12

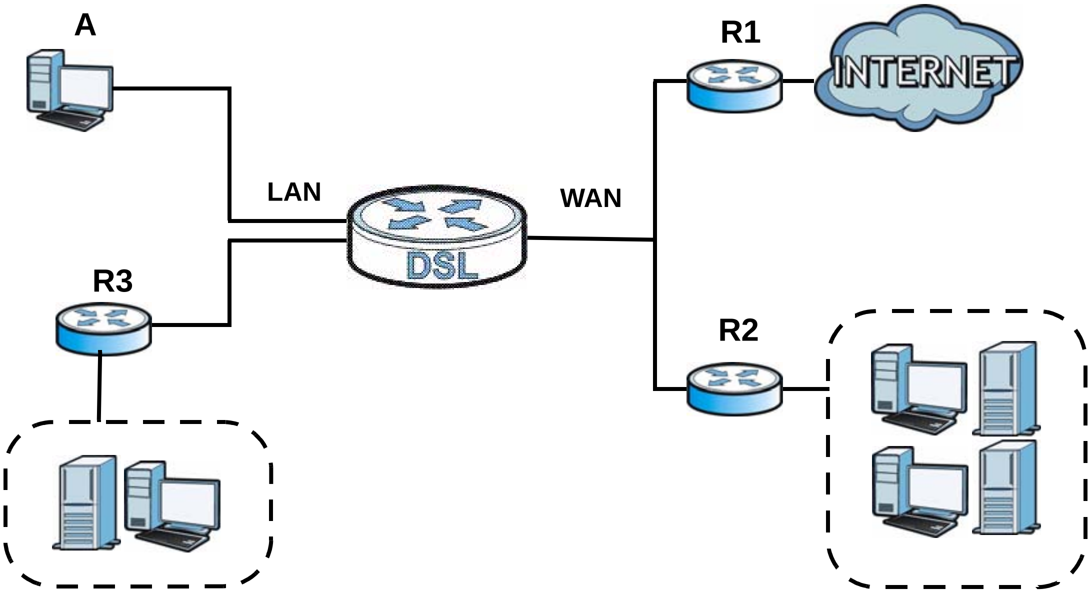
Static Route

12.1 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 77 Example of Static Routing Topology



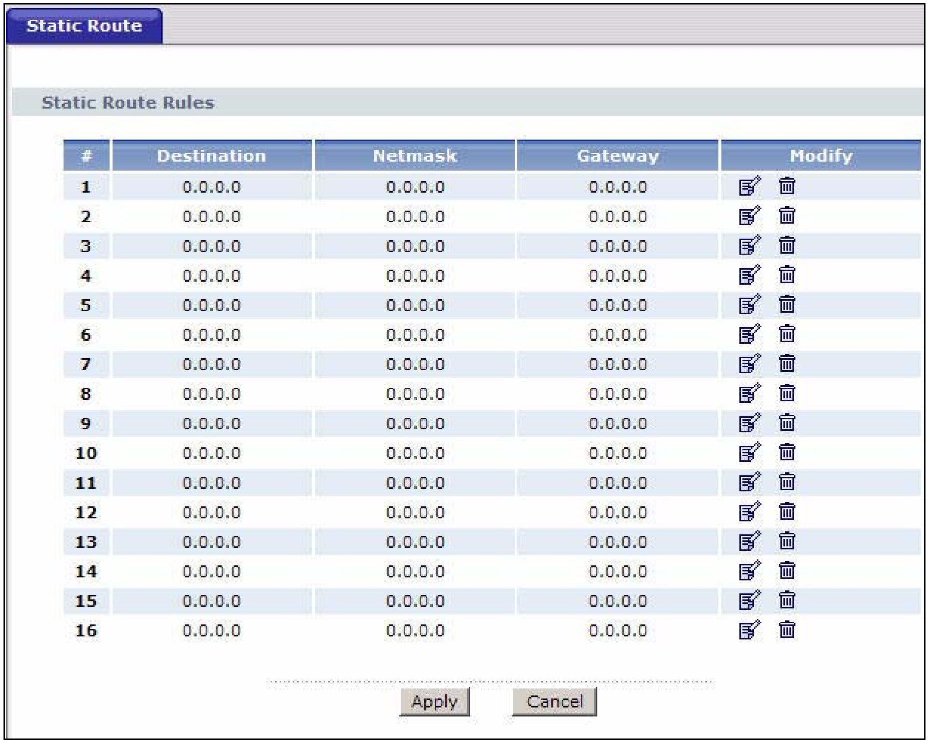
12.1.1 What You Can Do in the Static Route Screens

Use the **Static Route** screens (Section 12.2 on page 162) to view and configure IP static routes on the ZyXEL Device.

12.2 The Static Route Screen

Use this screen to view the static route rules. Click **Advanced > Static Route** to open the **Static Route** screen.

Figure 78 Advanced > Static Route



Static Route Rules

#	Destination	Netmask	Gateway	Modify
1	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
2	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
3	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
4	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
5	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
6	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
7	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
8	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
9	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
10	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
11	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
12	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
13	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
14	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
15	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑
16	0.0.0.0	0.0.0.0	0.0.0.0	✎ 🗑

The following table describes the labels in this screen.

Table 53 Advanced > Static Route

LABEL	DESCRIPTION
#	This is the number of an individual static route.
Destination	This parameter specifies the IP network address of the final destination. Routing is always based on network number.
Netmask	This parameter specifies the IP network subnet mask of the final destination.
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.

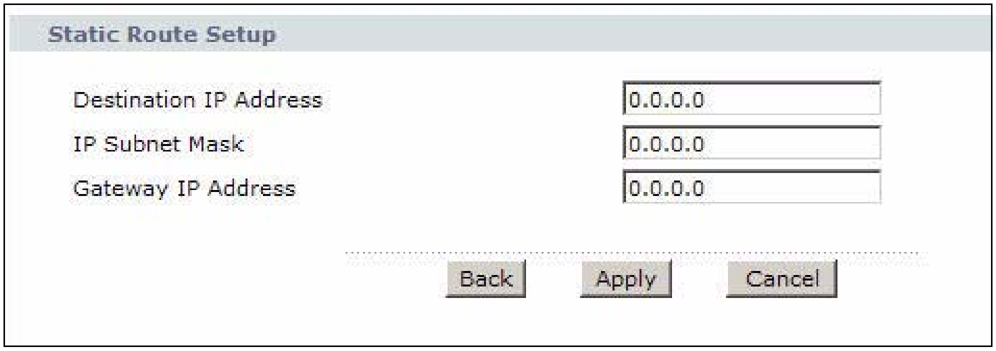
Table 53 Advanced > Static Route

LABEL	DESCRIPTION
Modify	Click the Edit icon to go to the screen where you can set up a static route on the ZyXEL Device. Click the Remove icon to remove a static route from the ZyXEL Device. A window displays asking you to confirm that you want to delete the route.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

12.2.1 Static Route Edit

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

Figure 79 Advanced > Static Route: Edit



Static Route Setup

Destination IP Address	0.0.0.0
IP Subnet Mask	0.0.0.0
Gateway IP Address	0.0.0.0

The following table describes the labels in this screen.

Table 54 Advanced > Static Route: Edit

LABEL	DESCRIPTION
Static Route Setup	
Destination IP Address	This parameter specifies the IP network address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.
IP Subnet Mask	Enter the IP subnet mask here.
Gateway IP Address	Enter the IP address of the gateway. The gateway is a router or switch on the same network segment as the device's LAN or WAN port. The gateway helps forward packets to their destinations.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

13

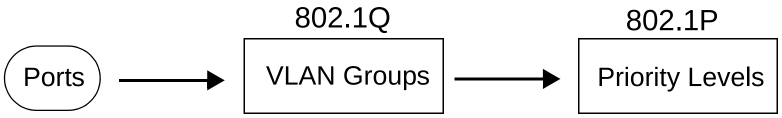
802.1Q/1P

13.1 Overview

This chapter describes how to configure the 802.1Q/1P settings.

A Virtual Local Area Network (VLAN) allows a physical network to be partitioned into multiple logical networks. A VLAN group can be treated as an individual device. Each group can have its own rules about where and how to forward traffic. You can assign any ports on the ZyXEL Device to a VLAN group and configure the settings for the group. You may also set the priority level for traffic trasmitted through the ports.

Figure 80 802.1Q/1P



13.1.1 What You Can Do in the 802.1Q/1P Screens

- Use the **Group Setting** screen (Section 13.2 on page 166) to activate 802.1Q/1P, specify the management VLAN group, display the VLAN groups and configure the settings for each VLAN group.
- Use the **Port Setting** screen (Section 13.3 on page 169) to configure the PVID for each port.

13.1.2 What You Need to Know About 802.1Q/1P

IEEE 802.1P Priority

IEEE 802.1P specifies the user priority field and defines up to eight separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service.

IEEE 802.1Q Tagged VLAN

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 device on which they were created. The VLAN ID associates a frame with a specific VLAN and provides the information that devices need to process the frame across the network.

PVC

A virtual circuit is a logical point-to-point circuit between customer sites. Permanent means that the circuit is preprogrammed by the carrier as a path through the network. It does not need to be set up or torn down for each session.

Forwarding Tagged and Untagged Frames

Each port on the device is capable of passing tagged or untagged frames. To forward a frame from an 802.1Q VLAN-aware device to an 802.1Q VLAN-unaware device, the ZyXEL Device first decides where to forward the frame and then strips off the VLAN tag. To forward a frame from an 802.1Q VLAN-unaware device to an 802.1Q VLAN-aware switch, the ZyXEL Device first decides where to forward the frame, and then inserts a VLAN tag reflecting the ingress port's default VID. The default PVID is VLAN 1 for all ports, but this can be changed.

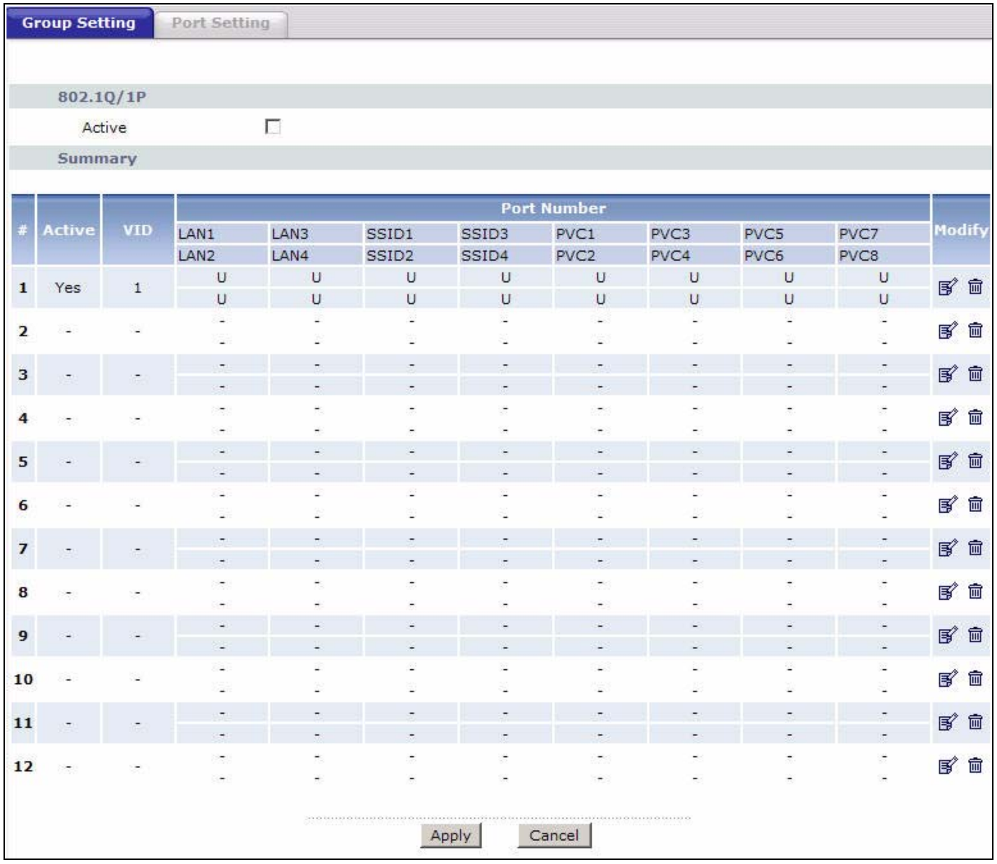
Whether to tag an outgoing frame depends on the setting of the egress port on a per-VLAN, per-port basis (recall that a port can belong to multiple VLANs). If the tagging on the egress port is enabled for the VID of a frame, then the frame is transmitted as a tagged frame; otherwise, it is transmitted as an untagged frame.

13.2 The 802.1Q/1P Group Setting Screen

Use this screen to activate 802.1Q/1P and display the VLAN groups. Click **Advanced > 802.1Q/1P** to display the following screen.

Note: If the WAN interface in the VLAN group is not the default router, you need to create a static route to communicate with the WAN.

Figure 81 Advanced > 802.1Q/1P > Group Setting



802.1Q/1P

Active □

Summary

#	Active	VID	Port Number								Modify
			LAN1 LAN2	LAN3 LAN4	SSID1 SSID2	SSID3 SSID4	PVC1 PVC2	PVC3 PVC4	PVC5 PVC6	PVC7 PVC8	
1	Yes	1	U U	U U	U U	U U	U U	U U	U U	U U	✎ 🗑
2	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
3	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
4	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
5	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
6	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
7	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
8	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
9	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
10	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
11	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑
12	-	-	- -	- -	- -	- -	- -	- -	- -	- -	✎ 🗑

The following table describes the labels in this screen.

Table 55 Advanced > 802.1Q/1P > Group Setting

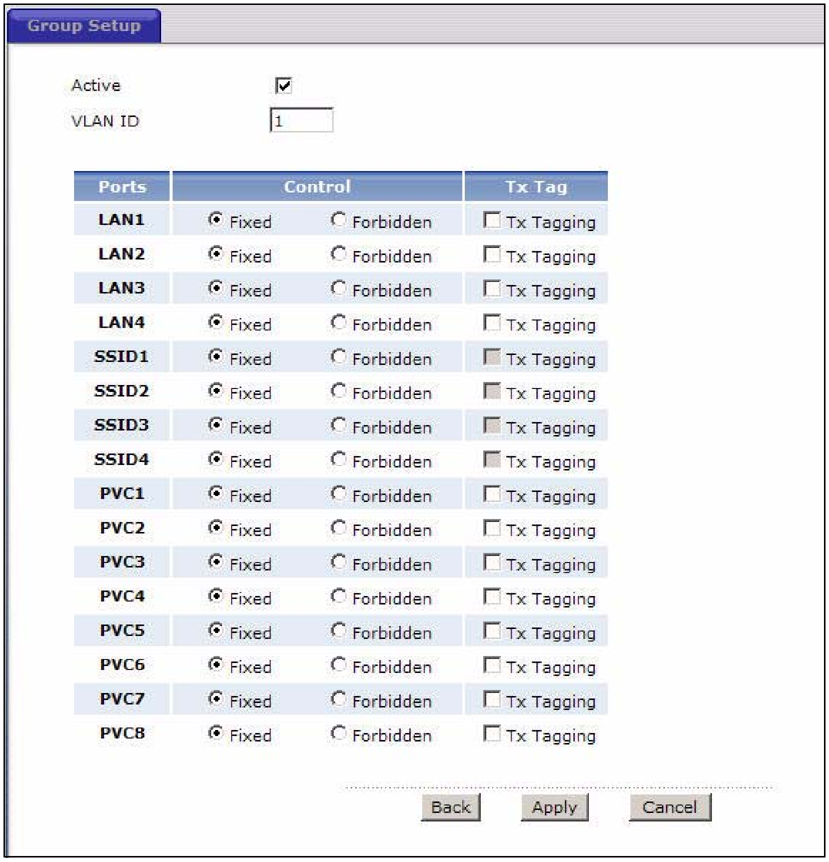
LABEL	DESCRIPTION
802.1Q/1P	
Active	Select this check box to activate the 802.1P/1Q feature.
Summary	
#	This field displays the index number of the VLAN group.
Active	This field displays whether 802.1P/1Q is active for the VLAN group.
VID	This field displays the ID number of the VLAN group.
Port Number	These columns display the VLAN's settings for each port. A tagged port is marked as **T**, an untagged port is marked as **U** and ports not participating in a VLAN are marked as "**–**".
Modify	Click the **Edit** button to configure the the ports in the VLAN group. Click the **Remove** button to delete the VLAN group.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

13.2.1 Editing 802.1Q/1P Group Setting

Use this screen to configure the settings for each VLAN group.

In the **802.1Q/1P** screen, click the **Edit** button from the **Modify** filed to display the following screen.

Figure 82 Advanced > 802.1Q/1P > Group Setting > Edit



Group Setup

Active ☑

VLAN ID 1

Ports	Control		Tx Tag
LAN1	● Fixed	○ Forbidden	□ Tx Tagging
LAN2	● Fixed	○ Forbidden	□ Tx Tagging
LAN3	● Fixed	○ Forbidden	□ Tx Tagging
LAN4	● Fixed	○ Forbidden	□ Tx Tagging
SSID1	● Fixed	○ Forbidden	□ Tx Tagging
SSID2	● Fixed	○ Forbidden	□ Tx Tagging
SSID3	● Fixed	○ Forbidden	□ Tx Tagging
SSID4	● Fixed	○ Forbidden	□ Tx Tagging
PVC1	● Fixed	○ Forbidden	□ Tx Tagging
PVC2	● Fixed	○ Forbidden	□ Tx Tagging
PVC3	● Fixed	○ Forbidden	□ Tx Tagging
PVC4	● Fixed	○ Forbidden	□ Tx Tagging
PVC5	● Fixed	○ Forbidden	□ Tx Tagging
PVC6	● Fixed	○ Forbidden	□ Tx Tagging
PVC7	● Fixed	○ Forbidden	□ Tx Tagging
PVC8	● Fixed	○ Forbidden	□ Tx Tagging

The following table describes the labels in this screen.

Table 56 Advanced > 802.1Q/1P > Group Setting > Edit

LABEL	DESCRIPTION
Active	Select this check box to activate the group setting.
VLAN ID	Assign a VLAN ID for the VLAN group. The valid VID range is between 1 and 4094.
Default Gateway	Select the default gateway for the VLAN group.
Ports	This field displays the types of ports available to join the VLAN group.
Control	Select **Fixed** for the port to be a permanent member of the VLAN group. Select **Forbidden** if you want to prohibit the port from joining the VLAN group.

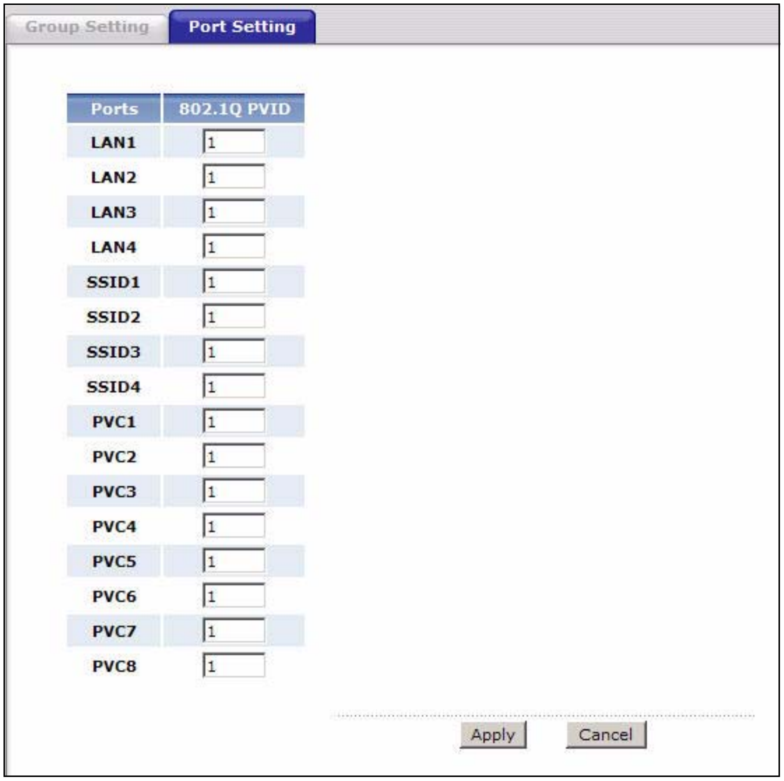
Table 56 Advanced > 802.1Q/1P > Group Setting > Edit (continued)

LABEL	DESCRIPTION
Tx Tag	Select **Tx Tagging** if you want the port to tag all outgoing traffic trasmitted through this VLAN. You select this if you want to create VLANs across different devices and not just the ZyXEL Device.
Back	Click this to return to the previous screen without saving.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

13.3 The 802.1Q/1P Port Setting Screen

Use this screen to configure the PVID for each port. Click **Advanced** > **802.1Q/1P** > **Port Setting** to display the following screen.

Figure 83 Advanced > 802.1Q/1P > Port Setting



Ports	802.1Q PVID
LAN1	1
LAN2	1
LAN3	1
LAN4	1
SSID1	1
SSID2	1
SSID3	1
SSID4	1
PVC1	1
PVC2	1
PVC3	1
PVC4	1
PVC5	1
PVC6	1
PVC7	1
PVC8	1

The following table describes the labels in this screen.

Table 57 Advanced > 802.1Q/1P > Port Setting

LABEL	DESCRIPTION
Ports	This field displays the types of ports available to join the VLAN group.
802.1Q PVID	Assign a VLAN ID for the port. The valid VID range is between 1 and 4094. The ZyXEL Device assigns the PVID to untagged frames or priority-tagged frames received on this port.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

14

Quality of Service (QoS)

14.1 Overview

Use the **QoS** screen to set up your ZyXEL Device to use QoS for traffic management.

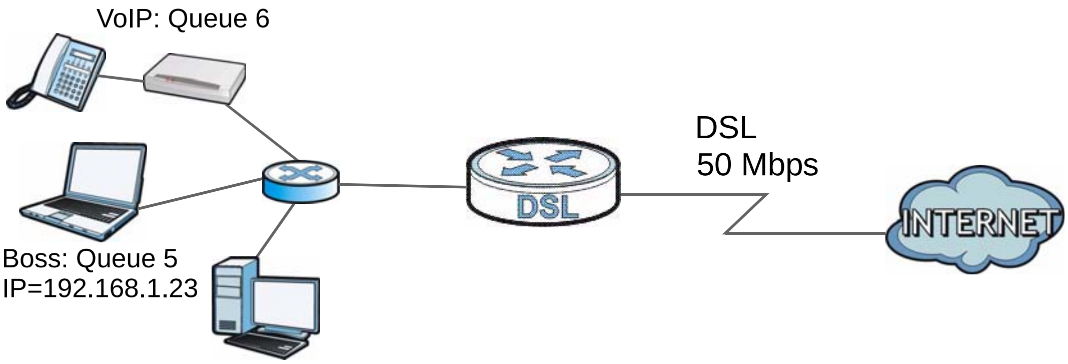
Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control bandwidth. QoS allows the ZyXEL Device to group and prioritize application traffic and fine-tune network performance.

Without QoS, all traffic data are 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 applications such as video-on-demand.

The ZyXEL Device assigns each packet a priority and then queues the packet accordingly. Packets assigned with a high priority are processed more quickly than those with low priorities 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 Voice over IP (VoIP) or Internet gaming, and those for which jitter alone is a problem such as Internet radio or streaming video.

In the following figure, your Internet connection has an upstream transmission speed of 50 Mbps. You configure a classifier to assign the highest priority queue (6) to VoIP traffic from the LAN interface, so that voice traffic would not get delayed when there is network congestion. Traffic from the boss's IP address (192.168.1.23 for example) is mapped to queue 5. Traffic that does not match these two classes are assigned priority queue based on the internal QoS mapping table on the ZyXEL Device.

Figure 84 QoS Example



14.1.1 What You Can Do in the QoS Screens

- Use the **QoS** screen (Section 14.2 on page 173) to configure QoS settings on the ZyXEL Device.
- Use the **QoS Settings Summary** screen (Section 14.2.1 on page 175) to check the summary of QoS rules and actions you configured for the ZyXEL Device.

14.1.2 What You Need to Know About QoS

802.1p

QoS is used to prioritize source-to-destination traffic flows. All packets in the same flow are given the same priority. 802.1p 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 802.1p to give different priorities to different packet types.

Tagging and Marking

In a QoS class, you can configure whether to add or change the DiffServ Code Point (DSCP) 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.

Finding Out More

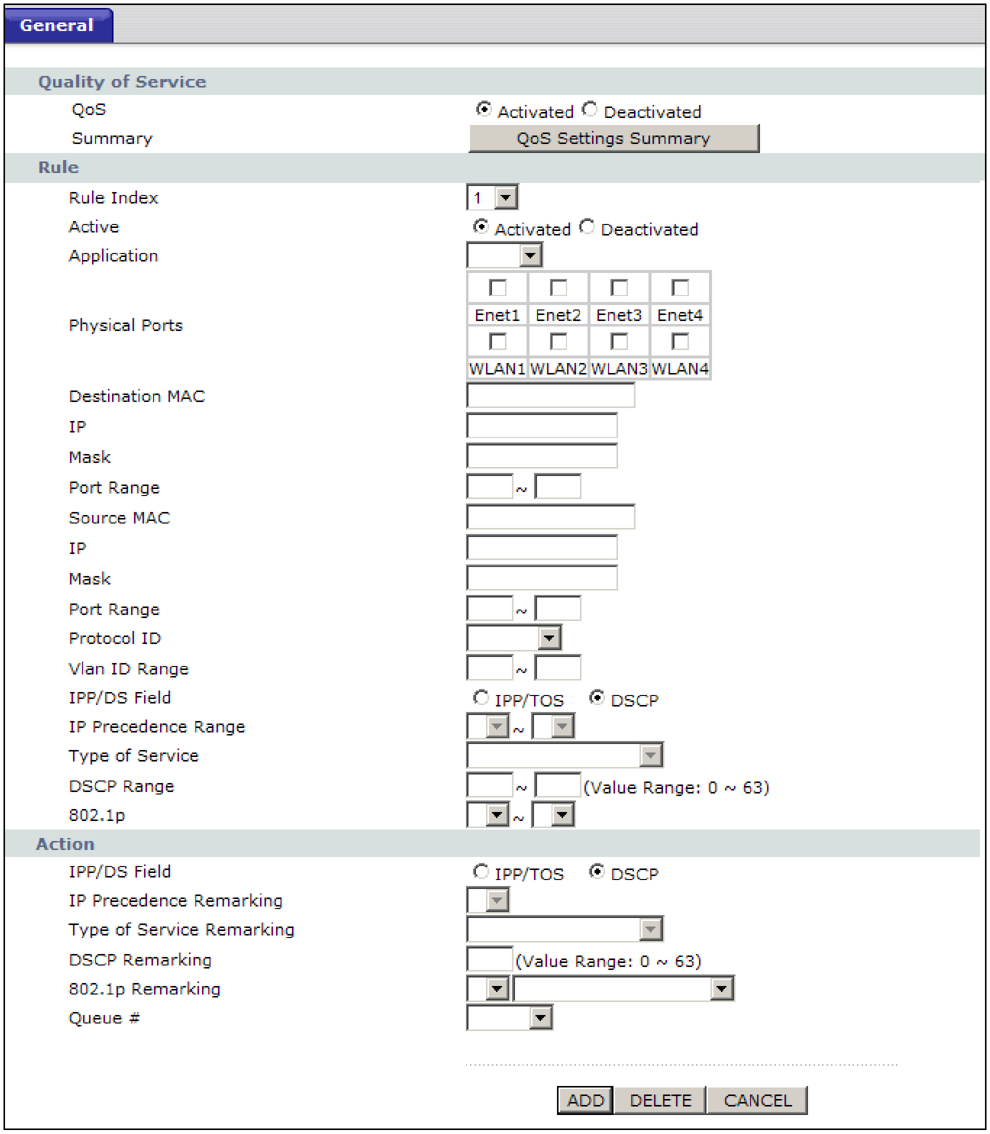
See Section 14.3 on page 176 for advanced technical information on QoS.

14.2 The QoS Screen

Use this screen to enable or disable QoS and have the ZyXEL Device assign priority levels to traffic according to the port range, IEEE 802.1p priority level and/or IP precedence.

Click **Advanced Setup > QoS** to open the screen as shown next.

Figure 85 Advanced Setup > QoS



General

Quality of Service	
QoS	● Activated ○ Deactivated
Summary	QoS Settings Summary
Rule	
Rule Index	1
Active	● Activated ○ Deactivated
Application	
Physical Ports	□ Enet1 □ Enet2 □ Enet3 □ Enet4 □ WLAN1 □ WLAN2 □ WLAN3 □ WLAN4
Destination MAC	
IP	
Mask	
Port Range	~
Source MAC	
IP	
Mask	
Port Range	~
Protocol ID	
Vlan ID Range	~
IPP/DS Field	○ IPP/TOS ● DSCP
IP Precedence Range	~
Type of Service	
DSCP Range	~ (Value Range: 0 ~ 63)
802.1p	~
Action	
IPP/DS Field	○ IPP/TOS ● DSCP
IP Precedence Remarking	
Type of Service Remarking	
DSCP Remarking	(Value Range: 0 ~ 63)
802.1p Remarking	
Queue #	

ADD DELETE CANCEL

The following table describes the labels in this screen.

Table 58 Advanced Setup > QoS

LABEL	DESCRIPTION
Quality of Service	
QoS	Use this field 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.
Summary	Click this to open a summary table showing the QoS settings. See Section 14.2.1 on page 175 for more details.
Rule	
Rule Index	Select the rule's index number from the drop-down list box.
Active	Use this field to enable or disable the rule.
Application	Select an application from the drop-down list box. The **Destination Port Range** and **Protocol ID** fields may change depending on the type of applications you choose.
Physical Ports	Select **Enet1** to apply the rule to the Ethernet port.
Destination MAC	Type a destination MAC address here. QoS is then applied to traffic containing this destination MAC address. Leave it blank to apply the rule to all MAC addresses.
IP	Enter a destination IP address in dotted decimal notation. QoS is then applied to traffic containing this destination IP address. A blank destination IP address means any destination IP address.
Mask	Enter a destination subnet mask here.
Port Range	Either use the default value set by the application you choose, or enter the port number to which the rule should be applied.
Source MAC	Type a source MAC address here. QoS is then applied to traffic containing this source MAC address. Leave it blank to apply the rule to all MAC addresses.
IP	Enter a source IP address in dotted decimal notation. QoS is then applied to traffic containing this source IP address. A blank source IP address means any source IP address.
Mask	Enter a source subnet mask here.
Port Range	Enter the port number to which the rule should be applied. 0 means any source port number. See Appendix E on page 307 for some common services and port numbers.
Protocol ID	Select an IP protocol type from the drop-down list box.
Vlan ID Range	Enter the source VLAN ID in this field.
IPP/DS Field	Select **IPP/TOS** to specify an IP precedence range and type of services. Select **DSCP** to specify a DiffServ Code Point (DSCP) range.
IP Precedence Range	Enter a range from 0 to 7 for IP precedence. Zero is the lowest priority and seven is the highest.

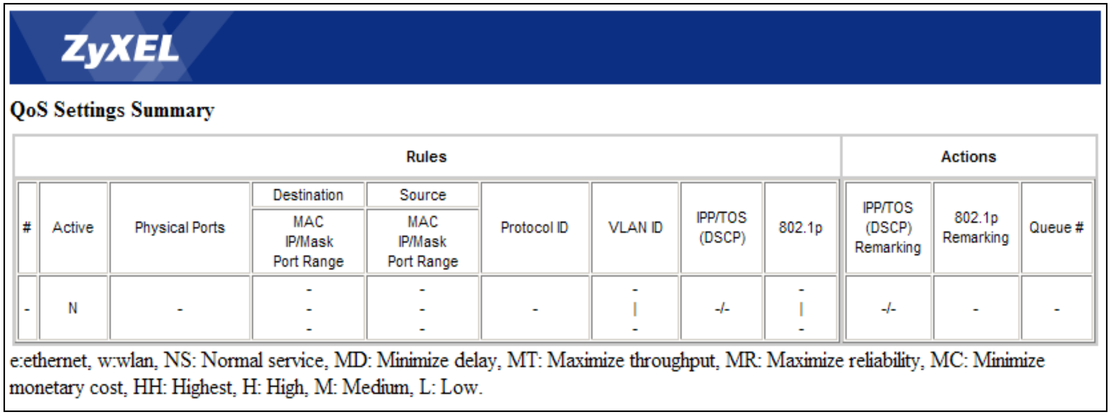
Table 58 Advanced Setup > QoS

LABEL	DESCRIPTION
Type of Service	Select a type of service from the drop-down list box. Available options are: **Normal service**, **Minimize delay**, **Maximize throughput**, **Maximize reliability** and **Minimize monetary cost**.
DSCP Range	Specify a DSCP number between 0 and 63 in this field.
802.1p	Select a priority level (0 to 7) from the drop-down list box.
Action	
IPP/DS Field	Select **IPP/TOS** to specify an IP precedence range and type of services. Select **DSCP** to specify a DiffServ Code Point (DSCP) range.
IP Precedence Remarking	Enter a range from 0 to 7 to re-assign IP precedence to matched traffic. Zero is the lowest priority and seven is the highest.
Type of Service Remarking	Select a type of service to re-assign the priority level to matched traffic. Available options are: **Normal service**, **Minimize delay**, **Maximize throughput**, **Maximize reliability** and **Minimize monetary cost**.
DSCP Remarking	Specify a DSCP number between 0 and 63 to re-assign the priority level to matched traffic.
802.1p Remarking	Select a priority level (0 to 7) to re-assign the priority level to matched traffic.
Queue #	Specify a **Low**, **Medium**, **High** or **Highest** queue tag to matched traffic. Traffic assigned to a higher queue gets through faster while traffic in lower queues is dropped when there is network congestion.
ADD	Click this to add the rule.
DELETE	Click this to remove the rule.
CANCEL	Click this to restore previously saved settings.

14.2.1 The QoS Settings Summary Screen

Use this screen to display a summary of rules and actions configured for the ZyXEL Device. In the **Advanced > QoS** screen, click the **QoS Settings Summary** button to open the following screen.

