P-793H

G.SHDSL.bis 4-port Security Gateway

User's Guide

Version 3.40
Edition 1
8/2006

ZyXEL

Copyright

Disclaimer

ZyXEL does not assume any liability arising out of the application or use of any products, or software described herein. Neither does it convey any license under its patent rights nor the patent rights of others. ZyXEL further reserves the right to make changes in any products described herein without notice. This publication is subject to change without notice.

Trademarks

ZyNOS (ZyXEL Network Operating System) is a registered trademark of ZyXEL Communications, Inc. Other trademarks mentioned in this publication are used for identification purposes only and may be properties of their respective owners.

Certifications

Federal Communications Commission (FCC) Interference Statement

The device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operations.

This device has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this device does cause harmful interference to radio/television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

Notices

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

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Viewing Certifications

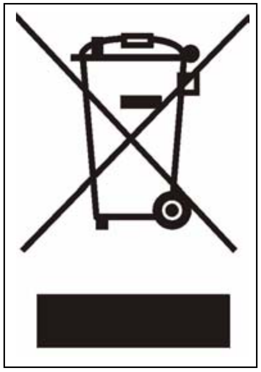
1. Go to http://www.zyxel.com.
2. Select your product from the drop-down list box on the ZyXEL home page to go to that product's page.
3. Select the certification you wish to view from this page.

Safety Warnings

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

- Do NOT use this product near water, for example, in a wet basement or near a swimming pool.
- Do NOT expose your device to dampness, dust or corrosive liquids.
- Do NOT store things on the device.
- Do NOT install, use, or service this device during a thunderstorm. There is a remote risk of electric shock from lightning.
- Connect ONLY suitable accessories to the device.
- Do NOT open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel should service or disassemble this device. Please contact your vendor for further information.
- Make sure to connect the cables to the correct ports.
- Place connecting cables carefully so that no one will step on them or stumble over them.
- Always disconnect all cables from this device before servicing or disassembling.
- Use ONLY an appropriate power adaptor or cord for your device.
- Connect the power adaptor or cord to the right supply voltage (for example, 110V AC in North America or 230V AC in Europe).
- Do NOT allow anything to rest on the power adaptor or cord and do NOT place the product where anyone can walk on the power adaptor or cord.
- Do NOT use the device if the power adaptor or cord is damaged as it might cause electrocution.
- If the power adaptor or cord is damaged, remove it from the power outlet.
- Do NOT attempt to repair the power adaptor or cord. Contact your local vendor to order a new one.
- Do not use the device outside, and make sure all the connections are indoors. There is a remote risk of electric shock from lightning.
- Do NOT obstruct the device ventilation slots, as insufficient airflow may harm your device.
- Use only No. 26 AWG (American Wire Gauge) or larger telecommunication line cord.
- If you wall mount your device, make sure that no electrical lines, gas or water pipes will be damaged.

This product is recyclable. Dispose of it properly.



ZyXEL Limited Warranty

ZyXEL warrants to the original end user (purchaser) that this product is free from any defects in materials or workmanship for a period of up to two years from the date of purchase. During the warranty period, and upon proof of purchase, should the product have indications of failure due to faulty workmanship and/or materials, ZyXEL will, at its discretion, repair or replace the defective products or components without charge for either parts or labor, and to whatever extent it shall deem necessary to restore the product or components to proper operating condition. Any replacement will consist of a new or re-manufactured functionally equivalent product of equal or higher value, and will be solely at the discretion of ZyXEL. This warranty shall not apply if the product has been modified, misused, tampered with, damaged by an act of God, or subjected to abnormal working conditions.

Note

Repair or replacement, as provided under this warranty, is the exclusive remedy of the purchaser. This warranty is in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular use or purpose. ZyXEL shall in no event be held liable for indirect or consequential damages of any kind to the purchaser.

To obtain the services of this warranty, contact ZyXEL's Service Center for your Return Material Authorization number (RMA). Products must be returned Postage Prepaid. It is recommended that the unit be insured when shipped. Any returned products without proof of purchase or those with an out-dated warranty will be repaired or replaced (at the discretion of ZyXEL) and the customer will be billed for parts and labor. All repaired or replaced products will be shipped by ZyXEL to the corresponding return address, Postage Paid. This warranty gives you specific legal rights, and you may also have other rights that vary from country to country.

Registration

Register your product online to receive e-mail notices of firmware upgrades and information at www.zyxel.com for global products, or at www.us.zyxel.com for North American products.

Customer Support

Please have the following information ready when you contact customer support.

- Product model and serial number.
- Warranty Information.
- Date that you received your device.
- Brief description of the problem and the steps you took to solve it.

METHOD	**SUPPORT E-MAIL**	**TELEPHONE**	**WEB SITE**	**REGULAR MAIL**
LOCATION	**SALES E-MAIL**	**FAX**	**FTP SITE**	
CORPORATE HEADQUARTERS (WORLDWIDE)	support@zyxel.com.tw	+886-3-578-3942	www.zyxel.com www.europe.zyxel.com	ZyXEL Communications Corp. 6 Innovation Road II Science Park Hsinchu 300 Taiwan
	sales@zyxel.com.tw	+886-3-578-2439	ftp.zyxel.com ftp.europe.zyxel.com	
COSTA RICA	soporte@zyxel.co.cr	+506-2017878	www.zyxel.co.cr	ZyXEL Costa Rica Plaza Roble Escazú Etapa El Patio, Tercer Piso San José, Costa Rica
	sales@zyxel.co.cr	+506-2015098	ftp.zyxel.co.cr	
CZECH REPUBLIC	info@cz.zyxel.com	+420-241-091-350	www.zyxel.cz	ZyXEL Communications Czech s.r.o. Modranská 621 143 01 Praha 4 - Modrany Ceská Republika
	info@cz.zyxel.com	+420-241-091-359		
DENMARK	support@zyxel.dk	+45-39-55-07-00	www.zyxel.dk	ZyXEL Communications A/S Columbusvej 2860 Soeborg Denmark
	sales@zyxel.dk	+45-39-55-07-07		
FINLAND	support@zyxel.fi	+358-9-4780-8411	www.zyxel.fi	ZyXEL Communications Oy Malminkaari 10 00700 Helsinki Finland
	sales@zyxel.fi	+358-9-4780 8448		
FRANCE	info@zyxel.fr	+33-4-72-52-97-97	www.zyxel.fr	ZyXEL France 1 rue des Vergers Bat. 1 / C 69760 Limonest France
		+33-4-72-52-19-20		
GERMANY	support@zyxel.de	+49-2405-6909-0	www.zyxel.de	ZyXEL Deutschland GmbH. Adenauerstr. 20/A2 D-52146 Wuerselen Germany
	sales@zyxel.de	+49-2405-6909-99		
HUNGARY	support@zyxel.hu	+36-1-3361649	www.zyxel.hu	ZyXEL Hungary 48, Zoldlomb Str. H-1025, Budapest Hungary
	info@zyxel.hu	+36-1-3259100		
KAZAKHSTAN	http://zyxel.kz/support	+7-3272-590-698	www.zyxel.kz	ZyXEL Kazakhstan 43, Dostyk ave.,Office 414 Dostyk Business Centre 050010, Almaty Republic of Kazakhstan
	sales@zyxel.kz	+7-3272-590-689		
NORTH AMERICA	support@zyxel.com	1-800-255-4101 +1-714-632-0882	www.us.zyxel.com	ZyXEL Communications Inc. 1130 N. Miller St. Anaheim CA 92806-2001 U.S.A.
	sales@zyxel.com	+1-714-632-0858	ftp.us.zyxel.com	

METHOD	SUPPORT E-MAIL	TELEPHONE	WEB SITE	REGULAR MAIL
LOCATION	SALES E-MAIL	FAX	FTP SITE	
NORWAY	support@zyxel.no	+47-22-80-61-80	www.zyxel.no	ZyXEL Communications A/S Nils Hansens vei 13 0667 Oslo Norway
	sales@zyxel.no	+47-22-80-61-81		
POLAND	info@pl.zyxel.com	+48 (22) 333 8250	www.pl.zyxel.com	ZyXEL Communications ul. Okrzei 1A 03-715 Warszawa Poland
		+48 (22) 333 8251		
RUSSIA	http://zyxel.ru/support	+7-095-542-89-29	www.zyxel.ru	ZyXEL Russia Ostrovityanova 37a Str. Moscow, 117279 Russia
	sales@zyxel.ru	+7-095-542-89-25		
SPAIN	support@zyxel.es	+34-902-195-420	www.zyxel.es	ZyXEL Communications Arte, 21 5ª planta 28033 Madrid Spain
	sales@zyxel.es	+34-913-005-345		
SWEDEN	support@zyxel.se	+46-31-744-7700	www.zyxel.se	ZyXEL Communications A/S Sjöporten 4, 41764 Göteborg Sweden
	sales@zyxel.se	+46-31-744-7701		
UKRAINE	support@ua.zyxel.com	+380-44-247-69-78	www.ua.zyxel.com	ZyXEL Ukraine 13, Pimonenko Str. Kiev, 04050 Ukraine
	sales@ua.zyxel.com	+380-44-494-49-32		
UNITED KINGDOM	support@zyxel.co.uk	+44-1344 303044 08707 555779 (UK only)	www.zyxel.co.uk	ZyXEL Communications UK Ltd.,11 The Courtyard, Eastern Road, Bracknell, Berkshire, RG12 2XB, United Kingdom (UK)
	sales@zyxel.co.uk	+44-1344 303034	ftp.zyxel.co.uk	

+” is the (prefix) number you enter to make an international telephone call.

Table of Contents

Chapter 10
** **

Chapter 11
** **

Chapter 12

Chapter 13

Chapter 14

List of Figures

List of Tables

Preface

Congratulations on your purchase of the P-793 G.SHDSL security gateway (“ZyXEL Device”). The ZyXEL Device has a 4-port switch that allows you to connect up to 4 computers to the ZyXEL Device without purchasing a switch/hub.

Note: Register your product online to receive e-mail notices of firmware upgrades and information at www.zyxel.com for global products, or at www.us.zyxel.com for North American products.

About This User's Guide

This manual is designed to guide you through the configuration of your ZyXEL Device for its various applications. The web configurator parts of this guide contain background information on features configurable by web configurator. The SMT parts of this guide contain background information on features configurable by the SMT and not configurable by the web configurator.

Note: Use the web configurator, SMT, or command interpreter interface to configure your ZyXEL Device. Not all features can be configured through all interfaces.

Syntax Conventions

- “Enter” means for you to type one or more characters. “Select” or “Choose” means for you to use one of the predefined choices.
- Mouse action sequences are denoted using a comma or right angle bracket (>). For example, “In Windows, click **Start**, **Settings**, **Control Panel**” (or click **Start** > **Settings** > **Control Panel**) means first click the **Start** button, then point your mouse pointer to **Settings** and then click **Control Panel**.
- “e.g.,” is a shorthand for “for instance”, and “i.e.,” means “that is” or “in other words”.
- The P-793H may be referred to as the “ZyXEL Device” or the “device” in this User’s Guide.

Related Documentation

- Supporting Disk

  Refer to the included CD for support documents.
- Quick Start Guide

  The Quick Start Guide is designed to help you get up and running right away. It contains connection information and instructions on getting started.
- Web Configurator Online Help

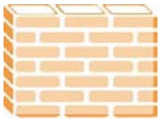
  Embedded web help for descriptions of individual screens and supplementary information.
- ZyXEL Web Site

Please go to http://www.zyxel.com for product news, firmware, updated documents, and other support materials.

User Guide Feedback

Help us help you. E-mail all User Guide-related comments, questions or suggestions for improvement to techwriters@zyxel.com.tw or send regular mail to The Technical Writing Team, ZyXEL Communications Corp., 6 Innovation Road II, Science-Based Industrial Park, Hsinchu, 300, Taiwan. Thank you.

Graphics Icons Key

ZyXEL Device 	Computer 	Notebook computer
Server 	DSLAM 	Firewall 
Telephone 	Switch 	Router

CHAPTER 1 Getting To Know Your ZyXEL Device

This chapter introduces the main features and applications of your ZyXEL Device.

1.1 Overview

This ZyXEL Device is a secure G.SHDSL.bis router with a 4-port switch.

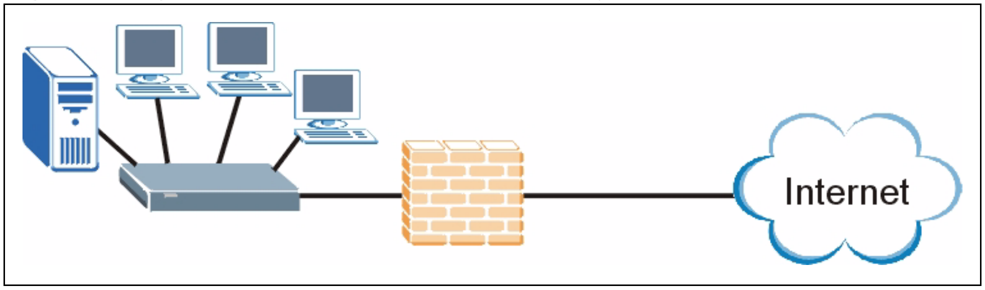
Set up your ZyXEL Device for high-speed Internet access or for high-speed point-to-point connections with other ZyXEL Devices of the same type. In either setup, the ZyXEL Device itself can act as a router or as a bridge. As a router, the ZyXEL Device provides features such as firewall, content filtering and bandwidth management. As a bridge, the ZyXEL Device minimizes the configuration changes you have to make in your existing network.

See the appendices for a complete list of features you can configure on your ZyXEL Device.

1.1.1 High-speed Internet Access

The ZyXEL Device is the ideal high-speed Internet access solution. In addition, unlike ADSL or VDSL, G.SHDSL.bis supports the same high speed for transmission and receiving.

Figure 1 High-speed Internet Access with Your ZyXEL Device



For Internet access, connect the DSL port to the phone port. Then, connect your computers or servers to the LAN ports for shared Internet access. (See the Quick Start Guide for detailed instructions about hardware connections.) Next, set up each ZyXEL Device as a router or as a bridge, depending on the desired configuration. As a router, the ZyXEL Device provides features such as firewall, content filtering and bandwidth management. As a bridge, the ZyXEL Device minimizes the configuration changes you have to make in your existing network.

When the firewall is on, all incoming traffic from the Internet to ~~the~~ your network is blocked unless it is initiated from your network. This means that probes from the outside to your network are not allowed, but you can safely browse the Internet and download files.

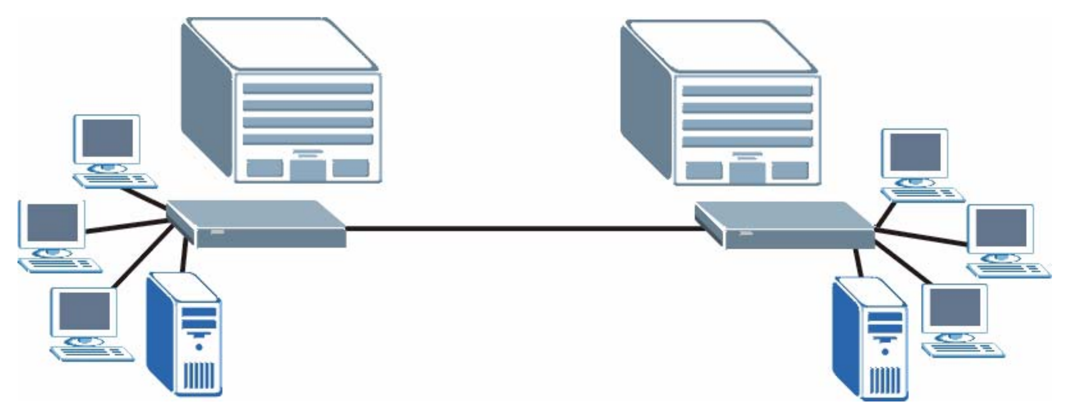
Use content filtering to block access to web sites containing keywords that you specify. You can define time periods and days during which content filtering is enabled and include or exclude particular computers on your network from content filtering. For example, you could block access to pornographic web sites or block access to some types of web sites during the workday.

Use bandwidth management to efficiently manage traffic on your network by giving priority to certain types of traffic and/or to particular computers. For example, you could make sure that Voice over Internet calls get enough bandwidth in your network and, at the same time, limit the amount of bandwidth available for large file downloads.

1.1.2 High-speed Point-to-point Connections

Use two ZyXEL Devices to create a cost-effective, high-speed connection for high-bandwidth applications such as videoconferencing and distance learning.

Figure 2 Point-to-point Connections with Your ZyXEL Device

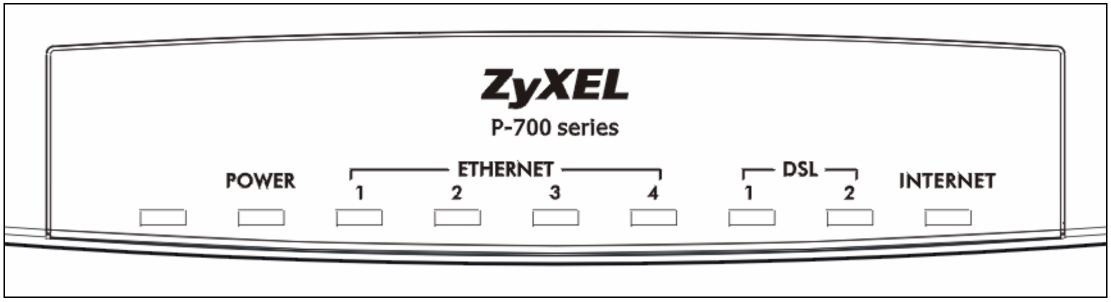


The ZyXEL Devices provide a simple, fast point-to-point connection between two geographically-dispersed networks. Set up each ZyXEL Device as a router or as a bridge, depending on the desired configuration. If you set up a ZyXEL Device as a router, you can use features such as firewall, content filtering and bandwidth management. If you set up a ZyXEL Device as a bridge, you can minimize the configuration changes you have to make in your existing network.

1.2 LEDs

The following figure shows the LEDs.

Figure 3 LEDs



The following table describes the LEDs.

Table 1 LEDs

LED	COLOR	STATUS	DESCRIPTION
POWER	Green	On	The ZyXEL Device is receiving power and functioning properly.
		Blinking	The ZyXEL Device is rebooting or performing diagnostics.
	Red	On	Power to the ZyXEL Device is too low.
		Off	The system is not ready or has malfunctioned.
LAN 1~4	Green	On	This port has a successful Ethernet connection.
		Blinking	This port is sending/receiving data.
		Off	This port is not connected.
DSL1/DSL2 (DSL2 for 4-wire only)	Green	On	The DSL line is up.
		Blinking	The ZyXEL Device is initializing the DSL line.
		Off	The DSL line is down.
INTERNET	Green	On	The Internet connection is up, and the ZyXEL Device has an IP address. (If the ZyXEL Device uses RFC 1483 in bridge mode, this light does not turn on, but it does blink when the ZyXEL Device is sending/receiving data.)
		Blinking	The ZyXEL Device is sending/receiving data.
	Red	On	The ZyXEL Device tried to get an IP address, but an error occurred.
		Off	The Internet connection is down.

CHAPTER 2 Introducing the Web Configurator

This chapter describes how to access and navigate the web configurator.

2.1 Web Configurator Overview

The web configurator is an HTML-based management interface that allows easy ZyXEL Device setup and management via Internet browser. Use Internet Explorer 6.0 and later or Netscape Navigator 7.0 and later versions. The recommended screen resolution is 1024 by 768 pixels.

In order to use the web configurator you need to allow:

- Web browser pop-up windows from your device. Web pop-up blocking is enabled by default in Windows XP SP (Service Pack) 2.
- JavaScripts (enabled by default).
- Java permissions (enabled by default).

See the chapter on troubleshooting if you need to make sure these functions are allowed in Internet Explorer.

2.2 Accessing the Web Configurator

1 Make sure your ZyXEL Device hardware is properly connected (refer to the Quick Start Guide).

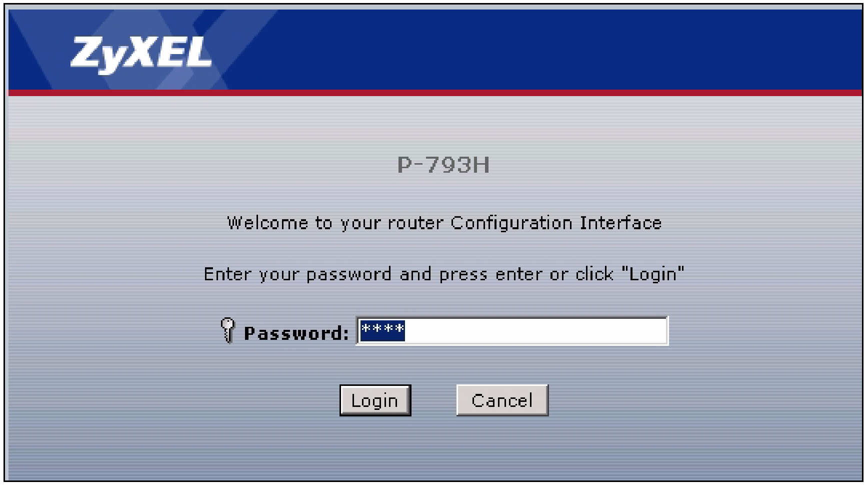
2 Prepare your computer/computer network to connect to the ZyXEL Device (refer to the Quick Start Guide).

3 Launch your web browser.

4 Type "192.168.1.1" as the URL.

5 A window displays as shown. Enter the default admin password **1234** to configure the wizards and the advanced features or enter the default user password **user** to view the status only. Click **Login** to proceed to a screen asking you to change your password or click **Cancel** to revert to the default password.

Figure 4 Login Screen



P-793H

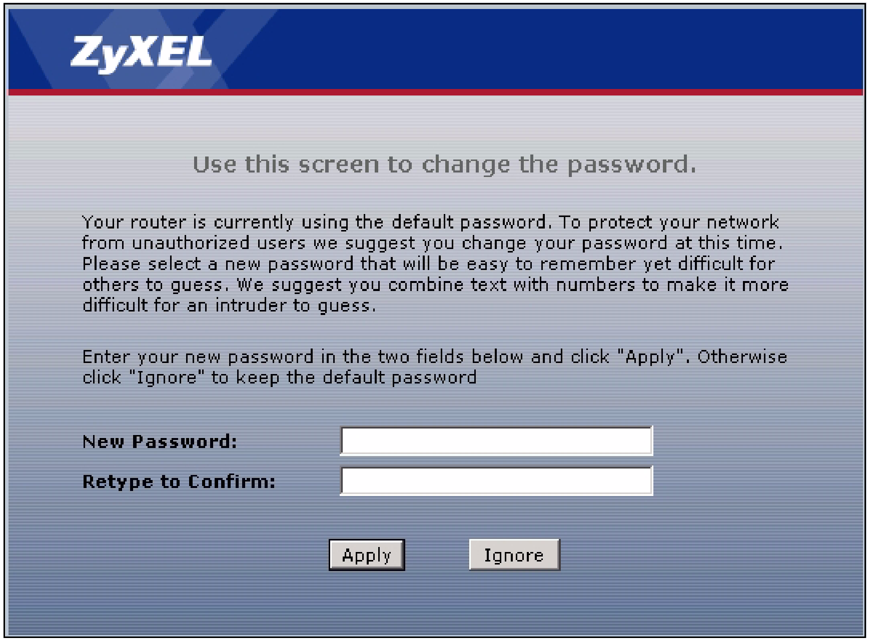
Welcome to your router Configuration Interface

Enter your password and press enter or click "Login"

Password: ****

6 If you entered the user password, the **Status** screen appears. See Section 2.4 on page 50. If you entered the admin password, the following screen appears.

Figure 5 Change Password at Login



Use this screen to change the password.

Your router is currently using the default password. To protect your network from unauthorized users we suggest you change your password at this time. Please select a new password that will be easy to remember yet difficult for others to guess. We suggest you combine text with numbers to make it more difficult for an intruder to guess.

Enter your new password in the two fields below and click "Apply". Otherwise click "Ignore" to keep the default password

New Password:

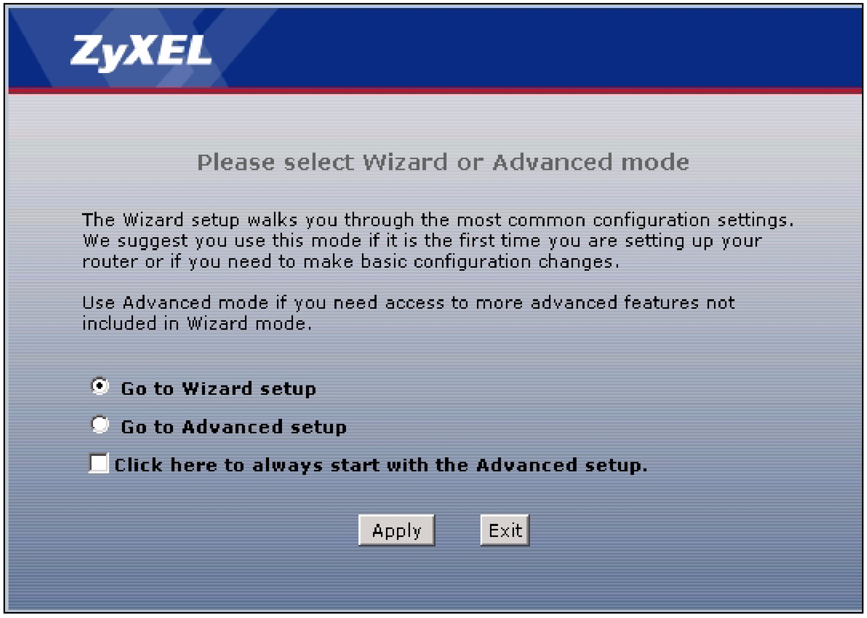
Retype to Confirm:

It is highly recommended you change the default admin password. Enter a new password between 1 and 30 characters, retype it to confirm and click **Apply**; alternatively click **Ignore** to proceed to the main menu if you do not want to change the password now.

Note: If you do not change the password at least once, this screen appears every time you log in with the admin password. You can also change the password in System > General or in Menu 23: System Password.

7 Select **Go to Wizard setup**, and click **Apply** to display the wizard main screen. Select **Go to Advanced setup**, and click **Apply** to display the **Status** screen. Select **Click here to always start with the Advanced setup** if you want the ZyXEL Device to skip this screen from now on and always go to the **Status** screen. See Section 2.4 on page 50.

Figure 6 Select a Mode



Please select Wizard or Advanced mode

The Wizard setup walks you through the most common configuration settings. We suggest you use this mode if it is the first time you are setting up your router or if you need to make basic configuration changes.

Use Advanced mode if you need access to more advanced features not included in Wizard mode.

● Go to Wizard setup

○ Go to Advanced setup

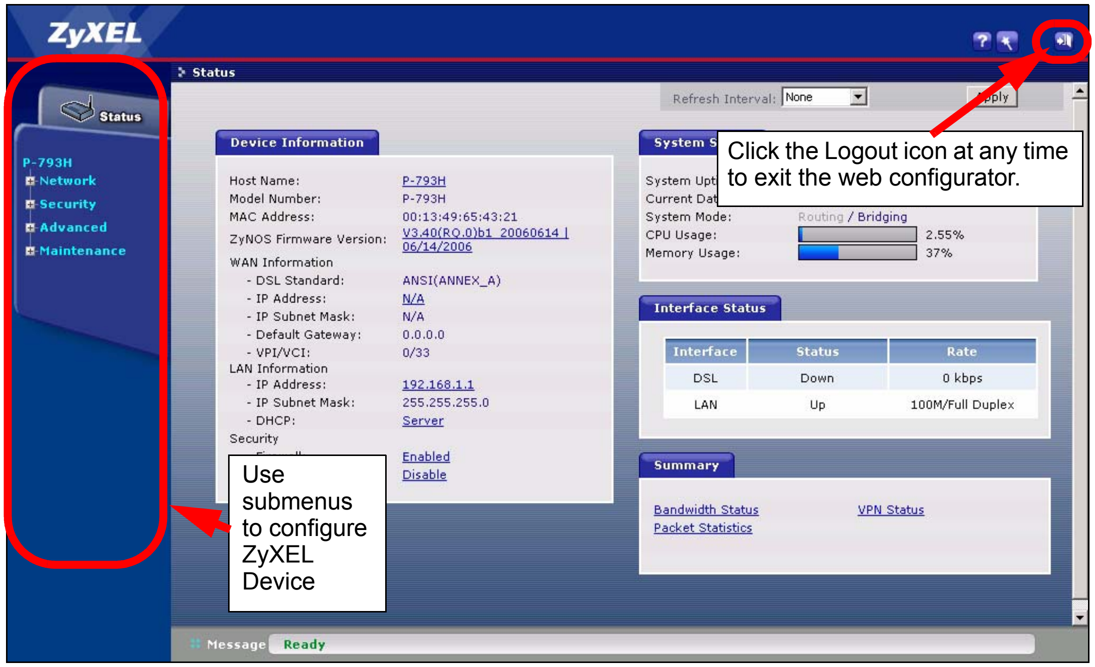
□ Click here to always start with the Advanced setup.

Note: The management session automatically times out when the time period set in the **Administrator Inactivity Timer** field expires (default five minutes). Simply log back into the ZyXEL Device if this happens to you.

2.3 Navigating the Web Configurator

After you enter the admin password, use the sub-menus on the navigation panel to configure ZyXEL Device features. The following table describes the sub-menus.

Figure 7   Web Configurator: Main Screen



Host Name: P-793H
Model Number: P-793H
MAC Address: 00:13:49:65:43:21
ZyNOS Firmware Version: V3.40(RQ.0)b1 20060614 | 06/14/2006
WAN Information
- DSL Standard: ANSI(ANNEX_A)
- IP Address: N/A
- IP Subnet Mask: N/A
- Default Gateway: 0.0.0.0
- VPI/VCI: 0/33
LAN Information
- IP Address: 192.168.1.1
- IP Subnet Mask: 255.255.255.0
- DHCP: Server
Security
Enabled
Disable

System Upt
Current Dat
System Mode: Routing / Bridging
CPU Usage: 2.55%
Memory Usage: 37%

Interface	Status	Rate
DSL	Down	0 kbps
LAN	Up	100M/Full Duplex

Bandwidth Status
VPN Status
Packet Statistics

Use submenus to configure ZyXEL Device

Click the Logout icon at any time to exit the web configurator.

Note: Click the ? icon (located in the top right corner of most screens) to view embedded help.

Table 2   Web Configurator Screens Summary

LINK/ICON	SUB-LINK	FUNCTION
Wizard	INTERNET SETUP	Use these screens for initial configuration including general setup, ISP parameters for Internet Access and WAN IP/DNS Server/MAC address assignment.
	BANDWIDTH MANAGEMENT SETUP	Use these screens to limit bandwidth usage by application or packet size.
Logout		Click this icon to exit the web configurator.
Status		Use this screen to look at the ZyXEL Device's general device, system and interface status information. You can also access the summary statistics tables.
Network		
WAN	Internet Connection	Use this screen to configure ISP parameters, WAN IP address assignment, and more advanced properties.
	More Connections	Use this screen to configure and place calls to a remote gateway.
	WAN Backup Setup	Use this screen to configure your traffic redirect properties and WAN backup settings.

Table 2 Web Configurator Screens Summary (continued)

LINK/ICON	SUB-LINK	FUNCTION
LAN	IP	Use this screen to configure LAN TCP/IP settings and other advanced properties.
	DHCP Setup	Use this screen to configure LAN DHCP settings.
	Client List	Use this screen to view current DHCP client information and to always assign an IP address to a MAC address (and host name).
	IP Alias	Use this screen to partition your LAN interface into subnets.
NAT	General	Use this screen to enable NAT.
	Port Forwarding	Use this screen to configure servers behind the ZyXEL Device.
	Address Mapping	Use this screen to configure network address translation mapping rules.
Security		
Firewall	General	Use this screen to activate/deactivate the firewall and the direction of network traffic to which to apply the rule.
	Rules	This screen shows a summary of the firewall rules, and allows you to edit/add a firewall rule.
	Anti Probing	Use this screen to change your anti-probing settings.
	Threshold	Use this screen to configure the threshold for DoS attacks.
Content Filter	Keyword	Use this screen to block sites containing certain keywords in the URL.
	Schedule	Use this screen to set the days and times for the ZyXEL Device to perform content filtering.
	Trusted	Use this screen to exclude a range of users on the LAN from content filtering on your ZyXEL Device.
VPN	Setup	Use this screen to configure each VPN tunnel.
	Monitor	Use this screen to look at the current status of each VPN tunnel.
	VPN Global Setting	Use this screen to allow NetBIOS traffic through VPN tunnels.
Advanced		
Static Route	Static Route	Use this screen to configure IP static routes.
Bandwidth MGMT	Summary	Use this screen to enable bandwidth management on an interface.
	Rule Setup	Use this screen to define a bandwidth rule.
	Monitor	Use this screen to view the ZyXEL Device's bandwidth usage and allotments.
Dynamic DNS	Dynamic DNS	Use this screen to set up dynamic DNS.

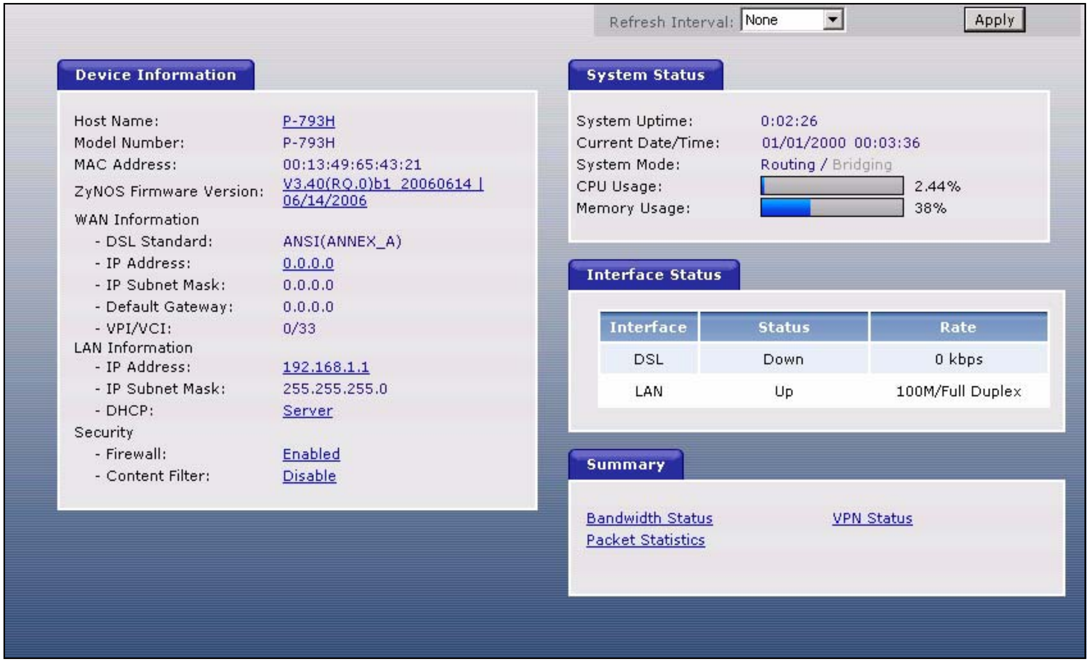
Table 2 Web Configurator Screens Summary (continued)

LINK/ICON	SUB-LINK	FUNCTION
Remote MGMT	WWW	Use this screen to configure through which interface(s) and from which IP address(es) users can use HTTPS or HTTP to manage the ZyXEL Device.
	Telnet	Use this screen to configure through which interface(s) and from which IP address(es) users can use Telnet to manage the ZyXEL Device.
	FTP	Use this screen to configure through which interface(s) and from which IP address(es) users can use FTP to access the ZyXEL Device.
	SNMP	Use this screen to configure your ZyXEL Device's settings for Simple Network Management Protocol management.
	DNS	Use this screen to configure through which interface(s) and from which IP address(es) users can send DNS queries to the ZyXEL Device.
	ICMP	Use this screen to change your anti-probing settings.
UPnP	General	Use this screen to enable UPnP on the ZyXEL Device.
Maintenance		
System	General	This screen contains administrative and system-related information and also allows you to change your password.
	Time Setting	Use this screen to change your ZyXEL Device's time and date.
Logs	View Log	Use this screen to view the logs for the categories that you selected.
	Log Settings	Use this screen to change your ZyXEL Device's log settings.
Tools	Firmware	Use this screen to upload firmware to your ZyXEL Device.
	Configuration	Use this screen to backup and restore the configuration or reset the factory defaults to your ZyXEL Device.
	Restart	This screen allows you to reboot the ZyXEL Device without turning the power off.
Diagnostic	General	These screens display information to help you identify problems with the ZyXEL Device general connection.
	DSL Line	These screens display information to help you identify problems with the DSL line.

2.4 Status Screen

The following summarizes how to navigate the web configurator from the **Status** screen. Some fields or links are not available if you entered the user password in the login password screen (see Figure 4 on page 46).

Figure 8 Status



Refresh Interval: None ▾ Apply

Device Information

Host Name: P-793H
Model Number: P-793H
MAC Address: 00:13:49:65:43:21
ZyNOS Firmware Version: V3.40(RQ.0)b1 20060614 | 06/14/2006
WAN Information
- DSL Standard: ANSI(ANNEX_A)
- IP Address: 0.0.0.0
- IP Subnet Mask: 0.0.0.0
- Default Gateway: 0.0.0.0
- VPI/VCI: 0/33
LAN Information
- IP Address: 192.168.1.1
- IP Subnet Mask: 255.255.255.0
- DHCP: Server
Security
- Firewall: Enabled
- Content Filter: Disable

System Status

System Uptime: 0:02:26
Current Date/Time: 01/01/2000 00:03:36
System Mode: Routing / Bridging
CPU Usage: 2.44%
Memory Usage: 38%

Interface Status

Interface	Status	Rate
DSL	Down	0 kbps
LAN	Up	100M/Full Duplex

Summary

Bandwidth Status
VPN Status
Packet Statistics

The following table describes the labels shown in the **Status** screen.

Table 3 Status

LABEL	DESCRIPTION
Refresh Interval	Select a number of seconds or **None** from the drop-down list box to refresh all screen statistics automatically at the end of every time interval or to not refresh the screen statistics.
Apply	Click this button to refresh the status screen statistics.
Device Information	
Host Name	This is the **System Name** you enter in the **Maintenance**, **System**, **General** screen. It is for identification purposes.
Model Number	This is the model number of the ZyXEL Device.
MAC Address	This is the MAC (Media Access Control) or Ethernet address unique to your ZyXEL Device.
ZyNOS Firmware Version	This is the ZyNOS Firmware version and the date created. ZyNOS is ZyXEL's proprietary Network Operating System design.
WAN Information	
DSL Standard	This is the standard that your ZyXEL Device is using.
IP Address	This is the WAN port IP address.
IP Subnet Mask	This is the WAN port IP subnet mask.
Default Gateway	This is the IP address of the default gateway, if applicable.
VPI/VCI	This is the Virtual Path Identifier and Virtual Channel Identifier that you entered in the Wizard or WAN screen.
LAN Information	
IP Address	This is the LAN port IP address.

Table 3 Status (continued)

LABEL	DESCRIPTION
IP Subnet Mask	This is the LAN port IP subnet mask.
DHCP	This is the WAN port DHCP role - **Server**, **Relay** or **None**.
Security	This section is not available if you use the user password to log in.
Firewall	This displays whether or not the ZyXEL Device's firewall is activated.
Content Filter	This displays whether or not the ZyXEL Device's content filtering is activated.
System Status	
System Uptime	This is the total time the ZyXEL Device has been on.
Current Date/Time	This field displays your ZyXEL Device's present date and time.
System Mode	This displays whether the ZyXEL Device is functioning as a router or a bridge.
CPU Usage	This number shows how many kilobytes of the heap memory the ZyXEL Device is using. Heap memory refers to the memory that is not used by ZyNOS (ZyXEL Network Operating System) and is thus available for running processes like NAT, VPN and the firewall. The bar displays what percent of the ZyXEL Device's heap memory is in use. The bar turns from green to red when the maximum is being approached.
Memory Usage	This number shows the ZyXEL Device's total heap memory (in kilobytes). The bar displays what percent of the ZyXEL Device's heap memory is in use. The bar turns from green to red when the maximum is being approached.
Interface Status	
Interface	This displays the ZyXEL Device port types.
Status	This field displays **Down** (line is down), **Up** (line is up or connected) if you're using Ethernet encapsulation and **Down** (line is down), **Up** (line is up or connected), **Idle** (line (ppp) idle), **Dial** (starting to trigger a call) and **Drop** (dropping a call) if you're using PPPoE encapsulation.
Rate	For the LAN ports, this displays the port speed and duplex setting. Ethernet port connections can be in half-duplex or full-duplex mode. Full-duplex refers to a device's ability to send and receive simultaneously, while half-duplex indicates that traffic can flow in only one direction at a time. The Ethernet port must use the same speed or duplex mode setting as the peer Ethernet port in order to connect. Simultaneous transmissions over the same port (Full-duplex) essentially double the bandwidth. For the WAN port, it displays the downstream and upstream transmission rate.
Summary	This section is not available if you use the user password to log in.
Bandwidth Status	Use this screen to view the ZyXEL Device's bandwidth usage and allotments.
Packet Statistics	Use this screen to view port status and packet specific statistics.
VPN Status	Use this screen to view the status of any VPN tunnels the ZyXEL Device has negotiated.

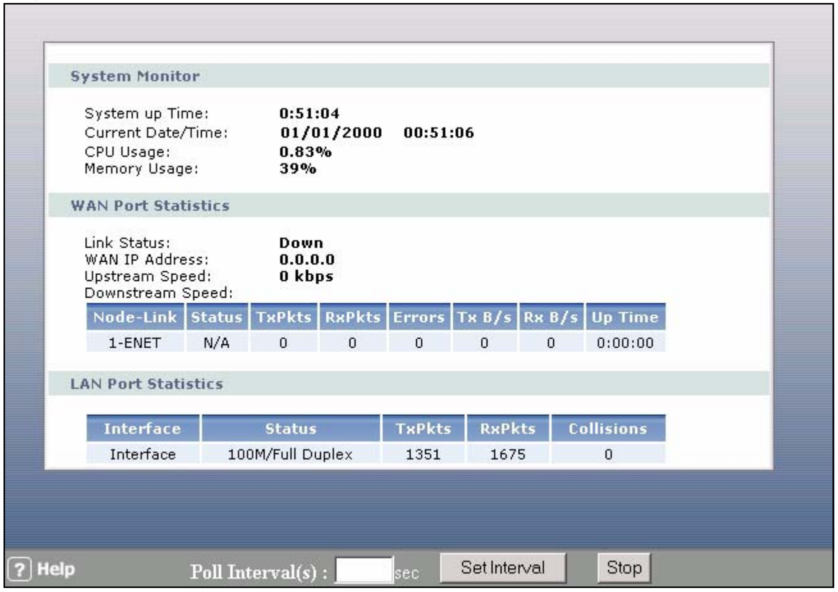
2.4.1 Status: Bandwidth Status

This is the same screen discussed in Figure 93 on page 197.

2.4.2 Status: Packet Statistics

Click the **Packet Statistics** hyperlink in the **Status** screen. Read-only information here includes port status and packet specific statistics. Also provided are "system up time" and "poll interval(s)". The **Poll Interval(s)** field is configurable.

Figure 9 Status > Packet Statistics



System Monitor

System up Time: 0:51:04
Current Date/Time: 01/01/2000 00:51:06
CPU Usage: 0.83%
Memory Usage: 39%

WAN Port Statistics

Link Status: Down
WAN IP Address: 0.0.0.0
Upstream Speed: 0 kbps
Downstream Speed:

Node-Link	Status	TxPkts	RxPkts	Errors	Tx B/s	Rx B/s	Up Time
1-ENET	N/A	0	0	0	0	0	0:00:00

LAN Port Statistics

Interface	Status	TxPkts	RxPkts	Collisions
Interface	100M/Full Duplex	1351	1675	0

The following table describes the fields in this screen.

Table 4 Status > Packet Statistics

LABEL	DESCRIPTION
System Monitor	
System up Time	This is the elapsed time the system has been up.
Current Date/Time	This field displays your ZyXEL Device’s present date and time.
CPU Usage	This field specifies the percentage of CPU utilization.
Memory Usage	This field specifies the percentage of memory utilization.
WAN Port Statistics	
Link Status	This is the status of your WAN link.
WAN IP Address	This is the IP address assigned to your ZyXEL Device on the WAN.
Upstream Speed	This is the upstream speed of your ZyXEL Device.
Downstream Speed	This is the downstream speed of your ZyXEL Device.
Node-Link	This field displays the remote node index number and link type. Link types are PPPoA, ENET, RFC 1483 and PPPoE.
Status	This field displays **Down** (line is down), **Up** (line is up or connected) if you're using Ethernet encapsulation and **Down** (line is down), **Up** (line is up or connected), **Idle** (line (ppp) idle), **Dial** (starting to trigger a call) and **Drop** (dropping a call) if you're using PPPoE encapsulation. It displays **N/A** if the port is not connected.
TxPkts	This field displays the number of packets transmitted on this port.

Table 4 Status > Packet Statistics (continued)

LABEL	DESCRIPTION
RxPkts	This field displays the number of packets received on this port.
Errors	This field displays the number of error packets on this port.
Tx B/s	This field displays the number of bytes transmitted in the last second.
Rx B/s	This field displays the number of bytes received in the last second.
Up Time	This field displays the elapsed time this port has been up.
LAN Port Statistics	
Interface	This field displays the type of port.
Status	This field displays **Down** (line is down), **Up** (line is up or connected) if you're using Ethernet encapsulation and **Down** (line is down), **Up** (line is up or connected), **Idle** (line (ppp) idle), **Dial** (starting to trigger a call) and **Drop** (dropping a call) if you're using PPPoE encapsulation.
TxPkts	This field displays the number of packets transmitted on this port.
RxPkts	This field displays the number of packets received on this port.
Collisions	This is the number of collisions on this port.
Help	Click this to open the embedded help.
Poll Interval(s)	Type the time interval for the browser to refresh system statistics.
Set Interval	Click this button to apply the new poll interval you entered in the **Poll Interval** field above.
Stop	Click this button to halt the refreshing of the system statistics.

2.4.3 Status: VPN Status

This is the same screen discussed in Figure 82 on page 177.

2.5 Resetting the ZyXEL Device

If you forget your password or cannot access the web configurator, you will need to use the **RESET** button at the back of the ZyXEL Device to reload the factory-default configuration file. This means that you will lose all configurations that you had previously and the password will be reset to "1234".

2.5.1 Using the Reset Button

1 Make sure the **POWER** LED is on (not blinking).

2 Press the **RESET** button for ten seconds or until the **POWER** LED begins to blink and then release it. When the **POWER** LED begins to blink, the defaults have been restored and the ZyXEL Device restarts.

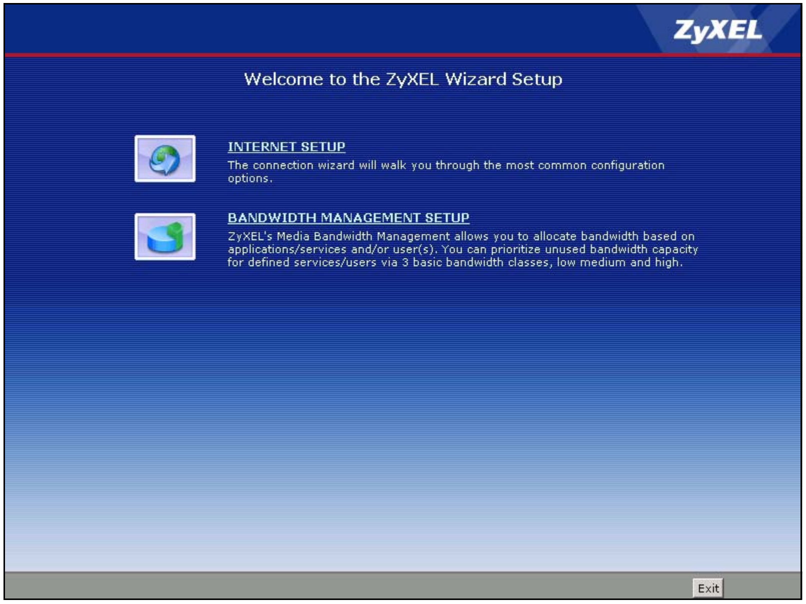
CHAPTER 3 Wizards

Use these screens to configure Internet access or to configure basic bandwidth management.

Note: See the advanced menu chapters for background information on these fields.

To access the wizards, click **Go to Wizard setup** in Figure 6 on page 47, or click the wizard icon ( ) in the top right corner of the web configurator. The wizard main screen appears.

Figure 10 Wizard Main Screen



Welcome to the ZyXEL Wizard Setup

INTERNET SETUP

The connection wizard will walk you through the most common configuration options.

BANDWIDTH MANAGEMENT SETUP

ZyXEL's Media Bandwidth Management allows you to allocate bandwidth based on applications/services and/or user(s). You can prioritize unused bandwidth capacity for defined services/users via 3 basic bandwidth classes, low medium and high.

The following table describes the fields in this screen.

Table 5 Wizard Main Screen

LABEL	DESCRIPTION
INTERNET SETUP	Click this if you want to configure Internet access settings. See Section 3.1 on page 56.
BANDWIDTH MANAGEMENT SETUP	Click this if you want to configure basic bandwidth management. See Section 3.2 on page 61.
Exit	Click this to close the wizard main screen and return to the **Status** screen or the main window.

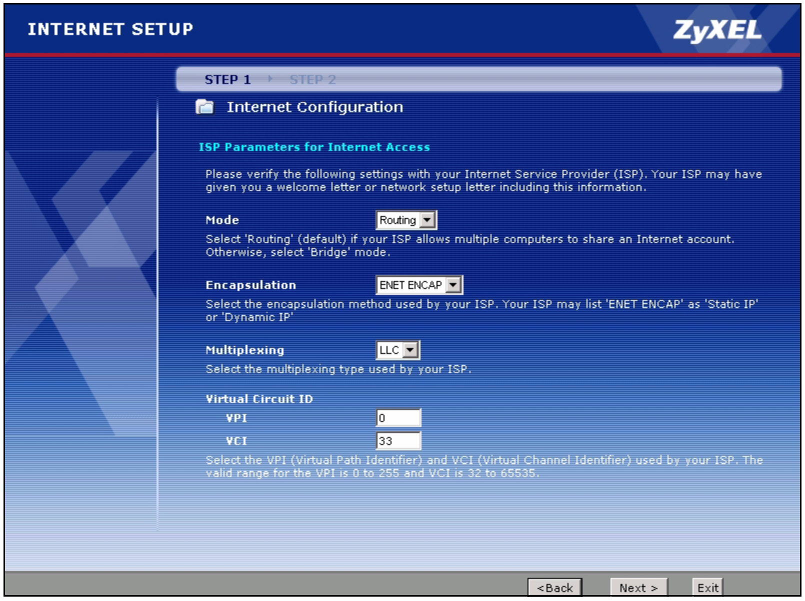
3.1 Internet Setup Wizard

Use these screens to configure Internet access settings. To access this wizard, click **INTERNET SETUP** in the wizard main screen.

3.1.1 Screen 1

This screen lets you enter some of the ISP settings for your Internet connection.

Figure 11 Internet Access Wizard Setup: ISP Parameters



ISP Parameters for Internet Access

Please verify the following settings with your Internet Service Provider (ISP). Your ISP may have given you a welcome letter or network setup letter including this information.

Mode: Routing

Select 'Routing' (default) if your ISP allows multiple computers to share an Internet account. Otherwise, select 'Bridge' mode.

Encapsulation: ENET ENCAP

Select the encapsulation method used by your ISP. Your ISP may list 'ENET ENCAP' as 'Static IP' or 'Dynamic IP'

Multiplexing: LLC

Select the multiplexing type used by your ISP.

Virtual Circuit ID

VPI: 0

VCI: 33

Select the VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) used by your ISP. The valid range for the VPI is 0 to 255 and VCI is 32 to 65535.

The following table describes the fields in this screen.

Table 6 Internet Setup Wizard: ISP Parameters

LABEL	DESCRIPTION
Mode	Select **Routing** (default) if your ISP allows multiple computers to share an Internet account. Otherwise, select **Bridge**.
Encapsulation	Select the encapsulation type your ISP uses from the **Encapsulation** drop-down list box. Choices vary depending on what you select in the **Mode** field. If you select **Bridge** in the Mode field, select either **PPPoA** or **RFC 1483**. If you select **Routing** in the Mode field, select **PPPoA**, **RFC 1483**, **ENET ENCAP** or **PPPoE**.
Multiplexing	Select the multiplexing method used by your ISP from the **Multiplex** drop-down list box either VC-based or LLC-based.
Virtual Circuit ID	VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) define a virtual circuit. Refer to the appendix for more information.
VPI	Enter the VPI assigned to you. This field may already be configured.
VCI	Enter the VCI assigned to you. This field may already be configured.
Back	Click **Back** to go back to the previous screen.

Table 6 Internet Setup Wizard: ISP Parameters

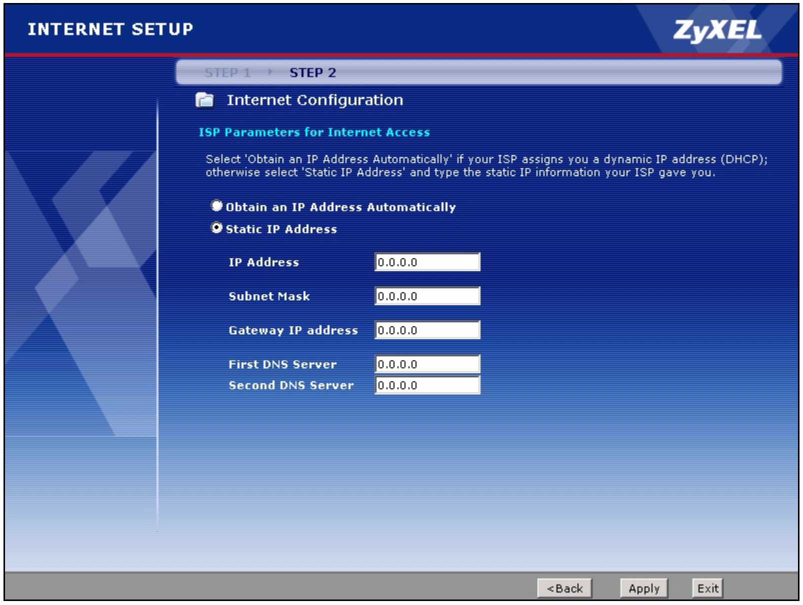
LABEL	DESCRIPTION
Next	Click **Next** to continue to the next wizard screen. The next wizard screen you see depends on what mode and encapsulation you selected above.
Exit	Click **Exit** to close the wizard screen without saving your changes.

3.1.2 Screen 2

These screens let you enter the rest of the Internet settings, which depend on the encapsulation your Internet connection uses (and the mode you selected, for RFC1483).

This screen appears if your Internet connection uses Ethernet encapsulation.

Figure 12 Internet Setup Wizard: ISP Parameters (Ethernet)



Select 'Obtain an IP Address Automatically' if your ISP assigns you a dynamic IP address (DHCP); otherwise select 'Static IP Address' and type the static IP information your ISP gave you.

○ Obtain an IP Address Automatically

● Static IP Address

IP Address: 0.0.0.0

Subnet Mask: 0.0.0.0

Gateway IP address: 0.0.0.0

First DNS Server: 0.0.0.0

Second DNS Server: 0.0.0.0

The following table describes the fields in this screen.

Table 7 Internet Setup Wizard: ISP Parameters (Ethernet)

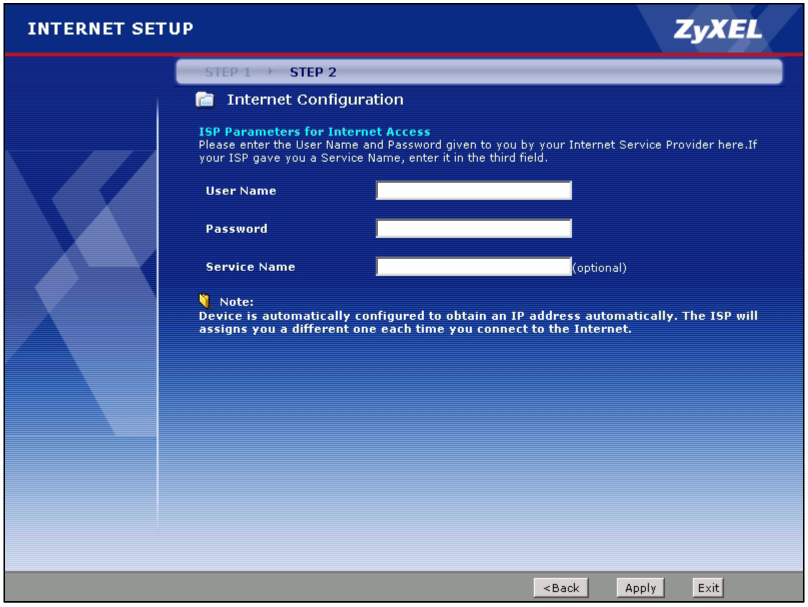
LABEL	DESCRIPTION
Obtain an IP Address Automatically	Select this if you have a dynamic IP address.
Static IP Address	Select this if you have a static (fixed) IP address, and enter the information below.
	These fields appear if you select **Static IP Address**.
IP Address	Enter the static IP address provided by your ISP.
Subnet Mask	Enter the subnet mask provided by your ISP.
Gateway IP Address	Enter the IP address of the gateway provided by your ISP. If your ISP did not provide one, use the default value.

Table 7 Internet Setup Wizard: ISP Parameters (Ethernet)

LABEL	DESCRIPTION
First DNS Server Second DNS Server	Enter the IP address(es) of the DNS server(s) provided by your ISP. If your ISP did not provide one or both, use the default value(s).
Back	Click **Back** to go back to the previous screen.
Apply	Click **Apply** to finish manual configuration.
Exit	Click **Exit** to close the wizard screen without saving your changes.

This screen appears if your Internet connection uses PPPoE encapsulation.

Figure 13 Internet Setup Wizard: ISP Parameters (PPPoE)



ISP Parameters for Internet Access

Please enter the User Name and Password given to you by your Internet Service Provider here.If your ISP gave you a Service Name, enter it in the third field.

User Name

Password

Service Name (optional)

Note:
Device is automatically configured to obtain an IP address automatically. The ISP will assigns you a different one each time you connect to the Internet.

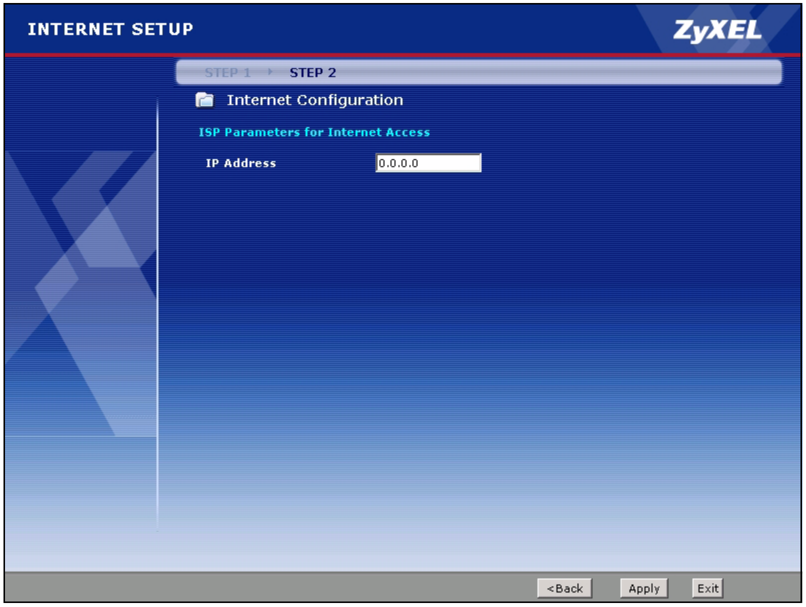
The following table describes the fields in this screen.

Table 8 Internet Setup Wizard: ISP Parameters (PPPoE)

LABEL	DESCRIPTION
User Name	Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.
Password	Enter the password associated with the user name above.
Service Name	Type the name of your PPPoE service here. Leave this field blank if your ISP did not provide you a PPPoE service.
Back	Click **Back** to go back to the previous screen.
Apply	Click **Apply** to finish manual configuration.
Exit	Click **Exit** to close the wizard screen without saving your changes.

This screen appears if your Internet connection uses RFC1483 encapsulation.

Figure 14 Internet Setup Wizard: ISP Parameters (RFC1483)



IP Address 0.0.0.0

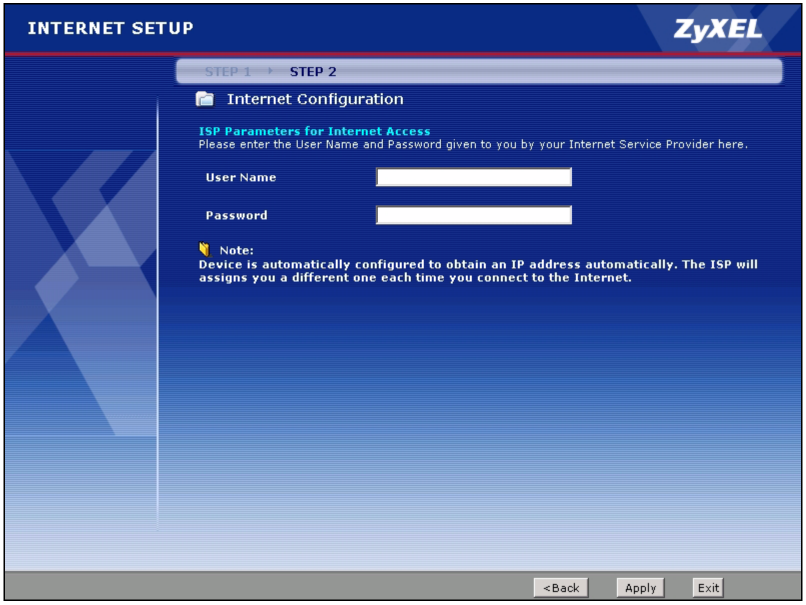
The following table describes the fields in this screen.

Table 9 Internet Setup Wizard: ISP Parameters (RFC1483)

LABEL	DESCRIPTION
IP Address	Enter the static IP address provided by your ISP.
Back	Click **Back** to go back to the previous screen.
Apply	Click **Apply** to finish manual configuration.
Exit	Click **Exit** to close the wizard screen without saving your changes.

This screen appears if your Internet connection uses PPPoA encapsulation.

Figure 15 Internet Setup Wizard: ISP Parameters (PPPoA)



ISP Parameters for Internet Access

Please enter the User Name and Password given to you by your Internet Service Provider here.

Note:
Device is automatically configured to obtain an IP address automatically. The ISP will assigns you a different one each time you connect to the Internet.

The following table describes the fields in this screen.

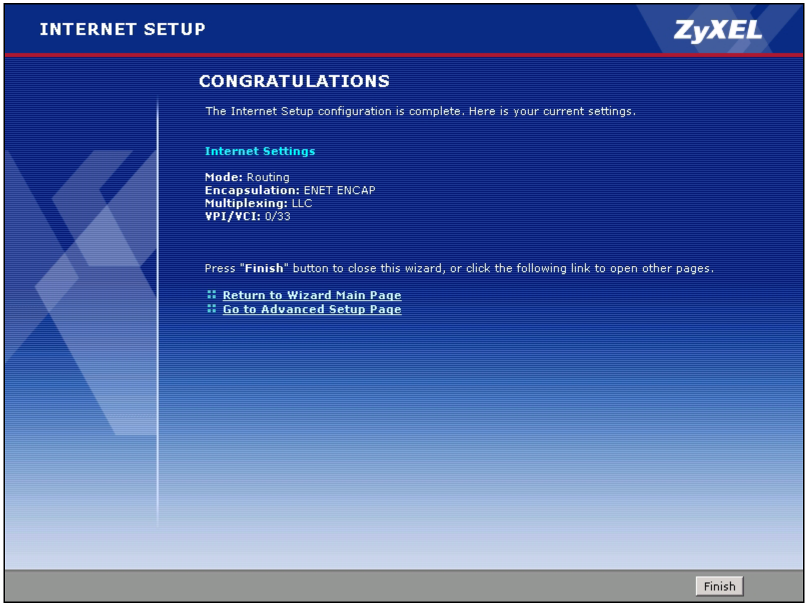
Table 10 Internet Setup Wizard: ISP Parameters (PPPoA)

LABEL	DESCRIPTION
User Name	Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.
Password	Enter the password associated with the user name above.
Back	Click **Back** to go back to the previous screen.
Apply	Click **Apply** to finish manual configuration.
Exit	Click **Exit** to close the wizard screen without saving your changes.

3.1.3 Screen 3

This screen appears when you complete the **Internet Setup** wizard.

Figure 16 Internet Setup Wizard: Summary Screen



CONGRATULATIONS

The Internet Setup configuration is complete. Here is your current settings.

Internet Settings

Mode: Routing
Encapsulation: ENET ENCAP
Multiplexing: LLC
VPI/VCI: 0/33

Press "**Finish**" button to close this wizard, or click the following link to open other pages.

3 Use the read-only summary table to check whether what you have configured is correct. Click **Finish** to complete and save the wizard setup.The following table describes the fields in this screen.

Table 11 Internet Setup Wizard: Summary

LABEL	DESCRIPTION
Return to Wizard Main Page	Click this to return to the wizard main page. See Figure 10 on page 55.
Go to Advanced Setup Page	Click this to go to the main window. See Figure 7 on page 48.
Finish	Click this to close the wizard main screen and return to the **Status** screen or the main window.

Launch your web browser and navigate to www.zyxel.com. If you cannot access the Internet, open the web configurator again to confirm that the Internet settings you configured in the wizard setup are correct.

Internet access is just the beginning. Refer to the rest of this guide for more detailed information on the complete range of ZyXEL Device features.

3.2 Bandwidth Management Wizard

Use these screens to control the amount of bandwidth going out through the ZyXEL Device's WAN port and prioritize the distribution of the bandwidth. This helps keep one service, or application, from using all of the available bandwidth and shutting out other services.

The following table describes the services you can select.

Table 12 Bandwidth Management Setup: Services

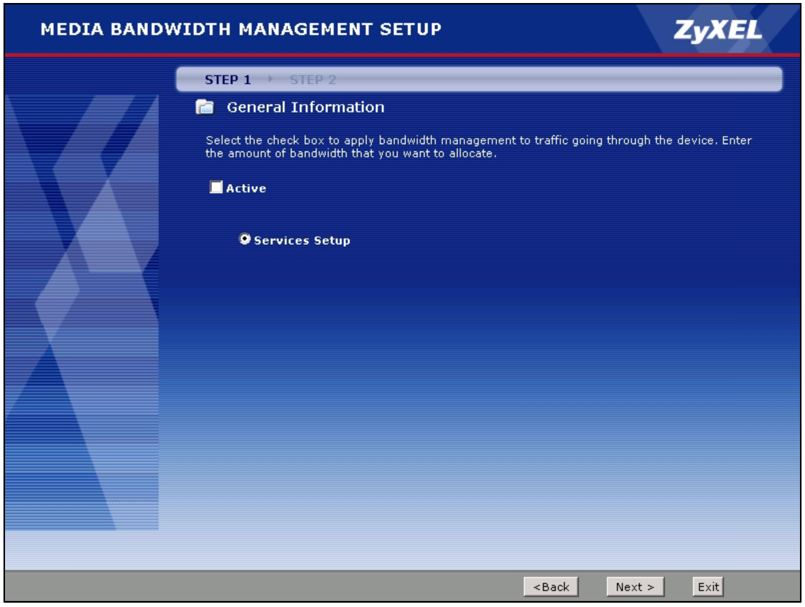
SERVICE	DESCRIPTION
E-Mail	Electronic mail consists of messages sent through a computer network to specific groups or individuals. Here are some default ports for e-mail: POP3 - port 110 IMAP - port 143 SMTP - port 25 HTTP - port 80
FTP	File Transfer Program enables fast transfer of files, including large files that may not be possible by e-mail. FTP uses port number 21.
NetMeeting (H.323)	A multimedia communications product from Microsoft that enables groups to teleconference and videoconference over the Internet. NetMeeting supports VoIP, text chat sessions, a whiteboard, and file transfers and application sharing. NetMeeting uses H.323. H.323 is a standard teleconferencing protocol suite that provides audio, data and videoconferencing. It allows for real-time point-to-point and multipoint communication between client computers over a packet-based network that does not provide a guaranteed quality of service. H.323 is transported primarily over TCP, using the default port number 1720.
VoIP (H.323)	Sending voice signals over the Internet is called Voice over IP or VoIP. H.323 is a standard teleconferencing protocol suite that provides audio, data and videoconferencing. It allows for real-time point-to-point and multipoint communication between client computers over a packet-based network that does not provide a guaranteed quality of service. H.323 is transported primarily over TCP, using the default port number 1720.
VoIP (SIP)	Sending voice signals over the Internet is called Voice over IP or VoIP. Session Initiated Protocol (SIP) is an internationally recognized standard for implementing VoIP. SIP is an application-layer control (signaling) protocol that handles the setting up, altering and tearing down of voice and multimedia sessions over the Internet. SIP is transported primarily over UDP but can also be transported over TCP, using the default port number 5060.
Telnet	Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems. Telnet uses TCP port 23.
TFTP	Trivial File Transfer Protocol is an Internet file transfer protocol similar to FTP, but uses the UDP (User Datagram Protocol) rather than TCP (Transmission Control Protocol).
WWW	The World Wide Web (WWW) is an Internet system to distribute graphical, hyper-linked information, based on Hyper Text Transfer Protocol (HTTP) - a client/server protocol for the World Wide Web. The Web is not synonymous with the Internet; rather, it is just one service on the Internet. Other services on the Internet include Internet Relay Chat and Newsgroups. The Web is accessed through use of a browser.

To access this wizard, open the web configurator (see Section 2.2 on page 45) and click **BANDWIDTH MANAGEMENT SETUP** in the wizard main screen.

3.2.1 Screen 1

Activate bandwidth management and select to allocate bandwidth to packets based on the services.

Figure 17 Bandwidth Management Wizard: General Information



General Information

Select the check box to apply bandwidth management to traffic going through the device. Enter the amount of bandwidth that you want to allocate.

□ Active

● Services Setup

The following fields describe the label in this screen.

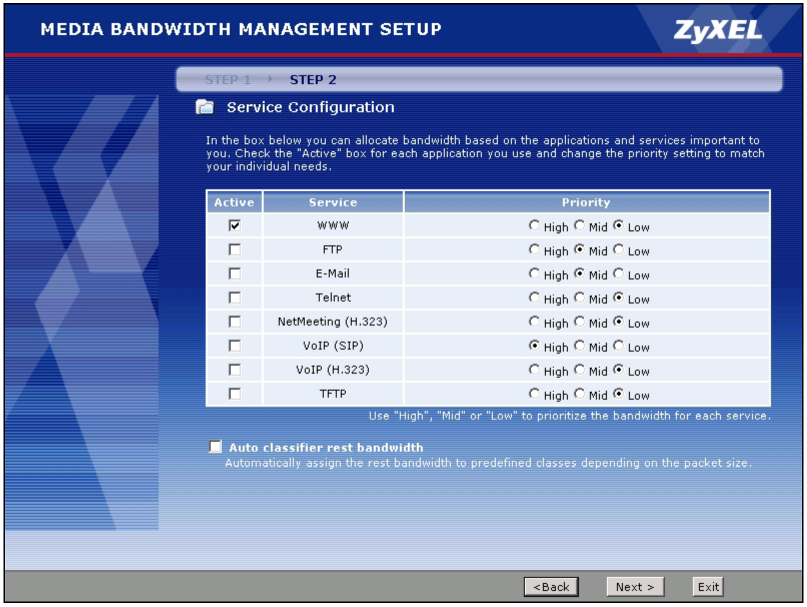
Table 13 Bandwidth Management Wizard: General Information

LABEL	DESCRIPTION
Active	Select the **Active** check box to have the ZyXEL Device apply bandwidth management to traffic going out through the ZyXEL Device's WAN or LAN port. If you do not select this, you cannot run the rest of the wizard.
Services Setup	Select **Services Setup** to allocate bandwidth based on the service requirements.
Back	Click **Back** to display the previous screen.
Next	Click **Next** to proceed to the next screen.
Exit	Click **Exit** to close the wizard screen without saving.

3.2.2 Screen 2

Use the second wizard screen to select the services that you want to apply bandwidth management, and select the priorities that you want to apply to the services listed.

Figure 18 Bandwidth Management Wizard: Configuration



Service Configuration

In the box below you can allocate bandwidth based on the applications and services important to you. Check the "Active" box for each application you use and change the priority setting to match your individual needs.

Active	Service	Priority
☑	WWW	○ High ○ Mid ● Low
□	FTP	○ High ● Mid ○ Low
□	E-Mail	○ High ● Mid ○ Low
□	Telnet	○ High ○ Mid ● Low
□	NetMeeting (H.323)	○ High ○ Mid ● Low
□	VoIP (SIP)	● High ○ Mid ○ Low
□	VoIP (H.323)	○ High ○ Mid ● Low
□	TFTP	○ High ○ Mid ● Low

Use "High", "Mid" or "Low" to prioritize the bandwidth for each service.

□ **Auto classifier rest bandwidth**
Automatically assign the rest bandwidth to predefined classes depending on the packet size.

The following table describes the labels in this screen.

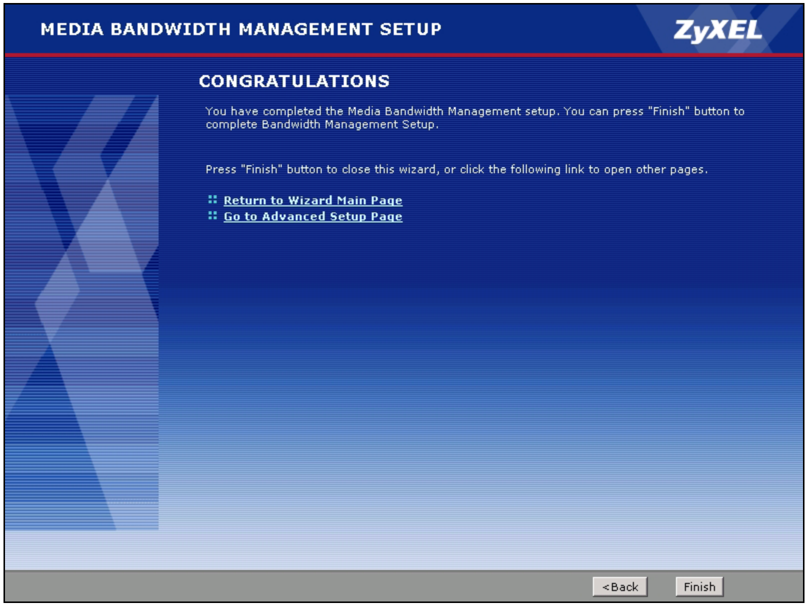
Table 14 Bandwidth Management Wizard: Configuration

LABEL	DESCRIPTION
Active	Select an entry’s **Active** check box to turn on bandwidth management for the service/ application.
Service	These fields display the services names.
Priority	Select **High**, **Mid** or **Low** priority for each service to have your ZyXEL Device use a priority for traffic that matches that service. A service with **High** priority is given as much bandwidth as it needs. If you select services as having the same priority, then bandwidth is divided equally amongst those services. Services not specified in bandwidth management are allocated bandwidth after all specified services receive their bandwidth requirements. If the rules set up in this wizard are changed in **Advanced** > **Bandwidth MGMT** > **Rule Setup**, then the service priority radio button will be set to **User Configured**. The **Advanced** > **Bandwidth MGMT** > **Rule Setup** screen allows you to edit these rule configurations.
Auto classifier rest bandwidth	Select **Auto classifier rest bandwidth** to automatically allocate unbudgeted or unused bandwidth to services based on the packet type.
Back	Click **Back** to go back to the previous wizard screen.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Exit	Click **Exit** to close the wizard screen without saving your changes.

3.2.3 Screen 3

Follow the on-screen instructions and click **Finish** to complete the wizard setup and save your configuration.

Figure 19 Bandwidth Management Wizard: Complete



CONGRATULATIONS

You have completed the Media Bandwidth Management setup. You can press "Finish" button to complete Bandwidth Management Setup.

Press "Finish" button to close this wizard, or click the following link to open other pages.

- Return to Wizard Main Page
- Go to Advanced Setup Page

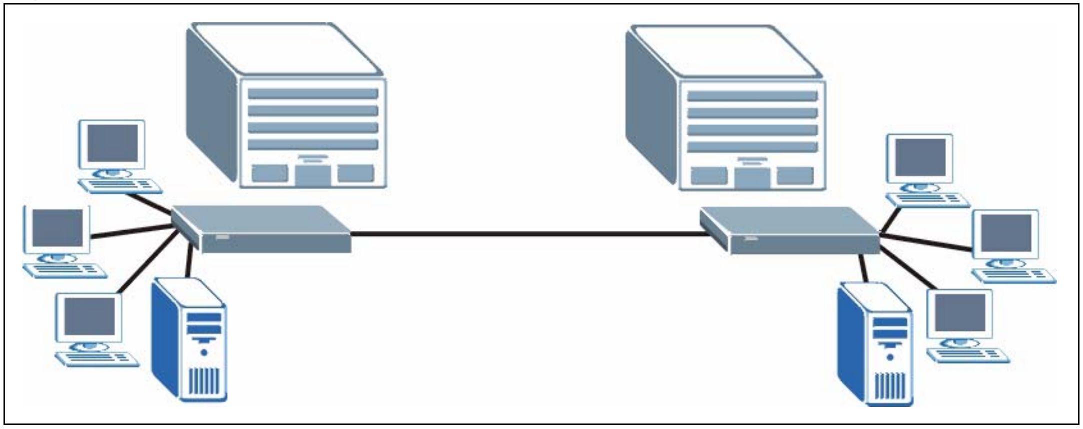
CHAPTER 4
Point-to-point Configuration

This chapter introduces point-to-point connections.

4.1 Point-to-point Connection Overview

You can set up point-to-point connections between two ZyXEL Devices. These connections offer a cost-effective, high-speed connection for high-bandwidth applications such as videoconferencing and distance learning. An example is shown below. (This figure is the same as the one in Figure 2 on page 42.)

Figure 20 Example: Point-to-point Connections



In a point-to-point connection, the DSL ports on the ZyXEL Devices are directly connected to each other, not to an ISP or the Internet. The connection can use RFC 1483 in bridge mode or ENET ENCAP in router mode, and the ZyXEL Devices must use the same VPI, VCI, multiplexing, and encapsulation method.

Note: A point-to-point connection can use RFC 1483 in bridge mode or ENET ENCAP in router mode.

Note: In a point-to-point connection, the ZyXEL Devices should use the same VPI, VCI, multiplexing, and encapsulation method.

To establish a point-to-point connection, one of the ZyXEL Devices becomes the server (normally, the ISP). The server controls some of the attributes of the DSL connection, such as the transfer rate and the DSL operational mode. Otherwise, there is no difference between the server and the client. Both of them can establish the point-to-point connection.

You can only establish point-to-point connections between ZyXEL Devices that support this kind of server/client mode.

4.2 Point-to-point Connection Procedure

Follow these directions to set up a point-to-point connection.

1 Set up the Server.

2 Set up the Client.

3 Connect the ZyXEL Devices.

4.2.1 Set up the Server

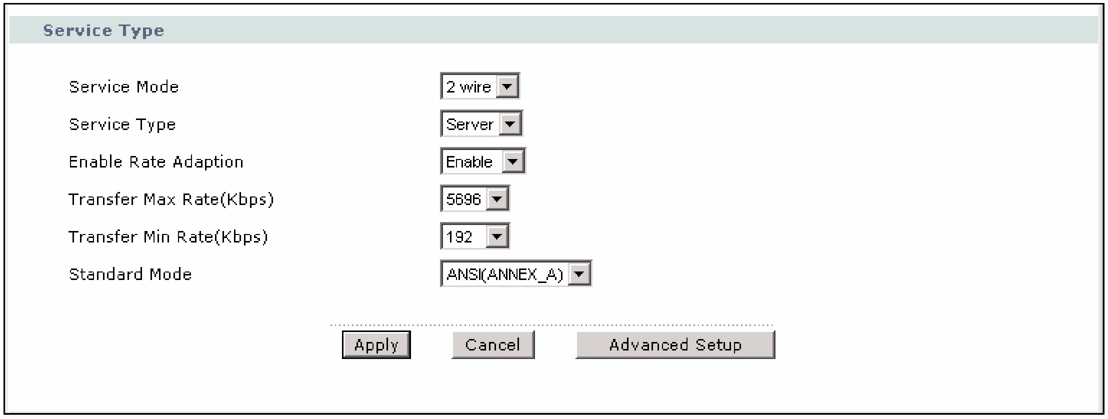
1 Log in to the ZyXEL Device that will be the server. (See Chapter 2 on page 45.)

2 Click **Network** > **WAN** > **Internet Connection**.

3 Configure the **VPI**, **VCI**, **Multiplexing**, and **Encapsulation** fields for the point-to-point connection. In the **Encapsulation** field, select either **RFC 1483** or **ENET ENCAP**.

4 Scroll down to the **Service Type** section. The following screen appears.

Figure 21 WAN > Internet Connection > Service Type



Service Type

Service Mode	2 wire
Service Type	Server
Enable Rate Adaption	Enable
Transfer Max Rate(Kbps)	5696
Transfer Min Rate(Kbps)	192
Standard Mode	ANSI(ANNEX_A)

5 In the **Service Mode** field, indicate whether the phone line is a 2-wire connection or a 4-wire connection.

6 In the **Service Type** field, select **Server**. The rest of the fields are enabled.

7 Configure the rest of the fields, if necessary. For example, you might want to set the **Transfer Max Rate** to the maximum value.

8 Click **Apply**.

4.2.2 Set up the Client

1 Log in to the ZyXEL Device that will be the client. (See Chapter 2 on page 45.)

2 Click **Network** > **WAN** > **Internet Connection**.

3 Set the **VPI**, **VCI**, **Multiplexing**, and **Encapsulation** to the same values you set in the server.

4 Scroll down to the **Service Type** section. See Figure 21 on page 68 above.

5 In the **Service Mode** field, select the same type of connection you selected for the server.

6 In the **Service Type** field, select **Client**. The rest of the fields will be negotiated with the server.

7 Click **Apply**.

4.2.3 Connect the ZyXEL Devices

Connect the **DSL** ports on the ZyXEL Devices together, and wait while the ZyXEL Devices automatically establish the connection. When the connection is established, the **DSL1**, **DSL2**, and **INTERNET** lights are on. It takes up to half a minute to establish the connection. If the connection is not established, verify that the settings match.

CHAPTER 5 WAN Setup

This chapter describes how to configure WAN settings.

5.1 WAN Overview

A WAN (Wide Area Network) is an outside connection to another network or the Internet.

5.1.1 Encapsulation

Be sure to use the encapsulation method required by your ISP. The ZyXEL Device supports the following methods.

5.1.1.1 ENET ENCAP

The MAC Encapsulated Routing Link Protocol (ENET ENCAP) is only implemented with the IP network protocol. IP packets are routed between the Ethernet interface and the WAN interface and then formatted so that they can be understood in a bridged environment. For instance, it encapsulates routed Ethernet frames into bridged ATM cells. ENET ENCAP requires that you specify a gateway IP address in the **ENET ENCAP Gateway** field in the second wizard screen. You can get this information from your ISP.

5.1.1.2 PPP over Ethernet

PPPoE (Point-to-Point Protocol over Ethernet) provides access control and billing functionality in a manner similar to dial-up services using PPP. PPPoE is an IETF standard (RFC 2516) specifying how a personal computer (PC) interacts with a broadband modem (DSL, cable, wireless, etc.) connection.

For the service provider, PPPoE offers an access and authentication method that works with existing access control systems (for example RADIUS).

One of the benefits of PPPoE is the ability to let you access one of multiple network services, a function known as dynamic service selection. This enables the service provider to easily create and offer new IP services for individuals.

Operationally, PPPoE saves significant effort for both you and the ISP or carrier, as it requires no specific configuration of the broadband modem at the customer site.

By implementing PPPoE directly on the ZyXEL Device (rather than individual computers), the computers on the LAN do not need PPPoE software installed, since the ZyXEL Device does that part of the task. Furthermore, with NAT, all of the LANs' computers will have access.

5.1.1.3 PPPoA

PPPoA stands for Point to Point Protocol over ATM Adaptation Layer 5 (AAL5). A PPPoA connection functions like a dial-up Internet connection. The ZyXEL Device encapsulates the PPP session based on RFC1483 and sends it through an ATM PVC (Permanent Virtual Circuit) to the Internet Service Provider's (ISP) DSLAM (DSL Access Multiplexer). Please refer to RFC 2364 for more information on PPPoA. Refer to RFC 1661 for more information on PPP.

5.1.1.4 RFC 1483

RFC 1483 describes two methods for Multiprotocol Encapsulation over ATM Adaptation Layer 5 (AAL5). The first method allows multiplexing of multiple protocols over a single ATM virtual circuit (LLC-based multiplexing) and the second method assumes that each protocol is carried over a separate ATM virtual circuit (VC-based multiplexing). Please refer to the RFC for more detailed information.

5.1.2 Multiplexing

There are two conventions to identify what protocols the virtual circuit (VC) is carrying. Be sure to use the multiplexing method required by your ISP.

5.1.2.1 VC-based Multiplexing

In this case, by prior mutual agreement, each protocol is assigned to a specific virtual circuit; for example, VC1 carries IP, etc. VC-based multiplexing may be dominant in environments where dynamic creation of large numbers of ATM VCs is fast and economical.

5.1.2.2 LLC-based Multiplexing

In this case one VC carries multiple protocols with protocol identifying information being contained in each packet header. Despite the extra bandwidth and processing overhead, this method may be advantageous if it is not practical to have a separate VC for each carried protocol, for example, if charging heavily depends on the number of simultaneous VCs.

5.1.3 VPI and VCI

Be sure to use the correct Virtual Path Identifier (VPI) and Virtual Channel Identifier (VCI) numbers assigned to you. The valid range for the VPI is 0 to 255 and for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Please see the appendix for more information.

5.1.4 IP Address Assignment

A static IP is a fixed IP that your ISP gives you. A dynamic IP is not fixed; the ISP assigns you a different one each time. The Single User Account feature can be enabled or disabled if you have either a dynamic or static IP. However the encapsulation method assigned influences your choices for IP address and ENET ENCAP gateway.

5.1.4.1 IP Assignment with PPPoA or PPPoE Encapsulation

If you have a dynamic IP, then the **IP Address** and **ENET ENCAP Gateway** fields are not applicable (N/A). If you have a static IP, then you *only* need to fill in the **IP Address** field and *not* the **ENET ENCAP Gateway** field.

5.1.4.2 IP Assignment with RFC 1483 Encapsulation

In this case the IP Address Assignment *must* be static with the same requirements for the **IP Address** and **ENET ENCAP Gateway** fields as stated above.

5.1.4.3 IP Assignment with ENET ENCAP Encapsulation

In this case you can have either a static or dynamic IP. For a static IP you must fill in all the **IP Address** and **ENET ENCAP Gateway** fields as supplied by your ISP. However for a dynamic IP, the ZyXEL Device acts as a DHCP client on the WAN port and so the **IP Address** and **ENET ENCAP Gateway** fields are not applicable (N/A) as the DHCP server assigns them to the ZyXEL Device.

5.1.5 Nailed-Up Connection (PPP)

A nailed-up connection is a dial-up line where the connection is always up regardless of traffic demand. The ZyXEL Device does two things when you specify a nailed-up connection. The first is that idle timeout is disabled. The second is that the ZyXEL Device will try to bring up the connection when turned on and whenever the connection is down. A nailed-up connection can be very expensive for obvious reasons.

Do not specify a nailed-up connection unless your telephone company offers flat-rate service or you need a constant connection and the cost is of no concern

5.1.6 NAT

NAT (Network Address Translation, RFC 1631) is the translation of the IP address of a host in a packet, for example, the source address of an outgoing packet, used within one network to a different IP address known within another network.

5.2 Metric

The metric represents the "cost of transmission". A router determines the best route for transmission by choosing a path with the lowest "cost". RIP routing uses hop count as the measurement of cost, with a minimum of "1" for directly connected networks. The number must be between "1" and "15"; a number greater than "15" means the link is down. The smaller the number, the lower the "cost".

The metric sets the priority for the ZyXEL Device's routes to the Internet. If any two of the default routes have the same metric, the ZyXEL Device uses the following pre-defined priorities:

- Normal route: designated by the ISP (see Section 5.4 on page 76)
- Traffic-redirect route (see Section 5.6 on page 85)
- WAN-backup route, also called dial-backup (see Section 5.8 on page 86)

For example, if the normal route has a metric of "1" and the traffic-redirect route has a metric of "2" and dial-backup route has a metric of "3", then the normal route acts as the primary default route. If the normal route fails to connect to the Internet, the ZyXEL Device tries the traffic-redirect route next. In the same manner, the ZyXEL Device uses the dial-backup route if the traffic-redirect route also fails.

If you want the dial-backup route to take first priority over the traffic-redirect route or even the normal route, all you need to do is set the dial-backup route's metric to "1" and the others to "2" (or greater).

IP Policy Routing overrides the default routing behavior and takes priority over all of the routes mentioned above.

5.3 Traffic Shaping

Traffic Shaping is an agreement between the carrier and the subscriber to regulate the average rate and fluctuations of data transmission over an ATM network. This agreement helps eliminate congestion, which is important for transmission of real time data such as audio and video connections.

Peak Cell Rate (PCR) is the maximum rate at which the sender can send cells. This parameter may be lower (but not higher) than the maximum line speed. 1 ATM cell is 53 bytes (424 bits), so a maximum speed of 832Kbps gives a maximum PCR of 1962 cells/sec. This rate is not guaranteed because it is dependent on the line speed.

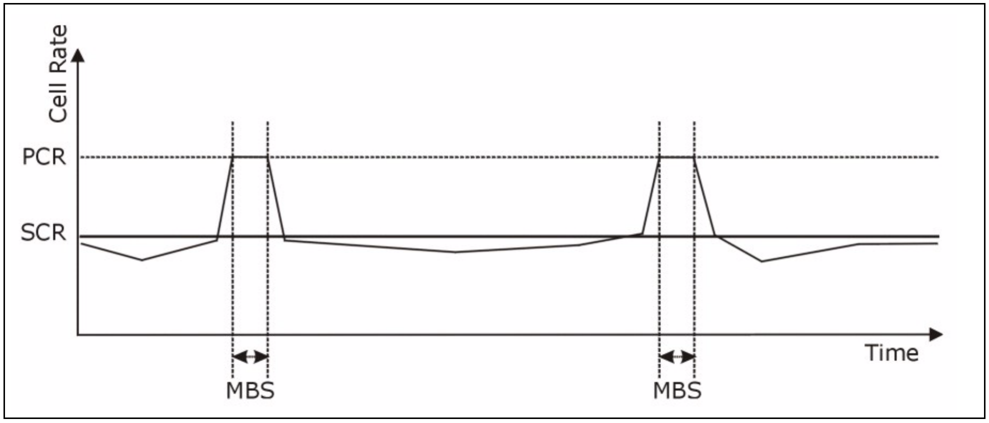
Sustained Cell Rate (SCR) is the mean cell rate of each bursty traffic source. It specifies the maximum average rate at which cells can be sent over the virtual connection. SCR may not be greater than the PCR.

Maximum Burst Size (MBS) is the maximum number of cells that can be sent at the PCR. After MBS is reached, cell rates fall below SCR until cell rate averages to the SCR again. At this time, more cells (up to the MBS) can be sent at the PCR again.

If the PCR, SCR or MBS is set to the default of "0", the system will assign a maximum value that correlates to your upstream line rate.

The following figure illustrates the relationship between PCR, SCR and MBS.

Figure 22 Example of Traffic Shaping



5.3.1 ATM Traffic Classes

These are the basic ATM traffic classes defined by the ATM Forum Traffic Management 4.0 Specification.

5.3.1.1 Constant Bit Rate (CBR)

Constant Bit Rate (CBR) provides fixed bandwidth that is always available even if no data is being sent. CBR traffic is generally time-sensitive (doesn't tolerate delay). CBR is used for connections that continuously require a specific amount of bandwidth. A PCR is specified and if traffic exceeds this rate, cells may be dropped. Examples of connections that need CBR would be high-resolution video and voice.

5.3.1.2 Variable Bit Rate (VBR)

The Variable Bit Rate (VBR) ATM traffic class is used with bursty connections. Connections that use the Variable Bit Rate (VBR) traffic class can be grouped into real time (VBR-RT) or non-real time (VBR-nRT) connections.

The VBR-RT (real-time Variable Bit Rate) type is used with bursty connections that require closely controlled delay and delay variation. It also provides a fixed amount of bandwidth (a PCR is specified) but is only available when data is being sent. An example of an VBR-RT connection would be videoconferencing. Videoconferencing requires real-time data transfers and the bandwidth requirement varies in proportion to the video image's changing dynamics.

The VBR-nRT (non real-time Variable Bit Rate) type is used with bursty connections that do not require closely controlled delay and delay variation. It is commonly used for "bursty" traffic typical on LANs. PCR and MBS define the burst levels, SCR defines the minimum level. An example of an VBR-nRT connection would be non-time sensitive data file transfers.

5.3.1.3 Unspecified Bit Rate (UBR)

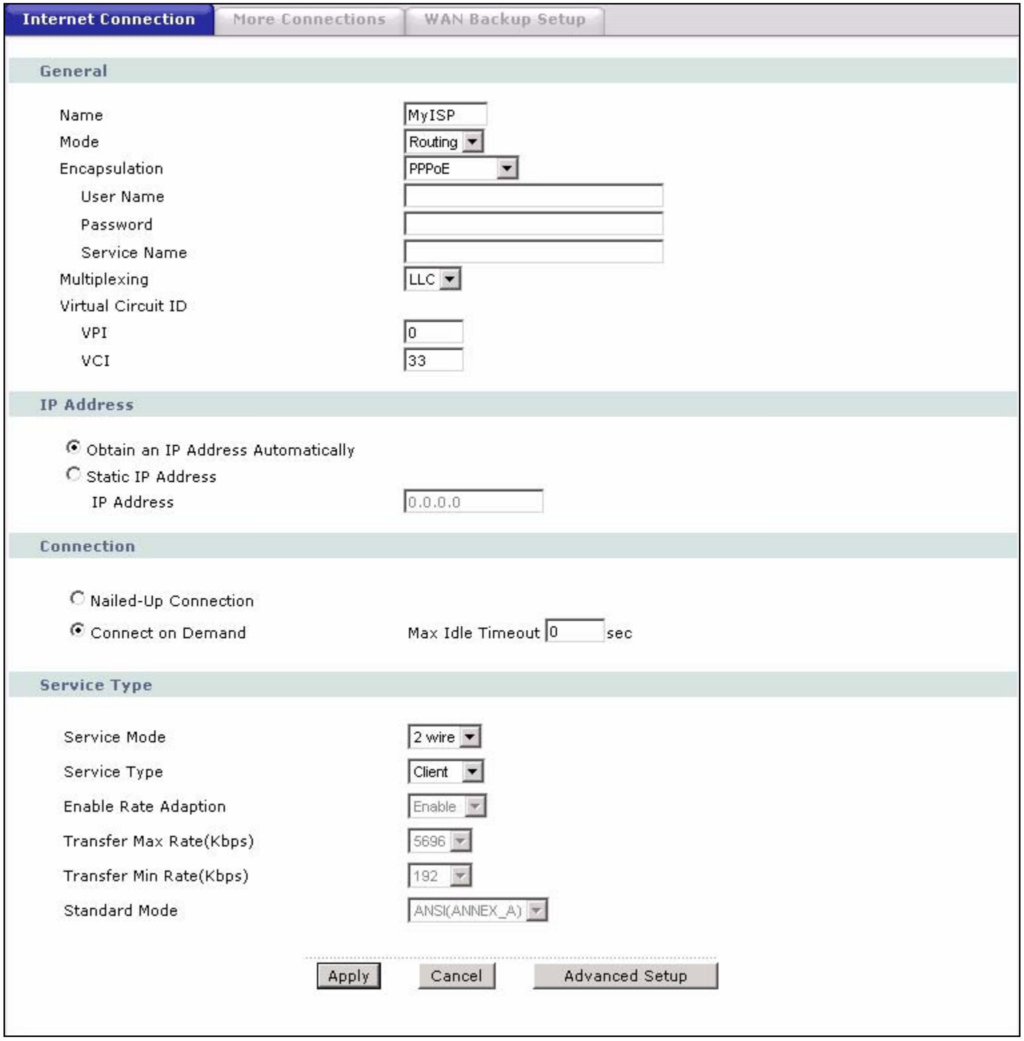
The Unspecified Bit Rate (UBR) ATM traffic class is for bursty data transfers. However, UBR doesn't guarantee any bandwidth and only delivers traffic when the network has spare bandwidth. An example application is background file transfer.

5.4 Internet Connection

To change your ZyXEL Device’s WAN remote node settings, click **Network > WAN > Internet Connection**. The screen differs by the encapsulation.

See Section 5.1 on page 71 for more information.

Figure 23 WAN > Internet Connection



General

Name: MyISP

Mode: Routing

Encapsulation: PPPoE

User Name:

Password:

Service Name:

Multiplexing: LLC

Virtual Circuit ID

VPI: 0

VCI: 33

IP Address

● Obtain an IP Address Automatically

○ Static IP Address

IP Address: 0.0.0.0

Connection

○ Nailed-Up Connection

● Connect on Demand Max Idle Timeout 0 sec

Service Type

Service Mode: 2 wire

Service Type: Client

Enable Rate Adaption: Enable

Transfer Max Rate(Kbps): 5696

Transfer Min Rate(Kbps): 192

Standard Mode: ANSI(ANNEX_A)

The following table describes the labels in this screen.

Table 15 WAN > Internet Connection

LABEL	DESCRIPTION
General	
Name	Enter the name of your Internet Service Provider, e.g., MyISP. This information is for descriptive purposes only.
Mode	Select **Routing** (default) from the drop-down list box if your ISP allows multiple computers to share an Internet account. Otherwise select **Bridge**.
Encapsulation	Select the method of encapsulation used by your ISP from the drop-down list box. Choices vary depending on the mode you select in the **Mode** field. If you select **Bridge** in the **Mode** field, select either **PPPoA** or **RFC 1483**. If you select **Routing** in the **Mode** field, select **PPPoA**, **RFC 1483**, **ENET ENCAP** or **PPPoE**. If you set up a point-to-point connection, select either **ENET ENCAP** or **RFC 1483**.

Table 15 WAN > Internet Connection (continued)

LABEL	DESCRIPTION
User Name	(PPPoA and PPPoE only) Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.
Password	(PPPoA and PPPoE only) Enter the password associated with the user name above.
Service Name	(PPPoE only) Type the name of your PPPoE service here.
Multiplexing	Select the method of multiplexing used by your ISP from the drop-down list. Choices are **VC** or **LLC**.
Virtual Circuit ID	VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) define a virtual circuit. Refer to the appendix for more information.
VPI	The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.
VCI	The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.
IP Address	These fields only appear if the **Mode** is **Routing**. A static IP address is a fixed IP that your ISP gives you. A dynamic IP address is not fixed; the ISP assigns you a different one each time you connect to the Internet. ‘
Obtain an IP Address Automatically	(PPPoE, PPPoA, and ENET ENCAP only) Select this if you have a dynamic IP address.
Static IP Address	(PPPoE, PPPoA, and ENET ENCAP only) Select this if you do not have a dynamic IP address.
IP Address	Enter the static IP address provided by your ISP.
Subnet Mask	(ENET ENCAP only) This field is enabled if you select **Static IP Address**. Enter the subnet mask provided by your ISP.
Gateway IP Address	(ENET ENCAP only) This field is enabled if you select **Static IP Address**. Enter the gateway IP address provided by your ISP. You must enter a valid IP address for Internet access. If you enter 0.0.0.0, the Internet connection does not work.
Connection	This section only appears if the **Encapsulation** is **PPPoE** and **PPPoA**.
Nailed-Up Connection	Select **Nailed-Up Connection** when you want your connection up all the time. The ZyXEL Device will try to bring up the connection automatically if it is disconnected.
Connect on Demand	Select **Connect on Demand** when you don't want the connection up all the time and specify an idle time-out in the **Max Idle Timeout** field.
Max Idle Timeout	Specify an idle time-out in the **Max Idle Timeout** field when you select **Connect on Demand**. The default setting is 0, which means the Internet session will not timeout.
Service Type	
Service Mode	Select 2-wire or 4-wire mode for the DSL connection. This is related to the phone line you use and affects the maximum speed of the connection. In 2-wire mode, the maximum data rate is up to 5.69 Mbps, while in 4-wire mode, the maximum data rate us up to 11.38 Mbps.
Service Type	Indicate whether the ZyXEL Device is the server or the client in the DSL connection. Select **Server** if this ZyXEL Device is the server in a point-to-point application. (See Chapter 4 on page 67.) Otherwise, select **Client**.
Enable Rate Adaption	This field is enabled if **Service Type** is **Server**. Indicate whether or not the ZyXEL Device can adjust the speed of its connection to that of the other device.

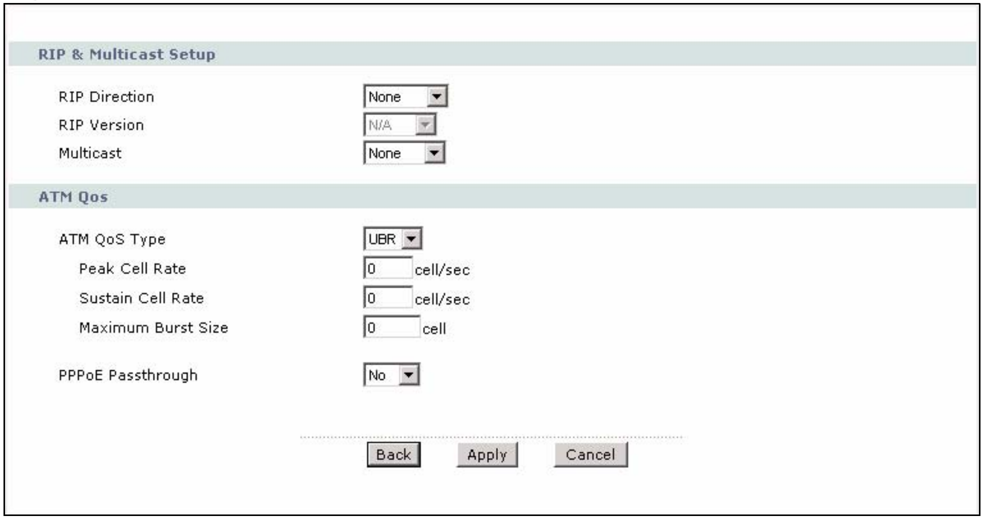
Table 15 WAN > Internet Connection (continued)

LABEL	DESCRIPTION
Transfer Max Rate (Kbps)	This field is enabled if **Service Type** is **Server**. Set the maximum rate at which the ZyXEL Device sends and receives information. If you select **Enable Rate Adaption**, the ZyXEL Device adjusts to the speed of the other device and may exceed this rate.
Transfer Min Rate (Kbps)	This field is enabled if **Service Type** is **Server**. Set the minimum rate at which the ZyXEL Device sends and receives information. If you select **Enable Rate Adaption**, the ZyXEL Device adjusts to the speed of the other device and may transfer information at less than this rate.
Standard Mode	This field is enabled if **Service Type** is **Server**. Select the operational mode the ZyXEL Device uses in the DSL connection.
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.
Advanced Setup	Click this button to display the **Advanced WAN Setup** screen and edit more details of your WAN setup.

5.4.1 Configuring Advanced Internet Connection

Use this screen to edit your ZyXEL Device's advanced settings for more connections. Click the **Advanced Setup** button in the **Internet Connection** screen. The screen appears as shown.

Figure 24 WAN > Internet Connection > Advanced Setup



RIP & Multicast Setup

RIP Direction: None
RIP Version: N/A
Multicast: None

ATM Qos

ATM QoS Type: UBR
Peak Cell Rate: 0 cell/sec
Sustain Cell Rate: 0 cell/sec
Maximum Burst Size: 0 cell

PPPoE Passthrough: No

The following table describes the labels in this screen.

Table 16 WAN > Internet Connection > Advanced Setup

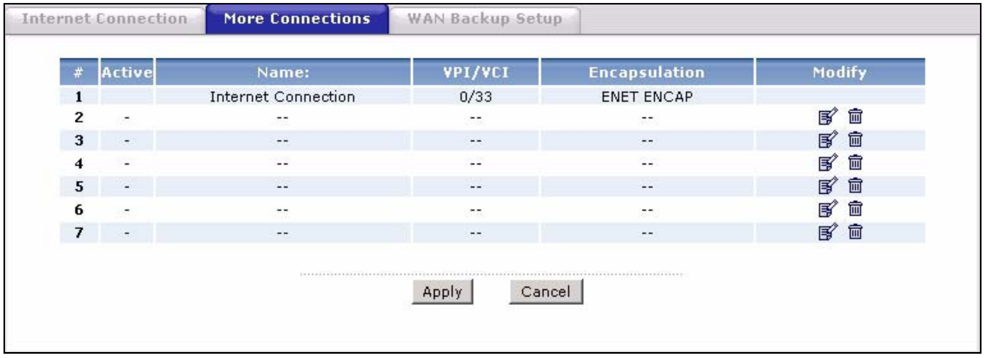
LABEL	DESCRIPTION
RIP & Multicast Setup	
RIP Direction	RIP (Routing Information Protocol, RFC 1058 and RFC 1389) allows a router to exchange routing information with other routers. The **RIP Direction** field controls the sending and receiving of RIP packets. Select the RIP direction from **Both**/**In Only**/**Out Only**/**None**. When set to **Both** or **Out Only**, the ZyXEL Device will broadcast its routing table periodically. When set to **Both** or **In Only**, it will incorporate the RIP information that it receives; when set to **None**, it will not send any RIP packets and will ignore any RIP packets received.
RIP Version	This field is enabled if **RIP Direction** is not **None**. The **RIP Version** field controls the format and the broadcasting method of the RIP packets that the ZyXEL Device sends (it recognizes both formats when receiving). **RIP-1** is universally supported but RIP-2 carries more information. RIP-1 is probably adequate for most networks, unless you have an unusual network topology. Both **RIP-2B** and **RIP-2M** sends the routing data in RIP-2 format; the difference being that **RIP-2B** uses subnet broadcasting while **RIP-2M** uses multicasting. Multicasting can reduce the load on non-router machines since they generally do not listen to the RIP multicast address and so will not receive the RIP packets. However, if one router uses multicasting, then all routers on your network must use multicasting, also.
Multicast	IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a multicast group. The ZyXEL Device supports both IGMP version 1 (**IGMP-v1**) and **IGMP-v2**. Select **None** to disable it.
ATM QoS	
ATM QoS Type	Select **CBR** (Constant Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select **UBR** (Unspecified Bit Rate) for applications that are non-time sensitive, such as e-mail. Select **VBR-nRT** (Variable Bit Rate-non Real Time) or **VBR-RT** (Variable Bit Rate-Real Time) for bursty traffic and bandwidth sharing with other applications.
Peak Cell Rate	Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.
Sustain Cell Rate	The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.
Maximum Burst Size	Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.
PPPoE Passthrough	This field is only effective for PPPoE connections. In addition to the ZyXEL Device's built-in PPPoE client, you can enable PPPoE Passthrough to allow up to ten hosts on the LAN to use PPPoE client software on their computers to connect to the ISP via the ZyXEL Device. Each host can have a separate account and a public WAN IP address. PPPoE pass through is an alternative to NAT for applications where NAT is not appropriate. Disable PPPoE passthrough if you do not need to allow hosts on the LAN to use PPPoE client software on their computers to connect to the ISP.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.

5.5 Configuring More Connections

This section describes the protocol-independent parameters for a remote network. They are required for placing calls to a remote gateway and the network behind it across a WAN connection. When you use the **WAN > Internet Connection** screen to set up Internet access, you are configuring the first WAN connection.

Click **Network > WAN > More Connections** to display the screen as shown next.

Figure 25 WAN > More Connections



#	Active	Name:	VPI/VCI	Encapsulation	Modify
1		Internet Connection	0/33	ENET ENCAP	
2	-	--	--	--	✎ 🗑
3	-	--	--	--	✎ 🗑
4	-	--	--	--	✎ 🗑
5	-	--	--	--	✎ 🗑
6	-	--	--	--	✎ 🗑
7	-	--	--	--	✎ 🗑

The following table describes the labels in this screen.

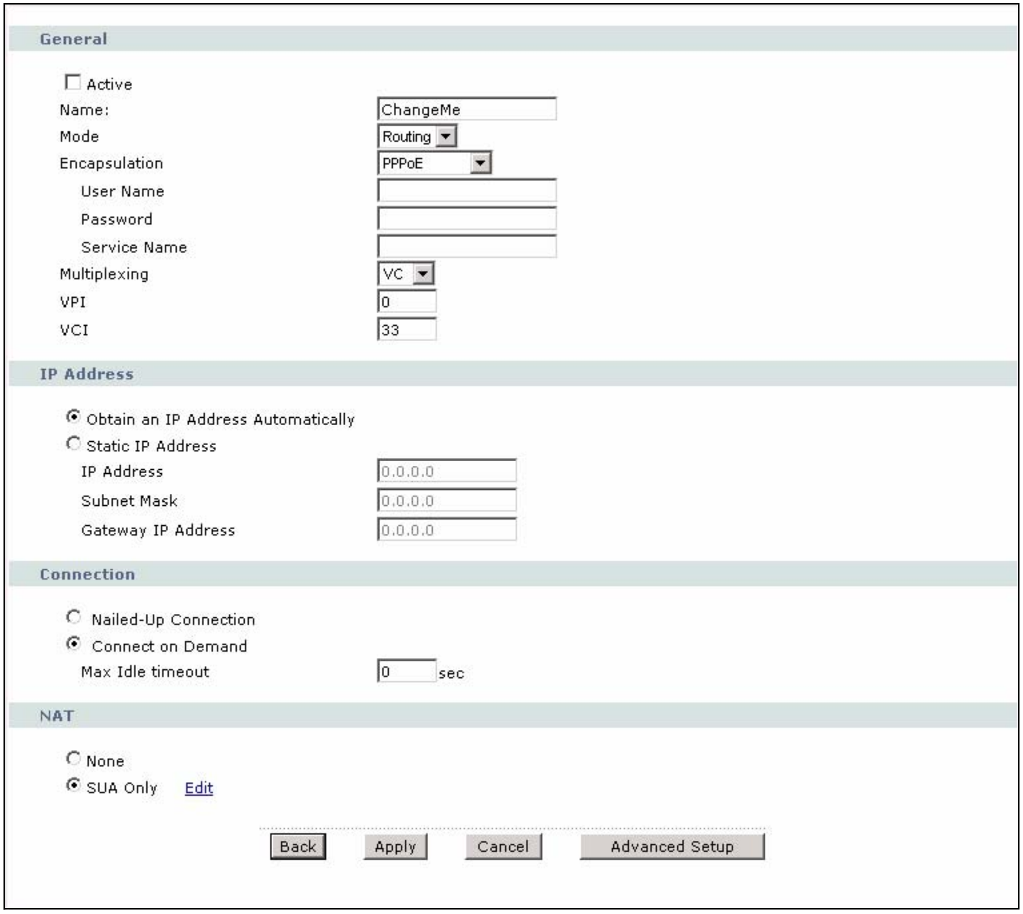
Table 17 WAN > More Connections

LABEL	DESCRIPTION
#	This is the index number of a connection.
Active	This display whether this connection is activated. Clear the check box to disable the connection. Select the check box to enable it.
Name	This is the descriptive name for this connection.
VPI/VCI	This is the VPI and VCI values used for this connection.
Encapsulation	This is the method of encapsulation used for this connection.
Modify	The first (ISP) connection is read-only in this screen. Use the **WAN > Internet Connection** screen to edit it. Click the edit icon to go to the screen where you can edit the connection. Click the delete icon to remove an existing connection. You cannot remove the first connection.
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.

5.5.1 More Connections Edit

Use this screen to configure a connection. Click the edit icon in the **More Connections** screen.

Figure 26 WAN > More Connections > Edit



General

□ Active

Name: ChangeMe

Mode: Routing

Encapsulation: PPPoE

User Name:

Password:

Service Name:

Multiplexing: VC

VPI: 0

VCI: 33

IP Address

● Obtain an IP Address Automatically

○ Static IP Address

IP Address: 0.0.0.0

Subnet Mask: 0.0.0.0

Gateway IP Address: 0.0.0.0

Connection

○ Nailed-Up Connection

● Connect on Demand

Max Idle timeout: 0 sec

NAT

○ None

● SUA Only Edit

The following table describes the labels in this screen.

Table 18 WAN > More Connections > Edit

LABEL	DESCRIPTION
General	
Active	Select the check box to activate or clear the check box to deactivate this connection.
Name	Enter a unique, descriptive name of up to 13 ASCII characters for this connection.
Mode	Select **Routing** from the drop-down list box if your ISP allows multiple computers to share an Internet account. If you select **Bridge**, the ZyXEL Device will forward any packet that it does not route to this remote node; otherwise, the packets are discarded.
Encapsulation	Select the method of encapsulation used by your ISP from the drop-down list box. Choices are **PPPoA**, **RFC 1483**, **ENET ENCAP** or **PPPoE**. If you set up a point-to-point connection, select either **ENET ENCAP** or **RFC 1483**.
User Name	(PPPoA and PPPoE encapsulation only) Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.

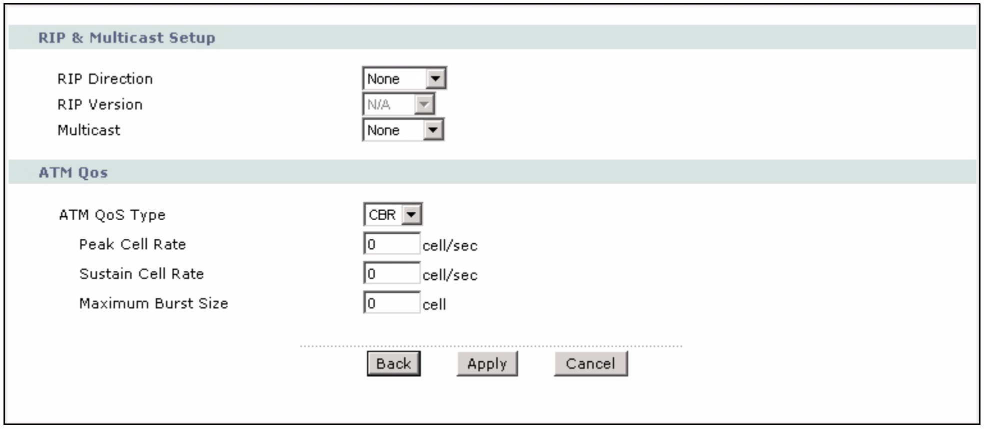
Table 18 WAN > More Connections > Edit (continued)

LABEL	DESCRIPTION
Password	(PPPoA and PPPoE encapsulation only) Enter the password associated with the user name above.
Service Name	(PPPoE only) Type the name of your PPPoE service here.
Multiplexing	Select the method of multiplexing used by your ISP from the drop-down list. Choices are **VC** or **LLC**. By prior agreement, a protocol is assigned a specific virtual circuit, for example, VC1 will carry IP. If you select VC, specify separate VPI and VCI numbers for each protocol. For LLC-based multiplexing or PPP encapsulation, one VC carries multiple protocols with protocol identifying information being contained in each packet header. In this case, only one set of VPI and VCI numbers need be specified for all protocols.
VPI	The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.
VCI	The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.
IP Address	These fields only appear if the **Mode** is **Routing**. A static IP address is a fixed IP that your ISP gives you. A dynamic IP address is not fixed; the ISP assigns you a different one each time you connect to the Internet. ‘
Obtain an IP Address Automatically	(PPPoE, PPPoA, and ENET ENCAP only) Select this if you have a dynamic IP address.
Static IP Address	(PPPoE, PPPoA, and ENET ENCAP only) Select this if you do not have a dynamic IP address.
IP Address	Enter the static IP address provided by your ISP.
Subnet Mask	Enter the subnet mask provided by your ISP.
Gateway IP Address	Enter the gateway IP address provided by your ISP.
Connection	This section only appears if the **Encapsulation** is **PPPoE** and **PPPoA**.
Nailed-Up Connection	Select **Nailed-Up Connection** when you want your connection up all the time. The ZyXEL Device will try to bring up the connection automatically if it is disconnected.
Connect on Demand	Select **Connect on Demand** when you don't want the connection up all the time and specify an idle time-out in the **Max Idle Timeout** field.
Max Idle Timeout	Specify an idle time-out in the **Max Idle Timeout** field when you select **Connect on Demand**. The default setting is 0, which means the Internet session will not timeout.
NAT	**SUA Only** is available only when you select **Routing** in the **Mode** field. Select **SUA Only** if you have one public IP address and want to use NAT. Click **Edit** to go to the **Port Forwarding** screen to edit a server mapping set. Otherwise, select **None** to disable NAT.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.
Advanced Setup	Click this button to display the **More Connections Advanced** screen and edit more details of your WAN setup.

