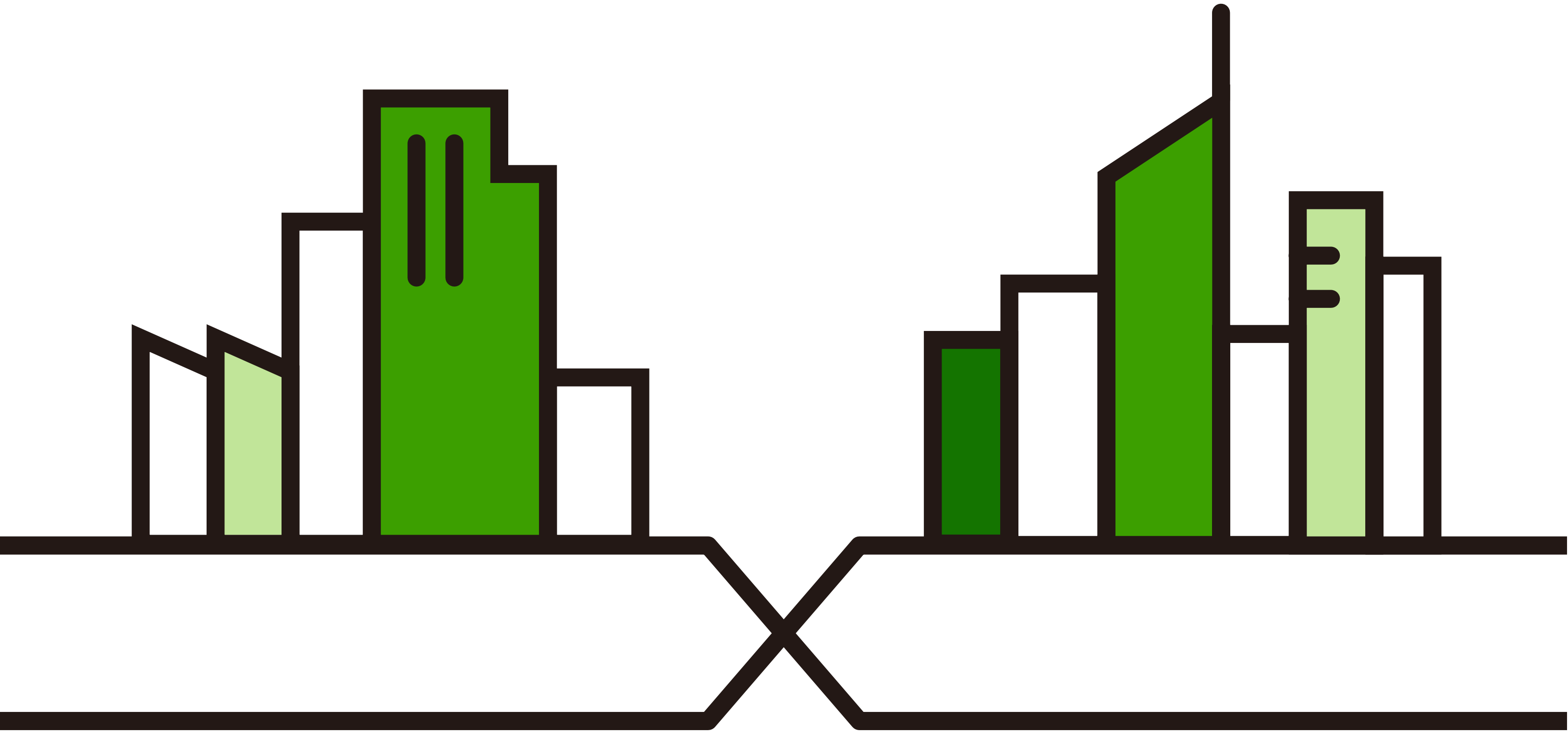
User's Guide

Nebula Mobile Router

Default Login Details	
LAN IP Address	http://192.168.1.1
User Name	admin
Password	See the Zyxel Device label

Version 1.15-1.60 Ed 1, 12/2025



IMPORTANT!

READ CAREFULLY BEFORE USE.

KEEP THIS GUIDE FOR FUTURE REFERENCE.

This is a User's Guide for a series of products. Not all products support all firmware features. Screenshots and graphics in this book may differ slightly from your product due to differences in product features or web configurator brand style. Every effort has been made to ensure that the information in this manual is accurate.

Related Documentation

- Quick Start Guide

  The Quick Start Guide shows how to connect the Zyxel Device.
- The Nebula Control Center help portal

  Go to *https://nebula.zyxel.com/cc/ui/index.html#/help* to register the Zyxel Device to the NCC.
- The Zyxel Air app help

  Go to *https://service-provider.zyxel.com/app-help/ZyxelAir/index.html* to find the best location to place the Zyxel Device.
- More Information

  Go to *support.zyxel.com* to find other information on the Zyxel Device.

Document Conventions

Warnings and Notes

These are how warnings and notes are shown in this guide.

Warnings tell you about things that could harm you or your Zyxel Device.

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

Syntax Conventions

- Product labels, screen names, field labels and field choices are all in bold font.
- A right angle bracket (>) within a screen name denotes a mouse click. For example, Network Setting > Routing > DNS Route means you first click Network Setting in the navigation panel, then the Routing submenu, and then finally the DNS Route tab to get to that screen.

Icons Used in Figures

Figures in this user guide may use the following generic icons. The Zyxel Device icon is not an exact representation of your Zyxel Device.

Zyxel Device 	Generic Router 	Switch
Server 	Firewall 	USB Storage Device
Printer 	4G LTE or 5G NR Base Station 	Desktop
Laptop 	Smart TV 	Wireless Device

Accessibility and Compatibility

Introduction

This User’s Guide complies with the accessibility requirements set out in EAA (European Accessibility Act) (EU) 2019/882.

Accessibility makes this User’s Guide usable for people with disabilities, including those with visual, auditory, motor, and cognitive impairments. Compatibility ensures this User’s Guide works well with a wide range of devices, software, and assistive technologies.

Accessibility Feature – Screen Reader Support

The visually impaired may use screen readers, such as NVDA to read contents.

To use the screen reader, do the following:

1 Open your screen reader software.

2 Navigate to this User’s Guide; the screen reader should automatically start reading the contents.

3 Use the keyboard shortcuts to navigate through this User’s Guide (refer to the screen reader documentation).

Accessibility Feature – Keyboard Navigation

Keyboard navigation allows you to read the contents in this User’s Guide without a mouse. Use the following keys.

- Tab key: navigate between interactive elements (for example, buttons, links, fields).
- Enter key: select or activate the highlighted item.
- Arrow keys: move between options in menus or lists.
- Esc (Escape) key: close pop-up windows or cancel actions.

How to Get Support

If you are an Internet Service Provider (ISP), please contact your Zyxel sales or service representative for direct support.

If you obtained your Zyxel Device from an ISP, please contact your ISP's support team directly, as the Zyxel Devices may have custom configurations.

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Part I

User's Guide

CHAPTER 1 Introduction

1.1 Overview

The Zyxel Device refers to the following models:

Indoor Mobile Routers

- Nebula LTE3301-PLUS (4G LTE-A Indoor Router)
- Nebula NR5101 (5G NR Indoor IAD)
- Nebula FWA505 (5G NR Indoor IAD)
- Nebula FWA510 (5G NR Indoor IAD)
- Nebula FWA515 (5G NR Indoor IAD)

Outdoor Mobile Routers

- Nebula LTE7461-M602 (4G LTE-A Outdoor Router)
- Nebula NR7101 (5G New Radio Outdoor Router)
- Nebula FWA70 (5G New Radio Outdoor Router)
- Nebula FWA710 (5G New Radio Outdoor Router)

1.1.1 Feature Differences

The Zyxel Device is a router that supports (but is not limited to) the following features. Note the following differences between the Zyxel Device models:

Table 1 Feature Differences 1

FEATURE/MODEL	NEBULA LTE3301-PLUS	NEBULA LTE7461-M602	NEBULA NR5101	NEBULA NR7101
2.4G WiFi	Y	Y (for config only)	Y	Y (for config only)
5G WiFi	Y	N	Y	N
1G LAN Port	Y	Y	Y	Y
2.5G LAN Port	N	N	N	N
External Antenna Support	Y	N	Y	N
Ethernet WAN	Y	N	Y	N
Dual SIM Slots	N	N	N	Y
Cellular Backup	Y	N	Y	Y
Cellular IP Passthrough	Y	Y	Y	Y
Cellular Lock	Y	Y	N	Y
Cellular SMS	Y	N	Y	N

Table 1 Feature Differences 1 (continued)

FEATURE/MODEL	NEBULA LTE3301-PLUS	NEBULA LTE7461-M602	NEBULA NR5101	NEBULA NR7101
Guest/More AP	Y	N	Y	N
More AP Edit	Y	N	Y	N
WLAN Scheduler	Y	N	Y	N
Channel Status	N	N	N	N
USB File Sharing	Y	N	Y	N
Parental Control	Y	N	Y	N
Network Monitoring	N	Y	Y	Y
Proxy ARP	N	N	N	Y
FQ_Codel (Fair Queuing with Controlled Delay)	N	N	N	Y
PIN Modification	Y	Y	Y	Y
IGMP Proxy	Y	Y	Y	Y
MLD Proxy	Y	Y	Y	Y
Fullcone NAT	N	Y	Y	Y
464XLAT	N	N	N	N
DHCP	Y	Y	Y	Y
DHCP Options	Y	Y	Y	Y
Policy Route	Y	Y	Y	Y
RIP	Y	Y	Y	N
ALG	Y	Y	Y	Y
Port Triggering	Y	Y	Y	Y
Dynamic DNS	Y	Y	Y	Y
VLAN Group	N	N	N	Y
Interface Grouping	Y	Y	Y	Y
Speed Test	N	Y	N	Y
XMPP	N	N	N	Y
TR-069 Client	Y	Y	Y	Y
TR-369 Local Agent	N	N	N	N
Email Notification	Y	Y	Y	Y
Module Upgrade	N	N	N	Y
Schedule Reboot	Y (NCC Web Portal)	Y	Y	Y
Firmware Version	1.15	1.15	1.15	1.15

Table 2 Feature Differences 2

FEATURE/MODEL	NEBULA FWA505	NEBULA FWA510	NEBULA FWA710	NEBULA FWA515
2.4G WiFi	Y	Y	Y (for config only)	Y
5G WiFi	Y	Y	N	Y
1G LAN Port	Y	N	N	N
2.5G LAN Port	N	Y	Y	Y

Table 2   Feature Differences 2 (continued)

FEATURE/MODEL	NEBULA FWA505	NEBULA FWA510	NEBULA FWA710	NEBULA FWA515
External Antenna Support	Y	Y	N	Y
Ethernet WAN	Y	Y	N	Y
Dual SIM Slots	N	N	N	N
Cellular Backup	Y	Y	N	Y
Cellular IP Passthrough	Y	Y	Y	Y
Cellular Lock	N	N	Y	N
Cellular SMS	Y	Y	N	Y
Guest/More AP	Y	Y	N	Y
More AP Edit	Y	Y	N	Y
WLAN Scheduler	Y	Y	N	Y
Channel Status	Y	Y	N	Y
USB File Sharing	Y	Y	N	Y
Parental Control	Y	N	N	N
Network Monitoring	N	Y	Y	Y
Proxy ARP	N	N	Y	N
FQ_Codel (Fair Queuing with Controlled Delay)	N	N	N	N
PIN Modification	Y	Y	Y	Y
IGMP Proxy	Y	Y	Y	Y
MLD Proxy	Y	Y	N	Y
Fullcone NAT	Y	Y	N	Y
464XLAT	Y	Y	N	Y
DHCP	Y	Y	Y	Y
DHCP Options	Y	Y	Y *Supports Custom DHCP Options screen	Y
Policy Route	N	N	Y	N
RIP	N	Y	N	Y
ALG	N	N	N	N
Port Triggering	N	N	N	N
Dynamic DNS	N	N	Y	N
VLAN Group	N	N	Y	N
Interface Grouping	N	N	Y	N
Speed Test	N	N	Y	N
XMPP	N	N	N	N
TR-069 Client	Y	Y	Y	Y
TR-369 Local Agent	N	N	N	Y
Email Notification	N	N	N	N
Module Upgrade	N	N	N	N

Table 2 Feature Differences 2 (continued)

FEATURE/MODEL	NEBULA FWA505	NEBULA FWA510	NEBULA FWA710	NEBULA FWA515
Schedule Reboot	Y (NCC Web Portal)	Y (NCC Web Portal)	Y (NCC Web Portal)	Y (NCC Web Portal)
Firmware Version	1.18	1.15	1.15	1.50

Table 3 Feature Differences 3

FEATURE/MODEL	NEBULA FWA70
2.4G WiFi	Y (for config only)
5G WiFi	N
1G LAN Port	N
2.5G LAN Port	Y
External Antenna Support	N
Ethernet WAN	N
Dual SIM Slots	N
Cellular Backup	N
Cellular IP Passthrough	Y
Cellular Lock	Y
Cellular SMS	N
Guest/More AP	N
More AP Edit	N
WLAN Scheduler	N
Channel Status	N
USB File Sharing	N
Parental Control	N
Network Monitoring	N
Proxy ARP	Y
FQ_Codel (Fair Queuing with Controlled Delay)	N
PIN Modification	Y
IGMP Proxy	Y
MLD Proxy	N
Fullcone NAT	N
464XLAT	N
DHCP	Y
DHCP Options	Y *Supports Custom DHCP Options screen
Policy Route	Y
RIP	N
ALG	N
Port Triggering	N
Dynamic DNS	Y

Table 3 Feature Differences 3 (continued)

FEATURE/MODEL	NEBULA FWA70
VLAN Group	Y
Interface Grouping	N
Speed Test	N
XMPP	N
TR-069 Client	Y
TR-369 Local Agent	Y
Email Notification	N
Module Upgrade	N
Schedule Reboot	Y (NCC Web Portal)
Firmware Version	1.60

See the Quick Start Guide for how to do the hardware installation, mounting, and Internet setup.

1.2 Nebula Management

You can manage the Zyxel Device with the Zyxel Nebula Control Center. The Zyxel Nebula Control Center (NCC) is a cloud-based network management system that allows you to remotely manage and monitor Zyxel Nebula routers. You need to create a Zyxel Account to log into the NCC for management first. You can access the NCC through the NCC web portal through a web browser on your computer or the Nebula Mobile app on your smartphone, see Section 1.4 on page 28 for more information.

For more information on configuring the Zyxel Device on the NCC, go to *https://nebula.zyxel.com/cc/ui/index.html#/help*. You will be prompted to log into the NCC using your NCC account.

For advanced configurations, such as configuring WAN settings, wireless LAN settings and firewall settings, use the Zyxel Device Web Configurator. To find the best place for your Zyxel Device to receive the optimal cellular signal or perform a signal strength test, use the Zyxel Air app.

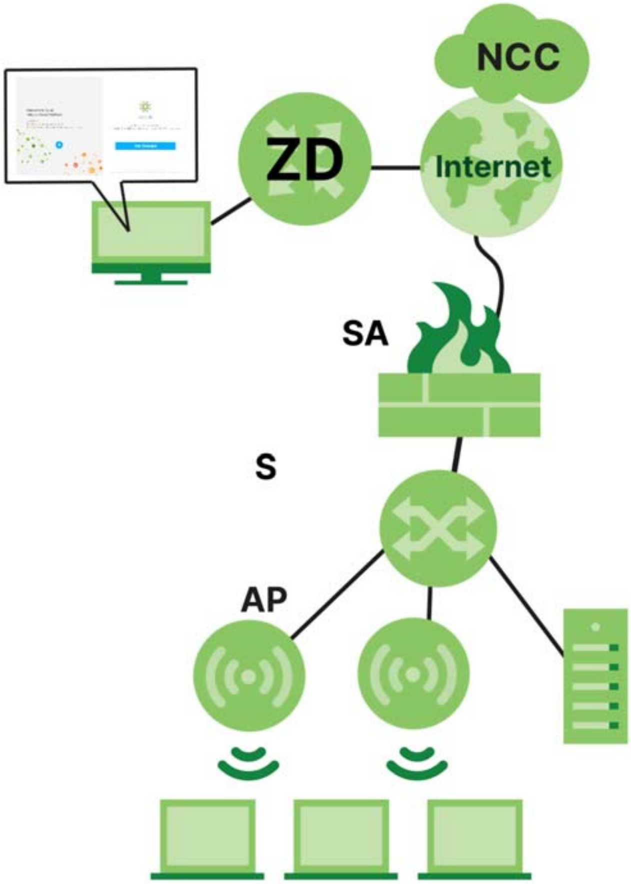
Table 4 Management Methods

MANAGEMENT METHOD	WHEN TO USE IT
Nebula Mobile APP	Registration and Monitoring
NCC Web Portal	Registration, Monitoring and Basic Management
Zyxel Device Web Configurator	Advanced Management
ZyxelAir App	Zyxel Device Installation

Note: The configurations you make in the NCC have priority over the configurations in the Web Configurator and the Zyxel Air app.

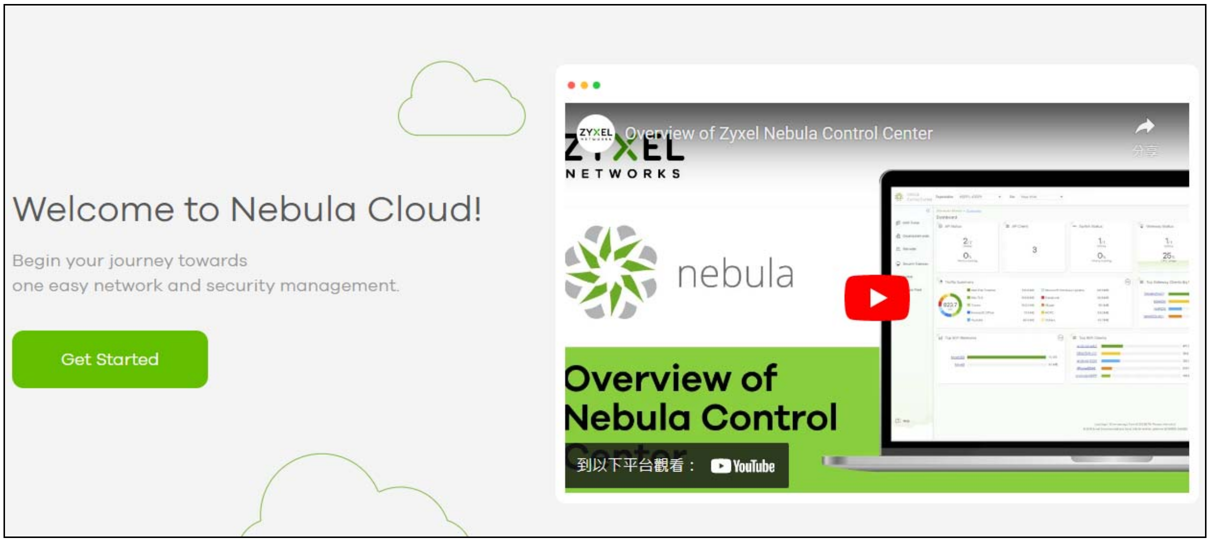
The Nebula Control Center (NCC) is an alternative cloud-based network management system that allows you to remotely manage and monitor the Zyxel Nebula Security Appliances (SA), Ethernet Switches (S), and Access Points (AP). You may also access the Web Configurator in cloud mode.

Figure 1 NCC Example Network Topology



1.2.1 Register Your Zyxel Device Using the Nebula Web Portal

1 Go to *https://nebula.zyxel.com*. Click Get Started.



Welcome to Nebula Cloud!

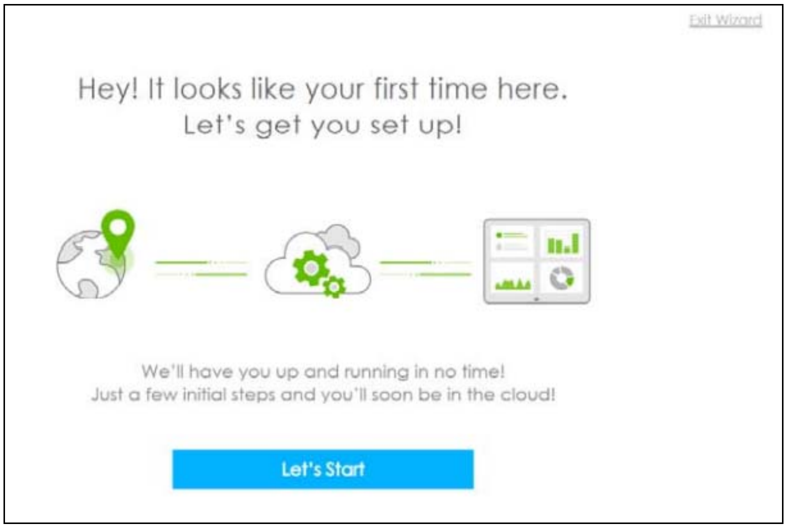
Begin your journey towards
one easy network and security management.

Get Started
Overview of Zyxel Nebula Control Center
ZYXEL NETWORKS
nebula
Overview of Nebula Control Center
到以下平台觀看： YouTube

2 The login screen displays. Enter your Zyxel Account information to log in. If you do not have one, click Create account. You will be redirected to another screen where you can sign up for a Zyxel Account.

3 Click Create organization to create an organization and a site (using the Nebula setup wizard), or select an existing site.

4 If you are creating the first organization under your account, click Let's Start to begin.



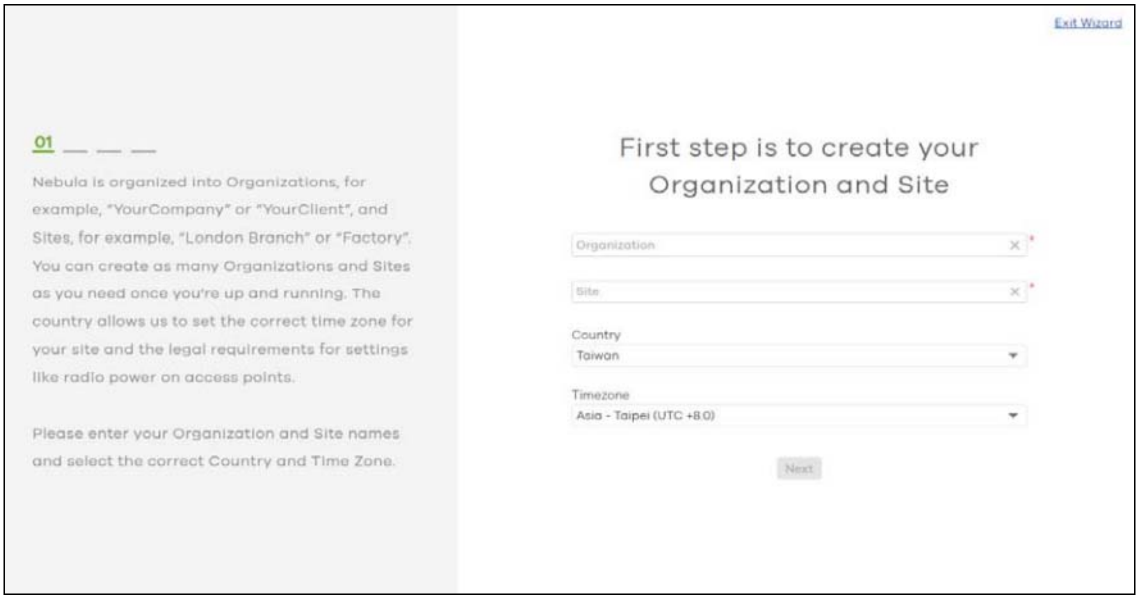
Hey! It looks like your first time here.
Let's get you set up!

We'll have you up and running in no time!
Just a few initial steps and you'll soon be in the cloud!

5 Enter a descriptive name for your organization and site. Both names must consist of 1 to 64 characters.

6 Select the time zone of your location. This will set the time difference between your time zone and Coordinated Universal Time (UTC).

7 Click Next to continue.



Nebula is organized into Organizations, for example, "YourCompany" or "YourClient", and Sites, for example, "London Branch" or "Factory". You can create as many Organizations and Sites as you need once you're up and running. The country allows us to set the correct time zone for your site and the legal requirements for settings like radio power on access points.

Please enter your Organization and Site names and select the correct Country and Time Zone.

First step is to create your Organization and Site

Organization *

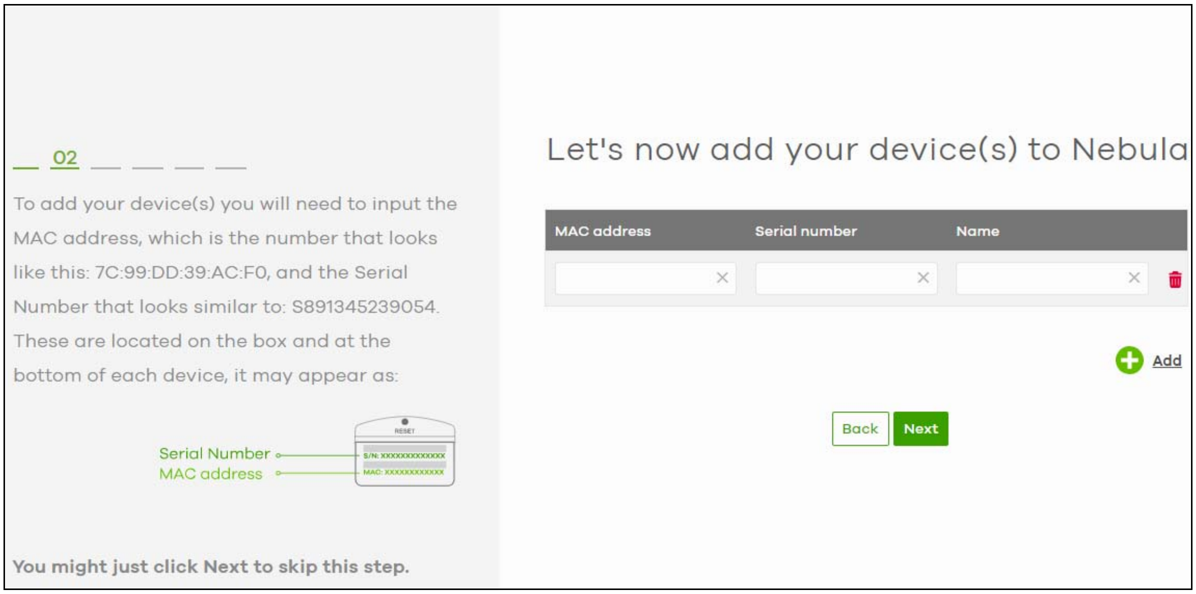
Site *

Country
Taiwan

Timezone
Asia - Taipei (UTC +8.0)

8 Enter your Zyxel Device MAC address and serial number. Enter a descriptive name for your Zyxel Device.

9 Click the +Add button to register and add the Zyxel Device to the site. You can register multiple Zyxel Device at a time.



02

To add your device(s) you will need to input the MAC address, which is the number that looks like this: 7C:99:DD:39:AC:F0, and the Serial Number that looks similar to: S891345239054. These are located on the box and at the bottom of each device, it may appear as:

You might just click Next to skip this step.

Let's now add your device(s) to Nebula

MAC address	Serial number	Name

10 Click Next to proceed to setting up your WiFi network and guest WiFi network.

Note: Your default web configurator login password will be changed when you register your Zyxel Device at NCC. Make sure to check the changed password and change it to your preferred one before logging in the web configurator. The password must be at least 8 characters long, including one letter and one number. ~!@#$%^&*()_+’-={};:<> are allowed.

1.3 Applications for the Zyxel Device

See the above table for which applications are supported by your Zyxel Device.

Wireless WAN

The Zyxel Device can connect to the Internet through a 4G/5G SIM card to access a wireless WAN connection. Just insert a SIM card into the SIM card slot of the Zyxel Device.

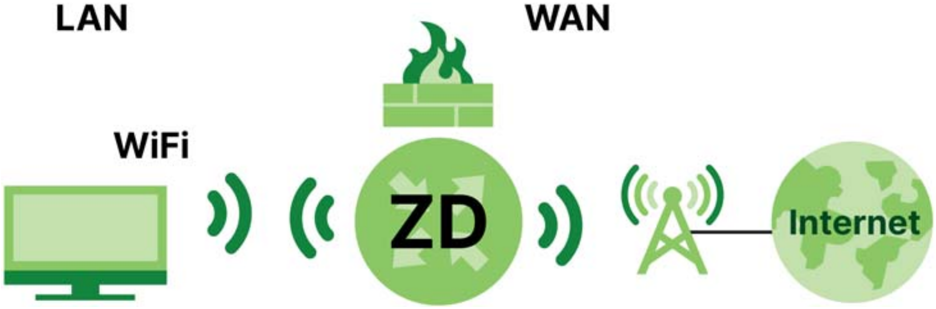
You can also install external antennas to improve your wireless WAN signal strength, see Table 1 on page 18 for more information.

Note: You must insert the SIM card into the card slot before turning on the Zyxel Device.

Internet Access

Your Zyxel Device provides shared Internet access by connecting to a cellular network. A computer can connect to the Zyxel Device’s LAN port for configuration through the Web Configurator.

Figure 2 Zyxel Device’s Internet Access Application

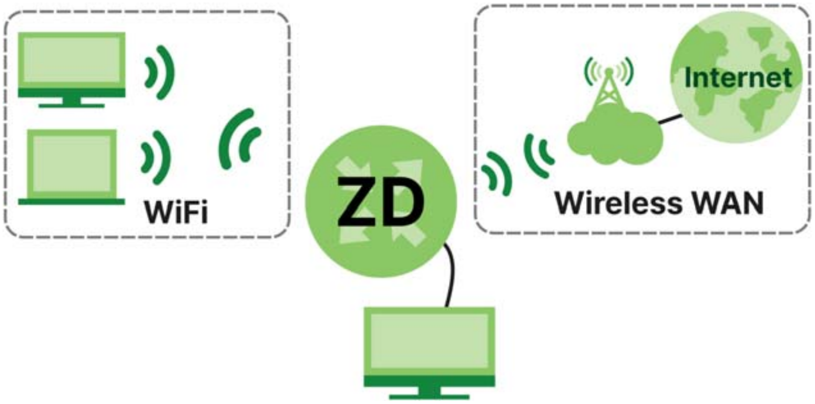


Wireless LAN (WiFi)

WiFi clients can connect to the Zyxel Device to access network resources and the Internet. The Zyxel Device supports WiFi Protected Setup (WPS), which allows you to quickly set up a WiFi network with strong security.

Your Zyxel Device WiFi may only be for configuration, see Table 1 on page 18 for more information.

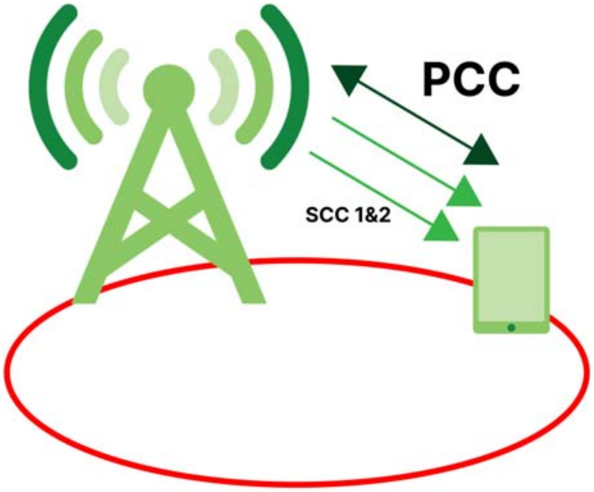
Figure 3 Zyxel Device’s Wireless LAN



Carrier Aggregation

Carrier Aggregation (CA) is a technology to deliver high downlink data rates by combining more than one carrier in the same or different bands together.

Figure 4   Zyxel Device's CA Application



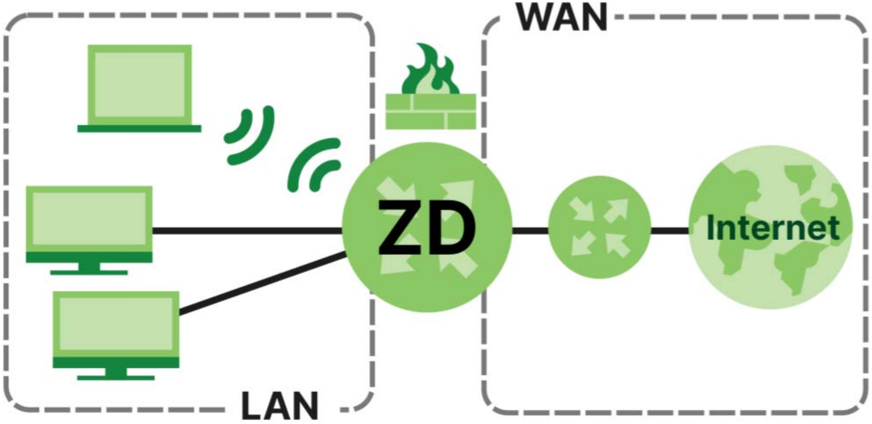
Ethernet WAN

Connect the WAN port to the Internet. Connect computers to the Zyxel Device's LAN ports, or wirelessly, and access the Internet simultaneously.

If you have another broadband modem or router available, you can use the Ethernet WAN port and then connect it to the broadband modem or router. This way, you can access the Internet through an Ethernet connection and still use the Firewall function on the Zyxel Device.

See Section 1.1.1 on page 18 to see if your Zyxel Device supports an Ethernet WAN port.

Figure 5   Zyxel Device's Internet Access Application: Ethernet WAN



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

Cellular Backup

Some Zyxel Devices support a WAN backup connection to ensure always-on Internet connectivity.

For Zyxel Devices that support Ethernet WAN, when the Ethernet WAN goes down, the Zyxel Devices automatically switch to use the cellular WAN connection.

The WAN connection priority is as follows:

1. Ethernet WAN
2. Cellular WAN

For Zyxel Devices that support dual SIM slots, when the primary cellular WAN goes down, the Zyxel Devices automatically switch to use the backup connection on the second SIM card.

See Section 1.1.1 on page 18 to see if your Zyxel Device supports Cellular Backup.

1.4 How to Manage your Zyxel Device

You can use the following way to manage your Zyxel Device.

- Web Configurator. This is recommended for everyday management of Zyxel Device using a (supported) web browser.
- Nebula Control Center Web Portal. Use the NCC web portal to monitor your Zyxel Device. You can register your Zyxel Device to a site and organization using the NCC web portal.
- Nebula Mobile App. Use the Nebula mobile app to monitor your Zyxel Device. You can register your Zyxel Device to a site and organization using the Nebula Mobile app. Download the Nebula Mobile app at Apple Store or Google Play.
- Zyxel Air. Use the Zyxel Air app (available on the App Store for Apple devices and Google Pay for Android devices) for setup and management of the Zyxel Device on your smartphone. You can also use the app for finding the optimal 5G NR signal strength. This User's Guide provides information about using the Zyxel Air app. To install the app, scan the QR code on the QSG.

1.5 Good Habits for Managing the Zyxel Device

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

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

CHAPTER 2
Hardware Panels

2.1 Overview

This chapter describes the LEDs and port panels of the Zyxel Device.

2.2 LEDs

The following figures show the Zyxel Device LED indicators. None of the LEDs are on if the Zyxel Device is not receiving power.

Note: Blinking (slow) means the LED blinks once per second. Blinking (fast) means the LED blinks once per 0.5 second.

Indoor Mobile Routers

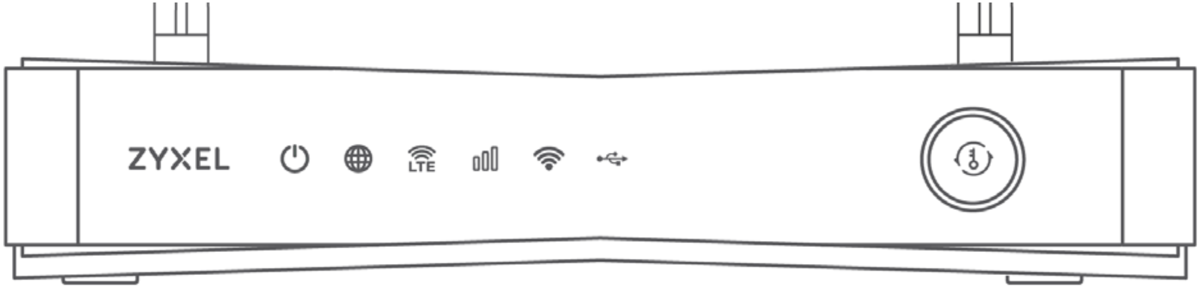
- Nebula LTE3301-PLUS
- Nebula NR5101
- Nebula FWA505
- Nebula FWA510
- Nebula FWA515

Outdoor Mobile Routers

- Nebula LTE7641-M602
- Nebula NR7101
- Nebula FWA70
- Nebula FWA710

Nebula LTE3301-PLUS

Figure 6 LED Indicators (Nebula LTE3301-PLUS)



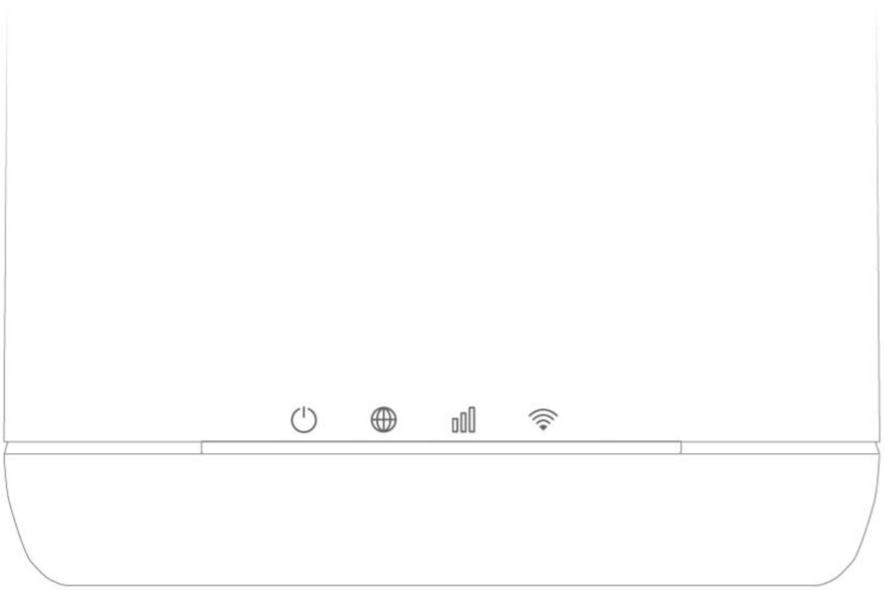
The following are the LED descriptions for your Zyxel Device.

Table 5 LED Descriptions (Nebula LTE3301-PLUS)

LED	COLOR	STATUS	DESCRIPTION
POWER	White	On	The Zyxel Device is receiving power and ready for use.
		Blinking	The Zyxel Device is booting or self-testing.
		Off	The Zyxel Device is not receiving power.
Internet	White	On	There is Internet connection.
		Blinking	The Zyxel Device is sending or receiving IP traffic.
		Off	There is no Internet connection.
LTE/3G	White	On	The Zyxel Device is registered and successfully connected to a 4G network.
		Blinking (slow)	The Zyxel Device is connected to a 3G network.
		Blinking (fast)	The Zyxel Device is trying to connect to a 3G/4G network.
		Off	There is no service.
	Green	On	The Zyxel Device has an Ethernet connection on the WAN.
		Off	There is no Ethernet connection on the WAN.
Signal Strength	Green	On	The signal strength is excellent.
	Amber	On	The signal strength is fair.
	Red	On	The signal strength is poor.
		Blinking	There is no SIM card inserted, no signal, or the signal strength is below the poor level.
		Off	The SIM card is invalid, or the PIN code is not correct.
WLAN	Green	On	The 2.4G wireless network is activated.
		Blinking (slow)	The Zyxel Device is setting up a WPS connection with a 2.4G wireless client.
		Blinking (fast)	The Zyxel Device is communicating with 2.4G wireless clients.
	White	On	The 5G wireless network is activated.
		Blinking (slow)	The Zyxel Device is setting up a WPS connection with a 5G wireless client.
		Blinking (fast)	The Zyxel Device is communicating with 2.4G and 5G wireless clients.
		Off	The wireless network is not activated.
USB	White	On	The Zyxel Device recognizes a USB connection through the USB port.
		Blinking	The Zyxel Device is sending/receiving data to/from the USB device connected to it.
		Off	The Zyxel Device does not detect a USB connection through the USB port.

Nebula NR5101

Figure 7 LED Indicators (Nebula NR5101 LED)



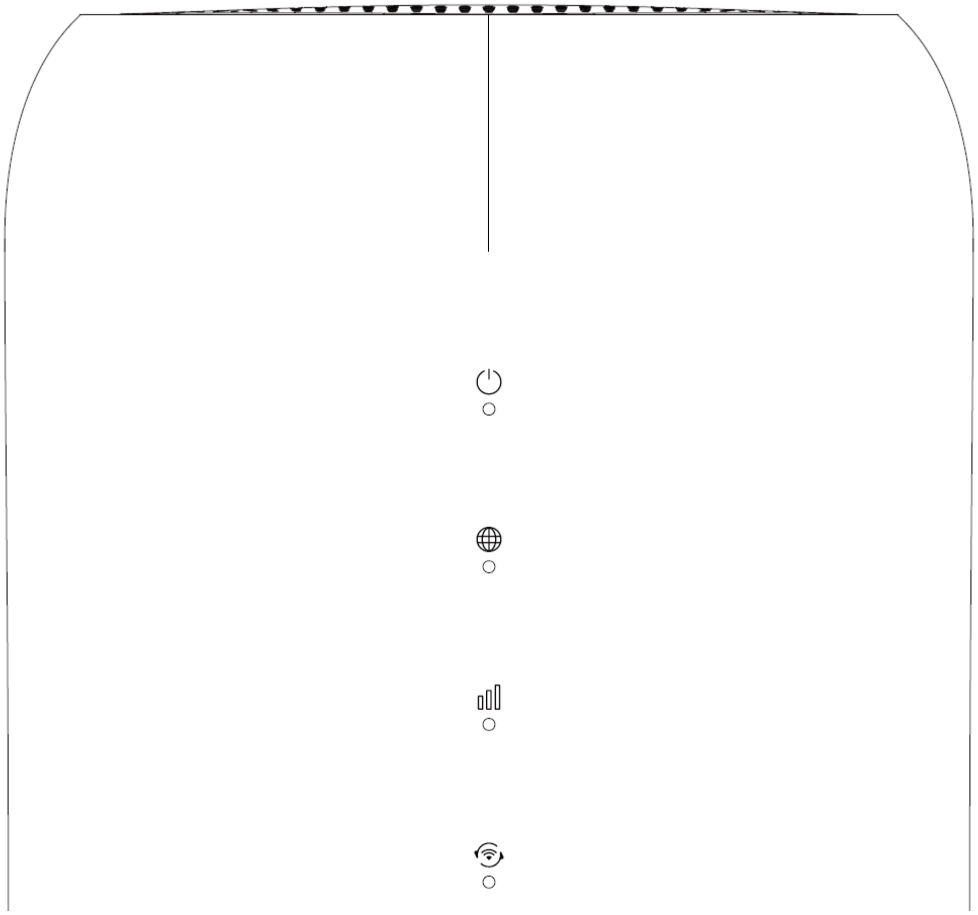
The following are the LED descriptions for your Zyxel Device.

Table 6 LED Descriptions (Nebula NR5101 LED Behavior)

LED	COLOR	STATUS	DESCRIPTION
Power/USB ⏻	Green	On	The Zyxel Device is receiving power and ready for use.
		Blinking	The Zyxel Device is booting.
		Off	The Zyxel Device is not receiving power.
	Blue	On	A USB device is connected to the USB port on the Zyxel Device.
Internet/SMS 🌐	Green	On	The Zyxel Device is connected to the Internet using 3G/4G.
		Blinking	There is a new SMS message.
		Off	The Zyxel Device is not connected to the Internet.
	Blue	On	The Zyxel Device is connected to the Internet using 5G.
Cellular Signal Strength 📶	Green	On	The signal strength is excellent.
	Orange	On	The signal strength is fair.
	Red	On	The signal strength is poor.
		Blinking	There is no cellular signal, or signal strength is below the poor level.
WiFi/WPS 🛜	Green	On	WiFi is enabled.
		Blinking (fast)	Data is being transmitted and received.
		Blinking (slow)	WPS is activated, and the Zyxel Device is establishing a WPS connection.

Nebula FWA505

Figure 8 LED Indicators (Nebula FWA505 LED)



The following are the LED descriptions for your Zyxel Device.

Table 7 LED Descriptions (Nebula FWA505)

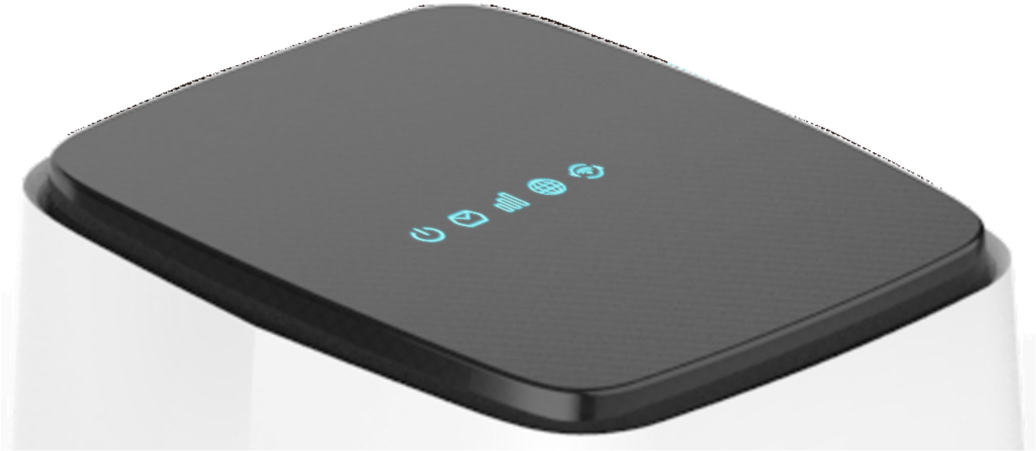
LED	COLOR	STATUS	DESCRIPTION
Power ⏻	Green	On	The Zyxel Device is receiving power and ready for use.
		Blinking	The Zyxel Device is booting.
		Off	The Zyxel Device is not receiving power.
	Red	On	Zyxel Device error, need to take action.
	Blue	On	There is a new SMS message.
		Blinking	The Inbox is full.
Internet 🌐	Blue	On	The Zyxel Device is connected to the Internet using 5G.
	Green	On	The Zyxel Device is connected to the Internet using 4G, or is connected in Ethernet WAN mode.
	Red	On	Internet connection is unavailable.

Table 7 LED Descriptions (Nebula FWA505) (continued)

LED	COLOR	STATUS	DESCRIPTION
Cellular Signal Strength	Blue	On	The signal strength is good.
		Blinking	No SIM card or invalid SIM card.
	Green	On	The signal strength is medium.
	Red	On	The signal strength is poor.
		Blinking	There is no cellular signal, or signal strength is below the poor level.
WiFi/WPS	Green	On	WiFi is enabled.
		Blinking	WPS is activated, and the Zyxel Device is establishing a WPS connection.
		Off	WiFi is disabled.

Nebula FWA510

Figure 9 LED Indicators (Nebula FWA510)



The following are the LED descriptions for your Zyxel Device.

Table 8 LED Descriptions (Nebula FWA510)

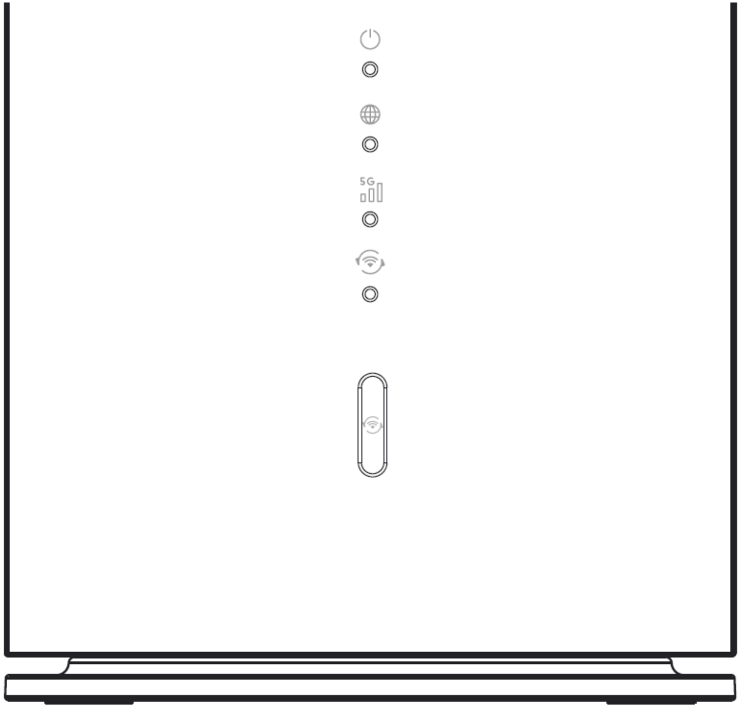
LED	COLOR	STATUS	DESCRIPTION
Power	Green	On	The Zyxel Device is receiving power and ready for use.
		Blinking	The Zyxel Device is booting.
		Off	The Zyxel Device is not receiving power.
	Red	On	Zyxel Device error, need to take action.
SMS	Green	On	There is a new SMS message.
		Blinking	The Inbox is full.
		Off	There is no unread SMS message.
Cellular Signal Strength	Blue	On	The signal strength is good.
	Green	On	The signal strength is medium.
	Red	On	The signal strength is poor.
		Blinking	There is no cellular signal, or signal strength is below the poor level.
		Off	The Zyxel Device is booting.

Table 8 LED Descriptions (Nebula FWA510) (continued)

LED	COLOR	STATUS	DESCRIPTION
Internet	Blue	On	The Zyxel Device is connected to the Internet using 5G.
	Green	On	The Zyxel Device is connected to the Internet using 4G, or is connected in Ethernet WAN mode.
	Red	On	Internet connection is unavailable.
WiFi/WPS	Green	On	WiFi is enabled.
		Blinking	WPS is activated, and the Zyxel Device is establishing a WPS connection.
		Off	WiFi is disabled.

Nebula FWA515

Figure 10 LED Indicators (Nebula FWA515)



The following are the LED descriptions for your Zyxel Device.

Table 9 LED Descriptions (Nebula FWA515)

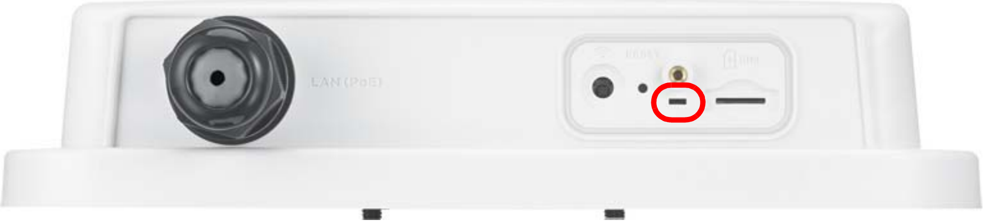
LED	COLOR	STATUS	DESCRIPTION
Power	Blue	On	There is a new SMS message.
		Blinking	The Inbox is full.
	Green	On	The Zyxel Device is receiving power and ready for use.
		Blinking	The Zyxel Device is booting.
		Intermittent On	The Zyxel Device is in power-saving mode.
		Off	The Zyxel Device is not receiving power.
	Red	On	Zyxel Device error, need to take action.

Table 9 LED Descriptions (Nebula FWA515) (continued)

LED	COLOR	STATUS	DESCRIPTION
Internet 🌐	Blue	On	The Zyxel Device is connected to the Internet using 5G.
	Green	On	The Zyxel Device is connected to the Internet using 4G, or is connected in Ethernet WAN mode.
	Red	On	Internet connection is unavailable.
Cellular Signal Strength 5G	Blue	On	The signal strength is good.
		Blinking	No SIM card or invalid SIM card.
	Green	On	The signal strength is medium.
	Red	On	The signal strength is poor.
WiFi/WPS	Green	On	WiFi is enabled.
		Blinking	WPS is activated, and the Zyxel Device is establishing a WPS connection.
		Off	WiFi is disabled.
All LEDs	Green	Blinking	The Zyxel Device is resetting to factory default settings or upgrading firmware.
LED	COLOR	STATUS	DESCRIPTION

Nebula LTE7641-M602

Figure 11 LED Indicators (Nebula LTE7641-M602)



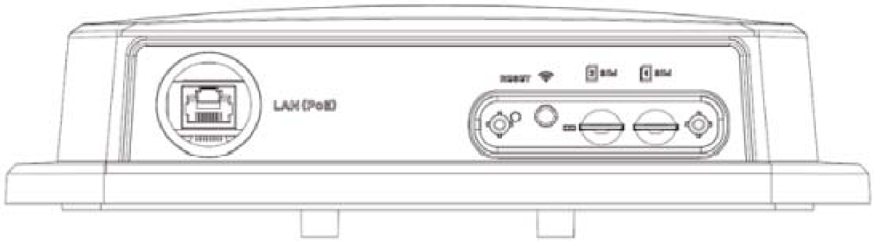
The following are the LED descriptions for your Zyxel Device.

Table 10 LED Descriptions (Nebula LTE7461-M602)

COLOR	STATUS	DESCRIPTION
Red	Blinking	The Zyxel Device is booting or self-testing.
	On	The Zyxel Device encountered an error.
Green	Blinking	The Zyxel Device is trying to connect to the Internet.
	On	The Zyxel Device is connected to the Internet.
Amber	Blinking	The Zyxel Device WiFi is on.

Nebula NR7101

Figure 12 LED Indicators (Nebula NR7101)



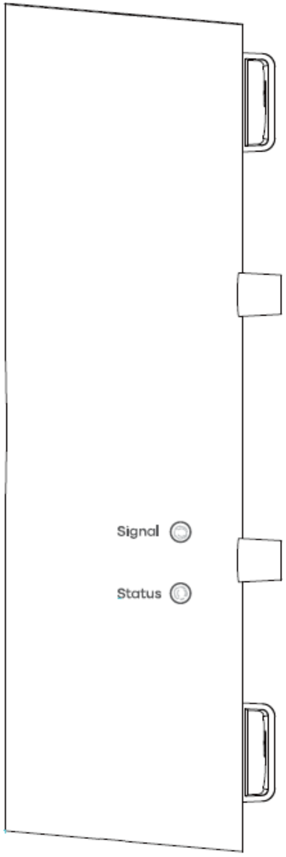
The following are the LED descriptions for your Zyxel Device.

Table 11 LED Descriptions (Nebula NR7101)

COLOR	STATUS	DESCRIPTION
Green	On	The Zyxel Device is connected to the Internet.
	Blinking	The Zyxel Device is trying to connect to the Internet.
Amber	On	The WiFi is activated. The Zyxel Device is connected to the Internet.
	Blinking	The WiFi is activated. The Zyxel Device is not connected to the Internet.
Red	On	The Zyxel Device is not connected to the Internet.
	Blinking	The Zyxel Device is booting or self-testing.
	Off	There is a system failure.
Green/Amber/Red	Looping	Firmware upgrade is in process.

Nebula FWA70

Figure 13 LED Indicators (Nebula FWA70)



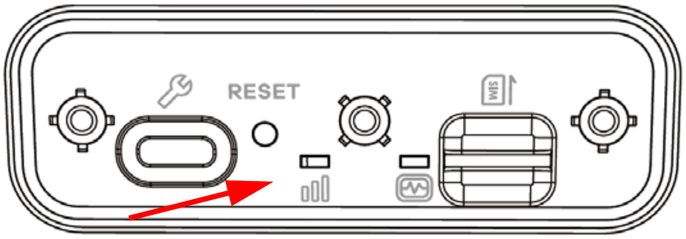
The following are the LED descriptions for your Zyxel Device.

Table 12 LED Descriptions (Nebula FWA70)

LED	COLOR	STATUS	DESCRIPTION
Signal	Green	On	The 5G signal strength is excellent.
		Blinking	The 4G signal strength is excellent.
	Amber	On	The 5G signal strength is fair.
		Blinking	The 4G signal strength is fair.
	Red	On	The 5G signal strength is weak.
		Blinking	The 4G signal strength is weak.
		Off	The Zyxel Device is not connected to the Internet.
Status	Green	On	The Zyxel Device is connected to the Internet with WiFi off.
		Fast blinking	The Zyxel Device is trying to connect to the Internet with WiFi off.
		Slow blinking	The Zyxel Device is booting.
	Amber	On	The Zyxel Device is connected to the Internet with WiFi on.
		Blinking	The Zyxel Device is trying to connect to the Internet with WiFi on.
	Red	On	There is a system failure.
		Off	The power is off.
	Green / Amber / Red	Looping	Firmware upgrade is in progress.

Nebula FWA710

Figure 14 LED Indicators (Nebula FWA710)



The following are the LED descriptions for your Zyxel Device.

Table 13 LED Descriptions (Nebula FWA710)

LED	COLOR	STATUS	DESCRIPTION
Cellular Signal Strength 📶	Green	On	The signal strength is excellent.
	Amber	On	The signal strength is fair.
	Red	On	The signal strength is weak.
		Blinking	There is no cellular signal, or signal strength is below the weak level.

Table 13 LED Descriptions (Nebula FWA710)

LED	COLOR	STATUS	DESCRIPTION
Status	Green	On	The Zyxel Device is connected to the Internet.
		Blinking	The Zyxel Device is trying to connect to the Internet.
		Off	The Zyxel Device is not receiving power.
	Amber	On	The WiFi is on.
	Red	On	There is a system failure.
		Blinking	The Zyxel Device is booting.
	Green/ Amber/Red	Looping	Firmware upgrade is in progress.

2.3 Panel Ports

The following figures show the panel ports and buttons of the Zyxel Device.

Indoor Mobile Routers

- Nebula LTE3301-PLUS
- Nebula NR5101
- Nebula FWA505
- Nebula FWA510
- Nebula FWA515

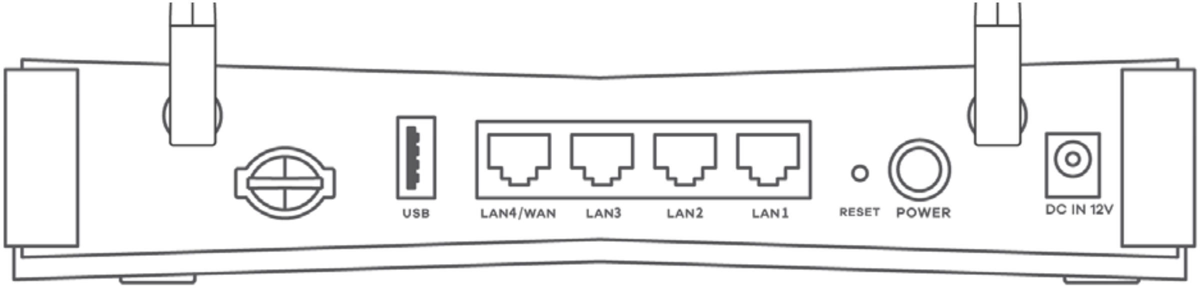
Outdoor Mobile Routers

- Nebula LTE7461-M602
- Nebula NR7101
- Nebula FWA70
- Nebula FWA710

Nebula LTE3301-PLUS

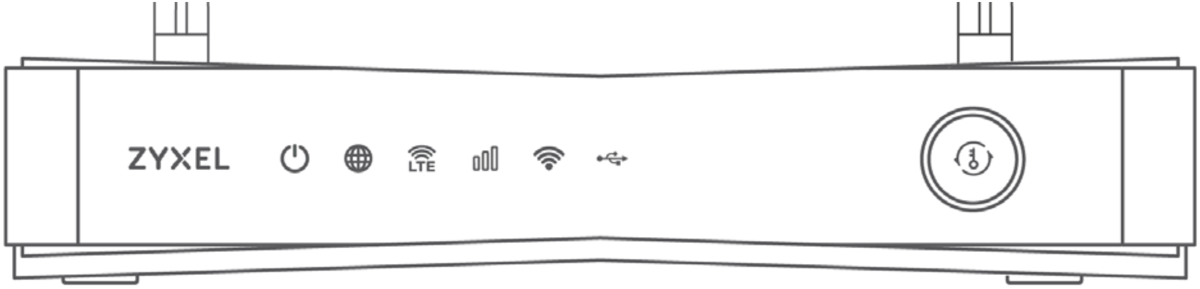
Place the Zyxel Device with the feet at the bottom and the ports facing you. The two antenna ports are located on the rear panel, closer to the top of the Zyxel Device.

Figure 15 Rear Panel (Nebula LTE3301-PLUS)



The WiFi / WPS button is on the front panel of the Zyxel Device, closer to the right, with the ports positioned farther from you.

Figure 16   WPS and WiFi On/Off Button on the Front Panel (Nebula LTE3301-PLUS)



The following table describes the ports and buttons on your Zyxel Device.

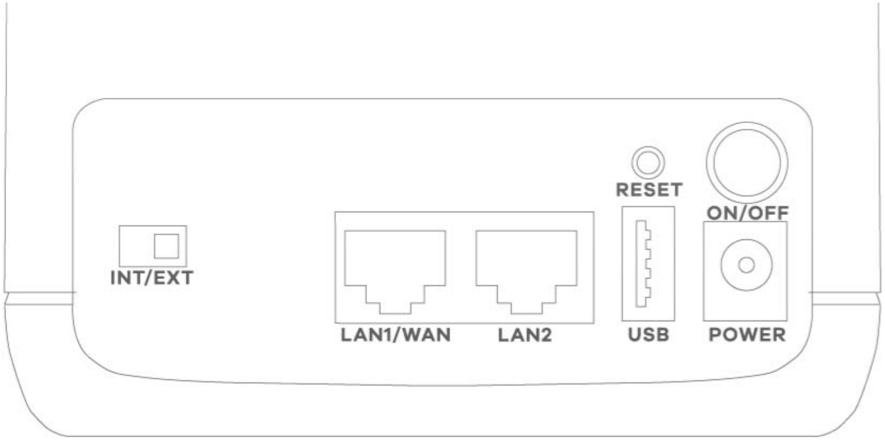
Table 14   Panel Ports and Buttons (Nebula LTE3301-PLUS)

LABELS	DESCRIPTION
ANT1-ANT2	Install the external antennas to strengthen the cellular signal.
Micro SIM	Insert a micro-SIM card into the slot with the chip facing down and the beveled corner in the top left corner.
USB	The USB port of the Zyxel Device is used for file sharing.
LAN4/WAN	LAN mode: LAN4 is a 1G LAN port that supports speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access. WAN mode: The 1G WAN port supports speeds of 100/1000 Mbps. Use an Ethernet cable to connect the WAN port to a gateway/modem for Internet connection.
LAN3- LAN1	LAN3 – LAN1 are 1G LAN ports that support speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access.
RESET	Press the RESET button for more than 5 seconds to return the Zyxel Device to the factory defaults. Press the RESET button for more than 2 seconds but less than 5 seconds, it will cause the system to reboot.
POWER	Press the POWER button after the power adapter is connected to start the Zyxel Device.
POWER / DC IN	Connect the power adapter and press the POWER button to start the Zyxel Device.
WiFi	Press the WLAN (WiFi) button for more than 5 seconds to enable WiFi.
WPS	After WiFi is enabled, press the WLAN button for more than one second but less than 5 seconds to quickly set up a secure wireless connection between the Zyxel Device and a WPS-compatible client.

Nebula NR5101

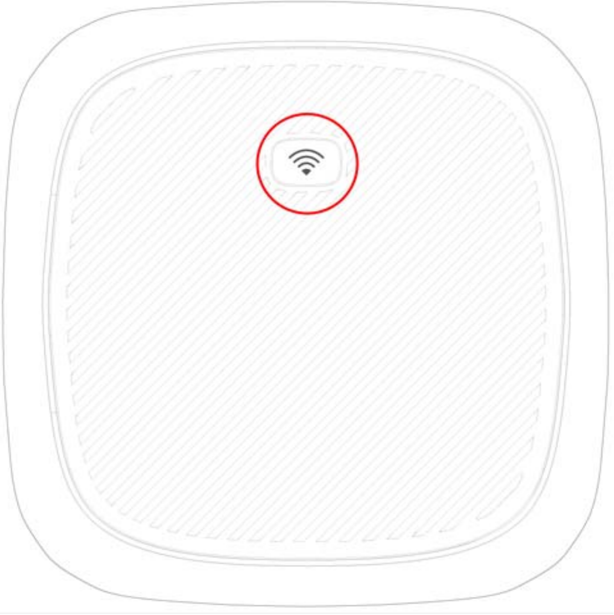
Place the Zyxel Device with the ports facing you and closer to the bottom.