Figure 86 Advanced Setup > QoS > QoS Settings Summary



QoS Settings Summary

Rules									Actions		
			Destination	Source							
#	Active	Physical Ports	MAC IP/Mask Port Range	MAC IP/Mask Port Range	Protocol ID	VLAN ID	IPP/TOS (DSCP)	802.1p	IPP/TOS (DSCP) Remarking	802.1p Remarking	Queue #
-	N	-	- - -	- - -	-	- | -	-/-	- | -	-/-	-	-

e:ethernet, w:wlan, NS: Normal service, MD: Minimize delay, MT: Maximize throughput, MR: Maximize reliability, MC: Minimize monetary cost, HH: Highest, H: High, M: Medium, L: Low.

The following table describes the labels in this screen.

Table 59 Advanced Setup > QoS > QoS Settings Summary

LABEL	DESCRIPTION
Rules	
#	This is the rule's index number.
Active	This shows whether the rule is enabled or disabled.
Physical Ports	This is the physical port associated with the rule.
Destination MAC and IP/Mask Port Ranges	This is the port range for destination MAC address and IP address.
Source MAC and IP/Mask Port Ranges	This is the port range for source MAC address and IP address.
Protocol ID	This is the protocol ID associated with the rule.
VLAN ID	This is the VLAN ID associated with the rule.
IPP/TOS (DSCP)	This shows the IPP/TOS or DSCP settings.
802.1p	This is the 802.1p priority level.
Actions	
IPP/TOS (DSCP) Remarking	The ZyXEL Device re-assigns the priority values specified in this field to matched traffic.
802.1p Remarking	The ZyXEL Device re-assigns the priority levels specified in this field to matched traffic.
Queue #	The ZyXEL Device assigns the queue level specified in this field to matched traffic.

14.3 QoS Technical Reference

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

14.3.1 IEEE 802.1p

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 60 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 60 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.

14.3.2 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.

14.3.3 Automatic Priority Queue Assignment

If you enable QoS on the ZyXEL Device, the ZyXEL Device can automatically base on the IEEE 802.1p priority level, IP precedence and/or packet length to assign priority to traffic which does not match a class.

The following table shows you the internal layer-2 and layer-3 QoS mapping on the ZyXEL Device. On the ZyXEL Device, traffic assigned to higher priority queues gets through faster while traffic in lower index queues is dropped if the network is congested.

Table 61 Internal Layer2 and Layer3 QoS Mapping

PRIORITY QUEUE	LAYER 2	LAYER 3		
	IEEE 802.1P USER PRIORITY (ETHERNET PRIORITY)	TOS (IP PRECEDENCE)	DSCP	IP PACKET LENGTH (BYTE)
0	1	0	000000	
1	2			
2	0	0	000000	>1100

Table 61 Internal Layer2 and Layer3 QoS Mapping

PRIORITY QUEUE	LAYER 2	LAYER 3		
	IEEE 802.1P USER PRIORITY (ETHERNET PRIORITY)	TOS (IP PRECEDENCE)	DSCP	IP PACKET LENGTH (BYTE)
3	3	1	001110 001100 001010 001000	250~1100
4	4	2	010110 010100 010010 010000	
5	5	3	011110 011100 011010 011000	<250
6	6	4	100110 100100 100010 100000	
		5	101110 101000	
7	7	6	110000	
		7	111000	

15

Dynamic DNS Setup

15.1 Overview

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

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

15.1.1 What You Can Do in the DDNS Screen

Use the **Dynamic DNS** screen (Section 15.2 on page 180) to enable DDNS and configure the DDNS settings on the ZyXEL Device.

15.1.2 What You Need To Know About DDNS

DYNDNS Wildcard

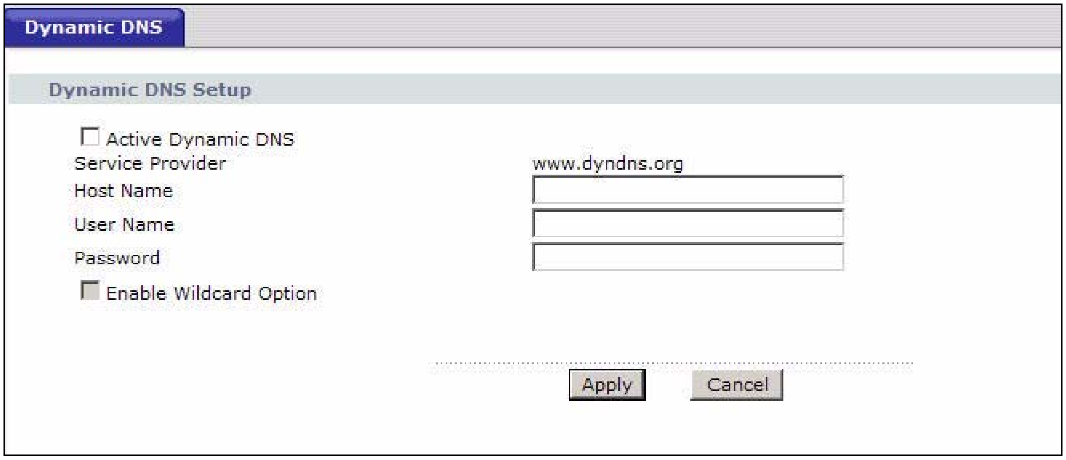
Enabling the wildcard feature for your host causes *.yourhost.dyndns.org to be aliased to the same IP address as yourhost.dyndns.org. This feature is useful if you want to be able to use, for example, www.yourhost.dyndns.org and still reach your hostname.

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

15.2 The Dynamic DNS Screen

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

Figure 87 Advanced > Dynamic DNS



Dynamic DNS

Dynamic DNS Setup

☐ Active Dynamic DNS

Service Provider www.dyndns.org

Host Name

User Name

Password

☐ Enable Wildcard Option

The following table describes the fields in this screen.

Table 62 Advanced > Dynamic DNS

LABEL	DESCRIPTION
Dynamic DNS Setup	
Active Dynamic DNS	Select this check box to use dynamic DNS.
Service Provider	This is the name of your Dynamic DNS service provider.
Dynamic DNS Type	Select the type of service that you are registered for from your Dynamic DNS service provider.
Host Name	Type the domain name assigned to your ZyXEL Device by your Dynamic DNS provider. You can specify up to two host names in the field separated by a comma (",").
User Name	Type your user name.
Password	Type the password assigned to you.
Enable Wildcard Option	Select the check box to enable DynDNS Wildcard.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

16

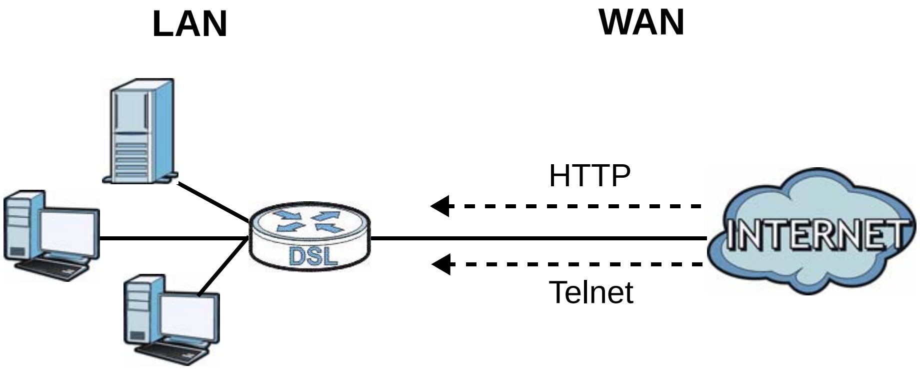
Remote Management

16.1 Overview

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

The following figure shows remote management of the ZyXEL Device coming in from the WAN.

Figure 88 Remote Management From the WAN



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

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

- Internet (WAN only)
- LAN only
- LAN and WAN
- None (Disable)

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

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

1. Telnet
2. HTTP

16.1.1 What You Can Do in the Remote Management Screens

- Use the **WWW** screen (Section 16.2 on page 183) to configure through which interface(s) and from which IP address(es) users can use HTTP to manage the ZyXEL Device.
- Use the **Telnet** screen (Section 16.3 on page 184) to configure through which interface(s) and from which IP address(es) users can use Telnet to manage the ZyXEL Device.
- Use the **FTP** screen (Section 16.4 on page 185) to configure through which interface(s) and from which IP address(es) users can use FTP to access the ZyXEL Device.
- Your ZyXEL Device can act as an SNMP agent, which allows a manager station to manage and monitor the ZyXEL Device through the network. Use the **SNMP** screen (see Section 16.5 on page 186) to configure through which interface(s) and from which IP address(es) users can use SNMP to access the ZyXEL Device.
- Use the **DNS** screen (Section 16.6 on page 188) to configure through which interface(s) and from which IP address(es) users can send DNS queries to the ZyXEL Device.
- Use the **ICMP** screen (Section 16.7 on page 189) to set whether or not your ZyXEL Device will respond to pings and probes for services that you have not made available.

16.1.2 What You Need to Know About Remote Management

Remote Management Limitations

Remote management does not work when:

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

Remote Management and NAT

When NAT is enabled:

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

System Timeout

There is a default system management idle timeout of five minutes (three hundred seconds). The ZyXEL Device automatically logs you out if the management session remains idle for longer than this timeout period. The management session does not time out when a statistics screen is polling.

16.2 The WWW Screen

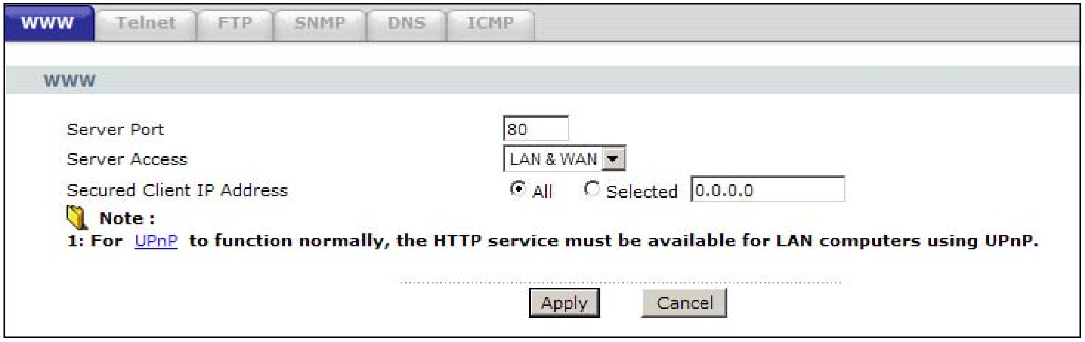
Use this screen to specify how to connect to the ZyXEL Device from a web browser, such as Internet Explorer.

Note: If you disable the **WWW** service in the **Remote MGMT > WWW** screen, then the ZyXEL Device blocks all HTTP connection attempts.

16.2.1 Configuring the WWW Screen

Click **Advanced > Remote MGMT** to display the **WWW** screen.

Figure 89 Advanced > Remote MGMT > WWW



WWW

Server Port	80
Server Access	LAN & WAN
Secured Client IP Address	● All ○ Selected 0.0.0.0

Note :

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

The following table describes the labels in this screen.

Table 63 Advanced > Remote Management > WWW

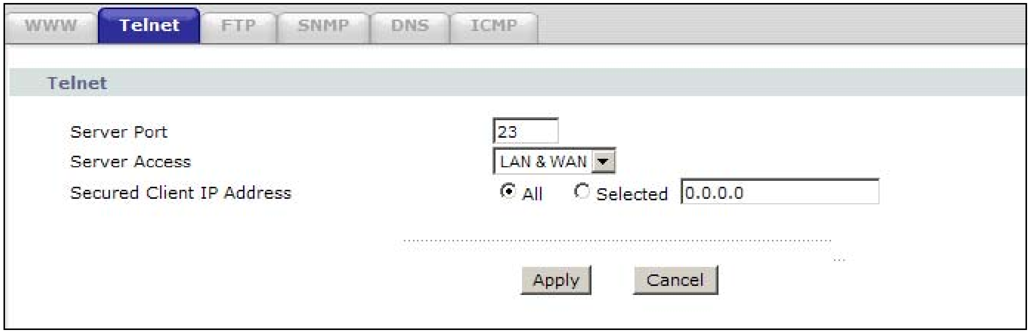
LABEL	DESCRIPTION
Server Port	You may change the server port number for a service, if needed. However, you must use the same port number in order to use that service for remote management.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.
Secured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

16.3 The Telnet Screen

You can use Telnet to access the ZyXEL Device's command line interface. Specify which interfaces allow Telnet access and from which IP address the access can come.

Click **Advanced > Remote MGMT** > **Telnet** tab to display the screen as shown.

Figure 90 Advanced > Remote MGMT > Telnet



Server Port: 23

Server Access: LAN & WAN

Secured Client IP Address: ● All ○ Selected 0.0.0.0

The following table describes the labels in this screen.

Table 64 Advanced > Remote Management > Telnet

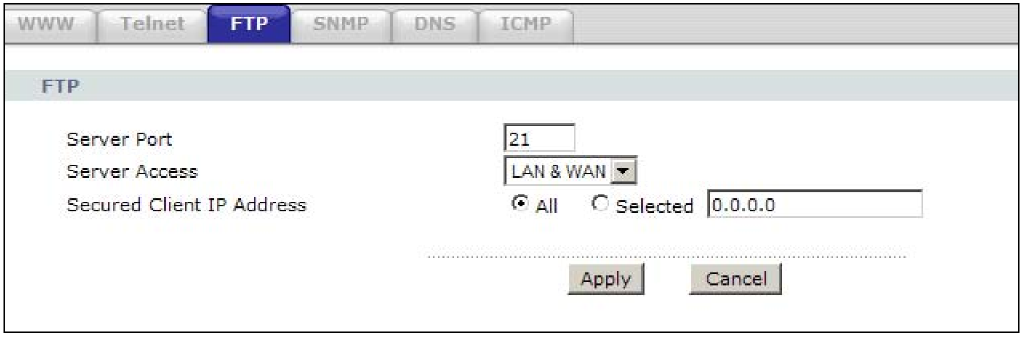
LABEL	DESCRIPTION
Server Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.
Secured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

16.4 The FTP Screen

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

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

Figure 91 Advanced > Remote MGMT > FTP



Server Port: 21

Server Access: LAN & WAN

Secured Client IP Address: ● All ○ Selected 0.0.0.0

The following table describes the labels in this screen.

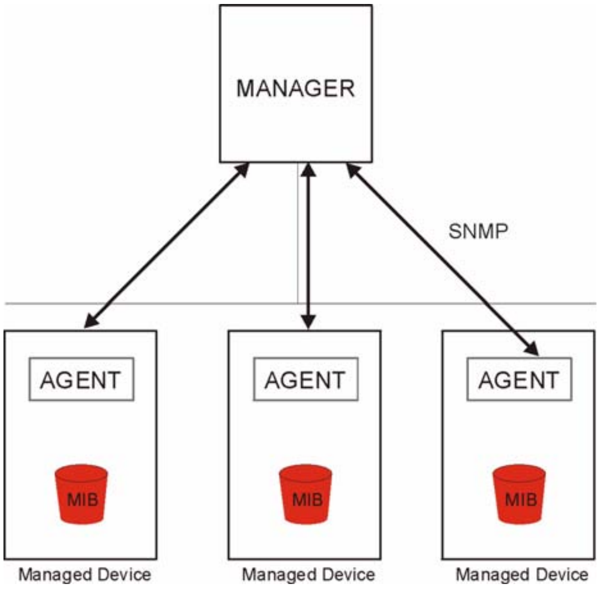
Table 65 Advanced > Remote MGMT > FTP

LABEL	DESCRIPTION
Server Port	You may change the server port number for a service, if needed. However, you must use the same port number in order to use that service for remote management.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.
Secured Client IP Address	A secured client is a “trusted” computer that is allowed to communicate with the ZyXEL Device using this service. Select **All** to allow any computer to access the ZyXEL Device using this service. Choose **Selected** to just allow the computer with the IP address that you specify to access the ZyXEL Device using this service.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

16.5 The SNMP Screen

Simple Network Management Protocol is a protocol used for exchanging management information between network devices. Your ZyXEL Device supports SNMP agent functionality, which allows a manager station to manage and monitor the ZyXEL Device through the network. The ZyXEL Device supports SNMP version one (SNMPv1) and version two (SNMPv2c). The next figure illustrates an SNMP management operation.

Figure 92 SNMP Management Model



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

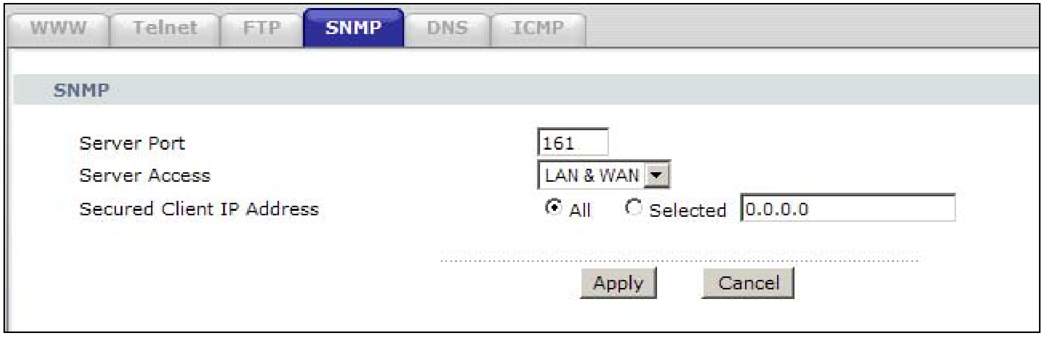
An agent is a management software module that resides in a managed device (the ZyXEL Device). An agent translates the local management information from the managed device into a form compatible with SNMP. The manager is the console through which network administrators perform network management functions.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

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

16.5.1 Configuring SNMP

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

Figure 93 Advanced > Remote MGMT > SNMP



SNMP

Server Port	161
Server Access	LAN & WAN
Secured Client IP Address	● All ○ Selected 0.0.0.0

The following table describes the labels in this screen.

Table 66 Advanced > Remote MGMT > SNMP

LABEL	DESCRIPTION
Server Port	The SNMP agent listens on port 161 by default. If you change the SNMP server port to a different number on the ZyXEL Device, for example 8161, then you must notify people who need to access the ZyXEL Device SNMP agent to use the same port.
Server Access	Select the interface(s) through which a computer may access the ZyXEL Device using this service.
Secured Client IP Address	A secured client is a "trusted" computer that is allowed to access the SNMP agent on the ZyXEL Device. Select **All** to allow any computer to access the SNMP agent. Choose **Selected** to just allow the computer with the IP address that you specify to access the SNMP agent.

Table 66 Advanced > Remote MGMT > SNMP (continued)

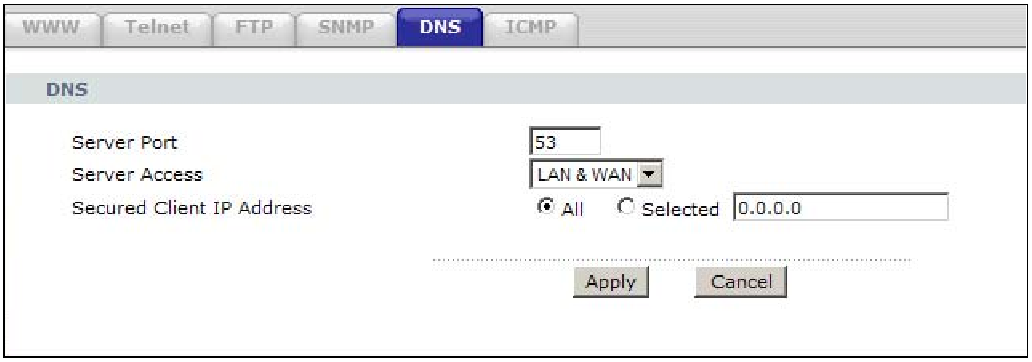
LABEL	DESCRIPTION
Apply	Click **Apply** to save your changes back to the ZyXEL Device.
Cancel	Click **Cancel** to begin configuring this screen afresh.

16.6 The DNS Screen

Use DNS (Domain Name System) to map a domain name to its corresponding IP address and vice versa. Refer to Chapter 7 on page 89 for background information.

Use this screen to set from which IP address the ZyXEL Device will accept DNS queries and on which interface it can send them your ZyXEL Device's DNS settings. This feature is not available when the ZyXEL Device is set to bridge mode. Click **Advanced > Remote MGMT** > **DNS** to change your ZyXEL Device's DNS settings.

Figure 94 Advanced > Remote Management > DNS



DNS

Server Port: 53

Server Access: LAN & WAN

Secured Client IP Address: ● All ○ Selected 0.0.0.0

The following table describes the labels in this screen.

Table 67 Advanced > Remote Management > DNS

LABEL	DESCRIPTION
Server Port	The DNS service port number is 53 and cannot be changed here.
Server Access	Select the interface(s) through which a computer may send DNS queries to the ZyXEL Device.
Secured Client IP Address	A secured client is a "trusted" computer that is allowed to send DNS queries to the ZyXEL Device. Select **All** to allow any computer to send DNS queries to the ZyXEL Device. Choose **Selected** to just allow the computer with the IP address that you specify to send DNS queries to the ZyXEL Device.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

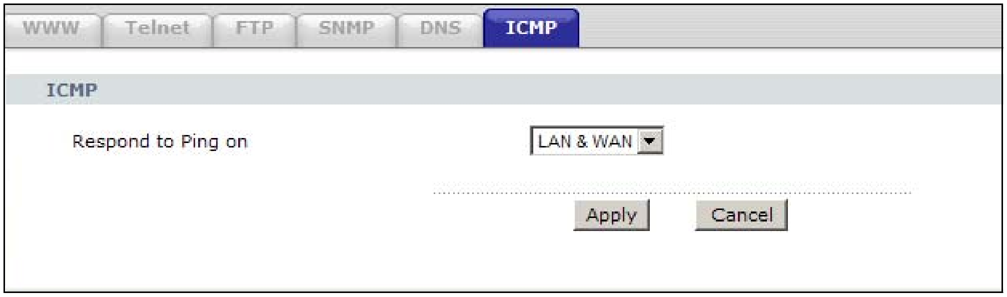
16.7 The ICMP Screen

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

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

Note: If you want your device to respond to pings and requests for unauthorized services, you may also need to configure the firewall anti probing settings to match.

Figure 95 Advanced > Remote Management > ICMP



Respond to Ping on: LAN & WAN

The following table describes the labels in this screen.

Table 68 Advanced > Remote Management > ICMP

LABEL	DESCRIPTION
ICMP	Internet Control Message Protocol is a message control and error-reporting protocol between a host server and a gateway to the Internet. ICMP uses Internet Protocol (IP) datagrams, but the messages are processed by the TCP/IP software and directly apparent to the application user.
Respond to Ping on	The ZyXEL Device will not respond to any incoming Ping requests when **Disable** is selected. Select **LAN** to reply to incoming LAN Ping requests. Select **WAN** to reply to incoming WAN Ping requests. Otherwise select **LAN & WAN** to reply to both incoming LAN and WAN Ping requests.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

17

Universal Plug-and-Play (UPnP)

17.1 Overview

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

17.1.1 What You Can Do in the UPnP Screen

Use the **UPnP** screen (Section 17.2 on page 193) to enable UPnP on the ZyXEL Device and allow UPnP-enabled applications to automatically configure the ZyXEL Device.

17.1.2 What You Need to Know About UPnP

Identifying UPnP Devices

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.

NAT Traversal

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

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

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

See the NAT chapter for more information on NAT.

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.

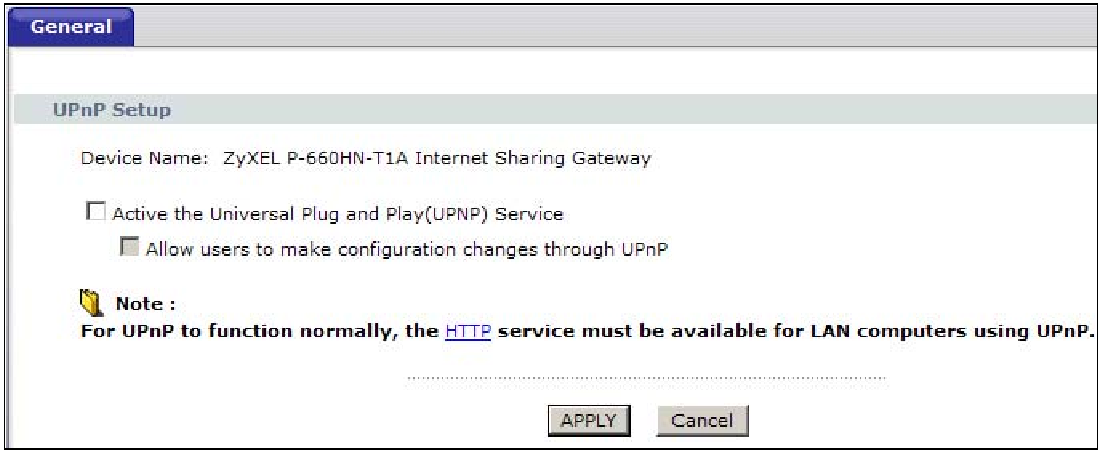
See the following sections for examples of installing and using UPnP.

17.2 The UPnP Screen

Use the following screen to configure the UPnP settings on your ZyXEL Device. Click **Advanced > UPnP** to display the screen shown next.

See Section 17.1 on page 191 for more information.

Figure 96 Advanced > UPnP > General



UPnP Setup

Device Name: ZyXEL P-660HN-T1A Internet Sharing Gateway

□ Active the Universal Plug and Play(UPNP) Service

□ Allow users to make configuration changes through UPnP

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

The following table describes the fields in this screen.

Table 69 Advanced > UPnP > General

LABEL	DESCRIPTION
Active the Universal Plug and Play (UPnP) Feature	Select this check box to activate UPnP. Be aware that anyone could use a UPnP application to open the web configurator's login screen without entering the ZyXEL Device's IP address (although you must still enter the password to access the web configurator).
Allow users to make configuration changes through UPnP	Select this check box to allow UPnP-enabled applications to automatically configure the ZyXEL Device so that they can communicate through the ZyXEL Device, for example by using NAT traversal, UPnP applications automatically reserve a NAT forwarding port in order to communicate with another UPnP enabled device; this eliminates the need to manually configure port forwarding for the UPnP enabled application.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

17.3 Installing UPnP in Windows Example

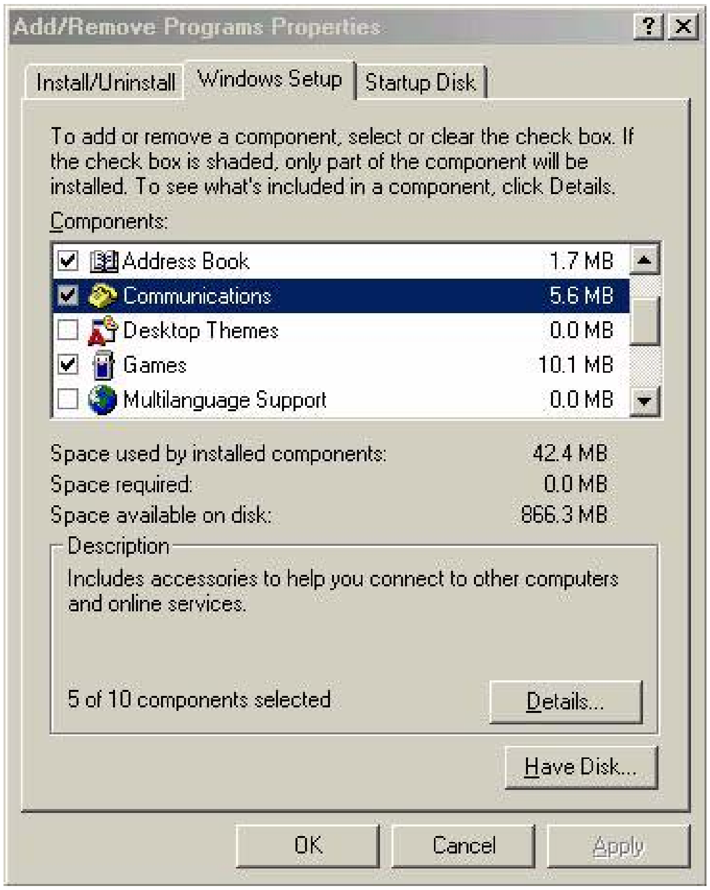
This section shows how to install UPnP in Windows Me and Windows XP.

Installing UPnP in Windows Me

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

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

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



Add/Remove Programs Properties

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

Components:

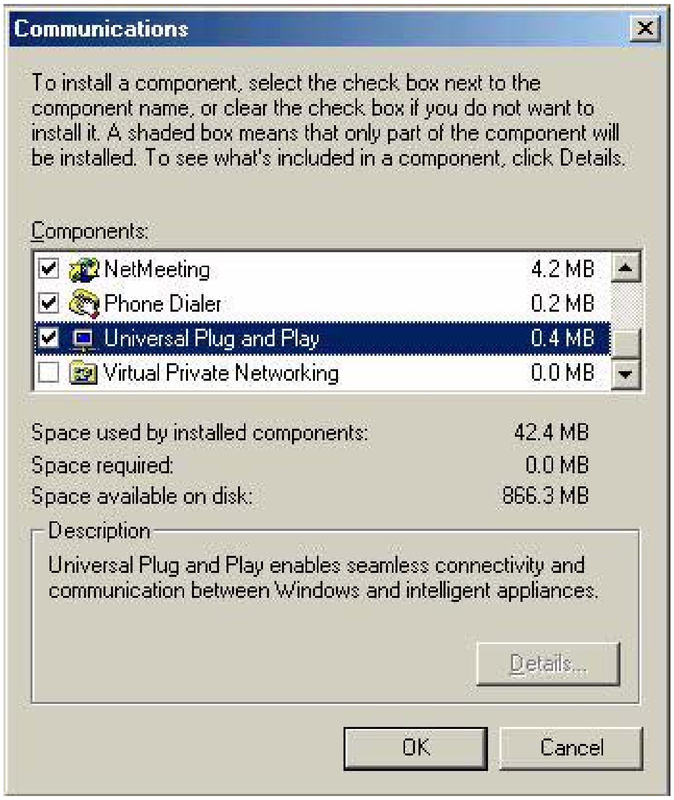
☑	Address Book	1.7 MB
☑	Communications	5.6 MB
□	Desktop Themes	0.0 MB
☑	Games	10.1 MB
□	Multilanguage Support	0.0 MB

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

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

5 of 10 components selected

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



Communications

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

Components:

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

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

Description

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

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

5 Restart the computer when prompted.

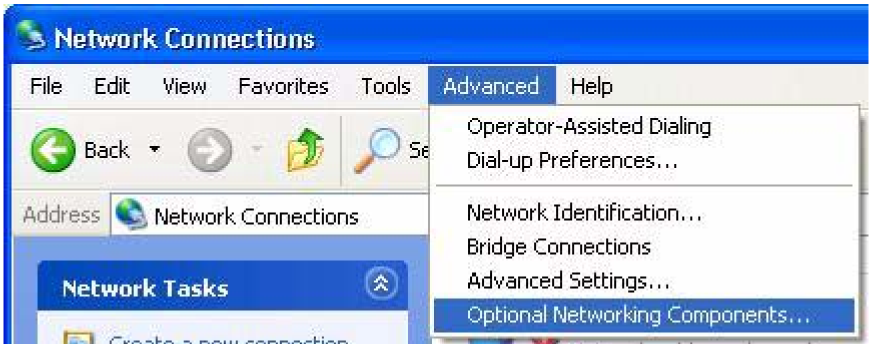
Installing UPnP in Windows XP

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

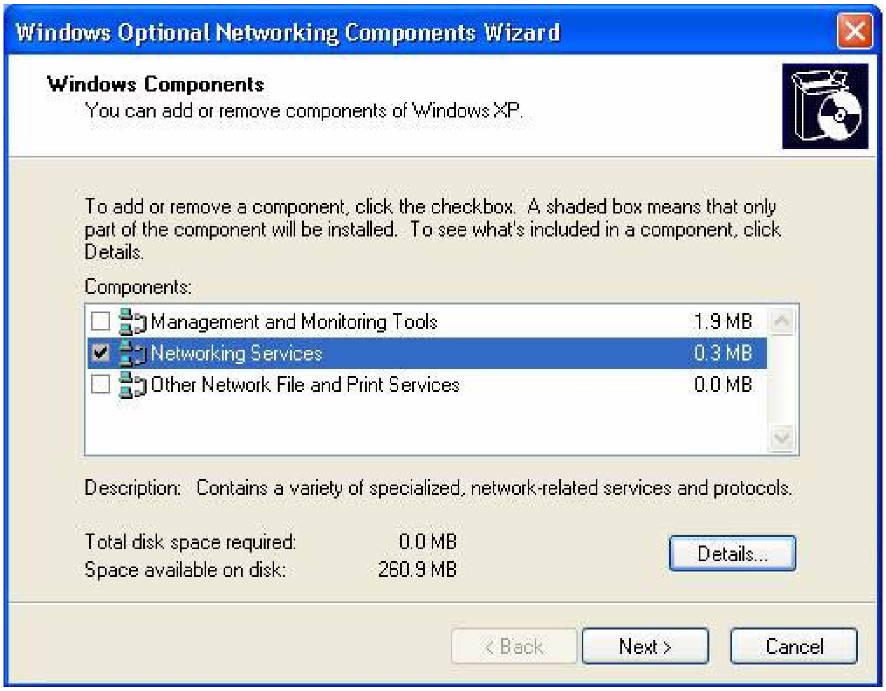
1 Click **Start** and **Control Panel**.

