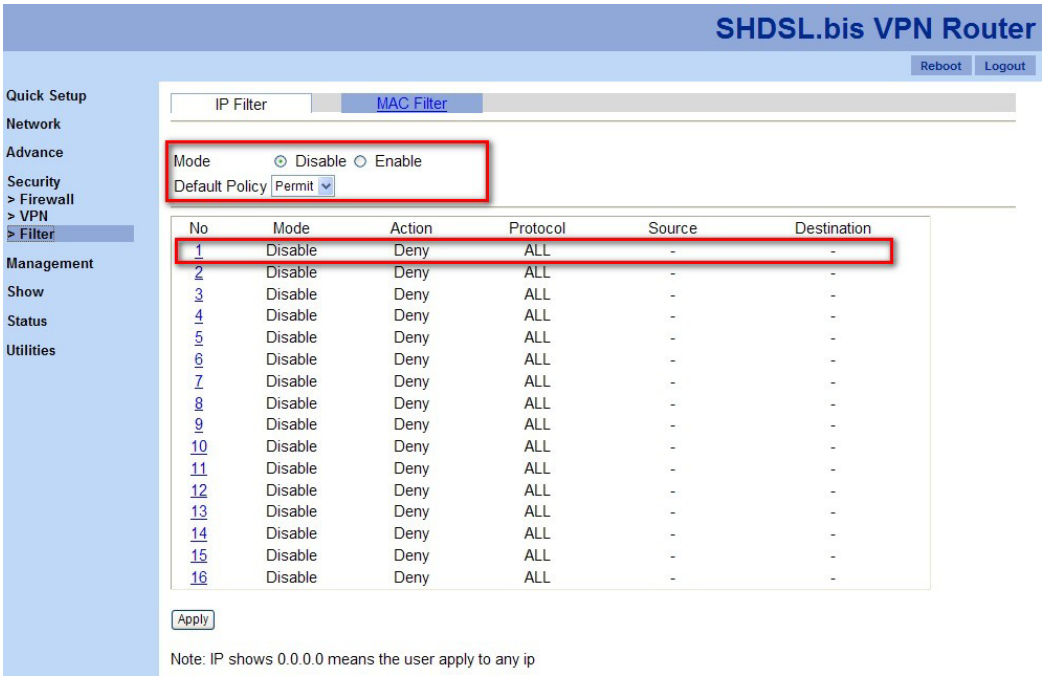
The IP address 69.1.121.33 is the Public IP address of the router located in head office. If you registered the DDNS (please refer to the DDNS section of this manual), you can also use the domain name instead of the IP address to reach the router.

3.7.3 Filter



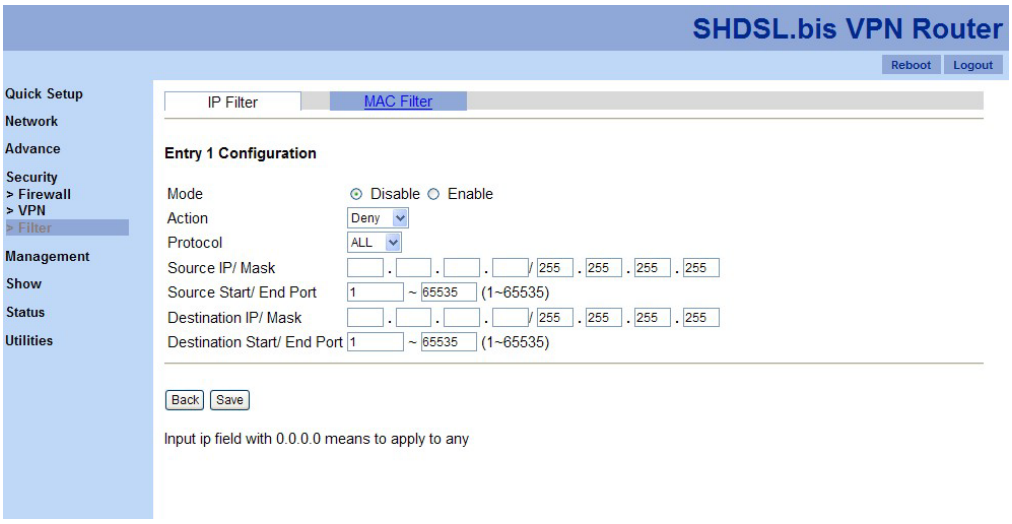
There are two features in “Filter” function: “IP Filter” and “MAC Filter”.

3.7.3.1 IP filter



“IP Filter” allows users to filter packets by IP address. Two sections are in “IP Filter” feature. The first section includes “Mode”, which allows user to enable or disable IP filter feature, and “Default Policy”, include “Deny”, “Permit” and “Reject”.

In the second section, you are able to configure each entry by clicking on the number on the table. Then, a configuration page as the following screen shot will be shown.



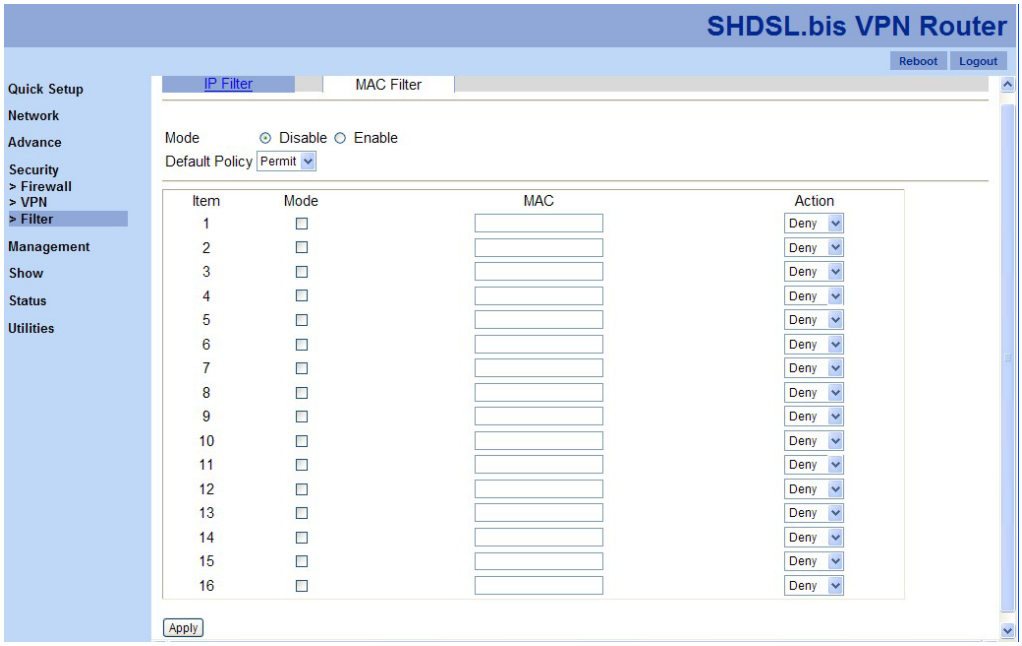
Six elements are included in this configuration page:

1. Mode: to enable or disable this policy entry.
2. Action: “Deny”, “Permit” or “Reject” the packets.
3. Protocol: It is the packet protocol type used by the application, select among from TCP or UDP or both of TCP/UDP.
4. Source IP Address / Destination IP Address: This is the Address-Filter used to allow or block traffic to/from particular IP address. Selecting the Subnet Mask of the IP address range you wish to allow/block the traffic to or form; set IP address and Subnet Mask to 0.0.0.0 to inactive the Address-Filter rule.
5. Source Port: This Port or Port Ranges defines the port allowed to be used by the Remote/WAN to connect to the application. Default is set from range 0 ~ 65535. It is recommended that this option be configured by an advanced user.
6. Destination Port: This is the Port or Port Ranges that defines the application.

Application	Protocol	Port Number	
		Start	End
HTTP	TCP	80	80
DNS	UDP	53	53
DNS	TCP	53	53
FTP	TCP	21	21
Telnet	TCP	23	23
SMTP	TCP	25	25
POP3	TCP	110	110
NEWS(NNTP)	TCP	119	119
Real Audio/ Real Video	UDP	7070	7070

PING	ICMP	N/A	N/A
H.323	TCP	1720	1720
T.120	TCP	1503	1503
SSH	TCP	22	22
NTP /SNTP	UDP	123	123
HTTP/HTTP Proxy	TCP	8080	8080
HTTPS	TCP	443	443
ICQ	TCP	5190	5190
MSN(1863)	TCP	1863	1863
MSN(7001)	UDP	7001	7001
MSB video	TCP	9000	9000

3.7.3.2 MAC filter



"MAC Filter" function refers to a security access control methodology whereby the 48-bit address (XX:XX:XX:XX:XX:XX) assigned to each network device is used to determine access to the network. MAC addresses are uniquely assigned to each network device, so using MAC filtering on a network permits and denies network access to specific devices through the use of black lists and white lists.

In "MAC Filter" page, you need to provide the following information in order to allow the VPN router to activate MAC filtering function.

1. Mode: to enable or disable "MAC Filter" feature.
2. Default Policy: "Deny", "Permit", or "Reject" packets from selected MAC addresses.
3. Policy Entry: there are 16 entries available in this feature. Check the check box of "Mode" to enable this policy, fill up MAC address in the text box of "MAC" and choose policy action from the drop-down menu of "Action.

3.8 Management

"Management" section provides eight features:

1. SNTP
2. SNMP
3. TR069
4. UPnP
5. Sys Log
6. Telnet
7. SSH
8. Web

3.8.1 SNTP

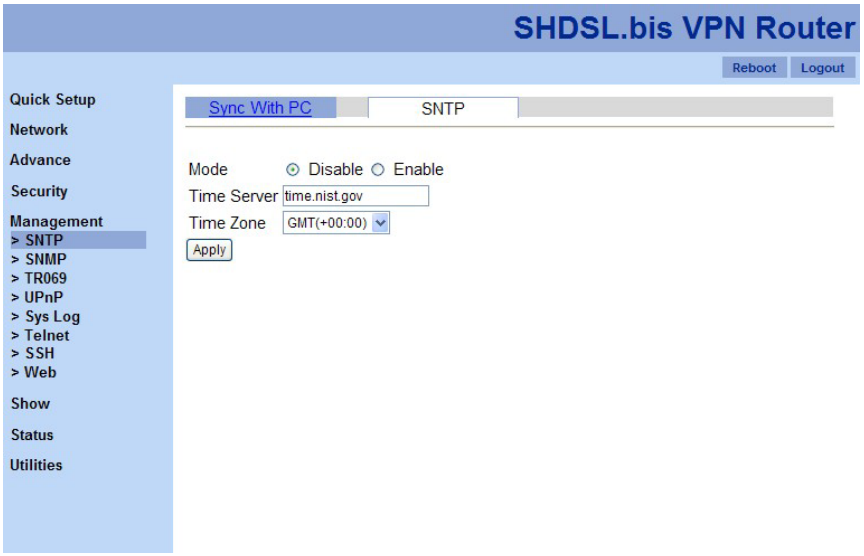
Time synchronization is an essential element for any business, which relies on the IT system. The reason for this is that these systems all have clock that is the source of timer for their filing or operations. Without time synchronization, these system's clocks vary and cause the failure of firewall packet filtering schedule processes, compromised security, or virtual server working in wrong schedule.

SNTP is the acronym for Simple Network Time Protocol, which is an adaptation of the Network Time Protocol (NTP) used to synchronize computer clocks in the Internet. SNTP can be used when the ultimate performance of the full NTP implementation. "SNTP" function is only available in "Router" mode.

3.8.1.1 Sync with PC

"Sync with PC" allows the VPN router to synchronize with computer's internal timer. Click on "Sync" button in order to start synchronization.

3.8.1.2 SNTP



"SNTP" features allow you to synchronize the time with the time server you provided. In order to make this feature works, you need to provide the following parameters.

