

P-334U/P-335U

802.11a/g Wireless Router

User's Guide

Version 3.60

Edition 2

11/2006

The logo for ZyXEL, featuring the word "ZyXEL" in a bold, blue, sans-serif font. The "Zy" is lowercase and the "XEL" is uppercase. The letters are closely spaced and have a slight shadow effect.

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Certifications

Federal Communications Commission (FCC) Interference Statement

This 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 equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

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

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



FCC Radiation Exposure Statement

- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- For operation within 5.15 ~ 5.25GHz frequency range, it is restricted to indoor environment.
- IEEE 802.11b or 802.11g operation of this product in the U.S.A. is firmware-limited to channels 1 through 11.
- To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

注意！

依據 低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用

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在 5250MHz~5350MHz 頻帶內操作之無線資訊傳輸設備，限於室內使用。

Notices

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

This device has been designed for the WLAN 2.4 GHz and 5 GHz networks throughout the EC region and Switzerland, with restrictions in France.

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 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.
- Antenna Warning! This device meets ETSI and FCC certification requirements when using the included antenna(s). Only use the included antenna(s).
- 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 ^A	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	
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	
NORWAY	support@zyxel.no	+47-22-80-61-80	www.zyxel.no	ZyXEL Communications A/S Niils Hansens vei 13 0667 Oslo Norway
	sales@zyxel.no	+47-22-80-61-81		

METHOD	SUPPORT E-MAIL	TELEPHONE^A	WEB SITE	REGULAR MAIL
LOCATION	SALES E-MAIL	FAX	FTP SITE	
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	

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

Table of Contents

Copyright	3
Certifications	4
Safety Warnings	6
ZyXEL Limited Warranty	7
Customer Support	8
Table of Contents	11
Preface	29
Chapter 1	
Getting to Know Your ZyXEL Device	31
1.1 ZyXEL Device Overview	31
1.2 Applications for the ZyXEL Device	31
1.2.1 Secure Broadband Internet Access via Cable or DSL Modem	31
1.2.2 Wireless LAN Application	32
1.2.3 Print Server and Router Combined Application (P-335U Only)	33
1.2.4 VPN Application (P-335U Only)	33
1.3 Ways to Manage the ZyXEL Device	33
1.4 Good Habits for Managing Your ZyXEL Device	34
1.4.1 Front Panel LEDs	34
Chapter 2	
Introducing the Web Configurator	37
2.1 Web Configurator Overview	37
2.2 Accessing the Web Configurator	37
2.3 Resetting the ZyXEL Device	38
2.3.1 Procedure to Use the Reset Button	38
2.4 Navigating the Web Configurator	38
2.4.1 Navigation Panel	41
2.4.2 Summary: Bandwidth Management Monitor	43
2.4.3 Summary: DHCP Table	44
2.4.4 Summary: Packet Statistics	45
2.4.5 VPN Monitor	46
2.4.6 Summary: Wireless Station Status	46

Chapter 3	
Connection Wizard.....	49
3.1 Wizard Setup	49
3.2 Connection Wizard: STEP 1: System Information	50
3.2.1 System Name	50
3.2.2 Domain Name	51
3.3 Connection Wizard: STEP 2: Wireless LAN	51
3.3.1 Basic(WEP) Security	53
3.3.2 Extend(WPA-PSK or WPA2-PSK) Security	54
3.3.3 OTIST	55
3.4 Connection Wizard: STEP 3: Internet Configuration	56
3.4.1 Ethernet Connection	56
3.4.2 PPPoE Connection	57
3.4.3 PPTP Connection	58
3.4.4 Your IP Address	60
3.4.5 WAN IP Address Assignment	60
3.4.6 IP Address and Subnet Mask	61
3.4.7 DNS Server Address Assignment	61
3.4.8 WAN IP and DNS Server Address Assignment.....	62
3.4.9 WAN MAC Address	63
3.5 Connection Wizard: STEP 4: Bandwidth management	64
3.6 Connection Wizard Complete	65
Chapter 4	
Wireless LAN	67
4.1 Wireless Network Overview	67
4.2 Wireless Security Overview	68
4.2.1 SSID	68
4.2.2 MAC Address Filter	68
4.2.3 User Authentication	68
4.2.4 Encryption	69
4.2.5 One-Touch Intelligent Security Technology (OTIST)	70
4.3 General Wireless LAN Screen	70
4.3.1 No Security	71
4.3.2 WEP Encryption	72
4.3.3 WPA-PSK/WPA2-PSK	74
4.3.4 WPA/WPA2	75
4.4 OTIST	77
4.4.1 Enabling OTIST	78
4.4.1.1 AP	78
4.4.1.2 Wireless Client	79
4.4.2 Starting OTIST	80
4.4.3 Notes on OTIST	80

4.5 MAC Filter	81
4.6 Wireless LAN Advanced Screen	83
Chapter 5	
Wireless Tutorial.....	85
5.1 Example Parameters	85
5.2 Configuring the AP	85
5.3 Configuring the Wireless Client	87
5.3.1 Connecting to a Wireless LAN	88
5.3.2 Creating and Using a Profile	90
Chapter 6	
WAN.....	95
6.1 WAN Overview	95
6.2 WAN MAC Address	95
6.3 Internet Connection	95
6.3.1 Ethernet Encapsulation	95
6.3.2 PPPoE Encapsulation	97
6.3.3 PPTP Encapsulation	100
6.4 Advanced WAN Screen	103
Chapter 7	
LAN.....	105
7.1 LAN Overview	105
7.1.1 IP Pool Setup	105
7.1.2 System DNS Servers	105
7.2 LAN TCP/IP	105
7.2.1 Factory LAN Defaults	105
7.2.2 IP Address and Subnet Mask	106
7.2.3 Multicast	106
7.3 LAN IP Screen	106
7.4 LAN IP Alias	107
7.5 Advanced LAN Screen	108
Chapter 8	
DHCP Server.....	111
8.1 DHCP	111
8.2 DHCP Server General Screen	111
8.3 DHCP Server Advanced Screen	112
8.4 Client List Screen	113

Chapter 9	
Network Address Translation (NAT)	115
9.1 NAT Overview	115
9.2 Using NAT	115
9.2.1 Port Forwarding: Services and Port Numbers	115
9.2.2 Configuring Servers Behind Port Forwarding (Example)	116
9.3 General NAT Screen	116
9.4 NAT Application Screen	117
9.4.1 Game List Example	119
9.5 Trigger Port Forwarding	120
9.5.1 Trigger Port Forwarding Example	121
9.5.2 Two Points To Remember About Trigger Ports	121
9.6 NAT Advanced Screen	121
Chapter 10	
Dynamic DNS	125
10.1 Dynamic DNS Introduction	125
10.1.1 DynDNS Wildcard	125
10.2 Dynamic DNS Screen	125
Chapter 11	
Firewall	127
11.1 Introduction to Firewall	127
11.1.1 What is a Firewall?	127
11.1.2 Stateful Inspection Firewall.	127
11.1.3 About the ZyXEL Device Firewall	127
11.1.4 Guidelines For Enhancing Security With Your Firewall	128
11.2 General Firewall Screen	128
11.3 Services Screen	129
Chapter 12	
Content Filtering	133
12.1 Introduction to Content Filtering	133
12.2 Restrict Web Features	133
12.3 Days and Times	133
12.4 Filter Screen	133
12.5 Schedule	135
12.6 Customizing Keyword Blocking URL Checking	136
12.6.1 Domain Name or IP Address URL Checking	136
12.6.2 Full Path URL Checking	136
12.6.3 File Name URL Checking	137

Chapter 13	
IPSec VPN	139
13.1 IPSec VPN Overview	139
13.1.1 IKE SA (IKE Phase 1) Overview	140
13.1.1.1 IP Addresses of the ZyXEL Device and Remote IPSec Router ..	140
13.1.2 IKE SA Setup	140
13.1.2.1 IKE SA Proposal	141
13.1.2.2 Diffie-Hellman (DH) Key Exchange	141
13.1.2.3 Authentication	141
13.1.2.4 Negotiation Mode	143
13.1.2.5 VPN, NAT, and NAT Traversal	143
13.1.3 IPSec SA (IKE Phase 2) Overview	144
13.1.3.1 Local Network and Remote Network	144
13.1.3.2 IPSec Protocol	144
13.1.3.3 Encapsulation	145
13.1.3.4 IPSec SA Proposal and Perfect Forward Secrecy	145
13.1.4 Additional IPSec VPN Topics	146
13.1.4.1 SA Life Time	146
13.1.4.2 Encryption and Authentication Algorithms	146
13.2 Remote DNS Server	147
13.3 VPN Summary	147
13.4 VPN Rule Setup (IKE)	148
13.5 Advanced VPN Rule Setup (IKE)	153
13.6 IPSec SA Using Manual Keys	159
13.6.1 IPSec SA Proposal Using Manual Keys	160
13.6.2 Authentication and the Security Parameter Index (SPI)	160
13.7 VPN Rule Setup (Manual)	160
13.8 VPN SA Monitor	164
13.9 VPN Global Setting	165
13.10 Telecommuter VPN/IPSec Examples	165
13.10.1 Telecommuters Sharing One VPN Rule Example	166
13.10.2 Telecommuters Using Unique VPN Rules Example	166
13.11 VPN and Remote Management	168
Chapter 14	
Static Route Screens	169
14.1 Static Route Overview	169
14.2 IP Static Route Screen	170
14.2.1 Static Route Setup Screen	171
Chapter 15	
Bandwidth Management	173
15.1 Bandwidth Management Overview	173

15.2 Application-based Bandwidth Management	173
15.3 Subnet-based Bandwidth Management	174
15.4 Application and Subnet-based Bandwidth Management	174
15.5 Bandwidth Management Priorities	175
15.6 Predefined Bandwidth Management Services	175
15.6.1 Services and Port Numbers	176
15.7 Default Bandwidth Management Classes and Priorities	178
15.8 Bandwidth Management General Configuration	179
15.9 Bandwidth Management Advanced Configuration	180
15.9.1 Rule Configuration with the Pre-defined Service	182
15.9.2 Rule Configuration with the User-defined Service	183
15.10 Bandwidth Management Monitor	184
Chapter 16	
Remote Management Screens	185
16.1 Remote Management Overview	185
16.1.1 Remote Management Limitations	185
16.1.2 Remote Management and NAT	186
16.1.3 System Timeout	186
16.2 WWW Screen	186
16.3 Telnet	187
16.4 Telnet Screen	187
16.5 FTP Screen	188
16.6 DNS Screen	189
Chapter 17	
UPnP.....	191
17.1 Universal Plug and Play Overview	191
17.1.1 How Do I Know If I'm Using UPnP?	191
17.1.2 NAT Traversal	191
17.1.3 Cautions with UPnP	191
17.2 UPnP and ZyXEL	192
17.3 UPnP Screen	192
17.4 Installing UPnP in Windows Example	193
17.4.1 Installing UPnP in Windows Me	193
17.4.2 Installing UPnP in Windows XP	194
17.5 Using UPnP in Windows XP Example	195
17.5.1 Auto-discover Your UPnP-enabled Network Device	195
17.5.2 Web Configurator Easy Access	196
17.5.3 Web Configurator Easy Access	197

Chapter 18	
Print Server	199
18.1 Print Server Overview	199
18.2 ZyXEL Device Print Server	199
18.3 Print Server Screen	200
Chapter 19	
Print Server Driver Setup	201
19.1 Installation Requirements	201
19.2 Windows 95/98 SE/Me/2000/XP/NT 4.0	201
19.2.1 Print Server Driver Setup Wizard	202
19.2.2 Adding a New Printer	207
19.3 Macintosh OS X	211
Chapter 20	
System	215
20.1 System Overview	215
20.2 System General Screen	215
20.3 Time Setting Screen	216
Chapter 21	
Logs	219
21.1 View Log	219
21.2 Log Settings	220
Chapter 22	
Tools	223
22.1 Firmware Upload Screen	223
22.2 Configuration Screen	224
22.2.1 Backup Configuration	225
22.2.2 Restore Configuration	225
22.2.3 Back to Factory Defaults	226
22.3 Restart Screen	227
Chapter 23	
Configuration Mode	229
Chapter 24	
Troubleshooting	231
24.1 Problems Starting Up the ZyXEL Device	231
24.2 Problems with the LAN	231
24.3 Problems with the WAN	232
24.4 Problems Accessing the ZyXEL Device	233

24.5 Problems with Restricted Web Pages and Keyword Blocking	233
24.5.1 Pop-up Windows, JavaScripts and Java Permissions	235
24.5.1.1 Internet Explorer Pop-up Blockers	235
24.5.1.2 JavaScripts	238
24.5.1.3 Java Permissions	240
24.5.2 ActiveX Controls in Internet Explorer	242
Appendix A	
Product Specifications	245
Appendix B	
Print Server Specifications	249
Appendix C	
Setting up Your Computer's IP Address.....	255
Appendix D	
IP Subnetting	271
Appendix E	
Wireless LANs	279
Appendix F	
Log Descriptions.....	293
Appendix G	
Services	309
Appendix H	
Internal SPTGEN	313
Appendix I	
Triangle Route.....	329

List of Figures

Figure 1 Secure Internet Access via Cable or DSL Modem	32
Figure 2 WLAN Application Example	32
Figure 3 Print Server Application	33
Figure 4 VPN Application	33
Figure 5 Front Panel (P-334U)	34
Figure 6 Front Panel (P-335U)	34
Figure 7 Change Password Screen	38
Figure 8 Web Configurator Status Screen	39
Figure 9 Summary: BW MGMT Monitor	44
Figure 10 Summary: DHCP Table	44
Figure 11 Summary: Packet Statistics	45
Figure 12 Summary: Packet Statistics	45
Figure 13 Summary: VPN Monitor	46
Figure 14 Summary: Wireless Association List	47
Figure 15 Select Wizard or Advanced Mode	49
Figure 16 Select a Language	50
Figure 17 Welcome to the Connection Wizard	50
Figure 18 Wizard Step 1: System Information	51
Figure 19 Wizard Step 2: Wireless LAN	52
Figure 20 Wizard Step 2: Basic(WEP) Security	53
Figure 21 Wizard Step 2: Extend(WPA-PSK or WPA2-PSK) Security	54
Figure 22 Wizard Step 2: OTIST	55
Figure 23 Wizard Step 3: ISP Parameters.	56
Figure 24 Wizard Step 3: Ethernet Connection	57
Figure 25 Wizard Step 3: PPPoE Connection	58
Figure 26 Wizard Step 3: PPTP Connection	59
Figure 27 Wizard Step 3: Your IP Address	60
Figure 28 Wizard Step 3: WAN IP and DNS Server Addresses	62
Figure 29 Wizard Step 3: WAN MAC Address	63
Figure 30 Wizard Step 4: Bandwidth Management	64
Figure 31 Connection Wizard Save	65
Figure 32 Connection Wizard Complete	65
Figure 33 Example of a Wireless Network	67
Figure 34 Wireless General	71
Figure 35 Wireless: No Security	72
Figure 36 Wireless: Static WEP Encryption	73

Figure 37 Wireless: WPA-PSK/WPA2-PSK	74
Figure 38 Wireless: WPA/WPA2	76
Figure 39 OTIST	78
Figure 40 Example Wireless Client OTIST Screen	79
Figure 41 Security Key	80
Figure 42 OTIST in Progress (AP)	80
Figure 43 OTIST in Progress (Client)	80
Figure 44 No AP with OTIST Found	80
Figure 45 Start OTIST?	81
Figure 46 MAC Address Filter	82
Figure 47 Advanced	83
Figure 48 AP: Wireless LAN > General	86
Figure 49 AP: Status	87
Figure 50 AP: Status: WLAN Station Status	87
Figure 51 ZyXEL Utility: Security Settings	89
Figure 52 ZyXEL Utility: Confirm Save	89
Figure 53 ZyXEL Utility: Link Info	90
Figure 54 ZyXEL Utility: Profile	90
Figure 55 ZyXEL Utility: Add New Profile	91
Figure 56 ZyXEL Utility: Profile Security	91
Figure 57 ZyXEL Utility: Profile Encryption	91
Figure 58 Profile: Wireless Protocol Settings	92
Figure 59 Profile: Confirm Save	92
Figure 60 Profile: Activate	92
Figure 61 Ethernet Encapsulation	96
Figure 62 PPPoE Encapsulation	98
Figure 63 PPTP Encapsulation	101
Figure 64 Advanced	104
Figure 65 LAN IP	106
Figure 66 LAN IP Alias	107
Figure 67 Advanced LAN	108
Figure 68 DHCP Server General	111
Figure 69 DHCP Server Advanced	112
Figure 70 Client List	114
Figure 71 Multiple Servers Behind NAT Example	116
Figure 72 NAT General	116
Figure 73 NAT Application	118
Figure 74 Game List Example	120
Figure 75 Trigger Port Forwarding Process: Example	121
Figure 76 NAT Advanced	122
Figure 77 Dynamic DNS	126
Figure 78 General	128
Figure 79 Services	130

Figure 80 Content Filter: Filter	134
Figure 81 Content Filter: Schedule	135
Figure 82 VPN: Example	139
Figure 83 VPN: IKE SA and IPSec SA	140
Figure 84 IKE SA: Main Negotiation Mode, Steps 1 - 2: IKE SA Proposal	141
Figure 85 IKE SA: Main Negotiation Mode, Steps 3 - 4: DH Key Exchange	141
Figure 86 IKE SA: Main Negotiation Mode, Steps 5 - 6: Authentication	142
Figure 87 VPN/NAT Example	143
Figure 88 VPN: Transport and Tunnel Mode Encapsulation	145
Figure 89 VPN Host using Intranet DNS Server Example	147
Figure 90 Security > VPN > Summary	147
Figure 91 IPSec Fields Summary	148
Figure 92 Security > VPN > Rule Setup: IKE (Basic)	149
Figure 93 Security > VPN > Rule Setup: IKE (Advanced)	154
Figure 94 Security > VPN > Rule Setup: Manual	161
Figure 95 Security > VPN > SA Monitor	164
Figure 96 Security > VPN > Global Setting	165
Figure 97 Telecommuters Sharing One VPN Rule Example	166
Figure 98 Telecommuters Using Unique VPN Rules Example	167
Figure 99 VPN for Remote Management Example	168
Figure 100 Example of Static Routing Topology	169
Figure 101 IP Static Route	170
Figure 102 Static Route Setup	171
Figure 103 Subnet-based Bandwidth Management Example	174
Figure 104 Bandwidth Management: General	179
Figure 105 Bandwidth Management: Advanced	180
Figure 106 Bandwidth Management Rule Configuration: Pre-defined Service	182
Figure 107 Bandwidth Management Rule Configuration: User-defined Service	183
Figure 108 Bandwidth Management: Monitor	184
Figure 109 WWW Remote Management	186
Figure 110 Telnet Remote Management	187
Figure 111 FTP Remote Management	188
Figure 112 DNS Remote Management	189
Figure 113 Configuring UPnP	192
Figure 114 Configuring Print Server	200
Figure 115 CD Autorun Screen	201
Figure 116 CD Autorun Screen: Printer Server Driver Setup	202
Figure 117 Network Print Server Setup Wizard: Welcome	203
Figure 118 Network Print Server Setup Wizard: Select A Print Server	203
Figure 119 Network Print Server Setup Wizard: Change Settings	204
Figure 120 Network Print Server Setup Wizard: Select A Printer	205
Figure 121 Network Print Server Setup Wizard: Summary	206
Figure 122 Network Print Server Setup Wizard: Installation Complete	206

Figure 123 Add Printer Help	207
Figure 124 Add Printer Wizard: Welcome	207
Figure 125 Add Printer Wizard: Local or Network Printer	208
Figure 126 Add Printer Wizard: Select the Printer Port	208
Figure 127 Add Printer Wizard: Printer Driver	209
Figure 128 Add Printer Wizard: Use Existing Driver	209
Figure 129 Add Printer Wizard: Name Your Printer	210
Figure 130 Add Printer Wizard: Printer Sharing	210
Figure 131 Add Printer Wizard: Print Test Page	211
Figure 132 Add Printer Wizard Complete	211
Figure 133 Macintosh HD	212
Figure 134 Macintosh HD folder	212
Figure 135 Applications Folder	212
Figure 136 Utilities Folder	212
Figure 137 Printer List Folder	213
Figure 138 Printer Configuration	213
Figure 139 Printer Model	214
Figure 140 Print Server	214
Figure 141 System General	215
Figure 142 Time Setting	217
Figure 143 View Log	219
Figure 144 Log Settings	221
Figure 145 Maintenance Firmware Upload	223
Figure 146 Upload Warning	224
Figure 147 Network Temporarily Disconnected	224
Figure 148 Upload Error Message	224
Figure 149 Configuration	225
Figure 150 Configuration Restore Successful	226
Figure 151 Temporarily Disconnected	226
Figure 152 Configuration Restore Error	226
Figure 153 System Restart	227
Figure 154 Config Mode	229
Figure 155 Pop-up Blocker	235
Figure 156 Internet Options	236
Figure 157 Internet Options	237
Figure 158 Pop-up Blocker Settings	238
Figure 159 Internet Options	239
Figure 160 Security Settings - Java Scripting	240
Figure 161 Security Settings - Java	241
Figure 162 Java (Sun)	242
Figure 163 Internet Options Security	243
Figure 164 Security Setting ActiveX Controls	244
Figure 165 WInows 95/98/Me: Network: Configuration	256

Figure 166 Windows 95/98/Me: TCP/IP Properties: IP Address	257
Figure 167 Windows 95/98/Me: TCP/IP Properties: DNS Configuration	258
Figure 168 Windows XP: Start Menu	259
Figure 169 Windows XP: Control Panel	259
Figure 170 Windows XP: Control Panel: Network Connections: Properties	260
Figure 171 Windows XP: Local Area Connection Properties	260
Figure 172 Windows XP: Internet Protocol (TCP/IP) Properties	261
Figure 173 Windows XP: Advanced TCP/IP Properties	262
Figure 174 Windows XP: Internet Protocol (TCP/IP) Properties	263
Figure 175 Macintosh OS 8/9: Apple Menu	264
Figure 176 Macintosh OS 8/9: TCP/IP	264
Figure 177 Macintosh OS X: Apple Menu	265
Figure 178 Macintosh OS X: Network	266
Figure 179 Red Hat 9.0: KDE: Network Configuration: Devices	267
Figure 180 Red Hat 9.0: KDE: Ethernet Device: General	267
Figure 181 Red Hat 9.0: KDE: Network Configuration: DNS	268
Figure 182 Red Hat 9.0: KDE: Network Configuration: Activate	268
Figure 183 Red Hat 9.0: Dynamic IP Address Setting in ifconfig-eth0	269
Figure 184 Red Hat 9.0: Static IP Address Setting in ifconfig-eth0	269
Figure 185 Red Hat 9.0: DNS Settings in resolv.conf	269
Figure 186 Red Hat 9.0: Restart Ethernet Card	270
Figure 187 Red Hat 9.0: Checking TCP/IP Properties	270
Figure 188 Peer-to-Peer Communication in an Ad-hoc Network	279
Figure 189 Basic Service Set	280
Figure 190 Infrastructure WLAN	281
Figure 191 RTS/CTS	282
Figure 192 WPA(2) with RADIUS Application Example	290
Figure 193 WPA(2)-PSK Authentication	290
Figure 194 Displaying Log Categories Example	307
Figure 195 Displaying Log Parameters Example	307
Figure 196 Configuration Text File Format: Column Descriptions	313
Figure 197 Invalid Parameter Entered: Command Line Example	314
Figure 198 Valid Parameter Entered: Command Line Example	314
Figure 199 Internal SPTGEN FTP Download Example	315
Figure 200 Internal SPTGEN FTP Upload Example	315
Figure 201 Ideal Setup	329
Figure 202 "Triangle Route" Problem	330
Figure 203 IP Alias	330

List of Tables

Table 1 Front Panel LEDs	35
Table 2 Status Screen Icon Key	39
Table 3 Web Configurator Status Screen	40
Table 4 Screens Summary	42
Table 5 Summary: DHCP Table	44
Table 6 Summary: VPN Monitor	46
Table 7 Summary: Wireless Association List	47
Table 8 Wizard Step 1: System Information	51
Table 9 Wizard Step 2: Wireless LAN	52
Table 10 Wizard Step 2: Basic(WEP) Security	53
Table 11 Wizard Step 2: Extend(WPA-PSK or WPA2-PSK) Security	54
Table 12 Wizard Step 2: OTIST	55
Table 13 Wizard Step 3: ISP Parameters	56
Table 14 Wizard Step 3: PPPoE Connection	58
Table 15 Wizard Step 3: PPTP Connection	59
Table 16 Wizard Step 3: Your IP Address	60
Table 17 Private IP Address Ranges	60
Table 18 Wizard Step 3: WAN IP and DNS Server Addresses	62
Table 19 Example of Network Properties for LAN Servers with Fixed IP Addresses	63
Table 20 Wizard Step 3: WAN MAC Address	64
Table 21 Wizard Step 4: Bandwidth Management	64
Table 22 Types of Encryption for Each Type of Authentication	69
Table 23 Wireless General	71
Table 24 Wireless No Security	72
Table 25 Wireless: Static WEP Encryption	73
Table 26 Wireless: WPA-PSK/WPA2-PSK	75
Table 27 Wireless: WPA/WPA2	76
Table 28 OTIST	79
Table 29 MAC Address Filter	82
Table 30 Advanced	83
Table 31 Ethernet Encapsulation	96
Table 32 PPPoE Encapsulation	99
Table 33 PPTP Encapsulation	102
Table 34 Advanced	104
Table 35 LAN IP	107
Table 36 LAN IP Alias	108

Table 37 Advanced LAN	108
Table 38 DHCP Server General	111
Table 39 DHCP Server Advanced	113
Table 40 Client List	114
Table 41 NAT General	117
Table 42 NAT Application	118
Table 43 NAT Advanced	122
Table 44 Dynamic DNS	126
Table 45 Firewall General	129
Table 46 Firewall Services	130
Table 47 Content Filter: Filter	134
Table 48 Content Filter: Schedule	136
Table 49 VPN Example: Matching ID Type and Content	142
Table 50 VPN Example: Mismatching ID Type and Content	142
Table 51 Security > VPN > Summary	148
Table 52 Security > VPN > Rule Setup: IKE (Basic)	149
Table 53 Security > VPN > Rule Setup: IKE (Advanced)	155
Table 54 Security > VPN > Rule Setup: Manual	161
Table 55 SECURITY > VPN > SA Monitor	165
Table 56 Security > VPN > Global Setting	165
Table 57 Telecommuters Sharing One VPN Rule Example	166
Table 58 Telecommuters Using Unique VPN Rules Example	167
Table 59 IP Static Route	170
Table 60 Static Route Setup	171
Table 61 Application and Subnet-based Bandwidth Management Example	174
Table 62 Bandwidth Management Priorities	175
Table 63 Media Bandwidth Management Setup: Services	175
Table 64 Commonly Used Services	176
Table 65 Bandwidth Management Priority with Default Classes	178
Table 66 Bandwidth Management: General	179
Table 67 Bandwidth Management: Advanced	181
Table 68 Bandwidth Management Rule Configuration: Pre-defined Service	182
Table 69 Bandwidth Management Rule Configuration: User-defined Service	183
Table 70 WWW Remote Management	186
Table 71 Telnet Remote Management	187
Table 72 FTP Remote Management	188
Table 73 DNS Remote Management	189
Table 74 Configuring UPnP	193
Table 75 Configuring Print Server	200
Table 76 System General	216
Table 77 Time Setting	217
Table 78 View Logs	220
Table 79 Log Settings	221

Table 80 Maintenance Firmware Upload	223
Table 81 Maintenance Restore Configuration	225
Table 82 Config Mode: Advanced Screens	229
Table 83 Troubleshooting Starting Up Your ZyXEL Device	231
Table 84 Troubleshooting the LAN	231
Table 85 Troubleshooting the WAN	232
Table 86 Troubleshooting Accessing the ZyXEL Device	233
Table 87 Troubleshooting Restricted Web Pages and Keyword Blocking	233
Table 88 Troubleshooting the Password	234
Table 89 Troubleshooting Telnet	234
Table 90 Troubleshooting the Print Server	235
Table 91 Hardware Specifications	245
Table 92 Firmware Specifications	245
Table 93 Print Server Interface	249
Table 94 Print Server Requirements and Specifications	249
Table 95 Compatible USB Printers	250
Table 96 Classes of IP Addresses	271
Table 97 Allowed IP Address Range By Class	272
Table 98 "Natural" Masks	272
Table 99 Alternative Subnet Mask Notation	273
Table 100 Two Subnets Example	273
Table 101 Subnet 1	274
Table 102 Subnet 2	274
Table 103 Subnet 1	275
Table 104 Subnet 2	275
Table 105 Subnet 3	275
Table 106 Subnet 4	276
Table 107 Eight Subnets	276
Table 108 Class C Subnet Planning	276
Table 109 Class B Subnet Planning	277
Table 110 IEEE 802.11g	283
Table 111 Wireless Security Levels	284
Table 112 Comparison of EAP Authentication Types	287
Table 113 Wireless Security Relational Matrix	291
Table 114 System Maintenance Logs	293
Table 115 System Error Logs	294
Table 116 Access Control Logs	294
Table 117 TCP Reset Logs	295
Table 118 Packet Filter Logs	295
Table 119 ICMP Logs	296
Table 120 CDR Logs	296
Table 121 PPP Logs	296
Table 122 UPnP Logs	297

Table 123 Content Filtering Logs	297
Table 124 Attack Logs	298
Table 125 IPSec Logs	299
Table 126 IKE Logs	299
Table 127 PKI Logs	302
Table 128 Certificate Path Verification Failure Reason Codes	303
Table 129 802.1X Logs	304
Table 130 ACL Setting Notes	305
Table 131 ICMP Notes	305
Table 132 Syslog Logs	306
Table 133 RFC-2408 ISAKMP Payload Types	306
Table 134 Examples of Services	309
Table 135 Abbreviations Used in the Example Internal SPTGEN Screens Table	316
Table 136 Menu 1 General Setup	316
Table 137 Menu 3	316
Table 138 Menu 4 Internet Access Setup	320
Table 139 Menu 12	321
Table 140 Menu 15 SUA Server Setup	322
Table 141 Menu 21.1 Filter Set #1	323
Table 142 Menu 21.1 Filter Set #2,	325
Table 143 Menu 23 System Menus	326
Table 144 Menu 24.11 Remote Management Control	327
Table 145 Command Examples	328

Preface

Congratulations on your purchase of the P-334U or P-335U 802.11a/g Wireless Router. This manual is designed to guide you through the configuration of your P-334U or P-335U for its various applications.

About This User's Guide

This User's Guide is designed to guide you through the configuration of your ZyXEL Device using the web configurator.

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

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. They contain connection information and instructions on getting started.
- Web Configurator Online Help
Embedded web help for descriptions of individual screens and supplementary information.
- ZyXEL Glossary and Web Site
Please refer to www.zyxel.com for an online glossary of networking terms and additional support documentation.

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!

Syntax Conventions

- “Enter” means for you to type one or more characters. “Select” or “Choose” means for you to use one predefined choice.
- Mouse action sequences are denoted using a right angle bracket (>). For example, “In Windows, 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-334U or P-335U series may be referred to as the “ZyXEL Device” in this User’s Guide.

Graphics Icons Key

ZyXEL Device 	Computer 	Notebook computer 
Server 	DSLAM 	Firewall 
Modem 	Switch 	Router 
Wireless Signal 		

CHAPTER 1

Getting to Know Your ZyXEL Device

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

1.1 ZyXEL Device Overview

The P-334U or P-335U is the ideal secure wireless firewall router for all data passing between the Internet and LAN's.

You can configure firewall and/or content filtering for secure Internet access. You can also use media bandwidth management to efficiently manage traffic on your network. On the P-335U, you can also set up a VPN tunnel that gives you a secure connection to another computer or network without the need (and expense) for leased lines between sites.

The P-334U or P-335U supports the IEEE 802.11a, b and g standards, so that either IEEE 802.11b/g or IEEE 802.11a compatible clients can wirelessly access the P-334U or P-335U or the wired network behind it.

The P-335U provides a USB port to connect to a USB v1.1 compliant printer and can act as a print server. The computers connected to the P-335U can share a printer without a dedicated or standalone print server.

Note: Only use firmware for your ZyXEL Device's specific model.

See [Appendix A on page 245](#) for a complete list of features.

1.2 Applications for the ZyXEL Device

Here are some examples of what you can do with your ZyXEL Device.

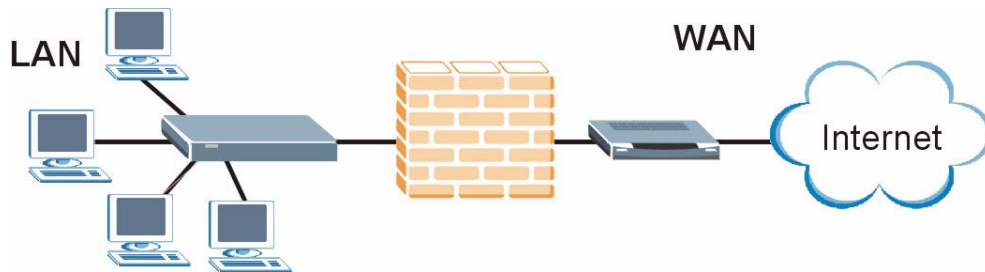
See the Quick Start Guide for instructions on hardware connections.

1.2.1 Secure Broadband Internet Access via Cable or DSL Modem

For Internet access, connect the WAN Ethernet port to your existing Internet access gateway (company network, or your cable or DSL modem for example). Connect computers or servers to the LAN ports for shared Internet access.

The ZyXEL Device guarantees not only high speed Internet access, but secure internal network protection and traffic management as well.

Figure 1 Secure Internet Access via Cable or DSL Modem



You can also configure firewall and content filtering on the ZyXEL Device for secure Internet access. When the firewall is on, all incoming traffic from the Internet to 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 for example.

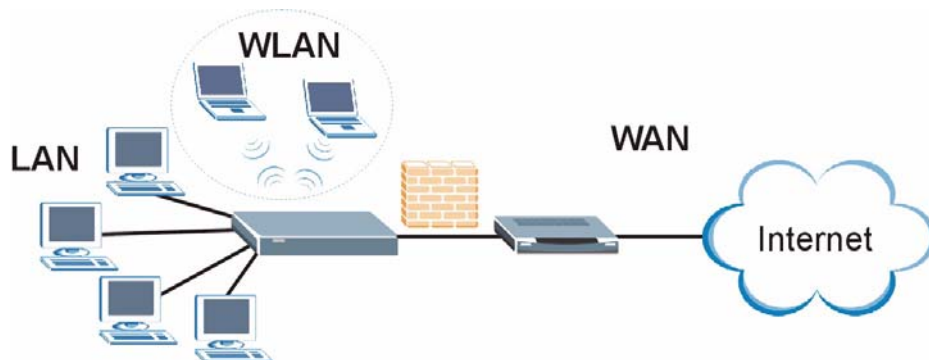
Use content filtering to block access to web sites containing keywords that you specify. You can define time periods and days during which content filtering is enabled and include or exclude particular computers on your network from content filtering. For example, you could block access to certain web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

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/or limit bandwidth devoted to the boss's excessive file downloading.

1.2.2 Wireless LAN Application

Add a wireless LAN to your existing network without expensive network cables. Wireless clients can move freely anywhere in the coverage area and use resources on the wired network.

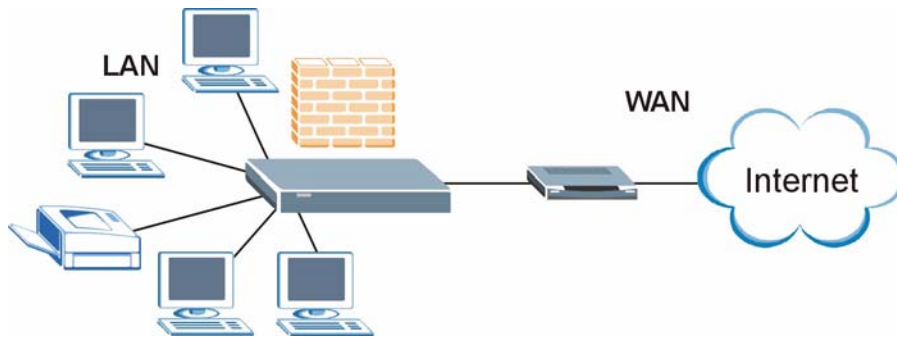
Figure 2 WLAN Application Example



1.2.3 Print Server and Router Combined Application (P-335U Only)

The P-335U's built-in print server allows your network's computers to share a printer. Simply connect a USB printer to the USB port on the ZyXEL Device. The following figure shows how you can setup your printer to operate on a LAN using the P-335U as a router and print server.

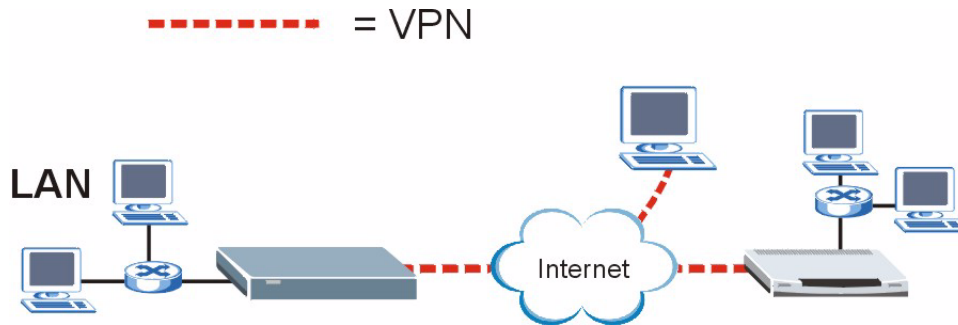
Figure 3 Print Server Application



1.2.4 VPN Application (P-335U Only)

The P-335U VPN is an ideal cost-effective way to connect branch offices, business partners and telecommuters over the Internet without the need (and expense) for leased lines between sites.

Figure 4 VPN Application



1.3 Ways to Manage the ZyXEL Device

Use any of the following methods to manage the ZyXEL Device.

- Web Configurator. This is recommended for everyday management of the ZyXEL Device using a (supported) web browser.
- FTP for firmware upgrades and configuration backup/restore ([Chapter 16 on page 185](#))
- SPTGEN. SPTGEN is a text configuration file that allows you to configure the device by uploading an SPTGEN file. This is especially convenient if you need to configure many devices of the same type.

1.4 Good Habits for Managing Your ZyXEL Device

Here are some things you should do regularly.

- Change the password. Use a password that's not easy to guess and that consists of different types of characters, such as numbers and letters.
- Write down the password and put it in a safe place.
- Back up the configuration (and make sure you know how to restore it). Restoring an earlier working configuration may be useful if the device becomes unstable or even crashes. If you forget your password, you will have to reset the ZyXEL Device to its factory default settings. If you backed up an earlier configuration file, you would not have to totally re-configure the ZyXEL Device. You could simply restore your last configuration.

1.4.1 Front Panel LEDs

Figure 5 Front Panel (P-334U)

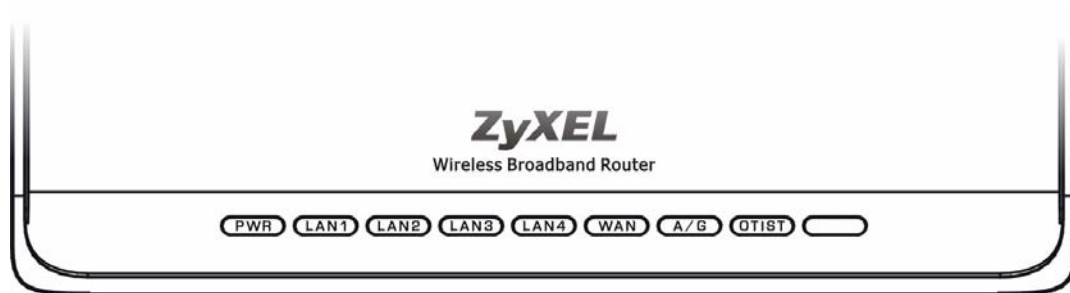
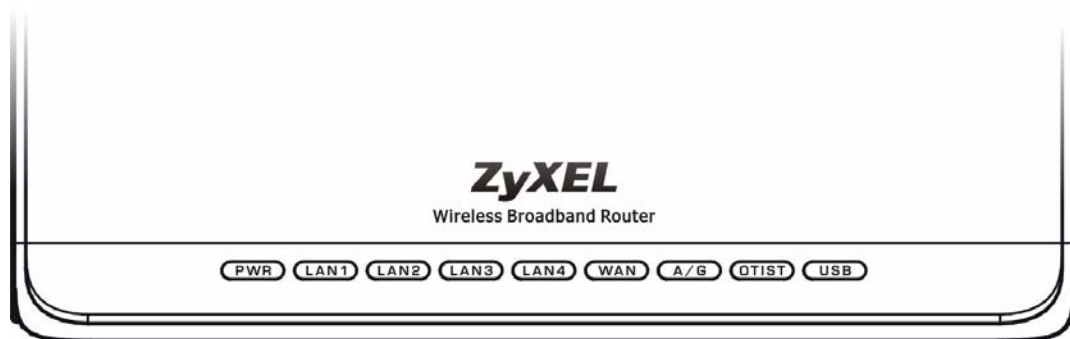


Figure 6 Front Panel (P-335U)



The following table describes the LEDs.

Table 1 Front Panel LEDs

	COLOR	STATUS	DESCRIPTION
PWR	Green	On	The ZyXEL Device is receiving power and functioning properly.
		Blinking	The ZyXEL Device is performing testing.
	Red	On	Power to the ZyXEL Device is too low.
	None	Off	The ZyXEL Device is not receiving power.
LAN 1-4	Green	On	The ZyXEL Device has a successful 10Mb Ethernet connection.
		Blinking	The ZyXEL Device is sending/receiving data.
	Amber	On	The ZyXEL Device has a successful 100Mb Ethernet connection.
		Blinking	The ZyXEL Device is sending/receiving data.
	None	Off	The LAN is not connected.
WAN	Green	On	The ZyXEL Device has a successful 10Mb WAN connection.
		Blinking	The ZyXEL Device is sending/receiving data.
	Amber	On	The ZyXEL Device has a successful 100Mb Ethernet connection.
		Blinking	The ZyXEL Device is sending/receiving data.
	None	Off	The WAN connection is not ready, or has failed.
A/G	Green	On	The ZyXEL Device is in IEEE 802.11b or g wireless LAN mode, but is not sending/receiving data through the wireless LAN.
		Blinking	The ZyXEL Device is sending/receiving data through the IEEE 802.11b or g wireless LAN.
	Amber	On	The ZyXEL Device is in IEEE 802.11a wireless LAN mode, but is not sending/receiving data through the wireless LAN.
		Blinking	The ZyXEL Device is sending/receiving data through the IEEE 802.11a wireless LAN.
	None	Off	The wireless LAN is not ready or has failed.
OTIST	Green	Blinking	OTIST is in progress
		On	OTIST is activated and the wireless security settings are given to a wireless client. The LED remains on unless the WLAN settings are changed.
	None	Off	OTIST is not activated or WLAN settings are manually configured after OTIST is successful.
USB (P-335U only)		Off	The print server connection is not ready, or has failed.
	Green	On	The print server has a successful connection.
		Blinking	The print server is sending/receiving data.

CHAPTER 2

Introducing the Web Configurator

This chapter describes how to access the ZyXEL Device web configurator and provides an overview of its screens.

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).

Refer to the Troubleshooting chapter to see how 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 and prepare your computer/computer network to connect to the ZyXEL Device (refer to the Quick Start Guide).
- 2 Launch your web browser.
- 3 Type "192.168.1.1" as the URL.
- 4 Type "1234" (default) as the password and click **Login**. In some versions, the default password appears automatically - if this is the case, click **Login**.
- 5 You should see a screen asking you to change your password (highly recommended) as shown next. Type a new password (and retype it to confirm) and click **Apply** or click **Ignore**.

Figure 7 Change Password Screen

ZyXEL

Please enter a new 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.

The administrator password should must be between 1 - 30 characters.

New Password:

Retype to Confirm:

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 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”.

2.3.1 Procedure to Use the Reset Button

- 1 Make sure the **PWR** LED is on (not blinking).
- 2 Press the **RESET** button for ten seconds or until the **PWR** LED begins to blink and then release it. When the **PWR** LED begins to blink, the defaults have been restored and the ZyXEL Device restarts.

2.4 Navigating the Web Configurator

We use the P-334U web screens in this guide as an example. Screens vary slightly for different ZyXEL Device models.

The following summarizes how to navigate the web configurator from the **Status** screen.

Figure 8 Web Configurator Status Screen



The screenshot displays the ZyXEL web configurator's status page. It features a left-hand navigation pane with a tree view including 'Network' (Wireless LAN, WAN, LAN, DHCP Server, NAT, DDNS), 'Security', 'Management', and 'Maintenance'. The main content area is titled 'Status' and includes a 'Refresh Interval' dropdown set to 'None' and a 'Refresh Now' button. The 'Device Information' panel lists system details such as name, firmware, and network configurations for WAN, LAN, and WLAN. The 'System Status' panel provides real-time metrics on system uptime, date/time, and resource usage (CPU and memory), along with configuration settings for firewall, bandwidth management, and UPnP. The 'Interface Status' panel contains a table showing the operational status and data rates for WAN, LAN, and WLAN interfaces. The 'Summary' panel offers quick access to various monitoring and diagnostic tools.

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

Table 2 Status Screen Icon Key

ICON	DESCRIPTION
	Select a language from the drop-down list box to have the web configurator display in that language.
	Click this icon to open a web help page relevant to the screen you are currently configuring.
	Click this icon to open the setup wizard. The ZyXEL Device has a connection wizard and a bandwidth management wizard.
	Click this icon to view copyright and a link for related product information.
	Click this icon at any time to exit the web configurator.

Table 2 Status Screen Icon Key

ICON	DESCRIPTION
	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.
	Click this button to refresh the status screen statistics.

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

Table 3 Web Configurator Status Screen

LABEL	DESCRIPTION
Device Information	
System Name	This is the System Name you enter in the Maintenance > System > General screen. It is for identification purposes.
Firmware Version	This is the ZyNOS firmware version and the date created. ZyNOS is ZyXEL's proprietary Network Operating System design.
WAN Information	
- MAC Address	This shows the WAN Ethernet adapter MAC Address of your device.
- IP Address	This shows the WAN port's IP address.
- IP Subnet Mask	This shows the WAN port's subnet mask.
- DHCP	This shows the WAN port's DHCP role - Client or None .
LAN Information	
- MAC Address	This shows the LAN Ethernet adapter MAC Address of your device.
- IP Address	This shows the LAN port's IP address.
- IP Subnet Mask	This shows the LAN port's subnet mask.
- DHCP	This shows the LAN port's DHCP role - Server, Relay or None .
WLAN Information	
- MAC Address	This shows the wireless adapter MAC Address of your device.
- Name(SSID)	This shows a descriptive name used to identify the ZyXEL Device in the wireless LAN.
- Channel	This shows the channel number which the ZyXEL Device uses over the wireless LAN.
- Security Mode	This shows the level of wireless security the ZyXEL Device is using.
- 802.11 Mode	This shows the wireless standard.
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 along with the difference from the Greenwich Mean Time (GMT) zone. The difference from GMT is based on the time zone. It is also adjusted for Daylight Saving Time if you set the ZyXEL Device to use it.
System Resource	

Table 3 Web Configurator Status Screen

LABEL	DESCRIPTION
- 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 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.
System Setting	
- Firewall	This shows whether the firewall is active or not.
- Bandwidth Management	This shows whether the bandwidth management is active or not.
- UPnP	This shows whether UPnP is active or not.
- Configuration Mode	This shows whether the advanced screens of each feature are turned on (Advanced) or not (Basic).
Interface Status	
Interface	This displays the ZyXEL Device port types. The port types are: WAN , LAN and WLAN .
Status	For the LAN and WAN ports, this field displays Down (line is down) or Up (line is up or connected). For the WLAN, it displays Up when the WLAN is enabled or Down when the WLAN is disabled.
Rate	For the LAN ports, this displays the port speed and duplex setting or N/A when the line is disconnected. For the WAN port, it displays the port speed and duplex setting if you're using Ethernet encapsulation and Idle (line (ppp) idle), Dial (starting to trigger a call) and Drop (dropping a call) if you're using PPPoE or PPTP encapsulation. This field displays N/A when the line is disconnected. For the WLAN, it displays the connection type (54M or 11M) when the WLAN is enabled and N/A when the WLAN is disabled.
Summary	
BW MGNT Monitor	Use this screen to view the ZyXEL Device's bandwidth usage and allotments.
DHCP Table	Use this screen to view current DHCP client information.
Packet Statistics	Use this screen to view port status and packet specific statistics.
VPN Monitor	Use this screen to view the active VPN connections.
WLAN Station Status	Use this screen to view the wireless stations that are currently associated to the ZyXEL Device.

2.4.1 Navigation Panel

After you enter the password, use the sub-menus on the navigation panel to configure ZyXEL Device features.

The following table describes the sub-menus.

Table 4 Screens Summary

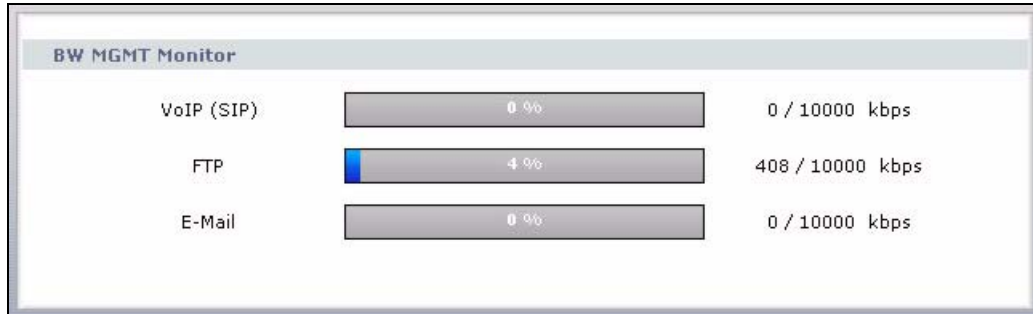
LINK	TAB	FUNCTION
Status		This screen shows the ZyXEL Device's general device, system and interface status information. Use this screen to access the wizard, and summary statistics tables.
Network		
Wireless LAN	General	Use this screen to configure wireless LAN.
	OTIST	This screen allows you to assign wireless clients the ZyXEL Device's wireless security settings.
	MAC Filter	Use the MAC filter screen to configure the ZyXEL Device to block access to devices or block the devices from accessing the ZyXEL Device.
	Advanced	This screen allows you to configure advanced wireless settings.
WAN	Internet Connection	This screen allows you to configure ISP parameters, WAN IP address assignment and the WAN MAC address.
	Advanced	Use this screen to configure DNS servers and other advanced properties.
LAN	IP	Use this screen to configure LAN IP address and subnet mask.
	IP Alias	Use this screen to partition your LAN interface into subnets.
	Advanced	Use this screen to enable other advanced properties.
DHCP Server	General	Use this screen to enable the ZyXEL Device's DHCP server.
	Advanced	Use this screen to assign IP addresses to specific individual computers based on their MAC addresses and to have DNS servers assigned by the DHCP server.
	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).
NAT	General	Use this screen to enable NAT.
	Application	Use this screen to configure servers behind the ZyXEL Device.
	Advanced	Use this screen to change your ZyXEL Device's port triggering settings.
DDNS	General	Use this screen to set up dynamic DNS.
Security		
Firewall	General	Use this screen to activate/deactivate the firewall.
	Services	This screen shows a summary of the firewall rules, and allows you to edit/add a firewall rule.
Content Filter	Filter	Use this screen to block certain web features and 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.
VPN (P-335U only)	Summary	Use this screen to view the rule summary
	Rule Setup	Use this screen to configure VPN connections.
	SA Monitor	Use this screen to display active VPN connections.
	Global Setting	Use this screen to allow NetBIOS traffic through VPN tunnels.
Management		
Static Route	IP Static Route	Use this screen to configure IP static routes.

Table 4 Screens Summary

LINK	TAB	FUNCTION
Bandwidth MGMT	General	Use this screen to enable bandwidth management.
	Advanced	Use this screen to set the upstream bandwidth and edit a bandwidth management rule.
	Monitor	Use this screen to view the ZyXEL Device's bandwidth usage and allotments.
Remote MGMT	WWW	Use this screen to configure through which interface(s) and from which IP address(es) users can use 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.
	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.
UPnP	General	Use this screen to enable UPnP on the ZyXEL Device.
Print Server (P-335U only)	Print Server	Use this screen to view the printer model name and to monitor the printer status.
Maintenance		
System	General	This screen contains administrative.
	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.
Config Mode	General	This screen allows you to display or hide the advanced screens or features.

2.4.2 Summary: Bandwidth Management Monitor

Select the **BW MGMT Monitor (Details...)** hyperlink in **Status** screen. View the bandwidth usage of the WAN configured bandwidth rules. This is also shown as bandwidth usage over the bandwidth budget for each rule. The gray section of the bar represents the percentage of unused bandwidth and the blue color represents the percentage of bandwidth in use.

Figure 9 Summary: BW MGMT Monitor

2.4.3 Summary: DHCP Table

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 DHCP service is disabled, you must have another DHCP server on your LAN, or else the computer must be manually configured.

Click the **DHCP Table (Details...)** hyperlink in the **Status** screen. Read-only information here relates to your DHCP status. The DHCP table shows current DHCP client information (including **IP Address**, **Host Name** and **MAC Address**) of all network clients using the ZyXEL Device's DHCP server.

Figure 10 Summary: DHCP Table

The screenshot shows a 'DHCP Table' window with a table containing one row of data. Below the table is a 'Refresh' button.

#	IP Address	Host Name	MAC Address
1	192.168.1.33	tw11477-02	00:50:8d:48:59:1f

Refresh

The following table describes the labels in this screen.

Table 5 Summary: DHCP Table

LABEL	DESCRIPTION
#	This is the index number of the host computer.
IP Address	This field displays the IP address relative to the # field listed above.
Host Name	This field displays the computer host name.

Table 5 Summary: DHCP Table (continued)

LABEL	DESCRIPTION
MAC Address	This field shows the MAC address of the computer with the name in the Host Name field. 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.
Refresh	Click Refresh to renew the screen.

2.4.4 Summary: Packet Statistics

Click the **Packet Statistics (Details...)** 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 11 Summary: Packet Statistics

Port	Status	TxPkts	RxPkts	Collisions	Tx B/s	Rx B/s	Up Time
WAN	Idle	210266	156607	0	0	448	0:00:00
LAN	100M/Full	247620	61040	0	0	0	8:01:43
WLAN	54M	1138	0	0	0	0	8:01:43

System Up Time : 8:01:49

Poll Interval(s) : sec

The following table describes the labels in this screen.

