Heritage Series

Multi-Mode

xDSL Router

User's Manual

Dec. 2003

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Chapter 1 Introduction

1.1 Overview

This xDSL Router features two broadband technologies such as ADSL and SHDSL. Multi-mode ADSL technology that provides a downstream rate of up to 8Mbps over existing copper wire lines, which is more than 100 times faster than a traditional 56K analog modem.
SHDSL technology that provides a symmetric upstream and downstream rate of up to 2.3Mbps over existing copper wire lines.

And it can be connected to your PC or LAN through the 10Base-T or 100Base-T Ethernet interface.

This xDSL Router is designed to meet both the needs of single user, and multiple users at small office and home office who want fast Internet access. A wide variety of features and interoperability offer scalability and flexibility for all the applications

1.2 Features and Compatibility

This Heritage series Router provides the following features:

- Multi-mode ADSL technology supports ITU-T G.dmt, G.lite, G.hs and ANSI T1.413 issue 2 to provide interoperability with most of DSLAM equipments.
- SHDSL technology supports ITU-T G.shdsl, G.hs and ANSI T1E1.4 to provide interoperability with most of DSLAM equipments.
- ATM (Asynchronous Transfer Mode) protocol allows the QoS(Quality of Service) transmission over a network
- Support for text-based and Windows-GUI based console management over Telnet and serial connection
- Support for remote configuration by your network administrator via IP network.
- Support IEEE 802.1d transparent bridging with spanning tree algorithm.
- Bridge filtering allows a network administrator to control the flow of packets across the router
- NAT : let multiple users on the LAN share one Internet connection simultaneously
- SNMP agent: allows monitoring and configuration by a standard SNMP manager.
- BOOTP / TFTP enable the remote configuration
- DHCP client : let an ISP dynamically issue an address upon initial connection.
- DHCP server : automatically assigns IP addresses to all computer on the LAN.
- DNS relay : allows for automatic name resolution when no DNS information is configured by the user.
- PPTP tunneling enable VPN configuration.
- Point-to-Point Protocol (PPP)
- RFC 1483 Link Protocol
- Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP) security under PPP protocol
- IP routing support includes the RIP(Routing Information Protocol) which allows the exchange of routing information on a TCP / IP

network

- Flash memory for Software upgrade
- Status LEDs for easy monitoring and troubleshooting

Some models of xDSL Router provides more features:

- Including 4-port 10/100 Base-T Ethernet Stackable Switch Hub.

1.3 What's in the package?

- One xDSL Router
- One 9VDC or 12VDC Adaptor, depend on different model
- One RJ-11 Telephone Cable
- One 10Base-T Ethernet straight-through Cable
- One 9-pin to 9-pin RS-232 Cable (option)
- One User's Guide

All packages have been checked carefully for their completeness and functionality before shipped. Please contact the place of purchase if any of the above listed items are missing or damaged.

If you encountered any difficulty in using this product while all the above items are complete, please refer to **Appendix C** for Troubleshooting information before making the decision to return your xDSL Router to your dealer.

1.4 Important Rules for Safe Operation

In addition to the careful attention devoted to quality standards on the manufacture of your ADSL Router, safety is a major factor in the design of every product. However, safety is your responsibility, too. This section lists important information that will help assure your enjoyment and proper use of the ADSL Router and accessory equipment. Please read them carefully before operation and using your Router.

- **Read and Follow Instructions** – you should read all the safety and operating instructions before operating the Router.
- **Retain Instructions** – You should save all the safety and operating instructions, for your future reference.
- **Heed Warning** – Comply with all warnings on the products and in the operating instructions.
- **Check Power Sources** – Operate this product only from the type of power source indicated on the product's marking label. If you are not sure of the type of power supplied to your home, consult your dealer or local power company.

- **Be Careful of Overloading** – Do not overload wall outlets or extension cords, as this can result in a risk of fire or electric shock. Overloaded AC outlets, extension cords, frayed power cords, damaged or cracked wire insulation, and broken plugs are dangerous. They may result in a shock or fire hazard. Periodically examine the cord, and if its appearance indicates damage or deteriorated insulation, have it replaced by your service technician.
- **Protect Power Cords** – Route power supply cords so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords where they are attached to plugs and convenience receptacles, and examine the point where they exit from the product.
- **Check Ventilation** – Slots and openings in the enclosure are provided for ventilation to ensure reliable operation of the product and to protect it from overheating. Do not block or cover these openings. Never block these openings by placing the product on a bed, sofa, rug, or other similar surface. Never place this product near or over a radiator or heat register, or any other

heat source (including amplifiers). Do not place this product in a built-in installation, such as a bookcase or equipment rack, unless you provide proper ventilation.

- **Do Not Use Accessories** – Do not use attachments, unless they are recommended by your vendor, as they may cause electrical or fire hazards.
- **Use the Recommended Power Adaptor** – You must use the Power Adaptor that comes with your ADSL Router.
- **Do Not Use Near Water** – Do not use this product near water. For example, near a swimming pool, bath tub, wash bowl, and the like.
- **Do Not place Near High Temperature Source** – For example near a steamer, kitchen range fire, and the like.
- **Use Caution in Mounting This Product** – Do not place this product on an unstable surface or support. The product may fall, causing serious injury to a child or adult, as well as serious damage to the product.
- **Use Care in Moving Product-and-Cart Combinations** – Quick stops, excessive, force and uneven surfaces may cause the product-and-cart combination to overturn.
- **Unplug Power Before Cleaning** – Do not use liquid cleaner or aerosol cleaner. Use a damp cloth for cleaning.
- **Keep Objects Out of Openings** – Never push objects of any kind into this product through openings, as they may touch dangerous voltage or "short-out" parts, which could result in a fire or electric shock. Never spill liquid on the product.
- **Protect From Lightning** – For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet, and disconnect the cable system. This will prevent damage to the product due to lightning and power line surges.
- **Turn Off the Power Switch Between DC Plug Off and On.**
- **Do Not Remove Covers** – Do not attempt to service this product yourself, as opening or removing covers may expose you to dangerous voltage or other hazards.
- **Unplug this Product From Wall Outlet Carefully, as the Power Adaptor May Be Hot.**

- **Refer Servicing to Qualified Service Personnel Under the Conditions Listed Below.**
  - When the power supply cord or plug is damaged.
  - If liquid has been spilled or objects have fallen into the product.
  - If the product has been exposed to rain or water.
  - If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions.
  - If the product has been dropped or the cabinet has been damaged.
  - When the product exhibits a distinct change in performance, such as the inability to perform basic functions – this indicates a need for service.
- **Require Safety Check** – Upon completion of any service or repairs to this product, ask the service technician to perform safety checks recommended by service point to determine that the products is in safe operating condition.

1.5 Front Panel

The xDSL Router has five status LEDs for diagnostics. You can monitor the LEDs during operation. Following table shows the xDSL Router status LEDs and identifies what each LED light means.

Function	Behavior	Definition
POWER	Dark	Power off
	Light	Power on
xDSL	Flashing slowly	xDSL training in progress
	Light	xDSL link is establish and ready to transfer data
PC	Dark	Ethernet link absent or power off
	Light	Ethernet link present
RX	Flashing	Receiving data from xDSL link
TX	Flashing	Transmitting data to xDSL link

The xDSL Router which including 4-port stackable switch hub that has several status LEDs for diagnostics. You can monitor the LEDs during operation. Following table shows the xDSL Router status LEDs and identifies what each LED light means.

Function	Behavior	Definition
POWER	Dark	Power off
	Light	Power on
TX/RX	Flashing	Transmitting/Receiving data to/from xDSL link
LINK	Flashing slowly	xDSL training in progress
	Light	xDSL link is establish and ready to transfer data
L1 ~ L4	Dark	Ethernet link absent or power off
	Light	Ethernet link present

1.6 Rear Panel

The rear panel of the xDSL Router consist of power jack, Console Port connector, Ethernet connect and xDSL link jack which they means as below:

Function	Definition
xDSL	xDSL jack connect to DSL line from TelCo.
10Base-T or 10/100Base-T	Ethernet interface connect to PC or HUB for LAN.
Console	This is RS232C interface and use to management xDSL Router.
DC 9V or DC12V	The power jack connects to Adaptor from wall outlet.

The rear panel of the xDSL Router which including 4-port stackable switch hub consist of power jack, Console Port connector, Ethernet connects and xDSL link jack which they means as below:

Function	Definition
xDSL	xDSL jack connect to xDSL line from TelCo.
Up-Link	This is HUB feature cascade to another HUB for expand LAN.
L1 ~ L4	Ethernet Ports: Port1 to Port4
Console	This is RS232C interface and use to management xDSL Router.
DC 9V	The power jack connects to Adaptor from wall outlet.

Chapter 2 Installing and Configuring your xDSL Router

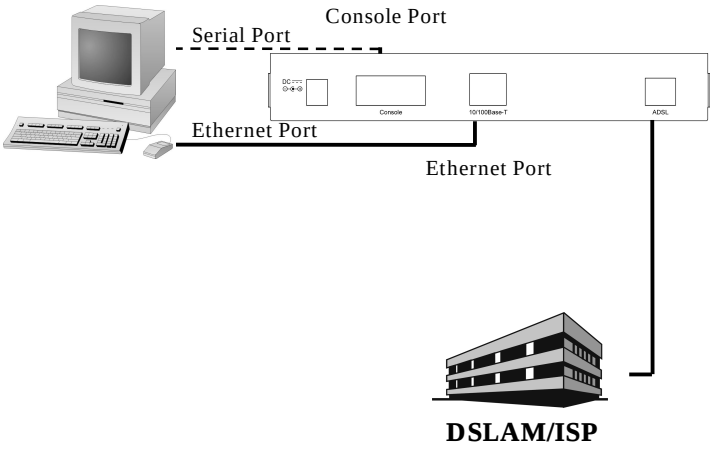
The major functions of the xDSL Router are performed by using Ethernet 10Base-T or 10/100Base-T network interface. Your computer has to install an Ethernet NIC card and set up the TCP/IP protocol before start to using the xDSL Router.

The xDSL Router also provides a serial console port for monitoring and configuring the Router via the xDSL Configuration Tool or HyperTerminal program.

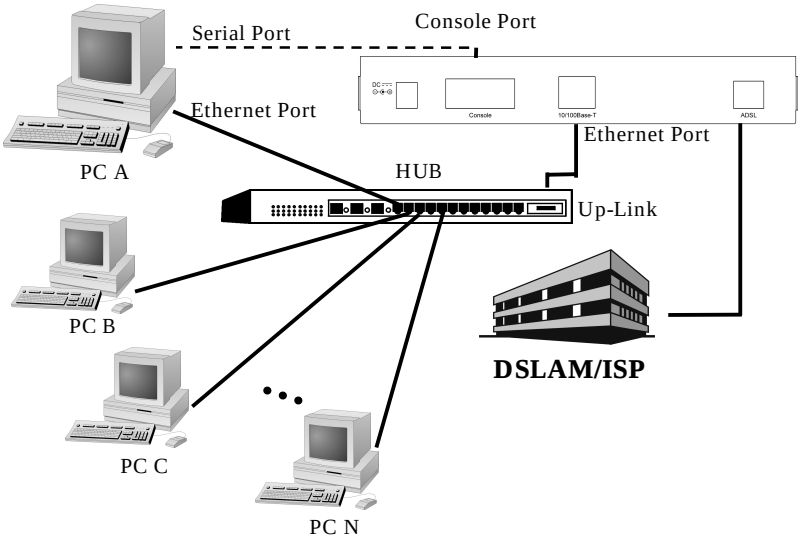
2.1 Preparation for Hardware and software installation

Before start the hardware installation. Please prepare all the materials listed below regarding to your application.

1. Connect to a computer directly
   - xDSL service provider or ISP / NSP service contract. Please sign an appropriate Internet connection contract with a reliable ISP / NSP and get necessary connection information that will help you configuring your Router.
   - Personal computer with OS that support Ethernet interface
   - TCP / IP protocol installed in your personal computer
   - Ethernet card (10 or 10 / 100Base-T)
   - Ethernet straight-through cable (included in this package)
   - RJ-11 telephone cable (included in this package)
   - RS-232 serial cable (optional)
   - Power adaptor (include in this package)



2. Connect to more than one computer
   Excepts the items listed on step 1 above, you still need following items:
   - Additional PC with OS that support Ethernet interface.
   - Additional Ethernet card for each PC you want to connect
   - Additional Ethernet Straight-through cable for each PC you want to connect.
   - One Ethernet Hub is required for more than one computer connection.
   - If your up-link hub without cascade switch, please prepare an Ethernet crossover cable instead of the straight-through cable that listed on step 1 above.



2.2 Hardware Installation

Before start to configure your Router, you have to complete all the hardware installation. The following steps provide instructions for installing your Router.

1. Be sure the power switch on the right side of the Router is at the **OFF** status.
2. Connect the power adaptor to the power jack that marked **Power** at the rear panel of the Router, then plug in the DC power adaptor to the wall electrical outlet.
3. Connect the Ethernet cable.
   A) If connect to computer directly
      Connect one end of Ethernet straight-through cable to the Ethernet port on your computer, then connect the other end of Ethernet straight-though cable to the connector that marked **10/100Base-T** at the rear panel of the Router.
   B) If connect to more than one computer via Hub Connect one end of Ethernet straight-through cable (If your up-link hub without cascade switch, please use an Ethernet crossover cable instead) to the uplink port on the Ethernet Hub, then connect the other end of Ethernet cable to the connector that marked **10/100Base-T** at the rear panel of the Router.
4. Connect one end of RJ11 telephone cable to the xDSL line jack that marked **xDSL** at the rear panel of the Router, then connect the other end of RJ-11 telephone cable to the xDSL service port that your xDSL service provider or ISP installed.
5. Connect the male (9 pin) end of the RS-232 serial cable to the connector that marked **Console port** at the rear panel of the Router, then plug the other end of the RS-232 serial cable to the RS-232 serial port of your computer.
6. Turn on the power switch. The Router should perform a self-test, and then be ready for use.

2.3 Windows 95/98 setting for Ethernet LAN connection

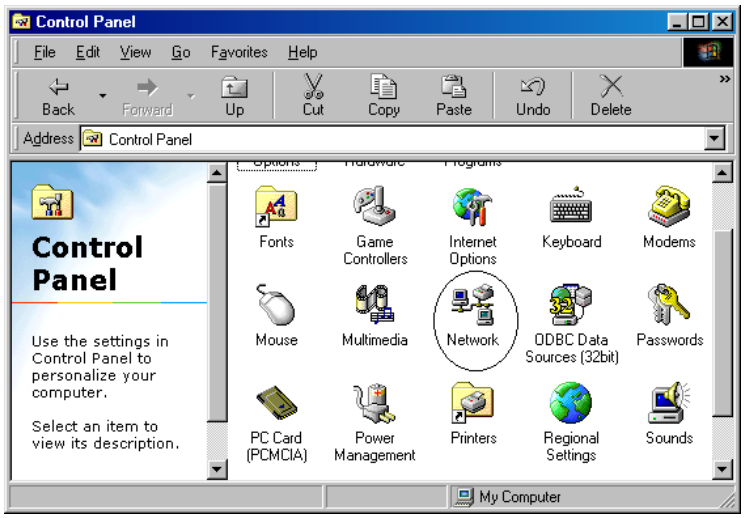
Either connect to Internet or configure the Router via Ethernet, the TCP/IP protocol is really necessary. And your computer must be on the same subnet with the Router.

When you directly connect the Router to your computer through the Ethernet network, you will first configure your computer to obtain an **IP address** automatically from your Router's **DHCP server**, or specify an **IP address** and **Subnet Mask** to the same subnet as remote host. The following steps provides the instructions to setup your computer to obtain an IP address by using Windows 95/98 on a PC

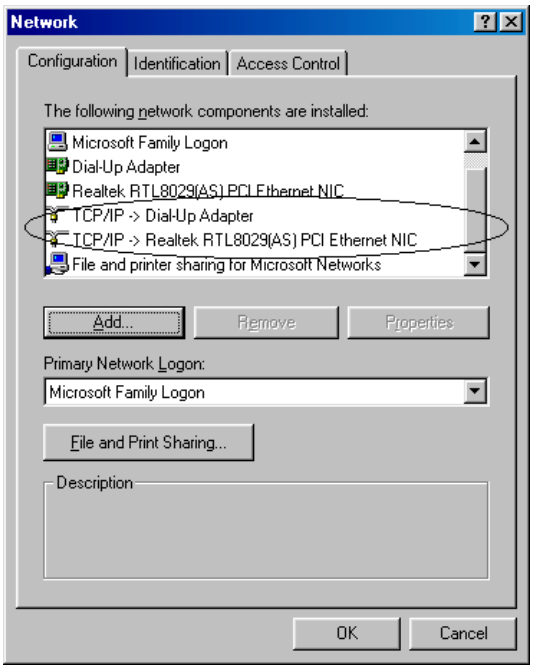
2.3.1 Check TCP/IP protocol

To check if TCP/IP is properly installed, please proceed to the following steps.

1. Double-click on **My computer->Control Panel->Network**



2. In **Network** window, check if **TCP/IP** is shown and properly setup for the Ethernet card that installed in your computer (for example, **TCP/IP->Realtek RTL8029(AS) PCI Ethernet NIC**).

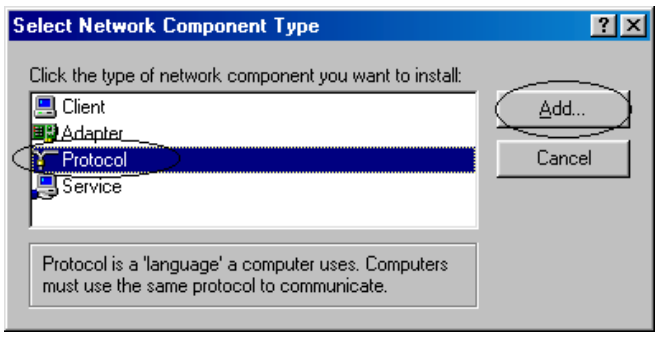


3. When TCP / IP has properly installed, please proceed to 2.3.3 TCP / IP Setting
4. When TCP / IP has not properly installed, go to next section to install the TCP / IP protocol.

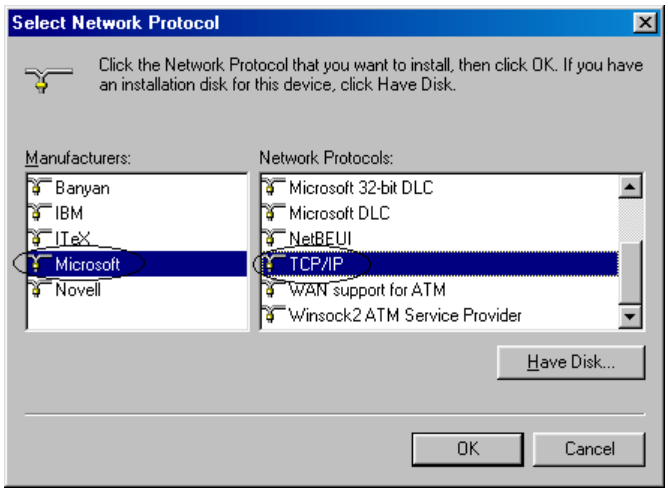
2.3.2 TCP/IP installation

Attention: When install TCP/IP protocol, you need Windows CD-ROM

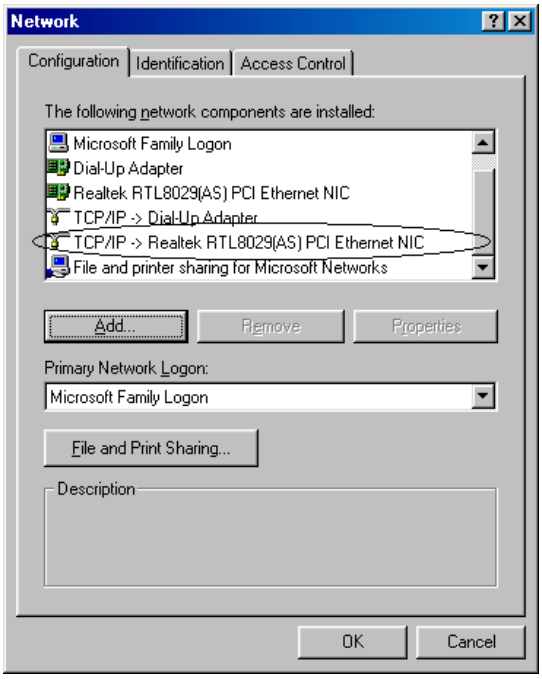
1. In **Network** window, click the **Add** button.
2. Choose the **Protocol** and click **Add**.



3. In **Select Network Protocol** window, choose **Microsoft** in **Manufacturers** and **TCP/IP** in **Network Protocols**. Then click **OK**



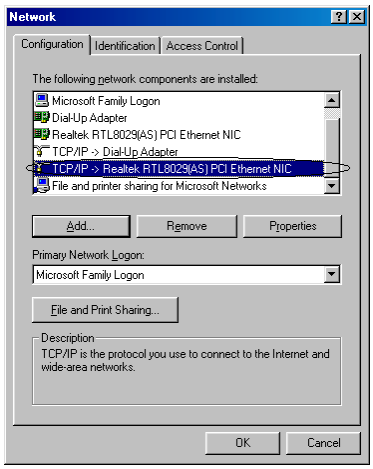
4. Confirm if the TCP / IP protocol has been correctly setup with your Ethernet card.



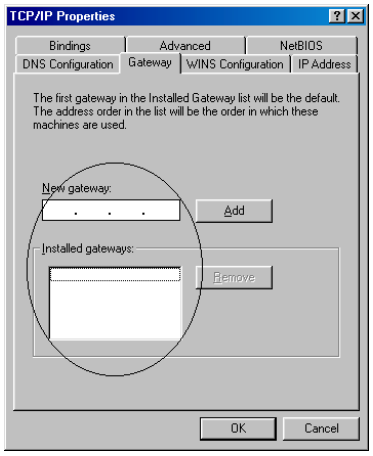
2.3.3 TCP/IP setting

Attention: When connecting your xDSL Router with existing LAN, consult your network manager for correct configurations

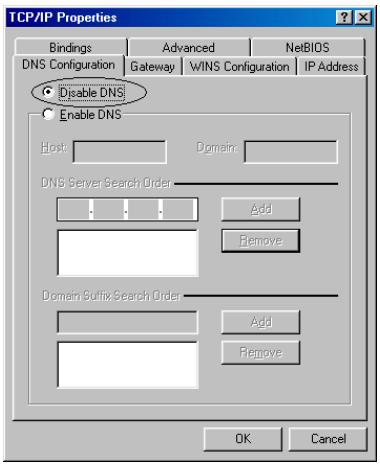
1. In **Network** window, double-click the TCP / IP service for the Ethernet card that installed in your computer (for example, **TCP/IP > Realtek RTL8029(AS) PCI Ethernet NIC**).



