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VDSL2 CO/CPE Router

NV-600L/R USER'S MANUAL

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Maximum signal rate derived form IEEE Standard specifications. Actual data throughput will vary. Network conditions and environmental factors, including volume of network traffic, building materials and construction, and network overhead lower actual data throughput rate. Netsys does not warrant that the hardware will work properly in all environments and applications, and makes no warranty and representation, either implied or expressed, with respect to the quality, performance, merchantability, or fitness for a particular purpose. Make sure you follow in line with the environmental conditions to use this product.

Foreword: VDSL2 Point to Point Solution

VDSL2 (Very-High-Bit-Rate Digital Subscriber Line 2, ITU-T G.993.2 Standard) is an access technology that exploits the existing infrastructure of copper wires that were originally deployed for POTS services. It can be deployed from central offices, from fibre-fed cabinets located near the customer premises, or within buildings.

ITU-T G.993.2 VDSL2 is the newest and most advanced standard of DSL broadband wireline communications. Designed to support the wide deployment of Triple Play services such as voice, video, data, high definition television (HDTV) and interactive gaming, VDSL2 enables operators and carriers to gradually, flexibly, and cost efficiently upgrade existing xDSL-infrastructure.

ITU-T G.993.2 (VDSL2) is an enhancement to G.993.1 VDSL that permits the transmission of asymmetric and symmetric(Full-Duplex) aggregate data rates up to 200 Mbit/s on twisted pairs using a bandwidth up to 30 MHz.

VDSL2 deteriorates quickly from a theoretical maximum of 200 Mbit/s (Full-Duplex) at "source" to 100 Mbit/s at 0.3 km (symmetric) and 50 Mbps at 1 km, but degrades at a much slower rate from there and still outperforms VDSL. Starting from 1.6 km its performance is equal to ADSL2+.

Attention:

Be sure to read this manual carefully before using this product. Especially Legal Disclaimer, Statement of Conditions and Safty Warnings.

Caution:

The NV-600 is for **indoor** applications only. This product does not have waterproof protection. We do not recommend for harsh environments. If user insist to install it for industrial applications (-20℃ ~ 70℃ (-4℉ ~ 158℉)), please do not use the included commercial-grade power supply. Please use of industrial-grade power supply for industrial applications.

Safety Warnings

For your safety, be sure to read and follow all warning notices and instructions before device use.

- **DO NOT** open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel can service the device. Please contact your vendor for further information.
- **Use ONLY** the dedicated power supply for your device. Connect the power cord or power adaptor to the right supply voltage (110V AC in North America or 230V AC in Europe).
- **DO NOT** use the device if the power supply is damaged as it might cause electrocution. If the power supply is damaged, remove it from the power outlet. DO NOT attempt to repair the power supply. Contact your local vendor to order a new power supply.
- **Place** connecting cables carefully so that no one will step on them or stumble over them. DO NOT allow anything to rest on the power cord and do NOT locate the product where anyone can work on the power cord.
- **DO NOT** install nor use your device during a thunderstorm. There may be a remote risk of electric shock from lightning.
- **DO NOT** expose your device to dampness, dust or corrosive liquids.
- **DO NOT** use this product near water, for example, in a wet basement or near a swimming pool.
- **Connect ONLY** suitable accessories to the device.
- **Make sure** to connect the cables to the correct ports.
- **DO NOT** obstruct the device ventilation slots, as insufficient airflow may harm your device.
- **DO NOT** store things on the device.
- **DO NOT** use the device for outdoor applications, and make sure all the connections are indoors. There may be a remote risk of electric shock from lightning.
- **Be careful** when unplugging the power, because the transformer may be very hot.
- **Keep** the device and all its parts and accessories out of children's reach.
- **Clean** the device using a soft and dry cloth rather than liquid or atomizers. Power off the equipment before cleansing it.
- This product is **recyclable**. Dispose of it properly.

Table of Contents

Chapter 1. Unpacking Information

1.1 Check List

Carefully unpack the package and check its contents against the checklist.

Package Contents:

- VDSL2 Router (NV-600L for CO side or NV-600R for CPE side)
- 2 x rubber feet (Pre-installed on the bottom)
- 1 x CD User's Manual
- 1 x AC to DC 12V Power Adapter
- 1 x RJ-45 cable
- 1 x RJ-11 cable

Note:

Please inform your dealer immediately for any missing or damaged parts.

If possible, retain the carton including the original packing materials.

Use them to repack the unit in case there is a need to return for repair.

Note2:

1. Do not use sub-standard power supply, connect the power supply in device before be sure to check compliance with specifications. The NV-600L/R of the power supply at least use DC12V/1A.
2. Power supply included in package is commercial-grade. Do not use in industrial applications.

Chapter 2. Complete Installation

2.1 Hardware Installation

This chapter describes how to install the NV-600L/R and establishes network connections. This may install the NV-600L/R on any level surface (e.g., a table or shelf). However, please take note of the following minimum site requirements before you begin.

2.2 Pre-installation Requirements

Before the start actual hardware installation, make sure to provide the right operating environment, including power requirements, sufficient physical space and proximity to other network devices that are to be connected. Verify the following installation requirement:

- Power requirements: DC**12V/1A** or above.
- The NV-600L/R should be located in a **cool dry place**, with at least **10cm(4in)** of space at the front and back for well ventilation.
- Place the NV-600L/R away from direct sunlight, heat sources, or areas with a high amount of electromagnetic interference.
- Check if network cables and connectors needed for installation are available
- Do Not install phone lines strapped together with AC power lines, or telephone office line with voice signal.
- Avoid installing this device radio amplifying station nearby or transformer station nearby.
- Please note NV-600 internal splitter, can pass through voice spectrum is 0KHz ~ 120KHz.

2.3 General Rules

Before making any connections to the NV-600L/R, note the following rules:

- **Ethernet Port (RJ-45)**
  All network connections to the Router Ethernet port must be made using Category 5 UTP for 100Mbps; Category 3, 4 UTP for 10Mbps
  No more than 100 meters of cabling may be use between the MUX or HUB and an end node.
- **Phone Port (RJ-11)**
  All Phone set connections to the RJ-11 Port must use **24~26** Gauge phone wiring.
- We **do not recommend using 28 gauge** or above phone line.

2.4 NV-600L/R Connections

The NV-600L/R can be controlled by a PC. For this purpose, a PC is needed with an Ethernet network interface and a RS-232(D-SUB 9Pin) serial interface. Two programs are required: A Web browser is mandatory and a terminal program should be available optionally.

The board has several connectors.

- 4 x Ethernet RJ-45 jack; the Auto MDIX feature of the port switches automatically between MDI and MDI-X (MDI – X = Media Dependant Interface - Crossover). Therefore straight Ethernet cables can be used.
- 2 x RJ-11 jack (Line port is for VDSL client side connection to Line interface, Phone port is for connection to phone set or FAX machine).
- 1 x Console port (access monitoring to operating system for firmware downloads, starting drivers and etc.)
- 1 x Power Supply (as described above)

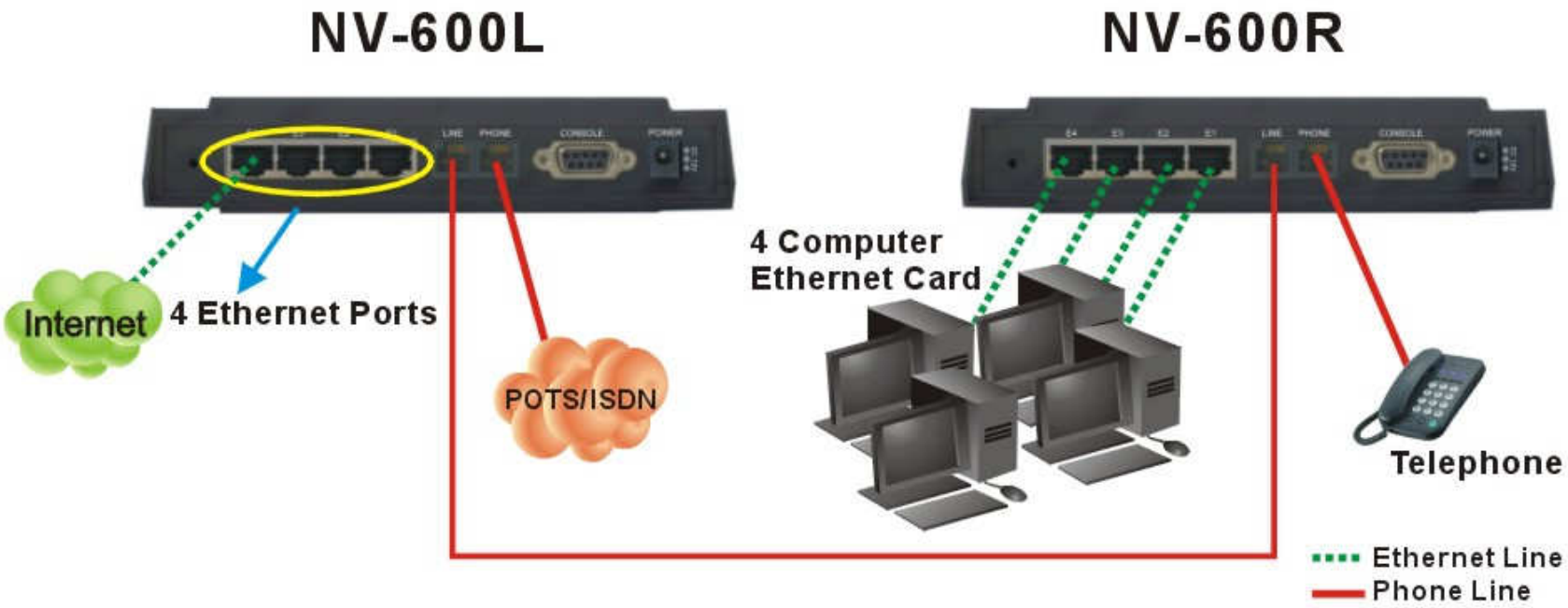


Figure 2.4 VDSL2 Basic Setup

Chapter 3. Hardware Description

This section describes the important parts of the NV-600L/R. It features the front indicators and rear connectors.

NV-600L Outlook

NV-600R Outlook

3.1 Front Panel

The following figure shows the front panel.

Figure 3.1.1 NV-600L / NV-600R front panel

3.2 Six LED indicators

At a quick glance of the front panel, it will be easy to tell if the router has power signal from its Ethernet RJ-45 port or there is phone line signal RJ-11port

3.3 Front Indicators

The following table describes the LEDs.

LEDs	Color	Status	Descriptions
PWR(Power)	Green	On(Steady)	The device is receiving the power and functioning properly.
		Off	The device is not ready or has malfunctioned.
E1~E4 (LAN)	Green	On(Steady)	The device has a good Ethernet connection.
		Blinking	The device is sending or receiving data or has malfunctioned.
		Off	The LAN is not connected or has malfunctioned.
LINK / WAN (VDSL2 LINK)	Green	On(Steady)	The Internet or network connection is up.
		Blinking	The device is sending or receiving data.
		Off	The Internet or network connection is down or has malfunctioned.

3.4 Rear Panel

The following figure shows the rear connectors

Figure 3.4 Rear Connectors

NV-600L/R Rear Connectors

Connectors	Type	Description
Line	RJ-11	For connecting to the VDSL2 Router Using a RJ-11 cable
Phone	RJ-11	For connecting to the POTS equipment or ISDN router
E1~E4	RJ-45	For connecting to a Ethernet equipped device
Console	RS-232	For connecting to PC with RS-232 serial port over a D-SUB Cable

3.5 Power On

1. Check the adapter is properly connected.
2. Verify the power LED is steadily on.

Chapter 4. Configure the NV-600L/R Via Web Browser

The NV-600L/R provides a built-in HTML based management interface that allow user configure the NV-600L/R via Internet Browser. Best viewed at using the Internet Explorer or Firefox and set screen resolution at 1024 x 768.

In order to use the web browser configure the device, you may need to allow:

- Web browser pop-up windows from your device. Web pop-up blocking is enabled by default in windows XP SP2 or above.
- Java Scripts. (Enabled by default)
- Java permissions. (Enabled by default)

Launch your web browser and input the IP address 192.168.16.249 (NV-600L) or 192.168.16.250 (NV-600R) in the Web page.

4.1 Login

The default password is "admin". The password is changeable in Administrator Settings.

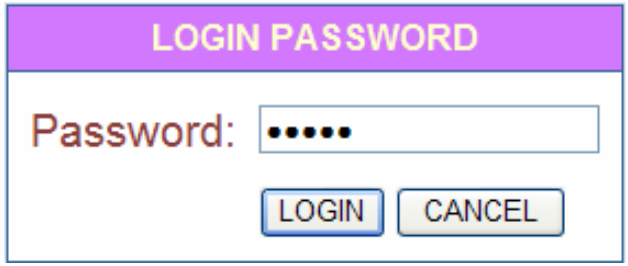


Figure 4.1 Login Password

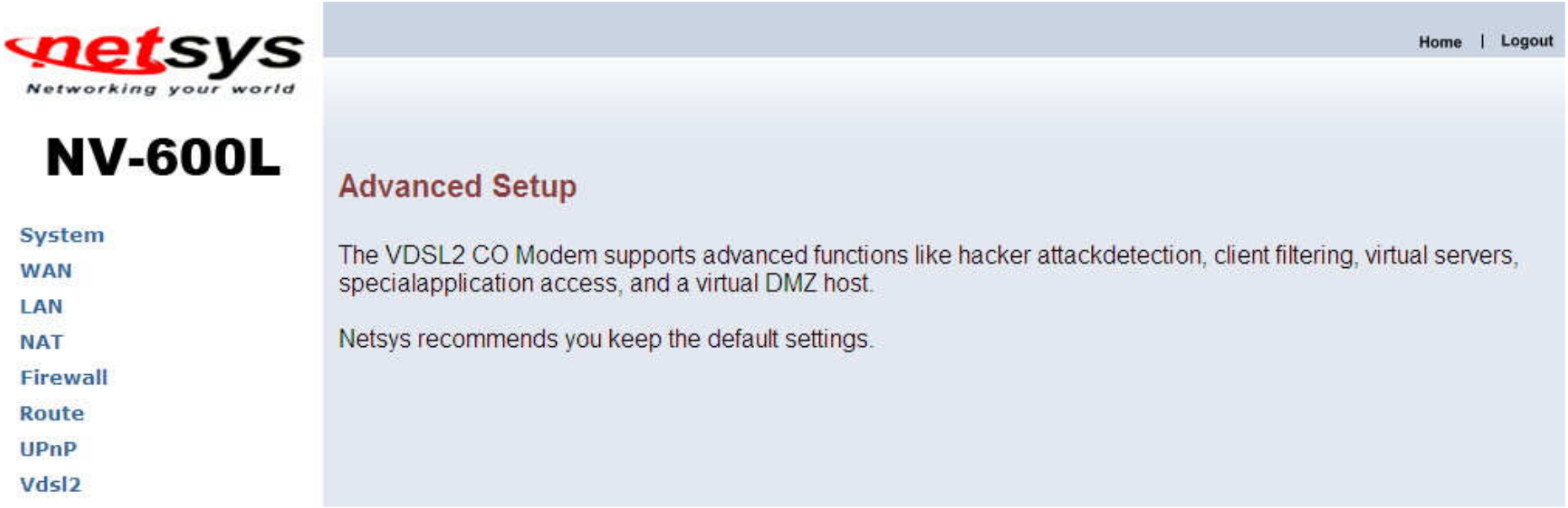
4.2 Select the Menu Level

There is an easy Setup Wizard for end users at the NV-600R and an Advanced Setup for more detail configurations. This manual attaches importance to the Advanced Setup.

Figure 4.2 Select the Advanced Setup in the Entry Screen

4.3 Select Advanced Setup

Select the Advanced Setup. The menu below will be used frequently. As an exercise and an example now the IP address will be set.



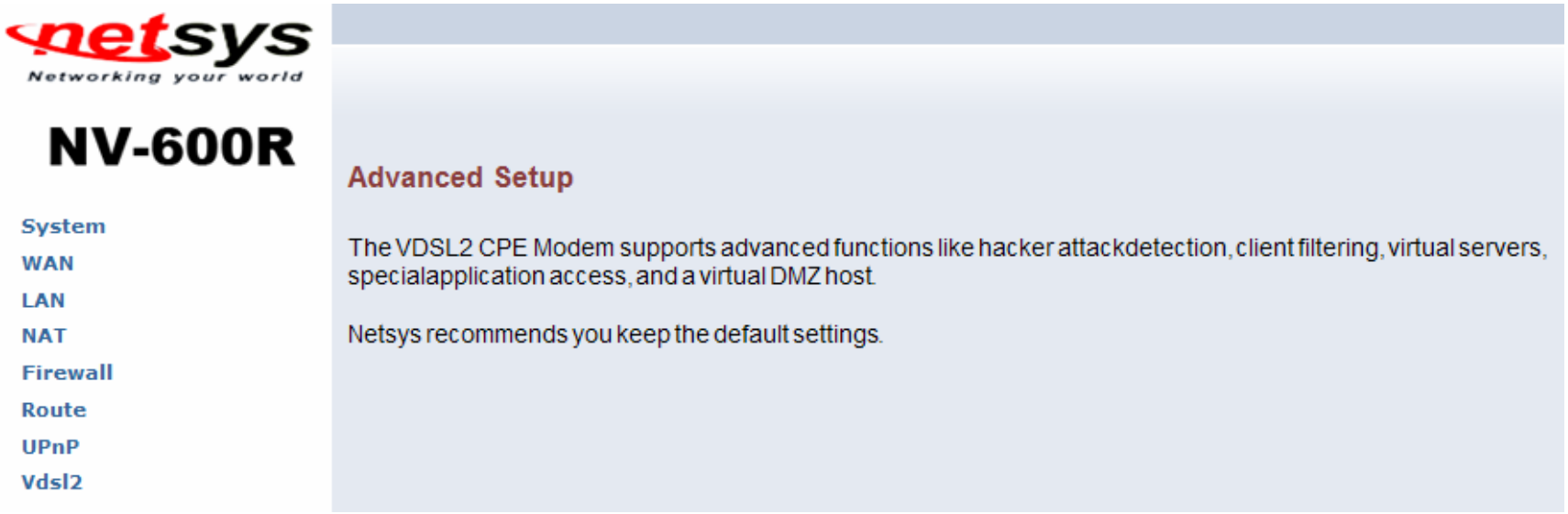


Figure 4.3 Advanced Setup

Note:

The settings in the following Section 4.4 only need to be performed in order to change LAN settings. Such a change may be necessary when connecting the NV-600L/R to a new control PC and/or in order to turn the IP address changed via a shell command into a default address for the next restart of the board.

4.4 Select LAN

The menu below will not be used very often, but when connecting the NV-600L/R to a new control PC, one may want to go through the following steps in order to make the IP address previously set by ifconfig in the console or on some later occasion one may want to change it again without using the console then the menu below will be helpful. In order to set the IP address, click on "LAN Settings".

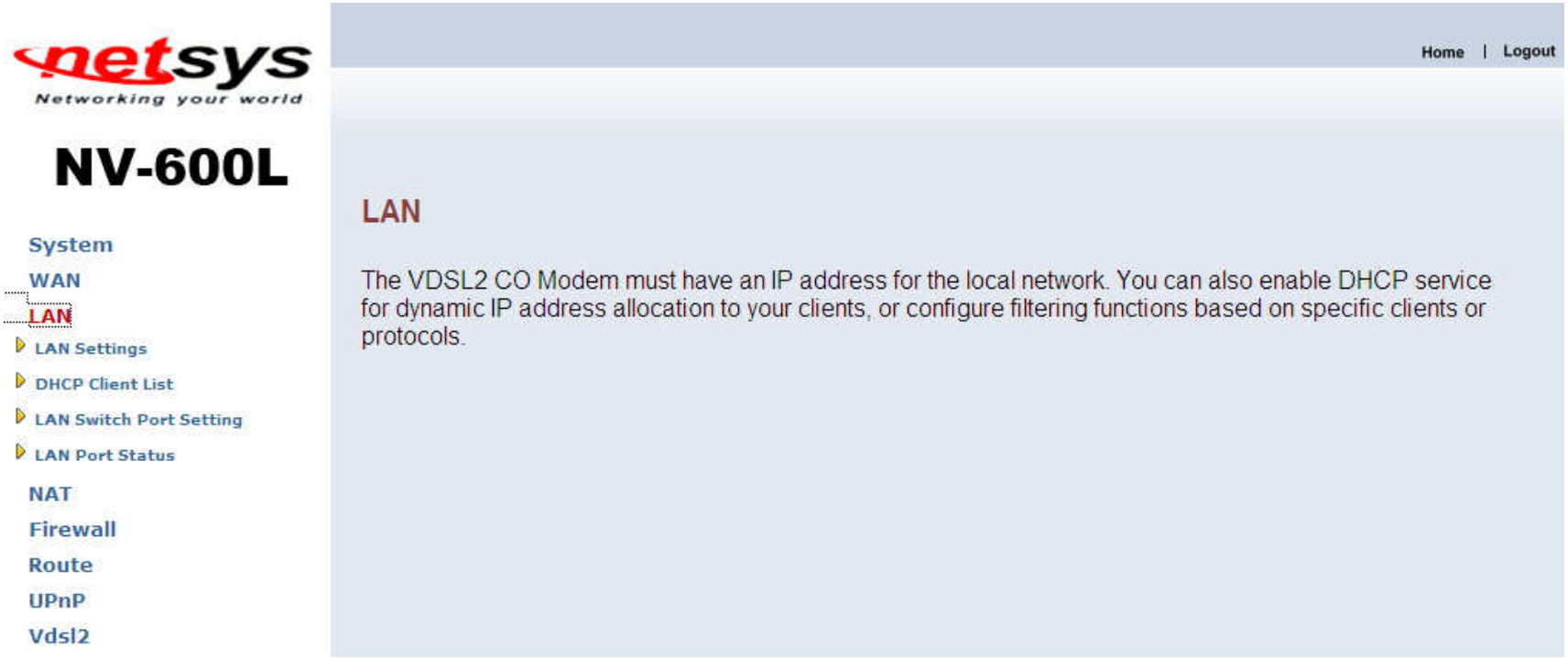
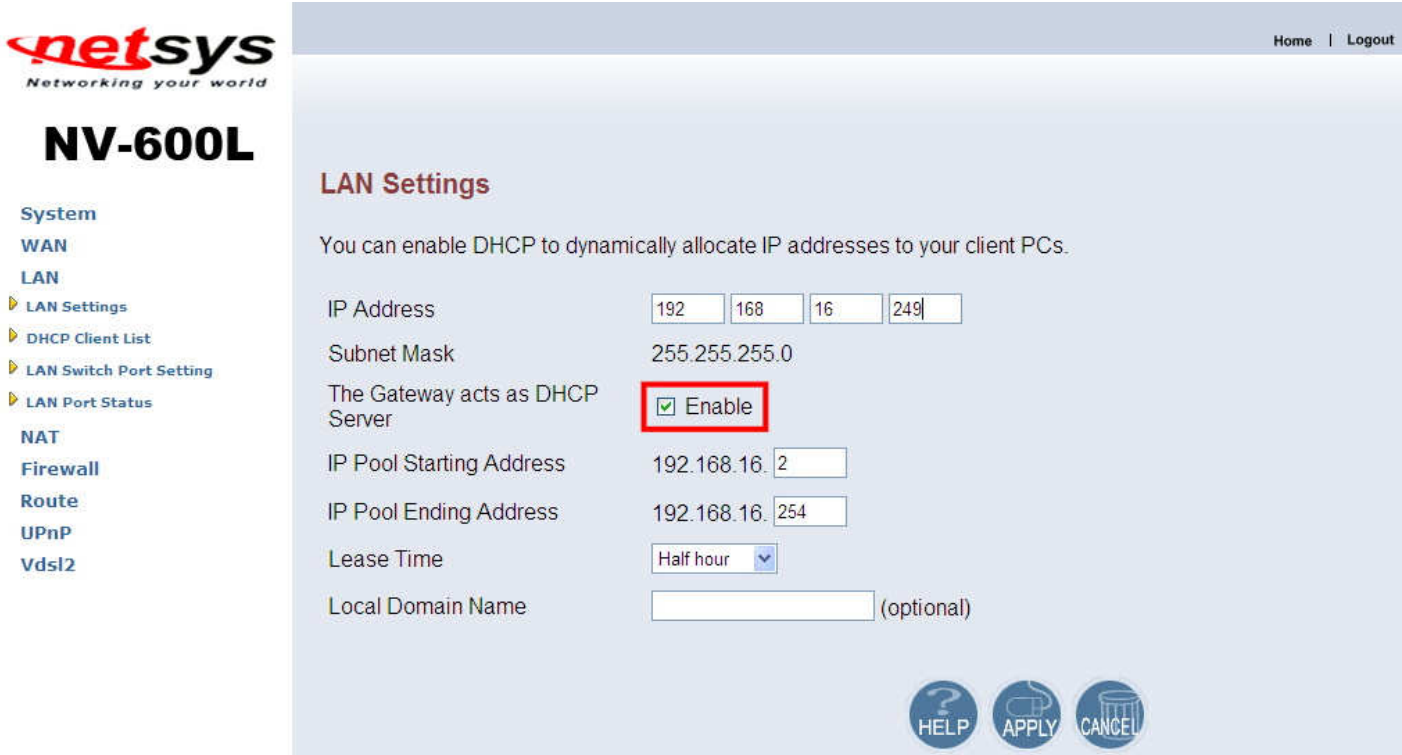


Figure 4.4 LAN menu

4.4.1 Select LAN Settings and set the IP Address

The form below is used to change the IP address of the LAN port "adm0" in the NV-600L/R.
The proposed IP address is either the default address of adm0 or it is the address changed by an ifconfig command via the shell running in the terminal. The Subnet Mask display can be ignored. In case the DHCP checkbox is checked, some additional data and options will be on display (see Chapter 8.2.5.1). The DHCP server is not required to work with VDSL2 in a lab environment. It recommend to uncheck the box if it is not unchecked already.