Figure 17 Rear Panel (Nebula NR5101)



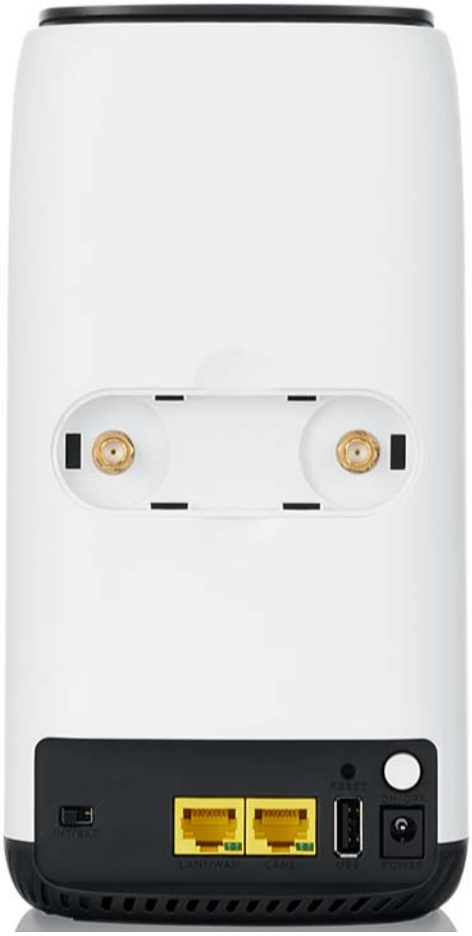
The WPS and WiFi On/Off button is on the top of the Zyxel Device.

Figure 18 WPS and WiFi On/Off Button on the Top Panel (NR5101)



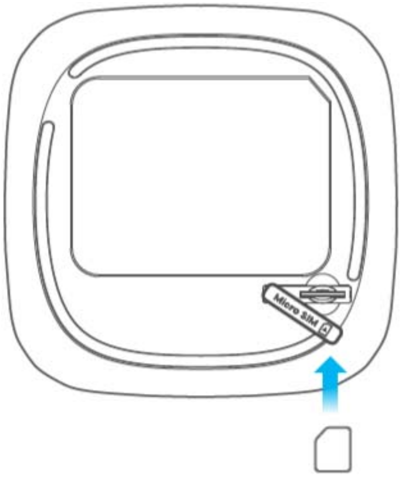
The two antenna ports are in the middle of the rear panel of the Zyxel Device.

Figure 19   Antenna Ports on the Rear Panel (NR5101)



The Micro SIM card slot is on the bottom of the Zyxel Device.

Figure 20   Micro SIM card slot on the bottom panel (NR5101)



The following table describes the ports and buttons on your Zyxel Device.

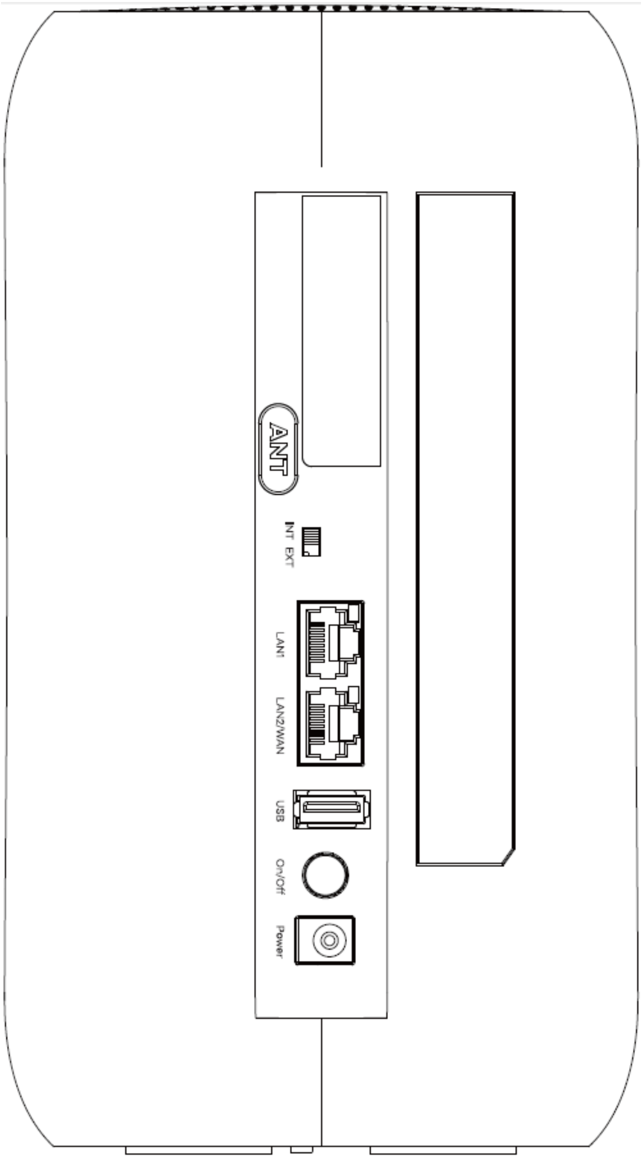
Table 15 Panel Ports and Buttons (Nebula NR5101)

LABELS	DESCRIPTION
WPS/WiFi On and Off	Press for 1 second: Enable or disable WiFi. Press for more than 5 seconds: Activate WPS connection process.
ANT1-ANT2 / Antenna	Install the external antennas to strengthen the cellular signal. Note: To use the external antennas, you must set the INT/EXT switch to EXT.
INT/EXT	Select between the internal or external cellular antennas.
LAN1/WAN	LAN mode: LAN1 is a 1G LAN port that supports speeds of 100/1000 Mbps. Connect computers or other Ethernet devices to Ethernet ports for Internet access. WAN mode: The 1G WAN port supports speeds of 100/1000 Mbps. Use an Ethernet cable to connect the WAN port to a gateway/modem for Internet connection.
LAN2	Connect a computer to the LAN using an RJ45 cable.
RESET	Press for 2 seconds: Reboot the Zyxel Device. Press for 5 seconds: Restore the Zyxel Device to its factory default settings.
USB	The USB port of the Zyxel Device is used for file sharing.
POWER Button	Press the POWER button after the power adapter is connected to start the Zyxel Device.
POWER	Connect the power adapter and press the POWER button to start the Zyxel Device.
Micro SIM	Insert a micro-SIM card into the slot with the chip facing down and the beveled corner in the top left corner.

Nebula FWA505

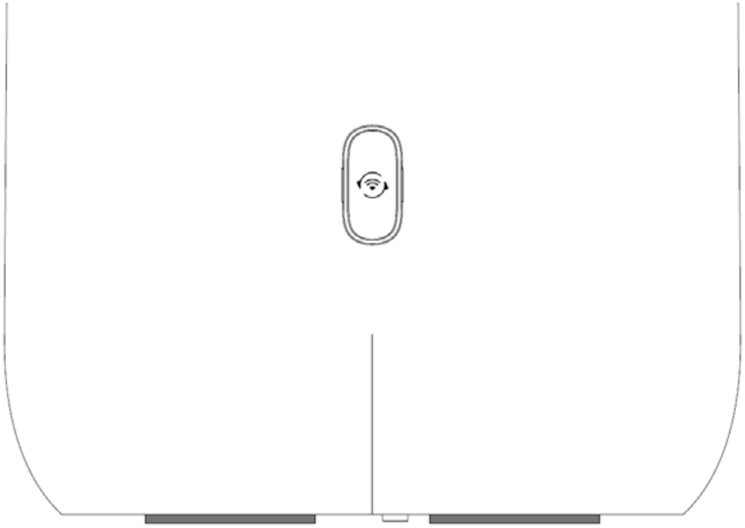
Place the Zyxel Device with the ports facing you and closer to the bottom. The two antenna ports are located on the rear panel, closer to the top of the Zyxel Device.

Figure 21 Rear Panel (Nebula FWA505)



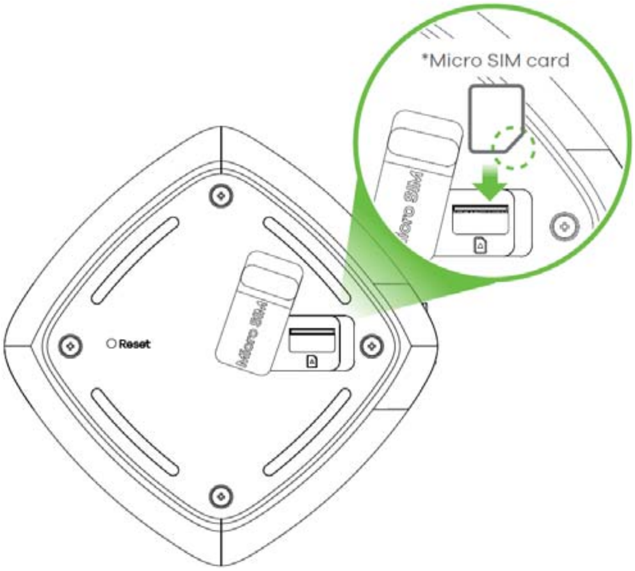
The WPS and WiFi On/Off button is on the front panel of the Zyxel Device, further from you, near the bottom.

Figure 22   WPS and WiFi On/Off Button on the Front Panel (FWA505)



The Micro SIM card slot is at the bottom of the Zyxel Device.

Figure 23   Micro SIM card slot on the Bottom Panel (FWA505)



The following table describes the ports and buttons on your Zyxel Device.

Table 16   Panel Ports and Buttons (Nebula FWA505)

LABELS	DESCRIPTION
ANT1-ANT2/Antenna	Install the external antennas to strengthen the cellular signal. Note: To use the external antennas, you must set the INT/EXT switch to EXT.
INT/EXT	Select between the internal or external cellular antennas.
LAN1	Connect a computer to the LAN using an RJ45 cable.
LAN2/WAN	LAN mode: Connect a computer to the LAN using an RJ45 cable. WAN mode: Connect the Zyxel Device to the Internet through the WAN.
USB	The USB port of the Zyxel Device is used for file sharing.

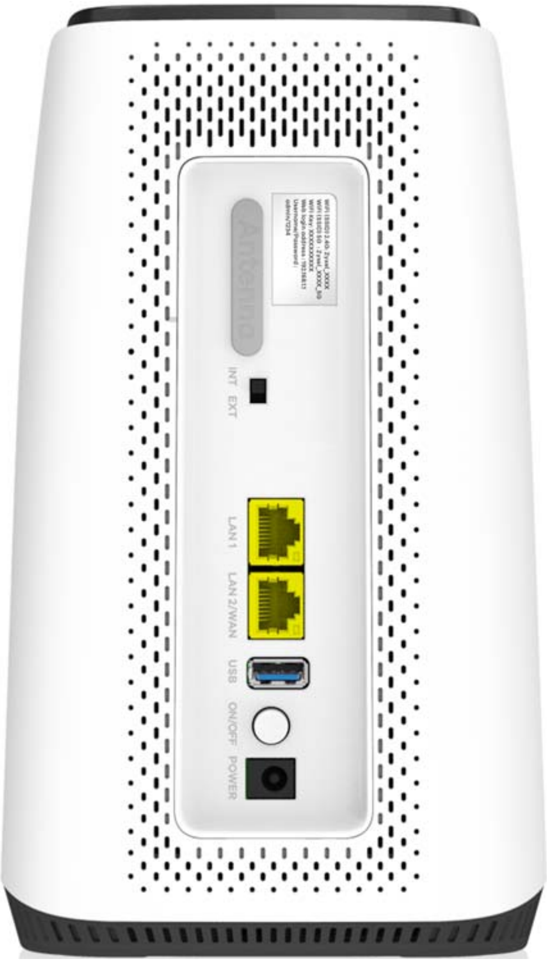
Table 16 Panel Ports and Buttons (Nebula FWA505) (continued)

LABELS	DESCRIPTION
ON/OFF	Press the ON/OFF button after the power adapter is connected to start the Zyxel Device.
POWER	Connect the power adapter and press the ON/OFF button to start the Zyxel Device.
WiFi/WPS	Press the WiFi/WPS button to activate WPS connection process. See Section 2.4 on page 51 for more information.
RESET	Press the RESET button to reboot or reset the Zyxel Device. See Section 2.5 on page 55 for more information.
Micro SIM	Insert a Micro-SIM card into the slot with the chip facing down and the beveled corner in the top left corner.

Nebula FWA510

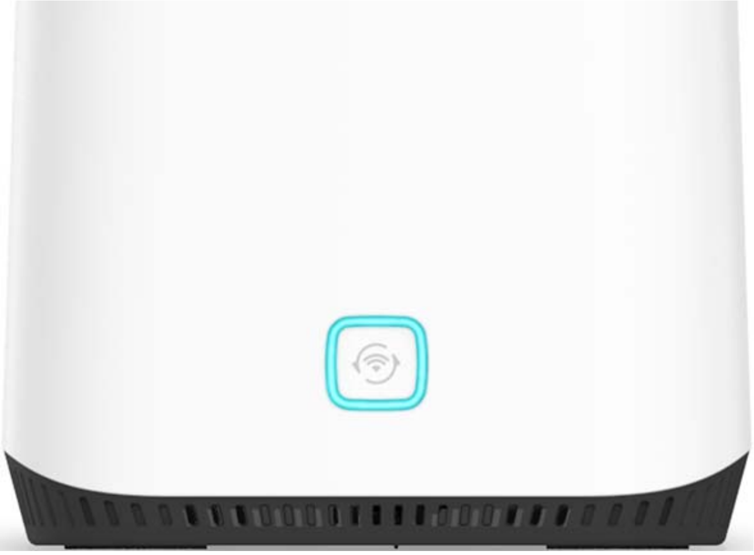
Place the Zyxel Device with the ports facing you and closer to the bottom. The two antenna ports are located on the rear panel, closer to the top of the Zyxel Device.

Figure 24 Rear Panel (Nebula FWA510)



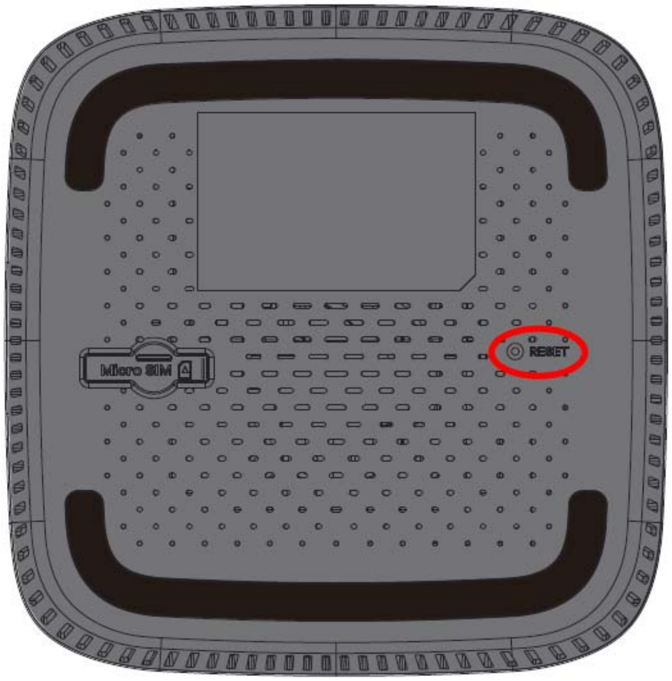
The WPS and WiFi On/Off button is on the front panel of the Zyxel Device, further from you, near the bottom.

Figure 25 WiFi / WPS on the Front Panel (Nebula FWA510)



The Micro SIM card slot and RESET button are on the bottom of the Zyxel Device.

Figure 26 Micro SIM card slot and RESET button on the bottom panel (Nebula FWA510)



The following table describes the ports and buttons on your Zyxel Device.

Table 17 Panel Ports and Buttons (Nebula FWA510)

LABELS	DESCRIPTION
ANT1-ANT2/Antenna	Install the external antennas to strengthen the cellular signal. Note: To use the external antennas, you must set the INT/EXT switch to EXT.
USB	The USB port of the Zyxel Device is used for file sharing.

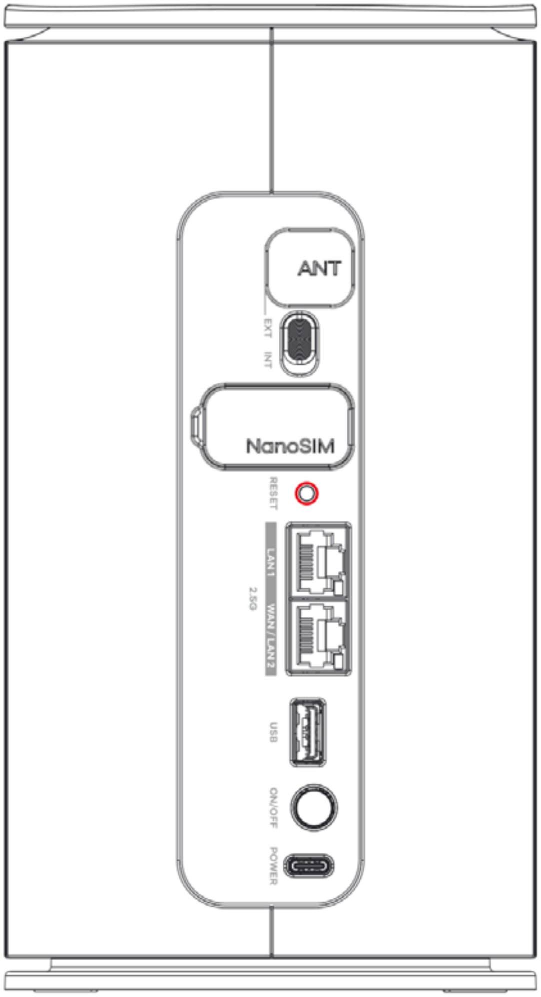
Table 17   Panel Ports and Buttons (Nebula FWA510) (continued)

LABELS	DESCRIPTION
LAN2/WAN	LAN mode: Connect a computer to the LAN using an RJ45 cable. WAN mode: Connect the Zyxel Device to the Internet through the WAN.
LAN1	Connect a computer to the LAN using an RJ45 cable.
WiFi/WPS	Press the WiFi/WPS button to activate WPS connection process. See Section 2.4 on page 51 for more information.
RESET	Press the RESET button to reboot or reset the Zyxel Device. See Section 2.5 on page 55 for more information.
ON/OFF	Press the ON/OFF button after the power adapter is connected to start the Zyxel Device.
POWER	Connect the power adapter and press the ON/OFF button to start the Zyxel Device.
Micro SIM	Insert a Micro-SIM card into the slot with the chip facing down and the beveled corner in the top left corner.
INT/EXT	Select between the internal or external cellular antennas.

Nebula FWA515

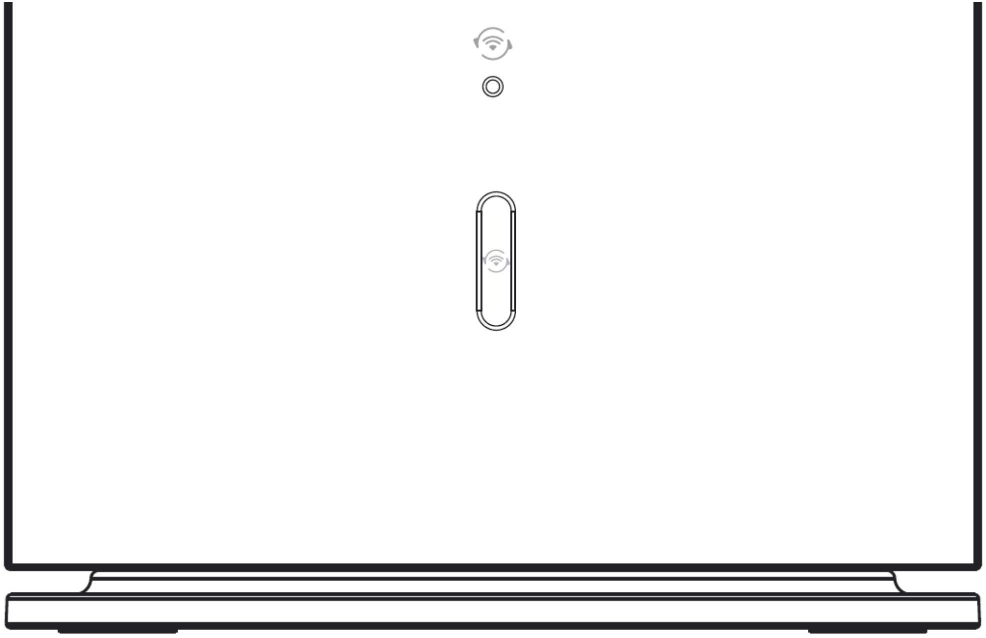
Place the Zyxel Device with the ports and buttons facing you and the rubber feet at the bottom.

Figure 27   Rear Panel (Nebula FWA515)



The WPS and WiFi On/Off button is on the front panel of the Zyxel Device, further from you, near the bottom.

Figure 28 WPS and WiFi On/Off Button on the Front Panel (FWA515)



The following table describes the ports and buttons on your Zyxel Device.

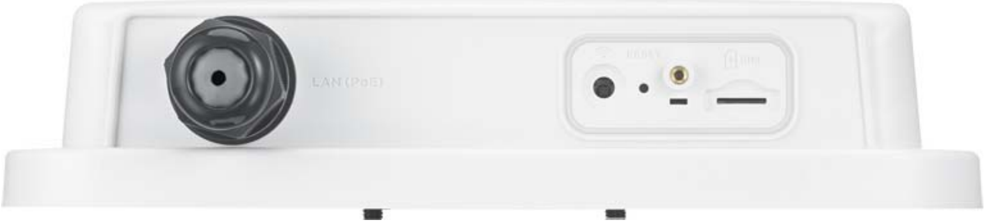
Table 18 Panel Ports and Buttons (Nebula FWA515)

LABELS	DESCRIPTION
ANT	Connect external antennas to better receive the cellular signal from the base station. Note: To use the external antennas, you must set the EXT/INT switch to EXT.
EXT/INT	Select between the external or internal cellular antennas.
NanoSIM	Place the Nano-SIM card on the tray with the chip facing up. Insert the tray into the slot with the beveled corner positioned at the top and facing forward.
RESET	Press the RESET button to reboot or reset the Zyxel Device. See Section 2.5 on page 55 for more information.
LAN1	Connect a computer to the LAN using an RJ45 cable.
WAN/LAN2	LAN mode: Connect a computer to the LAN using an RJ45 cable. WAN mode: Connect the Zyxel Device to the Internet through the WAN.
USB	The USB port of the Zyxel Device is used for file sharing.
ON/OFF	Press the ON/OFF button after the power adapter is connected to start the Zyxel Device.
POWER	Connect the power adapter and press the ON/OFF button to start the Zyxel Device.
WiFi/WPS	Press the WiFi/WPS button to activate WPS connection process. See Section 2.4 on page 51 for more information.

Nebula LTE7461-M602

Place the Zyxel Device with the ports facing you.

Figure 29 Bottom Panel (Nebula LTE7461-M602)



The following table describes the ports and buttons on your Zyxel Device.

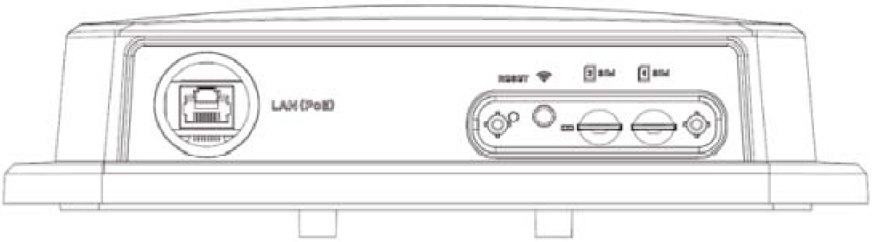
Table 19 Panel Ports and Buttons (Nebula LTE7461-M602)

LABELS	DESCRIPTION
LAN (PoE)	Connect a computer through the PoE injector for configuration. Connect the PoE injector to a power outlet to start the device.
WiFi	Press the WLAN (WiFi) button for more than 5 seconds to enable WiFi.
WPS	After WiFi is enabled, press the WLAN button for more than one second but less than 5 seconds to quickly set up a secure WiFi connection between the Zyxel Device and a WPS-compatible client.
RESET	Press the button for more than 5 seconds to return the Zyxel Device to the factory defaults.
Micro SIM	Insert a micro-SIM card into the slot with the chip facing down and the beveled corner in the top left corner.

Nebula NR7101

Place the Zyxel Device with the ports facing you.

Figure 30 Bottom Panel (Nebula NR7101)



The following table describes the ports and buttons on your Zyxel Device.

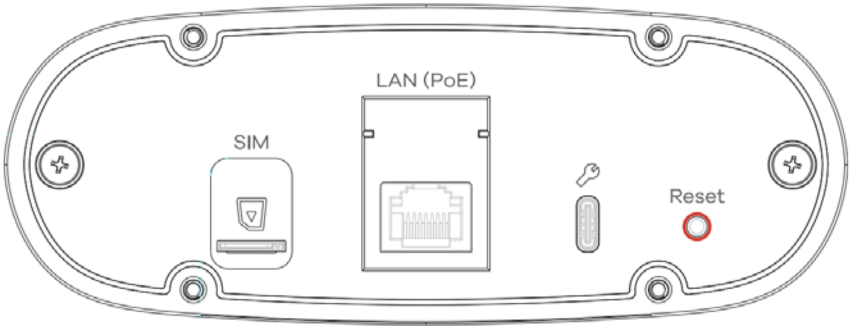
Table 20 Panel Ports and Buttons (Nebula NR7101)

LABELS	DESCRIPTION
LAN (PoE)	Connect the PoE port on the PoE injector to the Zyxel Device's LAN port through an Ethernet cable. Connect the LAN port on the PoE injector to your computer's RJ45 port through another Ethernet cable.
RESET	Press the RESET button to reboot or reset the Zyxel Device. See Section 2.5 on page 55 for more information.
WiFi/WPS	Press the WiFi/WPS button to activate WPS connection process. See Section 2.4 on page 51 for more information.
SIM 1/2	Insert a micro-SIM card into the slot with the chip facing down and the beveled corner in the top left corner.

Nebula FWA70

Place the Zyxel Device with the ports facing you.

Figure 31 Bottom Panel (Nebula FWA70)



The following table describes the ports and buttons on your Zyxel Device.

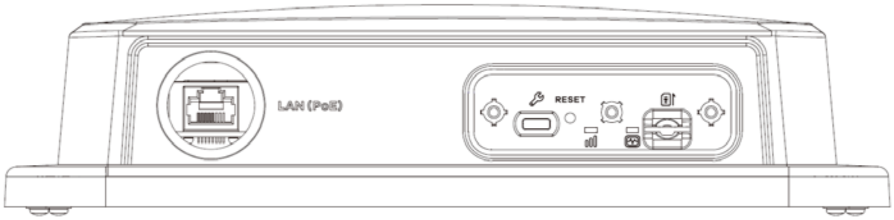
Table 21 Panel Ports and Buttons (Nebula FWA70)

LABELS	DESCRIPTION
Nano SIM	Insert a nano-SIM card into the slot with the chip facing down and the beveled corner in the top left corner.
LAN (PoE)	Connect the PoE port on the PoE injector to the Zyxel Device's LAN port through an Ethernet cable. Connect the LAN port on the PoE injector to your computer's RJ45 port through another Ethernet cable.
Reset	Press the Reset button to reboot or reset the Zyxel Device. See Section 2.5 on page 55 for more information.

Nebula FWA710

Place the Zyxel Device with the ports facing you.

Figure 32 Bottom Panel (Nebula FWA710)



The following table describes the ports and buttons on your Zyxel Device.

Table 22 Panel Ports and Buttons (Nebula FWA710)

LABELS	DESCRIPTION
LAN (PoE)	Connect the PoE port on the PoE injector to the Zyxel Device's LAN port through an Ethernet cable. Connect the LAN port on the PoE injector to your computer's RJ45 port through another Ethernet cable.
RESET	Press the RESET button to reboot or reset the Zyxel Device. See Section 2.5 on page 55 for more information.
Micro SIM	Insert a micro-SIM card into the slot with the chip facing down and the beveled corner in the top left corner.

2.4 WiFi/WPS Button

Use the WiFi/WPS button on the Zyxel Device to turn on or turn off the WiFi network or quickly build a WiFi connection with a WiFi client.

Follow the steps below to activate WiFi or WPS on the Zyxel Device.

Activating WiFi

1 Make sure the power is on.

2 Press the WiFi/WPS button (see the following table) then release it.

Table 23 How to Enable WiFi

MODELS	WIFI BUTTON PRESS HOLD TIME
Nebula LTE3301-PLUS	More than 5 seconds.
Nebula LTE7461-M602	
Nebula NR7101	
Nebula NR5101	Press for 1 second.
Nebula FWA505	More than 10 seconds.
Nebula FWA510	WiFi can only be enabled/disabled through the Web Configurator.

3 Check the WiFi LED to see if the WiFi is successfully turned on. See Section 2.2 on page 29 for your Zyxel Device LED behavior.

Activating WPS

You can quickly set up a secure WiFi connection between the Zyxel Device and a WPS-compatible client by adding one device at a time.

1 Ensure WiFi is turned on.

2 Press the WiFi/WPS button (see the following table) then release it.

Table 24 How to Enable WPS

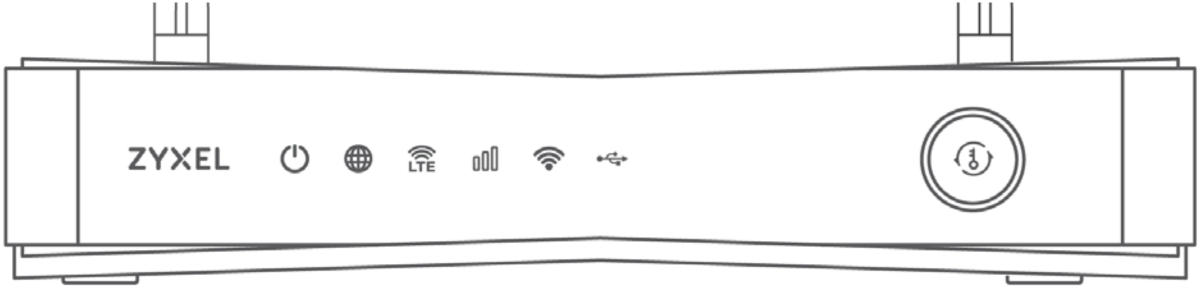
MODELS	WIFI BUTTON PRESS HOLD TIME
Nebula LTE3301-PLUS	More than 1 second but less than 5 seconds
Nebula LTE7461-M602	
Nebula NR7101	
Nebula NR5101	More than 5 seconds.
Nebula FWA505	More than 3 seconds.
Nebula FWA510	

3 Press the WPS button on another WPS-enabled device within range of the Zyxel Device (within 120 seconds).

4 Once the connection is successfully made, check the LED for connection status. See Section 2.2 on page 29 for the Zyxel Device LED behavior.

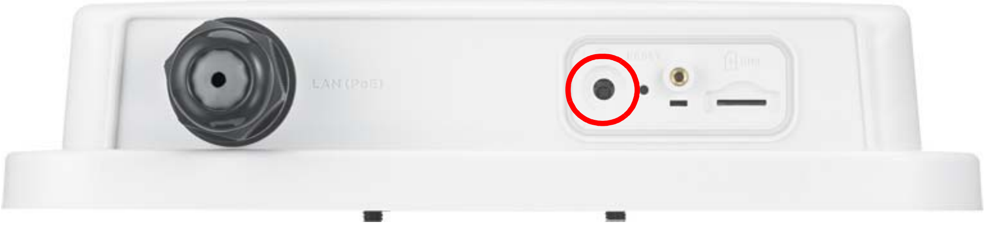
For Nebula LTE3301-PLUS, the WiFi / WPS button is on the front panel of the Zyxel Device, closer to the right, with the ports positioned farther from you.

Figure 33 Nebula LTE3301-PLUS WiFI/WPS Button



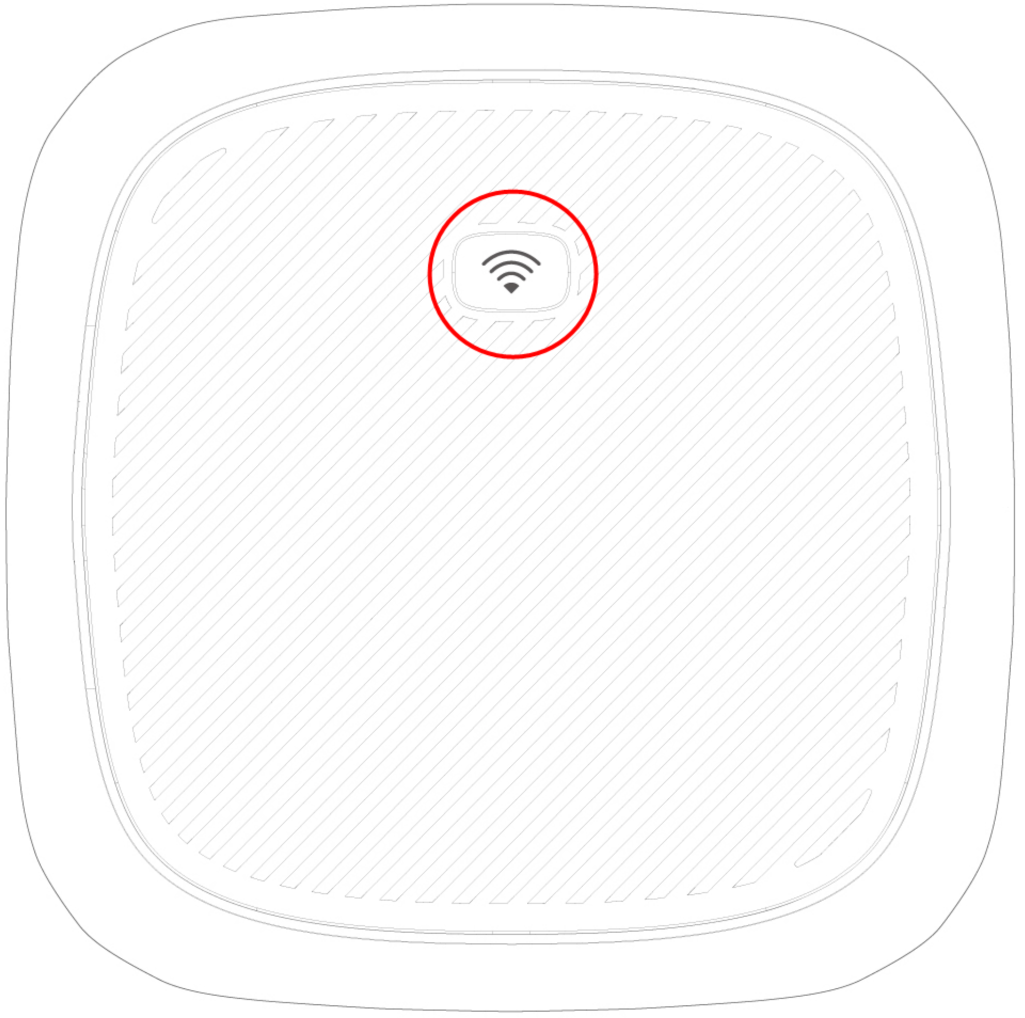
For Nebula LTE7461-M602, the WiFi / WPS button is on the rear panel of the Zyxel Device, closer to the right, with the ports facing you.

Figure 34 Nebula LTE7461-M602



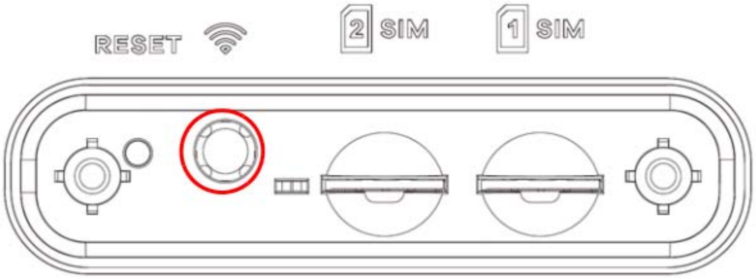
For Nebula NR5101, the WPS and WiFi On/Off button is on the top of the Zyxel Device.

Figure 35 Nebula NR5101 WiFi/WPS Button



For Nebula NR7101, the WPS and WiFi On/Off button is on the bottom of the Zyxel Device.

Figure 36 Nebula NR7101 WiFi/WPS Button



For Nebula FWA505, FWA510 and FWA515, the WPS and WiFi On/Off button is on the front panel of the Zyxel Device.

Figure 37 Nebula FWA505 WiFi/WPS Button

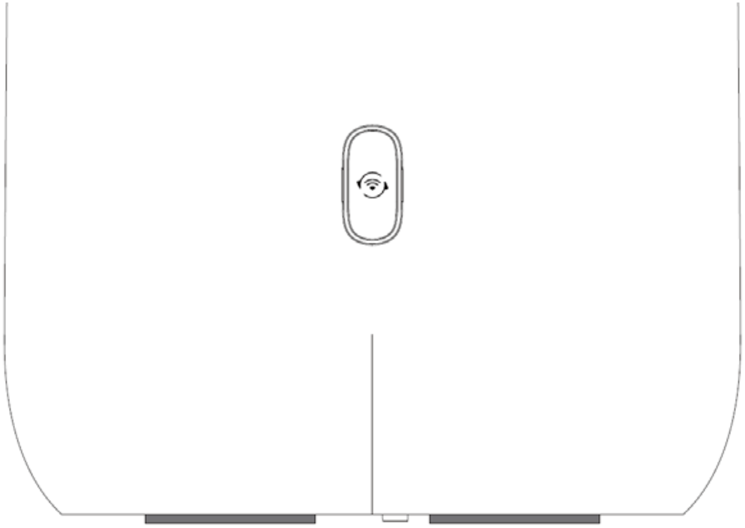


Figure 38 Nebula FWA510 WiFi/WPS Button

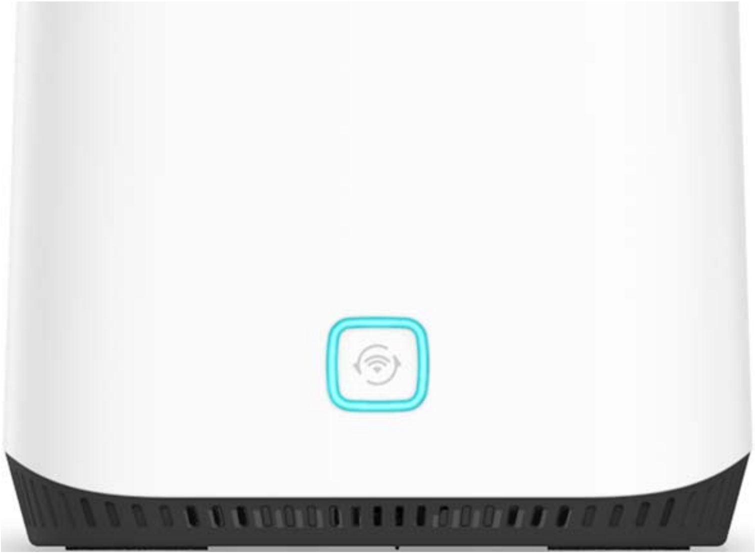
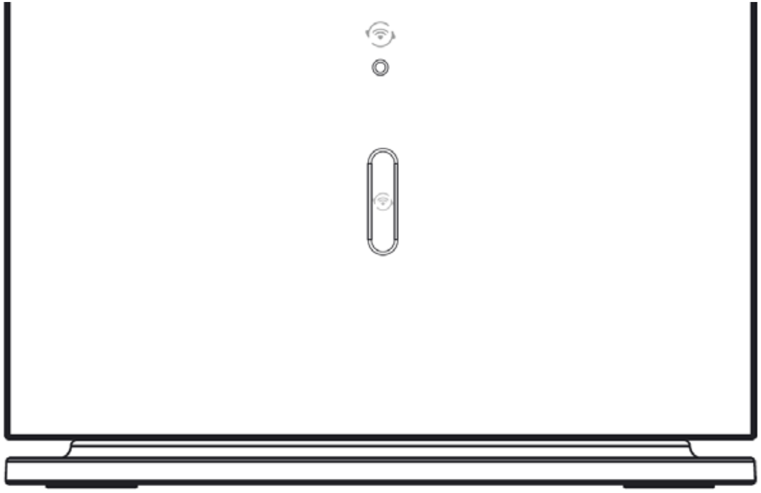


Figure 39 Nebula FWA515 WiFi/WPS Button



2.5 RESET Button

Insert a thin object into the RESET hole of the Zyxel Device to reload the factory-default configuration file if you forget your password or IP address, or you cannot access the Web Configurator. This means that you will lose all configurations that you had previously saved. The password will be reset to the default (see the Zyxel Device label) and the IP address will be reset to 192.168.1.1.

Figure 40 Nebula LTE3301-PLUS

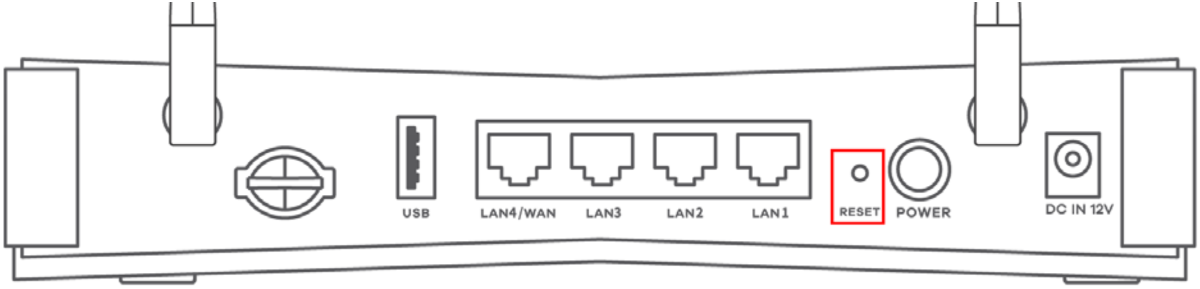


Figure 41 Nebula LTE7461-M602

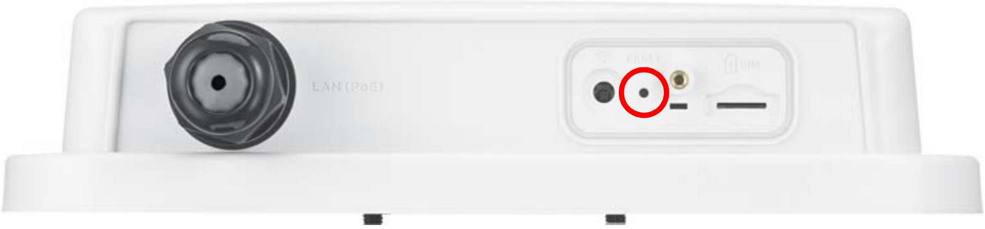


Figure 42 Nebula NR5101

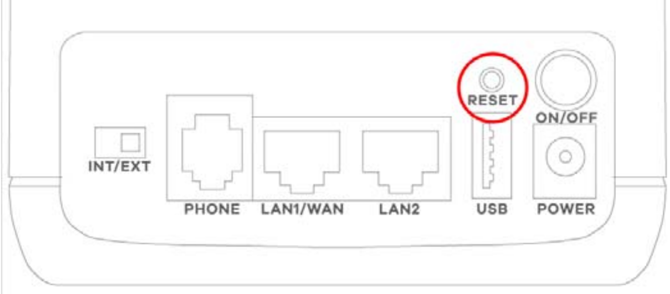


Figure 43 Nebula NR7101

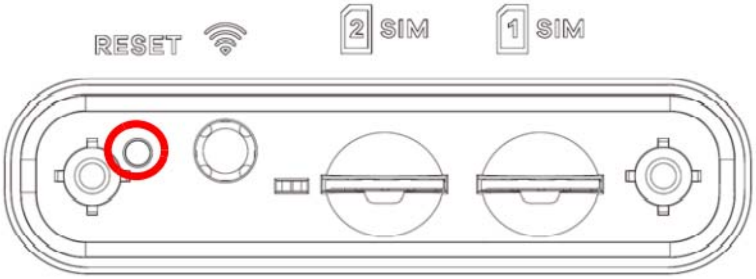


Figure 44   Nebula FWA505

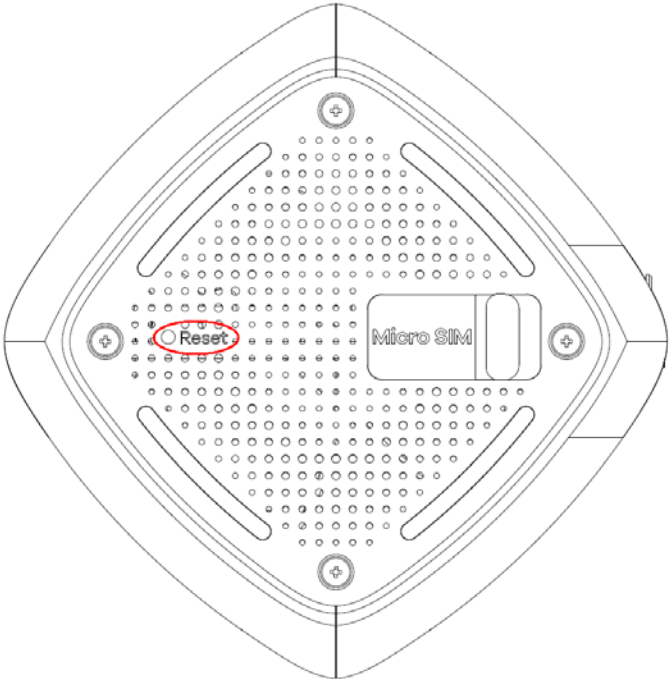


Figure 45   Nebula FWA510

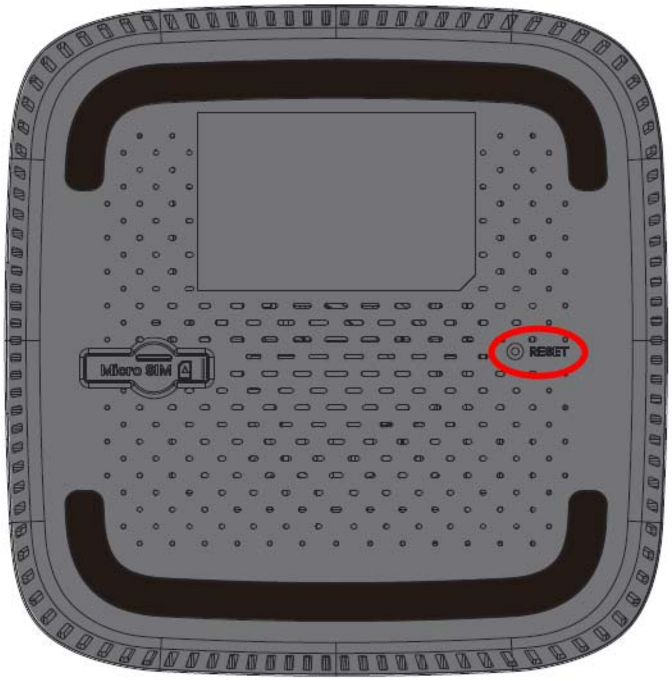


Figure 46 Nebula FWA515

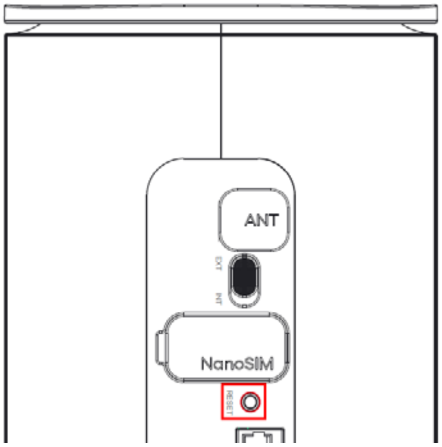


Figure 47 Nebula FWA70

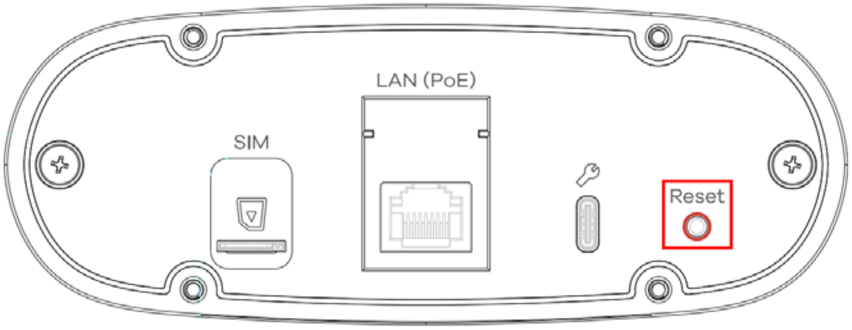
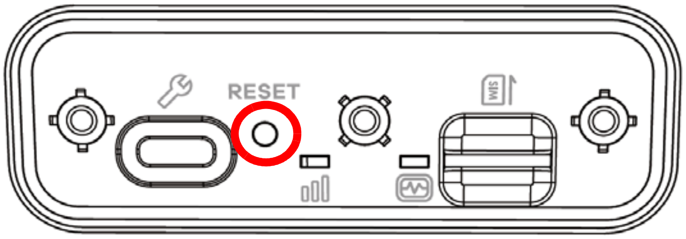


Figure 48 Nebula FWA710



1 Make sure the Zyxel Device is connected to power and the POWER LED is on.

2 Using a thin object, press the RESET button for more than 5 seconds.

Note: If you press the RESET button for less than 5 seconds, the Zyxel Device will reboot.

CHAPTER 3 Web Configurator

3.1 Overview

The Web Configurator is an HTML-based management interface that allows easy system setup and management through Internet browser. Use a browser that supports HTML5, such as Microsoft Edge, Mozilla Firefox, or Google Chrome. The recommended minimum screen resolution is 1024 by 768 pixels.

In order to use the Web Configurator you need to allow:

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

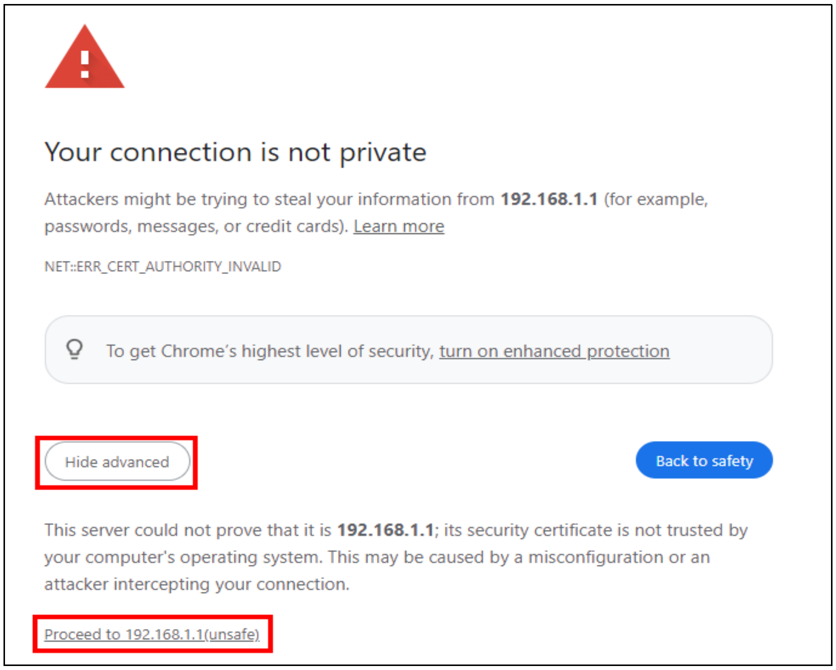
3.1.1 Access the Web Configurator

1 Make sure your Zyxel Device hardware is properly connected (refer to the Quick Start Guide).

2 Make sure your computer has an IP address in the same subnet as the Zyxel Device.

3 Launch your web browser. Type https://192.168.1.1 in your browser address bar.

4 If a "Your connection is not private" message appears, click Advanced, then click Proceed to 192.168.1.1(unsafe) to go to the login screen.



Your connection is not private

Attackers might be trying to steal your information from **192.168.1.1** (for example, passwords, messages, or credit cards). Learn more

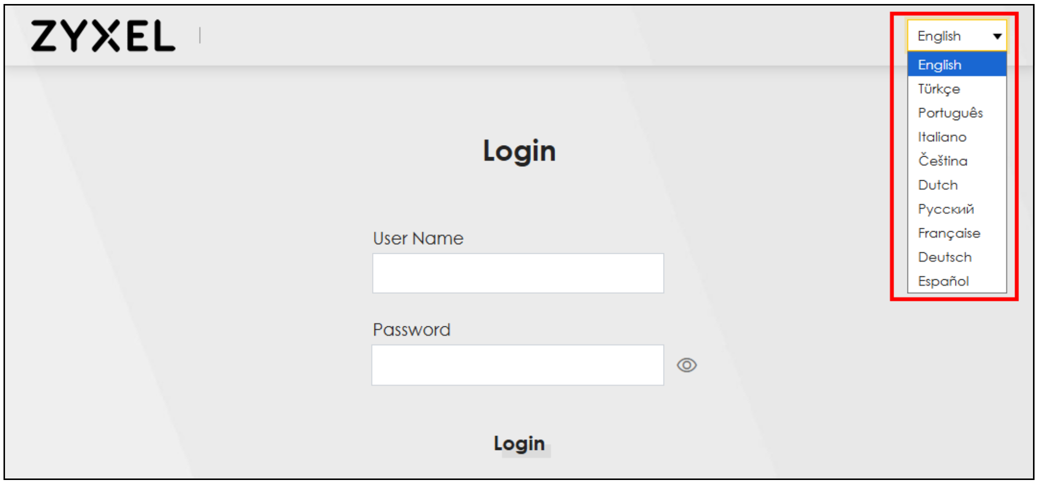
NET::ERR_CERT_AUTHORITY_INVALID

To get Chrome's highest level of security, turn on enhanced protection

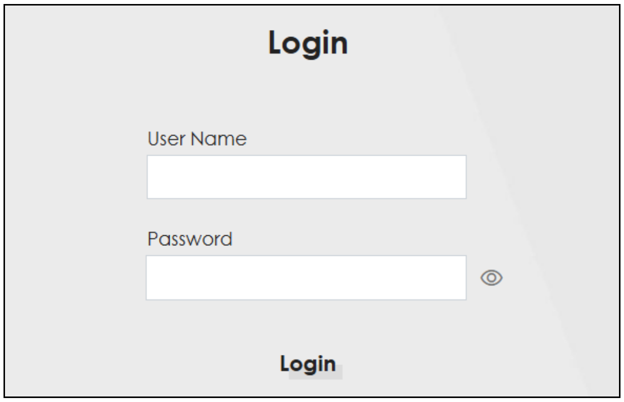
This server could not prove that it is **192.168.1.1**; its security certificate is not trusted by your computer's operating system. This may be caused by a misconfiguration or an attacker intercepting your connection.

Note: If you see this warning page, it indicates that your browser has failed to verify the Secure Sockets Layer (SSL) certificate, which opens an encrypted connection. You can ignore this message and proceed to 192.168.1.1.

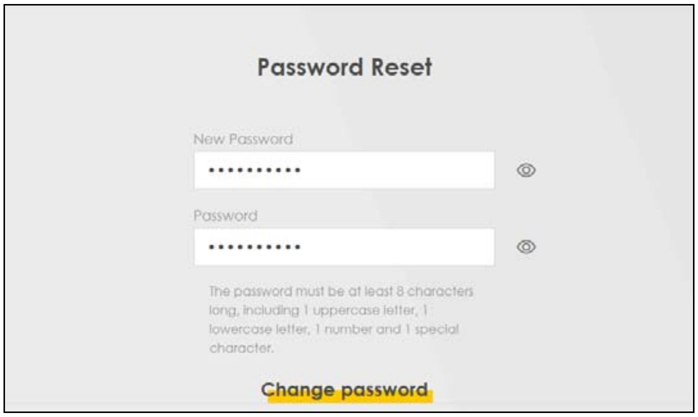
5 A login screen displays. Select the language you prefer (upper right).



6 To access the administrative Web Configurator and manage the Zyxel Device, enter the default user name admin and the randomly assigned default password (see the Zyxel Device label) in the Login screen and click Login. If you have changed the password, enter your password and click Login.



Note: The first time you enter the password, you will be asked to change it. The new password must be at least 8 characters, must contain at least one uppercase letter, one lowercase letter, one number, and one special character. For some models, the password must contain at least one English character and one number. Please see the password requirement displayed on the screen.



Password Reset

New Password

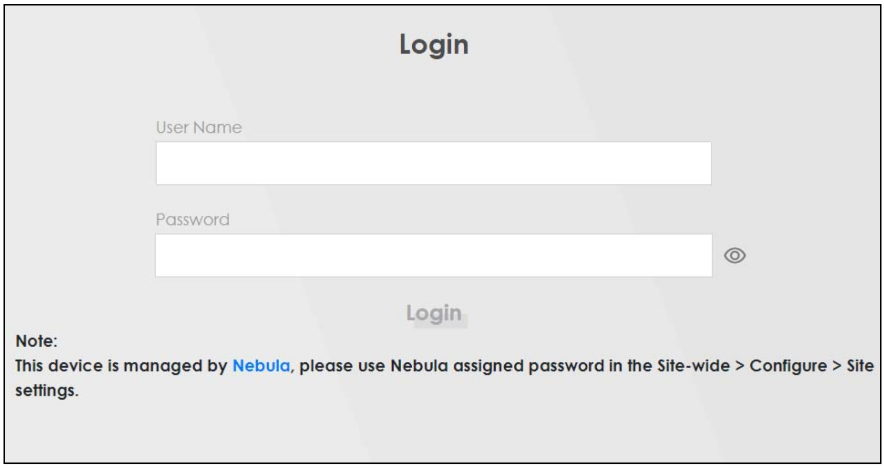
•••••••••••

Password

•••••••••••

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

When the Zyxel Device is managed by NCC, you will be prompted to use the Nebula-assigned password to log in. The Nebula-assigned password can be found in Nebula Web Portal: Site-wide > Configure > Site settings: Device configuration.



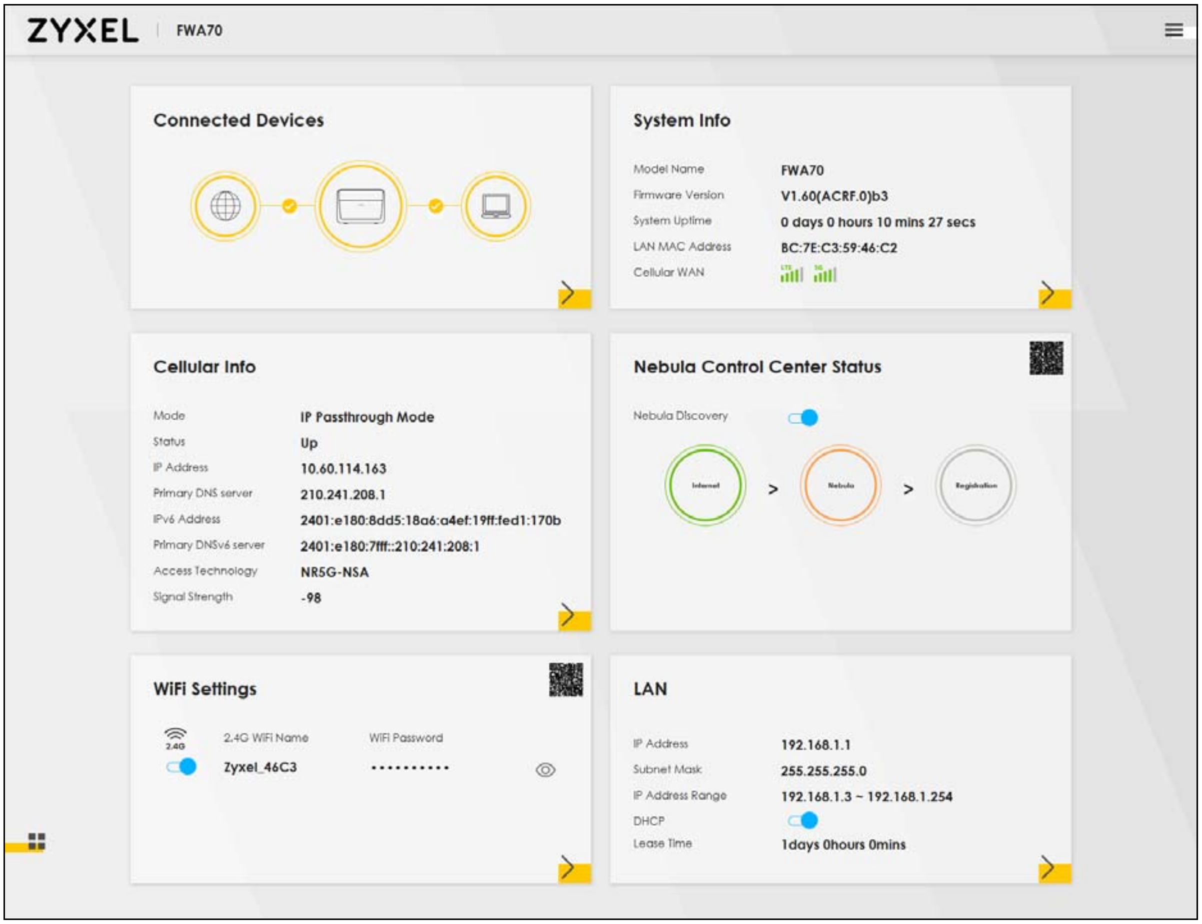
Login

User Name

Password

Note:
This device is managed by Nebula, please use Nebula assigned password in the Site-wide > Configure > Site settings.

7 The Connection Status screen appears. Use this screen to configure basic Internet access and Wi-Fi settings.



Connected Devices

System Info

Model Name	FWA70
Firmware Version	V1.60(ACRF.0)b3
System Uptime	0 days 0 hours 10 mins 27 secs
LAN MAC Address	BC:7E:C3:59:46:C2
Cellular WAN	LTE 5G

Cellular Info

Mode	IP Passthrough Mode
Status	Up
IP Address	10.60.114.163
Primary DNS server	210.241.208.1
IPv6 Address	2401:e180:8dd5:18a6:a4ef:19ff:fed1:170b
Primary DNSv6 server	2401:e180:7fff::210:241:208:1
Access Technology	NR5G-NSA
Signal Strength	-98

Nebula Control Center Status

Nebula Discovery

WiFi Settings

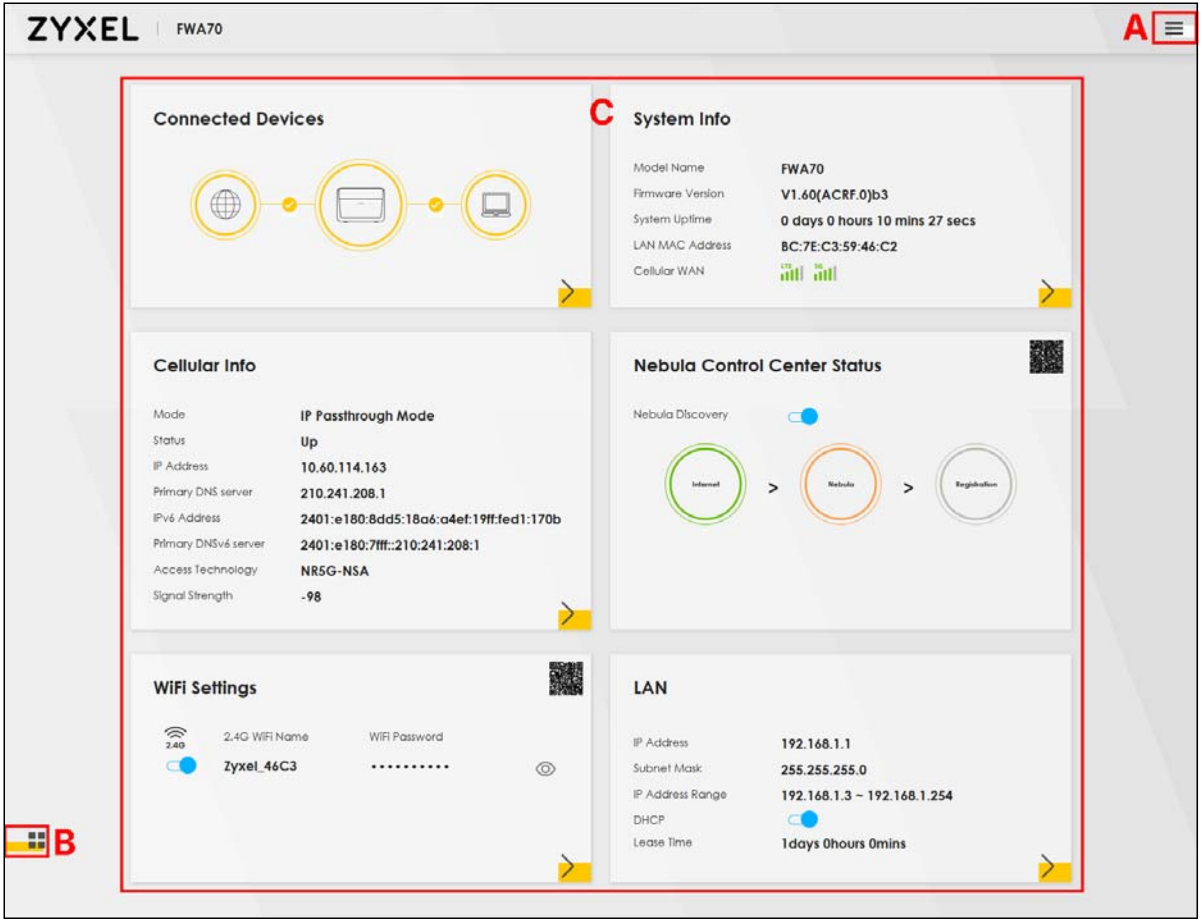
2.4G	2.4G WiFi Name	WiFi Password
	Zyxel_46C3	••••••••••

LAN

IP Address	192.168.1.1
Subnet Mask	255.255.255.0
IP Address Range	192.168.1.3 ~ 192.168.1.254
DHCP	
Lease Time	1days 0hours 0mins

3.2 Web Configurator Layout

Figure 49 Screen Layout



Connected Devices

System Info

Model Name	FWA70
Firmware Version	V1.60(ACRF.0)b3
System Uptime	0 days 0 hours 10 mins 27 secs
LAN MAC Address	BC:7E:C3:59:46:C2
Cellular WAN	

Cellular Info

Mode	IP Passthrough Mode
Status	Up
IP Address	10.60.114.163
Primary DNS server	210.241.208.1
IPv6 Address	2401:e180:8dd5:18a6:a4ef:19ff:fed1:170b
Primary DNSv6 server	2401:e180:7fff::210:241:208:1
Access Technology	NR5G-NSA
Signal Strength	-98

Nebula Control Center Status

Nebula Discovery ●

WiFi Settings

2.4G WiFi Name	WiFi Password
Zyxel_46C3	··········

LAN

IP Address	192.168.1.1
Subnet Mask	255.255.255.0
IP Address Range	192.168.1.3 ~ 192.168.1.254
DHCP	●
Lease Time	1days 0hours 0mins

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

- A – Settings Icon (Navigation Panel and Side Bar)
- B – Layout Icon
- C – Main Window

3.2.1 Settings Icon

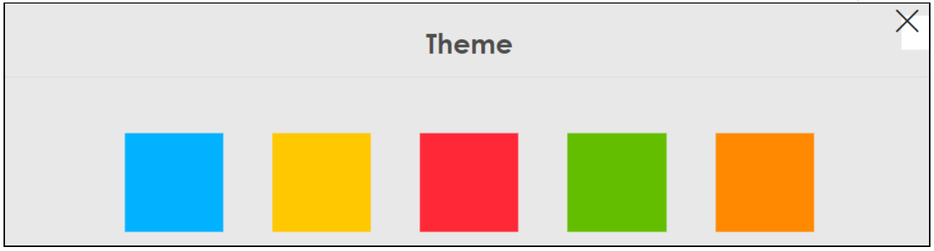
Click this icon (☰) to see the side bar and navigation panel.