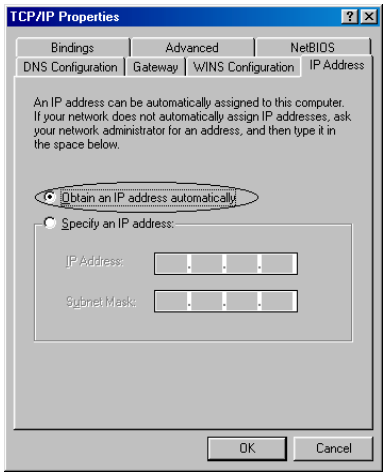
2. Click the **Gateway** tab, and remove any installed gateways.



3. Click the **DNS configuration** tab, and click the **disable DNS** button.



4. ***For DHCP client,*** Click the **IP address** tab, and click the **Obtain an IP address automatically** button.



For Fixed IP or DHCP server, Click the **IP address** tab, and click the **Specify an IP address** button. Then set **IP Address** and **Subnet Mask** to the same subnet as remote host. Refer to Chapter 3.2 for example.

5. Click **OK** to save the new setting.
6. Click **Yes** when prompted for "**Do you want to restart your computer ?**". Your computer will restart to make the new setting in effects.
7. Now your computer is ready to access your Router via Ethernet network.

2.4 Configuring the Router

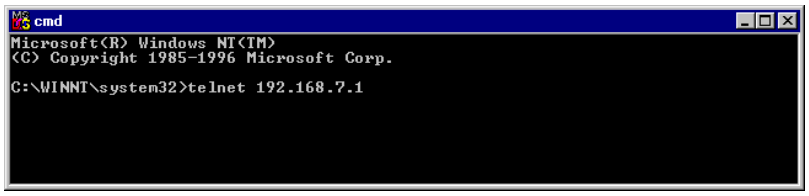
There is some setup required to get your xDSL Router working properly. The configuration of the xDSL Router can be accessed in three ways:

- Using TELNET via Ethernet interface
- Using terminal program via serial console port
- Using xDSL Configuration Tool (ACT) via serial console port

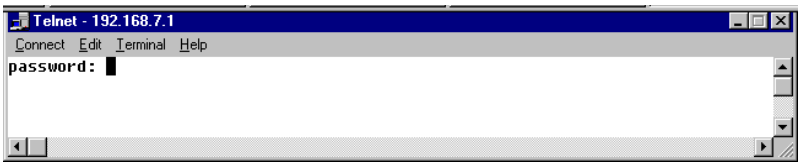
2.4.1 Using TELNET via Ethernet interface

To access the command line interface via Ethernet interface, you can use TELNET to log in the Router from the local Ethernet network using the Ethernet IP address that assigned to your xDSL Router. The Ethernet IP of the xDSL Router is default set to **192.168.7.1**.

1. Select **Start->Programs->MS-DOS Prompt**.
2. Find the IP address of the Router's Ethernet port. Then use TELNET to login the Router. For example, **`TELNET 192.168.7.1`**



3. You will see that a telnet dialog pops up asking for password (case sensitive), then enter **admin** ↵



4. Then you will see the following prompt, **DSL >**

5. Now you are ready to configure the Router by using command. Please contact your ISP / NSP to obtain the detail command sets of your Router. If the Router does not return any message, refer to Appendix B for troubleshooting information.

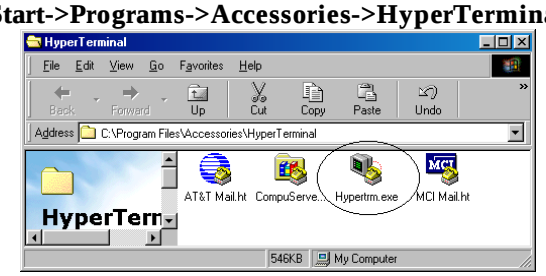
2.4.2 Using terminal program via serial console port

A terminal can be connected directly to the Serial console port. This requires the use of a terminal emulation software package such as Microsoft HyperTerminal. By default setting, the Router is configured to communicate at a baud rate of 9600. Any standard terminal that support baud rate of 9600 can be connected to the Router's console port. Please configure your serial port as:

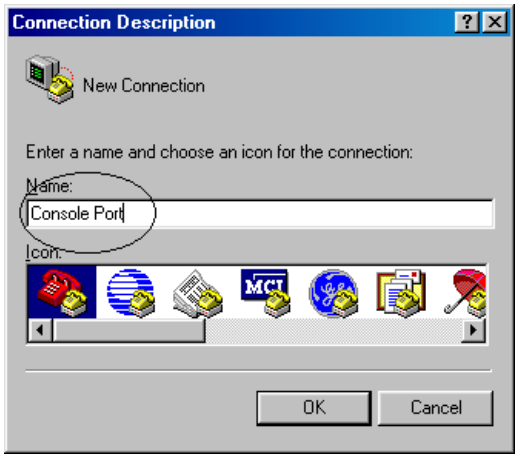
BPS	:	9600
Data bits	:	8
Parity	:	None
Stop Bits	:	1
Flow Control	:	None

Following steps provide the instructions to log on to the Router via Microsoft HyperTerminal.

1. Select **Start->Programs->Accessories->HyperTerminal**



2. Enter a connection name and click **OK**

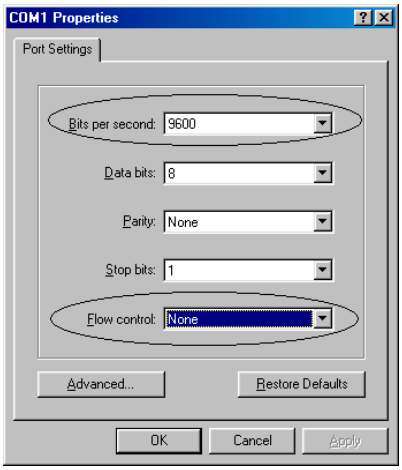


3. Select properly COM port and click **OK**

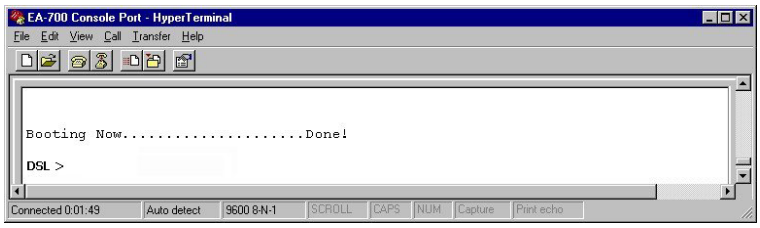
4. Enter the following parameters :

Bits per second	9600
Data bits	8
Parity	None
Stop bits	1
Flow Control	None

Then click **OK**



6. When the HyperTerminal window appears, you must press the enter key several time to get the command prompt for the Router's command line interface.



7. Now you are ready to configure the Router by using command. Please contact your ISP / NSP to obtain the detail command sets of your Router. If the Router does not return any message, refer to Appendix B for troubleshooting information.

Chapter 3 Basic Configurations

This chapter contains configuration information, instructions and examples for the basic link protocols that supported by the xDSL Router. The information needed to configure the Router is depending on the chosen link protocol. The link protocol is determined by your NSP(Network Service Provider). Therefore, It is necessary to know the link protocol which your NSP support before you refer to the configuration information that will apply to your setup.

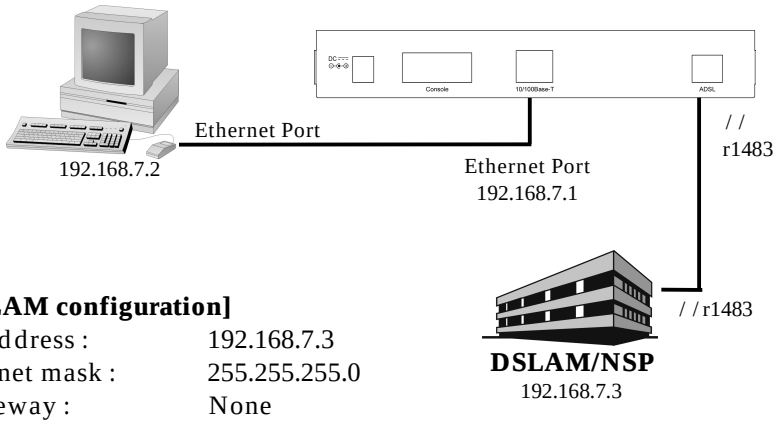
3.1 Factory default configuration

The Router is shipped with factory default settings. You may or may not need to change them depend on what kind of network that your Router is going to be installed.

Configuration item		Default settings of xDSL Router
Ethernet Interface	IP address	192.168.7.1
	Network Mask	255.255.255.0
xDSL interface	IP address	None
	Network Mask	None
ATM VPI/VCI number		0/32
Data Encapsulation Protocol		RFC1483
Machine Name		DSL
Domain name		Disabled
DHCP Server		Disabled
DHCP Client		Disabled
DNS Relay		Disabled
NAT		Disabled
RIP		Disabled
IP filtering		Disabled
Bridge filtering		Disabled
Spanning Tree		Disabled
Telnet login password		**admin**
SNMP access password		**admin**

3.2 Bridged RFC1483 (Default configuration for Router)

[System configuration]



[ISP/DSLAM configuration]

IP address :	192.168.7.3
Subnet mask :	255.255.255.0
Gateway :	None

[Local PC configuration]

IP address :	192.168.7.2
Subnet mask :	255.255.255.0
Gateway :	None

The Router already default to support the RFC 1483. However, you can use following procedure to reconfigure the Router to support the RFC 1483 again.

```
> ip device flush
> bridge device add edd
> bridge device add bun/port=r1483/rfc1483=true/mode=<x>/
  txvpi=<y>/txvci=<z>/rxvpi=<y>/rxvci=<z>
```

(<x> is the encapsulation mode of RFC1483, it can be one of LlcBridged and VcMuxBridged, and the setting of encapsulation mode is case sensitivity. <y> is the VPI value, and <z> is the VCI value)

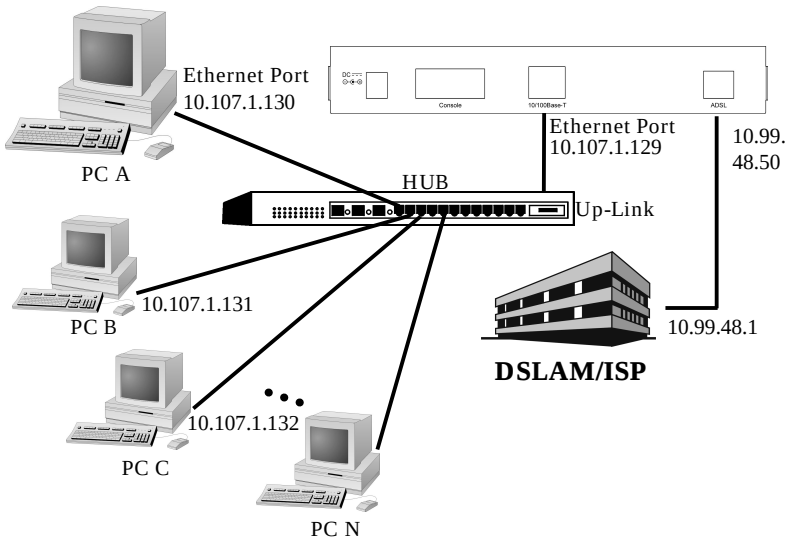
```
> config save
> restart
```

The following describes how to remove all configurations properly so that we start from a fresh configuration.

```
> isfs rm resolve↵
> isfs rm initbridge↵
> isfs rm initppp↵
> restart ↵
```

3.3 Routed RFC1483

[System configuration]



[ISP/DSLAM configuration]

IP address :	10.99.48.1
Subnet mask :	255.255.255.0
Gateway :	10.99.48.50

[Local PC A configuration]

IP address :	10.107.1.130
Subnet mask :	255.255.255.248
Gateway :	10.107.1.129

[Local PC B configuration]

IP address :	10.107.1.131
Subnet mask :	255.255.255.248
Gateway :	10.107.1.129

```
> home ↵
```
(ignores any error message, just ensures back to root prompt)
```
> ip device add ethernet ether //edd 10.107.1.129 ↵
```
(set 10.107.1.129 as the IP address for your xDSL Router)

> ip device add mpoa ptp //bun/port=r1483/rfc1483=true/mode=<x>/ txvpi=<y>/txvci=<z>/rxvpi=<y>/rxvci=<z> 10.99.48.50↵

(assume 10.99.48.50 is the static IP address assigned by your service provider for the PC); (<x> is the encapsulation mode of RFC1483, it can be one of LlcRouted and VcMuxRouted, and the setting of encapsulation mode is case sensitivity. <y> is the VPI value, and <z> is the VCI value)

> ip route add default 0.0.0.0 10.99.48.1 0:0:0:0 ↵

(10.99.48.1 is the IP address of your service provider)

> ip relay all↵

(enable routing between rfc1483 and ethernet ports)

config save ↵

restart ↵

You can use following procedure to remove existing RFC 1483 setting.

> isfs rm resolve↵

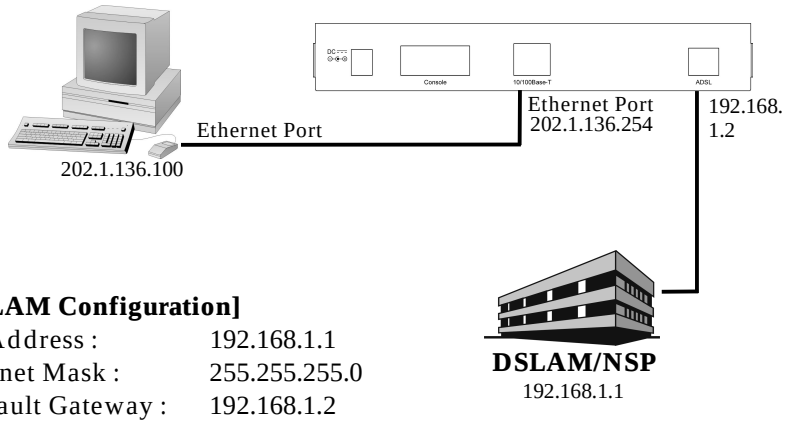
> isfs rm initbridge↵

> isfs rm initppp↵

> restart ↵

3.4 Classical IP (RFC1577)

[System configuration]



[ISP/DSLAM Configuration]

IP Address :	192.168.1.1
Subnet Mask :	255.255.255.0
Default Gateway :	192.168.1.2

[Local PC Configuration]

IP Address :	202.1.136.100
Subnet Mask :	255.255.255.0
Default Gateway :	202.1.136.254

The following describes how to remove all configurations properly so that we start from a fresh configuration.

Remove all existing bridge module configuration

```
> home ↵
> config reset bridge ↵
> config save ↵
> restart ↵
```

Remove all existing router module configuration

```
> home ↵
> ip device flush ↵
> ip norelay ↵
> ip ipatm pvc delete ipoa r1483 0/32 ↵
```

(use the same VPI/VCI of RFC 1577 setting)

```
> config save ↵
> restart ↵
```

Remove all existing IP module configuration device

```
> home ↵
> ip device flush ↵
> config save ↵
> restart ↵
```

We are ready for RFC1577 setup

Specify the gateway (RFC1577 on ISP / DSLAM site and Ethernet on local PC site)

```
> home ↵
> ip device add ethernet ether //edd 202.1.136.254 ↵
> ip device add ipoa atm //atm 192.168.1.2 ↵
> config save ↵
> restart ↵
```

Enable forwarding between router interface

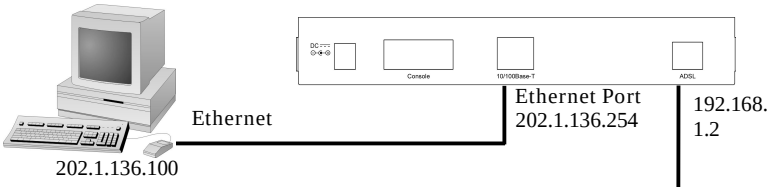
```
> home ↵
> ip relay all ↵
> ip ipatm pvc add ipoa r1483 x/y remoteip 192.168.1.1 ↵
```

(' x' is the VPI, ' y' is the VCI. Check with your service provider)

```
> config save ↵
> restart ↵
```

3.5 PPP Over ATM (RFC2364)

[System configuration]



DSLAM/NSP
192.168.1.1

[ISP/DSLAM Configuration]

IP Address :	192.168.1.1
Subnet Mask :	255.255.255.0
Default Gateway :	192.168.1.2

[Local PC Configuration]

IP Address :	202.1.136.100
Subnet Mask :	255.255.255.0
Default Gateway :	202.1.136.254

The xDSL Router also can be setup to support RFC 2364(PPP over ATM) with following procedure. Before setup RFC 2364, you have to ensure remove existing RFC 1483 or RFC 1577 configuration with the procedure mentioned above.

- IP dial out over PPPoA

```
> ip device add Ethernet ether //edd 202.1.136.254 ↵
```
(This is the IP of Ethernet port of xDSL Router)
```
> ip device add ppp_device ether //ppp/DEVICE=1 ↵
> config save ↵
> restart ↵

> ppp 1 pvc 0 32 ↵
```
(Set channel 1 to VPI=0, VCI=32)
```
> ppp 1 welogin <name> <password> ↵
```
(This is the login name and password of PPP server)
```
> ppp 1 enable ↵
```

```
> config save ↵
> restart ↵

> ip relay all ↵
> config save ↵
> restart ↵
```

- Remote bridging over PPPoA

```
> bridge device add edd ↵
> bridge device add ppp/DEVICE=2 ↵
> config save ↵
> restart ↵

> ppp 1 pvc 32 mac ↵
> ppp 1 interface 2 ↵
> ppp 1 enable ↵
> restart ↵
```

The RFC 2364 configuration also can be removed by following procedure. Please ensure to remove the RFC 2364 configuration before set the xDSL Router to other configuration.

- IP dial out over PPPoA

```
> ip device flush ↵
> config save ↵
> restart ↵

> ppp 1 pvc none ↵
> ppp 1 welogin none ↵
> ppp 1 interface 0 ↵
> ppp 1 disable ↵
> restart ↵

> ip norelay ↵
> config save ↵
> restart ↵
```

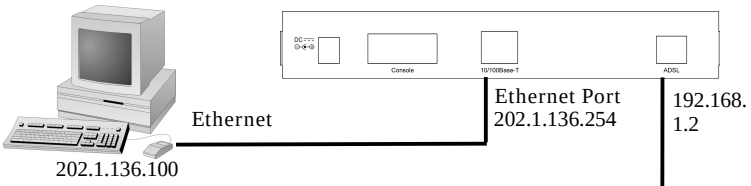
- Remote bridging over PPPoA

```
> config reset bridge ↵
> config save ↵
> restart ↵

> ppp 1 pvc none ↵
> ppp 1 interface 0 ↵
> ppp 1 disable ↵
> restart ↵
```

3.6 PPP Over Ethernet (RFC2516)

[System configuration]



DSLAM/NSP
192.168.1.1

[ISP/DSLAM Configuration]

IP Address :	192.168.1.1
Subnet Mask :	255.255.255.0
Default Gateway :	192.168.1.2

[Local PC Configuration]

IP Address :	202.1.136.100
Subnet Mask :	255.255.255.0
Default Gateway :	202.1.136.254

The xDSL Router also can be setup to support RFC 2516(PPP over Ethernet) with following procedure. Before setup RFC 2516, you have to ensure remove existing RFC 1483 or RFC 1577 or RFC 2364 configuration with the procedure mentioned above.

- IP dial out over PPPoE

```
> ip device add ethernet ether //edd 202.1.136.254 ↵
```
(This is the IP of Ethernet port of xDSL Router)
```
> ip device add ppp_device ether //ppp/DEVICE=1 ↵
> ppp 1 pppoe 0 32 ↵
```
(Set channel 1 to VPI=0, VCI=32)
```
> ppp 1 welogin <name> <password> chap↵
```
(This is the login name and password of PPP server)
```
> ppp 1 enable ↵
> config save ↵
> restart ↵
```

```
> ip relay all ↵
> config save ↵
> restart ↵
```

The RFC 2516 configuration also can be removed by following procedure. Please ensure to remove the RFC 2516 configuration before set the xDSL Router to other configuration.

```
> isfs rm resolve
> isfs rm initppp
> restart
```

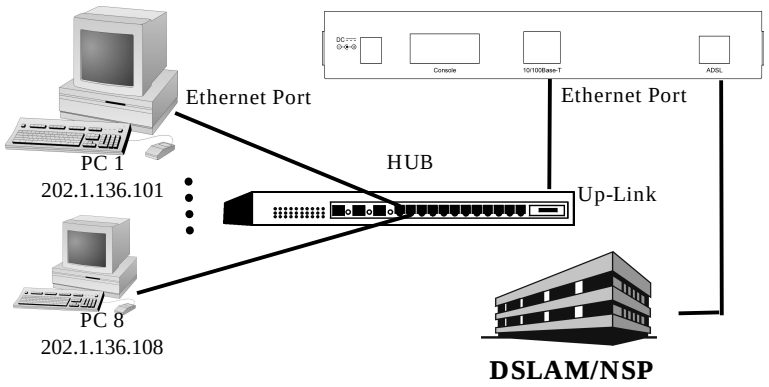
Chapter 4 Advanced Configurations

This Chapter described the advanced features that are primarily intended for experienced users and network administrators to perform network management and more complex configurations.

4.1 Add NAT to Classic IP, PPP over ATM or PPP over Ethernet

NAT is an IP address conversion feature that translates a PC's local (internal) address into a temporary global (outside / Internet) IP address. NAT is needed when a PC (or several PCs) on a Local Area Network wants to connect to the outside Internet to get to a remote network: NAT swaps the local IP address to a global IP address. Our version of NAT goes one step further by allowing several PCs to share one single IP address to the Internet, thus reducing connection costs. In effect, it allows a whole LAN to connect to the Internet as a single user.

[System configuration]



[ISP/DSLAM configuration]

IP address : 192.168.102.3
Subnet mask : 255.255.255.0
Gateway : None

[Local PC 1 configuration]

IP address : 202.1.136.101
Subnet mask : 255.255.255.0
Gateway : 202.1.136.254

[Local PC 8 configuration]

IP address : 202.1.136.108
Subnet mask : 255.255.255.0
Gateway : 202.1.136.254

The following command tell you how to adding a Network Address Translation protocol to the Classic IP(RFC1577) or PPP over ATM(RFC2364) or PPP over Ethernet(RFC2516) configuration that mentioned above. The following command must be added after the "`ip device add` …" commands have been given and the Router restarted.