Figure 12 Summary: Packet Statistics

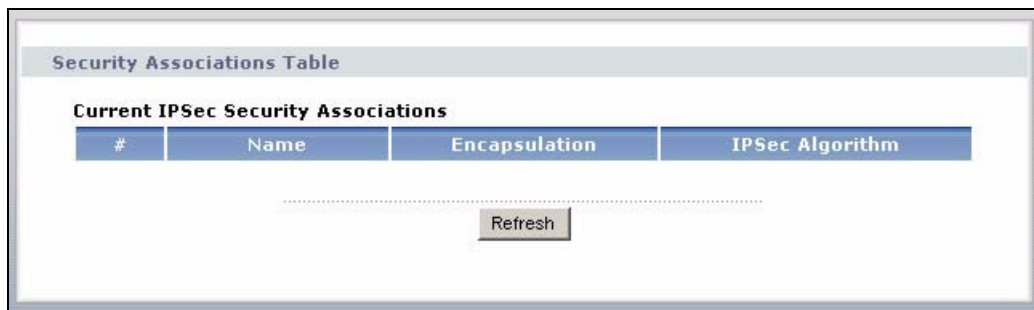
LABEL	DESCRIPTION
Port	This is the WAN, LAN or WLAN port.
Status	For the LAN ports, this displays the port speed and duplex setting or Down when the line is disconnected. For the WAN port, it displays the port speed and duplex setting if you're using Ethernet encapsulation and Idle (line (ppp) idle), Dial (starting to trigger a call) and Drop (dropping a call) if you're using PPPoE or PPTP encapsulation. This field displays Down when the line is disconnected. For the WLAN, it displays the connection type (54M or 11M) when the WLAN is enabled and Down when the WLAN is disabled.
TxPkts	This is the number of transmitted packets on this port.
RxPkts	This is the number of received packets on this port.
Collisions	This is the number of collisions on this port.
Tx B/s	This displays the transmission speed in bytes per second on this port.

Figure 12 Summary: Packet Statistics

LABEL	DESCRIPTION
Rx B/s	This displays the reception speed in bytes per second on this port.
Up Time	This is the total amount of time the line has been up.
System Up Time	This is the total time the ZyXEL Device has been on.
Poll Interval(s)	Enter the time interval for refreshing statistics in this field.
Set Interval	Click this button to apply the new poll interval you entered in the Poll Interval(s) field.
Stop	Click Stop to stop refreshing statistics, click Stop .

2.4.5 VPN Monitor

Click **VPN Monitor (Details...)** hyperlink in the **Status** screen. This screen displays read-only information about the active VPN connections. A Security Association (SA) is the group of security settings related to a specific VPN tunnel.

Figure 13 Summary: VPN Monitor

The following table describes the labels in this screen.

Table 6 Summary: VPN Monitor

LABEL	DESCRIPTION
#	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 protocols used for an SA. Both AH and ESP increase ZyXEL Device processing requirements and communications latency (delay).
Refresh	Click Refresh to redisplay the current screen.

2.4.6 Summary: Wireless Station Status

Click the **WLAN Station Status (Details...)** hyperlink in the **Status** screen. View the wireless stations that are currently associated to the ZyXEL Device in the **Association List** screen.

Figure 14 Summary: Wireless Association List

The following table describes the labels in this screen.

Table 7 Summary: Wireless Association List

LABEL	DESCRIPTION
#	This is the index number of an associated wireless station.
MAC Address	This field displays the MAC address of an associated wireless station.
Association Time	This field displays the time a wireless station first associated with the ZyXEL Device.
Refresh	Click Refresh to redisplay the current screen.

CHAPTER 3

Connection Wizard

This chapter provides information on the Wizard setup screens in the web configurator.

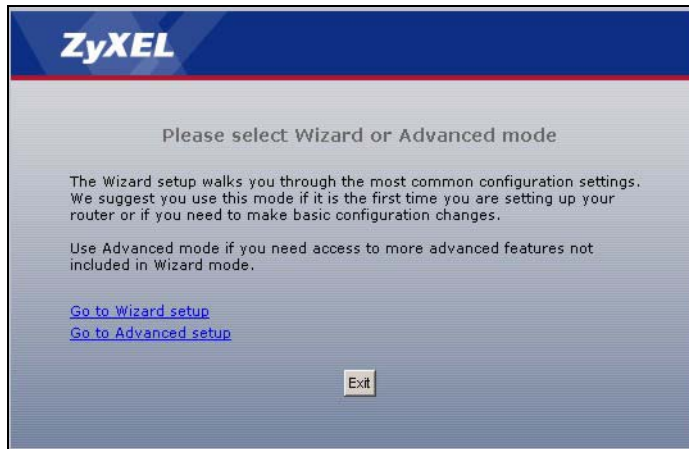
3.1 Wizard Setup

The web configurator's Wizard setup helps you configure your device to access the Internet. Refer to your ISP (Internet Service Provider) checklist in the Quick Start Guide to know what to enter in each field. Leave a field blank if you don't have that information.

- 1 After you access the ZyXEL Device Web configurator, click the **Go to Wizard setup** hyperlink.

You can click the **Go to Advanced setup** hyperlink to skip this wizard setup and configure advanced features.

Figure 15 Select Wizard or Advanced Mode



- 2 Choose your language from the drop-down list box.
- 3 Click the **Next** button to proceed to the next screen.

Figure 16 Select a Language

4 Read the on-screen information and click **Next**.

Figure 17 Welcome to the Connection Wizard

3.2 Connection Wizard: STEP 1: System Information

System Information contains administrative and system-related information.

3.2.1 System Name

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** and **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**.

3.2.2 Domain Name

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) on each individual computer, the domain name can be assigned from the ZyXEL Device via DHCP.

Click **Next** to configure the ZyXEL Device for Internet access.

Figure 18 Wizard Step 1: System Information

The following table describes the labels in this screen.

Table 8 Wizard Step 1: System Information

LABEL	DESCRIPTION
System Name	System Name is a unique name to identify the ZyXEL Device in an Ethernet network. Enter a descriptive name. This name can be up to 30 alphanumeric characters long. Spaces are not allowed, but dashes "-" and underscores "_" are accepted.
Domain Name	Type 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.
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.

3.3 Connection Wizard: STEP 2: Wireless LAN

Set up your wireless LAN using the following screen.

Figure 19 Wizard Step 2: Wireless LAN

The following table describes the labels in this screen.

Table 9 Wizard Step 2: Wireless LAN

LABEL	DESCRIPTION
Name(SSID)	Enter a descriptive name (up to 32 printable 7-bit ASCII characters) for the wireless LAN. If you change this field on the ZyXEL Device, make sure all wireless stations use the same SSID in order to access the network.
Security	Select a Security level from the drop-down list box. Choose Auto to use OTIST to generate a pre-shared key and only if your wireless clients support OTIST. If you choose this option, skip directly to section 3.3.3. Choose None to have no wireless LAN security configured. If you do not enable any wireless security on your ZyXEL Device, your network is accessible to any wireless networking device that is within range. If you choose this option, skip directly to section 3.3.3. Choose Basic security if you want to configure WEP Encryption parameters. If you choose this option, go directly to section 3.3.1. Choose Extend (WPA-PSK or WPA2-PSK) security to configure a Pre-Shared Key. Choose this option only if your wireless clients support WPA-PSK or WPA2-PSK respectively. If you choose this option, skip directly to section 3.3.2.
Channel Selection	The range of radio frequencies used by IEEE 802.11b/g wireless devices is called a channel. This field displays Auto which means the ZyXEL Device automatically scans for and selects a channel which is not used by a nearby device.
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.

Note: The wireless stations and ZyXEL Device must use the same SSID, channel ID and WEP encryption key (if WEP is enabled), WPA-PSK (if WPA-PSK is enabled) or WPA2-PSK (if WPA2-PSK is enabled) for wireless communication.

3.3.1 Basic(WEP) Security

Choose **Basic(WEP)** to setup WEP Encryption parameters.

Figure 20 Wizard Step 2: Basic(WEP) Security

STEP 1 > **STEP 2** > STEP 3 > STEP 4

WIRELESS LAN

Passphrase

Use Passphrase to automatically generates a WEP key.

Passphrase

WEP Key

The higher the WEP Encryption, the higher the security but the slower the throughput. Select 64-bit WEP, 128-bit WEP or 256-bit WEP to enable data encryption and select one of the Key radio buttons to use as the WEP key. Entering a manual key in a Key field and selecting ASCII or Hex WEP key input method.

WEP Encryption

64-bit WEP: Enter 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F") for each Key(1-4).
 128-bit WEP: Enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F") for each Key(1-4).
 256-bit WEP: Enter 29 ASCII characters or 58 hexadecimal characters ("0-9", "A-F") for each Key (1-4).
 (Select one WEP key as an active key to encrypt wireless data transmission.)

ASCII Hex

Key 1

Key 2

Key 3

Key 4

The following table describes the labels in this screen.

Table 10 Wizard Step 2: Basic(WEP) Security

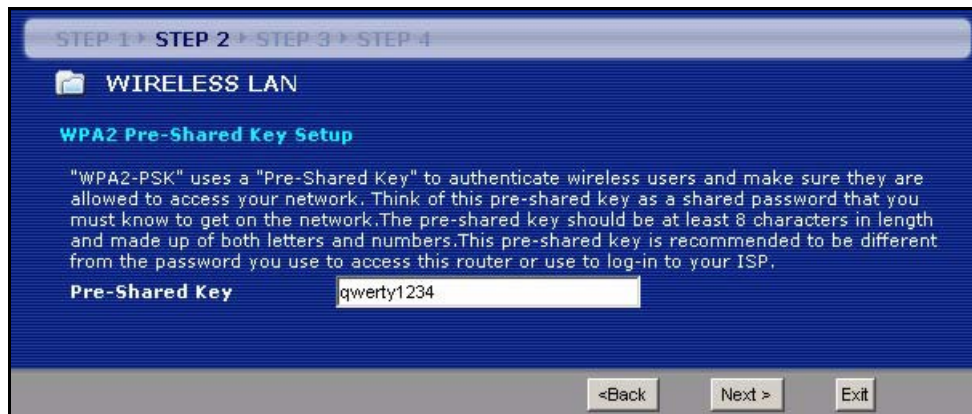
LABEL	DESCRIPTION
Passphrase	Type a Passphrase (up to 32 printable characters) and click Generate . The ZyXEL Device automatically generates a WEP key.
WEP Encryption	Select 64-bit WEP , 128-bit WEP or 256-bit WEP to allow data encryption.
ASCII	Select this option in order to enter ASCII characters as the WEP keys.
HEX	Select this option to enter hexadecimal characters as the WEP keys. The preceding "0x" is entered automatically.

Table 10 Wizard Step 2: Basic(WEP) Security

LABEL	DESCRIPTION
Key 1 to Key 4	The WEP keys are used to encrypt data. Both the ZyXEL Device and the wireless stations must use the same WEP key for data transmission. If you chose 64-bit WEP , then enter any 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F"). If you chose 128-bit WEP , then enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F"). If you chose 256-bit WEP , then enter 29 ASCII characters or 58 hexadecimal characters ("0-9", "A-F"). You must configure at least one key, only one key can be activated at any one time. The default key is key 1.
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.

3.3.2 Extend(WPA-PSK or WPA2-PSK) Security

Choose **Extend(WPA-PSK)** or **Extend(WPA2-PSK)** security in the Wireless LAN setup screen to set up a **Pre-Shared Key**.

Figure 21 Wizard Step 2: Extend(WPA-PSK or WPA2-PSK) Security

The following table describes the labels in this screen.

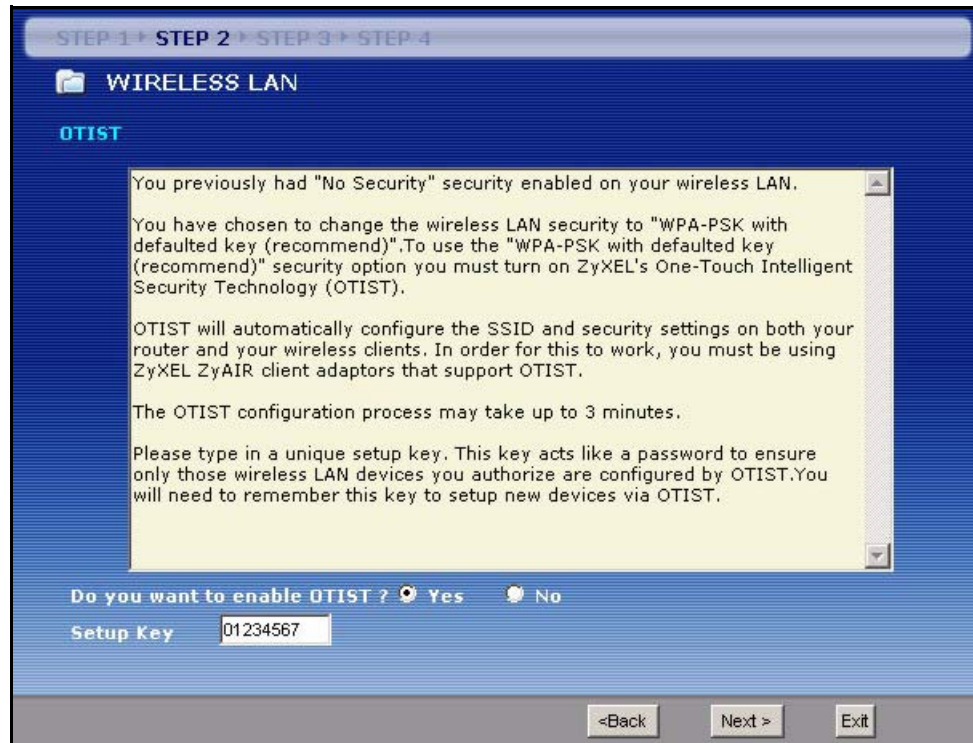
Table 11 Wizard Step 2: Extend(WPA-PSK or WPA2-PSK) Security

LABEL	DESCRIPTION
Pre-Shared Key	Type from 8 to 63 case-sensitive ASCII characters. You can set up the most secure wireless connection by configuring WPA in the wireless LAN screens. You need to configure an authentication server to do this.
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.

3.3.3 OTIST

The following screen allows you to enable ZyXEL Device One-Touch Intelligent Security Technology (OTIST). One-Touch Intelligent Security Technology (OTIST) allows your ZyXEL Device to assign wireless clients the ZyXEL Device's SSID and static WEP or WPA-PSK encryption settings. The wireless client must also support OTIST and have OTIST enabled. See [Section 4.4 on page 77](#) for more information.

Figure 22 Wizard Step 2: OTIST



The following table describes the labels in this screen.

Table 12 Wizard Step 2: OTIST

LABEL	DESCRIPTION
Do you want to enable OTIST?	Select the Yes radio button and click Next to proceed with the setup wizard and enable OTIST only when you click Finish in the final wizard screen. Click No and then Next to proceed to the following screen.
Setup Key	The default OTIST Setup Key is "01234567". This key can be changed in the web configurator. Be sure to use the same OTIST Setup Key on the ZyXEL Device and wireless clients.
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.

Refer to the chapter on wireless LAN for more information.

3.4 Connection Wizard: STEP 3: Internet Configuration

The ZyXEL Device offers three Internet connection types. They are **Ethernet**, **PPP over Ethernet** or **PPTP**. The wizard attempts to detect which WAN connection type you are using. If the wizard does not detect a connection type, you must select one from the drop-down list box. Check with your ISP to make sure you use the correct type.

This wizard screen varies according to the connection type that you select.

Figure 23 Wizard Step 3: ISP Parameters.



The following table describes the labels in this screen,

Table 13 Wizard Step 3: ISP Parameters

CONNECTION TYPE	DESCRIPTION
Ethernet	Select the Ethernet option when the WAN port is used as a regular Ethernet.
PPPoE	Select the PPP over Ethernet option for a dial-up connection. If your ISP gave you a an IP address and/or subnet mask, then select PPTP .
PPTP	Select the PPTP option for a dial-up connection.

3.4.1 Ethernet Connection

Choose **Ethernet** when the WAN port is used as a regular Ethernet.

Figure 24 Wizard Step 3: Ethernet Connection

3.4.2 PPPoE Connection

Point-to-Point Protocol over Ethernet (PPPoE) functions as a dial-up connection. PPPoE is an IETF (Internet Engineering Task Force) standard specifying how a host personal computer interacts with a broadband modem (for example DSL, cable, wireless, etc.) to achieve access to high-speed data networks.

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

One of the benefits of PPPoE is the ability to let end users 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 specific users.

Operationally, PPPoE saves significant effort for both the subscriber and the ISP/carrier, as it requires no specific configuration of the broadband modem at the subscriber's 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 LAN's computers will have Internet access.

Refer to the appendix for more information on PPPoE.

Figure 25 Wizard Step 3: PPPoE Connection

The following table describes the labels in this screen.

Table 14 Wizard Step 3: PPPoE Connection

LABEL	DESCRIPTION
ISP Parameter for Internet Access	
Connection Type	Select the PPP over Ethernet option for a dial-up connection.
Service Name	Type the name of your service provider.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the user name above.
Back	Click Back to return to the previous screen.
Next	Click Next to continue.
Exit	Click Exit to close the wizard screen without saving.

3.4.3 PPTP Connection

Point-to-Point Tunneling Protocol (PPTP) is a network protocol that enables transfers of data from a remote client to a private server, creating a Virtual Private Network (VPN) using TCP/IP-based networks.

PPTP supports on-demand, multi-protocol, and virtual private networking over public networks, such as the Internet.

Refer to the appendix for more information on PPTP.

Note: The ZyXEL Device supports one PPTP server connection at any given time.

Figure 26 Wizard Step 3: PPTP Connection

The following table describes the fields in this screen

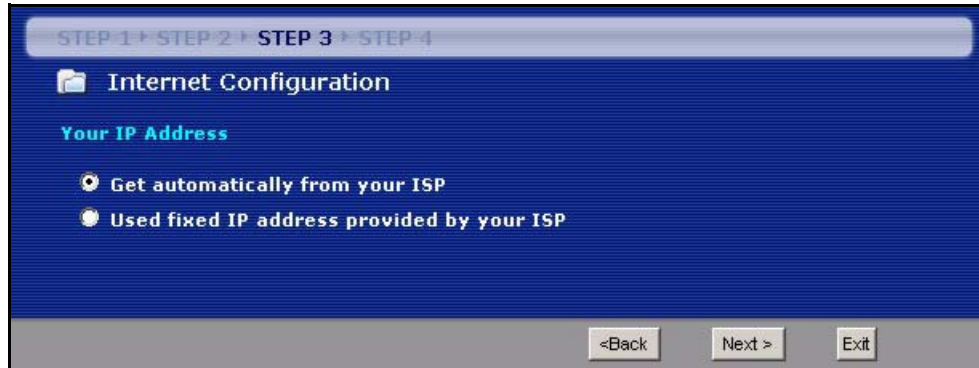
Table 15 Wizard Step 3: PPTP Connection

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
Connection Type	Select PPTP from the drop-down list box. To configure a PPTP client, you must configure the User Name and Password fields for a PPP connection and the PPTP parameters for a PPTP connection.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the User Name above.
PPTP Configuration	
Get automatically from ISP	Select this radio button if your ISP did not assign you a fixed IP address.
Use fixed IP address	Select this radio button, provided by your ISP to give the ZyXEL Device a fixed, unique IP address.
My IP Address	Type the (static) IP address assigned to you by your ISP.
My IP Subnet Mask	Type the subnet mask assigned to you by your ISP (if given).
Server IP Address	Type the IP address of the PPTP server.
Connection ID/Name	Enter the connection ID or connection name in this field. It must follow the "c:id" and "n:name" format. For example, C:12 or N:My ISP. This field is optional and depends on the requirements of your ISP.
Back	Click Back to return to the previous screen.
Next	Click Next to continue.
Exit	Click Exit to close the wizard screen without saving.

3.4.4 Your IP Address

The following wizard screen allows you to assign a fixed IP address or give the ZyXEL Device an automatically assigned IP address depending on your ISP.

Figure 27 Wizard Step 3: Your IP Address



The following table describes the labels in this screen

Table 16 Wizard Step 3: Your IP Address

LABEL	DESCRIPTION
Get automatically from your ISP	Select this option if your ISP did not assign you a fixed IP address. This is the default selection. If you choose this option, skip directly to section 3.4.9 .
Use fixed IP address provided by your ISP	Select this option if you were given IP address and/or DNS server settings by the ISP. The fixed IP address should be in the same subnet as your broadband modem or router.
Back	Click Back to return to the previous screen.
Next	Click Next to continue.
Exit	Click Exit to close the wizard screen without saving.

3.4.5 WAN IP Address Assignment

Every computer on the Internet must have a unique IP address. If your networks are isolated from the Internet, for instance, 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.

Table 17 Private IP Address Ranges

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 have it assigned by 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.

3.4.6 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. 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.

3.4.7 DNS Server Address Assignment

Use DNS (Domain Name System) to map a domain name to its corresponding IP address and vice versa, for instance, the IP address of www.zyxel.com is 204.217.0.2. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it.

The ZyXEL Device can get the DNS server addresses in the following ways.

- 1 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 **Wizard** and/or **WAN > Internet Connection** screen.
- 2 If the ISP did not give you DNS server information, leave the **DNS Server** fields set to **0.0.0.0** in the **Wizard** screen and/or set to **From ISP** in the **WAN > Internet Connection** screen for the ISP to dynamically assign the DNS server IP addresses.

3.4.8 WAN IP and DNS Server Address Assignment

The following wizard screen allows you to assign a fixed WAN IP address and DNS server addresses.

Figure 28 Wizard Step 3: WAN IP and DNS Server Addresses

The screenshot shows a wizard interface with a blue background. At the top, a progress bar indicates 'STEP 1', 'STEP 2', 'STEP 3' (highlighted), and 'STEP 4'. Below the progress bar is a folder icon and the text 'Internet Configuration'. The main content area is divided into two sections: 'WAN IP Address Assignment' and 'DNS Server Address Assignment'. Each section contains three text input fields with their respective values. At the bottom right, there are three buttons: '<Back', 'Next >', and 'Exit'.

The following table describes the labels in this screen

Table 18 Wizard Step 3: WAN IP and DNS Server Addresses

LABEL	DESCRIPTION
WAN IP Address Assignment	
My WAN IP Address	Enter your WAN IP address in this field. The WAN IP address should be in the same subnet as your DSL/Cable modem or router.
My WAN IP Subnet Mask	Enter the IP subnet mask in this field.
Gateway IP Address	Enter the gateway IP address in this field.
System DNS Server Address Assignment (if applicable)	
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 computer before you can access it. The ZyxEL Device uses a system DNS server (in the order you specify here) to resolve domain names for DDNS and the time server.	

Table 18 Wizard Step 3: WAN IP and DNS Server Addresses

LABEL	DESCRIPTION
First DNS Server	Enter the DNS server's IP address in the fields provided. If you do not configure a system DNS server, you must use IP addresses when configuring DDNS and the time server.
Second DNS Server	
Third DNS Server	
Back	Click Back to return to the previous screen.
Next	Click Next to continue.
Exit	Click Exit to close the wizard screen without saving.

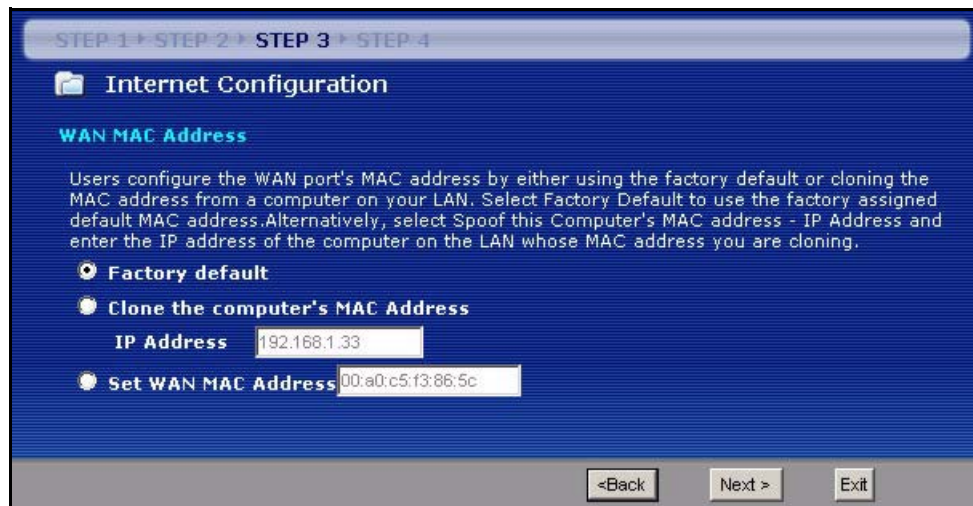
3.4.9 WAN MAC Address

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.

Table 19 Example of Network Properties for LAN Servers with Fixed IP Addresses

Choose an IP address	192.168.1.2-192.168.1.32; 192.168.1.65-192.168.1.254.
Subnet mask	255.255.255.0
Gateway (or default route)	192.168.1.1(ZyXEL Device LAN IP)

This screen allows users to configure the WAN port's MAC address by either using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address. Once it is successfully configured, the address will be copied to the "rom" file (ZyNOS configuration file). It will not change unless you change the setting or upload a different "rom" file. It is advisable to clone the MAC address from a computer on your LAN even if your ISP does not presently require MAC address authentication.

Figure 29 Wizard Step 3: WAN MAC Address

The following table describes the fields in this screen.

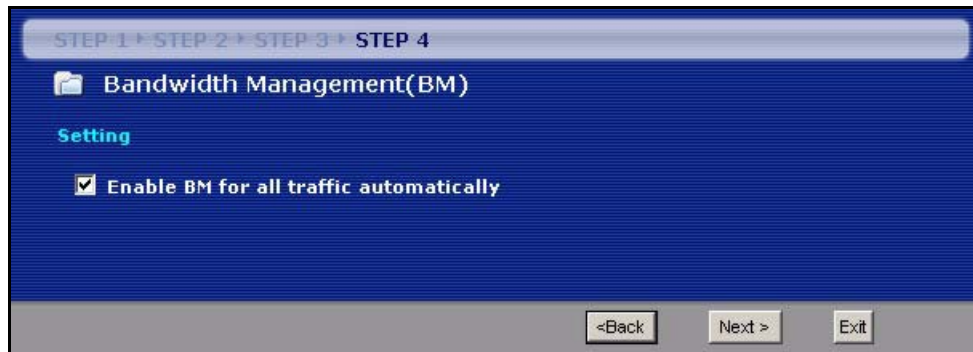
Table 20 Wizard Step 3: WAN MAC Address

LABEL	DESCRIPTION
Factory Default	Select Factory Default to use the factory assigned default MAC address.
Clone the computer's MAC address	Select this option and enter the IP address of the computer on the LAN whose MAC you are cloning. It is advisable to clone the MAC address from a computer on your LAN even if your ISP does not presently require MAC address authentication.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
Back	Click Back to return to the previous screen.
Next	Click Next to continue.
Exit	Click Exit to close the wizard screen without saving.

3.5 Connection Wizard: STEP 4: Bandwidth management

Bandwidth management allows you to control the amount of bandwidth going out through the ZyXEL Device's WAN, LAN or WLAN port and prioritize the distribution of the bandwidth according to the traffic type. This helps keep one service from using all of the available bandwidth and shutting out other users.

Figure 30 Wizard Step 4: Bandwidth Management



The following fields describe the label in this screen.

Table 21 Wizard Step 4: Bandwidth Management

LABEL	DESCRIPTION
Enable BM for all traffic automatically	Select the check box to have the ZyXEL Device apply bandwidth management to traffic going out through the ZyXEL Device's WAN, LAN or WLAN port. Bandwidth is allocated according to the traffic type automatically. Real-time packets, such as VoIP traffic always get higher priority.
Back	Click Back to return to the previous screen.

Table 21 Wizard Step 4: Bandwidth Management

LABEL	DESCRIPTION
Next	Click Next to continue.
Exit	Click Exit to close the wizard screen without saving.

3.6 Connection Wizard Complete

Click **Apply** to save your configuration.

Figure 31 Connection Wizard Save

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

Figure 32 Connection Wizard Complete

Well done! You have successfully set up your ZyXEL Device to operate on your network and access the Internet.

CHAPTER 4

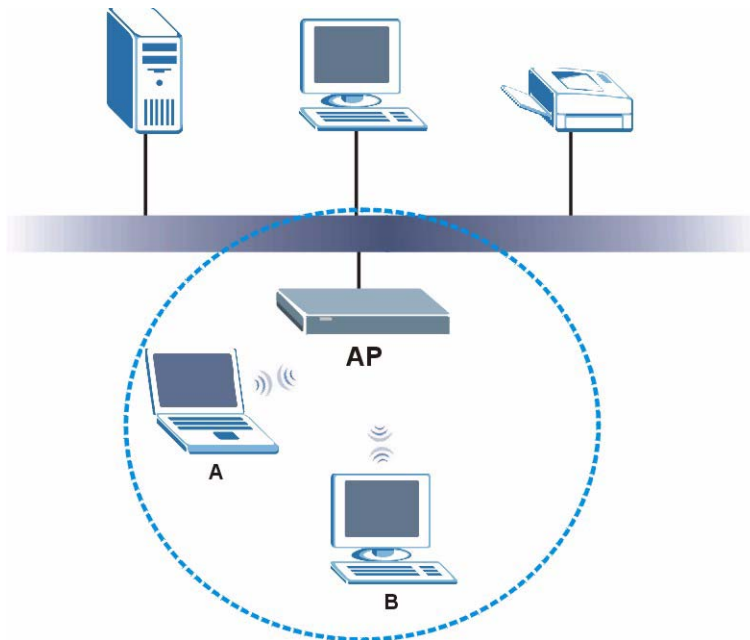
Wireless LAN

This chapter discusses how to configure the wireless network settings in your ZyXEL Device. See the appendices for more detailed information about wireless networks.

4.1 Wireless Network Overview

The following figure provides an example of a wireless network.

Figure 33 Example of a Wireless Network



The wireless network is the part in the blue circle. In this wireless network, devices A and B are called wireless clients. The wireless clients use the access point (AP) to interact with other devices (such as the printer) or with the Internet. Your ZyXEL Device is the AP.

Every wireless network must follow these basic guidelines.

- Every wireless client in the same wireless network must use the same SSID.
The SSID is the name of the wireless network. It stands for Service Set IDentity.
- If two wireless networks overlap, they should use different channels.
Like radio stations or television channels, each wireless network uses a specific channel, or frequency, to send and receive information.

- Every wireless client in the same wireless network must use security compatible with the AP.

Security stops unauthorized devices from using the wireless network. It can also protect the information that is sent in the wireless network.

4.2 Wireless Security Overview

The following sections introduce different types of wireless security you can set up in the wireless network.

4.2.1 SSID

Normally, the AP acts like a beacon and regularly broadcasts the SSID in the area. You can hide the SSID instead, in which case the AP does not broadcast the SSID. In addition, you should change the default SSID to something that is difficult to guess.

This type of security is fairly weak, however, because there are ways for unauthorized devices to get the SSID. In addition, unauthorized devices can still see the information that is sent in the wireless network.

4.2.2 MAC Address Filter

Every wireless client has a unique identification number, called a MAC address.¹ A MAC address is usually written using twelve hexadecimal characters²; for example, 00A0C5000002 or 00:A0:C5:00:00:02. To get the MAC address for each wireless client, see the appropriate User's Guide or other documentation.

You can use the MAC address filter to tell the AP which wireless clients are allowed or not allowed to use the wireless network. If a wireless client is allowed to use the wireless network, it still has to have the correct settings (SSID, channel, and security). If a wireless client is not allowed to use the wireless network, it does not matter if it has the correct settings.

This type of security does not protect the information that is sent in the wireless network. Furthermore, there are ways for unauthorized devices to get the MAC address of an authorized wireless client. Then, they can use that MAC address to use the wireless network.

4.2.3 User Authentication

You can make every user log in to the wireless network before they can use it. This is called user authentication. However, every wireless client in the wireless network has to support IEEE 802.1x to do this.

-
1. Some wireless devices, such as scanners, can detect wireless networks but cannot use wireless networks. These kinds of wireless devices might not have MAC addresses.
 2. Hexadecimal characters are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

For wireless networks, there are two typical places to store the user names and passwords for each user.

- In the AP: this feature is called a local user database or a local database.
- In a RADIUS server: this is a server used in businesses more than in homes.

If your AP does not provide a local user database and if you do not have a RADIUS server, you cannot set up user names and passwords for your users.

Unauthorized devices can still see the information that is sent in the wireless network, even if they cannot use the wireless network. Furthermore, there are ways for unauthorized wireless users to get a valid user name and password. Then, they can use that user name and password to use the wireless network.


Local user databases also have an additional limitation that is explained in the next section.

4.2.4 Encryption

Wireless networks can use encryption to protect the information that is sent in the wireless network. Encryption is like a secret code. If you do not know the secret code, you cannot understand the message.

The types of encryption you can choose depend on the type of user authentication. (See [Section 4.2.3 on page 68](#) for information about this.)

Table 22 Types of Encryption for Each Type of Authentication

		RADIUS Server
Weakest  Strongest	No Security	WPA WPA2
	Static WEP	
	WPA-PSK	
	WPA2-PSK	

For example, if the wireless network has a RADIUS server, you can choose **WPA** or **WPA2**. If users do not log in to the wireless network, you can choose no encryption, **Static WEP**, **WPA-PSK**, or **WPA2-PSK**.

Usually, you should set up the strongest encryption that every wireless client in the wireless network supports. For example, suppose the AP does not have a local user database, and you do not have a RADIUS server. Therefore, there is no user authentication. Suppose the wireless network has two wireless clients. Device A only supports WEP, and device B supports WEP and WPA. Therefore, you should set up **Static WEP** in the wireless network.

Note: It is recommended that wireless networks use **WPA-PSK**, **WPA**, or stronger encryption. IEEE 802.1x and WEP encryption are better than none at all, but it is still possible for unauthorized devices to figure out the original information pretty quickly.

It is not possible to use **WPA-PSK**, **WPA** or stronger encryption with a local user database. In this case, it is better to set up stronger encryption with no authentication than to set up weaker encryption with the local user database.

When you select **WPA2** or **WPA2-PSK** in your ZyXEL Device, you can also select an option (**WPA Compatible**) to support WPA as well. In this case, if some wireless clients support WPA and some support WPA2, you should set up **WPA2-PSK** or **WPA2** (depending on the type of wireless network login) and select the **WPA Compatible** option in the ZyXEL Device.

Many types of encryption use a key to protect the information in the wireless network. The longer the key, the stronger the encryption. Every wireless client in the wireless network must have the same key.

4.2.5 One-Touch Intelligent Security Technology (OTIST)

With ZyXEL's OTIST, you set up the SSID and WPA-PSK on the ZyXEL Device. Then, the ZyXEL Device transfers them to the devices in the wireless networks. As a result, you do not have to set up the SSID and encryption on every device in the wireless network.

The devices in the wireless network have to support OTIST, and they have to be in range of the ZyXEL Device when you activate it. See [Section 4.4 on page 77](#) for more details.

4.3 General Wireless LAN Screen

Note: If you are configuring the ZyXEL Device from a computer connected to the wireless LAN and you change the ZyXEL Device's SSID, channel or security settings, you will lose your wireless connection when you press **Apply** to confirm. You must then change the wireless settings of your computer to match the ZyXEL Device's new settings.

Click **Network > Wireless LAN** to open the **General** screen.

Figure 34 Wireless General

The following table describes the general wireless LAN labels in this screen.

Table 23 Wireless General

LABEL	DESCRIPTION
Enable Wireless LAN	Click the check box to activate wireless LAN.
Name(SSID)	(Service Set Identity) The SSID identifies the Service Set with which a wireless station is associated. Wireless stations associating to the access point (AP) must have the same SSID. Enter a descriptive name (up to 32 printable 7-bit ASCII characters) for the wireless LAN.
Hide SSID	Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.
Channel Selection	Set the operating frequency/channel depending on your particular region. Select a channel from the drop-down list box. The options vary depending on whether you are using A or B/G frequency band and the country you are in. This field is not available when you select Auto Channel Selection . Refer to the Connection Wizard chapter for more information on channels.
Auto Channel Selection	Select the check box to have the ZyXEL Device automatically scan for and select a channel which is not used by another device.
Operating Channel	This displays the channel the ZyXEL Device is currently using.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to reload the previous configuration for this screen.

See the rest of this chapter for information on the other labels in this screen.

4.3.1 No Security

Select **No Security** to allow wireless stations to communicate with the access points without any data encryption.

Note: If you do not enable any wireless security on your ZyXEL Device, your network is accessible to any wireless networking device that is within range.

Figure 35 Wireless: No Security

The screenshot shows the configuration interface for the wireless LAN. It is divided into two main sections: 'Wireless Setup' and 'Security'. In the 'Wireless Setup' section, the 'Enable Wireless LAN' checkbox is checked. The 'Name(SSID)' field is empty. The 'Hide SSID' checkbox is unchecked. The 'Channel Selection' dropdown menu is set to 'Channel-03 2422Mhz', and the 'Auto Channel Selection' checkbox is checked. The 'Operating Channel' is displayed as 'Channel-003'. In the 'Security' section, the 'Security Mode' dropdown menu is set to 'No Security'. At the bottom of the screen, there are two buttons: 'Apply' and 'Reset'.

The following table describes the labels in this screen.

Table 24 Wireless No Security

LABEL	DESCRIPTION
Security Mode	Choose No Security from the drop-down list box.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to reload the previous configuration for this screen.

4.3.2 WEP Encryption

WEP encryption scrambles the data transmitted between the wireless stations and the access points to keep network communications private. It encrypts unicast and multicast communications in a network. Both the wireless stations and the access points must use the same WEP key.

Your ZyXEL Device allows you to configure up to four 64-bit, 128-bit or 256-bit WEP keys but only one key can be enabled at any one time.

In order to configure and enable WEP encryption; click **Network > Wireless LAN** to display the **General** screen. Select **Static WEP** from the **Security Mode** list.

Figure 36 Wireless: Static WEP Encryption

Wireless Setup

Enable Wireless LAN

Name(SSID)

Hide SSID

Channel Selection Auto Channel Selection

Operating Channel Channel-040

Security

Security Mode

Passphrase

WEP Encryption

Authentication Method

Note:

64-bit WEP: Enter 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F") for each Key (1-4).
128-bit WEP: Enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F") for each Key (1-4).
256-bit WEP: Enter 29 ASCII characters or 58 hexadecimal characters ("0-9", "A-F") for each Key (1-4).
 (Select one WEP key as an active key to encrypt wireless data transmission.)

ASCII Hex

Key 1

Key 2

Key 3

Key 4

The following table describes the wireless LAN security labels in this screen.

Table 25 Wireless: Static WEP Encryption

LABEL	DESCRIPTION
Passphrase	Enter a passphrase (password phrase) of up to 32 printable characters and click Generate . The ZyXEL Device automatically generates four different WEP keys and displays them in the Key fields below.
WEP Encryption	Select 64-bit WEP , 128-bit WEP or 256-bit WEP to enable data encryption.
Authentication Method	This field is activated when you select 64-bit WEP , 128-bit WEP or 256-bit WEP in the WEP Encryption field. Select Auto , Open System or Shared Key from the drop-down list box.
ASCII	Select this option in order to enter ASCII characters as WEP key.
Hex	Select this option in order to enter hexadecimal characters as a WEP key. The preceding "0x", that identifies a hexadecimal key, is entered automatically.

Table 25 Wireless: Static WEP Encryption

LABEL	DESCRIPTION
Key 1 to Key 4	<p>The WEP keys are used to encrypt data. Both the ZyXEL Device and the wireless stations must use the same WEP key for data transmission.</p> <p>If you chose 64-bit WEP, then enter any 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F").</p> <p>If you chose 128-bit WEP, then enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F").</p> <p>If you chose 256-bit WEP, then enter 29 ASCII characters or 58 hexadecimal characters ("0-9", "A-F").</p> <p>You must configure at least one key, only one key can be activated at any one time. The default key is key 1.</p>
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to reload the previous configuration for this screen.

4.3.3 WPA-PSK/WPA2-PSK

Click **Network > Wireless LAN** to display the **General** screen.

Figure 37 Wireless: WPA-PSK/WPA2-PSK

The screenshot shows a configuration window with two tabs: 'General' (selected) and 'Advanced'. The 'Wireless Setup' section includes:

- Enable Wireless LAN
- Name(SSID): [Text Input Field]
- Hide SSID
- Channel Selection: Channel-040 5200MHz (dropdown)
- Operating Channel: Channel-040
- Auto Channel Selection

The 'Security' section includes:

- Security Mode: WPA2-PSK (dropdown)
- WPA Compatible
- Pre-Shared Key: [Text Input Field]
- ReAuthentication Timer: 1800 (In Seconds)
- Idle Timeout: 3600 (In Seconds)
- Group Key Update Timer: 1800 (In Seconds)

At the bottom, there are 'Apply' and 'Reset' buttons.

The following table describes the labels in this screen.

Table 26 Wireless: WPA-PSK/WPA2-PSK

LABEL	DESCRIPTION
WPA Compatible	This check box is available only when you select WPA2-PSK or WPA2 in the Security Mode field. Select the check box to have both WPA2 and WPA wireless clients be able to communicate with the ZyXEL Device even when the ZyXEL Device is using WPA2-PSK or WPA2.
Pre-Shared Key	The encryption mechanisms used for WPA/WPA2 and WPA-PSK/WPA2-PSK are the same. The only difference between the two is that WPA-PSK/WPA2-PSK uses a simple common password, instead of user-specific credentials. Type a pre-shared key from 8 to 63 case-sensitive ASCII characters (including spaces and symbols).
ReAuthentication Timer (in seconds)	Specify how often wireless stations have to resend usernames and passwords in order to stay connected. Enter a time interval between 10 and 9999 seconds. The default time interval is 1800 seconds (30 minutes). Note: If wireless station authentication is done using a RADIUS server, the reauthentication timer on the RADIUS server has priority.
Idle Timeout	The ZyXEL Device automatically disconnects a wireless station from the wired network after a period of inactivity. The wireless station needs to enter the username and password again before access to the wired network is allowed. The default time interval is 3600 seconds (or 1 hour).
Group Key Update Timer	The Group Key Update Timer is the rate at which the AP (if using WPA-PSK/WPA2-PSK key management) or RADIUS server (if using WPA/WPA2 key management) sends a new group key out to all clients. The re-keying process is the WPA/WPA2 equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis. Setting of the Group Key Update Timer is also supported in WPA-PSK/WPA2-PSK mode. The ZyXEL Device default is 1800 seconds (30 minutes).
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to reload the previous configuration for this screen.

4.3.4 WPA/WPA2

Click **Network > Wireless LAN** to display the **General** screen.

Figure 38 Wireless: WPA/WPA2

The following table describes the labels in this screen.

Table 27 Wireless: WPA/WPA2

LABEL	DESCRIPTION
WPA Compatible	This check box is available only when you select WPA2-PSK or WPA2 in the Security Mode field. Select the check box to have both WPA2 and WPA wireless clients be able to communicate with the ZyXEL Device even when the ZyXEL Device is using WPA2-PSK or WPA2.
ReAuthentication Timer (in seconds)	Specify how often wireless stations have to resend usernames and passwords in order to stay connected. Enter a time interval between 10 and 9999 seconds. The default time interval is 1800 seconds (30 minutes). Note: If wireless station authentication is done using a RADIUS server, the reauthentication timer on the RADIUS server has priority.
Idle Timeout	The ZyXEL Device automatically disconnects a wireless station from the wired network after a period of inactivity. The wireless station needs to enter the username and password again before access to the wired network is allowed. The default time interval is 3600 seconds (or 1 hour).

Table 27 Wireless: WPA/WPA2

LABEL	DESCRIPTION
Group Key Update Timer	The Group Key Update Timer is the rate at which the AP (if using WPA-PSK/WPA2-PSK key management) or RADIUS server (if using WPA/WPA2 key management) sends a new group key out to all clients. The re-keying process is the WPA/WPA2 equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis. Setting of the Group Key Update Timer is also supported in WPA-PSK/WPA2-PSK mode. The ZyXEL Device default is 1800 seconds (30 minutes).
Authentication Server	
IP Address	Enter the IP address of the external authentication server in dotted decimal notation.
Port Number	Enter the port number of the external authentication server. The default port number is 1812 . You need not change this value unless your network administrator instructs you to do so with additional information.
Shared Secret	Enter a password (up to 31 alphanumeric characters) as the key to be shared between the external authentication server and the ZyXEL Device. The key must be the same on the external authentication server and your ZyXEL Device. The key is not sent over the network.
Accounting Server	
Active	Select Yes from the drop down list box to enable user accounting through an external authentication server.
IP Address	Enter the IP address of the external accounting server in dotted decimal notation.
Port Number	Enter the port number of the external accounting server. The default port number is 1813 . You need not change this value unless your network administrator instructs you to do so with additional information.
Shared Secret	Enter a password (up to 31 alphanumeric characters) as the key to be shared between the external accounting server and the ZyXEL Device. The key must be the same on the external accounting server and your ZyXEL Device. The key is not sent over the network.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to reload the previous configuration for this screen.

4.4 OTIST

In a wireless network, the wireless clients must have the same SSID and security settings as the access point (AP) or wireless router (we will refer to both as “AP” here) in order to associate with it. Traditionally this meant that you had to configure the settings on the AP and then manually configure the exact same settings on each wireless client.

OTIST (One-Touch Intelligent Security Technology) allows you to transfer your AP’s SSID and WEP or WPA-PSK security settings to wireless clients that support OTIST and are within transmission range. You can also choose to have OTIST generate a WPA-PSK key for you if you didn’t configure one manually.

Note: OTIST replaces the pre-configured wireless settings on the wireless clients.

4.4.1 Enabling OTIST

You must enable OTIST on both the AP and wireless client before you start transferring settings.

Note: The AP and wireless client(s) **MUST** use the same **Setup key**.

4.4.1.1 AP

You can enable OTIST using the **OTIST** button or the web configurator.

4.4.1.1.1 OTIST button

If you use the **OTIST** button, the default (01234567) or previous saved (through the web configurator) **Setup key** is used to encrypt the settings that you want to transfer.

Hold in the **OTIST** button for about two seconds.

4.4.1.1.2 Web Configurator

Click the **Network > Wireless LAN > OTIST**. The following screen displays.

Figure 39 OTIST



The screenshot shows a web configurator interface for OTIST. At the top, there are four tabs: "General", "OTIST" (which is selected and highlighted in blue), "MAC Filter", and "Advanced". Below the tabs is a header for "One-Touch Intelligent Security Technology". The main content area contains a "Setup Key" field with the value "01234567". Below this is a checked checkbox with the text: "Yes! Please enhance the Wireless Security Level to WPA-PSK automatically if no WLAN security has been set. This will generate a random PSK key for your convenience." At the bottom of the form is a "Start" button.

The following table describes the labels in this screen.

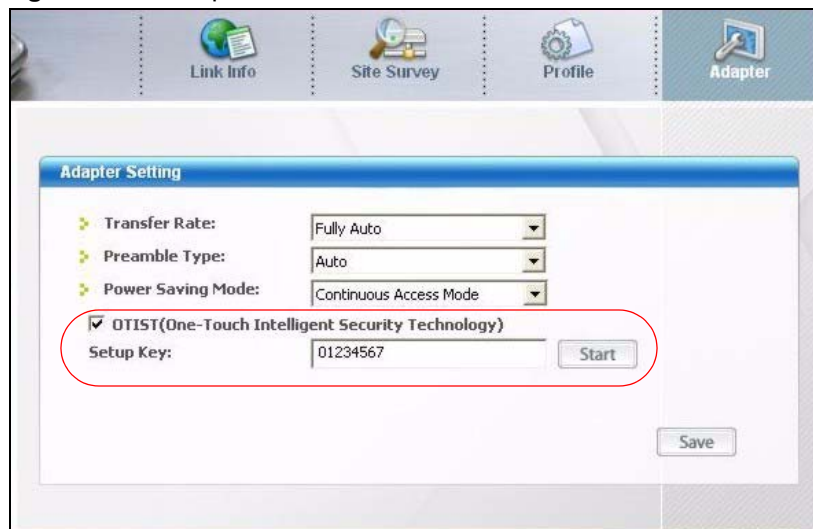
Table 28 OTIST

LABEL	DESCRIPTION
Setup Key	Type an OTIST Setup Key of exactly eight ASCII characters in length. The default OTIST setup key is "01234567". Note: If you change the OTIST setup key here, you must also make the same change on the wireless client(s).
Yes!	If you want OTIST to automatically generate a WPA-PSK, you must: <ul style="list-style-type: none"> • Change your security to No Security in the Wireless LAN > General screen. • Select the Yes! checkbox in the OTIST screen and click Apply. • The wireless screen displays an auto generated WPA-PSK and is now in WPA-PSK security mode. The WPA-PSK security settings are assigned to the wireless client when you start OTIST. Note: If you already have a WEP key or WPA-PSK configured in the Wireless LAN > General screen, and you run OTIST with Yes! selected, OTIST will use the existing WEP key or WPA-PSK.
Start	Click Start to encrypt the wireless security data using the setup key and have the ZyXEL Device set the wireless station to use the same wireless settings as the ZyXEL Device. You must also activate and start OTIST on the wireless station within three minutes.

4.4.1.2 Wireless Client

Start the ZyXEL utility and click the **Adapter** tab. Select the **OTIST** check box, enter the same **Setup Key** as your AP's and click **Save**.

Figure 40 Example Wireless Client OTIST Screen

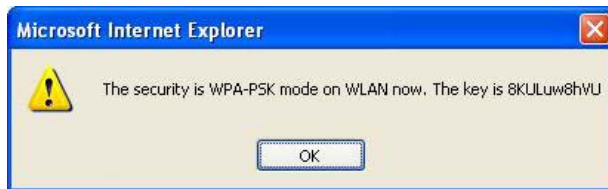


4.4.2 Starting OTIST

Note: You must press the **OTIST** button or click **Start** in the AP **OTIST** web configurator screen and in the wireless client(s) **Adapter** screen all within three minutes (at the time of writing). You can start OTIST in the wireless clients and AP in any order but they must all be within range and have OTIST enabled.

- 1 In the AP, a web configurator screen pops up showing you the security settings to transfer. You can use the key in this screen to set up WEP or WPA-PSK encryption manually for non-OTIST devices in the wireless network. After reviewing the settings, click **OK**.

Figure 41 Security Key

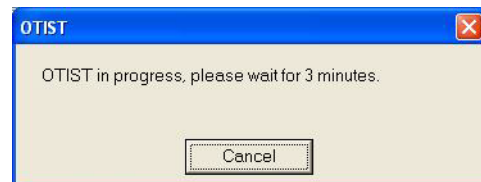


- 2 This screen appears while OTIST settings are being transferred. It closes when the transfer is complete.

Figure 42 OTIST in Progress (AP)



Figure 43 OTIST in Progress (Client)



- In the wireless client, you see this screen if it can't find an OTIST-enabled AP (with the same **Setup key**). Click **OK** to go back to the ZyXEL utility main screen.

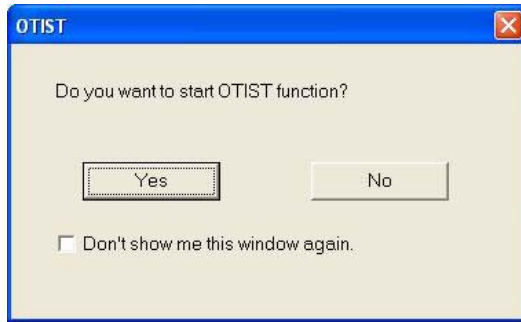
Figure 44 No AP with OTIST Found



- If there is more than one OTIST-enabled AP within range, you see a screen asking you to select one AP to get settings from.

4.4.3 Notes on OTIST

- 1 If you enabled OTIST in the wireless client, you see this screen each time you start the utility. Click **Yes** for it to search for an OTIST-enabled AP.

Figure 45 Start OTIST?

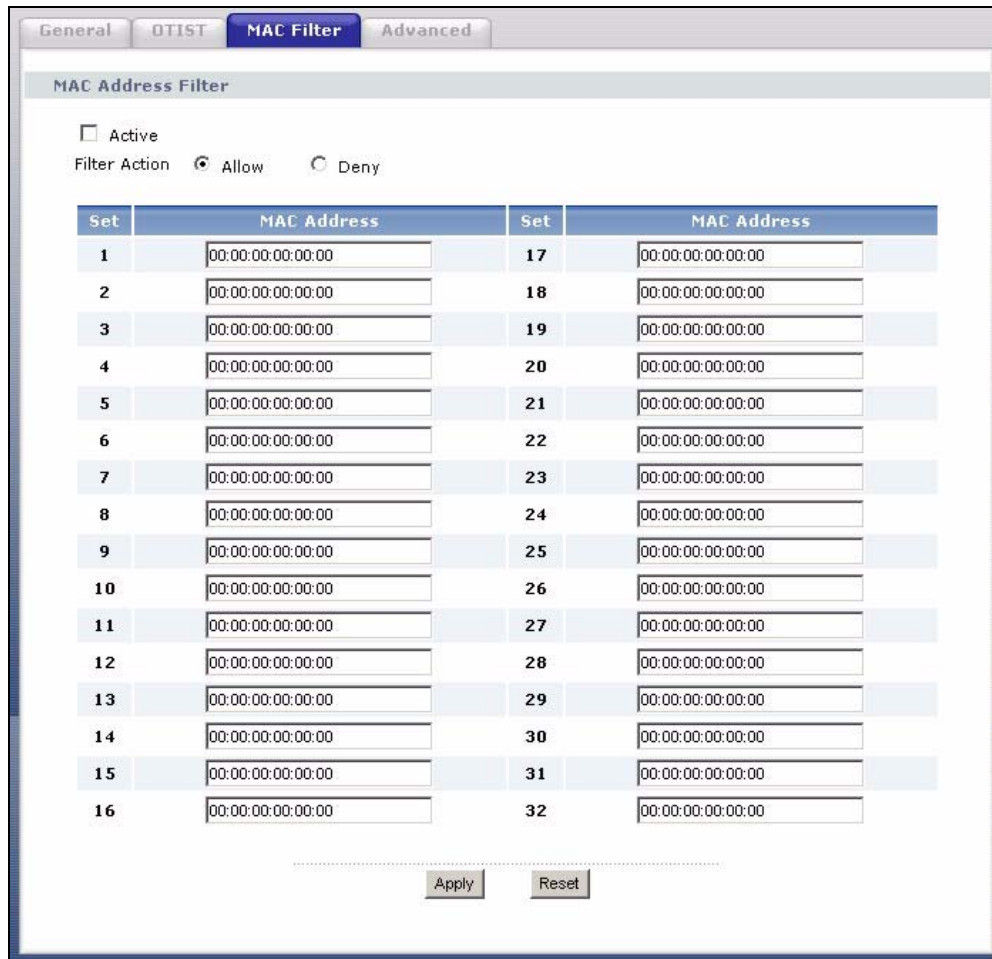
- 2** If an OTIST-enabled wireless client loses its wireless connection for more than ten seconds, it will search for an OTIST-enabled AP for up to one minute. (If you manually have the wireless client search for an OTIST-enabled AP, there is no timeout; click **Cancel** in the OTIST progress screen to stop the search.)
- 3** When the wireless client finds an OTIST-enabled AP, you must still click **Start** in the AP **OTIST** web configurator screen or hold in the **OTIST** button (for about two seconds) for the AP to transfer settings.
- 4** If you change the SSID or the keys on the AP after using OTIST, you need to run OTIST again or enter them manually in the wireless client(s).
- 5** If you configure OTIST to generate a WPA-PSK key, this key changes each time you run OTIST. Therefore, if a new wireless client joins your wireless network, you need to run OTIST on the AP and ALL wireless clients again.

4.5 MAC Filter

The MAC filter screen allows you to configure the ZyXEL Device to give exclusive access to up to 32 devices (Allow) or exclude up to 32 devices from accessing the ZyXEL Device (Deny). 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. You need to know the MAC address of the devices to configure this screen.