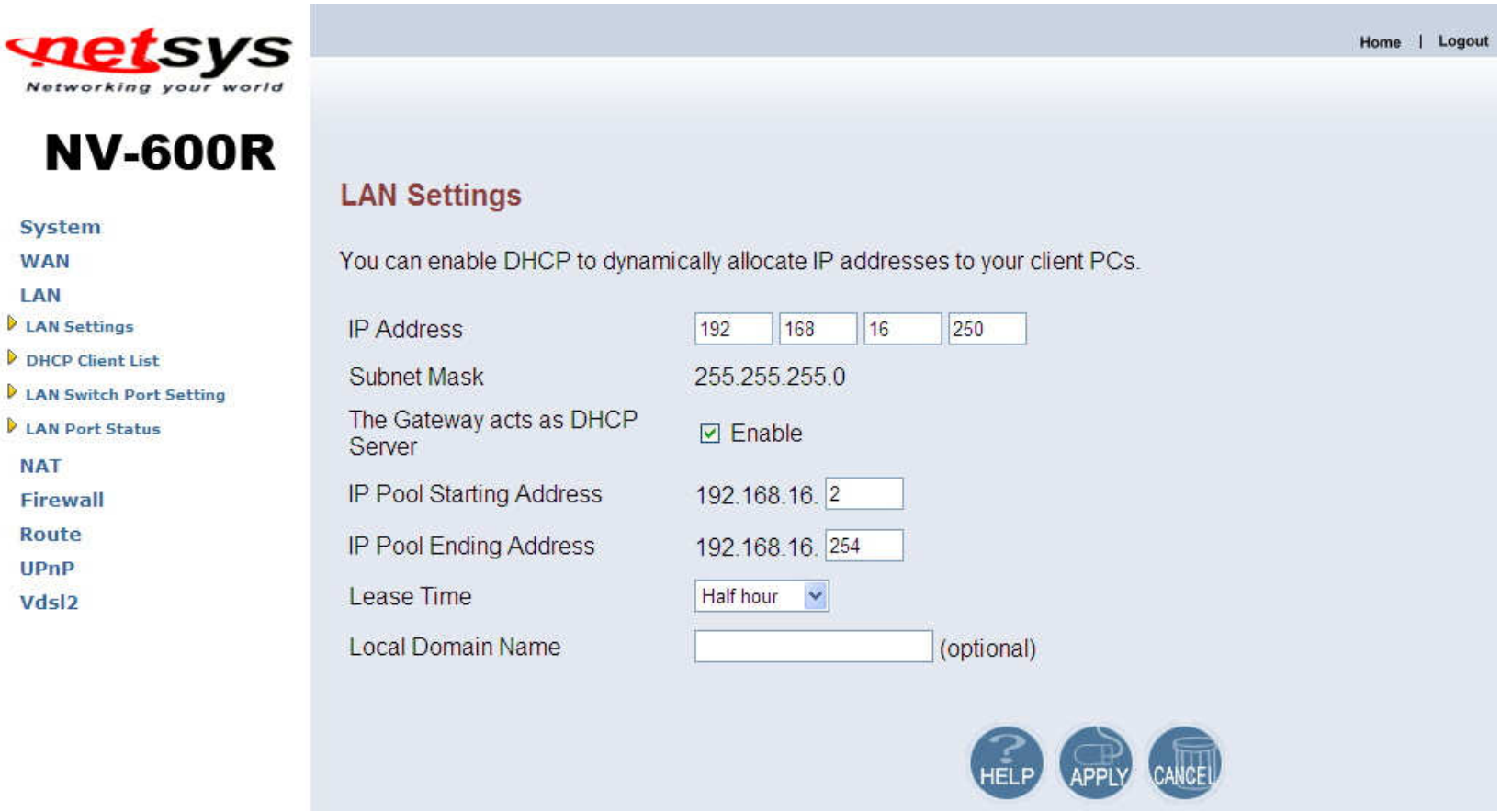


Figure 4.4.1 LAN Settings

Now the IP address either may be changed or left as it is. If it has been changed in the form or after it has been changed through console ifconfig command, it needs to be "APPLY" in order to make the displayed IP address new default address.

4.4.2 Restart the Settings Dialog

After the "APPLY" button has been hit, the displayed IP address "adm0" port will be stored in a non volatile memory on the NV-600L/R. Also, the Ethernet link between the control PC and the NV-600L/R will be re-initialized – even if the IP address has not been changed. Refresh the display of the HTTP browser running on the control PC and login again.

Figure 4.4.2 Login Password

The NV-600L/R is ready to be controlled by the control PC now.

Chapter 5. Configure the NV-600L/R via Console

5.1 Setup on Hyperterminal

Open the Hyperterminal and set the baud rate to 115200, 8N1N to properly set the hyperterminal.

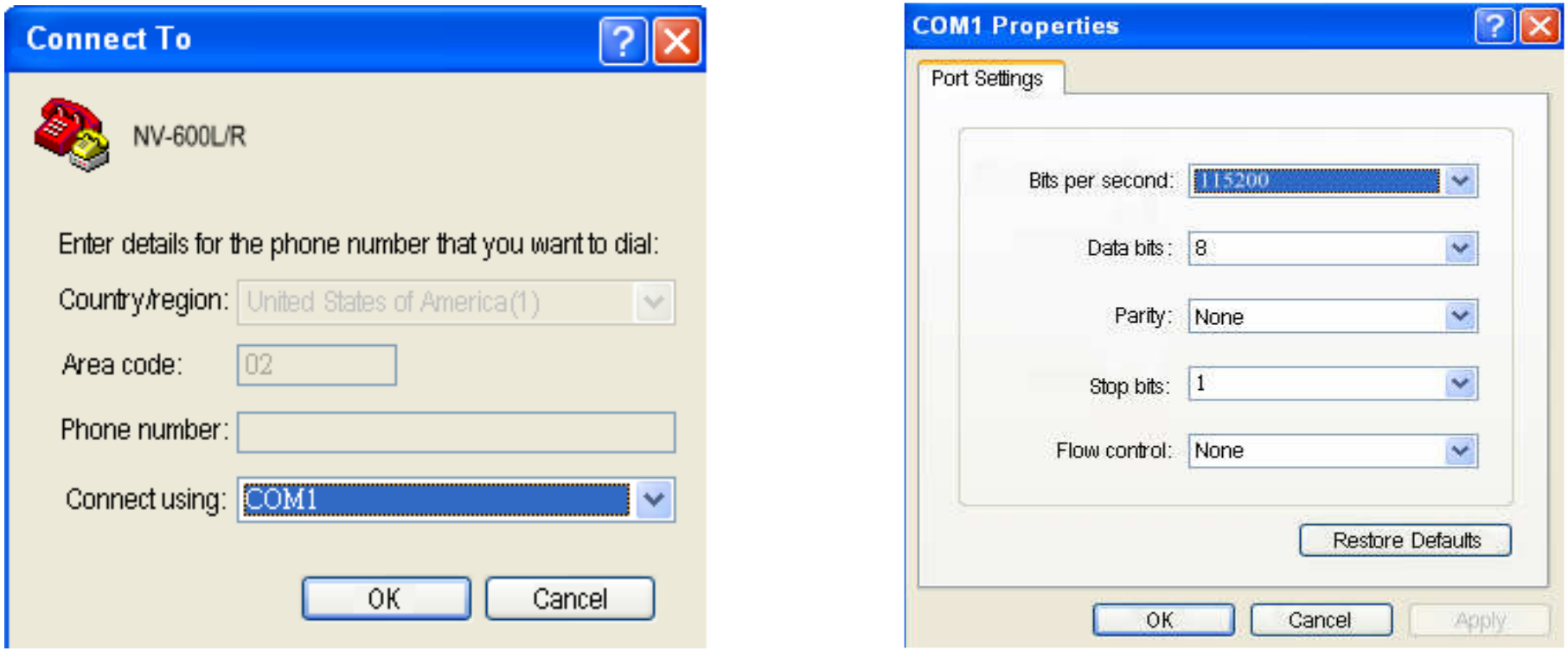


Figure 5 Hyperterminal Configuration

5.2 Reset the system to default configuration.

At the CLI command, write the command "**rawaccess –e**" to reset the system to default configuration. For it to take effect write the command "**reboot**" to restart the system.

Chapter 6. Building a VDSL2 System

First a quick overview on a complete setup of NV-600L/R:

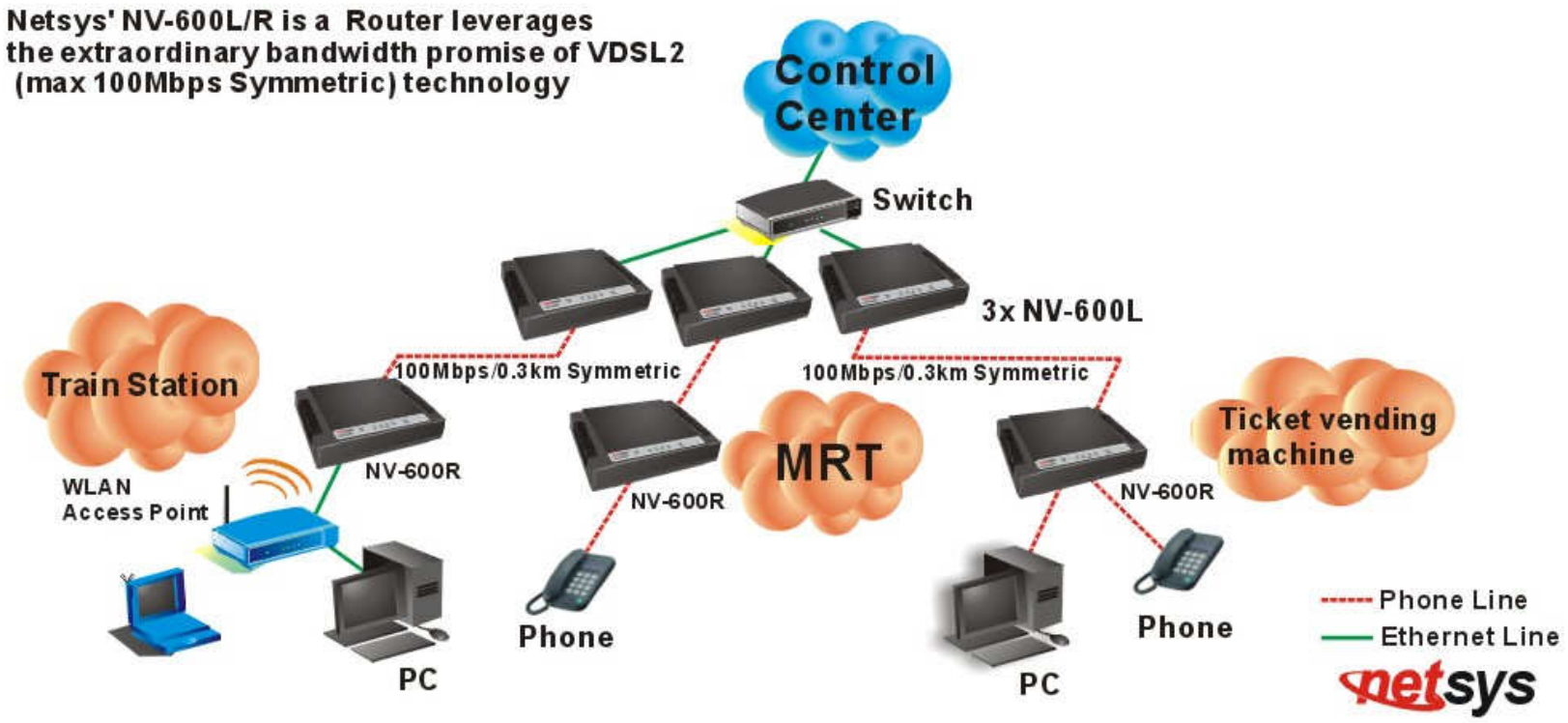


Figure 6 VDSL2 Application

6.1 Connect the NV-600L and the NV-600R to the Line

The objective for VDSL2 is to pass high speed data over a twisted pair cable. In the setup, connects NV-600L to NV-600R through phone wire or line simulator or any other hardware representation of a cable network, with or without noise injection and crosstalk simulations.

6.2 Connect the NV-600L and the NV-600R to LAN Devices

In the setup, usually an Ethernet tester serves as representation of the LAN side as well as representation of the WAN side.

6.3 Run Demos and Tests

The Ethernet tester may send data downstream as well as upstream. It also receives the data in order to check the integrity of the data transmission. Different data rates can be tested under different line conditions.

Chapter 7. Operating the VDSL2 System

After the VDSL2 system has been set up, one may want to configure the settings that are related to VDSL2. Configuration of operation modes, test modes (loop back) and the display of status information are supported by GUI (Graphical User Interface).

7.1 Configuration Settings

Configure and start the NV-600L (CO) and the NV-600R (CPE).

- Configuration: As a minimum configuration, usually selecting the bandplan is required.
  See Section 7.1.3, Profile Configuration.
- Next, both sides should be activated from the web interface.
  See Section 7.1.6, Line Activation
- The connection status of the link can be monitored.
  See Section 7.2.1, Line Status

7.1.1 Channel Configuration

This function is for setting VDSL2 channel.

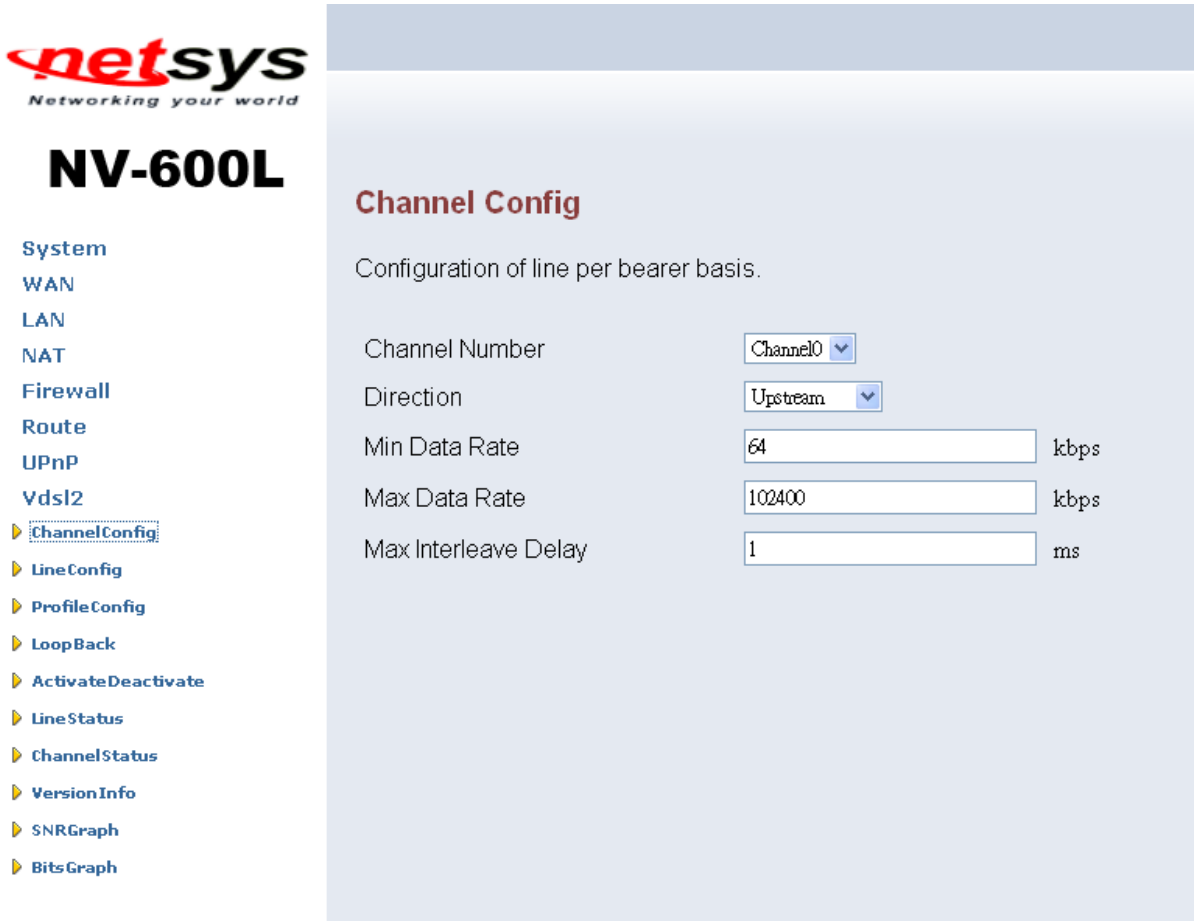


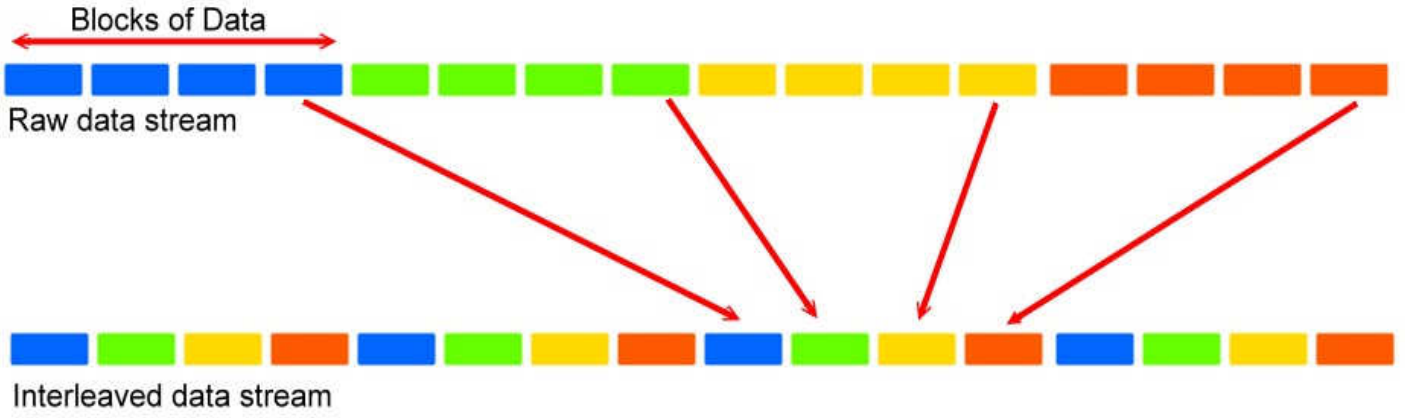
Figure 7.1.1 Channel Configuration Menu

Interleave delay function is used in digital data transmission technology to protect the transmission against noise issue and data error.

If during transit more than a certain amount of data has been lost then the data cannot be correctly decoded. Short bursts of noise on the line can cause these data packets to become corrupt and the router has to re-request data which in turn can slow down the overall rate at which data is transmitted.

Interleaving is a method of taking data packets, chopping them up into smaller bits and then rearranging them so that once contiguous data is now spaced further apart into a non continuous stream. Data packets are re-assembled by your router.

The diagram below is an example of how interleaved traffic is transmitted.



If your line is particularly susceptible to bursts of noise then interleaving should improve your VDSL2 experience simply because if you lose a whole batch of data then this could cause your router to loose sync with the exchange.

Using Interleaving, the router is able to re-assemble the data or if necessary just re-request the part of the data that it is unable to recover. By increasing the interleave depth of each ports that are susceptible to noise, this will improve error performance and stability of marginal lines.