Enables NAT on a Classic IP (RFC1577)

```
> ip nat add ipoa ↵
```

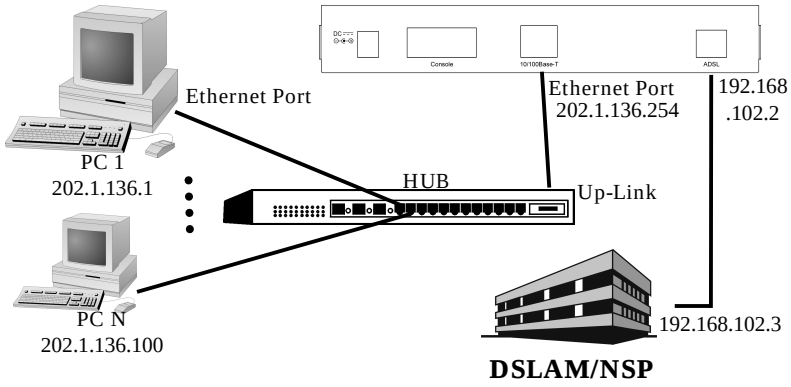
Enables NAT on a PPP over ATM (RFC2364) or PPP over Ethernet (RFC2516)

```
> ip nat add ppp_device ↵
```

4.2 Enables NAT to RFC1483, Classic IP (RFC1577), PPP over ATM (RFC2364), PPP over Ethernet (RFC2516) in Routing mode

The xDSL Router can be setup to adding NAT protocol to a Routing Mode configuration like RFC1483, RFC 1577, RFC 2364 or RFC 2516 with following procedure. The following procedure must be typed after **`ip device add`** command (in RFC1483, RFC 1577, RFC 2364 or RFC2516 configure procedure) have been given and the xDSL Router restarted.

[System configuration]



[ISP/DSLAM configuration]

IP address :	192.168.102.3
Subnet mask :	255.255.255.0
Gateway :	192.168.102.2

[Local PC 1 configuration]

IP address :	202.1.136.1
Subnet mask :	255.255.255.0
Gateway :	202.1.136.254

[Local PC 8 configuration]

IP address :	202.1.136.100
Subnet mask :	255.255.255.0
Gateway :	202.1.136.254

- Add NAT to RFC 1483 to above RFC 1483 Routing Mode example
  > ip nat add mpoa ↵
  (ipoa is the device name same as you configure in RFC 1483 example)

- Remove NAT to RFC 1483 to above RFC 1483 Routing Mode example
  > ip nat delete mpoa ↵

- Add NAT to RFC 1577 to above RFC 1577 Routing Mode example
  > ip nat add ipoa ↵
  (ipoa is the device name same as you configure in RFC 1577 example)

- Remove NAT to RFC 1577 to above RFC 1577 Routing Mode example
  > ip nat delete ipoa ↵

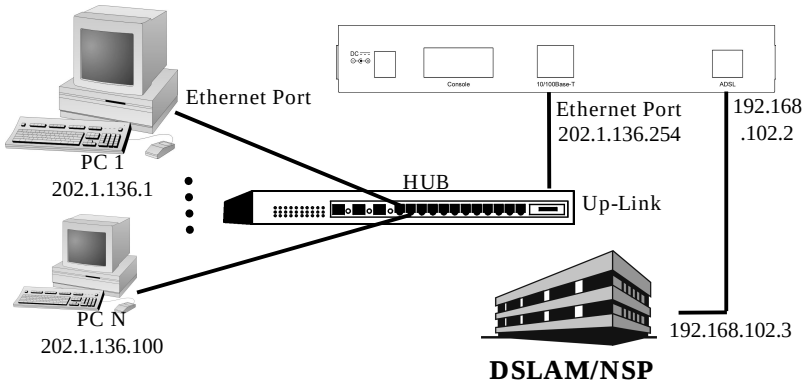
- Add NAT to RFC 2364 / RFC2516 to above RFC 2364 / RFC2516 Routing Mode example
  > ip nat add ppp_device ↵
  (ppp_device is the device name same as you configure in RFC 2364/RFC2516 example)

- Remove NAT to RFC 2364 / RFC2516 to above RFC 2364 / RFC2516 Routing Mode example
  > ip nat delete ppp_device ↵

4.3 Changing DHCP server configuration

DHCP is used to acquire IP addresses and options (such as the subnet mask, DNS, gateway, etc.) automatically. On the practical level, acquiring these initialization parameters with DHCP translates into avoiding the more involved Router / PC process (reconfiguration of Router and / or PC addresses in the same network.

[System configuration]



[ISP/DSLAM configuration]

IP address :	192.168.102.3
Subnet mask :	255.255.255.0
Gateway :	None

[Local PC configuration]

IP address :	None (obtained by DHCP)
Subnet mask :	None (obtained by DHCP)
Gateway :	None (obtained by DHCP)

By default, the xDSL Router is configured as a DHCP server with the following settings :

```
% Do not allocate dynamic IP addresses to unknown clients
deny unknown-clients;
% Do not repond to BOOTP queries
deny bootp;
```

```
% Use 255.255.255.0 as subnet mask for all clients in 10.0.0.0 subnet
subnet 10.0.0.0 netmask 255.255.255.0 {
% Range of dynamic IP addresses (change only the last digit)
range 10.0.0.2 10.0.0.5;
% If client does not request a specific lease time allocate 3600
% seconds
% (change as required)
default-lease-time 3600;
% If client requests specific expiration time, allocate 7200
% seconds
%(change as required)
max-lease-time 7200;
% Set clients default gateway to this (do not change)
option routers 10.0.0.1;
% Set clients primary/secondary DNS as these (change as required)
option domain-name-servers 206.13.28.12, 206.13.31.12;
% Set clients domain name as this (change as required)
option domain-name "pacbell.net";
}
% Use 255.255.255.248 as subnet mask for the IP addr 63.193.197.114
% Define subnet for the IP address used by NAT (change as needed)
subnet 63.193.197.114 netmask 255.255.255.248 {
}
```

The basic procedure to change the default setting is that you have to delete the existing configuration and reentering new configuration.

> home ↵
> dhcpserver config ↵
(displays the current DHCP server configuration)
> dhcpserver config flush ↵
(deletes current DHCP server settings)
> dhcpserver config confirm ↵
(confirm the previous action)
> config save ↵
(save the new configuration)
> dhcpserver config ↵
(displays the current DHCP server configuration. Should be empty.)

Now add the new settings for DHCP server.

> dhcpserver config add subnet 10.0.0.0 netmask 255.255.255.0 { range 10.0.0.A 10.0.0.B; default-lease-time C; max-lease-time D; option routers 10.0.0.1; option domain-name-servers eee.fff.ggg.hhh, iii.jjj.kkk.lll; option domain-name "mmmm" } ↵

(A, B are integers in the range 2--255, C/D indicate time in seconds,eee.fff.ggg.hhh/iii.jjj.kkk.lll are IP addresses of primary/secondary DNS, mmmm is domain name. All these values are assigned by your service provider.)

> dhcpserver config add subnet aaa.bbb.ccc.ddd netmask eee.fff.ggg.hhh { } ↵

(aaa.bbb.ccc.ddd is the static IP address assigned by your service provider for the PC, eee.fff.ggg.hhh is the subnet mask assigned by your service provider to PC)

> dhcpserver config confirm ↵

(confirm the new configuration)

> config save ↵

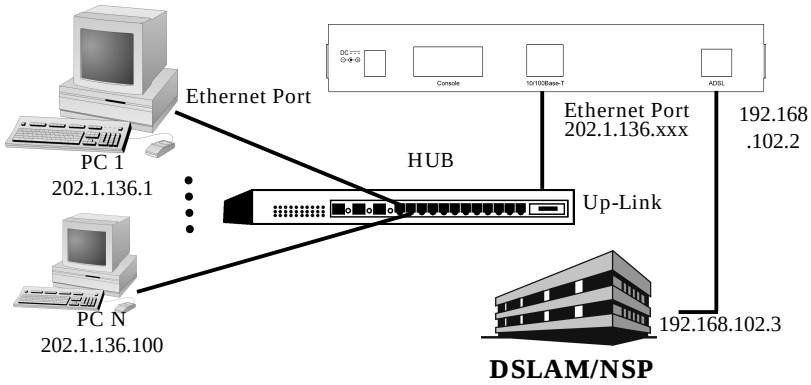
(save the new configuration)

> restart ↵

(after restart new configuration will take effect)

4.4 Changing DHCP client configuration

[System configuration]



[ISP/DSLAM configuration]

IP address :	192.168.102.3
Subnet mask :	255.255.255.0
Gateway :	None

[Local PC 1 configuration]

IP address :	202.1.136.101
Subnet mask :	255.255.255.0
Gateway :	202.1.136.xxx

The basic procedure to change the current setting is that you have to delete the existing configuration and reentering new configuration.

> **home** ↵
> **dhcpclient config** ↵
(displays the current DHCP client configuration)
> **dhcpclient config flush** ↵
(deletes current DHCP client settings)
> **dhcpclient config confirm** ↵
(confirm the previous action)
> **config save** ↵
(save the new configuration)
> **dhcpclient config** ↵
(displays the current DHCP client configuration. Should be empty.)

Now add the new settings for DHCP client.

> **ip device add Ethernet ether //edd dhcp** ↵
> **dhcpclient config add timeout 300;** ↵
> **dhcpclient config add retry 2000;** ↵
> **dhcpclient config add reboot 500;** ↵
> **dhcpclient config add backoff-cutoff 240;** ↵
> **dhcpclient config add interface "ethernet" { send dhcp-client-identifier xx:xx:xx:xx:xx:xx; send dpch-lease-time 900; }** ↵
(xx:xx:xx:xx:xx:xx is the Ethernet Mac address of your xDSL Router)
> **dhcpclient config confirm** ↵
(confirm the new configuration)
> **config save** ↵
(save the new configuration)
> **restart** ↵
(after restart new configuration will take effect)

4.5 PPTP Tunneling Configuration

The xDSL Router can be configured to supports PPTP as following procedure. But the xDSL Router currently provides the PPTP Access Concentrator (PAC) end of a PPTP tunnel. And the PC must run an OS, which supports PPTP, providing a PPTP Network Server (PNS). Windows 98, Me, 2000 or Windows XP provide.

- PPTP dial out

In the following example, the PC connects to the xDSL Router firstly must be configured as:

IP address of PNS : 192.168.10.1
Subnet mask of PNS : 255.255.255.0
Gateway of PNS : 192.168.10.2
IP address of PAC : 192.168.10.2

```
> ip device add Ethernet ether //edd 192.168.10.2 ↵
> config save ↵
> restart ↵

> ppp 2 pvc 0 32 ↵
(Set channel 2 to VPI=0, VCI=32)

> ppp 2 interface 0 ↵
> ppp 2 tunnel 1 pptp out ↵
> ppp 2 enable ↵

> pptp bind 192.168.10.2 ↵
> pptp 1 create listen ↵

> config save ↵
> restart ↵
```

- PPTP dial in

In the following example, the PC connects to the xDSL Router firstly must be configured as:

IP address of PNS : 192.168.10.1
Subnet mask of PNS : 255.255.255.0
Gateway of PNS : 192.168.10.2
IP address of PAC : 192.168.10.2

```
> ip device add Ethernet ether //edd 192.168.10.2 ↵
> config save ↵
> restart ↵

> ppp 2 pvc 0 32 listen ↵
(Set channel 2 to VPI=0, VCI=32)
> ppp 2 interface 0 ↵
> ppp 2 tunnel 1 pptp in ↵
> ppp 2 enable ↵

> pptp bind 192.168.10.2 ↵
> pptp 1 create 192.168.10.1 ↵
> config save ↵
> restart ↵
```

The PPTP configuration can be removed by following procedure. Please ensure to remove the PPTP configuration before set the xDSL Router to other configuration

- Remove PPTP either dial out or dial in

```
> ip device flush ↵
> config save ↵
> restart ↵

> ppp 2 pvc none ↵
> ppp 2 interface 0 ↵
> ppp 2 tunnel 0 ↵
> ppp 2 disable ↵

> pptp 1 delete ↵
```

```
> pptp bind none ↵
> config save ↵
> restart ↵
```

Chapter 5 Managing the xDSL Router

5.1 Booting the xDSL Router from Ethernet Network

By default, the Router is configured to boot from the on-board flash memory. But it is possible boot via Ethernet network as well. The executable image is stored in the local PC and is downloaded to the Router via Ethernet network upon every reset. For this, the Router needs to be configured and also a TFTP/BOOTP utility needs to be installed on the local PC.

- **Router Configuration**
  - Turn off the Router and turn it on again
  - Keep the * key be pressed
  - At the '**`Boot from Ethernet, USB or Flash? (E/U/F)`**' prompt type **`E`** ↵
- **Local PC Configuration**
  To download the software you need a TFTP/BOOTP server. You can use any. Be aware that every time the board is restarted the image will be transferred from the local PC to the Router.

5.2 Upgrading on-board flash memory from Ethernet network

You can update the on-board flash memory after you booting the new firmware from the Ethernet network by issue the following commands.

```
> home ↵
> flashfs rewrite boot.bin ↵
(this command is available for update boot code only)
> flashfs update ↵
> flashfs ls ↵
```

You should see some messages about the file name and file sizes that stored in the Router. If you get "`no flash content`" something went wrong.

5.3 SNMP

The xDSL Router provides SNMP agent support standard MIBs. SNMP is also used internally for configuration of the router. The active SNMP agent within the Router accepts SNMP requests for status, statistics, and configuration updates. Communication with the SNMP agent occurs over the LAN or WAN connection. Any management application using SNMP over UDP/IP (User Datagram Protocol/Internet Protocol) has access to the local SNMP agent. The following MIBs are supported:

- MIB II (RFC 1213)
- Bridge MIB (RFC 1493)
- PPP/LCP MIB (RFC 1471)
- PPP/Security MIB (RFC 1472)
- PPP/IP MIB (RFC 1473)
- PPP/Bridge MIB (RFC 1474)

Chapter 6 xDSL Link Performance Statistics

To see the xDSL link performance statistics, you can use the serial console port or the Ethernet interface to access the command line interface.

After power up wait till **xDSL** LED glows steadily. This condition indicates Router has reached "***SHOWTIME***". Now <dsl> process commands can be issued at the '<dsl>' prompt to retrieve various measurements. Refer to chapter 7 for the details of <dsl> process commands.

Chapter 7 Command Sets for Command Line Interface

Command line interface conventions

- Command line length may be up to 90 characters long.
- The command line interface is case-sensitive
- Parameters in between [and] are optional
- Parameters in between < and > must be entered
- The command line interface prompts for commands with a prompt that indicates the identity of the system. It determines how to indicate the identity as follows :
  - If the SNMP MIB variable sysName.0 exists and is non-empty, that is used first;
  - Otherwise, if a local IP address exists, that is used;
  - Otherwise, the local MAC address is used.

For example, the prompt might look like one of the following

```
DSL>
192.168.7.1>
0:30:eb:ff:0:ff>
```

Basic system command sets

1. <process>, <process> <command>

Syntax:

```
<process> <command>
<process>
<process> version
home
home <command>
```

Description:

In these commands, "<process>" can be any of a list of process names known to the console as following :

ip
ppp
snmp
config
bridge
nat
dsl
isfs
flashfs

The former variant sends the command to the process. The latter variant remembers the process name, and sends subsequent commands to the process, as if they had been preceded by the process name, until the command "home" is issued. The prompt is changed to reflect this; moreover, if a "help" command with no arguments is issued, it is passed to the process as usual, but then information about the "home" command is appended to the process's output by the console.

Example:

```
DSL> isfs help
Commands are:
ls          rm          cat
Type 'help all' or 'help <command>' for more details
DSL> isfs
DSL isfs> help
Commands are:
ls          rm          cat
Type 'help all' or 'help <command>' for more details
DSL isfs> home
DSL>
```

When the console is at the prompt of a particular process, the command "home <command>" or "home <process> <command>" may be used to execute a command as if the user had typed "home" followed by "<command>" or "<process> <command>". However, the console will remain at the same process prompt. The command "home <process>" will change the prompt from the current process to a new process "<process>".

Example:

```
DSL> conifg
DSL config> help
Commands are:
print         reset         save
Type 'help all' or 'help <command>' for more details
DSL config> home help
Commands are:
dsl         bridge      config      flashfs      ip
isfs        nat         ppp         restart      snmp
system
Type 'help all' or 'help <command>' for more details
DSL config> home flashfs help
Commands are:
cat           ls            update
Type 'help all' or 'help <command>' for more details
DSL config> home isfs
DSL isfs> help
Commands are:
ls            rm            cat
Type 'help all' or 'help <command>' for more details
DSL isfs> home
DSL>
```

2. help

Syntax:

```
help
help <cmd>
help all
<process> help
<process> help <cmd>
<process> help all
```

Description:

Displays a summary of available commands, more detailed information on a particular command, or more detailed information on all commands.

Example:

```
DSL> ip help
Commands are:
     arp      config   device   disable
     enable   help     ipatm    nat
     norelay  ping     relay    rip
     route    routes   stats    subnet
Type "help all" or "help <command>" for more details
DSL> ip help arp
arp syntax:
     arp <cmd> - execute arp subcommand
     arp help - list subcommands available
```

3. . (history mechanism)

Syntax:

.

Description:

Repeats the previous console command.

Example:

```
DSL> ip help arp
arp syntax:
     arp <cmd>     - execute arp subcommand
     arp help      - list subcommands available
DSL> .
arp syntax:
     arp <cmd>     - execute arp subcommand
     arp help      - list subcommands available
```

4. restart

Syntax:

```
restart
```

Description:

Reboots the Router

5. system

Syntax:

```
system
```

Description:

Displays the system type, firmware version and other information.

Commands for ISFS and FLASHFS process

1. ISFS and FLASHFS overview

The Router requiring storage of configuration data should make use of the ISFS file system. The FLASHFS file system provides permanent storage of files and is not normally used other than at start of day or when re-writing the FLASH. In addition to configuration files, FLASHFS stores the firmware image, which is loaded after system restart.

After system restart and during system initialization, FLASHFS files are copied into ISFS so that they are accessible by application processes. Typically, applications use the ISFS files to store their configuration data. Changes made to the configuration can be written back into ISFS, and subsequently FLASHFS, with the '`config save`' command. During a FLASHFS update, all configuration files in ISFS are written back to FLASH irrespective of whether they have changed or not.

Normally the firmware image is not rewritten. The FLASHFS configuration files can be considered the 'master' copies, and the ISFS files the run time copies. If the ISFS copies are written back to the FLASHFS, the current settings will be preserved. It is possible to read files from FLASHFS directly though this use is deprecated.

2. isfs cat | flashfs cat

Syntax:

```
isfs cat <file>
flashfs cat <file>
```

Description:

The `cat` command allows a console user to view the contents of the specified file. Only printable characters are displayed, non-printable characters are represented by a '.' character. Printable characters include all standard printable characters together with carriage return, line feed, and tab.

No output formatting is performed, and no scroll lock function implemented.

Example:

cat ipaddresses

3. isfs ls | flashfs ls

Syntax:

```
isfs ls
flashfs ls [-l]
```

Description:

The `ls` command allows a console user to list the files present in the filesystem.

The FLASHFS '`-l`' option displays more detailed information (logical address within FLASH and linked list information).

Example:

ls

4. isfs rm

Syntax:

```
isfs rm <file>
```

Description:

The `rm` command allows the user to remove a file from the ISFS file system. The memory used to store the file is freed .A subsequent FLASHFS update will write the new, shorter, ISFS files into FLASHFS, providing an implicit `rm` function for FLASHFS.

Note: If the file removed is the only file that would be stored in FLASHFS as type '`fixed`', the file will remain in FLASHFS as the fixed file area will not be re-written during an update.

Example:

> isfs rm foo

5. flashfs update

Syntax:

```
flashfs update
```

Description:

The '`update`' command instructs FLASHFS to update the FLASH memory from the files contained in the ISFS file system.

Example:

> flashfs update

Commands for Bridge process

1. device add

Syntax:

`device add <device>`

Description:

This command adds a device to the bridge configuration. Attempts to add the bridge itself or an existing device to the bridge are rejected. Attempts to add unsupported devices are rejected. There is a limit on the number of devices that can be attached to the bridge. If a device is successfully added to the bridge, it will only become active after the configuration is saved and the system is rebooted. If the device being added is from a process which supports multiple devices, the `/DEVICE` attribute must be specified as part of the device name. The table below shows devices, which may be attached to the bridge, although not all systems may support all devices.

lec1	Forum LAN emulation `alecjade`
edd	Ethernet driver `bun_ethernet`
ppp	Point-to-Point protocol `pp`

Configuration saving saves this information.

Example:

```
DSL bridge> device add edd
DSL bridge> device add ppp/DEVICE=2
```

2. device delete

Syntax:

`device delete <device>`

Description:

This command deletes a device from the bridge configuration. The changes will only take place after the configuration is saved and the system is rebooted. The syntax of the device name is the same as that for the `device add` command.

Configuration saving saves this information.

Example:

```
DSL bridge> device delete edd
```

3. device list

Syntax:

`device list`

Description:

This command lists all the devices that are currently attached to the bridge. It does not show the stored configuration (which can be seen with the `config print` command).

Example:

`DSL bridge>` **`device list`**

4. ethertype

Syntax:

`ethertype [<port> any|ip|pppoe]`

Description:

This command enables filtering of Ethernet packets according to the `ETHER_TYPE` field in the header. Only packets of the type specified using this command will be **sent** on the port specified; packets of all types will always be **received**. By default, all bridge ports are set to "any", which means that the type of the packet will never be checked. The meaning of the other options is as follows:

Option	**Permitted ETHER_TYPE values**
"ip"	0x0800 – IP
	0x0806 – ARP
"pppoe"	0x8863, 0x8864 – PPP Over Ethernet (RFC 2516)

The port is specified as an integer, as displayed by the `device list` command. When using this command in the `initbridge` configuration file, ports are numbered in the order in which the `device add` commands are given, starting from 1.
If no arguments are given, the current settings for each port are displayed.

Example:

`DSL bridge>` **`ethertype 2 any`**

5. filter

Syntax:

`filter`

Description:

This command shows the current contents of the bridge's filter table. The MAC entries for each device are shown in turn together with the time that the MAC address was last seen by the bridge. The command also shows the current filter ageing time, in seconds, and the number of creation failures since the system was started. Creation failures occur when there is no room left in the filter table for a new entry.

Example:

`DSL bridge>` **`filter`**

6. filterage

Syntax:

`filterage [<age>]`

Description:

This command sets, or displays if no arguments are given, the filter table ageing time. The ageing time is the time after which MAC addresses are removed from the filter table when there has been no activity. The time is specified in seconds and may be any integer value in the range 10…100,000 seconds. This value may also be changed through SNMP. Changing the value of filterage has immediate effect.