To change your ZyXEL Device's MAC filter settings, click **Network > Wireless LAN > MAC Filter**. The screen appears as shown.

Figure 46 MAC Address Filter



The following table describes the labels in this menu.

Table 29 MAC Address Filter

LABEL	DESCRIPTION
Active	Select Yes from the drop down list box to enable MAC address filtering.
Filter Action	Define the filter action for the list of MAC addresses in the MAC Address table. Select Deny to block access to the ZyXEL Device, MAC addresses not listed will be allowed to access the ZyXEL Device Select Allow to permit access to the ZyXEL Device, MAC addresses not listed will be denied access to the ZyXEL Device.
Set	This is the index number of the MAC address.
MAC Address	Enter the MAC addresses of the wireless station that are allowed or denied access to the ZyXEL Device in these address fields. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to reload the previous configuration for this screen.

4.6 Wireless LAN Advanced Screen

Click **Network > Wireless LAN > Advanced**. The screen appears as shown.

Figure 47 Advanced

The following table describes the labels in this screen.

Table 30 Advanced

LABEL	DESCRIPTION
Wireless Advanced Setup	
RTS/CTS Threshold	Enter a value between 0 and 2432.
Fragmentation Threshold	It is the maximum data fragment size that can be sent. Enter a value between 256 and 2432.
802.11 Mode	<p>Select 802.11b to allow only IEEE 802.11b compliant WLAN devices to associate with the ZyXEL Device.</p> <p>Select 802.11g to allow only IEEE 802.11g compliant WLAN devices to associate with the ZyXEL Device.</p> <p>Select 802.11b/g to allow either IEEE802.11b or IEEE802.11g compliant WLAN devices to associate with the ZyXEL Device. The transmission rate of your ZyXEL Device might be reduced.</p> <p>If you push the AG switch to the A side on the rear panel, this field is read-only and displays 802.11a to allow only IEEE 802.11a compliant WLAN devices to associate with the ZyXEL Device.</p>
Allow non 802.11h stations	<p>This field is available when you push the AG switch to the A side on the rear panel.</p> <p>The IEEE 802.11h standard defines two mechanisms (DFS and TPC) for IEEE 802.11a WLAN devices to avoid interference with other devices, such as satellites and military radar.</p> <p>DFS (dynamic frequency selection) allows the AP to detect other devices in the same channel. If found it, the AP changes to different channel, so that the AP can avoid interference with radar systems or other wireless networks.</p> <p>TPC (transmit power control) helps reduce the wireless device's transmission power to avoid interference with satellites.</p> <p>Select the check box to also allow the WLAN devices which do not support IEEE 802.11h to associate with the ZyXEL Device. Otherwise, clear the check box to allow only IEEE 802.11h compliant WLAN devices to associate with the ZyXEL Device.</p>

Table 30 Advanced

LABEL	DESCRIPTION
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to reload the previous configuration for this screen.

CHAPTER 5

Wireless Tutorial

This chapter gives you examples of how to set up an access point and wireless client for wireless communication using the following parameters. The wireless clients can access the Internet through an AP wirelessly.

5.1 Example Parameters

SSID	SSID_Example3
Channel	Auto
Security	WPA-PSK (Pre-Shared Key: ThisismyWPA-PSKpre-sharedkey)
802.11 mode	IEEE 802.11b/g

An access point (AP) or wireless router is referred to as “AP” and a computer with a wireless network card or USB/PCI adapter is referred to as “wireless client” here.

We use the P-334U web screens and M-302 utility screens as an example. The screens may vary slightly for different models.

5.2 Configuring the AP

Flow the steps below to configure the wireless settings on your AP.

- 1** Set the **AG** switch (on the rear panel) to the **G** side to have the wireless client that supports IEEE 802.11b/g be able to associate with the AP.
- 2** Open the **Wireless LAN > General** screen in the AP's web configurator.

Figure 48 AP: Wireless LAN > General

The screenshot shows the configuration interface for the AP's Wireless LAN. It is divided into two main sections: 'Wireless Setup' and 'Security'. In the 'Wireless Setup' section, the 'Enable Wireless LAN' checkbox is checked. The 'Name(SSID)' field contains 'SSID_Example3'. The 'Hide SSID' checkbox is unchecked. The 'Channel Selection' dropdown is set to 'Channel-01 2412MHz', and the 'Auto Channel Selection' checkbox is checked. The 'Operating Channel' field displays 'Channel-001'. In the 'Security' section, the 'Security Mode' dropdown is set to 'WPA-PSK'. The 'Pre-Shared Key' field contains 'ThisismyWPA-PSKpre-sharedkey'. The 'ReAuthentication Timer' is set to 1800 seconds, the 'Idle Timeout' is 3600 seconds, and the 'Group Key Update Timer' is 1800 seconds. At the bottom of the form, there are 'Apply' and 'Reset' buttons.

- 3** Make sure the **Enable Wireless LAN** check box is selected.
- 4** Enter **SSID_Example3** as the SSID, select a channel or select **Auto Channel Selection** to have the AP choose a channel which is not used by another AP and display the channel number in the field below after you click **Apply**.
- 5** Set security mode to **WPA-PSK** and enter **ThisismyWPA-PSKpre-sharedkey** in the **Pre-Shared Key** field. Click **Apply**.
- 6** Open the **Status** screen. Verify your wireless and wireless security settings under **Device Information** and check if the WLAN connection is up under **Interface Status**.

Figure 49 AP: Status

The screenshot displays the ZyXEL P-335U AP Status page. The interface includes a navigation menu on the left with categories like Network, Security, Management, and Maintenance. The main content area is divided into several sections:

- Device Information:** Shows system name (P-335U), firmware version (V3.60(AMB.1)b1 | 09/29/2006), and WAN/LAN information including MAC addresses, IP addresses, and subnets.
- WLAN Information (circled in red):**
 - MAC Address: 00:13:49:00:00:01
 - Name(SSID): SSID_Example3
 - Channel: 1
 - Operating Channel: 1
 - Security Mode: WPA-PSK
 - 802.11 Mode: 802.11b/g
- System Status:** Displays system up time (0:38:14), current date/time (2000-1-1/1:4:7), and resource usage (CPU: 1.27%, Memory: 31%). It also shows settings for Firewall (Enabled), Bandwidth Management (Disabled), UPnP (Disabled), and Configuration Mode (Advanced).
- Interface Status:** A table showing the status of WAN, LAN, and WLAN interfaces.

Interface	Status	Rate
WAN	Up	100M/Full
LAN	Up	100M/Full
WLAN	Up	54M
- Summary:** Contains several hyperlinks for monitoring: BW MGMT Monitor, DHCP Table, Packet Statistics, VPN Monitor, and WLAN Station Status (circled in red).

7 Click the **WLAN Station Status** hyperlink in the AP's **Status** screen. You can see if any wireless client has connected to the AP.

Figure 50 AP: Status: WLAN Station Status

The screenshot shows the WLAN Station Status page with an Association List table. The table has three columns: #, MAC Address, and Association Time.

#	MAC Address	Association Time
001	00:13:49:63:3f:5e	00:18:23 2000/01/01

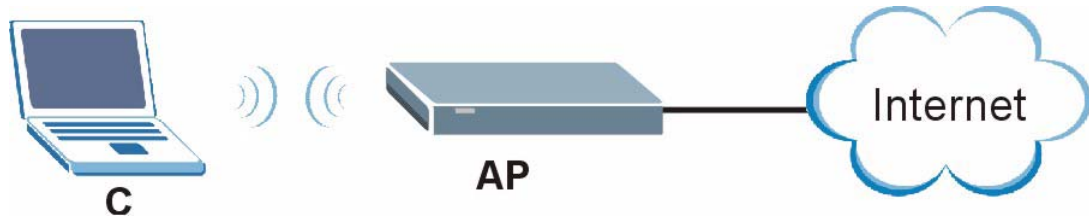
Below the table is a Refresh button.

5.3 Configuring the Wireless Client

This section describes how to connect the wireless client to a network.

5.3.1 Connecting to a Wireless LAN

The following sections show you how to join a wireless network using the ZyXEL utility, as in the following diagram. The wireless client is labeled **C** and the access point is labeled **AP**.



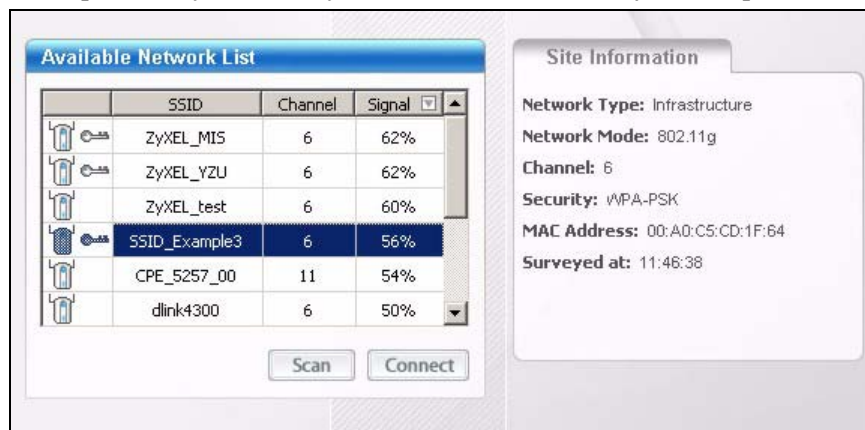
There are three ways to connect the client to an access point.

- Configure nothing and leave the wireless client to automatically scan for and connect to any available network that has no wireless security configured.
- Manually connect to a network.
- Configure a profile to have the wireless client automatically connect to a specific network or peer computer.

This example illustrates how to manually connect your wireless client to an access point (AP) which is configured for WPA-PSK security and connected to the Internet. Before you connect to the access point, you must know its Service Set IDentity (SSID) and WPA-PSK pre-shared key. In this example, the SSID is “SSID_Example3” and the pre-shared key is “ThisismyWPA-PSKpre-sharedkey”.

After you install the ZyXEL utility and then insert the wireless client, follow the steps below to connect to a network using the **Site Survey** screen.

- 1 Open the ZyXEL utility and click the **Site Survey** tab to open the screen shown next.

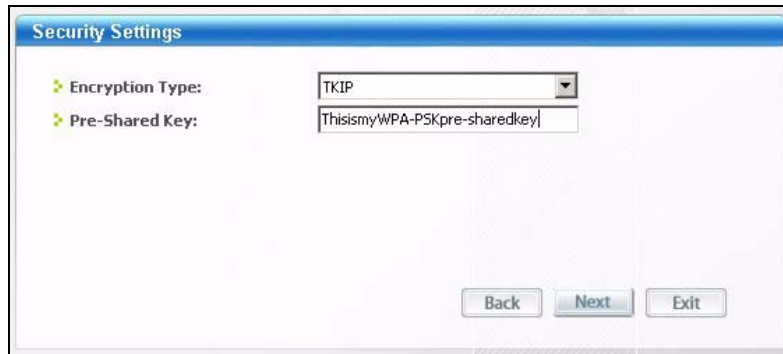


- 2 The wireless client automatically searches for available wireless networks. Click **Scan** if you want to search again. If no entry displays in the **Available Network List**, that means there is no wireless network available within range. Make sure the AP or peer computer is turned on or move the wireless client closer to the AP or peer computer.

- 3 When you try to connect to an AP with security configured, a window will pop up prompting you to specify the security settings. Enter the pre-shared key and leave the encryption type at the default setting.

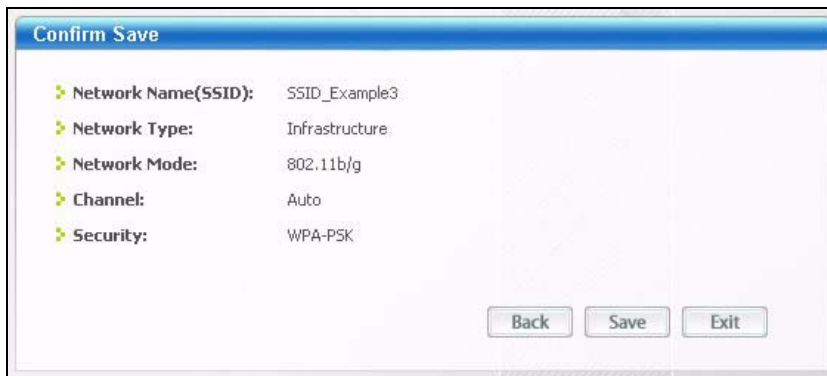
Use the **Next** button to move on to the next screen. You can use the **Back** button at any time to return to the previous screen, or the **Exit** button to return to the **Site Survey** screen.

Figure 51 ZyXEL Utility: Security Settings

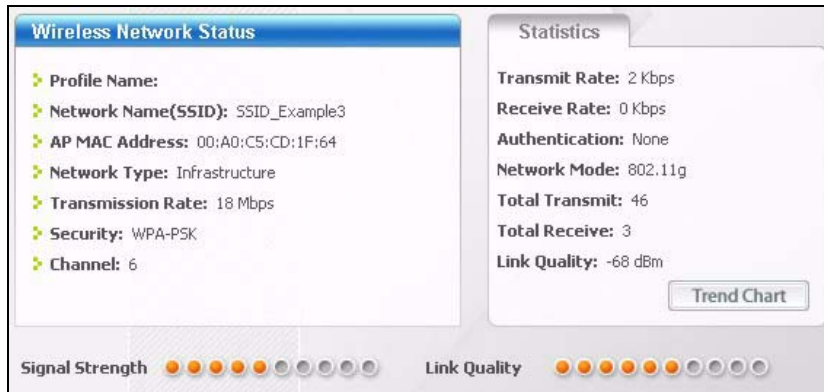


- 4 The **Confirm Save** window appears. Check your settings and click **Save** to continue.

Figure 52 ZyXEL Utility: Confirm Save



- 5 The ZyXEL utility returns to the **Link Info** screen while it connects to the wireless network using your settings. When the wireless link is established, the ZyXEL utility icon in the system tray turns green and the **Link Info** screen displays details of the active connection. Check the network information in the **Link Info** screen to verify that you have successfully connected to the selected network. If the wireless client is not connected to a network, the fields in this screen remain blank.

Figure 53 ZyXEL Utility: Link Info

- 6 Open your Internet browser and enter <http://www.zyxel.com> or the URL of any other web site in the address bar. If you are able to access the web site, your wireless connection is successfully configured.

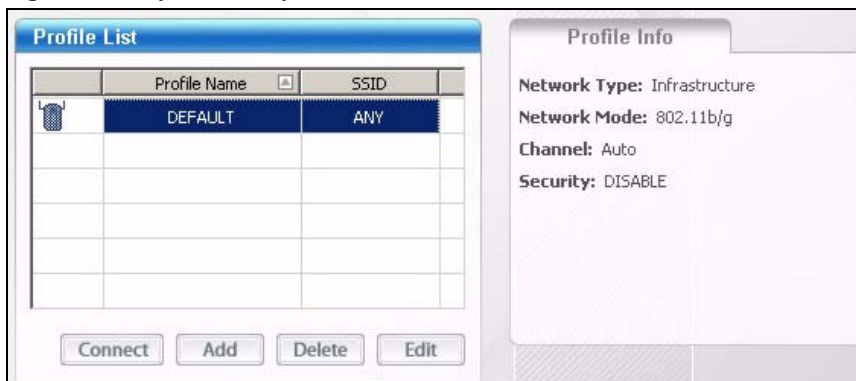
If you cannot access the web site, try changing the encryption type in the **Security Settings** screen, check the Troubleshooting section of this User's Guide or contact your network administrator.

5.3.2 Creating and Using a Profile

A profile lets you automatically connect to the same wireless network every time you use the wireless client. You can also configure different profiles for different networks, for example if you connect a notebook computer to wireless networks at home and at work.

This example illustrates how to set up a profile and connect the wireless client to an access point configured for WPA-PSK security. In this example, the SSID is “SSID_Example3”, the profile name is “PN_Example3” and the pre-shared key is “ThisismyWPA-PSKpre-sharedkey”. You have chosen the profile name “PN_Example3”.

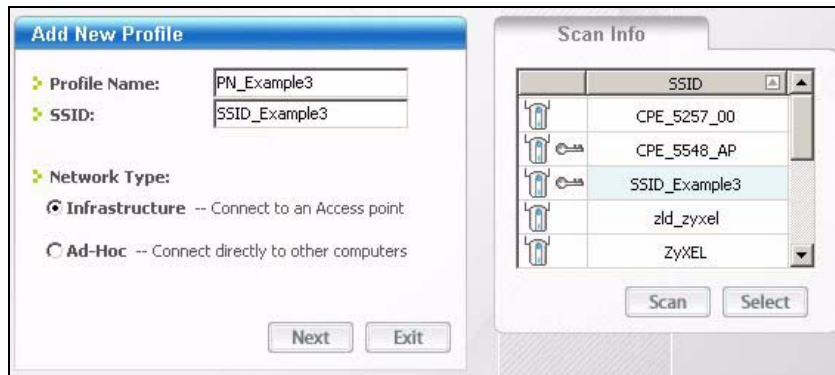
- 1 Open the ZyXEL utility and click the **Profile** tab to open the screen shown next. Click **Add** to configure a new profile.

Figure 54 ZyXEL Utility: Profile

- 2 The **Add New Profile** screen appears. The wireless client automatically searches for available wireless networks, which are displayed in the **Scan Info** box. Click on **Scan** if

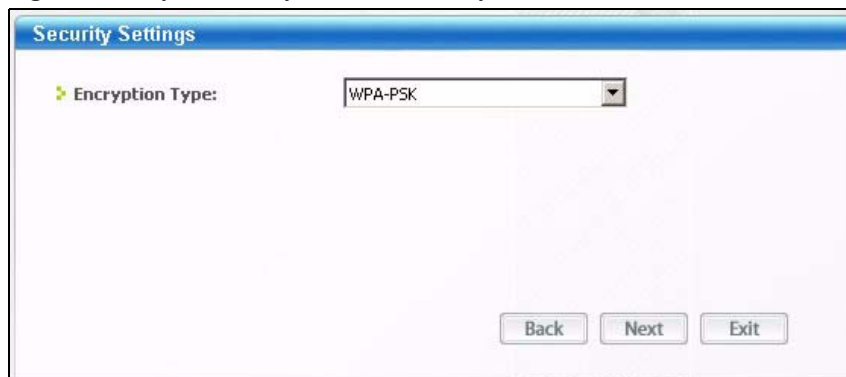
you want to search again. You can also configure your profile for a wireless network that is not in the list.

Figure 55 ZyXEL Utility: Add New Profile



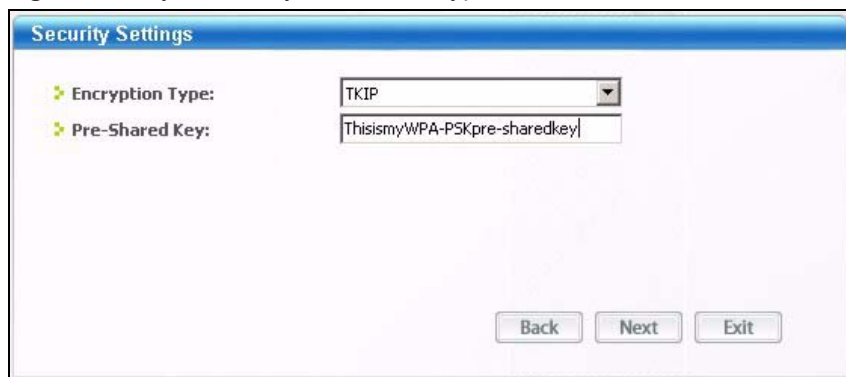
- 3 Give the profile a descriptive name (of up to 32 printable ASCII characters). Select **Infrastructure** and either manually enter or select the AP's SSID in the **Scan Info** table and click **Select**.
- 4 Choose the same encryption method as the AP to which you want to connect (In this example, WPA-PSK).

Figure 56 ZyXEL Utility: Profile Security



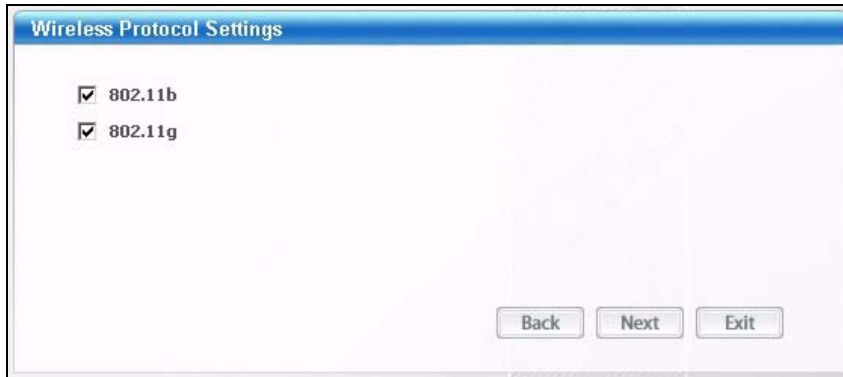
- 5 This screen varies depending on the encryption method you selected in the previous screen. Enter the pre-shared key and leave the encryption type at the default setting.

Figure 57 ZyXEL Utility: Profile Encryption



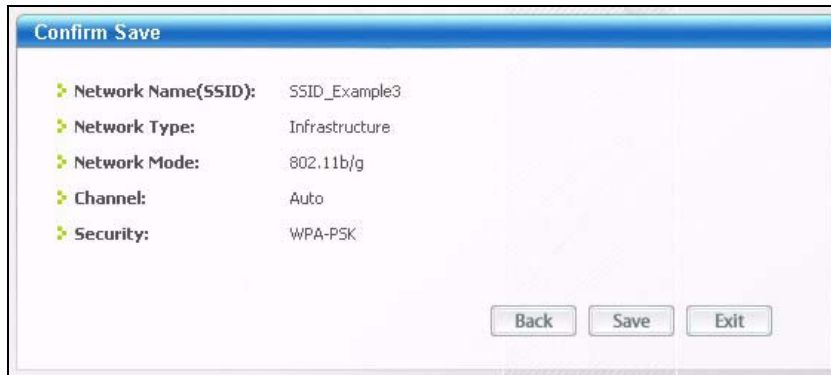
6 In the next screen, leave both boxes checked.

Figure 58 Profile: Wireless Protocol Settings.



7 Verify the profile settings in the read-only screen. Click **Save** to save and go to the next screen.

Figure 59 Profile: Confirm Save



8 Click **Activate Now** to use the new profile immediately. Otherwise, click the **Activate Later** button.

If you clicked **Activate Later**, you can select the profile from the list in the **Profile** screen and click **Connect** to activate it.

Note: Only one profile can be activated and used at any given time.

Figure 60 Profile: Activate



9 When you activate the new profile, the ZyXEL utility returns to the **Link Info** screen while it connects to the AP using your settings. When the wireless link is established, the ZyXEL utility icon in the system tray turns green and the **Link Info** screen displays details of the active connection.

- 10** Open your Internet browser, enter <http://www.zyxel.com> or the URL of any other web site in the address bar and press ENTER. If you are able to access the web site, your new profile is successfully configured.
- 11** If you cannot access the Internet go back to the **Profile** screen, select the profile you are using and click **Edit**. Check the details you entered previously. Also, refer to the Troubleshooting section of this User's Guide or contact your network administrator if necessary.

CHAPTER 6

WAN

This chapter describes how to configure WAN settings.

6.1 WAN Overview

See the chapter about the connection wizard for more information on the fields in the WAN screens.

6.2 WAN MAC Address

The MAC address screen allows users to configure the WAN port's MAC address by either using the factory default or cloning the MAC address from a computer on your LAN. Choose **Factory Default** to select the factory assigned default MAC Address.

Otherwise, click **Spoof this computer's MAC address - IP Address** and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file. It is recommended that you clone the MAC address prior to hooking up the WAN Port.

6.3 Internet Connection

To change your ZyXEL Device's Internet access settings, click **Network > WAN**. The screen differs by the encapsulation.

6.3.1 Ethernet Encapsulation

The screen shown next is for **Ethernet** encapsulation.

Figure 61 Ethernet Encapsulation

The screenshot shows the 'Internet Connection' window with the 'Advanced' tab selected. The 'ISP Parameters for Internet Access' section has 'Encapsulation' set to 'Ethernet' and 'Service Type' set to 'Standard'. The 'WAN IP Address Assignment' section has three radio buttons: 'Get automatically from ISP (Default)' (selected), 'Use Fixed IP Address', and 'Set WAN IP Address'. The 'Fixed IP Address' fields for IP Address, IP Subnet Mask, and Gateway IP Address are all set to '0.0.0.0'. The 'DNS Servers' section has three rows: 'First DNS Server' (From ISP, 172.23.5.1), 'Second DNS Server' (From ISP, 172.23.5.2), and 'Third DNS Server' (From ISP, 0.0.0.0). The 'WAN MAC Address' section has three radio buttons: 'Factory default' (selected), 'Clone the computer's MAC address - IP Address' (192.168.1.33), and 'Set WAN MAC Address' (00:13:49:02:95:88). At the bottom are 'Apply' and 'Reset' buttons.

The following table describes the labels in this screen.

Table 31 Ethernet Encapsulation

LABEL	DESCRIPTION
Encapsulation	You must choose the Ethernet option when the WAN port is used as a regular Ethernet.
Service Type	Choose from Standard , Telstra (RoadRunner Telstra authentication method), RR-Manager (Roadrunner Manager authentication method), RR-Toshiba (Roadrunner Toshiba authentication method) or Telia Login . The following fields do not appear with the Standard service type.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the user name above.
Retype to Confirm	Type your password again to make sure that you have entered is correctly.
Login Server IP Address	Type the authentication server IP address here if your ISP gave you one. This field is not available for Telia Login .
Login Server (Telia Login only)	Type the domain name of the Telia login server, for example login1.telia.com.
ReloginEvery(min) (Telia Login only)	The Telia server logs the ZyXEL Device out if the ZyXEL Device does not log in periodically. Type the number of minutes from 1 to 59 (30 default) for the ZyXEL Device to wait between logins.
WAN IP Address Assignment	

Table 31 Ethernet Encapsulation

LABEL	DESCRIPTION
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
IP Address	Enter your WAN IP address in this field if you selected Use Fixed IP Address .
IP Subnet Mask	Enter the IP Subnet Mask in this field.
Gateway IP Address	Enter a Gateway IP Address (if your ISP gave you one) in this field.
DNS Servers	
First DNS Server	Select From ISP if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right 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 field to the right. If you chose User-Defined , but leave the IP address set to 0.0.0.0, User-Defined changes to None after you click Apply . If you set a second choice to User-Defined , and enter the same IP address, the second User-Defined changes to None after you click Apply . 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 computer in order to access it.
Second DNS Server	
Third DNS Server	
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by either using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address.
Factory default	Select Factory default to use the factory assigned default MAC Address.
Clone the computer's MAC address	Select Clone the computer's MAC address - IP Address and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

6.3.2 PPPoE Encapsulation

The ZyXEL Device supports PPPoE (Point-to-Point Protocol over Ethernet). PPPoE is an IETF standard (RFC 2516) specifying how a personal computer (PC) interacts with a broadband modem (DSL, cable, wireless, etc.) connection. The **PPP over Ethernet** option is for a dial-up connection using PPPoE.

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.

The screen shown next is for **PPPoE** encapsulation.

Figure 62 PPPoE Encapsulation

The screenshot shows the 'Internet Connection' configuration page, specifically the 'Advanced' tab. The page is divided into several sections for configuring PPPoE:

- ISP Parameters for Internet Access:**
 - Encapsulation: PPP over Ethernet (selected)
 - Service Name: (optional)
 - User Name: (empty)
 - Password: (masked with asterisks)
 - Retype to Confirm: (masked with asterisks)
 - Nailed-Up Connection
 - Idle Timeout (sec): 100 (in seconds)
- WAN IP Address Assignment:**
 - Get automatically from ISP (Default)
 - Use Fixed IP Address
 - My WAN IP Address: 0.0.0.0
 - Remote IP Address: 0.0.0.0
 - Remote IP Subnet Mask: 0.0.0.0
 - Metric: 1
 - Private: No
- DNS Servers:**
 - First DNS Server: From ISP (selected), 172.23.5.1
 - Second DNS Server: From ISP (selected), 172.23.5.2
 - Third DNS Server: From ISP (selected), 0.0.0.0
- WAN MAC Address:**
 - Factory default
 - Clone the computer's MAC address - IP Address: 192.168.1.33
 - Set WAN MAC Address: 00:13:49:02:95:88

At the bottom of the form, there are 'Apply' and 'Reset' buttons.

The following table describes the labels in this screen.

Table 32 PPPoE Encapsulation

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
Encapsulation	The PPP over Ethernet choice is for a dial-up connection using PPPoE. The ZyXEL Device supports PPPoE (Point-to-Point Protocol over Ethernet). PPPoE is an IETF Draft standard (RFC 2516) specifying how a personal computer (PC) interacts with a broadband modem (i.e. xDSL, cable, wireless, etc.) connection. Operationally, PPPoE saves significant effort for both the end user and ISP/carrier, as it requires no specific configuration of the broadband modem at the customer site. By implementing PPPoE directly on the router rather than individual computers, the computers on the LAN do not need PPPoE software installed, since the router does that part of the task. Further, with NAT, all of the LAN's computers will have access.
Service Name	Type the PPPoE service name provided to you. PPPoE uses a service name to identify and reach the PPPoE server.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the user name above.
Retype to Confirm	Type your password again to make sure that you have entered is correctly.
Nailed-Up Connection	Select Nailed-Up Connection if you do not want the connection to time out.
Idle Timeout	This value specifies the time in seconds that elapses before the router automatically disconnects from the PPPoE server.
WAN IP Address Assignment	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
My WAN IP Address	Enter your WAN IP address in this field if you selected Use Fixed IP Address .
Remote IP Address	Enter the remote IP address (if your ISP gave you one) in this field.
Remote IP Subnet Mask	Enter the remote IP subnet mask in this field.
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 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.
DNS Servers	

Table 32 PPPoE Encapsulation

LABEL	DESCRIPTION
First DNS Server Second DNS Server Third DNS Server	Select From ISP if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right 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 field to the right. If you chose User-Defined , but leave the IP address set to 0.0.0.0, User-Defined changes to None after you click Apply . If you set a second choice to User-Defined , and enter the same IP address, the second User-Defined changes to None after you click Apply . 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 computer in order to access it.
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address.
Factory default	Select Factory default to use the factory assigned default MAC Address.
Clone the computer's MAC address	Select Clone the computer's MAC address - IP Address and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

6.3.3 PPTP Encapsulation

Point-to-Point Tunneling Protocol (PPTP) is a network protocol that enables secure transfer of data from a remote client to a private server, creating a Virtual Private Network (VPN) using TCP/IP-based networks.

PPTP supports on-demand, multi-protocol and virtual private networking over public networks, such as the Internet.

The screen shown next is for **PPTP** encapsulation.

Figure 63 PPTP Encapsulation

Internet Connection **Advanced**

ISP Parameters for Internet Access

Encapsulation: PPTP

User Name: _____

Password: _____

Retype to Confirm: _____

Nailed-Up Connection

Idle Timeout (sec): 100 (in seconds)

PPTP Configuration

Get automatically from ISP (Default)

Use Fixed IP Address

My IP Address: 172.23.37.206

My IP Subnet Mask: 255.255.255.0

Server IP Address: 0.0.0.0

Connection ID/Name: _____

WAN IP Address Assignment

Get automatically from ISP (Default)

Use Fixed IP Address

My WAN IP Address: 0.0.0.0

Remote IP Address: 0.0.0.0

Remote IP Subnet Mask: 0.0.0.0

Metric: 1

Private: No

DNS Servers

First DNS Server: From ISP 172.23.5.2

Second DNS Server: From ISP 172.23.5.1

Third DNS Server: From ISP 0.0.0.0

WAN MAC Address

Factory default

Clone the computer's MAC address - IP Address: 192.168.2.33

Set WAN MAC Address: 00:13:49:00:00:02

.....

Apply Reset

The following table describes the labels in this screen.

Table 33 PPTP Encapsulation

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
Encapsulation	Point-to-Point Tunneling Protocol (PPTP) is a network protocol that enables secure transfer of data from a remote client to a private server, creating a Virtual Private Network (VPN) using TCP/IP-based networks. PPTP supports on-demand, multi-protocol, and virtual private networking over public networks, such as the Internet. The ZyXEL Device supports only one PPTP server connection at any given time. To configure a PPTP client, you must configure the User Name and Password fields for a PPP connection and the PPTP parameters for a PPTP connection.
User Name	Type the user name given to you by your ISP.
Password	Type the password associated with the User Name above.
Retype to Confirm	Type your password again to make sure that you have entered is correctly.
Nailed-up Connection	Select Nailed-Up Connection if you do not want the connection to time out.
Idle Timeout	This value specifies the time in seconds that elapses before the ZyXEL Device automatically disconnects from the PPTP server.
PPTP Configuration	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
My IP Address	Type the (static) IP address assigned to you by your ISP.
My 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.
Server IP Address	Type the IP address of the PPTP server.
Connection ID/ Name	Type your identification name for the PPTP server.
WAN IP Address Assignment	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
My WAN IP Address	Enter your WAN IP address in this field if you selected Use Fixed IP Address .
Remote IP Address	Enter the remote IP address (if your ISP gave you one) in this field.
Remote IP Subnet Mask	Enter the remote IP subnet mask in this field.
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".

Table 33 PPTP Encapsulation

LABEL	DESCRIPTION
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.
DNS Servers	
First DNS Server Second DNS Server Third DNS Server	<p>Select From ISP if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns.</p> <p>Select User-Defined if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. If you chose User-Defined, but leave the IP address set to 0.0.0.0, User-Defined changes to None after you click Apply. If you set a second choice to User-Defined, and enter the same IP address, the second User-Defined changes to None after you click Apply.</p> <p>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 computer in order to access it.</p>
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by either using the ZyXEL Device's MAC address, copying the MAC address from a computer on your LAN or manually entering a MAC address.
Factory default	Select Factory default to use the factory assigned default MAC Address.
Clone the computer's MAC address	Select Clone the computer's MAC address - IP Address and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to the rom file (ZyNOS configuration file). It will not change unless you change the setting or upload a different ROM file.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

6.4 Advanced WAN Screen

To change your ZyXEL Device's advanced WAN settings, click **Network > WAN > Advanced**. The screen appears as shown.

Figure 64 Advanced

The screenshot shows a web interface for configuring network settings. At the top, there are two tabs: 'Internet Connection' and 'Advanced', with 'Advanced' selected. Below the tabs is a section titled 'Multicast Setup'. Under this section, there is a 'Multicast' label followed by a dropdown menu currently set to 'None'. Below the 'Multicast Setup' section is another section titled 'Windows Networking (NetBIOS over TCP/IP)'. This section contains two checkboxes: 'Allow between LAN and WAN' and 'Allow Trigger Dial', both of which are currently unchecked. At the bottom of the screen, there are two buttons: 'Apply' and 'Reset'.

The following table describes the labels in this screen.

Table 34 Advanced

LABEL	DESCRIPTION
Multicast Setup	
Multicast	Select IGMP V-1 or IGMP V-2 or None . 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.
Windows Networking (NetBIOS over TCP/IP): 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. 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.
Allow Trigger Dial	Select this option to allow NetBIOS packets to initiate calls.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

CHAPTER 7

LAN

This chapter describes how to configure LAN settings.

7.1 LAN Overview

Local Area Network (LAN) is a shared communication system to which many computers are attached. The LAN screens can help you configure a LAN DHCP server, manage IP addresses, and partition your physical network into logical networks.

7.1.1 IP Pool Setup

The ZyXEL Device is pre-configured with a pool of 32 IP addresses starting from 192.168.1.33 to 192.168.1.64. This configuration leaves 31 IP addresses (excluding the ZyXEL Device itself) in the lower range for other server computers, for instance, servers for mail, FTP, TFTP, web, etc., that you may have.

7.1.2 System DNS Servers

Refer to the IP Address and Subnet Mask section in the **Connection Wizard** chapter.

7.2 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.

7.2.1 Factory LAN Defaults

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.

7.2.2 IP Address and Subnet Mask

Refer to the IP Address and Subnet Mask section in the **Connection Wizard** chapter for this information.

7.2.3 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.

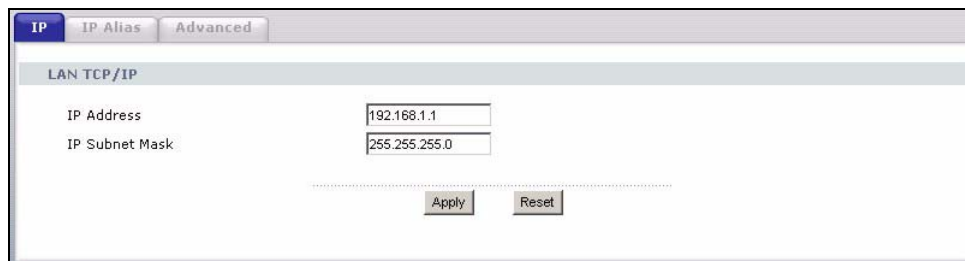
IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. IGMP version 2 (RFC 2236) is an improvement over version 1 (RFC 1112) but IGMP version 1 is still in wide use. If you would like to read more detailed 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.

7.3 LAN IP Screen

Click **Network** > **LAN** to open the **IP** screen.

Figure 65 LAN IP



The screenshot shows a web configurator interface for LAN IP settings. At the top, there are three tabs: 'IP', 'IP Alias', and 'Advanced'. The 'IP' tab is selected. Below the tabs, the section is titled 'LAN TCP/IP'. There are two input fields: 'IP Address' with the value '192.168.1.1' and 'IP Subnet Mask' with the value '255.255.255.0'. Below these fields, there are two buttons: 'Apply' and 'Reset'.

The following table describes the labels in this screen.

Table 35 LAN IP

LABEL	DESCRIPTION
LAN TCP/IP	
IP Address	Type the IP address of your ZyXEL Device in dotted decimal notation 192.168.1.1 (factory default).
IP Subnet Mask	The subnet mask specifies the network number portion of an IP address. 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 255.255.255.0.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

7.4 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.

To change your ZyXEL Device's IP alias settings, click **Network > LAN > IP Alias**. The screen appears as shown.

Figure 66 LAN IP Alias

The screenshot shows the 'IP Alias' configuration page. At the top, there are tabs for 'IP', 'IP Alias', and 'Advanced'. The 'IP Alias' tab is selected. Below the tabs, there are two sections for configuring IP aliases. Each section starts with a checkbox labeled 'IP Alias 1' and 'IP Alias 2'. Below each checkbox are two input fields: 'IP Address' and 'IP Subnet Mask'. Both fields in both sections contain the value '0.0.0.0'. At the bottom of the page, there are two buttons: 'Apply' and 'Reset'.

The following table describes the labels in this screen.

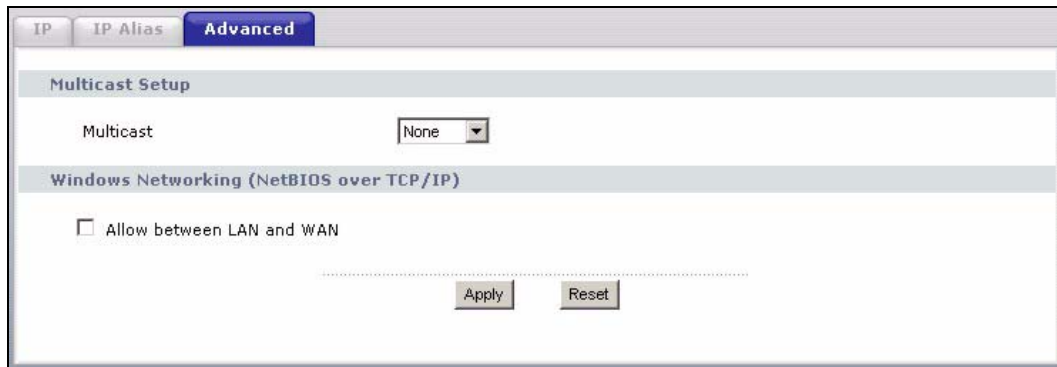
Table 36 LAN IP Alias

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.
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.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

7.5 Advanced LAN Screen

To change your ZyXEL Device's advanced IP settings, click **Network > LAN > Advanced**. The screen appears as shown.

Figure 67 Advanced LAN



The following table describes the labels in this screen.

Table 37 Advanced LAN

LABEL	DESCRIPTION
Multicast	Select IGMP V-1 or IGMP V-2 or None . 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.
Windows Networking (NetBIOS over TCP/IP): 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. 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.	

Table 37 Advanced LAN

LABEL	DESCRIPTION
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.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

CHAPTER 8

DHCP Server

8.1 DHCP

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 DHCP service is disabled, you must have another DHCP server on your LAN, or else the computer must be manually configured.

8.2 DHCP Server General Screen

Click **Network > DHCP Server**. The following screen displays.

Figure 68 DHCP Server General

The following table describes the labels in this screen.

Table 38 DHCP Server General

LABEL	DESCRIPTION
Enable DHCP Server	DHCP (Dynamic Host Configuration Protocol, RFC 2131 and RFC 2132) allows individual clients (computers) to obtain TCP/IP configuration at startup from a server. Leave the Enable DHCP Server check box selected unless your ISP instructs you to do otherwise. Clear it to disable the ZyXEL Device acting as a DHCP server. When configured as a server, the ZyXEL Device provides TCP/IP configuration for the clients. If not, DHCP service is disabled and you must have another DHCP server on your LAN, or else the computers must be manually configured. When set as a server, fill in the following four fields.
IP Pool Starting Address	This field specifies the first of the contiguous addresses in the IP address pool.
Pool Size	This field specifies the size, or count of the IP address pool.

Table 38 DHCP Server General

LABEL	DESCRIPTION
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

8.3 DHCP Server Advanced Screen

This screen allows you to assign IP addresses on the LAN to specific individual computers based on their MAC addresses. You can also use this screen to configure the DNS server information that the ZyXEL Device sends to the DHCP clients.

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.

To change your ZyXEL Device's static DHCP settings, click **Network > DHCP Server > Advanced**. The following screen displays.

Figure 69 DHCP Server Advanced

The screenshot shows the DHCP Server Advanced configuration interface. It features three tabs: 'General', 'Advanced' (which is active), and 'Client List'. The main content area is divided into two sections: 'Static DHCP Table' and 'DNS Server'.

Static DHCP Table: This section contains a table with 8 rows. The columns are '#', 'MAC Address', and 'IP Address'. All entries in the table are currently set to '00:00:00:00:00:00' for the MAC address and '0.0.0.0' for the IP address.

DNS Server: This section is titled 'DNS Servers Assigned by DHCP Server'. It includes three rows for configuring DNS servers:

- First DNS Server: 'From ISP' dropdown, '172.23.5.1' input field.
- Second DNS Server: 'From ISP' dropdown, '172.23.5.2' input field.
- Third DNS Server: 'From ISP' dropdown, '0.0.0.0' input field.

At the bottom of the configuration area, there are two buttons: 'Apply' and 'Reset'.

The following table describes the labels in this screen.

Table 39 DHCP Server Advanced

LABEL	DESCRIPTION
#	This is the index number of the static IP table entry (row).
MAC Address	Type the MAC address (with colons) of a computer on your LAN.
IP Address	Type the LAN IP address of a computer on your LAN.
<p>DNS Servers Assigned by DHCP Server</p> <p>The ZyXEL Device passes a DNS (Domain Name System) server IP address (in the order you specify here) to the DHCP clients. The ZyXEL Device only passes this information to the LAN DHCP clients when you select the Enable DHCP Server check box. When you clear the Enable DHCP Server check box, DHCP service is disabled and you must have another DHCP sever on your LAN, or else the computers must have their DNS server addresses manually configured.</p>	
First DNS Server Second DNS Server Third DNS Server	<p>Select From ISP if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns.</p> <p>Select User-Defined if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. If you chose User-Defined, but leave the IP address set to 0.0.0.0, User-Defined changes to None after you click Apply. If you set a second choice to User-Defined, and enter the same IP address, the second User-Defined changes to None after you click Apply.</p> <p>Select DNS Relay to have the ZyXEL Device act as a DNS proxy. The ZyXEL Device's LAN IP address displays in the field to the right (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 the WAN > Internet Connection screen) 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 click Apply.</p> <p>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 computer in order to access it.</p>
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

8.4 Client List Screen

The DHCP table shows current DHCP client information (including **IP Address**, **Host Name** and **MAC Address**) of all network clients using the ZyXEL Device's DHCP server.

Configure this screen to always assign an IP address to a MAC address (and host name). Click **Network > DHCP Server > Client List**.

Note: You can also view a read-only client list by clicking the **DHCP Table (Details...)** hyperlink in the **Status** screen.

The following screen displays.

Figure 70 Client List

#	IP Address	Host Name	MAC Address	Reserve
1	192.168.1.33	tw	00:00:e8:7c:14:80	<input type="checkbox"/>

The following table describes the labels in this screen.

Table 40 Client List

LABEL	DESCRIPTION
#	This is the index number of the host computer.
IP Address	This field displays the IP address relative to the # field listed above.
Host Name	This field displays the computer host name.
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 this check box to have the ZyXEL Device always assign this IP address to this MAC address (and host name). After you click Apply , the MAC address and IP address also display in the Advanced screen (where you can edit them).
Refresh	Click Refresh to reload the DHCP table.

CHAPTER 9

Network Address Translation (NAT)

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

9.1 NAT Overview

NAT (Network Address Translation - NAT, 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 is changed to a different IP address known within another network.

9.2 Using NAT

Note: You must create a firewall rule in addition to setting up NAT, to allow traffic from the WAN to be forwarded through the ZyXEL Device.

9.2.1 Port Forwarding: Services and Port Numbers

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

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

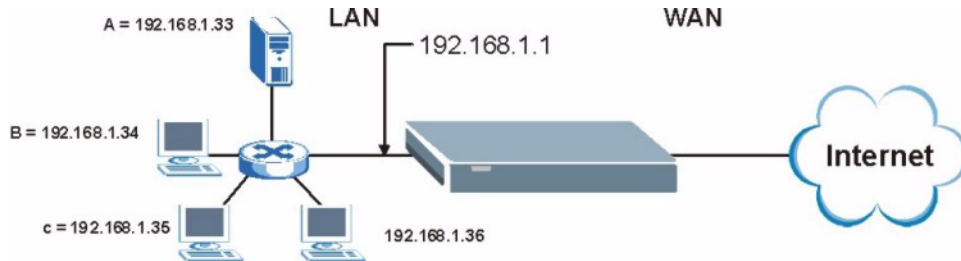
In addition to the servers for specified services, NAT supports a default server. A service request that does not have a server explicitly designated for it is forwarded to the default server. If the default is not defined, the service request is simply discarded.

Note: 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.

9.2.2 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 71 Multiple Servers Behind NAT Example



9.3 General NAT Screen

Click **Network > NAT** to open the **General** screen.

Figure 72 NAT General

The screenshot shows the NAT General configuration screen. The 'General' tab is selected. Under the 'NAT Setup' section, the checkbox 'Enable Network Address Translation' is checked. Under the 'Default Server Setup' section, the 'Default Server' field is set to 0.0.0.0. There are 'Apply' and 'Reset' buttons at the bottom.

The following table describes the labels in this screen.

Table 41 NAT General

LABEL	DESCRIPTION
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). Select the check box to enable NAT.
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 the Application screen. If you do not assign a Default Server IP address, the ZyXEL Device discards all packets received for ports that are not specified in the Application screen or remote management.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

9.4 NAT Application Screen

Port forwarding allows you to define the local servers to which the incoming services will be forwarded. To change your ZyXEL Device's port forwarding settings, click **Network > NAT > Application**. The screen appears as shown.

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

Refer to [Appendix G on page 309](#) for port numbers commonly used for particular services.

Figure 73 NAT Application

The screenshot shows the NAT Application configuration interface. It has three tabs: General, Application (selected), and Advanced. The 'Game List Update' section includes a 'File Path' input field, a 'Browse...' button, and an 'Update' button. The 'Add Application Rule' section features an 'Active' checkbox, a 'Service Name' input field, a 'Port' input field, and a 'Server IP Address' input field. The 'Application Rules Summary' table is as follows:

#	Active	Name	Port	Server IP Address	Modify
1		HTTP	80	10.2.3.4	
2		Battlefield 1942	14567,22000,23000-23009,27900,28900	172.12.2.3	
3					
4					
5					
6					
7					
8					
9					
10					

The following table describes the labels in this screen.

Table 42 NAT Application

LABEL	DESCRIPTION
Game List Update	A game list includes the pre-defined service name(s) and port number(s). You can edit and upload it to the ZyXEL Device to replace the existing entries in the second field next to Service Name .
File Path	Type in the location of the file you want to upload in this field or click Browse... to find it.
Browse...	Click Browse... to find the.txt file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Update	Click Update to begin the upload process. This process may take up to two minutes.
Add Application Rule	
Active	Select the check box to enable this rule and the requested service can be forwarded to the host with a specified internal IP address. Clear the checkbox to disallow forwarding of these ports to an inside server without having to delete the entry.

Table 42 NAT Application (continued)

LABEL	DESCRIPTION
Service Name	Type a name (of up to 31 printable characters) to identify this rule in the first field next to Service Name . Otherwise, select a predefined service in the second field next to Service Name . The predefined service name and port number(s) will display in the Service Name and Port fields.
Port	Type a port number(s) to be forwarded. To specify a range of ports, enter a hyphen (-) between the first port and the last port, such as 10-20. To specify two or more non-consecutive port numbers, separate them by a comma without spaces, such as 123,567.
Server IP Address	Type the inside IP address of the server that receives packets from the port(s) specified in the Port field.
Apply	Click Apply to save your changes to the Application Rules Summary table.
Reset	Click Reset to not save and return your new changes in the Service Name and Port fields to the previous one.
Application Rules Summary	
#	This is the number of an individual port forwarding server entry.
Active	This icon is turned on when the rule is enabled.
Name	This field displays a name to identify this rule.
Port	This field displays the port number(s).
Server IP Address	This field displays the inside IP address of the server.
Modify	Click the Edit icon to display and modify an existing rule setting in the fields under Add Application Rule . Click the Remove icon to delete a rule.

9.4.1 Game List Example

Here is an example game list text file. The index number, service name and associated port(s) are specified by semi-colons (no spaces). Use the name=xxx (where xxx is the service name) to create a new service. Port range can be separated with a hyphen (-) (no spaces). Multiple (non-consecutive) ports can be separated by commas.

Figure 74 Game List Example

```
version=1
1;name=Battlefield 1942;port=14567,22000,23000-23009,27900,28900
2;name=Call of Duty;port=28960
3;name=Civilization IV;port=2056
4;name=Diablo I and II;port=6112-6119,4000
5;name=Doom 3;port=27666
6;name=F.E.A.R;port=27888
7;name=Final Fantasy XI;port=25,80,110,443,50000-65535
8;name=Guild Wars;port=6112,80
9;name=Half Life;port=6003,7002,27005,27010,27011,27015
10;name=Jedi Knight III: Jedi Academy;port=28060-28062,28070-28081
11;name=Need for Speed: Hot Pursuit 2;port=1230,8511-
8512,27900,28900,61200-61230
12;name=Neverwinter Nights;port=5120-5300,6500,27900,28900
13;name=Quake 2;port=27910
14;name=Quake 3;port=27660,27960
15;name=Rainbow Six 3: Raven Shield;port=7777-7787,8777-8787
16;name=Serious Sam II;port=25600-25605
17;name=Silent Hunter III;port=17997-18003
18;name=Soldier of Fortune II;port=20100-20112
19;name=Starcraft;port=6112-6119,4000
20;name=Star Trek: Elite Force II;port=29250,29256
21;name=SWAT 4;port=10480-10483
22;name=Warcraft II and III;port=6112-6119,4000
23;name=World of Warcraft;port=3724
```

9.5 Trigger Port Forwarding

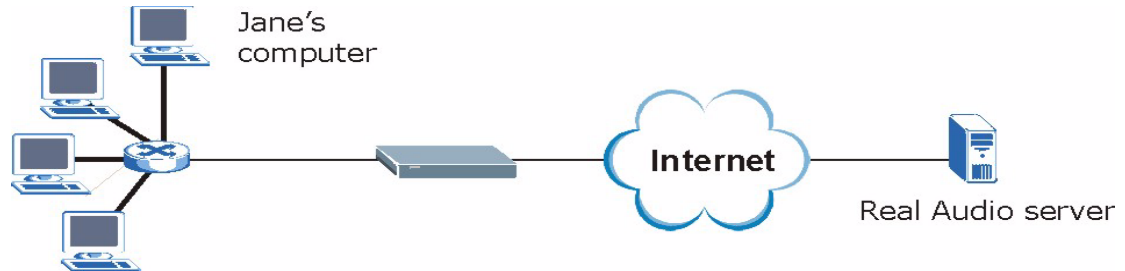
Some services use a dedicated range of ports on the client side and a dedicated range of ports on the server side. With regular port forwarding you set a forwarding port in NAT to forward a service (coming in from the server on the WAN) to the IP address of a computer on the client side (LAN). The problem is that port forwarding only forwards a service to a single LAN IP address. In order to use the same service on a different LAN computer, you have to manually replace the LAN computer's IP address in the forwarding port with another LAN computer's IP address.

Trigger port forwarding solves this problem by allowing computers on the LAN to dynamically take turns using the service. The ZyXEL Device records the IP address of a LAN computer that sends traffic to the WAN to request a service with a specific port number and protocol (a "trigger" port). When the ZyXEL Device's WAN port receives a response with a specific port number and protocol ("incoming" port), the ZyXEL Device forwards the traffic to the LAN IP address of the computer that sent the request. After that computer's connection for that service closes, another computer on the LAN can use the service in the same manner. This way you do not need to configure a new IP address each time you want a different LAN computer to use the application.

9.5.1 Trigger Port Forwarding Example

The following is an example of trigger port forwarding.

Figure 75 Trigger Port Forwarding Process: Example



- 1 Jane requests a file from the Real Audio server (port 7070).
- 2 Port 7070 is a “trigger” port and causes the ZyXEL Device to record Jane’s computer IP address. The ZyXEL Device associates Jane's computer IP address with the "incoming" port range of 6970-7170.
- 3 The Real Audio server responds using a port number ranging between 6970-7170.
- 4 The ZyXEL Device forwards the traffic to Jane’s computer IP address.
- 5 Only Jane can connect to the Real Audio server until the connection is closed or times out. The ZyXEL Device times out in three minutes with UDP (User Datagram Protocol), or two hours with TCP/IP (Transfer Control Protocol/Internet Protocol).

9.5.2 Two Points To Remember About Trigger Ports

- 1 Trigger events only happen on data that is going coming from inside the ZyXEL Device and going to the outside.
- 2 If an application needs a continuous data stream, that port (range) will be tied up so that another computer on the LAN can’t trigger it.

9.6 NAT Advanced Screen

To change your ZyXEL Device’s trigger port settings, click **Network > NAT > Advanced**. The screen appears as shown.

Note: Only one LAN computer can use a trigger port (range) at a time.

Figure 76 NAT Advanced

The following table describes the labels in this screen.

Table 43 NAT Advanced

LABEL	DESCRIPTION
Max NAT/Firewall Session Per User	Type a number ranging from 1 to 2048 to limit the number of NAT/firewall sessions that a host can create. When computers use peer to peer applications, such as file sharing applications, they may use a large number of 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.
#	This is the rule index number (read-only).
Name	Type a unique name (up to 15 characters) for identification purposes. All characters are permitted - including spaces.

