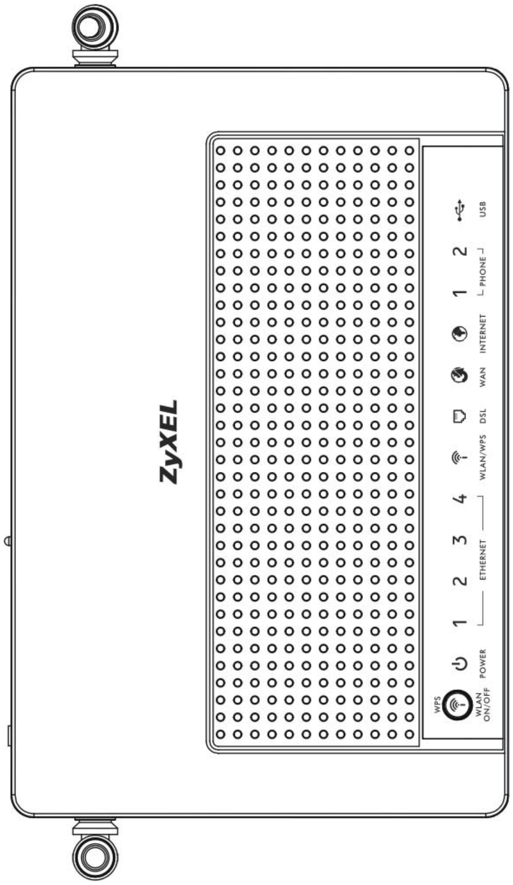
P-2612HNU(L)-FxF

802.11n ADSL2+ VoIP IAD

User's Guide



Default Login Details

IP Address	https://192.168.1.1
User Name	Admin account: admin User account: user
Password	Admin account: 1234 User account: 1234

Firmware Version 3.10
Edition 1, 9/2013

www.zyxel.com

About This User's Guide

Intended Audience

This manual is intended for people who want to configure the ZyXEL Device using the web configurator.

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.

Documentation Feedback

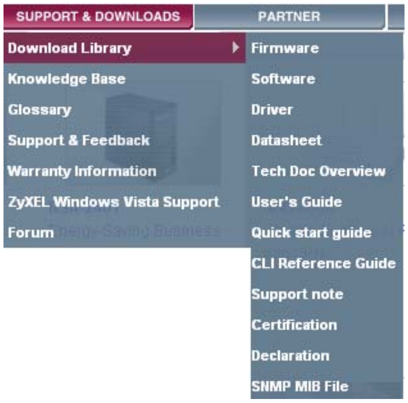
Send your comments, questions or suggestions to: techwriters@zyxel.com.tw

Thank you!

The Technical Writing Team, ZyXEL Communications Corp.,
6 Innovation Road II, Science-Based Industrial Park, Hsinchu, 30099, Taiwan.

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

Should problems arise that cannot be solved by the methods listed above, 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.

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.

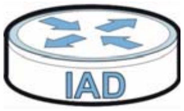
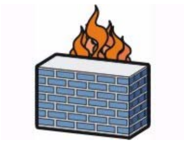
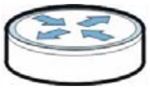
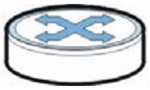
Note: Notes tell you other important information (for example, other things you may need to configure or helpful tips) or recommendations.

Syntax Conventions

- The P-2612HNU(L)-FxF 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.
- If you wall mount your device, make sure that no electrical lines, gas or water pipes will be damaged.
- This CPE is indoor use only. (Utilisation intérieure exclusivement.)

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.

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PART I

User's Guide

1

Introduction

1.1 Overview

The ZyXEL Device is an ADSL2+ Integrated Access Device (IAD) that combines an ADSL2+ router with Voice over IP (VoIP) communication capabilities to allow you to use a traditional analog telephone to make Internet calls. By integrating DSL and NAT, you are provided with ease of installation and high-speed, shared Internet access. The ZyXEL Device is also a complete security solution with a robust firewall.

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

- "H" denotes an integrated 4-port hub (switch).
- "N" denotes wireless functionality, including 802.11n mode. There is an embedded mini-PCI module for IEEE 802.11 b/g/n wireless LAN connectivity.
- "U" denotes a USB port used to set up a 3G WAN connection via a 3G wireless card or share files via a USB memory stick or a USB hard drive. The ZyXEL Device can function as a print server with an USB printer connected.
- "L" denotes the PSTN (Public Switched Telephone Network) line feature. The PSTN line lets you have VoIP phone service and PSTN phone service at the same time. All PSTN line features documented in this user's guide refer to the "L" models only.

When the ZyXEL Device does not have power, only the phone connected to the PHONE port 1 can be used for making calls. Ensure you know which phone this is, so that in case of emergency you can make outgoing calls.

- Models ending in "1", for example P-2612HNU(L)-F1, 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.

See the chapter on product specifications for a full list of features.

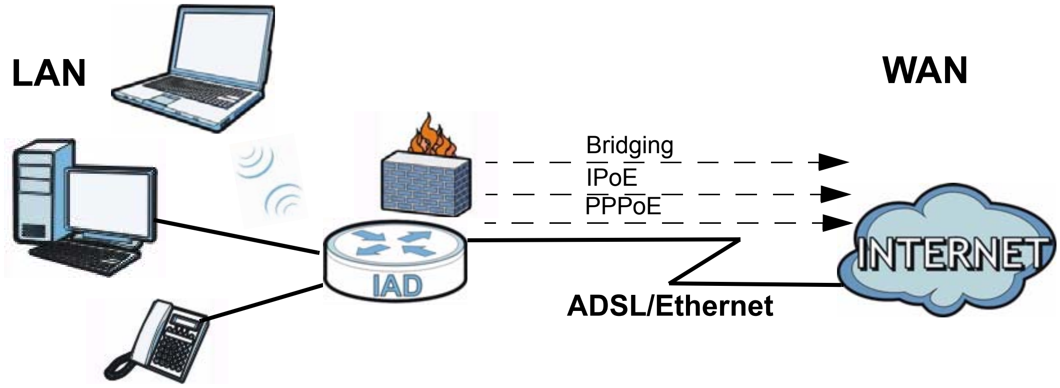
1.2 Applications for the ZyXEL Device

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

1.2.1 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). You can have multiple WAN services over one ADSL or Ethernet line. The ZyXEL Device cannot work in ADSL and Ethernet mode at the same time.

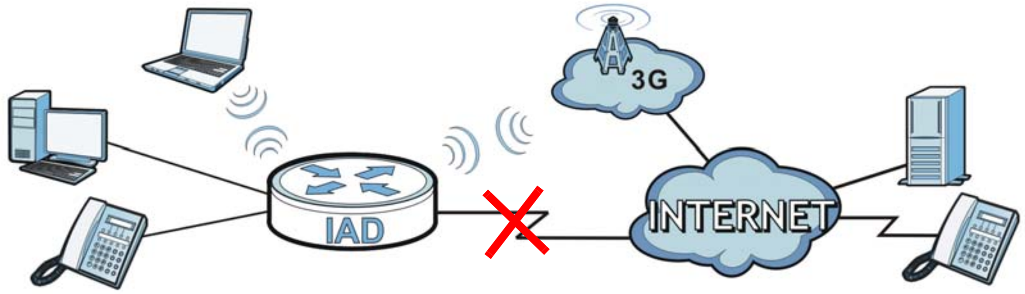
Figure 1 ZyXEL Device's Internet Access Application



1.2.1.1 3G WAN

The USB port allows you to wirelessly connect to a 3G network to get Internet access by attaching a 3G wireless card. You must leave the DSL or Ethernet WAN port unconnected and attached a 3G wireless card to use 3G as your WAN. You can also have the ZyXEL Device use the 3G WAN connection as a backup. That means the ZyXEL Device switches to the 3G wireless WAN connection after the wired DSL or Ethernet WAN connection fails. The ZyXEL Device automatically changes back to use the wired DSL or Ethernet WAN connection when it is available.

Figure 2 Internet Access Application: 3G WAN



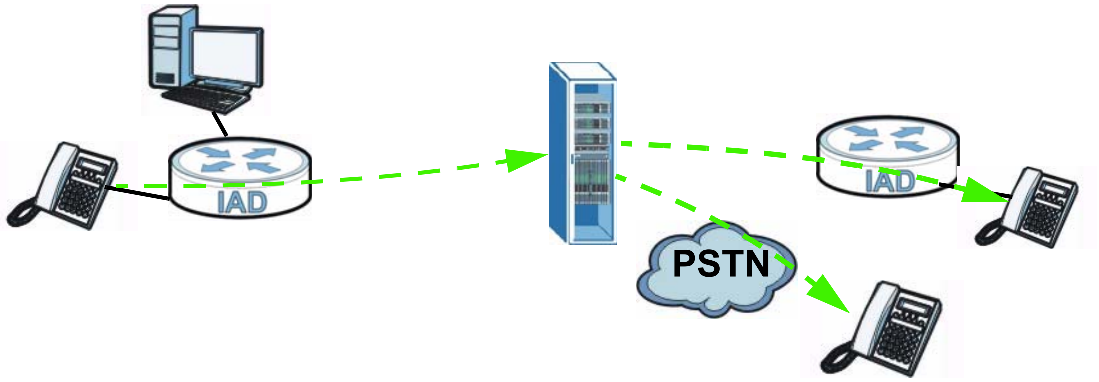
You can also configure firewall on the ZyXEL Device for secure Internet access. When the firewall is on, all incoming traffic from the Internet to your network is blocked unless it is initiated from your network. This means that probes from the outside to your network are not allowed, but you can safely browse the Internet and download files.

Use 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.

1.2.2 VoIP Features

You can register up to 2 SIP (Session Initiation Protocol) profiles (4 accounts for each profile) and use the ZyXEL Device to make and receive VoIP telephone calls:

Figure 3 ZyXEL Device’s VoIP Application

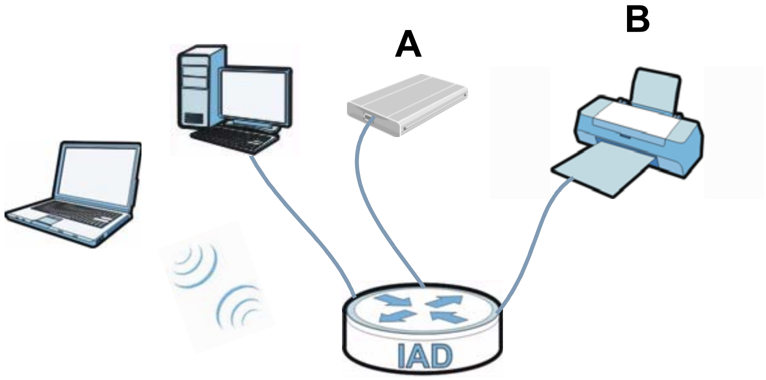


The ZyXEL Device sends your call to a VoIP service provider’s SIP server which forwards your calls to either VoIP or PSTN phones.

1.2.3 ZyXEL Device's USB Support

Use the built-in USB 2.0 port to share files via a USB memory stick or a USB hard drive (**A**). Alternatively, you can add a USB printer (**B**) and make it available on your local area network.

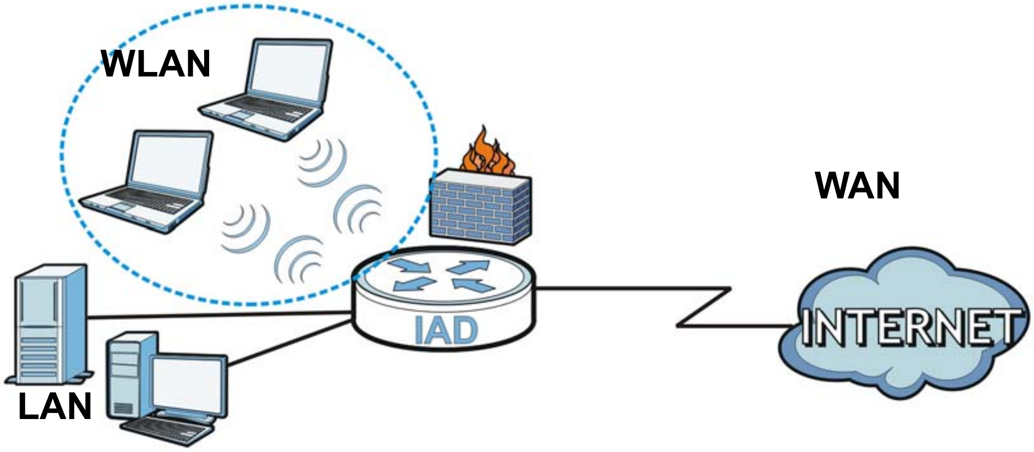
Figure 4 USB File Sharing or Print Server Application



1.2.4 Wireless Connection

By default, the wireless LAN (WLAN) is enabled on the ZyXEL Device. IEEE 802.11b/g/n compliant clients can wirelessly connect to the ZyXEL Device to access network resources. You can set up a wireless network with WPS (WiFi Protected Setup) or manually add a client to your wireless network.

Figure 5 Wireless Connection Application



1.3 The WPS/WLAN Button

You can use the **WPS** button (📶) on the top of the device to turn the wireless LAN off or on. You can also use it to activate WPS in order to quickly set up a wireless network with strong security.

Turn the Wireless LAN Off or On

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

2 Press the **WPS** button for one second and release it. The **WLAN/WPS** LED should change from on to off or vice versa.

Activate WPS

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

2 Press the **WPS** button for more than five seconds and release it. Press the WPS button on another WPS -enabled device within range of the ZyXEL Device. The **WLAN/WPS** LED should flash while the ZyXEL Device sets up a WPS connection with the wireless device.

Note: You must activate WPS in the ZyXEL Device and in another wireless device within two minutes of each other. See Chapter 6 on page 141 for more information.

1.4 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.

1.5 Good Habits for Managing the ZyXEL Device

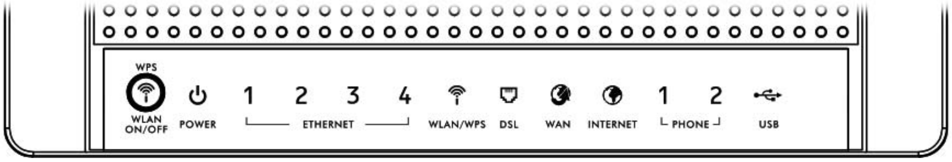
Do the following things regularly to make the ZyXEL Device more secure and to manage the ZyXEL Device more effectively.

- 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.

1.6 LEDs (Lights)

The following graphic displays the labels of the LEDs.

Figure 6 LEDs on the Top of the Device



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.
ETHERNET 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
WLAN/ WPS	Green	On	The wireless network is activated and is operating in IEEE 802.11 mode.
		Blinking	The ZyXEL Device is communicating with other wireless clients.
	Orange	Blinking	The WPS connection is being configured.
	Off		The wireless network is not activated.
DSL	Green	On	This light applies when the ZyXEL Device is in DSL WAN mode. The DSL line is up.
		Blinking	The ZyXEL Device is attempting to synchronize DSL signal.
	Off		The DSL line is down.
WAN	Green	On	This light applies when the ZyXEL Device is in Ethernet WAN mode. The ZyXEL Device has an Ethernet connection with a device on the WAN.
		Blinking	The ZyXEL Device is sending/receiving data to/from the WAN.
	Off		The ZyXEL Device does not have an Ethernet connection with the WAN.
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).
		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.
PHONE	Green	On	A SIP account is registered for the phone port.
		Blinking	A telephone connected to the phone port has its receiver off of the hook or there is an incoming call.
	Orange	On	A SIP account is registered for the phone port and there is a voice message in the corresponding SIP account.
		Blinking	A telephone connected to the phone port has its receiver off of the hook and there is a voice message in the corresponding SIP account.
	Off		The phone port does not have a SIP account registered.
USB	Green/ Orange	On	The ZyXEL Device recognizes a USB connection but there is no traffic.
		Blinking	The ZyXEL Device is sending/receiving data to /from the USB device connected to it.
	Off		The ZyXEL Device does not detect a USB 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 passwords will be reset to the defaults.

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 5 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.

2

Introducing 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 versions, Mozilla Firefox 3 and later versions, or Safari 2.0 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.
- JavaScript (enabled by default).
- Java permissions (enabled by default).

See Appendix C on page 347 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).

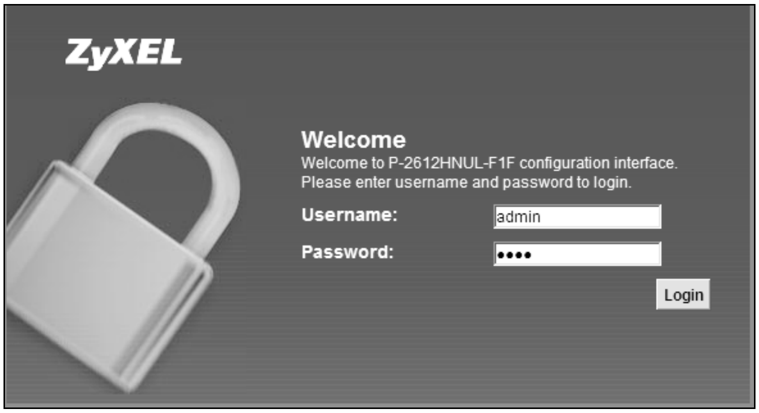
2 Launch your web browser.

3 Type "192.168.1.1" as the URL.

4 A password screen displays. Type “admin” or “user” (default) as the account username and “1234” as the password, and click **Login**. Some features are not configurable with the user account.

If you have changed the password, enter your password and click **Login**.

Figure 7 Password Screen



Welcome

Welcome to P-2612HNUL-F1F configuration interface.
Please enter username and password to login.

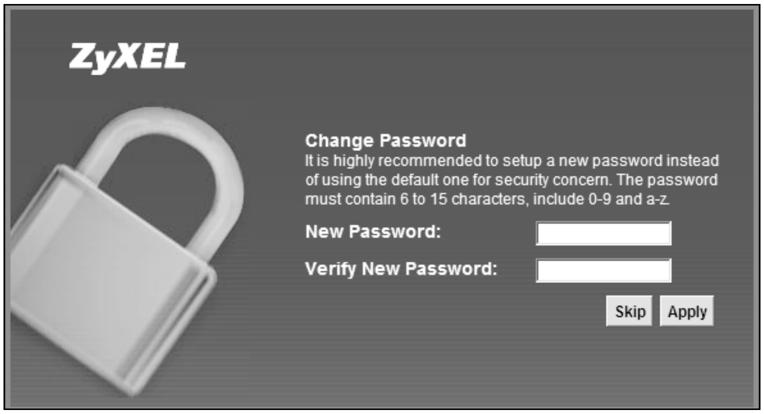
Username: admin

Password: ••••

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.

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 **Skip** to proceed to the main menu if you do not want to change the password now.

Figure 8 Change Password Screen



Change Password

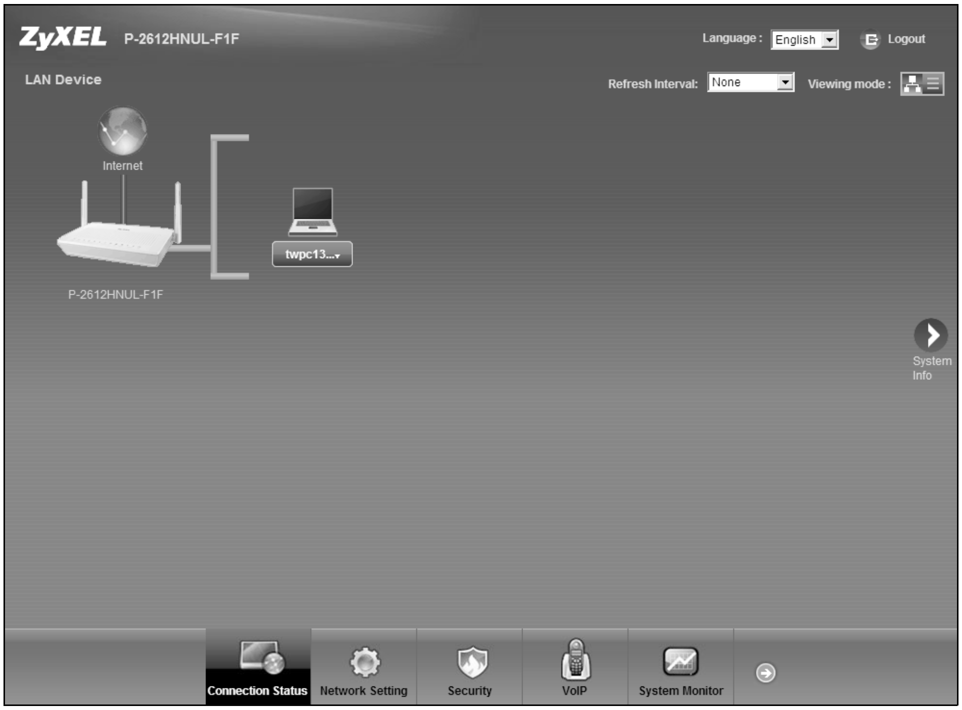
It is highly recommended to setup a new password instead of using the default one for security concern. The password must contain 6 to 15 characters, include 0-9 and a-z.

New Password:

Verify New Password:

6 The **Connection Status** screen appears.

Figure 9 Connection Status

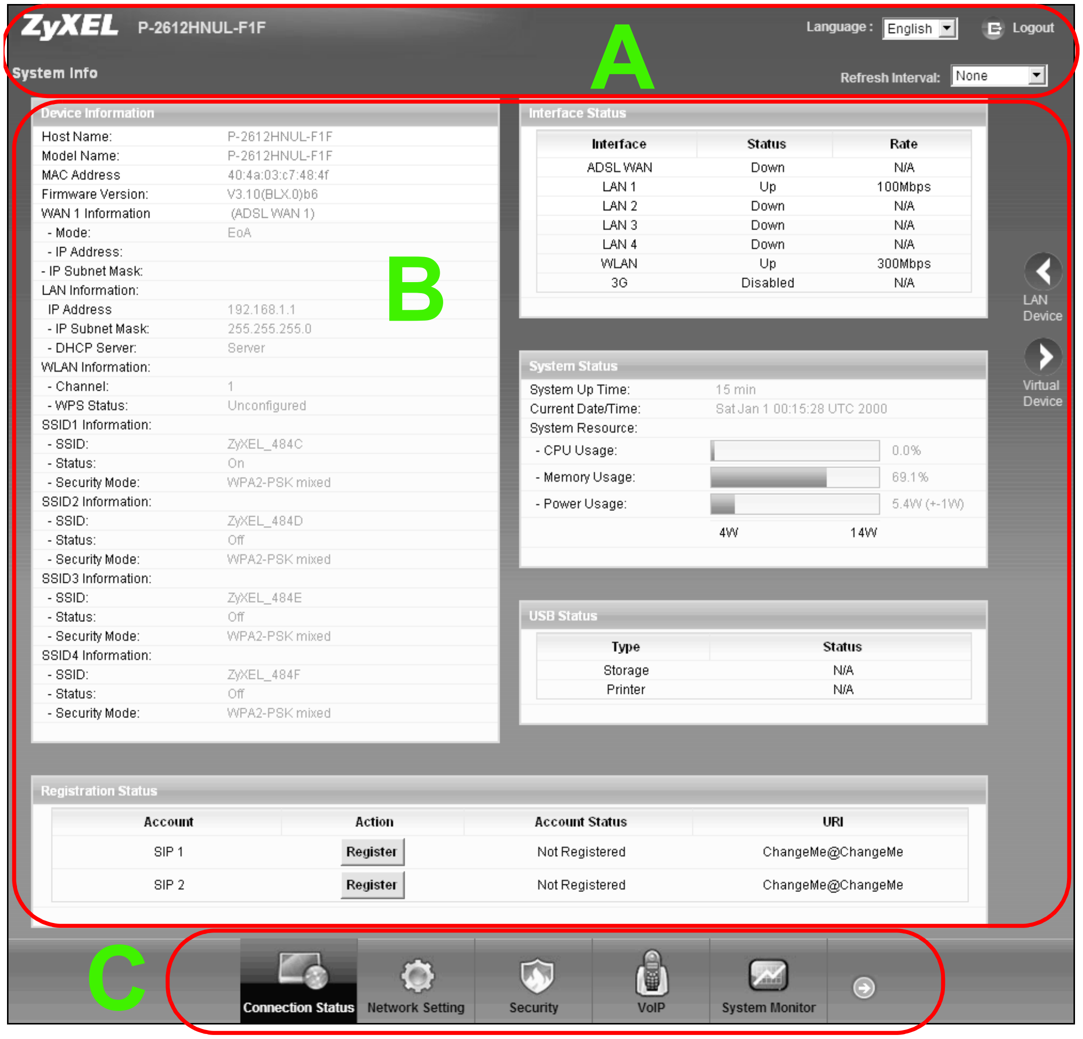


7 Click **System Info** to display the **System Info** screen, where you can view the ZyXEL Device's interface and system information.

2.2 The Web Configurator Layout

Click **Connection Status > System Info** to show the following screen.

Figure 10 Web Configurator Layout



P-2612HNUL-F1F

Language : English

System Info

Refresh Interval: None

Device Information

Host Name:	P-2612HNUL-F1F
Model Name:	P-2612HNUL-F1F
MAC Address	40:4a:03:c7:48:4f
Firmware Version:	V3.10(BLX.0)b6
WAN 1 Information	(ADSL WAN 1)
- Mode:	EoA
- IP Address:	
- IP Subnet Mask:	
LAN Information:	
IP Address	192.168.1.1
- IP Subnet Mask:	255.255.255.0
- DHCP Server:	Server
WLAN Information:	
- Channel:	1
- WPS Status:	Unconfigured
SSID1 Information:	
- SSID:	ZyXEL_484C
- Status:	On
- Security Mode:	WPA2-PSK mixed
SSID2 Information:	
- SSID:	ZyXEL_484D
- Status:	Off
- Security Mode:	WPA2-PSK mixed
SSID3 Information:	
- SSID:	ZyXEL_484E
- Status:	Off
- Security Mode:	WPA2-PSK mixed
SSID4 Information:	
- SSID:	ZyXEL_484F
- Status:	Off
- Security Mode:	WPA2-PSK mixed

Interface Status

Interface	Status	Rate
ADSL WAN	Down	N/A
LAN 1	Up	100Mbps
LAN 2	Down	N/A
LAN 3	Down	N/A
LAN 4	Down	N/A
WLAN	Up	300Mbps
3G	Disabled	N/A

System Status

System Up Time:	15 min
Current Date/Time:	Sat Jan 1 00:15:28 UTC 2000
System Resource:	
- CPU Usage:	0.0%
- Memory Usage:	69.1%
- Power Usage:	5.4W (+-1W)
	4W 14W

USB Status

Type	Status
Storage	N/A
Printer	N/A

Registration Status

Account	Action	Account Status	URI
SIP 1	Register	Not Registered	ChangeMe@ChangeMe
SIP 2	Register	Not Registered	ChangeMe@ChangeMe

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

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

2.2.1 Title Bar

The title bar shows the following icon in the upper right corner.

Click this icon to log out of the web configurator.

2.2.2 Main Window

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

After you click **System Info** on the **Connection Status** screen, the **System Info** screen is displayed. See Chapter 4 on page 87 for more information about the **System Info** screen.

If you click **LAN Device** on the **System Info** screen, the **Connection Status** screen appears. See Chapter 4 on page 85 for more information about the **Connection Status** screen.

If you click **Virtual Device** on the **System Info** screen, a visual graphic appears, showing the connection status of the ZyXEL Device's ports. The connected ports are in color and disconnected ports are gray.

2.2.3 Navigation Panel

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

Table 2 Navigation Panel Summary

LINK	TAB	FUNCTION
Connection Status		This screen shows the network status of the ZyXEL Device and computers/devices connected to it.
Network Setting		
Broadband	Broadband	Use this screen to view, remove or add a WAN interface. You can also configure ISP parameters, WAN IP address assignment, DNS servers and other advanced properties.
	3G Backup	Use this screen to configure the 3G WAN connection.
Wireless	General	Use this screen to turn the wireless connection on or off, specify the SSID(s) and 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 use WPS (Wi-Fi Protected Setup) to establish a wireless connection.
	WMM	Use this screen to enable or disable Wi-Fi MultiMedia (WMM).
	Scheduling	Use this screen to configure when the ZyXEL Device enables or disables the wireless LAN.

Table 2 Navigation Panel Summary (continued)

LINK	TAB	FUNCTION
Home Networking	LAN Setup	Use this screen to configure LAN TCP/IP settings, and other advanced properties.
	Static DHCP	Use this screen to assign specific IP addresses to individual MAC addresses.
	UPnP	Use this screen to enable the UPnP function.
	File Sharing	Use this screen to enable file sharing via the ZyXEL Device.
	Printer Server	Use this screen to enable or disable sharing of a USB printer via your ZyXEL Device.
Routing	Static Route	Use this screen to view and set up static routes on the ZyXEL Device.
DNS Route	DNS Route	Use this screen to view and configure DNS routes.
QoS	General	Use this screen to enable QoS and decide allowable bandwidth using QoS.
	Queue Setup	Use this screen to configure QoS queue assignment.
	Class Setup	Use this screen to set up classifiers to sort traffic into different flows and assign priority and define actions to be performed for a classified traffic flow.
	Monitor	Use this screen to view each queue’s statistics.
NAT	Port Forwarding	Use this screen to make your local servers visible to the outside world.
	Sessions	Use this screen to limit the number of NAT sessions a single client can establish.
DNS	Dynamic DNS	Use this screen to allow a static hostname alias for a dynamic IP address.
Security		
Firewall	General	Use this screen to activate/deactivate the firewall.
	Services	Use this screen to set the default action to take on network traffic going in specific directions.
MAC Filter	MAC Filter	Use this screen to allow specific devices to access the ZyXEL Device.
Certificates	Local Certificates	Use this screen to generate and export self-signed certificates or certification requests and import the ZyXEL Device’s CA-signed certificates.
	Trusted CAs	Use this screen to save CA certificates to the ZyXEL Device.
VoIP		
SIP	SIP Service Provider	Use this screen to configure your ZyXEL Device’s Voice over IP settings.
	SIP Account	Use this screen to set up information about your SIP account and configure audio settings such as volume levels for the phones connected to the ZyXEL Device.
	Common	Use this screen to configure RFC3262 support on the ZyXEL Device.

Table 2 Navigation Panel Summary (continued)

LINK	TAB	FUNCTION
Phone	Phone Device	Use this screen to set which phone ports use which SIP accounts.
	Region	Use this screen to select your location.
Call Rule	Speed Dial	Use this screen to configure speed dial for SIP phone numbers that you call often.
FXO	FXO	Use this screen to set up the PSTN line you use to make regular phone calls.
System Monitor		
Log	Phone Log	Use this screen to view the ZyXEL Device’s phone logs.
	VoIP Call History	Use this screen to view the ZyXEL Device’s VoIP call history.
Traffic Status	WAN	Use this screen to view the status of all network traffic going through the WAN port of the ZyXEL Device.
	LAN	Use this screen to view the status of all network traffic going through the LAN ports of the ZyXEL Device.
	NAT	Use this screen to view the status of NAT sessions on the ZyXEL Device.
	3G Backup	Use this screen to view the status of 3G Backup on the ZyXEL Device.
VoIP Status	VoIP Status	Use this screen to view the SIP, phone, and call status of the ZyXEL Device.
Maintenance		
Users Account	Users Account	Use this screen to configure the passwords your user accounts.
Remote MGMT	Remote MGMT	Use this screen to enable specific traffic directions for network services.
System	System	Use this screen to configure the ZyXEL Device’s name, domain name, management inactivity time-out.
Time Setting	Time Setting	Use this screen to change your ZyXEL Device’s time and date.
Log Setting	Log Setting	Use this screen to select which logs and/or immediate alerts your device is to record. You can also set it to e-mail the logs to you.
Firmware Upgrade	Firmware Upgrade	Use this screen to upload firmware to your device.
Backup/ Restore	Backup/ Restore	Use this screen to backup and restore your device’s configuration (settings) or reset the factory default settings.
Reboot	Reboot	Use this screen to reboot the ZyXEL Device without turning the power off.
Diagnostic	Ping	Use this screen to test the connections to other devices.
	DSL Line	Use this screen to identify problems with the DSL connection.

3

Tutorials

3.1 Overview

This chapter contains the following tutorials:

3.2 Setting Up Your DSL Connection

This tutorial shows you how to set up your Internet connection using the web configurator.

If you connect to the Internet through a DSL connection, use the information from your Internet Service Provider (ISP) to configure the ZyXEL Device. Do the following steps:

1. Connect the ZyXEL Device properly. Refer to the Quick Start Guide for details on the ZyXEL Device’s hardware connection.

2. Check the back panel of your device where the Ethernet ports are located and make sure the **DSL/WAN** switch is pointing up to **DSL**.

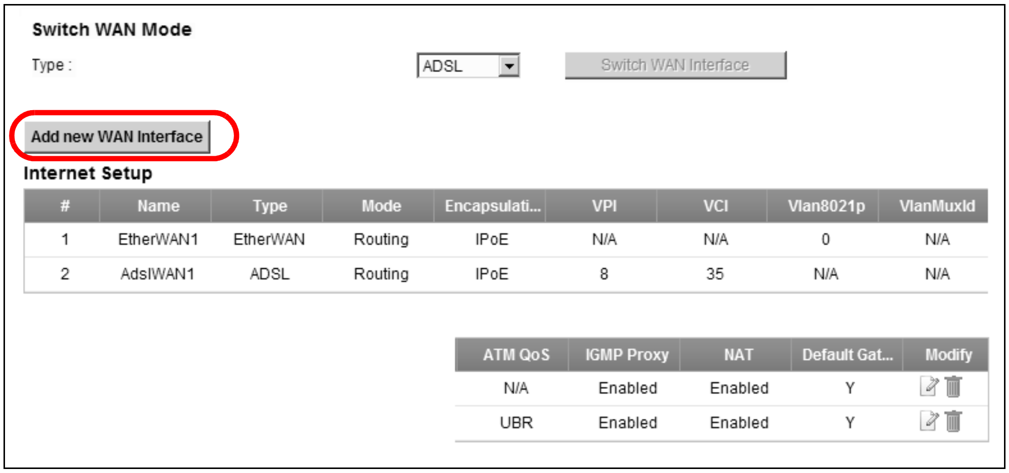
3 Connect one end of a DSL cable to the DSL port of your ZyXEL Device. The other end should be connected to the DSL port in your house or a DSL router/modem provided by your ISP.

4 Connect one end of Ethernet cable to an Ethernet port on the ZyXEL Device and the other end to a computer that you will use to access the web configurator.

5 Connect the ZyXEL Device to a power source, turn it on and wait for the **POWER** LED to become a steady green. Turn on the modem provided by your ISP as well as the computer.

Account Configuration

1 Click **Network Setting > Broadband** to open the following screen. Click **Add new WAN Interface**.



Internet Setup

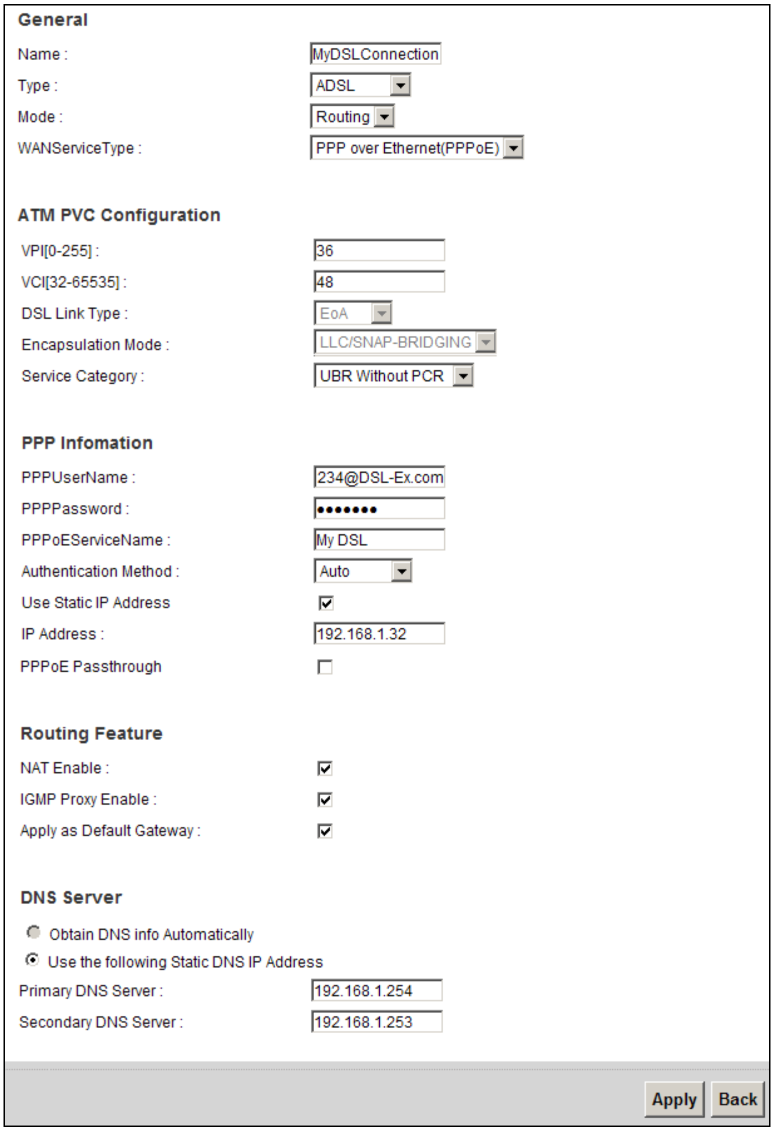
#	Name	Type	Mode	Encapsulati...	VPI	VCI	Vlan8021p	VlanMuxId	ATM QoS	IGMP Proxy	NAT	Default Gat...	Modify
1	EtherWAN1	EtherWAN	Routing	IPoE	N/A	N/A	0	N/A	N/A	Enabled	Enabled	Y	✎ 🗑
2	AdslWAN1	ADSL	Routing	IPoE	8	35	N/A	N/A	UBR	Enabled	Enabled	Y	✎ 🗑

2 For this example, the interface type is ADSL and the connection has the following information.

General	
Name	MyDSLConnection
Type	ADSL
Mode	Routing
WAN Service Type	PPPoE
ATM PVC Configuration	
VPI/VCI	36/48
Encapsulation Mode	LLC/SNAP-Bridging
Service Category	UBR without PCR
PPP Information	

PPP User Name	1234@DSL-Ex.com
PPP Password	ABCDEF!
PPPoE Service Name	My DSL
Authentication Method	Auto
Static IP Address	192.168.1.32
Others	PPPoE Passthrough: Disabled NAT: Enabled IGMP Multicast Proxy: Enabled Apply as Default Gateway: Enable DNS Server: Static DNS IP Address (Primary: 192.168.1.254 Secondary: 192.168.1.253)

Enter or select these values and click **Apply**.



General

Name : MyDSLConnection

Type : ADSL

Mode : Routing

WANServiceType : PPP over Ethernet(PPPoE)

ATM PVC Configuration

VPI[0-255] : 36

VCI[32-65535] : 48

DSL Link Type : EoA

Encapsulation Mode : LLC/SNAP-BRIDGING

Service Category : UBR Without PCR

PPP Infomation

PPPUserName : 234@DSL-Ex.com

PPPPassword : •••••••

PPPoEServiceName : My DSL

Authentication Method : Auto

Use Static IP Address ☑

IP Address : 192.168.1.32

PPPoE Passthrough □

Routing Feature

NAT Enable : ☑

IGMP Proxy Enable : ☑

Apply as Default Gateway : ☑

DNS Server

○ Obtain DNS info Automatically

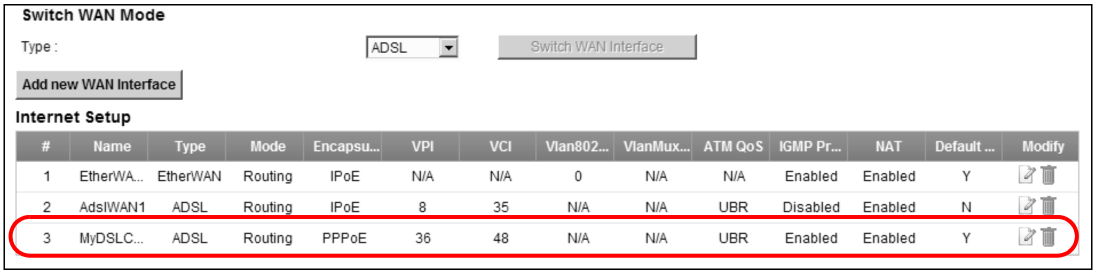
● Use the following Static DNS IP Address

Primary DNS Server : 192.168.1.254

Secondary DNS Server : 192.168.1.253

This completes your DSL WAN connection setting.

3 You should see a summary of your new DSL connection setup in the **Broadband** screen as follows.



Switch WAN Mode

Type : ADSL

Internet Setup

#	Name	Type	Mode	Encapsu...	VPI	VCI	Vlan802...	VlanMux...	ATM QoS	IGMP Pr...	NAT	Default ...	Modify
1	EtherWA...	EtherWAN	Routing	IPoE	N/A	N/A	0	N/A	N/A	Enabled	Enabled	Y	
2	AdslWAN1	ADSL	Routing	IPoE	8	35	N/A	N/A	UBR	Disabled	Enabled	N	
3	MyDSLC...	ADSL	Routing	PPPoE	36	48	N/A	N/A	UBR	Enabled	Enabled	Y	

Try to connect to a website, such as “www. zyxel.com” to see if you have correctly set up your Internet connection. Be sure to contact your service provider for any information you need to configure the WAN screens.

3.3 How to Set up a Wireless Network

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

3.3.1 Example Parameters

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

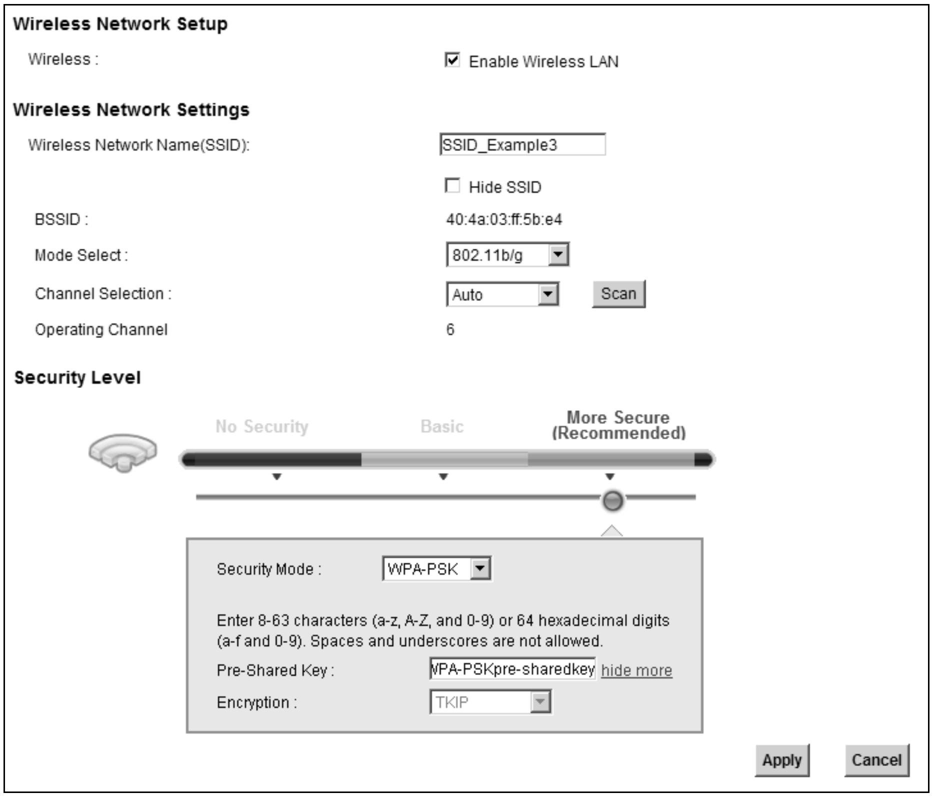
An access point (AP) or wireless router is referred to as the “AP” and a computer with a wireless network card or USB adapter is referred to as the “wireless client” here.

We use the P-2612HNU-Fx web screens and M-302 utility screens as an example. The screens may vary slightly for different models.

3.3.2 Configuring the AP

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

1 Open the **Network Setting > Wireless > General** screen in the AP's web configurator.



Wireless Network Setup

Wireless : ☑ Enable Wireless LAN

Wireless Network Settings

Wireless Network Name(SSID): SSID_Example3

□ Hide SSID

BSSID : 40:4a:03:ff:5b:e4

Mode Select : 802.11b/g

Channel Selection : Auto

Operating Channel 6

Security Level

Security Mode : WPA-PSK

Enter 8-63 characters (a-z, A-Z, and 0-9) or 64 hexadecimal digits (a-f and 0-9). Spaces and underscores are not allowed.