5.5.2 Configuring More Connections Advanced Setup

Use this screen to edit your ZyXEL Device's advanced WAN settings. Click the **Advanced Setup** button in the **More Connections Edit** screen. The screen appears as shown.

Figure 27 WAN > More Connections > Advanced Setup



RIP & Multicast Setup

RIP Direction: None
RIP Version: N/A
Multicast: None

ATM Qos

ATM QoS Type: CBR
Peak Cell Rate: 0 cell/sec
Sustain Cell Rate: 0 cell/sec
Maximum Burst Size: 0 cell

The following table describes the labels in this screen.

Table 19 WAN > More Connections > Advanced Setup

LABEL	DESCRIPTION
RIP & Multicast Setup	
RIP Direction	RIP (Routing Information Protocol, RFC 1058 and RFC 1389) allows a router to exchange routing information with other routers. The **RIP Direction** field controls the sending and receiving of RIP packets. Select the RIP direction from **Both**/**In Only**/**Out Only**/**None**. When set to **Both** or **Out Only**, the ZyXEL Device will broadcast its routing table periodically. When set to **Both** or **In Only**, it will incorporate the RIP information that it receives; when set to **None**, it will not send any RIP packets and will ignore any RIP packets received.
RIP Version	This field is enabled if **RIP Direction** is not **None**. The **RIP Version** field controls the format and the broadcasting method of the RIP packets that the ZyXEL Device sends (it recognizes both formats when receiving). **RIP-1** is universally supported but RIP-2 carries more information. RIP-1 is probably adequate for most networks, unless you have an unusual network topology. Both **RIP-2B** and **RIP-2M** sends the routing data in RIP-2 format; the difference being that **RIP-2B** uses subnet broadcasting while **RIP-2M** uses multicasting. Multicasting can reduce the load on non-router machines since they generally do not listen to the RIP multicast address and so will not receive the RIP packets. However, if one router uses multicasting, then all routers on your network must use multicasting, also.
Multicast	IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a multicast group. The ZyXEL Device supports both IGMP version 1 (**IGMP-v1**) and **IGMP-v2**. Select **None** to disable it.
ATM QoS	
ATM QoS Type	Select **CBR** (Constant Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select **UBR** (Unspecified Bit Rate) for applications that are non-time sensitive, such as e-mail. Select **VBR-nRT** (Variable Bit Rate-non Real Time) or **VBR-RT** (Variable Bit Rate-Real Time) for bursty traffic and bandwidth sharing with other applications.

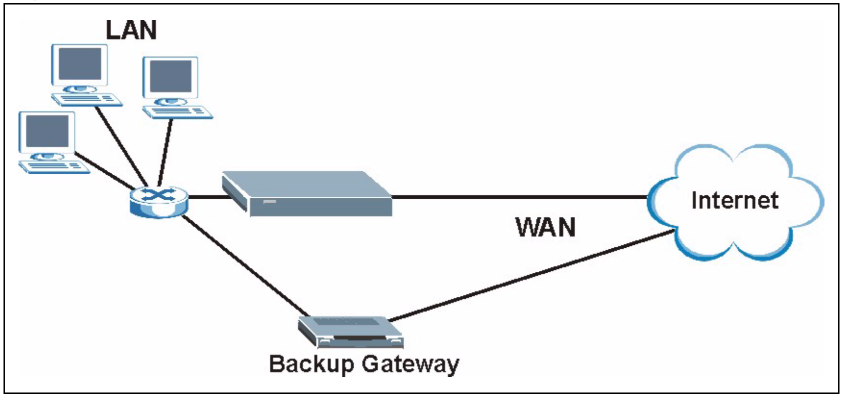
Table 19 WAN > More Connections > Advanced Setup (continued)

LABEL	DESCRIPTION
Peak Cell Rate	Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.
Sustain Cell Rate	The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.
Maximum Burst Size	Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.

5.6 Traffic Redirect

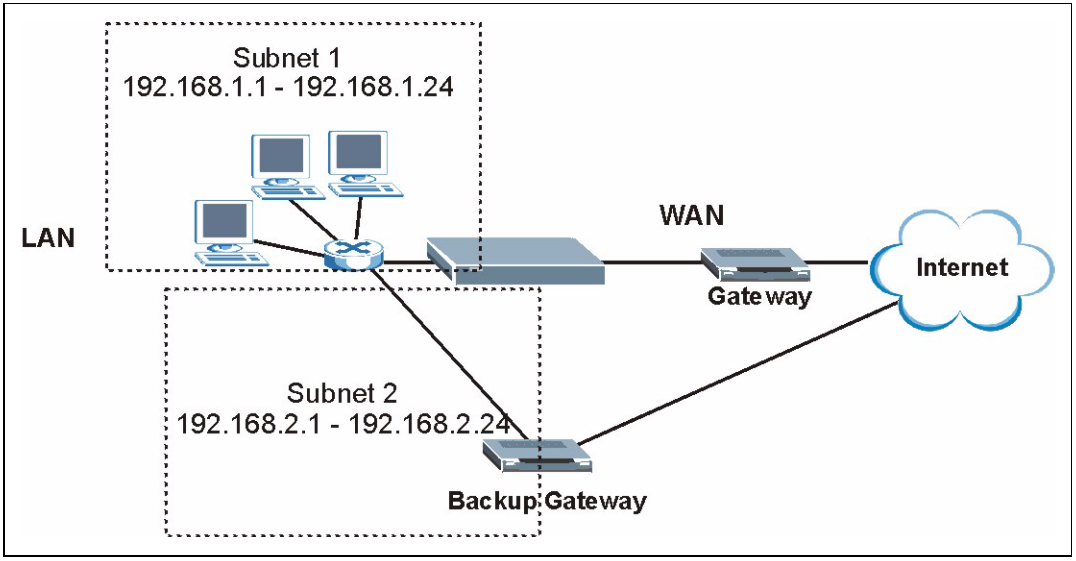
Traffic redirect forwards traffic to a backup gateway when the ZyXEL Device cannot connect to the Internet. An example is shown in the figure below.

Figure 28 Traffic Redirect Example



The following network topology allows you to avoid triangle route security issues when the backup gateway is connected to the LAN. Use IP alias to configure the LAN into two or three logical networks with the ZyXEL Device itself as the gateway for each LAN network. Put the protected LAN in one subnet (Subnet 1 in the following figure) and the backup gateway in another subnet (Subnet 2). Configure filters that allow packets from the protected LAN (Subnet 1) to the backup gateway (Subnet 2).

Figure 29 Traffic Redirect LAN Setup



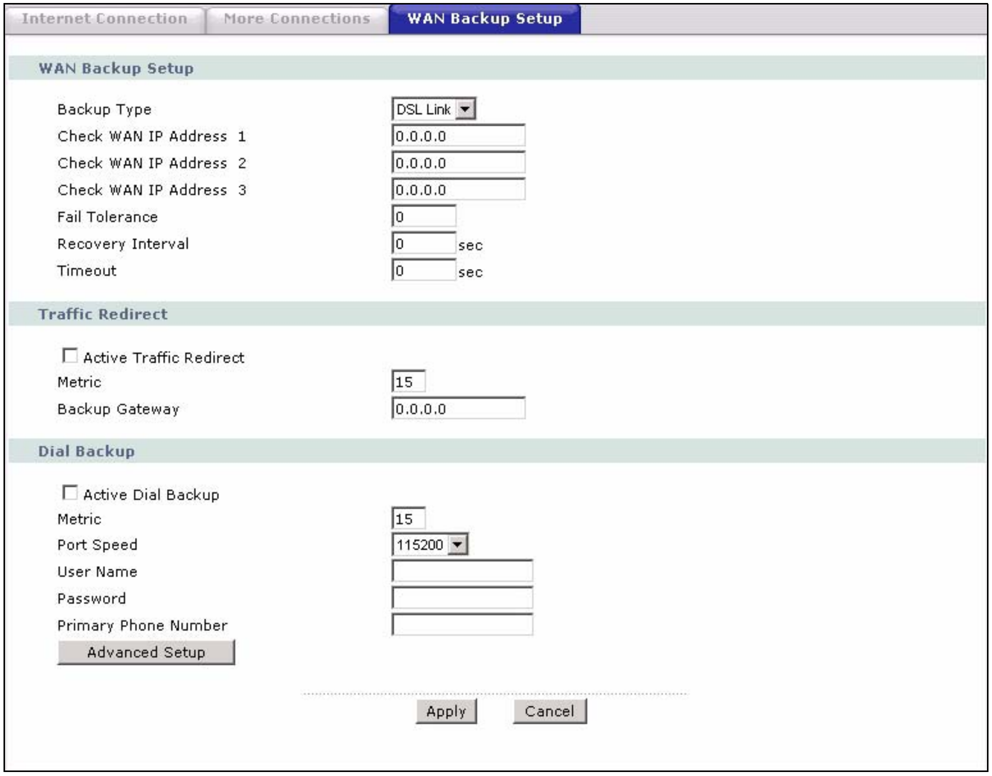
5.7 Dial Backup Interface

The Dial Backup port can be used in reserve, as a traditional dial-up connection should the broadband connection to the WAN port fail. To set up the auxiliary port (Dial Backup) for use in the event that the regular WAN connection is dropped, first make sure you have set up the switch and port connection.

5.8 Configuring WAN Backup Setup

Use this screen to forward traffic to a backup gateway or to use the dial-backup port when the ZyXEL Device cannot connect to the Internet. To open this screen, click **WAN** > **WAN Backup Setup**. The screen appears as shown.

Figure 30 WAN > WAN Backup Setup



WAN Backup Setup

Backup Type: DSL Link
Check WAN IP Address 1: 0.0.0.0
Check WAN IP Address 2: 0.0.0.0
Check WAN IP Address 3: 0.0.0.0
Fail Tolerance: 0
Recovery Interval: 0 sec
Timeout: 0 sec

Traffic Redirect

□ Active Traffic Redirect
Metric: 15
Backup Gateway: 0.0.0.0

Dial Backup

□ Active Dial Backup
Metric: 15
Port Speed: 115200
User Name:
Password:
Primary Phone Number:

The following table describes the labels in this screen.

Table 20 WAN > WAN Backup Setup

LABEL	DESCRIPTION
Backup Type	Select the method that the ZyXEL Device uses to check the DSL connection. Select **DSL Link** to have the ZyXEL Device check if the connection to the DSLAM is up. Select **ICMP** to have the ZyXEL Device periodically ping the IP addresses configured in the **Check WAN IP Address** fields.
Check WAN IP Address 1-3	Configure this field to test your ZyXEL Device's WAN accessibility. Type the IP address of a reliable nearby computer (for example, your ISP's DNS server address). **Note:** If you activate either traffic redirect or dial backup, you must configure at least one IP address here. When using a WAN backup connection, the ZyXEL Device periodically pings the addresses configured here and uses the other WAN backup connection (if configured) if there is no response.
Fail Tolerance	Type the number of times (2 recommended) that your ZyXEL Device may ping the IP addresses configured in the **Check WAN IP Address** field without getting a response before switching to a WAN backup connection (or a different WAN backup connection).

Table 20 WAN > WAN Backup Setup (continued)

LABEL	DESCRIPTION
Recovery Interval	When the ZyXEL Device is using a lower priority connection (usually a WAN backup connection), it periodically checks to whether or not it can use a higher priority connection. Type the number of seconds (30 recommended) for the ZyXEL Device to wait between checks. Allow more time if your destination IP address handles lots of traffic.
Timeout	Type the number of seconds (3 recommended) for your ZyXEL Device to wait for a ping response from one of the IP addresses in the **Check WAN IP Address** field before timing out the request. The WAN connection is considered "down" after the ZyXEL Device times out the number of times specified in the **Fail Tolerance** field. Use a higher value in this field if your network is busy or congested.
Traffic Redirect	Traffic redirect forwards traffic to a backup gateway when the ZyXEL Device cannot connect to the Internet.
Active Traffic Redirect	Select this check box to have the ZyXEL Device use traffic redirect if the normal WAN connection goes down. **Note:** If you activate traffic redirect, you must configure at least one Check WAN IP Address.
Metric	This field sets this route's priority among the routes the ZyXEL Device uses. The metric represents the "cost of transmission". A router determines the best route for transmission by choosing a path with the lowest "cost". RIP routing uses hop count as the measurement of cost, with a minimum of "1" for directly connected networks. The number must be between "1" and "15"; a number greater than "15" means the link is down. The smaller the number, the lower the "cost".
Backup Gateway	Type the IP address of your backup gateway in dotted decimal notation. The ZyXEL Device automatically forwards traffic to this IP address if the ZyXEL Device's Internet connection terminates.
Dial Backup	
Active Dial Backup	Select this to have the ZyXEL Device use a dial-backup connection if the normal WAN connection goes down. **Note:** If you activate dial backup, you must configure at least one Check WAN IP Address.
Metric	This field sets this route's priority among the routes the ZyXEL Device uses. The metric represents the "cost of transmission". A router determines the best route for transmission by choosing a path with the lowest "cost". RIP routing uses hop count as the measurement of cost, with a minimum of "1" for directly connected networks. The number must be between "1" and "15"; a number greater than "15" means the link is down. The smaller the number, the lower the "cost".
Port Speed	Use the drop-down list box to select the speed of the connection between the DSL port and the external device.
User Name	Type the login name assigned by your ISP.
Password	Type the password assigned by your ISP.
Primary Phone Number	Type the first (primary) phone number from the ISP for this remote node. If the Primary Phone number is busy or does not answer, your ZyWALL dials the Secondary Phone number, if available. (See **Advanced Setup**.) Some areas require dialing the pound sign # before the phone number for local calls. Include a # symbol at the beginning of the phone numbers as required.
Advanced Setup	Click this to configure advanced settings for the dial-backup connection.

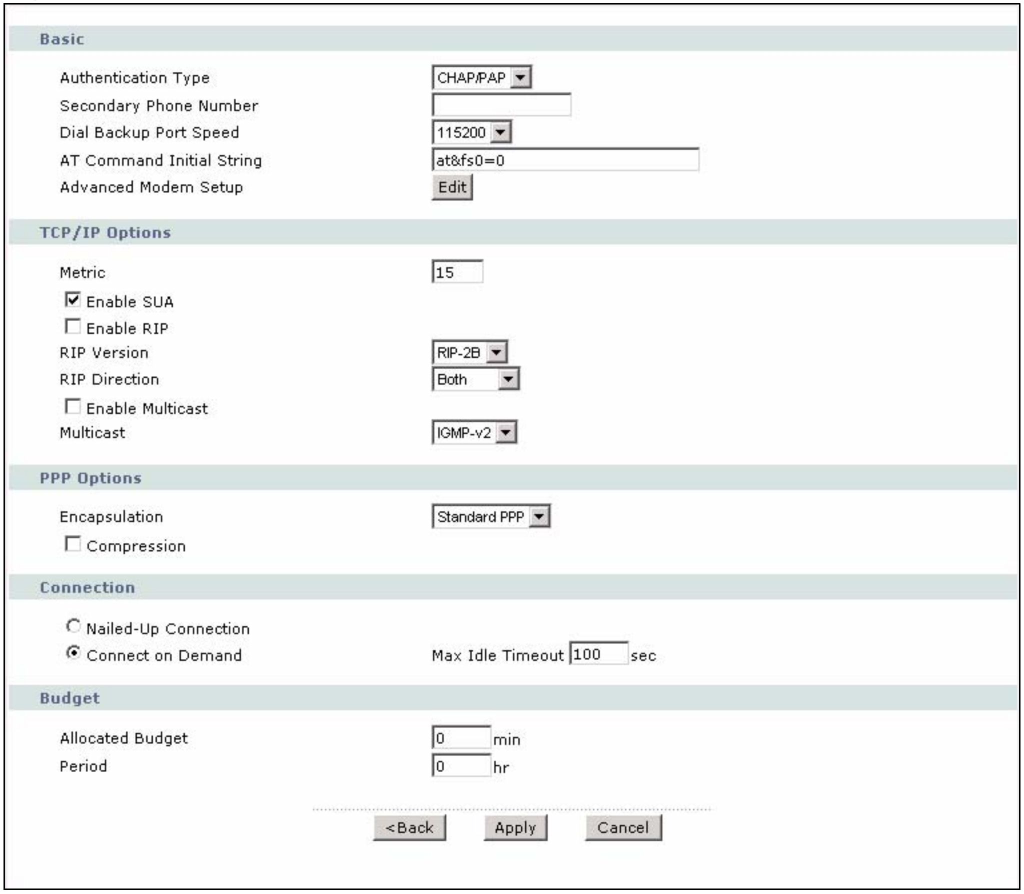
Table 20 WAN > WAN Backup Setup (continued)

LABEL	DESCRIPTION
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.

5.8.1 Advanced Backup Setup

Use this screen to change your ZyXEL Device's advanced dial backup settings. Click **WAN** > **WAN Backup Setup > Advanced Setup**. The screen appears as shown.

Figure 31 WAN > WAN Backup Setup > Advanced Setup



Basic

Authentication Type	CHAP/PAP
Secondary Phone Number	
Dial Backup Port Speed	115200
AT Command Initial String	at&fs0=0
Advanced Modem Setup	Edit

TCP/IP Options

Metric	15
☑ Enable SUA	
□ Enable RIP	
RIP Version	RIP-2B
RIP Direction	Both
□ Enable Multicast	
Multicast	IGMP-v2

PPP Options

Encapsulation	Standard PPP
□ Compression	

Connection

○ Nailed-Up Connection	
● Connect on Demand	Max Idle Timeout 100 sec

Budget

Allocated Budget	0 min
Period	0 hr

The following table describes the labels in this screen.

Table 21 WAN > WAN Backup Setup > Advanced Setup

LABEL	DESCRIPTION
Basic	
Authentication Type	Use the drop-down list box to select an authentication protocol for outgoing calls. Options are: **CHAP/PAP** - Your ZyXEL Device accepts either CHAP or PAP when requested by this remote node. **CHAP** - Your ZyXEL Device accepts CHAP only. **PAP** - Your ZyXEL Device accepts PAP only.
Secondary Phone Number	Type the backup phone number from the ISP. If the Primary Phone number is busy or does not answer, your ZyWALL dials the Secondary Phone number, if available. Some areas require dialing the pound sign # before the phone number for local calls. Include a # symbol at the beginning of the phone numbers as required.
Dial Backup Port Speed	Select the speed of the connection between the Dial Backup port and the external device. Available speeds are **9600**, **19200**, **38400**, **57600**, **115200** or **230400** bps.
AT Command Initial String	Enter the AT command string to initialize the WAN device. Consult the manual of your WAN device connected to your Dial Backup port for specific AT commands.
Advanced Modem Setup	Click **Edit** to change the advanced settings for the modem.
TCP/IP Options	
Metric	This field sets this route's priority among the routes the ZyXEL Device uses. The metric represents the "cost of transmission". A router determines the best route for transmission by choosing a path with the lowest "cost". RIP routing uses hop count as the measurement of cost, with a minimum of "1" for directly connected networks. The number must be between "1" and "15"; a number greater than "15" means the link is down. The smaller the number, the lower the "cost".
Enable SUA	Select this if you have one public IP address and want to use NAT, or clear it to disable NAT.
Enable RIP	Select this if you want to enable RIP in the dial-backup connection. RIP (Routing Information Protocol, RFC 1058 and RFC 1389) allows a router to exchange routing information with other routers. Clear this if you want the ZyXEL Deviceto not send any RIP packets and to ignore any RIP packets received.
RIP Version	The **RIP Version** field controls the format and the broadcasting method of the RIP packets that the ZyXEL Device sends (it recognizes both formats when receiving). **RIP-1** is universally supported but RIP-2 carries more information. RIP-1 is probably adequate for most networks, unless you have an unusual network topology. Both **RIP-2B** and **RIP-2M** sends the routing data in RIP-2 format; the difference being that **RIP-2B** uses subnet broadcasting while **RIP-2M** uses multicasting. Multicasting can reduce the load on non-router machines since they generally do not listen to the RIP multicast address and so will not receive the RIP packets. However, if one router uses multicasting, then all routers on your network must use multicasting, also.
RIP Direction	The **RIP Direction** field controls the sending and receiving of RIP packets. Select the RIP direction from **Both**/**In Only**/**Out Only**. When set to **Both** or **Out Only**, the ZyXEL Device will broadcast its routing table periodically. When set to **Both** or **In Only**, it will incorporate the RIP information that it receives.
Enable Multicast	Select this if you want to enable IGMP in the dial-backup connection. IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a multicast group.
Multicast	The ZyXEL Device supports both IGMP version 1 (**IGMP-v1**) and **IGMP-v2**.

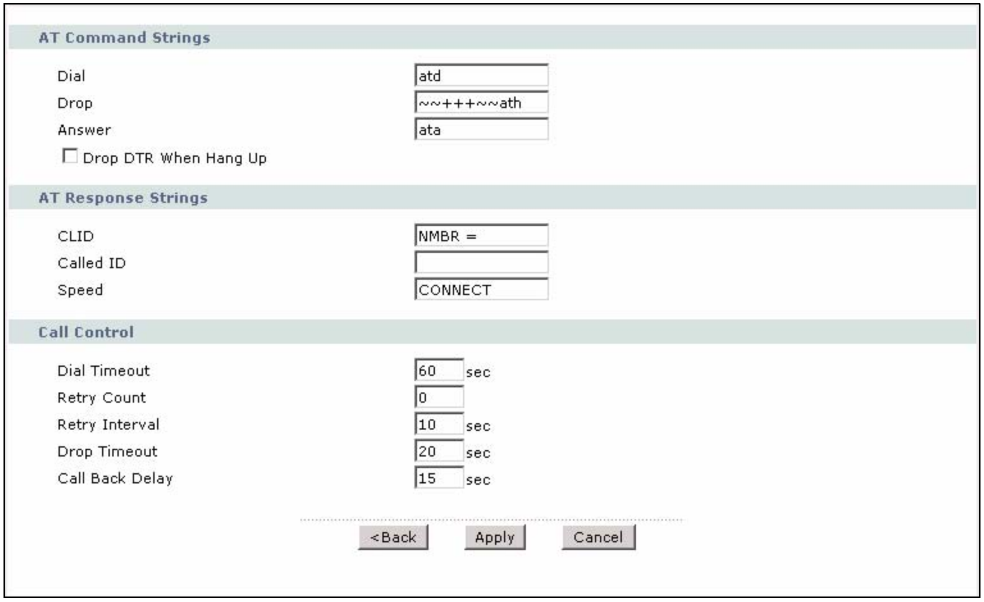
Table 21 WAN > WAN Backup Setup > Advanced Setup (continued)

LABEL	DESCRIPTION
PPP Options	
Encapsulation	Select **CISCO PPP** from the drop-down list box if your dial backup WAN device uses Cisco PPP encapsulation, otherwise select **Standard PPP**.
Compression	Select this to turn on stac compression.
Connection	
Nailed-Up Connection	Select **Nailed-Up Connection** when you want your connection up all the time. The ZyXEL Device will try to bring up the connection automatically if it is disconnected.
Connect on Demand	Select **Connect on Demand** when you don't want the connection up all the time and specify an idle time-out in the **Max Idle Timeout** field.
Max Idle Timeout	Specify an idle time-out in the **Max Idle Timeout** field when you select **Connect on Demand**. The default setting is 0, which means the Internet session will not timeout.
Budget	
Allocated Budget	Enter the maximum amount of time (in minutes) each call can last. Enter 0 if there is no limit. With **Period**, you can set a limit on the total outgoing call time of the ZyXEL Device within a certain period of time. When the total outgoing call time exceeds the limit, the current call will be dropped and any future outgoing calls will be blocked.
Period	Enter how often (in hours) the **Allocated Budget** is reset. For example, if you can call for thirty minutes every hour, set the **Allocated Budget** to 30, and set this field to 1.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.

5.8.2 Advanced Modem Settings for Dial Backup

Use this screen to change your ZyXEL Device’s modem settings for dial backup. Click **WAN** > **WAN Backup Setup > Advanced Setup > Edit**. The screen appears as shown.

Figure 32   WAN > WAN Backup Setup > Advanced Setup > Edit



AT Command Strings

Dial	atd
Drop	~~+++~~ath
Answer	ata

□ Drop DTR When Hang Up

AT Response Strings

CLID	NMBR =
Called ID	
Speed	CONNECT

Call Control

Dial Timeout	60 sec
Retry Count	0
Retry Interval	10 sec
Drop Timeout	20 sec
Call Back Delay	15 sec

The following table describes the labels in this screen.

Table 22   WAN > WAN Backup Setup > Advanced Setup > Edit

LABEL	DESCRIPTION
AT Command Strings	
Dial	Enter the AT Command string to make a call.
Drop	Enter the AT Command string to drop a call. “~” represents a one second wait, e.g., “~~~+++~~ath” can be used if your modem has a slow response time.
Answer	Enter the AT Command string to answer a call.
Drop DTR When Hang Up	Select this if you want the DTR (Data Terminal Ready) signal to be dropped after the **Drop** string is sent out.
AT Response Strings	
CLID	Enter the keyword that precedes the CLID (Calling Line Identification) in the AT response string. This lets the ZyXEL Device capture the CLID in the AT response string that comes from the WAN device. CLID is required for CLID authentication.
Called ID	Enter the keyword preceding the dialed number.
Speed	Enter the keyword preceding the connection speed.
Call Control	
Dial Timeout	Enter a number of seconds for the ZyXEL Device to keep trying to set up an outgoing call before timing out (stopping). The ZyXEL Device times out and stops if it cannot set up an outgoing call within the timeout value.
Retry Count	Enter a number of times for the ZyXEL Device to retry a busy or no-answer phone number before blacklisting the number.
Retry Interval	Enter a number of seconds for the ZyXEL Device to wait before trying another call after a call has failed. This applies before a phone number is blacklisted.
Drop Timeout	Enter a number of seconds for the ZyXEL Device to wait before dropping the DTR signal if it does not receive a positive disconnect confirmation.

Table 22 WAN > WAN Backup Setup > Advanced Setup > Edit (continued)

LABEL	DESCRIPTION
Call Back Delay	Enter a number of seconds for the ZyXEL Device to wait between dropping a callback request call and dialing the corresponding callback call.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 6 LAN Setup

This chapter describes how to configure LAN settings.

6.1 LAN Overview

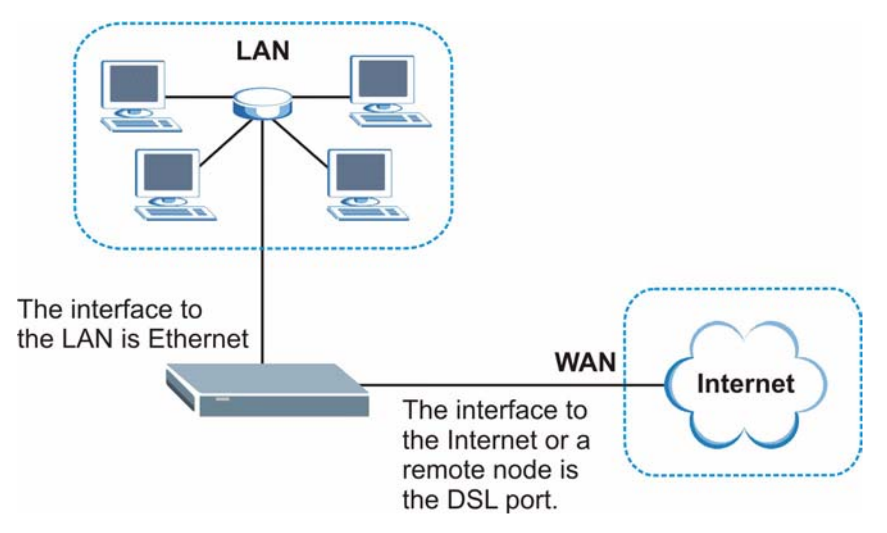
A Local Area Network (LAN) is a shared communication system to which many computers are attached. A LAN is a computer network limited to the immediate area, usually the same building or floor of a building. The LAN screens can help you configure a LAN DHCP server and manage IP addresses.

See Section 6.3 on page 99 to configure the **LAN** screens.

6.1.1 LANs, WANs and the ZyXEL Device

The actual physical connection determines whether the ZyXEL Device ports are LAN or WAN ports. There are two separate IP networks, one inside the LAN network and the other outside the WAN network as shown next.

Figure 33 LAN and WAN IP Addresses


LAN
The interface to the LAN is Ethernet
WAN
Internet
The interface to the Internet or a remote node is the DSL port.

6.1.2 DHCP Setup

DHCP (Dynamic Host Configuration Protocol, RFC 2131 and RFC 2132) allows individual clients to obtain TCP/IP configuration at start-up from a server. You can configure the ZyXEL Device as a DHCP server or disable it. When configured as a server, the ZyXEL Device provides the TCP/IP configuration for the clients. If you turn DHCP service off, you must have another DHCP server on your LAN, or else the computer must be manually configured.

6.1.2.1 IP Pool Setup

The ZyXEL Device is pre-configured with a pool of IP addresses for the DHCP clients (DHCP Pool). See the product specifications in the appendices. Do not assign static IP addresses from the DHCP pool to your LAN computers.

6.1.3 DNS Server Address

DNS (Domain Name System) is for mapping a domain name to its corresponding IP address and vice versa. The DNS server is extremely important because without it, you must know the IP address of a machine before you can access it. The DNS server addresses that you enter in the DHCP setup are passed to the client machines along with the assigned IP address and subnet mask.

There are two ways that an ISP disseminates the DNS server addresses. The first is for an ISP to tell a customer the DNS server addresses, usually in the form of an information sheet, when s/he signs up. If your ISP gives you the DNS server addresses, enter them in the **DNS Server** fields in **DHCP Setup**, otherwise, leave them blank.

Some ISP's choose to pass the DNS servers using the DNS server extensions of PPP IPCP (IP Control Protocol) after the connection is up. If your ISP did not give you explicit DNS servers, chances are the DNS servers are conveyed through IPCP negotiation. The ZyXEL Device supports the IPCP DNS server extensions through the DNS proxy feature.

If the **Primary** and **Secondary DNS Server** fields in the **DHCP Setup** screen are not specified, for instance, left as **0.0.0.0**, the ZyXEL Device tells the DHCP clients that it itself is the DNS server. When a computer sends a DNS query to the ZyXEL Device, the ZyXEL Device forwards the query to the real DNS server learned through IPCP and relays the response back to the computer.

Please note that DNS proxy works only when the ISP uses the IPCP DNS server extensions. It does not mean you can leave the DNS servers out of the DHCP setup under all circumstances. If your ISP gives you explicit DNS servers, make sure that you enter their IP addresses in the **DHCP Setup** screen. This way, the ZyXEL Device can pass the DNS servers to the computers and the computers can query the DNS server directly without the ZyXEL Device's intervention.

6.1.4 DNS Server Address Assignment

Use DNS (Domain Name System) to map a domain name to its corresponding IP address and vice versa. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it.

There are two ways that an ISP disseminates the DNS server addresses.

- The ISP tells you the DNS server addresses, usually in the form of an information sheet, when you sign up. If your ISP gives you DNS server addresses, enter them in the DNS Server fields in the **DHCP Setup** screen.
- The ZyXEL Device acts as a DNS proxy when the **Primary** and **Secondary DNS Server** fields are left as **0.0.0.0** in the **DHCP Setup** screen.

6.2 LAN TCP/IP

The ZyXEL Device has built-in DHCP server capability that assigns IP addresses and DNS servers to systems that support DHCP client capability.

The LAN parameters of the ZyXEL Device are preset in the factory with the following values:

- IP address of 192.168.1.1 with subnet mask of 255.255.255.0 (24 bits)
- DHCP server enabled with 32 client IP addresses starting from 192.168.1.33.

These parameters should work for the majority of installations. If your ISP gives you explicit DNS server address(es), read the embedded web configurator help regarding what fields need to be configured.

6.2.1 IP Address and Subnet Mask

Similar to the way houses on a street share a common street name, so too do computers on a LAN share one common network number.

Where you obtain your network number depends on your particular situation. If the ISP or your network administrator assigns you a block of registered IP addresses, follow their instructions in selecting the IP addresses and the subnet mask.

If the ISP did not explicitly give you an IP network number, then most likely you have a single user account and the ISP will assign you a dynamic IP address when the connection is established. If this is the case, it is recommended that you select a network number from 192.168.0.0 to 192.168.255.0 and you must enable the Network Address Translation (NAT) feature of the ZyXEL Device. The Internet Assigned Number Authority (IANA) reserved this block of addresses specifically for private use; please do not use any other number unless you are told otherwise. Let's say you select 192.168.1.0 as the network number; which covers 254 individual addresses, from 192.168.1.1 to 192.168.1.254 (zero and 255 are reserved). In other words, the first three numbers specify the network number while the last number identifies an individual computer on that network.

Once you have decided on the network number, pick an IP address that is easy to remember, for instance, 192.168.1.1, for your ZyXEL Device, but make sure that no other device on your network is using that IP address.

The subnet mask specifies the network number portion of an IP address. Your ZyXEL Device will compute the subnet mask automatically based on the IP address that you entered. You don't need to change the subnet mask computed by the ZyXEL Device unless you are instructed to do otherwise.

6.2.1.1 Private IP Addresses

Every machine on the Internet must have a unique address. If your networks are isolated from the Internet, for example, only between your two branch offices, you can assign any IP addresses to the hosts without problems. However, the Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of IP addresses specifically for private networks:

- 10.0.0.0 — 10.255.255.255
- 172.16.0.0 — 172.31.255.255
- 192.168.0.0 — 192.168.255.255

You can obtain your IP address from the IANA, from an ISP or it can be assigned from a private network. If you belong to a small organization and your Internet access is through an ISP, the ISP can provide you with the Internet addresses for your local networks. On the other hand, if you are part of a much larger organization, you should consult your network administrator for the appropriate IP addresses.

Note: Regardless of your particular situation, do not create an arbitrary IP address; always follow the guidelines above. For more information on address assignment, please refer to RFC 1597, *Address Allocation for Private Internets* and RFC 1466, *Guidelines for Management of IP Address Space.*

6.2.2 RIP Setup

RIP (Routing Information Protocol) allows a router to exchange routing information with other routers. The **RIP Direction** field controls the sending and receiving of RIP packets. When set to:

- **Both -** the ZyXEL Device will broadcast its routing table periodically and incorporate the RIP information that it receives.
- **In Only -** the ZyXEL Device will not send any RIP packets but will accept all RIP packets received.

- **Out Only -** the ZyXEL Device will send out RIP packets but will not accept any RIP packets received.
- **None -** the ZyXEL Device will not send any RIP packets and will ignore any RIP packets received.

The **Version** field controls the format and the broadcasting method of the RIP packets that the ZyXEL Device sends (it recognizes both formats when receiving). **RIP-1** is universally supported; but RIP-2 carries more information. RIP-1 is probably adequate for most networks, unless you have an unusual network topology.

Both **RIP-2B** and **RIP-2M** sends the routing data in RIP-2 format; the difference being that **RIP-2B** uses subnet broadcasting while **RIP-2M** uses multicasting.

6.2.3 Multicast

Traditionally, IP packets are transmitted in one of either two ways - Unicast (1 sender - 1 recipient) or Broadcast (1 sender - everybody on the network). Multicast delivers IP packets to a group of hosts on the network - not everybody and not just 1.

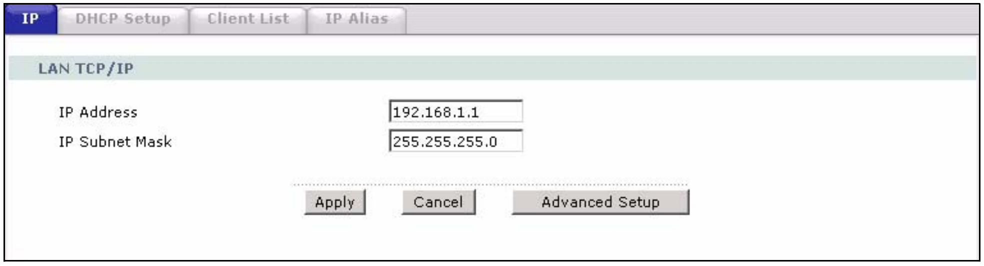
IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. IGMP version 2 (RFC 2236) is an improvement over version 1 (RFC 1112) but IGMP version 1 is still in wide use. If you would like to read more detailed information about interoperability between IGMP version 2 and version 1, please see sections 4 and 5 of RFC 2236. The class D IP address is used to identify host groups and can be in the range 224.0.0.0 to 239.255.255.255. The address 224.0.0.0 is not assigned to any group and is used by IP multicast computers. The address 224.0.0.1 is used for query messages and is assigned to the permanent group of all IP hosts (including gateways). All hosts must join the 224.0.0.1 group in order to participate in IGMP. The address 224.0.0.2 is assigned to the multicast routers group.

The ZyXEL Device supports both IGMP version 1 (**IGMP-v1**) and IGMP version 2 (**IGMP-v2**). At start up, the ZyXEL Device queries all directly connected networks to gather group membership. After that, the ZyXEL Device periodically updates this information. IP multicasting can be enabled/disabled on the ZyXEL Device LAN and/or WAN interfaces in the web configurator (**LAN**; **WAN**). Select **None** to disable IP multicasting on these interfaces.

6.3 Configuring LAN IP

Use this screen to set the LAN IP address of your ZyXEL Device. Click **LAN > IP**. See Section 6.1 on page 95 for background information.

Figure 34 LAN > IP



LAN TCP/IP

IP Address: 192.168.1.1

IP Subnet Mask: 255.255.255.0

The following table describes the fields in this screen.

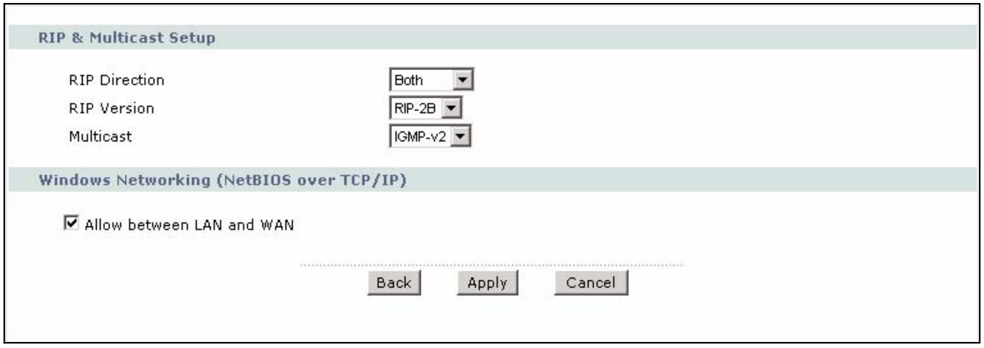
Table 23 LAN > IP

LABEL	DESCRIPTION
IP Address	Enter the IP address of your ZyXEL Device in dotted decimal notation, for example, 192.168.1.1 (factory default).
IP Subnet Mask	Type the subnet mask assigned to you by your ISP (if given).
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.
Advanced Setup	Click this button to display the **Advanced LAN Setup** screen and edit more details of your LAN setup.

6.3.1 Configuring Advanced LAN Setup

Use this screen to edit your ZyXEL Device's advanced LAN settings. Click the **Advanced Setup** button in the **LAN IP** screen. The screen appears as shown.

Figure 35 LAN > IP > Advanced Setup



RIP & Multicast Setup

RIP Direction: Both

RIP Version: RIP-2B

Multicast: IGMP-v2

Windows Networking (NetBIOS over TCP/IP)

☑ Allow between LAN and WAN

The following table describes the labels in this screen.

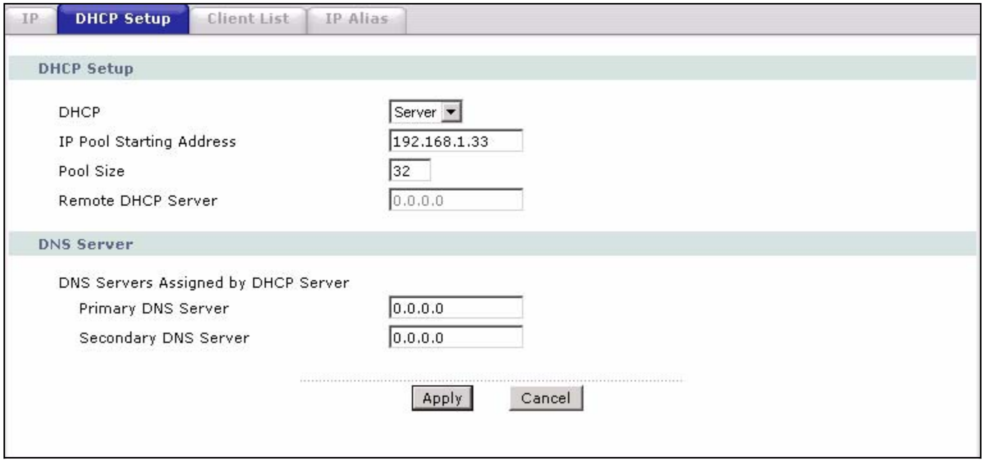
Table 24 LAN > IP > Advanced Setup

LABEL	DESCRIPTION
RIP & Multicast Setup	
RIP Direction	RIP (Routing Information Protocol, RFC 1058 and RFC 1389) allows a router to exchange routing information with other routers. The **RIP Direction** field controls the sending and receiving of RIP packets. Select the RIP direction from **Both**/**In Only**/**Out Only**/**None**. When set to **Both** or **Out Only**, the ZyXEL Device will broadcast its routing table periodically. When set to **Both** or **In Only**, it will incorporate the RIP information that it receives; when set to **None**, it will not send any RIP packets and will ignore any RIP packets received.
RIP Version	This field is enabled if **RIP Direction** is not **None**. The **RIP Version** field controls the format and the broadcasting method of the RIP packets that the ZyXEL Device sends (it recognizes both formats when receiving). **RIP-1** is universally supported but RIP-2 carries more information. RIP-1 is probably adequate for most networks, unless you have an unusual network topology. Both **RIP-2B** and **RIP-2M** sends the routing data in RIP-2 format; the difference being that **RIP-2B** uses subnet broadcasting while **RIP-2M** uses multicasting. Multicasting can reduce the load on non-router machines since they generally do not listen to the RIP multicast address and so will not receive the RIP packets. However, if one router uses multicasting, then all routers on your network must use multicasting, also.
Multicast	IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a multicast group. The ZyXEL Device supports both IGMP version 1 (**IGMP-v1**) and **IGMP-v2**. Select **None** to disable it.
Windows Networking (NetBIOS over TCP/IP)	NetBIOS (Network Basic Input/Output System) are TCP or UDP packets that enable a computer to connect to and communicate with a LAN. For some dial-up services such as PPPoE or PPTP, NetBIOS packets cause unwanted calls. However it may sometimes be necessary to allow NetBIOS packets to pass through to the WAN in order to find a computer on the WAN.
Allow between LAN and WAN	Select this check box to forward NetBIOS packets from the LAN to the WAN and from the WAN to the LAN. If your firewall is enabled with the default policy set to block WAN to LAN traffic, you also need to enable the default WAN to LAN firewall rule that forwards NetBIOS traffic. Clear this check box to block all NetBIOS packets going from the LAN to the WAN and from the WAN to the LAN.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save the changes.
Cancel	Click **Cancel** to begin configuring this screen afresh.

6.4 DHCP Setup

Use this screen to configure the DNS server information that the ZyXEL Device sends to the DHCP client devices on the LAN.

Figure 36 LAN > DHCP Setup



DHCP: Server
IP Pool Starting Address: 192.168.1.33
Pool Size: 32
Remote DHCP Server: 0.0.0.0

DNS Servers Assigned by DHCP Server
Primary DNS Server: 0.0.0.0
Secondary DNS Server: 0.0.0.0

The following table describes the labels in this screen.

Table 25 LAN > DHCP Setup

LABEL	DESCRIPTION
DHCP Setup	
DHCP	Select what type of DHCP services the ZyXEL Device provides to the network. Choices are: **None** - the ZyXEL Device does not provide any DHCP services. There is already a DHCP server on the network. **Relay** - the ZyXEL Device routes DHCP requests to the DHCP server. There may be a DHCP server on another network. **Server** - the ZyXEL Device assigns IP addresses and provides subnet mask, gateway, and DNS server information to the network. The ZyXEL Device is the DHCP server for the network.
IP Pool Starting Address	This field is enabled if the ZyXEL Device is a **Server**. Enter the first of the contiguous addresses in the IP address pool.
Pool Size	This field is enabled if the ZyXEL Device is a **Server**. Enter the size of, or the number of addresses in, the IP address pool.
Remote DHCP Server	This field is enabled if the ZyXEL Device is a **Relay**. Enter the IP address of the DHCP server to which the ZyXEL Device should route requests.
DNS Server	
DNS Servers Assigned by DHCP Server	The ZyXEL Device passes a DNS (Domain Name System) server IP address to the DHCP clients.
Primary DNS Server Secondary DNS Server	This field is not available when you set **DHCP** to **Relay**. Enter the IP addresses of the DNS servers. The DNS servers are passed to the DHCP clients along with the IP address and the subnet mask. If the fields are left as 0.0.0.0, the ZyXEL Device acts as a DNS proxy and forwards the DHCP client’s DNS query to the real DNS server learned through IPCP and relays the response back to the computer.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

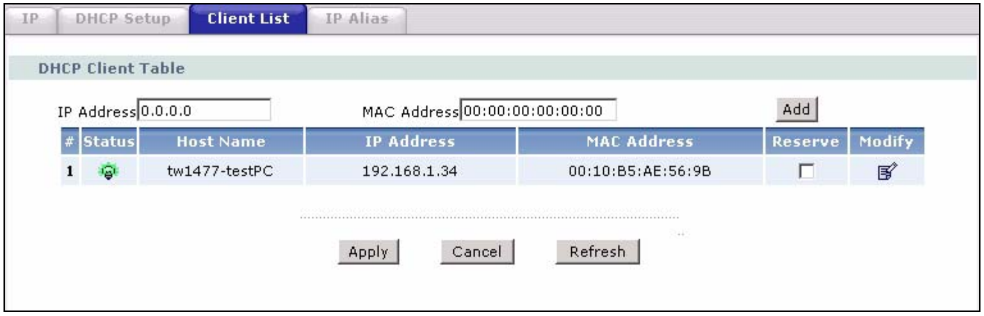
6.5 LAN Client List

This table allows you to assign IP addresses on the LAN to specific individual computers based on their MAC Addresses.

Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02.

Use this screen to change your ZyXEL Device's static DHCP settings. Click **Network > LAN > Client List**. The screen appears as shown.

Figure 37 LAN > Client List



DHCP Client Table

IP Address 0.0.0.0 MAC Address 00:00:00:00:00:00

#	Status	Host Name	IP Address	MAC Address	Reserve	Modify
1	●	tw1477-testPC	192.168.1.34	00:10:B5:AE:56:9B	□	✎

The following table describes the labels in this screen.

Table 26 LAN > Client List

LABEL	DESCRIPTION
IP Address	Enter the IP address that you want to assign to the computer on your LAN with the MAC address specified below. The IP address should be within the range of IP addresses you specified in the **DHCP Setup** for the DHCP client.
MAC Address	Enter the MAC address of a computer on your LAN.
Add	Click **Add** to add a static DHCP entry.
#	This is the index number of the static IP table entry (row).
Status	This field displays whether the client is connected to the ZyXEL Device.
Host Name	This field displays the computer host name.
IP Address	This field displays the IP address relative to the # field listed above.
MAC Address	The MAC (Media Access Control) or Ethernet address on a LAN (Local Area Network) is unique to your computer (six pairs of hexadecimal notation). A network interface card such as an Ethernet adapter has a hardwired address that is assigned at the factory. This address follows an industry standard that ensures no other adapter has a similar address.
Reserve	Select the check box(es) in each entry to have the ZyXEL Device always assign the selected entry(ies)'s IP address(es) to the corresponding MAC address(es) (and host name(s)). You can select up to 32 entries in this table.
Modify	Click the modify icon to have the IP address field editable and change it.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.

Table 26 LAN > Client List (continued)

LABEL	DESCRIPTION
Cancel	Click **Cancel** to begin configuring this screen afresh.
Refresh	Click **Refresh** to reload the DHCP table.

6.6 LAN IP Alias

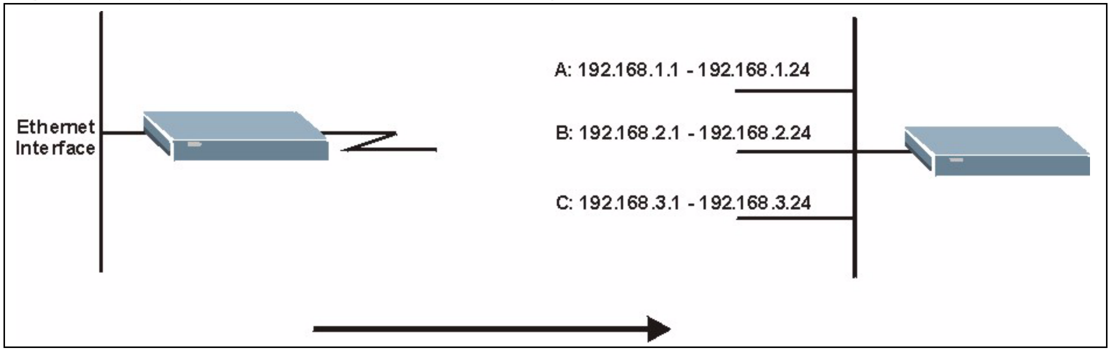
IP alias allows you to partition a physical network into different logical networks over the same Ethernet interface. The ZyXEL Device supports three logical LAN interfaces via its single physical Ethernet interface with the ZyXEL Device itself as the gateway for each LAN network.

When you use IP alias, you can also configure firewall rules to control access between the LAN's logical networks (subnets).

Note: Make sure that the subnets of the logical networks do not overlap.

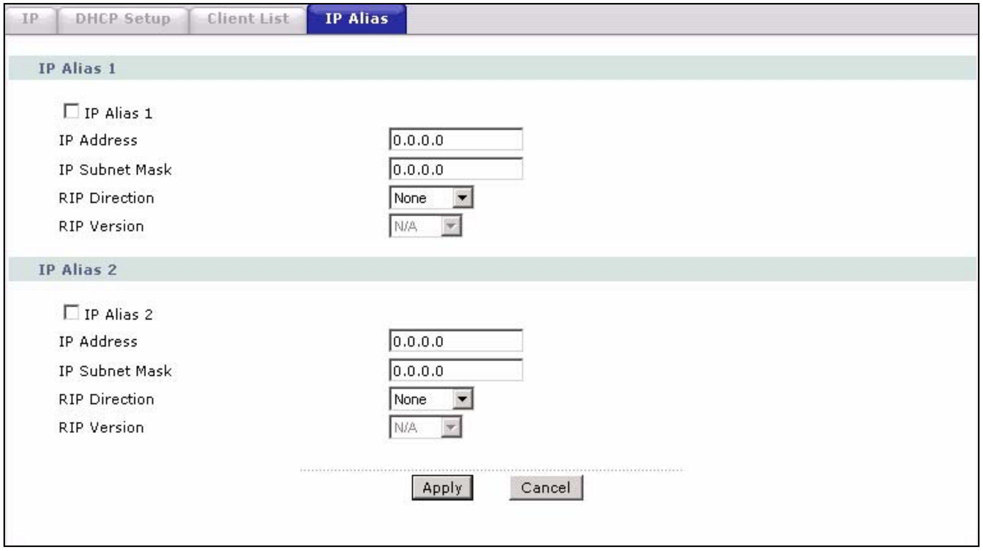
The following figure shows a LAN divided into subnets A, B, and C.

Figure 38 Physical Network & Partitioned Logical Networks


Ethernet Interface
A: 192.168.1.1 - 192.168.1.24
B: 192.168.2.1 - 192.168.2.24
C: 192.168.3.1 - 192.168.3.24

Use this screen to configure subnets on the LAN. Click **Network** > **LAN** > **IP Alias**. The screen appears as shown.

Figure 39 LAN > IP Alias



IP Alias 1

□ IP Alias 1

IP Address 0.0.0.0

IP Subnet Mask 0.0.0.0

RIP Direction None

RIP Version N/A

IP Alias 2

□ IP Alias 2

IP Address 0.0.0.0

IP Subnet Mask 0.0.0.0

RIP Direction None

RIP Version N/A

The following table describes the labels in this screen.

Table 27 LAN > IP Alias

LABEL	DESCRIPTION
IP Alias 1, 2	Select the check box to configure another LAN network for the ZyXEL Device.
IP Address	Enter the IP address of your ZyXEL Device in dotted decimal notation. Alternatively, click the right mouse button to copy and/or paste the IP address.
IP Subnet Mask	Your ZyXEL Device will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the ZyXEL Device.
RIP Direction	RIP (Routing Information Protocol, RFC 1058 and RFC 1389) allows a router to exchange routing information with other routers. The **RIP Direction** field controls the sending and receiving of RIP packets. Select the RIP direction from **Both**/**In Only**/**Out Only**/**None**. When set to **Both** or **Out Only**, the ZyXEL Device will broadcast its routing table periodically. When set to **Both** or **In Only**, it will incorporate the RIP information that it receives; when set to **None**, it will not send any RIP packets and will ignore any RIP packets received.
RIP Version	This field is enabled if **RIP Direction** is not **None**. The **RIP Version** field controls the format and the broadcasting method of the RIP packets that the ZyXEL Device sends (it recognizes both formats when receiving). **RIP-1** is universally supported but RIP-2 carries more information. RIP-1 is probably adequate for most networks, unless you have an unusual network topology. Both **RIP-2B** and **RIP-2M** sends the routing data in RIP-2 format; the difference being that **RIP-2B** uses subnet broadcasting while **RIP-2M** uses multicasting. Multicasting can reduce the load on non-router machines since they generally do not listen to the RIP multicast address and so will not receive the RIP packets. However, if one router uses multicasting, then all routers on your network must use multicasting, also.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 7 Network Address Translation (NAT) Screens

This chapter discusses how to configure NAT on the ZyXEL Device.

7.1 NAT Overview

NAT (Network Address Translation, RFC 1631) is the translation of the IP address of a host in a packet, for example, the source address of an outgoing packet, used within one network to a different IP address known within another network.

7.1.1 NAT Definitions

Inside/outside denotes where a host is located relative to the ZyXEL Device, for example, the computers of your subscribers are the inside hosts, while the web servers on the Internet are the outside hosts.

Global/local denotes the IP address of a host in a packet as the packet traverses a router, for example, the local address refers to the IP address of a host when the packet is in the local network, while the global address refers to the IP address of the host when the same packet is traveling in the WAN side.

Note that inside/outside refers to the location of a host, while global/local refers to the IP address of a host used in a packet. Thus, an inside local address (ILA) is the IP address of an inside host in a packet when the packet is still in the local network, while an inside global address (IGA) is the IP address of the same inside host when the packet is on the WAN side. The following table summarizes this information.

Table 28 NAT Definitions

ITEM	DESCRIPTION
Inside	This refers to the host on the LAN.
Outside	This refers to the host on the WAN.
Local	This refers to the packet address (source or destination) as the packet travels on the LAN.
Global	This refers to the packet address (source or destination) as the packet travels on the WAN.

NAT never changes the IP address (either local or global) of an outside host.

7.1.2 What NAT Does

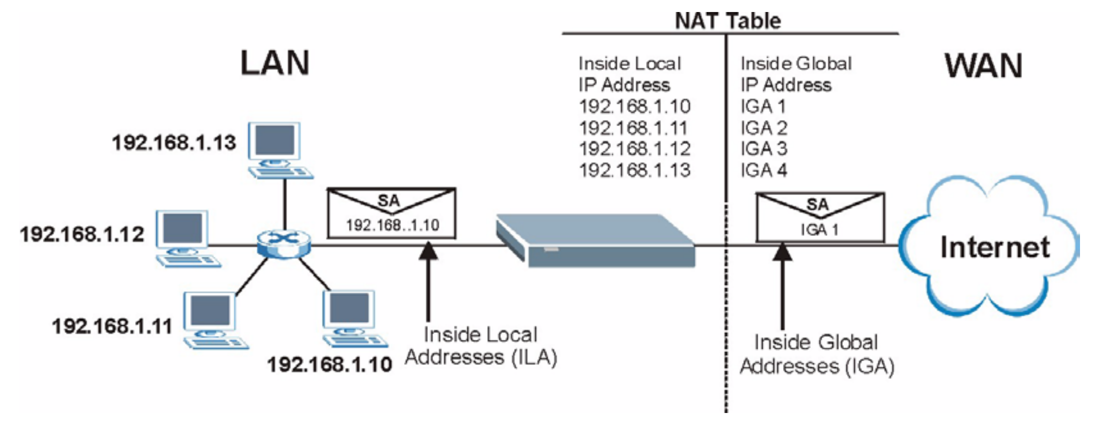
In the simplest form, NAT changes the source IP address in a packet received from a subscriber (the inside local address) to another (the inside global address) before forwarding the packet to the WAN side. When the response comes back, NAT translates the destination address (the inside global address) back to the inside local address before forwarding it to the original inside host. Note that the IP address (either local or global) of an outside host is never changed.

The global IP addresses for the inside hosts can be either static or dynamically assigned by the ISP. In addition, you can designate servers, for example, a web server and a telnet server, on your local network and make them accessible to the outside world. If you do not define any servers (for Many-to-One and Many-to-Many Overload mapping – see Table 29 on page 110), NAT offers the additional benefit of firewall protection. With no servers defined, your ZyXEL Device filters out all incoming inquiries, thus preventing intruders from probing your network. For more information on IP address translation, refer to *RFC 1631*, *The IP Network Address Translator (NAT)*.

7.1.3 How NAT Works

Each packet has two addresses – a source address and a destination address. For outgoing packets, the ILA (Inside Local Address) is the source address on the LAN, and the IGA (Inside Global Address) is the source address on the WAN. For incoming packets, the ILA is the destination address on the LAN, and the IGA is the destination address on the WAN. NAT maps private (local) IP addresses to globally unique ones required for communication with hosts on other networks. It replaces the original IP source address (and TCP or UDP source port numbers for Many-to-One and Many-to-Many Overload NAT mapping) in each packet and then forwards it to the Internet. The ZyXEL Device keeps track of the original addresses and port numbers so incoming reply packets can have their original values restored. The following figure illustrates this.

Figure 40 How NAT Works



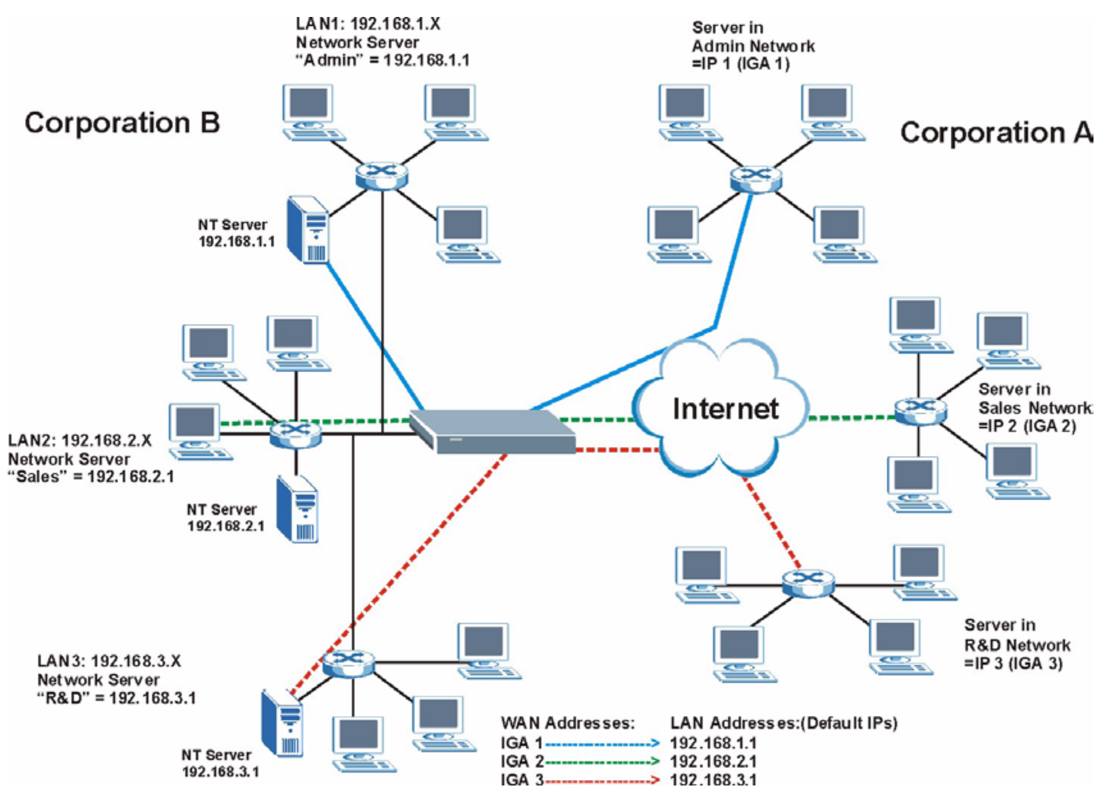
NAT Table

Inside Local IP Address	Inside Global IP Address
192.168.1.10	IGA 1
192.168.1.11	IGA 2
192.168.1.12	IGA 3
192.168.1.13	IGA 4

7.1.4 NAT Application

The following figure illustrates a possible NAT application, where three inside LANs (logical LANs using IP Alias) behind the ZyXEL Device can communicate with three distinct WAN networks. More examples follow at the end of this chapter.

Figure 41 NAT Application With IP Alias



7.1.5 NAT Mapping Types

NAT supports five types of IP/port mapping. They are:

- **One to One**: In One-to-One mode, the ZyXEL Device maps one local IP address to one global IP address.
- **Many to One**: In Many-to-One mode, the ZyXEL Device maps multiple local IP addresses to one global IP address. This is equivalent to SUA (for instance, PAT, port address translation), ZyXEL's Single User Account feature that previous ZyXEL routers supported (the **SUA Only** option in today's routers).
- **Many to Many Overload**: In Many-to-Many Overload mode, the ZyXEL Device maps the multiple local IP addresses to shared global IP addresses.
- **Many-to-Many No Overload**: In Many-to-Many No Overload mode, the ZyXEL Device maps each local IP address to a unique global IP address.
- **Server**: This type allows you to specify inside servers of different services behind the NAT to be accessible to the outside world.

Port numbers do NOT change for **One-to-One** and **Many-to-Many No Overload** NAT mapping types.

The following table summarizes these types.

Table 29 NAT Mapping Types

TYPE	IP MAPPING
One-to-One	ILA1←→ IGA1

Many-to-One (SUA/PAT)	ILA1←→ IGA1
	ILA2←→ IGA1
	…

Many-to-Many Overload	ILA1←→ IGA1
	ILA2←→ IGA2
	ILA3←→ IGA1
	ILA4←→ IGA2
	…

Many-to-Many No Overload	ILA1←→ IGA1
	ILA2←→ IGA2
	ILA3←→ IGA3
	…

Server	Server 1 IP←→ IGA1 Server 2 IP←→ IGA1 Server 3 IP←→ IGA1

7.2 SUA (Single User Account) Versus NAT

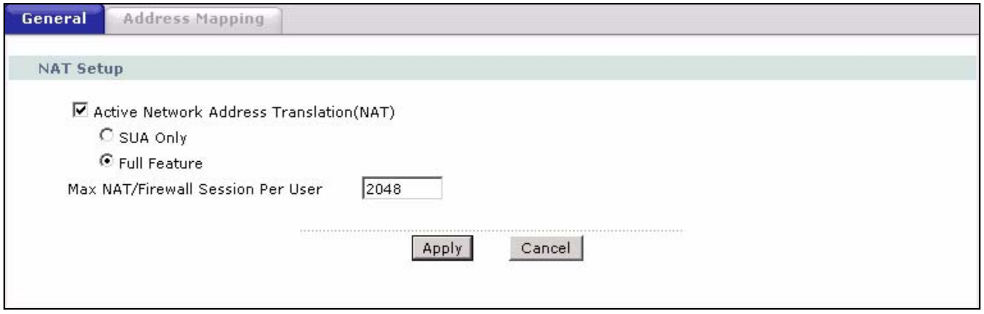
SUA (Single User Account) is a ZyNOS implementation of a subset of NAT that supports two types of mapping, **Many-to-One** and **Server**. The ZyXEL Device also supports **Full Feature** NAT to map multiple global IP addresses to multiple private LAN IP addresses of clients or servers using mapping types as outlined in Table 29 on page 110.

- Choose **SUA Only** if you have just one public WAN IP address for your ZyXEL Device.
- Choose **Full Feature** if you have multiple public WAN IP addresses for your ZyXEL Device.

7.3 NAT General Setup

You must create a firewall rule in addition to setting up SUA/NAT, to allow traffic from the WAN to be forwarded through the ZyXEL Device. Click **Network > NAT** to open the following screen.

Figure 42 NAT > General



☑ Active Network Address Translation(NAT)

○ SUA Only

● Full Feature

Max NAT/Firewall Session Per User 2048

The following table describes the labels in this screen.

Table 30 NAT General

LABEL	DESCRIPTION
Active Network Address Translation (NAT)	Select this check box to enable NAT.
SUA Only	Select this radio button if you have just one public WAN IP address for your ZyXEL Device.
Full Feature	Select this radio button if you have multiple public WAN IP addresses for your ZyXEL Device.
Max NAT/ Firewall Session Per User	When computers use peer to peer applications, such as file sharing applications, they need to establish NAT sessions. If you do not limit the number of NAT sessions a single client can establish, this can result in all of the available NAT sessions being used. In this case, no additional NAT sessions can be established, and users may not be able to access the Internet. Each NAT session establishes a corresponding firewall session. Use this field to limit the number of NAT/firewall sessions each client computer can establish through the ZyXEL Device. If your network has a small number of clients using peer to peer applications, you can raise this number to ensure that their performance is not degraded by the number of NAT sessions they can establish. If your network has a large number of users using peer to peer applications, you can lower this number to ensure no single client is using all of the available NAT sessions.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

7.4 Port Forwarding

A port forwarding set is a list of inside (behind NAT on the LAN) servers, for example, web or FTP, that you can make visible to the outside world even though NAT makes your whole inside network appear as a single computer to the outside world.

You may enter a single port number or a range of port numbers to be forwarded, and the local IP address of the desired server. The port number identifies a service; for example, web service is on port 80 and FTP on port 21. In some cases, such as for unknown services or where one server can support more than one service (for example both FTP and web service), it might be better to specify a range of port numbers. You can allocate a server IP address that corresponds to a port or a range of ports.

Many residential broadband ISP accounts do not allow you to run any server processes (such as a Web or FTP server) from your location. Your ISP may periodically check for servers and may suspend your account if it discovers any active services at your location. If you are unsure, refer to your ISP.

7.4.1 Default Server IP Address

In addition to the servers for specified services, NAT supports a default server IP address. A default server receives packets from ports that are not specified in this screen.

Note: If you do not assign a **Default Server** IP address, the ZyXEL Device discards all packets received for ports that are not specified here or in the remote management setup.

7.4.2 Port Forwarding: Services and Port Numbers

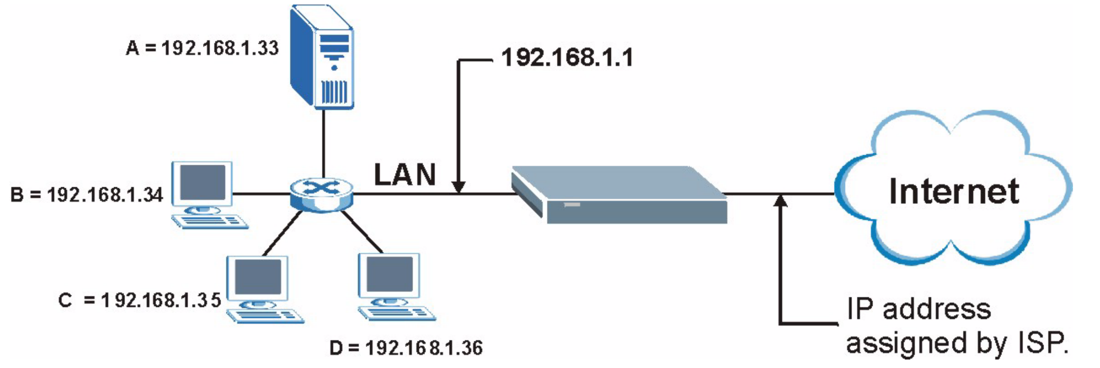
Use the **Port Forwarding** screen to forward incoming service requests to the server(s) on your local network.

The most often used port numbers are shown in Appendix E on page 389. Please refer to RFC 1700 for further information about port numbers.

7.4.3 Configuring Servers Behind Port Forwarding (Example)

Let's say you want to assign ports 21-25 to one FTP, Telnet and SMTP server (**A** in the example), port 80 to another (**B** in the example) and assign a default server IP address of 192.168.1.35 to a third (**C** in the example). You assign the LAN IP addresses and the ISP assigns the WAN IP address. The NAT network appears as a single host on the Internet.

Figure 43 Multiple Servers Behind NAT Example



7.5 Configuring Port Forwarding

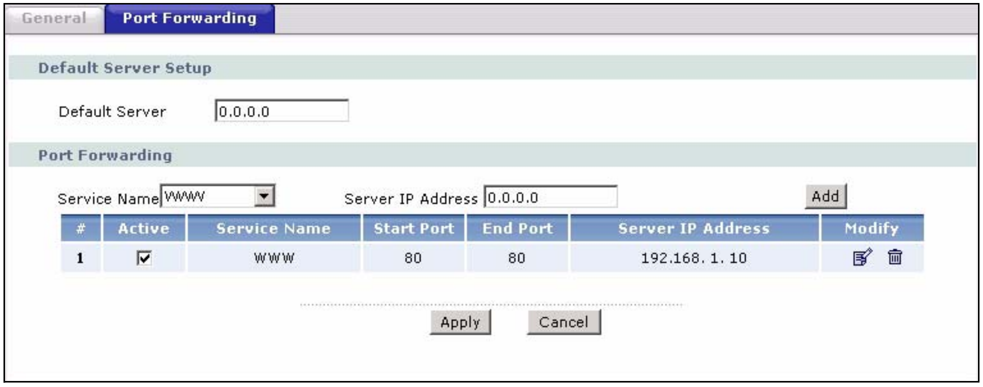
Note: The **Port Forwarding** screen is available when you select **SUA Only** in the **NAT > General** screen or when you edit a server mapping set with **Full Feature** NAT.

If you do not assign a **Default Server** IP address, the ZyXEL Device discards all packets received for ports that are not specified here or in the remote management setup.

Click **Network > NAT > Port Forwarding** to open the following screen.

See Appendix E on page 389 for port numbers commonly used for particular services.

Figure 44 NAT > Port Forwarding



Default Server Setup

Default Server: 0.0.0.0

Port Forwarding

Service Name: WWW

Server IP Address: 0.0.0.0

#	Active	Service Name	Start Port	End Port	Server IP Address	Modify
1	☑	WWW	80	80	192.168. 1. 10	

The following table describes the fields in this screen.

Table 31 NAT > Port Forwarding

LABEL	DESCRIPTION
Default Server Setup	
Default Server	In addition to the servers for specified services, NAT supports a default server. A default server receives packets from ports that are not specified in this screen. If you do not assign a **Default Server** IP address, the ZyXEL Device discards all packets received for ports that are not specified here or in the remote management setup.
Port Forwarding	
Service Name	Select a service from the drop-down list box.
Server IP Address	Enter the IP address of the server for the specified service.
Add	Click this button to add a rule to the table below.
#	This is the rule index number (read-only).
Active	Click this check box to enable the rule.
Service Name	This is a service’s name.
Start Port	This is the first port number that identifies a service.
End Port	This is the last port number that identifies a service.

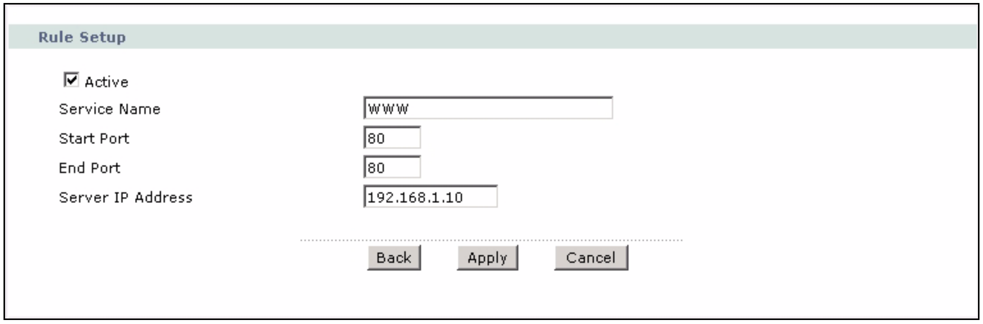
Table 31 NAT > Port Forwarding (continued)

LABEL	DESCRIPTION
Server IP Address	This is the server's IP address.
Modify	Click the edit icon to go to the screen where you can edit the port forwarding rule. Click the delete icon to delete an existing port forwarding rule. Note that subsequent rules move up by one when you take this action.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to return to the previous configuration.

7.5.1 Port Forwarding Rule Edit

Use this screen to edit a port forwarding rule. Click the rule's edit icon in the **Port Forwarding** screen to display the screen shown next.

Figure 45 NAT > Port Forwarding > Edit



Rule Setup

☑ Active

Service Name: WWW

Start Port: 80

End Port: 80

Server IP Address: 192.168.1.10

The following table describes the fields in this screen.

Table 32 NAT > Port Forwarding > Edit

LABEL	DESCRIPTION
Active	Click this check box to enable the rule.
Service Name	Enter a name to identify this port-forwarding rule.
Start Port	Enter a port number in this field. To forward only one port, enter the port number again in the **End Port** field. To forward a series of ports, enter the start port number here and the end port number in the **End Port** field.
End Port	Enter a port number in this field. To forward only one port, enter the port number again in the **Start Port** field above and then enter it again in this field. To forward a series of ports, enter the last port number in a series that begins with the port number in the **Start Port** field above.
Server IP Address	Enter the inside IP address of the server here.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

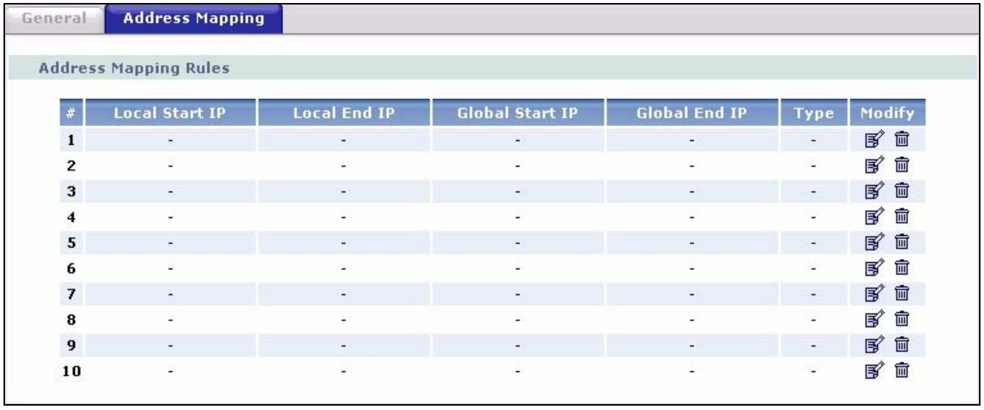
7.6 Address Mapping

Note: The **Address Mapping** screen is available only when you select **Full Feature** in the **NAT > General** screen.

Ordering your rules is important because the ZyXEL Device applies the rules in the order that you specify. When a rule matches the current packet, the ZyXEL Device takes the corresponding action and the remaining rules are ignored. If there are any empty rules before your new configured rule, your configured rule will be pushed up by that number of empty rules. For example, if you have already configured rules 1 to 6 in your current set and now you configure rule number 9. In the set summary screen, the new rule will be rule 7, not 9. Now if you delete rule 4, rules 5 to 7 will be pushed up by 1 rule, so old rules 5, 6 and 7 become new rules 4, 5 and 6.

Use this screen to change your ZyXEL Device's address mapping settings. Click **Network** > **NAT** > **Address Mapping** to open the following screen.

Figure 46 NAT > Address Mapping



Address Mapping Rules

#	Local Start IP	Local End IP	Global Start IP	Global End IP	Type	Modify
1	-	-	-	-	-	✎ 🗑
2	-	-	-	-	-	✎ 🗑
3	-	-	-	-	-	✎ 🗑
4	-	-	-	-	-	✎ 🗑
5	-	-	-	-	-	✎ 🗑
6	-	-	-	-	-	✎ 🗑
7	-	-	-	-	-	✎ 🗑
8	-	-	-	-	-	✎ 🗑
9	-	-	-	-	-	✎ 🗑
10	-	-	-	-	-	✎ 🗑

The following table describes the fields in this screen.

Table 33 NAT > Address Mapping

LABEL	DESCRIPTION
#	This is the rule index number.
Local Start IP	This is the starting Inside Local IP Address (ILA). Local IP addresses are **N/A** for **Server** port mapping.
Local End IP	This is the end Inside Local IP Address (ILA). If the rule is for all local IP addresses, then this field displays 0.0.0.0 as the **Local Start IP** address and 255.255.255.255 as the **Local End IP** address. This field is **N/A** for **One-to-one** and **Server** mapping types.
Global Start IP	This is the starting Inside Global IP Address (IGA). Enter 0.0.0.0 here if you have a dynamic IP address from your ISP. You can only do this for **Many-to-One** and **Server** mapping types.
Global End IP	This is the ending Inside Global IP Address (IGA). This field is **N/A** for **One-to-one**, **Many-to-One** and **Server** mapping types.

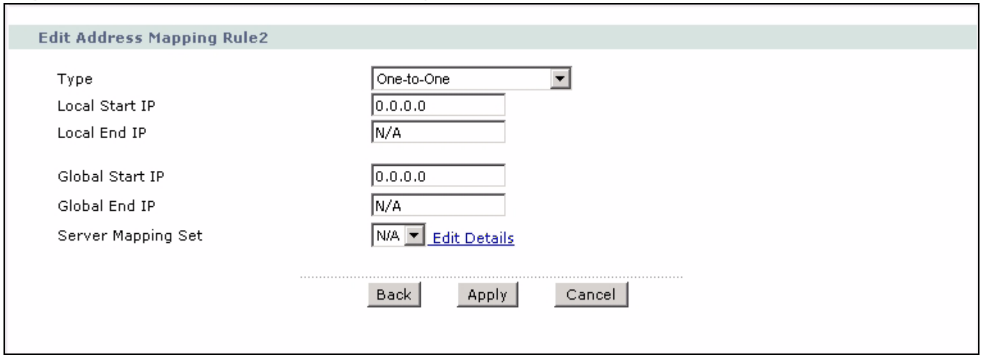
Table 33 NAT > Address Mapping (continued)

LABEL	DESCRIPTION
Type	**1-1**: One-to-one mode maps one local IP address to one global IP address. Note that port numbers do not change for the One-to-one NAT mapping type. **M-1**: Many-to-One mode maps multiple local IP addresses to one global IP address. This is equivalent to SUA (i.e., PAT, port address translation), ZyXEL's Single User Account feature that previous ZyXEL routers supported only. **M-M Ov** (Overload): Many-to-Many Overload mode maps multiple local IP addresses to shared global IP addresses. **MM No** (No Overload): Many-to-Many No Overload mode maps each local IP address to unique global IP addresses. **Server**: This type allows you to specify inside servers of different services behind the NAT to be accessible to the outside world.
Modify	Click the edit icon to go to the screen where you can edit the address mapping rule. Click the delete icon to delete an existing address mapping rule. Note that subsequent rules move up by one when you take this action.

7.6.1 Address Mapping Rule Edit

Use this screen to edit an address mapping rule. Click the rule’s edit icon in the **Address Mapping** screen to display the screen shown next.

Figure 47 NAT > Address Mapping > Edit



Edit Address Mapping Rule2

Type	One-to-One
Local Start IP	0.0.0.0
Local End IP	N/A
Global Start IP	0.0.0.0
Global End IP	N/A
Server Mapping Set	N/A Edit Details

The following table describes the fields in this screen.

Table 34 NAT > Address Mapping > Edit

LABEL	DESCRIPTION
Type	Choose the port mapping type from one of the following. **One-to-One**: One-to-One mode maps one local IP address to one global IP address. Note that port numbers do not change for One-to-one NAT mapping type. **Many-to-One**: Many-to-One mode maps multiple local IP addresses to one global IP address. This is equivalent to SUA (i.e., PAT, port address translation), ZyXEL's Single User Account feature that previous ZyXEL routers supported only. **Many-to-Many Overload**: Many-to-Many Overload mode maps multiple local IP addresses to shared global IP addresses. **Many-to-Many No Overload**: Many-to-Many No Overload mode maps each local IP address to unique global IP addresses. **Server**: This type allows you to specify inside servers of different services behind the NAT to be accessible to the outside world.
Local Start IP	This is the starting local IP address (ILA). Local IP addresses are **N/A** for **Server** port mapping.
Local End IP	This is the end local IP address (ILA). If your rule is for all local IP addresses, then enter 0.0.0.0 as the **Local Start IP** address and 255.255.255.255 as the **Local End IP** address. This field is **N/A** for **One-to-One** and **Server** mapping types.
Global Start IP	This is the starting global IP address (IGA). Enter 0.0.0.0 here if you have a dynamic IP address from your ISP.
Global End IP	This is the ending global IP address (IGA). This field is **N/A** for **One-to-One**, **Many-to-One** and **Server** mapping types.
Server Mapping Set	Only available when **Type** is set to **Server**. Select a number from the drop-down menu to choose a server mapping set.
Edit Details	Click this link to go to the **Port Forwarding** screen (Section 7.5 on page 113) to edit the server mapping set that you have selected in the **Server Mapping Set** field.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 8 Firewalls

This chapter gives some background information on firewalls and introduces the ZyXEL Device firewall.

8.1 Firewall Overview

Originally, the term *firewall* referred to a construction technique designed to prevent the spread of fire from one room to another. The networking term “firewall” is a system or group of systems that enforces an access-control policy between two networks. It may also be defined as a mechanism used to protect a trusted network from an untrusted network. Of course, firewalls cannot solve every security problem. A firewall is *one* of the mechanisms used to establish a network security perimeter in support of a network security policy. It should never be the *only* mechanism or method employed. For a firewall to guard effectively, you must design and deploy it appropriately. This requires integrating the firewall into a broad information-security policy. In addition, specific policies must be implemented within the firewall itself.

Refer to Section 9.6 on page 136 to configure default firewall settings.

Refer to Section 9.7 on page 137 to view firewall rules.

Refer to Section 9.7.1 on page 138 to configure firewall rules.

Refer to Section 9.7.2 on page 141 to configure a custom service.

Refer to Section 9.10.3 on page 149 to configure firewall thresholds.

8.2 Types of Firewalls

There are three main types of firewalls:

- Packet Filtering Firewalls
- Application-level Firewalls
- Stateful Inspection Firewalls

8.2.1 Packet Filtering Firewalls

Packet filtering firewalls restrict access based on the source/destination computer network address of a packet and the type of application.

8.2.2 Application-level Firewalls

Application-level firewalls restrict access by serving as proxies for external servers. Since they use programs written for specific Internet services, such as HTTP, FTP and telnet, they can evaluate network packets for valid application-specific data. Application-level gateways have a number of general advantages over the default mode of permitting application traffic directly to internal hosts:

Information hiding prevents the names of internal systems from being made known via DNS to outside systems, since the application gateway is the only host whose name must be made known to outside systems.

Robust authentication and logging pre-authenticates application traffic before it reaches internal hosts and causes it to be logged more effectively than if it were logged with standard host logging. Filtering rules at the packet filtering router can be less complex than they would be if the router needed to filter application traffic and direct it to a number of specific systems. The router need only allow application traffic destined for the application gateway and reject the rest.

8.2.3 Stateful Inspection Firewalls

Stateful inspection firewalls restrict access by screening data packets against defined access rules. They make access control decisions based on IP address and protocol. They also "inspect" the session data to assure the integrity of the connection and to adapt to dynamic protocols. These firewalls generally provide the best speed and transparency, however, they may lack the granular application level access control or caching that some proxies support. See Section 8.5 on page 125 for more information on stateful inspection.

Firewalls, of one type or another, have become an integral part of standard security solutions for enterprises.

8.3 Introduction to ZyXEL's Firewall

The ZyXEL Device firewall is a stateful inspection firewall and is designed to protect against Denial of Service attacks when activated. The ZyXEL Device's purpose is to allow a private Local Area Network (LAN) to be securely connected to the Internet. The ZyXEL Device can be used to prevent theft, destruction and modification of data, as well as log events, which may be important to the security of your network. The ZyXEL Device also has packet filtering capabilities.

The ZyXEL Device is installed between the LAN and the Internet. This allows it to act as a secure gateway for all data passing between the Internet and the LAN.

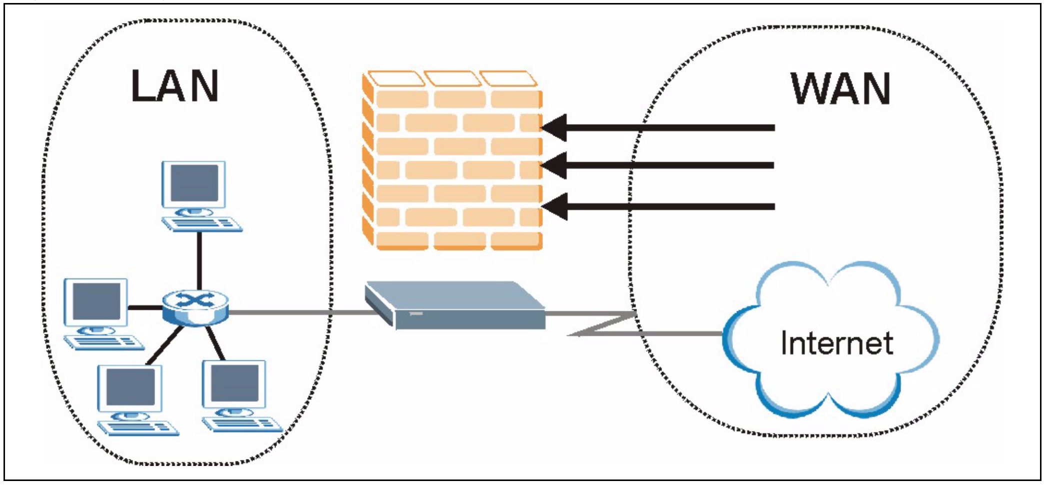
The ZyXEL Device has one DSL/ISDN port and one Ethernet LAN port, which physically separate the network into two areas.

- The DSL/ISDN port connects to the Internet.

- The LAN (Local Area Network) port attaches to a network of computers, which needs security from the outside world. These computers will have access to Internet services such as e-mail, FTP, and the World Wide Web. However, "inbound access" will not be allowed unless you configure remote management or create a firewall rule to allow a remote host to use a specific service.

8.3.1 Denial of Service Attacks

Figure 48 ZyXEL Device Firewall Application



8.4 Denial of Service

Denials of Service (DoS) attacks are aimed at devices and networks with a connection to the Internet. Their goal is not to steal information, but to disable a device or network so users no longer have access to network resources. The ZyXEL Device is pre-configured to automatically detect and thwart all known DoS attacks.

8.4.1 Basics

Computers share information over the Internet using a common language called TCP/IP. TCP/IP, in turn, is a set of application protocols that perform specific functions. An "extension number", called the "TCP port" or "UDP port" identifies these protocols, such as HTTP (Web), FTP (File Transfer Protocol), POP3 (E-mail), etc. For example, Web traffic by default uses TCP port 80.

When computers communicate on the Internet, they are using the client/server model, where the server "listens" on a specific TCP/UDP port for information requests from remote client computers on the network. For example, a Web server typically listens on port 80. Please note that while a computer may be intended for use over a single port, such as Web on port 80, other ports are also active. If the person configuring or managing the computer is not careful, a hacker could attack it over an unprotected port.

Some of the most common IP ports are shown in Appendix E on page 389.

8.4.2 Types of DoS Attacks

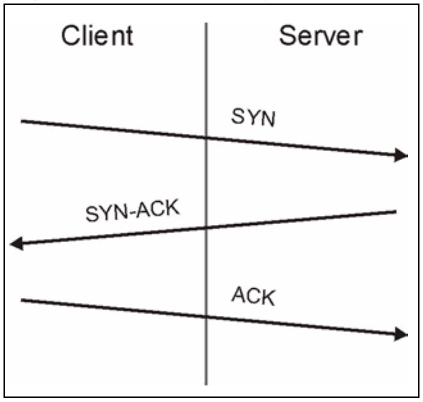
There are four types of DoS attacks:

1. Those that exploit bugs in a TCP/IP implementation.
2. Those that exploit weaknesses in the TCP/IP specification.
3. Brute-force attacks that flood a network with useless data.
4. IP Spoofing.
5. "**Ping of Death**" and "**Teardrop**" attacks exploit bugs in the TCP/IP implementations of various computer and host systems.

- Ping of Death uses a "ping" utility to create an IP packet that exceeds the maximum 65,536 bytes of data allowed by the IP specification. The oversize packet is then sent to an unsuspecting system. Systems may crash, hang or reboot.
- Teardrop attack exploits weaknesses in the re-assembly of IP packet fragments. As data is transmitted through a network, IP packets are often broken up into smaller chunks. Each fragment looks like the original IP packet except that it contains an offset field that says, for instance, "This fragment is carrying bytes 200 through 400 of the original (non fragmented) IP packet." The Teardrop program creates a series of IP fragments with overlapping offset fields. When these fragments are reassembled at the destination, some systems will crash, hang, or reboot.

6. Weaknesses in the TCP/IP specification leave it open to "**SYN Flood**" and "**LAND**" attacks. These attacks are executed during the handshake that initiates a communication session between two applications.

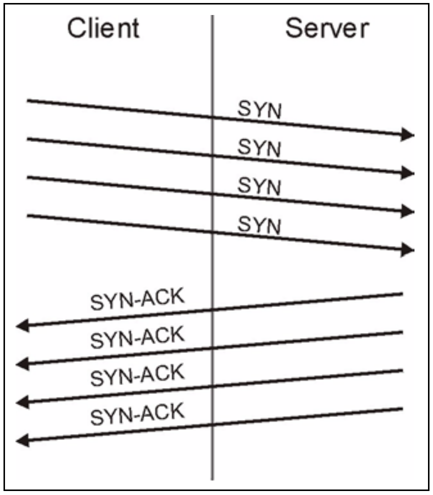
Figure 49 Three-Way Handshake



Under normal circumstances, the application that initiates a session sends a SYN (synchronize) packet to the receiving server. The receiver sends back an ACK (acknowledgment) packet and its own SYN, and then the initiator responds with an ACK (acknowledgment). After this handshake, a connection is established.

- **SYN Attack** floods a targeted system with a series of SYN packets. Each packet causes the targeted system to issue a SYN-ACK response. While the targeted system waits for the ACK that follows the SYN-ACK, it queues up all outstanding SYN-ACK responses on what is known as a backlog queue. SYN-ACKs are moved off the queue only when an ACK comes back or when an internal timer (which is set at relatively long intervals) terminates the three-way handshake. Once the queue is full, the system will ignore all incoming SYN requests, making the system unavailable for legitimate users.

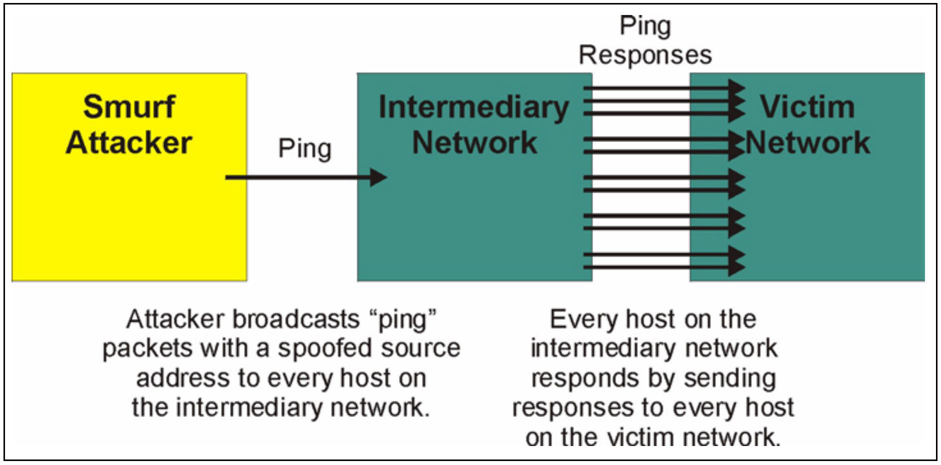
Figure 50 SYN Flood



- In a **LAND Attack**, hackers flood SYN packets into the network with a spoofed source IP address of the targeted system. This makes it appear as if the host computer sent the packets to itself, making the system unavailable while the target system tries to respond to itself.

7 A **brute-force** attack, such as a "Smurf" attack, targets a feature in the IP specification known as directed or subnet broadcasting, to quickly flood the target network with useless data. A Smurf hacker floods a router with Internet Control Message Protocol (ICMP) echo request packets (pings). Since the destination IP address of each packet is the broadcast address of the network, the router will broadcast the ICMP echo request packet to all hosts on the network. If there are numerous hosts, this will create a large amount of ICMP echo request and response traffic. If a hacker chooses to spoof the source IP address of the ICMP echo request packet, the resulting ICMP traffic will not only clog up the "intermediary" network, but will also congest the network of the spoofed source IP address, known as the "victim" network. This flood of broadcast traffic consumes all available bandwidth, making communications impossible.

Figure 51 Smurf Attack


Ping Responses
Smurf Attacker
Ping
Intermediary Network
Victim Network
Attacker broadcasts "ping" packets with a spoofed source address to every host on the intermediary network.
Every host on the intermediary network responds by sending responses to every host on the victim network.

8.4.2.1 ICMP Vulnerability

ICMP is an error-reporting protocol that works in concert with IP. The following ICMP types trigger an alert:

Table 35 ICMP Commands That Trigger Alerts

5	REDIRECT
13	TIMESTAMP_REQUEST
14	TIMESTAMP_REPLY
17	ADDRESS_MASK_REQUEST
18	ADDRESS_MASK_REPLY

8.4.2.2 Illegal Commands (NetBIOS and SMTP)

The only legal NetBIOS commands are the following - all others are illegal.

Table 36 Legal NetBIOS Commands

MESSAGE:
REQUEST:
POSITIVE:
VE:
RETARGET:
KEEPALIVE:

All SMTP commands are illegal except for those displayed in the following tables.

Table 37 Legal SMTP Commands

AUTH	DATA	EHLO	ETRN	EXPN	HELO	HELP	MAIL	NOOP
QUIT	RCPT	RSET	SAML	SEND	SOML	TURN	VRFY	

8.4.2.3 Traceroute

Traceroute is a utility used to determine the path a packet takes between two endpoints. Sometimes when a packet filter firewall is configured incorrectly an attacker can traceroute the firewall gaining knowledge of the network topology inside the firewall.

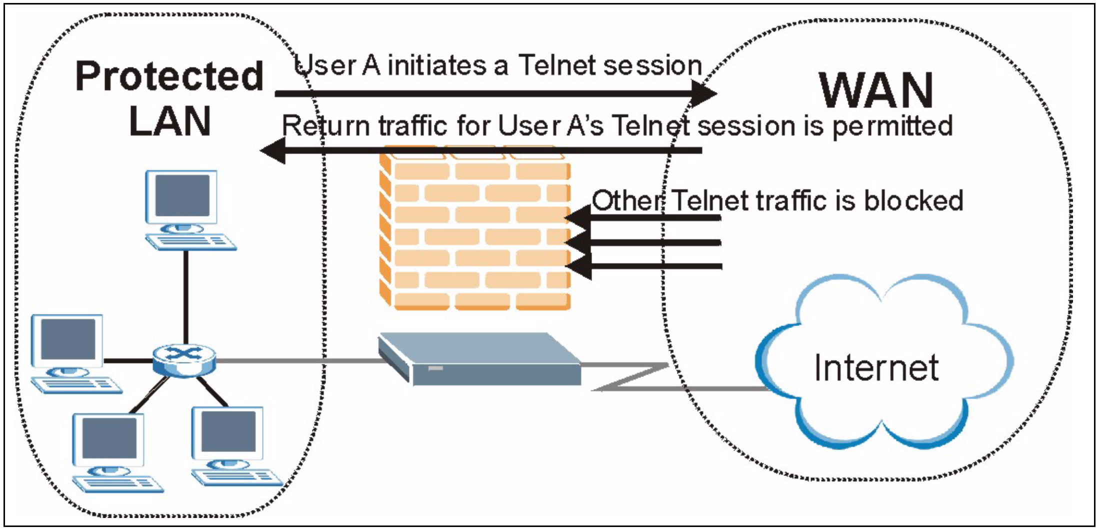
Often, many DoS attacks also employ a technique known as "**IP Spoofing**" as part of their attack. IP Spoofing may be used to break into systems, to hide the hacker's identity, or to magnify the effect of the DoS attack. IP Spoofing is a technique used to gain unauthorized access to computers by tricking a router or firewall into thinking that the communications are coming from within the trusted network. To engage in IP spoofing, a hacker must modify the packet headers so that it appears that the packets originate from a trusted host and should be allowed through the router or firewall. The ZyXEL Device blocks all IP Spoofing attempts.

8.5 Stateful Inspection

With stateful inspection, fields of the packets are compared to packets that are already known to be trusted. For example, if you access some outside service, the proxy server remembers things about your original request, like the port number and source and destination addresses. This “remembering” is called *saving the state.* When the outside system responds to your request, the firewall compares the received packets with the saved state to determine if they are allowed in. The ZyXEL Device uses stateful packet inspection to protect the private LAN from hackers and vandals on the Internet. By default, the ZyXEL Device’s stateful inspection allows all communications to the Internet that originate from the LAN, and blocks all traffic to the LAN that originates from the Internet. In summary, stateful inspection:

- Allows all sessions originating from the LAN (local network) to the WAN (Internet).
- Denies all sessions originating from the WAN to the LAN.

Figure 52 Stateful Inspection


Protected LAN
User A initiates a Telnet session
WAN
Return traffic for User A’s Telnet session is permitted
Other Telnet traffic is blocked
Internet

The previous figure shows the ZyXEL Device's default firewall rules in action as well as demonstrates how stateful inspection works. User A can initiate a Telnet session from within the LAN and responses to this request are allowed. However other Telnet traffic initiated from the WAN is blocked.

8.5.1 Stateful Inspection Process

In this example, the following sequence of events occurs when a TCP packet leaves the LAN network through the firewall's WAN interface. The TCP packet is the first in a session, and the packet's application layer protocol is configured for a firewall rule inspection:

1. The packet travels from the firewall's LAN to the WAN.
2. The packet is evaluated against the interface's existing outbound access list, and the packet is permitted (a denied packet would simply be dropped at this point).
3. The packet is inspected by a firewall rule to determine and record information about the state of the packet's connection. This information is recorded in a new state table entry created for the new connection. If there is not a firewall rule for this packet and it is not an attack, then the settings in the **Firewall General** screen determine the action for this packet.
4. Based on the obtained state information, a firewall rule creates a temporary access list entry that is inserted at the beginning of the WAN interface's inbound extended access list. This temporary access list entry is designed to permit inbound packets of the same connection as the outbound packet just inspected.
5. The outbound packet is forwarded out through the interface.
6. Later, an inbound packet reaches the interface. This packet is part of the connection previously established with the outbound packet. The inbound packet is evaluated against the inbound access list, and is permitted because of the temporary access list entry previously created.
7. The packet is inspected by a firewall rule, and the connection's state table entry is updated as necessary. Based on the updated state information, the inbound extended access list temporary entries might be modified, in order to permit only packets that are valid for the current state of the connection.
8. Any additional inbound or outbound packets that belong to the connection are inspected to update the state table entry and to modify the temporary inbound access list entries as required, and are forwarded through the interface.
9. When the connection terminates or times out, the connection's state table entry is deleted and the connection's temporary inbound access list entries are deleted.

8.5.2 Stateful Inspection and the ZyXEL Device

Additional rules may be defined to extend or override the default rules. For example, a rule may be created which will:

- Block all traffic of a certain type, such as IRC (Internet Relay Chat), from the LAN to the Internet.

- Allow certain types of traffic from the Internet to specific hosts on the LAN.
- Allow access to a Web server to everyone but competitors.
- Restrict use of certain protocols, such as Telnet, to authorized users on the LAN.

These custom rules work by evaluating the network traffic's Source IP address, Destination IP address, IP protocol type, and comparing these to rules set by the administrator.

Note: The ability to define firewall rules is a very powerful tool. Using custom rules, it is possible to disable all firewall protection or block all access to the Internet. Use extreme caution when creating or deleting firewall rules. Test changes after creating them to make sure they work correctly.

Below is a brief technical description of how these connections are tracked. Connections may either be defined by the upper protocols (for instance, TCP), or by the ZyXEL Device itself (as with the "virtual connections" created for UDP and ICMP).

8.5.3 TCP Security

The ZyXEL Device uses state information embedded in TCP packets. The first packet of any new connection has its SYN flag set and its ACK flag cleared; these are "initiation" packets. All packets that do not have this flag structure are called "subsequent" packets, since they represent data that occurs later in the TCP stream.

If an initiation packet originates on the WAN, this means that someone is trying to make a connection from the Internet into the LAN. Except in a few special cases (see "Upper Layer Protocols" shown next), these packets are dropped and logged.

If an initiation packet originates on the LAN, this means that someone is trying to make a connection from the LAN to the Internet. Assuming that this is an acceptable part of the security policy (as is the case with the default policy), the connection will be allowed. A cache entry is added which includes connection information such as IP addresses, TCP ports, sequence numbers, etc.

When the ZyXEL Device receives any subsequent packet (from the Internet or from the LAN), its connection information is extracted and checked against the cache. A packet is only allowed to pass through if it corresponds to a valid connection (that is, if it is a response to a connection which originated on the LAN).

8.5.4 UDP/ICMP Security

UDP and ICMP do not themselves contain any connection information (such as sequence numbers). However, at the very minimum, they contain an IP address pair (source and destination). UDP also contains port pairs, and ICMP has type and code information. All of this data can be analyzed in order to build "virtual connections" in the cache.

For instance, any UDP packet that originates on the LAN will create a cache entry. Its IP address and port pairs will be stored. For a short period of time, UDP packets from the WAN that have matching IP and UDP information will be allowed back in through the firewall.

A similar situation exists for ICMP, except that the ZyXEL Device is even more restrictive. Specifically, only outgoing echoes will allow incoming echo replies, outgoing address mask requests will allow incoming address mask replies, and outgoing timestamp requests will allow incoming timestamp replies. No other ICMP packets are allowed in through the firewall, simply because they are too dangerous and contain too little tracking information. For instance, ICMP redirect packets are never allowed in, since they could be used to reroute traffic through attacking machines.

8.5.5 Upper Layer Protocols

Some higher layer protocols (such as FTP and RealAudio) utilize multiple network connections simultaneously. In general terms, they usually have a "control connection" which is used for sending commands between endpoints, and then "data connections" which are used for transmitting bulk information.

Consider the FTP protocol. A user on the LAN opens a control connection to a server on the Internet and requests a file. At this point, the remote server will open a data connection from the Internet. For FTP to work properly, this connection must be allowed to pass through even though a connection from the Internet would normally be rejected.

In order to achieve this, the ZyXEL Device inspects the application-level FTP data. Specifically, it searches for outgoing "PORT" commands, and when it sees these, it adds a cache entry for the anticipated data connection. This can be done safely, since the PORT command contains address and port information, which can be used to uniquely identify the connection.

Any protocol that operates in this way must be supported on a case-by-case basis. You can use the web configurator’s Custom Ports feature to do this.

8.6 Guidelines for Enhancing Security with Your Firewall

- Change the default password.
- Limit who can telnet into your router.
- Don't enable any local service (such as SNMP or NTP) that you don't use. Any enabled service could present a potential security risk. A determined hacker might be able to find creative ways to misuse the enabled services to access the firewall or the network.
- For local services that are enabled, protect against misuse. Protect by configuring the services to communicate only with specific peers, and protect by configuring rules to block packets for the services at specific interfaces.
- Protect against IP spoofing by making sure the firewall is active.
- Keep the firewall in a secured (locked) room.

8.6.1 Security In General

You can never be too careful! Factors outside your firewall, filtering or NAT can cause security breaches. Below are some generalizations about what you can do to minimize them.

- Encourage your company or organization to develop a comprehensive security plan. Good network administration takes into account what hackers can do and prepares against attacks. The best defense against hackers and crackers is information. Educate all employees about the importance of security and how to minimize risk. Produce lists like this one!
- DSL or cable modem connections are "always-on" connections and are particularly vulnerable because they provide more opportunities for hackers to crack your system. Turn your computer off when not in use.
- Never give out a password or any sensitive information to an unsolicited telephone call or e-mail.
- Never e-mail sensitive information such as passwords, credit card information, etc., without encrypting the information first.
- Never submit sensitive information via a web page unless the web site uses secure connections. You can identify a secure connection by looking for a small "key" icon on the bottom of your browser (Internet Explorer 3.02 or better or Netscape 3.0 or better). If a web site uses a secure connection, it is safe to submit information. Secure web transactions are quite difficult to crack.
- Never reveal your IP address or other system networking information to people outside your company. Be careful of files e-mailed to you from strangers. One common way of getting BackOrifice on a system is to include it as a Trojan horse with other files.
- Change your passwords regularly. Also, use passwords that are not easy to figure out. The most difficult passwords to crack are those with upper and lower case letters, numbers and a symbol such as% or #.
- Upgrade your software regularly. Many older versions of software, especially web browsers, have well known security deficiencies. When you upgrade to the latest versions, you get the latest patches and fixes.
- If you use "chat rooms" or IRC sessions, be careful with any information you reveal to strangers.
- If your system starts exhibiting odd behavior, contact your ISP. Some hackers will set off hacks that cause your system to slowly become unstable or unusable.
- Always shred confidential information, particularly about your computer, before throwing it away. Some hackers dig through the trash of companies or individuals for information that might help them in an attack.

8.7 Packet Filtering vs. Firewall

Below are some comparisons between the ZyXEL Device's filtering and firewall functions.

8.7.1 Packet Filtering

- The router filters packets as they pass through the router's interface according to the filter rules you designed.
- Packet filtering is a powerful tool, yet can be complex to configure and maintain, especially if you need a chain of rules to filter a service.
- Packet filtering only checks the header portion of an IP packet.

8.7.1.1 When To Use Filtering

- To block/allow LAN packets by their MAC addresses.
- To block/allow special IP packets which are neither TCP nor UDP, nor ICMP packets.
- To block/allow both inbound (WAN to LAN) and outbound (LAN to WAN) traffic between the specific inside host/network "A" and outside host/network "B". If the filter blocks the traffic from A to B, it also blocks the traffic from B to A. Filters can not distinguish traffic originating from an inside host or an outside host by IP address.
- To block/allow IP trace route.

8.7.2 Firewall

- The firewall inspects packet contents as well as their source and destination addresses. Firewalls of this type employ an inspection module, applicable to all protocols, that understands data in the packet is intended for other layers, from the network layer (IP headers) up to the application layer.
- The firewall performs stateful inspection. It takes into account the state of connections it handles so that, for example, a legitimate incoming packet can be matched with the outbound request for that packet and allowed in. Conversely, an incoming packet masquerading as a response to a nonexistent outbound request can be blocked.
- The firewall uses session filtering, i.e., smart rules, that enhance the filtering process and control the network session rather than control individual packets in a session.
- The firewall provides e-mail service to notify you of routine reports and when alerts occur.

8.7.2.1 When To Use The Firewall

- To prevent DoS attacks and prevent hackers cracking your network.
- A range of source and destination IP addresses as well as port numbers can be specified within one firewall rule making the firewall a better choice when complex rules are required.
- To selectively block/allow inbound or outbound traffic between inside host/networks and outside host/networks. Remember that filters can not distinguish traffic originating from an inside host or an outside host by IP address.
- The firewall performs better than filtering if you need to check many rules.
- Use the firewall if you need routine e-mail reports about your system or need to be alerted when attacks occur.
- The firewall can block specific URL traffic that might occur in the future. The URL can be saved in an Access Control List (ACL) database.

CHAPTER 9
Firewall Configuration

This chapter shows you how to enable and configure the ZyXEL Device firewall.

9.1 Access Methods

The web configurator is, by far, the most comprehensive firewall configuration tool your ZyXEL Device has to offer. For this reason, it is recommended that you configure your firewall using the web configurator. CLI (Command Line Interpreter) commands provide limited configuration options and are only recommended for advanced users.

9.2 Firewall Policies Overview

Firewall rules are grouped based on the direction of travel of packets to which they apply:

- LAN to LAN/ Router
- LAN to WAN
- WAN to LAN
- WAN to WAN/ Router

By default, the ZyXEL Device's stateful packet inspection allows packets traveling in the following directions:

- LAN to LAN/ Router

  This allows computers on the LAN to manage the ZyXEL Device and communicate between networks or subnets connected to the LAN interface.

- LAN to WAN

By default, the ZyXEL Device's stateful packet inspection drops packets traveling in the following directions:

- WAN to LAN
- WAN to WAN/ Router

  This prevents computers on the WAN from using the ZyXEL Device as a gateway to communicate with other computers on the WAN and/or managing the ZyXEL Device.

  You may define additional rules and sets or modify existing ones but please exercise extreme caution in doing so.

Note: If you configure firewall rules without a good understanding of how they work, you might inadvertently introduce security risks to the firewall and to the protected network. Make sure you test your rules after you configure them.

For example, you may create rules to:

- Block certain types of traffic, such as IRC (Internet Relay Chat), from the LAN to the Internet.
- Allow certain types of traffic, such as Lotus Notes database synchronization, from specific hosts on the Internet to specific hosts on the LAN.
- Allow everyone except your competitors to access a Web server.
- Restrict use of certain protocols, such as Telnet, to authorized users on the LAN.

These custom rules work by comparing the Source IP address, Destination IP address and IP protocol type of network traffic to rules set by the administrator. Your customized rules take precedence and override the ZyXEL Device’s default rules.

9.3 Rule Logic Overview

Note: Study these points carefully before configuring rules.

9.3.1 Rule Checklist

State the intent of the rule. For example, “This restricts all IRC access from the LAN to the Internet.” Or, “This allows a remote Lotus Notes server to synchronize over the Internet to an inside Notes server.”

1. Is the intent of the rule to forward or block traffic?
2. What direction of traffic does the rule apply to?
3. What IP services will be affected?
4. What computers on the LAN are to be affected (if any)?
5. What computers on the Internet will be affected? The more specific, the better. For example, if traffic is being allowed from the Internet to the LAN, it is better to allow only certain machines on the Internet to access the LAN.

9.3.2 Security Ramifications

1. Once the logic of the rule has been defined, it is critical to consider the security ramifications created by the rule:
2. Does this rule stop LAN users from accessing critical resources on the Internet? For example, if IRC is blocked, are there users that require this service?
3. Is it possible to modify the rule to be more specific? For example, if IRC is blocked for all users, will a rule that blocks just certain users be more effective?

4 Does a rule that allows Internet users access to resources on the LAN create a security vulnerability? For example, if FTP ports (TCP 20, 21) are allowed from the Internet to the LAN, Internet users may be able to connect to computers with running FTP servers.

5 Does this rule conflict with any existing rules?

6 Once these questions have been answered, adding rules is simply a matter of plugging the information into the correct fields in the web configurator screens.

9.3.3 Key Fields For Configuring Rules

9.3.3.1 Action

Should the action be to **Drop**, **Reject** or **Permit**?

Note: "Drop" means the firewall silently discards the packet. "Reject" means the firewall discards packets and sends an ICMP destination-unreachable message to the sender.

9.3.3.2 Service

Select the service from the **Service** scrolling list box. If the service is not listed, it is necessary to first define it. See Appendix E on page 389 for more information on predefined services.

9.3.3.3 Source Address

What is the connection's source address; is it on the LAN or WAN? Is it a single IP, a range of IPs or a subnet?

9.3.3.4 Destination Address

What is the connection's destination address; is it on the LAN or WAN? Is it a single IP, a range of IPs or a subnet?

9.4 Connection Direction

This section describes examples for firewall rules for connections going from LAN to WAN and from WAN to LAN.

LAN to LAN/ Router and WAN to WAN/ Router rules apply to packets coming in on the associated interface (LAN or WAN, respectively). LAN to LAN/ Router means policies for LAN-to-ZyXEL Device (the policies for managing the ZyXEL Device through the LAN interface) and policies for LAN-to-LAN (the policies that control routing between two subnets on the LAN). Similarly, WAN to WAN/ Router polices apply in the same way to the WAN port.

9.4.1 LAN to WAN Rules

The default rule for LAN to WAN traffic is that all users on the LAN are allowed non-restricted access to the WAN. When you configure a LAN to WAN rule, you in essence want to limit some or all users from accessing certain services on the WAN. WAN to LAN Rules

The default rule for WAN to LAN traffic blocks all incoming connections (WAN to LAN). If you wish to allow certain WAN users to have access to your LAN, you will need to create custom rules to allow it.

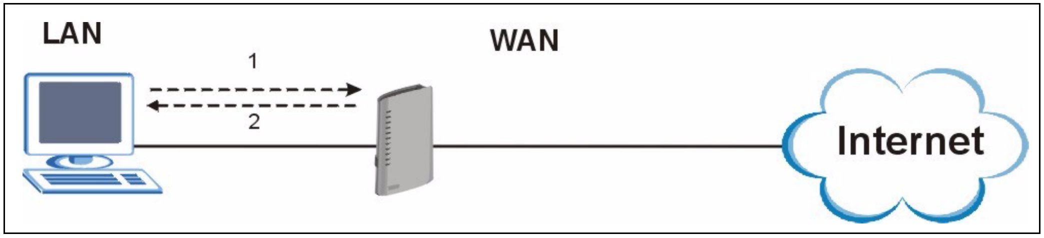
9.4.2 Alerts

Alerts are reports on events, such as attacks, that you may want to know about right away. You can choose to generate an alert when a rule is matched in the **Edit Rule** screen (see Figure 58 on page 139). When an event generates an alert, a message can be immediately sent to an e-mail account that you specify in the **Log Settings** screen. Refer to the chapter on logs for details.

9.5 Triangle Route

When the firewall is on, your ZyXEL Device acts as a secure gateway between your LAN and the Internet. In an ideal network topology, all incoming and outgoing network traffic passes through the ZyXEL Device to protect your LAN against attacks.

Figure 53 Ideal Firewall Setup



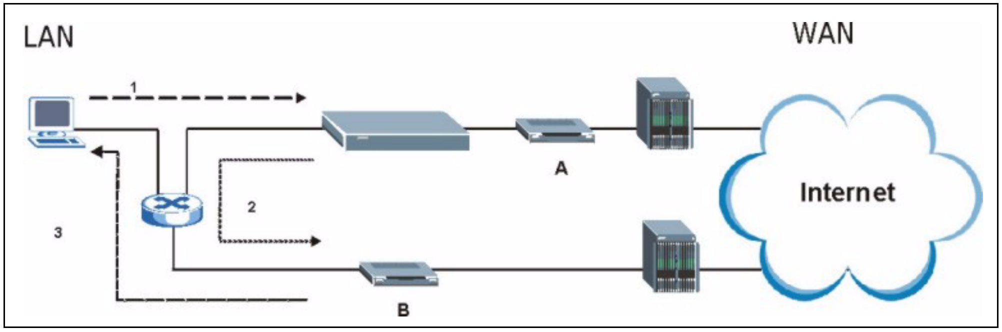
9.5.1 The "Triangle Route" Problem

You may have more than one connection to the Internet (through one or more ISPs). If the alternate gateway is on the LAN (and its IP address is in the same subnet as the ZyXEL Device's LAN IP address), the "triangle route" (also called asymmetrical route) problem may occur. The steps below describe the "triangle route" problem.

1. A computer on the LAN initiates a connection by sending out a SYN packet to a receiving server on the WAN.
2. The ZyXEL Device reroutes the SYN packet through Gateway **A** on the LAN to the WAN.
3. The reply from the WAN goes directly to the computer on the LAN without going through the ZyXEL Device.

As a result, the ZyXEL Device resets the connection, as the connection has not been acknowledged.

Figure 54 "Triangle Route" Problem



9.5.2 Solving the "Triangle Route" Problem

You can have the ZyXEL Device allow triangle route sessions. However this can allow traffic from the WAN to go directly to a LAN computer without passing through the ZyXEL Device and its firewall protection.

Another way to solve the triangle route problem is to use IP alias. IP alias allows you to partition your network into logical sections over the same Ethernet interface. Your ZyXEL Device supports up to three logical LAN interfaces with the ZyXEL Device being the gateway for each logical network. By putting your LAN and Gateway **A** in different subnets, all returning network traffic must pass through the ZyXEL Device to your LAN. The following steps describe such a scenario.