2 Double-click **Network Connections**.

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



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



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:

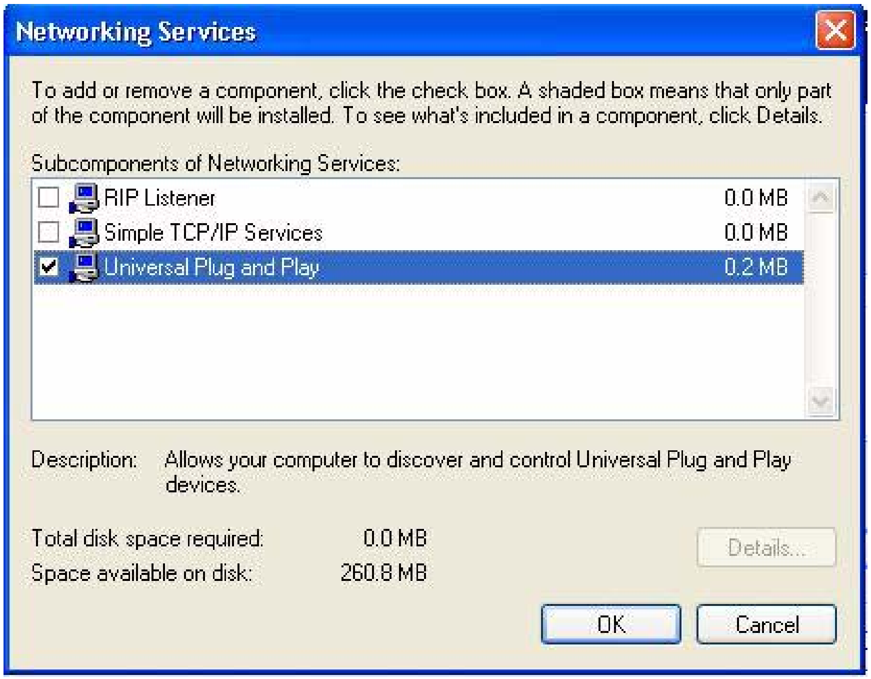
☐	Management and Monitoring Tools	1.9 MB
☑	Networking Services	0.3 MB
☐	Other Network File and Print Services	0.0 MB

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.



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**.

17.4 Using UPnP in Windows XP Example

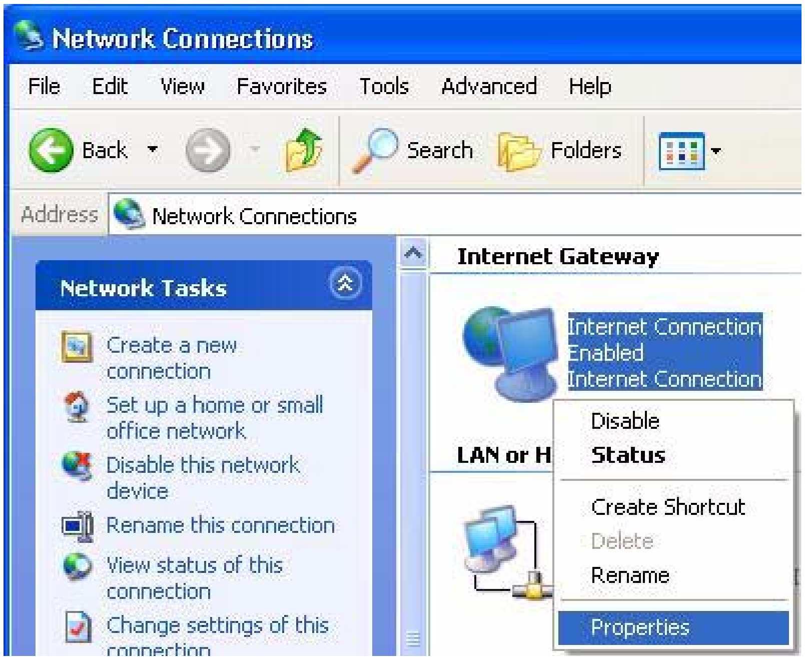
This section shows you how to use the UPnP feature in Windows XP. You must already have UPnP installed in Windows XP and UPnP activated on the ZyXEL Device.

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

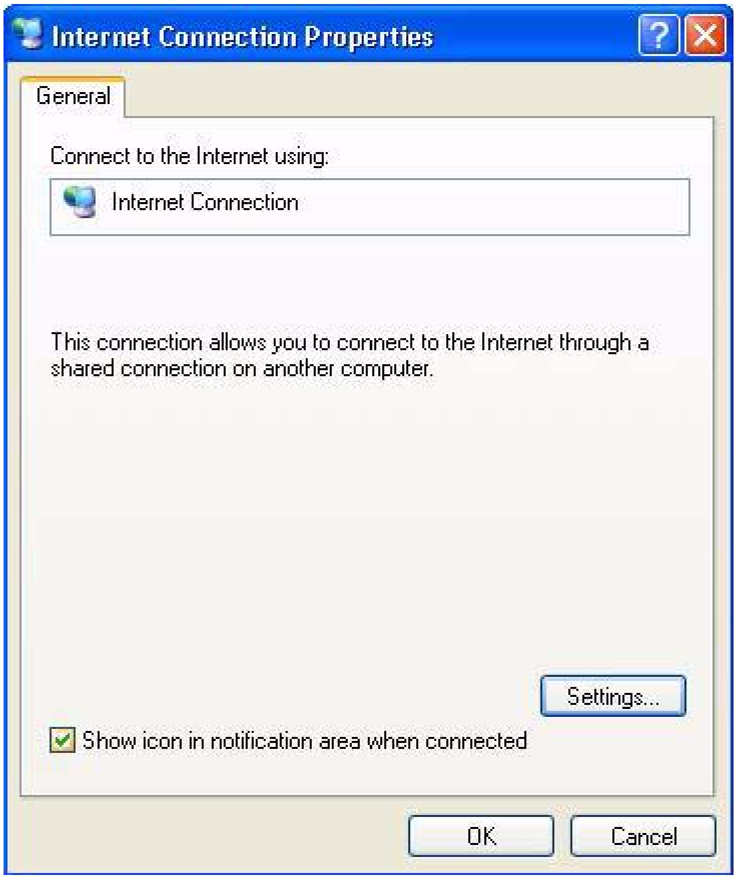
Auto-discover Your UPnP-enabled Network Device

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

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



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



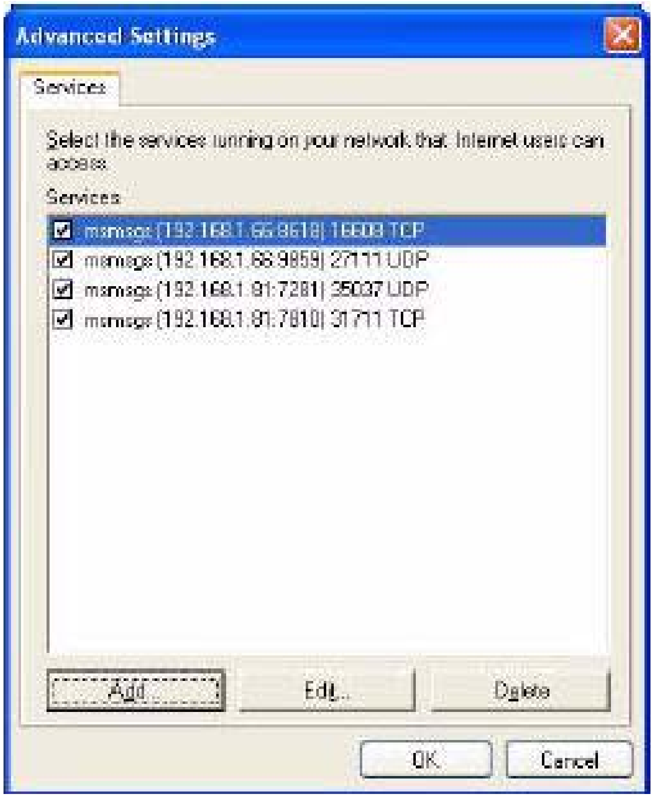
Connect to the Internet using:

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

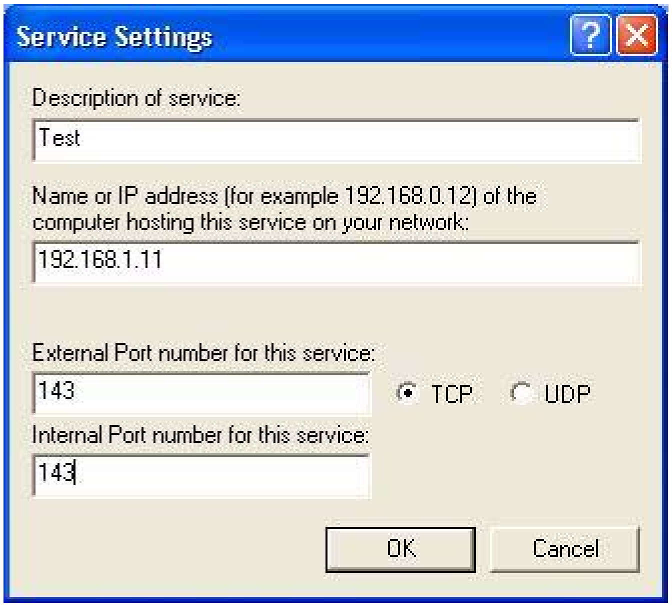
4 You may edit or delete the port mappings or click **Add** to manually add port mappings.



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

Services

☑ msmsgs (192.168.1.65:8618) 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



Description of service: Test

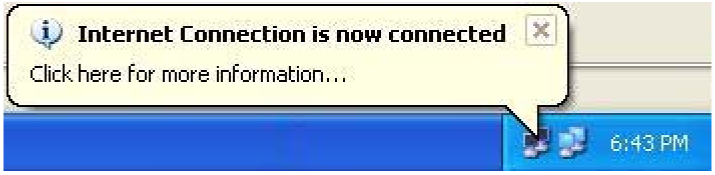
Name or IP address (for example 192.168.0.12) of the computer hosting this service on your network: 192.168.1.11

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.

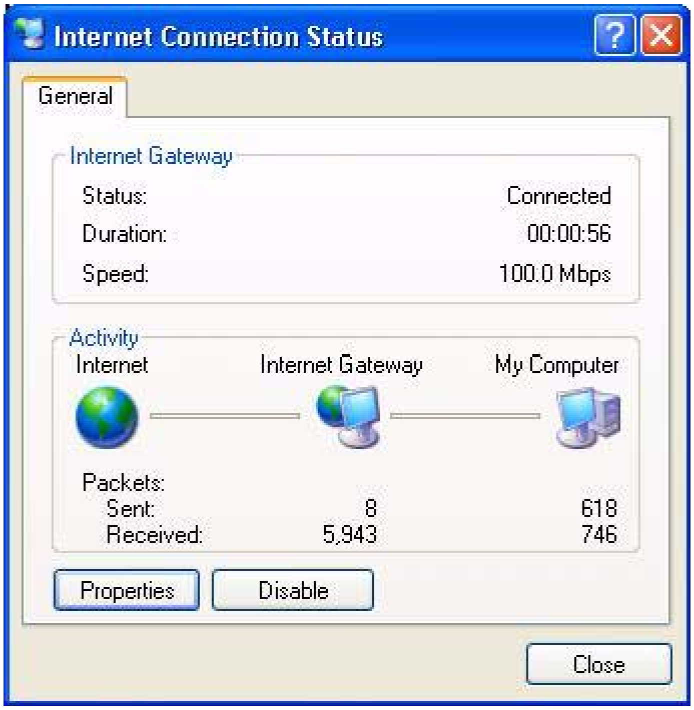
6 Select **Show icon in notification area when connected** option and click **OK**. An icon displays in the system tray.



Internet Connection is now connected

Click here for more information...

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



Internet Connection Status

Internet Gateway

Status: Connected

Duration: 00:00:56

Speed: 100.0 Mbps

Activity

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

Web Configurator Easy Access

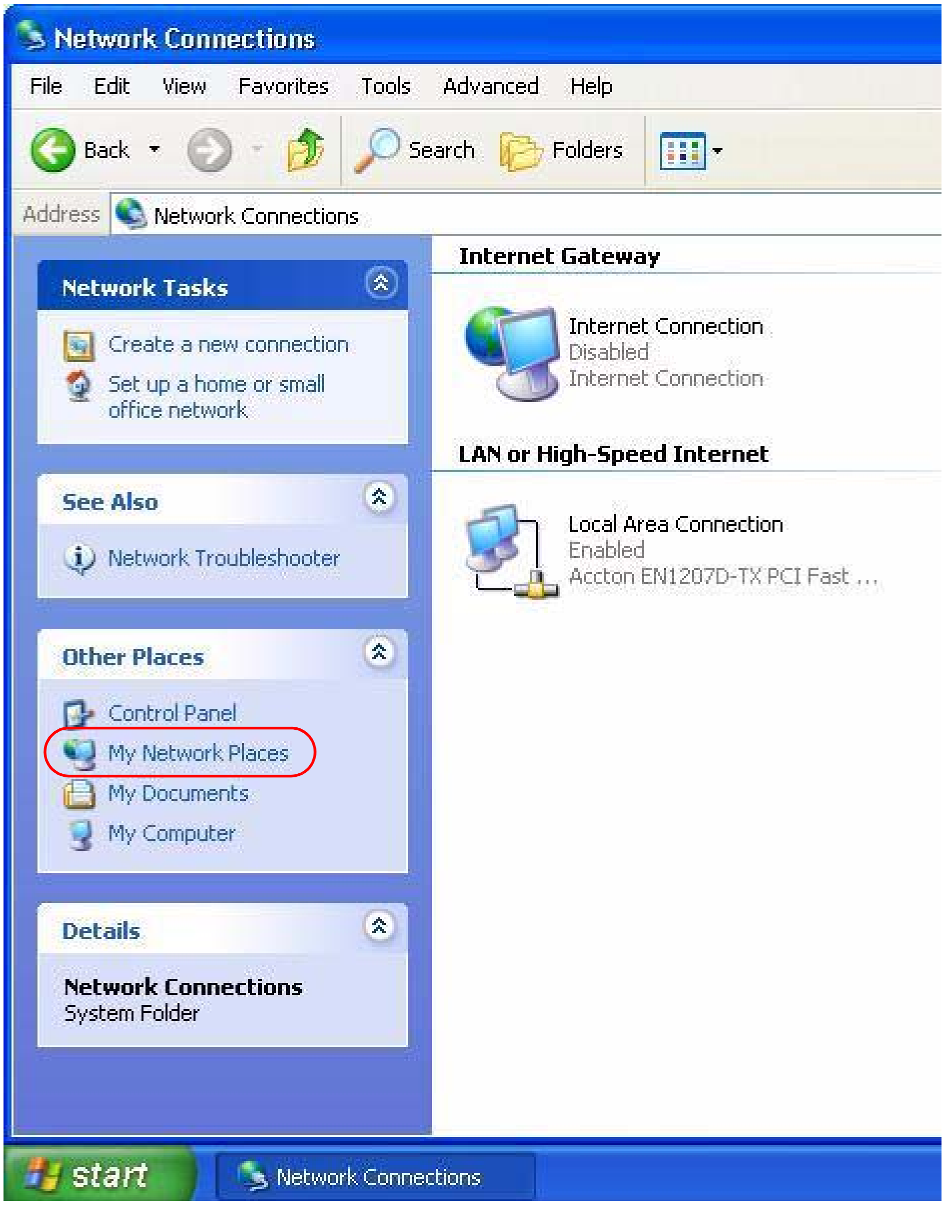
With UPnP, you can access the web-based configurator on the ZyXEL Device without finding out the IP address of the ZyXEL Device first. This comes helpful if you do not know the IP address of the ZyXEL Device.

Follow the steps below to access the web configurator.

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

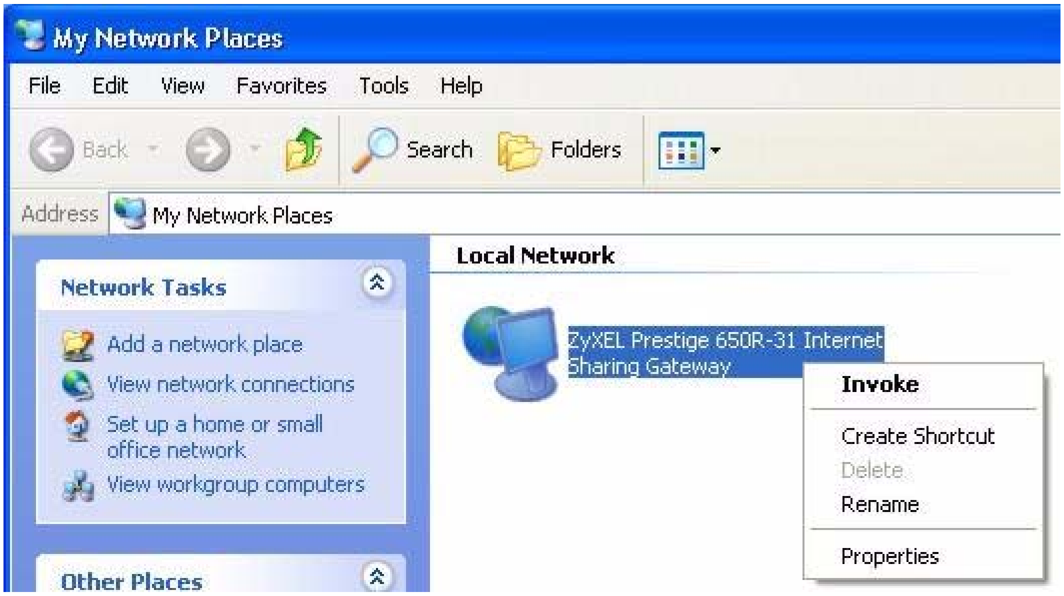
2 Double-click **Network Connections**.

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

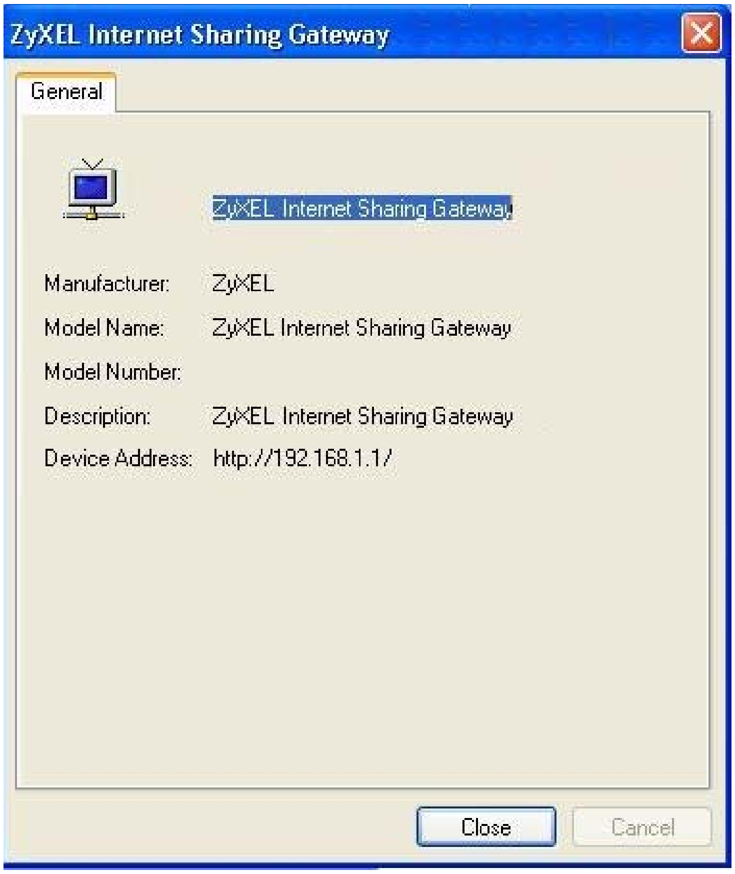


4 An icon with the description for each UPnP-enabled device displays under **Local Network**.

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



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



ZyXEL Internet Sharing Gateway

Manufacturer:	ZyXEL
Model Name:	ZyXEL Internet Sharing Gateway
Model Number:	
Description:	ZyXEL Internet Sharing Gateway
Device Address:	http://192.168.1.1/

18

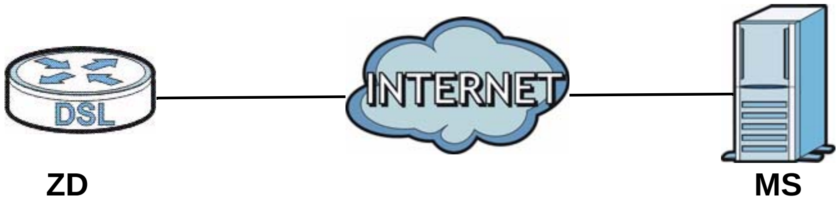
CWMP

18.1 Overview

The ZyXEL Device supports TR-069 Amendment 1 (CPE WAN Management Protocol Release 2.0) and TR-069 Amendment 2 (CPE WAN Management Protocol v1.1, Release 3.0).

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

Figure 97   LAN and WAN



An administrator can use a management server to remotely set up the ZyXEL device, modify settings, perform firmware upgrades as well as monitor and diagnose the ZyXEL device.

In order to use CWMP, you need to configure the following steps:

1 Activate CWMP

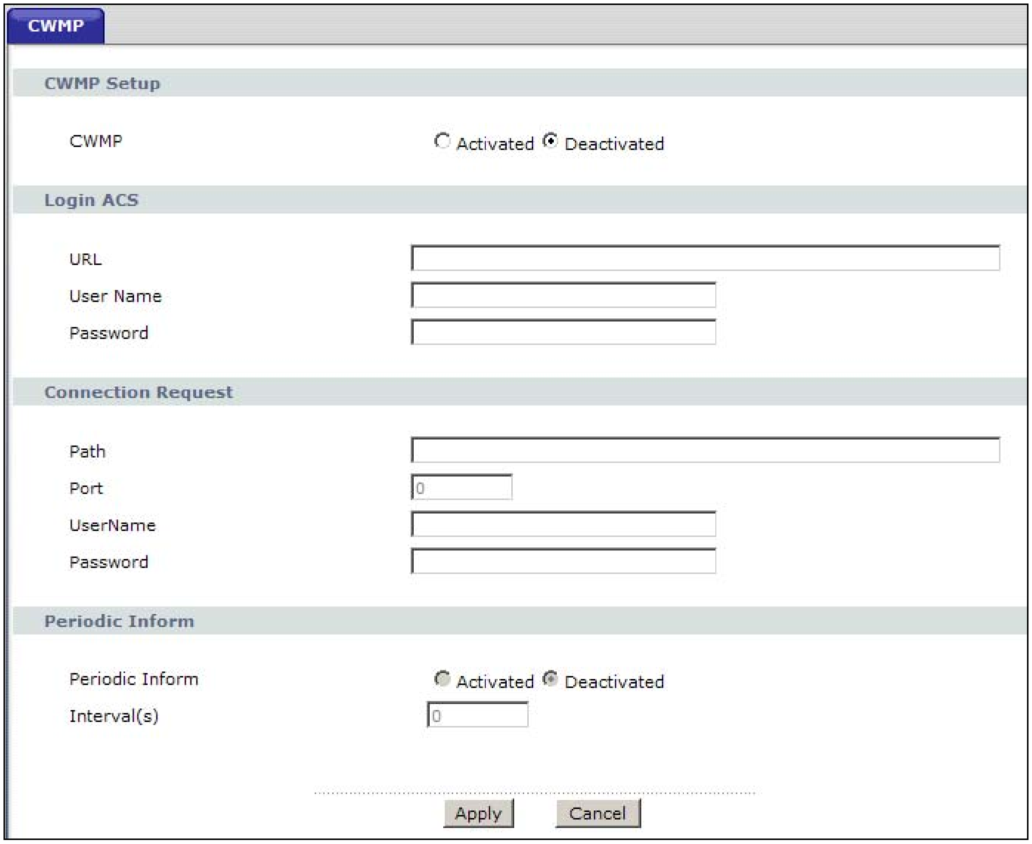
2 Specify the URL, username and password.

3 Activate periodic inform and specify an interval value.

18.2 The CWMP Setup Screen

Use this screen to configure your ZyXEL Device to be managed by a management server. Click **Advanced**> **CWMP** to display the following screen.

Figure 98 Advanced > CWMP



CWMP Setup

CWMP ○ Activated ● Deactivated

Login ACS

URL

User Name

Password

Connection Request

Path

Port 0

UserName

Password

Periodic Inform

Periodic Inform ○ Activated ● Deactivated

Interval(s) 0

The following table describes the fields in this screen.

Table 70 Advanced > CWMP

LINK	DESCRIPTION
CWMP Setup	
CWMP	Select **Activated** to allow the ZyXEL Device to be managed by a management server or select **Deactivated** to not allow the ZyXEL Device to be managed by a management server.
Login ACS	Configure this part of the screen to log into the management server.
URL	Type the IP address or domain name of the management server. If the ZyXEL Device is behind a NAT router that assigns it a private IP address, you will have to configure a NAT port forwarding rule on the NAT router.
User Name	The user name is used to authenticate the ZyXEL Device when making a connection to the management server. This user name on the management server and the ZyXEL Device must be the same. Type a user name of up to 255 printable characters found on an English-language keyboard. Spaces and characters such as @#$%^&*()_+ are allowed.

Table 70 Advanced > CWMP (continued)

LINK	DESCRIPTION
Password	The password is used to authenticate the ZyXEL Device when making a connection to the management server. This password on the management server and the ZyXEL Device must be the same. Type a password of up to 255 printable characters found on an English-language keyboard.
Connection Request	Use this part of the screen to allow the management server to connect to the ZyXEL Device after a successful login.
Path	Type the IP address or domain name of the ZyXEL Device. The management server uses this path to verify the ZyXEL Device.
Port	The default port for access to the ZyXEL Device from the management server is the HTTP port, port 80. If you change it, make sure it does not conflict with another port on your network and it is recommended to use a port number above 1024 (not a commonly used port). The management server should use this port to connect to the ZyXEL Device. You may need to alter your NAT port forwarding rules if they were already configured.
UserName	The user name is used to authenticate the management server when connecting to the ZyXEL Device. Type a user name of up to 255 printable characters found on an English-language keyboard. Spaces and characters such as @#$%^&*()_+ are allowed.
Password	The password is used to authenticate the management server when connecting to the ZyXEL Device. Type a password of up to 255 printable characters found on an English-language keyboard. Spaces are not allowed.
Periodic Inform	Select **Activated** to have the ZyXEL Device periodically send information to the management server (recommended if CWMP is enabled) or select **Deactivated** to not have the ZyXEL Device periodically send information to the management server
Interval	The interval is the duration in seconds for which the ZyXEL Device must attempt to connect with the management server to send information and check for configuration updates. Enter a value between 1 and 86400 seconds.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

19

System Settings

19.1 Overview

This chapter shows you how to configure system related settings, such as system time, password, name, the domain name and the inactivity timeout interval.

19.1.1 What You Can Do in the System Settings Screens

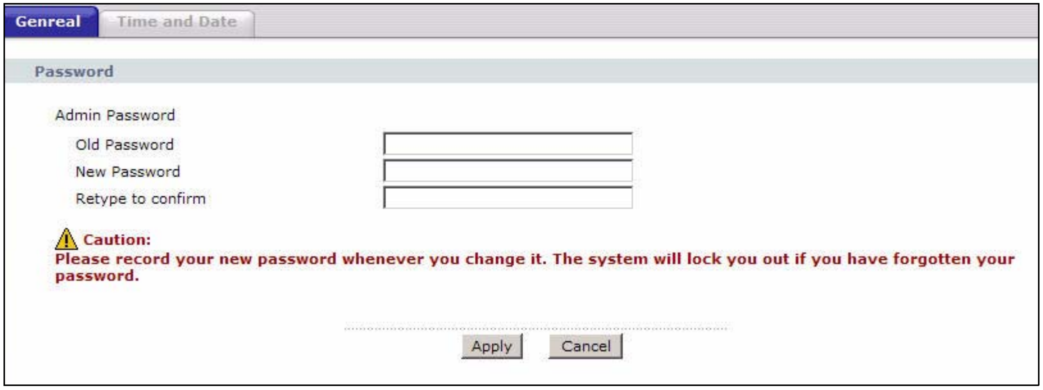
- Use the **General** screen (Section 19.2 on page 207) to configure system settings.
- Use the **Time and Date** screen (Section 19.3 on page 208) to set the system time.

19.2 The General Screen

Use this screen to configure system admin password.

Click **Maintenance > System** to open the **General** screen.

Figure 99 Maintenance > System > General



Caution:
Please record your new password whenever you change it. The system will lock you out if you have forgotten your password.

The following table describes the labels in this screen.

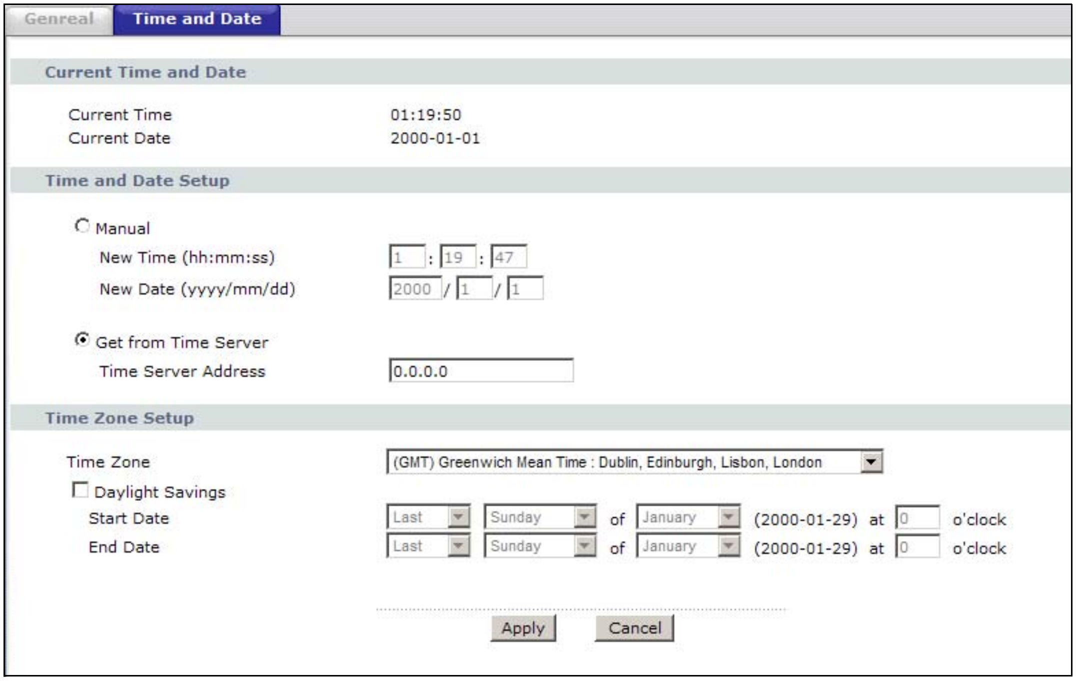
Table 71 Maintenance > System > General

LABEL	DESCRIPTION
Password	
Admin Password	
Old Password	Type the default password or the existing password you use to access the system in this field.
New Password	Type your new system password (up to 30 characters). Note that as you type a password, the screen displays a (*) for each character you type. After you change the password, use the new password to access the ZyXEL Device.
Retype to confirm	Type the new password again for confirmation.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

19.3 The Time and Date Screen

Use this screen to configure the ZyXEL Device’s time based on your local time zone. To change your ZyXEL Device’s time and date, click **Maintenance > System > Time and Date**. The screen appears as shown.

Figure 100 Maintenance > System > Time and Date



Current Time and Date

Current Time	01:19:50
Current Date	2000-01-01

Time and Date Setup

○ Manual

New Time (hh:mm:ss)	1 : 19 : 47
New Date (yyyy/mm/dd)	2000 / 1 / 1

● Get from Time Server

Time Server Address	0.0.0.0

Time Zone Setup

Time Zone	(GMT) Greenwich Mean Time : Dublin, Edinburgh, Lisbon, London
□ Daylight Savings	
Start Date	Last Sunday of January (2000-01-29) at 0 o'clock
End Date	Last Sunday of January (2000-01-29) at 0 o'clock

The following table describes the fields in this screen.

Table 72 Maintenance > System > Time and Date

LABEL	DESCRIPTION
Current Time and Date	
Current Time	This field displays the time of your ZyXEL Device. Each time you reload this page, the ZyXEL Device synchronizes the time with the time server.
Current Date	This field displays the date of your ZyXEL Device. Each time you reload this page, the ZyXEL Device synchronizes the date with the time server.
Time and Date Setup	
Manual	Select this radio button to enter the time and date manually. If you configure a new time and date, Time Zone and Daylight Saving at the same time, the new time and date you entered has priority and the Time Zone and Daylight Saving settings do not affect it.
New Time (hh:mm:ss)	This field displays the last updated time from the time server or the last time configured manually. When you set **Time and Date Setup** to **Manual**, enter the new time in this field and then click **Apply**.
New Date (yyyy/mm/dd)	This field displays the last updated date from the time server or the last date configured manually. When you set **Time and Date Setup** to **Manual**, enter the new date in this field and then click **Apply**.
Get from Time Server	Select this radio button to have the ZyXEL Device get the time and date from the time server you specified below.
Time Server Address	Enter the IP address or URL (up to 20 extended ASCII characters in length) of your time server. Check with your ISP/network administrator if you are unsure of this information.
Time Zone Setup	
Time Zone	Choose the time zone of your location. This will set the time difference between your time zone and Greenwich Mean Time (GMT).
Daylight Savings	Daylight saving is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daytime light in the evening. Select this option if you use Daylight Saving Time.

Table 72 Maintenance > System > Time and Date (continued)

LABEL	DESCRIPTION
Start Date	Configure the day and time when Daylight Saving Time starts if you selected **Enable Daylight Saving**. The **o'clock** field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time starts in most parts of the United States on the second Sunday of March. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **Second**, **Sunday**, **March** and type 2 in the **o'clock** field. Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **March**. The time you type in the **o'clock** field depends on your time zone. In Germany for instance, you would type 2 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
End Date	Configure the day and time when Daylight Saving Time ends if you selected **Enable Daylight Saving**. The **o'clock** field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time ends in the United States on the first Sunday of November. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **First**, **Sunday**, **November** and type 2 in the **o'clock** field. Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **October**. The time you type in the **o'clock** field depends on your time zone. In Germany for instance, you would type 2 because Germany's time zone is one hour ahead of GMT or UTC (GMT+1).
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

20

Logs

20.1 Overview

This chapter contains information about viewing the ZyXEL Device's logs.

The web configurator allows you to choose which types of events and/or alerts to have the ZyXEL Device log and then display the logs.