3.2.1.1 Side Bar

The side bar provides some icons on the right hand side.

The icons provide the following functions.

Table 25   Web Configurator Icons in the Title Bar

ICON	DESCRIPTION
Wizard	Wizard: Click this icon to open screens where you can configure the Zyxel Device's time zone and Wi-Fi settings.
Theme	Theme: Click this icon to select a color that you prefer and apply it to the Web Configurator. 
Restart	Restart: Click this icon to reboot the Zyxel Device without turning the power off.
Language	Language: Select the language you prefer.
Logout	Logout: Click this icon to log out of the Web Configurator.

3.2.1.2 Navigation Panel

Click the menu icon (☰) to display the navigation panel that contains configuration menus and icons (quick links). Click X to close the navigation panel.

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

Figure 50 Navigation Panel

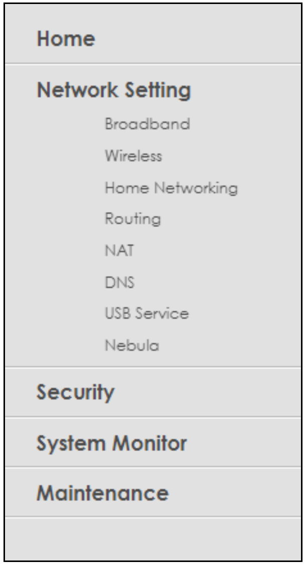


Table 26 Navigation Panel Summary

LINK	TAB	FUNCTION
Home		Use this screen to configure basic Internet access and wireless settings. This screen also shows the network status of the Zyxel Device and computers/devices connected to it.
Network Setting		
Broadband	Broadband	Use this screen to view and configure ISP parameters, WAN IP address assignment, and other advanced properties. You can also add new WAN connections.
	Ethernet WAN	Use this screen to convert the LAN port as WAN port, or restore the WAN port to LAN port.
	Cellular WAN	Use this screen to configure a cellular WAN connection.
	Cellular APN	Use this screen to configure the Access Point Name (APN) provided by your service provider.
	Cellular SIM	Use this screen to enter a PIN for your SIM card to prevent others from using it.
	Cellular Band	Use this screen to configure the cellular frequency bands that can be used for Internet access as provided by your service provider.
	Cellular PLMN	Use this screen to view available PLMNs and select your preferred network.
	Cellular IP Passthrough	Use this screen to enable IP Passthrough on the Zyxel Device.
	Cellular Lock (LTE)	Use this screen to enable or disable PCI Lock for 4G LTE connections.
	Cellular Lock (5G)	Use this screen to enable or disable PCI Lock for 5G NR connections.
	Cellular SMS	Use this screen to enable SMS Inbox and receive SMS messages.
Wireless	General	Use this screen to configure the Wi-Fi settings and Wi-Fi authentication or security settings.
	More AP	Use this screen to configure multiple BSSs on the Zyxel Device.
	MAC Authentication	Use this screen to block or allow wireless traffic from wireless devices of certain SSIDs and MAC addresses to the Zyxel Device.

Table 26 Navigation Panel Summary (continued)

LINK	TAB	FUNCTION
	WPS	Use this screen to configure and view your WPS (Wi-Fi Protected Setup) settings.
	WMM	Use this screen to enable or disable Wi-Fi MultiMedia (WMM).
	Others	Use this screen to configure advanced Wi-Fi settings.
	WLAN Scheduler	Use this screen to create rules to schedule the times to permit Internet traffic from each wireless network interfaces.
	Channel Status	Use this screen to scan Wi-Fi channel noises and view the results.
Home Networking	LAN Setup	Use this screen to configure LAN TCP or IP settings, and other advanced properties.
	Static DHCP	Use this screen to assign specific IP addresses to individual MAC addresses.
	UPnP	Use this screen to turn UPnP and UPnP NAT-T on or off.
	Custom DHCP	Use this screen to configure additional DHCP options.
Routing	Static Route	Use this screen to view and set up static routes on the Zyxel Device.
	DNS Route	Use this screen to forward DNS queries for certain domain names through a specific WAN interface to its DNS servers.
	Policy Route	Use this screen to configure policy routing on the Zyxel Device.
	RIP	Use this screen to configure Routing Information Protocol to exchange routing information with other routers.
NAT	Port Forwarding	Use this screen to make your local servers visible to the outside world.
	Port Triggering	Use this screen to change your Zyxel Device’s port triggering settings.
	DMZ	Use this screen to configure a default server which receives packets from ports that are not specified in the Port Forwarding screen.
	ALG	Use this screen to enable the ALGs (Application Layer Gateways) in the Zyxel Device to allow applications to operate through NAT.
DNS	DNS Entry	Use this screen to view and configure DNS routes.
	Dynamic DNS	Use this screen to allow a static hostname alias for a dynamic IP address.
USB Service	USB Service	Use this screen to enable file sharing through the Zyxel Device.
VLAN Group	VLAN Group	Use this screen to group and tag VLAN IDs to outgoing traffic from the specified interface.
Interface Grouping	Interface Grouping	Use this screen to map a port to create multiple networks on the Zyxel Device.
Nebula	Nebula	Use this screen to enable Nebula Discovery and configure proxy server settings.
Security		
Firewall	General	Use this screen to configure the security level of your firewall.
	Protocol	Use this screen to add Internet services and configure firewall rules.
	Access Control	Use this screen to enable specific traffic directions for network services.
	DoS	Use this screen to activate protection against Denial of Service (DoS) attacks.
MAC Filter	MAC Filter	Use this screen to block or allow traffic from devices of certain MAC addresses to the Zyxel Device.
Parental Control	Parental Control	Use this screen to define time periods and days during which the Zyxel Device performs parental control and/or block web sites with the specific URL.

Table 26 Navigation Panel Summary (continued)

LINK	TAB	FUNCTION
Certificates	Local Certificates	Use this screen to view a summary list of certificates and manage certificates and certification requests.
	Trusted CA	Use this screen to view and manage the list of the trusted CAs.
System Monitor		
Log	System Log	Use this screen to view the status of events that occurred to the Zyxel Device. You can export or email the logs.
	Security Log	Use this screen to view all security related events. You can select the level and category of the security events in their proper drop-down list window. Levels include: • Emergency • Alert • Critical • Error • Warning • Notice • Informational • Debugging Categories include: • Account • Attack • Firewall • MAC Filter
Traffic Status	WAN	Use this screen to view the status of all network traffic going through the WAN port of the Zyxel Device.
	LAN	Use this screen to view the status of all network traffic going through the LAN ports of the Zyxel Device.
ARP Table	ARP Table	Use this screen to view the ARP table. It displays the IP and MAC address of each DHCP connection.
Routing Table	Routing Table	Use this screen to view the routing table on the Zyxel Device.
WLAN Station Status	WLAN Station Status	Use this screen to view the wireless stations that are currently associated to the Zyxel Device's Wi-Fi.
Cellular WAN Status	Cellular WAN Status	Use this screen to look at the cellular Internet connection status.
Maintenance		
System	System	Use this screen to set the Zyxel Device name and Domain name.
User Account	User Account	Use this screen to change the user password on the Zyxel Device.
Remote Management	MGMT Services	Use this screen to enable specific traffic directions for network services.
	Trust Domain	Use this screen to view a list of public IP addresses which are allowed to access the Zyxel Device through the services configured in the Maintenance > Remote Management screen.
	MGMT Services for IP Passthrough	Use this screen to enable various approaches to access this Zyxel Device remotely from a WAN and/or LAN connection.
	Trust Domain for IP Passthrough	Use this screen to enable public IP addresses to access this Zyxel Device remotely from a WAN and/or LAN connection.
TR-069 Client	TR-069 Client	Use this screen to configure your Zyxel Device to be managed remotely by an Auto Configuration Server (ACS) using TR-069.

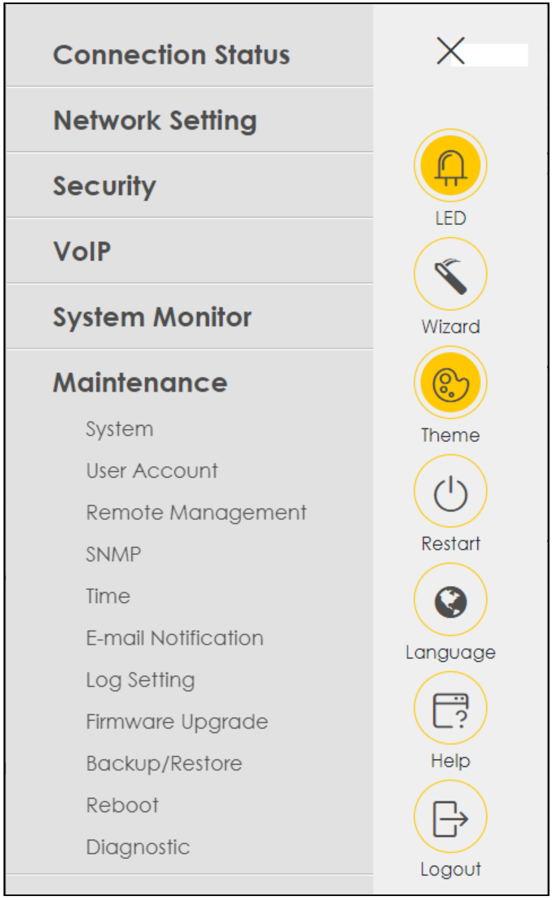
Table 26 Navigation Panel Summary (continued)

LINK	TAB	FUNCTION
TR-369 Local Agent	General	Use this screen to enable TR-369 and set the Zyxel Device as an agent. Select a cellular WAN, and configure the Message Transfer Protocol (MTP) to receive USP messages from USP (User Services Platform) controllers.
	Controller	Use this screen to configure controller settings for topics the Zyxel Device agent should publish to this controller.
	MQTT	Use this screen to manage the profile settings that the Zyxel Device will use to register with an MQTT broker.
Time	Time	Use this screen to change your Zyxel Device's time and date.
E-mail Notification	E-mail Notification	Use this screen to configure up to two mail servers and sender addresses on the Zyxel Device.
Log Setting	Log Setting	Use this screen to change your Zyxel Device's log settings.
Firmware Upgrade	Firmware Upgrade	Use this screen to upload firmware to your Zyxel Device.
	Module Upgrade	Use this screen to upload the module firmware to your Zyxel Device.
Backup/Restore	Backup/Restore	Use this screen to backup and restore your Zyxel Device's configuration (settings) or reset the factory default settings.
Reboot	Reboot	Use this screen to reboot the Zyxel Device or Zyxel Mesh system without turning the power off.
Diagnostic	Diagnostic	Use this screen to identify problems with the Zyxel Device. You can use Ping, TraceRoute, or Nslookup to help you identify problems.

3.2.1.3 Dashboard

Use the menu items in the navigation panel on the right to open screens to configure the Zyxel Device's features.

Figure 51 Navigation Panel

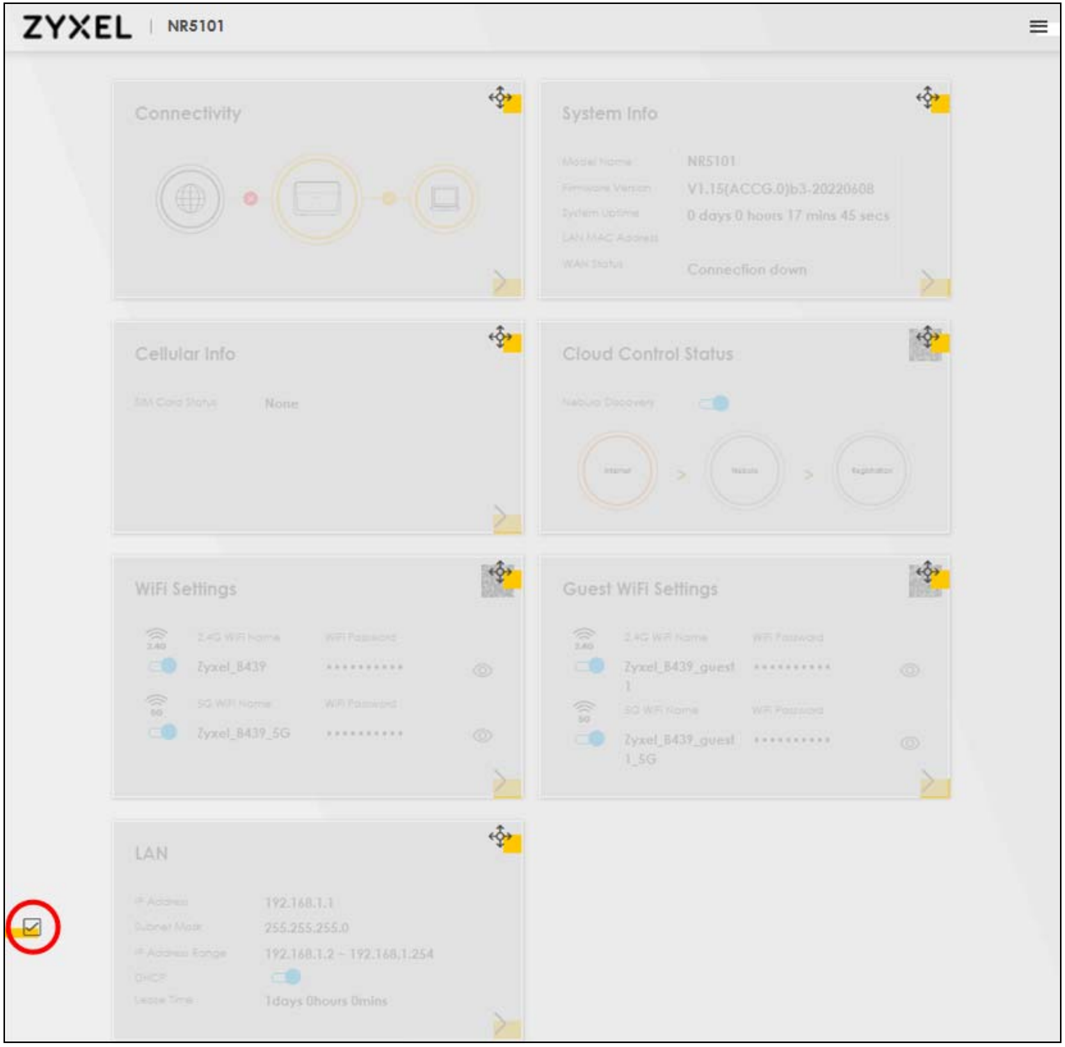


3.2.2 Widget Icon

Click the Widget icon (▦) in the lower left corner to arrange the screen order.

The following screen appears. Select a block and hold it to move around. Click the Check icon (☑) in the lower left corner to save the changes.

Figure 52   Check Icon



System Info

Model Name NR5101
Firmware Version V1.15(ACCG.0)b3-20220608
System Uptime 0 days 0 hours 17 mins 45 secs
LAN MAC Address
WAN Status Connection down

Cellular Info

SIM Card Status None

Nebula Discovery

WiFi Settings

2.4G WiFi Name	WiFi Password
Zyxel_8439	••••••••••
5G WiFi Name	WiFi Password
Zyxel_8439_5G	••••••••••

Guest WiFi Settings

2.4G WiFi Name	WiFi Password
Zyxel_8439_guest1	••••••••••
5G WiFi Name	WiFi Password
Zyxel_8439_guest1_5G	••••••••••

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

CHAPTER 4
Quick Start

4.1 Quick Start Overview

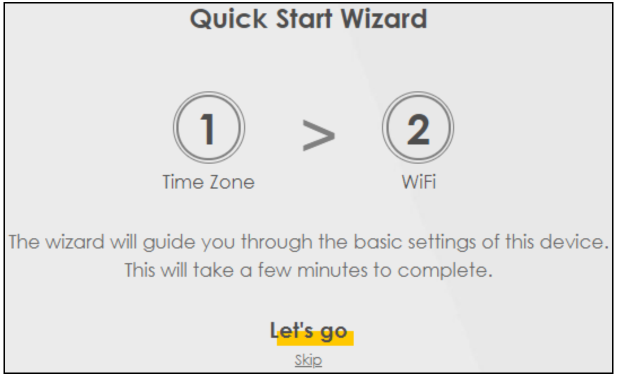
Use the Wizard screens to configure the Zyxel Device's time zone and Wi-Fi settings.

Note: See the technical reference chapters for background information on the features in this chapter.

4.2 Quick Start Setup

You can click the Wizard icon in the side bar to open the Wizard screens. After you click the Wizard icon, the following screen appears. Click Let's go to proceed with settings on time zone and Wi-Fi networks. It will take you a few minutes to complete the settings on the Wizard screens. You can click Skip to leave the Wizard screens.

Figure 53 Wizard – Home

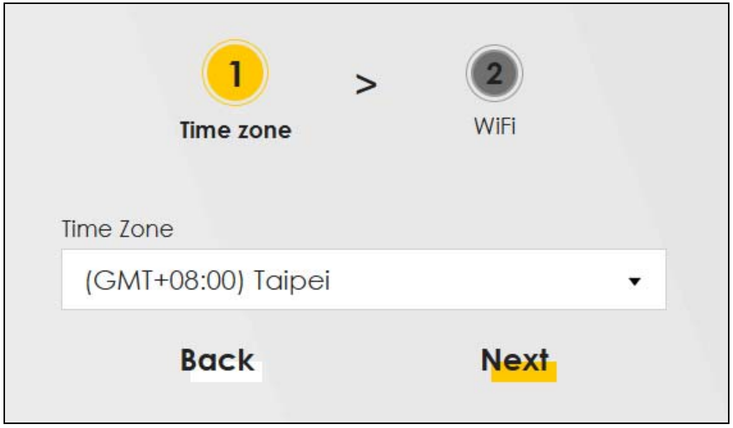


The wizard will guide you through the basic settings of this device. This will take a few minutes to complete.

4.3 Quick Start Setup – Time Zone

Select the time zone of the Zyxel Device's location. Click Next.

Figure 54 Wizard – Time Zone



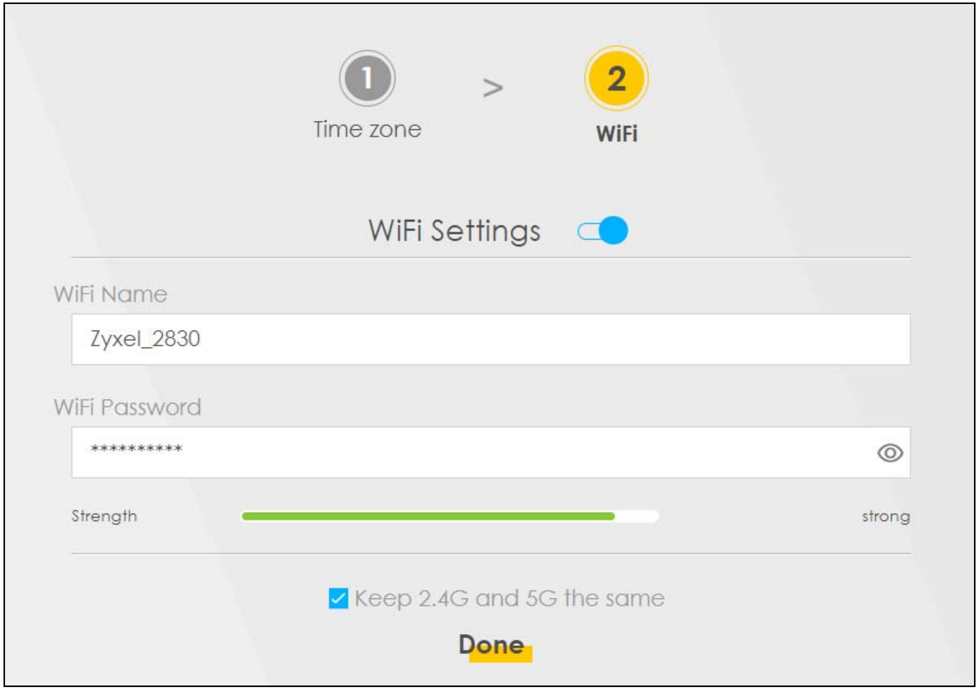
Time Zone: (GMT+08:00) Taipei

4.4 Quick Start Setup – Wi-Fi

Turn Wi-Fi on or off. If you keep it on, record the Wi-Fi Name and Password in this screen so you can configure your Wi-Fi clients to connect to the Zyxel Device. If you want to show or hide your Wi-Fi password, click the Eye icon (👁).

Select Keep 2.4GHz and 5GHz the same to use the same SSID for 2.4 GHz and 5 GHz Wi-Fi networks. Otherwise, clear the checkbox to have two different SSIDs for 2.4 GHz and 5 GHz Wi-Fi networks. The screen and fields to enter may vary when you select or clear the checkbox.

Figure 55 Wizard – Wi-Fi



WiFi Settings ●

WiFi Name: Zyxel_2830

WiFi Password: **********

Strength: strong

☑ Keep 2.4G and 5G the same

Note: Only the Nebula LTE3301-PLUS supports the Country feature.

Note: You can also enable the wireless service using any of the following methods:
Click Network Setting > Wireless to open the General screen. Then select Enable in the Wi-Fi field. Or, press the Wi-Fi ON/OFF button for more than 5 seconds.

4.5 Quick Start Setup – Finish

Your Zyxel Device saves and applies your settings.

CHAPTER 5
Web Interface Tutorials

5.1 Web Interface Overview

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

- SIM Card Setup - Activate and unblock the SIM card.
- Device Settings - Rename your Zyxel Device, change the admin password, change the management IP address, and create another admin or user account.
- Wired Network Setup - Set up a wired network connection using DSL, GPON, or Ethernet.
- Wi-Fi Network Setup - Change the Wi-Fi name, password, and security mode; connect to the Wi-Fi network using the WPS; set up a guest Wi-Fi network with different Wi-Fi bands; and configure the channel and bandwidth for each Wi-Fi band.
- Cellular Network Setup - Set up a cellular network connection and cellular APN setting.
- USB Applications - Set up file sharing, play files through Windows Media Player with a USB device, and set up a print server.
- Network Security - Configure a firewall rule and scheduler rule, set up parental control rule, set up home security, and configure a MAC Filter rule.
- Secure Server Setup - Set up a DMZ server.
- IP Passthrough Mode Setup - How and when to use IP Passthrough mode.
- Device Maintenance - Upgrade the firmware, back up the firmware, restore the Zyxel Device configuration, and reset the Zyxel Device to factory defaults.
- Remote Access from WAN - Configure remote access to your Zyxel Device and configure the trust domain.

5.2 SIM Card Setup

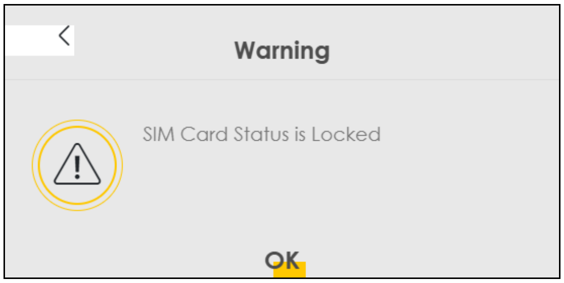
This section shows you how to:

- Unlock the SIM Card
- Unblock the SIM Card

5.2.1 Unlock the SIM Card

This section shows you how to unlock the SIM card if the SIM card you insert into the Zyxel Device has PIN code protection.

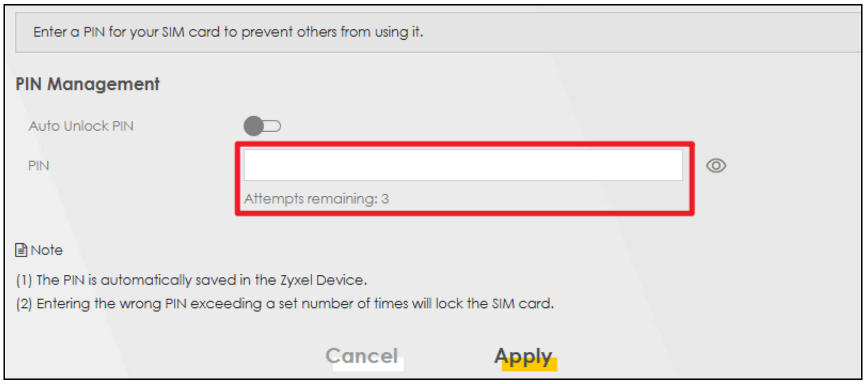
1 When you access the Web Configurator Home screen, a warning message will appear. Click OK. If you accidentally close the message, go to Network Setting > Broadband > Cellular SIM.



SIM Card Status is Locked

2 Enter the 4-digit PIN code (0000 for example) provided by your ISP in the PIN field.

Note: If you enter the PIN code incorrectly too many times, the SIM card will be blocked. You can check the remaining times from Attempts remaining. See Section 5.2.2 on page 75 to unblock the SIM card.


Enter a PIN for your SIM card to prevent others from using it.

PIN Management

Auto Unlock PIN

PIN

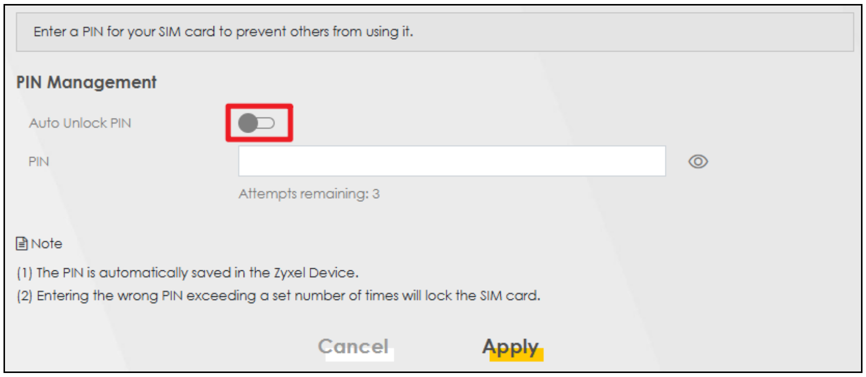
Attempts remaining: 3

Note

(1) The PIN is automatically saved in the Zyxel Device.

(2) Entering the wrong PIN exceeding a set number of times will lock the SIM card.

3 To avoid unlocking the SIM card after each restart, slide the Auto Unlock PIN switch to the right to have the Zyxel Device automatically unlock the SIM card. Otherwise, slide the switch to the left, you will need to manually enter the PIN every time you restart the Zyxel Device or reinsert the SIM card.


Enter a PIN for your SIM card to prevent others from using it.

PIN Management

Auto Unlock PIN

PIN

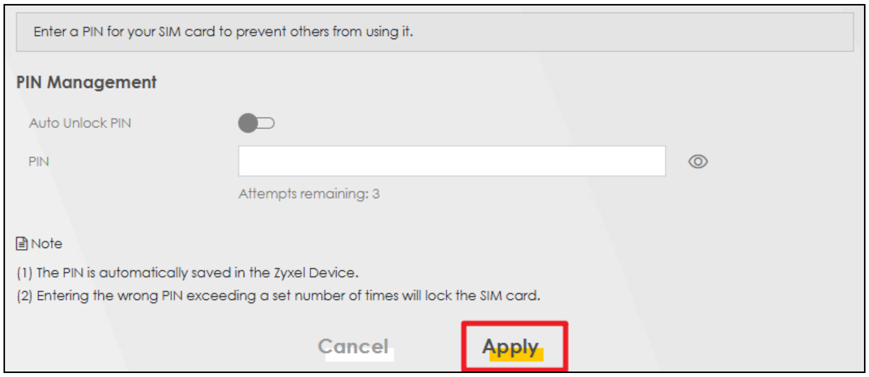
Attempts remaining: 3

Note

(1) The PIN is automatically saved in the Zyxel Device.

(2) Entering the wrong PIN exceeding a set number of times will lock the SIM card.

4 Click Apply.



Enter a PIN for your SIM card to prevent others from using it.

PIN Management

Auto Unlock PIN

PIN

Attempts remaining: 3

Note

(1) The PIN is automatically saved in the Zyxel Device.

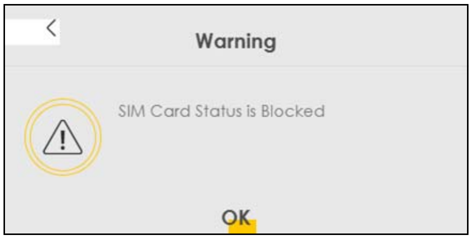
(2) Entering the wrong PIN exceeding a set number of times will lock the SIM card.

5.2.2 Unblock the SIM Card

This SIM card will be blocked if you enter the PIN code incorrectly too many times. Follow the steps below to unblock the SIM card.

1 Contact your ISP for the Personal Unblocking Key (PUK) code.

2 When you access the Web Configurator Home screen, a warning message will appear. Click OK. If you accidentally close the message, go to Network Setting > Broadband > Cellular SIM.

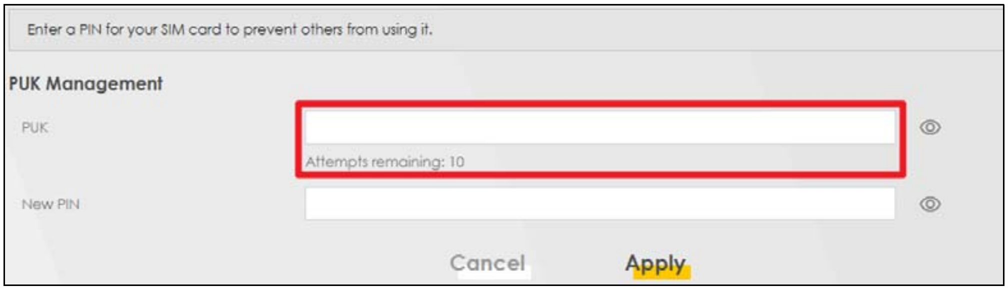


Warning

SIM Card Status is Blocked

3 Enter the PUK code provided by your ISP in the PUK field.

Note: If you enter the PUK code incorrectly too many times, your SIM card will be permanently locked, and you will need a new SIM card. You can check the remaining times from Attempts remaining.



Enter a PIN for your SIM card to prevent others from using it.

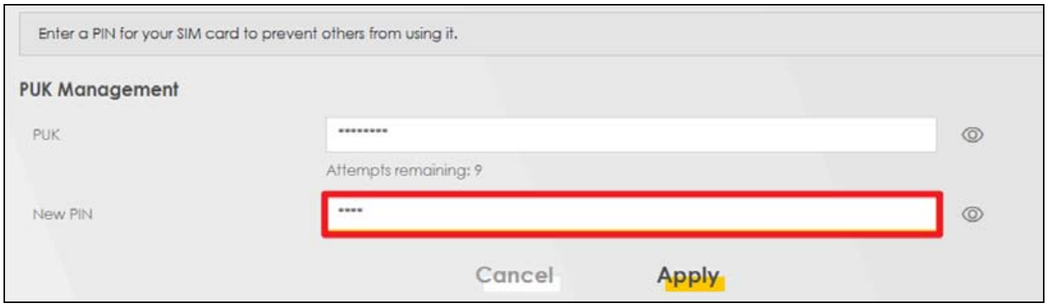
PUK Management

PUK

Attempts remaining: 10

New PIN

4 Set up a new PIN code by entering a 4-digit PIN code (0000 for example) in the New PIN field.



Enter a PIN for your SIM card to prevent others from using it.

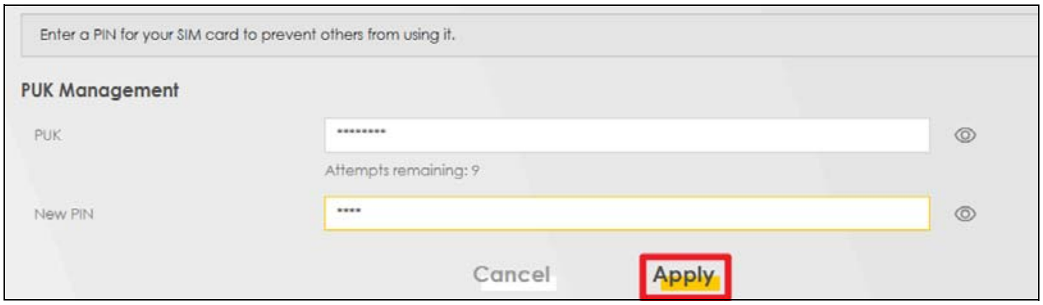
PUK Management

PUK: ********

Attempts remaining: 9

New PIN: ****

5 Click Apply.



Enter a PIN for your SIM card to prevent others from using it.

PUK Management

PUK: ********

Attempts remaining: 9

New PIN: ****

5.3 Device Settings

This section shows you how to:

- Rename Your Zyxel Device
- Change the Admin Password
- Change the Management IP Address
- Create Another Admin or User Account

You can rename your device, and change the admin password.

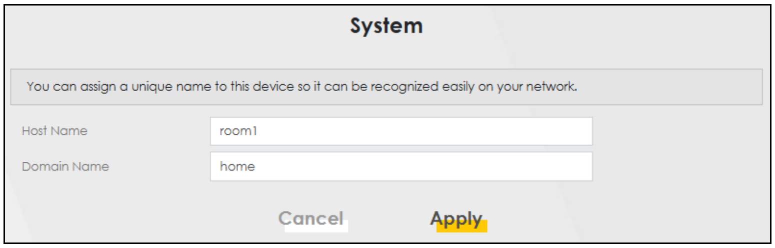
5.3.1 Rename Your Zyxel Device

An FQDN (Fully Qualified Domain Name) is used to identify a specific host on the Internet, consisting of a host name and a domain name.

Proper naming of the host name and domain name makes the Zyxel Device and the network easier to identify, manage, and troubleshoot. The host name is the name of your Zyxel Device, while the domain name is the name of the entire network your Zyxel Device belongs to. If your Zyxel Device's host name is room1, and it belongs to the domain you name with home.com, then your Zyxel Device's FQDN would be room1.home.com.

To change the host name and the domain name, please follow the steps below:

1 Go to the Maintenance > System screen. Enter a new host name in the Host Name field and a domain name in the Domain Name field (special characters and spaces are not allowed). Click Apply.



System

You can assign a unique name to this device so it can be recognized easily on your network.

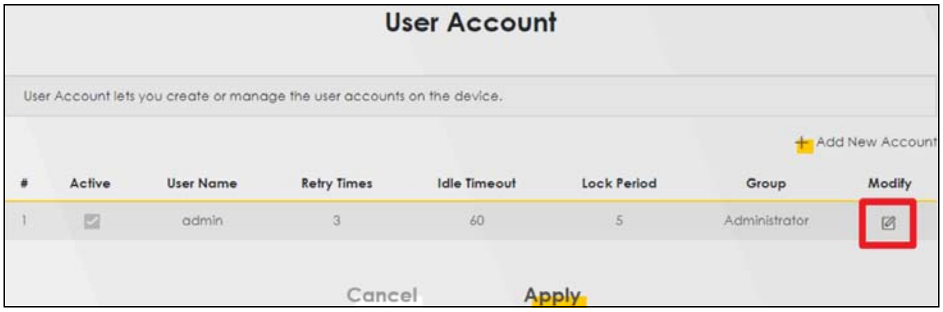
Host Name	room1
Domain Name	home

2 Go to the Connection Status > System Info. You can see the new host name has been applied successfully.

5.3.2 Change the Admin Password

Change the Web Configurator login password regularly to secure access to your Zyxel Device. To change the admin password, follow the steps below:

1 Go to the Maintenance > User Account screen. Click the Edit icon.



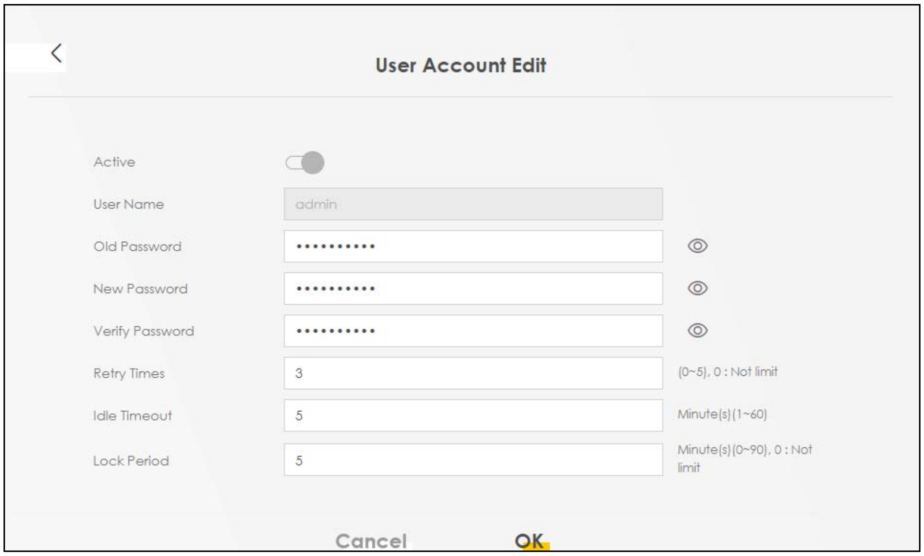
User Account

User Account lets you create or manage the user accounts on the device.

#	Active	User Name	Retry Times	Idle Timeout	Lock Period	Group	Modify
1	☑	admin	3	60	5	Administrator	✎

2 The User Account Edit screen appears. Enter your old and new passwords in the corresponding field. Click OK.

Note: The new password must be at least 8 characters, must contain at least one uppercase letter, one lowercase letter, one number, and one special character. For some models, the password must contain at least one English character and one number. Please see the password requirement displayed on the screen.



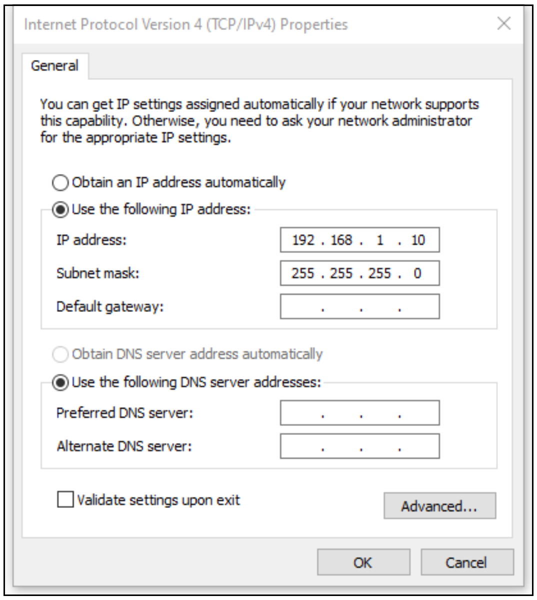
User Account Edit

Active	●
User Name	admin
Old Password	••••••••••
New Password	••••••••••
Verify Password	••••••••••
Retry Times	3 (0~5), 0 : Not limit
Idle Timeout	5 Minute(s) (1~60)
Lock Period	5 Minute(s) (0~90), 0 : Not limit

5.3.3 Change the Management IP Address

Duplicated IP addresses in the network environment may cause failure to connect to the Zyxel Device. To change the management IP address of your Zyxel Device, please follow the steps below:

1 Change your computer's IP address to the same subnet as the Zyxel Device. For example, if the default static IP address of the Zyxel Device is 192.168.1.1, set your computer IP address between 192.168.1.2 and 192.168.1.254.



Internet Protocol Version 4 (TCP/IPv4) Properties

General

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

○ Obtain an IP address automatically

● Use the following IP address:

IP address:	192 . 168 . 1 . 10
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	. . .

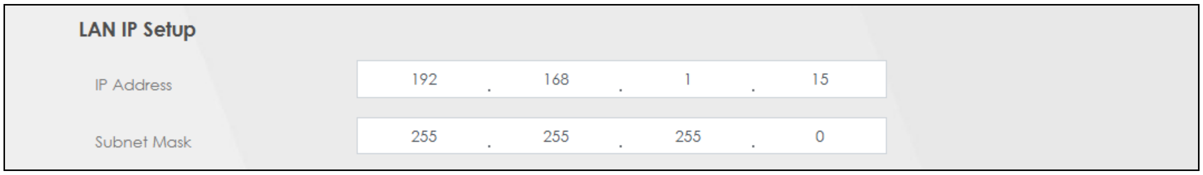
○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server:	. . .
Alternate DNS server:	. . .

□ Validate settings upon exit

2 Log into the Zyxel Device using the default IP address “192.168.1.1” “192.168.15.1”. Go to Network Setting > Home Networking. Enter your preferred IPv4 address in the IP Address field. For example, “192.168.1.15”. Click Apply and the Zyxel Device will disconnect from your computer due to the IP address change.



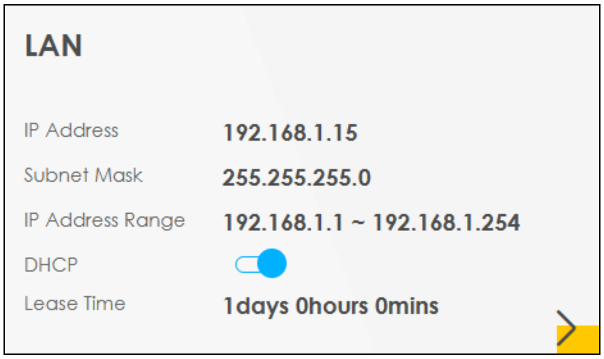
LAN IP Setup

IP Address 192 . 168 . 1 . 15

Subnet Mask 255 . 255 . 255 . 0

3 Enter the new IP address "192.168.1.15" in the address bar to check if you can access the Zyxel Device's Web Configurator.

4 After logging in, click the menu icon (☰) and go to Connection Status. In the LAN section, the IP Address should now be "192.168.1.15".



LAN

IP Address	192.168.1.15
Subnet Mask	255.255.255.0
IP Address Range	192.168.1.1 ~ 192.168.1.254
DHCP	●
Lease Time	1days 0hours 0mins

5.3.4 Create Another Admin or User Account

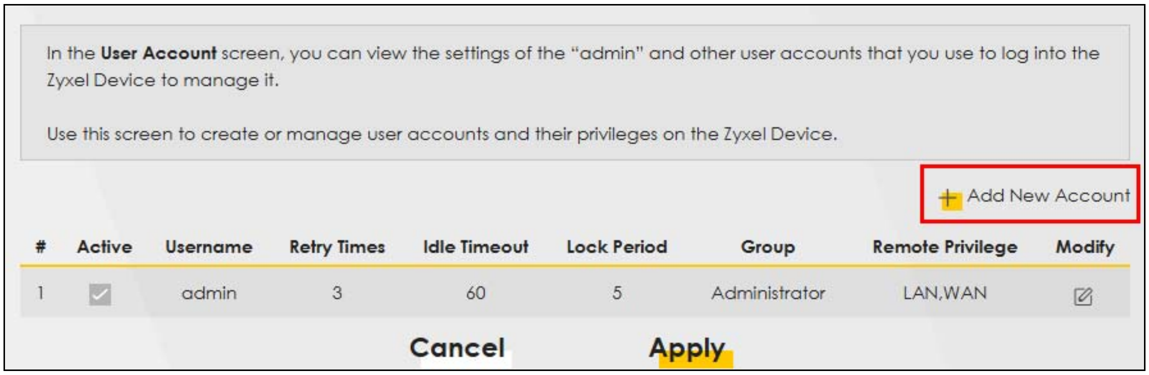
To let multiple users access the Web Configurator, you can create more than one Administrator or User account. A total of eight users can log in to the Zyxel Device at the same time.

The total number of accounts you can create for each group type:

Administrator Account	4
User Account	4

The steps below shows how to create Administrator and User accounts:

1 Log into the Web Configurator. Go to Maintenance > User Account. Click the + icon on the right to Add New Account.



In the **User Account** screen, you can view the settings of the "admin" and other user accounts that you use to log into the Zyxel Device to manage it.

Use this screen to create or manage user accounts and their privileges on the Zyxel Device.

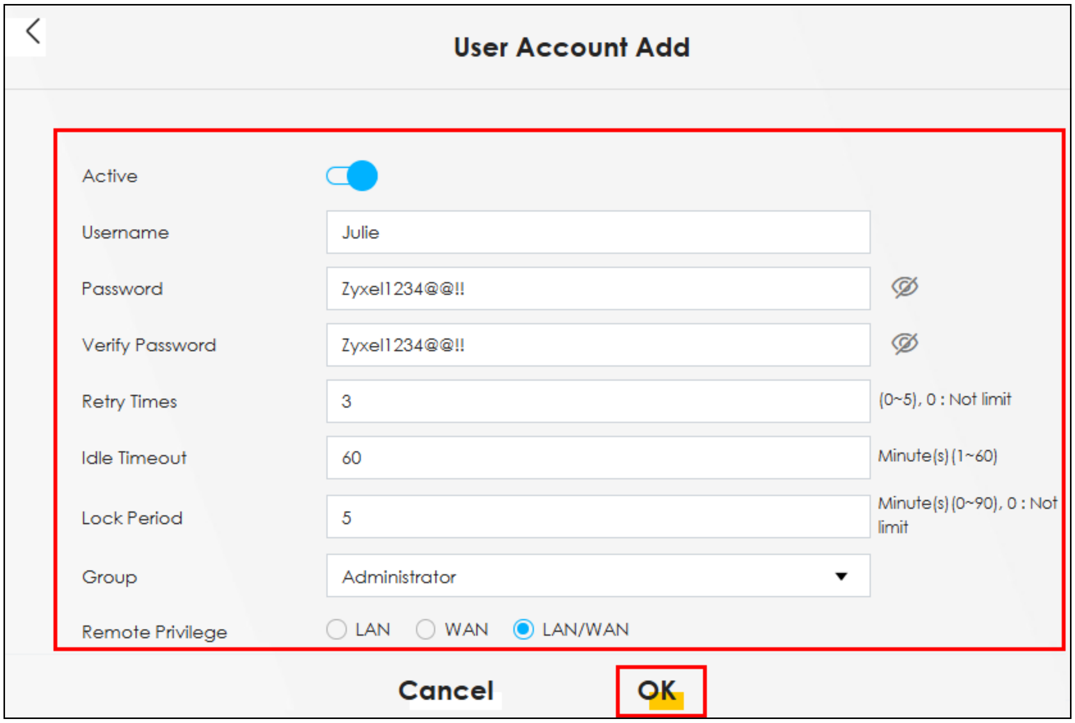
#	Active	Username	Retry Times	Idle Timeout	Lock Period	Group	Remote Privilege	Modify
1	☑	admin	3	60	5	Administrator	LAN,WAN	✎

2 The User Account Add screen appears. Enter the information for the new account. In the Group drop-down list, select Administrator for the account. Click OK.

Administrator and User accounts have different privileges. For more details, please refer to User Account.

The example below uses the following parameters for the new Administrator account.

Username	Julie
Password	Zyxel1234@@!!
Retry Times	3 Times
Idle Timeout	60 Minutes
Lock Period	5 Minutes
Remote Privilege	LAN/WAN

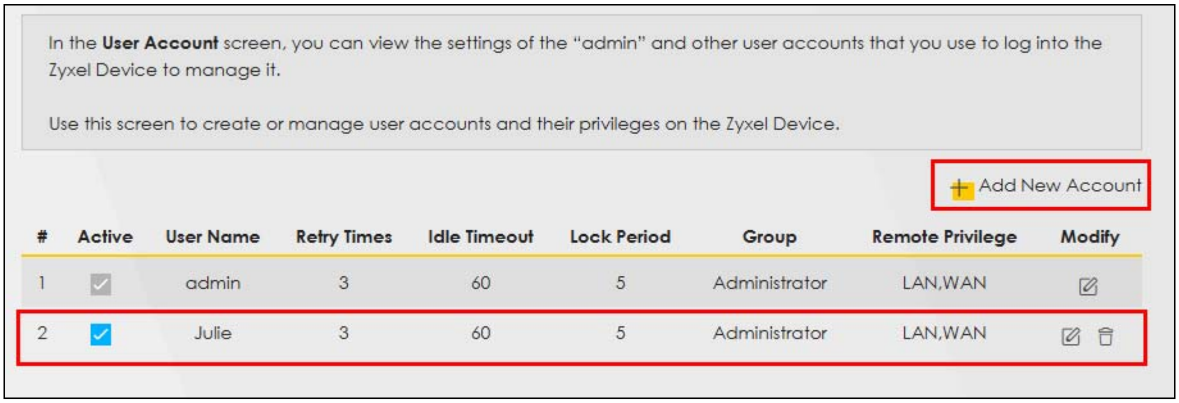


User Account Add

Active	●	
Username	Julie	
Password	Zyxel1234@@!!	
Verify Password	Zyxel1234@@!!	
Retry Times	3	(0~5), 0 : Not limit
Idle Timeout	60	Minute(s) (1~60)
Lock Period	5	Minute(s) (0~90), 0 : Not limit
Group	Administrator ▼	
Remote Privilege	○ LAN ○ WAN ● LAN/WAN	

3 In the Maintenance > User Account screen, an Administrator account named Julie has been created. To add a User account, click the + icon on the right to Add New Account.

The grayed-out box ☑ indicates the logged-in account. The highlighted box ☑ indicates that the status of the other account can be modified. In the below example, the logged-in admin account can block Julie's account by deselecting Julie's Active checkbox.



In the **User Account** screen, you can view the settings of the "admin" and other user accounts that you use to log into the Zyxel Device to manage it.

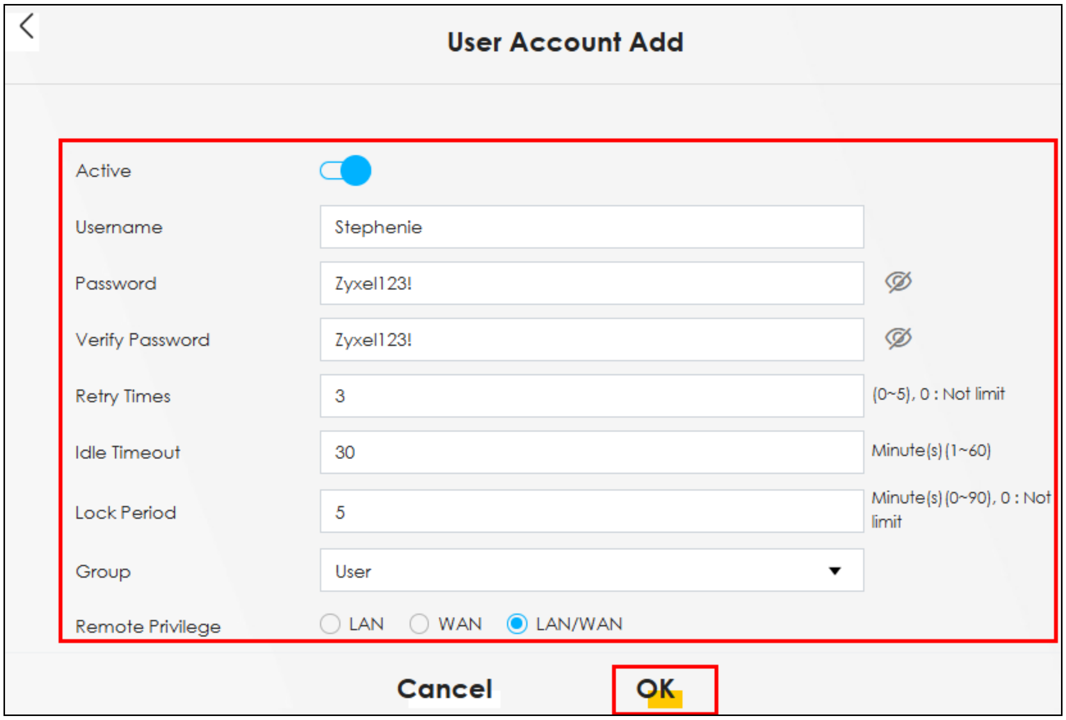
Use this screen to create or manage user accounts and their privileges on the Zyxel Device.

#	Active	User Name	Retry Times	Idle Timeout	Lock Period	Group	Remote Privilege	Modify
1	☑	admin	3	60	5	Administrator	LAN,WAN	
2	☑	Julie	3	60	5	Administrator	LAN,WAN	

4 The User Account Add screen appears. Enter the information for the new account. In the Group drop-down list, select User for the account. Click OK.

The example below uses the following parameters for the new User account.

Username	Stephenie
Password	Zyxel123!
Retry Times	3 Times
Idle Timeout	30 Minutes
Lock Period	5 Minutes
Remote Privilege	LAN/WAN

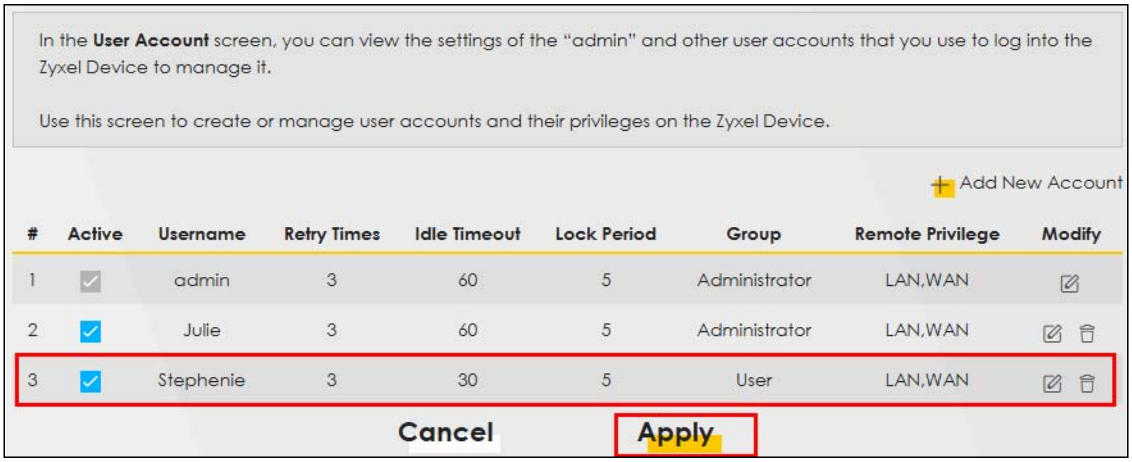


User Account Add

Active	●	
Username	Stephenie	
Password	Zyxel123!	
Verify Password	Zyxel123!	
Retry Times	3	(0~5), 0 : Not limit
Idle Timeout	30	Minute(s) (1~60)
Lock Period	5	Minute(s) (0~90), 0 : Not limit
Group	User	
Remote Privilege	○ LAN ○ WAN ● LAN/WAN	

5 In the Maintenance > User Account screen, a User account named Stephenie has been created. Click Apply to save the newly created accounts.

In the below example, the logged-in admin account can block Julie's account by deselecting Julie and Stephenie's Active checkbox ☑.



In the **User Account** screen, you can view the settings of the "admin" and other user accounts that you use to log into the Zyxel Device to manage it.

Use this screen to create or manage user accounts and their privileges on the Zyxel Device.

#	Active	Username	Retry Times	Idle Timeout	Lock Period	Group	Remote Privilege	Modify
1	☑	admin	3	60	5	Administrator	LAN,WAN	✎
2	☑	Julie	3	60	5	Administrator	LAN,WAN	✎ 🗑
3	☑	Stephenie	3	30	5	User	LAN,WAN	✎ 🗑

5.4 Wired Network Setup

This section shows you how to:

- Set Up an Ethernet Connection

You can set up a DSL Internet connection with the Broadband screens. The screens vary by the connection mode, encapsulation type and IP mode (IPv6 or IPv4) you select.

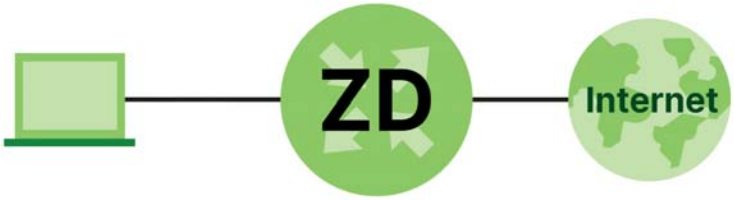
Set the Zyxel Device to Routing mode or Bridge mode on this connection as follows:

- Use Routing mode if you want the Zyxel Device to use routing mode functions such as NAT, Firewall, or DHCP Server. You will need to reconfigure your network if you have an existing router.
- Use Bridge mode to pass the ISP-assigned IP address(es) to your devices connected to the LAN port. All traffic from the Internet passes through the Zyxel Device directly to devices connected to the LAN port. Use this mode if you already have a router with complete routing functions in your network.

This tutorial shows you how to set up a DSL Internet connection using the Web Configurator on DSL routers (see Overview).

5.4.1 Set Up an Ethernet Connection

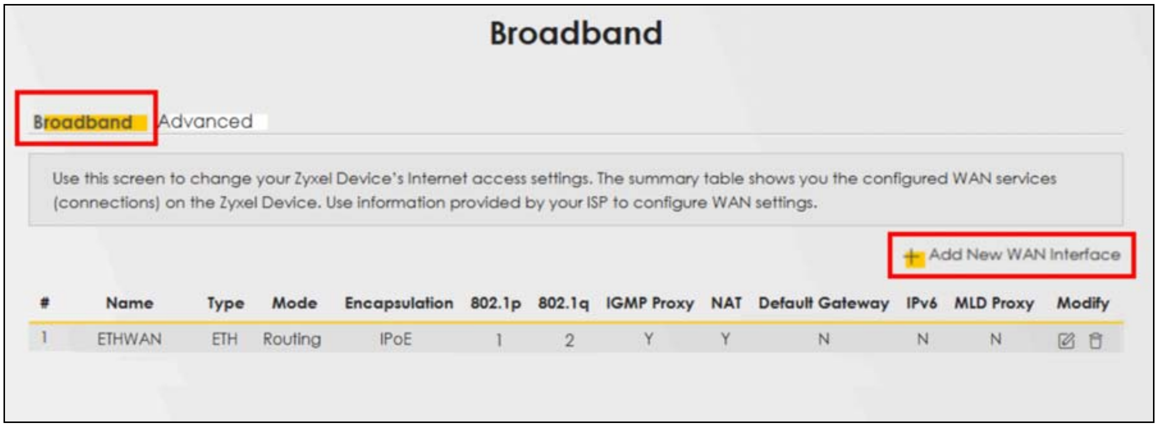
If you connect to the Internet through an Ethernet connection, you need to connect a broadband modem or router with Internet access to the WAN Ethernet port on the Zyxel Device. You need to configure the Internet settings from the broadband modem or router on the Zyxel Device. First, make sure you have Internet access through the broadband modem or router by connecting directly to it.



This example shows you how to configure an Ethernet WAN connection.

1 Make sure you have the Ethernet WAN port connect to a modem or router.

2 Go to Network Setting > Broadband and then the following screen appears. Click Add New WAN Interface to add a WAN connection.



Broadband

Broadband | Advanced

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.

+ Add New WAN Interface

#	Name	Type	Mode	Encapsulation	802.1p	802.1q	IGMP Proxy	NAT	Default Gateway	IPv6	MLD Proxy	Modify
1	ETHWAN	ETH	Routing	IPoE	1	2	Y	Y	N	N	N	✎ 🗑

3 To set the Zyxel Device to Routing mode, see Routing Mode.
To set the Zyxel Device to Bridge mode, see Bridge Mode.

Routing Mode

1 In this routing mode example, configure the following information for the Ethernet WAN connection.

General	
Name	My ETH Connection
Type	Ethernet
Connection Mode	Routing
Encapsulation (Internet Type)	IPoE
IPv6/IPv4 Mode	IPv4 Only

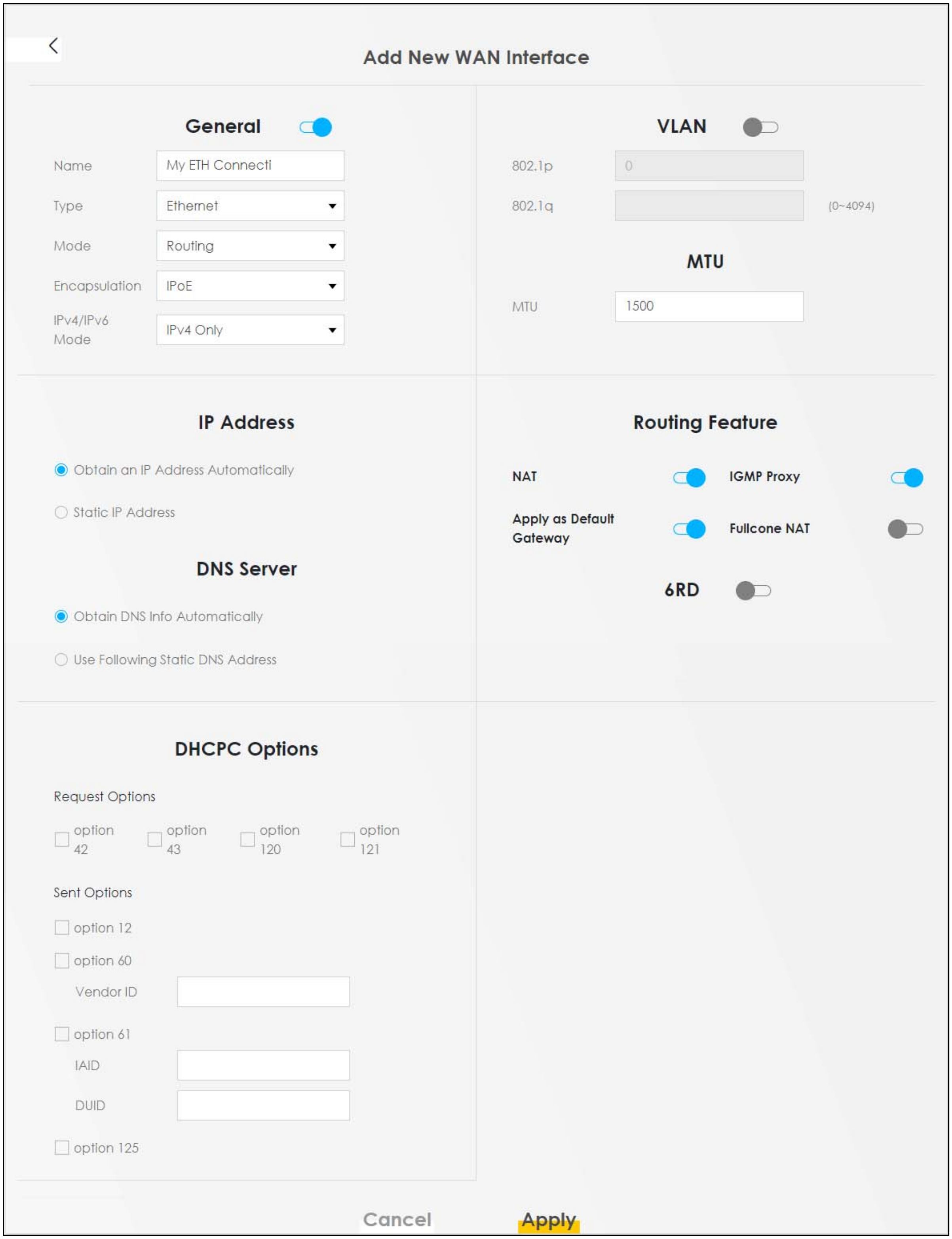
2 Enter the General settings provided by your Internet service provider.

- Enter a Name to identify your WAN connection.
- Set the Type to Ethernet.
- Set your Ethernet connection Mode to Routing.
- Choose the Encapsulation specified by your Internet service provider. For this example, select IPoE as the WAN encapsulation type.
- Set the IPv4/IPv6 Mode to IPv4 Only.

