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# **PART II**

## **Technical Reference**

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# CHAPTER 5

## Connection Status

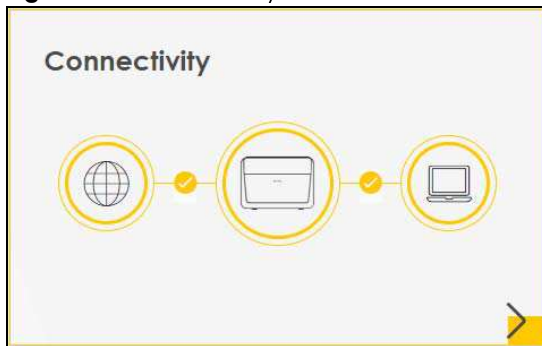
### 5.1 Overview

After you log into the Web Configurator, the **Connection Status** screen appears. You can configure basic Internet access, wireless settings, and parental control settings in this screen. It also shows the network status of the Zyxel Device and computers/devices connected to it.

### 5.2 Connectivity

Use this screen to view the network connection status of the Zyxel Device and its clients.

**Figure 21** Connectivity



Click the Arrow icon (➔) to open the following screen. Use this screen to view IP addresses and MAC addresses of the wireless and wired devices connected to the Zyxel Device.

Place your mouse within the device block, and an Edit icon (✎) will appear. Click the Edit icon to change the icon and name of a connected device.

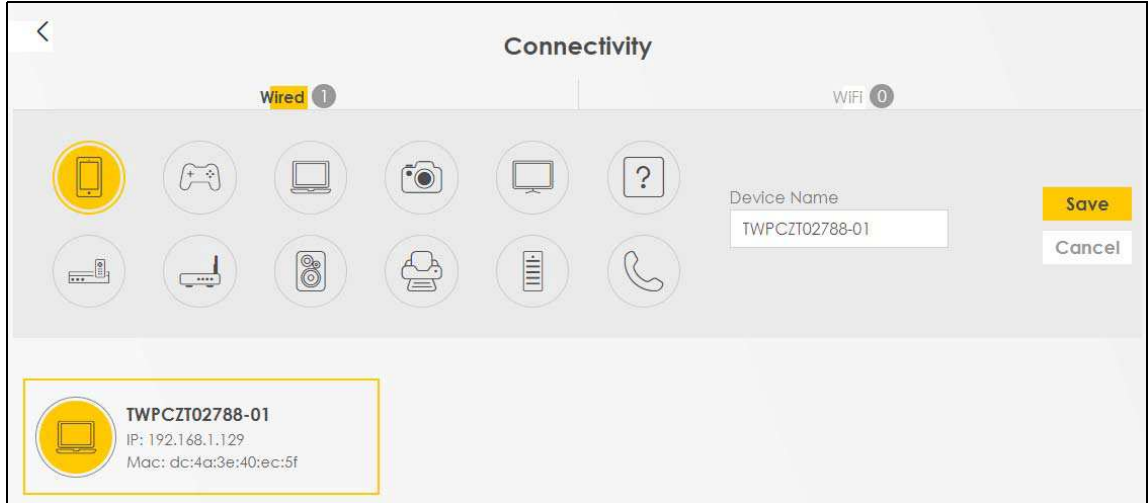
**Figure 22** Connectivity: Connected Devices



## 5.2.1 Icon and Device Name

Select an icon and/or enter a name in the **Device Name** field for a connected device. Click **Save** to save your changes.

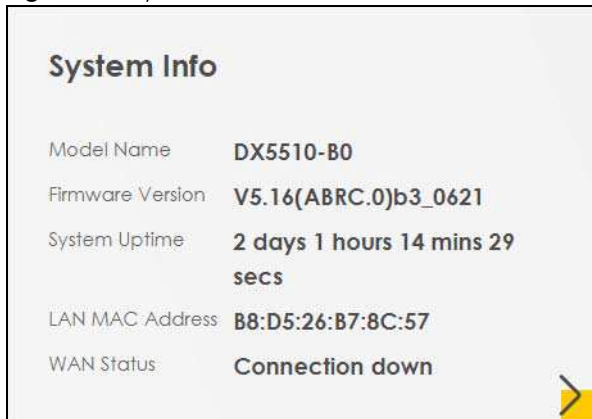
**Figure 23** Connectivity: Edit



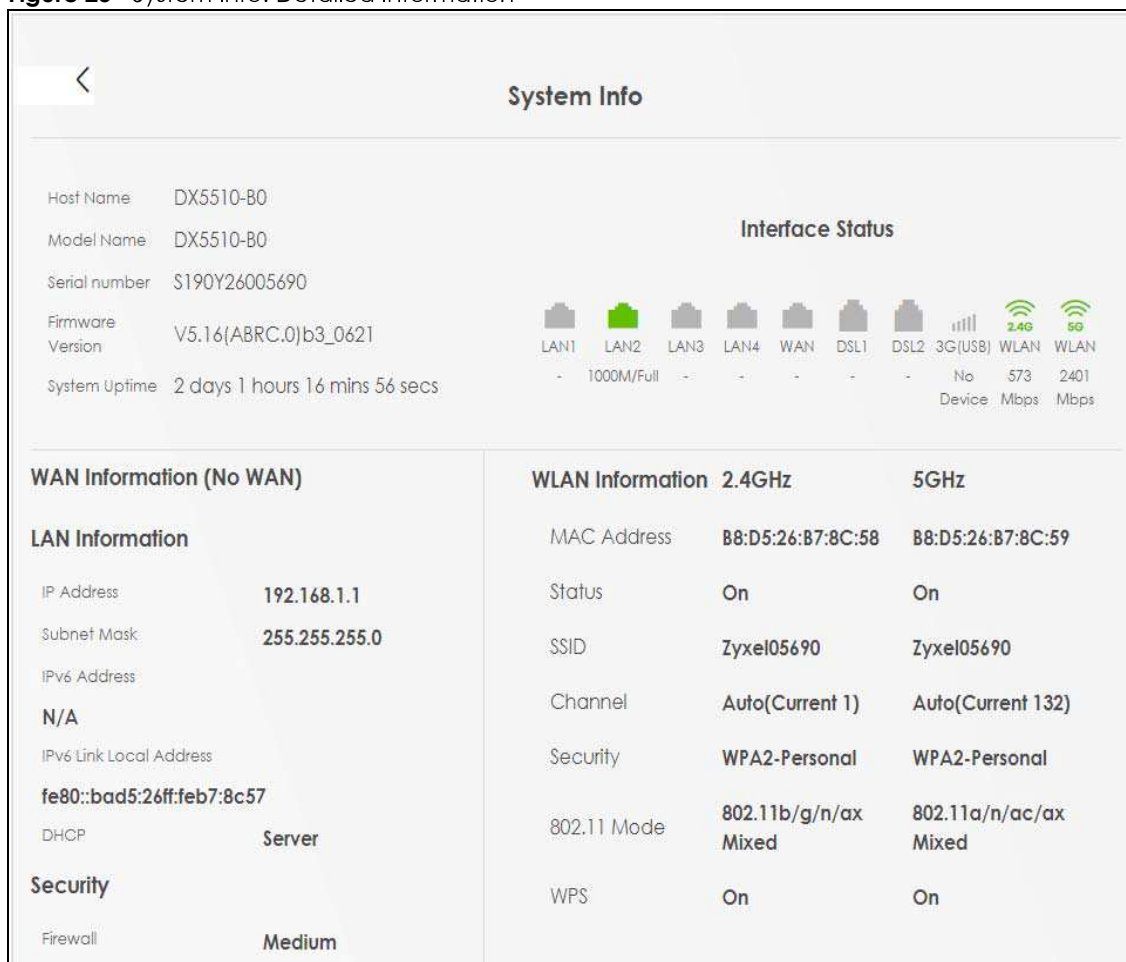
## 5.3 System Info

Use this screen to view the basic system information of the Zyxel Device.

**Figure 24** System Info



Click the Arrow icon (➡) to open the following screen. Use this screen to view more information on the status of your firewall and interfaces (WAN, LAN, and wireless LAN).

**Figure 25** System Info: Detailed Information

Each field is described in the following table.



**Table 6** System Info: Detailed Information

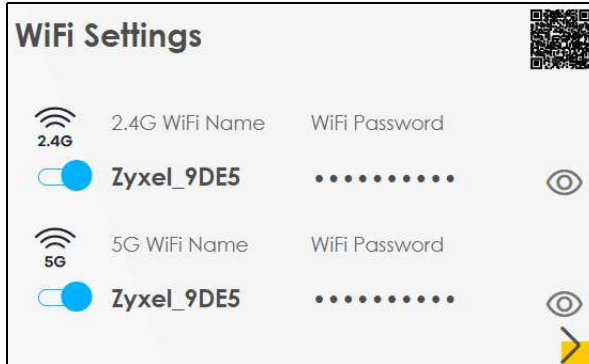
| LABEL   | DESCRIPTION  |
|---|--|
| Host Name   | This field displays the Zyxel Device system name. It is used for identification.   |
| Model Name  | This shows the model number of your Zyxel Device.  |
| Serial Number   | This field displays the serial number of the Zyxel Device.   |
| Firmware Version  | This is the current version of the firmware inside the Zyxel Device.   |
| System Up Time  | This field displays how long the Zyxel Device has been running since it last started up. The Zyxel Device starts up when you plug it in, when you restart it ( <b>Maintenance &gt; Reboot</b> ), or when you reset it. |
| Interface Status  |  |
| Virtual ports are shown here. You can see whether the ports are in use and their transmission rate. |  |
| <a href="#">WAN Information (These fields display when you have a WAN connection.)</a>              |  |
| <a href="#">Encapsulation</a>   | <a href="#">This field displays the current encapsulation method.</a>  |
| <a href="#">IP Address</a>  | <a href="#">This field displays the current IPv4 address of the Zyxel Device.</a><br><a href="#">Click the <b>Release</b> button to release the IP address provided by a DHCP server.</a>                              |
| <a href="#">IP Subnet Mask</a>  | <a href="#">This field displays the current subnet mask in the WAN.</a>  |
| <a href="#">IPv6 Address</a>  | <a href="#">This field displays the current IPv6 address of the Zyxel Device.</a>  |

Table 6 System Info: Detailed Information (continued)

| LABEL                                  | DESCRIPTION  |
|--|--|
| <a href="#">MAC Address</a>            | <a href="#">This shows the WAN Ethernet adapter MAC (Media Access Control) address of your Zyxel Device.</a>   |
| <a href="#">Primary DNS server</a>     | <a href="#">This field displays the first DNS server address assigned by the ISP.</a>  |
| <a href="#">Secondary DNS server</a>   | <a href="#">This field displays the second DNS server address assigned by the ISP.</a>   |
| <a href="#">Primary DNSv6 server</a>   | <a href="#">This field displays the first DNS server IPv6 address assigned by the ISP.</a>   |
| <a href="#">Secondary DNSv6 server</a> | <a href="#">This field displays the second DNS server IPv6 address assigned by the ISP.</a>  |
| LAN Information                        |  |
| IP Address                             | This is the current IPv4 address of the Zyxel Device.  |
| Subnet Mask                            | This is the current subnet mask.   |
| IPv6 Address                           | This is the current IPv6 address of the Zyxel Device.  |
| IPv6 Link Local Address                | This field displays the current link-local address of the Zyxel Device for the LAN interface.  |
| DHCP                                   | <p>This field displays what DHCP services the Zyxel Device is providing to the LAN. The possible values are:</p> <p><b>Server</b> - The Zyxel Device is a DHCP server in the LAN. It assigns IP addresses to other computers in the LAN.</p> <p><b>Relay</b> - The Zyxel Device acts as a surrogate DHCP server and relays DHCP requests and responses between the remote server and the clients.</p> <p><b>None</b> - The Zyxel Device is not providing any DHCP services to the LAN.</p> |
| Security                               |  |
| Firewall                               | This displays the firewall's current security level.   |
| WLAN 2.4G/5G Information               |  |
| MAC Address                            | This shows the wireless adapter MAC (Media Access Control) address of the wireless interface.  |
| Status                                 | This displays whether the WLAN is activated.   |
| SSID                                   | This is the descriptive name used to identify the Zyxel Device in a wireless LAN.  |
| Channel                                | This is the channel number used by the wireless interface now.   |
| Security                               | This displays the type of security mode the wireless interface is using in the wireless LAN.   |
| 802.11 Mode                            | This displays the type of 802.11 mode the wireless interface is using in the wireless LAN.   |
| WPS                                    | This displays whether WPS is activated on the wireless interface.  |

## 5.4 WiFi Settings

Use this screen to enable or disable the main 2.4G and/or 5G wireless networks. When the switch goes to the right () , the function is enabled. Otherwise, it is not. You can use this screen or the QR code on the upper right corner to check the SSIDs (WiFi network name) and passwords of the main wireless networks. If you want to show or hide your WiFi passwords, click the Eye icon ().