Table 43 NAT Advanced

LABEL	DESCRIPTION
Incoming	Incoming is a port (or a range of ports) that a server on the WAN uses when it sends out a particular service. The ZyXEL Device forwards the traffic with this port (or range of ports) to the client computer on the LAN that requested the service.
Start Port	Type a port number or the starting port number in a range of port numbers.
End Port	Type a port number or the ending port number in a range of port numbers.
Trigger	The trigger port is a port (or a range of ports) that causes (or triggers) the ZyXEL Device to record the IP address of the LAN computer that sent the traffic to a server on the WAN.
Start Port	Type a port number or the starting port number in a range of port numbers.
End Port	Type a port number or the ending port number in a range of port numbers.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

CHAPTER 10

Dynamic DNS

10.1 Dynamic DNS Introduction

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.

10.1.1 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.

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

10.2 Dynamic DNS Screen

To change your ZyXEL Device's DDNS, click **Network > DDNS**. The screen appears as shown.

Figure 77 Dynamic DNS

The following table describes the labels in this screen.

Table 44 Dynamic DNS

LABEL	DESCRIPTION
Enable Dynamic DNS	Select this check box to use dynamic DNS.
Service Provider	Select 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	Enter a host names in the field provided. You can specify up to two host names in the field separated by a comma (",").
User Name	Enter your user name.
Password	Enter 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 CustomDNS 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.
Dynamic DNS server auto detect IP Address	Select this option to update the IP address of the host name(s) automatically by the DDNS server. It is recommended that you select this option.
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.
Reset	Click Reset to begin configuring this screen afresh.

CHAPTER 11

Firewall

This chapter gives some background information on firewalls and explains how to get started with the ZyXEL Device firewall.

11.1 Introduction to Firewall

11.1.1 What is a Firewall?

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.

11.1.2 Stateful Inspection Firewall.

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

11.1.3 About the ZyXEL Device Firewall

The ZyXEL Device firewall is a stateful inspection firewall and is designed to protect against Denial of Service attacks when activated (click the **General** tab under **Firewall** and then click the **Enable Firewall** check box). 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 is installed between the LAN and a broadband modem connecting to 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 Ethernet WAN port and four Ethernet LAN ports, which are used to physically separate the network into two areas. The WAN (Wide Area Network) port attaches to the broadband (cable or DSL) modem 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" is not allowed (by default) unless the remote host is authorized to use a specific service.

11.1.4 Guidelines For Enhancing Security With Your Firewall

- 1 Change the default password via web configurator.
- 2 Think about access control before you connect to the network in any way, including attaching a modem to the port.
- 3 Limit who can access your router.
- 4 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.
- 5 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.
- 6 Protect against IP spoofing by making sure the firewall is active.
- 7 Keep the firewall in a secured (locked) room.

11.2 General Firewall Screen

Click **Security > Firewall** to open the **General** screen.

Figure 78 General

The screenshot shows the 'General' tab of the Firewall Setup screen. The 'Enable Firewall' checkbox is checked. Below this is a table with two columns: 'Packet Direction' and 'Log'. The table has two rows: 'LAN to WAN' and 'WAN to LAN'. The 'Log' column for both rows has a dropdown menu set to 'No Log'. At the bottom of the screen are 'Apply' and 'Reset' buttons.

Packet Direction	Log
LAN to WAN	No Log
WAN to LAN	No Log

The following table describes the labels in this screen.

Table 45 Firewall General

LABEL	DESCRIPTION
Enable 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.
Packet Direction	This is the direction of travel of packets. Firewall rules are grouped based on the direction of travel of packets to which they apply.
Log	Select whether to create a log for packets that are traveling in the selected direction when the packets are blocked or forwarded. To log packets related to firewall rules, make sure that Access Control under Log is selected in the Logs > Log Settings screen.
Apply	Click Apply to save the settings.
Reset	Click Reset to start configuring this screen again.

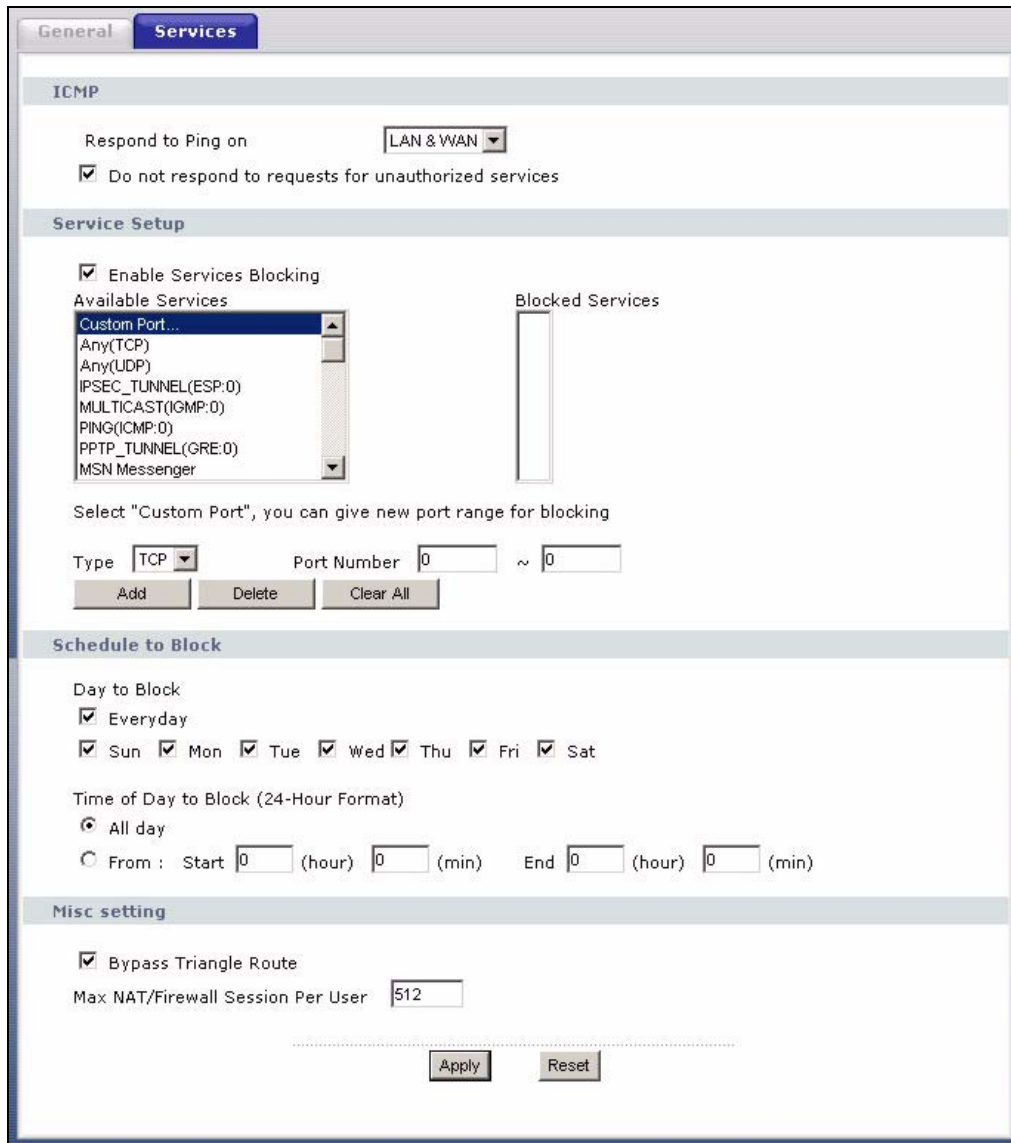
11.3 Services Screen

Click **Security > Firewall > Services**. The screen appears as shown next.

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. Use this screen to prevent the ICMP response packet from being sent. This keeps outsiders from discovering your ZyXEL Device when unsupported ports are probed.

You can also use this screen to enable service blocking, enter/delete/modify the services you want to block and the date/time you want to block them.

Figure 79 Services



The following table describes the labels in this screen.

Table 46 Firewall Services

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.

Table 46 Firewall Services

LABEL	DESCRIPTION
Do not respond to requests for unauthorized services	<p>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.</p> <p>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.</p>
Enable Services Blocking	Select this check box to enable this feature.
Available Services	This is a list of pre-defined services (ports) you may prohibit your LAN computers from using. Select the port you want to block using the drop-down list and click Add to add the port to the Blocked Services field.
Blocked Services	This is a list of services (ports) that will be inaccessible to computers on your LAN once you enable service blocking.
Custom Port	A custom port is a service that is not available in the pre-defined Available Services list and you must define using the next two fields.
Type	Choose the IP port (TCP or UDP) that defines your customized port from the drop down list box.
Port Number	Enter the port number range that defines the service. For example, if you want to define the Gnutella service, then select TCP type and enter a port range from 6345 to 6349.
Add	Select a service from the Available Services drop-down list and then click Add to add a service to the Blocked Services
Delete	Select a service from the Blocked Services list and then click Delete to remove this service from the list.
Clear All	Click Clear All to empty the Blocked Services .
Day to Block:	Select a check box to configure which days of the week (or everyday) you want the content filtering to be active.
Time of Day to Block (24-Hour Format)	Select the time of day you want service blocking to take effect. Configure blocking to take effect all day by selecting All Day . You can also configure specific times by selecting From and entering the start time in the Start (hour) and Start (min) fields and the end time in the End (hour) and End (min) fields. Enter times in 24-hour format, for example, "3:00pm" should be entered as "15:00".
Bypass Triangle Route	Select this check box to have the ZyXEL Device firewall ignore the use of triangle route topology on the network. See the appendix for more on triangle route topology.
Max NAT/Firewall Session Per User	Type a number ranging from 1 to 2048 to limit the number of NAT/firewall sessions that a host can create.
Apply	Click Apply to save the settings.
Reset	Click Reset to start configuring this screen again.

CHAPTER 12

Content Filtering

This chapter provides a brief overview of content filtering using the embedded web GUI.

12.1 Introduction to Content Filtering

Internet content filtering allows you to create and enforce Internet access policies tailored to their needs. Content filtering is the ability to block certain web features or specific URL keywords.

12.2 Restrict Web Features

The ZyXEL Device can block web features such as ActiveX controls, Java applets, cookies and disable web proxies.

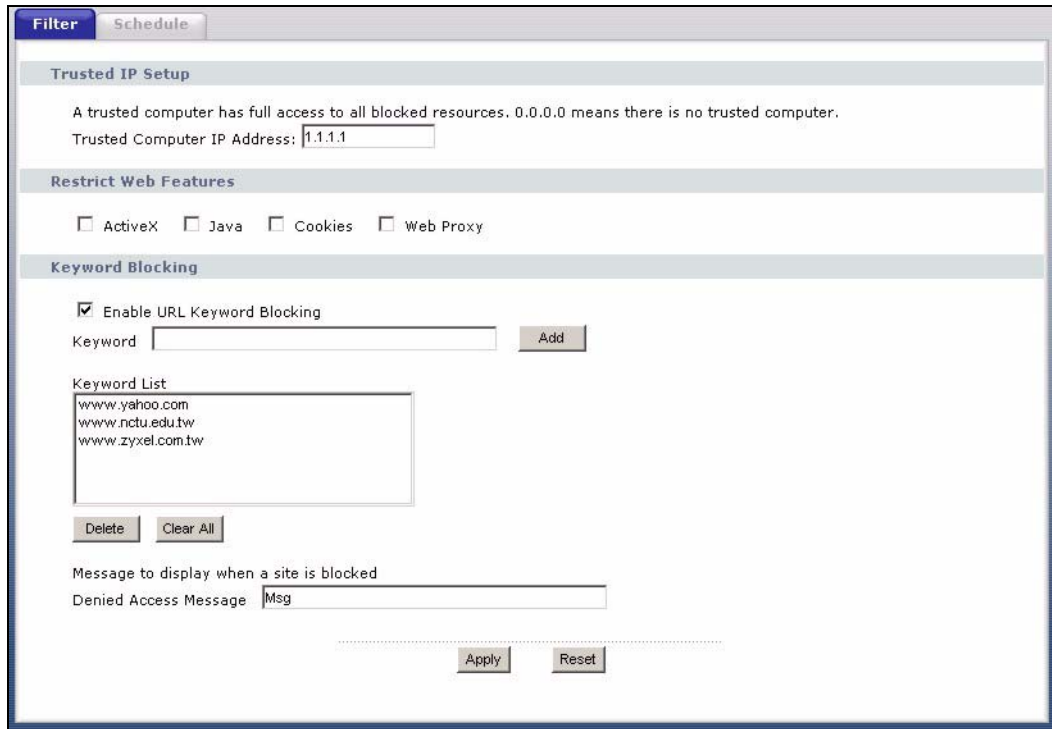
12.3 Days and Times

The ZyXEL Device also allows you to define time periods and days during which the ZyXEL Device performs content filtering.

12.4 Filter Screen

Click **Security > Content Filter** to open the **Filter** screen.

Figure 80 Content Filter: Filter



The following table describes the labels in this screen.

Table 47 Content Filter: Filter

LABEL	DESCRIPTION
Trusted Computer IP Address	To enable this feature, type an IP address of any one of the computers in your network that you want to have as a trusted computer. This allows the trusted computer to have full access to all features that are configured to be blocked by content filtering. Leave this field blank to have no trusted computers.
Restrict Web Features	Select the box(es) to restrict a feature. When you download a page containing a restricted feature, that part of the web page will appear blank or grayed out.
ActiveX	A tool for building dynamic and active Web pages and distributed object applications. When you visit an ActiveX Web site, ActiveX controls are downloaded to your browser, where they remain in case you visit the site again.
Java	A programming language and development environment for building downloadable Web components or Internet and intranet business applications of all kinds.
Cookies	Used by Web servers to track usage and provide service based on ID.
Web Proxy	A server that acts as an intermediary between a user and the Internet to provide security, administrative control, and caching service. When a proxy server is located on the WAN it is possible for LAN users to circumvent content filtering by pointing to this proxy server.
Enable URL Keyword Blocking	The ZyXEL Device can block Web sites with URLs that contain certain keywords in the domain name or IP address. For example, if the keyword "bad" was enabled, all sites containing this keyword in the domain name or IP address will be blocked, e.g., URL http://www.website.com/bad.html would be blocked. Select this check box to enable this feature.

Table 47 Content Filter: Filter

LABEL	DESCRIPTION
Keyword	Type a keyword in this field. You may use any character (up to 64 characters). Wildcards are not allowed. You can also enter a numerical IP address.
Keyword List	This list displays the keywords already added.
Add	Click Add 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.
Delete	Highlight a keyword in the lower box and click Delete to remove it. The keyword disappears from the text box after you click Apply .
Clear All	Click this button to remove all of the listed keywords.
Message to display when a site is blocked.	
Denied Access Message	Enter a message to be displayed when a user tries to access a restricted web site. The default message is Please contact your network administrator!!
Apply	Click Apply to save your changes.
Reset	Click Reset to begin configuring this screen afresh

12.5 Schedule

Click **Security > Content Filter > Schedule**. The following screen displays.

Figure 81 Content Filter: Schedule

Filter Schedule

Schedule to Block

Day to Block

Everyday

Sun Mon Tue Wed Thu Fri Sat

Time of Day to Block (24-Hour Format)

All day

From : Start (hour) (min) End (hour) (min)

Apply Reset

The following table describes the labels in this screen.

Table 48 Content Filter: Schedule

LABEL	DESCRIPTION
Day to Block	Select check boxes for the days that you want the ZyXEL Device to perform content filtering. Select the Everyday check box to have content filtering turned on all days of the week.
Time of Day to Block (24-Hour Format)	Time of Day to Block allows the administrator to define during which time periods content filtering is enabled. Time of Day to Block restrictions only apply to the keywords (see above). Restrict web server data, such as ActiveX, Java, Cookies and Web Proxy are not affected. Select All Day to have content filtering always active on the days selected in Day to Block with time of day limitations not enforced. Select From and enter the time period, in 24-hour format, during which content filtering will be enforced.
Apply	Click Apply to save your customized settings and exit this screen.
Reset	Click Reset to begin configuring this screen afresh

12.6 Customizing Keyword Blocking URL Checking

You can use commands to set how much of a website's URL the content filter is to check for keyword blocking. See the appendices for information on how to access and use the command interpreter.

12.6.1 Domain Name or IP Address URL Checking

By default, the ZyXEL Device checks the URL's domain name or IP address when performing keyword blocking.

This means that the ZyXEL Device checks the characters that come before the first slash in the URL.

For example, with the URL www.zyxel.com.tw/news/pressroom.php, content filtering only searches for keywords within www.zyxel.com.tw.

12.6.2 Full Path URL Checking

Full path URL checking has the ZyXEL Device check the characters that come before the last slash in the URL.

For example, with the URL www.zyxel.com.tw/news/pressroom.php, full path URL checking searches for keywords within www.zyxel.com.tw/news/.

Use the `ip urlfilter customize actionFlags 6 [disable | enable]` command to extend (or not extend) the keyword blocking search to include the URL's full path.

12.6.3 File Name URL Checking

Filename URL checking has the ZyXEL Device check all of the characters in the URL.

For example, filename URL checking searches for keywords within the URL

www.zyxel.com.tw/news/pressroom.php.

Use the `ip urlfilter customize actionFlags 8 [disable | enable]` command to extend (or not extend) the keyword blocking search to include the URL's complete filename.

CHAPTER 13

IPSec VPN

This chapter explains how to set up and maintain IPSec VPNs in the ZyXEL Device. First, it provides an overview of IPSec VPNs. Then, it introduces each screen for IPSec VPN in the ZyXEL Device. This chapter applies to the P-335U.

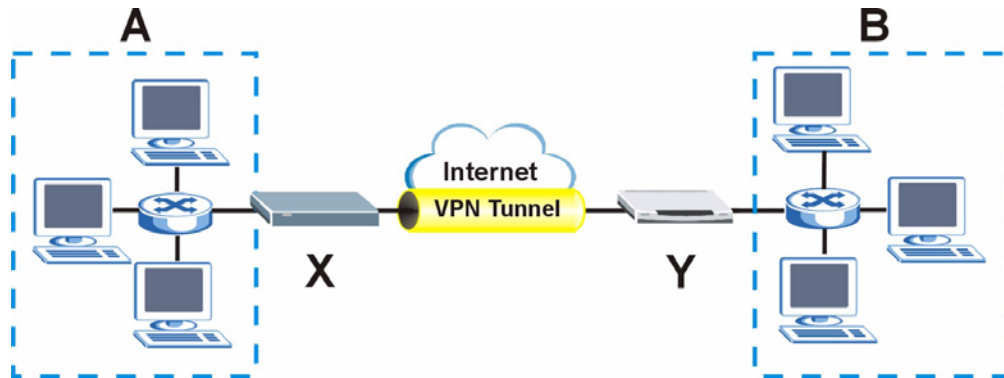
13.1 IPSec VPN Overview

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.

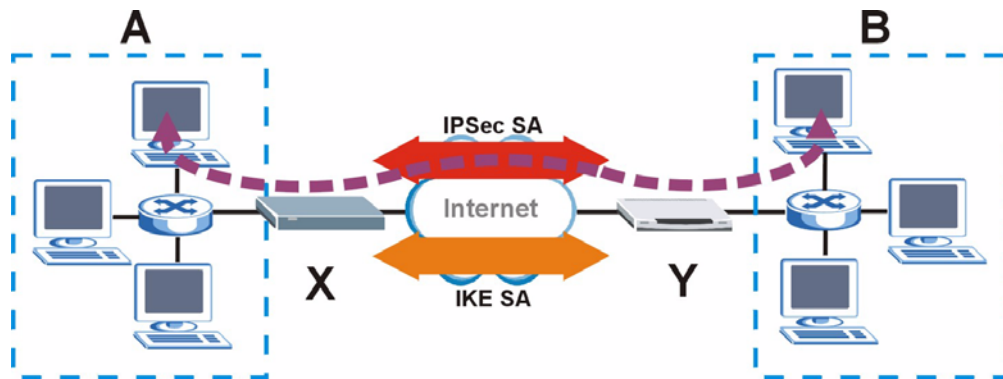
The following figure provides one perspective of a VPN tunnel.

Figure 82 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. The following figure illustrates this.

Figure 83 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 tunneling, encryption, authentication, and other security features 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.

13.1.1 IKE SA (IKE Phase 1) 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 the number of steps to use. 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 [Negotiation Mode on page 143](#). Main mode is used in various examples in the rest of this section.

13.1.1.1 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.

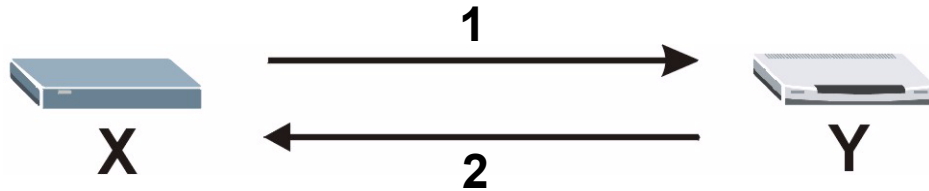
13.1.2 IKE SA Setup

This section provides more details about IKE SAs.

13.1.2.1 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 84 IKE SA: Main Negotiation Mode, Steps 1 - 2: IKE SA Proposal



The ZyXEL Device sends a proposal to the remote IPSec router. 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 sends the accepted proposal back to the ZyXEL Device. If the remote IPSec router rejects the proposal (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. See [Diffie-Hellman \(DH\) Key Exchange on page 141](#) for more information about DH key groups.

13.1.2.2 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 85 IKE SA: Main Negotiation Mode, Steps 3 - 4: DH Key Exchange



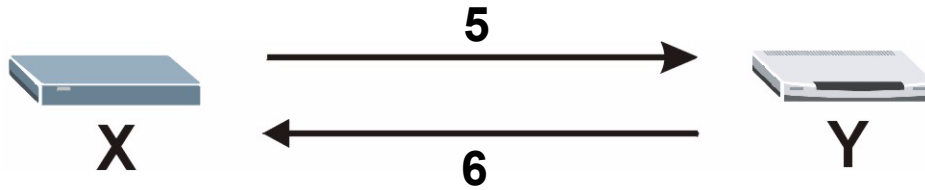
The DH key exchange is based on DH key groups. Each key group is a fixed number of bits long. The longer the key, the more secure the encryption keys, but also the longer it takes to encrypt and decrypt information. For example, DH2 keys (1024 bits) are more secure than DH1 keys (768 bits), but DH2 encryption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

13.1.2.3 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 86 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 ID type and content match so the ZyXEL Device and the remote IPSec router authenticate each other successfully.

Table 49 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 ID type and content do not match so the authentication fails and the ZyXEL Device and the remote IPSec router cannot establish an IKE SA.

Table 50 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

Table 50 VPN Example: Mismatching ID Type and Content

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

13.1.2.4 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.

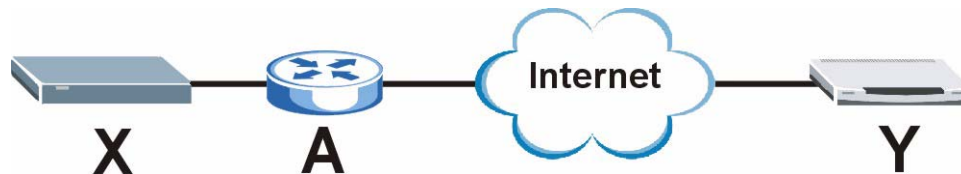
Step 2: The remote IPSec router selects an acceptable proposal and sends it back to the ZyXEL Device. It also finishes the Diffie-Hellman key exchange, authenticates the ZyXEL Device, and sends its (unencrypted) identity to the ZyXEL Device for authentication.

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).

13.1.2.5 VPN, NAT, and NAT Traversal

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

Figure 87 VPN/NAT Example

If router A does NAT, it might change the IP addresses, port numbers, or both. If router X and router Y try to establish a VPN tunnel, the authentication fails because it depends on this information. The routers cannot establish a VPN tunnel.

Most routers like router **A** now 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 IPSec protocol is ESP. (See [IPSec Protocol on page 144](#) for more information about active protocols.)

If router **A** does not have an IPSec pass-through or if the IPSec 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.

13.1.3 IPSec SA (IKE Phase 2) Overview

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

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

This section introduces the key components of an IPSec SA.

13.1.3.1 Local Network and Remote Network

In an IPSec SA, the local network consists of devices connected to the ZyXEL Device and may be called the local policy. Similarly, the remote network consists of the devices connected to the remote IPSec router and may be called the remote policy.

Note: It is not recommended to set a VPN rule's local and remote network settings both to 0.0.0.0 (any). This causes the ZyXEL Device to try to forward all access attempts (to the local network, the Internet or even the ZyXEL Device) to the remote IPSec router. In this case, you can no longer manage the ZyXEL Device.

13.1.3.2 IPSec Protocol

The IPSec 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 IPSec 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 IPSec protocol.

Usually, you should select ESP. AH does not support encryption, and ESP is more suitable with NAT.

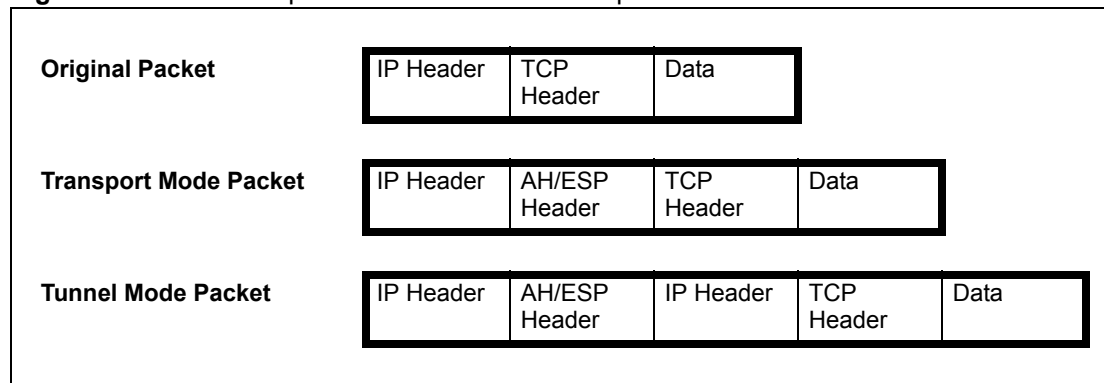
13.1.3.3 Encapsulation

There are two ways to encapsulate packets. Usually, you should use tunnel mode because it is more secure. Transport mode is only 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.

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

These modes are illustrated below.

Figure 88 VPN: Transport and Tunnel Mode Encapsulation



In tunnel mode, the ZyXEL Device uses the IPsec protocol to encapsulate the entire IP packet. As a result, there are two IP headers:

- Outside header: The outside IP header contains the IP address of the ZyXEL Device or remote IPsec router, whichever is the destination.
- Inside header: The inside IP header contains the IP address of the computer behind the ZyXEL Device or remote IPsec router. The header for the IPsec protocol (AH or ESP) appears between the IP headers.

In transport mode, the encapsulation depends on the IPsec protocol. With AH, the ZyXEL Device includes part of the original IP header when it encapsulates the packet. With ESP, however, the ZyXEL Device does not include the IP header when it encapsulates the packet, so it is not possible to verify the integrity of the source IP address.

13.1.3.4 IPsec SA Proposal and Perfect Forward Secrecy

An IPsec SA proposal is similar to an IKE SA proposal (see [IKE SA Proposal on page 141](#)), 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 root key from which encryption keys are generated. As a result, if one encryption key is compromised, other encryption keys remain secure.

If you do not enable PFS, the ZyXEL Device and remote IPsec router use the same root key that was generated when the IKE SA was established to generate encryption keys.

The DH key exchange is time-consuming and may be unnecessary for data that does not require such security.

13.1.4 Additional IPsec VPN Topics

This section discusses other IPsec VPN topics that apply to either IKE SAs or IPsec SAs or both. Relationships between the topics are also highlighted.

13.1.4.1 SA Life Time

SAs have a lifetime that specifies how long the SA lasts until it times out. When an SA times out, the ZyXEL Device automatically renegotiates the SA in the following situations:

- There is traffic when the SA life time expires
- The IPsec SA is configured on the ZyXEL Device as nailed up (see below)

Otherwise, the ZyXEL Device must re-negotiate the SA the next time someone wants to send traffic.

Note: If the IKE SA times out while an IPsec SA is connected, the IPsec SA stays connected.

An IPsec SA can be set to **keep alive**. Normally, the ZyXEL Device drops the IPsec SA when the life time expires or after two minutes of outbound traffic with no inbound traffic. If you set the IPsec SA to keep alive, the ZyXEL Device automatically renegotiates the IPsec SA when the SA life time expires, and it does not drop the IPsec SA if there is no inbound traffic.

Note: The SA life time and keep alive settings only apply if the rule identifies the remote IPsec router by a static IP address or a domain name. If the **Secure Gateway Address** field is set to **0.0.0.0**, the ZyXEL Device cannot initiate the tunnel (and cannot renegotiate the SA).

13.1.4.2 Encryption and Authentication Algorithms

In most ZyXEL Devices, you can select one of the following encryption algorithms for each proposal. The encryption algorithms are listed here 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.

You can select one of the following authentication algorithms for each proposal. The algorithms are listed here in order from weakest to strongest.

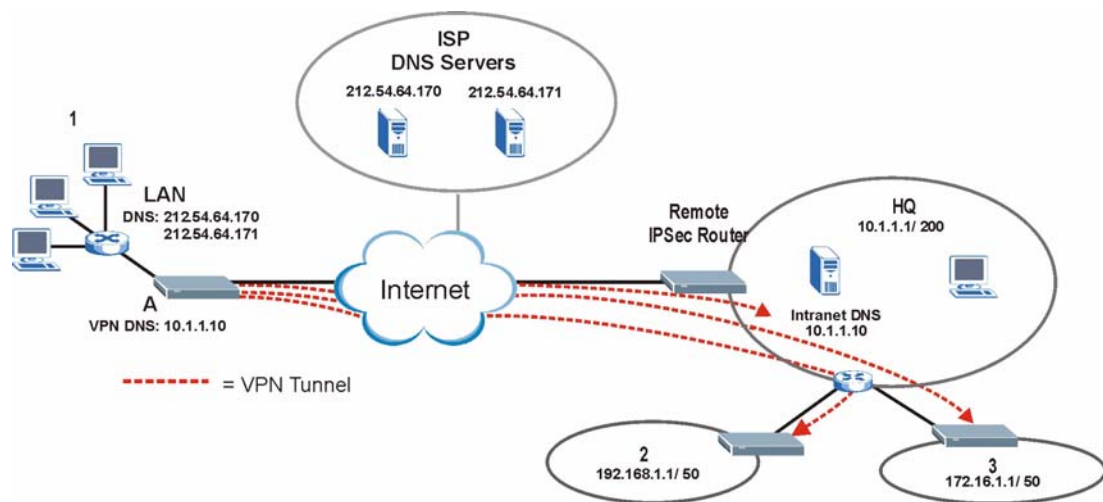
- MD5 (Message Digest 5) produces a 128-bit digest to authenticate packet data.
- SHA1 (Secure Hash Algorithm) produces a 160-bit digest to authenticate packet data.

13.2 Remote DNS Server

In cases where you want to use domain names to access Intranet servers on a remote network that has a DNS server, you must identify that DNS server. You cannot use DNS servers on the LAN or from the ISP since these DNS servers cannot resolve domain names to private IP addresses on the remote network.

The following figure depicts an example where three VPN tunnels are created from ZyXEL Device **A**; one to branch office **2**, one to branch office **3** and another to headquarters. In order to access computers that use private domain names on the headquarters (**HQ**) network, the ZyXEL Device at branch office **1** uses the Intranet DNS server in headquarters. The DNS server feature for VPN does not work with Windows 2000 or Windows XP.

Figure 89 VPN Host using Intranet DNS Server Example



If you do not specify an Intranet DNS server on the remote network, then the VPN host must use IP addresses to access the computers on the remote network.

13.3 VPN Summary

Click **Security > VPN** to display the **Summary** screen. This is a read-only menu of your VPN rules (tunnels). Edit a VPN by clicking the **Edit** icon.

Figure 90 Security > VPN > Summary

VPN Summary							
#	Active	Local Addr.	Remote Addr.	Encap.	Algorithm	Gateway	Modify
1		192.168.2.23 & 255.255.255.0	0.0.0.0	Tunnel	ESP-DES-SHA1	0.0.0.0	
2							

The following table describes the fields in this screen.

Table 51 Security > VPN > Summary

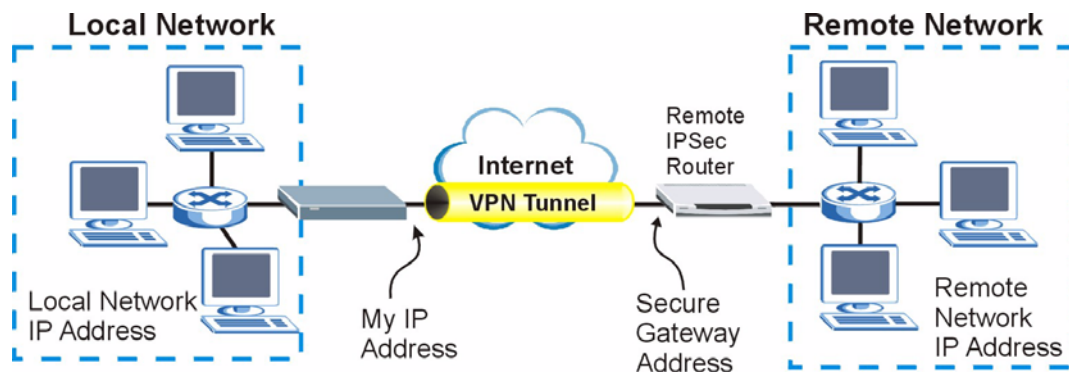
LABEL	DESCRIPTION
#	This is the VPN policy index number.
Active	This field displays whether the VPN policy is active or not. This icon is turned on when the rule is enabled.
Local Addr.	This displays the beginning and ending (static) IP addresses or a (static) IP address and a subnet mask of computer(s) on your local network behind your ZyXEL Device.
Remote Addr.	This displays the beginning and ending (static) IP addresses or a (static) IP address and a subnet mask of computer(s) on the remote network behind the remote IPsec router. This field displays 0.0.0.0 when the Secure Gateway Address field displays 0.0.0.0 . In this case only the remote IPsec router can initiate the VPN.
Encap.	This field displays Tunnel or Transport mode (Tunnel is the default selection).
Algorithm	This field displays the security protocol, encryption algorithm and authentication algorithm used for an SA.
Gateway	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 Rule Setup screen to 0.0.0.0 .
Modify	Click the Edit icon to go to the screen where you can edit the VPN rule. Click the Remove icon to remove an existing VPN rule.

13.4 VPN Rule Setup (IKE)

A VPN (Virtual Private Network) tunnel gives you a secure connection to another computer or network.

This figure helps explain the main fields in the VPN setup.

Figure 91 IPsec Fields Summary



Click the **Edit** icon in the **Summary** screen or click **Security > VPN > Rule Setup** to display the **Rule Setup** screen.

Use this screen to configure a VPN policy.

Figure 92 Security > VPN > Rule Setup: IKE (Basic)

The following table describes the labels in this screen.

Table 52 Security > VPN > Rule Setup: IKE (Basic)

LABEL	DESCRIPTION
Property	
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 this check box 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.

Table 52 Security > VPN > Rule Setup: IKE (Basic) (continued)

LABEL	DESCRIPTION
NAT Traversal	<p>Select this check box to enable NAT traversal. NAT traversal allows you to set up a VPN connection when there are NAT routers between the two IPsec routers.</p> <p>Note: The remote IPsec router must also have NAT traversal enabled. See Section 13.1.2.5 on page 143 for more information.</p> <p>You can use NAT traversal with ESP protocol using Transport or Tunnel mode, but not with AH protocol nor with manual key management. In order for an IPsec router behind a NAT router to receive an initiating IPsec packet, set the NAT router to forward UDP ports 500 and 4500 to the IPsec router behind the NAT router.</p>
IPsec Keying Mode	<p>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.</p>
DNS Server (for IPsec VPN)	<p>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.</p> <p>A DNS server allows clients on the VPN to find other computers and servers on the VPN by their (private) domain names.</p>
Local Policy	<p>Local IP addresses must be static and correspond to the remote IPsec router's configured remote IP addresses.</p> <p>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.</p> <p>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.</p> <p>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.</p>
Local Address	<p>For a single IP address, enter a (static) IP address on the LAN behind your ZyXEL Device.</p> <p>For a specific range of IP addresses, enter the beginning (static) IP address, in a range of computers on your LAN behind your ZyXEL Device.</p> <p>To specify IP addresses on a network by their subnet mask, enter a (static) IP address on the LAN behind your ZyXEL Device.</p>
Local Address End /Mask	<p>When the local IP address is a single address, type it a second time here.</p> <p>When the local IP address is a range, enter the end (static) IP address, in a range of computers on the LAN behind your ZyXEL Device.</p> <p>When the local IP address is a subnet address, enter a subnet mask on the LAN behind your ZyXEL Device.</p>
Remote Policy	<p>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.</p> <p>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.</p>

Table 52 Security > VPN > Rule Setup: IKE (Basic) (continued)

LABEL	DESCRIPTION
Remote Address	<p>For a single IP address, enter a (static) IP address on the network behind the remote IPSec router.</p> <p>For a specific range of IP addresses, enter the beginning (static) IP address, in a range of computers on the network behind the remote IPSec router.</p> <p>To specify IP addresses on a network by their subnet mask, enter a (static) IP address on the network behind the remote IPSec router.</p>
Remote Address End /Mask	<p>When the remote IP address is a single address, type it a second time here.</p> <p>When the remote IP address is a range, enter the end (static) IP address, in a range of computers on the network behind the remote IPSec router.</p> <p>When the remote IP address is a subnet address, enter a subnet mask on the network behind the remote IPSec router.</p>
Authentication Method	
My IP Address	<p>Enter the ZyXEL Device's static WAN IP address (if it has one) or leave the field set to 0.0.0.0.</p> <p>The ZyXEL Device uses its current WAN IP address (static or dynamic) in setting up the VPN tunnel if you leave this field as 0.0.0.0. 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.</p> <p>Otherwise, you can enter one of the dynamic domain names that you have configured (in the DDNS screen) to have the ZyXEL Device use that dynamic domain name's IP address.</p> <p>The VPN tunnel has to be rebuilt if My IP Address changes after setup.</p>
Local ID Type	<p>Select IP to identify this ZyXEL Device by its IP address.</p> <p>Select DNS to identify this ZyXEL Device by a domain name.</p> <p>Select E-mail to identify this ZyXEL Device by an e-mail address.</p>
Local Content	<p>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.</p> <p>It is recommended that you type an IP address other than 0.0.0.0 in the Local Content field or use the Domain Name or E-mail ID type in the following situations.</p> <ul style="list-style-type: none"> • 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. <p>When you select Domain Name 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.</p>

Table 52 Security > VPN > Rule Setup: IKE (Basic) (continued)

LABEL	DESCRIPTION
Secure Gateway Address	<p>Type the WAN IP address or the domain name (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 IPSec Keying Mode field must be set to IKE).</p> <p>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.</p> <p>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.</p> <p>Note: You can also enter a remote secure gateway's domain name in the Secure Gateway Address field if the remote secure gateway has a dynamic WAN IP address and is using DDNS. The ZyXEL Device has to rebuild the VPN tunnel each time the remote secure gateway's WAN IP address changes (there may be a delay until the DDNS servers are updated with the remote gateway's new WAN IP address).</p>
Peer ID Type	<p>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.</p>
Peer Content	<p>The configuration of the peer content depends on the peer ID type.</p> <p>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).</p> <p>For Domain Name 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.</p> <p>It is recommended that you type an IP address other than 0.0.0.0 or use the Domain Name or E-mail ID type in the following situations:</p> <ul style="list-style-type: none"> • 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.
IPSec Algorithm	
Encapsulation Mode	<p>Select Tunnel mode or Transport mode from the drop-down list box.</p>
IPSec Protocol	<p>Select the security protocols used for an SA.</p> <p>Both AH and ESP increase processing requirements and communications latency (delay).</p> <p>If you select ESP here, you must select options from the Encryption Algorithm and Authentication Algorithm fields (described below).</p>

Table 52 Security > VPN > Rule Setup: IKE (Basic) (continued)

LABEL	DESCRIPTION
Pre-Shared Key	<p>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.</p> <p>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.</p> <p>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.</p>
Encryption Algorithm	<p>Select which key size and encryption algorithm to use for data communications. Choices are:</p> <p>DES - a 56-bit key with the DES encryption algorithm</p> <p>3DES - a 168-bit key with the DES encryption algorithm</p> <p>The ZyXEL Device and the remote IPSec router must use the same algorithms and key, which can be used to encrypt and decrypt the message or to generate and verify a message authentication code. Longer keys require more processing power, resulting in increased latency and decreased throughput.</p>
Authentication Algorithm	<p>Select which hash algorithm to use to authenticate packet data. Choices are SHA1 and MD5. SHA1 is generally considered stronger than MD5, but it is also slower.</p>
Advanced...	<p>Click Advanced... to configure more detailed settings of your IKE key management.</p>
Apply	<p>Click Apply to save your changes back to the ZyXEL Device.</p>
Reset	<p>Click Reset to begin configuring this screen afresh.</p>

13.5 Advanced VPN Rule Setup (IKE)

Click **Advanced...** in the **Rule Setup** screen to open this screen.

Figure 93 Security > VPN > Rule Setup: IKE (Advanced)

Summary	Rule Setup	SA Monitor	Global Setting
Property			
<input type="checkbox"/> Active			
<input type="checkbox"/> Keep Alive			
<input type="checkbox"/> NAT Traversal			
Key Management	IKE		
Protocol Number			
Enable Replay Detection	No		
DNS Server (for IPSec VPN)			
Local Policy			
Local Address			
Local Port Start			
Local Port End			
Remote Policy			
Remote Address Start			
Remote Address End/Mask			
Remote Port Start			
Remote Port End			
Authentication Method			
My IP Address			
Local ID Type	IP		
Local Content			
Secure Gateway Address			
Peer ID Type	IP		
Peer Content			
IKE Phase 1			
Negotiation Mode	Main		
Encryption Algorithm	DES		
Authentication Algorithm	MD5		
SA Life Time	28800		
Key Group	DH1		
Pre-Shared Key			
IKE Phase 2			
Encapsulation Mode	Tunnel		
IPSec Protocol	ESP		
Encryption Algorithm	DES		
Authentication Algorithm	MD5		
SA Life Time	28800		
Perfect Forward Secrecy(PFS)	None		
Basic...			
<input type="button" value="Apply"/> <input type="button" value="Reset"/>			

The following table describes the labels in this screen.

Table 53 Security > VPN > Rule Setup: IKE (Advanced)

LABEL	DESCRIPTION
Property	
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 this check box 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	<p>Select this check box to enable NAT traversal. NAT traversal allows you to set up a VPN connection when there are NAT routers between the two IPsec routers.</p> <p>Note: The remote IPsec router must also have NAT traversal enabled. See Section 13.1.2.5 on page 143 for more information.</p> <p>You can use NAT traversal with ESP protocol using Transport or Tunnel mode, but not with AH protocol nor with manual key management. In order for an IPsec router behind a NAT router to receive an initiating IPsec packet, set the NAT router to forward UDP ports 500 and 4500 to the IPsec router behind the NAT router.</p>
IPsec Keying 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.
Protocol Number	Enter 1 for ICMP, 6 for TCP, 17 for UDP, etc. 0 is the default and signifies any protocol.
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. Select YES from the drop-down menu to enable replay detection, or select NO to disable it.
DNS Server (for IPsec VPN)	<p>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.</p> <p>A DNS server allows clients on the VPN to find other computers and servers on the VPN by their (private) domain names.</p>
Local Policy	<p>Local IP addresses must be static and correspond to the remote IPsec router's configured remote IP addresses.</p> <p>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.</p> <p>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.</p> <p>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.</p>

Table 53 Security > VPN > Rule Setup: IKE (Advanced) (continued)

LABEL	DESCRIPTION
Local Address	<p>For a single IP address, enter a (static) IP address on the LAN behind your ZyXEL Device.</p> <p>For a specific range of IP addresses, enter the beginning (static) IP address, in a range of computers on your LAN behind your ZyXEL Device.</p> <p>To specify IP addresses on a network by their subnet mask, enter a (static) IP address on the LAN behind your ZyXEL Device.</p>
Local Address End / Mask	<p>When the local IP address is a single address, type it a second time here.</p> <p>When the local IP address is a range, enter the end (static) IP address, in a range of computers on the LAN behind your ZyXEL Device.</p> <p>When the local IP address is a subnet address, enter a subnet mask on the LAN behind your ZyXEL Device.</p>
Local Port Start	<p>0 is the default and signifies any port. Type a port number from 0 to 65535. Some of the most common IP ports are: 21, FTP; 53, DNS; 23, Telnet; 80, HTTP; 25, SMTP; 110, POP3.</p>
Local Port End	<p>Enter a port number in this field to define a port range. This port number must be greater than that specified in the previous field. If Local Port Start is left at 0, Local Port End will also remain at 0.</p>
Remote Policy	<p>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.</p> <p>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.</p>
Remote Address	<p>For a single IP address, enter a (static) IP address on the network behind the remote IPSec router.</p> <p>For a specific range of IP addresses, enter the beginning (static) IP address, in a range of computers on the network behind the remote IPSec router.</p> <p>To specify IP addresses on a network by their subnet mask, enter a (static) IP address on the network behind the remote IPSec router.</p>
Remote Address End /Mask	<p>When the remote IP address is a single address, type it a second time here.</p> <p>When the remote IP address is a range, enter the end (static) IP address, in a range of computers on the network behind the remote IPSec router.</p> <p>When the remote IP address is a subnet address, enter a subnet mask on the network behind the remote IPSec router.</p>
Remote Port Start	<p>0 is the default and signifies any port. Type a port number from 0 to 65535. Some of the most common IP ports are: 21, FTP; 53, DNS; 23, Telnet; 80, HTTP; 25, SMTP; 110, POP3.</p>
Remote Port End	<p>Enter a port number in this field to define a port range. This port number must be greater than that specified in the previous field. If Remote Port Start is left at 0, Remote Port End will also remain at 0.</p>
Authentication Method	

Table 53 Security > VPN > Rule Setup: IKE (Advanced) (continued)

LABEL	DESCRIPTION
My IP Address	<p>Enter the ZyXEL Device's static WAN IP address (if it has one) or leave the field set to 0.0.0.0.</p> <p>The ZyXEL Device uses its current WAN IP address (static or dynamic) in setting up the VPN tunnel if you leave this field as 0.0.0.0. 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.</p> <p>Otherwise, you can enter one of the dynamic domain names that you have configured (in the DDNS screen) to have the ZyXEL Device use that dynamic domain name's IP address.</p> <p>The VPN tunnel has to be rebuilt if My IP Address changes after setup.</p>
Local ID Type	<p>Select IP to identify this ZyXEL Device by its IP address.</p> <p>Select DNS to identify this ZyXEL Device by a domain name.</p> <p>Select E-mail to identify this ZyXEL Device by an e-mail address.</p>
Local Content	<p>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 Domain Name or E-mail ID type in the following situations.</p> <ul style="list-style-type: none"> • 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. <p>When you select Domain Name 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.</p>
Secure Gateway Address	<p>Type the WAN IP address or the domain name (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 IPsec Keying Mode field must be set to IKE).</p> <p>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.</p> <p>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.</p> <p>Note: You can also enter a remote secure gateway's domain name in the Secure Gateway Address field if the remote secure gateway has a dynamic WAN IP address and is using DDNS. The ZyXEL Device has to rebuild the VPN tunnel each time the remote secure gateway's WAN IP address changes (there may be a delay until the DDNS servers are updated with the remote gateway's new WAN IP address).</p>
Peer ID Type	<p>Select IP to identify the remote IPsec router by its IP address.</p> <p>Select DNS to identify the remote IPsec router by a domain name.</p> <p>Select E-mail to identify the remote IPsec router by an e-mail address.</p>

Table 53 Security > VPN > Rule Setup: IKE (Advanced) (continued)

LABEL	DESCRIPTION
Peer Content	<p>The configuration of the peer content depends on the peer ID type.</p> <p>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).</p> <p>For Domain Name 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.</p> <p>It is recommended that you type an IP address other than 0.0.0.0 or use the Domain Name or E-mail ID type in the following situations:</p> <ul style="list-style-type: none"> • 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.
IKE Phase 1	
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.
Encryption Algorithm	<p>Select which key size and encryption algorithm to use in the IKE SA. Choices are:</p> <p>DES - a 56-bit key with the DES encryption algorithm</p> <p>3DES - a 168-bit key with the DES encryption algorithm</p> <p>The ZyXEL Device and the remote IPSec router must use the same algorithms and keys. Longer keys require more processing power, resulting in increased latency and decreased throughput.</p>
Authentication Algorithm	Select which hash algorithm to use to authenticate packet data in the IKE SA. Choices are SHA1 and MD5 . SHA1 is generally considered stronger than MD5 , but it is also slower.
SA Life Time (Seconds)	<p>Define the length of time before an IKE SA automatically renegotiates in this field. It may range from 180 to 3,000,000 seconds (almost 35 days).</p> <p>A short SA Life Time increases security by forcing the two VPN gateways to update the encryption and authentication keys. However, every time the VPN tunnel renegotiates, all users accessing remote resources are temporarily disconnected.</p>
Key Group	<p>Select which Diffie-Hellman key group (DHx) you want to use for encryption keys. Choices are:</p> <p>DH1 - use a 768-bit random number</p> <p>DH2 - use a 1024-bit random number</p>
Pre-Shared Key	<p>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.</p> <p>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.</p> <p>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.</p>
IKE Phase 2	
Encapsulation Mode	Select Tunnel mode or Transport mode.

Table 53 Security > VPN > Rule Setup: IKE (Advanced) (continued)

LABEL	DESCRIPTION
IPSec Protocol	Select the security protocols used for an SA. Both AH and ESP increase processing requirements and communications latency (delay). If you select ESP here, you must select options from the Encryption Algorithm and Authentication Algorithm fields (described below).
Encryption Algorithm	Select which key size and encryption algorithm to use in the IKE SA. Choices are: DES - a 56-bit key with the DES encryption algorithm 3DES - a 168-bit key with the DES encryption algorithm The ZyXEL Device and the remote IPSec router must use the same algorithms and keys. Longer keys require more processing power, resulting in increased latency and decreased throughput.
Authentication Algorithm	Select which hash algorithm to use to authenticate packet data in the IPSec SA. Choices are SHA1 and MD5 . SHA1 is generally considered stronger than MD5 , but it is also slower.
SA Life Time	Define the length of time before an IPSec SA automatically renegotiates in this field. The minimum value is 180 seconds. A short SA Life Time increases security by forcing the two VPN gateways to update the encryption and authentication keys. However, every time the VPN tunnel renegotiates, all users accessing remote resources are temporarily disconnected.
Perfect Forward Secret (PFS)	Select whether or not you want to enable Perfect Forward Secrecy (PFS) and, if you do, which Diffie-Hellman key group to use for encryption. Choices are: None - disable PFS DH1 - enable PFS and use a 768-bit random number DH2 - enable PFS and use a 1024-bit random number PFS changes the root key that is used to generate encryption keys for each IPSec SA. It is more secure but takes more time.
Basic...	Click Basic... to go to the previous VPN configuration screen.
Apply	Click Apply to save the changes.
Reset	Click Reset to begin configuring this screen afresh.

13.6 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, for troubleshooting. You should only do this 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 SA and some characteristics of IPSec SA. There are also some differences between IPSec SA using manual keys and other types of SA.

13.6.1 IPSec SA Proposal Using Manual Keys

In IPSec SA using manual keys, you can only specify one encryption algorithm and one authentication algorithm. 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.

13.6.2 Authentication and the Security Parameter Index (SPI)

For authentication, the ZyXEL Device and remote IPSec router use the SPI, instead of pre-shared keys, ID type and content. The SPI is an identification number.

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

13.7 VPN Rule Setup (Manual)

Refer to [Figure 91 on page 148](#) for a graphical representation of the fields in the web configurator.

Select **Manual** in the **IPSec Keying Mode** field on the **Rule Setup** screen to open the screen as shown next.

Use this screen to configure VPN rules (tunnels) that use manual keys. Manual key management is useful if you have problems with IKE key management.

See [Section 13.6 on page 159](#) for more information about IPSec SAs using manual keys.

Figure 94 Security > VPN > Rule Setup: Manual

The screenshot shows the 'Rule Setup: Manual' configuration page. It features a navigation bar with tabs for 'Summary', 'Rule Setup' (selected), 'SA Monitor', and 'Global Setting'. The main content area is organized into sections:

- Property:** Includes a checked 'Active' checkbox, 'IPSec Keying Mode' (Manual), 'Protocol Number' (0), and 'DNS Server (for IPSec VPN)' (0.0.0.0).
- Local Policy:** Includes 'Local Address' (0.0.0.0), 'Local Address End/Mask' (0.0.0.0), 'Local Port Start' (0), and 'Local Port End' (0).
- Remote Policy:** Includes 'Remote Address Start' (0.0.0.0), 'Remote Address End/Mask' (0.0.0.0), 'Remote Port Start' (0), and 'Remote Port End' (0).
- Remote Port End:** Includes 'My IP Address' (0.0.0.0) and 'Secure Gateway Address' (0.0.0.0).
- Secure Gateway Address:** Includes 'SPI' (0), 'Encapsulation Mode' (Transport), 'Enable Replay Detection' (No), 'IPSec Protocol' (ESP), 'Encryption Algorithm' (DES), 'Encryption Key' (empty), 'Authentication Algorithm' (SHA1), and 'Authentication Key' (empty).

At the bottom, there are 'Apply' and 'Reset' buttons.

The following table describes the labels in this screen.

Table 54 Security > VPN > Rule Setup: Manual

LABEL	DESCRIPTION
Property	
Active	Select this check box to activate this VPN policy.
IPSec Keying 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.
Protocol Number	Enter 1 for ICMP, 6 for TCP, 17 for UDP, etc. 0 is the default and signifies any protocol.

Table 54 Security > VPN > Rule Setup: Manual (continued)

LABEL	DESCRIPTION
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 Policy	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	For a single IP address, enter a (static) IP address on the LAN behind your ZyXEL Device. For a specific range of IP addresses, enter the beginning (static) IP address, in a range of computers on your LAN behind your ZyXEL Device. To specify IP addresses on a network by their subnet mask, enter a (static) IP address on the LAN behind your ZyXEL Device.
Local Address End /Mask	When the local IP address is a single address, type it a second time here. When the local IP address is a range, enter the end (static) IP address, in a range of computers on the LAN behind your ZyXEL Device. When the local IP address is a subnet address, enter a subnet mask on the LAN behind your ZyXEL Device.
Local Port Start	0 is the default and signifies any port. Type a port number from 0 to 65535. Some of the most common IP ports are: 21, FTP; 53, DNS; 23, Telnet; 80, HTTP; 25, SMTP; 110, POP3.
Local Port End	Enter a port number in this field to define a port range. This port number must be greater than that specified in the previous field. If Local Port Start is left at 0, Local Port End will also remain at 0.
Remote Policy	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	For a single IP address, enter a (static) IP address on the network behind the remote IPsec router. For a specific range of IP addresses, enter the beginning (static) IP address, in a range of computers on the network behind the remote IPsec router. To specify IP addresses on a network by their subnet mask, enter a (static) IP address on the network behind the remote IPsec router.

