

P-660HN-TxA

802.11n Wireless ADSL2+ 4-port Gateway

User's Guide

Default Login Details

IP Address	http://192.168.1.1
Password	1234

Firmware Version 3.40
Edition 1, 6/2010

www.zyxel.com

The logo for ZyXEL, featuring the word "ZyXEL" in a bold, blue, sans-serif font. The "Z" and "X" are significantly larger than the other letters, and the "Y" is also large. The "E" and "L" are smaller and positioned to the right of the "Y".

About This User's Guide

Intended Audience

This manual is intended for people who want to configure the ZyXEL Device using the web configurator. You should have at least a basic knowledge of TCP/IP networking concepts and topology.

Related Documentation

- Quick Start Guide

The Quick Start Guide is designed to help you get up and running right away. It contains information on setting up your network and configuring for Internet access.

- Support Disc

Refer to the included CD for support documents.

- ZyXEL Web Site

Please refer to www.zyxel.com for additional support documentation and product certifications.

Documentation Feedback

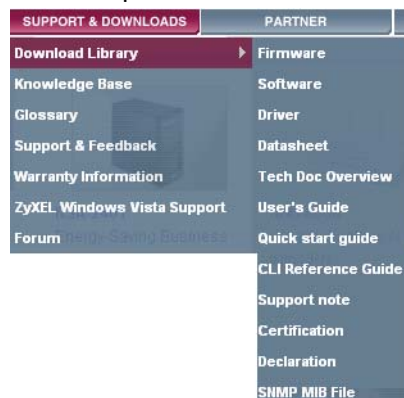
Send your comments, questions or suggestions to: techwriters@zyxel.com.tw

Thank you!

The Technical Writing Team, ZyXEL Communications Corp.,
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Need More Help?

More help is available at www.zyxel.com.



- Download Library

Search for the latest product updates and documentation from this link. Read the Tech Doc Overview to find out how to efficiently use the User Guide, Quick Start Guide and Command Line Interface Reference Guide in order to better understand how to use your product.

- Knowledge Base

If you have a specific question about your product, the answer may be here. This is a collection of answers to previously asked questions about ZyXEL products.

- Forum

This contains discussions on ZyXEL products. Learn from others who use ZyXEL products and share your experiences as well.

Customer Support

In the event of problems that cannot be solved by using this manual, you should contact your vendor. If you cannot contact your vendor, then contact a ZyXEL office for the region in which you bought the device. See http://www.zyxel.com/web/contact_us.php for contact information. Please have the following information ready when you contact an office.

- 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.

Disclaimer

Graphics in this book may differ slightly from the product due to differences in operating systems, operating system versions, or if you installed updated firmware/software for your device. Every effort has been made to ensure that the information in this manual is accurate.

Document Conventions

Warnings and Notes

These are how warnings and notes are shown in this User's Guide.

Warnings tell you about things that could harm you or your device.




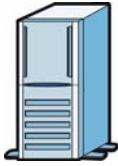




Note: Notes tell you other important information (for example, other things you may need to configure or helpful tips) or recommendations.

Syntax Conventions

- The P-660HN-TxA may be referred to as the "ZyXEL Device", the "device", the "system" or the "product" in this User's Guide.
- Product labels, screen names, field labels and field choices are all in **bold** font.
- A key stroke is denoted by square brackets and uppercase text, for example, [ENTER] means the "enter" or "return" key on your keyboard.
- "Enter" means for you to type one or more characters and then press the [ENTER] key. "Select" or "choose" means for you to use one of the predefined choices.
- A right angle bracket (>) within a screen name denotes a mouse click. For example, **Maintenance > Log > Log Setting** means you first click **Maintenance** in the navigation panel, then the **Log** sub menu and finally the **Log Setting** tab to get to that screen.
- Units of measurement may denote the "metric" value or the "scientific" value. For example, "k" for kilo may denote "1000" or "1024", "M" for mega may denote "1000000" or "1048576" and so on.
- "e.g.," is a shorthand for "for instance", and "i.e.," means "that is" or "in other words".

Icons Used in Figures

Figures in this User's Guide may use the following generic icons. The ZyXEL Device icon is not an exact representation of your device.

ZyXEL Device 	Computer 	Notebook computer 
Server 	Firewall 	Telephone 
Router 	Switch 	

Safety Warnings

- 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 device and the power source.
- Do NOT attempt to repair the power adaptor or cord. Contact your local vendor to order a new one.
- Do not use the device outside, and make sure all the connections are indoors. There is a remote risk of electric shock from lightning.
- Do NOT obstruct the device ventilation slots, as insufficient airflow may harm your device.
- Use only No. 26 AWG (American Wire Gauge) or larger telecommunication line cord.
- Antenna Warning! This device meets ETSI and FCC certification requirements when using the included antenna(s). Only use the included antenna(s).

Your product is marked with this symbol, which is known as the WEEE mark. WEEE stands for Waste Electronics and Electrical Equipment. It means that used electrical and electronic products should not be mixed with general waste. Used electrical and electronic equipment should be treated separately.



Contents Overview

User's Guide	19
Introduction	21
The Web Configurator	29
Status Screens	35
Tutorials	39
Technical Reference	57
Internet and Wireless Setup Wizard	59
WAN Setup	73
LAN Setup	89
Wireless LAN	103
Network Address Translation (NAT)	135
Firewall	151
Filters	155
Static Route	161
802.1Q/1P	165
Quality of Service (QoS)	171
Dynamic DNS Setup	179
Remote Management	181
Universal Plug-and-Play (UPnP)	191
CWMP	203
System Settings	207
Logs	211
Tools	221
Diagnostic	229
Troubleshooting	233
Product Specifications	239

Table of Contents

About This User's Guide	3
Document Conventions.....	5
Safety Warnings.....	7
Contents Overview	9
Table of Contents.....	11
Part I: User's Guide.....	19
Chapter 1	
Introduction.....	21
1.1 Overview	21
1.2 Ways to Manage the ZyXEL Device	21
1.3 Good Habits for Managing the ZyXEL Device	22
1.4 Applications for the ZyXEL Device	22
1.4.1 Internet Access	22
1.5 Wireless Access	23
1.5.1 Using the WPS/WLAN Button	24
1.6 LEDs (Lights)	25
1.7 The RESET Button	26
1.7.1 Using the Reset Button	27
Chapter 2	
The Web Configurator	29
2.1 Overview	29
2.1.1 Accessing the Web Configurator	29
2.2 The Main Screen	31
2.2.1 Title Bar	32
2.2.2 Navigation Panel	32
2.2.3 Main Window	34
2.2.4 Status Bar	34
Chapter 3	
Status Screens	35
3.1 Overview	35

3.2 The Status Screen	35
Chapter 4	
Tutorials	39
4.1 Overview	39
4.2 Setting Up a Secure Wireless Network	39
4.2.1 Configuring the Wireless Network Settings	40
4.2.2 Using WPS	41
4.2.3 Without WPS	46
4.2.4 Setting Up Wireless Network Scheduling	46
4.3 Configuring the MAC Address Filter	47
4.4 Configuring Static Route for Routing to Another Network	49
4.5 Multiple Public and Private IP Address Mappings	52
4.5.1 Full Feature NAT + Many-to-Many No Overload Mapping	53
4.5.2 Full Feature NAT + One-to-One Mapping	54
4.6 Multiple WAN Connections Example	55
Part II: Technical Reference	57
Chapter 5	
Internet and Wireless Setup Wizard	59
5.1 Overview	59
5.2 Internet Access Wizard Setup	59
5.2.1 Manual Configuration	62
5.3 Wireless Connection Wizard Setup	68
5.3.1 Manually Assign a WPA-PSK key	70
5.3.2 Manually Assign a WEP Key	71
Chapter 6	
WAN Setup	73
6.1 Overview	73
6.1.1 What You Can Do in the WAN Screens	73
6.1.2 What You Need to Know About WAN	73
6.1.3 Before You Begin	74
6.2 The Internet Access Setup Screen	75
6.2.1 Advanced Internet Access Setup	77
6.3 The More Connections Screen	79
6.3.1 More Connections Edit	80
6.3.2 Configuring More Connections Advanced Setup	82
6.4 WAN Technical Reference	83
6.4.1 Encapsulation	83

6.4.2 Multiplexing	85
6.4.3 VPI and VCI	85
6.4.4 IP Address Assignment	85
6.4.5 Nailed-Up Connection (PPP)	86
6.4.6 NAT	86
6.5 Traffic Shaping	86
6.5.1 ATM Traffic Classes	87
Chapter 7	
LAN Setup.....	89
7.1 Overview	89
7.1.1 What You Can Do in the LAN Screens	89
7.1.2 What You Need To Know About LAN	90
7.1.3 Before You Begin	91
7.2 The LAN IP Screen	91
7.2.1 The Advanced LAN IP Setup Screen	92
7.3 The DHCP Setup Screen	93
7.4 The Client List Screen	94
7.5 The IP Alias Screen	95
7.5.1 Configuring the LAN IP Alias Screen	96
7.6 LAN Technical Reference	97
7.6.1 LANs, WANs and the ZyXEL Device	98
7.6.2 DHCP Setup	98
7.6.3 DNS Server Addresses	98
7.6.4 LAN TCP/IP	99
7.6.5 RIP Setup	100
7.6.6 Multicast	101
Chapter 8	
Wireless LAN.....	103
8.1 Overview	103
8.1.1 What You Can Do in the Wireless LAN Screens	103
8.1.2 What You Need to Know About Wireless	104
8.1.3 Before You Start	104
8.2 The AP Screen	105
8.2.1 No Security	106
8.2.2 WEP Encryption	107
8.2.3 WPA(2)-PSK	108
8.2.4 WPA(2) Authentication	109
8.2.5 Wireless LAN Advanced Setup	110
8.2.6 MAC Filter	112
8.3 The More AP Screen	113
8.3.1 More AP Edit	114

8.4 The WPS Screen	115
8.5 The WPS Station Screen	116
8.6 The WDS Screen	117
8.7 The Scheduling Screen	119
8.8 Wireless LAN Technical Reference	120
8.8.1 Wireless Network Overview	120
8.8.2 Additional Wireless Terms	122
8.8.3 Wireless Security Overview	122
8.8.4 Signal Problems	125
8.8.5 BSS	125
8.8.6 MBSSID	126
8.8.7 Wireless Distribution System (WDS)	127
8.8.8 WiFi Protected Setup (WPS)	127
Chapter 9	
Network Address Translation (NAT).....	135
9.1 Overview	135
9.1.1 What You Can Do in the NAT Screens	135
9.1.2 What You Need To Know About NAT	135
9.2 The NAT General Setup Screen	137
9.3 The Port Forwarding Screen	138
9.3.1 Configuring the Port Forwarding Screen	139
9.3.2 The Port Forwarding Rule Edit Screen	141
9.4 The Address Mapping Screen	142
9.4.1 The Address Mapping Rule Edit Screen	144
9.5 The ALG Screen	145
9.6 NAT Technical Reference	146
9.6.1 NAT Definitions	146
9.6.2 What NAT Does	146
9.6.3 How NAT Works	147
9.6.4 NAT Application	148
9.6.5 NAT Mapping Types	148
Chapter 10	
Firewall.....	151
10.1 Overview	151
10.1.1 What You Can Do in the Firewall Screens	151
10.1.2 What You Need to Know About Firewall	151
10.2 The Firewall Screen	153
Chapter 11	
Filters	155
11.1 Overview	155

11.1.1 What You Can Do in the Filter Screens	155
11.1.2 What You Need to Know About Filtering	155
11.2 The URL Filter Screen	156
11.3 The Application Filter Screen	157
11.4 The IP/MAC Filter Screen	158
Chapter 12	
Static Route	161
12.1 Overview	161
12.1.1 What You Can Do in the Static Route Screens	162
12.2 The Static Route Screen	162
12.2.1 Static Route Edit	163
Chapter 13	
802.1Q/1P	165
13.1 Overview	165
13.1.1 What You Can Do in the 802.1Q/1P Screens	165
13.1.2 What You Need to Know About 802.1Q/1P	165
13.2 The 802.1Q/1P Group Setting Screen	166
13.2.1 Editing 802.1Q/1P Group Setting	168
13.3 The 802.1Q/1P Port Setting Screen	169
Chapter 14	
Quality of Service (QoS)	171
14.1 Overview	171
14.1.1 What You Can Do in the QoS Screens	172
14.1.2 What You Need to Know About QoS	172
14.2 The QoS Screen	173
14.2.1 The QoS Settings Summary Screen	175
14.3 QoS Technical Reference	176
14.3.1 IEEE 802.1p	176
14.3.2 IP Precedence	177
14.3.3 Automatic Priority Queue Assignment	177
Chapter 15	
Dynamic DNS Setup	179
15.1 Overview	179
15.1.1 What You Can Do in the DDNS Screen	179
15.1.2 What You Need To Know About DDNS	179
15.2 The Dynamic DNS Screen	180
Chapter 16	
Remote Management	181

16.1 Overview	181
16.1.1 What You Can Do in the Remote Management Screens	182
16.1.2 What You Need to Know About Remote Management	182
16.2 The WWW Screen	183
16.2.1 Configuring the WWW Screen	183
16.3 The Telnet Screen	184
16.4 The FTP Screen	185
16.5 The SNMP Screen	186
16.5.1 Configuring SNMP	187
16.6 The DNS Screen	188
16.7 The ICMP Screen	189
Chapter 17	
Universal Plug-and-Play (UPnP).....	191
17.1 Overview	191
17.1.1 What You Can Do in the UPnP Screen	191
17.1.2 What You Need to Know About UPnP	191
17.2 The UPnP Screen	193
17.3 Installing UPnP in Windows Example	194
17.4 Using UPnP in Windows XP Example	197
Chapter 18	
CWMP.....	203
18.1 Overview	203
18.2 The CWMP Setup Screen	204
Chapter 19	
System Settings.....	207
19.1 Overview	207
19.1.1 What You Can Do in the System Settings Screens	207
19.2 The General Screen	207
19.3 The Time and Date Screen	208
Chapter 20	
Logs.....	211
20.1 Overview	211
20.1.1 What You Need To Know About Logs	211
20.2 The System Log Screen	211
20.3 Log Descriptions	213
Chapter 21	
Tools.....	221
21.1 Overview	221

21.1.1 What You Can Do in the Tool Screens	221
21.2 The Firmware Screen	221
21.3 The Configuration Screen	224
21.4 The Restart Screen	227
Chapter 22	
Diagnostic.....	229
22.1 Overview	229
22.1.1 What You Can Do in the Diagnostic Screens	229
22.2 The General Screen	229
22.3 The DSL Line Screen	230
Chapter 23	
Troubleshooting.....	233
23.1 Power, Hardware Connections, and LEDs	233
23.2 ZyXEL Device Access and Login	234
23.3 Internet Access	236
Chapter 24	
Product Specifications	239
24.1 Hardware Specifications	239
24.2 Firmware Specifications	239
24.3 Wireless Features	243
24.4 Power Adaptor Specifications	246
Appendix A Setting up Your Computer's IP Address.....	247
Appendix B IP Addresses and Subnetting	271
Appendix C Pop-up Windows, JavaScripts and Java Permissions.....	281
Appendix D Wireless LANs	291
Appendix E Services	307
Appendix F Legal Information	311
Index.....	315

PART I

User's Guide

Introduction

1.1 Overview

The P-660HN-TxA is an ADSL2+ router. By integrating DSL and NAT, you are provided with ease of installation and high-speed, shared Internet access. The P-660HN-TxA is also a complete security solution with a robust firewall and content filtering.

Please refer to the following description of the product name format.

- “H” denotes an integrated 4-port hub (switch).
- “N” denotes 802.11n draft 2.0. The “N” models support 802.11n wireless connection mode.
- Models ending in “1”, for example P-660HN-T1, denote a device that works over the analog telephone system, POTS (Plain Old Telephone Service). Models ending in “3” denote a device that works over ISDN (Integrated Services Digital Network) or T-ISDN (UR-2).

Only use firmware for your ZyXEL Device's specific model. Refer to the label on the bottom of your ZyXEL Device.

Note: All screens displayed in this user's guide are from the **P-660HN-T1A** model.

See the product specifications for a full list of features.

1.2 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.
- Command Line Interface. Line commands are mostly used for troubleshooting by service engineers.
- FTP for firmware upgrades and configuration backup/restore.

- TR-069. This is an auto-configuration server used to remotely configure your device.

1.3 Good Habits for Managing the ZyXEL Device

Do the following things regularly to make the ZyXEL Device more secure and to manage the ZyXEL Device more effectively.

- 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.

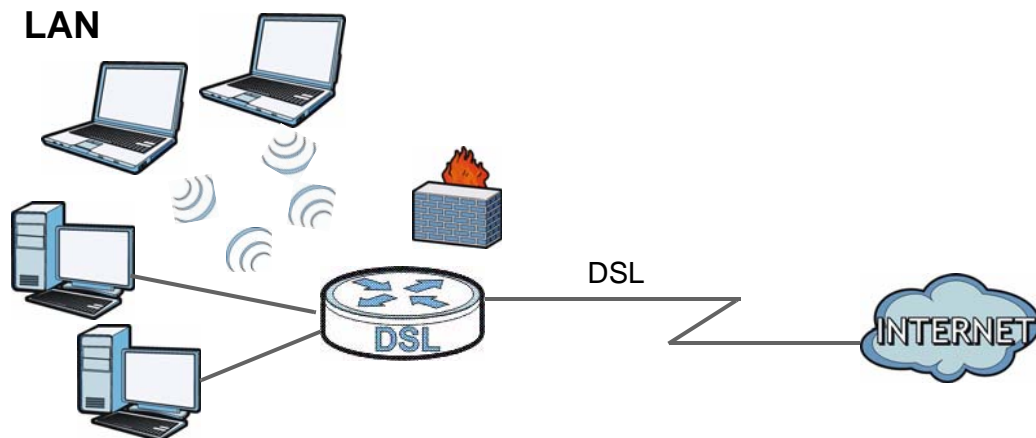
1.4 Applications for the ZyXEL Device

Here are some example uses for which the ZyXEL Device is well suited.

1.4.1 Internet Access

Your ZyXEL Device provides shared Internet access by connecting the DSL port to the **DSL** or **MODEM** jack on a splitter or your telephone jack. Computers can connect to the ZyXEL Device's LAN ports (or wirelessly).

Figure 1 ZyXEL Device's Router Features



You can also configure firewall and filtering feature 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.

Use the filtering feature to block access to specific web sites or Internet applications such as MSN or Yahoo Messenger. You can also configure IP/MAC filtering rules for incoming or outgoing traffic.

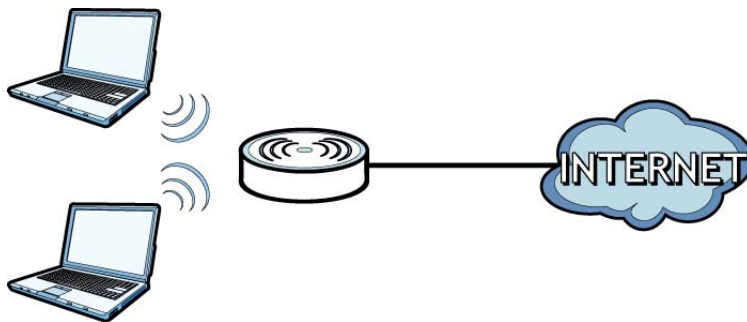
Use QoS to efficiently manage traffic on your network by giving priority to certain types of traffic and/or to particular computers. For example, you could make sure that the ZyXEL Device gives voice over Internet calls high priority, and/or limit bandwidth devoted to the boss's excessive file downloading.

1.5 Wireless Access

The ZyXEL Device is a wireless Access Point (AP) for wireless clients, such as notebook computers or PDAs and iPads. It allows them to connect to the Internet without having to rely on inconvenient Ethernet cables.

You can configure your wireless network in either the built-in Web Configurator, or using the WPS button.

Figure 2 Wireless Access Example



However, before you can use this ZyXEL Device to create a wireless network, you must set its country code first in the Web Configurator. This is very important.

To set the wireless country code:

- 1 Log into the ZyXEL Device's built-in Web Configurator. See [Chapter 8 on page 103](#).
- 2 Open the **Network > Wireless LAN > AP** screen.

- 3 Select your country from the **Channel Selection** list. See [Section 8.2 on page 105](#) for details.
- 4 Click **Apply** to save your changes.
- 5 Finally, open the Internet and Wireless Configuration wizards to set up your network. See [Chapter 5 on page 59](#).

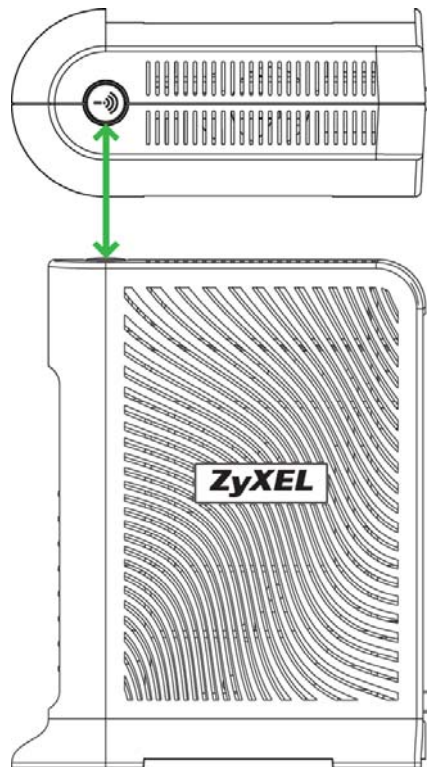
1.5.1 Using the WPS/WLAN Button

By default, the wireless network is turned off on the ZyXEL Device. To turn it on, simply press the **WPS/WLAN** button on top of the device for 1 second. Once the **WPS/WLAN** LED turns green, the wireless network is active.

You can also use the **WPS/WLAN** button to quickly set up a secure wireless connection between the ZyXEL Device and a WPS-compatible client by adding one device at a time.

To activate WPS:

- 1 Make sure the **POWER** LED is on and not blinking.
- 2 Press the **WPS/WLAN** button for five to ten seconds and release it.

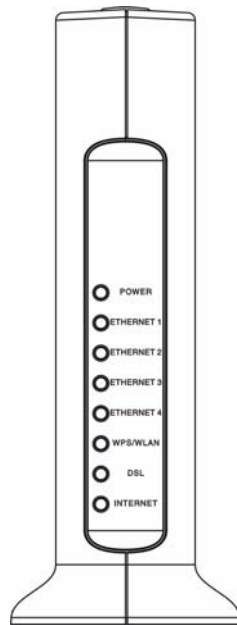


- 3 Press the WPS button on another WPS-enabled device within range of the ZyXEL Device. The **WPS/WLAN** LED should flash while the ZyXEL Device sets up a WPS connection with the other wireless device.
- 4 Once the connection is successfully made, the **WPS/WLAN** LED shines green.

1.6 LEDs (Lights)

The following graphic displays the labels of the LEDs.

Figure 3 LEDs



None of the LEDs are on if the ZyXEL Device is not receiving power.

Table 1 LED Descriptions

LED	COLOR	STATUS	DESCRIPTION
POWER	Green	On	The ZyXEL Device is receiving power and ready for use.
		Blinking	The ZyXEL Device is self-testing.
	Red	On	The ZyXEL Device detected an error while self-testing, or there is a device malfunction.
		Off	The ZyXEL Device is not receiving power.
LAN 1-4	Green	On	The ZyXEL Device has an Ethernet connection with a device on the Local Area Network (LAN).
		Blinking	The ZyXEL Device is sending/receiving data to /from the LAN.
	Off	The ZyXEL Device does not have an Ethernet connection with the LAN.	

Table 1 LED Descriptions

LED	COLOR	STATUS	DESCRIPTION
WPS/ WLAN	Green	On	The wireless network is activated.
		Blinking	The ZyXEL Device is communicating with other wireless clients.
	Orange	Blinking	The ZyXEL Device is setting up a WPS connection.
		Off	The wireless network is not activated.
DSL	Green	On	The DSL line is up.
		Blinking	The ZyXEL Device is initializing the DSL line.
		Off	The DSL line is down.
INTERNET	Green	On	The ZyXEL Device has an IP connection but no traffic. Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used) and the DSL connection is up.
		Blinking	The ZyXEL Device is sending or receiving IP traffic.
	Red	On	The ZyXEL Device attempted to make an IP connection but failed. Possible causes are no response from a DHCP server, no PPPoE response, PPPoE authentication failed.
		Off	The ZyXEL Device does not have an IP connection.

Refer to the Quick Start Guide for information on hardware connections.

1.7 The RESET Button

If you forget your password or cannot access the web configurator, you will need to use the **RESET** button at the back of the 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".

1.7.1 Using the Reset Button

- 1 Make sure the **POWER** LED is on (not blinking).
- 2 To set the device back to the factory default settings, press the **RESET** button for ten seconds or until the **POWER** LED begins to blink and then release it. When the **POWER** LED begins to blink, the defaults have been restored and the device restarts.

The Web Configurator

2.1 Overview

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

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

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

See [Appendix C on page 281](#) if you need to make sure these functions are allowed in Internet Explorer.

2.1.1 Accessing the Web Configurator

- 1 Make sure your ZyXEL Device hardware is properly connected (refer to the Quick Start Guide).
- 2 Launch your web browser.
- 3 Type "192.168.1.1" as the URL.

- 4 A password screen displays. To access the administrative web configurator and manage the ZyXEL Device, type the admin password (1234 by default) in the password screen and click **Login**. Click **Cancel** to revert to the default user password in the password field. If you have changed the password, enter your password and click **Login**.

Figure 4 Password Screen



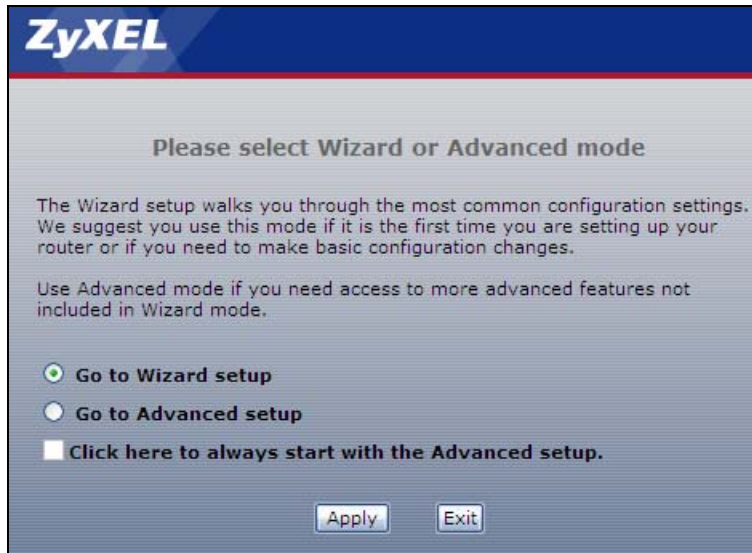
- 5 The following screen displays if you have not yet changed your password. It is strongly recommended you change the default password. Enter a new password, retype it to confirm and click **Apply**; alternatively click **Ignore** to proceed to the main menu if you do not want to change the password now.

Figure 5 Change Password Screen



- 6 Select **Go to Wizard setup** and click **Apply** to display the wizard main screen. Otherwise, select **Go to Advanced setup** and click **Apply** to display the **Status** screen.