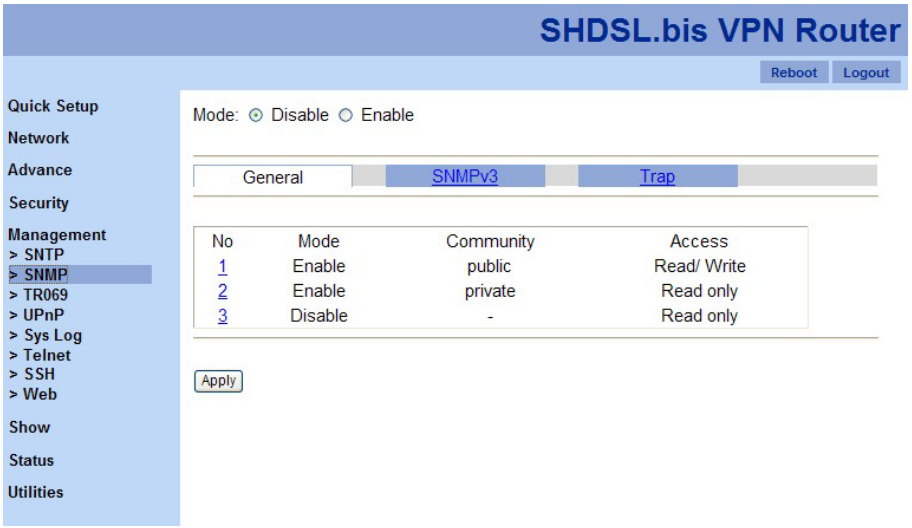
1. Mode: to enable or disable this feature.
2. Time Server: the address of a time server you wish to follow the time with.
3. Time Zone: choose the time zone of this VPN router with the drop-down menu.

3.8.2 SNMP

Simple Network Management Protocol (SNMP) provides for the exchange of messages between a network management client and a network management agent for remote management of network nodes. These messages contain requests to get and set variables that exist in network nodes in order to obtain statistics, set configuration parameters, and monitor network events. SNMP communications can occur over the LAN or WAN connection.

Three SNMP methods are available in “SNMP” function: 1. General, 2. SNMPv3 and 3. Trap.

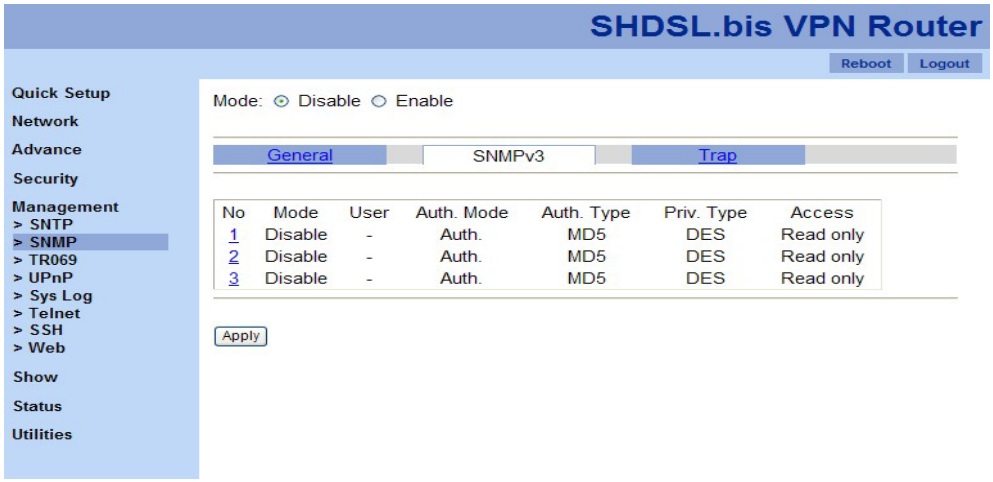
3.8.2.1 General



You are able to enable SNMPv1 and SNMPv2 from “General” section. First, you need to click on “Enable” radio button to enable this SNMP feature. Then, click on the number of the policy entry you want in the table. A policy configuration page will be shown as the screen shot below.

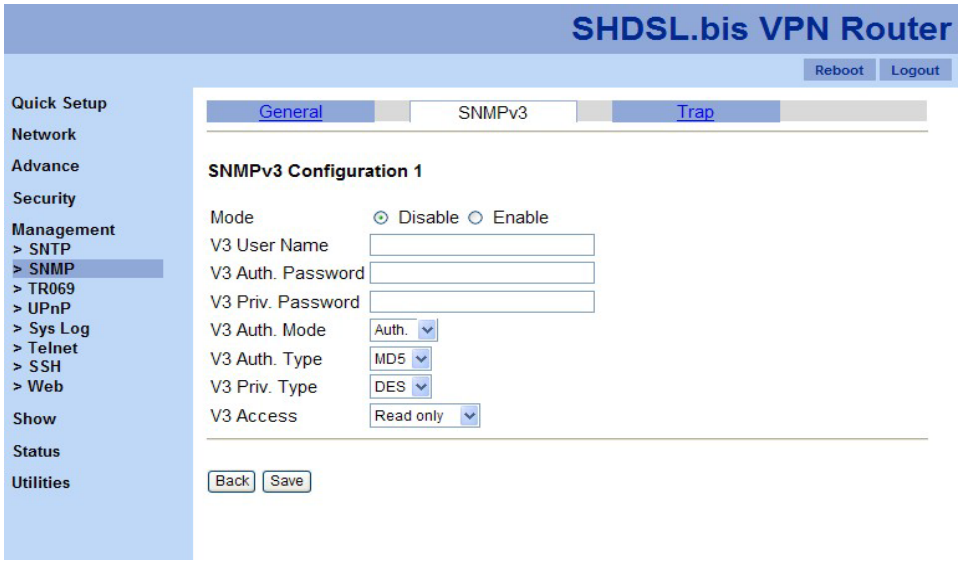
In this configuration page, you need to enable or disable this policy entry, provide a name in “Community” text box, and assign access mode from the drop-down menu of “Access”. Click “Save” button to finish this configuration section.

3.8.2.2 SNMPv3



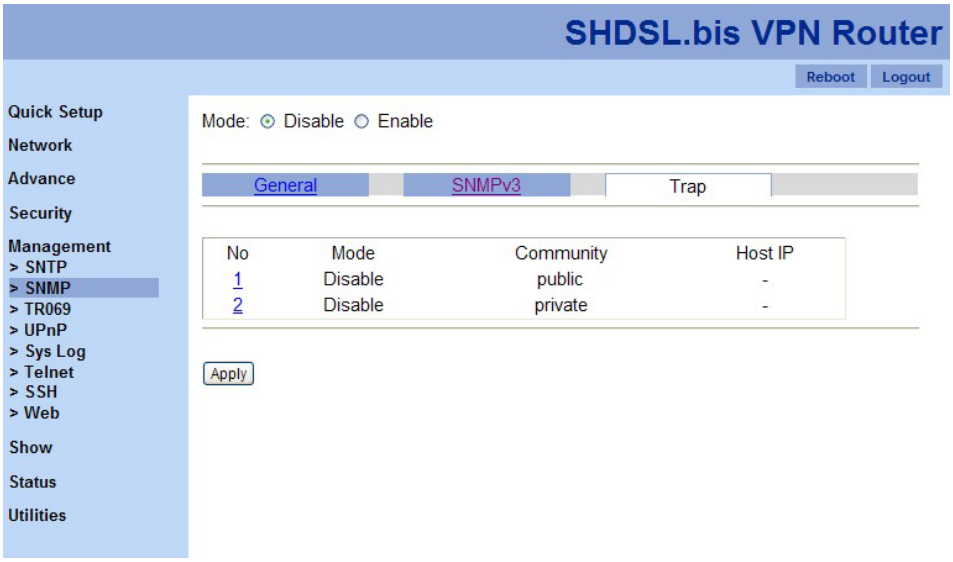
“SNMPv3” feature lets you to fill up the detail information, such as, password, for SNMPv3 function by click on the number of each policy entry. Then, you will see the following screen shot.

(Note: Please make sure you choose “Enable” to allow the VPN router supports SNMPv3.)

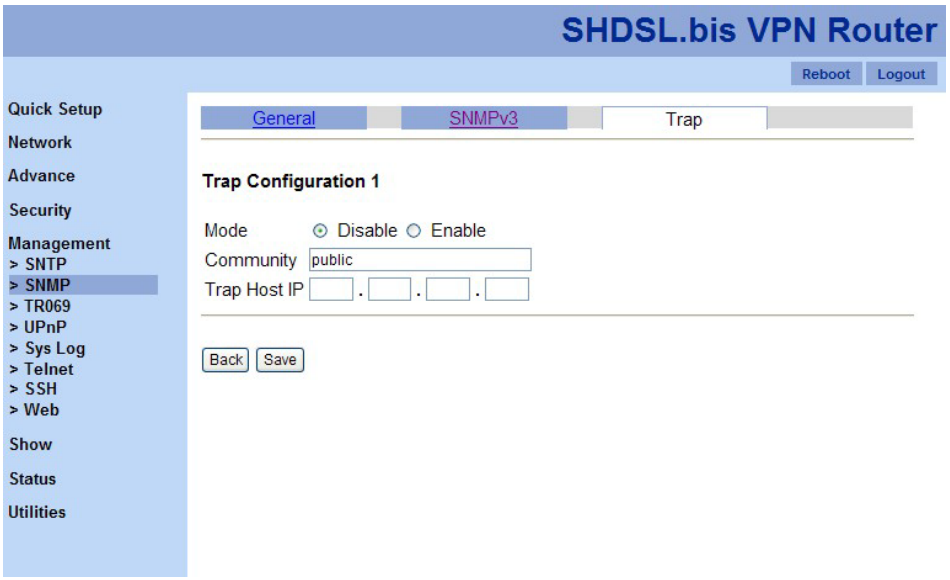


Once you fill up all the information needed, click on “Save” to finish this configuration.

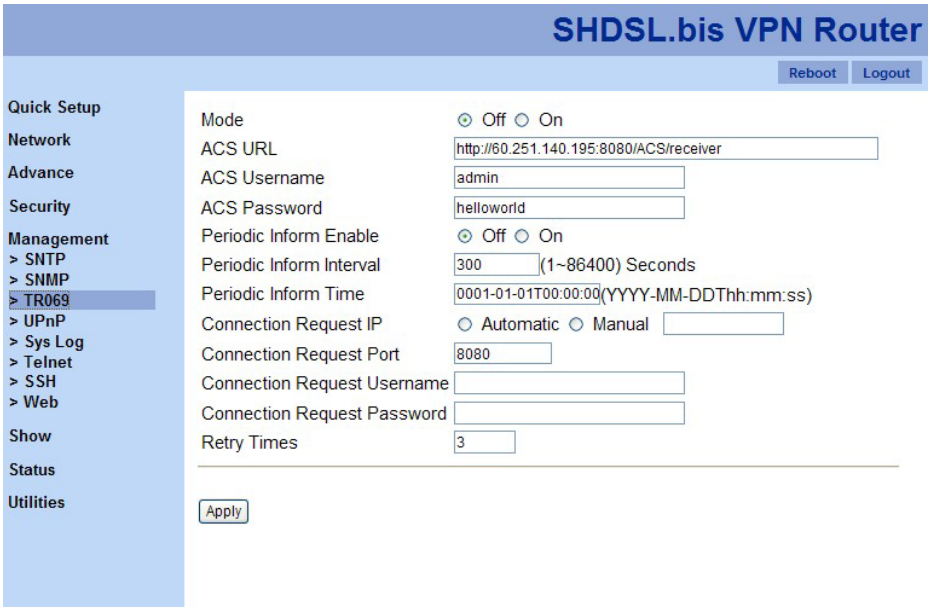
3.8.2.3 Trap



With “Trap” feature, the VPN router is able to support SNMP Trap function. You are able to disable or enable this feature by click on the radio buttons of “Mode”. Then, if you would like to modify each policy in the table, please click on the number. Then, you are able to see the screen shot below.



3.8.3 TR-069



TR-069 (Technical Report 069) is a DSL 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 HTTP based protocol, it provides the communication between CPE (customer premises equipment) and ACS (Auto Configuration Servers). Using TR-069 the terminals can get in contact with the ACS (Auto Configuration Servers) and establish the configuration automatically.