Channel Configuration Settings

Setting	Description
Channel Number	To which bearer channel number shall the settings apply? • Channel 0
Direction	To which direction shall the settings apply? • Upstream • Downstream
Min Data Rate	Minimum Payload Data Rate
Max Data Rate	Maximum Payload Data Rate
Max Interleave Delay	Maximum Interleave Delay (set from 0 to 255ms)

Note:
The Reboot is needed for saving the new settings.

7.1.2 Line Configuration

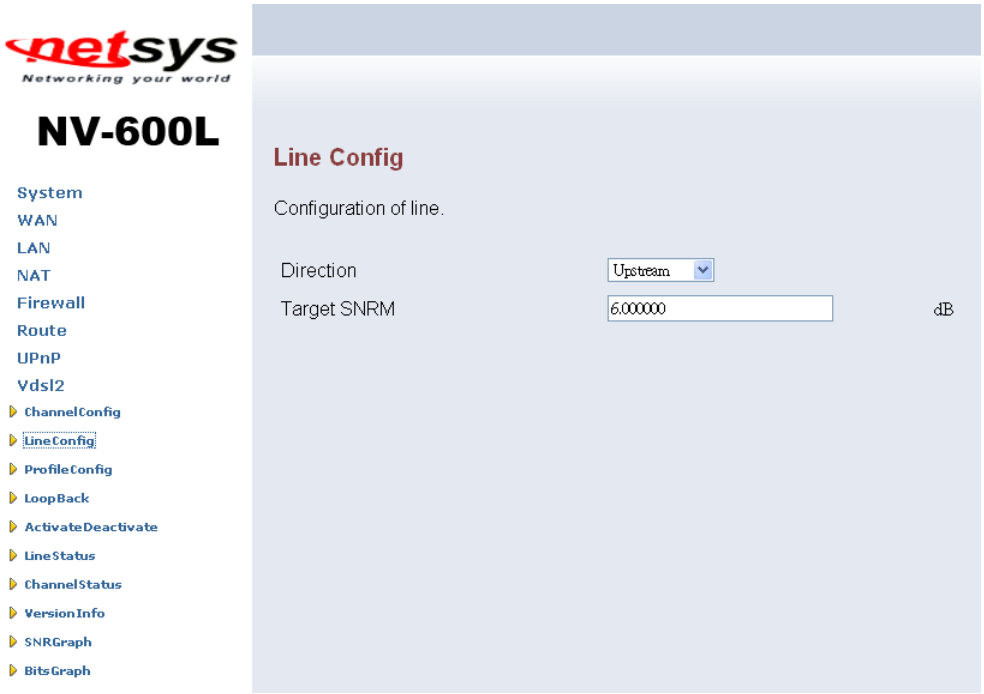


Figure 7.1.2 Line Configuration Menu for SNR Margin Selection

Line Configuration

Setting	Description
Direction	Select the target direction.
Target SNRM	Set the required SNR Margin *10 (**60=6dB**)

7.1.3 Profile Configuration

For this function, NV-600L/R provides world wide telecom standard band plan, such as meet European telecom standard band plan 998(17a), USA telecom standard band plan 997(8a, 8b) and APAC Telecom standard band plan (30a) etc.

Annex A specifies bandplans for the North American region and enables NV-600 to be deployed with traditional POTS telephony or in an all-digital mode. Annex B specifies bandplans for Europe and enables NV-600 deployment with underlying POTS and ISDN services. Annex C allows NV-600 to coexist with TCM-ISDN services, found primarily in APAC.

NV-600 has numerous configuration profiles and bandplans to meet regional service provider requirements. The frequency bandwidth has increased to 30 MHz, with configuration options at 8.5 MHz, 12 MHz, 17.7 MHz and 30 MHz.

Band profile and band plan can only be configured at NV-600L as NV-600R will auto-follow up on the settings of NV-600L. The only thing that NV-600R must be configured so that the routers will link is the tone mode. However, the default tone mode for NV-600L/R is V43, so at default there's no need to change the tone mode unless it is required by the telecom companies to use different tone mode. Another important thing is that band profile and band plan setting must be compatible to each other if not access error will show when applied. Please deactivate and activate once the setting has been changed.

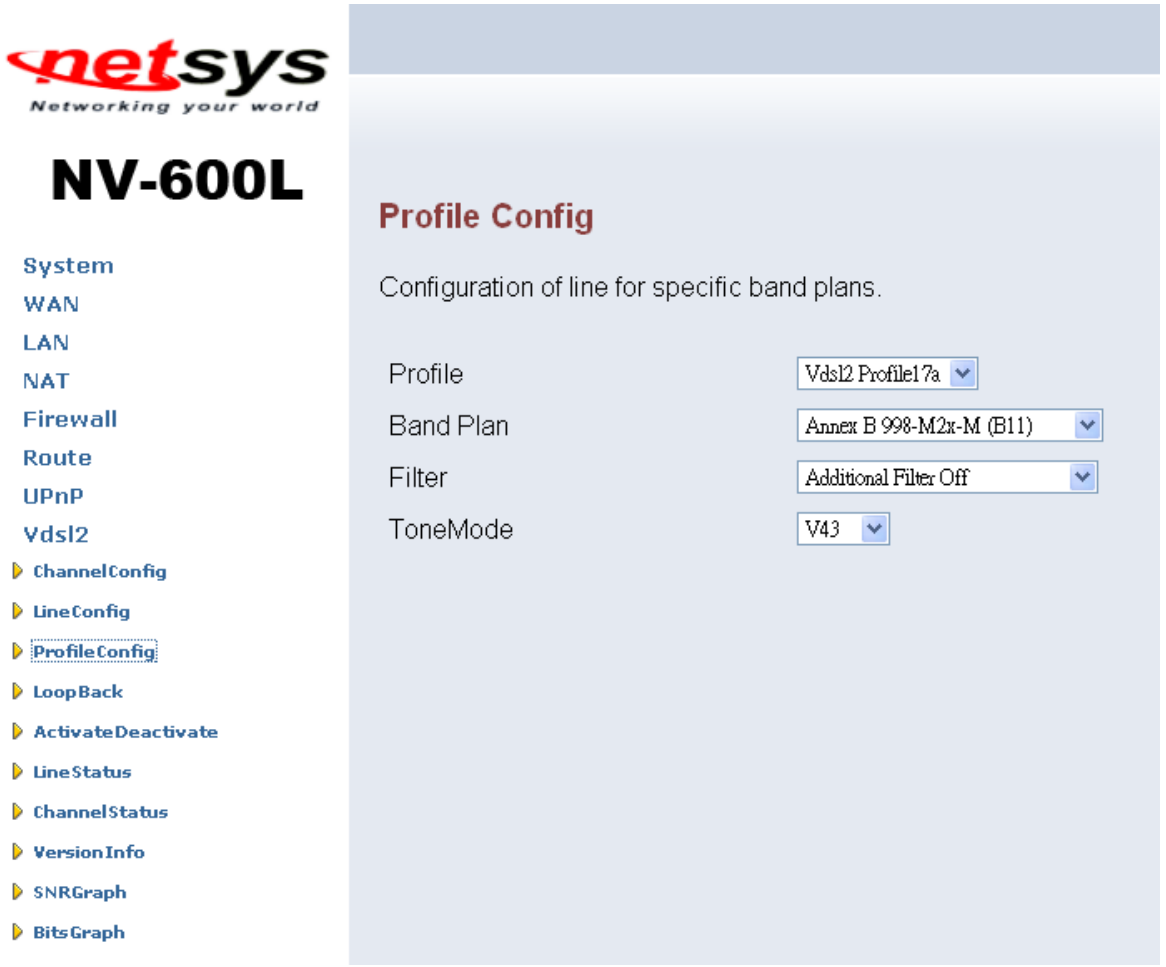


Figure 7.1.3.1 NV-600L Profile Configuration

Figure 7.1.3.2 NV-600R Profile Configuration

Figure 7.1.3.3 Band Profile and Plan Setup Error

Profile Region	8a US	8b EU	8c US	8d all	12a all	12b all	17a EU/US	30a APAC
Bandwidth (MHz)	8.832	8.832	8.500	8.832	12.000	12.000	17.664	30.000
Tones	2047	2047	1971	2047	2782	2782	4095	3478
Tone Spacing (kHz)	4.3125	4.3125	4.3125	4.3125	4.3125	4.3125	4.3125	8.625
Line Power (dBm)	+17.5	+20.5	+11.5	+14.5	+14.5	+14.5	+14.5	+14.5
Netsys(Infineon)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Competitor A	No	No	Yes	Yes	?	Yes	No	No
Competitor B	Yes	No	Yes	Yes	Yes	Yes	CO only	No

Figure 7.1.3.4 Band Profile Region

The following shows the band profile and band plan compatibility:

	Band Profile List		Band Plan List
0	VDSL2 Profile8a	0	Annex A M1_EU32
1	VDSL2 Profile8b	1	Annex A M9_EU64
2	VDSL2 Profile8c	8	Annex B 997-M2x-A (B05)
3	VDSL2 Profile8d	9	Annex B 997-M2x-M (B06)
4	VDSL2 Profile12a	10	Annex B 997-M1c-A-7 (B07)
5	VDSL2 Profile12b	11	Annex B 998-M1x-B (B08)
6	VDSL2 Profile17a	13	Annex B 998-M2x-A (B10)
7	VDSL2 Profile30a	14	Annex B 998-M2x-M (B11)
8	VDSL2 Profile17b	16	Annex B 998-M2x-B (B12)
		18	Annex B 998-M2x-NUS0 (B13)
		20	Annex C
		21	Annex C_8K
		22	Annex B 997-M2x-NUS0
		23	Annex C 1M1
		24	Annex C_8K 1M1
		25	Annex B 998E17-M2x-A
		26	Annex B 998E17-M2x-NUS0

Band Profile \ Band Plan	0	1	8	9	10	11	13	14	16	18	20	21	22	23	24	25	26
0	O	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X
1	O	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X
2	X	X	O	X	O	X	X	O	X	X	X	X	X	X	X	X	X
3	O	O	O	X	O	O	O	O	O	X	X	X	X	X	X	X	X
4	O	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X
5	O	O	X	X	O	O	O	O	O	O	X	X	X	X	X	X	X
6	O	X	X	X	O	O	O	O	O	X	O	X	X	O	X	X	O
7	O	X	X	X	X	X	X	X	X	X	X	O	O	X	O	X	X
8	X	X	X	X	X	X	X	O	O	X	X	X	X	X	X	O	X

Note: O = Compatible; X = Not Compatible

The following phone wire distance and data rates are possible according to the band profile and band plan setup:

Comment:

Downstream: Traffic from Transmitter to Receiver
Upstream: Traffic from Receiver to Transmitter

Default plan profile and band plan = 30a and C8K

Distance	0-350m	350-450m	450-600m	600-900m	Beyond 900m
Downstream	100Mbps	70-85Mbps	40-60Mbps	20-40Mbps	X
Upstream	100Mbps	40Mbps	10Mbps	1-5Mbps	X

Note:

Using Band profile 30a and band plan C8K for distances beyond 900m is not recommended.

Alternative band profile and band plan = 8d and M1_EU32

Distance	0-800m	800-1200m	1200-1500m	Beyond 1500m
Downstream	60-80Mbps	30-50Mbps	30Mbps	X
Upstream	15Mbps	5-10Mbps	2-5Mbps	X

Note:

Using Band profile 8d and band plan M1_EU32 for distances beyond 1500m is not recommended.

Note:

The performance data above is for reference only, the actual data rate will vary on the quality of the copper wire and environment factors.

7.1.4 Loop Back

The loop back testing function for checking phone wire link problem: 1. System Loop. 2. Line Side Loop

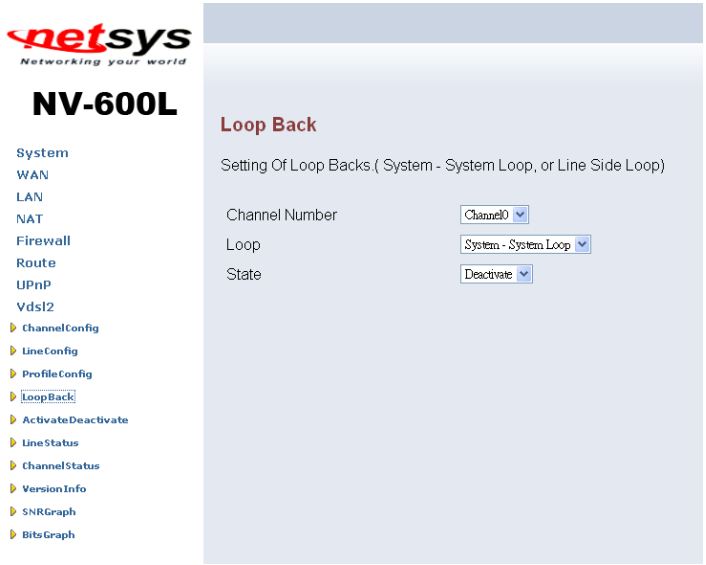


Figure 7.1.4 Loop Back Activation/Deactivation Menu

Loop Back

Setting	Description
Channel No.	To which bearer channel number shall the settings apply? Channel 0
Loop	System loop or line side loop
State	Activate or deactivate loop back within the transmission convergence layer

7.1.5 Line Activation

This function is for enable/disable VDSL2 port.

Figure 7.1.5 Activation and Deactivation of the Line

Line Activation/Deactivation:

Setting	Description
Line	Activate or deactivate the line. (Select the activity and the press the APPLY button.)

7.2 Status Displays

7.2.1 Line Status

This function provides SNR value for checking phone wiring quality.

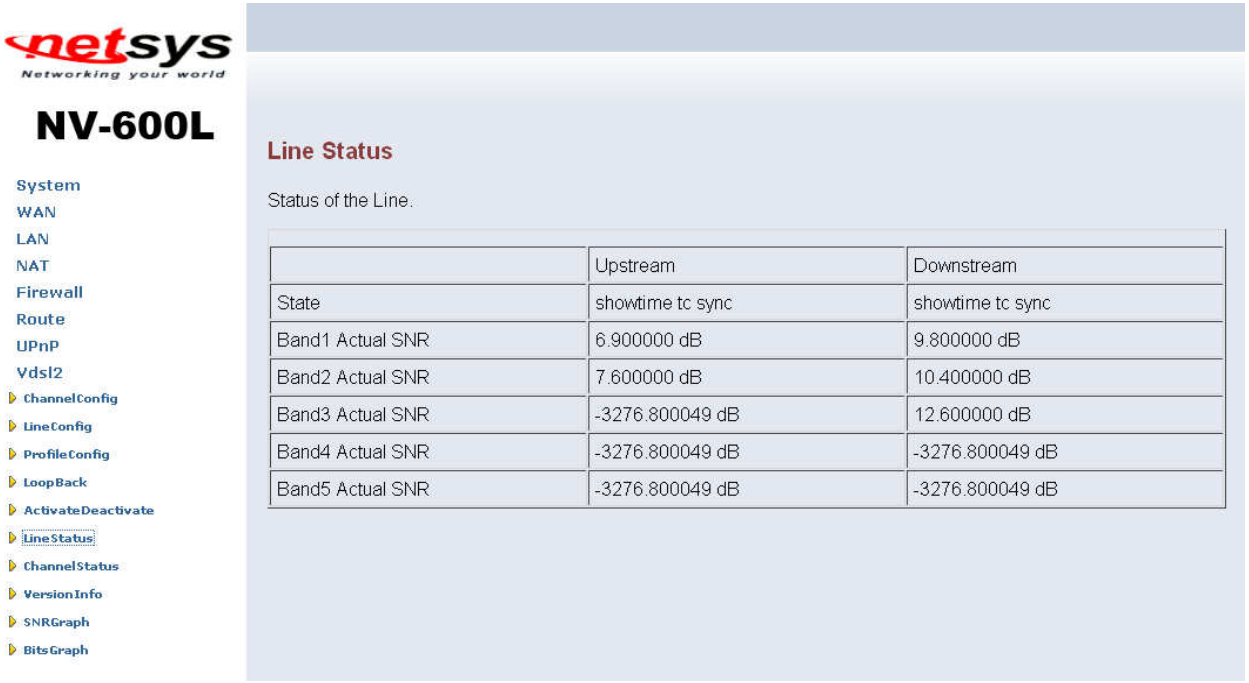


Figure 7.2.1 Line Status Display: Actual SNR

The following status messages may occur: not_initialized, exception, idle request, idle, silent request, silent, handshake, full init, discovery, training, analysis, exchange, showtime no sync, showtime tc sync, fast retrain, lowpower l2, loopdiagnostic, loopdiagnostic complete, resync, test, lowpower l3, unknown.

7.2.2 Channel Status

This function shows VDSL2 port status.

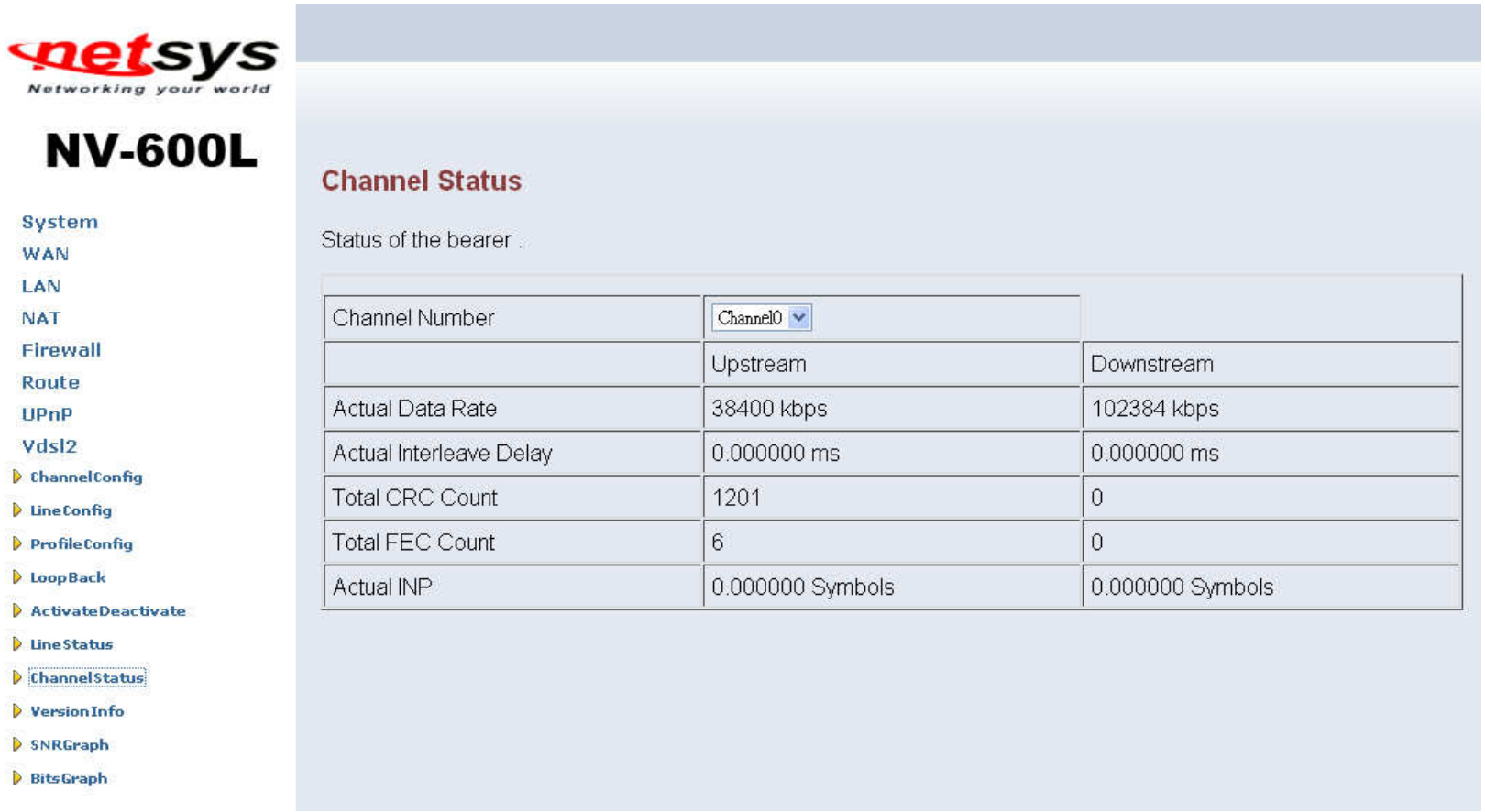


Figure 7.2.2 Channel Status Display: Data Rate, Delay, Error Counters and Impulse Noise Protection

7.2.3 Version Info

This function shows hardware and firmware version.