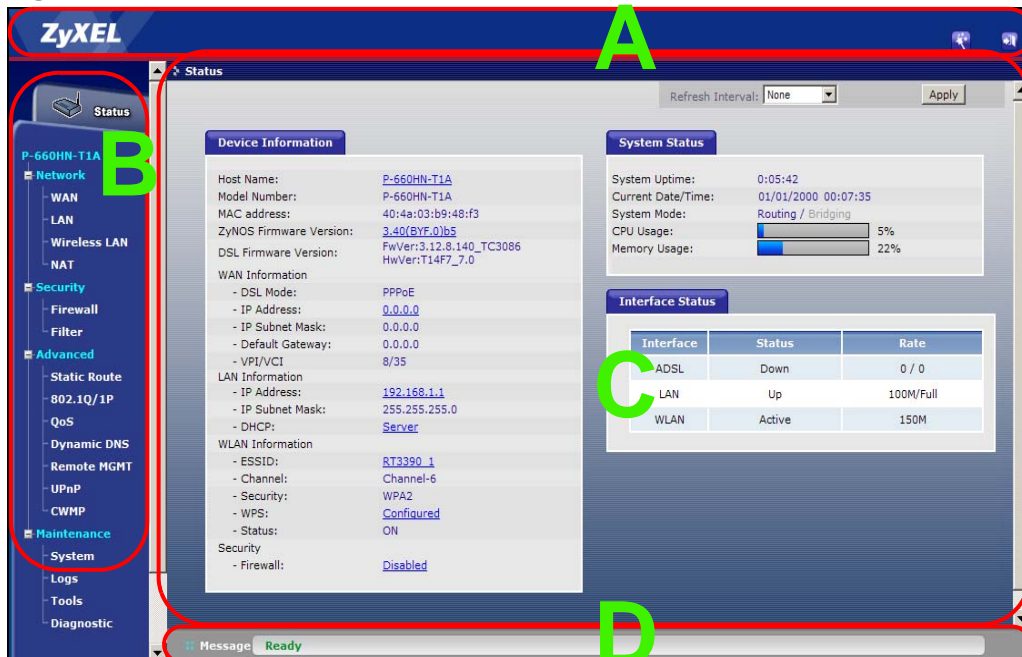
Figure 6 Replace Factory Default Certificate Screen



Note: For security reasons, the ZyXEL Device automatically logs you out if you do not use the web configurator for five minutes (default). If this happens, log in again.

2.2 The Main Screen

Figure 7 Main Screen



As illustrated above, the main screen is divided into these parts:

- **A** - title bar
- **B** - navigation panel
- **C** - main window
- **D** - status bar



2.2.1 Title Bar

The title bar provides some icons in the upper right corner.



The icons provide the following functions.

Table 2 Web Configurator Icons in the Title Bar

ICON	DESCRIPTION
	Wizards: Click this icon to go to the configuration wizards. See Chapter 5 on page 59 for more information.
	Logout: Click this icon to log out of the web configurator.

2.2.2 Navigation Panel

Use the menu items on the navigation panel to open screens to configure ZyXEL Device features. The following tables describe each menu item.

Table 3 Navigation Panel Summary

LINK	TAB	FUNCTION
Status		This screen shows the ZyXEL Device's general device and network status information. Use this screen to access the statistics and client list.
Network		
WAN	Internet Access Setup	Use this screen to configure ISP parameters, WAN IP address assignment, and other advanced properties.
	More Connections	Use this screen to configure additional WAN connections.
LAN	IP	Use this screen to configure LAN TCP/IP settings, and other advanced properties.
	DHCP Setup	Use this screen to configure LAN DHCP settings and DNS server.
	Client List	Use this screen to view current DHCP client information and to always assign specific IP addresses to individual MAC addresses (and host names).
	IP Alias	Use this screen to partition your LAN interface into subnets.

Table 3 Navigation Panel Summary

LINK	TAB	FUNCTION
Wireless LAN	AP	Use this screen to configure the wireless LAN settings and WLAN authentication/security settings.
	More AP	Use this screen to configure multiple BSSs on the ZyXEL Device.
	WPS	Use this screen to configure and view your WPS (Wi-Fi Protected Setup) settings.
	WPS Station	Use this screen to set up a WPS wireless network.
	WDS	Use this screen to set up Wireless Distribution System links to other access points.
	Scheduling	Use this screen to configure the dates/times to enable or disable the wireless LAN.
NAT	General	Use this screen to enable NAT.
	Port Forwarding	Use this screen to make your local servers visible to the outside world.
	ALG	Use this screen to enable or disable SIP ALG.
Security		
Firewall		Use this screen to activate/deactivate the firewall and SPI (Security Parameter Index).
Filter	URL Filter	Use this screen to block access to certain URL web sites.
	Application Filter	Use this screen to allow or block traffic from certain applications.
	IP/MAC Filter	Use this screen to configure IP/MAC filtering rules for incoming or outgoing traffic.
Advanced		
Static Route		Use this screen to configure IP static routes to tell your device about networks beyond the directly connected remote nodes.
802.1Q/1P	Group Setting	Use this screen to activate 802.1Q/1P, specify the management VLAN group, display the VLAN groups and configure the settings for each VLAN group.
	Port Setting	Use this screen to configure the PVID and assign traffic priority for each port.
QoS	General	Use this screen to enable QoS and traffic prioritizing. You can also configure the QoS rules and actions.
Dynamic DNS		This screen allows you to use a static hostname alias for a dynamic IP address.
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.

Table 3 Navigation Panel Summary

LINK	TAB	FUNCTION
	SNMP	Use this screen to configure through which interface(s) and from which IP address(es) users can access the SNMP agent on 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.
	ICMP	Use this screen to set whether or not your device will respond to pings and probes for services that you have not made available.
UPnP	General	Use this screen to turn UPnP on or off.
CWMP		Use this screen to have a management server manage the ZyXEL Device.
Maintenance		
System	General	Use this screen to configure your device's password.
	Time and Date	Use this screen to change your ZyXEL Device's time and date.
Logs	System Log	Use this screen to select which logs your device is to record.
Tools	Firmware	Use this screen to upload firmware to your device.
	Configuration	Use this screen to backup and restore your device's configuration (settings) or reset the factory default settings.
	Restart	This screen allows you to reboot the ZyXEL Device without turning the power off.
Diagnostic	General	Use this screen to test the connections to other devices.
	DSL Line	This screen displays information to help you identify problems with the DSL connection.

2.2.3 Main Window

The main window displays information and configuration fields. It is discussed in the rest of this document.

Right after you log in, the **Status** screen is displayed. See [Chapter 3 on page 35](#) for more information about the **Status** screen.

2.2.4 Status Bar

Check the status bar when you click **Apply** or **OK** to verify that the configuration has been updated.

Status Screens

3.1 Overview

Use the **Status** screens to look at the current status of the device, system resources, and interfaces (LAN and WAN). The **Status** screen also provides detailed information from DHCP and statistics from bandwidth management, and traffic.

3.2 The Status Screen

Use this screen to view the status of the ZyXEL Device. Click **Status** to open this screen.

Figure 8 Status Screen

The screenshot displays the ZyXEL Status screen with a 'Refresh Interval' dropdown set to 'None' and an 'Apply' button. The screen is divided into three main sections:

- Device Information:**
 - Host Name: [P-660HN-T1A](#)
 - Model Number: P-660HN-T1A
 - MAC address: 40:4a:03:b9:48:f3
 - ZyNOS Firmware Version: [3.40\(BYF_0\)65](#)
 - DSL Firmware Version: FwVer:3.12.8.140_TC3086, HwVer:T14F7_7.0
 - WAN Information:
 - DSL Mode: PPPoE
 - IP Address: [0.0.0.0](#)
 - IP Subnet Mask: 0.0.0.0
 - Default Gateway: 0.0.0.0
 - VPI/VCI: 8/35
 - LAN Information:
 - IP Address: [192.168.1.1](#)
 - IP Subnet Mask: 255.255.255.0
 - DHCP: [Server](#)
 - WLAN Information:
 - ESSID: [RT3390_1](#)
 - Channel: Channel-6
 - Security: WPA2
 - WPS: [Configured](#)
 - Status: ON
 - Security:
 - Firewall: [Disabled](#)
- System Status:**
 - System Uptime: 0:05:42
 - Current Date/Time: 01/01/2000 00:07:35
 - System Mode: [Routing / Bridging](#)
 - CPU Usage: 5% (represented by a progress bar)
 - Memory Usage: 22% (represented by a progress bar)
- Interface Status:**

Interface	Status	Rate
ADSL	Down	0 / 0
LAN	Up	100M/Full
WLAN	Active	150M

Each field is described in the following table.

Table 4 Status Screen

LABEL	DESCRIPTION
Refresh Interval	Select how often you want the ZyXEL Device to update this screen.
Apply	Click this to update this screen immediately.
Device Information	
Host Name	This field displays the ZyXEL Device system name. It is used for identification.
Model Number	This is the model name of your device.
MAC Address	This is the MAC (Media Access Control) or Ethernet address unique to your ZyXEL Device.
ZyNOS Firmware Version	This is the current version of the firmware inside the device. Click this to go to the screen where you can change it.
DSL Firmware Version	This is the current version of the device's DSL modem code.
WAN Information	
DSL Mode	This is the DSL standard that your ZyXEL Device is using.
IP Address	This is the current IP address of the ZyXEL Device in the WAN. Click this to go to the screen where you can change it.
IP Subnet Mask	This is the current subnet mask in the WAN.
Default Gateway	This is the IP address of the default gateway, if applicable.
VPI/VCI	This is the Virtual Path Identifier and Virtual Channel Identifier that you entered in the wizard or WAN screen.
LAN Information	
IP Address	This is the current IP address of the ZyXEL Device in the LAN. Click this to go to the screen where you can change it.
IP Subnet Mask	This is the current subnet mask in the LAN.
DHCP	<p>This field displays what DHCP services the ZyXEL Device is providing to the LAN. Choices are:</p> <p>Server - The ZyXEL Device is a DHCP server in the LAN. It assigns IP addresses to other computers in the LAN.</p> <p>Relay - The ZyXEL Device acts as a surrogate DHCP server and relays DHCP requests and responses between the remote server and the clients.</p> <p>None - The ZyXEL Device is not providing any DHCP services to the LAN.</p> <p>Click this to go to the screen where you can change it.</p>
WLAN Information	
ESSID	This is the descriptive name used to identify the ZyXEL Device in a wireless LAN. Click this to go to the screen where you can change it.

Table 4 Status Screen

LABEL	DESCRIPTION
Channel	This is the channel number used by the ZyXEL Device now.
Security	This displays the type of security mode the ZyXEL Device is using in the wireless LAN.
WPS	This displays whether WPS is activated. Click this to go to the screen where you can configure the settings.
Status	This displays whether WLAN is activated.
Security	
Firewall	This displays whether or not the ZyXEL Device's firewall is activated. Click this to go to the screen where you can change it.
System Status	
System Uptime	This field displays how long the ZyXEL Device has been running since it last started up. The ZyXEL Device starts up when you plug it in, when you restart it (Maintenance > Tools > Restart), or when you reset it.
Current Date/Time	This field displays the current date and time in the ZyXEL Device. You can change this in Maintenance > System > Time Setting .
System Mode	This displays whether the ZyXEL Device is functioning as a router or a bridge.
CPU Usage	This field displays what percentage of the ZyXEL Device's processing ability is currently used. When this percentage is close to 100%, the ZyXEL Device is running at full load, and the throughput is not going to improve anymore. If you want some applications to have more throughput, you should turn off other applications (for example, using QoS; see Chapter 14 on page 171).
Memory Usage	This field displays what percentage of the ZyXEL Device's memory is currently used. Usually, this percentage should not increase much. If memory usage does get close to 100%, the ZyXEL Device is probably becoming unstable, and you should restart the device. See Section 21.4 on page 227 , or turn off the device (unplug the power) for a few seconds.
Interface Status	
Interface	This column displays each interface the ZyXEL Device has.

Table 4 Status Screen

LABEL	DESCRIPTION
Status	<p>This field indicates whether or not the ZyXEL Device is using the interface.</p> <p>For the DSL interface, this field displays Down (line is down), Up (line is up or connected) if you're using Ethernet encapsulation and Down (line is down), Up (line is up or connected), Idle (line (ppp) idle), Dial (starting to trigger a call) and Drop (dropping a call) if you're using PPPoE encapsulation.</p> <p>For the LAN interface, this field displays Up when the ZyXEL Device is using the interface and Down when the ZyXEL Device is not using the interface.</p> <p>For the WLAN interface, it displays Active when WLAN is enabled or InActive when WLAN is disabled.</p>
Rate	<p>For the LAN interface, this displays the port speed and duplex setting.</p> <p>For the DSL interface, it displays the downstream and upstream transmission rate.</p> <p>For the WLAN interface, it displays the maximum transmission rate when WLAN is enabled or N/A when WLAN is disabled.</p>

4.1 Overview

This chapter shows you how to use the ZyXEL Device's various features.

- [Setting Up a Secure Wireless Network](#), see page 39
- [Configuring the MAC Address Filter](#), see page 47
- [Configuring Static Route for Routing to Another Network](#), see page 49
- [Multiple Public and Private IP Address Mappings](#), see page 52
- [Multiple WAN Connections Example](#), see page 55

4.2 Setting Up a Secure Wireless Network

Thomas wants to set up a wireless network so that he can use his notebook to access the Internet. In this wireless network, the ZyXEL Device serves as an access point (AP), and the notebook is the wireless client. The wireless client can access the Internet through the AP.



Thomas has to configure the wireless network settings on the ZyXEL Device. Then he can set up a wireless network using WPS ([Section 4.2.2 on page 41](#)) or manual configuration ([Section 4.2.3 on page 46](#)).

4.2.1 Configuring the Wireless Network Settings

This example uses the following parameters to set up a wireless network.

SSID	Example
Security Mode	WPA-PSK
Pre-Shared Key	DoNotStealMyWirelessNetwork
802.11 Mode	802.11b+g+n

- 1 Click **Network > Wireless LAN** to open the **AP** screen. Configure the screen using the provided parameters (see [page 40](#)). Click **Apply**.

The screenshot shows the 'Wireless Setup' configuration page. The 'Wireless Setup' section includes a checked 'Enable Wireless LAN' checkbox and a 'Channel Selection' dropdown set to 'TAMWAN', with a sub-dropdown for 'Channel06 2437MHz' and a 'Current Channel: 6' field. The 'Common Setup' section includes a text field for 'Name(SSID)' with the value 'Example', a 'Hide SSID' checkbox, a 'Security Mode' dropdown set to 'WPA-PSK', and a 'Pre-Shared Key' text field with the value 'DoNotStealMyWirelessNetwork'. Other fields include 'WPA Group Key Update Timer' (10), 'MAC Filter' (Allow Association), and 'QoS' (Enable QoS). The 'Apply' button is circled in red.

- 2 Click the **Advanced Setup** button and select **802.11b+g+n** in the **802.11 Mode** field. Click **Apply**.

The screenshot shows the 'Wireless Advanced Setup' configuration page. It includes fields for 'RTS/CTS Threshold' (2347), 'Fragmentation Threshold' (2346), 'Output Power' (100%), and 'Preamble' (Long). The '802.11 Mode' dropdown is set to '802.11b+g+n' and is circled in red. The 'Apply' button is also circled in red.

Thomas can now use the WPS feature to establish a wireless connection between his notebook and the ZyXEL Device (see [Section 4.2.2 on page 41](#)). He can also use the notebook's wireless client to search for the ZyXEL Device (see [Section 4.2.3 on page 46](#)).

4.2.2 Using WPS

This section shows you how to set up a wireless network using WPS. It uses the ZyXEL Device as the AP and ZyXEL NWD210N as the wireless client which connects to the notebook.

Note: The wireless client must be a WPS-aware device (for example, a WPS USB adapter or PCMCIA card).

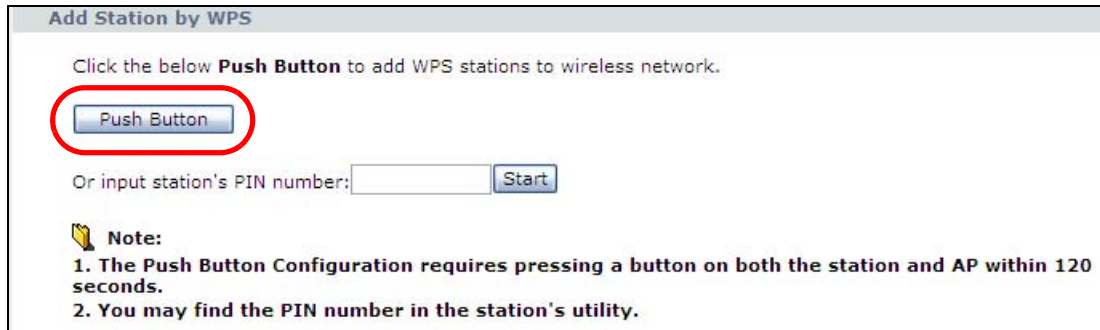
There are two WPS methods to set up the wireless client settings:

- **Push Button Configuration (PBC)** - simply press a button. This is the easier of the two methods.
- **PIN Configuration** - configure a Personal Identification Number (PIN) on the ZyXEL Device. A wireless client must also use the same PIN in order to download the wireless network settings from the ZyXEL Device.

Push Button Configuration (PBC)

- 1 Make sure that your ZyXEL Device is turned on and your notebook is within the cover range of the wireless signal.
- 2 Make sure that you have installed the wireless client driver and utility in your notebook.
- 3 In the wireless client utility, go to the WPS setting page. Enable WPS and press the WPS button (**Start** or **WPS** button).

- 4 Push and hold the **WPS** button located on the ZyXEL Device's rear panel for more than 5 seconds. Alternatively, you may log into ZyXEL Device's web configurator and click the **Push Button** in the **Network > Wireless LAN > WPS Station** screen.

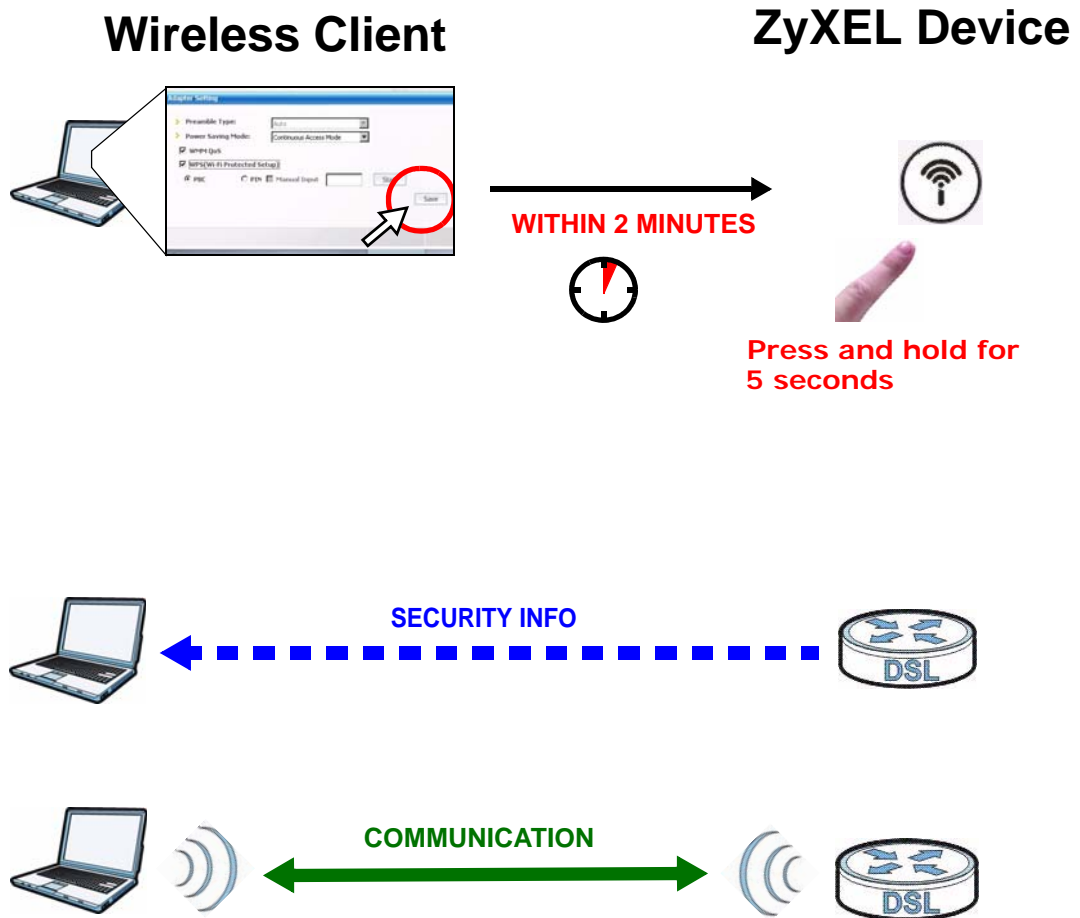


Note: Your ZyXEL Device has a WPS button located on its rear panel as well as a WPS button in its configuration utility. Both buttons have exactly the same function: you can use one or the other.

Note: It doesn't matter which button is pressed first. You must press the second button within two minutes of pressing the first one.

The ZyXEL Device sends the proper configuration settings to the wireless client. This may take up to two minutes. The wireless client is then able to communicate with the ZyXEL Device securely.

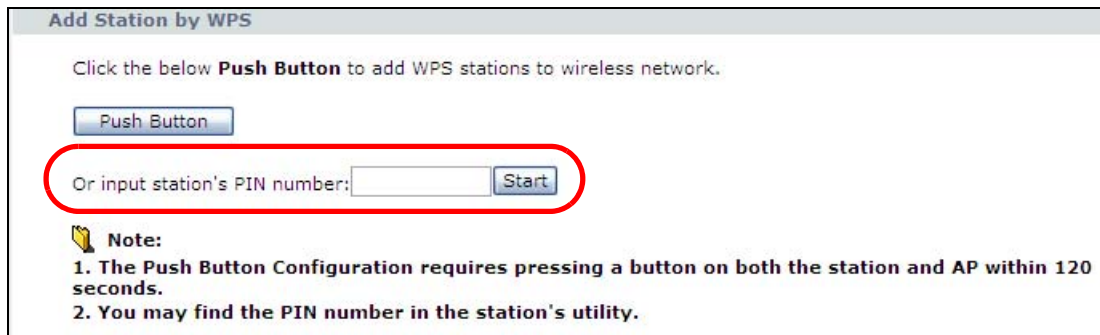
The following figure shows you an example of how to set up a wireless network and its security by pressing a button on both ZyXEL Device and wireless client.



PIN Configuration

When you use the PIN configuration method, you need to use both the ZyXEL Device's web configurator and the wireless client's utility.

- 1 Launch your wireless client's configuration utility. Go to the WPS settings and select the PIN method to get a PIN number.
- 2 Enter the PIN number in the **PIN** field in the **Network > Wireless LAN > WPS Station** screen on the ZyXEL Device.



Add Station by WPS

Click the below **Push Button** to add WPS stations to wireless network.

Or input station's PIN number:

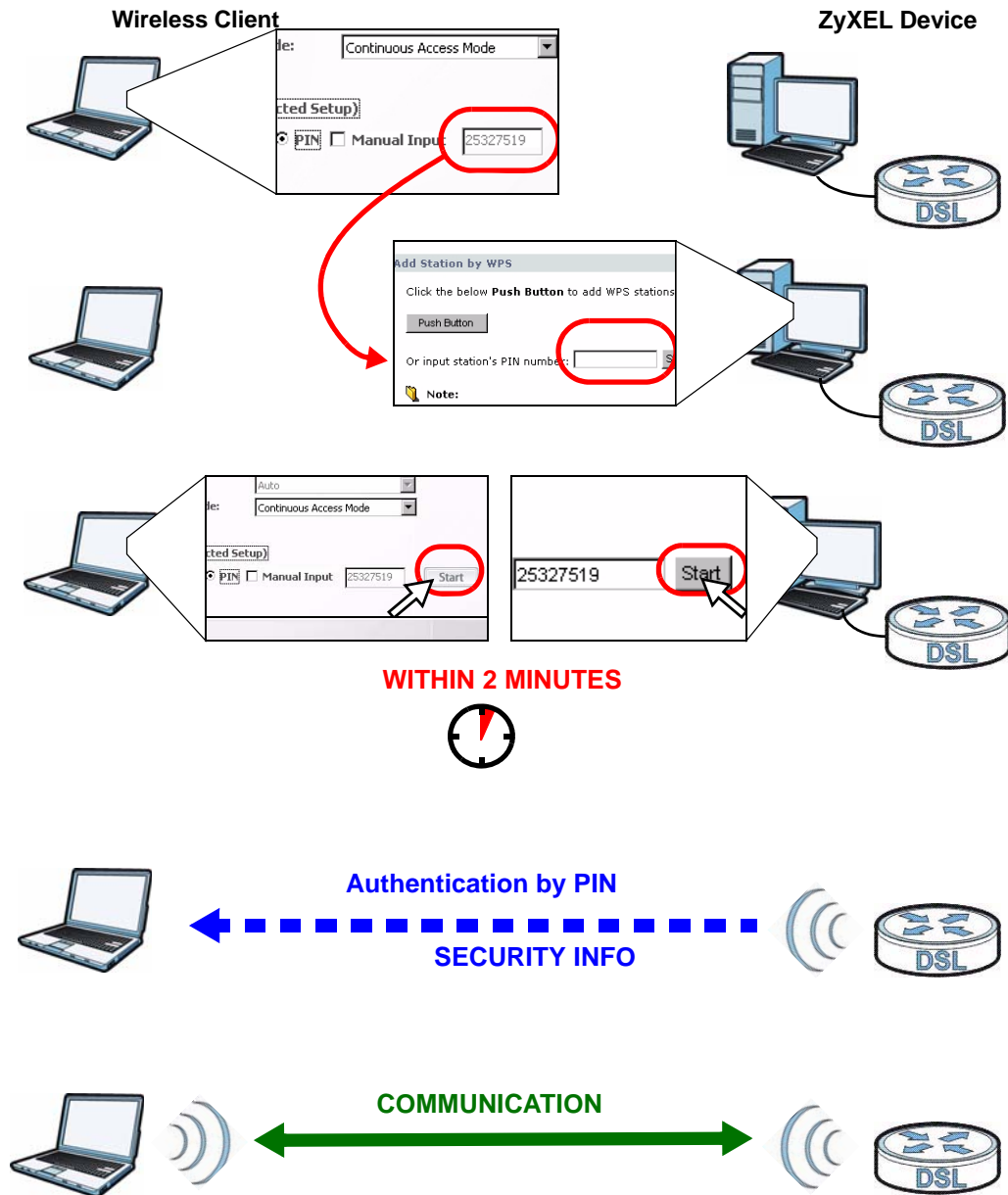
Note:

1. The **Push Button Configuration** requires pressing a button on both the station and AP within 120 seconds.
2. You may find the PIN number in the station's utility.

- 3 Click the **Start** buttons (or the button next to the PIN field) on both the wireless client utility screen and the ZyXEL Device's **WPS Station** screen within two minutes.

The ZyXEL Device authenticates the wireless client and sends the proper configuration settings to the wireless client. This may take up to two minutes. The wireless client is then able to communicate with the ZyXEL Device securely.

The following figure shows you how to set up a wireless network and its security on a ZyXEL Device and a wireless client by using PIN method.



4.2.3 Without WPS

Use the wireless adapter's utility installed on the notebook to search for the "Example" SSID. Then enter the "DoNotStealMyWirelessNetwork" pre-shared key to establish an wireless Internet connection.

Note: The ZyXEL Device supports IEEE 802.11b and IEEE 802.11g wireless clients. Make sure that your notebook or computer's wireless adapter supports one of these standards.

4.2.4 Setting Up Wireless Network Scheduling


Thomas mostly uses his notebook to access the Internet on weekends; occasionally he uses it at night on weekdays. Here is how Thomas can set up a schedule to turn on the wireless network at specific time and days.