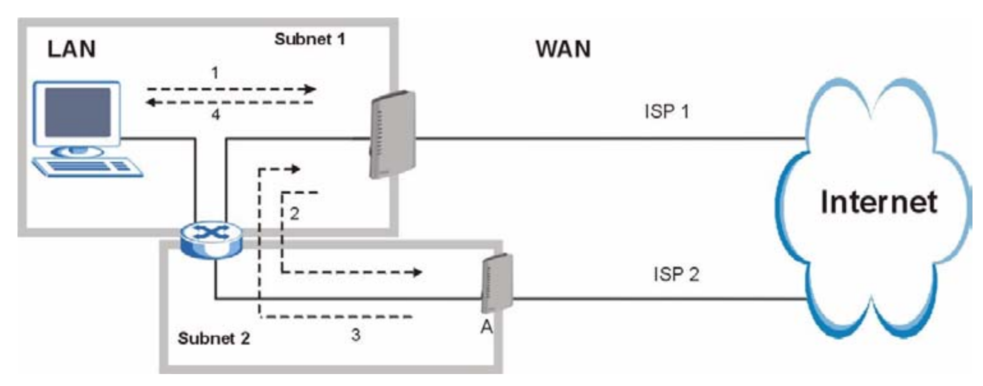
1 A computer on the LAN initiates a connection by sending a SYN packet to a receiving server on the WAN.

2 The ZyXEL Device reroutes the packet to Gateway A, which is in Subnet 2.

3 The reply from the WAN goes to the ZyXEL Device.

4 The ZyXEL Device then sends it to the computer on the LAN in Subnet 1.

Figure 55 IP Alias

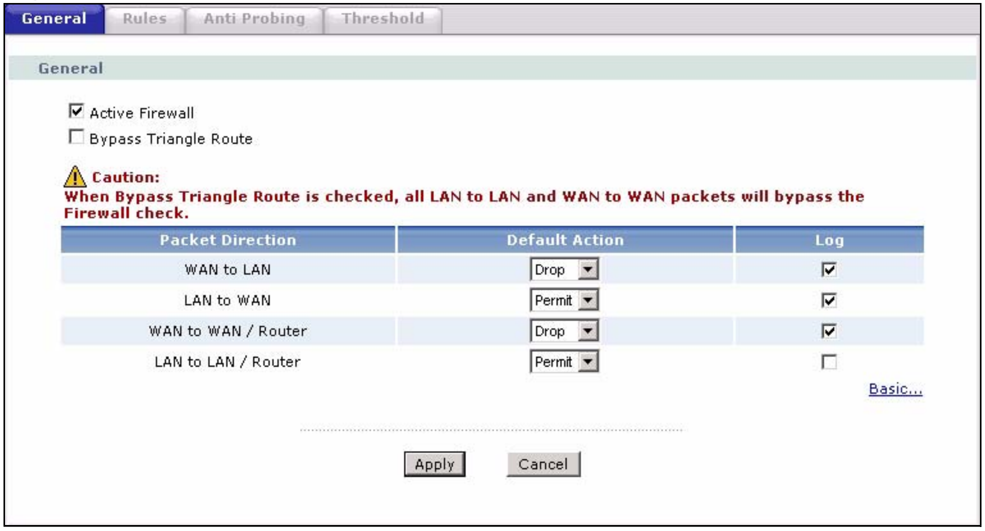


9.6 General Firewall Policy

Click **Security** > **Firewall** to display the following screen. Activate the firewall by selecting the **Active Firewall** check box as seen in the following screen.

Refer to Section 8.1 on page 119 for more information.

Figure 56 Firewall > General



General

☑ Active Firewall
□ Bypass Triangle Route

⚠ **Caution:**
When Bypass Triangle Route is checked, all LAN to LAN and WAN to WAN packets will bypass the Firewall check.

Packet Direction	Default Action	Log
WAN to LAN	Drop	☑
LAN to WAN	Permit	☑
WAN to WAN / Router	Drop	☑
LAN to LAN / Router	Permit	□

The following table describes the labels in this screen.

Table 38 Firewall > General

LABEL	DESCRIPTION
Active Firewall	Select this check box to activate the firewall. The ZyXEL Device performs access control and protects against Denial of Service (DoS) attacks when the firewall is activated.
Bypass Triangle Route	Select this check box to have the ZyXEL Device firewall permit the use of triangle route topology on the network. See the appendix for more on triangle route topology. **Note:** Allowing asymmetrical routes may let traffic from the WAN go directly to a LAN computer without passing through the router. See Appendix M on page 366 for more on triangle route topology and how to deal with this problem.
Packet Direction	This is the direction of travel of packets (**LAN to LAN / Router**, **LAN to WAN**, **WAN to WAN / Router**, **and WAN to LAN**). Firewall rules are grouped based on the direction of travel of packets to which they apply. For example, **LAN to LAN / Router** means packets traveling from a computer/subnet on the LAN to either another computer/subnet on the LAN interface of the ZyXEL Device or the ZyXEL Device itself.

Table 38 Firewall > General (continued)

LABEL	DESCRIPTION
Default Action	Use the drop-down list boxes to select the default action that the firewall is take on packets that are traveling in the selected direction and do not match any of the firewall rules. Select **Drop** to silently discard the packets without sending a TCP reset packet or an ICMP destination-unreachable message to the sender. Select **Reject** to deny the packets and send a TCP reset packet (for a TCP packet) or an ICMP destination-unreachable message (for a UDP packet) to the sender. Select **Permit** to allow the passage of the packets.
Log	Select the check box to create a log (when the above action is taken) for packets that are traveling in the selected direction and do not match any of your customized rules.
Expand...	Click this button to display more information.
Basic...	Click this button to display less information.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

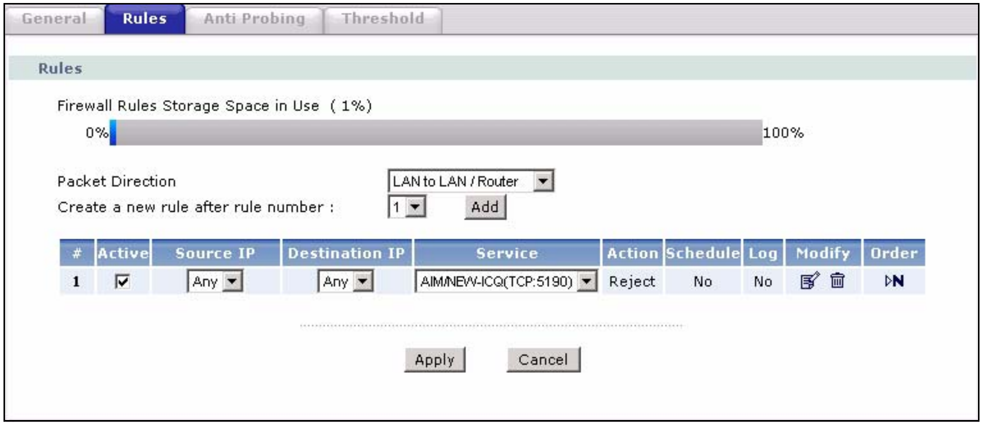
9.7 Firewall Rules Summary

Note: The ordering of your rules is very important as rules are applied in turn.

Refer to Section 8.1 on page 119 for more information.

Click **Security** > **Firewall** > **Rules** to bring up the following screen. This screen displays a list of the configured firewall rules. Note the order in which the rules are listed.

Figure 57 Firewall > Rules



Firewall Rules Storage Space in Use (1%)

Packet Direction: LAN to LAN / Router

Create a new rule after rule number : 1

#	Active	Source IP	Destination IP	Service	Action	Schedule	Log	Modify	Order
1	☑	Any	Any	AIM/NEW-ICQ(TCP:5190)	Reject	No	No		

The following table describes the labels in this screen.

Table 39 Firewall > Rules

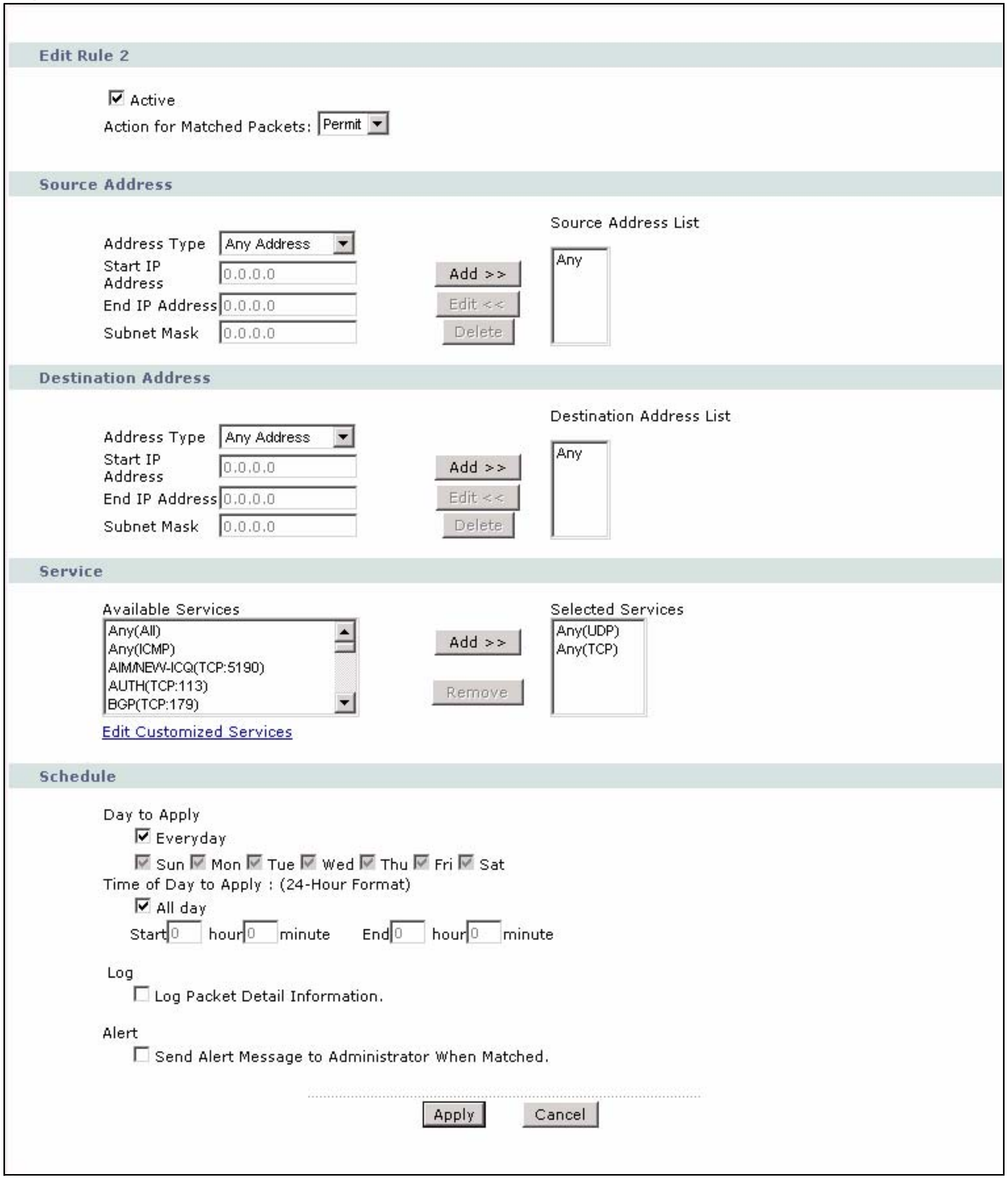
LABEL	DESCRIPTION
Firewall Rules Storage Space in Use	This read-only bar shows how much of the ZyXEL Device's memory for recording firewall rules it is currently using. When you are using 80% or less of the storage space, the bar is green. When the amount of space used is over 80%, the bar is red.
Packet Direction	Use the drop-down list box to select a direction of travel of packets for which you want to configure firewall rules.
Create a new rule after rule number	Select an index number and click **Add** to add a new firewall rule after the selected index number. For example, if you select "6", your new rule becomes number 7 and the previous rule 7 (if there is one) becomes rule 8.
	The following read-only fields summarize the rules you have created that apply to traffic traveling in the selected packet direction. The firewall rules that you configure (summarized below) take priority over the default actions in the **General** screen.
#	This is your firewall rule number. The ordering of your rules is important as rules are applied in turn.
Active	This field displays whether a firewall is turned on or not. Select the check box to enable the rule. Clear the check box to disable the rule.
Source IP	This drop-down list box displays the source addresses or ranges of addresses to which this firewall rule applies. Please note that a blank source or destination address is equivalent to **Any**.
Destination IP	This drop-down list box displays the destination addresses or ranges of addresses to which this firewall rule applies. Please note that a blank source or destination address is equivalent to **Any**.
Service	This drop-down list box displays the services to which this firewall rule applies. See Appendix E on page 389 for more information.
Action	This field displays whether the firewall silently discards packets (**Drop**), discards packets and sends a TCP reset packet or an ICMP destination-unreachable message to the sender (**Reject**) or allows the passage of packets (**Permit**).
Schedule	This field tells you whether a schedule is specified (**Yes**) or not (**No**).
Log	This field shows you whether a log is created when packets match this rule (**Yes**) or not (**No**).
Modify	Click the Edit icon to go to the screen where you can edit the rule. Click the Remove icon to delete an existing firewall rule. A window displays asking you to confirm that you want to delete the firewall rule. Note that subsequent firewall rules move up by one when you take this action.
Order	Click the Move icon to display the **Move the rule to** field. Type a number in the **Move the rule to** field and click the **Move** button to move the rule to the number that you typed. The ordering of your rules is important as they are applied in order of their numbering.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

9.7.1 Configuring Firewall Rules

Refer to Section 8.1 on page 119 for more information.

Use this screen to create or edit a firewall rule. In the **Rules** screen, select an index number and click **Add** or click a rule's Edit icon to display this screen and refer to the following table for information on the labels.

Figure 58 Firewall > Rules > Add/Edit



Edit Rule 2

☑ Active

Action for Matched Packets: Permit

Source Address

Address Type: Any Address

Start IP Address: 0.0.0.0

End IP Address: 0.0.0.0

Subnet Mask: 0.0.0.0

Source Address List: Any

Destination Address

Address Type: Any Address

Start IP Address: 0.0.0.0

End IP Address: 0.0.0.0

Subnet Mask: 0.0.0.0

Destination Address List: Any

Service

Available Services: Any(All), Any(ICMP), AIM/NEW-ICQ(TCP:5190), AUTH(TCP:113), BGP(TCP:179)

Selected Services: Any(UDP), Any(TCP)

Schedule

Day to Apply

☑ Everyday

☑ Sun ☑ Mon ☑ Tue ☑ Wed ☑ Thu ☑ Fri ☑ Sat

Time of Day to Apply : (24-Hour Format)

☑ All day

Start 0 hour 0 minute End 0 hour 0 minute

Log

□ Log Packet Detail Information.

Alert

□ Send Alert Message to Administrator When Matched.

The following table describes the labels in this screen.

Table 40 Firewall > Rules > Add/Edit

LABEL	DESCRIPTION
Edit Rule #	
Active	Select this option to enable this firewall rule.

Table 40 Firewall > Rules > Add/Edit (continued)

LABEL	DESCRIPTION
Action for Matched Packet	Use the drop-down list box to select what the firewall is to do with packets that match this rule. Select **Drop** to silently discard the packets without sending a TCP reset packet or an ICMP destination-unreachable message to the sender. Select **Reject** to deny the packets and send a TCP reset packet (for a TCP packet) or an ICMP destination-unreachable message (for a UDP packet) to the sender. Select **Permit** to allow the passage of the packets.
Source/Destination Address	
Address Type	Do you want your rule to apply to packets with a particular (single) IP, a range of IP addresses (e.g., 192.168.1.10 to 192.169.1.50), a subnet or any IP address? Select an option from the drop-down list box that includes: **Single Address**, **Range Address**, **Subnet Address** and **Any Address**.
Start IP Address	This is enabled if the **Address Type** is not **Any Address**. Enter the single IP address or the starting IP address in a range here.
End IP Address	This is enabled if the **Address Type** is **Range Address**. Enter the ending IP address in a range here.
Subnet Mask	This is enabled if the **Address Type** is **Subnet Address**. Enter the subnet mask here, if applicable.
Add >>	Click **Add >>** to add a new address to the **Source** or **Destination Address** box. You can add multiple addresses, ranges of addresses, and/or subnets.
Edit <<	To edit an existing source or destination address, select it from the box and click **Edit <<**.
Delete	Highlight an existing source or destination address from the **Source** or **Destination Address** box above and click **Delete** to remove it.
Services	
Available/ Selected Services	Please see Appendix E on page 389 for more information on services available. Highlight a service from the **Available Services** box on the left, then click **Add >>** to add it to the **Selected Services** box on the right. To remove a service, highlight it in the **Selected Services** box on the right, then click **Remove**.
Edit Customized Services	Click the **Edit Customized Services** link to bring up the screen that you use to configure a new custom service that is not in the predefined list of services.
Schedule	
Day to Apply	Select everyday or the day(s) of the week to apply the rule.
Time of Day to Apply (24-Hour Format)	Select **All Day** or enter the start and end times in the hour-minute format to apply the rule.
Log	
Log Packet Detail Information .	This field determines if a log for packets that match the rule is created or not. Go to the **Log Settings** page and select the **Access Control** logs category to have the ZyXEL Device record these logs.
Alert	
Send Alert Message to Administrator When Matched.	Select the check box to have the ZyXEL Device generate an alert when the rule is matched.

Table 40 Firewall > Rules > Add/Edit (continued)

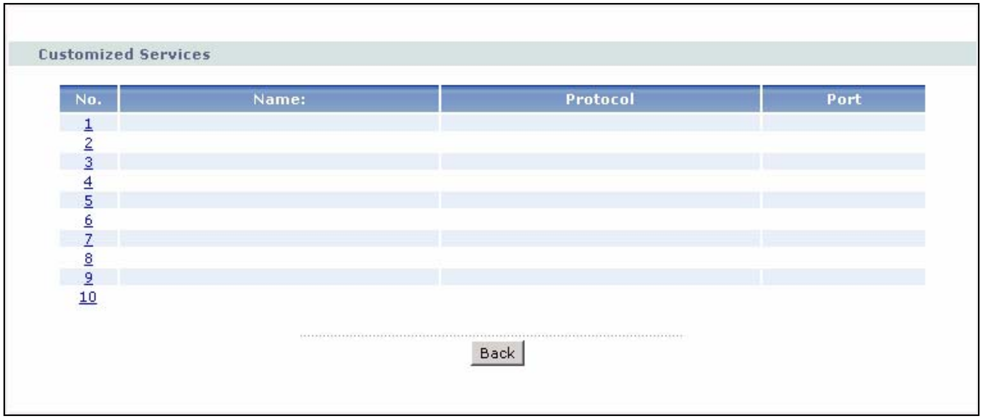
LABEL	DESCRIPTION
Apply	Click **Apply** to save your customized settings and exit this screen.
Cancel	Click **Cancel** to exit this screen without saving.

9.7.2 Customized Services

Configure customized services and port numbers not predefined by the ZyXEL Device. For a comprehensive list of port numbers and services, visit the IANA (Internet Assigned Number Authority) web site. For further information on these services, please read Appendix E on page 389. Click the **Edit Customized Services** link while editing a firewall rule to configure a custom service port. This displays the following screen.

Refer to Section 8.1 on page 119 for more information.

Figure 59 Firewall > Rules > Add/Edit > Edit Customized Services



Customized Services

No.	Name:	Protocol	Port
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

The following table describes the labels in this screen.

Table 41 Firewall > Rules > Add/Edit > Edit Customized Services

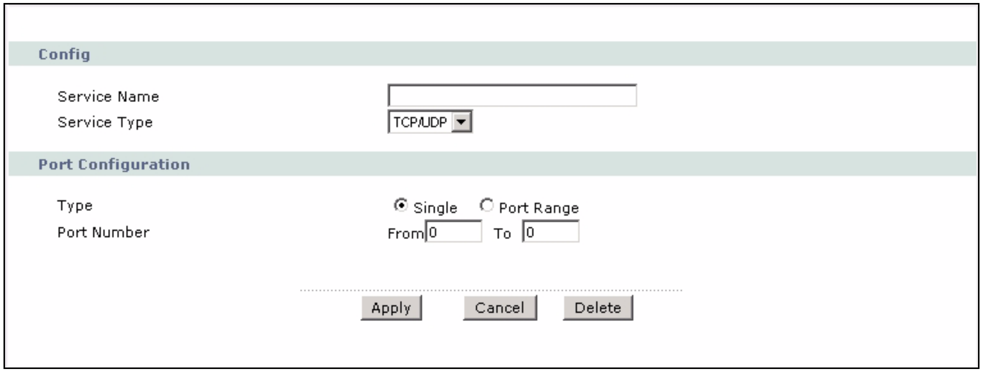
LABEL	DESCRIPTION
No.	This is the number of your customized port. Click a rule’s number of a service to go to the **Firewall Customized Services Config** screen to configure or edit a customized service. See Section 9.7.3 on page 141 for more information.
Name	This is the name of your customized service.
Protocol	This shows the IP protocol (**TCP**, **UDP** or **TCP/UDP**) that defines your customized service.
Port	This is the port number or range that defines your customized service.
Back	Click **Back** to return the **Firewall Edit Rule** screen.

9.7.3 Configuring A Customized Service

Use this screen to create a new custom port or edit an existing one. Click a rule number in the **Firewall Customized Services** screen. This action displays the following screen.

Refer to Section 8.1 on page 119 for more information.

Figure 60 Firewall > Rules > Add/Edit > Edit Customized Services > Edit



Config

Service Name

Service Type: TCP/UDP

Port Configuration

Type: ● Single ○ Port Range

Port Number: From 0 To 0

The following table describes the labels in this screen.

Table 42 Firewall > Rules > Add/Edit > Edit Customized Services > Edit

LABEL	DESCRIPTION
Config	
Service Name	Type a unique name for your custom port.
Service Type	Choose the IP port (**TCP**, **UDP** or **TCP/UDP**) that defines your customized port from the drop down list box.
Port Configuration	
Type	Click **Single** to specify one port only or **Port Range** to specify a span of ports that define your customized service.
Port Number	Type a single port number or the range of port numbers that define your customized service.
Apply	Click **Apply** to save your customized settings and exit this screen.
Cancel	Click **Cancel** to return to the previous screen.
Delete	Click **Delete** to delete the current rule and return to the previous screen.

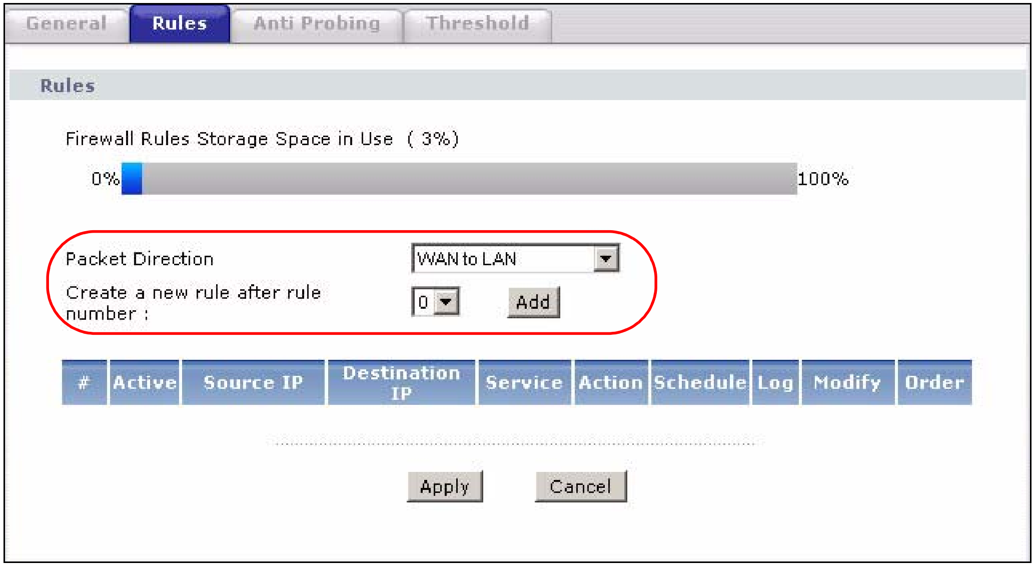
9.8 Example Firewall Rule

The following Internet firewall rule example allows a hypothetical "MyService" connection from the Internet.

1 Click **Security** > **Firewall** > **Rules**.

2 Select **WAN to LAN** in the **Packet Direction** field.

Figure 61 Firewall Example: Rules



Firewall Rules Storage Space in Use (3%)

Packet Direction: WAN to LAN

Create a new rule after rule number : 0

#	Active	Source IP	Destination IP	Service	Action	Schedule	Log	Modify	Order

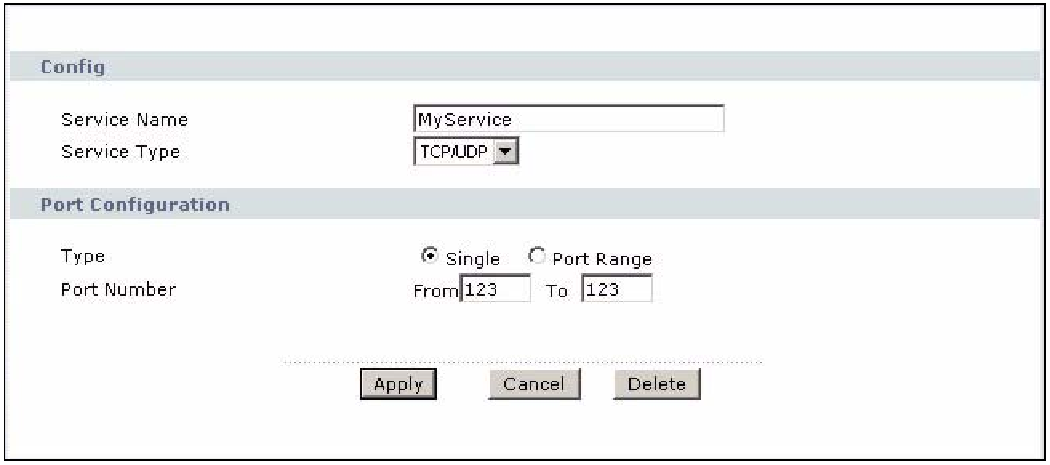
3 In the **Rules** screen, select the index number after that you want to add the rule. For example, if you select “6”, your new rule becomes number 7 and the previous rule 7 (if there is one) becomes rule 8.

4 Click **Add** to display the firewall rule configuration screen.

5 In the **Edit Rule** screen, click the **Edit Customized Services** link to open the **Customized Service** screen.

6 Click an index number to display the **Customized Services Config** screen and configure the screen as follows and click **Apply**.

Figure 62 Edit Custom Port Example



Service Name: MyService

Service Type: TCP/UDP

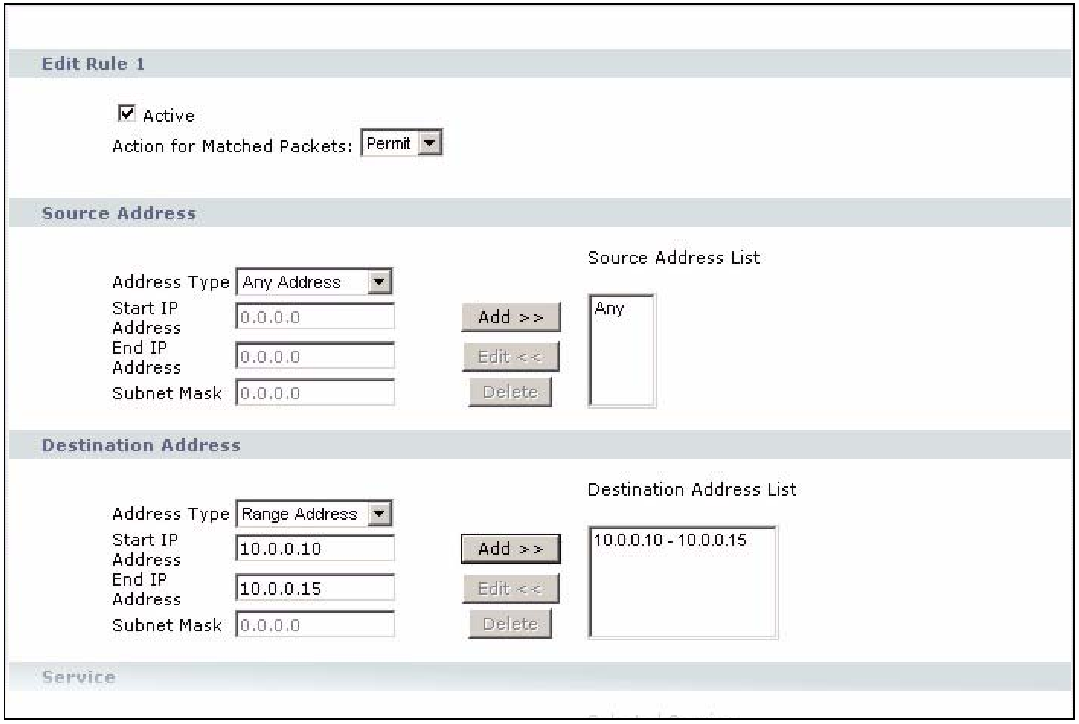
Type: ● Single ○ Port Range

Port Number: From 123 To 123

7 Select **Any** in the **Destination Address** box and then click **Delete**.

8 Configure the destination address screen as follows and click **Add**.

Figure 63 Firewall Example: Edit Rule: Destination Address



Edit Rule 1

☑ Active

Action for Matched Packets: Permit

Source Address

Address Type Any Address

Start IP Address 0.0.0.0

End IP Address 0.0.0.0

Subnet Mask 0.0.0.0

Source Address List

Any

Destination Address

Address Type Range Address

Start IP Address 10.0.0.10

End IP Address 10.0.0.15

Subnet Mask 0.0.0.0

Destination Address List

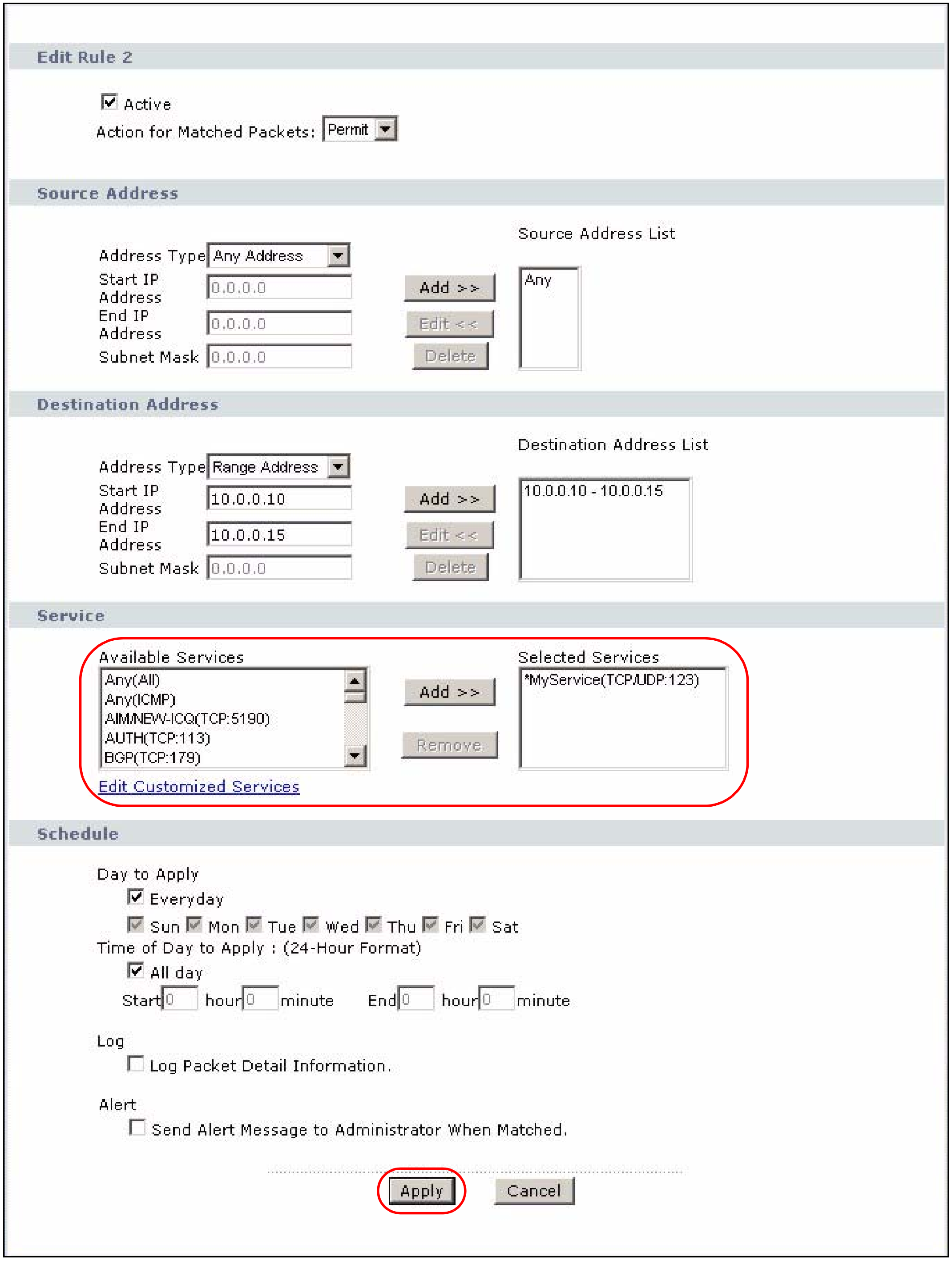
10.0.0.10 - 10.0.0.15

Service

9 Use the **Add** >> and **Remove** buttons between **Available Services** and **Selected Services** list boxes to configure it as follows. Click **Apply** when you are done.

Note: Custom services show up with an "*" before their names in the **Services** list box and the **Rules** list box.

Figure 64 Firewall Example: Edit Rule: Select Customized Services



Edit Rule 2

☑ Active

Action for Matched Packets: Permit

Source Address

Address Type: Any Address

Start IP Address: 0.0.0.0

End IP Address: 0.0.0.0

Subnet Mask: 0.0.0.0

Source Address List: Any

Destination Address

Address Type: Range Address

Start IP Address: 10.0.0.10

End IP Address: 10.0.0.15

Subnet Mask: 0.0.0.0

Destination Address List: 10.0.0.10 - 10.0.0.15

Service

Available Services:
Any(All)
Any(ICMP)
AIM/NEW-ICQ(TCP:5190)
AUTH(TCP:113)
BGP(TCP:179)

Edit Customized Services

Selected Services: *MyService(TCP/UDP:123)

Schedule

Day to Apply

☑ Everyday

☑ Sun ☑ Mon ☑ Tue ☑ Wed ☑ Thu ☑ Fri ☑ Sat

Time of Day to Apply : (24-Hour Format)

☑ All day

Start 0 hour 0 minute End 0 hour 0 minute

Log

☐ Log Packet Detail Information.

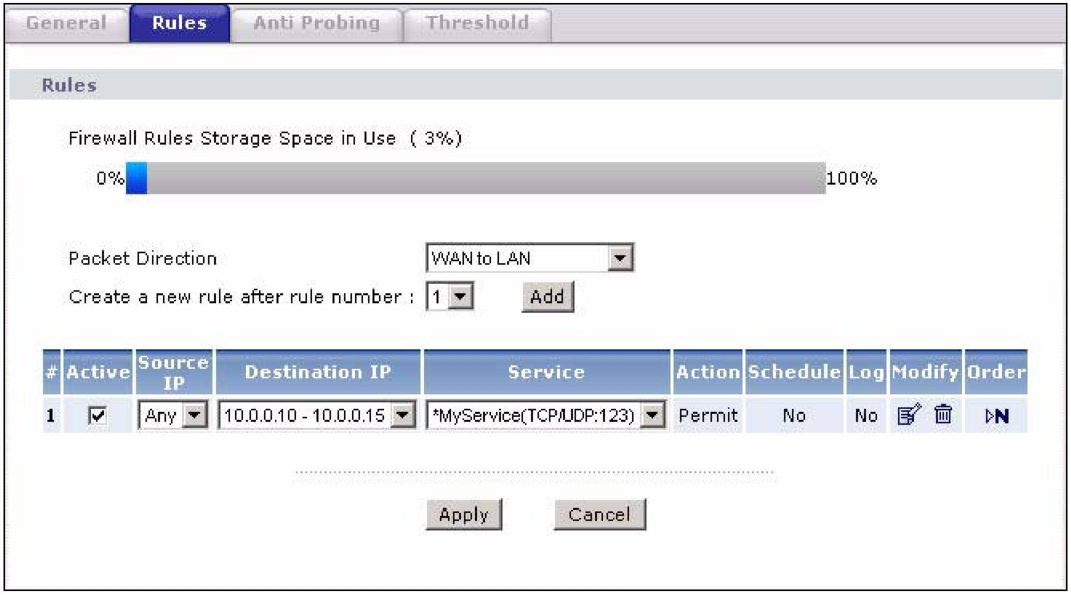
Alert

☐ Send Alert Message to Administrator When Matched.

On completing the configuration procedure for this Internet firewall rule, the **Rules** screen should look like the following.

Rule 1 allows a "MyService" connection from the WAN to IP addresses 10.0.0.10 through 10.0.0.15 on the LAN.

Figure 65 Firewall Example: Rules: MyService



Rules

Firewall Rules Storage Space in Use (3%)

0% 100%

Packet Direction: WAN to LAN

Create a new rule after rule number : 1

#	Active	Source IP	Destination IP	Service	Action	Schedule	Log	Modify	Order
1	☑	Any	10.0.0.10 - 10.0.0.15	*MyService(TCP/UDP:123)	Permit	No	No		

9.9 Anti-Probing

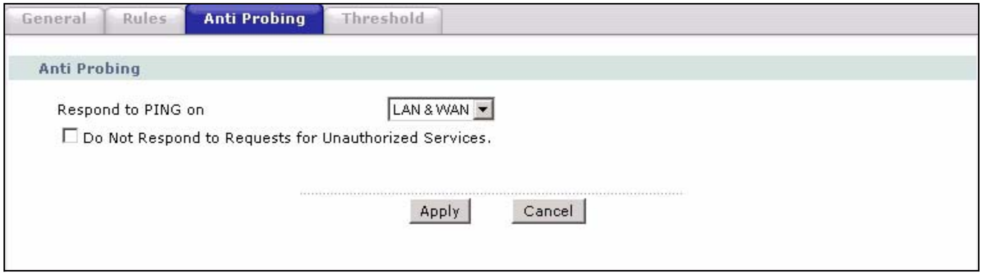
If an outside user attempts to probe an unsupported port on your ZyXEL Device, an ICMP response packet is automatically returned. This allows the outside user to know the ZyXEL Device exists. The ZyXEL Device supports anti-probing, which prevents the ICMP response packet from being sent. This keeps outsiders from discovering your ZyXEL Device when unsupported ports are probed.

Internet Control Message Protocol (ICMP) is a message control and error-reporting protocol between a host server and a gateway to the Internet. ICMP uses Internet Protocol (IP) datagrams, but the messages are processed by the TCP/IP software and directly apparent to the application user.

Refer to Section 8.1 on page 119 for more information.

Click **Security** > **Firewall** > **Anti Probing** to display the screen as shown.

Figure 66 Firewall > Anti Probing



Anti Probing

Respond to PING on: LAN & WAN

□ Do Not Respond to Requests for Unauthorized Services.

The following table describes the labels in this screen.

Table 43 Firewall > Anti Probing

LABEL	DESCRIPTION
Respond to PING on	The ZyXEL Device does not respond to any incoming Ping requests when **Disable** is selected. Select **LAN** to reply to incoming LAN Ping requests. Select **WAN** to reply to incoming WAN Ping requests. Otherwise select **LAN & WAN** to reply to both incoming LAN and WAN Ping requests.
Do Not Respond to Requests for Unauthorized Services.	Select this option to prevent hackers from finding the ZyXEL Device by probing for unused ports. If you select this option, the ZyXEL Device will not respond to port request(s) for unused ports, thus leaving the unused ports and the ZyXEL Device unseen. By default this option is not selected and the ZyXEL Device will reply with an ICMP Port Unreachable packet for a port probe on its unused UDP ports, and a TCP Reset packet for a port probe on its unused TCP ports. Note that the probing packets must first traverse the ZyXEL Device's firewall mechanism before reaching this anti-probing mechanism. Therefore if the firewall mechanism blocks a probing packet, the ZyXEL Device reacts based on the corresponding firewall policy to send a TCP reset packet for a blocked TCP packet or an ICMP port-unreachable packet for a blocked UDP packets or just drop the packets without sending a response packet.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

9.10 DoS Thresholds

For DoS attacks, the ZyXEL Device uses thresholds to determine when to drop sessions that do not become fully established. These thresholds apply globally to all sessions.

You can use the default threshold values, or you can change them to values more suitable to your security requirements.

Refer to Section 9.10.3 on page 149 to configure thresholds.

9.10.1 Threshold Values

Tune these parameters when something is not working and after you have checked the firewall counters. These default values should work fine for most small offices. Factors influencing choices for threshold values are:

- The maximum number of opened sessions.
- The minimum capacity of server backlog in your LAN network.
- The CPU power of servers in your LAN network.
- Network bandwidth.
- Type of traffic for certain servers.

If your network is slower than average for any of these factors (especially if you have servers that are slow or handle many tasks and are often busy), then the default values should be reduced.

You should make any changes to the threshold values before you continue configuring firewall rules.

9.10.2 Half-Open Sessions

An unusually high number of half-open sessions (either an absolute number or measured as the arrival rate) could indicate that a Denial of Service attack is occurring. For TCP, "half-open" means that the session has not reached the established state-the TCP three-way handshake has not yet been completed (see Figure 49 on page 122). For UDP, "half-open" means that the firewall has detected no return traffic.

The ZyXEL Device measures both the total number of existing half-open sessions and the rate of session establishment attempts. Both TCP and UDP half-open sessions are counted in the total number and rate measurements. Measurements are made once a minute.

When the number of existing half-open sessions rises above a threshold (**max-incomplete high**), the ZyXEL Device starts deleting half-open sessions as required to accommodate new connection requests. The ZyXEL Device continues to delete half-open requests as necessary, until the number of existing half-open sessions drops below another threshold (**max-incomplete low**).

When the rate of new connection attempts rises above a threshold (**one-minute high**), the ZyXEL Device starts deleting half-open sessions as required to accommodate new connection requests. The ZyXEL Device continues to delete half-open sessions as necessary, until the rate of new connection attempts drops below another threshold (**one-minute low**). The rate is the number of new attempts detected in the last one-minute sample period.

9.10.2.1 TCP Maximum Incomplete and Blocking Time

An unusually high number of half-open sessions with the same destination host address could indicate that a Denial of Service attack is being launched against the host.

Whenever the number of half-open sessions with the same destination host address rises above a threshold (**TCP Maximum Incomplete**), the ZyXEL Device starts deleting half-open sessions according to one of the following methods:

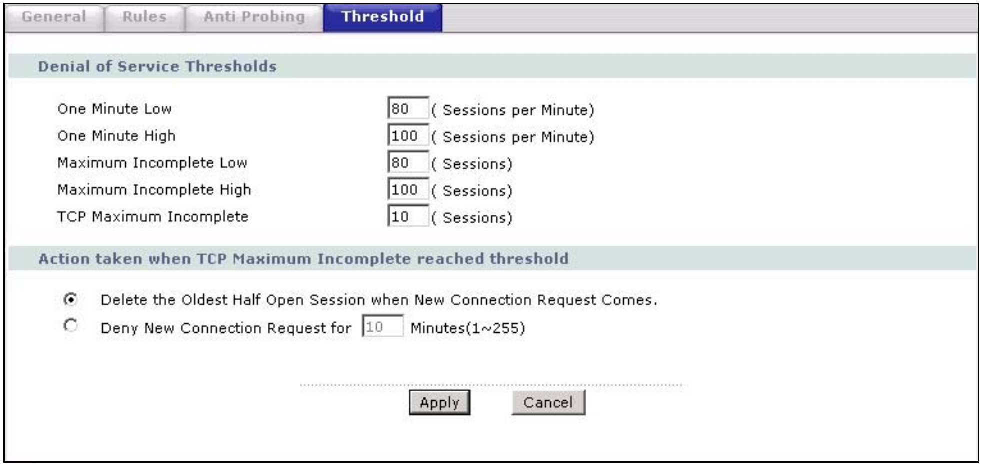
- If the **Blocking Time** timeout is 0 (the default), then the ZyXEL Device deletes the oldest existing half-open session for the host for every new connection request to the host. This ensures that the number of half-open sessions to a given host will never exceed the threshold.
- If the **Blocking Time** timeout is greater than 0, then the ZyXEL Device blocks all new connection requests to the host giving the server time to handle the present connections. The ZyXEL Device continues to block all new connection requests until the **Blocking Time** expires.

9.10.3 Configuring Firewall Thresholds

The ZyXEL Device also sends alerts whenever **TCP Maximum Incomplete** is exceeded. The global values specified for the threshold and timeout apply to all TCP connections.

Click **Firewall**, and **Threshold** to bring up the next screen.

Figure 67 Firewall > Threshold



Denial of Service Thresholds

One Minute Low: 80 (Sessions per Minute)
One Minute High: 100 (Sessions per Minute)
Maximum Incomplete Low: 80 (Sessions)
Maximum Incomplete High: 100 (Sessions)
TCP Maximum Incomplete: 10 (Sessions)

Action taken when TCP Maximum Incomplete reached threshold

● Delete the Oldest Half Open Session when New Connection Request Comes.
○ Deny New Connection Request for 10 Minutes(1~255)

The following table describes the labels in this screen.

Table 44 Firewall > Threshold

LABEL	DESCRIPTION
Denial of Service Thresholds	
One Minute Low	Type the rate of new half-open sessions that causes the firewall to stop deleting half-open sessions. The ZyXEL Device continues to delete half-open sessions as necessary, until the rate of new connection attempts drops below this number. See **One Minute High** for an example.
One Minute High	Type the rate of new half-open sessions that causes the firewall to start deleting half-open sessions. When the rate of new connection attempts rises above this number, the ZyXEL Device deletes half-open sessions as required to accommodate new connection attempts. For example, if **One Minute Low** is 80 and **One Minute High** is 100, the ZyXEL Device starts deleting half-open sessions when more than 100 session establishment attempts have been detected in the last minute and stops deleting half-open sessions when fewer than 80 session establishment attempts have been detected in the last minute.
Maximum Incomplete Low	Type the number of existing half-open sessions that causes the firewall to stop deleting half-open sessions. The ZyXEL Device continues to delete half-open requests as necessary, until the number of existing half-open sessions drops below this number. See **Maximum Incomplete High** for an example.

Table 44 Firewall > Threshold (continued)

LABEL	DESCRIPTION
Maximum Incomplete High	Type the number of existing half-open sessions that causes the firewall to start deleting half-open sessions. When the number of existing half-open sessions rises above this number, the ZyXEL Device deletes half-open sessions as required to accommodate new connection requests. Do not set **Maximum Incomplete High** to lower than the current **Maximum** I**ncomplete Low** number. For example, if **Maximum Incomplete Low** is 80 and **Maximum Incomplete High** is 100, the ZyXEL Device starts deleting half-open sessions when the number of existing half-open sessions rises above 100 and stops deleting half-open sessions with the number of existing half-open sessions drops below 80.
TCP Maximum Incomplete	Type the number of existing half-open TCP sessions with the same destination host IP address that causes the firewall to start dropping half-open sessions to that same destination host IP address. Enter a number between 1 and 256. As a general rule, you should choose a smaller number for a smaller network, a slower system or limited bandwidth.
Action taken when TCP Maximum Incomplete reached threshold	
Delete the Oldest Half Open Session when New Connection Request Comes.	Select this to clear the oldest half-open session when a new connection request comes.
Deny New Connection Request for	Select this, and specify for how long the ZyXEL Device should block new connection requests when **TCP Maximum Incomplete** is reached. Enter the length of blocking time in minutes (between 1 and 256).
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 10 Content Filtering

This chapter covers how to configure content filtering.

10.1 Content Filtering Overview

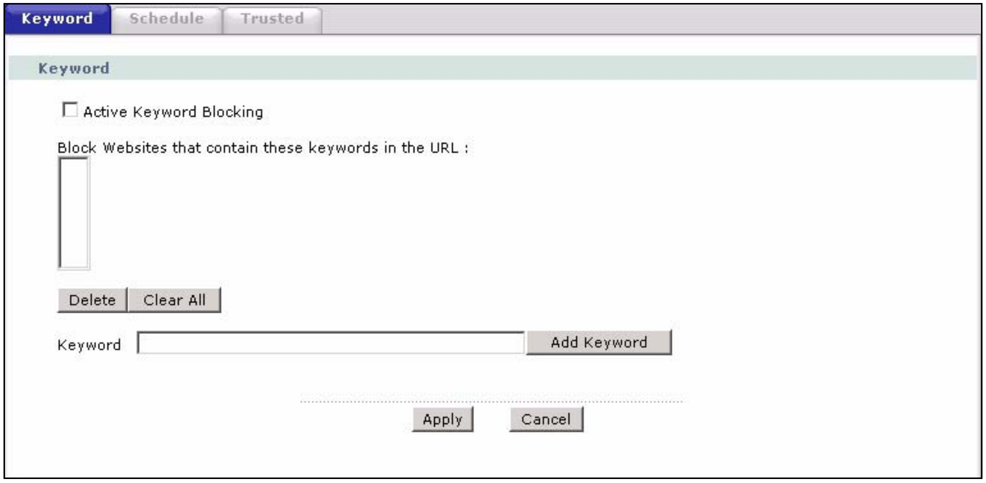
Internet content filtering allows you to create and enforce Internet access policies tailored to your needs. Content filtering gives you the ability to block web sites that contain key words (that you specify) in the URL. You can set a schedule for when the ZyXEL Device performs content filtering. You can also specify trusted IP addresses on the LAN for which the ZyXEL Device will not perform content filtering.

10.2 Configuring Keyword Blocking

Use this screen to block sites containing certain keywords in the URL. For example, if you enable the keyword "bad", the ZyXEL Device blocks all sites containing this keyword including the URL http://www.website.com/bad.html, even if it is not included in the Filter List.

To have your ZyXEL Device block Web sites containing keywords in their URLs, click **Security > Content Filter**. The screen appears as shown.

Figure 68 Content Filter > Keyword



□ Active Keyword Blocking

Block Websites that contain these keywords in the URL :

Keyword

The following table describes the labels in this screen.

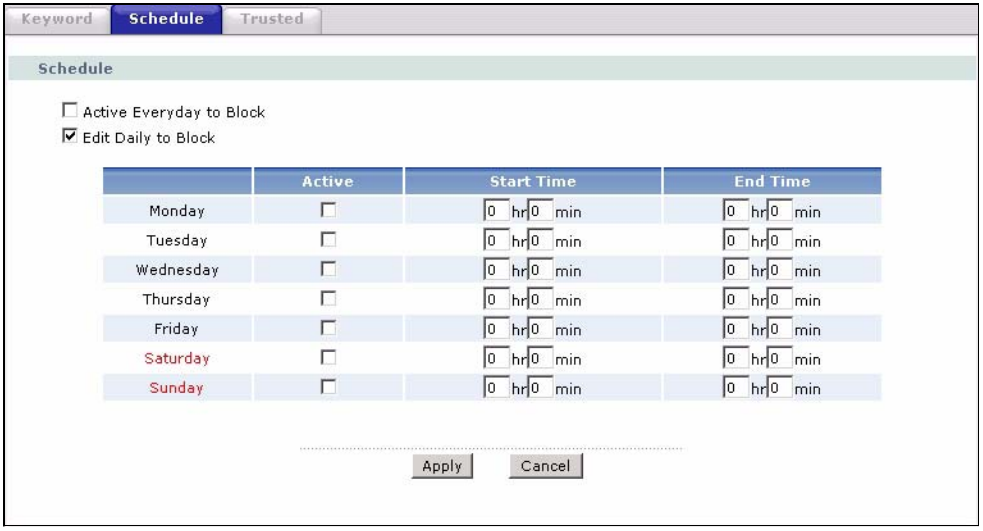
Table 45 Content Filter > Keyword

LABEL	DESCRIPTION
Active Keyword Blocking	Select this check box to enable this feature.
Block Websites that contain these keywords in the URL:	This box contains the list of all the keywords that you have configured the ZyXEL Device to block.
Delete	Highlight a keyword in the box and click **Delete** to remove it.
Clear All	Click **Clear All** to remove all of the keywords from the list.
Keyword	Type a keyword in this field. You may use any character (up to 127 characters). Wildcards are not allowed.
Add Keyword	Click **Add Keyword** after you have typed a keyword. Repeat this procedure to add other keywords. Up to 64 keywords are allowed. When you try to access a web page containing a keyword, you will get a message telling you that the content filter is blocking this request.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to return to the previously saved settings.

10.3 Configuring the Schedule

Use this screen to set the days and times for the ZyXEL Device to perform content filtering. Click **Security > Content Filter** > **Schedule**. The screen appears as shown.

Figure 69 Content Filter > Schedule



Schedule

□ Active Everyday to Block

☑ Edit Daily to Block

	Active	Start Time	End Time
Monday	□	0 hr 0 min	0 hr 0 min
Tuesday	□	0 hr 0 min	0 hr 0 min
Wednesday	□	0 hr 0 min	0 hr 0 min
Thursday	□	0 hr 0 min	0 hr 0 min
Friday	□	0 hr 0 min	0 hr 0 min
Saturday	□	0 hr 0 min	0 hr 0 min
Sunday	□	0 hr 0 min	0 hr 0 min

The following table describes the labels in this screen.

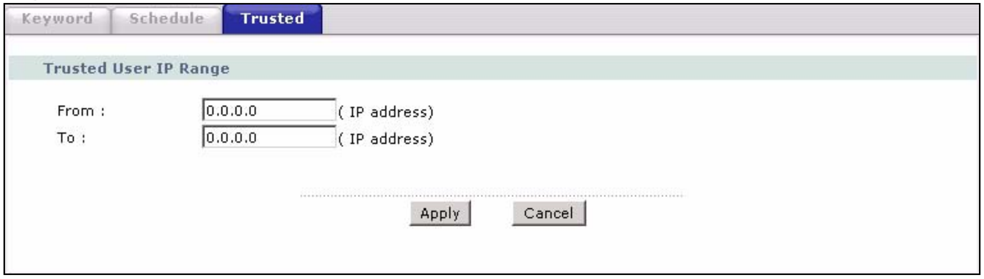
Table 46 Content Filter > Schedule

LABEL	DESCRIPTION
Schedule	Select **Active Everyday to Block** to make the content filtering active everyday. Otherwise, select **Edit Daily to Block** and configure which days of the week (or everyday) and which time of the day you want the content filtering to be active.
Active	Select the check box to have the content filtering to be active on the selected day.
Start Time	Enter the start time when you want the content filtering to take effect in hour-minute format.
End Time	Enter the end time when you want the content filtering to stop in hour-minute format.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to return to the previously saved settings.

10.4 Configuring Trusted Computers

Use this screen to exclude a range of users on the LAN from content filtering on your ZyXEL Device. Click **Security > Content Filter** > **Trusted**. The screen appears as shown.

Figure 70 Content Filter > Trusted



From : 0.0.0.0 (IP address)
To : 0.0.0.0 (IP address)

The following table describes the labels in this screen.

Table 47 Content Filter > Trusted

LABEL	DESCRIPTION
Trusted User IP Range	
From	Type the IP address of a computer (or the beginning IP address of a specific range of computers) on the LAN that you want to exclude from content filtering.
To	Type the ending IP address of a specific range of users on your LAN that you want to exclude from content filtering. Leave this field blank if you want to exclude an individual computer.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to return to the previously saved settings.

CHAPTER 11 IPSec VPN

This chapter explains how to set up and maintain IPSec VPNs in the ZyXEL Device.

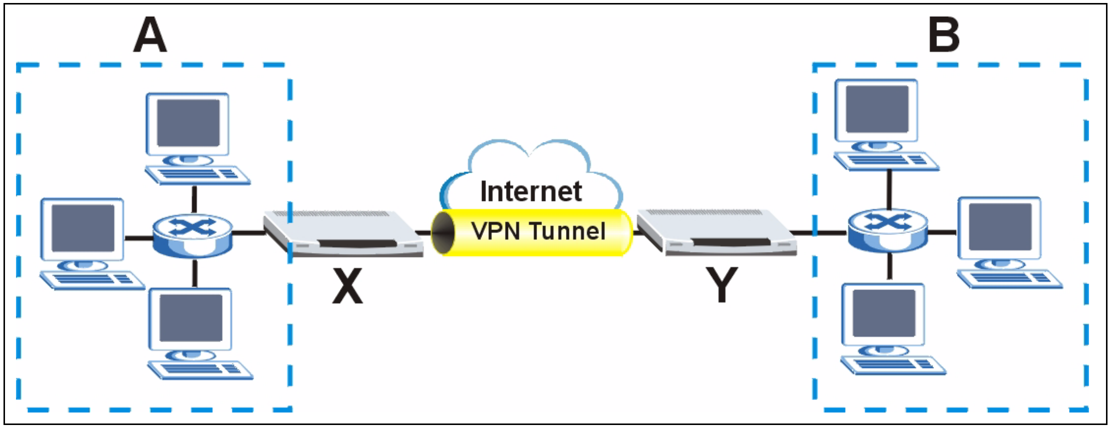
11.1 IPSec VPN Overview

A virtual private network (VPN) provides secure communications between sites without the expense of leased site-to-site lines. A secure VPN is a combination of tunneling, encryption, authentication, access control and auditing. It is used to transport traffic over the Internet or any insecure network that uses TCP/IP for communication.

Internet Protocol Security (IPSec) is a standards-based VPN that offers flexible solutions for secure data communications across a public network like the Internet. IPSec is built around a number of standardized cryptographic techniques to provide confidentiality, data integrity and authentication at the IP layer.

The following figure is one example of a VPN tunnel.

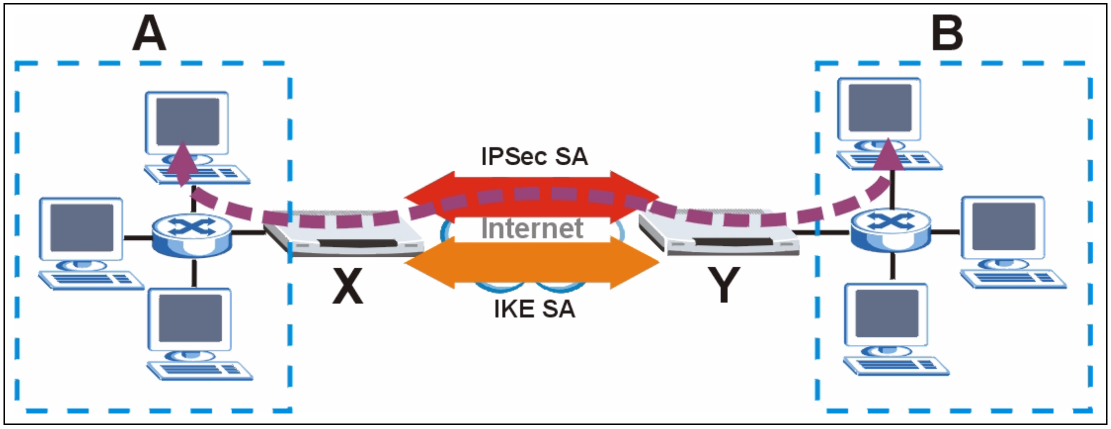
Figure 71 VPN: Example



The VPN tunnel connects the ZyXEL Device (**X**) and the remote IPSec router (**Y**). These routers then connect the local network (**A**) and remote network (**B**).

A VPN tunnel is usually established in two phases. Each phase establishes a security association (SA), a contract indicating what security parameters the ZyXEL Device and the remote IPSec router will use. The first phase establishes an Internet Key Exchange (IKE) SA between the ZyXEL Device and remote IPSec router. The second phase uses the IKE SA to securely establish an IPSec SA through which the ZyXEL Device and remote IPSec router can send data between computers on the local network and remote network. This is illustrated in the following figure.

Figure 72 VPN: IKE SA and IPSec SA



In this example, a computer in network **A** is exchanging data with a computer in network **B**. Inside networks **A** and **B**, the data is transmitted the same way data is normally transmitted in the networks. Between routers **X** and **Y**, the data is protected by the tunneling, encryption, and authentication of the IPSec SA. The IPSec SA is established securely using the IKE SA that routers **X** and **Y** established first.

The rest of this section discusses IKE SA and IPSec SA in more detail.

11.1.1 IKE SA Overview

The IKE SA provides a secure connection between the ZyXEL Device and remote IPSec router.

It takes several steps to establish an IKE SA. The negotiation mode determines how many steps are required. There are two negotiation modes: main mode and aggressive mode. Main mode provides better security, while aggressive mode is faster.

Note: Both routers must use the same negotiation mode.

These modes are discussed in more detail in Section 11.1.2.1 on page 159. The examples in this section use main mode.

11.1.1.1 IP Addresses of the ZyXEL Device and Remote IPSec Router

In the ZyXEL Device, you have to specify the IP addresses of the ZyXEL Device and the remote IPSec router to establish an IKE SA.

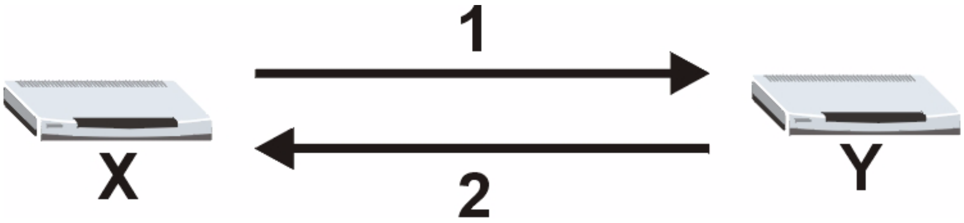
You can usually provide a static IP address or a domain name for the ZyXEL Device. Sometimes, your ZyXEL Device might also offer another alternative, such as using the IP address of a port or interface.

You can usually provide a static IP address or a domain name for the remote IPSec router as well. Sometimes, you might not know the IP address of the remote IPSec router (for example, telecommuters). In this case, you can still set up the IKE SA, but only the remote IPSec router can initiate an IKE SA.

11.1.1.2 IKE SA Proposal

The IKE SA proposal is used to identify the encryption algorithm, authentication algorithm, and Diffie-Hellman (DH) key group that the ZyXEL Device and remote IPSec router use in the IKE SA. In main mode, this is done in steps 1 and 2, as illustrated below.

Figure 73 IKE SA: Main Negotiation Mode, Steps 1 - 2: IKE SA Proposal



The ZyXEL Device sends one or more proposals to the remote IPSec router. (In some devices, you can set up only one proposal.) Each proposal consists of an encryption algorithm, authentication algorithm, and DH key group that the ZyXEL Device wants to use in the IKE SA. The remote IPSec router selects an acceptable proposal and sends the accepted proposal back to the ZyXEL Device. If the remote IPSec router rejects all of the proposals (for example, if the VPN tunnel is not configured correctly), the ZyXEL Device and remote IPSec router cannot establish an IKE SA.

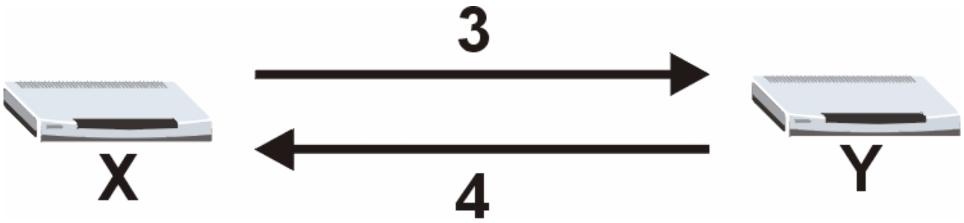
Note: Both routers must use the same encryption algorithm, authentication algorithm, and DH key group.

See the field descriptions for information about specific encryption algorithms, authentication algorithms, and DH key groups. You can also see Section 11.1.1.3 on page 157 for more information about the role of DH key groups.

11.1.1.3 Diffie-Hellman (DH) Key Exchange

The ZyXEL Device and the remote IPSec router use a DH key exchange to establish a shared secret, which is used to generate encryption keys for IKE SA and IPSec SA. In main mode, the DH key exchange is done in steps 3 and 4, as illustrated below.

Figure 74 IKE SA: Main Negotiation Mode, Steps 3 - 4: DH Key Exchange



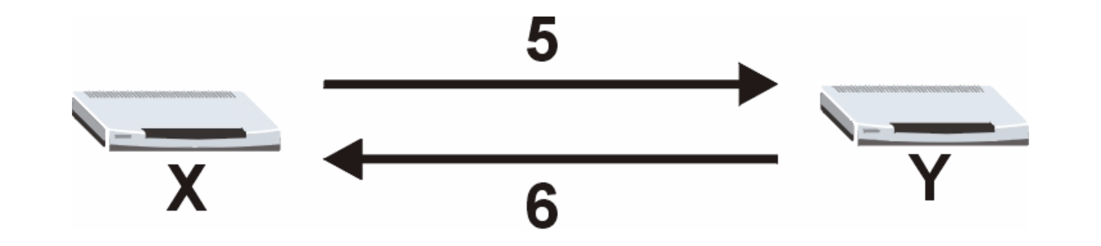
The DH key exchange is based on DH key groups. Each key group is a fixed number of bits long. The longer the key, the more secure the encryption keys, but also the longer it takes to encrypt and decrypt information. For example, DH2 keys (1024 bits) are more secure than DH1 keys (768 bits), but DH2 encryption keys take longer to encrypt and decrypt.

11.1.1.4 Authentication

Before the ZyXEL Device and remote IPSec router establish an IKE SA, they have to verify each other's identity. This process is based on pre-shared keys and router identities.

In main mode, the ZyXEL Device and remote IPSec router authenticate each other in steps 5 and 6, as illustrated below. Their identities are encrypted using the encryption algorithm and encryption key the ZyXEL Device and remote IPSec router selected in previous steps.

Figure 75 IKE SA: Main Negotiation Mode, Steps 5 - 6: Authentication



The ZyXEL Device and remote IPSec router use a pre-shared key in the authentication process, though it is not actually transmitted or exchanged.

Note: The ZyXEL Device and the remote IPSec router must use the same pre-shared key.

Router identity consists of ID type and ID content. The ID type can be IP address, domain name, or e-mail address, and the ID content is a specific IP address, domain name, or e-mail address. The ID content is only used for identification; the IP address, domain name, or e-mail address that you enter does not have to actually exist.

The ZyXEL Device and the remote IPSec router each has its own identity, so each one must store two sets of information, one for itself and one for the other router. Local ID type and ID content refers to the ID type and ID content that applies to the router itself, and peer ID type and ID content refers to the ID type and ID content that applies to the other router in the IKE SA.

Note: The ZyXEL Device's local and peer ID type and ID content must match the remote IPSec router's peer and local ID type and ID content, respectively.

In the following example, the ZyXEL Device and the remote IPSec router authenticate each other successfully.

Table 48 VPN Example: Matching ID Type and Content

ZYXEL DEVICE	REMOTE IPSEC ROUTER
Local ID type: E-mail	Local ID type: IP
Local ID content: tom@yourcompany.com	Local ID content: 1.1.1.2
Peer ID type: IP	Peer ID type: E-mail
Peer ID content: 1.1.1.2	Peer ID content: tom@yourcompany.com

In the following example, the authentication fails, so they cannot establish an IKE SA.

Table 49 VPN Example: Mismatching ID Type and Content

ZYXEL DEVICE	REMOTE IPSEC ROUTER
Local ID type: E-mail	Local ID type: IP
Local ID content: tom@yourcompany.com	Local ID content: **1.1.1.2**
Peer ID type: IP	Peer ID type: E-mail
Peer ID content: **1.1.1.15**	Peer ID content: tom@yourcompany.com

It is also possible to configure the ZyXEL Device to ignore the identity of the remote IPSec router. In this case, you usually set the peer ID type to **Any**. This is not as secure as other peer ID types, however.

11.1.2 Additional Topics for IKE SA

This section provides more information about IKE SA.

11.1.2.1 Negotiation Mode

There are two negotiation modes: main mode and aggressive mode. Main mode provides better security, while aggressive mode is faster.

Main mode takes six steps to establish an IKE SA.

Steps 1-2: The ZyXEL Device sends its proposals to the remote IPSec router. The remote IPSec router selects an acceptable proposal and sends it back to the ZyXEL Device.

Steps 3-4: The ZyXEL Device and the remote IPSec router participate in a Diffie-Hellman key exchange, based on the accepted DH key group, to establish a shared secret.

Steps 5-6: Finally, the ZyXEL Device and the remote IPSec router generate an encryption key from the shared secret, encrypt their identities, and exchange their encrypted identity information for authentication.

In contrast, aggressive mode only takes three steps to establish an IKE SA.

Step 1: The ZyXEL Device sends its proposals to the remote IPSec router. It also starts the Diffie-Hellman key exchange and sends its (unencrypted) identity to the remote IPSec router for authentication.

Step 2: The remote IPSec router selects an acceptable proposal and sends it back to the ZyXEL Device. It also finishes the Diffie-Hellman key exchange, authenticates the ZyXEL Device, and sends its (unencrypted) identity to the ZyXEL Device for authentication.

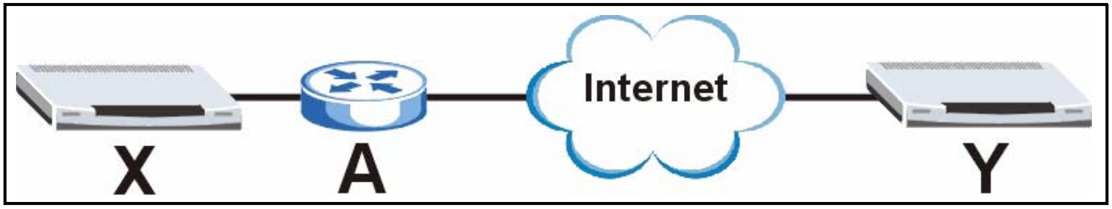
Step 3: The ZyXEL Device authenticates the remote IPSec router and confirms that the IKE SA is established.

Aggressive mode does not provide as much security as main mode because the identity of the ZyXEL Device and the identity of the remote IPSec router are not encrypted. It is usually used when the address of the initiator is not known by the responder and both parties want to use pre-shared keys for authentication (for example, telecommuters).

11.1.2.2 VPN, NAT and NAT Traversal

In the following example, there is another router (**A**) between router **X** and router **Y**.

Figure 76 VPN/NAT Example



If router **A** does NAT, it might change IP addresses (source or destination), port numbers (source or destination), or any combination of these. If router **X** and router **Y** try to establish a VPN tunnel, the authentication fails because authentication depends on the original IP addresses and port numbers.

Most routers that support NAT (like router **A**) have an IPSec pass-through feature. This feature helps router **A** recognize VPN packets and route them appropriately. If router **A** has this feature, router **X** and router **Y** can establish a VPN tunnel as long as the active protocol is ESP. (See Section 11.1.3.2 on page 161 for more information about active protocols.)

If router A does not have an IPSec pass-through or if the active protocol is AH, you can solve this problem by enabling NAT traversal. In NAT traversal, router **X** and router **Y** add an extra header to the IKE SA and IPSec SA packets. If you configure router **A** to forward these packets unchanged, router **X** and router **Y** can establish a VPN tunnel.

You have to do the following things to set up NAT traversal.

- Enable NAT traversal on the ZyXEL Device and remote IPSec router.
- Configure the NAT router to forward packets with the extra header unchanged. The extra header may be UDP port 500 or UDP port 4500, depending on the standard(s) the ZyXEL Device and remote IPSec router support.

Note: You must enable NAT traversal on the ZyXEL Device and the remote IPSec router, and you must configure the NAT router to forward packets with the extra header unchanged.

11.1.3 IPSec SA Overview

Once the ZyXEL Device and remote IPSec router have established the IKE SA, they can use the IKE SA to securely negotiate IPSec SAs through which to send data between computers on the networks.

Note: An IPSec SA stays connected even if the underlying IKE SA is not available anymore.

This section introduces the key components of IPSec SA.

11.1.3.1 Local Network and Remote Network

In IPSec SA terminology, the local network, the one(s) connected to the ZyXEL Device, may be called the local policy. Similarly, the remote network, the one(s) connected to the remote IPSec router, may be called the remote policy.

11.1.3.2 Active Protocol

The active protocol controls the format of each packet. It also specifies how much of each packet is protected by the encryption and authentication algorithms. IPSec VPN includes two active protocols, AH (Authentication Header, RFC 2402) and ESP (Encapsulating Security Payload, RFC 2406).

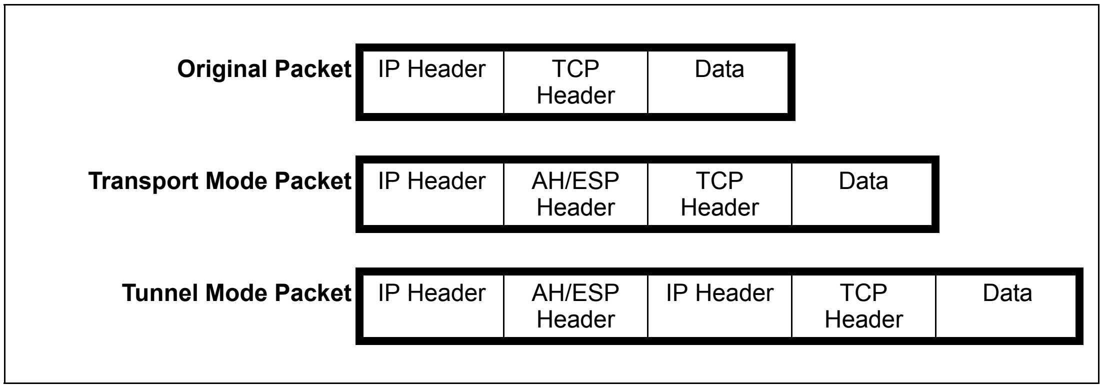
Note: The ZyXEL Device and remote IPSec router must use the same active protocol. ESP is recommended.

ESP is recommended because AH does not support encryption and ESP is more suitable with NAT. Use AH only if the remote IPSec router does not support ESP.

11.1.3.3 Encapsulation

There are two ways to encapsulate packets. These modes are illustrated below.

Figure 77 VPN: Transport and Tunnel Mode Encapsulation



In tunnel mode, the ZyXEL Device encapsulates the entire IP packet. As a result, there are two IP headers, as well as the header for the active protocol.

- Outside header: The outside IP header contains the IP addresses of the ZyXEL Device and remote IPSec router.
- AH/ESP header: The header for the active protocol encapsulates the original packet.

- Inside header: The inside IP header contains the IP address of the computers behind the ZyXEL Device or remote IPSec router.

In transport mode, the IP header is the original IP header, and the encapsulation depends on the active protocol. If the active protocol is AH, the ZyXEL Device includes part of the IP header when it encapsulates the packet. If the active protocol is ESP, the ZyXEL Device does not include the original IP header when it encapsulates the packet, in which case it is not possible to verify the integrity of the source IP address.

Note: The ZyXEL Device and remote IPSec router must use the same encapsulation.

Usually, you should use tunnel mode because it is more secure. Transport mode should only be used when the IPSec SA is used for communication between the ZyXEL Device and remote IPSec router (for example, for remote management), not between computers on the local and remote networks.

11.1.3.4 IPSec SA Proposal and Perfect Forward Secrecy

An IPSec SA proposal is similar to an IKE SA proposal (see Section 11.1.1.2 on page 157), except that you also have the choice whether or not the ZyXEL Device and remote IPSec router perform a new DH key exchange every time an IPSec SA is established. This is called Perfect Forward Secrecy (PFS).

If you enable PFS, the ZyXEL Device and remote IPSec router perform a DH key exchange every time an IPSec SA is established, changing the shared secret from which encryption keys are generated. As a result, if one encryption key is compromised, other encryption keys are secure because they are created from different shared secrets.

If you do not enable PFS, the ZyXEL Device and remote IPSec router use the same shared secret that was generated when the IKE SA was established to generate encryption keys. The ZyXEL Device and remote IPSec router still create a new shared secret every time they establish (or re-establish) the IKE SA.

A DH key exchange is time-consuming. You might consider disabling PFS, if it takes a long time to establish IPSec SA and if the VPN tunnel has good security (for example, strong encryption) without it.

11.1.4 Additional Topics for IPSec SA

This section provides more information about IPSec SA.

11.1.4.1 IPSec SA using Manual Keys

You might set up an IPSec SA using manual keys when you want to establish a VPN tunnel quickly (for example, while troubleshooting). You should do this only as a temporary solution, however, because it is not as secure as a regular IPSec SA.

In IPSec SAs using manual keys, the ZyXEL Device and remote IPSec router do not establish an IKE SA. They only establish an IPSec SA. As a result, an IPSec SA using manual keys has some characteristics of IKE SAs and some characteristics of IPSec SAs. There are also some differences between IPSec SAs using manual keys and other types of SAs.

11.1.4.1.1 IPSec SA Proposal using Manual Keys

In IPSec SAs using manual keys, you can only specify one encryption algorithm and one authentication algorithm. You cannot specify several proposals. There is no DH key exchange, so you have to provide the encryption key and the authentication key the ZyXEL Device and remote IPSec router use.

Note: The ZyXEL Device and remote IPSec router must use the same encryption key and authentication key.

11.1.4.1.2 Authentication and the Security Parameter Index (SPI)

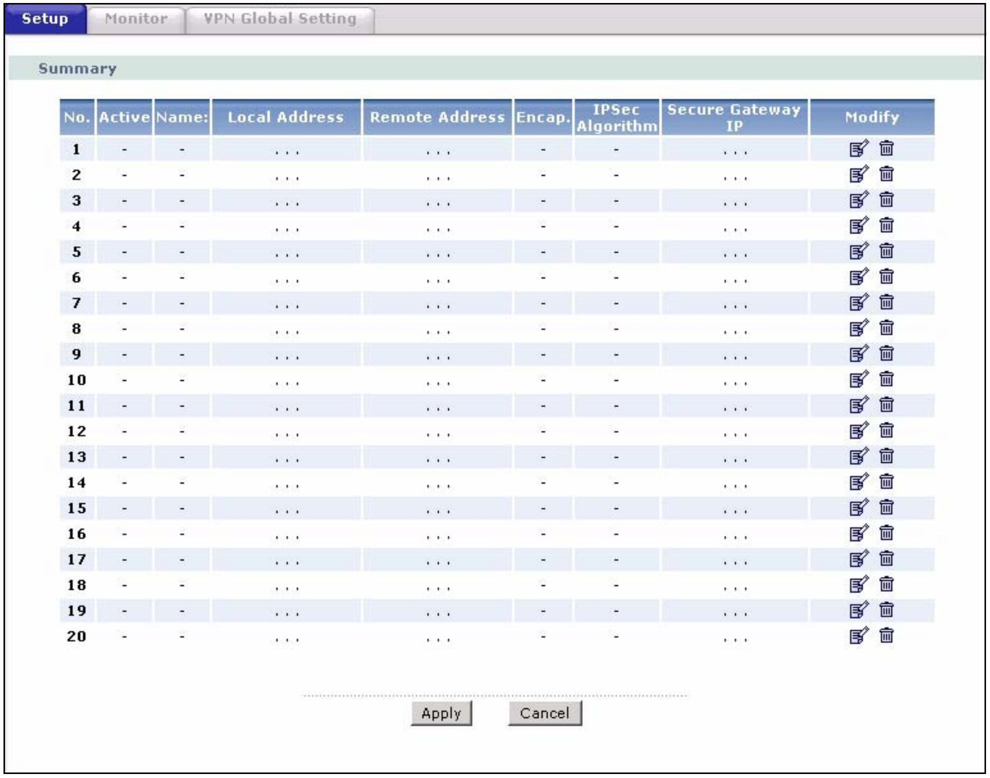
In IPSec SAs using manual keys, the ZyXEL Device and remote IPSec router use the SPI, instead of pre-shared keys, ID type and ID content, for authentication. The SPI is an arbitrary number that is used to help identify the IPSec SA.

Note: The ZyXEL Device and remote IPSec router must use the same SPI.

11.2 VPN Setup Screen

Click **Security** and **VPN** to open the **VPN Setup** screen. This is a read-only menu of your IPSec rules (tunnels). The IPSec summary menu is read-only. Edit a VPN by selecting an index number and then configuring its associated submenus.

Figure 78 VPN > Setup



No.	Active	Name:	Local Address	Remote Address	Encap.	IPSec Algorithm	Secure Gateway IP	Modify
1	-	-	...	...	-	-	...	✎ 🗑
2	-	-	...	...	-	-	...	✎ 🗑
3	-	-	...	...	-	-	...	✎ 🗑
4	-	-	...	...	-	-	...	✎ 🗑
5	-	-	...	...	-	-	...	✎ 🗑
6	-	-	...	...	-	-	...	✎ 🗑
7	-	-	...	...	-	-	...	✎ 🗑
8	-	-	...	...	-	-	...	✎ 🗑
9	-	-	...	...	-	-	...	✎ 🗑
10	-	-	...	...	-	-	...	✎ 🗑
11	-	-	...	...	-	-	...	✎ 🗑
12	-	-	...	...	-	-	...	✎ 🗑
13	-	-	...	...	-	-	...	✎ 🗑
14	-	-	...	...	-	-	...	✎ 🗑
15	-	-	...	...	-	-	...	✎ 🗑
16	-	-	...	...	-	-	...	✎ 🗑
17	-	-	...	...	-	-	...	✎ 🗑
18	-	-	...	...	-	-	...	✎ 🗑
19	-	-	...	...	-	-	...	✎ 🗑
20	-	-	...	...	-	-	...	✎ 🗑

The following table describes the fields in this screen.

Table 50 VPN > Setup

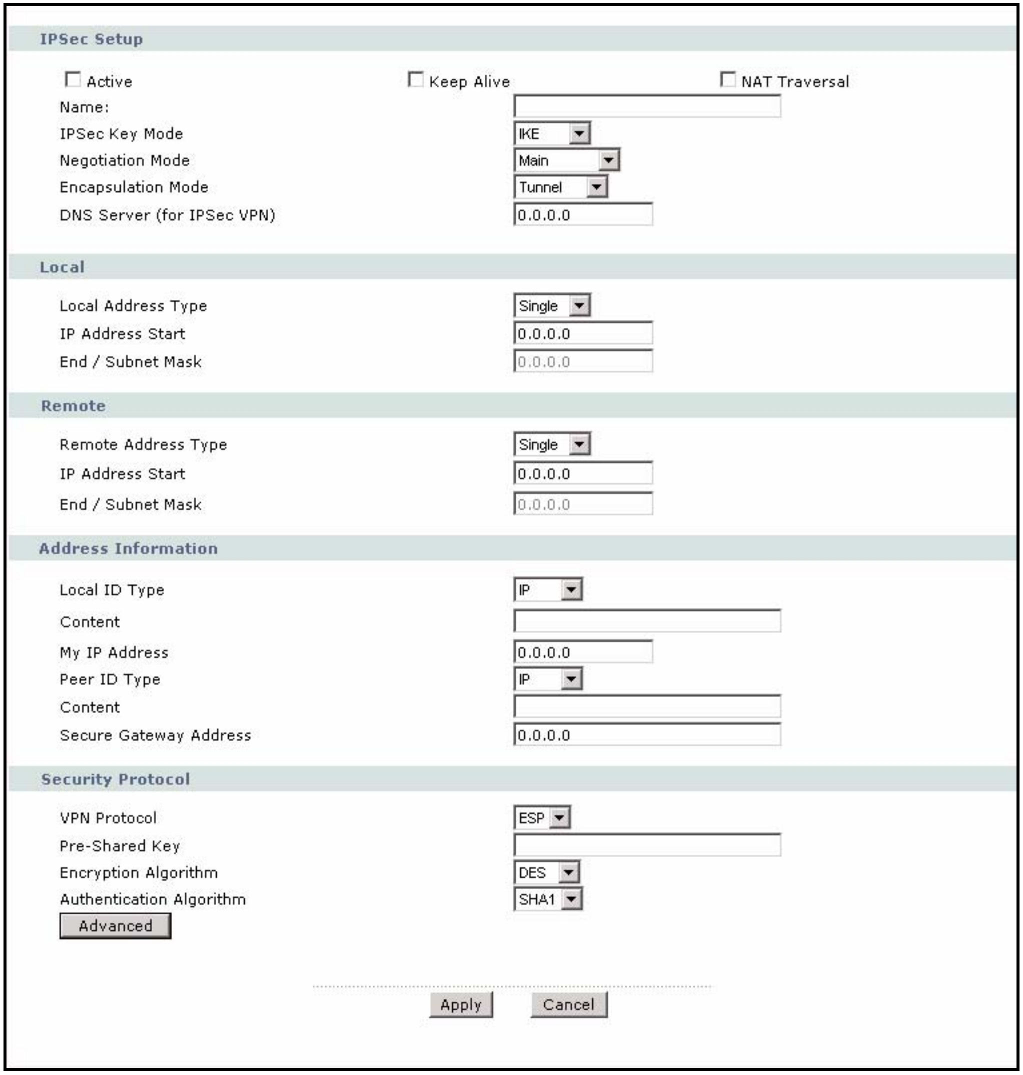
LABEL	DESCRIPTION
No.	This is the VPN policy index number. Click a number to edit VPN policies.
Active	This field displays whether the VPN policy is active or not. A **Yes** signifies that this VPN policy is active. **No** signifies that this VPN policy is not active.
Name	This field displays the identification name for this VPN policy.
Local Address	This is the IP address(es) of computer(s) on your local network behind your ZyXEL Device. The same (static) IP address is displayed twice when the **Local Address Type** field in the **VPN-IKE** (or **VPN-Manual Key**) screen is configured to **Single**. The beginning and ending (static) IP addresses, in a range of computers are displayed when the **Local Address Type** field in the **VPN-IKE** (or **VPN-Manual Key**) screen is configured to **Range**. A (static) IP address and a subnet mask are displayed when the **Local Address Type** field in the **VPN-IKE** (or **VPN-Manual Key**) screen is configured to **Subnet**.

Table 50 VPN > Setup (continued)

LABEL	DESCRIPTION
Remote Address	This is the IP address(es) of computer(s) on the remote network behind the remote IPSec router. This field displays **N/A** when the **Secure Gateway Address** field displays **0.0.0.0**. In this case only the remote IPSec router can initiate the VPN. The same (static) IP address is displayed twice when the **Remote Address Type** field in the **VPN-IKE** (or **VPN-Manual Key**) screen is configured to **Single**. The beginning and ending (static) IP addresses, in a range of computers are displayed when the **Remote Address Type** field in the **VPN-IKE** (or **VPN-Manual Key**) screen is configured to **Range**. A (static) IP address and a subnet mask are displayed when the **Remote Address Type** field in the **VPN-IKE** (or **VPN-Manual Key**) screen is configured to **Subnet**.
Encap.	This field displays **Tunnel** or **Transport** mode (**Tunnel** is the default selection).
IPSec Algorithm	This field displays the security protocols used for an SA. Both **AH** and **ESP** increase ZyXEL Device processing requirements and communications latency (delay).
Secure Gateway IP	This is the static WAN IP address or URL of the remote IPSec router. This field displays **0.0.0.0** when you configure the **Secure Gateway Address** field in the **VPN-IKE** screen to **0.0.0.0.**
Modify	Click the **Edit** icon to go to the screen where you can edit the VPN configuration. Click the **Remove** icon to remove an existing VPN configuration.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to return to the previously saved settings.

11.3 Editing VPN Policies

See Section 11.1 on page 155 for background information. Use this screen to edit VPN policies. Click an **Edit** icon in the VPN Setup Screen.



IPSec Setup

□ Active □ Keep Alive □ NAT Traversal

Name:	
IPSec Key Mode	IKE
Negotiation Mode	Main
Encapsulation Mode	Tunnel
DNS Server (for IPSec VPN)	0.0.0.0

Local

Local Address Type	Single
IP Address Start	0.0.0.0
End / Subnet Mask	0.0.0.0

Remote

Remote Address Type	Single
IP Address Start	0.0.0.0
End / Subnet Mask	0.0.0.0

Address Information

Local ID Type	IP
Content	
My IP Address	0.0.0.0
Peer ID Type	IP
Content	
Secure Gateway Address	0.0.0.0

Security Protocol

VPN Protocol	ESP
Pre-Shared Key	
Encryption Algorithm	DES
Authentication Algorithm	SHA1

Figure 79 VPN > Setup > Edit

The following table describes the fields in this screen.

Table 51 VPN > Setup > Edit

LABEL	DESCRIPTION
IPSec Setup	
Active	Select this check box to activate this VPN policy. This option determines whether a VPN rule is applied before a packet leaves the firewall.
Keep Alive	Select either **Yes** or **No** from the drop-down list box. Select **Yes** to have the ZyXEL Device automatically reinitiate the SA after the SA lifetime times out, even if there is no traffic. The remote IPSec router must also have keep alive enabled in order for this feature to work.
NAT Traversal	Select this check box if you want to set up a VPN tunnel when there are NAT routers between the ZyXEL Device and remote IPSec router. The remote IPSec router must also enable NAT traversal, and the NAT routers have to forward UDP port 500 packets to the remote IPSec router behind the NAT router.

Table 51 VPN > Setup > Edit (continued)

LABEL	DESCRIPTION
Name	Type up to 32 characters to identify this VPN policy. You may use any character, including spaces, but the ZyXEL Device drops trailing spaces.
IPSec Key Mode	Select **IKE** or **Manual** from the drop-down list box. **IKE** provides more protection so it is generally recommended. **Manual** is a useful option for troubleshooting if you have problems using **IKE** key management.
Negotiation Mode	Select **Main** or **Aggressive** from the drop-down list box. Multiple SAs connecting through a secure gateway must have the same negotiation mode.
Encapsulation Mode	Select **Tunnel** mode or **Transport** mode from the drop-down list box.
DNS Server (for IPSec VPN)	If there is a private DNS server that services the VPN, type its IP address here. The ZyXEL Device assigns this additional DNS server to the ZyXEL Device's DHCP clients that have IP addresses in this IPSec rule's range of local addresses. A DNS server allows clients on the VPN to find other computers and servers on the VPN by their (private) domain names.
Local	Local IP addresses must be static and correspond to the remote IPSec router's configured remote IP addresses. Two active SAs can have the same configured local or remote IP address, but not both. You can configure multiple SAs between the same local and remote IP addresses, as long as only one is active at any time. In order to have more than one active rule with the **Secure Gateway Address** field set to **0.0.0.0**, the ranges of the local IP addresses cannot overlap between rules. If you configure an active rule with **0.0.0.0** in the **Secure Gateway Address** field and the LAN's full IP address range as the local IP address, then you cannot configure any other active rules with the **Secure Gateway Address** field set to **0.0.0.0**.
Local Address Type	Use the drop-down menu to choose **Single**, **Range**, or **Subnet**. Select **Single** for a single IP address. Select **Range** for a specific range of IP addresses. Select **Subnet** to specify IP addresses on a network by their subnet mask.
IP Address Start	When the **Local Address Type** field is configured to **Single**, enter a (static) IP address on the LAN behind your ZyXEL Device. When the **Local Address Type** field is configured to **Range**, enter the beginning (static) IP address, in a range of computers on your LAN behind your ZyXEL Device. When the **Local Address Type** field is configured to **Subnet**, this is a (static) IP address on the LAN behind your ZyXEL Device.
End / Subnet Mask	When the **Local Address Type** field is configured to **Single**, this field is N/A. When the **Local Address Type** field is configured to **Range**, enter the end (static) IP address, in a range of computers on the LAN behind your ZyXEL Device. When the **Local Address Type** field is configured to **Subnet**, this is a subnet mask on the LAN behind your ZyXEL Device.
Remote	Remote IP addresses must be static and correspond to the remote IPSec router's configured local IP addresses. The remote fields do not apply when the **Secure Gateway IP Address** field is configured to **0.0.0.0**. In this case only the remote IPSec router can initiate the VPN. Two active SAs cannot have the local and remote IP address(es) both the same. Two active SAs can have the same local or remote IP address, but not both. You can configure multiple SAs between the same local and remote IP addresses, as long as only one is active at any time.
Remote Address Type	Use the drop-down menu to choose **Single**, **Range**, or **Subnet**. Select **Single** with a single IP address. Select **Range** for a specific range of IP addresses. Select **Subnet** to specify IP addresses on a network by their subnet mask.

Table 51 VPN > Setup > Edit (continued)

LABEL	DESCRIPTION
IP Address Start	When the **Remote Address Type** field is configured to **Single**, enter a (static) IP address on the network behind the remote IPSec router. When the **Remote Address Type** field is configured to **Range**, enter the beginning (static) IP address, in a range of computers on the network behind the remote IPSec router. When the **Remote Address Type** field is configured to **Subnet**, enter a (static) IP address on the network behind the remote IPSec router.
End / Subnet Mask	When the **Remote Address Type** field is configured to **Single**, this field is N/A. When the **Remote Address Type** field is configured to **Range**, enter the end (static) IP address, in a range of computers on the network behind the remote IPSec router. When the **Remote Address Type** field is configured to **Subnet**, enter a subnet mask on the network behind the remote IPSec router.
Address Information	
Local ID Type	Select **IP** to identify this ZyXEL Device by its IP address. Select **DNS** to identify this ZyXEL Device by a domain name. Select **E-mail** to identify this ZyXEL Device by an e-mail address.
Content	When you select **IP** in the **Local ID Type** field, type the IP address of your computer in the local **Content** field. The ZyXEL Device automatically uses the IP address in the **My IP Address** field (refer to the **My IP Address** field description) if you configure the local **Content** field to **0.0.0.0** or leave it blank. It is recommended that you type an IP address other than **0.0.0.0** in the local **Content** field or use the **DNS** or **E-mail** ID type in the following situations. When there is a NAT router between the two IPSec routers. When you want the remote IPSec router to be able to distinguish between VPN connection requests that come in from IPSec routers with dynamic WAN IP addresses. When you select **DNS** or **E-mail** in the **Local ID Type** field, type a domain name or e-mail address by which to identify this ZyXEL Device in the local **Content** field. Use up to 31 ASCII characters including spaces, although trailing spaces are truncated. The domain name or e-mail address is for identification purposes only and can be any string.
My IP Address	Enter the WAN IP address of your ZyXEL Device. The VPN tunnel has to be rebuilt if this IP address changes. The following applies if this field is configured as **0.0.0.0**: The ZyXEL Device uses the current ZyXEL Device WAN IP address (static or dynamic) to set up the VPN tunnel. If the WAN connection goes down, the ZyXEL Device uses the dial backup IP address for the VPN tunnel when using dial backup or the LAN IP address when using traffic redirect. See the chapter on WAN for details on dial backup and traffic redirect.
Peer ID Type	Select **IP** to identify the remote IPSec router by its IP address. Select **DNS** to identify the remote IPSec router by a domain name. Select **E-mail** to identify the remote IPSec router by an e-mail address.

Table 51 VPN > Setup > Edit (continued)

LABEL	DESCRIPTION
Content	The configuration of the peer content depends on the peer ID type. For **IP**, type the IP address of the computer with which you will make the VPN connection. If you configure this field to **0.0.0.0** or leave it blank, the ZyXEL Device will use the address in the **Secure Gateway Address** field (refer to the **Secure Gateway Address** field description). For **DNS** or **E-mail**, type a domain name or e-mail address by which to identify the remote IPSec router. Use up to 31 ASCII characters including spaces, although trailing spaces are truncated. The domain name or e-mail address is for identification purposes only and can be any string. It is recommended that you type an IP address other than **0.0.0.0** or use the **DNS** or **E-mail** ID type in the following situations: When there is a NAT router between the two IPSec routers. When you want the ZyXEL Device to distinguish between VPN connection requests that come in from remote IPSec routers with dynamic WAN IP addresses.
Secure Gateway Address	Type the WAN IP address or the URL (up to 31 characters) of the IPSec router with which you're making the VPN connection. Set this field to **0.0.0.0** if the remote IPSec router has a dynamic WAN IP address (the **Key Management** field must be set to **IKE**). In order to have more than one active rule with the **Secure Gateway Address** field set to **0.0.0.0**, the ranges of the local IP addresses cannot overlap between rules. If you configure an active rule with **0.0.0.0** in the **Secure Gateway Address** field and the LAN’s full IP address range as the local IP address, then you cannot configure any other active rules with the **Secure Gateway Address** field set to **0.0.0.0**.
Security Protocol	
VPN Protocol	Select **ESP** if you want to use ESP (Encapsulation Security Payload). The ESP protocol (RFC 2406) provides encryption as well as some of the services offered by **AH**. If you select **ESP** here, you must select options from the **Encryption Algorithm** and **Authentication Algorithm** fields (described below).
Pre-Shared Key	Type your pre-shared key in this field. A pre-shared key identifies a communicating party during a phase 1 IKE negotiation. It is called "pre-shared" because you have to share it with another party before you can communicate with them over a secure connection. Type from 8 to 31 case-sensitive ASCII characters or from 16 to 62 hexadecimal ("0-9", "A-F") characters. You must precede a hexadecimal key with a "0x” (zero x), which is not counted as part of the 16 to 62 character range for the key. For example, in "0x0123456789ABCDEF", “0x” denotes that the key is hexadecimal and “0123456789ABCDEF” is the key itself. Both ends of the VPN tunnel must use the same pre-shared key. You will receive a “PYLD_MALFORMED” (payload malformed) packet if the same pre-shared key is not used on both ends.
Encryption Algorithm	Select **DES**, **3DES**, **AES** or **NULL** from the drop-down list box. When you use one of these encryption algorithms for data communications, both the sending device and the receiving device must use the same secret key, which can be used to encrypt and decrypt the message or to generate and verify a message authentication code. The DES encryption algorithm uses a 56-bit key. Triple DES (**3DES**) is a variation on **DES** that uses a 168-bit key. As a result, **3DES** is more secure than **DES**. It also requires more processing power, resulting in increased latency and decreased throughput. This implementation of **AES** uses a 128-bit key. **AES** is faster than **3DES**. Select **NULL** to set up a tunnel without encryption. When you select **NULL**, you do not enter an encryption key.

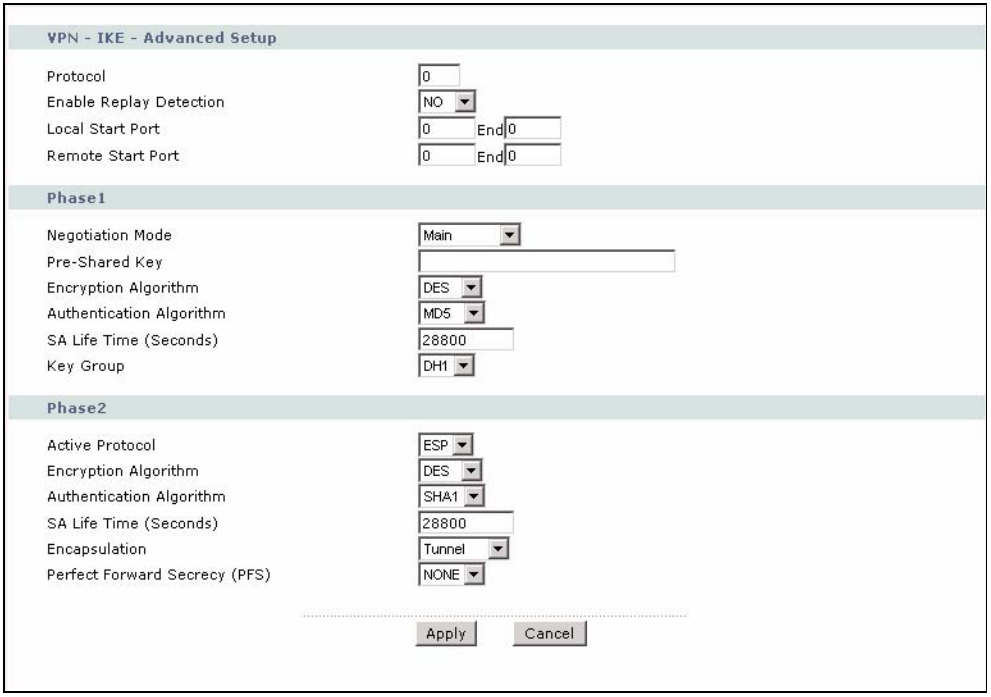
Table 51 VPN > Setup > Edit (continued)

LABEL	DESCRIPTION
Authentication Algorithm	Select **SHA1** or **MD5** from the drop-down list box. **MD5** (Message Digest 5) and **SHA1** (Secure Hash Algorithm) are hash algorithms used to authenticate packet data. The **SHA1** algorithm is generally considered stronger than **MD5**, but is slower. Select **MD5** for minimal security and **SHA1** for maximum security.
Advanced	Click **Advanced** to configure more detailed settings of your IKE key management.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

11.4 Configuring Advanced IKE Settings

See Section 11.1 on page 155 for background information. Use this screen to configure advanced settings for the VPN tunnel. Click **Advanced** in the Editing VPN Policies screen to open this screen.

Figure 80 VPN > Setup > Edit > Advanced



VPN - IKE - Advanced Setup

Protocol	0
Enable Replay Detection	NO
Local Start Port	0 End 0
Remote Start Port	0 End 0

Phase1

Negotiation Mode	Main
Pre-Shared Key	
Encryption Algorithm	DES
Authentication Algorithm	MD5
SA Life Time (Seconds)	28800
Key Group	DH1

Phase2

Active Protocol	ESP
Encryption Algorithm	DES
Authentication Algorithm	SHA1
SA Life Time (Seconds)	28800
Encapsulation	Tunnel
Perfect Forward Secrecy (PFS)	NONE

The following table describes the fields in this screen.

Table 52 VPN > Setup > Edit > Advanced

LABEL	DESCRIPTION
VPN - IKE - Advanced Setup	
Protocol	Enter the IP protocol number whose traffic is allowed to use the VPN tunnel. Enter 0 to allow all IP protocols to use the VPN tunnel. See Appendix E on page 407 for some common IP protocols.
Enable Replay Detection	Select this to enable replay detection. As a VPN setup is processing intensive, the system is vulnerable to Denial of Service (DoS) attacks. The IPSec receiver can detect and reject old or duplicate packets to protect against replay attacks.
Local Start Port End	Enter the port number or range of port numbers in the local network whose traffic is allowed to use the VPN tunnel. Enter 0 in both fields to allow all port numbers in the local network to use the VPN tunnel. See Appendix E on page 407 for some common port numbers.
Remote Start Port End	Enter the port number or range of port numbers in the remote network whose traffic is allowed to use the VPN tunnel. Enter 0 in both fields to allow all port numbers in the remote network to use the VPN tunnel. See Appendix E on page 407 for some common port numbers.
Phase 1	
Negotiation Mode	Select the negotiation mode for the IKE SA. **Main** is more secure than **Aggressive**. The ZyXEL Device and remote IPSec router must use the same negotiation mode.

Table 52 VPN > Setup > Edit > Advanced (continued)

LABEL	DESCRIPTION
Pre-Shared Key	Type the pre-shared key the IKE SA uses. The ZyXEL Device and remote IPSec router must use the same pre-shared key. If the keys are different, the ZyXEL Device receives a “PYLD_MALFORMED” (payload malformed) packet. You can use 8-31 ASCII characters or 16-62 hexadecimal ("0-9", "A-F") characters. You must precede a hexadecimal key with a "0x” (zero x), which is not counted as part of the 16-62 characters. For example, in "0x0123456789ABCDEF", “0x” denotes that the key is hexadecimal and “0123456789ABCDEF” is the key itself.
Encryption Algorithm	Select one of the following encryption algorithms for the IKE SA. The algorithms are listed in order from weakest to strongest. Data Encryption Standard (**DES**) is a widely used (but breakable) method of data encryption. It applies a 56-bit key to each 64-bit block of data. Triple DES (**3DES**) is a variant of DES. It iterates three times with three separate keys, effectively tripling the strength of DES. Advanced Encryption Standard (**AES**) is a newer method of data encryption that also uses a secret key. AES applies a 128-bit key to 128-bit blocks of data. Select **NULL** to set up a VPN tunnel without encryption.
Authentication Algorithm	Select one of the following authentication algorithms for the IKE SA. The algorithms are listed in order from weakest to strongest. Message Digest 5 (**MD5**) produces a 128-bit digest to authenticate packets. Secure Hash Algorithm (**SHA1**) produces a 160-bit digest to authenticate packets.
SA Life Time (Seconds)	Enter the length of time before the ZyXEL Device automatically renegotiates the IKE SA. It may range from 60 to 3,000,000 seconds (almost 35 days). A low value increases security by forcing the two VPN gateways to update the encryption and authentication keys. However, if every time the IKE SA is renegotiated, any users trying to establish IPSec SA experience delays. (Existing IPSec SA are not affected.)
Key Group	You must choose a DH key group for the IKE SA. The longer the key group, the stronger the encryption, but also the more processing is required. **DH1** refers to Diffie-Hellman Group 1, a 768-bit random number. **DH2** refers to Diffie-Hellman Group 2, a 1024-bit (1Kb) random number.
Phase 2	
Active Protocol	Select the active protocol the IPSec SA uses. It is recommended you select ESP, unless the remote IPSec router only uses AH.
Encryption Algorithm	Select one of the following encryption algorithms for the IPSec SA. The algorithms are listed in order from weakest to strongest. Data Encryption Standard (**DES**) is a widely used (but breakable) method of data encryption. It applies a 56-bit key to each 64-bit block of data. Triple DES (**3DES**) is a variant of DES. It iterates three times with three separate keys, effectively tripling the strength of DES. Advanced Encryption Standard (**AES**) is a newer method of data encryption that also uses a secret key. AES applies a 128-bit key to 128-bit blocks of data. Select **NULL** to set up a VPN tunnel without encryption.
Authentication Algorithm	Select one of the following authentication algorithms for the IPSec SA. The algorithms are listed in order from weakest to strongest. Message Digest 5 (**MD5**) produces a 128-bit digest to authenticate packets. Secure Hash Algorithm (**SHA1**) produces a 160-bit digest to authenticate packets.

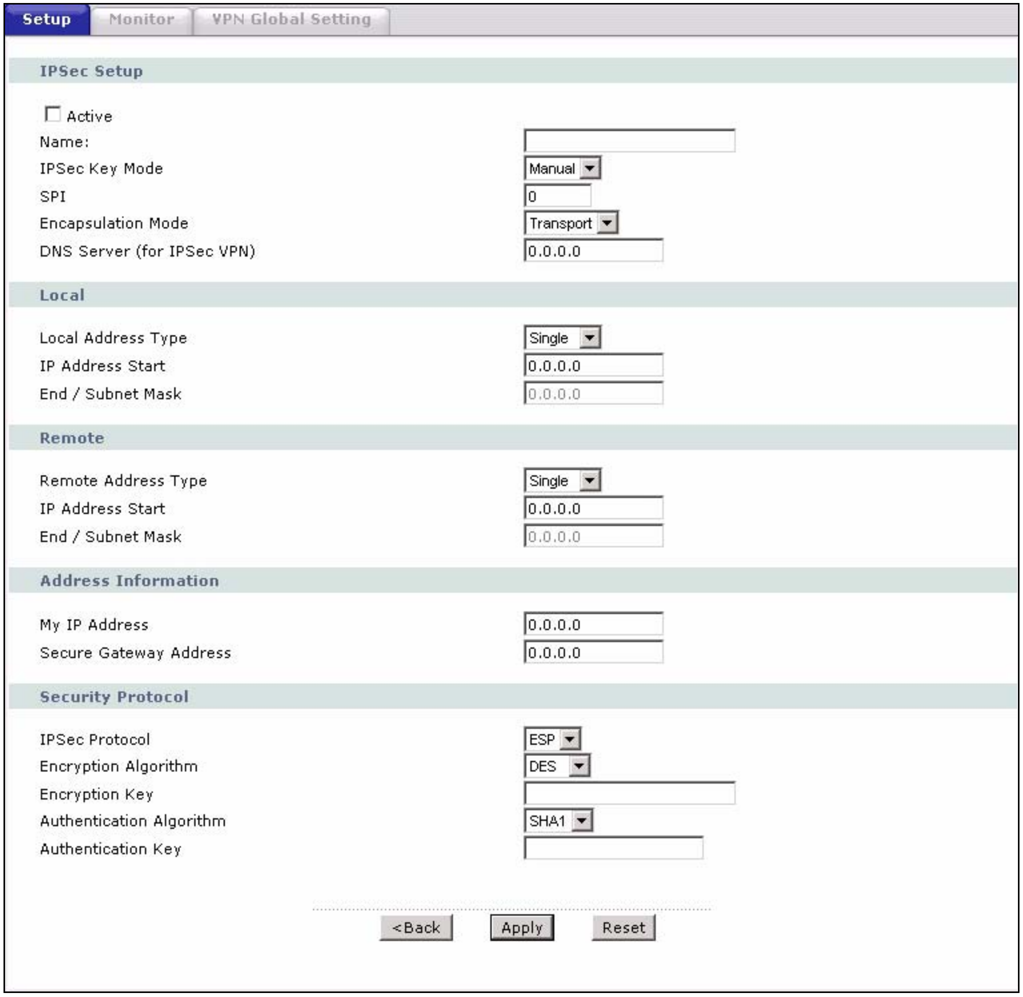
Table 52 VPN > Setup > Edit > Advanced (continued)

LABEL	DESCRIPTION
SA Life Time (Seconds)	Enter the length of time before the ZyXEL Device automatically renegotiates the IPSec SA. It may range from 60 to 3,000,000 seconds (almost 35 days). A low value increases security by forcing the two VPN gateways to update the encryption and authentication keys. However, every time the IPSec SA is renegotiated, all users accessing remote resources are temporarily disconnected.
Encapsulation	Select the encapsulation. Select **Tunnel**, unless the remote IPSec router only supports **Transport**. The ZyXEL Device and remote IPSec router must use the same encapsulation.
Perfect Forward Secrecy (PFS)	Select whether or not you want to enable Perfect Forward Secrecy (PFS) and, if so, which DH key group you want to use for the DH key exchange. The longer the key group, the stronger the encryption, but also the more processing is required. **NONE** disables PFS. This allows faster setup, but it is not as secure. **DH1** enables PFS and uses Diffie-Hellman Group 1, a 768-bit random number. **DH2** enables PFS and uses Diffie-Hellman Group 2, a 1024-bit random number.
Apply	Click **Apply** to save your changes back to the ZyXEL Device and return to the **VPN-IKE** screen.
Cancel	Click **Cancel** to return to the previous screen without saving your changes.

11.5 Configuring Manual Key

You only configure **VPN Manual Key** when you select **Manual** in the **IPSec Key Mode** field on the **VPN IKE** screen. This is the **VPN Manual Key** screen as shown next.

Figure 81 VPN > Setup > Edit > Manual



IPSec Setup

□ Active

Name:

IPSec Key Mode: Manual

SPI: 0

Encapsulation Mode: Transport

DNS Server (for IPSec VPN): 0.0.0.0

Local

Local Address Type: Single

IP Address Start: 0.0.0.0

End / Subnet Mask: 0.0.0.0

Remote

Remote Address Type: Single

IP Address Start: 0.0.0.0

End / Subnet Mask: 0.0.0.0

Address Information

My IP Address: 0.0.0.0

Secure Gateway Address: 0.0.0.0

Security Protocol

IPSec Protocol: ESP

Encryption Algorithm: DES

Encryption Key:

Authentication Algorithm: SHA1

Authentication Key:

The following table describes the fields in this screen.

Table 53 VPN > Setup > Edit > Manual

LABEL	DESCRIPTION
IPSec Setup	
Active	Select this check box to activate this VPN policy.
Name	Type up to 32 characters to identify this VPN policy. You may use any character, including spaces, but the ZyXEL Device drops trailing spaces.
IPSec Key Mode	Select **IKE** or **Manual** from the drop-down list box. **Manual** is a useful option for troubleshooting if you have problems using **IKE** key management.
SPI	Type a number (base 10) from 1 to 999999 for the Security Parameter Index.
Encapsulation Mode	Select **Tunnel** mode or **Transport** mode from the drop-down list box.
DNS Server (for IPSec VPN)	If there is a private DNS server that services the VPN, type its IP address here. The ZyXEL Device assigns this additional DNS server to the ZyXEL Device 's DHCP clients that have IP addresses in this IPSec rule's range of local addresses. A DNS server allows clients on the VPN to find other computers and servers on the VPN by their (private) domain names.

Table 53 VPN > Setup > Edit > Manual (continued)

LABEL	DESCRIPTION
Local	Local IP addresses must be static and correspond to the remote IPSec router's configured remote IP addresses. Two active SAs cannot have the local and remote IP address(es) both the same. Two active SAs can have the same local or remote IP address, but not both. You can configure multiple SAs between the same local and remote IP addresses, as long as only one is active at any time.
Local Address Type	Use the drop-down menu to choose **Single**, **Range**, or **Subnet**. Select **Single** for a single IP address. Select **Range** for a specific range of IP addresses. Select **Subnet** to specify IP addresses on a network by their subnet mask.
IP Address Start	When the **Local Address Type** field is configured to **Single**, enter a (static) IP address on the LAN behind your ZyXEL Device. When the **Local Address Type** field is configured to **Range**, enter the beginning (static) IP address, in a range of computers on your LAN behind your ZyXEL Device. When the **Local Address Type** field is configured to **Subnet**, this is a (static) IP address on the LAN behind your ZyXEL Device.
End / Subnet Mask	When the **Local Address Type** field is configured to **Single**, this field is N/A. When the **Local Address Type** field is configured to **Range**, enter the end (static) IP address, in a range of computers on the LAN behind your ZyXEL Device. When the **Local Address Type** field is configured to **Subnet**, this is a subnet mask on the LAN behind your ZyXEL Device.
Remote	Remote IP addresses must be static and correspond to the remote IPSec router's configured local IP addresses. Two active SAs cannot have the local and remote IP address(es) both the same. Two active SAs can have the same local or remote IP address, but not both. You can configure multiple SAs between the same local and remote IP addresses, as long as only one is active at any time.
Remote Address Type	Use the drop-down menu to choose **Single**, **Range**, or **Subnet**. Select **Single** with a single IP address. Select **Range** for a specific range of IP addresses. Select **Subnet** to specify IP addresses on a network by their subnet mask.
IP Address Start	When the **Remote Address Type** field is configured to Single, enter a (static) IP address on the network behind the remote IPSec router. When the **Remote Address Type** field is configured to **Range**, enter the beginning (static) IP address, in a range of computers on the network behind the remote IPSec router. When the **Remote Address Type** field is configured to **Subnet**, enter a (static) IP address on the network behind the remote IPSec router.
End / Subnet Mask	When the **Remote Address Type** field is configured to **Single**, this field is N/A. When the **Remote Address Type** field is configured to **Range**, enter the end (static) IP address, in a range of computers on the network behind the remote IPSec router. When the **Remote Address Type** field is configured to **Subnet**, enter a subnet mask on the network behind the remote IPSec router.
Address Information	
My IP Address	Enter the WAN IP address of your ZyXEL Device. The VPN tunnel has to be rebuilt if this IP address changes. The following applies if this field is configured as **0.0.0.0**: The ZyXEL Device uses the current ZyXEL Device WAN IP address (static or dynamic) to set up the VPN tunnel. If the WAN connection goes down, the ZyXEL Device uses the dial backup IP address for the VPN tunnel when using dial backup or the LAN IP address when using traffic redirect. See the chapter on WAN for details on dial backup and traffic redirect.
Secure Gateway Address	Type the WAN IP address or the URL (up to 31 characters) of the IPSec router with which you're making the VPN connection.

Table 53 VPN > Setup > Edit > Manual (continued)

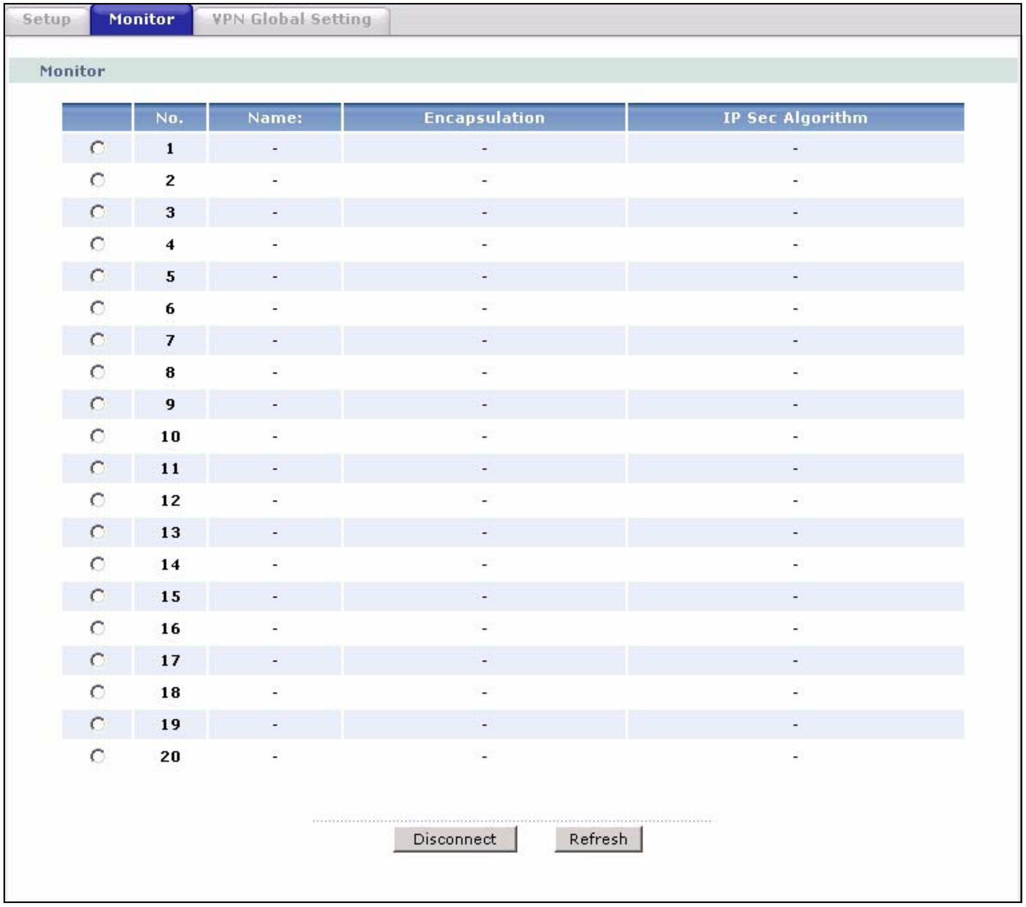
LABEL	DESCRIPTION
Security Protocol	
IPSec Protocol	Select **ESP** if you want to use ESP (Encapsulation Security Payload). The ESP protocol (RFC 2406) provides encryption as well as some of the services offered by **AH**. If you select ESP here, you must select options from the **Encryption Algorithm** and **Authentication Algorithm** fields (described next).
Encryption Algorithm	Select **DES**, **3DES** or **NULL** from the drop-down list box. When **DES** is used for data communications, both sender and receiver must know the same secret key, which can be used to encrypt and decrypt the message or to generate and verify a message authentication code. The **DES** encryption algorithm uses a 56-bit key. Triple DES (**3DES**) is a variation on **DES** that uses a 168-bit key. As a result, **3DES** is more secure than **DES**. It also requires more processing power, resulting in increased latency and decreased throughput. Select **NULL** to set up a tunnel without encryption. When you select **NULL**, you do not enter an encryption key.
Encryption Key	With **DES**, type a unique key 8 characters long. With **3DES**, type a unique key 24 characters long. Any characters may be used, including spaces, but trailing spaces are truncated.
Authentication Algorithm	Select **SHA1** or **MD5** from the drop-down list box. **MD5** (Message Digest 5) and **SHA1** (Secure Hash Algorithm) are hash algorithms used to authenticate packet data. The **SHA1** algorithm is generally considered stronger than **MD5**, but is slower. Select **MD5** for minimal security and **SHA1** for maximum security.
Authentication Key	Type a unique authentication key to be used by IPSec if applicable. Enter 16 characters for **MD5** authentication or 20 characters for **SHA1** authentication. Any characters may be used, including spaces, but trailing spaces are truncated.
Back	Click **Back** to return to the previous screen.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Reset	Click **Reset** to begin configuring this screen afresh.