Pre-Shared Key : WPA-PSKpre-sharedkey hide more

Encryption : TKIP

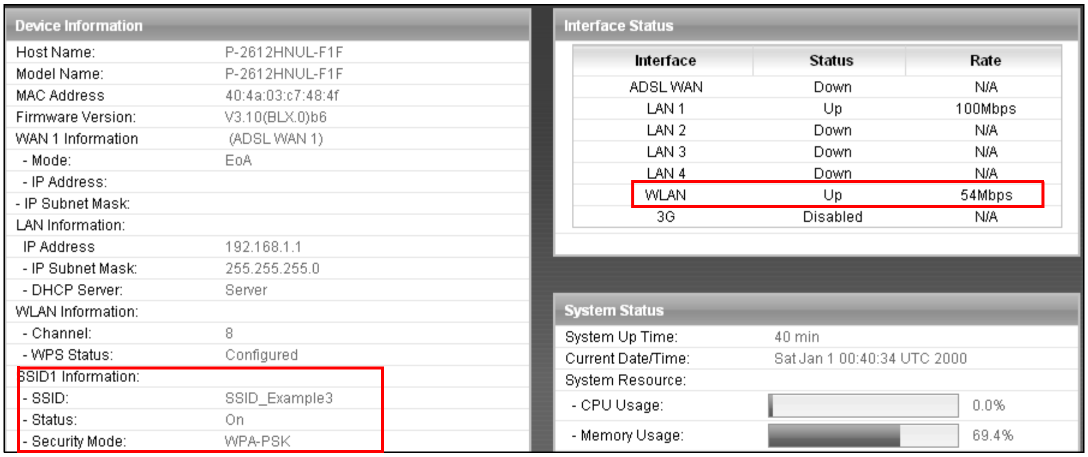
2 Make sure **Enable Wireless LAN** is selected.

3 Enter "SSID_Example3" as the SSID and select **Auto** in the **Channel Selection** field to have the device search for an available channel.

4 Select **802.11b/g** in the **Mode Select** field.

5 Select **More Secure** as your security level and set security mode to **WPA-PSK** and enter "ThisismyWPA-PSKpre-sharedkey" in the **Pre-Shared Key** field. Click **Apply**.

6 Click **Connection Status > System Info**.Verify your wireless and wireless security settings under **Device Information** and check if the WLAN connection is up under **Interface Status**.



Device Information

Host Name:	P-2612HNUL-F1F
Model Name:	P-2612HNUL-F1F
MAC Address	40:4a:03:c7:48:4f
Firmware Version:	V3.10(BLX.0)b6
WAN 1 Information	(ADSL WAN 1)
- Mode:	EoA
- IP Address:	
- IP Subnet Mask:	
LAN Information:	
IP Address	192.168.1.1
- IP Subnet Mask:	255.255.255.0
- DHCP Server:	Server
WLAN Information:	
- Channel:	8
- WPS Status:	Configured
SSID1 Information:	
- SSID:	SSID_Example3
- Status:	On
- Security Mode:	WPA-PSK

Interface Status

Interface	Status	Rate
ADSL WAN	Down	N/A
LAN 1	Up	100Mbps
LAN 2	Down	N/A
LAN 3	Down	N/A
LAN 4	Down	N/A
WLAN	Up	54Mbps
3G	Disabled	N/A

System Status

System Up Time:	40 min
Current Date/Time:	Sat Jan 1 00:40:34 UTC 2000
System Resource:	
- CPU Usage:	0.0%
- Memory Usage:	69.4%

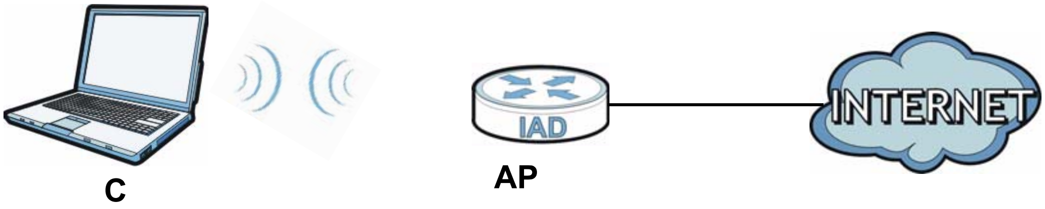
This finishes the configuration of the AP.

3.3.3 Configuring the Wireless Client

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

3.3.3.1 Connecting to a Wireless LAN

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



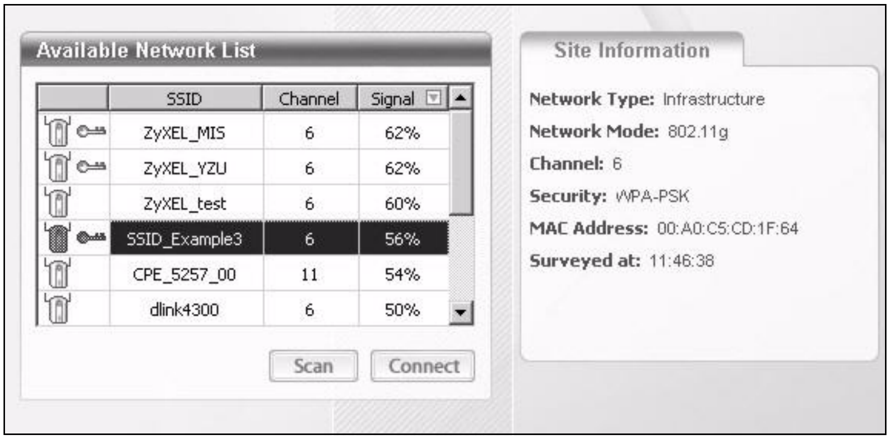
There are three ways to connect the client to an access point.

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

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

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

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



Available Network List

	SSID	Channel	Signal
🔑	ZyXEL_MIS	6	62%
🔑	ZyXEL_YZU	6	62%
	ZyXEL_test	6	60%
🔑	SSID_Example3	6	56%
	CPE_5257_00	11	54%
	dlink4300	6	50%

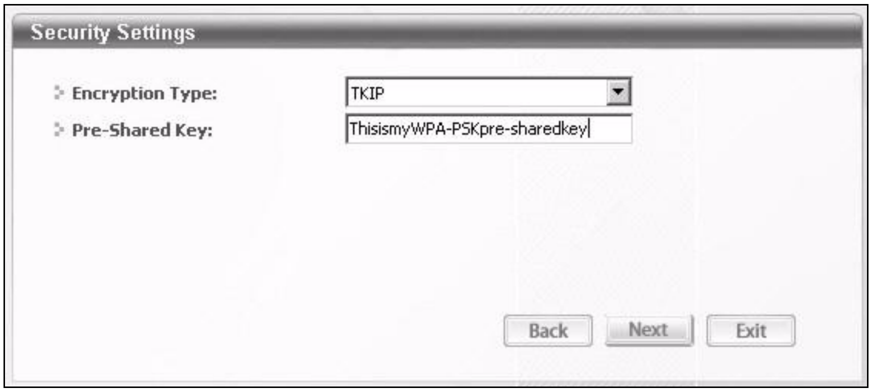
Site Information

Network Type: Infrastructure
Network Mode: 802.11g
Channel: 6
Security: WPA-PSK
MAC Address: 00:A0:C5:CD:1F:64
Surveyed at: 11:46:38

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

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

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

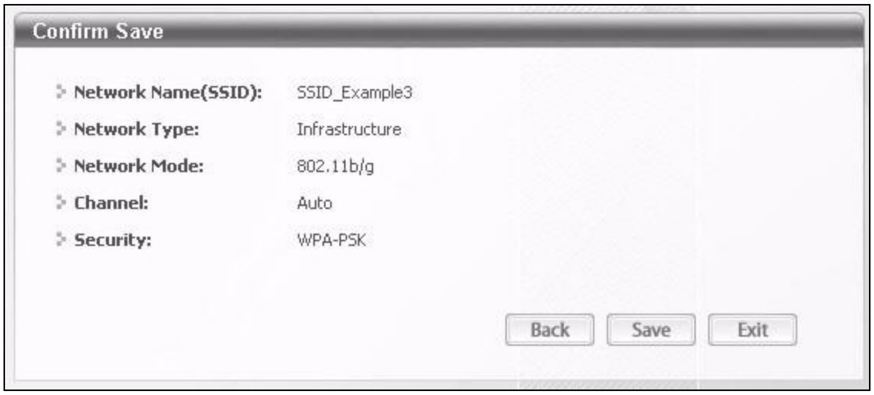


Security Settings

Encryption Type: TKIP

Pre-Shared Key: ThisismyWPA-PSKpre-sharedkey

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



Confirm Save

Network Name(SSID): SSID_Example3

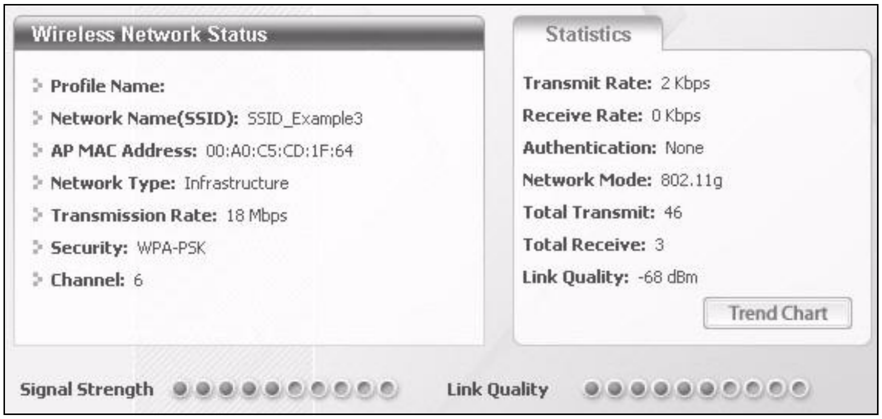
Network Type: Infrastructure

Network Mode: 802.11b/g

Channel: Auto

Security: WPA-PSK

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



Wireless Network Status

- Profile Name:
- Network Name(SSID): SSID_Example3
- AP MAC Address: 00:A0:C5:CD:1F:64
- Network Type: Infrastructure
- Transmission Rate: 18 Mbps
- Security: WPA-PSK
- Channel: 6

Statistics

Transmit Rate: 2 Kbps
Receive Rate: 0 Kbps
Authentication: None
Network Mode: 802.11g
Total Transmit: 46
Total Receive: 3
Link Quality: -68 dBm

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

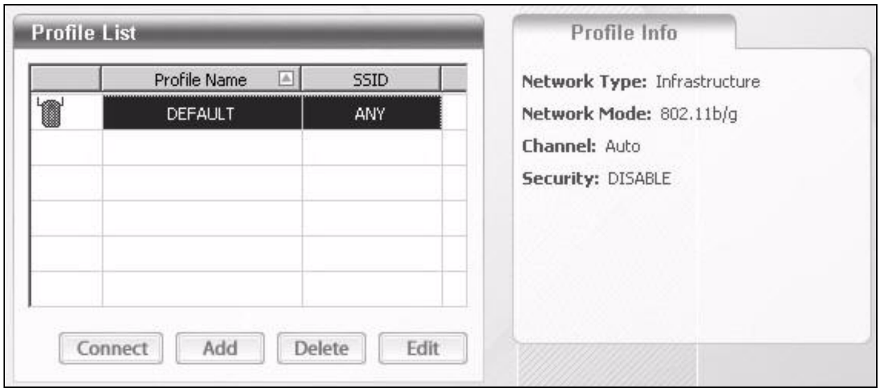
If you cannot access the web site, try changing the encryption type in the **Security Settings** screen, check the Troubleshooting section of this User's Guide or contact your network administrator.

3.3.3.2 Creating and Using a Profile

A profile lets you easily connect to the same wireless network again later. You can also configure different profiles for different networks, for example if you connect a notebook computer to wireless networks at home and at work.

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

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



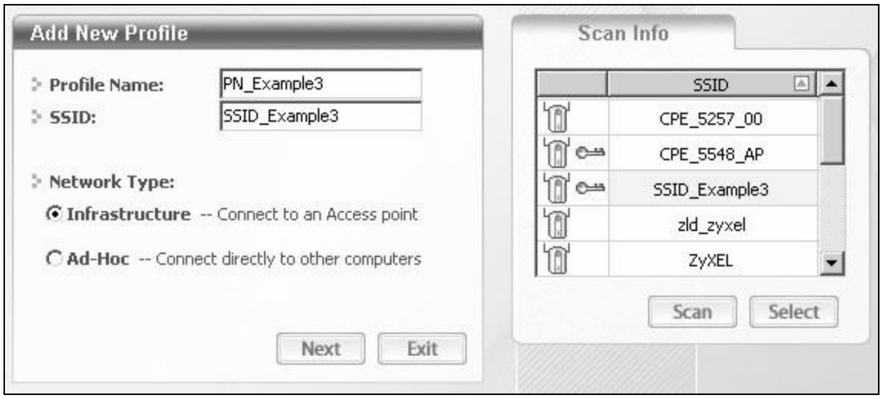
Profile List

	Profile Name	SSID
	DEFAULT	ANY

Profile Info

Network Type: Infrastructure
Network Mode: 802.11b/g
Channel: Auto
Security: DISABLE

2 The **Add New Profile** screen appears. The wireless client automatically searches for available wireless networks, and displays them in the **Scan Info** box. Click **Scan** if you want to search again. You can also configure your profile for a wireless network that is not in the list.



Add New Profile

Profile Name: PN_Example3
SSID: SSID_Example3

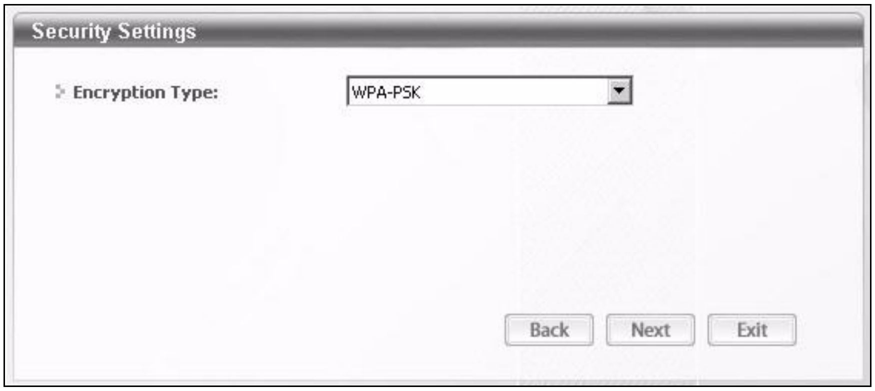
Network Type:
● Infrastructure -- Connect to an Access point
○ Ad-Hoc -- Connect directly to other computers

Scan Info

	SSID
	CPE_5257_00
	CPE_5548_AP
	SSID_Example3
	zld_zyxel
	ZyXEL

3 Give the profile a descriptive name (of up to 32 printable ASCII characters). Select **Infrastructure** and either manually enter or select the AP's SSID in the **Scan Info** table and click **Select**.

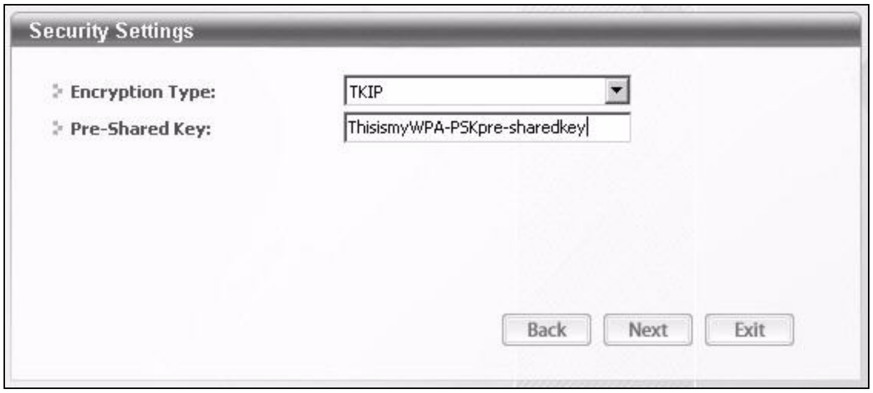
4 Choose the same encryption method as the AP to which you want to connect (In this example, WPA-PSK).



Security Settings

Encryption Type: WPA-PSK

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

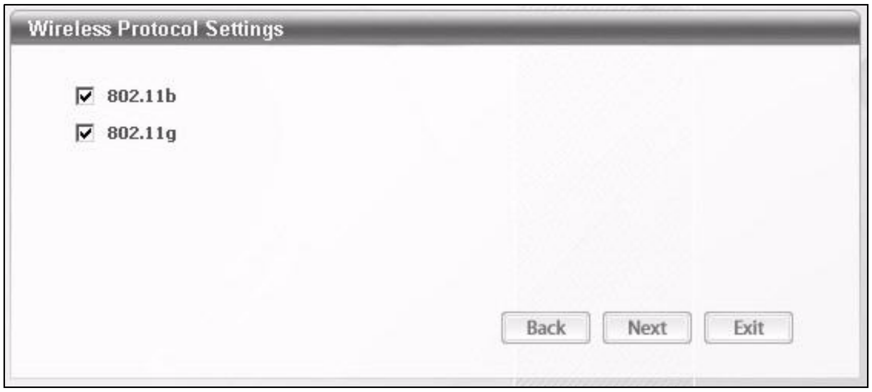


Security Settings

Encryption Type: TKIP

Pre-Shared Key: ThisismyWPA-PSKpre-sharedkey

6 In the next screen, leave both boxes selected.

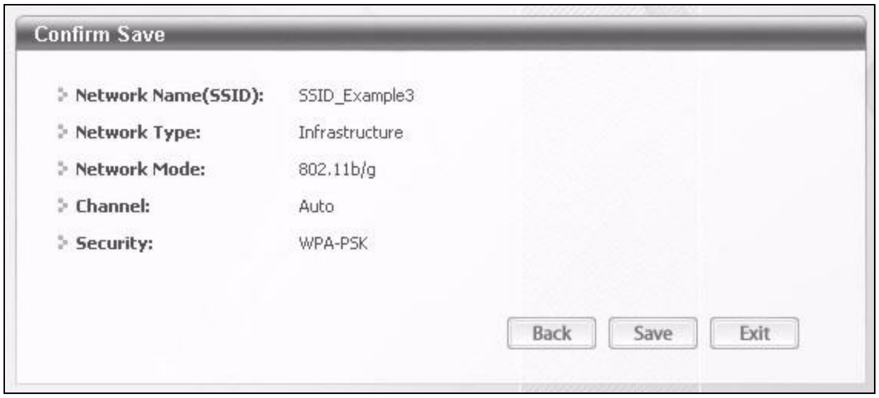


Wireless Protocol Settings

☑ 802.11b

☑ 802.11g

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



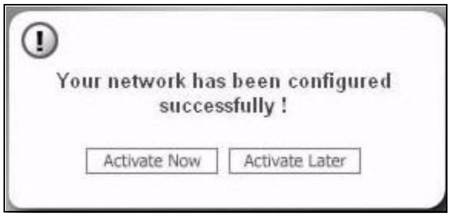
Confirm Save

Network Name(SSID):	SSID_Example3
Network Type:	Infrastructure
Network Mode:	802.11b/g
Channel:	Auto
Security:	WPA-PSK

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

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

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



Your network has been configured successfully !

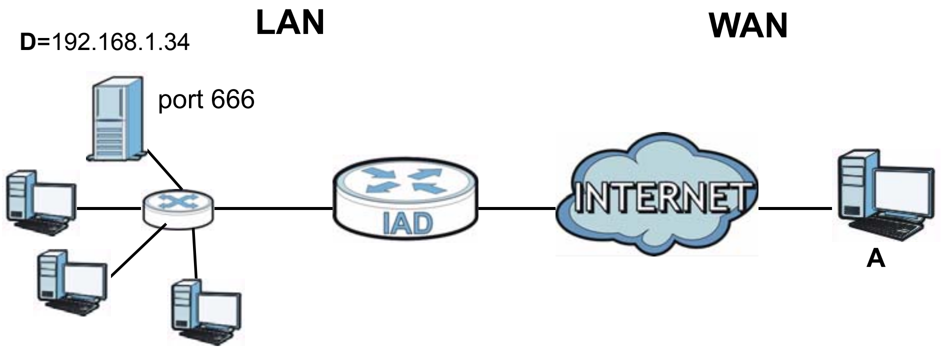
9 When you activate the new profile, the ZyXEL utility returns to the **Link Info** screen while it connects to the AP using your settings. When the wireless link is established, the ZyXEL utility icon in the system tray turns green and the **Link Info** screen displays details of the active connection.

10 Open your Internet browser, enter http://www.zyxel.com or the URL of any other web site in the address bar and press ENTER. If you are able to access the web site, your new profile is successfully configured.

11 If you cannot access the Internet go back to the **Profile** screen, select the profile you are using and click **Edit**. Check the details you entered previously. Also, refer to the Troubleshooting section of this User's Guide or contact your network administrator if necessary.

3.4 Setting Up NAT Port Forwarding

In this tutorial, you manage the Doom server on a computer behind the ZyXEL Device. In order for players on the Internet (like **A** in the figure below) to communicate with the Doom server, you need to configure the port settings and IP address on the ZyXEL Device. Traffic should be forwarded to the port 666 of the Doom server computer which has an IP address of 192.168.1.34.

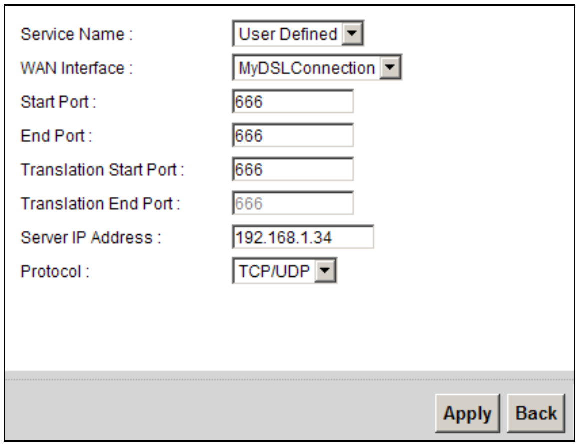


You may set up the port settings by configuring the port settings for the Doom server computer (see Chapter 11 on page 200 for more information).

1 Click **Network Setting** > **NAT** > **Port Forwarding**. Click **Add new rule**.

2 Enter the following values:

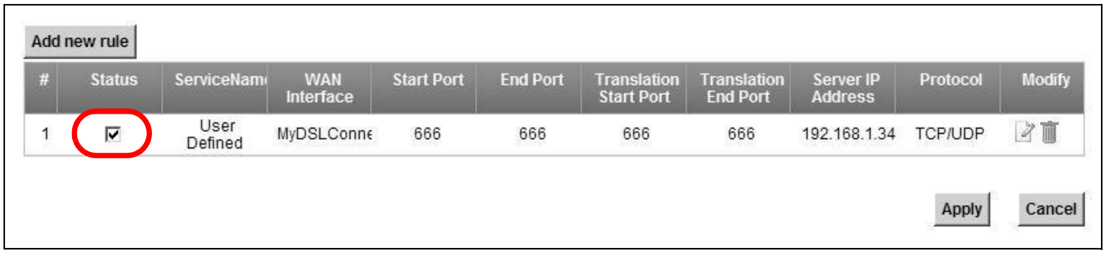
Service Name	Select **User Defined**.
WAN Interface	Select the WAN interface through which the Doom service is forwarded. This is the default interface for this example, which is **MyDSLConnection**.
Start/End Ports	**666**
Translation Start/End Ports	**666**
Server IP Address	Enter the IP address of the Doom server. This is **192.168.1.34** for this example.
Protocol	Select **TCP/UDP**. This should be the protocol supported by the Doom server.



Service Name :	User Defined
WAN Interface :	MyDSLConnection
Start Port :	666
End Port :	666
Translation Start Port :	666
Translation End Port :	666
Server IP Address :	192.168.1.34
Protocol :	TCP/UDP

3 Click **Apply**.

4 The port forwarding settings you configured should appear in the table. Make sure the **Status** check box for this rule is selected. Click **Apply** to have the ZyXEL Device start forwarding port 666 traffic to the computer with IP address 192.168.1.34.



#	Status	ServiceNam	WAN Interface	Start Port	End Port	Translation Start Port	Translation End Port	Server IP Address	Protocol	Modify
1	☑	User Defined	MyDSLConne	666	666	666	666	192.168.1.34	TCP/UDP	

Players on the Internet then can have access to your Doom server.

3.5 How to Make a VoIP Call

You can register a SIP account with the SIP server and make voice calls over the Internet to another VoIP device.

The following parameters are used in this example:

SIP Service Provider Name	ServiceProvider1
SIP Account Number	12345678
Username	ChangeMe
Password	ThisIsMySIP

3.5.1 VoIP Calls With a Registered SIP Account

To use a registered SIP account, you should configure the SIP service provider and applied for a SIP account.

3.5.1.1 SIP Service Provider Configuration

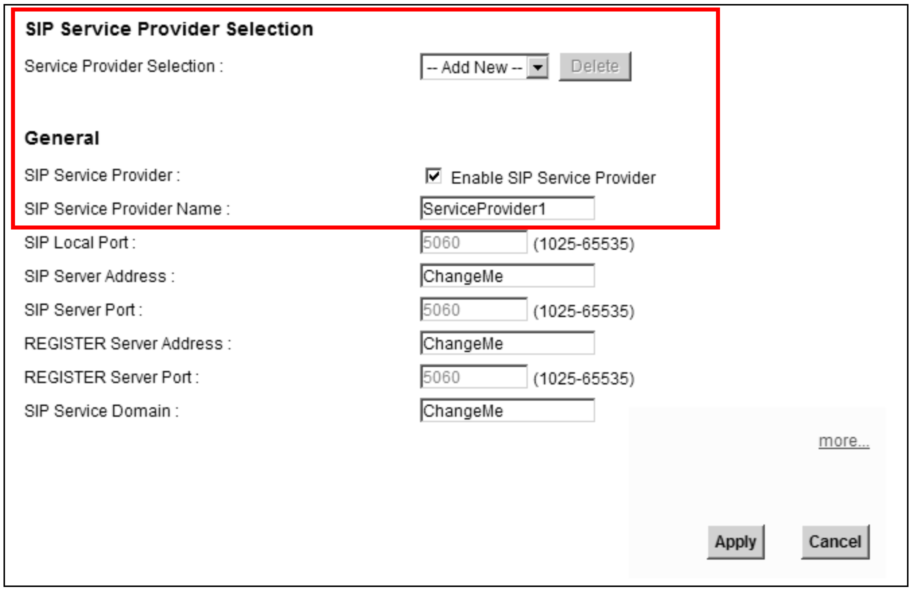
Follow the steps below to configure your SIP service provider.

1 Make sure your ZyXEL Device is connected to the Internet.

2 Open the web configurator.

3 Click **VoIP > SIP** to open the **SIP Service Provider** screen. Select **Add New** from the **Service Provider Selection** drop-down list box.

4 Select the **Enable** check box of **SIP Service Provider** and enter the **SIP Service Provider Name**.



SIP Service Provider Selection

Service Provider Selection : -- Add New -- ▾ Delete

General

SIP Service Provider : ☑ Enable SIP Service Provider

SIP Service Provider Name : ServiceProvider1

SIP Local Port : 5060 (1025-65535)

SIP Server Address : ChangeMe

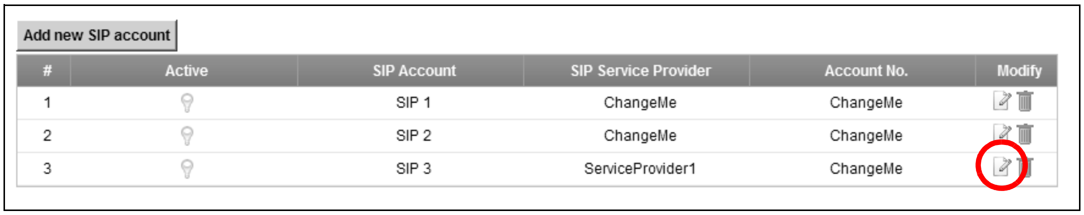
SIP Server Port : 5060 (1025-65535)

REGISTER Server Address : ChangeMe

REGISTER Server Port : 5060 (1025-65535)

SIP Service Domain : ChangeMe

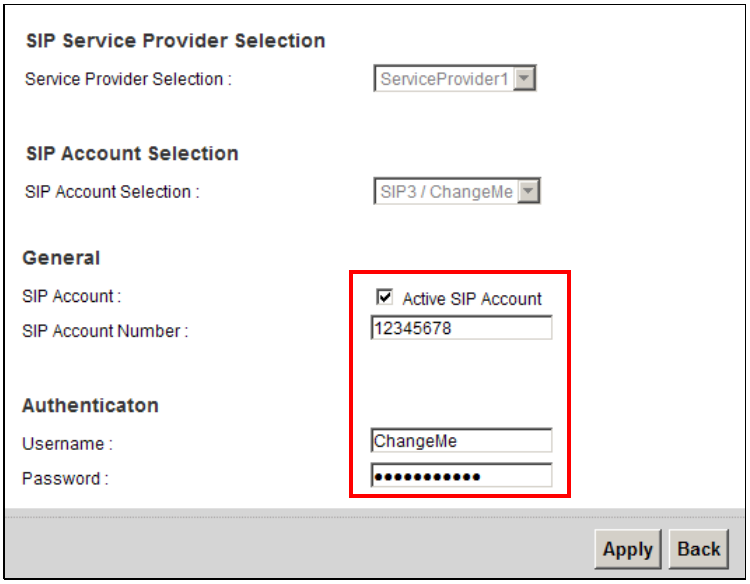
5 Go to the **SIP Account** screen, click the **Edit** icon of **SIP 3**.



#	Active	SIP Account	SIP Service Provider	Account No.	Modify
1		SIP 1	ChangeMe	ChangeMe	
2		SIP 2	ChangeMe	ChangeMe	
3		SIP 3	ServiceProvider1	ChangeMe	

6 Select the **Active SIP Account** check box, then enter the **SIP Account Number**, **Username**, and **Password**. Leave other settings as default.

7 Click **Apply** to save your settings.



SIP Service Provider Selection

Service Provider Selection : ServiceProvider1

SIP Account Selection

SIP Account Selection : SIP3 / ChangeMe

General

SIP Account : ☑ Active SIP Account

SIP Account Number : 12345678

Authenticaton

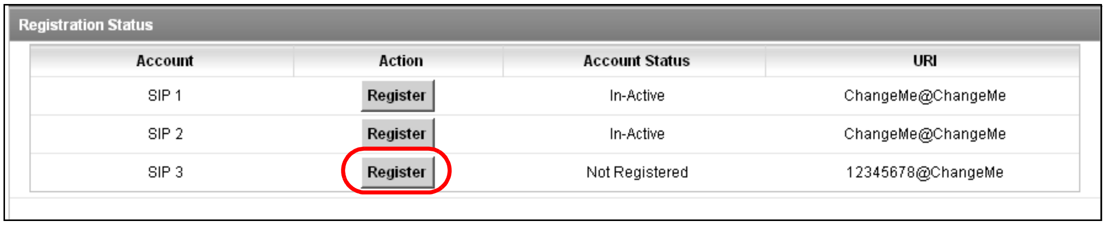
Username : ChangeMe

Password : ●●●●●●●●●●●●

3.5.1.2 SIP Account Registration

Follow the steps below to register and activate your SIP account.

1 Click **Connection Status > System Info** to check if your SIP account has been registered successfully. If the status is **Not Registered**, check your Internet connection and click **Register** to register your SIP account.

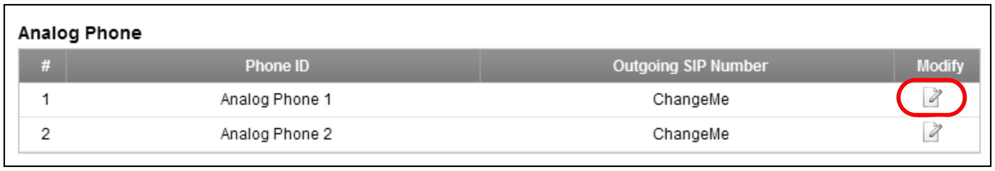


Registration Status

Account	Action	Account Status	URI
SIP 1	Register	In-Active	ChangeMe@ChangeMe
SIP 2	Register	In-Active	ChangeMe@ChangeMe
SIP 3	Register	Not Registered	12345678@ChangeMe

3.5.1.3 Analog Phone Configuration

1 Click **VoIP > Phone** to open the **Phone Device** screen. Click the **Edit** icon next to **Analog Phone 1** to configure the first phone port.



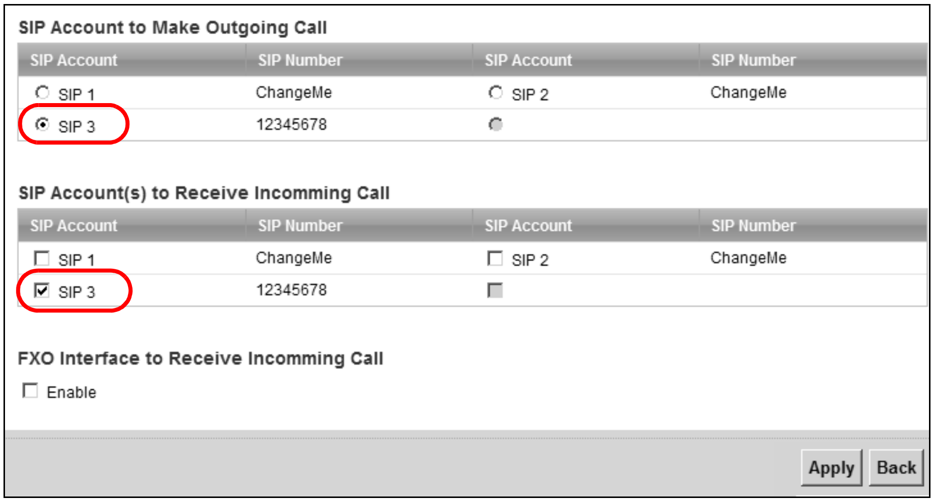
Analog Phone

#	Phone ID	Outgoing SIP Number	Modify
1	Analog Phone 1	ChangeMe	✎
2	Analog Phone 2	ChangeMe	✎

2 Select **SIP 3** from the **SIP Account** in the **SIP Account to Make Outgoing Call** section to have the phone (connected to the first phone port) use the registered SIP 3 account to make outgoing calls.

3 Select the **SIP 3** check box in the **SIP Account(s) to Receive Incoming Call** section to have the phone (connected to the first phone port) receive phone calls for the SIP 3 account.

4 Click **Apply** to save your changes.



SIP Account to Make Outgoing Call

SIP Account	SIP Number	SIP Account	SIP Number
○ SIP 1	ChangeMe	○ SIP 2	ChangeMe
● SIP 3	12345678	○	

SIP Account(s) to Receive Incomming Call

SIP Account	SIP Number	SIP Account	SIP Number
□ SIP 1	ChangeMe	□ SIP 2	ChangeMe
☑ SIP 3	12345678	□	

FXO Interface to Receive Incomming Call

□ Enable

3.5.1.4 Making a VoIP Call

1 Make sure you connect a telephone to the first phone port on the ZyXEL Device.

2 Make sure the ZyXEL Device is on and connected to the Internet.

3 Pick up the phone receiver.

4 Dial the VoIP phone number you want to call.

3.6 Using the File Sharing Feature

In this section you can:

- Set up file sharing of your USB device from the ZyXEL Device
- Access the shared files of your USB device from a computer

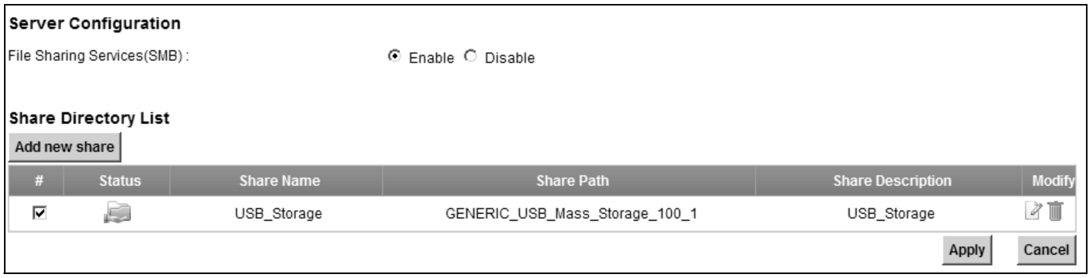
3.6.1 Set Up File Sharing

To set up file sharing you need to connect your USB device, enable file sharing and set up your share(s).

3.6.1.1 Activate File Sharing

1 Connect your USB device to one of the USB ports at the back panel of the ZyXEL Device.

2 Click **Network Setting > Home Networking > File Sharing**. Select **Enable** and click **Apply** to activate the file sharing function. The ZyXEL Device automatically adds your USB device to the **Share Directory List**.



Server Configuration

File Sharing Services(SMB) : ● Enable ○ Disable

Share Directory List

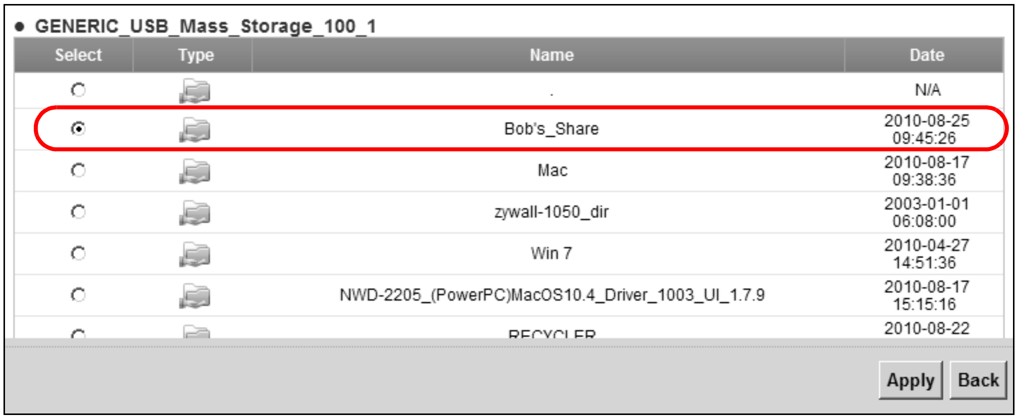
#	Status	Share Name	Share Path	Share Description	Modify
☑		USB_Storage	GENERIC_USB_Mass_Storage_100_1	USB_Storage	

3.6.1.2 Set up File Sharing on Your ZyXEL Device

You also need to set up file sharing on your ZyXEL Device in order to share files.

1 Click **Add new share** in the **File Sharing** screen to configure a new share. Select your USB device from the **Volume** drop-down list box.

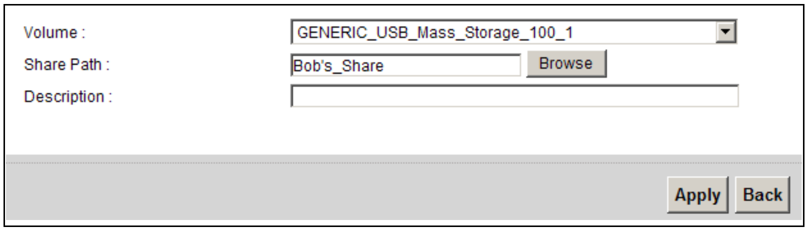
2 Click **Browse** to browse through all the files on your USB device. Select the folder that you want to add as a share. In this example, select **Bob's_Share**. Click **Apply**.



● GENERIC_USB_Mass_Storage_100_1

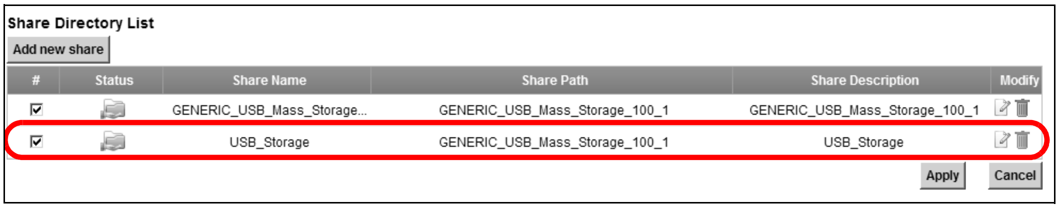
Select	Type	Name	Date
○		.	N/A
●		Bob's_Share	2010-08-25 09:45:26
○		Mac	2010-08-17 09:38:36
○		zywall-1050_dir	2003-01-01 06:08:00
○		Win 7	2010-04-27 14:51:36
○		NWD-2205_(PowerPC)MacOS10.4_Driver_1003_UI_1.7.9	2010-08-17 15:15:16
○		RECYCLER	2010-08-22

3 You can add a description for the share or leave it blank. The **Add Share Directory** screen should look like the following.Click **Apply** to finish.



Volume :	GENERIC_USB_Mass_Storage_100_1
Share Path :	Bob's_Share
Description :	

4 This sets up the file sharing server. You can see the USB storage device listed in the table below.



Share Directory List

#	Status	Share Name	Share Path	Share Description	Modify
☑		GENERIC_USB_Mass_Storage...	GENERIC_USB_Mass_Storage_100_1	GENERIC_USB_Mass_Storage_100_1	
☑		USB_Storage	GENERIC_USB_Mass_Storage_100_1	USB_Storage	

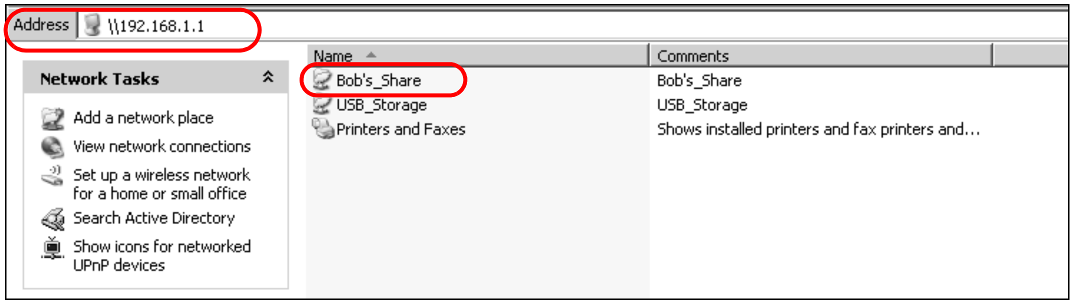
3.6.2 Access Your Shared Files From a Computer

You can use Windows Explorer to access the file storage devices connected to the ZyXEL Device.

Note: The examples in this User's Guide show you how to use Microsoft's Windows XP to browse your shared files. Refer to your operating system's documentation for how to browse your file structure.

Open Windows Explorer to access Bob's Share using Windows Explorer browser.

In Windows Explorer's Address bar type a double backslash "\\" followed by the IP address of the ZyXEL Device (the default IP address of the ZyXEL Device is 192.168.1.1) and press [ENTER]. The share folder **Bob's_Share** is available.



Address \\192.168.1.1

Name	Comments
Bob's_Share	Bob's_Share
USB_Storage	USB_Storage
Printers and Faxes	Shows installed printers and fax printers and...

Network Tasks
Add a network place
View network connections
Set up a wireless network for a home or small office
Search Active Directory
Show icons for networked UPnP devices

Once you access **Bob's_Share** via your ZyXEL Device, you do not have to relogin unless you restart your computer.

3.7 Using the Print Server Feature

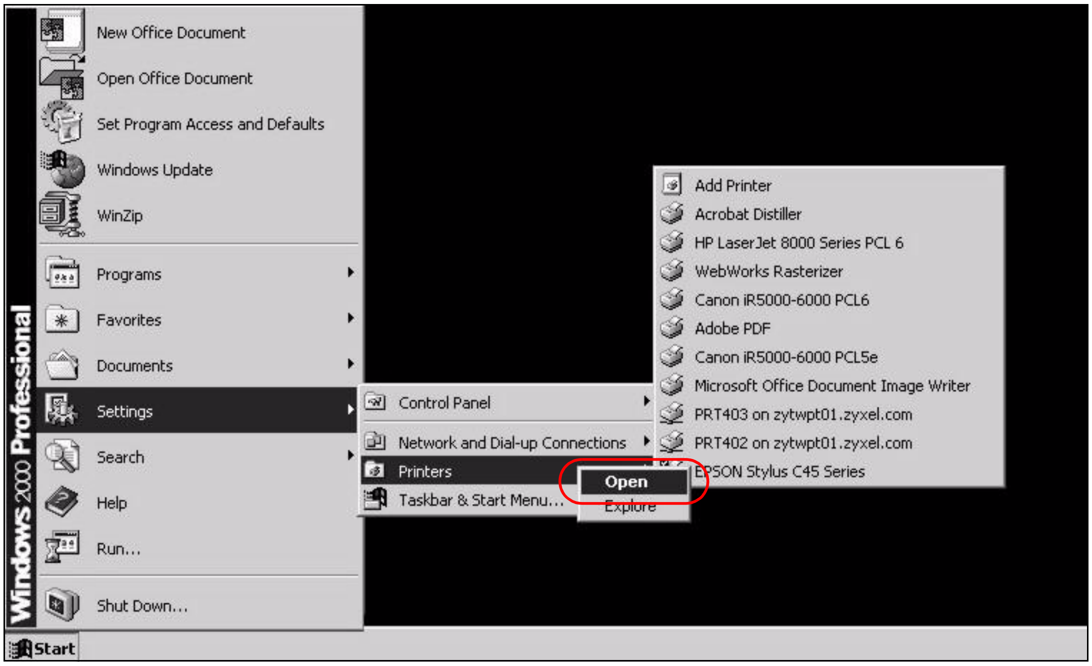
In this section you can:

- Configure a TCP/IP Printer Port
- Add a New Printer Using Windows
- Add a New Printer Using Macintosh OS X

Configure a TCP/IP Printer Port

This example shows how you can configure a TCP/IP printer port. This example is done using the Windows 2000 Professional operating system. Some menu items may look different on your operating system. The TCP/IP port must be configured with the IP address of the ZyXEL Device and must use the RAW protocol to communicate with the printer. Consult your operating systems documentation for instructions on how to do this or follow the instructions below if you have a Windows 2000/XP operating system.