3 Under Routing Feature, enable NAT and Apply as Default Gateway.

4 For the rest of the fields, use the default settings.

5 Click Apply to save your settings.



Add New WAN Interface

General ●

Name	My ETH Connecti
Type	Ethernet ▾
Mode	Routing ▾
Encapsulation	IPoE ▾
IPv4/IPv6 Mode	IPv4 Only ▾

VLAN ○

802.1p	0	
802.1q		(0~4094)

MTU

MTU	1500

IP Address

● Obtain an IP Address Automatically

○ Static IP Address

DNS Server

● Obtain DNS Info Automatically

○ Use Following Static DNS Address

Routing Feature

NAT	●	IGMP Proxy	●
Apply as Default Gateway	●	Fullcone NAT	○

6RD ○

DHCPC Options

Request Options

□ option 42 □ option 43 □ option 120 □ option 121

Sent Options

□ option 12

□ option 60

Vendor ID

□ option 61

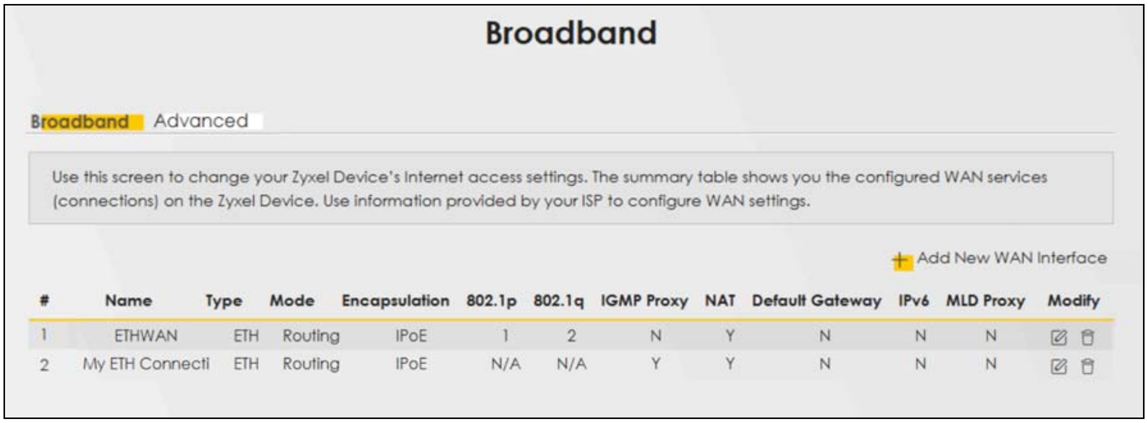
IAID

DUID

□ option 125

Cancel Apply

6 Go to the Network Setting > Broadband screen to view the established Ethernet connection. The new connection is displayed on the Broadband screen.



Broadband

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.

#	Name	Type	Mode	Encapsulation	802.1p	802.1q	IGMP Proxy	NAT	Default Gateway	IPv6	MLD Proxy	Modify
1	ETHWAN	ETH	Routing	IPoE	1	2	N	Y	N	N	N	
2	My ETH Connecti	ETH	Routing	IPoE	N/A	N/A	Y	Y	N	N	N	

Bridge Mode

1 In this bridge mode example, configure the following information for the Ethernet WAN connection.

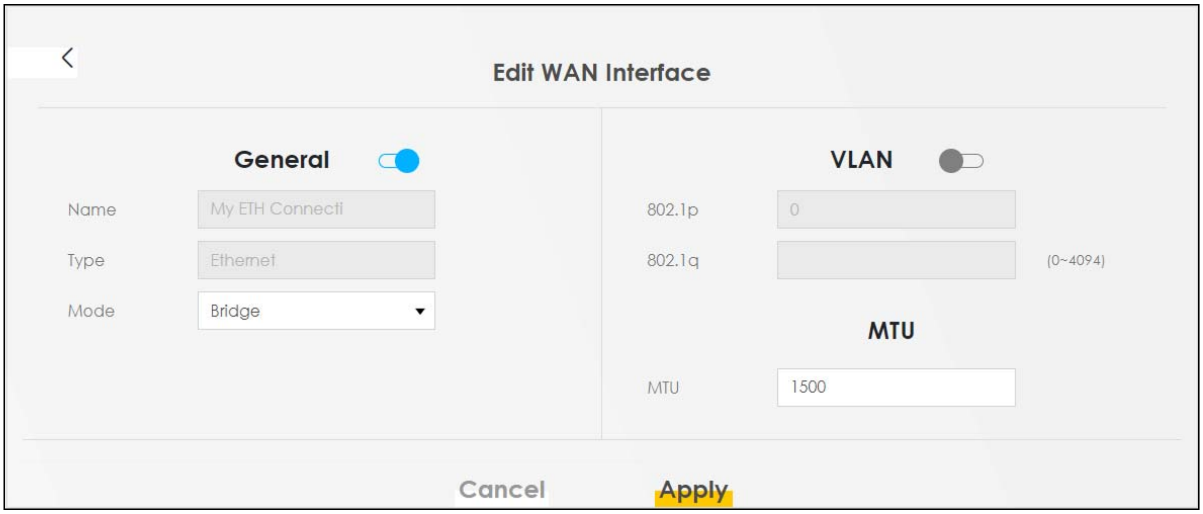
General	
Name	My ETH Connection
Type	Ethernet
Connection Mode	Bridge

2 Enter the General settings provided by your Internet service provider.

- Enter a Name to identify your WAN connection.
- Set the Type to Ethernet.
- Set your Ethernet connection Mode to Bridge.

3 For the rest of the fields, use the default settings.

4 Click Apply to save your settings.



Edit WAN Interface

General

Name: My ETH Connecti

Type: Ethernet

Mode: Bridge

VLAN

802.1p: 0

802.1q: (0~4094)

MTU

MTU: 1500

5.5 Wi-Fi Network Setup

This section shows you how to:

- Change the Zyxel Device Wireless Network Name (SSID)
- Change the Zyxel Device Wi-Fi Password
- Change Security Settings on a Wi-Fi Network
- Enhance Security Settings on a Zyxel Device Wi-Fi Network
- Connect to the Zyxel Device's Wi-Fi Network Using WPS
- Set Up a Guest Network
- Set Up Two Guest Wi-Fi Networks on Different Wi-Fi Bands
- Configure the Channel and Bandwidth for Each Wi-Fi Band

In this example, you want to set up a Wi-Fi network so that you can use your notebook to access the Internet. In this Wi-Fi network, the Zyxel Device is an access point (AP), and the notebook is a Wi-Fi client. The Wi-Fi client can access the Internet through the AP.

For NR Outdoor devices, the Wi-Fi network if only for configuring the Zyxel Device. Remember to turn it off after all configurations are done.

See the label on the Zyxel Device for the Wi-Fi network settings and then connect manually to the Zyxel Device. Alternatively, you can connect to the Zyxel Device Wi-Fi network using WPS. See Section 5.5.5 on page 96.

Figure 56 Wi-Fi Network Setup

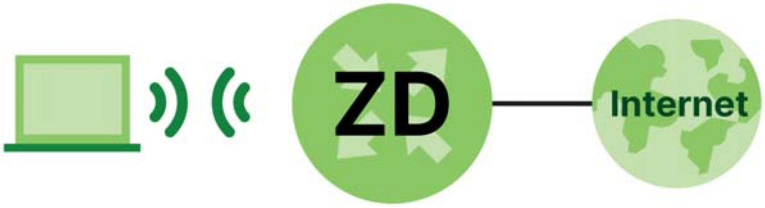


Figure 57 Zyxel Device Configuration through Wi-Fi Connection

5.5.1 Change the Zyxel Device Wireless Network Name (SSID)

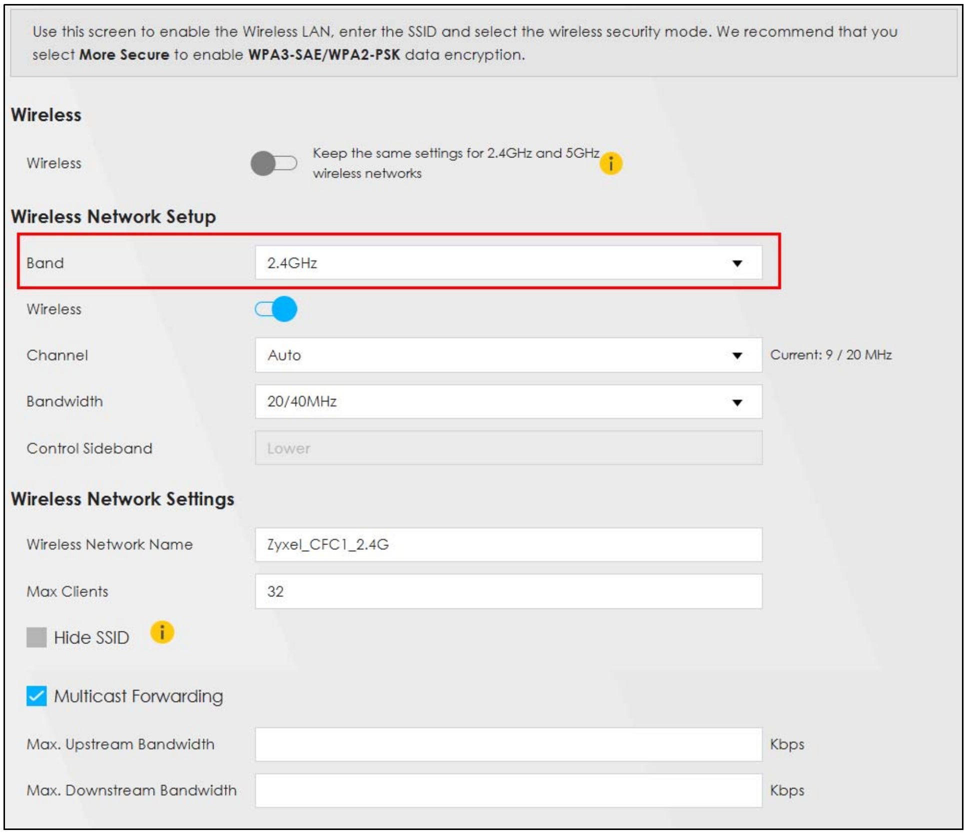
You set up the Zyxel Device at home but have trouble finding its Wi-Fi network among many nearby networks. To make it easier to identify, you can change the default Wireless Network Name.

To modify the Wireless Network Name, follow the steps below:

1 Log into the Web Configurator.

2 Go to Network Setting > Wireless > General.

3 In Wireless Network Setup, select the Band you want to change the Wireless Network Name in the drop down list.



Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable **WPA3-SAE/WPA2-PSK** data encryption.

Wireless

Wireless	○	Keep the same settings for 2.4GHz and 5GHz wireless networks

Wireless Network Setup

Band	2.4GHz ▾	
Wireless	●	
Channel	Auto ▾	Current: 9 / 20 MHz
Bandwidth	20/40MHz ▾	
Control Sideband	Lower	

Wireless Network Settings

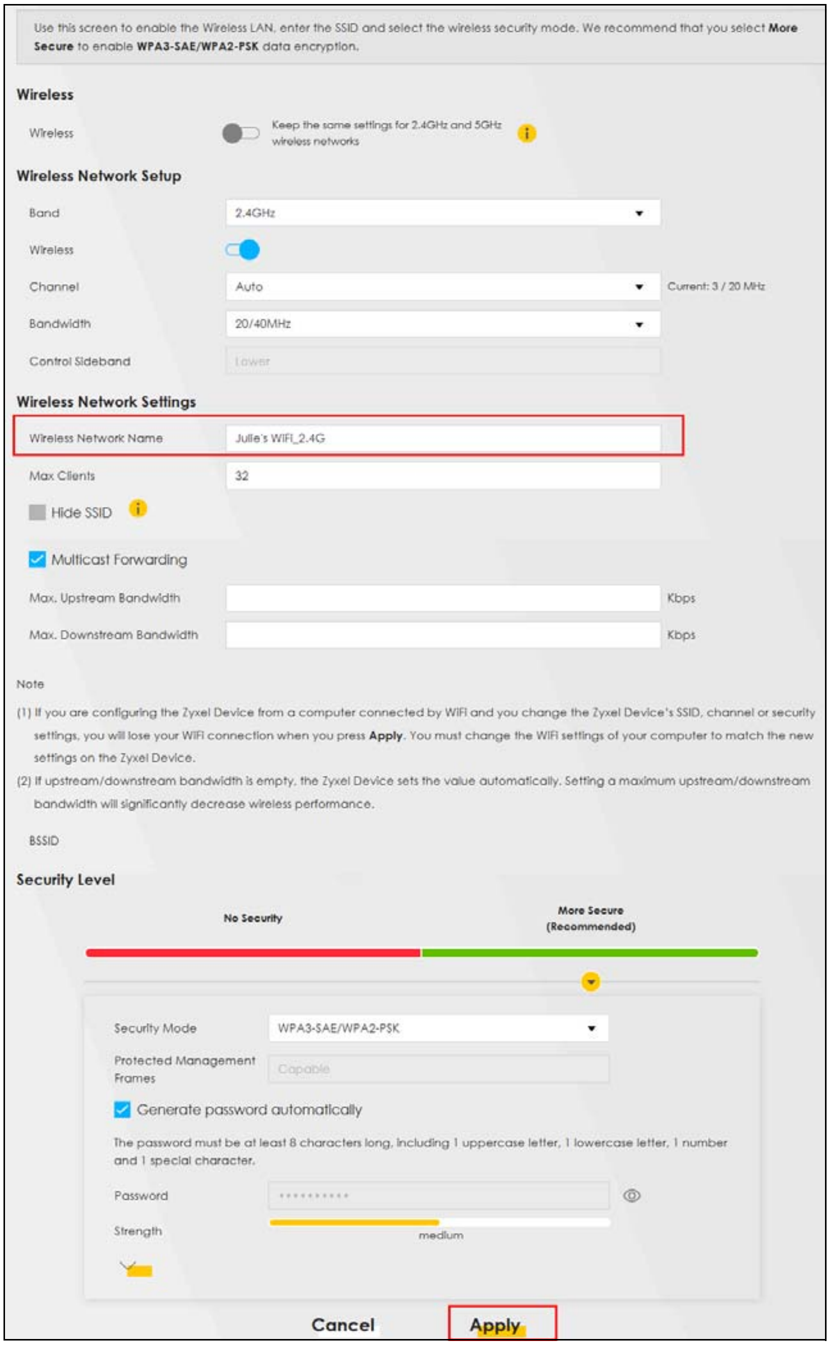
Wireless Network Name	Zyxel_CFC1_2.4G	
Max Clients	32	

□ Hide SSID

☑ Multicast Forwarding

Max. Upstream Bandwidth		Kbps
Max. Downstream Bandwidth		Kbps

4 In Wireless Network Settings, enter the new Wi-Fi network name in the Wireless Network Name field. You can use up to 32 printable characters, including spaces. In the example below, the 2.4GHz Wi-Fi network is renamed to “Julie’s Wi-Fi_2.4G”.



Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable **WPA3-SAE/WPA2-PSK** data encryption.

Wireless

Wireless: Keep the same settings for 2.4GHz and 5GHz wireless networks

Wireless Network Setup

Band	2.4GHz
Wireless	On
Channel	Auto — Current: 3 / 20 MHz
Bandwidth	20/40MHz
Control Sideband	Lower

Wireless Network Settings

Wireless Network Name	Julie's WIFI_2.4G
Max Clients	32

□ Hide SSID

☑ Multicast Forwarding

Max. Upstream Bandwidth	Kbps
Max. Downstream Bandwidth	Kbps

Note

(1) If you are configuring the Zyxel Device from a computer connected by WiFi and you change the Zyxel Device's SSID, channel or security settings, you will lose your WiFi connection when you press **Apply**. You must change the WiFi settings of your computer to match the new settings on the Zyxel Device.

(2) If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

BSSID

Security Level

Security Mode	WPA3-SAE/WPA2-PSK
Protected Management Frames	Capable

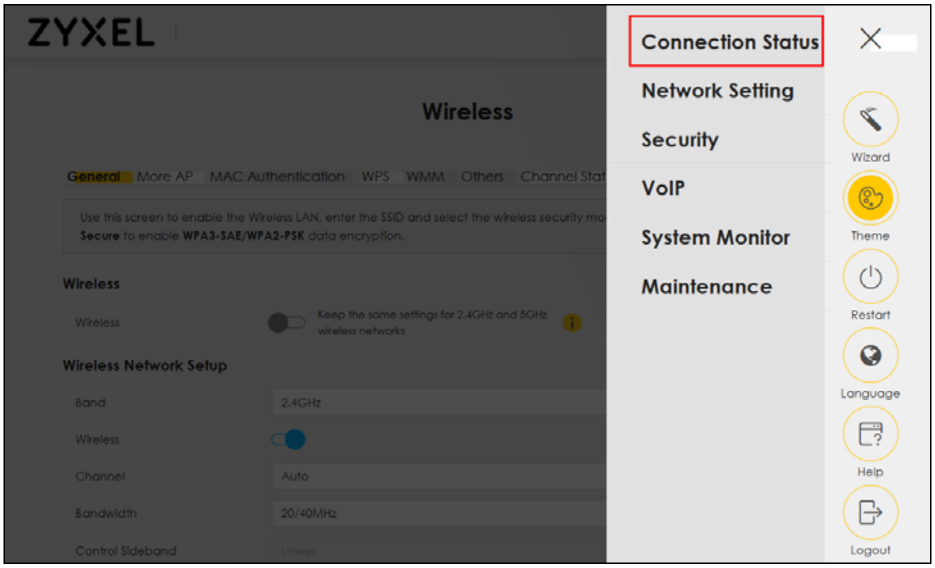
☑ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

Password	••••••••••
Strength	medium

5 When finished, scroll down and click Apply.

6 Click the menu icon (☰) in the upper right corner, and then click Connection Status.



Wireless

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mo
Secure to enable **WPA3-SAE/WPA2-PSK** data encryption.

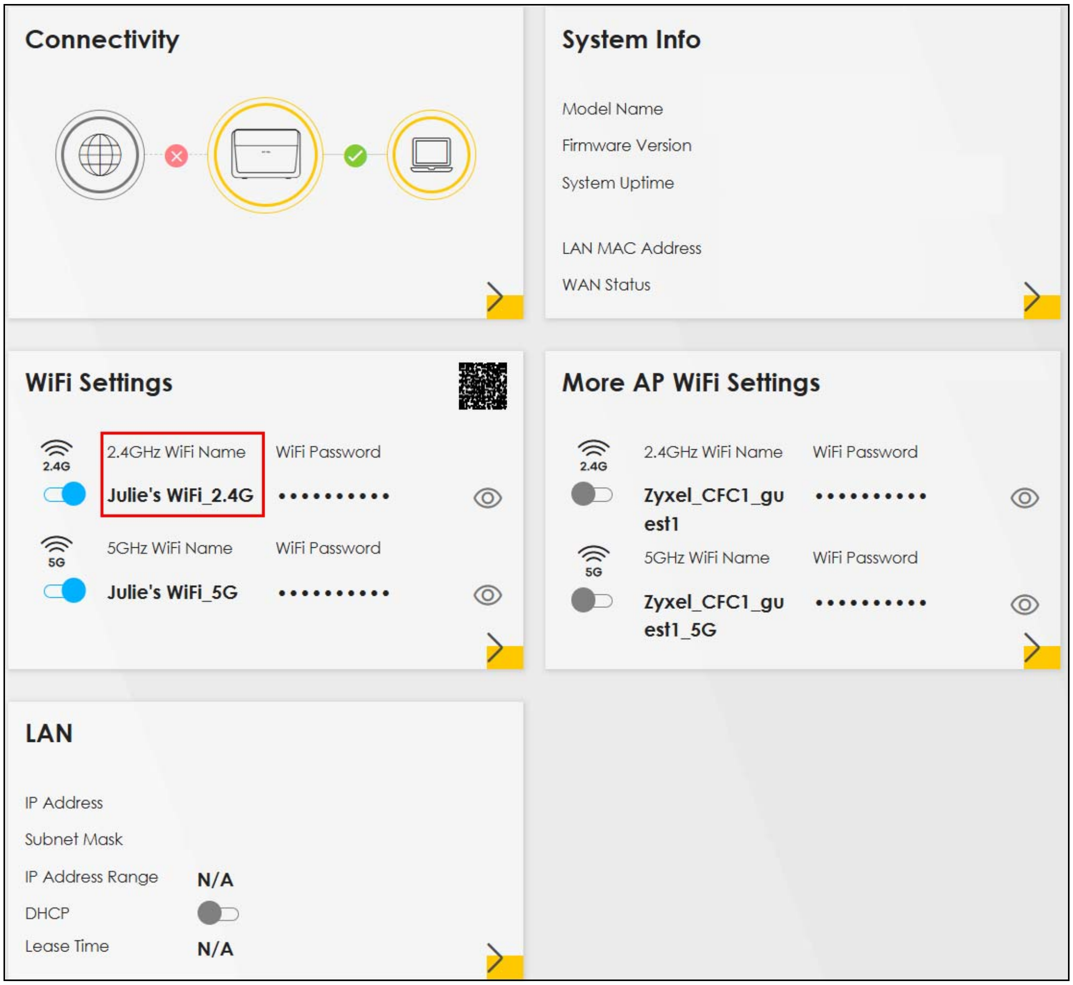
Wireless

Wireless ○ Keep the same settings for 2.4GHz and 5GHz wireless networks

Wireless Network Setup

Band	2.4GHz
Wireless	●
Channel	Auto
Bandwidth	20/40MHz
Control Sideband	Lower

7 In the Wi-Fi Settings section, your new 2.4GHz Wi-Fi Name is now set to “Julie’s Wi-Fi_2.4G”.



Connectivity

System Info

Model Name

Firmware Version

System Uptime

LAN MAC Address

WAN Status

WiFi Settings

2.4GHz WiFi Name	WiFi Password
Julie's WiFi_2.4G	••••••••••
5GHz WiFi Name	**WiFi Password**
Julie's WiFi_5G	••••••••••

More AP WiFi Settings

2.4GHz WiFi Name	WiFi Password
Zyxel_CFC1_guest1	••••••••••
5GHz WiFi Name	**WiFi Password**
Zyxel_CFC1_guest1_5G	••••••••••

LAN

IP Address	
Subnet Mask	
IP Address Range	N/A
DHCP	○
Lease Time	N/A

5.5.2 Change the Zyxel Device Wi-Fi Password

You set up the Zyxel Device at home but have trouble remembering the complicated default Wi-Fi Password on the device label. To make it easier to remember, you can change the default Wi-Fi Password. Changing the Zyxel Device Wi-Fi Password regularly can also enhance your Wi-Fi network's security and privacy.

To change the Zyxel Device Wi-Fi Password, follow the steps below:

1 Log into the Web Configurator.

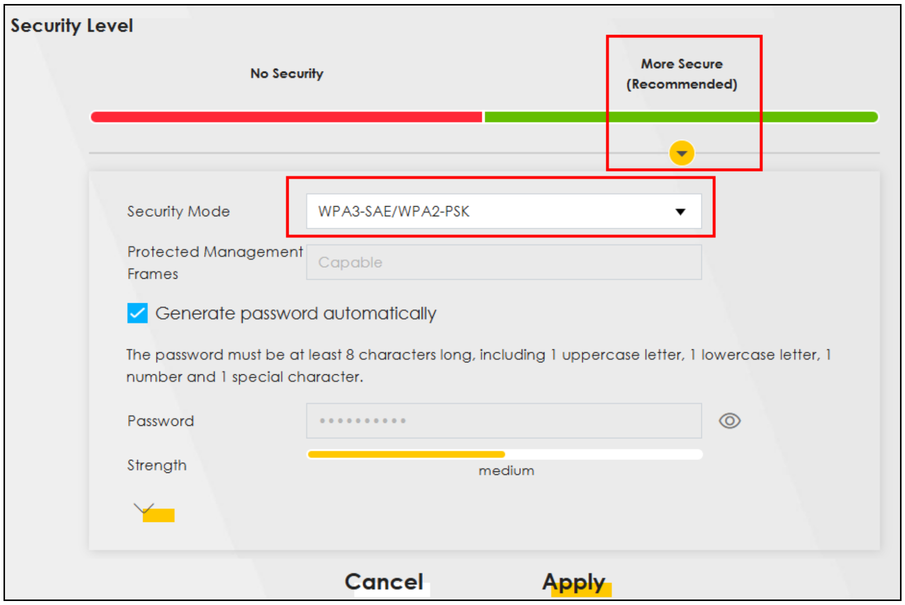
2 Go to Network Setting > Wireless > General.

3 In Security Level, select More Secure for better protection of your Wi-Fi network.

4 Choose a Security Mode from the drop-down list:

- If your Wi-Fi client supports WPA3-SAE, select this mode.
- If you are not sure whether your Wi-Fi client supports WPA3-SAE, select WPA3-SAE/WPA2-PSK or WPA2-PSK.

The example below uses WPA3-SAE/WPA2-PSK as the Security Mode.



Security Mode: WPA3-SAE/WPA2-PSK

Protected Management Frames: Capable

☑ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

Password: ••••••••••

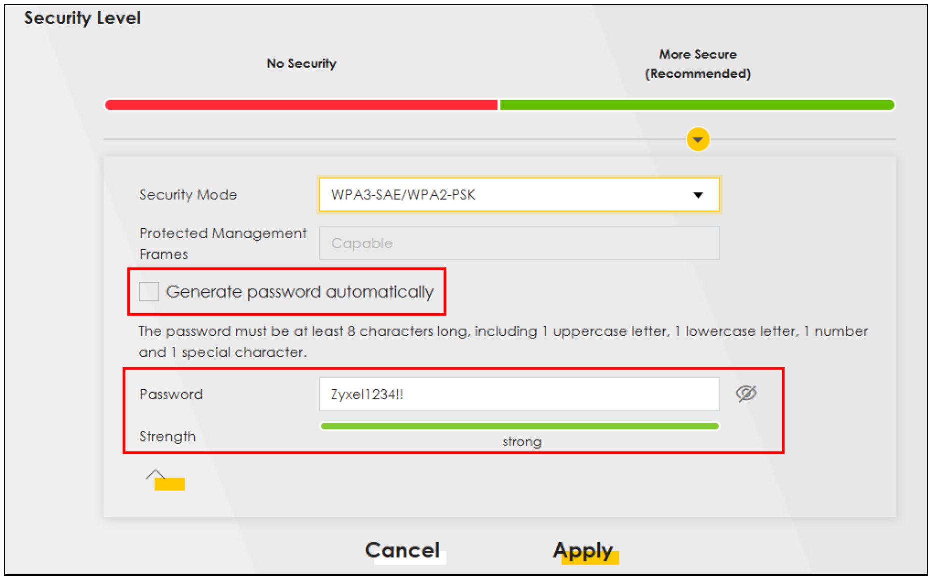
Strength: medium

5 After selecting the Security Mode, you have two methods to create a new Password.

- Select the Generate password automatically checkbox to have the Zyxel Device create a Password for you.
- Enter your own Wi-Fi Password. The Password must be 8 characters long and include at least 1 uppercase letter, 1 lowercase letter, 1 number, 1 special character, or 64 hexadecimal digits ("0-9", "A-F").

The Strength bar shows the current Password strength: weak, medium, or strong.

In the example below, the 2.4GHz Wi-Fi network's Password has been changed to "Zyxel1234!!".



Security Level

No Security

More Secure (Recommended)

Security Mode: WPA3-SAE/WPA2-PSK

Protected Management Frames: Capable

□ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

Password: Zyxel1234!!

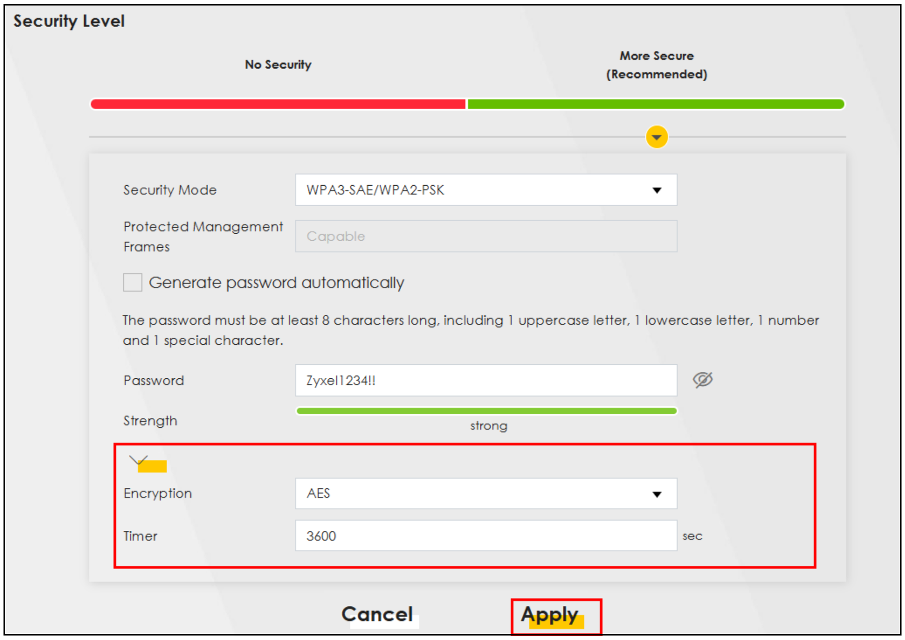
Strength: strong

6 Click this ^ to view the Encryption type and set the Timer for data transmission on the Zyxel Device:

- Encryption: The Zyxel Device Wi-Fi network uses AES with a 128-bit key for data encryption.
- Timer: This defines how often the RADIUS server sends a new group key out to all clients.

Note: The Protected Management Frames field is available when using WPA2-PSK as the Security Mode with AES Encryption. Management frame protection (MFP) helps prevent Wi-Fi DoS (Denial of Service) attacks. For more details about Protected Management Frames, please refer to More Secure (Recommended).

The example below uses AES as Encryption type and sets the Timer to 3600 seconds. For more details about the Encryption settings for your Zyxel Device network, please refer to More Secure (Recommended).



Security Level

No Security

More Secure (Recommended)

Security Mode: WPA3-SAE/WPA2-PSK

Protected Management Frames: Capable

□ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

Password: Zyxel1234!!

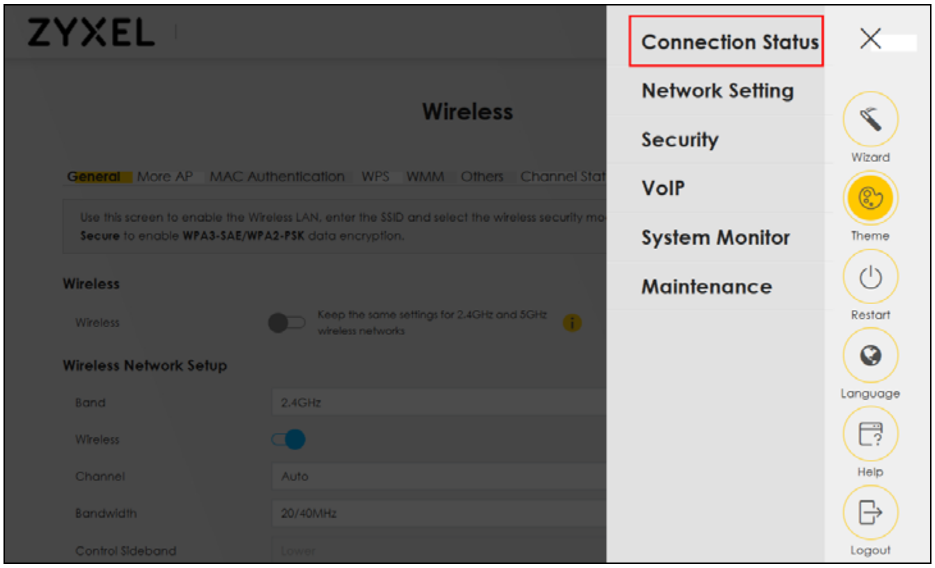
Strength: strong

Encryption: AES

Timer: 3600 sec

7 When finished, click Apply to save the settings.

8 Click the menu icon (☰) in the upper right corner, and then click Connection Status.



Wireless

General | More AP | MAC Authentication | WPS | WMM | Others | Channel Stat

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mo
Secure to enable **WPA3-SAE/WPA2-PSK** data encryption.

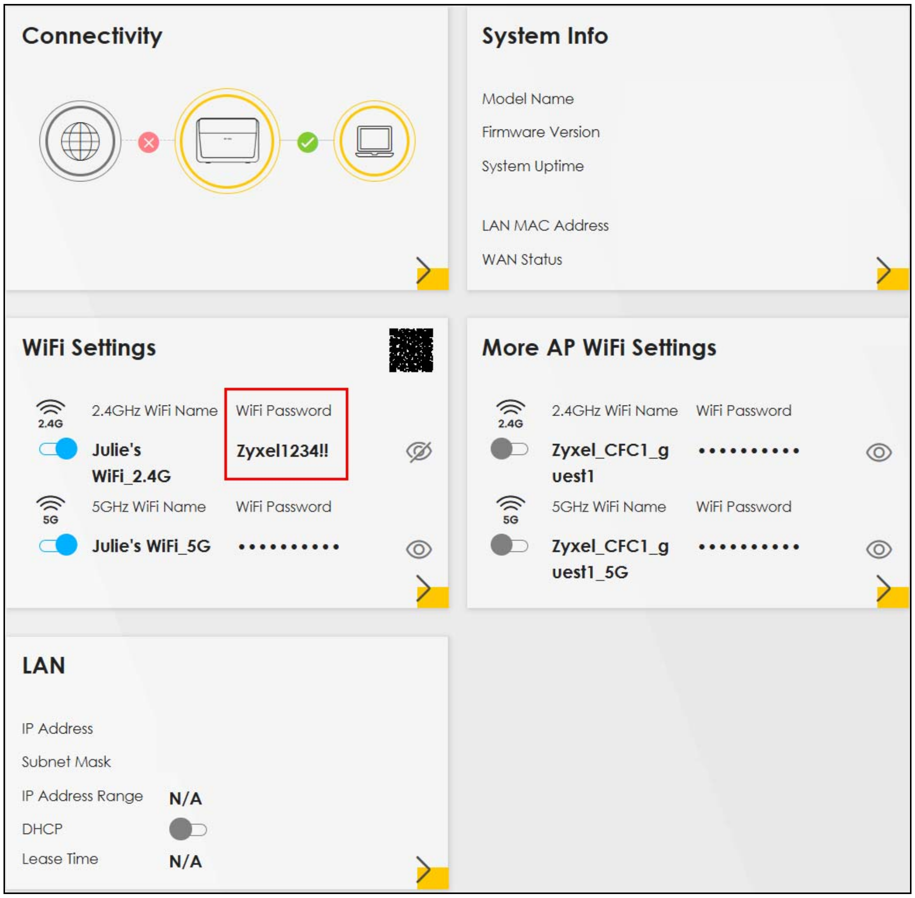
Wireless

Wireless — Keep the same settings for 2.4GHz and 5GHz wireless networks

Wireless Network Setup

Band	2.4GHz
Wireless	
Channel	Auto
Bandwidth	20/40MHz
Control Sideband	Lower

9 In the Wi-Fi Settings section, your new 2.4GHz Wi-Fi Password is now set to “Zyxel1234!!”.



Connectivity

System Info

Model Name
Firmware Version
System Uptime
LAN MAC Address
WAN Status

WiFi Settings

2.4G	2.4GHz WiFi Name Julie's WiFi_2.4G	WiFi Password Zyxel1234!!
5G	5GHz WiFi Name Julie's WiFi_5G	WiFi Password ••••••••••

More AP WiFi Settings

2.4G	2.4GHz WiFi Name Zyxel_CFC1_guest1	WiFi Password ••••••••••
5G	5GHz WiFi Name Zyxel_CFC1_guest1_5G	WiFi Password ••••••••••

LAN

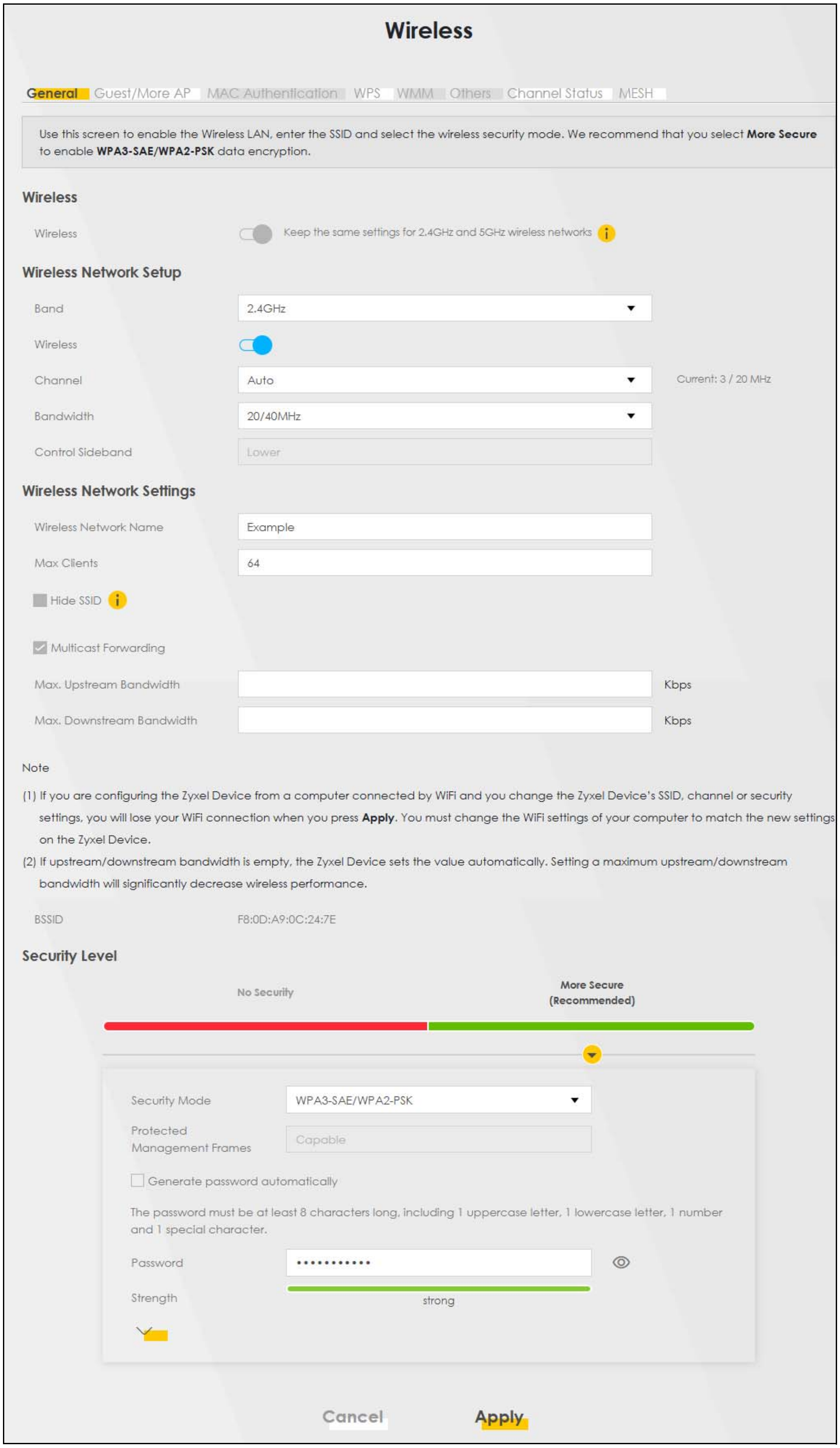
IP Address	
Subnet Mask	
IP Address Range	N/A
DHCP	
Lease Time	N/A

5.5.3 Change Security Settings on a Wi-Fi Network

This example changes the default security settings of a Wi-Fi network to the following:

SSID	Example
Security Mode	WPA3-SAE/WPA2-PSK
Pre-Shared Key	Admin1234!!
802.11 Mode	802.11b/g/n Mixed

1 Go to the Network Setting > Wireless > General screen. Select More Secure as the security level and WPA3-SAE/WPA2-PSK as the security mode. Configure the screen using the provided parameters. Click Apply.



Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable **WPA3-SAE/WPA2-PSK** data encryption.

Wireless

Wireless: Keep the same settings for 2.4GHz and 5GHz wireless networks

Wireless Network Setup

Band: 2.4GHz

Wireless

Channel: Auto — Current: 3 / 20 MHz

Bandwidth: 20/40MHz

Control Sideband: Lower

Wireless Network Settings

Wireless Network Name: Example

Max Clients: 64

□ Hide SSID

☑ Multicast Forwarding

Max. Upstream Bandwidth: Kbps

Max. Downstream Bandwidth: Kbps

Note

(1) If you are configuring the Zyxel Device from a computer connected by WiFi and you change the Zyxel Device's SSID, channel or security settings, you will lose your WiFi connection when you press **Apply**. You must change the WiFi settings of your computer to match the new settings on the Zyxel Device.

(2) If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

BSSID: F8:0D:A9:0C:24:7E

Security Level

No Security — More Secure (Recommended)

Security Mode: WPA3-SAE/WPA2-PSK

Protected Management Frames: Capable

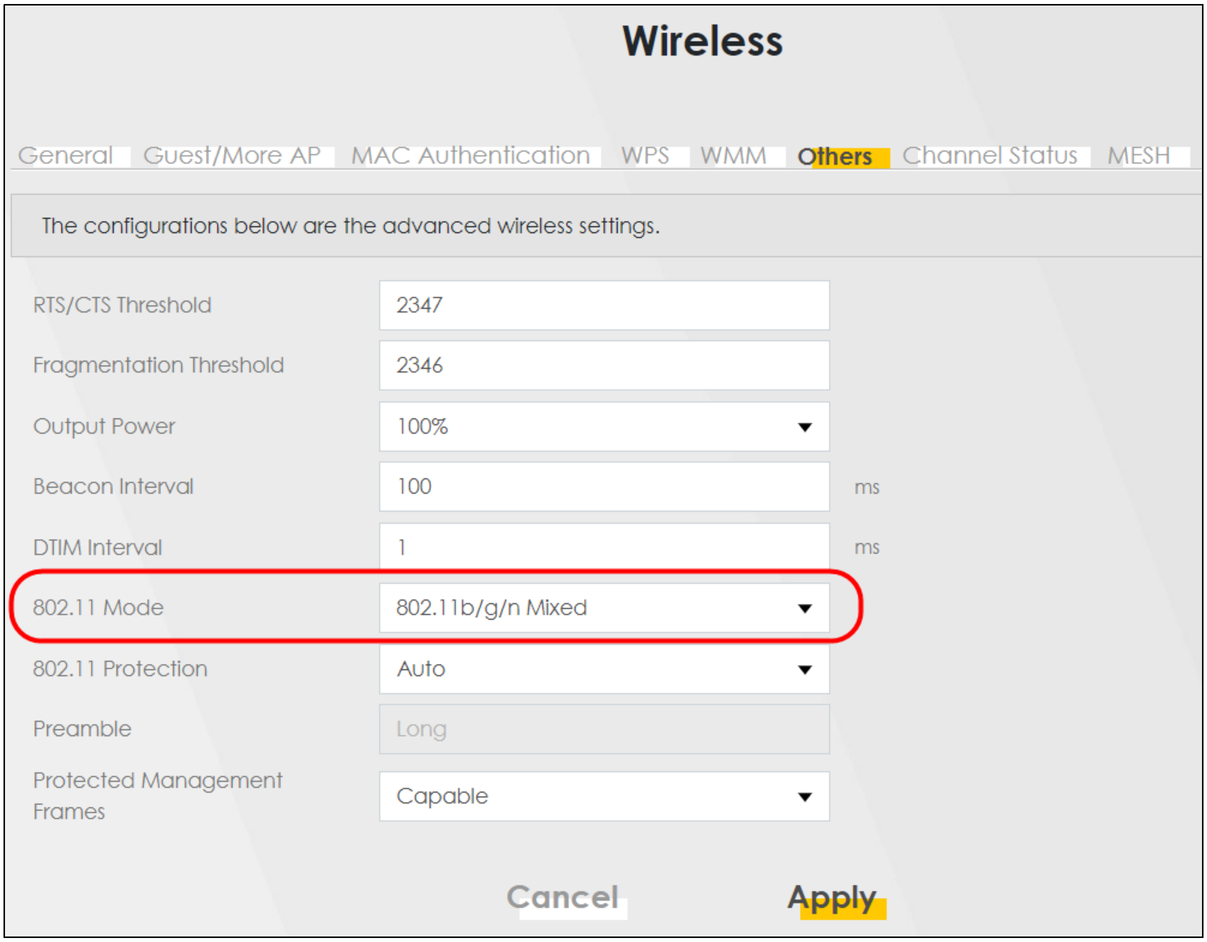
□ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character.

Password: ••••••••••••

Strength: strong

2 Go to the Wireless > Others screen. Set 802.11 Mode to 802.11b/g/n Mixed, and then click Apply.



The configurations below are the advanced wireless settings.

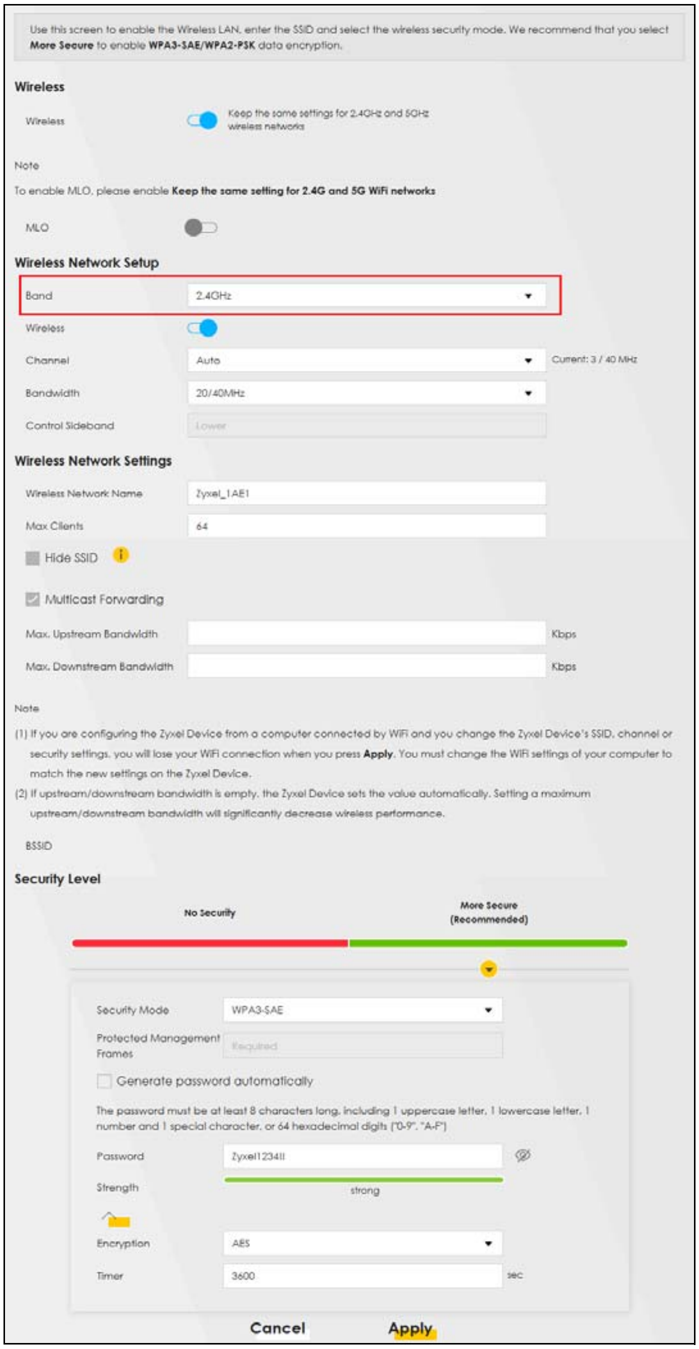
RTS/CTS Threshold	2347	
Fragmentation Threshold	2346	
Output Power	100%	
Beacon Interval	100	ms
DTIM Interval	1	ms
802.11 Mode	802.11b/g/n Mixed	
802.11 Protection	Auto	
Preamble	Long	
Protected Management Frames	Capable	

You can now use the WPS feature to establish a Wi-Fi connection between your notebook and the Zyxel Device. Now use the new security settings to connect to the Internet through the Zyxel Device using Wi-Fi.

5.5.4 Enhance Security Settings on a Zyxel Device Wi-Fi Network

To enhance the security of your Zyxel Device Wi-Fi network, you need to select the strongest Security Mode. To do this, follow the below steps:

1 Go to the Network Setting > Wireless > General screen. In Wireless Network Setup, select the Band you want to change the Security Mode.



Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable **WPA3-SAE/WPA2-PSK** data encryption.

Wireless

Wireless: ● Keep the same settings for 2.4GHz and 5GHz wireless networks

Note

To enable MLO, please enable **Keep the same setting for 2.4G and 5G WiFi networks**

MLO: ○

Wireless Network Setup

Band	2.4GHz ▾	
Wireless	●	
Channel	Auto ▾	Current: 3 / 40 MHz
Bandwidth	20/40MHz ▾	
Control Sideband	Lower	

Wireless Network Settings

Wireless Network Name	Zyxel_1AE1	
Max Clients	64	
□ Hide SSID		
☑ Multicast Forwarding		
Max. Upstream Bandwidth		Kbps
Max. Downstream Bandwidth		Kbps

Note

(1) If you are configuring the Zyxel Device from a computer connected by WiFi and you change the Zyxel Device's SSID, channel or security settings, you will lose your WiFi connection when you press **Apply**. You must change the WiFi settings of your computer to match the new settings on the Zyxel Device.

(2) If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

BSSID

Security Level

Security Mode	WPA3-SAE ▾	
Protected Management Frames	Required	

□ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character, or 64 hexadecimal digits ("0-9", "A-F")

Password	Zyxel1234!!	
Strength	strong	
Encryption	AES ▾	
Timer	3600	sec

5.5.5 Connect to the Zyxel Device’s Wi-Fi Network Using WPS

This section shows you how to connect a Windows 10 notebook to the Zyxel Device’s Wi-Fi network using WPS. WPS (Wi-Fi Protected Setup) is a security standard that allows devices to connect to a router securely without having to enter a password. There are two methods:

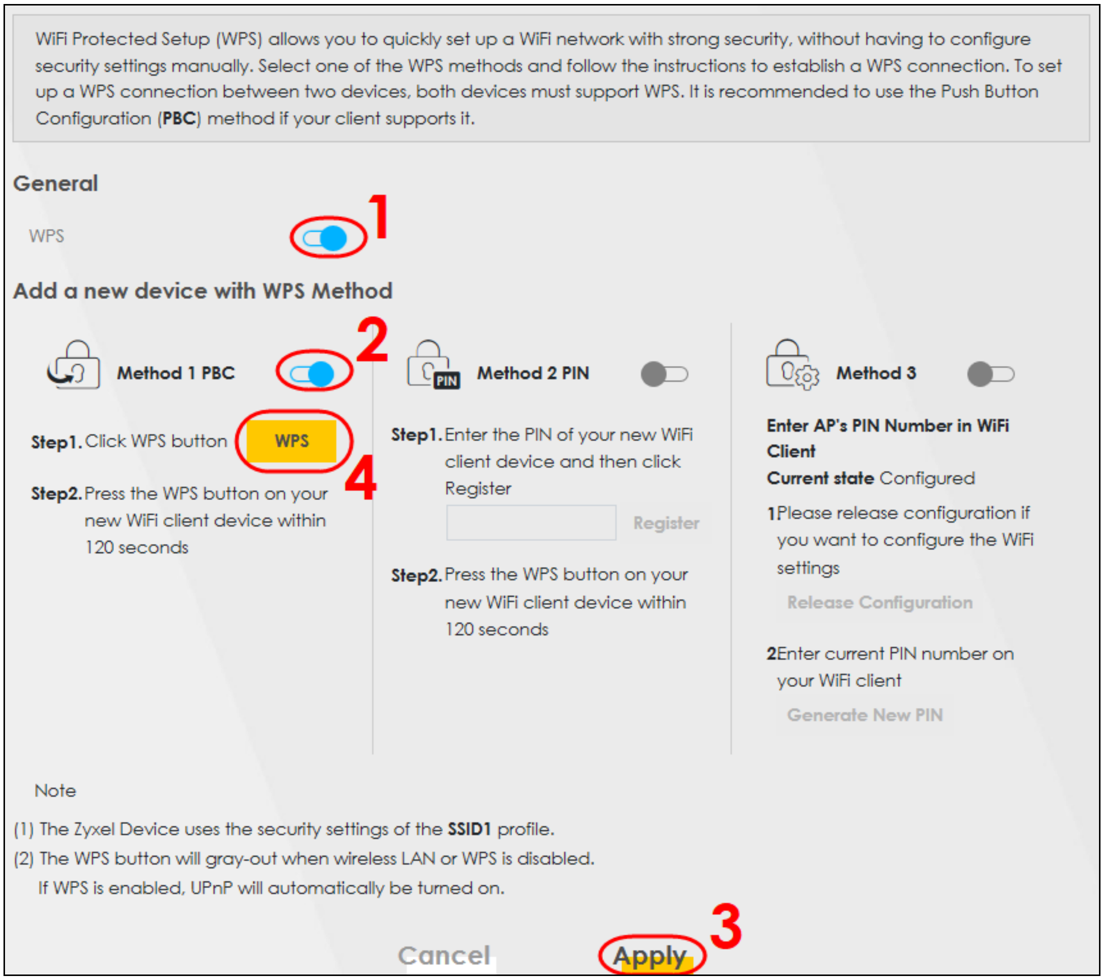
- Push Button Configuration (PBC) – Connect to the Wi-Fi network by pressing a button. This is the simplest method.

- PIN Configuration – Connect to the Wi-Fi network by entering a PIN (Personal Identification Number) from a Wi-Fi-enabled device in the Zyxel Device's Web Configurator. This is the more secure method, because one device can authenticate the other.

5.5.5.1 WPS Push Button Configuration (PBC)

1 Make sure the Zyxel Device is turned on, and your notebook is within range of the Zyxel Device's Wi-Fi signal.

2 Log into the Web Configurator to enable the notebook to connect to the Zyxel Device's Wi-Fi network by pressing the WPS button on the Zyxel Device. Go to Network Setting > Wireless > WPS. Select the band you want to use to connect to the Wi-Fi network. Click the Method 1 PBC switch to the right. Click Apply.



WiFi Protected Setup (WPS) allows you to quickly set up a WiFi network with strong security, without having to configure security settings manually. Select one of the WPS methods and follow the instructions to establish a WPS connection. To set up a WPS connection between two devices, both devices must support WPS. It is recommended to use the Push Button Configuration (**PBC**) method if your client supports it.

General

WPS

Add a new device with WPS Method

Method 1 PBC

Step1. Click WPS button

Step2. Press the WPS button on your new WiFi client device within 120 seconds

Method 2 PIN

Step1. Enter the PIN of your new WiFi client device and then click Register

Step2. Press the WPS button on your new WiFi client device within 120 seconds

Method 3

Enter AP's PIN Number in WiFi Client

Current state Configured

1 Please release configuration if you want to configure the WiFi settings

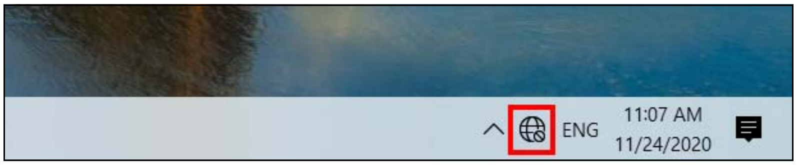
2 Enter current PIN number on your WiFi client

Note

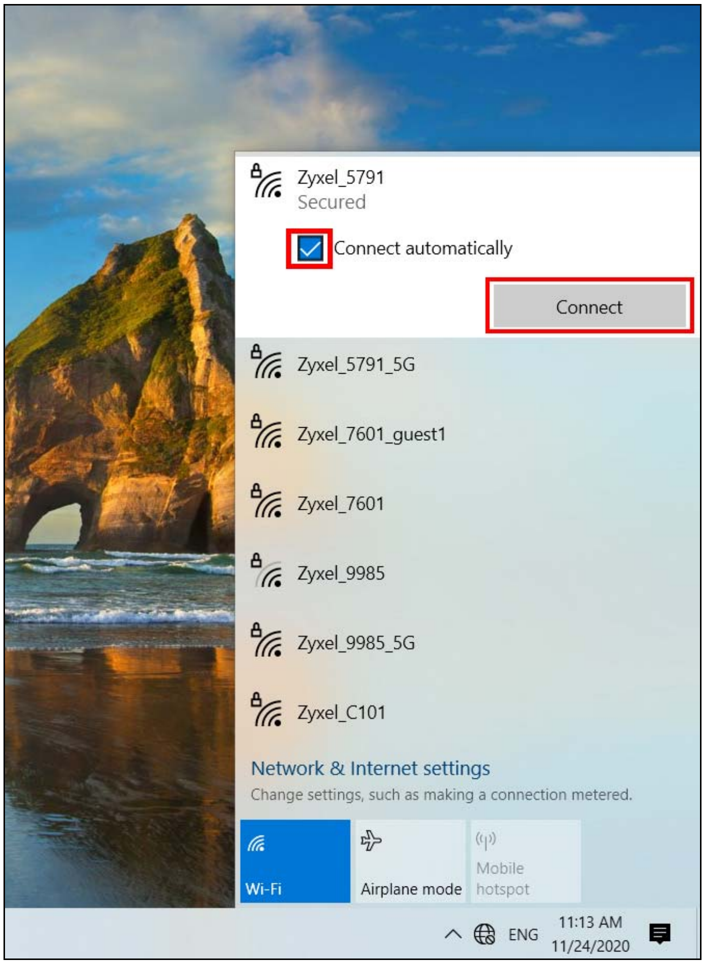
(1) The Zyxel Device uses the security settings of the **SSID1** profile.

(2) The WPS button will gray-out when wireless LAN or WPS is disabled.
If WPS is enabled, UPnP will automatically be turned on.

3 In Windows 10, click the Network icon in the system tray to open the list of available Wi-Fi networks.



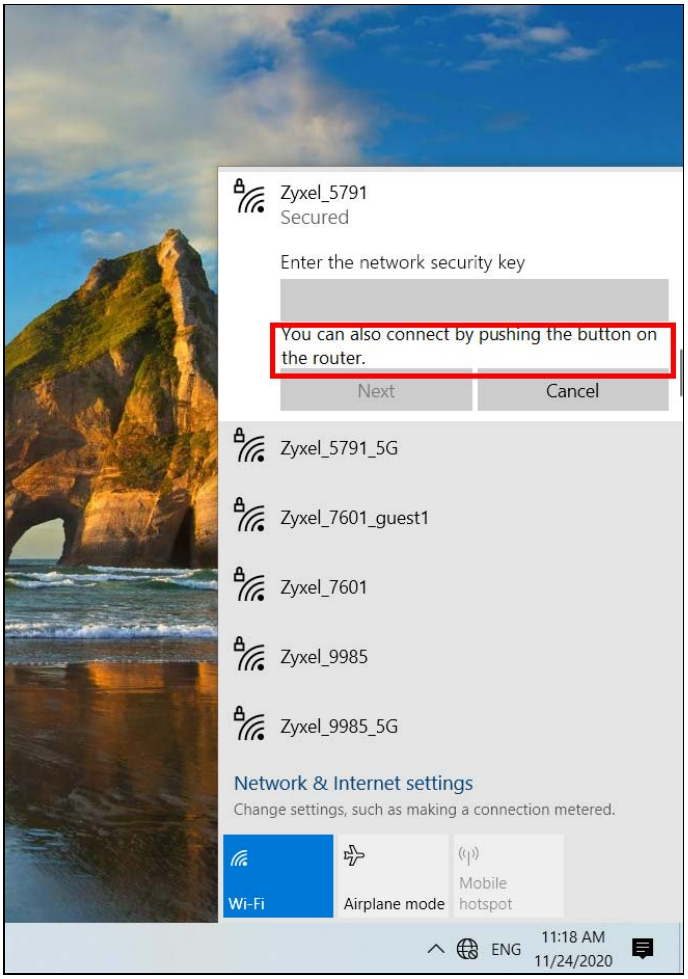
4 The pop-up list displays the Wi-Fi networks near you. In the screen below, locate the Zyxel Device's Wi-Fi network, Zyxel_5791 in this example. Zyxel_5791 is the default SSID shown on the Zyxel Device label. Select the Connect automatically ☑ checkbox, and then click Connect.



Zyxel_5791
Secured
☑ Connect automatically

5 You do not need to enter the network security key for the Zyxel Device's Wi-Fi network because you are using the WPS button to connect to the Zyxel Device's Wi-Fi network.

Note: You must press the WPS button on the Zyxel Device within two minutes.



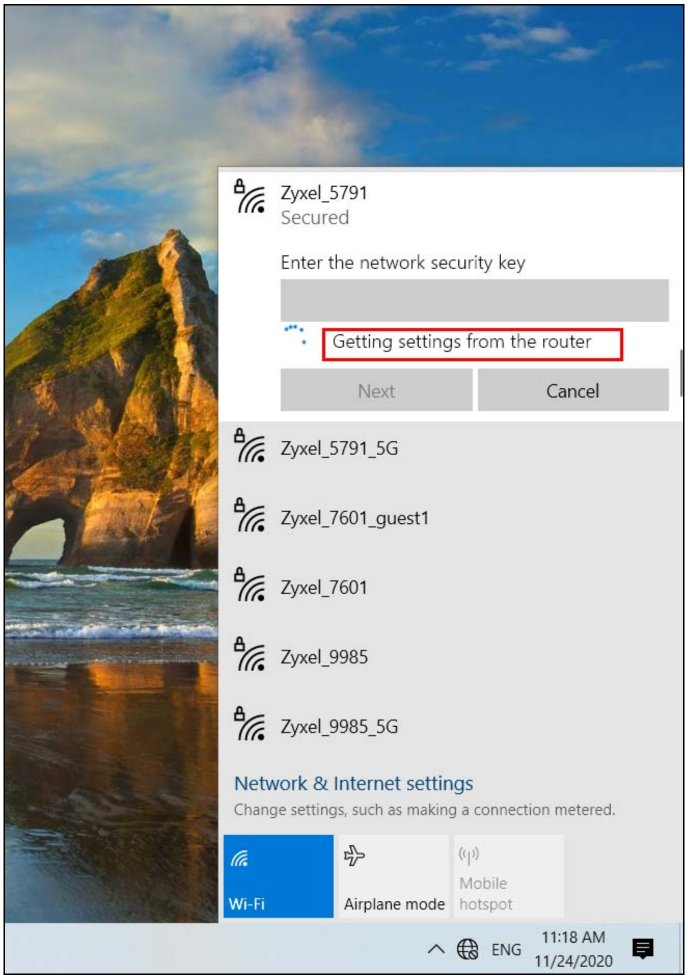
Zyxel_5791
Secured

Enter the network security key

You can also connect by pushing the button on the router.

6 Push and hold the WPS button located on the Zyxel Device for two minutes or until the Wi-Fi or WPS LED starts blinking slowly. This allows the Zyxel Device to send the Wi-Fi network settings to Windows 10 using WPS. To see the location of the WPS button on the Zyxel Device, please refer to WPS ButtonWiFi/WPS Button.

7 Windows 10 will display Getting settings from the router.



Zyxel_5791
Secured

Enter the network security key

Getting settings from the router

Your Windows 10 notebook can now connect securely to the Zyxel Device Wi-Fi network.

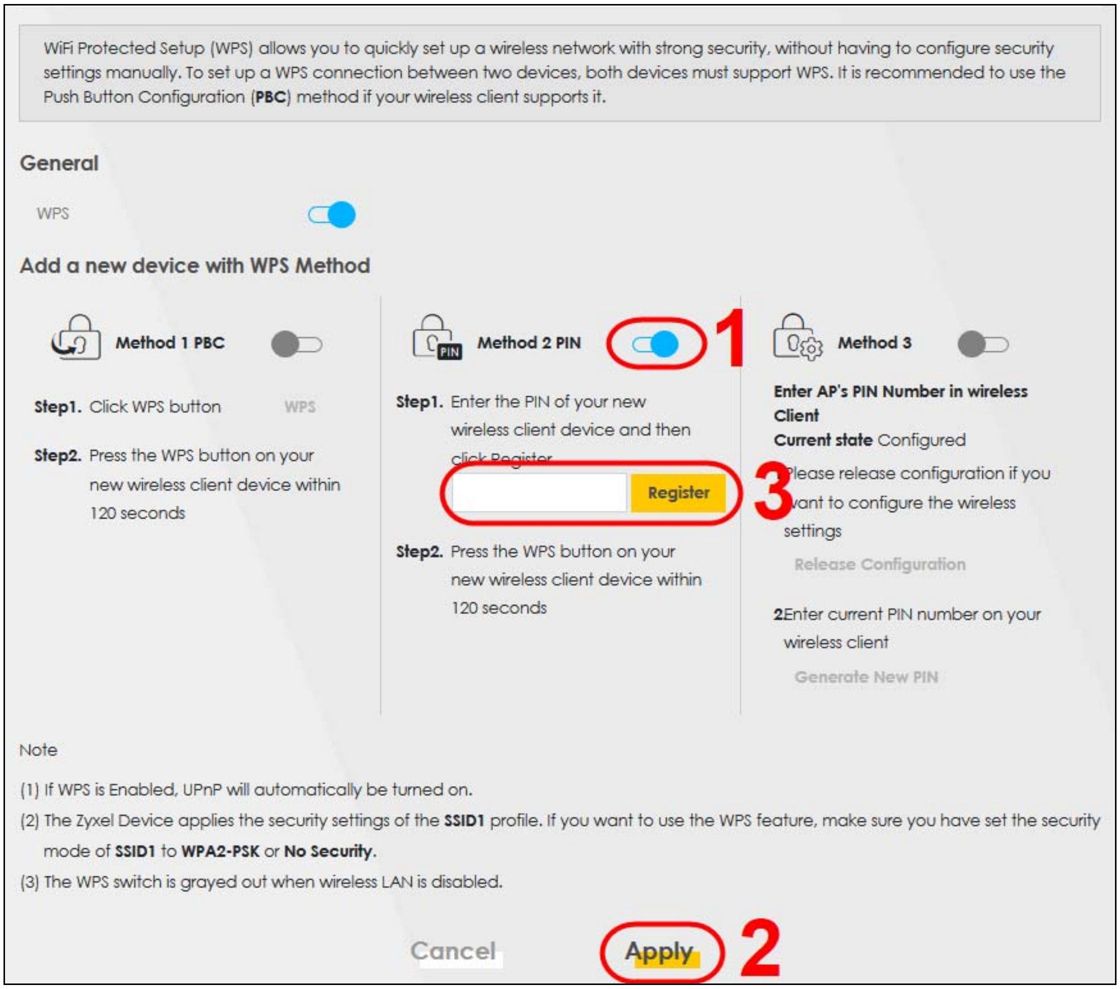
5.5.5.2 WPS PIN Configuration

The WPS PIN (Personal Identification Number) method is a more secure version of WPS, used by Wi-Fienabled devices such as printers. To use this connection method, you need to log into the Zyxel Device's Web Configurator.