Configuration saving saves this information. By default the filter ageing time is set to 300 seconds.

Example:

`DSL bridge>` **`filterage`**

6. flush

Syntax:

`flush [<port>]`

Description:

This command allows the MAC entries for a specified port, or all ports, to be removed from the filter table. The port number for a device may be determined using the `device list` or `status` commands. If the port number is omitted, all entries for all ports are removed from the filter table.

Example:

`DSL bridge>` **`flush`**

7. portfilter

Syntax:

`portfilter [<source port> all|<destination ports>]`

Description:

The `portfilter` command allows control over the bridge's forwarding and broadcasting behavior. By default, when a multicast or an unknown packet is received on a port (referred to above as the source port), it will be forwarded to all other bridge ports (referred to above as the destination ports). Each bridge port may have its behavior modified separately. The first example below configures the bridge so that packets arriving on port 2 will only be forwarded to ports 3, 4 and 5, and packets arriving on port 3 will only be forwarded to port 1. All other ports retain their default behavior. Note that this command does not force packets arriving on the source port to be sent to all specified destination ports. The bridge retains its learning behavior, so unicast packets, once their destination is known to the bridge, will still only be sent to one port. Note also that the bridge itself (for example when attached to the IP router) will always forward to all ports, and will always be forwarded to by all ports. The default behavior can be restored by calling this command with the argument "`all`", as shown in the second example. The ports are specified as integers, as displayed by the `device list` command. When using this command in the `initbridge` configuration file, ports are numbered in the order in which the `device add` commands are given, starting from 1. If no arguments are given, the current settings for each port are displayed.

Example 1:

```
DSL bridge> portfilter 2 3 4 5
DSL bridge> portfilter 3 1
```

Example 2:

```
DSL bridge> portfilter 2 all
DSL bridge> portfilter 3 all
```

8. status

Syntax:

`Status`

Description:

This command shows the status of the bridge and its ports. The status information for a port includes the SNMP type information about time exceeded packets, packets discarded, etc. It also includes the broadcast history of the port over the last five seconds and the high water mark of packets queued on the bridge for this device.

Example:

```
DSL bridge> status
```

9. spanning disable | enable

Syntax:

```
spanning disable
spanning enable
```

Description:

When spanning tree operation is disabled, the bridge operates in transparent mode and all bridge ports are set to the forwarding state. When spanning tree operation is enabled, the state of the bridge's ports is controlled by the spanning tree process.

The `status` command reports the state of the spanning tree process. Configuration saving saves this information. By default, spanning tree operation is enabled.

Example:

```
DSL bridge> spanning disable
DSL bridge> spanning enable
```

10. spanning forwarddelay

Syntax:

`spanning forwarddelay [<time>]`

Description:

Reads or sets the time in seconds, in which the bridge remains in the listening or learning states, and is used when the bridge is or is attempting to become the root bridge. The forward delay time may be any value between 4 and 30 but it is also constrained by the maximum age and hello times. The forward delay time may also by changed by SNMP command. The `maxage`, `hellotime` and `forwarddelay` times are constrained as follows:

2 × (forwarddelay - 1) ≥ maxage
maxage ≥ 2 × (hellotime + 1)

Configuration saving saves this information. By default the forward delay time is set to 15 seconds.

Example:

```
DSL bridge> spanning forwarddelay 10      ;Sets the forwarding
                                           delay to 10 seconds.
```

11. spanning hellotime

Syntax:

```
spanning hellotime [<time>]
```

Description:

Reads or sets the time in seconds, after which the spanning tree process sends notification of topology changes to the root bridge, and is used when the bridge is or is attempting to become the root bridge. The hello time may be any value between 1 and 10 and is also constrained by the forwarddelay and maxage times. The hello time may also be changed by SNMP command.

Configuration saving saves this information. By default the hello time is set to 2 seconds.

Example:

```
DSL bridge> spanning hellotime 5          ;Sets the hello time
                                           to 5 seconds
```

12. spanning maxage

Syntax:

```
spanning maxage [<time>]
```

Description:

Reads or sets the maximum age of received spanning tree protocol information before it is discarded, and is used when the bridge is or is attempting to become the root bridge. The maxage time may be any value between 6 and 40 and is also constrained by the forwarddelay and hellotime times. The maxage time may also be changed by SNMP command.

Configuration saving saves this information. By default the maxage time is set to 20 seconds.

Example:

```
DSL bridge> spanning maxage 6             ;Sets the maxage
                                                time to 6 seconds
```

13. spanning port <number>

The port commands, described in subsequent sections, control the configuration of the bridge's ports so far as the operation of the spanning tree protocol is concerned. Ports are numbered from 1. Every port on the bridge may be specified by typing `all` instead of a port number.

14. spanning port <number> disabled | enable

Syntax:

`spanning port <number> disable | enable`

Description:

Allows a port to be disabled or enabled. The state of a port may also be changed by SNMP command. A port, which is enabled will take part in the operation of the spanning tree protocol. If enabled, the physical port may be "enabled" or "disabled" as demanded by the operation of the protocol.

Configuration saving saves this information. By default ports are enabled.

Example:

`DSL bridge>` **`spanning port 1 enable`** ;Enables port 1 on the bridge.

15. spanning port <number> pathcost

Syntax:

`spanning port <number> pathcost [<cost>]`

Description:

Reads or sets the cost of using this port. The cost may be any number between 1 and 65535. The cost of the port is used when deciding which is the best path to the root bridge. The cost of a port may also be changed by SNMP command.

Configuration saving saves this information. By default a cost of 10 is assigned to a port

Example:

`DSL bridge>` **`spanning port 2 pathcost`** ;Displays the path cost for port 2 on the bridge

16. spanning port <number> priority

Syntax:

`spanning port <number> priority [<portpriority>]`

Description:

Reads or sets the priority of the port. The priority may be any value between 0 and 255. The priority is used in conjunction with the pathcost to determine the best root to the root bridge. The higher the priority number, the less significant, in protocol terms, the port. The port priority may also be changed by SNMP command.

Configuration saving saves this information. By default a port has a priority of 128.

Example:

```
DSL bridge> spanning port 1 priority     ;Displays the
                                          priority for port 1
                                          on the bridge
```

17. spanning priority

Syntax:

`spanning priority [<bridgepriority>]`

Description:

Reads or sets the priority of the bridge. The priority may be any value in the range 0 to 65535. The higher the priority number, the less significant, in protocol terms, the bridge. Where two bridges have the same priority, their MAC address is compared and the smaller MAC address is treated as more significant. The priority of the bridge may be changed by SNMP command.

Configuration saving saves this information. By default the bridge is assigned a priority of 32768.

Example:

```
DSL bridge> spanning priority 4000  ;Sets the bridge
                                     priority to 4000.
```

18. spanning status

Syntax:

```
spanning status
```

Description:

Reports the status of the spanning tree. If spanning tree operation is disabled, a message is printed to that effect and no other information is displayed. When spanning tree operation is enabled, the following information is displayed:

- The identifier of the bridge.
- The identifier of the root bridge.
- The root port for this bridge.
- The root path cost: how far the bridge is from the root
- The various spanning tree time values as defined by the current root bridge:
- The maximum age of spanning tree information before it is discarded: max age time.
- The amount of time between configuration protocol packets: hello time.
- The amount of time delay when ports are changing state: forward delay time.
- For each port:
- The identifier of the designated bridge
- The identifier of the designated port for the designated bridge
- The identifier of the designated root bridge

Example:

```
DSL bridge> spanning status
```

Commands for DHCP server process

1. dhcpserver config

Syntax:

```
dhcpserver config [add <text>|confirm|delete|flush]
```

Description:

This command displays or edits the current configuration of the DHCP server. To display current configuration, provide no arguments to the command. Use of the “add” argument adds the line <text> to the configuration file. Use of the “confirm” argument reparses the configuration file, confirming the changes made if the parse is successful. Use of the “delete” argument deletes the last line from the configuration file. Use of the “flush” argument deletes the whole configuration. Following any change to the configuration file, it is necessary to “confirm” the changes, issue a “flashfs update” to commit the change to FLASH, and then restart the system before the changes can take effect.

Example:

```
DSL> dhcpserver config
---
Current DHCP server configuration
---
allow unknown-clients;
allow bootp;
subnet 192.168.219.0 netmask 255.255.255.0 {
range 192.168.219.10 192.168.219.30;
max-lease-time 5000;
}
DSL> dhcpserver config flush
Configuration file flushed.
DSL> dhcpserver config
---
Current DHCP server configuration
(Issue "dhcpserver config confirm" followed by "flashfs
update" to confirm new configuration)
---
DSL>
```

2. dhcpserver status

Syntax:

dhcpserver status

Description:

This command provides a summary of all leases known to the server on each interface in turn. It also shows remaining available IP addresses (i.e. those with no specified lease time, or client identifier).

Example:

```
DSL> dhcpserver status
DHCP Server Lease Status
Interface "ethernet"
```

IP address	Client UID	Expiry
192.168.219.1	01:00:20:af:20:6f:59	11 hours
192.168.219.2	01:00:20:af:11:2a:ac	8 hours
192.168.219.3	Myclient	140 seconds
192.168.219.4	00:20:af:20:00:2b:43	2 days
192.168.219.5	<unknown>	Never
192.168.219.6	<unknown>	Never
192.168.219.7	<unknown>	Never
192.168.219.8	<unknown>	Expired
192.168.219.9	<unknown>	Expired
192.168.219.10	Foobarbozzle	Expired

Commands for DHCP Client process

1. dhcpclient config

Syntax:

```
dhcpclient config
```

Description:

This command displays the current configuration of the DHCP client, including selected DHCP options.

Example:

```
DSL> dhcpclient config
---
DHCP client configuration file: '//isfs/dhclient.conf'
timeout 60;
retry 60;
reboot 10;
backoff-cutoff 40;
interface "ethernet" {
send dhcp-lease-time 5000;
send dhcp-client-identifier "Galapagos";
}
```

2. dhcpclient status

Syntax:

```
dhcpclient status [all]
```

Description:

This command provides DHCP status information for the active bound lease associated with each valid interface in turn, including IP address, time until lease renewal, subnet mask and DHCP server address. Including the "all" flag shows, for each valid interface, the active lease, leases which are being, or have been offered to the interface, and any leases which are still being held by the client which are not currently active (since a single interface can only have one active lease at a time).

Example:

```
DSL> dhcpclient status
DHCP Client Lease Status (active lease only)
Interface 'ethernet'
```

Status	Server ID	IP address	Subnet mask	Renewal
ACTIVE	192.168.219.151	192.168.219.1	255.255.255.0	31 seconds

3. ip device

Syntax:

```
ip device add <i/f> <type> <file> [mtu <size>] [<IP
address>|dhcp]
ip device
```

Description:

The **ip device add** command adds an interface to the configuration of the IP stack. The last parameter of the command would normally the IP address of the interface; use of the string **dhcp** causes the IP address to be discovered by the DHCP client software. Note that using the flag **dhcp** on an interface precludes running a DHCP server on that interface! The **ip device** command lists the current configuration of any devices attached to the IP stack. A device configured to use DHCP will show "dhcp" in the "IP address" column, followed by the actual IP address discovered and bound by DHCP, if any. For interfaces configured to use DHCP, saving configuration only marks the interface as using DHCP; it does not save the actual IP address discovered by DHCP, which must be renewed.

Example:

```
DSL> ip device add ethernet ether //edd dhcp
…DHCP then discovers the IP address for the interface…
DSL> ip device
# type dev file IP address
device ethernet ether //edd mtu 1500 dhcp
```

Commands for IP process

1. arp

Syntax:

```
arp add <i/f> <IP address> <MAC address>
arp delete <i/f> <IP address>
arp flush
arp [list]
arp help [all|<cmd>]
```

Description:

Allows display and manipulation of the ARP table: the list of IP addresses and corresponding MAC addresses obtained by ARP on Ethernet-like interfaces. Normally there is no need to add entries to the table with "`arp add`", since they should be discovered by the ARP protocol. Displaying the table with "`arp list`" (or just "`arp`") is sometimes useful, and deleting an entry with "`arp delete`", or the whole table with "`arp flush`", can sometimes speed up recovery from temporary problems if something unusual has happened. Entries added with "`arp add`" do not time out like those discovered by use of the ARP protocol, but they are deleted by "`arp flush`" and will not survive a restart (they are not saved by configuration saving). Note that the ARP table is used only for destinations on directly connected Ethernet-like networks, not for those reached through routers (although the ARP table may be used to discover the MAC address of the router).

Example:

```
DSL> ip arp add ether 192.168.50.1 8:0:20:19:9A:D9
DSL> ip arp
arp add flane 192.168.2.63 00:20:2b:e0:03:87 # 8m58s
arp add flane 192.168.2.109 00:20:2b:03:08:b1 # 2m24s
arp add ether 192.168.50.1 08:00:20:19:9a:d9 # forever
arp add ether 192.168.50.57 00:20:af:2e:fa:3c # 3m25s
DSL> ip arp delete flane 192.168.2.109
DSL> ip arp list
arp add flane 192.168.2.63 00:20:2b:e0:03:87 # 8m46s
arp add ether 192.168.50.1 08:00:20:19:9a:d9 # forever
arp add ether 192.168.50.57 00:20:af:2e:fa:3c # 3m13s
DSL> ip arp flush
DSL> ip arp
# flane ARP table is empty
# ether ARP table is empty
DSL> ip arp
arp add flane 192.168.2.108 00:20:2b:03:0a:72 # 10m58s
# ether ARP table is empty
```

(The last example shows that the MAC address for 192.168.2.108 has

been automatically added again, having been discovered by means of the ARP protocol.)

2. config

Syntax:

`config [save]`

Description:

Displays the IP configuration (not including the "`snmp`" configuration), or saves it in flash memory. The functionality of the "`config`" command is also accessible in the standard way through the config process (e.g. "`config print ip`"), if that process is present. However, when accessed through the config process, the "`snmp`" configuration *is* included.

Example:

```
DSL> ip config
device add ether ether //nice mtu 1500 192.168.2.1
device add vlane ether //lane mtu 1500 192.168.55.1
subnet add vlane.home . 192.168.55.0 ff:ff:ff:00
subnet add ether.home . 192.168.2.0 ff:ff:ff:00
rip send ether 2
rip send vlane 2
rip accept ether 1 2
rip accept vlane 1 2
autoloop on
route add default 0.0.0.0 192.168.2.7 00:00:00:00 2 # MAN
relay ether ether
relay ether vlane
relay vlane vlane
ipatm lifetime 60
# IP host table:
# Port table:
router 520/UDP
snmp 161/UDP
tftp 69/UDP
telnet 23/TCP
DSL> ip config save
Updating flash filing system ...
done
ip: configuration saved
```

3. device

Syntax:

`device`

```
device add <i/f> <type> [<file>] [mtu <size>] [<IP address>]
device delete <i/f>
device flush
```

Description:

Displays the interfaces that IP is configured to use, or adds an interface to the configuration, or deletes an interface, or all interfaces, from the configuration. However, the commands to change the configuration do not take effect immediately (except when the "`device add`" command is run at start-up from the initialisation file). It is necessary to save the configuration (e.g. with "`ip config save`") and restart the system (e.g. with "`ip restart`") before they take effect. "`device`" will display both the current interfaces and those that have been configured but are not yet in effect. (Other commands apply only to the devices in effect, rather than to those configured; when adding a device, for example, one may need to issue the "`device add`" command, then the "`config save`" and reboot, then issue any other configuration commands that depend on the existence of the device, and then "`config save`" again.)

"`<i/f>`" is an arbitrary label for the interface, which is used in referring to it in subsequent commands. (It is often chosen to be the same as "`<type>`", though this is perhaps slightly confusing.)

"`<type>`" specifies the class of interface: Ethernet-like, IP-over-ATM, or loopback. For an Ethernet-like or IP-over-ATM interface, "`<file>`" specifies the file name that will be opened to access the underlying device. For a loopback interface, "`<file>`" is not used, and can just be specified as "-" or omitted altogether.

Several different values of "`<type>`" specify the same class of interface; they differ in that each implies a different default value for "`<file>`". As a result, for the most common interface configurations, "`<file>`" can be omitted, and one need only specify the appropriate value of "`<type>`". The supported values for "`<type>`" are

Class	**<type>**	**Default file**
Ethernet	`ether`	`//nice` or `//ethernet` or

		//edd
	vlane	//lane
	flane	//lec1
	bridge	//bridge
IP-over-ATM	atm	//q93b
	atmpvc	//atm
Loopback	loop	-

"<mtu>" specifies the MTU (maximum transmission unit); that is, the size of the largest datagram (excluding media-specific headers) that IP will attempt to send through the interface. The value specified will be ignored if it is larger than the maximum supported by the interface class, which is currently 1500 except for the loopback interface, unless the IP-over-ATM MTU has been changed; normally there is no point in setting the MTU less than this, so the "<mtu>" option is of little use.

"<IP address>" is the IP address that this system uses on the interface ; if it is not specified, the interface will be disabled until an IP address is supplied with the "ip enable" command. For a loopback interface, the address should be set to 127.0.0.1. (All addresses of the form 127.*.*.* will then be recognized as loopback addresses, as is normal practice.) For non-loopback interfaces, the subnet mask for the local network will be assumed to be ff:ff:ff:00 (e.g. a class C network); if the correct subnet mask is other than this then it will need to be set with the "subnet" command.

If there is no initialisation file //isfs/resolve (or //isfs/arptable) at all, then default interfaces are configured as if by the "device" commands

```
device add ether ether //edd
device add ether ether //nice (otherwise)
device add atm atm //q93b
```

but in each case only if the file concerned ("//edd", "//nice", or "//q93b") can be opened. Furthermore, if the IP process is given a command line then each argument will be treated as a possible Ethernet-like file to open, given names "ether1", "ether2", and so on. For example, if the IP process is defined in the system file as "Process ip is tcp_ip/ip //bridge //lec1 " (and "//bridge" and "//lec1" can be opened), then the equivalents of the commands

```
device add ether1 ether //bridge
device add ether2 ether //lec1
```

will be processed, in addition to the others above.

Configuration saving saves the interface configuration.

Example:

```
DSL> ip device
# type dev file IP address
device ether ether //nice mtu 1500 192.168.2.1
device vlane ether //lane mtu 1500 192.168.55.1
DSL> ip device add loop loop 127.0.0.1
Change will have no effect until after config save and restart.
DSL> ip device delete vlane
Change will have no effect until after config save and restart.
DSL> ip device
# type dev file IP address
device ether ether //nice mtu 1500 192.168.2.1
device vlane ether //lane mtu 1500 192.168.55.1 # DELETED
device loop loop - mtu 2048 127.0.0.1 # ADDED
Additions/deletions will have no effect until after config
save and restart.
```

4. disable

Syntax:

```
disable [<i/f>]
```

Description:

Disables all interfaces, or just a specified interface.

Example:

```
DSL> ip disable vlane
DSL> ip device
# type dev file IP address
device ether ether //nice mtu 1500 192.168.2.1
device vlane ether //lane mtu 1500 192.168.55.1 # DISABLED
```

5. enable

Syntax:

```
enable [<i/f> [mtu <size>] [<IP address>]]
```

Description:

Enables all interfaces, or just a specified interface. Can also be used to set the MTU and IP address on an interface when enabling it (or change them on an interface that is already enabled); see the "device" command for details on these.

Configuration saving saves the MTU and IP addresses, but not the disabled / enabled state.

Example:

```
DSL> ip enable vlane 192.168.56.3
ip/vlane: IP address 192.168.56.3
```

```
DSL> ip device
# type dev file IP address
device ether ether //nice mtu 1500 192.168.2.1
device vlane ether //lane mtu 1500 192.168.56.3
```

6. get

Syntax:

`get <file>`

Description:

Reads and executes commands from a file. The commands in the file are in the same format as those documented in this chapter, with no "`ip`" prefix. They can contain comments, introduced by the "#" character. The "`get`" command is "`hidden`", not shown by "`ip help`".

Example:

`DSL>` **ip get //isfs/cmdfile**

7. ipatm abort

Syntax:

`ipatm abort <n>`

Description:

Closes an IP-over-ATM SVC; the number `<n>` is as displayed by "`ipatm files`". If there is still traffic being sent to the destination concerned, IP will soon open a new SVC to the destination.

Example:

`DSL>` **ip ipatm abort 14**

8. ipatm arp

Syntax:

`ipatm arp [list]`

Description:

Lists the cached mappings from IP addresses to ATM addresses; only relevant when using IP-over-ATM with SVCs. (The "list" parameter is optional and makes no difference to the behavior.)

Example:

```
DSL> ip ipatm arp
192.168.5.72 47.00.83.10.a2.b1.00.00.00.00.00.00.00.00.20.2b.01.00.07.00
192.168.5.33 47.00.83.10.a4.00.00.00.00.00.00.00.00.00.20.2b.01.00.19.00
192.168.5.111 47.00.83.10.e2.00.00.00.20.2b.01.01.a8.00.20.2b.01.01.a8.00
```

9. ipatm arpserver

Syntax:

`ipatm arpserver [<i/f> [<ATM address>|here]]`

Description:

Displays or sets the ATMARP server used for an interface, which must be an IP-over-ATM interface using SVCs. The interface name is optional when displaying: if omitted, the ATMARP servers for all such interfaces are listed. (Since currently there can only be one such interface, this behavior is present only for possible consistency with future versions.) The parameter "`here`" causes no ATMARP server to be used; only the local ATMARP cache will be consulted when setting up an SVC. This will normally be used when this machine is the ATMARP server for the local network.

Configuration saving saves this information.

Example:

```
DSL> ip ipatm arpserver
ipatm arpserver atm here
DSL> ip ipatm arpserver atm 47.0.83.10.a2.0.0.0.0.0.0.0.0.0.20.2b.4.3.8.0
DSL> ip ipatm arpserver atm
ipatm arpserver atm
47.00.83.10.a2.00.00.00.00.00.00.00.00.20.2b.04.03.08.00
```

10. ipatm files

Syntax:

```
ipatm files
```

Description:

Lists the IP-over-ATM connections, listens, and slots for available connections.

Example:

```
DSL> ip ipatm files
i/f atm 0 transmissions queued, 6 free connections, 4
listeners
0: on atm Connected to 192.168.220.48, 2 rx buffers idle 0ms
1: on atm Listening, 1 rx buffers (in use)
2: on atm Listening, 1 rx buffers (in use)
3: on atm Listening, 1 rx buffers (in use)
4: on atm Listening, 1 rx buffers (in use)
5: on atm Idle, 0 rx buffers
6: on atm Idle, 0 rx buffers
7: on atm Idle, 0 rx buffers
8: on atm Idle, 0 rx buffers
9: on atm Idle, 0 rx buffers
10: on atm Idle, 0 rx buffers
```

11. ipatm lifetime

Syntax:

```
ipatm lifetime <secs>
```

Description:

Displays or sets idle time-out for IP-over-ATM SVCs: if there is no traffic on an SVC for this period, then it will be disconnected. (It might be disconnected before this period in order to make room for new connections.) There is no way to disable the time-out, but "`ip ipatm lifetime 999999`" will have much the same effect. Configuration saving saves this information. The default lifetime is 60 seconds.