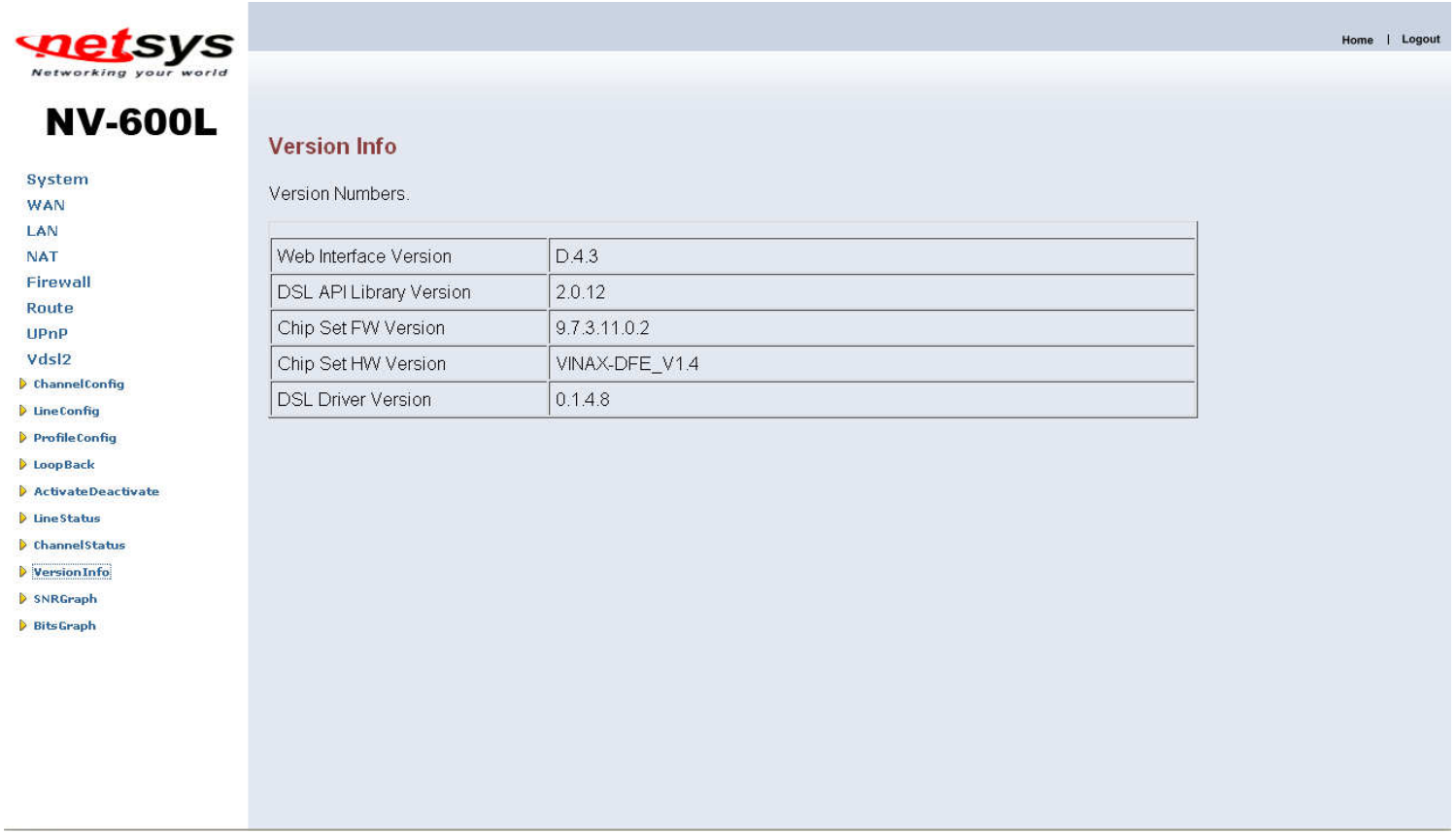
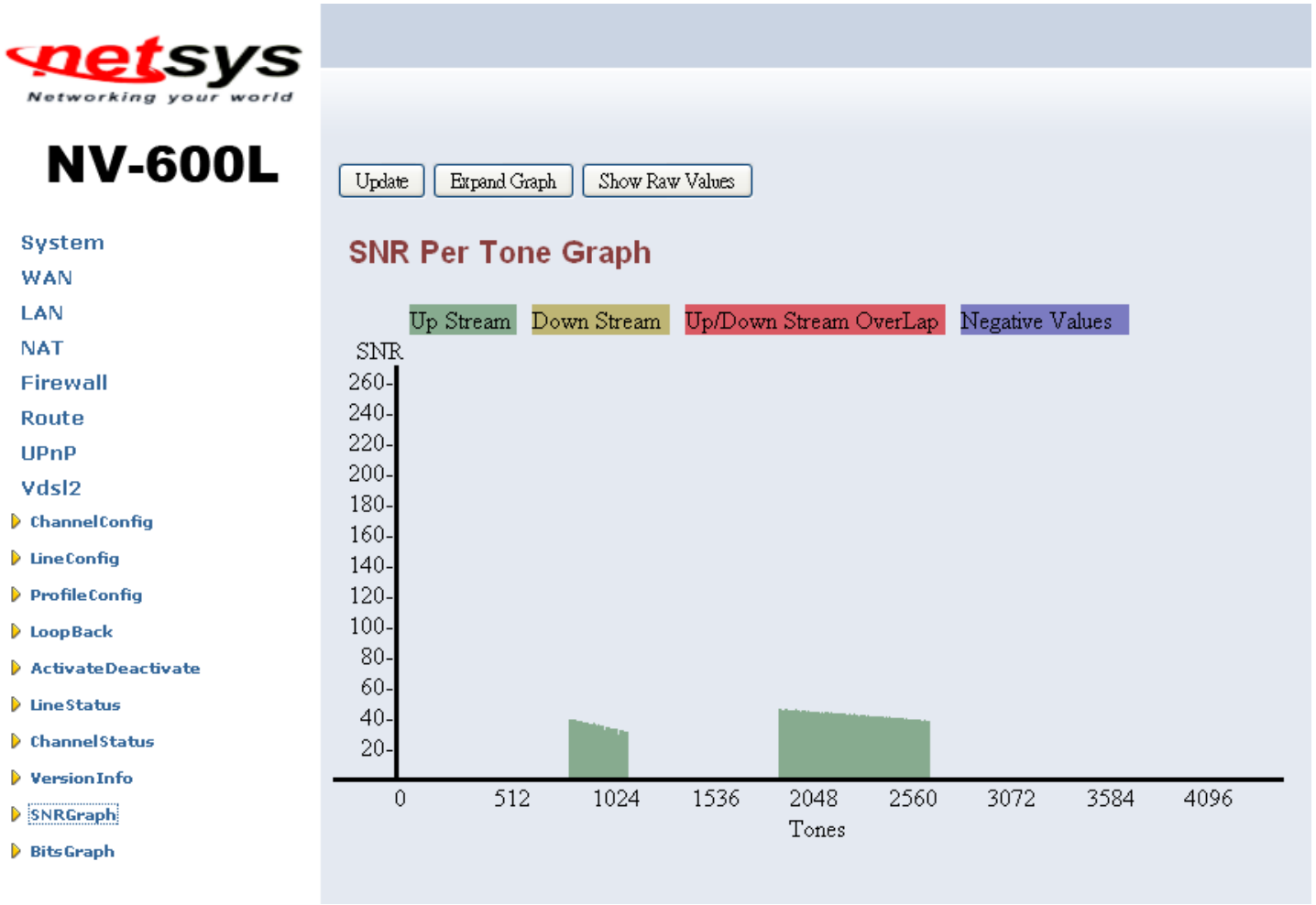


Figure 7.2.3 Display of Version Data

7.2.4 SNR Graphs

When NV-600L link with NV-600R, this graph will show the SNR value for each band.



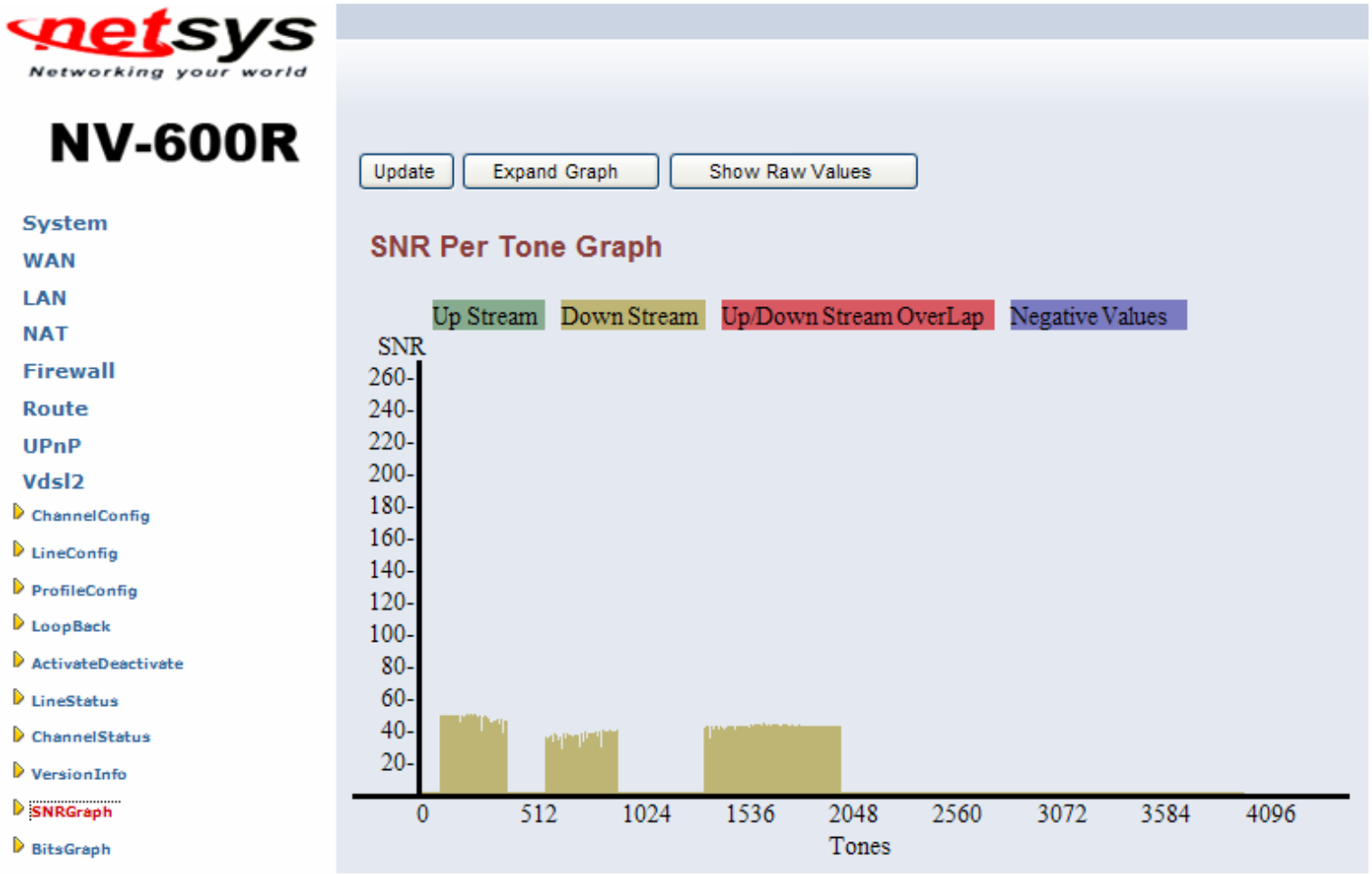


Figure 7.2.4 Display of SNR per Carrier

7.2.5 BitsGraphs

When NV-600L link with NV-600R, this graph will show the bits value for each tone.

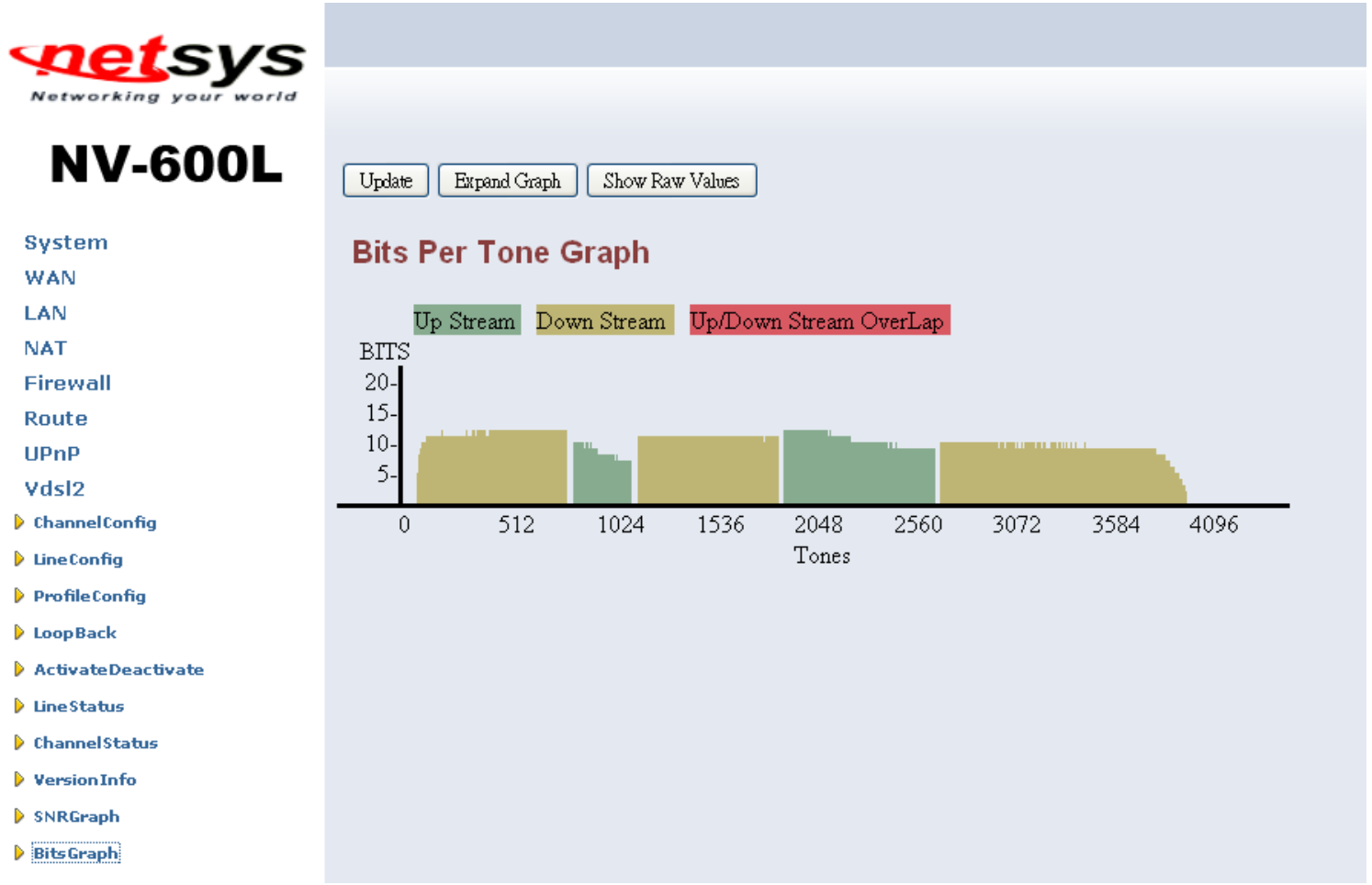


Figure 7.2.5 Display Bits Per Tone Graph

Chapter 8. Configuration Interface of the Router

This section explains how to configure the router section of the NV-600L/R using its web-based configuration.

The part of the circuitry as well as the router configuration menu has been ported from that of the reference kit to the NV-600L/R reference board. As for the menu, there are only a few differences:

- The "adm1" port now is the port to the VDSL2 side. The port on the LAN is "adm0". It supports four Ethernet connections.
- The IP addresses are used in this chapter are different from the examples in the previous chapters.
- The password used in this chapter is different from the examples in the previous chapters.

8.1 Logging in to the NV-600L/R

To log on to the NV-600L/R Web Application, you must have a valid password. The Administrator creates the log on user with its password. When one log on to the NV-600L/R Web Application, the LOGIN PASSWORD window is displayed as shown in Figure 8.1.

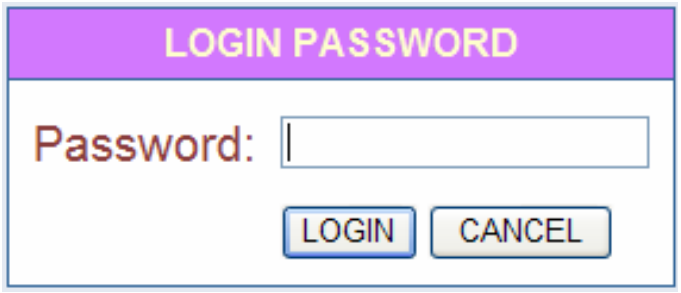


Figure 8.1 NV-600L/R Web Application

In the LOGIN PASSWORD window:

1. Enter the password in the Password text box. For an Admin user, the default password is "admin".
2. Click LOGIN to begin the configuration or click CANCEL in the LOGIN PASSWORD window to cancel this log on operation.

8.2 Setup Wizard and Advanced Setup

There is an easy Setup Wizard for end users at the NV-600R Router only and an Advanced Setup for more detail configurations for both NV-600L/R. This manual gives importance to the Advanced Setup.

Figure 8.2 Select the Advanced Setup in the Entry Screen

8.2.1 Setup Wizard

The Setup Wizard is designed for ease-of-use in order to quickly configure the most common settings. The Admin can view the Setup Wizard link in the homepage. The wizard first step is to allow the admin to configure the system host settings displayed as shown in Figure 8.2.1.

Figure 8.2.1 Setup Wizard's First Step

Note:

There are four steps to complete the wizard. Follow the instructions given in each step and enter the desired settings.

8.2.2 Advanced Setup

Click on the Advanced Setup link in the homepage in case you want to configure a wider range of settings. The following configuration options are displayed in the left navigation bar, as shown in Figure 8.2.2.

- System
- WAN
- LAN
- NAT
- Firewall
- Route
- UPnP
- VDSL2

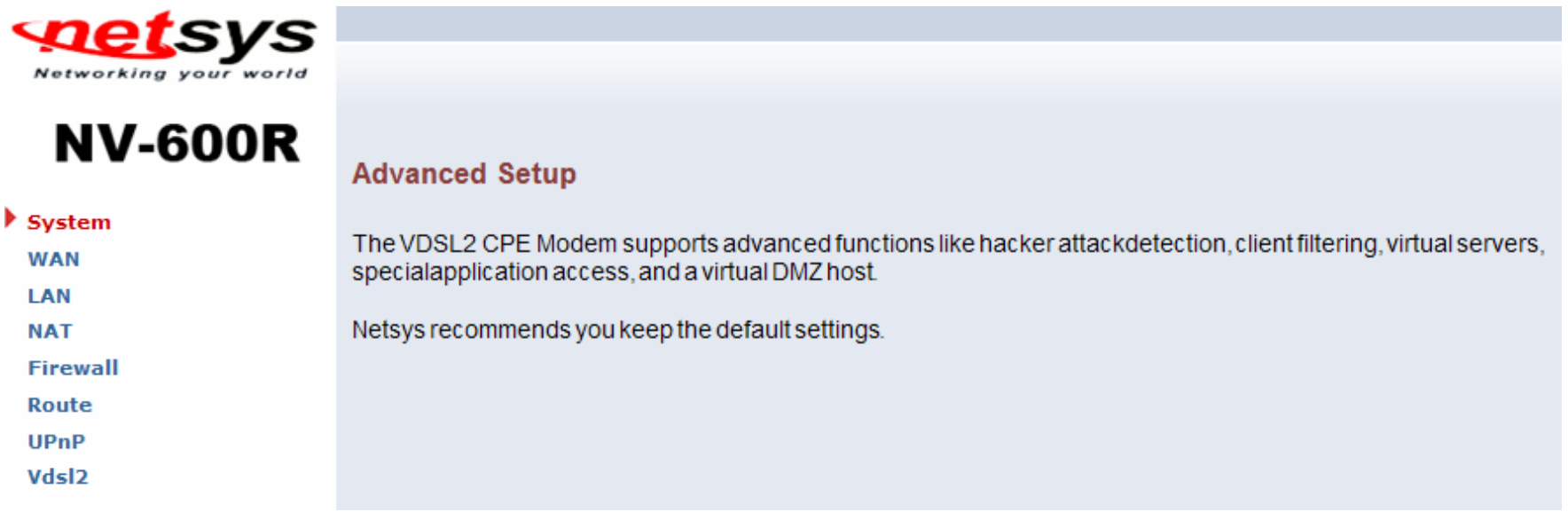


Figure 8.2.2 Advanced Setup

8.2.3 System

The System link can be viewed in the left navigation bar. The following are the options available under System, as shown in Figure 8.2.3.

- Administrator Settings
- Firmware Upgrade
- Device Mode
- System Status
- Reboot
- Reset System

Figure 8.2.3 System in the Left Navigator Bar

8.2.3.1 Administrator Settings

To add a user or change user's password, click on the "Administrator Settings" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.3.1.

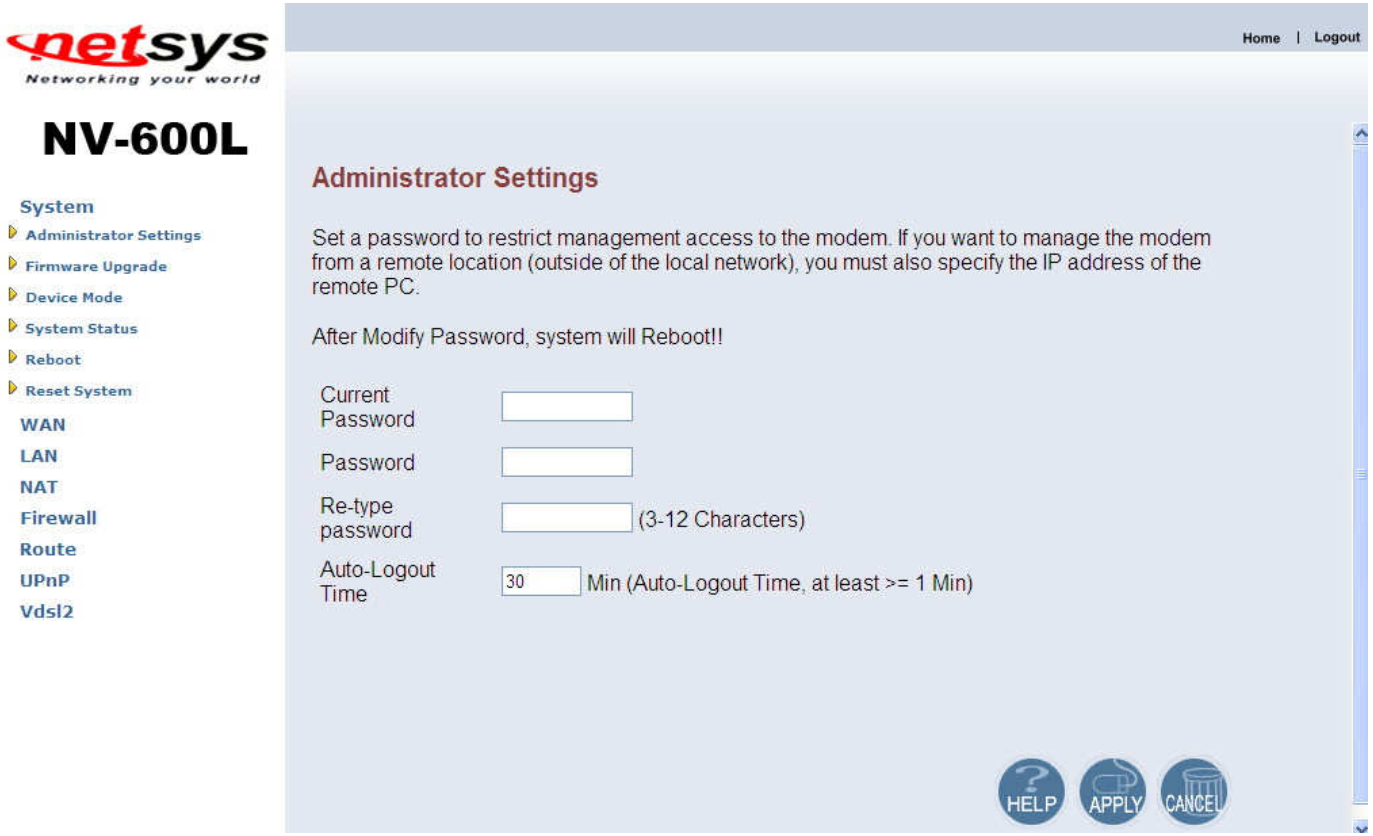


Figure 8.2.3.1 Administrator Settings Configuration

While adding a user, each user must assign a separate port. Hence the number of users that can be added to the system depends on the number of ports available on the NV-600L/R.