- 1 Click **Network > Wireless Network > Scheduling** to open the following screen.

Wireless LAN Scheduling

Enable Wireless LAN Scheduling

Action	Day	Except for the following times (24-Hour Format)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Everyday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Monday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Tuesday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Wednesday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Thursday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Friday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Saturday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Sunday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)

 **Note:** (Wireless signal is currently turned on/off by scheduling.)

- 2 Configure the screen as follows. Turn on the wireless network from Mondays to Fridays between 18:00 and 23:30. Turn on the wireless network all day on Saturdays and Sundays. Click **Apply**.

Wireless LAN Scheduling

Enable Wireless LAN Scheduling

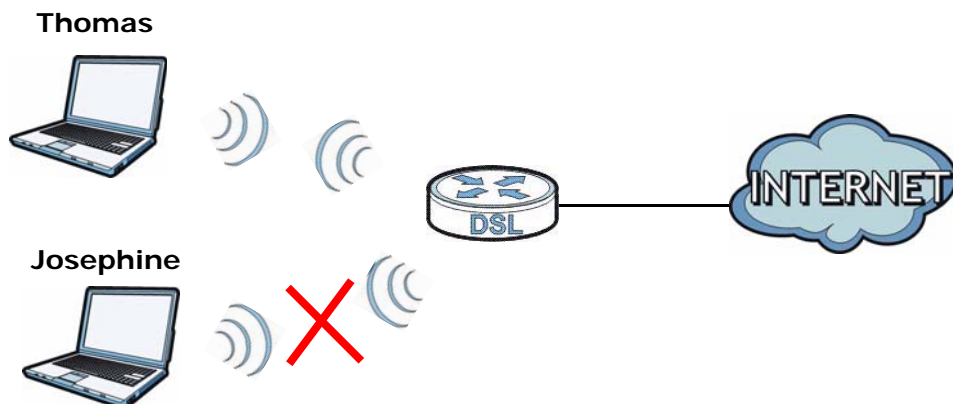
WLAN status	Day	The following times (24-Hour Format)
<input checked="" type="radio"/> Off <input type="radio"/> On	<input type="checkbox"/> Everyday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> Off <input checked="" type="radio"/> On	<input checked="" type="checkbox"/> Mon	18 (hour) 00 (min) ~ 23 (hour) 30 (min)
<input type="radio"/> Off <input checked="" type="radio"/> On	<input checked="" type="checkbox"/> Tue	18 (hour) 00 (min) ~ 23 (hour) 30 (min)
<input type="radio"/> Off <input checked="" type="radio"/> On	<input checked="" type="checkbox"/> Wed	18 (hour) 00 (min) ~ 23 (hour) 30 (min)
<input type="radio"/> Off <input checked="" type="radio"/> On	<input checked="" type="checkbox"/> Thu	18 (hour) 00 (min) ~ 23 (hour) 30 (min)
<input type="radio"/> Off <input checked="" type="radio"/> On	<input checked="" type="checkbox"/> Fri	18 (hour) 00 (min) ~ 23 (hour) 30 (min)
<input type="radio"/> Off <input checked="" type="radio"/> On	<input checked="" type="checkbox"/> Sat	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> Off <input checked="" type="radio"/> On	<input checked="" type="checkbox"/> Sun	00 (hour) 00 (min) ~ 00 (hour) 00 (min)

Note: Specify the same begin time and end time means the whole day schedule.

4.3 Configuring the MAC Address Filter

Thomas noticed that his daughter Josephine spends too much time surfing the web and downloading media files. He decided to prevent Josephine from accessing the Internet so that she can concentrate on preparing for her final exams.

Josephine's computer connects wirelessly to the Internet through the ZyXEL Device. Thomas can deny access to the wireless network using the MAC address of Josephine's computer.



- 1 Click **Network > LAN > Client List** to open the following screen. Look for the MAC address of Josephine's computer.

DHCP Client Table

IP Address: MAC Address:

#	Status	Host Name	IP Address	MAC Address	Reserve	Modify
1		twpc13477	192.168.1.33	00:0F:FE:32:B4:12	<input type="checkbox"/>	
2		Josephine-PC	192.168.1.34	00:1E:52:C3:5C:1B	<input type="checkbox"/>	

.....

- 2 Click **Network > Wireless LAN** to open the **AP** screen. Click the **Edit** button in the **MAC Filter** field.

AP More AP WPS WPS Station WDS Scheduling

Wireless Setup

Enable Wireless LAN

Channel Selection: TAMWAN Channel06 2437MHz Current Channel: 6

Common Setup

Name(SSID):

Hide SSID

Security Mode: WPA-PSK

Pre-Shared Key:

WPA Group Key Update Timer: (In Seconds)

MAC Filter: Allow Association

QoS: Enable QoS

.....

- 3 Select **Active MAC Filter** and **Deny Filter Action**. Enter the MAC address you found in the **Client List** screen. Click **Apply**.

MAC Filter

Active MAC Filter

Filter Action Allow Deny

Set	MAC Address	Set	MAC Address
1	00:1E:52:C3:5C:1E	2	00:00:00:00:00:00
3	00:00:00:00:00:00	4	00:00:00:00:00:00
5	00:00:00:00:00:00	6	00:00:00:00:00:00
7	00:00:00:00:00:00	8	00:00:00:00:00:00
9	00:00:00:00:00:00	10	00:00:00:00:00:00
29	00:00:00:00:00:00	30	00:00:00:00:00:00
31	00:00:00:00:00:00	32	00:00:00:00:00:00

Back Apply Cancel

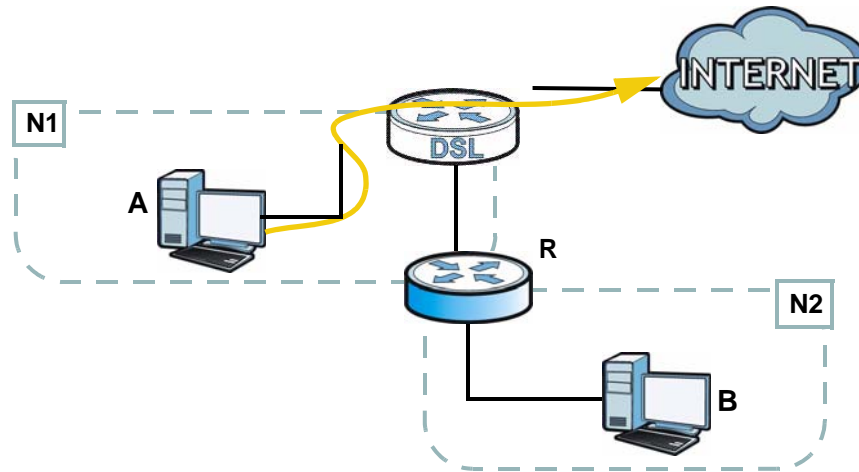
Josephine will no longer be able to access the Internet through the ZyXEL Device.

4.4 Configuring Static Route for Routing to Another Network

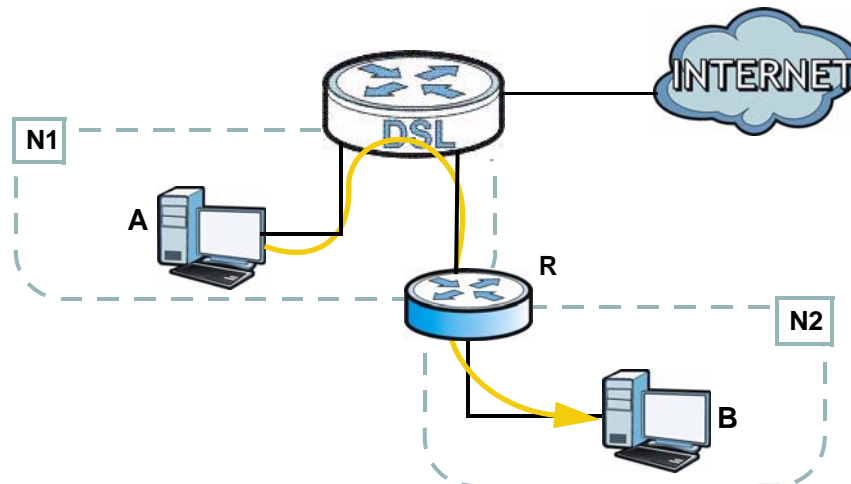
In order to extend your Intranet and control traffic flowing directions, you may connect a router to the ZyXEL Device's LAN. The router may be used to separate two department networks. This tutorial shows how to configure a static routing rule for two network routings.

In the following figure, router **R** is connected to the ZyXEL Device's LAN. **R** connects to two networks, **N1** (192.168.1.x/24) and **N2** (192.168.10.x/24). If you want to send traffic from computer **A** (in **N1** network) to computer **B** (in **N2**

network), the traffic is sent to the ZyXEL Device's WAN default gateway by default. In this case, **B** will never receive the traffic.



You need to specify a static routing rule on the ZyXEL Device to specify **R** as the router in charge of forwarding traffic to **N2**. In this case, the ZyXEL Device routes traffic from **A** to **R** and then **R** routes the traffic to **B**.



This tutorial uses the following example IP settings:

Table 5 IP Settings in this Tutorial

DEVICE / COMPUTER	IP ADDRESS
The ZyXEL Device's WAN	172.16.1.1
The ZyXEL Device's LAN	192.168.1.1
A	192.168.1.34
R's N1	192.168.1.253

Table 5 IP Settings in this Tutorial

DEVICE / COMPUTER	IP ADDRESS
R's N2	192.168.10.2
B	192.168.10.33

To configure a static route to route traffic from **N1** to **N2**:

- 1 Log into the ZyXEL Device's Web Configurator in advanced mode.
- 2 Click **Advanced** > **Static Route**.
- 3 Click **Edit** on a new rule in the **Static Route** screen.

Static Route				
Static Route Rules				
#	Destination	Netmask	Gateway	Modify
1	0.0.0.0	0.0.0.0	0.0.0.0	
2	0.0.0.0	0.0.0.0	0.0.0.0	
3	0.0.0.0	0.0.0.0	0.0.0.0	
4	0.0.0.0	0.0.0.0	0.0.0.0	
5	0.0.0.0	0.0.0.0	0.0.0.0	

- 4 Configure the **Static Route Setup** screen using the following settings:
 - 4a Type **192.168.10.0** and subnet mask **255.255.255.0** for the destination, **N2**.
 - 4b Type **192.168.1.253** (**R's N1** address) in the **Gateway IP Address** field.

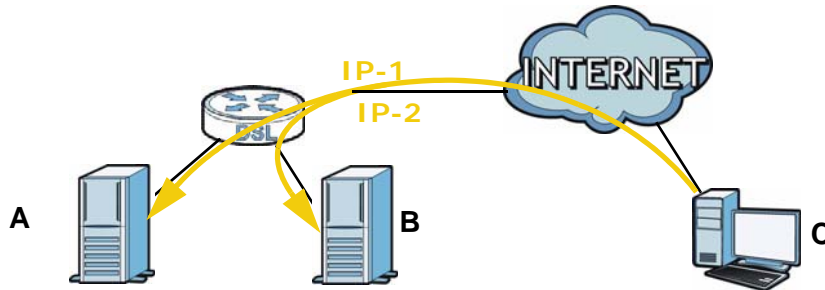
Static Route Setup	
Destination IP Address	<input type="text" value="192.168.10.0"/>
IP Subnet Mask	<input type="text" value="255.255.255.0"/>
Gateway IP Address	<input type="text" value="192.168.1.253"/>
<input type="button" value="Back"/> <input type="button" value="Apply"/> <input type="button" value="Cancel"/>	

- 4a Click **Apply**.

Now **B** should be able to receive traffic from **A**. You may need to additionally configure **B's** firewall settings to allow specific traffic to pass through.

4.5 Multiple Public and Private IP Address Mappings

If your ISP gives you more than one static IP address for your Internet access, you can map each IP address for a specific service. This tutorial assumes you are given two static public IP addresses. You want to map them to two servers **A** and **B**.



This tutorial uses the following example settings:

Table 6 IP Settings in this Tutorial

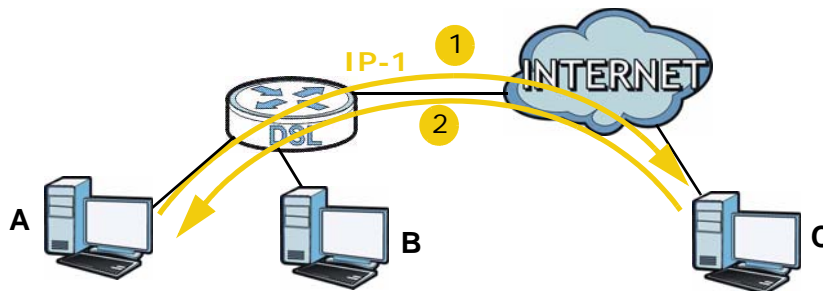
DEVICE / COMPUTER	IP ADDRESS
The ZyXEL Device's WAN	172.16.1.253 (IP-1) 172.16.1.254 (IP-2)
The ZyXEL Device's LAN	192.168.1.1
A	192.168.1.2
B	192.168.1.3
C	a.b.c.d

To do this, you can use either of the following settings:

- Full Feature NAT with many-to-many no overload mapping
- Full Feature NAT with one-to-one mapping

4.5.1 Full Feature NAT + Many-to-Many No Overload Mapping

Use this setting if your applications can use random public IP addresses and the applications are initiated from the Intranet computers (**A** and **B**). For example, VoIP application. See [Section 4.5.2 on page 54](#) if it is not.



To configure this:

- 1 Click **Network > NAT**.
- 2 Select **Active Network Address Translation(NAT)** and **Full Feature** in the **General** screen. Click **Apply**.

- 3 Click the **Address Mapping** tab, and then click the **Edit** icon on a new rule.

#	Local Start IP	Local End IP	Global Start IP	Global End IP	Type	Modify
1	-	-	-	-	-	
2	-	-	-	-	-	
3	-	-	-	-	-	

- 4 Configure the rule using the following settings:
 - Type: **Many-to-Many No Overload**
 - Local IP addresses: **192.168.1.2 ~ 192.168.1.3**

- Global IP addresses: **172.16.1.253 ~ 172.16.1.254**

Edit Address Mapping Rule1

Type: Many-to-Many No Overload

Local Start IP: 192.168.1.2

Local End IP: 192.168.1.3

Global Start IP: 172.16.1.253

Global End IP: 172.16.1.254

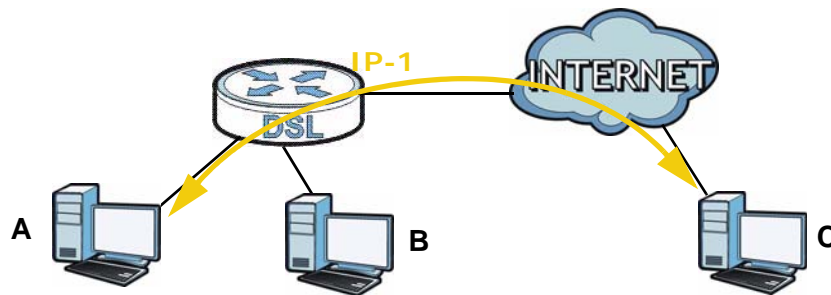
Server Mapping Set: PVC0 [Edit Details](#)

Back Apply Cancel

Then click **Apply**.

4.5.2 Full Feature NAT + One-to-One Mapping

Use this setting if your applications must use fixed public IP addresses and the applications can be initiated either from the Intranet computers (**A** and **B**) or the Internet computer (**C**). For example, gaming application.



To configure this setting:

- 1 Click **Network > NAT**.
- 2 Select **Active Network Address Translation(NAT)** and **Full Feature** in the **General** screen. Click **Apply**.

General Address Mapping ALG

NAT Setup

Active Network Address Translation(NAT)




SUA Only

Full Feature

Max NAT/Firewall Session Per User: 512

Apply Cancel

- 3 Click the **Address Mapping** tab, click the **Edit** icon on a new rule.

#	Local Start IP	Local End IP	Global Start IP	Global End IP	Type	Modify
1	-	-	-	-	-	
2	-	-	-	-	-	
3	-	-	-	-	-	

- 4 Configure two rules for the one-to-one mappings:

- Rule 1 (This maps the public IP address 172.16.1.253 to the private IP address 192.168.1.2)

Type: **One-to-One**

Local Start IP: **192.168.1.2**

Global Start IP: **172.16.1.253**

- Rule 2 (This maps the public IP address 172.16.1.254 to the private IP address 192.168.1.3)

Type: **One-to-One**

Local Start IP: **192.168.1.3**

Global Start IP: **172.16.1.254**

Click **Apply** on each of the screens.

4.6 Multiple WAN Connections Example

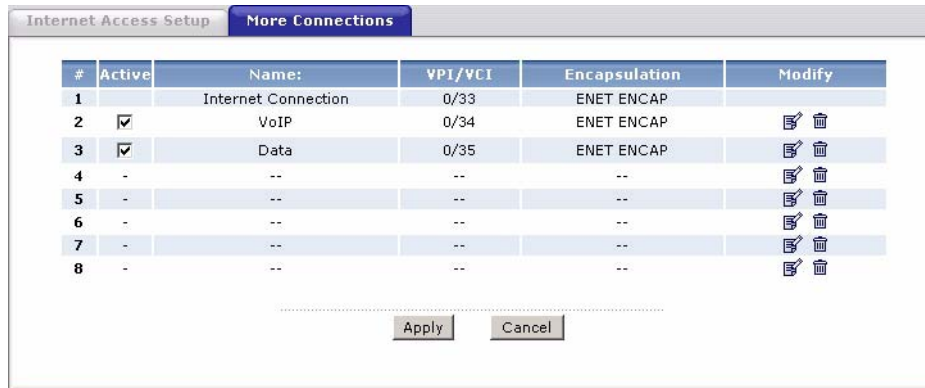
This example shows an application for multiple WAN connections.















Your ISP may configure more than one WAN connection on the ZyXEL Device to record traffic statistics or calculate service charges.

In [Figure 9](#), three WAN connections are configured over the ADSL line:

- The connection with VPI/VCI, **0/33**, is dedicated for Media-On-Demand (MOD) service.
- The connection with VPI/VCI, **0/34**, is dedicated for VoIP service.
- The connection with VPI/VCI, **0/35**, is dedicated for general data transmission.

Figure 9 Example for Multiple WAN Connections



#	Active	Name:	VPI/VCI	Encapsulation	Modify
1		Internet Connection	0/33	ENET ENCAP	
2	<input checked="" type="checkbox"/>	VoIP	0/34	ENET ENCAP	 
3	<input checked="" type="checkbox"/>	Data	0/35	ENET ENCAP	 
4	-	--	--	--	 
5	-	--	--	--	 
6	-	--	--	--	 
7	-	--	--	--	 
8	-	--	--	--	 

PART II

Technical Reference

Internet and Wireless Setup Wizard

5.1 Overview

Use the wizard setup screens to configure your system for Internet access with the information given to you by your ISP.

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

5.2 Internet Access Wizard Setup


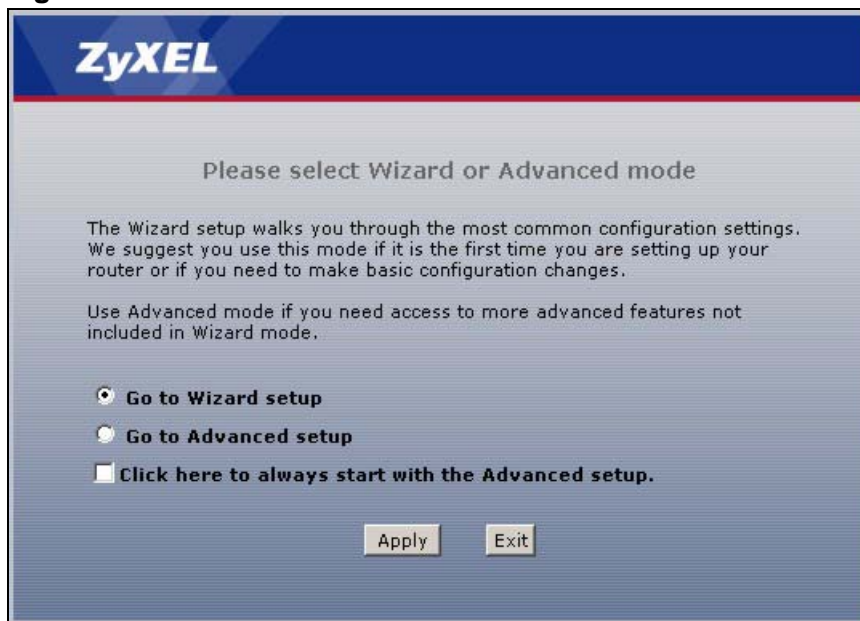
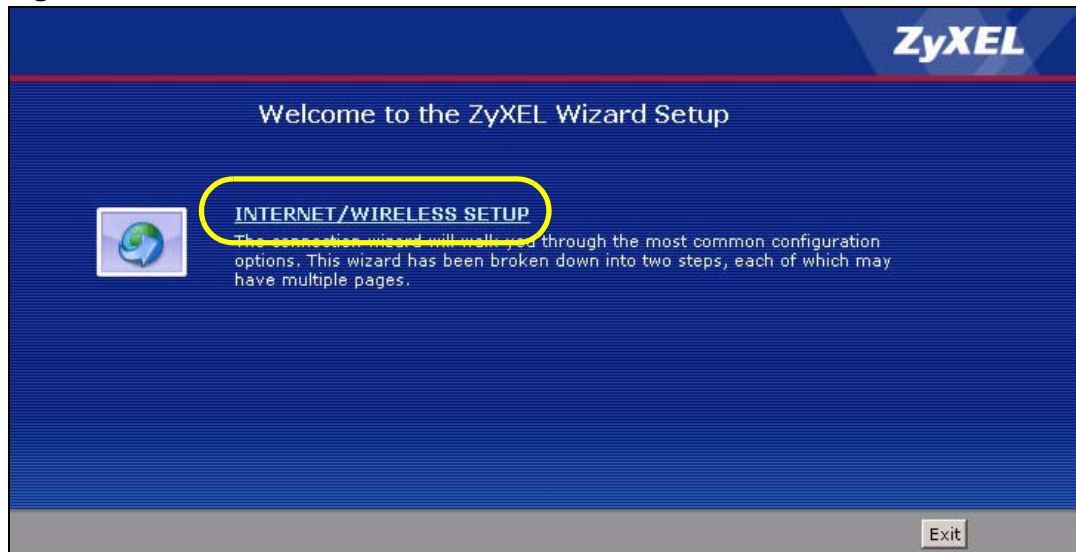
- 1 After you enter the password to access the web configurator, select **Go to Wizard setup** and click **Apply**. Otherwise, click the wizard icon () in the top right corner of the web configurator to go to the wizards.

Figure 10 Select a Mode



- 2 Click **INTERNET/WIRELESS SETUP** to configure the system for Internet access and wireless connection.

Figure 11 Wizard Welcome



- 3 Your ZyXEL device attempts to detect your DSL connection and your connection type.
 - 3a The following screen appears if a connection is not detected. Check your hardware connections and click **Restart the INTERNET/WIRELESS SETUP Wizard** to return to the wizard welcome screen. If you still cannot connect, click **Manually configure your Internet connection**. Follow the directions in the wizard and enter your Internet setup information as provided to you by your ISP. See [Section 5.2.1 on page 62](#) for more details. If you would like to skip your Internet setup and configure the wireless LAN settings, leave **Yes** selected and click **Next**.

Figure 12 Auto Detection: No DSL Connection



- 3b** The following screen displays if a PPPoE or PPPoA connection is detected. Enter your Internet account information (username, password and/or service name) exactly as provided by your ISP. Then click **Next** and see [Section 5.3 on page 68](#) for wireless connection wizard setup.

Figure 13 Auto-Detection: PPPoE

The screenshot shows the 'Internet Configuration' wizard at Step 1. The 'Auto-Detected ISP' section indicates the 'Connection Type' is 'PPP over Ethernet (PPPoE)'. Below this, the 'ISP Parameters for Internet Access' section provides instructions to enter the User Name, Password, and Service Name (optional) as provided by the ISP. There are three input fields corresponding to these fields. At the bottom, there are three buttons: '< Back', 'Next >', and 'Exit'.

- 3c** The following screen appears if the ZyXEL device detects a connection but not the connection type. Click **Next** and refer to [Section 5.2.1 on page 62](#) on how to manually configure the ZyXEL Device for Internet access.

Figure 14 Auto Detection: Failed

The screenshot shows the 'Internet Configuration' wizard at Step 1. The 'Auto-Detected ISP' section displays a message: 'Detection Failed. Please make sure the DSL cable is connected. Click the 'Next' button below to manually configure your Internet connection'. Below this, a 'Note' section states: 'This wizard can only automatically detect PPP over Ethernet (PPPoE), PPP over ATM (PPPoA), or dynamically assigned Ethernet Internet connections. Your Internet connection may use a Static IP address which cannot be detected automatically.' At the bottom, there are three buttons: '< Back', 'Next >', and 'Exit'.

5.2.1 Manual Configuration

- 1 If the ZyXEL Device fails to detect your DSL connection type but the physical line is connected, enter your Internet access information in the wizard screen exactly as your service provider gave it to you. Leave the defaults in any fields for which you were not given information.

Figure 15 Internet Access Wizard Setup: ISP Parameters

The following table describes the fields in this screen.

Table 7 Internet Access Wizard Setup: ISP Parameters

LABEL	DESCRIPTION
Mode	Select Routing (default) from the drop-down list box if your ISP give you one IP address only and you want multiple computers to share an Internet account. Select Bridge when your ISP provides you more than one IP address and you want the connected computers to get individual IP address from ISP's DHCP server directly. If you select Bridge , you cannot use Firewall, DHCP server and NAT on the ZyXEL Device.
Encapsulation	Select the encapsulation type your ISP uses from the Encapsulation drop-down list box. Choices vary depending on what you select in the Mode field. If you select Bridge in the Mode field, select either PPPoA or RFC 1483 . If you select Routing in the Mode field, select PPPoA , RFC 1483 , ENET ENCAP or PPPoE .

Table 7 Internet Access Wizard Setup: ISP Parameters

LABEL	DESCRIPTION
Multiplexing	Select the multiplexing method used by your ISP from the Multiplex drop-down list box either VC-based or LLC-based.
Virtual Circuit ID	VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) define a virtual circuit. Refer to the appendix for more information.
VPI	Enter the VPI assigned to you. This field may already be configured.
VCI	Enter the VCI assigned to you. This field may already be configured.
Back	Click this to return to the previous screen without saving.
Next	Click this to continue to the next wizard screen. The next wizard screen you see depends on what protocol you chose above.
Exit	Click this to close the wizard screen without saving.

- 2 The next wizard screen varies depending on what mode and encapsulation type you use. All screens shown are with routing mode. Configure the fields and click **Next** to continue. See [Section 5.3 on page 68](#) for wireless connection wizard setup

Figure 16 Internet Connection with PPPoE

STEP 1 | STEP 2

Internet Configuration

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

User Name

Password

Service Name (optional)

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

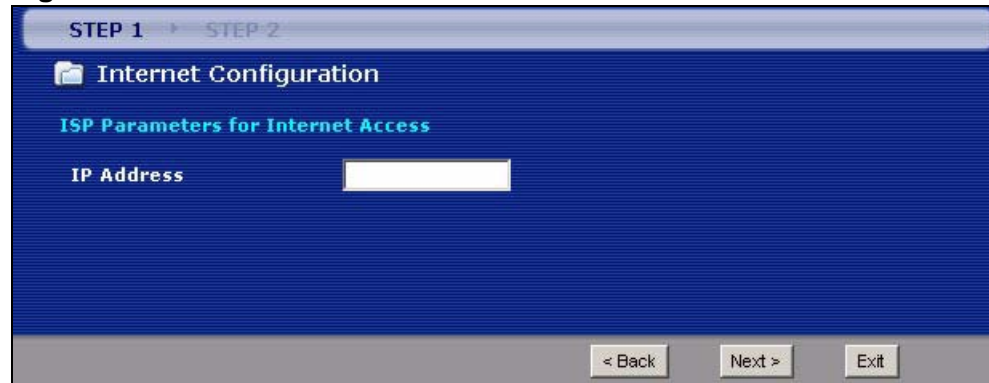
< Back Apply Exit

The following table describes the fields in this screen.