11.6 Viewing SA Monitor

Click **Security**, **VPN** and **Monitor** to open the **SA Monitor** screen as shown. Use this screen to display and manage active VPN connections.

When there is outbound traffic but no inbound traffic, the SA times out automatically after two minutes. A tunnel with no outbound or inbound traffic is "idle" and does not timeout until the SA lifetime period expires. You can also configure the ZyXEL Device to renegotiate an IPSec SA when the SA lifetime expires, even if there is no traffic.

Figure 82 VPN > Monitor



	No.	Name:	Encapsulation	IP Sec Algorithm
○	1	-	-	-
○	2	-	-	-
○	3	-	-	-
○	4	-	-	-
○	5	-	-	-
○	6	-	-	-
○	7	-	-	-
○	8	-	-	-
○	9	-	-	-
○	10	-	-	-
○	11	-	-	-
○	12	-	-	-
○	13	-	-	-
○	14	-	-	-
○	15	-	-	-
○	16	-	-	-
○	17	-	-	-
○	18	-	-	-
○	19	-	-	-
○	20	-	-	-

The following table describes the fields in this screen.

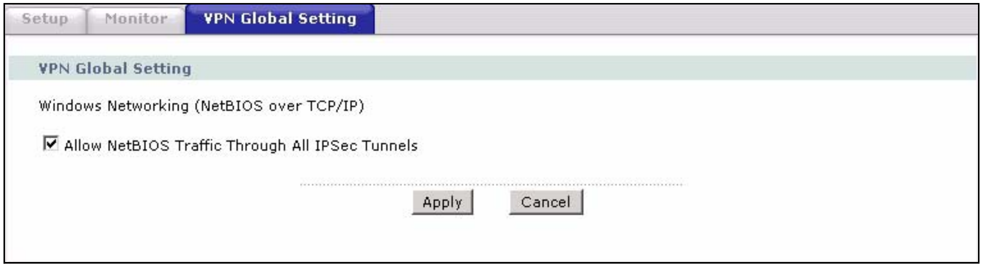
Table 54 VPN > Monitor

LABEL	DESCRIPTION
No	This is the security association index number.
Name	This field displays the identification name for this VPN policy.
Encapsulation	This field displays **Tunnel** or **Transport** mode.
IPSec Algorithm	This field displays the security protocol, encryption algorithm, and authentication algorithm used in each VPN tunnel.
Disconnect	Select one of the security associations, and then click **Disconnect** to stop that security association.
Refresh	Click **Refresh** to display the current active VPN connection(s).

11.7 Configuring Global Setting

Use this screen to change your ZyXEL Device’s global settings. Click **VPN** and then **VPN Global Setting**. The screen appears as shown.

Figure 83 VPN > VPN Global Setting



VPN Global Setting

Windows Networking (NetBIOS over TCP/IP)

☑ Allow NetBIOS Traffic Through All IPSec Tunnels

The following table describes the fields in this screen.

Table 55 VPN > VPN Global Setting

LABEL	DESCRIPTION
Windows Networking (NetBIOS over TCP/IP)	NetBIOS (Network Basic Input/Output System) are TCP or UDP packets that enable a computer to find other computers. It may sometimes be necessary to allow NetBIOS packets to pass through VPN tunnels in order to allow local computers to find computers on the remote network and vice versa.
Allow NetBIOS Traffic Through All IPSec Tunnels	Select this check box to send NetBIOS packets through the VPN connection.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

11.8 Telecommuter VPN/IPSec Examples

The following examples show how multiple telecommuters can make VPN connections to a single ZyXEL Device at headquarters. The telecommuters use IPSec routers with dynamic WAN IP addresses. The ZyXEL Device at headquarters has a static public IP address.

11.8.1 Telecommuters Sharing One VPN Rule Example

See the following figure and table for an example configuration that allows multiple telecommuters (A, B and C in the figure) to use one VPN rule to simultaneously access a ZyXEL Device at headquarters (HQ in the figure). The telecommuters do not have domain names mapped to the WAN IP addresses of their IPSec routers. The telecommuters must all use the same IPSec parameters but the local IP addresses (or ranges of addresses) should not overlap.

Figure 84 Telecommuters Sharing One VPN Rule Example

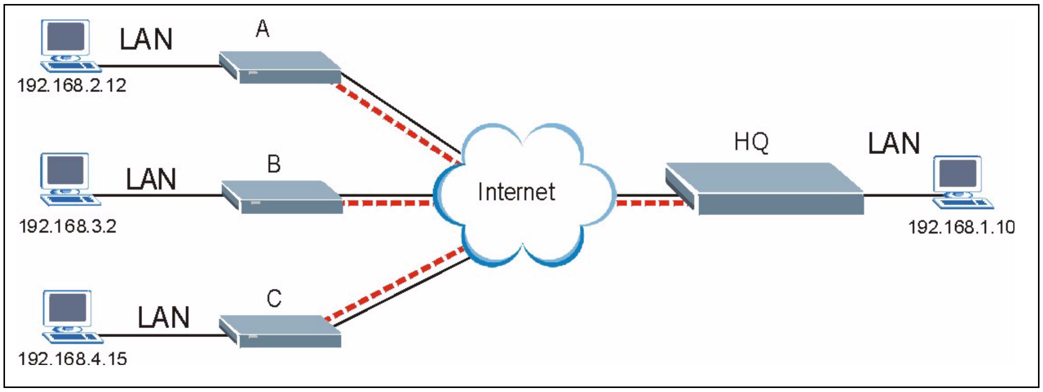


Table 56 Telecommuters Sharing One VPN Rule Example

FIELDS	TELECOMMUTERS	HEADQUARTERS
My IP Address:	0.0.0.0 (dynamic IP address assigned by the ISP)	Public static IP address
Secure Gateway IP Address:	Public static IP address	0.0.0.0 With this IP address only the telecommuter can initiate the IPSec tunnel.
Local IP Address:	Telecommuter A: 192.168.2.12 Telecommuter B: 192.168.3.2 Telecommuter C: 192.168.4.15	192.168.1.10
Remote IP Address:	192.168.1.10	0.0.0.0 (N/A)

11.8.2 Telecommuters Using Unique VPN Rules Example

In this example the telecommuters (A, B and C in the figure) use IPSec routers with domain names that are mapped to their dynamic WAN IP addresses (use Dynamic DNS to do this).

With aggressive negotiation mode (see Section 11.1.2.1 on page 159), the ZyXEL Device can use the ID types and contents to distinguish between VPN rules. Telecommuters can each use a separate VPN rule to simultaneously access a ZyXEL Device at headquarters. They can use different IPSec parameters. The local IP addresses (or ranges of addresses) of the rules configured on the ZyXEL Device at headquarters can overlap. The local IP addresses of the rules configured on the telecommuters’ IPSec routers should not overlap.

See the following table and figure for an example where three telecommuters each use a different VPN rule for a VPN connection with a ZyXEL Device located at headquarters. The ZyXEL Device at headquarters (HQ in the figure) identifies each incoming SA by its ID type and content and uses the appropriate VPN rule to establish the VPN connection.

The ZyXEL Device at headquarters can also initiate VPN connections to the telecommuters since it can find the telecommuters by resolving their domain names.

Figure 85 Telecommuters Using Unique VPN Rules Example

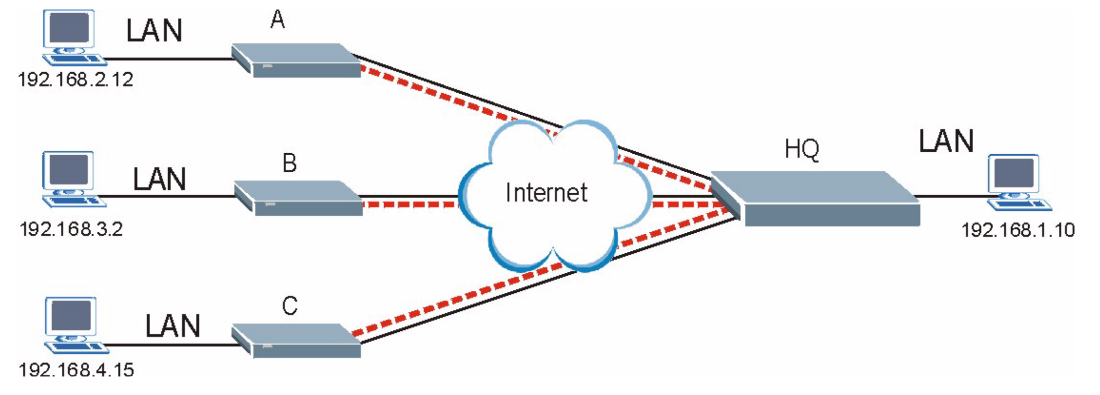


Table 57 Telecommuters Using Unique VPN Rules Example

TELECOMMUTERS	HEADQUARTERS
All Telecommuter Rules:	All Headquarters Rules:
My IP Address 0.0.0.0	My IP Address: bigcompanyhq.com
Secure Gateway Address: bigcompanyhq.com	Local IP Address: 192.168.1.10
Remote IP Address: 192.168.1.10	Local ID Type: E-mail
Peer ID Type: E-mail	Local ID Content: bob@bigcompanyhq.com
Peer ID Content: bob@bigcompanyhq.com	
Telecommuter A (telecommutera.dydns.org)	Headquarters ZyXEL Device Rule 1:
Local ID Type: IP	Peer ID Type: IP
Local ID Content: 192.168.2.12	Peer ID Content: 192.168.2.12
Local IP Address: 192.168.2.12	Secure Gateway Address: telecommuter1.com
	Remote Address 192.168.2.12
Telecommuter B (telecommuterb.dydns.org)	Headquarters ZyXEL Device Rule 2:
Local ID Type: DNS	Peer ID Type: DNS
Local ID Content: telecommuterb.com	Peer ID Content: telecommuterb.com
Local IP Address: 192.168.3.2	Secure Gateway Address: telecommuterb.com
	Remote Address 192.168.3.2
Telecommuter C (telecommuterc.dydns.org)	Headquarters ZyXEL Device Rule 3:
Local ID Type: E-mail	Peer ID Type: E-mail
Local ID Content: myVPN@myplace.com	Peer ID Content: myVPN@myplace.com
Local IP Address: 192.168.4.15	Secure Gateway Address: telecommuterc.com
	Remote Address 192.168.4.15

11.9 VPN and Remote Management

If a VPN tunnel uses Telnet, FTP, WWW, then you should configure remote management (**Remote Management**) to allow access for that service.

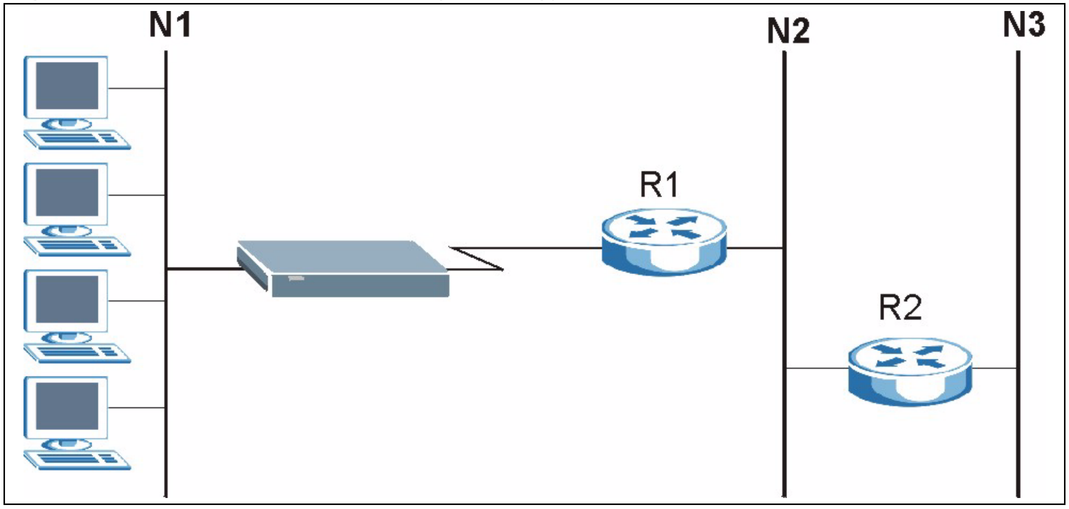
CHAPTER 12
Static Route

This chapter shows you how to configure static routes for your ZyXEL Device.

12.1 Static Route

Each remote node specifies only the network to which the gateway is directly connected, and the ZyXEL Device has no knowledge of the networks beyond. For instance, the ZyXEL Device knows about network N2 in the following figure through remote node Router 1. However, the ZyXEL Device is unable to route a packet to network N3 because it doesn't know that there is a route through the same remote node Router 1 (via gateway Router 2). The static routes are for you to tell the ZyXEL Device about the networks beyond the remote nodes.

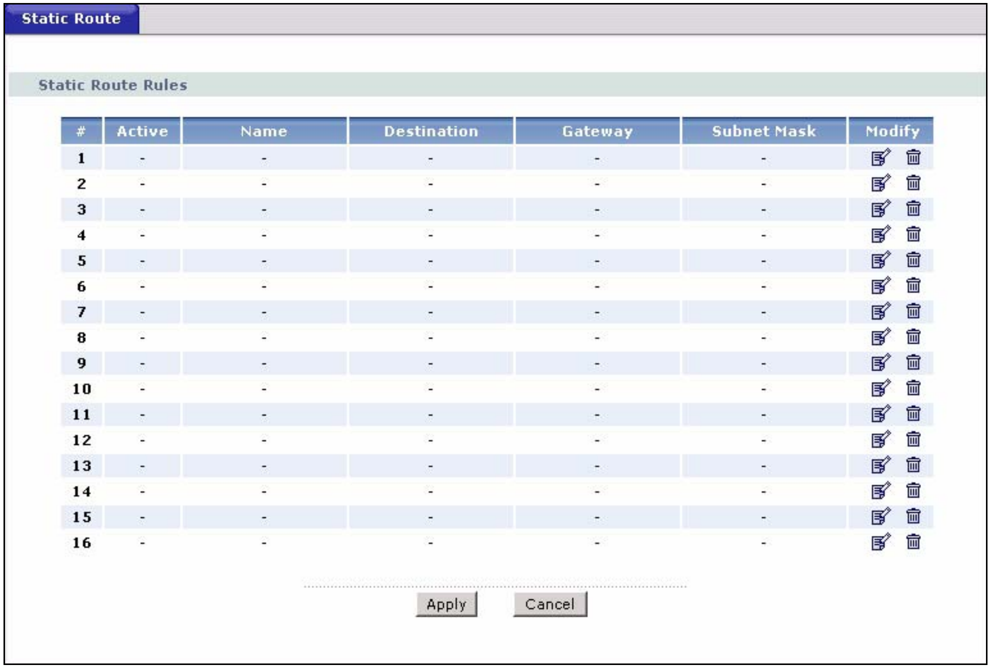
Figure 86 Example of Static Routing Topology



12.2 Configuring Static Route

Use this screen to look at static routes in the ZyXEL Device. Click **Advanced** > **Static Route** to open the **Static Route** screen.

Figure 87 Static Route > Static Route



#	Active	Name	Destination	Gateway	Subnet Mask	Modify
1	-	-	-	-	-	✎ 🗑
2	-	-	-	-	-	✎ 🗑
3	-	-	-	-	-	✎ 🗑
4	-	-	-	-	-	✎ 🗑
5	-	-	-	-	-	✎ 🗑
6	-	-	-	-	-	✎ 🗑
7	-	-	-	-	-	✎ 🗑
8	-	-	-	-	-	✎ 🗑
9	-	-	-	-	-	✎ 🗑
10	-	-	-	-	-	✎ 🗑
11	-	-	-	-	-	✎ 🗑
12	-	-	-	-	-	✎ 🗑
13	-	-	-	-	-	✎ 🗑
14	-	-	-	-	-	✎ 🗑
15	-	-	-	-	-	✎ 🗑
16	-	-	-	-	-	✎ 🗑

The following table describes the labels in this screen.

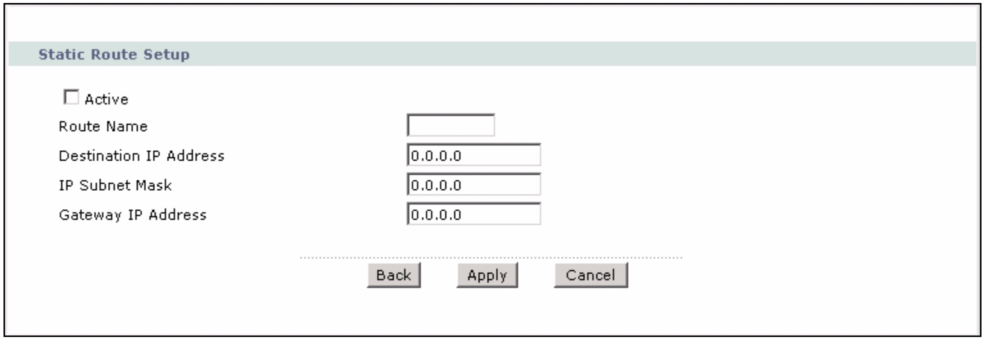
Table 58 Static Route > Static Route

LABEL	DESCRIPTION
#	This is the number of an individual static route.
Active	This field shows whether this static route is active (**Yes**) or not (**No**).
Name	This is the name that describes or identifies this route.
Destination	This parameter specifies the IP network address of the final destination. Routing is always based on network number.
Gateway	This is the IP address of the gateway. The gateway is a router or switch on the same network segment as the device's LAN or WAN port. The gateway helps forward packets to their destinations.
Subnet Mask	This is the subnet mask of the static route.
Modify	Click the edit icon to go to the screen where you can set up a static route on the ZyXEL Device. Click the delete icon to remove a static route from the ZyXEL Device. A window displays asking you to confirm that you want to delete the route.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

12.2.1 Static Route Edit

Select a static route index number and click **Edit**. The screen shown next appears. Use this screen to configure the required information for a static route.

Figure 88 Static Route > Static Route > Edit



Static Route Setup

□ Active

Route Name	
Destination IP Address	0.0.0.0
IP Subnet Mask	0.0.0.0
Gateway IP Address	0.0.0.0

The following table describes the labels in this screen.

Table 59 Static Route > Static Route > Edit

LABEL	DESCRIPTION
Active	This field allows you to activate/deactivate this static route.
Route Name	Enter the name of the IP static route. Leave this field blank to delete this static route.
Destination IP Address	This parameter specifies the IP network address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.
IP Subnet Mask	Enter the IP subnet mask here.
Gateway IP Address	Enter the IP address of the gateway. The gateway is a router or switch on the same network segment as the device's LAN or WAN port. The gateway helps forward packets to their destinations.
Back	Click **Back** to return to the previous screen without saving.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 13
Bandwidth Management

This chapter contains information about configuring bandwidth management, editing rules and viewing the ZyXEL Device's bandwidth management logs.

13.1 Bandwidth Management Overview

ZyXEL's Bandwidth Management allows you to specify bandwidth management rules based on an application and/or subnet. You can allocate specific amounts of bandwidth capacity (bandwidth budgets) to different bandwidth rules.

The ZyXEL Device applies bandwidth management to traffic that it forwards out through an interface. The ZyXEL Device does not control the bandwidth of traffic that comes into an interface.

Bandwidth management applies to all traffic flowing out of the router, regardless of the traffic's source.

Traffic redirect or IP alias may cause LAN-to-LAN traffic to pass through the ZyXEL Device and be managed by bandwidth management.

The sum of the bandwidth allotments that apply to any interface must be less than or equal to the speed allocated to that interface in the Bandwidth Management Summary screen.

13.2 Application-based Bandwidth Management

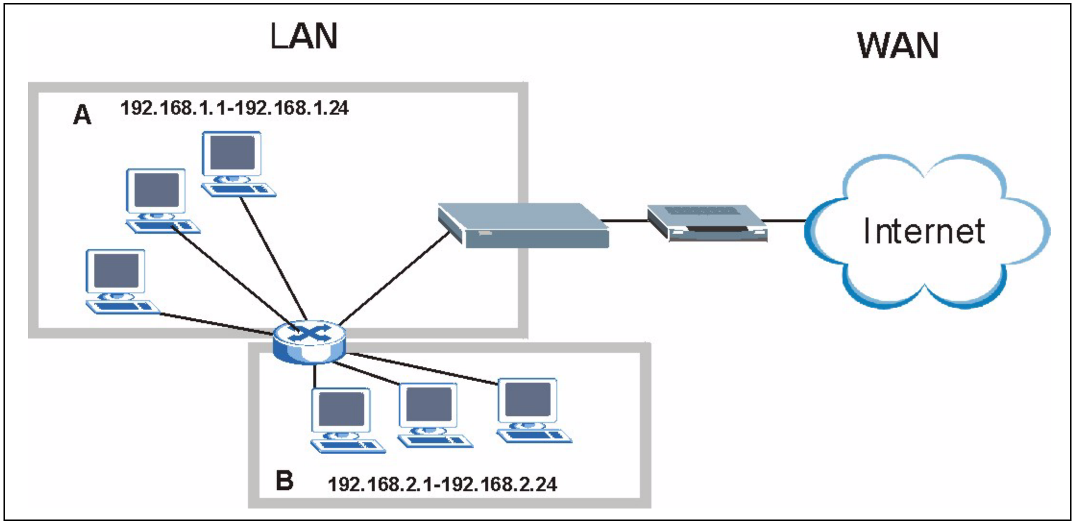
You can create bandwidth classes based on individual applications (like VoIP, Web, FTP, E-mail and Video for example).

13.3 Subnet-based Bandwidth Management

You can create bandwidth classes based on subnets.

The following figure shows LAN subnets. You could configure one bandwidth class for subnet **A** and another for subnet **B**.

Figure 89 Subnet-based Bandwidth Management Example



13.4 Application and Subnet-based Bandwidth Management

You could also create bandwidth classes based on a combination of a subnet and an application. The following example table shows bandwidth allocations for application specific traffic from separate LAN subnets.

Table 60 Application and Subnet-based Bandwidth Management Example

TRAFFIC TYPE	FROM SUBNET A	FROM SUBNET B
VoIP	64 Kbps	64 Kbps
Web	64 Kbps	64 Kbps
FTP	64 Kbps	64 Kbps
E-mail	64 Kbps	64 Kbps
Video	64 Kbps	64 Kbps

13.5 Scheduler

The scheduler divides up an interface's bandwidth among the bandwidth classes. The ZyXEL Device has two types of scheduler: fairness-based and priority-based.

13.5.1 Priority-based Scheduler

With the priority-based scheduler, the ZyXEL Device forwards traffic from bandwidth classes according to the priorities that you assign to the bandwidth classes. The larger a bandwidth class's priority number is, the higher the priority. Assign real-time applications (like those using audio or video) a higher priority number to provide smoother operation.

13.5.2 Fairness-based Scheduler

The ZyXEL Device divides bandwidth equally among bandwidth classes when using the fairness-based scheduler; thus preventing one bandwidth class from using all of the interface’s bandwidth.

13.6 Maximize Bandwidth Usage

The maximize bandwidth usage option (see Figure 90 on page 192) allows the ZyXEL Device to divide up any available bandwidth on the interface (including unallocated bandwidth and any allocated bandwidth that a class is not using) among the bandwidth classes that require more bandwidth.

When you enable maximize bandwidth usage, the ZyXEL Device first makes sure that each bandwidth class gets up to its bandwidth allotment. Next, the ZyXEL Device divides up an interface’s available bandwidth (bandwidth that is unbudgeted or unused by the classes) depending on how many bandwidth classes require more bandwidth and on their priority levels. When only one class requires more bandwidth, the ZyXEL Device gives extra bandwidth to that class.

When multiple classes require more bandwidth, the ZyXEL Device gives the highest priority classes the available bandwidth first (as much as they require, if there is enough available bandwidth), and then to lower priority classes if there is still bandwidth available. The ZyXEL Device distributes the available bandwidth equally among classes with the same priority level.

13.6.1 Reserving Bandwidth for Non-Bandwidth Class Traffic

Do the following three steps to configure the ZyXEL Device to allow bandwidth for traffic that is not defined in a bandwidth filter.

1 Leave some of the interface’s bandwidth unbudgeted.

2 Do not enable the interface’s **Maximize Bandwidth Usage** option.

3 Do not enable bandwidth borrowing on the child-classes that have the root class as their parent (see Section 13.8 on page 193).

13.6.2 Maximize Bandwidth Usage Example

Here is an example of a ZyXEL Device that has maximize bandwidth usage enabled on an interface. The following table shows each bandwidth class's bandwidth budget. The classes are set up based on subnets. The interface is set to 10240 kbps. Each subnet is allocated 2048 kbps. The unbudgeted 2048 kbps allows traffic not defined in any of the bandwidth filters to go out when you do not select the maximize bandwidth option.

Table 61 Maximize Bandwidth Usage Example

BANDWIDTH CLASSES AND ALLOTMENTS	
Root Class: 10240 kbps	Administration: 2048 kbps
	Sales: 2048 kbps
	Marketing: 2048 kbps
	Research: 2048 kbps

The ZyXEL Device divides up the unbudgeted 2048 kbps among the classes that require more bandwidth. If the administration department only uses 1024 kbps of the budgeted 2048 kbps, the ZyXEL Device also divides the remaining 1024 kbps among the classes that require more bandwidth. Therefore, the ZyXEL Device divides a total of 3072 kbps of unbudgeted and unused bandwidth among the classes that require more bandwidth.

13.6.2.1 Priority-based Allotment of Unused and Unbudgeted Bandwidth

The following table shows the priorities of the bandwidth classes and the amount of bandwidth that each class gets.

Table 62 Priority-based Allotment of Unused and Unbudgeted Bandwidth Example

BANDWIDTH CLASSES, PRIORITIES AND ALLOTMENTS	
Root Class: 10240 kbps	Administration: Priority 4, 1024 kbps
	Sales: Priority 6, 3584 kbps
	Marketing: Priority 6, 3584 kbps
	Research: Priority 5, 2048 kbps

Suppose that all of the classes except for the administration class need more bandwidth.

- Each class gets up to its budgeted bandwidth. The administration class only uses 1024 kbps of its budgeted 2048 kbps.
- The sales and marketing are first to get extra bandwidth because they have the highest priority (6). If they each require 1536 kbps or more of extra bandwidth, the ZyXEL Device divides the total 3072 kbps total of unbudgeted and unused bandwidth equally between the sales and marketing departments (1536 kbps extra to each for a total of 3584 kbps for each) because they both have the highest priority level.

- Research requires more bandwidth but only gets its budgeted 2048 kbps because all of the unbudgeted and unused bandwidth goes to the higher priority sales and marketing classes.

13.6.2.2 Fairness-based Allotment of Unused and Unbudgeted Bandwidth

The following table shows the amount of bandwidth that each class gets.

Table 63 Fairness-based Allotment of Unused and Unbudgeted Bandwidth Example

BANDWIDTH CLASSES AND ALLOTMENTS	
Root Class: 10240 kbps	Administration: 1024 kbps
	Sales: 3072 kbps
	Marketing: 3072 kbps
	Research: 3072 kbps

Suppose that all of the classes except for the administration class need more bandwidth.

- Each class gets up to its budgeted bandwidth. The administration class only uses 1024 kbps of its budgeted 2048 kbps.
- The ZyXEL Device divides the total 3072 kbps total of unbudgeted and unused bandwidth equally among the other classes. 1024 kbps extra goes to each so the other classes each get a total of 3072 kbps.

13.6.3 Over Allotment of Bandwidth

You can set the bandwidth management speed for an interface higher than the interface's actual transmission speed. Higher priority traffic gets to use up to its allocated bandwidth, even if it takes up all of the interface's available bandwidth. This could stop lower priority traffic from being sent. The following is an example.

Table 64 Over Allotment of Bandwidth Example

BANDWIDTH CLASSES, ALLOTMENTS		PRIORITIES
Actual outgoing bandwidth available on the interface: 1000 kbps		
Root Class: 1500 kbps (same as Speed setting)	VoIP traffic (Service = SIP): 500 Kbps	High
	NetMeeting traffic (Service = H.323): 500 kbps	High
	FTP (Service = FTP): 500 Kbps	Medium

If you use VoIP and NetMeeting at the same time, the device allocates up to 500 Kbps of bandwidth to each of them before it allocates any bandwidth to FTP. As a result, FTP can only use bandwidth when VoIP and NetMeeting do not use all of their allocated bandwidth.

Suppose you try to browse the web too. In this case, VoIP, NetMeeting and FTP all have higher priority, so they get to use the bandwidth first. You can only browse the web when VoIP, NetMeeting, and FTP do not use all 1000 Kbps of available bandwidth.

13.6.4 Bandwidth Management Priorities

The following table describes the priorities that you can apply to traffic that the ZyXEL Device forwards out through an interface.

Table 65 Bandwidth Management Priorities

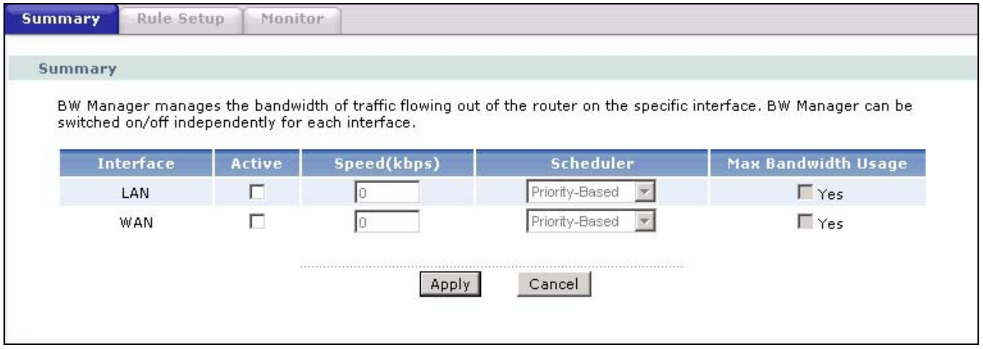
PRIORITY LEVELS: TRAFFIC WITH A HIGHER PRIORITY GETS THROUGH FASTER WHILE TRAFFIC WITH A LOWER PRIORITY IS DROPPED IF THE NETWORK IS CONGESTED.	
High	Typically used for voice traffic or video that is especially sensitive to jitter (jitter is the variations in delay).
Mid	Typically used for “excellent effort” or better than best effort and would include important business traffic that can tolerate some delay.
Low	This is typically used for non-critical “background” traffic such as bulk transfers that are allowed but that should not affect other applications and users.

13.7 Configuring Summary

Click **Advanced** > **Bandwidth MGMT** to open the screen as shown next.

Enable bandwidth management on an interface and set the maximum allowed bandwidth for that interface.

Figure 90 Bandwidth MGMT > Summary



Summary

BW Manager manages the bandwidth of traffic flowing out of the router on the specific interface. BW Manager can be switched on/off independently for each interface.

Interface	Active	Speed(kbps)	Scheduler	Max Bandwidth Usage
LAN	□	0	Priority-Based	□ Yes
WAN	□	0	Priority-Based	□ Yes

The following table describes the labels in this screen.

Table 66 Bandwidth MGMT > Summary

LABEL	DESCRIPTION
Interface	These read-only labels represent the physical interfaces. Select an interface’s check box to enable bandwidth management on that interface. Bandwidth management applies to all traffic flowing out of the router through the interface, regardless of the traffic’s source. Traffic redirect or IP alias may cause LAN-to-LAN traffic to pass through the ZyXEL Device and be managed by bandwidth management.
Active	Select an interface’s check box to enable bandwidth management on that interface.

Table 66 Bandwidth MGMT > Summary (continued)

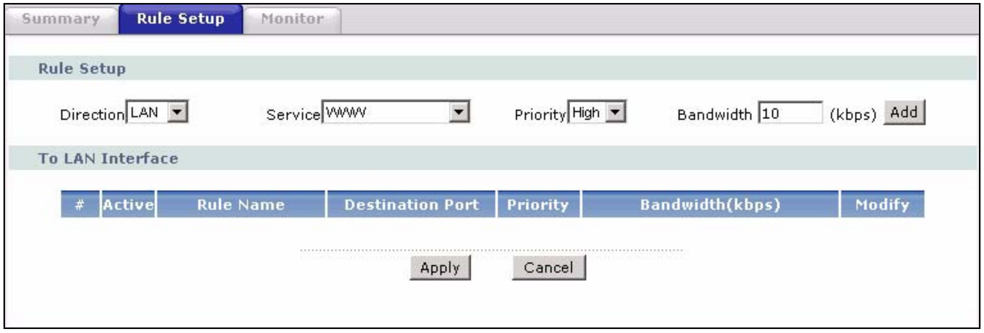
LABEL	DESCRIPTION
Speed (kbps)	Enter the amount of bandwidth for this interface that you want to allocate using bandwidth management. This appears as the bandwidth budget of the interface’s root class. The recommendation is to set this speed to match the interface’s actual transmission speed. For example, set the WAN interface speed to 1000 kbps if your Internet connection has an upstream transmission speed of 1 Mbps. If this number is higher than the interface’s actual transmission speed, and you configure bandwidth rules for all of the bandwidth, higher priority traffic could use all of the bandwidth so lower priority traffic does not get through. **Note:** Unless you enable **Max Bandwidth Usage**, the ZyXEL Device only uses up to the amount of bandwidth that you configure here. The ZyXEL Device does not use any more bandwidth for the interface’s connections, even if the interface has more outgoing bandwidth.
Scheduler	Select either **Priority-Based** or **Fairness-Based** from the drop-down menu to control the traffic flow. Select **Priority-Based** to give preference to bandwidth classes with higher priorities. Select **Fairness-Based** to treat all bandwidth classes equally.
Max Bandwidth Usage	Select this check box to have the ZyXEL Device divide up all of the interface’s unallocated and/or unused bandwidth among the bandwidth classes that require bandwidth. Do not select this if you want to reserve bandwidth for traffic that does not match a bandwidth class or you want to limit the speed of this interface (see the **Speed** field description).
Apply	Click **Apply** to save your settings back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

13.8 Bandwidth Management Rule Setup

See Section 13.1 on page 187 for background information. You must use the **Bandwidth Management Summary** screen to enable bandwidth management on an interface before you can configure rules for that interface.

Click **Advanced** > **Bandwidth MGMT** > **Rule Setup** to open the following screen.

Figure 91 Bandwidth MGMT > Rule Setup



Rule Setup

Direction LAN ▾ Service WWW ▾ Priority High ▾ Bandwidth 10 (kbps) Add

To LAN Interface

#	Active	Rule Name	Destination Port	Priority	Bandwidth(kbps)	Modify

The following table describes the labels in this screen.

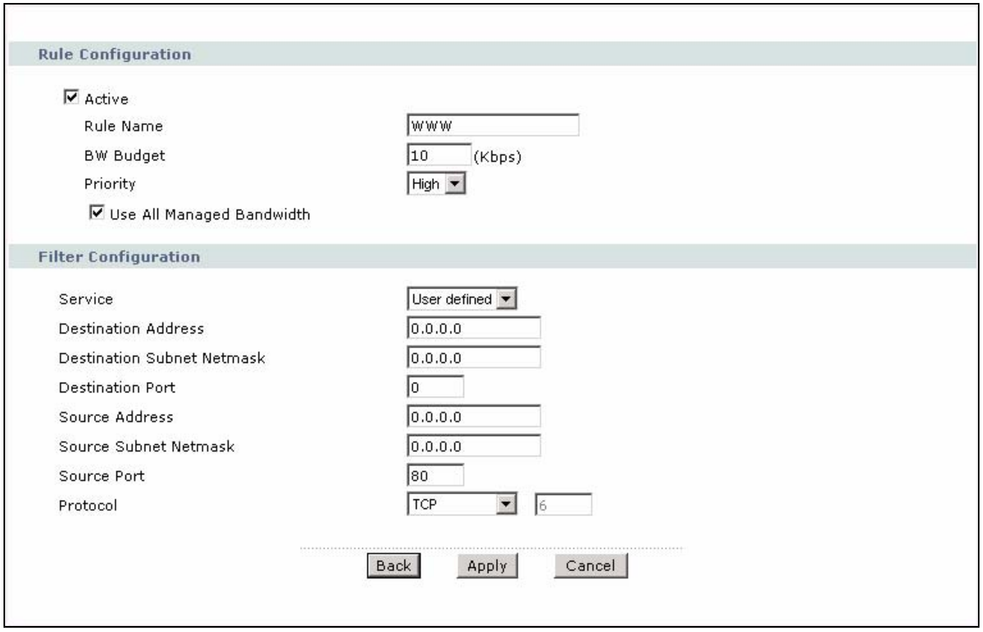
Table 67 Bandwidth MGMT > Rule Setup

LABEL	DESCRIPTION
Rule Setup	
Direction	Select the direction of traffic to which you want to apply bandwidth management.
Service	Select a service for your rule or you can select **User define** to go to the screen where you can define your own.
Priority	Select a priority from the drop down list box. Choose **High**, **Mid** or **Low**.
Bandwidth	Specify the maximum bandwidth allowed for the rule in kbps. The recommendation is a setting between 20 kbps and 20000 kbps for an individual rule.
Add	Click this button to add a rule to the following table.
To Interface	
#	This is the number of an individual bandwidth management rule.
Active	This displays whether the rule is enabled. Select this check box to have the ZyXEL Device apply this bandwidth management rule. Enable a bandwidth management rule to give traffic that matches the rule priority over traffic that does not match the rule. Enabling a bandwidth management rule also allows you to control the maximum amounts of bandwidth that can be used by traffic that matches the rule.
Rule Name	This is the name of the rule.
Destination Port	This is the port number of the destination. 0 means any destination port.
Priority	This is the priority of this rule.
Bandwidth (kbps)	This is the maximum bandwidth allowed for the rule in kbps.
Modify	Click the **Edit** icon to go to the screen where you can edit the rule. Click the **Remove** icon to delete an existing rule.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

13.8.1 Rule Configuration

See Section 13.1 on page 187 for background information. Use this screen to configure a bandwidth management rule. Use bandwidth rules to allocate specific amounts of bandwidth capacity (bandwidth budgets) to specific applications and/or subnets. To open this screen, click the Edit icon or select **User define** in the **Service** field

Figure 92 Bandwidth MGMT > Rule Setup > Add/Edit



Rule Configuration

☑ Active

Rule Name: WWW

BW Budget: 10 (Kbps)

Priority: High

☑ Use All Managed Bandwidth

Filter Configuration

Service: User defined

Destination Address: 0.0.0.0

Destination Subnet Netmask: 0.0.0.0

Destination Port: 0

Source Address: 0.0.0.0

Source Subnet Netmask: 0.0.0.0

Source Port: 80

Protocol: TCP 6

The following table describes the labels in this screen.

Table 68 Bandwidth MGMT > Rule Setup > Add/Edit

LABEL	DESCRIPTION
Rule Configuration	
Active	Select this check box to have the ZyXEL Device apply this bandwidth management rule. Enable a bandwidth management rule to give traffic that matches the rule priority over traffic that does not match the rule. Enabling a bandwidth management rule also allows you to control the maximum amounts of bandwidth that can be used by traffic that matches the rule.
Rule Name	Use the auto-generated name or enter a descriptive name of up to 20 alphanumeric characters, including spaces.
BW Budget	Specify the maximum bandwidth allowed for the rule in kbps. The recommendation is a setting between 20 kbps and 20000 kbps for an individual rule.
Priority	Select a priority from the drop down list box. Choose **High**, **Mid** or **Low**.
Use All Managed Bandwidth	Select this option to allow a rule to borrow unused bandwidth on the interface. Bandwidth borrowing is governed by the priority of the rules. That is, a rule with the highest priority is the first to borrow bandwidth. Do not select this if you want to leave bandwidth available for other traffic types or if you want to restrict the amount of bandwidth that can be used for the traffic that matches this rule.
Filter Configuration	

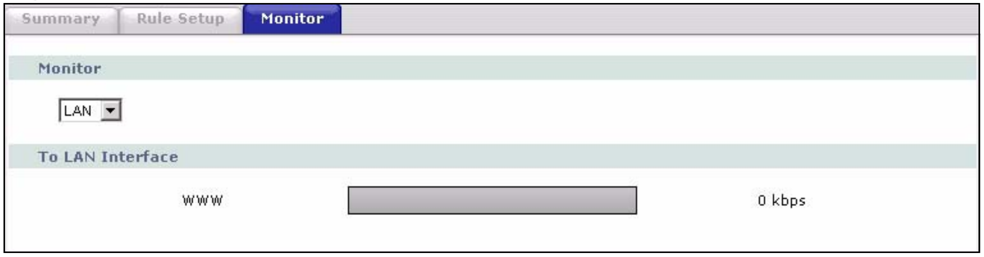
Table 68 Bandwidth MGMT > Rule Setup > Add/Edit (continued)

LABEL	DESCRIPTION
Service	This field simplifies bandwidth class configuration by allowing you to select a predefined application. When you select a predefined application, you do not configure the rest of the bandwidth filter fields (other than enabling or disabling the filter). SIP (Session Initiation Protocol) is a signaling protocol used in Internet telephony, instant messaging and other VoIP (Voice over IP) applications. Select **SIP** from the drop-down list box to configure this bandwidth filter for traffic that uses SIP. File Transfer Protocol (FTP) is an Internet file transfer service that operates on the Internet and over TCP/IP networks. A system running the FTP server accepts commands from a system running an FTP client. The service allows users to send commands to the server for uploading and downloading files. Select **FTP** from the drop-down list box to configure this bandwidth filter for FTP traffic. H.323 is a standard teleconferencing protocol suite that provides audio, data and videoconferencing. It allows for real-time point-to-point and multipoint communication between client computers over a packet-based network that does not provide a guaranteed quality of service. Select **H.323** from the drop-down list box to configure this bandwidth filter for traffic that uses H.323. Select **User defined** from the drop-down list box if you do not want to use a predefined application for the bandwidth class. When you select **User defined**, you need to configure at least one of the following fields (other than the **Subnet Mask** fields which you only enter if you also enter a corresponding destination or source IP address).
Destination Address	Enter the destination IP address in dotted decimal notation.
Destination Subnet Netmask	Enter the destination subnet mask. This field is N/A if you do not specify a **Destination Address**. Refer to the appendices for more information on IP subnetting.
Destination Port	Enter the port number of the destination. See Appendix E on page 389 for some common services and port numbers. A blank destination IP address means any destination IP address.
Source Address	Enter the source IP address in dotted decimal notation. A blank source IP address means any source IP address.
Source Subnet Netmask	Enter the destination subnet mask. This field is N/A if you do not specify a **Source Address**. Refer to the appendices for more information on IP subnetting. A blank source port means any source port number.
Source Port	Enter the port number of the source. See Appendix E on page 389 for some common services and port numbers.
Protocol	Select the protocol (**TCP** or **UDP**) or select **User defined** and enter the protocol (service type) number. ID 0 means any protocol number.
Back	Click **Back** to go to the previous screen.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

13.9 Bandwidth Monitor

See Section 13.1 on page 187 for background information. Use this screen to view the ZyXEL Device’s bandwidth usage and allotments. Click **Advanced** > **Bandwidth MGMT** > **Monitor**. The screen appears as shown. Select an interface from the drop-down list box to view the bandwidth usage of its bandwidth rules.

Figure 93 Bandwidth MGMT > Monitor



CHAPTER 14
Dynamic DNS Setup

This chapter discusses how to configure your ZyXEL Device to use Dynamic DNS.

14.1 Dynamic DNS Overview

Dynamic DNS allows you to update your current dynamic IP address with one or many dynamic DNS services so that anyone can contact you (in NetMeeting, CU-SeeMe, etc.). You can also access your FTP server or Web site on your own computer using a domain name (for instance myhost.dhs.org, where myhost is a name of your choice) that will never change instead of using an IP address that changes each time you reconnect. Your friends or relatives will always be able to call you even if they don't know your IP address.

First of all, you need to have registered a dynamic DNS account with www.dyndns.org. This is for people with a dynamic IP from their ISP or DHCP server that would still like to have a domain name. The Dynamic DNS service provider will give you a password or key.

14.1.1 DYNDNS Wildcard

Enabling the wildcard feature for your host causes *.yourhost.dyndns.org to be aliased to the same IP address as yourhost.dyndns.org. This feature is useful if you want to be able to use, for example, www.yourhost.dyndns.org and still reach your hostname.

If you have a private WAN IP address, then you cannot use Dynamic DNS.

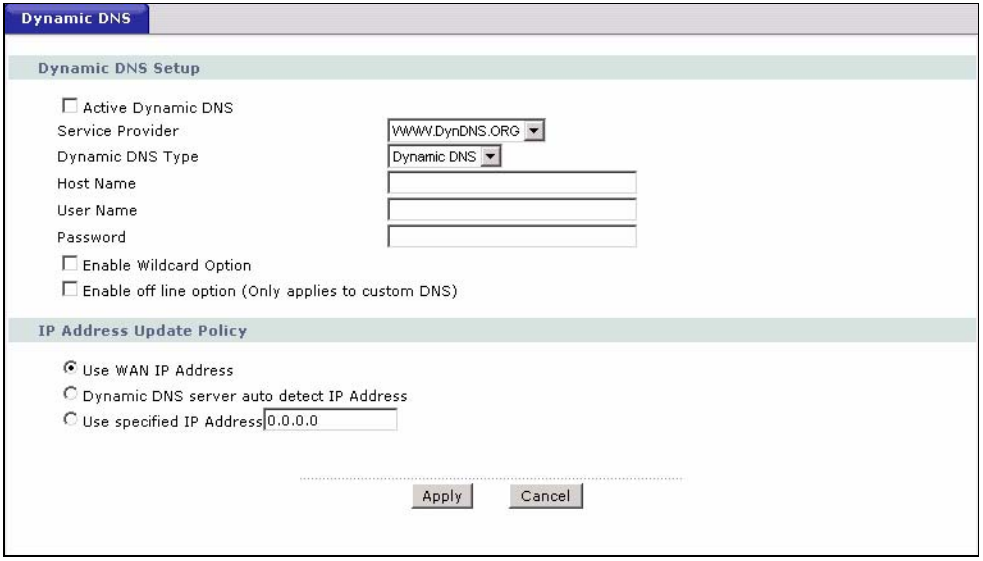
See Section 14.2 on page 199 for configuration instruction.

14.2 Configuring Dynamic DNS

Use this screen to change your ZyXEL Device's DDNS settings. Click **Advanced > Dynamic DNS**. The screen appears as shown.

See Section 14.1 on page 199 for more information.

Figure 94   Dynamic DNS > Dynamic DNS



Dynamic DNS Setup

☐ Active Dynamic DNS
Service Provider: WWW.DynDNS.ORG
Dynamic DNS Type: Dynamic DNS
Host Name:
User Name:
Password:
☐ Enable Wildcard Option
☐ Enable off line option (Only applies to custom DNS)

IP Address Update Policy

● Use WAN IP Address
○ Dynamic DNS server auto detect IP Address
○ Use specified IP Address: 0.0.0.0

The following table describes the fields in this screen.

Table 69   Dynamic DNS > Dynamic DNS

LABEL	DESCRIPTION
Dynamic DNS Setup	
Active Dynamic DNS	Select this check box to use dynamic DNS.
Service Provider	This is the name of your Dynamic DNS service provider.
Dynamic DNS Type	Select the type of service that you are registered for from your Dynamic DNS service provider.
Host Name	Type the domain name assigned to your ZyXEL Device by your Dynamic DNS provider. You can specify up to two host names in the field separated by a comma (",").
User Name	Type your user name.
Password	Type the password assigned to you.
Enable Wildcard Option	Select the check box to enable DynDNS Wildcard.
Enable off line option	This option is available when **Custom DNS** is selected in the **DDNS Type** field. Check with your Dynamic DNS service provider to have traffic redirected to a URL (that you can specify) while you are off line.
IP Address Update Policy	
Use WAN IP Address	Select this option to update the IP address of the host name(s) to the WAN IP address.

Table 69 Dynamic DNS > Dynamic DNS (continued)

LABEL	DESCRIPTION
Dynamic DNS server auto detect IP Address	Select this option only when there are one or more NAT routers between the ZyXEL Device and the DDNS server. This feature has the DDNS server automatically detect and use the IP address of the NAT router that has a public IP address. **Note:** The DDNS server may not be able to detect the proper IP address if there is an HTTP proxy server between the ZyXEL Device and the DDNS server.
Use specified IP Address	Type the IP address of the host name(s). Use this if you have a static IP address.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 15 Remote Management Configuration

This chapter provides information on configuring remote management.

15.1 Remote Management Overview

Remote management allows you to determine which services/protocols can access which ZyXEL Device interface (if any) from which computers.

Note: When you configure remote management to allow management from the WAN, you still need to configure a firewall rule to allow access.

You may manage your ZyXEL Device from a remote location via:

- Internet (WAN only)
- ALL (LAN and WAN)
- LAN only,
- Neither (Disable).

Note: When you choose **WAN** only or **LAN & WAN**, you still need to configure a firewall rule to allow access.

To disable remote management of a service, select **Disable** in the corresponding **Access Status** field.

You may only have one remote management session running at a time. The ZyXEL Device automatically disconnects a remote management session of lower priority when another remote management session of higher priority starts. The priorities for the different types of remote management sessions are as follows.

1. Telnet
2. HTTP

15.1.1 Remote Management Limitations

Remote management over LAN or WAN will not work when:

- You have disabled that service in one of the remote management screens.

- The IP address in the **Secured Client IP** field does not match the client IP address. If it does not match, the ZyXEL Device will disconnect the session immediately.
- There is already another remote management session with an equal or higher priority running. You may only have one remote management session running at one time.
- There is a firewall rule that blocks it.

15.1.2 Remote Management and NAT

When NAT is enabled:

- Use the ZyXEL Device's WAN IP address when configuring from the WAN.
- Use the ZyXEL Device's LAN IP address when configuring from the LAN.

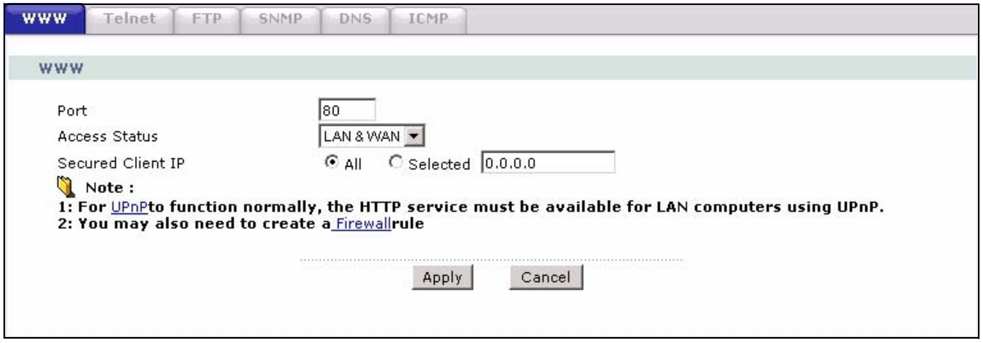
15.1.3 System Timeout

There is a system management idle timeout. The ZyXEL Device automatically logs you out if the management session remains idle for longer than this timeout period. The management session does not time out when a statistics screen is polling. The default value is five minutes, and you can change or disable this in Section 17.1.2 on page 227.

15.2 WWW

Use this screen to change your ZyXEL Device's World Wide Web settings. Click **Advanced > Remote MGMT** to display the **WWW** screen.

Figure 95 Remote MGMT > WWW



WWW

Port: 80

Access Status: LAN & WAN

Secured Client IP: ● All ○ Selected 0.0.0.0

Note :
1: For UPnPto function normally, the HTTP service must be available for LAN computers using UPnP.
2: You may also need to create a Firewallrule

The following table describes the labels in this screen.

Table 70 Remote MGMT > WWW

LABEL	DESCRIPTION
Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Access Status	Select the interface(s) through which a computer may access the ZyXEL Device using this service.

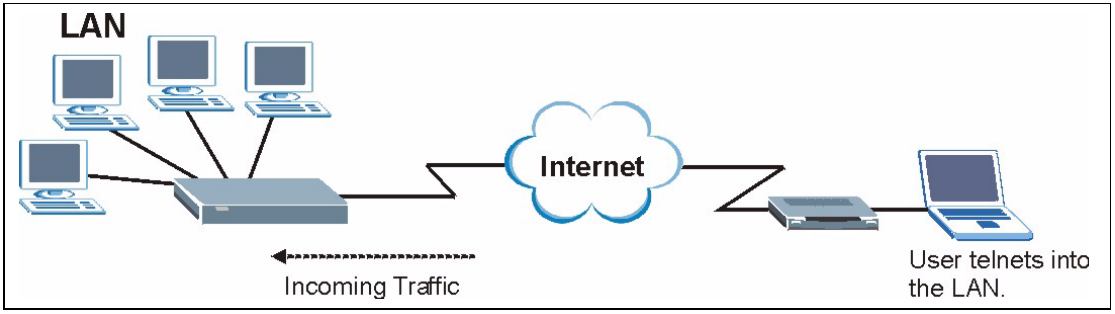
Table 70 Remote MGMT > WWW (continued)

LABEL	DESCRIPTION
Secured Client IP	A secured client is a "trusted" computer that is allowed to communicate with the ZyXEL Device using this service. Select **All** to allow any computer to access the ZyXEL Device using this service. Choose **Selected** to just allow the computer with the IP address that you specify to access the ZyXEL Device using this service.
Apply	Click **Apply** to save your settings back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

15.3 Telnet

You can configure your ZyXEL Device for remote Telnet access as shown next. The administrator uses Telnet from a computer on a remote network to access the ZyXEL Device.

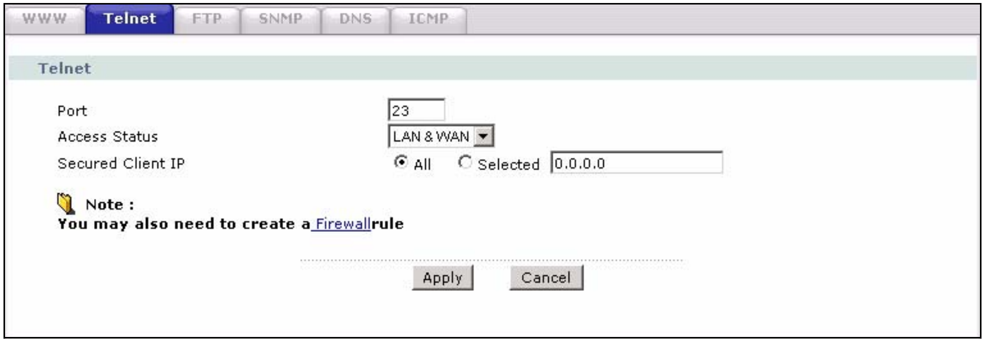
Figure 96 Telnet Configuration on a TCP/IP Network



15.4 Configuring Telnet

See Section 15.1 on page 203 for background information. Use this screen to configure Telnet access to the ZyXEL Device. Click **Advanced** > **Remote MGMT** > **Telnet** tab to display the screen as shown.

Figure 97 Remote MGMT > Telnet



Telnet

Port 23

Access Status LAN & WAN

Secured Client IP ● All ○ Selected 0.0.0.0

Note :
You may also need to create a Firewall rule

The following table describes the labels in this screen.

Table 71 Remote MGMT > Telnet

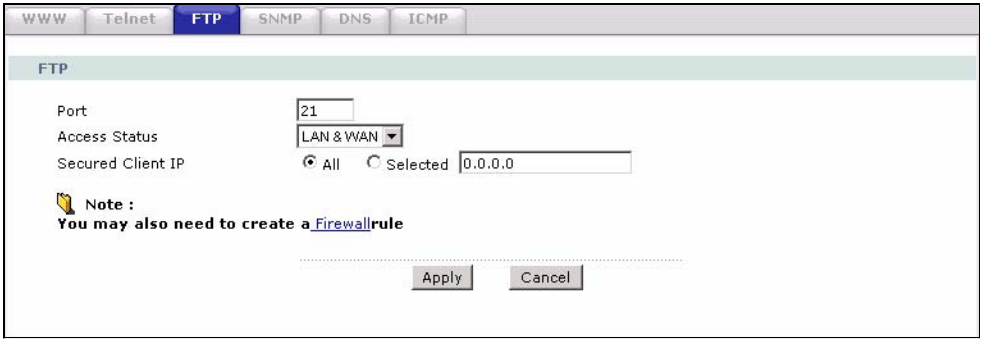
LABEL	DESCRIPTION
Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Access Status	Select the interface(s) through which a computer may access the ZyXEL Device using this service.
Secured Client IP	A secured client is a "trusted" computer that is allowed to communicate with the ZyXEL Device using this service. Select **All** to allow any computer to access the ZyXEL Device using this service. Choose **Selected** to just allow the computer with the IP address that you specify to access the ZyXEL Device using this service.
Apply	Click **Apply** to save your customized settings and exit this screen.
Cancel	Click **Cancel** to begin configuring this screen afresh.

15.5 Configuring FTP

You can upload and download the ZyXEL Device's firmware and configuration files using FTP, please see the chapter on firmware and configuration file maintenance for details. To use this feature, your computer must have an FTP client.

See Section 15.1 on page 203 for background information. Use this screen to control FTP access to the ZyXEL Device. To change your ZyXEL Device's FTP settings, click **Advanced > Remote MGMT** > **FTP** tab. The screen appears as shown.

Figure 98 Remote MGMT > FTP



Port 21
Access Status LAN & WAN
Secured Client IP ● All ○ Selected 0.0.0.0

Note :
You may also need to create a Firewall rule

The following table describes the labels in this screen.

Table 72 Remote MGMT > FTP

LABEL	DESCRIPTION
Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Access Status	Select the interface(s) through which a computer may access the ZyXEL Device using this service.

Table 72 Remote MGMT > FTP (continued)

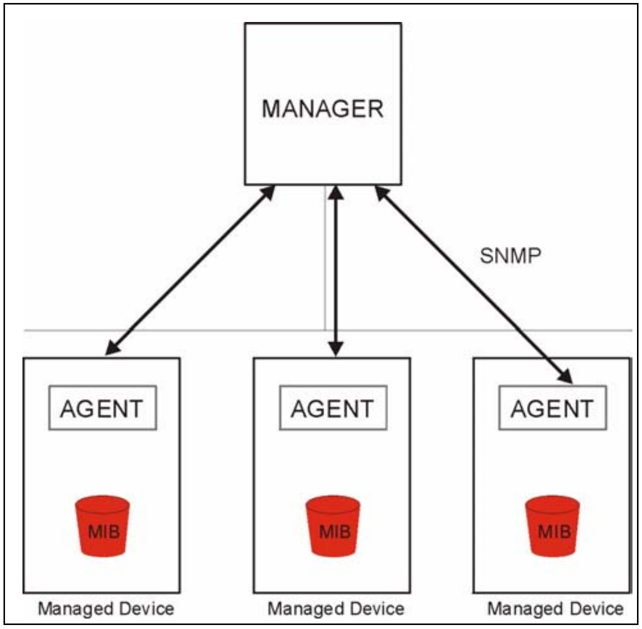
LABEL	DESCRIPTION
Secured Client IP	A secured client is a "trusted" computer that is allowed to communicate with the ZyXEL Device using this service. Select **All** to allow any computer to access the ZyXEL Device using this service. Choose **Selected** to just allow the computer with the IP address that you specify to access the ZyXEL Device using this service.
Apply	Click **Apply** to save your customized settings and exit this screen.
Cancel	Click **Cancel** to begin configuring this screen afresh.

15.6 SNMP

Simple Network Management Protocol (SNMP) is a protocol used for exchanging management information between network devices. SNMP is a member of the TCP/IP protocol suite. Your ZyXEL Device supports SNMP agent functionality, which allows a manager station to manage and monitor the ZyXEL Device through the network. The ZyXEL Device supports SNMP version one (SNMPv1) and version two (SNMPv2). The next figure illustrates an SNMP management operation.

Note: SNMP is only available if TCP/IP is configured.

Figure 99 SNMP Management Model



An SNMP managed network consists of two main types of component: agents and a manager.

An agent is a management software module that resides in a managed device (the ZyXEL Device). An agent translates the local management information from the managed device into a form compatible with SNMP. The manager is the console through which network administrators perform network management functions. It executes applications that control and monitor managed devices.

The managed devices contain object variables/managed objects that define each piece of information to be collected about a device. Examples of variables include such as number of packets received, node port status etc. A Management Information Base (MIB) is a collection of managed objects. SNMP allows a manager and agents to communicate for the purpose of accessing these objects.

SNMP itself is a simple request/response protocol based on the manager/agent model. The manager issues a request and the agent returns responses using the following protocol operations:

- Get - Allows the manager to retrieve an object variable from the agent.
- GetNext - Allows the manager to retrieve the next object variable from a table or list within an agent. In SNMPv1, when a manager wants to retrieve all elements of a table from an agent, it initiates a Get operation, followed by a series of GetNext operations.
- Set - Allows the manager to set values for object variables within an agent.
- Trap - Used by the agent to inform the manager of some events.

15.6.1 Supported MIBs

The ZyXEL Device supports MIB II that is defined in RFC-1213 and RFC-1215. The focus of the MIBs is to let administrators collect statistical data and monitor status and performance.

15.6.2 SNMP Traps

The ZyXEL Device will send traps to the SNMP manager when any one of the following events occurs:

Table 73 SNMPv1 Traps

TRAP #	TRAP NAME	DESCRIPTION
0	coldStart (defined in *RFC-1215*)	A trap is sent after booting (power on).
1	warmStart (defined in *RFC-1215*)	A trap is sent after booting (software reboot).
6	whyReboot (defined in ZYXEL-MIB)	A trap is sent with the reason of restart before rebooting when the system is going to restart (warm start).
6a	For intentional reboot:	A trap is sent with the message "System reboot by user!" if reboot is done intentionally, (for example, download new files, CI command "sys reboot", etc.).
6b	For fatal error:	A trap is sent with the message of the fatal code if the system reboots because of fatal errors.

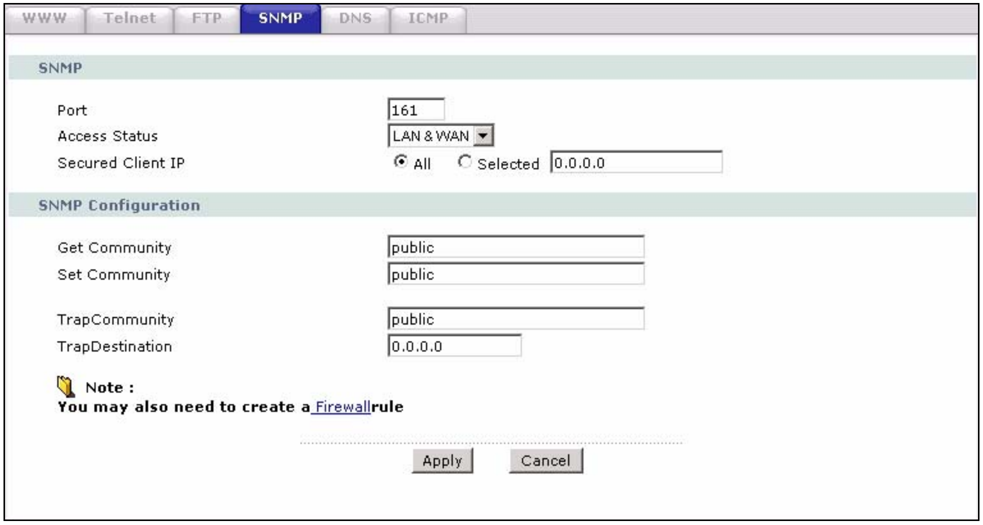
Table 74 SNMPv2 Traps

OBJECT LABEL	OBJECT ID	DESCRIPTION
SNMPv2 Traps		
Cold Start	1.3.6.1.6.3.1.1.5.1	This trap is sent when the switch is turned on.
WarmStart	1.3.6.1.6.3.1.1.5.2	This trap is sent when the switch restarts.
linkDown	1.3.6.1.6.3.1.1.5.3	This trap is sent when the Ethernet link is down.
linkUp	1.3.6.1.6.3.1.1.5.4	This trap is sent when the Ethernet link is up.
RFC 1493 Traps		
newRoot	1.3.6.1.2.1.17.0.1	This trap is sent when the STP topology changes.
topology change	1.3.6.1.2.1.17.0.2	This trap is sent when the STP root switch changes.

15.6.3 Configuring SNMP

See Section 15.1 on page 203 for background information. Use this screen to change your ZyXEL Device’s SNMP settings. Click **Advanced > Remote MGMT** > **SNMP**. The screen appears as shown.

Figure 100 Remote MGMT > SNMP



Port: 161

Access Status: LAN & WAN

Secured Client IP: ● All ○ Selected 0.0.0.0

Get Community: public

Set Community: public

TrapCommunity: public

TrapDestination: 0.0.0.0

Note :
You may also need to create a Firewall**rule**

The following table describes the labels in this screen.

Table 75 Remote MGMT > SNMP

LABEL	DESCRIPTION
SNMP	
Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Access Status	Select the interface(s) through which a computer may access the ZyXEL Device using this service.

Table 75 Remote MGMT > SNMP (continued)

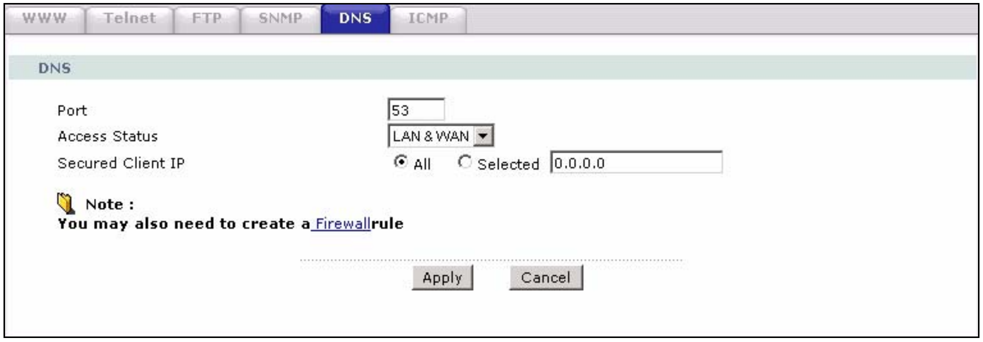
LABEL	DESCRIPTION
Secured Client IP	A secured client is a "trusted" computer that is allowed to communicate with the ZyXEL Device using this service. Select **All** to allow any computer to access the ZyXEL Device using this service. Choose **Selected** to just allow the computer with the IP address that you specify to access the ZyXEL Device using this service.
SNMP Configuration	
Get Community	Enter the **Get Community**, which is the password for the incoming Get and GetNext requests from the management station. The default is public and allows all requests.
Set Community	Enter the **Set community**, which is the password for incoming Set requests from the management station. The default is public and allows all requests.
Trap Community	Type the trap community, which is the password sent with each trap to the SNMP manager. The default is public and allows all requests.
Trap Destination	Type the IP address of the station to send your SNMP traps to.
Apply	Click **Apply** to save your customized settings and exit this screen.
Cancel	Click **Cancel** to begin configuring this screen afresh.

15.7 Configuring DNS

Use DNS (Domain Name System) to map a domain name to its corresponding IP address and vice versa. Refer to the chapter on LAN for background information.

See Section 15.1 on page 203 for background information. Click **Advanced > Remote MGMT** > **DNS**. The screen appears as shown. Use this screen to set from which IP address the ZyXEL Device will accept DNS queries and on which interface it can send them your ZyXEL Device's DNS settings.

Figure 101 Remote MGMT > DNS



DNS

Port 53

Access Status LAN & WAN

Secured Client IP ● All ○ Selected 0.0.0.0

Note :
You may also need to create a Firewall rule

The following table describes the labels in this screen.

Table 76 Remote MGMT > DNS

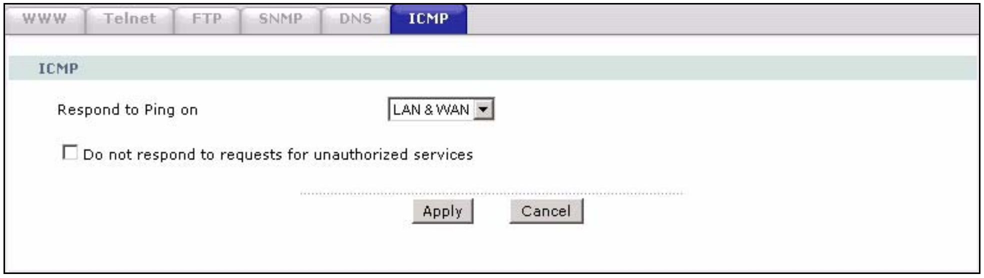
LABEL	DESCRIPTION
Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Access Status	Select the interface(s) through which a computer may send DNS queries to the ZyXEL Device.
Secured Client IP	A secured client is a "trusted" computer that is allowed to send DNS queries to the ZyXEL Device. Select **All** to allow any computer to send DNS queries to the ZyXEL Device. Choose **Selected** to just allow the computer with the IP address that you specify to send DNS queries to the ZyXEL Device.
Apply	Click **Apply** to save your customized settings and exit this screen.
Cancel	Click **Cancel** to begin configuring this screen afresh.

15.8 Configuring ICMP

Use this screen to control how the ZyXEL Device responds to other types of requests. Click **Advanced > Remote MGMT** > **ICMP**. The screen appears as shown.

If an outside user attempts to probe an unsupported port on your ZyXEL Device, an ICMP response packet is automatically returned. This allows the outside user to know the ZyXEL Device exists. Your ZyXEL Device supports anti-probing, which prevents the ICMP response packet from being sent. This keeps outsiders from discovering your ZyXEL Device when unsupported ports are probed.

Figure 102 Remote MGMT > ICMP



ICMP

Respond to Ping on: LAN & WAN

□ Do not respond to requests for unauthorized services

The following table describes the labels in this screen.

Table 77 Remote MGMT > ICMP

LABEL	DESCRIPTION
ICMP	Internet Control Message Protocol is a message control and error-reporting protocol between a host server and a gateway to the Internet. ICMP uses Internet Protocol (IP) datagrams, but the messages are processed by the TCP/IP software and directly apparent to the application user.
Respond to Ping on	The ZyXEL Device will not respond to any incoming Ping requests when **Disable** is selected. Select **LAN** to reply to incoming LAN Ping requests. Select **WAN** to reply to incoming WAN Ping requests. Otherwise, select **LAN & WAN** to reply to both incoming LAN and WAN Ping requests.
Do not respond to requests for unauthorized services	Select this option to prevent hackers from finding the ZyXEL Device by probing for unused ports. If you select this option, the ZyXEL Device will not respond to port request(s) for unused ports, thus leaving the unused ports and the ZyXEL Device unseen. By default this option is not selected and the ZyXEL Device will reply with an ICMP Port Unreachable packet for a port probe on its unused UDP ports, and a TCP Reset packet for a port probe on its unused TCP ports. Note that the probing packets must first traverse the ZyXEL Device's firewall mechanism before reaching this anti-probing mechanism. Therefore if the firewall mechanism blocks a probing packet, the ZyXEL Device reacts based on the firewall policy, which by default, is to send a TCP reset packet for a blocked TCP packet. You can use the command "`sys firewall tcprst rst [on|off]`" to change this policy. When the firewall mechanism blocks a UDP packet, it drops the packet without sending a response packet.
Apply	Click **Apply** to save your customized settings and exit this screen.
Cancel	Click **Cancel** to begin configuring this screen afresh.

15.9 TR-069

TR-069 is a protocol that defines how your ZyXEL Device can be managed via a management server such as ZyXEL's Vantage CNM Access.

An administrator can use CNM Access to remotely set up the ZyXEL Device, modify settings, perform firmware upgrades as well as monitor and diagnose the ZyXEL Device. All you have to do is enable the device to be managed by CNM Access and specify the CNM Access IP address or domain name and username and password.

Follow the procedure below to configure your ZyXEL Device to be managed by CNM Access. See the Command Interpreter appendix for information on the command structure and how to access the CLI (Command Line Interface) on the ZyXEL Device.

Note: In this example **a.b.c.d** is the IP address of CNM Access. You must change this value to reflect your actual management server IP address or domain name. See **Table 78 on page 213**for detailed descriptions of the commands.

Figure 103 Enabling TR-069

```
ras> wan tr069 load
ras> wan tr069 acsUrl a.b.c.d
Auto-Configuration Server URL: http://a.b.c.d
ras> wan tr069 periodicEnable 1
ras> wan tr069 informInterval 2400
TR069 Informinterval 2400
ras> wan tr069 active 1
ras> wan tr069 save
```

The following table gives a description of TR-069 commands.

Table 78 TR-069 Commands

Root	Command or Subdirectory	Command	Description
`wan`	`tr069`		All TR-069 related commands must be preceded by `wan tr069`.
		`load`	Start configuring TR-069 on your ZyXEL Device.
		`active [0:no/ 1:yes]`	Enable/disable TR-069 operation.
		`acsUrl <URL>`	Set the IP address or domain name of CNM Access.
		`username [maxlength:15]`	Username used to authenticate the device when making a connection to CNM Access. This username is set up on the server and must be provided by the CNM Access administrator.
		`password [maxlength:15]`	Password used to authenticate the device when making a connection to CNM Access. This password is set up on the server and must be provided by the CNM Access administrator.
		`periodicEnable [0:Disable/ 1:Enable]`	Whether or not the device must periodically send information to CNM Access. It is recommended to set this value to `1` in order for the ZyXEL Device to send information to CNM Access.
		`informInterval [sec]`	The duration in seconds of the interval for which the device MUST attempt to connect with CNM Access to send information and check for configuration updates. Enter a value between 30 and 2147483647 seconds.
		`save`	Save the TR-069 settings to your ZyXEL Device.

CHAPTER 16 Universal Plug-and-Play (UPnP)

This chapter introduces the UPnP feature in the web configurator.

16.1 Introducing Universal Plug and Play

Universal Plug and Play (UPnP) is a distributed, open networking standard that uses TCP/IP for simple peer-to-peer network connectivity between devices. A UPnP device can dynamically join a network, obtain an IP address, convey its capabilities and learn about other devices on the network. In turn, a device can leave a network smoothly and automatically when it is no longer in use.

See Section 16.2.1 on page 216 for configuration instructions.

16.1.1 How do I know if I'm using UPnP?

UPnP hardware is identified as an icon in the Network Connections folder (Windows XP). Each UPnP compatible device installed on your network will appear as a separate icon. Selecting the icon of a UPnP device will allow you to access the information and properties of that device.

16.1.2 NAT Traversal

UPnP NAT traversal automates the process of allowing an application to operate through NAT. UPnP network devices can automatically configure network addressing, announce their presence in the network to other UPnP devices and enable exchange of simple product and service descriptions. NAT traversal allows the following:

- Dynamic port mapping
- Learning public IP addresses
- Assigning lease times to mappings

Windows Messenger is an example of an application that supports NAT traversal and UPnP.

See the NAT chapter for more information on NAT.

16.1.3 Cautions with UPnP

The automated nature of NAT traversal applications in establishing their own services and opening firewall ports may present network security issues. Network information and configuration may also be obtained and modified by users in some network environments.

When a UPnP device joins a network, it announces its presence with a multicast message. For security reasons, the ZyXEL Device allows multicast messages on the LAN only.

All UPnP-enabled devices may communicate freely with each other without additional configuration. Disable UPnP if this is not your intention.

16.2 UPnP and ZyXEL

ZyXEL has achieved UPnP certification from the Universal Plug and Play Forum UPnP™ Implementers Corp. (UIC). ZyXEL's UPnP implementation supports Internet Gateway Device (IGD) 1.0.

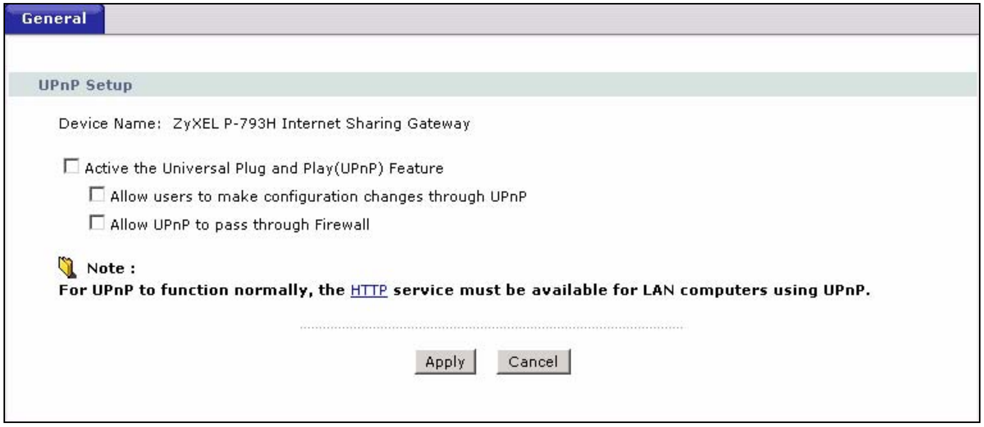
See the following sections for examples of installing and using UPnP.

16.2.1 Configuring UPnP

Use this screen to set up UPnP in the ZyXEL Device. Click **Advanced > UPnP** to display the screen shown next.

See Section 16.1 on page 215 for more information.

Figure 104 UPnP > General



Device Name: ZyXEL P-793H Internet Sharing Gateway

□ Active the Universal Plug and Play(UPnP) Feature

□ Allow users to make configuration changes through UPnP

□ Allow UPnP to pass through Firewall

Note :
For UPnP to function normally, the HTTP service must be available for LAN computers using UPnP.

The following table describes the fields in this screen.

Table 79 UPnP > General

LABEL	DESCRIPTION
Active the Universal Plug and Play (UPnP) Feature	Select this check box to activate UPnP. Be aware that anyone could use a UPnP application to open the web configurator's login screen without entering the ZyXEL Device's IP address (although you must still enter the password to access the web configurator).
Allow users to make configuration changes through UPnP	Select this check box to allow UPnP-enabled applications to automatically configure the ZyXEL Device so that they can communicate through the ZyXEL Device, for example by using NAT traversal, UPnP applications automatically reserve a NAT forwarding port in order to communicate with another UPnP enabled device; this eliminates the need to manually configure port forwarding for the UPnP enabled application.
Allow UPnP to pass through Firewall	Select this to allow UPnP-enabled applications to automatically pass through the ZyXEL Device's firewall. This is less secure, but you do not have to configure firewall rules for these applications.
Apply	Click **Apply** to save the setting to the ZyXEL Device.
Cancel	Click **Cancel** to return to the previously saved settings.

16.3 Installing UPnP in Windows Example

This section shows how to install UPnP in Windows Me and Windows XP.

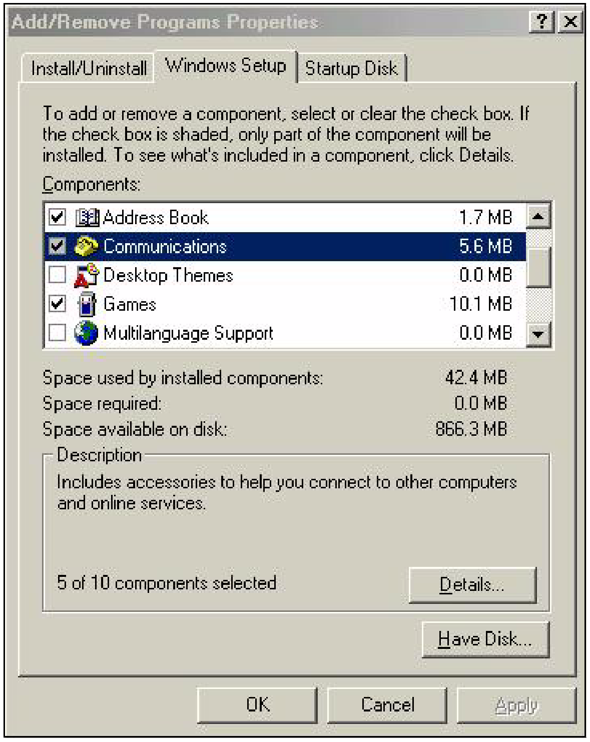
Installing UPnP in Windows Me

Follow the steps below to install the UPnP in Windows Me.

1 Click **Start** and **Control Panel**. Double-click **Add/Remove Programs**.

2 Click on the **Windows Setup** tab and select **Communication** in the **Components** selection box. Click **Details**.

Figure 105 Add/Remove Programs: Windows Setup: Communication



Add/Remove Programs Properties

To add or remove a component, select or clear the check box. If the check box is shaded, only part of the component will be installed. To see what's included in a component, click Details.

Components:

☑	Address Book	1.7 MB
☑	Communications	5.6 MB
□	Desktop Themes	0.0 MB
☑	Games	10.1 MB
□	Multilanguage Support	0.0 MB

Space used by installed components: 42.4 MB
Space required: 0.0 MB
Space available on disk: 866.3 MB

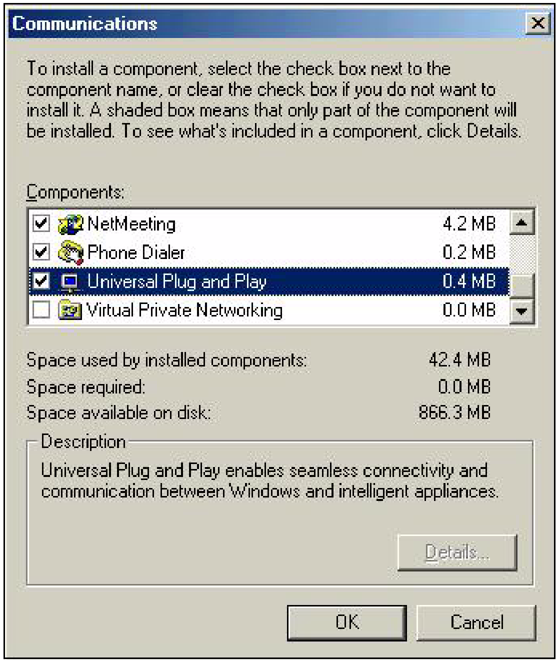
Description

Includes accessories to help you connect to other computers and online services.

5 of 10 components selected

3 In the **Communications** window, select the **Universal Plug and Play** check box in the **Components** selection box.

Figure 106 Add/Remove Programs: Windows Setup: Communication: Components



Communications

To install a component, select the check box next to the component name, or clear the check box if you do not want to install it. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.

Components:

☑	NetMeeting	4.2 MB
☑	Phone Dialer	0.2 MB
☑	Universal Plug and Play	0.4 MB
□	Virtual Private Networking	0.0 MB

Space used by installed components: 42.4 MB
Space required: 0.0 MB
Space available on disk: 866.3 MB

Description

Universal Plug and Play enables seamless connectivity and communication between Windows and intelligent appliances.

4 Click **OK** to go back to the **Add/Remove Programs Properties** window and click **Next**.

5 Restart the computer when prompted.

Installing UPnP in Windows XP

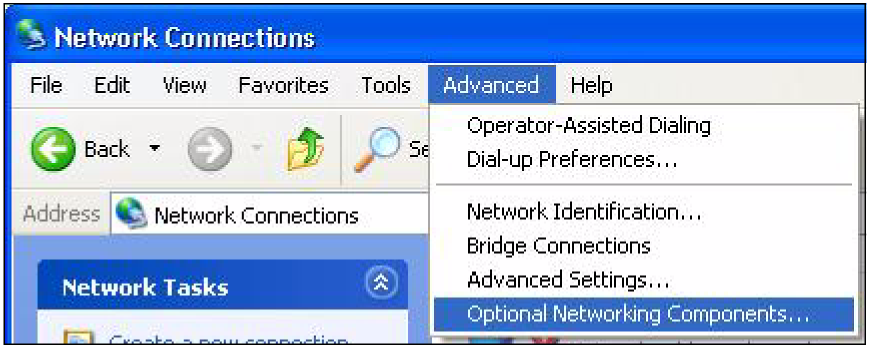
Follow the steps below to install the UPnP in Windows XP.

1 Click **Start** and **Control Panel**.

2 Double-click **Network Connections**.

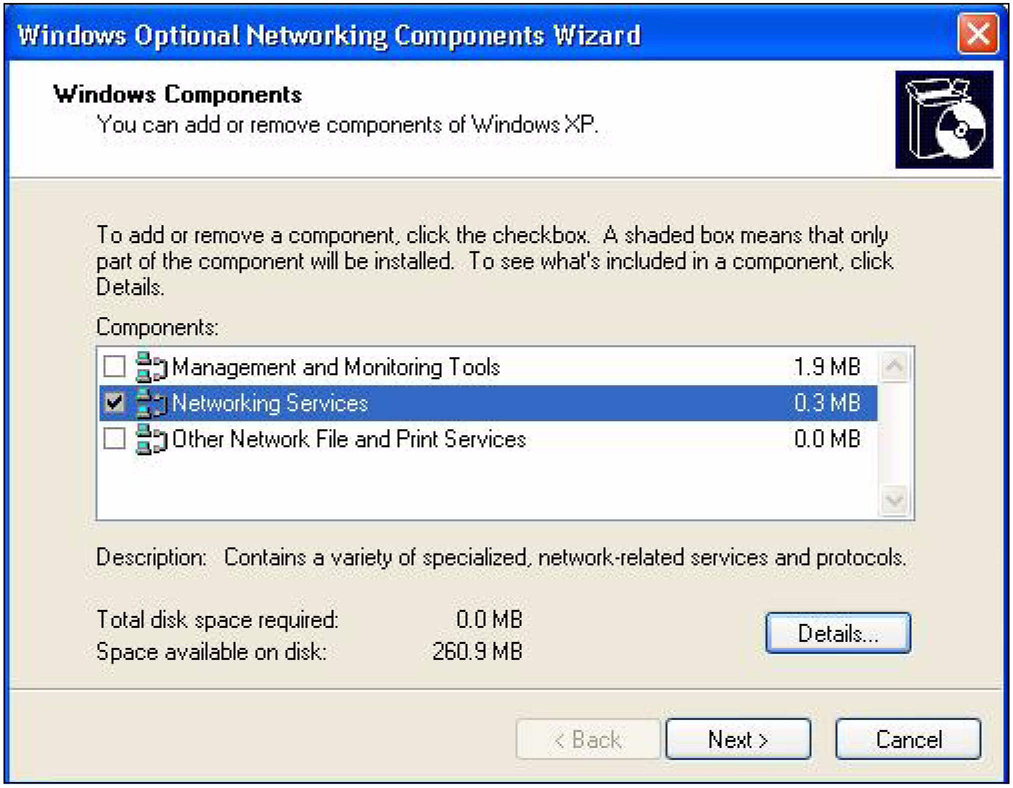
3 In the **Network Connections** window, click **Advanced** in the main menu and select **Optional Networking Components ….**

Figure 107 Network Connections



4 The **Windows Optional Networking Components Wizard** window displays. Select **Networking Service** in the **Components** selection box and click **Details**.

Figure 108 Windows Optional Networking Components Wizard



Windows Components
You can add or remove components of Windows XP.

To add or remove a component, click the checkbox. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.

Components:

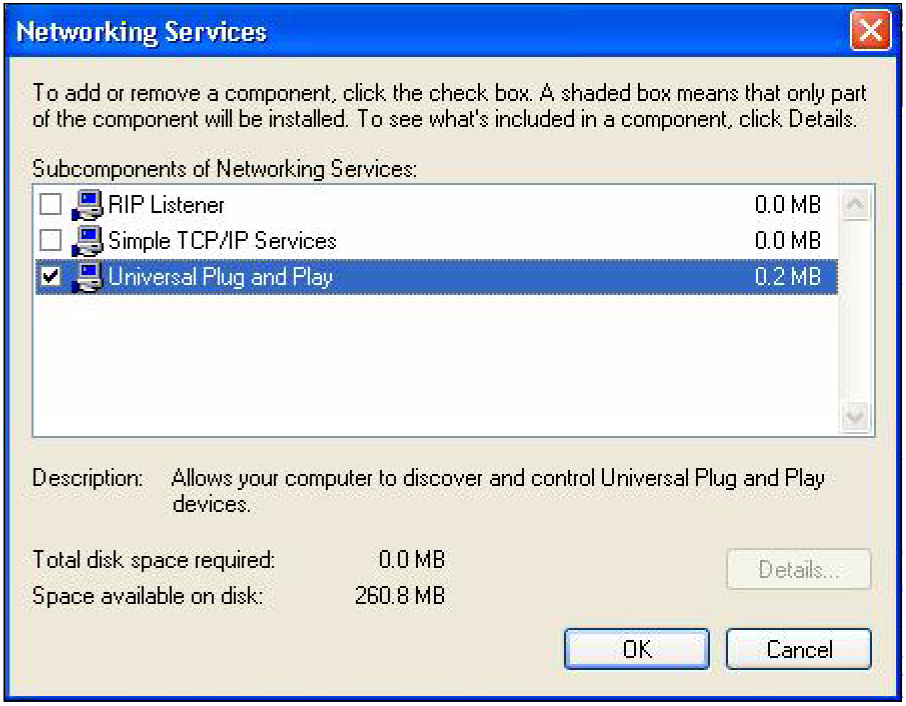
☐	Management and Monitoring Tools	1.9 MB
☑	Networking Services	0.3 MB
☐	Other Network File and Print Services	0.0 MB

Description: Contains a variety of specialized, network-related services and protocols.

Total disk space required: 0.0 MB
Space available on disk: 260.9 MB

5 In the **Networking Services** window, select the **Universal Plug and Play** check box.

Figure 109 Networking Services



Networking Services

To add or remove a component, click the check box. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.

Subcomponents of Networking Services:

□	RIP Listener	0.0 MB
□	Simple TCP/IP Services	0.0 MB
☑	Universal Plug and Play	0.2 MB

Description: Allows your computer to discover and control Universal Plug and Play devices.

Total disk space required: 0.0 MB

Space available on disk: 260.8 MB

6 Click **OK** to go back to the **Windows Optional Networking Component Wizard** window and click **Next**.

16.4 Using UPnP in Windows XP Example

This section shows you how to use the UPnP feature in Windows XP. You must already have UPnP installed in Windows XP and UPnP activated on the ZyXEL Device.

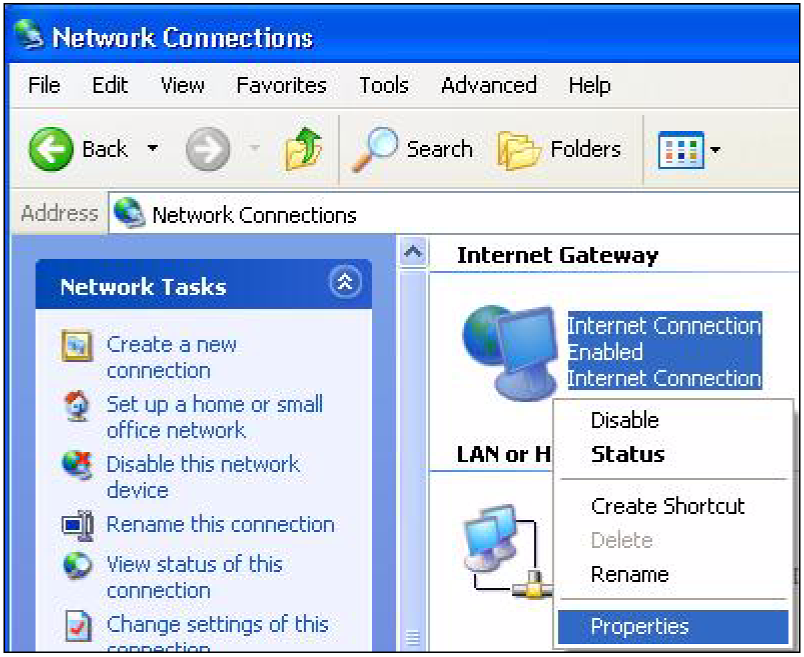
Make sure the computer is connected to a LAN port of the ZyXEL Device. Turn on your computer and the ZyXEL Device.

Auto-discover Your UPnP-enabled Network Device

1 Click **Start** and **Control Panel**. Double-click **Network Connections**. An icon displays under Internet Gateway.

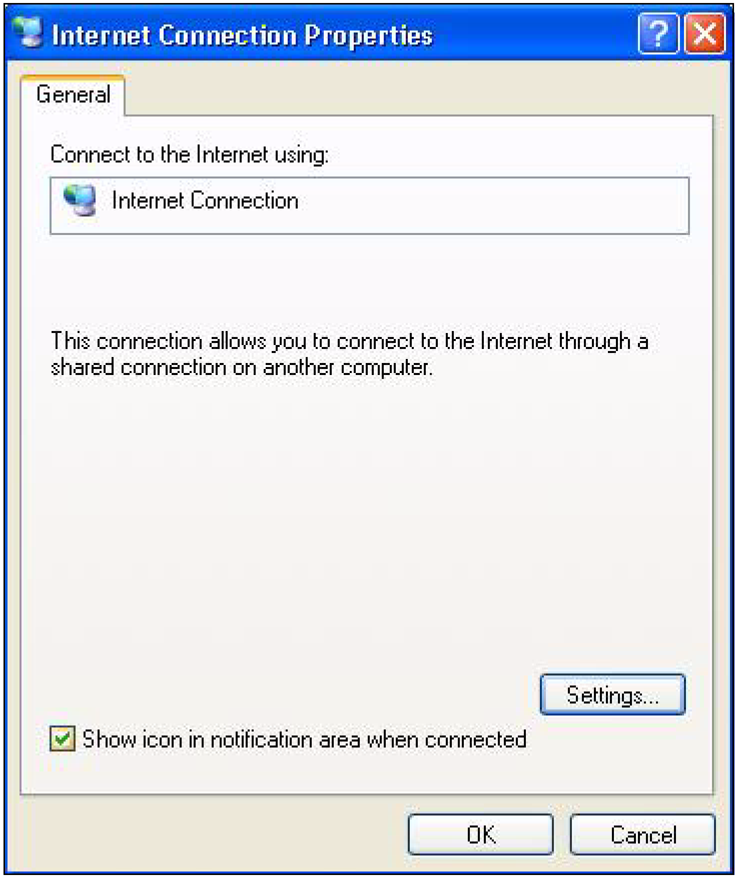
2 Right-click the icon and select **Properties**.

Figure 110 Network Connections



3 In the **Internet Connection Properties** window, click **Settings** to see the port mappings there were automatically created.

Figure 111 Internet Connection Properties



Connect to the Internet using:

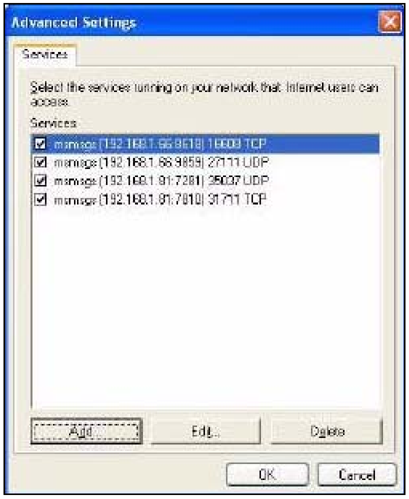
Internet Connection

This connection allows you to connect to the Internet through a shared connection on another computer.

☑ Show icon in notification area when connected

4 You may edit or delete the port mappings or click **Add** to manually add port mappings.

Figure 112 Internet Connection Properties: Advanced Settings

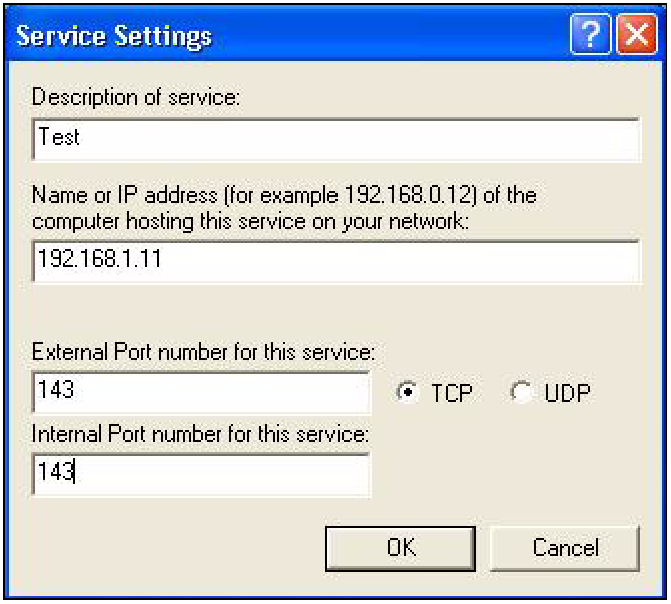


Select the services running on your network that Internet users can access.

Services

☑ msmsgs (192.168.1.66:9618) 16608 TCP
☑ msmsgs (192.168.1.66:9859) 27111 UDP
☑ msmsgs (192.168.1.91:7281) 35037 UDP
☑ msmsgs (192.168.1.91:7810) 31711 TCP

Figure 113 Internet Connection Properties: Advanced Settings: Add



Description of service:

Test

Name or IP address (for example 192.168.0.12) of the computer hosting this service on your network:

192.168.1.11

External Port number for this service:

143 ● TCP ○ UDP

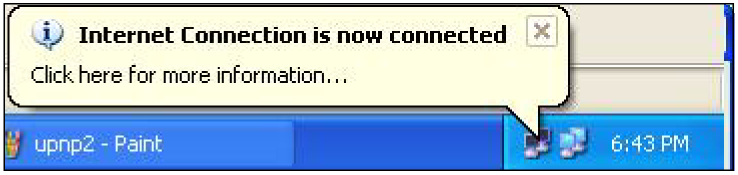
Internal Port number for this service:

143

5 When the UPnP-enabled device is disconnected from your computer, all port mappings will be deleted automatically.

6 Select **Show icon in notification area when connected** option and click **OK**. An icon displays in the system tray.

Figure 114 System Tray Icon

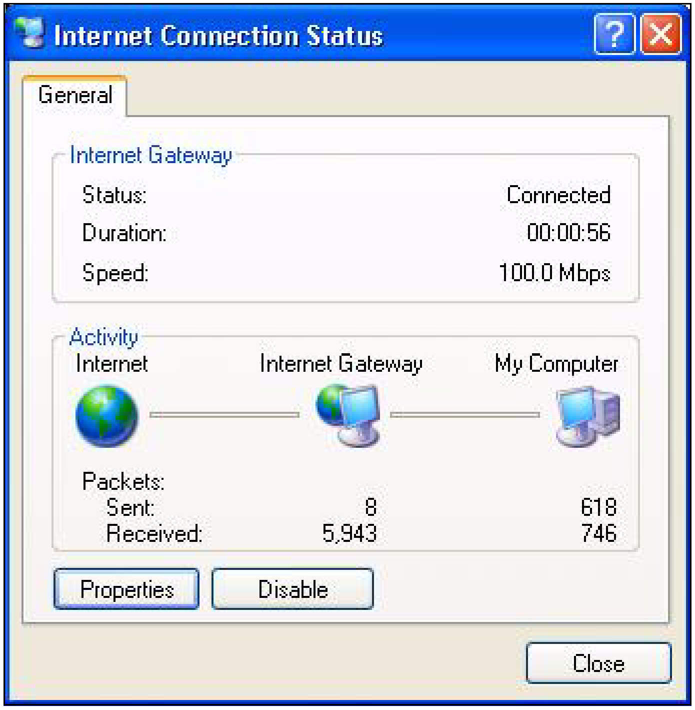


Internet Connection is now connected

Click here for more information...

7 Double-click on the icon to display your current Internet connection status.

Figure 115 Internet Connection Status



Internet Connection Status

General

Internet Gateway

Status: Connected

Duration: 00:00:56

Speed: 100.0 Mbps

Activity

Packets:	Internet Gateway	My Computer
Sent:	8	618
Received:	5,943	746

Web Configurator Easy Access

With UPnP, you can access the web-based configurator on the ZyXEL Device without finding out the IP address of the ZyXEL Device first. This comes helpful if you do not know the IP address of the ZyXEL Device.

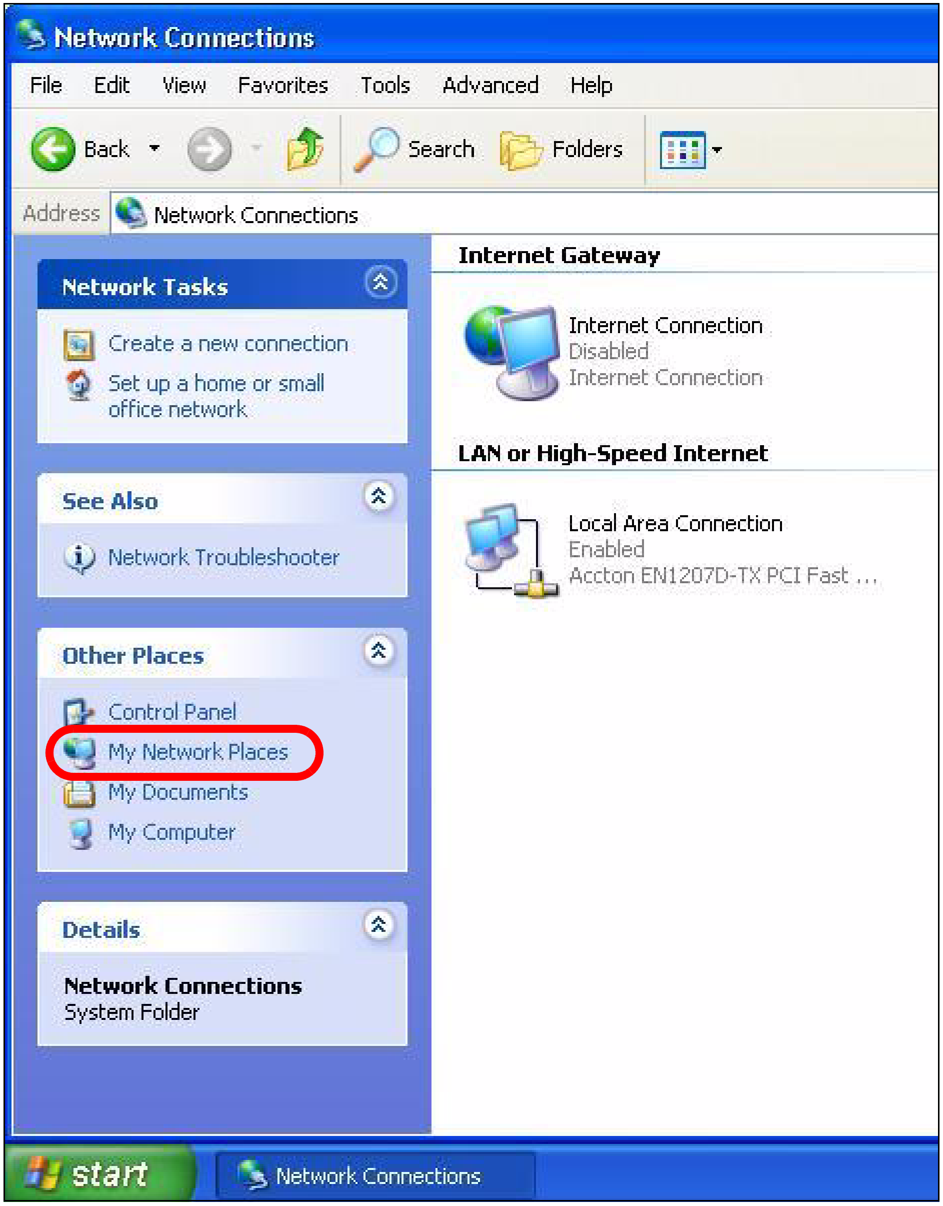
Follow the steps below to access the web configurator.

1 Click **Start** and then **Control Panel**.

2 Double-click **Network Connections**.

3 Select **My Network Places** under **Other Places**.

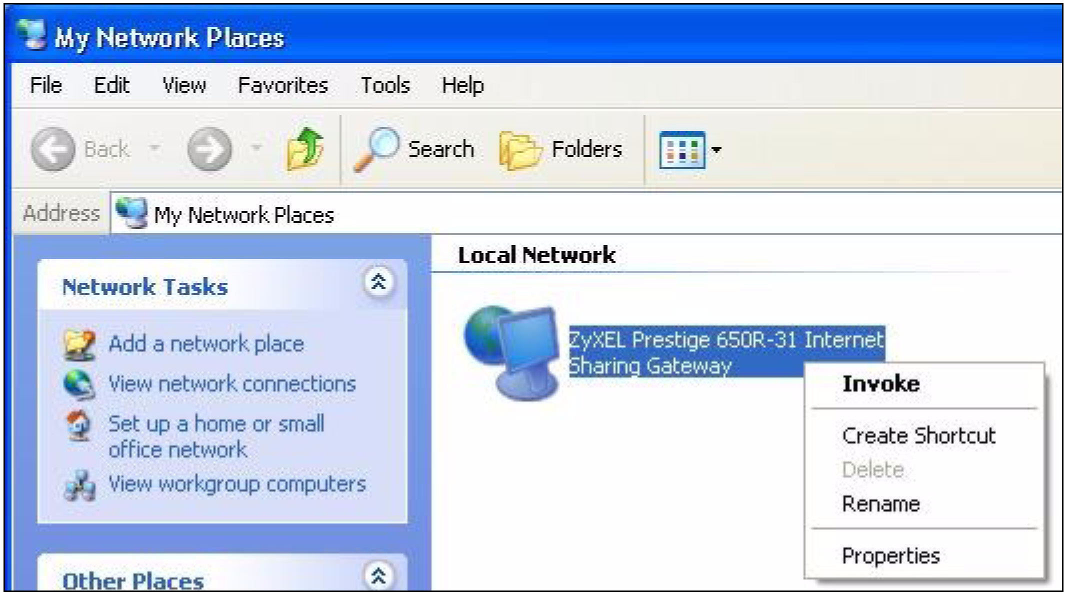
Figure 116 Network Connections



4 An icon with the description for each UPnP-enabled device displays under **Local Network**.

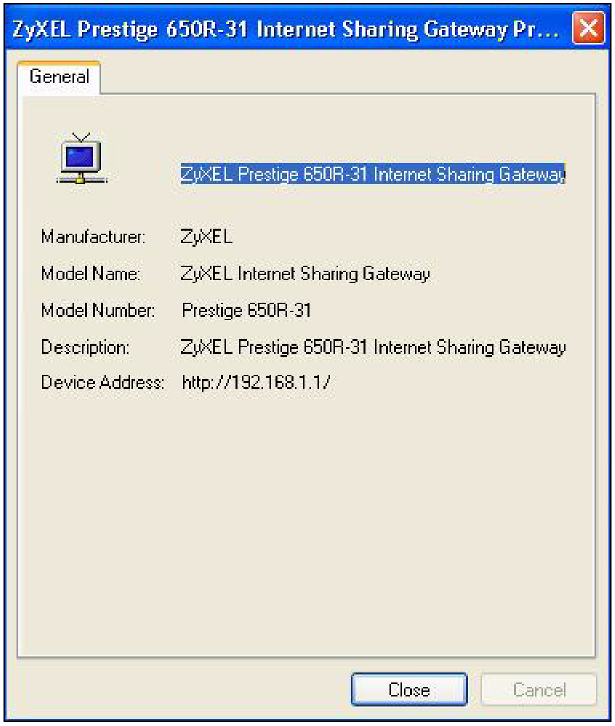
5 Right-click on the icon for your ZyXEL Device and select **Invoke**. The web configurator login screen displays.

Figure 117 Network Connections: My Network Places



6 Right-click on the icon for your ZyXEL Device and select **Properties**. A properties window displays with basic information about the ZyXEL Device.

Figure 118 Network Connections: My Network Places: Properties: Example


ZyXEL Prestige 650R-31 Internet Sharing Gateway Pr...
General
ZyXEL Prestige 650R-31 Internet Sharing Gateway
Close
Cancel

Manufacturer:	ZyXEL
Model Name:	ZyXEL Internet Sharing Gateway
Model Number:	Prestige 650R-31
Description:	ZyXEL Prestige 650R-31 Internet Sharing Gateway
Device Address:	http://192.168.1.1/

CHAPTER 17 System

This chapter explains how to configure the ZyXEL Device’s system name, domain name, password, and time and date settings.

17.1 General Setup

17.1.1 General Setup and System Name

General Setup contains administrative and system-related information. **System Name** is for identification purposes. However, because some ISPs check this name you should enter your computer's "Computer Name".

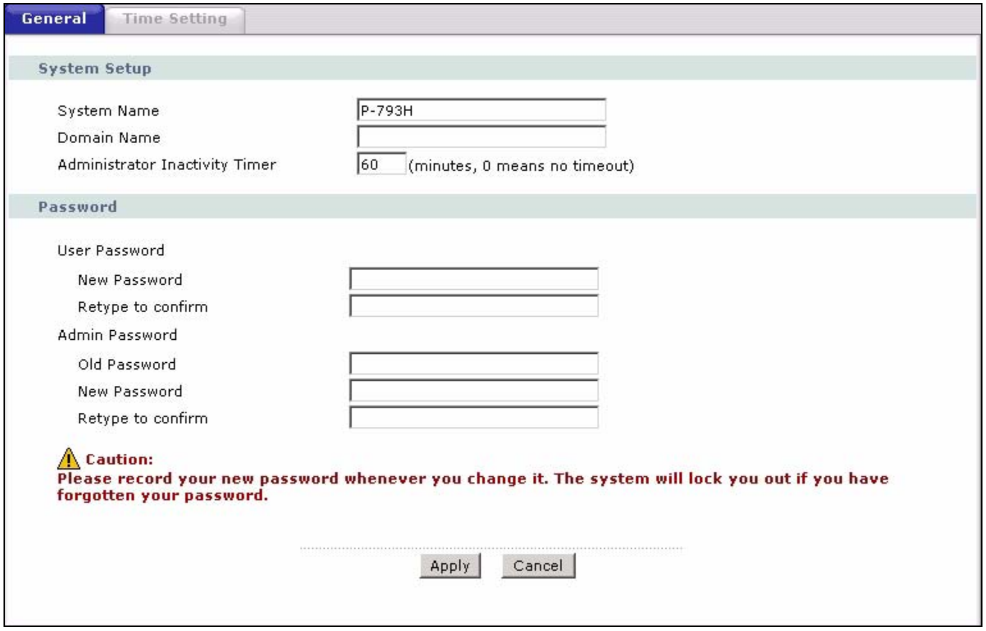
- In Windows 95/98 click **Start**, **Settings**, **Control Panel**, **Network**. Click the Identification tab, note the entry for the **Computer Name** field and enter it as the **System Name**.
- In Windows 2000, click **Start**, **Settings**, **Control Panel** and then double-click **System**. Click the **Network Identification** tab and then the **Properties** button. Note the entry for the **Computer name** field and enter it as the **System Name**.
- In Windows XP, click **start**, **My Computer**, **View system information** and then click the **Computer Name** tab. Note the entry in the **Full computer name** field and enter it as the ZyXEL Device **System Name**.

17.1.2 General Setup

The **Domain Name** entry is what is propagated to the DHCP clients on the LAN. If you leave this blank, the domain name obtained by DHCP from the ISP is used. While you must enter the host name (System Name), the domain name can be assigned from the ZyXEL Device via DHCP.

Use this screen to set up the ZyXEL Device’s system name, domain name, inactivity timer, and passwords. Click **Maintenance > System** to open the **General** screen.

Figure 119 System > General



System Name P-793H

Domain Name

Administrator Inactivity Timer 60 (minutes, 0 means no timeout)

Caution:
Please record your new password whenever you change it. The system will lock you out if you have forgotten your password.

The following table describes the labels in this screen.

Table 80 System > General

LABEL	DESCRIPTION
System Setup	
System Name	Choose a descriptive name for identification purposes. It is recommended you enter your computer's "Computer name" in this field. This name can be up to 30 alphanumeric characters long. Spaces are not allowed, but dashes "-" and underscores "_" are accepted.
Domain Name	Enter the domain name (if you know it) here. If you leave this field blank, the ISP may assign a domain name via DHCP. The domain name entered by you is given priority over the ISP assigned domain name.
Administrator Inactivity Timer	Type how many minutes a management session (either via the web configurator or CLI (Command Line Interpreter)) can be left idle before the session times out. The default is 5 minutes. After it times out you have to log in with your password again. Very long idle timeouts may have security risks. A value of "0" means a management session never times out, no matter how long it has been left idle (not recommended).
Password	
User Password	If you log in with the user password, you can only view the ZyXEL Device status. The default user password is **user**.
New Password	Type your new system password (up to 30 characters). Note that as you type a password, the screen displays a (*) for each character you type. After you change the password, use the new password to access the ZyXEL Device.
Retype to Confirm	Type the new password again for confirmation.
Admin Password	In addition to the wizard setup, a user logs in with the admin password can also view and configure the advanced features on the ZyXEL Device.

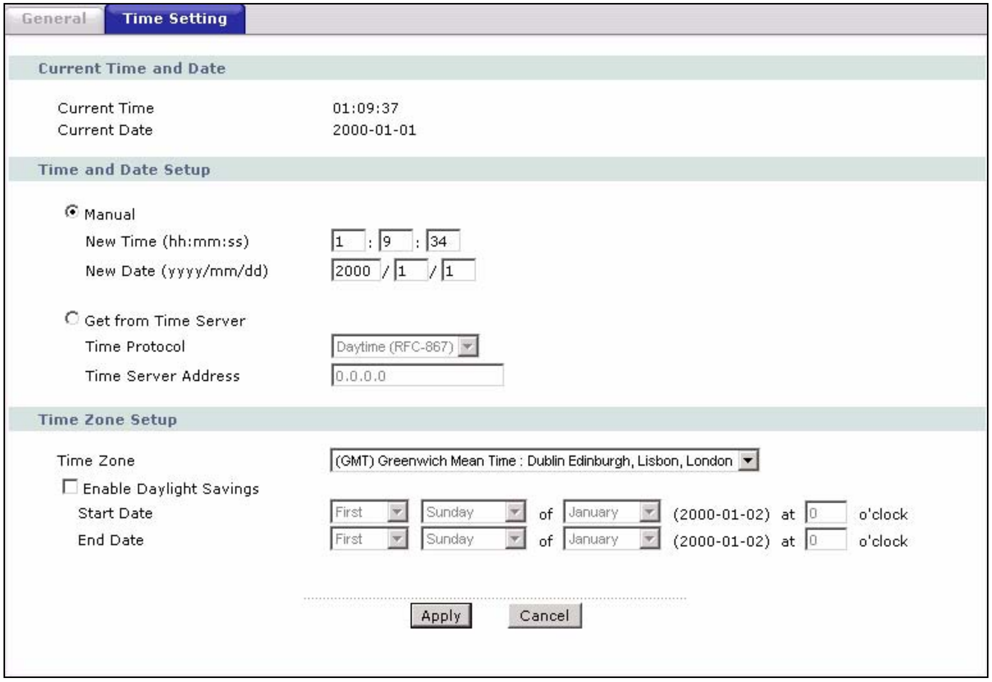
Table 80 System > General (continued)

LABEL	DESCRIPTION
Old Password	Type the default administrator password (**1234**) or the existing password you use to access the system for configuring advanced features in this field.
New Password	Type your new system password (up to 30 characters). Note that as you type a password, the screen displays a (*) for each character you type. After you change the password, use the new password to access the ZyXEL Device.
Retype to Confirm	Type the new password again for confirmation.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

17.2 Time Setting

To change your ZyXEL Device's time and date, click **Maintenance** > **System** > **Time Setting**. The screen appears as shown. Use this screen to configure the ZyXEL Device's time based on your local time zone.