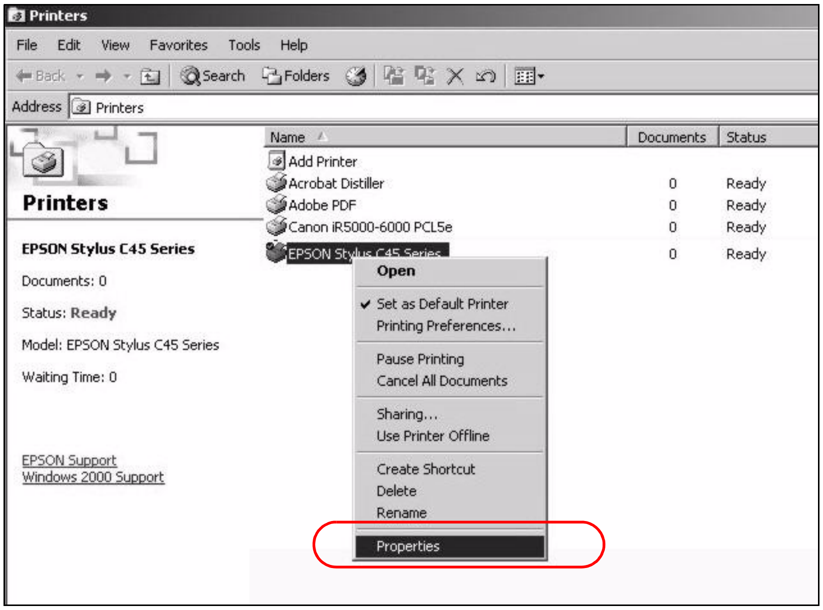
1 Click **Start** > **Settings**, then right click on **Printers** and select **Open**.



The **Printers** folder opens up. First you need to open up the properties windows for the printer you want to configure a TCP/IP port.

2 Locate your printer.

3 Right click on your printer and select **Properties**.



EPSON Stylus C45 Series

Documents: 0

Status: Ready

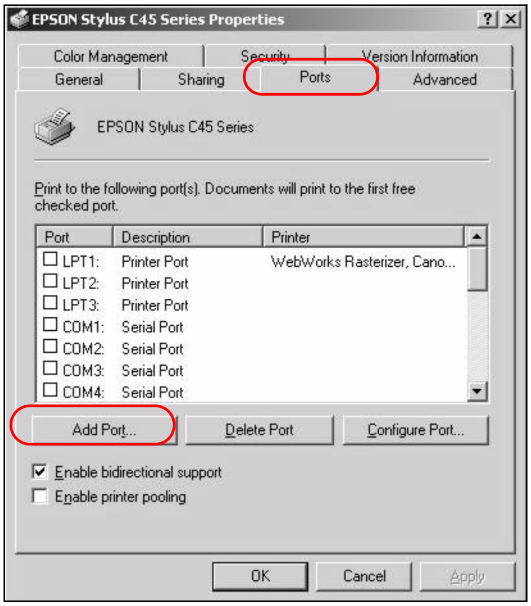
Model: EPSON Stylus C45 Series

Waiting Time: 0

EPSON Support
Windows 2000 Support

Name	Documents	Status
Add Printer		
Acrobat Distiller	0	Ready
Adobe PDF	0	Ready
Canon iR5000-6000 PCL5e	0	Ready
EPSON Stylus C45 Series	0	Ready

4 Select the **Ports** tab and click **Add Port...**



EPSON Stylus C45 Series

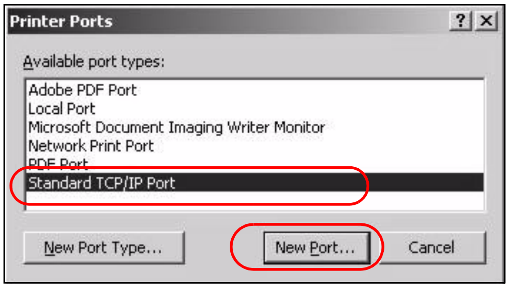
Print to the following port(s). Documents will print to the first free checked port.

Port	Description	Printer
□ LPT1:	Printer Port	WebWorks Rasterizer, Cano...
□ LPT2:	Printer Port	
□ LPT3:	Printer Port	
□ COM1:	Serial Port	
□ COM2:	Serial Port	
□ COM3:	Serial Port	
□ COM4:	Serial Port	

☑ Enable bidirectional support

□ Enable printer pooling

5 A **Printer Ports** window appears. Select **Standard TCP/IP Port** and click **New Port...**.

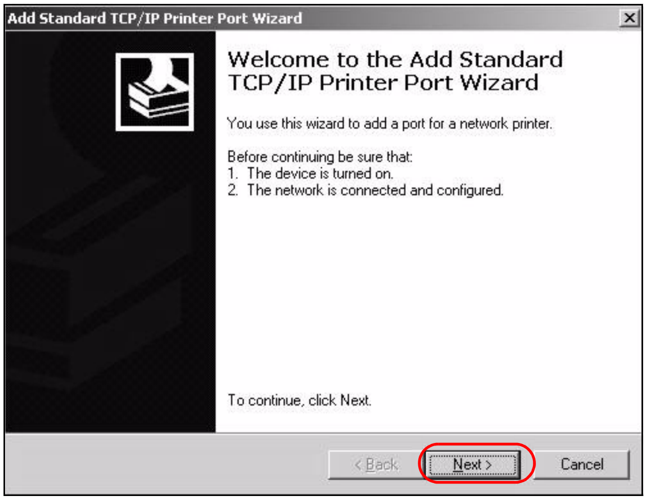


Printer Ports

Available port types:

Adobe PDF Port
Local Port
Microsoft Document Imaging Writer Monitor
Network Print Port
PDF Port
Standard TCP/IP Port

6 **Add Standard TCP/IP Printer Port Wizard** window opens up. Click **Next** to start configuring the printer port.



Add Standard TCP/IP Printer Port Wizard

Welcome to the Add Standard TCP/IP Printer Port Wizard

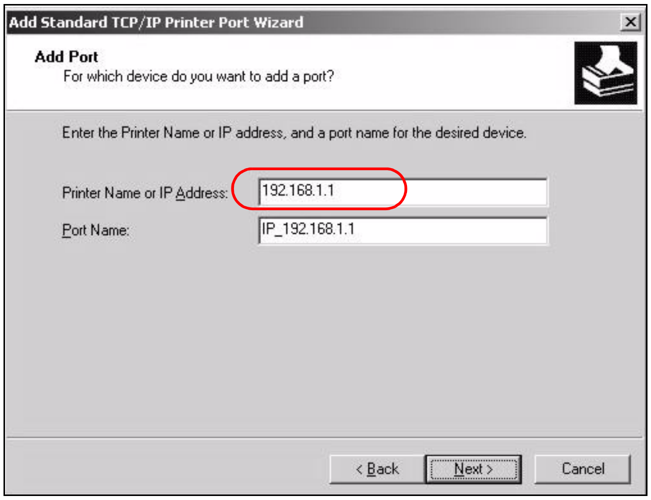
You use this wizard to add a port for a network printer.

Before continuing be sure that:
1. The device is turned on.
2. The network is connected and configured.

To continue, click Next.

7 Enter the IP address of the ZyXEL Device to which the printer is connected in the **Printer Name or IP Address:** field. In our example we use the default IP address of the ZyXEL Device, 192.168.1.1. The **Port Name** field updates automatically to reflect the IP address of the port. Click **Next**.

Note: The computer from which you are configuring the TCP/IP printer port must be on the same LAN in order to use the printer sharing function.



Add Standard TCP/IP Printer Port Wizard

Add Port

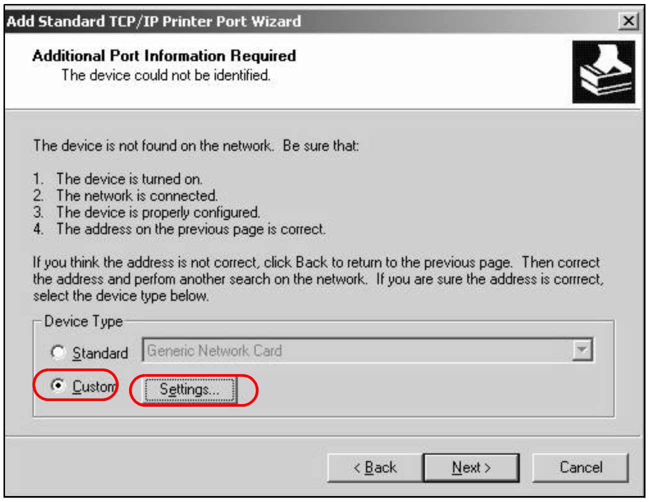
For which device do you want to add a port?

Enter the Printer Name or IP address, and a port name for the desired device.

Printer Name or IP Address: 192.168.1.1

Port Name: IP_192.168.1.1

8 Select **Custom** under **Device Type** and click **Settings**.



Add Standard TCP/IP Printer Port Wizard

Additional Port Information Required

The device could not be identified.

The device is not found on the network. Be sure that:

1. The device is turned on.
2. The network is connected.
3. The device is properly configured.
4. The address on the previous page is correct.

If you think the address is not correct, click Back to return to the previous page. Then correct the address and perfom another search on the network. If you are sure the address is correct, select the device type below.

Device Type

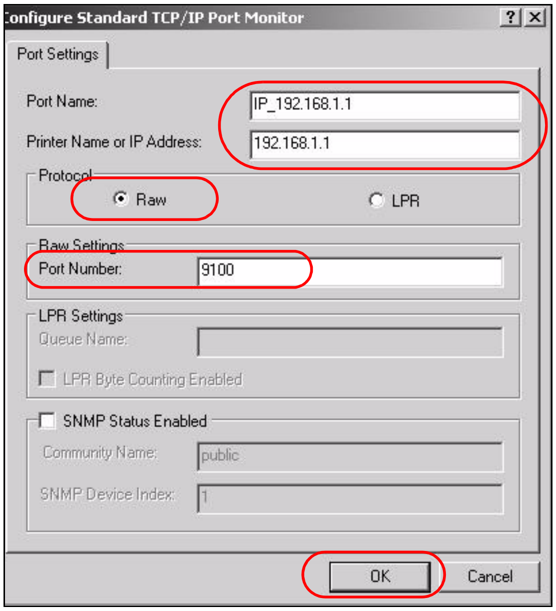
○ Standard Generic Network Card

● Custom

9 Confirm the IP address of the ZyXEL Device in the IP Address field.

10 Select Raw under **Protocol**.

11 The **Port Number** is automatically configured as **9100**. Click **OK**.



Configure Standard TCP/IP Port Monitor

Port Settings

Port Name: IP_192.168.1.1

Printer Name or IP Address: 192.168.1.1

Protocol

● Raw ○ LPR

Raw Settings

Port Number: 9100

LPR Settings

Queue Name:

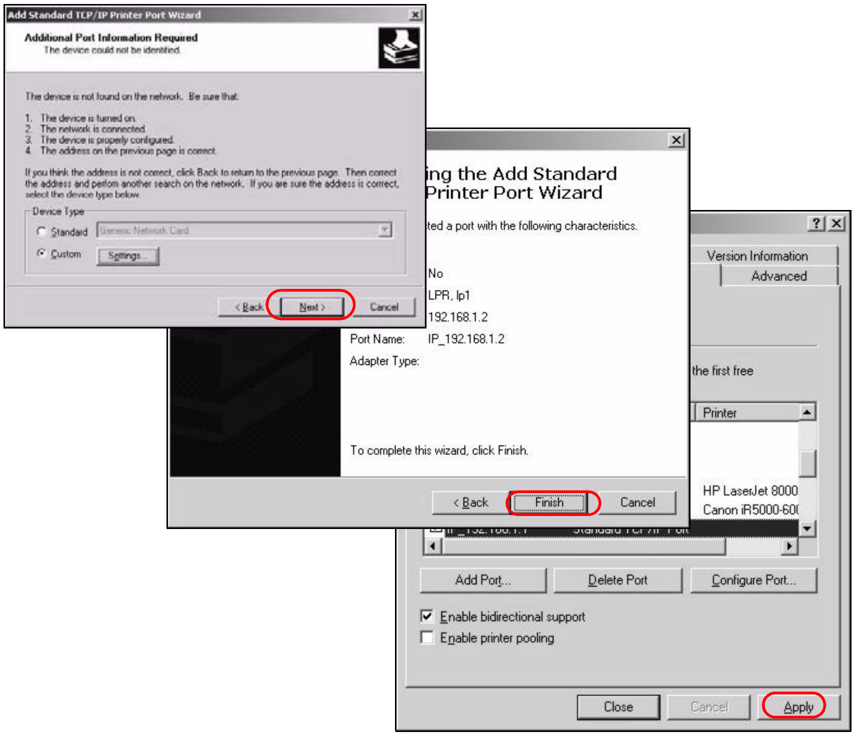
□ LPR Byte Counting Enabled

□ SNMP Status Enabled

Community Name: public

SNMP Device Index: 1

12 Continue through the wizard, apply your settings and close the wizard window.



Add Standard TCP/IP Printer Port Wizard

Additional Port Information Required

The device could not be identified.

The device is not found on the network. Be sure that:

1. The device is turned on.
2. The network is connected.
3. The device is properly configured.
4. The address on the previous page is correct.

If you think the address is not correct, click Back to return to the previous page. Then correct the address and perform another search on the network. If you are sure the address is correct, select the device type below.

Device Type

○ Standard Generic Network Card

● Custom Settings...

ing the Add Standard Printer Port Wizard

ted a port with the following characteristics.

No

LPR, lp1

192.168.1.2

Port Name: IP_192.168.1.2

Adapter Type:

To complete this wizard, click Finish.

☑ Enable bidirectional support

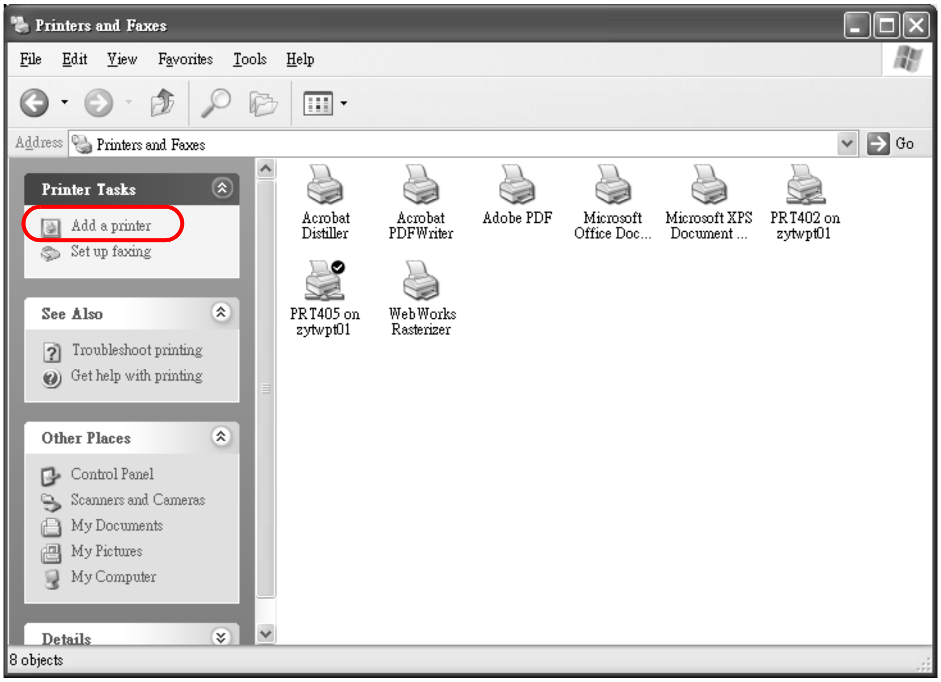
□ Enable printer pooling

13 Repeat steps 1 to 12 to add this printer to other computers on your network.

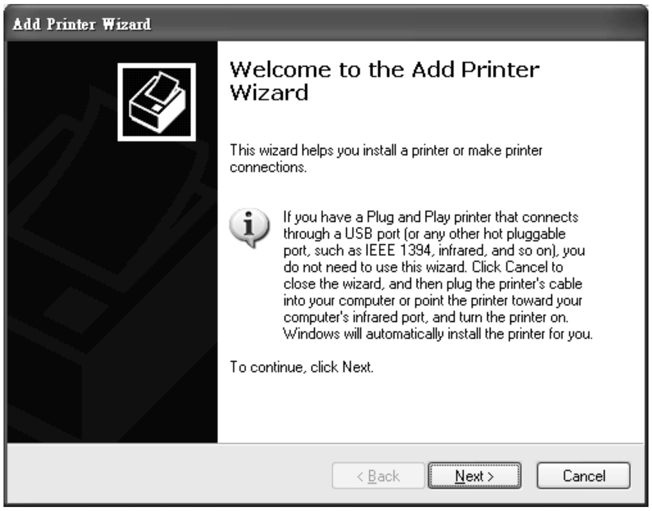
Add a New Printer Using Windows

This example shows how to connect a printer to your ZyXEL Device using the Windows XP Professional operating system. Some menu items may look different on your operating system.

1 Click **Start** > **Control Panel** > **Printers and Faxes** to open the **Printers and Faxes** screen. Click **Add a Printer**.



2 The **Add Printer Wizard** screen displays. Click **Next**.


Add Printer Wizard

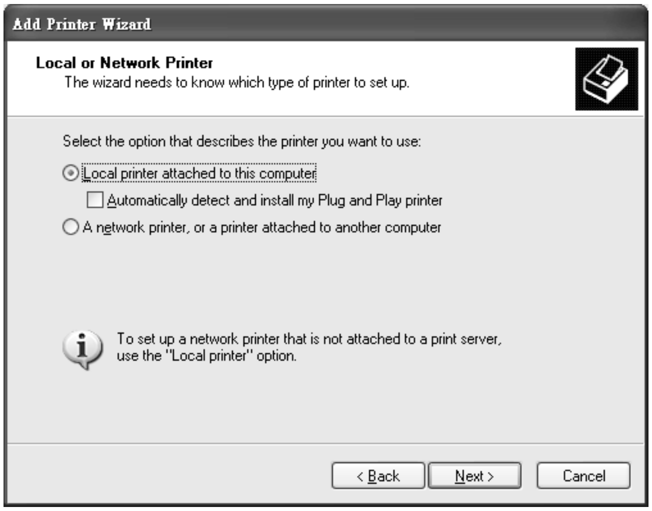
Welcome to the Add Printer Wizard

This wizard helps you install a printer or make printer connections.

If you have a Plug and Play printer that connects through a USB port (or any other hot pluggable port, such as IEEE 1394, infrared, and so on), you do not need to use this wizard. Click Cancel to close the wizard, and then plug the printer's cable into your computer or point the printer toward your computer's infrared port, and turn the printer on. Windows will automatically install the printer for you.

To continue, click Next.

3 Select **Local printer attached to this computer** and click **Next**.



Add Printer Wizard

Local or Network Printer
The wizard needs to know which type of printer to set up.

Select the option that describes the printer you want to use:

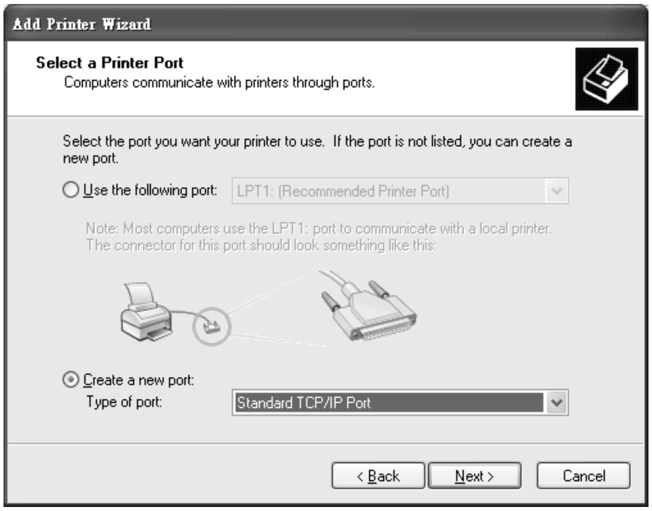
● Local printer attached to this computer

□ Automatically detect and install my Plug and Play printer

○ A network printer, or a printer attached to another computer

To set up a network printer that is not attached to a print server, use the "Local printer" option.

4 Select **Create a new port** and **Standard TCP/IP Port**. Click **Next**.



Add Printer Wizard

Select a Printer Port
Computers communicate with printers through ports.

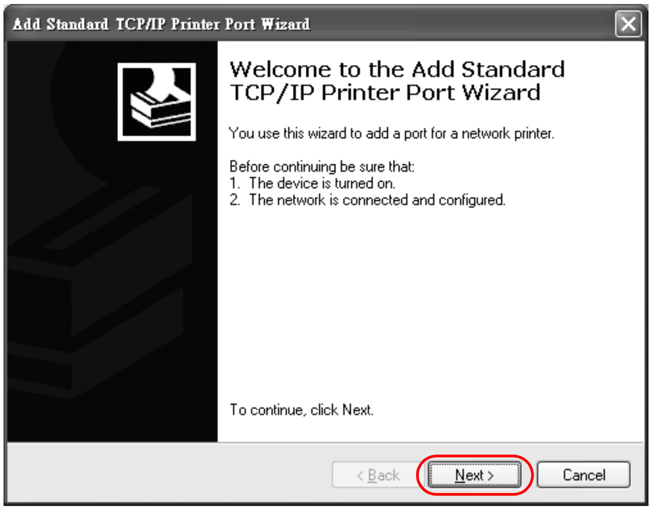
Select the port you want your printer to use. If the port is not listed, you can create a new port.

○ Use the following port: LPT1: (Recommended Printer Port)

Note: Most computers use the LPT1: port to communicate with a local printer. The connector for this port should look something like this:

● Create a new port:
Type of port: Standard TCP/IP Port

5 **Add Standard TCP/IP Printer Port Wizard** window opens up. Click **Next** to start configuring the printer port.



Add Standard TCP/IP Printer Port Wizard

Welcome to the Add Standard TCP/IP Printer Port Wizard

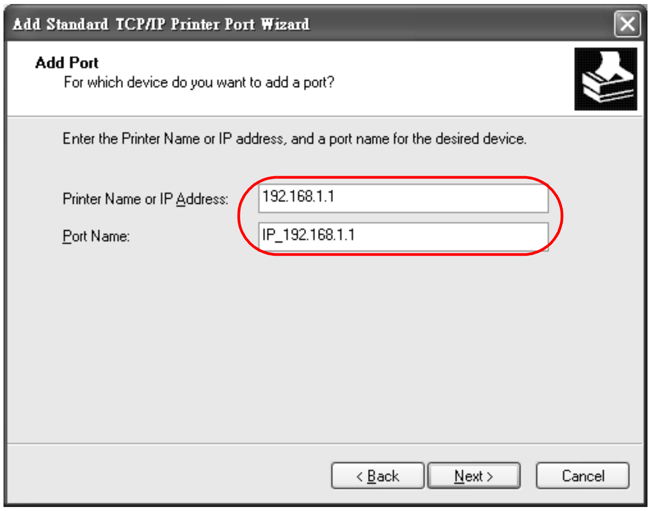
You use this wizard to add a port for a network printer.

Before continuing be sure that:
1. The device is turned on.
2. The network is connected and configured.

To continue, click Next.

6 Enter the IP address of the ZyXEL Device to which the printer is connected in the **Printer Name or IP Address:** field. In our example we use the default IP address of the ZyXEL Device, 192.168.1.1. The **Port Name** field updates automatically to reflect the IP address of the port. Click **Next.**

Note: The computer from which you are configuring the TCP/IP printer port must be on the same LAN in order to use the printer sharing function.



Add Standard TCP/IP Printer Port Wizard

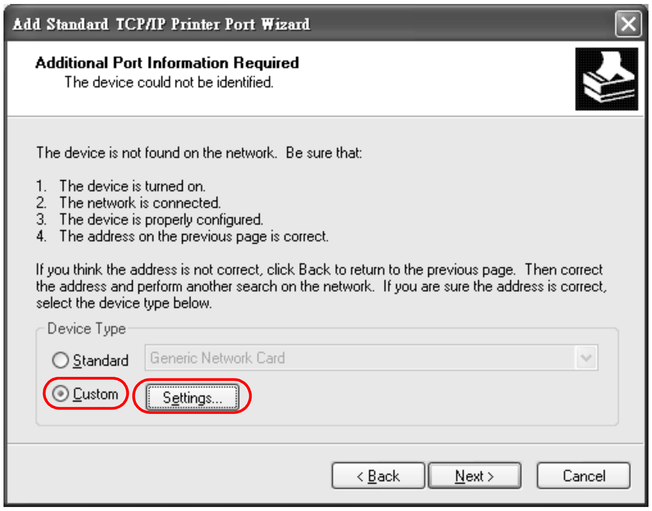
Add Port
For which device do you want to add a port?

Enter the Printer Name or IP address, and a port name for the desired device.

Printer Name or IP Address: 192.168.1.1

Port Name: IP_192.168.1.1

7 Select **Custom** under **Device Type** and click **Settings**.



Add Standard TCP/IP Printer Port Wizard

Additional Port Information Required

The device could not be identified.

The device is not found on the network. Be sure that:

1. The device is turned on.
2. The network is connected.
3. The device is properly configured.
4. The address on the previous page is correct.

If you think the address is not correct, click Back to return to the previous page. Then correct the address and perform another search on the network. If you are sure the address is correct, select the device type below.

Device Type

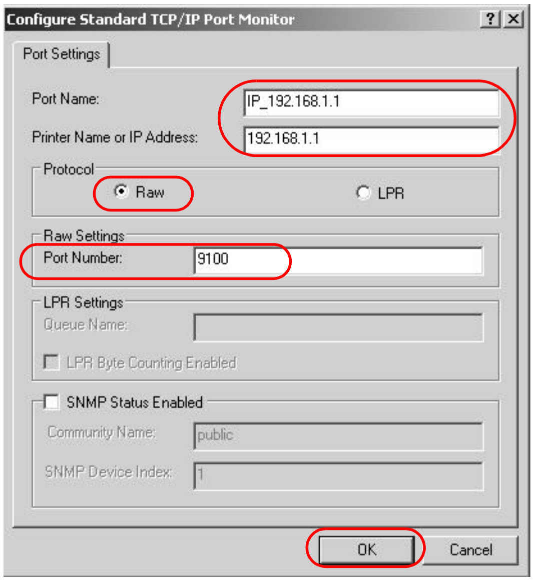
○ Standard Generic Network Card

● Custom

8 Confirm the IP address of the ZyXEL Device in the Printer **Name or IP Address** field.

9 Select **Raw** under **Protocol**.

10 The **Port Number** is automatically configured as **9100**. Click **OK** to go back to the previous screen and click **Next**.



Configure Standard TCP/IP Port Monitor

Port Settings

Port Name: IP_192.168.1.1

Printer Name or IP Address: 192.168.1.1

Protocol

● Raw ○ LPR

Raw Settings

Port Number: 9100

LPR Settings

Queue Name:

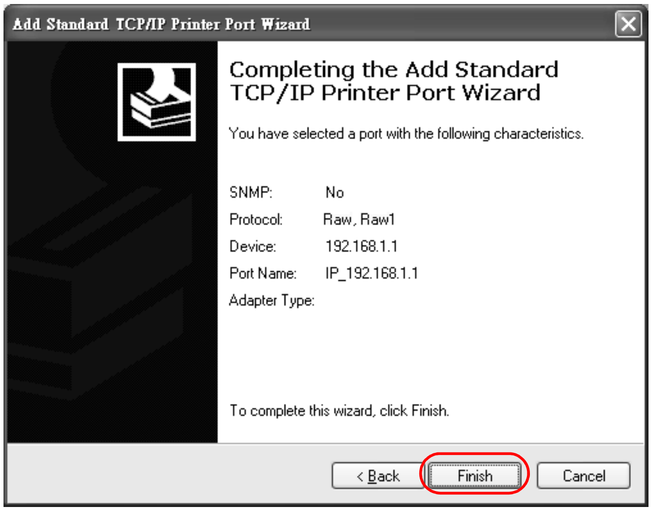
□ LPR Byte Counting Enabled

□ SNMP Status Enabled

Community Name: public

SNMP Device Index: 1

11 Click **Finish** to close the wizard window.



Add Standard TCP/IP Printer Port Wizard

Completing the Add Standard TCP/IP Printer Port Wizard

You have selected a port with the following characteristics.

SNMP:	No
Protocol:	Raw, Raw1
Device:	192.168.1.1
Port Name:	IP_192.168.1.1
Adapter Type:	

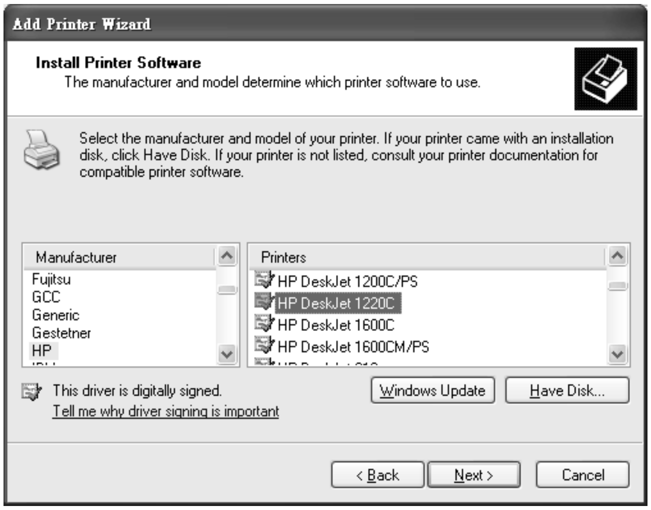
To complete this wizard, click Finish.

12 Select the make of the printer that you want to connect to the print server in the **Manufacturer** list of printers.

13 Select the printer model from the list of **Printers**.

14 If your printer is not displayed in the list of **Printers**, you can insert the printer driver installation CD/disk or download the driver file to your computer, click **Have Disk...** and install the new printer driver.

15 Click **Next** to continue.



Add Printer Wizard

Install Printer Software

The manufacturer and model determine which printer software to use.

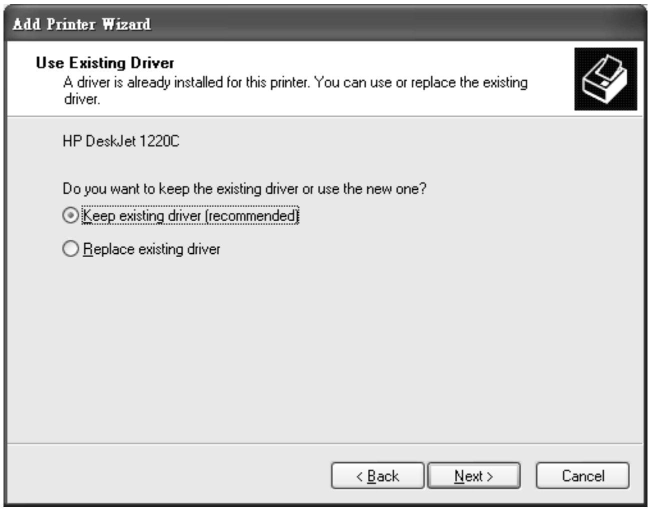
Select the manufacturer and model of your printer. If your printer came with an installation disk, click Have Disk. If your printer is not listed, consult your printer documentation for compatible printer software.

Manufacturer	Printers
Fujitsu	HP DeskJet 1200C/PS
GCC	HP DeskJet 1220C
Generic	HP DeskJet 1600C
Gestetner	HP DeskJet 1600CM/PS
HP	

This driver is digitally signed.

Tell me why driver signing is important

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



Add Printer Wizard

Use Existing Driver

A driver is already installed for this printer. You can use or replace the existing driver.

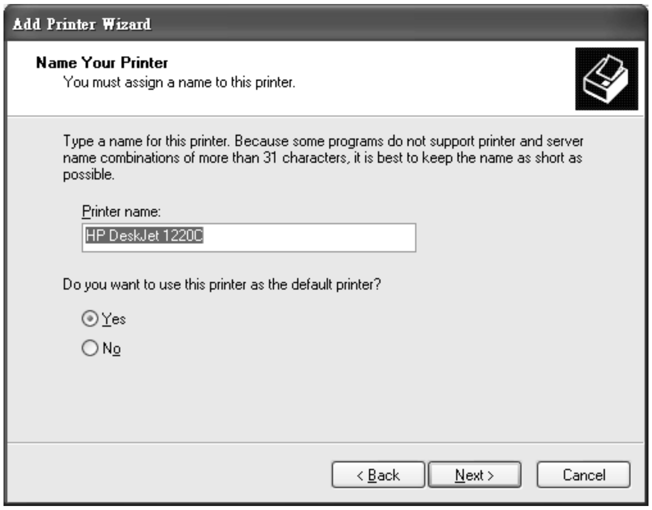
HP DeskJet 1220C

Do you want to keep the existing driver or use the new one?

● Keep existing driver (recommended)

○ Replace existing driver

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



Add Printer Wizard

Name Your Printer

You must assign a name to this printer.

Type a name for this printer. Because some programs do not support printer and server name combinations of more than 31 characters, it is best to keep the name as short as possible.

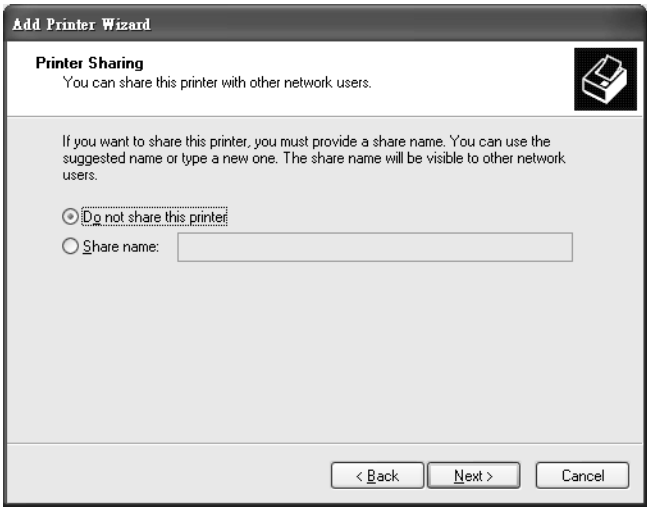
Printer name: HP DeskJet 1220C

Do you want to use this printer as the default printer?

● Yes

○ No

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



Add Printer Wizard

Printer Sharing

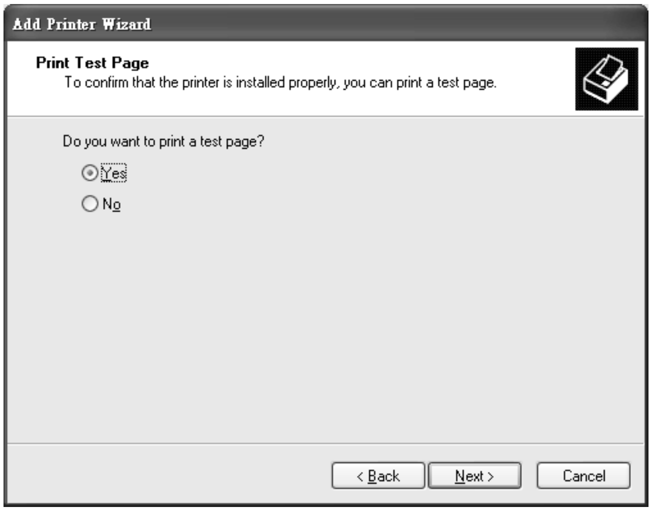
You can share this printer with other network users.

If you want to share this printer, you must provide a share name. You can use the suggested name or type a new one. The share name will be visible to other network users.

● Do not share this printer

○ Share name:

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



Add Printer Wizard

Print Test Page

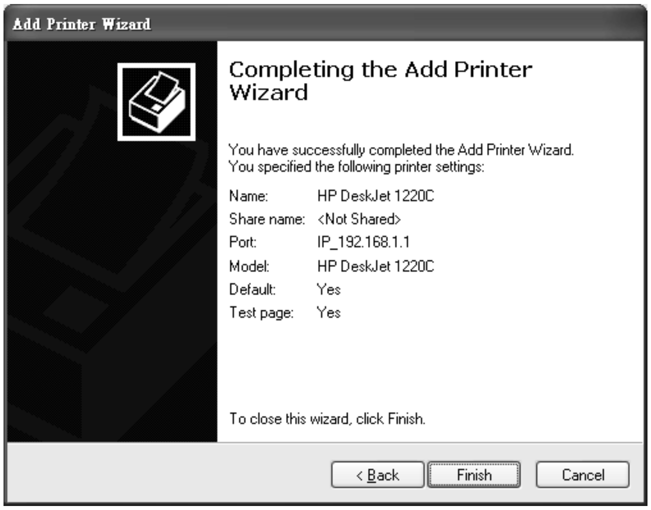
To confirm that the printer is installed properly, you can print a test page.

Do you want to print a test page?

● Yes

○ No

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



Completing the Add Printer Wizard

You have successfully completed the Add Printer Wizard.
You specified the following printer settings:

Name:	HP DeskJet 1220C
Share name:	<Not Shared>
Port:	IP_192.168.1.1
Model:	HP DeskJet 1220C
Default:	Yes
Test page:	Yes

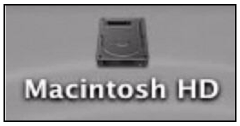
To close this wizard, click Finish.

Add a New Printer Using Macintosh OS X

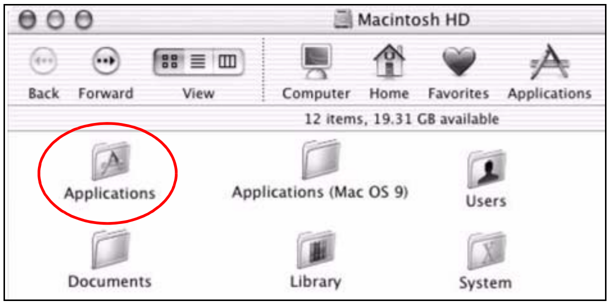
Complete the following steps to set up a print server driver on your Macintosh computer.

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

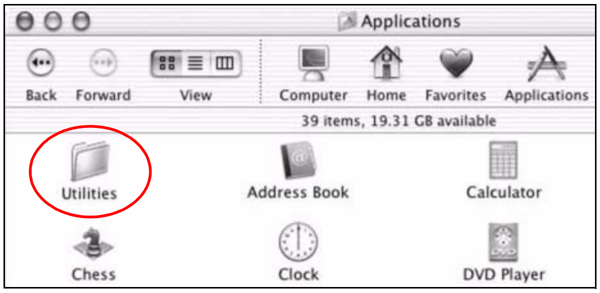
2 On your desktop, double-click the **Macintosh HD** icon to open the **Macintosh HD** window.



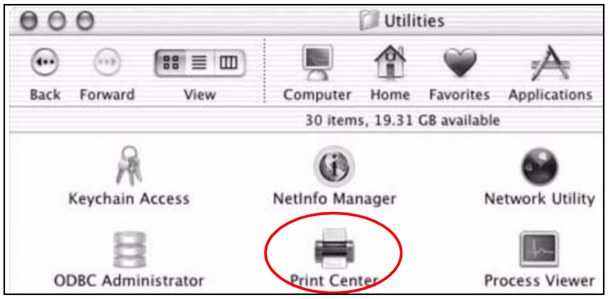
3 Double-click the **Applications** folder.



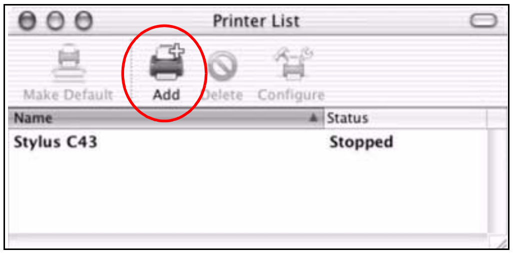
4 Double-click the **Utilities** folder.



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



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



Name	Status
Stylus C43	Stopped

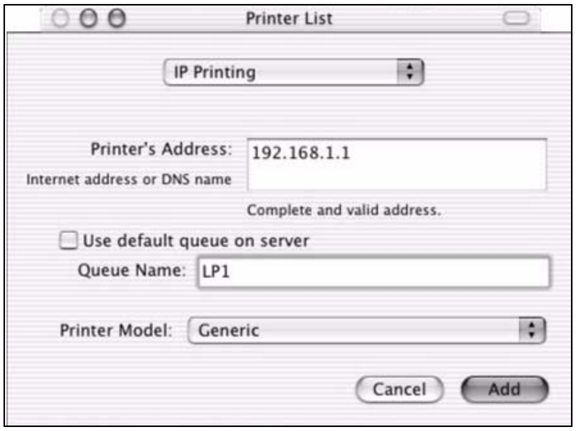
7 Set up your printer in the **Printer List** configuration screen. Select **IP Printing** from the drop-down list box.

8 In the **Printer's Address** field, type the IP address of your ZyXEL Device.

9 Deselect the **Use default queue on server** check box.

10 Type **LP1** in the **Queue Name** field.

11 Select your **Printer Model** from the drop-down list box. If the printer's model is not listed, select **Generic**.



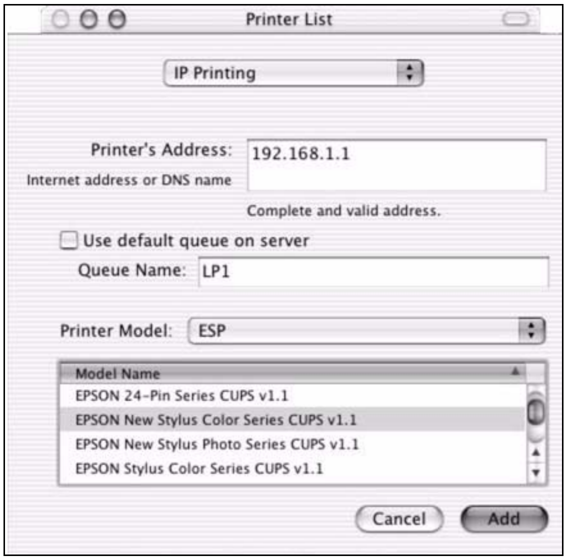
Printer's Address: 192.168.1.1

□ Use default queue on server

Queue Name: LP1

Printer Model: Generic

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



Printer's Address: 192.168.1.1

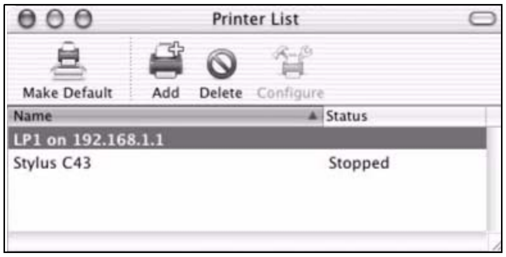
□ Use default queue on server

Queue Name: LP1

Printer Model: ESP

Model Name
EPSON 24-Pin Series CUPS v1.1
EPSON New Stylus Color Series CUPS v1.1
EPSON New Stylus Photo Series CUPS v1.1
EPSON Stylus Color Series CUPS v1.1

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



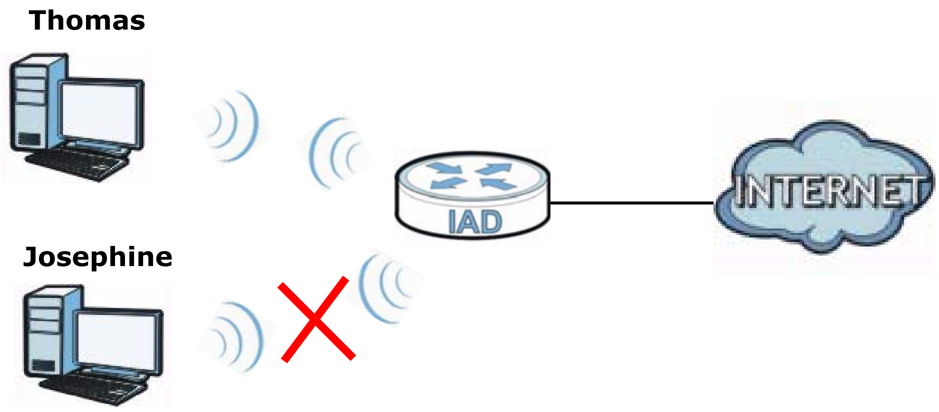
Name	Status
LP1 on 192.168.1.1	
Stylus C43	Stopped

Your Macintosh print server driver setup is complete. You can now use the ZyXEL Device's print server to print from a Macintosh computer.

3.8 Configuring the MAC Address Filter

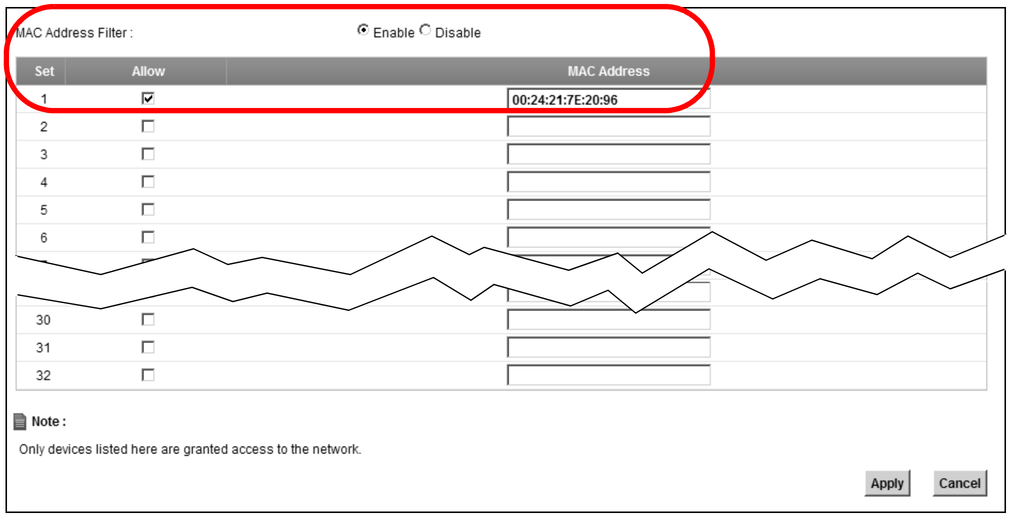
Thomas noticed that his daughter Josephine spends too much time surfing the web and downloading media files. He decided to prevent Josephine from accessing the Internet so that she can concentrate on preparing for her final exams.