1. Mode: to turn on or turn off TR069 feature.
2. ACS URL: to fill up URL for connecting to the ACS using the CPE WAN Management Protocol. This parameter MUST be in the form of a valid HTTP or HTTPs URL.
3. ACS User Name: this username is used only for HTTP-based authentication of the CPE.

4. ACS Password
5. Periodic Inform Enable
6. Periodic Inform Interval: the duration in seconds of the interval, for which the CPE attempts to connect with the ACS and call the Inform method.
7. Periodic Inform Time
8. Connection Request IP: two options: automatic or manual (if you choose “Manual”, please fill up the IP address.)
9. Connection Request Port
10. Connection Request Username: the username used to authenticate an ACS making a Connection Request to the CPE.
11. Connection Request Password: the password used to authenticate an ACS making a Connection Request to the CPE.

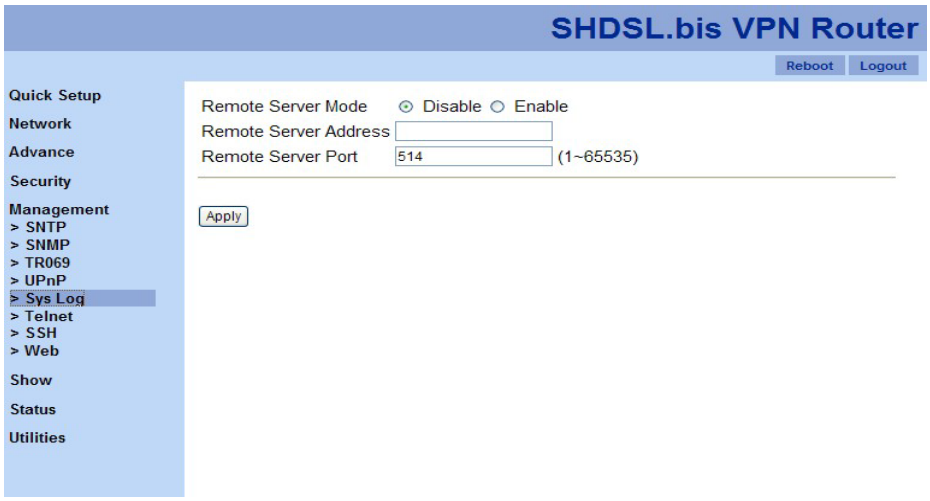
3.8.4 UPnP

To “enable” UPnP (Universal Plug and Play) allows automatic discovery and configuration of equipment attached to your LAN. UPnP is supported by Windows ME, XP or later.

“Enable”: this VPN Router will be visible via UPnP

“Disable”: this VPN Router will not be visible via UPnP

3.8.5 Sys Log

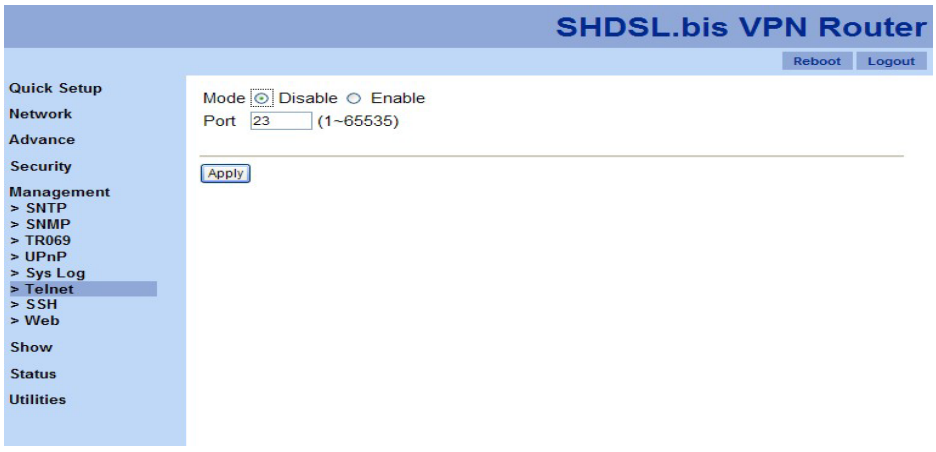


Syslog is a standard method of centralizing various logs. You can use a syslog server to store your server's logs in a remote location for later perusal or long-term storage.

To send logs to the LOG server, please provide the following information.

1. Remote Server Mode: click on "Enable" button to send logs to a remote server.
2. Remote Server Address: this allows you to send logs to different files in the syslog server.
3. Remote Server Port: to specify a UDP port number to which the syslog server is listening. The default value is 514. Also, please make sure this port is not blocked from your firewall.

3.8.6 Telnet

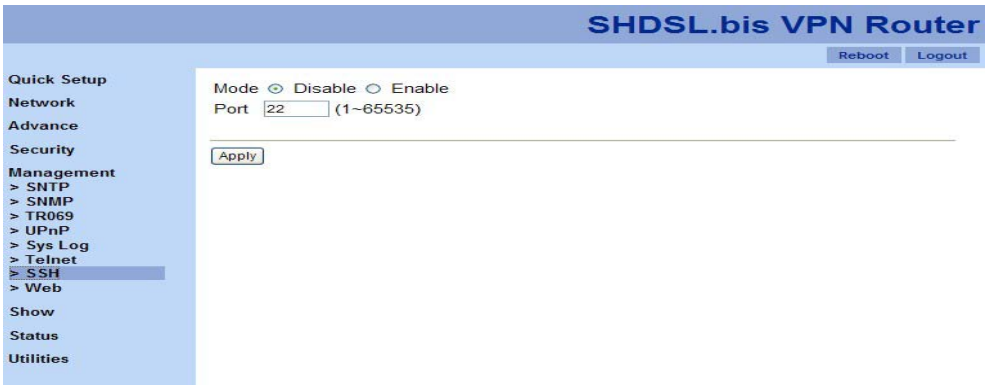


You are able to change the default port of the VPN router's Telnet function in this feature.

1. Mode: to enable or disable Telnet function of this VPN router.

2. Port: the default port number is 23. Please fill in a number from 1 to 65535 if you want to change another port number.

3.8.7 SSH

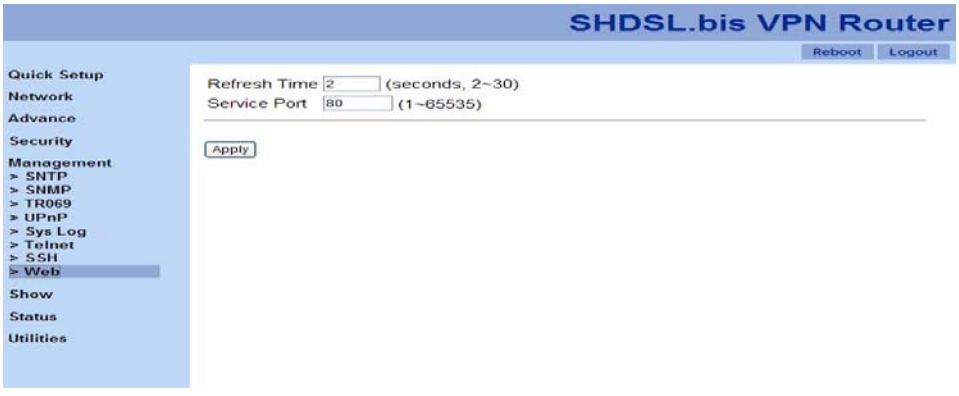


SSH (or Secure Shell) is a protocol that can be used to log into a remote machine (your Virtual Server) and provide secure encrypted communications between your VPN Router and your local computer. All of the commands you would use in a Telnet client, you can use in an SSH client. The only difference is that the communication is made via encrypted channels to and from your VPN Router.

In “SSH” function, you are able to change the default port number.

1. Mode: to enable or disable SSH function.
2. Port: the default port number is 22. You are able to change the port number by providing a number from 1 to 65535.
3.

3.8.8 Web



In “Web” function, you are able to change some setups as the following list.

1. Refresh Time: you are able to refresh your web page in a particular time intervals. The default interval is

2 seconds.

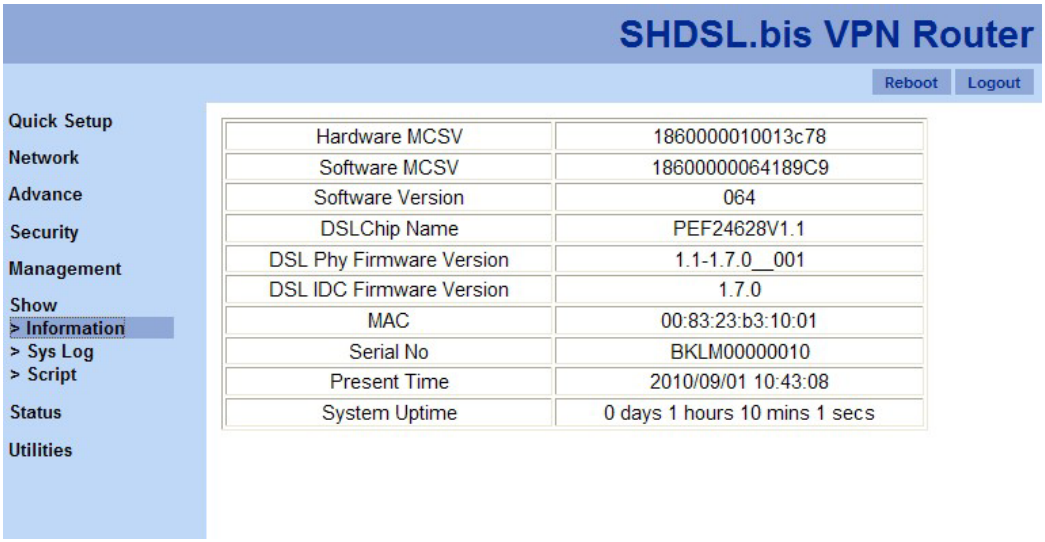
2. Service Port: the default port number is 80. You are able to change this port number to a new one and please make sure you login with this new port number next time.

3.9 Show

Three functions are available in “Show” section.

1. Information
2. Sys Log
3. Script

3.9.1 Information

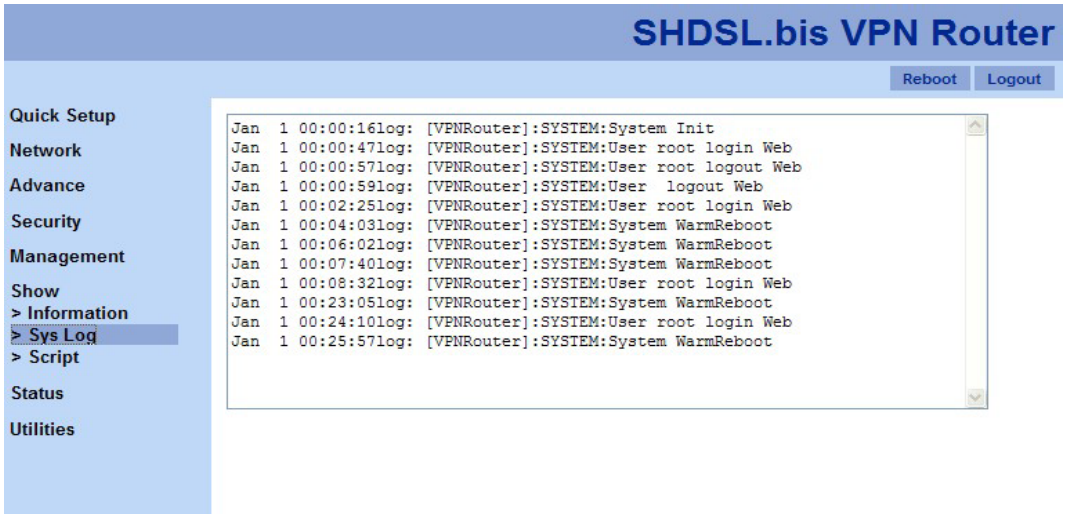


“Information” feature shows the general system information, such as, hardware and software MCSV (the Manufacture's Concurrent Software Version), software version, etc. (Note: please include a screen shot of this page when you request any technical support!)