The screen contains the following details:

Fields in User Setting:

Field	Description
Current Password	This is the password associated with the administrator. This is enabled only for the user Administrator login.
Password	This is the password of the login administrator.
Re-type Password	This is the password verification.
Auto-Logout Time	The auto-logout time, at least one minute.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.3.2 Firmware Upgrade

To update the system firmware, click on the "Firmware Upgrade" link in the left navigation bar. A screen is displayed as shown in 8.2.3.2

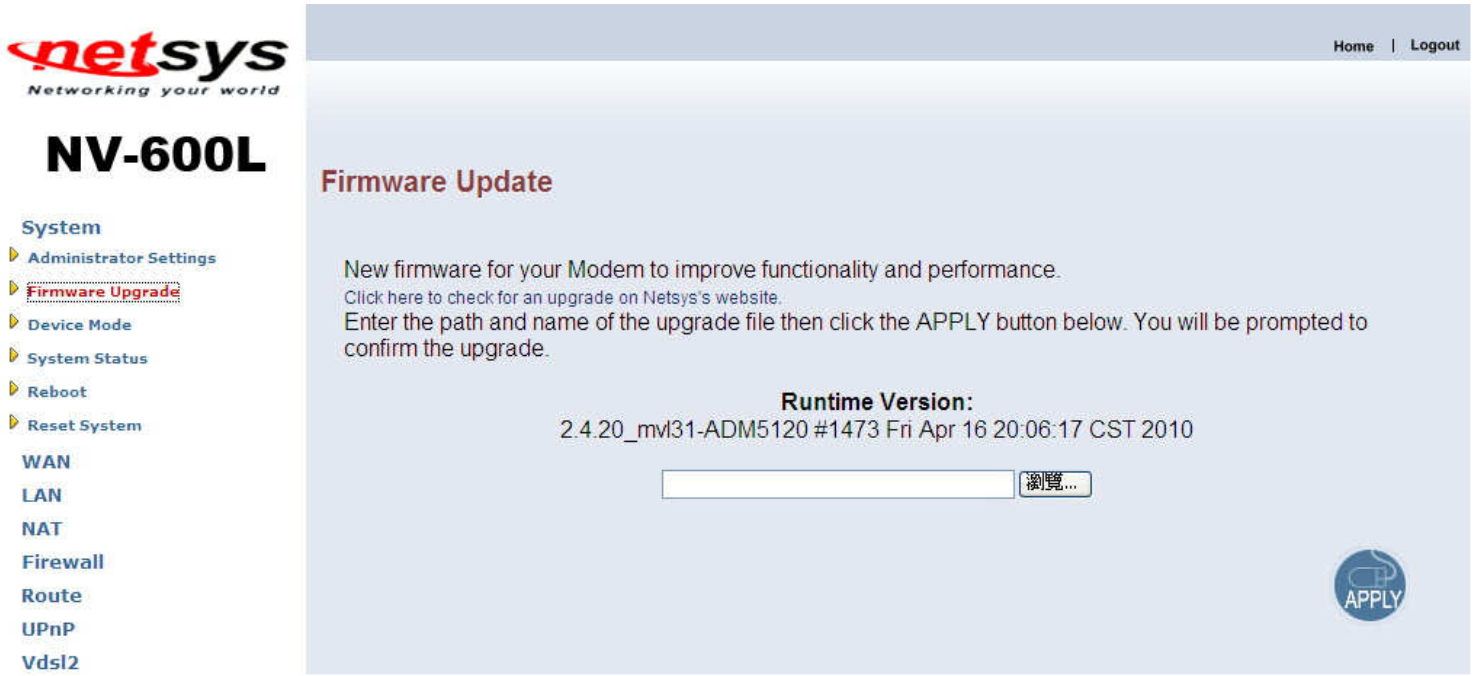


Figure 8.2.3.2 Firmware Update

The screen contains the following detail:

- Click "Browse" to select a specific file name in preparation upgrade the firmware.
- Click APPLY to start the firmware update.

8.2.3.3 Device Mode

The ADM5120 network processor used in the reference system is able to act as either a switch or a router. Clicking on "Device Mode" on the left navigation bar allows the user to change the mode of operation, as shown in the following figure.

Figure 8.2.3.3 Device Mode

The default setting is in Switch(Bridge) mode, it is not necessary to change the setting in most of the case. In situations, which devices (e.g. PC, Server, VoIP) connected to CPE requires Router function. Hence, set the CPE on Router mode.

8.2.3.4 System Status

To view system status, click on the "System Status" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.3.4

Figure 8.2.3.4 Status Window

8.2.3.5 Reboot

To reboot the unit, click on the "Reboot" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.3.5.

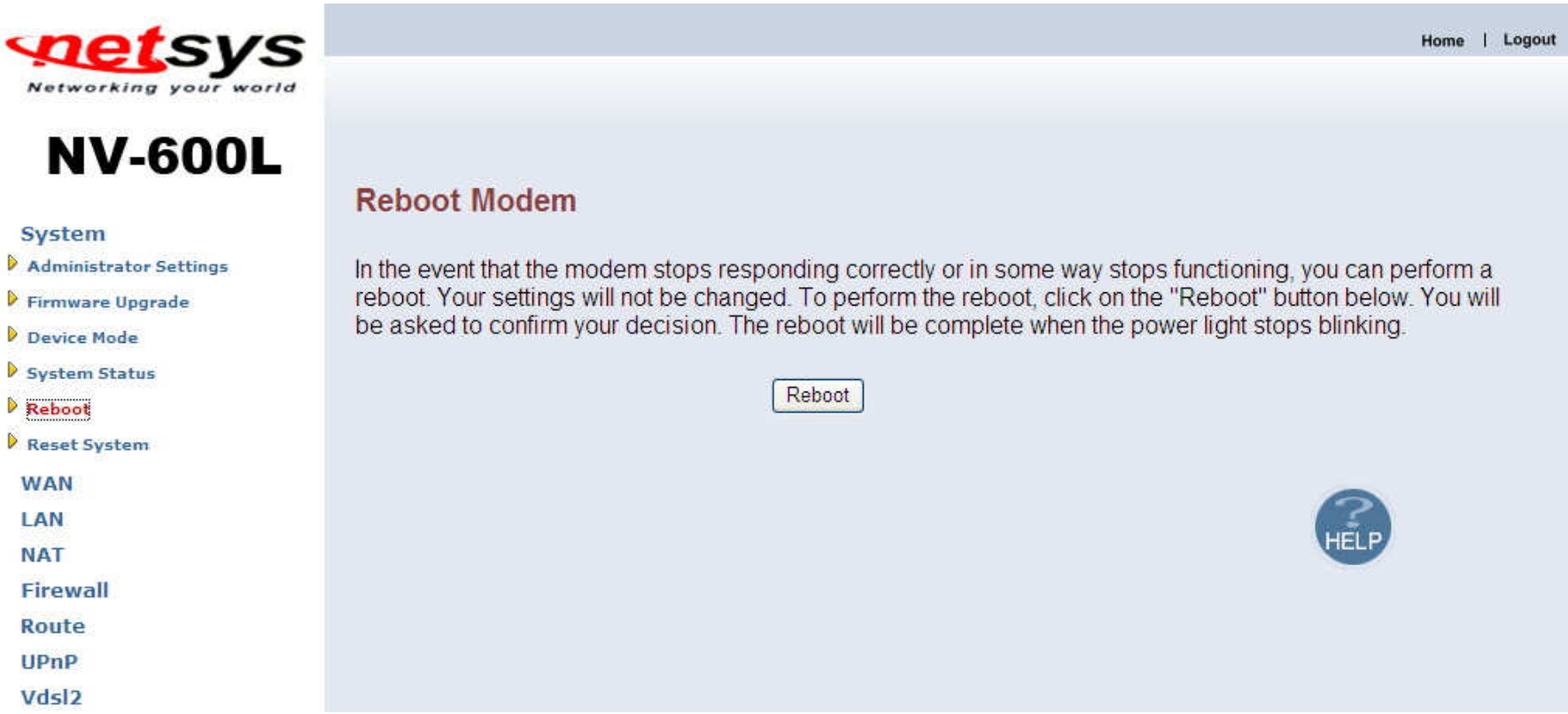


Figure 8.2.3.5 Reboot NV-600L/R Router

- Click Reboot to restart the unit.

8.2.3.6 Reset system

To reset the system, click on the "Reset" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.3.6.

Figure 8.2.3.6 Reset NV-600L/R Router

- Click Reset to restart the system to default configuration.

8.2.4 WAN

The WAN settings can be viewed in the left navigation bar. The following are the options available under WAN, as shown Figure 8.2.4:

- Dynamic IP
- IP Settings
- PPPoE
- DNS

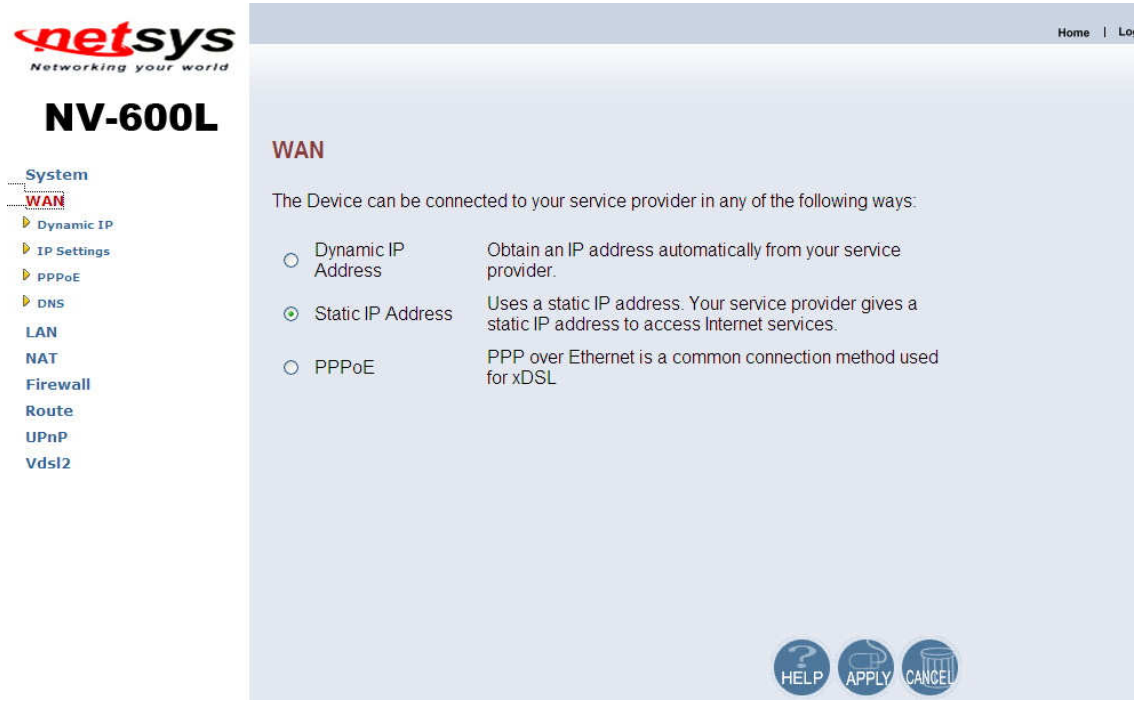


Figure 8.2.4 WAN Setting in Left Navigator Bar

8.2.4.1 Dynamic IP

To configure the WAN interface to dynamically obtain an IP Address, click on the "Dynamic IP" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.4.1.

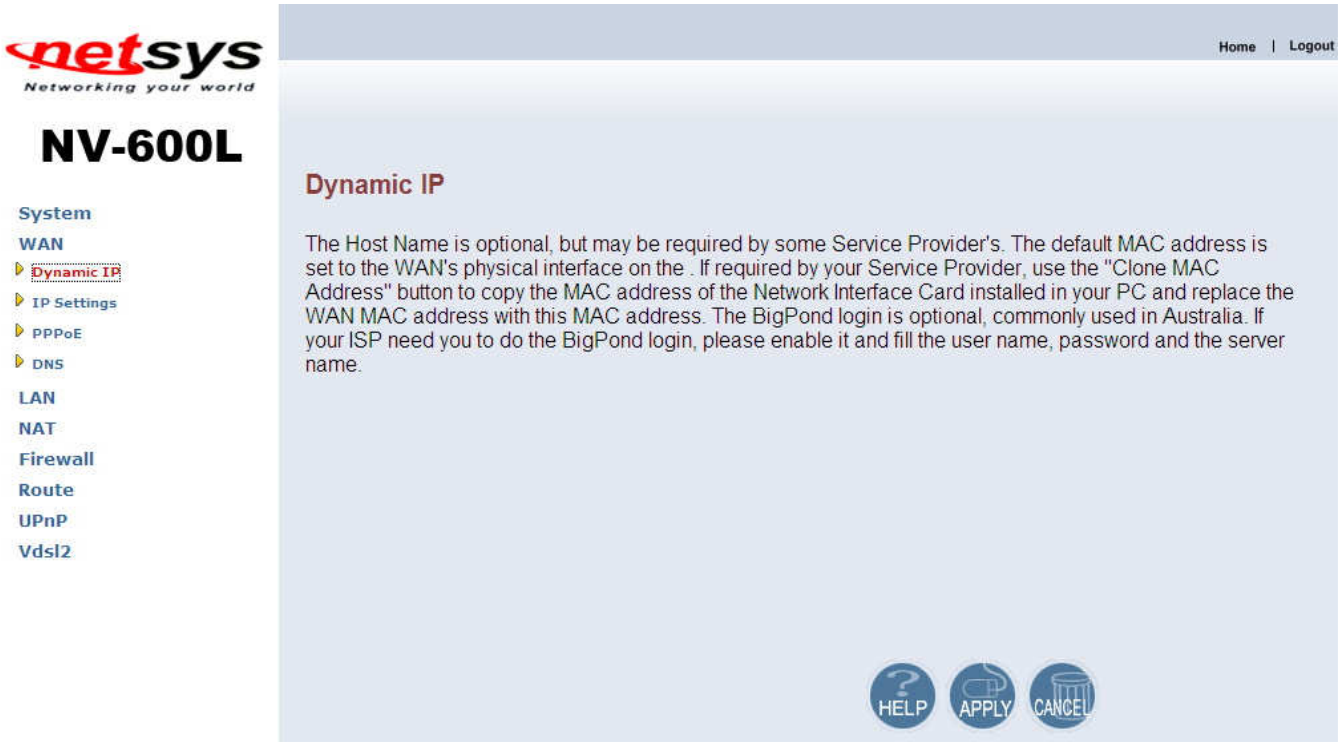


Figure 8.2.4.1 Dynamic IP Configuration

The screen contains the following details:

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page.

8.2.4.2 IP Settings

To configure the WAN interface to use a Static IP Address, click on the "Static IP" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.4.2.

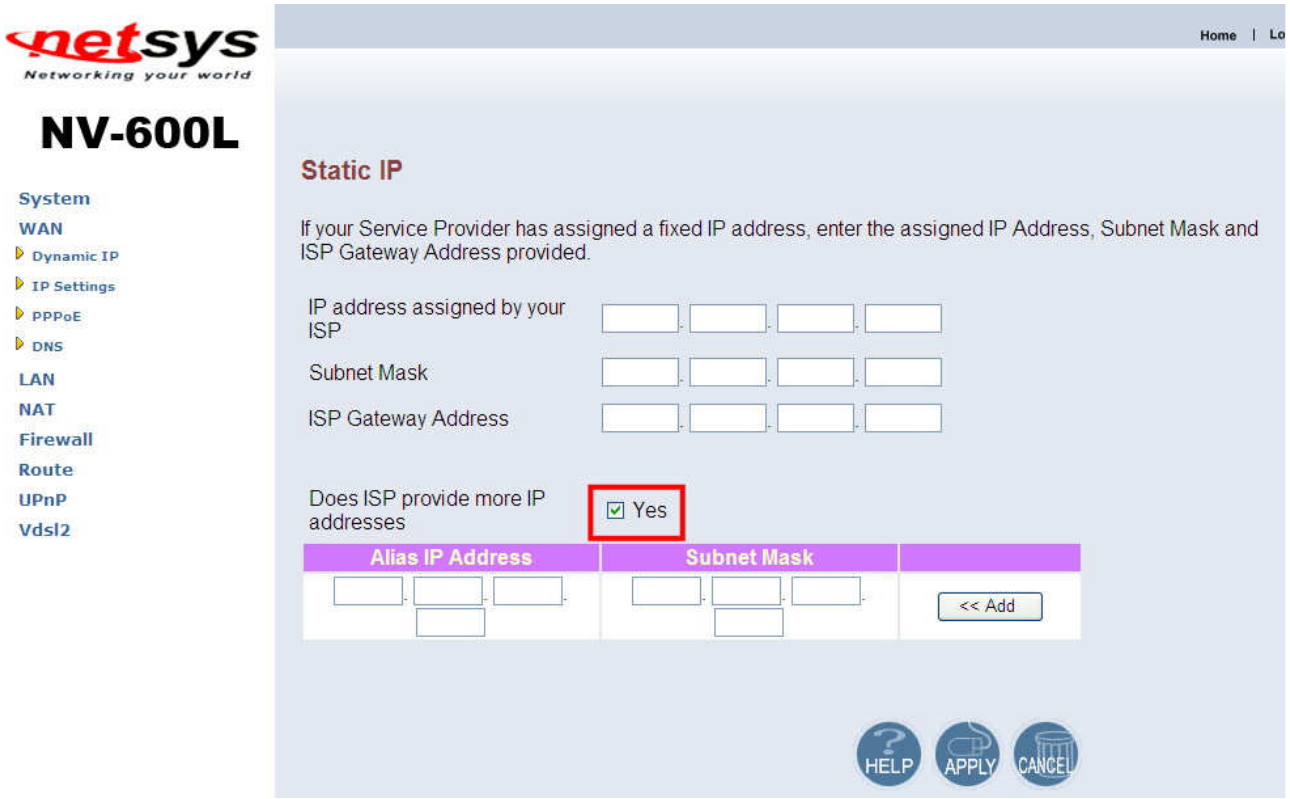


Figure 8.2.4.2 Static IP Configuration

The screen contains the following details:

Fields in Static IP:

Field	Description
IP Address assigned by your ISP	Enter the IP Address of NV-600L/R.
Subnet Mask	Enter the Subnet Mask of NV-600L/R.
ISP Gateway Address	Enter the Gateway address of the NV-600L/R.
Does ISP provide more IP Address	Provides more IP Addresses of the WAN interface. Select the check box to enable this option. A screen is displayed as shown in Figure 8.2.4.2. Click Add to add IP Address and Subnet Mask.
IP Pool Starting Address	Enter the starting IP Pool Address.
IP Pool Ending Address	Enter the ending IP Pool Address.
Lease Time	Enter the Lease Time from half hour to two weeks.
Local Domain Name	Enter the Local Domain Name but is optional.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.4.3 PPPoE

To configure the WAN interface to use PPPoE, click on the "PPPoE" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.4.3.