1 Enable Wi-Fi on the device you want to connect to the Wi-Fi network. Then, note down the WPS PIN in the device's Wi-Fi settings.

2 Log into Zyxel Device's Web Configurator, and then go to the Network Setting > Wireless > WPS screen. Enable WPS, and then click Apply.

3 Enable Method 2 PIN, and then click Apply. Enter the PIN of the Wi-Fi device, and then click Register.



WiFi Protected Setup (WPS) allows you to quickly set up a wireless network with strong security, without having to configure security settings manually. To set up a WPS connection between two devices, both devices must support WPS. It is recommended to use the Push Button Configuration (**PBC**) method if your wireless client supports it.

General

WPS: on

Add a new device with WPS Method

Method 1 PBC: off

Step1. Click WPS button

Step2. Press the WPS button on your new wireless client device within 120 seconds

Method 2 PIN: on

Step1. Enter the PIN of your new wireless client device and then click Register

Step2. Press the WPS button on your new wireless client device within 120 seconds

Method 3: off

Enter AP's PIN Number in wireless Client

Current state Configured

Please release configuration if you want to configure the wireless settings

2Enter current PIN number on your wireless client

Note

(1) If WPS is Enabled, UPnP will automatically be turned on.

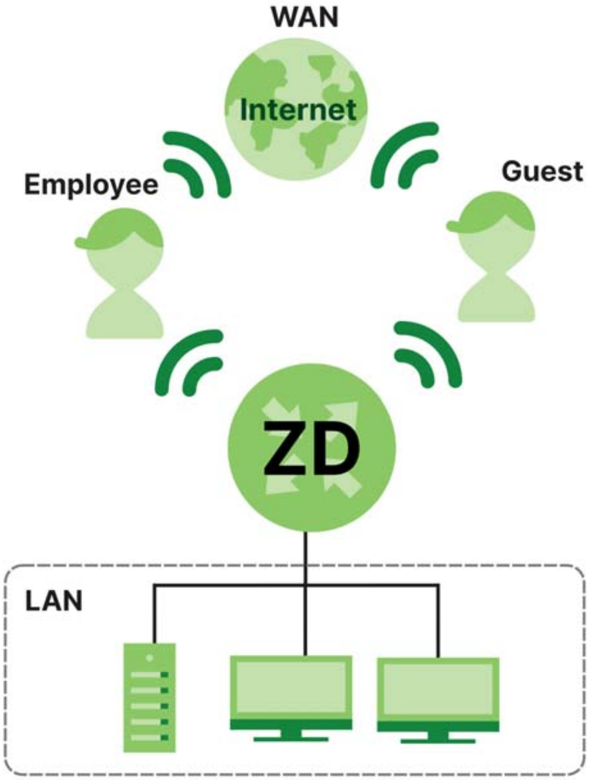
(2) The Zyxel Device applies the security settings of the **SSID1** profile. If you want to use the WPS feature, make sure you have set the security mode of **SSID1** to **WPA2-PSK** or **No Security**.

(3) The WPS switch is grayed out when wireless LAN is disabled.

4 Within 2 minutes, enable WPS on the Wi-Fi device.

5.5.6 Set Up a Guest Network

The Zyxel Device authenticates the Wi-Fi device using the PIN, and then sends the Wi-Fi network settings to the device using WPS. This process may take up to 2 minutes. The Wi-Fi device is then able to connect to the Wi-Fi network securely. A company wants to create two Wi-Fi networks for different groups of users as shown in the following figure. Each Wi-Fi network has its own SSID and security mode. Both networks are accessible on both 2.4 GHz and 5 GHz Wi-Fi bands.

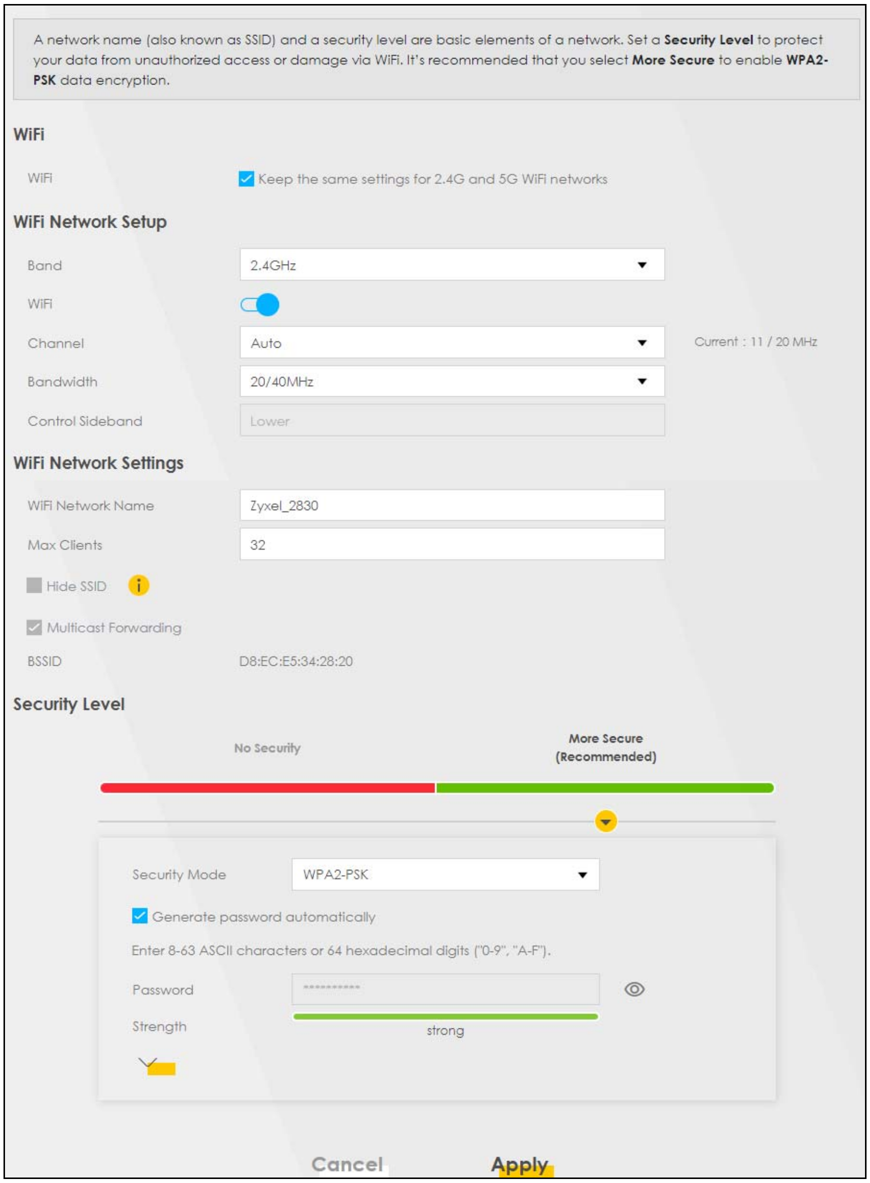


- Employees using the General Wi-Fi network group will have access to the local network and the Internet.
- Visitors using the Guest Wi-Fi network group with a different SSID and password will have access to the Internet only.

Use the following parameters to set up the Wi-Fi network groups.

	GENERAL	GUEST
2.4/5G SSID	Example	Guest
Security Level	More Secure	More Secure
Security Mode	WPA2-PSK	WPA2-PSK
Pre-Shared Key	ForCompanyOnly123!	Guest123456!

1 Go to the Network Setting > Wireless > General screen. Use this screen to set up the company's general Wi-Fi network group. Configure the screen using the provided parameters and click Apply. Note that if you have employees using 2.4 GHz and 5 GHz devices, enable Keep the same settings for 2.4GHz and 5GHz wireless networks to use the same SSID and password. Clear it if you want to configure different SSIDs and passwords for 2.4 GHz and 5 GHz bands.



A network name (also known as SSID) and a security level are basic elements of a network. Set a **Security Level** to protect your data from unauthorized access or damage via WiFi. It's recommended that you select **More Secure** to enable **WPA2-PSK** data encryption.

WiFi

WiFi: ☑ Keep the same settings for 2.4G and 5G WiFi networks

WiFi Network Setup

Band	2.4GHz
WiFi	On
Channel	Auto — Current : 11 / 20 MHz
Bandwidth	20/40MHz
Control Sideband	Lower

WiFi Network Settings

WiFi Network Name	Zyxel_2830
Max Clients	32

□ Hide SSID

☑ Multicast Forwarding

BSSID: D8:EC:E5:34:28:20

Security Level

Security Mode: WPA2-PSK

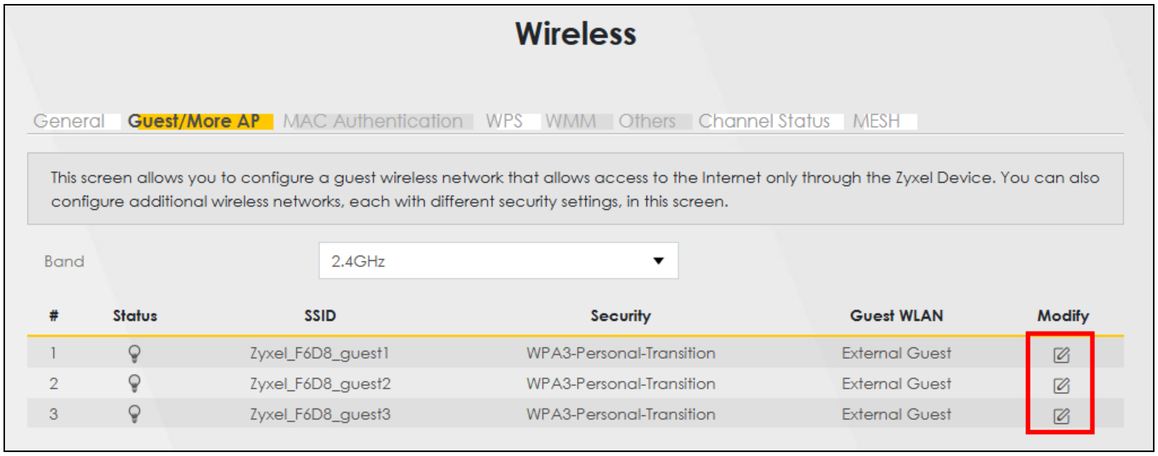
☑ Generate password automatically

Enter 8-63 ASCII characters or 64 hexadecimal digits ("0-9", "A-F").

Password: **********

Strength: strong

2 Go to the Network Setting > Wireless > Guest/More AP screen. Click the Modify icon to configure the second Wi-Fi network group. A Home Guest can access the Internet and other Home Guest Wi-Fi clients on the same Wi-Fi network. They cannot communicate with wired devices connected to the Zyxel Device's LAN. An External Guest can just access the Internet through the Zyxel Device.

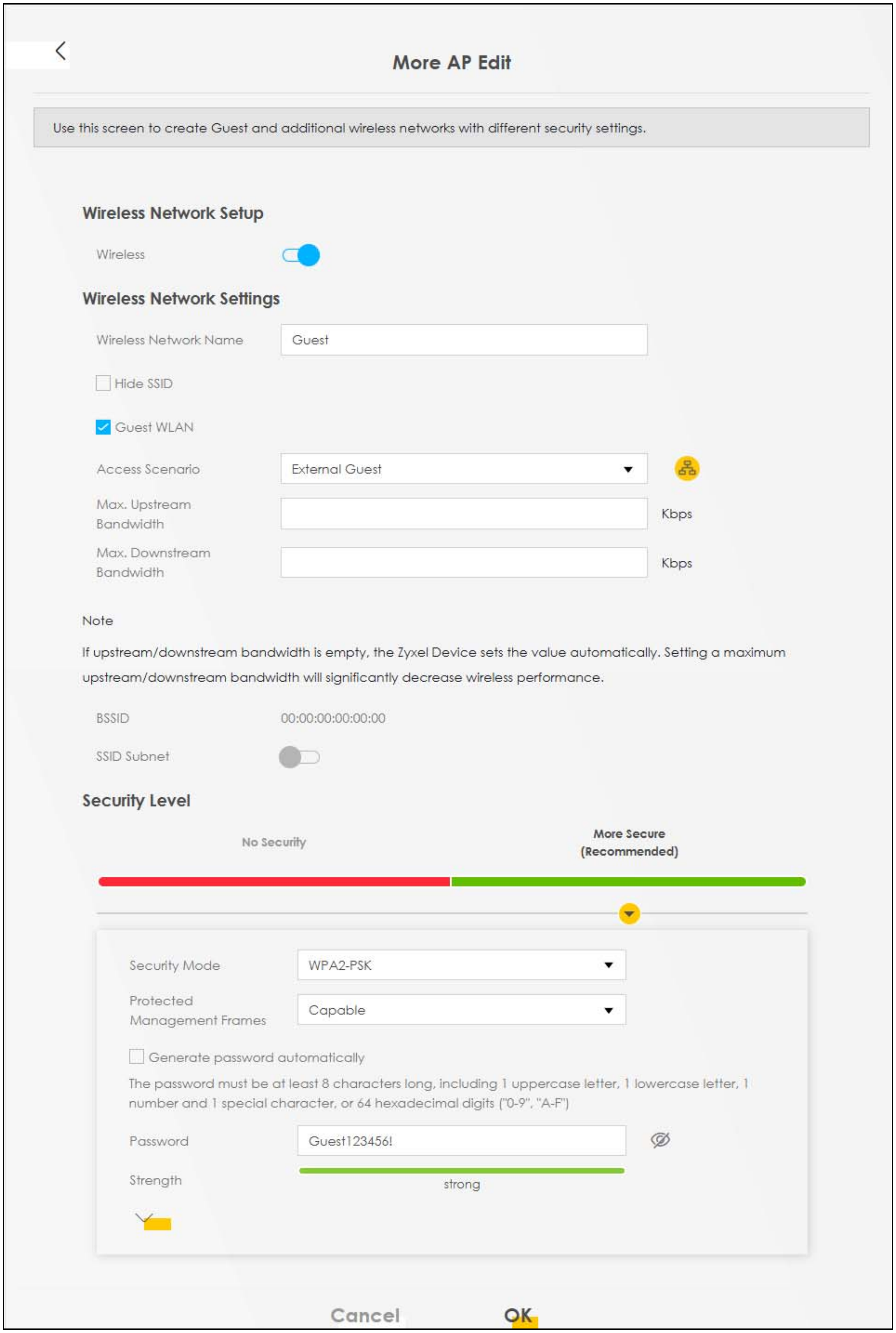


This screen allows you to configure a guest wireless network that allows access to the Internet only through the Zyxel Device. You can also configure additional wireless networks, each with different security settings, in this screen.

Band: 2.4GHz

#	Status	SSID	Security	Guest WLAN	Modify
1	💡	Zyxel_F6D8_guest1	WPA3-Personal-Transition	External Guest	✎
2	💡	Zyxel_F6D8_guest2	WPA3-Personal-Transition	External Guest	✎
3	💡	Zyxel_F6D8_guest3	WPA3-Personal-Transition	External Guest	✎

3 On the Guest/More AP screen, click the Modify icon to configure the other Guest Wi-Fi network group. Configure the screen using the provided parameters and click OK.



More AP Edit

Use this screen to create Guest and additional wireless networks with different security settings.

Wireless Network Setup

Wireless: On

Wireless Network Settings

Wireless Network Name	Guest

□ Hide SSID

☑ Guest WLAN

Access Scenario	External Guest	
Max. Upstream Bandwidth		Kbps
Max. Downstream Bandwidth		Kbps

Note

If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

BSSID	00:00:00:00:00:00
SSID Subnet	Off

Security Level

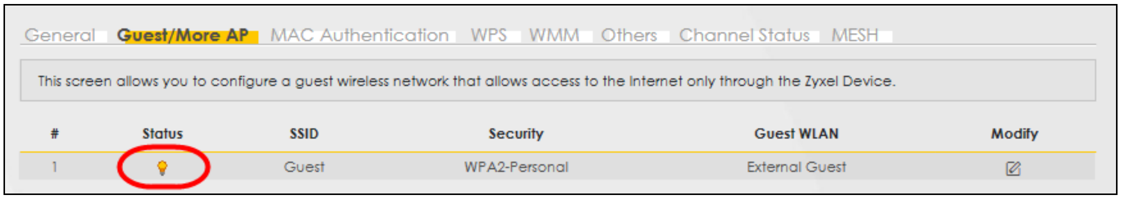
Security Mode	WPA2-PSK
Protected Management Frames	Capable

□ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character, or 64 hexadecimal digits ("0-9", "A-F")

Password	Guest123456!
Strength	strong

4 Check the status of Guest in the Guest/More AP screen. A yellow bulb under Status means the SSID is active and ready for Wi-Fi access.

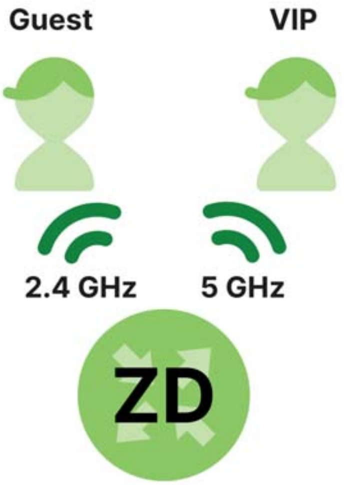


This screen allows you to configure a guest wireless network that allows access to the Internet only through the Zyxel Device.

#	Status	SSID	Security	Guest WLAN	Modify
1	💡	Guest	WPA2-Personal	External Guest	✎

5.5.7 Set Up Two Guest Wi-Fi Networks on Different Wi-Fi Bands

In this example, a company wants to create two Guest Wi-Fi networks: one for the Guest group and the other for the VIP group as shown in the following figure. Each network will have its SSID and security mode to access the internet.



- The Guest group will use the 2.4 GHz band.
- The VIP group will use the 5 GHz band.

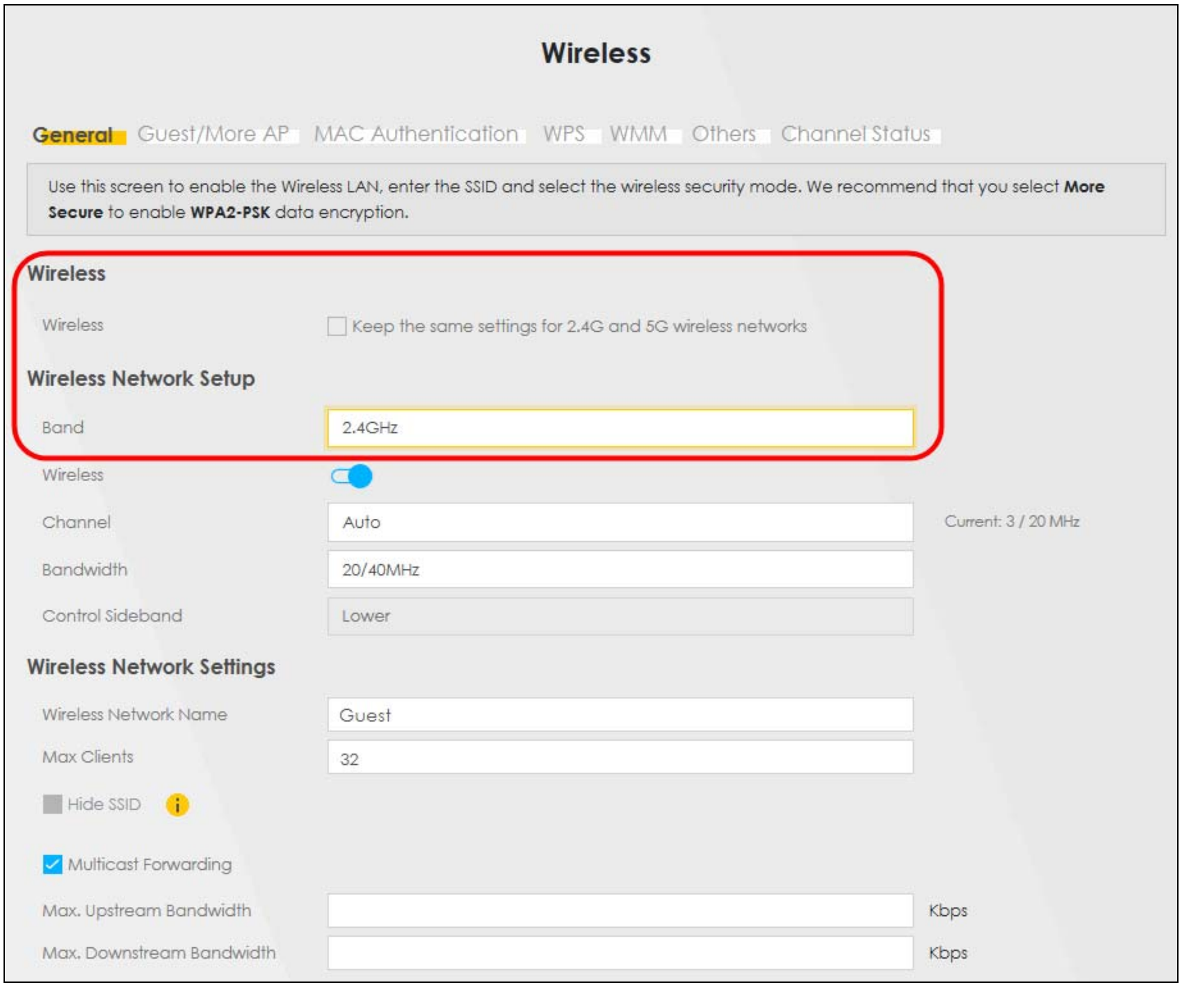
The Company will use the following parameters to set up the Wi-Fi network groups.

Table 27 Wi-Fi Settings Parameters Example

BAND	2.4 GHZ	5 GHZ
SSID	Guest	VIP
Security Mode	WPA2-PSK	WPA2-PSK
Pre-Shared Key	Guest123456!	Zyxel1234@@!

1 Go to the Wireless > General screen and set Band to 2.4GHz to configure 2.4 GHz Guest Wi-Fi settings for Guest. Click Apply.

Note: You will not be able to configure the 2.4 GHz and 5 GHz Guest Wi-Fi settings separately if Keep the same settings for 2.4GHz and 5GHz wireless networks is enabled.



Wireless

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable **WPA2-PSK** data encryption.

Wireless

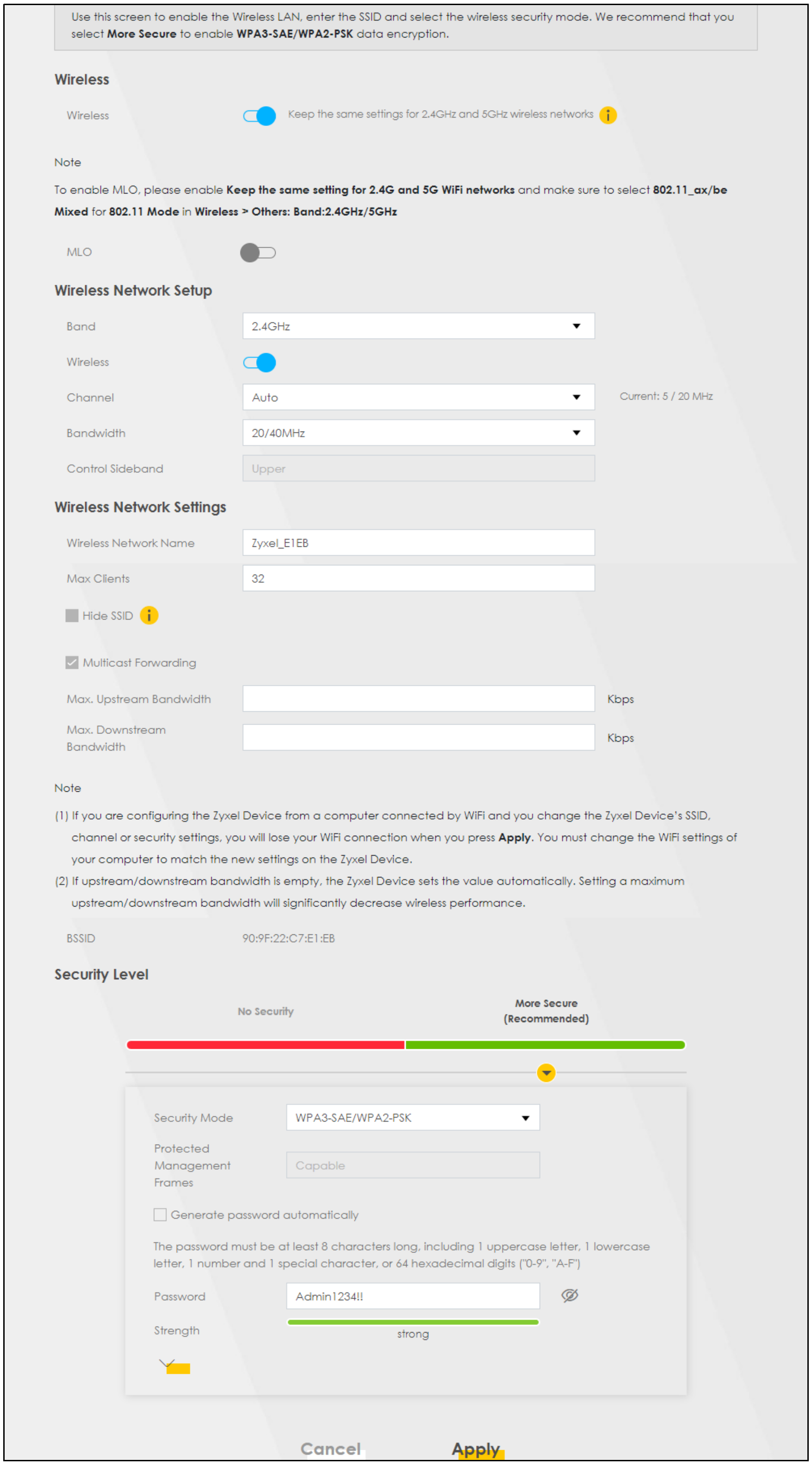
Wireless □ Keep the same settings for 2.4G and 5G wireless networks

Wireless Network Setup

Band	2.4GHz	
Wireless	●	
Channel	Auto	Current: 3 / 20 MHz
Bandwidth	20/40MHz	
Control Sideband	Lower	

Wireless Network Settings

Wireless Network Name	Guest	
Max Clients	32	
□ Hide SSID		
☑ Multicast Forwarding		
Max. Upstream Bandwidth		Kbps
Max. Downstream Bandwidth		Kbps



Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable **WPA3-SAE/WPA2-PSK** data encryption.

Wireless

Wireless ● Keep the same settings for 2.4GHz and 5GHz wireless networks

Note

To enable MLO, please enable **Keep the same setting for 2.4G and 5G WiFi networks** and make sure to select **802.11_ax/be Mixed** for **802.11 Mode** in **Wireless > Others: Band:2.4GHz/5GHz**

MLO ○

Wireless Network Setup

Band	2.4GHz
Wireless	●
Channel	Auto — Current: 5 / 20 MHz
Bandwidth	20/40MHz
Control Sideband	Upper

Wireless Network Settings

Wireless Network Name	Zyxel_E1EB
Max Clients	32

□ Hide SSID

☑ Multicast Forwarding

Max. Upstream Bandwidth	Kbps
Max. Downstream Bandwidth	Kbps

Note

(1) If you are configuring the Zyxel Device from a computer connected by WiFi and you change the Zyxel Device's SSID, channel or security settings, you will lose your WiFi connection when you press **Apply**. You must change the WiFi settings of your computer to match the new settings on the Zyxel Device.

(2) If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

BSSID 90:9F:22:C7:E1:EB

Security Level

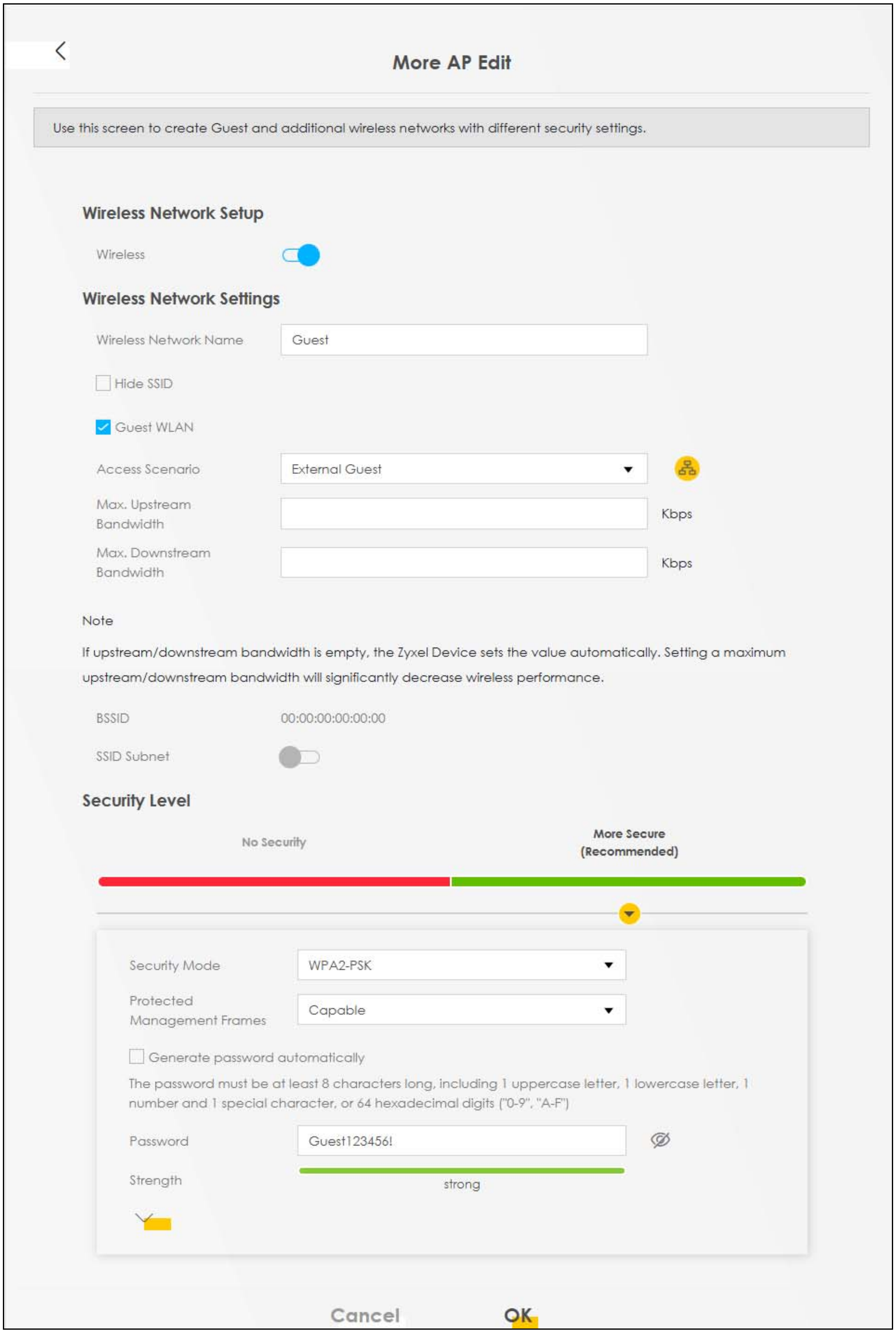
Security Mode	WPA3-SAE/WPA2-PSK
Protected Management Frames	Capable

□ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character, or 64 hexadecimal digits ("0-9", "A-F")

Password	Admin1234!!
Strength	strong

2 Go to the Wireless > Guest/More AP screen and click the Modify icon. The following screen appears. Configure the Security Mode and Password using the provided parameters and click OK.



More AP Edit

Use this screen to create Guest and additional wireless networks with different security settings.

Wireless Network Setup

Wireless: On

Wireless Network Settings

Wireless Network Name: Guest

□ Hide SSID

☑ Guest WLAN

Access Scenario: External Guest

Max. Upstream Bandwidth: Kbps

Max. Downstream Bandwidth: Kbps

Note

If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

BSSID: 00:00:00:00:00:00

SSID Subnet: Off

Security Level

Security Mode: WPA2-PSK

Protected Management Frames: Capable

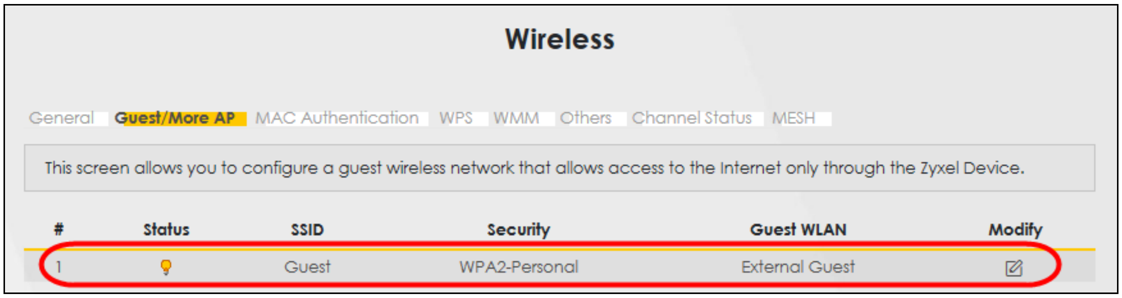
□ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character, or 64 hexadecimal digits ("0-9", "A-F")

Password: Guest123456!

Strength: strong

The 2.4 GHz Guest Wi-Fi network is now configured.

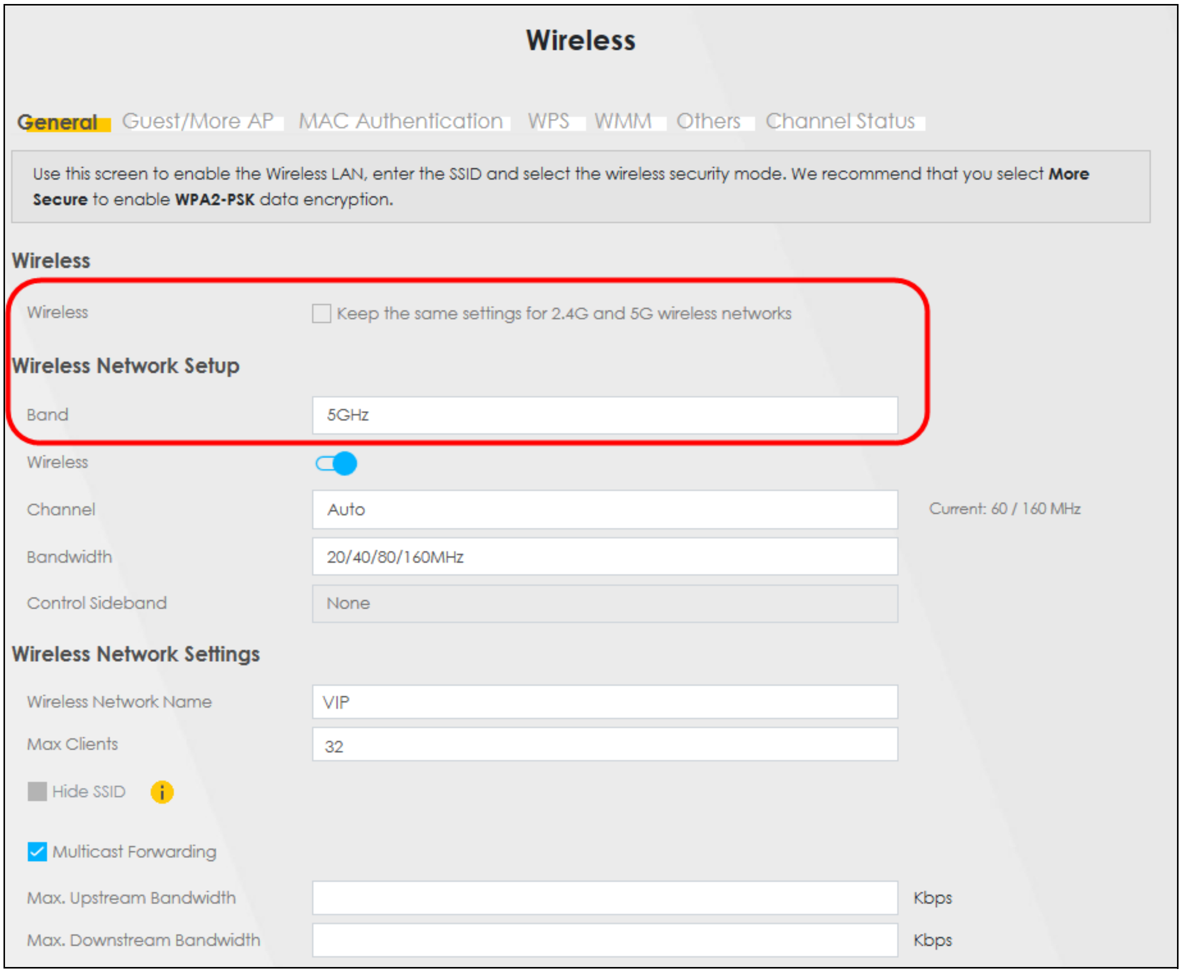


Wireless

This screen allows you to configure a guest wireless network that allows access to the Internet only through the Zyxel Device.

#	Status	SSID	Security	Guest WLAN	Modify
1	●	Guest	WPA2-Personal	External Guest	✎

3 Go to the Wireless > General screen and set Band to 5GHz to configure the 5G Guest Wi-Fi settings for VIP. Click OK.



Wireless

Use this screen to enable the Wireless LAN, enter the SSID and select the wireless security mode. We recommend that you select **More Secure** to enable **WPA2-PSK** data encryption.

Wireless

Wireless □ Keep the same settings for 2.4G and 5G wireless networks

Wireless Network Setup

Band 5GHz

Wireless ●

Channel Auto Current: 60 / 160 MHz

Bandwidth 20/40/80/160MHz

Control Sideband None

Wireless Network Settings

Wireless Network Name VIP

Max Clients 32

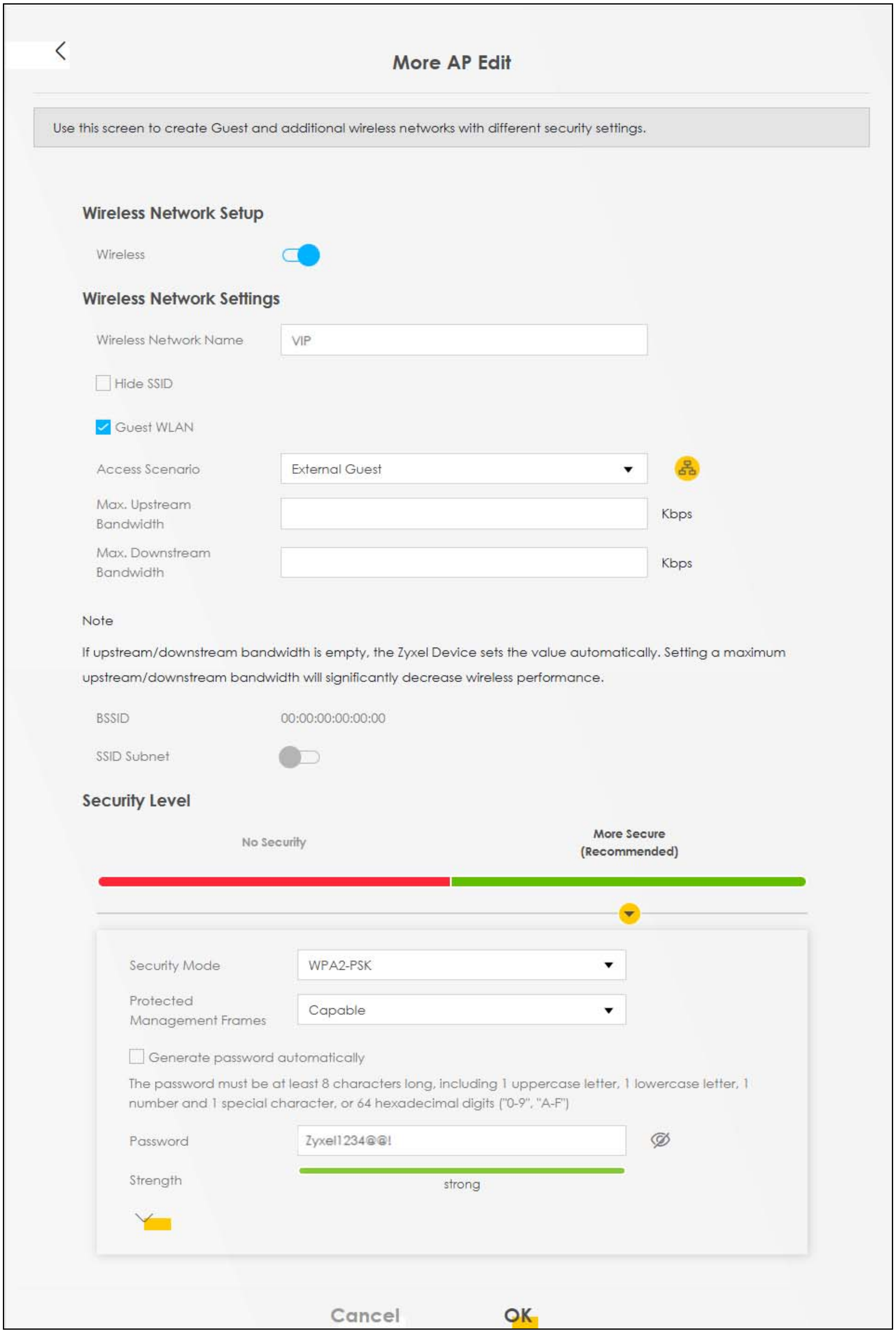
□ Hide SSID

☑ Multicast Forwarding

Max. Upstream Bandwidth Kbps

Max. Downstream Bandwidth Kbps

4 Go to the Wireless > Guest/More AP screen and click the Modify icon. The following screen appears. Configure the Security Mode and Password using the provided parameters and click OK.



More AP Edit

Use this screen to create Guest and additional wireless networks with different security settings.

Wireless Network Setup

Wireless: On

Wireless Network Settings

Wireless Network Name: VIP

□ Hide SSID

☑ Guest WLAN

Access Scenario: External Guest

Max. Upstream Bandwidth: Kbps

Max. Downstream Bandwidth: Kbps

Note

If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease wireless performance.

BSSID: 00:00:00:00:00:00

SSID Subnet: Off

Security Level

Security Mode: WPA2-PSK

Protected Management Frames: Capable

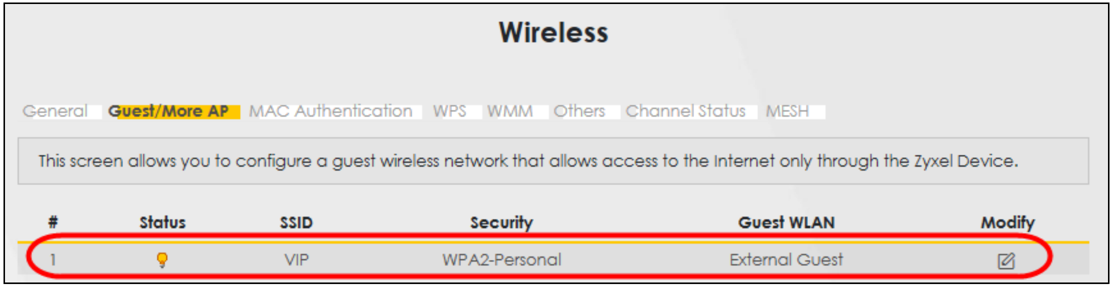
□ Generate password automatically

The password must be at least 8 characters long, including 1 uppercase letter, 1 lowercase letter, 1 number and 1 special character, or 64 hexadecimal digits ("0-9", "A-F")

Password: Zyxel1234@@!

Strength: strong

The 5G VIP Wi-Fi network is now configured.



This screen allows you to configure a guest wireless network that allows access to the Internet only through the Zyxel Device.

#	Status	SSID	Security	Guest WLAN	Modify
1	💡	VIP	WPA2-Personal	External Guest	✎

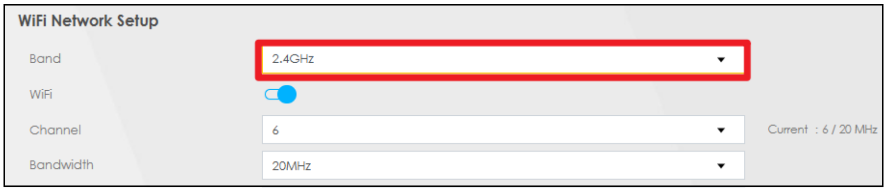
5.5.8 Configure the Channel and Bandwidth for Each Wi-Fi Band

For optimal Wi-Fi network performance, you can change the bandwidth and channel for a specific band to improve the throughput and minimize the interference. You can refer to Recommended Application for Each Band for the recommended setup.

In this tutorial, you want to configure the channel to 6 and bandwidth to 20 MHz for 2.4 GHz band.

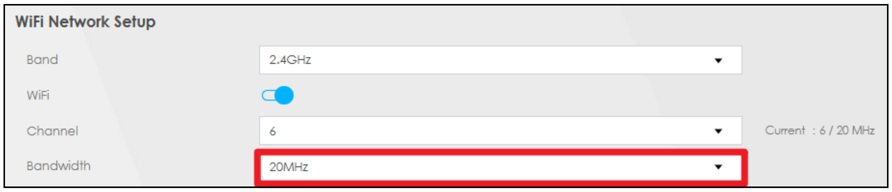
1 Go to Network Setting > Wireless > General.

2 In Band, select 2.4GHz from the drop-down list.



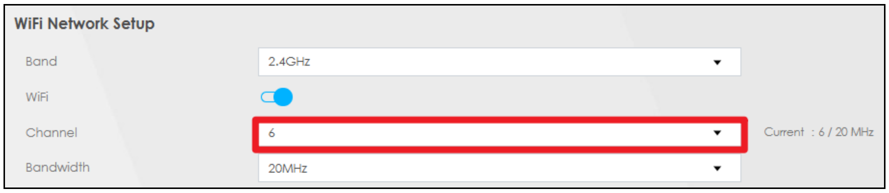
Band 2.4GHz
WiFi
Channel 6 Current : 6 / 20 MHz
Bandwidth 20MHz

3 In Bandwidth, select 20MHz from the drop-down list.



Band 2.4GHz
WiFi
Channel 6 Current : 6 / 20 MHz
Bandwidth 20MHz

4 In Channel, select 6 from the drop-down list.



Band 2.4GHz
WiFi
Channel 6 Current : 6 / 20 MHz
Bandwidth 20MHz

The table below shows the recommended application for each band, along with the suggested channel and bandwidth.

Table 28 Recommended Application for Each Band

BAND	BANDWIDTH	CHANNEL	APPLICATION
2.4 GHz	20 MHz	1, 6, 11	Web browsing, email, IoT (Internet of Things)

Table 28   Recommended Application for Each Band (continued)

BAND	BANDWIDTH	CHANNEL	APPLICATION
5 GHz	40 MHz	36, 40, 44, 48	HD streaming, online meetings
	80 MHz	36, 40, 44, 48 or 52-128	4K or 8K streaming, multiplayer gaming

Note: If you are still unsure about this configuration, you can set the Channel to Auto, allowing the Zyxel Device to automatically determine the proper channel for the selected band.

5.6 Cellular Network Setup

This section shows you how to:

- Set Up a Cellular Network Connection
- Set Up a Cellular APN Setting

5.6.1 Set Up a Cellular Network Connection

This section gives you an example on how to connect to the Internet using over a cellular connection.

1 Insert a SIM Card into your Zyxel Device SIM slot. Make sure this SIM card has an active data plan with your Internet Service Provider (ISP).

2 Connect your Zyxel Device to your computer, and log into the Web Configurator.

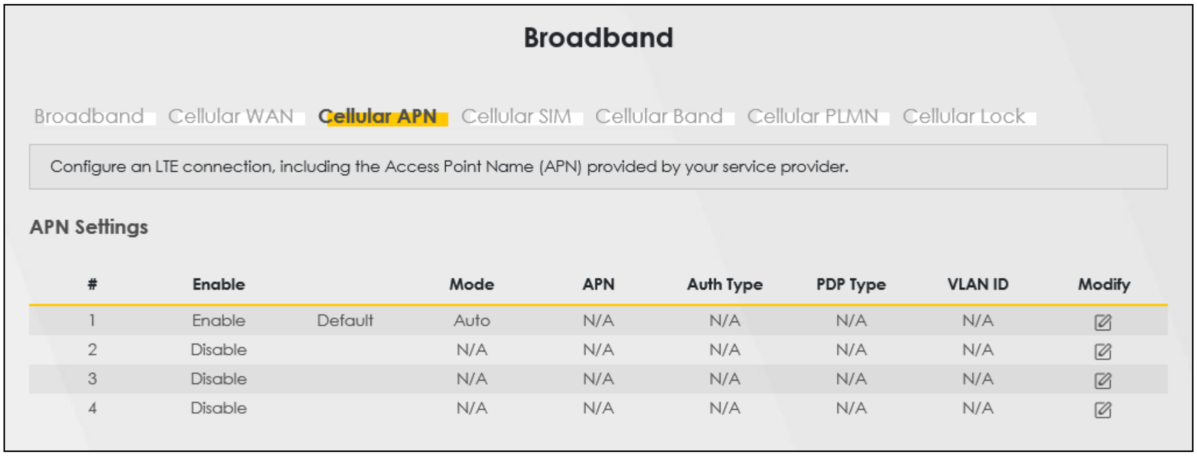
3 If your SIM has a PIN Code, enter this code in the Network Setting > Broadband > Cellular SIM screen.

Use the Home screen to check the Internet Status (IPv4) or Internet Status (IPv6). If it shows Connected this means your Internet connection is up.

5.6.2 Set Up a Cellular APN Setting

You can define an APN (Access Point Name) which is a connection profile with the parameters you need to connect to a cellular network.

Click Network Setting > Broadband > Cellular APN to display the following screen.



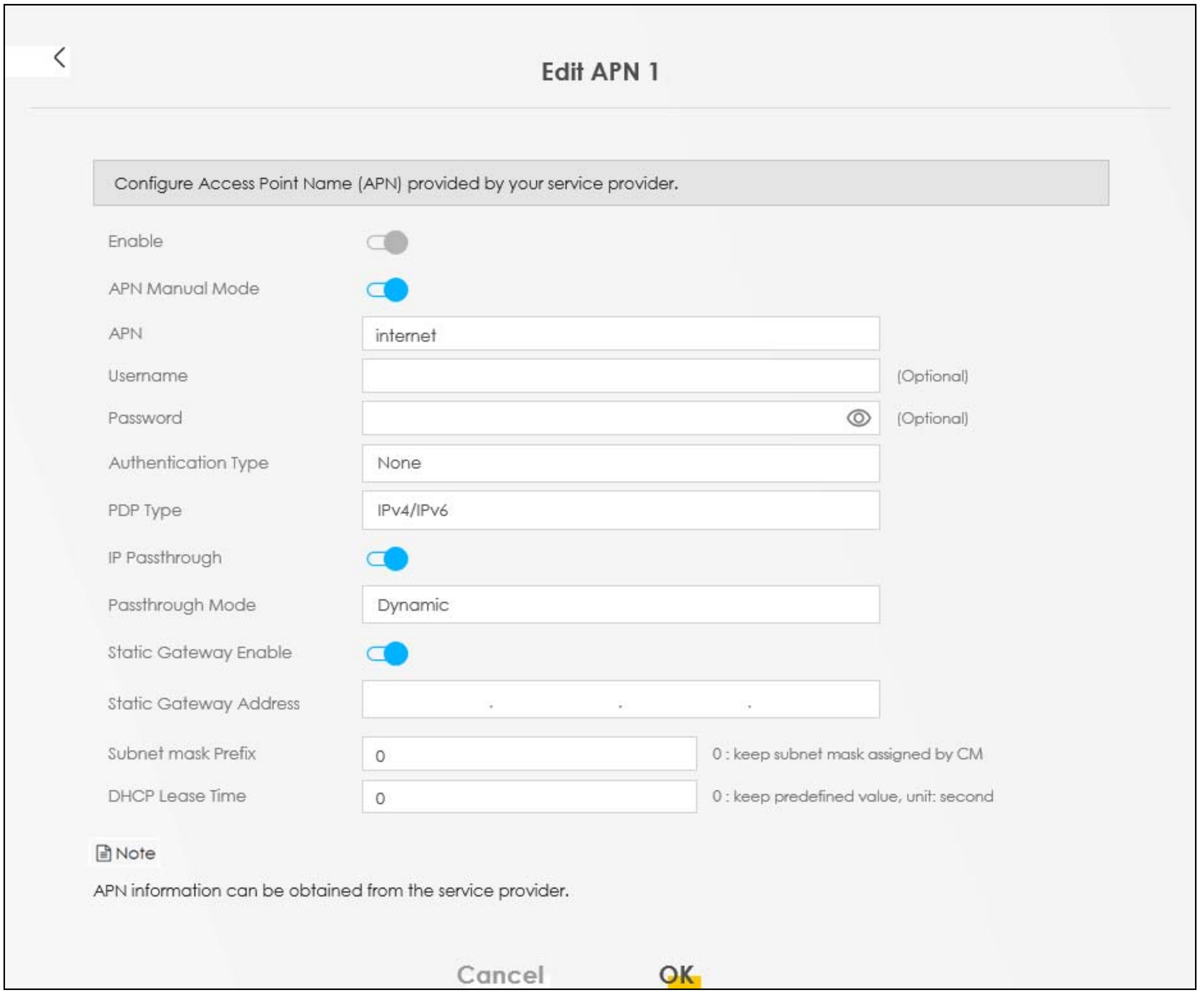
Broadband

Configure an LTE connection, including the Access Point Name (APN) provided by your service provider.

APN Settings

#	Enable		Mode	APN	Auth Type	PDP Type	VLAN ID	Modify
1	Enable	Default	Auto	N/A	N/A	N/A	N/A	✎
2	Disable		N/A	N/A	N/A	N/A	N/A	✎
3	Disable		N/A	N/A	N/A	N/A	N/A	✎
4	Disable		N/A	N/A	N/A	N/A	N/A	✎

Click the Edit icon (✎) in the Cellular APN screen, the following screen appears.



Edit APN 1

Configure Access Point Name (APN) provided by your service provider.

Enable	○	
APN Manual Mode	●	
APN	internet	
Username		(Optional)
Password		(Optional)
Authentication Type	None	
PDP Type	IPv4/IPv6	
IP Passthrough	●	
Passthrough Mode	Dynamic	
Static Gateway Enable	●	
Static Gateway Address	. . .	
Subnet mask Prefix	0	0 : keep subnet mask assigned by CM
DHCP Lease Time	0	0 : keep predefined value, unit: second

Note

APN information can be obtained from the service provider.

- VLAN ID Enable: Enable this to set your VLAN ID.
- APN Manual Mode: Enable this to configure your APN cellular information manually.
- APN: Enter the Access Point Name (APN) provided by your ISP. You can enter a name up to 30 printable ASCII characters, including spaces.

- Username: Type the username provided by your ISP for authentication. The allowed username is up to 31 printable ASCII characters.
- Password: Type the password provided by your ISP for authentication. The allowed password is up to 31 printable ASCII characters.
- Authentication Type: Select the authentication type (PAP, CHAP, PAP/CHAP) used by the Zyxel Device.
- PDP Type: Select the IP address type (IPv4, IPv6, IPv4/IPv6) the Zyxel Device uses for connection.
- VLAN ID: Enter a unique ID number, from 1 to 4,094, to identify this VLAN group.
- IP Passthrough: Enable this to turn off the routing functionality on the Zyxel Device.
- Passthrough Mode: Select Fixed to specify the MAC address of the computer using the public IP address provided by the ISP. Otherwise, select Dynamic.
- Static Gateway Enable: Select Enable to use a static IP address for your gateway.
- Static Gateway Address: Enter the IP address of your gateway.
- Subnet mask Prefix: Enter the subnet address of your gateway.
- DHCP Lease Time: Enter the lease time provided by your DHCP server.

5.7 USB Applications

This section shows you how to:

- Set Up File Sharing on Your Zyxel Device
- Access Your Shared Files From a Computer

5.7.1 File Sharing

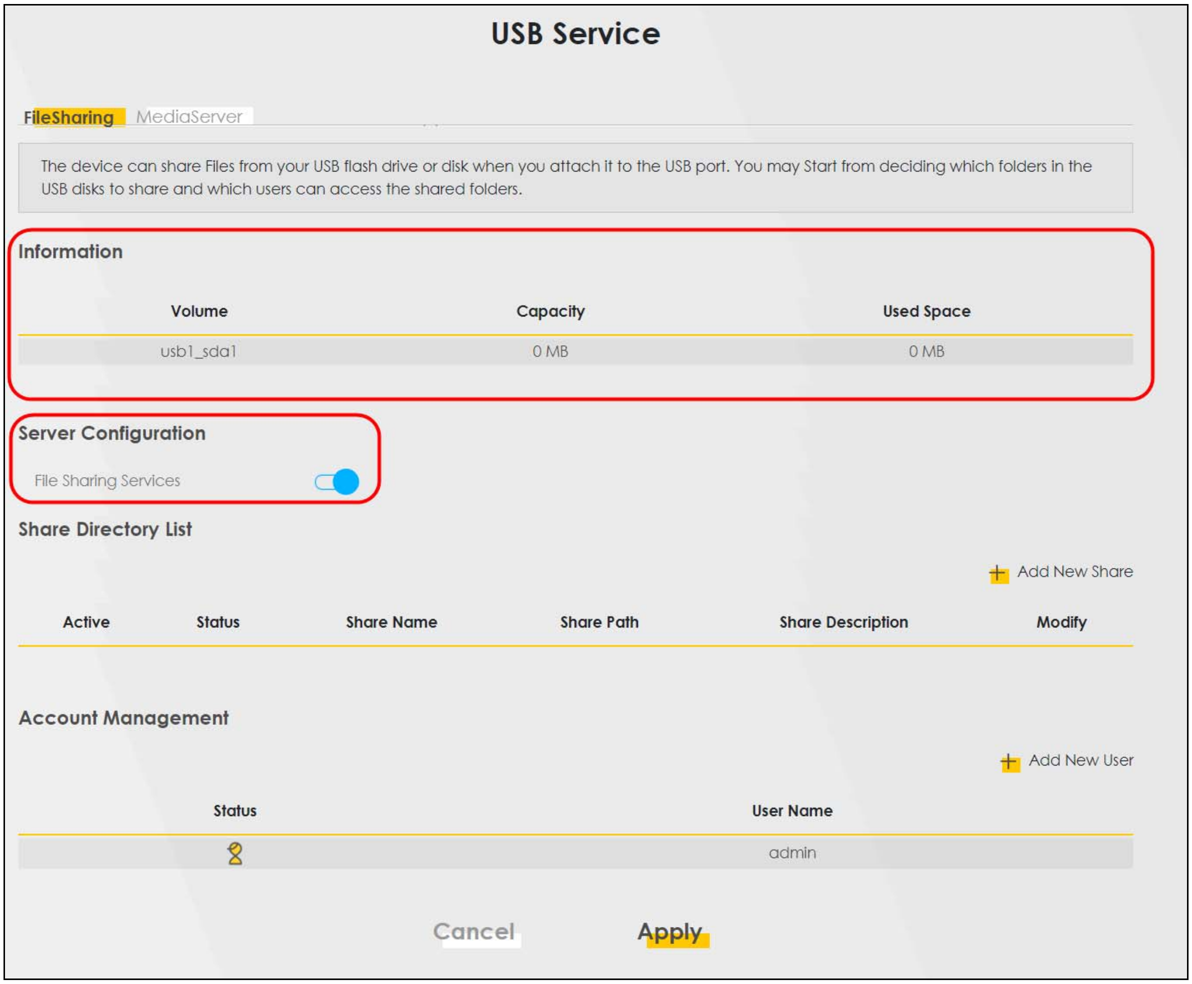
This section shows you how to create a shared folder on your Zyxel Device through a USB device and allow others to access the shared folder with File Sharing services.

5.7.1.1 Set Up File Sharing on Your Zyxel Device

1 Before enabling file sharing in the Zyxel Device, please set up your shared folders beforehand in your USB device.

2 Connect your USB device to the USB port of the Zyxel Device.

3 Go to the Network Setting > USB Service > File Sharing screen. Enable File Sharing Services and click Apply to activate the file sharing function. The Zyxel Device automatically adds your USB device to the Information table.



The device can share Files from your USB flash drive or disk when you attach it to the USB port. You may Start from deciding which folders in the USB disks to share and which users can access the shared folders.

Information

Volume	Capacity	Used Space
usb1_sda1	0 MB	0 MB

Server Configuration

File Sharing Services ●

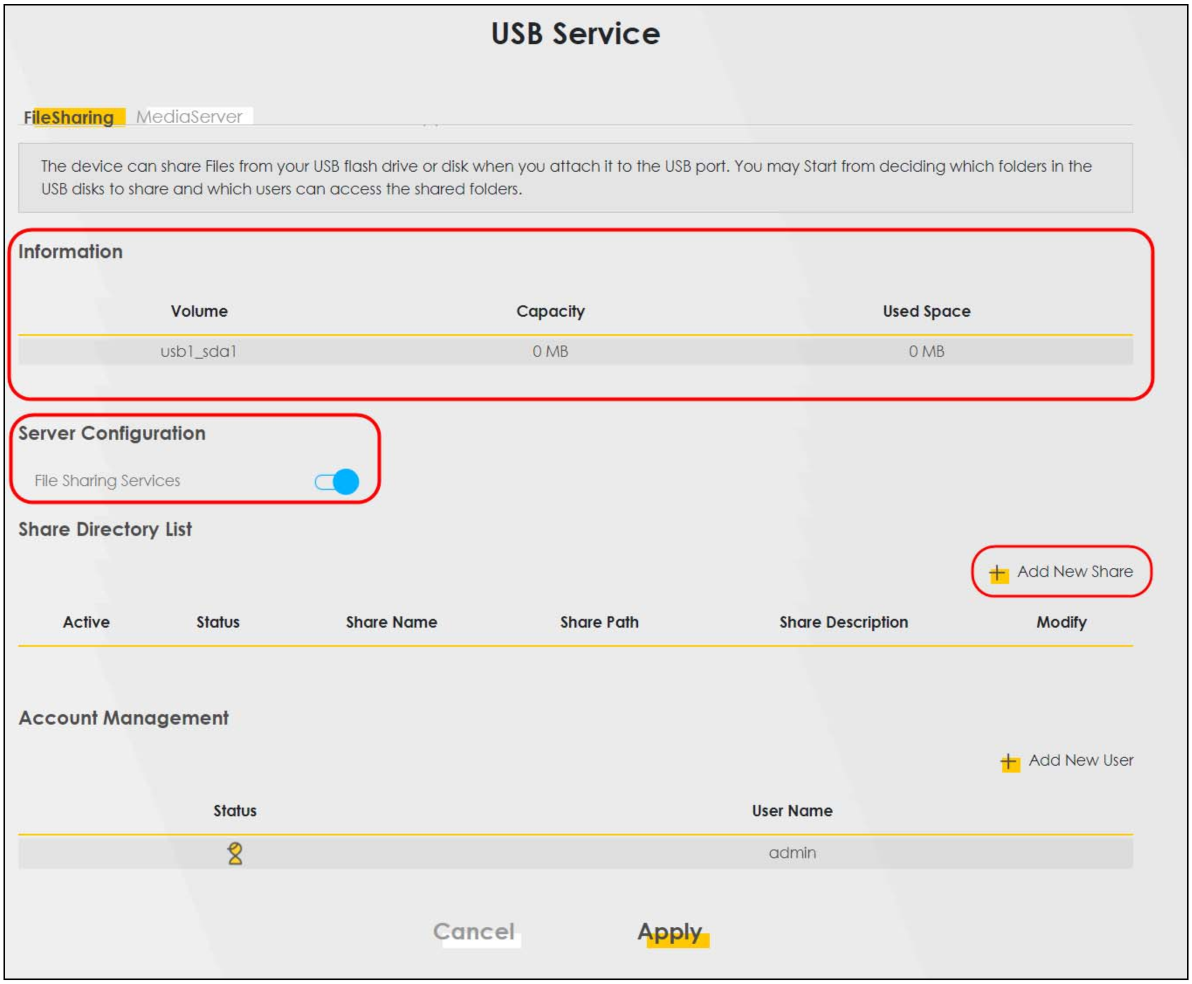
Share Directory List

Active	Status	Share Name	Share Path	Share Description	Modify

Account Management

Status	User Name
👤	admin

4 Click + Add New Share to add a new share.



USB Service

The device can share Files from your USB flash drive or disk when you attach it to the USB port. You may Start from deciding which folders in the USB disks to share and which users can access the shared folders.