1. Hardware MCSV
2. Software MCSV
3. Software Version
4. DSL Chip Name
5. DSL Phy Firmware Version
6. DSL IDC Firmware Version
7. MAC

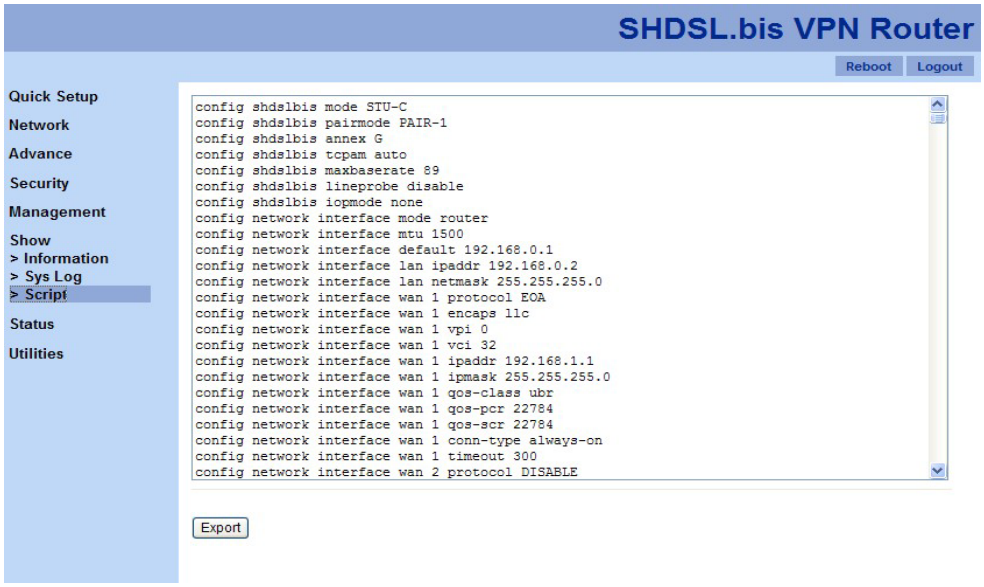
8. Serial No.
9. Present Time
10. System Uptime: the total time the VPN router is on.

3.9.2 Sys Log



"Sys Log" feature shows all of system logs.

3.9.3 Script



"Script" presents the VPN router's system setups in script manner. Clicking on "Export" button will generate a file, includes all configurations of the VPN router.

3.10 Status

"Status" section provides five features:

1. SHDSL
2. WAN
3. Route Table
4. Interfaces
5. STP

3.10.1 SHDSL

For 2-wire models:

Item	Local Side	Remote Side
	Channel A	Channel A
State	IDLE	IDLE
Base-Rate	0 kbps	0 kbps
Sub-rate	0 kbps	0 kbps
SNR Margin	0	0
LoopAttn	0 dB	0 dB
ES	0	0
SES	0	0
UAS	0	0
LOSWS	0	0
CRC	0	0
Clear CRC		

For 4-wire models:

Item	Local Side		Remote Side	
	Channel A	Channel B	Channel A	Channel B
State	IDLE	IDLE	IDLE	IDLE
Base-Rate	0 kbps	0 kbps	0 kbps	0 kbps
Sub-rate	0 kbps	0 kbps	0 kbps	0 kbps
SNR Margin	0	0	0	0
LoopAttn	0 dB	0 dB	0 dB	0 dB
ES	0	0	0	0
SES	0	0	0	0
UAS	0	0	0	0
LOSWS	0	0	0	0
CRC	0	0	0	0
Clear CRC				

For 8-wire models:

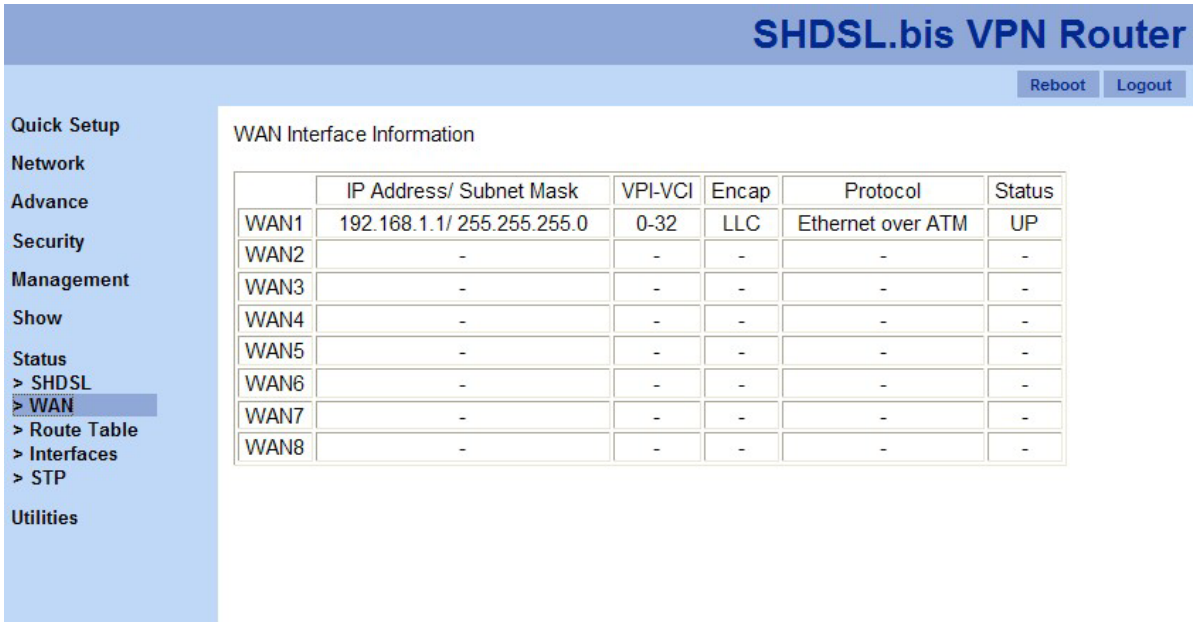
Item	Local Side				Remote Side			
	Channel A	Channel B	Channel C	Channel D	Channel A	Channel B	Channel C	Channel D
State	IDLE	IDLE	IDLE	IDLE	IDLE	IDLE	IDLE	IDLE
Base-Rate	0 kbps	0 kbps	0 kbps	0 kbps	0 kbps	0 kbps	0 kbps	0 kbps
Sub-rate	0 kbps	0 kbps	0 kbps	0 kbps	0 kbps	0 kbps	0 kbps	0 kbps
SNR Margin	0	0	0	0	0	0	0	0
LoopAttn	0 dB	0 dB	0 dB	0 dB	0 dB	0 dB	0 dB	0 dB
ES	0	0	0	0	0	0	0	0
SES	0	0	0	0	0	0	0	0
UAS	0	0	0	0	0	0	0	0
LOSWS	0	0	0	0	0	0	0	0
CRC	0	0	0	0	0	0	0	0
	Clear CRC							

If the VPN router have connected to remote side, it can also show the performance information of remote side.

Click “Clear CRC” button will clear the CRC error count.

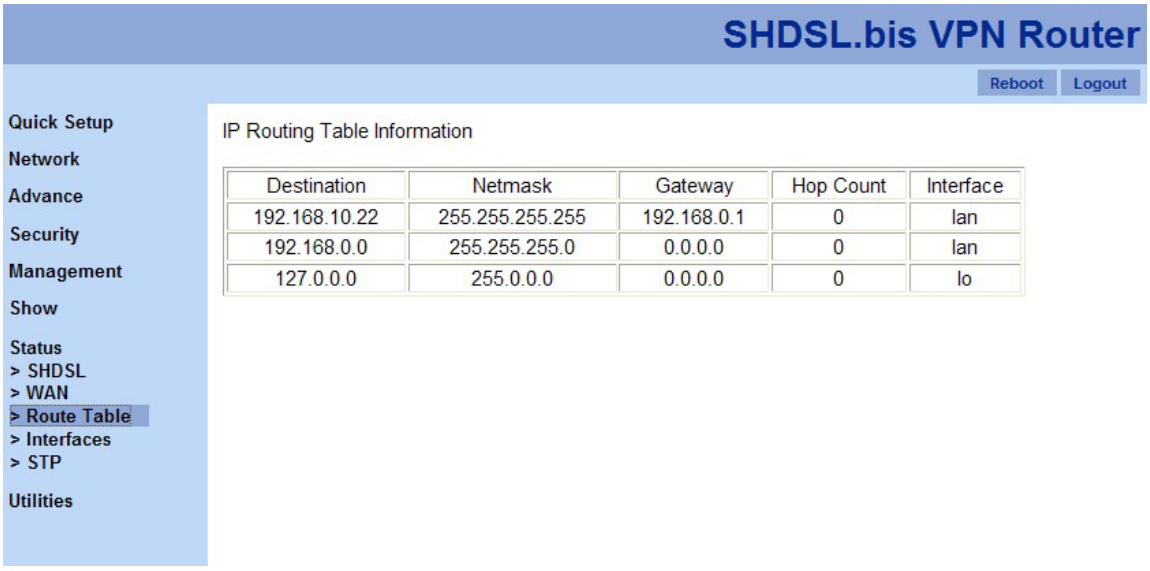
3.10.2 WAN

“WAN” feature presents all information of eight WAN interfaces.

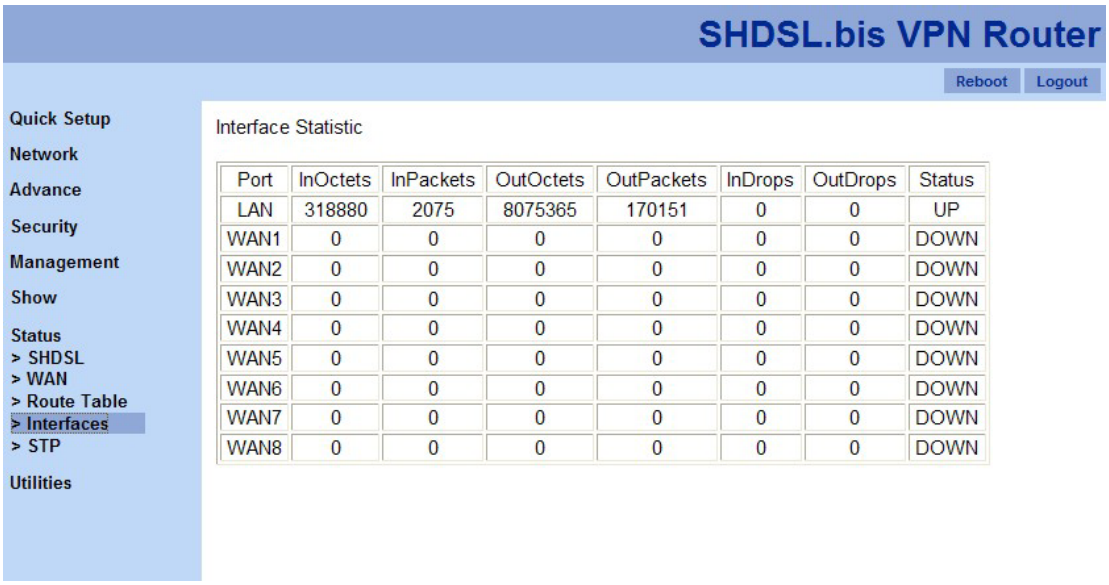


3.10.3 Route Table

Routing table contains a list of IP address. Each IP address identifies a remote router (or other network gateway) that the local router is configured to recognize. For each IP address, the routing table additionally stores a network mask and other data that specifies the destination IP address ranges that remote device will accept.



3.10.4 Interfaces



"Interface" table shows the interface statistics. "Octet" is a group of 8 bits, often referred to as a byte. "Packet" is a formatted block of data carried by a packet mode computer networks, often referred to the IP packet.