Figure 120 System > Time Setting



Current Time and Date

Current Time 01:09:37
Current Date 2000-01-01

Time and Date Setup

● Manual
New Time (hh:mm:ss) 1 : 9 : 34
New Date (yyyy/mm/dd) 2000 / 1 / 1

○ Get from Time Server
Time Protocol Daytime (RFC-867)
Time Server Address 0.0.0.0

Time Zone Setup

Time Zone (GMT) Greenwich Mean Time : Dublin Edinburgh, Lisbon, London
□ Enable Daylight Savings
Start Date First Sunday of January (2000-01-02) at 0 o'clock
End Date First Sunday of January (2000-01-02) at 0 o'clock

The following table describes the fields in this screen.

Table 81 System > Time Setting

LABEL	DESCRIPTION
Current Time and Date	
Current Time	This field displays the time of your ZyXEL Device. Each time you reload this page, the ZyXEL Device synchronizes the time with the time server.
Current Date	This field displays the date of your ZyXEL Device. Each time you reload this page, the ZyXEL Device synchronizes the date with the time server.
Time and Date Setup	
Manual	Select this radio button to enter the time and date manually. If you configure a new time and date, Time Zone and Daylight Saving at the same time, the new time and date you entered has priority and the Time Zone and Daylight Saving settings do not affect it.
New Time (hh:mm:ss)	This field displays the last updated time from the time server or the last time configured manually. When you set **Time and Date Setup** to **Manual**, enter the new time in this field and then click **Apply**.
New Date (yyyy/mm/dd)	This field displays the last updated date from the time server or the last date configured manually. When you set **Time and Date Setup** to **Manual**, enter the new date in this field and then click **Apply**.
Get from Time Server	Select this radio button to have the ZyXEL Device get the time and date from the time server you specified below.
Time Protocol	Select the time service protocol that your time server sends when you turn on the ZyXEL Device. Not all time servers support all protocols, so you may have to check with your ISP/network administrator or use trial and error to find a protocol that works. The main difference between them is the format. **Daytime (RFC 867)** format is day/month/year/time zone of the server. **Time (RFC 868)** format displays a 4-byte integer giving the total number of seconds since 1970/1/1 at 0:0:0. The default, **NTP (RFC 1305)**, is similar to Time (RFC 868).
Time Server Address	Enter the IP address or URL (up to 20 extended ASCII characters in length) of your time server. Check with your ISP/network administrator if you are unsure of this information.
Time Zone Setup	
Time Zone	Choose the time zone of your location. This will set the time difference between your time zone and Greenwich Mean Time (GMT).
Enable Daylight Saving	Daylight saving is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daytime light in the evening. Select this option if you use Daylight Saving Time.

Table 81 System > Time Setting (continued)

LABEL	DESCRIPTION
Start Date	Configure the day and time when Daylight Saving Time starts if you selected **Enable Daylight Saving**. The **o'clock** field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time starts in most parts of the United States on the first Sunday of April. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **First**, **Sunday**, **April** and type 2 in the **o'clock** field. Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **March**. The time you type in the **o'clock** field depends on your time zone. In Germany for instance, you would type 2 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
End Date	Configure the day and time when Daylight Saving Time ends if you selected **Enable Daylight Saving**. The **o'clock** field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time ends in the United States on the last Sunday of October. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **Last**, **Sunday**, **October** and type 2 in the **o'clock** field. Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **October**. The time you type in the **o'clock** field depends on your time zone. In Germany for instance, you would type 2 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 18 Logs

This chapter contains information about configuring general log settings and viewing the ZyXEL Device's logs. Refer to the appendix for example log message explanations.

18.1 Logs Overview

The web configurator allows you to choose which categories of events and/or alerts to have the ZyXEL Device log and then display the logs or have the ZyXEL Device send them to an administrator (as e-mail) or to a syslog server.

18.1.1 Alerts and Logs

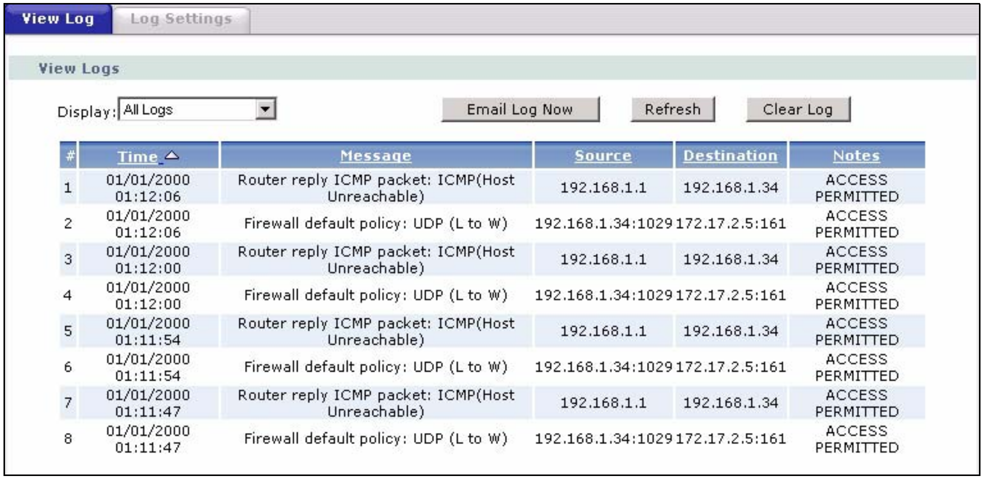
An alert is a type of log that warrants more serious attention. They include system errors, attacks (access control) and attempted access to blocked web sites. Some categories such as **System Errors** consist of both logs and alerts. You may differentiate them by their color in the **View Log** screen. Alerts display in red and logs display in black.

18.2 Viewing the Logs

Click **Maintenance > Logs** to open the **View Log** screen. Use the **View Log** screen to see the logs for the categories that you selected in the **Log Settings** screen (see Section 18.3 on page 234).

Log entries in red indicate alerts. The log wraps around and deletes the old entries after it fills. Click a column heading to sort the entries. A triangle indicates ascending or descending sort order.

Figure 121 Logs > View Log



#	Time	Message	Source	Destination	Notes
1	01/01/2000 01:12:06	Router reply ICMP packet: ICMP(Host Unreachable)	192.168.1.1	192.168.1.34	ACCESS PERMITTED
2	01/01/2000 01:12:06	Firewall default policy: UDP (L to W)	192.168.1.34:1029	172.17.2.5:161	ACCESS PERMITTED
3	01/01/2000 01:12:00	Router reply ICMP packet: ICMP(Host Unreachable)	192.168.1.1	192.168.1.34	ACCESS PERMITTED
4	01/01/2000 01:12:00	Firewall default policy: UDP (L to W)	192.168.1.34:1029	172.17.2.5:161	ACCESS PERMITTED
5	01/01/2000 01:11:54	Router reply ICMP packet: ICMP(Host Unreachable)	192.168.1.1	192.168.1.34	ACCESS PERMITTED
6	01/01/2000 01:11:54	Firewall default policy: UDP (L to W)	192.168.1.34:1029	172.17.2.5:161	ACCESS PERMITTED
7	01/01/2000 01:11:47	Router reply ICMP packet: ICMP(Host Unreachable)	192.168.1.1	192.168.1.34	ACCESS PERMITTED
8	01/01/2000 01:11:47	Firewall default policy: UDP (L to W)	192.168.1.34:1029	172.17.2.5:161	ACCESS PERMITTED

The following table describes the fields in this screen.

Table 82 Logs > View Log

LABEL	DESCRIPTION
Display	The categories that you select in the **Log Settings** screen display in the drop-down list box. Select a category of logs to view; select **All Logs** to view logs from all of the log categories that you selected in the **Log Settings** page.
Email Log Now	Click **Email Log Now** to send the log screen to the e-mail address specified in the **Log Settings** page (make sure that you have first filled in the **E-mail Log Settings** fields in **Log Settings**).
Refresh	Click **Refresh** to renew the log screen.
Clear Log	Click **Clear Log** to delete all the logs.
#	This field displays an index number.
Time	This field displays the time the log was recorded.
Message	This field states the reason for the log.
Source	This field lists the source IP address and the port number of the incoming packet.
Destination	This field lists the destination IP address and the port number of the incoming packet.
Notes	This field displays additional information about the log entry.

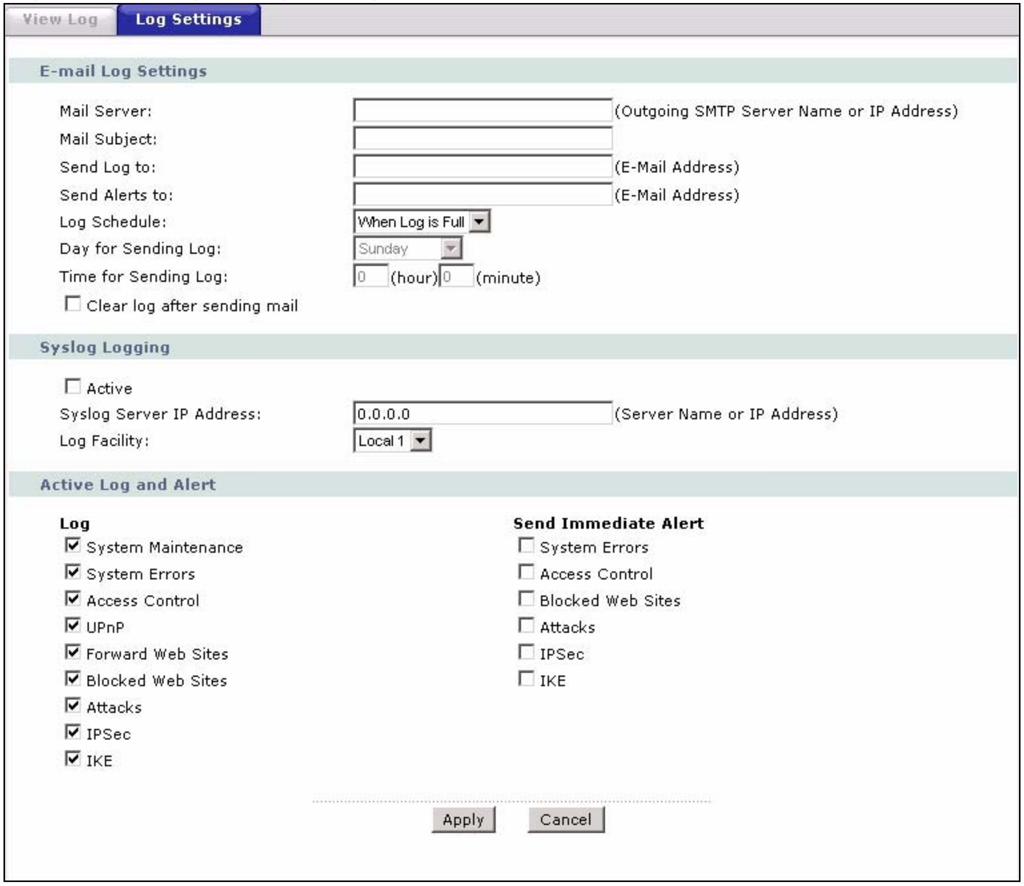
18.3 Configuring Log Settings

See Section 18.1 on page 233 for background information. Use the **Log Settings** screen to configure where the ZyXEL Device is to send logs; the schedule for when the ZyXEL Device is to send the logs and which logs and/or immediate alerts the ZyXEL Device is to record. See Section 18.1 on page 233 for more information.

To change your ZyXEL Device's log settings, click **Maintenance > Logs** > **Log Settings**. The screen appears as shown.

Alerts are e-mailed as soon as they happen. Logs may be e-mailed as soon as the log is full. Selecting many alert and/or log categories (especially **Access Control**) may result in many e-mails being sent.

Figure 122 Logs > Log Settings



E-mail Log Settings

Mail Server: (Outgoing SMTP Server Name or IP Address)

Mail Subject:

Send Log to: (E-Mail Address)

Send Alerts to: (E-Mail Address)

Log Schedule: When Log is Full

Day for Sending Log: Sunday

Time for Sending Log: 0 (hour) 0 (minute)

□ Clear log after sending mail

Syslog Logging

□ Active

Syslog Server IP Address: 0.0.0.0 (Server Name or IP Address)

Log Facility: Local 1

Active Log and Alert

Log	Send Immediate Alert
☑ System Maintenance	□ System Errors
☑ System Errors	□ Access Control
☑ Access Control	□ Blocked Web Sites
☑ UPnP	□ Attacks
☑ Forward Web Sites	□ IPSec
☑ Blocked Web Sites	□ IKE
☑ Attacks	
☑ IPSec	
☑ IKE	

The following table describes the fields in this screen.

Table 83 Logs > Log Settings

LABEL	DESCRIPTION
E-mail Log Settings	
Mail Server	Enter the server name or the IP address of the mail server for the e-mail addresses specified below. If this field is left blank, logs and alert messages will not be sent via E-mail.
Mail Subject	Type a title that you want to be in the subject line of the log e-mail message that the ZyXEL Device sends. Not all ZyXEL Device models have this field.
Send Log To	The ZyXEL Device sends logs to the e-mail address specified in this field. If this field is left blank, the ZyXEL Device does not send logs via e-mail.
Send Alerts To	Alerts are real-time notifications that are sent as soon as an event, such as a DoS attack, system error, or forbidden web access attempt occurs. Enter the E-mail address where the alert messages will be sent. Alerts include system errors, attacks and attempted access to blocked web sites. If this field is left blank, alert messages will not be sent via E-mail.

Table 83 Logs > Log Settings

LABEL	DESCRIPTION
Log Schedule	This drop-down menu is used to configure the frequency of log messages being sent as E-mail: **Daily** **Weekly** **Hourly** **When Log is Full** **None.** If you select **Weekly** or **Daily**, specify a time of day when the E-mail should be sent. If you select **Weekly**, then also specify which day of the week the E-mail should be sent. If you select **When Log is Full**, an alert is sent when the log fills up. If you select **None**, no log messages are sent.
Day for Sending Log	Use the drop down list box to select which day of the week to send the logs.
Time for Sending Log	Enter the time of the day in 24-hour format (for example 23:00 equals 11:00 pm) to send the logs.
Clear log after sending mail	Select the check box to delete all the logs after the ZyXEL Device sends an E-mail of the logs.
Syslog Logging	The ZyXEL Device sends a log to an external syslog server.
Active	Click **Active** to enable syslog logging.
Syslog Server IP Address	Enter the server name or IP address of the syslog server that will log the selected categories of logs.
Log Facility	Select a location from the drop down list box. The log facility allows you to log the messages to different files in the syslog server. Refer to the syslog server manual for more information.
Active Log and Alert	
Log	Select the categories of logs that you want to record.
Send Immediate Alert	Select log categories for which you want the ZyXEL Device to send E-mail alerts immediately.
Apply	Click **Apply** to save your customized settings and exit this screen.
Cancel	Click **Cancel** to return to the previously saved settings.

CHAPTER 19 Tools

This chapter covers uploading new firmware, managing configuration and restarting your ZyXEL Device.

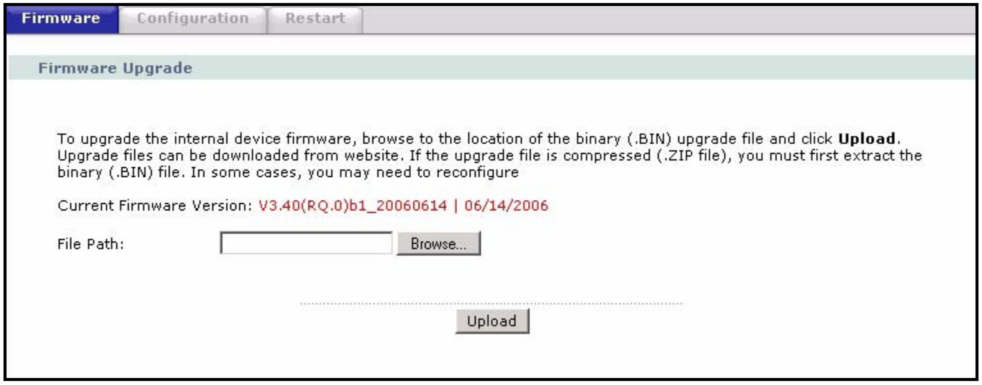
19.1 Firmware Upgrade

Find firmware at www.zyxel.com in a file that (usually) uses the system model name with a .bin extension, for example, "ZyXEL Device.bin". The upload process uses HTTP (Hypertext Transfer Protocol) and may take up to two minutes. After a successful upload, the system will reboot.

Only use firmware for your device's specific model. Refer to the label on the bottom of your device.

Click **Maintenance** > **Tools** to open the **Firmware** screen. Follow the instructions in this screen to upload firmware to your ZyXEL Device.

Figure 123 Tools > Firmware



Firmware Upgrade

To upgrade the internal device firmware, browse to the location of the binary (.BIN) upgrade file and click **Upload**. Upgrade files can be downloaded from website. If the upgrade file is compressed (.ZIP file), you must first extract the binary (.BIN) file. In some cases, you may need to reconfigure

Current Firmware Version: V3.40(RQ.0)b1_20060614 | 06/14/2006

File Path:

The following table describes the labels in this screen.

Table 84 Tools > Firmware

LABEL	DESCRIPTION
Current Firmware Version	This is the present Firmware version and the date created.
File Path	Type in the location of the file you want to upload in this field or click **Browse ...** to find it.

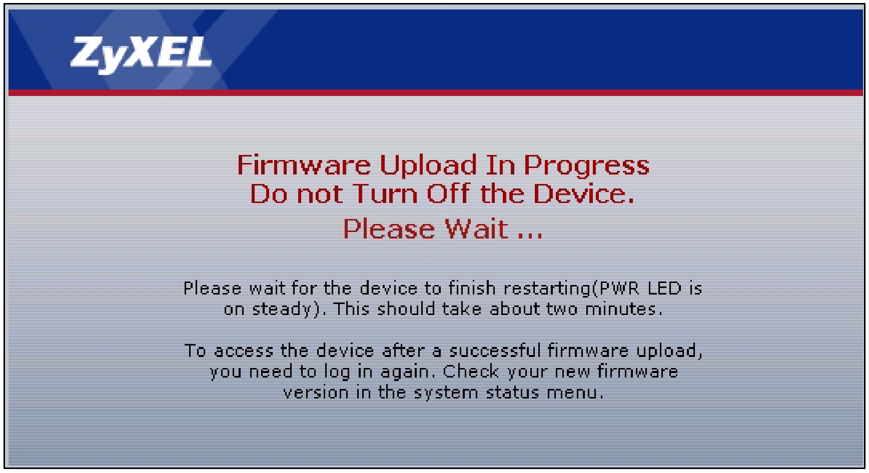
Table 84 Tools > Firmware (continued)

LABEL	DESCRIPTION
Browse...	Click **Browse...** to find the .bin file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Upload	Click **Upload** to begin the upload process. This process may take up to two minutes. **Note:** Do NOT turn off the ZyXEL Device while firmware upload is in progress!

Note: Do NOT turn off the ZyXEL Device while firmware upload is in progress!

After you see the **Firmware Upload in Progress** screen, wait two minutes before logging into the ZyXEL Device again.

Figure 124 Firmware Upload In Progress



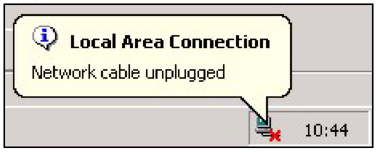
Firmware Upload In Progress
Do not Turn Off the Device.
Please Wait ...

Please wait for the device to finish restarting(PWR LED is on steady). This should take about two minutes.

To access the device after a successful firmware upload, you need to log in again. Check your new firmware version in the system status menu.

The ZyXEL Device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

Figure 125 Network Temporarily Disconnected

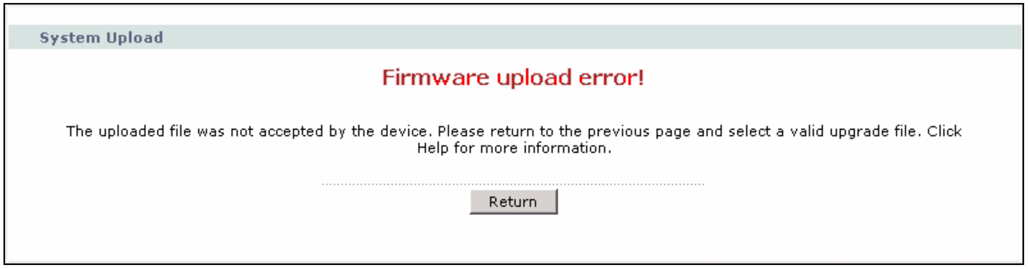


Local Area Connection
Network cable unplugged

After two minutes, log in again and check your new firmware version in the **Status** screen.

If the upload was not successful, the following screen will appear. Click **Return** to go back to the **Firmware** screen.

Figure 126 Error Message



System Upload

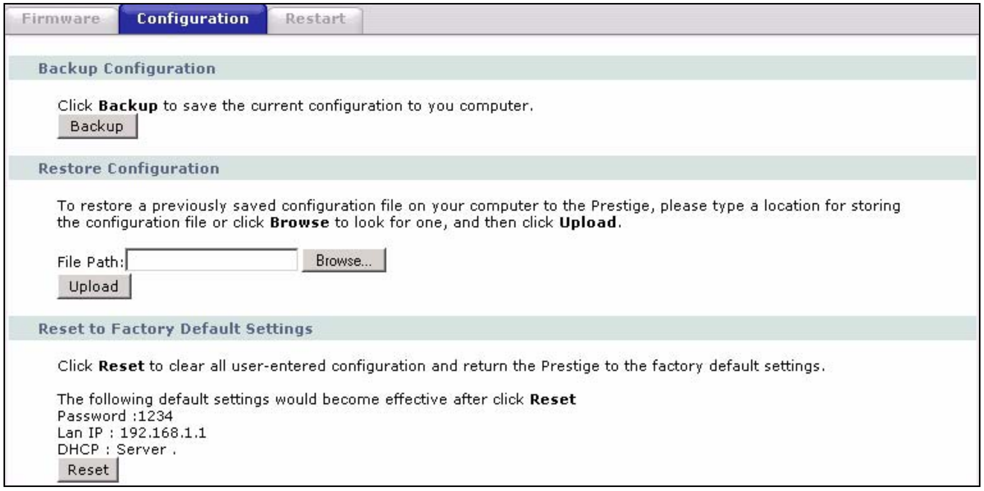
Firmware upload error!

The uploaded file was not accepted by the device. Please return to the previous page and select a valid upgrade file. Click Help for more information.

19.2 Configuration

Use this screen to back up or restore the configuration of the ZyXEL Device. You can also use this screen to reset the ZyXEL Device to the factory default settings. To access this screen, click **Maintenance** > **Tools** > **Configuration**.

Figure 127 Tools > Configuration



Backup Configuration

Click **Backup** to save the current configuration to you computer.

Restore Configuration

To restore a previously saved configuration file on your computer to the Prestige, please type a location for storing the configuration file or click **Browse** to look for one, and then click **Upload**.

File Path:

Reset to Factory Default Settings

Click **Reset** to clear all user-entered configuration and return the Prestige to the factory default settings.

The following default settings would become effective after click **Reset**
Password :1234
Lan IP : 192.168.1.1
DHCP : Server .

The following table describes the labels in this screen.

Table 85 Tools > Configuration

LABEL	DESCRIPTION
Backup Configuration	
Backup	Click this to save the ZyXEL Device's current configuration to a file on your computer. Once your device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes. The backup configuration file is useful if you need to return to your previous settings.
Restore Configuration	
File Path	Enter the location of the file you want to upload, or click **Browse...** to find it.
Browse	Click this to find the file you want to upload.

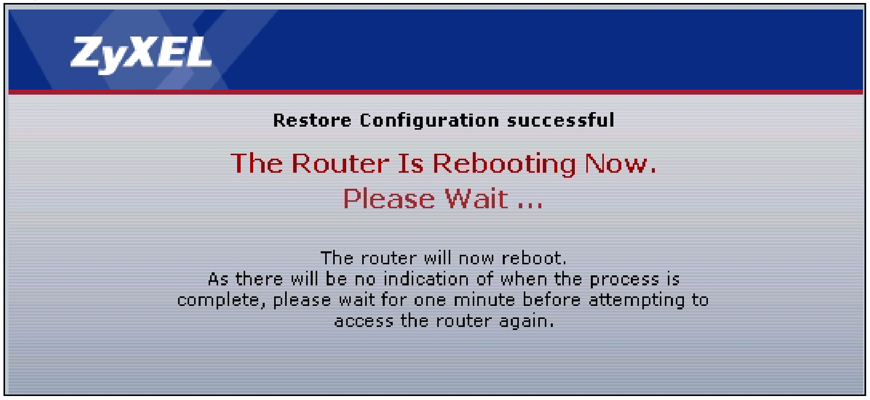
Table 85 Tools > Configuration (continued)

LABEL	DESCRIPTION
Upload	Click this to restore the selected configuration file. See below for more information about this. **Note:** Do not turn off the device while configuration file upload is in progress.
Reset to Factory Default Settings	
Reset	Click this to clear all user-entered configuration information and return the ZyXEL Device to its factory defaults. There is no warning screen. See Section 2.5 on page 54 for more information about resetting the ZyXEL Device.

Note: Do not turn off the device while configuration file upload is in progress.

When the ZyXEL Device has finished restoring the selected configuration file, the following screen appears.

Figure 128 Configuration Upload Successful



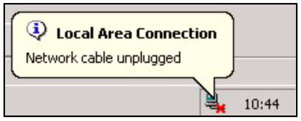
Restore Configuration successful

The Router Is Rebooting Now.
Please Wait ...

The router will now reboot.
As there will be no indication of when the process is complete, please wait for one minute before attempting to access the router again.

The device now automatically restarts. This causes a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

Figure 129 Network Temporarily Disconnected



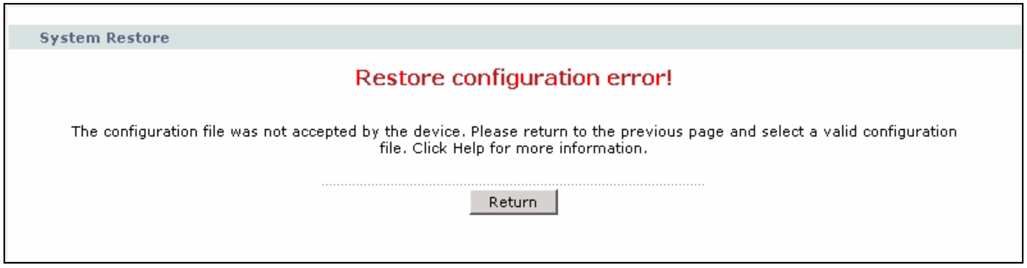
Local Area Connection
Network cable unplugged

If the ZyXEL Device's IP address is different in the configuration file you selected, you may need to change the IP address of your computer to be in the same subnet as that of the ZyXEL Device. See your Quick Start Guide or the appendices for details on how to set up your computer's IP address.

You might have to open a new browser to log in again.

If the upload was not successful, a **Configuration Upload Error** screen appears.

Figure 130 Configuration Upload Error



Restore configuration error!

The configuration file was not accepted by the device. Please return to the previous page and select a valid configuration file. Click Help for more information.

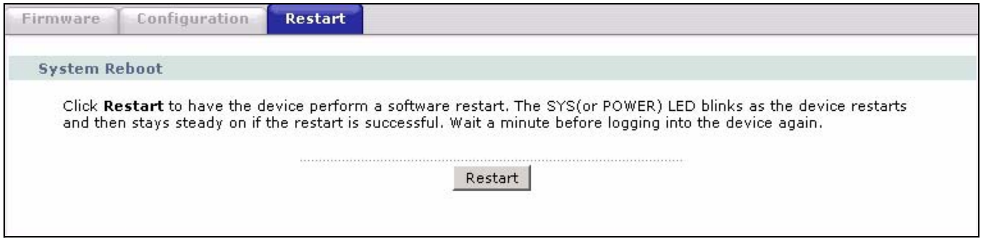
Click **Return** to go back to the previous screen.

19.3 Restart

System restart allows you to reboot the ZyXEL Device without turning the power off.

Click **Maintenance > Tools** > **Restart**. Click **Restart** to have the ZyXEL Device reboot. This does not affect the ZyXEL Device's configuration.

Figure 131 Tools > Restart



Click **Restart** to have the device perform a software restart. The SYS(or POWER) LED blinks as the device restarts and then stays steady on if the restart is successful. Wait a minute before logging into the device again.

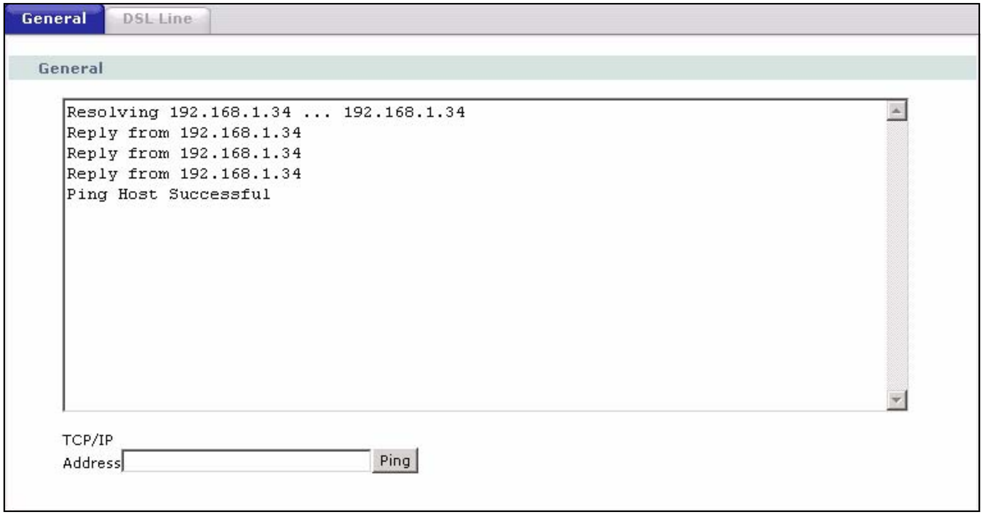
CHAPTER 20 Diagnostic

These read-only screens display information to help you identify problems with the ZyXEL Device.

20.1 General Diagnostic

Use this screen to ping a computer on the network. Click **Maintenance > Diagnostic** to open the screen shown next.

Figure 132 Diagnostic > General



```
Resolving 192.168.1.34 ... 192.168.1.34
Reply from 192.168.1.34
Reply from 192.168.1.34
Reply from 192.168.1.34
Ping Host Successful
```

The following table describes the fields in this screen.

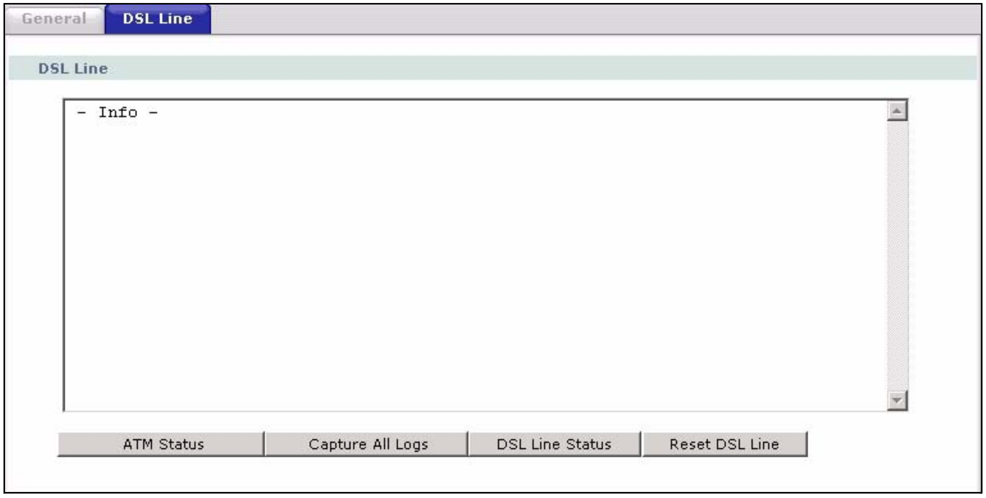
Table 86 Diagnostic > General

LABEL	DESCRIPTION
TCP/IP Address	Type the IP address of a computer that you want to ping in order to test a connection.
Ping	Click this button to ping the IP address that you entered. The results are displayed in the screen.

20.2 DSL Line Diagnostic

Use this screen to run DSL diagnostics. Click **Maintenance > Diagnostic > DSL Line** to open the screen shown next.

Figure 133 Diagnostic > DSL Line



The following table describes the fields in this screen.

Table 87 Diagnostic > DSL Line

LABEL	DESCRIPTION
ATM Status	Click this button to view ATM status.
Capture All Logs	Click this button to display all logs generated by the DSL line.
DSL Line Status	Click this button to view the DSL port's line operating values and line bit allocation.

Reset DSL Line	Click this button to reinitialize the DSL line. The large text box above then displays the progress and results of this operation, for example:
	`"Start to reset DSL`
	`Loading DSL modem F/W...`
	`Reset DSL Line Successfully!"`

CHAPTER 21 Introducing the SMT

The System Management Terminal (SMT) provides a text-based, menu-driven console to manage the ZyXEL Device. This chapter describes how to access the SMT and then provides an overview of its menus.

21.1 Accessing the SMT

Use Telnet to access the SMT. Follow these steps.

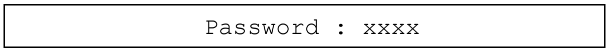
1 In Windows, click **Start** > **Run**.

2 Type "telnet w.x.y.z", and click **OK**.

w.x.y.z is the IP address of the ZyXEL Device; the default address is 192.168.1.1.

The ZyXEL Device prompts you for the password.

Figure 134 Login Screen



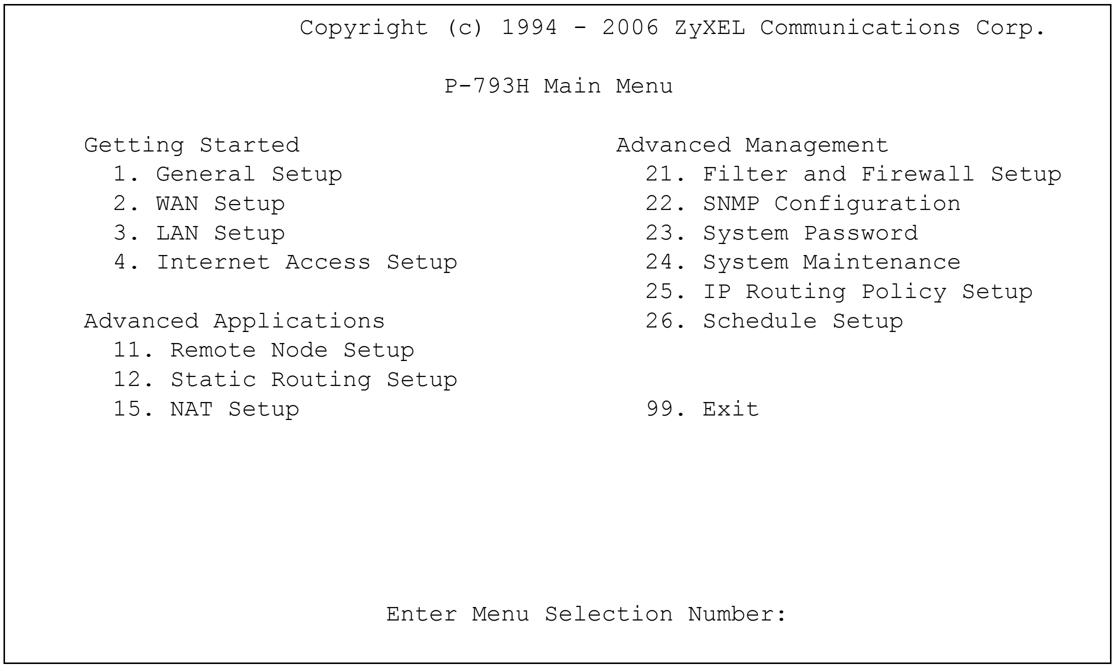
```
                    Password : xxxx
```

3 Enter the password. The default password is 1234. As you type the password, the screen displays an asterisk "*" for each character you type.

4 After you enter the password, the SMT main menu appears, as shown next.

Note: Use menu 23.1 to change the password.

Figure 135 SMT Main Menu



```
                   Copyright (c) 1994 - 2006 ZyXEL Communications Corp.

                             P-793H Main Menu

    Getting Started                      Advanced Management
      1. General Setup                     21. Filter and Firewall Setup
      2. WAN Setup                         22. SNMP Configuration
      3. LAN Setup                         23. System Password
      4. Internet Access Setup             24. System Maintenance
                                           25. IP Routing Policy Setup
    Advanced Applications                  26. Schedule Setup
      11. Remote Node Setup
      12. Static Routing Setup
      15. NAT Setup                        99. Exit




                         Enter Menu Selection Number:
```

Note: There is an inactivity timeout, and the default value is ten minutes. If there is no activity for longer than this, your ZyXEL Device will automatically log you out. You will then have to telnet into the ZyXEL Device again. You can use the web configurator or the CI commands (menu 24.8) to change the inactivity timeout period.

21.2 SMT Menu Items

The following table provides an overview of each menu item.

Table 88 Main Menu Summary

MENU	FUNCTION
1 General Setup	Use this menu to set up device mode, dynamic DNS and administrative information.
2 WAN Setup	Use this menu to configure the DSL connection, traffic redirect, and dial-backup interface.
3 LAN Setup	Use this to apply LAN filters, configure LAN DHCP and TCP/IP settings, and to allow or block layer-2 traffic between each pair of ports.
4 Internet Access Setup	Use this menu to configure your Internet connection.
11 Remote Node Setup	Use this menu to configure detailed remote node settings (for example, your ISP is a remote node) as well as apply filters.
12 Static Routing Setup	Use this menu to configure IP and bridge (MAC) static routes.
15 NAT Setup	Use this menu to configure Network Address Translation (NAT) on the ZyXEL Device.

Table 88 Main Menu Summary

MENU	FUNCTION
21 Filter and Firewall Setup	Use this menu to configure filters and to activate or deactivate the firewall.
22 SNMP Configuration	Use this menu to configure SNMP.
23 System Password	Use this menu to change your password.
24 System Maintenance	Use this menu for comprehensive system maintenance, from looking at the system status to uploading firmware. You can also access the Command Interface (CI).
25 IP Routing Policy Setup	Use this menu to configure policy routes.
26 Schedule Setup	Use this menu to configure schedule sets.
99 Exit	Use this menu to exit the SMT.

The following table gives you an overview of the various SMT menus.

Table 89 SMT Menus Overview

MENUS	SUB MENUS		
1 General Setup	1.1 Configure Dynamic DNS		
2 WAN Setup	2.1 Traffic Redirect Setup		
	2.2 Dial Backup Setup	2.2.1 Advanced Dial Backup Setup	
3 LAN Setup	3.1 LAN Port Filter Setup		
	3.2 TCP/IP and DHCP Setup	3.2.1 IP Alias Setup	
	3.6 Port Based VLAN Setup		
4 Internet Access Setup			
11 Remote Node Setup	11.1 Remote Node Profile	11.1.3 Remote Node Network Layer Options	
		11.1.5 Remote Node Filter	
		11.1.6 Remote Node ATM Layer Options	
12 Static Route Setup	12.1 IP Static Route Setup	12.1.1 Edit IP Static Route	
	12.3 Bridge Static Route Setup	12.3.1 Edit Bridge Static Route	
15 NAT Setup	15.1 Address Mapping Sets	15.1.x Address Mapping Rules	15.1.x.x Address Mapping Rule
	15.2 NAT Server Sets	15.2.x NAT Server Setup	
21 Filter and Firewall Setup	21.1 Filter Set Configuration	21.1.x Filter Rules Summary	21.1.x.x Generic Filter Rule
			21.1.x.x TCP/IP Filter Rule
	21.2 Firewall Setup		
22 SNMP Configuration			
23 System Password			

Table 89 SMT Menus Overview (continued)

MENUS	SUB MENUS		
24 System Maintenance	24.1 System Maintenance - Status		
	24.2 System Information and Console Port Speed	24.2.1 System Maintenance - Information	
		24.2.2 System Maintenance - Change Console Port Speed	
	24.3 System Maintenance - Log and Trace	24.3.1 View Error Log	
		24.3.2 System Maintenance - UNIX Syslog	
	24.4 System Maintenance - Diagnostic		
	24.5 Backup Configuration		
	24.6 Restore Configuration		
	24.7 System Maintenance - Upload Firmware	24.7.1 System Maintenance - Upload System Firmware	
		24.7.2 System Maintenance - Upload System Configuration File	
	24.8 Command Interpreter Mode		
	24.9 System Maintenance - Call Control	24.9.1 Budget Management	
	24.10 System Maintenance - Time and Date Setting		
	24.11 Remote Management Control		
25 IP Routing Policy Summary	25.1 IP Routing Policy Setup	25.1.1 IP Routing Policy	
26 Schedule Setup	26.1 Schedule Set Setup		

21.3 Navigating the SMT Interface

You should be familiar with the following operations before you try to use the SMT to modify the configuration.

Table 90 Main Menu Commands

OPERATION	KEYSTROKE	DESCRIPTION
Move down to another menu	[ENTER]	To move forward to a submenu, type in the number of the desired submenu and press [ENTER].
Move up to a previous menu	[ESC]	Press [ESC] to move back to the previous menu.

Table 90 Main Menu Commands

OPERATION	KEYSTROKE	DESCRIPTION
Move to a “hidden” menu	Press [SPACE BAR] to change **No** to **Yes** then press [ENTER].	Fields beginning with “Edit” lead to hidden menus and have a default setting of **No**. Press [SPACE BAR] once to change **No** to **Yes**, then press [ENTER] to go to the “hidden” menu.
Move the cursor	[ENTER] or [UP]/[DOWN] arrow keys.	Within a menu, press [ENTER] to move to the next field. You can also use the [UP]/[DOWN] arrow keys to move to the previous and the next field, respectively.
Entering information	Type in or press [SPACE BAR], then press [ENTER].	You need to fill in two types of fields. The first requires you to type in the appropriate information. The second allows you to cycle through the available choices by pressing [SPACE BAR].
Required fields	<?> or **ChangeMe**	All fields with the symbol <?> must be filled in order to be able to save the new configuration. All fields with **ChangeMe** must not be left blank in order to be able to save the new configuration.
N/A fields	<N/A>	Some of the fields in the SMT will show a <N/A>. This symbol refers to an option that is Not Applicable.
Save your configuration	[ENTER]	Save your configuration by pressing [ENTER] at the message “Press ENTER to confirm or ESC to cancel”. Saving the data on the screen will take you, in most cases to the previous menu.
Exit the SMT	Type 99, then press [ENTER].	Type 99 at the main menu prompt and press [ENTER] to exit the SMT interface.

CHAPTER 22 General Setup

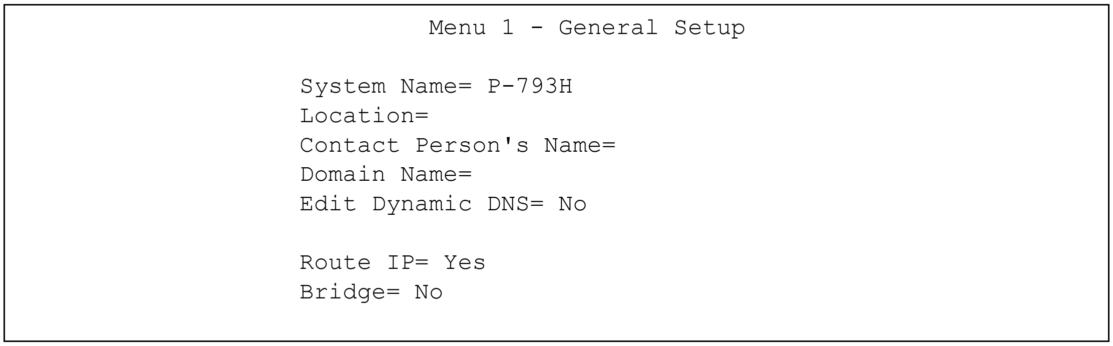
Use this menu to set up device mode, dynamic DNS and administrative information.

22.1 Configuring General Setup

1 Enter 1 in the main menu to open **Menu 1 - General Setup**.

2 The **Menu 1 - General Setup** screen appears, as shown next. Fill in the required fields.

Figure 136 Menu 1: General Setup



```
                        Menu 1 - General Setup

               System Name= P-793H
               Location=
               Contact Person's Name=
               Domain Name=
               Edit Dynamic DNS= No

               Route IP= Yes
               Bridge= No
```

The following table describes the fields in this menu.

Table 91 Menu 1: General Setup

FIELD	DESCRIPTION
System Name	Choose a descriptive name for identification purposes. It is recommended you enter your computer’s “Computer name” in this field. This name can be up to 30 alphanumeric characters long. Spaces are not allowed, but dashes “-” and underscores "_" are accepted.
Location	Enter a descriptive name for the place where the ZyXEL Device is located. You can enter up to 31 characters, or you can leave this field blank.
Contact Person’s Name	Enter the name of the person to contact for questions about the ZyXEL Device. You can enter up to 30 characters, or you can leave this field blank.
Domain Name	Enter the domain name (if you know it) here. If you leave this field blank, the ISP may assign a domain name via DHCP. You can go to menu 24.8 and type "sys domain name" to see the current domain name used by your router. The domain name entered by you is given priority over the ISP assigned domain name. If you want to clear this field just press [SPACE BAR] and then [ENTER].
Edit Dynamic DNS	Press [SPACE BAR] and then [ENTER] to select **Yes** or **No** (default). Select **Yes** to configure **Menu 1.1: Configure Dynamic DNS** discussed next.

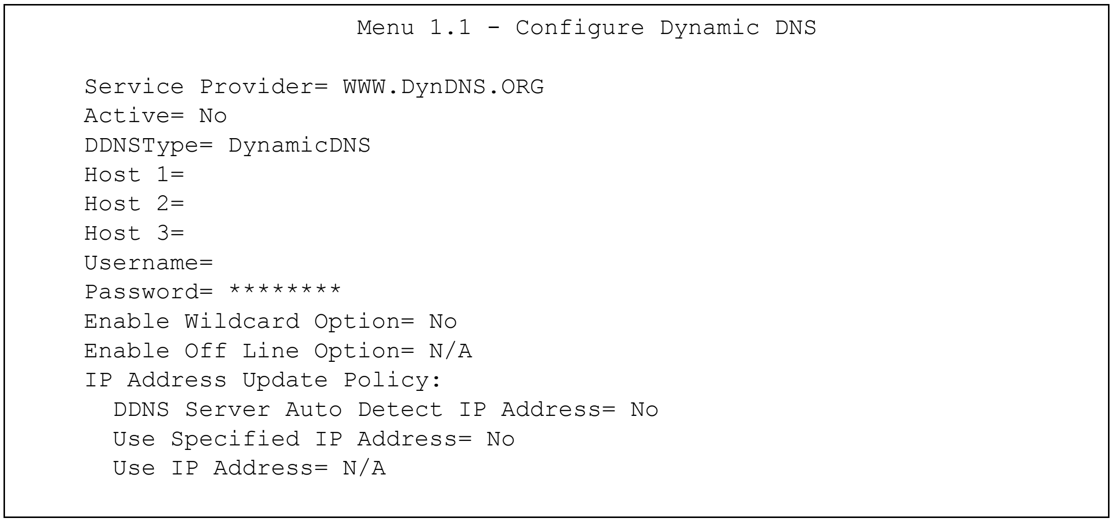
Table 91 Menu 1: General Setup (continued)

FIELD	DESCRIPTION
Route IP	Select **Yes** to enable IP-based routing in the ZyXEL Device. This is not effective for a specific remote node unless you enable IP-based routing in the remote node too. See Menu 11.1: Remote Node Profile (nodes 1-7) in Section 26.3 on page 269. You should enable **Route IP**, **Bridge**, or both in this screen. If you disable **Route IP** and **Bridge**, the device does not send traffic between the LAN ports and remote node.
Bridge	If **Route IP** is **Yes**, select **Yes** in this field to enable bridging in the ZyXEL Device for protocols that are not supported by IP-based routing (for example, SNA). If **Route IP** is **No**, select **Yes** in this field to enable bridging in the ZyXEL Device for all protocols. In either case, this setting is not effective for a specific remote node unless you enable bridging in the remote node too. See Menu 11.1: Remote Node Profile (nodes 1-7) in Section 26.3 on page 269. You should enable **Route IP**, **Bridge**, or both in this screen. If you disable **Route IP** and **Bridge**, the device does not send traffic between the LAN ports and remote node.
When you have completed this menu, press [ENTER] at the prompt “Press ENTER to Confirm…” to save your configuration, or press [ESC] at any time to cancel.	

22.1.1 Configuring Dynamic DNS

To configure Dynamic DNS, set the ZyXEL Device to router mode in menu 1 or in the **MAINTENANCE Device Mode** screen and go to **Menu 1 - General Setup** and press [SPACE BAR] to select **Yes** in the **Edit Dynamic DNS** field. Press [ENTER] to display **Menu 1.1 - Configure Dynamic DNS** (shown next).

Figure 137 Menu 1.1: Configure Dynamic DNS



```
                        Menu 1.1 - Configure Dynamic DNS

     Service Provider= WWW.DynDNS.ORG
     Active= No
     DDNSType= DynamicDNS
     Host 1=
     Host 2=
     Host 3=
     Username=
     Password= ********
     Enable Wildcard Option= No
     Enable Off Line Option= N/A
     IP Address Update Policy:
       DDNS Server Auto Detect IP Address= No
       Use Specified IP Address= No
       Use IP Address= N/A
```

Follow the instructions in the next table to configure Dynamic DNS parameters.

Table 92 Menu 1.1: Configure Dynamic DNS

FIELD	DESCRIPTION
Service Provider	This is the name of your Dynamic DNS service provider.
Active	Press [SPACE BAR] to select **Yes** and then press [ENTER] to make dynamic DNS active.
DDNSType	Press [SPACE BAR] and then [ENTER] to select **DynamicDNS** if you have the Dynamic DNS service. Select **StaticDNS** if you have the Static DNS service. Select **CustomDNS** if you have the Custom DNS service.
Host 1-3	Enter up to three host names in these fields.
Username	Enter your user name.
Password	Enter the password assigned to you.
Enable Wildcard Option	Your ZyXEL Device supports DYNDNS Wildcard. Press [SPACE BAR] and then [ENTER] to select **Yes** or **No**. This field is **N/A** when you choose DDNS client as your service provider.
Enable Off Line Option	This field is only available when **CustomDNS** is selected in the **DDNS Type** field. Press [SPACE BAR] and then [ENTER] to select **Yes**. When **Yes** is selected, http://www.dyndns.org/ traffic is redirected to a URL that you have previously specified (see www.dyndns.org for details).
IP Address Update Policy:	You can select **Yes** in either the **DDNS Server Auto Detect IP Address** field (recommended) or the **Use Specified IP Address** field, but not both. With the **DDNS Server Auto Detect IP Address** and **Use Specified IP Address** fields both set to **No**, the DDNS server automatically updates the IP address of the host name(s) with the ZyXEL Device's WAN IP address. DDNS does not work with a private IP address. When both fields are set to **No**, the ZyXEL Device must have a public WAN IP address in order for DDNS to work.
DDNS Server Auto Detect IP Address	Only select this option when there are one or more **NAT** routers between the ZyXEL Device and the DDNS server. Press [SPACE BAR] to select **Yes** and then press [ENTER] to have the DDNS server automatically detect and use the IP address of the NAT router that has a public IP address. **Note:** The DDNS server may not be able to detect the proper IP address if there is an HTTP proxy server between the ZyXEL Device and the DDNS server.
Use Specified IP Address	Press [SPACE BAR] to select **Yes** and then press [ENTER] to update the IP address of the host name(s) to the IP address specified below. Only select **Yes** if the ZyXEL Device uses or is behind a static public IP address.
Use IP Address	Enter the static public IP address if you select **Yes** in the **Use Specified IP Address** field.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to Confirm…" to save your configuration, or press [ESC] at any time to cancel.	

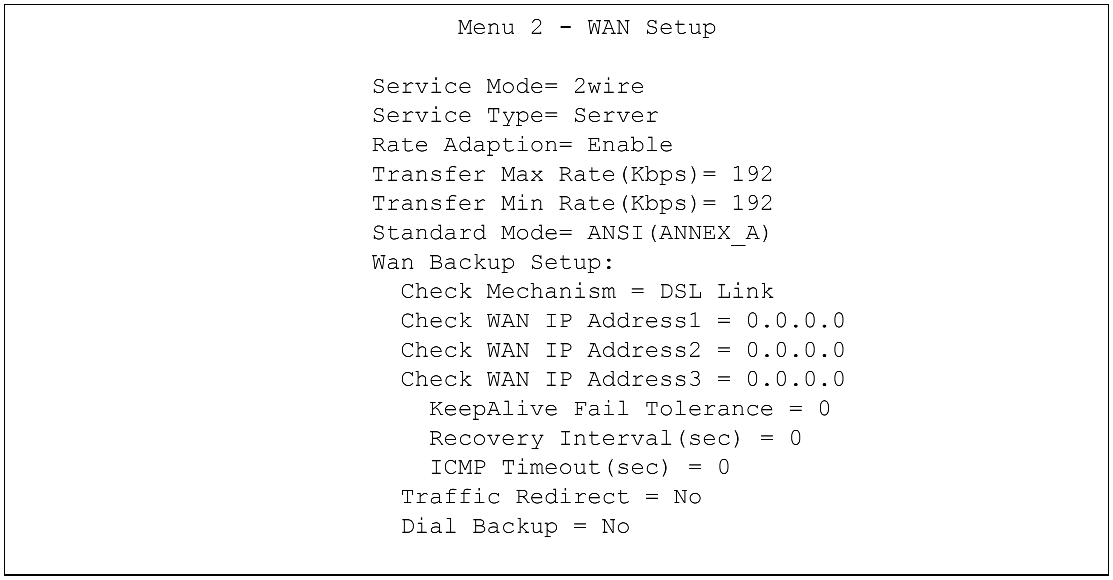
CHAPTER 23 WAN Setup

Use this menu to configure the DSL connection, traffic redirect, and dial-backup interface.

23.1 WAN Setup

From the main menu, enter 2 to open menu 2.

Figure 138 Menu 2: WAN Setup



```
                          Menu 2 - WAN Setup

                    Service Mode= 2wire
                    Service Type= Server
                    Rate Adaption= Enable
                    Transfer Max Rate(Kbps)= 192
                    Transfer Min Rate(Kbps)= 192
                    Standard Mode= ANSI(ANNEX_A)
                    Wan Backup Setup:
                      Check Mechanism = DSL Link
                      Check WAN IP Address1 = 0.0.0.0
                      Check WAN IP Address2 = 0.0.0.0
                      Check WAN IP Address3 = 0.0.0.0
                        KeepAlive Fail Tolerance = 0
                        Recovery Interval(sec) = 0
                        ICMP Timeout(sec) = 0
                      Traffic Redirect = No
                      Dial Backup = No
```

The following table describes the fields in this screen.

Table 93 Menu 2: WAN Setup

FIELD	DESCRIPTION
Service Mode	Press [SPACE BAR] to indicate whether the ZyXEL Device should use 2-wire or 4-wire mode for the DSL connection. This is related to the phone line you use and affects the maximum speed of the connection. In 2-wire mode, the maximum data rate is up to 5.69 Mbps, while in 4-wire mode, the maximum data rate us up to 11.38 Mbps.
Service Type	Press [SPACE BAR] to indicate whether the ZyXEL Device is the server or the client in the DSL connection. Select **Server** if this ZyXEL Device is the server in a point-to-point application. (See Chapter 4 on page 67.) Otherwise, select **Client**.
Rate Adaption	This field is enabled if **Service Type** is **Server**. Press [SPACE BAR] to let the ZyXEL Device adjust the speed of its connection to that of the other device.

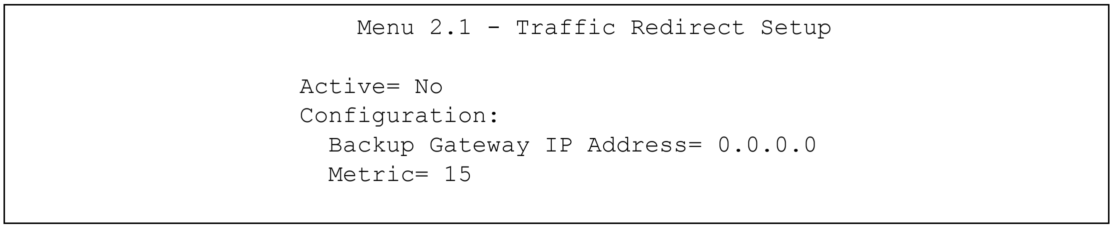
Table 93 Menu 2: WAN Setup (continued)

FIELD	DESCRIPTION
Transfer Max Rate(Kbps)	This field is enabled if **Service Type** is **Server**. Press [SPACE BAR] to set the maximum rate at which the ZyXEL Device sends and receives information. If you enable **Rate Adaption**, the ZyXEL Device adjusts to the speed of the other device and may exceed this rate.
Transfer Min Rate(Kbps)	This field is enabled if **Service Type** is **Server**. Press [SPACE BAR] to set the minimum rate at which the ZyXEL Device sends and receives information. If you enable **Rate Adaption**, the ZyXEL Device adjusts to the speed of the other device and may transfer information at less than this rate.
Standard Mode	This field is enabled if **Service Type** is **Server**. Press [SPACE BAR] to select the operational mode the ZyXEL Device uses in the DSL connection.
Wan Backup Setup	
Check Mechanism	Select the method that the ZyXEL Device uses to check the DSL connection. Select **DSL Link** to have the ZyXEL Device check if the connection to the DSLAM is up. Select **ICMP** to have the ZyXEL Device periodically ping the IP addresses configured in the **Check WAN IP Address** fields.
Check WAN IP Address1 Check WAN IP Address2 Check WAN IP Address3	Configure this field to test your ZyXEL Device's WAN accessibility. Type the IP address of up to three reliable, nearby computers (for example, your ISP's DNS server address). **Note:** If you activate either traffic redirect or dial backup, you must configure at least one IP address here. When using a WAN backup connection, the ZyXEL Device periodically pings the addresses configured here and uses the other WAN backup connection (if configured) if there is no response.
KeepAlive Fail Tolerance	Type the number of times (2 recommended) that your ZyXEL Device may ping the IP addresses configured in the **Check WAN IP Address** field without getting a response before switching to a WAN backup connection (or a different WAN backup connection).
Recovery Interval(sec)	When the ZyXEL Device is using a lower priority connection (usually a WAN backup connection), it periodically checks to whether or not it can use a higher priority connection. Type the number of seconds (30 recommended) for the ZyXEL Device to wait between checks. Allow more time if your destination IP address handles lots of traffic.
ICMP Timeout(sec)	Type the number of seconds (3 recommended) for your ZyXEL Device to wait for a ping response from one of the IP addresses in the **Check WAN IP Address** field before timing out the request. The WAN connection is considered "down" after the ZyXEL Device times out the number of times specified in the **Fail Tolerance** field. Use a higher value in this field if your network is busy or congested.
Traffic Redirect	Press [SPACE BAR] to select **Yes** and then press [ENTER] to activate traffic redirect and to edit its settings.
Dial Backup	Press [SPACE BAR] to select **Yes** and then press [ENTER] to activate the dial-backup interface and to edit its settings.
When you have completed this menu, press [ENTER] at the prompt “Press ENTER to Confirm…” to save your configuration, or press [ESC] at any time to cancel.	

23.2 Configuring Traffic Redirect

From the main menu, in menu 2, select **Yes** in **Traffic Redirect**, and then press [ENTER].

Figure 139 Menu 2.1: Traffic Redirect Setup



```
                    Menu 2.1 - Traffic Redirect Setup

                Active= No
                Configuration:
                  Backup Gateway IP Address= 0.0.0.0
                  Metric= 15
```

The following table describes the fields in this menu.

Table 94 Menu 2.1: Traffic Redirect Setup

FIELD	DESCRIPTION
Active	Use this field to turn the traffic redirect feature on (**Yes**) or off (**No**).
Configuration	
Backup Gateway IP Address	Type the IP address of your backup gateway in dotted decimal notation. The ZyXEL Device automatically forwards traffic to this IP address if the ZyXEL Device's Internet connection terminates.
Metric	This field sets this route's priority among the routes the ZyXEL Device uses. The metric represents the "cost of transmission". A router determines the best route for transmission by choosing a path with the lowest "cost". RIP routing uses hop count as the measurement of cost, with a minimum of "1" for directly connected networks. The number must be between "1" and "15"; a number greater than "15" means the link is down. The smaller the number, the lower the "cost".
When you have completed this menu, press [ENTER] at the prompt “Press ENTER to Confirm…” to save your configuration, or press [ESC] at any time to cancel.	

23.3 Dial Backup Interface

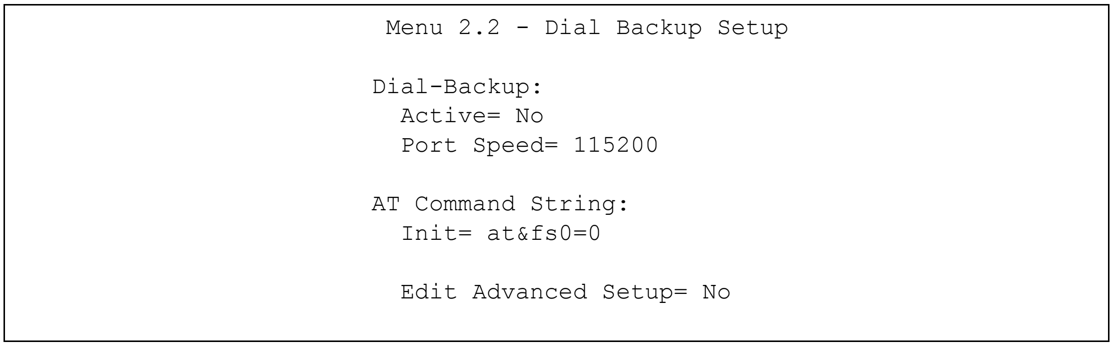
In the SMT, to set up the auxiliary port for use, first make sure you have set up the switch and port connection. Then, use the following menus.

1. Menu 2 - WAN Setup
2. Menu 2.2 - Dial Backup Setup
3. Menu 2.2.1 - Advanced Dial Backup Setup and
4. Menu 11.1 - Remote Node Profile (node 8, Backup ISP)

23.4 Configuring Dial Backup in Menu 2

From the main menu, enter 2 to open menu 2.

Figure 140 Menu 2.2: Dial Backup Setup



```
                         Menu 2.2 - Dial Backup Setup

                        Dial-Backup:
                          Active= No
                          Port Speed= 115200

                        AT Command String:
                          Init= at&fs0=0

                          Edit Advanced Setup= No
```

The following table describes the fields in this menu.

Table 95 Menu 2.2: Dial Backup Setup

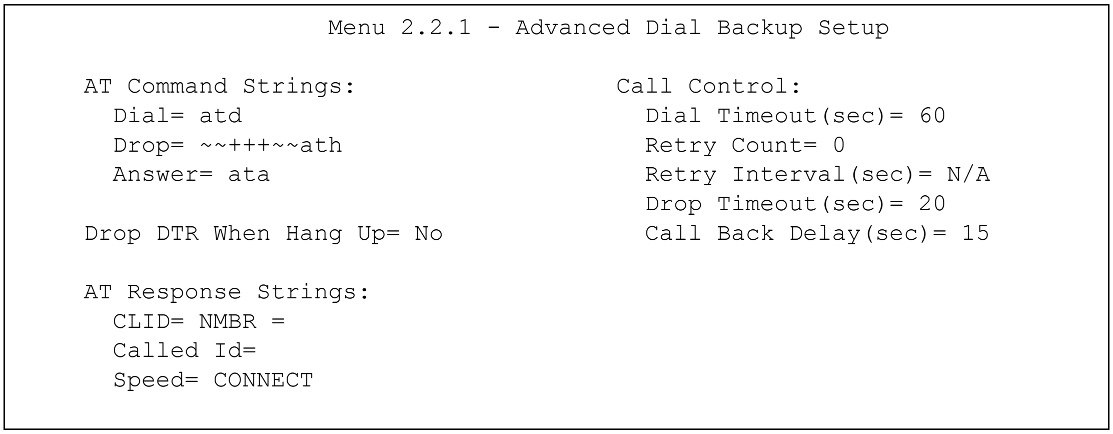
FIELD	DESCRIPTION
Dial-Backup:	
Active	Use this field to turn the dial-backup feature on (**Yes**) or off (**No**).
Port Speed	Press [SPACE BAR] and then press [ENTER] to select the speed of the connection between the Dial Backup port and the external device. Available speeds are: **9600**, **19200**, **38400**, **57600**, **115200** or **230400** bps.
AT Command String:	
Init	Enter the AT command string to initialize the WAN device. Consult the manual of your WAN device connected to your Dial Backup port for specific AT commands.
Edit Advanced Setup	To edit the advanced setup for the Dial Backup port, move the cursor to this field; press the [SPACE BAR] to select **Yes** and then press [ENTER] to go to **Menu 2.1 - Advanced Setup**.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to Confirm…" to save your configuration, or press [ESC] at any time to cancel.	

23.5 Advanced Dial Backup Setup

Note: Consult the manual of the device connected to your Dial Backup port for specific AT commands.

To edit the advanced setup for the Dial Backup port, move the cursor to the **Edit Advanced Setup** field in **Menu 2.2 - Dial Backup Setup**, press the [SPACE BAR] to select **Yes** and then press [ENTER].

Figure 141 Menu 2.2.1: Advanced Dial Backup Setup



```
                    Menu 2.2.1 - Advanced Dial Backup Setup

   AT Command Strings:                    Call Control:
     Dial= atd                              Dial Timeout(sec)= 60
     Drop= ~~+++~~ath                       Retry Count= 0
     Answer= ata                            Retry Interval(sec)= N/A
                                            Drop Timeout(sec)= 20
   Drop DTR When Hang Up= No                Call Back Delay(sec)= 15

   AT Response Strings:
     CLID= NMBR =
     Called Id=
     Speed= CONNECT
```

The following table describes fields in this menu.

Table 96 Menu 2.2.1: Advanced Dial Backup Setup

FIELD	DESCRIPTION
AT Command Strings:	
Dial	Enter the AT Command string to make a call.
Drop	Enter the AT Command string to drop a call. “~” represents a one second wait, e.g., “~~~+++~~ath” can be used if your modem has a slow response time.
Answer	Enter the AT Command string to answer a call.
Drop DTR When Hang Up	Press the [SPACE BAR] to choose either **Yes** or **No**. When **Yes** is selected (the default), the DTR (Data Terminal Ready) signal is dropped after the “AT Command String: Drop” is sent out.
AT Response Strings:	
CLID (Calling Line Identification)	Enter the keyword that precedes the CLID (Calling Line Identification) in the AT response string. This lets the ZyXEL Device capture the CLID in the AT response string that comes from the WAN device. CLID is required for CLID authentication.
Called Id	Enter the keyword preceding the dialed number.
Speed	Enter the keyword preceding the connection speed.
Call Control	
Dial Timeout (sec)	Enter a number of seconds for the ZyXEL Device to keep trying to set up an outgoing call before timing out (stopping). The ZyXEL Device times out and stops if it cannot set up an outgoing call within the timeout value.
Retry Count	Enter a number of times for the ZyXEL Device to retry a busy or no-answer phone number before blacklisting the number.
Retry Interval (sec)	Enter a number of seconds for the ZyXEL Device to wait before trying another call after a call has failed. This applies before a phone number is blacklisted.
Drop Timeout (sec)	Enter a number of seconds for the ZyXEL Device to wait before dropping the DTR signal if it does not receive a positive disconnect confirmation.
Call Back Delay (sec)	Enter a number of seconds for the ZyXEL Device to wait between dropping a callback request call and dialing the corresponding callback call.

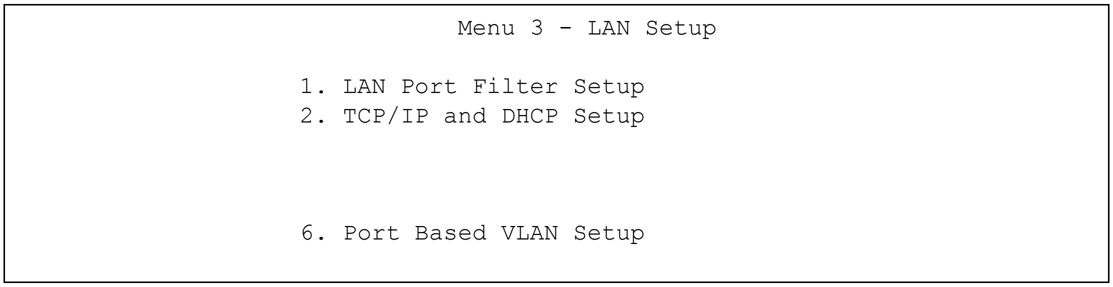
CHAPTER 24
LAN Setup

Use this to apply LAN filters, configure LAN DHCP and TCP/IP settings, and to activate or deactivate VLAN on each LAN port.

24.1 Accessing the LAN Menus

From the main menu, enter 3 to open **Menu 3 - LAN Setup**.

Figure 142 Menu 3: LAN Setup

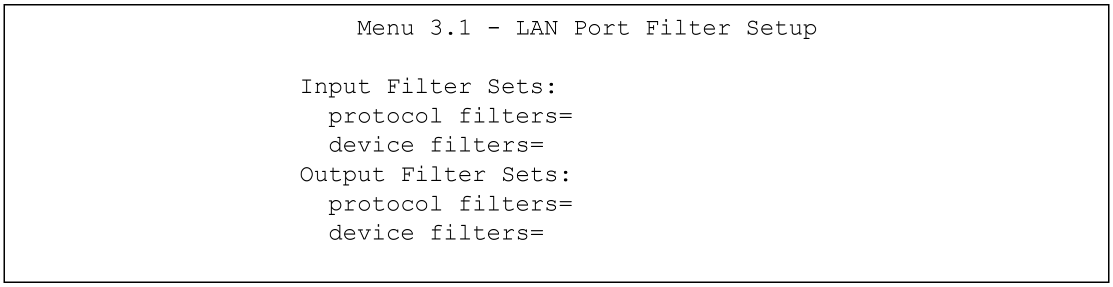


```
                                Menu 3 - LAN Setup

                      1. LAN Port Filter Setup
                      2. TCP/IP and DHCP Setup



                      6. Port Based VLAN Setup
```

24.2 LAN Port Filter Setup

This menu allows you to specify the filter sets that you wish to apply to the LAN traffic. You seldom need to filter the LAN traffic, however, the filter sets may be useful to block certain packets, reduce traffic and prevent security breaches.

Figure 143 Menu 3.1: LAN Port Filter Setup

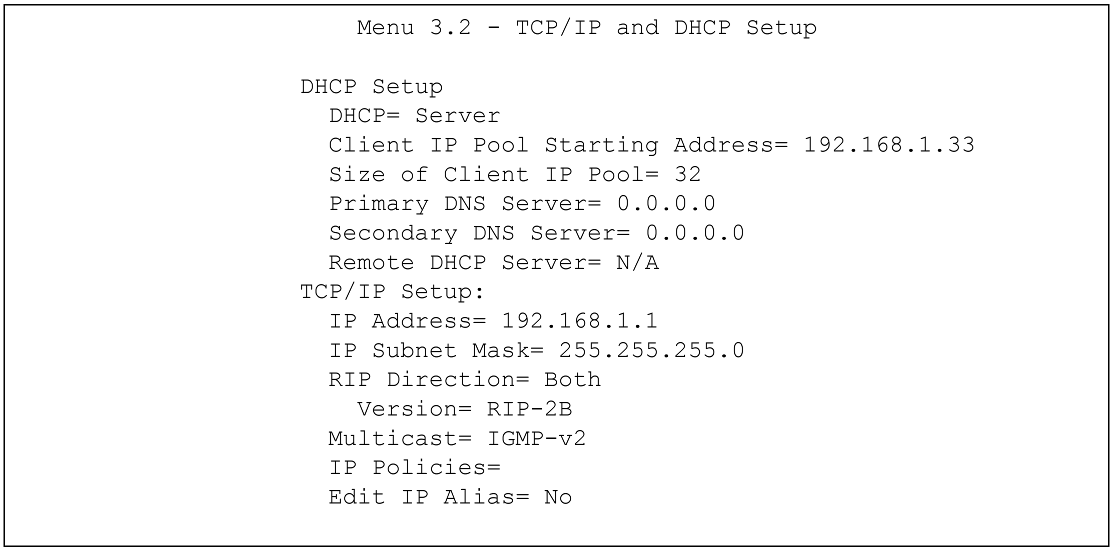


```
                          Menu 3.1 - LAN Port Filter Setup

                      Input Filter Sets:
                        protocol filters=
                        device filters=
                      Output Filter Sets:
                        protocol filters=
                        device filters=
```

24.3 TCP/IP and DHCP Setup Menu

From the main menu, enter 3 to open **Menu 3 - LAN Setup** to configure TCP/IP (RFC 1155) and DHCP setup. From menu 3, select the submenu option **TCP/IP and DHCP Setup** and press [ENTER]. The screen now displays **Menu 3.2 - TCP/IP and DHCP Ethernet Setup**, as shown next. Not all fields are available on all models.

Figure 144 Menu 3.2: TCP/IP and DHCP Ethernet Setup



```
                        Menu 3.2 - TCP/IP and DHCP Setup

                    DHCP Setup
                      DHCP= Server
                      Client IP Pool Starting Address= 192.168.1.33
                      Size of Client IP Pool= 32
                      Primary DNS Server= 0.0.0.0
                      Secondary DNS Server= 0.0.0.0
                      Remote DHCP Server= N/A
                    TCP/IP Setup:
                      IP Address= 192.168.1.1
                      IP Subnet Mask= 255.255.255.0
                      RIP Direction= Both
                        Version= RIP-2B
                      Multicast= IGMP-v2
                      IP Policies=
                      Edit IP Alias= No
```

Follow the instructions in the next table to configure these fields.

Table 97 Menu 3.2: TCP/IP and DHCP Ethernet Setup

FIELD	DESCRIPTION
DHCP Setup	
DHCP	This field enables/disables the DHCP server. If set to **Server**, your ZyXEL Device will act as a DHCP server. You should configure the rest of the fields in this section except for **Remote DHCP Server**. If set to **Relay**, the ZyXEL Device acts as a surrogate DHCP server and relays requests and responses between the remote server and the clients. The **Remote DHCP Server** needs to be set. If set to **None**, the DHCP server will be disabled.
Client IP Pool Starting Address:	This field specifies the first of the contiguous addresses in the IP address pool.
Size of Client IP Pool	This field specifies the size, or count of the IP address pool.

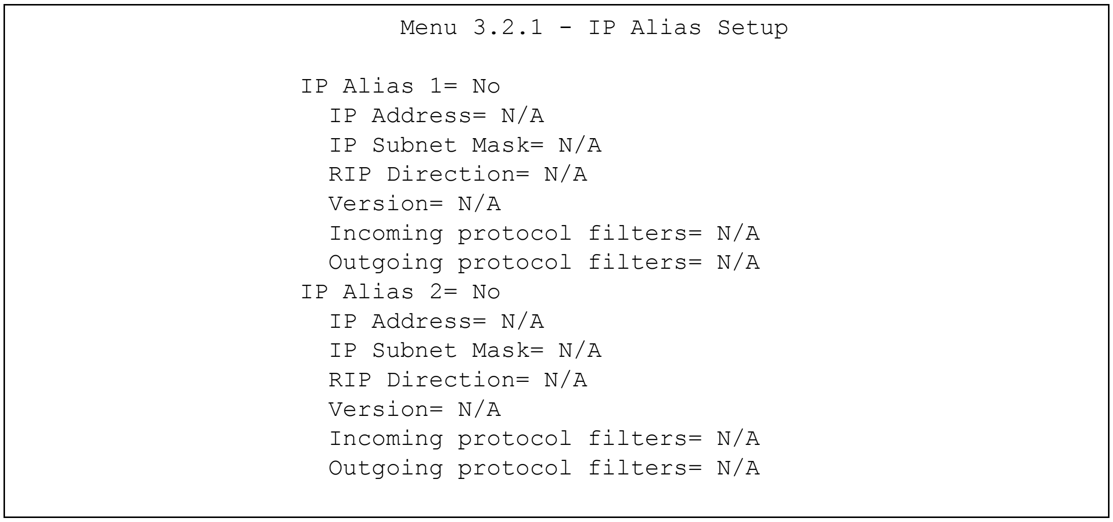
Table 97 Menu 3.2: TCP/IP and DHCP Ethernet Setup (continued)

FIELD	DESCRIPTION
Primary DNS Server Secondary DNS Server	The ZyXEL Device passes a DNS (Domain Name System) server IP address (in the order you specify here) to the DHCP clients. Select **From ISP** if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The **IP Address** field below displays the (read-only) DNS server IP address that the ISP assigns. Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the **IP Address** field below. If you chose **User-Defined**, but leave the IP address set to 0.0.0.0, **User-Defined** changes to **None** after you save your changes. If you set a second choice to **User-Defined**, and enter the same IP address, the second **User-Defined** changes to **None** after you save your changes. Select **DNS Relay** to have the ZyXEL Device act as a DNS proxy. The ZyXEL Device's LAN IP address displays in the I**P Address** field below (read-only). The ZyXEL Device tells the DHCP clients on the LAN that the ZyXEL Device itself is the DNS server. When a computer on the LAN sends a DNS query to the ZyXEL Device, the ZyXEL Device forwards the query to the ZyXEL Device's system DNS server (configured in menu 1) and relays the response back to the computer. You can only select **DNS Relay** for one of the three servers; if you select **DNS Relay** for a second or third DNS server, that choice changes to **None** after you save your changes. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IP address of a machine in order to access it.
Remote DHCP Server	If **Relay** is selected in the **DHCP** field above, then type the IP address of the actual remote DHCP server here.
TCP/IP Setup:	
IP Address	Enter the LAN IP address of your ZyXEL Device in dotted decimal notation
IP Subnet Mask	Your ZyXEL Device will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the ZyXEL Device.
RIP Direction	Press [SPACE BAR] and then [ENTER] to select the RIP direction. Options are: **Both**, **In Only**, **Out Only** or **None**.
Version	Press [SPACE BAR] and then [ENTER] to select the RIP version. Options are: **RIP-1**, **RIP-2B** or **RIP-2M**.
Multicast	IGMP (Internet Group Multicast Protocol) is a session-layer protocol used to establish membership in a Multicast group. The ZyXEL Device supports both IGMP version 1 (**IGMP-v1**) and version 2 (**IGMP-v2**). Press [SPACE BAR] and then [ENTER] to enable IP Multicasting or select **None** (default) to disable it.
IP Policies	You can apply up to four policy routes for this remote node. Configure the policy routes in menu 25 first. See Chapter 36 on page 349 for information about policy routes.
Edit IP Alias	The ZyXEL Device supports three logical LAN interfaces via its single physical Ethernet interface with the ZyXEL Device itself as the gateway for each LAN network. Press [SPACE BAR] to select **Yes** and then press [ENTER] to display menu 3.2.1.
When you have completed this menu, press [ENTER] at the prompt [Press ENTER to Confirm…] to save your configuration, or press [ESC] at any time to cancel.	

24.4 LAN IP Alias

Use menu 3.2 to configure the first network, and you use menu 3.2.1 to configure the other two networks. Move the cursor to the **Edit IP Alias** field, press [SPACE BAR] to choose **Yes** and press [ENTER] to configure the second and third network.

Figure 145 Menu 3.2.1: IP Alias Setup



```
                           Menu 3.2.1 - IP Alias Setup

                    IP Alias 1= No
                      IP Address= N/A
                      IP Subnet Mask= N/A
                      RIP Direction= N/A
                      Version= N/A
                      Incoming protocol filters= N/A
                      Outgoing protocol filters= N/A
                    IP Alias 2= No
                      IP Address= N/A
                      IP Subnet Mask= N/A
                      RIP Direction= N/A
                      Version= N/A
                      Incoming protocol filters= N/A
                      Outgoing protocol filters= N/A
```

Use the instructions in the following table to configure IP alias parameters.

Table 98 Menu 3.2.1: IP Alias Setup

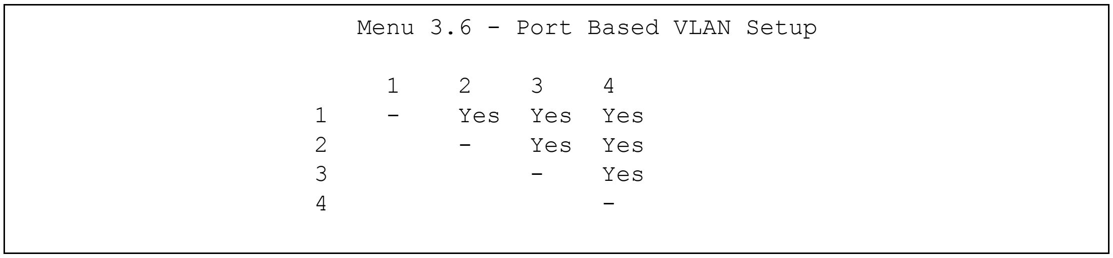
FIELD	DESCRIPTION
IP Alias 1, 2	Choose **Yes** to configure the LAN network for the ZyXEL Device.
IP Address	Enter the IP address of your ZyXEL Device in dotted decimal notation.
IP Subnet Mask	Your ZyXEL Device will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the ZyXEL Device.
RIP Direction	Press [SPACE BAR] and then [ENTER] to select the RIP direction. Options are **Both**, **In Only**, **Out Only** or **None**.
Version	Press [SPACE BAR] and then [ENTER] to select the RIP version. Options are **RIP-1**, **RIP-2B** or **RIP-2M**.
Incoming protocol filters	Enter the filter set(s) you wish to apply to the incoming traffic between this node and the ZyXEL Device.
Outgoing protocol filters	Enter the filter set(s) you wish to apply to the outgoing traffic between this node and the ZyXEL Device.
When you have completed this menu, press [ENTER] at the prompt [Press ENTER to Confirm…] to save your configuration, or press [ESC] at any time to cancel.	

24.4.1 Port-based VLAN Setup

You use menu 3.6 to control whether or not the ZyXEL Device sends layer-2 traffic (MAC addresses) between LAN ports. For example, if LAN port 1 and LAN port 2 are connected to different departments, you might not want the ZyXEL Device to broadcast traffic to both networks. In this case, you should disable the connection between these ports. These departments then have to communicate with each other using IP addresses, instead of MAC addresses.

From the main menu, enter 3 to open **Menu 3 - LAN Setup** and select sub-menu 6.

Figure 146 Menu 3.6: Port Based VLAN Setup



```
                        Menu 3.6 - Port Based VLAN Setup

                         1    2    3    4
                    1    -    Yes  Yes  Yes
                    2         -    Yes  Yes
                    3              -    Yes
                    4                   -
```

Press [SPACE BAR] to select **Yes** or **No** to allow or block layer-2 traffic between each pair of ports.

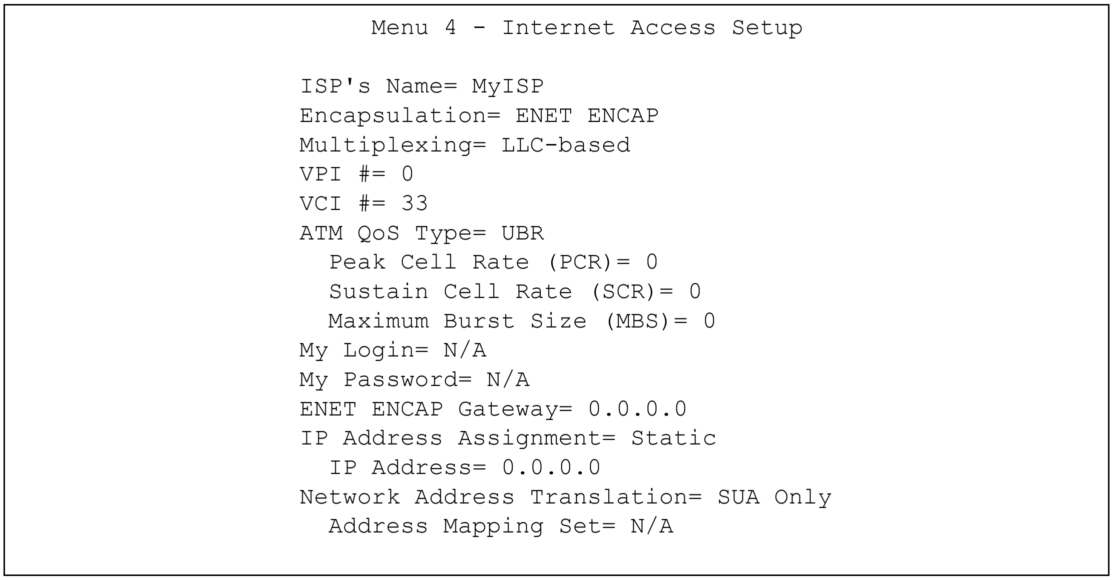
CHAPTER 25 Internet Access Setup

Use this menu to configure your Internet connection. Use information from your ISP along with the instructions in this chapter to set up your ZyXEL Device to access the Internet. Contact your ISP to determine what encapsulation type you should use.

25.1 Internet Access Setup

Enter 4 in the main menu.

Figure 147 Menu 4: Internet Access Setup



```
                     Menu 4 - Internet Access Setup

                ISP's Name= MyISP
                Encapsulation= ENET ENCAP
                Multiplexing= LLC-based
                VPI #= 0
                VCI #= 33
                ATM QoS Type= UBR
                  Peak Cell Rate (PCR)= 0
                  Sustain Cell Rate (SCR)= 0
                  Maximum Burst Size (MBS)= 0
                My Login= N/A
                My Password= N/A
                ENET ENCAP Gateway= 0.0.0.0
                IP Address Assignment= Static
                  IP Address= 0.0.0.0
                Network Address Translation= SUA Only
                  Address Mapping Set= N/A
```

The following table describes the fields in this menu.

Table 99 Menu 4: Internet Access Setup

FIELD	DESCRIPTION
ISP's Name	Enter a descriptive name for your ISP for identification purposes.
Encapsulation	Press [SPACE BAR] and then press [ENTER] to select the type of encapsulation your ISP uses.
Multiplexing	Press [SPACE BAR] to select the method of multiplexing used by your ISP. Choices are **VC-based** or **LLC-based**.
VPI	VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) define a virtual circuit. The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.

Table 99 Menu 4: Internet Access Setup (continued)

FIELD	DESCRIPTION
VCI	The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.
ATM QoS Type	Select **CBR** (Constant Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select **UBR** (Unspecified Bit Rate) for applications that are non-time sensitive, such as e-mail. Select **VBR** (Variable Bit Rate) for bursty traffic and bandwidth sharing with other applications.
Peak Cell Rate (PCR)	Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.
Sustain Cell Rate (SCR)	The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.
Maximum Burst Size (MBS)	Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.
My Login	(PPPoE and PPPoA only) Enter the login name given to you by your ISP.
My Password	(PPPoE and PPPoA only) Type your password again for confirmation.
ENET ENCAP Gateway	(ENET ENCAP only) Enter the gateway IP address provided by your ISP.
Idle Timeout (sec)	(PPPoE and PPPoA only) Specify an idle time-out. The default setting is 0, which means the Internet session will not timeout.
IP Address Assignment	If your ISP did not assign you a fixed IP address, press [SPACE BAR] and then [ENTER] to select **Dynamic**, otherwise select **Static** and enter the IP address and subnet mask in the following fields.
IP Address	This field is enabled if the **IP Address Assignment** is **Static**. Enter the (fixed) IP address assigned to you by your ISP (static IP address assignment is selected in the previous field).
Network Address Translation	Network Address Translation (NAT) allows the translation of an Internet protocol address used within one network (for example a private IP address used in a local network) to a different IP address known within another network (for example a public IP address used on the Internet). Choose **None** to disable NAT. Choose **SUA Only** if you have a single public IP address. SUA (Single User Account) is a subset of NAT that supports two types of mapping: **Many-to-One** and **Server**. Choose **Full Feature** if you have multiple public IP addresses. **Full Feature** mapping types include: **One-to-One**, **Many-to-One** (SUA/PAT), **Many-to-Many Overload**, **Many- One-to-One** and **Server**. When you select **Full Feature** you must configure at least one address mapping set. Please see Chapter 7 on page 107 for a more detailed discussion on the Network Address Translation feature.
Address Mapping Set	This field is enabled if the **Network Address Translation** is **Full Feature**. Enter the number of the address mapping set you want to use for your Internet connection.
When you have completed this menu, press [ENTER] at the prompt "Press ENTER to Confirm…" to save your configuration, or press [ESC] at any time to cancel.	

Chapter 26 Remote Node Setup

Use this menu to configure detailed remote node settings (for example, your ISP is a remote node) as well as apply filters.

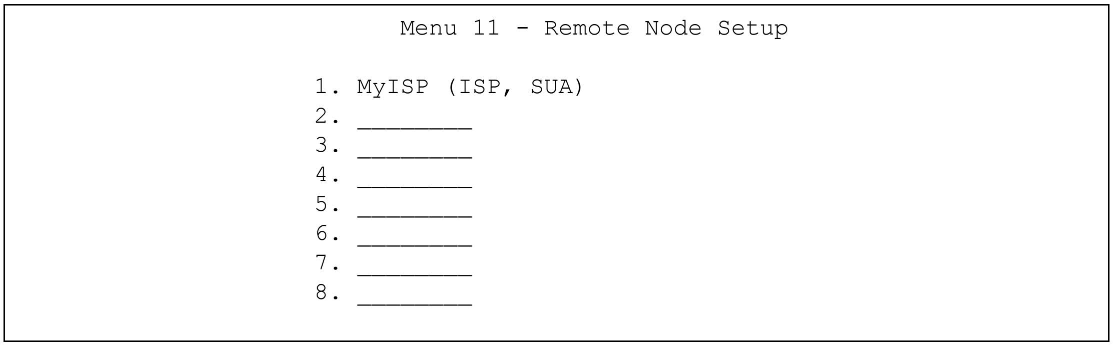
26.1 Introduction to Remote Node Setup

A remote node is required for placing calls to a remote gateway. A remote node represents both the remote gateway and the network behind it across a WAN connection. Note that when you use menu 4 to set up Internet access, you are actually configuring a remote node.

26.2 Remote Node Setup

From the main menu, select menu option 11 to open **Menu 11 - Remote Node Setup** (shown below).

Figure 148 Menu 11: Remote Node Setup



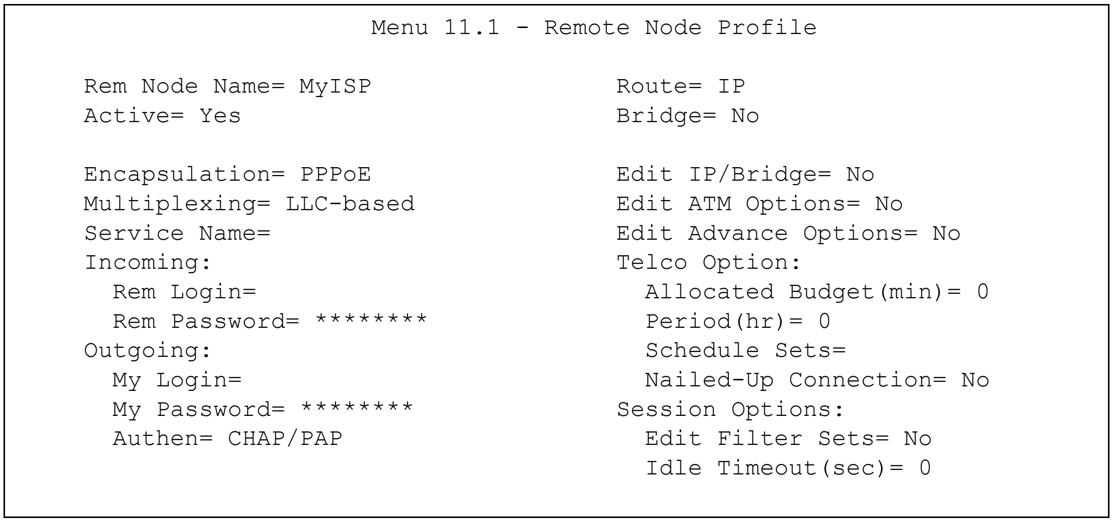
```
                         Menu 11 - Remote Node Setup

                   1. MyISP (ISP, SUA)
                   2. ________
                   3. ________
                   4. ________
                   5. ________
                   6. ________
                   7. ________
                   8. ________
```

Select the node you want to configure.

26.3 Remote Node Profile

The following explains how to configure remote nodes 1-7.

Figure 149 Menu 11.1: Remote Node Profile (nodes 1-7)



```
                        Menu 11.1 - Remote Node Profile

    Rem Node Name= MyISP                 Route= IP
    Active= Yes                          Bridge= No

    Encapsulation= PPPoE                 Edit IP/Bridge= No
    Multiplexing= LLC-based              Edit ATM Options= No
    Service Name=                        Edit Advance Options= No
    Incoming:                            Telco Option:
      Rem Login=                           Allocated Budget(min)= 0
      Rem Password= ********               Period(hr)= 0
    Outgoing:                              Schedule Sets=
      My Login=                            Nailed-Up Connection= No
      My Password= ********              Session Options:
      Authen= CHAP/PAP                     Edit Filter Sets= No
                                           Idle Timeout(sec)= 0
```

The following table describes the labels in this menu.

Table 100 Menu 11.1: Remote Node Profile (nodes 1-7)

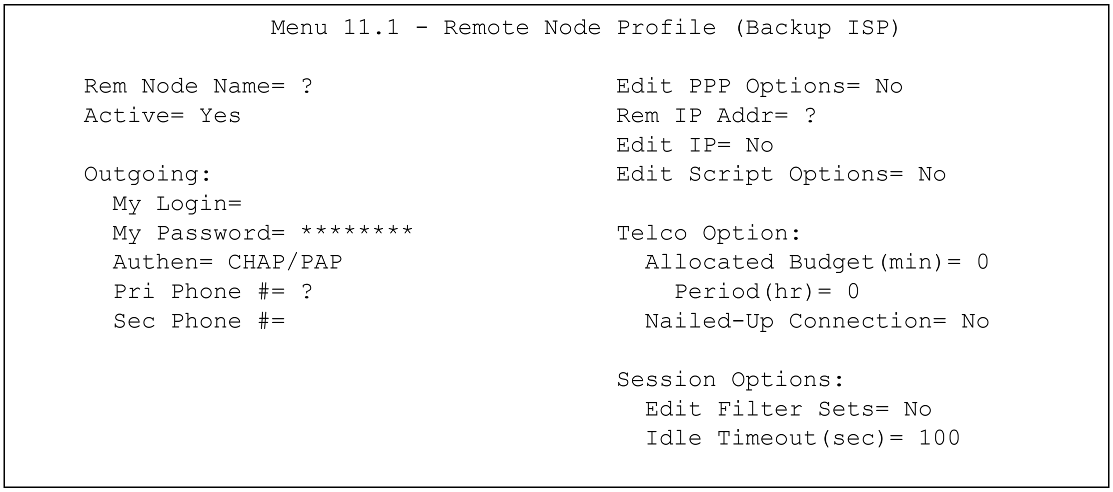
FIELD	DESCRIPTION
Rem Node Name	Enter the name of the ISP.
Active	Select whether or not you want to use this Internet connection.
Encapsulation	Select the type of encapsulation your ISP uses.
Multiplexing	Select the method of multiplexing used by your ISP from the drop-down list. Choices are **VC** or **LLC**.
Service Name	(PPPoE only) Enter the service name provided by your ISP. Leave this field blank if your ISP did not provide one.
Incoming	This section is only enabled for PPPoA or PPPoE connections.
Rem Login	Type the login name that this remote node will use to call your ZyXEL Device. The login name and the **Rem Password** will be used to authenticate this node.
Rem Password	Type the password used when this remote node calls your ZyXEL Device.
Outgoing	This section is only enabled for PPPoA or PPPoE connections.
My Login	Enter the user name provided by your ISP.
My Password	Enter the password provided by your ISP.
Retype to Confirm	Enter the password again.
Authen	This field appears if you select **PPPoE** in the **Encapsulation** field. Select what type of authentication your ISP uses. Select **CHAP/PAP** if you want the ZyXEL Device to support both choices.
Route	Press [SPACE BAR] and then [ENTER] to select **IP** to enable IP-based routing to this remote node. This is not effective unless you enable IP-based routing in the ZyXEL Device too. See Menu 1: General Setup in Section 22.1 on page 251. You should enable either **Route** or **Bridge** in this screen, but you should not enable both of them or disable both of them at the same time.

Table 100 Menu 11.1: Remote Node Profile (nodes 1-7) (continued)

FIELD	DESCRIPTION
Bridge	If **Route** is **IP**, select **Yes** in this field to enable bridging to this remote node for protocols that are not supported by IP-based routing (for example, SNA). If **Route** is **None**, select **Yes** in this field to enable bridging to this remote node for all protocols. In either case, this setting is not effective unless you enable bridging in the ZyXEL Device too. See Menu 1: General Setup in Section 22.1 on page 251. You should enable either **Route** or **Bridge** in this screen, but you should not enable both of them or disable both of them at the same time.
Edit IP/Bridge	This field is enabled if **Route** is **IP**. If you want to set up the WAN IP address and advanced features for the WAN port, press [SPACE BAR] to select **Yes** and press [ENTER]. Menu 11.3 appears.
Edit ATM Options	This field is enabled if **Route** is **IP**. Press [SPACE BAR] to select **Yes** and press [ENTER] to edit the virtual channel and ATM QoS settings. Menu 11.6 appears.
Edit Advance Options	This field is displayed if you are editing remote node 1, and it is only enabled for PPPoE connections. If you want to set up advanced features for the Internet connection, press [SPACE BAR] to select **Yes** and press [ENTER]. Menu 11.8 appears.
Telco Option	This section is only enabled for PPPoA or PPPoE connections.
Allocated Budget(min)	Enter the maximum amount of time (in minutes) each call can last. Enter 0 if there is no limit. With **Period**, you can set a limit on the total outgoing call time of the ZyXEL Device within a certain period of time. When the total outgoing call time exceeds the limit, the current call will be dropped and any future outgoing calls will be blocked.
Period(hr)	Enter how often (in hours) the **Allocated Budget** is reset. For example, if you can call for thirty minutes every hour, set the **Allocated Budget** to 30, and set this field to 1.
Schedule Sets	Enter the schedule sets that apply to this connection.
Nailed-Up Connection	Select this if you want the ZyXEL Device to automatically connect to your ISP when it is turned on and to remain connected all the time. This is not recommended if you pay for your Internet connected based on the amount of time you are connected.
Session Options	
Edit Filter Sets	If you want to specify input and output filter sets for the WAN port, press [SPACE BAR] to select **Yes** and press [ENTER]. Menu 11.5 appears.
Idle Timeout(sec)	Enter the number of seconds the ZyXEL Device should wait while there is no Internet traffic before it automatically disconnects from the ISP. Enter a time interval between 10 and 9999 seconds.

The following explains how to configure remote node 8 for the dial backup connection.

Figure 150 Menu 11.1: Remote Node Profile (node 8)



```
                 Menu 11.1 - Remote Node Profile (Backup ISP)

    Rem Node Name= ?                     Edit PPP Options= No
    Active= Yes                          Rem IP Addr= ?
                                         Edit IP= No
    Outgoing:                            Edit Script Options= No
      My Login=
      My Password= ********              Telco Option:
      Authen= CHAP/PAP                     Allocated Budget(min)= 0
      Pri Phone #= ?                         Period(hr)= 0
      Sec Phone #=                         Nailed-Up Connection= No

                                         Session Options:
                                           Edit Filter Sets= No
                                           Idle Timeout(sec)= 100
```

The following table describes the labels in this menu.

Table 101 Menu 11.1: Remote Node Profile (node 8)

FIELD	DESCRIPTION
Rem Node Name	Enter the name of the ISP.
Active	Select whether or not you want to use this Internet connection.
Outgoing	This section is only enabled for PPPoA or PPPoE connections.
My Login	Enter the user name provided by your ISP.
My Password	Enter the password provided by your ISP.
Retype to Confirm	Enter the password again.
Authen	This field appears if you select **PPPoE** in the **Encapsulation** field. Select what type of authentication your ISP uses. Select **CHAP/PAP** if you want the ZyXEL Device to support both choices.
Pri Phone # Sec Phone #	Type the phone number(s) for this remote node. If the Primary Phone number is busy or does not answer, your ZyWALL dials the Secondary Phone number, if available. Some areas require dialing the pound sign # before the phone number for local calls. Include a # symbol at the beginning of the phone numbers as required.
Edit PPP Options	Press [SPACE BAR] to select **Yes** and press [ENTER] to configure the PPP settings for the backup ISP. Menu 11.2 appears.
Rem IP Addr	This field displays the type of routing the ZyXEL Device uses.
Edit IP/Bridge	This field is enabled if **Route** is **IP**. If you want to set up the WAN IP address and advanced features for the WAN port, press [SPACE BAR] to select **Yes** and press [ENTER]. Menu 11.3 appears.
Edit ATM Options	This field is enabled if **Route** is **IP**. Press [SPACE BAR] to select **Yes** and press [ENTER] to edit the virtual channel and ATM QoS settings. Menu 11.1.6 appears.
Edit Advance Options	This field is displayed if you are editing remote node 1, and it is only enabled for PPPoE connections. If you want to set up advanced features for the Internet connection, press [SPACE BAR] to select **Yes** and press [ENTER]. Menu 11.1.8 appears.

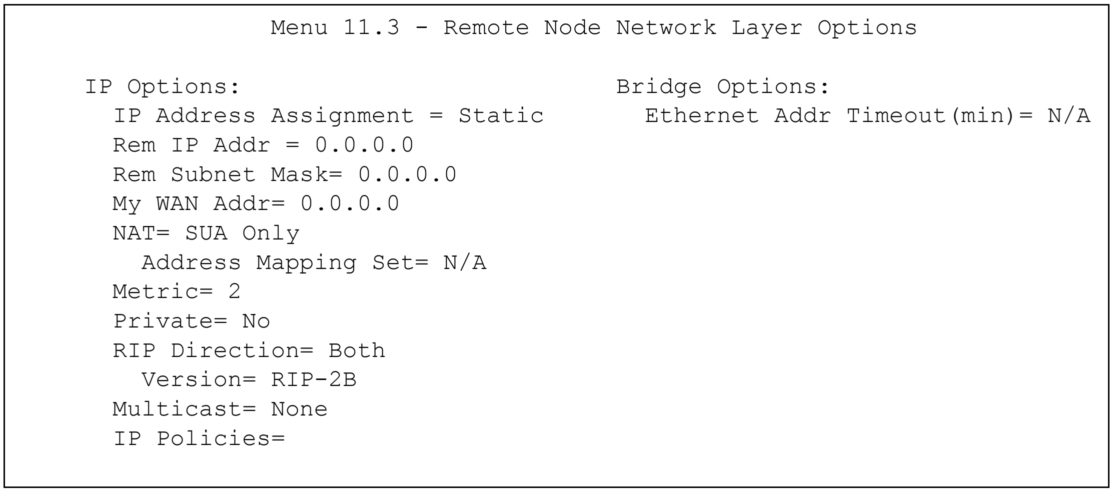
Table 101 Menu 11.1: Remote Node Profile (node 8) (continued)

FIELD	DESCRIPTION
Telco Option	This section is only enabled for PPPoA or PPPoE connections.
Allocated Budget(min)	Enter the maximum amount of time (in minutes) each call can last. Enter 0 if there is no limit. With **Period**, you can set a limit on the total outgoing call time of the ZyXEL Device within a certain period of time. When the total outgoing call time exceeds the limit, the current call will be dropped and any future outgoing calls will be blocked.
Period(hr)	Enter how often (in hours) the **Allocated Budget** is reset. For example, if you can call for thirty minutes every hour, set the **Allocated Budget** to 30, and set this field to 1.
Schedule Sets	Enter the schedule sets that apply to this connection.
Nailed-Up Connection	Select this if you want the ZyXEL Device to automatically connect to your ISP when it is turned on and to remain connected all the time. This is not recommended if you pay for your Internet connected based on the amount of time you are connected.
Session Options	
Edit Filter Sets	If you want to specify input and output filter sets for the WAN port, press [SPACE BAR] to select **Yes** and press [ENTER]. Menu 11.1.4 appears.
Idle Timeout(sec)	Enter the number of seconds the ZyXEL Device should wait while there is no Internet traffic before it automatically disconnects from the ISP. Enter a time interval between 10 and 9999 seconds.

26.4 Remote Node Network Layer Options

Move the cursor to the **Edit IP/Bridge** field in menu 11.1, then press [SPACE BAR] to select **Yes**. Press [ENTER] to open **Menu 11.3 - Remote Node Network Layer Options**.

Figure 151 Menu 11.3: Remote Node Network Layer Options



```
                  Menu 11.3 - Remote Node Network Layer Options

     IP Options:                          Bridge Options:
       IP Address Assignment = Static       Ethernet Addr Timeout(min)= N/A
       Rem IP Addr = 0.0.0.0
       Rem Subnet Mask= 0.0.0.0
       My WAN Addr= 0.0.0.0
       NAT= SUA Only
         Address Mapping Set= N/A
       Metric= 2
       Private= No
       RIP Direction= Both
         Version= RIP-2B
       Multicast= None
       IP Policies=
```

The following table describes the fields in this menu.

Table 102 Menu 11.3: Remote Node Network Layer Options

FIELD	DESCRIPTION
IP Address Assignment	Select **Dynamic** if your ISP did not give you a fixed (static) IP address. Select **Static** if your ISP gave you a fixed (static) IP address. The next three fields are not available if you select **Dynamic**.
	These fields appear if you selected **Ethernet** in **Encapsulation** in menu 11.
IP Address	Enter the fixed (static) IP address provided by your ISP.
IP Subnet Mask	Enter the subnet mask provided by your ISP.
Gateway IP Addr	Enter the IP address of the gateway provided by your ISP.
	These fields appear if you selected **PPPoE** in **Encapsulation** in menu 11.
Rem IP Addr	Enter the IP address of the remote (peer) computer to which the ZyXEL Device connects.
Rem Subnet Mask	Enter the subnet mask of the remote (peer) computer to which the ZyXEL Device connects.
My WAN Addr	Enter the fixed (static) IP address provided by your ISP.
NAT	Select **None** if you do not want to use port forwarding, trigger ports, or NAT. Select **SUA Only** if you want to use one or more of these features and have only one WAN IP address for your ZyXEL Device. Select **Full Feature** if you want to use one or more of these features and have more than one public WAN IP address for your ZyXEL Device.
Address Mapping Set	This field is enabled if **NAT** is **Full Feature**. Specify which address mapping set you want to use for this remote node.
Metric	This field sets this route's priority among the routes the ZyXEL Device uses. The metric represents the "cost of transmission". A router determines the best route for transmission by choosing a path with the lowest "cost". RIP routing uses hop count as the measurement of cost, with a minimum of "1" for directly connected networks. The number must be between "1" and "15"; a number greater than "15" means the link is down. The smaller the number, the lower the "cost".
Private	This field is related to RIP. This field determines whether or not the ZyXEL Device includes the route to this remote node in its RIP broadcasts. If you select **Yes**, this route is not included in RIP broadcast. If you select **No**, the route to this remote node is propagated to other hosts through RIP broadcasts. Usually, you should keep the default value.
RIP Direction	Use this field to control how much routing information the ZyXEL Device sends and receives through this connection. **None** - The ZyXEL Device does not send or receive routing information through this connection. **Both** - The ZyXEL Device sends and receives routing information through this connection. **In Only** - The ZyXEL Device only receives routing information through this connection. **Out Only** - The ZyXEL Device only sends routing information through this connection.

Table 102 Menu 11.3: Remote Node Network Layer Options (continued)

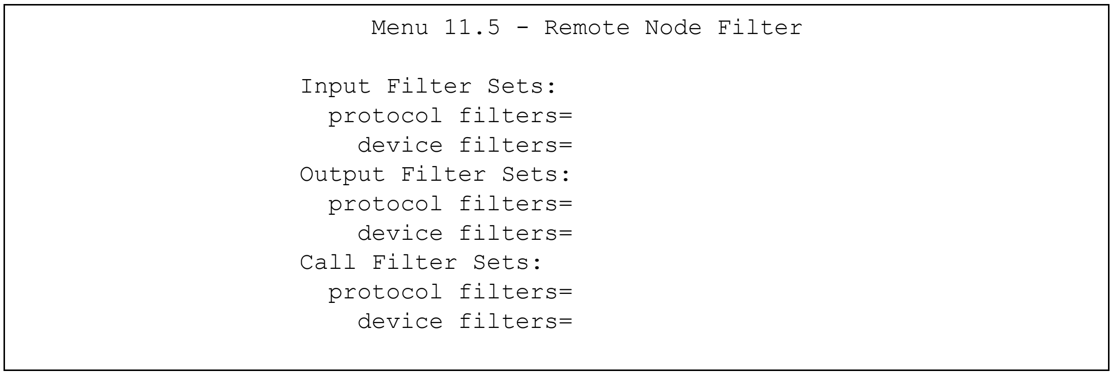
FIELD	DESCRIPTION
Version	Select which version of RIP the ZyXEL Device uses when it sends or receives information on the subnet. **RIP-1** - The ZyXEL Device uses RIPv1 to exchange routing information. **RIP-2B** - The ZyXEL Device broadcasts RIPv2 to exchange routing information. **RIP-2M** - The ZyXEL Device multicasts RIPv2 to exchange routing information.
Multicast	You do not have to enable multicasting to use **RIP-2M**. (See **RIP Version**.) Select which version of IGMP the ZyXEL Device uses to support multicasting on this port. Multicasting only sends packets to some computers and is an alternative to unicasting (sending packets to one computer) and broadcasting (sending packets to every computer). **None** - The ZyXEL Device does not support multicasting. **IGMP-v1** - The ZyXEL Device supports IGMP version 1. **IGMP-v2** - The ZyXEL Device supports IGMP version 2. Multicasting can improve overall network performance. However, it requires extra processing and generates more network traffic. In addition, other computers have to support the same version of IGMP.
IP Policies	You can apply up to four policy routes for this remote node. Configure the policy routes in menu 25 first. See Chapter 36 on page 349 for information about policy routes.
Bridge Options	
Ethernet Addr Timeout(min)	This field is enabled if **Bridge** is **Yes** in SMT Menu 11.1: Remote Node Profile (nodes 1-7). Type the time (in minutes) for the ZyXEL Device to retain the Ethernet address information in its internal tables while the line is down. If this information is retained, your ZyXEL Device will not have to recompile the tables when the line comes back up.
Once you have completed filling in this menu, press [ENTER] at the message "Press ENTER to Confirm..." to save your configuration and return to menu 11.1, or press [ESC] at any time to cancel.	

26.5 Remote Node Filter

Move the cursor to the field **Edit Filter Sets** in menu 11.1, and then press [SPACE BAR] to set the value to **Yes**. Press [ENTER] to open **Menu 11.1.5 - Remote Node Filter**.

Use this menu to specify the filter set(s) to apply to the incoming and outgoing traffic between this remote node and the ZyXEL Device to prevent certain packets from triggering calls. You can specify up to 4 filter sets separated by commas, for example, 1, 5, 9, 12, in each filter field. Note that spaces are accepted in this field. For more information on defining the filters, please refer to Chapter 30 on page 299. For PPPoE or PPTP encapsulation, you have the additional option of specifying remote node call filter sets.

Figure 152 Menu 11.5: Remote Node Filter



```
                     Menu 11.5 - Remote Node Filter

                Input Filter Sets:
                  protocol filters=
                    device filters=
                Output Filter Sets:
                  protocol filters=
                    device filters=
                Call Filter Sets:
                  protocol filters=
                    device filters=
```

The following table describes the labels in this menu.

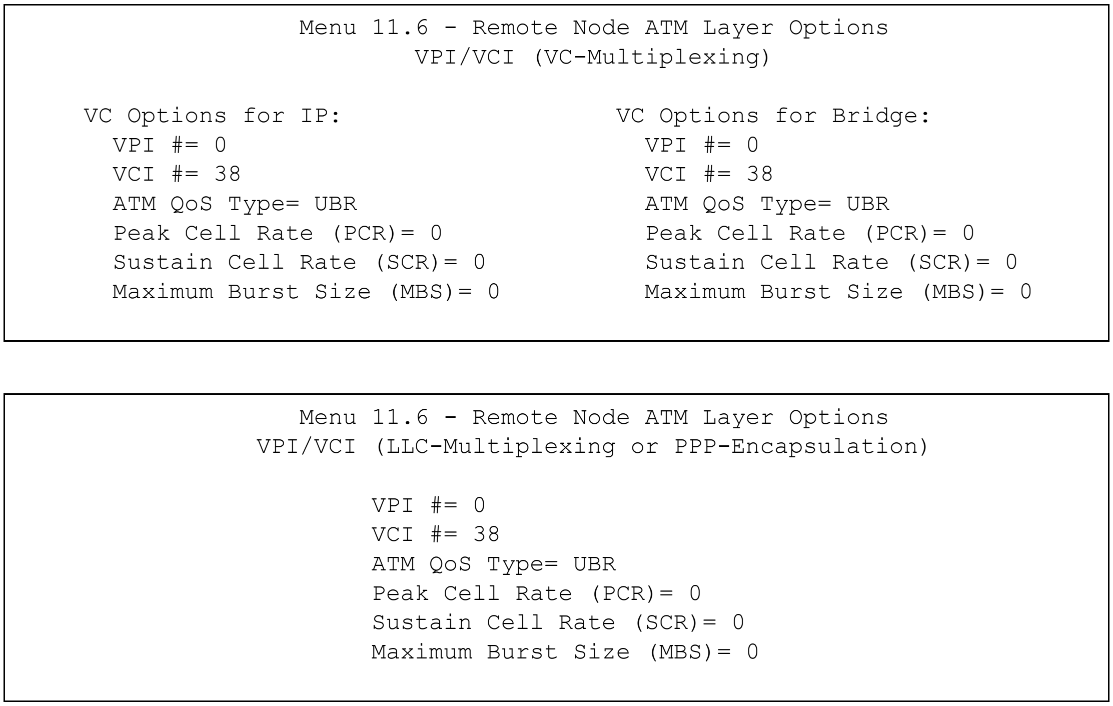
Table 103 Menu 11.5: Remote Node Filter

FIELD	DESCRIPTION
Input Filter Sets	
protocol filters	Enter up to four filter sets. If you enter more than one, separate each one with a comma (,).
device filters	Enter up to four filter sets. If you enter more than one, separate each one with a comma (,).
Output Filter Sets	
protocol filters	Enter up to four filter sets. If you enter more than one, separate each one with a comma (,).
device filters	Enter up to four filter sets. If you enter more than one, separate each one with a comma (,).
Call Filter Sets	These fields appear if you selected **PPPoA** or **PPPoE** in **Encapsulation** in menu 11.1.
protocol filters	Enter up to four filter sets. If you enter more than one, separate each one with a comma (,).
device filters	Enter up to four filter sets. If you enter more than one, separate each one with a comma (,).

26.6 Remote Node ATM Layer Options

Move the cursor to the **Edit ATM Options** field in menu 11.1, then press [SPACE BAR] to select **Yes**. Press [ENTER] to open this menu. This menu depends on the multiplexing and encapsulation you select in menu 11.1.

Figure 153 Menu 11.6: Remote Node ATM Layer Options



```
                    Menu 11.6 - Remote Node ATM Layer Options
                            VPI/VCI (VC-Multiplexing)

     VC Options for IP:                     VC Options for Bridge:
       VPI #= 0                               VPI #= 0
       VCI #= 38                              VCI #= 38
       ATM QoS Type= UBR                      ATM QoS Type= UBR
       Peak Cell Rate (PCR)= 0                Peak Cell Rate (PCR)= 0
       Sustain Cell Rate (SCR)= 0             Sustain Cell Rate (SCR)= 0
       Maximum Burst Size (MBS)= 0            Maximum Burst Size (MBS)= 0
```

```
                    Menu 11.6 - Remote Node ATM Layer Options
                 VPI/VCI (LLC-Multiplexing or PPP-Encapsulation)

                         VPI #= 0
                         VCI #= 38
                         ATM QoS Type= UBR
                         Peak Cell Rate (PCR)= 0
                         Sustain Cell Rate (SCR)= 0
                         Maximum Burst Size (MBS)= 0
```

The following table describes the fields in this menu.

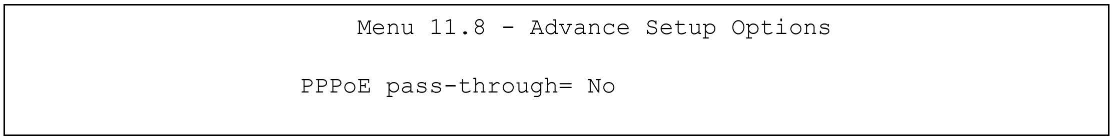
Table 104 Menu 11.6: Remote Node ATM Layer Options

FIELD	DESCRIPTION
VPI	The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.
VCI	The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.
ATM QoS Type	Select **CBR** (Constant Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select **UBR** (Unspecified Bit Rate) for applications that are non-time sensitive, such as e-mail. Select **VBR-nRT** (Variable Bit Rate-non Real Time) or **VBR-RT** (Variable Bit Rate-Real Time) for bursty traffic and bandwidth sharing with other applications.
Peak Cell Rate (PCR)	Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.
Sustain Cell Rate (SCR)	The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.
Maximum Burst Size (MBS)	Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.
Once you have completed filling in this menu, press [ENTER] at the message “Press ENTER to Confirm...” to save your configuration and return to menu 11.1, or press [ESC] at any time to cancel.	