Information

Volume	Capacity	Used Space
usb1_sda1	0 MB	0 MB

Server Configuration

File Sharing Services: ●

Share Directory List

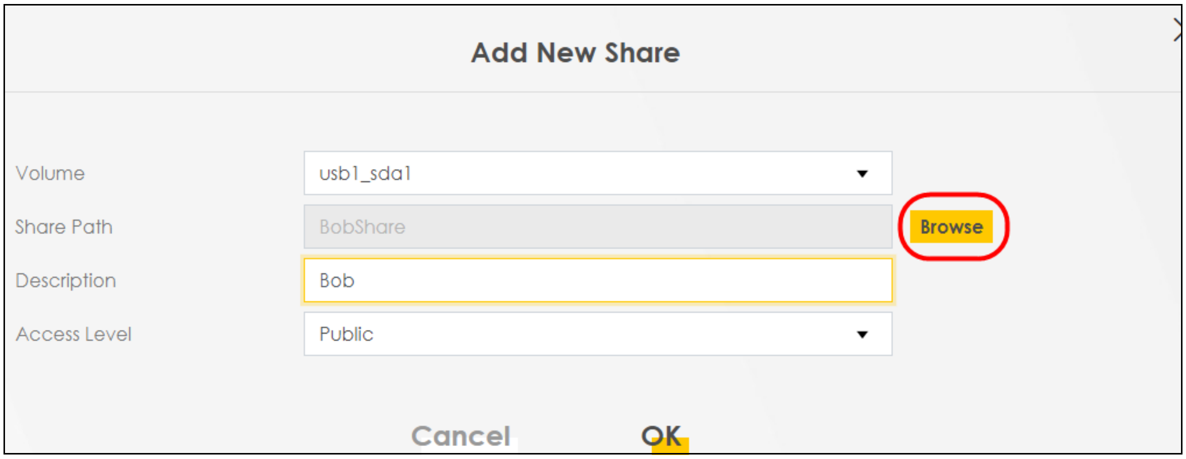
Active	Status	Share Name	Share Path	Share Description	Modify

Account Management

Status	User Name
	admin

5 The Add New Share screen appears.

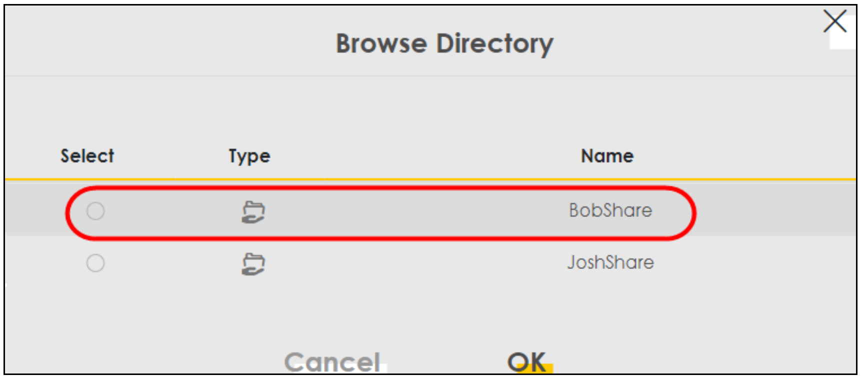
- Select your USB device from the Volume drop-down list box.
- Enter a Description name for the added share to identify the device.
- Click Browse and the Browse Directory screen appears.



Add New Share

Volume	usb1_sda1
Share Path	BobShare
Description	Bob
Access Level	Public

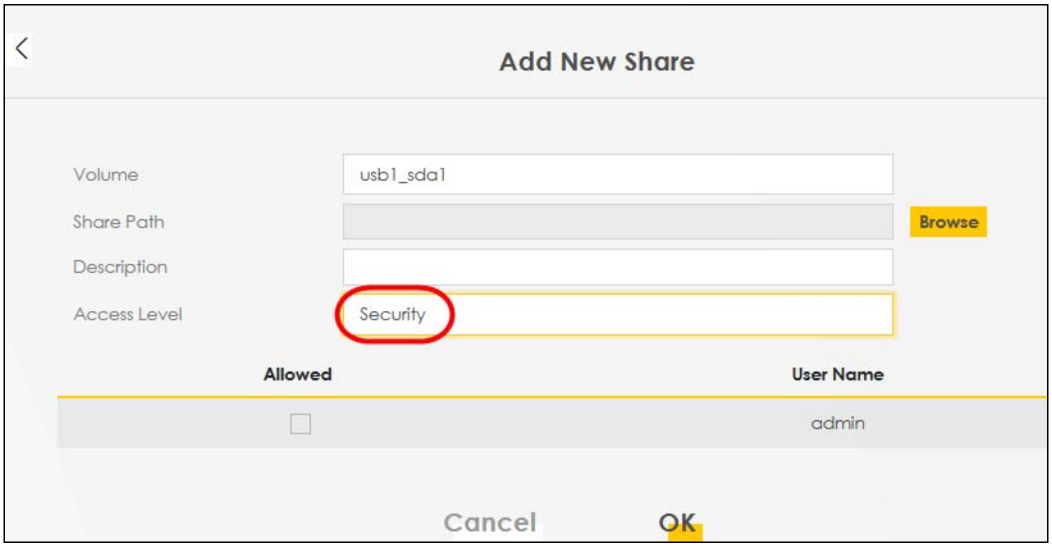
- On the Browse Directory screen, select the folder that you want to add as a share. In this example, select BobShare and then click OK.



Browse Directory

Select	Type	Name
○		BobShare
○		JoshShare

- In Access Level, select Public to let the share to be accessed by all users connected to the Zyxel Device. Otherwise, select Security to let the share to be accessed by specific users to access only. Click OK to save the settings.

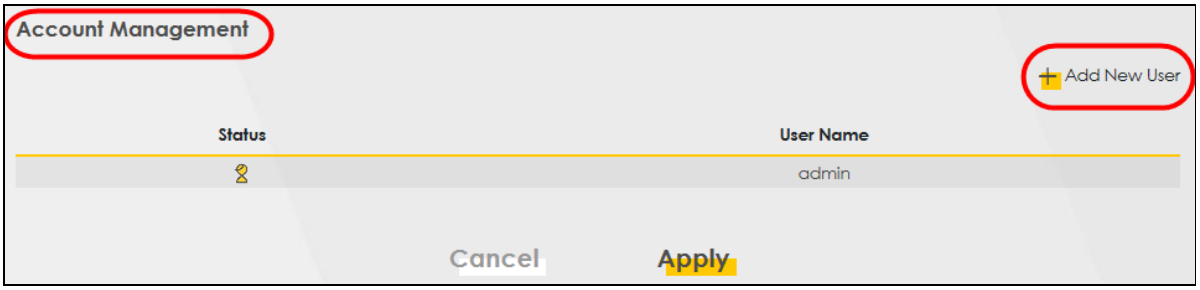


Add New Share

Volume	usb1_sda1
Share Path	
Description	
Access Level	Security

Allowed	User Name
□	admin

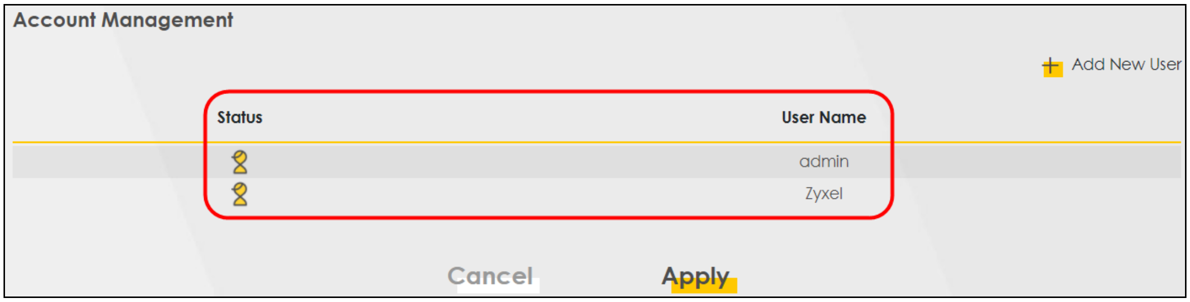
6 To set Access level to Security, you need to create one or more users accounts. Under Account Management, click + Add New User to open the User Account screen.



Account Management

Status	User Name
	admin

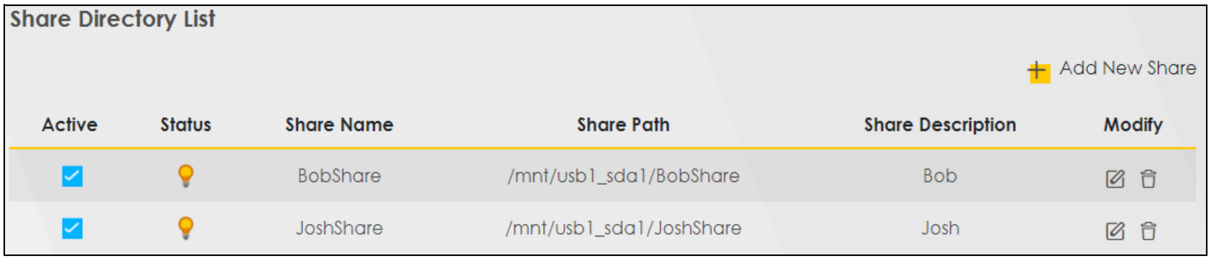
7 After you create a new user account, the screen looks like the following.



Account Management

Status	User Name
	admin
	Zyxel

8 File sharing is now configured. You can see the USB storage device listed in the table below.



Share Directory List

Active	Status	Share Name	Share Path	Share Description	Modify
☑		BobShare	/mnt/usb1_sda1/BobShare	Bob	
☑		JoshShare	/mnt/usb1_sda1/JoshShare	Josh	

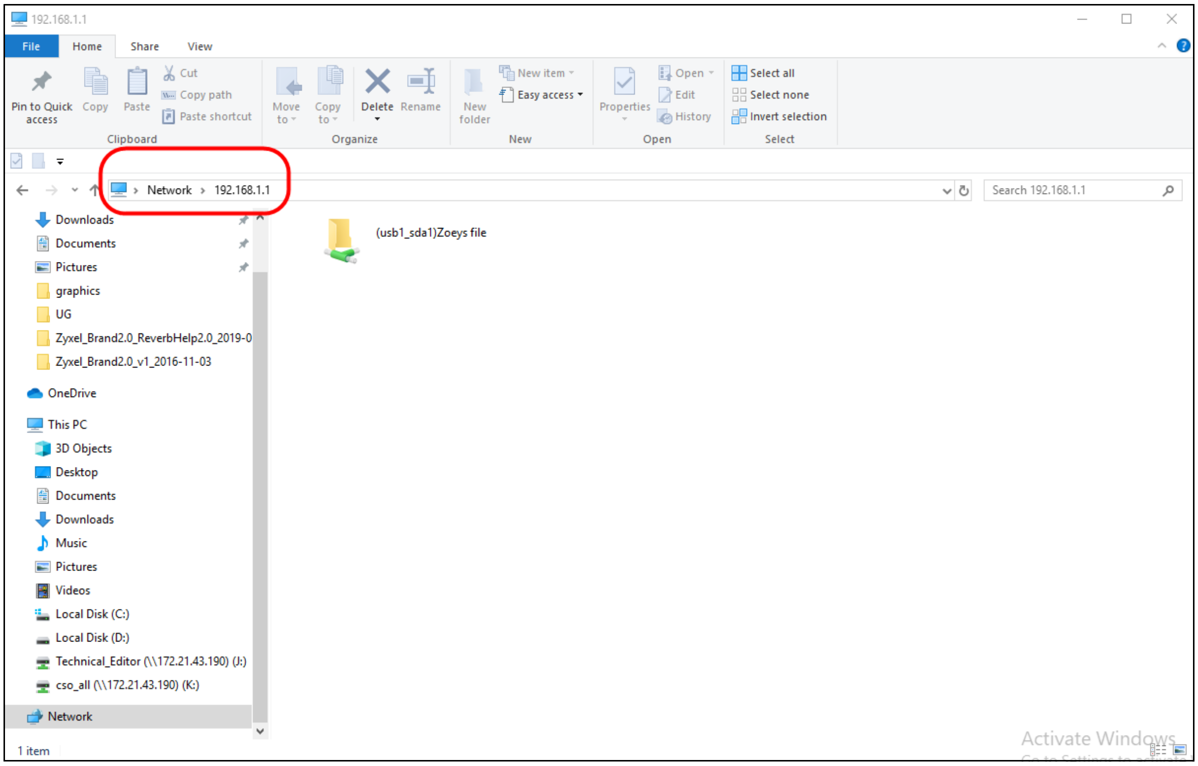
5.7.1.2 Access Your Shared Files From a Computer

You can use Windows Explorer to access the USB storage devices connected to the Zyxel Device.

Note: This example shows you how to use Microsoft Windows 10 to browse shared files in a share called (usb1_sda)Zoeys file. Refer to your operating system's documentation for how to browse your file structure.

1 Open Windows Explorer.

2 In the Windows Explorer's address bar, enter a double backslash "\\" followed by the IP address of the Zyxel Device (the default IP address of the Zyxel Device is 192.168.1.1



3 Double-click on (usb1_sda)Zoeys file, and then enter the share's username and password if prompted.

4 After you access (usb1_sda)Zoeys file through your Zyxel Device, you do not have to log in again unless you restart your computer.

5.7.2 Media Server

Use the media server feature to play files on a computer or on your television.

This section shows you how the media server feature works using the following:

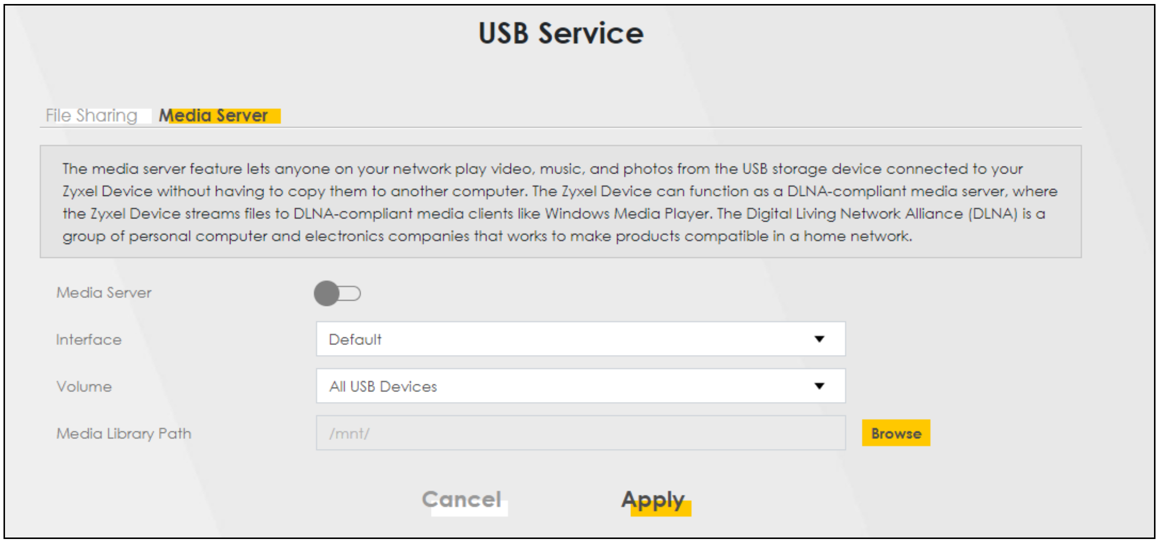
- Microsoft (MS) Windows Media Player
  Media Server works with Windows 10. Make sure your computer is able to play media files (music, videos and pictures).
- A digital media adapter
  You need to set up the media adapter to work with your television (TV).

Before you begin, connect the USB storage device containing the media files you want to play to the USB port of your Zyxel Device.

5.7.2.1 Configure the Zyxel Device as a Media server

To use your Zyxel Device as a media server, follow the steps below.

1 Go to the Network Setting > USB Service > Media Server screen.



The media server feature lets anyone on your network play video, music, and photos from the USB storage device connected to your Zyxel Device without having to copy them to another computer. The Zyxel Device can function as a DLNA-compliant media server, where the Zyxel Device streams files to DLNA-compliant media clients like Windows Media Player. The Digital Living Network Alliance (DLNA) is a group of personal computer and electronics companies that works to make products compatible in a home network.

Media Server	○
Interface	Default
Volume	All USB Devices
Media Library Path	/mnt/

5.8 Network Security

This section shows you how to:

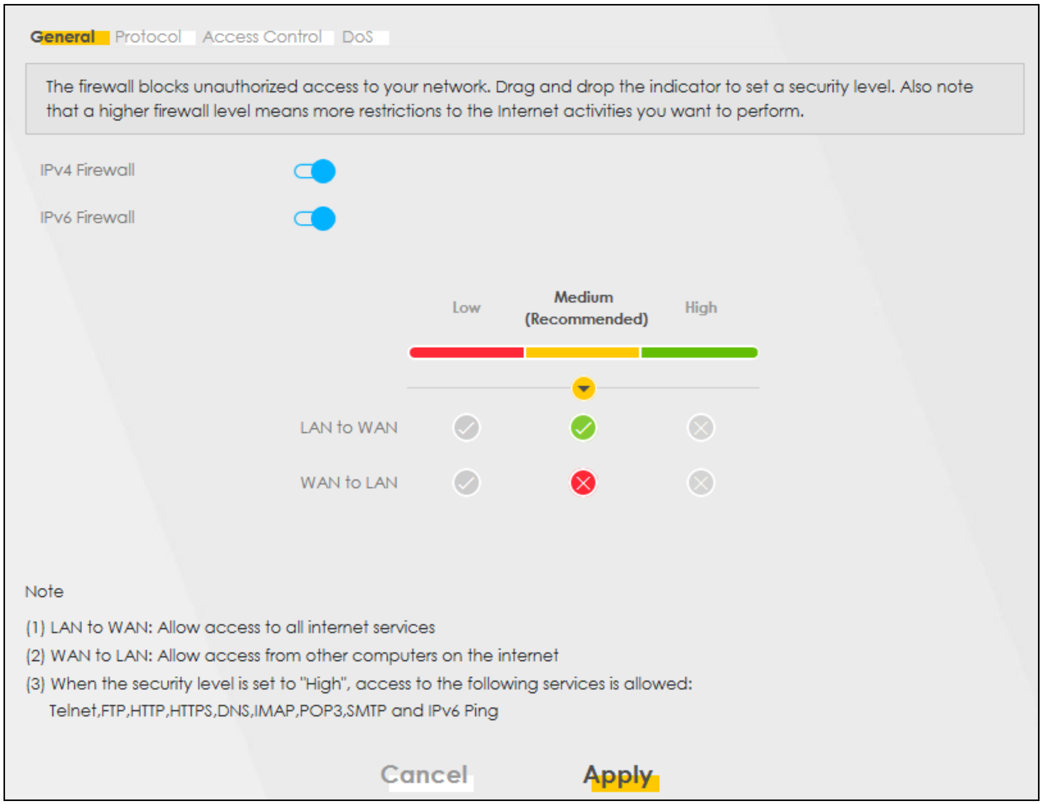
- Configure a Firewall Rule
- Configure a Schedule for Firewall ACL Rules
- Set Up Home Security
- Set Up Parental Control

5.8.1 Configure a Firewall Rule

You can enable the firewall to protect your LAN computers from malicious attacks from the Internet.

1 Go to the Security > Firewall > General screen.

2 Select IPv4 Firewall/IPv6 Firewall to enable the firewall, and then click Apply.



The firewall blocks unauthorized access to your network. Drag and drop the indicator to set a security level. Also note that a higher firewall level means more restrictions to the Internet activities you want to perform.

IPv4 Firewall ●

IPv6 Firewall ●

	Low	Medium (Recommended)	High
LAN to WAN	✓	✓	✗
WAN to LAN	✓	✗	✗

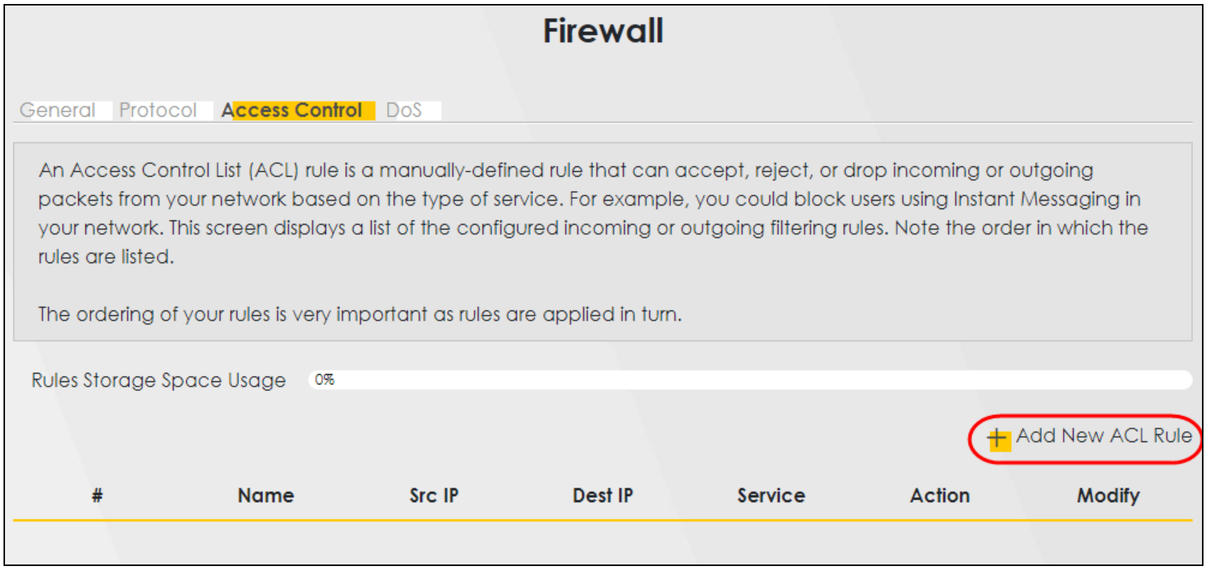
Note

(1) LAN to WAN: Allow access to all internet services

(2) WAN to LAN: Allow access from other computers on the internet

(3) When the security level is set to "High", access to the following services is allowed:
Telnet,FTP,HTTP,HTTPS,DNS,IMAP,POP3,SMTP and IPv6 Ping

3 Open the Access Control screen, click + Add New ACL Rule to create a rule.



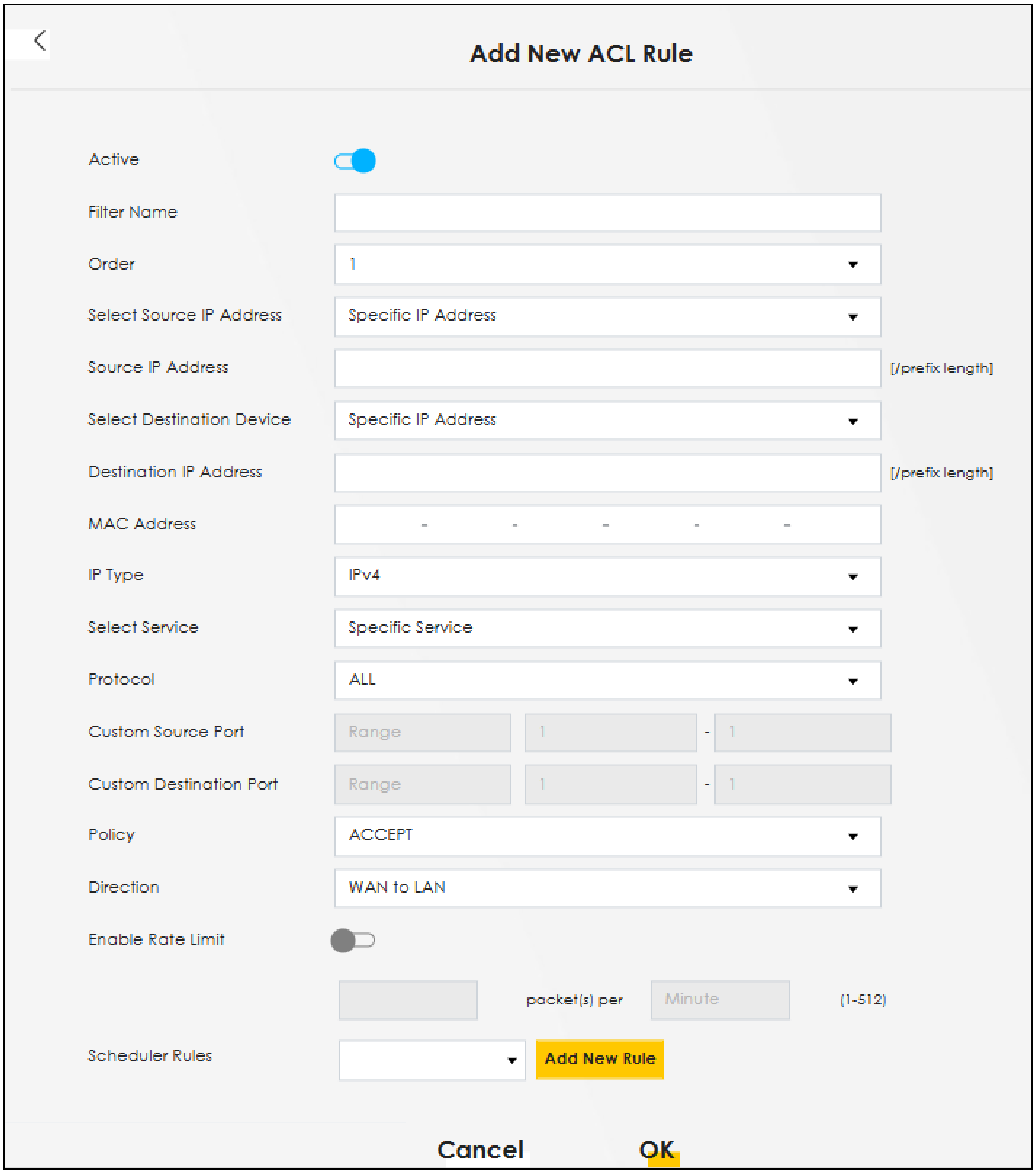
An Access Control List (ACL) rule is a manually-defined rule that can accept, reject, or drop incoming or outgoing packets from your network based on the type of service. For example, you could block users using Instant Messaging in your network. This screen displays a list of the configured incoming or outgoing filtering rules. Note the order in which the rules are listed.

The ordering of your rules is very important as rules are applied in turn.

Rules Storage Space Usage 0%

#	Name	Src IP	Dest IP	Service	Action	Modify

4 Use the following fields to configure and apply a new ACL (Access Control List) rule.



Add New ACL Rule

Active	●
Filter Name	
Order	1
Select Source IP Address	Specific IP Address
Source IP Address	[/prefix length]
Select Destination Device	Specific IP Address
Destination IP Address	[/prefix length]
MAC Address	- - - - -
IP Type	IPv4
Select Service	Specific Service
Protocol	ALL
Custom Source Port	Range 1 - 1
Custom Destination Port	Range 1 - 1
Policy	ACCEPT
Direction	WAN to LAN
Enable Rate Limit	○
	packet(s) per Minute (1-512)
Scheduler Rules	Add New Rule

- Active: Click this button to the right to enable this rule.
- Filter Name: Enter a name to identify the firewall rule.
- Source IP Address: Enter the IP address of the computer that initializes traffic for the application or service.
- Destination IP Address: Enter the IP address of the computer to which traffic for the application or service is entering.
- Protocol: Select the protocol (ALL, TCP/UDP, TCP, UDP, ICMP or ICMPv6) used to transport the packets.
- Policy: Select whether to (ACCEPT, DROP, or REJECT) the packets.
- Direction: Select the direction (WAN to LAN, LAN to WAN, WAN to ROUTER, or LAN to ROUTER) of the traffic to which this rule applies.

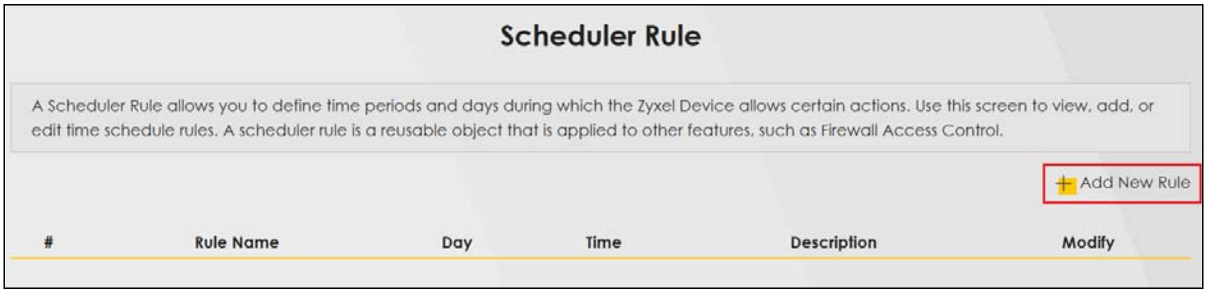
5 Select Enable Rate Limit to limit the number of requests a client can make within a specific time period. Click OK.

5.8.2 Configure a Schedule for Firewall ACL Rules

This section shows you how to create a Scheduler Rule and apply it to a Firewall ACL Rule to block employees' access to Youtube during work hours.

Add New Scheduler Rule screen

1 Go to Security > Scheduler Rule > + Add New Rule



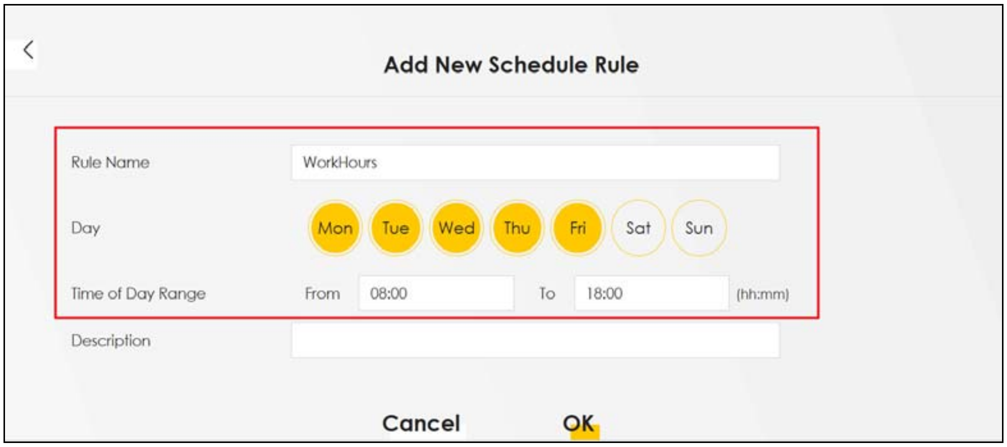
Scheduler Rule

A Scheduler Rule allows you to define time periods and days during which the Zyxel Device allows certain actions. Use this screen to view, add, or edit time schedule rules. A scheduler rule is a reusable object that is applied to other features, such as Firewall Access Control.

#	Rule Name	Day	Time	Description	Modify

2 In the Add New Schedule Rule screen:

- Enter WorkHours for the Rule Name.
- Under Day, select Monday to Friday.
- Set Time of Day Range to 08:00 to 18:00.
- Click OK to save.



Add New Schedule Rule

Rule Name: WorkHours

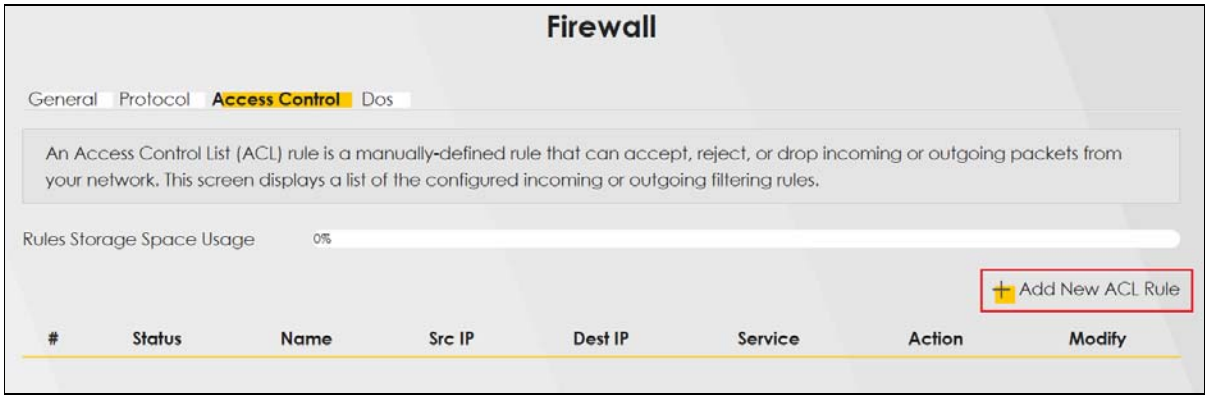
Day: Mon Tue Wed Thu Fri Sat Sun

Time of Day Range: From 08:00 To 18:00 (hh:mm)

Description:

Add New ACL Rule Screen

3 Go to Security > Firewall > Access Control > + Add New ACL Rule



Firewall

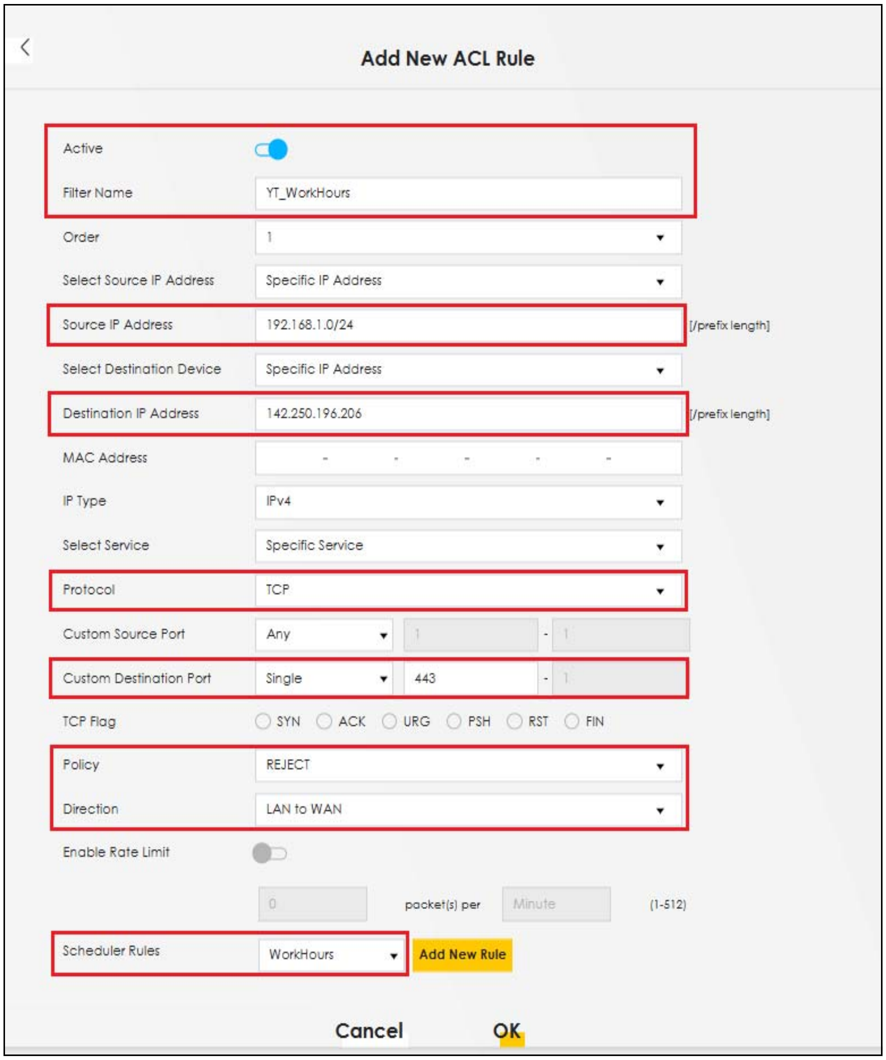
An Access Control List (ACL) rule is a manually-defined rule that can accept, reject, or drop incoming or outgoing packets from your network. This screen displays a list of the configured incoming or outgoing filtering rules.

Rules Storage Space Usage 0%

#	Status	Name	Src IP	Dest IP	Service	Action	Modify

4 In the Add New ACL Rule screen:

- Click the Active button to the right to enable this rule.
- Enter YT_WorkHours for the Filter Name.
- Set Source IP Address to your office’s internal network.
- Use nslookup to find Youtube’s IP address and set the Destination IP Address accordingly.
- Select TCP for Protocol.
- Set Custom Destination Port to 443.
- Select REJECT for Policy to discard the packets.
- Set Direction to LAN to WAN.
- Under Scheduler Rules, select WorkHours that you created earlier.
- Click OK.



Add New ACL Rule

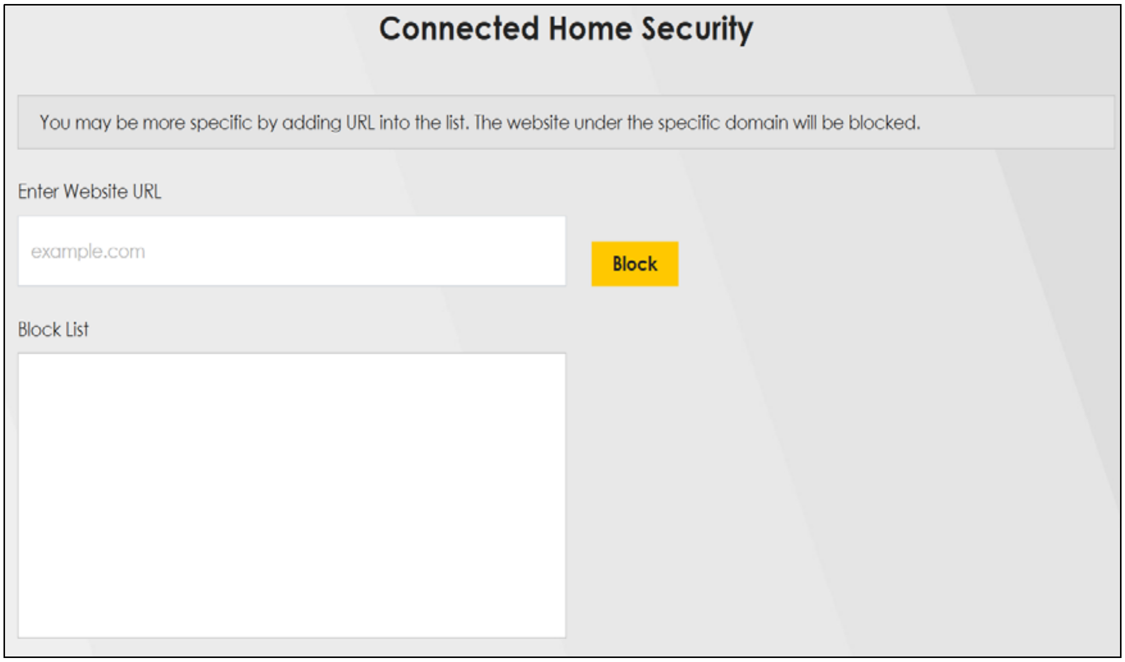
Active	●
Filter Name	YT_WorkHours
Order	1
Select Source IP Address	Specific IP Address
Source IP Address	192.168.1.0/24 [/prefix length]
Select Destination Device	Specific IP Address
Destination IP Address	142.250.196.206 [/prefix length]
MAC Address	- - - - -
IP Type	IPv4
Select Service	Specific Service
Protocol	TCP
Custom Source Port	Any 1 - 1
Custom Destination Port	Single 443 - 1
TCP Flag	○ SYN ○ ACK ○ URG ○ PSH ○ RST ○ FIN
Policy	REJECT
Direction	LAN to WAN
Enable Rate Limit	○
	0 packet(s) per Minute (1-512)
Scheduler Rules	WorkHours

Youtube access will now be blocked from 08:00 to 18:00, Monday to Friday.

5.8.3 Set Up Home Security

This section shows you how to use Home Security to block social media at all times.

1 Go to Security > Home Security to open the Connected Home Security screen.



Connected Home Security

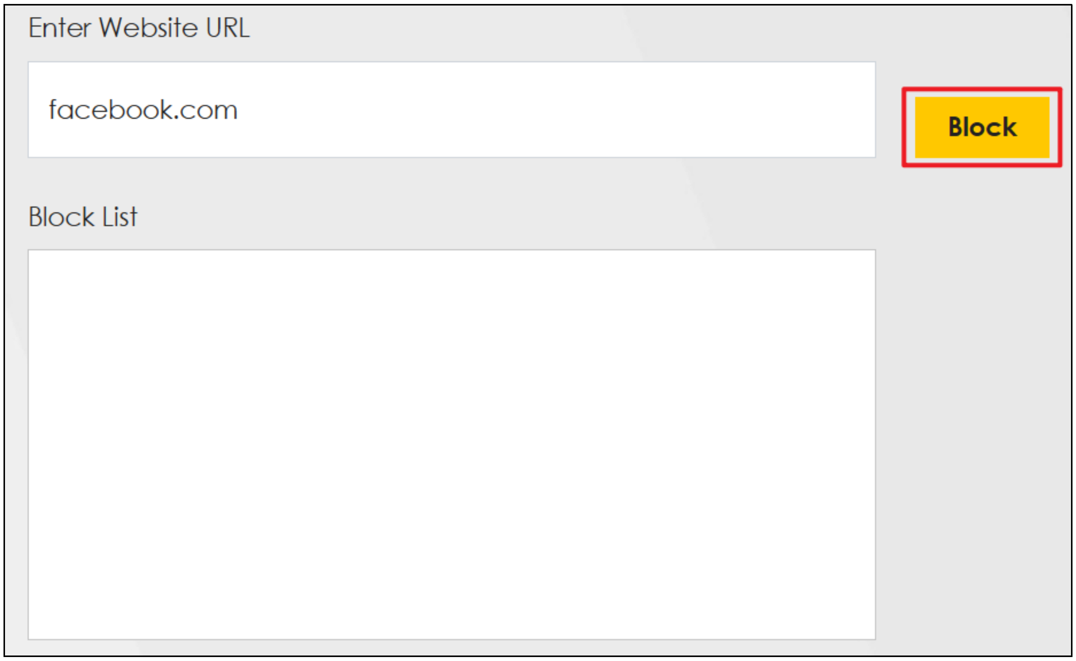
You may be more specific by adding URL into the list. The website under the specific domain will be blocked.

Enter Website URL

example.com

Block List

2 Enter Facebook's domain name (e.g., facebook.com) in the Enter Website URL field, then click Block.

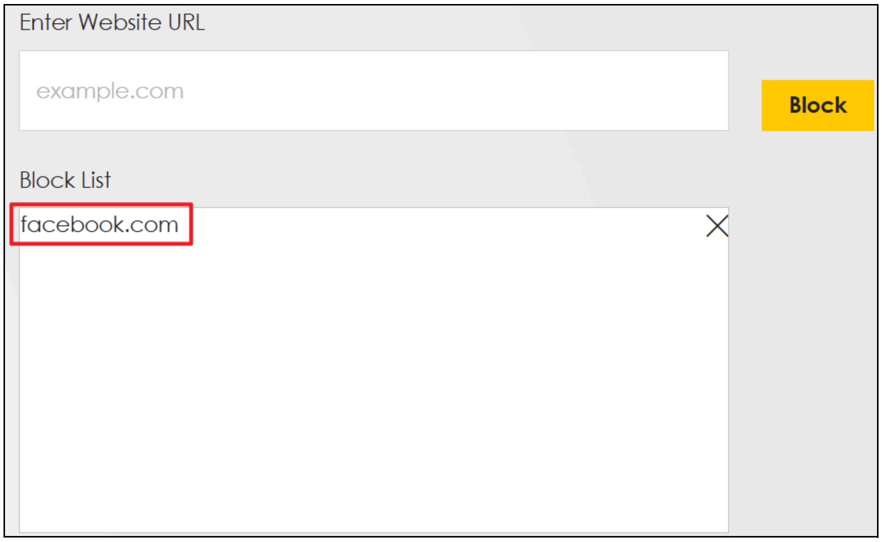


Enter Website URL

facebook.com

Block List

3 The domain name will appear in the Block List below. Facebook will now be blocked for all devices on your network.



Enter Website URL

example.com

Block List

facebook.com

5.8.4 Set Up Parental Control

This section shows you how to configure PC to restrict access to certain Internet websites.

Note: The style and features of your parental control vary depending on the Zyxel Device you are using.

5.8.4.1 Configure Parental Control Schedule and Filter

Parental Control Profile (PCP) allows you to set up a rule for:

- Internet usage scheduling.
- Websites and URL keyword blocking.

Use this feature to:

- Limit the days and times a user can access the Internet.
- Limit the websites a user can access on the Internet.

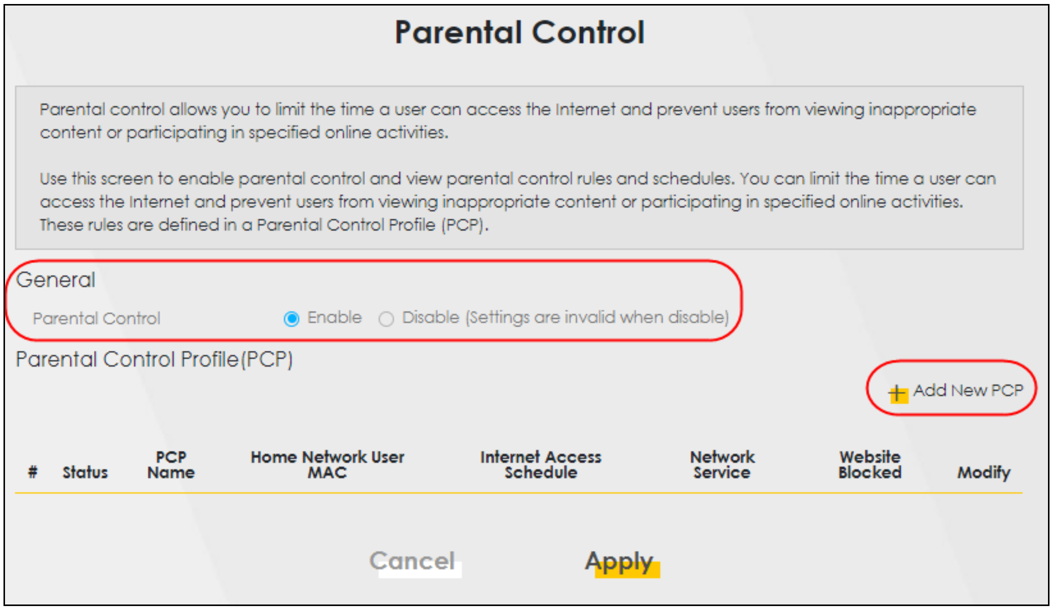
This example shows you how to block a user from accessing the Internet during time for studying. It also shows you how to stop a user from accessing specific websites.

Use the parameters below to configure a schedule rule and a URL keyword blocking rule.

PROFILE NAME	INTERNET ACCESS SCHEDULE	NETWORK SERVICE	SITE / URL KEYWORD
Study	Day: Monday to Friday Time: 8:00 to 11:00 13:00 to 17:00	Network Service Setting: Block Service Name: HTTP Protocol: TCP Port: 80	Block or Allow the Web Site: Block the web URLs Website: gambling

Parental Control Screen

Open the Parental Control screen. Select Enable under General to enable parental control. Then click + Add New PCP to add a rule.



Parental Control

Parental control allows you to limit the time a user can access the Internet and prevent users from viewing inappropriate content or participating in specified online activities.

Use this screen to enable parental control and view parental control rules and schedules. You can limit the time a user can access the Internet and prevent users from viewing inappropriate content or participating in specified online activities. These rules are defined in a Parental Control Profile (PCP).

General

Parental Control ● Enable ○ Disable (Settings are invalid when disable)

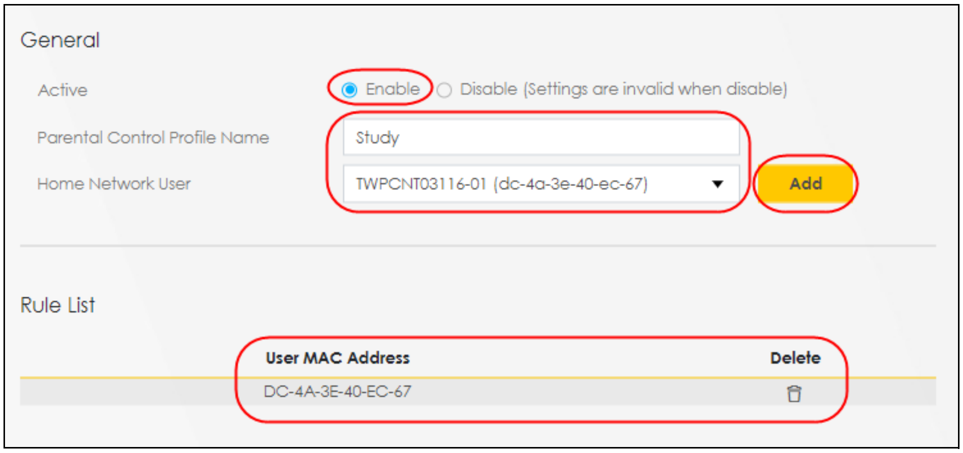
Parental Control Profile(PCP)

#	Status	PCP Name	Home Network User MAC	Internet Access Schedule	Network Service	Website Blocked	Modify

Add New PCP Screen

1 Go to Parental Control > Add New PCP. Under General:

- Select Enable to enable the rule you are configuring.
- Enter the Parental Control Profile Name given in the above parameter.
- Select an user this rule applies to in Home Network User, then click Add. You will see the MAC address of the user you just select in Rule List.



General

Active ● Enable ○ Disable (Settings are invalid when disable)

Parental Control Profile Name: Study

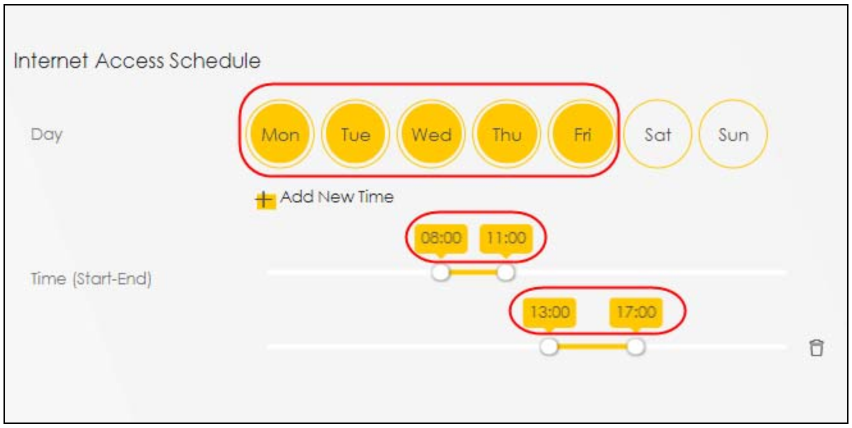
Home Network User: TWPCNT03116-01 (dc-4a-3e-40-ec-67) Add

Rule List

User MAC Address	Delete
DC-4A-3E-40-EC-67	🗑

2 Under Internet Access Schedule:

- Click + Add New Time to add a second schedule.
- Use the parameter given above to configure the time settings of your schedule.



Internet Access Schedule

Day: Mon Tue Wed Thu Fri Sat Sun

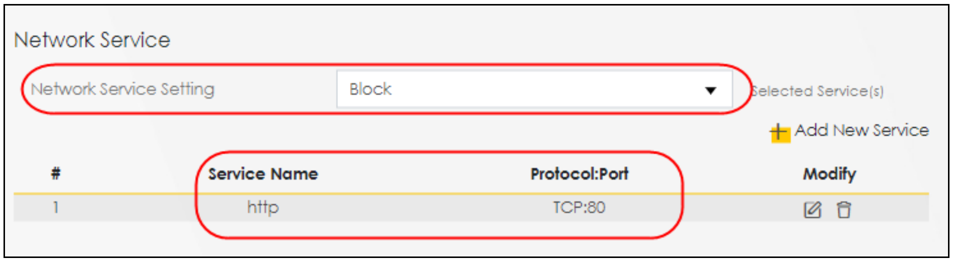
+ Add New Time

Time (Start-End): 08:00 11:00

13:00 17:00 🗑

3 Under Network Service:

- In Network Service Setting, select Block.
- Click + Add New Service, then use the parameter given above to configure settings for the Internet service you are blocking.



Network Service

Network Service Setting: Block

Selected Service(s)

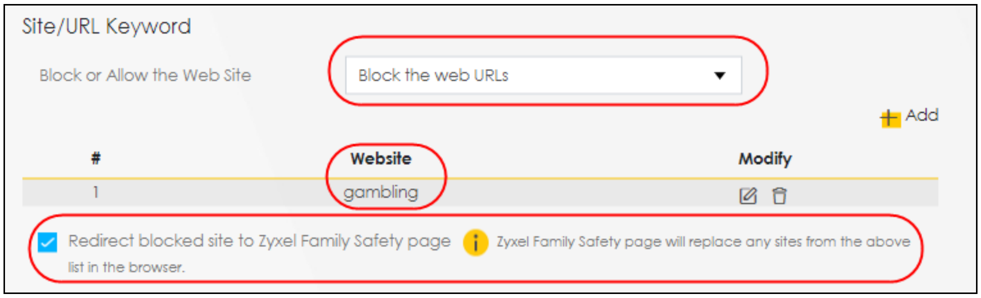
+ Add New Service

#	Service Name	Protocol:Port	Modify
1	http	TCP:80	✎ 🗑

4 Under Site / URL Keyword:

- Select Block the web URLs in Block or Allow the Web Site.
- Click Add, then use the parameter given above to configure settings for the URL keyword you are blocking.

- Select Redirect blocked site to Zyxel Family Safety page to redirect the web browser to the Zyxel Family Safety page if he or she tries to access a website with the blocked URL keyword.


Site/URL Keyword

Block or Allow the Web Site: Block the web URLs

#	Website	Modify
1	gambling	

☑ Redirect blocked site to Zyxel Family Safety page

Zyxel Family Safety page will replace any sites from the above list in the browser.

5 Click OK to save your settings.

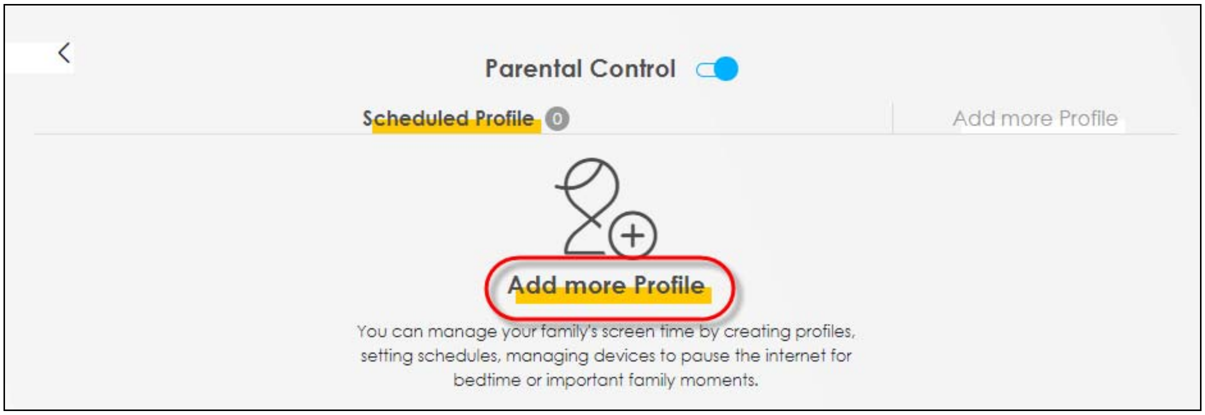
5.8.4.2 Configuring a Parental Control Schedule

Parental Control Profile allows you to set up a schedule rule for Internet usage. Use this feature to limit the days and times a user can access the Internet.

This example shows you how to block an user from accessing the Internet during time for studying. Use the parameter below to configure a schedule rule.

PROFILE NAME	START BLOCKING	END BLOCKING	REPEAT ON
Study	8:00 am	11:00 am	from Monday to Friday
	1:00 pm	5:00 pm	from Monday to Friday

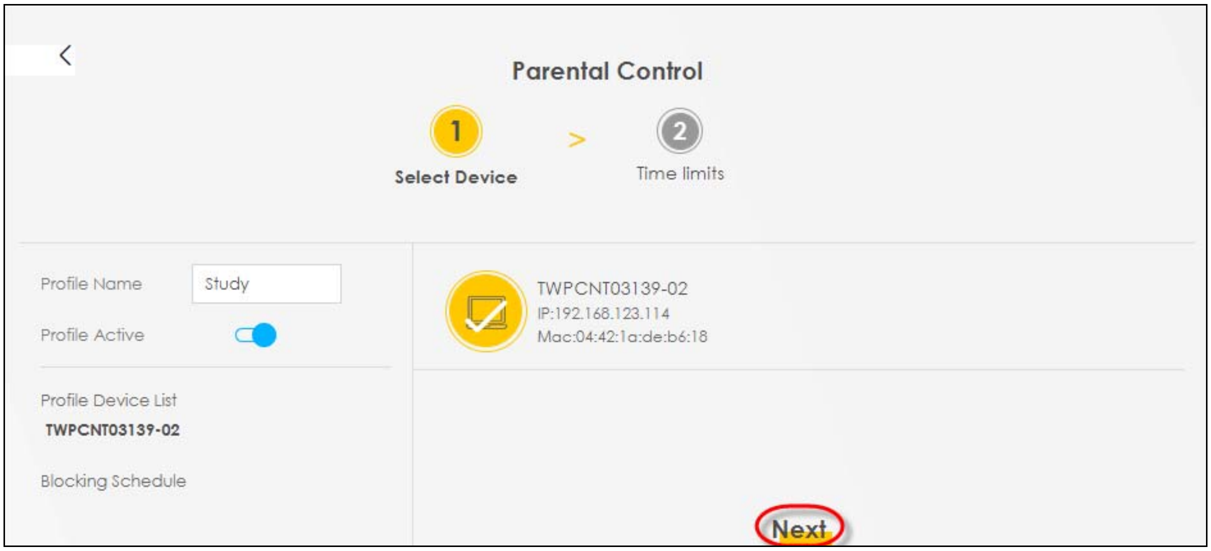
1 Click Add more Profile to open the Parental Control screen.



You can manage your family's screen time by creating profiles, setting schedules, managing devices to pause the internet for bedtime or important family moments.

2 Use this screen to add a Parental Control rule.

- Enter the Profile Name given in the above parameter.
- Click on the switch to enable Profile Active.
- Select a device, and then click Next to proceed.



Profile Name: Study

Profile Active

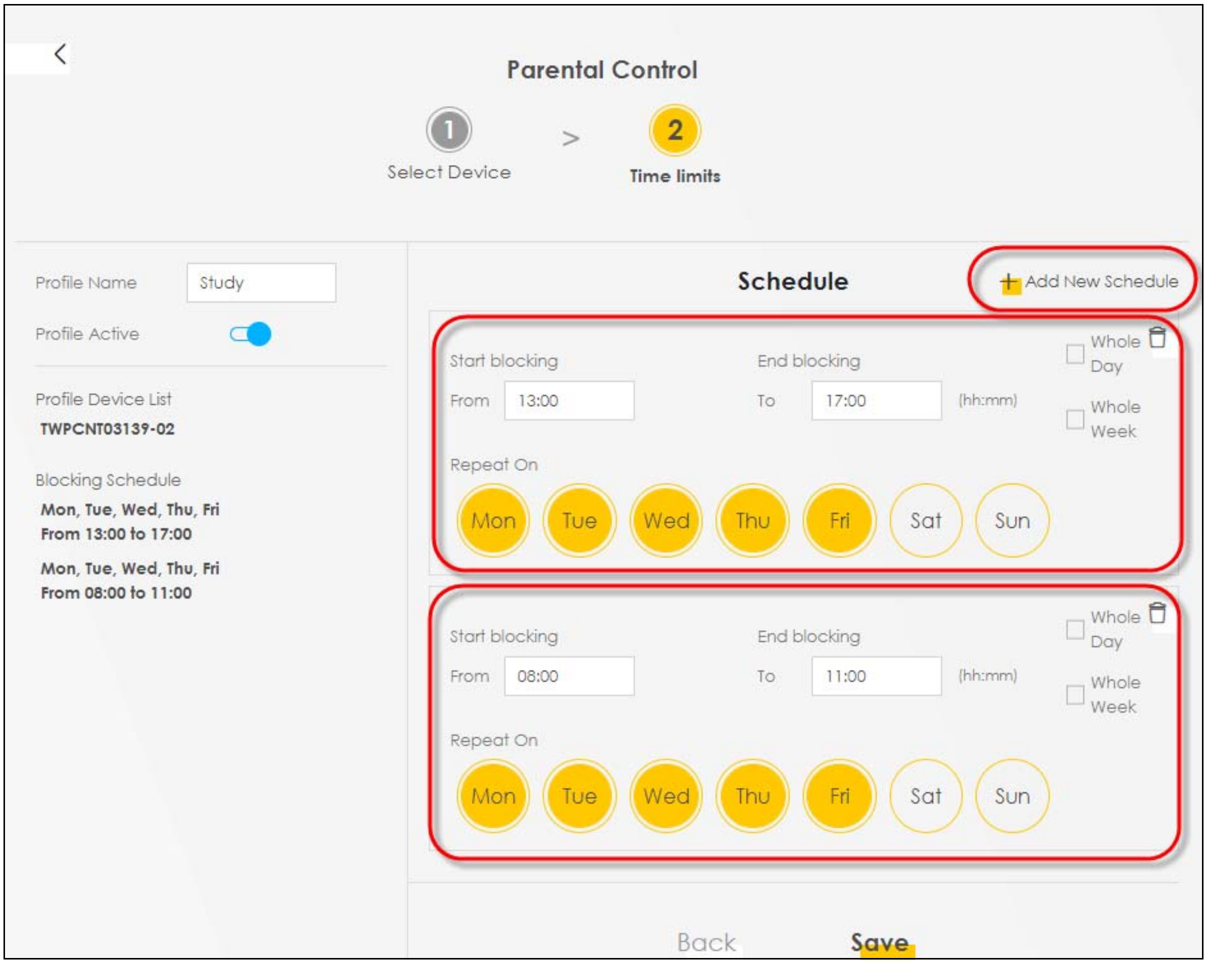
Profile Device List
TWPCNT03139-02

Blocking Schedule

TWPCNT03139-02
IP:192.168.123.114
Mac:04:42:1a:de:b6:18

3 Use this screen to edit the Parental Control schedule.

- Click Add New Schedule to add a second schedule.
- Use the parameter given above to configure the time settings of your schedules.
- Click Save to save the settings.