20.1.1 What You Need To Know About Logs

Alerts

An alert is a message that is enabled as soon as the event occurs. They include system errors, attacks (access control) and attempted access to blocked web sites. Some categories such as **System Errors** consist of both logs and alerts. You may differentiate them by their color in the **View Log** screen. Alerts display in red and logs display in black.

Logs

A log is a message about an event that occurred on your ZyXEL Device. For example, when someone logs in to the ZyXEL Device, you can set a schedule for how often logs should be enabled, or sent to a syslog server.

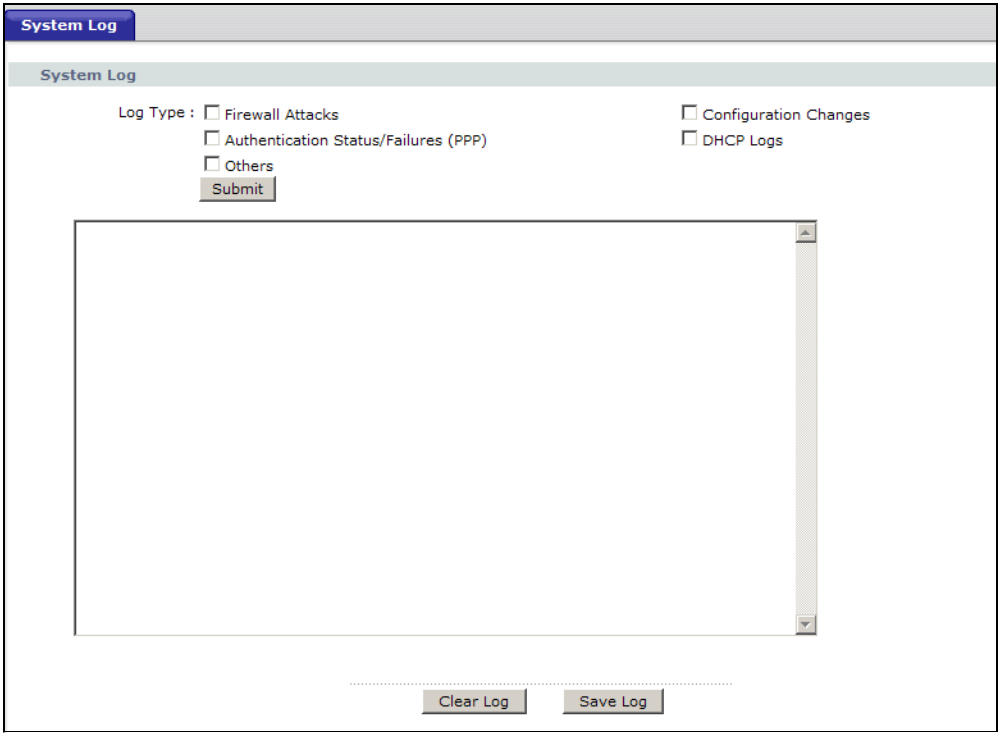
20.2 The System Log Screen

Use the **System Log** screen to configure and view the logs you wish to display.

To change your ZyXEL Device's log settings, click **Maintenance > Logs > Log Settings**. The screen appears as shown.

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

Figure 101 Maintenance > System Logs



The following table describes the fields in this screen.

Table 73 Maintenance > Logs > Log Settings

LABEL	DESCRIPTION
System Log	
Log Type	Select the types of logs that you want to display and record. Then click **Submit** to display the details.
Clear Log	Click this to delete all the logs.
Save Log	Click this to save the logs in a text file.

20.3 Log Descriptions

This section provides descriptions of example log messages.

Table 74 System Maintenance Logs

LOG MESSAGE	DESCRIPTION
`Time calibration is successful`	The router has adjusted its time based on information from the time server.
`Time calibration failed`	The router failed to get information from the time server.
`WAN interface gets IP: %s`	A WAN interface got a new IP address from the DHCP, PPPoE, or dial-up server.
`DHCP client IP expired`	A DHCP client's IP address has expired.
`DHCP server assigns %s`	The DHCP server assigned an IP address to a client.
`Successful WEB login`	Someone has logged on to the router's web configurator interface.
`WEB login failed`	Someone has failed to log on to the router's web configurator interface.
`Successful TELNET login`	Someone has logged on to the router via telnet.
`TELNET login failed`	Someone has failed to log on to the router via telnet.
`Successful FTP login`	Someone has logged on to the router via ftp.
`FTP login failed`	Someone has failed to log on to the router via ftp.
`NAT Session Table is Full!`	The maximum number of NAT session table entries has been exceeded and the table is full.
`Starting Connectivity Monitor`	Starting Connectivity Monitor.
`Time initialized by Daytime Server`	The router got the time and date from the Daytime server.
`Time initialized by Time server`	The router got the time and date from the time server.
`Time initialized by NTP server`	The router got the time and date from the NTP server.
`Connect to Daytime server fail`	The router was not able to connect to the Daytime server.
`Connect to Time server fail`	The router was not able to connect to the Time server.
`Connect to NTP server fail`	The router was not able to connect to the NTP server.
`Too large ICMP packet has been dropped`	The router dropped an ICMP packet that was too large.
`Configuration Change: PC = 0x%x, Task ID = 0x%x`	The router is saving configuration changes.
`Successful SSH login`	Someone has logged on to the router’s SSH server.
`SSH login failed`	Someone has failed to log on to the router’s SSH server.

Table 74 System Maintenance Logs (continued)

LOG MESSAGE	DESCRIPTION
`Successful HTTPS login`	Someone has logged on to the router's web configurator interface using HTTPS protocol.
`HTTPS login failed`	Someone has failed to log on to the router's web configurator interface using HTTPS protocol.

Table 75 System Error Logs

LOG MESSAGE	DESCRIPTION
`%s exceeds the max. number of session per host!`	This attempt to create a NAT session exceeds the maximum number of NAT session table entries allowed to be created per host.
`setNetBIOSFilter: calloc error`	The router failed to allocate memory for the NetBIOS filter settings.
`readNetBIOSFilter: calloc error`	The router failed to allocate memory for the NetBIOS filter settings.
`WAN connection is down.`	A WAN connection is down. You cannot access the network through this interface.

Table 76 Access Control Logs

LOG MESSAGE	DESCRIPTION
`Firewall default policy: [ TCP | UDP | IGMP | ESP | GRE | OSPF ] <Packet Direction>`	Attempted TCP/UDP/IGMP/ESP/GRE/OSPF access matched the default policy and was blocked or forwarded according to the default policy's setting.
`Firewall rule [NOT] match:[ TCP | UDP | IGMP | ESP | GRE | OSPF ] <Packet Direction>, <rule:%d>`	Attempted TCP/UDP/IGMP/ESP/GRE/OSPF access matched (or did not match) a configured firewall rule (denoted by its number) and was blocked or forwarded according to the rule.
`Triangle route packet forwarded: [ TCP | UDP | IGMP | ESP | GRE | OSPF ]`	The firewall allowed a triangle route session to pass through.
`Packet without a NAT table entry blocked: [ TCP | UDP | IGMP | ESP | GRE | OSPF ]`	The router blocked a packet that didn't have a corresponding NAT table entry.
`Router sent blocked web site message: TCP`	The router sent a message to notify a user that the router blocked access to a web site that the user requested.

Table 77 TCP Reset Logs

LOG MESSAGE	DESCRIPTION
`Under SYN flood attack, sent TCP RST`	The router sent a TCP reset packet when a host was under a SYN flood attack (the TCP incomplete count is per destination host.)
`Exceed TCP MAX incomplete, sent TCP RST`	The router sent a TCP reset packet when the number of TCP incomplete connections exceeded the user configured threshold. (the TCP incomplete count is per destination host.) Note: Refer to **TCP Maximum Incomplete** in the **Firewall Attack Alerts** screen.
`Peer TCP state out of order, sent TCP RST`	The router sent a TCP reset packet when a TCP connection state was out of order.Note: The firewall refers to RFC793 Figure 6 to check the TCP state.
`Firewall session time out, sent TCP RST`	The router sent a TCP reset packet when a dynamic firewall session timed out.Default timeout values:ICMP idle timeout (s): 60UDP idle timeout (s): 60TCP connection (three way handshaking) timeout (s): 30TCP FIN-wait timeout (s): 60TCP idle (established) timeout (s): 3600
`Exceed MAX incomplete, sent TCP RST`	The router sent a TCP reset packet when the number of incomplete connections (TCP and UDP) exceeded the user-configured threshold. (Incomplete count is for all TCP and UDP connections through the firewall.)Note: When the number of incomplete connections (TCP + UDP) > “Maximum Incomplete High”, the router sends TCP RST packets for TCP connections and destroys TOS (firewall dynamic sessions) until incomplete connections < “Maximum Incomplete Low”.
`Access block, sent TCP RST`	The router sends a TCP RST packet and generates this log if you turn on the firewall TCP reset mechanism (via CI command: "sys firewall tcprst").

Table 78 Packet Filter Logs

LOG MESSAGE	DESCRIPTION
`[ TCP | UDP | ICMP | IGMP | Generic ] packet filter matched (set: %d, rule: %d)`	Attempted access matched a configured filter rule (denoted by its set and rule number) and was blocked or forwarded according to the rule.

For type and code details, see Table 87 on page 219.

Table 79 ICMP Logs

LOG MESSAGE	DESCRIPTION
`Firewall default policy: ICMP <Packet Direction>, <type:%d>, <code:%d>`	ICMP access matched the default policy and was blocked or forwarded according to the user's setting.
`Firewall rule [NOT] match: ICMP <Packet Direction>, <rule:%d>, <type:%d>, <code:%d>`	ICMP access matched (or didn't match) a firewall rule (denoted by its number) and was blocked or forwarded according to the rule.
`Triangle route packet forwarded: ICMP`	The firewall allowed a triangle route session to pass through.
`Packet without a NAT table entry blocked: ICMP`	The router blocked a packet that didn't have a corresponding NAT table entry.
`Unsupported/out-of-order ICMP: ICMP`	The firewall does not support this kind of ICMP packets or the ICMP packets are out of order.
`Router reply ICMP packet: ICMP`	The router sent an ICMP reply packet to the sender.

Table 80 CDR Logs

LOG MESSAGE	DESCRIPTION
`board %d line %d channel %d, call %d, %s C01 Outgoing Call dev=%x ch=%x %s`	The router received the setup requirements for a call. “call” is the reference (count) number of the call. “dev” is the device type (3 is for dial-up, 6 is for PPPoE, 10 is for PPTP) "channel" or “ch” is the call channel ID. For example,"board 0 line 0 channel 0, call 3, C01 Outgoing Call dev=6 ch=0 "Means the router has dialed to the PPPoE server 3 times.
`board %d line %d channel %d, call %d, %s C02 OutCall Connected %d %s`	The PPPoE, PPTP or dial-up call is connected.
`board %d line %d channel %d, call %d, %s C02 Call Terminated`	The PPPoE, PPTP or dial-up call was disconnected.

Table 81 PPP Logs

LOG MESSAGE	DESCRIPTION
`ppp:LCP Starting`	The PPP connection’s Link Control Protocol stage has started.
`ppp:LCP Opening`	The PPP connection’s Link Control Protocol stage is opening.
`ppp:CHAP Opening`	The PPP connection’s Challenge Handshake Authentication Protocol stage is opening.
`ppp:IPCP Starting`	The PPP connection’s Internet Protocol Control Protocol stage is starting.
`ppp:IPCP Opening`	The PPP connection’s Internet Protocol Control Protocol stage is opening.

Table 81 PPP Logs (continued)

LOG MESSAGE	DESCRIPTION
`ppp:LCP Closing`	The PPP connection’s Link Control Protocol stage is closing.
`ppp:IPCP Closing`	The PPP connection’s Internet Protocol Control Protocol stage is closing.

Table 82 UPnP Logs

LOG MESSAGE	DESCRIPTION
`UPnP pass through Firewall`	UPnP packets can pass through the firewall.

Table 83 Content Filtering Logs

LOG MESSAGE	DESCRIPTION
`%s: block keyword`	The content of a requested web page matched a user defined keyword.
`%s`	The system forwarded web content.

For type and code details, see Table 87 on page 219.

Table 84 Attack Logs

LOG MESSAGE	DESCRIPTION
`attack [ TCP | UDP | IGMP | ESP | GRE | OSPF ]`	The firewall detected a TCP/UDP/IGMP/ESP/GRE/OSPF attack.
`attack ICMP (type:%d, code:%d)`	The firewall detected an ICMP attack.
`land [ TCP | UDP | IGMP | ESP | GRE | OSPF ]`	The firewall detected a TCP/UDP/IGMP/ESP/GRE/OSPF land attack.
`land ICMP (type:%d, code:%d)`	The firewall detected an ICMP land attack.
`ip spoofing - WAN [ TCP | UDP | IGMP | ESP | GRE | OSPF ]`	The firewall detected an IP spoofing attack on the WAN port.
`ip spoofing - WAN ICMP (type:%d, code:%d)`	The firewall detected an ICMP IP spoofing attack on the WAN port.
`icmp echo : ICMP (type:%d, code:%d)`	The firewall detected an ICMP echo attack.
`syn flood TCP`	The firewall detected a TCP syn flood attack.
`ports scan TCP`	The firewall detected a TCP port scan attack.
`teardrop TCP`	The firewall detected a TCP teardrop attack.
`teardrop UDP`	The firewall detected an UDP teardrop attack.
`teardrop ICMP (type:%d, code:%d)`	The firewall detected an ICMP teardrop attack.
`illegal command TCP`	The firewall detected a TCP illegal command attack.

Table 84 Attack Logs (continued)

LOG MESSAGE	DESCRIPTION
`NetBIOS TCP`	The firewall detected a TCP NetBIOS attack.
`ip spoofing - no routing entry [ TCP | UDP | IGMP | ESP | GRE | OSPF ]`	The firewall classified a packet with no source routing entry as an IP spoofing attack.
`ip spoofing - no routing entry ICMP (type:%d, code:%d)`	The firewall classified an ICMP packet with no source routing entry as an IP spoofing attack.
`vulnerability ICMP (type:%d, code:%d)`	The firewall detected an ICMP vulnerability attack.
`traceroute ICMP (type:%d, code:%d)`	The firewall detected an ICMP traceroute attack.

Table 85 802.1X Logs

LOG MESSAGE	DESCRIPTION
`RADIUS accepts user.`	A user was authenticated by the RADIUS Server.
`RADIUS rejects user. Pls check RADIUS Server.`	A user was not authenticated by the RADIUS Server. Please check the RADIUS Server.
`User logout because of session timeout expired.`	The router logged out a user whose session expired.
`User logout because of user deassociation.`	The router logged out a user who ended the session.
`User logout because of no authentication response from user.`	The router logged out a user from which there was no authentication response.
`User logout because of idle timeout expired.`	The router logged out a user whose idle timeout period expired.
`User logout because of user request.`	A user logged out.
`No response from RADIUS. Pls check RADIUS Server.`	There is no response message from the RADIUS server, please check the RADIUS server.
`Use RADIUS to authenticate user.`	The RADIUS server is operating as the authentication server.
`No Server to authenticate user.`	There is no authentication server to authenticate a user.

Table 86 ACL Setting Notes

PACKET DIRECTION	DIRECTION	DESCRIPTION
(L to W)	LAN to WAN	ACL set for packets traveling from the LAN to the WAN.
(W to L)	WAN to LAN	ACL set for packets traveling from the WAN to the LAN.

Table 86 ACL Setting Notes (continued)

PACKET DIRECTION	DIRECTION	DESCRIPTION
(L to L/ZyXEL Device)	LAN to LAN/ ZyXEL Device	ACL set for packets traveling from the LAN to the LAN or the ZyXEL Device.
(W to W/ZyXEL Device)	WAN to WAN/ ZyXEL Device	ACL set for packets traveling from the WAN to the WAN or the ZyXEL Device.

Table 87 ICMP Notes

TYPE	CODE	DESCRIPTION
0		Echo Reply
	0	Echo reply message
3		Destination Unreachable
	0	Net unreachable
	1	Host unreachable
	2	Protocol unreachable
	3	Port unreachable
	4	A packet that needed fragmentation was dropped because it was set to Don't Fragment (DF)
	5	Source route failed
4		Source Quench
	0	A gateway may discard internet datagrams if it does not have the buffer space needed to queue the datagrams for output to the next network on the route to the destination network.
5		Redirect
	0	Redirect datagrams for the Network
	1	Redirect datagrams for the Host
	2	Redirect datagrams for the Type of Service and Network
	3	Redirect datagrams for the Type of Service and Host
8		Echo
	0	Echo message
11		Time Exceeded
	0	Time to live exceeded in transit
	1	Fragment reassembly time exceeded
12		Parameter Problem
	0	Pointer indicates the error
13		Timestamp
	0	Timestamp request message
14		Timestamp Reply
	0	Timestamp reply message
15		Information Request

Table 87 ICMP Notes (continued)

TYPE	CODE	DESCRIPTION
	0	Information request message
16		Information Reply
	0	Information reply message

Table 88 Syslog Logs

LOG MESSAGE	DESCRIPTION
<Facility*8 + Severity>Mon dd hr:mm:ss hostname src="<srcIP:srcPort>" dst="<dstIP:dstPort>" msg="<msg>" note="<note>" devID="<mac address last three numbers>" cat="<category>	"This message is sent by the system ("RAS" displays as the system name if you haven't configured one) when the router generates a syslog. The facility is defined in the web MAIN MENU->LOGS->Log Settings page. The severity is the log's syslog class. The definition of messages and notes are defined in the various log charts throughout this appendix. The "devID" is the last three characters of the MAC address of the router's LAN port. The "cat" is the same as the category in the router's logs.

The following table shows RFC-2408 ISAKMP payload types that the log displays. Please refer to RFC 2408 for detailed information on each type.

Table 89 RFC-2408 ISAKMP Payload Types

LOG DISPLAY	PAYLOAD TYPE
SA	Security Association
PROP	Proposal
TRANS	Transform
KE	Key Exchange
ID	Identification
CER	Certificate
CER_REQ	Certificate Request
HASH	Hash
SIG	Signature
NONCE	Nonce
NOTFY	Notification
DEL	Delete
VID	Vendor ID

21

Tools

21.1 Overview

This chapter explains how to upload new firmware, manage configuration files and restart your ZyXEL Device.

Use the instructions in this chapter to change the device's configuration file or upgrade its firmware. After you configure your device, you can backup the configuration file to a computer. That way if you later misconfigure the device, you can upload the backed up configuration file to return to your previous settings. You can alternately upload the factory default configuration file if you want to return the device to the original default settings. The firmware determines the device's available features and functionality. You can download new firmware releases from your nearest ZyXEL FTP site (or www.zyxel.com) to use to upgrade your device's performance.

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

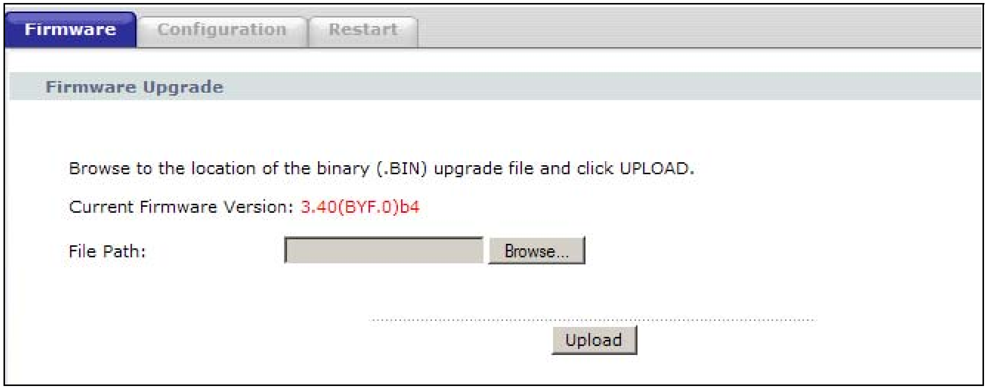
21.1.1 What You Can Do in the Tool Screens

- Use the **Firmware Upgrade** screen (Section 21.2 on page 221) to upload firmware to your device.
- Use the **Configuration** screen (Section 21.3 on page 224) to backup and restore device configurations. You can also reset your device settings back to the factory default.
- Use the **Restart** screen (Section 21.4 on page 227) to restart your ZyXEL device.

21.2 The Firmware Screen

Click **Maintenance > Tools** to open the **Firmware** screen. Follow the instructions in this screen to upload firmware to your ZyXEL Device. The upload process uses HTTP (Hypertext Transfer Protocol) and may take up to two minutes. After a successful upload, the system will reboot.

Do NOT turn off the ZyXEL Device while firmware upload is in progress!



Browse to the location of the binary (.BIN) upgrade file and click UPLOAD.

Current Firmware Version: 3.40(BYF.0)b4

File Path:

Figure 102 Maintenance > Tools > Firmware

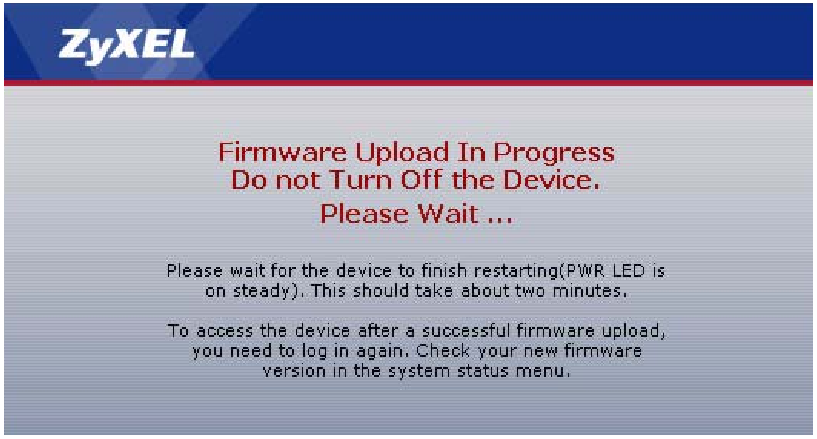
The following table describes the labels in this screen.

Table 90 Maintenance > Tools > Firmware

LABEL	DESCRIPTION
Current Firmware Version	This is the present Firmware version and the date created.
File Path	Type in the location of the file you want to upload in this field or click **Browse ...** to find it.
Browse...	Click this to find the .bin file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Upload	Click this to begin the upload process. This process may take up to two minutes.

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

Figure 103 Firmware Upload In Progress



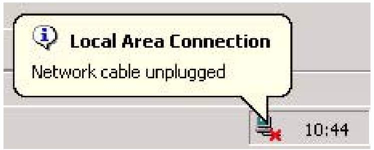
Firmware Upload In Progress
Do not Turn Off the Device.
Please Wait ...

Please wait for the device to finish restarting(PWR LED is on steady). This should take about two minutes.

To access the device after a successful firmware upload, you need to log in again. Check your new firmware version in the system status menu.

The ZyXEL Device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

Figure 104 Network Temporarily Disconnected



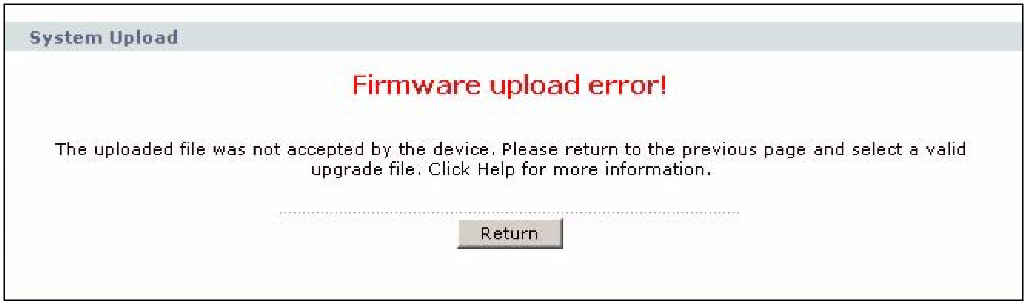
Local Area Connection

Network cable unplugged

After two minutes, log in again and check your new firmware version in the **Status** screen.

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

Figure 105 Error Message



System Upload

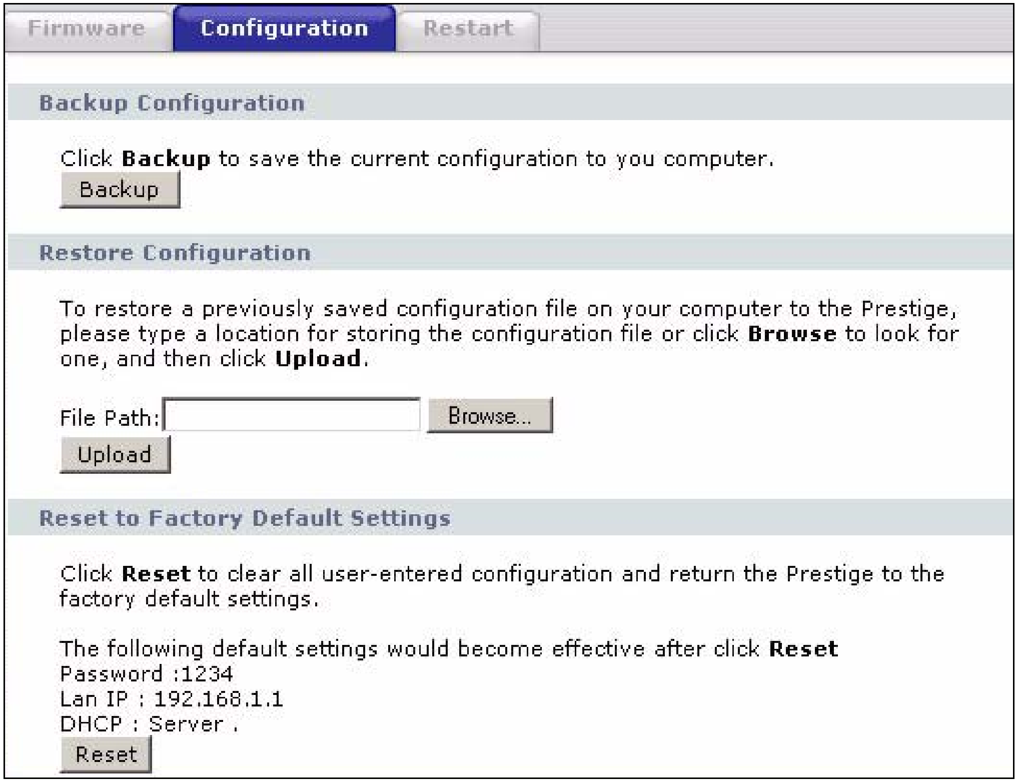
Firmware upload error!

The uploaded file was not accepted by the device. Please return to the previous page and select a valid upgrade file. Click Help for more information.

21.3 The Configuration Screen

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

Figure 106 Maintenance > Tools > Configuration



Backup Configuration

Click **Backup** to save the current configuration to you computer.

Restore Configuration

To restore a previously saved configuration file on your computer to the Prestige, please type a location for storing the configuration file or click **Browse** to look for one, and then click **Upload**.

File Path:

Reset to Factory Default Settings

Click **Reset** to clear all user-entered configuration and return the Prestige to the factory default settings.

The following default settings would become effective after click **Reset**
Password :1234
Lan IP : 192.168.1.1
DHCP : Server .

Backup Configuration

Backup Configuration allows you to back up (save) the ZyXEL Device's current configuration to a file on your computer. Once your ZyXEL Device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes. The backup configuration file will be useful in case you need to return to your previous settings.

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

Restore Configuration

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

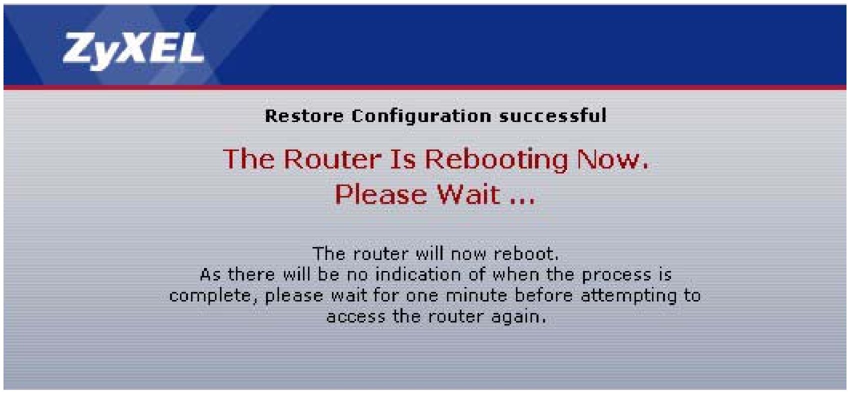
Table 91 Restore Configuration

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

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

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

Figure 107 Configuration Upload Successful



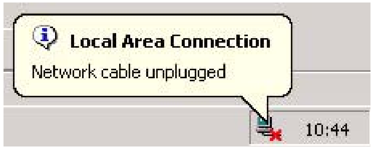
Restore Configuration successful

The Router Is Rebooting Now.
Please Wait ...

The router will now reboot.
As there will be no indication of when the process is complete, please wait for one minute before attempting to access the router again.

The ZyXEL Device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

Figure 108 Network Temporarily Disconnected

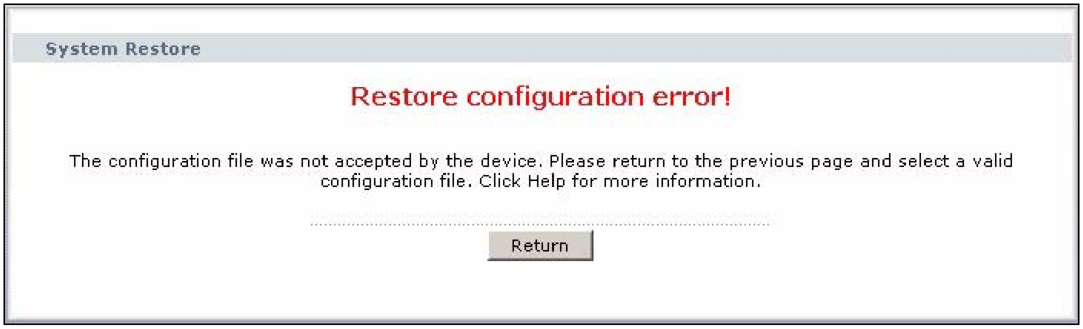


Local Area Connection
Network cable unplugged

If you uploaded the default configuration file you may need to change the IP address of your computer to be in the same subnet as that of the default device IP address (192.168.1.1). See Appendix A on page 247 for details on how to set up your computer’s IP address.

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

Figure 109 Configuration Upload Error



System Restore

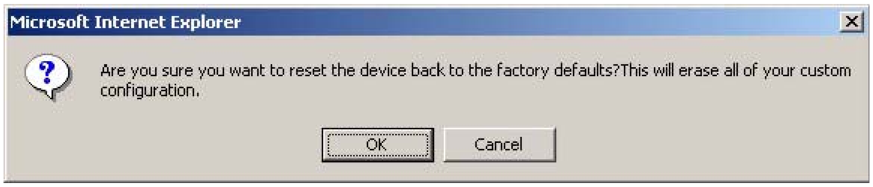
Restore configuration error!

The configuration file was not accepted by the device. Please return to the previous page and select a valid configuration file. Click Help for more information.

Reset to Factory Defaults

Click the **Reset** button to clear all user-entered configuration information and return the ZyXEL Device to its factory defaults. The following warning screen appears.

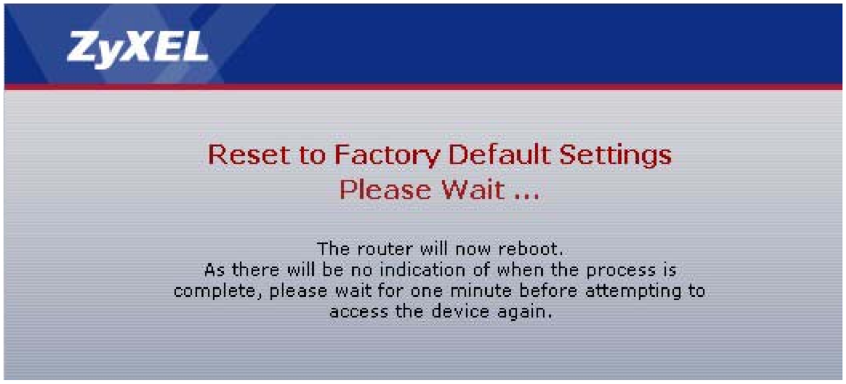
Figure 110 Reset Warning Message



Microsoft Internet Explorer

Are you sure you want to reset the device back to the factory defaults?This will erase all of your custom configuration.

Figure 111 Reset In Process Message



Reset to Factory Default Settings
Please Wait ...

The router will now reboot.
As there will be no indication of when the process is complete, please wait for one minute before attempting to access the device again.

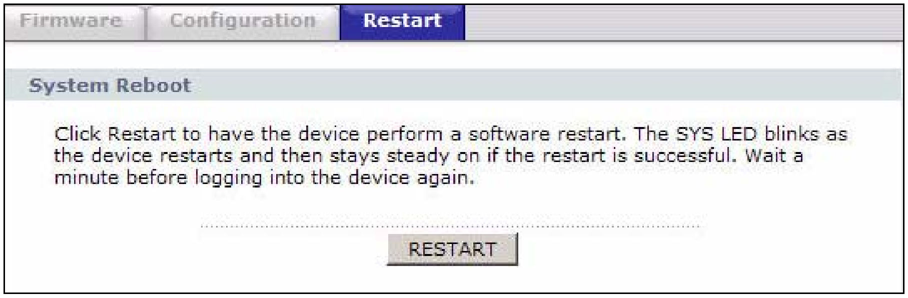
You can also press the **RESET** button on the rear panel to reset the factory defaults of your ZyXEL Device. Refer to Section 1.7 on page 26 for more information on the **RESET** button.

21.4 The Restart Screen

System restart allows you to reboot the ZyXEL Device remotely without turning the power off. You may need to do this if the ZyXEL Device hangs, for example.

Click **Maintenance > Tools** > **Restart**. Click **Restart** to have the ZyXEL Device reboot. This does not affect the ZyXEL Device's configuration.

Figure 112 Maintenance > Tools >Restart



Click Restart to have the device perform a software restart. The SYS LED blinks as the device restarts and then stays steady on if the restart is successful. Wait a minute before logging into the device again.