InOctets	The field shows the number of received bytes on this port
InPactets	The field shows the number of received packets on this port
OutOctets	The field shows the number of transmitted bytes on this port
OutPactets	The field shows the number of transmitted packets on this port
InDrops	The field shows the discarded number of received packets on this port
OutDrops	The field shows the discarded number of transmitted packets on this port

3.11 Utilities

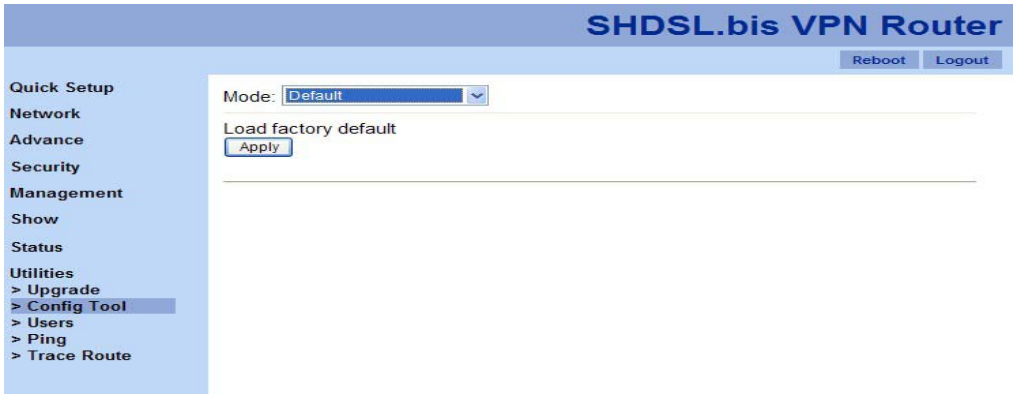
There are five features in “Utilities” function:

1. Upgrade
2. Config Tool
3. Users
4. Ping
5. Trace Route

3.11.1 Upgrade

“Upgrade” features allows user to upgrade firmware. Click on “Browser” button and browse to the file you wish to upgrade in your computer. Then, click on “Upgrade” button to commence the firmware upgrade.

3.11.2 Config Tool

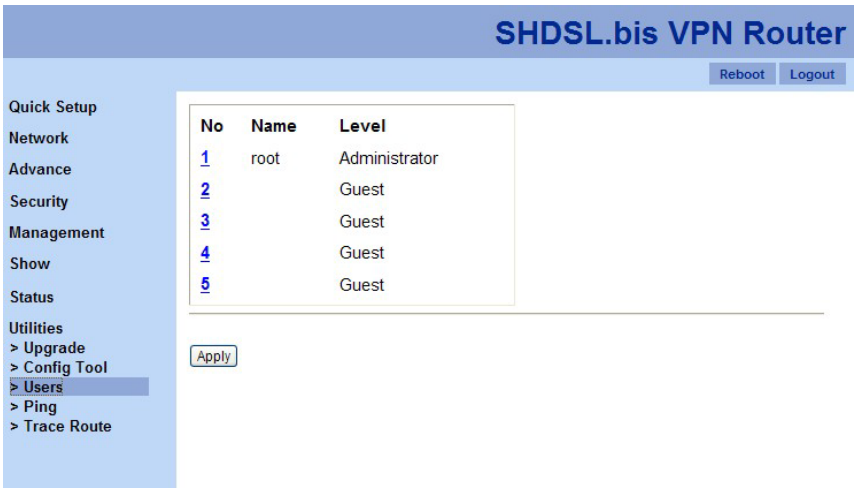


This configuration tool has three functions:

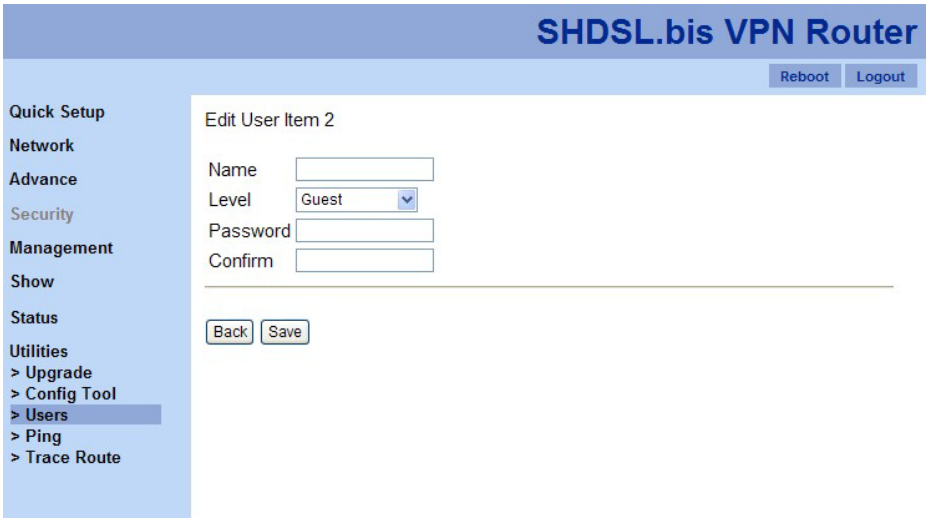
1. Default: to load the factory default settings to the VPN router.
2. Backup: to backup the current setups of the VPN router. The default file name is “config1.log”
3. Restore: to restore the VPN router’s configuration from a selected file.

You are able to choose which function you will do from the drop-down menu of “Mode” and click on “Apply” button to start the process.

3.11.3 Users

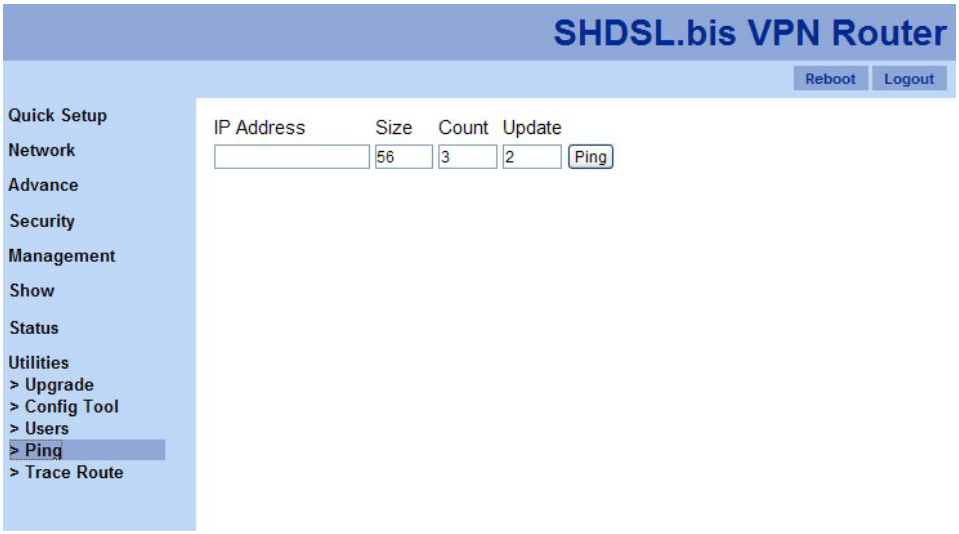


For a better security, change the Administrator name and password for the VPN router. The default administrator name and password are “root”. Five sets of users and passwords can be stored in the VPN router. Click on the number of each entry to start the configuration.



1. Name: the user name
2. Level: three levels are available, administrator, normal and guest. Functions will be shown according to users' authorization level.
3. Password
4. Password Confirm

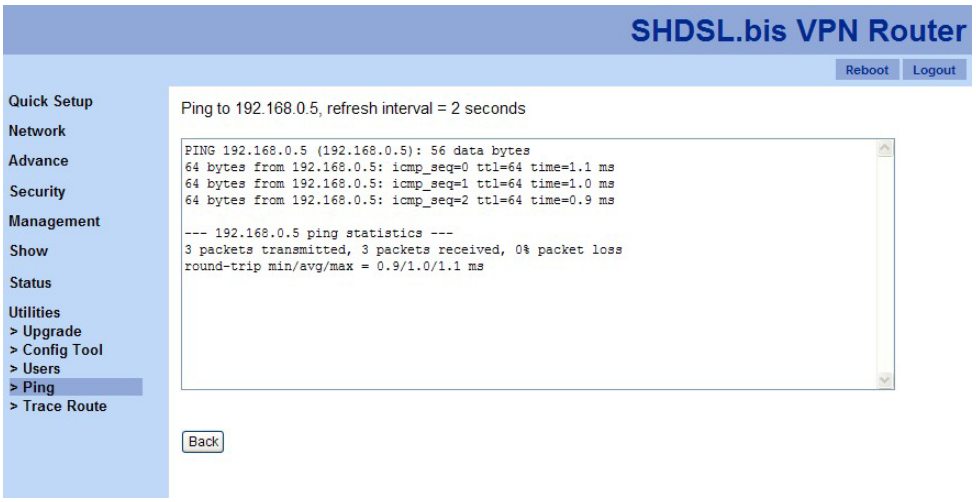
3.11.4 Ping



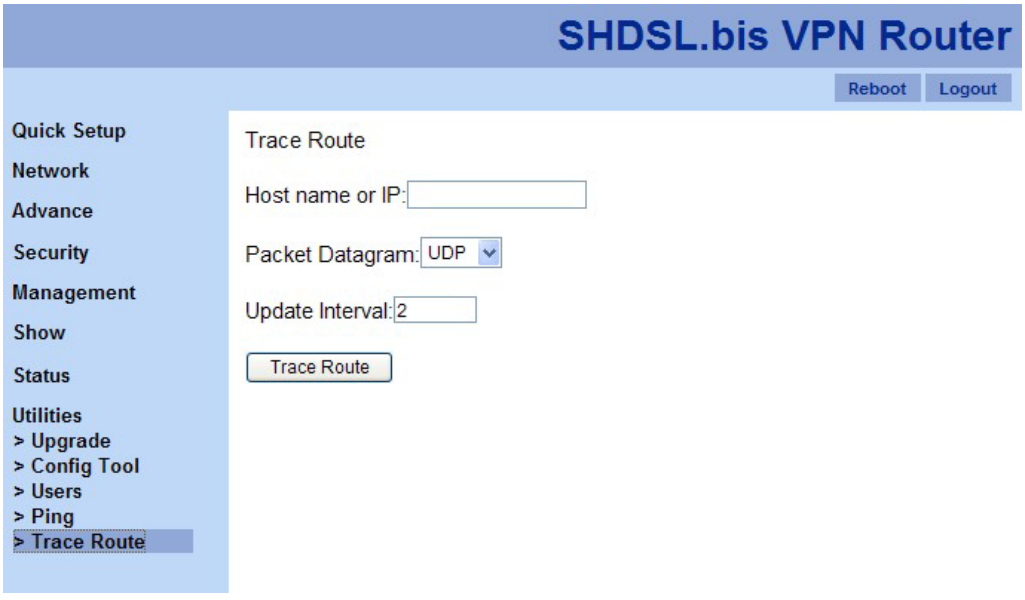
Ping test determines whether your VPN router can communicate with another computer or other web sites over the network. Then, if network communication is established, ping tests also determine the connection latency (technical term for delay) between the two device. You can use a ping test to troubleshoot connectivity problems with your home network. Ping tests are also commonly used to measure the delay ("lag") with some Internet servers.

1. IP Address : Which IP address you want to ping
2. Size : Size of byte packets to the destination, default is 56
3. Count : Ping count number, default is 3
4. Update : Updated time, default is 2

Once you click on “Ping”, you will see the following screen shot.