**Figure 26** WiFi Settings

Click the Arrow icon (➔) to open the following screen. Use this screen to configure the SSIDs and/or passwords for your main wireless networks. Select **Keep 2.4G and 5G the same** to use the same SSID for 2.4 GHz and 5 GHz bands.

**Figure 27** WiFi Settings: Configuration

Each field is described in the following table.

**Table 7** WiFi Settings: Configuration



| LABEL                     | DESCRIPTION   |
|---------------------------|---|
| Keep 2.4G and 5G the same | Select this and the 2.4G and 5G wireless networks will use the same SSID.<br>If you deselect this, the screen will change. You need to assign different SSIDs for the 2.4G and 5G wireless networks.  |
| 2.4G/5G WiFi              | Click this switch to enable or disable the 2.4G and/or 5G wireless networks. When the switch goes to the right  , the function is enabled. Otherwise, it is not. |

Table 7 WiFi Settings: Configuration (continued)

| LABEL           | DESCRIPTION  |
|-----------------|--|
| WiFi Name       | The SSID (Service Set IDentity) identifies the service set with which a wireless device is associated. Wireless devices associating to the access point (AP) must have the same SSID.<br>Enter a descriptive name (up to 32 English keyboard characters) for WiFi. |
| WiFi Password   | If you selected <b>Random Password</b> , this field displays a pre-shared key generated by the Zyxel Device.<br><br>If you did not select <b>Random Password</b> , you can manually type a pre-shared key from 8 to 64 case-sensitive keyboard characters.         |
|                 | Click the Eye icon to show or hide the password for your wireless network. When the Eye icon is slashed  , you'll see the password in plain text. Otherwise, it is hidden.        |
| Random Password | Select this option to have the Zyxel Device automatically generate a password. The <b>WiFi Password</b> field will not be configurable when you select this option.  |
| Hide WiFi Name  | Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.<br><br>Note: Disable WPS in the <b>Network Setting &gt; Wireless &gt; WPS</b> screen to hide the SSID.          |
| Save            | Click <b>Save</b> to save your changes.  |

## 5.5 Guest WiFi Settings


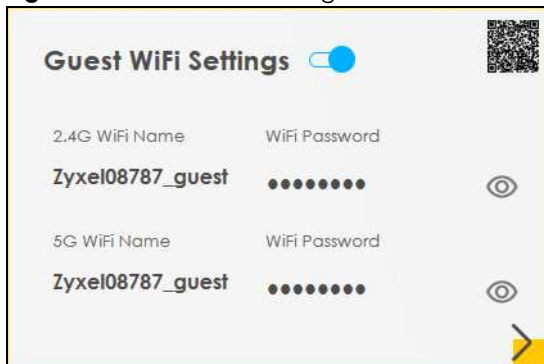

Use this screen to enable or disable the guest 2.4G and/or 5G wireless networks. When the switch goes to the right (  ), the function is enabled. Otherwise, it is not. You can check their SSIDs (WiFi network name) and passwords from this screen. If you want to show or hide your WiFi passwords, click the Eye icon.

Figure 28 Guest WiFi Settings



Click the Arrow icon (  ) to open the following screen. Use this screen to configure the 2.4G and 5G SSIDs and/or passwords for your guest wireless networks.

**Figure 29** Guest WiFi Settings: Configuration

To assign different SSIDs to the 2.4G and 5G guest wireless networks, clear the **Keep 2.4G and 5G the same** check box in the **WiFi Settings** screen, and the **Guest WiFi Settings** screen will change.

**Figure 30** Guest WiFi Settings: Different SSIDs

Each field is described in the following table.

**Table 8** WiFi Settings: Configuration



| LABEL                | DESCRIPTION  |
|----------------------|--|
| WiFi<br>2.4G/5G WiFi | Click this switch to enable or disable the 2.4G and/or 5G wireless networks. When the switch goes to the right  , the function is enabled. Otherwise, it is not.                            |
| WiFi Name            | The SSID (Service Set IDentity) identifies the service set with which a wireless device is associated. Wireless devices associating to the access point (AP) must have the same SSID.<br>Enter a descriptive name (up to 32 English keyboard characters) for the wireless LAN. |



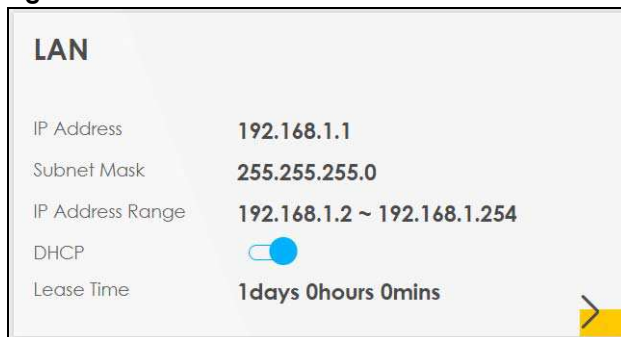
Table 8 WiFi Settings: Configuration (continued)

| LABEL           | DESCRIPTION  |
|-----------------|--|
| WiFi Password   | <p>If you selected <b>Random Password</b>, this field displays a pre-shared key generated by the Zyxel Device.</p> <p>If you did not select <b>Random Password</b>, you can manually type a pre-shared key from 8 to 64 case-sensitive keyboard characters.</p>  |
|                 | Click the Eye icon to show or hide the password of your wireless network. When the Eye icon is slashed  , you'll see the password in plain text. Otherwise, it is hidden.       |
| Random Password | Select this option to have the Zyxel Device automatically generate a password. The <b>WiFi Password</b> field will not be configurable when you select this option.  |
| Hide WiFi Name  | <p>Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.</p> <p>Note: Disable WPS in the <b>Network Setting &gt; Wireless &gt; WPS</b> screen to hide the SSID.</p> |
| Save            | Click <b>Save</b> to save your changes.  |

## 5.6 LAN Settings

Use this screen to view the LAN IP address, subnet mask, and DHCP settings of your Zyxel Device.

Figure 31 LAN



**LAN**


IP Address      **192.168.1.1**


Subnet Mask    **255.255.255.0**

IP Address Range    **192.168.1.2 ~ 192.168.1.254**

DHCP            ☒

Lease Time      **1days 0hours 0mins**



Click the Arrow icon () to open the following screen. Use this screen to configure the LAN IP address and DHCP setting for your Zyxel Device.

**Figure 32** LAN Setup

**LAN**

**LAN IP Setup**

IP Address: 192 . 168 . 1 . 1

Subnet Mask: 255 . 255 . 255 . 0

**IP Addressing Values**

Beginning IP Address: 192 . 168 . 1 . 2

Ending IP Address: 192 . 168 . 1 . 254

**DHCP Server State**

DHCP Server Lease Time: 1 days 0 hours 0 minutes

**Save**

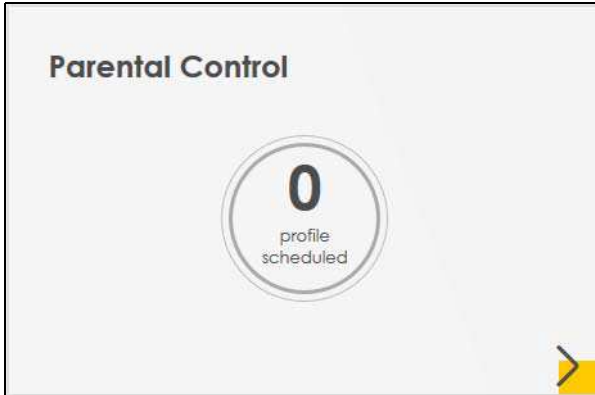
Each field is described in the following table.


Table 9 Status Screen

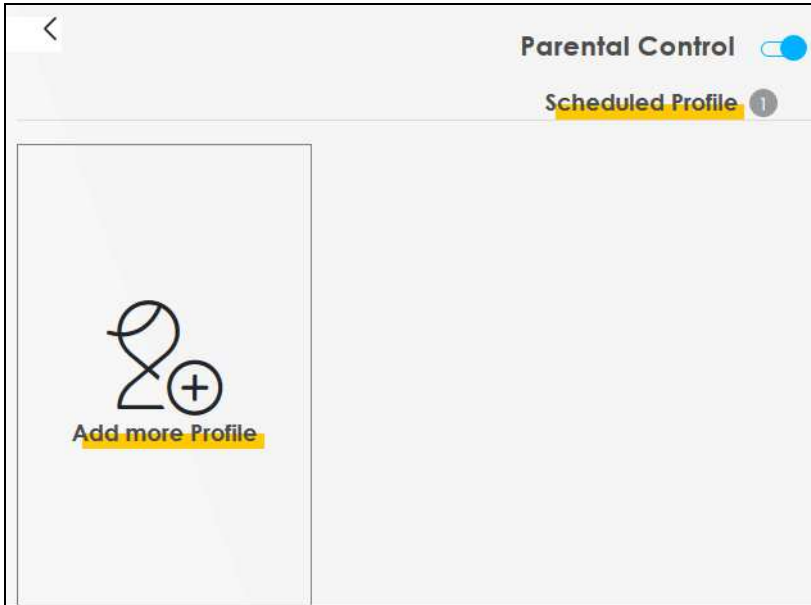
| LABEL                  | DESCRIPTION   |
|------------------------|---|
| LAN IP Setup           |   |
| IP Address             | Enter the LAN IPv4 address you want to assign to your Zyxel Device in dotted decimal notation, for example, 192.168.1.1 (factory default).  |
| Subnet Mask            | Type the subnet mask of your network in dotted decimal notation, for example 255.255.255.0 (factory default). Your Zyxel Device automatically computes the subnet mask based on the IP address you enter, so do not change this field unless you are instructed to do so.   |
| IP Addressing Values   |   |
| Beginning IP Address   | This field specifies the first of the contiguous addresses in the IP address pool.  |
| Ending IP Address      | This field specifies the last of the contiguous addresses in the IP address pool.   |
| DHCP Server State      |   |
| DHCP Server Lease Time | This is the period of time DHCP-assigned addresses is used. DHCP automatically assigns IP addresses to clients when they log in. DHCP centralizes IP address management on central computers that run the DHCP server program. DHCP leases addresses, for a period of time, which means that past addresses are “recycled” and made available for future reassignment to other systems. |
| Days/Hours/Minutes     | Enter the lease time of the DHCP server.  |
| Save                   | Click <b>Save</b> to save your changes.   |

## 5.7 Parental Control

Use this screen to view the number of profiles that were created for parental control.


**Figure 33** Parental Control

Click the yellow Arrow icon (  ) to open the following screen. Use this screen to enable parental control and add more profiles. Add a profile to create restricted access schedules. Go to the **Security > Parental Control > Add New PCP/Edit** screen to configure URL filtering settings to block the users on your network from accessing certain web sites.

**Figure 34** Parental Control

Each field is described in the following table.

Table 10 Parental Control: Schedule

| LABEL             | DESCRIPTION  |
|-------------------|--|
| Parental Control  | Click this switch to enable or disable parental control. When the switch goes to the right (  ), the function is enabled. Otherwise, it is not. |
| Scheduled Profile | This screen shows all the created profile(s).  |


### 5.7.1 Create a Parental Control Profile

Click **Add more Profile** to create a profile. Use this screen to add a device(s) in a profile and block Internet access on the profile device(s).

**Figure 35** Parental Control: Add More Profile

Each field is described in the following table.