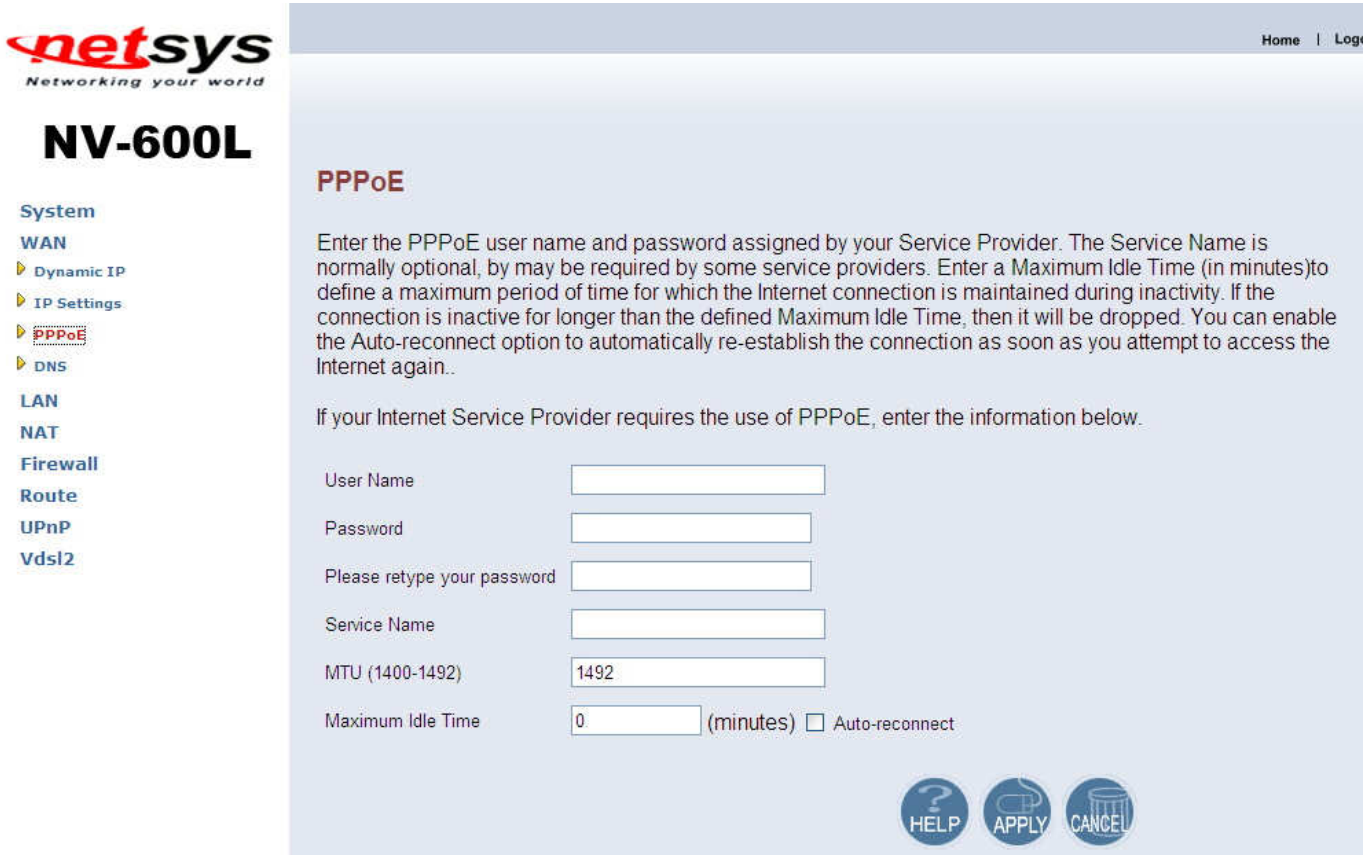


Figure 8.2.4.3 PPPoE Configuration

The screen contains the following details:

Fields in PPPoE:

Field	Description
User Name	Enter a name to use the PPPoE session.
Password	Enter the password of the login user.
Retype Password	Enter the password again to reconfirm.
Service Name	Enter a service name.
Field	Description
MTU	Enter the maximum connection units of the PPPoE. The MTU range is 1400 to 1492 bytes. By default, it is 1492.
Maximum Idle Time	This is the period of time required to keep the connection alive if no packets are transmitted. If no packets are transmitted between LAN port and WAN port or between NV-600L/R and WAN, the connection is disconnected after the 'Maximum idle time. If the Auto-reconnect check box is selected, the PPP connection is re-established if there is some data that is received from the upper layers to be transmitted on this link.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.4.4 DNS

To configure the DNS address, click on the "DNS" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.4.4:

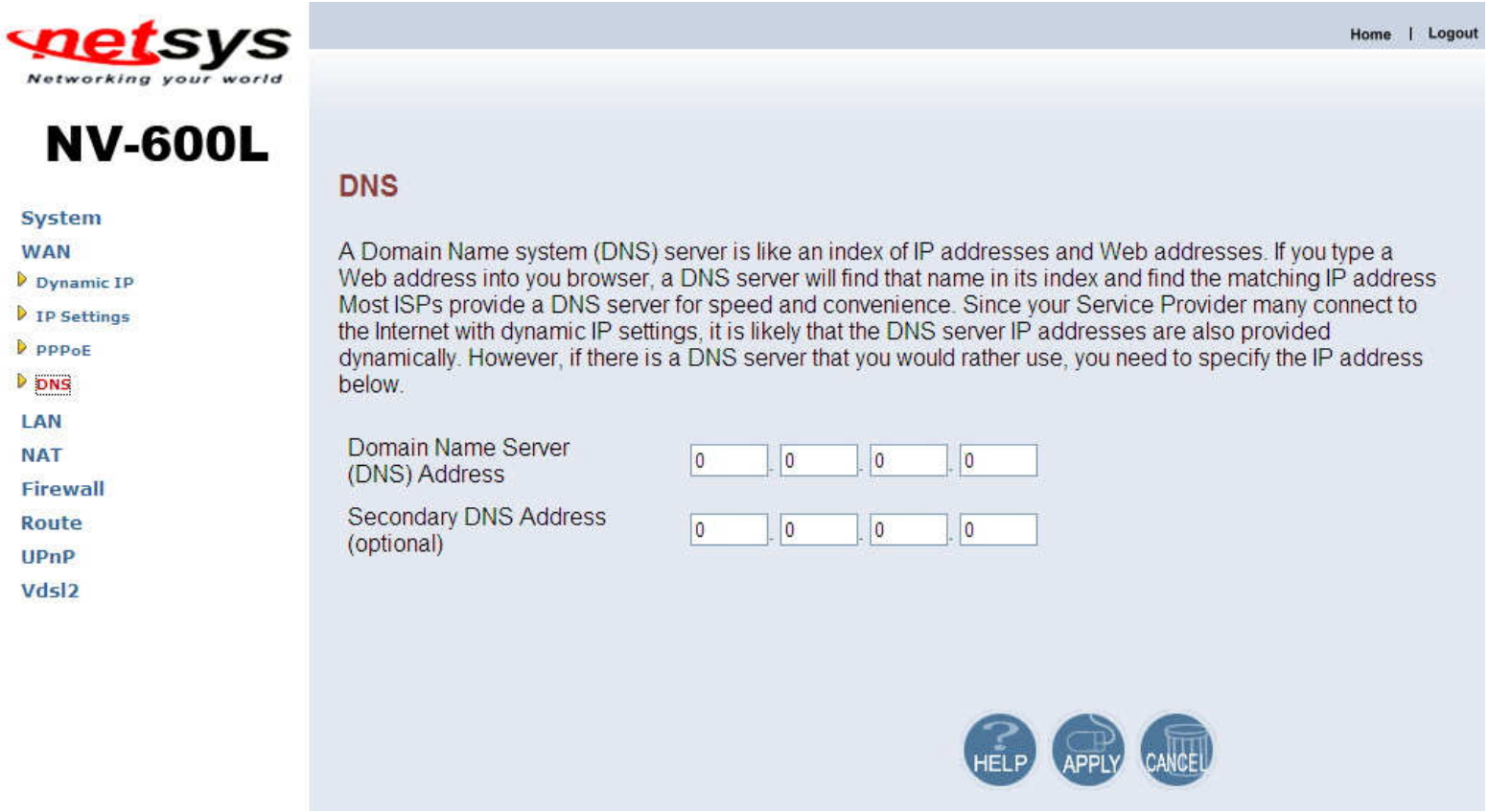


Figure 8.2.4.4 DNS Configuration

The screen contains the following details:

Fields in DNS:

Field	Description
Domain Name Server(DNS) Address	Enter the DNS address of the primary DNS server.
Secondary DNS Address(optional)	Enter the address of the secondary DNS server, if available.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.5 LAN

The LAN Setting can be viewed in the left navigation bar. The following are the options available under LAN, as shown in Figure 8.2.5:

- LAN Settings
- DHCP Client List
- LAN Switch Port Setting
- LAN Port Status

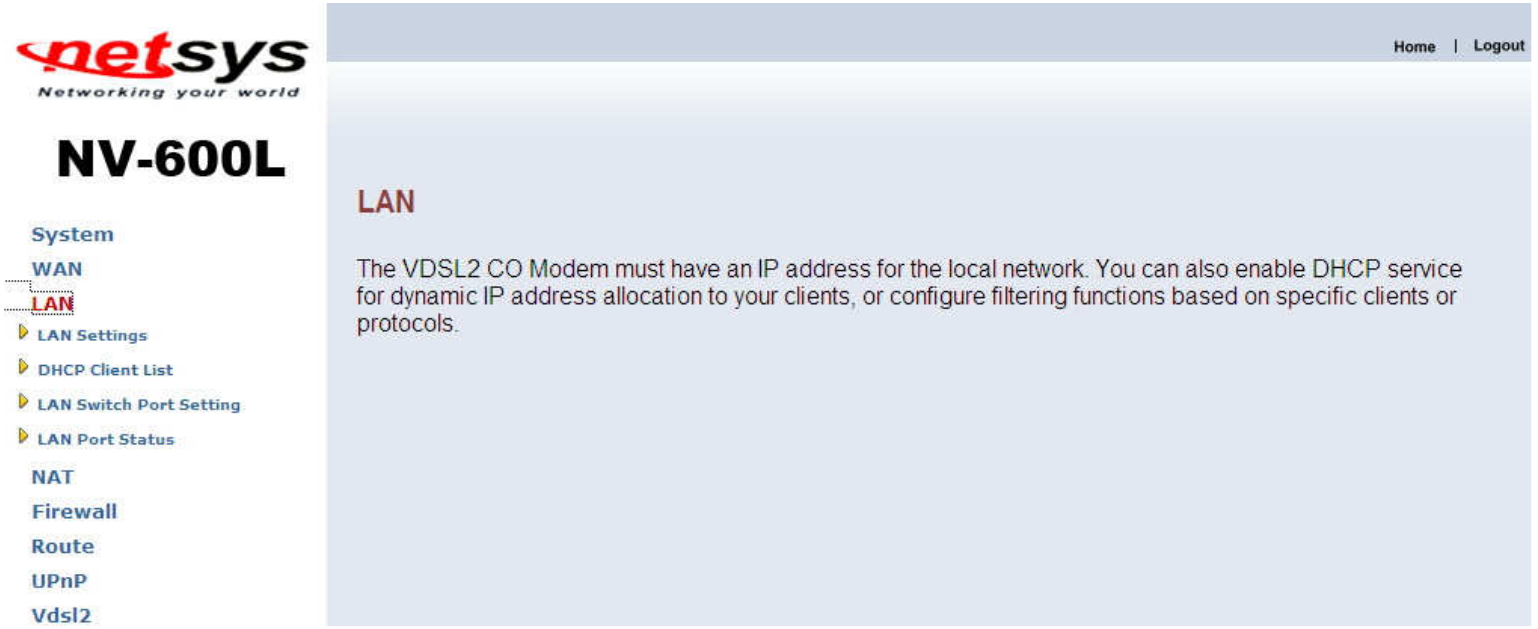


Figure 8.2.5 LAN in Left Navigator Bar

8.2.5.1 LAN Settings

Note:

For the NV-600L/R it is recommended to select a simple IP setting suitable to controlled lab environments. Set a static IP address and don't use DHCP. The required steps are explained in section 4.4.1.

To configure the LAN interface, click on the "LAN Settings" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.5.1 in case of the NV-600L/R.

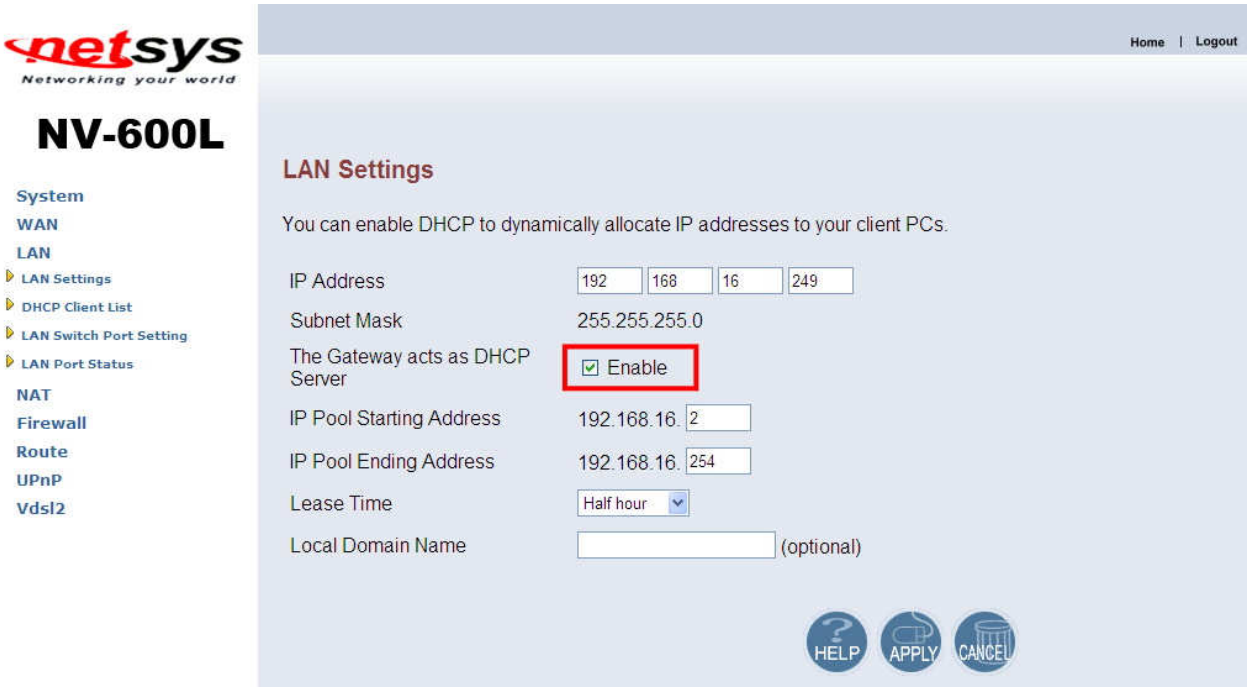


Figure 8.2.5.1 LAN Settings

The screen contains the following details:

Fields in LAN Settings:

Field	Description
IP Address	Enter the LAN interface IP Address of NV-600L/R.
Subnet Mask	Enter the LAN Subnet Mask of NV-600L/R.
The Gateway acts as DHCP Server	Enable or disables the DHCP Server of the NV-600L/R. Select the check-box to enable this option.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.5.2 DHCP Client List

To view the DHCP client list, click on the "DHCP Client List" link in the left navigation bar. A screen is displayed to list all DHCP client connection with IP Address and MAC Address as shown in Figure 8.2.5.2.

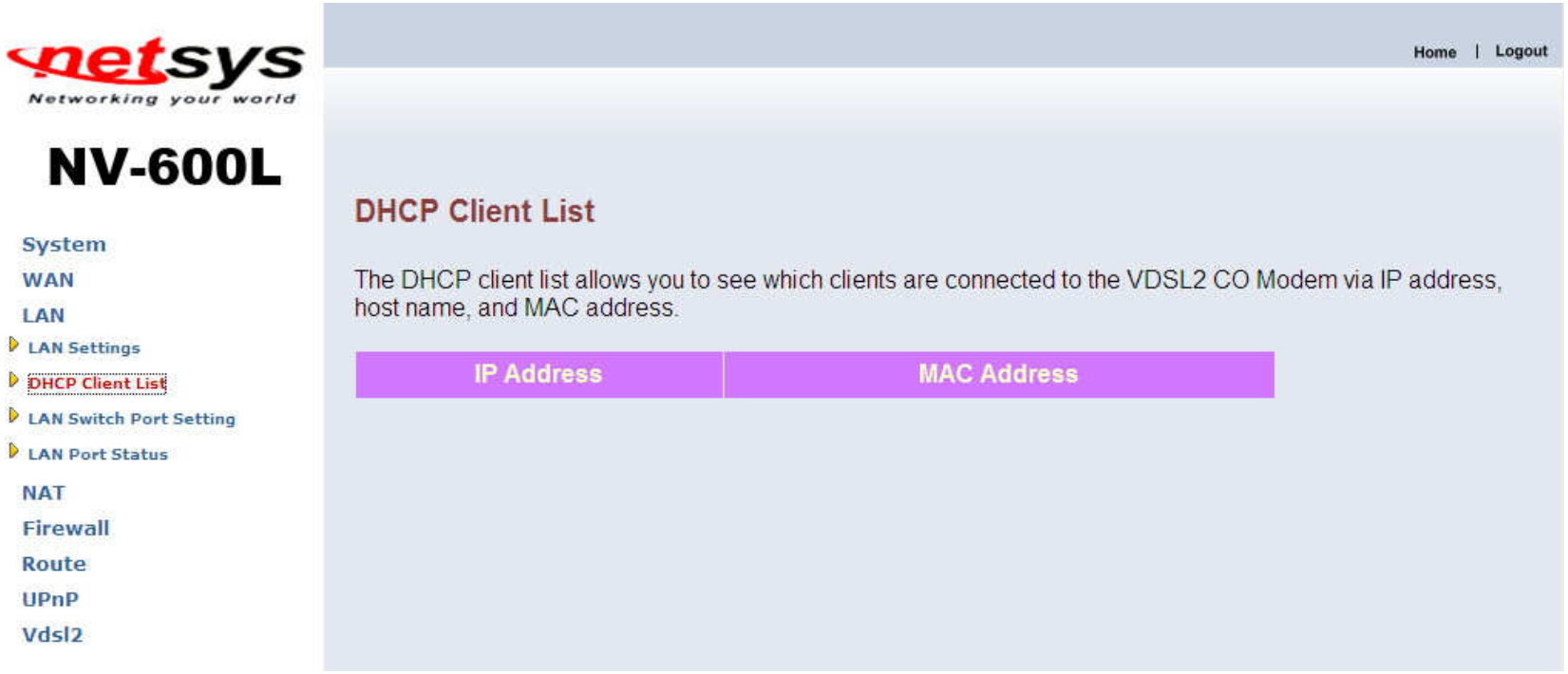


Figure 8.2.5.2 DHCP Client List

8.2.5.3 LAN Switch Port Setting

To view the All LAN Port Setting, click on the "Lan Switch Port Setting" link in the left navigation bar. A screen is displayed to all LAN Port Setting as shown in Figure 8.2.5.3.

Figure 8.2.5.3 DHCP Client List

8.2.5.4 LAN Port Status

To view the All LAN Port Status, click on the "Lan Port Status" link in the left navigation bar.The following information provides a view of the current Ethernet ports status of the unit. A screen is displayed to Status as shown in Figure 8.2.5.4.

Figure 8.2.5.4 LAN Port Status

8.2.6 NAT

The NAT Settings can be viewed in the left navigation bar of NV-600R only. The following are the options available under NAT, as shown in Figure 8.2.6:

- Virtual Server
- Port Mapping
- DMZ

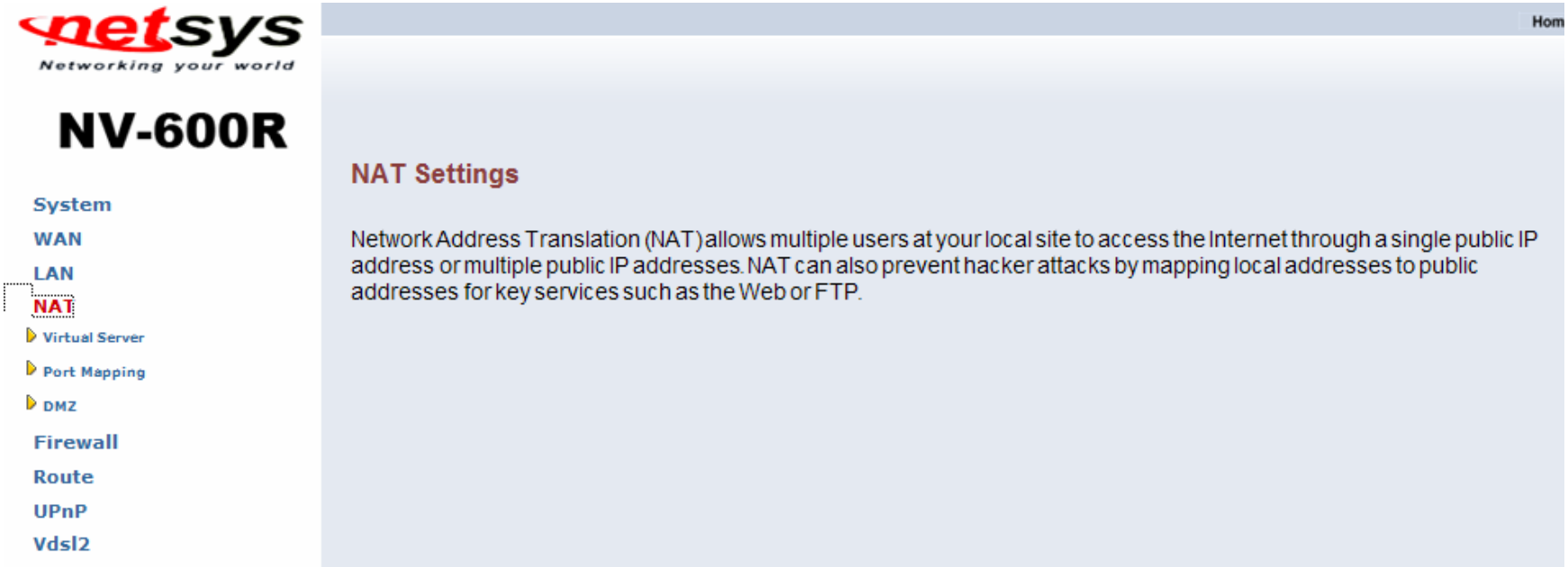


Figure 8.2.6 NAT in Left Navigator Bar

8.2.6.1 Virtual Server

To configure virtual server, click on the "Virtual Server" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.6.1:

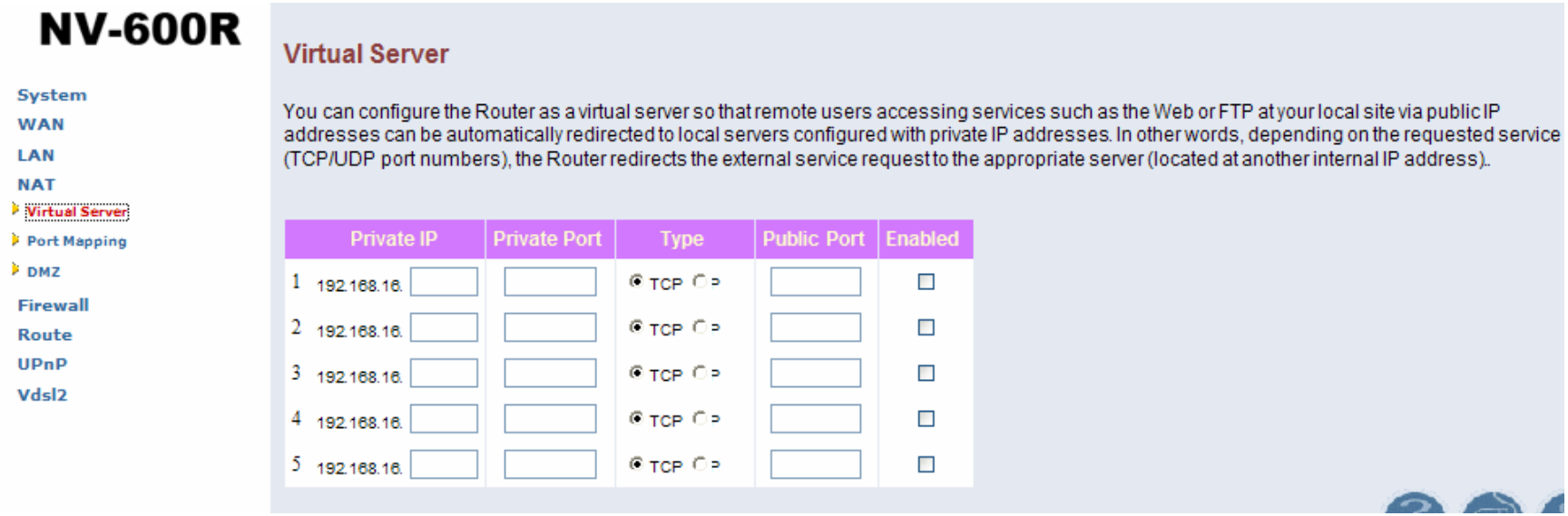


Figure 8.2.6.1 Virtual Server Configuration

The screen contains the following details:

Fields in Virtual Server:

Field	Description
Private IP	Enter a private IP Address of specified entry.
Private Port	Enter a private Port number of the specified entry.
Type	Select virtual server protocol type of the specified entry.
Public Port	Enter a public port number of the internet user to access the virtual server.
Enabled	Enable the specified entry of the virtual server.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.6.2 Port Mapping