3.11.5 Trace Route

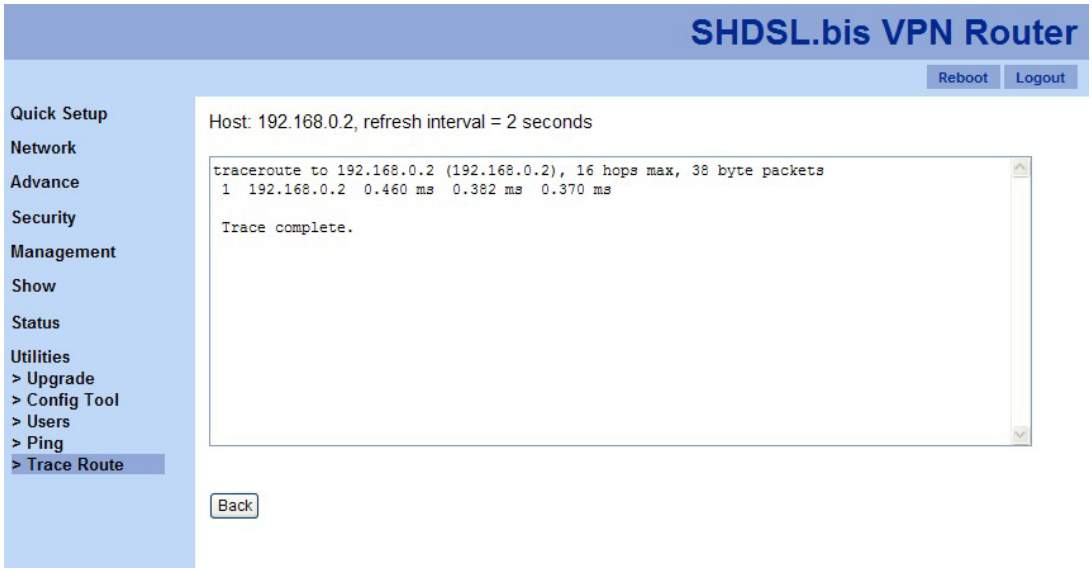


The trace route command traces the network path of Internet routers that packets take as they are forwarded from your VPN router to a destination address.

1. Host name or IP

2. Packet Datagram: the packet type, UDP or IGMP.
3. Update Interval: for the refresh interval.

Once you click on “Trace Route” button, you will see the following screen shot.



Appendix A. Terminology

Abbreviation	Full Name	Meaning
ACS	Auto Configuration Server	The management server for TR-069 compliant Customer Premises Equipment.
APN	Access Point Name	APN identifies an IP packet data network (PDN), that a mobile data user wants to communicate with. In addition to identifying a PDN, an APN may also be used to define the type of service, (eg. connection to wireless application protocol (WAP) server, multimedia messaging service (MMS)), that is provided by the PDN.
CBR	Constant Bit Rate	CBR is used by connections that require a static amount of bandwidth that is available during the connection life time. This bandwidth is characterized by Peak Cell Rate (PCR). Based on the PCR of the CBR traffic, specific cell slots are assigned for the VC in the schedule table. The ATM always sends a single cell during the CBR connection's assigned cell slot.
CFI	Canonical Format Indicator	CFI is always set to zero for Ethernet switches. CFI is used for compatibility reason between Ethernet type network and Token Ring type network.
DDNS	Dynamic DNS	Dynamic DNS is a method, protocol, or network service that provides the capability for a networked device, such as, a router or computer system using the Internet Protocol Suite, to notify a Domain Name System (DNS) name server to change, in real time, the active DNS configuration of its configured hostnames, addresses or other information.
DHCP	Dynamic Host Configuration Protocol	DHCP is an auto-configuration protocol used on IP networks. DHCP allows a computer to be configured automatically, eliminating the need for intervention by a network administrator. It also provides a central database for keeping track of computers that have been connected to the network. This prevents two computers from accidentally being configured with the

		same IP address.
DMZ	Demilitarized Zone	In computer security, DMZ is a physical or logical sub-network that contains and exposes an organization's external services to a larger distrusted network, usually the Internet. The term is normally referred to as a DMZ by IT professionals. It is sometimes referred to as a Perimeter Network. The purpose of a DMZ is to add an additional layer of security to an organization's LAN (Local Area Network); an external attacker only has access to equipment in the DMZ, rather than any other part of the network.
DNS	Domain Name System	DNS is a distributed hierarchical naming system for computers, services, or any resource connected to the Internet or a private network. Most importantly, it translates domain names meaningful to humans into the numerical (binary) identifiers associated with networking equipment for the purpose of locating and addressing these devices worldwide.
DSCP	Differentiated Service or DiffServ	DSCP is a computer networking architecture that specifies a simple, scalable and coarse-grained mechanism for classifying, managing network traffic and providing Quality of Service (QoS) guarantees on modern IP networks. DiffServ can, for example, be used to provide low-latency, guaranteed service (GS) to critical network traffic such as voice or video while providing simple best-effort traffic guarantees to non-critical services such as web traffic or file transfers. DiffServ uses the 6-bit Differentiated Services Code Point (DSCP) field in the header of IP packets for packet classification purposes. DSCP replaces the outdated IP precedence, a 3-bit field in the Type of Service byte of the IP header originally used to classify and prioritize types of traffic.
DSL	Digital Subscriber Line	DSL is a family of technologies that provides digital data transmission over the wires of a local telephone network. In telecommunications marketing, the term Digital Subscriber Line is widely understood to mean Asymmetric Digital Subscriber Line (ADSL), the most

		commonly installed technical variety of DSL. DSL service is delivered simultaneously with regular telephone on the same telephone line. This is possible because DSL uses a higher frequency.
EoA	Ethernet-over-ATM	EoA protocol is commonly used to carry data between local area networks that use the Ethernet protocol and wide-area networks that use the ATM protocol. Many telecommunications industry networks use the ATM protocol. ISPs that provide DSL services often use the EoA protocol for data transfer with their customers' DSL modems.
IGMP	Internet Group Management Protocol	IGMP is a communications protocol used to manage the membership of Internet Protocol multicast groups. IGMP is used by IP hosts and adjacent multicast routers to establish multicast group memberships.
IPoA	Dynamic IP over ATM	IPoA interfaces carries IP packets over AAL5. AAL5 provides the IP hosts on the same network with the data link layer for communications. In addition, to allow these hosts to communicate on the same ATM networks, IP packets must be tuned somewhat. AS the bearer network of IP services, ATM provides high speed point-to-point connections which considerably improve the bandwidth performance of IP network. On the other hand, ATM provides excellent network performance and perfect QoS.
MSCV	Manufacture's Concurrent Software Version	MCSV is the original factory version and remains even after upgrading the router in the field. This is for internal identification purposes.
NAT	Network Address Translation	NAT is the process of modifying network address information in datagram (IP) packet headers while in transit across a traffic routing device for the purpose of remapping one IP address space into another.
PCR	Peak Cell Rate	PCR in kbps: The maximum rate at which you expect to transmit data, voice and video. Consider PCR and MBS as a means of reducing latency, not increasing bandwidth.
Port-Based VLAN	Known as Static VLAN	Static VLAN assignments are created by assigning ports to a VLAN. As a device enters the network, the device automatically assumes the VLAN of the port. If

		the user changes ports and needs access to the same VLAN, the network administrator must manually make a port-to-VLAN assignment for the new connection.
PPPoA	Point-to-Point Protocol over ATM	PPPoA and PPPoE are authentication and connection protocols used by many service providers for broadband Internet access. These are specifications for connecting multiple computer users on an Ethernet local area network to a remote site through common customer premises equipment, which is the telephone company's term for a modem and similar devices. PPPoE and PPPoA can be used to office or building. Users share a common Digital Subscriber Line (DSL), cable modem, or wireless connection to the Internet. PPPoE and PPPoA combine the Point-to-Point Protocol (PPP), commonly used in dialup connections, with the Ethernet protocol or ATM protocol, which supports multiple users in a local area network. The PPP protocol information is encapsulated within an Ethernet frame or ATM frame.
PPPoE	Point-to-Point Protocol over Ethernet	
PVID	Port VID	PVID is an untagged member from 1 to 4094 of default VLAN.
QoS	Quality of Service	In the field of computer networking and other packet-switched telecommunication networks, the traffic engineering term quality of service (QoS) refers to resource reservation control mechanisms rather than the achieved service quality. QoS is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow.
RIP	Routing Information Protocol	The Routing Information Protocol (RIP) is a dynamic routing protocol used in local and wide area networks. As such it is classified as an interior gateway protocol (IGP). It uses the distance-vector routing algorithm. It was first defined in RFC 1058 (1988). The protocol has since been extended several times, resulting in RIP Version 2 (RFC 2453). Both versions are still in use today, however, they are considered to have been made technically obsolete by more advanced techniques such as Open Shortest Path First (OSPF)

		and the OSI protocol IS-IS. RIP has also been adapted for use in IPv6 networks, a standard known as RIPng (RIP next generation), published in RFC 2080 (1997).
SCR	Sustained Cell Rate	The sustained rate at which you expect to transmit data, voice and video. Consider SCR to be the true bandwidth of a VC and not the lone-term average traffic rate.
SHDSL	Single-Pair High-speed Digital Subscriber Line	Single-Pair High-speed Digital Subscriber Line (SHDSL) is a form of DSL, a data communications technology that enables faster data transmission over copper telephone lines than a conventional voice band modem can provide.
SNMP	Simple Network Management Protocol	SNMP is a UDP-based network protocol. It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention. SNMP is a component of the Internet Protocol Suite as defined by the Internet Engineering Task Force (IETF). It consists of a set of standards for network management, including an application layer protocol, a database schema, and a set of data objects.[1]
SNTP	Simple Network Time Protocol	A less complex implementation of NTP, using the same protocol but without requiring the storage of state over extended periods of time is known as the Simple Network Time Protocol (SNTP). It is used in some embedded devices and in applications where high accuracy timing is not required.
SSH	Secure Shell	SSH is a network protocol that allows data to be exchanged using a secure channel between two networked devices. The two major versions of the protocol are referred to as SSH1 or SSH-1 and SSH2 or SSH-2. Used primarily on Linux and Unix based systems to access shell accounts, SSH was designed as a replacement for Telnet and other insecure remote shells, which send information, notably passwords, in plaintext, rendering them susceptible to packet analysis.[2] The encryption used by SSH is intended to provide confidentiality and integrity of data over an unsecured network, such as the Internet.

STP	Spanning-Tree Protocol	STP, defined in the IEEE 802.1D, is a link management protocol that provides path redundancy while preventing undesirable loops in the network. For an Ethernet network to function properly, only one active path can exist between two stations.
STU-C		Central Office or CO.
STU-R		Customer Premises Equipment or CPE.
TCI	Tag Control Information field	TCI includes user priority, Canonical format indicator (CFI) and VLAN ID.
TCP	Transmission Control Protocol	TCP is a connection-oriented protocol that is responsible for reliable communication between two end processes. The unit of data transferred is called a stream, which is simply a sequence of bytes.
TC-PAM	Trellis Coded Pulse Amplitude Modulation	TC-PAM is the modulation format that is used in both HDSL2 and SHDSL, and provides vigorous presentation over an assortment of loop circumstances. SHDSL uses TC-PAM to give a rate/reach adaptive potential offering improved performance and enhanced spectral compatibility with ADSL when compared to today's traditional 2B1Q SDSL offerings.
ToS	Type of Service	The Type of Service (TOS) field in the IPv4 header has had various purposes over the years, and has been defined in different ways by five RFCs[note 1] The modern redefinition of the TOS field is a six-bit Differentiated Services Code Point (DSCP) field and a two-bit Explicit Congestion Notification field.
TPID	Tag Protocol Identifier	TPID defined value of 8100 in hex. When a frame has the EtherType equal to 8100H, this frame carries the tag IEEE 802.1Q / 802.1P.
TR069	Technical Report 069	TR-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.
UBR	Unspecified Bit Rate	UBR (Unspecified Bit Rate) is the simplest service provided by ATM networks. There is no guarantee of anything. It is a primary service used for transferring Internet traffic over the ATM network.