26.7 Advance Setup Options

Move the cursor to the **Edit Advance Options** field in menu 11.1 (only for remote node 1), then press [SPACE BAR] to select **Yes**. Press [ENTER] to open **Menu 11.8 - Advanced Setup Options**.

Figure 154 Menu 11.8: Advance Setup Options



```
                        Menu 11.8 - Advance Setup Options

                    PPPoE pass-through= No
```

The following table describes the fields in this menu.

Table 105 Menu 11.8: Advance Setup Options

FIELD	DESCRIPTION
PPPoE pass-through	In addition to the ZyXEL Device's built-in PPPoE client, you can enable PPPoE Passthrough to allow up to ten hosts on the LAN to use PPPoE client software on their computers to connect to the ISP via the ZyXEL Device. Each host can have a separate account and a public WAN IP address. PPPoE pass through is an alternative to NAT for applications where NAT is not appropriate. Disable PPPoE passthrough if you do not need to allow hosts on the LAN to use PPPoE client software on their computers to connect to the ISP.
Once you have completed filling in this menu, press [ENTER] at the message “Press ENTER to Confirm...” to save your configuration and return to menu 11.1, or press [ESC] at any time to cancel.	

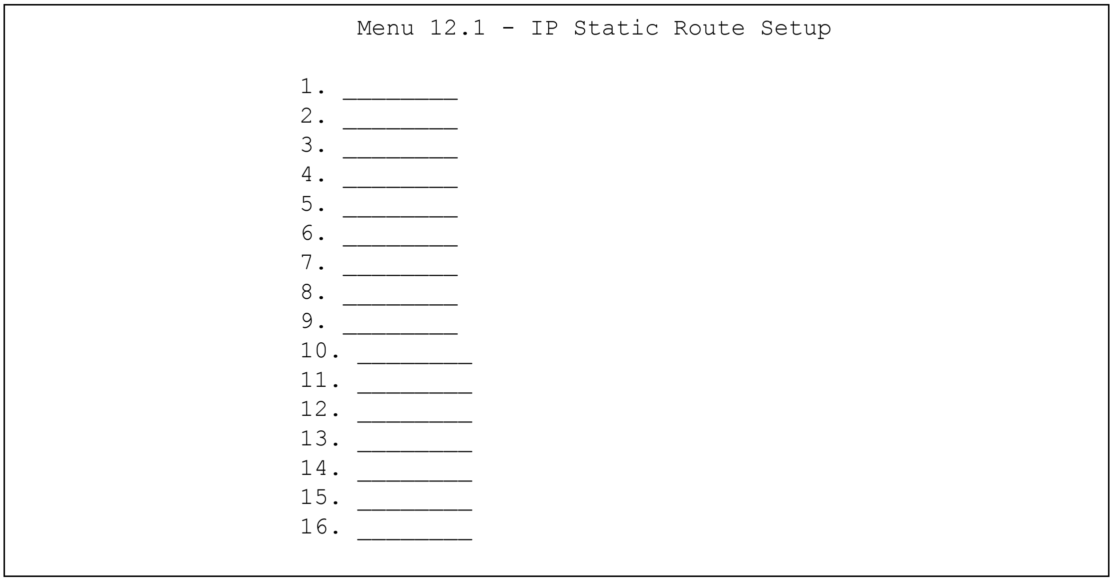
CHAPTER 27
Static Route Setup

Use this menu to configure IP and bridge (MAC) static routes.

27.1 IP Static Route Setup

Enter 1 from the menu 12. Select one of the IP static routes as shown next to configure IP static routes in menu 12.1.

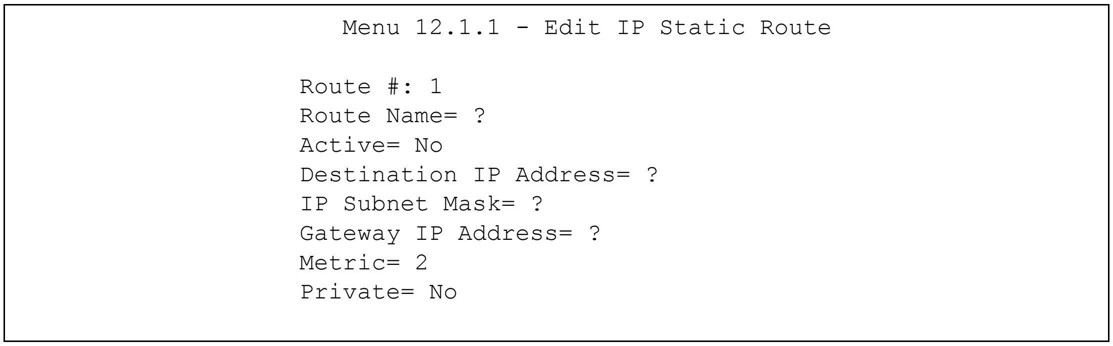
Figure 155 Menu 12.1: IP Static Route Setup



```
                    Menu 12.1 - IP Static Route Setup

                1. _________
                2. _________
                3. _________
                4. _________
                5. _________
                6. _________
                7. _________
                8. _________
                9. _________
                10. _________
                11. _________
                12. _________
                13. _________
                14. _________
                15. _________
                16. _________
```

Now, enter the index number of the static route that you want to configure.

Figure 156 Menu 12.1.1: Edit IP Static Route



```
                   Menu 12.1.1 - Edit IP Static Route

                Route #: 1
                Route Name= ?
                Active= No
                Destination IP Address= ?
                IP Subnet Mask= ?
                Gateway IP Address= ?
                Metric= 2
                Private= No
```

`The following table describes the fields in this screen.

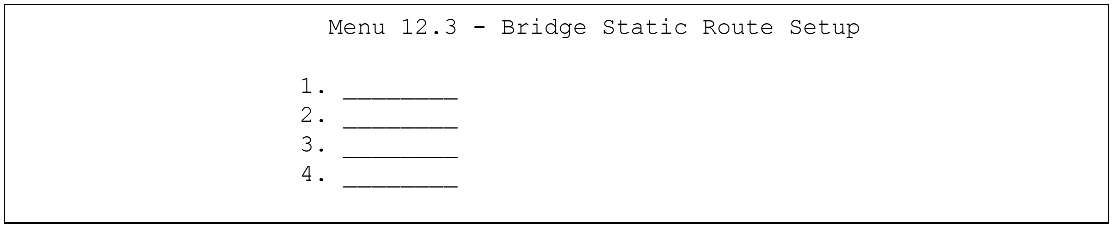
Table 106 Menu 12.1.1: Edit IP Static Route

FIELD	DESCRIPTION
Route #	This is the index number of the static route that you chose in menu 12.
Route Name	Enter a descriptive name for this route. This is for identification purposes only.
Active	This field allows you to activate/deactivate this static route.
Destination IP Address	This parameter specifies the IP network address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.
IP Subnet Mask	Enter the IP subnet mask for this destination.
Gateway IP Address	Enter the IP address of the gateway. The gateway is an immediate neighbor of your ZyXEL Device that will forward the packet to the destination. On the LAN, the gateway must be a router on the same segment as your ZyXEL Device; over the WAN, the gateway must be the IP address of one of the remote nodes.
Metric	Enter a number from 1 to 15 to set this route's priority among the ZyXEL Device's routes (see Section 5.2 on page 74). The smaller the number, the higher priority the route has.
Private	This parameter determines if the ZyXEL Device will include the route to this remote node in its RIP broadcasts. If set to **Yes**, this route is kept private and not included in RIP broadcast. If **No**, the route to this remote node will be propagated to other hosts through RIP broadcasts.
Once you have completed filling in this menu, press [ENTER] at the message "Press ENTER to Confirm…" to save your configuration, or press [ESC] to cancel.	

27.2 Bridge Static Route Setup

Enter 3 from the menu 12. Select one of the bridge static routes as shown next to configure IP static routes in menu 12.3.

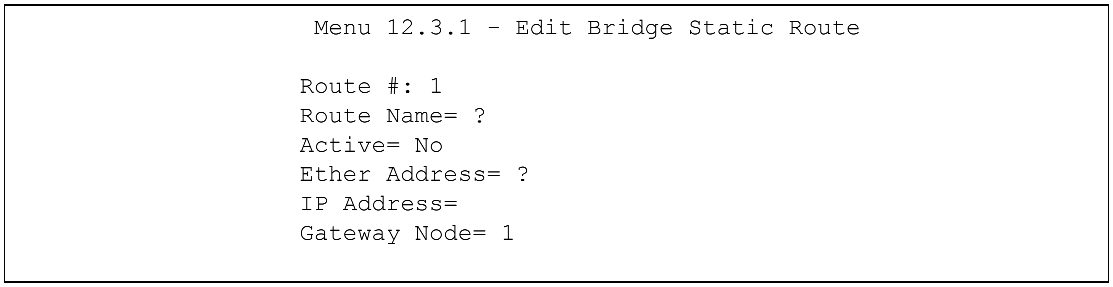
Figure 157 Menu 12.3: Bridge Static Route Setup



```
                         Menu 12.3 - Bridge Static Route Setup

                       1. ________
                       2. ________
                       3. ________
                       4. ________
```

Now, enter the index number of the static route that you want to configure.

Figure 158 Menu 12.3.1: Edit Bridge Static Route



```
                    Menu 12.3.1 - Edit Bridge Static Route

                   Route #: 1
                   Route Name= ?
                   Active= No
                   Ether Address= ?
                   IP Address=
                   Gateway Node= 1
```

`The following table describes the fields in this screen.

Table 107 Menu 12.3.1: Edit Bridge Static Route

FIELD	DESCRIPTION
Route #	This is the index number of the static route that you chose in menu 12.
Route Name	Enter a descriptive name for this route. This is for identification purposes only.
Active	This field allows you to activate/deactivate this static route.
Ether Address	This parameter specifies the MAC address of the final destination.
IP Address	Enter the IP address of the gateway. The gateway is an immediate neighbor of your ZyXEL Device that will forward the packet to the destination. On the LAN, the gateway must be a router on the same segment as your ZyXEL Device; over the WAN, the gateway must be the IP address of one of the remote nodes.
Gateway Node	Press [SPACE BAR] and then [ENTER] to select the number of the remote node that is the gateway for this static route.
Once you have completed filling in this menu, press [ENTER] at the message "Press ENTER to Confirm…" to save your configuration, or press [ESC] to cancel.	

CHAPTER 28 NAT Setup

Use this menu to configure Network Address Translation (NAT) on the ZyXEL Device.

28.1 Using NAT

Note: You must create a firewall rule in addition to setting up SUA/NAT, to allow traffic from the WAN to be forwarded through the ZyXEL Device.

28.1.1 SUA (Single User Account) Versus NAT

SUA (Single User Account) is a ZyNOS implementation of a subset of NAT that supports two types of mapping, **Many-to-One** and **Server**. See Section 28.2.1 on page 285 for a detailed description of the NAT set for SUA. The ZyXEL Device also supports **Full Feature** NAT to map multiple global IP addresses to multiple private LAN IP addresses of clients or servers using mapping types.

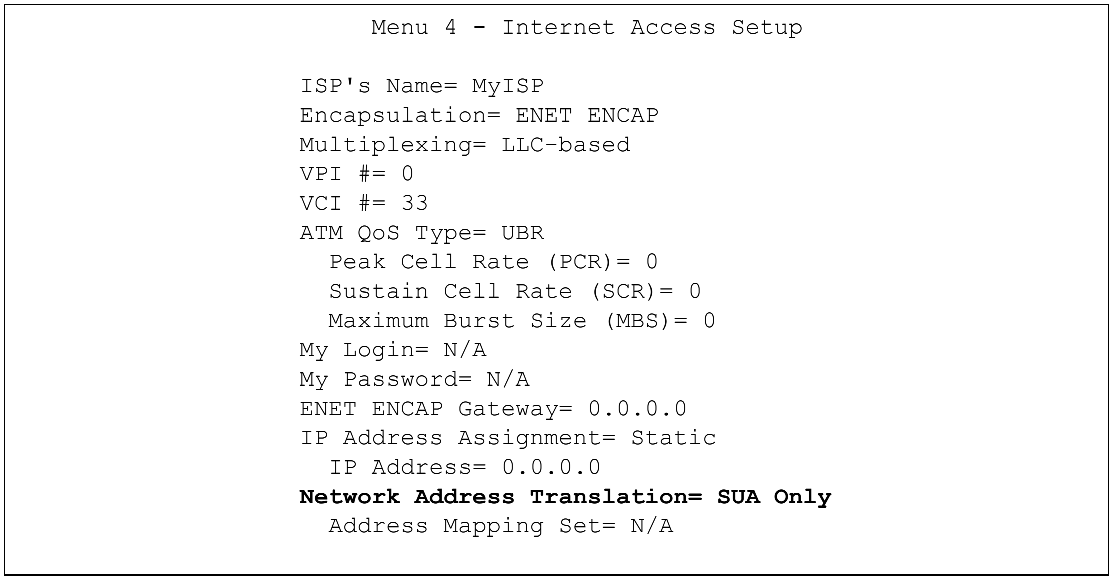
Note: Choose **SUA Only** if you have just one public WAN IP address for your ZyXEL Device.

Choose **Full Feature** if you have multiple public WAN IP addresses for your ZyXEL Device.

28.1.2 Applying NAT

You apply NAT via menus 4 or 11.3 as displayed next. The next figure shows you how to apply NAT for Internet access in menu 4. Enter 4 from the main menu to go to **Menu 4 - Internet Access Setup**.

Figure 159 Menu 4: Applying NAT for Internet Access



```
                         Menu 4 - Internet Access Setup

                    ISP's Name= MyISP
                    Encapsulation= ENET ENCAP
                    Multiplexing= LLC-based
                    VPI #= 0
                    VCI #= 33
                    ATM QoS Type= UBR
                      Peak Cell Rate (PCR)= 0
                      Sustain Cell Rate (SCR)= 0
                      Maximum Burst Size (MBS)= 0
                    My Login= N/A
                    My Password= N/A
                    ENET ENCAP Gateway= 0.0.0.0
                    IP Address Assignment= Static
                      IP Address= 0.0.0.0
                    Network Address Translation= SUA Only
                      Address Mapping Set= N/A
```

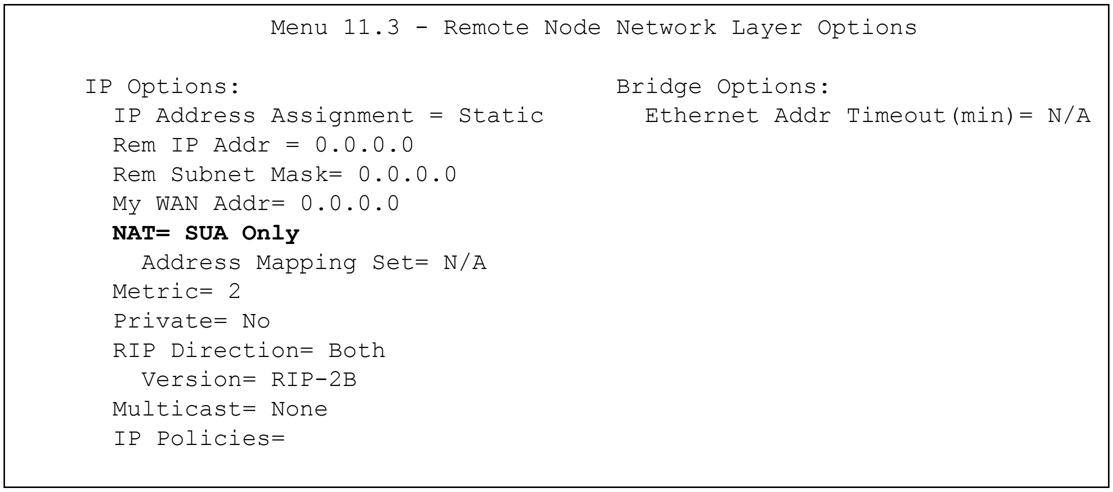
The following figure shows how you apply NAT to the remote node in menu 11.3.

1 Enter 11 from the main menu.

2 Enter 1 to open **Menu 11.1 - Remote Node Profile**.

3 Move the cursor to the **Edit IP/Bridge** field, press [SPACE BAR] to select **Yes** and then press [ENTER] to bring up **Menu 11.3 - Remote Node Network Layer Options**.

Figure 160 Menu 11.3: Applying NAT to the Remote Node



```
                  Menu 11.3 - Remote Node Network Layer Options

     IP Options:                          Bridge Options:
       IP Address Assignment = Static       Ethernet Addr Timeout(min)= N/A
       Rem IP Addr = 0.0.0.0
       Rem Subnet Mask= 0.0.0.0
       My WAN Addr= 0.0.0.0
       NAT= SUA Only
         Address Mapping Set= N/A
       Metric= 2
       Private= No
       RIP Direction= Both
         Version= RIP-2B
       Multicast= None
       IP Policies=
```

The following table describes the fields in this menu.

Table 108 Applying NAT in Menus 4 & 11.3

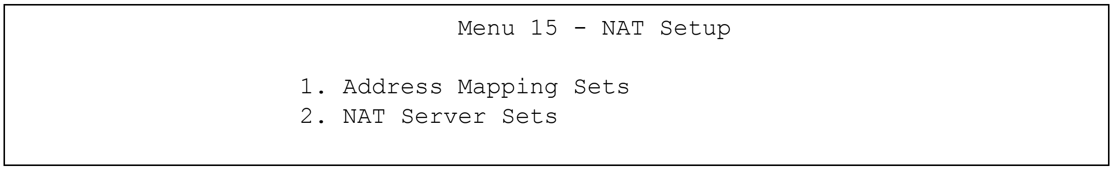
FIELD	DESCRIPTION	OPTIONS
Network Address Translation	When you select this option the SMT will use the specified address mapping set (menu 15.1 - see Section 28.2.1 on page 285 for further discussion). You can configure any of the mapping types described in Chapter 7 on page 107. Choose **Full Feature** if you have multiple public WAN IP addresses for your ZyXEL Device. When you select **Full Feature** you must configure at least one address mapping set.	Full Feature
	NAT is disabled when you select this option.	None
	When you select this option the SMT will use Address Mapping Set 255 (menu 15.1 - see Section 28.2.1 on page 285). Choose **SUA Only** if you have just one public WAN IP address for your ZyXEL Device.	SUA Only

28.2 NAT Setup

Use the address mapping sets menus and submenus to create the mapping table used to assign global addresses to computers on the LAN and the DMZ. **Set 255** is used for SUA. When you select **Full Feature** in menu 4 or menu 11.3, the SMT will use the address mapping set that you specify. When you select **SUA Only**, the SMT will use the pre-configured **Set 255** (read only).

A server set is a list of LAN servers mapped to external ports. To use this set, a server rule must be set up inside the NAT address mapping set. Please see the section on port forwarding in Section 7.4 on page 111 for further information on these menus. To configure NAT, enter 15 from the main menu to bring up the following screen.

Figure 161 Menu 15: NAT Setup

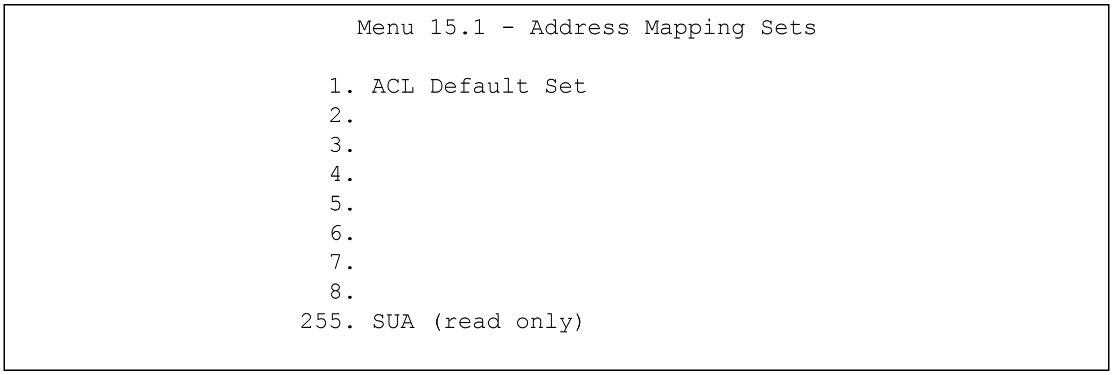


```
                              Menu 15 - NAT Setup

                        1. Address Mapping Sets
                        2. NAT Server Sets
```

28.2.1 Address Mapping Sets

Enter 1 to bring up **Menu 15.1.1 - Address Mapping Sets**.

Figure 162 Menu 15.1: Address Mapping Sets



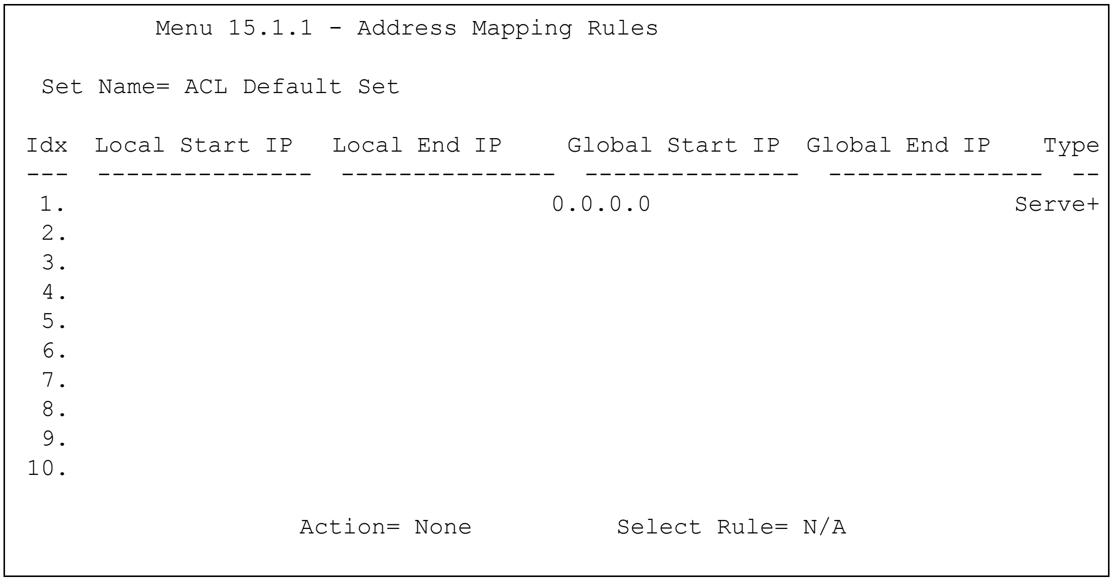
```
                          Menu 15.1 - Address Mapping Sets

                        1. ACL Default Set
                        2.
                        3.
                        4.
                        5.
                        6.
                        7.
                        8.
                      255. SUA (read only)
```

Select the address mapping set you want to modify. The fields in address 255 are used for SUA and are read-only.

28.2.1.1 User-Defined Address Mapping Sets

Note: The entire set will be deleted if you leave the Set Name field blank and press [ENTER] at the bottom of the screen.

Figure 163 Menu 15.1.1: Address Mapping Rules



```
            Menu 15.1.1 - Address Mapping Rules

  Set Name= ACL Default Set

 Idx  Local Start IP   Local End IP     Global Start IP  Global End IP    Type
 ---  ---------------  ---------------  ---------------  ---------------  --
  1.                                   0.0.0.0                          Serve+
  2.
  3.
  4.
  5.
  6.
  7.
  8.
  9.
 10.

                     Action= None          Select Rule= N/A
```

Note: The Type, Local and Global Start/End IPs are configured in menu 15.1.1.1 (described later) and the values are displayed here.

Table 109 Menu 15.1.1: Address Mapping Rules

FIELD	DESCRIPTION
Set Name	This is the name of the set you selected in menu 15.1 or enter the name of a new set you want to create.
Idx	This is the index or rule number.
Local Start IP	**Local Start IP** is the starting local IP address (ILA).
Local End IP	**Local End IP** is the ending local IP address (ILA). If the rule is for all local IPs, then the start IP is 0.0.0.0 and the end IP is 255.255.255.255.
Global Start IP	This is the starting global IP address (IGA). If you have a dynamic IP, enter 0.0.0.0 as the **Global Start IP**.
Global End IP	This is the ending global IP address (IGA).
Type	These are the mapping types discussed above. **Server** allows us to specify multiple servers of different types behind NAT to this machine. See later for some examples.
Once you have finished configuring a rule in this menu, press [ENTER] at the message "Press ENTER to Confirm…" to save your configuration, or press [ESC] to cancel.	

Ordering your rules is important because the ZyXEL Device applies the rules in the order that you specify. When a rule matches the current packet, the ZyXEL Device takes the corresponding action and the remaining rules are ignored. If there are any empty rules before your new configured rule, your configured rule will be pushed up by that number of empty rules. For example, if you have already configured rules 1 to 6 in your current set and now you configure rule number 9. In the set summary screen, the new rule will be rule 7, not 9.

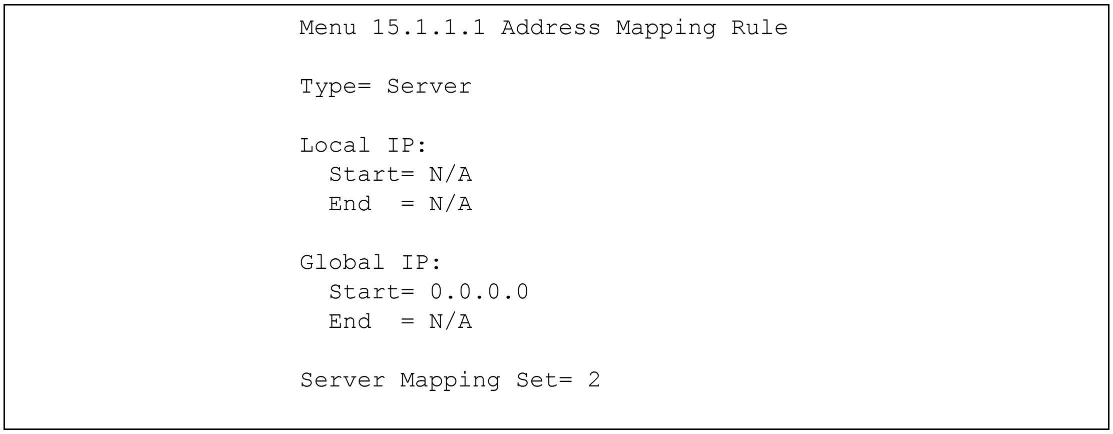
Now if you delete rule 4, rules 5 to 7 will be pushed up by 1 rule, so as old rule 5 becomes rule 4, old rule 6 becomes rule 5 and old rule 7 becomes rule 6.

Note: You must press [ENTER] at the bottom of the screen to save the whole set. You must do this again if you make any changes to the set – including deleting a rule. No changes to the set take place until this action is taken.

Selecting **Edit** in the **Action** field and then selecting a rule brings up the following menu, **Menu 15.1.1.1 - Address Mapping Rule** in which you can edit an individual rule and configure the **Type**, **Local** and **Global Start/End IPs**.

Note: An IP End address must be numerically greater than its corresponding IP Start address.

Figure 164 Menu 15.1.1.1: Address Mapping Rule



```
                    Menu 15.1.1.1 Address Mapping Rule

                    Type= Server

                    Local IP:
                      Start= N/A
                      End  = N/A

                    Global IP:
                      Start= 0.0.0.0
                      End  = N/A

                    Server Mapping Set= 2
```

The following table describes the fields in this menu.

Table 110 Menu 15.1.1.1: Address Mapping Rule

FIELD	DESCRIPTION
Type	Press [SPACE BAR] and then [ENTER] to select from a total of five types. These are the mapping types discussed in Chapter 7 on page 107. **Server** allows you to specify multiple servers of different types behind NAT to this computer. See Section 28.4.3 on page 292 for an example.
Local IP	These fields are enabled depending on the **Type**.
Start	Enter the starting local IP address (ILA).
End	Enter the ending local IP address (ILA). If the rule is for all local IPs, then put the Start IP as 0.0.0.0 and the End IP as 255.255.255.255. This field is **N/A** for One-to-One and Server types.
Global IP	These fields are enabled depending on the **Type**.
Start	Enter the starting global IP address (IGA). If you have a dynamic IP, enter 0.0.0.0 as the **Global IP Start**. Note that **Global IP Start** can be set to 0.0.0.0 only if the types are **Many-to-One** or **Server**.
End	Enter the ending global IP address (IGA). This field is **N/A** for **One-to-One**, **Many-to-One** and **Server types**.
Server Mapping Set	This field is available only when you select **Server** in the **Type** field. Select which server mapping set to use for this rule.
Once you have finished configuring a rule in this menu, press [ENTER] at the message “Press ENTER to Confirm…” to save your configuration, or press [ESC] to cancel.	

28.3 Configuring a Server behind NAT

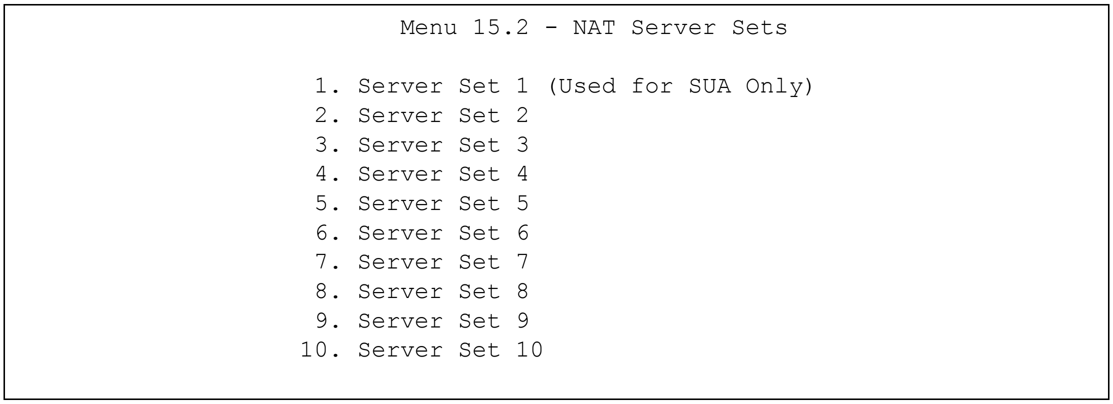
Note: If you do not assign a **Default Server** IP address, the ZyXEL Device discards all packets received for ports that are not specified here or in the remote management setup.

Follow these steps to configure a server behind NAT:

1 Enter 15 in the main menu to go to **Menu 15 - NAT Setup.**

2 Enter 2 to open menu 15.2 (and configure the address mapping rules for the WAN port on a ZyXEL Device with a single WAN port).

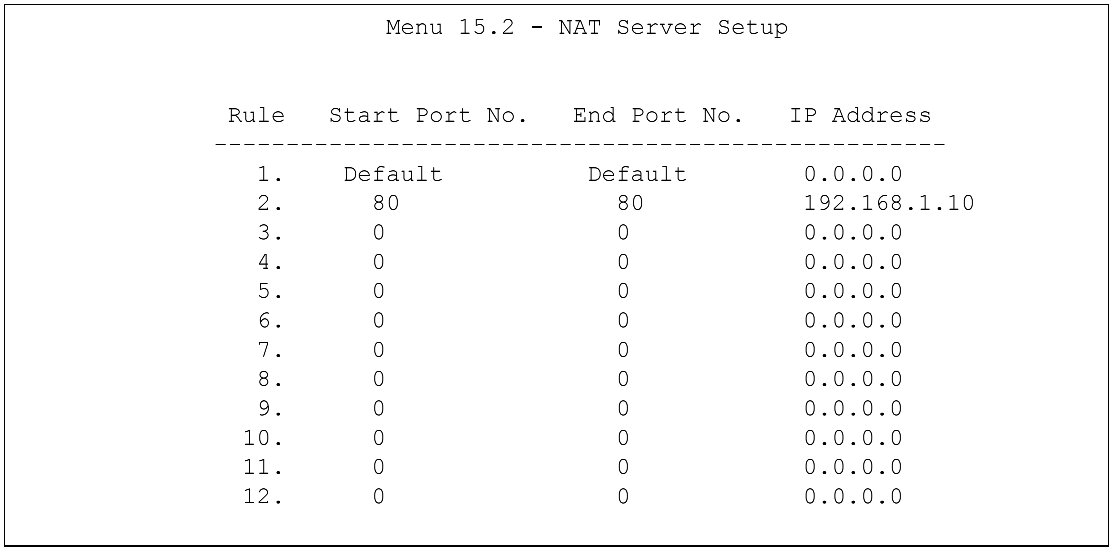
Figure 165 Menu 15.2: NAT Server Sets



```
                         Menu 15.2 - NAT Server Sets

                   1. Server Set 1 (Used for SUA Only)
                   2. Server Set 2
                   3. Server Set 3
                   4. Server Set 4
                   5. Server Set 5
                   6. Server Set 6
                   7. Server Set 7
                   8. Server Set 8
                   9. Server Set 9
                  10. Server Set 10
```

3 Enter 1 to configure the server set used by SUA, or enter the number of the server set you want to modify for full-feature NAT. In **Menu 15.2 - NAT Server Setup**, configure the port forwarding rules.

Figure 166 Menu 15.2: NAT Server Setup



```
                        Menu 15.2 - NAT Server Setup


               Rule   Start Port No.   End Port No.   IP Address
              ---------------------------------------------------
                 1.    Default          Default        0.0.0.0
                 2.      80               80           192.168.1.10
                 3.      0                0            0.0.0.0
                 4.      0                0            0.0.0.0
                 5.      0                0            0.0.0.0
                 6.      0                0            0.0.0.0
                 7.      0                0            0.0.0.0
                 8.      0                0            0.0.0.0
                 9.      0                0            0.0.0.0
                10.      0                0            0.0.0.0
                11.      0                0            0.0.0.0
                12.      0                0            0.0.0.0
```

The first entry is for the **Default Server**. The following table describes the labels in this menu.

Table 111 Menu 15.2: NAT Server Setup

FIELD	DESCRIPTION
Rule	This field is a sequential value, and it is not associated with a specific rule. The sequence is important, however. The ZyXEL Device checks each active rule in order, and it only follows the first one that applies.
Start Port	This field displays the beginning of the range of port numbers forwarded by this rule.
End Port	This field displays the end of the range of port numbers forwarded by this rule. If it is the same as the **Start Port**, only one port number is forwarded.
IP Address	This field displays the IP address of the server to which packet for the selected port(s) are forwarded.

28.4 General NAT Examples

The following are some examples of NAT configuration.

28.4.1 Internet Access Only

In the following Internet access example, you only need one rule where all your ILAs (Inside Local addresses) map to one dynamic IGA (Inside Global Address) assigned by your ISP.

Figure 167 NAT Example 1

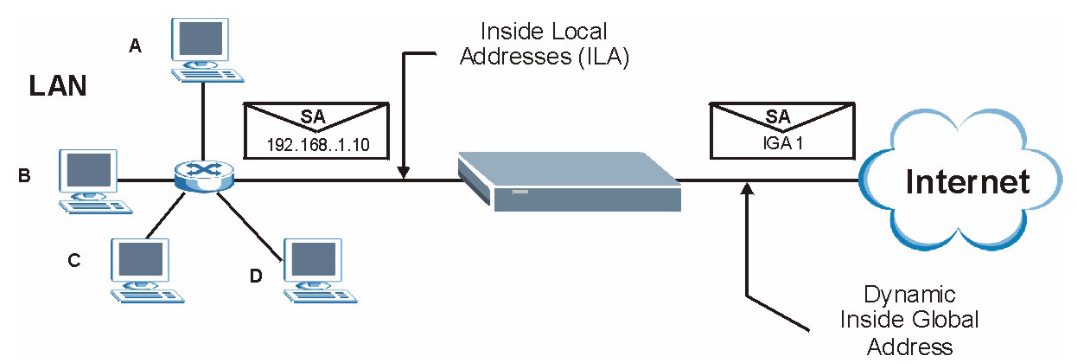
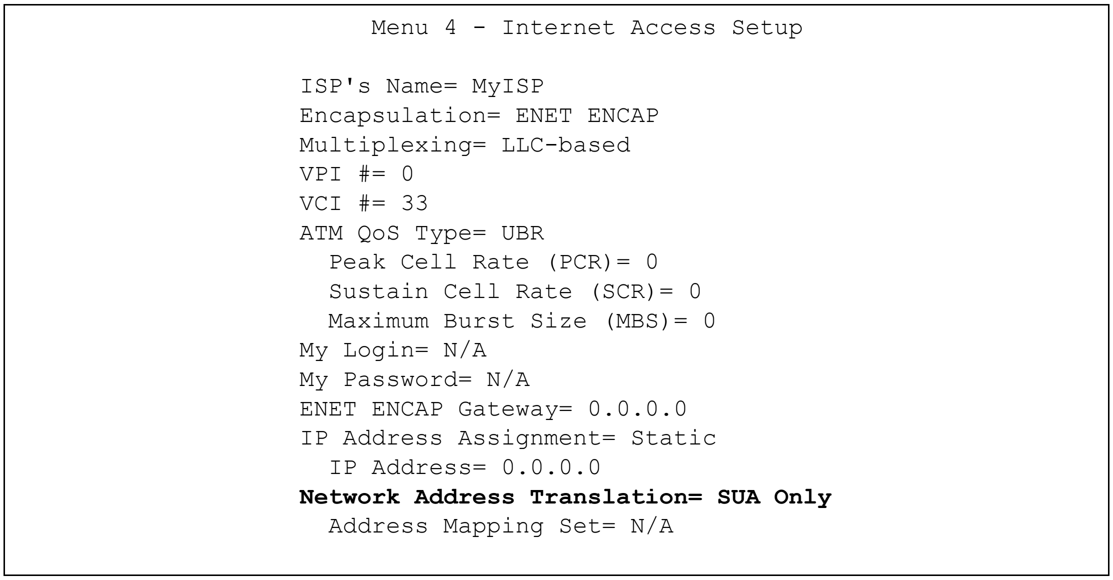


Figure 168 Menu 4: Internet Access & NAT Example

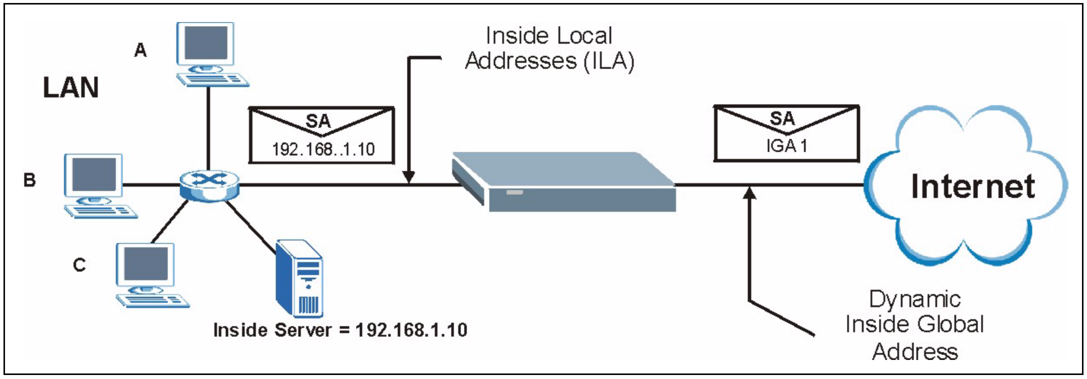


```
                    Menu 4 - Internet Access Setup

               ISP's Name= MyISP
               Encapsulation= ENET ENCAP
               Multiplexing= LLC-based
               VPI #= 0
               VCI #= 33
               ATM QoS Type= UBR
                 Peak Cell Rate (PCR)= 0
                 Sustain Cell Rate (SCR)= 0
                 Maximum Burst Size (MBS)= 0
               My Login= N/A
               My Password= N/A
               ENET ENCAP Gateway= 0.0.0.0
               IP Address Assignment= Static
                 IP Address= 0.0.0.0
               Network Address Translation= SUA Only
                 Address Mapping Set= N/A
```

From menu 4 shown above, simply choose the **SUA Only** option from the **Network Address Translation** field. This is the Many-to-One mapping discussed in Section 28.4 on page 290. The **SUA Only** read-only option from the **Network Address Translation** field in menus 4 and 11.3 is specifically pre-configured to handle this case.

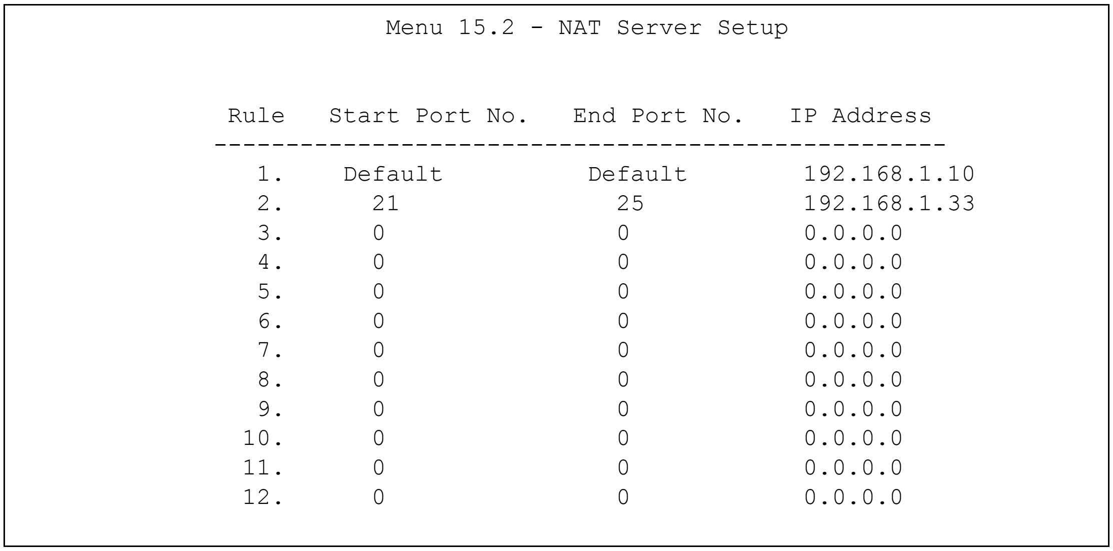
28.4.2 Example 2: Internet Access with an Default Server

Figure 169 NAT Example 2



In this case, you do exactly as above (use the convenient pre-configured **SUA Only** set) and also go to menu 15.2.1 to specify the **Default Server** behind the NAT as shown in the next figure.

Figure 170 Menu 15.2: Specifying an Inside Server



```
                      Menu 15.2 - NAT Server Setup


           Rule   Start Port No.   End Port No.   IP Address
          ---------------------------------------------------
             1.    Default          Default        192.168.1.10
             2.      21               25           192.168.1.33
             3.      0                0            0.0.0.0
             4.      0                0            0.0.0.0
             5.      0                0            0.0.0.0
             6.      0                0            0.0.0.0
             7.      0                0            0.0.0.0
             8.      0                0            0.0.0.0
             9.      0                0            0.0.0.0
            10.      0                0            0.0.0.0
            11.      0                0            0.0.0.0
            12.      0                0            0.0.0.0
```

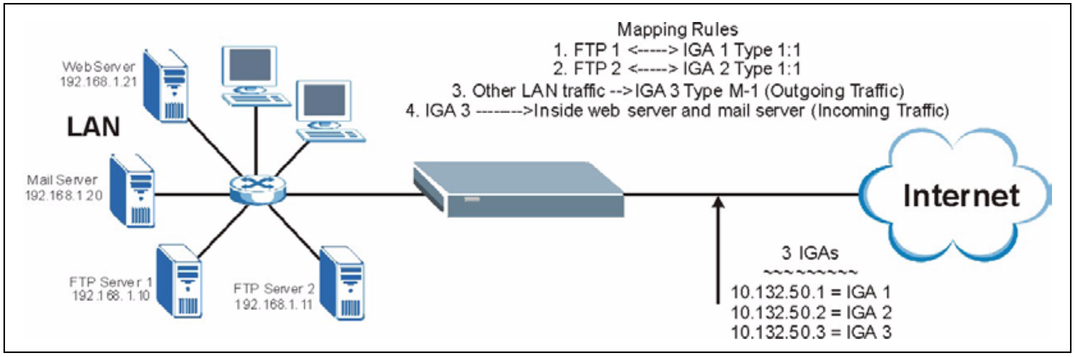
28.4.3 Example 3: Multiple Public IP Addresses With Inside Servers

In this example, there are 3 IGAs from our ISP. There are many departments but two have their own FTP server. All departments share the same router. The example will reserve one IGA for each department with an FTP server and all departments use the other IGA. Map the FTP servers to the first two IGAs and the other LAN traffic to the remaining IGA. Map the third IGA to an inside web server and mail server. Four rules need to be configured, two bi-directional and two uni-directional as follows.

1. Map the first IGA to the first inside FTP server for FTP traffic in both directions (**1 : 1** mapping, giving both local and global IP addresses).
2. Map the second IGA to our second inside FTP server for FTP traffic in both directions (**1 : 1** mapping, giving both local and global IP addresses).
3. Map the other outgoing LAN traffic to IGA3 (**Many : 1** mapping).
4. You also map your third IGA to the web server and mail server on the LAN. Type **Server** allows you to specify multiple servers, of different types, to other computers behind NAT on the LAN.

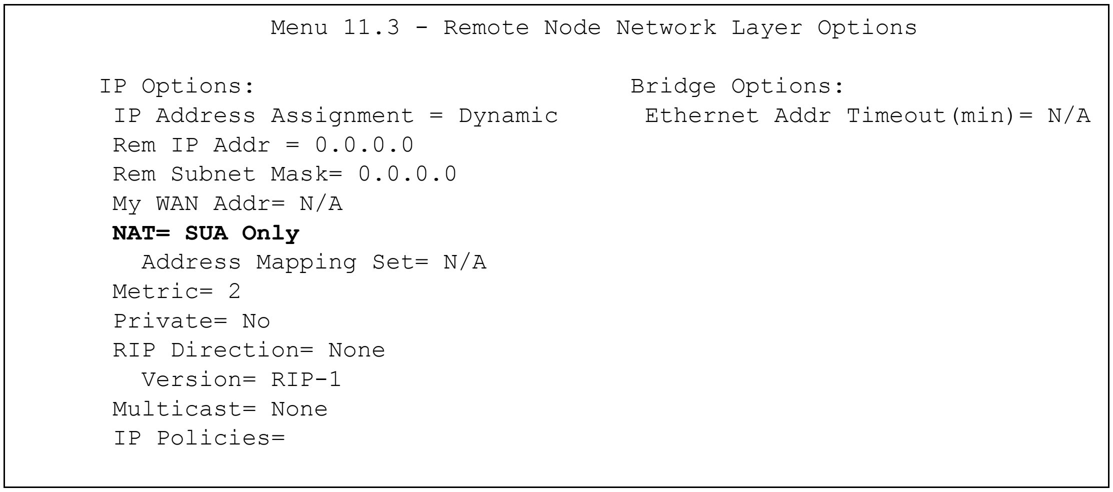
The example situation looks somewhat like this:

Figure 171 NAT Example 3



1. In this case you need to configure Address Mapping Set 1 from **Menu 15.1 - Address Mapping Sets**. Therefore you must choose the **Full Feature** option from the **Network Address Translation** field (in menu 4 or menu 11.3) in Figure 172 on page 293.
2. Then enter 15 from the main menu.
3. Enter 1 to configure the Address Mapping Sets.
4. Enter 1 to begin configuring this new set. Enter a Set Name, choose the **Edit Action** and then enter 1 for the **Select Rule** field. Press [ENTER] to confirm.
5. Select **Type** as **One-to-One** (direct mapping for packets going both ways), and enter the local **Start IP** as 192.168.1.10 (the IP address of FTP Server 1), the global **Start IP** as 10.132.50.1 (our first IGA). (See Figure 173 on page 294).
6. Repeat the previous step for rules 2 to 4 as outlined above.
7. When finished, menu 15.1.1 should look like as shown in Figure 174 on page 294.

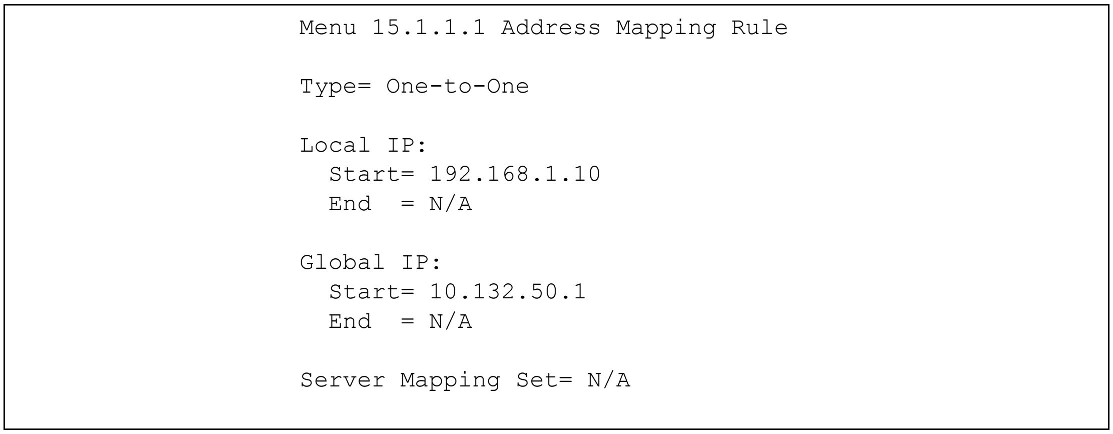
Figure 172 Example 3: Menu 11.3



```
                  Menu 11.3 - Remote Node Network Layer Options

      IP Options:                           Bridge Options:
       IP Address Assignment = Dynamic        Ethernet Addr Timeout(min)= N/A
       Rem IP Addr = 0.0.0.0
       Rem Subnet Mask= 0.0.0.0
       My WAN Addr= N/A
       NAT= SUA Only
         Address Mapping Set= N/A
       Metric= 2
       Private= No
       RIP Direction= None
         Version= RIP-1
       Multicast= None
       IP Policies=
```

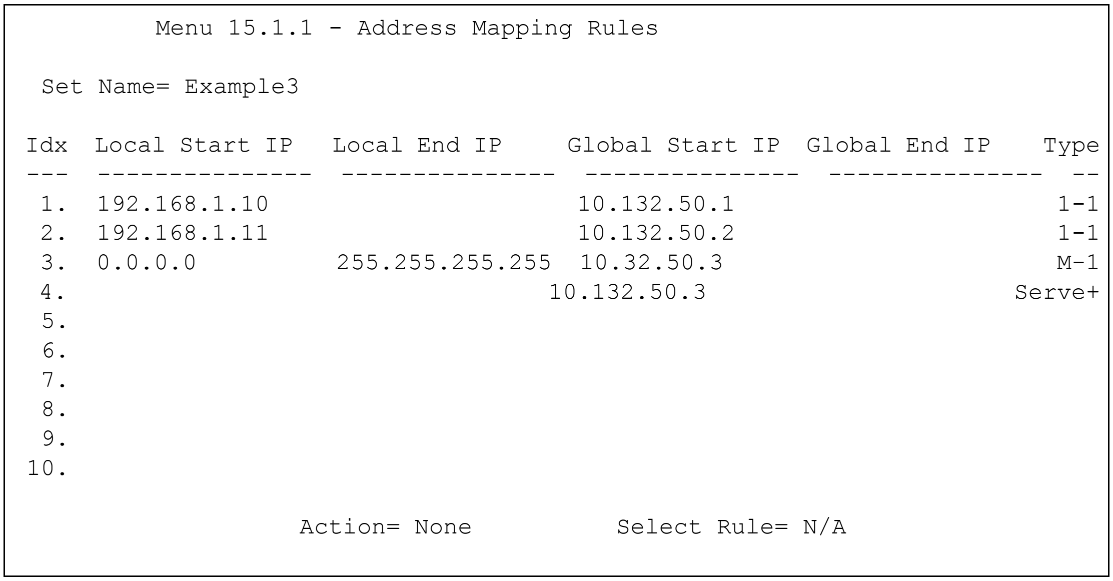
The following figure shows how to configure the first rule.

Figure 173 Example 3: Menu 15.1.1.1



```
                    Menu 15.1.1.1 Address Mapping Rule

                    Type= One-to-One

                    Local IP:
                      Start= 192.168.1.10
                      End  = N/A

                    Global IP:
                      Start= 10.132.50.1
                      End  = N/A

                    Server Mapping Set= N/A
```

Figure 174 Example 3: Final Menu 15.1.1



```
          Menu 15.1.1 - Address Mapping Rules

  Set Name= Example3

 Idx  Local Start IP   Local End IP     Global Start IP  Global End IP    Type
 ---  ---------------  ---------------  ---------------  ---------------  --
  1.  192.168.1.10                      10.132.50.1                       1-1
  2.  192.168.1.11                      10.132.50.2                       1-1
  3.  0.0.0.0          255.255.255.255  10.32.50.3                        M-1
  4.                                  10.132.50.3                       Serve+
  5.
  6.
  7.
  8.
  9.
 10.

                    Action= None          Select Rule= N/A
```

Now configure the IGA3 to map to our web server and mail server on the LAN.

1. Enter 15 from the main menu.
2. Enter 2 to go to menu 15.2.
3. (Enter 1 or 2 from menu 15.2 on a ZyXEL Device with multiple WAN ports) configure the menu as shown in Figure 175 on page 295.

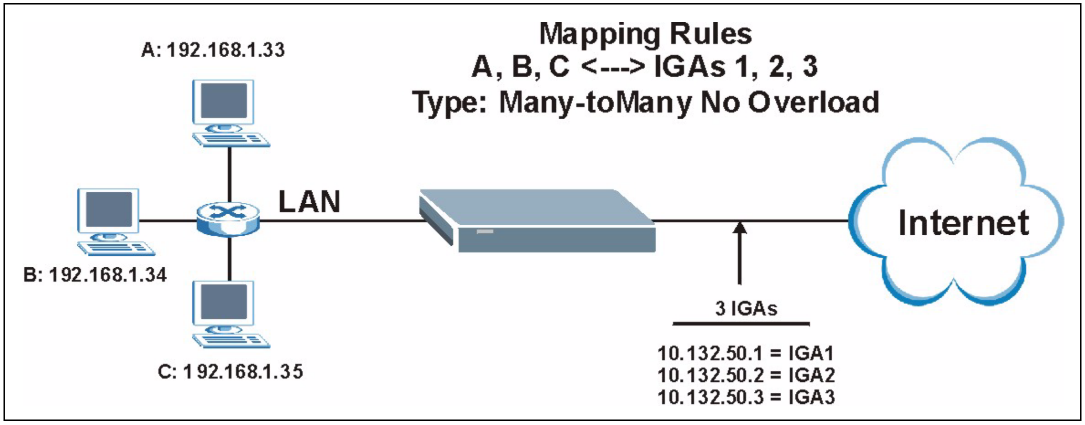
Figure 175 Example 3: Menu 15.2

```
                    Menu 15.2 - NAT Server Setup


          Rule   Start Port No.   End Port No.   IP Address
         ---------------------------------------------------
            1.     Default           Default        0.0.0.0
            2.       80                80           192.168.1.21
            3.       25                25           192.168.1.20
            4.       0                 0            0.0.0.0
            5.       0                 0            0.0.0.0
            6.       0                 0            0.0.0.0
            7.       0                 0            0.0.0.0
            8.       0                 0            0.0.0.0
            9.       0                 0            0.0.0.0
           10.       0                 0            0.0.0.0
           11.       0                 0            0.0.0.0
           12.       0                 0            0.0.0.0
```

28.4.4 Example 4: NAT Unfriendly Application Programs

Some applications do not support NAT Mapping using TCP or UDP port address translation. In this case it is better to use **Many-One-to-One** mapping as port numbers do *not* change for **Many-One-to-One** (and **One-to-One**) NAT mapping types. The following figure illustrates this.

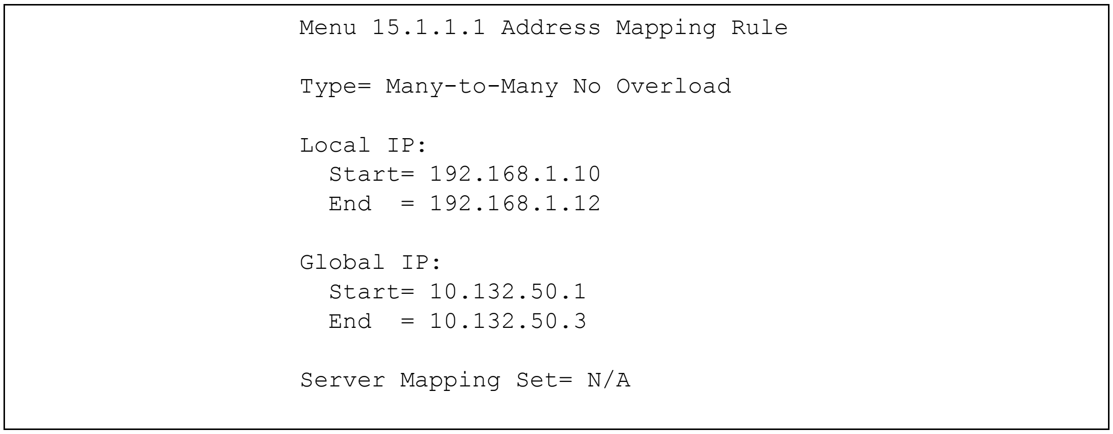
Figure 176 NAT Example 4



Note: Other applications such as some gaming programs are NAT unfriendly because they embed addressing information in the data stream. These applications won't work through NAT even when using **One-to-One** and **Many-One-to-One** mapping types.

Follow the steps outlined in example 3 above to configure these two menus as follows.

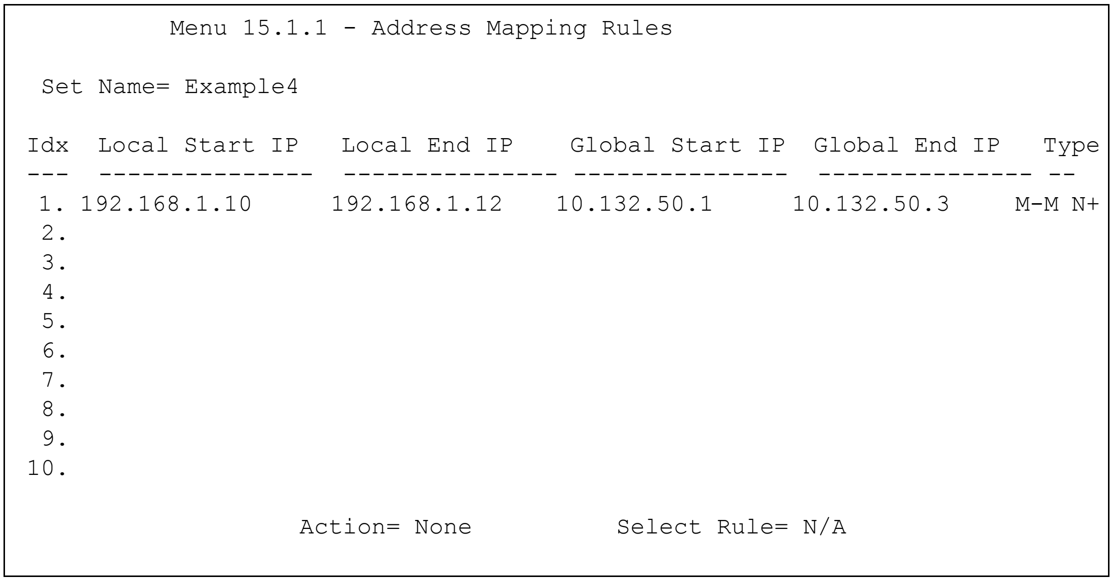
Figure 177 Example 4: Menu 15.1.1.1: Address Mapping Rule



```
                    Menu 15.1.1.1 Address Mapping Rule

                    Type= Many-to-Many No Overload

                    Local IP:
                      Start= 192.168.1.10
                      End  = 192.168.1.12

                    Global IP:
                      Start= 10.132.50.1
                      End  = 10.132.50.3

                    Server Mapping Set= N/A
```

After you’ve configured your rule, you should be able to check the settings in menu 15.1.1 as shown next.

Figure 178 Example 4: Menu 15.1.1: Address Mapping Rules



```
           Menu 15.1.1 - Address Mapping Rules

  Set Name= Example4

 Idx  Local Start IP   Local End IP    Global Start IP  Global End IP   Type
 ---  ---------------  --------------- ---------------  --------------- --
  1. 192.168.1.10     192.168.1.12    10.132.50.1      10.132.50.3     M-M N+
  2.
  3.
  4.
  5.
  6.
  7.
  8.
  9.
 10.

                    Action= None          Select Rule= N/A
```

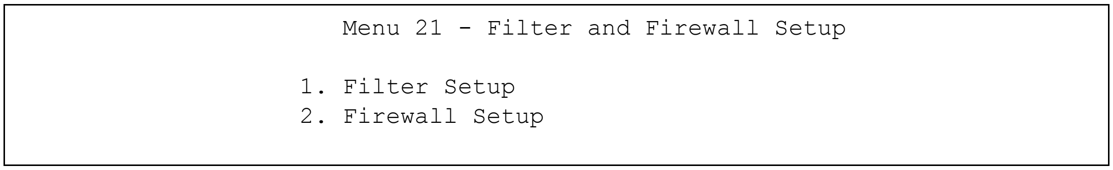
CHAPTER 29 Firewall Setup

Use this menu to activate or deactivate the firewall.

29.1 Using ZyXEL Device SMT Menus

From the main menu enter 21 to go to **Menu 21 - Filter and Firewall Setup** to display the screen shown next.

Figure 179 Menu 21: Filter and Firewall Setup

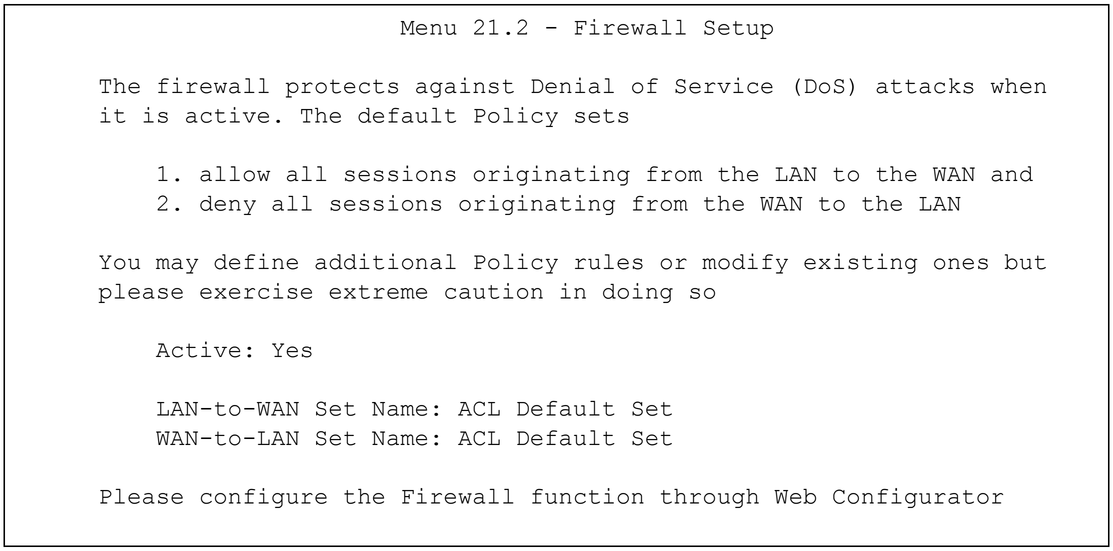


```
                              Menu 21 - Filter and Firewall Setup

                           1. Filter Setup
                           2. Firewall Setup
```

29.1.1 Activating the Firewall

Enter option 2 in this menu to bring up the following screen. Press [SPACE BAR] and then [ENTER] to select **Yes** in the **Active** field to activate the firewall. The firewall must be active to protect against Denial of Service (DoS) attacks. Use the web configurator to configure firewall rules. Use the web configurator or SMT menu 15 to configure the **LAN-to-WAN Set Name** and **WAN-to-LAN Set Name**.

Figure 180 Menu 21.2: Firewall Setup



```
                                  Menu 21.2 - Firewall Setup

      The firewall protects against Denial of Service (DoS) attacks when
      it is active. The default Policy sets

          1. allow all sessions originating from the LAN to the WAN and
          2. deny all sessions originating from the WAN to the LAN

      You may define additional Policy rules or modify existing ones but
      please exercise extreme caution in doing so

          Active: Yes

          LAN-to-WAN Set Name: ACL Default Set
          WAN-to-LAN Set Name: ACL Default Set

      Please configure the Firewall function through Web Configurator
```

Note: Configure the firewall rules using the web configurator or CLI commands.

CHAPTER 30
Filter Configuration

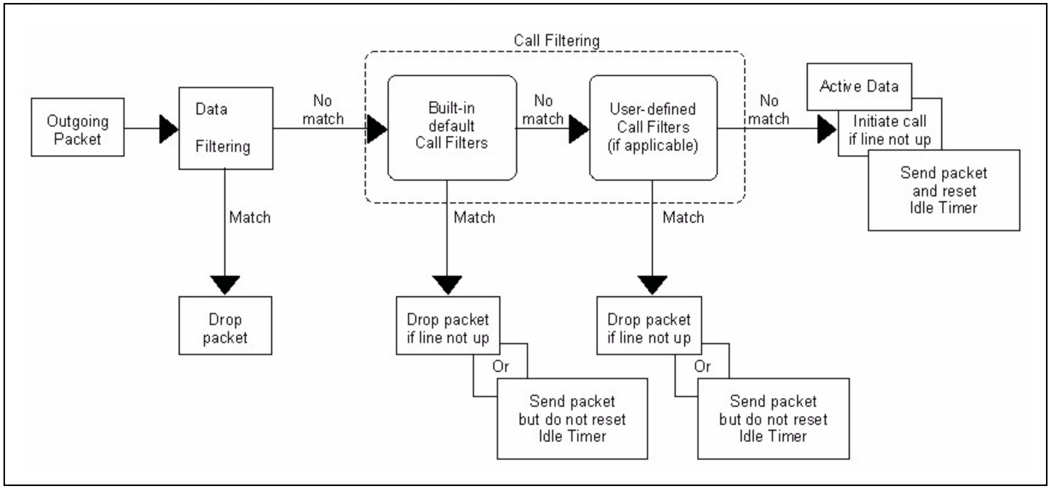
This chapter shows you how to create and apply filters.

30.1 Introduction to Filters

Your ZyXEL Device uses filters to decide whether to allow passage of a data packet and/or to make a call. There are two types of filter applications: data filtering and call filtering. Filters are subdivided into device and protocol filters, which are discussed later.

Data filtering screens the data to determine if the packet should be allowed to pass. Data filters are divided into incoming and outgoing filters, depending on the direction of the packet relative to a port. Data filtering can be applied on either the WAN side or the LAN side. Call filtering is used to determine if a packet should be allowed to trigger a call. Remote node call filtering is only applicable when using PPPoE encapsulation. Outgoing packets must undergo data filtering before they encounter call filtering as shown in the following figure.

Figure 181 Outgoing Packet Filtering Process


Call Filtering
Outgoing Packet
Data Filtering
No match
Built-in default Call Filters
No match
User-defined Call Filters (if applicable)
No match
Active Data
Initiate call if line not up
Send packet and reset Idle Timer
Match
Match
Match
Drop packet
Drop packet if line not up
Or
Send packet but do not reset Idle Timer
Drop packet if line not up
Or
Send packet but do not reset Idle Timer

For incoming packets, your ZyXEL Device applies data filters only. Packets are processed depending upon whether a match is found. The following sections describe how to configure filter sets.

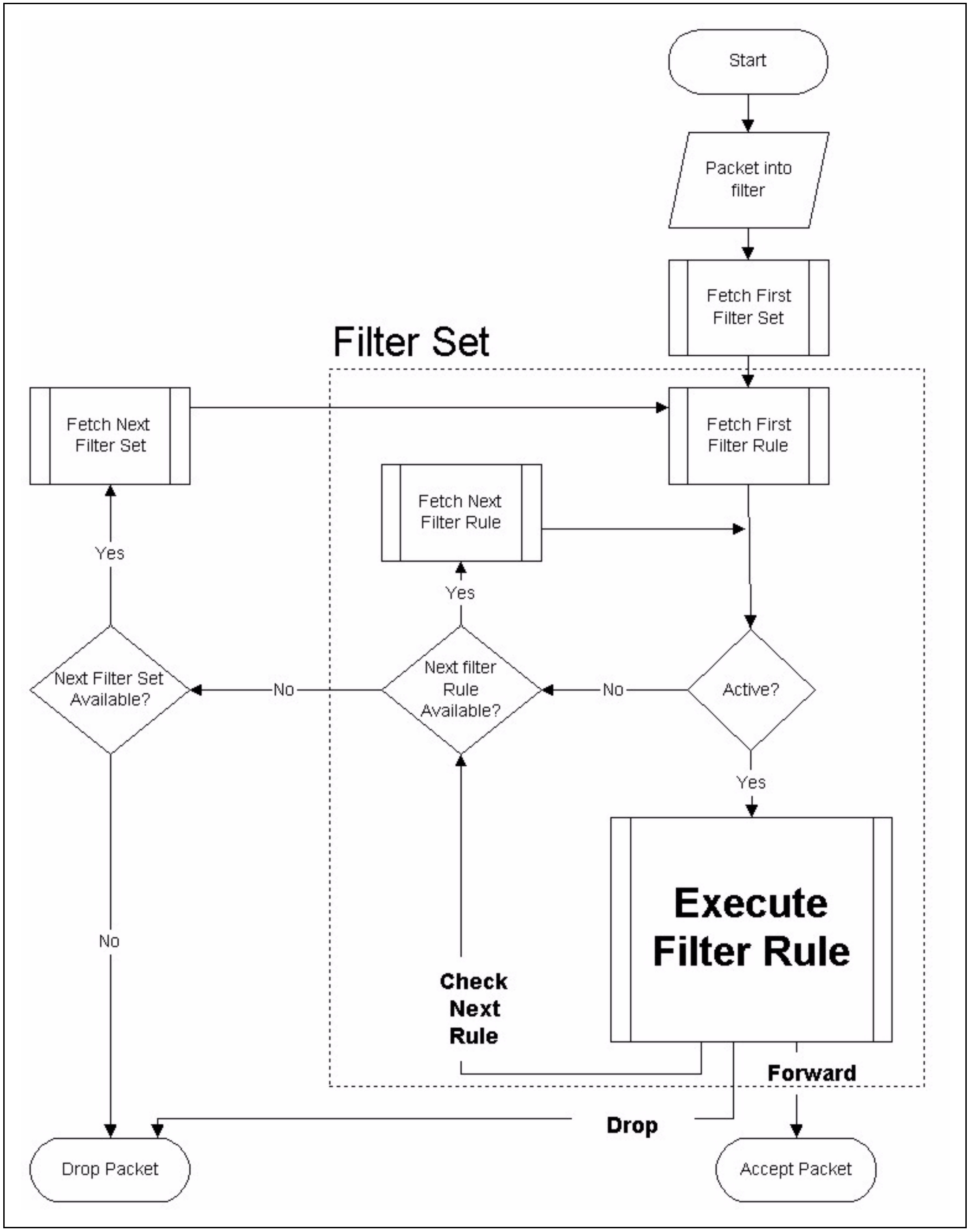
30.1.1 The Filter Structure of the ZyXEL Device

A filter set consists of one or more filter rules. Usually, you would group related rules, e.g., all the rules for NetBIOS, into a single set and give it a descriptive name. The ZyXEL Device allows you to configure up to twelve filter sets with six rules in each set, for a total of 72 filter rules in the system. You cannot mix device filter rules and protocol filter rules within the same set. You can apply up to four filter sets to a particular port to block multiple types of packets. With each filter set having up to six rules, you can have a maximum of 24 rules active for a single port.

Sets of factory default filter rules have been configured in menu 21 to prevent NetBIOS traffic from triggering calls and to prevent incoming telnet sessions. A summary of their filter rules is shown in the figures that follow.

The following figure illustrates the logic flow when executing a filter rule. See also Figure 187 on page 307 for the logic flow when executing an IP filter.

Figure 182 Filter Rule Process



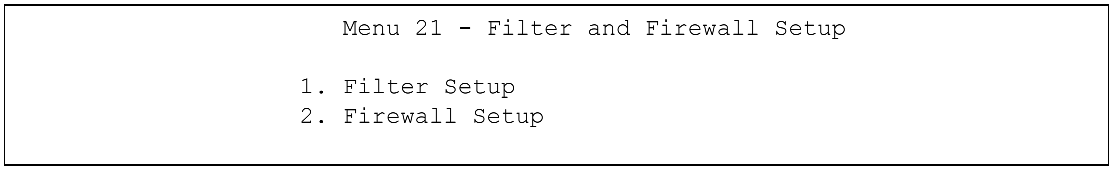
You can apply up to four filter sets to a particular port to block multiple types of packets. With each filter set having up to six rules, you can have a maximum of 24 rules active for a single port.

30.2 Configuring a Filter Set

The ZyXEL Device includes filtering for NetBIOS over TCP/IP packets by default. To configure another filter set, follow the procedure below.

1 Enter 21 in the main menu to open menu 21.

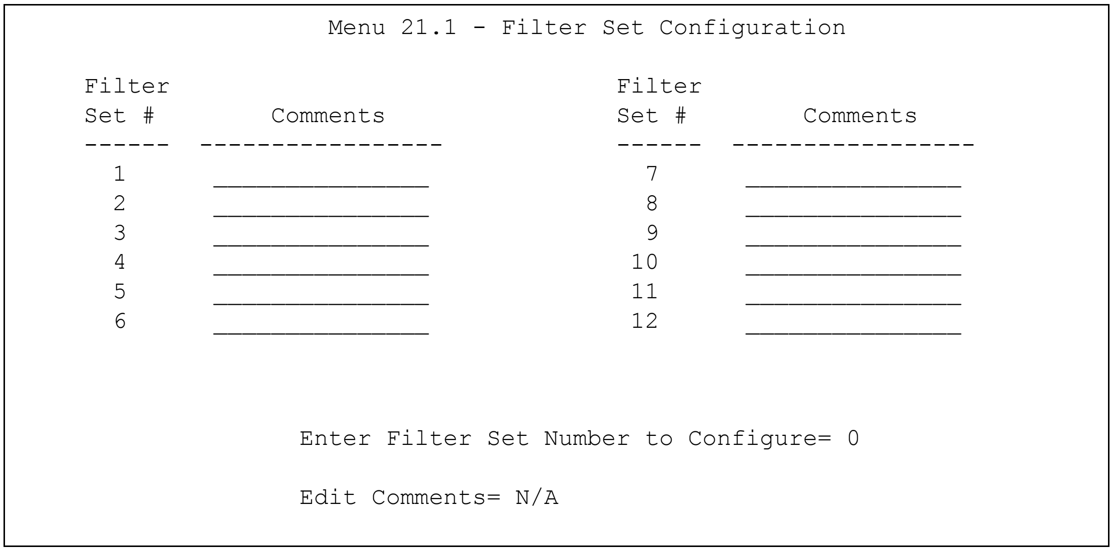
Figure 183 Menu 21: Filter and Firewall Setup



```
                    Menu 21 - Filter and Firewall Setup

                 1. Filter Setup
                 2. Firewall Setup
```

2 Enter 1 to bring up the following menu.

Figure 184 Menu 21.1: Filter Set Configuration



```
                    Menu 21.1 - Filter Set Configuration

   Filter                              Filter
   Set #        Comments               Set #        Comments
   ------  -----------------           ------  -----------------
     1      _______________              7      _______________
     2      _______________              8      _______________
     3      _______________              9      _______________
     4      _______________             10      _______________
     5      _______________             11      _______________
     6      _______________             12      _______________



                Enter Filter Set Number to Configure= 0

                Edit Comments= N/A
```

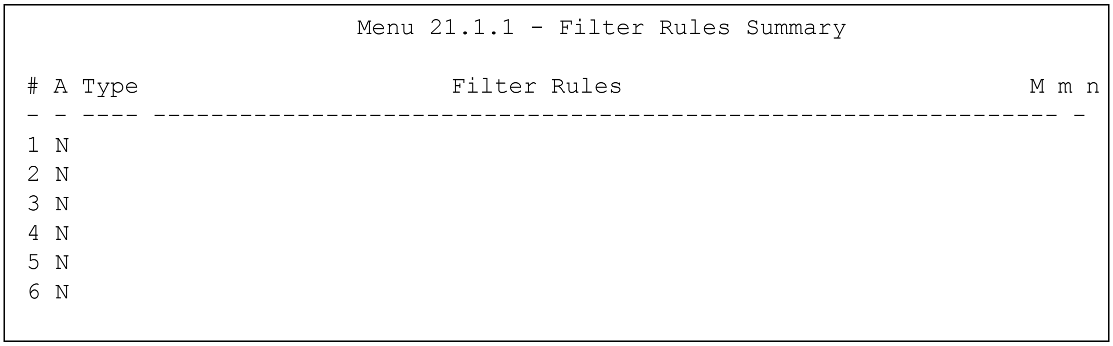
3 Select the filter set you wish to configure (1-12) and press [ENTER].

4 Enter a descriptive name or comment in the **Edit Comments** field and press [ENTER].

5 Press [ENTER] at the message [Press ENTER to confirm] to open **Menu 21.1.1 - Filter Rules Summary**.

This screen shows the summary of the existing rules in the filter set.

Figure 185 Menu 21.1.1: Filter Rules Summary



```
                         Menu 21.1.1 - Filter Rules Summary

 # A Type                      Filter Rules                             M m n
 - - ---- --------------------------------------------------------------- -
 1 N
 2 N
 3 N
 4 N
 5 N
 6 N
```

The following table describes the labels in this screen.

Table 112 Abbreviations Used in the Filter Rules Summary Menu

FIELD	DESCRIPTION
#	This is an index number.
A	Active: “Y” means the rule is active. “N” means the rule is inactive.
Type	The type of filter rule: “GEN” for Generic, “IP” for TCP/IP.
Filter Rules	These parameters are displayed here.
M	More. “Y” means there are more rules to check which form a rule chain with the present rule. An action cannot be taken until the rule chain is complete. “N” means there are no more rules to check. You can specify an action to be taken i.e., forward the packet, drop the packet or check the next rule. For the latter, the next rule is independent of the rule just checked.
m	Action Matched. “F” means to forward the packet immediately and skip checking the remaining rules. “D” means to drop the packet. “N“ means to check the next rule.
n	Action Not Matched. “F” means to forward the packet immediately and skip checking the remaining rules. “D” means to drop the packet. “N” means to check the next rule.

The following tables contain a brief description of the abbreviations used in the previous menus. The protocol dependent filter rules abbreviation are listed as follows:

Table 113 Rule Abbreviations Used

ABBREVIATION	DESCRIPTION
IP	
Pr	Protocol
SA	Source Address
SP	Source Port number
DA	Destination Address

Table 113 Rule Abbreviations Used

ABBREVIATION	DESCRIPTION
DP	Destination Port number
GEN	
Off	Offset
Len	Length

Refer to the next section for information on configuring the filter rules.

30.2.1 Configuring a Filter Rule

To configure a filter rule, type its number in **Menu 21.1.1 - Filter Rules Summary** and press [ENTER] to open menu 21.1.1.1 for the rule.

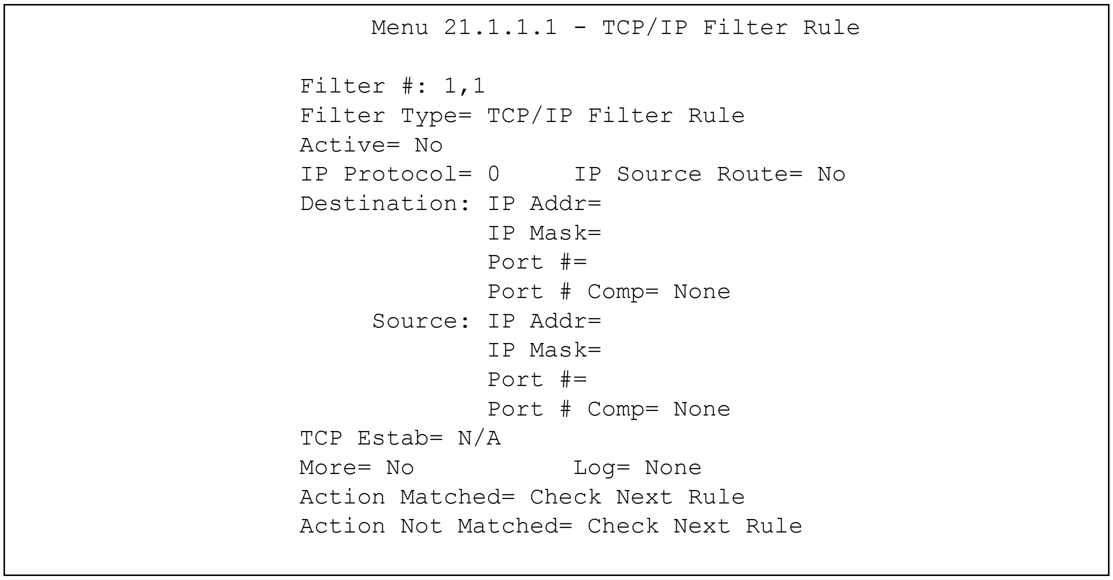
To speed up filtering, all rules in a filter set must be of the same class, i.e., protocol filters or generic filters. The class of a filter set is determined by the first rule that you create. When applying the filter sets to a port, separate menu fields are provided for protocol and device filter sets. If you include a protocol filter set in a device filter field or vice versa, the ZyXEL Device will warn you and will not allow you to save.

30.2.2 Configuring a TCP/IP Filter Rule

This section shows you how to configure a TCP/IP filter rule. TCP/IP rules allow you to base the rule on the fields in the IP and the upper layer protocol, for example, UDP and TCP headers.

To configure TCP/IP rules, select **TCP/IP Filter Rule** from the **Filter Type** field and press [ENTER] to open **Menu 21.1.1.1 - TCP/IP Filter Rule**, as shown next.

Figure 186 Menu 21.1.1.1: TCP/IP Filter Rule



```
                           Menu 21.1.1.1 - TCP/IP Filter Rule

                      Filter #: 1,1
                      Filter Type= TCP/IP Filter Rule
                      Active= No
                      IP Protocol= 0     IP Source Route= No
                      Destination: IP Addr=
                                   IP Mask=
                                   Port #=
                                   Port # Comp= None
                           Source: IP Addr=
                                   IP Mask=
                                   Port #=
                                   Port # Comp= None
                      TCP Estab= N/A
                      More= No           Log= None
                      Action Matched= Check Next Rule
                      Action Not Matched= Check Next Rule
```

The following table describes how to configure your TCP/IP filter rule.

Table 114 Menu 21.1.1.1: TCP/IP Filter Rule

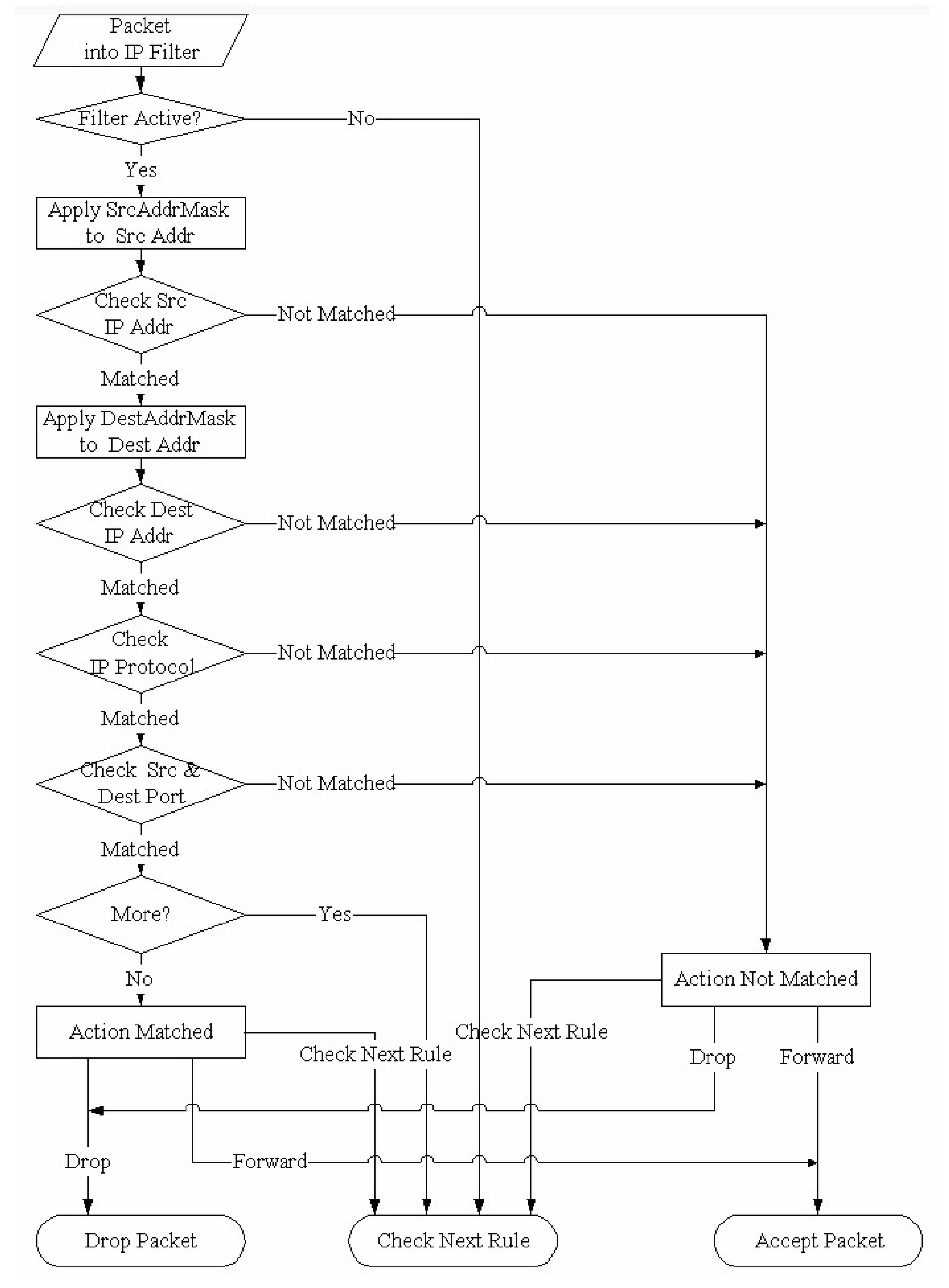
FIELD	DESCRIPTION
Active	Press [SPACE BAR] and then [ENTER] to select **Yes** to activate the filter rule or **No** to deactivate it.
IP Protocol	Protocol refers to the upper layer protocol, e.g., TCP is 6, UDP is 17 and ICMP is 1. Type a value between 0 and 255. A value of 0 matches ANY protocol.
IP Source Route	Press [SPACE BAR] and then [ENTER] to select **Yes** to apply the rule to packets with an IP source route option. Otherwise the packets must not have a source route option. The majority of IP packets do not have source route.
Destination	
IP Addr	Enter the destination IP Address of the packet you wish to filter. This field is ignored if it is 0.0.0.0.
IP Mask	Enter the IP mask to apply to the **Destination: IP Addr**.
Port #	Enter the destination port of the packets that you wish to filter. The range of this field is 0 to 65535. This field is ignored if it is 0.
Port # Comp	Press [SPACE BAR] and then [ENTER] to select the comparison to apply to the destination port in the packet against the value given **in Destination: Port #**. Options are **None**, **Equal**, **Not Equal**, **Less** and **Greater**.
Source	
IP Addr	Enter the source IP Address of the packet you wish to filter. This field is ignored if it is 0.0.0.0.
IP Mask	Enter the IP mask to apply to the **Source: IP Addr**.
Port #	Enter the source port of the packets that you wish to filter. The range of this field is 0 to 65535. This field is ignored if it is 0.

Table 114 Menu 21.1.1.1: TCP/IP Filter Rule

FIELD	DESCRIPTION
Port # Comp	Press [SPACE BAR] and then [ENTER] to select the comparison to apply to the source port in the packet against the value given in **Source: Port #**. Options are **None**, **Equal**, **Not Equal**, **Less** and **Greater**.
TCP Estab	This field is applicable only when the IP Protocol field is 6, TCP. Press [SPACE BAR] and then [ENTER] to select **Yes**, to have the rule match packets that want to establish a TCP connection (SYN=1 and ACK=0); if **No**, it is ignored.
More	Press [SPACE BAR] and then [ENTER] to select **Yes** or **No**. If **Yes**, a matching packet is passed to the next filter rule before an action is taken; if **No**, the packet is disposed of according to the action fields. If **More** is **Yes**, then **Action Matched** and **Action Not Matched** will be **N/A**.
Log	Press [SPACE BAR] and then [ENTER] to select a logging option from the following: **None** – No packets will be logged. **Action Matched** - Only packets that match the rule parameters will be logged. **Action Not Matched** - Only packets that do not match the rule parameters will be logged. **Both** – All packets will be logged.
Action Matched	Press [SPACE BAR] and then [ENTER] to select the action for a matching packet. Options are **Check Next Rule**, **Forward** and **Drop**.
Action Not Matched	Press [SPACE BAR] and then [ENTER] to select the action for a packet not matching the rule. Options are **Check Next Rule**, **Forward** and **Drop**.
When you have **Menu 21.1.1.1 - TCP/IP Filter Rule** configured, press [ENTER] at the message "Press ENTER to Confirm" to save your configuration, or press [ESC] to cancel. This data will now be displayed on **Menu 21.1.1 - Filter Rules Summary**.	

The following figure illustrates the logic flow of an IP filter.

Figure 187 Executing an IP Filter



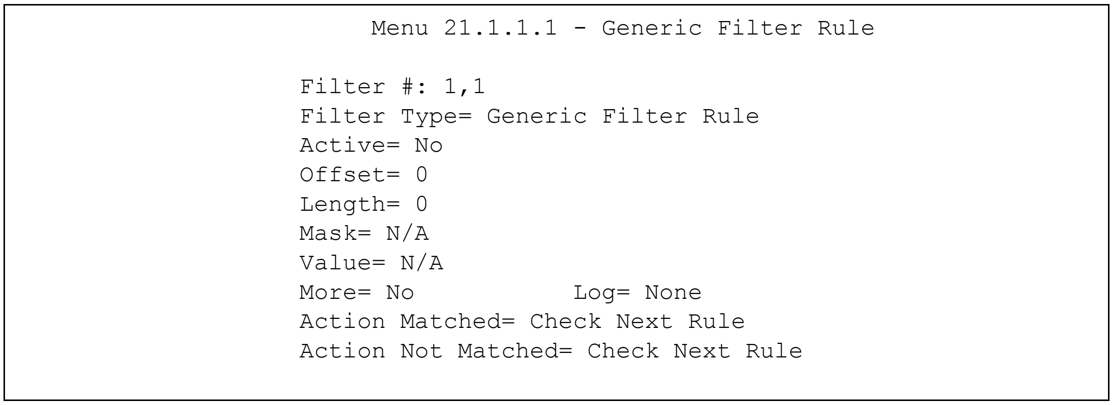
30.2.3 Configuring a Generic Filter Rule

This section shows you how to configure a generic filter rule. The purpose of generic rules is to allow you to filter non-IP packets. For IP, it is generally easier to use the IP rules directly.

For generic rules, the ZyXEL Device treats a packet as a byte stream as opposed to an IP or IPX packet. You specify the portion of the packet to check with the **Offset** (from 0) and the **Length** fields, both in bytes. The ZyXEL Device applies the Mask (bit-wise ANDing) to the data portion before comparing the result against the Value to determine a match. The **Mask** and **Value** are specified in hexadecimal numbers. Note that it takes two hexadecimal digits to represent a byte, so if the length is 4, the value in either field will take 8 digits, for example, `FFFFFFFF`.

To configure a generic rule, select **Generic Filter Rule** in the **Filter Type** field in menu 21.1.1.1 and press [ENTER] to open Generic Filter Rule, as shown below.

Figure 188 Menu 21.1.1.1: Generic Filter Rule



```
                    Menu 21.1.1.1 - Generic Filter Rule

               Filter #: 1,1
               Filter Type= Generic Filter Rule
               Active= No
               Offset= 0
               Length= 0
               Mask= N/A
               Value= N/A
               More= No           Log= None
               Action Matched= Check Next Rule
               Action Not Matched= Check Next Rule
```

The following table describes the fields in the **Generic Filter Rule** menu.

Table 115 Menu 21.1.1.1: Generic Filter Rule

FIELD	DESCRIPTION
Filter #	This is the filter set, filter rule co-ordinates, i.e., 2,3 refers to the second filter set and the third rule of that set.
Filter Type	Use [SPACE BAR] and then [ENTER] to select a rule type. Parameters displayed below each type will be different. TCP/IP filter rules are used to filter IP packets while generic filter rules allow filtering of non-IP packets. Options are **Generic Filter Rule** and **TCP/IP Filter Rule**.
Active	Select **Yes** to turn on the filter rule or **No** to turn it off.
Offset	Enter the starting byte of the data portion in the packet that you wish to compare. The range for this field is from 0 to 255.
Length	Enter the byte count of the data portion in the packet that you wish to compare. The range for this field is 0 to 8.
Mask	Enter the mask (in Hexadecimal notation) to apply to the data portion before comparison.
Value	Enter the value (in Hexadecimal notation) to compare with the data portion.
More	If **Yes**, a matching packet is passed to the next filter rule before an action is taken; else the packet is disposed of according to the action fields. If **More** is **Yes**, then Action Matched and Action Not Matched will be **No**.

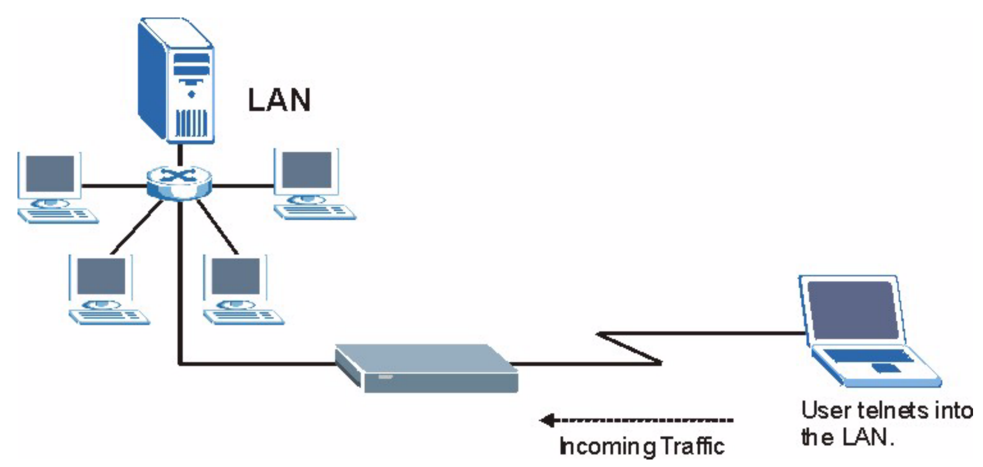
Table 115 Menu 21.1.1.1: Generic Filter Rule (continued)

FIELD	DESCRIPTION
Log	Select the logging option from the following: **None** - No packets will be logged. **Action Matched** - Only packets that match the rule parameters will be logged. **Action Not Matched** - Only packets that do not match the rule parameters will be logged. **Both** – All packets will be logged.
Action Matched	Select the action for a packet matching the rule. Options are **Check Next Rule**, **Forward** and **Drop**.
Action Not Matched	Select the action for a packet not matching the rule. Options are **Check Next Rule**, **Forward** and **Drop**.
Once you have completed filling in **Menu 21.1.1.1 - Generic Filter Rule**, press [ENTER] at the message "Press ENTER to Confirm" to save your configuration, or press [ESC] to cancel. This data will now be displayed on **Menu 21.1.1 - Filter Rules Summary**.	

30.3 Example Filter

Let's look at an example to block outside users from accessing the ZyXEL Device via telnet. Please see our included disk for more example filters.

Figure 189 Telnet Filter Example



1 Enter 21 from the main menu to open **Menu 21 - Filter and Firewall Setup**.

2 Enter 1 to open Menu 21.1 - Filter Set Configuration.

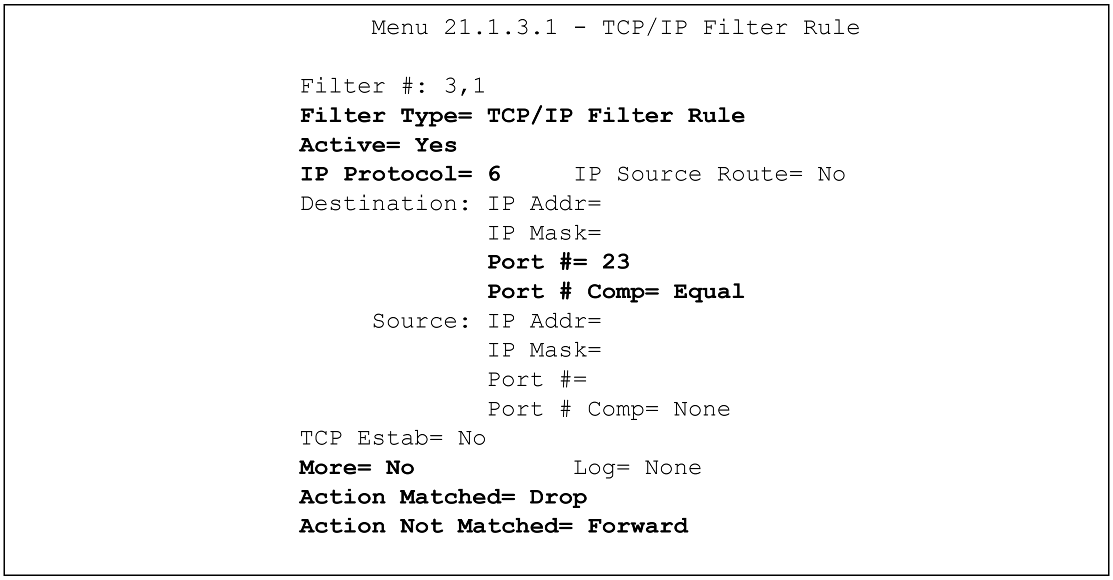
3 Enter the index of the filter set you wish to configure (say 3) and press [ENTER].

4 Enter a descriptive name or comment in the **Edit Comments** field and press [ENTER].

5 Press [ENTER] at the message [Press ENTER to confirm] to open **Menu 21.1.3 - Filter Rules Summary**.

6 Enter 1 to configure the first filter rule (the only filter rule of this set). Make the entries in this menu as shown in the following figure.

Figure 190 Example Filter: Menu 21.1.3.1

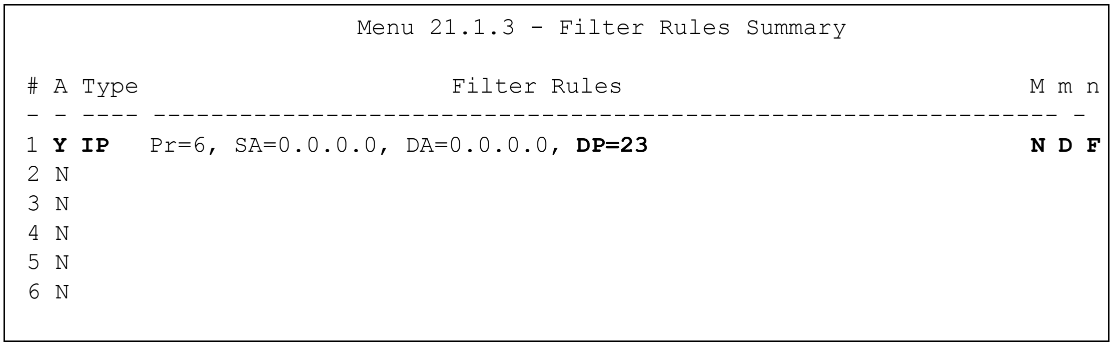


```
     Menu 21.1.3.1 - TCP/IP Filter Rule

Filter #: 3,1
Filter Type= TCP/IP Filter Rule
Active= Yes
IP Protocol= 6     IP Source Route= No
Destination: IP Addr=
             IP Mask=
             Port #= 23
             Port # Comp= Equal
     Source: IP Addr=
             IP Mask=
             Port #=
             Port # Comp= None
TCP Estab= No
More= No           Log= None
Action Matched= Drop
Action Not Matched= Forward
```

The port number for the telnet service (TCP protocol) is **23**. See *RFC 1060* for port numbers of well-known services.

When you press [ENTER] to confirm, you will see the following screen. Note that there is only one filter rule in this set.

Figure 191 Example Filter Rules Summary: Menu 21.1.3



```
                       Menu 21.1.3 - Filter Rules Summary

# A Type                     Filter Rules                             M m n
- - ---- -------------------------------------------------------------- -
1 Y IP   Pr=6, SA=0.0.0.0, DA=0.0.0.0, DP=23                          N D F
2 N
3 N
4 N
5 N
6 N
```

This shows you that you have configured and activated (**A = Y**) a TCP/IP filter rule (**Type = IP**, **Pr = 6**) for destination telnet ports (**DP = 23**).

M = N means an action can be taken immediately. The action is to drop the packet (**m = D**) if the action is matched and to forward the packet immediately (**n = F**) if the action is not matched no matter whether there are more rules to be checked (there aren’t in this example).

After you’ve created the filter set, you must apply it.

1 Enter 11 from the main menu to go to menu 11.

2 Enter 1 or 2 to open **Menu 11.x - Remote Node Profile**.

3 Go to the **Edit Filter Sets** field, press [SPACE BAR] to select **Yes** and press [ENTER].

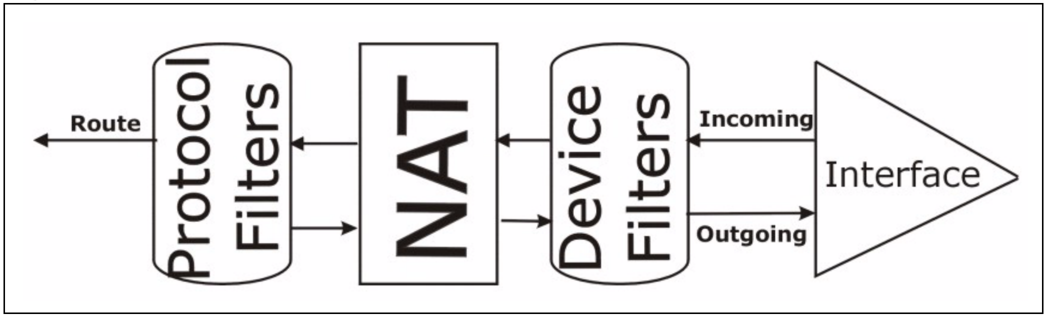
4 This brings you to menu 11.1.4. Apply a filter set (our example filter set 3) as shown in Figure 152 on page 276.

5 Press [ENTER] to confirm after you enter the set numbers and to leave menu 11.1.4.

30.4 Filter Types and NAT

There are two classes of filter rules, **Generic Filter** (Device) rules and protocol filter (**TCP/IP**) rules. Generic filter rules act on the raw data from/to LAN and WAN. Protocol filter rules act on the IP packets. Generic and TCP/IP filter rules are discussed in more detail in the next section. When NAT (Network Address Translation) is enabled, the inside IP address and port number are replaced on a connection-by-connection basis, which makes it impossible to know the exact address and port on the wire. Therefore, the ZyXEL Device applies the protocol filters to the "native" IP address and port number before NAT for outgoing packets and after NAT for incoming packets. On the other hand, the generic, or device filters are applied to the raw packets that appear on the wire. They are applied at the point when the ZyXEL Device is receiving and sending the packets; i.e., the interface. The interface can be an Ethernet port or any other hardware port. The following diagram illustrates this.

Figure 192 Protocol and Device Filter Sets



30.5 Firewall Versus Filters

Firewall configuration is discussed in Chapter 9 on page 131. Further comparisons are also made between filtering, NAT and the firewall.

30.6 Applying a Filter

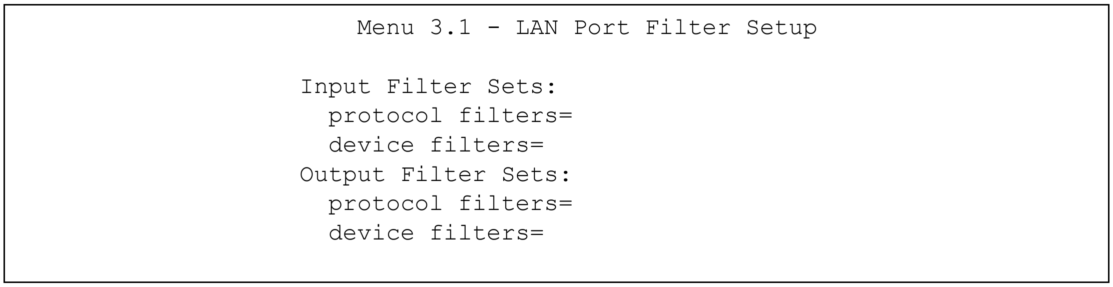
This section shows you where to apply the filter(s) after you design it (them). The ZyXEL Device already has filters to prevent NetBIOS traffic from triggering calls, and block incoming telnet, FTP and HTTP connections.

Note: If you do not activate the firewall, it is advisable to apply filters.

30.6.1 Applying LAN Filters

LAN traffic filter sets may be useful to block certain packets, reduce traffic and prevent security breaches. Go to menu 3.1 (shown next) and enter the number(s) of the filter set(s) that you want to apply as appropriate. You can choose up to four filter sets (from twelve) by entering their numbers separated by commas, e.g., 3, 4, 6, 11. Input filter sets filter incoming traffic to the ZyXEL Device and output filter sets filter outgoing traffic from the ZyXEL Device.

Figure 193 Filtering LAN Traffic

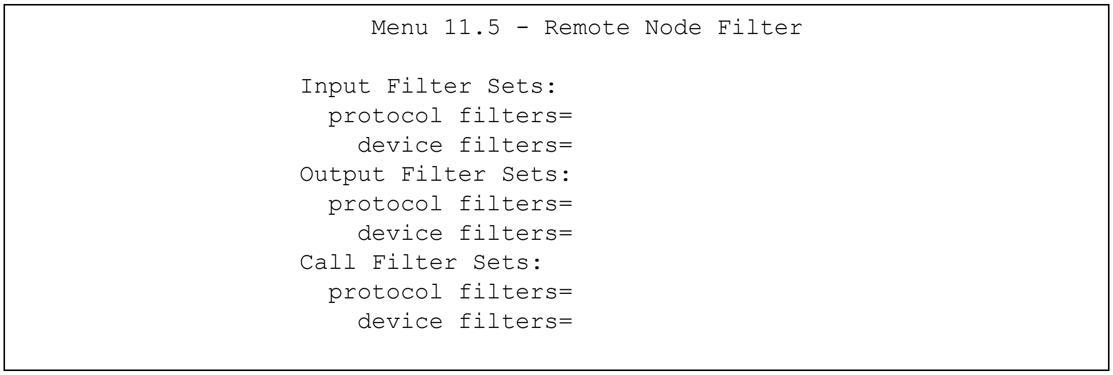


```
                        Menu 3.1 - LAN Port Filter Setup

                    Input Filter Sets:
                      protocol filters=
                      device filters=
                    Output Filter Sets:
                      protocol filters=
                      device filters=
```

30.6.2 Applying Remote Node Filters

Go to menu 11.5 (shown below – note that call filter sets are only present for PPPoA or PPPoE encapsulation) and enter the number(s) of the filter set(s) as appropriate. You can cascade up to four filter sets by entering their numbers separated by commas. The ZyXEL Device already has filters to prevent NetBIOS traffic from triggering calls, and block incoming telnet, FTP and HTTP connections.

Figure 194 Filtering Remote Node Traffic



```
                         Menu 11.5 - Remote Node Filter

                    Input Filter Sets:
                      protocol filters=
                        device filters=
                    Output Filter Sets:
                      protocol filters=
                        device filters=
                    Call Filter Sets:
                      protocol filters=
                        device filters=
```

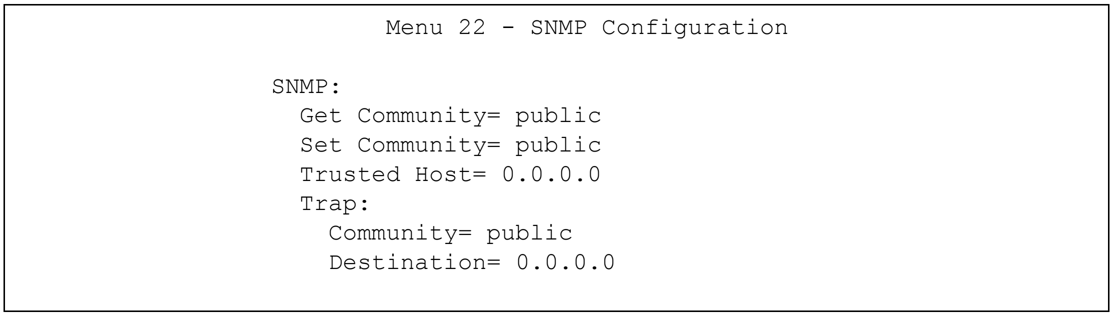
CHAPTER 31
SNMP Configuration

Use this menu to configure SNMP. See Section 15.6 on page 207 for more information about SNMP.

31.1 SNMP Configuration

To configure SNMP, enter 22 from the main menu to display **Menu 22 - SNMP Configuration** as shown next. The "community" for **Get**, **Set** and **Trap** fields is SNMP terminology for password.

Figure 195 Menu 22: SNMP Configuration



```
                    Menu 22 - SNMP Configuration

            SNMP:
              Get Community= public
              Set Community= public
              Trusted Host= 0.0.0.0
              Trap:
                Community= public
                Destination= 0.0.0.0
```

The following table describes the SNMP configuration parameters.

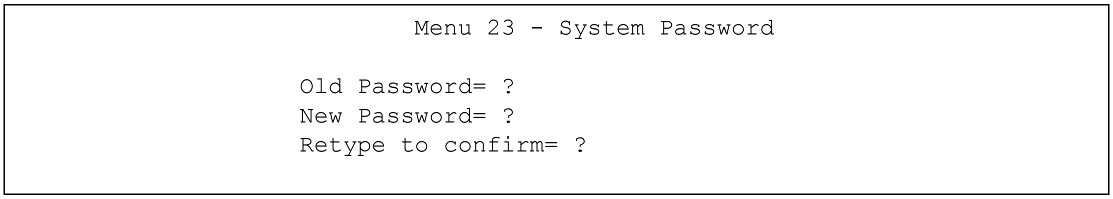
Table 116 Menu 22: SNMP Configuration

FIELD	DESCRIPTION
Get Community	Type the Get community, which is the password for the incoming Get- and GetNext requests from the management station.
Set Community	Type the Set community, which is the password for incoming Set requests from the management station.
Trusted Host	If you enter a trusted host, your ZyXEL Device will only respond to SNMP messages from this address. A blank (default) field means your ZyXEL Device will respond to all SNMP messages it receives, regardless of source.
Trap	
Community	Type the Trap community, which is the password sent with each trap to the SNMP manager.
Destination	Type the IP address of the station to send your SNMP traps to.
When you have completed this menu, press [ENTER] at the prompt "Press [ENTER] to confirm or [ESC] to cancel" to save your configuration or press [ESC] to cancel and go back to the previous screen.	

CHAPTER 32
System Password

Use this menu to change your password. This is the same password used to access the web configurator. To open this menu, enter 23 in the main menu.

Figure 196 Menu 23: System Password



```
                              Menu 23 - System Password

                      Old Password= ?
                      New Password= ?
                      Retype to confirm= ?
```

The following table describes the labels in this menu.

Table 117 Menu 23: System Password

FIELD	DESCRIPTION
Old Password	Enter the current administrator password for the ZyXEL Device.
New Password	Enter the new administrator password for the ZyXEL Device.
Retype to confirm	Enter the new administrator password again.

CHAPTER 33
System Information & Diagnosis

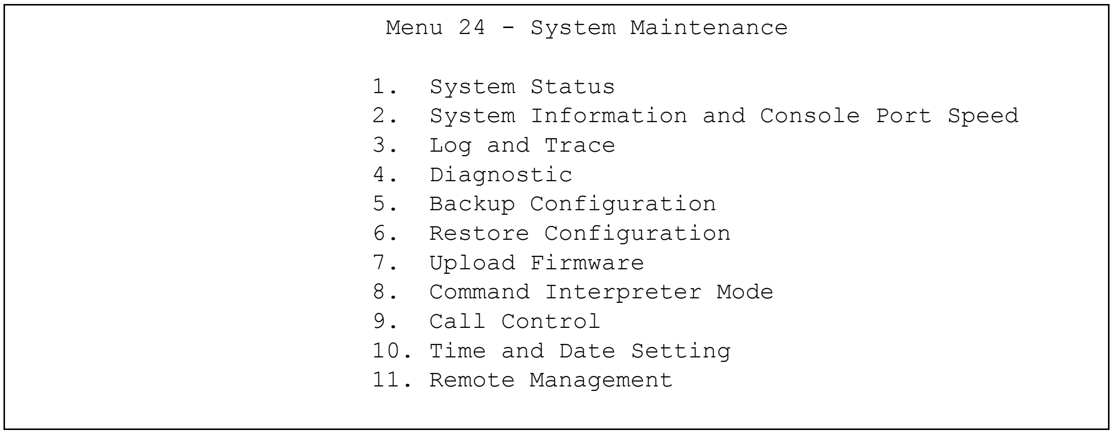
This chapter covers SMT menus 24.1 to 24.4.

33.1 Introduction to System Status

This chapter covers the diagnostic tools that help you to maintain your ZyXEL Device. These tools include updates on system status, port status and log and trace capabilities.

Select menu 24 in the main menu to open **Menu 24 - System Maintenance, as shown below.**

Figure 197 Menu 24: System Maintenance



```
                         Menu 24 - System Maintenance

                        1.  System Status
                        2.  System Information and Console Port Speed
                        3.  Log and Trace
                        4.  Diagnostic
                        5.  Backup Configuration
                        6.  Restore Configuration
                        7.  Upload Firmware
                        8.  Command Interpreter Mode
                        9.  Call Control
                        10. Time and Date Setting
                        11. Remote Management
```

33.2 System Status

The first selection, System Status, gives you information on the version of your system firmware and the status and statistics of the ports, as shown in the next figure. System Status is a tool that can be used to monitor your ZyXEL Device. Specifically, it gives you information on your system firmware version, number of packets sent and number of packets received.

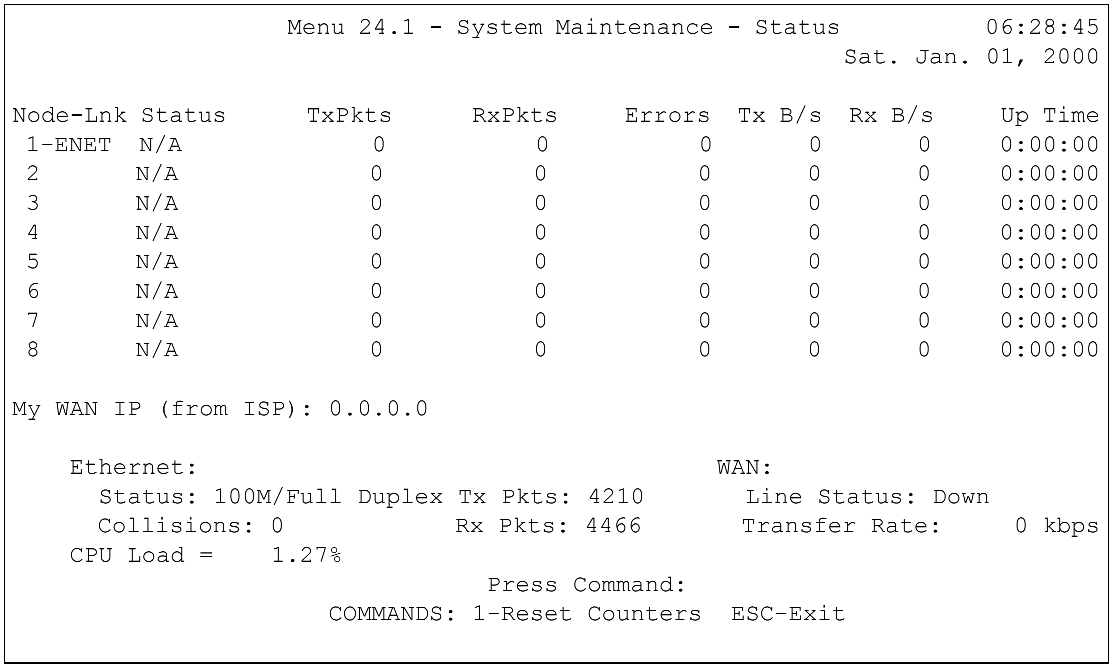
To get to the System Status:

1 Enter number 24 to go to Menu 24 - System Maintenance.

2 In this menu, enter 1 to open System Maintenance - Status.

3 There are three commands in **Menu 24.1 - System Maintenance - Status**. Entering 1 drops the WAN connection, 9 resets the counters and [ESC] takes you back to the previous screen.