Table 8 Internet Connection with PPPoE

LABEL	DESCRIPTION
User Name	Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.
Password	Enter the password associated with the user name above.
Service Name	Type the name of your PPPoE service here.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Exit	Click this to close the wizard screen without saving.

Figure 17 Internet Connection with RFC 1483



STEP 1 > STEP 2

Internet Configuration

ISP Parameters for Internet Access

IP Address

< Back Next > Exit

The following table describes the fields in this screen.

Table 9 Internet Connection with RFC 1483

LABEL	DESCRIPTION
IP Address	This field is available if you select Routing in the Mode field. Type your ISP assigned IP address in this field.
Back	Click this to return to the previous screen without saving.
Next	Click this to continue to the next wizard screen.
Exit	Click this to close the wizard screen without saving.

Figure 18 Internet Connection with ENET ENCAP

STEP 1 ▶ STEP 2

Internet Configuration

ISP Parameters for Internet Access

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

Obtain an IP Address Automatically
 Static IP Address

IP Address: 0.0.0.0
 Subnet Mask: 0.0.0.0
 Gateway IP address: 0.0.0.0
 First DNS Server: 0.0.0.0
 Second DNS Server: 0.0.0.0

<Back Apply Exit

The following table describes the fields in this screen.

Table 10 Internet Connection with ENET ENCAP

LABEL	DESCRIPTION
Obtain an IP Address Automatically	A static IP address is a fixed IP that your ISP gives you. A dynamic IP address is not fixed; the ISP assigns you a different one each time you connect to the Internet. Select Obtain an IP Address Automatically if you have a dynamic IP address.
Static IP Address	Select Static IP Address if your ISP gave you an IP address to use.
IP Address	Enter your ISP assigned IP address.
Subnet Mask	Enter a subnet mask in dotted decimal notation. Refer to the appendix to calculate a subnet mask If you are implementing subnetting.
Gateway IP address	You must specify a gateway IP address (supplied by your ISP) when you use ENET ENCAP in the Encapsulation field in the previous screen.
First DNS Server	Enter the IP addresses of the DNS servers. The DNS servers are passed to the DHCP clients along with the IP address and the subnet mask.
Second DNS Server	As above.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Exit	Click this to close the wizard screen without saving.

Figure 19 Internet Connection with PPPoA

STEP 1 | STEP 2

Internet Configuration

ISP Parameters for Internet Access
Please enter the User Name and Password given to you by your Internet Service Provider here

User Name

Password

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

< Back Apply Exit

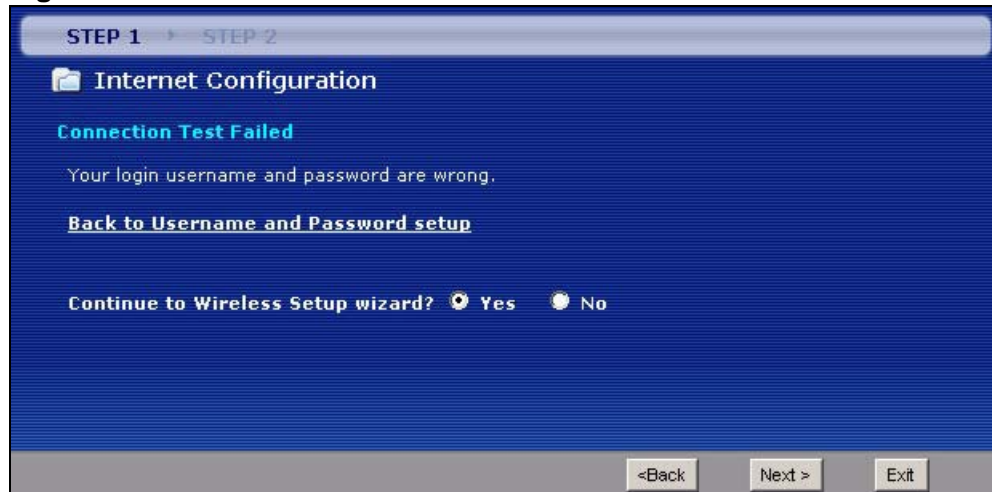
The following table describes the fields in this screen.

Table 11 Internet Connection with PPPoA

LABEL	DESCRIPTION
User Name	Enter the login name that your ISP gives you.
Password	Enter the password associated with the user name above.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Exit	Click this to close the wizard screen without saving.

- If the user name and/or password you entered for PPPoE or PPPoA connection are not correct, the screen displays as shown next. Click **Back to Username and Password setup** to go back to the screen where you can modify them.

Figure 20 Connection Test Failed-1



- If the following screen displays, check if your account is activated or click **Restart the Internet/Wireless Setup Wizard** to verify your Internet access settings.

Figure 21 Connection Test Failed-2.

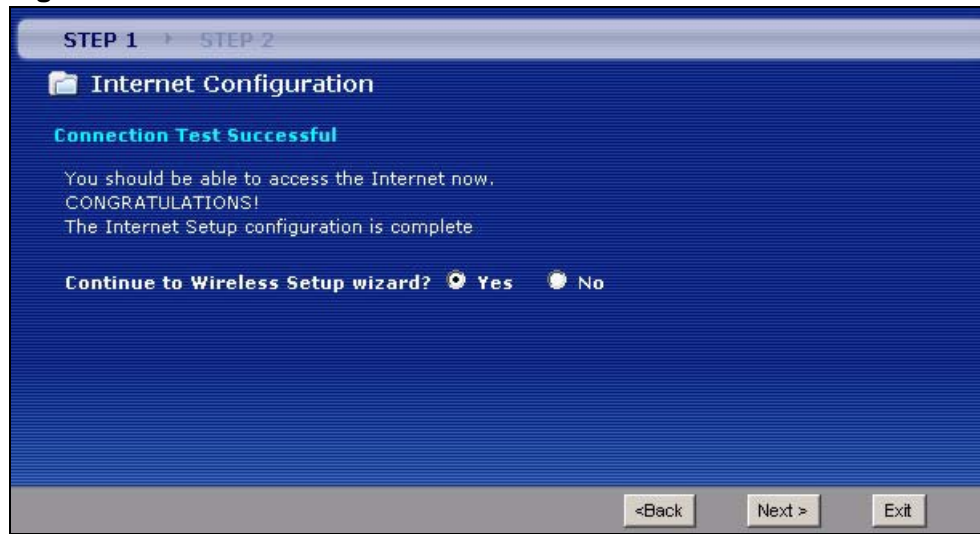


5.3 Wireless Connection Wizard Setup

After you configure the Internet access information, use the following screens to set up your wireless LAN.

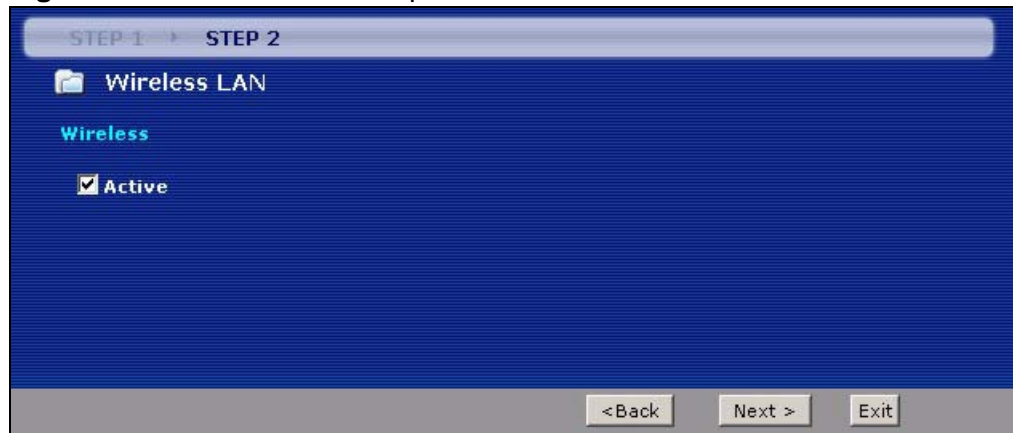
- 1 Select **Yes** and click **Next** to configure wireless settings. Otherwise, select **No** and skip to Step 6.

Figure 22 Connection Test Successful



- 2 Use this screen to activate the wireless LAN. Click **Next** to continue.

Figure 23 Wireless LAN Setup Wizard 1



The following table describes the labels in this screen.

Table 12 Wireless LAN Setup Wizard 1

LABEL	DESCRIPTION
Active	Select the check box to turn on the wireless LAN.
Back	Click this to return to the previous screen without saving.

Table 12 Wireless LAN Setup Wizard 1

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

- 3 Configure your wireless settings in this screen. Click **Next**.

Figure 24 Wireless LAN

The following table describes the labels in this screen.

Table 13 Wireless LAN Setup Wizard 2

LABEL	DESCRIPTION
Network 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.
Channel Selection	The range of radio frequencies used by IEEE 802.11b/g wireless devices is called a channel. Select a channel ID that is not already in use by a neighboring device.
Security	Select Manually assign a WPA-PSK key to configure a Pre-Shared Key (WPA-PSK). Choose this option only if your wireless clients support WPA. See Section 5.3.1 on page 70 for more information. Select Manually assign a WEP key to configure a WEP Key. See Section 5.3.2 on page 71 for more information. Select Disable wireless security to have no wireless LAN security configured and your network is accessible to any wireless networking device that is within range.
Back	Click this to return to the previous screen without saving.

Table 13 Wireless LAN Setup Wizard 2

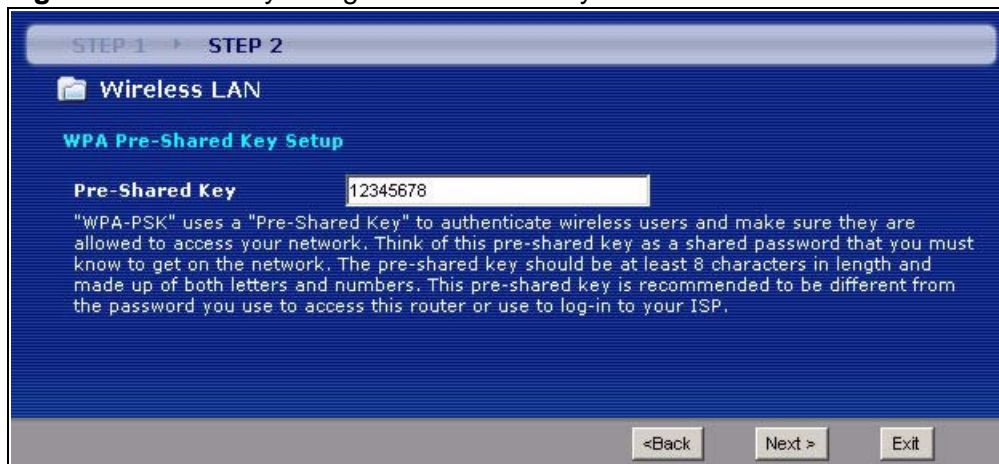
LABEL	DESCRIPTION
Next	Click this to continue to the next wizard screen.
Exit	Click this to close the wizard screen without saving.

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) for wireless communication.

- This screen varies depending on the security mode you selected in the previous screen. Fill in the field (if available) and click **Next**.

5.3.1 Manually Assign a WPA-PSK key

Choose **Manually assign a WPA-PSK key** in the Wireless LAN setup screen to set up a **Pre-Shared Key**.

Figure 25 Manually Assign a WPA-PSK key

The following table describes the labels in this screen.

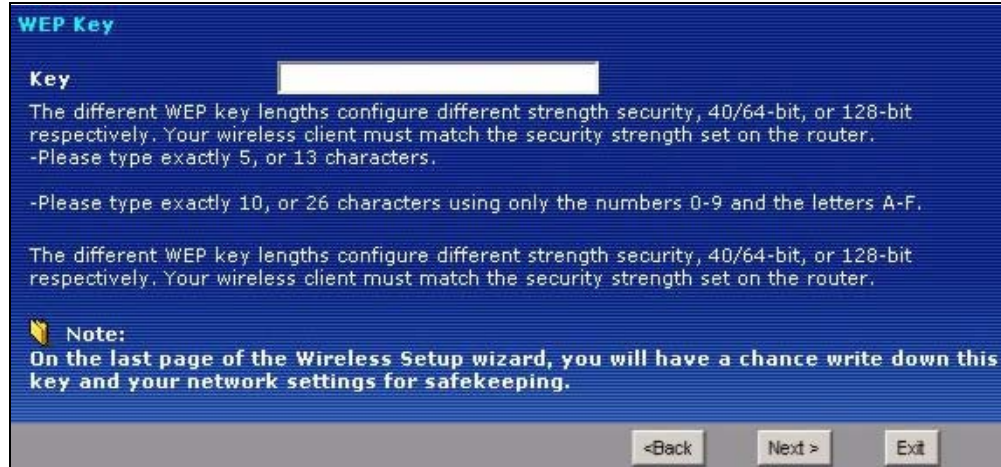
Table 14 Manually Assign a WPA-PSK key

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 this to return to the previous screen without saving.
Next	Click this to continue to the next wizard screen.
Exit	Click this to close the wizard screen without saving.

5.3.2 Manually Assign a WEP Key

Choose **Manually assign a WEP key** to setup WEP Encryption parameters.

Figure 26 Manually Assign a WEP key



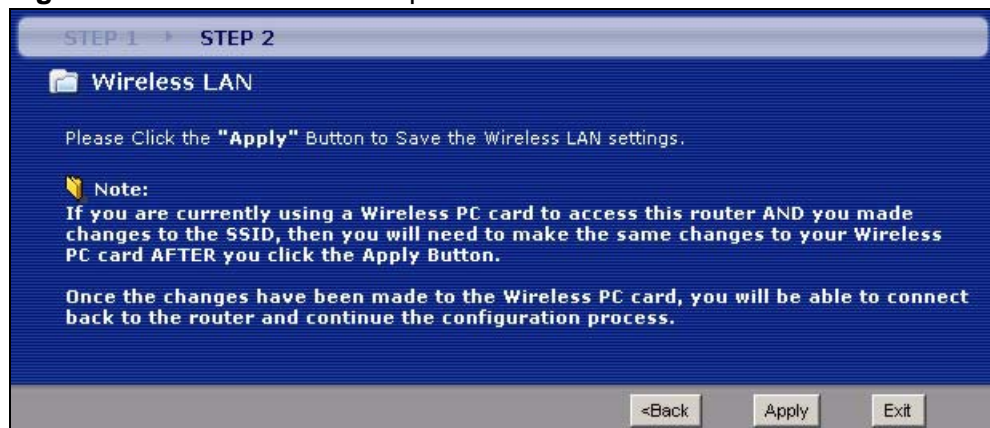
The following table describes the labels in this screen.

Table 15 Manually Assign a WEP key

LABEL	DESCRIPTION
Key	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. Enter any 5 or 13 ASCII characters, or 10 or 26 hexadecimal characters ("0-9", "A-F") for a 64-bit or 128-bit WEP key respectively.
Back	Click this to return to the previous screen without saving.
Next	Click this to continue to the next wizard screen.
Exit	Click this to close the wizard screen without saving.

- 5 Click **Apply** to save your wireless LAN settings.

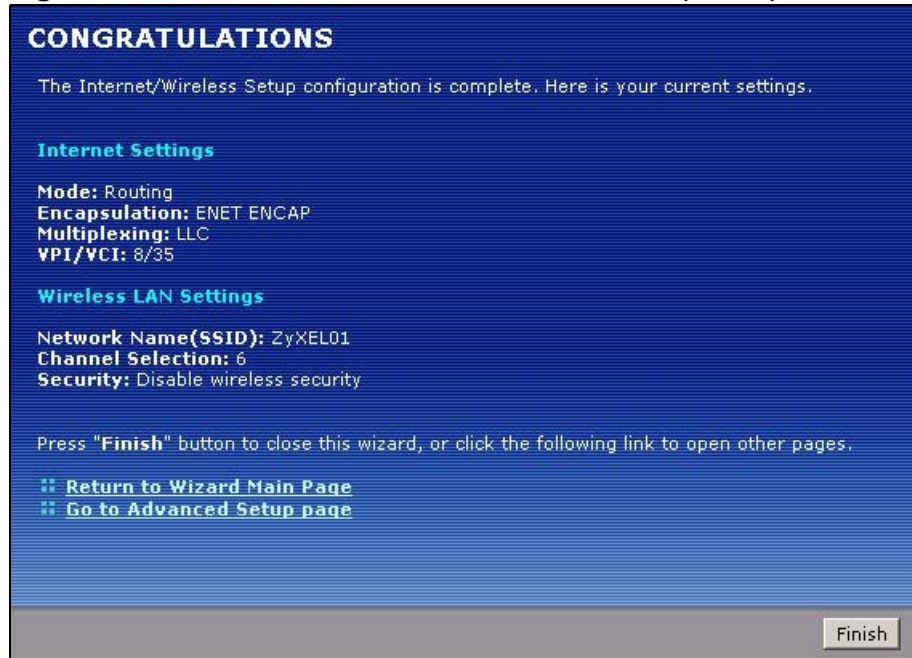
Figure 27 Wireless LAN Setup 3



- 6 Use the read-only summary table to check whether what you have configured is correct. Click **Finish** to complete and save the wizard setup.

Note: No wireless LAN settings display if you chose not to configure wireless LAN settings.

Figure 28 Internet Access and WLAN Wizard Setup Complete



- 7 Launch your web browser and navigate to www.zyxel.com. Internet access is just the beginning. Refer to the rest of this guide for more detailed information on the complete range of ZyXEL Device features. If you cannot access the Internet, open the web configurator again to confirm that the Internet settings you configured in the wizard setup are correct.

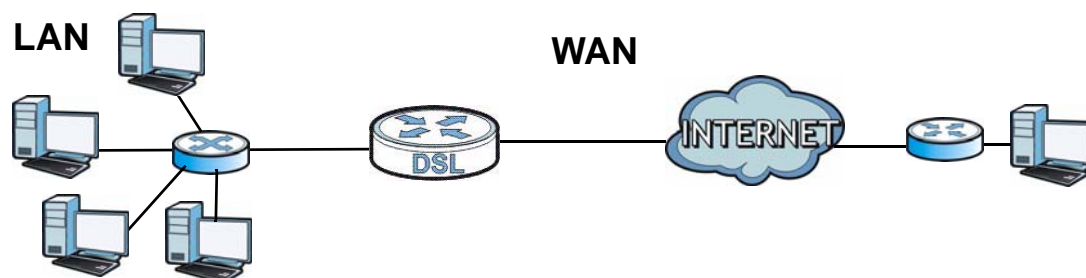
WAN Setup

6.1 Overview

This chapter describes how to configure WAN settings from the **WAN** screens. Use these screens to configure your ZyXEL Device for Internet access.

A WAN (Wide Area Network) connection is an outside connection to another network or the Internet. It connects your private networks (such as a LAN (Local Area Network)) and other networks, so that a computer in one location can communicate with computers in other locations.

Figure 29 LAN and WAN



6.1.1 What You Can Do in the WAN Screens

- Use the **Internet Access Setup** screen ([Section 6.2 on page 75](#)) to configure the WAN settings on the ZyXEL Device for Internet access.
- Use the **More Connections** screen ([Section 6.3 on page 79](#)) to set up additional Internet access connections.

6.1.2 What You Need to Know About WAN

Encapsulation Method

Encapsulation is used to include data from an upper layer protocol into a lower layer protocol. To set up a WAN connection to the Internet, you need to use the same encapsulation method used by your ISP (Internet Service Provider). If your ISP offers a dial-up Internet connection using PPPoE (PPP over Ethernet) or PPPoA,

they should also provide a username and password (and service name) for user authentication.

WAN IP Address

The WAN IP address is an IP address for the ZyXEL Device, which makes it accessible from an outside network. It is used by the ZyXEL Device to communicate with other devices in other networks. It can be static (fixed) or dynamically assigned by the ISP each time the ZyXEL Device tries to access the Internet.

If your ISP assigns you a static WAN IP address, they should also assign you the subnet mask and DNS server IP address(es) (and a gateway IP address if you use the Ethernet or ENET ENCAP encapsulation method).

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 one.

IGMP

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. There are three versions of IGMP. IGMP version 2 and 3 are improvements over version 1, but IGMP version 1 is still in wide use.

Finding Out More

See [Section 6.4 on page 83](#) for technical background information on WAN.

6.1.3 Before You Begin

You need to know your Internet access settings such as encapsulation and WAN IP address. Get this information from your ISP.

6.2 The Internet Access Setup Screen

Use this screen to change your ZyXEL Device's WAN settings. Click **Network > WAN > Internet Access Setup**. The screen differs by the WAN type and encapsulation you select.

Figure 30 Network > WAN > Internet Access Setup (PPPoE)

The following table describes the labels in this screen.

Table 16 Network > WAN > Internet Access Setup

LABEL	DESCRIPTION
Line	
ADSL Mode	Select the mode supported by your ISP. Use Auto Sync-Up if you are not sure which mode to choose from. The ZyXEL Device dynamically diagnoses the mode supported by the ISP and selects the best compatible one for your connection. Other options are ADSL2+ , ADSL2 , G.DMT , T1.413 and G.lite .
ADSL Type	Select the type supported by your ISP. Available options are ANNEX A , ANNEX A/L , ANNEX M and ANNEX A/L/M .

Table 16 Network > WAN > Internet Access Setup (continued)

LABEL	DESCRIPTION
General	
Mode	Select Routing (default) from the drop-down list box if your ISP gives you one IP address only and you want multiple computers to share an Internet account. Select Bridge when your ISP provides you more than one IP address and you want the connected computers to get individual IP address from ISP's DHCP server directly. If you select Bridge , you cannot use Firewall, DHCP server and NAT on the ZyXEL Device.
Encapsulation	Select the method of encapsulation used by your ISP from the drop-down list box. Choices vary depending on the mode you select in the Mode field. If you select Bridge in the Mode field, select either PPPoA or RFC 1483 . If you select Routing in the Mode field, select PPPoA , RFC 1483 , ENET ENCAP or PPPoE .
User Name	(PPPoA and PPPoE encapsulation only) Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.
Password	(PPPoA and PPPoE encapsulation only) Enter the password associated with the user name above.
Service Name	(PPPoE only) Type the name of your PPPoE service here.
Multiplexing	Select the method of multiplexing used by your ISP from the drop-down list. Choices are VC or LLC . This field is not available if you set the WAN type to Ethernet .
Virtual Circuit ID	VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) define a virtual circuit. Refer to the appendix for more information. These fields are not available if you set the WAN type to Ethernet .
VPI	The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.
VCI	The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.
IP Address	This option is available if you select Routing in the Mode field. A static IP address is a fixed IP that your ISP gives you. A dynamic IP address is not fixed; the ISP assigns you a different one each time you connect to the Internet. Select Obtain an IP Address Automatically if you have a dynamic IP address; otherwise select Static IP Address and type your ISP assigned IP address in the IP Address field below.
Subnet Mask	This option is available if you select ENET ENCAP in the Encapsulation field. Enter a subnet mask in dotted decimal notation.
ENET ENCAP Gateway	This option is available if you select ENET ENCAP in the Encapsulation field. Specify a gateway IP address (supplied by your ISP).

Table 16 Network > WAN > Internet Access Setup (continued)

LABEL	DESCRIPTION
Connection (PPPoA and PPPoE encapsulation only)	
Keep Alive	Select Keep Alive when you want your connection up all the time. The ZyXEL Device will try to bring up the connection automatically if it is disconnected.
Connect on Demand	Select Connect on Demand when you don't want the connection up all the time and specify an idle time-out in the Max Idle Timeout field.
Max Idle Timeout	Specify an idle time-out in the Max Idle Timeout field when you select Connect on Demand . The default setting is 0, which means the Internet session will not timeout.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.
Advanced Setup	Click this to display the Advanced WAN Setup screen and edit more details of your WAN setup.

6.2.1 Advanced Internet Access Setup

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

Figure 31 Network > WAN > Internet Access Setup: Advanced Setup

RIP & Multicast Setup

RIP Direction: None

RIP Version: N/A

Multicast: None

ATM QoS

ATM QoS Type: UBR

Peak Cell Rate: 0 cell/sec

Sustain Cell Rate: 0 cell/sec

Maximum Burst Size: 0 cell

MTU

MTU: 1492

Back Apply Cancel

The following table describes the labels in this screen.

Table 17 Network > WAN > Internet Access Setup: Advanced Setup

LABEL	DESCRIPTION
RIP & Multicast Setup	This section is not available when you configure the ZyXEL Device to be in bridge mode.
RIP Direction	RIP (Routing Information Protocol) allows a router to exchange routing information with other routers. Use this field to control how much routing information the ZyXEL Device sends and receives on the subnet. Select the RIP direction from None , Both , In Only and Out Only .
RIP Version	This field is not configurable if you select None in the RIP Direction field. Select the RIP version from RIP-1 , RIP-2B and RIP-2M .
Multicast	Multicast packets are sent to a group of computers on the LAN and are an alternative to unicast packets (packets sent to one computer) and broadcast packets (packets sent to every computer). Internet Group Multicast Protocol (IGMP) is a network-layer protocol used to establish membership in a multicast group. The ZyXEL Device supports IGMP-v1 , IGMP-v2 and IGMP-v3 . Select None to disable it.
ATM QoS	
ATM QoS Type	Select CBR (Continuous Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select UBR (Unspecified Bit Rate) for applications that are non-time sensitive, such as e-mail. Select rtVBR (real-time Variable Bit Rate) type for applications with bursty connections that require closely controlled delay and delay variation. Select nrtVBR (non real-time Variable Bit Rate) type for connections that do not require closely controlled delay and delay variation.
Peak Cell Rate	Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.
Sustain Cell Rate	The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.
Maximum Burst Size	Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.
MTU	
MTU	The Maximum Transmission Unit (MTU) defines the size of the largest packet allowed on an interface or connection. Enter the MTU in this field. For ENET ENCAP, the MTU value is 1500. For PPPoE, the MTU value is 1492. For PPPoA and RFC 1483, the MTU is 65535.
Back	Click this to return to the previous screen without saving.

Table 17 Network > WAN > Internet Access Setup: Advanced Setup (continued)

LABEL	DESCRIPTION
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

6.3 The More Connections Screen

The ZyXEL Device allows you to configure more than one Internet access connection. To configure additional Internet access connections click **Network > WAN > More Connections**. The screen differs by the encapsulation you select. When you use the **WAN > Internet Access Setup** screen to set up Internet access, you are configuring the first WAN connection.

Figure 32 Network > WAN > More Connections

#	Active	Name:	VPI/VCI	Encapsulation	Modify
1		Internet Connection	8/35	ENET ENCAP	
2	-	--	--	--	
3	-	--	--	--	
4	-	--	--	--	
5	-	--	--	--	
6	-	--	--	--	
7	-	--	--	--	
8	-	--	--	--	

The following table describes the labels in this screen.