Table 11 Parental Control: Add More Profile

| LABEL                             | DESCRIPTION  |
|-----------------------------------|--|
| Profile Name                      | Enter a descriptive name for the profile.  |
| Profile Active                    | Click this switch to enable or disable Internet access. When the switch goes to the right  , the function is enabled. Otherwise, it is not. |
| Profile Device List               | This field shows the devices selected on the right for this profile.   |
| <a href="#">Blocking Schedule</a> | This field shows the time during which Internet access is blocked on the profile device(s).  |
|                                   | Select a device(s) on your network for this profile.   |


## 5.7.2 Define a Schedule

Click **Next** to define time periods and days during which Internet access is blocked on the profile device(s).

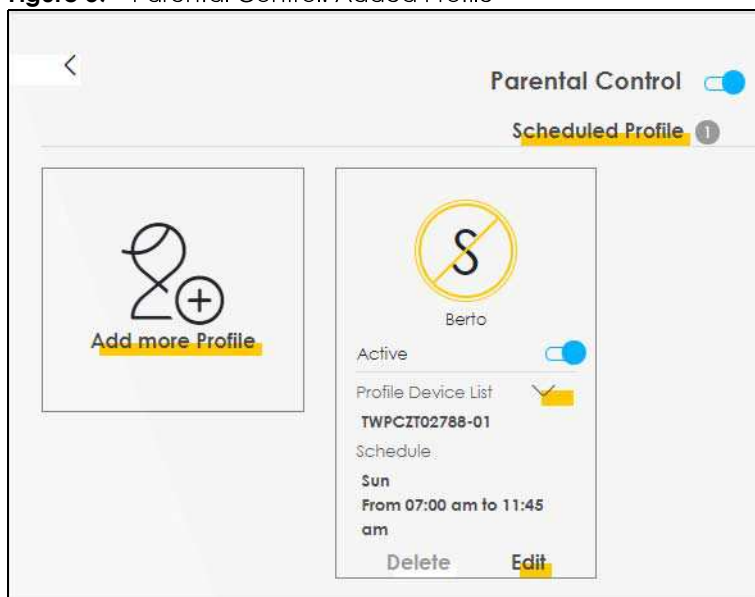
**Figure 36** Parental Control: Schedule

Each field is described in the following table.



Table 12 Parental Control: Schedule

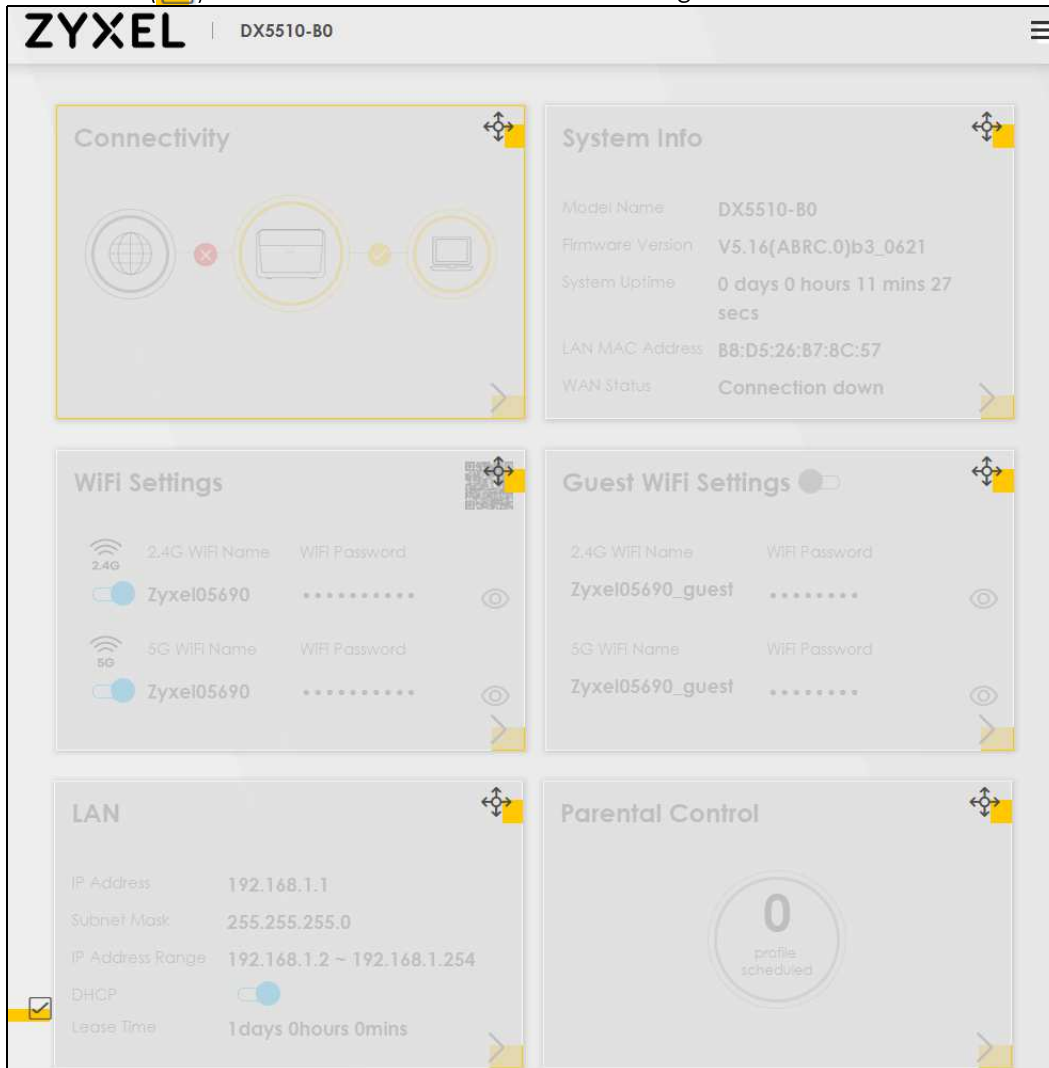
| LABEL               | DESCRIPTION  |
|---------------------|--|
| Profile Name        | Enter a descriptive name for the profile.  |
| Internet Blocking   | Click this switch to enable or disable Internet access. When the switch goes to the right  , the function is enabled. Otherwise, it is not. |
| Profile Device List | This field shows the devices selected on the right for this profile.   |
| Blocking Schedule   | This field shows the time during which Internet access is blocked on the profile device(s).  |
| Schedule            |  |
| Add New Schedule    | Click this to add a new block for scheduling.  |
| Start/End blocking  | Select the time period when Internet access is blocked on the profile device(s).<br>Select <b>All Day</b> and the scheduler rule will be activated for 24 hours.   |
| Repeat On           | Select the days when Internet access is blocked on the profile device(s).  |
| Back                | Click <b>Back</b> to return to the previous screen.  |
| Save                | Click <b>Save</b> to save your changes.  |

Once a profile is created, it will show in the following screen. Click this  to **Delete** or **Edit** a profile.

**Figure 37** Parental Control: Added Profile

## 5.8 Layout Icon

Click this icon (  ) to arrange the screen order. Select a block and hold it to move around. Click the Check icon (  ) in the lower left corner to save the changes.



# CHAPTER 6

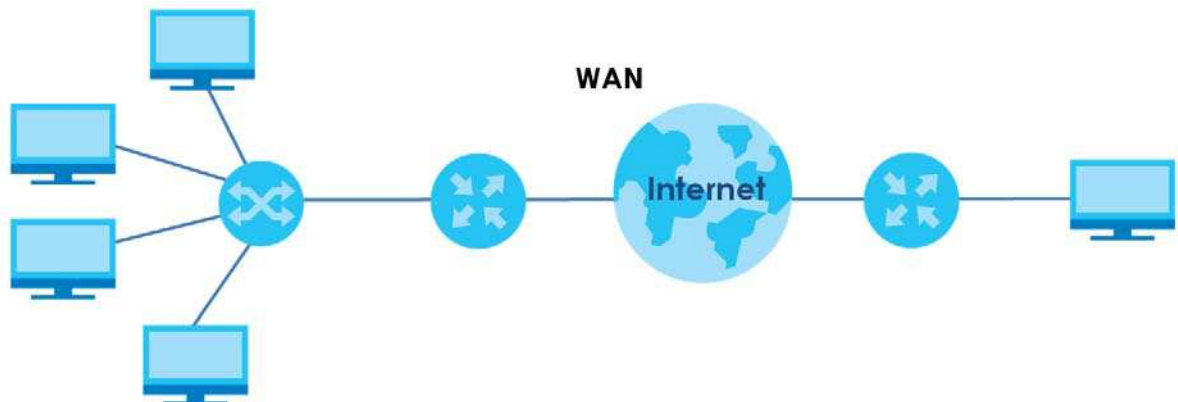
## Broadband

### 6.1 Overview

This chapter discusses the Zyxel Device's **Broadband** screens. Use these screens to configure your Zyxel Device for Internet access.

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

**Figure 38** LAN and WAN



#### 6.1.1 What You Can Do in this Chapter

- Use the **Broadband** screen to view, remove or add a WAN interface. You can also configure the WAN settings on the Zyxel Device for Internet access ([Section 6.2 on page 76](#)).
- Use the **Cellular Backup** screen to configure cellular WAN connection ([Section 6.3 on page 85](#)).
- Use the **Advanced** screen to enable or disable PTM over ADSL, Annex M/Annex J, and DSL PhyR functions ([Section 6.4 on page 90](#)).
- Use the **GEWAN or SFP** screen to convert LAN port number four as a WAN port or restore the Ethernet WAN port to a LAN port ([Section 6.5 on page 94](#)).

[Table 13 WAN Setup Overview](#)

| LAYER-2 INTERFACE  |               | INTERNET CONNECTION |               |  |
|--------------------|---------------|---------------------|---------------|--|
| CONNECTION         | DSL LINK TYPE | MODE                | ENCAPSULATION | CONNECTION SETTINGS  |
| ADSL/VDSL over PTM | N/A           | Routing             | PPPoE         | PPP information, IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU |
|                    |               |                     | IPoE          | IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU                  |
|                    |               | Bridge              | N/A           | VLAN and QoS   |



| LAYER-2 INTERFACE |               | INTERNET CONNECTION |               |   |
|-------------------|---------------|---------------------|---------------|---|
| CONNECTION        | DSL LINK TYPE | MODE                | ENCAPSULATION | CONNECTION SETTINGS   |
| ADSL over ATM     | EoA           | Routing             | PPPoE/PPPoA   | ATM PVC configuration, PPP information, IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU |
|                   |               |                     | IPoE/IPoA     | ATM PVC configuration, IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU                  |
|                   |               | Bridge              | N/A           | ATM PVC configuration, and QoS  |
| Ethernet          | N/A           | Routing             | PPPoE         | PPP user name and password, WAN IPv4/IPv6 IP address, routing feature, DNS server, VLAN, QoS, and MTU         |
|                   |               |                     | IPoE          | WAN IPv4/IPv6 IP address, NAT, DNS server and routing feature   |
|                   |               | Bridge              | N/A           | VLAN and QoS  |

## 6.1.2 What You Need to Know

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

### WAN IP Address

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

If your ISP assigns you a static WAN IP address, they should also assign you the subnet mask and DNS server IP address(es).

### ATM

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

### PTM

Packet Transfer Mode (PTM) is packet-oriented and supported by the VDSL2 standard. In PTM, packets are encapsulated directly in the High-level Data Link Control (HDLC) frames. It is designed to provide a low-overhead, transparent way of transporting packets over DSL links, as an alternative to ATM.

### IPv6 Introduction

IPv6 (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in IPv6 address size to 128 bits (from the 32-bit IPv4 address) allows up to  $3.4 \times 10^{38}$  IP addresses. The Zyxel Device can use IPv4/IPv6 dual stack to connect to IPv4 and IPv6 networks, and supports IPv6 rapid deployment (6RD).

## IPv6 Addressing

The 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address `2001:0db8:1a2b:0015:0000:0000:1a2f:0000`.