Table 54 Security > VPN > Rule Setup: Manual (continued)

LABEL	DESCRIPTION
Remote Address End /Mask	<p>When the remote IP address is a single address, type it a second time here.</p> <p>When the remote IP address is a range, enter the end (static) IP address, in a range of computers on the network behind the remote IPSec router.</p> <p>When the remote IP address is a subnet address, enter a subnet mask on the network behind the remote IPSec router.</p>
Remote Port Start	<p>0 is the default and signifies any port. Type a port number from 0 to 65535. Some of the most common IP ports are: 21, FTP; 53, DNS; 23, Telnet; 80, HTTP; 25, SMTP; 110, POP3.</p>
Remote Port End	<p>Enter a port number in this field to define a port range. This port number must be greater than that specified in the previous field. If Remote Port Start is left at 0, Remote Port End will also remain at 0.</p>
My IP Address	<p>Enter the ZyXEL Device's static WAN IP address (if it has one) or leave the field set to 0.0.0.0.</p> <p>The ZyXEL Device uses its current WAN IP address (static or dynamic) in setting up the VPN tunnel if you leave this field as 0.0.0.0. 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.</p> <p>Otherwise, you can enter one of the dynamic domain names that you have configured (in the DDNS screen) to have the ZyXEL Device use that dynamic domain name's IP address.</p> <p>The VPN tunnel has to be rebuilt if My IP Address changes after setup.</p>
Secure Gateway Address	<p>Type the WAN IP address or the domain name (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 IPSec Keying Mode field must be set to IKE).</p> <p>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.</p> <p>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.</p> <p>Note: You can also enter a remote secure gateway's domain name in the Secure Gateway Address field if the remote secure gateway has a dynamic WAN IP address and is using DDNS. The ZyXEL Device has to rebuild the VPN tunnel each time the remote secure gateway's WAN IP address changes (there may be a delay until the DDNS servers are updated with the remote gateway's new WAN IP address).</p>
SPI	<p>Type a unique SPI (Security Parameter Index) from one to four characters long. Valid Characters are "0, 1, 2, 3, 4, 5, 6, 7, 8, and 9".</p>
Encapsulation Mode	<p>Select Tunnel mode or Transport mode from the drop-down list box.</p>
Enable Replay Detection	<p>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. Select YES from the drop-down menu to enable replay detection, or select NO to disable it.</p>

Table 54 Security > VPN > Rule Setup: Manual (continued)

LABEL	DESCRIPTION
IPSec Protocol	Select the security protocols used for an SA. Both AH and ESP increase processing requirements and communications latency (delay). If you select ESP here, you must select options from the Encryption Algorithm and Authentication Algorithm fields (described below).
Encryption Algorithm	Select which key size and encryption algorithm to use in the IKE SA. Choices are: DES - a 56-bit key with the DES encryption algorithm 3DES - a 168-bit key with the DES encryption algorithm The ZyXEL Device and the remote IPSec router must use the same algorithms and keys. Longer keys require more processing power, resulting in increased latency and decreased throughput.
Encryption Key	This field is applicable when you select ESP in the IPSec Protocol field above. 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 which hash algorithm to use to authenticate packet data in the IPSec SA. Choices are SHA1 and MD5 . SHA1 is generally considered stronger than MD5 , but it is also slower.
Authentication Key	Type a unique authentication key to be used by IPSec if applicable. Enter 16 characters for MD5 authentication or 20 characters for SHA-1 authentication. Any characters may be used, including spaces, but trailing spaces are truncated.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

13.8 VPN SA Monitor

In the web configurator, click **SECURITY > VPN > SA Monitor**. Use this screen to display and manage active VPN connections.

A Security Association (SA) is the group of security settings related to a specific VPN tunnel. This screen displays active VPN connections. Use **Refresh** to display active VPN connections.

Figure 95 Security > VPN > SA Monitor

The following table describes the labels in this screen.

Table 55 SECURITY > VPN > SA Monitor

	DESCRIPTION
#	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 protocols used for an SA. Both AH and ESP increase ZyXEL Device processing requirements and communications latency (delay).
Refresh	Click Refresh to display the current active VPN connection(s).

13.9 VPN Global Setting

Click **SECURITY > VPN > Global Setting** to open the **VPN Global Setting** screen. Use this screen to change settings that apply to all of your VPN tunnels.

Figure 96 Security > VPN > Global Setting



The following table describes the labels in this screen.

Table 56 Security > VPN > Global Setting

	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 IPSec Tunnel	Select this check box to send NetBIOS packets through the VPN connection.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

13.10 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.

13.10.1 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 97 Telecommuters Sharing One VPN Rule Example

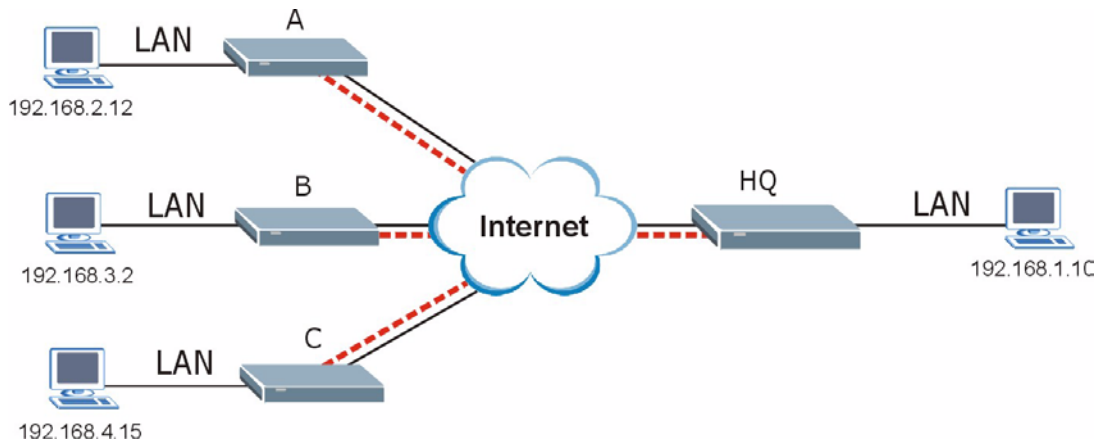


Table 57 Telecommuters Sharing One VPN Rule Example

FIELDS	TELECOMMUTERS	HEADQUARTERS
My ZyXEL Device:	0.0.0.0 (dynamic IP address assigned by the ISP)	Public static IP address
Remote Gateway Address:	Public static IP address	0.0.0.0 With this IP address only the telecommuter can initiate the IPSec tunnel.
Local Network - Single 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 Network - Single IP Address:	192.168.1.10	Not Applicable

13.10.2 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 13.1.2.4 on page 143](#)), 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 98 Telecommuters Using Unique VPN Rules Example

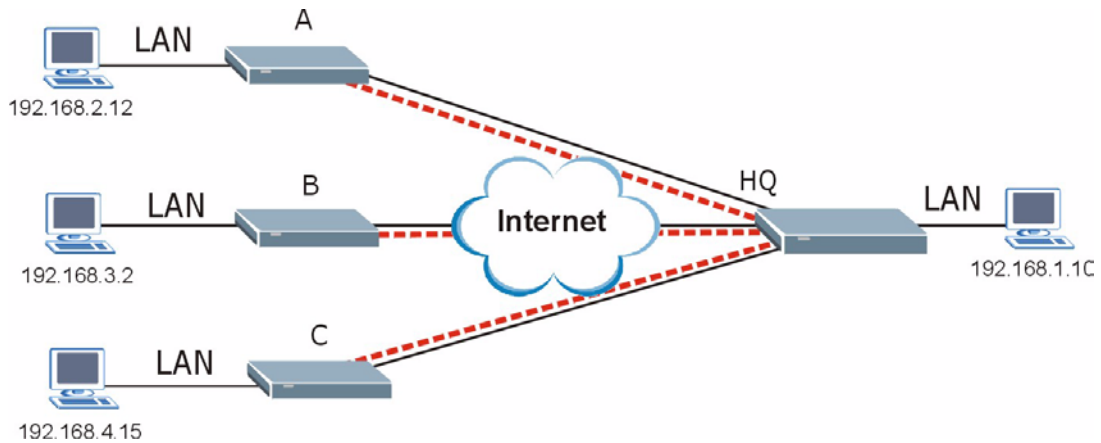


Table 58 Telecommuters Using Unique VPN Rules Example

TELECOMMUTERS	HEADQUARTERS
All Telecommuter Rules:	All Headquarters Rules:
My ZyXEL Device 0.0.0.0	My ZyXEL Device: bigcompanyhq.com
Remote Gateway Address: bigcompanyhq.com	Local Network - Single IP Address: 192.168.1.10
Remote Network - Single 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	Remote Gateway Address: telecommutera.dydns.org
	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	Remote Gateway Address: telecommuterb.dydns.org
	Remote Address 192.168.3.2

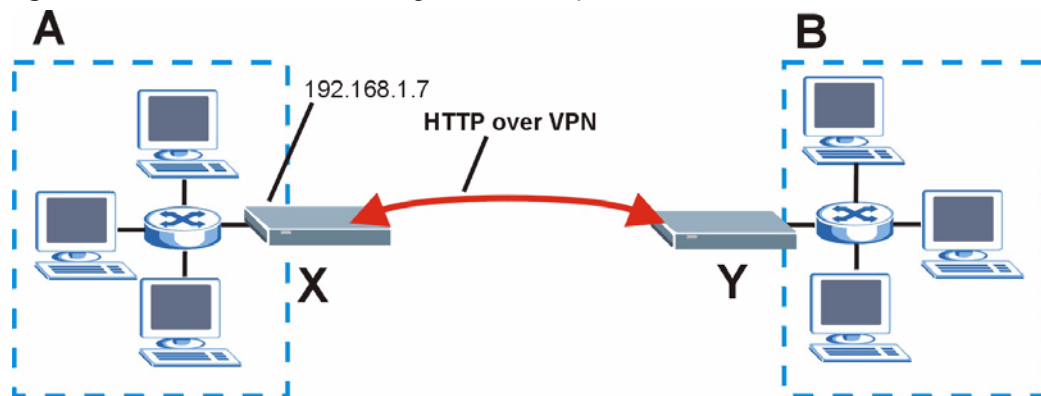
Table 58 Telecommuters Using Unique VPN Rules Example

TELECOMMUTERS	HEADQUARTERS
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	Remote Gateway Address: telecommuterc.dydns.org
	Remote Address 192.168.4.15

13.11 VPN and Remote Management

You can allow someone to use a service (like Telnet or HTTP) through a VPN tunnel to manage the ZyXEL Device. One of the ZyXEL Device's ports must be part of the VPN rule's local network. This can be the ZyXEL Device's LAN port if you do not want to allow remote management on the WAN port. You also have to configure remote management (**REMOTE MGMT**) to allow management access for the service through the specific port.

In the following example, the VPN rule's local network (A) includes the ZyXEL Device's LAN IP address of 192.168.1.7. Someone in the remote network (B) can use a service (like HTTP for example) through the VPN tunnel to access the ZyXEL Device's LAN interface. Remote management must also be configured to allow HTTP access on the ZyXEL Device's LAN interface.

Figure 99 VPN for Remote Management Example

CHAPTER 14

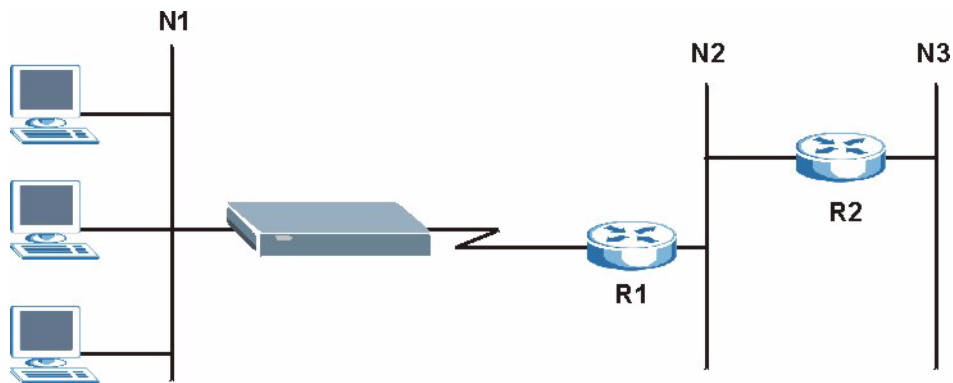
Static Route Screens

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

14.1 Static Route Overview

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 **R1**. 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 **R1** (via gateway router **R2**). The static routes are for you to tell the ZyXEL Device about the networks beyond the remote nodes.

Figure 100 Example of Static Routing Topology



14.2 IP Static Route Screen

Click **Management > Static Route** to open the **IP Static Route** screen. The following screen displays.

Figure 101 IP Static Route

#	Name	Active	Destination	Gateway	Modify
1	-	-	...	...
2	test		1. 2. 3. 4	10. 1. 2. 25	
3	-	-	...	...
4	-	-	...	...
5	-	-	...	...
6	-	-	...	...
7	-	-	...	...
8	-	-	...	...

The following table describes the labels in this screen.

Table 59 IP Static Route

LABEL	DESCRIPTION
#	This is the index number of an individual static route. The first entry is for the default route and not editable.
Name	This is the name that describes or identifies this route.
Active	This icon is turned on when this static route is active. Click the Edit icon under Modify and select the Active checkbox in the Static Route Setup screen to enable the static route. Clear the checkbox to disable this static route without having to delete the entry.
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 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.
Modify	Click the Edit icon to open the static route setup screen. Modify a static route or create a new static route in the Static Route Setup screen. Click the Remove icon to delete a static route.

14.2.1 Static Route Setup Screen

To edit a static route, click the edit icon under **Modify**. The following screen displays. Fill in the required information for each static route.

Figure 102 Static Route Setup

The following table describes the labels in this screen.

Table 60 Static Route Setup

LABEL	DESCRIPTION
Route Name	Enter the name of the IP static route. Leave this field blank to delete this static route.
Active	This field allows you to activate/deactivate this static route.
Private	This parameter determines if the ZyXEL Device will include this route to a remote node in its RIP broadcasts. Select this check box to keep this route private and not included in RIP broadcasts. Clear this checkbox to propagate this route to other hosts through RIP broadcasts.
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 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	Metric represents the "cost" of transmission for routing purposes. IP routing uses hop count as the measurement of cost, with a minimum of 1 for directly connected networks. Enter a number that approximates the cost for this link. The number need not be precise, but it must be between 1 and 15. In practice, 2 or 3 is usually a good number.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Cancel	Click Cancel to return to the previous screen and not save your changes.

CHAPTER 15

Bandwidth Management

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

15.1 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 the WAN interface (LAN to WAN, WLAN to WAN, WLAN to WLAN / ZyXEL Device) must be less than or equal to the **Upstream Bandwidth** that you configure in the **Bandwidth Management Advanced** screen.
- The sum of the bandwidth allotments that apply to the LAN port (WAN to LAN, WLAN to LAN, LAN to LAN / ZyXEL Device) must be less than or equal to 100,000 kbps (you cannot configure the bandwidth budget for the LAN port).
- The sum of the bandwidth allotments that apply to the WLAN port (LAN to WLAN, WAN to WLAN, WLAN to WLAN / ZyXEL Device) must be less than or equal to 54,000 kbps (you cannot configure the bandwidth budget for the WLAN port).

15.2 Application-based Bandwidth Management

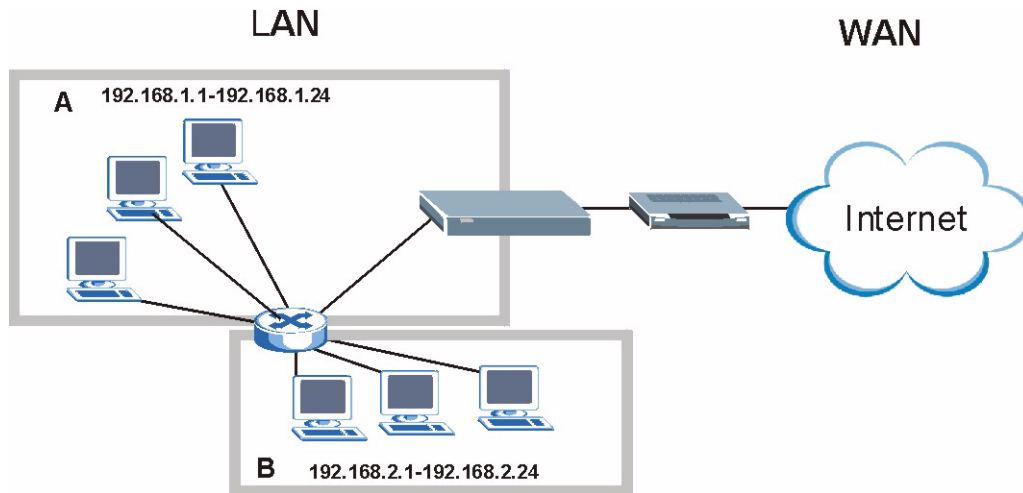
You can create bandwidth classes based on individual applications (like VoIP, Web, FTP, E-mail and Video for example).

15.3 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 103 Subnet-based Bandwidth Management Example



15.4 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 61 Application and Subnet-based Bandwidth Management Example

	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

15.5 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 62 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.

15.6 Predefined Bandwidth Management Services

The following is a description of the services that you can select and to which you can apply media bandwidth management using the wizard screens.

Table 63 Media Bandwidth Management Setup: Services

SERVICE	DESCRIPTION
Xbox Live	This is Microsoft's online gaming service that lets you play multiplayer Xbox games on the Internet via broadband technology. Xbox Live uses port 3074.
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.
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.
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
eMule	These programs use advanced file sharing applications relying on central servers to search for files. They use default port 4662.
BitTorrent	BitTorrent is a free P2P (peer-to-peer) sharing tool allowing you to distribute large software and media files using ports 6881 to 6889. BitTorrent requires you to search for a file with a searching engine yourself. It distributes files by corporation and trading, that is, the client downloads the file in small pieces and share the pieces with other peers to get other half of the file.

Table 63 Media Bandwidth Management Setup: Services (continued)

SERVICE	DESCRIPTION
MSN Webcam	MSN messenger allows you to chat online and send instant messages. If you use MSN messenger and also have a webcam, you can send your image/photo in real-time along with messages
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.

15.6.1 Services and Port Numbers

The commonly used services and port numbers are shown in the following table. Please refer to RFC 1700 for further information about port numbers. Next to the name of the service, two fields appear in brackets. The first field indicates the IP protocol type (TCP, UDP, or ICMP). The second field indicates the IP port number that defines the service. (Note that there may be more than one IP protocol type. For example, look at the **DNS** service. **(UDP/TCP:53)** means UDP port 53 and TCP port 53.

Table 64 Commonly Used Services

SERVICE	DESCRIPTION
AIM/New-ICQ(TCP:5190)	AOL's Internet Messenger service, used as a listening port by ICQ.
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:7648, 24032)	A popular videoconferencing solution from White Pines Software.
DNS(UDP/TCP:53)	Domain Name Server, a service that matches web names (e.g. www.zyxel.com) to IP numbers.
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: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.
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.
ICQ(UDP:4000)	This is a popular Internet chat program.
IKE(UDP:500)	The Internet Key Exchange algorithm is used for key distribution and management.
IPSEC_TUNNEL(AH:0)	The IPSEC AH (Authentication Header) tunneling protocol uses this service.

Table 64 Commonly Used Services

SERVICE	DESCRIPTION
IPSEC_TUNNEL(ESP:0)	The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service.
IRC(TCP/UDP:6667)	This is another popular Internet chat program.
MSN Messenger(TCP:1863)	Microsoft Networks' messenger service uses this protocol.
MULTICAST(IGMP:0)	Internet Group Multicast Protocol is used when sending packets to a specific group of hosts.
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(ICMP:0)	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).
PPTP(TCP:1723)	Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel.
PPTP_TUNNEL(GRE:0)	Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the data channel.
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.
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)	Simple File Transfer Protocol.
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.
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.
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).

Table 64 Commonly Used Services

SERVICE	DESCRIPTION
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.
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:7000)	Another videoconferencing solution.

15.7 Default Bandwidth Management Classes and Priorities

If you enable bandwidth management but do not configure a rule for critical traffic like VoIP, the voice traffic may then get delayed due to insufficient bandwidth. With the automatic traffic classifier feature activated, the ZyXEL Device automatically assigns a default bandwidth management class and priority to traffic that does not match any of the user-defined rules. The traffic is classified based on the traffic type. Real-time traffic always gets higher priority over other traffic.

The following table shows you the priorities between the three default classes (**AutoClass_H**, **AutoClass_M** and **Default Class**) and user-defined rules. 6 is the highest priority.

Table 65 Bandwidth Management Priority with Default Classes

CLASS TYPE	PRIORITY
User-defined with high priority	6
AutoClass_H	5
User-defined with medium priority	4
AutoClass_M	3
User-defined with low priority	2
Default Class	1

15.8 Bandwidth Management General Configuration

Click **Management > Bandwidth MGMT** to open the bandwidth management **General** screen.

Figure 104 Bandwidth Management: General



The following table describes the labels in this screen.

Table 66 Bandwidth Management: General

LABEL	DESCRIPTION
Enable Bandwidth Management	Select this check box to have the ZyXEL Device apply bandwidth management. Enable bandwidth management to give traffic that matches a bandwidth rule priority over traffic that does not match a bandwidth rule. Enabling bandwidth management also allows you to control the maximum or minimum amounts of bandwidth that can be used by traffic that matches a bandwidth rule.
Enable Automatic Traffic Classifier	This field is only applicable when you select the Enable Bandwidth Management check box. Select this check box to have the ZyXEL Device base on the default bandwidth classes to apply bandwidth management. Real-time packets, such as VoIP traffic always get higher priority.
Apply	Click Apply to save your customized settings.
Reset	Click Reset to begin configuring this screen afresh.

15.9 Bandwidth Management Advanced Configuration

Click **Management > Bandwidth MGMT > Advanced** to open the bandwidth management **Advanced** screen.

Figure 105 Bandwidth Management: Advanced

General **Advanced** Monitor

Management Bandwidth

Upstream Bandwidth (kbps)(10 kbps reserved)

Application List

#	Enable	Service	Priority	Advanced Setting
1	<input type="checkbox"/>	XBox Live	High	
2	<input type="checkbox"/>	VoIP (SIP)	High	
3	<input type="checkbox"/>	FTP	High	
4	<input type="checkbox"/>	E-Mail	High	
5	<input type="checkbox"/>	eMule/eDonkey	High	
6	<input type="checkbox"/>	BitTorrent	High	
7	<input type="checkbox"/>	MSN Webcam	High	
8	<input type="checkbox"/>	WWW	High	

User-defined Service

#	Enable	Direction	Service Name	Priority	Modify
1	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
2	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
3	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
4	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
5	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
6	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
7	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
8	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
9	<input type="checkbox"/>	To LAN	<input type="text"/>	High	
10	<input type="checkbox"/>	To LAN	<input type="text"/>	High	

The following table describes the labels in this screen.

Table 67 Bandwidth Management: Advanced

	DESCRIPTION
Upstream Bandwidth (kbps)	Enter the amount of bandwidth in kbps (2 to 100,000) that you want to allocate for traffic. 20 kbps to 20,000 kbps is recommended. The recommendation is to set this speed to be equal to or less than the speed of the broadband device connected to the WAN port. For example, set the speed to 1000 Kbps (or less) if the broadband device connected to the WAN port has an upstream speed of 1000 Kbps.
Application List	Use this table to allocate specific amounts of bandwidth based on the pre-defined service.
#	This is the number of an individual bandwidth management rule.
Enable	Select this check box to have the ZyXEL Device apply this bandwidth management rule.
Service	This is the name of the service.
Priority	Select a priority from the drop down list box. Choose High , Mid or Low .
Advanced Setting	Click the Edit icon to open the Rule Configuration screen where you can modify the rule.
User-defined Service	Use this table to allocate specific amounts of bandwidth to specific applications and/or subnets.
#	This is the number of an individual bandwidth management rule.
Enable	Select this check box to have the ZyXEL Device apply this bandwidth management rule.
Direction	Select To LAN to apply bandwidth management to traffic that the ZyXEL Device forwards to the LAN. Select To WAN to apply bandwidth management to traffic that the ZyXEL Device forwards to the WAN. Select To WLAN to apply bandwidth management to traffic that the ZyXEL Device forwards to the WLAN.
Service Name	Enter a descriptive name of up to 19 alphanumeric characters, including spaces.
Priority	Select a priority from the drop down list box. Choose High , Mid or Low .
Modify	Click the Edit icon to open the Rule Configuration screen. Modify an existing rule or create a new rule in the Rule Configuration screen. See Section 15.9.2 on page 183 for more information. Click the Remove icon to delete a rule.
Apply	Click Apply to save your customized settings.
Reset	Click Reset to begin configuring this screen afresh.

15.9.1 Rule Configuration with the Pre-defined Service

To edit a bandwidth management rule for the pre-defined service in the ZyXEL Device, click the **Edit** icon in the **Application List** table of the **Advanced** screen. The following screen displays.

Figure 106 Bandwidth Management Rule Configuration: Pre-defined Service

#	Enable	Direction	Bandwidth		Destination Port	Source Port	Protocol
1	<input type="checkbox"/>	LAN	Minimum Bandwidth	10 (kbps)	3074	0	TCP
2	<input type="checkbox"/>	LAN	Maximum Bandwidth	10 (kbps)	3074	0	UDP
3	<input type="checkbox"/>	WAN	Minimum Bandwidth	10 (kbps)	3074	0	TCP
4	<input type="checkbox"/>	WAN	Minimum Bandwidth	10 (kbps)	3074	0	UDP
5	<input type="checkbox"/>	WLAN	Minimum Bandwidth	10 (kbps)	3074	0	TCP
6	<input type="checkbox"/>	WLAN	Minimum Bandwidth	10 (kbps)	3074	0	UDP

The following table describes the labels in this screen.

Table 68 Bandwidth Management Rule Configuration: Pre-defined Service

LABEL	DESCRIPTION
#	This is the number of an individual bandwidth management rule.
Enable	Select an interface's check box to enable bandwidth management on that interface.
Direction	These read-only labels represent the physical interfaces. 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.
Bandwidth	Select Maximum Bandwidth or Minimum Bandwidth and specify the maximum or minimum bandwidth allowed for the rule in kilobits per second.
Destination Port	This is the port number of the destination. See Table 64 on page 176 for some common services and port numbers.
Source Port	This is the port number of the source. See Table 64 on page 176 for some common services and port numbers.
Protocol	This is the protocol (TCP or UDP) used for the service.
OK	Click OK to save your customized settings.
Cancel	Click Cancel to exit this screen without saving.

15.9.2 Rule Configuration with the User-defined Service

In addition to the pre-defined services, if you want to edit a bandwidth management rule for other applications and/or subnets, click the **Edit** icon in the **User-defined Service** table of the **Advanced** screen. The following screen displays.

Figure 107 Bandwidth Management Rule Configuration: User-defined Service

The following table describes the labels in this screen.

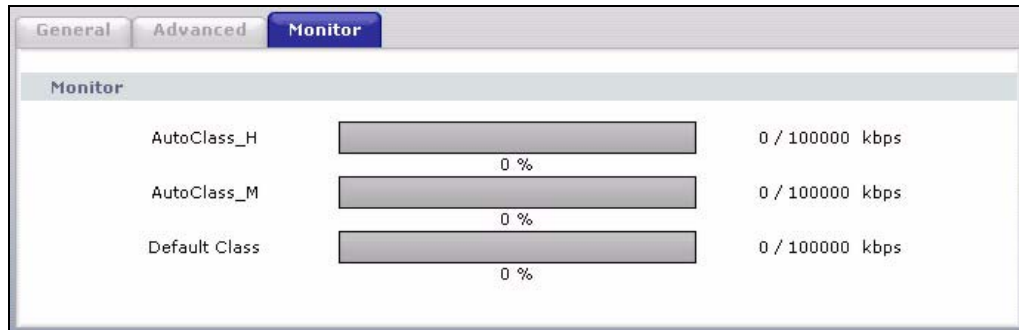
Table 69 Bandwidth Management Rule Configuration: User-defined Service

LABEL	DESCRIPTION
BW Budget	Select Maximum Bandwidth or Minimum Bandwidth and specify the maximum or minimum bandwidth allowed for the rule in kilobits per second.
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 Table 64 on page 176 for some common services and port numbers.
Source Address	Enter the source IP address in dotted decimal notation.
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.
Source Port	Enter the port number of the source. See Table 64 on page 176 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.
OK	Click OK to save your customized settings.
Cancel	Click Cancel to exit this screen without saving.

15.10 Bandwidth Management Monitor

Click **Management > Bandwidth MGMT > Monitor** to open the bandwidth management **Monitor** screen. View the bandwidth usage of the WAN configured bandwidth rules. This is also shown as bandwidth usage over the bandwidth budget for each rule. The gray section of the bar represents the percentage of unused bandwidth and the blue color represents the percentage of bandwidth in use.

Figure 108 Bandwidth Management: Monitor



CHAPTER 16

Remote Management Screens

This chapter provides information on the Remote Management screens.

16.1 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. See the firewall chapters for details on configuring firewall rules.

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** 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 **Server Access** 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

16.1.1 Remote Management Limitations

Remote management over LAN or WAN will not work when:

- 1 You have disabled that service in one of the remote management screens.
- 2 The IP address in the **Secured Client IP Address** field does not match the client IP address. If it does not match, the ZyXEL Device will disconnect the session immediately.

- 3 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.
- 4 There is a firewall rule that blocks it.

16.1.2 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.

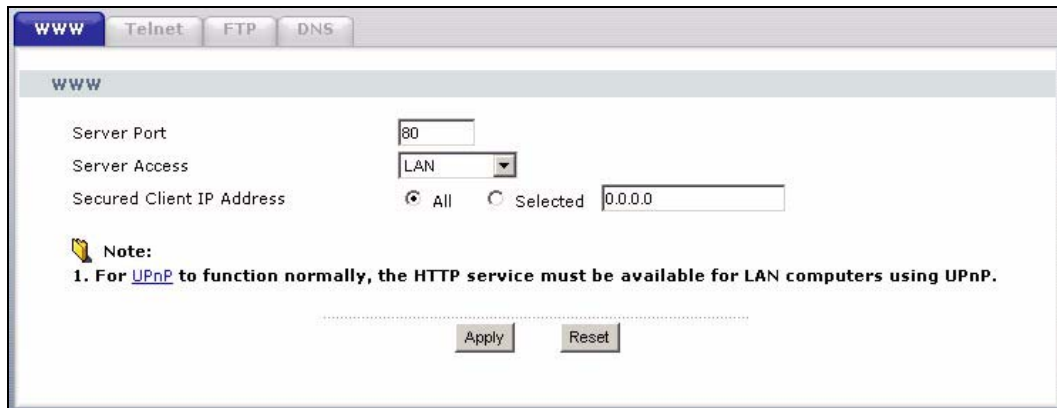
16.1.3 System Timeout

There is a default system management idle timeout of five minutes (three hundred seconds). 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. You can change the timeout period in the **System** screen

16.2 WWW Screen

To change your ZyXEL Device's World Wide Web settings, click **Management > Remote MGMT** to display the **WWW** screen.

Figure 109 WWW Remote Management



The following table describes the labels in this screen.

Table 70 WWW Remote Management

LABEL	DESCRIPTION
Server 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.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.

Table 70 WWW Remote Management

LABEL	DESCRIPTION
Secured Client IP Address	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.
Reset	Click Reset to begin configuring this screen afresh.

16.3 Telnet

You can use Telnet to access the ZyXEL Device. Specify which interfaces allow Telnet access and from which IP address the access can come.

16.4 Telnet Screen

To change your ZyXEL Device’s Telnet settings, click **Management > Remote MGMT > Telnet**. The following screen displays. Use this screen to specify which interfaces allow Telnet access and from which IP address the access can come.

Figure 110 Telnet Remote Management

The following table describes the labels in this screen.

Table 71 Telnet Remote Management

LABEL	DESCRIPTION
Server 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.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.

Table 71 Telnet Remote Management

LABEL	DESCRIPTION
Secured Client IP Address	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.
Reset	Click Reset to begin configuring this screen afresh.

16.5 FTP Screen

You can use FTP (File Transfer Protocol) to upload and download the ZyXEL Device’s firmware and configuration files, please see the User’s Guide chapter on firmware and configuration file maintenance for details. To use this feature, your computer must have an FTP client.

To change your ZyXEL Device’s FTP settings, click **Management > Remote MGMT > FTP**. The screen appears as shown. Use this screen to specify which interfaces allow FTP access and from which IP address the access can come.

Figure 111 FTP Remote Management

The following table describes the labels in this screen.

Table 72 FTP Remote Management

LABEL	DESCRIPTION
Server 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.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.
Secured Client IP Address	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.

Table 72 FTP Remote Management

LABEL	DESCRIPTION
Apply	Click Apply to save your customized settings and exit this screen.
Reset	Click Reset to begin configuring this screen afresh.

16.6 DNS Screen

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

To change your ZyXEL Device's DNS settings, click **Management > Remote MGMT > DNS**. The screen appears as shown.

Figure 112 DNS Remote Management

The screenshot shows the DNS configuration interface. At the top, there are navigation tabs: WWW, Telnet, FTP, and DNS. Below the tabs, the title 'DNS' is displayed. The configuration area includes three main sections: 'Service Port' with a text input field containing '53'; 'Service Access' with a dropdown menu showing 'LAN'; and 'Secured Client IP Address' with two radio buttons, 'All' (which is selected) and 'Selected', followed by a text input field containing '0.0.0.0'. At the bottom of the configuration area, there are two buttons: 'Apply' and 'Reset'.

The following table describes the labels in this screen.

Table 73 DNS Remote Management

LABEL	DESCRIPTION
Server Port	The DNS service port number is 53 and cannot be changed here.
Server Access	Select the interface(s) through which a computer may send DNS queries to the ZyXEL Device.
Secured Client IP Address	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.
Reset	Click Reset to begin configuring this screen afresh.

CHAPTER 17

UPnP

This chapter introduces the Universal Plug and Play feature.

17.1 Universal Plug and Play Overview

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.

17.1.1 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.

17.1.2 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:

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

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

See the chapter on SUA/NAT for further information about NAT.

17.1.3 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.

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

17.2 UPnP and ZyXEL

ZyXEL has achieved UPnP certification from the Universal Plug and Play Forum Creates UPnP™ Implementers Corp. (UIC). ZyXEL's UPnP implementation supports IGD 1.0 (Internet Gateway Device). At the time of writing ZyXEL's UPnP implementation supports Windows Messenger 4.6 and 4.7 while Windows Messenger 5.0 and Xbox are still being tested.

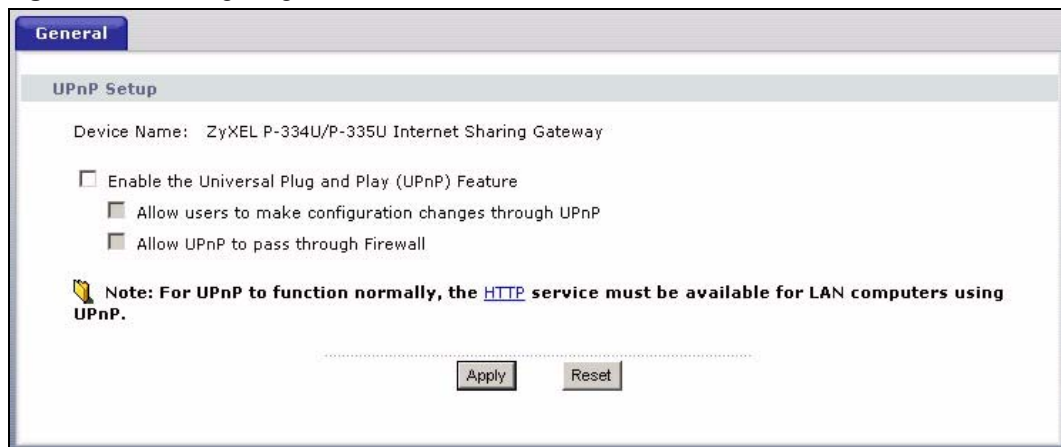
UPnP broadcasts are only allowed on the LAN.

Please see later in this User's Guide for examples of installing UPnP in Windows XP and Windows Me as well as an example of using UPnP in Windows.

17.3 UPnP Screen

Click the **UPnP** link under **Management** to display the UPnP screen.

Figure 113 Configuring UPnP



The following table describes the labels in this screen.

Table 74 Configuring UPnP

LABEL	DESCRIPTION
Enable the Universal Plug and Play (UPnP) feature	Select this checkbox 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	UPnP broadcasts are only allowed on the LAN. If you block LAN-to-LAN/ZyXEL Device traffic using the firewall, then you need to select this check box to allow UPnP-enabled traffic to pass through the firewall. This setting remains active until you disable UPnP. Clear this check box if you do not want to create a hole in the firewall for UPnP application packets (for example, MSN packets).
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

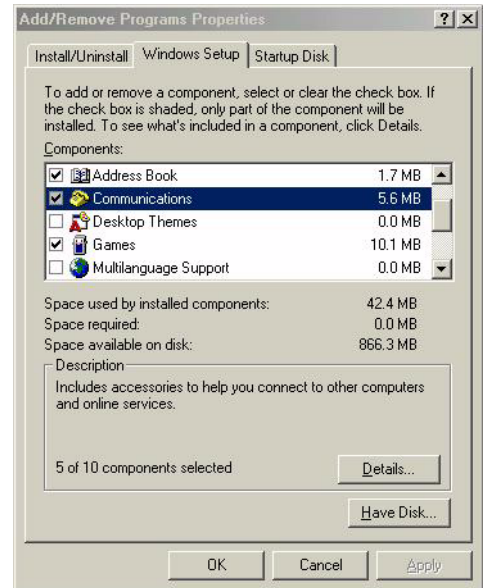
17.4 Installing UPnP in Windows Example

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

17.4.1 Installing UPnP in Windows Me

Follow the steps below to install 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**.



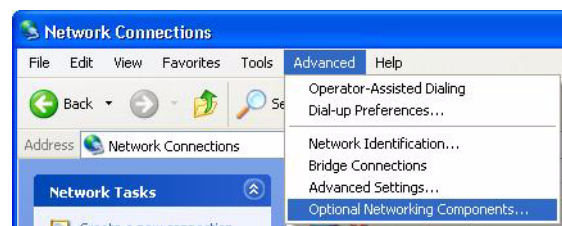
- 3 In the **Communications** window, select the **Universal Plug and Play** check box in the **Components** selection box.
- 4 Click **OK** to go back to the **Add/Remove Programs Properties** window and click **Next**.
- 5 Restart the computer when prompted.



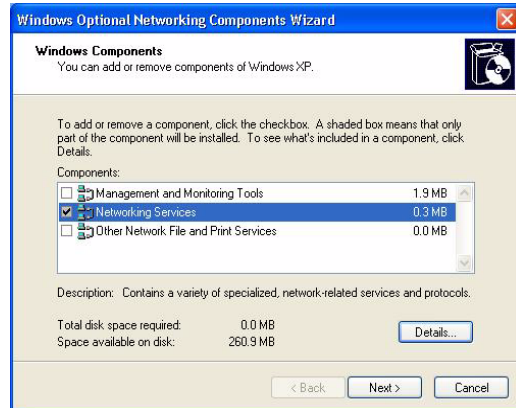
17.4.2 Installing UPnP in Windows XP

Follow the steps below to install UPnP in Windows XP.

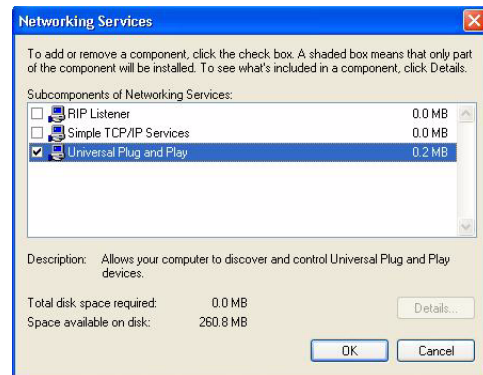
- 1 Click **Start** and **Control Panel**.
- 2 Double-click **Network Connections**.
- 3 In the **Network Connections** window, click **Advanced** in the main menu and select **Optional Networking Components ...**. The **Windows Optional Networking Components Wizard** window displays.



- 4 Select **Networking Service** in the **Components** selection box and click **Details**.



- 5 In the **Networking Services** window, select the **Universal Plug and Play** check box.
- 6 Click **OK** to go back to the **Windows Optional Networking Component Wizard** window and click **Next**.



17.5 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.

17.5.1 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**.



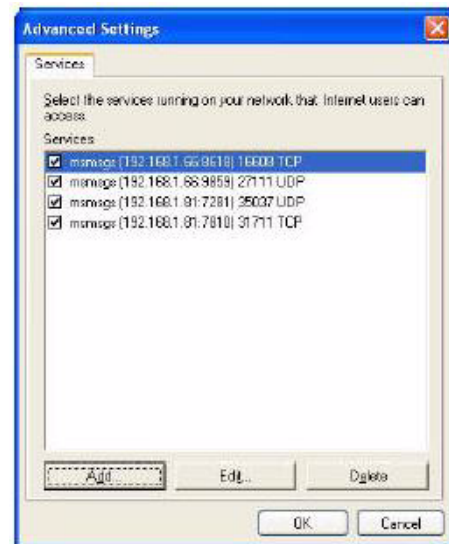
- 3 In the **Internet Connection Properties** window, click **Settings** to see the port mappings that were automatically created.
- 4 You may edit or delete the port mappings or click **Add** to manually add port mappings.

Note: When the UPnP-enabled device is disconnected from your computer, all port mappings will be deleted automatically.

- 5 Select the **Show icon in notification area when connected** check box and click **OK**. An icon displays in the system tray



- 6 Double-click the icon to display your current Internet connection status.



17.5.2 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 is 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**.



- 4 An icon with the description for each UPnP-enabled device displays under **Local Network**.
- 5 Right-click the icon for your ZyXEL device and select **Invoke**. The web configurator login screen displays.
- 6 Right-click the icon for your ZyXEL device and select **Properties**. A properties window displays with basic information about the ZyXEL device.



17.5.3 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 is 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**.



- 4 An icon with the description for each UPnP-enabled device displays under **Local Network**.
- 5 Right-click the icon for your ZyXEL device and select **Invoke**. The web configurator login screen displays.



- 6 Right-click the icon for your ZyXEL device and select **Properties**. A properties window displays with basic information about the ZyXEL device.



CHAPTER 18

Print Server

This chapter discusses how to configure the print server on the ZyXEL Device.

18.1 Print Server Overview

A print server is a device or software that provides users on a network with shared access to one or more printers. The print server acts as a buffer, holding the information to be printed out in memory until the printer becomes free. Print servers can be programmed to print jobs in the order that they arrive or to give priority to particular users who, in effect, can jump the print queue. The advantages of a print server include efficient use of expensive resources, for example, laser printers. This avoids having to retry to print if the printer is initially busy.

18.2 ZyXEL Device Print Server

The ZyXEL Device has a built-in print server that allows the LAN to share a printer. There is no need to assign a dedicated computer as a print server or have a standalone print server device.

Print requests are sent by each computer to the ZyXEL Device. These request are placed in a queue and are then printed when the printer becomes available.

The print server driver must be set up on each computer in your network that you want to use the print server. Before you set up the print server driver, make sure the USB printer and your computer are connected to the ZyXEL Device and that both the ZyXEL Device, your computer and the USB printer are turned on.

Use [Chapter 19 on page 201](#) to set up your computer to use the ZyXEL Device print server driver.

18.3 Print Server Screen

Click the **Print Server** link under **Management** to display the **Print Server** screen.

Figure 114 Configuring Print Server

The screenshot shows a web-based configuration interface for a print server. At the top, there is a blue header with the text 'Print Server'. Below this is a light gray sub-header also labeled 'Print Server'. The main content area contains three rows of configuration data. The first row shows 'Print Device Name' followed by a text input field containing 'PrintServer'. The second row shows 'Print Model Name' followed by the text ':EPSON Stylus C43'. The third row shows 'Print Port Status' followed by the text ': Ready'. At the bottom of the configuration area, there are two buttons: 'Apply' and 'Reset', separated by a dotted line.

The following table describes the labels in this screen.

Table 75 Configuring Print Server

LABEL	DESCRIPTION
Print Device Name	Type a Print Device Name (of up to 31 printable characters) for recognition of the associated printer on the print server network. This name is displayed on a computer on the print server network when a print job is executed.
Print Model Name	This displays the model name of the printer currently connected to the ZyXEL Device print server.
Print Port Status	This field displays the print server status on the ZyXEL Device. Ready: The print server has established a TCP/IP connection with a printer, is online and ready to print. Printing: A computer on the print server network is executed a print job. PaperOut: The printer loading tray has no paper to perform the printing job Offline: The computers in the print server network cannot use the print server. Make sure a USB v1.1 compliant printer is connected to the ZyXEL Device's USB port and powered on.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to configure the Print Device Name afresh.

CHAPTER 19

Print Server Driver Setup

This chapter shows you how to set up a print server driver for a Windows or Macintosh computer.

19.1 Installation Requirements

To install the print server driver you will need the following requirements

- Microsoft Windows 95, Windows 98 SE (Second Edition), Windows Me, Windows NT 4.0, Windows 2000, Windows XP or Macintosh OS X
- A computer with an Ethernet port
- An Ethernet cable and a USB cable

19.2 Windows 95/98 SE/Me/2000/XP/NT 4.0

We use the Windows 2000 screens here as an example. Screens and steps vary slightly for different Windows operating systems.

Note: You must have a printer with a driver and you need to know the IP address of the ZyXEL Device.

- 1 Insert the CD (supplied with the ZyXEL Device) into the CD-ROM driver on your computer. The CD Autorun screen is displayed.
- 2 Select **Network Print Server Setup**.

Figure 115 CD Autorun Screen



3 You can either

- use the **Setup Wizard for Windows NT/2000/XP** to install the print monitor and open the setup wizard automatically
- or
- use the **Setup Wizard for Windows 98/ME/NT/2000/XP** to install the print monitor in a specified file location and open the setup wizard (by running the PSWizard.exe file in the folder you selected) manually.

Figure 116 CD Autorun Screen: Printer Server Driver Setup



19.2.1 Print Server Driver Setup Wizard

After you install the print monitor and open the setup wizard, follow the steps below to install the print server driver on your computer.

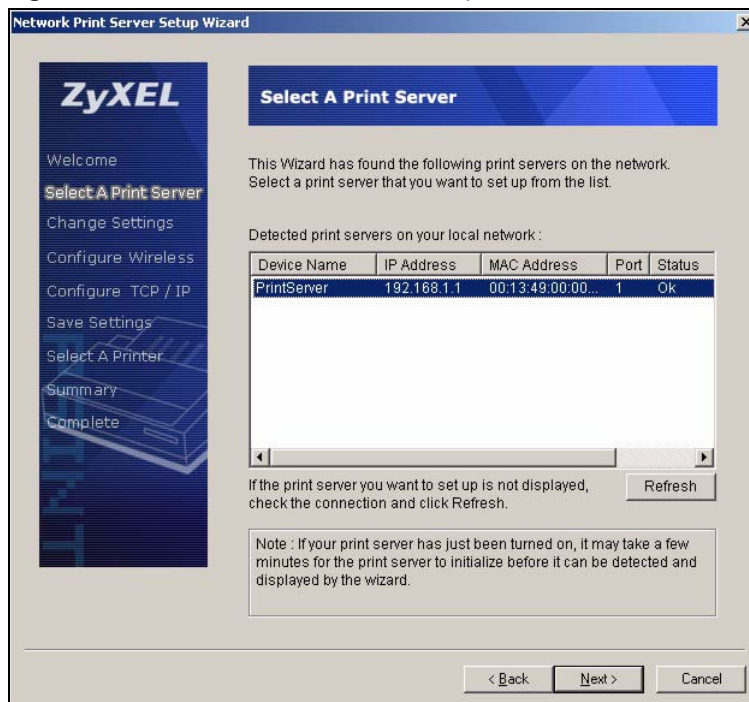
- 1 The **Welcome** screen displays. Click **Next** to continue.

Figure 117 Network Print Server Setup Wizard: Welcome



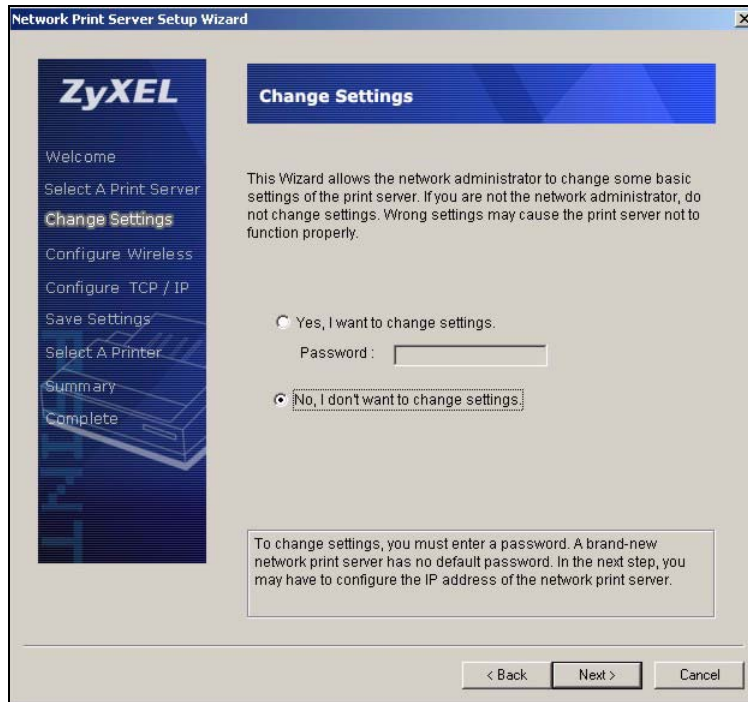
- 2 The **Select A Print Server** screen displays. The wizard automatically detects whether or not a print server is connected to your computer. Make sure that your ZyXEL Device is correctly connected and a compatible USB printer is connected to the ZyXEL Device. Highlight the print server and click **Next** to continue.

Figure 118 Network Print Server Setup Wizard: Select A Print Server



- The **Change Settings** screen displays. If you want to change your print server's IP address, select **Yes, I want to change settings**, leave the **Password** field blank and click **Next**. The print server's IP address is the ZyXEL Device's IP address. Since the wizard detects your print server's IP address automatically, it's recommended that you select **No, I don't want to change settings** and click **Next** to use the current print server settings and continue with the wizard.

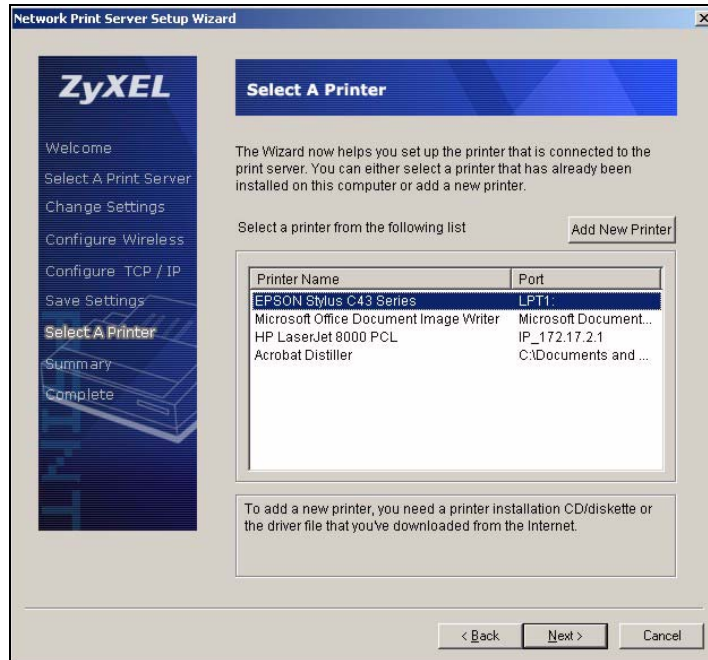
Figure 119 Network Print Server Setup Wizard: Change Settings



- 4 Select the USB printer that is connected to the ZyXEL Device if you have added it on your computer already and click **Next**.

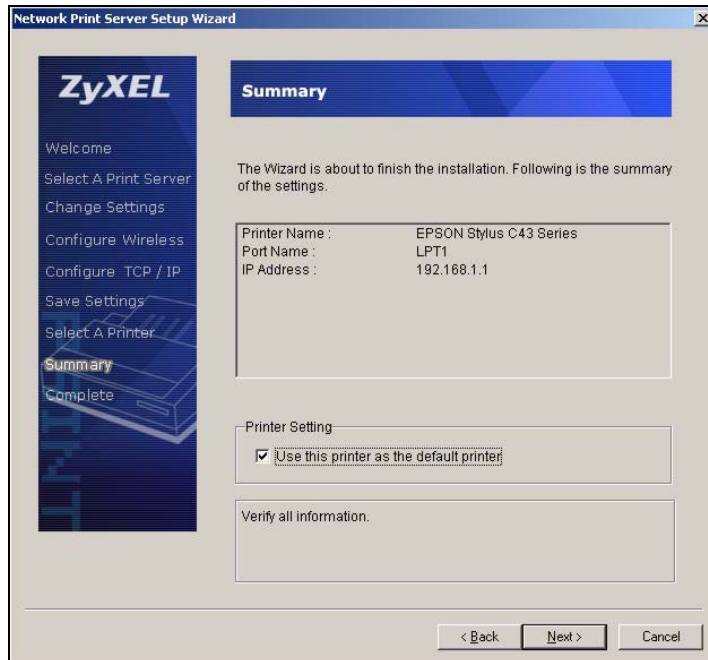
If your printer is not listed, click **Add New Printer** and see [Section 19.2.2 on page 207](#) for how to add a printer on your computer. After you have added a printer, the **Select A Printer** screen displays again. Select the printer you have added and click **Next** to continue.

Figure 120 Network Print Server Setup Wizard: Select A Printer



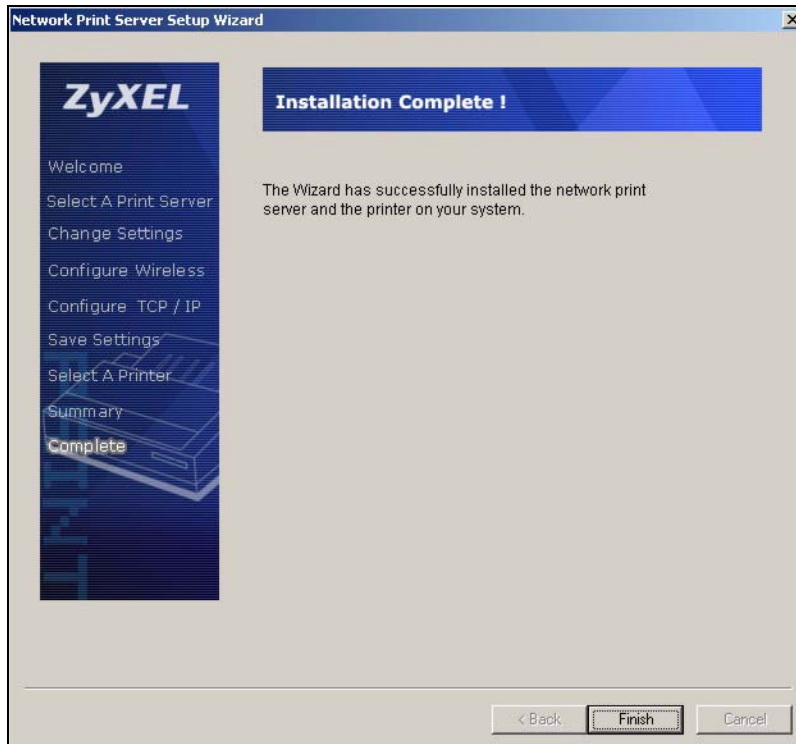
- 5 A **Summary** screen displays. Check your settings and click **Next** to continue.