Table 18 Network > WAN > More Connections

LABEL	DESCRIPTION
#	This is an index number indicating the number of the corresponding connection.
Active	This field indicates whether the connection is active or not. Clear the check box to disable the connection. Select the check box to enable it.
Name	This is the name you gave to the Internet connection.
VPI/VCI	This field displays the Virtual Path Identifier (VPI) and Virtual Channel Identifier (VCI) numbers configured for this WAN connection.
Encapsulation	This field indicates the encapsulation method of the Internet connection.

Table 18 Network > WAN > More Connections (continued)

LABEL	DESCRIPTION
Modify	<p>The first (ISP) connection is read-only in this screen. Use the WAN > Internet Access Setup screen to edit it.</p> <p>Click the Edit icon to edit the Internet connection settings. Click this icon on an empty configuration to add a new Internet access setup.</p> <p>Click the Remove icon to delete the Internet access setup from your connection list.</p>
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

6.3.1 More Connections Edit

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

Figure 33 Network > WAN > More Connections: Edit

General

Active

Node Name: Node2

Mode: Routing

Encapsulation: PPPoE

User Name: _____

Password: _____

Service Name: _____

Multiplex: LLC

VPI: 0

VCI: 34

IP address

Obtain an IP Address Automatically

Static IP Address

IP Address: 0.0.0.0

Subnet Mask: 0.0.0.0

ENET ENCAP Gateway: 0.0.0.0

Connection

Nailed-Up Connection

Connect on Demand

Max Idle Timeout: 0 Sec

NAT

None

SUA Only [Edit](#)

Back Apply Cancel Advanced Setup

The following table describes the labels in this screen.

Table 19 Network > WAN > More Connections: Edit

LABEL	DESCRIPTION
General	
Active	Select the check box to activate or clear the check box to deactivate this connection.
Name	Enter a unique, descriptive name of up to 13 ASCII characters for this connection.
Mode	<p>Select Routing from the drop-down list box if your ISP allows multiple computers to share an Internet account.</p> <p>If you select Bridge, the ZyXEL Device will forward any packet that it does not route to this remote node; otherwise, the packets are discarded.</p>
Encapsulation	<p>Select the method of encapsulation used by your ISP from the drop-down list box. Choices vary depending on the mode you select in the Mode field.</p> <p>If you select Bridge in the Mode field, select either PPPoA or RFC 1483.</p> <p>If you select Routing in the Mode field, select PPPoA, RFC 1483, ENET ENCAP or PPPoE.</p>
Multiplexing	<p>Select the method of multiplexing used by your ISP from the drop-down list. Choices are VC or LLC.</p> <p>By prior agreement, a protocol is assigned a specific virtual circuit, for example, VC1 will carry IP. If you select VC, specify separate VPI and VCI numbers for each protocol.</p> <p>For LLC-based multiplexing or PPP encapsulation, one VC carries multiple protocols with protocol identifying information being contained in each packet header. In this case, only one set of VPI and VCI numbers need be specified for all protocols.</p>
VPI	The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.
VCI	The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.
IP Address	<p>This option is available if you select Routing in the Mode field.</p> <p>A static IP address is a fixed IP that your ISP gives you. A dynamic IP address is not fixed; the ISP assigns you a different one each time you connect to the Internet.</p> <p>If you use the encapsulation type except RFC 1483, select Obtain an IP Address Automatically when you have a dynamic IP address; otherwise select Static IP Address and type your ISP assigned IP address in the IP Address field below.</p> <p>If you use RFC 1483, enter the IP address given by your ISP in the IP Address field.</p>
Subnet Mask	<p>This option is available if you select ENET ENCAP in the Encapsulation field.</p> <p>Enter a subnet mask in dotted decimal notation.</p>

Table 19 Network > WAN > More Connections: Edit (continued)

LABEL	DESCRIPTION
ENET ENCAP Gateway	This option is available if you select ENET ENCAP in the Encapsulation field. Specify a gateway IP address (supplied by your ISP).
Connection	
Nailed-Up Connection	Select Nailed-Up Connection when you want your connection up all the time. The ZyXEL Device will try to bring up the connection automatically if it is disconnected.
Connect on Demand	Select Connect on Demand when you don't want the connection up all the time and specify an idle time-out in the Max Idle Timeout field.
Max Idle Timeout	Specify an idle time-out in the Max Idle Timeout field when you select Connect on Demand . The default setting is 0, which means the Internet session will not timeout.
NAT	SUA only is available only when you select Routing in the Mode field. Select SUA Only if you have one public IP address and want to use NAT. Click Edit Detail to go to the Port Forwarding screen to edit a server mapping set. Otherwise, select None to disable NAT.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.
Advanced Setup	Click this to display the More Connections Advanced Setup screen and edit more details of your WAN setup.

6.3.2 Configuring More Connections Advanced Setup

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

Figure 34 Network > WAN > More Connections: Edit: Advanced Setup

The screenshot shows the 'Advanced Setup' configuration page. It features a header 'ATM Qos' and a sub-header 'MTU'. Under 'ATM Qos', the 'ATM QoS Type' is set to 'UBR'. The 'Peak Cell Rate' is 0 cell/sec, 'Sustain Cell Rate' is 0 cell/sec, and 'Maximum Burst Size' is 0 cell. Under 'MTU', the 'MTU' value is 1500. At the bottom of the form, there are three buttons: 'Back', 'Apply', and 'Cancel'.

The following table describes the labels in this screen.

Table 20 Network > WAN > More Connections: Edit: Advanced Setup

LABEL	DESCRIPTION
ATM QoS	
ATM QoS Type	Select CBR (Continuous Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select UBR (Unspecified Bit Rate) for applications that are non-time sensitive, such as e-mail. Select nrtVBR (Variable Bit Rate-non Real Time) or rtVBR (Variable Bit Rate-Real Time) for bursty traffic and bandwidth sharing with other applications.
Peak Cell Rate	Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.
Sustain Cell Rate	The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.
Maximum Burst Size	Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.
MTU	
MTU	The Maximum Transmission Unit (MTU) defines the size of the largest packet allowed on an interface or connection. Enter the MTU in this field. For ENET ENCAP, the MTU value is 1500. For PPPoE, the MTU value is 1492. For PPPoA and RFC, the MTU is 65535.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

6.4 WAN Technical Reference

This section provides some technical background information about the topics covered in this chapter.

6.4.1 Encapsulation

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

6.4.1.1 ENET ENCAP

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

6.4.1.2 PPP over Ethernet

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 (DSL, cable, wireless, etc.) connection. The PPPoE 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.

6.4.1.3 PPPoA

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

6.4.1.4 RFC 1483

RFC 1483 describes two methods for Multiprotocol Encapsulation over ATM Adaptation Layer 5 (AAL5). The first method allows multiplexing of multiple protocols over a single ATM virtual circuit (LLC-based multiplexing) and the second

method assumes that each protocol is carried over a separate ATM virtual circuit (VC-based multiplexing). Please refer to RFC 1483 for more detailed information.

6.4.2 Multiplexing

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

VC-based Multiplexing

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

LLC-based Multiplexing

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

6.4.3 VPI and VCI

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

6.4.4 IP Address Assignment

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

IP Assignment with PPPoA or PPPoE Encapsulation

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

IP Assignment with RFC 1483 Encapsulation

In this case the IP address assignment must be static.

IP Assignment with ENET ENCAP Encapsulation

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

6.4.5 Nailed-Up Connection (PPP)

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

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

6.4.6 NAT

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 to a different IP address known within another network.

6.5 Traffic Shaping

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

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

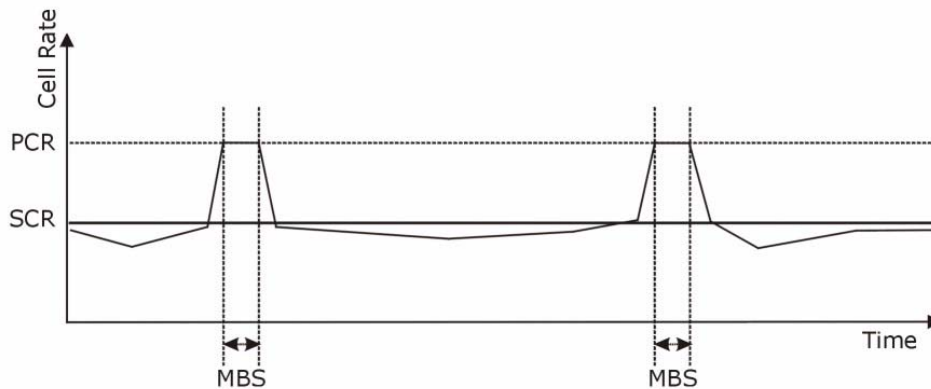
Sustained Cell Rate (SCR) is the mean cell rate of each bursty traffic source. It specifies the maximum average rate at which cells can be sent over the virtual connection. SCR may not be greater than the PCR.

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

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

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

Figure 35 Example of Traffic Shaping



6.5.1 ATM Traffic Classes

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

Constant Bit Rate (CBR)

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

Variable Bit Rate (VBR)

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

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

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

Unspecified Bit Rate (UBR)

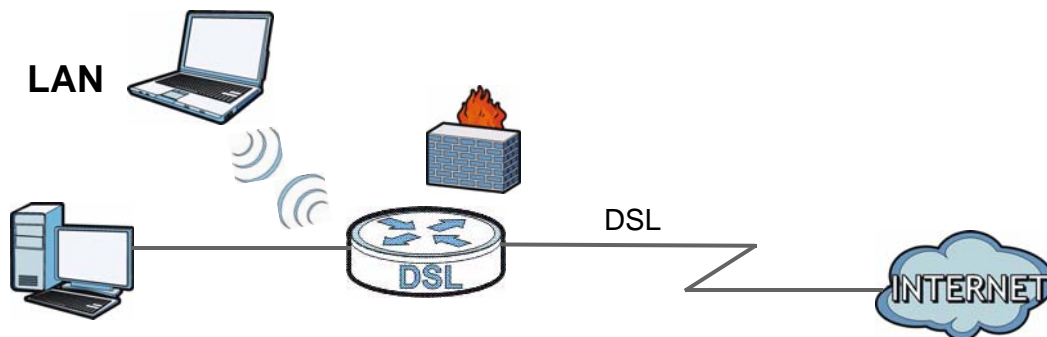
The Unspecified Bit Rate (UBR) ATM traffic class is for bursty data transfers. However, UBR doesn't guarantee any bandwidth and only delivers traffic when the network has spare bandwidth. An example application is background file transfer.

LAN Setup

7.1 Overview

A Local Area Network (LAN) is a shared communication system to which many networking devices are connected. It is usually located in one immediate area such as a building or floor of a building.

Use the LAN screens to help you configure a LAN DHCP server and manage IP addresses.



7.1.1 What You Can Do in the LAN Screens

- Use the **LAN IP** screen ([Section 7.2 on page 91](#)) to set the LAN IP address and subnet mask of your ZyXEL device. You can also edit your ZyXEL Device's RIP, multicast and Windows Networking settings from this screen.
- Use the **DHCP Setup** screen ([Section 7.3 on page 93](#)) to configure the ZyXEL Device's DHCP settings.
- Use the **Client List** screen ([Section 7.4 on page 94](#)) to assign IP addresses on the LAN to specific individual computers based on their MAC Addresses.
- Use the **IP Alias** screen ([Section 7.5 on page 95](#)) to change your ZyXEL Device's IP alias settings.

7.1.2 What You Need To Know About LAN

IP Address

IP addresses identify individual devices on a network. Every networking device (including computers, servers, routers, printers, etc.) needs an IP address to communicate across the network. These networking devices are also known as hosts.

Subnet Mask

Subnet masks determine the maximum number of possible hosts on a network. You can also use subnet masks to divide one network into multiple sub-networks.

DHCP

A DHCP (Dynamic Host Configuration Protocol) server can assign your ZyXEL Device an IP address, subnet mask, DNS and other routing information when it's turned on.

RIP

RIP (Routing Information Protocol) allows a router to exchange routing information with other routers.

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

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. There are three versions of IGMP. IGMP version 2 and 3 are improvements over version 1, but IGMP version 1 is still in wide use.

DNS

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 networking device before you can access it.

Finding Out More

See [Section 7.6 on page 97](#) for technical background information on LANs.

7.1.3 Before You Begin

Find out the MAC addresses of your network devices if you intend to add them to the DHCP Client List screen.

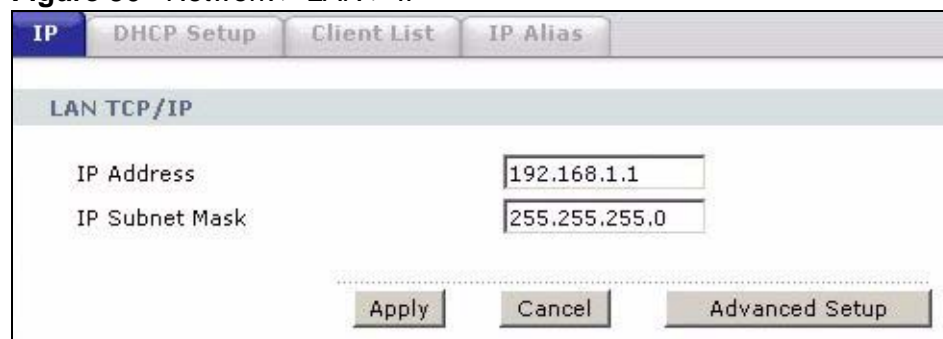
7.2 The LAN IP Screen

Use this screen to set the Local Area Network IP address and subnet mask of your ZyXEL Device. Click **Network > LAN** to open the **IP** screen.

Follow these steps to configure your LAN settings.

- 1 Enter an IP address into the **IP Address** field. The IP address must be in dotted decimal notation. This will become the IP address of your ZyXEL Device.
- 2 Enter the IP subnet mask into the **IP Subnet Mask** field. Unless instructed otherwise it is best to leave this alone, the configurator will automatically compute a subnet mask based upon the IP address you entered.
- 3 Click **Apply** to save your settings.

Figure 36 Network > LAN > IP



IP	DHCP Setup	Client List	IP Alias
LAN TCP/IP			
IP Address	<input type="text" value="192.168.1.1"/>		
IP Subnet Mask	<input type="text" value="255.255.255.0"/>		
<input type="button" value="Apply"/> <input type="button" value="Cancel"/> <input type="button" value="Advanced Setup"/>			

The following table describes the fields in this screen.

Table 21 Network > LAN > IP

LABEL	DESCRIPTION
IP Address	Enter the LAN IP address you want to assign to your ZyXEL Device in dotted decimal notation, for example, 192.168.1.1 (factory default).
IP Subnet Mask	Type the subnet mask of your network in dotted decimal notation, for example 255.255.255.0 (factory default). Your ZyXEL Device automatically computes the subnet mask based on the IP Address you enter, so do not change this field unless you are instructed to do so.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.
Advanced Setup	Click this to display the Advanced LAN Setup screen and edit more details of your LAN setup.

7.2.1 The Advanced LAN IP Setup Screen

Use this screen to edit your ZyXEL Device's RIP, multicast and Windows Networking settings. Click the **Advanced Setup** button in the **LAN IP** screen. The screen appears as shown.

Figure 37 Network > LAN > IP: Advanced Setup

The following table describes the labels in this screen.

Table 22 Network > LAN > IP: Advanced Setup

LABEL	DESCRIPTION
RIP & Multicast Setup	
RIP Direction	Select the RIP direction from None , Both , In Only and Out Only .
RIP Version	Select the RIP version from RIP-1 , RIP-2B and RIP-2M .
Multicast	IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a multicast group. The ZyXEL Device supports IGMP-v1 , IGMP-v2 and IGMP-v3 . Select None to disable it.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

7.3 The DHCP Setup Screen

Use this screen to configure the DNS server information that the ZyXEL Device sends to the DHCP client devices on the LAN. Click **Network > DHCP Setup** to open this screen.

Figure 38 Network > LAN > DHCP Setup

The following table describes the labels in this screen.

Table 23 Network > LAN > DHCP Setup

LABEL	DESCRIPTION
DHCP Setup	
DHCP	<p>If set to Server, your ZyXEL Device can assign IP addresses, an IP default gateway and DNS servers to Windows 95, Windows NT and other systems that support the DHCP client.</p> <p>If set to None, the DHCP server will be disabled.</p> <p>If set to Relay, the ZyXEL Device acts as a surrogate DHCP server and relays DHCP requests and responses between the remote server and the clients. Enter the IP address of the actual, remote DHCP server in the Remote DHCP Server field in this case.</p> <p>When DHCP is used, the following items need to be set:</p>
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.
Remote DHCP Server	If Relay is selected in the DHCP field above then enter the IP address of the actual remote DHCP server here.
DNS Server	

Table 23 Network > LAN > DHCP Setup

LABEL	DESCRIPTION
DNS Servers Assigned by DHCP Server	The ZyXEL Device passes a DNS (Domain Name System) server IP address to the DHCP clients.
Primary / Secondary DNS Server	Enter the IP address of your primary/secondary DNS server.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

7.4 The Client List Screen

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

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

Use this screen to change your ZyXEL Device's static DHCP settings. Click **Network > LAN > Client List** to open the following screen.

Figure 39 Network > LAN > Client List

The screenshot shows the 'Client List' screen with the following data:

#	Status	Host Name	IP Address	MAC Address	Reserve	Modify
1	Lightbulb icon	IBM1	192.168.1.33	11:22:33:44:55:66	<input checked="" type="checkbox"/>	Modify icon
2	Lightbulb icon		192.168.1.34	AA:BB:CC:DD:EE:FF	<input checked="" type="checkbox"/>	Modify icon
3	Lightbulb icon	HP	192.168.1.99	AA:BB:CC:KK:FF:GG	<input type="checkbox"/>	

The following table describes the labels in this screen.

Table 24 Network > LAN > Client List

LABEL	DESCRIPTION
IP Address	Enter the IP address that you want to assign to the computer on your LAN with the MAC address that you will also specify.
MAC Address	Enter the MAC address of a computer on your LAN.
Add	Click this to add a static DHCP entry.

Table 24 Network > LAN > Client List

LABEL	DESCRIPTION
#	This is the index number of the static IP table entry (row).
Status	This field displays whether the client is connected to the ZyXEL Device.
Host Name	This field displays the computer host name.
IP Address	This field displays the IP address relative to the # field listed above.
MAC Address	The MAC (Media Access Control) or Ethernet address on a LAN (Local Area Network) is unique to your computer (six pairs of hexadecimal notation). A network interface card such as an Ethernet adapter has a hardwired address that is assigned at the factory. This address follows an industry standard that ensures no other adapter has a similar address.
Reserve	Select the check box in the heading row to automatically select all check boxes or select the check box(es) in each entry to have the ZyXEL Device always assign the selected entry(ies)'s IP address(es) to the corresponding MAC address(es) (and host name(s)). You can select up to 10 entries in this table.
Modify	Click the modify icon to have the IP address field editable and change it.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.
Refresh	Click this to reload the DHCP table.

7.5 The IP Alias Screen

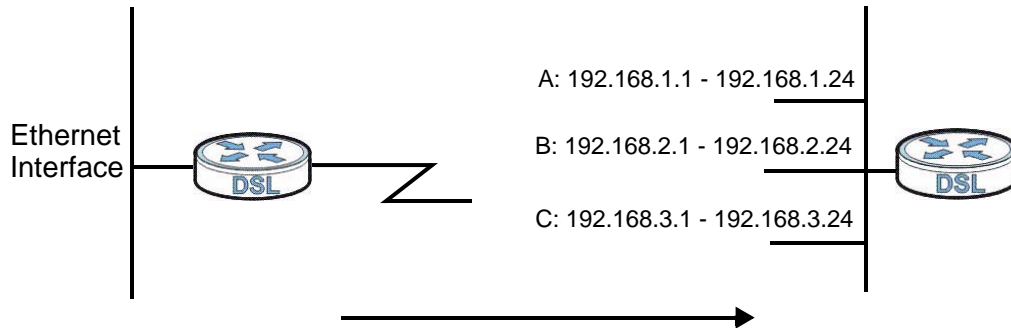
IP alias allows you to partition a physical network into different logical networks over the same Ethernet interface. The ZyXEL Device supports three logical LAN interfaces via its single physical Ethernet interface with the ZyXEL Device itself as the gateway for each LAN network.

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

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

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

Figure 40 Physical Network & Partitioned Logical Networks



7.5.1 Configuring the LAN IP Alias Screen

Use this screen to change your ZyXEL Device's IP alias settings. Click **Network > LAN > IP Alias** to open the following screen.

Figure 41 Network > LAN > IP Alias

The screenshot shows the 'IP Alias' configuration screen. At the top, there are four tabs: 'IP', 'DHCP Server', 'Client List', and 'IP Alias'. The 'IP Alias' tab is active. Below the tabs, the title 'IP Alias 1' is displayed. There is a checkbox labeled 'IP Alias 1'. Below the checkbox are four fields: 'IP Address' with the value '0.0.0.0', 'IP Subnet Mask' with the value '0.0.0.0', 'RIP Direction' with a dropdown menu set to 'None', and 'RIP Version' with a dropdown menu set to 'N/A'. At the bottom of the screen, there are two buttons: 'Apply' and 'Cancel'.

The following table describes the labels in this screen.

Table 25 Network > LAN > IP Alias

LABEL	DESCRIPTION
IP Alias 1	Select the check box to configure another LAN network for the ZyXEL Device.
IP Address	Enter the IP address of your ZyXEL Device in dotted decimal notation. Alternatively, click the right mouse button to copy and/or paste the IP address.
IP Subnet Mask	Your ZyXEL Device will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the ZyXEL Device.

Table 25 Network > LAN > IP Alias

LABEL	DESCRIPTION
RIP Direction	RIP (Routing Information Protocol, RFC 1058 and RFC 1389) allows a router to exchange routing information with other routers. The RIP Direction field controls the sending and receiving of RIP packets. Select the RIP direction from Both/In Only/Out Only/None . When set to Both or Out Only , the ZyXEL Device will broadcast its routing table periodically. When set to Both or In Only , it will incorporate the RIP information that it receives; when set to None , it will not send any RIP packets and will ignore any RIP packets received.
RIP Version	The RIP Version field controls the format and the broadcasting method of the RIP packets that the ZyXEL Device sends (it recognizes both formats when receiving). RIP-1 is universally supported but RIP-2 carries more information. RIP-1 is probably adequate for most networks, unless you have an unusual network topology. Both RIP-2B and RIP-2M sends the routing data in RIP-2 format; the difference being that RIP-2B uses subnet broadcasting while RIP-2M uses multicasting. Multicasting can reduce the load on non-router machines since they generally do not listen to the RIP multicast address and so will not receive the RIP packets. However, if one router uses multicasting, then all routers on your network must use multicasting, also. By default, RIP direction is set to Both and the Version set to RIP-1 .
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

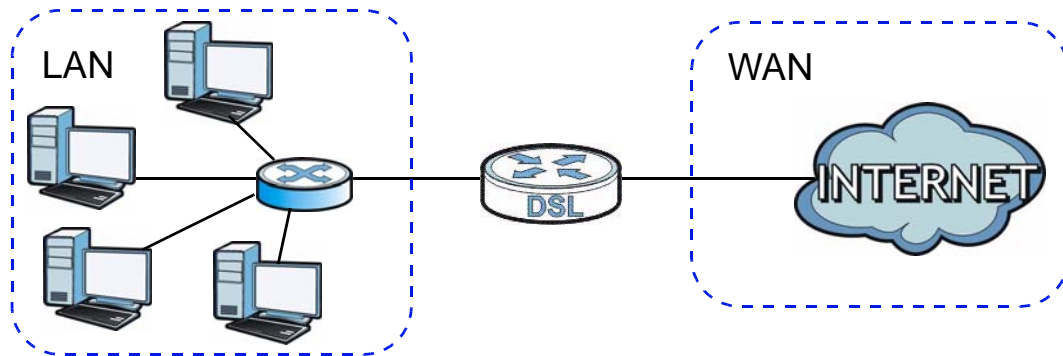
7.6 LAN Technical Reference

This section provides some technical background information about the topics covered in this chapter.

7.6.1 LANs, WANs and the ZyXEL Device

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

Figure 42 LAN and WAN IP Addresses



7.6.2 DHCP Setup

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

IP Pool Setup

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

7.6.3 DNS Server Addresses

DNS (Domain Name System) maps 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 DNS server addresses you enter when you set up DHCP are passed to the client machines along with the assigned IP address and subnet mask.

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

- The ISP tells you the DNS server addresses, usually in the form of an information sheet, when you sign up. If your ISP gives you DNS server addresses, enter them in the **DNS Server** fields in the **DHCP Setup** screen.
- Some ISPs choose to disseminate the DNS server addresses using the DNS server extensions of IPCP (IP Control Protocol) after the connection is up. If your ISP did not give you explicit DNS servers, chances are the DNS servers are conveyed through IPCP negotiation. The ZyXEL Device supports the IPCP DNS server extensions through the DNS proxy feature.

Please note that DNS proxy works only when the ISP uses the IPCP DNS server extensions. It does not mean you can leave the DNS servers out of the DHCP setup under all circumstances. If your ISP gives you explicit DNS servers, make sure that you enter their IP addresses in the **DHCP Setup** screen.

7.6.4 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.

IP Address and Subnet Mask

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

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

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

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

The subnet mask specifies the network number portion of an IP address. Your ZyXEL Device will compute the subnet mask automatically based on the IP

address that you entered. You don't need to change the subnet mask computed by the ZyXEL Device unless you are instructed to do otherwise.

Private IP Addresses

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

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

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

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

7.6.5 RIP Setup

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

- **Both** - the ZyXEL Device will broadcast its routing table periodically and incorporate the RIP information that it receives.
- **In Only** - the ZyXEL Device will not send any RIP packets but will accept all RIP packets received.
- **Out Only** - the ZyXEL Device will send out RIP packets but will not accept any RIP packets received.
- **None** - the ZyXEL Device will not send any RIP packets and will ignore any RIP packets received.

The **Version** field controls the format and the broadcasting method of the RIP packets that the ZyXEL Device sends (it recognizes both formats when receiving). RIP-1 is universally supported; but RIP-2 carries more information. RIP-1 is

probably adequate for most networks, unless you have an unusual network topology.

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

7.6.6 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. IGMP version 3 supports source filtering, reporting or ignoring traffic from specific source address to a particular host on the network. 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 IGMP version 1 (**IGMP-v1**), IGMP version 2 (**IGMP-v2**) and IGMP version 3 (**IGMP-v3**). 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.

Wireless LAN

8.1 Overview

This chapter describes how to perform tasks related to setting up and optimizing your wireless network, including the following.

- Turning the wireless connection on or off.
- Configuring a name, wireless channel and security for the network.
- Using WiFi Protected Setup (WPS) to configure your wireless network.
- Setting up multiple wireless networks.
- Using a MAC (Media Access Control) address filter to restrict access to the wireless network.
- Setting up a Wireless Distribution System (WDS).
- Performing other performance-related wireless tasks.

8.1.1 What You Can Do in the Wireless LAN Screens

This section describes the ZyXEL Device's **Network > Wireless LAN** screens. Use these screens to set up your ZyXEL Device's wireless connection.

- Use the **AP** screen (see [Section 8.2 on page 105](#)) to turn the wireless connection on or off, set up wireless security, configure the MAC filter, and make other basic configuration changes.
- Use the **More AP** screen (see [Section 8.3 on page 113](#)) to set up multiple wireless networks on your ZyXEL Device.
- Use the **WPS** screen (see [Section 8.4 on page 115](#)) to enable or disable WPS, generate a security PIN (Personal Identification Number) and see information about the ZyXEL Device's WPS status.
- Use the **WPS Station** (see [Section 8.5 on page 116](#)) screen to set up WPS by pressing a button or using a PIN.
- Use the **WDS** screen (see [Section 8.6 on page 117](#)) to set up a Wireless Distribution System, in which the ZyXEL Device acts as a bridge with other ZyXEL access points.
- Use the **Scheduling** screen (see [Section 8.7 on page 119](#)) to configure the dates/times to enable or disable the wireless LAN.