Josephine’s computer connects wirelessly to the Internet through the ZyXEL Device. Thomas decides to use the **Security > MAC Filter** screen to grant wireless network access to his computer but not to Josephine’s computer.



1 Click **Security** > **MAC Filter** to open the **MAC Filter** screen. Select the **Enable** check box to activate MAC filter fuction.

2 Find the MAC address of Thomas’ computer in this screen. Select **Allow**. Click **Apply**.



MAC Address Filter : ● Enable ○ Disable

Set	Allow	MAC Address
1	☑	00:24:21:7E:20:96
2	□	
3	□	
4	□	
5	□	
6	□	
30	□	
31	□	
32	□	

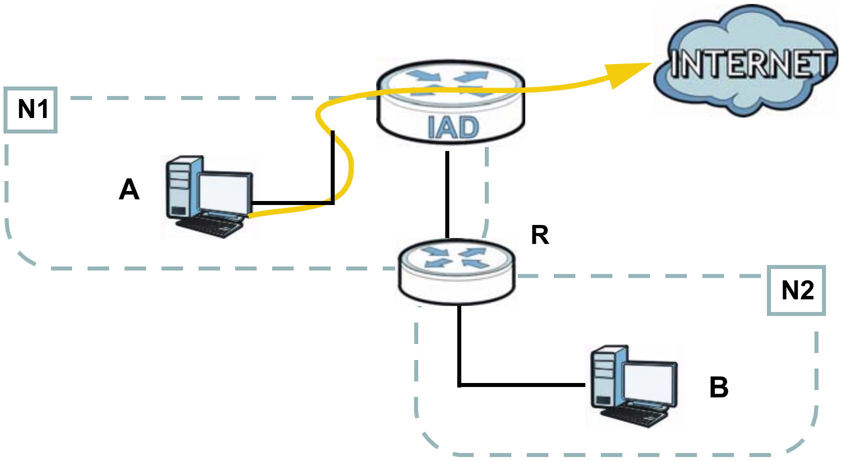
Note :
Only devices listed here are granted access to the network.

Thomas can also grant access to the computers of other members of his family and friends. However, Josephine and others not listed in this screen will no longer be able to access the Internet through the ZyXEL Device.

3.9 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:

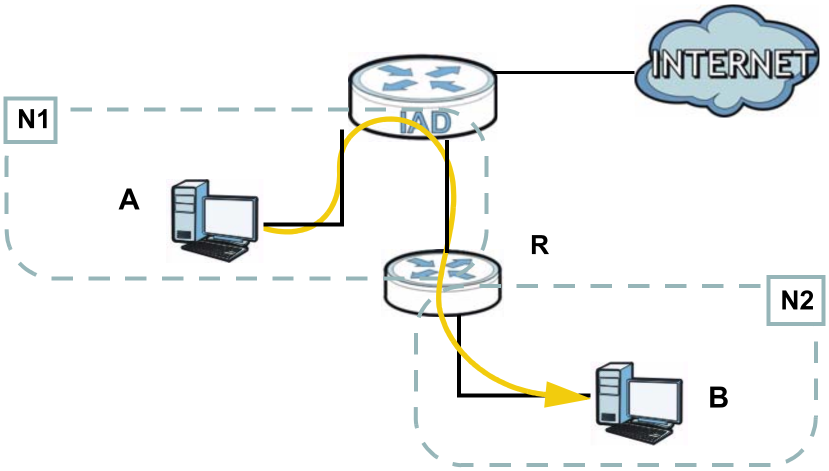
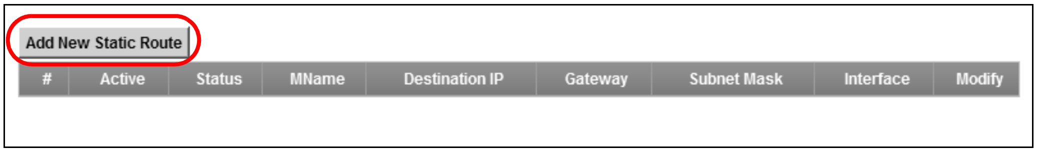


Table 3 IP Settings in this Tutorial

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
R's N2	192.168.10.2
B	192.168.10.33

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

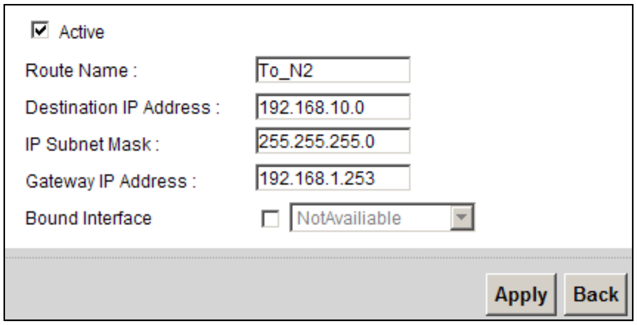
1 Click **Network Setting > Routing**. Click **Add New Static Route**.


Add New Static Route
# | Active | Status | MName | Destination IP | Gateway | Subnet Mask | Interface | Modify

2 Configure the **Static Route Setup** screen using the following settings:

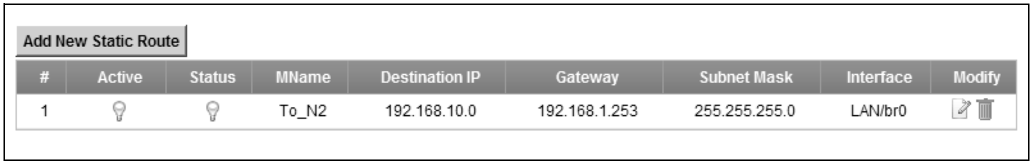
- Select **Active**.
- Specify a descriptive name for this routing rule.
- Type **192.168.10.0** and subnet mask **255.255.255.0** for the destination, **N2**.

- Type **192.168.1.253** (**R**'s N1 address) in the **Gateway IP Address** field.



☑ Active	
Route Name :	To_N2
Destination IP Address :	192.168.10.0
IP Subnet Mask :	255.255.255.0
Gateway IP Address :	192.168.1.253
Bound Interface	□ NotAvailiable

Click **Apply**. The **Routing** screen should display the route you just added.



#	Active	Status	MName	Destination IP	Gateway	Subnet Mask	Interface	Modify
1			To_N2	192.168.10.0	192.168.1.253	255.255.255.0	LAN/br0	

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.

3.10 Configuring QoS Queue and Class Setup

This section contains tutorials on how you can configure the QoS screen.

Note: Voice traffic will not be affected by the user-defined QoS settings on the ZyXEL Device. It always gets the highest priority.

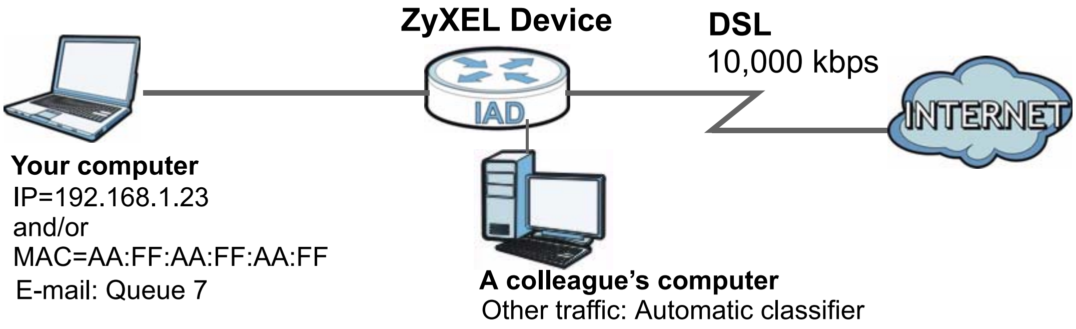
Let's say you are a team leader of a small sales branch office. You want to prioritize e-mail traffic because your task includes sending urgent updates to clients at least twice every hour. You also upload data files (such as logs and e-mail archives) to the FTP server throughout the day. Your colleagues use the Internet for research, as well as chat applications for communicating with other branch offices.

In the following figure, your Internet connection has an upstream transmission bandwidth of 10,000 kbps. For this example, you want to configure QoS so that e-mail traffic gets the highest priority with at least 5,000 kbps. You can do the following:

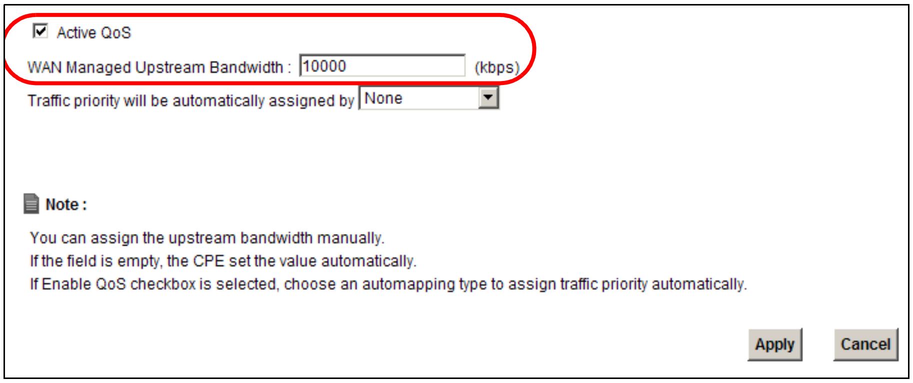
- Configure a queue to assign the highest priority queue (7) to e-mail traffic from the LAN interface, so that e-mail traffic would not get delayed when there is network congestion.
- Note the IP address (192.168.1.23 for example) and/or MAC address (AA:FF:AA:FF:AA:FF for example) of your computer and map it to queue 7.

Note: QoS is applied to traffic flowing out of the ZyXEL Device.

Traffic that does not match this class is assigned a priority queue based on the internal QoS mapping table on the ZyXEL Device.



1 Click **Network Setting > QoS > General** and check **Active**. Set your **WAN Managed Upstream Bandwidth** to 10,000 kbps (or leave this blank to have the ZyXEL Device automatically determine this figure). Click **Apply** to save your settings.



☑ Active QoS

WAN Managed Upstream Bandwidth : 10000 (kbps)

Traffic priority will be automatically assigned by None

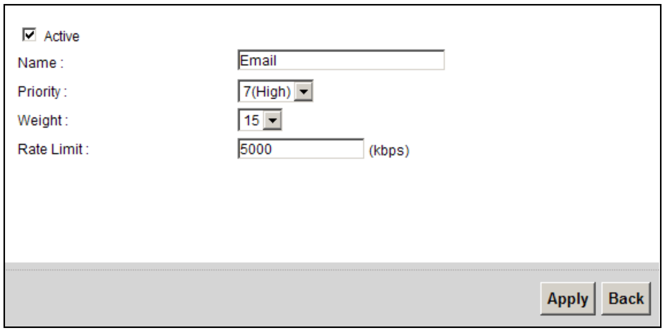
Note :

You can assign the upstream bandwidth manually.
If the field is empty, the CPE set the value automatically.
If Enable QoS checkbox is selected, choose an automapping type to assign traffic priority automatically.

2 Go to **Network Setting > QoS > Queue Setup**. Click **Add new Queue** to create a new queue. In the screen that opens, check **Active** and enter or select the following values, then click **Apply**.

- **Name**: Email
- **Priority**: 7 (High)
- **Weight**: 15

- **Rate Limit**: 5,000 (kbps)



☑ Active

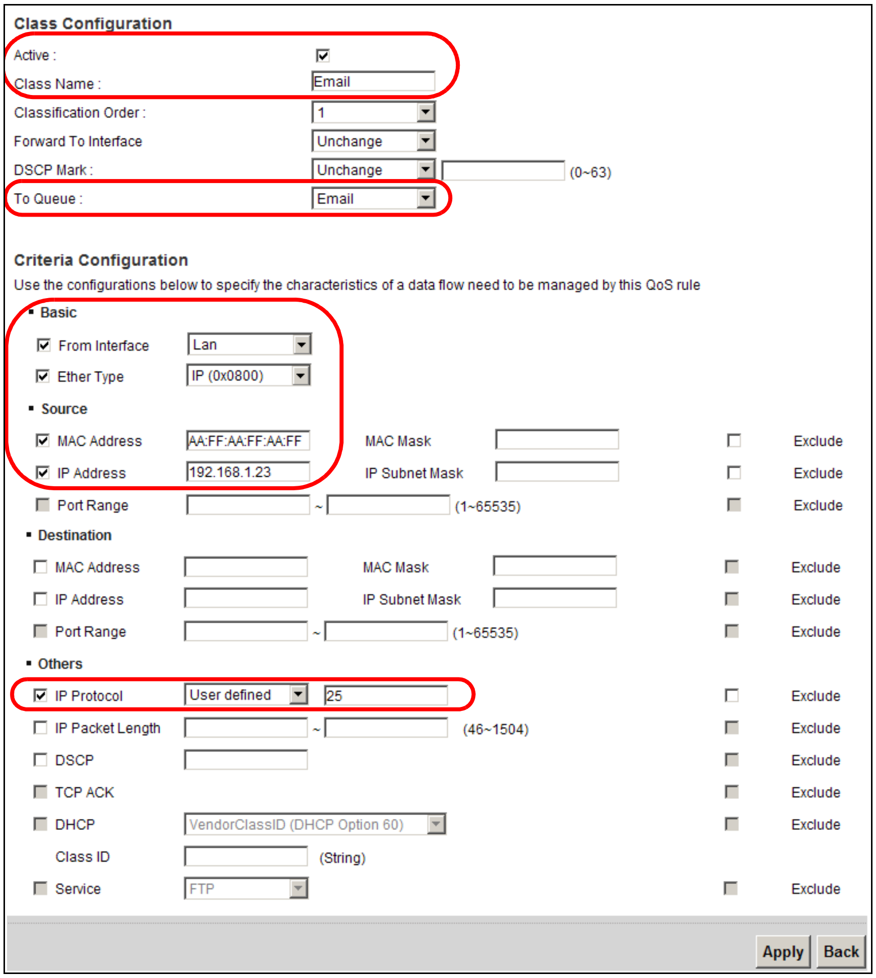
Name : Email

Priority : 7(High)

Weight : 15

Rate Limit : 5000 (kbps)

3 Go to **Network Setting > QoS > Class Setup**. Click **Add new Classifier** to create a new class. Check **Active** and follow the settings as shown in the screen below. Then click **Apply**.



Class Configuration

Active : ☑

Class Name : Email

Classification Order : 1

Forward To Interface : Unchange

DSCP Mark : Unchange (0~63)

To Queue : Email

Criteria Configuration

Use the configurations below to specify the characteristics of a data flow need to be managed by this QoS rule

- **Basic**

☑ From Interface: Lan

☑ Ether Type: IP (0x0800)

- **Source**

☑ MAC Address: AA:FF:AA:FF:AA:FF MAC Mask □ Exclude

☑ IP Address: 192.168.1.23 IP Subnet Mask □ Exclude

□ Port Range ~ (1~65535) □ Exclude

- **Destination**

□ MAC Address MAC Mask □ Exclude

□ IP Address IP Subnet Mask □ Exclude

□ Port Range ~ (1~65535) □ Exclude

- **Others**

☑ IP Protocol: User defined 25 □ Exclude

□ IP Packet Length ~ (46~1504) □ Exclude

□ DSCP □ Exclude

□ TCP ACK □ Exclude

□ DHCP VendorClassID (DHCP Option 60) □ Exclude

Class ID (String)

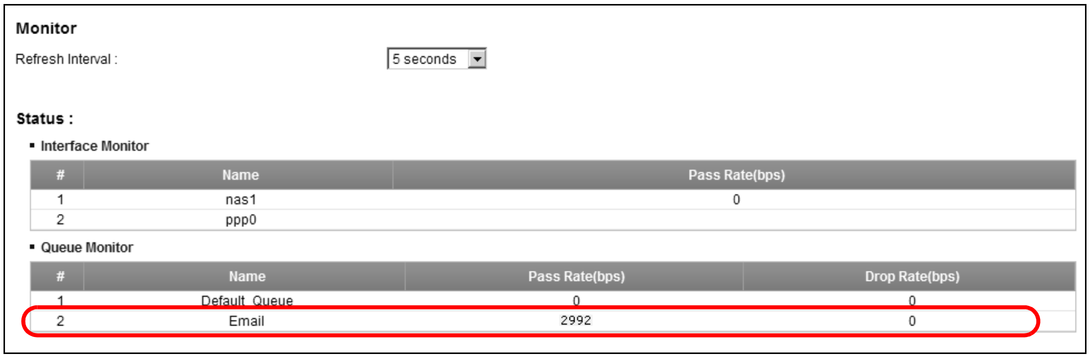
□ Service FTP □ Exclude

Class Name	Give a class name to this traffic, such as **Email** in this example.
To Queue	Link this to a queue created in the **QoS > Queue Setup** screen, which is the **Email** queue created in this example.

From Interface	This is the interface from which the traffic will be coming from. Select **Lan**.
Ether Type	Select **IP** to identify the traffic source by its IP address or MAC address.
MAC Address	Type the MAC address of your computer - **AA:FF:AA:FF:AA:FF**. Type the **MAC Mask** if you know it.
IP Address	Type the IP address of your computer - **192.168.1.23**. Type the **IP Subnet Mask** if you know it.

This maps e-mail traffic to queue 7 created in the previous screen (see the **IP Protocol** field). This also maps your computer's IP address and MAC address to queue 7 (see the **Source** fields).

4 Verify that the queue setup works by checking **Network Setting > QoS > Monitor**. This shows the bandwidth allotted to e-mail traffic compared to other network traffic.



Monitor

Refresh Interval : 5 seconds

Status :

▪ Interface Monitor

#	Name	Pass Rate(bps)
1	nas1	0
2	ppp0	

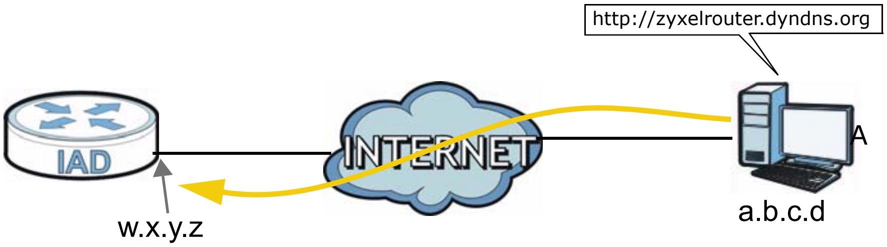
▪ Queue Monitor

#	Name	Pass Rate(bps)	Drop Rate(bps)
1	Default_Queue	0	0
2	Email	2992	0

3.11 Access the ZyXEL Device Using DDNS

If you connect your ZyXEL Device to the Internet and it uses a dynamic WAN IP address, it is inconvenient for you to manage the device from the Internet. The

ZyXEL Device's WAN IP address changes dynamically. Dynamic DNS (DDNS) allows you to access the ZyXEL Device using a domain name.



To use this feature, you have to apply for DDNS service at www.dyndns.org.

This tutorial shows you how to:

- Registering a DDNS Account on www.dyndns.org
- Configuring DDNS on Your ZyXEL Device
- Testing the DDNS Setting

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

3.11.1 Registering a DDNS Account on www.dyndns.org

1 Open a browser and type **http://www.dyndns.org**.

2 Apply for a user account. This tutorial uses **UserName1** and **12345** as the username and password.

3 Log into www.dyndns.org using your account.

4 Add a new DDNS host name. This tutorial uses the following settings as an example.

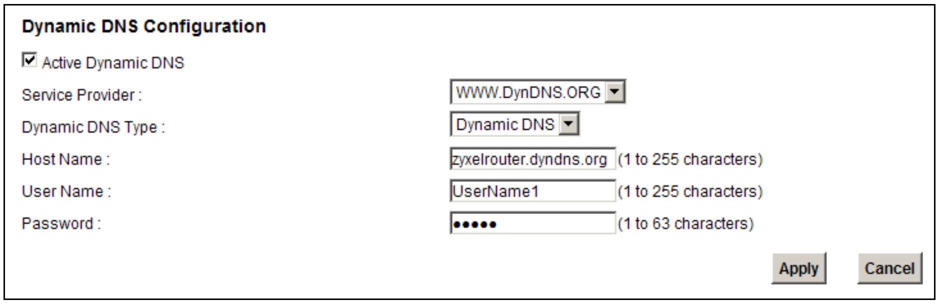
- Hostname: **zyxelrouter.dyndns.org**
- Service Type: **Host with IP address**
- IP Address: Enter the WAN IP address that your ZyXEL Device is currently using. You can find the IP address on the ZyXEL Device's web configurator **Status** page.

Then you will need to configure the same account and host name on the ZyXEL Device later.

3.11.2 Configuring DDNS on Your ZyXEL Device

Configure the following settings in the **Network Setting** > **DNS** screen.

- Select **Active Dynamic DNS**.
- Select **Dynamic DNS** for the DDNS type.
- Type **zyxelrouter.dyndns.org** in the **Host Name** field.
- Enter the user name (**UserName1**) and password (**12345**).



Dynamic DNS Configuration

☑ Active Dynamic DNS

Service Provider :	WWW.DynDNS.ORG	
Dynamic DNS Type :	Dynamic DNS	
Host Name :	zyxelrouter.dyndns.org	(1 to 255 characters)
User Name :	UserName1	(1 to 255 characters)
Password :	●●●●●	(1 to 63 characters)

Click **Apply**.

3.11.3 Testing the DDNS Setting

Now you should be able to access the ZyXEL Device from the Internet. To test this:

1 Open a web browser on the computer (using the IP address **a.b.c.d**) that is connected to the Internet.

2 Type **http://zyxelrouter.dyndns.org** and press [Enter].

3 The ZyXEL Device’s login page should appear. You can then log into the ZyXEL Device and manage it.

PART II
Technical Reference

4

Connection Status and System Info Screens

4.1 Overview

After you log into the web configurator, the **Connection Status** screen appears. This shows the network connection status of the ZyXEL Device and clients connected to it.

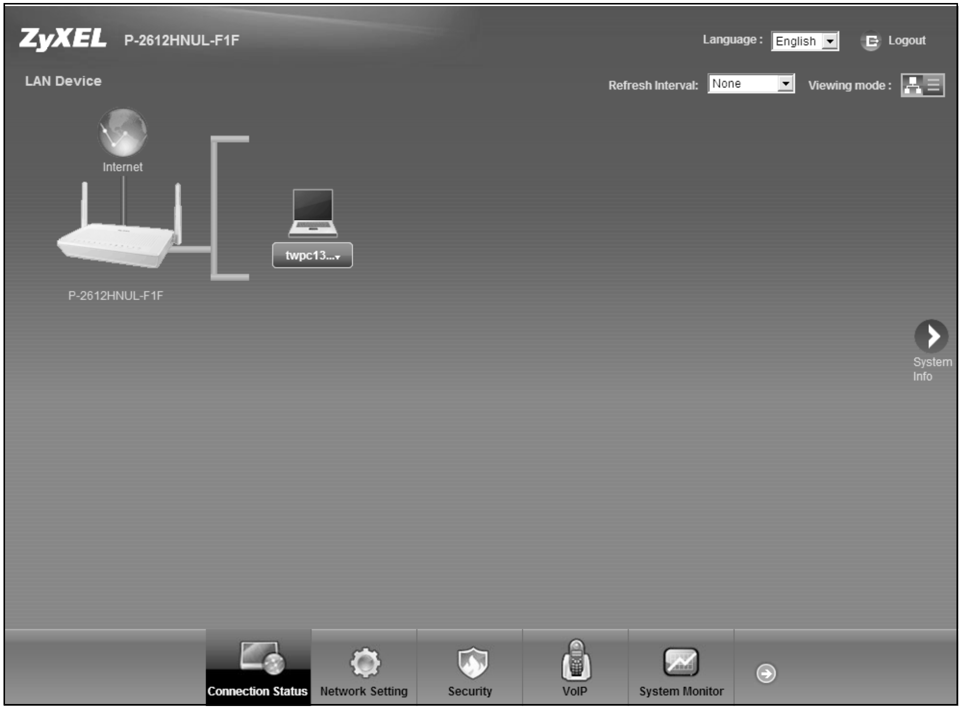
Use the **System Info** screen to look at the current status of the device, system resources, interfaces (LAN, WAN and WLAN), and SIP accounts. You can also register and unregister SIP accounts.

4.2 The Connection Status Screen

Use this screen to view the network connection status of the device and its clients. A warning message appears if there is a connection problem.

If you prefer to view the status in a list, click **List View** in the **Viewing mode** selection box. You can configure how often you want the ZyXEL Device to update this screen in **Refresh Interval**.

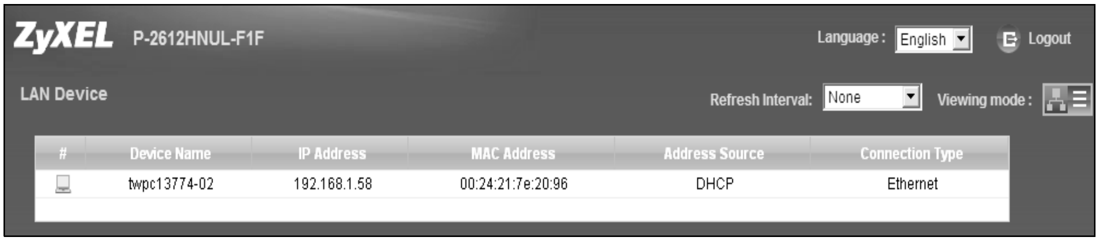
Figure 11 Connection Status: Icon View



Language : English

Refresh Interval: None

Figure 12 Connection Status: List View



Language : English

Refresh Interval: None

#	Device Name	IP Address	MAC Address	Address Source	Connection Type
🖥	twpc13774-02	192.168.1.58	00:24:21:7e:20:96	DHCP	Ethernet

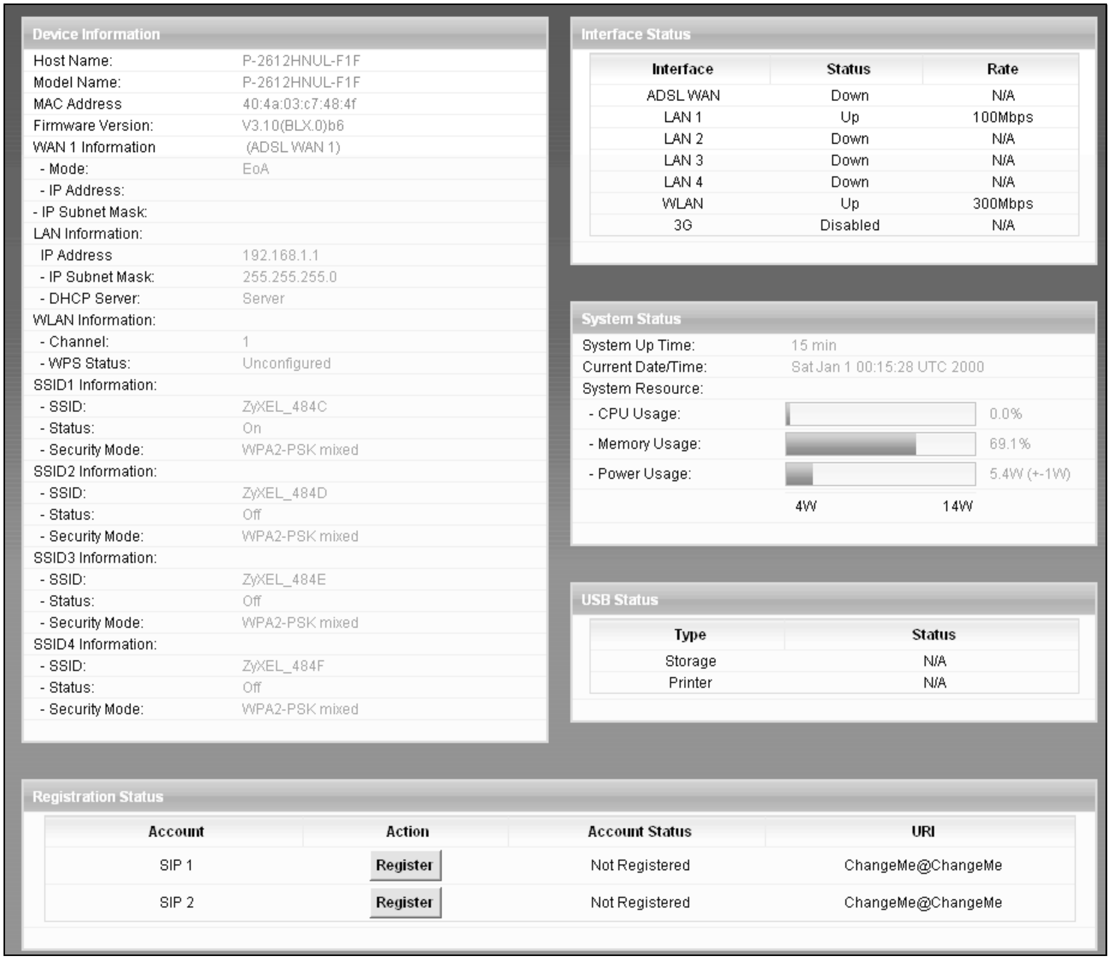
In **Icon View**, if you want to view information about a client, click the client’s name and **Info.** Click the IP address if you want to change it. If you want to change the name or icon of the client, click **Change name/icon**.

In **List View**, you can also view the client’s information.

4.3 The System Info Screen

Click **Connection Status > System Info** to open this screen.

Figure 13 System Info Screen



Device Information

Host Name:	P-2612HNUL-F1F
Model Name:	P-2612HNUL-F1F
MAC Address	40:4a:03:c7:48:4f
Firmware Version:	V3.10(BLX.0)b6
WAN 1 Information	(ADSL WAN 1)
- Mode:	EoA
- IP Address:	
- IP Subnet Mask:	
LAN Information:	
IP Address	192.168.1.1
- IP Subnet Mask:	255.255.255.0
- DHCP Server:	Server
WLAN Information:	
- Channel:	1
- WPS Status:	Unconfigured
SSID1 Information:	
- SSID:	ZyXEL_484C
- Status:	On
- Security Mode:	WPA2-PSK mixed
SSID2 Information:	
- SSID:	ZyXEL_484D
- Status:	Off
- Security Mode:	WPA2-PSK mixed
SSID3 Information:	
- SSID:	ZyXEL_484E
- Status:	Off
- Security Mode:	WPA2-PSK mixed
SSID4 Information:	
- SSID:	ZyXEL_484F
- Status:	Off
- Security Mode:	WPA2-PSK mixed

Interface Status

Interface	Status	Rate
ADSL WAN	Down	N/A
LAN 1	Up	100Mbps
LAN 2	Down	N/A
LAN 3	Down	N/A
LAN 4	Down	N/A
WLAN	Up	300Mbps
3G	Disabled	N/A

System Status

System Up Time:	15 min
Current Date/Time:	Sat Jan 1 00:15:28 UTC 2000
System Resource:	
- CPU Usage:	0.0%
- Memory Usage:	69.1%
- Power Usage:	5.4W (+-1W)

USB Status

Type	Status
Storage	N/A
Printer	N/A

Registration Status

Account	Action	Account Status	URI
SIP 1	Register	Not Registered	ChangeMe@ChangeMe
SIP 2	Register	Not Registered	ChangeMe@ChangeMe

Each field is described in the following table.

Table 4 System Info Screen

LABEL	DESCRIPTION
Language	Select the web configurator language from the drop-down list box.
Refresh Interval	Select how often you want the ZyXEL Device to update this screen from the drop-down list box.
Device Information	
Host Name	This field displays the ZyXEL Device system name. It is used for identification. You can change this in the **Maintenance > System** screen's **Host Name** field.
Model Name	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.

LABEL	DESCRIPTION
Firmware Version	This field displays the current version of the firmware inside the device. It also shows the date the firmware version was created. Go to the **Maintenance > Firmware Upgrade** screen to change it.
WAN Information	
Mode	This is the method of encapsulation used by your ISP.
IP Address	This field displays the current IP address of the ZyXEL Device in the WAN.
IP Subnet Mask	This field displays the current subnet mask in the WAN.
LAN Information	
IP Address	This field displays the current IP address of the ZyXEL Device in the LAN.
IP Subnet Mask	This field displays the current subnet mask in the LAN.
DHCP Server	This field displays what DHCP services the ZyXEL Device is providing to the LAN. Choices are: **Server** - The ZyXEL Device is a DHCP server in the LAN. It assigns IP addresses to other computers in the LAN. **Relay** - The ZyXEL Device acts as a surrogate DHCP server and relays DHCP requests and responses between the remote server and the clients. **None** - The ZyXEL Device is not providing any DHCP services to the LAN.
WLAN Information	
Channel	This is the channel number used by the ZyXEL Device now.
WPS Status	**Configured** displays when a wireless client has connected to the ZyXEL Device or WPS is enabled and wireless or wireless security settings have been configured. **Unconfigured** displays if WPS is disabled or wireless security settings have not been configured.
SSID (1~4) Information	
SSID	This is the descriptive name used to identify the ZyXEL Device in the wireless LAN.
Status	This shows whether or not the SSID is enabled (on).
Security Mode	This displays the type of security the ZyXEL Device is using in the wireless LAN.
Interface Status	
Interface	This column displays each interface the ZyXEL Device has.

LABEL	DESCRIPTION
Status	This field indicates whether or not the ZyXEL Device is using the interface. 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. For the WAN interface, this field displays **Up** when the ZyXEL Device is using the interface and **Down** when the ZyXEL Device is not using the interface. 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. For the WLAN interface, it displays **Active** when WLAN is enabled or **InActive** when WLAN is disabled.
Rate	For the LAN interface, this displays the port speed and duplex setting. For the WAN interface, this displays the port speed and duplex setting. For the DSL interface, it displays the downstream and upstream transmission rate. For the WLAN interface, it displays the maximum transmission rate when WLAN is enabled or **N/A** when WLAN is disabled.
System Status	
System Up Time	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 > Reboot**), or when you reset it (see Chapter 1 on page 28).
Current Date/Time	This field displays the current date and time in the ZyXEL Device. You can change this in **Maintenance > Time Setting**.
System Resource	
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.
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 Chapter 25 on page 281, or turn off the device (unplug the power) for a few seconds.
Power Usage	This field displays what percentage of traffic passing through the ZyXEL Device is using NAT.
USB Status	
Type	This shows the type of device connected to the ZyXEL Device.

LABEL	DESCRIPTION
Status	This shows whether the device is currently active (**Up**). This shows **N/A** if there are no device connected to the ZyXEL Device or the connected device is not working.
Registration Status	
Account	This column displays each SIP account in the ZyXEL Device.
Action	This field displays the current registration status of the SIP account. You have to register SIP accounts with a SIP server to use VoIP. If the SIP account is already registered with the SIP server, • Click **Unregister** to delete the SIP account's registration in the SIP server. This does not cancel your SIP account, but it deletes the mapping between your SIP identity and your IP address or domain name. • The second field displays **Registered**. If the SIP account is not registered with the SIP server, • Click **Register** to have the ZyXEL Device attempt to register the SIP account with the SIP server. • The second field displays the reason the account is not registered. **Inactive** - The SIP account is not active. You can activate it in **VoIP > SIP > SIP Settings**. **Register Fail** - The last time the ZyXEL Device tried to register the SIP account with the SIP server, the attempt failed. The ZyXEL Device automatically tries to register the SIP account when you turn on the ZyXEL Device or when you activate it.
Account Status	This shows **Active** when the SIP account has been registered and ready for use or **In-Active** when the SIP account is not yet registered.
URI	This field displays the account number and service domain of the SIP account. You can change these in **VoIP > SIP > SIP Settings**.

5

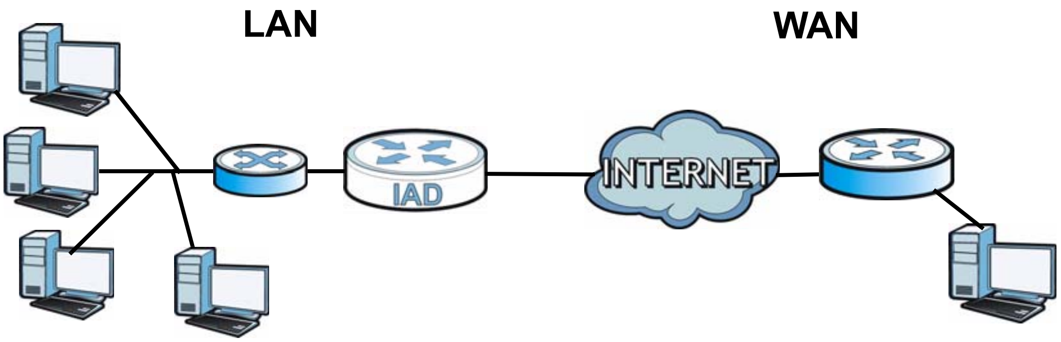
Broadband

5.1 Overview

This chapter discusses the ZyXEL Device's **Broadband** 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.

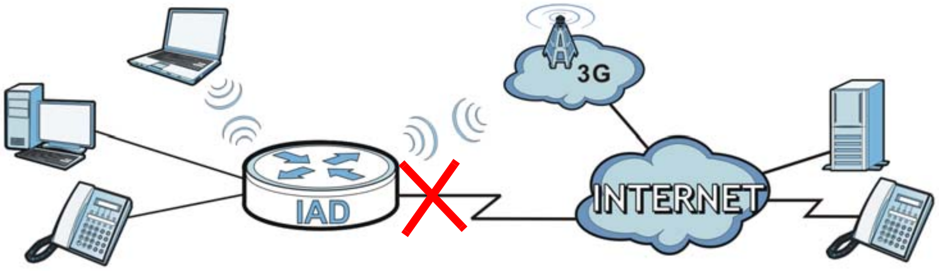
Figure 14 LAN and WAN



3G (third generation) standards for the sending and receiving of voice, video, and data in a mobile environment.

You can attach a 3G wireless adapter to the USB port and set the ZyXEL Device to use this 3G connection as your WAN or a backup when the wired WAN connection fails.

Figure 15 3G WAN Connection



5.1.1 What You Can Do in this Chapter

- Use the **Broadband** screen to view, remove or add a WAN interface. You can also configure the WAN settings on the ZyXEL Device for Internet access (Section 5.2 on page 94).
- Use the **3G Backup** screen to configure 3G WAN connection (Section 5.3 on page 108).

Table 5 WAN Setup Overview

LAYER-2 INTERFACE		INTERNET CONNECTION		
INTERFACE	**DSL LINK TYPE**	**MODE**	**WAN SERVICE TYPE**	**CONNECTION SETTINGS**
Ethernet		Routing	PPPoE	PPP user name and password, WAN IP address, DNS server and default gateway
			IPoE	WAN IP address, NAT, DNS server and default gateway
		Bridge	N/A	N/A
ATM	EoA	Routing	PPPoE	PPP user name and password, WAN IP address, DNS server and default gateway
			IPoE	WAN IP address, NAT, DNS server and default gateway
		Bridge	N/A	N/A

5.1.2 What You Need to Know

The following terms and concepts may help as you read this chapter.

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), 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).

ATM

Asynchronous Transfer Mode (ATM) is a LAN and WAN networking technology that provides high-speed data transfer. ATM uses fixed-size packets of information called cells. With ATM, a high QoS (Quality of Service) can be guaranteed. ATM uses a connection-oriented model and establishes a virtual circuit (VC) between two endpoints before the actual data exchange begins.

3G

3G (Third Generation) is a digital, packet-switched wireless technology. Bandwidth usage is optimized as multiple users share the same channel and bandwidth is only allocated to users when they send data. It allows fast transfer of voice and non-voice data and provides broadband Internet access to mobile devices.

Finding Out More

- See Section 5.4 on page 110 for advanced technical information on WAN and 3G.
- See Chapter 3 on page 37 for WAN tutorials.

5.1.3 Before You Begin

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

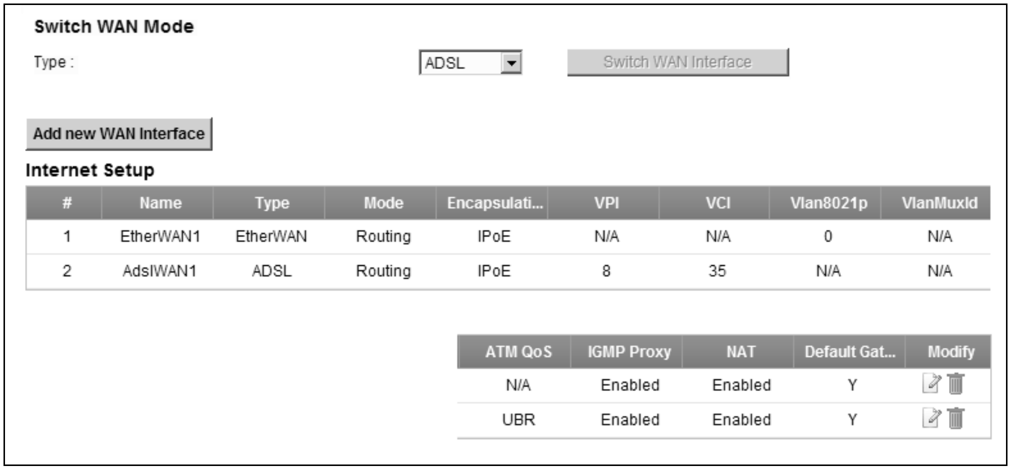
5.2 The Broadband Screen

The ZyXEL Device must have a WAN interface to allow users to use the Ethernet WAN port or DSL port to access the Internet. Use the **Broadband** screen to view, remove or add a WAN interface.

Note: The ATM and Ethernet layer-2 interfaces cannot work at the same time.

Click **Network Setting > Broadband**. The following screen opens.

Figure 16 Network Setting > Broadband



Switch WAN Mode

Type : ADSL

Internet Setup

#	Name	Type	Mode	Encapsulati...	VPI	VCI	Vlan8021p	VlanMuxId
1	EtherWAN1	EtherWAN	Routing	IPoE	N/A	N/A	0	N/A
2	AdslWAN1	ADSL	Routing	IPoE	8	35	N/A	N/A

ATM QoS	IGMP Proxy	NAT	Default Gat...	Modify
N/A	Enabled	Enabled	Y	✎ 🗑
UBR	Enabled	Enabled	Y	✎ 🗑

The following table describes the fields in this screen.

Table 6 Network Setting > Broadband

LABEL	DESCRIPTION
Switch WAN Mode	
Type	The default WAN mode is **ADSL**. If you prefer not to use a DSL line and you have another broadband modem or router (such as ADSL) available, you can select **EtherWAN** from the drop-down list box and click **Switch WAN Interface**. The ZyXEL Device will use Ethernet WAN as the WAN mode.
Add new WAN Interface	Click this to create a new WAN interface.
Internet Setup	
#	This is the index number of the connection.
Name	This is the service name of the connection.
Type	This shows the type of interface used by this connection.
Mode	This shows whether the connection is in routing mode or bridge mode.
Encapsulation	This shows the method of encapsulation used by this connection.
VPI	This is the Virtual Path Identifier (VPI).
VCI	This is the Virtual Channel Identifier (VCI).

Table 6 Network Setting > Broadband (continued)

LABEL	DESCRIPTION
Vlan8021p	This indicates the 802.1P priority level assigned to traffic sent through this connection. This displays **N/A** when there is no priority level assigned.
VlanMuxId	This indicates the VLAN ID number assigned to traffic sent through this connection. This displays **N/A** when there is no VLAN ID number assigned.
ATM QoS	This shows the ATM Quality of Service (QoS) type configured for this connection. This displays **N/A** when there is no ATM QoS assigned.
IGMP Proxy	This shows whether IGMP (Internet Group Multicast Protocol) is activated or not for this connection. IGMP is not available when the connection uses the bridging service.
NAT	This shows whether NAT is activated or not for this connection. NAT is not available when the connection uses the bridging service.
Default Gateway	This shows whether the ZyXEL Device uses the interface of this connection as the system default gateway.
Modify	Click the **Edit** icon to configure the connection. Click the **Delete** icon to delete this connection from the ZyXEL Device. A window displays asking you to confirm that you want to delete the connection.