22

Diagnostic

22.1 Overview

These read-only screens display information to help you identify problems with the ZyXEL Device.

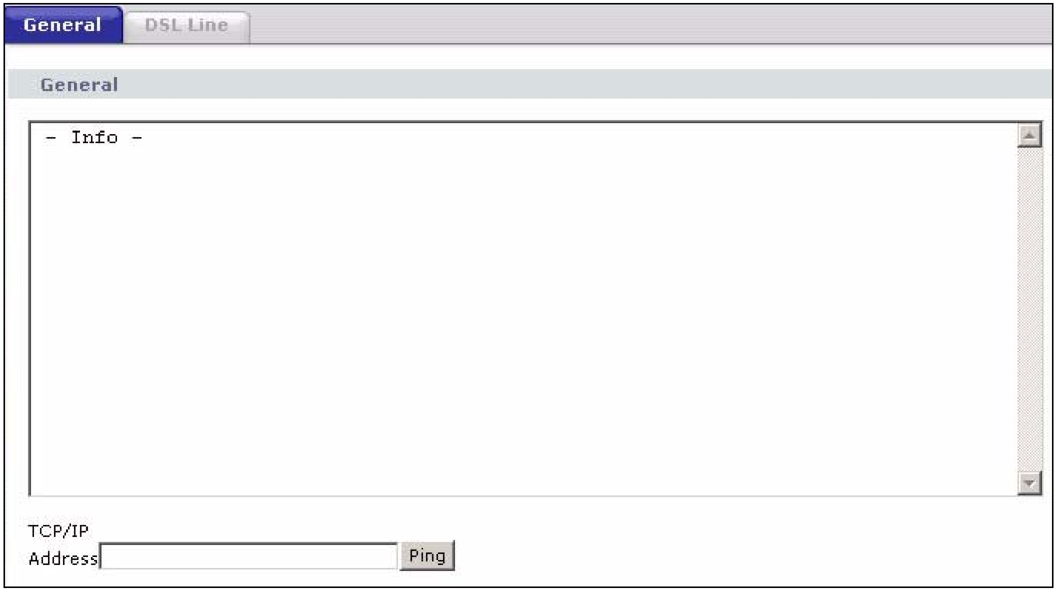
22.1.1 What You Can Do in the Diagnostic Screens

- Use the **General** screen (Section 22.2 on page 229) to ping an IP address.
- Use the **DSL Line** screen (Section 22.3 on page 230) to view the DSL line statistics and reset the ADSL line.

22.2 The General Screen

Use this screen to ping an IP address. Click **Maintenance > Diagnostic** to open the screen shown next.

Figure 113 Maintenance > Diagnostic > General



The following table describes the fields in this screen.

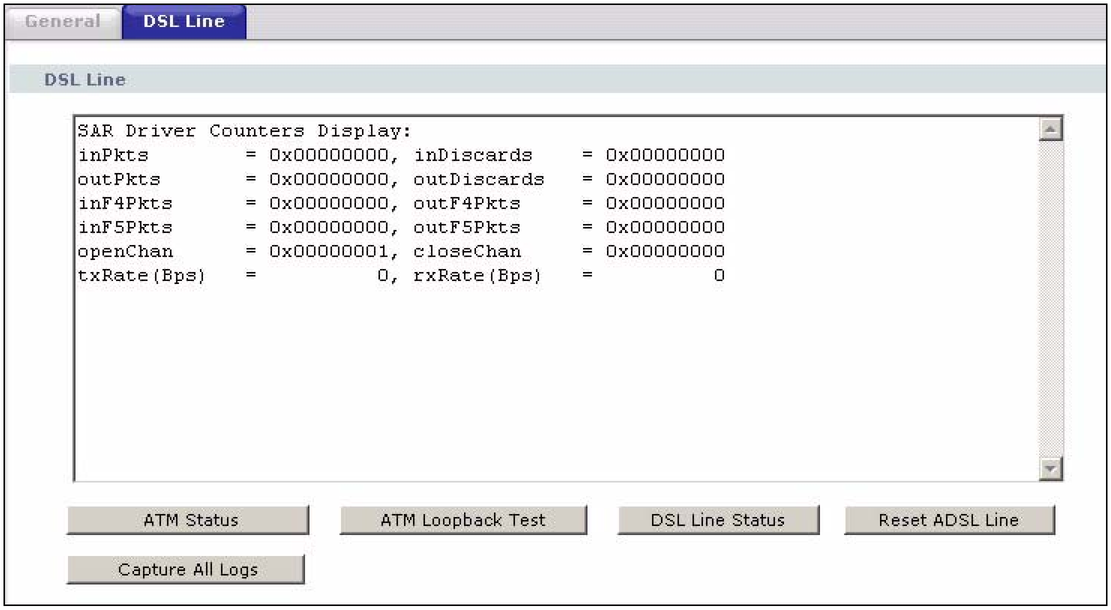
Table 92 Maintenance > Diagnostic > General

LABEL	DESCRIPTION
TCP/IP Address	Type the IP address of a computer that you want to ping in order to test a connection.
Ping	Click this to ping the IP address that you entered.

22.3 The DSL Line Screen

Use this screen to view the DSL line statistics and reset the ADSL line. Click **Maintenance > Diagnostic** > **DSL Line** to open the screen shown next.

Figure 114 Maintenance > Diagnostic > DSL Line



```
SAR Driver Counters Display:
inPkts        = 0x00000000, inDiscards    = 0x00000000
outPkts       = 0x00000000, outDiscards   = 0x00000000
inF4Pkts      = 0x00000000, outF4Pkts     = 0x00000000
inF5Pkts      = 0x00000000, outF5Pkts     = 0x00000000
openChan      = 0x00000001, closeChan     = 0x00000000
txRate(Bps)   =          0, rxRate(Bps)   =          0
```

The following table describes the fields in this screen.

Table 93 Maintenance > Diagnostic > DSL Line

LABEL	DESCRIPTION
ATM Status	Click this to view your DSL connection's Asynchronous Transfer Mode (ATM) statistics. ATM is a 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. The (Segmentation and Reassembly) SAR driver translates packets into ATM cells. It also receives ATM cells and reassembles them into packets. These counters are set back to zero whenever the device starts up. **inPkts** is the number of good ATM cells that have been received. **inDiscards** is the number of received ATM cells that were rejected. **outPkts** is the number of ATM cells that have been sent. **outDiscards** is the number of ATM cells sent that were rejected. **inF4Pkts** is the number of ATM Operations, Administration, and Management (OAM) F4 cells that have been received. See ITU recommendation I.610 for more on OAM for ATM. **outF4Pkts** is the number of ATM OAM F4 cells that have been sent. **inF5Pkts** is the number of ATM OAM F5 cells that have been received. **outF5Pkts** is the number of ATM OAM F5 cells that have been sent. **openChan** is the number of times that the ZyXEL Device has opened a logical DSL channel. **closeChan** is the number of times that the ZyXEL Device has closed a logical DSL channel. **txRate** is the number of bytes transmitted per second. **rxRate** is the number of bytes received per second.
ATM Loopback Test	Click this to start the ATM loopback test. Make sure you have configured at least one PVC with proper VPIs/VCIs before you begin this test. The ZyXEL Device sends an OAM F5 packet to the DSLAM/ATM switch and then returns it (loops it back) to the ZyXEL Device. The ATM loopback test is useful for troubleshooting problems with the DSLAM and ATM network.

Table 93 Maintenance > Diagnostic > DSL Line (continued)

LABEL	DESCRIPTION
DSL Line Status	Click this to view statistics about the DSL connections. **noise margin downstream** is the signal to noise ratio for the downstream part of the connection (coming into the ZyXEL Device from the ISP). It is measured in decibels. The higher the number the more signal and less noise there is. **output power upstream** is the amount of power (in decibels) that the ZyXEL Device is using to transmit to the ISP. **attenuation downstream** is the reduction in amplitude (in decibels) of the DSL signal coming into the ZyXEL Device from the ISP. Discrete Multi-Tone (DMT) modulation divides up a line's bandwidth into sub-carriers (sub-channels) of 4.3125 KHz each called tones. The rest of the display is the line's bit allocation. This is displayed as the number (in hexadecimal format) of bits transmitted for each tone. This can be used to determine the quality of the connection, whether a given sub-carrier loop has sufficient margins to support certain ADSL transmission rates, and possibly to determine whether particular specific types of interference or line attenuation exist. Refer to the ITU-T G.992.1 recommendation for more information on DMT. The better (or shorter) the line, the higher the number of bits transmitted for a DMT tone. The maximum number of bits that can be transmitted per DMT tone is 15. There will be some tones without any bits as there has to be space between the upstream and downstream channels.

Reset ADSL Line	Click this to reinitialize the ADSL line. The large text box above then displays the progress and results of this operation, for example:
	`"Start to reset ADSL`
	`Loading ADSL modem F/W...`
	`Reset ADSL Line Successfully!"`

Capture All Logs	Click this to display information and statistics about your ZyXEL Device's ATM statistics, DSL connection statistics, DHCP settings, firmware version, WAN and gateway IP address, VPI/VCI and LAN IP address.

23

Troubleshooting

This chapter offers some suggestions to solve problems you might encounter. The potential problems are divided into the following categories.

- Power, Hardware Connections, and LEDs
- ZyXEL Device Access and Login
- Internet Access

23.1 Power, Hardware Connections, and LEDs

The ZyXEL Device does not turn on. None of the LEDs turn on.

1 Make sure the ZyXEL Device is turned on.

2 Make sure you are using the power adaptor or cord included with the ZyXEL Device.

3 Make sure the power adaptor or cord is connected to the ZyXEL Device and plugged in to an appropriate power source. Make sure the power source is turned on.

4 Turn the ZyXEL Device off and on.

5 If the problem continues, contact the vendor.

One of the LEDs does not behave as expected.

1 Make sure you understand the normal behavior of the LED. See Section 1.6 on page 25.

2 Check the hardware connections.

3 Inspect your cables for damage. Contact the vendor to replace any damaged cables.

4 Turn the ZyXEL Device off and on.

5 If the problem continues, contact the vendor.

23.2 ZyXEL Device Access and Login

I forgot the IP address for the ZyXEL Device.

1 The default IP address is **192.168.1.1**.

2 If you changed the IP address and have forgotten it, you might get the IP address of the ZyXEL Device by looking up the IP address of the default gateway for your computer. To do this in most Windows computers, click **Start > Run**, enter **cmd**, and then enter **ipconfig**. The IP address of the **Default Gateway** might be the IP address of the ZyXEL Device (it depends on the network), so enter this IP address in your Internet browser.

3 If this does not work, you have to reset the device to its factory defaults. See Section 1.7 on page 26.

I forgot the password.

1 The default admin password is **1234**.

2 If this does not work, you have to reset the device to its factory defaults. See Section 1.7 on page 26.

I cannot see or access the **Login** screen in the web configurator.

1 Make sure you are using the correct IP address.

- The default IP address is 192.168.1.1.

- If you changed the IP address (Section 7.2 on page 91), use the new IP address.
- If you changed the IP address and have forgotten it, see the troubleshooting suggestions for I forgot the IP address for the ZyXEL Device.

2 Check the hardware connections, and make sure the LEDs are behaving as expected. See the Quick Start Guide.

3 Make sure your Internet browser does not block pop-up windows and has JavaScripts and Java enabled. See Appendix C on page 281.

4 Reset the device to its factory defaults, and try to access the ZyXEL Device with the default IP address. See Section 1.7 on page 26.

5 If the problem continues, contact the network administrator or vendor, or try one of the advanced suggestions.

Advanced Suggestions

- Try to access the ZyXEL Device using another service, such as Telnet. If you can access the ZyXEL Device, check the remote management settings and firewall rules to find out why the ZyXEL Device does not respond to HTTP.
- If your computer is connected to the **WAN** port or is connected wirelessly, use a computer that is connected to a **ETHERNET** port.

I can see the **Login** screen, but I cannot log in to the ZyXEL Device.

1 Make sure you have entered the password correctly. The default admin password is **1234**. The field is case-sensitive, so make sure [Caps Lock] is not on.

2 You cannot log in to the web configurator while someone is using Telnet to access the ZyXEL Device. Log out of the ZyXEL Device in the other session, or ask the person who is logged in to log out.

3 Turn the ZyXEL Device off and on.

4 If this does not work, you have to reset the device to its factory defaults. See Section 23.1 on page 233.

I cannot Telnet to the ZyXEL Device.

See the troubleshooting suggestions for I cannot see or access the Login screen in the web configurator. Ignore the suggestions about your browser.

I cannot use FTP to upload / download the configuration file. / I cannot use FTP to upload new firmware.

See the troubleshooting suggestions for I cannot see or access the Login screen in the web configurator. Ignore the suggestions about your browser.

23.3 Internet Access

I cannot access the Internet.

1. Check the hardware connections, and make sure the LEDs are behaving as expected. See the Quick Start Guide and Section 1.6 on page 25.
2. Make sure you entered your ISP account information correctly in the wizard. These fields are case-sensitive, so make sure [Caps Lock] is not on.
3. If you are trying to access the Internet wirelessly, make sure the wireless settings in the wireless client are the same as the settings in the AP.
4. If you are trying to access the Internet wirelessly, make sure you enabled the wireless LAN and have selected the correct country and channel in which your ZyXEL Device operates in the **Wireless LAN > AP** screen.
5. Disconnect all the cables from your device, and follow the directions in the Quick Start Guide again.
6. If the problem continues, contact your ISP.

I cannot access the Internet anymore. I had access to the Internet (with the ZyXEL Device), but my Internet connection is not available anymore.

1. Check the hardware connections, and make sure the LEDs are behaving as expected. See the Quick Start Guide and Section 1.6 on page 25.
2. Turn the ZyXEL Device off and on.
3. If the problem continues, contact your ISP.

The Internet connection is slow or intermittent.

1 There might be a lot of traffic on the network. Look at the LEDs, and check Section 1.6 on page 25. If the ZyXEL Device is sending or receiving a lot of information, try closing some programs that use the Internet, especially peer-to-peer applications.

2 Check the signal strength. If the signal strength is low, try moving your computer closer to the ZyXEL Device if possible, and look around to see if there are any devices that might be interfering with the wireless network (for example, microwaves, other wireless networks, and so on).

3 Turn the ZyXEL Device off and on.

4 If the problem continues, contact the network administrator or vendor, or try one of the advanced suggestions.

Advanced Suggestions

- Check the settings for QoS. If it is disabled, you might consider activating it. If it is enabled, you might consider raising or lowering the priority for some applications.

24

Product Specifications

The following tables summarize the ZyXEL Device's hardware and firmware features.

24.1 Hardware Specifications

Table 94 Hardware Specifications

Dimensions	133 x 61 x 163 mm
Weight	215g
Power Specification	12VDC 1A
Built-in Switch	Four auto-negotiating, auto MDI/MDI-X 10/100 Mbps RJ-45 Ethernet ports
ADSL Port	1 RJ-11 FXS POTS port
RESET Button	Restores factory defaults
Antenna	1 internal antenna, 3.5dBi
WPS Button	1 second: turn on or off WLAN 5 seconds: enable WPS (Wi-Fi Protected Setup)
Operation Temperature	0º C ~ 40º C
Storage Temperature	-20º ~ 60º C
Operation Humidity	20% ~ 90% RH
Storage Humidity	20% ~ 90% RH

24.2 Firmware Specifications

Table 95 Firmware Specifications

Default IP Address	192.168.1.1
Default Subnet Mask	255.255.255.0 (24 bits)

Table 95 Firmware Specifications (continued)

Default Admin Password	1234
DHCP Server IP Pool	192.168.1.32 to 192.168.1.64
Static DHCP Addresses	10
URL Filtering	URL web page blocking
Static Routes	16
Device Management	Use the web configurator to easily configure the rich range of features on the ZyXEL Device.
Wireless Functionality (wireless devices only)	Allow the IEEE 802.11b/g/n wireless clients to connect to the ZyXEL Device wirelessly. Enable wireless security (WEP, WPA(2), WPA(2)-PSK) and/or MAC filtering to protect your wireless network.
Firmware Upgrade	Download new firmware (when available) from the ZyXEL web site and use the web configurator to put it on the ZyXEL Device. Note: Only upload firmware for your specific model!
Configuration Backup & Restoration	Make a copy of the ZyXEL Device's configuration. You can put it back on the ZyXEL Device later if you decide to revert back to an earlier configuration.
Network Address Translation (NAT)	Each computer on your network must have its own unique IP address. Use NAT to convert your public IP address(es) to multiple private IP addresses for the computers on your network.
Port Forwarding	If you have a server (mail or web server for example) on your network, you can use this feature to let people access it from the Internet.
DHCP (Dynamic Host Configuration Protocol)	Use this feature to have the ZyXEL Device assign IP addresses, an IP default gateway and DNS servers to computers on your network. Your device can also act as a surrogate DHCP server (DHCP Relay) where it relays IP address assignment from the actual real DHCP server to the clients.
Dynamic DNS Support	With Dynamic DNS (Domain Name System) support, you can use a fixed URL, www.zyxel.com for example, with a dynamic IP address. You must register for this service with a Dynamic DNS service provider.
IP Multicast	IP multicast is used to send traffic to a specific group of computers. The ZyXEL Device supports versions 1 and 2 of IGMP (Internet Group Management Protocol) used to join multicast groups (see RFC 2236).
Time and Date	Get the current time and date from an external server when you turn on your ZyXEL Device. You can also set the time manually. These dates and times are then used in logs.
Logs	Use logs for troubleshooting. You can send logs from the ZyXEL Device to an external syslog server.
Universal Plug and Play (UPnP)	A UPnP-enabled device can dynamically join a network, obtain an IP address and convey its capabilities to other devices on the network.

Table 95 Firmware Specifications (continued)

Firewall	Your device has a stateful inspection firewall with DoS (Denial of Service) protection. By default, when the firewall is activated, all incoming traffic from the WAN to the LAN is blocked unless it is initiated from the LAN. The firewall supports TCP/UDP inspection, DoS detection and prevention, real time alerts, reports and logs.
URL Filtering	URL filtering allows you to block access to Internet web sites of certain URL that you specify.
QoS (Quality of Service)	You can efficiently manage traffic on your network by reserving bandwidth and giving priority to certain types of traffic and/or to particular computers.
Remote Management	This allows you to decide whether a service (HTTP or FTP traffic for example) from a computer on a network (LAN or WAN for example) can access the ZyXEL Device.
PPPoE Support (RFC2516)	PPPoE (Point-to-Point Protocol over Ethernet) emulates a dial-up connection. It allows your ISP to use their existing network configuration with newer broadband technologies such as ADSL. The PPPoE driver on your device is transparent to the computers on the LAN, which see only Ethernet and are not aware of PPPoE thus saving you from having to manage PPPoE clients on individual computers.
Other PPPoE Features	PPPoE idle time out PPPoE dial on demand
Multiple PVC (Permanent Virtual Circuits) Support	Your device supports up to 8 Permanent Virtual Circuits (PVCs).
IP Alias	IP alias allows you to partition a physical network into logical networks over the same Ethernet interface. Your device supports three logical LAN interfaces via its single physical Ethernet interface with the your device itself as the gateway for each LAN network.
Packet Filters	Your device’s packet filtering function allows added network security and management.

Table 95 Firmware Specifications (continued)

ADSL Standards	Support Multi-Mode standard (ANSI T1.413, Issue 2; G.dmt (G.992.1); G.lite (G992.2)) EOC specified in ITU-T G.992.1 ADSL2 G.dmt.bis (G.992.3) ADSL2 G.lite.bis (G.992.4) ADSL2+ (G.992.5) Reach Extended ADSL (RE ADSL) SRA (Seamless Rate Adaptation) Auto-negotiating rate adaptation ADSL physical connection ATM AAL5 (ATM Adaptation Layer type 5) Support multi-protocol over AAL5 (RFC2684/1483) Support PPP over ATM AAL5 (RFC2364) PPP over Ethernet support for DSL connection (RFC 2516) Support VC-based and LLC-based multiplexing Support up to 8 PVCs I.610 F4/F5 OAM TR-067/TR-100 supported

Table 95 Firmware Specifications (continued)

Other Protocol Support	SIP pass-through DNS Proxy Dynamic DNS (www.dyndns.org) IP Alias DHCP client/server/relay RIP I/ RIP II supported Support 16 IP Static routes by Gateway IGMP v1 and v2 IP Policy Routing UPnP support Transparent bridging, VLAN-tagging pass-through bridge mode Static DHCP
Management	Embedded Web Configurator(remove webhelp) SNMP v1 & v2c with MIB II Remote Management Control: Telnet, FTP, and Web. TR-069 HTTPS MTU adjustable on WebGUI SMT

24.3 Wireless Features

Table 96 Wireless Features

Internal Antenna	The ZyXEL Device is equipped with one internal antenna to provide a clear radio signal between the wireless stations and the access points.
Wireless LAN MAC Address Filtering	Your device can check the MAC addresses of wireless stations against a list of allowed or denied MAC addresses.
WEP Encryption	WEP (Wired Equivalent Privacy) encrypts data frames before transmitting over the wireless network to help keep network communications private.
Wi-Fi Protected Access	Wi-Fi Protected Access (WPA) is a subset of the IEEE 802.11i security standard. Key differences between WPA and WEP are user authentication and improved data encryption.
WPA2	WPA 2 is a wireless security standard that defines stronger encryption, authentication and key management than WPA.

Table 96 Wireless Features

WMM QoS	WMM (Wi-Fi MultiMedia) QoS (Quality of Service) allows you to prioritize wireless traffic according to the delivery requirements of individual services.
Other Wireless Features	WDS(wireless client: G-570S v2) IEEE 802.11n Compliance Frequency Range:2.4 GHz Advanced Orthogonal Frequency Division Multiplexing (OFDM) Data Rates:150Mbps and Auto Fallback EIRP: 22dBm Wired Equivalent Privacy (WEP) Data Encryption 64/128 WLAN bridge to LAN 32 MAC Address filter WPA, WPA-PSK, WPA2, WPA2-PSK WPS IEEE 802.1x (EAP-MD5, TLS and TTLS) WMM WDS Multi BSSID (4 BSSIDs) Wireless Scheduling

The following list, which is not exhaustive, illustrates the standards supported in the ZyXEL Device.

Table 97 Standards Supported

STANDARD	DESCRIPTION
RFC 867	Daytime Protocol
RFC 868	Time Protocol.
RFC 1058	RIP-1 (Routing Information Protocol)
RFC 1112	IGMP v1
RFC 1305	Network Time Protocol (NTP version 3)
RFC 1483	Multiprotocol Encapsulation over ATM Adaptation Layer 5
RFC 1631	IP Network Address Translator (NAT)
RFC 1661	The Point-to-Point Protocol (PPP)
RFC 1723	RIP-2 (Routing Information Protocol)
RFC 2236	Internet Group Management Protocol, Version 2.
RFC 2364	PPP over AAL5 (PPP over ATM over ADSL)
RFC 2408	Internet Security Association and Key Management Protocol (ISAKMP)

Table 97 Standards Supported (continued)

STANDARD	DESCRIPTION
RFC 2516	A Method for Transmitting PPP Over Ethernet (PPPoE)
RFC 2684	Multiprotocol Encapsulation over ATM Adaptation Layer 5.
RFC 2766	Network Address Translation - Protocol
IEEE 802.11	Also known by the brand Wi-Fi, denotes a set of Wireless LAN/ WLAN standards developed by working group 11 of the IEEE LAN/MAN Standards Committee (IEEE 802).
IEEE 802.11b	Uses the 2.4 gigahertz (GHz) band
IEEE 802.11g	Uses the 2.4 gigahertz (GHz) band
IEEE 802.11n	Uses the 2.4 gigahertz (GHz) band
IEEE 802.11d	Standard for Local and Metropolitan Area Networks: Media Access Control (MAC) Bridges
IEEE 802.11x	Port Based Network Access Control.
IEEE 802.11e QoS	IEEE 802.11 e Wireless LAN for Quality of Service
ANSI T1.413, Issue 2	Asymmetric Digital Subscriber Line (ADSL) standard.
G dmt(G.992.1)	G.992.1 Asymmetrical Digital Subscriber Line (ADSL) Transceivers
ITU G.992.1 (G.DMT)	ITU standard for ADSL using discrete multitone modulation.
ITU G.992.2 (G. Lite)	ITU standard for ADSL using discrete multitone modulation.
ITU G.992.3 (G.dmt.bis)	ITU standard (also referred to as ADSL2) that extends the capability of basic ADSL in data rates.
ITU G.992.4 (G.lite.bis)	ITU standard (also referred to as ADSL2) that extends the capability of basic ADSL in data rates.
ITU G.992.5 (ADSL2+)	ITU standard (also referred to as ADSL2+) that extends the capability of basic ADSL by doubling the number of downstream bits.
Microsoft PPTP	MS PPTP (Microsoft's implementation of Point to Point Tunneling Protocol)
MBM v2	Media Bandwidth Management v2
RFC 2383	ST2+ over ATM Protocol Specification - UNI 3.1 Version
TR-069	TR-069 DSL Forum Standard for CPE Wan Management.
1.363.5	Compliant AAL5 SAR (Segmentation And Re-assembly)

24.4 Power Adaptor Specifications

Table 98 ZyXEL Device Series Power Adaptor Specifications

NORTH AMERICAN PLUG STANDARDS	
AC Power Adapter Model	12V 1A SOCB PA
Input Power	AC 120Volts/60Hz
Output Power	DC 12Volts/1.0A
Power Consumption	7.7 Watt max
Safety Standards	ANSI/UL 60950-1, CSA 60950-1
EUROPEAN PLUG STANDARDS	
AC Power Adapter Model	
Input Power	AC 230Volts/50Hz
Output Power	DC 12Volts/1.0A
Power Consumption	8.3 Watt max
Safety Standards	CE, GS or TUV, EN60950-1

A

Setting up Your Computer's IP Address

All computers must have a 10M or 100M Ethernet adapter card and TCP/IP installed.

Windows 95/98/Me/NT/2000/XP/Vista, Macintosh OS 7 and later operating systems and all versions of UNIX/LINUX include the software components you need to install and use TCP/IP on your computer. Windows 3.1 requires the purchase of a third-party TCP/IP application package.

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

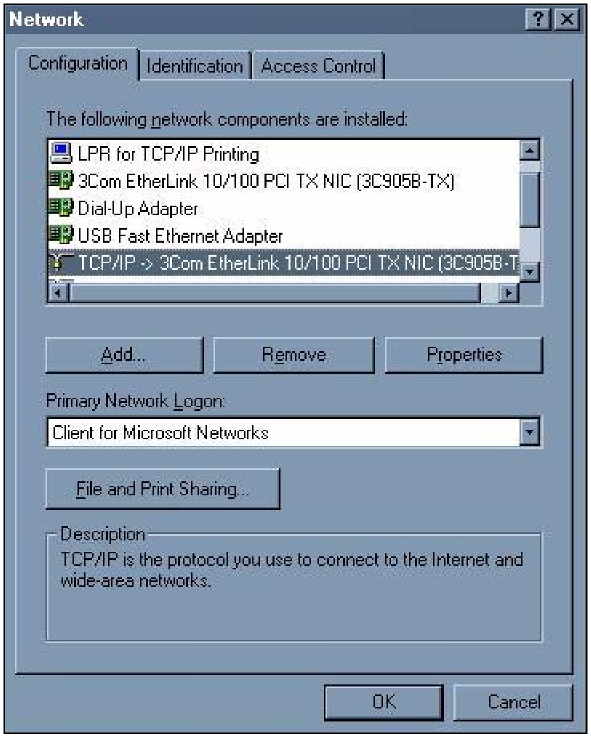
After the appropriate TCP/IP components are installed, configure the TCP/IP settings in order to "communicate" with your network.

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

Windows 95/98/Me

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

Figure 115 WIndows 95/98/Me: Network: Configuration



The following network components are installed:

- LPR for TCP/IP Printing
- 3Com EtherLink 10/100 PCI TX NIC (3C905B-TX)
- Dial-Up Adapter
- USB Fast Ethernet Adapter
- TCP/IP -> 3Com EtherLink 10/100 PCI TX NIC (3C905B-T

Primary Network Logon:

Client for Microsoft Networks

Description

TCP/IP is the protocol you use to connect to the Internet and wide-area networks.

Installing Components

The **Network** window **Configuration** tab displays a list of installed components. You need a network adapter, the TCP/IP protocol and Client for Microsoft Networks.

If you need the adapter:

1 In the **Network** window, click **Add**.

2 Select **Adapter** and then click **Add**.

3 Select the manufacturer and model of your network adapter and then click **OK**.

If you need TCP/IP:

1 In the **Network** window, click **Add**.

2 Select **Protocol** and then click **Add**.

3 Select **Microsoft** from the list of **manufacturers**.

4 Select **TCP/IP** from the list of network protocols and then click **OK**.

If you need Client for Microsoft Networks:

1 Click **Add**.

2 Select **Client** and then click **Add**.

3 Select **Microsoft** from the list of manufacturers.

4 Select **Client for Microsoft Networks** from the list of network clients and then click **OK**.

5 Restart your computer so the changes you made take effect.

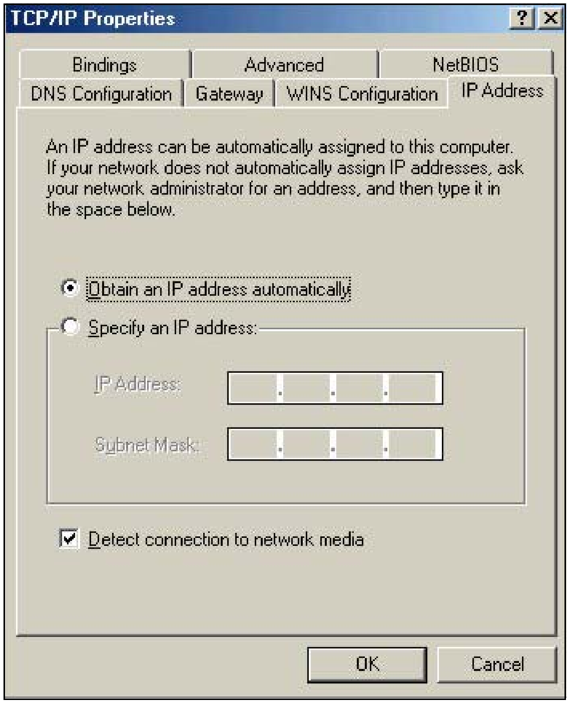
Configuring

1 In the **Network** window **Configuration** tab, select your network adapter's TCP/IP entry and click **Properties**

2 Click the **IP Address** tab.

- If your IP address is dynamic, select **Obtain an IP address automatically**.
- If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.

Figure 116 Windows 95/98/Me: TCP/IP Properties: IP Address



TCP/IP Properties

An IP address can be automatically assigned to this computer. If your network does not automatically assign IP addresses, ask your network administrator for an address, and then type it in the space below.

● Obtain an IP address automatically

○ Specify an IP address:

IP Address: . . .

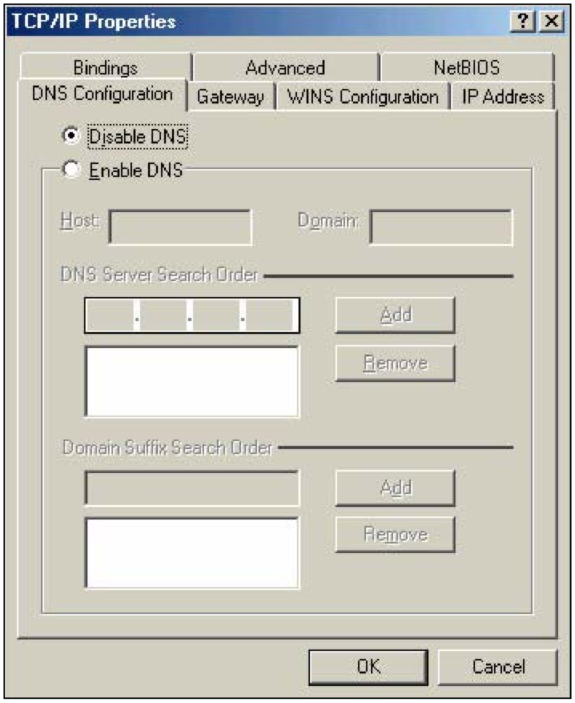
Subnet Mask: . . .

☑ Detect connection to network media

3 Click the **DNS** Configuration tab.

- If you do not know your DNS information, select **Disable DNS**.
- If you know your DNS information, select **Enable DNS** and type the information in the fields below (you may not need to fill them all in).

Figure 117 Windows 95/98/Me: TCP/IP Properties: DNS Configuration



● Disable DNS
○ Enable DNS

4 Click the **Gateway** tab.

- If you do not know your gateway’s IP address, remove previously installed gateways.
- If you have a gateway IP address, type it in the **New gateway field** and click **Add**.

5 Click **OK** to save and close the **TCP/IP Properties** window.

6 Click **OK** to close the **Network** window. Insert the Windows CD if prompted.

7 Turn on your ZyXEL Device and restart your computer when prompted.

Verifying Settings

1 Click **Start** and then **Run**.

2 In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.

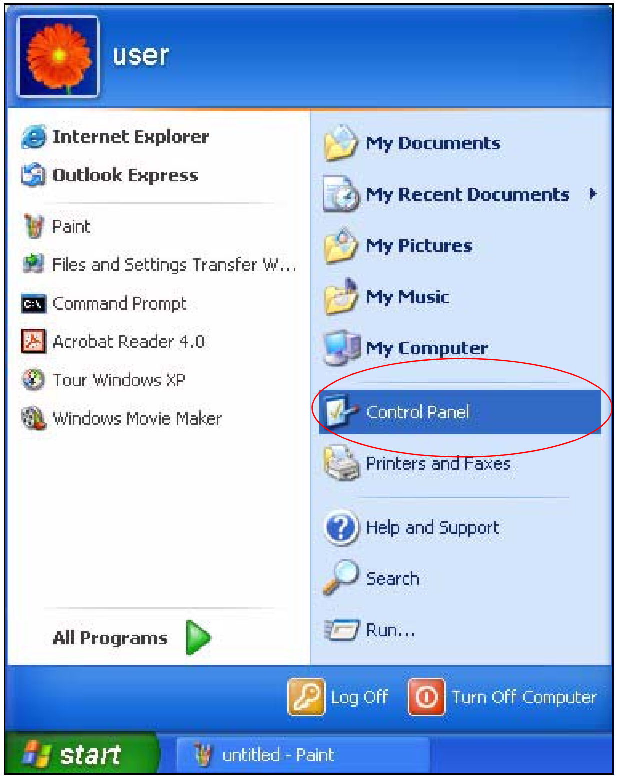
3 Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

Windows 2000/NT/XP

The following example figures use the default Windows XP GUI theme.