To configure Port Mapping, click on the "Port Mapping" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.6.2:

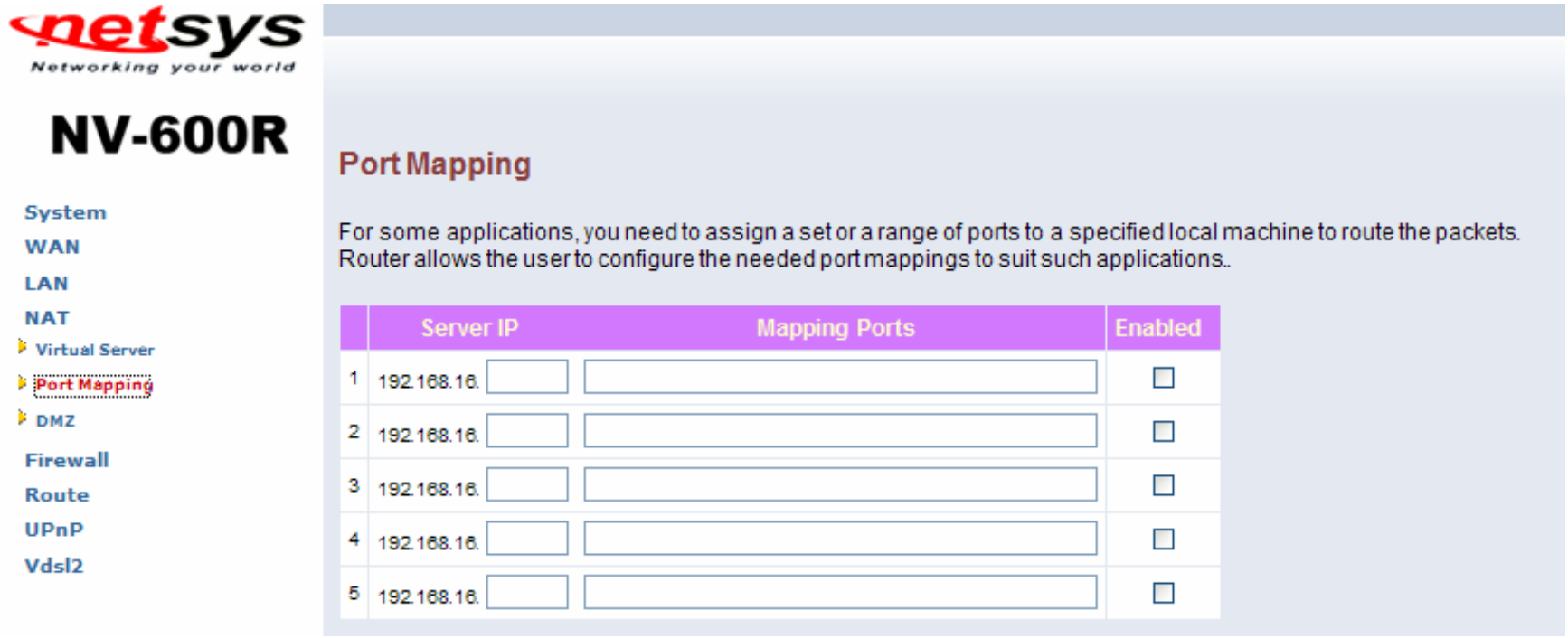


Figure 8.2.6.2 Port Mapping Configuration

The screen contains the following details:

Fields in Port Mapping:

Field	Description
Server IP	Enter the IP Address of a specified local machine.
Mapping Port	Assign a range of port or specific port number to route the packets.
Enabled	Enable a specified entry of the Port Mapping.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.6.3 DMZ

To configure the DMZ, click on the "DMZ" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.6.3:

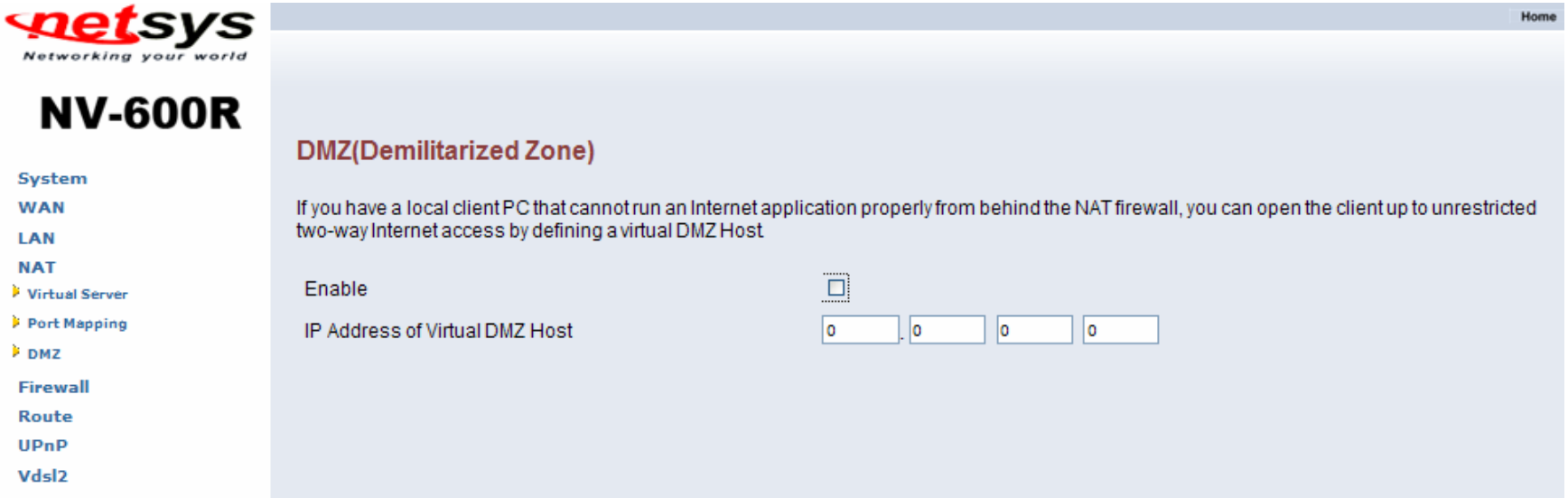


Figure 8.2.6.3 DMZ Configuration

The screen contains the following details:

Fields in DMZ:

Field	Description
Enable	Enable or disable the DMZ setting of NV-600L/R. Select the check box to enable this option.
IP Address	Enter IP Address of the DMZ host.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.7 Firewall

The Firewall Settings can be viewed in the left navigation bar of NV-600R only. The following are the options available under Firewall, as shown in Figure 8.2.7:

- Firewall Options
- Client Filter MAC Control
- MAC Control

Figure 8.2.7 Firewall in Left Navigator Bar

8.2.7.1 Firewall Options

To enable the firewall options, click on the "Firewall Options" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.7.1:

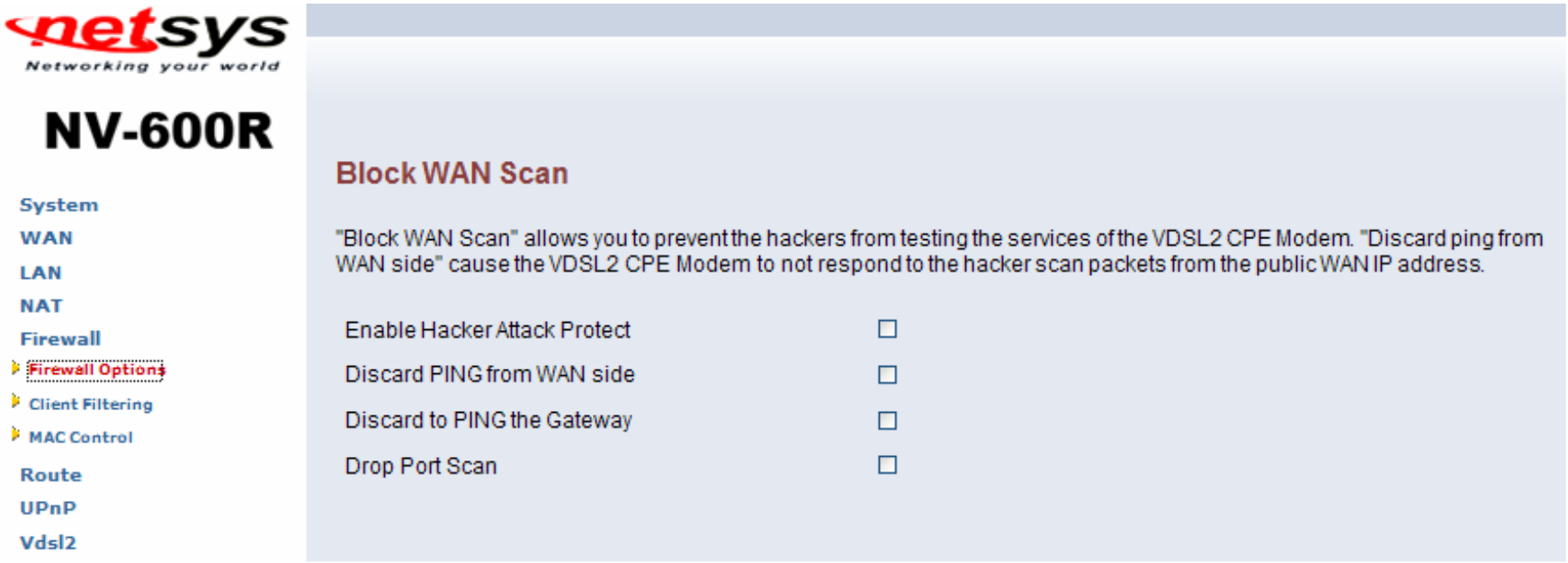


Figure 8.2.7.1 Firewall Options Configuration

The screen contains the following details:

Fields in Firewall Options:

Field	Description
Enable Hacker Attack Protect	Select the check box to log and drop all the hacker attack events.
Discard PING from WAN	Select the check box to drop all PING from the WAN side.
Discard PING the Gateway	Select the check box to drop all PING to NV-600L/R packet for the LAN side.
Drop Port Scan	Select the check box to drop all the port scan packets.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.7.2 Client Filtering

To enable Client Filter, click on the "Client Filtering" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.7.2.

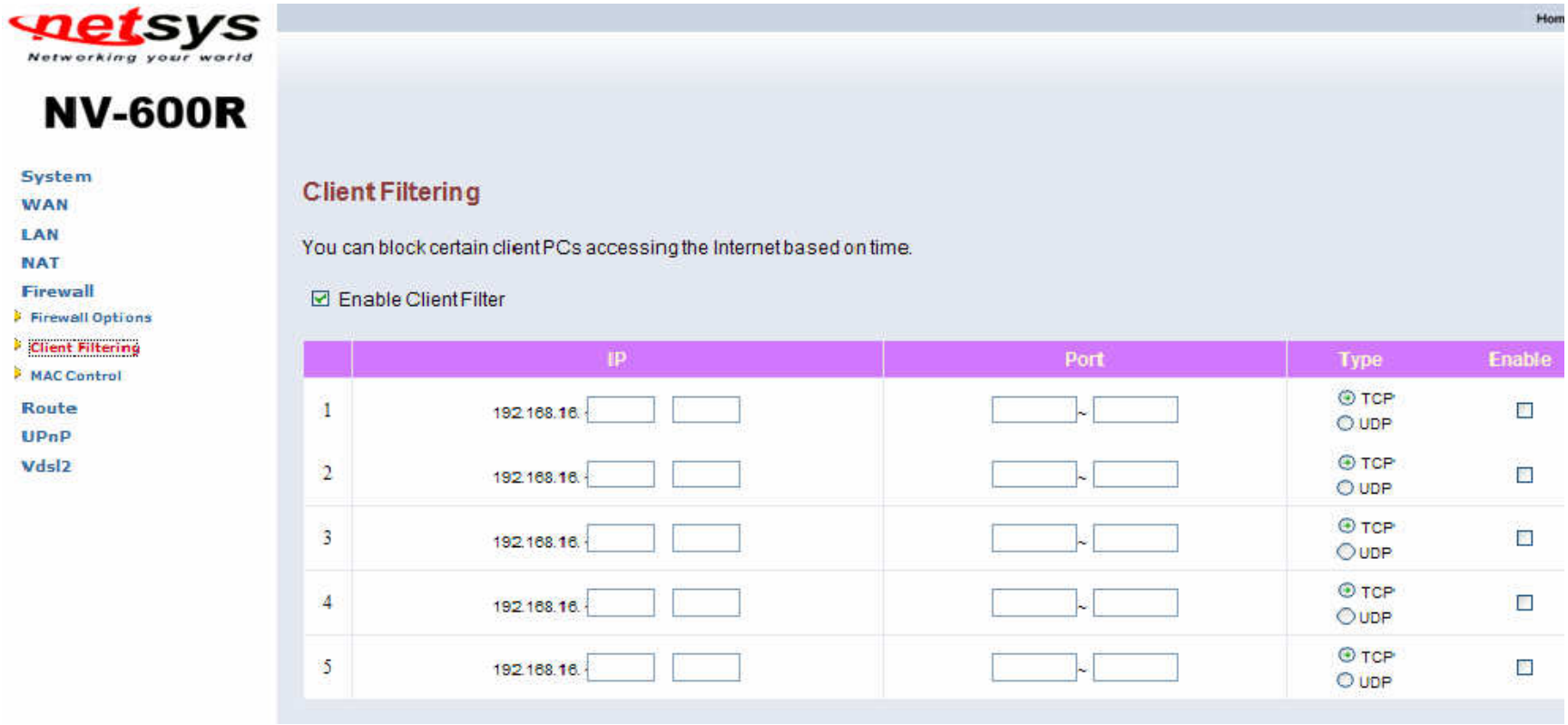


Figure 8.2.7.2 Client Filter Configuration

The screen contains the following details:

Fields in Client Filter:

Field	Description
Enable Client Filter	Enable or disable the Client Filter feature of VDSL2 CO&CPE ROUTER. Select the check box to enable this option.
IP	Enter the filter IP Address range of the local machines under VDSL2 CO&CPE ROUTER.
Port	Enter the filter Port number range of the local machines under VDSL2 CO&CPE ROUTER.
Type	Select TCP or UDP to filter the protocol type packets from the local machines.
Enable	Provides more IP Addresses of the WAN interface.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.7.3 MAC Control

To configure MAC Control, click on the "MAC Control" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.7.3

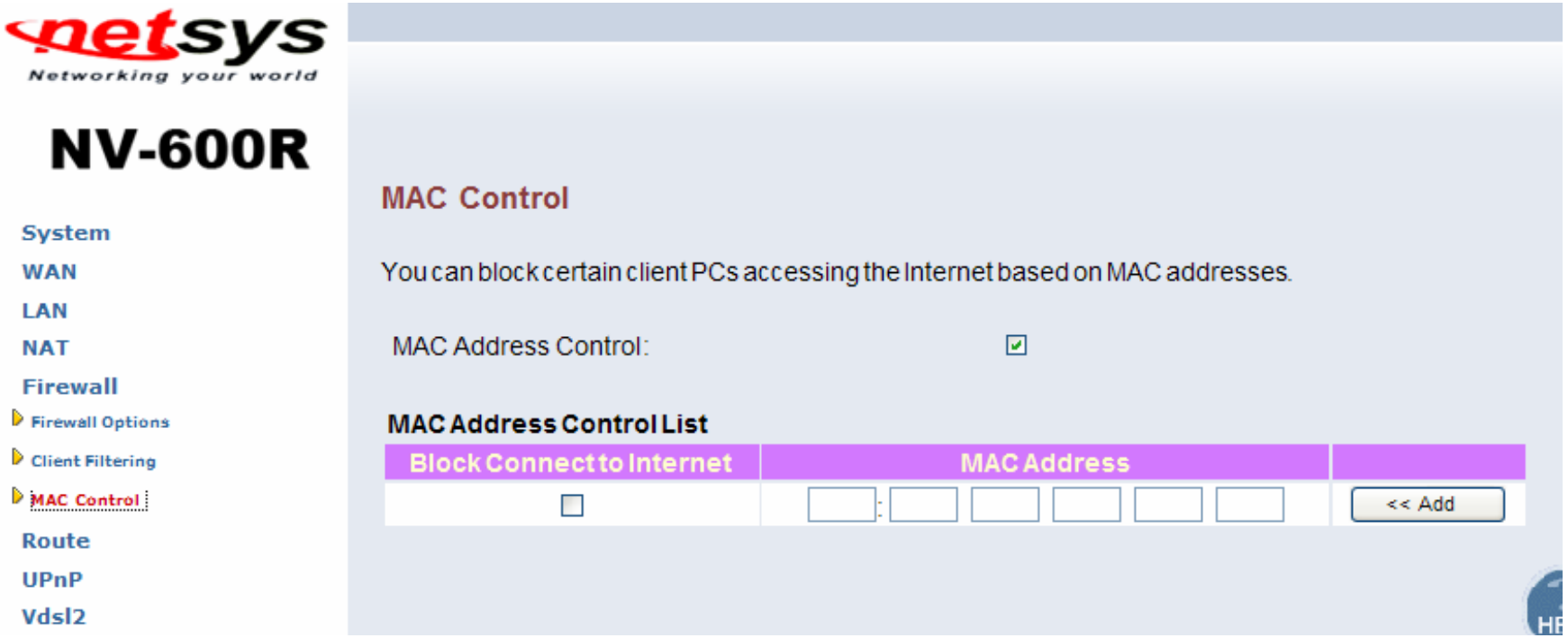


Figure 8.2.7.3 MAC Control Configuration

The screen contains the following details:

Fields in MAC Control:

Field	Description
MAC Address Control	Enable or disable the MAC address control.
Block Connection to Internet	Enable or disable block status. If the check box is selected, it blocks the specified MAC address.
MAC Address	Assign the blocking MAC address for local machine.

- Click APPLY to save the information that has been entered.
- Click CANCEL to exit from this page without saving the changes.

8.2.8 Route Settings

The Route Settings can be viewed in the left navigation bar. The following are the options available under Route, as shown in Figure 8.2.8:

- Static Routing
- Routing Table List

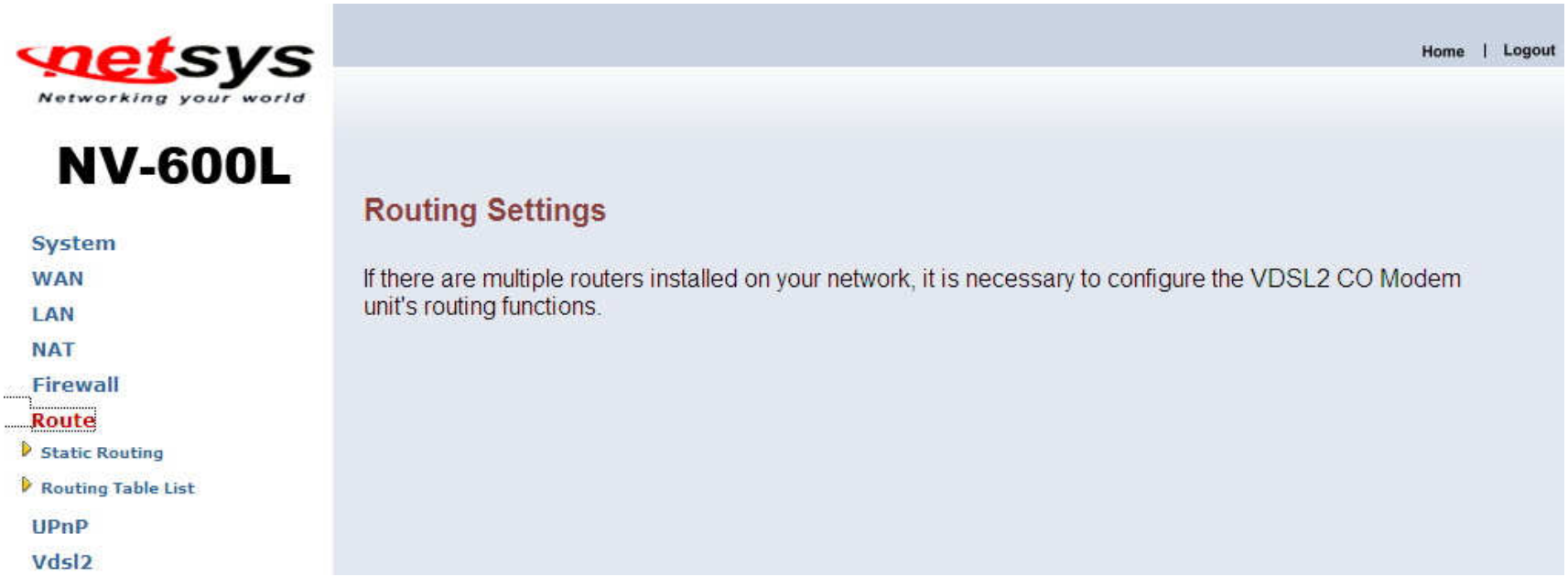


Figure 8.2.8 Route in Left Navigator Bar

8.2.8.1 Static Routing

To setup Static Routing, click on the "Static Routing" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.8.1.