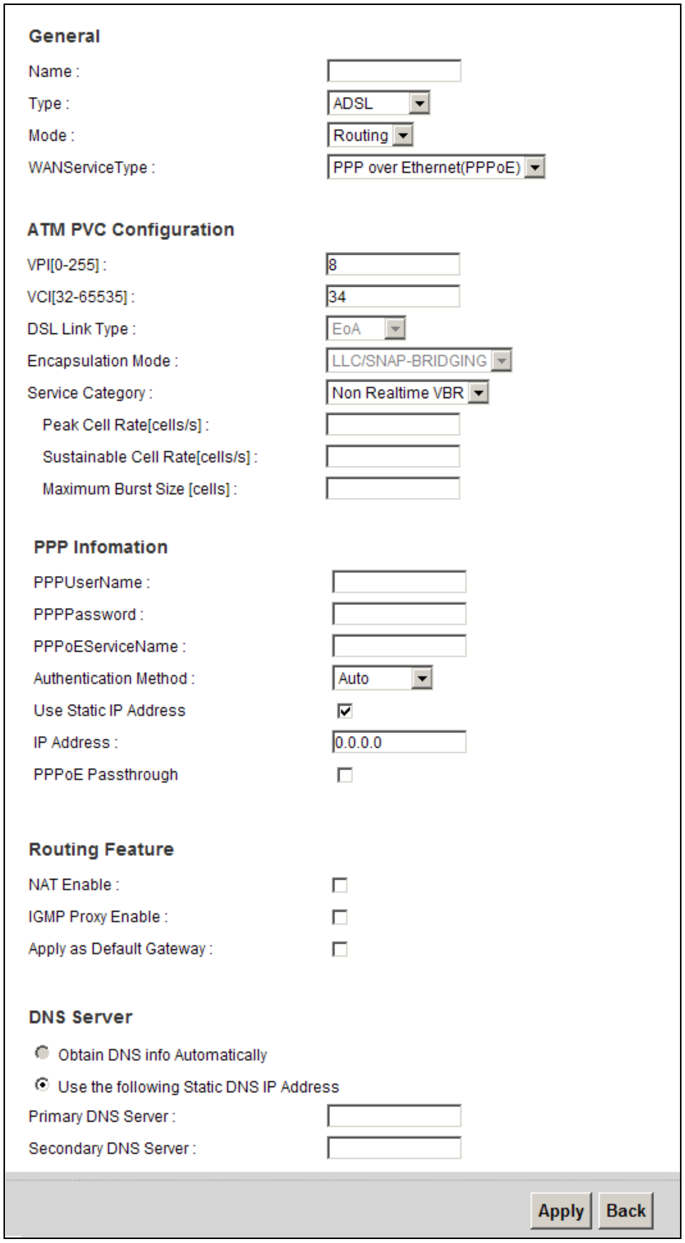
5.2.1 Add/Edit Internet Connection

Use this screen to configure a WAN connection. The screen varies depending on the encapsulation and WAN service type you select.

5.2.1.1 Routing- PPPoE

Click the **Add new WAN Interface** in the **Network Setting > Broadband** screen or the **Edit** icon next to the connection you want to configure. Select **Routing** as the encapsulation mode and **PPPoE** as the WAN service type.

Figure 17 Broadband Add/Edit: Routing- PPPoE



General

Name :	
Type :	ADSL
Mode :	Routing
WANServiceType :	PPP over Ethernet(PPPoE)

ATM PVC Configuration

VPI[0-255] :	8
VCI[32-65535] :	34
DSL Link Type :	EoA
Encapsulation Mode :	LLC/SNAP-BRIDGING
Service Category :	Non Realtime VBR
Peak Cell Rate[cells/s] :	
Sustainable Cell Rate[cells/s] :	
Maximum Burst Size [cells] :	

PPP Infomation

PPPUserName :	
PPPPassword :	
PPPoEServiceName :	
Authentication Method :	Auto
Use Static IP Address	☑
IP Address :	0.0.0.0
PPPoE Passthrough	□

Routing Feature

NAT Enable :	□
IGMP Proxy Enable :	□
Apply as Default Gateway :	□

DNS Server

○ Obtain DNS info Automatically

● Use the following Static DNS IP Address

Primary DNS Server :	
Secondary DNS Server :	

The following table describes the fields in this screen.

Table 7 Broadband Add/Edit: Routing- PPPoE

Label	DESCRIPTION
General	
Name	Enter a service name of the connection.
Type	Select an interface for which you want to configure here. **ADSL**: The ZyXEL Device uses the ADSL technology for data transmission over the DSL port. **EtherWAN**: The ZyXEL Device transmits data over the Ethernet WAN port. Select this if you have a DSL router or modem in your network already.
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.
WAN Service Type	This field is available only when you select **Routing** in the **Mode** field. Select the method of encapsulation used by your ISP. • **PPP over Ethernet (PPPoE)** - PPPoE (Point to Point Protocol over Ethernet) provides access control and billing functionality in a manner similar to dial-up services using PPP. Select this if you have a username and password for Internet access. • **IP over Ethernet** - In this type of Internet connection, 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.
ATM PVC Configuration	VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) define a virtual circuit. This section is available only when you select **ADSL** in the **Type** field to configure an ATM layer-2 interface.
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.
DSL Link Type	The DSL link type is set to **EoA** (Ethernet over ATM) to have an Ethernet header in the packet, so that you can have multiple services/ connections over one PVC. You can set each connection to have its own MAC address or all connections share one MAC address but use different VLAN IDs for different services. **EoA** supports IPoE, PPPoE and RFC1483/2684 bridging encapsulation methods.
Encapsulation Mode	The encapsulation method of multiplexing used by your is **LLC/SNAP-BRIDGING**. In LCC encapsulation, bridged PDUs are encapsulated by identifying the type of the bridged media in the SNAP header.

Table 7 Broadband Add/Edit: Routing- PPPoE (continued)

Label	DESCRIPTION
Service Category	Select **UBR Without PCR** for applications that are non-time sensitive, such as e-mail. Select **CBR** (Constant Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select **Non Realtime VBR** (non real-time Variable Bit Rate) for connections that do not require closely controlled delay and delay variation. Select **Realtime VBR** (real-time Variable Bit Rate) for applications with bursty connections that 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. This field is not available when you select **UBR Without PCR**.
Sustainable 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. This field is available only when you select **Non Realtime VBR** or **Realtime VBR**.
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. This field is available only when you select **Non Realtime VBR** or **Realtime VBR**.
VLAN	This section is available only when you select **EtherWAN** in the **Type** field.
Enable VLAN	Select this to add the VLAN tag (specified below) to the outgoing traffic through this connection.
Enter 802.1P Priority	IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service. Type the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.
Enter 802.1Q VLAN ID	Type the VLAN ID number (from 1 to 4094) for traffic through this connection.
PPP Information	This section is available only when you select **Routing** in the **Mode** field and **PPPoE** in the **WAN Service Type** field.
PPP 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.
PPP Password	Enter the password associated with the user name above.
PPPoE Service Name	Type the name of your PPPoE service here.

Table 7 Broadband Add/Edit: Routing- PPPoE (continued)

Label	DESCRIPTION
Authentication Mode	The ZyXEL Device supports PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol). CHAP is more secure than PAP; however, PAP is readily available on more platforms. Use the drop-down list box to select an authentication protocol for outgoing calls. Options are: **AUTO**: Your ZyXEL Device accepts either CHAP or PAP when requested by this remote node. **CHAP**: Your ZyXEL Device accepts CHAP only. **PAP**: Your ZyXEL Device accepts PAP only. **MSCHAP**: Your ZyXEL Device accepts MSCHAP only. MS-CHAP is the Microsoft version of the CHAP.
Use Static IP Address	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 this if you want to get a dynamic IP address from the ISP.
IP Address	Enter the static IP address provided by your ISP.
PPPoE Passthrough	In addition to the ZyXEL Device’s built-in PPPoE client, you can enable PPPoE pass through to allow up to ten hosts on the LAN to use PPPoE client software on their computers to connect to the ISP via the ZyXEL Device. Each host can have a separate account and a public WAN IP address. PPPoE pass through is an alternative to NAT for application where NAT is not appropriate. Disable PPPoE pass through if you do not need to allow hosts on the LAN to use PPPoE client software on their computers to connect to the ISP.
Routing Feature	
NAT Enable	Select this option to activate NAT on this connection.
IGMP Proxy Enable	Internet Group Multicast Protocol (IGMP) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. Select this option to have the ZyXEL Device act as an IGMP proxy on this connection. This allows the ZyXEL Device to get subscribing information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly.
Apply as Default Gateway	Select this option to have the ZyXEL Device use the WAN interface of this connection as the system default gateway.
DNS Server	The section is not available when you select **Bridge** in the **WAN Service Type** field.
Obtain DNS info Automatically	Select this to have the ZyXEL Device get the DNS server addresses from the ISP automatically.
Use the following Static DNS IP Address	Select this to have the ZyXEL Device use the DNS server addresses you configure manually.

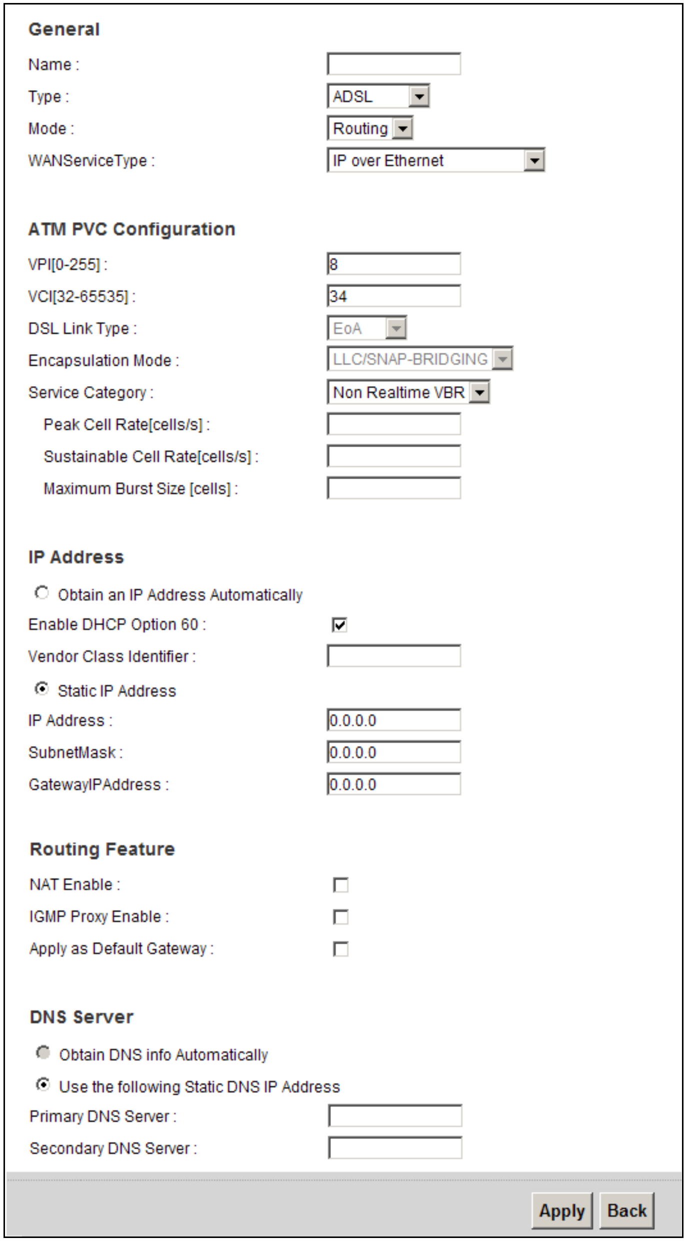
Table 7 Broadband Add/Edit: Routing- PPPoE (continued)

Label	DESCRIPTION
Primary DNS Server	Enter the first DNS server address assigned by the ISP.
Secondary DNS Server	Enter the second DNS server address assigned by the ISP.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to return to the previous screen.

5.2.1.2 Routing- IPoE

Click the **Add new WAN Interface** in the **Network Setting > Broadband** screen or the **Edit** icon next to the connection you want to configure. Select **Routing** as the encapsulation mode and **IPoE** as the WAN service type.

Broadband Add/Edit: Routing- IPoE



General

Name :	
Type :	ADSL
Mode :	Routing
WANServiceType :	IP over Ethernet

ATM PVC Configuration

VPI[0-255] :	8
VCI[32-65535] :	34
DSL Link Type :	EoA
Encapsulation Mode :	LLC/SNAP-BRIDGING
Service Category :	Non Realtime VBR
Peak Cell Rate[cells/s] :	
Sustainable Cell Rate[cells/s] :	
Maximum Burst Size [cells] :	

IP Address

○ Obtain an IP Address Automatically

Enable DHCP Option 60 :	☑
Vendor Class Identifier :	

● Static IP Address

IP Address :	0.0.0.0
SubnetMask :	0.0.0.0
GatewayIPAddress :	0.0.0.0

Routing Feature

NAT Enable :	□
IGMP Proxy Enable :	□
Apply as Default Gateway :	□

DNS Server

○ Obtain DNS info Automatically

● Use the following Static DNS IP Address

Primary DNS Server :	
Secondary DNS Server :	

The following table describes the fields in this screen.

Table 8 Broadband Add/Edit: Routing- IPoE

Label	DESCRIPTION
General	
Name	Enter a service name of the connection.

Table 8 Broadband Add/Edit: Routing- IPoE (continued)

Label	DESCRIPTION
Type	Select an interface for which you want to configure here. **ADSL**: The ZyXEL Device uses the ADSL technology for data transmission over the DSL port. **EtherWAN**: The ZyXEL Device transmits data over the Ethernet WAN port. Select this if you have a DSL router or modem in your network already.
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.
WAN Service Type	This field is available only when you select **Routing** in the **Mode** field. Select the method of encapsulation used by your ISP. • **PPP over Ethernet (PPPoE)** - PPPoE (Point to Point Protocol over Ethernet) provides access control and billing functionality in a manner similar to dial-up services using PPP. Select this if you have a username and password for Internet access. • **IP over Ethernet** - In this type of Internet connection, 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.
ATM PVC Configuration	VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) define a virtual circuit. This section is available only when you select **ADSL** in the **Type** field to configure an ATM layer-2 interface.
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.
DSL Link Type	The DSL link type is set to **EoA** (Ethernet over ATM) to have an Ethernet header in the packet, so that you can have multiple services/ connections over one PVC. You can set each connection to have its own MAC address or all connections share one MAC address but use different VLAN IDs for different services. **EoA** supports IPoE, PPPoE and RFC1483/2684 bridging encapsulation methods.
Encapsulation Mode	The encapsulation method of multiplexing used by your is **LLC/SNAP-BRIDGING**. In LCC encapsulation, bridged PDUs are encapsulated by identifying the type of the bridged media in the SNAP header.
Service Category	Select **UBR Without PCR** for applications that are non-time sensitive, such as e-mail. Select **CBR** (Constant Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select **Non Realtime VBR** (non real-time Variable Bit Rate) for connections that do not require closely controlled delay and delay variation. Select **Realtime VBR** (real-time Variable Bit Rate) for applications with bursty connections that require closely controlled delay and delay variation.

Table 8 Broadband Add/Edit: Routing- IPoE (continued)

Label	DESCRIPTION
Peak Cell Rate	Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here. This field is not available when you select **UBR Without PCR**.
Sustainable 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. This field is available only when you select **Non Realtime VBR** or **Realtime VBR**.
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. This field is available only when you select **Non Realtime VBR** or **Realtime VBR**.
VLAN	This section is available only when you select **EtherWAN** in the **Type** field.
Enable VLAN	Select this to add the VLAN tag (specified below) to the outgoing traffic through this connection.
Enter 802.1P Priority	IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service. Type the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.
Enter 802.1Q VLAN ID	Type the VLAN ID number (from 1 to 4094) for traffic through this connection.
IP Address	This section is available only when you select **Routing** in the **Mode** field and **IPoE** in the **WAN Service Type** field.
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 this if you want to get a dynamic IP address from the ISP.
Enable DHCP Option 60	Select this to identify the vendor and functionality of the ZyXEL Device in DHCP requests that the ZyXEL Device sends to a DHCP server when getting a WAN IP address.
Vendor Class Identifier	Enter the Vendor Class Identifier (Option 60), such as the type of the hardware or firmware.
Static IP Address	Select this option If the ISP assigned a fixed IP address.
IP Address	Enter the static IP address provided by your ISP.
Subnet Mask	Enter the subnet mask provided by your ISP.
Gateway IP Address	Enter the gateway IP address provided by your ISP.
Routing Feature	
NAT Enable	Select this option to activate NAT on this connection.

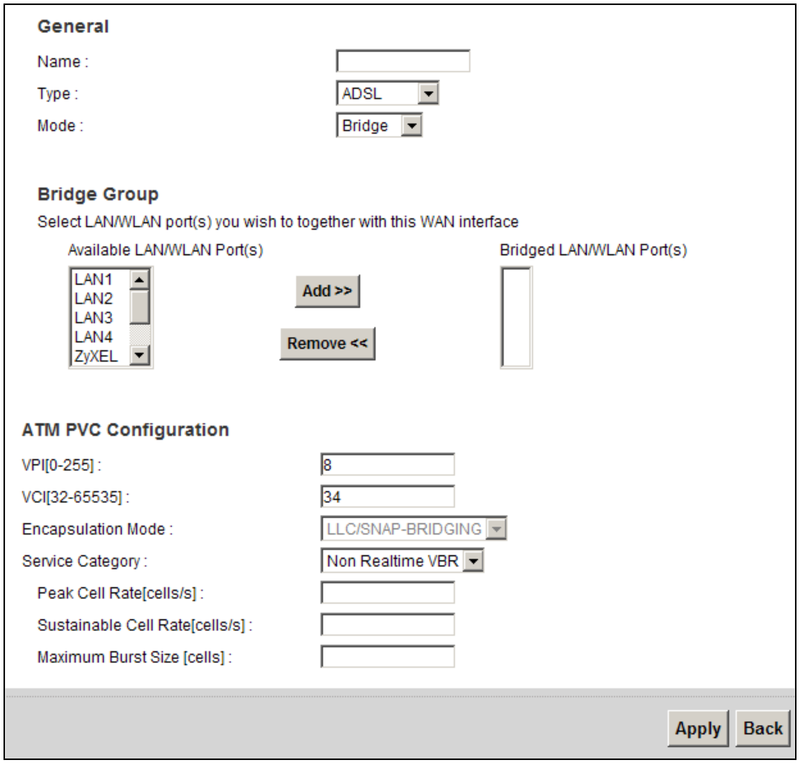
Table 8 Broadband Add/Edit: Routing- IPoE (continued)

Label	DESCRIPTION
IGMP Proxy Enable	Internet Group Multicast Protocol (IGMP) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data. Select this option to have the ZyXEL Device act as an IGMP proxy on this connection. This allows the ZyXEL Device to get subscribing information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly.
Apply as Default Gateway	Select this option to have the ZyXEL Device use the WAN interface of this connection as the system default gateway.
DNS Server	This is available only when you select **Apply as Default Gateway** in the **Routing Feature** field.
Obtain DNS info Automatically	Select this to have the ZyXEL Device get the DNS server addresses from the ISP automatically.
Use the following Static DNS IP Address	Select this to have the ZyXEL Device use the DNS server addresses you configure manually.
Primary DNS Server	Enter the first DNS server address assigned by the ISP.
Secondary DNS Server	Enter the second DNS server address assigned by the ISP.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to return to the previous screen.

5.2.1.3 Bridge Mode

Click the **Add new WAN Interface** in the **Network Setting > Broadband** screen or the **Edit** icon next to the connection you want to configure. Select **Bridge** as the encapsulation mode. The screen differs according to the interface type you select. If you select **ADSL** as the interface type, the following screen appears.

Figure 18 Broadband Add/Edit: Bridge (ADSL)



General

Name :

Type : ADSL

Mode : Bridge

Bridge Group

Select LAN/WLAN port(s) you wish to together with this WAN interface

Available LAN/WLAN Port(s): LAN1, LAN2, LAN3, LAN4, ZyXEL

Bridged LAN/WLAN Port(s):

ATM PVC Configuration

VPI[0-255] : 8

VCI[32-65535] : 34

Encapsulation Mode : LLC/SNAP-BRIDGING

Service Category : Non Realtime VBR

Peak Cell Rate[cells/s] :

Sustainable Cell Rate[cells/s] :

Maximum Burst Size [cells] :

The following table describes the fields in this screen.

Table 9 Broadband Add/Edit: Bridge (ADSL)

Label	DESCRIPTION
General	
Name	Enter a service name of the connection.
Type	Select **ADSL** as the interface for which you want to configure here. The ZyXEL Device uses the ADSL technology for data transmission over the DSL port.
Mode	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 routing functions, such as QoS, Firewall, DHCP server and NAT on traffic from the selected LAN port(s).

Table 9 Broadband Add/Edit: Bridge (ADSL) (continued)

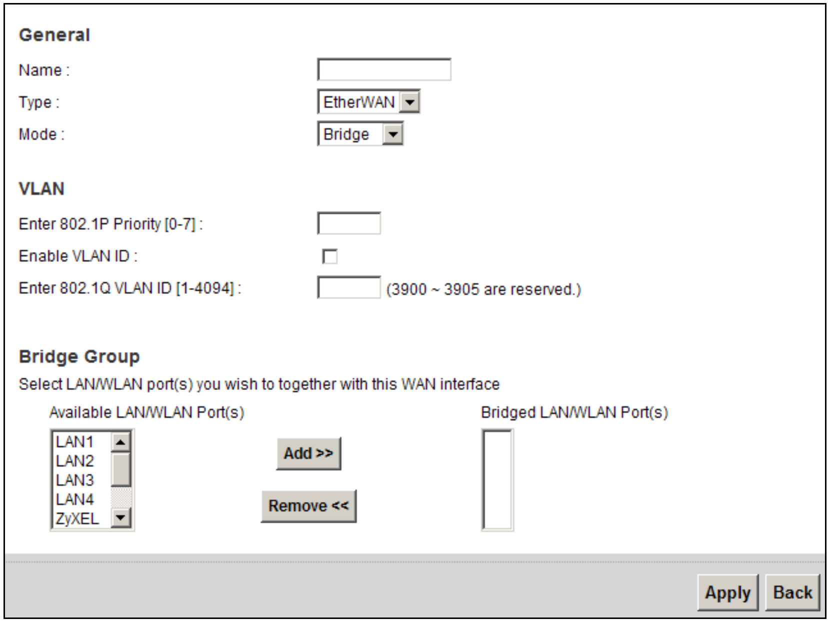
Label	DESCRIPTION
Bridge Group	Select the LAN/WLAN port(s) from which traffic will be forwarded to the WAN interface directly. Select a port from the **Available LAN/WLAN Port(s)** list and click **Add >>** to add it to the **Bridged LAN/WLAN Port(s)** list. If you want to remove a port from the **Bridged LAN/WLAN Port(s)** list, select it and click **Remove <<**. You cannot configure a QoS class for traffic from the LAN port which is selected here.
ATM PVC Configuration	VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier) define a virtual circuit. This section is available only when you select **ADSL** in the **Type** field to configure an ATM layer-2 interface.
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.
DSL Link Type	The DSL link type is set to **EoA** (Ethernet over ATM) to have an Ethernet header in the packet, so that you can have multiple services/ connections over one PVC. You can set each connection to have its own MAC address or all connections share one MAC address but use different VLAN IDs for different services. **EoA** supports IPoE, PPPoE and RFC1483/2684 bridging encapsulation methods.
Encapsulation Mode	The encapsulation method of multiplexing used by your is **LLC/SNAP-BRIDGING**. In LCC encapsulation, bridged PDUs are encapsulated by identifying the type of the bridged media in the SNAP header.
Service Category	Select **UBR Without PCR** for applications that are non-time sensitive, such as e-mail. Select **CBR** (Constant Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic. Select **Non Realtime VBR** (non real-time Variable Bit Rate) for connections that do not require closely controlled delay and delay variation. Select **Realtime VBR** (real-time Variable Bit Rate) for applications with bursty connections that 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. This field is not available when you select **UBR Without PCR**.
Sustainable 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. This field is available only when you select **Non Realtime VBR** or **Realtime VBR**.

Table 9 Broadband Add/Edit: Bridge (ADSL) (continued)

Label	DESCRIPTION
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. This field is available only when you select **Non Realtime VBR** or **Realtime VBR**.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to return to the previous screen.

If you select EtherWAN as the interface type, the following screen appears.

Figure 19 Broadband Add/Edit: Bridge (Ethernet)



General

Name :

Type : EtherWAN

Mode : Bridge

VLAN

Enter 802.1P Priority [0-7] :

Enable VLAN ID : □

Enter 802.1Q VLAN ID [1-4094] : (3900 ~ 3905 are reserved.)

Bridge Group

Select LAN/WLAN port(s) you wish to together with this WAN interface

Available LAN/WLAN Port(s): LAN1, LAN2, LAN3, LAN4, ZyXEL

Bridged LAN/WLAN Port(s)

The following table describes the fields in this screen.

Table 10 Broadband Add/Edit: Bridge (Ethernet)

Label	DESCRIPTION
General	
Name	Enter a service name of the connection.
Type	Select **EtherWAN** as the interface for which you want to configure The ZyXEL Device transmits data over the Ethernet WAN port. Select this if you have a DSL router or modem in your network already.
Mode	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 routing functions, such as QoS, Firewall, DHCP server and NAT on traffic from the selected LAN port(s).
VLAN	This section is available only when you select **EtherWAN** in the **Type** field.

Table 10 Broadband Add/Edit: Bridge (Ethernet) (continued)

Label	DESCRIPTION
Enable VLAN	Select this to add the VLAN Tag (specified below) to the outgoing traffic through this connection.
Enter 802.1P Priority	IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service. Type the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.
Enter 802.1Q VLAN ID	Type the VLAN ID number (from 1 to 4094) for traffic through this connection.
Bridge Group	Select the LAN/WLAN port(s) from which traffic will be forwarded to the WAN interface directly. Select a port from the **Available LAN/WLAN Port(s)** list and click **Add >>** to add it to the **Bridged LAN/WLAN Port(s)** list. If you want to remove a port from the **Bridged LAN/WLAN Port(s)** list, select it and click **Remove <<**. You cannot configure a QoS class for traffic from the LAN port which is selected here.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to return to the previous screen.

5.3 The 3G Backup Screen

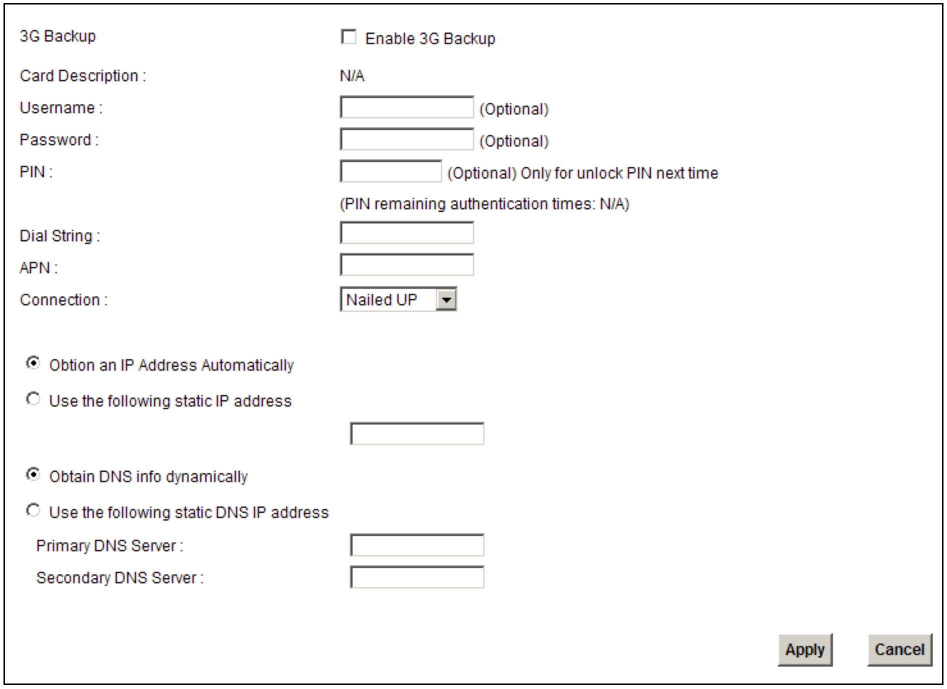
Use this screen to configure your 3G settings. Click **Broadband > 3G Backup**.

At the time of writing, the 3G card you can use in the ZyXEL Device is Huawei E220.

Note: The actual data rate you obtain varies depending the 3G card you use, the signal strength to the service provider’s base station, and so on.

If the signal strength of a 3G network is too low, the 3G card may switch to an available 2.5G or 2.75G network. Refer to Section 5.4 on page 110 for a comparison between 2G, 2.5G, 2.75G and 3G wireless technologies.

Figure 20 Broadband > 3G Backup



3G Backup ☐ Enable 3G Backup

Card Description : N/A

Username : (Optional)

Password : (Optional)

PIN : (Optional) Only for unlock PIN next time

(PIN remaining authentication times: N/A)

Dial String :

APN :

Connection : Nailed UP

● Obtion an IP Address Automatically

○ Use the following static IP address

● Obtain DNS info dynamically

○ Use the following static DNS IP address

Primary DNS Server :

Secondary DNS Server :

The following table describes the labels in this screen.

Table 11 Broadband > 3G Backup

LABEL	DESCRIPTION
3G Backup	Select **Enable 3G Backup** to have the ZyXEL Device use the 3G connection as your WAN or a backup when the wired WAN connection fails.
Card Description	This field displays the manufacturer and model name of your 3G card if you inserted one in the ZyXEL Device. Otherwise, it displays **N/A**.
Username	Type the user name (of up to 70 ASCII printable characters) given to you by your service provider.
Password	Type the password (of up to 70 ASCII printable characters) associated with the user name above.
PIN	A PIN (Personal Identification Number) code is a key to a 3G card. Without the PIN code, you cannot use the 3G card. If your ISP enabled PIN code authentication, enter the 4-digit PIN code (0000 for example) provided by your ISP. If you enter the PIN code incorrectly, the 3G card may be blocked by your ISP and you cannot use the account to access the Internet. If your ISP disabled PIN code authentication, leave this field blank.

Table 11 Broadband > 3G Backup (continued)

LABEL	DESCRIPTION
Dial String	Enter the phone number (dial string) used to dial up a connection to your service provider's base station. Your ISP should provide the phone number. For example, *99# is the dial string to establish a GPRS or 3G connection in Taiwan.
APN Code	Enter the APN (Access Point Name) provided by your service provider. Connections with different APNs may provide different services (such as Internet access or MMS (Multi-Media Messaging Service)) and charge method. You can enter up to 31 ASCII printable characters. Spaces are allowed.
Connection	Select **Nailed-UP** if you do not want the connection to time out. Select **On-Demand** if you do not want the connection up all the time and specify an idle time-out in the **Max Idle Timeout** field.
Max Idle Timeout	This value specifies the time in minutes that elapses before the ZyXEL Device automatically disconnects from the ISP.
Obtain an IP Address Automatically	Select this option If your ISP did not assign you a fixed IP address.
Use the following static IP address	Select this option If the ISP assigned a fixed IP address.
IP Address	Enter your WAN IP address in this field if you selected **Use the following static IP address**.
Obtain DNS info dynamically	Select this to have the ZyXEL Device get the DNS server addresses from the ISP automatically.
Use the following static DNS IP address	Select this to have the ZyXEL Device use the DNS server addresses you configure manually.
Primary DNS server	Enter the first DNS server address assigned by the ISP.
Secondary DNS server	Enter the second DNS server address assigned by the ISP.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to return to the previous configuration.

5.4 Technical Reference

The following section contains additional technical information about the ZyXEL Device features described in this chapter.

Encapsulation

Be sure to use the encapsulation method required by your ISP. The ZyXEL Device can work in bridge mode or routing mode. When the ZyXEL Device is in routing mode, it supports the following methods.

IP over Ethernet

IP over Ethernet (IPoE) is an alternative to PPPoE. IP packets are being delivered across an Ethernet network, without using PPP encapsulation. They 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 Ethernet cells.

PPP over Ethernet

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

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

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

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

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

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.

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.

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.

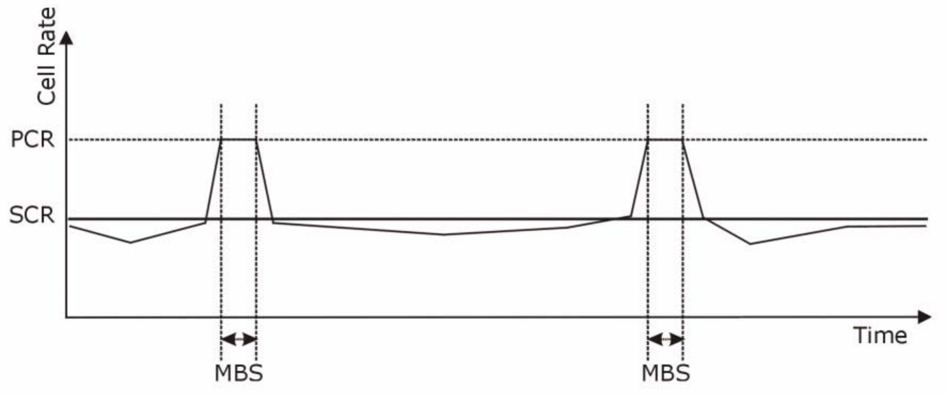
Sustained Cell Rate (SCR) is the mean cell rate of each bursty traffic source. It specifies the maximum average rate at which cells can be sent over the virtual connection. SCR may not be greater than the PCR.

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 21 Example of Traffic Shaping



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.

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 default gateway.

Introduction to VLANs

A Virtual Local Area Network (VLAN) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same group(s); the traffic must first go through a router.

In Multi-Tenant Unit (MTU) applications, VLAN is vital in providing isolation and security among the subscribers. When properly configured, VLAN prevents one subscriber from accessing the network resources of another on the same LAN, thus a user will not see the printers and hard disks of another user in the same building.

VLAN also increases network performance by limiting broadcasts to a smaller and more manageable logical broadcast domain. In traditional switched environments, all broadcast packets go to each and every individual port. With VLAN, all broadcasts are confined to a specific broadcast domain.

Introduction to IEEE 802.1Q Tagged VLAN

A tagged VLAN uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across bridges - they are not confined to the switch on which they were created. The VLANs can be created statically by hand or dynamically through GVRP. The VLAN ID associates a frame with a specific VLAN and provides the information that switches need to process the frame across the network. A tagged frame is four bytes longer than an untagged frame and contains two bytes of TPID (Tag Protocol Identifier), residing within the type/length field of the Ethernet frame) and two bytes of TCI (Tag Control Information), starts after the source address field of the Ethernet frame).

The CFI (Canonical Format Indicator) is a single-bit flag, always set to zero for Ethernet switches. If a frame received at an Ethernet port has a CFI set to 1, then that frame should not be forwarded as it is to an untagged port. The remaining twelve bits define the VLAN ID, giving a possible maximum number of 4,096 VLANs. Note that user priority and VLAN ID are independent of each other. A frame with VID (VLAN Identifier) of null (0) is called a priority frame, meaning that only the priority level is significant and the default VID of the ingress port is given as the VID of the frame. Of the 4096 possible VIDs, a VID of 0 is used to identify priority frames and value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4,094.

TPID	User Priority	CFI	VLAN ID
2 Bytes	3 Bits	1 Bit	12 Bits

Multicast

IP packets are transmitted in either one of 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.

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

At start up, the ZyXEL Device queries all directly connected networks to gather group membership. After that, the ZyXEL Device periodically updates this information.

DNS Server Address Assignment

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

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

1 The ISP tells you the DNS server addresses, usually in the form of an information sheet, when you sign up. If your ISP gives you DNS server addresses, manually enter them in the DNS server fields.

2 If your ISP dynamically assigns the DNS server IP addresses (along with the ZyXEL Device’s WAN IP address), set the DNS server fields to get the DNS server address from the ISP.

3G Comparison Table

See the following table for a comparison between 2G, 2.5G, 2.75G and 3G wireless technologies.

Table 12 2G, 2.5G, 2.75G, 3G and 3.5G Wireless Technologies

NAME	TYPE	MOBILE PHONE AND DATA STANDARDS		DATA SPEED
		GSM-BASED	CDMA-BASED	
2G	Circuit-switched	GSM (Global System for Mobile Communications), Personal Handy-phone System (PHS), etc.	Interim Standard 95 (IS-95), the first CDMA-based digital cellular standard pioneered by Qualcomm. The brand name for IS-95 is cdmaOne. IS-95 is also known as TIA-EIA-95.	Slow ↕
2.5G	Packet-switched	GPRS (General Packet Radio Services), High-Speed Circuit-Switched Data (HSCSD), etc.	CDMA2000 is a hybrid 2.5G / 3G protocol of mobile telecommunications standards that use CDMA, a multiple access scheme for digital radio. CDMA2000 1xRTT (1 times Radio Transmission Technology) is the core CDMA2000 wireless air interface standard. It is also known as 1x, 1xRTT, or IS-2000 and considered to be a 2.5G or 2.75G technology.	
2.75G	Packet-switched	Enhanced Data rates for GSM Evolution (EDGE), Enhanced GPRS (EGPRS), etc.		
3G	Packet-switched	UMTS (Universal Mobile Telecommunications System), a third-generation (3G) wireless standard defined in ITU[A] specification, is sometimes marketed as 3GSM. The UMTS uses GSM infrastructures and W-CDMA (Wideband Code Division Multiple Access) as the air interface.	CDMA2000 EV-DO (Evolution-Data Optimized, originally 1x Evolution-Data Only), also referred to as EV-DO, EVDO, or just EV, is an evolution of CDMA2000 1xRTT and enables high-speed wireless connectivity. It is also denoted as IS-856 or High Data Rate (HDR).	
3.5G	Packet-switched	HSDPA (High-Speed Downlink Packet Access) is a mobile telephony protocol, used for UMTS-based 3G networks and allows for higher data transfer speeds.		Fast

[A] The International Telecommunication Union (ITU) is an international organization within which governments and the private sector coordinate global telecom networks and services.

6

Wireless

6.1 Overview

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

6.1.1 What You Can Do in this Chapter

- Use the **General** screen to enable the Wireless LAN, enter the SSID and select the wireless security mode (Section 6.2 on page 121).
- Use the **More AP** screen to set up multiple wireless networks on your ZyXEL Device (Section 6.3 on page 129).
- Use the **WPS** screen to enable or disable WPS, view or generate a security PIN (Personal Identification Number) (Section 6.4 on page 131).
- Use the **WMM** screen to enable Wi-Fi MultiMedia (WMM) to ensure quality of service in wireless networks for multimedia applications (Section 6.5 on page 133).
- Use the **Scheduling** screen to schedule a time period for the wireless LAN to operate each day (Section 6.6 on page 135).

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 some security in the **General** screen.

6.1.2 Wireless Network Overview

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

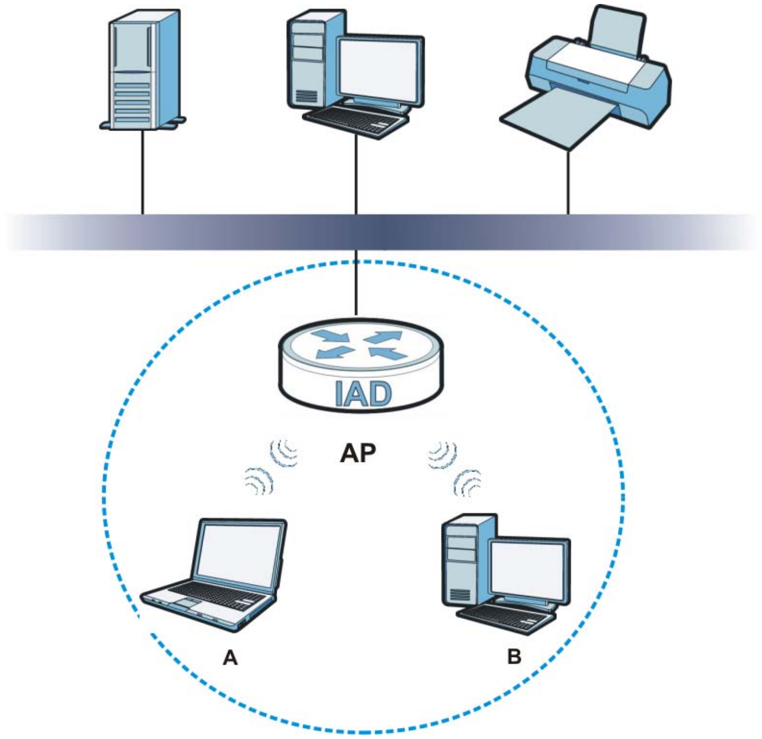
- A wireless client is a radio connected to a user's computer.
- An access point is a radio with a wired connection to a network, which can connect with numerous wireless clients and let them access the network.
- A bridge is a radio that relays communications between access points and wireless clients, 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 22 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.

6.1.3 Before You Begin

Before you start using these screens, ask yourself the following questions. See Section 6.7 on page 135 if some of the terms used here do not make sense to you.

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

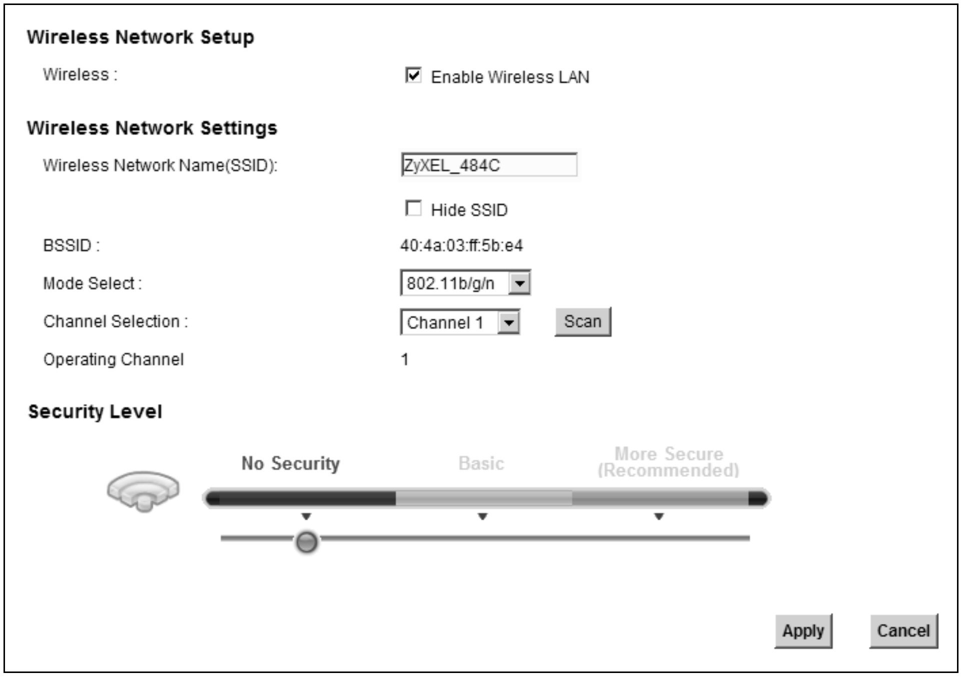
  Even if some of your devices support WPS and some do not, you can use WPS to set up your network and then add the non-WPS devices manually, although this is somewhat more complicated to do.
- What advanced options do you want to configure, if any? If you want to configure advanced options, ensure that you know precisely what you want to do. If you do not want to configure advanced options, leave them alone.

6.2 The Wireless General Screen

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode.

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.

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



Wireless Network Setup

Wireless : ☑ Enable Wireless LAN

Wireless Network Settings

Wireless Network Name(SSID): ZyXEL_484C

□ Hide SSID

BSSID : 40:4a:03:ff:5b:e4

Mode Select : 802.11b/g/n

Channel Selection : Channel 1

Operating Channel 1

Security Level

Figure 23 Network Setting > Wireless > General

The following table describes the labels in this screen.

Table 13 Network > Wireless LAN > General

LABEL	DESCRIPTION
Wireless Network Setup	
Wireless	Select the **Enable Wireless LAN** check box to activate the wireless LAN.
Wireless Network Settings	
Wireless 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 English keyboard characters) for the wireless LAN.
Hide SSID	Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.
BSSID	This shows the MAC address of the wireless interface on the ZyXEL Device when wireless LAN is enabled.

Table 13 Network > Wireless LAN > General (continued)

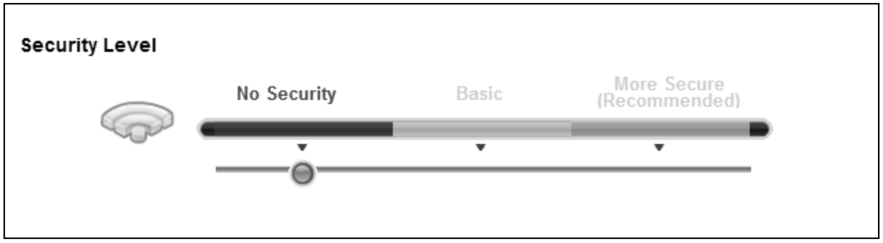
LABEL	DESCRIPTION
Mode Select	This makes sure that only compliant WLAN devices can associate with the ZyXEL Device. Select **802.11b/g/n** to allow IEEE802.11b, IEEE802.11g and IEEE802.11n compliant WLAN devices to associate with the ZyXEL Device. The transmission rate of your ZyXEL Device might be reduced. Select **802.11b/g** to allow both IEEE802.11b and IEEE802.11g compliant WLAN devices to associate with the ZyXEL Device. The transmission rate of your ZyXEL Device might be reduced. Select **802.11g Only** to allow only IEEE 802.11g compliant WLAN devices to associate with the ZyXEL Device. Select **802.11n only in 2.4G band** to allow only IEEE 802.11n compliant WLAN devices with the same frequency range (2.4 GHz) to associate with the ZyXEL Device.
Channel Selection	Set the channel depending on your particular region. Select a channel or use **Auto** to have the ZyXEL Device automatically determine a channel to use. If you are having problems with wireless interference, changing the channel may help. Try to use a channel that is as many channels away from any channels used by neighboring APs as possible. The channel number which the ZyXEL Device is currently using then displays in the **Operating Channel** field.
Scan	Click this button to have the ZyXEL Device immediately scan for and select a channel (which is not used by another device) whenever the device reboots or the wireless setting is changed.
Operating Channel	This is the channel currently being used by your AP.
Security Level	
Security Mode	Select **Basic** or **More Secure** to add security on this wireless network. The wireless clients which want to associate to this network must have same wireless security settings as the ZyXEL Device. When you select to use a security, additional options appears in this screen. Or you can select **No Security** to allow any client to associate this network without any data encryption or authentication. See the following sections for more details about wireless security modes.
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to restore your previously saved settings.