Figure 121 Network Print Server Setup Wizard: Summary



- 6 Click **Finish** to save and close your **Network Print Server Setup Wizard**. Your print server driver setup is complete.

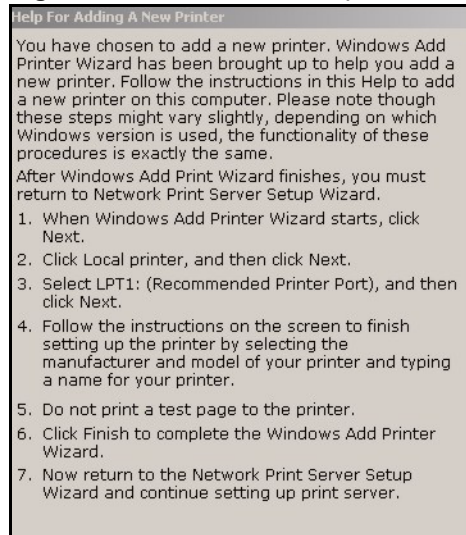
Figure 122 Network Print Server Setup Wizard: Installation Complete



19.2.2 Adding a New Printer

- 1 Click **Add New Printer** in the **Network Print Server Setup Wizard: Select A Printer** screen (see [Figure 120 on page 205](#)). A help dialog box pops up to guide you through the adding printer process.

Figure 123 Add Printer Help



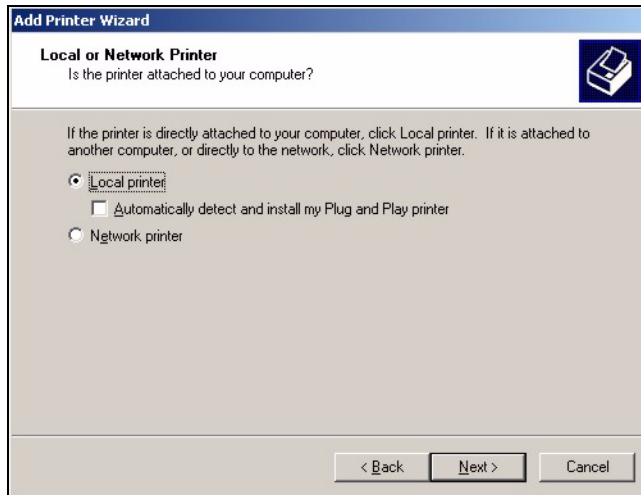
- 2 The **Add Printer Wizard** screen then also displays. Click **Next**.

Figure 124 Add Printer Wizard: Welcome



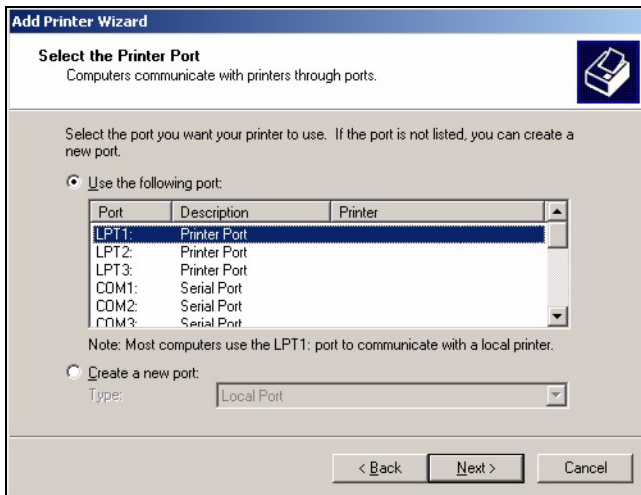
3 Select **Local printer** and click **Next**.

Figure 125 Add Printer Wizard: Local or Network Printer



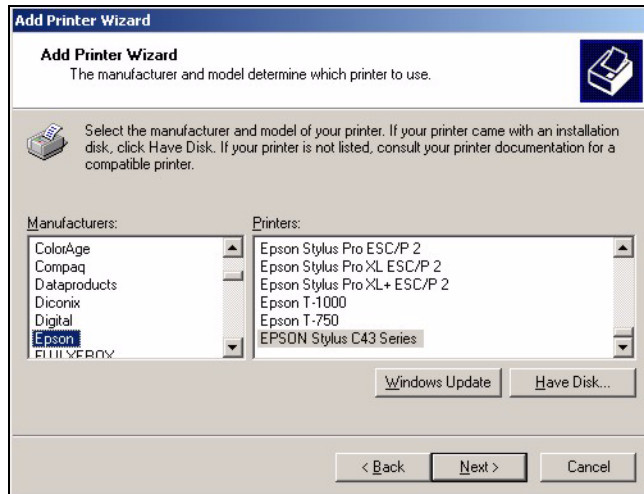
4 Select an **LPT** (Line Printing Terminal) port (a parallel port) as the computer interface for the USB printer.

Figure 126 Add Printer Wizard: Select the Printer Port



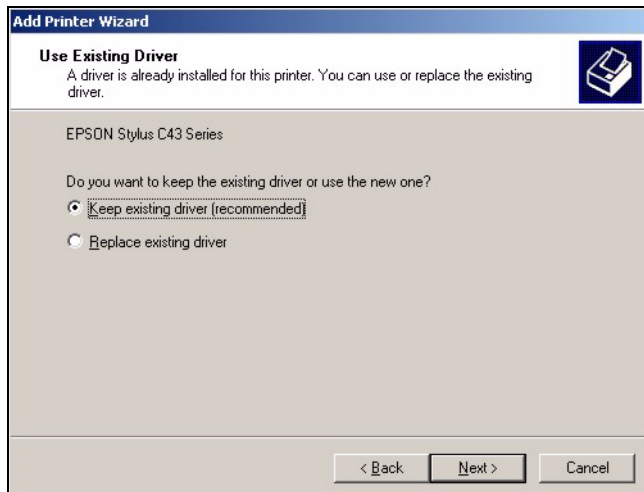
- 5 Select the make of the printer that you want to connect to the print server in the **Manufacturers** list of printers.
- 6 Select the printer model from the list of **Printers**.
- 7 If your printer is not displayed in the list of **Printers**, you can insert the printer driver installation CD/disk or download the driver file to your computer, click **Have Disk...** and install the new printer driver.
- 8 Click **Next** to continue.

Figure 127 Add Printer Wizard: Printer Driver



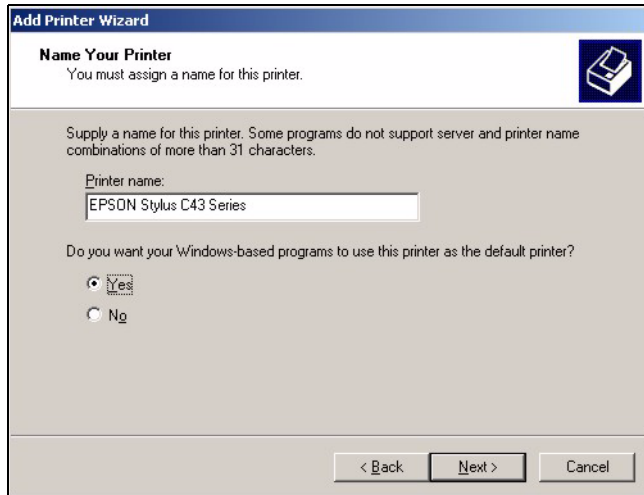
- 9 If the following screen displays, select **Keep existing driver** radio button and click **Next** if you already have a printer driver installed on your computer and you do not want to change it. Otherwise, select **Replace existing driver** to replace it with the new driver you selected in the previous screen and click **Next**.

Figure 128 Add Printer Wizard: Use Existing Driver



10 Type a name to identify the printer and then click **Next** to continue.

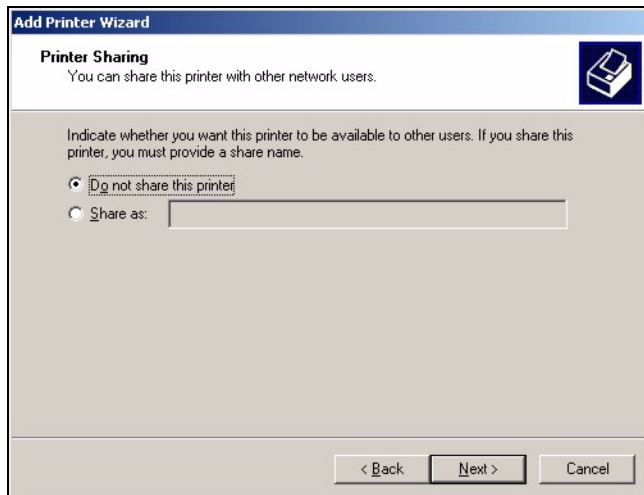
Figure 129 Add Printer Wizard: Name Your Printer



The screenshot shows the 'Name Your Printer' step of the 'Add Printer Wizard'. The window title is 'Add Printer Wizard'. The main heading is 'Name Your Printer' with a sub-heading 'You must assign a name for this printer.' and a printer icon. Below this, it says 'Supply a name for this printer. Some programs do not support server and printer name combinations of more than 31 characters.' There is a text box labeled 'Printer name:' containing 'EPSON Stylus C43 Series'. Below the text box is the question 'Do you want your Windows-based programs to use this printer as the default printer?' with two radio buttons: 'Yes' (selected) and 'No'. At the bottom are three buttons: '< Back', 'Next >', and 'Cancel'.

11 The ZyXEL Device is a print server itself and you do not need to have your computer act as a print server by sharing the printer with other users in the same network; just select **Do not share this printer** and click **Next** to proceed to the following screen.

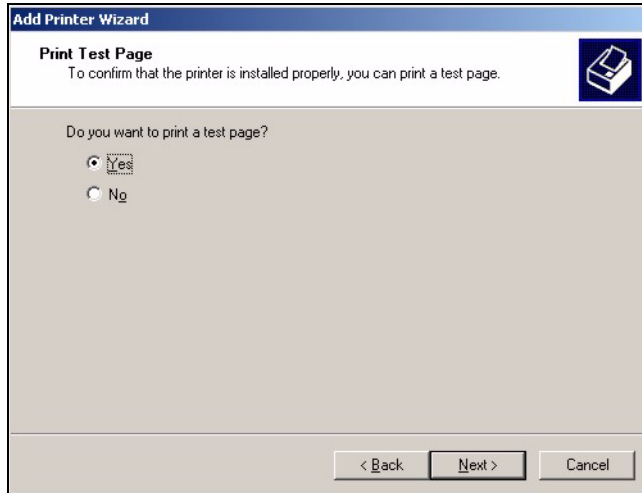
Figure 130 Add Printer Wizard: Printer Sharing



The screenshot shows the 'Printer Sharing' step of the 'Add Printer Wizard'. The window title is 'Add Printer Wizard'. The main heading is 'Printer Sharing' with a sub-heading 'You can share this printer with other network users.' and a printer icon. Below this, it says 'Indicate whether you want this printer to be available to other users. If you share this printer, you must provide a share name.' There are two radio buttons: 'Do not share this printer' (selected) and 'Share as:' followed by an empty text box. At the bottom are three buttons: '< Back', 'Next >', and 'Cancel'.

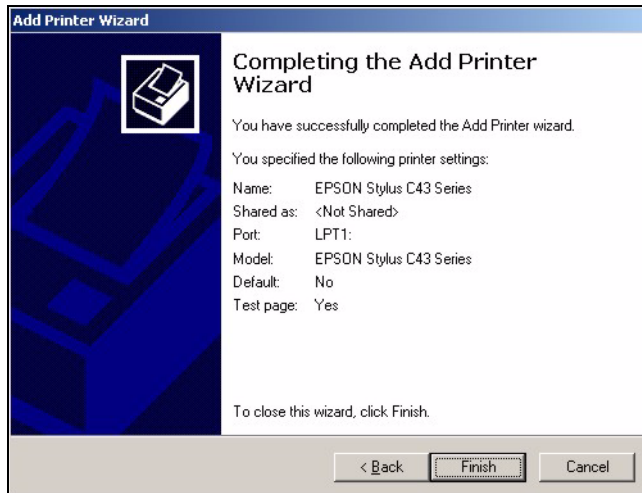
- 12** Select **Yes** and then click the **Next** button if you want to print a test page. A pop-up screen displays to ask if the test page printed correctly. Otherwise select **No** and then click **Next** to continue.

Figure 131 Add Printer Wizard: Print Test Page




- 13** The following screen shows your current printer settings. Select **Finish** to complete adding a new printer.

Figure 132 Add Printer Wizard Complete



19.3 Macintosh OS X

Use the following steps to set up a print server driver on your Macintosh computer.

- 1 Click the **Print Center** icon  located in the Macintosh Dock (a place holding a series of icons/shortcuts at the bottom of the desktop). Proceed to step 6 to continue. If the **Print Center** icon is not in the Macintosh Dock, proceed to the next step.

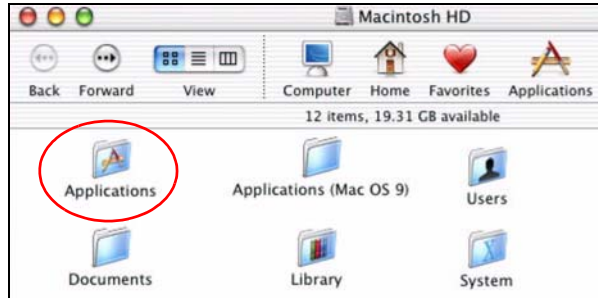
- 2 On your desktop, double-click the **Macintosh HD** icon to open the **Macintosh HD** window.

Figure 133 Macintosh HD



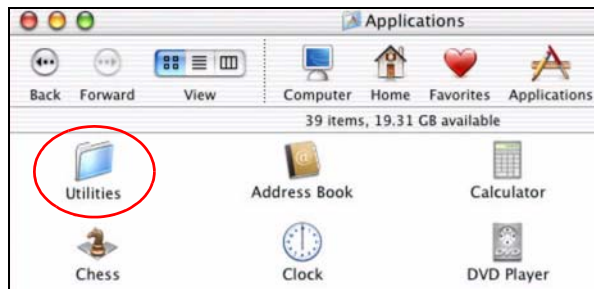
- 3 Double-click the **Applications** folder.

Figure 134 Macintosh HD folder



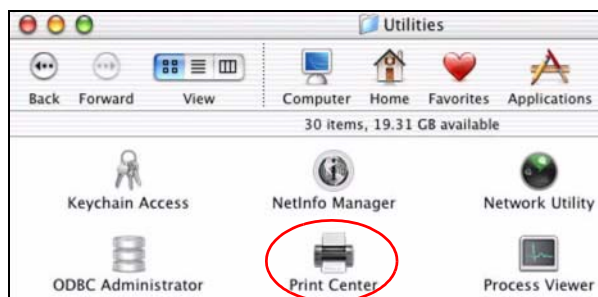
- 4 Double-click the **Utilities** folder.

Figure 135 Applications Folder



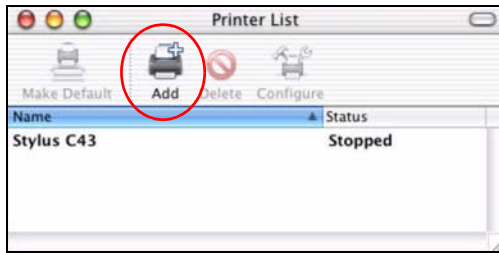
- 5 Double-click the **Print Center** icon.

Figure 136 Utilities Folder



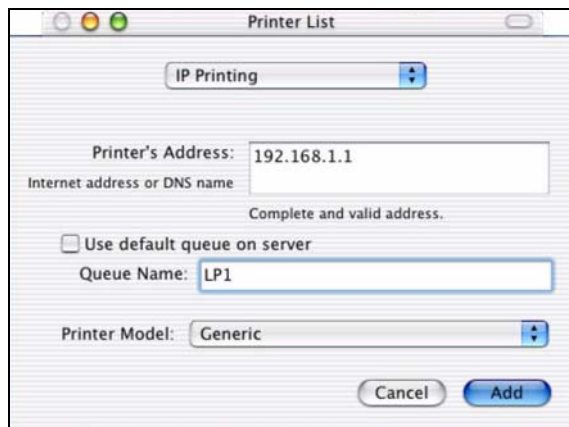
- 6 Click the **Add** icon at the top of the screen.

Figure 137 Printer List Folder



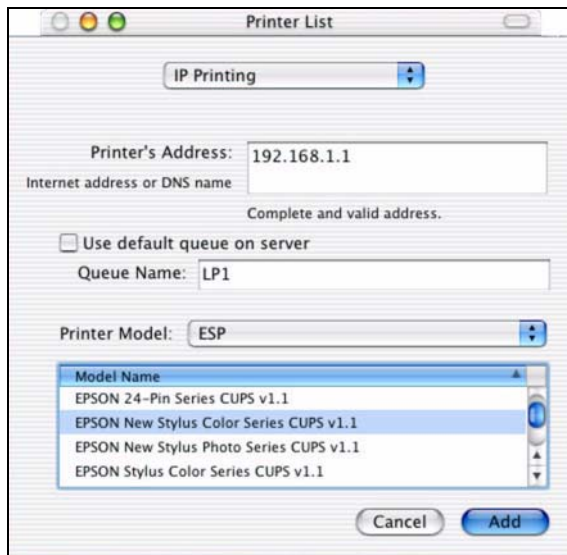
- 7 Set up your printer in the **Printer List** configuration screen. Select **IP Printing** from the drop-down list box.
- 8 In the **Printer's Address** field, type the IP address of your ZyXEL Device.
- 9 Deselect the **Use default queue on server** check box.
- 10 Type **LP1** (a parallel port) in the **Queue Name** field.
- 11 Select your **Printer Model** from the drop-down list box. If the printer's model is not listed, select **Generic**.

Figure 138 Printer Configuration



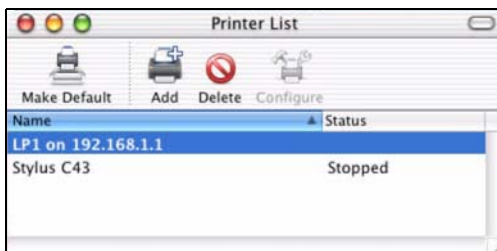
12 Click **Add** to select a printer model, save and close the **Printer List** configuration screen.

Figure 139 Printer Model



13 The **Name LP1 on 192.168.1.1** displays in the **Printer List** field. The default printer Name displays in bold type.

Figure 140 Print Server



14 Your Macintosh print server driver setup is complete. You can now use the ZyXEL Device's print server to print from a Macintosh computer. Refer to the [Chapter 18 on page 199](#) for information on your ZyXEL Device print server configuration screen.

CHAPTER 20

System

This chapter provides information on the System screens.

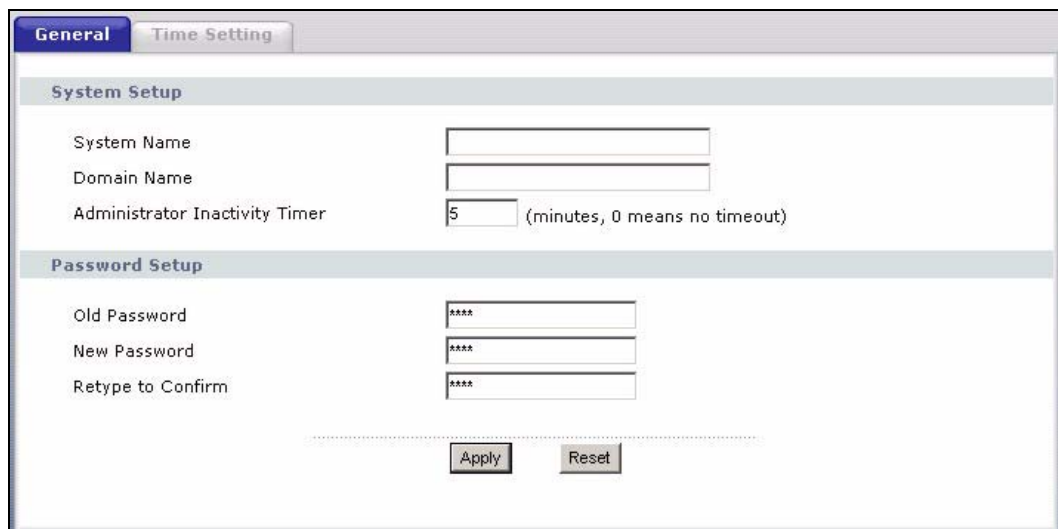
20.1 System Overview

See the chapter about wizard setup for more information on the next few screens.

20.2 System General Screen

Click **Maintenance > System**. The following screen displays.

Figure 141 System General



The screenshot shows a web-based configuration interface for the System General screen. It features two tabs: "General" (selected) and "Time Setting". The main content area is divided into two sections: "System Setup" and "Password Setup".

System Setup

System Name	<input type="text"/>
Domain Name	<input type="text"/>
Administrator Inactivity Timer	<input type="text" value="5"/> (minutes, 0 means no timeout)

Password Setup

Old Password	<input type="password" value="****"/>
New Password	<input type="password" value="****"/>
Retype to Confirm	<input type="password" value="****"/>

At the bottom of the form, there are two buttons: "Apply" and "Reset".

The following table describes the labels in this screen.

Table 76 System General

LABEL	DESCRIPTION
System Name	System Name is a unique name to identify the ZyXEL Device in an Ethernet network. It is recommended you enter your computer's "Computer name" in this field (see the chapter about wizard setup for how to find your computer's name). 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 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 Setup	Change your ZyXEL Device's password (recommended) using the fields as shown.
Old Password	Type the default password or the existing password you use to access the system in this field.
New Password	Type your new system password (up to 30 characters). Note that as you type a password, the screen displays an asterisk (*) for each character you type.
Retype to Confirm	Type the new password again in this field.
Apply	Click Apply to save your changes back to the ZyXEL Device.
Reset	Click Reset to begin configuring this screen afresh.

20.3 Time Setting Screen

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 142 Time Setting

The following table describes the labels in this screen.

Table 77 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 .

Table 77 Time Setting

LABEL	DESCRIPTION
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.
Auto	Select Auto to have the ZyXEL Device automatically search for an available time server and synchronize the date and time with the time server after you click Apply .
User Defined Time Server Address	Select User Defined Time Server Address and 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).
Daylight Savings	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.
Start Date	Configure the day and time when Daylight Saving Time starts if you selected Daylight Savings . 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 Daylight Savings . 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.
Reset	Click Reset to begin configuring this screen afresh.

CHAPTER 21

Logs

This chapter contains information about configuring general log settings and viewing the ZyXEL Device's logs. Refer to the appendices for example log message explanations.

21.1 View Log

The web configurator allows you to look at all of the ZyXEL Device's logs in one location.

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 21.2 on page 220](#)). Options include logs about system maintenance, system errors, access control, allowed or blocked web sites, blocked web features (such as ActiveX controls, Java and cookies), attacks (such as DoS) and IPSec.

Log entries in red indicate system error logs. 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 143 View Log

#	Time	Message	Source	Destination	Note
1	04/06/2006 14:28:47	Successful WEB login	192.168.1.33		User:admin
2	04/06/2006 14:18:15	Time synchronization successful			
3	04/06/2006 14:18:15	Time initialized by NTP server: ntp3.cs.wisc.edu	128.105.37.11:123	172.23.23.114:123	
4	04/06/2006 14:17:13	Time synchronization successful			
5	04/06/2006 14:17:13	Time initialized by NTP server: ntp3.cs.wisc.edu	128.105.37.11:123	172.23.23.114:123	
6	04/06/2006 06:11:52	Time synchronization successful			
7	04/06/2006 06:11:52	Time initialized by NTP server: time1.stupi.se	192.36.143.150:123	172.23.23.114:123	
8	01/01/2000 04:50:52	WAN interface gets IP:172.23.23.114			WAN1
9	01/01/2000 04:23:06	Successful WEB login	192.168.1.33		User:admin
10	01/01/2000 03:43:10	Waiting content filter server (66.35.255.70) timeout!	192.168.1.33:3241	202.43.201.234:80	tw.f172.mail.yahoo.com
11	01/01/2000 03:42:02	Waiting content filter server (66.35.255.70) timeout!	192.168.1.33:3188	203.84.196.97:80	tw.yimg.com

The following table describes the labels in this screen.

Table 78 View Logs

LABEL	DESCRIPTION
Display	The categories that you select in the Log Settings page (see Section 21.2 on page 220) 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.
Time	This field displays the time the log was recorded. See the chapter on system maintenance and information to configure the ZyXEL Device's time and date.
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.
Note	This field displays additional information about the log entry.
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 Address Info fields in Log Settings).
Refresh	Click Refresh to renew the log screen.
Clear Log	Click Clear Log to delete all the logs.

21.2 Log Settings

You can configure the ZyXEL Device's general log settings in one location.

Click **Maintenance > Logs > Log Settings** to open the **Log Settings** screen.

Use the **Log Settings** screen to configure to 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 to send.

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 or web sites with restricted web features such as cookies, active X and so on. 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.

Alerts are e-mailed as soon as they happen. Logs may be e-mailed as soon as the log is full (see **Log Schedule**). Selecting many alert and/or log categories (especially **Access Control**) may result in many e-mails being sent

Figure 144 Log Settings

The following table describes the labels in this screen.

Table 79 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.

Table 79 Log Settings

LABEL	DESCRIPTION
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.
SMTP Authentication	SMTP (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. Select the check box to activate SMTP authentication. If mail server authentication is needed but this feature is disabled, you will not receive the e-mail logs.
User Name	Enter the user name (up to 31 characters) (usually the user name of a mail account).
Password	Enter the password associated with the user name above.
Log Schedule	This drop-down menu is used to configure the frequency of log messages being sent as E-mail: <ul style="list-style-type: none"> • 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 checkbox 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.
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 changes.
Reset	Click Reset to begin configuring this screen afresh.

CHAPTER 22

Tools

This chapter shows you how to upload a new firmware, upload or save backup configuration files and restart the ZyXEL Device.

22.1 Firmware Upload Screen

Find firmware at www.zyxel.com in a file that (usually) uses the system model name with a "*.bin" extension, e.g., "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. See the Firmware and Configuration File Maintenance chapter for upgrading firmware using FTP/TFTP commands.

Click **Maintenance > Tools**. Follow the instructions in this screen to upload firmware to your ZyXEL Device.

Figure 145 Maintenance Firmware Upload

The following table describes the labels in this screen.

Table 80 Maintenance Firmware Upload

LABEL	DESCRIPTION
File Path	Type in the location of the file you want to upload in this field or click Browse... to find it.
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!

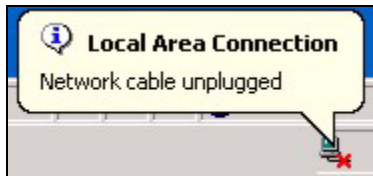
After you see the **Firmware Upload In Process** screen, wait two minutes before logging into the ZyXEL Device again.

Figure 146 Upload Warning



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 147 Network Temporarily Disconnected



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 148 Upload Error Message



22.2 Configuration Screen

See the Firmware and Configuration File Maintenance chapter for transferring configuration files using FTP/TFTP commands.

Click **Maintenance > Tools > Configuration**. Information related to factory defaults, backup configuration, and restoring configuration appears as shown next.

Figure 149 Configuration

The screenshot shows the Configuration page with the following sections:

- Backup Configuration:** "Click Backup to save the current configuration of your system to your computer." with a **Backup** button.
- Restore Configuration:** "To restore a previously saved configuration file to your system, browse to the location of the configuration file and click Upload." It includes a "File Path:" input field, a **Browse...** button, and an **Upload** button.
- Back to Factory Defaults:** "Click **Reset** to clear all user-entered configuration information and return to factory defaults. After resetting, the
 - Password will be 1234
 - LAN IP address will be 192.168.1.1
 - DHCP will be reset to server
 with a **Reset** button.

22.2.1 Backup Configuration

Backup configuration allows you to back up (save) the ZyXEL Device's current configuration to a file on your computer. Once your ZyXEL 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 will be useful in case you need to return to your previous settings.

Click **Backup** to save the ZyXEL Device's current configuration to your computer

22.2.2 Restore Configuration

Restore configuration allows you to upload a new or previously saved configuration file from your computer to your ZyXEL Device.

Table 81 Maintenance Restore Configuration

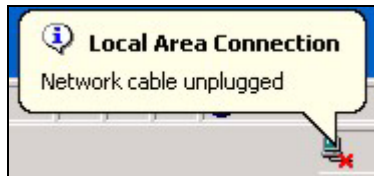
LABEL	DESCRIPTION
File Path	Type in the location of the file you want to upload in this field or click Browse... to find it.
Browse...	Click Browse... to find the file you want to upload. Remember that you must decompress compressed (.ZIP) files before you can upload them.
Upload	Click Upload to begin the upload process.

Note: Do not turn off the ZyXEL Device while configuration file upload is in progress

After you see a "configuration upload successful" screen, you must then wait one minute before logging into the ZyXEL Device again.

Figure 150 Configuration Restore Successful

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 151 Temporarily Disconnected

If you uploaded the default configuration file you may need to change the IP address of your computer to be in the same subnet as that of the default ZyXEL Device IP address (192.168.1.1). See your Quick Start Guide for details on how to set up your computer's IP address.

If the upload was not successful, the following screen will appear. Click **Return** to go back to the **Configuration** screen.

Figure 152 Configuration Restore Error

22.2.3 Back to Factory Defaults

Pressing the **Reset** button in this section clears all user-entered configuration information and returns the ZyXEL Device to its factory defaults.

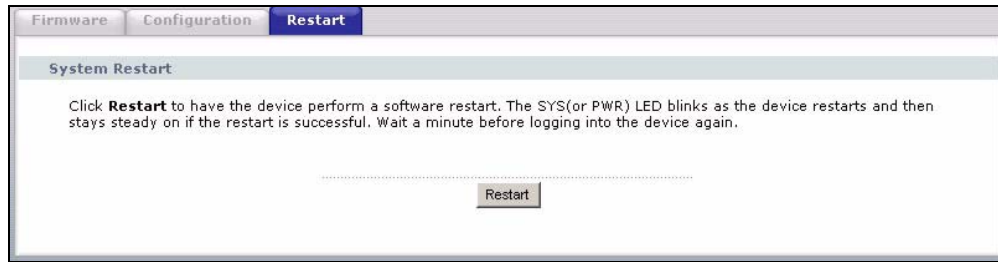
You can also press the **RESET** button on the rear panel to reset the factory defaults of your ZyXEL Device. Refer to the chapter about introducing the web configurator for more information on the **RESET** button.

22.3 Restart Screen

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 153 System Restart

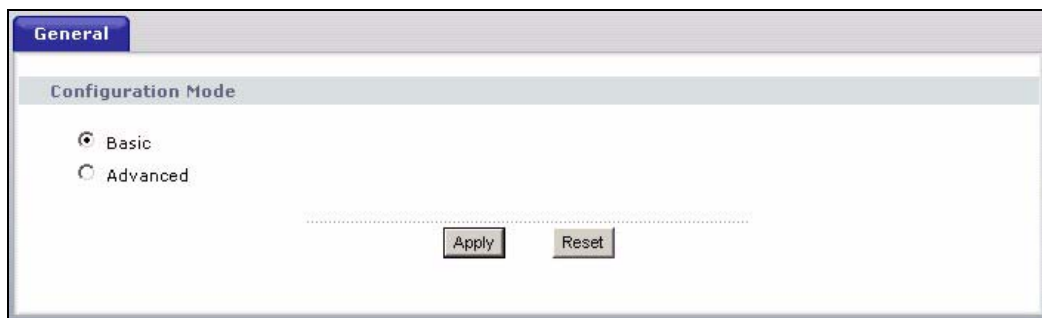


CHAPTER 23

Configuration Mode

Click **Maintenance > Config Mode** to open the following screen. This screen allows you to hide or display the advanced screens of some features or the advanced features, such as MAC filter or static route. **Basic** is selected by default and you cannot see the advanced screens or features. If you want to view and configure all screens including the advanced ones, select **Advanced** and click **Apply**.

Figure 154 Config Mode



The following table includes the screens that you can view and configure only when you select **Advanced**.

Table 82 Config Mode: Advanced Screens

CATEGORY	LINK	TAB
Network	Wireless LAN	OTIST
		MAC Filter
		Advanced
	WAN	Advanced
	LAN	IP Alias
		Advanced
	DHCP Server	Advanced
NAT	Advanced	
Security	Firewall	Services
	Content Filter	Schedule
	VPN	Summary
		Rule Setup
		SA Monitor
Global Setting		

Table 82 Config Mode: Advanced Screens

CATEGORY	LINK	TAB
Management	Static Route	IP Static Route
	Bandwidth MGMT	Advanced
		Monitor
	Remote MGMT	Telnet
		FTP
		DNS
Maintenance	Logs	Log Settings

CHAPTER 24

Troubleshooting

This chapter covers potential problems and the corresponding remedies.

24.1 Problems Starting Up the ZyXEL Device

Table 83 Troubleshooting Starting Up Your ZyXEL Device

PROBLEM	CORRECTIVE ACTION
None of the LEDs turn on when I turn on the ZyXEL Device.	<p>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.</p> <p>Turn the ZyXEL Device off and on.</p> <p>If the error persists, you may have a hardware problem. In this case, you should contact your vendor.</p>

24.2 Problems with the LAN

Table 84 Troubleshooting the LAN

PROBLEM	CORRECTIVE ACTION
The LAN LEDs do not turn on.	<p>Check your Ethernet cable connections (refer to the Quick Start Guide for details). Check for faulty Ethernet cables.</p>
	<p>Make sure your computer's Ethernet Card is working properly.</p>
I cannot access the ZyXEL Device from the LAN.	<p>If Any IP is disabled, make sure that the IP address and the subnet mask of the ZyXEL Device and your computer(s) are on the same subnet.</p>

24.3 Problems with the WAN

Table 85 Troubleshooting the WAN

PROBLEM	CORRECTIVE ACTION
The WAN LED is off.	Check the connections between the ZyXEL Device WAN port and the cable/DSL modem or ethernet jack.
	Check whether your cable/DSL device requires a crossover or straight-through cable.
I cannot get a WAN IP address from the ISP.	Click WAN to verify your settings. 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.	If you use PPPoE encapsulation, check the idle time-out setting. Refer to the Chapter 6 on page 95 . Contact your ISP.

24.4 Problems Accessing the ZyXEL Device

Table 86 Troubleshooting Accessing the ZyXEL Device

PROBLEM	CORRECTIVE ACTION
I cannot access the ZyXEL Device.	<p>The username is "admin". The default password is "1234". The Password and Username fields are case-sensitive. Make sure that you enter the correct password and username using the proper casing.</p> <p>If you have changed the password and have now forgotten it, you will need to upload the default configuration file. This restores all of the factory defaults including the password.</p>
I cannot access the web configurator.	<p>Make sure that there is not a Telnet console session running.</p> <p>Use the ZyXEL Device's WAN IP address when configuring from the WAN. Refer to the instructions on checking your WAN connection.</p> <p>Use the ZyXEL Device's LAN IP address when configuring from the LAN. Refer to for instructions on checking your LAN connection.</p> <p>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.</p> <p>Your computer's and the ZyXEL Device's IP addresses must be on the same subnet for LAN access.</p> <p>If you changed the ZyXEL Device's LAN IP address, then enter the new one as the URL.</p> <p>See the following section to check that pop-up windows, JavaScripts and Java permissions are allowed.</p>

24.5 Problems with Restricted Web Pages and Keyword Blocking

Table 87 Troubleshooting Restricted Web Pages and Keyword Blocking

PROBLEM	CORRECTIVE ACTION
Access to a restricted web page is not blocked.	Make sure that the Enable Parental Control check box is selected in the Parental Control screen.
	Make sure that you select a category in the Parental Control screen to restrict access to web pages relevant to that category. For example, select the Gambling check box to prevent access to www.onlinegambling.com .
Access to a web page with a URL containing a forbidden keyword is not blocked.	Make sure that you select the Keyword Blocking check box in the Content Filtering screen. Make sure that the keywords that you type are listed in the Keyword List.
	If a keyword that is listed in the Keyword List is not blocked when it is found in a URL, customize the keyword blocking using commands. See the Customizing Keyword Blocking URL Checking section in the Content Filter chapter.

Table 87 Troubleshooting Restricted Web Pages and Keyword Blocking

PROBLEM	CORRECTIVE ACTION
Parental Control is configured correctly, but I can still access restricted web pages.	Restart the device to clear the cache.
	The content filter server may be unavailable. The View Logs screen can display content filtering log messages. See the Log Descriptions appendix for a list of possible log messages. In the View Logs screen copy and paste the log messages and e-mail them to customer support with an explanation of the problem.
	If you still have problems, contact your vendor or customer support for further advice.

Problems with the Password

Table 88 Troubleshooting the Password

PROBLEM	CORRECTIVE ACTION
Cannot access the ZyXEL Device.	The password field is case sensitive. Make sure that you enter the correct password using the proper casing.
	Use the Reset button to restore the factory default configuration file. This will restore all of the factory defaults including the password; see section 2.3 for details.

Problems with Remote Management

Table 89 Troubleshooting Telnet

PROBLEM	CORRECTIVE ACTION
Cannot access the ZyXEL Device from the LAN or WAN.	Refer to Chapter 16 on page 185 for scenarios when remote management may not be possible.
	When NAT is enabled: <ul style="list-style-type: none"> • 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.

Problems with the Print Server

Table 90 Troubleshooting the Print Server

PROBLEM	CORRECTIVE ACTION
Cannot print anything using the USB printer connected to the P-335U.	Verify that the printer uses USB 1.1 or 1.0 by checking your printer's specifications.
	Make sure the USB printer is powered on and can work properly.
	Make sure you install the print server driver on your computer. See Chapter 19 on page 201 for how to set up the print server driver on your computer.
	Check the USB cable connections.

24.5.1 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.

24.5.1.1 Internet Explorer Pop-up Blockers

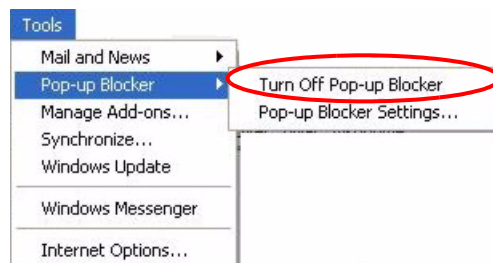
You may have to disable pop-up blocking to log into your device.

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.

24.5.1.1.1 Disable pop-up Blockers

- 1 In Internet Explorer, select **Tools, Pop-up Blocker** and then select **Turn Off Pop-up Blocker**.

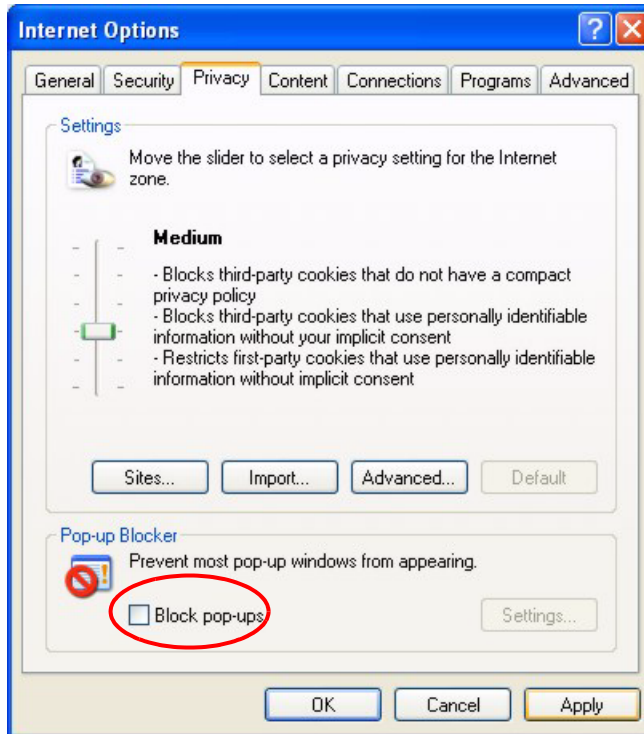
Figure 155 Pop-up Blocker



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 156 Internet Options

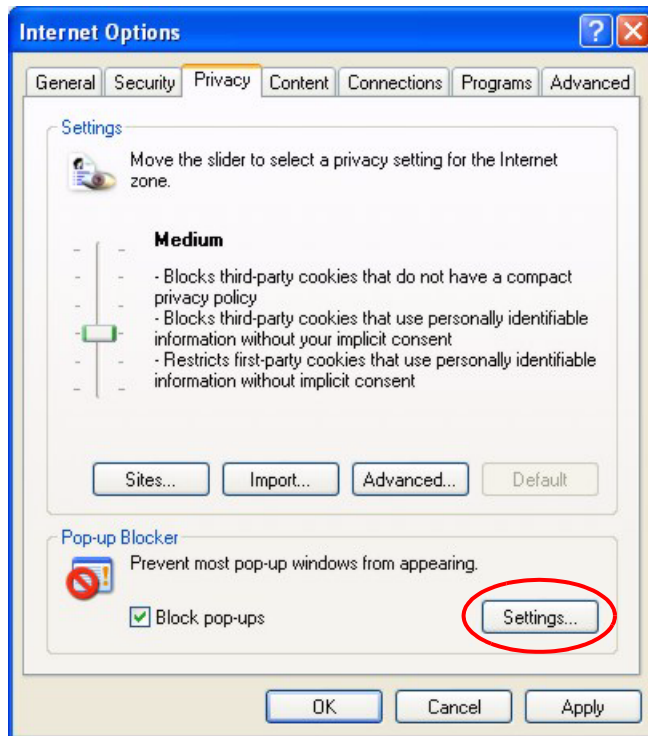


- 3 Click **Apply** to save this setting.

24.5.1.1.2 Enable pop-up Blockers with Exceptions

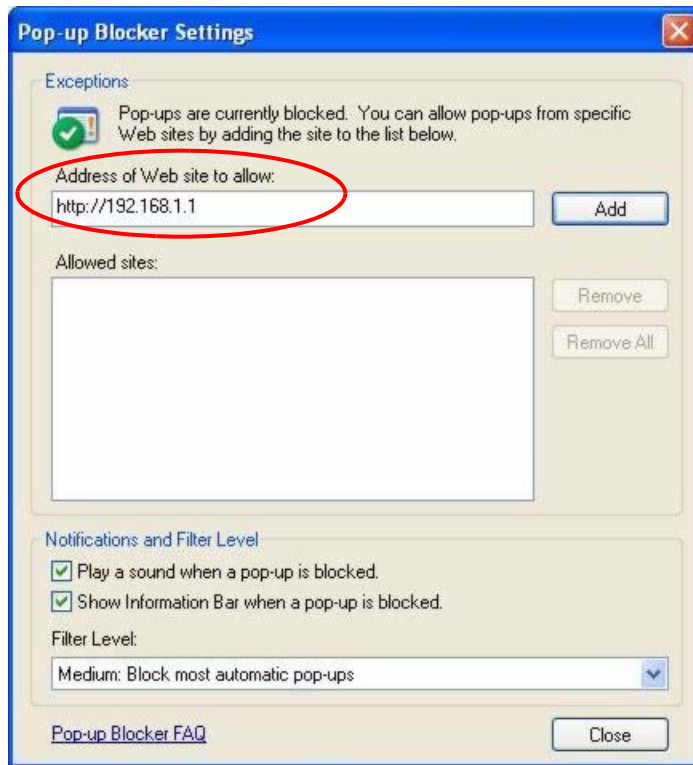
Alternatively, if you only want to allow pop-up windows from your device, see the following steps.

- 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 157 Internet Options

- 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**.

Note: If you change the IP address of your device, make sure that the new address matches the address you type in the **Pop-up Blocker Settings** screen.

Figure 158 Pop-up Blocker Settings

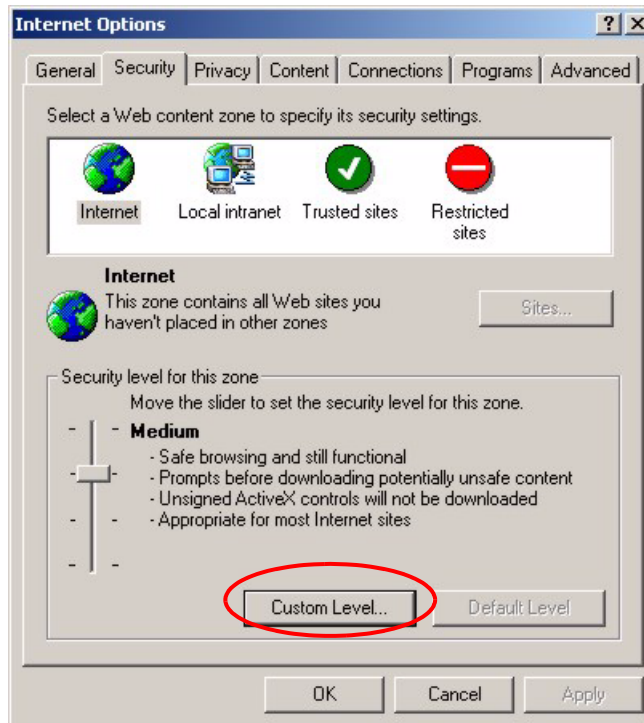
5 Click **Close** to return to the **Privacy** screen.

6 Click **Apply** to save this setting.

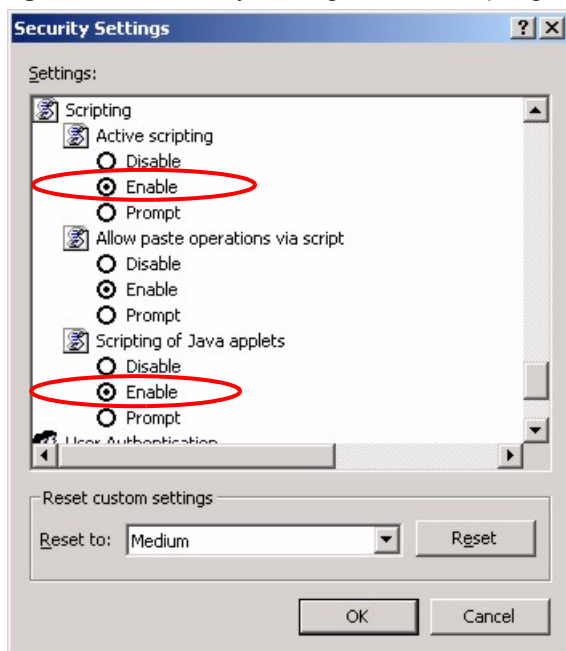
24.5.1.2 JavaScripts

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.

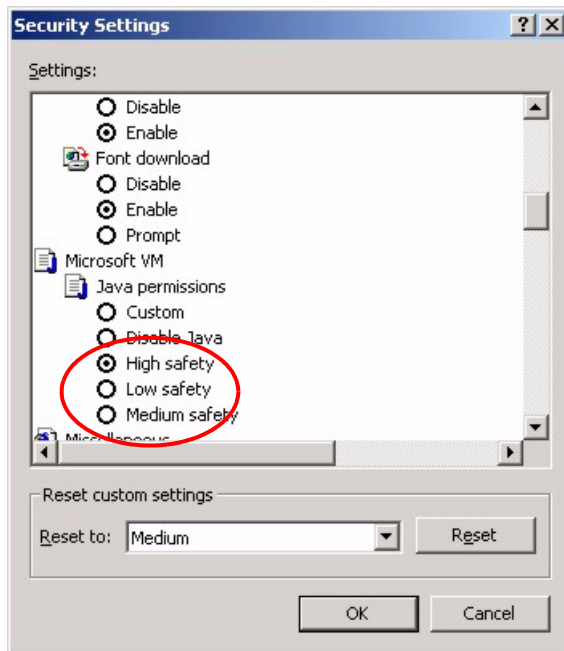
Figure 159 Internet Options

- 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 160 Security Settings - Java Scripting

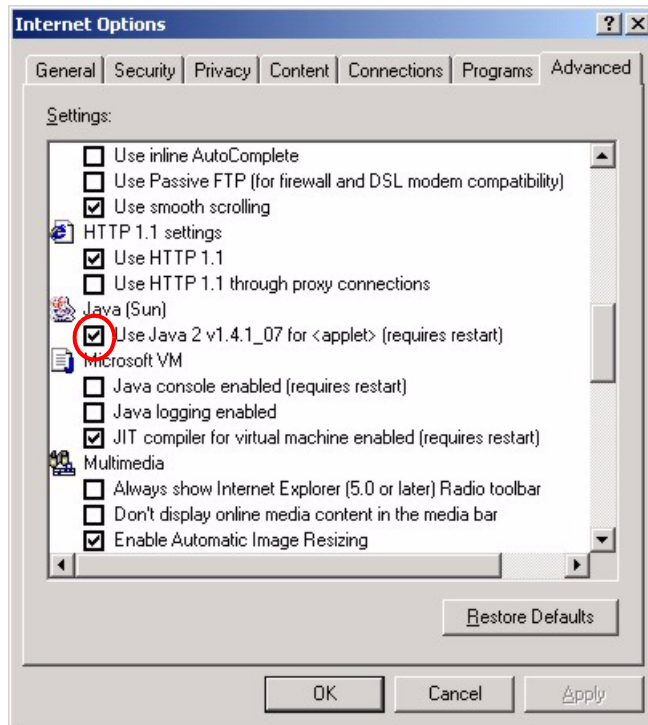
24.5.1.3 Java Permissions

- 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 161 Security Settings - Java

24.5.1.3.1 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.

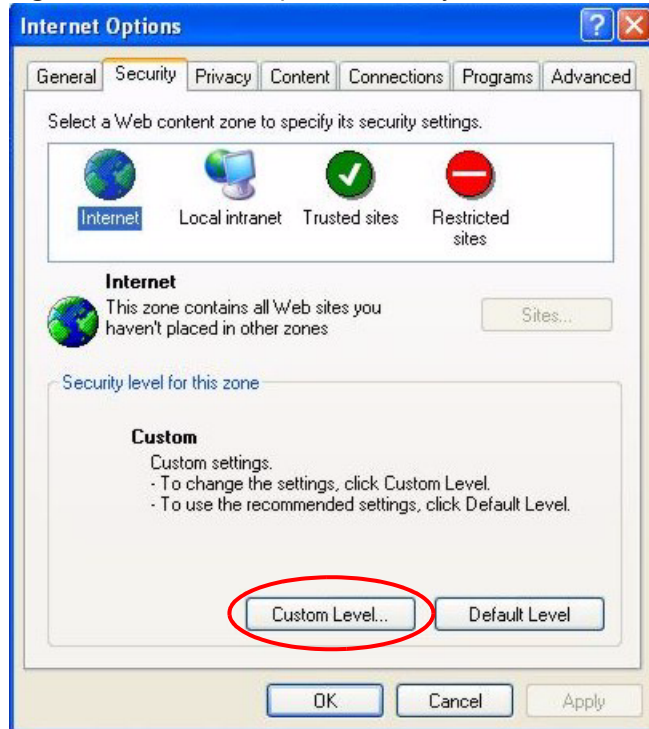
Figure 162 Java (Sun)

24.5.2 ActiveX Controls in Internet Explorer

If ActiveX is disabled, you will not be able to download ActiveX controls or to use Trend Micro Security Services. Make sure that ActiveX controls are allowed in Internet Explorer.

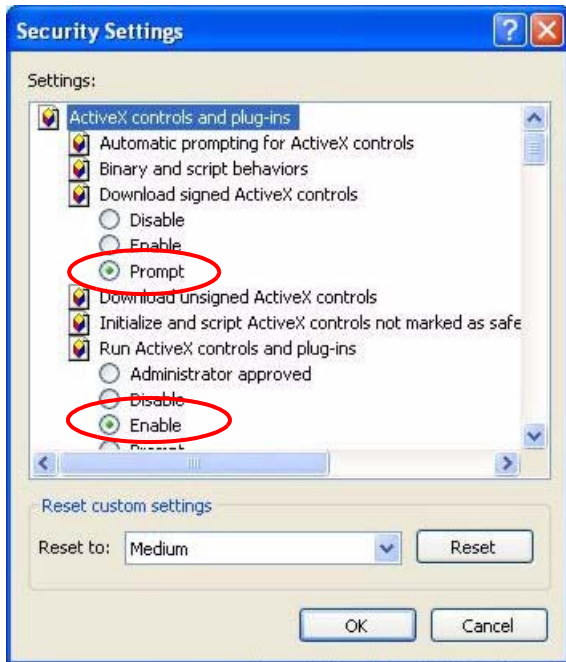
Screen shots for Internet Explorer 6 are shown. Steps may vary depending on your version of Internet Explorer.

- 1** In Internet Explorer, click **Tools, Internet Options** and then the **Security** tab.
- 2** In the **Internet Options** window, click **Custom Level**.

Figure 163 Internet Options Security

- 3** Scroll down to **ActiveX controls and plug-ins**.
- 4** Under **Download signed ActiveX controls** select the **Prompt** radio button.
- 5** Under **Run ActiveX controls and plug-ins** make sure the **Enable** radio button is selected.
- 6** Then click the **OK** button.

Figure 164 Security Setting ActiveX Controls



APPENDIX A

Product Specifications

The following table is a summary of other features available.

Table 91 Hardware Specifications

Dimensions (W x D x H)	190 x 150 x 33 mm
Device Weight	413 g
Power Specification	12 V AC 1 A
Ethernet Ports	Auto-negotiating: 10 Mbps or 100 Mbps in either half-duplex or full-duplex mode. Auto-crossover: Use either crossover or straight-through Ethernet cables.
USB Port (P-335U only)	USB version 1.1.
Antenna	One 2dBi fixed antenna
Dual Band Switch	One AG switch to allow either IEEE 802.11a or IEEE 802.11b/g compliant wireless devices to communicate with the ZyXEL Device wirelessly.
Operation Temperature	0° C ~ 50° C
Operation Humidity	20% ~ 95% (non-condensing)
Distance between the centers of the holes (for wall mounting) on the device's back.	138 mm
Screw size for wall-mounting	M 3*10

Table 92 Firmware Specifications

FEATURE	DESCRIPTION
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
Device Management	Use the web configurator to easily configure the rich range of features on the ZyXEL Device.
Wireless Functionality	Allow the IEEE 802.11b and/or IEEE 802.11g or IEEE 802.11a wireless clients to connect to the ZyXEL Device wirelessly. Enable wireless security (WEP, WPA(2), WPA(2)-PSK) and/or MAC filtering to protect your wireless network.