Example:

```
DSL> ip ipatm lifetime
Idle lifetime for connections: 1m
DSL> ip ipatm lifetime 90
Idle lifetime for connections: 1m30s
```

12. ipatm pvc

Syntax:

```
ipatm pvc
ipatm pvc add <i/f> <vci>/[<IP address>][/<pcr>] [<port>]
ipatm pvc delete <vci> [<port>]
ipatm pvc flush
```

Description:

Lists configured PVCs for use by IP-over-ATM; configures another; deletes one; or deletes all. "`<i/f>`" is the name of an interface configured for IP-over-ATM using PVCs.

"`<vci>`" is the VCI to use for the PVC. The range of possible VCIs depends on the system.

"`<IP address>`" is the IP address of the machine at the other end of the PVC. If it is not specified, TCP/IP will use Inverse ATMARP (RFC 1577) to determine the IP address; if it is specified, then Inverse ATMARP will not be used.

"`<pcr>`" is the peak cell rate, in cells per second. The default is 60000. (If neithe r IP address nor PCR is specified, the "/" after the VCI can be omitted.)

"`<port>`" is the port name: it must be specified if the machine is a switch, and not otherwise. Configuration saving saves this information.

Example:

```
myswitch> ip ipatm pvc add atm 60 a3
myswitch> ip ipatm pvc add atm 61//50000 b1
```

```
myswitch> ip ipatm pvc add atm 62/192.168.4.32 b1
myswitch> ip ipatm pvc
ipatm pvc atm 60//60000 A3
ipatm pvc atm 61//50000 B1
ipatm pvc atm 62/192.168.4.32/60000 B1
```

13. iphostname

Syntax:

```
iphostname add <IP address> <name>
iphostname flush
iphostname list
iphostname help [all|<cmd>]
```

Description:

Sets up a mapping between an IP address and a symbolic name; deletes all such mappings; lists the mappings; or displays help on the "`iphostname`" command.

The symbolic names can be used in most IP commands where an IP address is required, and as values of the attributes LHOST and RHOST. They are also displayed and returned as attribute values in place of numerical addresses, when a suitable mapping exists.

The "`iphostname`" command is "`hidden`", not shown by "`ip help`".

Configuration saving saves this information.

14. norelay

Syntax:

```
norelay [all | <i/f> [<i/f>] [forward]]
```

Description:

Turns off forwarding between interfaces; see the "`relay`" command for more details.

The command "`norelay`" with no parameters is equivalent to "`norelay all`": it turns off all forwarding.

Configuration saving saves this information.

Example:

```
DSL> ip relay
relay ether ether
relay ether vlane
relay vlane vlane
DSL> ip norelay ether vlane forward
relay ether ether
relay vlane ether forward
```

```
relay vlane vlane
```

15. ping

Syntax:

```
ping <IP address> [<ttl> [<size>]]
```

Description:

Sends an ICMP Echo message to the specified IP address. "`<ttl>`" (default 30) is the TTL (time-to-live) to use. A crude "`traceroute`" functionality can be obtained by repeating the "`ping`" command with increasing TTL values, starting with 1. "`<size>`" (default 56) is the data size of the Echo message. This does not include the IP header (20 bytes) and the ICMP header (8 bytes). TCP/IP waits 10 seconds for a reply to the message; if none arrives, it reports the lack of a reply. A reply is an ICMP Echo Reply message, or an ICMP error message reporting destination unreachable, time exceeded, or (as should never happen) a parameter problem. ICMP redirect and source quench messages are reported, but TCP/IP continues to wait for a final reply or time-out.

Example:

```
DSL> ip ping 192.168.4.13 1
ip: ping - 192.168.1.9 reports pkt #5834 to 192.168.4.13:
time-to-live
exceeded
DSL> ip ping 192.168.4.13 2
ip: ping - reply received from 192.168.4.13
DSL> ip ping 192.168.77.77
ip: ping - no reply received
```

16. portname

Syntax:

```
portname add <name> <number>[/<protocol>]
portname flush
portname list
portname read <file>
portname help [all|<cmd>]
```

Description:

Sets up a mapping between a UDP or TCP port and a symbolic name; deletes all such mappings; lists the mappings; reads the mappings from a file; or displays help on the "`portname`" command. The symbolic names can be used as values of the attributes LPORT and RPORT provided the protocol type (UDP or TCP) is appropriate. They are also displayed in place of port numbers, when a suitable

mapping exists.

"<protocol>" should be either "UDP" or "TCP"; it can be omitted, but that is not very useful. For "portname read", the file is in the same format as //isfs/services, which is the same as the output from "portname list". The "portname" command is "hidden", not shown by "ip help".

Configuration saving saves this information.

Example:

```
DSL> ip portname flush
DSL> ip portname add someport 105/tcp
DSL> ip portname list
someport 105/TCP
DSL> ip portname read //isfs/services
DSL> ip portname list
router 520/UDP
snmp 161/UDP
tftp 69/UDP
telnet 23/TCP
someport 105/TCP
```

17. relay

Syntax:

```
relay
relay all | <i/f> [<i/f>] [forward]
```

Description:

Displays or sets what forwarding TCP/IP will do between interfaces. The combinations of setting forwarding can be a bit confusing; they behave as follows:

Command:	**Enables forwarding:**
relay all	from every interface to every non-loopback interface
relay if1	from if1 to every non-loopback interface, and from every interface to if1
relay if1 forward	from if1 to every non-loopback interface
relay if1 if2	from if1 to if2 and from if2 to if1
relay if1 if2 forward	from if1 to if2

(Don't confuse the "forward" keyword, which indicates one-way relaying, with the term "forwarding"!)

To disable forwarding, use the "norelay" command.

Configuration saving saves this information. By default all

forwarding is disabled.

Example:

```
DSL> ip relay
No relaying is being performed
DSL> ip relay ether vlane forward
relay ether vlane forward
DSL> ip relay ether forward
relay ether ether
relay ether vlane forward
DSL> ip relay ether vlane
relay ether ether
relay ether vlane
DSL> ip relay all
relay ether ether
relay ether vlane
relay vlane vlane
```

18. rip accept

Syntax:

```
rip accept [all|<i/f>] [none|<version>*]
```

Description:

Controls for which version or versions of RIP (RIP version 1, RFC 1058, or RIP version 2, RFC 1723) TCP/IP will accept incoming information on each interface.

Configuration saving saves this information. By default both RIP versions are accepted on all interfaces ("`rip accept all 1 2`").

Example:

```
DSL> ip rip accept all 1 2
DSL> ip rip accept ether 2
DSL> ip rip allowed
rip send ether none
rip send vlane none
rip accept ether 2
rip accept vlane 1 2
```

19. rip allowed

Syntax:

```
rip allowed
```

Description:

Displays the RIP versions that will be accepted and sent on each interface.

Example:

```
DSL> ip rip allowed
rip send ether 2
rip send vlane 2
rip accept ether 1 2
rip accept vlane 1 2
```

20. rip boot

Syntax:

```
rip boot
```

Description:

Broadcasts a request for RIP information from other machines. TCP/IP does this automatically when it first starts up, and the routing information should be kept up to date by regular broadcasts from the other machines, so this command is normally of little use.

Example:

```
DSL> ip rip boot
```

21. rip hostroutes

Syntax:

```
rip hostroutes [off]
```

Description:

Sets or clears the "`hostroutes`" flag; TCP/IP will accept RIP routes to individual hosts only if this flag is on. If the flag is off, then RIP version 1 routes that appear to be to individual hosts will be treated as if they were to the network containing the host; RIP version 2 routes to individual hosts will be ignored. (The reason for this difference is that RIP version 1 does not allow specification of subnet masks; a RIP version 1 route that appears to be to an individual host might in fact be to a subnet, and treating it as a route to the whole network may be the best way to make use of the information.) To see the state of the flag without changing it, the "`config`" command must be used.

Configuration saving saves this information. By default the "`hostroutes`" flag is off.

Example:

```
DSL> ip rip hostroutes off
```

22. rip killrelay

Syntax:

`rip killrelay <relay>`

Description:

Deletes a RIP relay. See "`rip relay`" for information on RIP relays.

23. rip poison

Syntax:

`rip poison [off]`

Description:

Sets or clears the "`poisoned reverse`" flag. If this flag is on, TCP/IP performs "`poisoned reverse`" as defined in RFC 1058; see that RFC for discussion of when this is a good thing. To see the state of the flag without changing it, the "`config`" command must be used.

Configuration saving saves this information. By default the "`poisoned reverse`" flag is off.

Example:

`DSL>` **ip rip poison**

24. rip relay

Syntax:

`rip relay <RIP version> <name> [<i/f> [<timeout>]]`

Description:

Configures a RIP relay. RIP relays were designed as a means of using RIP on a non-broadcast medium (currently, only IP-over-ATM); on such an interface, TCP/IP will send RIP information individually to each configured RIP relay, instead of broadcasting it. However, the RIP relay support has not been recently tested and is not believed to be reliable; furthermore, configuration saving does not save the RIP relay configuration. On a non-broadcast medium, therefore, it is preferable to use static (manually configured) routes.

25. rip relays

Syntax:

`rip relays`

Description:

Displays the configured RIP relays. See "`rip relay`" for information on RIP relays

26. rip send

Syntax:

```
rip send [all|<i/f>] [none|<version>*]
```

Description:

Controls which version or versions of RIP (RIP version 1, RFC 1058, or RIP version 2, RFC 1723). TCP/IP will use to broadcast routing information on each interface. If both versions are specified, routing information is broadcast in duplicate, once using each version.

Specifying "`all`" affects all interfaces except the loopback interface (if any).

Configuration saving saves this information. By default RIP version 2 only is used on all non-loopback interfaces ("`rip send all 2`").

Example:

```
DSL> ip rip send all 2
DSL> ip rip send ether 1
DSL> ip rip allowed
rip send ether 1
rip send vlane 2
rip accept ether 1 2
rip accept vlane 1 2
```

27. route

Syntax:

```
route
route add <name> <dest> <relay> [<mask> [<cost> [<timeout>]]]
route delete <name>
route flush
```

Description:

Lists routes; adds or deletes a static route; or deletes all routes.

"`<name>`" is an arbitrary name specified to "`route add`" that can be used to delete the route using "`route delete`".

"`<dest>`" is the IP address of the network being routed to (only those bits of "`<dest>`" corresponding to bits set in "`<mask>`" are relevant).

"`<relay>`" is the IP address of the next-hop gateway for the route.

"`<mask>`" (default ff:ff:ff:00) is the subnet mask of the network being routed to, specified as four hexadecimal numbers separated by colons. For example, 0:0:0:0 is a default route (matches everything without a

more specific route), ff:ff:ff:0 would match a Class C network, and ff:ff:ff:ff is a route to a single host. (Note: the default is not always sensible; in particular, if "<dest>" is 0.0.0.0 then it would be better for the mask to default to 0:0:0:0.)

"`<cost>`" (default 1) is the number of hops counted as the cost of the route, which may affect the choice of route when the route is competing with routes acquired from RIP. (But note that using a mixture of RIP and static routing is not advised.)

"`<timeout>`" (default 0, meaning that the route does not time out) is the number of seconds that the route will remain in the routing table. Note that the routing table does not contain routes to the directly connected networks, without going through a gateway. TCP/IP routes packets to such destinations by using the information in the device and subnet tables instead. The "`route`" command (with no parameters) displays the routing table. It adds a comment to each route with the following information:

- How the route was obtained; one of
  - MAN — configured by the "`route`" command
  - RIP — obtained from RIP
  - ICMP — obtained from an ICMP redirect message
  - SNMP — configured by SNMP network management;
- The time-out, if the route is not permanent;
- The original time-out, if the route is not permanent;
- The name of the interface (if known) that will be used for the route;
- An asterisk ("`*`") if the route was added recently and RIP has not yet processed the change

(the asterisk should disappear within 30 seconds, when RIP next considers broadcasting routing information).

Configuration saving saves this information. (Only the routes configured by the "`route`" command are saved or displayed by "`config`".)

Example:

```
DSL> ip route add default 0.0.0.0 192.168.2.3 0:0:0:0
DSL> ip route add testnet1 192.168.101.0 192.168.2.34
DSL> ip route add testnet2 192.168.102.0 192.168.2.34 ff:ff:ff:0 1 60
DSL> ip route
route add testnet2 192.168.102.0 192.168.2.34 ff:ff:ff:00 1 # MAN 58s/1m via
ether *
route add testnet1 192.168.101.0 192.168.2.34 ff:ff:ff:00 1 # MAN via ether
route add default 0.0.0.0 192.168.2.3 00:00:00:00 1 # MAN via ether
```

28. routeflush

Syntax:

`routeflush [<i/f>] [all]`

Description:

Removes routes from the route table. If "`<i/f>`" is specified, only routes through the named interface are removed. If "`all`" is not specified, only host routes (those with a mask of ff:ff:ff:ff) are removed. The "`routeflush`" command is "`hidden`", not shown by "`ip help`".

Configuration saving saves this information.

Example:

```
DSL> ip routeflush ether all
DSL> ip routeflush
```

29. routes

Syntax:

`routes`

Description:

Lists routes. (The same as "`route`", with no parameters.)

30. stats

Syntax:

```
stats arp|icmp|ip|tcp|udp [reset]
stats help [<cmd>|all]
```

Description:

Displays or clears a subset of IP statistics.

Example:

```
DSL> ip stats udp
ip: UDP receptions delivered to users: 0
ip: UDP receptions with no users: 170
ip: Otherwise discarded UDP receptions: 0
ip: Transmitted UDP packets: 35
DSL> ip stats udp reset
DSL> ip stats udp
ip: UDP receptions delivered to users: 0
ip: UDP receptions with no users: 0
ip: Otherwise discarded UDP receptions: 0
ip: Transmitted UDP packets: 0
```

31. subnet

Syntax:

`subnet`

```
subnet add <name> <i/f> <IP address> <mask>
subnet delete <name>
subnet flush
```

Description:

Lists defined subnets; defines a subnet; deletes a subnet definition; or deletes all subnet definitions.

"<name>" is a label, that can be specified by "subnet add" and later used by "subnet delete" to delete the subnet.

"<i/f>" is not used, but is present for historical reasons and must be specified as either "." or a valid interface name.

"<IP address>" is the IP address of the subnet being defined (only those bits of "<dest>" corresponding to bits set in "<mask>" are relevant).

"<mask>" is the subnet mask of the subnet being defined, specified as four hexadecimal numbers separated by colons.

A subnet is defined automatically for each interface, with a name formed by appending ".home" to the device name. The only significant use for the "subnet" command is to change the masks for these automatic subnets, if the default masks (see "device" command) are not correct. (Subnet definitions for other subnets *can* also be useful in conjunction with RIP version 1, which does not communicate subnet masks, but this is not very common.)

Configuration saving saves this information.

Example:

```
DSL> ip device
# type dev file IP address
device ether ether //nice mtu 1500 192.168.2.1
device vlane ether //lane mtu 1500 192.168.55.1
DSL> ip subnet
subnet vlane.home . 192.168.55.0 ff:ff:ff:00 vlane
subnet ether.home . 192.168.2.0 ff:ff:ff:00 ether
DSL> ip subnet add vlane.home . 192.168.55.1 ff:ff:fc:0
DSL> ip subnet
subnet vlane.home . 192.168.52.0 ff:ff:fc:00 vlane
subnet ether.home . 192.168.2.0 ff:ff:ff:00 ether
```

Commands for NAT process

1. ip nat

Syntax:

`ip nat add|delete <i/f name>`

Description:

This command adds or removes NAT functionality from the named interface. The interface name is the name as listed by the `ip device` command. NAT should always be enabled only on the interface connecting to the public network, not the interface connecting to the private network.

Example:

> **`ip nat add ppp_device`**

2. nat interfaces

Syntax:

`nat interfaces`

Description:

The `nat interfaces` command displays the IP router ports on which NAT is currently enabled. For each of these, a status and IP address is listed. The IP address is discovered automatically from the IP stack. The status shows the user whether NAT is currently operational on that interface ("`enabled`"), or whether NAT is still waiting to find out the interface's IP address ("`not ready`").

Example:

> **nat interfaces**

```
Name Status IP address
ethernet enabled 194.129.40.2
ppp not ready
```

3. nat inbound

Syntax:

```
nat inbound list
nat inbound add <i/f> <port>/<proto> <new IP> [quiet]
nat inbound delete <#>
nat inbound flush
```

Description:

This command enables the user to list or to set up a series of rules, to determine what happens to incoming traffic. By default all incoming packets, other that packets arriving in response to outgoing traffic will be rejected.

The `nat inbound add` command allows packets arriving on a specific port and IP protocol to be forwarded to a machine on the private network. `<i/f>` is an interface name as shown by the `nat interface list` command; `<port>` is the destination UDP or TCP port number to match in the incoming traffic; `<proto>` is the IP protocol, either "udp" or "tcp"; `<new IP>` is the new IP address on the private network which the packet's destination IP address should be translated to. If a rule is added for an interface on which NAT is not enabled, the rule is added anyway but a warning is printed to alert the user to this fact. `quiet` is a special option which should not normally be issued at the console, and causes this warning to be suppressed. The `quiet` option is automatically added by NAT to when writing its configuration to flash; this is because when a system boots, the NAT process reads in these rules before IP has registered any interfaces

`nat inbound list` shows the current rules for inbound traffic, including all the arguments passed to the `nat inbound add` command.

`nat inbound delete` removes a rule, where <#> is the rule number as shown by the `nat inbound list` command.

`nat inbound flush` removes all the rules.

Example:

```
> nat inbound add ppp_device 80/TCP 192.168.219.38
> nat inbound list
# Interface Port/Proto New IP address
1 ppp_device 80/tcp 192.168.219.38
2 r1483 21/tcp 192.168.219.40
> nat inbound delete 2
```

4. nat info

Syntax:

```
nat info
```

Description:

This command displays the values of various parameters, which are defined in the module file, for example the session table size and the session timeouts. NAT's current memory usage is also displayed.

Example:

```
> nat info
Interface table size 1 (116 bytes)
Session table size per interface: 128 (6656 bytes)
Total: 6656 bytes
```

```
Hash table size per interface: 128 (512 bytes)
Total: 512 bytes
Fragment table size per interface: 32 (640 bytes)
Total: 640 bytes
Max queued buffers: 16
Fragment timeout: 30
Support for incoming fragments: enabled
Support for outgoing fragments: enabled
Session timeouts:
ICMP query: 10
UDP: 30
TCP (established): 300
TCP (other): 15
Initial port number: 10000
```

5. nat protocol

Syntax:

```
nat protocols
```

Description:

The `nat protocols` command lists the application level gateways (ALGs) provided in the current image in order to support particular higher-level protocols, and the port or ports, which each ALG monitors

Example

```
> nat protocols
Name Port/IP protocol
ftp 21/tcp
```

6. nat sessions

Syntax:

```
nat sessions <i/f> [all | summary]
```

Description:

The `nat sessions` command displays a list of currently active NAT sessions on the interface **<i/f>**. In this context, a session is a pair of source IP addresses and port numbers (and corresponding new port number) that NAT regards as one side of an active connection. For each TCP or UDP session active, the source and destination IP address and port number, and the local port number and the age of the session, are printed.

The `all` option causes the `sessions` command to print out information on every session, including sessions, which have timed out. Normally the `sessions` command only shows active sessions (those which have not timed out). The `summary` command does not

show detailed information on each session, but only prints out the total number of active, timed out and available sessions.

Example:

```
> nat sessions ppp
Proto Age NAT port Private address/port Public address/port
TCP 34 1024 192.168.219.38/3562 194.129.50.6/21
TCP 10 1025 192.168.219.64/2135 185.45.30.30/80
Total:
2 sessions active
101 sessions timed out
126 sessions available
```

7. nat stats

Syntax:

```
nat stats <i/f> [reset]
```

Description:

This command displays various statistics gathered by NAT on the interface **<i/f>**. These are cumulative totals since power on, or since the `reset` keyword was given. The `nat stats` command does not provide the total number of packets or bytes transferred, as this information is normally available from the device driver on the interface which NAT is filtering.

Example:

```
> nat stats ppp_device
Outgoing TCP sessions created: 456
Outgoing UDP sessions created: 123
Outgoing ICMP query sessions: 12
Outgoing ICMP errors: 0
Incoming ICMP errors: 6
Incoming connections refused: 2
Sessions deleted early: 0
Fragments currently queued: 0
```

Commands for PPP process

1. Console object types

The **ppp** process presents its setup in terms of a number of distinct object types:

The upper limit on the number of each of these objects permitted in a system is configured using the '`config resource`' console command. The current state of each object is saved by '`config save`'.

1.1 Channels

The **ppp** process provides a number of PPP connection *channel*s. A channel is a single PPP connection. Channels are numbered from 1. Many **ppp** console commands affect only a single channel. The command is prefixed with the channel number.

1.2 Users

A *user* is a user name and password. All users must have distinct names. The user console command controls these.

1.3 Interfaces

An interface is an internal MAC (Ethernet) device. PPP channels must be associated with an interface to be involved with bridging or routing.

1.4 Interface 1 and Channel 1

Interface 1 has some special functions associated with it, allowing dynamic IP address assignment to be performed. Channel 1 is by default associated with Interface 1 These two should be used only for IP dial-out functions, and for this function should be attached to the router interface named '`ppp_device`'.

2. <channel> clear

Syntax:

```
<channel> clear
```

Description:

Clear all aspects of this channel back to their default settings. If there is an active connection it is torn down.

3. <channel> disable

Syntax:

```
<channel> disable
```

Description:

Clear the enable flag for a PPP channel. This is the default setting. Disabling does not remove other configured information about this channel. In the PPP state machine, this sets the PPP link to '`closed`'. If it is already closed, there is no effect.

Configuration saving saves this information. By default all channels are disabled.

4. <channel> discard

Syntax:

```
<channel> discard [<size>]
```

Description:

Discard is a PPP LCP packet type, which is like the Echo packet type but does not generate a return. This can be used for more careful tests of data transfer on the link, for instance at sizes near the negotiated MRU. This command sends an LCP Discard packet, of the specified size. If no size is given, a minimal sized packet is sent. Arrival of a Discard packet is logged locally as a level 2 event. The link must be up and operational in order to do the discard test.