6.2.1 No Security

Select **No Security** to allow wireless stations to communicate with the access points 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 24 Wireless > General: No Security



The following table describes the labels in this screen.

Table 14 Wireless > General: No Security

LABEL	DESCRIPTION
Security Level	Choose **No Security** from the sliding bar.

6.2.2 Basic (Static WEP/Shared WEP Encryption)

WEP encryption scrambles the data transmitted between the wireless stations and the access points (AP) to keep network communications private. Both the wireless stations and the access points must use the same WEP key.

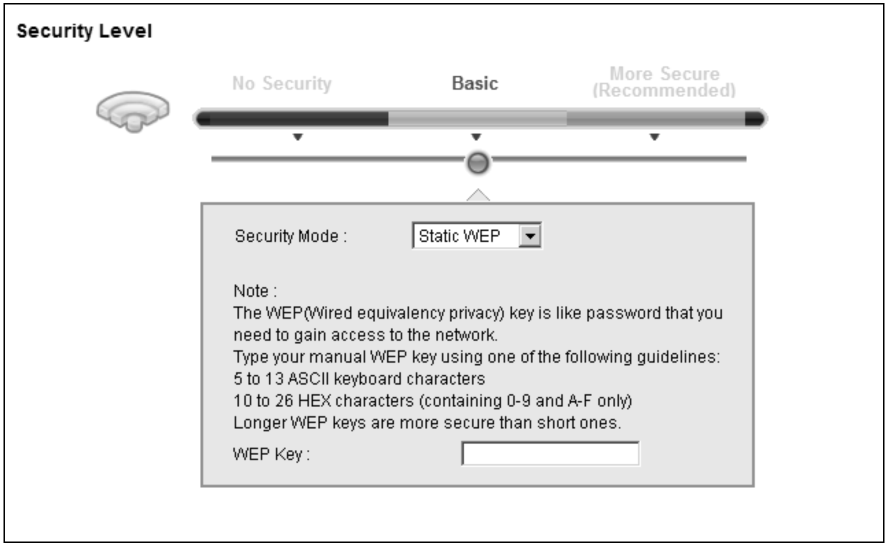
There are two types of WEP authentication namely, Open System (**Static WEP**) and Shared Key (**Shared WEP**).

Open system is implemented for ease-of-use and when security is not an issue. The wireless station and the AP or peer computer do not share a secret key. Thus the wireless stations can associate with any AP or peer computer and listen to any transmitted data that is not encrypted.

Shared key mode involves a shared secret key to authenticate the wireless station to the AP or peer computer. This requires you to enable the wireless LAN security and use same settings on both the wireless station and the AP or peer computer.

In order to configure and enable WEP encryption, click **Network Settings > Wireless** to display the **General** screen. Select **Basic** as the security level. Then select **Static WEP** or **Shared WEP** from the **Security Mode** list.

Figure 25 Wireless > General: Basic (Static WEP/Shared WEP)



Security Mode : Static WEP

Note :
The WEP(Wired equivalency privacy) key is like password that you need to gain access to the network.
Type your manual WEP key using one of the following guidelines:
5 to 13 ASCII keyboard characters
10 to 26 HEX characters (containing 0-9 and A-F only)
Longer WEP keys are more secure than short ones.

WEP Key :

The following table describes the labels in this screen.

Table 15 Wireless > General: Basic (Static WEP/Shared WEP)

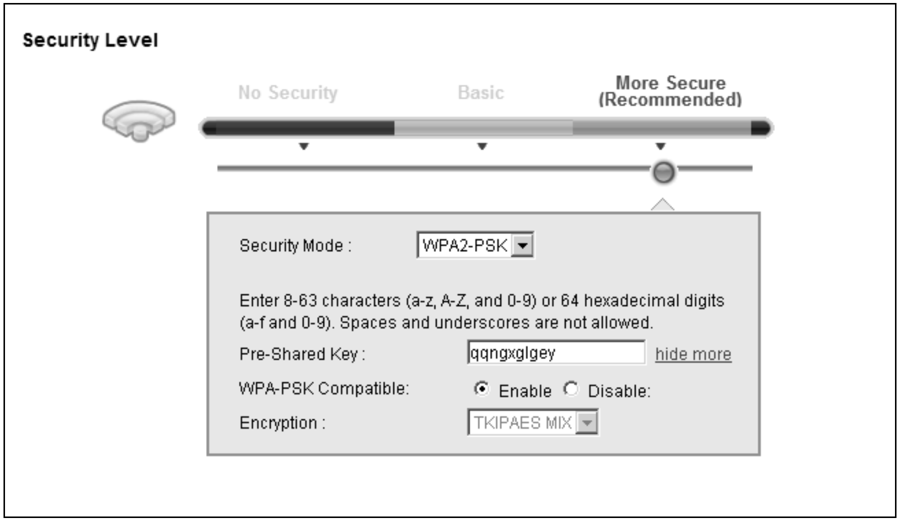
LABEL	DESCRIPTION
Security Mode	Choose **Static WEP** or **Shared WEP** from the drop-down list box. • Select **Static WEP** to have the ZyXEL Device allow association with wireless clients that use Open System mode. Data transfer is encrypted as long as the wireless client has the correct WEP key for encryption. The ZyXEL Device authenticates wireless clients using Shared Key mode that have the correct WEP key. • Select **Shared WEP** to have the ZyXEL Device authenticate only those wireless clients that use Shared Key mode and have the correct WEP key.
WEP Key	Enter a WEP key that will be 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.

6.2.3 More Secure (WPA(2)-PSK)

The WPA-PSK security mode provides both improved data encryption and user authentication over WEP. Using a Pre-Shared Key (PSK), both the ZyXEL Device and the connecting client share a common password in order to validate the connection. This type of encryption, while robust, is not as strong as WPA, WPA2 or even WPA2-PSK. The WPA2-PSK security mode is a newer, more robust version of the WPA encryption standard. It offers slightly better security, although the use of PSK makes it less robust than it could be.

Click **Network Settings** > **Wireless** to display the **General** screen. Select **More Secure** as the security level. Then select **WPA-PSK** or **WPA2-PSK** from the **Security Mode** list.

Figure 26 Wireless > General: More Secure: WPA(2)-PSK



Security Level

Security Mode : WPA2-PSK

Enter 8-63 characters (a-z, A-Z, and 0-9) or 64 hexadecimal digits (a-f and 0-9). Spaces and underscores are not allowed.

Pre-Shared Key : qqngxglgey

WPA-PSK Compatible: ● Enable ○ Disable:

Encryption : TKIPAES MIX

The following table describes the labels in this screen.

Table 16 Wireless > General: WPA(2)-PSK

LABEL	DESCRIPTION
Security Level	Select **More Secure** to enable WPA(2)-PSK data encryption.
Security Mode	Select **WPA-PSK** or **WPA2-PSK** from the drop-down list box.
Pre-Shared Key	The encryption mechanisms used for **WPA/WPA2** and **WPA-PSK/ WPA2-PSK** are the same. The only difference between the two is that **WPA-PSK/WPA2-PSK** uses a simple common password, instead of user-specific credentials. Type a pre-shared key from 8 to 63 case-sensitive ASCII characters or 64 hexidecimal digits.
more.../hide more	Click **more...** to show more fields in this section. Click **hide more** to hide them.

Table 16 Wireless > General: WPA(2)-PSK (continued)

LABEL	DESCRIPTION
WPA-PSK Compatible	This field appears when you choose **WPA-PSK2** as the **Security Mode**. Check this field to allow wireless devices using **WPA-PSK** security mode to connect to your ZyXEL Device. The ZyXEL Device supports WPA-PSK and WPA2-PSK simultaneously.
Encryption	If the security mode is **WPA-PSK**, the encryption mode is set to **TKIP** to enable Temporal Key Integrity Protocol (TKIP) security on your wireless network. If the security mode is **WPA-PSK2** and **WPA-PSK Compatible** is disabled, the encryption mode is set to **AES** to enable Advanced Encryption System (AES) security on your wireless network. AES provides superior security to TKIP. If the security mode is **WPA-PSK2** and **WPA-PSK Compatible** is enabled, the encryption mode is set to **TKIPAES MIX** to allow both TKIP and AES types of security in your wireless network.

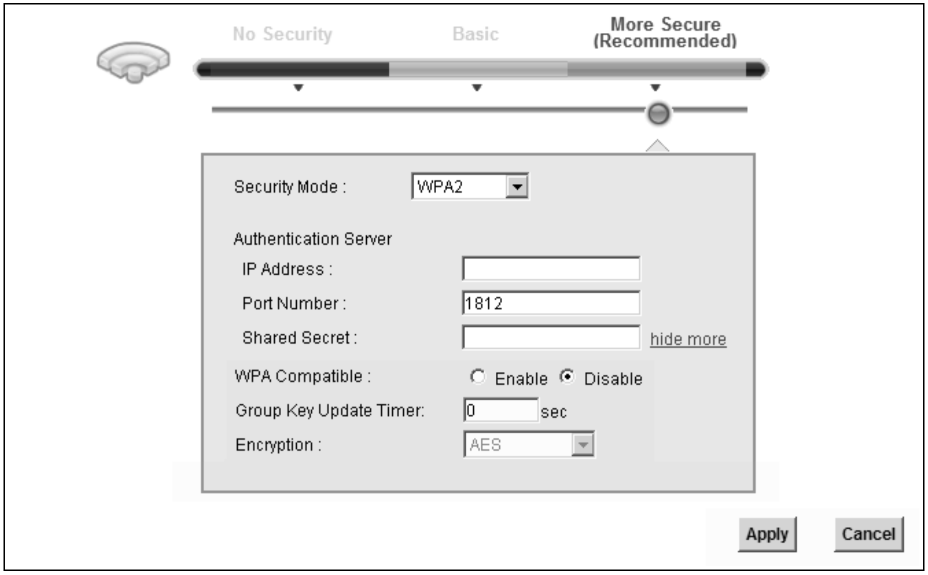
6.2.4 WPA(2) Authentication

The WPA2 security mode is currently the most robust form of encryption for wireless networks. It requires a RADIUS server to authenticate user credentials and is a full implementation the security protocol. Use this security option for maximum protection of your network. However, it is the least backwards compatible with older devices.

The WPA security mode is a security subset of WPA2. It requires the presence of a RADIUS server on your network in order to validate user credentials. This encryption standard is slightly older than WPA2 and therefore is more compatible with older devices.

Click **Network Settings** > **Wireless** to display the **General** screen. Select **More Secure** as the security level. Then select **WPA** or **WPA2** from the **Security Mode** list.

Figure 27 Wireless > General: More Secure: WPA(2)



Security Mode : WPA2

Authentication Server

IP Address :

Port Number : 1812

Shared Secret :

WPA Compatible : ○ Enable ● Disable

Group Key Update Timer: 0 sec

Encryption : AES

The following table describes the labels in this screen.

Table 17 Wireless > General: More Secure: WPA(2)

LABEL	DESCRIPTION
Security Level	Select **More Secure** to enable WPA(2)-PSK data encryption.
Security Mode	Choose **WPA** or **WPA2** from the drop-down list box.
Authentication Server	
IP Address	Enter the IP address of the external authentication server in dotted decimal notation.
Port Number	Enter the port number of the external authentication server. The default port number is **1812**. You need not change this value unless your network administrator instructs you to do so with additional information.
Shared Secret	Enter a password (up to 31 alphanumeric characters) as the key to be shared between the external authentication server and the ZyXEL Device. The key must be the same on the external authentication server and your ZyXEL Device. The key is not sent over the network.
more.../hide more	Click **more...** to show more fields in this section. Click **hide more** to hide them.
WPA Compatible	This field is only available for WPA2. Select this if you want the ZyXEL Device to support WPA and WPA2 simultaneously.

Table 17 Wireless > General: More Secure: WPA(2) (continued)

LABEL	DESCRIPTION
Group Key Update Timer	The **Group Key Update Timer** is the rate at which the RADIUS server sends a new group key out to all clients.
Encryption	If the security mode is **WPA**, the encryption mode is set to **TKIP** to enable Temporal Key Integrity Protocol (TKIP) security on your wireless network. If the security mode is **WPA2** and **WPA Compatible** is disabled, the encryption mode is set to **AES** to enable Advanced Encryption System (AES) security on your wireless network. AES provides superior security to TKIP. If the security mode is **WPA2** and **WPA Compatible** is enabled, the encryption mode is set to **TKIPAES MIX** to allow the wireless clients to use either TKIP or AES.

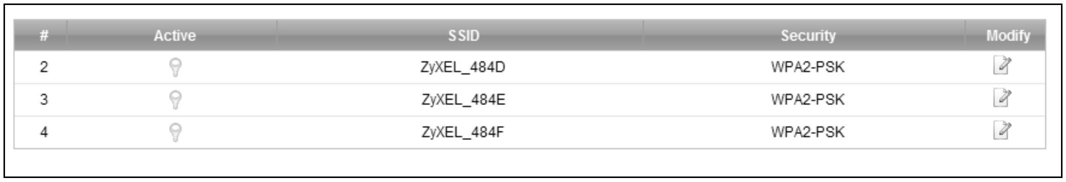
6.3 The More AP Screen

The ZyXEL Device can broadcast up to four wireless network names at the same time. This means that users can connect to the ZyXEL Device using different SSIDs. You can secure the connection on each SSID profile so that wireless clients connecting to the ZyXEL Device using different SSIDs cannot communicate with each other.

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

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

Figure 28 Network Settings > Wireless > More AP



#	Active	SSID	Security	Modify
2	💡	ZyXEL_484D	WPA2-PSK	✎
3	💡	ZyXEL_484E	WPA2-PSK	✎
4	💡	ZyXEL_484F	WPA2-PSK	✎

The following table describes the labels in this screen.

Table 18 Network Settings > Wireless > More AP

LABEL	DESCRIPTION
#	This is the index number of the entry.
Active	This field indicates whether this SSID is active. A yellow bulb signifies that this SSID is active. A gray bulb signifies that this SSID is not active.

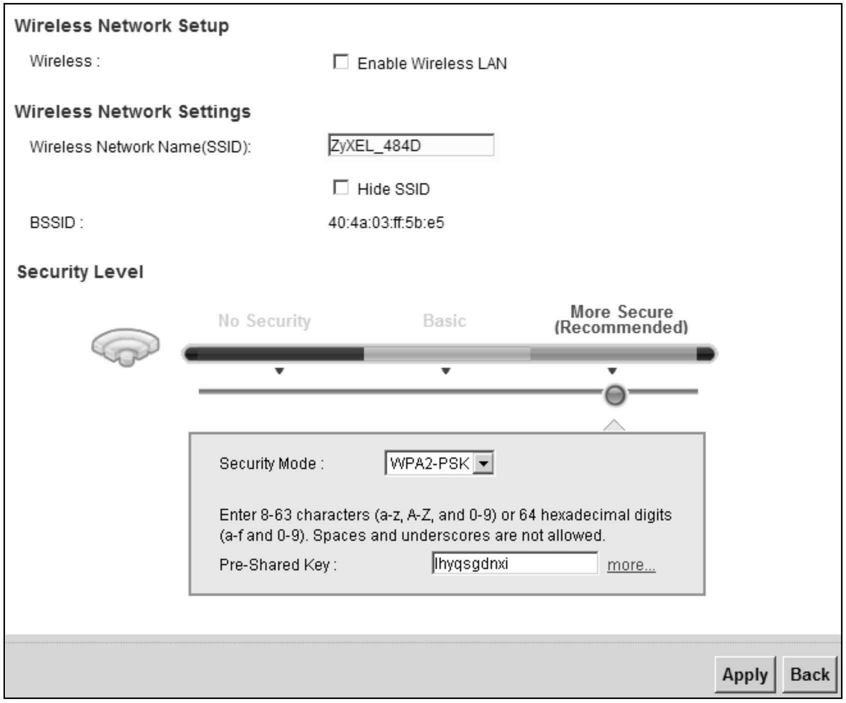
Table 18 Network Settings > Wireless > More AP (continued)

LABEL	DESCRIPTION
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.

6.3.1 Edit More AP

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 29 Wireless > More AP: Edit



Wireless Network Setup

Wireless : □ Enable Wireless LAN

Wireless Network Settings

Wireless Network Name(SSID): ZyXEL_484D

□ Hide SSID

BSSID : 40:4a:03:ff:5b:e5

Security Level

Security Mode : WPA2-PSK

Enter 8-63 characters (a-z, A-Z, and 0-9) or 64 hexadecimal digits (a-f and 0-9). Spaces and underscores are not allowed.

Pre-Shared Key : lhyqsgdnxi

The following table describes the fields in this screen.

Table 19 Wireless > More AP: Edit

LABEL	DESCRIPTION
Wireless Network Setup	
Wireless	Select the **Enable Wireless LAN** check box to activate the wireless LAN.
Wireless Network Settings	

Table 19 Wireless > More AP: Edit (continued)

LABEL	DESCRIPTION
Wireless 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 English keyboard characters) for the wireless LAN.
Hide SSID	Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.
BSSID	This shows the MAC address of the wireless interface on the ZyXEL Device when wireless LAN is enabled.
Security Level	
Security Mode	Select **Basic (WEP)** or **More Secure (WPA(2)-PSK, WPA(2))** to add security on this wireless network. The wireless clients which want to associate to this network must have same wireless security settings as the ZyXEL Device. After you select to use a security, additional options appears in this screen. Or you can select **No Security** to allow any client to associate this network without any data encryption or authentication. See Section 6.2.1 on page 123 for more details about this field.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to exit this screen without saving.

6.4 The WPS Screen

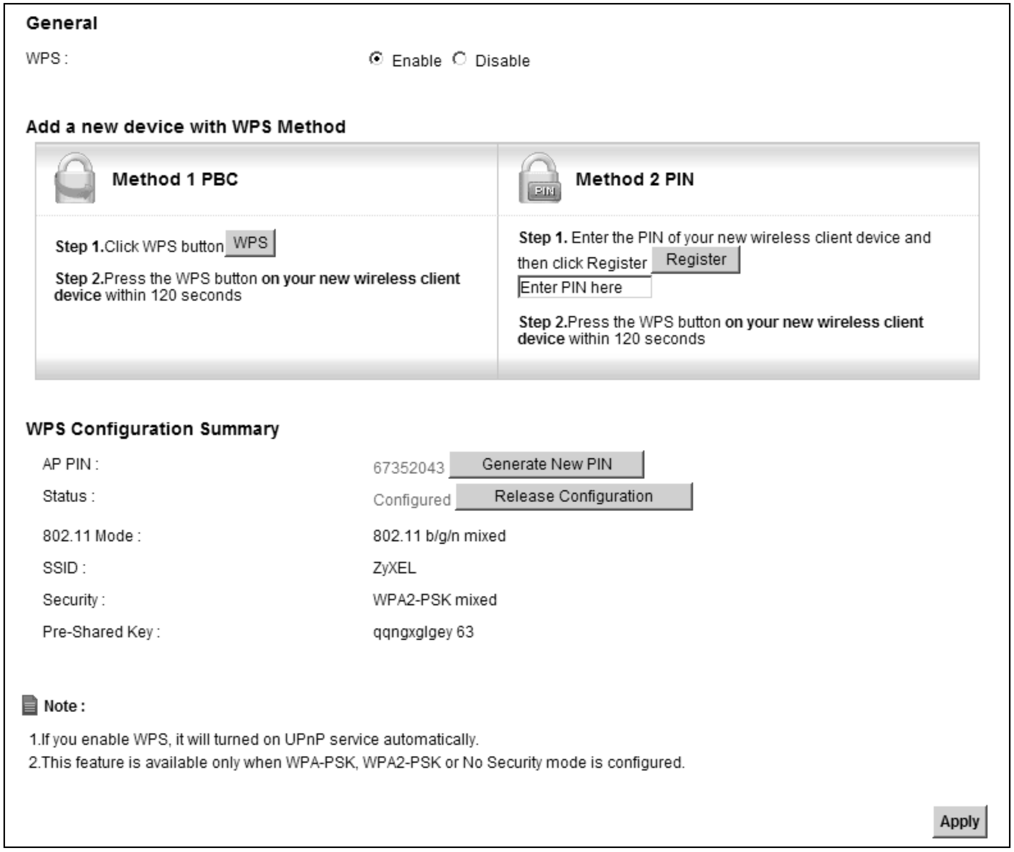
Use this screen to configure WiFi Protected Setup (WPS) on your ZyXEL Device.

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. See Section 6.7.6.3 on page 143 for more information about WPS.

Note: The ZyXEL Device applies the security settings of the **SSID1** profile (see Section 6.2 on page 121). If you want to use the WPS feature, make sure you have set the security mode of **SSID1** to **WPA-PSK**, **WPA2-PSK** or **No Security**.

Click **Network Setting > Wireless > WPS**. The following screen displays. Select **Enable** and click **Apply** to activate the WPS function. You can configure the WPS settings in this screen.

Figure 30 Network Setting > Wireless > WPS



General

WPS : ● Enable ○ Disable

Add a new device with WPS Method

Method 1 PBC

Step 1. Click WPS button WPS

Step 2. Press the WPS button **on your new wireless client device** within 120 seconds

Method 2 PIN

Step 1. Enter the PIN of your new wireless client device and then click Register Register

Enter PIN here

Step 2. Press the WPS button **on your new wireless client device** within 120 seconds

WPS Configuration Summary

AP PIN :	67352043 Generate New PIN
Status :	Configured Release Configuration
802.11 Mode :	802.11 b/g/n mixed
SSID :	ZyXEL
Security :	WPA2-PSK mixed
Pre-Shared Key :	qqngxglgey 63

Note :

1.If you enable WPS, it will turned on UPnP service automatically.

2.This feature is available only when WPA-PSK, WPA2-PSK or No Security mode is configured.

The following table describes the labels in this screen.

Table 20 Network Setting > Wireless > WPS

LABEL	DESCRIPTION
Enable WPS	Select **Enable** to activate WPS on the ZyXEL Device.
Add a new device with WPS Method	
Method 1PBC	Use this section to set up a WPS wireless network using Push Button Configuration (PBC).
WPS	Click this button 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 **WPS** button on this screen. Note: You must press the other wireless device's WPS button within two minutes of pressing this button.
Method 2 PIN	Use this section to set up a WPS wireless network by entering the PIN (Personal Identification Number) of the client into the ZyXEL Device.

Table 20 Network Setting > Wireless > WPS (continued)

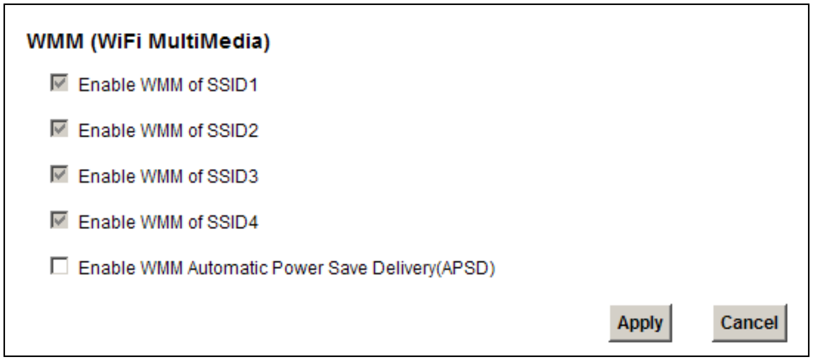
LABEL	DESCRIPTION
Register	Enter the PIN of the device that you are setting up a WPS connection with and click **Register** to authenticate and add the wireless device to your wireless network. You can find the PIN either on the outside of the device, or by checking the device's settings. Note: You must also activate WPS on that device within two minutes to have it present its PIN to the ZyXEL Device.
WPS Configuration Summary	
AP PIN	The PIN of the ZyXEL Device is shown here. 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. Click the **Generate New PIN** button to have the ZyXEL Device create a new PIN.
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 **Not Configured** when there is no wireless or wireless security changes on the ZyXEL Device or you click **Release Configuration** to remove the configured wireless and wireless security settings.
Release Configuration	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.
802.11 Mode	This is the 802.11 mode used. Only compliant WLAN devices can associate with the ZyXEL Device.
SSID	This is the name of the wireless network.
Security	This is the type of wireless security employed by the network.
Apply	Click **Apply** to save your changes.

6.5 The WMM Screen

Use this screen to enable or disable Wi-Fi MultiMedia (WMM) wireless networks for multimedia applications.

Click **Network Setting > Wireless > WMM**. The following screen displays.

Figure 31 Network Setting > Wireless > WMM



WMM (WiFi MultiMedia)

☑ Enable WMM of SSID1

☑ Enable WMM of SSID2

☑ Enable WMM of SSID3

☑ Enable WMM of SSID4

☐ Enable WMM Automatic Power Save Delivery(APSD)

The following table describes the labels in this screen.

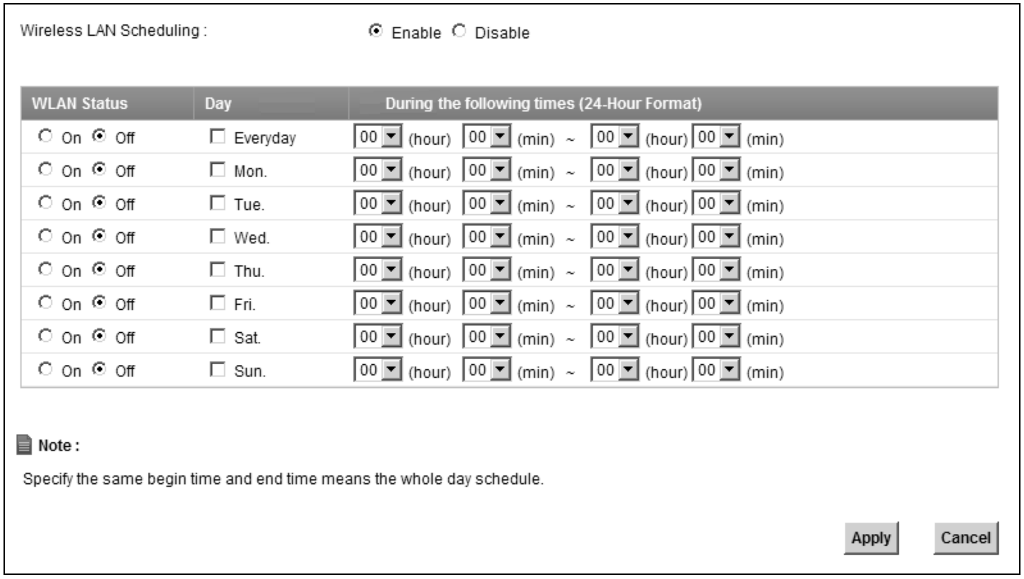
Table 21 Network Setting > Wireless > WMM

LABEL	DESCRIPTION
Enable WMM of SSID1~4	This enables the ZyXEL Device to automatically give a service a priority level according to the ToS value in the IP header of packets it sends. WMM QoS (Wifi MultiMedia Quality of Service) gives high priority to voice and video, which makes them run more smoothly.
Enable WMM Automatic Power Save Deliver (APSD)	Click this to increase battery life for battery-powered wireless clients. APSD uses a longer beacon interval when transmitting traffic that does not require a short packet exchange interval.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to restore your previously saved settings.

6.6 Scheduling Screen

Click **Network Setting > Wireless > Scheduling** to open the **Wireless LAN Scheduling** screen. Use this screen to configure when the ZyXEL Device enables or disables the wireless LAN.

Figure 32 Network Setting > Wireless > Scheduling



Wireless LAN Scheduling : ● Enable ○ Disable

WLAN Status	Day	During the following times (24-Hour Format)
○ On ● Off	□ Everyday	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
○ On ● Off	□ Mon.	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
○ On ● Off	□ Tue.	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
○ On ● Off	□ Wed.	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
○ On ● Off	□ Thu.	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
○ On ● Off	□ Fri.	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
○ On ● Off	□ Sat.	00 (hour) 00 (min) ~ 00 (hour) 00 (min)
○ On ● Off	□ Sun.	00 (hour) 00 (min) ~ 00 (hour) 00 (min)

Note :

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

The following table describes the labels in this screen.

Table 22 Network Setting > Wireless > Scheduling

LABEL	DESCRIPTION
Wireless LAN Scheduling	Select **Enable** to activate wireless LAN scheduling on your ZyXEL Device.
WLAN status	Select **On** or **Off** to enable or disable the wireless LAN.
Day	Select the day(s) you want to turn the wireless LAN on or off.
During the following times	Specify the time period during which to apply the schedule. For example, you want the wireless network to be only available during work hours. Check Mon ~ Fri in the day column, and specify 8:00 ~ 18:00 in the time table.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to restore your previously saved settings.

6.7 Technical Reference

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

6.7.1 Additional Wireless Terms

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

Table 23 Additional Wireless Terms

TERM	DESCRIPTION
RTS/CTS Threshold	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. 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. 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.
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.

6.7.2 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.

6.7.2.1 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.

6.7.2.2 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 characters[2]; 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.

6.7.2.3 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.

6.7.2.4 Encryption

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

The types of encryption you can choose depend on the type of authentication. (See Section 6.7.2.3 on page 138 for information about this.)

Table 24 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.

6.7.3 Signal Problems

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

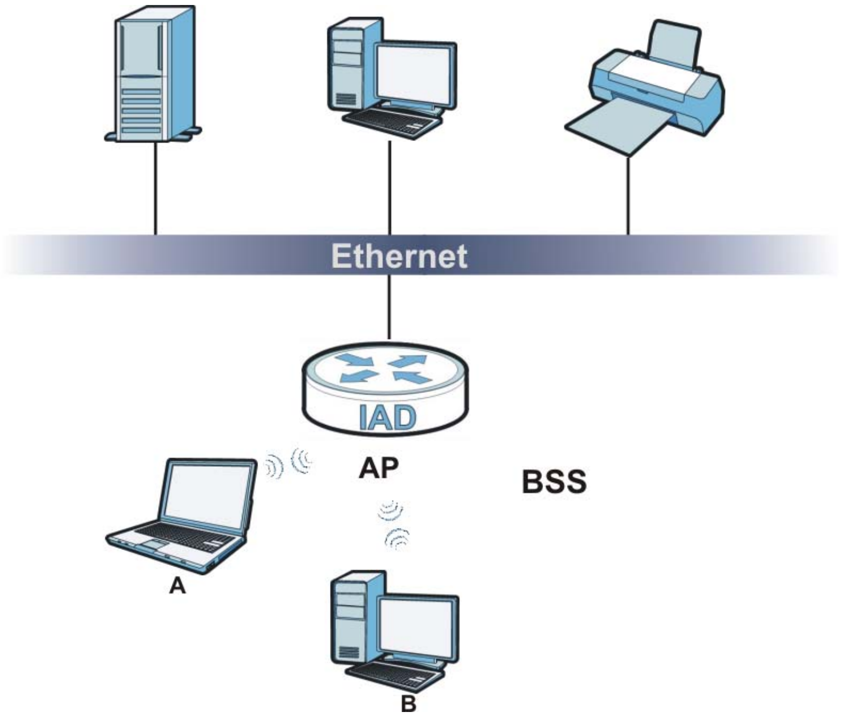
Problems with distance occur when the two radios are too far apart. Problems with interference occur when other radio waves interrupt the data signal. Interference may come from other radio transmissions, such as military or air traffic control communications, or from machines that are coincidental emitters 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.

6.7.4 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 33 Basic Service set



6.7.5 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.

6.7.5.1 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.

6.7.6 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.

6.7.6.1 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 6.4 on page 131).

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.

6.7.6.2 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.

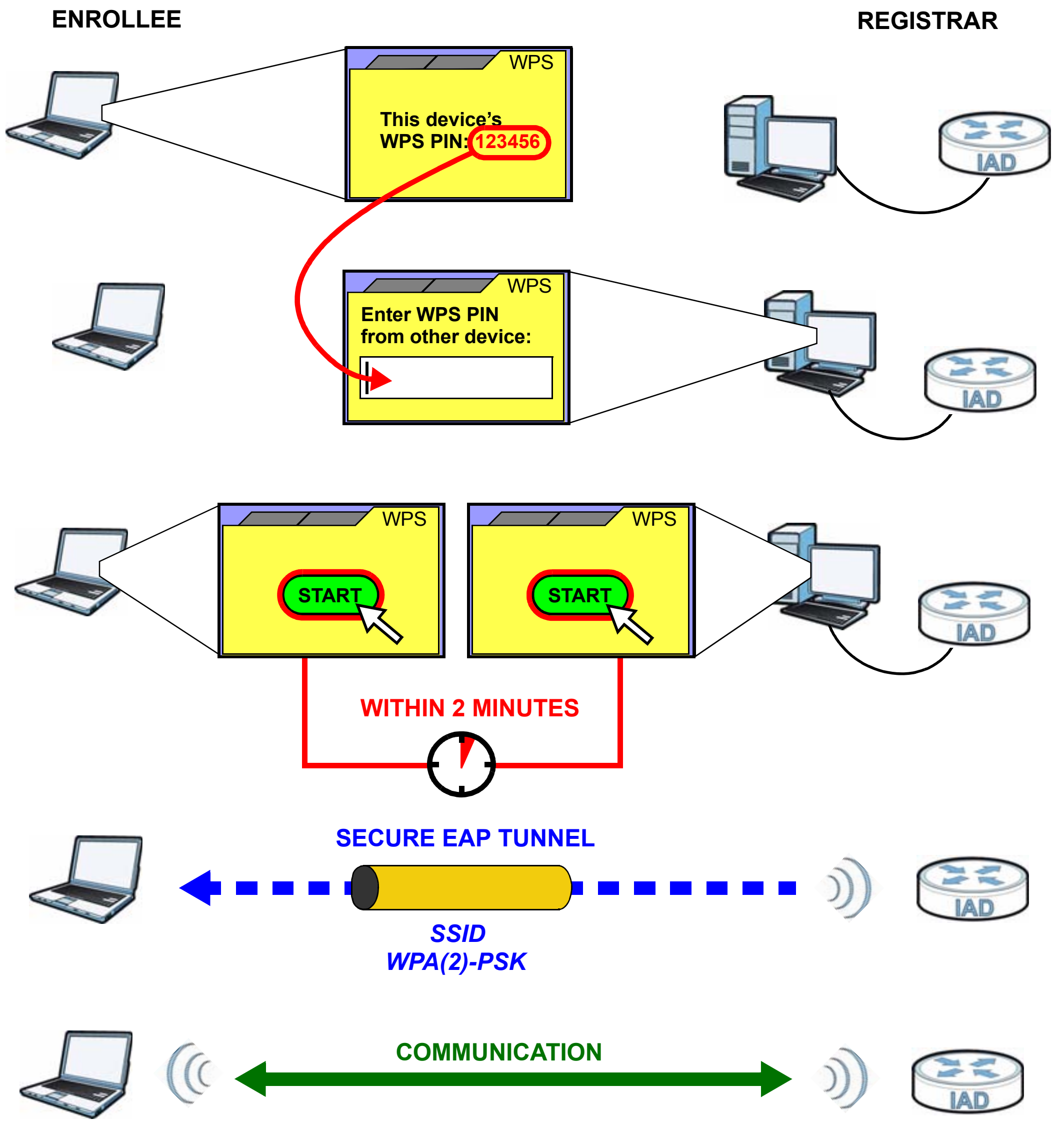
Take the following steps to set up a WPS connection between an access point or wireless router (referred to here as the AP) and a client device using the PIN method.

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 6.4 on page 131).
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 34 Example WPS Process: PIN Method

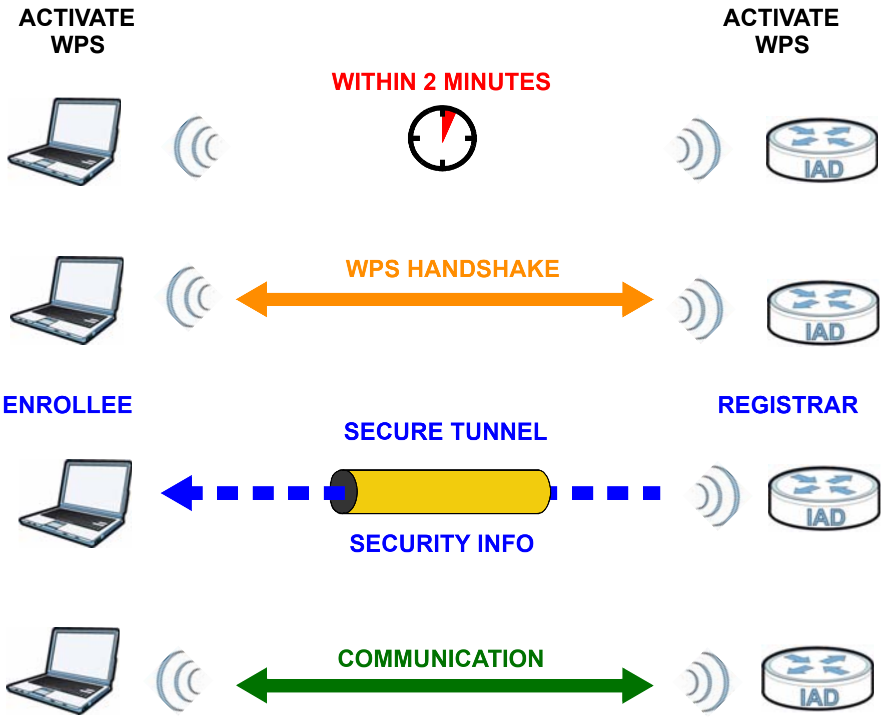


6.7.6.3 How WPS Works

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 35 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.

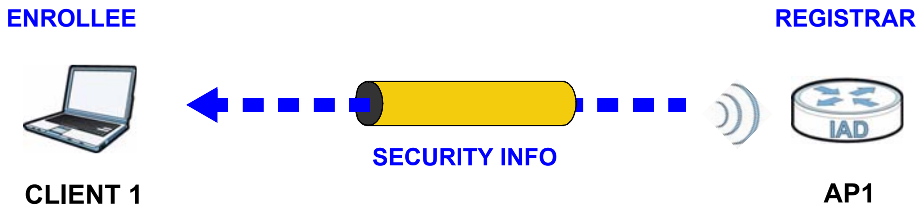
By default, a WPS devices is “unconfigured”. This means that it is not part of an existing network and can act as either enrollee or registrar (if it supports both functions). If the registrar is unconfigured, the security settings it transmits to the enrollee are randomly-generated. Once a WPS-enabled 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.

6.7.6.4 Example WPS Network Setup

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

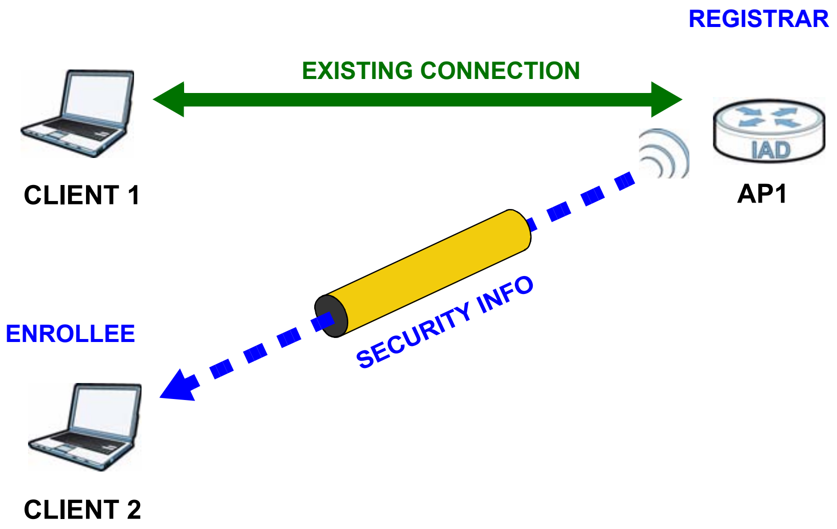
The following figure shows an example network. In step **1**, both **AP1** and **Client 1** are unconfigured. When WPS is activated on both, they perform the handshake. In this example, **AP1** is the registrar, and **Client 1** is the enrollee. The registrar randomly generates the security information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

Figure 36 WPS: Example Network Step 1



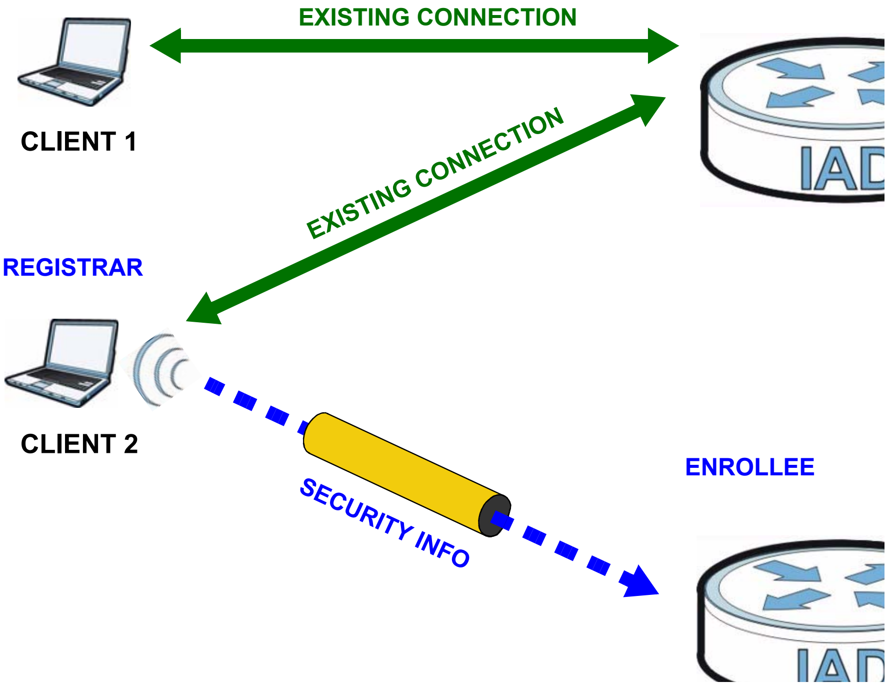
In step **2**, you add another wireless client to the network. You know that **Client 1** supports registrar mode, but it is better to use **AP1** for the WPS handshake with the new client since you must connect to the access point anyway in order to use the network. In this case, **AP1** must be the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

Figure 37 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 38 WPS: Example Network Step 3



6.7.6.5 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.

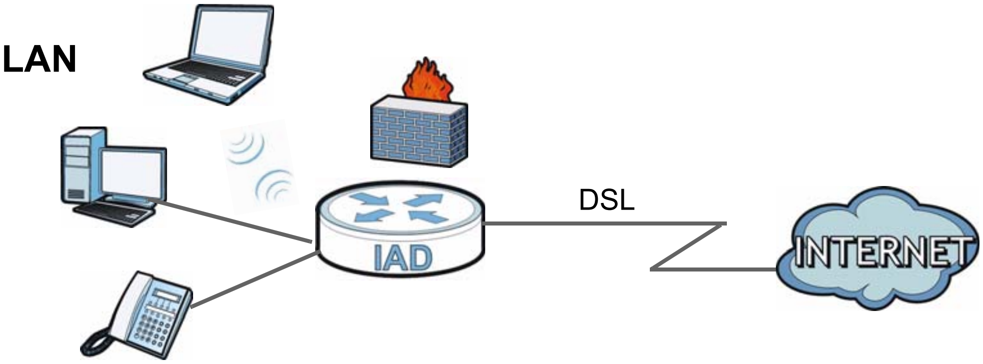
7

Home Networking

7.1 Overview

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

The LAN screens can help you configure a LAN DHCP server and manage IP addresses.



7.1.1 What You Can Do in this Chapter

- Use the **LAN IP** screen to set the LAN IP address, subnet mask, and DHCP settings (Section 7.2 on page 153).
- Use the **DHCP Server** screen to configure the DNS server information that the ZyXEL Device sends to the DHCP client devices on the LAN (Section 7.3 on page 154).
- Use the **UPnP** screen to enable UPnP (Section 7.4 on page 156).
- Use the **File Sharing** screen to enable file-sharing server (Section 7.5 on page 157).
- Use the **Printer Server** screen to enable the print server (Section 7.6 on page 160).

7.1.2 What You Need To Know

The following terms and concepts may help as you read this chapter.

7.1.2.1 About LAN

IP Address

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. This is known as an Internet Protocol address.

Subnet Mask

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.

DHCP

DHCP (Dynamic Host Configuration Protocol) allows clients to obtain TCP/IP configuration at start-up from a server. This ZyXEL Device has a built-in DHCP server capability that assigns IP addresses and DNS servers to systems that support DHCP client capability.

DNS

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.

7.1.2.2 About UPnP

How do I know if I'm using UPnP?

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

Cautions with UPnP

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

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

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

UPnP and ZyXEL

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

See Section 7.8 on page 165 for examples of installing and using UPnP.

7.1.2.3 About File Sharing

User Account

This gives you access to the file sharing server. It includes your user name and password.

Workgroup name

This is the name given to a set of computers that are connected on a network and share resources such as a printer or files. Windows automatically assigns the workgroup name when you set up a network.

Shares

When settings are set to default, each USB device connected to the ZyXEL Device is given a folder, called a “share”. If a USB hard drive connected to the ZyXEL Device has more than one partition, then each partition will be allocated a share. You can also configure a “share” to be a sub-folder or file on the USB device.

File Systems

A file system is a way of storing and organizing files on your hard drive and storage device. Often different operating systems such as Windows or Linux have different file systems. The file sharing feature on your ZyXEL Device supports File Allocation Table (FAT), FAT32, and New Technology File System (NTFS).

Common Internet File System

The ZyXEL Device uses Common Internet File System (CIFS) protocol for its file sharing functions. CIFS compatible computers can access the USB file storage devices connected to the ZyXEL Device. CIFS protocol is supported on Microsoft Windows, Linux Samba and other operating systems (refer to your systems specifications for CIFS compatibility).