Profile Name: Study

Profile Active

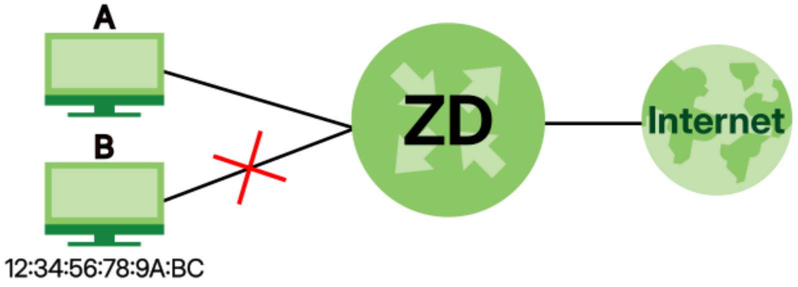
Profile Device List
TWPCNT03139-02

Blocking Schedule
Mon, Tue, Wed, Thu, Fri
From 13:00 to 17:00
Mon, Tue, Wed, Thu, Fri
From 08:00 to 11:00

Start blocking From 13:00 End blocking To 17:00 (hh:mm) □ Whole Day □ Whole Week
Repeat On: Mon, Tue, Wed, Thu, Fri

Start blocking From 08:00 End blocking To 11:00 (hh:mm) □ Whole Day □ Whole Week
Repeat On: Mon, Tue, Wed, Thu, Fri

Figure 58 Configure a MAC Address Filter Example

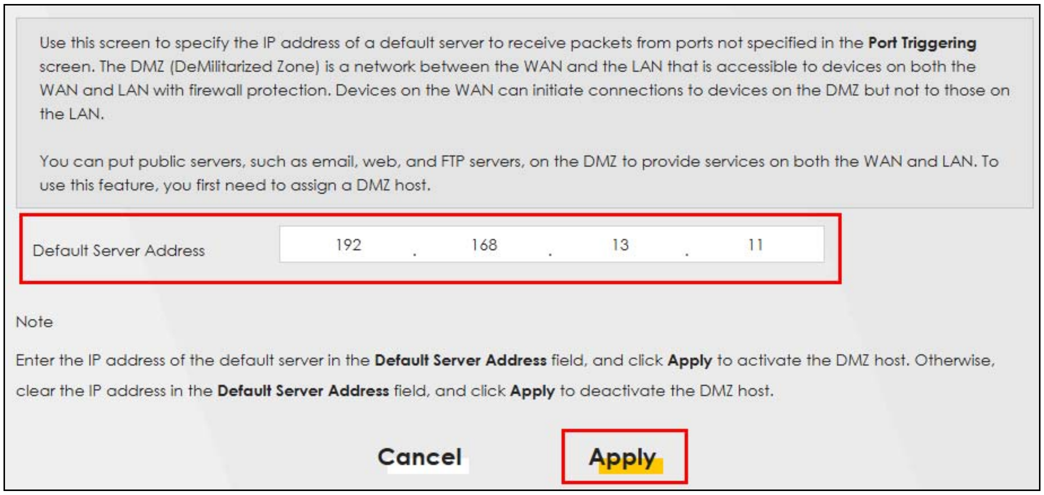


5.9 Secure Server Setup

Use DMZ (DeMilitarized Zone) when you want to make specific devices or servers accessible from the Internet while keeping your internal (LAN) network secure. The DMZ allows traffic from the WAN and LAN but blocks traffic from the DMZ to the LAN. This helps protect client devices within the LAN. To set up a gaming server using DMZ, follow the steps below:

1 Log into the Web Configurator. Go to Network Setting > NAT > DMZ.

2 In the Default Server Address field, enter the default public server IP address 192.168.13.11 that you set up. Click Apply.



Use this screen to specify the IP address of a default server to receive packets from ports not specified in the **Port Triggering** screen. The DMZ (DeMilitarized Zone) is a network between the WAN and the LAN that is accessible to devices on both the WAN and LAN with firewall protection. Devices on the WAN can initiate connections to devices on the DMZ but not to those on the LAN.

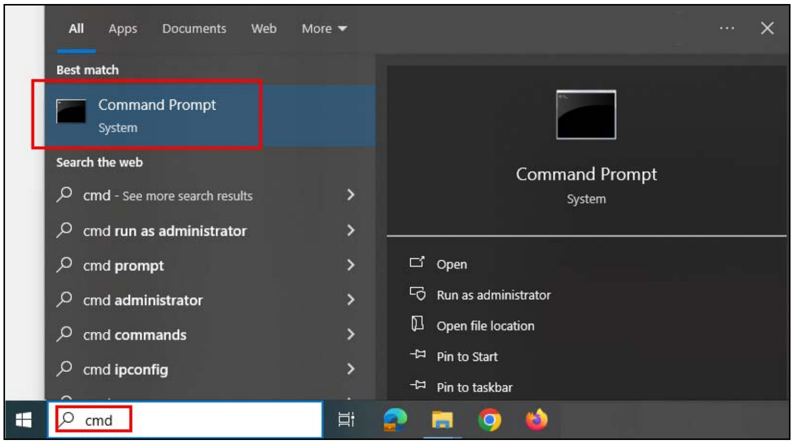
You can put public servers, such as email, web, and FTP servers, on the DMZ to provide services on both the WAN and LAN. To use this feature, you first need to assign a DMZ host.

Default Server Address 192 . 168 . 13 . 11

Note

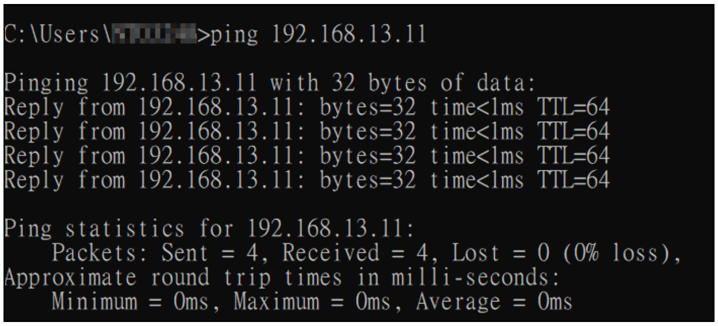
Enter the IP address of the default server in the **Default Server Address** field, and click **Apply** to activate the DMZ host. Otherwise, clear the IP address in the **Default Server Address** field, and click **Apply** to deactivate the DMZ host.

3 To test if the server setup is successful, check the connection between the DMZ server and the LAN. Enter cmd in your client computer's search bar, and click Command Prompt to open it.



4 The following screen appears. Enter ping 192.168.13.11 to check if the client in the LAN can access the server set up in the DMZ. The example below uses the following settings:

- Client: 192.168.11.33 (LAN)
- Server: 192.168.13.11 (DMZ Server)



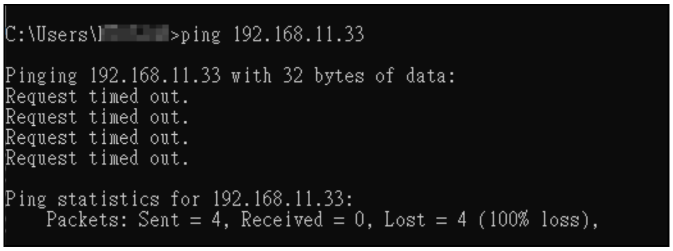
```
C:\Users\[redacted]>ping 192.168.13.11

Pinging 192.168.13.11 with 32 bytes of data:
Reply from 192.168.13.11: bytes=32 time<1ms TTL=64
Reply from 192.168.13.11: bytes=32 time<1ms TTL=64
Reply from 192.168.13.11: bytes=32 time<1ms TTL=64
Reply from 192.168.13.11: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.13.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

The screen shows that ping 192.168.13.11 was successful, indicating that the connection from the LAN to the DMZ server is allowed.

5 On your DMZ server, open Command Prompt. Enter ping 192.168.11.33 to check if the DMZ server can access the client computer in the LAN. Request timed out in the screen below indicates that the DMZ server cannot ping clients within the LAN.



```
C:\Users\[redacted]>ping 192.168.11.33

Pinging 192.168.11.33 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.11.33:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

These two tests ensure that the DMZ server setup is complete.

5.10 IP Passthrough Mode Setup

Use IP Passthrough mode when you want the Zyxel Device to pass the public IP address from your ISP directly to another device behind the Zyxel Device. If the device behind the Zyxel Device will handle NAT and routing functions, then you want to avoid double NAT (on both the Zyxel Device and the firewall), which can cause issues with VPNs, VoIP, and online gaming. The device behind the Zyxel Device may need a public IP address directly for:

- IPSec (IP Security Protocol) VPNs: to establish a secure tunnel between your private network and a remote public IP address.
- Remote access: to make the device directly accessible from the Internet.
- Hosting services (e.g., web or mail servers): to ensure the servers are reachable from the Internet on a fixed public IP address.

Below are the tutorials for you to:

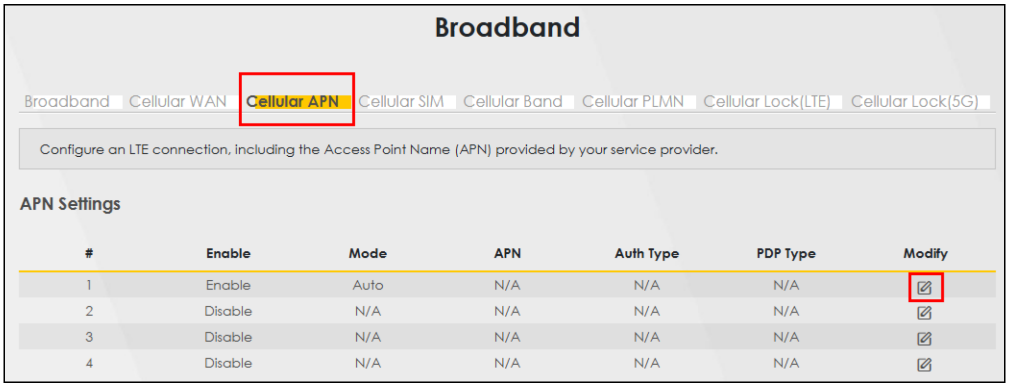
- Outdoor Zyxel Device: IP Passthrough Mode
- Indoor Zyxel Device: IP Passthrough Mode

5.10.1 Outdoor Zyxel Device: IP Passthrough Mode

To set an outdoor Zyxel Device to IP Passthrough mode, follow the steps below:

1 Log into the Web Configurator.

2 Go to Network Setting > Broadband > Cellular APN. In APN Settings, select the client device that you want to receive the public IP address assigned by the ISP. Click the Modify icon ✎.

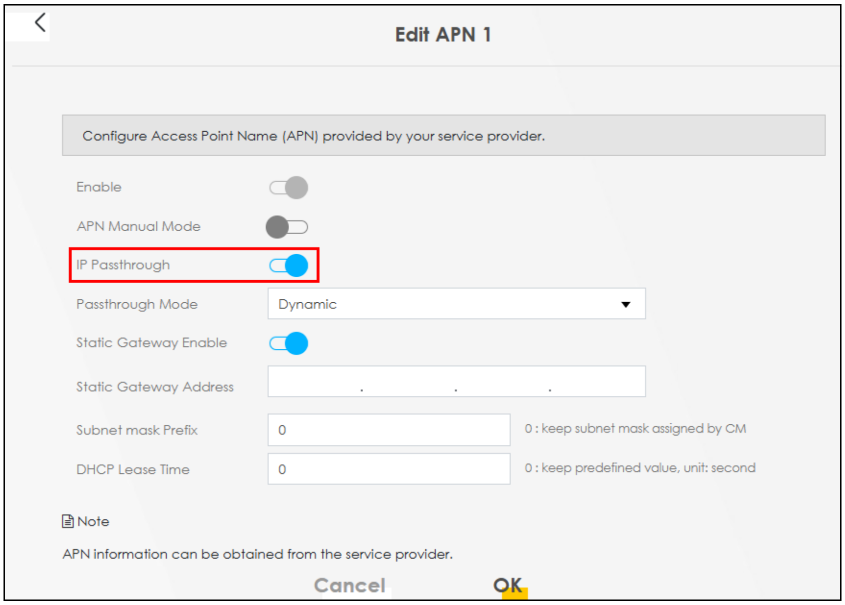


Configure an LTE connection, including the Access Point Name (APN) provided by your service provider.

APN Settings

#	Enable	Mode	APN	Auth Type	PDP Type	Modify
1	Enable	Auto	N/A	N/A	N/A	✎
2	Disable	N/A	N/A	N/A	N/A	✎
3	Disable	N/A	N/A	N/A	N/A	✎
4	Disable	N/A	N/A	N/A	N/A	✎

3 The Edit APN screen appears. Click the IP Passthrough switch to the right to enable IP Passthrough mode on the Zyxel Device for the selected client device.



Edit APN 1

Configure Access Point Name (APN) provided by your service provider.

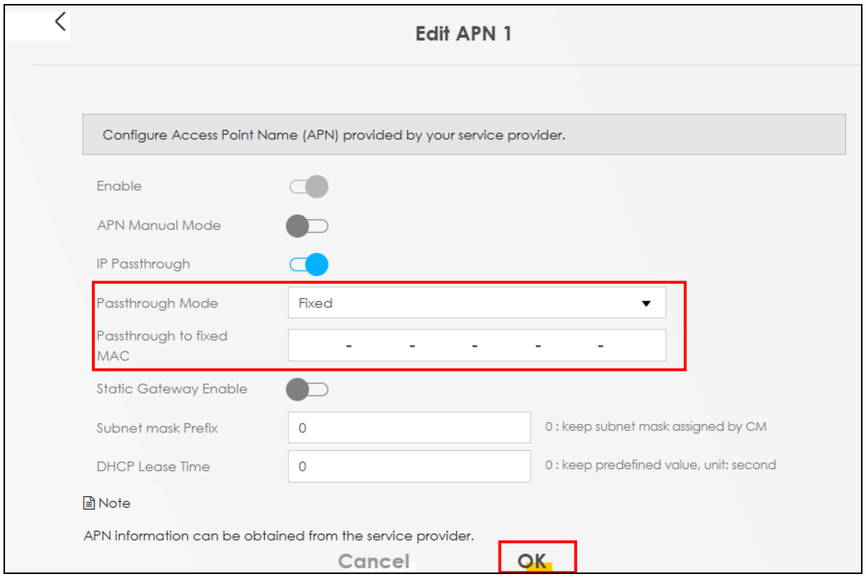
Enable		
APN Manual Mode		
IP Passthrough		
Passthrough Mode	Dynamic	
Static Gateway Enable		
Static Gateway Address	. . .	
Subnet mask Prefix	0	0 : keep subnet mask assigned by CM
DHCP Lease Time	0	0 : keep predefined value, unit: second

Note

APN information can be obtained from the service provider.

4 In the Passthrough Mode drop-down list, you have two options:

- Dynamic: This option forwards traffic to any LAN computer on the Zyxel Device’s local network.
- Fixed: This option forwards traffic to a specific computer by entering its MAC address. When you select Fixed, the Passthrough to fixed MAC field appears. This allows you to enter the MAC address of the specific computer.



Edit APN 1

Configure Access Point Name (APN) provided by your service provider.

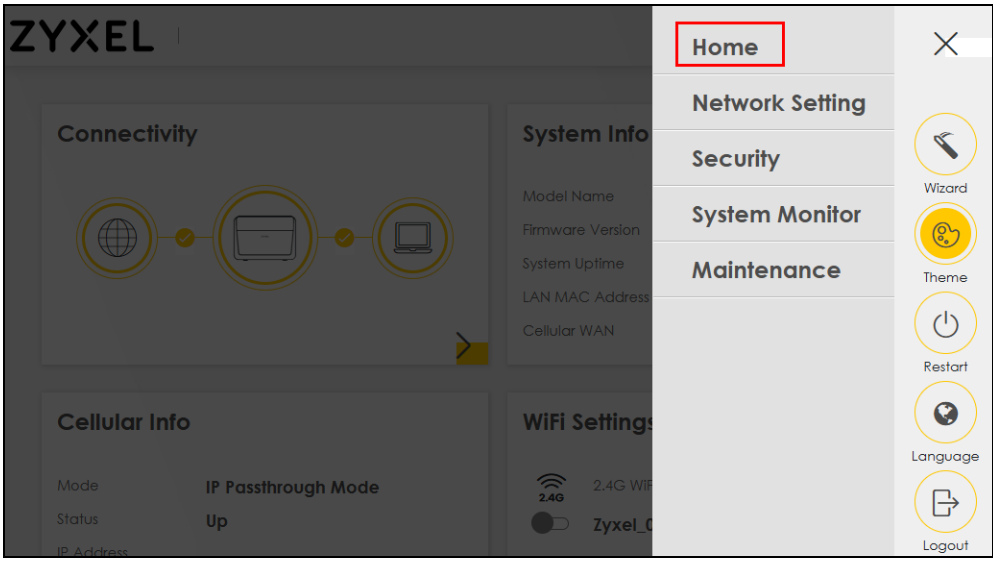
Enable		
APN Manual Mode		
IP Passthrough		
Passthrough Mode	Fixed	
Passthrough to fixed MAC	- - - - -	
Static Gateway Enable		
Subnet mask Prefix	0	0 : keep subnet mask assigned by CM
DHCP Lease Time	0	0 : keep predefined value, unit: second

Note

APN information can be obtained from the service provider.

5 Click OK to save the settings.

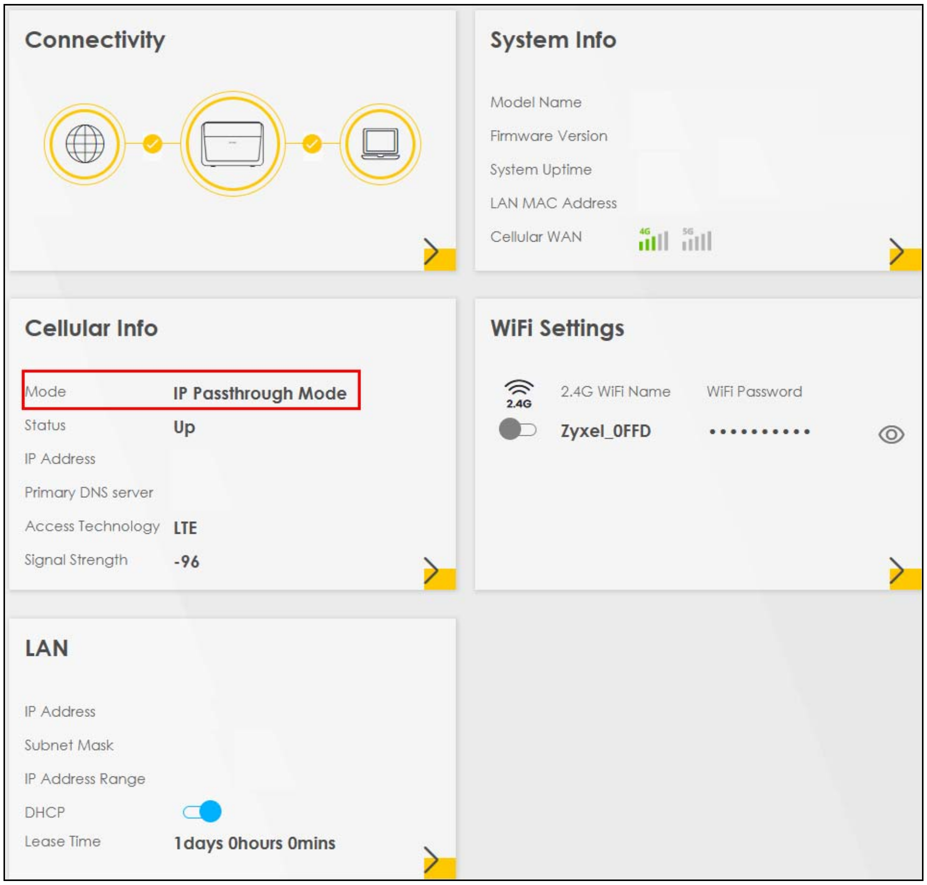
6 When finished, Click the menu icon (☰) in the upper right corner, and then click Home.



Mode IP Passthrough Mode

Status Up

7 In the Cellular Info section, your Mode is set to IP Passthrough Mode.



Model Name

Firmware Version

System Uptime

LAN MAC Address

Cellular WAN

Mode IP Passthrough Mode

Status Up

IP Address

Primary DNS server

Access Technology LTE

Signal Strength -96

2.4G WiFi Name Zyxel_0FFD

WiFi Password ••••••••••

IP Address

Subnet Mask

IP Address Range

DHCP

Lease Time 1days 0hours 0mins

5.10.2 Indoor Zyxel Device: IP Passthrough Mode

To set an indoor Zyxel Device to IP Passthrough mode, follow the steps below:

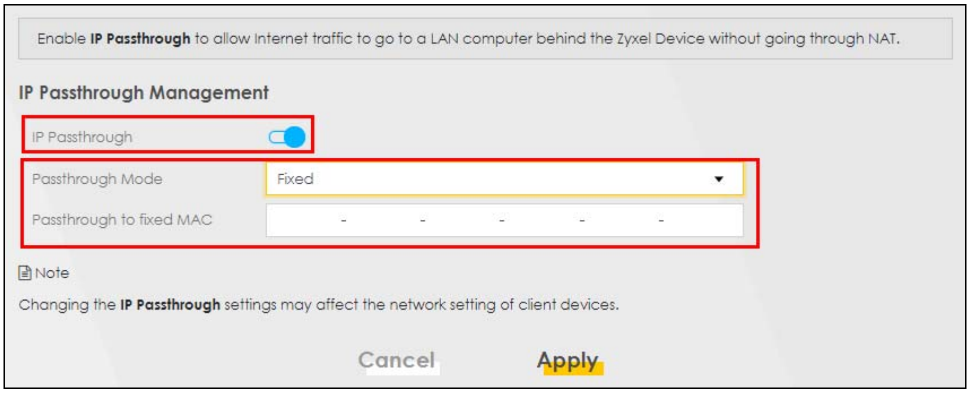
1 Log into the Web Configurator.

2 Go to Network Setting > Broadband > Cellular IP Passthrough.

3 In IP Passthrough Management, click the IP Passthrough switch to the right to enable IP Passthrough on the Zyxel Device.

4 In Passthrough Mode, you have two options: Dynamic and Fixed.

- Dynamic: This option forwards traffic to the any LAN computer on the Zyxel Device's local network.
- Fixed: This option forwards traffic to a specific computer by entering its MAC address. When you select Fixed, the Passthrough to fixed MAC field appears. This allows you to enter the MAC address of the specific computer.



Enable **IP Passthrough** to allow Internet traffic to go to a LAN computer behind the Zyxel Device without going through NAT.

IP Passthrough Management

IP Passthrough: On

Passthrough Mode: Fixed

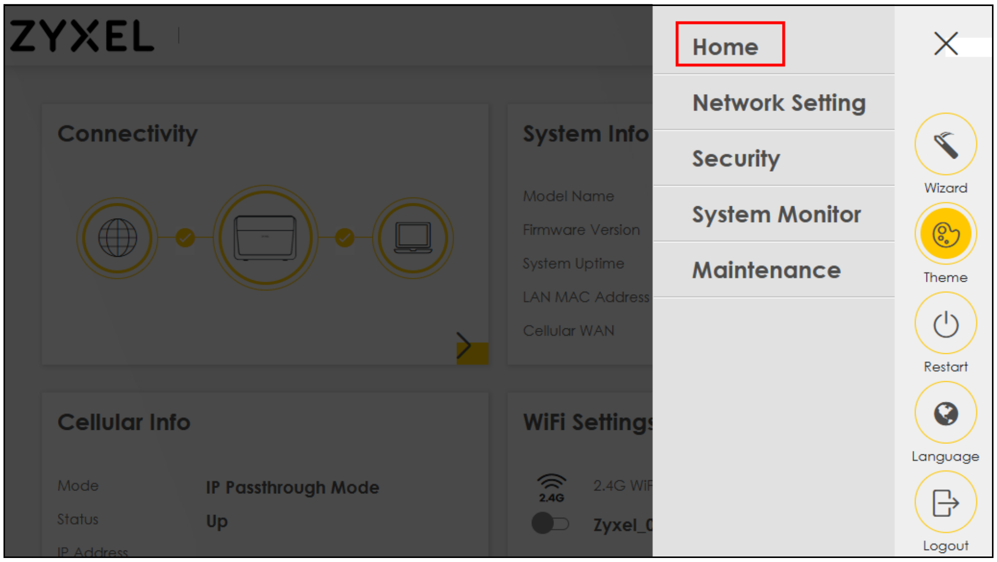
Passthrough to fixed MAC: - - - - -

Note

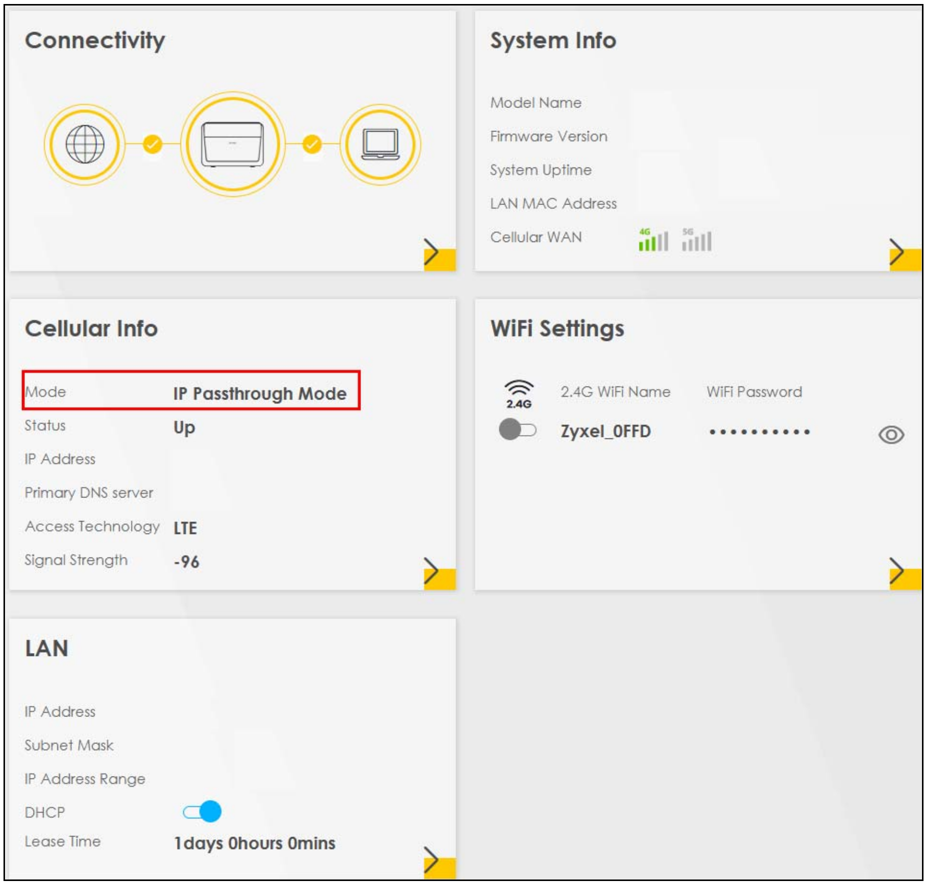
Changing the **IP Passthrough** settings may affect the network setting of client devices.

5 Click Apply to save the settings.

6 When finished, Click the menu icon (☰) in the upper right corner, and then click Home.



7 In the Cellular Info section, your Mode is set to IP Passthrough Mode.



Connectivity

System Info

Model Name

Firmware Version

System Uptime

LAN MAC Address

Cellular WAN

Cellular Info

Mode	IP Passthrough Mode
Status	Up
IP Address	
Primary DNS server	
Access Technology	LTE
Signal Strength	-96

WiFi Settings

	2.4G WiFi Name	WiFi Password
2.4G	Zyxel_0FFD	••••••••••

LAN

IP Address	
Subnet Mask	
IP Address Range	
DHCP	
Lease Time	1days 0hours 0mins

5.11 Device Maintenance

This section shows you how to:

- Upgrade the Firmware
- Back up the Device Configuration
- How to Reset the Zyxel Device to the Factory Defaults

You can upgrade the Zyxel Device firmware, back up the configuration and restore the Zyxel Device to its previous or default settings.

5.11.1 Upgrade the Firmware

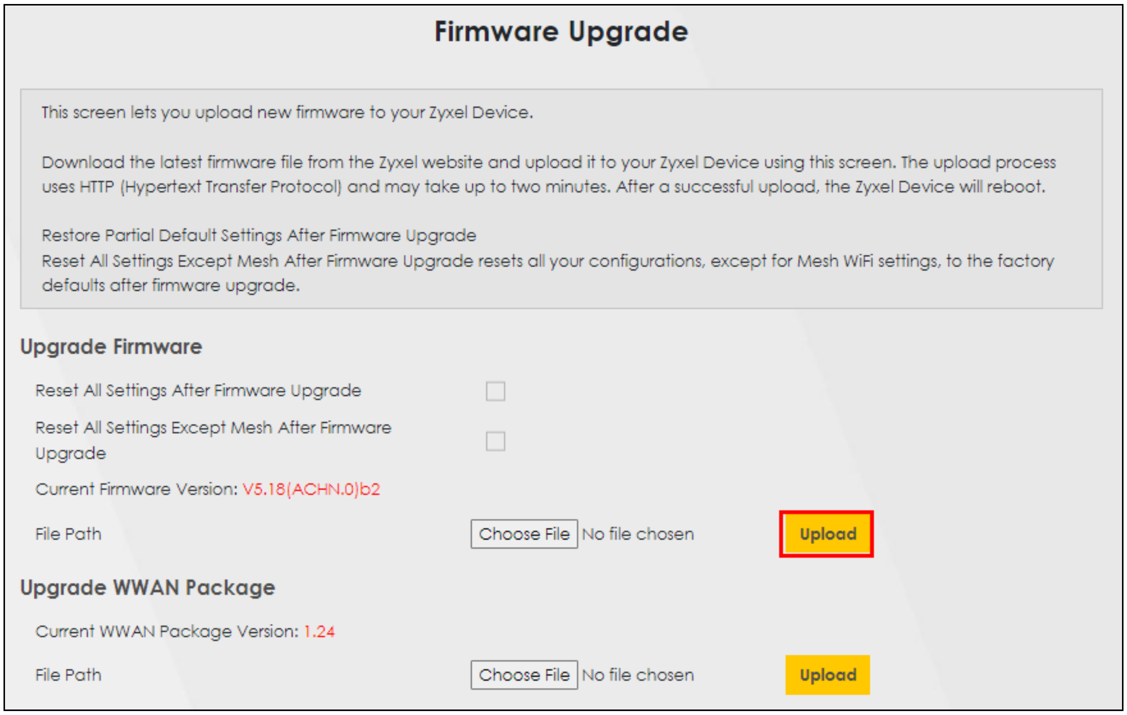
Upload the latest firmware to the Zyxel Device for feature enhancements.

1 To download the latest firmware of your Zyxel Device, go to *https://www.zyxel.com/service-provider* and search for your model. The latest firmware will be available under the Downloads & resources tab. The model code for the Zyxel Device in this example is v5.13(ABLZ.1). Note the model code for your Zyxel Device.

2 Unzip the file.

3 Go to the Maintenance > Firmware Upgrade screen.

4 Click Browse/Choose File and select the file with a ".bin" extension to upload. Click Upload.



Firmware Upgrade

This screen lets you upload new firmware to your Zyxel Device.

Download the latest firmware file from the Zyxel website and upload it to your Zyxel Device using this screen. The upload process uses HTTP (Hypertext Transfer Protocol) and may take up to two minutes. After a successful upload, the Zyxel Device will reboot.

Restore Partial Default Settings After Firmware Upgrade
Reset All Settings Except Mesh After Firmware Upgrade resets all your configurations, except for Mesh WiFi settings, to the factory defaults after firmware upgrade.

Upgrade Firmware

Reset All Settings After Firmware Upgrade □

Reset All Settings Except Mesh After Firmware Upgrade □

Current Firmware Version: V5.18(ACHN.0)b2

File Path Choose File No file chosen Upload

Upgrade WWAN Package

Current WWAN Package Version: 1.24

File Path Choose File No file chosen Upload

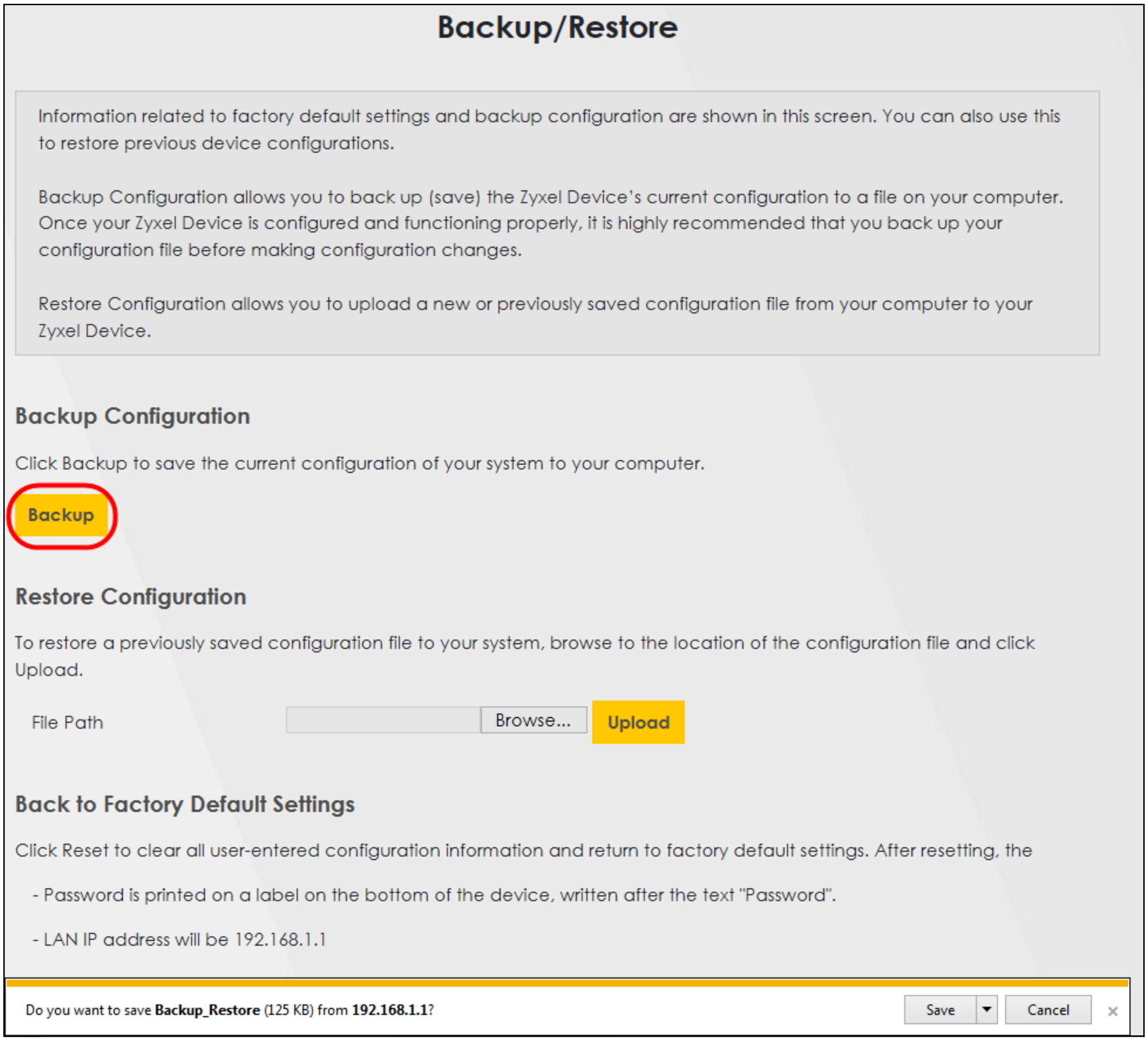
5 This process may take up to 2 minutes to finish. After 2 minutes, log in again and check your new firmware version in the Connection Status screen.

5.11.2 Back up the Device Configuration

Back up a configuration file allows you to return to your previous settings.

1 Go to the Maintenance > Backup/Restore screen.

2 Under Backup Configuration, click Backup. A configuration file is saved to your computer. In this case, the Backup/Restore file is saved.



Backup/Restore

Information related to factory default settings and backup configuration are shown in this screen. You can also use this to restore previous device configurations.

Backup Configuration allows you to back up (save) the Zyxel Device's current configuration to a file on your computer. Once your Zyxel Device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes.

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

Backup Configuration

Click Backup to save the current configuration of your system to your computer.

Restore Configuration

To restore a previously saved configuration file to your system, browse to the location of the configuration file and click Upload.

Back to Factory Default Settings

Click Reset to clear all user-entered configuration information and return to factory default settings. After resetting, the

- Password is printed on a label on the bottom of the device, written after the text "Password".

- LAN IP address will be 192.168.1.1

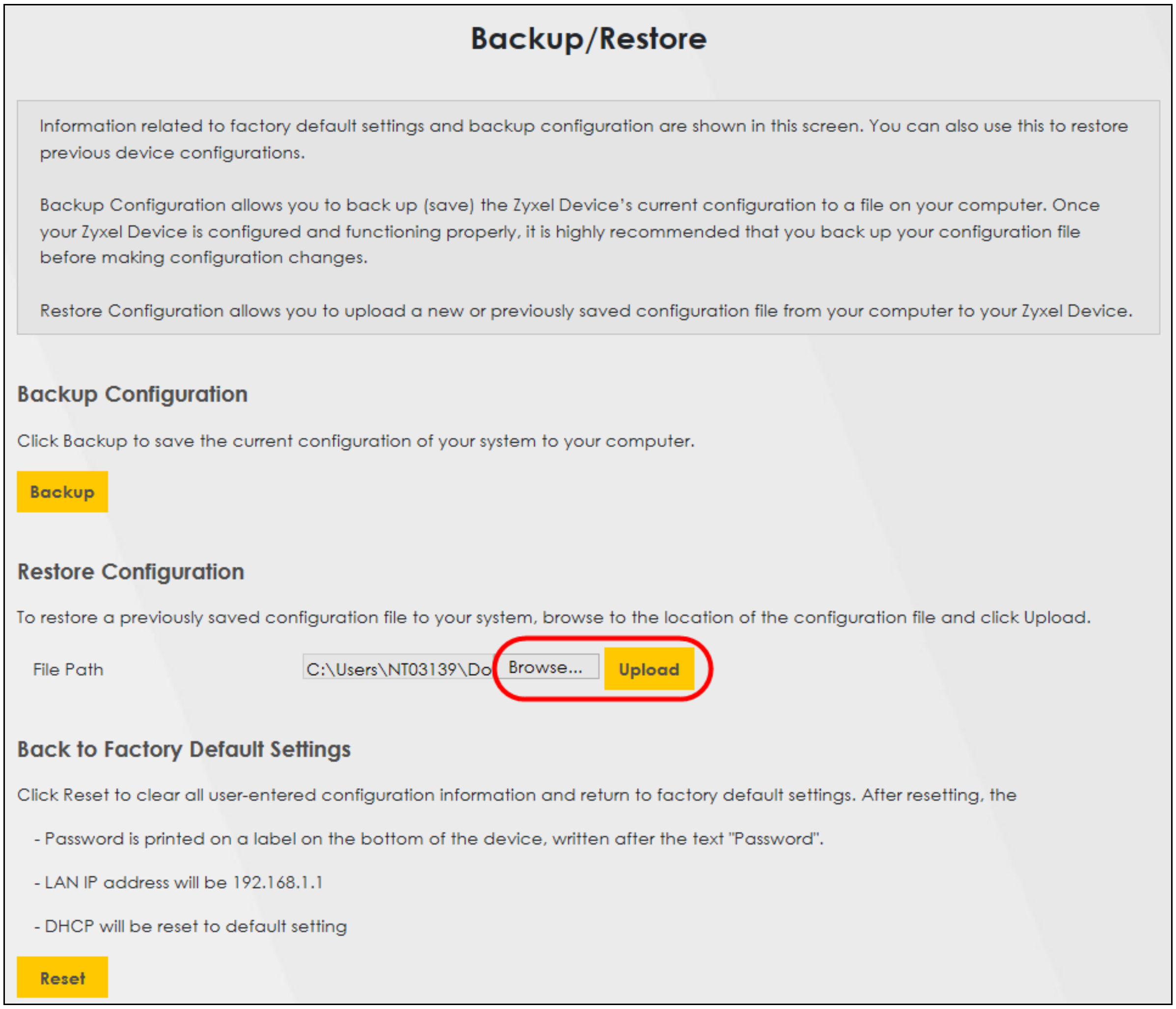
Do you want to save **Backup_Restore** (125 KB) from **192.168.1.1**?

5.11.3 Restore the Device Configuration

This section shows you how to restore a previously-saved configuration file from your computer to your Zyxel Device.

1 Go to the Maintenance > Backup/Restore screen.

2 Under Restore Configuration, click Browse/Choose File, and then select the configuration file that you want to upload. Click Upload.



Backup/Restore

Information related to factory default settings and backup configuration are shown in this screen. You can also use this to restore previous device configurations.

Backup Configuration allows you to back up (save) the Zyxel Device's current configuration to a file on your computer. Once your Zyxel Device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes.

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

Backup Configuration

Click Backup to save the current configuration of your system to your computer.

Restore Configuration

To restore a previously saved configuration file to your system, browse to the location of the configuration file and click Upload.

File Path C:\Users\NT03139\Do

Back to Factory Default Settings

Click Reset to clear all user-entered configuration information and return to factory default settings. After resetting, the

- Password is printed on a label on the bottom of the device, written after the text "Password".

- LAN IP address will be 192.168.1.1

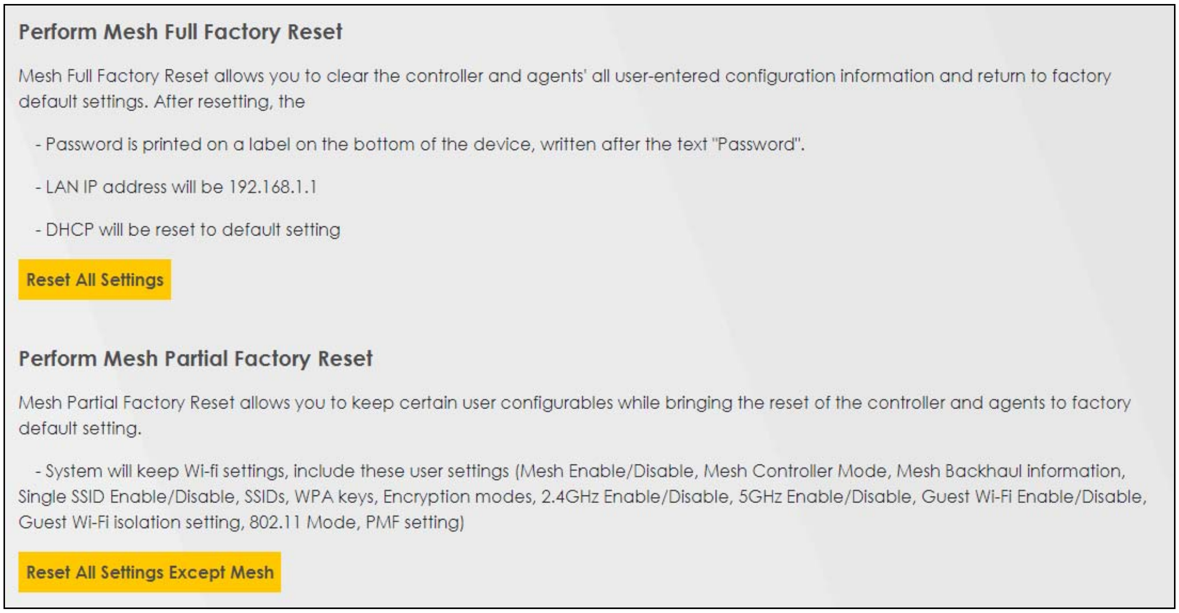
- DHCP will be reset to default setting

3 The Zyxel Device automatically restarts after the configuration file is successfully uploaded. Wait for one minute before logging into the Zyxel Device again. Go to the Connection Status page to check the firmware version after the reboot.

5.11.4 How to Reset the Zyxel Device to the Factory Defaults

To reset the Zyxel Device, you can press the RESET button on the rear panel for more than 5 seconds. Alternatively, you can use the web configurator to reset the Zyxel Device.

Go to Maintenance > Backup/Restore and click the Reset All Settings / Reset button. The Zyxel Device will reset to factory defaults and the LAN IP address will be set to the default IP address.



Perform Mesh Full Factory Reset

Mesh Full Factory Reset allows you to clear the controller and agents' all user-entered configuration information and return to factory default settings. After resetting, the

- Password is printed on a label on the bottom of the device, written after the text "Password".

- LAN IP address will be 192.168.1.1

- DHCP will be reset to default setting

Perform Mesh Partial Factory Reset

Mesh Partial Factory Reset allows you to keep certain user configurables while bringing the reset of the controller and agents to factory default setting.

- System will keep Wi-fi settings, include these user settings (Mesh Enable/Disable, Mesh Controller Mode, Mesh Backhaul information, Single SSID Enable/Disable, SSIDs, WPA keys, Encryption modes, 2.4GHz Enable/Disable, 5GHz Enable/Disable, Guest Wi-Fi Enable/Disable, Guest Wi-Fi isolation setting, 802.11 Mode, PMF setting)

If you want to reset the Zyxel Device while keeping the Mesh Wi-Fi Settings, click the Reset All Settings Except Mesh button. See Backup/Restore for more details.

5.12 Remote Access from WAN

This section shows you how to:

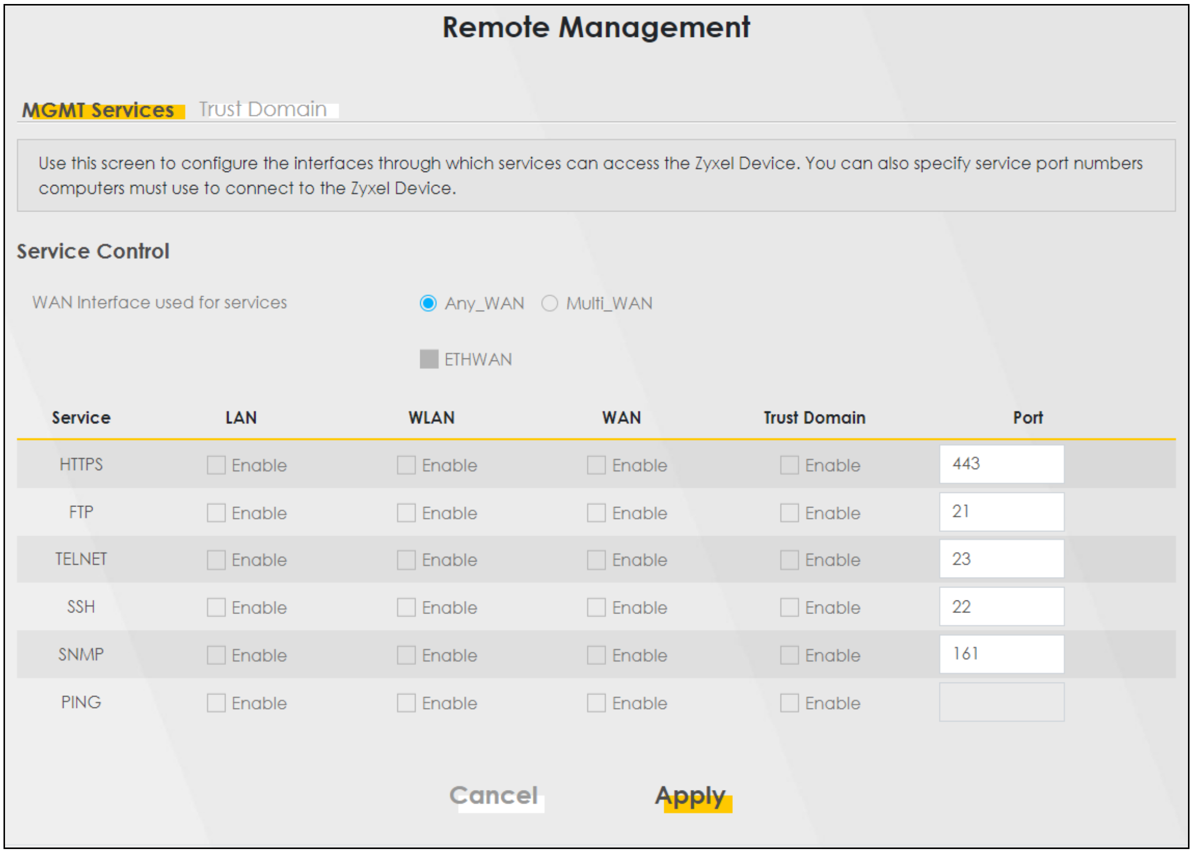
- Configure Access to Your Zyxel Device
- Configure the Trust Domain

You can configure WAN access for a specific trusted computer through HTTPS, SSH to the Zyxel Device. Remote management determines which interface and web services are allowed to access the Zyxel Device. Customer support may also request remote access to your Zyxel Device for debugging purposes.

5.12.1 Configure Access to Your Zyxel Device

Perform the following to configure access to your Zyxel Device:

1 Go to the Maintenance > Remote Management > MGMT Services screen. Select the WAN interface and services allowed to access the Zyxel Device remotely.



Use this screen to configure the interfaces through which services can access the Zyxel Device. You can also specify service port numbers computers must use to connect to the Zyxel Device.

Service Control

WAN Interface used for services ● Any_WAN ○ Multi_WAN

■ ETHWAN

Service	LAN	WLAN	WAN	Trust Domain	Port
HTTPS	□ Enable	□ Enable	□ Enable	□ Enable	443
FTP	□ Enable	□ Enable	□ Enable	□ Enable	21
TELNET	□ Enable	□ Enable	□ Enable	□ Enable	23
SSH	□ Enable	□ Enable	□ Enable	□ Enable	22
SNMP	□ Enable	□ Enable	□ Enable	□ Enable	161
PING	□ Enable	□ Enable	□ Enable	□ Enable	

These are the different ways to access the Zyxel Device remotely.

ACCESS TYPE	LABEL	DESCRIPTION
LAN / WLAN (Wi-Fi)	LAN / WLAN	This allows access of the selected Service from the local LAN.
WAN	WAN	This allows access of the selected Service from the WAN connections.
Trust Domain	Trust Domain	This allows access of the selected Service only from the trusted IPv4 / IPv6 addresses configured under Trust Domain.

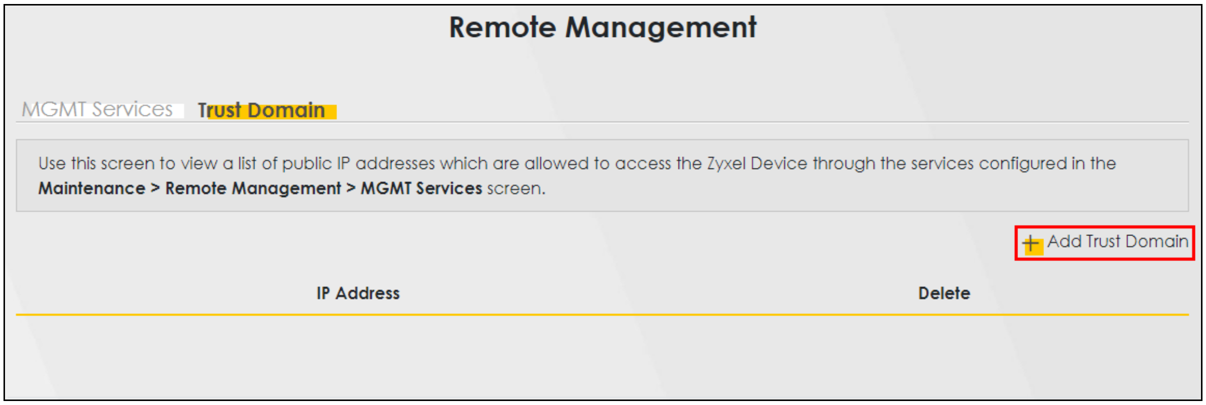
2 Select how you want to access the Zyxel Device remotely.

3 You may change the server Port number for a service if needed, however you must use the same port number in order to use that service for remote management.

5.12.2 Configure the Trust Domain

Perform the following to configure the Trust Domain on your Zyxel Device:

1 Go to the Maintenance > Remote Management > Trust Domain screen. Click + Add Trust Domain to go to the Add Trust Domain screen to add a trusted host IPv4 / IPv6 address.

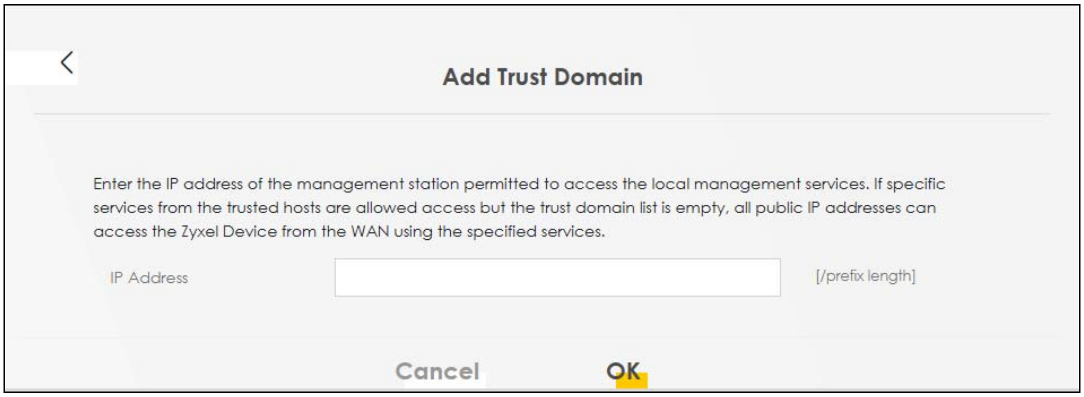


Remote Management

Use this screen to view a list of public IP addresses which are allowed to access the Zyxel Device through the services configured in the **Maintenance > Remote Management > MGMT Services** screen.

IP Address	Delete

2 Enter a public IPv4 / IPv6 IP address which is allowed to access the service on the Zyxel Device from the WAN. Then click OK.



Add Trust Domain

Enter the IP address of the management station permitted to access the local management services. If specific services from the trusted hosts are allowed access but the trust domain list is empty, all public IP addresses can access the Zyxel Device from the WAN using the specified services.

IP Address [/prefix length]

PART II
Technical Reference

CHAPTER 6
Connection Status

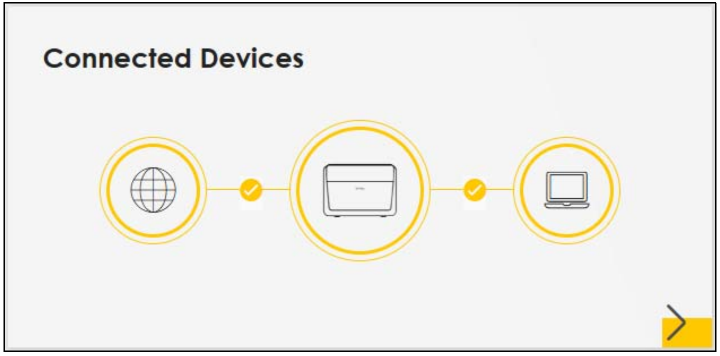
6.1 Connection Status Overview

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

6.1.1 Connected Devices

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

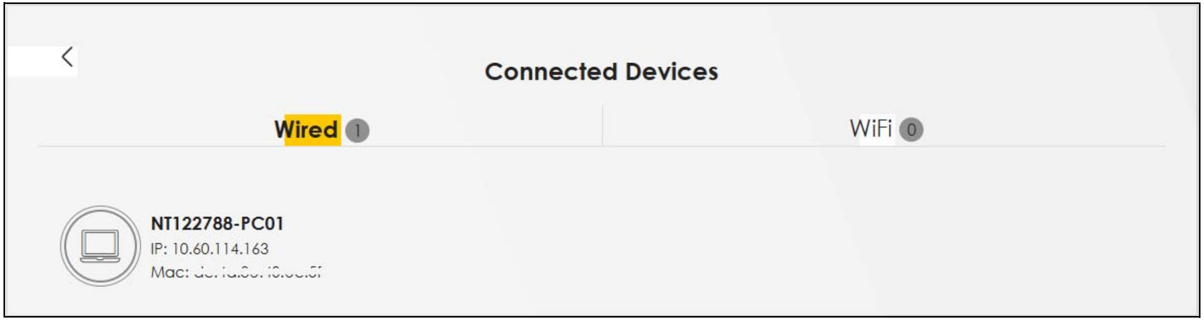
Figure 59 Connected Devices



Connected Devices

Click the Arrow icon (>) to view IP addresses and MAC addresses of the wireless and wired devices connected to the Zyxel Device.

Figure 60 Connectivity: Connected Devices



Connected Devices

Wired 1 | WiFi 0

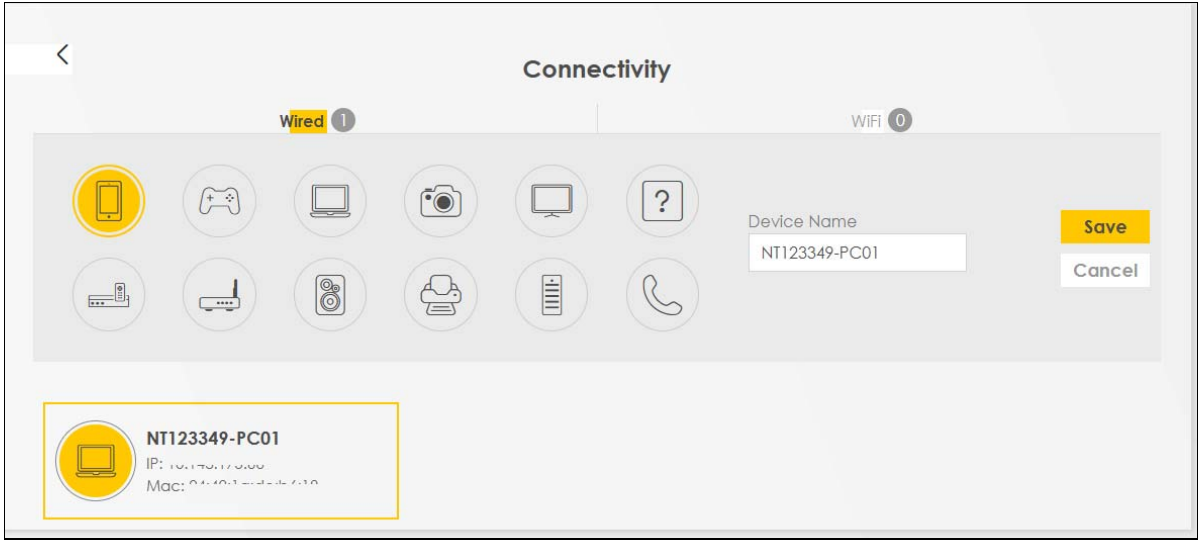
NT122788-PC01
IP: 10.60.114.163
Mac: [illegible]

You can change the icon and name of a connected device. Place your mouse within the device block, and an Edit icon (✎) will appear. Click the Edit icon, and you will see there are several icon choices for you to select. Enter a name in the Device Name field for a connected device. Click to enable (●) Internet Blocking for a connected Wi-Fi client.

6.1.2 Icon and Device Name

Select an icon and/or enter a name in the Device Name field for a connected device. Click to enable (●) Internet Blocking (or Active) for a connected Wi-Fi client. Click Save to save your changes.

Figure 61 Connectivity: Edit



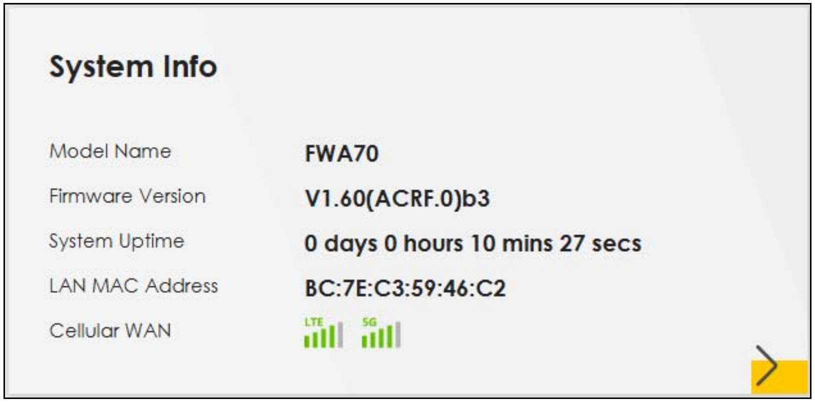
Device Name: NT123349-PC01

NT123349-PC01
IP:
Mac:

6.1.3 System Info

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

Figure 62 System Info

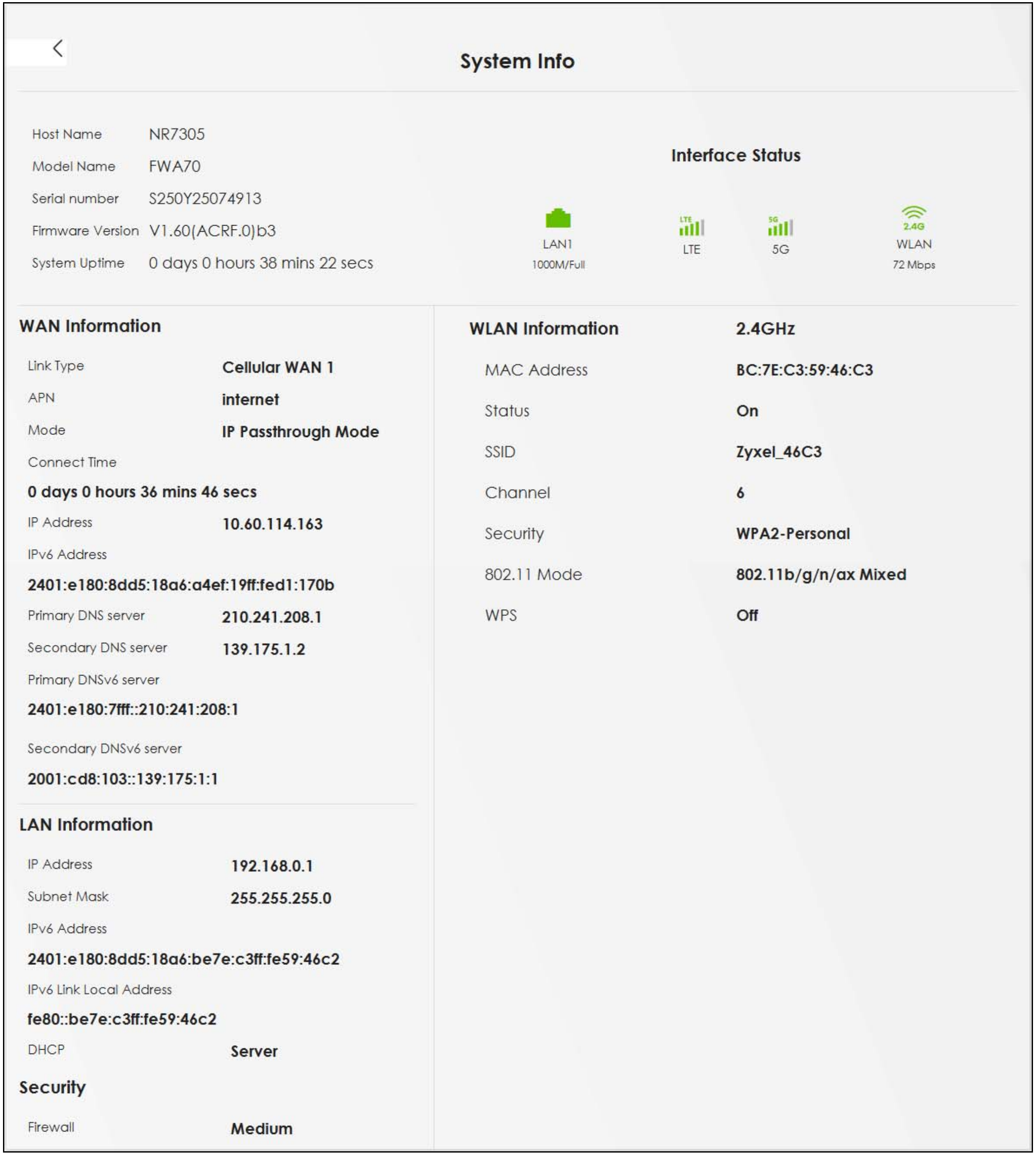


System Info

Model Name	FWA70
Firmware Version	V1.60(ACRF.0)b3
System Uptime	0 days 0 hours 10 mins 27 secs
LAN MAC Address	BC:7E:C3:59:46:C2
Cellular WAN	

Click the Arrow icon (>) to view more information on the status of your firewall and interfaces (WAN, LAN, and WLAN).

Figure 63 System Info: Detailed Information



System Info

Host Name	NR7305
Model Name	FWA70
Serial number	S250Y25074913
Firmware Version	V1.60(ACRF.0)b3
System Uptime	0 days 0 hours 38 mins 22 secs

Interface Status

WAN Information

Link Type	Cellular WAN 1
APN	internet
Mode	IP Passthrough Mode
Connect Time	0 days 0 hours 36 mins 46 secs
IP Address	10.60.114.163
IPv6 Address	2401:e180:8dd5:18a6:a4ef:19ff:fed1:170b
Primary DNS server	210.241.208.1
Secondary DNS server	139.175.1.2
Primary DNSv6 server	2401:e180:7fff::210:241:208:1
Secondary DNSv6 server	2001:cd8:103::139:175:1:1

LAN Information

IP Address	192.168.0.1
Subnet Mask	255.255.255.0
IPv6 Address	2401:e180:8dd5:18a6:be7e:c3ff:fe59:46c2
IPv6 Link Local Address	fe80::be7e:c3ff:fe59:46c2
DHCP	Server

Security

Firewall	Medium

WLAN Information	2.4GHz
MAC Address	BC:7E:C3:59:46:C3
Status	On
SSID	Zyxel_46C3
Channel	6
Security	WPA2-Personal
802.11 Mode	802.11b/g/n/ax Mixed
WPS	Off

Figure 64

Each field is described in the following table.

Table 29 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.