You don't necessarily need to use all these screens to set up your wireless connection. For example, you may just want to set up a network name, a wireless radio channel and security in the **AP** screen.

8.1.2 What You Need to Know About Wireless

Wireless Basics

"Wireless" is essentially radio communication. In the same way that walkie-talkie radios send and receive information over the airwaves, wireless networking devices exchange information with one another. A wireless networking device is just like a radio that lets your computer exchange information with radios attached to other computers. Like walkie-talkies, most wireless networking devices operate at radio frequency bands that are open to the public and do not require a license to use. However, wireless networking is different from that of most traditional radio communications in that there a number of wireless networking standards available with different methods of data encryption.

SSID

Each network must have a name, referred to as the SSID - "Service Set Identifier". The "service set" is the network, so the "service set identifier" is the network's name. This helps you identify your wireless network when wireless networks' coverage areas overlap and you have a variety of networks to choose from.

MAC Address Filter

Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address consists of twelve hexadecimal characters (0-9, and A to F), and it is usually written in the following format: "0A:A0:00:BB:CC:DD".

The MAC address filter controls access to the wireless network. You can use the MAC address of each wireless client to allow or deny access to the wireless network.

Finding Out More

See [Section 8.8 on page 120](#) for advanced technical information on wireless networks.

8.1.3 Before You Start

Before you start using these screens, ask yourself the following questions. See [Section 8.1.2 on page 104](#) if some of the terms used here are not familiar to you.

- What wireless standards do the other wireless devices in your network support (IEEE 802.11g, for example)? What is the most appropriate standard to use?
- What security options do the other wireless devices in your network support (WPA-PSK, for example)? What is the strongest security option supported by all the devices in your network?
- Do the other wireless devices in your network support WPS (Wi-Fi Protected Setup)? If so, you can set up a well-secured network very easily.

Even if some of your devices support WPS and some do not, you can use WPS to set up your network and then add the non-WPS devices manually, although this is somewhat more complicated to do.

- What advanced options do you want to configure, if any? If you want to configure advanced options such as Quality of Service, ensure that you know precisely what you want to do. If you do not want to configure advanced options, leave them as they are.

8.2 The AP Screen

Use this screen to configure the wireless settings of your ZyXEL Device. Click **Network > Wireless LAN** to open the **AP** screen.

Figure 43 Network > Wireless LAN > AP

The screenshot shows the configuration interface for the AP screen. At the top, there are tabs for 'AP', 'More AP', 'WPS', 'WPS Station', 'WDS', and 'Scheduling'. The 'AP' tab is selected.

Wireless Setup

- Enable Wireless LAN
- Channel Selection:
 - Region: TAIWAN
 - Channel: Channel06 2437MHz
 - Current Channel: 6

Common Setup

- Name(SSID): RT3390_1
- Hide SSID
- Security Mode: No Security
- MAC Filter: Allow Association (with an 'Edit' button)
- QoS: Enable QoS

At the bottom, there are three buttons: 'Apply', 'Cancel', and 'Advanced Setup'.

The following table describes the labels in this screen.

Table 26 Network > Wireless LAN > AP

LABEL	DESCRIPTION
Wireless Setup	
Enable Wireless LAN	Click the check box to activate wireless LAN.
Channel Selection	Select the country in which your ZyXEL Device operates. Channels available vary according to the country you select. Set the operating channel manually by selecting a channel from the Channel Selection list or use Auto Channel Select to have it automatically configured.
Common Setup	
Network Name (SSID)	The SSID (Service Set IDentity) identifies the service set with which a wireless device is associated. Wireless devices 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. Note: If you are configuring the ZyXEL Device from a computer connected to the wireless LAN and you change the ZyXEL Device's SSID or WEP 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.
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.
Security Mode	See the following sections for more details about this field.
MAC Filter	This shows whether the wireless devices with the MAC addresses listed are allowed or denied to access the ZyXEL Device using this SSID.
Edit	Click this to go to the MAC Filter screen to configure MAC filter settings. See Section 8.2.6 on page 112 for more details.
QoS	Select this check box to activate Quality of Service (QoS).
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.
Advanced Setup	Click this to display the Wireless Advanced Setup screen and edit more details of your WLAN setup. See Section 8.2.5 on page 110 for more details.

8.2.1 No Security

In the **Network > Wireless LAN > AP** screen, select **No Security** from the **Security Mode** list to allow wireless devices to communicate with the ZyXEL Device without any data encryption or authentication.

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 44 Network > Wireless LAN > AP: No Security

The screenshot shows the 'Common Setup' configuration page. The 'Network Name(SSID)' field contains 'ZyXEL01'. The 'Hide SSID' checkbox is unchecked. The 'Security Mode' dropdown menu is set to 'No Security'.

The following table describes the labels in this screen.

Table 27 Network > Wireless LAN > AP: No Security

LABEL	DESCRIPTION
Security Mode	Choose No Security from the drop-down list box.

8.2.2 WEP Encryption

Use this screen to configure and enable WEP encryption. Click **Network > Wireless LAN** to display the **AP** screen. Select **Static WEP** from the **Security Mode** list.

Note: WEP is extremely insecure. Its encryption can be broken by an attacker, using widely-available software. It is strongly recommended that you use a more effective security mechanism. Use the strongest security mechanism that all the wireless devices in your network support. For example, use WPA-PSK or WPA2-PSK if all your wireless devices support it, or use WPA or WPA2 if your wireless devices support it and you have a RADIUS server. If your wireless devices support nothing stronger than WEP, use the highest encryption level available.

Figure 45 Network > Wireless LAN > AP: Static WEP

The screenshot shows the 'Common Setup' configuration page with 'Static WEP' selected in the 'Security Mode' dropdown. There are input fields for 'Passphrase' and 'WEP Key', and a 'Generate' button next to the 'Passphrase' field. A note at the bottom provides instructions on WEP key lengths and character sets.

Note:
 The different WEP key lengths configure different strength security, 40/64-bit, or 128-bit respectively. Your wireless client must match the security strength set on the router.
 -Please type exactly 5, or 13 characters.
 -Please type exactly 10, or 26 characters using only the numbers 0-9 and the letters A-F.

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

Table 28 Network > Wireless LAN > AP: Static WEP

LABEL	DESCRIPTION
Security Mode	Choose Static WEP from the drop-down list box.
Passphrase	Enter a passphrase (up to 32 printable characters) and click Generate . The ZyXEL Device automatically generates a WEP key.
WEP Key	The WEP key is used to encrypt data. Both the ZyXEL Device and the wireless stations must use the same WEP key for data transmission. If you want to manually set the WEP key, enter any 5 or 13 characters (ASCII string) or 10 or 26 hexadecimal characters ("0-9", "A-F") for a 64-bit or 128-bit WEP key respectively.

8.2.3 WPA(2)-PSK

Use this screen to configure and enable WPA(2)-PSK authentication. Click **Network > Wireless LAN** to display the **AP** screen. Select **WPA-PSK** or **WPA2-PSK** from the **Security Mode** list.

Figure 46 Network > Wireless LAN > AP: WPA(2)-PSK

The screenshot shows a configuration window titled 'Common Setup'. It contains the following fields and controls:

- Name(SSID)**: A text input field containing 'ZyXEL01'.
- Hide SSID**: A checkbox that is currently unchecked.
- Security Mode**: A dropdown menu with 'WPA-PSK' selected.
- Pre-Shared Key**: An empty text input field.
- WPA Group Key Update Timer**: A text input field containing '10' followed by '(In Seconds)'.

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

Table 29 Network > Wireless LAN > AP: WPA(2)-PSK

LABEL	DESCRIPTION
Security Mode	Choose WPA-PSK or WPA2-PSK from the drop-down list box.
Pre-Shared Key	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. Type a pre-shared key from 8 to 63 case-sensitive ASCII characters (including spaces and symbols).
WPA Group Key Update Timer	The Group Key Update Timer is the rate at which the AP (if using WPA(2)-PSK key management) or RADIUS server (if using WPA(2) key management) sends a new group key out to all clients. The re-keying process is the WPA(2) equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis.

8.2.4 WPA(2) Authentication

Use this screen to configure and enable WPA or WPA2 authentication. Click the **Wireless LAN** link under **Network** to display the **AP** screen. Select **WPA**, **WPA2** or **WPAMixed** from the **Security Mode** list.

Figure 47 Network > Wireless LAN > AP: WPA(2)

Common Setup	
Name(SSID)	RT3390_1
<input type="checkbox"/> Hide SSID	
Security Mode	WPA2
<input type="checkbox"/> WPA Compatible	
ReAuthentication Timer	0 (In Seconds)
Idle Timeout	300 (In Seconds)
WPA Group Key Update Timer	10 (In Seconds)
Authentication Server	
IP Address	192.168.7.187
Port Number	1812
Shared Secret	12345678

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

Table 30 Network > Wireless LAN > AP: WPA(2)

LABEL	DESCRIPTION
Security Mode	Choose WPA or WPA2 from the drop-down list box.
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 WPA-PSK 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	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. 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.
WPA Group Key Update Timer	The Group Key Update Timer is the rate at which the AP (if using WPA(2)-PSK key management) or RADIUS server (if using WPA(2) key management) sends a new group key out to all clients. The re-keying process is the WPA(2) equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis.

Table 30 Network > Wireless LAN > AP: WPA(2)

LABEL	DESCRIPTION
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. 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.

8.2.5 Wireless LAN Advanced Setup

Use this screen to configure advanced wireless settings. Click the **Advanced Setup** button in the **AP** screen. The screen appears as shown.

See [Section 8.8.2 on page 122](#) for detailed definitions of the terms listed in this screen.

Figure 48 Network > Wireless LAN > AP: Advanced Setup

The following table describes the labels in this screen.

Table 31 Network > Wireless LAN > AP: Advanced Setup

LABEL	DESCRIPTION
RTS/CTS Threshold	Enter a value between 0 and 2432.
Fragmentation Threshold	This is the maximum data fragment size that can be sent. Enter a value between 256 and 2432.

Table 31 Network > Wireless LAN > AP: Advanced Setup

LABEL	DESCRIPTION
Output Power	Set the output power of the ZyXEL Device. If there is a high density of APs in an area, decrease the output power to reduce interference with other APs. Select one of the following: 100% , 75% , 50% or 25% .
Preamble	Select a preamble type from the drop-down list menu. Choices are Long or Short . See the Appendix D on page 295 for more information.
802.11 Mode	<p>Select 802.11b Only to allow only IEEE 802.11b compliant WLAN devices to associate with the ZyXEL Device.</p> <p>Select 802.11g Only to allow only IEEE 802.11g compliant WLAN devices to associate with the ZyXEL Device.</p> <p>Select 802.11b+g to allow either IEEE 802.11b or IEEE 802.11g compliant WLAN devices to associate with the ZyXEL Device. The transmission rate of your ZyXEL Device might be reduced.</p> <p>Select 802.11n to allow only IEEE 802.11n compliant WLAN devices to associate with the ZyXEL Device.</p> <p>Select 802.11g+n to allow either IEEE 802.11g or IEEE 802.11n compliant WLAN devices to associate with the ZyXEL Device. The transmission rate of your ZyXEL Device might be reduced.</p> <p>Select 802.11b+g+n to allow IEEE 802.11b, IEEE 802.11g or IEEE802.11n compliant WLAN devices to associate with the ZyXEL Device. The transmission rate of your ZyXEL Device might be reduced.</p>
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

8.2.6 MAC Filter

Use this screen to change your ZyXEL Device's MAC filter settings. Click the **Edit** button in the **AP** screen. The screen appears as shown.

Figure 49 Network > Wireless LAN > AP: MAC Address Filter

Set	MAC Address	Set	MAC Address
1	00:a0:c5:01:23:45	2	00:00:00:00:00:00
3	00:00:00:00:00:00	4	00:00:00:00:00:00
5	00:00:00:00:00:00	6	00:00:00:00:00:00
7	00:00:00:00:00:00	8	00:00:00:00:00:00
9	00:00:00:00:00:00	10	00:00:00:00:00:00
11	00:00:00:00:00:00	12	00:00:00:00:00:00
13	00:00:00:00:00:00	14	00:00:00:00:00:00
15	00:00:00:00:00:00	16	00:00:00:00:00:00
17	00:00:00:00:00:00	18	00:00:00:00:00:00
19	00:00:00:00:00:00	20	00:00:00:00:00:00
21	00:00:00:00:00:00	22	00:00:00:00:00:00
23	00:00:00:00:00:00	24	00:00:00:00:00:00
25	00:00:00:00:00:00	26	00:00:00:00:00:00
27	00:00:00:00:00:00	28	00:00:00:00:00:00
29	00:00:00:00:00:00	30	00:00:00:00:00:00
31	00:00:00:00:00:00	32	00:00:00:00:00:00

The following table describes the labels in this screen.

Table 32 Network > Wireless LAN > AP: MAC Address Filter

LABEL	DESCRIPTION
Active MAC Filter	Select the check 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 devices 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.

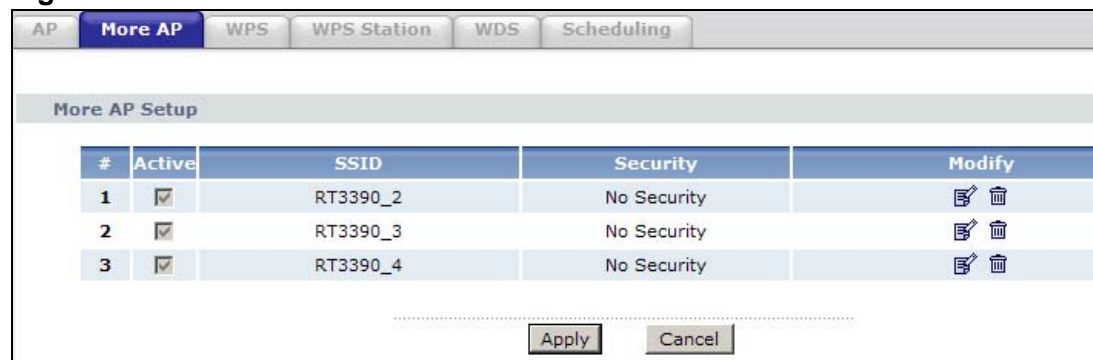
Table 32 Network > Wireless LAN > AP: MAC Address Filter

LABEL	DESCRIPTION
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

8.3 The More AP Screen

This screen allows you to enable and configure multiple Basic Service Sets (BSSs) on the ZyXEL Device.

Click **Network > Wireless LAN > More AP**. The following screen displays.

Figure 50 Network > Wireless LAN > More AP

The following table describes the labels in this screen.

Table 33 Network > Wireless LAN > More AP

LABEL	DESCRIPTION
#	This is the index number of each SSID profile.
Active	This field indicates whether this SSID is active.
SSID	An SSID profile is the set of parameters relating to one of the ZyXEL Device's BSSs. The SSID (Service Set Identifier) identifies the Service Set with which a wireless device is associated. This field displays the name of the wireless profile on the network. When a wireless client scans for an AP to associate with, this is the name that is broadcast and seen in the wireless client utility.
Security	This field indicates the security mode of the SSID profile.
Modify	Click the Edit icon to configure the SSID profile. Click the Remove icon to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.

Table 33 Network > Wireless LAN > More AP

LABEL	DESCRIPTION
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

8.3.1 More AP Edit

Use this screen to edit an SSID profile. Click the **Edit** icon next to an SSID in the **More AP** screen. The following screen displays.

Figure 51 Network > Wireless LAN > More AP: Edit

The screenshot shows a 'Common Setup' window with the following fields and controls:

- Name(SSID): Text input field containing 'ZyXEL02'.
- Hide SSID: Check box, currently unchecked.
- Security Mode: Dropdown menu showing 'No Security'.
- MAC Filter: Text 'Allow Association' followed by an 'Edit' button.
- QoS: Check box 'Enable QoS', currently unchecked.

At the bottom of the window, there are three buttons: 'Back', 'Apply', and 'Cancel'.

The following table describes the fields in this screen.

Table 34 Network > Wireless LAN > More AP: Edit

LABEL	DESCRIPTION
Network Name (SSID)	The SSID (Service Set IDentity) identifies the service set with which a wireless device is associated. Enter a descriptive name (up to 32 printable 7-bit ASCII characters) for the wireless LAN. Note: If you are configuring the ZyXEL Device from a computer connected to the wireless LAN and you change the ZyXEL Device's SSID 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.
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.
Security Mode	See Section 8.2 on page 105 for more details about this field.
MAC Filter	This shows whether the wireless devices with the MAC addresses listed are allowed or denied to access the ZyXEL Device using this SSID.
Edit	Click this to go to the MAC Filter screen to configure MAC filter settings. See Section 8.2.6 on page 112 for more details.

Table 34 Network > Wireless LAN > More AP: Edit

LABEL	DESCRIPTION
QoS	Select this check box to activate Quality of Service (QoS).
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

8.4 The WPS Screen

Use this screen to configure WiFi Protected Setup (WPS) on your ZyXEL Device.

WPS allows you to quickly set up a wireless network with strong security, without having to configure security settings manually. Set up each WPS connection between two devices. Both devices must support WPS.

Click **Network > Wireless LAN > WPS**. The following screen displays.

Figure 52 Network > Wireless LAN > WPS

The following table describes the labels in this screen.

Table 35 Network > Wireless LAN > WPS

LABEL	DESCRIPTION
WPS Setup	
WPS Setup	Select the check box to activate WPS on the ZyXEL Device.

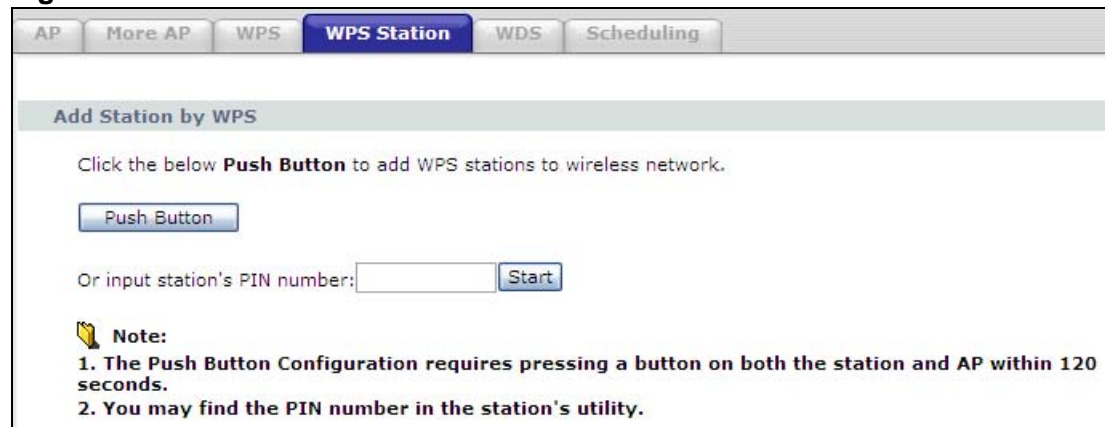
Table 35 Network > Wireless LAN > WPS

LABEL	DESCRIPTION
PIN Number	This shows the PIN (Personal Identification Number) of the ZyXEL Device. Enter this PIN in the configuration utility of the device you want to connect to using WPS. The PIN is not necessary when you use WPS push-button method.
Generate	Click this to have the ZyXEL Device create a new PIN.
WPS Status	This displays Configured when the ZyXEL Device has connected to a wireless network using WPS or Enable WPS is selected and wireless or wireless security settings have been changed. The current wireless and wireless security settings also appear in the screen. This displays Unconfigured if WPS is disabled and there is no wireless or wireless security changes on the ZyXEL Device or you click Release to remove the configured wireless and wireless security settings.
Release	This button is available when the WPS status is Configured . Click this button to remove all configured wireless and wireless security settings for WPS connections on the ZyXEL Device.
Apply	Click this to save your changes.
Refresh	Click this to restore your previously saved settings.

8.5 The WPS Station Screen

Use this screen to set up a WPS wireless network using either Push Button Configuration (PBC) or PIN Configuration.

Click **Network > Wireless LAN > WPS Station**. The following screen displays.

Figure 53 Network > Wireless LAN > WPS Station


AP More AP WPS **WPS Station** WDS Scheduling

Add Station by WPS

Click the below **Push Button** to add WPS stations to wireless network.

Push Button

Or input station's PIN number: Start

Note:

1. The Push Button Configuration requires pressing a button on both the station and AP within 120 seconds.
2. You may find the PIN number in the station's utility.

The following table describes the labels in this screen.

Table 36 Network > Wireless LAN > WPS Station

LABEL	DESCRIPTION
Push Button	<p>Click this to add another WPS-enabled wireless device (within wireless range of the ZyXEL Device) to your wireless network. This button may either be a physical button on the outside of device, or a menu button similar to the Push Button on this screen.</p> <p>Note: You must press the other wireless device's WPS button within two minutes of pressing this button.</p>
Or input station's PIN number	<p>Enter the PIN of the device that you are setting up a WPS connection with and click Start to authenticate and add the wireless device to your wireless network.</p> <p>You can find the PIN either on the outside of the device, or by checking the device's settings.</p> <p>Note: You must also activate WPS on that device within two minutes to have it present its PIN to the ZyXEL Device.</p>

8.6 The WDS Screen

An AP using the Wireless Distribution System (WDS) can function as a wireless network bridge allowing you to wirelessly connect two wired network segments. The **WDS** screen allows you to configure the ZyXEL Device to connect to two or more APs wirelessly when WDS is enabled.

Use this screen to set up your WDS (Wireless Distribution System) links between the ZyXEL Device and other wireless APs. You need to know the MAC address of the peer device. Once the security settings of peer sides match one another, the connection between devices is made.

Note: WDS security is independent of the security settings between the ZyXEL Device and any wireless clients.

Note: At the time of writing, WDS is compatible with other ZyXEL APs only. Not all models support WDS links. Check your other AP's documentation.

Click **Network > Wireless LAN > WDS**. The following screen displays.

Figure 54 Network > Wireless LAN > WDS

#	Active	Remote Bridge MAC Address	PSK
1	<input type="checkbox"/>	00:00:00:00:00:00	
2	<input type="checkbox"/>	00:00:00:00:00:00	
3	<input type="checkbox"/>	00:00:00:00:00:00	
4	<input type="checkbox"/>	00:00:00:00:00:00	

The following table describes the labels in this screen.

Table 37 Network > Wireless LAN > WDS

LABEL	DESCRIPTION
WDS Security	Select the type of the key used to encrypt data between APs. All the wireless APs (including the ZyXEL Device) must use the same pre-shared key for data transmission. The option is available only when you set the security mode to WPA(2) or WPA(2)-PSK in the Wireless LAN > AP screen .
TKIP	Select this to use TKIP (Temporal Key Integrity Protocol) encryption.
AES	Select this to use AES (Advanced Encryption Standard) encryption.
#	This is the index number of the individual WDS link.
Active	Select this to activate the link between the ZyXEL Device and the peer device to which this entry refers. When you do not select the check box this link is down.
Remote Bridge MAC Address	Type the MAC address of the peer device in a valid MAC address format (six hexadecimal character pairs, for example 12:34:56:78:9a:bc).
PSK	Enter a Pre-Shared Key (PSK) from 8 to 63 case-sensitive ASCII characters (including spaces and symbols).
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

8.7 The Scheduling Screen

Use the wireless LAN scheduling to configure the days you want to enable or disable the wireless LAN. Click **Network > Wireless LAN > Scheduling**. The following screen displays.

Figure 55 Network > Wireless LAN > Scheduling

Action	Day	Except for the following times (24-Hour Format)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Everyday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Monday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Tuesday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Wednesday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Thursday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Friday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Saturday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
<input type="radio"/> On <input checked="" type="radio"/> Off	<input type="checkbox"/> Sunday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)

Note: (Wireless signal is currently turned on/off by scheduling.)

Apply Reset

The following table describes the labels in this screen.

Table 38 Network > Wireless LAN > QoS

LABEL	DESCRIPTION
Enable Wireless LAN Scheduling	Select this box to activate wireless LAN scheduling on your ZyXEL Device.
Action	Select On or Off to enable or disable the wireless LAN.
Day	Check the day(s) you want to turn the wireless LAN on or off.
Except for the following times	Specify a time frame during which the schedule would apply. For example, if you set the time range from 12:00 to 23:00, the wireless LAN will be turned on only during this time period.
Apply	Click this to save your changes.
Reset	Click this to restore your previously saved settings.

8.8 Wireless LAN Technical Reference

This section discusses wireless LANs in depth. For more information, see the appendix.

8.8.1 Wireless Network Overview

Wireless networks consist of wireless clients, access points and bridges.

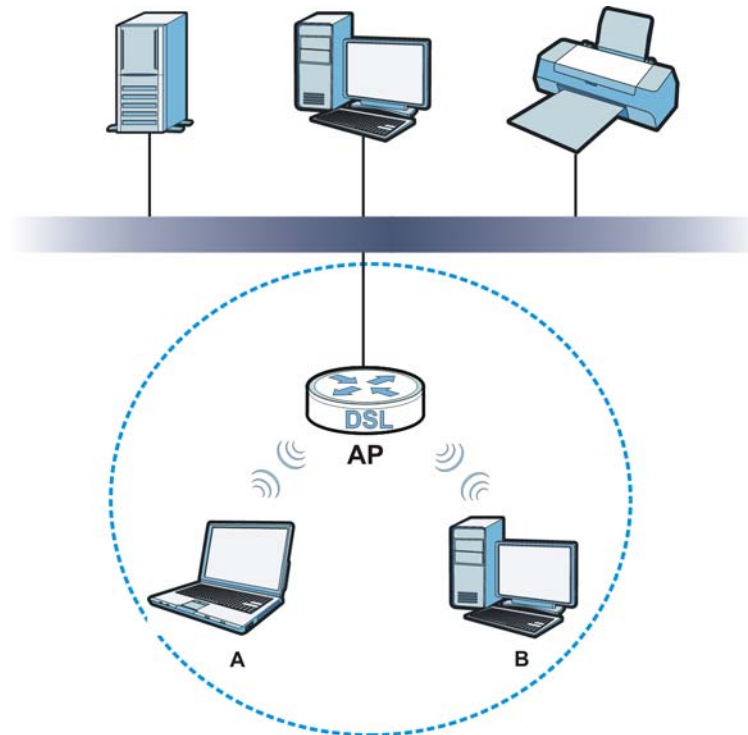
- A wireless client is a radio connected to a user's computer.
- An access point is a radio with a wired connection to a network, which can connect with numerous wireless clients and let them access the network.
- A bridge is a radio that relays communications between access points and wireless clients, extending a network's range.

Traditionally, a wireless network operates in one of two ways.

- An "infrastructure" type of network has one or more access points and one or more wireless clients. The wireless clients connect to the access points.
- An "ad-hoc" type of network is one in which there is no access point. Wireless clients connect to one another in order to exchange information.

The following figure provides an example of a wireless network.

Figure 56 Example of a Wireless Network



The wireless network is the part in the blue circle. In this wireless network, devices **A** and **B** use the access point (**AP**) to interact with the 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 device in the same wireless network must use the same SSID.
The SSID is the name of the wireless network. It stands for Service Set Identifier.
- If two wireless networks overlap, they should use a different channel.
Like radio stations or television channels, each wireless network uses a specific channel, or frequency, to send and receive information.
- Every device 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.