7.1.2.4 About Printer Server

Print Server

This is a computer or other device which manages one or more printers, and which sends print jobs to each printer from the computer itself or other devices.

Operating System

An operating system (OS) is the interface which helps you manage a computer. Common examples are Microsoft Windows, Mac OS or Linux.

TCP/IP

TCP/IP (Transmission Control Protocol/ Internet Protocol) is a set of communications protocols that most of the Internet runs on.

Port

A port maps a network service such as http to a process running on your computer, such as a process run by your web browser. When traffic from the Internet is received on your computer, the port number is used to identify which process running on your computer it is intended for.

Supported OSs

Your operating system must support TCP/IP ports for printing and be compatible with the RAW protocol.

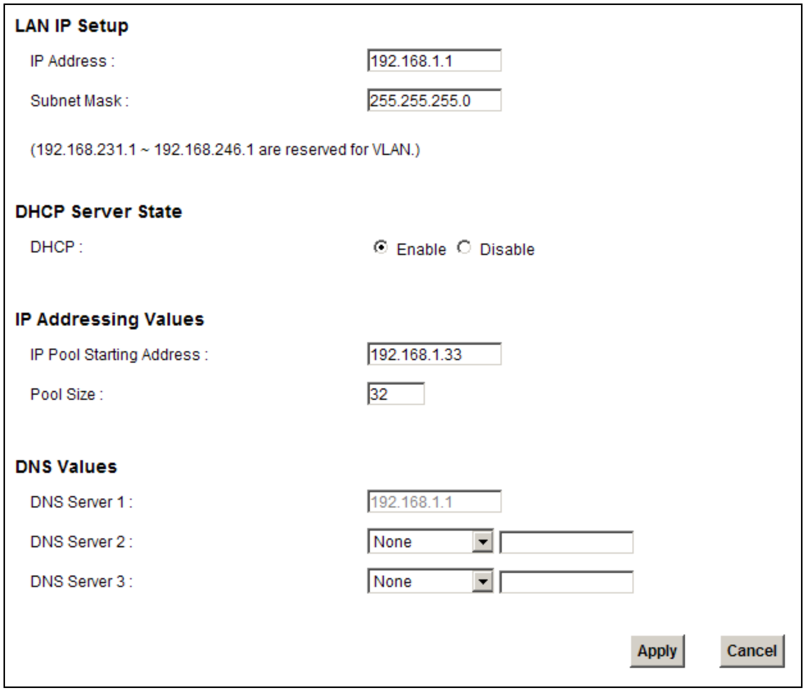
The following OSs support ZyXEL Device’s printer sharing feature.

- Microsoft Windows 95, Windows 98 SE (Second Edition), Windows Me, Windows NT 4.0, Windows 2000, Windows XP or Macintosh OS X.

7.2 The LAN Setup Screen

Click **Network Setting > Home Networking** to open the **LAN Setup** screen. Use this screen to set the Local Area Network IP address and subnet mask of your ZyXEL Device and configure the DNS server information that the ZyXEL Device sends to the DHCP client devices on the LAN.

Figure 39 Network Setting > Home Networking > LAN Setup



LAN IP Setup

IP Address : 192.168.1.1

Subnet Mask : 255.255.255.0

(192.168.231.1 ~ 192.168.246.1 are reserved for VLAN.)

DHCP Server State

DHCP : ● Enable ○ Disable

IP Addressing Values

IP Pool Starting Address : 192.168.1.33

Pool Size : 32

DNS Values

DNS Server 1 : 192.168.1.1

DNS Server 2 : None

DNS Server 3 : None

The following table describes the fields in this screen.

Table 25 Network Setting > Home Networking > LAN Setup

LABEL	DESCRIPTION
LAN IP Setup	
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.
DHCP Server State	
DHCP	Select **Enable** to have your ZyXEL Device assign IP addresses, an IP default gateway and DNS servers to LAN computers and other devices that are DHCP clients. If you select **Disable**, you need to manually configure the IP addresses of the computers and other devices on your LAN. When DHCP is used, the following fields need to be set.

Table 25 Network Setting > Home Networking > LAN Setup (continued)

LABEL	DESCRIPTION
IP Addressing Values	
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.
DNS Values	
DNS Server 1-3	Select **From ISP** if your ISP dynamically assigns DNS server information (and the ZyXEL Device's WAN IP address). Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. If you chose **User-Defined**, but leave the IP address set to 0.0.0.0, **User-Defined** changes to **None** after you click **Apply**. If you set a second choice to **User-Defined**, and enter the same IP address, the second **User-Defined** changes to **None** after you click **Apply**. Select **None** if you do not want to configure DNS servers. You must have another DHCP sever on your LAN, or else the computers must have their DNS server addresses manually configured. If you do not configure a DNS server, you must know the IP address of a computer in order to access it.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to restore your previously saved settings.

7.3 The Static DHCP Screen

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

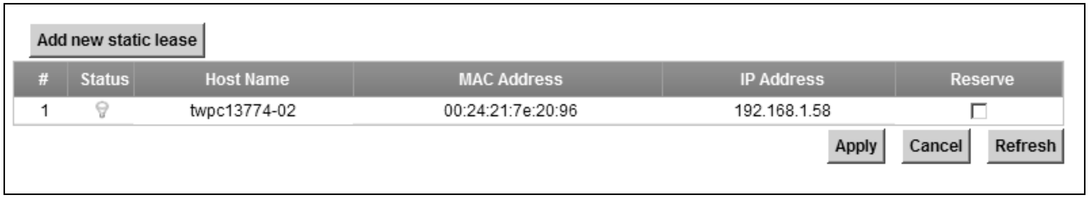
Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02.

7.3.1 Before You Begin

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

Use this screen to change your ZyXEL Device’s static DHCP settings. Click **Network Setting > Home Networking > Static DHCP** to open the following screen.

Figure 40 Network Setting > Home Networking > Static DHCP



#	Status	Host Name	MAC Address	IP Address	Reserve
1		twpc13774-02	00:24:21:7e:20:96	192.168.1.58	□

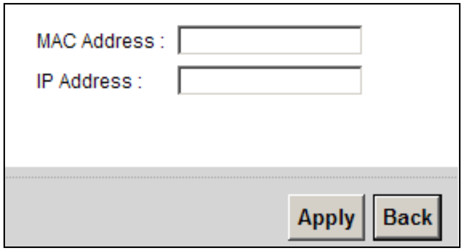
The following table describes the labels in this screen.

Table 26 Network Setting > Home Networking > Static DHCP

LABEL	DESCRIPTION
Add new static lease	Click this to add a new static DHCP entry.
#	This is the index number of the entry.
Status	This field displays whether the client is connected to the ZyXEL Device.
Host Name	This field displays the client host name.
MAC Address	The MAC (Media Access Control) or Ethernet address on a LAN (Local Area Network) is unique to your computer (six pairs of hexadecimal notation). A network interface card such as an Ethernet adapter has a hardwired address that is assigned at the factory. This address follows an industry standard that ensures no other adapter has a similar address.
IP Address	This field displays the IP address relative to the # field listed above.
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 128 entries in this table.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to restore your previously saved settings.
Refresh	Click **Refresh** to reload the DHCP table.

If you click **Add new static lease** in the **Static DHCP** screen, the following screen displays.

Figure 41 Static DHCP: Add



The following table describes the labels in this screen.

Table 27 Static DHCP: Add

LABEL	DESCRIPTION
MAC Address	Enter the MAC address of a computer on your LAN.
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.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to exit this screen without saving.

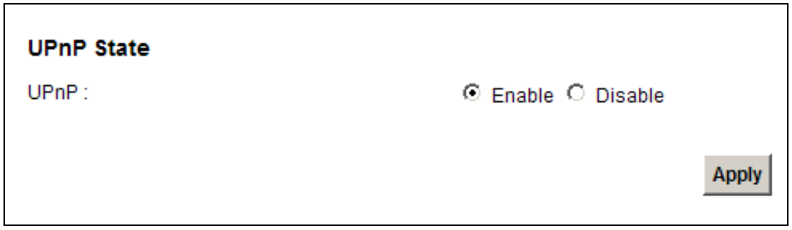
7.4 The UPnP Screen

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

See page 165 for more information on UPnP.

Use the following screen to configure the UPnP settings on your ZyXEL Device. Click **Network Setting > Home Networking > Static DHCP > UPnP** to display the screen shown next.

Figure 42 Network Setting > Home Networking > UPnP



UPnP State

UPnP : ● Enable ○ Disable

The following table describes the labels in this screen.

Table 28 Network Settings > Home Networking > UPnP

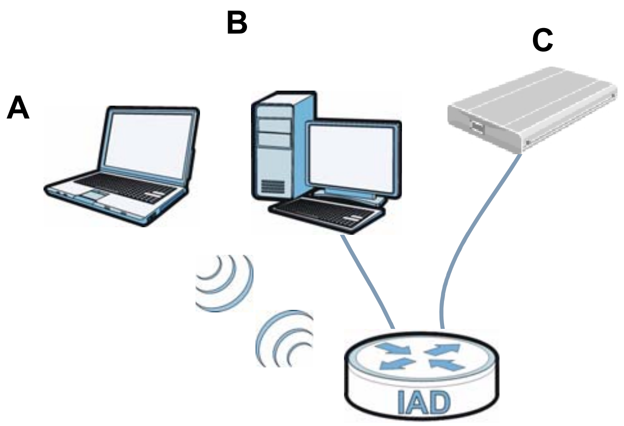
LABEL	DESCRIPTION
UPnP	Select **Enable** to activate UPnP. Be aware that anyone could use a UPnP application to open the web configurator's login screen without entering the ZyXEL Device's IP address (although you must still enter the password to access the web configurator).
Apply	Click **Apply** to save your changes.

7.5 The File Sharing Screen

You can share files on a USB memory stick or hard drive connected to your ZyXEL Device with users on your network.

The following figure is an overview of the ZyXEL Device's file server feature. Computers **A** and **B** can access files on a USB device (**C**) which is connected to the ZyXEL Device.

Figure 43 File Sharing Overview



The ZyXEL Device will not be able to join the workgroup if your local area network has restrictions set up that do not allow devices to join a workgroup. In this case, contact your network administrator.

7.5.1 Before You Begin

Make sure the ZyXEL Device is connected to your network and turned on.

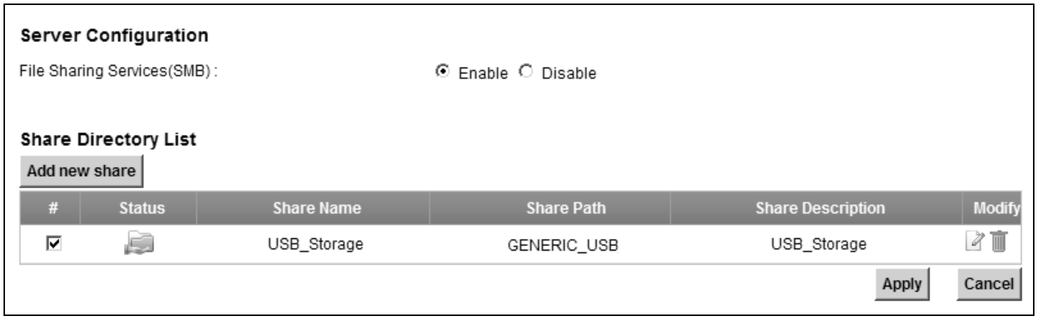
1 Connect the USB device to one of the ZyXEL Device's USB ports. Make sure the ZyXEL Device is connected to your network.

2 The ZyXEL Device detects the USB device and makes its contents available for browsing. If you are connecting a USB hard drive that comes with an external power supply, make sure it is connected to an appropriate power source that is on.

Note: If your USB device cannot be detected by ZyXEL Device, see the troubleshooting for suggestions.

Use this screen to set up file sharing using the ZyXEL Device. To access this screen, click **Network Setting > Home Networking > File Sharing**.

Figure 44 Network Setting > Home Networking > File Sharing



Server Configuration

File Sharing Services(SMB) : ● Enable ○ Disable

Share Directory List

#	Status	Share Name	Share Path	Share Description	Modify
☑		USB_Storage	GENERIC_USB	USB_Storage	

Each field is described in the following table.

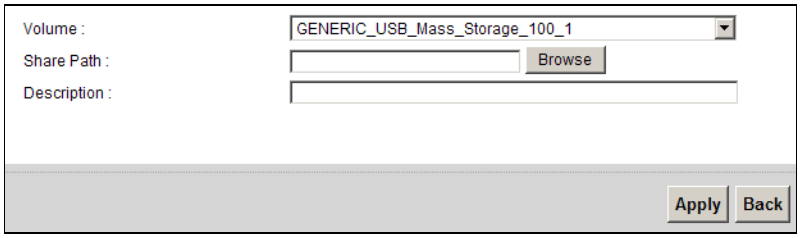
Table 29 Network Setting > Home Networking > File Sharing

LABEL	DESCRIPTION
Server Configuration	
File Sharing Services (SMB)	Select **Enable** to activate file sharing through the ZyXEL Device.
Add new share	Click this to set up a new share on the ZyXEL Device.
#	Select the check box to make the share available to the network. Otherwise, clear this.
Status	This shows whether or not the share is available for sharing.
Share Name	This field displays the share name on the ZyXEL Device.
Share Path	This field displays the path for the share directories (folders) on the ZyXEL Device. These are the directories (folders) on your USB storage device.
Share Description	This field displays information about the share.
Modify	Click the **Edit** icon to change the settings of an existing share. Click the **Delete** icon to delete this share in the list.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to restore your previously saved settings.

7.5.2 Add/Edit File Sharing

Use this screen to set up a new share or edit an existing share on the ZyXEL Device. Click **Add new share** in the **File Sharing** screen or click the **Edit** icon next to an existing share.

Figure 45 File Sharing: Add/Edit



Volume : GENERIC_USB_Mass_Storage_100_1

Share Path :

Description :

Each field is described in the following table.

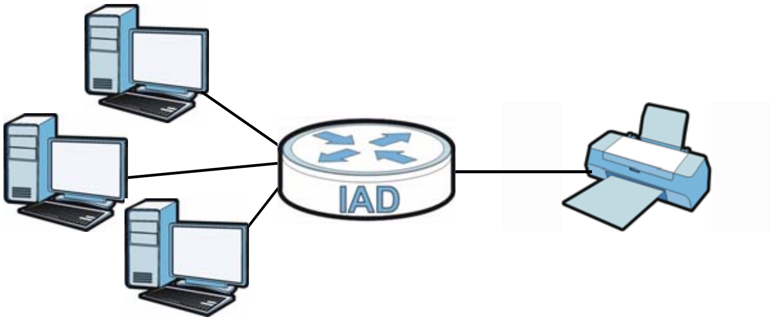
Table 30 File Sharing: Add/Edit

LABEL	DESCRIPTION
Volume	Select the volume in the USB storage device that you want to add as a share in the ZyXEL Device. This field is read-only when you are editing the share.
Share Path	Manually enter the file path for the share, or click the **Browse** button and select the folder that you want to add as a share. This field is read-only when you are editing the share.
Description	You can either enter a short description of the share, or leave this field blank.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to return to the previous screen.

7.6 The Printer Server Screen

The ZyXEL Device allows you to share a USB printer on your LAN. You can do this by connecting a USB printer to one of the USB ports on the ZyXEL Device and then configuring a TCP/IP port on the computers connected to your network.

Figure 46 Sharing a USB Printer



7.6.1 Before You Begin

To configure the print server you need the following:

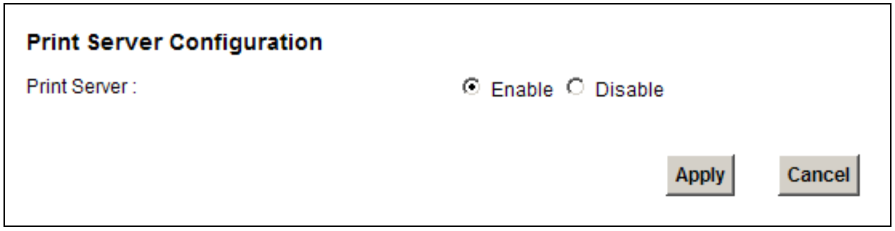
- Your ZyXEL Device must be connected to your computer and any other devices on your network. The USB printer must be connected to your ZyXEL Device.
- A USB printer with the driver already installed on your computer.
- The computers on your network must have the printer software already installed before they can create a TCP/IP port for printing via the network. Follow your printer manufacturers instructions on how to install the printer software on your computer.

Note: Your printer's installation instructions may ask that you connect the printer to your computer. Connect your printer to the ZyXEL Device instead.

Use this screen to enable or disable sharing of a USB printer via your ZyXEL Device.

To access this screen, click **Network Setting > Home Networking > Printer Server**.

Figure 47 Network Setting > Home Networking > Printer Server



Print Server Configuration

Print Server : ● Enable ○ Disable

The following table describes the labels in this menu.

Table 31 Network Setting > Home Networking > Print Server

LABEL	DESCRIPTION
Printer Server	Select **Enable** to have the ZyXEL Device share a USB printer.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to restore your previously saved settings.

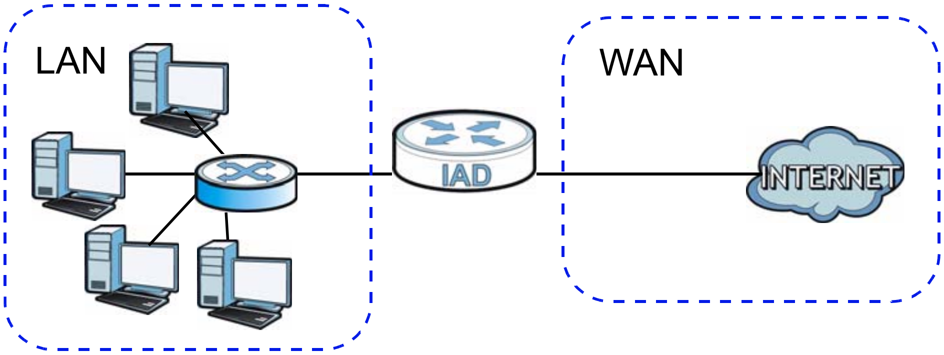
7.7 Technical Reference

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

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 48 LAN and WAN IP Addresses



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.

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".

ZyXEL Device Print Server Compatible USB Printers

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

Table 32 Compatible USB Printers

BRAND	MODEL
Brother	MFC7420
CANON	BJ F9000
CANON	i320
CANON	PIXMA MP450
CANON	PIXMA MP730
CANON	PIXMA MP780
CANON	PIXMA MP830
CANON	PIXUS ip2500
CANON	PIXMA ip4200
CANON	PIXMA ip5000
CANON	PIXUS 990i
EPSON	CX3500
EPSON	CX3900
EPSON	EPL-5800
EPSON	EPL-6200L

Table 32 Compatible USB Printers (continued)

BRAND	MODEL
EPSON	LP-2500
EPSON	LP-8900
EPSON	RX 510
EPSON	RX 530
EPSON	Stylus 830U
EPSON	Stylus 1270
EPSON	Stylus C43UX
EPSON	Stylus C60
EPSON	Stylus Color 670
HP	Deskjet 5550
HP	Deskjet 5652
HP	Deskjet 830C
HP	Deskjet 845C
HP	Deskjet 1125C
HP	Deskjet 1180C
HP	Deskjet 1220C
HP	Deskjet F4185
HP	Laserjet 1022
HP	Laserjet 1200
HP	Laserjet 2200D
HP	Laserjet 2420
HP	Color Laserjet 1500L
HP	Laserjet 3015
HP	Officejet 4255
HP	Officejet 5510
HP	Officejet 5610
HP	Officejet 7210
HP	Officejet Pro L7380
HP	Photosmart 2610
HP	Photosmart 3110
HP	Photosmart 7150

Table 32 Compatible USB Printers (continued)

BRAND	MODEL
HP	Photosmart 7830
HP	Photosmart C5280
HP	Photosmart D5160
HP	PSC 1350
HP	PSC 1410
IBM	Infoprint 1332
LEXMARK	Z55
LEXMARK	Z705
OKI	B4350
SAMSUNG	ML-1710
SAMSUNG	SCX-4016

7.8 Installing UPnP in Windows Example

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

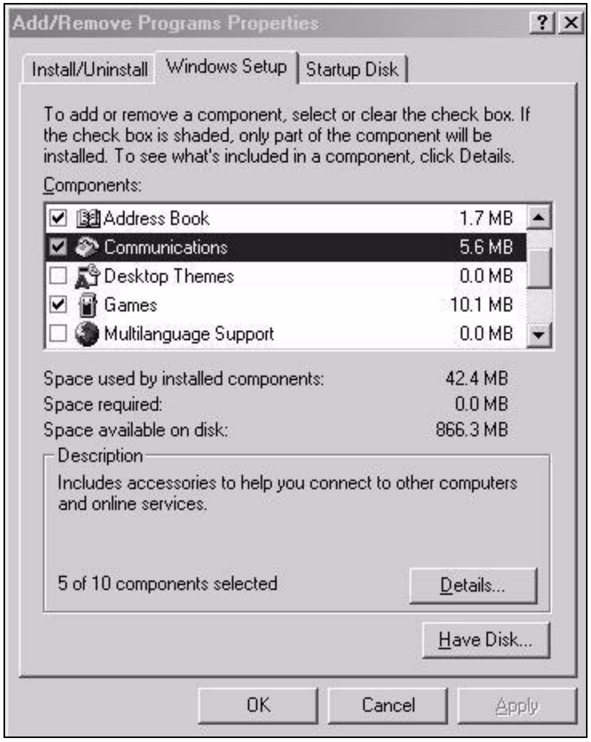
Installing UPnP in Windows Me

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

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

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

Figure 49 Add/Remove Programs: Windows Setup: Communication



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

Components:

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

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

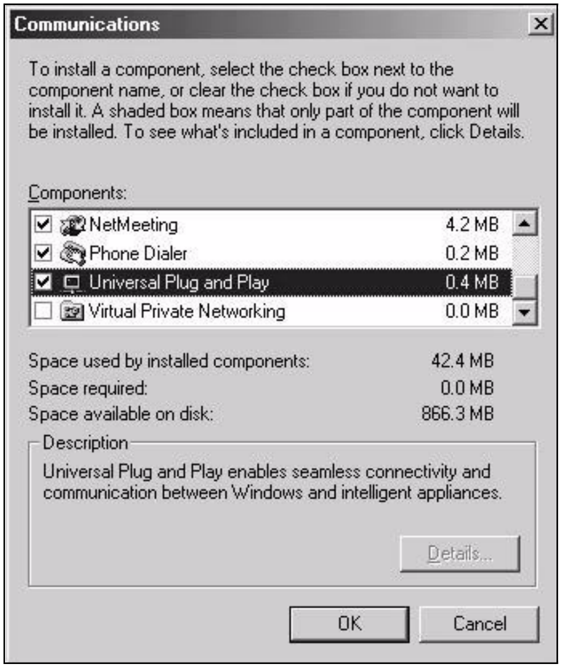
Description

Includes accessories to help you connect to other computers and online services.

5 of 10 components selected

3 In the **Communications** window, select the **Universal Plug and Play** check box in the **Components** selection box.

Figure 50 Add/Remove Programs: Windows Setup: Communication: Components



To install a component, select the check box next to the component name, or clear the check box if you do not want to install it. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.

Components:

☑	NetMeeting	4.2 MB
☑	Phone Dialer	0.2 MB
☑	Universal Plug and Play	0.4 MB
□	Virtual Private Networking	0.0 MB

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

Description

Universal Plug and Play enables seamless connectivity and communication between Windows and intelligent appliances.

4 Click **OK** to go back to the **Add/Remove Programs Properties** window and click **Next**.

5 Restart the computer when prompted.

Installing UPnP in Windows XP

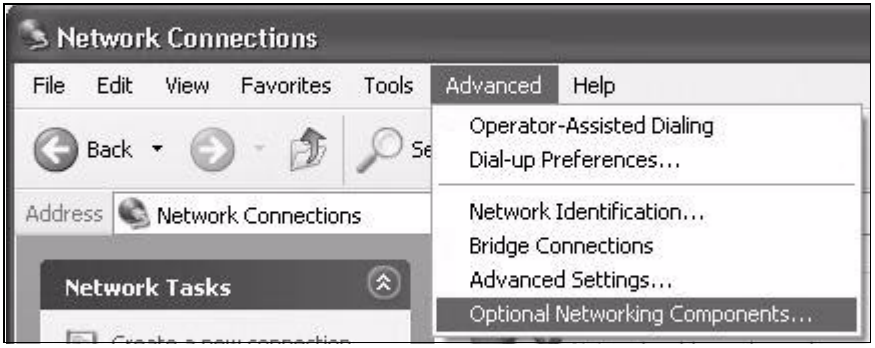
Follow the steps below to install the UPnP in Windows XP.

1 Click **Start** and **Control Panel**.

2 Double-click **Network Connections**.

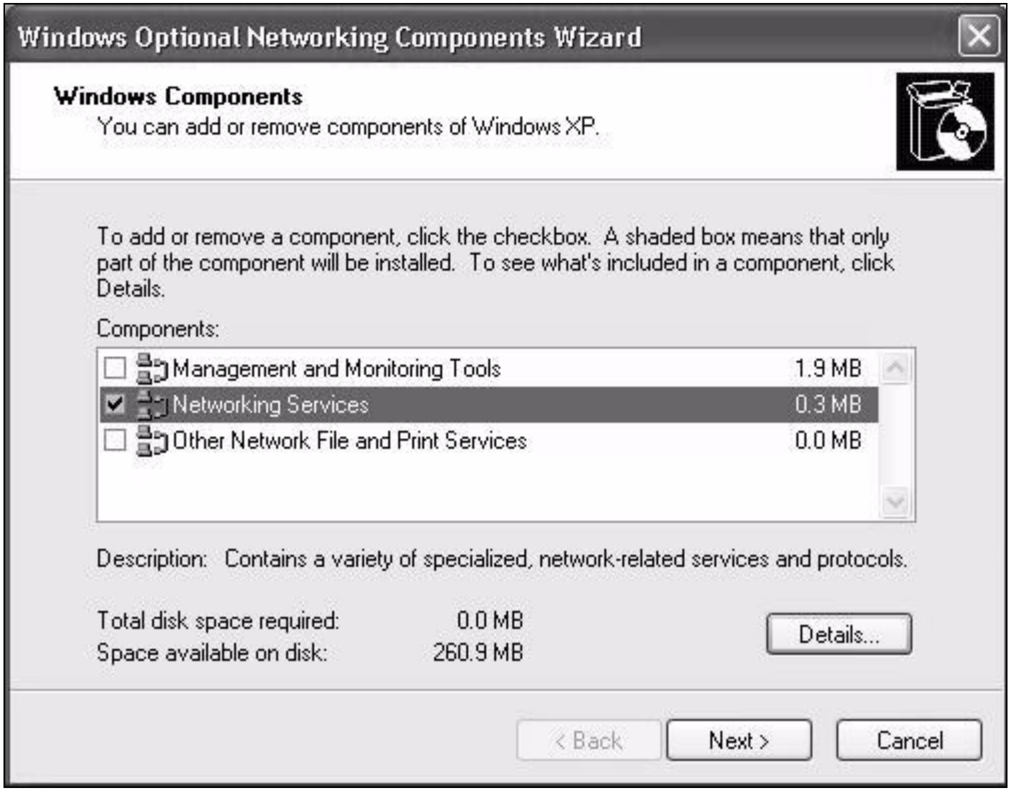
3 In the **Network Connections** window, click **Advanced** in the main menu and select **Optional Networking Components ...**.

Figure 51 Network Connections



4 The **Windows Optional Networking Components Wizard** window displays. Select **Networking Service** in the **Components** selection box and click **Details.**

Figure 52 Windows Optional Networking Components Wizard



Windows Optional Networking Components Wizard

Windows Components

You can add or remove components of Windows XP.

To add or remove a component, click the checkbox. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.

Components:

□	Management and Monitoring Tools	1.9 MB
☑	Networking Services	0.3 MB
□	Other Network File and Print Services	0.0 MB

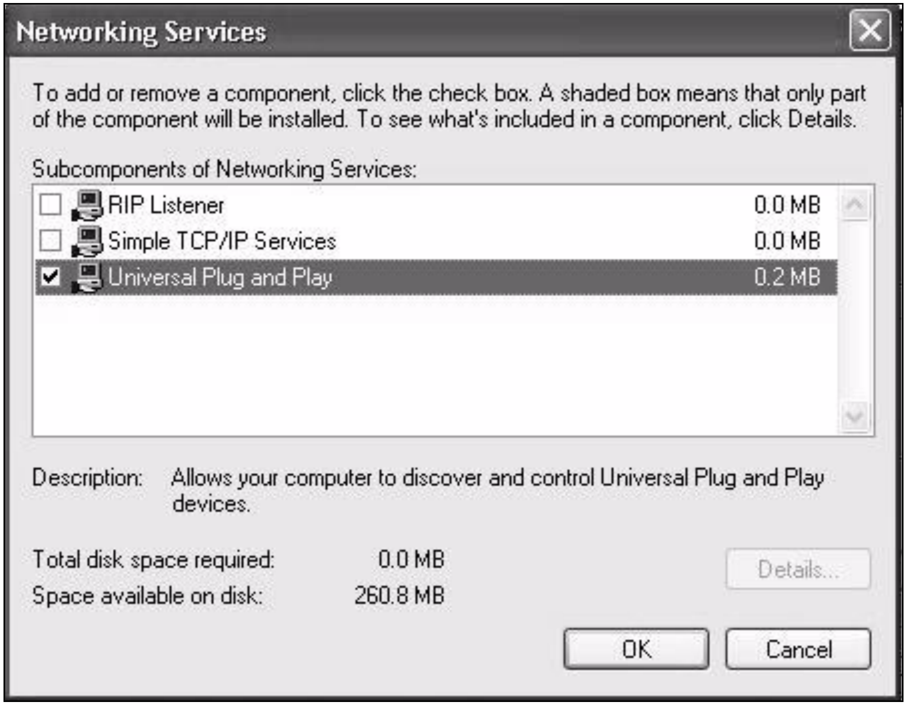
Description: Contains a variety of specialized, network-related services and protocols.

Total disk space required: 0.0 MB

Space available on disk: 260.9 MB

5 In the **Networking Services** window, select the **Universal Plug and Play** check box.

Figure 53 Networking Services



To add or remove a component, click the check box. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.

Subcomponents of Networking Services:

□ RIP Listener	0.0 MB
□ Simple TCP/IP Services	0.0 MB
☑ Universal Plug and Play	0.2 MB

Description: Allows your computer to discover and control Universal Plug and Play devices.

Total disk space required: 0.0 MB
Space available on disk: 260.8 MB

6 Click **OK** to go back to the **Windows Optional Networking Component Wizard** window and click **Next**.

7.9 Using UPnP in Windows XP Example

This section shows you how to use the UPnP feature in Windows XP. You must already have UPnP installed in Windows XP and UPnP activated on the ZyXEL Device.

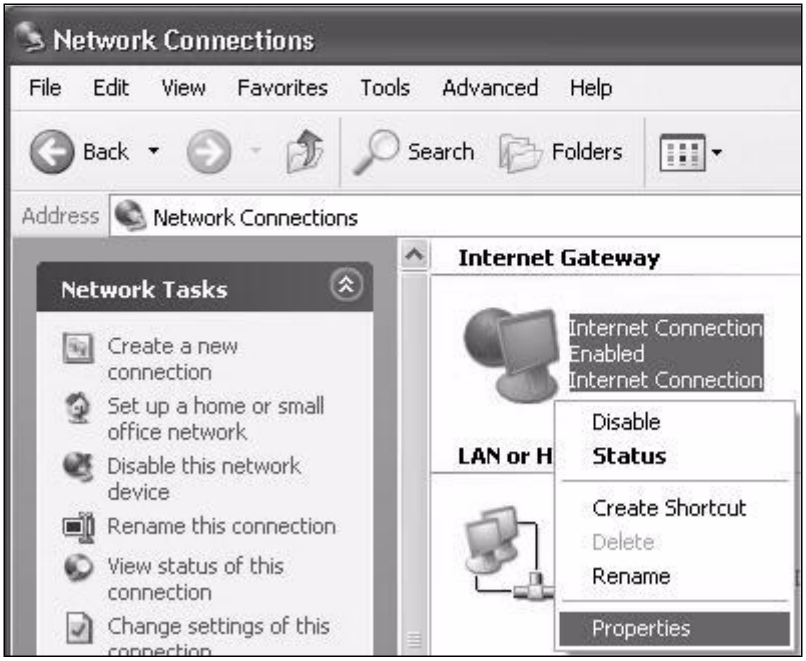
Make sure the computer is connected to a LAN port of the ZyXEL Device. Turn on your computer and the ZyXEL Device.

Auto-discover Your UPnP-enabled Network Device

1 Click **Start** and **Control Panel**. Double-click **Network Connections**. An icon displays under Internet Gateway.

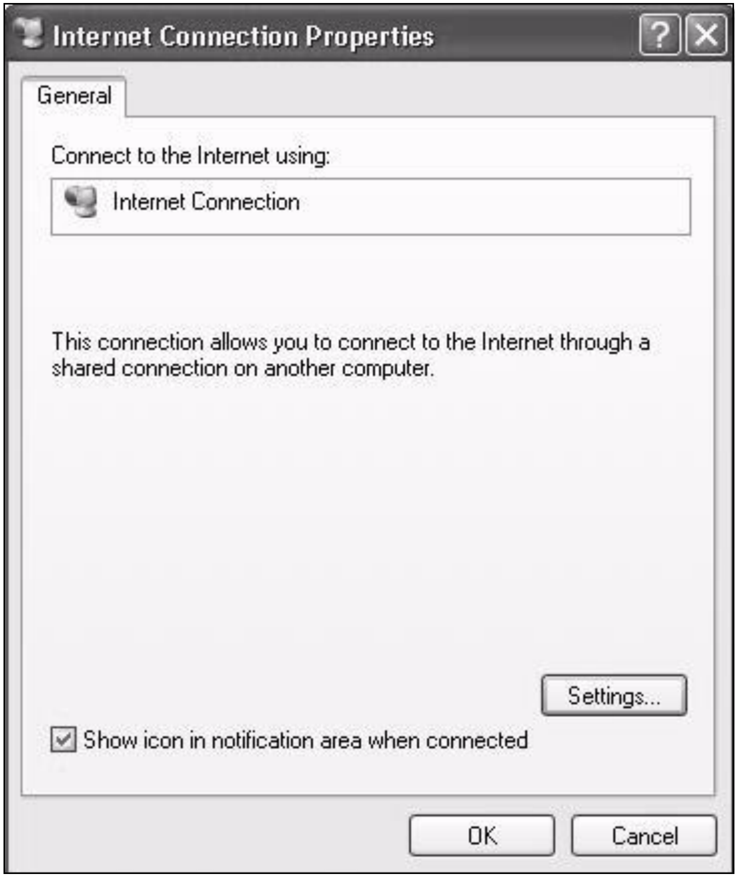
2 Right-click the icon and select **Properties**.

Figure 54 Network Connections



3 In the **Internet Connection Properties** window, click **Settings** to see the port mappings there were automatically created.

Figure 55 Internet Connection Properties



Connect to the Internet using:

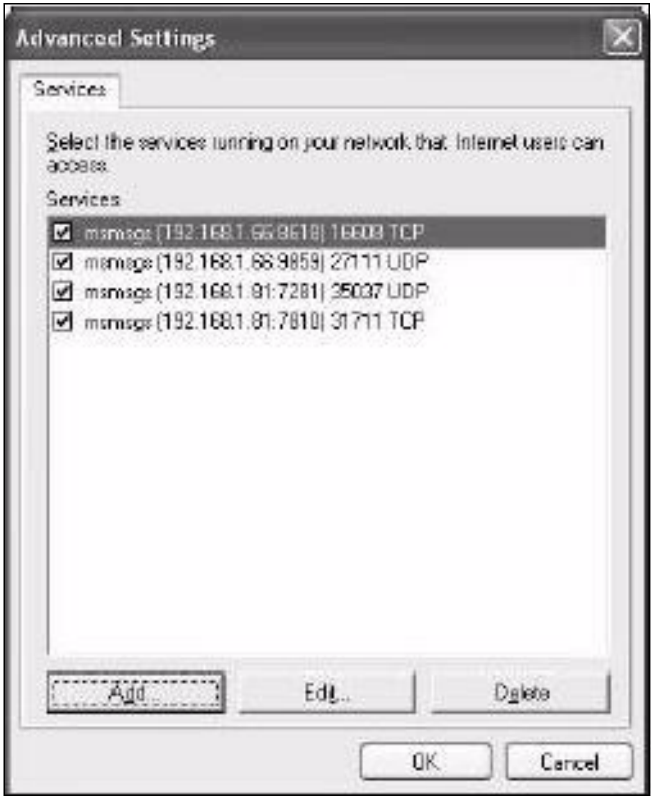
Internet Connection

This connection allows you to connect to the Internet through a shared connection on another computer.

☑ Show icon in notification area when connected

4 You may edit or delete the port mappings or click **Add** to manually add port mappings.

Figure 56 Internet Connection Properties: Advanced Settings

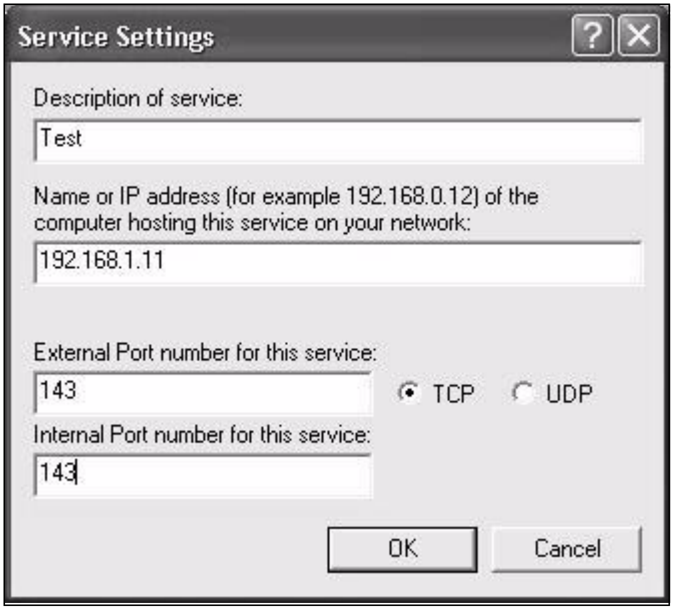


Select the services running on your network that Internet users can access.

Services

☑ msmsgs (192.168.1.66:8618) 16608 TCP
☑ msmsgs (192.168.1.66:9859) 27111 UDP
☑ msmsgs (192.168.1.81:7281) 35037 UDP
☑ msmsgs (192.168.1.81:7810) 31711 TCP

Figure 57 Internet Connection Properties: Advanced Settings: Add



Description of service: Test

Name or IP address (for example 192.168.0.12) of the computer hosting this service on your network: 192.168.1.11

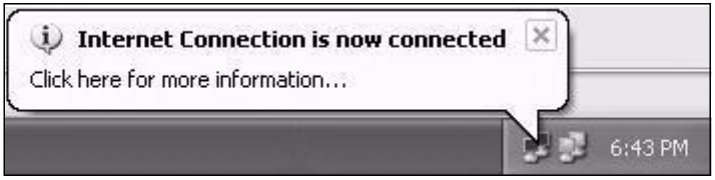
External Port number for this service: 143 ● TCP ○ UDP

Internal Port number for this service: 143

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

6 Select **Show icon in notification area when connected** option and click **OK**. An icon displays in the system tray.

Figure 58 System Tray Icon

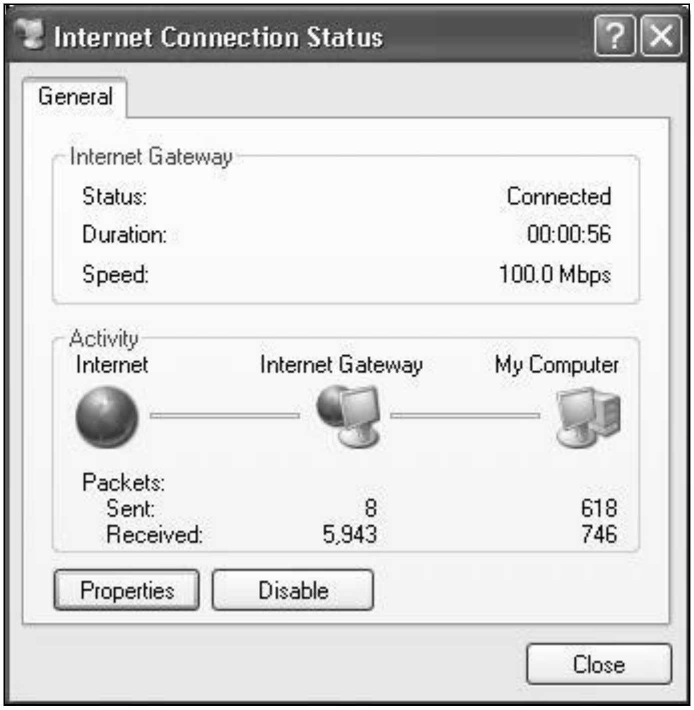


Internet Connection is now connected

Click here for more information...

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

Figure 59 Internet Connection Status



Internet Connection Status

Internet Gateway

Status: Connected

Duration: 00:00:56

Speed: 100.0 Mbps

Activity

	Internet Gateway	My Computer
Packets:		
Sent:	8	618
Received:	5,943	746

Web Configurator Easy Access

With UPnP, you can access the web-based configurator on the ZyXEL Device without finding out the IP address of the ZyXEL Device first. This comes helpful if you do not know the IP address of the ZyXEL Device.

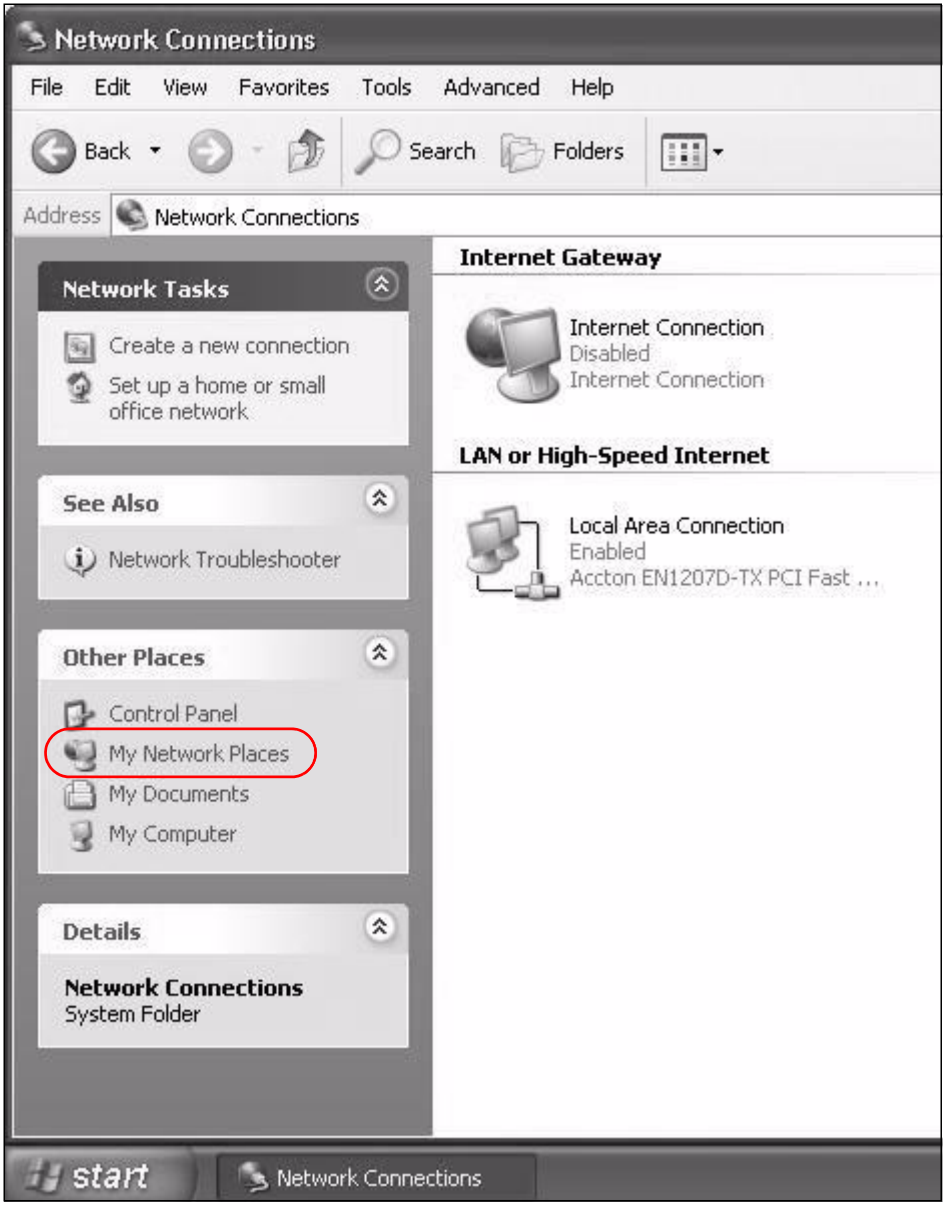
Follow the steps below to access the web configurator.