Figure 198 Menu 24.1: System Maintenance - Status



```
                    Menu 24.1 - System Maintenance - Status          06:28:45
                                                               Sat. Jan. 01, 2000

Node-Lnk Status      TxPkts      RxPkts     Errors  Tx B/s  Rx B/s     Up Time
 1-ENET  N/A             0           0          0       0       0     0:00:00
 2       N/A             0           0          0       0       0     0:00:00
 3       N/A             0           0          0       0       0     0:00:00
 4       N/A             0           0          0       0       0     0:00:00
 5       N/A             0           0          0       0       0     0:00:00
 6       N/A             0           0          0       0       0     0:00:00
 7       N/A             0           0          0       0       0     0:00:00
 8       N/A             0           0          0       0       0     0:00:00

My WAN IP (from ISP): 0.0.0.0

    Ethernet:                                    WAN:
      Status: 100M/Full Duplex Tx Pkts: 4210       Line Status: Down
      Collisions: 0           Rx Pkts: 4466       Transfer Rate:     0 kbps
    CPU Load =    1.27%
                            Press Command:
                       COMMANDS: 1-Reset Counters  ESC-Exit
```

The following table describes the fields present in **Menu 24.1 - System Maintenance - Status**. These fields are read-only and meant for diagnostic purposes. The upper right corner of the screen shows the time and date.

Table 118 Menu 24.1: System Maintenance - Status

FIELD	DESCRIPTION
Node-Lnk	This field is the remote node index number and link type (encapsulation).
Status	This field displays **Down** (line is down), **Up** (line is up or connected) if you're using Ethernet encapsulation and **Down** (line is down), **Up** (line is up or connected), **Idle** (line (ppp) idle), **Dial** (starting to trigger a call) and **Drop** (dropping a call) if you're using PPPoE encapsulation. It displays **N/A** if the port is not connected.
TxPkts	This is the number of packets transmitted from the ZyXEL Device to the remote node.
RxPkts	This is the number of packets received by the ZyXEL Device from the remote node.
Errors	This is the number of error packets on this connection.
Tx B/s	This field shows the transmission rate in bytes per second on this port.
Rx B/s	This field shows the reception rate in bytes per second on this port.
Up Time	This is the total amount of time the this channel has been connected to the remote node.
My WAN IP (from ISP)	This is the IP address assigned by your ISP or the static IP address you set up in menu 4.
Ethernet:	This section displays information about the LAN ports.
Status	This field displays the speed and duplex settings of the LAN ports.
Collisions	This is the number of collisions on this port.

Table 118 Menu 24.1: System Maintenance - Status (continued)

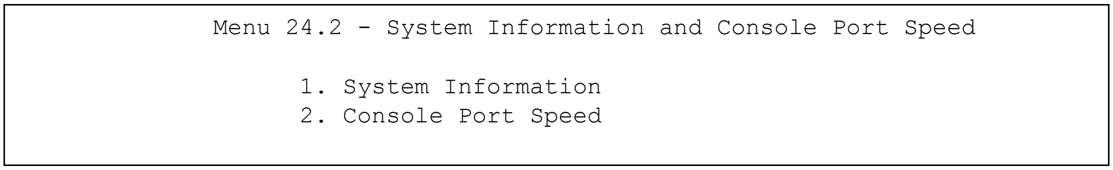
FIELD	DESCRIPTION
TxPkts	This is the number of transmitted packets on this port.
RxPkts	This is the number of received packets on this port.
WAN	This section displays information about the WAN port.
Line Status	This field displays the port speed and duplex setting if you're using Ethernet encapsulation and **Down** (line is down or not connected), **Idle** (line (ppp) idle), **Dial** (starting to trigger a call) or **Drop** (dropping a call) if you're using PPPoE encapsulation.
Transfer Rate	This field shows the transmission speed in kilobits per second on this port.
CPU Load	This field displays the percentage of CPU utilization.
You may enter 1 to reset the counters or [ESC] to return to menu 24.	

33.3 System Information and Console Port Speed

This section describes your system and allows you to choose different console port speeds. To get to the System Information and Console Port Speed:

1. Enter 24 to go to **Menu 24 - System Maintenance**.
2. Enter 2 to open **Menu 24.2 - System Information and Console Port Speed**.
3. From this menu you have two choices as shown in the next figure:

Figure 199 Menu 24.2: System Information and Console Port Speed

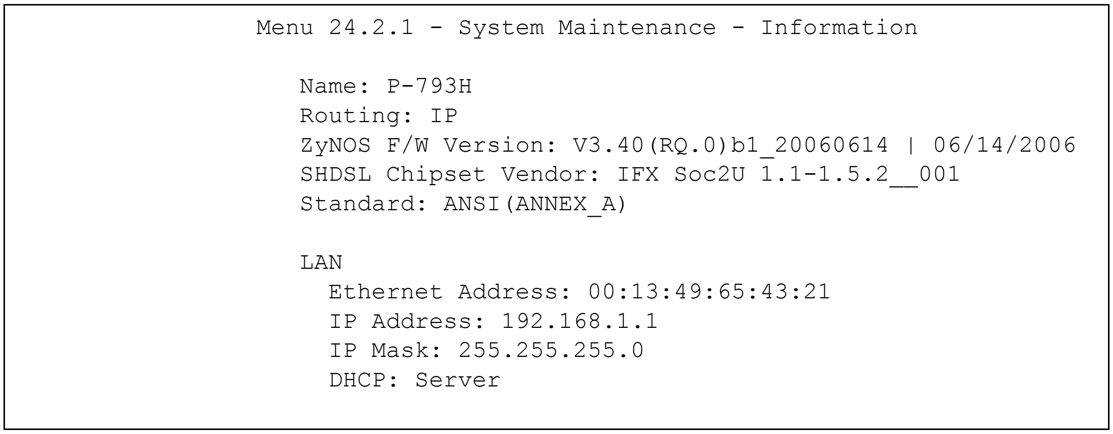


```
                Menu 24.2 - System Information and Console Port Speed

                        1. System Information
                        2. Console Port Speed
```

33.3.1 System Information

System Information gives you information about your system as shown below. More specifically, it gives you information on your routing protocol, Ethernet address, IP address, etc.

Figure 200 Menu 24.2.1: System Maintenance - Information



```
                Menu 24.2.1 - System Maintenance - Information

                   Name: P-793H
                   Routing: IP
                   ZyNOS F/W Version: V3.40(RQ.0)b1_20060614 | 06/14/2006
                   SHDSL Chipset Vendor: IFX Soc2U 1.1-1.5.2__001
                   Standard: ANSI(ANNEX_A)

                   LAN
                     Ethernet Address: 00:13:49:65:43:21
                     IP Address: 192.168.1.1
                     IP Mask: 255.255.255.0
                     DHCP: Server
```

The following table describes the fields in this screen.

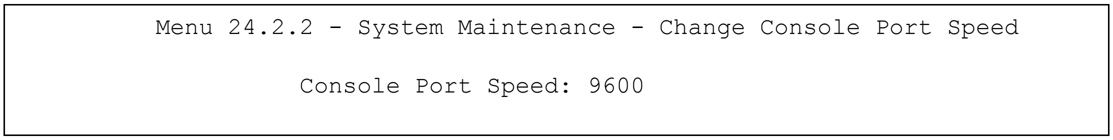
Table 119 Menu 24.2.1: System Maintenance - Information

FIELD	DESCRIPTION
Name	This is the ZyXEL Device's system name + domain name assigned in menu 1. For example, System Name= xxx; Domain Name= baboo.mickey.com Name= xxx.baboo.mickey.com
Routing	Refers to the routing protocol used.
ZyNOS F/W Version	Refers to the version of ZyXEL's Network Operating System software.
SHDSL Chipset Vendor	Refers to the SHDSL chipset inside the ZyXEL Device.
Standard	This refers to the operational protocol the ZyXEL Device and DSLAM (Digital Subscriber Line Access Multiplexer) are using.
LAN	
Ethernet Address	Refers to the Ethernet MAC (Media Access Control) address of your ZyXEL Device.
IP Address	This is the IP address of the ZyXEL Device in dotted decimal notation.
IP Mask	This shows the IP mask of the ZyXEL Device.
DHCP	This field shows the DHCP setting of the ZyXEL Device.
When finished viewing, press [ESC] or [ENTER] to exit.	

33.3.2 Console Port Speed

You can change the speed of the console port through **Menu 24.2.2 – System Maintenance - Change Console Port Speed**. Your ZyXEL Device supports 9600 (default), 19200, 38400, 57600, and 115200 bps for the console port. Press [SPACE BAR] and then [ENTER] to select the desired speed in menu 24.2.2, as shown next.

Figure 201 Menu 24.2.2: System Maintenance: Change Console Port Speed



```
          Menu 24.2.2 - System Maintenance - Change Console Port Speed

                    Console Port Speed: 9600
```

33.4 Log and Trace

There are two logging facilities in the ZyXEL Device. The first is the error logs and trace records that are stored locally. The second is the UNIX syslog facility for message logging.

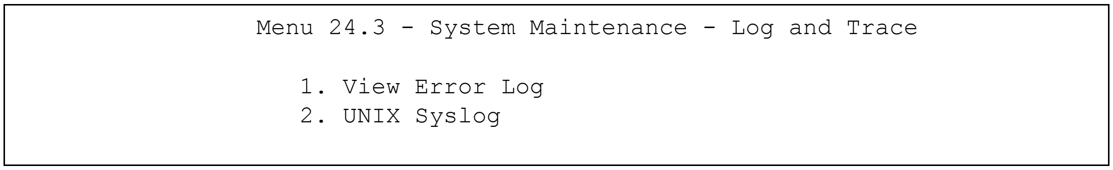
33.4.1 Viewing Error Log

The first place you should look for clues when something goes wrong is the error/trace log. Follow the procedure below to view the local error/trace log:

1. Select option 24 from the main menu to open **Menu 24 - System Maintenance**.
2. From menu 24, select option 3 to open **Menu 24.3 - System Maintenance - Log and Trace**.
3. Select the first option from **Menu 24.3 - System Maintenance - Log and Trace** to display the error log in the system.

After the ZyXEL Device finishes displaying, you will have the option to clear the error log.

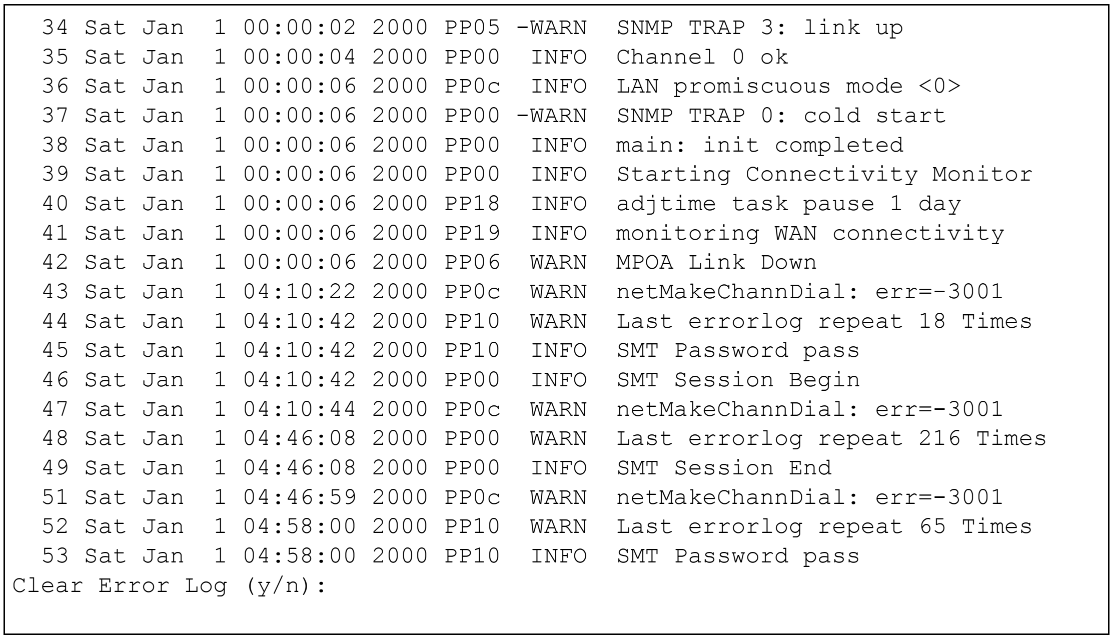
Figure 202 Menu 24.3: System Maintenance - Log and Trace



```
                Menu 24.3 - System Maintenance - Log and Trace

                      1. View Error Log
                      2. UNIX Syslog
```

Examples of typical error and information messages are presented in the following figure.

Figure 203 Examples of Error and Information Messages

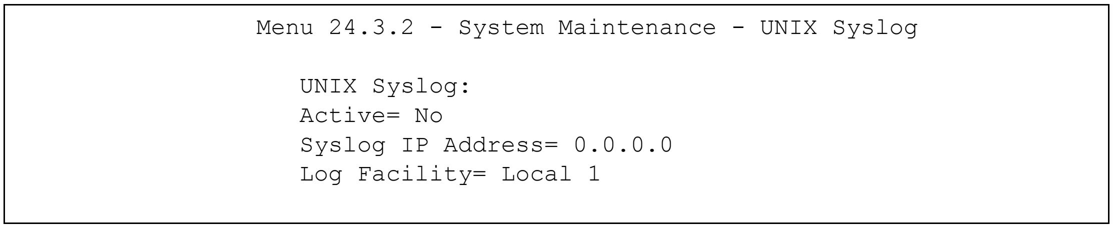


```
  34 Sat Jan  1 00:00:02 2000 PP05 -WARN  SNMP TRAP 3: link up
  35 Sat Jan  1 00:00:04 2000 PP00  INFO  Channel 0 ok
  36 Sat Jan  1 00:00:06 2000 PP0c  INFO  LAN promiscuous mode <0>
  37 Sat Jan  1 00:00:06 2000 PP00 -WARN  SNMP TRAP 0: cold start
  38 Sat Jan  1 00:00:06 2000 PP00  INFO  main: init completed
  39 Sat Jan  1 00:00:06 2000 PP00  INFO  Starting Connectivity Monitor
  40 Sat Jan  1 00:00:06 2000 PP18  INFO  adjtime task pause 1 day
  41 Sat Jan  1 00:00:06 2000 PP19  INFO  monitoring WAN connectivity
  42 Sat Jan  1 00:00:06 2000 PP06  WARN  MPOA Link Down
  43 Sat Jan  1 04:10:22 2000 PP0c  WARN  netMakeChannDial: err=-3001
  44 Sat Jan  1 04:10:42 2000 PP10  WARN  Last errorlog repeat 18 Times
  45 Sat Jan  1 04:10:42 2000 PP10  INFO  SMT Password pass
  46 Sat Jan  1 04:10:42 2000 PP00  INFO  SMT Session Begin
  47 Sat Jan  1 04:10:44 2000 PP0c  WARN  netMakeChannDial: err=-3001
  48 Sat Jan  1 04:46:08 2000 PP00  WARN  Last errorlog repeat 216 Times
  49 Sat Jan  1 04:46:08 2000 PP00  INFO  SMT Session End
  51 Sat Jan  1 04:46:59 2000 PP0c  WARN  netMakeChannDial: err=-3001
  52 Sat Jan  1 04:58:00 2000 PP10  WARN  Last errorlog repeat 65 Times
  53 Sat Jan  1 04:58:00 2000 PP10  INFO  SMT Password pass
Clear Error Log (y/n):
```

33.4.2 Syslog Logging

The ZyXEL Device uses the syslog facility to log the CDR (Call Detail Record) and system messages to a syslog server. Syslog and accounting can be configured in **Menu 24.3.2 - System Maintenance - Syslog Logging**, as shown next.

Figure 204 Menu 24.3.2: System Maintenance - UNIX Syslog



```
                 Menu 24.3.2 - System Maintenance - UNIX Syslog

                    UNIX Syslog:
                    Active= No
                    Syslog IP Address= 0.0.0.0
                    Log Facility= Local 1
```

You need to configure the syslog parameters described in the following table to activate syslog then choose what you want to log.

Table 120 Menu 24.3.2: System Maintenance - UNIX Syslog

FIELD	DESCRIPTION
UNIX Syslog:	
Active	Press [SPACE BAR] and then [ENTER] to turn syslog on or off.
Syslog IP Address	Enter the server name or IP address of the syslog server that will log the selected categories of logs.

Table 120 Menu 24.3.2: System Maintenance - UNIX Syslog (continued)

FIELD	DESCRIPTION
Log Facility	Press [SPACE BAR] and then [ENTER] to select a location. The log facility allows you to log the messages to different files in the syslog server. Refer to the documentation of your syslog program for more details.
When finished configuring this screen, press [ENTER] to confirm or [ESC] to cancel.	

Your ZyXEL Device sends five types of syslog messages. Some examples (not all ZyXEL Device specific) of these syslog messages with their message formats are shown next:

1 CDR

```
CDR Message Format
```

```
   SdcmdSyslogSend( SYSLOG_CDR, SYSLOG_INFO, String );
   String = board xx line xx channel xx, call xx, str
   board = the hardware board ID
   line = the WAN ID in a board
   Channel = channel ID within the WAN
   call = the call reference number which starts from 1 and increments by 1 for
each new call
   str = C01 Outgoing Call dev xx ch xx (dev:device No. ch:channel No.)
         L02 Tunnel Connected(L2TP)
         C02 OutCall Connected xxxx (means connected speed) xxxxx (means Remote
Call Number)
         L02 Call Terminated
         C02 Call Terminated
Jul 19 11:19:27 192.168.102.2 ZyXEL: board 0 line 0 channel 0, call 1, C01
Outgoing Call dev=2 ch=0 40002
Jul 19 11:19:32 192.168.102.2 ZyXEL: board 0 line 0 channel 0, call 1, C02 OutCall
Connected 64000 40002
Jul 19 11:20:06 192.168.102.2 ZyXEL: board 0 line 0 channel 0, call 1, C02 Call
Terminated
```

2 Packet triggered

```
Packet triggered Message Format
```

```
SdcmdSyslogSend( SYSLOG_PKTTRI, SYSLOG_NOTICE, String );
       String = Packet trigger: Protocol=xx Data=xxxxxxxxxx…..x
       Protocol: (1:IP 2:IPX 3:IPXHC 4:BPDU 5:ATALK 6:IPNG)
       Data: We will send forty-eight Hex characters to the server
Jul 19 11:28:39 192.168.102.2 ZyXEL: Packet Trigger: Protocol=1,
Data=4500003c100100001f010004c0a86614ca849a7b08004a5c020001006162636465666768696a
6b6c6d6e6f7071727374
Jul 19 11:28:56 192.168.102.2 ZyXEL: Packet Trigger: Protocol=1,
Data=4500002c1b0140001f06b50ec0a86614ca849a7b0427001700195b3e00000000600220008cd4
0000020405b4
Jul 19 11:29:06 192.168.102.2 ZyXEL: Packet Trigger: Protocol=1,
Data=45000028240140001f06ac12c0a86614ca849a7b0427001700195b451d1430135004000077600
000
```

3 Filter log

```
Filter log Message Format

SdcmdSyslogSend(SYSLOG_FILLOG, SYSLOG_NOTICE, String );
String = IP[Src=xx.xx.xx.xx Dst=xx.xx.xx.xx prot spo=xxxx dpo=xxxx] S04>R01mD
IP[…] is the packet header and S04>R01mD means filter set 4 (S) and rule 1 (R),
match (m) drop (D).
     Src: Source Address
     Dst: Destination Address
     prot: Protocol ("TCP","UDP","ICMP")
spo: Source port
dpo: Destination portMar 03 10:39:43 202.132.155.97 ZyXEL:
GEN[ffffffffffnordff0080] }S05>R01mF
Mar 03 10:41:29 202.132.155.97 ZyXEL:
GEN[00a0c5f502fnord010080] }S05>R01mF
Mar 03 10:41:34 202.132.155.97 ZyXEL:
IP[Src=192.168.2.33 Dst=202.132.155.93 ICMP]}S04>R01mF
Mar 03 11:59:20 202.132.155.97 ZyXEL:
GEN[00a0c5f502fnord010080] }S05>R01mF
Mar 03 12:00:52 202.132.155.97 ZyXEL:
GEN[ffffffffffff0080] }S05>R01mF
Mar 03 12:00:57 202.132.155.97 ZyXEL:
GEN[00a0c5f502010080] }S05>R01mF
Mar 03 12:01:06 202.132.155.97 ZyXEL:
IP[Src=192.168.2.33 Dst=202.132.155.93 TCP spo=01170  dpo=00021]}S04>R01mF
```

4 PPP log

```
PPP Log Message Format

SdcmdSyslogSend( SYSLOG_PPPLOG, SYSLOG_NOTICE, String );
String = ppp:Proto Starting / ppp:Proto Opening / ppp:Proto Closing / ppp:Proto
Shutdown
Proto = LCP / ATCP / BACP / BCP / CBCP / CCP / CHAP/ PAP / IPCP /
IPXCP
Jul 19 11:42:44 192.168.102.2 ZyXEL: ppp:LCP Closing
Jul 19 11:42:49 192.168.102.2 ZyXEL: ppp:IPCP Closing
Jul 19 11:42:54 192.168.102.2 ZyXEL: ppp:CCP Closing
```

5 Firewall log

```
Firewall Log Message Format

SdcmdSyslogSend(SYSLOG_FIREWALL, SYSLOG_NOTICE, buf);
buf = IP[Src=xx.xx.xx.xx : spo=xxxx Dst=xx.xx.xx.xx : dpo=xxxx | prot | rule |
action]
Src: Source Address
spo: Source port (empty means no source port information)
Dst: Destination Address
dpo: Destination port (empty means no destination port information)
prot: Protocol ("TCP","UDP","ICMP", "IGMP", "GRE", "ESP")
rule: <a,b> where a means "set" number; b means "rule" number.
Action: nothing(N) block (B) forward (F)
08-01-200011:48:41Local1.Notice192.168.10.10RAS: FW 172.21.1.80     :137  -
>172.21.1.80     :137  |UDP|default permit:<2,0>|B
08-01-200011:48:41Local1.Notice192.168.10.10RAS: FW 192.168.77.88   :520  -
>192.168.77.88   :520  |UDP|default permit:<2,0>|B
08-01-200011:48:39Local1.Notice192.168.10.10RAS: FW 172.21.1.50   ->172.21.1.50
|IGMP<2>|default permit:<2,0>|B
08-01-200011:48:39Local1.Notice192.168.10.10RAS: FW 172.21.1.25   ->172.21.1.25
|IGMP<2>|default permit:<2,0>|B
```

33.5 Diagnostic

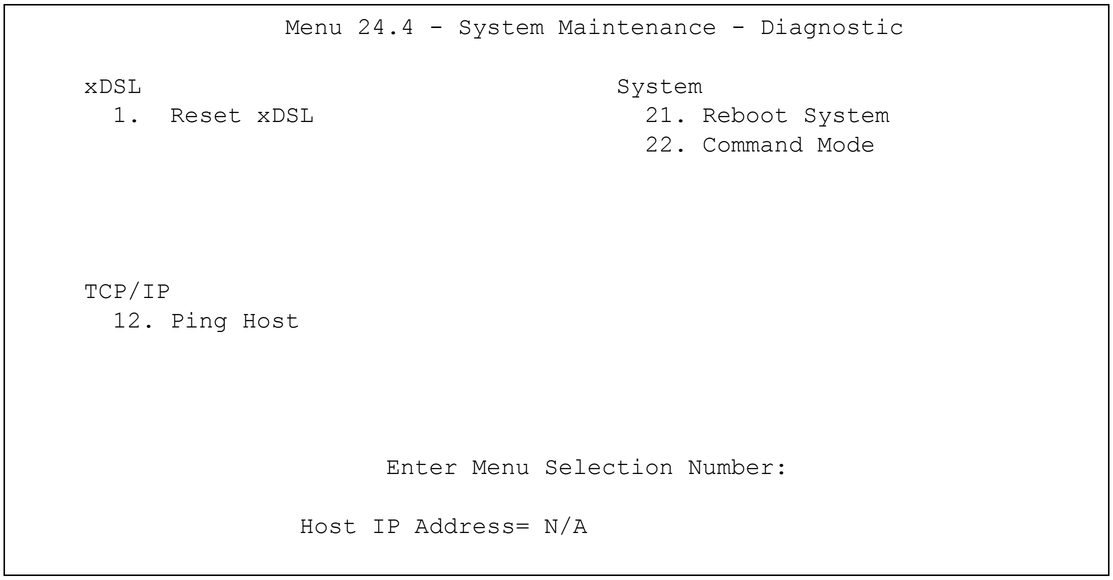
The diagnostic facility allows you to test the different aspects of your ZyXEL Device to determine if it is working properly. Menu 24.4 allows you to choose among various types of diagnostic tests to evaluate your system, as shown next. Not all fields are available on all models.

Follow the procedure below to get to **Menu 24.4 - System Maintenance - Diagnostic**.

1 From the main menu, select option 24 to open **Menu 24 - System Maintenance**.

2 From this menu, select option 4. Diagnostic. This will open **Menu 24.4 - System Maintenance - Diagnostic**.

Figure 205 Menu 24.4: System Maintenance - Diagnostic



```
                   Menu 24.4 - System Maintenance - Diagnostic

     xDSL                                  System
       1.  Reset xDSL                        21. Reboot System
                                             22. Command Mode





     TCP/IP
       12. Ping Host





                          Enter Menu Selection Number:

                    Host IP Address= N/A
```

The following table describes the labels in this screen.

Table 121 Menu 24.4: System Maintenance - Diagnostic

FIELD	DESCRIPTION
Reset xDSL	Enter 1 to reset the DSL connection on the WAN port.
Ping Host	Enter 12 to ping any machine (with an IP address) on your LAN or WAN. Enter its IP address in the **Host IP Address** field below.
Reboot System	Enter 11 to reboot the ZyXEL Device.
Command Mode	Enter 22 to go to the Command Interpreter (CI) for further diagnosis. You can also enter the CI using menu 24.8.
Host IP Address	If you entered 1in the **Enter Menu Selection Number** field, then enter the IP address of the computer you want to ping in this field.
Enter the number of the selection you would like to perform or press [ESC] to cancel.	

CHAPTER 34
Firmware and Configuration File Maintenance

This chapter tells you how to back up and restore your configuration file as well as upload new firmware and a new configuration file.

34.1 Introduction

Use the instructions in this chapter to change the ZyXEL Device’s configuration file or upgrade its firmware. After you configure your ZyXEL Device, you can backup the configuration file to a computer. That way if you later misconfigure the ZyXEL Device, you can upload the backed up configuration file to return to your previous settings. You can alternately upload the factory default configuration file if you want to return the ZyXEL Device to the original default settings. The firmware determines the ZyXEL Device’s available features and functionality. You can download new firmware releases from your nearest ZyXEL FTP site to use to upgrade your ZyXEL Device’s performance.

34.2 Filename Conventions

The configuration file (often called the romfile or rom-0) contains the factory default settings in the menus such as password, DHCP Setup, TCP/IP Setup, etc. It arrives from ZyXEL with a “rom” filename extension. Once you have customized the ZyXEL Device's settings, they can be saved back to your computer under a filename of your choosing.

ZyNOS (ZyXEL Network Operating System sometimes referred to as the “ras” file) is the system firmware and has a “bin” filename extension. With many FTP and TFTP clients, the filenames are similar to those seen next.

```
ftp> put firmware.bin ras
```

This is a sample FTP session showing the transfer of the computer file " firmware.bin" to the ZyXEL Device.

```
ftp> get rom-0 config.cfg
```

This is a sample FTP session saving the current configuration to the computer file “config.cfg”.

If your (T)FTP client does not allow you to have a destination filename different than the source, you will need to rename them as the ZyXEL Device only recognizes “rom-0” and “ras”. Be sure you keep unaltered copies of both files for later use.

The following table is a summary. Please note that the internal filename refers to the filename on the ZyXEL Device and the external filename refers to the filename not on the ZyXEL Device, that is, on your computer, local network or FTP site and so the name (but not the extension) may vary. After uploading new firmware, see the **ZyNOS F/W Version** field in **Menu 24.2.1 - System Maintenance - Information** to confirm that you have uploaded the correct firmware version. The AT command is the command you enter after you press “y” when prompted in the SMT menu to go into debug mode.

Table 122 Filename Conventions

FILE TYPE	INTERNAL NAME	EXTERNAL NAME	DESCRIPTION
Configuration File	Rom-0	This is the configuration filename on the ZyXEL Device. Uploading the rom-0 file replaces the entire ROM file system, including your ZyXEL Device configurations, system-related data (including the default password), the error log and the trace log.	*.rom
Firmware	Ras	This is the generic name for the ZyNOS firmware on the ZyXEL Device.	*.bin

34.3 Backup Configuration

Note: The ZyXEL Device displays different messages explaining different ways to backup, restore and upload files in menus 24.5, 24.6, 24. 7.1 and 24.7.2 depending on whether you use the console port or Telnet.

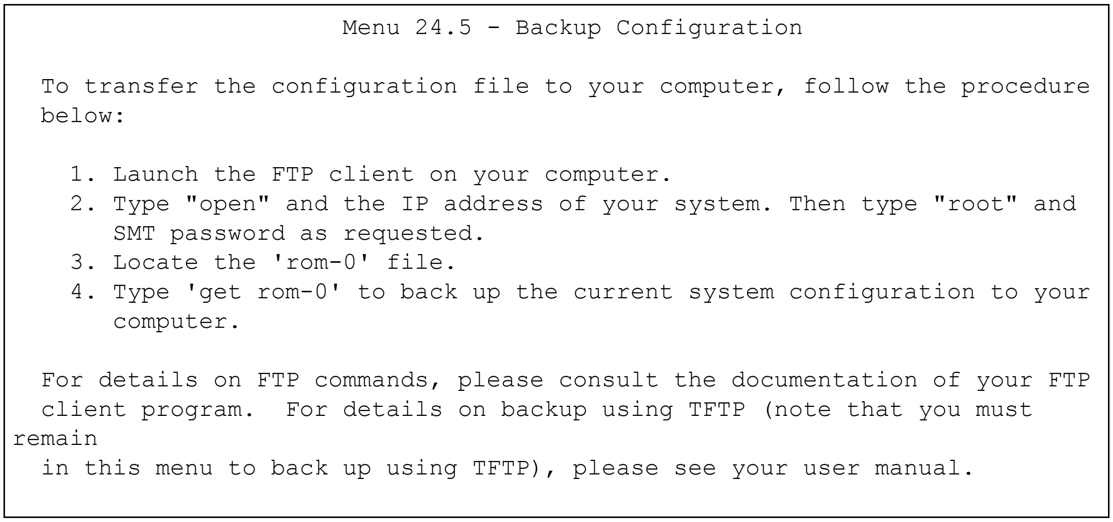
Option 5 from **Menu 24 - System Maintenance** allows you to backup the current ZyXEL Device configuration to your computer. Backup is highly recommended once your ZyXEL Device is functioning properly. FTP is the preferred method for backing up your current configuration to your computer since it is faster. You can also perform backup and restore using menu 24 through the console port. Any serial communications program should work fine; however, you must use Xmodem protocol to perform the download/upload and you don’t have to rename the files.

Please note that terms “download” and “upload” are relative to the computer. Download means to transfer from the ZyXEL Device to the computer, while upload means from your computer to the ZyXEL Device.

34.3.1 Backup Configuration

Follow the instructions as shown in the next screen.

Figure 206 Menu 24.5: Backup Configuration



```
                       Menu 24.5 - Backup Configuration

  To transfer the configuration file to your computer, follow the procedure
  below:

    1. Launch the FTP client on your computer.
    2. Type "open" and the IP address of your system. Then type "root" and
       SMT password as requested.
    3. Locate the 'rom-0' file.
    4. Type 'get rom-0' to back up the current system configuration to your
       computer.

  For details on FTP commands, please consult the documentation of your FTP
  client program.  For details on backup using TFTP (note that you must
remain
  in this menu to back up using TFTP), please see your user manual.
```

34.3.2 Using the FTP Command from the Command Line

1 Launch the FTP client on your computer.

2 Enter "open", followed by a space and the IP address of your ZyXEL Device.

3 Press [ENTER] when prompted for a username.

4 Enter your password as requested (the default is "1234").

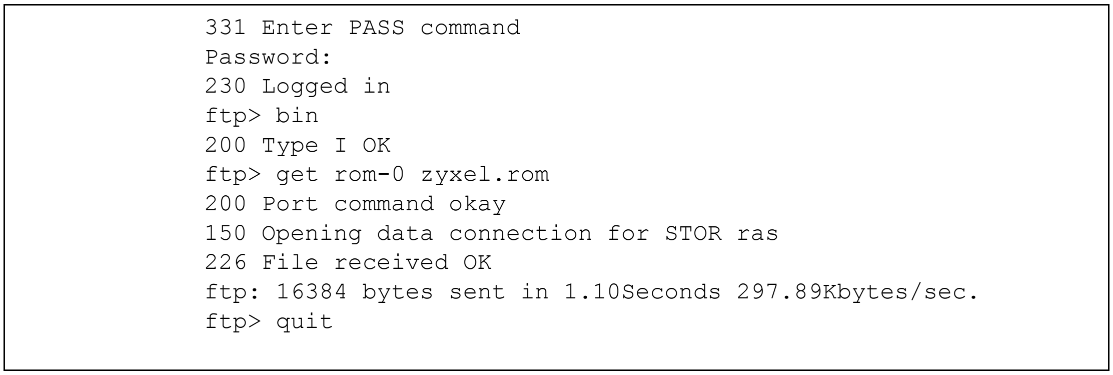
5 Enter "bin" to set transfer mode to binary.

6 Use "get" to transfer files from the ZyXEL Device to the computer, for example, "get rom-0 config.rom" transfers the configuration file on the ZyXEL Device to your computer and renames it "config.rom". See earlier in this chapter for more information on filename conventions.

7 Enter "quit" to exit the ftp prompt.

34.3.3 Example of FTP Commands from the Command Line

Figure 207 FTP Session Example



```
              331 Enter PASS command
              Password:
              230 Logged in
              ftp> bin
              200 Type I OK
              ftp> get rom-0 zyxel.rom
              200 Port command okay
              150 Opening data connection for STOR ras
              226 File received OK
              ftp: 16384 bytes sent in 1.10Seconds 297.89Kbytes/sec.
              ftp> quit
```

34.3.4 GUI-based FTP Clients

The following table describes some of the commands that you may see in GUI-based FTP clients.

Table 123 General Commands for GUI-based FTP Clients

COMMAND	DESCRIPTION
Host Address	Enter the address of the host server.
Login Type	Anonymous. This is when a user I.D. and password is automatically supplied to the server for anonymous access. Anonymous logins will work only if your ISP or service administrator has enabled this option. Normal. The server requires a unique User ID and Password to login.
Transfer Type	Transfer files in either ASCII (plain text format) or in binary mode. Configuration and firmware files should be transferred in binary mode
Initial Remote Directory	Specify the default remote directory (path).
Initial Local Directory	Specify the default local directory (path).

34.3.5 File Maintenance Over WAN

TFTP, FTP and Telnet over the WAN will not work when:

1 The firewall is active (turn the firewall off in menu 21.2 or create a firewall rule to allow access from the WAN).

2 You have disabled Telnet service in menu 24.11.

3 You have applied a filter in menu 3.1 (LAN) or in menu 11.5 (WAN) to block Telnet service.

4 The IP you entered in the **Secured Client IP** field in menu 24.11 does not match the client IP. If it does not match, the ZyXEL Device will disconnect the Telnet session immediately.

5 You have an SMT console session running.

34.3.6 Backup Configuration Using TFTP

The ZyXEL Device supports the up/downloading of the firmware and the configuration file using TFTP (Trivial File Transfer Protocol) over LAN. Although TFTP should work over WAN as well, it is not recommended.

To use TFTP, your computer must have both telnet and TFTP clients. To backup the configuration file, follow the procedure shown next.

1 Use telnet from your computer to connect to the ZyXEL Device and log in. Because TFTP does not have any security checks, the ZyXEL Device records the IP address of the telnet client and accepts TFTP requests only from this address.

2 Put the SMT in command interpreter (CI) mode by entering 8 in **Menu 24 – System Maintenance**.

3 Enter command "sys stdio 0" to disable the SMT timeout, so the TFTP transfer will not be interrupted. Enter command "sys stdio 5" to restore the five-minute SMT timeout (default) when the file transfer is complete.

4 Launch the TFTP client on your computer and connect to the ZyXEL Device. Set the transfer mode to binary before starting data transfer.

5 Use the TFTP client (see the example below) to transfer files between the ZyXEL Device and the computer. The file name for the configuration file is "rom-0" (rom-zero, not capital o).

Note that the telnet connection must be active and the SMT in CI mode before and during the TFTP transfer. For details on TFTP commands (see following example), please consult the documentation of your TFTP client program. For UNIX, use "get" to transfer from the ZyXEL Device to the computer and "binary" to set binary transfer mode.

34.3.7 TFTP Command Example

The following is an example TFTP command:

```
tftp [-i] host get rom-0 config.rom
```

Where "i" specifies binary image transfer mode (use this mode when transferring binary files), "host" is the ZyXEL Device IP address, "get" transfers the file source on the ZyXEL Device (rom-0, name of the configuration file on the ZyXEL Device) to the file destination on the computer and renames it config.rom.

34.3.8 GUI-based TFTP Clients

The following table describes some of the fields that you may see in GUI-based TFTP clients.

Table 124 General Commands for GUI-based TFTP Clients

COMMAND	DESCRIPTION
Host	Enter the IP address of the ZyXEL Device. 192.168.1.1 is the ZyXEL Device's default IP address when shipped.
Send/Fetch	Use "Send" to upload the file to the ZyXEL Device and "Fetch" to back up the file on your computer.
Local File	Enter the path and name of the firmware file (*.bin extension) or configuration file (*.rom extension) on your computer.
Remote File	This is the filename on the ZyXEL Device. The filename for the firmware is "ras" and for the configuration file, is "rom-0".
Binary	Transfer the file in binary mode.
Abort	Stop transfer of the file.

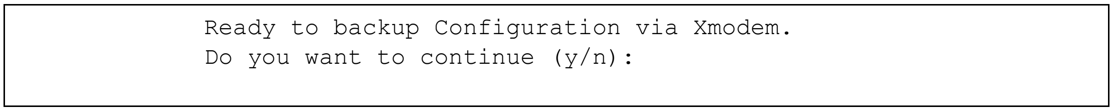
Refer to Section 34.3.5 on page 330 to read about configurations that disallow TFTP and FTP over WAN.

34.3.9 Backup Via Console Port

Back up configuration via console port by following the HyperTerminal procedure shown next. Procedures using other serial communications programs should be similar.

1 Display menu 24.5 and enter "y" at the following screen.

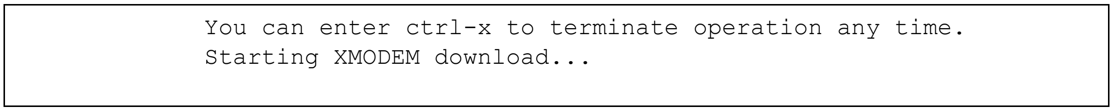
Figure 208 System Maintenance: Backup Configuration



```
Ready to backup Configuration via Xmodem.
Do you want to continue (y/n):
```

2 The following screen indicates that the Xmodem download has started.

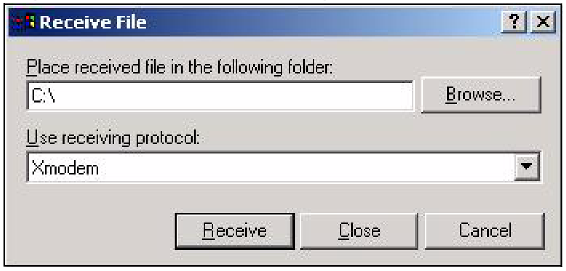
Figure 209 System Maintenance: Starting Xmodem Download Screen



```
You can enter ctrl-x to terminate operation any time.
Starting XMODEM download...
```

3 Run the HyperTerminal program by clicking **Transfer**, then **Receive File** as shown in the following screen.

Figure 210 Backup Configuration Example



Receive File

Place received file in the following folder: C:\

Use receiving protocol: Xmodem

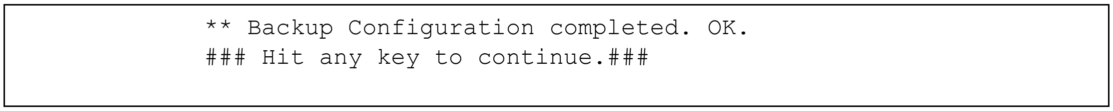
Type a location for storing the configuration file or click **Browse** to look for one.

Choose the **Xmodem** protocol.

Then click **Receive**.

4 After a successful backup you will see the following screen. Press any key to return to the SMT menu.

Figure 211 Successful Backup Confirmation Screen



```
              ** Backup Configuration completed. OK.
              ### Hit any key to continue.###
```

34.4 Restore Configuration

This section shows you how to restore a previously saved configuration. Note that this function erases the current configuration before restoring a previous back up configuration; please do not attempt to restore unless you have a backup configuration file stored on disk.

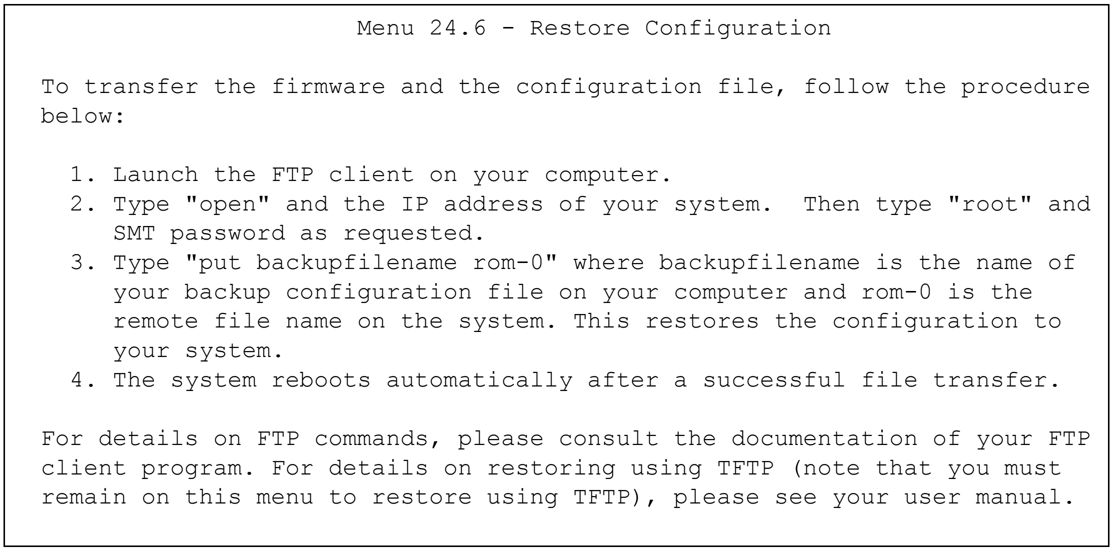
FTP is the preferred method for restoring your current computer configuration to your ZyXEL Device since FTP is faster. Please note that you must wait for the system to automatically restart after the file transfer is complete.

Note: WARNING!
Do not interrupt the file transfer process as this may PERMANENTLY DAMAGE YOUR ZyXEL Device. When the Restore Configuration process is complete, the ZyXEL Device will automatically restart.

34.4.1 Restore Using FTP

For details about backup using (T)FTP please refer to earlier sections on FTP and TFTP file upload in this chapter.

Figure 212 Menu 24.6: Restore Configuration



```
                      Menu 24.6 - Restore Configuration

To transfer the firmware and the configuration file, follow the procedure
below:

  1. Launch the FTP client on your computer.
  2. Type "open" and the IP address of your system.  Then type "root" and
     SMT password as requested.
  3. Type "put backupfilename rom-0" where backupfilename is the name of
     your backup configuration file on your computer and rom-0 is the
     remote file name on the system. This restores the configuration to
     your system.
  4. The system reboots automatically after a successful file transfer.

For details on FTP commands, please consult the documentation of your FTP
client program. For details on restoring using TFTP (note that you must
remain on this menu to restore using TFTP), please see your user manual.
```

1 Launch the FTP client on your computer.

2 Enter “open”, followed by a space and the IP address of your ZyXEL Device.

3 Press [ENTER] when prompted for a username.

4 Enter your password as requested (the default is “1234”).

5 Enter “bin” to set transfer mode to binary.

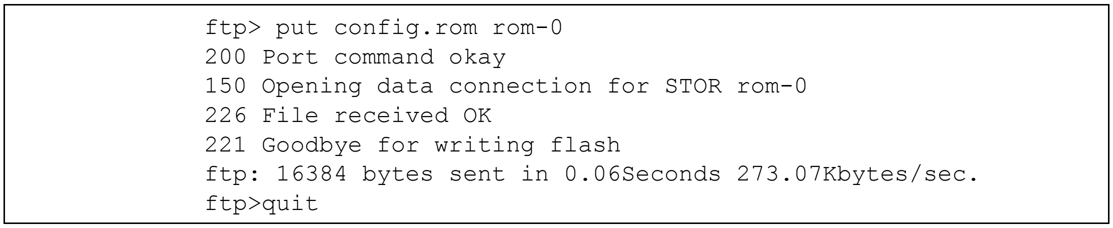
6 Find the “rom” file (on your computer) that you want to restore to your ZyXEL Device.

7 Use “put” to transfer files from the ZyXEL Device to the computer, for example, “put config.rom rom-0” transfers the configuration file “config.rom” on your computer to the ZyXEL Device. See earlier in this chapter for more information on filename conventions.

8 Enter “quit” to exit the ftp prompt. The ZyXEL Device will automatically restart after a successful restore process.

34.4.2 Restore Using FTP Session Example

Figure 213 Restore Using FTP Session Example



```
ftp> put config.rom rom-0
200 Port command okay
150 Opening data connection for STOR rom-0
226 File received OK
221 Goodbye for writing flash
ftp: 16384 bytes sent in 0.06Seconds 273.07Kbytes/sec.
ftp>quit
```

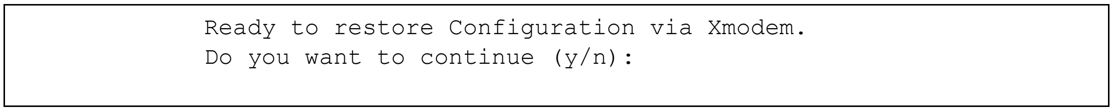
Refer to Section 34.3.5 on page 330 to read about configurations that disallow TFTP and FTP over WAN.

34.4.3 Restore Via Console Port

Restore configuration via console port by following the HyperTerminal procedure shown next. Procedures using other serial communications programs should be similar.

1 Display menu 24.6 and enter “y” at the following screen.

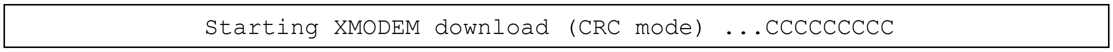
Figure 214 System Maintenance: Restore Configuration



```
Ready to restore Configuration via Xmodem.
Do you want to continue (y/n):
```

2 The following screen indicates that the Xmodem download has started.

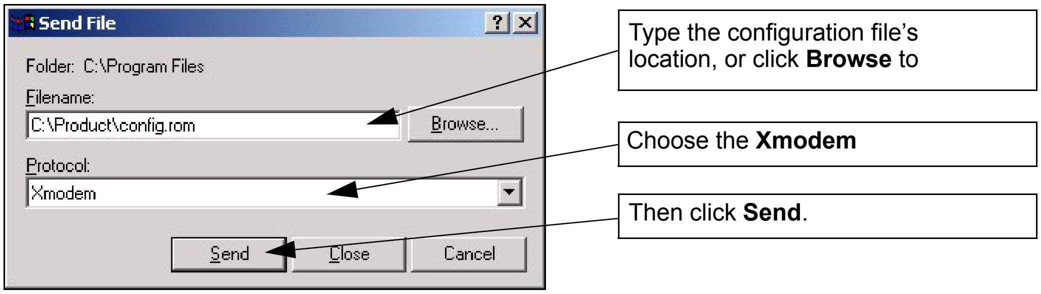
Figure 215 System Maintenance: Starting Xmodem Download Screen



```
Starting XMODEM download (CRC mode) ...CCCCCCCCC
```

3 Run the HyperTerminal program by clicking **Transfer**, then **Send File** as shown in the following screen.

Figure 216 Restore Configuration Example



Type the configuration file's location, or click **Browse** to

Choose the **Xmodem**

Then click **Send**.

4 After a successful restoration you will see the following screen. Press any key to restart the ZyXEL Device and return to the SMT menu.

Figure 217 Successful Restoration Confirmation Screen

```
              Save to ROM
              Hit any key to start system reboot.
```

34.5 Uploading Firmware and Configuration Files

This section shows you how to upload firmware and configuration files. You can upload configuration files by following the procedure in Section 34.4 on page 333 or by following the instructions in **Menu 24.7.2 - System Maintenance - Upload System Configuration File** (for console port).

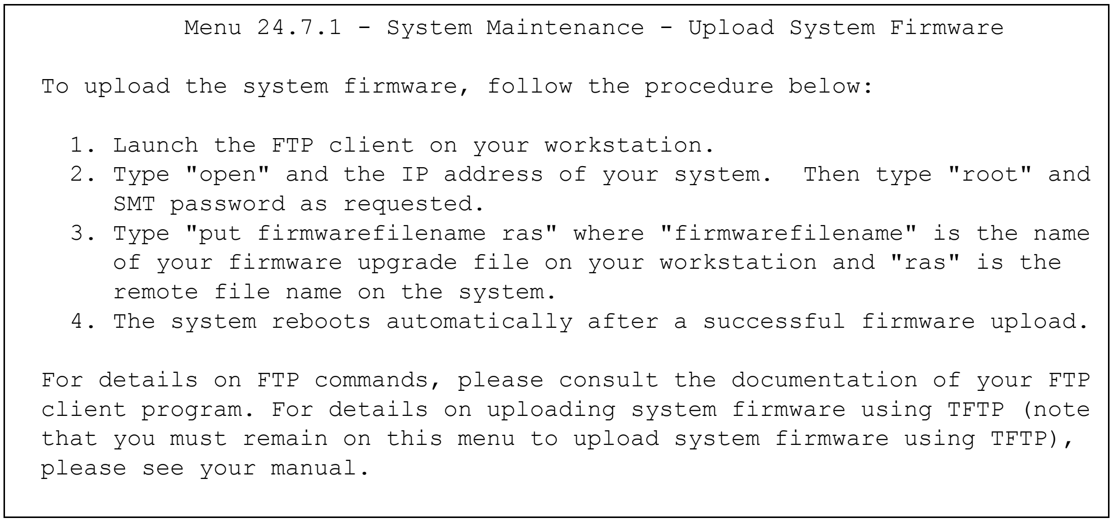
Note: WARNING!
Do not interrupt the file transfer process as this may PERMANENTLY DAMAGE YOUR ZyXEL Device.

34.5.1 Firmware File Upload

FTP is the preferred method for uploading the firmware and configuration. To use this feature, your computer must have an FTP client.

When you telnet into the ZyXEL Device, you will see the following screens for uploading firmware and the configuration file using FTP.

Figure 218 Menu 24.7.1: System Maintenance - Upload System Firmware

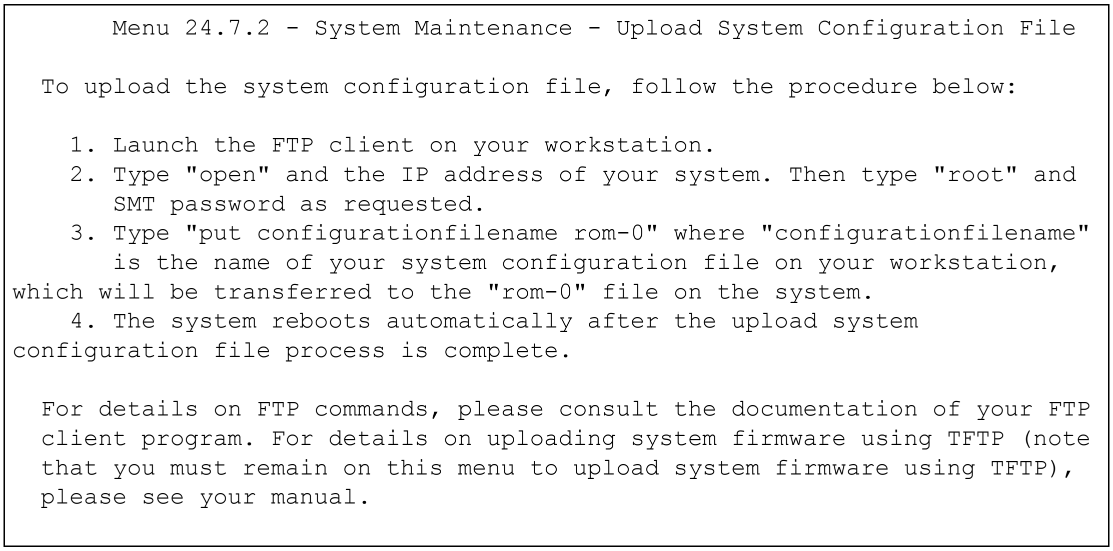


```
          Menu 24.7.1 - System Maintenance - Upload System Firmware

  To upload the system firmware, follow the procedure below:

    1. Launch the FTP client on your workstation.
    2. Type "open" and the IP address of your system.  Then type "root" and
       SMT password as requested.
    3. Type "put firmwarefilename ras" where "firmwarefilename" is the name
       of your firmware upgrade file on your workstation and "ras" is the
       remote file name on the system.
    4. The system reboots automatically after a successful firmware upload.

  For details on FTP commands, please consult the documentation of your FTP
  client program. For details on uploading system firmware using TFTP (note
  that you must remain on this menu to upload system firmware using TFTP),
  please see your manual.
```

34.5.2 Configuration File Upload

You see the following screen when you telnet into menu 24.7.2.

Figure 219 Menu 24.7.2: System Maintenance - Upload System Configuration File



```
       Menu 24.7.2 - System Maintenance - Upload System Configuration File

  To upload the system configuration file, follow the procedure below:

    1. Launch the FTP client on your workstation.
    2. Type "open" and the IP address of your system. Then type "root" and
       SMT password as requested.
    3. Type "put configurationfilename rom-0" where "configurationfilename"
       is the name of your system configuration file on your workstation,
which will be transferred to the "rom-0" file on the system.
    4. The system reboots automatically after the upload system
configuration file process is complete.

  For details on FTP commands, please consult the documentation of your FTP
  client program. For details on uploading system firmware using TFTP (note
  that you must remain on this menu to upload system firmware using TFTP),
  please see your manual.
```

To upload the firmware and the configuration file, follow these examples

34.5.3 FTP File Upload Command from the DOS Prompt Example

1 Launch the FTP client on your computer.

2 Enter "open", followed by a space and the IP address of your ZyXEL Device.

3 Press [ENTER] when prompted for a username.

4 Enter your password as requested (the default is “1234”).

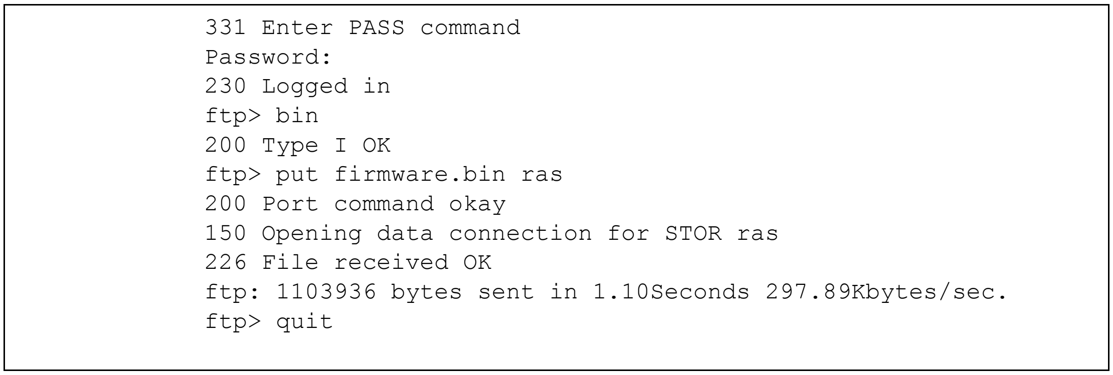
5 Enter “bin” to set transfer mode to binary.

6 Use “put” to transfer files from the computer to the ZyXEL Device, for example, “put firmware.bin ras” transfers the firmware on your computer (firmware.bin) to the ZyXEL Device and renames it “ras”. Similarly, “put config.rom rom-0” transfers the configuration file on your computer (config.rom) to the ZyXEL Device and renames it “rom-0”. Likewise “get rom-0 config.rom” transfers the configuration file on the ZyXEL Device to your computer and renames it “config.rom.” See earlier in this chapter for more information on filename conventions.

7 Enter “quit” to exit the ftp prompt.

34.5.4 FTP Session Example of Firmware File Upload

Figure 220 FTP Session Example of Firmware File Upload



```
331 Enter PASS command
Password:
230 Logged in
ftp> bin
200 Type I OK
ftp> put firmware.bin ras
200 Port command okay
150 Opening data connection for STOR ras
226 File received OK
ftp: 1103936 bytes sent in 1.10Seconds 297.89Kbytes/sec.
ftp> quit
```

More commands (found in GUI-based FTP clients) are listed earlier in this chapter.

Refer to Section 34.3.5 on page 330 to read about configurations that disallow TFTP and FTP over WAN.

34.5.5 TFTP File Upload

The ZyXEL Device also supports the uploading of firmware files using TFTP (Trivial File Transfer Protocol) over LAN. Although TFTP should work over WAN as well, it is not recommended.

To use TFTP, your computer must have both telnet and TFTP clients. To transfer the firmware and the configuration file, follow the procedure shown next.

1 Use telnet from your computer to connect to the ZyXEL Device and log in. Because TFTP does not have any security checks, the ZyXEL Device records the IP address of the telnet client and accepts TFTP requests only from this address.

2 Put the SMT in command interpreter (CI) mode by entering 8 in **Menu 24 – System Maintenance**.

3 Enter the command “sys stdio 0” to disable the console timeout, so the TFTP transfer will not be interrupted. Enter “command sys stdio 5” to restore the five-minute console timeout (default) when the file transfer is complete.

4 Launch the TFTP client on your computer and connect to the ZyXEL Device. Set the transfer mode to binary before starting data transfer.

5 Use the TFTP client (see the example below) to transfer files between the ZyXEL Device and the computer. The file name for the firmware is “ras”.

Note that the telnet connection must be active and the ZyXEL Device in CI mode before and during the TFTP transfer. For details on TFTP commands (see following example), please consult the documentation of your TFTP client program. For UNIX, use “get” to transfer from the ZyXEL Device to the computer, “put” the other way around, and “binary” to set binary transfer mode.

34.5.6 TFTP Upload Command Example

The following is an example TFTP command:

```
tftp [-i] host put firmware.bin ras
```

Where “i” specifies binary image transfer mode (use this mode when transferring binary files), “host” is the ZyXEL Device’s IP address, “put” transfers the file source on the computer (firmware.bin – name of the firmware on the computer) to the file destination on the remote host (ras - name of the firmware on the ZyXEL Device).

Commands that you may see in GUI-based TFTP clients are listed earlier in this chapter.

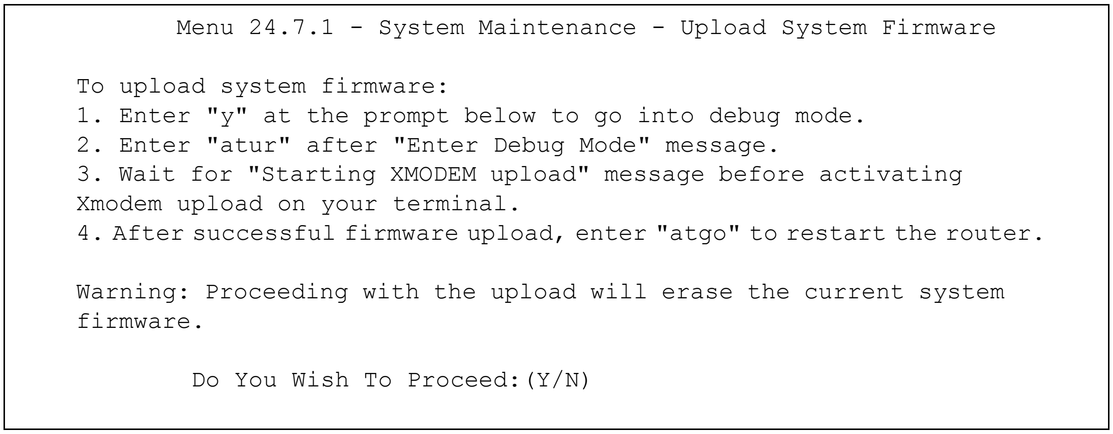
34.5.7 Uploading Via Console Port

FTP or TFTP are the preferred methods for uploading firmware to your ZyXEL Device. However, in the event of your network being down, uploading files is only possible with a direct connection to your ZyXEL Device via the console port. Uploading files via the console port under normal conditions is not recommended since FTP or TFTP is faster. Any serial communications program should work fine; however, you must use the Xmodem protocol to perform the download/upload.

34.5.8 Uploading Firmware File Via Console Port

1 Select 1 from Menu 24.7 – System Maintenance – Upload Firmware to display Menu 24.7.1 - System Maintenance - Upload System Firmware, and then follow the instructions as shown in the following screen.

Figure 221 Menu 24.7.1 As Seen Using the Console Port



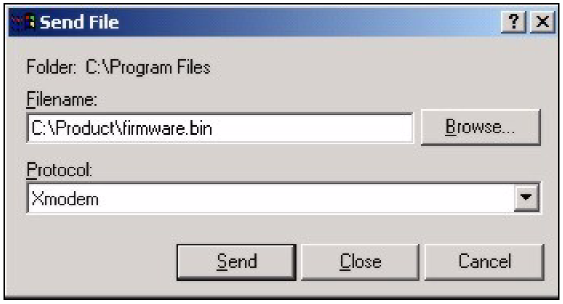
```
             Menu 24.7.1 - System Maintenance - Upload System Firmware

    To upload system firmware:
    1. Enter "y" at the prompt below to go into debug mode.
    2. Enter "atur" after "Enter Debug Mode" message.
    3. Wait for "Starting XMODEM upload" message before activating
    Xmodem upload on your terminal.
    4. After successful firmware upload, enter "atgo" to restart the router.

    Warning: Proceeding with the upload will erase the current system
    firmware.

            Do You Wish To Proceed:(Y/N)
```

2 After the "Starting Xmodem upload" message appears, activate the Xmodem protocol on your computer. Follow the procedure as shown previously for the HyperTerminal program. The procedure for other serial communications programs should be similar.

34.5.9 Example Xmodem Firmware Upload Using HyperTerminal

Click **Transfer**, then **Send File** to display the following screen.

Figure 222 Example Xmodem Upload



Folder: C:\Program Files

Filename: C:\Product\firmware.bin

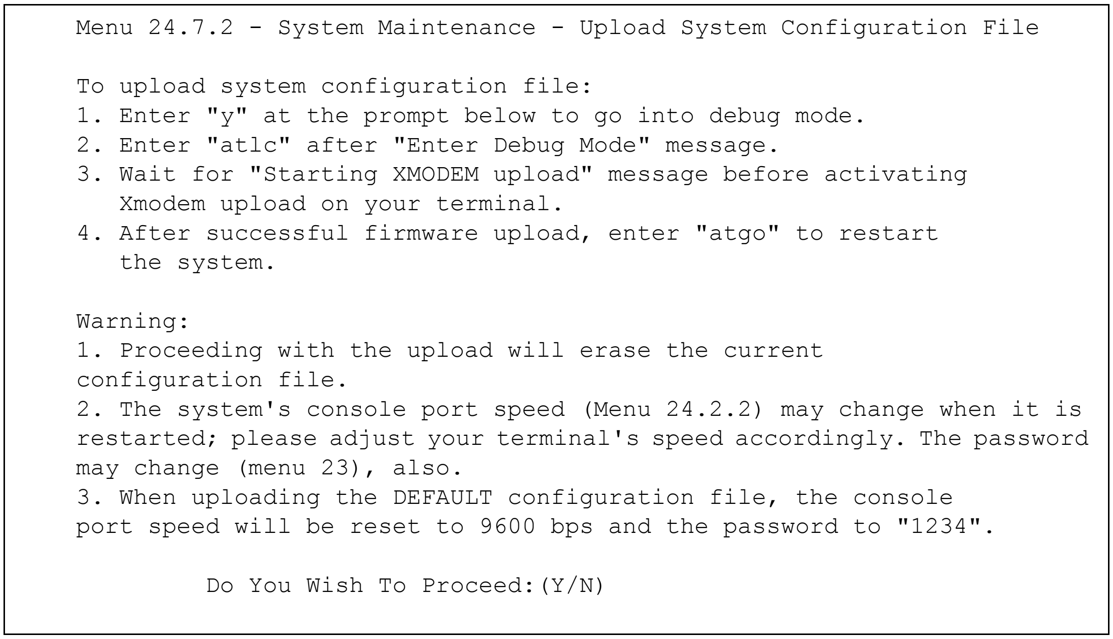
Protocol: Xmodem

After the firmware upload process has completed, the ZyXEL Device will automatically restart.

34.5.10 Uploading Configuration File Via Console Port

1 Select 2 from Menu 24.7 – System Maintenance – Upload Firmware to display Menu 24.7.2 - System Maintenance - Upload System Configuration File. Follow the instructions as shown in the next screen.

Figure 223 Menu 24.7.2 As Seen Using the Console Port



```
    Menu 24.7.2 - System Maintenance - Upload System Configuration File

    To upload system configuration file:
    1. Enter "y" at the prompt below to go into debug mode.
    2. Enter "atlc" after "Enter Debug Mode" message.
    3. Wait for "Starting XMODEM upload" message before activating
       Xmodem upload on your terminal.
    4. After successful firmware upload, enter "atgo" to restart
       the system.

    Warning:
    1. Proceeding with the upload will erase the current
    configuration file.
    2. The system's console port speed (Menu 24.2.2) may change when it is
    restarted; please adjust your terminal's speed accordingly. The password
    may change (menu 23), also.
    3. When uploading the DEFAULT configuration file, the console
    port speed will be reset to 9600 bps and the password to "1234".

             Do You Wish To Proceed:(Y/N)
```

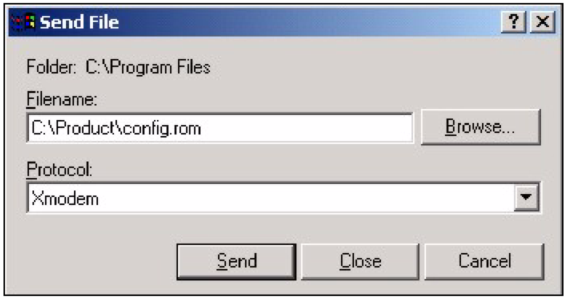
2 After the "Starting Xmodem upload" message appears, activate the Xmodem protocol on your computer. Follow the procedure as shown previously for the HyperTerminal program. The procedure for other serial communications programs should be similar.

3 Enter “atgo” to restart the ZyXEL Device.

34.5.11 Example Xmodem Configuration Upload Using HyperTerminal

Click **Transfer**, then **Send File** to display the following screen.

Figure 224 Example Xmodem Upload



Folder: C:\Program Files

Filename: C:\Product\config.rom

Protocol: Xmodem

After the configuration upload process has completed, restart the ZyXEL Device by entering “atgo”.

CHAPTER 35 Menus 24.8 to 24.11

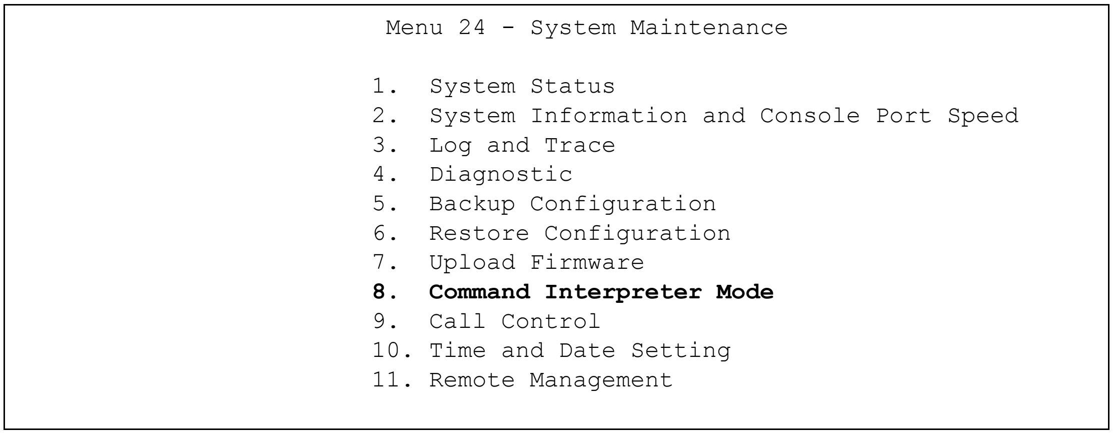
This chapter leads you through SMT menus 24.8 to 24.11.

35.1 Command Interpreter Mode

The Command Interpreter (CI) is a part of the main router firmware. The CI provides much of the same functionality as the SMT, while adding some low-level setup and diagnostic functions. Enter the CI from the SMT by selecting menu 24.8. Access can be by Telnet or by a serial connection to the console port, although some commands are only available with a serial connection. See the included disk or zyxel.com for more detailed information on CI commands. Enter 8 from **Menu 24 - System Maintenance**.

Note: Use of undocumented commands or misconfiguration can damage the unit and possibly render it unusable.

Figure 225 Command Mode in Menu 24



```
                    Menu 24 - System Maintenance

                   1.   System Status
                   2.   System Information and Console Port Speed
                   3.   Log and Trace
                   4.   Diagnostic
                   5.   Backup Configuration
                   6.   Restore Configuration
                   7.   Upload Firmware
                   8.   Command Interpreter Mode
                   9.   Call Control
                   10.  Time and Date Setting
                   11.  Remote Management
```

35.1.1 Command Syntax

The command keywords are in `courier new` font.

Enter the command keywords exactly as shown, do not abbreviate.

The required fields in a command are enclosed in angle brackets <>.

The optional fields in a command are enclosed in square brackets `[]`.

The `|` symbol means "or".

For example,

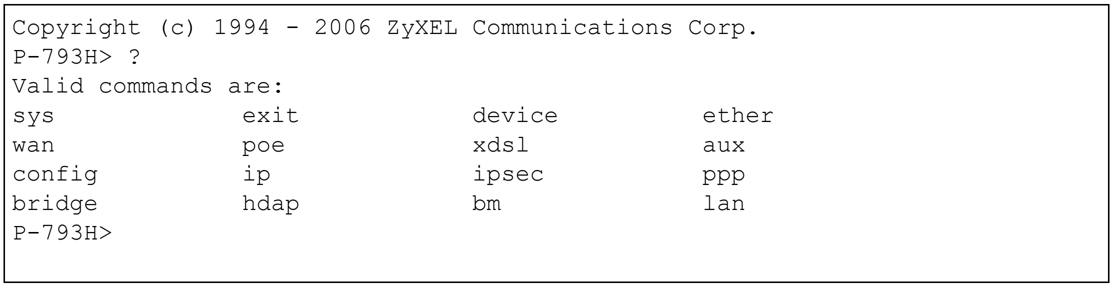
```
sys filter netbios config <type> <on|off>
```

means that you must specify the type of netbios filter and whether to turn it on or off.

35.1.2 Command Usage

A list of commands can be found by typing `help` or `?` at the command prompt. Always type the full command. Type `exit` to return to the SMT main menu when finished.

Figure 226 Valid Commands



```
Copyright (c) 1994 - 2006 ZyXEL Communications Corp.
P-793H> ?
Valid commands are:
sys             exit            device          ether
wan             poe             xdsl            aux
config          ip              ipsec           ppp
bridge          hdap            bm              lan
P-793H>
```

35.2 Call Control Support

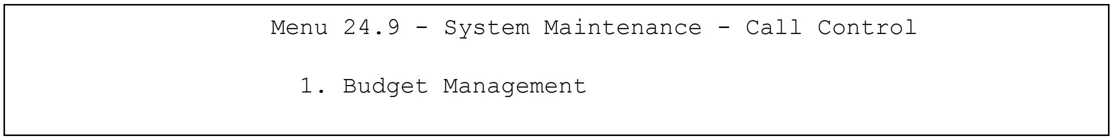
The ZyXEL Device provides a call control function for budget management. Please note that this menu is only applicable when **Encapsulation** is set to **PPPoE** or **PPPoA** in menu 4 or menu 11.1.

The budget management function allows you to set a limit on the total outgoing call time of the ZyXEL Device within certain times. When the total outgoing call time exceeds the limit, the current call will be dropped and any future outgoing calls will be blocked.

Call history chronicles preceding incoming and outgoing calls.

To access the call control menu, select option 9 in menu 24 to go to **Menu 24.9 - System Maintenance - Call Control**, as shown in the next table.

Figure 227 Menu 24.9: System Maintenance - Call Control

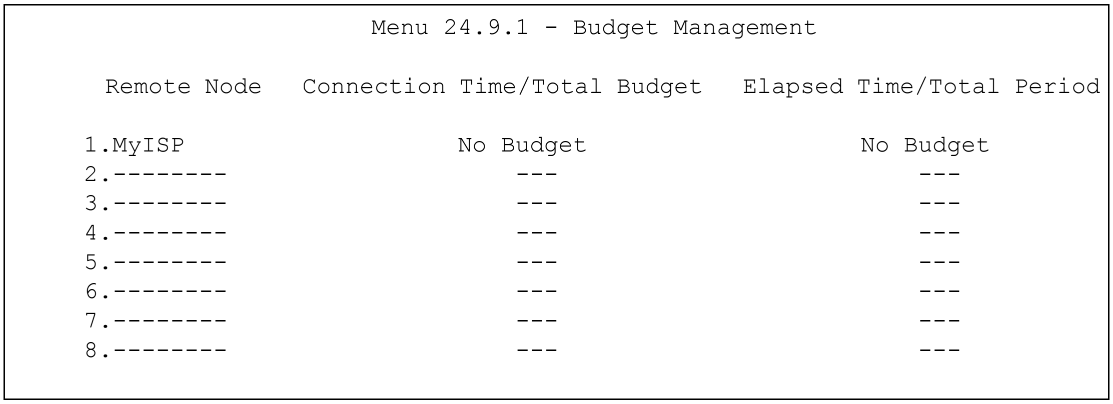


```
                  Menu 24.9 - System Maintenance - Call Control

                    1. Budget Management
```

35.2.1 Budget Management

Menu 24.9.1 shows the budget management statistics for outgoing calls. Enter 1 from **Menu 24.9 - System Maintenance - Call Control** to bring up the following menu. Not all fields are available on all models.

Figure 228 Menu 24.9.1 - Budget Management



```
                       Menu 24.9.1 - Budget Management

    Remote Node   Connection Time/Total Budget   Elapsed Time/Total Period

   1.MyISP                No Budget                      No Budget
   2.--------                ---                            ---
   3.--------                ---                            ---
   4.--------                ---                            ---
   5.--------                ---                            ---
   6.--------                ---                            ---
   7.--------                ---                            ---
   8.--------                ---                            ---
```

The total budget is the time limit on the accumulated time for outgoing calls to a remote node. When this limit is reached, the call will be dropped and further outgoing calls to that remote node will be blocked. After each period, the total budget is reset. The default for the total budget is 0 minutes and the period is 0 hours, meaning no budget control. You can reset the accumulated connection time in this menu by entering the index of a remote node. Enter 0 to update the screen. The budget and the reset period can be configured in menu 11.1 for the remote node.

Table 125 Menu 24.9.1 - Budget Management

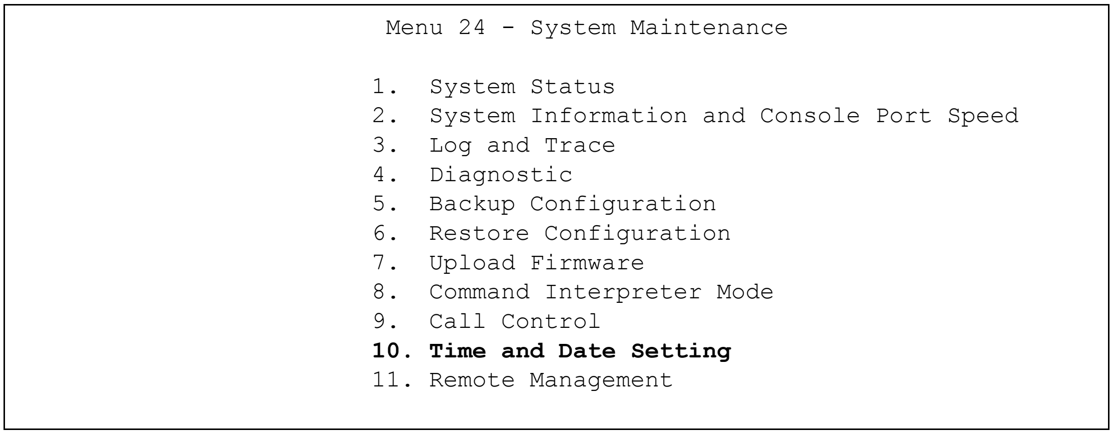
FIELD	DESCRIPTION	EXAMPLE
Remote Node	Enter the index number of the remote node you want to reset (just one in this case)	1
Connection Time/ Total Budget	This is the total connection time that has gone by (within the allocated budget that you set in menu 11.1).	5/10 means that 5 minutes out of a total allocation of 10 minutes have lapsed.
Elapsed Time/Total Period	The period is the time cycle in hours that the allocation budget is reset (see menu 11.1.) The elapsed time is the time used up within this period.	0.5/1 means that 30 minutes out of the 1-hour time period has lapsed.
Enter “0” to update the screen or press [ESC] to return to the previous screen.		

35.3 Time and Date Setting

The ZyXEL Device's Real Time Chip (RTC) keeps track of the time and date. There is also a software mechanism to set the time manually or get the current time and date from an external server when you turn on your ZyXEL Device. Menu 24.10 allows you to update the time and date settings of your ZyXEL Device. The real time is then displayed in the ZyXEL Device error logs and firewall logs.

Select menu 24 in the main menu to open **Menu 24 - System Maintenance**, as shown next.

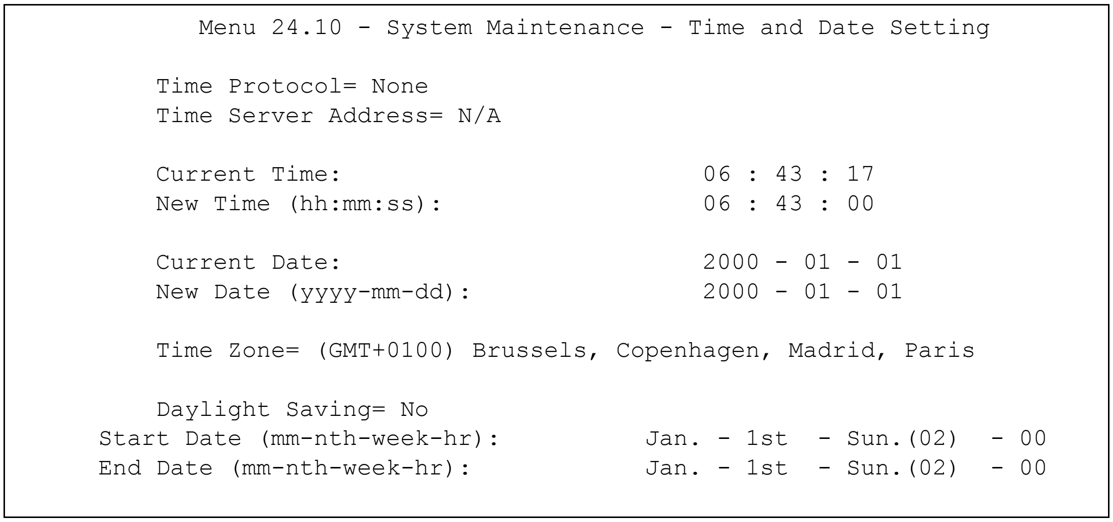
Figure 229 Menu 24: System Maintenance



```
                         Menu 24 - System Maintenance

                        1.  System Status
                        2.  System Information and Console Port Speed
                        3.  Log and Trace
                        4.  Diagnostic
                        5.  Backup Configuration
                        6.  Restore Configuration
                        7.  Upload Firmware
                        8.  Command Interpreter Mode
                        9.  Call Control
                        10. Time and Date Setting
                        11. Remote Management
```

Enter 10 to go to **Menu 24.10 - System Maintenance - Time and Date Setting** to update the time and date settings of your ZyXEL Device as shown in the following screen.

Figure 230 Menu 24.10: System Maintenance - Time and Date Setting



```
             Menu 24.10 - System Maintenance - Time and Date Setting

          Time Protocol= None
          Time Server Address= N/A

          Current Time:                         06 : 43 : 17
          New Time (hh:mm:ss):                  06 : 43 : 00

          Current Date:                         2000 - 01 - 01
          New Date (yyyy-mm-dd):                2000 - 01 - 01

          Time Zone= (GMT+0100) Brussels, Copenhagen, Madrid, Paris

          Daylight Saving= No
      Start Date (mm-nth-week-hr):          Jan. - 1st  - Sun.(02)  - 00
      End Date (mm-nth-week-hr):            Jan. - 1st  - Sun.(02)  - 00
```

The following table describes the fields in this screen.

Table 126 Menu 24.10: System Maintenance - Time and Date Setting

FIELD	DESCRIPTION
Time Protocol	Enter the time service protocol that your timeserver uses. Not all time servers support all protocols, so you may have to check with your ISP/network administrator or use trial and error to find a protocol that works. The main differences between them are the format. **Daytime (RFC 867)** format is day/month/year/time zone of the server. **Time (RFC-868)** format displays a 4-byte integer giving the total number of seconds since 1970/1/1 at 0:0:0. The default, **NTP (RFC-1305)**, is similar to **Time (RFC-868)**. Select **None** to enter the new time and new date manually.
Time Server Address	Enter the IP address or domain name of your timeserver. Check with your ISP/ network administrator if you are unsure of this information. The default is tick.stdtime.gov.tw
Current Time	This field displays an updated time only when you reenter this menu.
New Time (hh:mm:ss)	Enter the new time in hour, minute and second format. This field is available when you select **None** in the **Time Protocol** field.
Current Date	This field displays an updated date only when you reenter this menu.
New Date (yyyy-mm-dd)	Enter the new date in year, month and day format. This field is available when you select **None** in the **Time Protocol** field.
Time Zone	Press [SPACE BAR] and then [ENTER] to set the time difference between your time zone and Greenwich Mean Time (GMT).
Daylight Saving	Daylight Saving Time is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daylight time in the evenings. If you use daylight savings time, then choose **Yes**.
Start Date (mm-nth-week-hr)	Configure the day and time when Daylight Saving Time starts if you selected **Yes** in the **Daylight Saving** field. The **hr** field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time starts in most parts of the United States on the first Sunday of April. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **Apr.**, **1st**, **Sun.** and type 02 in the **hr** field. Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Mar.**, **Last**, **Sun.** The time you type in the **hr** field depends on your time zone. In Germany for instance, you would type 02 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).

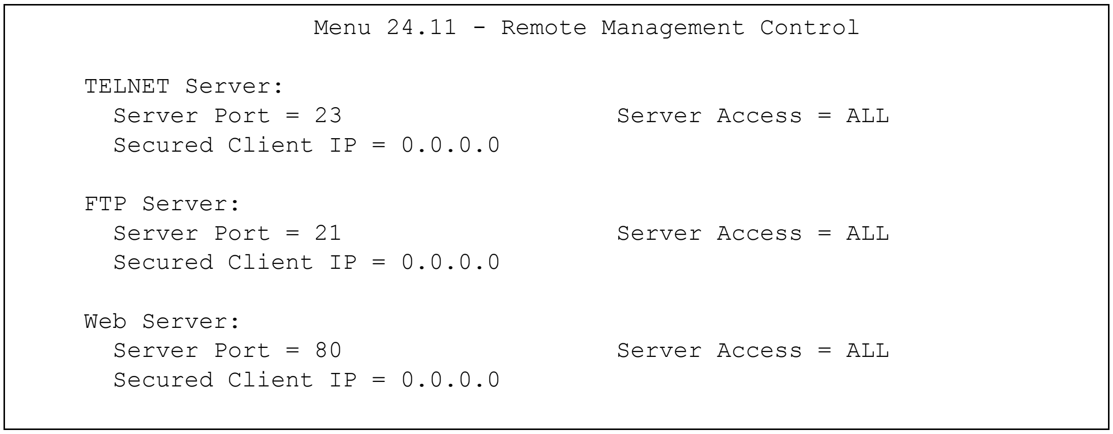
Table 126 Menu 24.10: System Maintenance - Time and Date Setting (continued)

FIELD	DESCRIPTION
End Date (mm-nth-week-hr)	Configure the day and time when Daylight Saving Time ends if you selected **Yes** in the **Daylight Saving** field. The **hr** field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time ends in the United States on the last Sunday of October. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **Oct.**, **Last**, **Sun.** and type 02 in the **hr** field. Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Oct.**, **Last**, **Sun.** The time you type in the **hr** field depends on your time zone. In Germany for instance, you would type 02 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
Once you have filled in this menu, press [ENTER] at the message “Press ENTER to Confirm or ESC to Cancel“ to save your configuration, or press [ESC] to cancel.	

35.4 Remote Management

To disable remote management of a service, select **Disable** in the corresponding **Server Access** field. Enter 11 from menu 24 to bring up **Menu 24.11 - Remote Management Control**.

Figure 231 Menu 24.11 – Remote Management Control



```
                    Menu 24.11 - Remote Management Control

     TELNET Server:
       Server Port = 23                   Server Access = ALL
       Secured Client IP = 0.0.0.0

     FTP Server:
       Server Port = 21                   Server Access = ALL
       Secured Client IP = 0.0.0.0

     Web Server:
       Server Port = 80                   Server Access = ALL
       Secured Client IP = 0.0.0.0
```

The following table describes the fields in this screen.

Table 127 Menu 24.11 – Remote Management Control

FIELD	DESCRIPTION
TELNET Server FTP Server Web Server	Each of these read-only labels denotes a service that you may use to remotely manage the ZyXEL Device.
Server Port	This field shows the port number for the service or protocol. You may change the port number if needed, but you must use the same port number to access the ZyXEL Device.
Server Access	Select the access interface (if any) by pressing [SPACE BAR], then [ENTER] to choose from: **LAN only**, **WAN only**, **ALL** or **Disable**.
Secured Client IP	The default 0.0.0.0 allows any client to use this service to remotely manage the ZyXEL Device. Enter an IP address to restrict access to a client with a matching IP address.
Once you have filled in this menu, press [ENTER] at the message "Press ENTER to Confirm or ESC to Cancel" to save your configuration, or press [ESC] to cancel.	

35.4.1 Remote Management Limitations

Remote management over LAN or WAN will not work when:

1. A filter in menu 3.1 (LAN) or in menu 11.5 (WAN) is applied to block a Telnet, FTP or Web service.
2. You have disabled that service in menu 24.11.
3. The IP address in the **Secure Client IP** field (menu 24.11) does not match the client IP address. If it does not match, the ZyXEL Device will disconnect the session immediately.
4. There is an SMT console session running.
5. There is already another remote management session with an equal or higher priority running. You may only have one remote management session running at one time.
6. There is a firewall rule that blocks it.

CHAPTER 36
IP Routing Policy Setup

Use this menu to look at and configure policy routes.

36.1 Policy Route

Traditionally, routing is based on the destination address only and the ZyXEL Device takes the shortest path to forward a packet. IP Policy Routing (IPPR) provides a mechanism to override the default routing behavior and alter the packet forwarding based on the policy defined by the network administrator. Policy-based routing is applied to incoming packets on a per interface basis, prior to the normal routing.

36.2 Benefits

- Source-Based Routing – Network administrators can use policy-based routing to direct traffic from different users through different connections.
- Bandwidth Shaping – Organizations can allocate bandwidth to traffic that matches the routing policy and prioritize traffic.
- Cost Savings – IPPR allows organizations to distribute interactive traffic on high-bandwidth, high-cost paths while using low-cost paths for batch traffic.
- Load Sharing – Network administrators can use IPPR to distribute traffic among multiple paths.
- NAT - The ZyXEL Device performs NAT by default for traffic going to or from the **ge1** interface. Routing policy's SNAT allows network administrators to have traffic received on a specified interface use a specified IP address as the source IP address.

36.3 Routing Policy

Individual routing policies are used as part of the overall IPPR process. A policy defines the matching criteria and the action to take when a packet meets the criteria. The action is taken only when all the criteria are met. The criteria can include the user name, source address and incoming interface, destination address, schedule, IP protocol (ICMP, UDP, TCP, etc.) and port.

The actions that can be taken include:

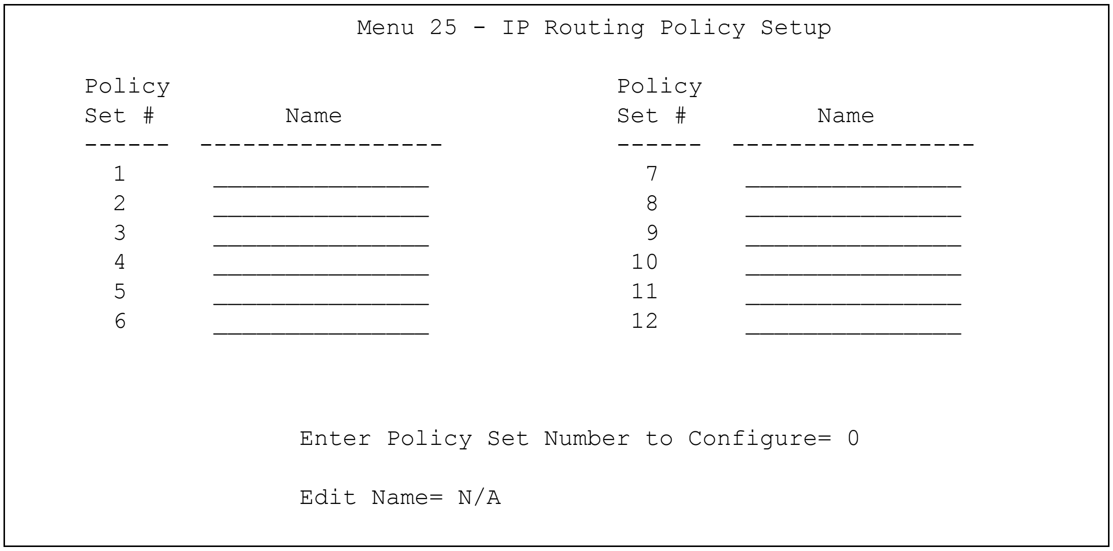
- Routing the packet to a different gateway, outgoing interface, VPN tunnel, or trunk.
- Limiting the amount of bandwidth available and setting a priority for traffic.

IPPR follows the existing packet filtering facility of RAS in style and in implementation.

36.4 IP Routing Policy Setup

Use this menu to look at a summary of policy routes. To open this menu, enter 25 in the main menu.

Figure 232 Menu 25: IP Routing Policy Setup



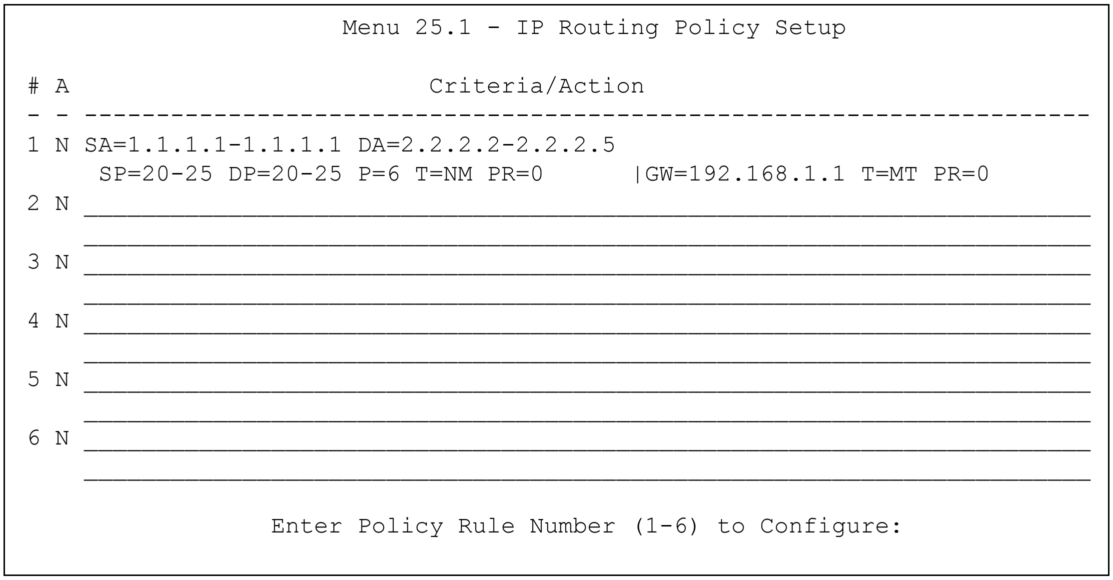
```
                   Menu 25 - IP Routing Policy Setup

    Policy                              Policy
    Set #         Name                  Set #         Name
    ------  -----------------           ------  -----------------
      1      _______________              7      _______________
      2      _______________              8      _______________
      3      _______________              9      _______________
      4      _______________             10      _______________
      5      _______________             11      _______________
      6      _______________             12      _______________



                   Enter Policy Set Number to Configure= 0

                   Edit Name= N/A
```

1. Select the filter set you wish to configure (1-12) and press [ENTER].
2. Enter a descriptive name or comment in the **Edit Name** field and press [ENTER].
3. Press [ENTER] at the message [Press ENTER to confirm] to open **Menu 25.1 - IP Routing Policy Setup**.

36.5 IP Routing Policy Setup

Use this menu to look at a policy route. To open this menu, enter the number and name of a policy route in menu 25.

Figure 233 Menu 25.1: IP Routing Policy Setup



```
                    Menu 25.1 - IP Routing Policy Setup

# A                          Criteria/Action
- - ----------------------------------------------------------------------
1 N SA=1.1.1.1-1.1.1.1 DA=2.2.2.2-2.2.2.5
     SP=20-25 DP=20-25 P=6 T=NM PR=0      |GW=192.168.1.1 T=MT PR=0
2 N ______________________________________________________________________
    ______________________________________________________________________
3 N ______________________________________________________________________
    ______________________________________________________________________
4 N ______________________________________________________________________
    ______________________________________________________________________
5 N ______________________________________________________________________
    ______________________________________________________________________
6 N ______________________________________________________________________
    ______________________________________________________________________

               Enter Policy Rule Number (1-6) to Configure:
```

The following table describes the labels in this menu.

Table 128 Menu 25.1: IP Routing Policy Setup

FIELD	DESCRIPTION
#	This field displays the rule number.
Criteria/Action	See Table 129 on page 351.
Enter Policy Rule Number (1-6) to Configure	Enter the rule number you would like to edit.

Table 129 Menu 25: IP Routing Policy Setup, Abbreviations

ABBREVIATION	MEANING
SA	Source IP Address
SP	Source Port
DA	Destination IP Address
DP	Destination Port
P	IP layer 4 protocol number (TCP=6, UDP=17…)
T	Type of service of incoming packet
PR	Precedence of incoming packet
Action GW	Gateway IP address
T	Outgoing Type of service
P	Outgoing Precedence
Service NM	Normal
MD	Minimum Delay

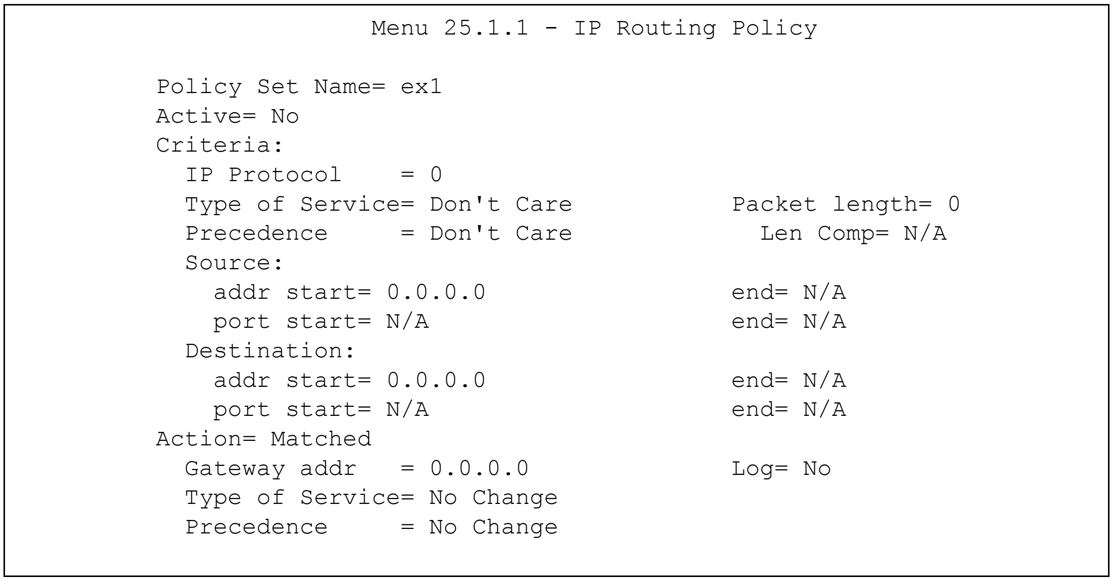
Table 129 Menu 25: IP Routing Policy Setup, Abbreviations (continued)

ABBREVIATION	MEANING
MT	Maximum Throughput
MR	Maximum Reliability
MC	Minimum Cost

36.6 IP Routing Policy

Use this menu to configure policy routes. To open this menu, select **Edit** and enter the appropriate rule number in menu 25.

Figure 234 Menu 25.1.1: IP Routing Policy



```
                         Menu 25.1.1 - IP Routing Policy

          Policy Set Name= ex1
          Active= No
          Criteria:
            IP Protocol    = 0
            Type of Service= Don't Care           Packet length= 0
            Precedence     = Don't Care             Len Comp= N/A
            Source:
              addr start= 0.0.0.0                 end= N/A
              port start= N/A                     end= N/A
            Destination:
              addr start= 0.0.0.0                 end= N/A
              port start= N/A                     end= N/A
          Action= Matched
            Gateway addr   = 0.0.0.0              Log= No
            Type of Service= No Change
            Precedence     = No Change
```

The following table describes the labels in this menu.

Table 130 Menu 25.1.1: IP Routing Policy

FIELD	DESCRIPTION
Policy Set Name	This is the descriptive name of the routing policy selected in **Menu 25.1 - IP Routing Policy Summary**.
Active	Press [SPACE BAR] and then [ENTER] to select **Yes** to activate the policy.
Criteria	
IP Protocol	Enter a number that represents an IP layer 4 protocol, for example, UDP=17, TCP=6, ICMP=1 and Don't care=0.
Type of Service	Prioritize incoming network traffic by choosing from **Don't Care**, **Normal**, **Min Delay**, **Max Thruput** or **Max Reliable**.
Precedence	Precedence value of the incoming packet. Press [SPACE BAR] and then [ENTER] to select a value from **0** to **7** or **Don't Care**.

Table 130 Menu 25.1.1: IP Routing Policy (continued)

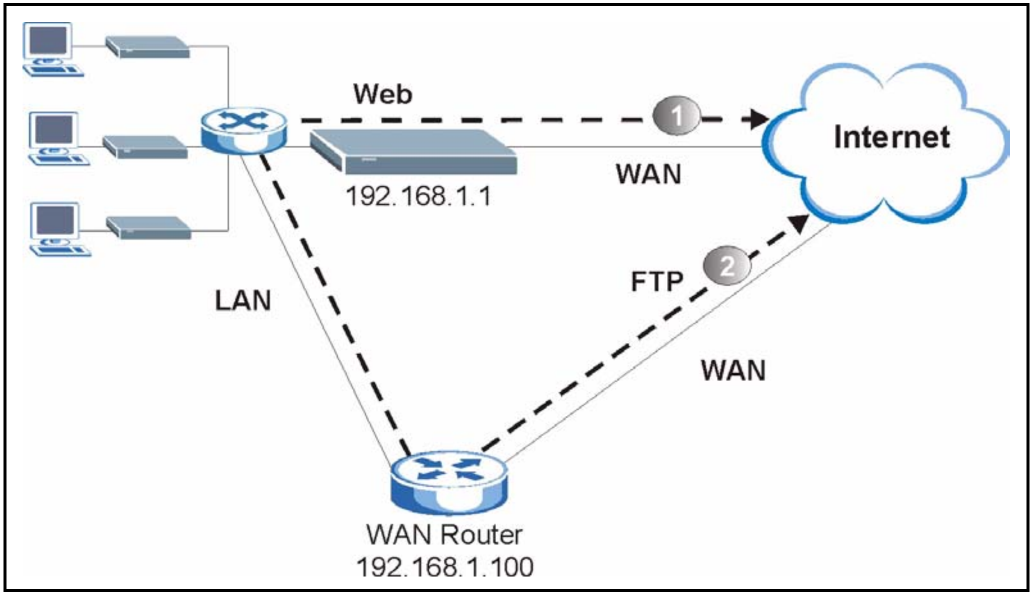
FIELD	DESCRIPTION
Packet Length	Type the length of incoming packets (in bytes). The operators in the **Len Comp** (next field) apply to packets of this length.
Len Comp	Press [SPACE BAR] and then [ENTER] to choose from **Equal**, **Not Equal**, **Less**, **Greater**, **Less or Equal** or **Greater or Equal**.
Source	
addr start / end	Source IP address range from start to end.
port start / end	Source port number range from start to end; applicable only for TCP/UDP.
Destination	
addr start / end	Destination IP address range from start to end.
port start / end	Destination port number range from start to end; applicable only for TCP/UDP.
Action	Specifies whether action should be taken on criteria Matched or Not Matched.
Gateway addr	Enter the IP address of the gateway to which the ZyXEL Device forwards the packet. The gateway is an immediate neighbor of your ZyXEL Device and must be on the same subnet as the ZyXEL Device, if it is on the LAN, or the IP address of a remote node, if it is on the WAN. Enter 0.0.0.0 to specify the default gateway.
Type of Service	Set the new TOS value of the outgoing packet. Prioritize incoming network traffic by choosing **No Change**, **Normal**, **Min Delay**, **Max Thruput**, **Max Reliable** or **Min Cost**.
Precedence	Set the new outgoing packet precedence value. Values are **0** to **7** or **Don't Care**.
Log	Press [SPACE BAR] and then [ENTER] to select **Yes** to make an entry in the system log when a policy is executed.

36.7 IP Policy Routing Example

If a network has both Internet and remote node connections, you can route Web packets to the Internet using one policy and route FTP packets to a remote network using another policy. See the next figure.

Route 1 represents the default IP route and route 2 represents the configured IP route.

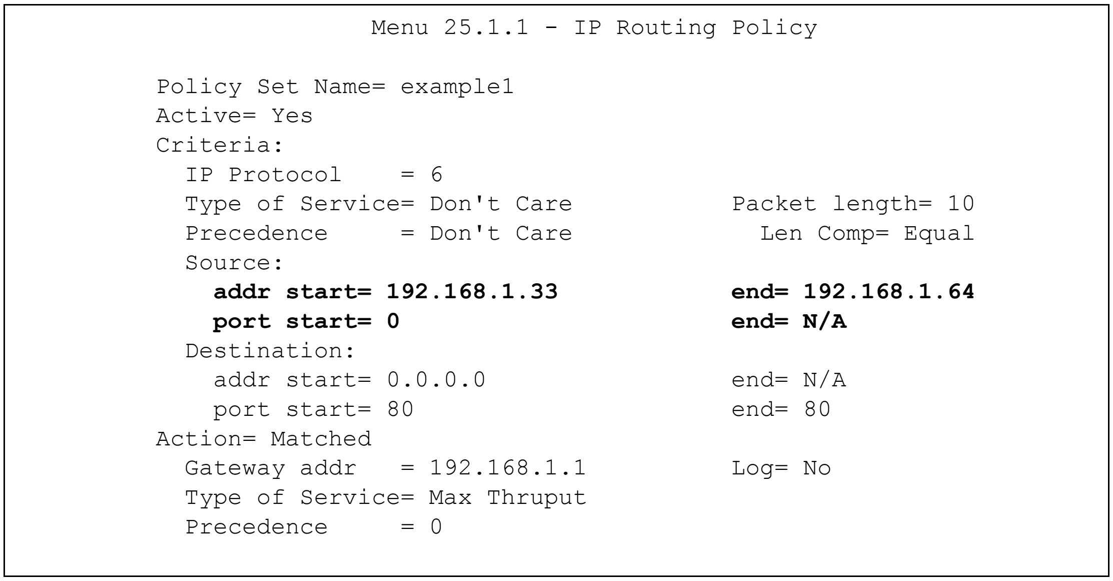
Figure 235 IP Routing Policy Example



To force Web packets coming from clients with IP addresses of 192.168.1.33 to 192.168.1.64 to be routed to the Internet via the WAN port of the ZyWALL, follow the steps as shown next.

1 Create a rule in **Menu 25.1 - IP Routing Policy Setup** as shown next.

Figure 236 IP Routing Policy Example 1



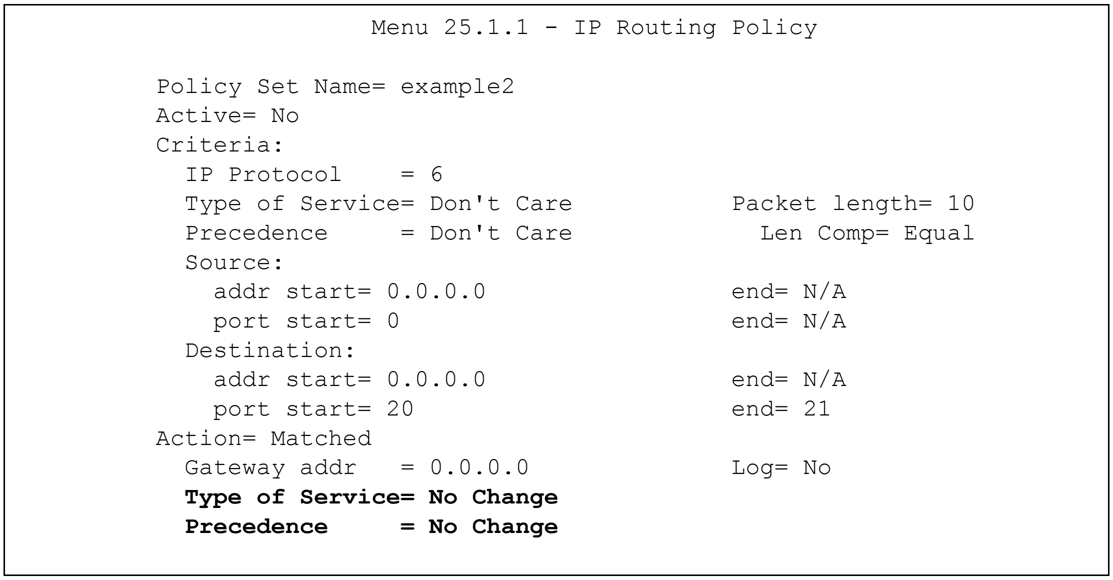
```
                   Menu 25.1.1 - IP Routing Policy

      Policy Set Name= example1
      Active= Yes
      Criteria:
        IP Protocol    = 6
        Type of Service= Don't Care          Packet length= 10
        Precedence     = Don't Care            Len Comp= Equal
        Source:
          addr start= 192.168.1.33           end= 192.168.1.64
          port start= 0                      end= N/A
        Destination:
          addr start= 0.0.0.0                end= N/A
          port start= 80                     end= 80
      Action= Matched
        Gateway addr   = 192.168.1.1         Log= No
        Type of Service= Max Thruput
        Precedence     = 0
```

2 Select **Yes** in the **LAN** field in menu 25.1.1 to apply the policy to packets received on the LAN port.

3 Check **Menu 25 - IP Routing Policy Summary** to see if the rule is added correctly.

4 Create another rule in menu 25.1 for this rule to route packets from any host (IP=0.0.0.0 means any host) with protocol TCP and port FTP access through another gateway (192.168.1.100).

Figure 237 IP Routing Policy Example 2



```
                      Menu 25.1.1 - IP Routing Policy

          Policy Set Name= example2
          Active= No
          Criteria:
            IP Protocol    = 6
            Type of Service= Don't Care           Packet length= 10
            Precedence     = Don't Care             Len Comp= Equal
            Source:
              addr start= 0.0.0.0                 end= N/A
              port start= 0                       end= N/A
            Destination:
              addr start= 0.0.0.0                 end= N/A
              port start= 20                      end= 21
          Action= Matched
            Gateway addr   = 0.0.0.0              Log= No
            Type of Service= No Change
            Precedence     = No Change
```

5 Check **Menu 25 - IP Routing Policy Summary** to see if the rule is added correctly.

Chapter 37 Schedule Setup

Use this menu to look at and configure the schedule sets in the ZyXEL Device.

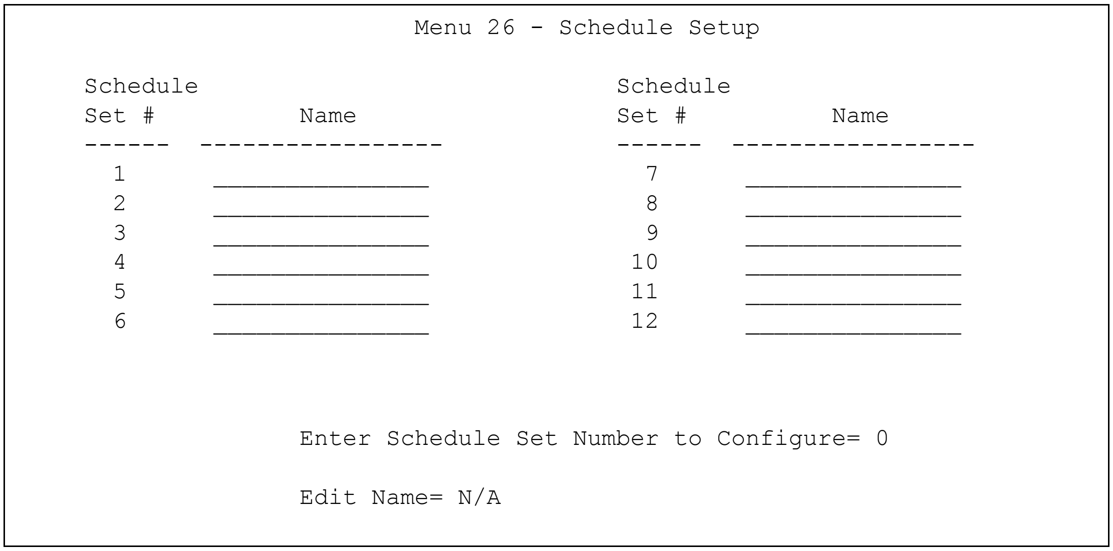
37.1 Schedule Set Overview

Call scheduling (applicable for PPPoE encapsulation only) allows the ZyXEL Device to manage a remote node and dictate when a remote node should be called and for how long. This feature is similar to the scheduler that lets you specify a time period to record a television program in a VCR or TiVo.

37.2 Schedule Setup

This menu is only applicable if your Internet connection uses PPPoE encapsulation. Use this menu to look at the schedule sets in the ZyXEL Device. To open this menu, enter 26 in the main menu.

Figure 238 Menu 26: Schedule Setup



```
                            Menu 26 - Schedule Setup

     Schedule                                    Schedule
     Set #          Name                         Set #          Name
     ------  -----------------                   ------  -----------------
       1      _______________                      7      _______________
       2      _______________                      8      _______________
       3      _______________                      9      _______________
       4      _______________                     10      _______________
       5      _______________                     11      _______________
       6      _______________                     12      _______________


                    Enter Schedule Set Number to Configure= 0

                    Edit Name= N/A
```

The following table describes the labels in this menu.

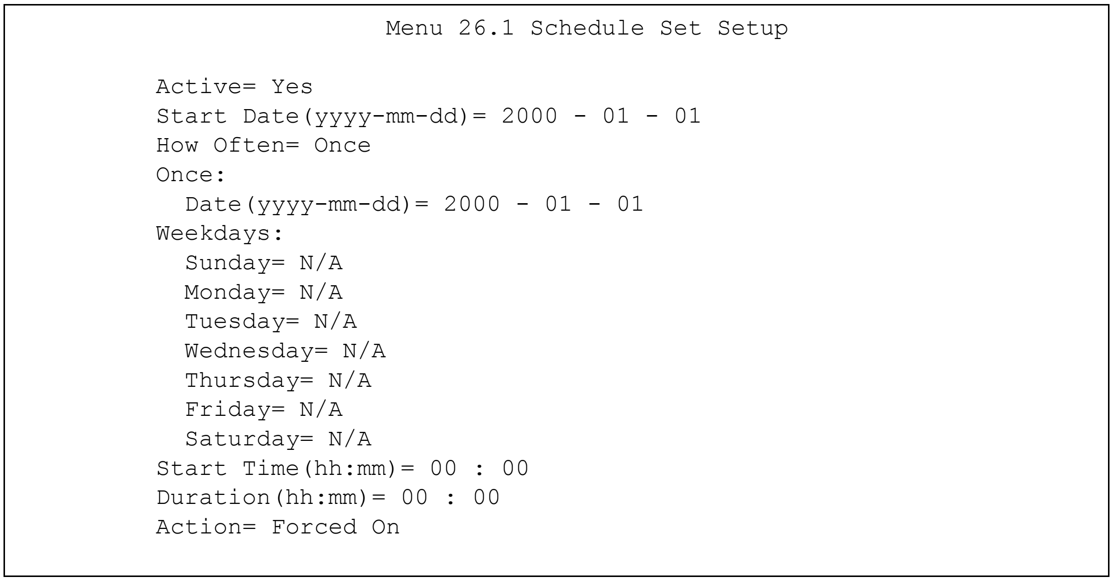
Table 131 Menu 26: Schedule Setup

FIELD	DESCRIPTION
1-12	This field shows the beginning of the name of each schedule set. Lower numbered sets take precedence over higher numbered sets. This avoids scheduling conflicts. For example, if sets 1, 2, 3 and 4 in are applied in the remote node, then set 1 takes precedence over set 2, 3 and 4.
Enter Schedule Set Number to Configure	If you want to configure a schedule set, enter the number of the static route in this field, enter the name in the **Edit Name** field, and press [ENTER]. Menu 26.1 appears. If you want to delete a schedule set, enter the number of the static route in this field, leave the name blank in the **Edit Name** field, and press [ENTER].
Edit Name	Enter the name of the schedule set you want to configure, or leave this field blank to delete the specified schedule set.

37.3 Schedule Set Setup

This menu is only applicable if your Internet connection uses PPPoE encapsulation. Use this menu to configure the schedule sets in the ZyXEL Device. To open this menu, enter the number of the schedule set in the **Enter Schedule Set Number to Configure** field, enter the name of the schedule set in the **Edit Name** field, and press [ENTER] in menu 26.

Figure 239 Menu 26.1: Schedule Set Setup



```
                          Menu 26.1 Schedule Set Setup

          Active= Yes
          Start Date(yyyy-mm-dd)= 2000 - 01 - 01
          How Often= Once
          Once:
            Date(yyyy-mm-dd)= 2000 - 01 - 01
          Weekdays:
            Sunday= N/A
            Monday= N/A
            Tuesday= N/A
            Wednesday= N/A
            Thursday= N/A
            Friday= N/A
            Saturday= N/A
          Start Time(hh:mm)= 00 : 00
          Duration(hh:mm)= 00 : 00
          Action= Forced On
```

The following table describes the labels in this menu.

Table 132 Menu 26.1: Schedule Set Setup

FIELD	DESCRIPTION
Active	Press [SPACE BAR] to select **Yes** or **No**. Choose **Yes** and press [ENTER] to activate the schedule set.
Start Date	Should this schedule set recur weekly or be used just once only? Press the [SPACE BAR] and then [ENTER] to select **Once** or **Weekly**. Both these options are mutually exclusive. If **Once** is selected, then all weekday settings are **N/A**. When **Once** is selected, the schedule rule deletes automatically after the scheduled time elapses.
How Often	Enter the start date when you wish the set to take effect in year -month-date format. Valid dates are from the present to 2036-February-5.
Once	
Date	If you selected **Once** in the **How Often** field above, then enter the date the set should activate here in year-month-date format.
Weekdays	If you selected **Weekly** in the **How Often** field above, then select the day(s) when the set should activate (and recur) by going to that day(s) and pressing [SPACE BAR] to select **Yes**, then press [ENTER].
Start Time	Enter the start time when you wish the schedule set to take effect in hour-minute format.
Duration	Enter the maximum length of time this connection is allowed in hour-minute format.
Action	**Forced On** means that the connection is maintained whether or not there is a demand call on the line and will persist for the time period specified in the **Duration** field. **Forced Down** means that the connection is blocked whether or not there is a demand call on the line. **Enable Dial-On-Demand** means that this schedule permits a demand call on the line. **Disable Dial-On-Demand** means that this schedule prevents a demand call on the line.