5. <channel> echo

Syntax:

```
<channel> echo [<size>]
```

Description:

Echo is an LCP packet, which is used to test an established PPP link. It solicits a ping-like reply from the far end. This command sends an LCP Echo packet, of the specified size. If no size is given, a minimal sized packet is sent. If a size greater than the remote Maximum Receive Unit size is specified, the value is reduced to the remote MRU before sending. The command waits for 1 second for a reply packet to arrive, and prints whether the reply arrived. If a reply arrives subsequent to this, it is logged as a level 2 event. The link must be up and operational in order to do the echo test. See also the discard test.

6. <channel> echo every

Syntax:

`<channel> echo every <seconds>`

Description:

Echo is an LCP packet, which is used to test an established PPP link. It solicits a ping-like reply from the far end. This command sets a channel to confirm the continued presence of an open PPP connection by sending an LCP echo every few seconds, and requiring an echo reply. The number of seconds between echo requests is specified as a parameter. If 0 is specified, the function is disabled. Use the info all command to read the current state on a channel. Configuration saving saves this information. By default the function is disabled.

7. <channel> enable

Syntax:

`<channel> enable`

Description:

Set the enable flag for a PPP channel. By default this is disabled.
In the PPP state machine, this flag sets the PPP link to 'open'. If it is already open, there is no effect.
Configuration saving saves this information. By default all channels are disabled.

8. <channel> hdlc

Syntax:

`<channel> hdlc [1|0]`

Description:

If 1, use an HDLC header on the front of transmitted packets and require one on received ones. This consists of two bytes, FF-03, and assists in interoperability with some other (non-standard) implementations. If 0, disable this. Call with no argument to find the current setting.
The default value is 0 (disabled). Configuration saving saves this information.
If not set, and a packet is received with an HDLC header, the channel goes into a 'learned HDLC' mode and sends packets with the HDLC header. Thus, interoperation with HDLC-using equipment should not normally require any configuration. Learning occurs in this direction only. Setting `hdlc` to 0 clears this learned state.

Configuration saving does not save the learned state.

9. <channel> info

Syntax:

```
<channel> info [all]
```

Description:

Provide information about the current settings of this channel. This includes all configured state, and also current protocol information. Specifying 'all' prints out more information. info and status are synonyms.

10. <channel> interface

Syntax:

```
<channel> interface <n>
```

Description:

Logically associate the specified channel with the specified interface. Interface 1 is always the router port. It should be used for any PPP channel over which IPCP communication with the local system's IP router is desired. Other interfaces can be created for bridging. A single PPP channel can only be associated with a single interface, or a single tunnel. Use info to find the current setting.

Calling with n=0 removes any association. This is the default state. Configuration saving saves this information.

11. <channel> lcpmaxconfigure

Syntax:

```
<channel> lcpmaxconfigure [<n>]
```

Description:

Set the Max-Configure parameter for LCP. This is the maximum number of Configure Requests that will be sent without reply, before assuming that the peer is unable to respond. Call with no argument to find the current setting.

The default value is 10. Configuration saving saves this information

12. <channel> lcpmaxfailure

Syntax:

```
<channel> lcpmaxfailure [<n>]
```

Description:

Set the Max-Failure parameter for LCP. This is the maximum number of consecutive Configure Naks that will be sent before assuming that

parameter negotiation is not converging. Call with no argument to find the current setting.
The default value is 5. Configuration saving saves this information.

13. <channel> lcpmaxterminate

Syntax:

```
<channel> lcpmaxterminate [<n>]
```

Description:

Set the Max-Terminate parameter for LCP. This is the maximum number of Terminate Requests that will be sent without reply, before assuming that the peer is unable to respond. Call with no argument to find the current setting.
The default value is 2. Configuration saving saves this information.

14. <channel> llc

Syntax:

```
<channel> llc [1|0]
```

Description:

If 1, use an LLC header on the front of transmitted packets and require one on received ones. This consists of four bytes, FE-FE-03-CF, and is required for PPP Over AAL5 (RFC 2364 p4) when using LLC encapsulated PPP. If 0, disable this. Call with no argument to find the current setting.
The default value is 0 (disabled). Configuration saving saves this information.
If not set, and a packet is received with an LLC header, the channel goes into a 'learned LLC' mode and sends packets with the LLC header. Thus, interoperation with LLC-using equipment should not normally require any configuration. Learning occurs in this direction only. Setting `hdlc` to 0 clears this learned state.
Configuration saving does not save the learned state.

15. <channel> pvc

Syntax:

```
<channel> pvc [[<port>] <vpi>] <vci> [ip|mac] [listen]
<channel> pvc none
```

Description:

Attach an ATM PVC to the given PPP channel. The port can be specified (only for a multi-port device), and the VPI (default is 0), and the VCI. The allowable range of port, VPI, VCI depends on the ATM

driver. Normal limits are 0 only for port, 0 only for VPI, 1..1023 for VCI. If a single argument none is supplied, any current connection is torn down. This is equivalent to svc none on the channel. In the PPP state machine, providing a link of this form causes the link to be 'up'. Note that enable must also be used, to allow the link to become operational. The ip or mac indicates which form of data is transported over the connection: one of IP data (controlled by the IPCP protocol), or MAC data (for BCP). If neither is provided, ip is assumed. If the channel is not linked to an interface, and the channel is for IP data, the channel is linked to interface 1. If the channel is not linked to an interface, and the channel is for MAC data, the channel is linked to interface 2. Providing a PVC setting unsets any SVC setting. See the svc command. It is possible for a PVC to become 'down' in the PPP state machine even though the PVC is still there, for instance due to an authentication failure. If in this state, an incoming packet will cause the PPP state machine to go 'up'. If listen is specified then this is the server end of a PVC. It will not send out PPP Configure Requests until it first receives a packet over the PVC. When a connection is torn down it goes returns to this state. Use the info command to read this information.

Configuration saving saves this information. By default a channel has no connection information.

Example:

```
> ppp 3 pvc 3 32          ;set channel 3 to be (VPI=3,VCI=32)
> ppp 4 pvc               ;read PVC settings for channel 4
> ppp 5 pvc 0             ;remove any PVC settings from
                           channel 5
```

16. <channel> qos

Syntax:

```
<channel> qos [cbr|ubr] [pcr <pcr-tx> [<pcr-rx>]]
```

Description:

Specify that the VC for a PPP channel should be Constant Bit Rate or Unspecified Bit Rate, and (optionally for UBR) give a Peak Cell Rate for the connection. If two values are specified then they are transmit and receive PCRs respectively. If called while not attached to a VC then the settings are saved for use when a VC is created. If the channel is already attached to a VC then it is closed, and re-opened with the new values. If it cannot be reopened, it remains closed.

Configuration saving saves this information. By default channels are

established UBR.

Example:

```
> ppp 3 qos cbr pcr 10000  ;set channel 3 to be CBR limited
                             at 10000 cells/sec
```

17. <channel> remoteip

Syntax:

```
<channel> remoteip [<ipaddress>]
```

Description:

If a PPP link is established using IPCP, this call causes the channel to provide the given IP address to the remote end of the connection. PPP will refuse to complete the connection if the other end will not accept this. This is normally used for channels on which the remote party dials in, to allocate the IP address to that remote party. Call with no argument to find the current setting.

Call with 0.0.0.0 to remove any setting. This is the default state. Configuration saving saves this information.

18. <channel> svc

Syntax:

```
<channel> svc listen [ip|mac]
<channel> svc addr <addr> [ip|mac]
<channel> svc none
```

Description:

Specify that the VC for a PPP channel should be an SVC (i.e. created by signaling). This can either be by listening for an incoming call, or by making an outgoing call to a specified ATM address.

The outgoing call or listen occurs immediately. If the call fails it will be retried after a few seconds. In the PPP state machine, providing a connection of this form causes the channel to be 'up' or 'down'. Note that `enable` must also be used, to allow the link to become operational. Outgoing and incoming UNI signaling calls are identified by a BLLI value that identifies PPP. (Aside: A BLLI of length 3 bytes is used, hex values 6B, 78. C0.) If the channel is already attached to an SVC or PVC then it is closed, and re-opened with the new settings. If it cannot, it remains closed. If a single argument `none` is supplied, any current connection is torn down. This is equivalent to `pvc none` on the channel. The `ip` or `mac` indicates which form of data is transported over the connection: one of IP data (controlled by the IPCP protocol), or MAC data (for BCP). If neither is provided, `ip` is

assumed. Providing an SVC setting unsets any PVC setting. See the pvc command.

Configuration saving saves this information. By default a channel has no connection information.

Example:

```
> ppp 3 svc 47.00.83.01.03.00.00.00.00.00.00.00.00.00.20.2b.00.03.0b.00
> ppp 4 svc listen          ;listen for incoming call
> ppp 7 svc none            ;tear down connection, remove setting
```

19. <channel> theylogin

Syntax:

```
<channel> theylogin pap|chap|none
```

Description:

This command describes how we require the far end to log in on this channel. Requiring the other end to log in most frequently happens when they dial us (rather than the other way round), so this is likely to be one of several channels which are set using `svc listen`. Because of this, exact names and passwords are not attached to individual channels but are matched to particular users, as defined using the `user` command. This command specifies that when using this channel, the user must log on using the specified protocol, and that they must provide any name/password combination which has been defined for that protocol, using the `user` command. To remove this information on a channel, call `theylogin` with a single argument of `none`.

Configuration saving saves this information. By default no login is required.

20. <channel> welogin

Syntax:

```
<channel> welogin <name> <password> [pap|chap]
<channel> welogin none
```

Description:

This command describes how we should log in to the far end when a connection is established.

A name and password are supplied, and whether these should be used with the PAP or CHAP authentication protocol. CHAP is the default. To remove this information on a channel, call `welogin` with a single argument of `none`. If `chap` is specified, we will also log in using `pap` if the other end prefers this. If `pap` is specified we will only log in using `pap`.

Configuration saving saves this information. By default no login is performed.

21. bcp

Syntax:

`bcp stp|nostp`

Description:

This command describes parameters for BCP, the Bridge Control Protocol, which is used to transport MAC (Ethernet) packets over the PPP link. See the protocol conformance section of this spec for BCP option settings which are not controllable. If `stp` is specified, the Spanning Tree Protocol is in use by the Bridges, to control bridge loops. In this case STP frames should be carried over any links using BCP. If `nostp` is specified, STP frames should not be carried. Configuration saving saves this information. By default STP is not supported.

22. interface <n> localip

Syntax:

`interface <n> localip <address>`

Description:

This command describes parameters for IPCP, the IP Control Protocol, when providing the server end of an IPCP connection. The server knows its own IP address (and may allocate an IP address to the remote end). This command tells the PPP process, for a particular interface, the local IP address to be associated with the local end.
For interface 1, this should be the same IP address as possessed by the device `ppp_device` in the IP stack. See the IP dial-in server console example, at the start of this section. If PPP channels are now associated with this interface, remote users can dial in to those channels and will be connected to the IP stack. They can be allocated IP addresses, see the command `<channel> remoteip`.
Call with 0.0.0.0 to remove any IP address setting. This is the default state.
Configuration saving saves this information

23. interface <n> stats

Syntax:

```
interface <n> stats
```

Description:

The interface is regarded by the operating system as an Ethernet-like device like other Ethernet devices. It also provides an ifEntry to SNMP providing basic information about traffic through the interface. This command shows the basic information about byte and packet traffic through the interface, in SNMP terms.

24. user

Syntax:

```
user add <name> [pwd <passwd> [pap|chap]]
user [<name>]
user delete <name>|all
```

Description:

This command stores information about a particular login name/password combination. This is referred to as a 'user', regardless of whether it represents an individual. When `user` is called on its own, information about all existing users is listed. When `user <name>` is called with no further arguments, details of that user alone are printed. Passwords are not shown.

Use `user delete` to delete an individual user by name, or to delete all users.

Use `user add <name>` to create a new user or update an existing one. The password is stored, and the authentication protocol which must be used for this user.

If a user is deleted or changed, existing sessions are not affected. Configuration saving saves this information.

Commands for SNMP configuration

1. access

Syntax:

```
access [read | write] <community> [<IP addr>]
access delete <community> [<IP addr>]
access flush
access list
```

Description:

The "`read`" and "`write`" options configure a community name that can be used for read-only or read-write access, respectively. If an IP address is specified, then the community name is valid only for SNMP requests issued from that IP address. (It should be noted that this can be rather weak security, since it is possible for the source address of IP packets to be forged.) The same community name can be configured several times with different IP addresses, to allow access with the same community name from a number of different machines. The number of access records (community names paired with optional IP addresses) that can be configured is limited only by available memory.

The "`delete`" option deletes an access record. The IP address must match exactly; if it is not specified, only a matching access record that has no IP address will be deleted. The "`flush`" option deletes all access records. The "`list`" option lists the access records. Configuration saving saves the access records.

By default, if there are no access records in the `snmpinit` file, no SNMP management is allowed.

Example:

```
DSL> snmp access list
access read public
access write password
DSL> snmp access write xyzzy 192.168.4.73
DSL> snmp access delete password
DSL> snmp access list
access read public
access write xyzzy 192.168.4.73
```

2. config

Syntax:

```
config [save]
```

Description:

Displays the configuration (as from "`access list`" and "`trap list`" together), or saves it to flash memory.

Example:

```
DSL> snmp config
access read public
access write xyzzy 192.168.4.73
trap add public 192.168.4.73 162
```

3. trap

Syntax:

```
trap add <community> <IP addr> [<port>]
trap delete <community> <IP addr> [<port>]
trap flush
trap list
```

Description:

Manipulates the list of destinations to which SNMP traps will be sent. The default UDP port to send traps to is 162, but it may be overridden by specifying `<port>`.

Configuration saving saves the list of trap destinations.

Example:

```
DSL> snmp trap flush
DSL> snmp trap add public 192.168.4.73
DSL> snmp trap add public 192.168.4.74 999
DSL> snmp trap list
trap add public 192.168.4.73 162
trap add public 192.168.4.74 999
```

Commands for DSL process

1. show rate

Syntax:

`Show rate`

Description:

This command displays the channel data of the xDSL link. It will not return any message if xDSL link is not established yet.

2. show defect

Syntax:

`show defect`

Description:

This command displays the defects data of the xDSL link. It will not return any message if xDSL link is not established yet.

3. down

Syntax:

`down`

Description:

Disable xDSL link

4. up

Syntax:

`up`

Description:

Enables xDSL link

5. mode

Syntax:

`mode`

Description:

This command displays the current mode of the xDSL link.

6. mode multi

Syntax:

`mode multi`

Description:

Set multi mode of ADSL link (ADSL Router which supports Annex A

available)

7. mode glite

Syntax:

`mode glite`

Description:

Set G.lite mode of ADSL link (ADSL Router which supports Annex A available)

8. mode gdmt-dbm

Syntax:

`mode gdmt-dbm`

Description:

Set G.dmt DBM mode of ADSL link (ADSL Router which supports Annex C available)

9. mode gdmt-fbm

Syntax:

`mode gdmt-fbm`

Description:

Set G.dmt FDM mode of ADSL link (ADSL Router which supports Annex C available)

10. mode glite-dbm

Syntax:

`mode glite-dbm`

Description:

Set G.lite DBM mode of ADSL link (ADSL Router which supports Annex C available)

11. mode glite-fbm

Syntax:

`mode glite-fbm`

Description:

Set G.Lite FBM mode of ADSL link (ADSL Router which supports Annex C available)

12. mode cpe-ab

Syntax:

`mode cpe-ab`

Description:

Set SHDSL Router to be CPE which supports Annex A, Annex B or auto detection.

13. mode cpe-a

Syntax:

```
mode cpe-a
```

Description:

Set SHDSL Router to be CPE which supports Annex A.

14. mode cpe-b

Syntax:

```
mode cpe-b
```

Description:

Set SHDSL Router to be CPE which supports Annex B.

15. mode co-ab

Syntax:

```
mode co-ab
```

Description:

Set SHDSL Router to be CO side equipment which supports Annex A, Annex B or auto detection.

16. mode co-a

Syntax:

```
mode co-a
```

Description:

Set SHDSL Router to be CO side equipment which supports Annex A.

17. mode co-b

Syntax:

```
mode co-b
```

Description:

Set SHDSL Router to be CO side equipment which supports Annex B.

18. show error

Syntax:

```
show error
```

Description:

This command displays the line data of the xDSL link. It will not return any message if xDSL link is not established yet.

19. show perf

Syntax:

`show perf`

Description:

This command displays the performance counters data of the xDSL link. It will not return any message if xDSL link is not established yet.

20. show id

Syntax:

`show id`

Description:

This command displays the vendor id of local equipment and remote equipment. It will not return any message if xDSL link is not established yet.

Chapter 8 DHCP Server Operation

8.1 DHCP Server overview

This section describes the general operation of the DHCP server.

The DHCP protocol allows a host which is unknown to the network administrator to be automatically assigned a new IP address out of a pool of IP addresses for its network. In order for this to work, the network administrator allocates address pools for each available subnet and enters them into the dhcpd.conf file.

On startup, the DHCP server software reads the dhcpd.conf file and stores a list of available addresses on each subnet. When a client requests an address using the DHCP protocol, the server allocates an address for it. Each client is assigned a lease, which expires after an amount of time chosen by the administrator (by default, 12 hours). Some time before leases expire, the clients to which leases are assigned are expected to renew them in order to continue to use the addresses. Once a lease has expired, the client to which that lease was assigned is no longer permitted to use the leased IP address and must resort back to the DHCPDISCOVER mechanism.

In order to keep track of leases across system reboots and server restarts, the server keeps a list of leases it has assigned in the dhcpd.leases file. This lease file is stored using ISFS, which is in turn committed to flash memory (if available) according to user requirement, via issuing of the "flashfs update" command.

Before a lease is granted to a host, it records the lease in this file. Upon startup, after reading the dhcpd.conf file, the DHCP server reads the

dhcpd.leases file to gain information about which leases have been assigned. New leases are appended to the end of the lease file. In order to prevent the file from becoming arbitrarily large, the server periodically creates a new dhcp.leases file from its in-memory lease database, controlled by the values of DHCP_LEASE_UPDATE_THRESHOLD and DHCP_LEASE_UPDATE_PERIOD. If the system crashes in the middle of this process, only the lease file present in flash memory can be restored. This gives a window of vulnerability whereby leases may be lost.
BOOTP support is also provided by this server. Unlike DHCP, the BOOTP protocol does not provide a protocol for recovering dynamically-assigned addresses once they are no longer needed. It is still possible to dynamically assign addresses to BOOTP clients, but some administrative process for reclaiming addresses is required. By default, leases are granted to BOOTP clients in perpetuity, although the network administrator may set an earlier cut-off date or a shorter lease length for BOOTP leases if that makes sense. BOOTP clients may be served in the old way, which is to provide a declaration in the dhcpd.conf file for each BOOTP client, permanently assigning an address to each client.

8.2 DHCP Server Configuration

This section discusses the required format of the dhcpd.conf file, first as an informal guide to the simpler aspects of server configuration, followed by a more detailed reference section.

8.3 Informal configuration guide

This section provides an overview of the DHCP server configuration process.

8.3.1 Subnets

The DHCP server software needs to know the subnet numbers and net masks of all subnets for which it will be providing service. In addition, in order to dynamically allocate addresses, it must be assigned one or more ranges of addresses on each subnet which it can in turn assign to client hosts as they boot. A very simple configuration providing DHCP support might look like this:

```
subnet 239.252.197.0 netmask 255.255.255.0 {
range 239.252.197.10 239.252.197.250;
}
```

Multiple address ranges may be specified as follows:

```
subnet 239.252.197.0 netmask 255.255.255.0 {
range 239.252.197.10 239.252.197.107;
range 239.252.197.113 239.252.197.250;
}
```

If a subnet will only be provided with BOOTP service and no dynamic address assignment, the range clause can be left out entirely, but the subnet statement must appear.

8.3.2 Lease Length

DHCP leases can be assigned almost any length from zero seconds to infinity. What lease length makes sense for any given subnet, or for any given installation, will vary depending on the kinds of hosts being served. It is possible to specify two lease lengths: the default length that will be assigned if a client does not request a particular lease length, and a maximum lease length. These are specified as clauses to the subnet command:

```
subnet 239.252.197.0 netmask 255.255.255.0 {
range 239.252.197.10 239.252.197.107;
default-lease-time 600;
max-lease-time 7200;
}
```

This subnet declaration specifies a default lease time of 600 seconds (ten minutes), with a maximum lease time of 7200 seconds (two hours). Other common values would be 86400 (one day), 604800 (one week) and 2592000 (30 days)

8.3.3 BOOTP Support

Each BOOTP client must be explicitly declared in the dhcpd.conf file. A very basic client declaration will specify the client network interface's hardware address and the IP address to assign to that client. If the client needs to be able to load a boot file from the server, that file's name must be specified. A simple bootp client declaration might look like this:

```
host haagen {
hardware ethernet 08:00:2b:4c:59:23;
fixed-address 239.252.197.9;
filename "/tftpboot/haagen.boot";
}
```

This would probably require an explicit communication with a TFTP server to actually obtain the named file.

8.3.4 Options

DHCP (and also BOOTP with Vendor Extensions) provide a mechanism whereby the server can provide the client with information about how to configure its network interface (e.g., subnet mask), and also how the client can access various network services (e.g., IP routers). These options can be specified on a per-subnet basis, and, for BOOTP clients, also on a per-client basis. In the event that a BOOTP client declaration specifies options that are also specified in its subnet declaration, the options specified in the client declaration take precedence. A reasonably complete DHCP configuration would take the following form:

```
subnet 239.252.197.0 netmask 255.255.255.0 {
range 239.252.197.10 239.252.197.250;
default-lease-time 600;
max-lease-time 7200;
option subnet-mask 255.255.255.0;
option broadcast-address 239.252.197.255;
option routers 239.252.197.1;
}
```

Note that the DHCP client cannot use all the options given in RFC2132 to actually configure its own IP stack. However, the DHCP server can supply any of the options given there - this could be useful when using, for example, a DHCP server with several Microsoft® DHCP clients.

8.4 Configuration reference guide

The DHCP configuration file, dhcpd.conf, is a free-form ASCII text file. The file may contain extra tabs and newlines for formatting purposes.
Keywords in the file are case-insensitive.
Comments may be placed anywhere within the file (except within quotes).
Comments begin with the # character and end at the end of the line.
The file essentially consists of a list of statements. Statements fall into two broad categories – parameters and declarations.
Parameter statements indicate how to do something (e.g., duration of offered lease), whether to do something (e.g., provision of IP addresses to unknown clients), or what parameters to provide to the client (e.g., use gateway 220.177.244.7).
Declarations are used to describe the topology of the network, to describe clients on the network, to provide addresses that can be assigned to clients, or to apply a group of parameters to a group of declarations. In any group of parameters and declarations, all parameters must be specified before any declarations which depend on those parameters may be specified.