IPv6 addresses can be abbreviated in two ways:

- Leading zeros in a block can be omitted. So  
`2001:0db8:1a2b:0015:0000:0000:1a2f:0000` can be written as  
`2001:db8:1a2b:15:0:0:1a2f:0`.
- Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So  
`2001:0db8:0000:0000:1a2f:0000:0000:0015` can be written as  
`2001:0db8::1a2f:0000:0000:0015`, `2001:0db8:0000:0000:1a2f::0015`,  
`2001:db8::1a2f:0:0:15` Or `2001:db8:0:0:1a2f::15`.

## IPv6 Prefix and Prefix Length

Similar to an IPv4 subnet mask, IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example,

`2001:db8:1a2b:15::1a2f:0/32`

means that the first 32 bits (`2001:db8`) is the subnet prefix.

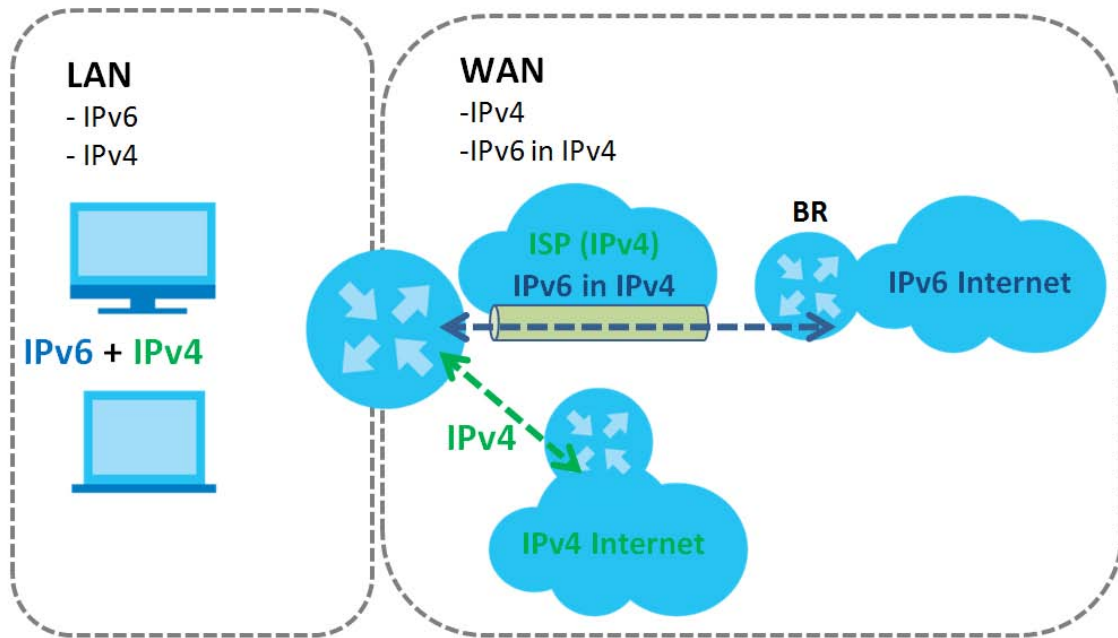
## IPv6 Subnet Masking

Both an IPv6 address and IPv6 subnet mask compose of 128-bit binary digits, which are divided into eight 16-bit blocks and written in hexadecimal notation. Hexadecimal uses four bits for each character (1 ~ 10, A ~ F). Each block's 16 bits are then represented by four hexadecimal characters. For example, `FFFF:FFFF:FFFF:FFFF:FC00:0000:0000:0000`.

## IPv6 Rapid Deployment

Use IPv6 Rapid Deployment (6rd) when the local network uses IPv6 and the ISP has an IPv4 network. When the Zyxel Device has an IPv4 WAN address and you set **IPv6/IPv4 Mode** to **IPv4 Only**, you can enable 6rd to encapsulate IPv6 packets in IPv4 packets to cross the ISP's IPv4 network.

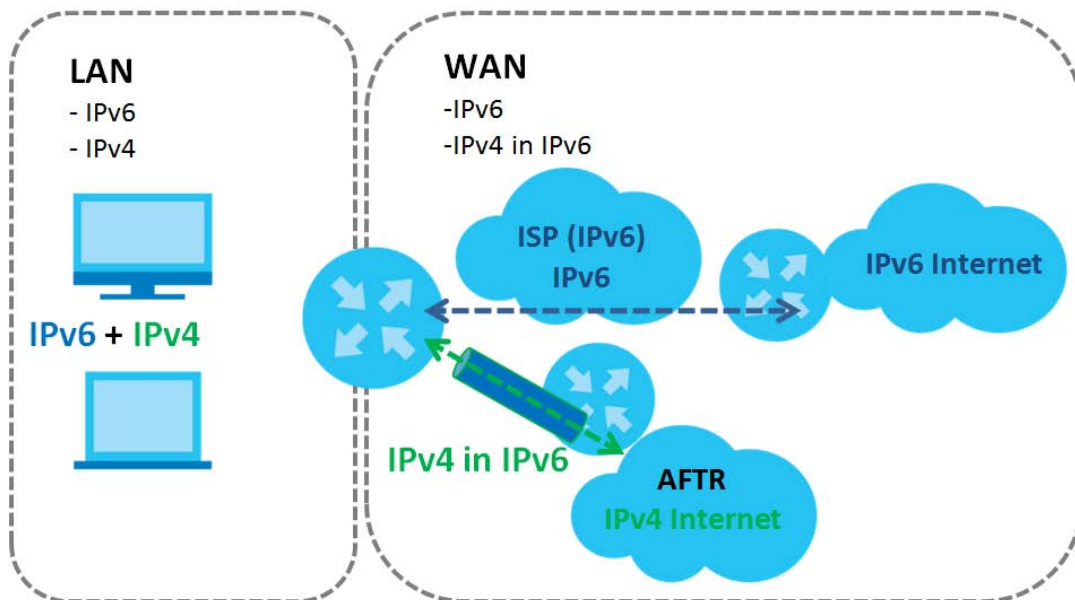
The Zyxel Device generates a global IPv6 prefix from its IPv4 WAN address and tunnels IPv6 traffic to the ISP's Border Relay router (BR in the figure) to connect to the native IPv6 Internet. The local network can also use IPv4 services. The Zyxel Device uses its configured IPv4 WAN IP to route IPv4 traffic to the IPv4 Internet.

**Figure 39** IPv6 Rapid Deployment

## Dual Stack Lite

Use Dual Stack Lite when local network computers use IPv4 and the ISP has an IPv6 network. When the Zyxel Device has an IPv6 WAN address and you set **IPv6/IPv4 Mode** to **IPv6 Only**, you can enable Dual Stack Lite to use IPv4 computers and services.

The Zyxel Device tunnels IPv4 packets inside IPv6 encapsulation packets to the ISP's Address Family Transition Router (AFTR in the graphic) to connect to the IPv4 Internet. The local network can also use IPv6 services. The Zyxel Device uses its configured IPv6 WAN IP to route IPv6 traffic to the IPv6 Internet.

**Figure 40** Dual Stack Lite

### 6.1.3 Before You Begin

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

## 6.2 Broadband Settings

Use this screen to change your Zyxel Device's Internet access settings. The summary table shows you the configured WAN services (connections) on the Zyxel Device. Use information provided by your ISP to configure WAN settings.

Click **Network Setting** > **Broadband** to access this screen.

**Figure 41** Network Setting > Broadband

| #                       | Name | Type | Mode | Encapsulation | 802.1p | 802.1q | IGMP Proxy | NAT | Default Gateway | IPv6 | MLD Proxy | Modify |
|-------------------------|------|------|------|---------------|--------|--------|------------|-----|-----------------|------|-----------|--------|
| + Add New WAN Interface |      |      |      |               |        |        |            |     |                 |      |           |        |

The following table describes the labels in this screen.

Table 14 Network Setting > Broadband

| LABEL                 | DESCRIPTION   |
|-----------------------|---|
| Add New WAN Interface | Click this button to create a new connection.   |
| #                     | This is the index number of the entry.  |
| Name                  | This is the service name of the connection.   |
| Type                  | This shows it is an Ethernet connection.  |
| Mode                  | This shows whether the connection is in routing or bridge mode.   |
| Encapsulation         | This is the method of encapsulation used by this connection.  |
| 802.1p                | This indicates the 802.1p priority level assigned to traffic sent through this connection. This displays <b>N/A</b> when there is no priority level assigned. |
| 802.1q                | This indicates the VLAN ID number assigned to traffic sent through this connection. This displays <b>N/A</b> when there is no VLAN ID number assigned.        |
| IGMP Proxy            | This shows whether the Zyxel Device act as an IGMP proxy on this connection.  |
| NAT                   | This shows whether NAT is activated or not for this connection.   |
| Default Gateway       | This shows whether the Zyxel Device use the WAN interface of this connection as the system default gateway.   |
| IPv6                  | This shows whether IPv6 is activated or not for this connection. IPv6 is not available when the connection uses the bridging service.                         |

Table 14 Network Setting &gt; Broadband (continued)

| LABEL     | DESCRIPTION  |
|-----------|--|
| MLD Proxy | This shows whether Multicast Listener Discovery (MLD) is activated or not for this connection. MLD is not available when the connection uses the bridging service. |
| Modify    | Click the <b>Edit</b> icon to configure the WAN connection.  |
|           | Click the <b>Delete</b> icon to remove the WAN connection.   |

## 6.2.1 Add/Edit Internet Connection

Click **Add New WAN Interface** in the **Broadband** screen or the Edit icon next to an existing WAN interface to open the following screen. Use this screen to configure a WAN connection. The screen varies depending on the mode, encapsulation, and IPv6/IPv4 mode you select.

### 6.2.1.1 Routing Mode

Use **Routing** mode if your ISP give you one IP address only and you want multiple computers to share an Internet account.

The following example screen displays when you select the **Routing** mode and **PPPoE** encapsulation. The screen varies when you select other encapsulation and IPv6/IPv4 mode.

**Figure 42** Network Setting > Broadband > Add/Edit New WAN Interface (Routing Mode)

<

Add New WAN Interface

General

Name

Type

ADSL/VDSL over PTB

Mode

Routing

Encapsulation

IPoE

IPv4/IPv6 Mode

IPv4 IPv6 DualStack

VLAN

802.1p

0

802.1q

(1~4094)

MTU

1500

IP Address

☒ Obtain an IP Address Automatically

☐ Static IP Address

DNS Server

☒ Obtain DNS Info Automatically

☐ Use Following Static DNS Address

DHCP Options

Request Options

☐ option 43

☐ option 121

Sent Options

☐ option 60

Vendor ID

☐ option 61

I/AID

DUID

☐ option 125

IPv6 Address

☒ Obtain an IPv6 Address Automatically

☐ Static IPv6 Address

IPv6 DNS Server

☒ Obtain IPv6 DNS Info Automatically

☐ Use Following Static IPv6 DNS Address

IPv6 Routing Feature

MLD Proxy

☒

Apply as Default Gateway

☐

Prefix Delegation

☐

IPv6 Address From DHCPv6 Server

☐

WAN MAC Address

☒ Factory Default

☐ Clone LAN Host's MAC Address

☐ Set WAN MAC Address

Cancel

Apply

The following table describes the labels in this screen.