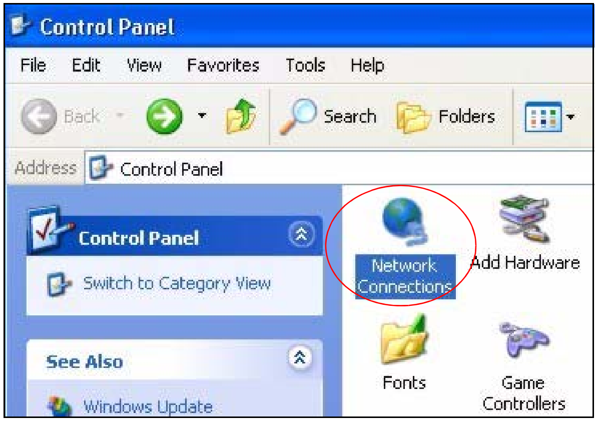
1 Click **start** (**Start** in Windows 2000/NT), **Settings**, **Control Panel**.

Figure 118 Windows XP: Start Menu



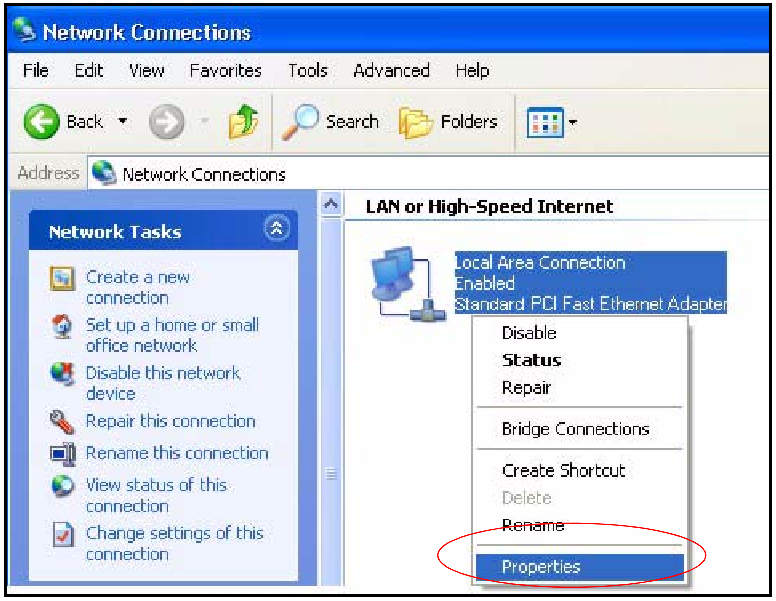
2 In the **Control Panel**, double-click **Network Connections** (**Network and Dial-up Connections** in Windows 2000/NT).

Figure 119 Windows XP: Control Panel



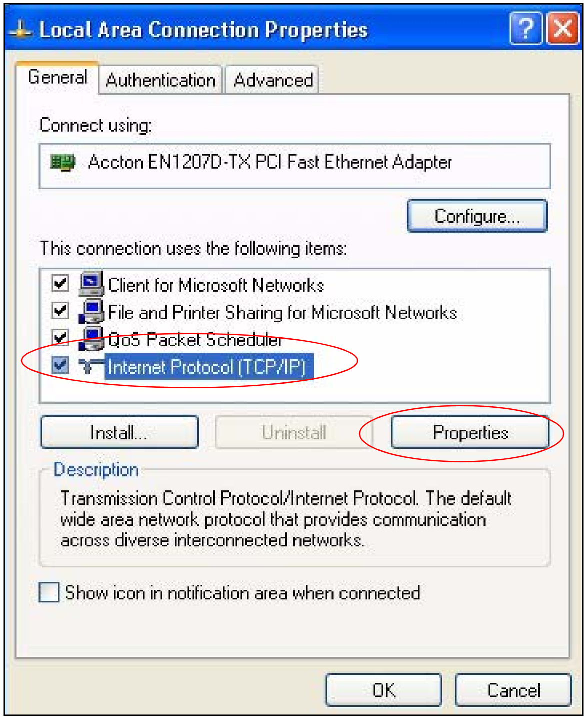
3 Right-click **Local Area Connection** and then click **Properties**.

Figure 120 Windows XP: Control Panel: Network Connections: Properties


Network Connections
File Edit View Favorites Tools Advanced Help
Back Search Folders
Address Network Connections
Network Tasks
Create a new connection
Set up a home or small office network
Disable this network device
Repair this connection
Rename this connection
View status of this connection
Change settings of this connection
LAN or High-Speed Internet
Local Area Connection
Enabled
Standard PCI Fast Ethernet Adapter
Disable
Status
Repair
Bridge Connections
Create Shortcut
Delete
Rename
Properties

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

Figure 121 Windows XP: Local Area Connection Properties


Local Area Connection Properties
General Authentication Advanced

Connect using:

Accton EN1207D-TX PCI Fast Ethernet Adapter

This connection uses the following items:

☑ Client for Microsoft Networks
☑ File and Printer Sharing for Microsoft Networks
☑ QoS Packet Scheduler
☑ Internet Protocol (TCP/IP)

Install... Uninstall Properties
Description

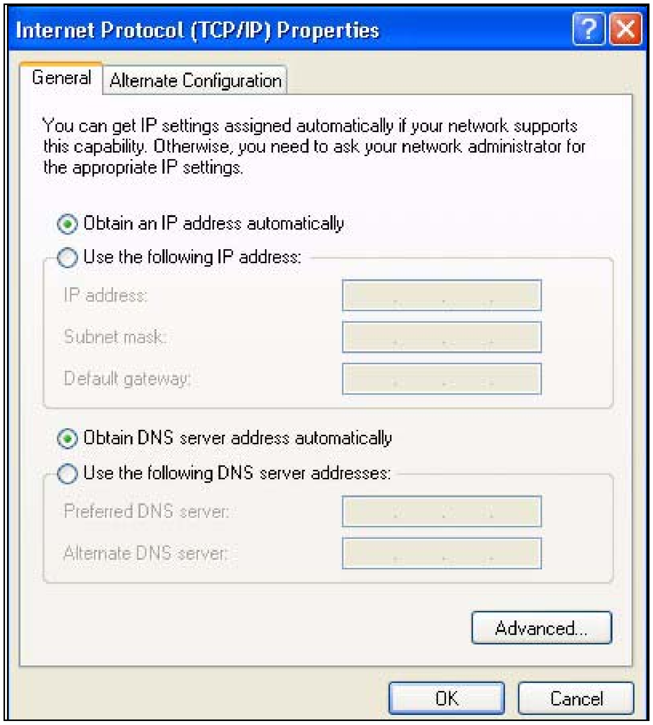
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☐ Show icon in notification area when connected

5 The **Internet Protocol TCP/IP Properties** window opens (the **General tab** in Windows XP).

- If you have a dynamic IP address click **Obtain an IP address automatically**.
- If you have a static IP address click **Use the following IP Address** and fill in the **IP address**, **Subnet mask**, and **Default gateway** fields.
- Click **Advanced**.

Figure 122 Windows XP: Internet Protocol (TCP/IP) Properties



Internet Protocol (TCP/IP) Properties

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically
○ Use the following IP address:

IP address:
Subnet mask:
Default gateway:

● Obtain DNS server address automatically
○ Use the following DNS server addresses:

Preferred DNS server:
Alternate DNS server:

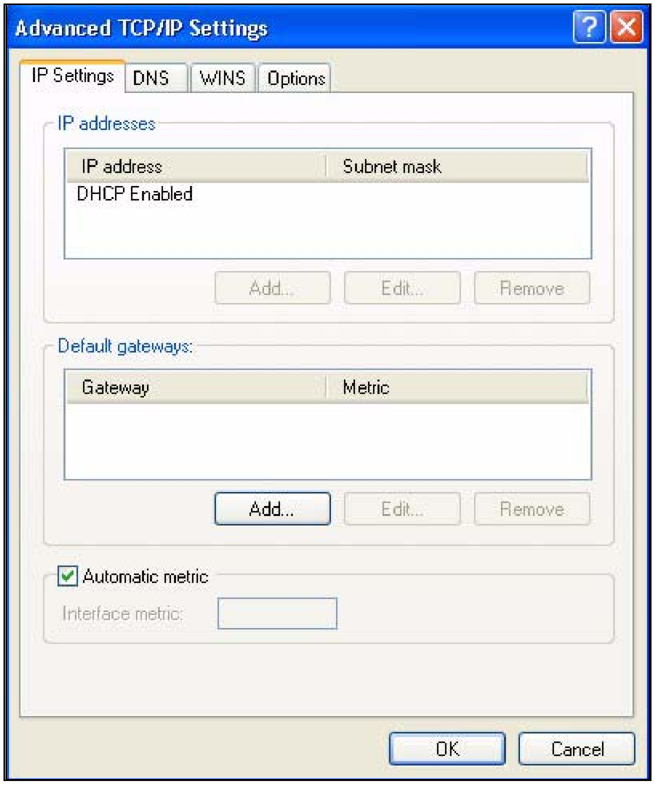
6 If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Settings** tab and click **OK**.

Do one or more of the following if you want to configure additional IP addresses:

- In the **IP Settings** tab, in IP addresses, click **Add**.
- In **TCP/IP Address**, type an IP address in **IP address** and a subnet mask in **Subnet mask**, and then click **Add**.
- Repeat the above two steps for each IP address you want to add.
- Configure additional default gateways in the **IP Settings** tab by clicking **Add** in **Default gateways**.
- In **TCP/IP Gateway Address**, type the IP address of the default gateway in **Gateway**. To manually configure a default metric (the number of transmission hops), clear the **Automatic metric** check box and type a metric in **Metric**.
- Click **Add**.
- Repeat the previous three steps for each default gateway you want to add.

- Click **OK** when finished.

Figure 123 Windows XP: Advanced TCP/IP Properties



IP address	Subnet mask
DHCP Enabled	

Gateway	Metric

☑ Automatic metric

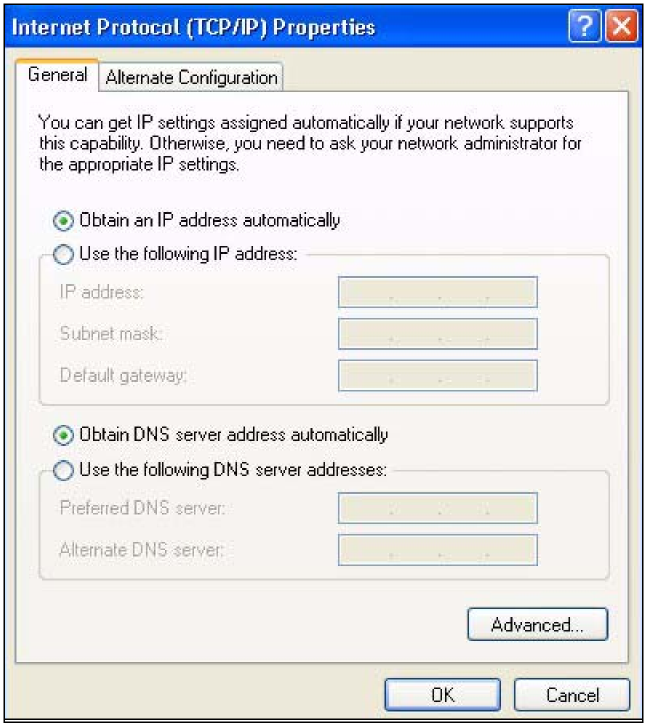
Interface metric:

7 In the **Internet Protocol TCP/IP Properties** window (the **General** tab in Windows XP):

- Click **Obtain DNS server address automatically** if you do not know your DNS server IP address(es).
- If you know your DNS server IP address(es), click **Use the following DNS server addresses**, and type them in the **Preferred DNS server** and **Alternate DNS server** fields.

If you have previously configured DNS servers, click **Advanced** and then the **DNS** tab to order them.

Figure 124   Windows XP: Internet Protocol (TCP/IP) Properties



You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically

○ Use the following IP address:

IP address:

Subnet mask:

Default gateway:

● Obtain DNS server address automatically

○ Use the following DNS server addresses:

Preferred DNS server:

Alternate DNS server:

8 Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.

9 Click **Close** (**OK** in Windows 2000/NT) to close the **Local Area Connection Properties** window.

10 Close the **Network Connections** window (**Network and Dial-up Connections** in Windows 2000/NT).

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

Verifying Settings

1 Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.

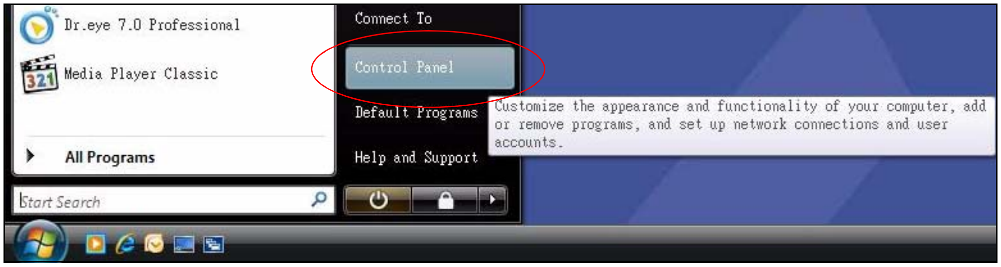
2 In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Windows Vista

This section shows screens from Windows Vista Enterprise Version 6.0.

1 Click the **Start** icon, **Control Panel**.

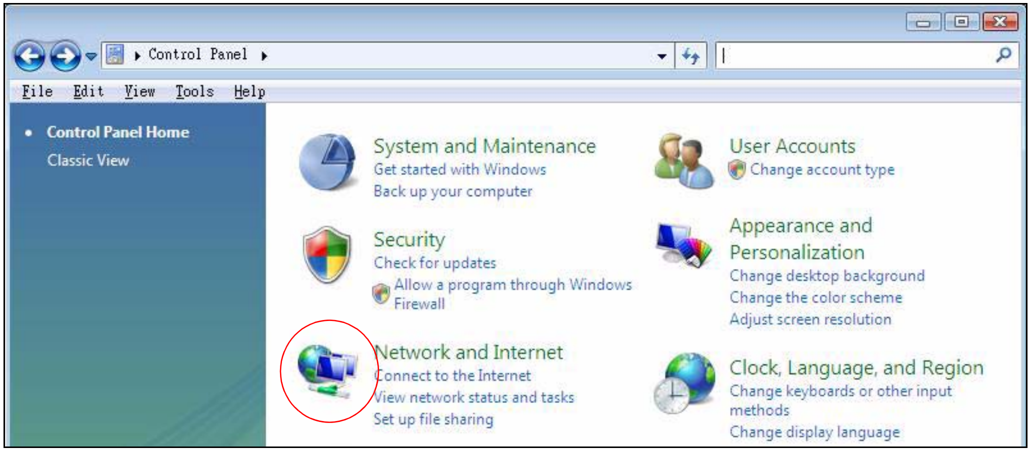
Figure 125 Windows Vista: Start Menu



Customize the appearance and functionality of your computer, add or remove programs, and set up network connections and user accounts.

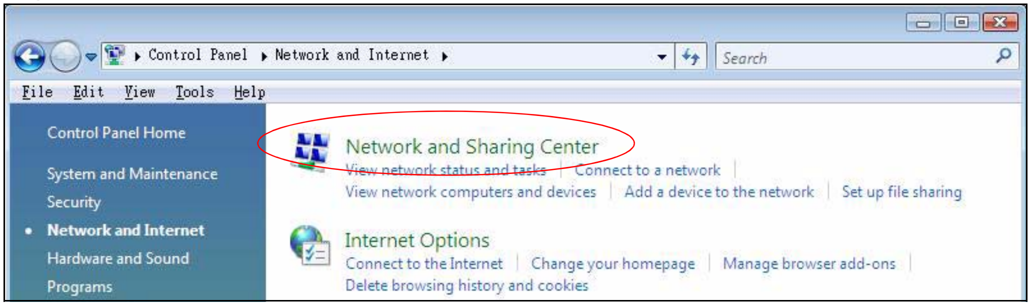
2 In the **Control Panel**, double-click **Network and Internet**.

Figure 126 Windows Vista: Control Panel



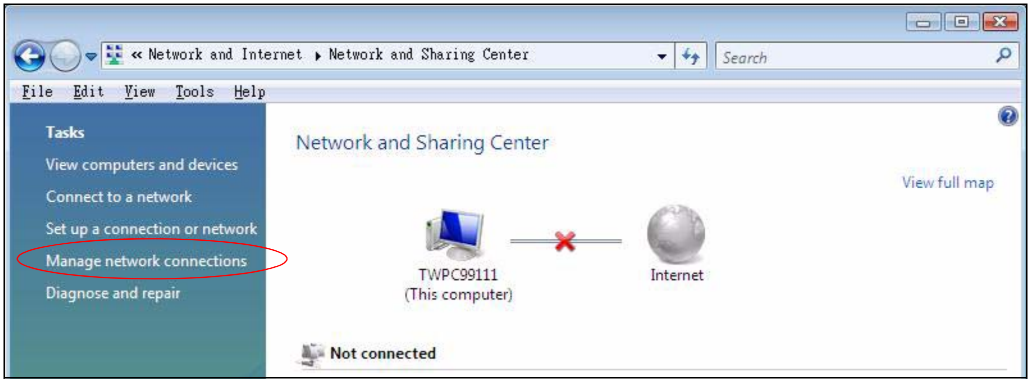
3 Click **Network and Sharing Center**.

Figure 127 Windows Vista: Network And Internet



4 Click **Manage network connections**.

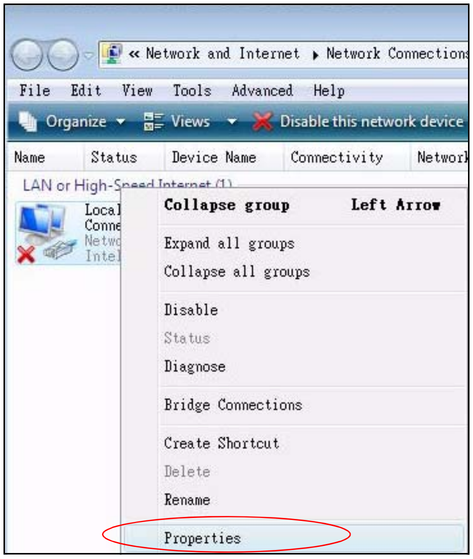
Figure 128 Windows Vista: Network and Sharing Center


« Network and Internet ▸ Network and Sharing Center
Search
File Edit View Tools Help
Tasks
View computers and devices
Connect to a network
Set up a connection or network
Manage network connections
Diagnose and repair
Network and Sharing Center
View full map
TWPC99111
(This computer)
Internet
Not connected

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

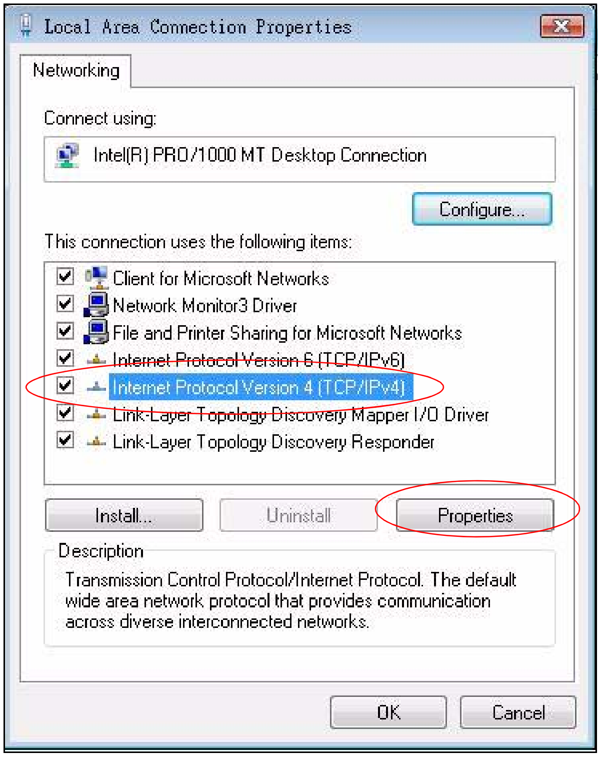
Note: During this procedure, click **Continue** whenever Windows displays a screen saying that it needs your permission to continue.

Figure 129 Windows Vista: Network and Sharing Center


« Network and Internet ▸ Network Connections
File Edit View Tools Advanced Help
Organize Views Disable this network device
Name Status Device Name Connectivity Network
LAN or High-Speed Internet (1)
Local
Conne
Netwo
Intel
Collapse group Left Arrow
Expand all groups
Collapse all groups
Disable
Status
Diagnose
Bridge Connections
Create Shortcut
Delete
Rename
Properties

6 Select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.

Figure 130 Windows Vista: Local Area Connection Properties



Local Area Connection Properties

Connect using:

Intel(R) PRO/1000 MT Desktop Connection

This connection uses the following items:

- ☑ Client for Microsoft Networks
- ☑ Network Monitor3 Driver
- ☑ File and Printer Sharing for Microsoft Networks
- ☑ Internet Protocol Version 6 (TCP/IPv6)
- ☑ Internet Protocol Version 4 (TCP/IPv4)
- ☑ Link-Layer Topology Discovery Mapper I/O Driver
- ☑ Link-Layer Topology Discovery Responder

Description

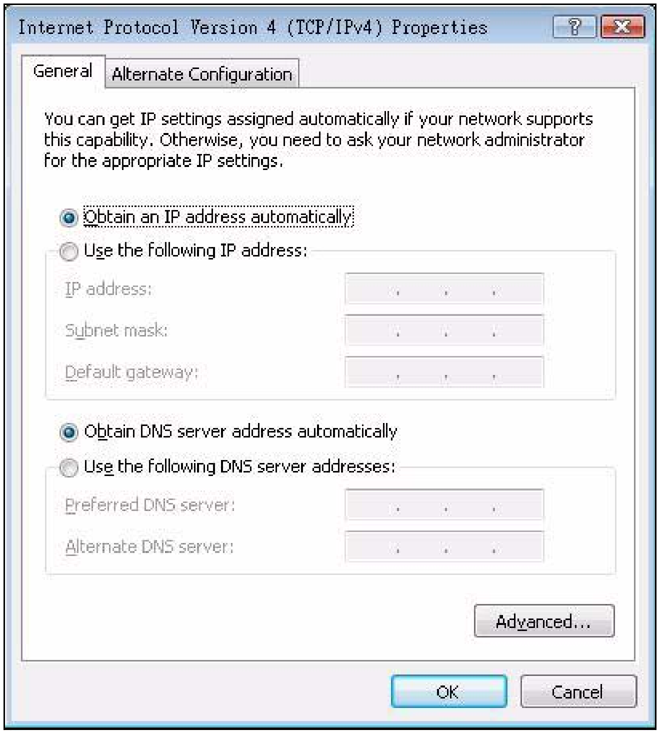
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

7 The **Internet Protocol Version 4 (TCP/IPv4) Properties** window opens (the **General tab**).

- If you have a dynamic IP address click **Obtain an IP address automatically**.
- If you have a static IP address click **Use the following IP address** and fill in the **IP address**, **Subnet mask**, and **Default gateway** fields.

- Click **Advanced**.

Figure 131 Windows Vista: Internet Protocol Version 4 (TCP/IPv4) Properties



Internet Protocol Version 4 (TCP/IPv4) Properties

General | Alternate Configuration

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically
○ Use the following IP address:
IP address: . . .
Subnet mask: . . .
Default gateway: . . .

● Obtain DNS server address automatically
○ Use the following DNS server addresses:
Preferred DNS server: . . .
Alternate DNS server: . . .

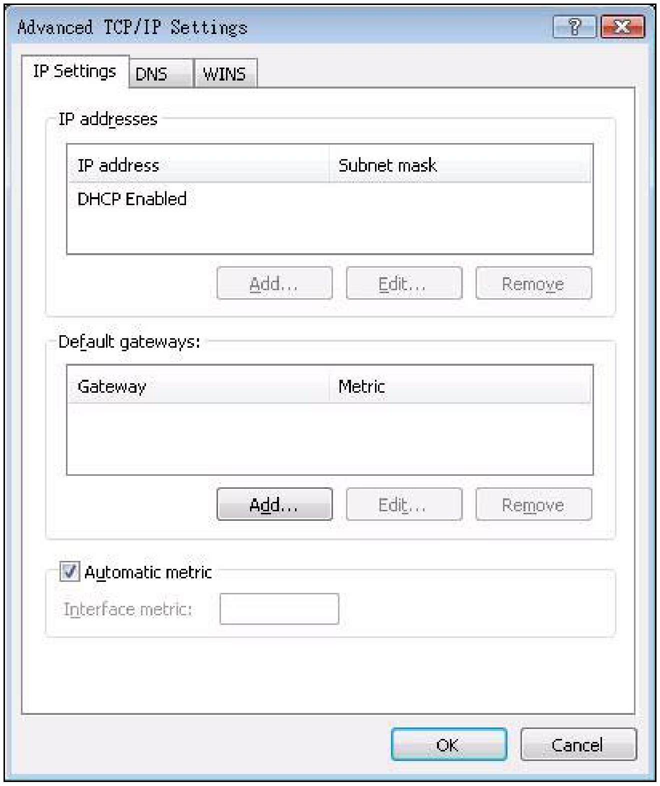
8 If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Settings** tab and click **OK**.

Do one or more of the following if you want to configure additional IP addresses:

- In the **IP Settings** tab, in IP addresses, click **Add**.
- In **TCP/IP Address**, type an IP address in **IP address** and a subnet mask in **Subnet mask**, and then click **Add**.
- Repeat the above two steps for each IP address you want to add.
- Configure additional default gateways in the **IP Settings** tab by clicking **Add** in **Default gateways**.
- In **TCP/IP Gateway Address**, type the IP address of the default gateway in **Gateway**. To manually configure a default metric (the number of transmission hops), clear the **Automatic metric** check box and type a metric in **Metric**.
- Click **Add**.
- Repeat the previous three steps for each default gateway you want to add.

- Click **OK** when finished.

Figure 132 Windows Vista: Advanced TCP/IP Properties



IP address	Subnet mask
DHCP Enabled	

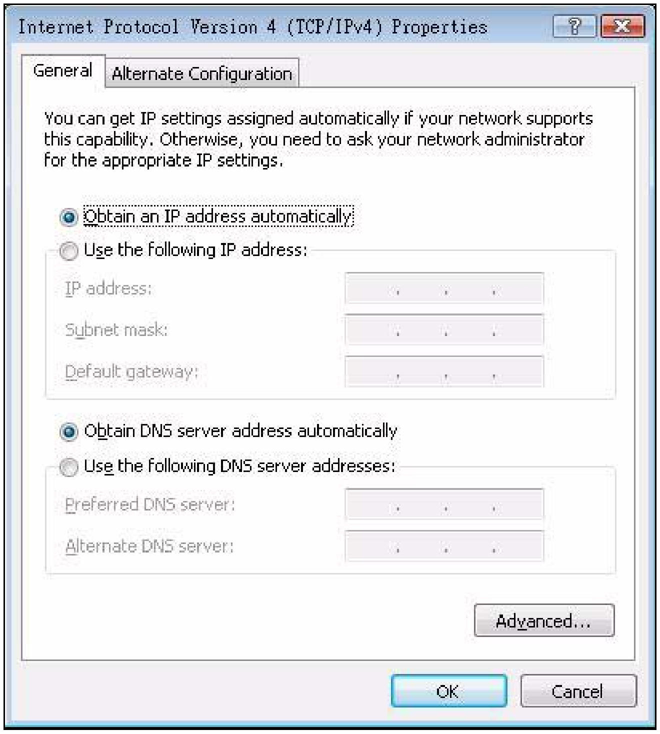
☑ Automatic metric

9 In the **Internet Protocol Version 4 (TCP/IPv4) Properties** window, (the **General tab**):

- Click **Obtain DNS server address automatically** if you do not know your DNS server IP address(es).
- If you know your DNS server IP address(es), click **Use the following DNS server addresses**, and type them in the **Preferred DNS server** and **Alternate DNS server** fields.

If you have previously configured DNS servers, click **Advanced** and then the **DNS** tab to order them.

Figure 133 Windows Vista: Internet Protocol Version 4 (TCP/IPv4) Properties



Internet Protocol Version 4 (TCP/IPv4) Properties

General | Alternate Configuration

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

● Obtain an IP address automatically

○ Use the following IP address:

IP address: . . .

Subnet mask: . . .

Default gateway: . . .

● Obtain DNS server address automatically

○ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

10 Click **OK** to close the **Internet Protocol Version 4 (TCP/IPv4) Properties** window.

11 Click **Close** to close the **Local Area Connection Properties** window.

12 Close the **Network Connections** window.

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

Verifying Settings

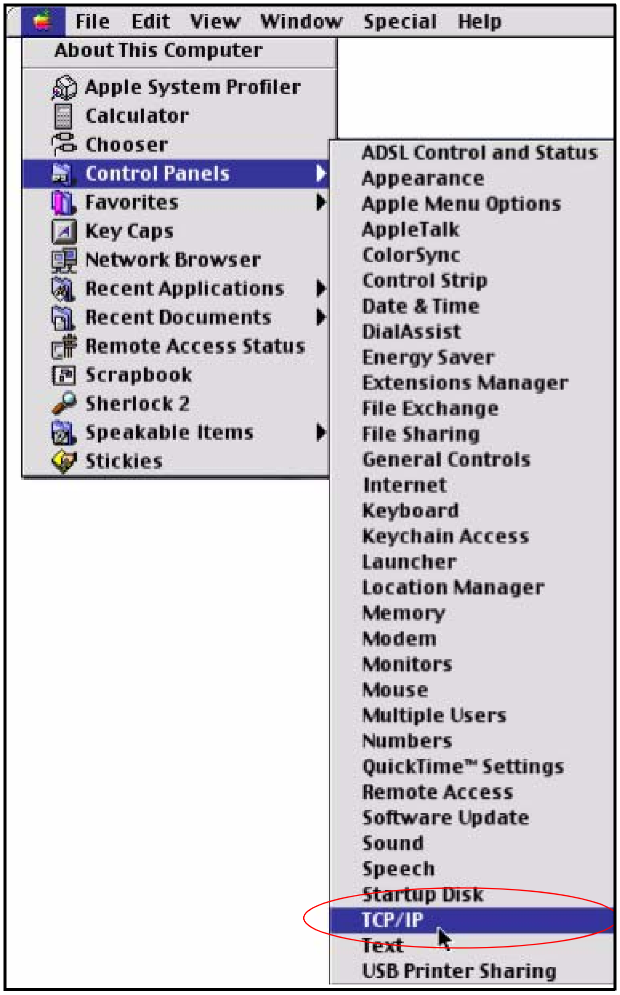
1 Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.

2 In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Macintosh OS 8/9

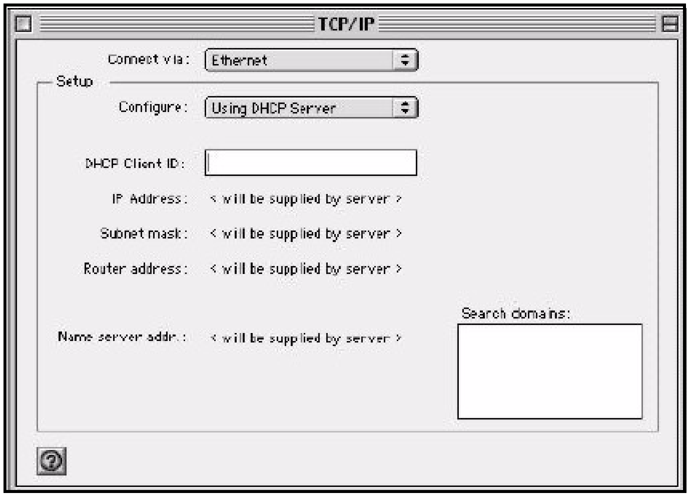
1 Click the **Apple** menu, **Control Panel** and double-click **TCP/IP** to open the **TCP/IP Control Panel**.

Figure 134 Macintosh OS 8/9: Apple Menu



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

Figure 135 Macintosh OS 8/9: TCP/IP



TCP/IP

Connect via: Ethernet

Setup

Configure: Using DHCP Server

DHCP Client ID:

IP Address: < will be supplied by server >

Subnet mask: < will be supplied by server >

Router address: < will be supplied by server >

Name server addr.: < will be supplied by server >

Search domains:

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

4 For statically assigned settings, do the following:

- From the **Configure** box, select **Manually**.
- Type your IP address in the **IP Address** box.
- Type your subnet mask in the **Subnet mask** box.
- Type the IP address of your ZyXEL Device in the **Router address** box.