8.4.1 Network topology

Declarations about network topology include the shared-network and the subnet declarations. If clients on a subnet are to be assigned addresses dynamically, a range declaration must appear within the subnet declaration. For clients with statically assigned addresses, or for installations where only known clients will be served, each such client must have a host declaration. If parameters are to be applied to a group of declarations which are not related strictly on a per-subnet basis, the group declaration can be used.

For every subnet which will be served, and for every subnet to which the DHCP server is connected, there must be one subnet declaration, which informs DHCP of the addresses present on that subnet. A subnet declaration is required for each subnet even if no addresses will be dynamically allocated on that subnet.

Some installations have physical networks on which more than one IP subnet operates. For example, if there is a site-wide requirement that 8-bit subnet masks be used, but a department with a single physical ethernet network expands to the point where it has more than 254 nodes, it may be necessary to run two 8-bit subnets on the same ethernet until such time as a new physical network can be added. In this case, the subnet declarations for these two networks may be enclosed in a shared-network declaration. Some sites may have departments which have clients on more than one subnet, but it may be desirable to offer those clients a uniform set of parameters which are different than what would be offered to clients from other departments on the same subnet. For clients which will be declared explicitly with host declarations, these declarations can be enclosed in a group declaration along with the parameters which are common to that department. For clients whose addresses will be dynamically assigned, there is currently no way to group parameter assignments other than by network topology. When a client is to be booted, its boot parameters are determined by first consulting that client's host declaration (if any), then consulting the group declaration (if any) which enclosed that host declaration, then consulting the subnet declaration for the subnet on which the client is booting, then consulting the shared-network declaration (if any) containing that subnet, and finally consulting the top-level parameters which may be specified outside of any declaration. When DHCP tries to find a host declaration for a client, it first looks for a host declaration which has a fixed-address parameter which matches the subnet or shared network

on which the client is booting. If it doesn't find any such entry, it then tries to find an entry which has no fixed-address parameter. If no such entry is found, then DHCP acts as if there is no entry in the dhcpd.conf file for that client, even if there is an entry for that client on a different subnet or shared network.

8.4.2 Declarations

Subnet

```
subnet subnet-number netmask netmask {
[ parameters ]
[ declarations ]
}
```

The subnet statement is used to provide the DHCP server with enough information to determine whether or not an IP address is on that subnet. It may also be used to provide subnet-specific parameters and to specify what addresses may be dynamically allocated to clients booting on that subnet. Such addresses are specified using the range declaration.
subnet-number should be an IP address which resolves to the subnet number of the subnet being described. The netmask should be an IP address which resolves to the subnet mask of the subnet being described. The subnet number, together with the subnet mask, are sufficient to determine whether any given IP address is on the specified subnet.
Although a subnet mask must be given with every subnet declaration, it is recommended that if there is any variance in subnet masks at a site, a subnet-mask option statement be used in each subnet declaration to set the desired subnet mask; any subnet-mask option statement will override the subnet mask declared in the subnet statement.

Range

```
range [ dynamic-bootp ] low-address [ high-address ];
```

For any subnet on which addresses will be assigned dynamically, there must be at least one range statement. The range statement gives the lowest and highest IP addresses in a range. All IP addresses in the range should be in the subnet in which the range statement is declared. The dynamic-bootp flag may be specified if addresses in the specified range may be dynamically assigned to BOOTP clients as well as DHCP clients. When specifying a single address, high-address can be omitted.

Host

host hostname {
[parameters]
[declarations]
}

There must be at least one host statement for every BOOTP client that is to be served. Host statements may also be specified for DHCP clients, although this is not required unless booting is only enabled for known hosts. If it is desirable to be able to boot a DHCP or BOOTP client on more than one subnet with fixed addresses, more than one address may be specified in the fixed-address parameter, or more than one host statement may be specified. If client-specific boot parameters must change based on the network to which the client is attached, then multiple host statements should be used. If a client is to be booted using a fixed address if it's possible, but should be allocated a dynamic address otherwise, then a host statement must be specified without a fixed-address clause. hostname should be a name identifying the host. If a hostname option is not specified for the host, hostname is used. Host declarations are matched to actual DHCP or BOOTP clients by matching the dhcp-client-identifier option specified in the host declaration to the one supplied by the client, or, if the host declaration or the client does not provide a dhcp-client-identifier option, by matching the hardware parameter in the host declaration to the network hardware address supplied by the client. BOOTP clients do not normally provide a dhcp-client-identifier, so the hardware address must be used for all clients that may boot using the BOOTP protocol.

Group

group { [parameters] [declarations] }

The group statement is used simply to apply one or more parameters to a group of declarations.
It can be used to group hosts, shared networks, subnets, or even other groups.

8.4.3 ALLOW and DENY

The allow and deny statements can be used to control the behaviour of the DHCP server in response to various sorts of requests.

unknown-clients

allow unknown-clients;

deny unknown-clients;

The unknown-clients flag is used to tell the DHCP server whether or not to dynamically assign addresses to unknown clients. Dynamic address assignment to unknown clients is allowed by default.

bootp

allow bootp;
deny bootp;

The bootp flag is used to tell the DHCP server whether or not to respond to BOOTP queries. BOOTP queries are allowed by default.

booting

allow booting;
deny booting;

The booting flag is used to inform the DHCP server whether or not to respond to queries from a particular client. This keyword only has meaning when it appears in a host declaration. By default, booting is allowed, but if it is disabled for a particular client, then that client will not be able to get and address from the DHCP server.

8.4.4 Parameters

default-lease-time

default-lease-time time;

Time should be the length in seconds that will be assigned to a lease if the client requesting the lease does not ask for a specific expiration time.

max-lease-time

max-lease-time time;

Time should be the maximum length in seconds that will be assigned to a lease if the client requesting the lease asks for a specific expiration time.

hardware

hardware hardware-type hardware-address;

In order for a BOOTP client to be recognized, its network hardware address must be declared using a hardware clause in the host statement. hardware-type must be the name of a physical hardware interface type. Currently, only the ethernet and token-ring types are recognized. The hardware-address should be a set of hexadecimal octets (numbers from 0 through ff) separated by colons. The hardware statement may also be used

for DHCP clients.

filename

filename " filename";

The filename statement can be used to specify the name of the initial boot file which is to be loaded by a client. The filename should be a filename recognizable to whatever file transfer protocol the client can be expected to use to load the file.

server-name

server-name " name";

The server-name statement can be used to inform the client of the name of the server from which it is booting. Name should be the name that will be provided to the client.

next-server

next-server server-name;

The next-server statement is used to specify the host address of the server from which the initial boot file (specified in the filename statement) is to be loaded. Server-name should be a numeric IP address or a domain name. If no next-server parameter applies to a given client, the DHCP server's IP address is used.

fixed-address

fixed-address IP-address [, IP-address ...];

The fixed-address statement is used to assign one or more fixed IP addresses to a client. It should only appear in a host declaration. If more than one address is supplied, then when the client boots, it will be assigned the address which corresponds to the network on which it is booting. If none of the addresses in the fixed-address statement are on the network on which the client is booting, that client will not match the host declaration containing that fixed-address statement.

dynamic-bootp-lease-cutoff

dynamic-bootp-lease-cutoff date;

The dynamic-bootp-lease-cutoff statement sets the ending time for all leases assigned dynamically to BOOTP clients. Since BOOTP clients have no way of renewing leases, and do not know that their leases could expire, the DHCP server assigns infinite leases to BOOTP clients. However, it may make sense in some situations to set a cut-off date for all BOOTP leases.

Date should be the date on which all assigned BOOTP leases will end. The date is specified in the form

W YYYY/MM/DD HH:MM:SS

W is the day of the week expressed as a number from zero (Sunday) to six (Saturday). YYYY is the year, including the century. MM is the month expressed as a number from 1 to 12. DD is the day of the month, counting from 1. HH is the hour, from zero to 23. MM is the minute and SS is the second. The time is assumed to be in Greenwich Mean Time (GMT), not local time.

If the system upon which DHCP will be operating does not support a real-time clock, then care should be taken to specify a date which is 1, January, 1970 (i.e. start of UNIX time) offset by the required BOOTP lease duration. Clients and server(s) must agree on a common time and date (even if just from start of UNIX time), otherwise this will not work correctly. If clients and servers cannot be guaranteed to share a common notion of time and date, use dynamic-bootp-lease-length instead.

dynamic-bootp-lease-length

dynamic-bootp-lease-length length;

The dynamic-bootp-lease-length statement is used to set the length of leases dynamically assigned to BOOTP clients. At some sites, it may be possible to assume that a lease is no longer in use if its holder has not used BOOTP or DHCP to get its address within a certain time period. The period is specified in length as a number of seconds. If a client reboots using BOOTP during the timeout period, the lease duration is reset to length, so a BOOTP client that boots frequently enough will never lose its lease. Needless to say, this parameter should be adjusted with extreme caution.

use-host-decl-names

use-host-decl-names flag;

If the use-host-decl-names parameter is true in a given scope, then for every host declaration within that scope, the name provided for the host declaration will be supplied to the client as its hostname. For example:

```
group {
        use-host-decl-names on;
        host joe {
                hardware ethernet 08:00:2b:4c:29:32;
                fixed-address joe.fugue.com;
        }
}
```

is equivalent to

```
host joe {
        hardware ethernet 08:00:2b:4c:29:32;
        fixed-address joe.fugue.com;
        option host-name "joe";
}
```

An option host-name statement within a host declaration will override the use of the name in the host declaration.

server-identifier

server-identifier hostname;

The server-identifier statement can be used to define the value that is sent in the DHCP Server Identifier option for a given scope. The value specified **must** be an IP address for the DHCP server, and must be reachable by all clients served by a particular scope. The use of the server-identifier statement is not recommended - the only reason to use it is to force a value other than the default value to be sent on occasions where the default value would be incorrect. The default value is the first IP address associated with the physical network interface on which the request arrived. The usual case where the server-identifier statement needs to be sent is when a physical interface has more than one IP address, and the one being sent by default is not appropriate for some or all clients served by that interface.

8.4.5 Option statements

The DHCP server can supply values for all options given in RFC2132, including those which the DHCP client cannot use for configuration (this is to allow option support on, for example, Microsoft clients, which should support a much wider range of configuration options). The available options are as follows.

option subnet-mask ip-address;

The subnet mask option specifies the client's subnet mask as per RFC 950. If no subnet mask option is provided anywhere in scope, DHCP will use the subnet mask from the subnet declaration for the network on which an address is being assigned. However, any subnet-mask option declaration that is in scope for the address being assigned will override the subnet mask specified in the subnet declaration.

option time-offset int32;

The time-offset option specifies the offset of the client's subnet in seconds from Coordinated Universal Time (UTC).

option routers ip-address [, ip-address ...];

The routers option specifies a list of IP addresses for routers on the client's subnet. Routers should be listed in order of preference.

option time-servers ip-address [, ip-address ...];

The time-server option specifies a list of RFC 868 time servers available to the client. Servers should be listed in order of preference.

option ien116-name-servers ip-address [, ip-address ...];

The ien116-name-servers option specifies a list of IEN 116 name servers available to the client. Servers should be listed in order of preference.

option domain-name-servers ip-address [, ip-address ...];

The domain-name-servers option specifies a list of Domain Name System (STD 13, RFC 1035) name servers available to the client. Servers should be listed in order of preference.

option log-servers ip-address [, ip-address ...];

The log-server option specifies a list of MIT-LCS UDP log servers available to the client. Servers should be listed in order of preference.

option cookie-servers ip-address [, ip-address ...];

The cookie server option specifies a list of RFC 865 cookie servers available to the client. Servers should be listed in order of preference.

option lpr-servers ip-address [, ip-address ...];

The LPR server option specifies a list of RFC 1179 line printer servers available to the client. Servers should be listed in order of preference.

option impress-servers ip-address [, ip-address ...];

The impress-server option specifies a list of Imagen Impress servers available to the client. Servers should be listed in order of preference.

option resource-location-servers ip-address [, ip-address ...];

This option specifies a list of RFC 887 Resource Location servers available to the client. Servers should be listed in order of preference.

option host-name string;

This option specifies the name of the client. The name may or may not be qualified with the local domain name (it is preferable to use the domain-name option to specify the domain name). See RFC 1035 for character set restrictions.

option boot-size uint16;

This option specifies the length in 512-octet blocks of the default boot image for the client.

option merit-dump string;

This option specifies the path-name of a file to which the client's core image should be dumped in the event the client crashes. The path is formatted as a character string consisting of characters from the NVT ASCII character set.

option domain-name string;

This option specifies the domain name that client should use when resolving hostnames via the Domain Name System

option swap-server ip-address;

This specifies the IP address of the client's swap server.

option root-path string;

This option specifies the path-name that contains the client's root disk. The path is formatted as a character string consisting of characters from the NVT ASCII character set.

option ip-forwarding flag;

This option specifies whether the client should configure its IP layer for packet forwarding. A value of 0 means disable IP forwarding, and a value of 1 means enable IP forwarding.

option non-local-source-routing flag;

This option specifies whether the client should configure its IP layer to allow forwarding of datagrams with non-local source routes. A value of 0 means disallow forwarding of such datagrams, and a value of 1 means allow forwarding.

option policy-filter ip-address ip-address [, ip-address ip-address ...];

This option specifies policy filters for non-local source routing. The filters consist of a list of IP addresses and masks which specify destination / mask pairs with which to filter incoming source routes. Any source routed datagram whose next-hop address does not match one of the filters should be discarded by the client.

option max-dgram-reassembly uint16;

This option specifies the maximum size datagram that the client should be prepared to reassemble. The minimum value legal value is 576.

option default-ip-ttl uint8;

This option specifies the default time-to-live that the client should use on outgoing datagrams.

option path-mtu-aging-timeout uint32;

This option specifies the timeout (in seconds) to use when ageing Path MTU values discovered by the mechanism defined in RFC 1191.

option path-mtu-plateau-table uint16 [, uint16 ...];

This option specifies a table of MTU sizes to use when performing Path MTU Discovery as defined in RFC 1191. The table is formatted as a list of 16-bit unsigned integers, ordered from smallest to largest. The minimum MTU value cannot be smaller than 68.

option interface-mtu uint16;

This option specifies the MTU to use on this interface. The minimum legal value for the MTU is 68.

option all-subnets-local flag;

This option specifies whether or not the client may assume that all subnets of the IP network to which the client is connected use the same MTU as the subnet of that network to which the client is directly connected. A value of 1 indicates that all subnets share the same MTU. A value of 0 means that the client should assume that some subnets of the directly connected network may have smaller MTUs.

option broadcast-address ip-address;

This option specifies the broadcast address in use on the client's

subnet..

option perform-mask-discovery flag;

This option specifies whether or not the client should perform subnet mask discovery using ICMP. A value of 0 indicates that the client should not perform mask discovery. A value of 1 means that the client should perform mask discovery.

option mask-supplier flag;

This option specifies whether or not the client should respond to subnet mask requests using ICMP. A value of 0 indicates that the client should not respond. A value of 1 means that the client should respond.

option router-discovery flag;

This option specifies whether or not the client should solicit routers using the Router Discovery mechanism defined in RFC 1256. A value of 0 indicates that the client should not perform router discovery. A value of 1 means that the client should perform router discovery.

option router-solicitation-address ip-address;

This option specifies the address to which the client should transmit router solicitation requests.

option static-routes ip-address ip-address [, ip-address ip-address...];

This option specifies a list of static routes that the client should install in its routing cache. If multiple routes to the same destination are specified, they are listed in descending order of priority. The routes consist of a list of IP address pairs. The first address is the destination address, and the second address is the router for the destination. The default route (0.0.0.0) is an illegal destination for a static route. To specify the default route, use the routers option.

option trailer-encapsulation flag;

This option specifies whether or not the client should negotiate the use of trailers (RFC 893 [14]) when using the ARP protocol. A value of 0 indicates that the client should not attempt to use trailers. A value of 1 means that the client should attempt to use trailers.

option arp-cache-timeout uint32;

This option specifies the timeout in seconds for ARP cache entries

option ieee802-3-encapsulation flag;

This option specifies whether or not the client should use Ethernet Version 2 (RFC 894) or IEEE 802.3 (RFC 1042) encapsulation if the interface is an Ethernet. A value of 0 indicates that the client should use RFC 894 encapsulation. A value of 1 means that the client should use RFC 1042 encapsulation.

option default-tcp-ttl uint8;

This option specifies the default TTL that the client should use when sending TCP segments. The minimum value is 1.

option tcp-keepalive-interval uint32;

This option specifies the interval (in seconds) that the client TCP should wait before sending a keep-alive message on a TCP connection. The time is specified as a 32-bit unsigned integer. A value of zero indicates that the client should not generate keep-alive messages on connections unless specifically requested by an application.

option tcp-keepalive-garbage flag;

This option specifies the whether or not the client should send TCP keep-alive messages with a octet of garbage for compatibility with older implementations. A value of 0 indicates that a garbage octet should not be sent. A value of 1 indicates that a garbage octet should be sent.

option nis-domain string;

This option specifies the name of the client's NIS (Sun Network Information Services) domain. The domain is formatted as a character string consisting of characters from the NVT ASCII character set.

option nis-servers ip-address [, ip-address ...];

This option specifies a list of IP addresses indicating NIS servers available to the client. Servers should be listed in order of preference.

option ntp-servers ip-address [, ip-address ...];

This option specifies a list of IP addresses indicating NTP (RFC 1035) servers available to the client. Servers should be listed in order of

preference.

option netbios-name-servers ip-address [, ip-address ...];
The NetBIOS name server (NBNS) option specifies a list of RFC 1001/1002 NBNS name servers listed in order of preference.

option netbios-dd-server ip-address [, ip-address ...];
The NetBIOS datagram distribution server (NBDD) option specifies a list of RFC 1001/1002 NBDD servers listed in order of preference.

option netbios-node-type uint8;
The NetBIOS node type option allows NetBIOS over TCP/IP clients which are configurable to be configured as described in RFC 1001/1002. The value is specified as a single octet which identifies the client type. A value of 1 corresponds to a NetBIOS B-node; a value of 2 corresponds to a P-node; a value of 4 corresponds to an M-node; a value of 8 corresponds to an H-node.

option netbios-scope string;
The NetBIOS scope option specifies the NetBIOS over TCP/IP scope parameter for the client as specified in RFC 1001/1002. See RFC1001, RFC1002, and RFC1035 for character-set restrictions.

option font-servers ip-address [, ip-address ...];
This option specifies a list of X Window System Font servers available to the client. Servers should be listed in order of preference.

option x-display-manager ip-address [, ip-address ...];
This option specifies a list of systems that are running the X Window System Display Manager and are available to the client. Addresses should be listed in order of preference.

option dhcp-client-identifier data-string;
This option can be used to specify a DHCP client identifier in a host declaration, so that DHCP can find the host record by matching against the client identifier. (Also used by the client in a "send dhcp-client-identifier" declaration to supply its identifier to the server)

Chapter 9 DHCP Client Configuration

This section describes basic configuration options for the DHCP Client; these are placed into an ASCII file which is read by the system at startup (dhclient.conf) via ISFS (which in turn may be retrieved from FLASH, if the file exists there). The DHCP Client omits support for permanent lease declarations, IP aliasing, and media requests, and does not allow all DHCP options specified in [3]. For details and format of supported options, see section 7. While an client can “accept” anything a server sends to it, it can only actually configure the IP stack with a very limited set of options.

9.1 Protocol Timing

The timing behaviour of the client need not be configured by the user. If no timing configuration is provided by the user, a reasonable timing behaviour will be used by default - one which results in timely updates without placing an inordinate load on the server. The following statements can be used to adjust the timing behaviour of the DHCP client if required:

9.1.1 Timeout

timeout time;

The **timeout** statement determines the amount of time that must pass between the time that the client begins to try to determine its address and the time that it decides that it is not going to be able to contact a server. By default, this timeout is sixty seconds. After the timeout has passed, if there are any static leases defined in the configuration file, or any leases remaining in the lease database that have not yet expired, the client will loop through these leases attempting to validate them, and if it finds one that appears to be valid, it will use that lease's address. If there are no valid static leases or unexpired leases in the lease database, the client will restart the protocol after the defined **"retry"** interval.

9.1.2 Retry

retry time;

The **retry** statement determines the time that must pass after the client has determined that there is no DHCP server present before it tries again to contact a DHCP server. By default, this is five minutes.

9.1.3 Select-timeout

select-timeout time;

It is possible (some might say desirable) for there to be more than one DHCP server serving any given network. In this case, it is possible that a client may be sent more than one offer in response to its initial lease discovery message. It may be that one of these offers is preferable to the other (e.g., one offer may have the address the client previously used, and the other may not).

The **select-timeout** is the time after the client sends its first lease discovery request at which it stops waiting for offers from servers, assuming that it has received at least one such offer. If no offers have been received by the time the select-timeout has expired, the client will accept the first offer that

arrives. By default, the select-timeout is zero seconds - that is, the client will take the first offer it sees.

9.1.4 Reboot

reboot time;

When the client is restarted, it first tries to reacquire the last address it had. This is called the INIT-REBOOT state. If it is still attached to the same network it was attached to when it last ran, this is the quickest way to get started. The **reboot** statement sets the time that must elapse after the client first tries to reacquire its old address before it gives up and tries to discover a new address. By default, the reboot timeout is ten seconds.

9.1.5 Backoff-cutoff

backoff-cutoff time;

The client uses an exponential backoff algorithm with some randomness, so that if many clients try to configure themselves at the same time, they will not make their requests in lockstep.

The **backoff-cutoff** statement determines the maximum amount of time that the client is allowed to back off. The backoff-cutoff time defaults to two minutes.

9.1.6 Initial-interval

initial-interval time;

The **initial-interval** statement sets the amount of time between the first attempt to reach a server and the second attempt to reach a server. Each time a message is sent, the interval between messages is incremented by twice the current interval multiplied by a random number between zero and one. If it is greater than the backoff-cutoff amount, it is set to that amount. The initial interval time defaults to ten seconds.

9.2 Lease requirements and requests

The DHCP protocol allows the client to request that the server send it specific information, and not send it other information that it is not prepared to accept. The protocol also allows the client to reject offers from servers if they do not contain information the client needs, or if the information provided is not satisfactory.

There is a variety of data contained in offers that DHCP servers send to DHCP clients. The data that can be specifically requested are called *DHCP*

*Option*s. DHCP Options are defined in [3], although an DHCP client only supports a limited subset of those described there

9.2.1 Request

request [option] [, ... option];

The **request** statement causes the client to request that any server responding to the client send the client its values for the specified options. Only the option names should be specified in the request statement - not option parameters.