Table 15 Network Setting > Broadband > Add/Edit New WAN Interface (Routing Mode)



| LABEL  | DESCRIPTION   |
|--|---|
| General  | Click this switch to enable or disable the interface. When the switch goes to the right  , the function is enabled. Otherwise, it is not.  |
| Name   | Specify a descriptive name for this connection.   |
| Type   | This field shows an Ethernet connection.  |
| Mode   | Select <b>Routing</b> if your ISP give you one IP address only and you want multiple computers to share an Internet account.  |
| Encapsulation  | Select the method of encapsulation used by your ISP from the drop-down list box. This option is available only when you select <b>Routing</b> in the <b>Mode</b> field.<br><br><u>When you select <b>ADSL/VDSL over ATM</b> or <b>Ethernet</b>, the choices are <b>PPPoE</b> and <b>IPoE</b>.</u><br><br><u>When you select <b>ADSL over ATM</b>, the choices are <b>PPPoE</b>, <b>IPoE</b>, <b>PPPoA</b> and <b>IPoA</b>.</u>  |
| IPv4/IPv6 Mode   | Select <b>IPv4 Only</b> if you want the Zyxel Device to run IPv4 only.<br><br>Select <b>IPv4 IPv6 DualStack</b> to allow the Zyxel Device to run IPv4 and IPv6 at the same time.<br><br>Select <b>IPv6 Only</b> if you want the Zyxel Device to run IPv6 only.  |
| PPP Information (This is available only when you select <b>Routing</b> in the <b>Mode</b> field <u>and <b>PPPoE</b> or <b>PPPoA</b> in the <b>Encapsulation</b> field.</u> ) |   |
| PPP User Name  | Enter the user name exactly as your ISP assigned. If assigned a name in the form user@domain where domain identifies a service name, then enter both components exactly as given.   |
| PPP Password   | Enter the password associated with the user name above. Select <b>password unmask</b> to show your entered password in plain text.  |
| PPP Connection Trigger   | Select when to have the Zyxel Device establish the PPP connection.<br><br><b>Auto Connect</b> - select this to not let the connection time out.<br><br><b>On Demand</b> - select this to automatically bring up the connection when the Zyxel Device receives packets destined for the Internet.  |
| Idle Timeout   | This value specifies the time in minutes that elapses before the router automatically disconnects from the PPPoE server.<br><br>This field is not available if you select <b>Auto Connect</b> in the <b>PPP Connection Trigger</b> field.   |
| PPPoE Passthrough  | This field is available when you select <b>PPPoE</b> encapsulation.<br><br>In addition to the Zyxel Device's built-in PPPoE client, you can enable PPPoE pass through to allow up to ten hosts on the LAN to use PPPoE client software on their computers to connect to the ISP via the Zyxel Device. Each host can have a separate account and a public WAN IP address.<br><br>PPPoE pass through is an alternative to NAT for application where NAT is not appropriate.<br><br>Disable PPPoE pass through if you do not need to allow hosts on the LAN to use PPPoE client software on their computers to connect to the ISP. |
| VLAN   | Click this switch to enable or disable VLAN on this WAN interface. When the switch goes to the right  , the function is enabled. Otherwise, it is not. <u>This field is not available if you select <b>ADSL over ATM</b> in the <b>Type</b> field and <b>PPPoA</b> or <b>IPoA</b> in the <b>Encapsulation</b> field.</u>   |
| 802.1p   | IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service.<br><br>Select the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.  |
| 802.1q   | Type the VLAN ID number (from 1 to 4094) for traffic through this connection.   |
| MTU <u>(This is not available if you select <b>ADSL over ATM</b> in the <b>Type</b> field and <b>PPPoA</b> or <b>IPoA</b> in the <b>Encapsulation</b> field.)</u>            |   |

Table 15 Network Setting &gt; Broadband &gt; Add/Edit New WAN Interface (Routing Mode)






| LABEL   | DESCRIPTION   |
|---|---|
| MTU   | Enter the MTU (Maximum Transfer Unit) size for this traffic.  |
| IP Address (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)      |   |
| Obtain an IP Address Automatically  | A static IP address is a fixed IP that your ISP gives you. A dynamic IP address is not fixed; the ISP assigns you a different one each time you connect to the Internet. Select this if you have a dynamic IP address.  |
| Static IP Address   | Select this option if the ISP assigned a fixed IP address.  |
| IP Address  | Enter the static IP address provided by your ISP.   |
| Subnet Mask   | Enter the subnet mask provided by your ISP.   |
| Gateway IP Address  | Enter the gateway IP address provided by your ISP.  |
| DNS Server (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.)      |   |
| Obtain DNS Info Automatically   | Select <b>Obtain DNS Info Automatically</b> if you want the Zyxel Device to use the DNS server addresses assigned by your ISP.  |
| Use Following Static DNS Address  | Select <b>Use Following Static DNS Address</b> if you want the Zyxel Device to use the DNS server addresses you configure manually.   |
| Primary DNS Server  | Enter the first DNS server address assigned by the ISP.   |
| Secondary DNS Server  | Enter the second DNS server address assigned by the ISP.  |
| Routing Feature (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field.) |   |
| NAT   | Click this switch to activate or deactivate NAT on this connection. When the switch goes to the right  , the function is enabled. Otherwise, it is not.  |
| IGMP Proxy  | <p>Internet Group Multicast Protocol (IGMP) is a network-layer protocol used to establish membership in a Multicast group - it is not used to carry user data.</p> <p>Click this switch to have the Zyxel Device act as an IGMP proxy on this connection. When the switch goes to the right , the function is enabled. Otherwise, it is not.</p> <p>This allows the Zyxel Device to get subscribing information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly.</p> |
| Apply as Default Gateway  | Click this switch to have the Zyxel Device use the WAN interface of this connection as the system default gateway. When the switch goes to the right  , the function is enabled. Otherwise, it is not.   |
| Fullcone NAT Enable   | <p>Click this switch to enable or disable full cone NAT on this connection. When the switch goes to the right , the function is enabled. Otherwise, it is not.</p> <p>This field is available only when you activate <b>NAT</b>.</p> <p>In full cone NAT, the Zyxel Device maps all outgoing packets from an internal IP address and port to a single IP address and port on the external network. The Zyxel Device also maps packets coming to that external IP address and port to the internal IP address and port.</p>     |
| 6RD   | <p>The 6RD (IPv6 rapid deployment) fields display when you set the <b>IPv6/IPv4 Mode</b> field to <b>IPv4 Only</b>. See <a href="#">IPv6 Rapid Deployment on page 74</a> for more information.</p> <p>Click this switch to tunnel IPv6 traffic from the local network through the ISP's IPv4 network. When the switch goes to the right , the function is enabled. Otherwise, it is not.</p>   |
| Manually Configured   | Select <b>Manually Configured</b> if you have the IPv4 address of the relay server. Otherwise, select <b>Automatically configured by DHCP</b> to have the Zyxel Device detect it automatically through DHCP.  |
| Automatically configured by DHCP  | The <b>Automatically configured by DHCP</b> option is configurable only when you set the method of encapsulation to <b>IPoE</b> .   |



Table 15 Network Setting &gt; Broadband &gt; Add/Edit New WAN Interface (Routing Mode)

| LABEL   | DESCRIPTION   |
|---|---|
| Service Provider IPv6 Prefix  | Enter an IPv6 prefix for tunneling IPv6 traffic to the ISP's border relay router and connecting to the native IPv6 Internet.  |
| IPv4 Mask Length  | Enter the subnet mask number (1~32) for the IPv4 network.   |
| Border Relay IPv4 Address   | When you select <b>Manually Configured</b> , specify the relay server's IPv4 address in this field.   |
| DHCP Options (This is available only when you select <b>IPv4 Only</b> or <b>IPv4 IPv6 DualStack</b> in the <b>IPv4/IPv6 Mode</b> field and <b>IPoE</b> in the <b>Encapsulation</b> field.)                      |   |
| Request Options   | Select <b>Option 43</b> to have the Zyxel Device automatically add vendor specific information in the DHCP packets to request the vendor specific options from the DHCP server.<br><br>Select <b>Option 121</b> to have the Zyxel Device push static routes to clients. |
| Sent Options  |   |
| option 60   | Select this and enter the device identity you want the Zyxel Device to add in the DHCP discovery packets that go to the DHCP server.  |
| Vendor ID   | Enter the Vendor Class Identifier, such as the type of the hardware or firmware.  |
| option 61   | Select this and enter any string that identifies the device.  |
| IAID  | Enter the Identity Association Identifier (IAID) of the device, for example, the WAN connection index number.   |
| DUID  | Enter the hardware type, a time value and the MAC address of the device.  |
| option 125  | Select this to have the Zyxel Device automatically generate and add vendor specific parameters in the DHCP discovery packets that go to the DHCP server.  |
| IPv6 Address (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field.)  |   |
| Obtain an IPv6 Address Automatically  | Select <b>Obtain an IPv6 Address Automatically</b> if you want to have the Zyxel Device use the IPv6 prefix from the connected router's Router Advertisement (RA) to generate an IPv6 address.  |
| Static IPv6 Address   | Select <b>Static IPv6 Address</b> if you have a fixed IPv6 address assigned by your ISP. When you select this, the following fields appear.   |
| IPv6 Address  | Enter an IPv6 IP address that your ISP gave to you for this WAN interface.  |
| IPv6 Address  | Enter the address prefix length to specify how many most significant bits in an IPv6 address compose the network address.   |
| IPv6 Default Gateway  | Enter the IP address of the next-hop gateway. The gateway is a router or switch on the same segment as your Zyxel Device's interface(s). The gateway helps forward packets to their destinations.   |
| IPv6 DNS Server (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. Configure the IPv6 DNS server in the following section.              |   |
| Obtain IPv6 DNS Info Automatically  | Select <b>Obtain IPv6 DNS Info Automatically</b> to have the Zyxel Device get the IPv6 DNS server addresses from the ISP automatically.   |
| Use Following Static IPv6 DNS Address   | Select <b>Use Following Static IPv6 DNS Address</b> to have the Zyxel Device use the IPv6 DNS server addresses you configure manually.  |
| Primary DNS Server  | Enter the first IPv6 DNS server address assigned by the ISP.  |
| Secondary DNS Server  | Enter the second IPv6 DNS server address assigned by the ISP.   |
| IPv6 Routing Feature (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. You can enable IPv6 routing features in the following section.) |   |

Table 15 Network Setting &gt; Broadband &gt; Add/Edit New WAN Interface (Routing Mode)




| LABEL  | DESCRIPTION   |
|--|---|
| MLD Proxy Enable   | Select this check box to have the Zyxel Device act as an MLD proxy on this connection. This allows the Zyxel Device to get subscription information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly.  |
| Apply as Default Gateway   | Select this option to have the Zyxel Device use the WAN interface of this connection as the system default gateway.   |
| DS-Lite  | This is available only when you select <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field. Enable Dual Stack Lite to let local computers use IPv4 through an ISP's IPv6 network. See <a href="#">Dual Stack Lite on page 75</a> for more information.<br><br>Click this switch to let local computers use IPv4 through an ISP's IPv6 network. When the switch goes to the right  , the function is enabled. Otherwise, it is not.   |
| DS-Lite Relay Server IP  | Specify the transition router's IPv6 address.   |
| <a href="#">IPv6 IA_PD and IA_NA (This is available only when you select <b>IPv4 IPv6 DualStack</b> or <b>IPv6 Only</b> in the <b>IPv4/IPv6 Mode</b> field.)</a> |   |
| <a href="#">Prefix Delegation</a>  | <a href="#">Click this switch to use DHCP PD (Prefix Delegation) which enables the Zyxel Device to pass the IPv6 prefix information to its LAN hosts. The hosts can then use the prefix to generate their IPv6 addresses.</a><br><br><a href="#">When the switch goes to the right , the function is enabled. Otherwise, it is disabled.</a>   |
| <a href="#">IPv6 Address from DHCPv6 Server</a>  | <a href="#">Click this switch to obtain an IPv6 address from a DHCPv6 server. The IP address assigned by a DHCPv6 server has priority over the IP address automatically generated by the Zyxel Device using the IPv6 prefix from a Router Advertisement (RA).</a><br><br><a href="#">When the switch goes to the right , the function is enabled. Otherwise, it is disabled.</a>   |
| WAN MAC Address (You can set the WAN MAC address in the following section.)  |   |
| Factory Default  | Select <b>Factory Default</b> to use the factory assigned default MAC address.  |
| Clone LAN Host's MAC Address   | Select this option to clone the MAC address of the computer (displaying in the screen) from which you are configuring the Zyxel Device. It is advisable to clone the MAC address from a computer on your LAN even if your ISP does not presently require MAC address authentication.  |
| IP Address   | Enter the IP address of the computer on the LAN whose MAC address you are cloning.  |
| Set WAN MAC Address  | Select this option to enter the MAC address you want to use.  |
| <a href="#">ATM PVC Configuration (This is available only when you select <b>ADSL over ATM</b> in the <b>Type</b> field.)</a>                                    |   |
| <a href="#">VPI [0-255]</a>  | <a href="#">The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.</a>   |
| <a href="#">VCI [32-65535]</a>   | <a href="#">The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.</a>  |
| <a href="#">Encapsulation</a>  | <a href="#">Select the method of multiplexing used by your ISP from the drop-down list box. Choices are:</a><br><br><ul style="list-style-type: none"> <li>• <a href="#">LLC/SNAP-BRIDGING:</a> In LLC encapsulation, bridged PDUs are encapsulated by identifying the type of the bridged media in the SNAP header. This is available only when you select <b>IPoE</b> or <b>PPPoE</b> in the <b>Select DSL Link Type</b> field.</li> <li>• <a href="#">VC/MUX:</a> In VC multiplexing, each protocol is carried on a single ATM virtual circuit (VC). To transport multiple protocols, the Zyxel Device needs separate VCs. There is a binding between a VC and the type of the network protocol carried on the VC. This reduces payload overhead since there is no need to carry protocol information in each Protocol Data Unit (PDU) payload.</li> </ul> |
| <a href="#">Service Category</a>   | <a href="#">Select <b>UBR Without PCR</b> for applications that are non-time sensitive, such as email.</a><br><br><a href="#">Select <b>CBR</b> (Continuous Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic.</a><br><br><a href="#">Select <b>Non Realtime VBR</b> (non real-time Variable Bit Rate) for connections that do not require closely controlled delay and delay variation.</a><br><br><a href="#">Select <b>Realtime VBR</b> (real-time Variable Bit Rate) for applications with bursty connections that require closely controlled delay and delay variation.</a>   |