UDP	User Datagram Protocol	UDP (User Datagram Protocol) offers only a minimal transport service (non-guaranteed datagram delivery) and gives applications direct access to the datagram service of the IP layer. UDP is used by applications that do not require the level of service of TCP or that wish to use communications services (e.g., multicast or broadcast delivery) not available from TCP.
UPnP	Universal Plug and Play	Universal Plug and Play (UPnP) is a set of networking protocols for primarily residential networks without expert administrators that permits networked devices, such as personal computers, printers, Internet gateways, Wi-Fi access points, mobile device, to seamlessly discover each other's presence on the network and establish functional network services for data sharing, communications, and entertainment.
VBR-nrt	Variable Bit Rate non-real-time	VBR-nrt is intended for non-real-time applications, such as FTP, e-mail and browsing.
VBR-rt	Variable Bit Rate real-time	VBR-rt is intended for real-time applications, such as compressed voice over IP and video conferencing that require tightly constrained delays and delay variation. VBR-rt is characterized by a peak cell rate (PCR), sustained cell rate (SCR), and maximum burst rate (MBR).
VCI	Virtual Channel Identifier	for set up ATM Permanent Virtual Channels(PVC).
VID	Virtual LAN ID	VID (VLAN ID) is the identification of the VLAN, which is basically used by the standard 802.1Q. It has 12 bits and allow the identification of 4096 (212) VLANs. Of the 4096 possible VIDs, a VID of 0 is used to identify priority frames and value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4,094. The VPN Router initially default configures one VLAN, VID=1.
VLAN	Virtual LAN	A VLAN is a group of hosts with a common set of requirements that communicate as if they were attached to the same broadcast domain, regardless of their 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. Network reconfiguration can be

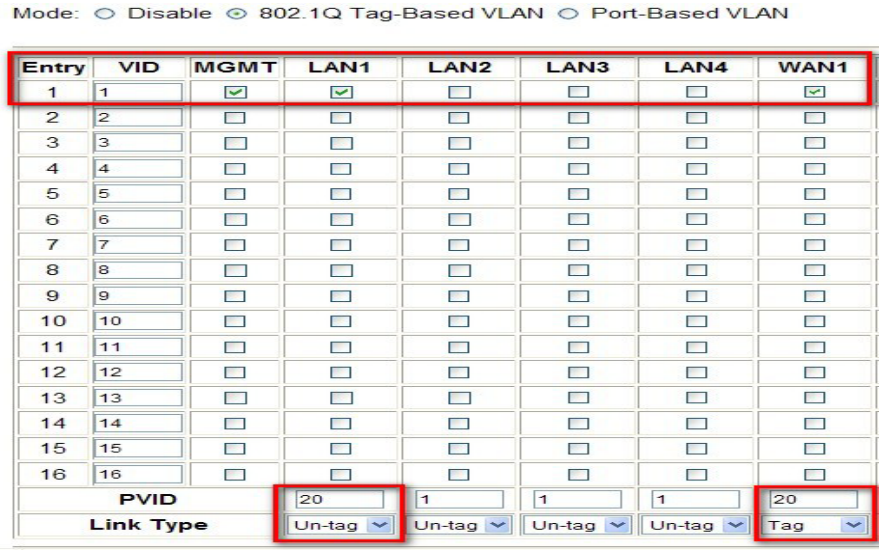
		done through software instead of physically relocating devices.
VPI	Virtual Path Identifier	For set up ATM Permanent Virtual Channels (PVC).
VPN	Virtual Private Network	A virtual private network (VPN) is a network that uses a public telecommunication infrastructure and their technology such as the Internet, to provide remote offices or individual users with secure access to their organization's network. It aims to avoid an expensive system of owned or leased lines that can be used by only one organization. The goal of a VPN is to provide the organization with the same secure capabilities but at a much lower cost.
WAN	Wide Area Network	WAN is a computer network that covers a broad area. This is in contrast with personal networks (PANs), local area networks (LANs), campus area networks (CANs) or metropolitan area networks (MANs), which are usually limited to a room, building, campus or specific metropolitan area respectively.

Appendix B. FAQ

B-1. 802.1Q Tag-Based VLAN Test Cases

Choose MGMT, LAN1 and WAN1 for entry 1 as one group for all configurations.

Configuration 1:



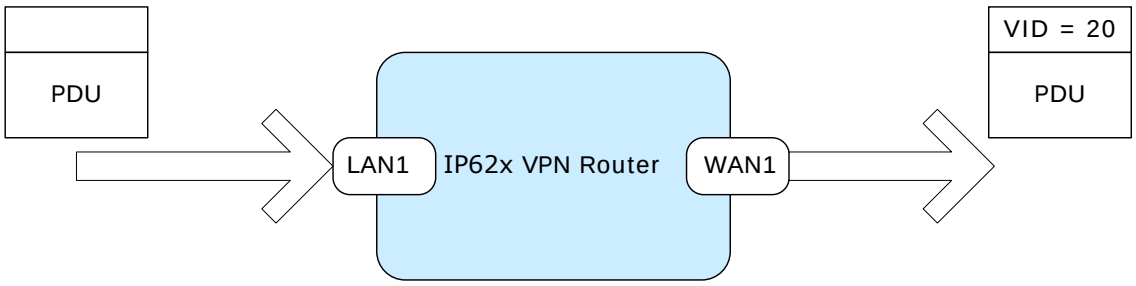
	PVID	Link Type
LAN1	20	Un-tag
WAN1	20	Tag
VID	1	

Case 1

Ingress Port = LAN1 (un-tag)

Egress Port = WAN1 (tag)

Incoming Packet without VID

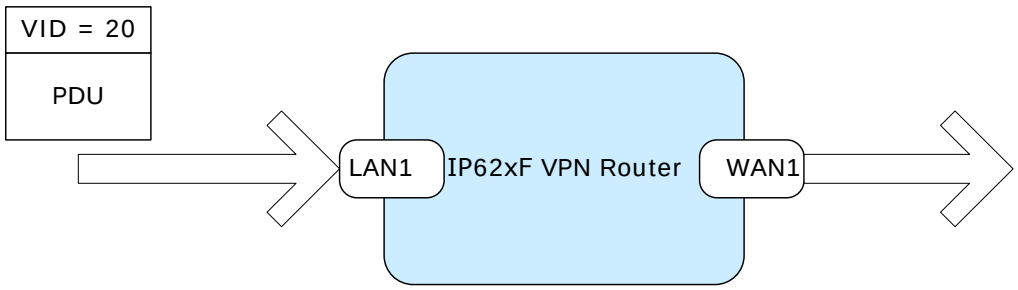


Case 2

Ingress Port = LAN1 (un-tag)

Egress Port = WAN1 (tag)

Incoming Packet with VID = 20



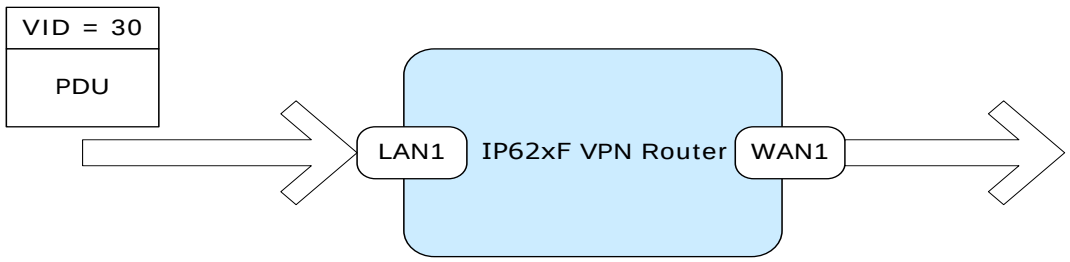
The packet will be dropped since the VID (20) is not matched with the VID (1) of the Egress port.

Case 3

Ingress Port = LAN1 (un-tag)

Egress Port = WAN1 (tag)

Incoming Packet with VID = 30



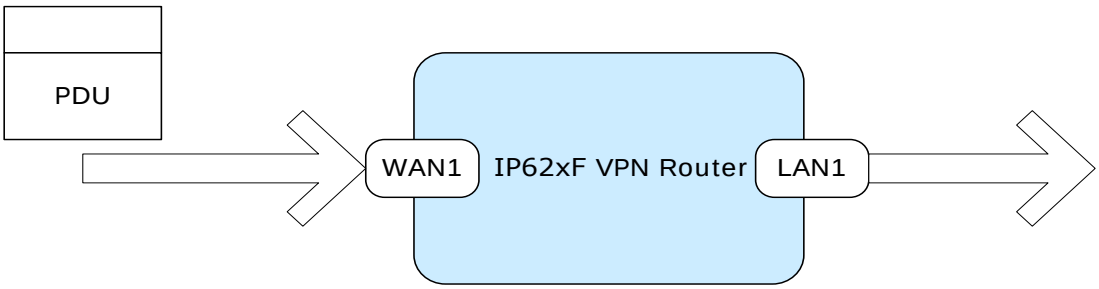
The packet will be dropped since the VID (30) is not matched with the VID (1) of the Egress port.

Case 4

Ingress Port = WAN1 (tag)

Egress Port = LAN1 (un-tag)

Incoming Packet with no VID



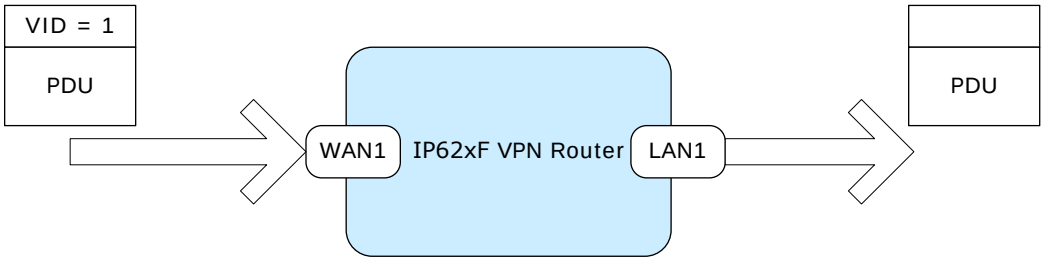
The packet will be dropped since the packet's VID is not matched with WAN1's VID (1).

Case 5

Ingress Port = WAN1 (tag)

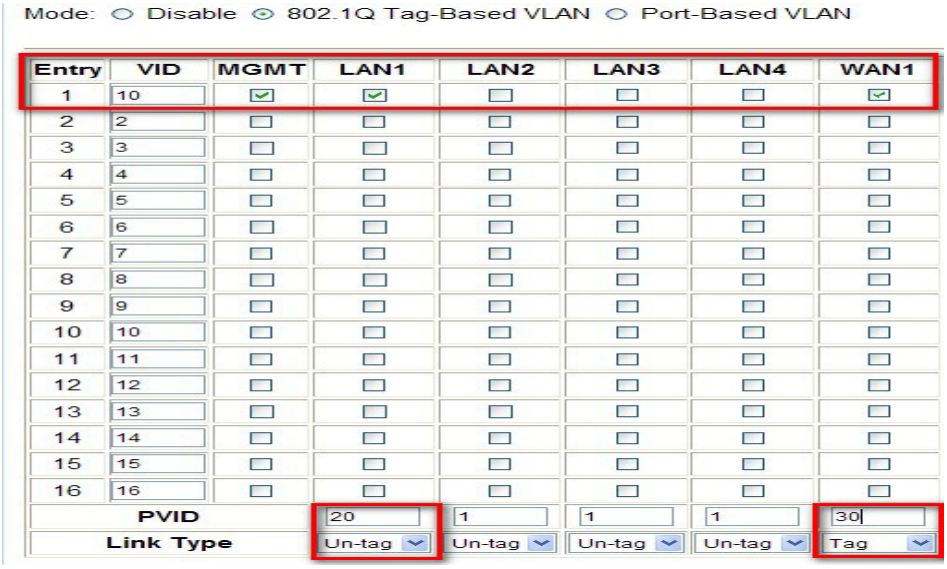
Egress Port = LAN1 (un-tag)

Incoming packet with VID = 1



The VID will be removed and the packet will be forwarded.