CHAPTER 38 Troubleshooting

This chapter covers potential problems and the corresponding remedies.

38.1 Problems Starting Up the ZyXEL Device

Table 133 Troubleshooting Starting Up Your ZyXEL Device

PROBLEM	CORRECTIVE ACTION
None of the LEDs turn on when I turn on the ZyXEL Device.	Make sure that the ZyXEL Device’s power adaptor is connected to the ZyXEL Device and plugged in to an appropriate power source. Make sure that the ZyXEL Device and the power source are both turned on. Turn the ZyXEL Device off and on. If the error persists, you may have a hardware problem. In this case, you should contact your vendor.

38.2 Problems with the LAN

Table 134 Troubleshooting the LAN

PROBLEM	CORRECTIVE ACTION
The LAN LEDs do not turn on.	Check your Ethernet cable connections (refer to the *Quick Start Guide* for details). Check for faulty Ethernet cables.
	Make sure your computer’s Ethernet Card is working properly.
I cannot access the ZyXEL Device from the LAN.	Make sure that the IP address and the subnet mask of the ZyXEL Device and your computer(s) are on the same subnet.

38.3 Problems with the WAN

Table 135 Troubleshooting the WAN

PROBLEM	CORRECTIVE ACTION
The DSL LED is off.	Check the telephone wire and connections between the ZyXEL Device DSL port and the wall jack.
	Make sure that the telephone company has checked your phone line and set it up for DSL service.
	Reset your ADSL line to reinitialize your link to the DSLAM. For details, refer to Table 87 on page 244.
I cannot get a WAN IP address from the ISP.	The ISP provides the WAN IP address after authenticating you. Authentication may be through the user name and password, the MAC address or the host name. The username and password apply to PPPoE and PPPoA encapsulation only. Make sure that you have entered the correct **Service Type**, **User Name** and **Password** (be sure to use the correct casing). Refer to the WAN Setup chapter.
I cannot access the Internet.	Make sure the ZyXEL Device is turned on and connected to the network. Verify your WAN settings. Refer to the chapter on WAN setup. Make sure you entered the correct user name and password. If you use PPPoE pass through, make sure that bridge mode is turned on.
The Internet connection disconnects.	Check the schedule rules. If you use PPPoA or PPPoE encapsulation, check the idle time-out setting. Refer to the Chapter 5 on page 71. Contact your ISP.

38.4 Problems Accessing the ZyXEL Device

Table 136 Troubleshooting Accessing the ZyXEL Device

PROBLEM	CORRECTIVE ACTION
I cannot access the ZyXEL Device.	The default user password is "user" and admin password is "1234".The **Password** field is case-sensitive. Make sure that you enter the correct password using the proper case. If you have changed the password and have now forgotten it, you have to use the RESET button. See Section 2.5 on page 54.
I cannot access the web configurator.	Make sure there is not a telnet session running. Use the ZyXEL Device's WAN IP address when configuring from the WAN. Refer to the instructions on checking your WAN connection. Use the ZyXEL Device's LAN IP address when configuring from the LAN. Refer to for instructions on checking your LAN connection. Check that you have enabled web service access. If you have configured a secured client IP address, your computer's IP address must match it. Refer to the chapter on remote management for details. Your computer's and the ZyXEL Device's IP addresses must be on the same subnet for LAN access. If you changed the ZyXEL Device's LAN IP address, then enter the new one as the URL. Check that pop-up windows, JavaScripts and Java permissions are allowed (See Appendix D on page 383).

Appendix A
Product Specifications

Table 137 Device

Default IP Address	192.168.1.1
Default Subnet Mask	255.255.255.0 (24 bits)
Default Password	1234
DHCP Pool	192.168.1.33 to 192.168.1.64
Dimensions (W x D x H)	180 x 128 x 36 mm
Power Specification	12V AC 1A
Built-in Switch	Four auto-negotiating, auto MDI/MDI-X 10/100 Mbps RJ-45 Ethernet ports
G.SHDSL Port	RJ-11 interface Data Rate: 192 Kbps - 5700 Kbps, 192-11400kbps (4-wire mode) Line Code: TC-PAM modulation Line Impedance: 135 W Connection Loops: one pair (2-wire) or two pairs (4-wire)
Operation Temperature	0º C ~ 40º C
Storage Temperature	-20º ~ 60º C
Operation Humidity	20% ~ 90% RH
Storage Humidity	10% ~ 90% RH
Distance between the centers of the holes on the device’s back.	108 mm
Screw size for wall-mounting	M3*10

Table 138 Firmware

Routing/Bridge Support	IP (RFC 791) routing is supported. TCP, UDP, ICMP, IGMP v1 and v2, ARP, RIP v1, RIP v2 Transparent bridging (IEEE 802.1D) PPP BCP (RFC 3185) support
G.SHDSL	TC-PAM line modulation Configurable as either server or client mode Rate negotiating / Manually rate adaptation configuration 2-wire and 4-wire mode auto detect - Data Rate Selections: From 192 kbps to 5700 kbps (2-wire mode) - Data Rate Selections: From 192 kbps to 11400 kbps (4-wire mode)

Table 138 Firmware (continued)

ATM Support	Multiple protocols over AAL5 (RFC1483) PPP over ATM (RFC 2364) PPP over Ethernet (RFC2516) ATM AAL5 supported Support 8 PVCs ATM Forum UNI3.0/4.0 PVC UBR CBR, and VBR traffic shaping
Internet Access Sharing	NAT (includes multi-to-multi NAT) / SUA, 2048 NAT sessions Port restricted cone NAT SIP ALG pass-through NAT server (Port forwarding) Multi-NAT Dynamic DNS (www.dyndns.org) DHCP server/client/relay
Security	User Authentication (PAP, CHAP) with PPP (RFC 1334, RFC 1994) Microsoft CHAP Stateful packet inspection firewall Content filter Prevent Denial of service Access control of service Real-time attack alert and log
Network Management	Web-based Configuration Command-line interface Password-protected Telnet support SNMP MIB I /MIB II support TFTP & FTP firmware upgrade and configuration backup
VPN	IPSec VPN support 10 VPN tunnels IKE/ Manual Key DES/ 3DES/AES Encryption software MD5/ SHA1 Authentication FQDN NETBIOS pass-through for IPSec IPSec VPN keep-alive IPSec NAT Traversal
Diagnostics Capabilities (for the following circuitry)	FLASH memory SDSL circuitry RAM LAN port
Others	DNS Proxy UNIX syslog

APPENDIX B
Wall-mounting Instructions

Do the following to hang your ZyXEL Device on a wall.

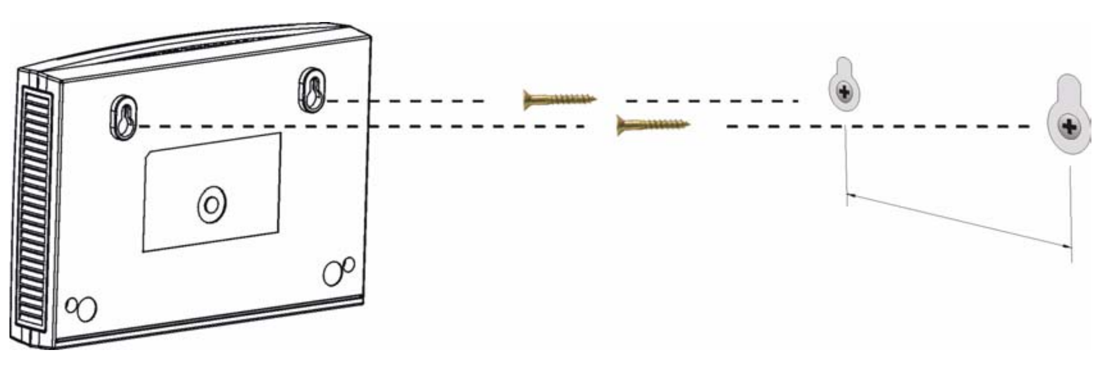
Note: See the product specifications appendix for the size of screws to use and how far apart to place them.

1. Locate a high position on wall that is free of obstructions. Use a sturdy wall.
2. Drill two holes for the screws. Make sure the distance between the centers of the holes matches what is listed in the product specifications appendix.

Note: Be careful to avoid damaging pipes or cables located inside the wall when drilling holes for the screws.

3. Do not screw the screws all the way into the wall. Leave a small gap of about 0.5 cm between the heads of the screws and the wall.
4. Make sure the screws are snugly fastened to the wall. They need to hold the weight of the ZyXEL Device with the connection cables.
5. Align the holes on the back of the ZyXEL Device with the screws on the wall. Hang the ZyXEL Device on the screws.

Figure 240 Wall-mounting Example



Appendix C Setting up Your Computer’s IP Address

All computers must have a 10M or 100M Ethernet adapter card and TCP/IP installed.

Windows 95/98/Me/NT/2000/XP, Macintosh OS 7 and later operating systems and all versions of UNIX/LINUX include the software components you need to install and use TCP/IP on your computer. Windows 3.1 requires the purchase of a third-party TCP/IP application package.

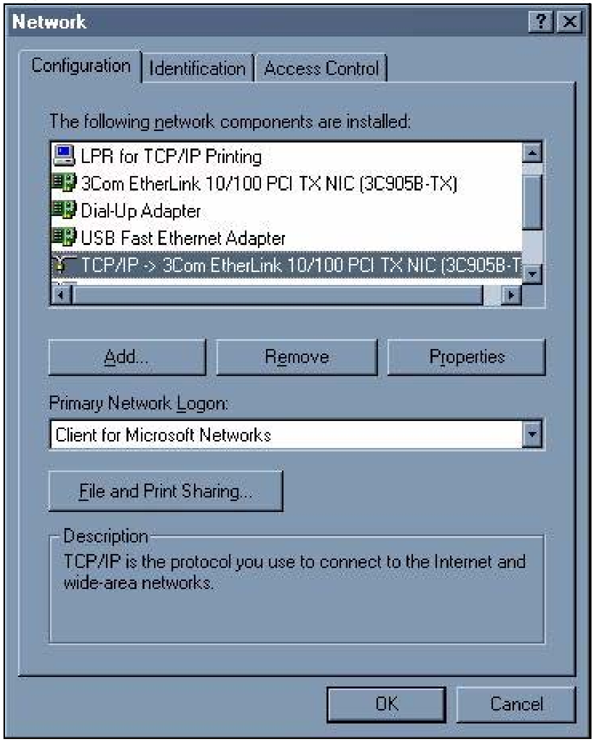
TCP/IP should already be installed on computers using Windows NT/2000/XP, Macintosh OS 7 and later operating systems.

After the appropriate TCP/IP components are installed, configure the TCP/IP settings in order to “communicate” with your network.

Windows 95/98/Me

Click **Start**, **Settings**, **Control Panel** and double-click the **Network** icon to open the **Network** window.

Figure 241 WIndows 95/98/Me: Network: Configuration



The following network components are installed:

- LPR for TCP/IP Printing
- 3Com EtherLink 10/100 PCI TX NIC (3C905B-TX)
- Dial-Up Adapter
- USB Fast Ethernet Adapter
- TCP/IP -> 3Com EtherLink 10/100 PCI TX NIC (3C905B-T

Primary Network Logon: Client for Microsoft Networks

Description
TCP/IP is the protocol you use to connect to the Internet and wide-area networks.

Installing Components

The **Network** window **Configuration** tab displays a list of installed components. You need a network adapter, the TCP/IP protocol and Client for Microsoft Networks.

If you need the adapter:

1 In the **Network** window, click **Add**.

2 Select **Adapter** and then click **Add**.

3 Select the manufacturer and model of your network adapter and then click **OK**.

If you need TCP/IP:

1 In the **Network** window, click **Add**.

2 Select **Protocol** and then click **Add**.

3 Select **Microsoft** from the list of **manufacturers**.

4 Select **TCP/IP** from the list of network protocols and then click **OK**.

If you need Client for Microsoft Networks:

1 Click **Add**.

2 Select **Client** and then click **Add**.

3 Select **Microsoft** from the list of manufacturers.

4 Select **Client for Microsoft Networks** from the list of network clients and then click **OK**.

5 Restart your computer so the changes you made take effect.

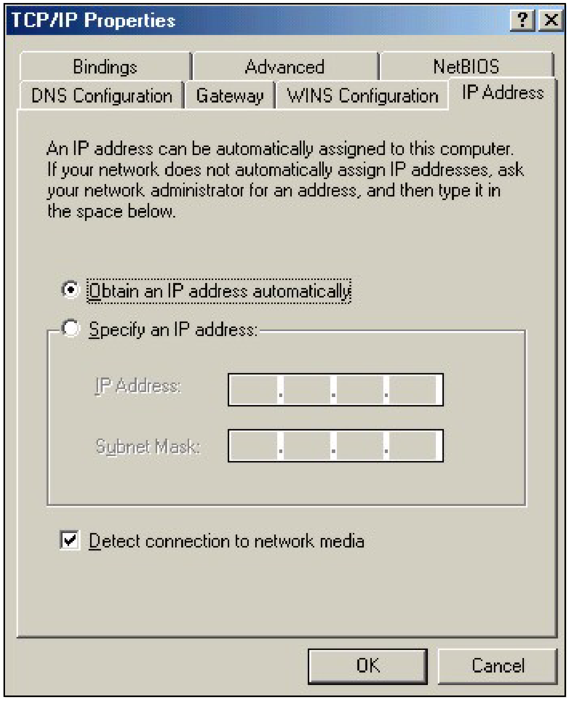
Configuring

1 In the **Network** window **Configuration** tab, select your network adapter's TCP/IP entry and click **Properties**

2 Click the **IP Address** tab.

- If your IP address is dynamic, select **Obtain an IP address automatically**.
- If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.

Figure 242 Windows 95/98/Me: TCP/IP Properties: IP Address



TCP/IP Properties

? ×
Bindings | Advanced | NetBIOS
DNS Configuration | Gateway | WINS Configuration | IP Address

An IP address can be automatically assigned to this computer. If your network does not automatically assign IP addresses, ask your network administrator for an address, and then type it in the space below.

● Obtain an IP address automatically

○ Specify an IP address:

IP Address: . . .

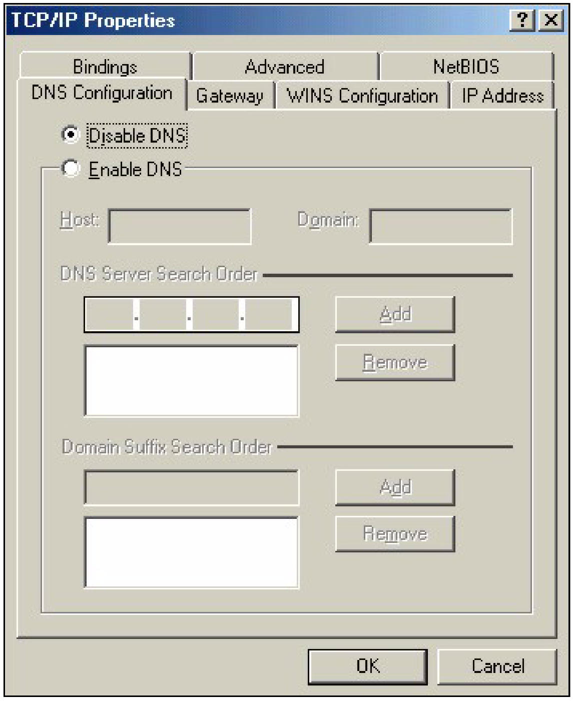
Subnet Mask: . . .

☑ Detect connection to network media

3 Click the **DNS** Configuration tab.

- If you do not know your DNS information, select **Disable DNS**.
- If you know your DNS information, select **Enable DNS** and type the information in the fields below (you may not need to fill them all in).

Figure 243 Windows 95/98/Me: TCP/IP Properties: DNS Configuration



TCP/IP Properties

? ×
Bindings | Advanced | NetBIOS
DNS Configuration | Gateway | WINS Configuration | IP Address

● Disable DNS

○ Enable DNS

Host:

Domain:

DNS Server Search Order

Domain Suffix Search Order

4 Click the **Gateway** tab.

- If you do not know your gateway’s IP address, remove previously installed gateways.
- If you have a gateway IP address, type it in the **New gateway field** and click **Add**.

5 Click **OK** to save and close the **TCP/IP Properties** window.

6 Click **OK** to close the **Network** window. Insert the Windows CD if prompted.

7 Restart your computer when prompted.

Verifying Settings

1 Click **Start** and then **Run**.

2 In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.

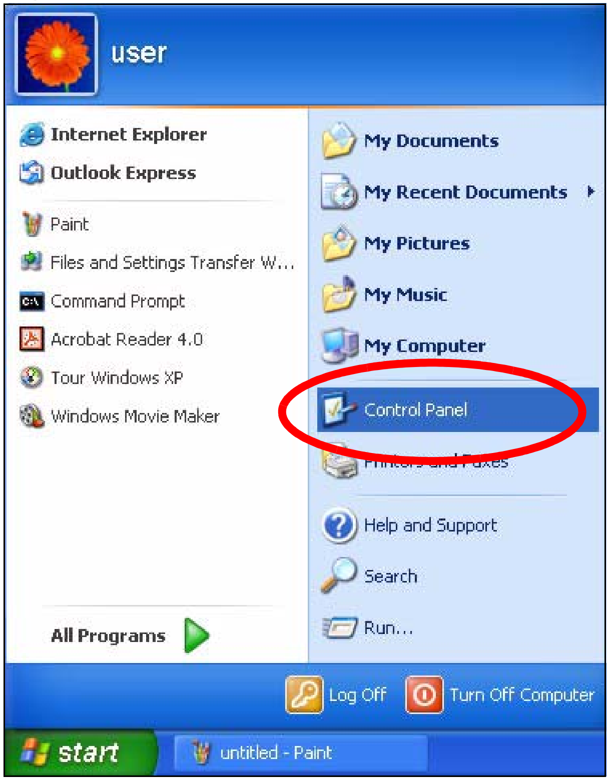
3 Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

Windows 2000/NT/XP

The following example figures use the default Windows XP GUI theme.

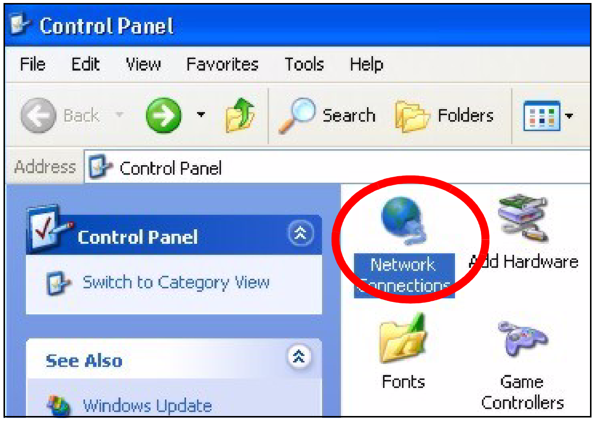
1 Click **start** (**Start** in Windows 2000/NT), **Settings**, **Control Panel**.

Figure 244 Windows XP: Start Menu



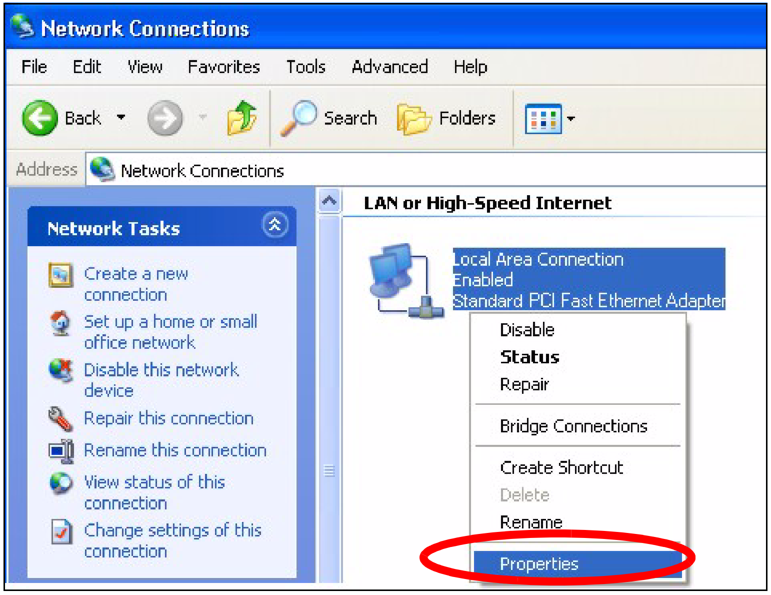
2 In the **Control Panel**, double-click **Network Connections** (**Network and Dial-up Connections** in Windows 2000/NT).

Figure 245 Windows XP: Control Panel



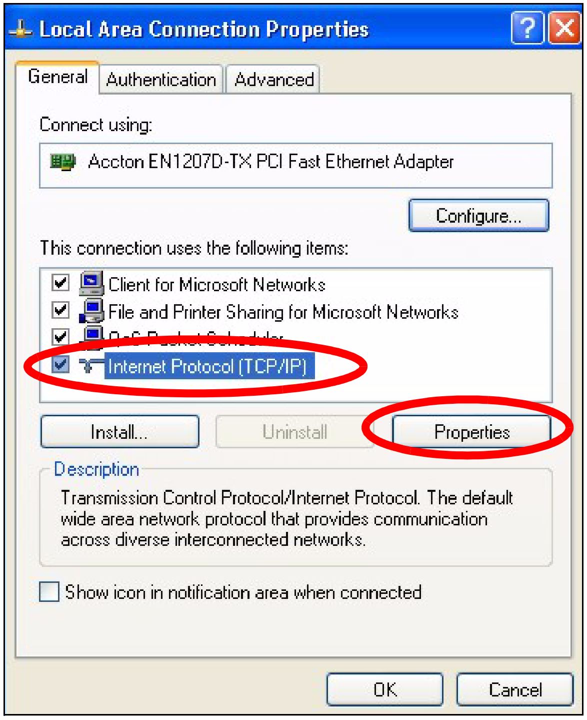
3 Right-click **Local Area Connection** and then click **Properties**.

Figure 246 Windows XP: Control Panel: Network Connections: Properties



4 Select **Internet Protocol (TCP/IP)** (under the **General** tab in Win XP) and then click **Properties**.

Figure 247 Windows XP: Local Area Connection Properties



Connect using:

Accton EN1207D-TX PCI Fast Ethernet Adapter

This connection uses the following items:

☑ Client for Microsoft Networks
☑ File and Printer Sharing for Microsoft Networks
☑ QoS Packet Scheduler
☑ Internet Protocol (TCP/IP)

Description

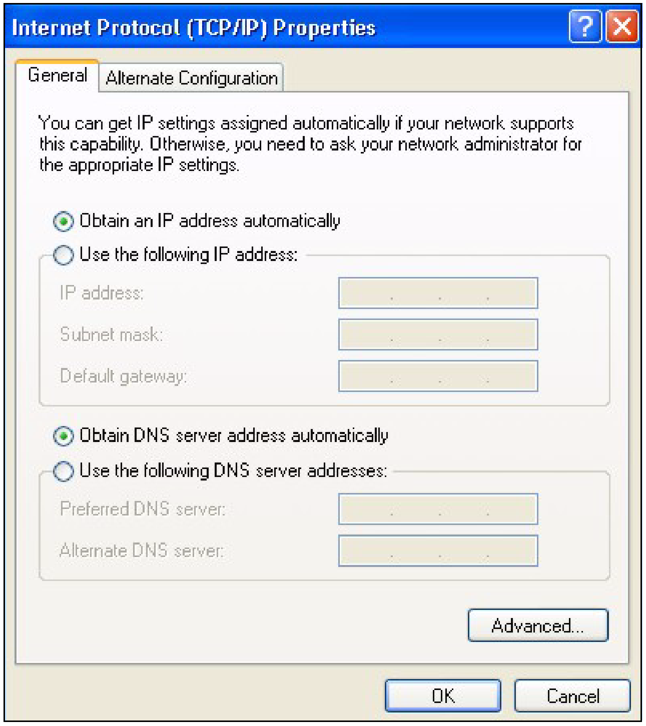
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

□ Show icon in notification area when connected

5 The **Internet Protocol TCP/IP Properties** window opens (the **General tab** in Windows XP).

- If you have a dynamic IP address click **Obtain an IP address automatically**.
- If you have a static IP address click **Use the following IP Address** and fill in the **IP address**, **Subnet mask**, and **Default gateway** fields.
- Click **Advanced**.

Figure 248 Windows XP: Internet Protocol (TCP/IP) Properties



Internet Protocol (TCP/IP) Properties

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically

○ Use the following IP address:

IP address: . . .

Subnet mask: . . .

Default gateway: . . .

● Obtain DNS server address automatically

○ Use the following DNS server addresses:

Preferred DNS server: . . .

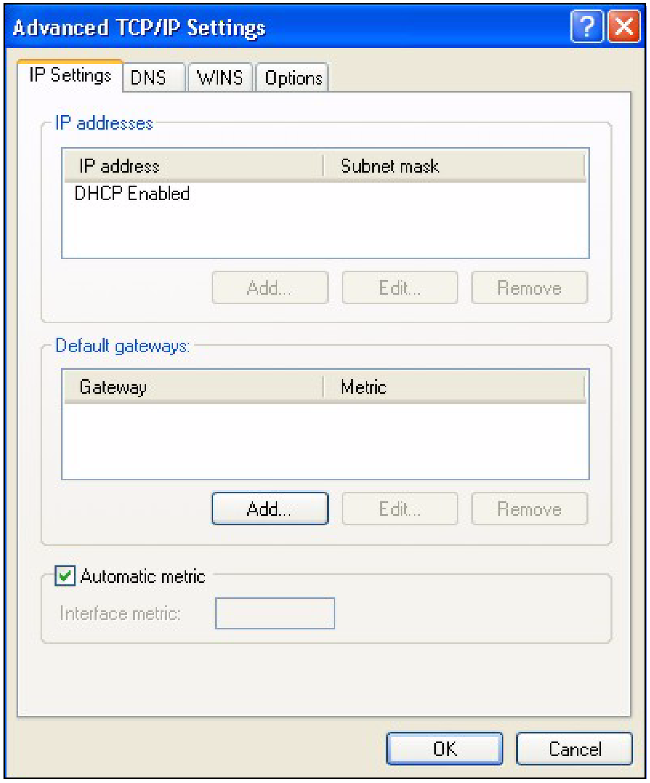
Alternate DNS server: . . .

6 If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Settings** tab and click **OK**.

Do one or more of the following if you want to configure additional IP addresses:

- In the **IP Settings** tab, in IP addresses, click **Add**.
- In **TCP/IP Address**, type an IP address in **IP address** and a subnet mask in **Subnet mask**, and then click **Add**.
- Repeat the above two steps for each IP address you want to add.
- Configure additional default gateways in the **IP Settings** tab by clicking **Add** in **Default gateways**.
- In **TCP/IP Gateway Address**, type the IP address of the default gateway in **Gateway**. To manually configure a default metric (the number of transmission hops), clear the **Automatic metric** check box and type a metric in **Metric**.
- Click **Add**.
- Repeat the previous three steps for each default gateway you want to add.
- Click **OK** when finished.

Figure 249 Windows XP: Advanced TCP/IP Properties



IP address	Subnet mask
DHCP Enabled	

Gateway	Metric

☑ Automatic metric

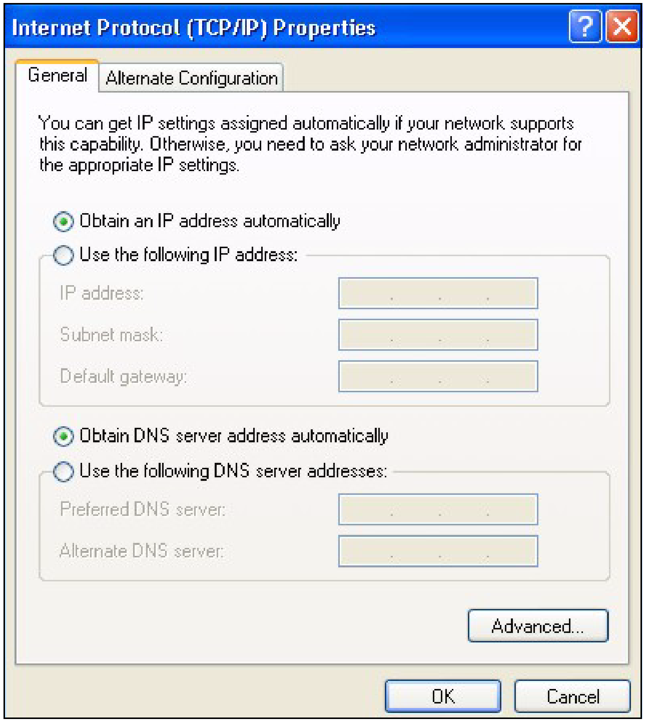
Interface metric:

7 In the **Internet Protocol TCP/IP Properties** window (the **General** tab in Windows XP):

- Click **Obtain DNS server address automatically** if you do not know your DNS server IP address(es).
- If you know your DNS server IP address(es), click **Use the following DNS server addresses**, and type them in the **Preferred DNS server** and **Alternate DNS server** fields.

  If you have previously configured DNS servers, click **Advanced** and then the **DNS** tab to order them.

Figure 250 Windows XP: Internet Protocol (TCP/IP) Properties



Internet Protocol (TCP/IP) Properties

General | Alternate Configuration

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically

○ Use the following IP address:

IP address: . . .

Subnet mask: . . .

Default gateway: . . .

● Obtain DNS server address automatically

○ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

8 Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.

9 Click **Close** (**OK** in Windows 2000/NT) to close the **Local Area Connection Properties** window.

10 Close the **Network Connections** window (**Network and Dial-up Connections** in Windows 2000/NT).

11 Restart your computer (if prompted).

Verifying Settings

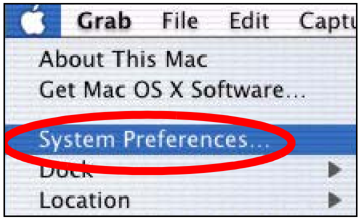
1 Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.

2 In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Macintosh OS X

1 Click the **Apple** menu, and click **System Preferences** to open the **System Preferences** window.

Figure 251 Macintosh OS X: Apple Menu

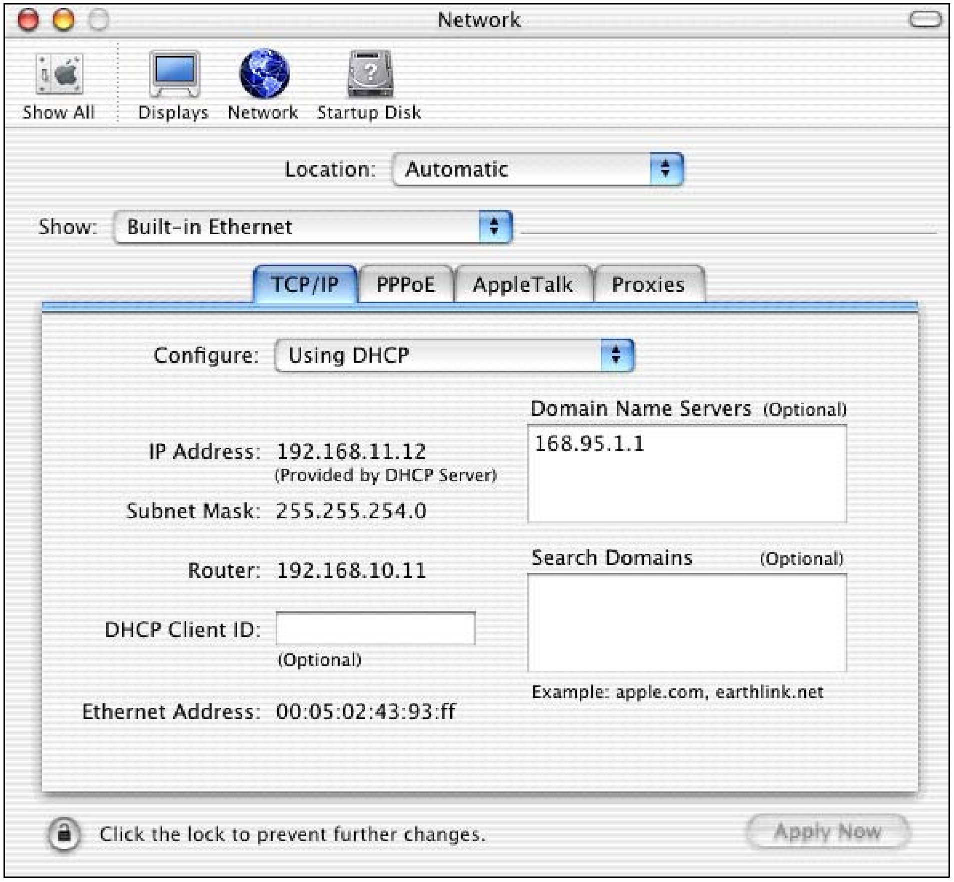


2 Click **Network** in the icon bar.

- Select **Automatic** from the **Location** list.
- Select **Built-in Ethernet** from the **Show** list.
- Click the **TCP/IP** tab.

3 For dynamically assigned settings, select **Using DHCP** from the **Configure** list.

Figure 252 Macintosh OS X: Network



Location: Automatic

Show: Built-in Ethernet

Configure: Using DHCP

IP Address: 192.168.11.12
(Provided by DHCP Server)

Subnet Mask: 255.255.254.0

Router: 192.168.10.11

DHCP Client ID:
(Optional)

Ethernet Address: 00:05:02:43:93:ff

Domain Name Servers (Optional)
168.95.1.1

Search Domains (Optional)

Example: apple.com, earthlink.net

Click the lock to prevent further changes.

4 For statically assigned settings, do the following:

- From the **Configure** box, select **Manually**.
- Type your IP address in the **IP Address** box.
- Type your subnet mask in the **Subnet mask** box.
- Type the IP address of your gateway in the **Router address** box.

5 Click **Apply Now** and close the window.

6 Restart your computer (if prompted).

Verifying Settings

Check your TCP/IP properties in the **Network** window.

Linux

This section shows you how to configure your computer's TCP/IP settings in Red Hat Linux 9.0. Procedure, screens and file location may vary depending on your Linux distribution and release version.

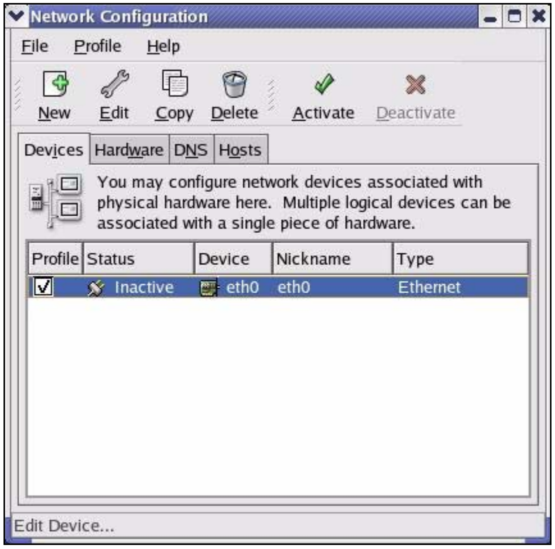
Note: Make sure you are logged in as the root administrator.

Using the K Desktop Environment (KDE)

Follow the steps below to configure your computer IP address using the KDE.

1 Click the Red Hat button (located on the bottom left corner), select **System Setting** and click **Network**.

Figure 253 Red Hat 9.0: KDE: Network Configuration: Devices



Network Configuration

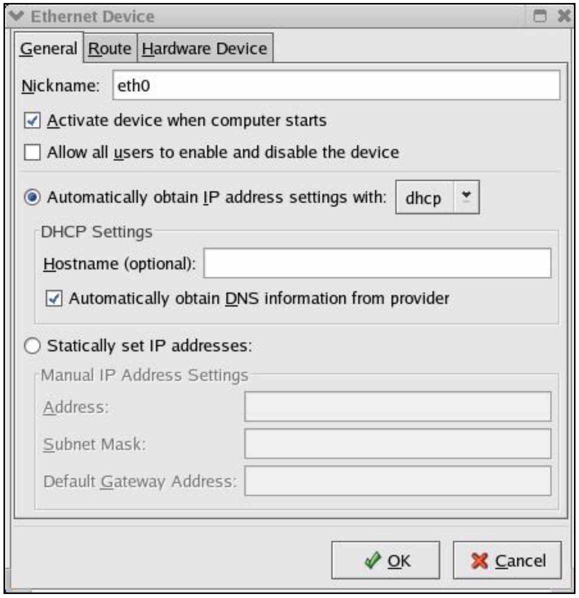
You may configure network devices associated with physical hardware here. Multiple logical devices can be associated with a single piece of hardware.

Profile	Status	Device	Nickname	Type
☑	Inactive	eth0	eth0	Ethernet

Edit Device...

2 Double-click on the profile of the network card you wish to configure. The **Ethernet Device General** screen displays as shown.

Figure 254 Red Hat 9.0: KDE: Ethernet Device: General



Nickname: eth0

☑ Activate device when computer starts

□ Allow all users to enable and disable the device

● Automatically obtain IP address settings with: dhcp

DHCP Settings

Hostname (optional):

☑ Automatically obtain DNS information from provider

○ Statically set IP addresses:

Manual IP Address Settings

Address:

Subnet Mask:

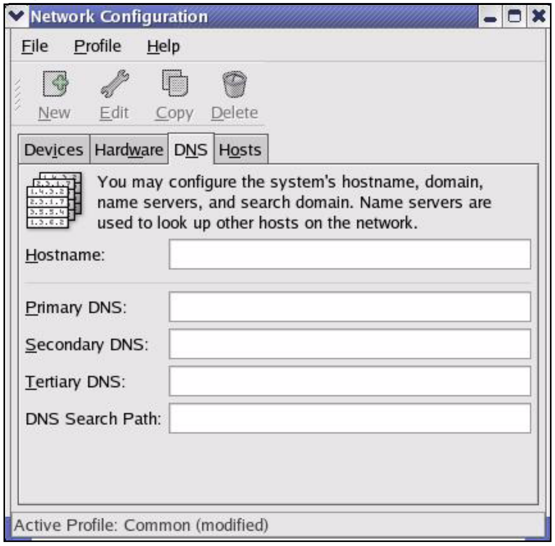
Default Gateway Address:

- If you have a dynamic IP address, click **Automatically obtain IP address settings with** and select **dhcp** from the drop down list.
- If you have a static IP address, click **Statically set IP Addresses** and fill in the **Address**, **Subnet mask**, and **Default Gateway Address** fields.

3 Click **OK** to save the changes and close the **Ethernet Device General** screen.

4 If you know your DNS server IP address(es), click the **DNS** tab in the **Network Configuration** screen. Enter the DNS server information in the fields provided.

Figure 255 Red Hat 9.0: KDE: Network Configuration: DNS



You may configure the system's hostname, domain, name servers, and search domain. Name servers are used to look up other hosts on the network.

Hostname:

Primary DNS:

Secondary DNS:

Tertiary DNS:

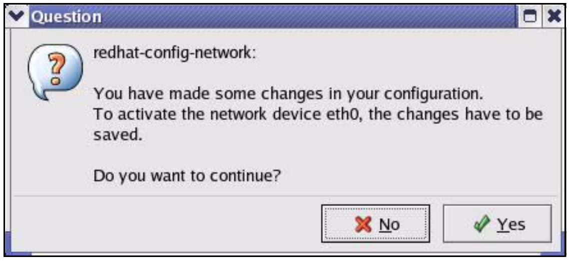
DNS Search Path:

Active Profile: Common (modified)

5 Click the **Devices** tab.

6 Click the **Activate** button to apply the changes. The following screen displays. Click **Yes** to save the changes in all screens.

Figure 256 Red Hat 9.0: KDE: Network Configuration: Activate



Question

redhat-config-network:

You have made some changes in your configuration.
To activate the network device eth0, the changes have to be saved.

Do you want to continue?

7 After the network card restart process is complete, make sure the **Status** is **Active** in the **Network Configuration** screen.

Using Configuration Files

Follow the steps below to edit the network configuration files and set your computer IP address.

1 Assuming that you have only one network card on the computer, locate the `ifconfig-eth0` configuration file (where `eth0` is the name of the Ethernet card). Open the configuration file with any plain text editor.

- If you have a dynamic IP address, enter **`dhcp`** in the `BOOTPROTO=` field. The following figure shows an example.

Figure 257 Red Hat 9.0: Dynamic IP Address Setting in ifconfig-eth0

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=dhcp
USERCTL=no
PEERDNS=yes
TYPE=Ethernet
```

- If you have a static IP address, enter **`static`** in the `BOOTPROTO=` field. Type `IPADDR=` followed by the IP address (in dotted decimal notation) and type `NETMASK=` followed by the subnet mask. The following example shows an example where the static IP address is 192.168.1.10 and the subnet mask is 255.255.255.0.

Figure 258 Red Hat 9.0: Static IP Address Setting in ifconfig-eth0

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=static
IPADDR=192.168.1.10
NETMASK=255.255.255.0
USERCTL=no
PEERDNS=yes
TYPE=Ethernet
```

2 If you know your DNS server IP address(es), enter the DNS server information in the `resolv.conf` file in the `/etc` directory. The following figure shows an example where two DNS server IP addresses are specified.

Figure 259 Red Hat 9.0: DNS Settings in resolv.conf

```
nameserver 172.23.5.1
nameserver 172.23.5.2
```

3 After you edit and save the configuration files, you must restart the network card. Enter `./network restart` in the `/etc/rc.d/init.d` directory. The following figure shows an example.

Figure 260 Red Hat 9.0: Restart Ethernet Card

```
[root@localhost init.d]# network restart

Shutting down interface eth0:                  [OK]
Shutting down loopback interface:              [OK]
Setting network parameters:                    [OK]
Bringing up loopback interface:                [OK]
Bringing up interface eth0:                    [OK]
```

Verifying Settings

Enter `ifconfig` in a terminal screen to check your TCP/IP properties.

Figure 261 Red Hat 9.0: Checking TCP/IP Properties

```
[root@localhost]# ifconfig
eth0      Link encap:Ethernet HWaddr 00:50:BA:72:5B:44
          inet addr:172.23.19.129 Bcast:172.23.19.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:717 errors:0 dropped:0 overruns:0 frame:0
          TX packets:13 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:100
          RX bytes:730412 (713.2 Kb) TX bytes:1570 (1.5 Kb)
          Interrupt:10 Base address:0x1000
[root@localhost]#
```

APPENDIX D
Pop-up Windows, JavaScripts and Java Permissions

In order to use the web configurator you need to allow:

- Web browser pop-up windows from your device.
- JavaScripts (enabled by default).
- Java permissions (enabled by default).

Note: Internet Explorer 6 screens are used here. Screens for other Internet Explorer versions may vary.

Internet Explorer Pop-up Blockers

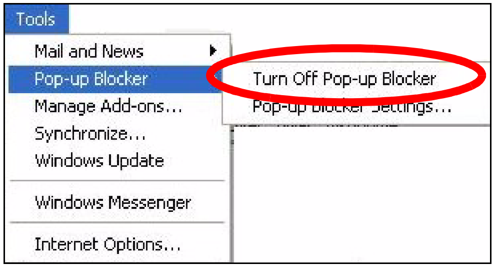
You may have to disable pop-up blocking to log into your device.

Either disable pop-up blocking (enabled by default in Windows XP SP (Service Pack) 2) or allow pop-up blocking and create an exception for your device’s IP address.

Disable pop-up Blockers

1 In Internet Explorer, select **Tools**, **Pop-up Blocker** and then select **Turn Off Pop-up Blocker**.

Figure 262 Pop-up Blocker

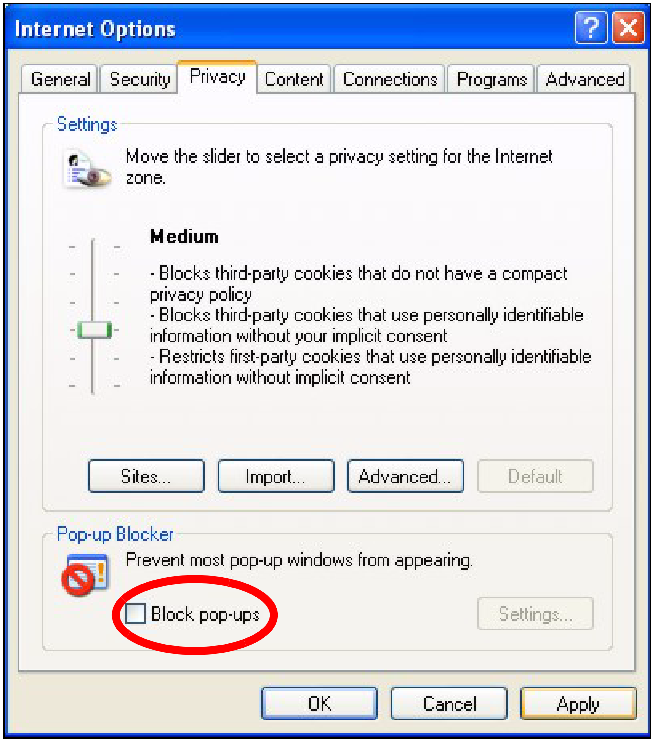


You can also check if pop-up blocking is disabled in the **Pop-up Blocker** section in the **Privacy** tab.

1 In Internet Explorer, select **Tools**, **Internet Options**, **Privacy**.

2 Clear the **Block pop-ups** check box in the **Pop-up Blocker** section of the screen. This disables any web pop-up blockers you may have enabled.

Figure 263 Internet Options



Move the slider to select a privacy setting for the Internet zone.

Medium

- Blocks third-party cookies that do not have a compact privacy policy
- Blocks third-party cookies that use personally identifiable information without your implicit consent
- Restricts first-party cookies that use personally identifiable information without implicit consent

Prevent most pop-up windows from appearing.

□ Block pop-ups

3 Click **Apply** to save this setting.

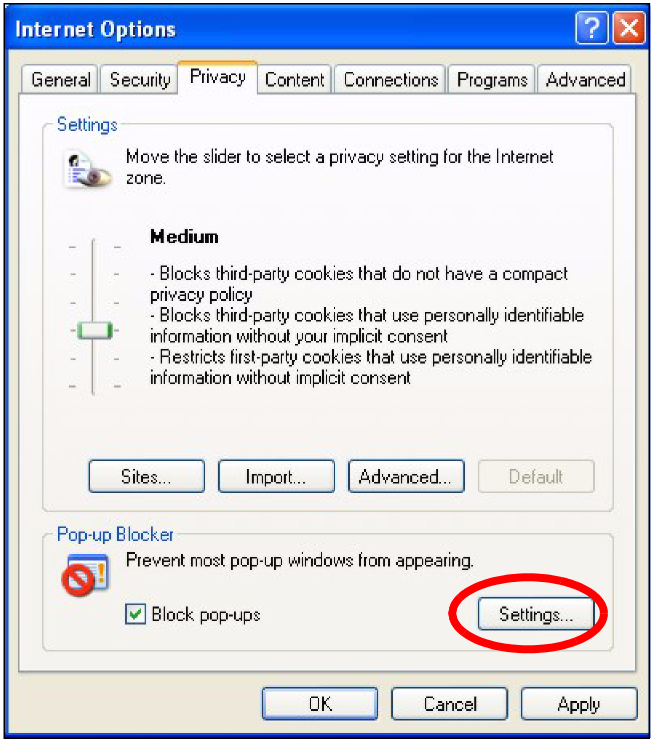
Enable pop-up Blockers with Exceptions

Alternatively, if you only want to allow pop-up windows from your device, see the following steps.

1 In Internet Explorer, select **Tools**, **Internet Options** and then the **Privacy** tab.

2 Select **Settings…**to open the **Pop-up Blocker Settings** screen.

Figure 264 Internet Options



Move the slider to select a privacy setting for the Internet zone.

Medium

- Blocks third-party cookies that do not have a compact privacy policy
- Blocks third-party cookies that use personally identifiable information without your implicit consent
- Restricts first-party cookies that use personally identifiable information without implicit consent

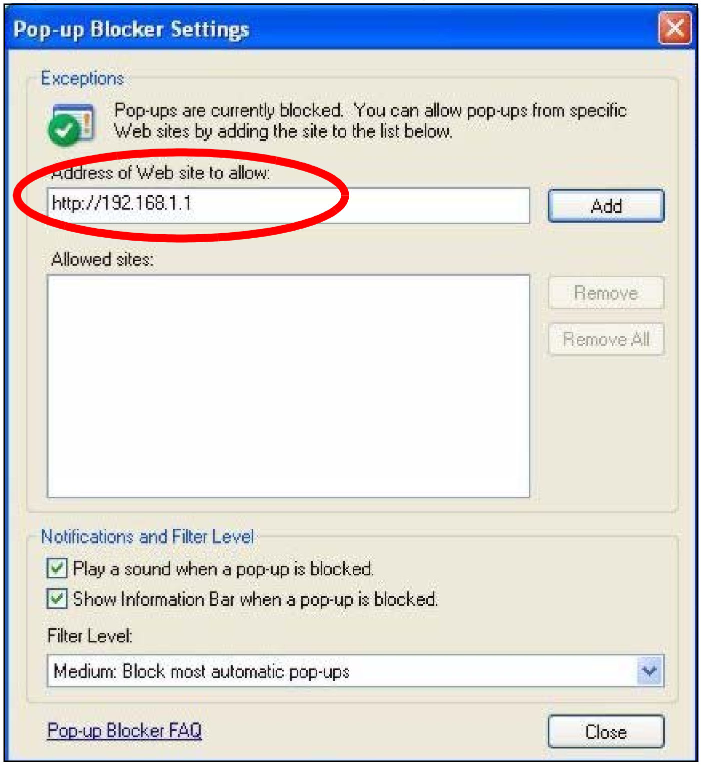
Prevent most pop-up windows from appearing.

☑ Block pop-ups

3 Type the IP address of your device (the web page that you do not want to have blocked) with the prefix "http://". For example, http://192.168.1.1.

4 Click **Add** to move the IP address to the list of **Allowed sites**.

Figure 265 Pop-up Blocker Settings



Pop-ups are currently blocked. You can allow pop-ups from specific Web sites by adding the site to the list below.

Address of Web site to allow: http://192.168.1.1

☑ Play a sound when a pop-up is blocked.

☑ Show Information Bar when a pop-up is blocked.

Filter Level: Medium: Block most automatic pop-ups

5 Click **Close** to return to the **Privacy** screen.

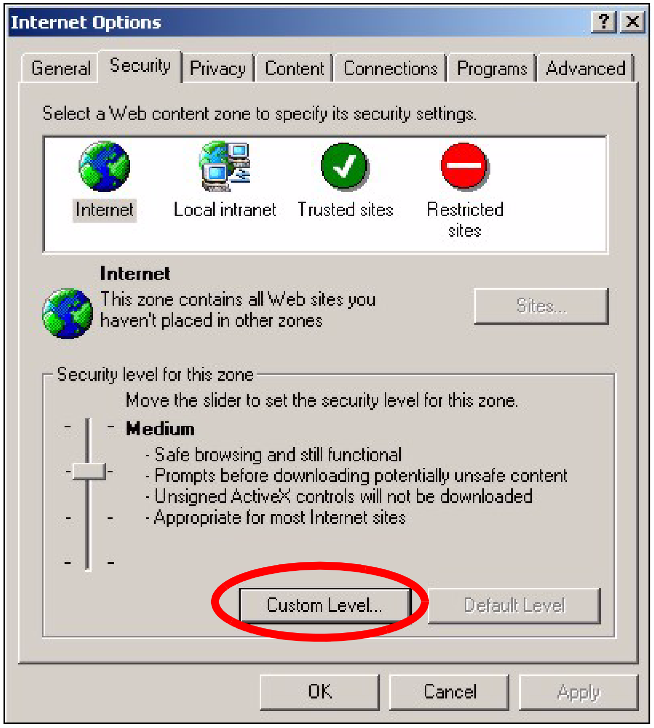
6 Click **Apply** to save this setting.

JavaScripts

If pages of the web configurator do not display properly in Internet Explorer, check that JavaScripts are allowed.

1 In Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.

Figure 266 Internet Options



Select a Web content zone to specify its security settings.

Internet

This zone contains all Web sites you haven't placed in other zones

Security level for this zone

Move the slider to set the security level for this zone.

Medium

- Safe browsing and still functional
- Prompts before downloading potentially unsafe content
- Unsigned ActiveX controls will not be downloaded
- Appropriate for most Internet sites

2 Click the **Custom Level...** button.

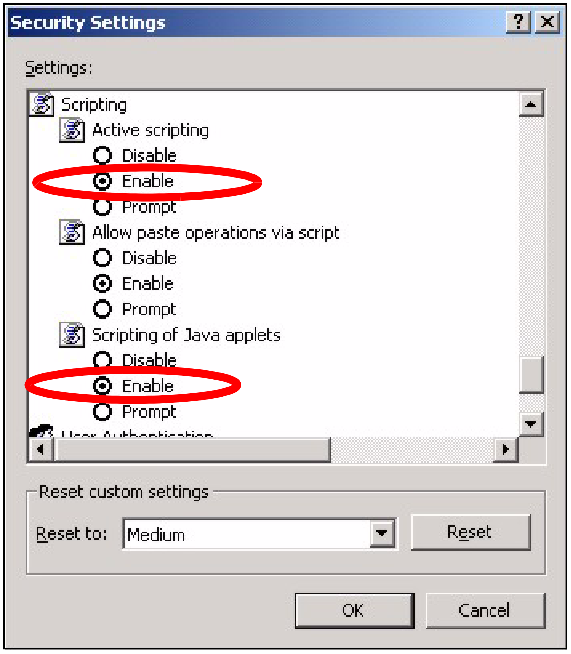
3 Scroll down to **Scripting**.

4 Under **Active scripting** make sure that **Enable** is selected (the default).

5 Under **Scripting of Java applets** make sure that **Enable** is selected (the default).

6 Click **OK** to close the window.

Figure 267 Security Settings - Java Scripting



Settings:

- Scripting
  - Active scripting
    - ○ Disable
    - ● Enable
    - ○ Prompt
  - Allow paste operations via script
    - ○ Disable
    - ● Enable
    - ○ Prompt
  - Scripting of Java applets
    - ○ Disable
    - ● Enable
    - ○ Prompt
- User Authentication

Reset custom settings

Reset to: Medium

Java Permissions

1 From Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.

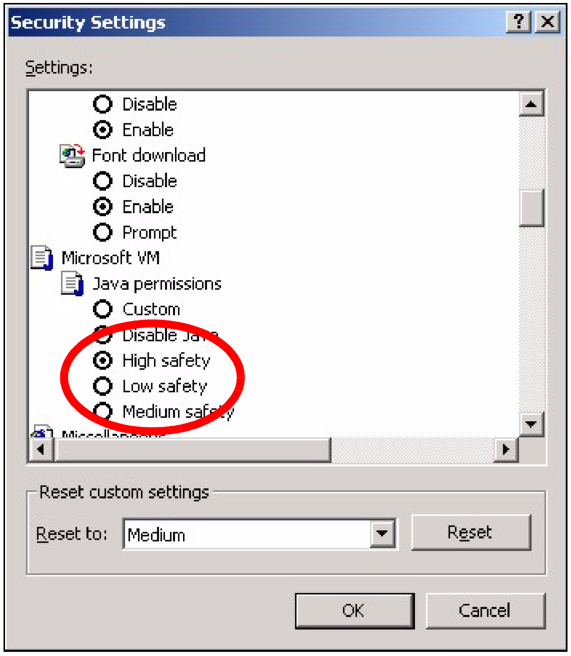
2 Click the **Custom Level...** button.

3 Scroll down to **Microsoft VM**.

4 Under **Java permissions** make sure that a safety level is selected.

5 Click **OK** to close the window.

Figure 268 Security Settings - Java



Security Settings

Settings:

- ○ Disable
- ● Enable
- Font download
  - ○ Disable
  - ● Enable
  - ○ Prompt
- Microsoft VM
  - Java permissions
    - ○ Custom
    - ○ Disable Java
    - ● High safety
    - ○ Low safety
    - ○ Medium safety
- Miscellaneous

Reset custom settings

Reset to: Medium ▼ Reset

OK Cancel

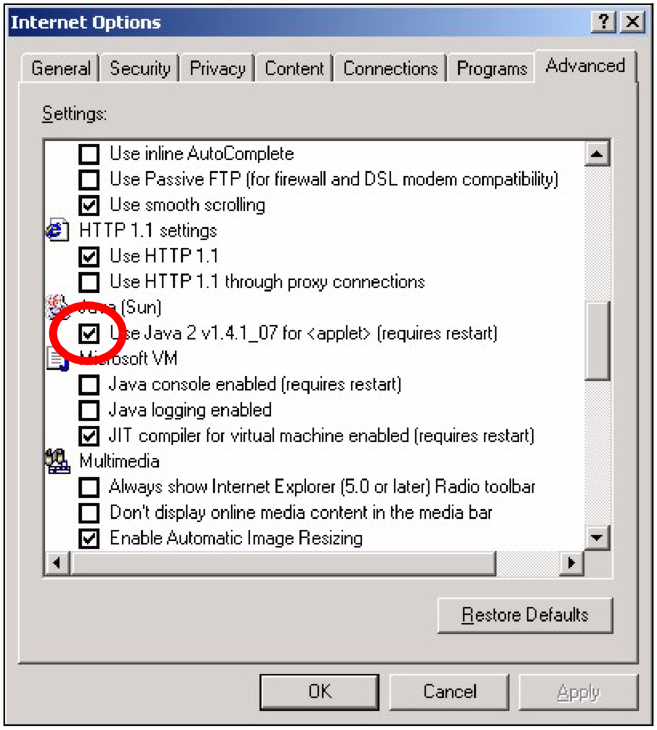
JAVA (Sun)

1 From Internet Explorer, click **Tools**, **Internet Options** and then the **Advanced** tab.

2 make sure that **Use Java 2 for <applet>** under **Java (Sun)** is selected.

3 Click **OK** to close the window.

Figure 269 Java (Sun)



Internet Options

General | Security | Privacy | Content | Connections | Programs | Advanced

Settings:

- □ Use inline AutoComplete
- □ Use Passive FTP (for firewall and DSL modem compatibility)
- ☑ Use smooth scrolling
- HTTP 1.1 settings
  - ☑ Use HTTP 1.1
  - □ Use HTTP 1.1 through proxy connections
- Java (Sun)
  - ☑ Use Java 2 v1.4.1_07 for <applet> (requires restart)
- Microsoft VM
  - □ Java console enabled (requires restart)
  - □ Java logging enabled
  - ☑ JIT compiler for virtual machine enabled (requires restart)
- Multimedia
  - □ Always show Internet Explorer (5.0 or later) Radio toolbar
  - □ Don't display online media content in the media bar
  - ☑ Enable Automatic Image Resizing

Restore Defaults

OK Cancel Apply

APPENDIX E
Services

The following table lists some commonly-used services and their associated protocols and port numbers.

- **Name**: This is a short, descriptive name for the service. You can use this one or create a different one, if you like.
- **Protocol**: This is the type of IP protocol used by the service. If this is **TCP/UDP**, then the service uses the same port number with TCP and UDP. If this is **USER-DEFINED**, the **Port(s)** is the IP protocol number, not the port number.
- **Port(s)**: This value depends on the **Protocol**.
  - If the **Protocol** is **TCP**, **UDP**, or **TCP/UDP**, this is the IP port number.
  - If the **Protocol** is **USER**, this is the IP protocol number.
- **Description**: This is a brief explanation of the applications that use this service or the situations in which this service is used.

Table 139 Examples of Services

NAME	PROTOCOL	PORT(S)	DESCRIPTION
AH (IPSEC_TUNNEL)	User-Defined	51	The IPSEC AH (Authentication Header) tunneling protocol uses this service.
AIM	TCP	5190	AOL’s Internet Messenger service.
AUTH	TCP	113	Authentication protocol used by some servers.
BGP	TCP	179	Border Gateway Protocol.
BOOTP_CLIENT	UDP	68	DHCP Client.
BOOTP_SERVER	UDP	67	DHCP Server.
CU-SEEME	TCP/UDP TCP/UDP	7648 24032	A popular videoconferencing solution from White Pines Software.
DNS	TCP/UDP	53	Domain Name Server, a service that matches web names (e.g. www.zyxel.com) to IP numbers.
ESP (IPSEC_TUNNEL)	User-Defined	50	The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service.
FINGER	TCP	79	Finger is a UNIX or Internet related command that can be used to find out if a user is logged on.
FTP	TCP TCP	20 21	File Transfer Program, a program to enable fast transfer of files, including large files that may not be possible by e-mail.
H.323	TCP	1720	NetMeeting uses this protocol.

Table 139 Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
HTTP	TCP	80	Hyper Text Transfer Protocol - a client/server protocol for the world wide web.
HTTPS	TCP	443	HTTPS is a secured http session often used in e-commerce.
ICMP	User-Defined	1	Internet Control Message Protocol is often used for diagnostic purposes.
ICQ	UDP	4000	This is a popular Internet chat program.
IGMP (MULTICAST)	User-Defined	2	Internet Group Multicast Protocol is used when sending packets to a specific group of hosts.
IKE	UDP	500	The Internet Key Exchange algorithm is used for key distribution and management.
IMAP4	TCP	143	The Internet Message Access Protocol is used for e-mail.
IMAP4S	TCP	993	This is a more secure version of IMAP4 that runs over SSL.
IRC	TCP/UDP	6667	This is another popular Internet chat program.
MSN Messenger	TCP	1863	Microsoft Networks' messenger service uses this protocol.
NetBIOS	TCP/UDP TCP/UDP TCP/UDP TCP/UDP	137 138 139 445	The Network Basic Input/Output System is used for communication between computers in a LAN.
NEW-ICQ	TCP	5190	An Internet chat program.
NEWS	TCP	144	A protocol for news groups.
NFS	UDP	2049	Network File System - NFS is a client/server distributed file service that provides transparent file sharing for network environments.
NNTP	TCP	119	Network News Transport Protocol is the delivery mechanism for the USENET newsgroup service.
PING	User-Defined	1	Packet INternet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable.
POP3	TCP	110	Post Office Protocol version 3 lets a client computer get e-mail from a POP3 server through a temporary connection (TCP/IP or other).
POP3S	TCP	995	This is a more secure version of POP3 that runs over SSL.
PPTP	TCP	1723	Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel.
PPTP_TUNNEL (GRE)	User-Defined	47	PPTP (Point-to-Point Tunneling Protocol) enables secure transfer of data over public networks. This is the data channel.

Table 139 Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
RCMD	TCP	512	Remote Command Service.
REAL_AUDIO	TCP	7070	A streaming audio service that enables real time sound over the web.
REXEC	TCP	514	Remote Execution Daemon.
RLOGIN	TCP	513	Remote Login.
ROADRUNNER	TCP/UDP	1026	This is an ISP that provides services mainly for cable modems.
RTELNET	TCP	107	Remote Telnet.
RTSP	TCP/UDP	554	The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet.
SFTP	TCP	115	The Simple File Transfer Protocol is an old way of transferring files between computers.
SMTP	TCP	25	Simple Mail Transfer Protocol is the message-exchange standard for the Internet. SMTP enables you to move messages from one e-mail server to another.
SMTPS	TCP	465	This is a more secure version of SMTP that runs over SSL.
SNMP	TCP/UDP	161	Simple Network Management Program.
SNMP-TRAPS	TCP/UDP	162	Traps for use with the SNMP (RFC:1215).
SQL-NET	TCP	1521	Structured Query Language is an interface to access data on many different types of database systems, including mainframes, midrange systems, UNIX systems and network servers.
SSDP	UDP	1900	The Simple Service Discovery Protocol supports Universal Plug-and-Play (UPnP).
SSH	TCP/UDP	22	Secure Shell Remote Login Program.
STRM WORKS	UDP	1558	Stream Works Protocol.
SYSLOG	UDP	514	Syslog allows you to send system logs to a UNIX server.
TACACS	UDP	49	Login Host Protocol used for (Terminal Access Controller Access Control System).
TELNET	TCP	23	Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems.

Table 139 Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
TFTP	UDP	69	Trivial File Transfer Protocol is an Internet file transfer protocol similar to FTP, but uses the UDP (User Datagram Protocol) rather than TCP (Transmission Control Protocol).
VDOLIVE	TCP UDP	7000 user-defined	A videoconferencing solution. The UDP port number is specified in the application.

Appendix F
IP Addresses and Subnetting

This appendix introduces IP addresses, IP address classes and subnet masks. You use subnet masks to subdivide a network into smaller logical networks.

Introduction to IP Addresses

An IP address has two parts: the network number and the host ID. Routers use the network number to send packets to the correct network, while the host ID identifies a single device on the network.

An IP address is made up of four octets, written in dotted decimal notation, for example, 192.168.1.1. (An octet is an 8-digit binary number. Therefore, each octet has a possible range of 00000000 to 11111111 in binary, or 0 to 255 in decimal.)

There are several classes of IP addresses. The first network number (192 in the above example) defines the class of IP address. These are defined as follows:

- Class A: 0 to 127
- Class B: 128 to 191
- Class C: 192 to 223
- Class D: 224 to 239
- Class E: 240 to 255

IP Address Classes and Hosts

The class of an IP address determines the number of hosts you can have on your network.

- In a class A address the first octet is the network number, and the remaining three octets are the host ID.
- In a class B address the first two octets make up the network number, and the two remaining octets make up the host ID.
- In a class C address the first three octets make up the network number, and the last octet is the host ID.

The following table shows the network number and host ID arrangement for classes A, B and C.

Table 140 Classes of IP Addresses

IP ADDRESS	OCTET 1	OCTET 2	OCTET 3	OCTET 4
Class A	**Network number**	Host ID	Host ID	Host ID
Class B	**Network number**	**Network number**	Host ID	Host ID
Class C	**Network number**	**Network number**	**Network number**	Host ID

An IP address with host IDs of all zeros is the IP address of the network (192.168.1.0 for example). An IP address with host IDs of all ones is the broadcast address for that network (192.168.1.255 for example). Therefore, to determine the total number of hosts allowed in a network, deduct two as shown next:

- A class C address (1 host octet: 8 host bits) can have $2^8 – 2$, or 254 hosts.
- A class B address (2 host octets: 16 host bits) can have $2^{16} – 2$, or 65534 hosts.

A class A address (3 host octets: 24 host bits) can have $2^{24} – 2$ hosts, or approximately 16 million hosts.

IP Address Classes and Network ID

The value of the first octet of an IP address determines the class of an address.

- Class A addresses have a **0** in the leftmost bit.
- Class B addresses have a **1** in the leftmost bit and a **0** in the next leftmost bit.
- Class C addresses start with **1 1 0** in the first three leftmost bits.
- Class D addresses begin with **1 1 1 0**. Class D addresses are used for multicasting, which is used to send information to groups of computers.
- There is also a class E. It is reserved for future use.

The following table shows the allowed ranges for the first octet of each class. This range determines the number of subnets you can have in a network.

Table 141 Allowed IP Address Range By Class

CLASS	ALLOWED RANGE OF FIRST OCTET (BINARY)	ALLOWED RANGE OF FIRST OCTET (DECIMAL)
Class A	**0**0000000 to **0**1111111	0 to 127
Class B	**10**000000 to **10**111111	128 to 191
Class C	**110**00000 to **110**11111	192 to 223
Class D	**1110**0000 to **1110**1111	224 to 239
Class E (reserved)	**1111**0000 to **1111**1111	240 to 255

Subnet Masks

A subnet mask is used to determine which bits are part of the network number, and which bits are part of the host ID (using a logical AND operation).

A subnet mask has 32 bits. If a bit in the subnet mask is a “1” then the corresponding bit in the IP address is part of the network number. If a bit in the subnet mask is “0” then the corresponding bit in the IP address is part of the host ID.

Subnet masks are expressed in dotted decimal notation just like IP addresses. The “natural” masks for class A, B and C IP addresses are as follows.

Table 142 “Natural” Masks

CLASS	NATURAL MASK
A	255.0.0.0
B	255.255.0.0
C	255.255.255.0

Subnetting

With subnetting, the class arrangement of an IP address is ignored. For example, a class C address no longer has to have 24 bits of network number and 8 bits of host ID. With subnetting, some of the host ID bits are converted into network number bits. By convention, subnet masks always consist of a continuous sequence of ones beginning from the left most bit of the mask, followed by a continuous sequence of zeros, for a total number of 32 bits.

Since the mask is always a continuous number of ones beginning from the left, followed by a continuous number of zeros for the remainder of the 32 bit mask, you can simply specify the number of ones instead of writing the value of each octet. This is usually specified by writing a “/” followed by the number of bits in the mask after the address.

For example, 192.1.1.0 /25 is equivalent to saying 192.1.1.0 with mask 255.255.255.128.

The following table shows all possible subnet masks for a class “C” address using both notations.

Table 143 Alternative Subnet Mask Notation

SUBNET MASK	SUBNET MASK “1” BITS	LAST OCTET BIT VALUE
255.255.255.0	/24	0000 0000
255.255.255.128	/25	1000 0000
255.255.255.192	/26	1100 0000
255.255.255.224	/27	1110 0000
255.255.255.240	/28	1111 0000

Table 143 Alternative Subnet Mask Notation (continued)

SUBNET MASK	SUBNET MASK "1" BITS	LAST OCTET BIT VALUE
255.255.255.248	/29	1111 1000
255.255.255.252	/30	1111 1100

The first mask shown is the class "C" natural mask. Normally if no mask is specified it is understood that the natural mask is being used.

Example: Two Subnets

As an example, you have a class "C" address 192.168.1.0 with subnet mask of 255.255.255.0.

Table 144 Two Subnets Example

IP/SUBNET MASK	NETWORK NUMBER	HOST ID
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	00000000
Subnet Mask	255.255.255.	0
Subnet Mask (Binary)	11111111.11111111.11111111.	00000000

The first three octets of the address make up the network number (class "C"). You want to have two separate networks.

Divide the network 192.168.1.0 into two separate subnets by converting one of the host ID bits of the IP address to a network number bit. The "borrowed" host ID bit can be either "0" or "1" thus giving two subnets; 192.168.1.0 with mask 255.255.255.128 and 192.168.1.128 with mask 255.255.255.128.

Note: In the following charts, shaded/bolded last octet bit values indicate host ID bits "borrowed" to form network ID bits. The number of "borrowed" host ID bits determines the number of subnets you can have. The remaining number of host ID bits (after "borrowing") determines the number of hosts you can have on each subnet.

Table 145 Subnet 1

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	**0**0000000
Subnet Mask	255.255.255.	128
Subnet Mask (Binary)	11111111.11111111.11111111.	**1**0000000

Table 145 Subnet 1 (continued)

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
Subnet Address: 192.168.1.0	Lowest Host ID: 192.168.1.1	
Broadcast Address: 192.168.1.127	Highest Host ID: 192.168.1.126	

Table 146 Subnet 2

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	**1**0000000
Subnet Mask	255.255.255.	128
Subnet Mask (Binary)	11111111.11111111.11111111.	**1**0000000
Subnet Address: 192.168.1.128	Lowest Host ID: 192.168.1.129	
Broadcast Address: 192.168.1.255	Highest Host ID: 192.168.1.254	

The remaining 7 bits determine the number of hosts each subnet can have. Host IDs of all zeros represent the subnet itself and host IDs of all ones are the broadcast address for that subnet, so the actual number of hosts available on each subnet in the example above is $2^7 – 2$ or 126 hosts for each subnet.

192.168.1.0 with mask 255.255.255.128 is the subnet itself, and 192.168.1.127 with mask 255.255.255.128 is the directed broadcast address for the first subnet. Therefore, the lowest IP address that can be assigned to an actual host for the first subnet is 192.168.1.1 and the highest is 192.168.1.126. Similarly the host ID range for the second subnet is 192.168.1.129 to 192.168.1.254.

Example: Four Subnets

The above example illustrated using a 25-bit subnet mask to divide a class “C” address space into two subnets. Similarly to divide a class “C” address into four subnets, you need to “borrow” two host ID bits to give four possible combinations of 00, 01, 10 and 11. The subnet mask is 26 bits (11111111.11111111.11111111.**11**000000) or 255.255.255.192. Each subnet contains 6 host ID bits, giving 2^6-2 or 62 hosts for each subnet (all 0’s is the subnet itself, all 1’s is the broadcast address on the subnet).

Table 147 Subnet 1

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	**00**000000

Table 147 Subnet 1 (continued)

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.0	Lowest Host ID: 192.168.1.1	
Broadcast Address: 192.168.1.63	Highest Host ID: 192.168.1.62	

Table 148 Subnet 2

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	64
IP Address (Binary)	11000000.10101000.00000001.	**01**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.64	Lowest Host ID: 192.168.1.65	
Broadcast Address: 192.168.1.127	Highest Host ID: 192.168.1.126	

Table 149 Subnet 3

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	**10**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.128	Lowest Host ID: 192.168.1.129	
Broadcast Address: 192.168.1.191	Highest Host ID: 192.168.1.190	

Table 150 Subnet 4

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	192
IP Address (Binary)	11000000.10101000.00000001.	**11**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.192	Lowest Host ID: 192.168.1.193	
Broadcast Address: 192.168.1.255	Highest Host ID: 192.168.1.254	

Example Eight Subnets

Similarly use a 27-bit mask to create 8 subnets (000, 001, 010, 011, 100, 101, 110, 111).

The following table shows class C IP address last octet values for each subnet.

Table 151 Eight Subnets

SUBNET	SUBNET ADDRESS	FIRST ADDRESS	LAST ADDRESS	BROADCAST ADDRESS
1	0	1	30	31
2	32	33	62	63
3	64	65	94	95
4	96	97	126	127
5	128	129	158	159
6	160	161	190	191
7	192	193	222	223
8	224	225	254	255

The following table is a summary for class "C" subnet planning.

Table 152 Class C Subnet Planning

NO. "BORROWED" HOST BITS	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
1	255.255.255.128 (/25)	2	126
2	255.255.255.192 (/26)	4	62
3	255.255.255.224 (/27)	8	30
4	255.255.255.240 (/28)	16	14
5	255.255.255.248 (/29)	32	6
6	255.255.255.252 (/30)	64	2
7	255.255.255.254 (/31)	128	1

Subnetting With Class A and Class B Networks.

For class "A" and class "B" addresses the subnet mask also determines which bits are part of the network number and which are part of the host ID.

A class "B" address has two host ID octets available for subnetting and a class "A" address has three host ID octets (see Table 140 on page 394) available for subnetting.

The following table is a summary for class "B" subnet planning.

Table 153 Class B Subnet Planning

NO. "BORROWED" HOST BITS	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
1	255.255.128.0 (/17)	2	32766
2	255.255.192.0 (/18)	4	16382
3	255.255.224.0 (/19)	8	8190
4	255.255.240.0 (/20)	16	4094
5	255.255.248.0 (/21)	32	2046
6	255.255.252.0 (/22)	64	1022
7	255.255.254.0 (/23)	128	510
8	255.255.255.0 (/24)	256	254
9	255.255.255.128 (/25)	512	126
10	255.255.255.192 (/26)	1024	62
11	255.255.255.224 (/27)	2048	30
12	255.255.255.240 (/28)	4096	14
13	255.255.255.248 (/29)	8192	6
14	255.255.255.252 (/30)	16384	2
15	255.255.255.254 (/31)	32768	1

Appendix G Command Interpreter

The following describes how to use the command interpreter. You can use **telnet** to access the CLI (Command Line Interface) commands. See the included disk or zyxel.com for more detailed information on these commands.

Note: Use of undocumented commands or misconfiguration can damage the unit and possibly render it unusable.

Command Syntax

- The command keywords are in `courier new` font.
- Enter the command keywords exactly as shown, do not abbreviate.
- The required fields in a command are enclosed in angle brackets <>.
- The optional fields in a command are enclosed in square brackets `[]`.
- The `|` symbol means or.

  For example,

  sys filter netbios config <type> <on|off>

  means that you must specify the type of netbios filter and whether to turn it on or off.

Command Usage

A list of valid commands can be found by typing `help` or `?` at the command prompt. Always type the full command. Type `exit` to end the session when finished.

Appendix H
Firewall Commands

The following describes the firewall commands.

Table 154 Firewall Commands

FUNCTION	COMMAND	DESCRIPTION
Firewall SetUp		
	`config edit firewall active <yes	no>`	This command turns the firewall on or off.
	`config retrieve firewall`	This command returns the previously saved firewall settings.
	`config save firewall`	This command saves the current firewall settings.
Display		
	`config display firewall`	This command shows the of all the firewall settings including e-mail, attack, and the sets/ rules.
	`config display firewall set <set #>`	This command shows the current configuration of a set; including timeout values, name, default-permit, and etc.If you don’t put use a number (#) after “set”, information about all of the sets/rules appears.
	`config display firewall set <set #> rule <rule #>`	This command shows the current entries of a rule in a firewall rule set.
	`config display firewall attack`	This command shows all of the attack response settings.
	`config display firewall e-mail`	This command shows all of the e-mail settings.
	`config display firewall?`	This command shows all of the available firewall sub commands.
Edit		
E-mail	`config edit firewall e-mail mail-server <ip address of mail server>`	This command sets the IP address to which the e-mail messages are sent.

Table 154 Firewall Commands (continued)

FUNCTION	COMMAND	DESCRIPTION
	config edit firewall e-mail return-addr <e-mail address>	This command sets the source e-mail address of the firewall e-mails.
	config edit firewall e-mail email-to <e-mail address>	This command sets the e-mail address to which the firewall e-mails are sent.
	config edit firewall e-mail policy <full | hourly | daily | weekly>	This command sets how frequently the firewall log is sent via e-mail.
	config edit firewall e-mail day <sunday | monday | tuesday | wednesday | thursday | friday | saturday>	This command sets the day on which the current firewall log is sent through e-mail if the ZyXEL Device is set to send it on a weekly basis.
	config edit firewall e-mail hour <0-23>	This command sets the hour when the firewall log is sent through e- mail if the ZyXEL Device is set to send it on an hourly, daily or weekly basis.
	config edit firewall e-mail minute <0-59>	This command sets the minute of the hour for the firewall log to be sent via e- mail if the ZyXEL Device is set to send it on a hourly, daily or weekly basis.
Attack	config edit firewall attack send-alert <yes | no>	This command enables or disables the immediate sending of DOS attack notification e-mail messages.
	config edit firewall attack block <yes | no>	Set this command to yes to block new traffic after the tcp-max-incomplete threshold is exceeded. Set it to no to delete the oldest half-open session when traffic exceeds the tcp-max-incomplete threshold.
	config edit firewall attack block-minute <0-255>	This command sets the number of minutes for new sessions to be blocked when the tcp-max-incomplete threshold is reached. This command is only valid when block is set to yes.
	config edit firewall attack minute-high <0-255>	This command sets the threshold rate of new half-open sessions per minute where the ZyXEL Device starts deleting old half-opened sessions until it gets them down to the minute-low threshold.

Table 154 Firewall Commands (continued)

FUNCTION	COMMAND	DESCRIPTION
	`config edit firewall attack minute-low <0-255>`	This command sets the threshold of half-open sessions where the ZyXEL Device stops deleting half-opened sessions.
	`config edit firewall attack max-incomplete-high <0-255>`	This command sets the threshold of half-open sessions where the ZyXEL Device starts deleting old half-opened sessions until it gets them down to the max incomplete low.
	`config edit firewall attack max-incomplete-low <0-255>`	This command sets the threshold where the ZyXEL Device stops deleting half-opened sessions.
	`config edit firewall attack tcp-max-incomplete <0-255>`	This command sets the threshold of half-open TCP sessions with the same destination where the ZyXEL Device starts dropping half-open sessions to that destination.
Sets	`config edit firewall set <set #> name <desired name>`	This command sets a name to identify a specified set.
	`Config edit firewall set <set #> default-permit <forward | block>`	This command sets whether a packet is dropped or allowed through, when it does not meet a rule within the set.
	`Config edit firewall set <set #> icmp-timeout <seconds>`	This command sets the time period to allow an ICMP session to wait for the ICMP response.
	`Config edit firewall set <set #> udp-idle-timeout <seconds>`	This command sets how long a UDP connection is allowed to remain inactive before the ZyXEL Device considers the connection closed.
	`Config edit firewall set <set #> connection-timeout <seconds>`	This command sets how long ZyXEL Device waits for a TCP session to be established before dropping the session.
	`Config edit firewall set <set #> fin-wait-timeout <seconds>`	This command sets how long the ZyXEL Device leaves a TCP session open after the firewall detects a FIN-exchange (indicating the end of the TCP session).
	`Config edit firewall set <set #> tcp-idle-timeout <seconds>`	This command sets how long ZyXEL Device lets an inactive TCP connection remain open before considering it closed.

Table 154 Firewall Commands (continued)

FUNCTION	COMMAND	DESCRIPTION
	`Config edit firewall set <set #> log <yes | no>`	This command sets whether or not the ZyXEL Device creates logs for packets that match the firewall’s default rule set.
Rules	`Config edit firewall set <set #> rule <rule #> permit <forward | block>`	This command sets whether packets that match this rule are dropped or allowed through.
	`Config edit firewall set <set #> rule <rule #> active <yes | no>`	This command sets whether a rule is enabled or not.
	`Config edit firewall set <set #> rule <rule #> protocol <integer protocol value >`	This command sets the protocol specification number made in this rule for ICMP.
	`Config edit firewall set <set #> rule <rule #> log <none | match | not-match | both>`	This command sets the ZyXEL Device to log traffic that matches the rule, doesn't match, both or neither.
	`Config edit firewall set <set #> rule <rule #> alert <yes | no>`	This command sets whether or not the ZyXEL Device sends an alert e-mail when a DOS attack or a violation of a particular rule occurs.
	`config edit firewall set <set #> rule <rule #> srcaddr-single <ip address>`	This command sets the rule to have the ZyXEL Device check for traffic with this individual source address.
	`config edit firewall set <set #> rule <rule #> srcaddr-subnet <ip address> <subnet mask>`	This command sets a rule to have the ZyXEL Device check for traffic from a particular subnet (defined by IP address and subnet mask).
	`config edit firewall set <set #> rule <rule #> srcaddr-range <start ip address> <end ip address>`	This command sets a rule to have the ZyXEL Device check for traffic from this range of addresses.
	`config edit firewall set <set #> rule <rule #> destaddr-single <ip address>`	This command sets the rule to have the ZyXEL Device check for traffic with this individual destination address.

Table 154 Firewall Commands (continued)

FUNCTION	COMMAND	DESCRIPTION
	`config edit firewall set <set #> rule <rule #> destaddr-subnet <ip address> <subnet mask>`	This command sets a rule to have the ZyXEL Device check for traffic with a particular subnet destination (defined by IP address and subnet mask).
	`config edit firewall set <set #> rule <rule #> destaddr-range <start ip address> <end ip address>`	This command sets a rule to have the ZyXEL Device check for traffic going to this range of addresses.
	`config edit firewall set <set #> rule <rule #> TCP destport-single <port #>`	This command sets a rule to have the ZyXEL Device check for TCP traffic with this destination address. You may repeat this command to enter various, non-consecutive port numbers.
	`config edit firewall set <set #> rule <rule #> TCP destport-range <start port #> <end port #>`	This command sets a rule to have the ZyXEL Device check for TCP traffic with a destination port in this range.
	`config edit firewall set <set #> rule <rule #> UDP destport-single <port #>`	This command sets a rule to have the ZyXEL Device check for UDP traffic with this destination address. You may repeat this command to enter various, non-consecutive port numbers.
	`config edit firewall set <set #> rule <rule #> UDP destport-range <start port #> <end port #>`	This command sets a rule to have the ZyXEL Device check for UDP traffic with a destination port in this range.
Delete		
	`config delete firewall e-mail`	This command removes all of the settings for e-mail alert.
	`config delete firewall attack`	This command resets all of the attack response settings to their defaults.
	`config delete firewall set <set #>`	This command removes the specified set from the firewall configuration.
	`config delete firewall set <set #> rule<rule #>`	This command removes the specified rule in a firewall configuration set.

Appendix I
NetBIOS Filter Commands

The following describes the NetBIOS packet filter commands.

Introduction

NetBIOS (Network Basic Input/Output System) are TCP or UDP broadcast packets that enable a computer to connect to and communicate with a LAN.

For some dial-up services such as PPPoE or PPTP, NetBIOS packets cause unwanted calls.

You can configure NetBIOS filters to do the following:

- Allow or disallow the sending of NetBIOS packets from the LAN to the WAN and from the WAN to the LAN.
- Allow or disallow the sending of NetBIOS packets through VPN connections.
- Allow or disallow NetBIOS packets to initiate calls.

Display NetBIOS Filter Settings

Syntax: `sys filter netbios disp`

This command gives a read-only list of the current NetBIOS filter modes for The ZyXEL Device.

NetBIOS Display Filter Settings Command Example

```
              =========== NetBIOS Filter Status ===========
                      Between LAN and WAN: Block
                      IPSec Packets: Forward
                      Trigger Dial: Disabled
```

The filter types and their default settings are as follows.

Table 155 NetBIOS Filter Default Settings

NAME	DESCRIPTION	EXAMPLE
Between LAN and WAN	This field displays whether NetBIOS packets are blocked or forwarded between the LAN and the WAN.	Block
IPSec Packets	This field displays whether NetBIOS packets sent through a VPN connection are blocked or forwarded.	Forward
Trigger dial	This field displays whether NetBIOS packets are allowed to initiate calls. Disabled means that NetBIOS packets are blocked from initiating calls.	Disabled

NetBIOS Filter Configuration

```
Syntax:sys filter netbios config <type> <on|off>
```

where

`<type> =` Identify which NetBIOS filter (numbered 0-3) to configure.

0 = Between LAN and WAN

3 = IPSec packet pass through

4 = Trigger Dial

`<on|off> =` For type 0 and 1, use on to enable the filter and block NetBIOS packets. Use off to disable the filter and forward NetBIOS packets.

For type 3, use on to block NetBIOS packets from being sent through a VPN connection. Use off to allow NetBIOS packets to be sent through a VPN connection.

For type 4, use on to allow NetBIOS packets to initiate dial backup calls. Use off to block NetBIOS packets from initiating dial backup calls.

Example commands

`sys filter netbios config 0 on` This command blocks LAN to WAN and WAN to LAN NetBIOS packets.

`sys filter netbios config 3 on` This command blocks IPSec NetBIOS packets.

`sys filter netbios config 4 off` This command stops NetBIOS commands from initiating calls.

Appendix J
Log Descriptions

This appendix provides descriptions of example log messages.

Table 156 System Maintenance Logs

LOG MESSAGE	DESCRIPTION
`Time calibration is successful`	The router has adjusted its time based on information from the time server.
`Time calibration failed`	The router failed to get information from the time server.
`WAN interface gets IP:%s`	A WAN interface got a new IP address from the DHCP, PPPoE, PPTP or dial-up server.
`DHCP client IP expired`	A DHCP client's IP address has expired.
`DHCP server assigns%s`	The DHCP server assigned an IP address to a client.
`Successful WEB login`	Someone has logged on to the router's web configurator interface.
`WEB login failed`	Someone has failed to log on to the router's web configurator interface.
`Successful TELNET login`	Someone has logged on to the router via telnet.
`TELNET login failed`	Someone has failed to log on to the router via telnet.
`Successful FTP login`	Someone has logged on to the router via ftp.
`FTP login failed`	Someone has failed to log on to the router via ftp.
`NAT Session Table is Full!`	The maximum number of NAT session table entries has been exceeded and the table is full.
`Starting Connectivity Monitor`	Starting Connectivity Monitor.
`Time initialized by Daytime Server`	The router got the time and date from the Daytime server.
`Time initialized by Time server`	The router got the time and date from the Time server.
`Time initialized by NTP server`	The router got the time and date from the NTP server.
`Connect to Daytime server fail`	The router was not able to connect to the Daytime server.
`Connect to Time server fail`	The router was not able to connect to the Time server.
`Connect to NTP server fail`	The router was not able to connect to the NTP server.
`Too large ICMP packet has been dropped`	The router dropped an ICMP packet that was too large.
`Configuration Change: PC = 0x%x, Task ID = 0x%x`	The router is saving configuration changes.
`Successful SSH login`	Someone has logged on to the router’s SSH server.
`SSH login failed`	Someone has failed to log on to the router’s SSH server.

Table 156 System Maintenance Logs (continued)

LOG MESSAGE	DESCRIPTION
`Successful HTTPS login`	Someone has logged on to the router's web configurator interface using HTTPS protocol.
`HTTPS login failed`	Someone has failed to log on to the router's web configurator interface using HTTPS protocol.

Table 157 System Error Logs

LOG MESSAGE	DESCRIPTION
`%s exceeds the max. number of session per host!`	This attempt to create a NAT session exceeds the maximum number of NAT session table entries allowed to be created per host.
`setNetBIOSFilter: calloc error`	The router failed to allocate memory for the NetBIOS filter settings.
`readNetBIOSFilter: calloc error`	The router failed to allocate memory for the NetBIOS filter settings.
`WAN connection is down.`	A WAN connection is down. You cannot access the network through this interface.

Table 158 Access Control Logs

LOG MESSAGE	DESCRIPTION
`Firewall default policy: [TCP | UDP | IGMP | ESP | GRE | OSPF] <Packet Direction>`	Attempted TCP/UDP/IGMP/ESP/GRE/OSPF access matched the default policy and was blocked or forwarded according to the default policy’s setting.
`Firewall rule [NOT] match:[TCP | UDP | IGMP | ESP | GRE | OSPF] <Packet Direction>, <rule:%d>`	Attempted TCP/UDP/IGMP/ESP/GRE/OSPF access matched (or did not match) a configured firewall rule (denoted by its number) and was blocked or forwarded according to the rule.
`Triangle route packet forwarded: [TCP | UDP | IGMP | ESP | GRE | OSPF]`	The firewall allowed a triangle route session to pass through.
`Packet without a NAT table entry blocked: [TCP | UDP | IGMP | ESP | GRE | OSPF]`	The router blocked a packet that didn't have a corresponding NAT table entry.
`Router sent blocked web site message: TCP`	The router sent a message to notify a user that the router blocked access to a web site that the user requested.

Table 159 TCP Reset Logs

LOG MESSAGE	DESCRIPTION
`Under SYN flood attack, sent TCP RST`	The router sent a TCP reset packet when a host was under a SYN flood attack (the TCP incomplete count is per destination host.)
`Exceed TCP MAX incomplete, sent TCP RST`	The router sent a TCP reset packet when the number of TCP incomplete connections exceeded the user configured threshold. (the TCP incomplete count is per destination host.) Note: Refer to **TCP Maximum Incomplete** in the **Firewall Attack Alerts** screen.
`Peer TCP state out of order, sent TCP RST`	The router sent a TCP reset packet when a TCP connection state was out of order.Note: The firewall refers to RFC793 Figure 6 to check the TCP state.
`Firewall session time out, sent TCP RST`	The router sent a TCP reset packet when a dynamic firewall session timed out. The default timeout values are as follows: ICMP idle timeout: 3 minutes UDP idle timeout: 3 minutes TCP connection (three way handshaking) timeout: 270 seconds TCP FIN-wait timeout: 2 MSL (Maximum Segment Lifetime set in the TCP header). TCP idle (established) timeout (s): 150 minutes TCP reset timeout: 10 seconds
`Exceed MAX incomplete, sent TCP RST`	The router sent a TCP reset packet when the number of incomplete connections (TCP and UDP) exceeded the user-configured threshold. (Incomplete count is for all TCP and UDP connections through the firewall.)Note: When the number of incomplete connections (TCP + UDP) > “Maximum Incomplete High”, the router sends TCP RST packets for TCP connections and destroys TOS (firewall dynamic sessions) until incomplete connections < “Maximum Incomplete Low”.
`Access block, sent TCP RST`	The router sends a TCP RST packet and generates this log if you turn on the firewall TCP reset mechanism (via CI command: "sys firewall tcprst").

Table 160 Packet Filter Logs

LOG MESSAGE	DESCRIPTION
`[TCP | UDP | ICMP | IGMP | Generic] packet filter matched (set:%d, rule:%d)`	Attempted access matched a configured filter rule (denoted by its set and rule number) and was blocked or forwarded according to the rule.

Table 161 ICMP Logs

LOG MESSAGE	DESCRIPTION
`Firewall default policy: ICMP <Packet Direction>, <type:%d>, <code:%d>`	ICMP access matched the default policy and was blocked or forwarded according to the user's setting. For type and code details, see Table 173 on page 423.
`Firewall rule [NOT] match: ICMP <Packet Direction>, <rule:%d>, <type:%d>, <code:%d>`	ICMP access matched (or didn’t match) a firewall rule (denoted by its number) and was blocked or forwarded according to the rule. For type and code details, see Table 173 on page 423.
`Triangle route packet forwarded: ICMP`	The firewall allowed a triangle route session to pass through.
`Packet without a NAT table entry blocked: ICMP`	The router blocked a packet that didn’t have a corresponding NAT table entry.
`Unsupported/out-of-order ICMP: ICMP`	The firewall does not support this kind of ICMP packets or the ICMP packets are out of order.
`Router reply ICMP packet: ICMP`	The router sent an ICMP reply packet to the sender.

Table 162 CDR Logs

LOG MESSAGE	DESCRIPTION
`board%d line%d channel%d, call%d,%s C01 Outgoing Call dev=%x ch=%x%s`	The router received the setup requirements for a call. “call” is the reference (count) number of the call. “dev” is the device type (3 is for dial-up, 6 is for PPPoE, 10 is for PPTP). "channel" or “ch” is the call channel ID.For example,"board 0 line 0 channel 0, call 3, C01 Outgoing Call dev=6 ch=0 "Means the router has dialed to the PPPoE server 3 times.
`board%d line%d channel%d, call%d,%s C02 OutCall Connected%d%s`	The PPPoE, PPTP or dial-up call is connected.
`board%d line%d channel%d, call%d,%s C02 Call Terminated`	The PPPoE, PPTP or dial-up call was disconnected.

Table 163 PPP Logs

LOG MESSAGE	DESCRIPTION
`ppp:LCP Starting`	The PPP connection’s Link Control Protocol stage has started.
`ppp:LCP Opening`	The PPP connection’s Link Control Protocol stage is opening.
`ppp:CHAP Opening`	The PPP connection’s Challenge Handshake Authentication Protocol stage is opening.
`ppp:IPCP Starting`	The PPP connection’s Internet Protocol Control Protocol stage is starting.
`ppp:IPCP Opening`	The PPP connection’s Internet Protocol Control Protocol stage is opening.

Table 163 PPP Logs (continued)

LOG MESSAGE	DESCRIPTION
`ppp:LCP Closing`	The PPP connection’s Link Control Protocol stage is closing.
`ppp:IPCP Closing`	The PPP connection’s Internet Protocol Control Protocol stage is closing.

Table 164 UPnP Logs

LOG MESSAGE	DESCRIPTION
`UPnP pass through Firewall`	UPnP packets can pass through the firewall.

Table 165 Content Filtering Logs

LOG MESSAGE	DESCRIPTION
`%s: Keyword blocking`	The content of a requested web page matched a user defined keyword.
`%s: Not in trusted web list`	The web site is not in a trusted domain, and the router blocks all traffic except trusted domain sites.
`%s: Forbidden Web site`	The web site is in the forbidden web site list.
`%s: Contains ActiveX`	The web site contains ActiveX.
`%s: Contains Java applet`	The web site contains a Java applet.
`%s: Contains cookie`	The web site contains a cookie.
`%s: Proxy mode detected`	The router detected proxy mode in the packet.
`%s`	The content filter server responded that the web site is in the blocked category list, but it did not return the category type.
`%s:%s`	The content filter server responded that the web site is in the blocked category list, and returned the category type.
`%s(cache hit)`	The system detected that the web site is in the blocked list from the local cache, but does not know the category type.
`%s:%s(cache hit)`	The system detected that the web site is in blocked list from the local cache, and knows the category type.
`%s: Trusted Web site`	The web site is in a trusted domain.
`%s`	When the content filter is not on according to the time schedule or you didn't select the "Block Matched Web Site” check box, the system forwards the web content.
`Waiting content filter server timeout`	The external content filtering server did not respond within the timeout period.
`DNS resolving failed`	The ZyXEL Device cannot get the IP address of the external content filtering via DNS query.
`Creating socket failed`	The ZyXEL Device cannot issue a query because TCP/IP socket creation failed, port:port number.

Table 165 Content Filtering Logs (continued)

LOG MESSAGE	DESCRIPTION
`Connecting to content filter server fail`	The connection to the external content filtering server failed.
`License key is invalid`	The external content filtering license key is invalid.

Table 166 Attack Logs

LOG MESSAGE	DESCRIPTION
`attack [TCP | UDP | IGMP | ESP | GRE | OSPF]`	The firewall detected a TCP/UDP/IGMP/ESP/GRE/OSPF attack.
`attack ICMP (type:%d, code:%d)`	The firewall detected an ICMP attack. For type and code details, see Table 173 on page 423.
`land [TCP | UDP | IGMP | ESP | GRE | OSPF]`	The firewall detected a TCP/UDP/IGMP/ESP/GRE/OSPF land attack.
`land ICMP (type:%d, code:%d)`	The firewall detected an ICMP land attack. For type and code details, see Table 173 on page 423.
`ip spoofing - WAN [TCP | UDP | IGMP | ESP | GRE | OSPF]`	The firewall detected an IP spoofing attack on the WAN port.
`ip spoofing - WAN ICMP (type:%d, code:%d)`	The firewall detected an ICMP IP spoofing attack on the WAN port. For type and code details, see Table 173 on page 423.
`icmp echo: ICMP (type:%d, code:%d)`	The firewall detected an ICMP echo attack. For type and code details, see Table 173 on page 423.
`syn flood TCP`	The firewall detected a TCP syn flood attack.
`ports scan TCP`	The firewall detected a TCP port scan attack.
`teardrop TCP`	The firewall detected a TCP teardrop attack.
`teardrop UDP`	The firewall detected an UDP teardrop attack.
`teardrop ICMP (type:%d, code:%d)`	The firewall detected an ICMP teardrop attack. For type and code details, see Table 173 on page 423.
`illegal command TCP`	The firewall detected a TCP illegal command attack.
`NetBIOS TCP`	The firewall detected a TCP NetBIOS attack.
`ip spoofing - no routing entry [TCP | UDP | IGMP | ESP | GRE | OSPF]`	The firewall classified a packet with no source routing entry as an IP spoofing attack.
`ip spoofing - no routing entry ICMP (type:%d, code:%d)`	The firewall classified an ICMP packet with no source routing entry as an IP spoofing attack.
`vulnerability ICMP (type:%d, code:%d)`	The firewall detected an ICMP vulnerability attack. For type and code details, see Table 173 on page 423.
`traceroute ICMP (type:%d, code:%d)`	The firewall detected an ICMP traceroute attack. For type and code details, see Table 173 on page 423.

Table 167 IPSec Logs

LOG MESSAGE	DESCRIPTION
`Discard REPLAY packet`	The router received and discarded a packet with an incorrect sequence number.
`Inbound packet authentication failed`	The router received a packet that has been altered. A third party may have altered or tampered with the packet.
`Receive IPSec packet, but no corresponding tunnel exists`	The router dropped an inbound packet for which SPI could not find a corresponding phase 2 SA.
`Rule <%d> idle time out, disconnect`	The router dropped a connection that had outbound traffic and no inbound traffic for a certain time period. You can use the "ipsec timer chk_conn" CI command to set the time period. The default value is 2 minutes.
`WAN IP changed to <IP>`	The router dropped all connections with the “MyIP” configured as “0.0.0.0” when the WAN IP address changed.

Table 168 IKE Logs

LOG MESSAGE	DESCRIPTION
`Active connection allowed exceeded`	The IKE process for a new connection failed because the limit of simultaneous phase 2 SAs has been reached.
`Start Phase 2: Quick Mode`	Phase 2 Quick Mode has started.
`Verifying Remote ID failed:`	The connection failed during IKE phase 2 because the router and the peer’s Local/Remote Addresses don’t match.
`Verifying Local ID failed:`	The connection failed during IKE phase 2 because the router and the peer’s Local/Remote Addresses don’t match.
`IKE Packet Retransmit`	The router retransmitted the last packet sent because there was no response from the peer.
`Failed to send IKE Packet`	An Ethernet error stopped the router from sending IKE packets.
`Too many errors! Deleting SA`	An SA was deleted because there were too many errors.
`Phase 1 IKE SA process done`	The phase 1 IKE SA process has been completed.
`Duplicate requests with the same cookie`	The router received multiple requests from the same peer while still processing the first IKE packet from the peer.
`IKE Negotiation is in process`	The router has already started negotiating with the peer for the connection, but the IKE process has not finished yet.
`No proposal chosen`	Phase 1 or phase 2 parameters don’t match. Please check all protocols / settings. Ex. One device being configured for 3DES and the other being configured for DES causes the connection to fail.
`Local / remote IPs of incoming request conflict with rule <%d>`	The security gateway is set to “0.0.0.0” and the router used the peer’s “Local Address” as the router’s “Remote Address”. This information conflicted with static rule #d; thus the connection is not allowed.

Table 168 IKE Logs (continued)

LOG MESSAGE	DESCRIPTION
`Cannot resolve Secure Gateway Addr for rule <%d>`	The router couldn’t resolve the IP address from the domain name that was used for the secure gateway address.
`Peer ID: <peer id> <My remote type> -<My local type>`	The displayed ID information did not match between the two ends of the connection.
`vs. My Remote <My remote> - <My remote>`	The displayed ID information did not match between the two ends of the connection.
`vs. My Local <My local>-<My local>`	The displayed ID information did not match between the two ends of the connection.
`Send <packet>`	A packet was sent.
`Recv <packet>`	IKE uses ISAKMP to transmit data. Each ISAKMP packet contains many different types of payloads. All of them show in the LOG. Refer to RFC2408 – ISAKMP for a list of all ISAKMP payload types.
`Recv <Main or Aggressive> Mode request from <IP>`	The router received an IKE negotiation request from the peer address specified.
`Send <Main or Aggressive> Mode request to <IP>`	The router started negotiation with the peer.
`Invalid IP <Peer local> / <Peer local>`	The peer’s “Local IP Address” is invalid.
`Remote IP <Remote IP> / <Remote IP> conflicts`	The security gateway is set to “0.0.0.0” and the router used the peer’s “Local Address” as the router’s “Remote Address”. This information conflicted with static rule #d; thus the connection is not allowed.
`Phase 1 ID type mismatch`	This router’s "Peer ID Type" is different from the peer IPSec router's "Local ID Type".
`Phase 1 ID content mismatch`	This router’s "Peer ID Content" is different from the peer IPSec router's "Local ID Content".
`No known phase 1 ID type found`	The router could not find a known phase 1 ID in the connection attempt.
`ID type mismatch. Local / Peer: <Local ID type/Peer ID type>`	The phase 1 ID types do not match.
`ID content mismatch`	The phase 1 ID contents do not match.
`Configured Peer ID Content: <Configured Peer ID Content>`	The phase 1 ID contents do not match and the configured "Peer ID Content" is displayed.
`Incoming ID Content: <Incoming Peer ID Content>`	The phase 1 ID contents do not match and the incoming packet's ID content is displayed.
`Unsupported local ID Type: <%d>`	The phase 1 ID type is not supported by the router.
`Build Phase 1 ID`	The router has started to build the phase 1 ID.
`Adjust TCP MSS to%d`	The router automatically changed the TCP Maximum Segment Size value after establishing a tunnel.
`Rule <%d> input idle time out, disconnect`	The tunnel for the listed rule was dropped because there was no inbound traffic within the idle timeout period.
`XAUTH succeed! Username: <Username>`	The router used extended authentication to authenticate the listed username.

Table 168 IKE Logs (continued)

LOG MESSAGE	DESCRIPTION
`XAUTH fail! Username: <Username>`	The router was not able to use extended authentication to authenticate the listed username.
`Rule[%d] Phase 1 negotiation mode mismatch`	The listed rule's IKE phase 1 negotiation mode did not match between the router and the peer.
`Rule [%d] Phase 1 encryption algorithm mismatch`	The listed rule's IKE phase 1 encryption algorithm did not match between the router and the peer.
`Rule [%d] Phase 1 authentication algorithm mismatch`	The listed rule's IKE phase 1 authentication algorithm did not match between the router and the peer.
`Rule [%d] Phase 1 authentication method mismatch`	The listed rule's IKE phase 1 authentication method did not match between the router and the peer.
`Rule [%d] Phase 1 key group mismatch`	The listed rule's IKE phase 1 key group did not match between the router and the peer.
`Rule [%d] Phase 2 protocol mismatch`	The listed rule's IKE phase 2 protocol did not match between the router and the peer.
`Rule [%d] Phase 2 encryption algorithm mismatch`	The listed rule's IKE phase 2 encryption algorithm did not match between the router and the peer.
`Rule [%d] Phase 2 authentication algorithm mismatch`	The listed rule's IKE phase 2 authentication algorithm did not match between the router and the peer.
`Rule [%d] Phase 2 encapsulation mismatch`	The listed rule's IKE phase 2 encapsulation did not match between the router and the peer.
`Rule [%d]> Phase 2 pfs mismatch`	The listed rule's IKE phase 2 perfect forward secret (pfs) setting did not match between the router and the peer.
`Rule [%d] Phase 1 ID mismatch`	The listed rule's IKE phase 1 ID did not match between the router and the peer.
`Rule [%d] Phase 1 hash mismatch`	The listed rule's IKE phase 1 hash did not match between the router and the peer.
`Rule [%d] Phase 1 preshared key mismatch`	The listed rule's IKE phase 1 pre-shared key did not match between the router and the peer.
`Rule [%d] Tunnel built successfully`	The listed rule's IPSec tunnel has been built successfully.
`Rule [%d] Peer's public key not found`	The listed rule's IKE phase 1 peer's public key was not found.
`Rule [%d] Verify peer's signature failed`	The listed rule's IKE phase 1verification of the peer's signature failed.
`Rule [%d] Sending IKE request`	IKE sent an IKE request for the listed rule.
`Rule [%d] Receiving IKE request`	IKE received an IKE request for the listed rule.
`Swap rule to rule [%d]`	The router changed to using the listed rule.
`Rule [%d] Phase 1 key length mismatch`	The listed rule's IKE phase 1 key length (with the AES encryption algorithm) did not match between the router and the peer.
`Rule [%d] phase 1 mismatch`	The listed rule's IKE phase 1 did not match between the router and the peer.

Table 168 IKE Logs (continued)

LOG MESSAGE	DESCRIPTION
`Rule [%d] phase 2 mismatch`	The listed rule’s IKE phase 2 did not match between the router and the peer.
`Rule [%d] Phase 2 key length mismatch`	The listed rule’s IKE phase 2 key lengths (with the AES encryption algorithm) did not match between the router and the peer.

Table 169 PKI Logs

LOG MESSAGE	DESCRIPTION
`Enrollment successful`	The SCEP online certificate enrollment was successful. The Destination field records the certification authority server IP address and port.
`Enrollment failed`	The SCEP online certificate enrollment failed. The Destination field records the certification authority server’s IP address and port.
`Failed to resolve <SCEP CA server url>`	The SCEP online certificate enrollment failed because the certification authority server’s address cannot be resolved.
`Enrollment successful`	The CMP online certificate enrollment was successful. The Destination field records the certification authority server’s IP address and port.
`Enrollment failed`	The CMP online certificate enrollment failed. The Destination field records the certification authority server’s IP address and port.
`Failed to resolve <CMP CA server url>`	The CMP online certificate enrollment failed because the certification authority server’s IP address cannot be resolved.
`Rcvd ca cert: <subject name>`	The router received a certification authority certificate, with subject name as recorded, from the LDAP server whose IP address and port are recorded in the Source field.
`Rcvd user cert: <subject name>`	The router received a user certificate, with subject name as recorded, from the LDAP server whose IP address and port are recorded in the Source field.
`Rcvd CRL <size>: <issuer name>`	The router received a CRL (Certificate Revocation List), with size and issuer name as recorded, from the LDAP server whose IP address and port are recorded in the Source field.
`Rcvd ARL <size>: <issuer name>`	The router received an ARL (Authority Revocation List), with size and issuer name as recorded, from the LDAP server whose address and port are recorded in the Source field.
`Failed to decode the received ca cert`	The router received a corrupted certification authority certificate from the LDAP server whose address and port are recorded in the Source field.
`Failed to decode the received user cert`	The router received a corrupted user certificate from the LDAP server whose address and port are recorded in the Source field.
`Failed to decode the received CRL`	The router received a corrupted CRL (Certificate Revocation List) from the LDAP server whose address and port are recorded in the Source field.
`Failed to decode the received ARL`	The router received a corrupted ARL (Authority Revocation List) from the LDAP server whose address and port are recorded in the Source field.

Table 169 PKI Logs (continued)

LOG MESSAGE	DESCRIPTION
`Rcvd data <size> too large! Max size allowed: <max size>`	The router received directory data that was too large (the size is listed) from the LDAP server whose address and port are recorded in the Source field. The maximum size of directory data that the router allows is also recorded.
`Cert trusted: <subject name>`	The router has verified the path of the certificate with the listed subject name.
`Due to <reason codes>, cert not trusted: <subject name>`	Due to the reasons listed, the certificate with the listed subject name has not passed the path verification. The recorded reason codes are only approximate reasons for not trusting the certificate. Please see Table 170 on page 421 for the corresponding descriptions of the codes.

Table 170 Certificate Path Verification Failure Reason Codes

CODE	DESCRIPTION
1	Algorithm mismatch between the certificate and the search constraints.
2	Key usage mismatch between the certificate and the search constraints.
3	Certificate was not valid in the time interval.
4	(Not used)
5	Certificate is not valid.
6	Certificate signature was not verified correctly.
7	Certificate was revoked by a CRL.
8	Certificate was not added to the cache.
9	Certificate decoding failed.
10	Certificate was not found (anywhere).
11	Certificate chain looped (did not find trusted root).
12	Certificate contains critical extension that was not handled.
13	Certificate issuer was not valid (CA specific information missing).
14	(Not used)
15	CRL is too old.
16	CRL is not valid.
17	CRL signature was not verified correctly.
18	CRL was not found (anywhere).
19	CRL was not added to the cache.
20	CRL decoding failed.
21	CRL is not currently valid, but in the future.
22	CRL contains duplicate serial numbers.
23	Time interval is not continuous.
24	Time information not available.
25	Database method failed due to timeout.

Table 170 Certificate Path Verification Failure Reason Codes (continued)

CODE	DESCRIPTION
26	Database method failed.
27	Path was not verified.
28	Maximum path length reached.

Table 171 802.1X Logs

LOG MESSAGE	DESCRIPTION
Local User Database accepts user.	A user was authenticated by the local user database.
Local User Database reports user credential error.	A user was not authenticated by the local user database because of an incorrect user password.
Local User Database does not find user`s credential.	A user was not authenticated by the local user database because the user is not listed in the local user database.
RADIUS accepts user.	A user was authenticated by the RADIUS Server.
RADIUS rejects user. Pls check RADIUS Server.	A user was not authenticated by the RADIUS Server. Please check the RADIUS Server.
Local User Database does not support authentication method.	The local user database only supports the EAP-MD5 method. A user tried to use another authentication method and was not authenticated.
User logout because of session timeout expired.	The router logged out a user whose session expired.
User logout because of user deassociation.	The router logged out a user who ended the session.
User logout because of no authentication response from user.	The router logged out a user from which there was no authentication response.
User logout because of idle timeout expired.	The router logged out a user whose idle timeout period expired.
User logout because of user request.	A user logged out.
Local User Database does not support authentication mothed.	A user tried to use an authentication method that the local user database does not support (it only supports EAP-MD5).
No response from RADIUS. Pls check RADIUS Server.	There is no response message from the RADIUS server, please check the RADIUS server.
Use Local User Database to authenticate user.	The local user database is operating as the authentication server.
Use RADIUS to authenticate user.	The RADIUS server is operating as the authentication server.
No Server to authenticate user.	There is no authentication server to authenticate a user.
Local User Database does not find user`s credential.	A user was not authenticated by the local user database because the user is not listed in the local user database.

Table 172 ACL Setting Notes

PACKET DIRECTION	DIRECTION	DESCRIPTION
(L to W)	LAN to WAN	ACL set for packets traveling from the LAN to the WAN.
(W to L)	WAN to LAN	ACL set for packets traveling from the WAN to the LAN.
(L to L)	LAN to LAN/ ZyXEL Device	ACL set for packets traveling from the LAN to the LAN or the ZyXEL Device.
(W to W)	WAN to WAN/ ZyXEL Device	ACL set for packets traveling from the WAN to the WAN or the ZyXEL Device.

Table 173 ICMP Notes

TYPE	CODE	DESCRIPTION
0		Echo Reply
	0	Echo reply message
3		Destination Unreachable
	0	Net unreachable
	1	Host unreachable
	2	Protocol unreachable
	3	Port unreachable
	4	A packet that needed fragmentation was dropped because it was set to Don't Fragment (DF)
	5	Source route failed
4		Source Quench
	0	A gateway may discard internet datagrams if it does not have the buffer space needed to queue the datagrams for output to the next network on the route to the destination network.
5		Redirect
	0	Redirect datagrams for the Network
	1	Redirect datagrams for the Host
	2	Redirect datagrams for the Type of Service and Network
	3	Redirect datagrams for the Type of Service and Host
8		Echo
	0	Echo message
11		Time Exceeded
	0	Time to live exceeded in transit
	1	Fragment reassembly time exceeded
12		Parameter Problem
	0	Pointer indicates the error
13		Timestamp

Table 173 ICMP Notes (continued)

TYPE	CODE	DESCRIPTION
	0	Timestamp request message
14		Timestamp Reply
	0	Timestamp reply message
15		Information Request
	0	Information request message
16		Information Reply
	0	Information reply message

Table 174 Syslog Logs

LOG MESSAGE	DESCRIPTION
`<Facility*8 + Severity>Mon dd hr:mm:ss hostname src="<srcIP:srcPort>" dst="<dstIP:dstPort>" msg="<msg>" note="<note>" devID="<mac address last three numbers>" cat="<category>`	"This message is sent by the system ("RAS" displays as the system name if you haven't configured one) when the router generates a syslog. The facility is defined in the web MAIN MENU->LOGS->Log Settings page. The severity is the log's syslog class. The definition of messages and notes are defined in the various log charts throughout this appendix. The "devID" is the last three characters of the MAC address of the router's LAN port. The "cat" is the same as the category in the router's logs.

The following table shows RFC-2408 ISAKMP payload types that the log displays. Please refer to the RFC for detailed information on each type.

Table 175 RFC-2408 ISAKMP Payload Types

LOG DISPLAY	PAYLOAD TYPE
SA	Security Association
PROP	Proposal
TRANS	Transform
KE	Key Exchange
ID	Identification
CER	Certificate
CER_REQ	Certificate Request
HASH	Hash
SIG	Signature
NONCE	Nonce
NOTFY	Notification
DEL	Delete
VID	Vendor ID

Log Commands

This section provides some general examples of how to use the log commands. The items that display with your device may vary but the basic function should be the same.

Go to the command interpreter interface. Appendix G on page 401 explains how to access and use the commands.

Configuring What You Want the ZyXEL Device to Log

1 Use the sys logs load command to load the log setting buffer that allows you to configure which logs the ZyXEL Device is to record.

2 Use sys logs category to view a list of the log categories.

Figure 270 Displaying Log Categories Example

```
ras>?
Valid commands are:
sys             exit            ether           aux
ip              ipsec           bridge          bm
certificates    cnm             8021x           radius
ras>
```

3 Use sys logs category followed by a log category to display the parameters that are available for the category.

Figure 271 Displaying Log Parameters Example

```
ras> sys logs category access
Usage: [0:none/1:log/2:alert/3:both]
```

4 Use sys logs category followed by a log category and a parameter to decide what to record.

Use 0 to not record logs for that category, 1 to record only logs for that category, 2 to record only alerts for that category, and 3 to record both logs and alerts for that category. Not every parameter is available with every category.

5 Step 5.Use the sys logs save command to store the settings in the ZyXEL Device (you must do this in order to record logs).

Displaying Logs

- Use the sys logs display command to show all of the logs in the ZyXEL Device's log.

- Use the sys logs category display command to show the log settings for all of the log categories.
- Use the sys logs display [log category] command to show the logs in an individual ZyXEL Device log category.
- Use the sys logs clear command to erase all of the ZyXEL Device’s logs.

Log Command Example

This example shows how to set the ZyXEL Device to record the access logs and alerts and then view the results.

```
ras> sys logs load
ras> sys logs category access 3
ras> sys logs save
ras> sys logs display access

#.time                 source                 destination            notes

    message
 0|06/08/2004 05:58:21 |172.21.4.154         |224.0.1.24            |ACCESS
BLOCK
    Firewall default policy: IGMP (W to W/ZW)
 1|06/08/2004 05:58:20 |172.21.3.56          |239.255.255.250       |ACCESS
BLOCK
    Firewall default policy: IGMP (W to W/ZW)
 2|06/08/2004 05:58:20 |172.21.0.2           |239.255.255.254       |ACCESS
BLOCK
    Firewall default policy: IGMP (W to W/ZW)
 3|06/08/2004 05:58:20 |172.21.3.191         |224.0.1.22            |ACCESS
BLOCK
    Firewall default policy: IGMP (W to W/ZW)
 4|06/08/2004 05:58:20 |172.21.0.254         |224.0.0.1             |ACCESS
BLOCK
    Firewall default policy: IGMP (W to W/ZW)
 5|06/08/2004 05:58:20 |172.21.4.187:137     |172.21.255.255:137    |ACCESS
BLOCK
    Firewall default policy: UDP (W to W/ZW)
```

Index