1 Click **Start** and then **Control Panel**.

2 Double-click **Network Connections**.

3 Select **My Network Places** under **Other Places**.

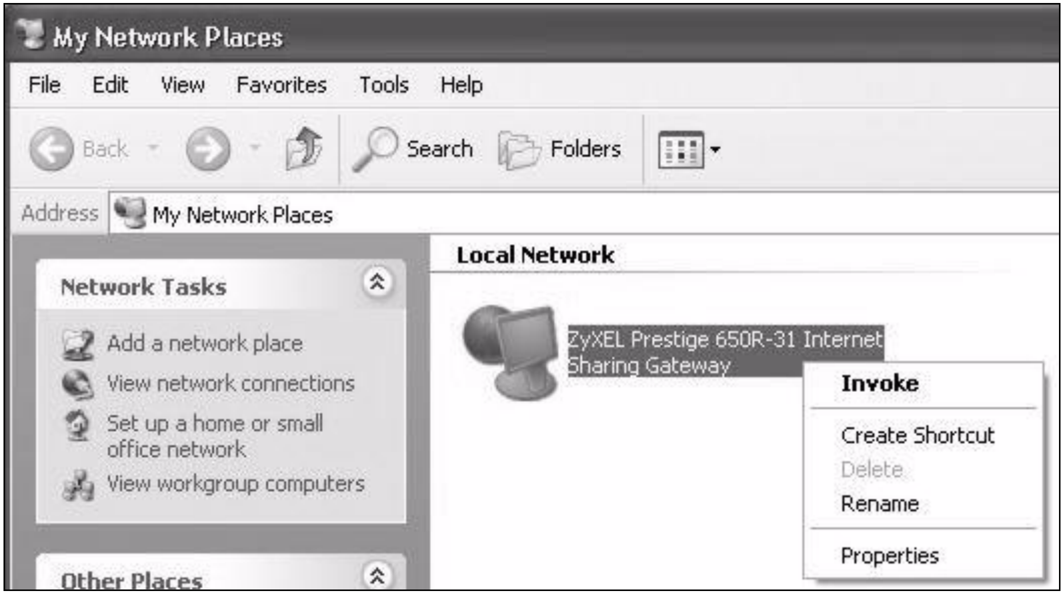
Figure 60 Network Connections



4 An icon with the description for each UPnP-enabled device displays under **Local Network**.

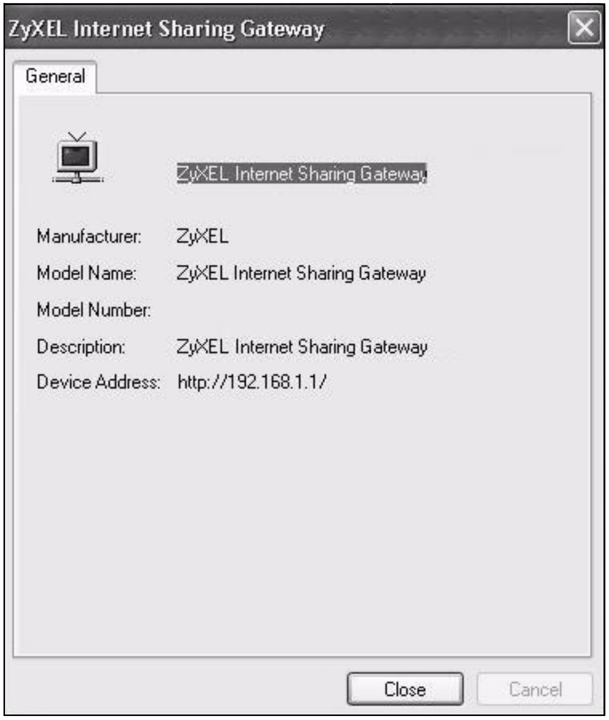
5 Right-click on the icon for your ZyXEL Device and select **Invoke**. The web configurator login screen displays.

Figure 61 Network Connections: My Network Places



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

Figure 62 Network Connections: My Network Places: Properties: Example


ZyXEL Internet Sharing Gateway
General
ZyXEL Internet Sharing Gateway
Close
Cancel

Manufacturer: ZyXEL

Model Name: ZyXEL Internet Sharing Gateway

Model Number:

Description: ZyXEL Internet Sharing Gateway

Device Address: http://192.168.1.1/

8

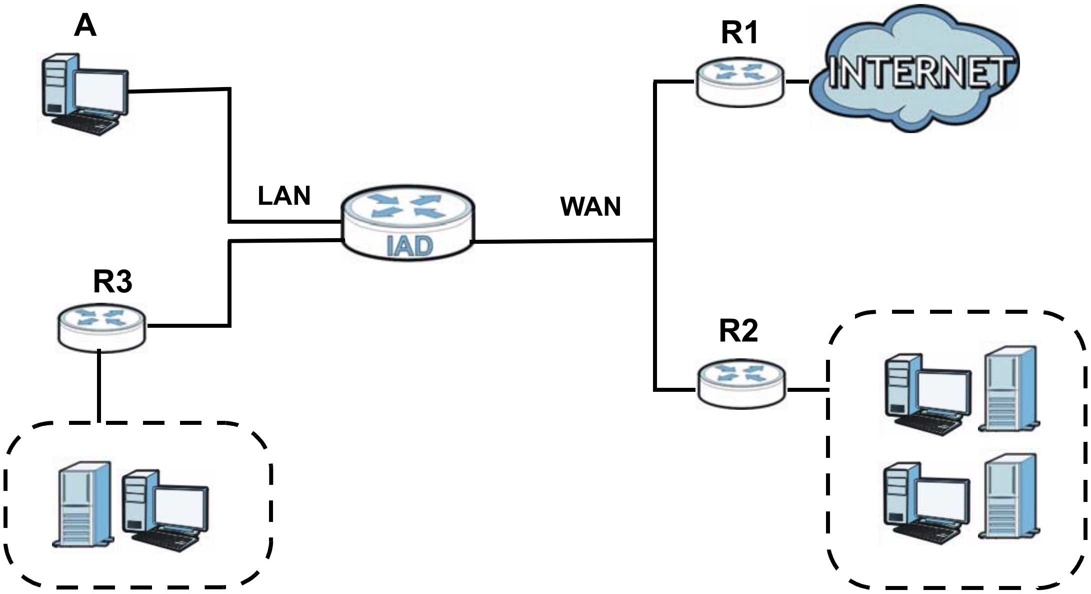
Routing

8.1 Overview

The ZyXEL Device usually uses the default gateway to route outbound traffic from computers on the LAN to the Internet. To have the ZyXEL Device send data to devices not reachable through the default gateway, use static routes.

For example, the next figure shows a computer (**A**) connected to the ZyXEL Device's LAN interface. The ZyXEL Device routes most traffic from **A** to the Internet through the ZyXEL Device's default gateway (**R1**). You create one static route to connect to services offered by your ISP behind router **R2**. You create another static route to communicate with a separate network behind a router **R3** connected to the LAN.

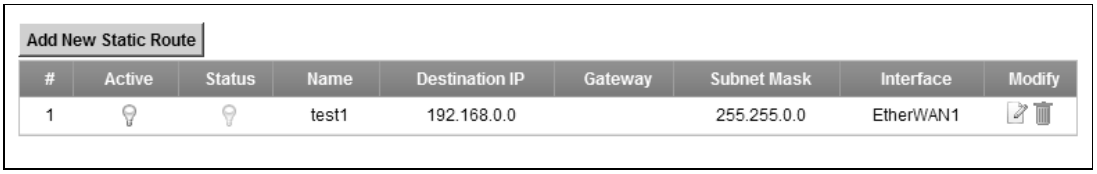
Figure 63 Example of Static Routing Topology



8.2 Configuring Static Route

Use this screen to view and configure IP static routes on the ZyXEL Device. Click **Network Setting > Routing** to open the following screen.

Figure 64 Network Setting > Routing



#	Active	Status	Name	Destination IP	Gateway	Subnet Mask	Interface	Modify
1	○	○	test1	192.168.0.0		255.255.0.0	EtherWAN1	✎ 🗑

The following table describes the labels in this screen.

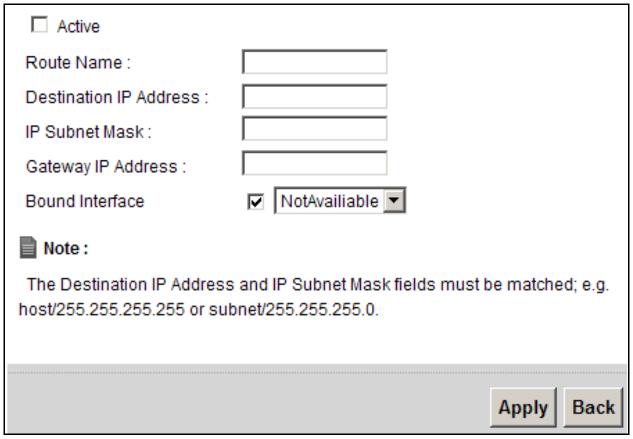
Table 33 Network Setting > Routing

LABEL	DESCRIPTION
Add New Static Route	Click this to set up a new static route on the ZyXEL Device.
#	This is the number of an individual static route.
Active	This indicates whether the rule is active or not. A yellow bulb signifies that this static route is active. A gray bulb signifies that this static route is not active.
Status	This shows whether the static route is currently in use or not. A yellow bulb signifies that this static route is in use. A gray bulb signifies that this static route is not in use.
Name	This is the name that describes or identifies this route.
Destination IP	This parameter specifies the IP network address of the final destination. Routing is always based on network number.
Gateway	This is the IP address of the gateway. The gateway is a router or switch on the same network segment as the device's LAN or WAN port. The gateway helps forward packets to their destinations.
Subnet Mask	This parameter specifies the IP network subnet mask of the final destination.
Interface	This is the WAN interface through which the traffic is routed.
Modify	Click the **Edit** icon to go to the screen where you can set up a static route on the ZyXEL Device. Click the **Delete** icon to remove a static route from the ZyXEL Device.

8.2.1 Add/Edit Static Route

Click **add new Static Route** in the **Routing** screen or click the **Edit** icon next to a rule. The following screen appears. Use this screen to configure the required information for a static route.

Figure 65 Routing: Add/Edit



☐ Active

Route Name :

Destination IP Address :

IP Subnet Mask :

Gateway IP Address :

Bound Interface ☑ NotAvailiable

Note :

The Destination IP Address and IP Subnet Mask fields must be matched; e.g. host/255.255.255.255 or subnet/255.255.255.0.

The following table describes the labels in this screen.

Table 34 Routing: Add/Edit

LABEL	DESCRIPTION
Active	Click this to activate this static route.
Route Name	Enter the name of the IP static route. Leave this field blank to delete this static route.
Destination IP Address	This parameter specifies the IP network address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.
IP Subnet Mask	Enter the IP subnet mask here.
Gateway IP Address	You can decide if you want to forward packets to a gateway IP address or a bound interface. If you want to configure **Gateway IP Address**, enter the IP address of the next-hop gateway. The gateway is a router or switch on the same network segment as the device's LAN or WAN port. The gateway helps forward packets to their destinations.
Bound Interface	You can decide if you want to forward packets to a gateway IP address or a bound interface. If you want to configure **Bound Interface**, select the check box and choose an interface through which the traffic is sent. You must have the WAN interface(s) already configured in the **Broadband** screen.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to exit this screen without saving.

9

DNS Route

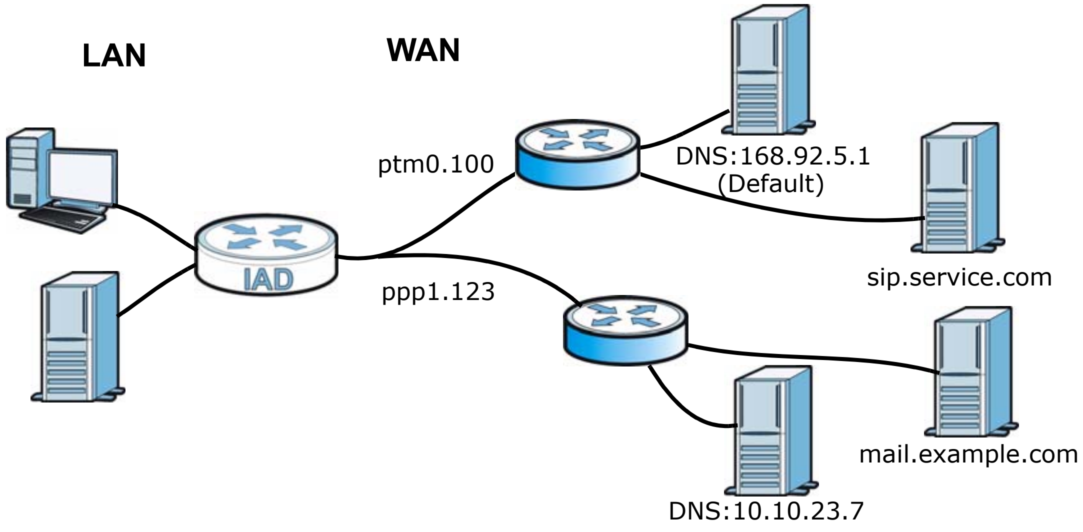
9.1 Overview

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

In addition to the system DNS server(s), each WAN interface (service) is set to have its own static or dynamic DNS server list. You can configure a DNS static route to forward DNS queries for certain domain names through a specific WAN interface to its DNS server(s). The ZyXEL Device uses a system DNS server (in the order you specify in the **Broadband** screen) to resolve domain names that do not match any DNS routing entry. After the ZyXEL Device receives a DNS reply from a DNS server, it creates a new entry for the resolved IP address in the routing table.

In the following example, the DNS server 168.92.5.1 obtained from the WAN interface ptm0.100 is set to be the system DNS server. The DNS server 10.10.23.7 is obtained from the WAN interface ppp1.123. You configure a DNS route for *example.com to have the ZyXEL Device forward DNS requests for the domain name mail.example.com through the WAN interface ppp1.123 to the DNS server 10.10.23.7.

Figure 66 Example of DNS Routing Topology



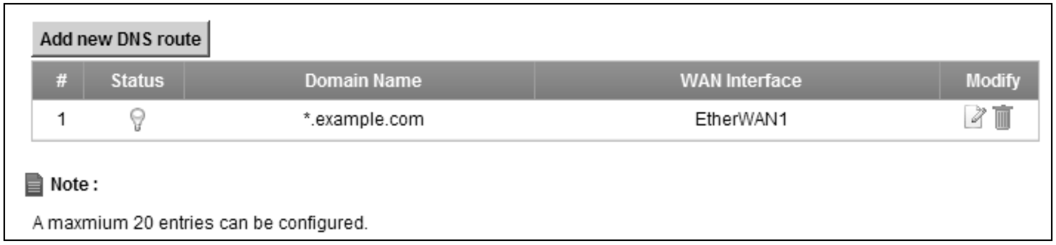
9.1.1 What You Can Do in this Chapter

The **DNS Route** screens let you view and configure DNS routes on the ZyXEL Device (Section 9.2 on page 182).

9.2 The DNS Route Screen

The **DNS Route** screens let you view and configure DNS routes on the ZyXEL Device. Click **Network Setting > DNS Route** to open the **DNS Route** screen.

Figure 67 Network Setting > DNS Route



#	Status	Domain Name	WAN Interface	Modify
1	💡	*.example.com	EtherWAN1	✎ 🗑

Note :

A maxmium 20 entries can be configured.

The following table describes the labels in this screen.

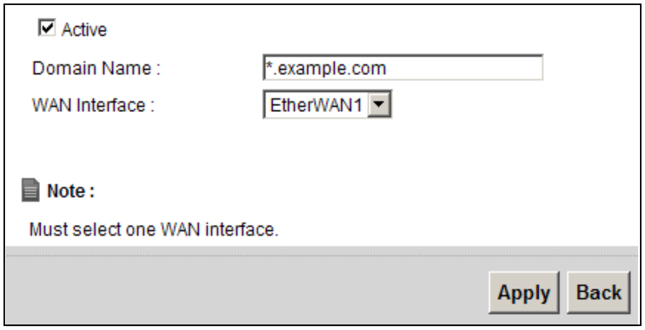
Table 35 Network Setting > DNS Route

LABEL	DESCRIPTION
Add new DNS route	Click this to create a new entry.
#	This is the number of an individual DNS route.
Status	This shows whether the DNS route is currently in use or not. A yellow bulb signifies that this DNS route is in use. A gray bulb signifies that this DNS route is not in use.
Domain Name	This is the domain name to which the DNS route applies.
WAN Interface	This is the WAN interface through which the matched DNS request is routed.
Modify	Click the **Edit** icon to configure a DNS route on the ZyXEL Device. Click the **Delete** icon to remove a DNS route from the ZyXEL Device.

9.2.1 Add/Edit DNS Route Edit

Click **Add new DNS route** in the **DNS Route** screen or the **Edit** icon next to an existing DNS route. Use this screen to configure the required information for a DNS route.

Figure 68 DNS Route: Add/Edit



☑ Active

Domain Name : *.example.com

WAN Interface : EtherWAN1

Note :

Must select one WAN interface.

The following table describes the labels in this screen.

Table 36 DNS Route: Add/Edit

LABEL	DESCRIPTION
Active	Select this to activate this DNS route.
Domain Name	Enter the domain name you want to resolve. You can use the wildcard character, an "*" (asterisk) as the left most part of a domain name, such as *.example.com. The ZyXEL Device forwards DNS queries for any domain name ending in example.com to the WAN interface specified in this route.
WAN Interface	Select a WAN interface through which the matched DNS query is sent. You must have the WAN interface(s) already configured in the **Broadband** screen.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to exit this screen without saving.

10

Quality of Service (QoS)

10.1 Overview

This chapter discusses the ZyXEL Device's **QoS** screens. Use these screens to set up your ZyXEL Device to use QoS for traffic management.

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. QoS allows the ZyXEL Device to group and prioritize application traffic and fine-tune network performance.

Without QoS, all traffic data is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and make the network inadequate for time-critical application such as video-on-demand.

The ZyXEL Device assigns each packet a priority and then queues the packet accordingly. Packets assigned a high priority are processed more quickly than those with low priority if there is congestion, allowing time-sensitive applications to flow more smoothly. Time-sensitive applications include both those that require a low level of latency (delay) and a low level of jitter (variations in delay) such as Internet gaming, and those for which jitter alone is a problem such as Internet radio or streaming video.

Note: The ZyXEL Device has built-in configurations for Voice over IP (IP). The Quality of Service (QoS) feature does not affect VoIP traffic.

- See Section 10.6 on page 195 for advanced technical information on SIP.

10.1.1 What You Can Do in this Chapter

- Use the **General** screen to enable QoS, set the bandwidth, and allow the ZyXEL Device to automatically assign priority to upstream traffic according to the IEEE 802.1p priority level, IP precedence or packet length (Section 10.2 on page 186).
- Use the **Queue Setup** screen to configure QoS queue assignment (Section 10.3 on page 188).

- Use the **Class Setup** screen to set up classifiers to sort traffic into different flows and assign priority and define actions to be performed for a classified traffic flow (Section 10.4 on page 190).
- Use the **Monitor** screen to view the ZyXEL Device's QoS-related packet statistics (Section 10.5 on page 194).

10.1.2 What You Need to Know

The following terms and concepts may help as you read this chapter.

QoS versus Cos

QoS is used to prioritize source-to-destination traffic flows. All packets in the same flow are given the same priority. CoS (class of service) is a way of managing traffic in a network by grouping similar types of traffic together and treating each type as a class. You can use CoS to give different priorities to different packet types.

CoS technologies include IEEE 802.1p layer 2 tagging and DiffServ (Differentiated Services or DS). IEEE 802.1p tagging makes use of three bits in the packet header, while DiffServ is a new protocol and defines a new DS field, which replaces the eight-bit ToS (Type of Service) field in the IP header.

Tagging and Marking

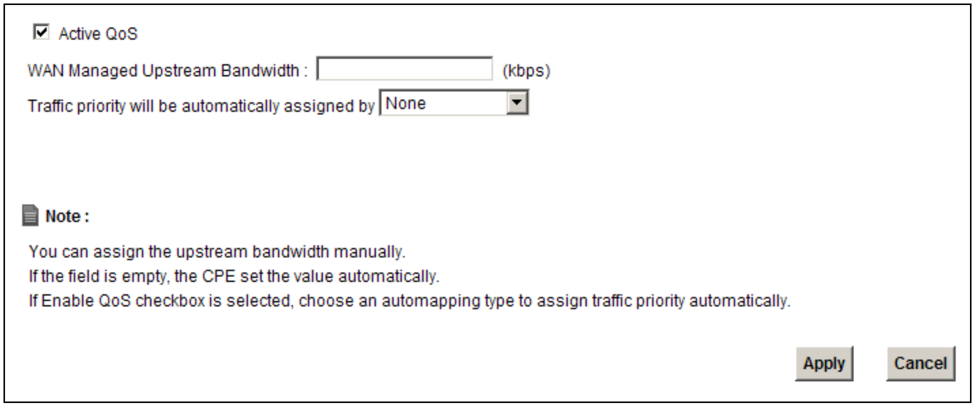
In a QoS class, you can configure whether to add or change the DSCP (DiffServ Code Point) value, IEEE 802.1p priority level and VLAN ID number in a matched packet. When the packet passes through a compatible network, the networking device, such as a backbone switch, can provide specific treatment or service based on the tag or marker.

10.2 The QoS General Screen

Use this screen to enable or disable QoS, set the bandwidth, and select to have the ZyXEL Device automatically assign priority to upstream traffic according to the IEEE 802.1p priority level, IP precedence or packet length.

Click **Network Setting > QoS** to open the **General** screen.

Figure 69 Network Setting > QoS > General



☑ Active QoS

WAN Managed Upstream Bandwidth : ____ (kbps)

Traffic priority will be automatically assigned by None

Note :

You can assign the upstream bandwidth manually.
If the field is empty, the CPE set the value automatically.
If Enable QoS checkbox is selected, choose an automapping type to assign traffic priority automatically.

The following table describes the labels in this screen.

Table 37 Network Setting > QoS > General

LABEL	DESCRIPTION
Active QoS	Select the check box to turn on QoS to improve your network performance. You can give priority to traffic that the ZyXEL Device forwards out through the WAN interface. Give high priority to voice and video to make them run more smoothly. Similarly, give low priority to many large file downloads so that they do not reduce the quality of other applications.
WAN Managed Upstream Bandwidth	Enter the amount of bandwidth for the WAN interface that you want to allocate using QoS. The recommendation is to set this speed to match the interface’s actual transmission speed. For example, set the WAN interface speed to 100000 kbps if your Internet connection has an upstream transmission speed of 100 Mbps. Setting this number higher than the interface’s actual transmission speed will stop lower priority traffic from being sent if higher priority traffic uses all of the actual bandwidth. If you set this number lower than the interface’s actual transmission speed, the ZyXEL Device will not use some of the interface’s available bandwidth. Leave this field blank to have the ZyXEL Device set this value automatically.
Traffic priority will be automatically assigned by	These fields are ignored if upstream traffic matches a class you configured in the **Class Setup** screen. If you select **Ethernet Priority**, **IP Precedence** or **Packet Length** and traffic does not match a class configured in the **Class Setup** screen, the ZyXEL Device assigns priority to unmatched traffic based on the IEEE 802.1p priority level, IP precedence or packet length. See Section 10.6.1 on page 195 for more information.

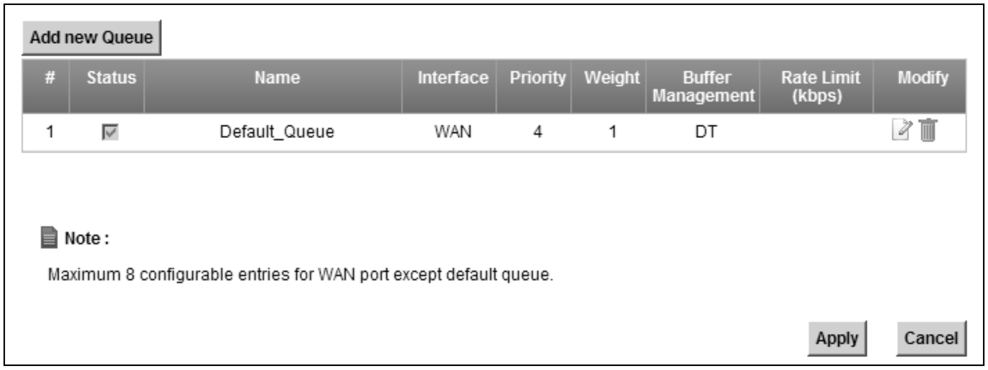
Table 37 Network Setting > QoS > General (continued)

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

10.3 The Queue Setup Screen

Use this screen to configure QoS queue assignment. Click **Network Setting > QoS > Queue Setup** to open the screen as shown next.

Figure 70 Network Setting > QoS > Queue Setup



#	Status	Name	Interface	Priority	Weight	Buffer Management	Rate Limit (kbps)	Modify
1	☑	Default_Queue	WAN	4	1	DT		

Note :

Maximum 8 configurable entries for WAN port except default queue.

The following table describes the labels in this screen.

Table 38 Network Setting > QoS > Queue Setup

LABEL	DESCRIPTION
Add new Queue	Click this to create a new entry.
#	This is the index number of this entry.
Status	Select the check box to enable the queue.
Name	This shows the descriptive name of this queue.
Interface	This shows the name of the ZyXEL Device's interface through which traffic in this queue passes.
Priority	This shows the priority of this queue.
Weight	This shows the weight of this queue.
Buffer Management	This shows the queue management algorithm used by the ZyXEL Device.
Rate Limit (kbps)	This shows the maximum transmission rate allowed for traffic on this queue.
Modify	Click the **Edit** icon to edit the queue. Click the **Delete** icon to delete an existing queue. Note that subsequent rules move up by one when you take this action.

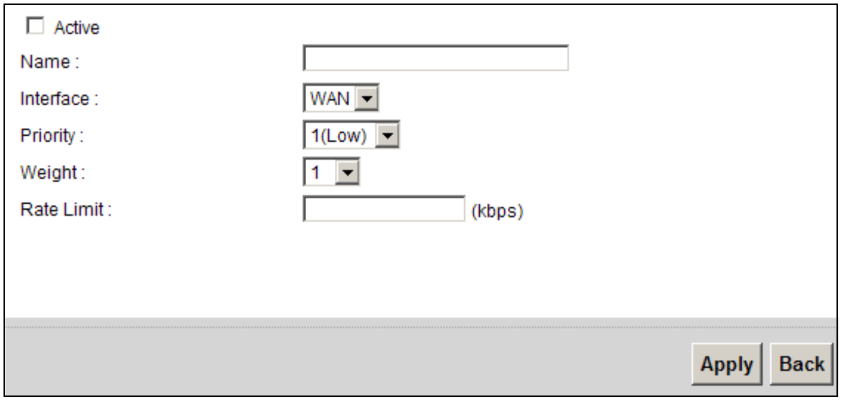
Table 38 Network Setting > QoS > Queue Setup (continued)

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

10.3.1 Add/Edit a QoS Queue

Use this screen to configure a queue. Click **Add new queue** in the **Queue Setup** screen or the **Edit** icon next to an existing queue.

Figure 71 Queue Setup: Add/Edit



□ Active

Name :

Interface : WAN

Priority : 1(Low)

Weight : 1

Rate Limit : (kbps)

The following table describes the labels in this screen.

Table 39 Queue Setup: Add/Edit

LABEL	DESCRIPTION
Active	Select to enable or disable this queue.
Name	Enter the descriptive name of this queue.
Interface	Select the interface to which this queue is applied.
Priority	Select the priority level (from 1 to 7) of this queue. The larger the number, the higher the priority level. Traffic assigned to higher priority queues gets through faster while traffic in lower priority queues is dropped if the network is congested.
Weight	Select the weight (from 1 to 15) of this queue. If two queues have the same priority level, the ZyXEL Device divides the bandwidth across the queues according to their weights. Queues with larger weights get more bandwidth than queues with smaller weights.
Rate Limit	Specify the maximum transmission rate (in Kbps) allowed for traffic on this queue.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to return to the previous screen without saving.

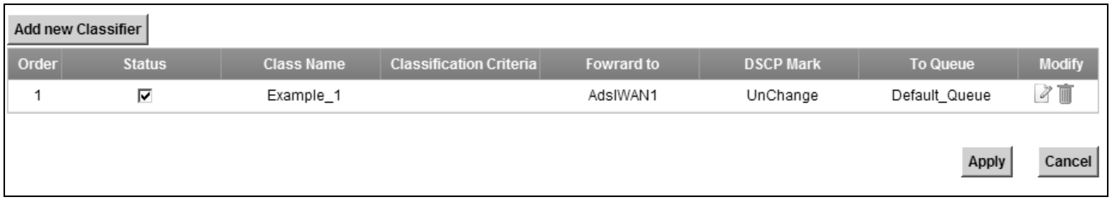
10.4 The Class Setup Screen

Use this screen to add, edit or delete QoS classifiers. A classifier groups traffic into data flows according to specific criteria such as the source address, destination address, source port number, destination port number or incoming interface. For example, you can configure a classifier to select traffic from the same protocol port (such as Telnet) to form a flow.

You can give different priorities to traffic that the ZyXEL Device forwards out through the WAN interface. Give high priority to voice and video to make them run more smoothly. Similarly, give low priority to many large file downloads so that they do not reduce the quality of other applications.

Click **Network Setting > QoS > Class Setup** to open the following screen.

Figure 72 Network Setting > QoS > Class Setup



Order	Status	Class Name	Classification Criteria	Fowrard to	DSCP Mark	To Queue	Modify
1	☑	Example_1		AdslWAN1	UnChange	Default_Queue	

The following table describes the labels in this screen.

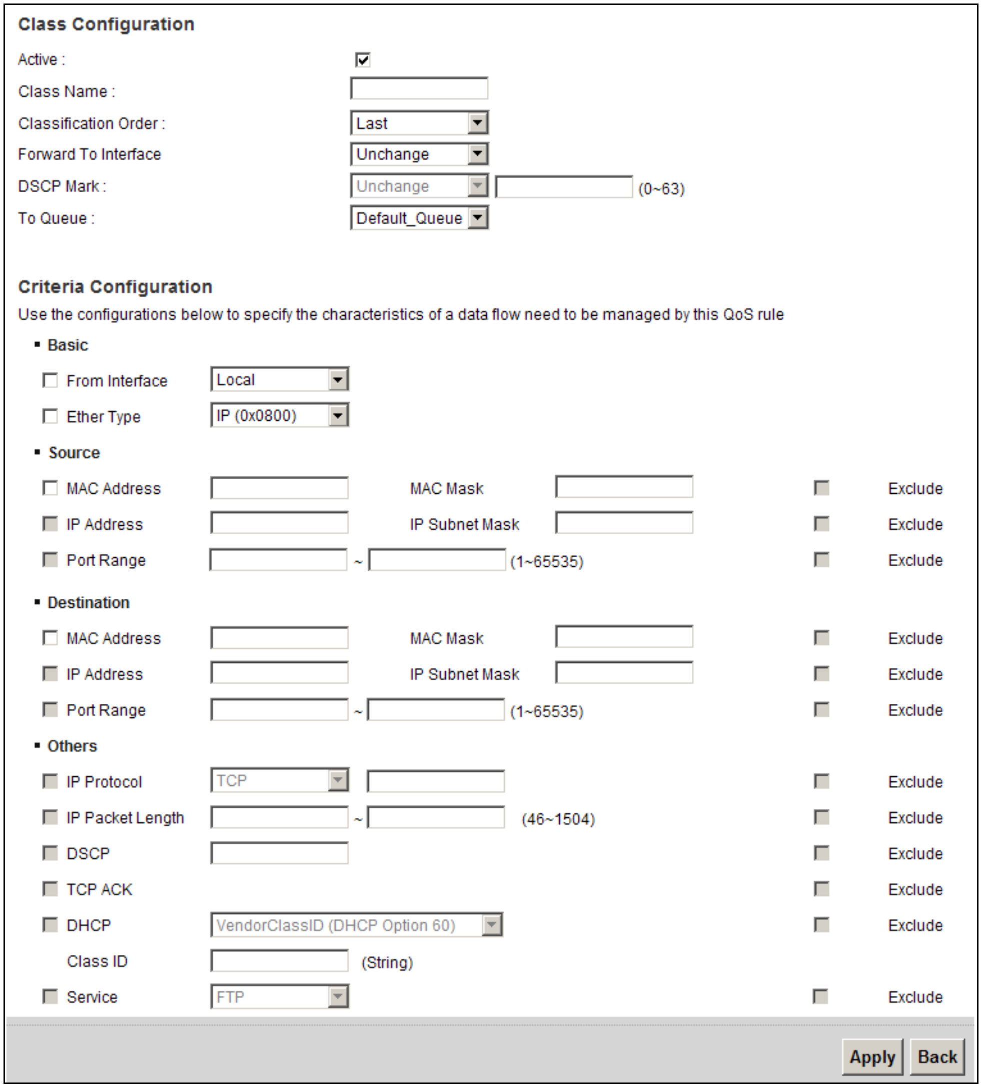
Table 40 Network Setting > QoS > Class Setup

LABEL	DESCRIPTION
Add new Classifier	Click this to create a new classifier.
Order	This field displays the order number of the classifier.
Status	Select the check box to enable the classifier.
Class Name	This is the name of the classifier.
Classification Criteria	This shows criteria specified in this classifier, for example the interface from which traffic of this class should come and the source MAC address of traffic that matches this classifier.
Forward to	This is the interface through which traffic that matches this classifier is forwarded out.
DSCP Mark	This is the DSCP number added to traffic of this classifier.
To Queue	This is the name of the queue in which traffic of this classifier is put.
Modify	Click the **Edit** icon to edit the classifier. Click the **Delete** icon to delete an existing classifier. Note that subsequent rules move up by one when you take this action.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to restore your previously saved settings.

10.4.1 Add/Edit QoS Class

Click **Add new Classifier** in the **Class Setup** screen or the **Edit** icon next to an existing classifier to configure it.

Figure 73 Class Setup: Add/Edit



Class Configuration

Active : ☑

Class Name :

Classification Order : Last

Forward To Interface : Unchange

DSCP Mark : Unchange (0~63)

To Queue : Default_Queue

Criteria Configuration

Use the configurations below to specify the characteristics of a data flow need to be managed by this QoS rule

- **Basic**

☐ From Interface: Local

☐ Ether Type: IP (0x0800)

- **Source**

☐ MAC Address — MAC Mask — ☐ Exclude

☐ IP Address — IP Subnet Mask — ☐ Exclude

☐ Port Range ~ (1~65535) — ☐ Exclude

- **Destination**

☐ MAC Address — MAC Mask — ☐ Exclude

☐ IP Address — IP Subnet Mask — ☐ Exclude

☐ Port Range ~ (1~65535) — ☐ Exclude

- **Others**

☐ IP Protocol: TCP — ☐ Exclude

☐ IP Packet Length ~ (46~1504) — ☐ Exclude

☐ DSCP — ☐ Exclude

☐ TCP ACK — ☐ Exclude

☐ DHCP: VendorClassID (DHCP Option 60) — ☐ Exclude

Class ID (String)

☐ Service: FTP — ☐ Exclude

The following table describes the labels in this screen.

Table 41 Class Setup: Add/Edit

LABEL	DESCRIPTION
Class Configuration	
Active	Select to enable this classifier.
Class Name	Enter a descriptive name of up to 32 printable English keyboard characters, including spaces.

Table 41 Class Setup: Add/Edit (continued)

LABEL	DESCRIPTION
Classification Order	Select an existing number for where you want to put this classifier to move the classifier to the number you selected after clicking **Apply**. Select **Last** to put this rule in the back of the classifier list.
Forward to Interface	Select a WAN interface through which traffic of this class will be forwarded out. If you select **Unchange**, the ZyXEL Device forward traffic of this class according to the default routing table.
DSCP Mark	This field is available only when you select the **Ether Type** check box in **Criteria Configuration-Basic** section. If you select **Mark**, enter a DSCP value with which the ZyXEL Device replaces the DSCP field in the packets. If you select **Unchange**, the ZyXEL Device keep the DSCP field in the packets.
To Queue	Select a queue that applies to this class. You should have configured a queue in the **Queue Setup** screen already.
Criteria Configuration Use the following fields to configure the criteria for traffic classification.	
Basic	
From Interface	Select whether the traffic class comes from the LAN or a wireless interface.
Ether Type	Select a predefined application to configure a class for the matched traffic. If you select **IP**, you also need to configure source or destination MAC address, IP address, DHCP options, DSCP value or the protocol type. If you select **8021Q**, you can configure an 802.1p priority level and VLAN ID in the **Others** section.
Source	
MAC Address	Select the check box and enter the source MAC address of the packet.
MAC Mask	Type the mask for the specified MAC address to determine which bits a packet's MAC address should match. Enter "f" for each bit of the specified source MAC address that the traffic's MAC address should match. Enter "0" for the bit(s) of the matched traffic's MAC address, which can be of any hexadecimal character(s). For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria.
IP Address	Select the check box and enter the source IP address in dotted decimal notation. A blank source IP address means any source IP address.
IP Subnet Mask	Enter the source subnet mask.
Port Range	If you select **TCP** or **UDP** in the **IP Protocol** field, select the check box and enter the port number(s) of the source.

Table 41 Class Setup: Add/Edit (continued)

LABEL	DESCRIPTION
Exclude	Select this option to exclude the packets that match the specified criteria from this classifier.
Destination	
MAC Address	Select the check box and enter the destination MAC address of the packet.
MAC Mask	Type the mask for the specified MAC address to determine which bits a packet's MAC address should match. Enter "f" for each bit of the specified source MAC address that the traffic's MAC address should match. Enter "0" for the bit(s) of the matched traffic's MAC address, which can be of any hexadecimal character(s). For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria.
IP Address	Select the check box and enter the destination IP address in dotted decimal notation. A blank source IP address means any source IP address.
IP Subnet Mask	Enter the destination subnet mask.
Port Range	If you select **TCP** or **UDP** in the **IP Protocol** field, select the check box and enter the port number(s) of the source.
Exclude	Select this option to exclude the packets that match the specified criteria from this classifier.
Others	
IP Protocol	This field is available only when you select **IP** in the **Ether Type** field. Select this option and select the protocol (service type) from **TCP** or **UDP**. If you select **User defined**, enter the protocol (service type) number.
IP Packet Length	This field is available only when you select **IP** in the **Ether Type** field. Select this option and enter the minimum and maximum packet length (from 46 to 1504) in the fields provided.
DSCP	This field is available only when you select **IP** in the **Ether Type** field. Select this option and specify a DSCP (DiffServ Code Point) number between 0 and 63 in the field provided.
TCP ACK	This field is available only when you select **IP** in the **Ether Type** field. If you select this option, the matched TCP packets must contain the ACK (Acknowledge) flag.

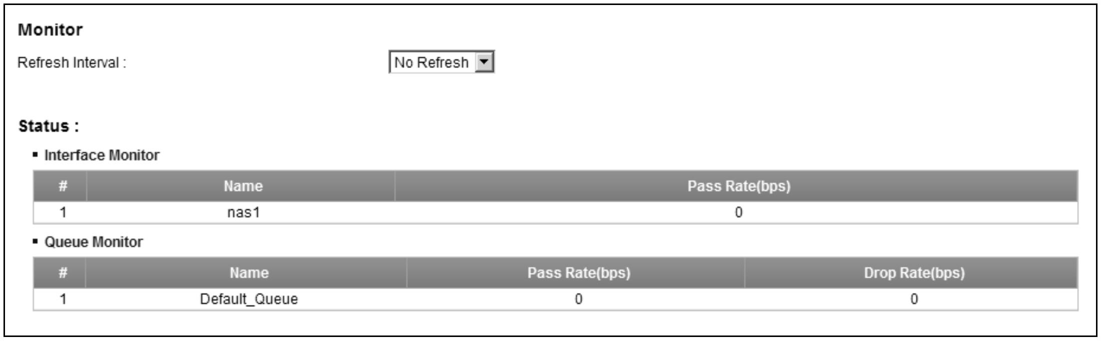
Table 41 Class Setup: Add/Edit (continued)

LABEL	DESCRIPTION
DHCP	This field is available only when you select **IP** in the **Ether Type** field, and **UDP** in the **IP Protocol** field. Select this option and select a DHCP option. If you select **Vendor Class ID (DHCP Option 60)**, enter the **Class ID** of the matched traffic, such as the type of the hardware or firmware. If you select **ClientID (DHCP Option 61)**, enter the **Type** of the matched traffic and **Client ID** of the DHCP client. If you select **User Class ID (DHCP Option 77)**, enter the **User Class Data**, which is a string that identifies the user's category or application type in the matched DHCP packets. If you select **VendorSpecificIntro (DHCP Option 125)**, enter the **Enterprise Number** of the software of the matched traffic and **Vendor Class Data** used by all the DHCP clients.
Service	Select the service classification of the traffic.
Exclude	Select this option to exclude the packets that match the specified criteria from this classifier.
Apply	Click **Apply** to save your changes.
Back	Click **Back** to return to the previous screen without saving.

10.5 The QoS Monitor Screen

To view the ZyXEL Device's QoS packet statistics, click **Network Setting > QoS > Monitor**. The screen appears as shown.

Figure 74 Network Setting > QoS > Monitor



Monitor

Refresh Interval : No Refresh

Status :

- Interface Monitor

#	Name	Pass Rate(bps)
1	nas1	0

- Queue Monitor

#	Name	Pass Rate(bps)	Drop Rate(bps)
1	Default_Queue	0	0

The following table describes the labels in this screen.

Table 42 Network Setting > QoS > Monitor

LABEL	DESCRIPTION
Monitor	
Refresh Interval	Select how often you want the ZyXEL Device to update this screen. Select **No Refresh** to stop refreshing statistics.
Status	
#	This is the index number of the entry.
Name	This shows the name of the WAN interface on the ZyXEL Device.
Pass Rate (bps)	This shows how many packets forwarded to this interface are transmitted successfully.
Queue Monitor	
#	This is the index number of the entry.
Name	This shows the name of the queue.
Pass Rate (bps)	This shows how many packets assigned to this queue are transmitted successfully.
Drop Rate (bps)	This shows how many packets assigned to this queue are dropped.

10.6 QoS Technical Reference

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

10.6.1 IEEE 802.1Q Tag

The IEEE 802.1Q standard defines an explicit VLAN tag in the MAC header to identify the VLAN membership of a frame across bridges. A VLAN tag includes the 12-bit VLAN ID and 3-bit user priority. The VLAN ID associates a frame with a specific VLAN and provides the information that devices need to process the frame across the network.

IEEE 802.1p specifies the user priority field and defines up to eight separate traffic types. The following table describes the traffic types defined in the IEEE 802.1d standard (which incorporates the 802.1p).

Table 43 IEEE 802.1p Priority Level and Traffic Type

PRIORITY LEVEL	TRAFFIC TYPE
Level 7	Typically used for network control traffic such as router configuration messages.
Level 6	Typically used for voice traffic that is especially sensitive to jitter (jitter is the variations in delay).

Table 43 IEEE 802.1p Priority Level and Traffic Type

PRIORITY LEVEL	TRAFFIC TYPE
Level 5	Typically used for video that consumes high bandwidth and is sensitive to jitter.
Level 4	Typically used for controlled load, latency-sensitive traffic such as SNA (Systems Network Architecture) transactions.
Level 3	Typically used for “excellent effort” or better than best effort and would include important business traffic that can tolerate some delay.
Level 2	This is for “spare bandwidth”.
Level 1	This is typically used for non-critical “background” traffic such as bulk transfers that are allowed but that should not affect other applications and users.
Level 0	Typically used for best-effort traffic.

10.6.2 IP Precedence

Similar to IEEE 802.1p prioritization at layer-2, you can use IP precedence to prioritize packets in a layer-3 network. IP precedence uses three bits of the eight-bit ToS (Type of Service) field in the IP header. There are eight classes of services (ranging from zero to seven) in IP precedence. Zero is the lowest priority level and seven is the highest.

10.6.3 DiffServ

QoS is used to prioritize source-to-destination traffic flows. All packets in the flow are given the same priority. You can use CoS (class of service) to give different priorities to different packet types.

DiffServ (Differentiated Services) is a class of service (CoS) model that marks packets so that they receive specific per-hop treatment at DiffServ-compliant network devices along the route based on the application types and traffic flow. Packets are marked with DiffServ Code Points (DSCPs) indicating the level of service desired. This allows the intermediary DiffServ-compliant network devices to handle the packets differently depending on the code points without the need to negotiate paths or remember state information for every flow. In addition, applications do not have to request a particular service or give advanced notice of where the traffic is going.

DSCP and Per-Hop Behavior

DiffServ defines a new DS (Differentiated Services) field to replace the Type of Service (TOS) field in the IP header. The DS field contains a 2-bit unused field and a 6-bit DSCP field which can define up to 64 service levels. The following figure illustrates the DS field.

DSCP is backward compatible with the three precedence bits in the ToS octet so that non-DiffServ compliant, ToS-enabled network device will not conflict with the DSCP mapping.

DSCP (6 bits)	Unused (2 bits)

The DSCP value determines the forwarding behavior, the PHB (Per-Hop Behavior), that each packet gets across the DiffServ network. Based on the marking rule, different kinds of traffic can be marked for different kinds of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

11

Network Address Translation (NAT)

11.1 Overview

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

11.1.1 What You Can Do in this Chapter

- Use the **Port Forwarding** screen to configure forward incoming service requests to the server(s) on your local network (Section 11.2 on page 200).
- Use the **Sessions** screen to limit the number of concurrent NAT sessions each client can use (Section 11.3 on page 203).

11.1.2 What You Need To Know

The following terms and concepts may help as you read this chapter.

Inside/Outside and Global/Local

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.

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.

Finding Out More

See Section 11.4 on page 204 for advanced technical information on NAT.

11.2 The Port Forwarding Screen

Use the **Port Forwarding** 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 381. 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.

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