Table 15 Network Setting &gt; Broadband &gt; Add/Edit New WAN Interface (Routing Mode)

| LABEL                                      | DESCRIPTION   |
|--|---|
| <a href="#">Peak Cell Rate [cells/s]</a>   | <a href="#">Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.</a>   |
| <a href="#">Sustainable Cell Rate</a>      | <a href="#">The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.</a> |
| <a href="#">Maximum Burst Size [cells]</a> | <a href="#">Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.</a>   |
| MAC Address                                | Enter the MAC address you want to use.  |
| Cancel                                     | Click <b>Cancel</b> to exit this screen without saving.   |
| Apply                                      | Click <b>Apply</b> to save your changes.  |

Click the **Add new WAN Interface** in the **Network Setting > Broadband** screen or the **Edit** icon next to the connection you want to configure. Select **Bridge** as the encapsulation mode. The following screen appears.

**Figure 43** Network Setting > Broadband > Add/Edit New WAN Interface (Bridge Mode)

**Add New WAN Interface**

**General** ☒

Name

Type

Mode

**VLAN** ☒

802.1p

802.1q

**WAN MAC Address**

☐ Factory Default

☐ Clone LAN Host's MAC Address

☒ Set WAN MAC Address

MAC Address

**Cancel** **Apply**

The following table describes the fields in this screen.

Table 16 Network Setting &gt; Broadband &gt; Add/Edit New WAN Interface (Bridge Mode)



| LABEL   | DESCRIPTION  |
|---------|--|
| General | Click this switch to enable or disable the interface. When the switch goes to the right  , the function is enabled. Otherwise, it is not. |
| Name    | Enter a service name of the connection.  |
| Type    | This field shows an Ethernet connection.   |

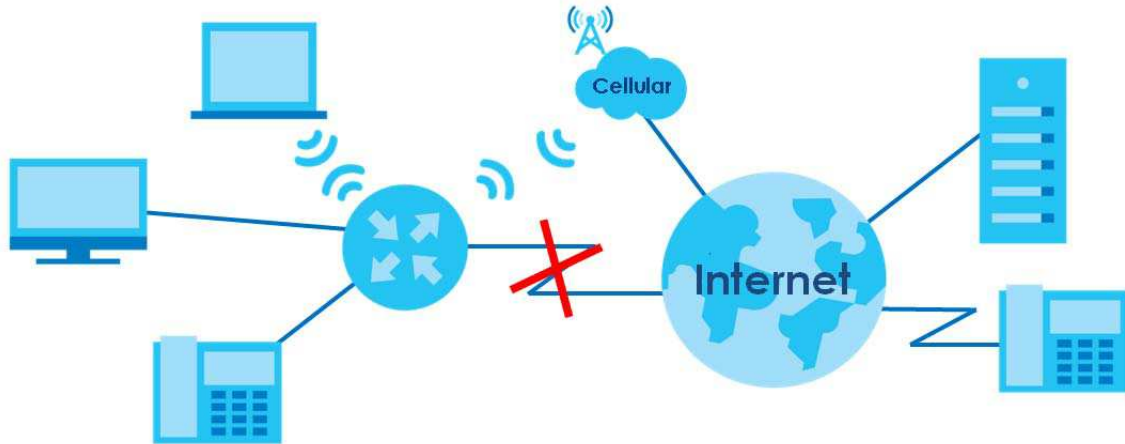
Table 16 Network Setting &gt; Broadband &gt; Add/Edit New WAN Interface (Bridge Mode) (continued)

| LABEL  | DESCRIPTION  |
|--|--|
| Mode   | Select <b>Bridge</b> when your ISP provides you more than one IP address and you want the connected computers to get individual IP address from ISP's DHCP server directly. If you select <b>Bridge</b> , you cannot use routing functions, such as QoS, Firewall, DHCP server and NAT on traffic from the selected LAN port(s).   |
| VLAN   | Click this switch to enable or disable VLAN on this WAN interface. When the switch goes to the right  , the function is enabled. Otherwise, it is not.  |
| 802.1p   | IEEE 802.1p defines up to 8 separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service.<br><br>Select the IEEE 802.1p priority level (from 0 to 7) to add to traffic through this connection. The greater the number, the higher the priority level.   |
| 802.1q   | Type the VLAN ID number (from 0 to 4094) for traffic through this connection.  |
| WAN MAC Address (You can set the WAN MAC address in the following section.)  |  |
| Factory Default  | Select <b>Factory Default</b> to use the factory assigned default MAC address.   |
| Clone LAN Host's MAC Address   | Select this option to clone the MAC address of the computer (displaying in the screen) from which you are configuring the Zyxel Device. It is advisable to clone the MAC address from a computer on your LAN even if your ISP does not presently require MAC address authentication.   |
| IP Address   | Enter the IP address of the computer on the LAN whose MAC address you are cloning.   |
| Set WAN MAC Address  | Select this option to enter the MAC address you want to use.   |
| MAC Address  | Enter the MAC address you want to use.   |
| <u>ATM PVC Configuration (This is available only when you select <b>ADSL over ATM</b> in the <b>Type</b> field.)</u> |  |
| <u>VPI [0-255]</u>   | <u>The valid range for the VPI is 0 to 255. Enter the VPI assigned to you.</u>   |
| <u>VCI [32-65535]</u>  | <u>The valid range for the VCI is 32 to 65535 (0 to 31 is reserved for local management of ATM traffic). Enter the VCI assigned to you.</u>  |
| <u>Encapsulation</u>   | <u>Select the method of multiplexing used by your ISP from the drop-down list box. Choices are:</u><br><br><ul style="list-style-type: none"> <li>• <u><b>LLC/SNAP-BRIDGING:</b> In LLC encapsulation, bridged PDUs are encapsulated by identifying the type of the bridged media in the SNAP header. This is available only when you select <b>IPoE</b> or <b>PPPoE</b> in the <b>Select DSL Link Type</b> field.</u></li> <li>• <u><b>VC/MUX:</b> In VC multiplexing, each protocol is carried on a single ATM virtual circuit (VC). To transport multiple protocols, the Zyxel Device needs separate VCs. There is a binding between a VC and the type of the network protocol carried on the VC. This reduces payload overhead since there is no need to carry protocol information in each Protocol Data Unit (PDU) payload.</u></li> </ul> |
| <u>Service Category</u>  | <u>Select <b>UBR Without PCR</b> for applications that are non-time sensitive, such as email.</u><br><br><u>Select <b>CBR</b> (Continuous Bit Rate) to specify fixed (always-on) bandwidth for voice or data traffic.</u><br><br><u>Select <b>Non Realtime VBR</b> (non real-time Variable Bit Rate) for connections that do not require closely controlled delay and delay variation.</u><br><br><u>Select <b>Realtime VBR</b> (real-time Variable Bit Rate) for applications with bursty connections that require closely controlled delay and delay variation.</u>  |
| <u>Peak Cell Rate [cells/s]</u>  | <u>Divide the DSL line rate (bps) by 424 (the size of an ATM cell) to find the Peak Cell Rate (PCR). This is the maximum rate at which the sender can send cells. Type the PCR here.</u>   |
| <u>Sustainable Cell Rate</u>   | <u>The Sustain Cell Rate (SCR) sets the average cell rate (long-term) that can be transmitted. Type the SCR, which must be less than the PCR. Note that system default is 0 cells/sec.</u>   |
| <u>Maximum Burst Size [cells]</u>  | <u>Maximum Burst Size (MBS) refers to the maximum number of cells that can be sent at the peak rate. Type the MBS, which is less than 65535.</u>   |
| Cancel   | Click <b>Cancel</b> to exit this screen without saving.  |
| Apply  | Click <b>Apply</b> to save your changes.   |

## 6.3 The Cellular Backup Screen

The USB port of the Zyxel Device allows you to attach a cellular dongle to wirelessly connect to a cellular network for Internet access. You can have the Zyxel Device use the cellular WAN connection as a backup to keep you online if the primary WAN connection fails for **Consecutive Fail** times. Consult your cellular service provider to configure the settings in this screen. Disconnect the DSL and Ethernet WAN ports to use the cellular dongle as your primary WAN connection, as the Zyxel Device automatically uses a wired WAN connection when available.

**Figure 44** Internet Access Application: Cellular WAN



Use this screen to configure your cellular settings. Click **Network Setting > Broadband > Cellular Backup**.

The actual data rate you obtain varies depending on the cellular card you use, the signal strength to the service provider's base station, and so on.

**Note:** Entering a wrong PIN code three times will lock the SIM card in your cellular dongle.

**Note:** If you select **Drop** in the **Current Cellular Connection** field, the Zyxel Device will drop the cellular WAN connection when the **Time Budget** or **Data Budget** is reached. It may take some time for the cellular WAN connection to be disconnected when the **Time Budget** or **Data Budget** is reached.

**Figure 45** Network Setting > Broadband > Cellular Backup (General & Cellular Connection Settings)

**Broadband**

Broadband
**Cellular Backup**
Advanced
GEWAN or SFP

Whenever the WAN connection is down, Cellular Backup takes over the job and keeps you online. It is valid when a Cellular USB dongle is attached to the device and proper settings are configured. You may consult your Cellular service provider for the following settings.

### General

Cellular Backup ☒

Ping Check ☐

Check Cycle Every  (20~180 Sec)

Consecutive Fail  (2~5 times)

☐ Ping Default Gateway

☒ Ping Host  (Host name or IP address)

**Note**

Primary WAN is not in service when ping failed after consecutive times.

### Cellular Connection Settings

Card Description N/A

Username  (Optional)

Password   (Optional)

Authentication  ▼

PIN  (Optional) (Only for unlock PIN next time)

(PIN remaining authentication times)

Dial String

APN

Connection  ▼

☒ Obtain an IP Address Automatically

☐ Use the Following Static IP Address

☒ Obtain DNS Info Dynamically

☐ Use the Following Static DNS IP Address

Enable e-mail Notification ☐

**Note**

Entering the wrong PIN code 3 times will lock SIM card.

Cancel
Apply

**Figure 46** Network > Broadband > Cellular Backup (Budget Setup)

**Budget Setup**

Enable Budget Control ☒

☐ Time Budget: 0 hours per month

☐ Data Budget: 0 Mbytes Download/Upload per month

☐ Data Budget: 0 kPackets Download/Upload per month

Reset all budget counters on: last day of the month

**Reset time and data budget counters**

Actions before over budget

☐ Data Budget: 0 % of time budget

☐ Data Budget: 0 % of data budget (Mbytes)

☐ Data Budget: 0 % of data budget (Packets)

Actions when over budget

Current Cellular Connection: Keep

Actions

Enable e-mail Notification ☒

Mail Account: None

Cellular Backup e-mail Title:

Send Notification to E-mail:

☐ Enable Log: Interval 0 minutes

**Note**  
Budget control is an approximate value.

**Cancel** **Apply**

The following table describes the labels in this screen.