Configuration 2



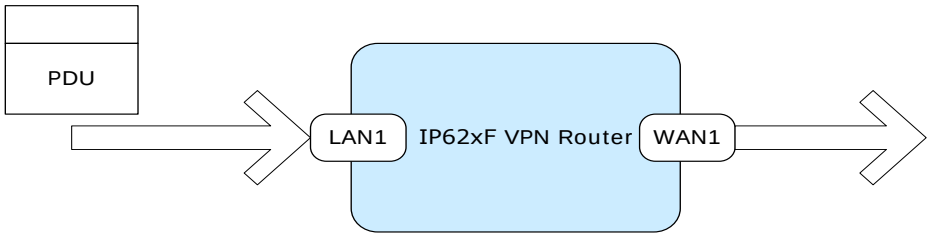
	PVID	Link Type
LAN1	20	Un-tag
WAN1	30	Tag
VID	10	

Case 1

Ingress Port = LAN1 (Un-tag)

Egress Port = WAN1 (Tag)

Incoming Packet with no VID



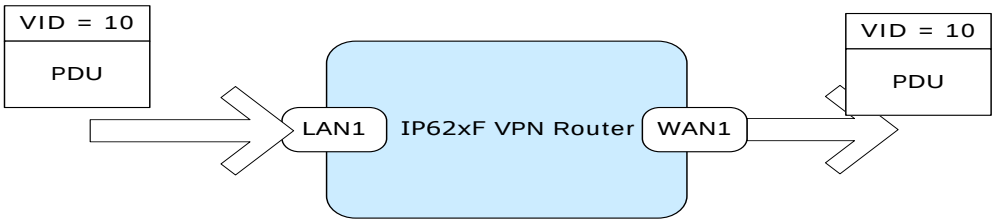
The packet is dropped because the VID is not matched with WAN1 VID (10).

Case 2

Ingress Port = LAN1 (Un-tag)

Egress Port = WAN1 (Tag)

Incoming Packet with VID = 10

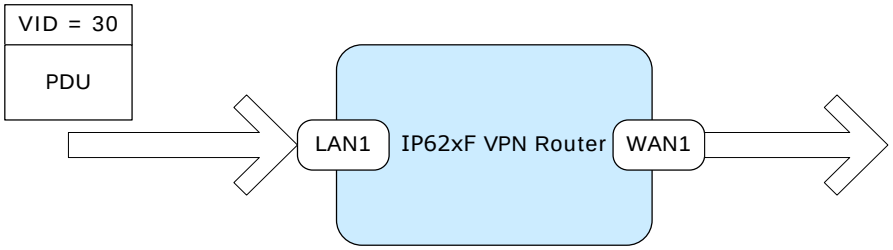


Case 3

Ingress Port = LAN1 (Un-tag)

Egress Port = WAN1 (Tag)

Incoming Packet with VID = 30



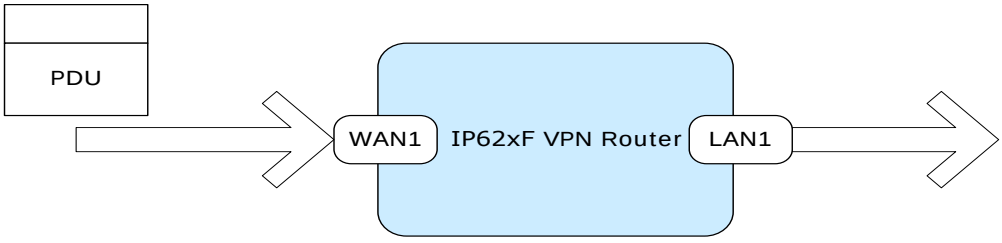
The packet is dropped because the packet's VID (30) is not matched with WAN VID (10).

Case 4

Ingress Port = WAN1 (Tag)

Egress Port = LAN1 (Un-tag)

Incoming Packet with no VID



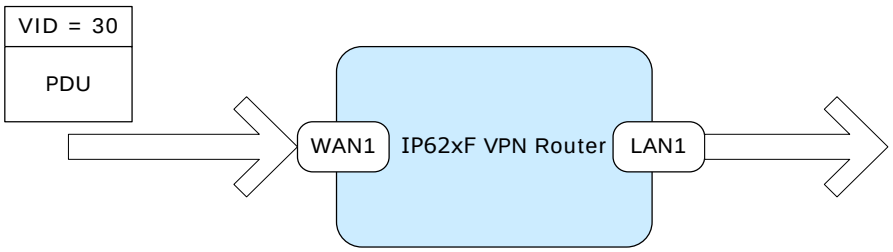
The packet is dropped because the packet's VID is not matched with VID.

Case 5

Ingress Port = WAN1 (Tag)

Egress Port = LAN1 (Un-tag)

Incoming Packet with VID = 30



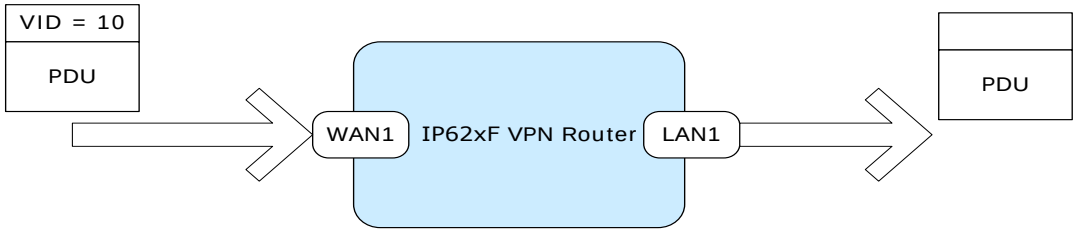
The packet is dropped because the packet's VID (30) is not matched with VID (10).

Case 6

Ingress Port = WAN1 (Tag)

Egress Port = LAN1 (Un-tag)

Incoming Packet with VID = 10



The packet's VID will be removed and the packet will be forward.

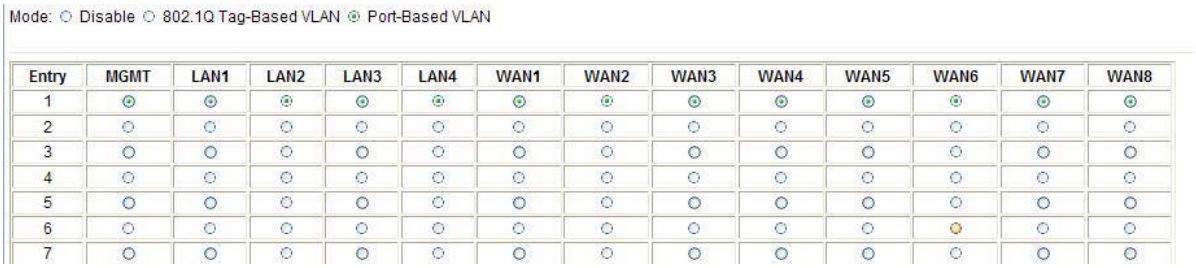
B-2. Port-Based VLAN

Port-Based VLANs are VLANs where the packet forwarding decision is based on the destination MAC address and its associated port.

When using the port-based VLAN, the port is assigned to a specific VLAN independent of the user or system attached to the port. This means all users attached to the port should be members in the same VLAN. The network administrator typically performs the VLAN assignment. The port configuration is static and cannot be automatically changed to another VLAN without manual reconfiguration.

As with other VLAN approaches, the packets forwarded using this method do not leak into other VLAN domains on the network. After a port has been assigned to a VLAN, the port cannot send to or receive from devices in another VLAN.

For example,



The default setting is all ports connected which means all ports can communicate with each other. That is, there are no virtual LANs. The option is the most flexible but the least secure.

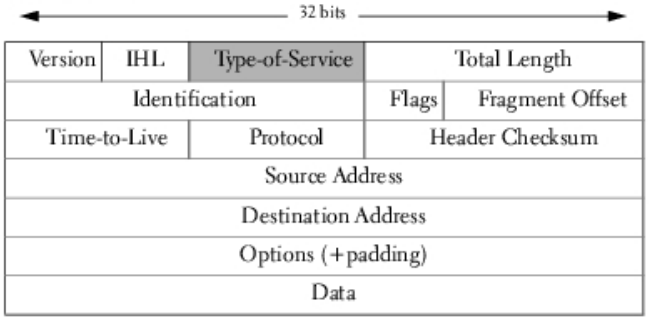
B-1. What is IP DSCP?

Differentiated Services (DiffServ) is a class of service (CoS) model that enhances best-effort Internet services by differentiating traffic by users, service requirements and other criteria. Packet are specifically marked, allowing network nodes to provide different levels of service, as appropriate for video playback, voice calls or other delay-sensitive applications, via priority queuing or bandwidth allocation.

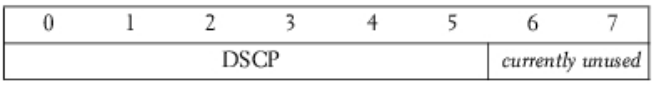
DiffServ defines a new DS(Differentiated Services) field to replace the Type of Service(ToS) field in the IP header. The DS field contains a 2-bits unused field and 6-bits DSCP field which can define up to 64 service levels.

The following figure illustrates the DS field:

Ethernet packet header



Type-of-Service Octet for DSCP



The DSCP value used to identify 64 levels (2^6=64) of service determines the forwarding behavior that each packet gets across the DiffServ network. Based on the marking rule different kinds of traffic can be marked for different priorities of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

The following is an illustration about how the bits are used in DSCP field.

Bit 0	Bit 1	Bit 2	Precedence	Usage
1	1	1	7	Stays the same(link layer and routing protocol keep alive)
1	1	0	6	Stays the same(used for IP routing Protocols)
1	0	1	5	Express Forwarding (EF)
1	0	0	4	Class 4
0	1	1	3	Class 3
0	1	0	2	Class 2
0	0	1	1	Class 1
0	0	0	0	Best effort

Bit 3	Bit 4	Bit 5	Usage	Meaning
0	--	--	Delay	Normal
1	--	--	Delay	Low
--	0	--	Throughput	Normal
--	1	--	Throughput	High

--	--	0	Reliability	Normal
--	--	1	Reliability	High

The standardized DiffServ field of the packet is marked with a value so that the packet receives a particular forwarding treatment at each network node.

RFC 2597 defines the assured forwarding (AF) classes. There are four AF classes, AF1x through AF4x. Within each class, there are three drop probabilities. Depending on a given network's policy, packets can be selected for a PHB based on required throughput, delay, jitter, loss, or according to priority of access to network services.

Classes 1 through 4 are referred to as AF classes.
The following table illustrates the DSCP coding for specifying the AF class with the probability. Bits 0, 1, and 2 define the class; bits 3 and 4 specify the drop probability; bit 5 is always 0.

	Class 1	Class 2	Class 3	Class 4
Low Drop	001010 AF11 DSCP 10	010010 AF21 DSCP 18	011010 AF31 DSCP 26	100010 AF41 DSCP 34
Medium Drop	001100 AF12 DSCP 12	010100 AF22 DSCP 20	011100 AF32 DSCP 28	100100 AF42 DSCP 36
High Drop	001110 AF13 DSCP 14	010110 AF23 DSCP 22	011110 AF33 DSCP 30	100110 AF43 DSCP 38

The recommended DSCP values which are based on RFC 4594 are in the following table:

Service Class Name	DSCP Name	DSCP Value	Application Examples
Network Control and OAM	CS6	110000 (48)	Network routing and OAM (e.g. SNMP, Ethernet CFM, proprietary NMS traffic)
Signaling	CS5	101000 (40)	Signaling (e.g. H.323, SIP)
Telephony	EF	101110 (46)	IP Telephony bearer
Multimedia Conferencing	AF41, AF42, AF43	100010 (34), 100100 (36), 100110(38)	Videoconferencing
Real-Time	CS4	100000 (32)	Interactive control (e.g. CAM), real-time

Interactive			e-learning, games, e-arts
Multimedia Streaming	AF31,AF32, AF33	011010 (26), 011100 (28), 011110 (30)	Streaming video and audio on demand
Broadcast Video	CS3	011000 (24)	Broadcast TV & live events
Low-Latency Data	AF21,AF22, AF23	010010 (18), 010100 (20), 010110 (22)	Transactional applications, database access, interactive data applications
High-Throughput Data	AF11,AF12, AF13	001010 (10), 001100 (12), 001110 (14)	Bandwidth channels
Standard (Best Effort)	DF (CS0)	000000 (0)	Undifferentiated applications
Low-Priority Data (LBE)	CS1	001000 (8)	Mirror service, remote backups, etc