9.2.2 Require

require [option] [, ... option];

The **require** statement lists options that must be sent in order for an offer to be accepted. Offers that do not contain *all* the listed options will be ignored.

9.2.3 Send

send { [option declaration] [... option declaration] }

The send statement causes the client to send the specified options to the server with the specified values. Options that are always sent in the DHCP protocol should not be specified here, except that the client can specify a *requested-lease-time* option other than the default requested lease time, which is two hours (this would normally be done on a per-interface basis: see section 6.3.2). The other obvious use for this statement is to send information to the server that will allow it to differentiate between this client and other clients or kinds of clients.

9.3 Other declarations

9.3.1 Reject

reject ip-address;

The **reject** statement causes the DHCP client to reject offers from servers who use the specified address as a server identifier. This can be used to avoid being configured by rogue or misconfigured dhcp servers, although it should be a last resort - better to track down the bad DHCP server and fix it.

9.3.2 Interface

interface " name" { declarations ... }

A client with more than one network interface may require different behaviour depending on which interface is being configured. All timing parameters and declarations other than lease and alias declarations can be enclosed in an interface declaration, and those parameters will then be used only for the interface that matches the specified name. Interfaces for which there is no interface declaration will use the parameters declared outside of any interface declaration, or the default settings

9.4 DHCP Options

The DHCP client supports only a subset of configuration options specified in [3]. However, this mechanism is extensible, allowing vendor-specific customization and possible support of more options in future. A DHCP client accepts the following information and uses it to configure the IP stack:

- IP address
- Subnet mask

The following would be useful, but are not supported in current software:

- Default routers (one only)
- Static routes

These are less useful but it is possible they will be supported in future:

- IP forwarding enable / disable
- Default IP time-to-live (TTL)
- Interface Maximum Transmission Unit (MTU)
- Host name

The following are not configurable in the current IP core and are unlikely to be supported:

- Non-local source routing enable / disable
- Policy filters for non-local source routing
- Maximum re-assembly size
- Path MTU ageing timeout
- MTU plateau table
- All-subnets-MTU
- Broadcast address flavour
- Perform mask discovery
- Be a mask supplier
- Perform router discovery
- Router solicitation address
- Trailer encapsulation
- ARP cache timeout

Ethernet encapsulation
Default TCP TTL
TCP keep-alive interval
TCP keep-alive data size

The following documentation, adapted from manual pages provided by the Internet Software Consortium, gives the format of allowed DHCP options which may be specified in the configuration file.

9.4.1 Option statements

DHCP option statements always start with the **option** keyword, followed by an option name, followed by option data. The option names and data formats are described below. It is not necessary to exhaustively specify all DHCP options - only those options which are needed by clients must be specified. Option data comes in a variety of formats, as follows:

The **ip-address** data type can be entered either as an explicit IP address (e.g., 239.254.197.10) or as a domain name (e.g. haagen.isc.org). When entering a domain name, be sure that that domain name resolves to a single IP address.

The **int32** data type specifies a signed 32-bit integer. The **uint32** data type specifies an unsigned 32-bit integer. The **int16** and **uint16** data types specify signed and unsigned 16-bit integers. The **int8** and **uint8** data types specify signed and unsigned 8-bit integers. Unsigned 8-bit integers are also sometimes referred to as octets.

The **string** data type specifies an NVT ASCII string, which must be enclosed in double quotes –for example, to specify a domain-name option, the syntax would be

```
option domain-name "isc.org";
```

The **flag** data type specifies a Boolean value. Booleans may take the value 1 (true) or 0 (false).

The **data-string** data type specifies either an NVT ASCII string enclosed in double quotes, or a
series of octets specified in hexadecimal, separated by colons. For example:

```
option client-identifier "CLIENT-FOO";
option client-identifier 43:4c:49:45:54:2d:46:4f:4f;
```

The documentation for the various options mentioned below is taken from the latest IETF draft document on DHCP options. Options which are not listed by name may be defined by the name **option-nnn**, where nnn is the decimal number of the option code. These options may be followed either by a string, enclosed in quotes, or by a series of octets, expressed as

two-digit hexadecimal numbers separated by colons. For example:

```
option option-133 "my-option-133-text";
option option-129 1:54:c9:2b:47;
```

Because DHCP does not know the format of these undefined option codes, no checking is done to ensure the correctness of the entered data.

9.4.2 Supported DHCP client options

The following section shows configuration options which the DHCP client can use to
configure the IP stack.

option subnet-mask ip-address;

The **subnet-mask** option specifies, or requests the server to supply, the client's subnet mask.

option dhcp-lease-time int;

This option can be used to request a specific lease duration by the client. The analogous option on the server is "max-lease-time". For example, "send dhcp-lease-time 200" would set a client to request a lease time of 200 seconds.

option dhcp-client-identifier data-string;

This option should be used to specify a client identifier in a host declaration, so that a DHCP server can find the host record by matching against the client identifier. This option is required when attempting to operate the DHCP client with a Microsoft DHCP server. In this case, the hardware address of the card upon which DHCP is running must be sent to the server as the client-identifier. Otherwise, it is recommended that every DHCP client has at least a unique identifier (this can be a MAC address, or a text string such as a hostname)- otherwise the DHCP server may not function optimally.

Appendix A Product Specifications

PC interface	10Base-T or 10/100Base-T Ethernet through RJ-45 connector, or 10/100Base-T Ethernet 4-port Stackable Switch Hub
xDSL interface	xDSL line through RJ-11 connector
Console Port	RS-232 interface
Standard Compliance	ADSL: ANSI T1.413 issue2 ITU-T G.992.1 (Full rate DMT) ITU-T G.992.2 (Lite DMT) ITU-T G.994.1 (G.hs) SHDSL: ANSI T1E1.4 (HDSL2) ITU-T G.991.2 (G.shdsl) ITU-T G.994.1 (G.hs) RFC 1483 BPDU(Bridge Ethernet over ATM PVC, LLC/SNAP) RFC 1483 RPDU(Routed IP over ATM PVC, LLC/SNAP) RFC 1577(Classic IP over ATM, MTU=1500) RFC 2364(PPP over ATM)

	ATM Forum INU 3.0, 3.1 and 4.0 signaling***
	ATM Forum ILMI 4.0***
	ATM Forum LANE 1.0 client, MTU=1516, over SVC only***
	ATM supports AAL5, AAL3/4 and AAL0
	ATM Traffic shaping supports CBR and UBR
	OAM F4 and F5 segment end-to-end loopback are supported(F4 on all VPIs, F5 on VIP 0 only)***
	Transparent Bridging features conformance to IEEE 802.1d and supports spanning tree protocol and bridge filters
	TCP/IP with RIP version 1(RFC 1058) and version 2(RFC 1723) compatible
	ARP(RFC 1293, supports only one single subnet)
	DHCP(RFC 2131, RFC 2132) server and client***
	BOOTP(RFC 2131, RFC 2132)
	SNMP version 1(RFC 1155, RFC 1157, RFC 1213)
	TELNET server(RFC 854, 855, 857, 858)
	NAT server
	TFTP revision 2(RFC 1350)
	PPP (Point-to-Point Protocol) support
	PAP/CHAP user Authentication with PPP
	PPTP tunneling***
Data rates	ADSL: Up to 8 Mbps downstream and 640 Kbps upstream. Rate adaptive in 32 Kbps steps
	SHDSL: Symmetric 2.3Mbps maximum
Connect Distance	ADSL: Up to 18,000 feet
	SHDSL: Up to 16,000 feet
Supported OS	Windows 95, 98, 2000, Me, NT4.0, XP, Mac, Unix & Linux
Power Consumption	6W max through 9V or 12V DC 1000mA power adaptor
Product certification	FCC part 15, FCC part 68, and CE marking
Physical Dimension	Approximately 150mm(W) x 135mm(D) x 35mm(H)

Operating Environment	Temperature 0 to 45° C ambient
	Humidity 5% to 95%(non-condensing)

*** Some models does not support

Power Adaptor

The Heritage xDSL Router is powered by a 9V or 12V DC 1A power adaptor, which included in this package, with positive polarity inside and negative polarity outside. In any case the standard power adaptor come with the modem is not available, please find a power adaptor meet above specifications.

Appendix B Troubleshooting

This chapter is intended to help you troubleshoot problems you may encounter while setting up and using the Modem. It also describes some common hardware and software problems and gives some suggestions to troubleshoot them.

B.1 Diagnostics with the LEDs

Most hardware problems can be diagnosed and solved by checking the LEDs on the front panel of your router.

- **If the POWER LED is dark**
  - Make sure the power cord is firmly plugged into the back panel of the router and the other end into an active AC wall or power strip outlet.
  - Make sure the power switch is turned on.
- **If the PC LED is dark**
  - Make sure your Ethernet cable is firmly plugged into the back panel of the router and the other end into your computer or HUB.
  - Make sure you using the correct Ethernet cable for your application.
  - Make sure your Ethernet board is installed properly in your system by ping the IP address of your PC.

B.2 Problems when configure the Modem via the console port

- **Can't see any message from the configuration screen**
  - Make sure the cable connection from the Modem's console port to the computer being used as a console is securely connected.
  - Make sure the terminal emulation software is accessing the correct port on the computer that's being used as a console.
  - Make sure that flow control on serial connections is turned off.
  - Make sure the RS232 device attached to the console is configured as a 'DTE'. If not, a crossover or null modem adapter is required.
- **Junk characters appear on the configuration screen**
  - Make sure the terminal emulation software is configured correctly. Check the baud rate and data format is configured to 9600 bps, No parity, 8 data bits, and 1 stop bit.

B.3 Problems when connecting to the Modem via Ethernet

- **Cannot connect your PC to the Modem for configuration via Ethernet.**
  - Make sure the PC LED is light
  - Make sure the Modem's IP address matches the IP address previously stored into the Modem's configuration. You must have previously set the Modem's Ethernet IP address and subnet mask, saved the Ethernet configuration changes, and rebooted the Modem for the new IP address to take effect.
  - Make sure the PC and the Modem are on the same IP subnetwork or the target router is reachable through a router on your LAN.
  - Make sure the TCP/IP properties setting is correct in your PC.
  - Make sure if the TX and RX LED on the Modem's front panel blinks when 'pinged'.

B.4 Problems when accessing the Internet or remote network

- **Cant's access the Internet or remote network**
  There are four possibilities to causes this problem
  1. The connection between the computer and the Modem
  2. The connection between the Modem and your NSP
  3. The connection between your NSP and your ISP
  4. The connection between your ISP and the Internet

  To isolate the problem, you can verify IP connectivity with following steps by running a **ping <IP address>** command. For example, **ping 192.168.254.254**.

  1. Ping the IP address of your PC. If you get a response back, proceed to next step directly. If you don't get a response back, check that:
     - The network adapter card is installed.
     - The TCP / IP protocol is installed.
     - The TCP / IP protocol is bound to the network adapter.
  2. Ping the IP address of your Modem. If you get a response back, proceed to next step directly. If you don't get a response back, the problem lies between your PC and your Modem:
     - Check the cables.
     - Check the hub.
     - Make sure that your PC and your Modem belong to the same IP sub network.
     - Observe the TX and RX LEDs to see if data traffic flow appears to be normal
  3. Ping the DNS server.
- **If the Modem is configured to bridging mode**
  - Be sure to reboot the Modem if you have made any changes with configuration.
  - All IP addresses must be in the same IP sub network.

- **If the Modem is configured to routing mode**

- Check that IP Routing is enabled at the local and the remote end.
- Make sure he IP addresses of the local and remote networks belong to different IP sub networks.
- Make sure that there is an existing route to the remote network.
- Make sure that there is a route back from the remote network.
- Be sure to reboot the Modem if you have made any changes with configuration.

B.5 Contact us for Technical support

We are committed to providing our customers with reliable products and documentation, backed by excellent technical support.

*Before contacting us, please l*ook in this chapter for a solution to your problem. You may find a solution in this chapter. If you cannot find a solution, collect your configuration information listed below before contacting our technical support. We can help you with your problem more effectively if you have completed the configuration information.

Model number:
Serial (MAC) number:
Firmware version:
PC configuration
Network configuration
Other:

Appendix C Glossary

10Base-T
IEEE 802.3 standard for the use of Ethernet LAN technology over unshielded twisted pair wiring, running at 10Mbps.

100Base-T
IEEE 802.3u standard for the use of Ethernet LAN technology over unshielded twisted pair wiring, running at 100Mbps.

ADSL
Asymmetric Digital Subscriber Line - Technology that delivers high-speed data and voice connections over existing phone lines. Up to 8 Mbits/sec can be sent downstream and 640 Kbits/sec upstream.

ANSI (American National Standards Institute)
Devises and proposes recommendations for international communications standards.

ARP
Address Resolution Protocol. An Internet protocol used to bind an IP address to Ethernet/802.3 addresses.

ASCII
American Standard Code for Information Interchange. 8-bit code for character representation.

ATM
Asynchronous Transfer Mode - Cell-relay broadband technology for high-speed transmission of video, audio, data over LAN/WAN, making use of fixed-size cells (53-byte cells).

Bridge
A device that segments network traffic. A bridge maintains a list of each segment's nodes and only traffic destined for a node on the

adjacent segment is passed across the bridge. A bridge operates at Layer 2 of the OSI reference model.

CHAP

Challenge Handshake Authentication Protocol. A security protocol supported under Point-to-Point Protocol (PPP) used to prevent unauthorized access to devices and remote networks. Uses encryption of password, device names, and random number generation.

Class A, B, and C networks:

The values assigned to the first few bits in an IP network address determine which class designation the network has. In decimal notation, Class A network addresses range from 1.X.X.X to 126.X.X.X, Class B network addresses range from 128.1.X.X to 191.254.X.X, and Class C addresses range from 192.0.1.X to 223.255.254.X.

Client

An intelligent workstation that makes requests to other computers known as servers. PC computers on a LAN can be clients.

Community strings

Sequences of characters that serve much like passwords for devices using SNMP. Different community strings may be used to allow an SNMP user to gather device information or change device configurations.

Console port

Device used by the network administrator to configure and monitor the Modem. The console port employs an RS232 interface. Command Line Interface are used on the console port.

DHCP

Dynamic Host Configuration Protocol - Service that provides network information (such as IP addresses, masks, domain names) to PCs and other clients automatically.

DNS

Domain Name Service - Transmission Control Protocol/Internet Protocol (TCP/IP) service which translates a name that a person can remember into an IP address that a computer can use.

DTE

Data Terminal Equipment - Term defined by standards committees, that applies to communications equipment, typically personal computers or data terminals, as distinct from other devices that attach to the network, typically modems.

Ethernet address

Sometimes referred to as a hardware address. A 48-bits long number assigned to every Ethernet hardware device. Ethernet addresses are usually expressed as 12-character hexadecimal numbers, where each hexadecimal character (0 through F) represents four binary bits. Do not confuse the Ethernet address of a device with its network address.

Firmware

System software stored in a device's memory that controls the device.

HDLC

High-Level Data Link Control - A generic link-level communications protocol developed by the International Organization for Standardization (ISO). HDLC manages synchronous, code-transparent, serial information transfer over a link connection.

Internet

A set of networks connected together by routers. This is a general term, not to be confused with the large, multi-organizational collection of IP networks known as the Internet. An internet is sometimes also known as an internetwork.

Internet address, IP address

Any computing device that uses the Internet Protocol (IP) must be assigned an internet or IP address. This is a 32-bit number assigned by the system administrator, usually written in the form of 4 decimal fields separated by periods, e.g., 192.9.200.1. Part of the internet address is the IP network number (IP network address), and part is the host address (IP host address). All machines on a given IP network use the same IP network number, and each machine has a unique IP host address. The system administrator sets the subnet mask to specify how much of the address is network number and how much is host address.

IP

Internet Protocol - A networking protocol developed for use on computer systems that use the UNIX operating system. Often used with Ethernet cabling systems. In this manual, IP is used as an umbrella term to cover all packets and networking operations that include the use of the Internet Protocol. See also *TCP/IP*.

ISP

Internet service provider - A company that provides Internet-related services. Most importantly, an ISP provides Internet access services and products to other companies and consumers.

ITU

International Telecommunication Union - United Nations specialized agency for telecommunications

LAN

Local area network - A privately owned network that offers high-speed communications channels to connect information processing equipment in a limited geographic area. (usually within a single campus or building).

LED

Light Emitting Diodes - Type of indicator lights on the panel of the router.

MAC layer/address

Media Access Control layer / address defined by the IEEE 802.3 specification which defines media access including framing and error detection. Part of the OSI reference model data link layer.

MIB

Management information base - A standardized structure for SNMP management information.

NAT

Network Address Translation - A feature that allows communication between the LAN connected to the Modem and the Internet using a single IP address, instead of having a separate IP address for each computer on the network.

NSP

Network Service Provider - Company from which you buy your network services.

PAP

PPP Authentication Protocol - A method for ensuring secure network access.

Ping

An echo message, available within the TCP / IP protocol suite, sent to a remote node and returned; used to test the accessibility of the remote node.

Port number

A number that identifies a TCP / IP-based service. Telnet, for example, is identified with TCP port 23.

Protocol

A set of rules for communication, sometimes made up of several smaller sets of rules also called protocols.

PPP

Point-to-Point Protocol - A Data Link layer protocol that provides asynchronous and synchronous connectivity between computer / network nodes. It defines how packets of information are exchanged between computers or network nodes connect via a point-to-point connection (as opposed to multipoint or broadcast). Includes standardization for security and compression negotiation.

PVC

Permanent Virtual Circuit - Dedicated connection between end stations. The PVC is made up of 2 parts: the VPI and the VCI. In a PVC number of 0,32, 0 represents the Virtual Path Identifier (VPI) and 32 represents the Virtual Circuit Identifier (VCI).

RFC 1483

Protocol that encapsulates ATM cells into logical data link frames.

RFC

Request for Comment - A series of documents used to exchange information and standards about the Internet.

RIP

Routing Information Protocol - A protocol used for the transmission of IP routing information.

RJ-11

A telephone-industry standard connector type, usually containing four pins.

RJ-45

A telephone-industry standard connector type, usually containing eight pins.

Routing

A network layer function that determines the path for transmitting packets through a network from source to destination.

Router

A device that supports network communications. A router can connect identical network types, However—unless a gateway is available—a common protocol, such as TCP / IP, must be used over both networks. Routers may be equipped to provide WAN line support to the LAN devices they serve. They may also provide various management and monitoring functions as well as a variety of configuration capabilities.

Routing table

A list of networks maintained by each router on an internet. Information in the routing table helps the router determine the next router to forward packets to.

Serial port

A connector on the back of the workstation through which data flows to and from a serial device.

Server

A device or system that has been specifically configured to provide a service, usually to a group of clients.

SHDSL

G.SHDSL stands for Symmetric High Bit Rate Digital Subscriber Loop and is defined by the new ITU Global Standard G991.2 from February 2001. It delivers voice and data services based on highly innovative communication technologies and will thus be able to replace older communication technologies such as T1, E1, HDSL, HDSL2, SDSL, ISDN and IDSL in the future.

Subnet

A network address created by using a subnet mask to specify that a number of bits in an internet address will be used as a subnet number rather than a host address.

Subnet Address

An extension of the Internet 32-bit addressing scheme which allows the separation of physical or logical networks within the single network number. assigned to an organization. TCP/IP entities outside this organization have no knowledge of the internal 'subnetting'.

Subnet mask

A 32-bit number to specify which part of an internet address is the network number, and which part is the host address. When written in binary notation, each bit written as 1 corresponds to 1 bit of network address information. One subnet mask applies to all IP devices on an individual IP network.

RS-232

EIA standard specifying the physical layer interface used to connect a device to communications media.

SNMP

Simple Network Management Protocol - A widely implemented Internet network management protocol that allows status monitoring, getting/setting of parameters for configuration and control of network devices, such as routers and bridges.

TCP/IP

Transmission Control Protocol / Internet Protocol - An open network standard that defines how devices from different manufacturers communicate with each other over one or more interconnected networks. TCP / IP protocols are the foundation of the Internet, a worldwide network of networks connecting businesses, governments, researchers, and educators. TCP provides a connection-oriented transport layer ensuring end-to-end reliability in data transmission. IP provides for network layer connectivity using connectionless datagrams.

TFTP

Trivial File Transfer Protocol - A protocol used to transfer files between IP nodes. TFTP is often used to transfer firmware and configuration information from a UNIX computer acting as a TFTP server to an IP networking device.

TELNET

Internet standard protocol for remote terminal emulation that allows a user to remotely log in to another device and appear as if directly connected.

Transparent Bridging

Bridging technique used in Ethernet networks which allows transfer of frames across intermediate nodes using tables associating end nodes with bridging addresses. Bridges are unknown to the end nodes.

VCI

Virtual Channel Identifier - Number that identifies a channel within a virtual path in a xDSL / ATM environment.

Virtual Channel

Refers to a logical connection between end stations in a xDSL / ATM environment

Virtual Path

Refers to a bundle of virtual channels in a xDSL / ATM environment.

VPI

Virtual Path Identifier - Number that identifies the link formed by the virtual path in a xDSL / ATM environment.

UDP

User Datagram Protocol - A TCP / IP protocol describing how packets reach applications in destination nodes.

Wall jack

A small hardware component used to tap into telephone wall cable.

An RJ-11 wall jack usually has four pins; an RJ-45 wall jack usually has eight pins.

WAN

Wide Area Network - A network that consists of nodes connected by long-distance transmission media, such as telephone lines. WANs can span a state, a country, or even the world.

Appendix D Government compliance notices

D.1 FCC compliance

This equipment complies with Part 68 of the FCC Rules. On this equipment is a label that contains, among other information, the FCC registration number and Ringer Equivalence Number (REN) for this equipment. You must, upon request, provide this information to your telephone company.

If your telephone equipment causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify in advance. But, if advance notice isn't practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect proper operation of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service. The FCC prohibits this equipment to be connected to party lines or coin-telephone service.

In the event that this equipment should fail to operate properly, disconnect the equipment from the phone line to determine if it is causing the problem. If the problem is with the equipment, discontinue use and contact your dealer or vendor.

D.2 DOC compliance information

NOTICE: The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users ensure that it is permissible to be connected to the facilities of the local Telecommunications Company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions might not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.
Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

NOTICE: The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the sum of the Load Numbers of all the devices does not exceed 100.

D.3 European CTR 21 compliance

The equipment has been approved in accordance with Council Decision 98/482/EC for pan-European single terminal connection to the public switched telephone network (PSTN). However, due to differences between the individual PSTNs provided in different countries, the approval does not, of itself, give an unconditional assurance of successful operation on every PSTN network termination point. In the event of problem, you should contact your equipment supplier in the first instance.

Note: The manufacturer should ensure that the vendor and user of the equipment is clearly informed of the above information by means of package and/or user manuals of the forms of user instructions.