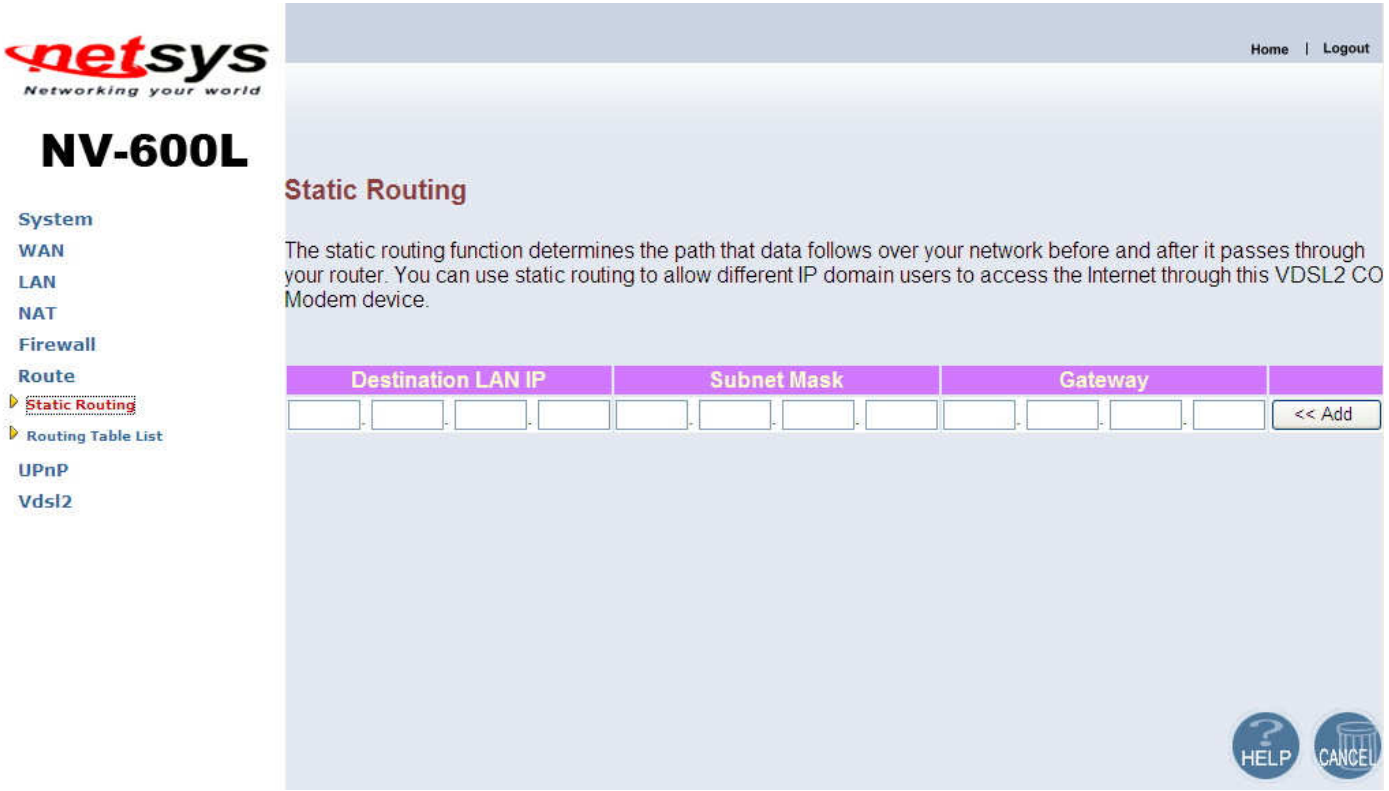


Figure 8.2.8.1 Static Routing Configuration

The screen contains the following details:

Fields in Static Routing:

Field	Description
Destination LAN IP	Enter the IP Address **0-0-0-0** of routing entry.
Subnet Mask	Enter the Subnet Mask **0-0-0-0** of routing entry.
Gateway	Enter the Gateway address of routing entry.

- Click Add to add the information that has been entered.

Note:

Static Routing functionality is used to define the connected Gateway between the LAN and WAN. For example, if we want to activate the Network Time Protocol (NTP) service, and we have to define the Gateway connected to NTP server in the WAN.

8.2.8.2 Routing Table List

To view the Routing entry table list of NV-600L/R, click on the "Routing Table List" link in the left navigation bar.
A screen is displayed as shown in Figure 8.2.8.2.

Figure 8.2.8.2 Routing Table List

The screen contains the following details:

- Click Refresh to update currently routing list of the NV-600L/R.

8.2.9 UPnP Setting

The UPnP Settings can be viewed in the left navigation bar. The following are the options available under UPnP, as shown in Figure 8.2.9.

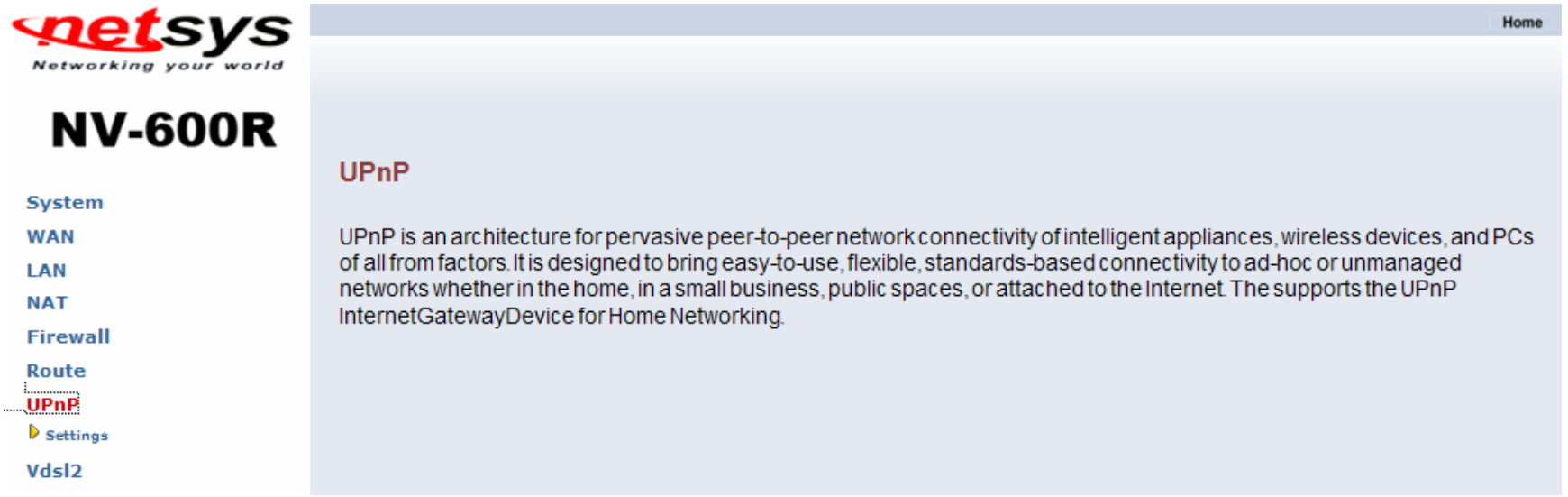


Figure 8.2.9 UPnP in Left Navigator Bar

8.2.9.1 Settings

To enable or disable the UPnP Settings, click on the "Settings" link in the left navigation bar. A screen is displayed as shown in Figure 8.2.9.1.

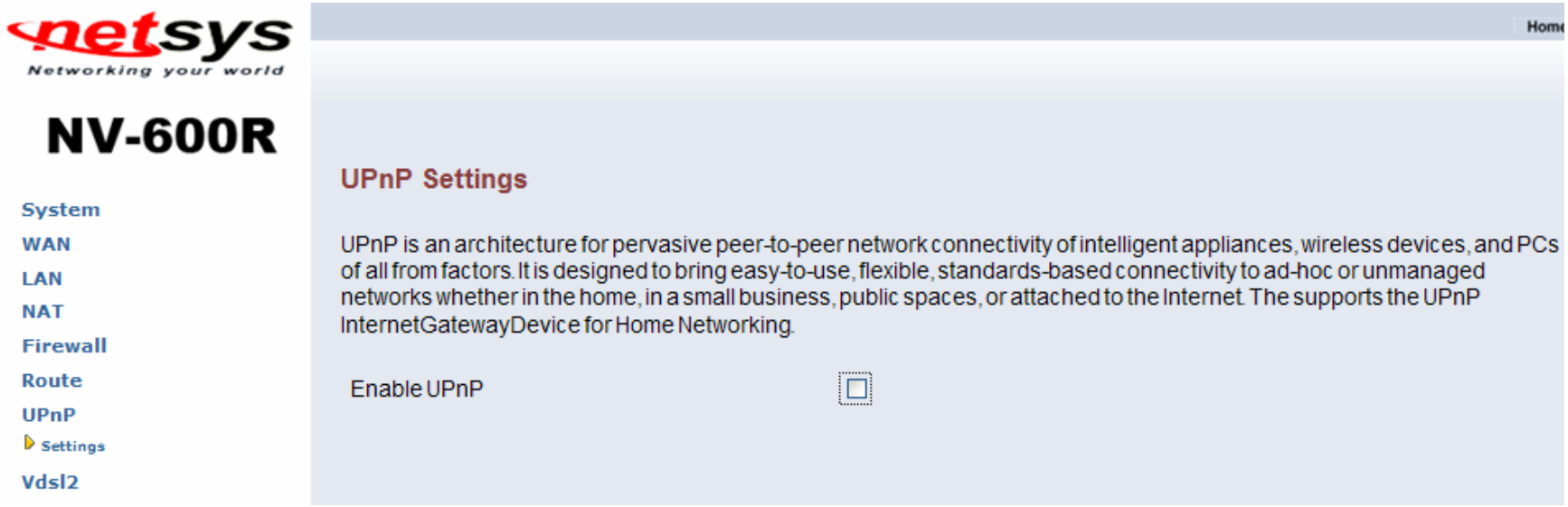


Figure 8.2.9.1 UPnP Configuration

The screen contains the following details:

Fields in UPnP Settings:

Field	Description
Enable UPnP	To enable or disable UPnP Setting. Select the check box to Enable or Disable the UPnP function of SPEED-VDSL2 CO&CPE ROUTER.

- Click APPLY at any time during configuration to save the information that you have entered.
- Click CANCEL to exit from this page without saving the changes.

Appendix A: Product Features & Specification

Features:

- Compliant with IEEE 802.3 & 802.3u Ethernet Standards
- Compliant with G993.2 VDSL2 standards
- Provides 4 x 10/100M auto-sensing RJ-45 Ethernet ports
- Supports Bandwidth up to 100Mbps over RJ-11 ports
- POTS / ISDN Splitter port RJ-11 x 1 (Splitter on board)
- Support Downstream Power Back-Off(DPBO)
- Supports auto speed for VDSL2 port
- Supports Web management (HTTP)
- Supports uPnP/PPPoE/NAT/DHCP/DMZ/Firewall
- Supports Console (RS-232C)
- Supports Route & Switch (Bridge) mode
- Supports Loop back test
- Supports SNR indicator for checking phone wiring quality
- Supports Interleave Delay to prevent against noise and data errors
- Support 8a, 8b, 8c, 8d, 12a, 12b, 17a, 17b, and 30a band profile
- Support 997, 998 band plan
- Provides surge protection for VDSL2 port

Specifications:

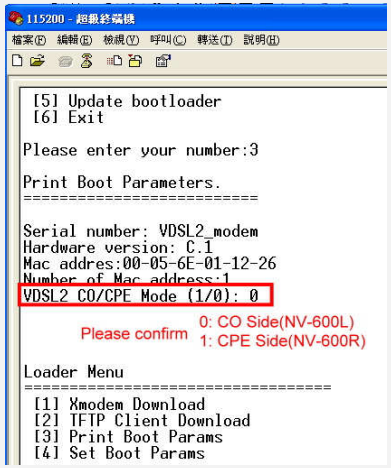
Standard:	IEEE802.3 standard IEEE802.3u standard Compliant G993.2 VDSL2 standard
Interface:	4 * RJ-45 10/100Mbps Ethernet port 1 * RJ-11 connector for VDSL2 1 * RJ-11 connector for POTS/ISDN device
Band Profile:	8a, 8b, 8c, 8d, 12a, 12b, 17a, 17b, 30a
Band Plan:	997, 998
Max. Bandwidth:	Symmetric 100 Mbps / 0.3 km
LED indication:	Power LED Link/Active Status for Ethernet port * 4 Link LED for VDSL2 port
Switch method:	Store and forward
Console port:	RS-232C/115200bps
Flow control:	Full duplex: IEEE 802.3x Half duplex: Back pressure
Power Consumption:	NV-600L (LT): 5.52W NV-600R (NT): 6.12W
Operating Temperature:	0℃ ~ 50℃ (32℉ ~ 122℉)

Storage Temperature:	-20℃ ~ 65℃ (-4℉ ~ 149℉)
Humidity:	10 to 90% (non-condensing)
Weight:	About 0.96kg
Dimensions:	184 x 146 x 40 mm (7.2" x 5.74" x 1.57")
AC to DC adapter:	Input range: 85VAC~240VAC/50~60Hz Output: 12V DC/1A
EMI Compliant:	CE, FCC, VCCI
Chipset:	Lantiq MIPS ADM5120P / VINAX

Appendix B: Troubleshooting

1. Symptom:	Connected the CO Router with CPE Router within 300 meters RJ-11 phone cable got only less than 10 Mbit/s.
Cause:	Some testing program which is base on TCP/IP protocol such as FTP, Iperf, NetIQ, the bandwidth of testing outcome will be limited by TCP window size.
Solution:	We recommend to test VDSL2 bandwidth best by Smartbit equipment, if you don't have Smartbit, we recommend test that by IPERF program, and TCP window size must be settled max. 64k, the parameter as iperf –c server IP address –i 1 –t 50 –w 65535 for client side.

2. Symptom:	VDSL2 CO router cannot link with CPE router.
Cause:	1. The VDSL2 CO/CPE mode settings of VDSL2 router become unknown. 2. VDSL2 CO and CPE router tone mode is different due to mixed use of new and old hardware VDSL2 routers.
Solution:	1. Using the console, reboot the system and go to loader menu. Select set boot parameters and choose the VDSL2 CO/CPE mode correctly. Choose "1" if it is CO router and "0" if it is CPE router. Do not just press enter to skip the setting as it will not retain even if the setting is correct, then it will become unknown causing the VDSL2 router not to link. 0: NV-600L. 1: NV-600R.

	 2. Update the old hardware to D series firmware so that you can set the same tone mode for both CO and CPE router.

3. Symptom:	VDSL2 web management that uses public IP address cannot be accessed.
Cause:	It can be affected by some incoming traffic perhaps web crawlers, worms or other automated activity.
Solution:	Open a command prompt and log in to telnet by writing "telnet xxx.xxx.xxx.xxx", xxx is the IP address of your router, then write "cd /etc/rc.d/init.d" to go to this folder, then write "./httpd start" to open the web management, so that it can be accessed again.

Appendix C: Cable Requirements

A CAT 3, 4 or 5 UTP (unshielded twisted pair) cable is typically used to connect the Ethernet device to the modem. A 10Base-T cable often consists of four pairs of wires, two of which are used for transmission. The connector at the end of the 10Base-T cable is referred to as an RJ-45 connector and it consists of eight pins. The Ethernet standard uses pins 1, 2, 3 and 6 for data transmission purposes. (Table C-1)

Table C-1 RJ-45 Ethernet Connector Pin Assignments

PIN #	MDI		MDI-X	
	Signal	Media Dependant interface	**Signal**	Media Dependant interface-cross
1	TX+	Transmit Data +	RX+	Receive Data +
2	TX-	Transmit Data -	RX-	Receive Data -
3	RX+	Receive Data +	TX+	Transmit Data +
4	--	Unused	--	Unused
5	--	Unused	--	Unused
6	RX-	Receive Data -	TX-	Transmit Data -
7	--	Unused	--	Unused
8	--	Unused	--	Unused

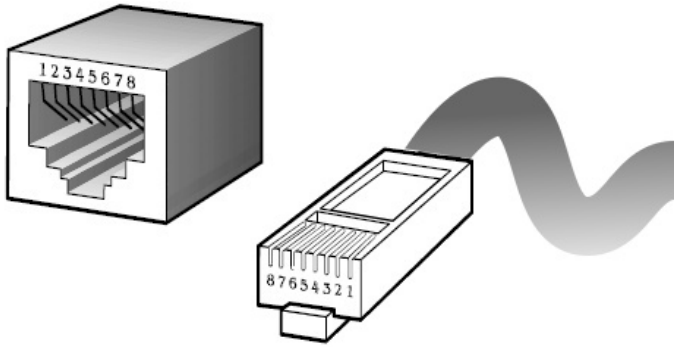


Figure C-1 Standard RJ-45 repectacle/connector

Note:

Please make sure your connected cables are with same pin assignment as above table before deploying the cables into your network.

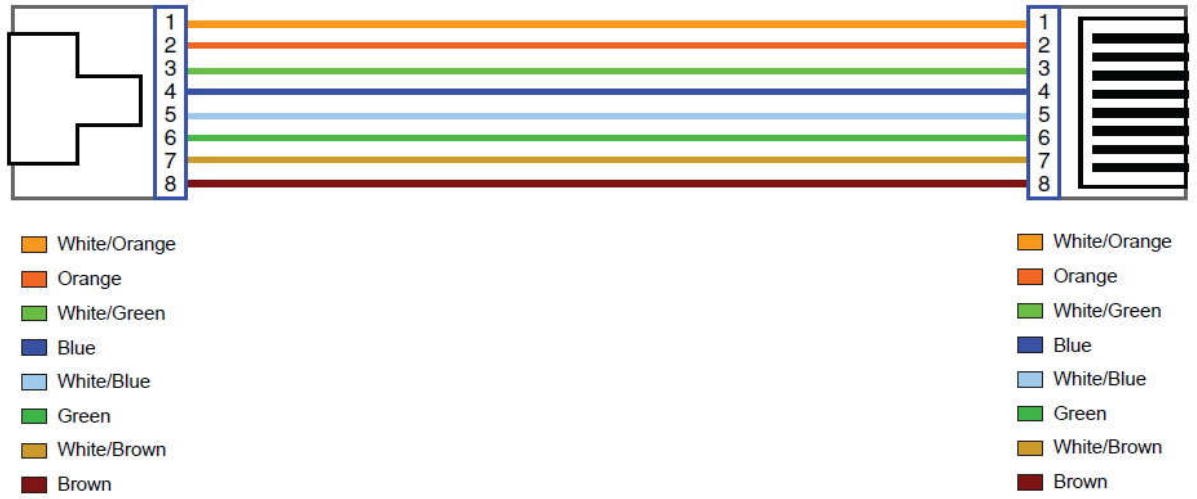


Figure C-2 Pin Assignments and Wiring for an RJ-45 Straight-Through Cable

Figure C-3 Pin Assignments and Wiring for an RJ-45 Crossover Cable

Serial Console Interface Connector Pin Assignments

The serial console interface connector is a 9-pin, RS-232 D-type, DTE connector. A null modem cable is required to connect a workstation running the Linux or Windows operating system. Table C-2 lists the pin assignments for the serial console interface connector.

Table C-2 RS-232 Connector Pin Assignments

Description	Pin	I/O	Signal Name
Not used	1	-	-
Receive data; input	2	In	RXD
Transmit data; output	3	Out	TXD
Data terminal ready; output	4	Out	DTR
Interface signal ground	5	-	GND
Data set ready; input	6	In	DSR
Not used	7	-	-
Not used	8	-	-
Not used	9	-	-

The CDEs have one standard serial port connector located on the back of the device. Figure C-4 shows the pin number assignments for the 9-pin, male D-shell serial port connector on the back of the device. These pin number assignments conform to the industry standard for RS-232 communications.

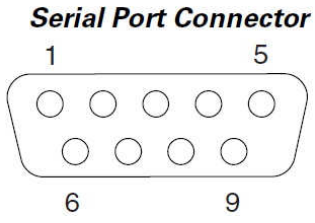


Figure C-4

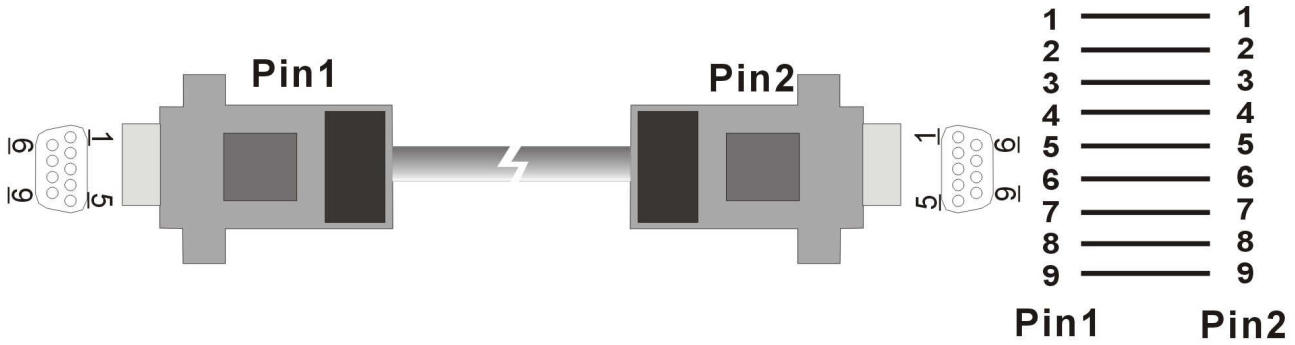


Figure C-5 Pin Assignments and Wiring for an RS-232 Cable

Appendix D : Compliance and Safety Information

FCC Radio Frequency Interference Statement

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

1. Reorient or relocate the receiving antenna.
2. Increase the distance between the equipment and receiver.
3. The equipment and the receiver should be connected to outlets on separate circuits.
4. Consult the dealer or an experienced radio/television technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

If this telephone equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance in order for you to make necessary modifications to maintain uninterrupted service.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

Important Safety Instructions

- **Caution:** The direct plug-in wall transformer serves as the main product for disconnecting. The socket outlet shall be installed near the product and be readily accessible.
- **Caution:** Use only the power supply included with this product. In the event the power supply is lost or damaged:In the United States, use only with CSA certified or UL listed Class 2 power supply, rated **12Vdc 1A** or above.
  IN Europe, use only with CE certified power supply, rated **12Vdc 1A** or above.
- **Do not** use this equipment near water, for example in a wet basement.
- **Avoid** using a telephone during an electrical storm. There may be a remote risk of electrical shock from lightning.
- **Do not** use the telephone to report a gas leak in the vicinity of the leaking area.
- If you experience trouble with this unit, please contact customer service of your dealer immediately.
- **DO NOT DISASSEMBLE THIS EQUIPMENT**. It does not contain any user serviceable components.

FCC Warning

This equipment has been tested to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment can generate, use, and radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at owner's expense.

CE Mark Warning

This is a CE class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

WEEE Warning

To avoid the potential effects on the environment and human health as a result of the presence of hazardous substances in electrical and electronic equipment, end users of electrical and electronic equipment should understand the meaning of the crossed-out wheeled bin symbol. Do not dispose of WEEE as unsorted municipal waste and have to collect such WEEE separately.

Warranty

The original owner of this package will be free from defects in material and workmanship for one year parts after purchase. For the warranty to apply, you must register your purchase by returning the registration card indicating the date of purchase.

There will be a minimal charge to replace consumable components, such as fuses, power transformers, and mechanical cooling devices. The warranty will not apply to any products which have been subjected to any misuse, neglect or accidental damage, or which contain defects which are in any way attributable to improper installation or to alteration or repairs made or performed by any person not under control of the original owner.

The above warranty is in lieu of any other warranty, whether express, implied, or statutory, including but not limited to any warranty of merchantability, fitness for a particular purpose, or any warranty arising out of any proposal, specification, or sample. We shall not be liable for incidental or consequential damages. We neither assume nor authorize any person to assume for it any other liability.

WARNING:

1. **DO NOT TEAR OFF OR REMOVE THE WARRANTY STICKER AS SHOWN, OR THE WARRANTY IS VOID.**
2. **WARRANTY VOID IF USE COMMERCIAL-GRADE POWER SUPPLY IS USED AT INDUSTRIAL ENVIRONMENTS.**