Table 17 Network Setting &gt; Broadband &gt; Cellular Backup



| LABEL            | DESCRIPTION  |
|------------------|--|
| General          |  |
| Cellular Backup  | Click this switch to have the Zyxel Device use the cellular connection as your WAN or a backup when the wired WAN connection fails. When the switch goes to the right  , the function is enabled. Otherwise, it is not.   |
| Ping Check       | Click this switch to ping check the connection status of your WAN. When the switch goes to the right  , the function is enabled. Otherwise, it is not.<br><br>You can configure the frequency of the ping check and number of consecutive failures before triggering cellular backup. |
| Check Cycle      | Enter the frequency of the ping check in this field.   |
| Consecutive Fail | Enter how many consecutive failures are required before cellular backup is triggered.  |



Table 17 Network Setting &gt; Broadband &gt; Cellular Backup (continued)

| LABEL                                   | DESCRIPTION   |
|---|---|
| Ping Default Gateway                    | Select this to have the Zyxel Device ping the WAN interface's default gateway IP address.   |
| Ping the Host                           | Select this to have the Zyxel Device ping the particular host name or IP address you typed in this field.   |
| Cellular Connection Settings            |   |
| Card description                        | This field displays the manufacturer and model name of your cellular card if you inserted one in the Zyxel Device. Otherwise, it displays <b>N/A</b> .  |
| Username                                | Type the user name (of up to 64 ASCII printable characters) given to you by your service provider.  |
| Password                                | Type the password (of up to 64 ASCII printable characters) associated with the user name above.   |
| PIN                                     | <p>A PIN (Personal Identification Number) code is a key to a cellular card. Without the PIN code, you cannot use the cellular card.</p> <p>If your ISP enabled PIN code authentication, enter the 4-digit PIN code (0000 for example) provided by your ISP. If you enter the PIN code incorrectly, the cellular card may be blocked by your ISP and you cannot use the account to access the Internet.</p> <p>If your ISP disabled PIN code authentication, leave this field blank.</p> |
| Dial string                             | <p>Enter the phone number (dial string) used to dial up a connection to your service provider's base station. Your ISP should provide the phone number.</p> <p>For example, *99# is the dial string to establish a GPRS or cellular connection in Taiwan.</p>   |
| APN                                     | <p>Enter the APN (Access Point Name) provided by your service provider. Connections with different APNs may provide different services (such as Internet access or MMS (Multi-Media Messaging Service)) and charge method.</p> <p>You can enter up to 32 ASCII printable characters. Spaces are allowed.</p>  |
| Connection                              | <p>Select <b>Nailed UP</b> if you do not want the connection to time out.</p> <p>Select <b>on Demand</b> if you do not want the connection up all the time and specify an idle time-out in the <b>Max Idle Timeout</b> field.</p>   |
| Max Idle Timeout                        | This value specifies the time in minutes that elapses before the Zyxel Device automatically disconnects from the ISP.   |
| Obtain an IP Address Automatically      | Select this option if your ISP did not assign you a fixed IP address.   |
| Use the following static IP address     | Select this option if the ISP assigned a fixed IP address.  |
| IP Address                              | Enter your WAN IP address in this field if you selected <b>Use the following static IP address</b> .  |
| Subnet Mask                             | Enter the subnet mask of the IP address.  |
| Obtain DNS info dynamically             | Select this to have the Zyxel Device get the DNS server addresses from the ISP automatically.   |
| Use the following static DNS IP address | Select this to have the Zyxel Device use the DNS server addresses you configure manually.   |
| Primary DNS server                      | Enter the first DNS server address assigned by the ISP.   |
| Secondary DNS server                    | Enter the second DNS server address assigned by the ISP.  |
| Enable Email Notification               | Select this to enable the email notification function. The Zyxel Device will email you a notification when the cellular connection is up.   |



Table 17 Network Setting &gt; Broadband &gt; Cellular Backup (continued)




| LABEL                               | DESCRIPTION   |
|-------------------------------------|---|
| Mail Account                        | <p>Select an email address you have configured in <b>Maintenance &gt; E-mail Notification</b>. The Zyxel Device uses the corresponding mail server to send notifications.</p> <p>You must have configured a mail server already in the <b>Maintenance &gt; E-mail Notification</b> screen.</p>  |
| Cellular backup Email Title         | Type a title that you want to be in the subject line of the email notifications that the Zyxel Device sends.  |
| Send Notification to Email          | Notifications are sent to the email address specified in this field. If this field is left blank, notifications cannot be sent via email.   |
|                                     | Click this  to show the advanced cellular backup settings.   |
| Budget Setup                        |   |
| Enable Budget Control               | <p>Click this switch to set a monthly limit for the user account of the installed cellular card. When the switch goes to the right , the function is enabled. Otherwise, it is not.</p> <p>You can set a limit on the total traffic and/or call time. The Zyxel Device takes the actions you specified when a limit is exceeded during the month.</p>  |
| Time Budget                         | Select this and specify the amount of time (in hours) that the cellular connection can be used within one month. If you change the value after you configure and enable budget control, the Zyxel Device resets the statistics.   |
| Data Budget (Mbytes)                | <p>Select this and specify how much downstream and/or upstream data (in Mega bytes) can be transmitted via the cellular connection within one month.</p> <p>Select <b>Download/Upload</b> to set a limit on the total traffic in both directions.</p> <p>Select <b>Download</b> to set a limit on the downstream traffic (from the ISP to the Zyxel Device).</p> <p>Select <b>Upload</b> to set a limit on the upstream traffic (from the Zyxel Device to the ISP).</p> <p>If you change the value after you configure and enable budget control, the Zyxel Device resets the statistics.</p> |
| Data Budget (kPackets)              | <p>Select this and specify how much downstream and/or upstream data (in k Packets) can be transmitted via the cellular connection within one month.</p> <p>Select <b>Download/Upload</b> to set a limit on the total traffic in both directions.</p> <p>Select <b>Download</b> to set a limit on the downstream traffic (from the ISP to the Zyxel Device).</p> <p>Select <b>Upload</b> to set a limit on the upstream traffic (from the Zyxel Device to the ISP).</p> <p>If you change the value after you configure and enable budget control, the Zyxel Device resets the statistics.</p>  |
| Reset all budget counters on        | Select the date on which the Zyxel Device resets the budget every month. Select <b>last</b> if you want the Zyxel Device to reset the budget on the last day of the month. Select <b>specific</b> and enter the number of the date you want the Zyxel Device to reset the budget.   |
| Reset time and data budget counters | Click this button to reset the time and data budgets immediately. The count starts over with the cellular connection's full configured monthly time and data budgets. This does not affect the normal monthly budget restart; so if you configured the time and data budget counters to reset on the second day of the month and you use this button on the first, the time and data budget counters will still reset on the second.  |
| Actions before over budget          | Specify the actions the Zyxel Device takes before the time or data limit exceeds.   |

Table 17 Network Setting &gt; Broadband &gt; Cellular Backup (continued)

| LABEL  | DESCRIPTION   |
|--|---|
| Data Budget<br>% of time<br>budget/data<br>budget<br>(Mbytes)/data<br>budget<br>(kPackets) | Select the check boxes and enter a number from 1 to 99 in the percentage fields. If you change the value after you configure and enable budget control, the Zyxel Device resets the statistics.   |
| Actions when<br>over budget  | Specify the actions the Zyxel Device takes when the time or data limit is exceeded.   |
| Current Cellular<br>connection   | Select <b>Keep</b> to maintain an existing cellular connection or <b>Drop</b> to disconnect it.   |
| Actions  |   |
| Enable Email<br>Notification   | Click this switch to enable or disable the email notification function. When the switch goes to the right  , the function is enabled. Otherwise, it is not.<br><br>The Zyxel Device will email you a notification whenever over budget occurs. |
| Mail<br>Account  | Select an email address you have configured in <b>Maintenance &gt; Email Notification</b> . The Zyxel Device uses the corresponding mail server to send notifications.<br><br>You must have configured a mail server already in the <b>Maintenance &gt; Email Notification</b> screen.  |
| Cellular<br>Backup<br>Email Title  | Type a title that you want to be in the subject line of the email notifications that the Zyxel Device sends.  |
| Send<br>Notification<br>to Email   | Notifications are sent to the email address specified in this field. If this field is left blank, notifications cannot be sent via email.   |
| Interval   | Enter the interval of how many minutes you want the Zyxel Device to email you.  |
| Enable Log   | Select this to activate the logging function at the interval you set in this field.   |
| Cancel   | Click <b>Cancel</b> to return to the previous configuration.  |
| Apply  | Click <b>Apply</b> to save your changes back to the Zyxel Device.   |

## 6.4 The Broadband Advanced Screen

Use the **Advanced** screen to enable or disable ADSL over PTM, Annex M, DSL PhyR, and SRA (Seamless Rate Adaptation) functions. The Zyxel Device supports the PhyR retransmission scheme. PhyR is a retransmission scheme designed to provide protection against noise on the DSL line. It improves voice, video and data transmission resilience by utilizing a retransmission buffer. It also lists ITU-T G.993.2 standard VDSL profiles you can comply with.

ITU-T G.993.2 standard defines a wide range of settings for various parameters, some of which are encompassed in profiles as shown in the next table.

Note: If the settings in the screen are changed, the Zyxel Device will re-establish the DSL connection(s).

Table 18 VDSL Profiles

| PROFILE | BANDWIDTH (MHZ) | NUMBER OF DOWNSTREAM CARRIERS | CARRIER BANDWIDTH (KHZ) | POWER (DBM) | MAX. DOWNSTREAM THROUGHPUT (MBIT/S) |
|---------|-----------------|-------------------------------|-------------------------|-------------|-------------------------------------|
| 8a      | 8.832           | 2048                          | 4.3125                  | 17.5        | 50                                  |
| 8b      | 8.832           | 2048                          | 4.3125                  | 20.5        | 50                                  |
| 8c      | 8.5             | 1972                          | 4.3125                  | 11.5        | 50                                  |
| 8d      | 8.832           | 2048                          | 4.3125                  | 14.5        | 50                                  |
| 12a     | 12              | 2783                          | 4.3125                  | 14.5        | 68                                  |
| 12b     | 12              | 2783                          | 4.3125                  | 14.5        | 68                                  |
| 17a     | 17.664          | 4096                          | 4.3125                  | 14.5        | 100                                 |
| 35b     | 35.328          | 8192                          | 4.3125                  | 17.0        | 300                                 |

Click **Network Setting** > **Broadband** > **Advanced** to display the following screen.

**Figure 47** Network Setting > Broadband > Advanced

## Broadband

Broadband Cellular Backup Advanced GEWAN or SFP

If xDSL setting is changed, the modem will require a retrain.

### DSL Capabilities

|         |                                     |
|---------|-------------------------------------|
| PhyR US | <input type="checkbox"/>            |
| PhyR DS | <input checked="" type="checkbox"/> |
| Bitswap | <input checked="" type="checkbox"/> |
| SRA     | <input type="checkbox"/>            |

### DSL Line Mode

State ☒ Auto ☐ Single ☐ Bonding

### DSL Modulation

|               |                                     |
|---------------|-------------------------------------|
| PTM over ADSL | <input checked="" type="checkbox"/> |
| G.dmt         | <input checked="" type="checkbox"/> |
| G.lite        | <input checked="" type="checkbox"/> |
| T1.413        | <input checked="" type="checkbox"/> |
| ADSL2         | <input checked="" type="checkbox"/> |
| Annex L       | <input checked="" type="checkbox"/> |
| ADSL2+        | <input checked="" type="checkbox"/> |
| Annex M       | <input checked="" type="checkbox"/> |
| VDSL2         | <input checked="" type="checkbox"/> |
| G.fast        | <input checked="" type="checkbox"/> |

### VDSL Profile

|            |                                     |
|------------|-------------------------------------|
| 8a Enable  | <input checked="" type="checkbox"/> |
| 8b Enable  | <input checked="" type="checkbox"/> |
| 8c Enable  | <input checked="" type="checkbox"/> |
| 8d Enable  | <input checked="" type="checkbox"/> |
| 12a Enable | <input checked="" type="checkbox"/> |
| 12b Enable | <input checked="" type="checkbox"/> |
| 17a Enable | <input checked="" type="checkbox"/> |
| 30a Enable | <input checked="" type="checkbox"/> |
| 35b Enable | <input checked="" type="checkbox"/> |
| US0        | <input checked="" type="checkbox"/> |

Cancel Apply

The following table describes the labels in this screen.