Radio Channels

In the radio spectrum, there are certain frequency bands allocated for unlicensed, civilian use. For the purposes of wireless networking, these bands are divided into numerous channels. This allows a variety of networks to exist in the same place without interfering with one another. When you create a network, you must select a channel to use.

Since the available unlicensed spectrum varies from one country to another, the number of available channels also varies.

8.8.2 Additional Wireless Terms

The following table describes some wireless network terms and acronyms used in the ZyXEL Device's Web Configurator.

Table 39 Additional Wireless Terms

TERM	DESCRIPTION
RTS/CTS Threshold	<p>In a wireless network which covers a large area, wireless devices are sometimes not aware of each other's presence. This may cause them to send information to the AP at the same time and result in information colliding and not getting through.</p> <p>By setting this value lower than the default value, the wireless devices must sometimes get permission to send information to the ZyXEL Device. The lower the value, the more often the devices must get permission.</p> <p>If this value is greater than the fragmentation threshold value (see below), then wireless devices never have to get permission to send information to the ZyXEL Device.</p>
Preamble	A preamble affects the timing in your wireless network. There are two preamble modes: long and short. If a device uses a different preamble mode than the ZyXEL Device does, it cannot communicate with the ZyXEL Device.
Authentication	The process of verifying whether a wireless device is allowed to use the wireless network.
Fragmentation Threshold	A small fragmentation threshold is recommended for busy networks, while a larger threshold provides faster performance if the network is not very busy.

8.8.3 Wireless Security Overview

By their nature, radio communications are simple to intercept. For wireless data networks, this means that anyone within range of a wireless network without security can not only read the data passing over the airwaves, but also join the network. Once an unauthorized person has access to the network, he or she can steal information or introduce malware (malicious software) intended to compromise the network. For these reasons, a variety of security systems have been developed to ensure that only authorized people can use a wireless data network, or understand the data carried on it.

These security standards do two things. First, they authenticate. This means that only people presenting the right credentials (often a username and password, or a "key" phrase) can access the network. Second, they encrypt. This means that the information sent over the air is encoded. Only people with the code key can understand the information, and only people who have been authenticated are given the code key.

These security standards vary in effectiveness. Some can be broken, such as the old Wired Equivalent Protocol (WEP). Using WEP is better than using no security at all, but it will not keep a determined attacker out. Other security standards are secure in themselves but can be broken if a user does not use them properly. For example, the WPA-PSK security standard is very secure if you use a long key which is difficult for an attacker's software to guess - for example, a twenty-letter long string of apparently random numbers and letters - but it is not very secure if you use a short key which is very easy to guess - for example, a three-letter word from the dictionary.

Because of the damage that can be done by a malicious attacker, it's not just people who have sensitive information on their network who should use security. Everybody who uses any wireless network should ensure that effective security is in place.

A good way to come up with effective security keys, passwords and so on is to use obscure information that you personally will easily remember, and to enter it in a way that appears random and does not include real words. For example, if your mother owns a 1970 Dodge Challenger and her favorite movie is Vanishing Point (which you know was made in 1971) you could use "70dodchal71vanpoi" as your security key.

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

8.8.3.1 SSID

Normally, the ZyXEL Device acts like a beacon and regularly broadcasts the SSID in the area. You can hide the SSID instead, in which case the ZyXEL Device 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 wireless devices to get the SSID. In addition, unauthorized wireless devices can still see the information that is sent in the wireless network.

8.8.3.2 MAC Address Filter

Every device that can use a wireless network 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 device in the wireless network, see the device's User's Guide or other documentation.

-
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.

You can use the MAC address filter to tell the ZyXEL Device which devices are allowed or not allowed to use the wireless network. If a device is allowed to use the wireless network, it still has to have the correct information (SSID, channel, and security). If a device is not allowed to use the wireless network, it does not matter if it has the correct information.

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

8.8.3.3 User Authentication

Authentication is the process of verifying whether a wireless device is allowed to use the wireless network. You can make every user log in to the wireless network before using it. However, every device in the wireless network has to support IEEE 802.1x to do this.

For wireless networks, you can store the user names and passwords for each user in a RADIUS server. This is a server used in businesses more than in homes. If you do not have a RADIUS server, you cannot set up user names and passwords for your users.

Unauthorized wireless 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.

8.8.3.4 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 authentication. (See [Section 8.8.3.3 on page 124](#) for information about this.)

Table 40 Types of Encryption for Each Type of Authentication

	NO AUTHENTICATION	RADIUS SERVER
Weakest ↑ ↓	No Security	WPA
	Static WEP	
	WPA-PSK	
Strongest	WPA2-PSK	WPA2

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 device in the wireless network supports. For example, suppose you have a wireless network with the ZyXEL Device and you do not have a RADIUS server. Therefore, there is no authentication. Suppose the wireless network has two devices. 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. The other types of encryption are better than none at all, but it is still possible for unauthorized wireless devices to figure out the original information pretty quickly.

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 of the devices 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 device in the wireless network must have the same key.

8.8.4 Signal Problems

Because wireless networks are radio networks, their signals are subject to limitations of distance, interference and absorption.

Problems with distance occur when the two radios are too far apart. Problems with interference occur when other radio waves interrupt the data signal. Interference may come from other radio transmissions, such as military or air traffic control communications, or from machines that are coincidental emitters such as electric motors or microwaves. Problems with absorption occur when physical objects (such as thick walls) are between the two radios, muffling the signal.

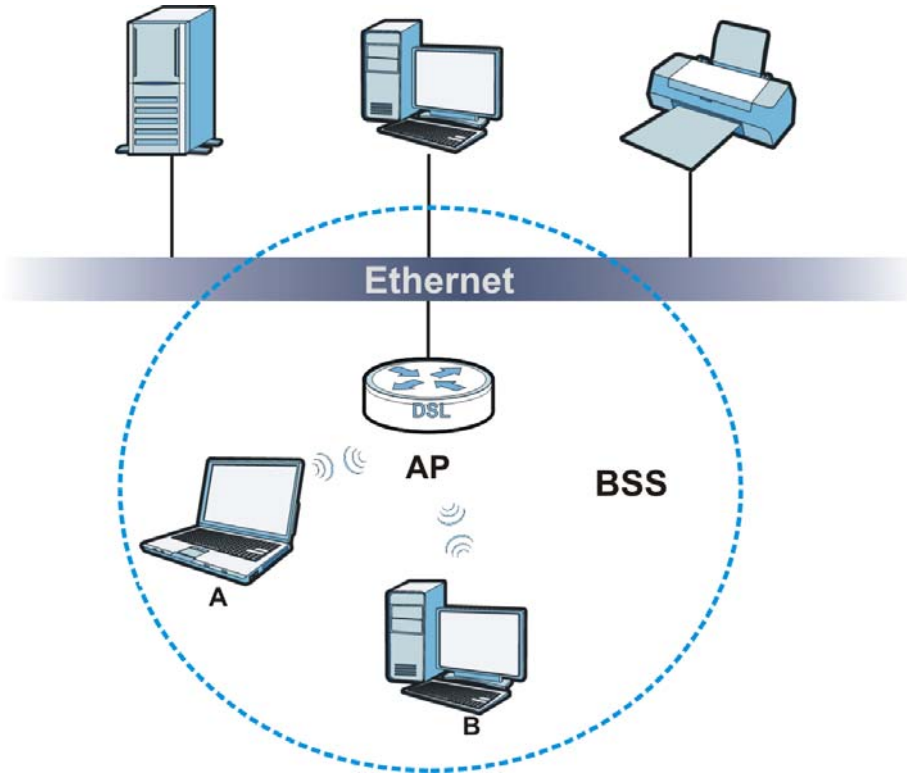
8.8.5 BSS

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

Intra-BSS traffic is traffic between wireless stations in the BSS. When Intra-BSS traffic blocking is disabled, wireless station A and B can access the wired network

and communicate with each other. When Intra-BSS traffic blocking is enabled, wireless station A and B can still access the wired network but cannot communicate with each other.

Figure 57 Basic Service set



8.8.6 MBSSID

Traditionally, you need to use different APs to configure different Basic Service Sets (BSSs). As well as the cost of buying extra APs, there is also the possibility of channel interference. The ZyXEL Device's MBSSID (Multiple Basic Service Set IDentifier) function allows you to use one access point to provide several BSSs simultaneously. You can then assign varying QoS priorities and/or security modes to different SSIDs.

Wireless devices can use different BSSIDs to associate with the same AP.

8.8.6.1 Notes on Multiple BSSs

- A maximum of eight BSSs are allowed on one AP simultaneously.
- You must use different keys for different BSSs. If two wireless devices have different BSSIDs (they are in different BSSs), but have the same keys, they may hear each other's communications (but not communicate with each other).
- MBSSID should not replace but rather be used in conjunction with 802.1x security.

8.8.7 Wireless Distribution System (WDS)

The ZyXEL Device can act as a wireless network bridge and establish WDS (Wireless Distribution System) links with other APs. You need to know the MAC addresses of the APs you want to link to. Once the security settings of peer sides match one another, the connection between devices is made.

At the time of writing, WDS security is compatible with other ZyXEL access points only. Refer to your other access point's documentation for details.

The following figure illustrates how WDS link works between APs. Notebook computer **A** is a wireless client connecting to access point **AP 1**. **AP 1** has no wired Internet connection, but it can establish a WDS link with access point **AP 2**, which has a wired Internet connection. When **AP 1** has a WDS link with **AP 2**, the notebook computer can access the Internet through **AP 2**.

Figure 58 WDS Link Example



8.8.8 WiFi Protected Setup (WPS)

Your ZyXEL Device supports WiFi Protected Setup (WPS), which is an easy way to set up a secure wireless network. WPS is an industry standard specification, defined by the WiFi Alliance.

WPS allows you to quickly set up a wireless network with strong security, without having to configure security settings manually. Each WPS connection works between two devices. Both devices must support WPS (check each device's documentation to make sure).

Depending on the devices you have, you can either press a button (on the device itself, or in its configuration utility) or enter a PIN (a unique Personal Identification Number that allows one device to authenticate the other) in each of the two devices. When WPS is activated on a device, it has two minutes to find another device that also has WPS activated. Then, the two devices connect and set up a secure network by themselves.

8.8.8.1 Push Button Configuration

WPS Push Button Configuration (PBC) is initiated by pressing a button on each WPS-enabled device, and allowing them to connect automatically. You do not need to enter any information.

Not every WPS-enabled device has a physical WPS button. Some may have a WPS PBC button in their configuration utilities instead of or in addition to the physical button.

Take the following steps to set up WPS using the button.

- 1 Ensure that the two devices you want to set up are within wireless range of one another.
- 2 Look for a WPS button on each device. If the device does not have one, log into its configuration utility and locate the button (see the device's User's Guide for how to do this - for the ZyXEL Device, see [Section 8.5 on page 116](#)).
- 3 Press the button on one of the devices (it doesn't matter which). For the ZyXEL Device you must press the WPS button for more than three seconds.
- 4 Within two minutes, press the button on the other device. The registrar sends the network name (SSID) and security key through an secure connection to the enrollee.

If you need to make sure that WPS worked, check the list of associated wireless clients in the AP's configuration utility. If you see the wireless client in the list, WPS was successful.

8.8.8.2 PIN Configuration

Each WPS-enabled device has its own PIN (Personal Identification Number). This may either be static (it cannot be changed) or dynamic (in some devices you can generate a new PIN by clicking on a button in the configuration interface).

Use the PIN method instead of the push-button configuration (PBC) method if you want to ensure that the connection is established between the devices you specify, not just the first two devices to activate WPS in range of each other. However, you need to log into the configuration interfaces of both devices to use the PIN method.

When you use the PIN method, you must enter the PIN from one device (usually the wireless client) into the second device (usually the Access Point or wireless router). Then, when WPS is activated on the first device, it presents its PIN to the second device. If the PIN matches, one device sends the network and security information to the other, allowing it to join the network.

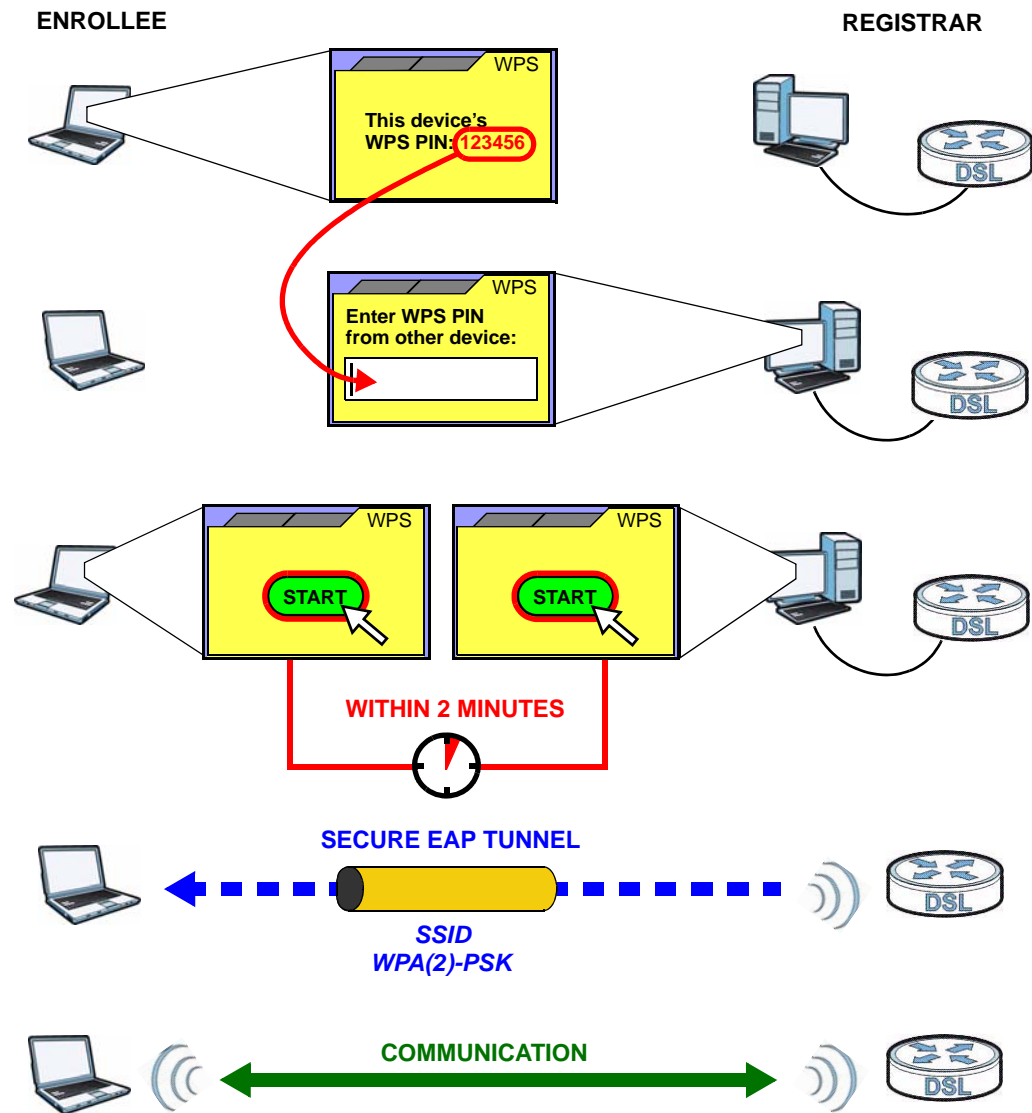
Take the following steps to set up a WPS connection between an access point or wireless router (referred to here as the AP) and a client device using the PIN method.

- 1** Ensure WPS is enabled on both devices.
- 2** Access the WPS section of the AP's configuration interface. See the device's User's Guide for how to do this.
- 3** Look for the client's WPS PIN; it will be displayed either on the device, or in the WPS section of the client's configuration interface (see the device's User's Guide for how to find the WPS PIN - for the ZyXEL Device, see [Section 8.4 on page 115](#)).
- 4** Enter the client's PIN in the AP's configuration interface.
- 5** If the client device's configuration interface has an area for entering another device's PIN, you can either enter the client's PIN in the AP, or enter the AP's PIN in the client - it does not matter which.
- 6** Start WPS on both devices within two minutes.
- 7** Use the configuration utility to activate WPS, not the push-button on the device itself.
- 8** On a computer connected to the wireless client, try to connect to the Internet. If you can connect, WPS was successful.

If you cannot connect, check the list of associated wireless clients in the AP's configuration utility. If you see the wireless client in the list, WPS was successful.

The following figure shows a WPS-enabled wireless client (installed in a notebook computer) connecting to the WPS-enabled AP via the PIN method.

Figure 59 Example WPS Process: PIN Method

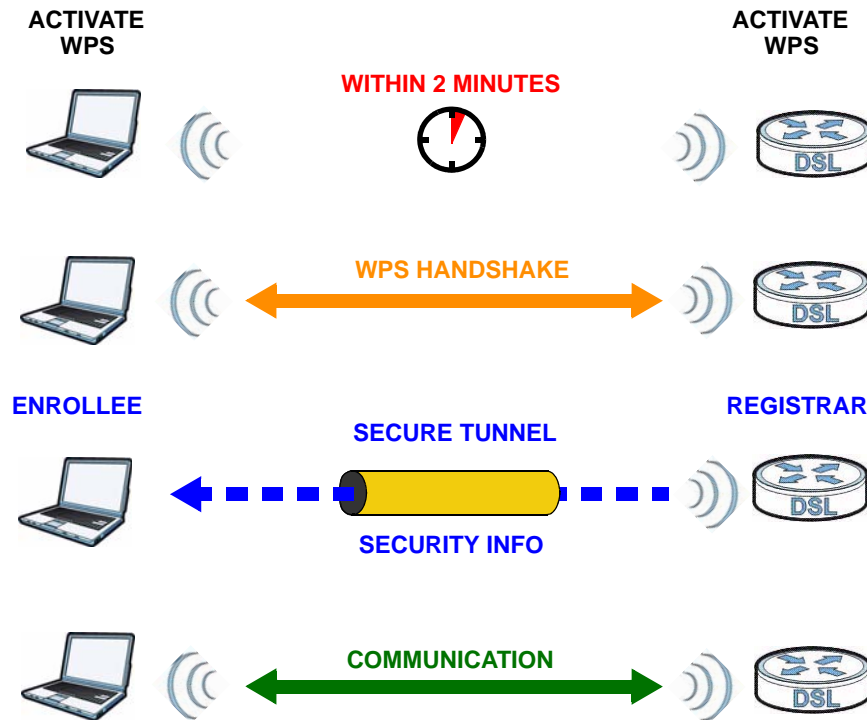


8.8.8.3 How WPS Works

When two WPS-enabled devices connect, each device must assume a specific role. One device acts as the registrar (the device that supplies network and security settings) and the other device acts as the enrollee (the device that receives network and security settings). The registrar creates a secure EAP (Extensible Authentication Protocol) tunnel and sends the network name (SSID) and the WPA-PSK or WPA2-PSK pre-shared key to the enrollee. Whether WPA-PSK or WPA2-PSK is used depends on the standards supported by the devices. If the registrar is already part of a network, it sends the existing information. If not, it generates the SSID and WPA(2)-PSK randomly.

The following figure shows a WPS-enabled client (installed in a notebook computer) connecting to a WPS-enabled access point.

Figure 60 How WPS works



The roles of registrar and enrollee last only as long as the WPS setup process is active (two minutes). The next time you use WPS, a different device can be the registrar if necessary.

The WPS connection process is like a handshake; only two devices participate in each WPS transaction. If you want to add more devices you should repeat the process with one of the existing networked devices and the new device.

Note that the access point (AP) is not always the registrar, and the wireless client is not always the enrollee. All WPS-certified APs can be a registrar, and so can some WPS-enabled wireless clients.

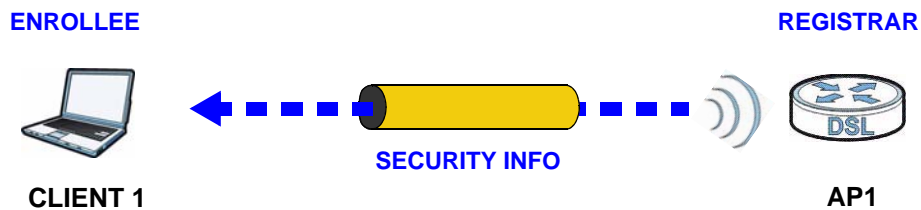
By default, a WPS device is “unconfigured”. This means that it is not part of an existing network and can act as either enrollee or registrar (if it supports both functions). If the registrar is unconfigured, the security settings it transmits to the enrollee are randomly-generated. Once a WPS-enabled device has connected to another device using WPS, it becomes “configured”. A configured wireless client can still act as enrollee or registrar in subsequent WPS connections, but a configured access point can no longer act as enrollee. It will be the registrar in all subsequent WPS connections in which it is involved. If you want a configured AP to act as an enrollee, you must reset it to its factory defaults.

8.8.8.4 Example WPS Network Setup

This section shows how security settings are distributed in an example WPS setup.

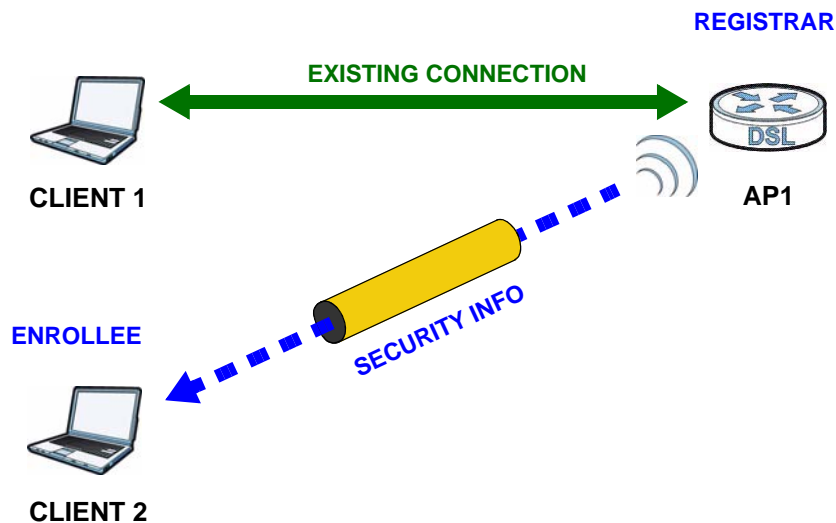
The following figure shows an example network. In step **1**, both **AP1** and **Client 1** are unconfigured. When WPS is activated on both, they perform the handshake. In this example, **AP1** is the registrar, and **Client 1** is the enrollee. The registrar randomly generates the security information to set up the network, since it is unconfigured and has no existing information.

Figure 61 WPS: Example Network Step 1



In step **2**, you add another wireless client to the network. You know that **Client 1** supports registrar mode, but it is better to use **AP1** for the WPS handshake with the new client since you must connect to the access point anyway in order to use the network. In this case, **AP1** must be the registrar, since it is configured (it already has security information for the network). **AP1** supplies the existing security information to **Client 2**.

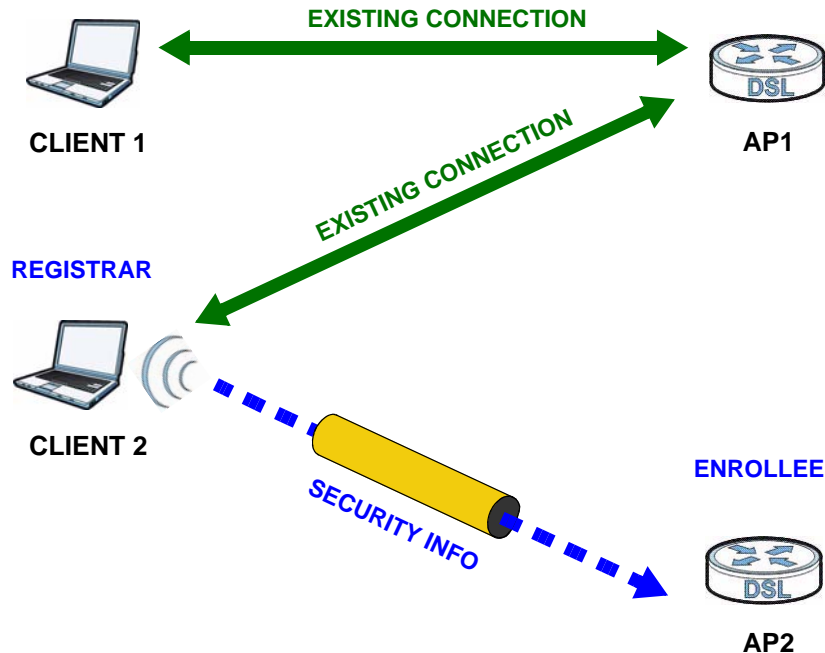
Figure 62 WPS: Example Network Step 2



In step **3**, you add another access point (**AP2**) to your network. **AP2** is out of range of **AP1**, so you cannot use **AP1** for the WPS handshake with the new access

point. However, you know that **Client 2** supports the registrar function, so you use it to perform the WPS handshake instead.

Figure 63 WPS: Example Network Step 3



8.8.8.5 Limitations of WPS

WPS has some limitations of which you should be aware.

- WPS works in Infrastructure networks only (where an AP and a wireless client communicate). It does not work in Ad-Hoc networks (where there is no AP).
- When you use WPS, it works between two devices only. You cannot enroll multiple devices simultaneously, you must enroll one after the other.

For instance, if you have two enrollees and one registrar you must set up the first enrollee (by pressing the WPS button on the registrar and the first enrollee, for example), then check that it successfully enrolled, then set up the second device in the same way.

- WPS works only with other WPS-enabled devices. However, you can still add non-WPS devices to a network you already set up using WPS.

WPS works by automatically issuing a randomly-generated WPA-PSK or WPA2-PSK pre-shared key from the registrar device to the enrollee devices. Whether the network uses WPA-PSK or WPA2-PSK depends on the device. You can check the configuration interface of the registrar device to discover the key the network is using (if the device supports this feature). Then, you can enter the key into the non-WPS device and join the network as normal (the non-WPS device must also support WPA-PSK or WPA2-PSK).

- When you use the PBC method, there is a short period (from the moment you press the button on one device to the moment you press the button on the other device) when any WPS-enabled device could join the network. This is because the registrar has no way of identifying the “correct” enrollee, and cannot differentiate between your enrollee and a rogue device. This is a possible way for a hacker to gain access to a network.

You can easily check to see if this has happened. WPS works between only two devices simultaneously, so if another device has enrolled your device will be unable to enroll, and will not have access to the network. If this happens, open the access point’s configuration interface and look at the list of associated clients (usually displayed by MAC address). It does not matter if the access point is the WPS registrar, the enrollee, or was not involved in the WPS handshake; a rogue device must still associate with the access point to gain access to the network. Check the MAC addresses of your wireless clients (usually printed on a label on the bottom of the device). If there is an unknown MAC address you can remove it or reset the AP.

Network Address Translation (NAT)

9.1 Overview

This chapter discusses how to configure NAT on the ZyXEL Device. 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 to a different IP address known within another network.

9.1.1 What You Can Do in the NAT Screens

- Use the **NAT General Setup** screen ([Section 9.2 on page 137](#)) to configure the NAT setup settings.
- Use the **Port Forwarding** screen ([Section 9.3 on page 138](#)) to configure forward incoming service requests to the server(s) on your local network.
- Use the **Address Mapping** screen ([Section 9.4 on page 142](#)) to change your ZyXEL Device's address mapping settings.
- Use the **ALG** screen ([Section 9.5 on page 145](#)) to enable and disable the SIP (VoIP) ALG in the ZyXEL Device.