5 Close the **TCP/IP Control Panel**.

6 Click **Save** if prompted, to save changes to your configuration.

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

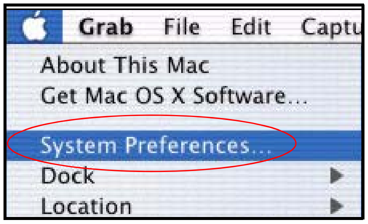
Verifying Settings

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

Macintosh OS X

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

Figure 136 Macintosh OS X: Apple Menu

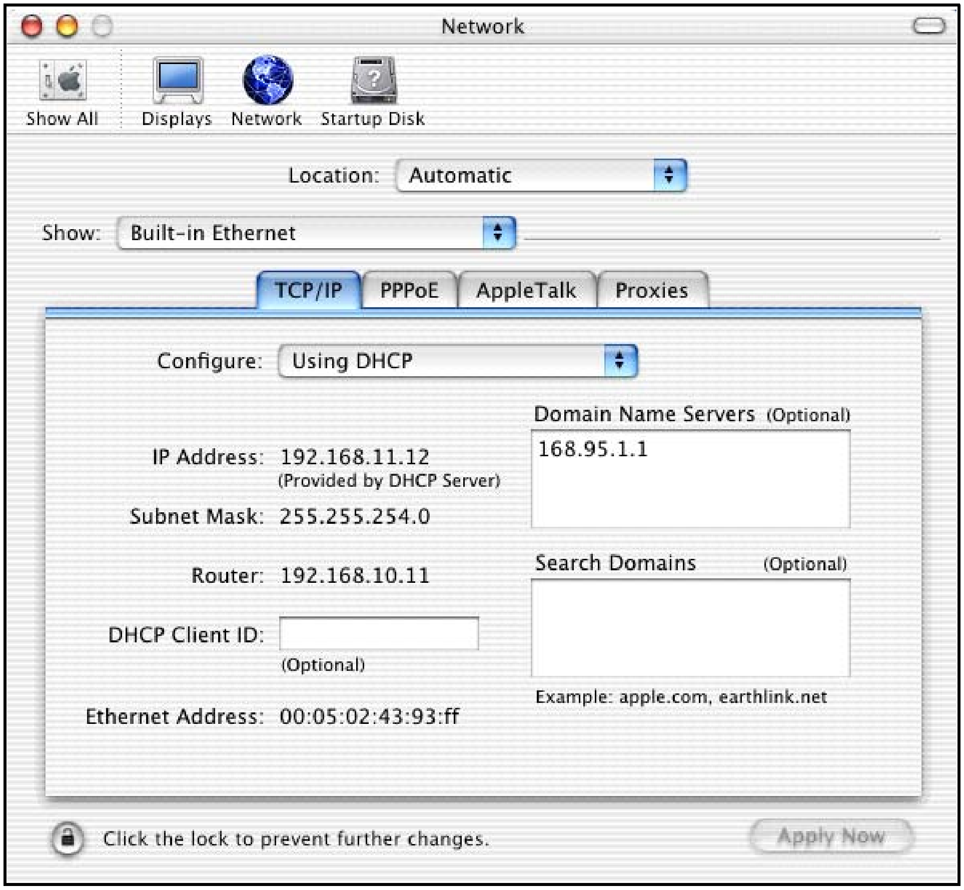


2 Click **Network** in the icon bar.

- Select **Automatic** from the **Location** list.
- Select **Built-in Ethernet** from the **Show** list.
- Click the **TCP/IP** tab.

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

Figure 137 Macintosh OS X: Network



Location: Automatic

Show: Built-in Ethernet

Configure: Using DHCP

Domain Name Servers (Optional)
168.95.1.1

IP Address: 192.168.11.12
(Provided by DHCP Server)

Subnet Mask: 255.255.254.0

Router: 192.168.10.11

Search Domains (Optional)

DHCP Client ID:
(Optional)

Example: apple.com, earthlink.net

Ethernet Address: 00:05:02:43:93:ff

Click the lock to prevent further changes.

4 For statically assigned settings, do the following:

- From the **Configure** box, select **Manually**.
- Type your IP address in the **IP Address** box.
- Type your subnet mask in the **Subnet mask** box.
- Type the IP address of your ZyXEL Device in the **Router address** box.

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

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

Verifying Settings

Check your TCP/IP properties in the **Network** window.

Linux

This section shows you how to configure your computer's TCP/IP settings in Red Hat Linux 9.0. Procedure, screens and file location may vary depending on your Linux distribution and release version.

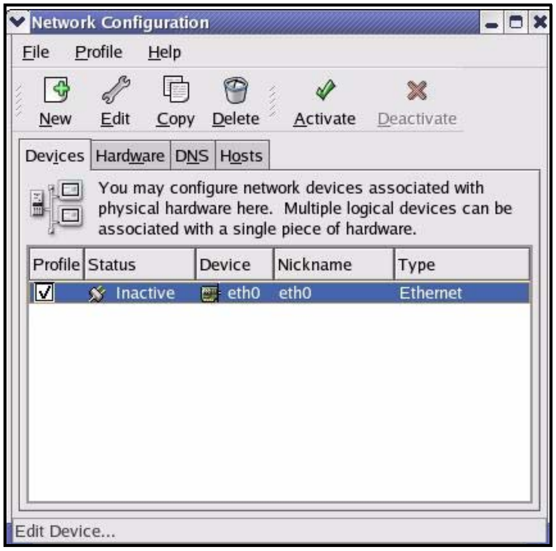
Note: Make sure you are logged in as the root administrator.

Using the K Desktop Environment (KDE)

Follow the steps below to configure your computer IP address using the KDE.

1 Click the Red Hat button (located on the bottom left corner), select **System Setting** and click **Network**.

Figure 138 Red Hat 9.0: KDE: Network Configuration: Devices



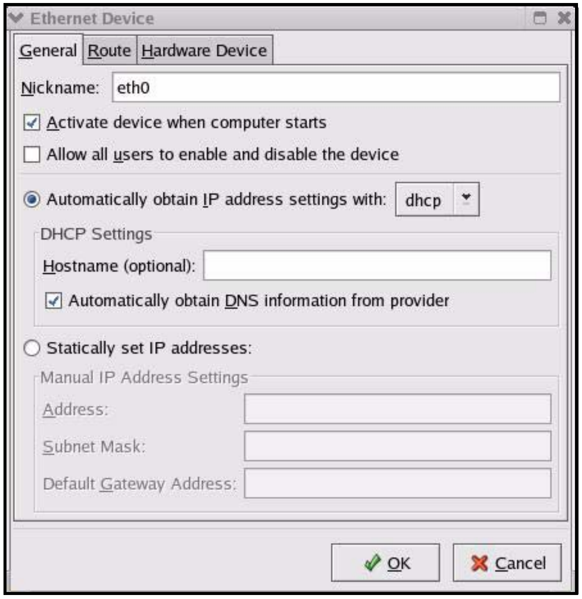
You may configure network devices associated with physical hardware here. Multiple logical devices can be associated with a single piece of hardware.

Profile	Status	Device	Nickname	Type
☑	Inactive	eth0	eth0	Ethernet

Edit Device...

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

Figure 139 Red Hat 9.0: KDE: Ethernet Device: General



Nickname: eth0

☑ Activate device when computer starts

□ Allow all users to enable and disable the device

● Automatically obtain IP address settings with: dhcp

DHCP Settings

Hostname (optional):

☑ Automatically obtain DNS information from provider

○ Statically set IP addresses:

Manual IP Address Settings

Address:

Subnet Mask:

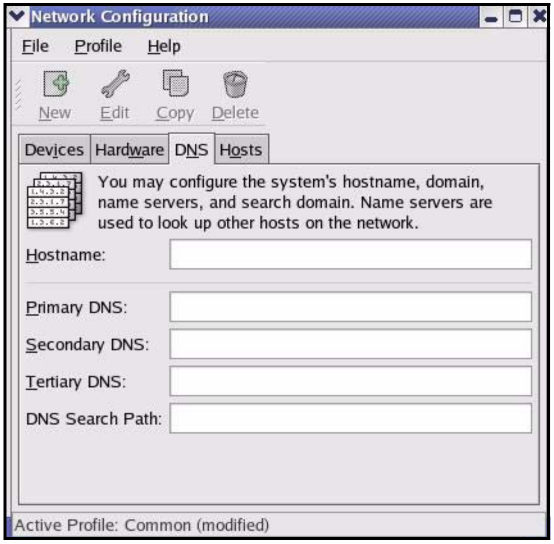
Default Gateway Address:

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

3 Click **OK** to save the changes and close the **Ethernet Device General** screen.

4 If you know your DNS server IP address(es), click the **DNS** tab in the **Network Configuration** screen. Enter the DNS server information in the fields provided.

Figure 140 Red Hat 9.0: KDE: Network Configuration: DNS



You may configure the system's hostname, domain, name servers, and search domain. Name servers are used to look up other hosts on the network.

Hostname:

Primary DNS:

Secondary DNS:

Tertiary DNS:

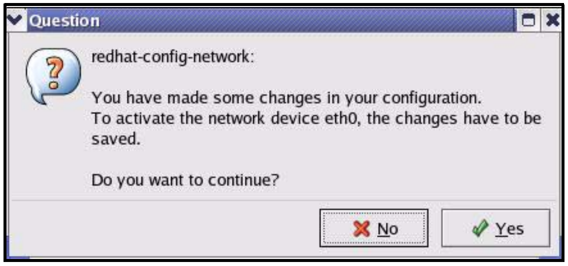
DNS Search Path:

Active Profile: Common (modified)

5 Click the **Devices** tab.

6 Click the **Activate** button to apply the changes. The following screen displays. Click **Yes to save the changes in all screens.**

Figure 141 Red Hat 9.0: KDE: Network Configuration: Activate



redhat-config-network:

You have made some changes in your configuration.
To activate the network device eth0, the changes have to be saved.

Do you want to continue?

7 After the network card restart process is complete, make sure the **Status** is **Active** in the **Network Configuration** screen.

Using Configuration Files

Follow the steps below to edit the network configuration files and set your computer IP address.

1 Assuming that you have only one network card on the computer, locate the `ifconfig-eth0` configuration file (where `eth0` is the name of the Ethernet card). Open the configuration file with any plain text editor.

- If you have a dynamic IP address, enter **dhcp** in the `BOOTPROTO=` field. The following figure shows an example.

Figure 142 Red Hat 9.0: Dynamic IP Address Setting in ifconfig-eth0

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=dhcp
USERCTL=no
PEERDNS=yes
TYPE=Ethernet
```

- If you have a static IP address, enter **static** in the BOOTPROTO= field. Type IPADDR= followed by the IP address (in dotted decimal notation) and type NETMASK= followed by the subnet mask. The following example shows an example where the static IP address is 192.168.1.10 and the subnet mask is 255.255.255.0.

Figure 143 Red Hat 9.0: Static IP Address Setting in ifconfig-eth0

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=static
IPADDR=192.168.1.10
NETMASK=255.255.255.0
USERCTL=no
PEERDNS=yes
TYPE=Ethernet
```

2 If you know your DNS server IP address(es), enter the DNS server information in the resolv.conf file in the /etc directory. The following figure shows an example where two DNS server IP addresses are specified.

Figure 144 Red Hat 9.0: DNS Settings in resolv.conf

```
nameserver 172.23.5.1
nameserver 172.23.5.2
```

3 After you edit and save the configuration files, you must restart the network card. Enter ./network restart in the /etc/rc.d/init.d directory. The following figure shows an example.

Figure 145 Red Hat 9.0: Restart Ethernet Card

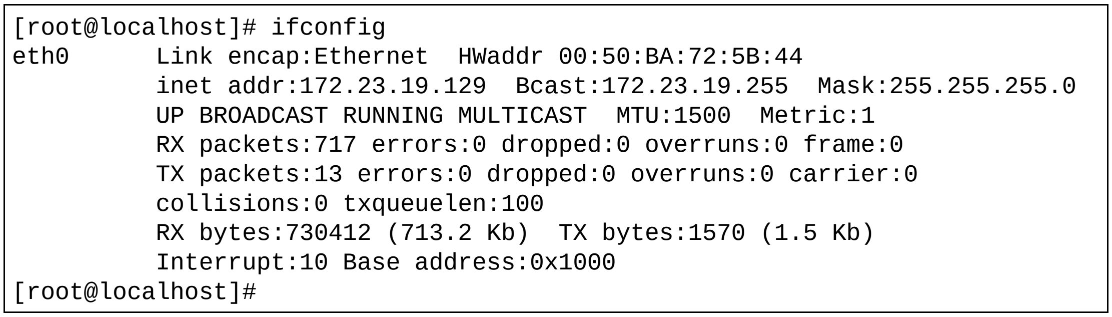
```
[root@localhost init.d]# network restart

Shutting down interface eth0:                    [OK]
Shutting down loopback interface:                [OK]
Setting network parameters:                      [OK]
Bringing up loopback interface:                  [OK]
Bringing up interface eth0:                      [OK]
```

Verifying Settings

Enter ifconfig in a terminal screen to check your TCP/IP properties.

Figure 146 Red Hat 9.0: Checking TCP/IP Properties



```
[root@localhost]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:50:BA:72:5B:44
          inet addr:172.23.19.129  Bcast:172.23.19.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:717 errors:0 dropped:0 overruns:0 frame:0
          TX packets:13 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:100
          RX bytes:730412 (713.2 Kb)  TX bytes:1570 (1.5 Kb)
          Interrupt:10 Base address:0x1000
[root@localhost]#
```

B

IP Addresses and Subnetting

This appendix introduces IP addresses and subnet masks.

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

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

Introduction to IP Addresses

One part of the IP address is the network number, and the other part is the host ID. In the same way that houses on a street share a common street name, the hosts on a network share a common network number. Similarly, as each house has its own house number, each host on the network has its own unique identifying number - the host ID. Routers use the network number to send packets to the correct network, while the host ID determines to which host on the network the packets are delivered.

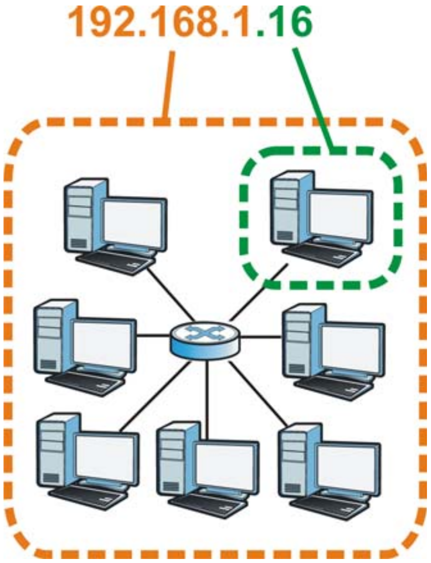
Structure

An IP address is made up of four parts, written in dotted decimal notation (for example, 192.168.1.1). Each of these four parts is known as an octet. An octet is an eight-digit binary number (for example 11000000, which is 192 in decimal notation).

Therefore, each octet has a possible range of 00000000 to 11111111 in binary, or 0 to 255 in decimal.

The following figure shows an example IP address in which the first three octets (192.168.1) are the network number, and the fourth octet (16) is the host ID.

Figure 147 Network Number and Host ID



How much of the IP address is the network number and how much is the host ID varies according to the subnet mask.

Subnet Masks

A subnet mask is used to determine which bits are part of the network number, and which bits are part of the host ID (using a logical AND operation). The term “subnet” is short for “sub-network”.

A subnet mask has 32 bits. If a bit in the subnet mask is a “1” then the corresponding bit in the IP address is part of the network number. If a bit in the subnet mask is “0” then the corresponding bit in the IP address is part of the host ID.

The following example shows a subnet mask identifying the network number (in bold text) and host ID of an IP address (192.168.1.2 in decimal).

Table 99 Subnet Masks

	1ST OCTET: **(192)**	**2ND OCTET:** **(168)**	**3RD OCTET:** **(1)**	**4TH OCTET** **(2)**
IP Address (Binary)	11000000	10101000	00000001	00000010
Subnet Mask (Binary)	**11111111**	**11111111**	**11111111**	00000000
Network Number	**11000000**	**10101000**	**00000001**	
Host ID				00000010

By convention, subnet masks always consist of a continuous sequence of ones beginning from the leftmost bit of the mask, followed by a continuous sequence of zeros, for a total number of 32 bits.

Subnet masks can be referred to by the size of the network number part (the bits with a "1" value). For example, an "8-bit mask" means that the first 8 bits of the mask are ones and the remaining 24 bits are zeroes.

Subnet masks are expressed in dotted decimal notation just like IP addresses. The following examples show the binary and decimal notation for 8-bit, 16-bit, 24-bit and 29-bit subnet masks.

Table 100 Subnet Masks

	BINARY				DECIMAL
	1ST OCTET	2ND OCTET	3RD OCTET	4TH OCTET	
8-bit mask	11111111	00000000	00000000	00000000	255.0.0.0
16-bit mask	11111111	11111111	00000000	00000000	255.255.0.0
24-bit mask	11111111	11111111	11111111	00000000	255.255.255.0
29-bit mask	11111111	11111111	11111111	11111000	255.255.255.248

Network Size

The size of the network number determines the maximum number of possible hosts you can have on your network. The larger the number of network number bits, the smaller the number of remaining host ID bits.

An IP address with host IDs of all zeros is the IP address of the network (192.168.1.0 with a 24-bit subnet mask, for example). An IP address with host IDs of all ones is the broadcast address for that network (192.168.1.255 with a 24-bit subnet mask, for example).

As these two IP addresses cannot be used for individual hosts, calculate the maximum number of possible hosts in a network as follows:

Table 101 Maximum Host Numbers

SUBNET MASK		HOST ID SIZE		MAXIMUM NUMBER OF HOSTS
8 bits	255.0.0.0	24 bits	$2^{24} – 2$	16777214
16 bits	255.255.0.0	16 bits	$2^{16} – 2$	65534
24 bits	255.255.255.0	8 bits	$2^{8} – 2$	254
29 bits	255.255.255.248	3 bits	$2^{3} – 2$	6

Notation

Since the mask is always a continuous number of ones beginning from the left, followed by a continuous number of zeros for the remainder of the 32 bit mask, you can simply specify the number of ones instead of writing the value of each octet. This is usually specified by writing a “/” followed by the number of bits in the mask after the address.

For example, 192.1.1.0 /25 is equivalent to saying 192.1.1.0 with subnet mask 255.255.255.128.

The following table shows some possible subnet masks using both notations.

Table 102 Alternative Subnet Mask Notation

SUBNET MASK	ALTERNATIVE NOTATION	LAST OCTET (BINARY)	LAST OCTET (DECIMAL)
255.255.255.0	/24	0000 0000	0
255.255.255.128	/25	1000 0000	128
255.255.255.192	/26	1100 0000	192
255.255.255.224	/27	1110 0000	224
255.255.255.240	/28	1111 0000	240
255.255.255.248	/29	1111 1000	248
255.255.255.252	/30	1111 1100	252

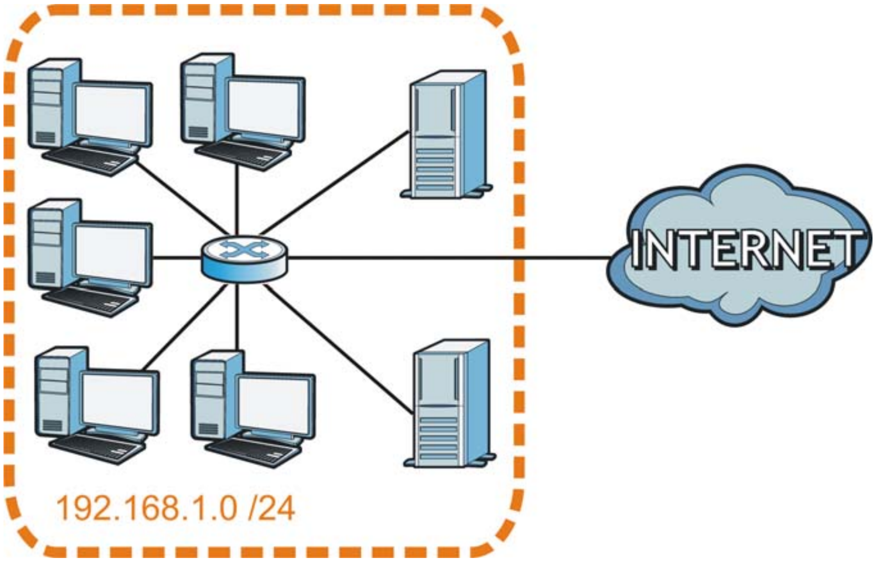
Subnetting

You can use subnetting to divide one network into multiple sub-networks. In the following example a network administrator creates two sub-networks to isolate a group of servers from the rest of the company network for security reasons.

In this example, the company network address is 192.168.1.0. The first three octets of the address (192.168.1) are the network number, and the remaining octet is the host ID, allowing a maximum of 2^8 – 2 or 254 possible hosts.

The following figure shows the company network before subnetting.

Figure 148 Subnetting Example: Before Subnetting

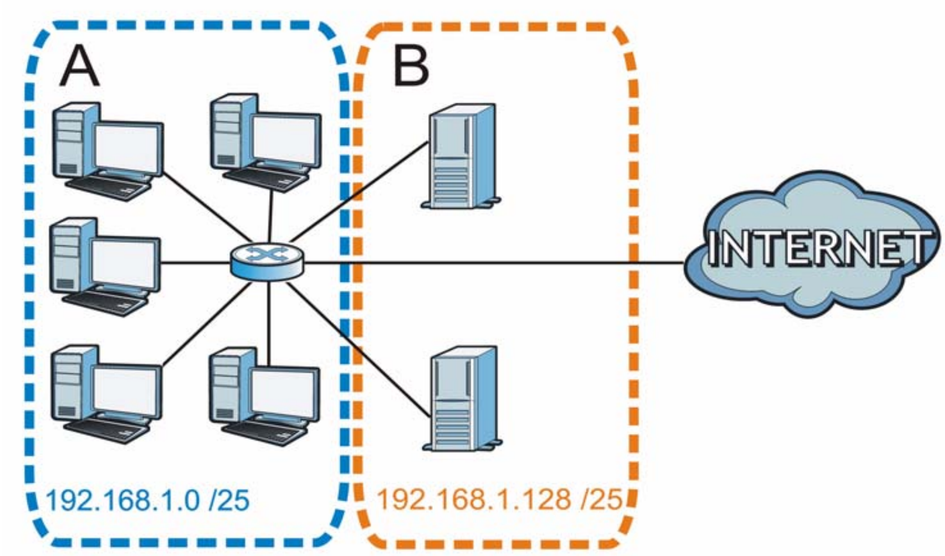


You can “borrow” one of the host ID bits to divide the network 192.168.1.0 into two separate sub-networks. The subnet mask is now 25 bits (255.255.255.128 or /25).

The “borrowed” host ID bit can have a value of either 0 or 1, allowing two subnets; 192.168.1.0 /25 and 192.168.1.128 /25.

The following figure shows the company network after subnetting. There are now two sub-networks, **A** and **B**.

Figure 149 Subnetting Example: After Subnetting



In a 25-bit subnet the host ID has 7 bits, so each sub-network has a maximum of 2^7 – 2 or 126 possible hosts (a host ID of all zeroes is the subnet's address itself, all ones is the subnet's broadcast address).

192.168.1.0 with mask 255.255.255.128 is subnet **A** itself, and 192.168.1.127 with mask 255.255.255.128 is its broadcast address. Therefore, the lowest IP address that can be assigned to an actual host for subnet **A** is 192.168.1.1 and the highest is 192.168.1.126.

Similarly, the host ID range for subnet **B** is 192.168.1.129 to 192.168.1.254.

Example: Four Subnets

The previous example illustrated using a 25-bit subnet mask to divide a 24-bit address into two subnets. Similarly, to divide a 24-bit address into four subnets, you need to "borrow" two host ID bits to give four possible combinations (00, 01, 10 and 11). The subnet mask is 26 bits (11111111.11111111.11111111.**11**000000) or 255.255.255.192.

Each subnet contains 6 host ID bits, giving 2^6 - 2 or 62 hosts for each subnet (a host ID of all zeroes is the subnet itself, all ones is the subnet's broadcast address).

Table 103 Subnet 1

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address (Decimal)	192.168.1.	0
IP Address (Binary)	11000000.10101000.00000001.	**00**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.0	Lowest Host ID: 192.168.1.1	
Broadcast Address: 192.168.1.63	Highest Host ID: 192.168.1.62	

Table 104 Subnet 2

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	64
IP Address (Binary)	11000000.10101000.00000001.	**01**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.64	Lowest Host ID: 192.168.1.65	
Broadcast Address: 192.168.1.127	Highest Host ID: 192.168.1.126	

Table 105 Subnet 3

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	128
IP Address (Binary)	11000000.10101000.00000001.	**10**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.128	Lowest Host ID: 192.168.1.129	
Broadcast Address: 192.168.1.191	Highest Host ID: 192.168.1.190	

Table 106 Subnet 4

IP/SUBNET MASK	NETWORK NUMBER	LAST OCTET BIT VALUE
IP Address	192.168.1.	192
IP Address (Binary)	11000000.10101000.00000001.	**11**000000
Subnet Mask (Binary)	11111111.11111111.11111111.	**11**000000
Subnet Address: 192.168.1.192	Lowest Host ID: 192.168.1.193	
Broadcast Address: 192.168.1.255	Highest Host ID: 192.168.1.254	

Example: Eight Subnets

Similarly, use a 27-bit mask to create eight subnets (000, 001, 010, 011, 100, 101, 110 and 111).

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

Table 107 Eight Subnets

SUBNET	SUBNET ADDRESS	FIRST ADDRESS	LAST ADDRESS	BROADCAST ADDRESS
1	0	1	30	31
2	32	33	62	63
3	64	65	94	95
4	96	97	126	127
5	128	129	158	159
6	160	161	190	191
7	192	193	222	223
8	224	225	254	255

Subnet Planning

The following table is a summary for subnet planning on a network with a 24-bit network number.

Table 108 24-bit Network Number Subnet Planning

NO. “BORROWED” HOST BITS	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
1	255.255.255.128 (/25)	2	126
2	255.255.255.192 (/26)	4	62
3	255.255.255.224 (/27)	8	30
4	255.255.255.240 (/28)	16	14
5	255.255.255.248 (/29)	32	6
6	255.255.255.252 (/30)	64	2
7	255.255.255.254 (/31)	128	1

The following table is a summary for subnet planning on a network with a 16-bit network number.

Table 109 16-bit Network Number Subnet Planning

NO. “BORROWED” HOST BITS	SUBNET MASK	NO. SUBNETS	NO. HOSTS PER SUBNET
1	255.255.128.0 (/17)	2	32766
2	255.255.192.0 (/18)	4	16382
3	255.255.224.0 (/19)	8	8190
4	255.255.240.0 (/20)	16	4094
5	255.255.248.0 (/21)	32	2046
6	255.255.252.0 (/22)	64	1022
7	255.255.254.0 (/23)	128	510
8	255.255.255.0 (/24)	256	254
9	255.255.255.128 (/25)	512	126
10	255.255.255.192 (/26)	1024	62
11	255.255.255.224 (/27)	2048	30
12	255.255.255.240 (/28)	4096	14
13	255.255.255.248 (/29)	8192	6
14	255.255.255.252 (/30)	16384	2
15	255.255.255.254 (/31)	32768	1

Configuring IP Addresses

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. 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. You must also enable Network Address Translation (NAT) on the ZyXEL Device.

Once you have decided on the network number, pick an IP address for your ZyXEL Device that is easy to remember (for instance, 192.168.1.1) 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 (running only between two branch offices, for example) 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.

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.*

Pop-up Windows, JavaScripts and Java Permissions

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

- Web browser pop-up windows from your device.
- JavaScripts (enabled by default).
- Java permissions (enabled by default).

Note: Internet Explorer 6 screens are used here. Screens for other Internet Explorer versions may vary.

Internet Explorer Pop-up Blockers

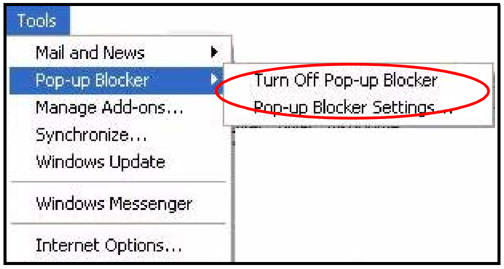
You may have to disable pop-up blocking to log into your device.

Either disable pop-up blocking (enabled by default in Windows XP SP (Service Pack) 2) or allow pop-up blocking and create an exception for your device's IP address.

Disable Pop-up Blockers

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

Figure 150 Pop-up Blocker

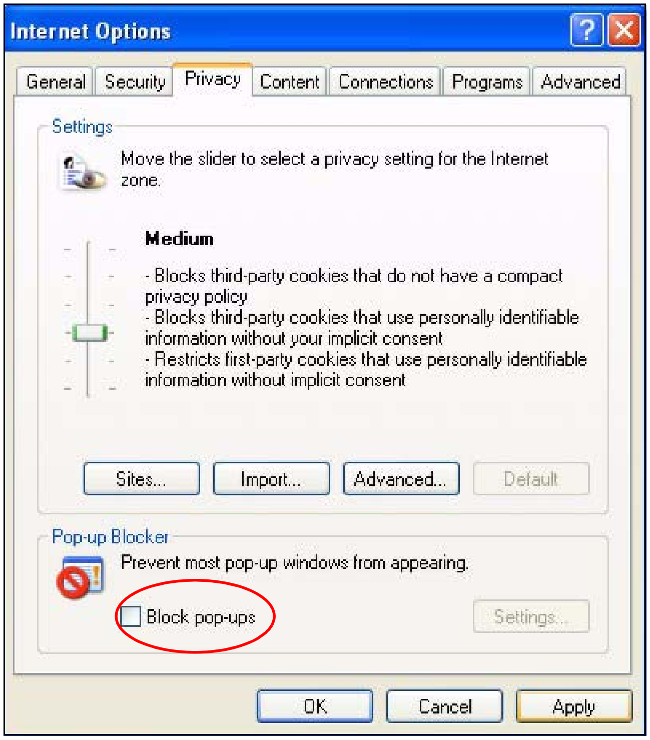


You can also check if pop-up blocking is disabled in the **Pop-up Blocker** section in the **Privacy** tab.

1 In Internet Explorer, select **Tools**, **Internet Options**, **Privacy**.

2 Clear the **Block pop-ups** check box in the **Pop-up Blocker** section of the screen. This disables any web pop-up blockers you may have enabled.

Figure 151 Internet Options: Privacy



Move the slider to select a privacy setting for the Internet zone.

Medium

- Blocks third-party cookies that do not have a compact privacy policy
- Blocks third-party cookies that use personally identifiable information without your implicit consent
- Restricts first-party cookies that use personally identifiable information without implicit consent

Prevent most pop-up windows from appearing.

□ Block pop-ups

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

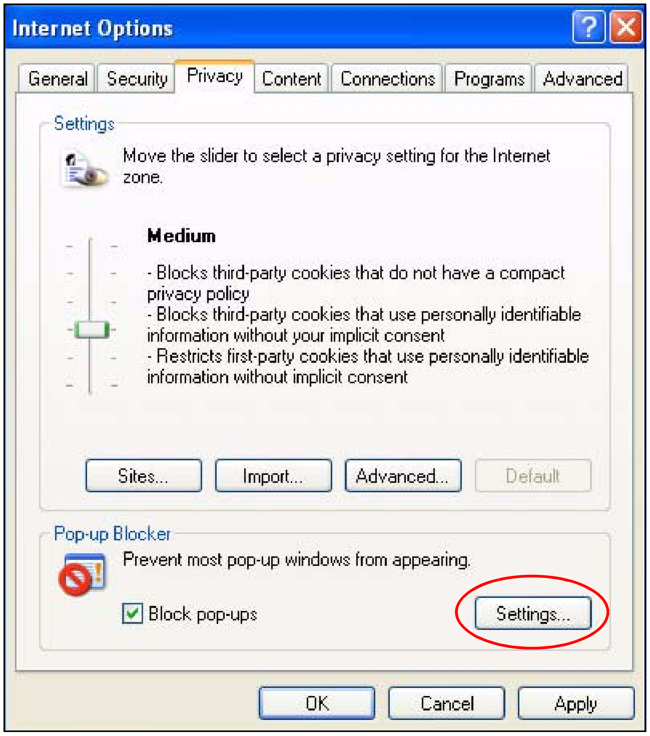
Enable Pop-up Blockers with Exceptions

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

1 In Internet Explorer, select **Tools**, **Internet Options** and then the **Privacy** tab.

2 Select **Settings...**to open the **Pop-up Blocker Settings** screen.

Figure 152 Internet Options: Privacy



Move the slider to select a privacy setting for the Internet zone.

Medium

- Blocks third-party cookies that do not have a compact privacy policy
- Blocks third-party cookies that use personally identifiable information without your implicit consent
- Restricts first-party cookies that use personally identifiable information without implicit consent

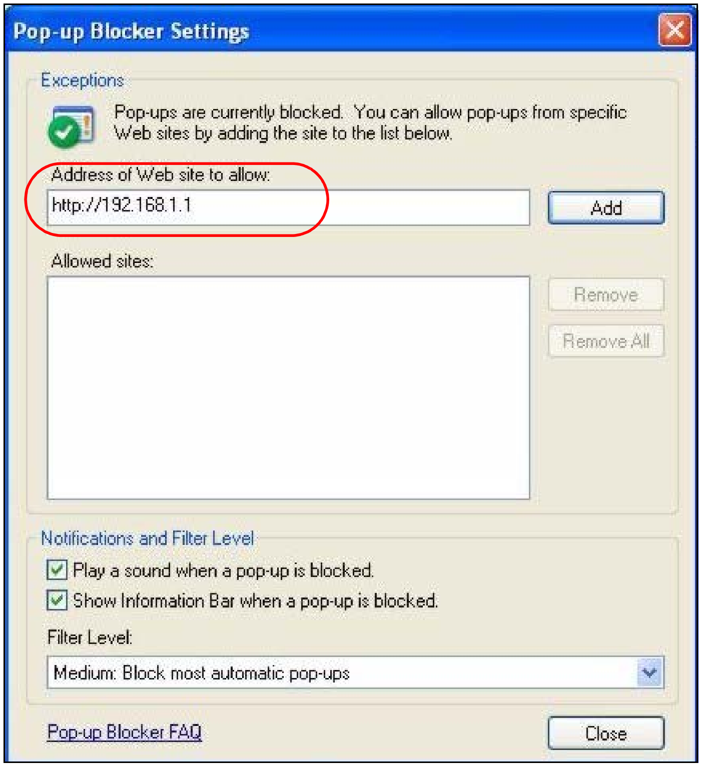
Prevent most pop-up windows from appearing.

☑ Block pop-ups

3 Type the IP address of your device (the web page that you do not want to have blocked) with the prefix “http://”. For example, http://192.168.167.1.

4 Click **Add** to move the IP address to the list of **Allowed sites**.

Figure 153 Pop-up Blocker Settings



Pop-ups are currently blocked. You can allow pop-ups from specific Web sites by adding the site to the list below.

Address of Web site to allow: http://192.168.1.1

Allowed sites:

Notifications and Filter Level

☑ Play a sound when a pop-up is blocked.

☑ Show Information Bar when a pop-up is blocked.