Table 92 Firmware Specifications

FEATURE	DESCRIPTION
Firmware Upgrade	Download new firmware (when available) from the ZyXEL web site and use the web configurator, an FTP or a TFTP tool to put it on the ZyXEL Device. Note: Only upload firmware for your specific model!
Configuration Backup & Restoration	Make a copy of the ZyXEL Device's configuration. You can put it back on the ZyXEL Device later if you decide to revert back to an earlier configuration.
Network Address Translation (NAT)	Each computer on your network must have its own unique IP address. Use NAT to convert your public IP address(es) to multiple private IP addresses for the computers on your network.
Port Forwarding	If you have a server (mail or web server for example) on your network, you can use this feature to let people access it from the Internet.
DHCP (Dynamic Host Configuration Protocol)	Use this feature to have the ZyXEL Device assign IP addresses, an IP default gateway and DNS servers to computers on your network.
Dynamic DNS Support	With Dynamic DNS (Domain Name System) support, you can use a fixed URL, www.zyxel.com for example, with a dynamic IP address. You must register for this service with a Dynamic DNS service provider.
IP Multicast	IP multicast is used to send traffic to a specific group of computers. The ZyXEL Device supports versions 1 and 2 of IGMP (Internet Group Management Protocol) used to join multicast groups (see RFC 2236).
IP Alias	IP alias allows you to subdivide a physical network into logical networks over the same Ethernet interface with the ZyXEL Device itself as the gateway for each subnet.
Time and Date	Get the current time and date from an external server when you turn on your ZyXEL Device. You can also set the time manually. These dates and times are then used in logs.
Logging and Tracing	Use packet tracing and logs for troubleshooting. You can send logs from the ZyXEL Device to an external syslog server.
PPPoE	PPPoE mimics a dial-up Internet access connection.
PPTP Encapsulation	Point-to-Point Tunneling Protocol (PPTP) enables secure transfer of data through a Virtual Private Network (VPN). The ZyXEL Device supports one PPTP connection at a time.
Universal Plug and Play (UPnP)	A UPnP-enabled device can dynamically join a network, obtain an IP address and convey its capabilities to other devices on the network. Activate UPnP to have the ZyXEL Device communicate with other UPnP-enabled devices in a network.
RoadRunner Support	The ZyXEL Device supports Time Warner's RoadRunner Service in addition to standard cable modem services.
Firewall	You can configure firewall on the ZyXEL Device for secure Internet access. When the firewall is on, by default, all incoming traffic from the Internet to 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 for example.
Content Filter	The ZyXEL Device blocks access to web sites with URLs that contain keywords that you specify. You can define time periods and days during which content filtering is enabled.

Table 92 Firmware Specifications

FEATURE	DESCRIPTION
IPSec VPN (P-335U only)	Establish a Virtual Private Network (VPN) to connect with business partners and branch offices using data encryption and the Internet to provide secure communications without the expense of leased site-to-site lines. The ZyXEL Device VPN is based on the IPSec standard and is fully interoperable with other IPSec-based VPN products.
Print Server (P-335U only)	The ZyXEL Device has a built-in print server that allows computers on the LAN to share a USB printer. This eliminates the need to assign a dedicated computer as a print server or have a standalone print server device.
Bandwidth Management	You can efficiently manage traffic on your network by reserving bandwidth and giving priority to certain types of traffic and/or to particular computers.
Remote Managemet	This allows you to decide whether a service (HTTP or FTP traffic for example) from a computer on a network (LAN or WAN for example) can access the ZyXEL Device.

APPENDIX B

Print Server Specifications

This appendix provides details on the print server interface and system requirements.

Table 93 Print Server Interface

PRINT SERVER INTERFACE	
USB	USB 1.1 (full speed) - compliant port, 1.5Mbps (low speed) and 12Mbps (full speed) data transmission rates. This port automatically detects the make and model of the USB printer connected to this port.

Table 94 Print Server Requirements and Specifications

PRINT SERVER REQUIREMENTS AND SPECIFICATIONS	
Network Operating System Support	Windows 95/98/98SE/Me Windows NT 4.0/2000/XP/2003 Mac OS X or higher
Network Protocol Support ^a	Print Monitor: UDP <ul style="list-style-type: none"> • Windows 95/98/98SE/Me • Windows NT 4.0/2000/XP/2003 LPD/LPR (RFC 1179): TCP/IP <ul style="list-style-type: none"> • Windows NT 4.0/2000/XP/2003 • Mac OS X or higher
DHCP (client) Support	Yes
Management	Web interface Windows-based wizard program

a. Only a printer with a USB connection can be used with the ZyXEL Device.

ZyXEL Device Print Server Compatible USB Printers

The following is a list of USB printer models compatible with the ZyXEL Device print server.

Table 95 Compatible USB Printers

BRAND	MODEL	TYPE	REMARK
CANON	BJ F9000	Inkjet	
CANON	i2355	Inkjet	
CANON	i255	Inkjet	
CANON	i320	Inkjet	
CANON	i355	Inkjet	
CANON	i450	Inkjet	
CANON	i455	Inkjet	
CANON	i470D	Inkjet	
CANON	i475D	Inkjet	
CANON	i550	Inkjet	
CANON	i560	Inkjet	
CANON	i6100	Inkjet	
CANON	i6500	Inkjet	
CANON	i850	Inkjet	
CANON	i865	Inkjet	
CANON	i9100	Inkjet	
CANON	i950	Inkjet	
CANON	i9950	Inkjet	
CANON	S200SPx	Inkjet	
CANON	S200SRx	Inkjet	
CANON	S520	Inkjet	
CANON	PIXMA ip1000	Inkjet	
CANON	PIXMA ip2000	Inkjet	
CANON	PIXMA ip3000	Inkjet	
CANON	PIXMA ip4000	Inkjet	
CANON	PIXMA ip5000	Inkjet	
CANON	PIXMA ip6000D	Inkjet	
CANON	PIXMA ip8500	Inkjet	
CANON	MP-110	MFP	

Table 95 Compatible USB Printers

BRAND	MODEL	TYPE	REMARK
CANON	MP-130	MFP	
EPSON	Aculaser C1900	Color Laser	
EPSON	EPL-6100	Laser	Disable bi-directional support on printer.
EPSON	Stylus C20	Inkjet	Disable bi-directional support on printer.
EPSON	Stylus C20SX	Inkjet	Disable bi-directional support on printer.
EPSON	Stylus C40	Inkjet	Disable bi-directional support on printer.
EPSON	Stylus C43UX	Inkjet	
EPSON	Stylus C60	Inkjet	Disable bi-directional support on printer.
EPSON	Stylus C63	Inkjet	
EPSON	Stylus C83	Inkjet	
EPSON	Stylus Color 1160	Inkjet	Disable bi-directional support on printer.
EPSON	Stylus Color 670	Inkjet	
EPSON	Stylus Color 800	Inkjet	Disable printer status monitor.
EPSON	Stylus Color 810	Inkjet	
EPSON	Stylus Photo 915	Inkjet	
EPSON	Stylus Photo1270	Inkjet	
EPSON	Stylus Photo2100	Inkjet	
EPSON	Stylus Photo810	Inkjet	
EPSON	Stylus PhotoEX3	Inkjet	
EPSON	EPL-5900	Laser	
EPSON	Stylus Photo1270	Inkjet	
EPSON	EPL-6200	Laser	
EPSON	LP 2500	Laser	
EPSON	LP 8900	Laser	
EPSON	Stylus Photo830U	Inkjet	
EPSON	TM-T88III	Thermo	
HP	DeskJet 1125C	Inkjet	Change data type to EMF and disable bi-directional support on printer.
HP	DeskJet 1220C	Inkjet	Change data type to EMF and disable bi-directional support on printer.
HP	DeskJet 3650	Inkjet	

Table 95 Compatible USB Printers

BRAND	MODEL	TYPE	REMARK
HP	DeskJet 5550	Inkjet	
HP	DeskJet 810C	Inkjet	
HP	DeskJet 845C	Inkjet	
HP	DeskJet 920C	Inkjet	
HP	Deskjet 1180c	Inkjet	
HP	DeskJet 930C	Inkjet	
HP	LaserJet 1200	Laser	Disable bi-directional support on printer.
HP	LaserJet 1220	Laser	Disable bi-directional support on printer.
HP	LaserJet 1300	Laser	
HP	LaserJet 2200	Laser	Disable bi-directional support on printer.
HP	LaserJet 2200D	Laser	Disable bi-directional support on printer.
HP	LaserJet 3330	Laser	
HP	LaserJet 5000	Color Laser	Requires PCL5 or PCL6 printer driver.
HP	LaserJet 5000LE	Color Laser	Requires PCL5 or PCL6 printer driver.
HP	Photosmart 7150	Inkjet	
HP	Photosmart 2610	MFP	
HP	LaserJet 1500L	Color Laser	
HP	PSC 1315	MFP	
HP	DeskJet 3535	Inkjet	
HP	DeskJet 5550	Inkjet	
HP	DeskJet 5652	Inkjet	
HP	LaserJet 2300	Laser	
HP	LaserJet 2420	Laser	
HP	LaserJet 4250	Laser	
HP	LaserJet 2550	Color Laser	
HP	LaserJet 3015	MFP	
IBM	Infoprint 1332	Laser	
IBM	Infoprint 1412	Laser	
KYOCERA	FS-1010	Laser	
KYOCERA	FS-1020D	Laser	

Table 95 Compatible USB Printers

BRAND	MODEL	TYPE	REMARK
KYOCERA	FS-1920	Laser	
KONICA MINOLTA	PagePro 1350W	Laser	
LEXMARK	C750	Color Laser	
LEXMARK	E210	Laser	
LEXMARK	E322	Laser	
LEXMARK	T420	Laser	
LEXMARK	T620	Laser	
LEXMARK	W812	Laser	
LEXMARK	Z42	Inkjet	
LEXMARK	Z43	Inkjet	
LEXMARK	Z45	Inkjet	
LEXMARK	Z55	Inkjet	
LEXMARK	Z705	Inkjet	
LEXMARK	E230	Laser	
LEXMARK	X6170	MFP	
LEXMARK	Z515	Inkjet	
OKI	B4350	Laser	
SAMSUNG	ML-1710	Laser	
SAMSUNG	ML-1750	Laser	
SAMSUNG	CLP-510	Laser	
SAMSUNG	SCX-4016	MFP	
SHARP	AR-M160	MFP	
SHARP	AR-M205	MFP	
XEROX	Phaser 3310	Laser	
XEROX	DocuPrint 240A	Laser	
PS: For MFP, the print server supports the printing function only.			

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.

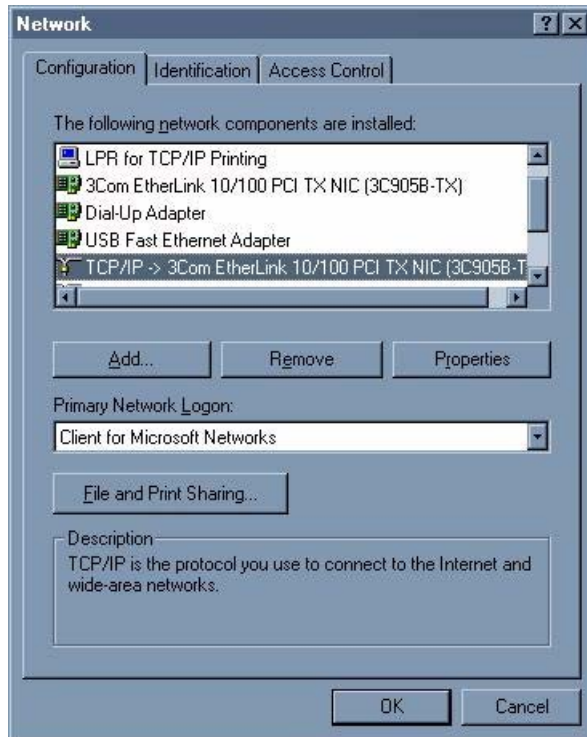
TCP/IP should already be installed on computers using Windows NT/2000/XP, Macintosh OS 7 and later operating systems.

After the appropriate TCP/IP components are installed, configure the TCP/IP settings in order to "communicate" with your network.

If you manually assign IP information instead of using dynamic assignment, make sure that your computers have IP addresses that place them in the same subnet as the ZyXEL Device's LAN port.

Windows 95/98/Me

Click **Start**, **Settings**, **Control Panel** and double-click the **Network** icon to open the **Network** window.

Figure 165 Windows 95/98/Me: Network: Configuration

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:

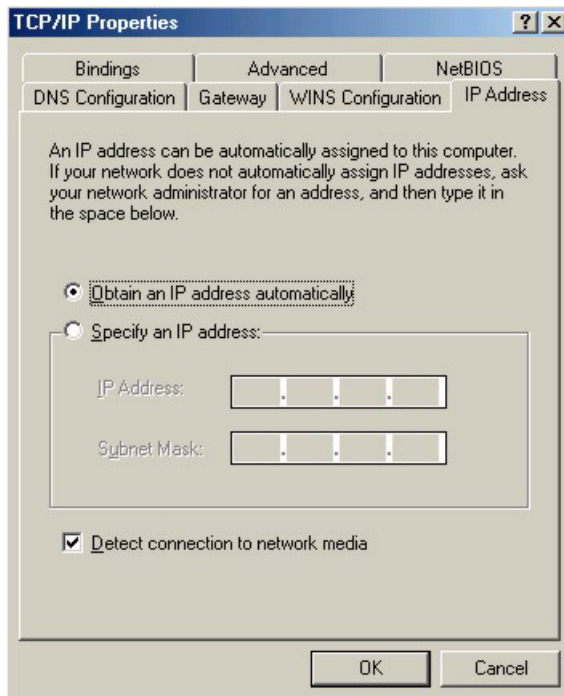
- 1 Click **Add**.
- 2 Select **Client** and then click **Add**.

- 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.

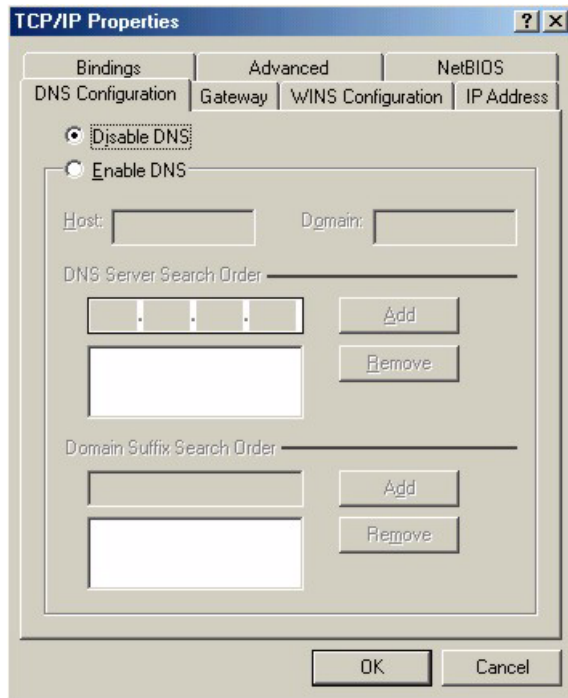
Configuring

- 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 166 Windows 95/98/Me: TCP/IP Properties: IP Address



- 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 167 Windows 95/98/Me: TCP/IP Properties: DNS Configuration**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** Turn on your ZyXEL Device and restart your computer when prompted.

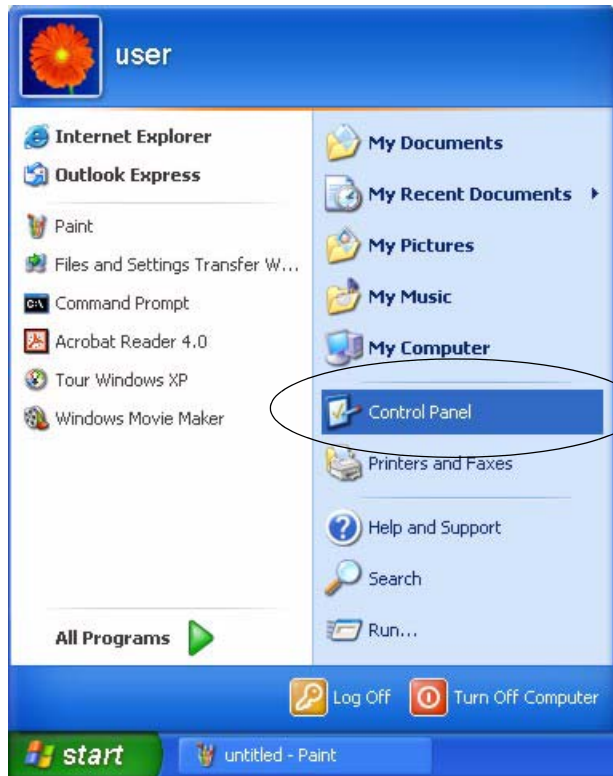
Verifying Settings

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.

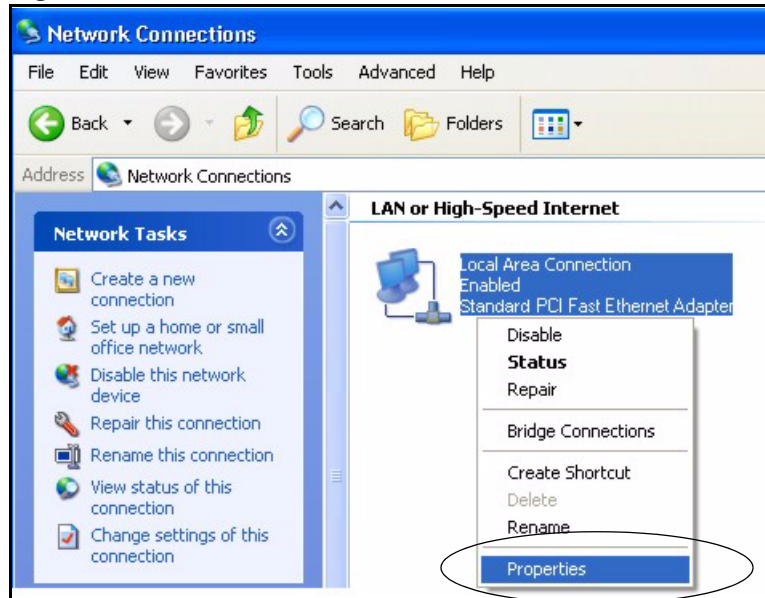
1 Click **start** (**Start** in Windows 2000/NT), **Settings, Control Panel**.

Figure 168 Windows XP: Start Menu

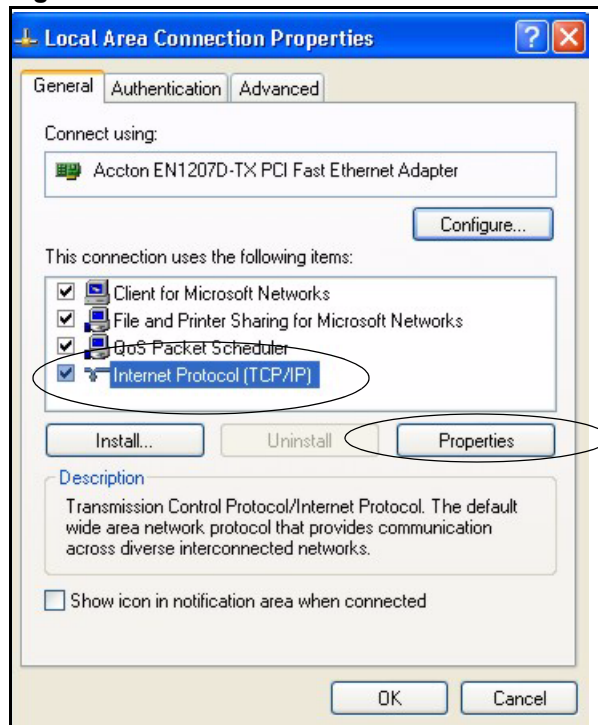
2 In the **Control Panel**, double-click **Network Connections (Network and Dial-up Connections)** in Windows 2000/NT).

Figure 169 Windows XP: Control Panel

3 Right-click **Local Area Connection** and then click **Properties**.

Figure 170 Windows XP: Control Panel: Network Connections: Properties

- 4** Select **Internet Protocol (TCP/IP)** (under the **General** tab in Win XP) and then click **Properties**.

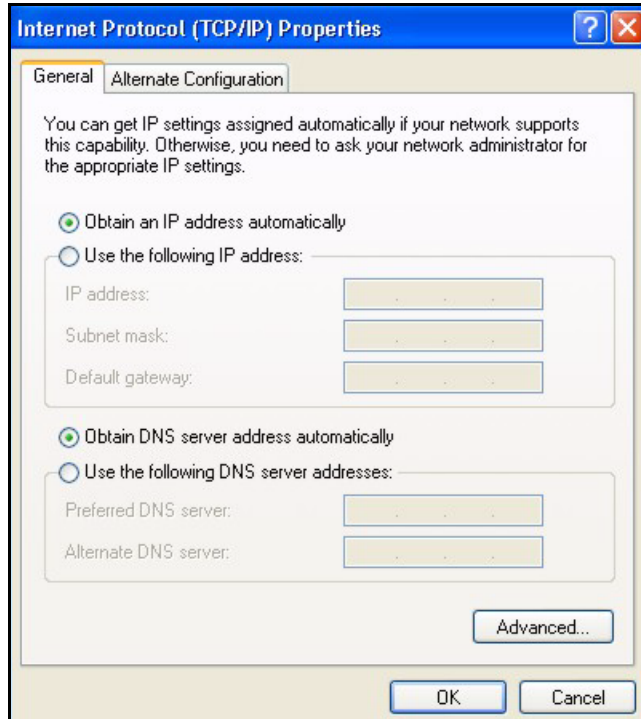
Figure 171 Windows XP: Local Area Connection Properties

- 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**.

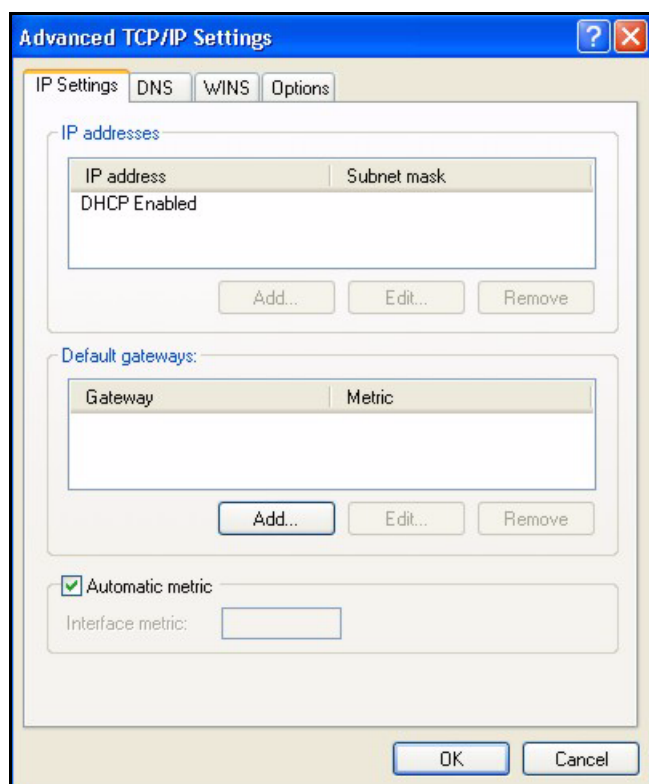
Figure 172 Windows XP: Internet Protocol (TCP/IP) Properties



- 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:

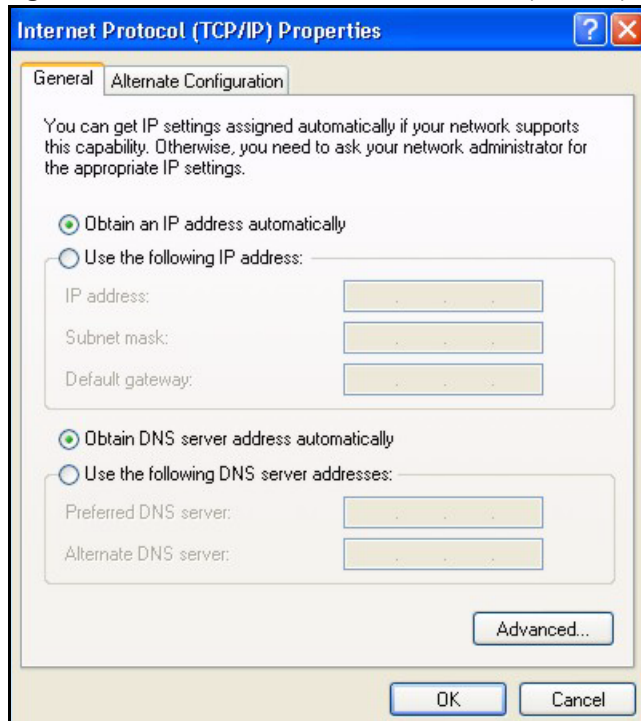
- In the **IP Settings** tab, in IP addresses, click **Add**.
- In **TCP/IP Address**, type an IP address in **IP address** and a subnet mask in **Subnet mask**, and then click **Add**.
- Repeat the above two steps for each IP address you want to add.
- Configure additional default gateways in the **IP 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 173 Windows XP: Advanced TCP/IP Properties

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 174 Windows XP: Internet Protocol (TCP/IP) Properties

- 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** Turn on your ZyXEL Device and restart your computer (if prompted).

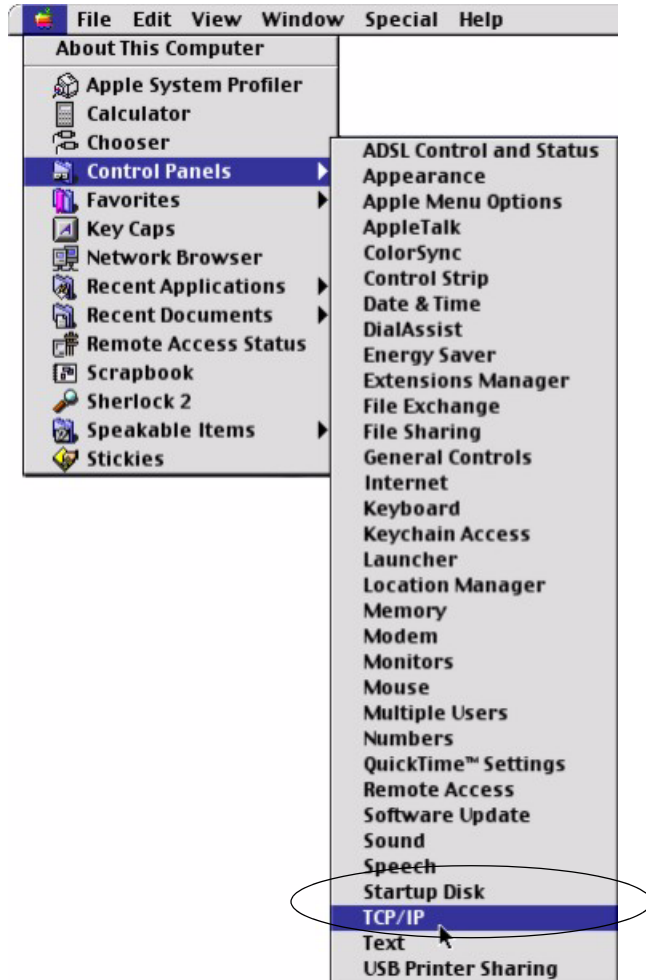
Verifying Settings

- 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 8/9

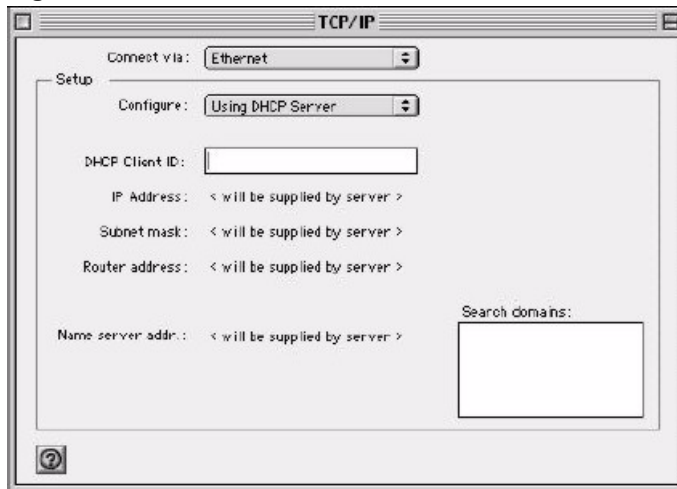
- 1** Click the **Apple** menu, **Control Panel** and double-click **TCP/IP** to open the **TCP/IP Control Panel**.

Figure 175 Macintosh OS 8/9: Apple Menu



2 Select **Ethernet built-in** from the **Connect via** list.

Figure 176 Macintosh OS 8/9: TCP/IP



3 For dynamically assigned settings, select **Using DHCP Server** from the **Configure:** list.

- 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 ZyXEL Device in the **Router address** box.
- 5 Close the **TCP/IP Control Panel**.
- 6 Click **Save** if prompted, to save changes to your configuration.
- 7 Turn on your ZyXEL Device and restart your computer (if prompted).

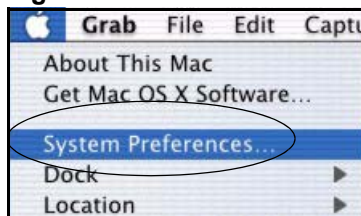
Verifying Settings

Check your TCP/IP properties in the **TCP/IP Control Panel** window.

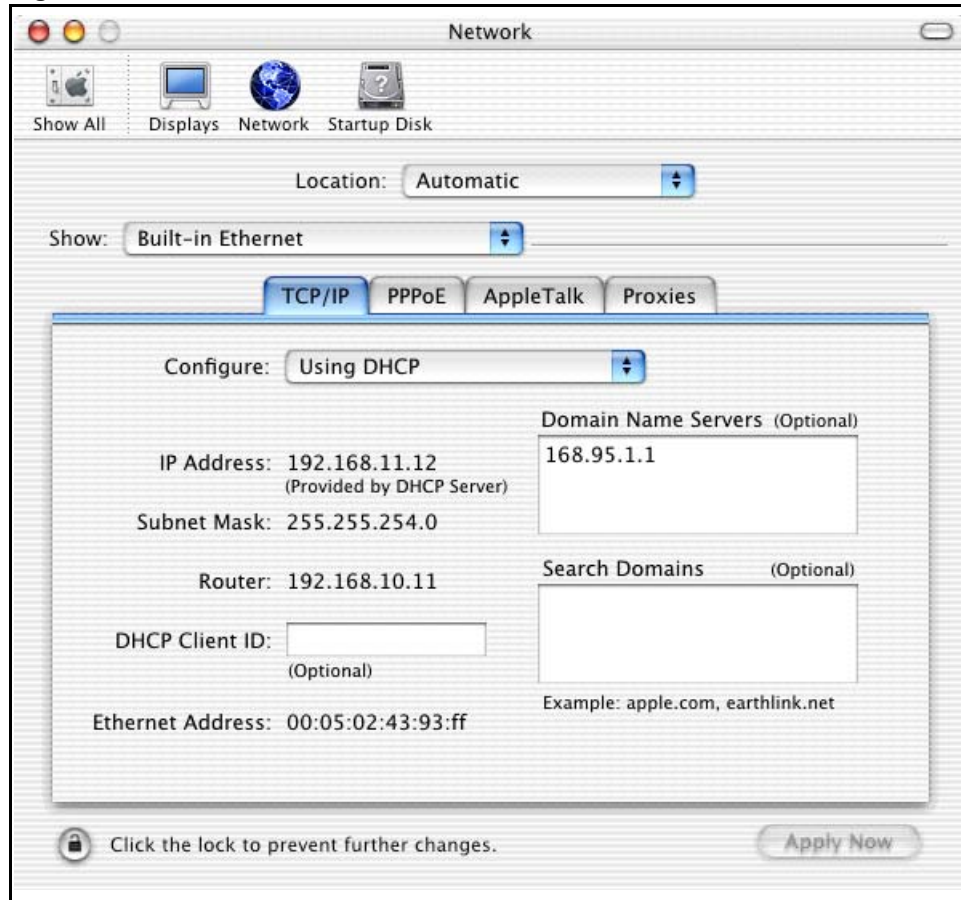
Macintosh OS X

- 1 Click the **Apple** menu, and click **System Preferences** to open the **System Preferences** window.

Figure 177 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 178 Macintosh OS X: Network

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 ZyXEL Device in the **Router address** box.

5 Click **Apply Now** and close the window.

6 Turn on your ZyXEL Device and 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.

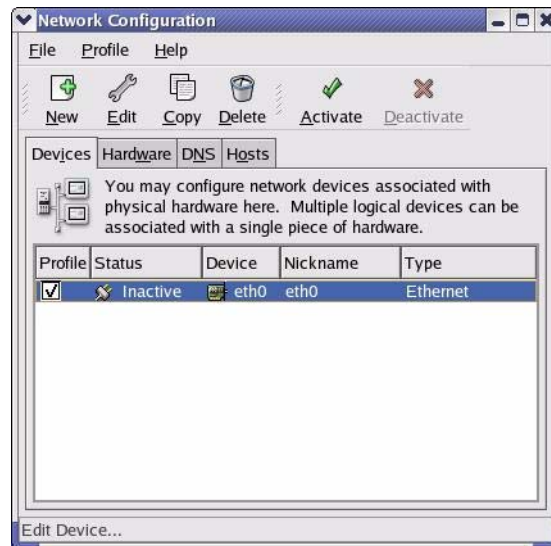
Note: Make sure you are logged in as the root administrator.

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 179 Red Hat 9.0: KDE: Network Configuration: Devices



- 2 Double-click on the profile of the network card you wish to configure. The **Ethernet Device General** screen displays as shown.

Figure 180 Red Hat 9.0: KDE: Ethernet Device: General

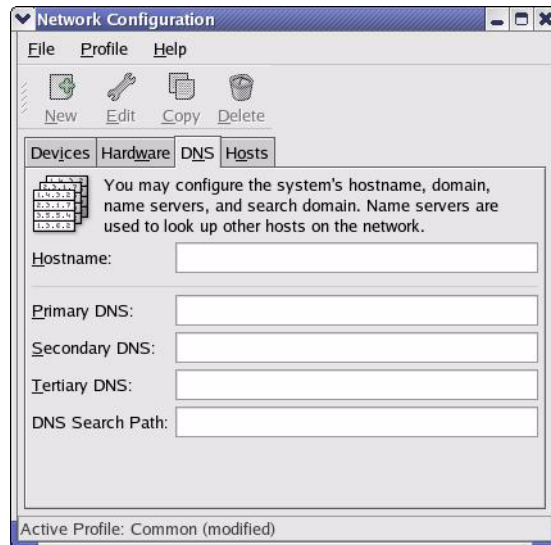


- If you have a dynamic IP address click **Automatically obtain IP address settings with** and select **dhcp** from the drop down list.
- If you have a static IP address click **Statically set IP Addresses** and fill in the **Address**, **Subnet mask**, and **Default Gateway Address** fields.

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.

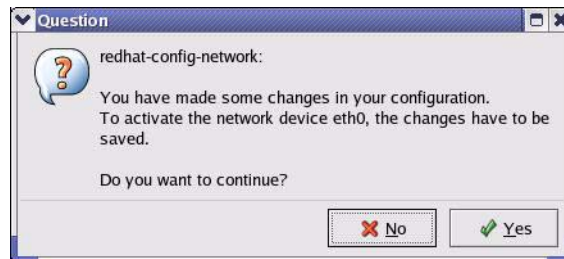
Figure 181 Red Hat 9.0: KDE: Network Configuration: DNS



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 182 Red Hat 9.0: KDE: Network Configuration: Activate



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 183 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 184 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 185 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 186 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 187 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

IP Subnetting

IP Addressing

Routers “route” based on the network number. The router that delivers the data packet to the correct destination host uses the host ID.

IP Classes

An IP address is made up of four octets (eight bits), written in dotted decimal notation, for example, 192.168.1.1. IP addresses are categorized into different classes. The class of an address depends on the value of its first octet.

- Class “A” addresses have a 0 in the left most bit. In a class “A” address the first octet is the network number and the remaining three octets make up the host ID.
- Class “B” addresses have a 1 in the left most bit and a 0 in the next left most bit. In a class “B” address the first two octets make up the network number and the two remaining octets make up the host ID.
- Class “C” addresses begin (starting from the left) with 1 1 0. In a class “C” address the first three octets make up the network number and the last octet is the host ID.
- Class “D” addresses begin with 1 1 1 0. Class “D” addresses are used for multicasting. (There is also a class “E” address. It is reserved for future use.)

Table 96 Classes of IP Addresses

			OCTET 2	OCTET 3	OCTET 4
Class A	0	Network number	Host ID	Host ID	Host ID
Class B	10	Network number	Network number	Host ID	Host ID
Class C	110	Network number	Network number	Network number	Host ID

Note: Host IDs of all zeros or all ones are not allowed.

Therefore:

A class “C” network (8 host bits) can have $2^8 - 2$ or 254 hosts.

A class “B” address (16 host bits) can have $2^{16} - 2$ or 65534 hosts.

A class “A” address (24 host bits) can have $2^{24} - 2$ hosts (approximately 16 million hosts).

Since the first octet of a class “A” IP address must contain a “0”, the first octet of a class “A” address can have a value of 0 to 127.

Similarly the first octet of a class “B” must begin with “10”, therefore the first octet of a class “B” address has a valid range of 128 to 191. The first octet of a class “C” address begins with “110”, and therefore has a range of 192 to 223.

Table 97 Allowed IP Address Range By Class

	ALLOWED RANGE OF FIRST OCTET (BINARY)	ALLOWED RANGE OF FIRST OCTET (DECIMAL)
Class A	00000000 to 01111111	0 to 127
Class B	10000000 to 10111111	128 to 191
Class C	11000000 to 11011111	192 to 223
Class D	11100000 to 11101111	224 to 239

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 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 as IP addresses are. The “natural” masks for class A, B and C IP addresses are as follows.

Table 98 “Natural” Masks

	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 99 Alternative Subnet Mask Notation

	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
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 100 Two Subnets Example

	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 101 Subnet 1

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	00000000
Subnet Mask	255.255.255.	128
Subnet Mask (Binary)	11111111.11111111.11111111.	10000000
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 102 Subnet 2

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	10000000
Subnet Mask	255.255.255.	128
Subnet Mask (Binary)	11111111.11111111.11111111.	10000000
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 (11111111.11111111.11111111.11000000) 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 103 Subnet 1

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	00000000
Subnet Mask (Binary)	11111111.11111111.11111111.	11000000
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 104 Subnet 2

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	64
IP Address (Binary)	11000000.10101000.00000001.	01000000
Subnet Mask (Binary)	11111111.11111111.11111111.	11000000
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 105 Subnet 3

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	10000000
Subnet Mask (Binary)	11111111.11111111.11111111.	11000000
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 106 Subnet 4

	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	192
IP Address (Binary)	11000000.10101000.00000001.	11000000
Subnet Mask (Binary)	11111111.11111111.11111111.	11000000
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 (001, 010, 011, 100, 101, 110).

The following table shows class C IP address last octet values for each subnet.

Table 107 Eight Subnets

	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 108 Class C Subnet Planning

	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 96 on page 271](#)) available for subnetting.

The following table is a summary for class “B” subnet planning.

Table 109 Class B Subnet Planning

	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 E

Wireless LANs

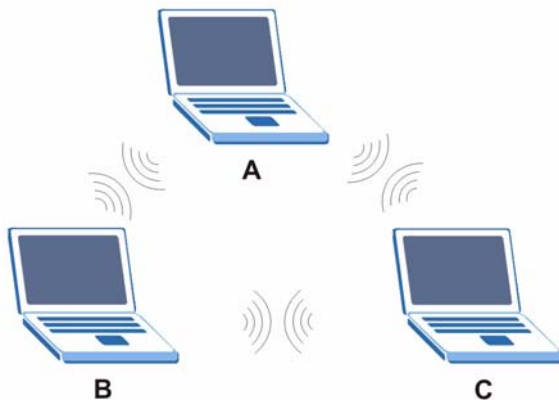
Wireless LAN Topologies

This section discusses ad-hoc and infrastructure wireless LAN topologies.

Ad-hoc Wireless LAN Configuration

The simplest WLAN configuration is an independent (Ad-hoc) WLAN that connects a set of computers with wireless adapters (A, B, C). Any time two or more wireless adapters are within range of each other, they can set up an independent network, which is commonly referred to as an Ad-hoc network or Independent Basic Service Set (IBSS). The following diagram shows an example of notebook computers using wireless adapters to form an Ad-hoc wireless LAN.

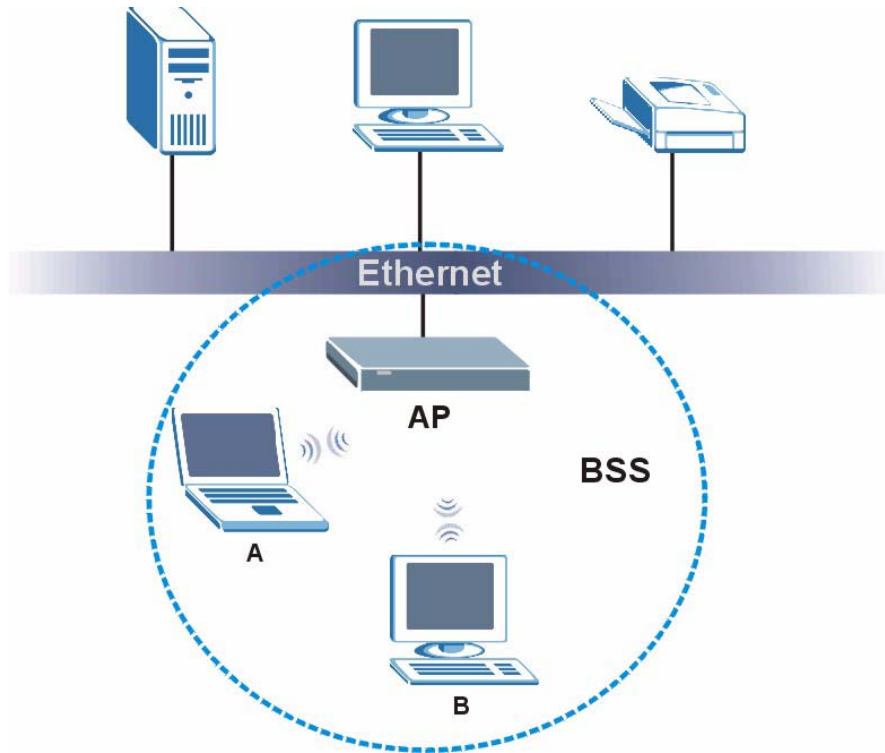
Figure 188 Peer-to-Peer Communication in an Ad-hoc Network



BSS

A Basic Service Set (BSS) exists when all communications between wireless clients or between a wireless client and a wired network client go through one access point (AP).

Intra-BSS traffic is traffic between wireless clients in the BSS. When Intra-BSS is enabled, wireless client **A** and **B** can access the wired network and communicate with each other. When Intra-BSS is disabled, wireless client **A** and **B** can still access the wired network but cannot communicate with each other.

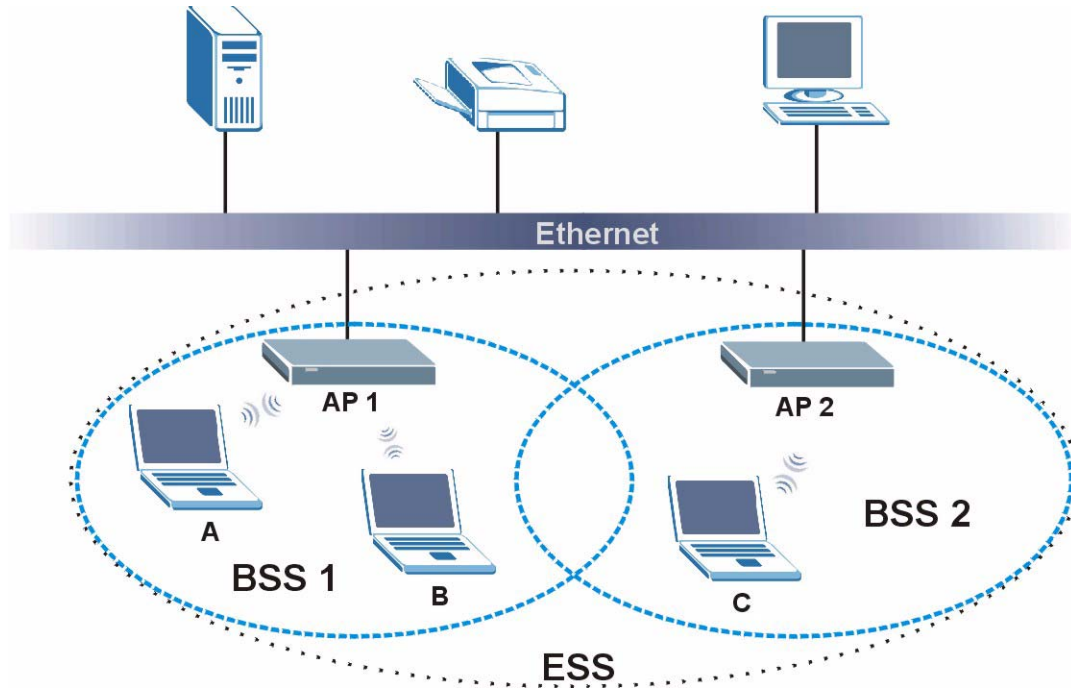
Figure 189 Basic Service Set

ESS

An Extended Service Set (ESS) consists of a series of overlapping BSSs, each containing an access point, with each access point connected together by a wired network. This wired connection between APs is called a Distribution System (DS).

This type of wireless LAN topology is called an Infrastructure WLAN. The Access Points not only provide communication with the wired network but also mediate wireless network traffic in the immediate neighborhood.

An ESSID (ESS Identification) uniquely identifies each ESS. All access points and their associated wireless clients within the same ESS must have the same ESSID in order to communicate.

Figure 190 Infrastructure WLAN

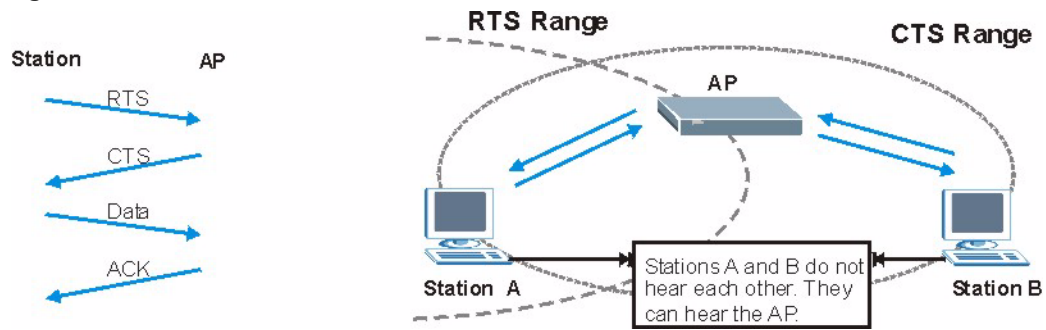
Channel

A channel is the radio frequency(ies) used by IEEE 802.11a/b/g wireless devices. Channels available depend on your geographical area. You may have a choice of channels (for your region) so you should use a different channel than an adjacent AP (access point) to reduce interference. Interference occurs when radio signals from different access points overlap causing interference and degrading performance.

Adjacent channels partially overlap however. To avoid interference due to overlap, your AP should be on a channel at least five channels away from a channel that an adjacent AP is using. For example, if your region has 11 channels and an adjacent AP is using channel 1, then you need to select a channel between 6 or 11.

RTS/CTS

A hidden node occurs when two stations are within range of the same access point, but are not within range of each other. The following figure illustrates a hidden node. Both stations (STA) are within range of the access point (AP) or wireless gateway, but out-of-range of each other, so they cannot "hear" each other, that is they do not know if the channel is currently being used. Therefore, they are considered hidden from each other.

Figure 191 RTS/CTS

When station **A** sends data to the AP, it might not know that the station **B** is already using the channel. If these two stations send data at the same time, collisions may occur when both sets of data arrive at the AP at the same time, resulting in a loss of messages for both stations.

RTS/CTS is designed to prevent collisions due to hidden nodes. An **RTS/CTS** defines the biggest size data frame you can send before an RTS (Request To Send)/CTS (Clear to Send) handshake is invoked.

When a data frame exceeds the **RTS/CTS** value you set (between 0 to 2432 bytes), the station that wants to transmit this frame must first send an RTS (Request To Send) message to the AP for permission to send it. The AP then responds with a CTS (Clear to Send) message to all other stations within its range to notify them to defer their transmission. It also reserves and confirms with the requesting station the time frame for the requested transmission.

Stations can send frames smaller than the specified **RTS/CTS** directly to the AP without the RTS (Request To Send)/CTS (Clear to Send) handshake.

You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake.

If the **RTS/CTS** value is greater than the **Fragmentation Threshold** value (see next), then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Note: Enabling the RTS Threshold causes redundant network overhead that could negatively affect the throughput performance instead of providing a remedy.

Fragmentation Threshold

A **Fragmentation Threshold** is the maximum data fragment size (between 256 and 2432 bytes) that can be sent in the wireless network before the AP will fragment the packet into smaller data frames.

A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference.

If the **Fragmentation Threshold** value is smaller than the **RTS/CTS** value (see previously) you set then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Preamble Type

Preamble is used to signal that data is coming to the receiver. **Short** and **Long** refer to the length of the synchronization field in a packet.

Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11b/g compliant wireless adapters support long preamble, but not all support short preamble.

Select **Long** preamble if you are unsure what preamble mode the wireless adapters support, and to provide more reliable communications in busy wireless networks.

Select **Short** preamble if you are sure the wireless adapters support it, and to provide more efficient communications.

Select **Dynamic** to have the AP automatically use short preamble when wireless adapters support it, otherwise the AP uses long preamble.

Note: The AP and the wireless adapters **MUST** use the same preamble mode in order to communicate.

IEEE 802.11g Wireless LAN

IEEE 802.11g is fully compatible with the IEEE 802.11b standard. This means an IEEE 802.11b adapter can interface directly with an IEEE 802.11g access point (and vice versa) at 11 Mbps or lower depending on range. IEEE 802.11g has several intermediate rate steps between the maximum and minimum data rates. The IEEE 802.11g data rate and modulation are as follows:

Table 110 IEEE 802.11g

DATA RATE (MBPS)	MODULATION
1	DBPSK (Differential Binary Phase Shift Keyed)
2	DQPSK (Differential Quadrature Phase Shift Keying)
5.5 / 11	CCK (Complementary Code Keying)
6/9/12/18/24/36/48/54	OFDM (Orthogonal Frequency Division Multiplexing)

Wireless Security Overview

Wireless security is vital to your network to protect wireless communication between wireless clients, access points and the wired network.

Wireless security methods available on the Prestige are data encryption, wireless client authentication, restricting access by device MAC address and hiding the Prestige identity.

The following figure shows the relative effectiveness of these wireless security methods available on your Prestige.

Table 111 Wireless Security Levels

Security Level	Security Type
Least Secure	Unique SSID (Default)
	Unique SSID with Hide SSID Enabled
	MAC Address Filtering
	WEP Encryption
	IEEE802.1x EAP with RADIUS Server Authentication
Most Secure	Wi-Fi Protected Access (WPA)
	WPA2

Note: You must enable the same wireless security settings on the Prestige and on all wireless clients that you want to associate with it.

IEEE 802.1x

In June 2001, the IEEE 802.1x standard was designed to extend the features of IEEE 802.11 to support extended authentication as well as providing additional accounting and control features. It is supported by Windows XP and a number of network devices. Some advantages of IEEE 802.1x are:

- User based identification that allows for roaming.
- Support for RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) for centralized user profile and accounting management on a network RADIUS server.
- Support for EAP (Extensible Authentication Protocol, RFC 2486) that allows additional authentication methods to be deployed with no changes to the access point or the wireless clients.

RADIUS

RADIUS is based on a client-server model that supports authentication, authorization and accounting. The access point is the client and the server is the RADIUS server. The RADIUS server handles the following tasks:

- **Authentication**
Determines the identity of the users.
- **Authorization**
Determines the network services available to authenticated users once they are connected to the network.
- **Accounting**
Keeps track of the client's network activity.

RADIUS is a simple package exchange in which your AP acts as a message relay between the wireless client and the network RADIUS server.

Types of RADIUS Messages

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user authentication:

- **Access-Request**
Sent by an access point requesting authentication.
- **Access-Reject**
Sent by a RADIUS server rejecting access.
- **Access-Accept**
Sent by a RADIUS server allowing access.
- **Access-Challenge**
Sent by a RADIUS server requesting more information in order to allow access. The access point sends a proper response from the user and then sends another Access-Request message.

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user accounting:

- **Accounting-Request**
Sent by the access point requesting accounting.
- **Accounting-Response**
Sent by the RADIUS server to indicate that it has started or stopped accounting.

In order to ensure network security, the access point and the RADIUS server use a shared secret key, which is a password, they both know. The key is not sent over the network. In addition to the shared key, password information exchanged is also encrypted to protect the network from unauthorized access.

Types of Authentication

This section discusses some popular authentication types: **EAP-MD5**, **EAP-TLS**, **EAP-TTLS**, **PEAP** and **LEAP**.

The type of authentication you use depends on the RADIUS server or the AP. Consult your network administrator for more information.

EAP-MD5 (Message-Digest Algorithm 5)

MD5 authentication is the simplest one-way authentication method. The authentication server sends a challenge to the wireless client. The wireless client 'proves' that it knows the password by encrypting the password with the challenge and sends back the information. Password is not sent in plain text.

However, MD5 authentication has some weaknesses. Since the authentication server needs to get the plaintext passwords, the passwords must be stored. Thus someone other than the authentication server may access the password file. In addition, it is possible to impersonate an authentication server as MD5 authentication method does not perform mutual authentication. Finally, MD5 authentication method does not support data encryption with dynamic session key. You must configure WEP encryption keys for data encryption.

EAP-TLS (Transport Layer Security)

With EAP-TLS, digital certifications are needed by both the server and the wireless clients for mutual authentication. The server presents a certificate to the client. After validating the identity of the server, the client sends a different certificate to the server. The exchange of certificates is done in the open before a secured tunnel is created. This makes user identity vulnerable to passive attacks. A digital certificate is an electronic ID card that authenticates the sender's identity. However, to implement EAP-TLS, you need a Certificate Authority (CA) to handle certificates, which imposes a management overhead.

EAP-TTLS (Tunneled Transport Layer Service)

EAP-TTLS is an extension of the EAP-TLS authentication that uses certificates for only the server-side authentications to establish a secure connection. Client authentication is then done by sending username and password through the secure connection, thus client identity is protected. For client authentication, EAP-TTLS supports EAP methods and legacy authentication methods such as PAP, CHAP, MS-CHAP and MS-CHAP v2.

PEAP (Protected EAP)

Like EAP-TTLS, server-side certificate authentication is used to establish a secure connection, then use simple username and password methods through the secured connection to authenticate the clients, thus hiding client identity. However, PEAP only supports EAP methods, such as EAP-MD5, EAP-MSCHAPv2 and EAP-GTC (EAP-Generic Token Card), for client authentication. EAP-GTC is implemented only by Cisco.

LEAP

LEAP (Lightweight Extensible Authentication Protocol) is a Cisco implementation of IEEE 802.1x.

Dynamic WEP Key Exchange

The AP maps a unique key that is generated with the RADIUS server. This key expires when the wireless connection times out, disconnects or reauthentication times out. A new WEP key is generated each time reauthentication is performed.

If this feature is enabled, it is not necessary to configure a default encryption key in the Wireless screen. You may still configure and store keys here, but they will not be used while Dynamic WEP is enabled.