9.1.2 What You Need To Know About NAT

Inside/Outside

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

Global/Local

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

NAT

In the simplest form, NAT changes the source IP address in a packet received from a subscriber (the inside local address) to another (the inside global address) before forwarding the packet to the WAN side. When the response comes back, NAT translates the destination address (the inside global address) back to the inside local address before forwarding it to the original inside host.

Port Forwarding

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

SUA (Single User Account) Versus NAT

SUA (Single User Account) is a ZyNOS implementation of a subset of NAT that supports two types of mapping, **Many-to-One** and **Server**. The ZyXEL Device also supports **Full Feature** NAT to map multiple global IP addresses to multiple private LAN IP addresses of clients or servers using mapping types as outlined in [Table 48 on page 149](#).

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

Finding Out More

See [Section 9.6 on page 146](#) for advanced technical information on NAT.

9.2 The NAT General Setup Screen

Use this screen to activate NAT. Click **Network > NAT** to open the following screen.

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

Figure 64 Network > NAT > General

The following table describes the labels in this screen.

Table 41 Network > NAT > General

LABEL	DESCRIPTION
Active Network Address Translation	Select this check box to enable NAT.
SUA Only	Select this radio button if you have just one public WAN IP address for your ZyXEL Device.
Full Feature	Select this radio button if you have multiple public WAN IP addresses for your ZyXEL Device.
Max NAT/Firewall Session Per User	<p>When computers use peer to peer applications, such as file sharing applications, they need to establish NAT sessions. If you do not limit the number of NAT sessions a single client can establish, this can result in all of the available NAT sessions being used. In this case, no additional NAT sessions can be established, and users may not be able to access the Internet.</p> <p>Each NAT session establishes a corresponding firewall session. Use this field to limit the number of NAT/Firewall sessions client computers can establish through the ZyXEL Device.</p> <p>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 exhausting all of the available NAT sessions.</p>

Table 41 Network > NAT > General (continued)

LABEL	DESCRIPTION
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

9.3 The Port Forwarding Screen

Note: This screen is available only when you select **SUA only** in the **NAT > General** screen.

Use this 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. You can allocate a server IP address that corresponds to a port or a range of ports.

The most often used port numbers and services are shown in [Appendix E on page 307](#). Please refer to RFC 1700 for further information about port numbers.

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.

Default Server IP Address

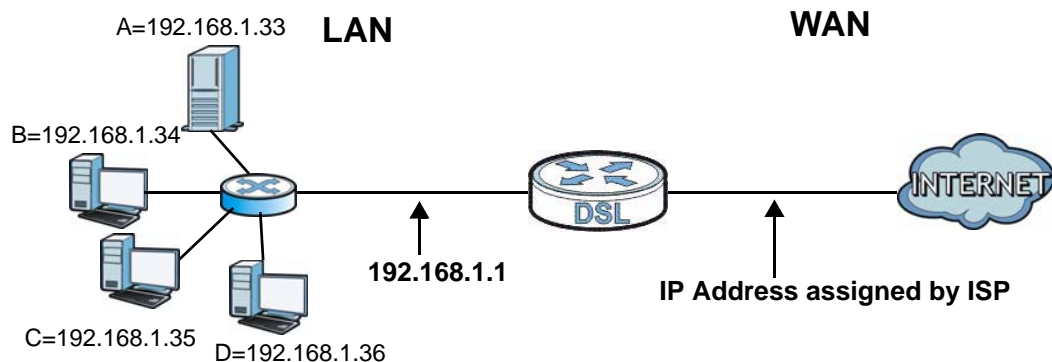
In addition to the servers for specified services, NAT supports a default server IP address. A default server receives packets from ports that are not specified in this screen.

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

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 65 Multiple Servers Behind NAT Example



9.3.1 Configuring the Port Forwarding Screen

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

See [Appendix E on page 307](#) for port numbers commonly used for particular services.

Figure 66 Network > NAT > Port Forwarding

The screenshot shows a web-based configuration interface for NAT Port Forwarding. At the top, there are three tabs: 'General', 'Port Forwarding' (selected), and 'ALG'. Below the tabs, there are two main sections: 'Default Server Setup' and 'Port Forwarding'. In 'Default Server Setup', there is a text input field for 'Default Server' containing '0.0.0.0'. In 'Port Forwarding', there is a dropdown menu for 'Service Name' set to 'WWW' and a text input field for 'Server IP Address' set to '0.0.0.0', with an 'Add' button to the right. Below this is a table with the following data:

#	Active	Service Name	Start Port	End Port	Port Translation Start Port	Port Translation End Port	Server IP Address	Modify
1	<input checked="" type="checkbox"/>	WWW	80	80	80	80	192.168.1.2	

At the bottom of the screen, there are 'Apply' and 'Cancel' buttons.

The following table describes the fields in this screen.

Table 42 Network > NAT > Port Forwarding

LABEL	DESCRIPTION
Default Server Setup	
Default Server	In addition to the servers for specified services, NAT supports a default server. A default server receives packets from ports that are not specified in this screen. If you do not assign a Default Server IP address, the ZyXEL Device discards all packets received for ports that are not specified here or in the remote management setup.
Port Forwarding	
Service Name	Select a service from the drop-down list box.
Server IP Address	Enter the IP address of the server for the specified service.
Add	Click this button to add a rule to the table below.
#	This is the rule index number (read-only).
Active	This field indicates whether the rule is active or not. Clear the check box to disable the rule. Select the check box to enable it.
Service Name	This is a service's name.
Start Port	This is the first port number that identifies a service.
End Port	This is the last port number that identifies a service.
Port Translation Start/End Port	This is the start/end port number that the device translates.
Server IP Address	This is the server's IP address.
Modify	Click the edit icon to go to the screen where you can edit the port forwarding rule. Click the delete icon to delete an existing port forwarding rule. Note that subsequent address mapping rules move up by one when you take this action.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

9.3.2 The Port Forwarding Rule Edit Screen

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

Figure 67 Network > NAT > Port Forwarding: Edit

The following table describes the fields in this screen.

Table 43 Network > NAT > Port Forwarding: Edit

LABEL	DESCRIPTION
Rule Setup	
Active	Click this check box to enable the rule.
Service Name	Enter a name to identify this port-forwarding rule.
Start Port	Enter a port number in this field. To forward only one port, enter the port number again in the End Port field. To forward a series of ports, enter the start port number here and the end port number in the End Port field.
End Port	Enter a port number in this field. To forward only one port, enter the port number again in the Start Port field above and then enter it again in this field. To forward a series of ports, enter the last port number in a series that begins with the port number in the Start Port field above.
Server IP Address	Enter the inside IP address of the server here.
Port Translation Start / End Port	Enter the start port number here to which you want the device to translate the incoming port. For a range of ports, you only need to enter the first number of the range to which you want the incoming ports translated, the device automatically calculates the last port of the translated port range.
Back	Click this to return to the previous screen without saving.

Table 43 Network > NAT > Port Forwarding: Edit (continued)

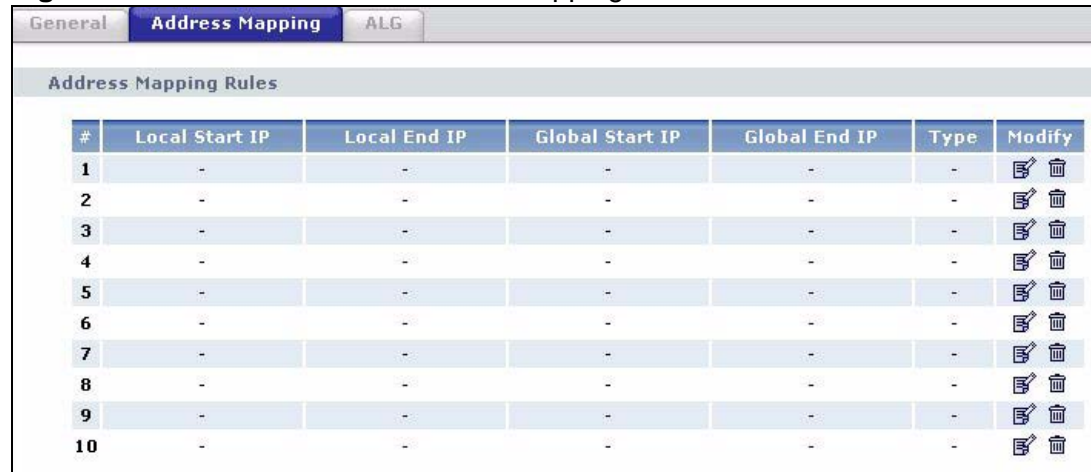
LABEL	DESCRIPTION
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.





















9.4 The Address Mapping Screen

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

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

To change your ZyXEL Device's address mapping settings, click **Network > NAT > Address Mapping** to open the following screen.

Figure 68 Network > NAT > Address Mapping


Address Mapping Rules						
#	Local Start IP	Local End IP	Global Start IP	Global End IP	Type	Modify
1	-	-	-	-	-	 
2	-	-	-	-	-	 
3	-	-	-	-	-	 
4	-	-	-	-	-	 
5	-	-	-	-	-	 
6	-	-	-	-	-	 
7	-	-	-	-	-	 
8	-	-	-	-	-	 
9	-	-	-	-	-	 
10	-	-	-	-	-	 

The following table describes the fields in this screen.

Table 44 Network > NAT > Address Mapping

LABEL	DESCRIPTION
#	This is the rule index number.
Local Start IP	This is the starting Inside Local IP Address (ILA). Local IP addresses are N/A for Server port mapping.
Local End IP	This is the end Inside Local IP Address (ILA). If the rule is for all local IP addresses, then this field displays 0.0.0.0 as the Local Start IP address and 255.255.255.255 as the Local End IP address. This field is N/A for One-to-one and Server mapping types.
Global Start IP	This is the starting Inside Global IP Address (IGA). Enter 0.0.0.0 here if you have a dynamic IP address from your ISP. You can only do this for Many-to-One and Server mapping types.
Global End IP	This is the ending Inside Global IP Address (IGA). This field is N/A for One-to-one , Many-to-One and Server mapping types.
Type	<p>1-1: One-to-one mode maps one local IP address to one global IP address. Note that port numbers do not change for the One-to-one NAT mapping type.</p> <p>M-1: Many-to-One mode maps multiple local IP addresses to one global IP address. This is equivalent to SUA (i.e., PAT, port address translation), ZyXEL's Single User Account feature that previous ZyXEL routers supported only.</p> <p>M-M Ov (Overload): Many-to-Many Overload mode maps multiple local IP addresses to shared global IP addresses.</p> <p>MM No (No Overload): Many-to-Many No Overload mode maps each local IP address to unique global IP addresses.</p> <p>Server: This type allows you to specify inside servers of different services behind the NAT to be accessible to the outside world.</p>
Modify	<p>Click the edit icon to go to the screen where you can edit the address mapping rule.</p> <p>Click the delete icon to delete an existing address mapping rule. Note that subsequent address mapping rules move up by one when you take this action.</p>

9.4.1 The Address Mapping Rule Edit Screen

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

Figure 69 Network > NAT > Address Mapping: Edit

The screenshot shows a web-based configuration interface titled "Edit Address Mapping Rule1". It contains several input fields and a dropdown menu. The "Type" field is a dropdown menu currently set to "One-to-One". The "Local Start IP" field contains "0.0.0.0", and the "Local End IP" field contains "N/A". The "Global Start IP" field contains "0.0.0.0", and the "Global End IP" field contains "N/A". The "Server Mapping Set" field contains "PVC0" with a blue link "Edit Details" next to it. At the bottom of the form are three buttons: "Back", "Apply", and "Cancel".

The following table describes the fields in this screen.

Table 45 Network > NAT > Address Mapping: Edit

LABEL	DESCRIPTION
Type	<p>Choose the port mapping type from one of the following.</p> <p>One-to-One: One-to-One mode maps one local IP address to one global IP address. Note that port numbers do not change for One-to-one NAT mapping type.</p> <p>Many-to-One: Many-to-One mode maps multiple local IP addresses to one global IP address. This is equivalent to SUA (i.e., PAT, port address translation), ZyXEL's Single User Account feature that previous ZyXEL routers supported only.</p> <p>Many-to-Many Overload: Many-to-Many Overload mode maps multiple local IP addresses to shared global IP addresses.</p> <p>Many-to-Many No Overload: Many-to-Many No Overload mode maps each local IP address to unique global IP addresses.</p> <p>Server: This type allows you to specify inside servers of different services behind the NAT to be accessible to the outside world.</p>
Local Start IP	This is the starting local IP address (ILA). Local IP addresses are N/A for Server port mapping.
Local End IP	<p>This is the end local IP address (ILA). If your rule is for all local IP addresses, then enter 0.0.0.0 as the Local Start IP address and 255.255.255.255 as the Local End IP address.</p> <p>This field is N/A for One-to-One and Server mapping types.</p>
Global Start IP	This is the starting global IP address (IGA). Enter 0.0.0.0 here if you have a dynamic IP address from your ISP.

Table 45 Network > NAT > Address Mapping: Edit (continued)

LABEL	DESCRIPTION
Global End IP	This is the ending global IP address (IGA). This field is N/A for One-to-One , Many-to-One and Server mapping types.
Server Mapping Set Edit Details	Click this link to go to the Port Forwarding screen to edit a port forwarding set that you have selected in the Server Mapping Set field.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

9.5 The ALG Screen

Some NAT routers may include a SIP Application Layer Gateway (ALG). A SIP ALG allows SIP calls to pass through NAT by examining and translating IP addresses embedded in the data stream. When the ZyXEL Device registers with the SIP register server, the SIP ALG translates the ZyXEL Device's private IP address inside the SIP data stream to a public IP address. You do not need to use STUN or an outbound proxy if your ZyXEL Device is behind a SIP ALG.

Use this screen to enable and disable the SIP (VoIP) ALG in the ZyXEL Device. To access this screen, click **Network > NAT > ALG**.

Figure 70 Network > NAT > ALG

The following table describes the fields in this screen.

Table 46 Network > NAT > ALG

LABEL	DESCRIPTION
Enable SIP ALG	Select this to make sure SIP (VoIP) works correctly with port-forwarding and address-mapping rules.
Apply	Click this to save your changes.
Reset	Click this to restore your previously saved settings.

9.6 NAT Technical Reference

This chapter contains more information regarding NAT.

9.6.1 NAT Definitions

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

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

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

Table 47 NAT Definitions

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

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

9.6.2 What NAT Does

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

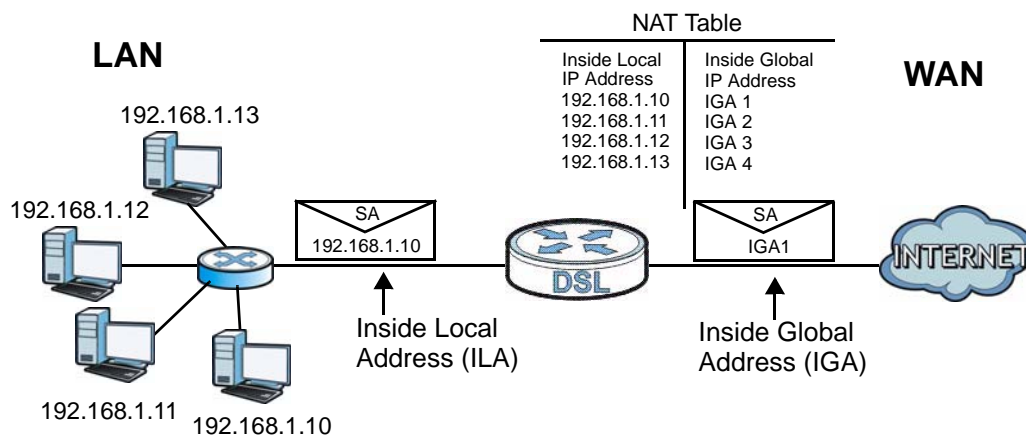
The global IP addresses for the inside hosts can be either static or dynamically assigned by the ISP. In addition, you can designate servers, for example, a web server and a telnet server, on your local network and make them accessible to the

outside world. If you do not define any servers (for Many-to-One and Many-to-Many Overload mapping – see [Table 48 on page 149](#)), NAT offers the additional benefit of firewall protection. With no servers defined, your ZyXEL Device filters out all incoming inquiries, thus preventing intruders from probing your network. For more information on IP address translation, refer to *RFC 1631, The IP Network Address Translator (NAT)*.

9.6.3 How NAT Works

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

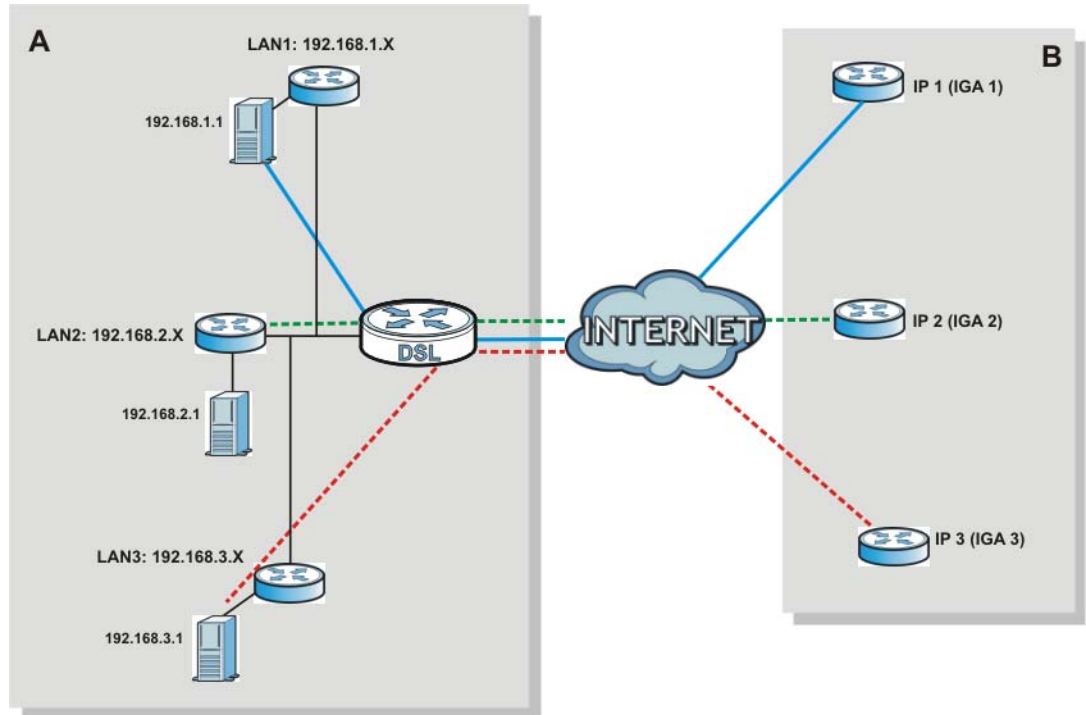
Figure 71 How NAT Works



9.6.4 NAT Application

The following figure illustrates a possible NAT application, where three inside LANs (logical LANs using IP alias) behind the ZyXEL Device can communicate with three distinct WAN networks.

Figure 72 NAT Application With IP Alias



9.6.5 NAT Mapping Types

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

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

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

The following table summarizes these types.

Table 48 NAT Mapping Types

TYPE	IP MAPPING
One-to-One	ILA1 ↔ IGA1
Many-to-One (SUA/PAT)	ILA1 ↔ IGA1 ILA2 ↔ IGA1 ...
Many-to-Many Overload	ILA1 ↔ IGA1 ILA2 ↔ IGA2 ILA3 ↔ IGA1 ILA4 ↔ IGA2 ...
Many-to-Many No Overload	ILA1 ↔ IGA1 ILA2 ↔ IGA2 ILA3 ↔ IGA3 ...
Server	Server 1 IP ↔ IGA1 Server 2 IP ↔ IGA1 Server 3 IP ↔ IGA1

10.1 Overview

This chapter shows you how to enable the ZyXEL Device firewall. Use the firewall to protect your ZyXEL Device and network from attacks by hackers on the Internet and control access to it. By default the firewall:

- allows traffic that originates from your LAN computers to go to all other networks.
- blocks traffic that originates on other networks from going to the LAN.
- blocks SYN and port scanner attacks.

By default, the ZyXEL Device blocks DDOS, LAND and Ping of Death attacks whether the firewall is enabled or disabled.

10.1.1 What You Can Do in the Firewall Screens

Use the **Firewall** screen ([Section 10.2 on page 153](#)) to enable firewall and/or SPI on the ZyXEL Device.

10.1.2 What You Need to Know About Firewall

SYN Attack

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

DoS

Denials of Service (DoS) attacks are aimed at devices and networks with a connection to the Internet. Their goal is not to steal information, but to disable a

device or network so users no longer have access to network resources. The ZyXEL Device is pre-configured to automatically detect and thwart all known DoS attacks.

DDoS

A DDoS attack is one in which multiple compromised systems attack a single target, thereby causing denial of service for users of the targeted system.

LAND Attack

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

Ping of Death

Ping of Death uses a "ping" utility to create and send an IP packet that exceeds the maximum 65,536 bytes of data allowed by the IP specification. This may cause systems to crash, hang or reboot.

SPI

Stateful Packet Inspection (SPI) tracks each connection crossing the firewall and makes sure it is valid. Filtering decisions are based not only on rules but also context. For example, traffic from the WAN may only be allowed to cross the firewall in response to a request from the LAN.

10.2 The Firewall Screen

Use this screen to enable firewall and/or SPI. Click **Advanced Setup > Firewall** to display the following screen.

Figure 73 Advanced Setup > Firewall

The screenshot shows a web-based configuration interface for the Firewall. At the top, there is a blue header with the word "Firewall". Below this is a light gray sub-header also labeled "Firewall". The main content area contains two rows of radio buttons. The first row is for "Firewall" with "Enabled" and "Disabled" options; "Disabled" is selected. The second row is for "SPI" with "Enabled" and "Disabled" options; "Disabled" is selected. Below the radio buttons is a yellow note icon followed by the text: "Note : (WARNING: If You enabled SPI, all traffics initiated from WAN would be blocked, including DMZ, Virtual Server, and ACL WAN side.)". At the bottom of the form are two buttons: "Apply" and "Cancel".

The following table describes the labels in this screen.

Table 49 Advanced > Firewall

LABEL	DESCRIPTION
Firewall	Use this field to enable or disable firewall on your ZyXEL Device.
SPI	Use this field to enable or disable SPI on your ZyXEL Device.
SAVE	Click this to save your changes.
CANCEL	Click this to restore your previously saved settings.

Enabling SPI blocks all traffic initiated from the WAN side, including the DMZ, virtual server and ACL on the WAN side.

11.1 Overview

This chapter introduces three types of filters supported by the ZyXEL Device. You can configure rules to restrict traffic by IP addresses, MAC addresses, application types and/or URLs.

11.1.1 What You Can Do in the Filter Screens

- Use the **URL Filter** screen ([Section 11.2 on page 156](#)) to block access to web sites.
- Use the **Application Filter** screen ([Section 11.3 on page 157](#)) to allow or deny traffic from certain types of applications.
- Use the **IP/MAC Filter** screen ([Section 11.4 on page 158](#)) to create IP/MAC filter rules.

11.1.2 What You Need to Know About Filtering

URL

The URL (Uniform Resource Locator) identifies and helps locates resources on a network. On the Internet the URL is the web address that you type in the address bar of your Internet browser, for example “<http://www.zyxel.com>”.

IP/MAC Filter Structure

An IP/MAC filter set consists of one or more filter rules. The ZyXEL Device allows you to configure up to twelve filter sets with six rules in each set, for a total of 72 filter rules in the system.

11.2 The URL Filter Screen

Use this screen to block websites by URL. Click **Security > Filter > URL Filter**. The screen appears as shown.

Figure 74 Security > Filter > URL Filter

The following table describes the labels in this screen.

Table 50 Access Management > Filter (URL)

LABEL	DESCRIPTION
URL Filter Editing	
Active	Use this field to enable or disable the URL filter.
URL Index	Select the index number of the filter.
URL	Enter the URL for the ZyXEL Device to block.
URL Filter Listing	
Index	This is the index number of the filter rule.
URL	This is the URL you have configured the ZyXEL Device to block.
Apply	Click this to save your changes.
Delete	Click this to remove the filter rule.
Cancel	Click this to restore your previously saved settings.

11.3 The Application Filter Screen

Use this screen to allow or deny traffic for certain types of applications. The application filter provides a convenient way to manage the use of various applications on the network.

Click **Security > Filter > Application Filter**. The screen appears as shown.

Figure 75 Security > Filter > Application Filter

The following table describes the labels in this screen.

Table 51 Access Management > Filter (Application)

LABEL	DESCRIPTION
Application Filter Editing	
Application Filter	Use this field to enable or disable the application filter.
ICQ	Use this field to allow or deny ICQ traffic.
MSN	Use this field to allow or deny MSN traffic.
YMSG	Use this field to allow or deny Yahoo Messenger traffic
Real Audio/Video	Use this field to allow or deny transferring RealPlayer format files.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

11.4 The IP/MAC Filter Screen

Use this screen to create and apply IP/MAC filters. Click **Security > Filter > IP/MAC Filter**. The screen appears as shown.

Figure 76 Security > Filter > IP/MAC Filter

The following table describes the labels in this screen.

Table 52 Access Management > Filter (IP/MAC)

LABEL	DESCRIPTION
IP/MAC Filter Set Editing	
IP/MAC Filter Set Index	Select the index number of the filter set.
Interface	Select the PVC to which to apply the filter.
Direction	Apply the filter to Both , Incoming or Outgoing traffic direction.
IP/MAC Filter Rule Editing	
IP/MAC Filter Rule Index	Select the index number of the filter rule.

Table 52 Access Management > Filter (IP/MAC) (continued)

LABEL	DESCRIPTION
Rule Type	Select IP or MAC type to configure the rule. Use the IP Filter to block traffic by IP addresses. Use the MAC Filter to block traffic by MAC address.
Active	Use this field to enable or disable the rule.
Source IP Address	Enter the source IP address of the packets you wish to filter. This field is ignored if it is 0.0.0.0.
Subnet Mask	Enter the IP subnet mask for the source IP address
Port Number	Enter the source port of the packets that you wish to filter. The range of this field is 0 to 65535. This field is ignored if it is 0.
Destination IP Address	Enter the destination IP address of the packets you wish to filter. This field is ignored if it is 0.0.0.0.
Subnet Mask	Enter the IP subnet mask for the destination IP address.
Port Number	Enter the destination port of the packets that you wish to filter. The range of this field is 0 to 65535. This field is ignored if it is 0.
Protocol	Select ICMP , TCP or UDP for the upper layer protocol.
MAC Address	This field is only available when you select MAC in the Rule Type field. Enter the MAC address of the packets you wish to filter.
Rule Unmatched	Select the action for a packet not matching the rule. Select Forward to forward traffic immediately and skip checking the remaining rules. Select Next to check the next rule.
IP/MAC Filter Listing	
IP/MAC Filter Set Index	Select the index number of the filter set from the drop-down list box.
Interface	This is the interface that the filter set applies to.
Direction	The filter set applies to this traffic direction.
#	This is the index number of the rule in a filter set.
Active	This field shows whether the rule is activated.
Src Address/Mask	This is the source IP address and subnet mask when you select IP as the rule type. This is the MAC address when you select MAC as the rule type.
Dest IP/Mask	This is the destination IP address and subnet mask.
Src Port	This is the source port number.
Dest Port	This is the destination port number.
Protocol	This is the upper layer protocol.
Unmatched	When a packet doesn't match the rule, this is the action the ZyXEL Device takes on the packet.
SAVE	Click this to save your changes.

Table 52 Access Management > Filter (IP/MAC) (continued)

LABEL	DESCRIPTION
DELETE	Click this to remove the filter rule.
CANCEL	Click this to restore your previously saved settings.