Table 19 Network Setting > Broadband > Advanced

| LABEL            | DESCRIPTION   |
|------------------|---|
| DSL Capabilities |   |
| PhyR US          | Enable or disable <b>PhyR US</b> (upstream) for upstream transmission to the WAN. PhyR US should be enabled if data being transmitted upstream is sensitive to noise. However, enabling PhyR US can decrease the US line rate. Enabling or disabling PhyR will require the CPE to retrain. For PhyR to function, the DSLAM must also support PhyR and have it enabled.  |
| PhyR DS          | Enable or disable <b>PhyR DS</b> (downstream) for downstream transmission from the WAN. PhyR DS should be enabled if data being transmitted downstream is sensitive to noise. However, enabling PhyR DS can decrease the DS line rate. Enabling or disabling PhyR will require the CPE to retrain. For PhyR to function, the DSLAM must also support PhyR and have it enabled.  |
| Bitswap          | Select <b>Enable</b> to allow the Zyxel Device to adapt to line changes when you are using G.dmt.<br><br>Bit-swapping is a way of keeping the line more stable by constantly monitoring and redistributing bits between channels.   |
| SRA              | Enable or disable Seamless Rate Adaption (SRA). Select <b>Enable</b> to have the Zyxel Device automatically adjust the connection's data rate according to line conditions without interrupting service.  |
| DSL Modulation   |   |
| PTM over ADSL :  | Select <b>Enable</b> to use PTM over ADSL. Since PTM has less overhead than ATM, some ISPs use this for better performance.   |
| G.Dmt :          | ITU G.992.1 (better known as G.dmt) is an ITU standard for ADSL using discrete multitone modulation. G.dmt full-rate ADSL expands the usable bandwidth of existing copper telephone lines, delivering high-speed data communications at rates up to 8 Mbit/s downstream and 1.3 Mbit/s upstream.  |
| G.lite :         | ITU G.992.2 (better known as G.lite) is an ITU standard for ADSL using discrete multitone modulation. G.lite does not strictly require the use of DSL filters, but like all variants of ADSL generally functions better with splitters.   |
| T1.413 :         | ANSI T1.413 is a technical standard that defines the requirements for the single asymmetric digital subscriber line (ADSL) for the interface between the telecommunications network and the customer installation in terms of their interaction and electrical characteristics.   |
| ADSL2 :          | It optionally extends the capability of basic ADSL in data rates to 12 Mbit/s downstream and, depending on Annex version, up to 3.5 Mbit/s upstream (with a mandatory capability of ADSL2 transceivers of 8 Mbit/s downstream and 800 kbit/s upstream).   |
| Annex L :        | Annex L is an optional specification in the ITU-T ADSL2 recommendation G.992.3 titled Specific requirements for a Reach Extended ADSL2 (READSL2) system operating in the frequency band above POTS, therefore it is often referred to as Reach Extended ADSL2 or READSL2. The main difference between this specification and commonly deployed Annex A is the maximum distance that can be used. The power of the lower frequencies used for transmitting data is boosted up to increase the reach of this signal up to 7 kilometers (23,000 ft). |
| ADSL2+ :         | ADSL2+ extends the capability of basic ADSL by doubling the number of downstream channels. The data rates can be as high as 24 Mbit/s downstream and up to 1.4 Mbit/s upstream depending on the distance from the DSLAM to the customer's premises.   |
| Annex M :        | Annex M is an optional specification in ITU-T recommendations G.992.3 (ADSL2) and G.992.5 (ADSL2+), also referred to as ADSL2 M and ADSL2+ M. This specification extends the capability of commonly deployed Annex A by more than doubling the number of upstream bits. The data rates can be as high as 12 or 24 Mbit/s downstream and 3 Mbit/s upstream depending on the distance from the DSLAM to the customer's premises.  |
| VDSL2            | VDSL2 (Very High Speed Digital Subscriber Line 2) is the second generation of the VDSL standard (which is currently denoted VDSL1). VDSL2 allows a frequency band of up to 30MHz and transmission rates of up to 100 Mbps in each direction. VDSL2 is defined in G.993.2.   |
| VDSL Profile     | VDSL2 profiles differ in the width of the frequency band used to transmit the broadband signal. Profiles that use a wider frequency band can deliver higher maximum speeds.   |

Table 19 Network Setting &gt; Broadband &gt; Advanced (continued)

| LABEL                                  | DESCRIPTION   |
|--|---|
| 8a, 8b, 8c, 8d, 12a, 12b, 17a, 35b US0 | The G.993.2 VDSL standard defines a wide range of profiles that can be used in different VDSL deployment settings, such as in a central office, a street cabinet or a building.<br><br>The Zyxel Device must comply with at least one profile specified in G.993.2. but compliance with more than one profile is allowed. |
| Cancel                                 | Click <b>Cancel</b> to return to the previous configuration.  |
| Apply                                  | Click <b>Apply</b> to save your changes back to the Zyxel Device.   |

## 6.5 GEWAN or SFP

Use this screen to have the 2.5G WAN port act as an Ethernet WAN port or LAN port. Slide the **State** switch to the right to have the 2.5G WAN port act as an Ethernet WAN port. Keep the **State** switch on the left to have the 2.5G WAN port act as an Ethernet LAN port, see [Section 1.1.1 on page 16](#). Click **Apply** to save your changes back to the Zyxel Device.

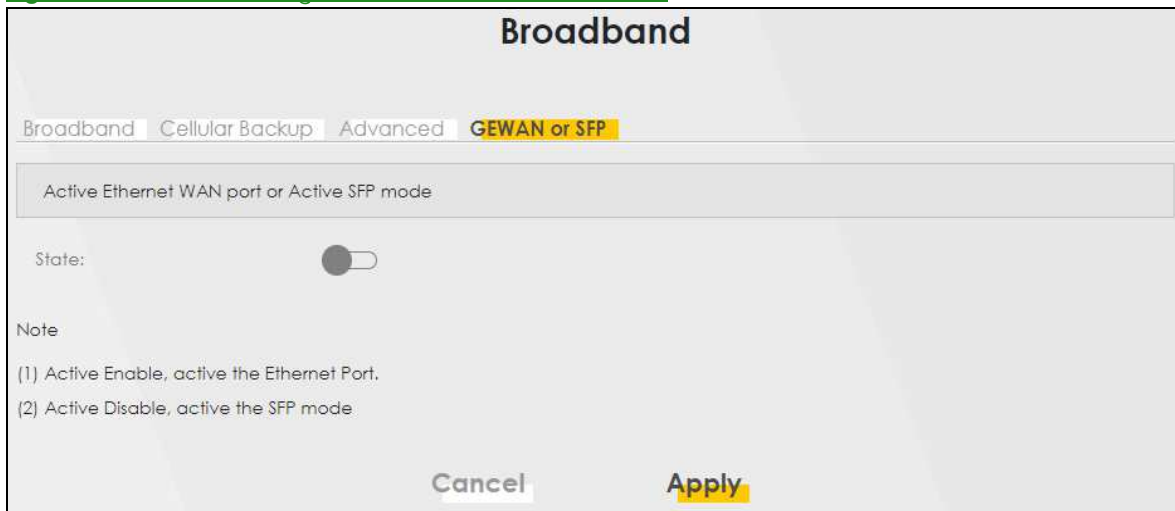
It's not enough to just enable the 2.5G WAN port act as an Ethernet WAN port or LAN port here. You must also go to **Network Setting > Broadband** screen and create a new interface for it with the **Type** as **Ethernet** and **Encapsulation** as **IPoE**, and it's advisable to enable NAT.

The SFP mode is not available at the time of writing.

**Note:** The Ethernet WAN connection has priority over the DSL connection.

Click **Network Setting > Broadband > GEWAN or SFP** to display the following screen.

Figure 48 Network Setting &gt; Broadband &gt; GEWAN or SFP



## 6.6 Technical Reference

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

## **Encapsulation**

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

### **IP over Ethernet**

IP over Ethernet (IPoE) is an alternative to PPPoE. IP packets are being delivered across an Ethernet network, without using PPP encapsulation. They are routed between the Ethernet interface and the WAN interface and then formatted so that they can be understood in a bridged environment. For instance, it encapsulates routed Ethernet frames into bridged Ethernet cells.

### **PPP over ATM (PPPoA)**

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

### **PPP over Ethernet (PPPoE)**

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

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

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

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

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

## **RFC 1483**

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

## **Multiplexing**

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

### VC-based Multiplexing

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

### LLC-based Multiplexing

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

## **Traffic Shaping**

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

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

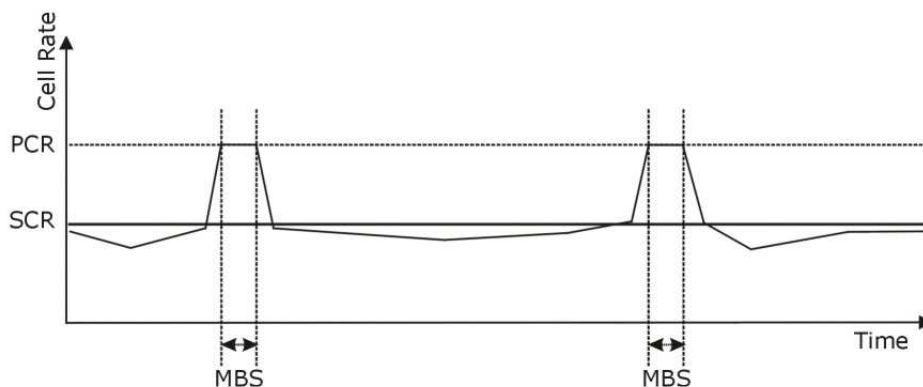
Sustained Cell Rate (SCR) is the mean cell rate of each bursty traffic source. It specifies the maximum average rate at which cells can be sent over the virtual connection. SCR may not be greater than the PCR.

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

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

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

**Figure 49** Example of Traffic Shaping





## **ATM Traffic Classes**

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

### Constant Bit Rate (CBR)

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

### Variable Bit Rate (VBR)

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

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

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

### Unspecified Bit Rate (UBR)

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

## **IP Address Assignment**

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

## **Introduction to VLANs**

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

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

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

## **Introduction to IEEE 802.1Q Tagged VLAN**

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

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

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

## **Multicast**

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

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

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

## **DNS Server Address Assignment**

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

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

- 1 The ISP tells you the DNS server addresses, usually in the form of an information sheet, when you sign up. If your ISP gives you DNS server addresses, manually enter them in the DNS server fields.
- 2 If your ISP dynamically assigns the DNS server IP addresses (along with the Zyxel Device's WAN IP address), set the DNS server fields to get the DNS server address from the ISP.

## **IPv6 Addressing**

The 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address 2001:0db8:1a2b:0015:0000:0000:1a2f:0000.

IPv6 addresses can be abbreviated in two ways:

- Leading zeros in a block can be omitted. So 2001:0db8:1a2b:0015:0000:0000:1a2f:0000 can be written as 2001:db8:1a2b:15:0:0:1a2f:0.
- Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So 2001:0db8:0000:0000:1a2f:0000:0000:0015 can be written as 2001:0db8::1a2f:0000:0000:0015, 2001:0db8:0000:0000:1a2f::0015, 2001:db8::1a2f:0:0:15 or 2001:db8:0:0:1a2f::15.

## **IPv6 Prefix and Prefix Length**

Similar to an IPv4 subnet mask, IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example,

2001:db8:1a2b:15::1a2f:0/32

means that the first 32 bits (2001:db8) is the subnet prefix.