Filter Level: Medium: Block most automatic pop-ups

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

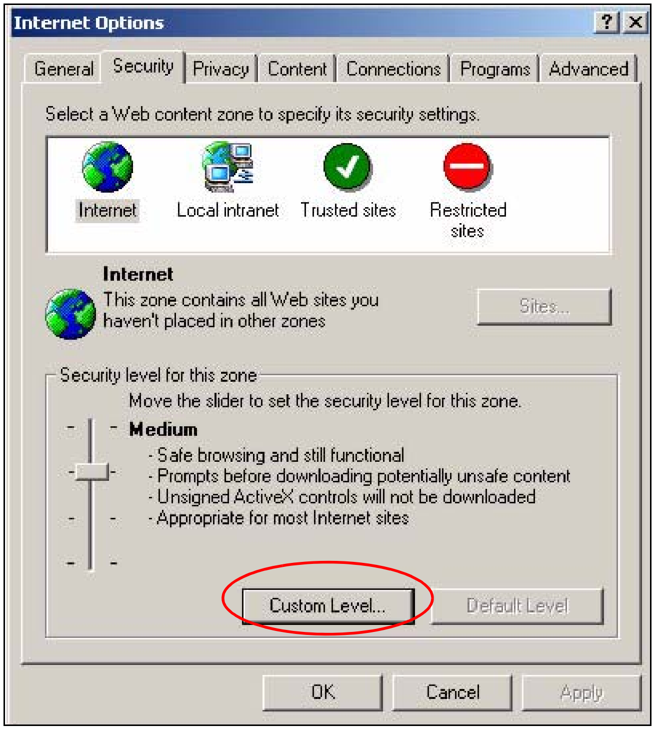
6 Click **Apply** to save this setting.

JavaScripts

If pages of the web configurator do not display properly in Internet Explorer, check that JavaScripts are allowed.

1 In Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.

Figure 154 Internet Options: Security



Select a Web content zone to specify its security settings.

Internet

This zone contains all Web sites you haven't placed in other zones

Security level for this zone

Move the slider to set the security level for this zone.

Medium

- Safe browsing and still functional
- Prompts before downloading potentially unsafe content
- Unsigned ActiveX controls will not be downloaded
- Appropriate for most Internet sites

2 Click the **Custom Level...** button.

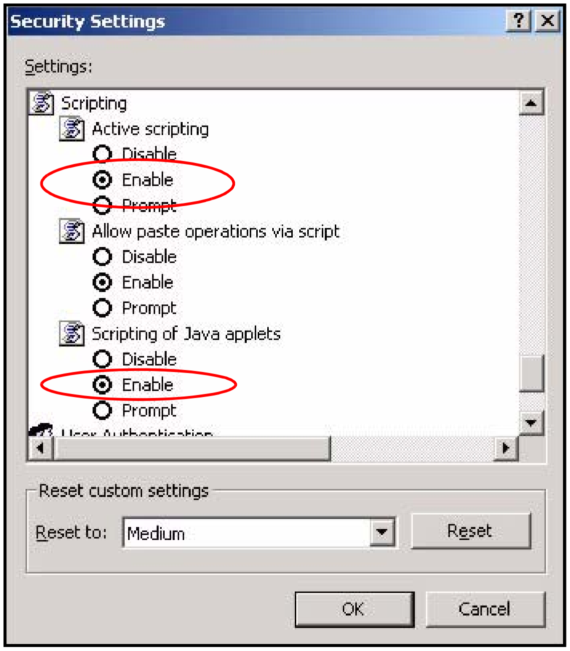
3 Scroll down to **Scripting**.

4 Under **Active scripting** make sure that **Enable** is selected (the default).

5 Under **Scripting of Java applets** make sure that **Enable** is selected (the default).

6 Click **OK** to close the window.

Figure 155 Security Settings - Java Scripting



Settings:

Scripting

Active scripting

○ Disable

● Enable

○ Prompt

Allow paste operations via script

○ Disable

● Enable

○ Prompt

Scripting of Java applets

○ Disable

● Enable

○ Prompt

User Authentication

Reset custom settings

Reset to: Medium

Java Permissions

1 From Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.

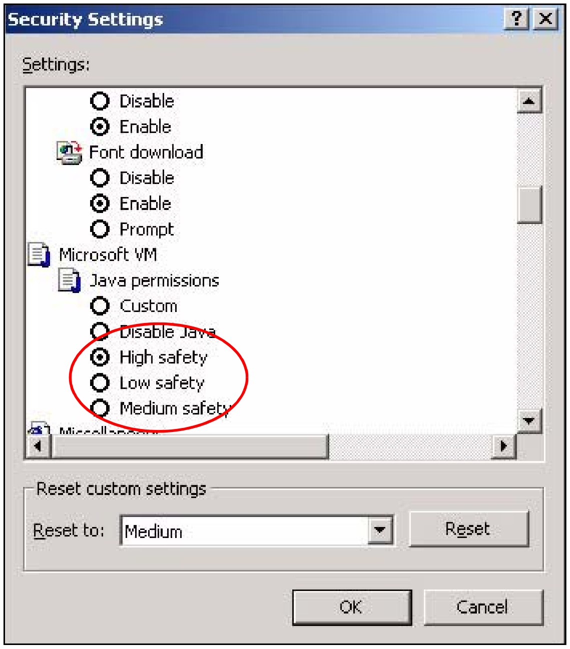
2 Click the **Custom Level...** button.

3 Scroll down to **Microsoft VM**.

4 Under **Java permissions** make sure that a safety level is selected.

5 Click **OK** to close the window.

Figure 156 Security Settings - Java



Security Settings

Settings:

○ Disable
● Enable
Font download
○ Disable
● Enable
○ Prompt
Microsoft VM
Java permissions
○ Custom
○ Disable Java
● High safety
○ Low safety
○ Medium safety

Reset custom settings

Reset to: Medium

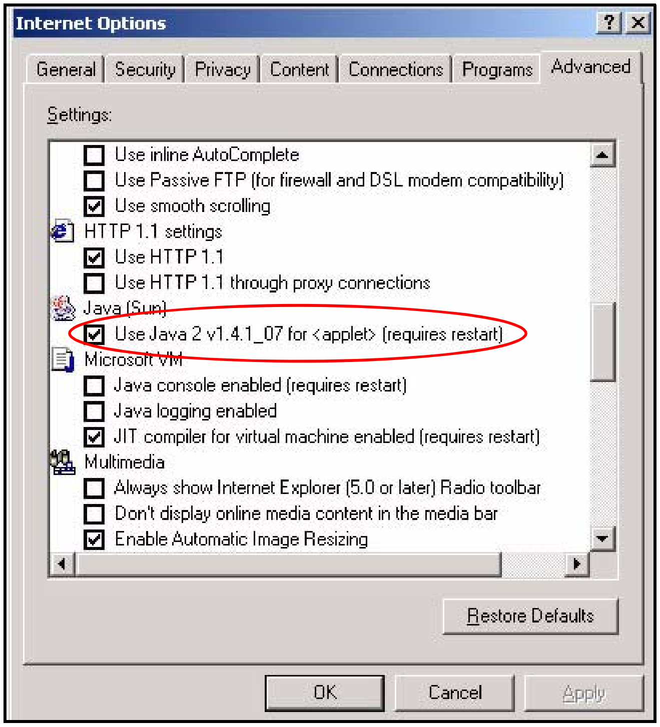
JAVA (Sun)

1 From Internet Explorer, click **Tools**, **Internet Options** and then the **Advanced** tab.

2 Make sure that **Use Java 2 for <applet>** under **Java (Sun)** is selected.

3 Click **OK** to close the window.

Figure 157 Java (Sun)



- ☐ Use inline AutoComplete
- ☐ Use Passive FTP (for firewall and DSL modem compatibility)
- ☑ Use smooth scrolling

HTTP 1.1 settings

- ☑ Use HTTP 1.1
- ☐ Use HTTP 1.1 through proxy connections

Java (Sun)

- ☑ Use Java 2 v1.4.1_07 for <applet> (requires restart)

Microsoft VM

- ☐ Java console enabled (requires restart)
- ☐ Java logging enabled
- ☑ JIT compiler for virtual machine enabled (requires restart)

Multimedia

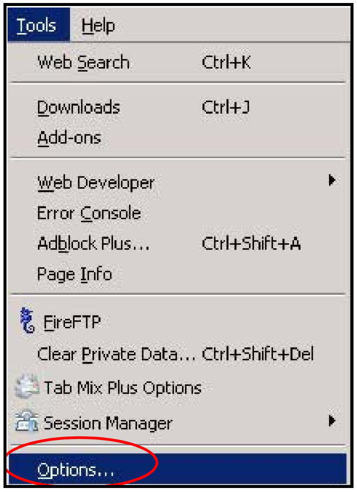
- ☐ Always show Internet Explorer (5.0 or later) Radio toolbar
- ☐ Don't display online media content in the media bar
- ☑ Enable Automatic Image Resizing

Mozilla Firefox

Mozilla Firefox 2.0 screens are used here. Screens for other versions may vary.

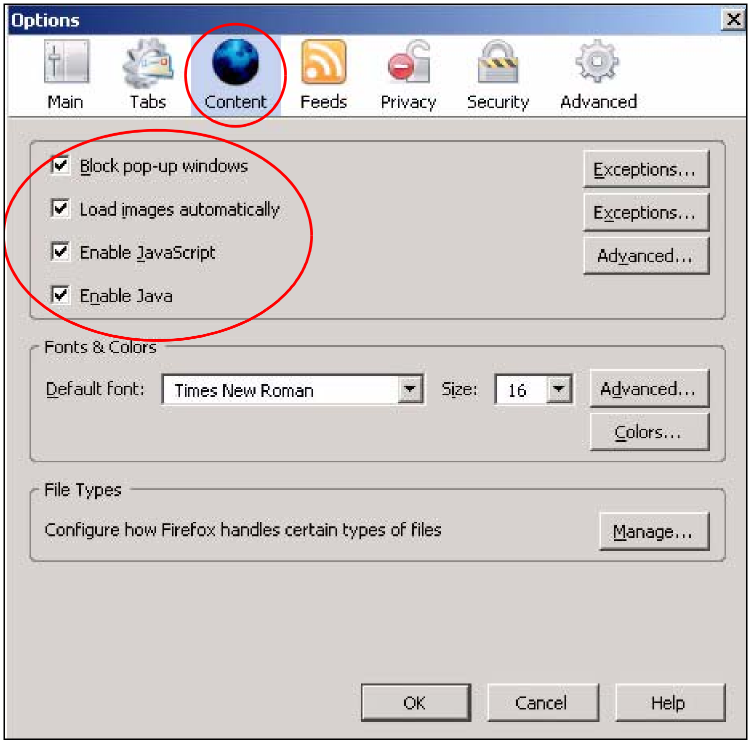
You can enable Java, Javascripts and pop-ups in one screen. Click **Tools,** then click **Options** in the screen that appears.

Figure 158 Mozilla Firefox: Tools > Options



Click **Content**.to show the screen below. Select the check boxes as shown in the following screen.

Figure 159 Mozilla Firefox Content Security



☑ Block pop-up windows

☑ Load images automatically

☑ Enable JavaScript

☑ Enable Java

Fonts & Colors

Default font: Times New Roman

Size: 16

File Types

Configure how Firefox handles certain types of files

D

Wireless LANs

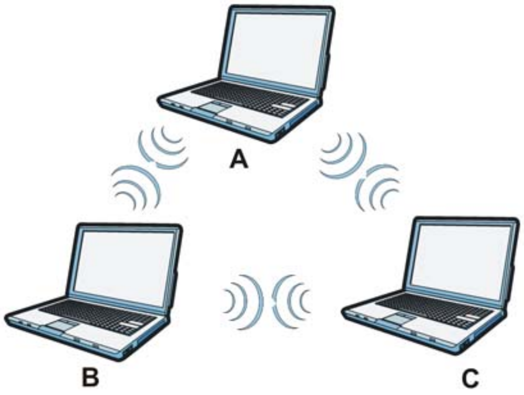
Wireless LAN Topologies

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

Ad-hoc Wireless LAN Configuration

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

Figure 160 Peer-to-Peer Communication in an Ad-hoc Network

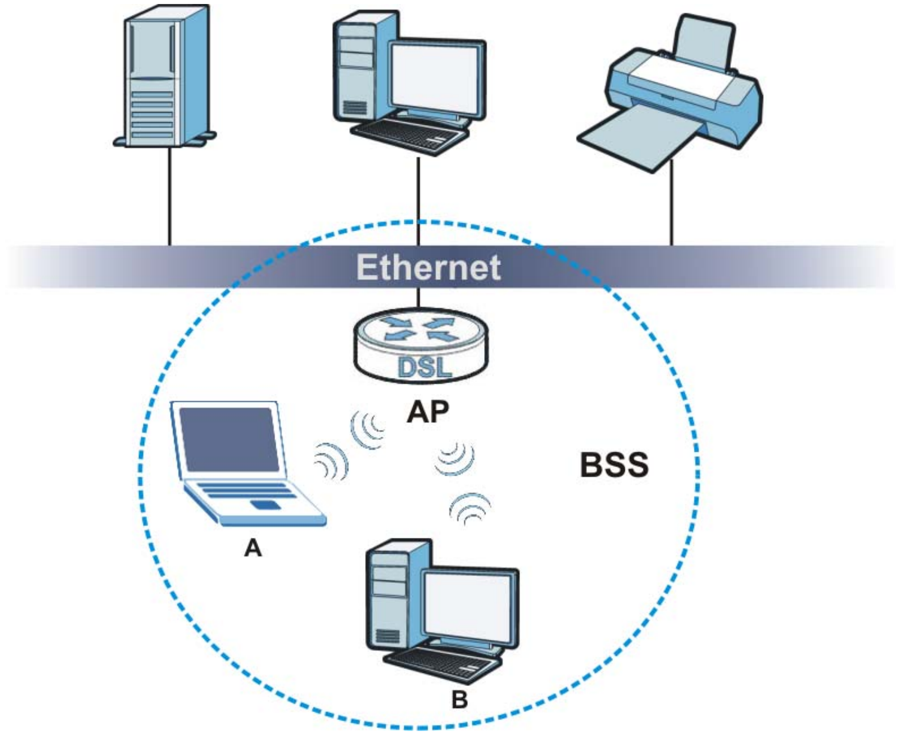


BSS

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

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

Figure 161 Basic Service Set



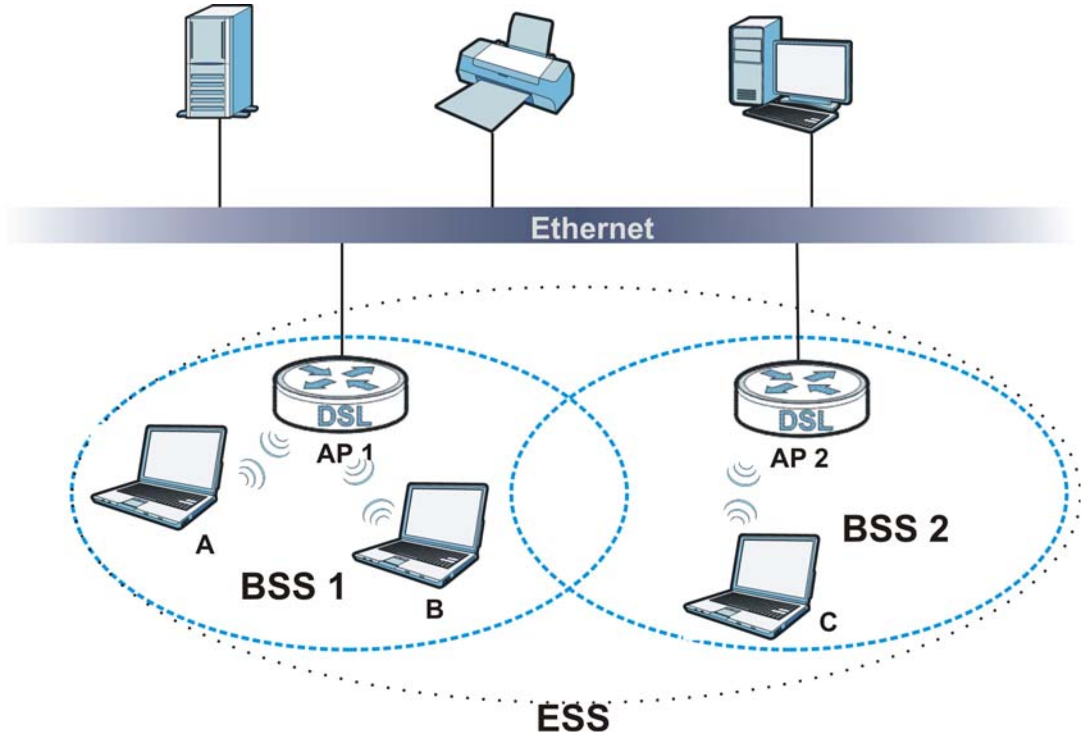
ESS

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

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

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

Figure 162 Infrastructure WLAN



Channel

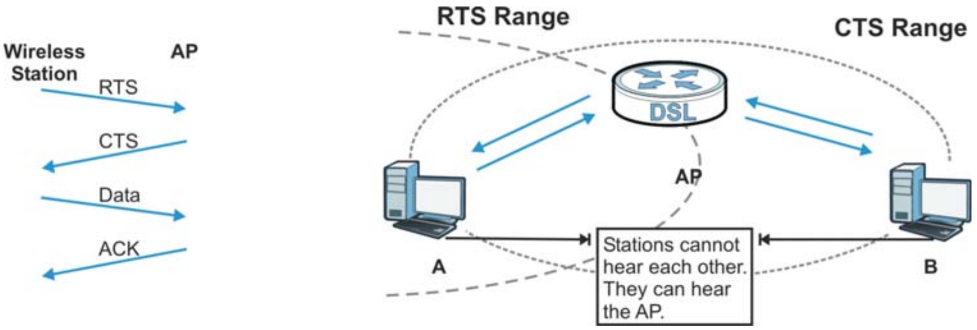
A channel is the radio frequency(ies) used by wireless devices to transmit and receive data. Channels available depend on your geographical area. You may have a choice of channels (for your region) so you should use a channel different from an adjacent AP (access point) to reduce interference. Interference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

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

RTS/CTS

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

Figure 163 RTS/CTS



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

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

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

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

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

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

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

Fragmentation Threshold

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

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

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

Preamble Type

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

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

Use long preamble if you are unsure what preamble mode other wireless devices on the network support, and to provide more reliable communications in busy wireless networks.

Use short preamble if you are sure all wireless devices on the network support it, and to provide more efficient communications.

Use the dynamic setting to automatically use short preamble when all wireless devices on the network support it, otherwise the ZyXEL Device uses long preamble.

Note: The wireless devices MUST use the same preamble mode in order to communicate.

IEEE 802.11g Wireless LAN

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

Table 110 IEEE 802.11g

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

Wireless Security Overview

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

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

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

Table 111 Wireless Security Levels

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

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

IEEE 802.1x

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

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

RADIUS

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

- Authentication

  Determines the identity of the users.
- Authorization

  Determines the network services available to authenticated users once they are connected to the network.
- Accounting

  Keeps track of the client’s network activity.

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

Types of RADIUS Messages

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

- Access-Request

  Sent by an access point requesting authentication.
- Access-Reject

  Sent by a RADIUS server rejecting access.
- Access-Accept

  Sent by a RADIUS server allowing access.

- Access-Challenge

  Sent by a RADIUS server requesting more information in order to allow access. The access point sends a proper response from the user and then sends another Access-Request message.

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

- Accounting-Request

  Sent by the access point requesting accounting.

- Accounting-Response

  Sent by the RADIUS server to indicate that it has started or stopped accounting.

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

Types of EAP Authentication

This section discusses some popular authentication types: EAP-MD5, EAP-TLS, EAP-TTLS, PEAP and LEAP. Your wireless LAN device may not support all authentication types.

EAP (Extensible Authentication Protocol) is an authentication protocol that runs on top of the IEEE 802.1x transport mechanism in order to support multiple types of user authentication. By using EAP to interact with an EAP-compatible RADIUS server, an access point helps a wireless station and a RADIUS server perform authentication.

The type of authentication you use depends on the RADIUS server and an intermediary AP(s) that supports IEEE 802.1x. .

For EAP-TLS authentication type, you must first have a wired connection to the network and obtain the certificate(s) from a certificate authority (CA). A certificate (also called digital IDs) can be used to authenticate users and a CA issues certificates and guarantees the identity of each certificate owner.

EAP-MD5 (Message-Digest Algorithm 5)

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

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

EAP-TLS (Transport Layer Security)

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

EAP-TTLS (Tunneled Transport Layer Service)

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

PEAP (Protected EAP)

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

LEAP

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

Dynamic WEP Key Exchange

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

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

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

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

Table 112 Comparison of EAP Authentication Types

	EAP-MD5	EAP-TLS	EAP-TTLS	PEAP	LEAP
Mutual Authentication	No	Yes	Yes	Yes	Yes
Certificate – Client	No	Yes	Optional	Optional	No
Certificate – Server	No	Yes	Yes	Yes	No
Dynamic Key Exchange	No	Yes	Yes	Yes	Yes
Credential Integrity	None	Strong	Strong	Strong	Moderate
Deployment Difficulty	Easy	Hard	Moderate	Moderate	Moderate
Client Identity Protection	No	No	Yes	Yes	No

WPA and WPA2

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

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

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

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

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

Encryption

WPA improves data encryption by using Temporal Key Integrity Protocol (TKIP), Message Integrity Check (MIC) and IEEE 802.1x. WPA2 also uses TKIP when required for compatibility reasons, but offers stronger encryption than TKIP with Advanced Encryption Standard (AES) in the Counter mode with Cipher block chaining Message authentication code Protocol (CCMP).

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

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

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

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

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

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

User Authentication

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

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

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

Wireless Client WPA Supplicants

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

The Windows XP patch is a free download that adds WPA capability to Windows XP's built-in "Zero Configuration" wireless client. However, you must run Windows XP to use it.

WPA(2) with RADIUS Application Example

To set up WPA(2), you need the IP address of the RADIUS server, its port number (default is 1812), and the RADIUS shared secret. A WPA(2) application example with an external RADIUS server looks as follows. "A" is the RADIUS server. "DS" is the distribution system.

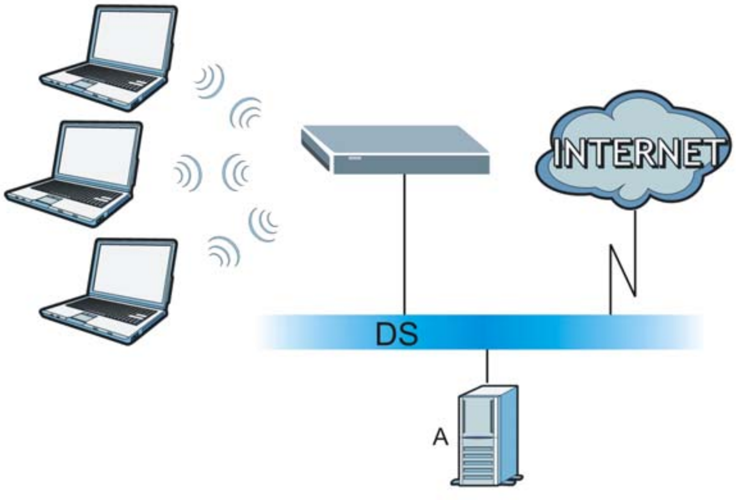
1 The AP passes the wireless client's authentication request to the RADIUS server.

2 The RADIUS server then checks the user's identification against its database and grants or denies network access accordingly.

3 A 256-bit Pairwise Master Key (PMK) is derived from the authentication process by the RADIUS server and the client.

4 The RADIUS server distributes the PMK to the AP. The AP then sets up a key hierarchy and management system, using the PMK to dynamically generate unique data encryption keys. The keys are used to encrypt every data packet that is wirelessly communicated between the AP and the wireless clients.

Figure 164 WPA(2) with RADIUS Application Example



WPA(2)-PSK Application Example

A WPA(2)-PSK application looks as follows.

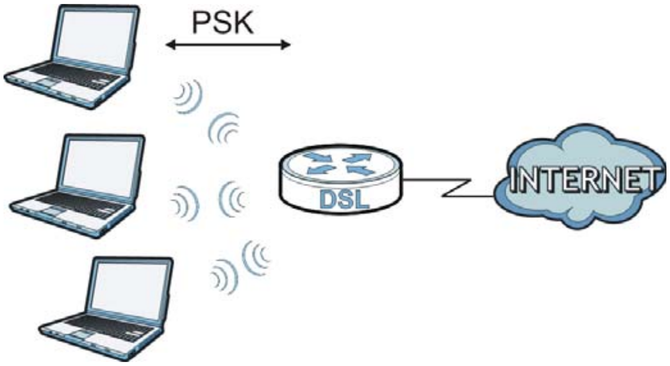
1 First enter identical passwords into the AP and all wireless clients. The Pre-Shared Key (PSK) must consist of between 8 and 63 ASCII characters or 64 hexadecimal characters (including spaces and symbols).

2 The AP checks each wireless client's password and allows it to join the network only if the password matches.

3 The AP and wireless clients generate a common PMK (Pairwise Master Key). The key itself is not sent over the network, but is derived from the PSK and the SSID.

4 The AP and wireless clients use the TKIP or AES encryption process, the PMK and information exchanged in a handshake to create temporal encryption keys. They use these keys to encrypt data exchanged between them.

Figure 165 WPA(2)-PSK Authentication



Security Parameters Summary

Refer to this table to see what other security parameters you should configure for each authentication method or key management protocol type. MAC address filters are not dependent on how you configure these security features.

Table 113 Wireless Security Relational Matrix

AUTHENTICATION METHOD/ KEY MANAGEMENT PROTOCOL	ENCRYPTION METHOD	ENTER MANUAL KEY	IEEE 802.1X
Open	None	No	Disable
			Enable without Dynamic WEP Key
Open	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
Shared	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
WPA	TKIP/AES	No	Enable
WPA-PSK	TKIP/AES	Yes	Disable
WPA2	TKIP/AES	No	Enable
WPA2-PSK	TKIP/AES	Yes	Disable

Antenna Overview

An antenna couples RF signals onto air. A transmitter within a wireless device sends an RF signal to the antenna, which propagates the signal through the air. The antenna also operates in reverse by capturing RF signals from the air.

Positioning the antennas properly increases the range and coverage area of a wireless LAN.

Antenna Characteristics

Frequency

An antenna in the frequency of 2.4GHz (IEEE 802.11b and IEEE 802.11g) or 5GHz (IEEE 802.11a) is needed to communicate efficiently in a wireless LAN

Radiation Pattern

A radiation pattern is a diagram that allows you to visualize the shape of the antenna's coverage area.

Antenna Gain

Antenna gain, measured in dB (decibel), is the increase in coverage within the RF beam width. Higher antenna gain improves the range of the signal for better communications.

For an indoor site, each 1 dB increase in antenna gain results in a range increase of approximately 2.5%. For an unobstructed outdoor site, each 1dB increase in gain results in a range increase of approximately 5%. Actual results may vary depending on the network environment.

Antenna gain is sometimes specified in dBi, which is how much the antenna increases the signal power compared to using an isotropic antenna. An isotropic antenna is a theoretical perfect antenna that sends out radio signals equally well in all directions. dBi represents the true gain that the antenna provides.

Types of Antennas for WLAN

There are two types of antennas used for wireless LAN applications.

- Omni-directional antennas send the RF signal out in all directions on a horizontal plane. The coverage area is torus-shaped (like a donut) which makes these antennas ideal for a room environment. With a wide coverage area, it is possible to make circular overlapping coverage areas with multiple access points.
- Directional antennas concentrate the RF signal in a beam, like a flashlight does with the light from its bulb. The angle of the beam determines the width of the coverage pattern. Angles typically range from 20 degrees (very directional) to 120 degrees (less directional). Directional antennas are ideal for hallways and outdoor point-to-point applications.

Positioning Antennas

In general, antennas should be mounted as high as practically possible and free of obstructions. In point-to–point application, position both antennas at the same height and in a direct line of sight to each other to attain the best performance.

For omni-directional antennas mounted on a table, desk, and so on, point the antenna up. For omni-directional antennas mounted on a wall or ceiling, point the antenna down. For a single AP application, place omni-directional antennas as close to the center of the coverage area as possible.

For directional antennas, point the antenna in the direction of the desired coverage area.

E

Services

The following table lists some commonly-used services and their associated protocols and port numbers.

- **Name**: This is a short, descriptive name for the service. You can use this one or create a different one, if you like.
- **Protocol**: This is the type of IP protocol used by the service. If this is **TCP/UDP**, then the service uses the same port number with TCP and UDP. If this is **USER-DEFINED**, the **Port(s**) is the IP protocol number, not the port number.
- **Port(s)**: This value depends on the **Protocol**.
    - If the **Protocol** is **TCP**, **UDP**, or **TCP/UDP**, this is the IP port number.
    - If the **Protocol** is **USER**, this is the IP protocol number.
- **Description**: This is a brief explanation of the applications that use this service or the situations in which this service is used.

Table 114 Examples of Services

NAME	PROTOCOL	PORT(S)	DESCRIPTION
AH (IPSEC_TUNNEL)	User-Defined	51	The IPSEC AH (Authentication Header) tunneling protocol uses this service.
AIM	TCP	5190	AOL's Internet Messenger service.
AUTH	TCP	113	Authentication protocol used by some servers.
BGP	TCP	179	Border Gateway Protocol.
BOOTP_CLIENT	UDP	68	DHCP Client.
BOOTP_SERVER	UDP	67	DHCP Server.
CU-SEEME	TCP/UDP TCP/UDP	7648 24032	A popular videoconferencing solution from White Pines Software.
DNS	TCP/UDP	53	Domain Name Server, a service that matches web names (for instance www.zyxel.com) to IP numbers.
ESP (IPSEC_TUNNEL)	User-Defined	50	The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service.
FINGER	TCP	79	Finger is a UNIX or Internet related command that can be used to find out if a user is logged on.
FTP	TCP TCP	20 21	File Transfer Protocol, a program to enable fast transfer of files, including large files that may not be possible by e-mail.
H.323	TCP	1720	NetMeeting uses this protocol.
HTTP	TCP	80	Hyper Text Transfer Protocol - a client/server protocol for the world wide web.
HTTPS	TCP	443	HTTPS is a secured http session often used in e-commerce.
ICMP	User-Defined	1	Internet Control Message Protocol is often used for diagnostic purposes.
ICQ	UDP	4000	This is a popular Internet chat program.
IGMP (MULTICAST)	User-Defined	2	Internet Group Multicast Protocol is used when sending packets to a specific group of hosts.
IKE	UDP	500	The Internet Key Exchange algorithm is used for key distribution and management.
IMAP4	TCP	143	The Internet Message Access Protocol is used for e-mail.
IMAP4S	TCP	993	This is a more secure version of IMAP4 that runs over SSL.
IRC	TCP/UDP	6667	This is another popular Internet chat program.

Table 114 Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
MSN Messenger	TCP	1863	Microsoft Networks' messenger service uses this protocol.
NetBIOS	TCP/UDP TCP/UDP TCP/UDP TCP/UDP	137 138 139 445	The Network Basic Input/Output System is used for communication between computers in a LAN.
NEW-ICQ	TCP	5190	An Internet chat program.
NEWS	TCP	144	A protocol for news groups.
NFS	UDP	2049	Network File System - NFS is a client/server distributed file service that provides transparent file sharing for network environments.
NNTP	TCP	119	Network News Transport Protocol is the delivery mechanism for the USENET newsgroup service.
PING	User-Defined	1	Packet INternet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable.
POP3	TCP	110	Post Office Protocol version 3 lets a client computer get e-mail from a POP3 server through a temporary connection (TCP/IP or other).
POP3S	TCP	995	This is a more secure version of POP3 that runs over SSL.
PPTP	TCP	1723	Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel.
PPTP_TUNNEL (GRE)	User-Defined	47	PPTP (Point-to-Point Tunneling Protocol) enables secure transfer of data over public networks. This is the data channel.
RCMD	TCP	512	Remote Command Service.
REAL_AUDIO	TCP	7070	A streaming audio service that enables real time sound over the web.
REXEC	TCP	514	Remote Execution Daemon.
RLOGIN	TCP	513	Remote Login.
ROADRUNNER	TCP/UDP	1026	This is an ISP that provides services mainly for cable modems.
RTELNET	TCP	107	Remote Telnet.
RTSP	TCP/UDP	554	The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet.

Table 114 Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
SFTP	TCP	115	The Simple File Transfer Protocol is an old way of transferring files between computers.
SMTP	TCP	25	Simple Mail Transfer Protocol is the message-exchange standard for the Internet. SMTP enables you to move messages from one e-mail server to another.
SMTPS	TCP	465	This is a more secure version of SMTP that runs over SSL.
SNMP	TCP/UDP	161	Simple Network Management Program.
SNMP-TRAPS	TCP/UDP	162	Traps for use with the SNMP (RFC:1215).
SQL-NET	TCP	1521	Structured Query Language is an interface to access data on many different types of database systems, including mainframes, midrange systems, UNIX systems and network servers.
SSDP	UDP	1900	The Simple Service Discovery Protocol supports Universal Plug-and-Play (UPnP).
SSH	TCP/UDP	22	Secure Shell Remote Login Program.
STRM WORKS	UDP	1558	Stream Works Protocol.
SYSLOG	UDP	514	Syslog allows you to send system logs to a UNIX server.
TACACS	UDP	49	Login Host Protocol used for (Terminal Access Controller Access Control System).
TELNET	TCP	23	Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems.
VDOLIVE	TCP UDP	7000 user-defined	A videoconferencing solution. The UDP port number is specified in the application.

Legal Information

Copyright

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Certifications

Federal Communications Commission (FCC) Interference Statement

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

- This device may not cause harmful interference.

- This device must accept any interference received, including interference that may cause undesired operations.

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

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

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

FCC Radiation Exposure Statement

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

注意 ！

依據　低功率電波輻射性電機管理辦法

第十二條　經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條　低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍
受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

本機限在不干擾合法電臺與不受被干擾保障條件下於室內使用。
減少電磁波影響，請妥適使用。

Notices

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

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

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

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

Viewing Certifications

1 Go to http://www.zyxel.com.

2 Select your product on the ZyXEL home page to go to that product's page.

3 Select the certification you wish to view from this page.

ZyXEL Limited Warranty

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

Note

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

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

Registration

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

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