Note: EAP-MD5 cannot be used with Dynamic WEP Key Exchange

For added security, certificate-based authentications (EAP-TLS, EAP-TTLS and PEAP) use dynamic keys for data encryption. They are often deployed in corporate environments, but for public deployment, a simple user name and password pair is more practical. The following table is a comparison of the features of authentication types.

Table 112 Comparison of EAP Authentication Types

		EAP-TLS	EAP-TTLS	PEAP	LEAP
Mutual Authentication	No	Yes	Yes	Yes	Yes
Certificate – Client	No	Yes	Optional	Optional	No
Certificate – Server	No	Yes	Yes	Yes	No
Dynamic Key Exchange	No	Yes	Yes	Yes	Yes
Credential Integrity	None	Strong	Strong	Strong	Moderate
Deployment Difficulty	Easy	Hard	Moderate	Moderate	Moderate
Client Identity Protection	No	No	Yes	Yes	No

WPA and WPA2

Wi-Fi Protected Access (WPA) is a subset of the IEEE 802.11i standard. WPA2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA.

Key differences between WPA or WPA2 and WEP are improved data encryption and user authentication.

If both an AP and the wireless clients support WPA2 and you have an external RADIUS server, use WPA2 for stronger data encryption. If you don't have an external RADIUS server, you should use WPA2-PSK (WPA2-Pre-Shared Key) that only requires a single (identical) password entered into each access point, wireless gateway and wireless client. As long as the passwords match, a wireless client will be granted access to a WLAN.

If the AP or the wireless clients do not support WPA2, just use WPA or WPA-PSK depending on whether you have an external RADIUS server or not.

Select WEP only when the AP and/or wireless clients do not support WPA or WPA2. WEP is less secure than WPA or WPA2.

Encryption

Both WPA and WPA2 improve data encryption by using Temporal Key Integrity Protocol (TKIP), Message Integrity Check (MIC) and IEEE 802.1x. WPA and WPA2 use Advanced Encryption Standard (AES) in the Counter mode with Cipher block chaining Message authentication code Protocol (CCMP) to offer stronger encryption than TKIP.

TKIP uses 128-bit keys that are dynamically generated and distributed by the authentication server. AES (Advanced Encryption Standard) is a block cipher that uses a 256-bit mathematical algorithm called Rijndael. They both include a per-packet key mixing function, a Message Integrity Check (MIC) named Michael, an extended initialization vector (IV) with sequencing rules, and a re-keying mechanism.

WPA and WPA2 regularly change and rotate the encryption keys so that the same encryption key is never used twice.

The RADIUS server distributes a Pairwise Master Key (PMK) key to the AP that then sets up a key hierarchy and management system, using the PMK to dynamically generate unique data encryption keys to encrypt every data packet that is wirelessly communicated between the AP and the wireless clients. This all happens in the background automatically.

The Message Integrity Check (MIC) is designed to prevent an attacker from capturing data packets, altering them and resending them. The MIC provides a strong mathematical function in which the receiver and the transmitter each compute and then compare the MIC. If they do not match, it is assumed that the data has been tampered with and the packet is dropped.

By generating unique data encryption keys for every data packet and by creating an integrity checking mechanism (MIC), with TKIP and AES it is more difficult to decrypt data on a Wi-Fi network than WEP and difficult for an intruder to break into the network.

The encryption mechanisms used for WPA(2) and WPA(2)-PSK are the same. The only difference between the two is that WPA(2)-PSK uses a simple common password, instead of user-specific credentials. The common-password approach makes WPA(2)-PSK susceptible to brute-force password-guessing attacks but it's still an improvement over WEP as it employs a consistent, single, alphanumeric password to derive a PMK which is used to generate unique temporal encryption keys. This prevent all wireless devices sharing the same encryption keys. (a weakness of WEP)

User Authentication

WPA and WPA2 apply IEEE 802.1x and Extensible Authentication Protocol (EAP) to authenticate wireless clients using an external RADIUS database. WPA2 reduces the number of key exchange messages from six to four (CCMP 4-way handshake) and shortens the time required to connect to a network. Other WPA2 authentication features that are different from WPA include key caching and pre-authentication. These two features are optional and may not be supported in all wireless devices.

Key caching allows a wireless client to store the PMK it derived through a successful authentication with an AP. The wireless client uses the PMK when it tries to connect to the same AP and does not need to go with the authentication process again.

Pre-authentication enables fast roaming by allowing the wireless client (already connecting to an AP) to perform IEEE 802.1x authentication with another AP before connecting to it.

Wireless Client WPA Supplicants

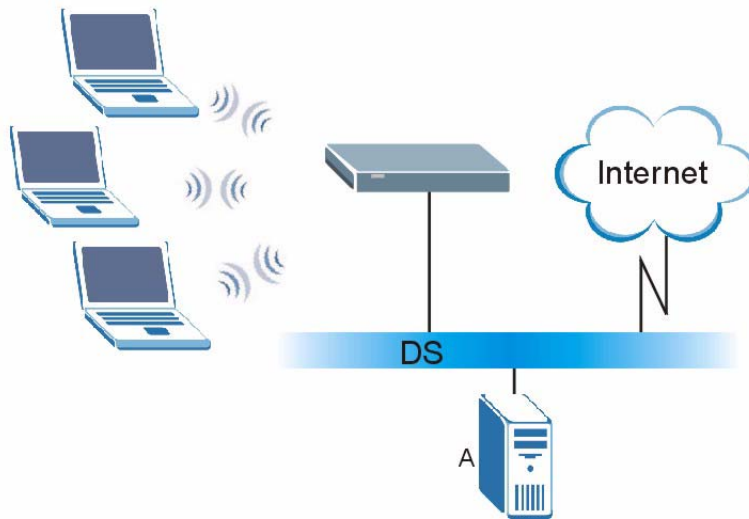
A wireless client supplicant is the software that runs on an operating system instructing the wireless client how to use WPA. At the time of writing, the most widely available supplicant is the WPA patch for Windows XP, Funk Software's Odyssey client.

The Windows XP patch is a free download that adds WPA capability to Windows XP's built-in "Zero Configuration" wireless client. However, you must run Windows XP to use it.

WPA(2) with RADIUS Application Example

You need the IP address of the RADIUS server, its port number (default is 1812), and the RADIUS shared secret. A WPA(2) application example with an external RADIUS server looks as follows. "A" is the RADIUS server. "DS" is the distribution system.

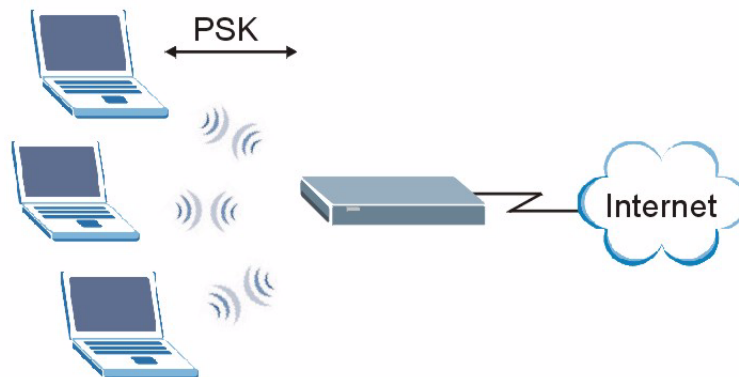
- 1** The AP passes the wireless client's authentication request to the RADIUS server.
- 2** The RADIUS server then checks the user's identification against its database and grants or denies network access accordingly.
- 3** The RADIUS server distributes a Pairwise Master Key (PMK) key to the AP that then sets up a key hierarchy and management system, using the pair-wise key to dynamically generate unique data encryption keys to encrypt every data packet that is wirelessly communicated between the AP and the wireless clients.

Figure 192 WPA(2) with RADIUS Application Example

WPA(2)-PSK Application Example

A WPA(2)-PSK application looks as follows.

- 1** First enter identical passwords into the AP and all wireless clients. The Pre-Shared Key (PSK) must consist of between 8 and 63 ASCII characters or 64 hexadecimal characters (including spaces and symbols).
- 2** The AP checks each wireless client's password and (only) allows it to join the network if the password matches.
- 3** The AP and wireless clients use the pre-shared key to generate a common PMK (Pairwise Master Key).
- 4** The AP and wireless clients use the TKIP or AES encryption process to encrypt data exchanged between them.

Figure 193 WPA(2)-PSK Authentication

Security Parameters Summary

Refer to this table to see what other security parameters you should configure for each Authentication Method/ key management protocol type. MAC address filters are not dependent on how you configure these security features.

Table 113 Wireless Security Relational Matrix

	ENCRYPTION METHOD	ENTER MANUAL KEY	IEEE 802.1X
Open	None	No	Disable
			Enable without Dynamic WEP Key
Open	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
Shared	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
WPA	TKIP/AES	No	Enable
WPA-PSK	TKIP/AES	Yes	Disable
WPA2	TKIP/AES	No	Enable
WPA2-PSK	TKIP/AES	Yes	Disable

APPENDIX F

Log Descriptions

This appendix provides descriptions of example log messages.

Table 114 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 114 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 115 System Error Logs

	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 116 Access Control Logs

	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 117 TCP Reset Logs

	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 CLI command: "sys firewall tcprst").

Table 118 Packet Filter Logs

	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 119 ICMP Logs

	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 131 on page 305 .
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 131 on page 305 .
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 120 CDR Logs

	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 121 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 121 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 122 UPnP Logs

	DESCRIPTION
UPnP pass through Firewall	UPnP packets can pass through the firewall.

Table 123 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 123 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 124 Attack Logs

	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 131 on page 305 .
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 131 on page 305 .
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 131 on page 305 .
icmp echo: ICMP (type:%d, code:%d)	The firewall detected an ICMP echo attack. For type and code details, see Table 131 on page 305 .
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 131 on page 305 .
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 131 on page 305 .
traceroute ICMP (type:%d, code:%d)	The firewall detected an ICMP traceroute attack. For type and code details, see Table 131 on page 305 .

Table 125 IPsec Logs

	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" CLI 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 126 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 126 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 126 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 1 verification 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 126 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 127 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 127 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 128 on page 303 for the corresponding descriptions of the codes.

Table 128 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 128 Certificate Path Verification Failure Reason Codes (continued)

CODE	DESCRIPTION
26	Database method failed.
27	Path was not verified.
28	Maximum path length reached.

Table 129 802.1X Logs

	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 method.	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 130 ACL Setting Notes

	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.
(D to L)	DMZ to LAN	ACL set for packets traveling from the DMZ to the LAN.
(D to W)	DMZ to WAN	ACL set for packets traveling from the DMZ to the WAN.
(W to D)	WAN to DMZ	ACL set for packets traveling from the WAN to the DMZ.
(L to D)	LAN to DMZ	ACL set for packets traveling from the LAN to the DMZ.
(L to L/ZW)	LAN to LAN/ ZyXEL Device	ACL set for packets traveling from the LAN to the LAN or the ZyXEL Device.
(W to W/ZW)	WAN to WAN/ ZyXEL Device	ACL set for packets traveling from the WAN to the WAN or the ZyXEL Device.
(D to D/ZW)	DMZ to DMZ/ ZyXEL Device	ACL set for packets traveling from the DMZ to the DM or the ZyXEL Device.

Table 131 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

Table 131 ICMP Notes (continued)

TYPE	CODE	DESCRIPTION
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
	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 132 Syslog Logs

	DESCRIPTION
<pre><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>"</pre>	<p>"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.</p>

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 133 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

Table 133 RFC-2408 ISAKMP Payload Types (continued)

LOG DISPLAY	PAYLOAD TYPE
SIG	Signature
NONCE	Nonce
NOTFY	Notification
DEL	Delete
VID	Vendor ID

Log Commands

Go to the command interpreter interface.

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 194 Displaying Log Categories Example

```

Copyright (c) 1994 - 2004 ZyXEL Communications Corp.
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 195 Displaying Log Parameters Example

```

ras> sys logs category access
Usage: [0:none/1:log/2:alert/3:both] [0:don't show debug type/
1:show debug type]

```

- 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.

- 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)			

APPENDIX G

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 134 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 134 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 134 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 134 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 H

Internal SPTGEN

This appendix introduces Internal SPTGEN. All menus shown in this appendix are example menus meant to show SPTGEN usage. Actual menus for your product may differ.

Internal SPTGEN Overview

Internal SPTGEN (System Parameter Table Generator) is a configuration text file useful for efficient configuration of multiple Prestiges. Internal SPTGEN lets you configure, save and upload multiple menus at the same time using just one configuration text file – eliminating the need to navigate and configure individual screens for each Prestige. You can use FTP to get the Internal SPTGEN file. Then edit the file in a text editor and use FTP to upload it again to the same device or another one. See the following sections for details.

The Configuration Text File Format

All Internal SPTGEN text files conform to the following format:

```
<field identification number = field name = parameter values
allowed = input>,
```

where <input> is your input conforming to <parameter values allowed>.

The figure shown next is an example of an Internal SPTGEN text file.

Figure 196 Configuration Text File Format: Column Descriptions

```
/ Menu 1 General Setup
10000000 = Configured          <0 (No) | 1 (Yes)>      = 1
10000001 = System Name        <Str>                  = Your Device
10000002 = Location           <Str>                  =
10000003 = Contact Person's Name <Str>                  =
10000004 = Route IP           <0 (No) | 1 (Yes)>      = 1
10000005 = Route IPX          <0 (No) | 1 (Yes)>      = 0
10000006 = Bridge             <0 (No) | 1 (Yes)>      = 0
```

Note: DO NOT alter or delete any field except parameters in the Input column.

This appendix introduces Internal SPTGEN. All menus shown in this appendix are example menus meant to show SPTGEN usage. Actual menus for your product may differ.

Internal SPTGEN File Modification - Important Points to Remember

Each parameter you enter must be preceded by one “=” sign and one space.

Some parameters are dependent on others. For example, if you disable the **Configured** field in menu 1 (see [Figure 196 on page 313](#)), then you disable every field in this menu.

If you enter a parameter that is invalid in the **Input** column, the Prestige will not save the configuration and the command line will display the **Field Identification Number**. [Figure 197 on page 314](#), shown next, is an example of what the Prestige displays if you enter a value other than “0” or “1” in the **Input** column of **Field Identification Number** 1000000 (refer to [Figure 196 on page 313](#)).

Figure 197 Invalid Parameter Entered: Command Line Example

```
field value is not legal error:-1
ROM-t is not saved, error Line ID:10000000
reboot to get the original configuration
Bootbase Version: V2.02 | 2/22/2001 13:33:11
RAM: Size = 8192 Kbytes
FLASH: Intel 8M *2
```

The Prestige will display the following if you enter parameter(s) that *are* valid.

Figure 198 Valid Parameter Entered: Command Line Example

```
Please wait for the system to write SPT text file(ROM-t)...
Bootbase Version: V2.02 | 2/22/2001 13:33:11
RAM: Size = 8192 Kbytes
FLASH: Intel 8M *2
```

Internal SPTGEN FTP Download Example

- 1 Launch your FTP application.
- 2 Enter "bin". The command “bin” sets the transfer mode to binary.
- 3 Get "rom-t" file. The command “get” transfers files from the Prestige to your computer. The name “rom-t” is the configuration filename on the Prestige.
- 4 Edit the "rom-t" file using a text editor (do not use a word processor). You must leave this FTP screen to edit.

Figure 199 Internal SPTGEN FTP Download Example

```
c:\ftp 192.168.1.1
220 PPP FTP version 1.0 ready at Sat Jan 1 03:22:12 2000
User (192.168.1.1:(none)):
331 Enter PASS command
Password:
230 Logged in
ftp>bin
200 Type I OK
ftp> get rom-t
ftp>bye
c:\edit rom-t
(edit the rom-t text file by a text editor and save it)
```

Note: You can rename your “rom-t” file when you save it to your computer but it must be named “rom-t” when you upload it to your Prestige.

Internal SPTGEN FTP Upload Example

- 1 Launch your FTP application.
- 2 Enter "bin". The command “bin” sets the transfer mode to binary.
- 3 Upload your “rom-t” file from your computer to the Prestige using the “put” command.
computer to the Prestige.
- 4 Exit this FTP application.

Figure 200 Internal SPTGEN FTP Upload Example

```
c:\ftp 192.168.1.1
220 PPP FTP version 1.0 ready at Sat Jan 1 03:22:12 2000
User (192.168.1.1:(none)):
331 Enter PASS command
Password:
230 Logged in
ftp>bin
200 Type I OK
ftp> put rom-t
ftp>bye
```

Example Internal SPTGEN Menus

This section provides example Internal SPTGEN menus.

Table 135 Abbreviations Used in the Example Internal SPTGEN Screens Table

ABBREVIATION	MEANING
FIN	Field Identification Number
FN	Field Name
PVA	Parameter Values Allowed
INPUT	An example of what you may enter
*	Applies to the Prestige.

Table 136 Menu 1 General Setup

/ Menu 1 General Setup			
FIN	FN	PVA	INPUT
10000000 =	Configured	<0 (No) | 1 (Yes)>	= 0
10000001 =	System Name	<Str>	= Your Device
10000002 =	Location	<Str>	=
10000003 =	Contact Person's Name	<Str>	=
10000004 =	Route IP	<0 (No) | 1 (Yes)>	= 1
10000006 =	Bridge	<0 (No) | 1 (Yes)>	= 0

Table 137 Menu 3

/ Menu 3.1 General Ethernet Setup			
FIN	FN	PVA	INPUT
30100001 =	Input Protocol filters Set 1		= 2
30100002 =	Input Protocol filters Set 2		= 256
30100003 =	Input Protocol filters Set 3		= 256
30100004 =	Input Protocol filters Set 4		= 256
30100005 =	Input device filters Set 1		= 256
30100006 =	Input device filters Set 2		= 256
30100007 =	Input device filters Set 3		= 256
30100008 =	Input device filters Set 4		= 256
30100009 =	Output protocol filters Set 1		= 256
30100010 =	Output protocol filters Set 2		= 256
30100011 =	Output protocol filters Set 3		= 256

Table 137 Menu 3

30100012 =	Output protocol filters Set 4		= 256
30100013 =	Output device filters Set 1		= 256
30100014 =	Output device filters Set 2		= 256
30100015 =	Output device filters Set 3		= 256
30100016 =	Output device filters Set 4		= 256
/ Menu 3.2 TCP/IP and DHCP Ethernet Setup			
FIN	FN	PVA	INPUT
30200001 =	DHCP	<0 (None) | 1 (Server) | 2 (Relay)>	= 0
30200002 =	Client IP Pool Starting Address		= 192.168.1.33
30200003 =	Size of Client IP Pool		= 32
30200004 =	Primary DNS Server		= 0.0.0.0
30200005 =	Secondary DNS Server		= 0.0.0.0
30200006 =	Remote DHCP Server		= 0.0.0.0
30200008 =	IP Address		= 172.21.2.200
30200009 =	IP Subnet Mask		= 16
30200010 =	RIP Direction	<0 (None) | 1 (Both) | 2 (In Only) | 3 (Out Only)>	= 0
30200011 =	Version	<0 (Rip-1) | 1 (Rip-2B) | 2 (Rip-2M)>	= 0
30200012 =	Multicast	<0 (IGMP-v2) | 1 (IGMP-v1) | 2 (None)>	= 2
30200013 =	IP Policies Set 1 (1~12)		= 256
30200014 =	IP Policies Set 2 (1~12)		= 256
30200015 =	IP Policies Set 3 (1~12)		= 256
30200016 =	IP Policies Set 4 (1~12)		= 256
/ Menu 3.2.1 IP Alias Setup			
FIN	FN	PVA	INPUT
30201001 =	IP Alias 1	<0 (No) | 1 (Yes)>	= 0
30201002 =	IP Address		= 0.0.0.0
30201003 =	IP Subnet Mask		= 0
30201004 =	RIP Direction	<0 (None) | 1 (Both) | 2 (In Only) | 3 (Out Only)>	= 0

Table 137 Menu 3

30201005 =	Version	<0 (Rip-1) | 1 (Rip-2B) | 2 (Rip-2M) >	= 0
30201006 =	IP Alias #1 Incoming protocol filters Set 1		= 256
30201007 =	IP Alias #1 Incoming protocol filters Set 2		= 256
30201008 =	IP Alias #1 Incoming protocol filters Set 3		= 256
30201009 =	IP Alias #1 Incoming protocol filters Set 4		= 256
30201010 =	IP Alias #1 Outgoing protocol filters Set 1		= 256
30201011 =	IP Alias #1 Outgoing protocol filters Set 2		= 256
30201012 =	IP Alias #1 Outgoing protocol filters Set 3		= 256
30201013 =	IP Alias #1 Outgoing protocol filters Set 4		= 256
30201014 =	IP Alias 2 <0 (No) | 1 (Yes) >		= 0
30201015 =	IP Address		= 0.0.0.0
30201016 =	IP Subnet Mask		= 0
30201017 =	RIP Direction	<0 (None) | 1 (Both) | 2 (In Only) | 3 (Out Only) >	= 0
30201018 =	Version	<0 (Rip-1) | 1 (Rip-2B) | 2 (Rip-2M) >	= 0
30201019 =	IP Alias #2 Incoming protocol filters Set 1		= 256
30201020 =	IP Alias #2 Incoming protocol filters Set 2		= 256
30201021 =	IP Alias #2 Incoming protocol filters Set 3		= 256
30201022 =	IP Alias #2 Incoming protocol filters Set 4		= 256
30201023 =	IP Alias #2 Outgoing protocol filters Set 1		= 256
30201024 =	IP Alias #2 Outgoing protocol filters Set 2		= 256
30201025 =	IP Alias #2 Outgoing protocol filters Set 3		= 256
30201026 =	IP Alias #2 Outgoing protocol filters Set 4		= 256

*/ Menu 3.5 Wireless LAN Setup

Table 137 Menu 3

FIN	FN	PVA	INPUT
30500001 =	ESSID		Wireless
30500002 =	Hide ESSID	<0 (No) | 1 (Yes)>	= 0
30500003 =	Channel ID	<1|2|3|4|5|6|7 |8|9|10|11|12| 13>	= 1
30500004 =	RTS Threshold	<0 ~ 2432>	= 2432
30500005 =	FRAG. Threshold	<256 ~ 2432>	= 2432
30500006 =	WEP	<0 (DISABLE) | 1 (64-bit WEP) | 2 (128-bit WEP)>	= 0
30500007 =	Default Key	<1|2|3|4>	= 0
30500008 =	WEP Key1		=
30500009 =	WEP Key2		=
30500010 =	WEP Key3		=
30500011 =	WEP Key4		=
30500012 =	Wlan Active	<0 (Disable) | 1 (Enable)>	= 0
30500013 =	Wlan 4X Mode	<0 (Disable) | 1 (Enable)>	= 0
*/ MENU 3.5.1 WLAN MAC ADDRESS FILTER			
FIN	FN	PVA	INPUT
30501001 =	Mac Filter Active	<0 (No) | 1 (Yes)>	= 0
30501002 =	Filter Action	<0 (Allow) | 1 (Deny)>	= 0
30501003 =	Address 1		= 00:00:00:00:0 0:00
30501004 =	Address 2		= 00:00:00:00:0 0:00
30501005 =	Address 3		= 00:00:00:00:0 0:00
Continued	...		...
30501034 =	Address 32		= 00:00:00:00:0 0:00

Table 138 Menu 4 Internet Access Setup

/ Menu 4 Internet Access Setup			
FIN	FN	PVA	INPUT
40000000 =	Configured	<0 (No) | 1 (Yes)>	= 1
40000001 =	ISP	<0 (No) | 1 (Yes)>	= 1
40000002 =	Active	<0 (No) | 1 (Yes)>	= 1
40000003 =	ISP's Name		= ChangeMe
40000004 =	Encapsulation	<2 (PPPOE) | 3 (RFC 1483) | 4 (PPPoA ) | 5 (ENET ENCAP)>	= 2
40000005 =	Multiplexing	<1 (LLC-based) | 2 (VC-based)>	= 1
40000006 =	VPI #		= 0
40000007 =	VCI #		= 35
40000008 =	Service Name	<Str>	= any
40000009 =	My Login	<Str>	= test@pqa
40000010 =	My Password	<Str>	= 1234
40000011 =	Single User Account	<0 (No) | 1 (Yes)>	= 1
40000012 =	IP Address Assignment	<0 (Static) | 1 (D ynamic)>	= 1
40000013 =	IP Address		= 0.0.0.0
40000014 =	Remote IP address		= 0.0.0.0
40000015 =	Remote IP subnet mask		= 0
40000016 =	ISP incoming protocol filter set 1		= 6
40000017 =	ISP incoming protocol filter set 2		= 256
40000018 =	ISP incoming protocol filter set 3		= 256
40000019 =	ISP incoming protocol filter set 4		= 256
40000020 =	ISP outgoing protocol filter set 1		= 256
40000021 =	ISP outgoing protocol filter set 2		= 256
40000022 =	ISP outgoing protocol filter set 3		= 256
40000023 =	ISP outgoing protocol filter set 4		= 256
40000024 =	ISP PPPoE idle timeout		= 0
40000025 =	Route IP	<0 (No) | 1 (Yes)>	= 1
40000026 =	Bridge	<0 (No) | 1 (Yes)>	= 0

Table 138 Menu 4 Internet Access Setup (continued)

40000027 =	ATM QoS Type	<0 (CBR) | 1 (UBR)>	= 1
40000028 =	Peak Cell Rate (PCR)		= 0
40000029 =	Sustain Cell Rate (SCR)		= 0
40000030 =	Maximum Burst Size (MBS)		= 0
40000031 =	RIP Direction	<0 (None) | 1 (Both) | 2 (In Only) | 3 (Out Only)>	= 0
40000032 =	RIP Version	<0 (Rip-1) | 1 (Rip-2B) | 2 (Rip-2M)>	= 0
40000033 =	Nailed-up Connection	<0 (No) | 1 (Yes)>	= 0

Table 139 Menu 12

/ Menu 12.1.1 IP Static Route Setup			
FIN	FN	PVA	INPUT
120101001 =	IP Static Route set #1, Name	<Str>	=
120101002 =	IP Static Route set #1, Active	<0 (No) | 1 (Yes)>	= 0
120101003 =	IP Static Route set #1, Destination IP address		= 0.0.0.0
120101004 =	IP Static Route set #1, Destination IP subnetmask		= 0
120101005 =	IP Static Route set #1, Gateway		= 0.0.0.0
120101006 =	IP Static Route set #1, Metric		= 0
120101007 =	IP Static Route set #1, Private	<0 (No) | 1 (Yes)>	= 0
/ Menu 12.1.2 IP Static Route Setup			
FIN	FN	PVA	INPUT
120108001 =	IP Static Route set #8, Name	<Str>	=
120108002 =	IP Static Route set #8, Active	<0 (No) | 1 (Yes)>	= 0
120108003 =	IP Static Route set #8, Destination IP address		= 0.0.0.0
120108004 =	IP Static Route set #8, Destination IP subnetmask		= 0
120108005 =	IP Static Route set #8, Gateway		= 0.0.0.0
120108006 =	IP Static Route set #8, Metric		= 0
120108007 =	IP Static Route set #8, Private	<0 (No) | 1 (Yes)>	= 0

Table 140 Menu 15 SUA Server Setup

/ Menu 15 SUA Server Setup			
FIN	FN	PVA	INPUT
150000001 =	SUA Server IP address for default port		= 0.0.0.0
150000002 =	SUA Server #2 Active	<0 (No) | 1 (Yes)>	= 0
150000003 =	SUA Server #2 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000004 =	SUA Server #2 Port Start		= 0
150000005 =	SUA Server #2 Port End		= 0
150000006 =	SUA Server #2 Local IP address		= 0.0.0.0
150000007 =	SUA Server #3 Active	<0 (No) | 1 (Yes)>	= 0
150000008 =	SUA Server #3 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000009 =	SUA Server #3 Port Start		= 0
150000010 =	SUA Server #3 Port End		= 0
150000011 =	SUA Server #3 Local IP address		= 0.0.0.0
150000012 =	SUA Server #4 Active	<0 (No) | 1 (Yes)>	= 0
150000013 =	SUA Server #4 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000014 =	SUA Server #4 Port Start		= 0
150000015 =	SUA Server #4 Port End		= 0
150000016 =	SUA Server #4 Local IP address		= 0.0.0.0
150000017 =	SUA Server #5 Active	<0 (No) | 1 (Yes)>	= 0
150000018 =	SUA Server #5 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000019 =	SUA Server #5 Port Start		= 0
150000020 =	SUA Server #5 Port End		= 0
150000021 =	SUA Server #5 Local IP address		= 0.0.0.0
150000022 =	SUA Server #6 Active	<0 (No) | 1 (Yes)> = 0	= 0
150000023 =	SUA Server #6 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000024 =	SUA Server #6 Port Start		= 0
150000025 =	SUA Server #6 Port End		= 0
150000026 =	SUA Server #6 Local IP address		= 0.0.0.0
150000027 =	SUA Server #7 Active	<0 (No) | 1 (Yes)>	= 0
150000028 =	SUA Server #7 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0.0.0.0
150000029 =	SUA Server #7 Port Start		= 0
150000030 =	SUA Server #7 Port End		= 0

Table 140 Menu 15 SUA Server Setup (continued)

150000031 =	SUA Server #7 Local IP address		= 0.0.0.0
150000032 =	SUA Server #8 Active	<0 (No) | 1 (Yes)>	= 0
150000033 =	SUA Server #8 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000034 =	SUA Server #8 Port Start		= 0
150000035 =	SUA Server #8 Port End		= 0
150000036 =	SUA Server #8 Local IP address		= 0.0.0.0
150000037 =	SUA Server #9 Active	<0 (No) | 1 (Yes)>	= 0
150000038 =	SUA Server #9 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000039 =	SUA Server #9 Port Start		= 0
150000040 =	SUA Server #9 Port End		= 0
150000041 =	SUA Server #9 Local IP address		= 0.0.0.0
150000042 =	SUA Server #10 Active	<0 (No) | 1 (Yes)>	= 0
150000043 =	SUA Server #10 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000044 =	SUA Server #10 Port Start		= 0
150000045 =	SUA Server #10 Port End		= 0
150000046 =	SUA Server #10 Local IP address		= 0.0.0.0
150000047 =	SUA Server #11 Active	<0 (No) | 1 (Yes)>	= 0
150000048 =	SUA Server #11 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000049 =	SUA Server #11 Port Start		= 0
150000050 =	SUA Server #11 Port End		= 0
150000051 =	SUA Server #11 Local IP address		= 0.0.0.0
150000052 =	SUA Server #12 Active	<0 (No) | 1 (Yes)>	= 0
150000053 =	SUA Server #12 Protocol	<0 (All) | 6 (TCP) | 17 (UDP)>	= 0
150000054 =	SUA Server #12 Port Start		= 0
150000055 =	SUA Server #12 Port End		= 0
150000056 =	SUA Server #12 Local IP address		= 0.0.0.0

Table 141 Menu 21.1 Filter Set #1

/ Menu 21 Filter set #1			
FIN	FN	PVA	INPUT
210100001 =	Filter Set 1, Name	<Str>	=
/ Menu 21.1.1.1 set #1, rule #1			
FIN	FN	PVA	INPUT
210101001 =	IP Filter Set 1, Rule 1 Type	<2 (TCP/IP)>	= 2

Table 141 Menu 21.1 Filter Set #1 (continued)

210101002 =	IP Filter Set 1,Rule 1 Active	<0 (No) |1 (Yes)>	= 1
210101003 =	IP Filter Set 1,Rule 1 Protocol		= 6
210101004 =	IP Filter Set 1,Rule 1 Dest IP address		= 0.0.0.0
210101005 =	IP Filter Set 1,Rule 1 Dest Subnet Mask		= 0
210101006 =	IP Filter Set 1,Rule 1 Dest Port		= 137
210101007 =	IP Filter Set 1,Rule 1 Dest Port Comp	<0 (none) |1 (equal) |2 (not equal) |3 (less) |4 (greater)>	= 1
210101008 =	IP Filter Set 1,Rule 1 Src IP address		= 0.0.0.0
210101009 =	IP Filter Set 1,Rule 1 Src Subnet Mask		= 0
210101010 =	IP Filter Set 1,Rule 1 Src Port		= 0
210101011 =	IP Filter Set 1,Rule 1 Src Port Comp	<0 (none) |1 (equal) |2 (not equal) |3 (less) |4 (greater)>	= 0
210101013 =	IP Filter Set 1,Rule 1 Act Match	<1 (check next) |2 (forward) |3 (drop)>	= 3
210101014 =	IP Filter Set 1,Rule 1 Act Not Match	<1 (check next) |2 (forward) |3 (drop)>	= 1
/ Menu 21.1.1.2 set #1, rule #2			
FIN	FN	PVA	INPUT
210102001 =	IP Filter Set 1,Rule 2 Type	<2 (TCP/IP)>	= 2
210102002 =	IP Filter Set 1,Rule 2 Active	<0 (No) |1 (Yes)>	= 1
210102003 =	IP Filter Set 1,Rule 2 Protocol		= 6
210102004 =	IP Filter Set 1,Rule 2 Dest IP address		= 0.0.0.0
210102005 =	IP Filter Set 1,Rule 2 Dest Subnet Mask		= 0
210102006 =	IP Filter Set 1,Rule 2 Dest Port		= 138
210102007 =	IP Filter Set 1,Rule 2 Dest Port Comp	<0 (none) |1 (equal) |2 (not equal) |3 (less) |4 (greater)>	= 1
210102008 =	IP Filter Set 1,Rule 2 Src IP address		= 0.0.0.0
210102009 =	IP Filter Set 1,Rule 2 Src Subnet Mask		= 0
210102010 =	IP Filter Set 1,Rule 2 Src Port		= 0
210102011 =	IP Filter Set 1,Rule 2 Src Port Comp	<0 (none) |1 (equal) |2 (not equal) |3 (less) |4 (greater)>	= 0

Table 141 Menu 21.1 Filter Set #1 (continued)

210102013 =	IP Filter Set 1,Rule 2 Act Match	<1 (check next) |2 (forward) | 3 (drop)>	= 3
210102014 =	IP Filter Set 1,Rule 2 Act Not Match	<1 (check next) |2 (forward) | 3 (drop)>	= 1

Table 142 Menu 21.1 Filer Set #2,

/ Menu 21.1 filter set #2,			
FIN	FN	PVA	INPUT
210200001 =	Filter Set 2, Nam	<Str>	= NetBIOS_WAN
/ Menu 21.1.2.1 Filter set #2, rule #1			
FIN	FN	PVA	INPUT
210201001 =	IP Filter Set 2, Rule 1 Type	<0 (none) |2 (TCP/IP)>	= 2
210201002 =	IP Filter Set 2, Rule 1 Active	<0 (No) |1 (Yes)>	= 1
210201003 =	IP Filter Set 2, Rule 1 Protocol		= 6
210201004 =	IP Filter Set 2, Rule 1 Dest IP address		= 0.0.0.0
210201005 =	IP Filter Set 2, Rule 1 Dest Subnet Mask		= 0
210201006 =	IP Filter Set 2, Rule 1 Dest Port		= 137
210201007 =	IP Filter Set 2, Rule 1 Dest Port Comp	<0 (none) |1 (equal) |2 (not equal) |3 (less) |4 (greater)>	= 1
210201008 =	IP Filter Set 2, Rule 1 Src IP address		= 0.0.0.0
210201009 =	IP Filter Set 2, Rule 1 Src Subnet Mask		= 0
210201010 =	IP Filter Set 2, Rule 1 Src Port		= 0
210201011 =	IP Filter Set 2, Rule 1 Src Port Comp	<0 (none) |1 (equal) |2 (not equal) |3 (less) |4 (greater)>	= 0
210201013 =	IP Filter Set 2, Rule 1 Act Match	<1 (check next) |2 (forward) |3 (drop)>	= 3
210201014 =	IP Filter Set 2, Rule 1 Act Not Match	<1 (check next) |2 (forward) |3 (drop)>	= 1
/ Menu 21.1.2.2 Filter set #2, rule #2			
FIN	FN	PVA	INPUT

Table 142 Menu 21.1 Filer Set #2, (continued)

210202001 =	IP Filter Set 2, Rule 2 Type	<0 (none) | 2 (TCP/IP)>	= 2
210202002 =	IP Filter Set 2, Rule 2 Active	<0 (No) | 1 (Yes)>	= 1
210202003 =	IP Filter Set 2, Rule 2 Protocol		= 6
210202004 =	IP Filter Set 2, Rule 2 Dest IP address		= 0.0.0.0
210202005 =	IP Filter Set 2, Rule 2 Dest Subnet Mask		= 0
210202006 =	IP Filter Set 2, Rule 2 Dest Port		= 138
210202007 =	IP Filter Set 2, Rule 2 Dest Port Comp	<0 (none) | 1 (equal) | 2 (not equal) | 3 (less) | 4 (greater)>	= 1
210202008 =	IP Filter Set 2, Rule 2 Src IP address		= 0.0.0.0
210202009 =	IP Filter Set 2, Rule 2 Src Subnet Mask		= 0
210202010 =	IP Filter Set 2, Rule 2 Src Port		= 0
210202011 =	IP Filter Set 2, Rule 2 Src Port Comp	<0 (none) | 1 (equal) | 2 (not equal) | 3 (less) | 4 (greater)>	= 0
210202013 =	IP Filter Set 2, Rule 2 Act Match	<1 (check next) | 2 (forward) | 3 (drop)>	= 3
210202014 =	IP Filter Set 2, Rule 2 Act Not Match	<1 (check next) | 2 (forward) | 3 (drop)>	= 1

Table 143 Menu 23 System Menus

*/ Menu 23.1 System Password Setup			
FIN	FN	PVA	INPUT
230000000 =	System Password		= 1234
*/ Menu 23.2 System security: radius server			
FIN	FN	PVA	INPUT
230200001 =	Authentication Server Configured	<0 (No) | 1 (Yes)>	= 1
230200002 =	Authentication Server Active	<0 (No) | 1 (Yes)>	= 1
230200003 =	Authentication Server IP Address		= 192.168.1.32
230200004 =	Authentication Server Port		= 1822

Table 143 Menu 23 System Menus (continued)

230200005 =	Authentication Server Shared Secret		= 111111111111 111 111111111111 1111
230200006 =	Accounting Server Configured	<0 (No) | 1 (Yes)>	= 1
230200007 =	Accounting Server Active	<0 (No) | 1 (Yes)>	= 1
230200008 =	Accounting Server IP Address		= 192.168.1.44
230200009 =	Accounting Server Port		= 1823
230200010 =	Accounting Server Shared Secret		= 1234
*/ Menu 23.4 System security: IEEE802.1x			
FIN	FN	PVA	INPUT
230400001 =	Wireless Port Control	<0 (Authentication Required) | 1 (No Access Allowed) | 2 (No Authentication Required)>	= 2
230400002 =	ReAuthentication Timer (in second)		= 555
230400003 =	Idle Timeout (in second)		= 999
230400004 =	Authentication Databases	<0 (Local User Database Only) | 1 (RADIUS Only) | 2 (Local, RADIUS) | 3 (RADIUS, Local)>	= 1
230400005 =	Key Management Protocol	<0 (8021x) | 1 (WPA) | 2 (WPA2)>	= 0
230400006 =	Dynamic WEP Key Exchange	<0 (Disable) | 1 (64-bit WEP) | 2 (128-bit WEP)>	= 0
230400007 =	PSK =		=
230400008 =	WPA Mixed Mode	<0 (Disable) | 1 (Enable)>	= 0
230400009 =	Data Privacy for Broadcast/Multicast packets	<0 (TKIP) | 1 (WEP)>	= 0
230400010 =	WPA Broadcast/Multicast Key Update Timer		= 0

Table 144 Menu 24.11 Remote Management Control

/ Menu 24.11 Remote Management Control			
FIN	FN	PVA	INPUT
241100001 =	TELNET Server Port		= 23

Table 144 Menu 24.11 Remote Management Control (continued)

241100002 =	TELNET Server Access	<0 (all) |1 (none) |2 (Lan) |3 (Wan) >	= 0
241100003 =	TELNET Server Secured IP address		= 0.0.0.0
241100004 =	FTP Server Port		= 21
241100005 =	FTP Server Access	<0 (all) |1 (none) |2 (Lan) |3 (Wan) >	= 0
241100006 =	FTP Server Secured IP address		= 0.0.0.0
241100007 =	WEB Server Port		= 80
241100008 =	WEB Server Access	<0 (all) |1 (none) |2 (Lan) |3 (Wan) >	= 0
241100009 =	WEB Server Secured IP address		= 0.0.0.0

Command Examples

The following are example Internal SPTGEN screens associated with the Prestige's command interpreter commands.

Table 145 Command Examples

	FN	PVA	INPUT
/ci command (for annex a): wan adsl opencmd			
	FN	PVA	INPUT
	ADSL OPMD	<0 (glite) |1 (t1.413) |2 (gdm) |3 (multimode) >	= 3
/ci command (for annex B): wan adsl opencmd			
	FN	PVA	INPUT
	ADSL OPMD	<0 (etsi) |1 (normal) |2 (gdm) |3 (multimode) >	= 3

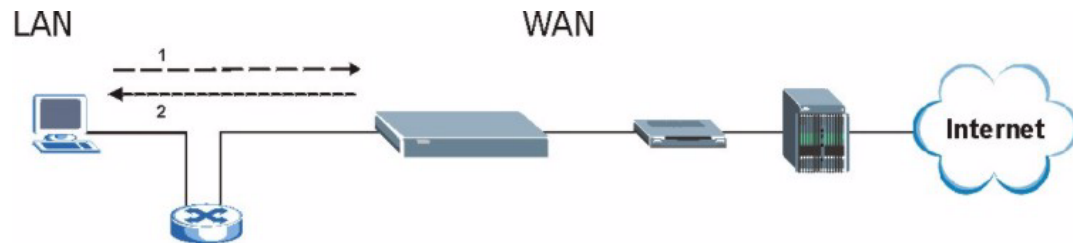
APPENDIX I

Triangle Route

The Ideal Setup

When the firewall is on, your Prestige 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 Prestige to protect your LAN against attacks.

Figure 201 Ideal Setup

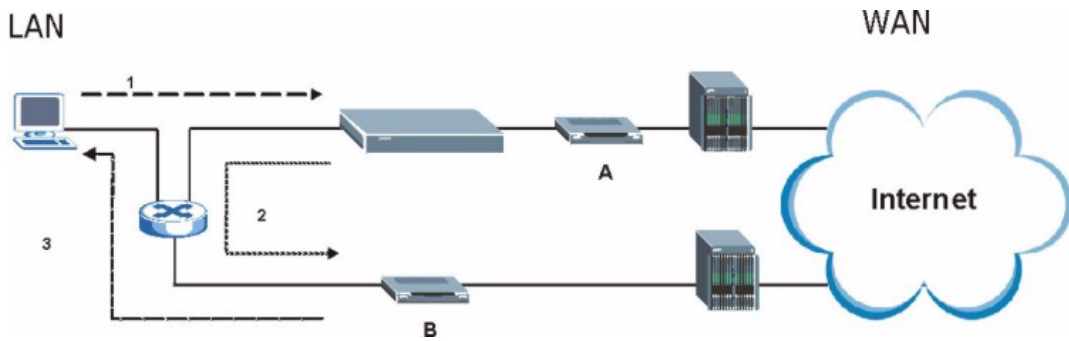


The “Triangle Route” Problem

A traffic route is a path for sending or receiving data packets between two Ethernet devices. Some companies have more than one route to one or more ISPs. If the alternate gateway is on the LAN (and its IP address is in the same subnet), the “triangle 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 Prestige reroutes the SYN packet through Gateway **B** on the LAN to the WAN.
- 3** The reply from the WAN goes directly to the computer on the LAN without going through the Prestige.

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

Figure 202 “Triangle Route” Problem

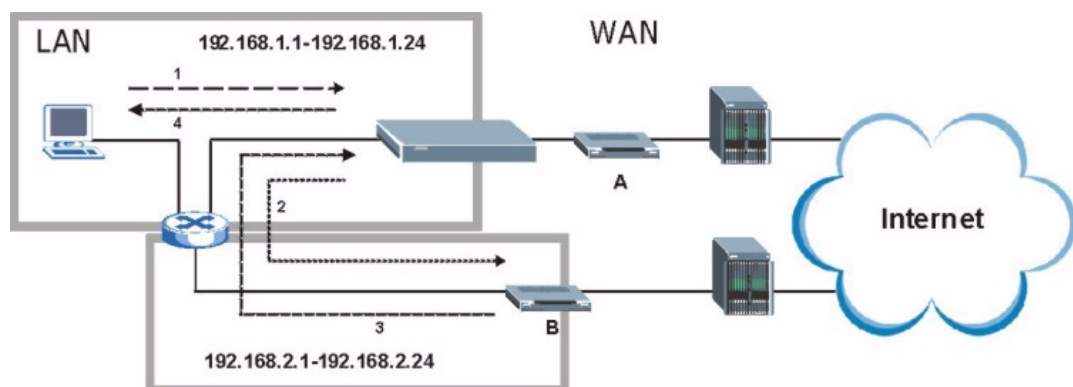
The “Triangle Route” Solutions

This section presents you two solutions to the “triangle route” problem.

IP Aliasing

IP alias allows you to partition your network into logical sections over the same Ethernet interface. Your Prestige supports up to three logical LAN interfaces with the Prestige being the gateway for each logical network. By putting your LAN and Gateway **B** in different subnets, all returning network traffic must pass through the Prestige 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 Prestige reroutes the packet to Gateway B, which is in Subnet 2.
- 3 The reply from WAN goes through the Prestige to the computer on the LAN in Subnet 1.

Figure 203 IP Alias

Index

A

access point [67](#)
 access point. See also AP.
 active protocol [144](#)
 AH [144](#)
 and encapsulation [145](#)
 ESP [144](#)
 ActiveX [134](#)
 Advanced Encryption Standard [288](#)
 AH [144](#)
 and transport mode [145](#)
 Alternative Subnet Mask Notation [273](#)
 AP [67](#)
 AP (access point) [281](#)
 AP. See also access point.
 Applications [31, 33](#)
 broadband connection [31](#)
 PR switch [33](#)
 Print Server [33](#)
 USB port [33](#)
 authentication algorithms [141, 146](#)
 and active protocol [141](#)
 Authentication Header. See AH.

B

Backup [225](#)
 Bandwidth management monitor [43, 184](#)
 Basic wireless security [53](#)
 BSS [279](#)

C

CA [286](#)
 Certificate Authority [286](#)
 Certifications
 viewing [5](#)
 certifications

 notices [5](#)
 Channel [281](#)
 Interference [281](#)
 channel [67](#)
 Channel ID [71](#)
 Configuration [44, 111](#)
 Contact Information [8](#)
 Content Filtering [133](#)
 Days and Times [133](#)
 Restrict Web Features [133](#)
 Cookies [134](#)
 Copyright [3](#)
 CTS (Clear to Send) [282](#)
 Customer Support [8](#)

D

Default [226](#)
 Device Weight [245](#)
 DHCP [44, 105, 111, 125](#)
 DHCP Table Summary [44](#)
 DHCP_client list [113](#)
 Diffie-Hellman key group [141](#)
 Perfect Forward Secrecy (PFS) [145](#)
 Dimensions [245](#)
 Disclaimer [3](#)
 DNS [189](#)
 DNS Server
 For VPN Host [147](#)
 Dynamic DNS [125](#)
 Dynamic WEP Key Exchange [287](#)
 DYNDNS Wildcard [125](#)

E

EAP Authentication [286](#)
 Encapsulating Security Payload. See ESP.
 encapsulation
 and active protocol [145](#)

- transport mode [145](#)
- tunnel mode [145](#)
- VPN [145](#)
- Encryption [288](#)
- encryption [69](#)
 - and local (user) database [70](#)
 - key [70](#)
 - WPA compatible [70](#)
- encryption algorithms [141](#), [146](#)
 - and active protocol [141](#)
- ESP [144](#)
 - and transport mode [145](#)
- ESS [280](#)
- Ethernet Encapsulation [115](#)
- Extended Service Set [280](#)
- Extended Service Set IDentification [71](#)
- Extended wireless security [54](#)

F

- Factory LAN Defaults [105](#)
- FCC [4](#)
- Federal Communications Commission [4](#)
- Firewall [127](#), [128](#)
- Firmware File
 - Maintenance [223](#), [224](#)
- Fragmentation Threshold [282](#)
- Fragmentation threshold [282](#)
- FTP [105](#), [125](#), [185](#), [188](#)
- FTP Restrictions [185](#)

G

- General wireless LAN screen [70](#)

H

- Hidden node [281](#)
- hide SSID [68](#)
- Host [216](#)
- Host IDs [271](#)
- Humidity [245](#)

I

- IBSS [279](#)
- IEEE 802.11g [283](#)
- IGMP [106](#)
- IKE SA
 - aggressive mode [140](#), [143](#)
 - authentication algorithms [141](#), [146](#)
 - Diffie-Hellman key group [141](#)
 - encryption algorithms [141](#), [146](#)
 - ID content [142](#)
 - ID type [142](#)
 - IP address, remote IPSec router [140](#)
 - IP address, ZyXEL Device [140](#)
 - local identity [142](#)
 - main mode [140](#), [143](#)
 - NAT traversal [144](#)
 - negotiation mode [140](#)
 - peer identity [142](#)
 - pre-shared key [142](#)
 - proposal [141](#)
 - SA life time [146](#)
- IKE SA. See also VPN.
- Independent Basic Service Set [279](#)
- initialization vector (IV) [288](#)
- Interference Statement [4](#)
- Internal SPTGEN [313](#)
 - FTP Upload Example [315](#)
 - Points to Remember [314](#)
 - Text File [313](#)
- Internet Access Setup [232](#)
- Internet Protocol Security. See IPSec.
- IP Address [44](#), [106](#), [107](#), [113](#), [117](#)
- IP Addressing [271](#)
- IP Classes [271](#)
- IP Pool [111](#)
- IP Pool Setup [105](#)
- IPSec [139](#)
- IPSec SA
 - active protocol [144](#)
 - authentication algorithms [141](#), [146](#)
 - authentication key (manual keys) [160](#)
 - encapsulation [145](#)
 - encryption algorithms [141](#), [146](#)
 - encryption key (manual keys) [160](#)
 - local policy [144](#)
 - manual keys [159](#)
 - Perfect Forward Secrecy (PFS) [145](#)
 - proposal [145](#)
 - remote policy [144](#)
 - SA life time [146](#)
 - Security Parameter Index (SPI) (manual keys) [160](#)
 - transport mode [145](#)
 - tunnel mode [145](#)
 - when IKE SA is disconnected [144](#), [146](#)

IPSec SA. See also VPN.

IPSec. See also VPN.

J

Java [134](#)

K

Keep alive [146](#)

L

LAN Setup [95](#), [105](#)

LAN TCP/IP [105](#)

Liability [3](#)

License [3](#)

Link type [41](#)

local (user) database [69](#)
and encryption [70](#)

M

MAC address [68](#)

MAC address filter [68](#)

MAC Address Filter Action [82](#)

MAC Address Filtering [81](#)

MAC Filter [81](#)

managing the device
using FTP. See FTP.

Message Integrity Check (MIC) [288](#)

Metric [171](#)

Multicast [104](#), [106](#), [108](#)

N

NAT

and VPN [143](#)

Server Sets [115](#)

NAT traversal [144](#)

Navigation Panel [41](#)

O

OTIST [77](#)

OTIST Wizard [55](#)

P

Packet statistics [45](#)

Pairwise Master Key (PMK) [288](#), [290](#)

Patent [3](#)

Perfect Forward Secrecy. see PFS.

Permission [3](#)

PFS [145](#)

Diffie-Hellman key group [145](#)

Photocopying [3](#)

Point-to-Point Tunneling Protocol [100](#)

Port Forwarding [116](#)

Power Specification [245](#)

Preamble Mode [283](#)

Priorities [175](#)

Private [171](#)

R

RADIUS [284](#)

Shared Secret Key [285](#)

RADIUS Message Types [285](#)

RADIUS Messages [285](#)

RADIUS server [69](#)

Registered [3](#)

Registered Trademark [3](#)

Related Documentation [29](#)

remote management

Telnet [187](#)

Remote Management and NAT [186](#)

Remote Management Limitations [185](#)

Reproduction [3](#)

Restore [225](#)

Restrict Web Features [134](#)

RFC 2402. See AH.

RFC 2406. See ESP.

Rights [3](#)

Roaming [83](#)

RTS (Request To Send) [282](#)

RTS Threshold [281](#), [282](#)

S

SA
 life time [146](#)

Safety Warnings [6](#)

security associations. See VPN.

Security Parameters [291](#)

Service Set [71](#)

Service Set IDentity. See SSID.

Service Type [232](#)

Services [115](#), [129](#)

SNMP [128](#)

SSID [67](#)
 hide [68](#)

Stateful Inspection [127](#)

Static DHCP [112](#)

Static Route [169](#), [170](#)

Subnet Mask [106](#), [107](#)

Subnet Masks [272](#)

Subnetting [272](#)

Syntax Conventions [29](#)

System General Setup [215](#)

System information [50](#)

System Maintenance [220](#)

System Parameter Table Generator [313](#)

System Timeout [186](#)

T

TCP/IP [107](#)

Telnet [187](#)

Temperature [245](#)

Temporal Key Integrity Protocol (TKIP) [288](#)

Text File Format [313](#)

TFTP Restrictions [185](#)

Time Zone [216](#)

Trademark [3](#)

Trademark Owners [3](#)

Trademarks [3](#)

Translation [3](#)

Triangle [329](#)

Triangle Route Solutions [330](#)

Trigger Port Forwarding
 Process [121](#)

U

Universal Plug and Play (UPnP) [191](#)

URL Keyword Blocking [134](#)

User Authentication [289](#)

user authentication [68](#)
 local (user) database [69](#)
 RADIUS server [69](#)
 weaknesses [69](#)

User Name [126](#)

V

Virtual Private Network. See VPN.

VPN [100](#), [139](#)
 active protocol [144](#)
 and NAT [143](#)
 established in two phases [139](#)
 IKE SA. See IKE SA.
 IPSec [139](#)
 IPSec SA. See IPSec SA.
 local network [139](#)
 proposal [141](#)
 remote IPSec router [139](#)
 remote network [139](#)
 security associations (SA) [139](#)

VPN. See also IKE SA, IPSec SA.

W

WAN advanced [103](#)

WAN IP address assignment [62](#)

WAN MAC address [63](#)

WAN Wizard [56](#)

Warnings [6](#)

Web [186](#)

Web Configurator [37](#), [38](#)

Web Proxy [134](#)

WEP Encryption [73](#), [75](#)

WEP encryption [72](#)

Wi-Fi Protected Access [287](#)

Wireless association list summary [46](#)

wireless client [67](#)

Wireless Client WPA Supplicants [289](#)

Wireless LAN Wizard [51](#)

wireless network [67](#)
 basic guidelines [67](#)

wireless networks

- channel [67](#)
- encryption [69](#)
- MAC address filter [68](#)
- security [68](#)
- SSID [67](#)
- Wireless security [284](#)
- wireless security [68](#)
- WLAN
 - Interference [281](#)
 - Security parameters [291](#)
- WPA [287](#)
- WPA compatible [70](#)
- WPA2 [287](#)
- WPA2-Pre-Shared Key [288](#)
- WPA2-PSK [288](#)
- WPA-PSK [288](#)
- Written Permission [3](#)

Z

- ZyNOS [3](#)
- ZyXEL Communications Corporation [3](#)
- ZyXEL Limited Warranty
 - Note [7](#)
- ZyXEL Network Operating System [3](#)