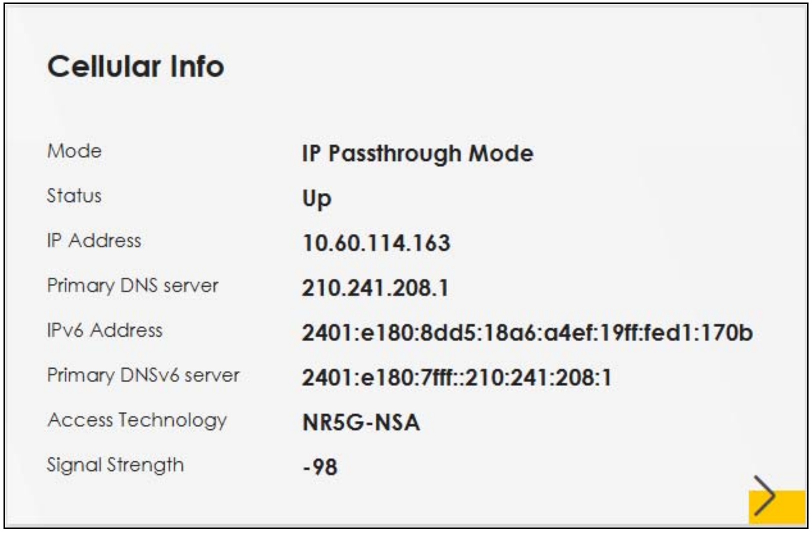
Table 29 System Info: Detailed Information (continued)

LABEL	DESCRIPTION
System Uptime	This field displays how long the Zyxel Device has been running since it last started up. The Zyxel Device starts up when you plug it in, when you restart it (Maintenance > Reboot), or when you reset it.
Interface Status Virtual ports are shown here. You can see the ports in use and their transmission rate.	
WAN Information (These fields display when you have a WAN connection.)	
Link Type	This field displays the type of WAN connection that the Zyxel Device is currently using, such as Cellular WAN or Ethernet.
APN	This field displays the Access Point Name (APN).
Mode	This field displays the current mode of your Zyxel Device.
Connect Time	This field displays the current WAN connection time.
IP Address	This field displays the current IPv4 address of the Zyxel Device in the WAN.
IP Subnet Mask	This field displays the current IPv4 subnet mask of the Zyxel Device in the WAN.
IPv6 Address	This field displays the current IPv6 address of the Zyxel Device in the WAN.

6.1.4 Cellular Info

Use this screen to view cellular connection information, details on signal strength that you can use as a reference for positioning the Zyxel Device. SIM card and module information is also shown in the screen.

Figure 65 Cellular Info

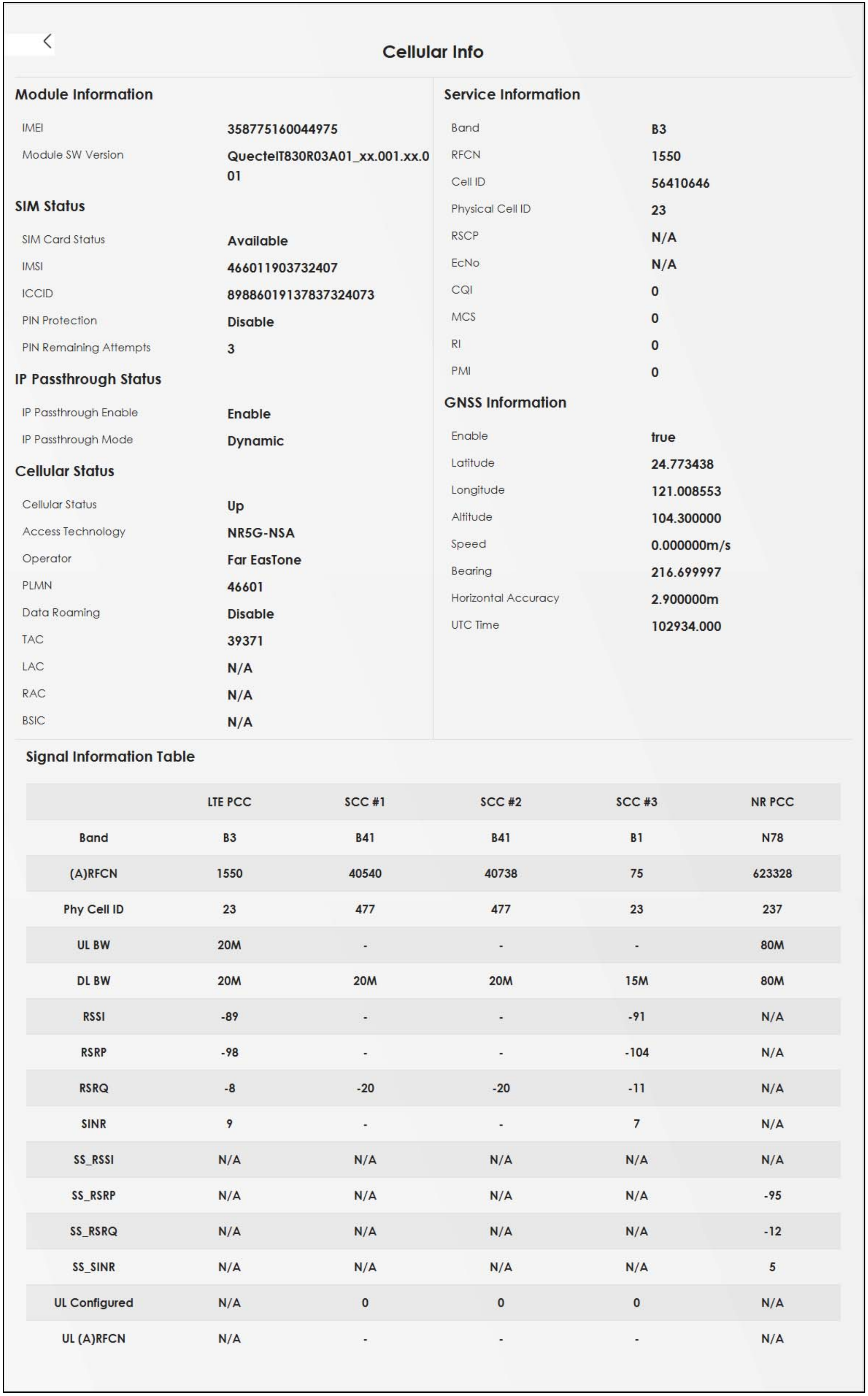


Cellular Info

Mode	IP Passthrough Mode
Status	Up
IP Address	10.60.114.163
Primary DNS server	210.241.208.1
IPv6 Address	2401:e180:8dd5:18a6:a4ef:19ff:fed1:170b
Primary DNSv6 server	2401:e180:7fff::210:241:208:1
Access Technology	NR5G-NSA
Signal Strength	-98

Click the Arrow icon (>) to view the more information on the cellular connection.

Figure 66   Cellular Info: Detailed Information



Cellular Info

Module Information

IMEI	358775160044975
Module SW Version	QuectelT830R03A01_xx.001.xx.001

SIM Status

SIM Card Status	Available
IMSI	466011903732407
ICCID	89886019137837324073
PIN Protection	Disable
PIN Remaining Attempts	3

IP Passthrough Status

IP Passthrough Enable	Enable
IP Passthrough Mode	Dynamic

Cellular Status

Cellular Status	Up
Access Technology	NR5G-NSA
Operator	Far EasTone
PLMN	46601
Data Roaming	Disable
TAC	39371
LAC	N/A
RAC	N/A
BSIC	N/A

Service Information

Band	B3
RFCN	1550
Cell ID	56410646
Physical Cell ID	23
RSCP	N/A
EcNo	N/A
CQI	0
MCS	0
RI	0
PMI	0

GNSS Information

Enable	true
Latitude	24.773438
Longitude	121.008553
Altitude	104.300000
Speed	0.000000m/s
Bearing	216.699997
Horizontal Accuracy	2.900000m
UTC Time	102934.000

Signal Information Table

	LTE PCC	SCC #1	SCC #2	SCC #3	NR PCC
Band	B3	B41	B41	B1	N78
(A)RFCN	1550	40540	40738	75	623328
Phy Cell ID	23	477	477	23	237
UL BW	20M	-	-	-	80M
DL BW	20M	20M	20M	15M	80M
RSSI	-89	-	-	-91	N/A
RSRP	-98	-	-	-104	N/A
RSRQ	-8	-20	-20	-11	N/A
SINR	9	-	-	7	N/A
SS_RSSI	N/A	N/A	N/A	N/A	N/A
SS_RSRP	N/A	N/A	N/A	N/A	-95
SS_RSRQ	N/A	N/A	N/A	N/A	-12
SS_SINR	N/A	N/A	N/A	N/A	5
UL Configured	N/A	0	0	0	N/A
UL (A)RFCN	N/A	-	-	-	N/A

Note: The fields in the screen may slightly differ based on the Access Technology your Zyxel Device supports.

Note: The value is '0' (zero) or 'N/A' if the Access Technology the Zyxel Device is currently connected to does not have this value in that specific parameter field or there is no network connection.

The following table describes the labels in this screen.

Table 30 Cellular Info: Detailed Information

LABEL	DESCRIPTION
Module Information	
IMEI	This shows the International Mobile Equipment Identity of the Zyxel Device.
Module SW Version	This shows the software version of the cellular network module.
SIM Status	
SIM Card Status	This displays the SIM card status: None – the Zyxel Device does not detect that there is a SIM card inserted. Waiting SIM Available – the SIM card is detected but not available yet. Available – the SIM card is detected and activated. Locked – the SIM card has PIN code security, but you did not enter the PIN code yet. Blocked – you entered an incorrect PIN code too many times, so the SIM card has been locked; call the ISP for a PUK (Pin Unlock Key) to unlock the SIM card. Error – the Zyxel Device detected that the SIM card has errors.
IMSI	This displays the International Mobile Subscriber Identity (IMSI) of the installed SIM card. An IMSI is a unique ID used to identify a mobile subscriber in a mobile network.
ICCID	Integrated Circuit Card Identifier (ICCID). This is the serial number of the SIM card.
PIN Protection	A PIN (Personal Identification Number) code is a key to a SIM card. Without the PIN code, you cannot use the SIM card. Shows Enable if the service provider requires you to enter a PIN to use the SIM card. Shows Disable if the service provider lets you use the without inputting a PIN, or you disable PIN Protection in Network Setting > Broadband > Cellular SIM.
PIN Remaining Attempts	This is how many more times you can try to enter the PIN code before the ISP blocks your SIM card.
IP Passthrough Status	
IP Passthrough Enable	This displays if IP Passthrough is enabled on the Zyxel Device. IP Passthrough allows a LAN computer on the local network of the Zyxel Device to have access to web services using the public IP address. When IP Passthrough is configured, all traffic is forwarded to the LAN computer and will not go through NAT.
IP Passthrough Mode	This displays the IP Passthrough mode. This displays Dynamic and the Zyxel Device will allow traffic to be forwarded to the first LAN computer requesting an IP address from the Zyxel Device. This displays Fixed and the Zyxel Device will allow traffic to be forwarded to a specific LAN computer on the local network of the Zyxel Device.
Cellular Status	
Cellular Status	This displays the status of the cellular Internet connection.

Table 30 Cellular Info: Detailed Information (continued)

LABEL	DESCRIPTION
Access Technology	This displays the type of the mobile network (such as LTE, UMTS, GSM, NR5G) to which the Zyxel Device is connecting.
Operator	This displays the name of the service provider.
PLMN	This displays the PLMN (Public Land Mobile Network) number.
Data Roaming	This displays if data roaming is enabled on the Zyxel Device. Data roaming is to use your Zyxel Device in an area which is not covered by your service provider. Enable roaming to ensure that your Zyxel Device is kept connected to the Internet when you are traveling outside the geographical coverage area of the network to which you are registered.
GNSS Information Global Navigation Satellite System (GNSS) sends position and timing data from high orbit artificial satellites. It works with GPS navigational satellites to provide better receiver accuracy and reliability than just using GPS alone. This is necessary for 5G networks that require very accurate timing for time and frequency synchronization. With GNSS, your can easily locate the Zyxel Device with accurate information. Note: Not all models support the GNSS feature.	
Enable	This shows if GNSS is enabled. Note: This can only be configured by a qualified service technician.
Scan OnBoot	This shows Enable if Scan OnBoot is enabled, so that GNSS runs automatically after the Zyxel Device is turned on. Note: This can only be configured by a qualified service technician.
Scan Status	This shows GNSS error codes for debugging by a qualified service technician.
HDOP	Horizontal Dilution of Precision (HDOP) shows how accurate data collected by the Zyxel Device is according to the current satellite configuration. A smaller value of HDOP means a higher precision.
Display Format	This shows the latitude and longitude display modes. There are three modes: 0, 1, and 2. Below are examples for these modes shown in latitude/longitude. 0 – ddmm.mmmmN/S, dddmm.mmmmE/W 1 – ddmm.mmmmmm, N/S, dddmm.mmmmmm, E/W 2 – (–)dd.ddddd, (–)ddd.ddddd N/S/E/W: North/South/East/West "–" : Negative values refer to South latitude/West longitude respectively. Positive values refer to North latitude/East longitude.
Latitude	This shows the latitude coordinate of the Zyxel Device. These positioning values (latitude, longitude, and altitude) help you locate the Zyxel Device accurately.
Longitude	This shows the longitude coordinate of the Zyxel Device.
Elevation	This shows the measure of the Zyxel Device above mean sea level (MSL) in meters.
Altitude	This shows the height of the Zyxel Device above mean sea level or ground level in meters.
Positioning Mode	This shows the GNSS positioning mode. 2D ("2") GNSS positioning mode displays latitude and longitude co-ordinates; 3D ("3") GNSS positioning mode displays latitude and longitude co-ordinates, and elevation.
Course over ground	This shows the course of the Zyxel Device based on true North. Course Over Ground (COG) is different from the direction an object is headed, but the path derived from its actual motion (considered as Track), since the motion of an object is often with respect to other factors like wind and tides.
Speed	This shows the Speed Over Ground (SOG) of the Zyxel Device in meters per second (m/s). SOG is the true object speed over the surface of the Earth.

Table 30 Cellular Info: Detailed Information (continued)

LABEL	DESCRIPTION
Last Fix Time	This shows the last time in UTC format that the position of the Zyxel Device was updated.
Number Of Satellites	This shows the number of current active satellites. GNSS requires at least 4 satellites to determine the position of the Zyxel Device.
NR-NSA Information	
MCC	This shows the Mobile Country Code (MCC). MCC is a unique code that identifies the country where a Public Land Mobile Network (PLMN) is at.
MNC	This shows the Mobile Network Code (MNC). MNC is a unique code that identifies a Public Land Mobile Network (PLMN) in a country. MCC and MNC combined together are used to identify a globally unique PLMN.
Service Information Note: If the cellular service provider supports carrier aggregation (CA), then this section displays statistics for the connection's primary component carrier (PCC).	
Access Technology	This displays the type of the mobile network (such as LTE, UMTS, GSM) to which the Zyxel Device is connecting.
Band	This displays the current cellular band of your Zyxel Device (WCDMA2100).
RSSI (dBm)	This displays the strength of the cellular signal between an associated cellular station and the Zyxel Device.
Cell ID	This shows the cell ID, which is a unique number used to identify the Base Transceiver Station to which the Zyxel Device is connecting. The value depends on the type of the mobile network (such as LTE, UMTS, GSM) to which the Zyxel Device is connecting: • For UMTS, it is the Cell Identity as defined in SIB3 3GPP-TS.25.331, 3GPP-TS.24.008. • For LTE, it is the 28-bit binary number Cell Identity as specified in SIB1 in 3GPP-TS.36.331. The value is '0' (zero) or 'N/A' if there is no network connection.
Physical Cell ID	This shows the Physical Cell ID (PCI), which are queries and replies between the Zyxel Device and the mobile network it is connecting to. The normal range is 1 to 504.
UL Bandwidth (MHz)	This shows the uplink cellular channel bandwidth from the Zyxel Device to the base station. According to 3GPP specifications, the bandwidths defined by the standard are 1.4, 3, 5, 10, 15, and 20 MHz. The wider the bandwidth the higher the throughput.
DL Bandwidth (MHz)	This shows the downlink cellular channel bandwidth from the base station to the Zyxel Device. According to 3GPP specifications, the bandwidths defined by the standard are 1.4, 3, 5, 10, 15, and 20 MHz. The wider the bandwidth the higher the throughput.
RFCN	This displays the Radio Frequency Channel Number of DL carrier frequency used by the mobile network to which the Zyxel Device is connecting. The value depends on the type of the mobile network (such as LTE, UMTS, GSM) to which the Zyxel Device is connecting: • For UMTS (3G), it is the UARFCN (UTRA Absolute Radio-Frequency Channel Number) as specified in 3GPP-TS.25.101. • For LTE, it is the EARFCN (E-UTRA Absolute Radio-Frequency Channel Number) as specified in 3GPP-TS.36.101. The value is '0' (zero) or 'N/A' if there is no network connection.

Table 30 Cellular Info: Detailed Information (continued)

LABEL	DESCRIPTION
RSRP (dBm)	This displays the Reference Signal Receive Power (RSRP), which is the average received power of all Resource Element (RE) that carry cell-specific Reference Signals (RS) within the specified bandwidth. The received RSRP level of the connected E-UTRA cell, in dBm, is as specified in 3GPP-TS.36.214. The reporting range is specified in 3GPP-TS.36.133. An undetectable signal is indicated by the lower limit, example –140 dBm. This parameter is for LTE only. The normal range is –44 to –140. The signal is better when the value is closer to -44. The value is –140 if the Current Access Technology is not LTE. The value is ‘N/A’ if there is no network connection.
RSRQ (dB)	This displays the Reference Signal Receive Quality (RSRQ), which is the ratio of RSRP to the E-UTRA carrier RSSI and indicates the quality of the received reference signal. The received RSRQ level of the connected E-UTRA cell, in 0.1 dB, is as specified in 3GPP-TS.36.214. An undetectable signal is indicated by the lower limit, example –240. This parameter is for LTE only. The normal range is –30 to –240. The value is –240 if the Current Access Technology is not LTE. The value is ‘N/A’ if there is no network connection.
RSCP	This displays the Received Signal Code Power, which measures the power of channel used by the Zyxel Device. The received signal level, in dBm, is of the CPICH channel (Ref. 3GPP TS 25.133). An undetectable signal is indicated by the lower limit, example –120 dBm. This parameter is for UMTS only. The normal range is –30 to –120. The value is –120 if the Current Access Technology is not UMTS. The value is ‘N/A’ if there is no network connection.
EcNo	This displays the ratio (in dB) of the received energy per chip and the interference level. The measured EcNo is in 0.1 dB and is received in the downlink pilot channel. An undetectable signal is indicated by the lower limit, example –240 dB. This parameter is for UMTS only. The normal range is –30 to –240. The value is –240 if the Current Access Technology is not UMTS or there is no network connection.
TAC	This displays the Tracking Area Code (TAC), which is used to identify the country of a mobile subscriber. The physical cell ID of the connected E-UTRAN cell, is as specified in 3GPP-TS.36.101. This parameter is for LTE only. The value is ‘0’ (zero) or ‘N/A’ if the Current Access Technology is not LTE or there is no network connection.
LAC	This displays the 2-octet Location Area Code (LAC), which is used to identify a location area within a PLMN. The LAC of the connected cell is as defined in SIB 1 [3GPP-TS.25.331]. The concatenation of PLMN ID (MCC+MNC) and LAC uniquely identifies the LAI (Location Area ID) [3GPP-TS.23.003]. This parameter is for UMTS or GPRS. The value is ‘0’ (zero) if the Current Access Technology is not UMTS or GPRS. The value is ‘N/A’ if there is no network connection.
RAC	This displays the RAC (Routing Area Code), which is used in mobile network “packet domain service” (PS) to identify a routing area within a location area. In a mobile network, the Zyxel Device uses LAC (Location Area Code) to identify the geographical location for the old 3G voice only service, and uses RAC to identify the location of data service like HSDPA or LTE. The RAC of the connected UTRAN cell is as defined in SIB 1 [3GPP-TS.25.331]. The concatenation of PLMN ID (MCC+MNC), LAC, and RAC uniquely identifies the RAI (Routing Area ID) [3GPP-TS.23.003]. This parameter is for UMTS or GPRS. The value is ‘0’ (zero) if the Current Access Technology is not UMTS or GPRS. The value is ‘N/A’ if there is no network connection.

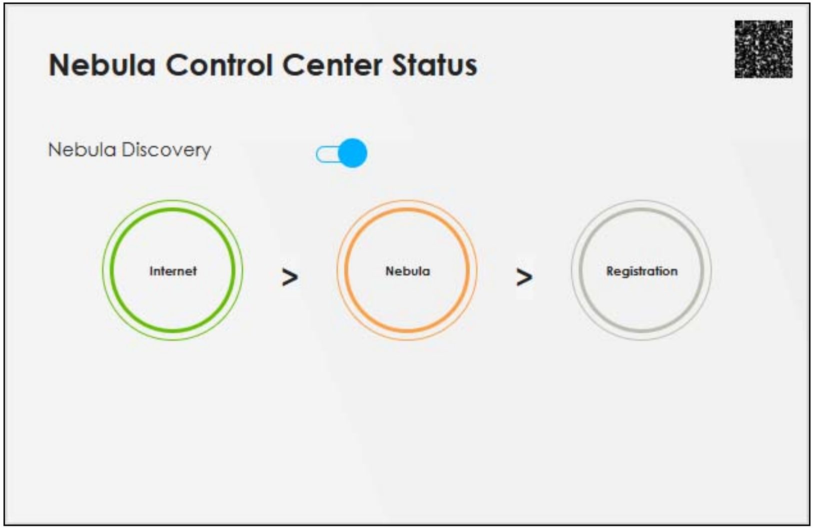
Table 30 Cellular Info: Detailed Information (continued)

LABEL	DESCRIPTION
BSIC	The Base Station Identity Code (BSIC), which is a code used in GSM to uniquely identify a base station. This parameter is for GPRS only. The value is ‘0’ (zero) if the Current Access Technology is not GPRS. The value is ‘N/A’ if there is no network connection.
SINR (dB)	This displays the Signal to Interference plus Noise Ratio (SINR) in dB. This is also a measure of signal quality and used by the UE (User Equipment) to calculate the Channel Quality Indicator (CQI) that it reports to the network. A negative value means more noise than signal.
CQI	This displays the Channel Quality Indicator (CQI). It is an indicator carrying the information on how good or bad the communication channel quality is.
MCS	MCS stands for modulation coding scheme. The base station selects MCS based on current radio conditions. The higher the MCS the more bits can be transmitted per time unit.
RI	This displays the Rank Indication, one of the control information that a UE will report to eNodeB (Evolved Node-B) on either PUCCH (Physical Uplink Control Channel) or PUSCH (Physical Uplink Shared Channel) based on uplink scheduling.
PMI	This displays the Precoding Matrix Indicator (PMI). PMI is for transmission modes 4 (closed loop spatial multiplexing), 5 (multi-user MIMO), and 6 (closed loop spatial multiplexing using a single layer). PMI determines how cellular data are encoded for the antennas to improve downlink rate.
SCC Information	If the cellular service provider supports carrier aggregation (CA), then this section displays statistics for the connection’s secondary component carriers (SCCs).
#	This displays the ID of the SCC. Some cellular providers support two or more SCCs.
NR Physical Cell ID	This displays the Physical Cell ID (PCI) of the SCC.
UL Bandwidth (MHz)	This shows the uplink cellular channel bandwidth from the Zyxel Device to the base station. According to 3GPP specifications, the bandwidths defined by the standard are 1.4, 3, 5, 10, 15, and 20 MHz. The wider the bandwidth the higher the throughput.
DL Bandwidth (MHz)	This shows the downlink cellular channel bandwidth from the base station to the Zyxel Device. According to 3GPP specifications, the bandwidths defined by the standard are 1.4, 3, 5, 10, 15, and 20 MHz. The wider the bandwidth the higher the throughput.
RFCN	This displays the Radio Frequency Channel Number of DL carrier frequency used by the SCC.
Band	This displays the current cellular band used by the SCC.
RSSI	This displays the cellular signal strength between an associated cellular station and the Zyxel Device for this SCC.
NR RSRP	This displays the Received Signal Code Power of the SCC.
NR RSRQ	This displays the Reference Signal Receive Quality of the SCC.
NR SINR (dBm)	This displays the Signal to Interference plus Noise Ratio (SINR) of the SCC.
TAC	This displays the Tracking Area Code (TAC), which is used to identify the country of a mobile subscriber. The physical cell ID of the connected E-UTRAN cell, is as specified in 3GPP-TS.36.101. This parameter is for LTE only. The value is ‘0’ (zero) or ‘N/A’ if the Current Access Technology is not LTE or there is no network connection.

6.1.5 Nebula Control Center Status

Use this screen to enable or disable Nebula Discovery. You can also view the Internet connection status, Nebula connection status and the Zyxel Device registration status in this screen.

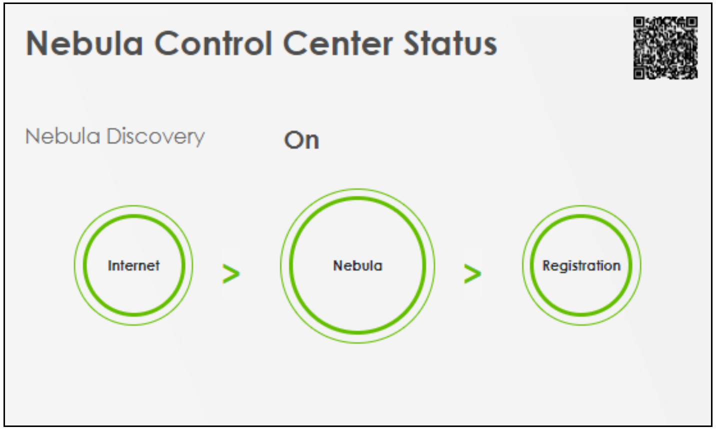
Figure 67   Nebula Control Center Status


Nebula Control Center Status

Nebula Discovery

When the Zyxel Device is being managed by NCC, the Nebula Control Center Status will appear as follows.

Figure 68   Nebula Control Center Status – NCC Managed


Nebula Control Center Status

Nebula Discovery On

Each field is described in the following table.

Table 31 Nebula Control Center Status

LABEL	DESCRIPTION
Nebula Discovery	Enable this to have the Zyxel Device connect to the NCC and change to the NCC management mode if the Zyxel Device is connected to the Internet and has been registered on the NCC. This is not configurable and will only display ON when your Zyxel Device is being managed by NCC.
Nebula Control Center Status	This field displays: • The Zyxel Device Internet connection status. • The connection status between the Zyxel Device and the NCC. • The Zyxel Device registration status on the NCC. Mouse over the circles to display detailed information. To pass your Zyxel Device management to the NCC, make sure your Zyxel Device is connected to the Internet. Then go to the NCC and register your Zyxel Device. Internet • Green: The Zyxel Device is connected to the Internet. • Orange: The Zyxel Device is not connected to the Internet. Nebula • Green: The Zyxel Device is connected to the NCC. • Gray: The Zyxel Device is not connected to the NCC. Registration • Green: The Zyxel Device is registered on the NCC. • Gray: The Zyxel Device is not registered on the NCC. Please note that all circles will gray out if you disable Nebula Discovery. When a circle is gray or orange, hover the mouse over the circle to check the diagnostic message.
QR Code	Click on the QR code icon at the top right corner to show the QR code you can use to register the Zyxel Device on the NCC using the Nebula Mobile app.

6.1.6 Wi-Fi Settings

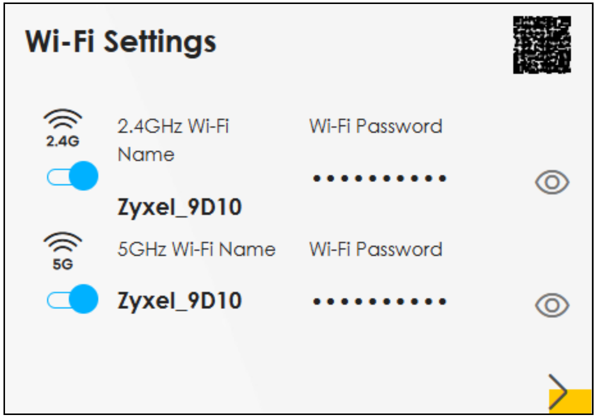
The following compares the main Wi-Fi network and the guest Wi-Fi network.

Table 32 Main or Guest Wi-Fi Networks key Differences

FEATURE	MAIN WI-FI	GUEST WI-FI
Purpose	For primary household or business users.	For visitors.
Network Access	For access to internal devices, such as printers or file servers.	Internet access only; no access to internal devices.

Use this screen to enable or disable the main Wi-Fi network. When the switch turns blue, the function is enabled. You can use this screen or the QR code on the upper right corner to check the SSIDs (Wi-Fi network name) and passwords of the main Wi-Fi networks. If you want to show or hide your Wi-Fi passwords, click the Eye icon (👁).

Figure 69 Wi-Fi Settings (for 2.4 GHz and 5 GHz models)



Wi-Fi Settings

2.4G

2.4GHz Wi-Fi Name

Zyxel_9D10

Wi-Fi Password

••••••••••

5G

5GHz Wi-Fi Name

Zyxel_9D10

Wi-Fi Password

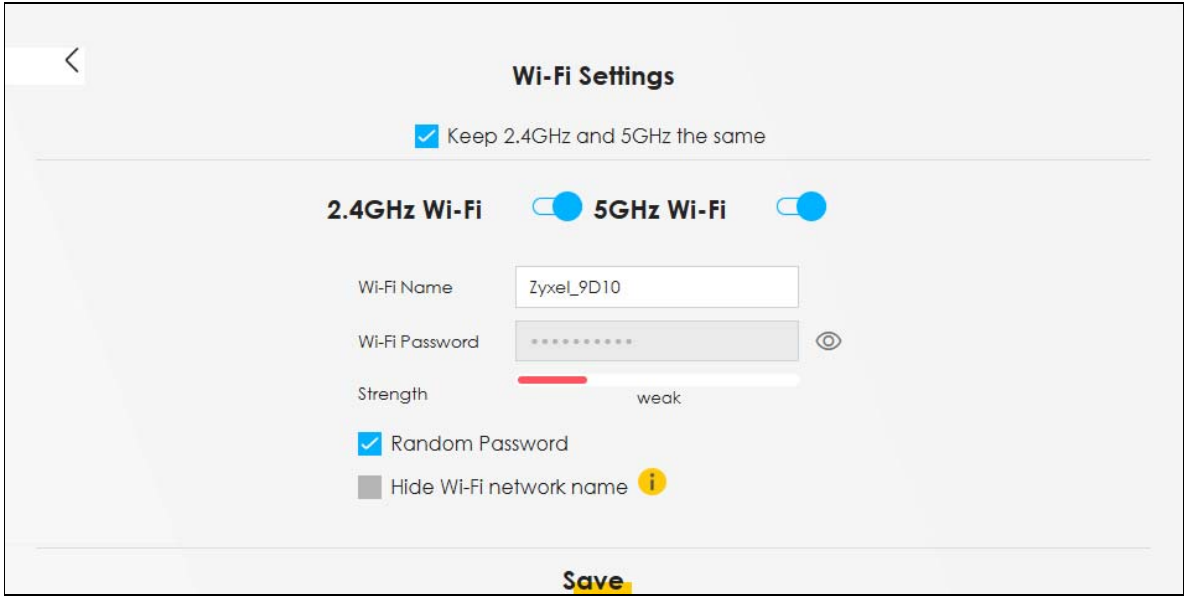
••••••••••

Click the Arrow icon (>) to configure the SSIDs and/or passwords for your main Wi-Fi networks. Click the Eye icon (◎) to display the characters as you enter the Wi-Fi Password.

Scanning the QR code is an alternative way to connect your Wi-Fi client to the Wi-Fi network.

Select Keep 2.4G and 5G the same to use the same SSID for 2.4 GHz and 5 GHz bands.

Figure 70 Wi-Fi Settings: Configuration (for 2.4 GHz and 5 GHz models)



Wi-Fi Settings

☑ Keep 2.4GHz and 5GHz the same

2.4GHz Wi-Fi ● 5GHz Wi-Fi ●

Wi-Fi Name: Zyxel_9D10

Wi-Fi Password: ••••••••••

Strength: weak

☑ Random Password

□ Hide Wi-Fi network name

Save

Each field is described in the following table.

Table 33 Wi-Fi Settings: Configuration

LABEL	DESCRIPTION
2.4G/5GWi-Fi	Click this switch to enable or disable the 2.4 GHz / 5 GHz Wi-Fi networks. When the switch goes to the right ●, the function is enabled. Otherwise, it is not.
Wi-Fi 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. Enter a descriptive name (up to 32 printable characters, including spaces) for the Wi-Fi.

Table 33 Wi-Fi Settings: Configuration (continued)

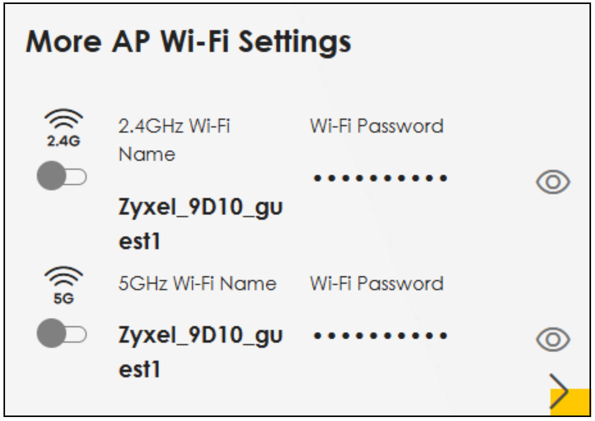
LABEL	DESCRIPTION
Wi-Fi Password	If you selected Random Password, this field displays a pre-shared key generated by the Zyxel Device. If you did not select Random Password, you can manually enter a pre-shared key from 8 to 64 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces.
	Click the Eye icon to show or hide the password of your Wi-Fi network. When the Eye icon is slashed , you will 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 Wi-Fi Password field will not be configurable when you select this option.
Hide Wi-Fi network name	Select this checkbox to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool. Note: Disable WPS in the Network Setting > Wireless > WPS screen to hide the SSID.
Save	Click Save to save your changes.

6.2 More AP Wi-Fi Settings

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

Note: To see the difference of the main Wi-Fi network and the guest Wi-Fi network, please refer to Main or Guest Wi-Fi Networks key Differences.

Figure 71 More AP Wi-Fi Settings (for 2.4 GHz and 5 GHz models)



More AP Wi-Fi Settings

2.4G

2.4GHz Wi-Fi Name: Zyxel_9D10_guest1

Wi-Fi Password: ••••••••••

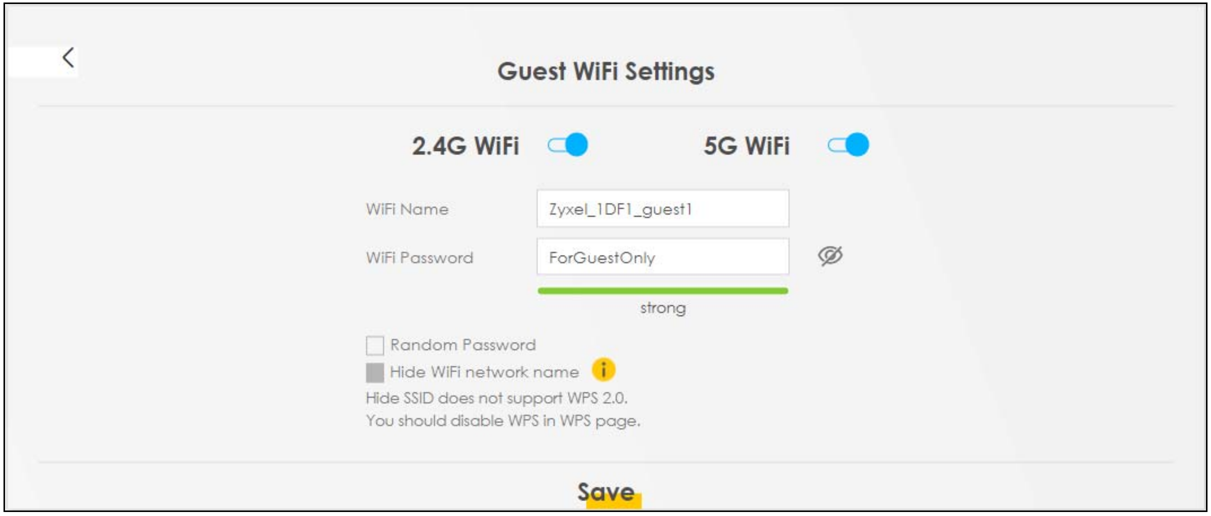
5G

5GHz Wi-Fi Name: Zyxel_9D10_guest1

Wi-Fi Password: ••••••••••

Click the Arrow icon (>) to open the following screen. Use this screen configure the SSIDs and/or passwords for your More AP Wi-Fi networks.

Figure 72   Guest Wi-Fi Settings: Configuration (for 2.4G and 5G models)



Guest WiFi Settings

2.4G WiFi ● 5G WiFi ●

WiFi Name: Zyxel_1DF1_guest1

WiFi Password: ForGuestOnly

strong

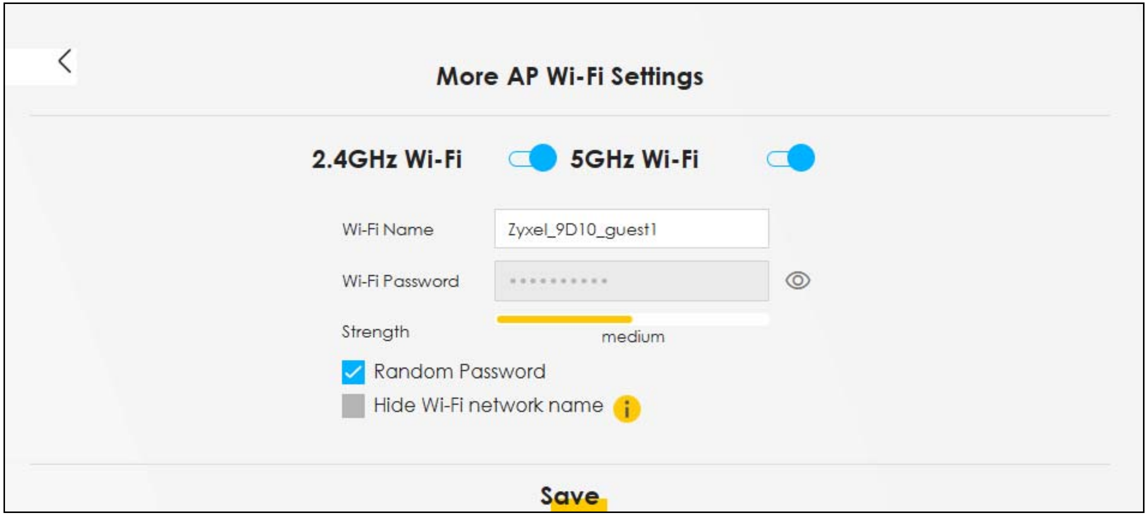
□ Random Password

■ Hide WiFi network name

Hide SSID does not support WPS 2.0.
You should disable WPS in WPS page.

To assign different SSIDs to the 2.4 GHz and 5 GHz guest wireless networks, clear the Keep 2.4GHz and 5GHz the same checkbox in the Wi-Fi Settings screen, and the More AP Wi-Fi Settings screen will change.

Figure 73   More AP Wi-Fi Settings: Different SSIDs (for 2.4 GHz and 5 GHz models)



More AP Wi-Fi Settings

2.4GHz Wi-Fi ● 5GHz Wi-Fi ●

Wi-Fi Name: Zyxel_9D10_guest1

Wi-Fi Password: ••••••••••••

Strength: medium

☑ Random Password

■ Hide Wi-Fi network name

Each field is described in the following table.

Table 34   Wi-Fi Settings: Configuration

LABEL	DESCRIPTION
2.4G/5GWi-Fi	Click this switch to enable or disable the 2.4 GHz / 5 GHz Wi-Fi networks. When the switch goes to the right ●, the function is enabled. Otherwise, it is not.
Wi-Fi 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. Enter a descriptive name (up to 32 printable characters, including spaces) for the Wi-Fi.
Wi-Fi Password	If you selected Random Password, this field displays a pre-shared key generated by the Zyxel Device. If you did not select Random Password, you can manually enter a pre-shared key from 8 to 64 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces.

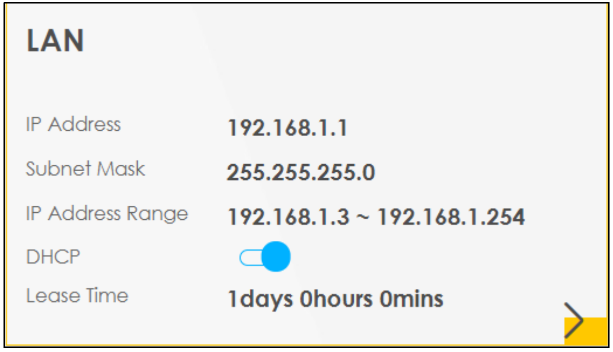
Table 34 Wi-Fi Settings: Configuration (continued)

LABEL	DESCRIPTION
	Click the Eye icon to show or hide the password of your Wi-Fi network. When the Eye icon is slashed, you will 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 Wi-Fi Password field will not be configurable when you select this option.
Hide Wi-Fi network name	Select this checkbox to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool. Note: Disable WPS in the Network Setting > Wireless > WPS screen to hide the SSID.
Save	Click Save to save your changes.

6.2.1 LAN

Use this screen to view the LAN IP address, subnet mask, and DHCP settings of your Zyxel Device. Click the switch button to turn on/off the DHCP server.

Figure 74 LAN

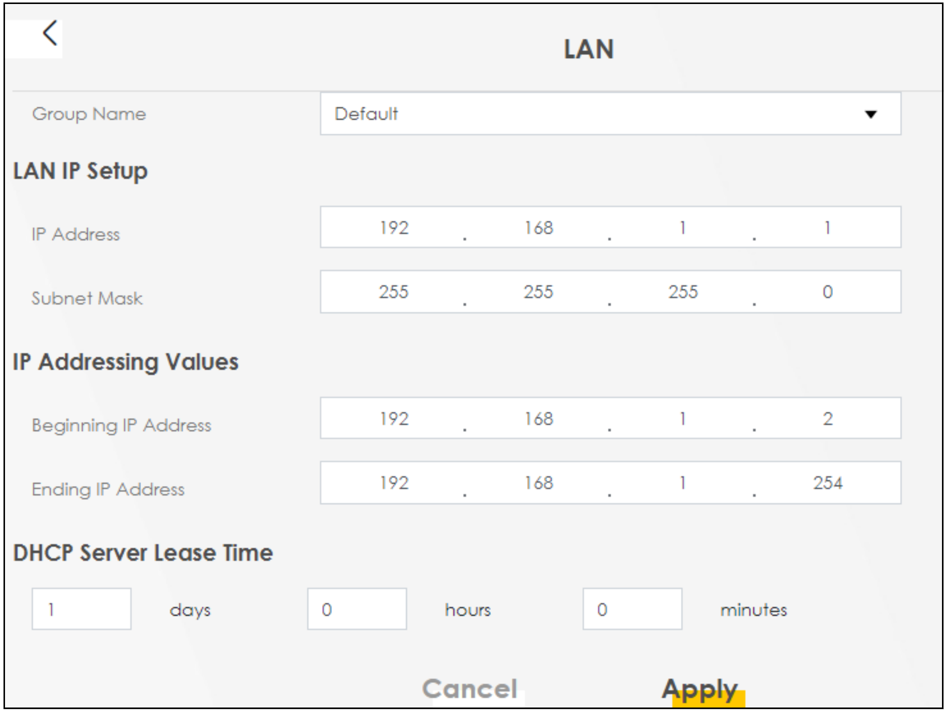


LAN

IP Address	192.168.1.1
Subnet Mask	255.255.255.0
IP Address Range	192.168.1.3 ~ 192.168.1.254
DHCP	●
Lease Time	1days 0hours 0mins

Click the Arrow icon (>) to configure the LAN IP settings and DHCP setting for your Zyxel Device.

Figure 75 LAN Setup



LAN

Group Name: Default

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 Lease Time

1 days 0 hours 0 minutes

Each field is described in the following table.

Table 35 LAN Setup

LABEL	DESCRIPTION
Group Name	Select the interface group you want to use. Usually Default.
LAN IP Setup	
IP Address	Enter the LAN IPv4 IP address you want to assign to your Zyxel Device in dotted decimal notation, for example, (factory default).
IP Address	Enter the LAN IPv4 IP address you want to assign to your Zyxel Device in dotted decimal notation, for example, 192.168.15.1 (factory default).
Subnet Mask	Enter 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 a DHCP-assigned address is valid, before it expires. When a client connects to the Zyxel Device, DHCP automatically assigns the client an IP addresses from the IP address pool. DHCP leases each addresses for a limited period of time, which means that past addresses are “recycled” and made available for future reassignment to other devices.
Days/Hours/ Minutes	Enter the lease time of the DHCP server.
Save	Click Save to save your changes.

Table 35 LAN Setup (continued)

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

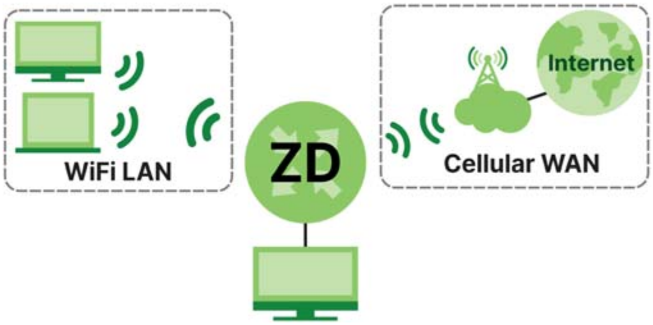
CHAPTER 7 Broadband

7.1 Broadband 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 76 LAN and WAN



7.1.1 What You Can Do in this Chapter

- Use the Broadband screen to view a WAN interface. You can also configure the WAN settings on the Zyxel Device for Internet access (Section 7.2 on page 167).
- Use the Ethernet WAN screen to convert LAN port number four as a WAN port or restore the Ethernet WAN port to a LAN port (Section 7.3 on page 173).
- Use the Cellular WAN screen to configure a cellular WAN connection (Section 7.5 on page 174).
- Use the Cellular APN screen to configure the APN setting (Section 7.6 on page 176).
- Use the Cellular SIM screen to enter the PIN of your SIM card (Section 7.7 on page 182).
- Use the Cellular Dual SIM screen to configure your dual SIM cards settings and cellular backup (Section 7.8 on page 184).
- Use the Cellular Band screen to view or edit a cellular WAN interface. You can also configure the WAN settings on the Zyxel Device for Internet access (Section 7.9 on page 185).
- Use the Cellular PLMN screen to display available Public Land Mobile Networks (Section 7.10 on page 186).
- Use the Cellular IP Passthrough screen to configure a cellular WAN connection (Section 7.11 on page 189).
- Use the Cellular Lock screens to configure the base station you choose to connect to (Section 7.12 on page 190).
- Use the Cellular SMS screen to send and receive SMS messages from the Zyxel Device (Section 7.13 on page 193).

Table 36 WAN Setup Overview

LAYER-2 INTERFACE		INTERNET CONNECTION		
CONNECTION	DSL LINK TYPE	MODE	ENCAPSULATION	CONNECTION SETTINGS
Ethernet	N/A	Routing	IPoE	WAN IPv4/IPv6 IP address, NAT, DNS server and routing feature.

7.1.2 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. The ISP dynamically assigns it each time the Zyxel Device tries to access the Internet.

APN

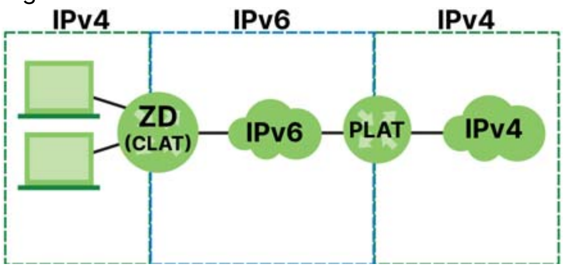
An Access Point Name (APN) is the name of a gateway between a cellular network and another network, such as the Internet. The Zyxel Device requires an APN to connect to a cellular network. Different APNs may provide different services, such as Internet access or MMS (Multi-Media Messaging Service), and different charging methods.

464XLAT

Enable 464XLAT to send IPv4 traffic through the Zyxel Device when the Zyxel Device has an IPv6 WAN address.

464XLAT sends traffic from an IPv4 private network to another IPv4 network across an IPv6-only network. The Zyxel Device acts as a Customer-side Translator (CLAT). The CLAT adds an IPv6 prefix to the outgoing IPv4 packets, encapsulating IPv4 addresses as IPv6 addresses. When the packets go through the IPv6-only network, a Provider-side Translator (PLAT) removes the IPv6 prefixes so as the IPv4 addresses can reach the target IPv4 network.

Figure 77 464XLAT



7.1.3 Before You Begin

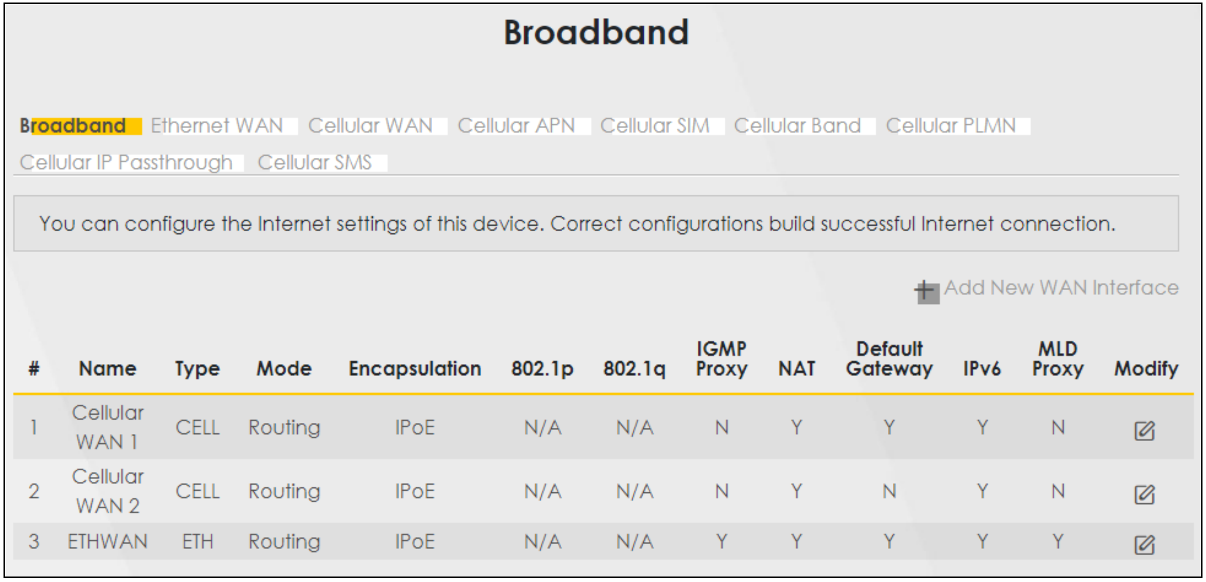
You may need to know your Internet access settings such as APN, WAN IP address and SIM card’s PIN code if the INTERNET light on your Zyxel Device is off. Get this information from your service provider.

7.2 Broadband

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 78 Network Setting > Broadband



Broadband

You can configure the Internet settings of this device. Correct configurations build successful Internet connection.

#	Name	Type	Mode	Encapsulation	802.1p	802.1q	IGMP Proxy	NAT	Default Gateway	IPv6	MLD Proxy	Modify
1	Cellular WAN 1	CELL	Routing	IPoE	N/A	N/A	N	Y	Y	Y	N	✎
2	Cellular WAN 2	CELL	Routing	IPoE	N/A	N/A	N	Y	N	Y	N	✎
3	ETHWAN	ETH	Routing	IPoE	N/A	N/A	Y	Y	Y	Y	Y	✎

The following table describes the labels in this screen.

Table 37 Network Setting > Broadband

LABEL	DESCRIPTION
#	This is the index number of the entry.
Name	This is the service name of the connection.
Type	This shows whether it is a cellular or Ethernet connection.
Mode	This shows the connection is in routing 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 N/A when there is no priority level assigned.
802.1q	This indicates the VLAN ID number assigned to traffic sent through this connection. This displays N/A when there is no VLAN ID number assigned.
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 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.

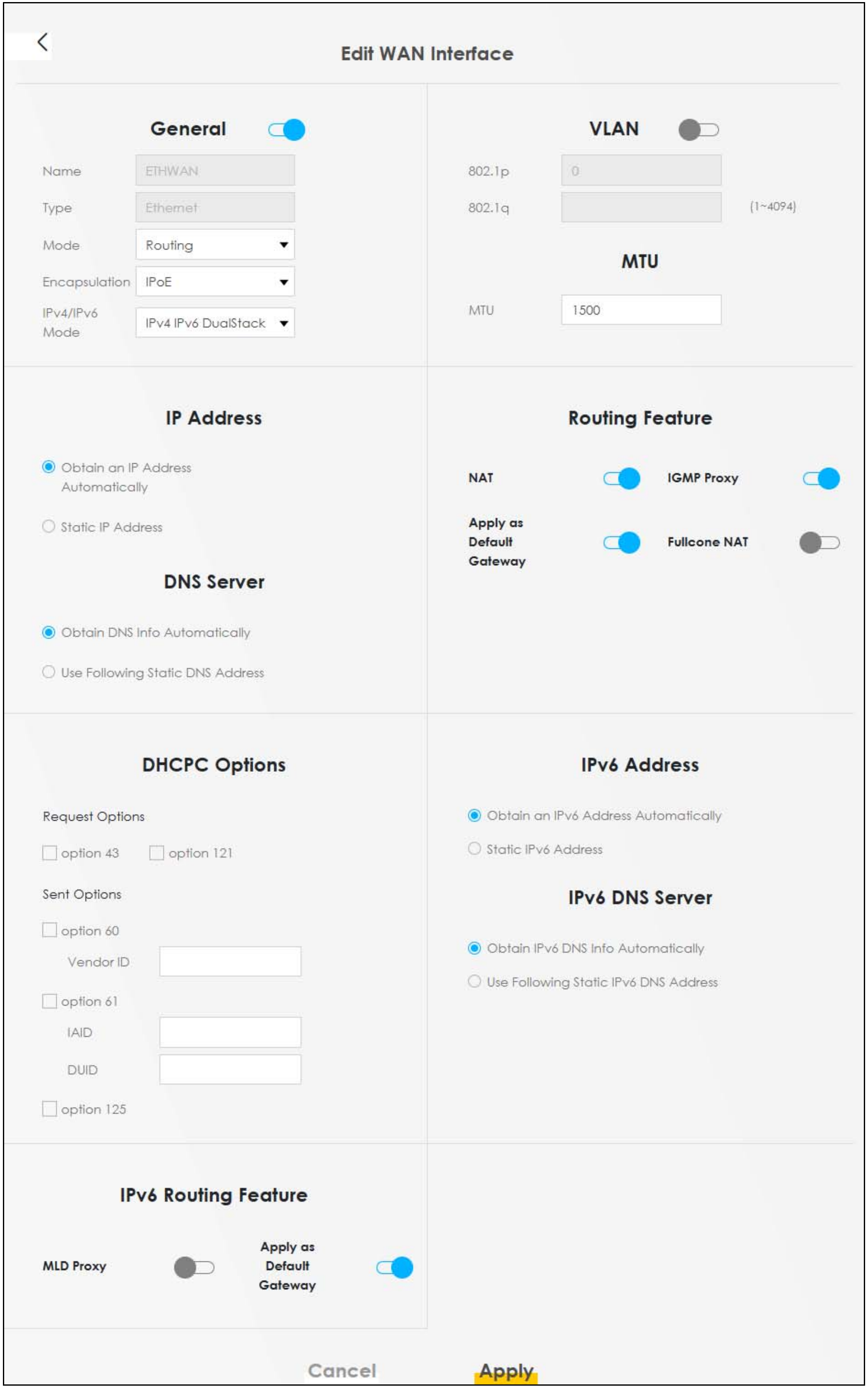
Table 37 Network Setting > Broadband (continued)

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 Modify icon to configure the WAN connection. Click the Delete icon to remove the WAN connection.

7.2.1 Add or Edit Internet Connection

Click the Edit or Modify icon next to a WAN interface to open the following screen. Use this screen to configure a WAN connection.

Figure 79 Network Setting > Broadband > Add or Edit New WAN Interface (Ethernet WAN)



Edit WAN Interface

General

Name	ETHWAN
Type	Ethernet
Mode	Routing
Encapsulation	IPoE
IPv4/IPv6 Mode	IPv4 IPv6 DualStack

VLAN

802.1p	0	
802.1q		(1~4094)

MTU

MTU	1500

IP Address

● Obtain an IP Address Automatically

○ Static IP Address

DNS Server

● Obtain DNS Info Automatically

○ Use Following Static DNS Address

Routing Feature

NAT

IGMP Proxy

Apply as Default Gateway

Fullcone NAT

DHCPC Options

Request Options

□ option 43 □ option 121

Sent Options

□ option 60

Vendor ID

□ option 61

IAID

DUID

□ option 125

IPv6 Address

● Obtain an IPv6 Address Automatically

○ Static IPv6 Address

IPv6 DNS Server

● Obtain IPv6 DNS Info Automatically

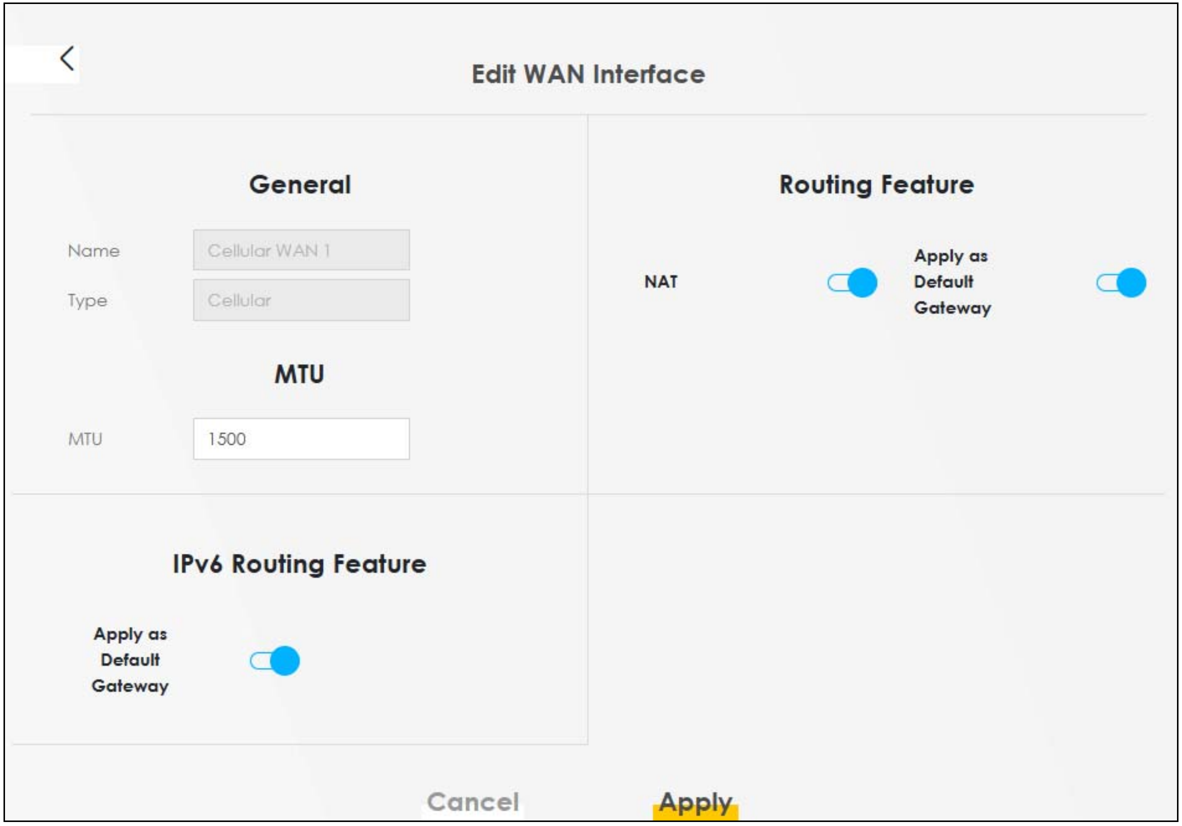
○ Use Following Static IPv6 DNS Address

IPv6 Routing Feature

MLD Proxy

Apply as Default Gateway

Figure 80 Network Setting > Broadband > Add or Edit New WAN Interface (Cellular WAN)



Edit WAN Interface

General

Name: Cellular WAN 1

Type: Cellular

MTU

MTU: 1500

Routing Feature

NAT: ●

Apply as Default Gateway: ●

IPv6 Routing Feature

Apply as Default Gateway: ●

The following table describes the labels in this screen.

Table 38 Network Setting > Broadband > Add or Edit New WAN Interface

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	This is the service name of the connection.
Type	This shows the type of the connection the Zyxel Device is currently associated with.
Mode	This shows the connection is in Routing or Bridge mode. If the Zyxel Device is in routing mode, your ISP gives you one IP address only and you want multiple computers to share an Internet account.
Encapsulation	This is the method of encapsulation used by this connection.
IPv4/IPv6 Mode	This shows IPv4 IPv6 DualStack. IPv4 IPv6 DualStack allows the Zyxel Device to run IPv4 and IPv6 at the same time.
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. 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	
MTU	Enter the MTU (Maximum Transfer Unit) size for this traffic.

Table 38 Network Setting > Broadband > Add or Edit New WAN Interface (continued)

LABEL	DESCRIPTION
IP Address	
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	
	Select Obtain DNS Info Automatically if you want the Zyxel Device to use the DNS server addresses assigned by your ISP. Select Use Following Static DNS Address 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	
NAT	Click this switch to activate or deactivate NAT on this connection. When the switch goes to the right ●, the function is enabled.
IGMP Proxy	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. 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. This allows the Zyxel Device to get subscribing information and maintain a joined member list for each multicast group. It can reduce multicast traffic significantly.
Apply as Default Gateway	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.
Fullcone NAT	Click this switch to enable or disable fullcone NAT on this connection. When the switch goes to the right ●, the function is enabled. This field is available only when you activate NAT. In fullcone 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.
DHCPC Options	
Request Options	Select Option 43 to have the Zyxel Device get vendor specific information from DHCP packets sent from the DHCP server. Select Option 120 to have the Zyxel Device get an IP address or a fully-qualified domain name of a SIP server from DHCP packets sent from the DHCP server. Select Option 121 to have the Zyxel Device get static route information from DHCP packets sent from the DHCP server.
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.

Table 38 Network Setting > Broadband > Add or Edit New WAN Interface (continued)

LABEL	DESCRIPTION
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	
Obtain an IPv6 Address Automatically	Select Obtain an IPv6 Address Automatically 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 Static IPv6 Address 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.
Prefix Length	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 interfaces. The gateway helps forward packets to their destinations.
IPv6 DNS Server	
Obtain IPv6 DNS Info Automatically	Select Obtain IPv6 DNS Info Automatically to have the Zyxel Device get the IPv6 DNS server addresses from the ISP automatically.
Use Following Static IPv6 DNS Address	Select Use Following Static IPv6 DNS Address 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	
MLD Proxy	Select this check box or option 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.
464XLAT	Enable this to have the Zyxel Device translate outgoing IPv4 packets to IPv6 packets. Use this function if you want to use IPv4 devices and services when your ISP provides an IPv6-only mobile network. See Section 7.1.2 on page 166 for more information about 464XLAT.
Auto Prefix64	Enable this to have the Zyxel Device automatically add the IPv6 prefix assigned by your ISP to the outgoing IPv4 packets. Disable this and configure the Static IPv6 Prefix field if you want to manually assign an IPv6 prefix.
Static IPv6 Prefix	Enter an IPv6 prefix that the Zyxel Device adds to the outgoing IPv4 packets.
Cancel	Click Cancel to exit this screen without saving.
Apply	Click Apply to save your changes.

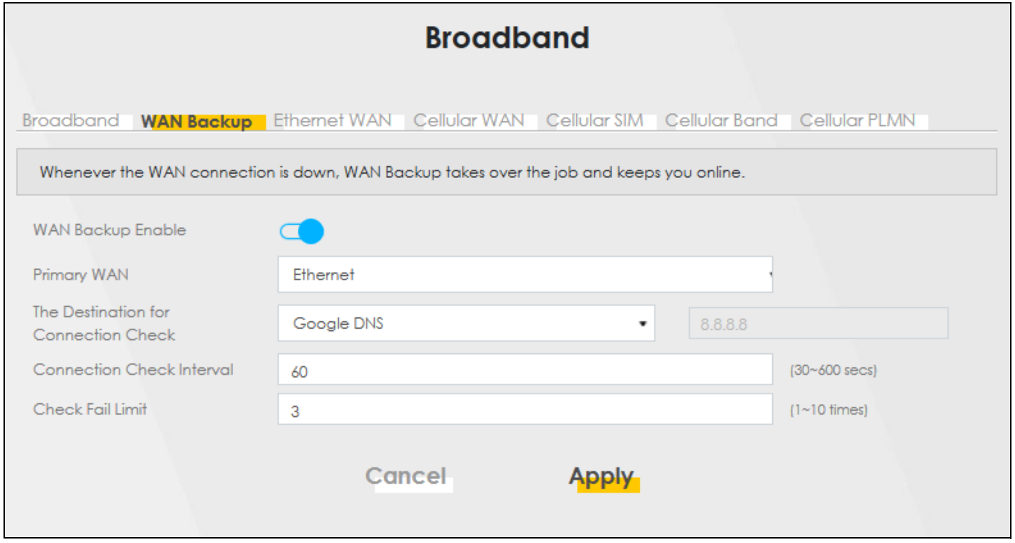
7.3 WAN Backup

Use this screen to configure your Zyxel Device’s Internet settings if the wired connection is down. You can use an alternative network, and assign an IP address to verify the accessibility of the Internet and the time interval allowed between each connection check.

Click Network Setting > Broadband > WAN Backup to display the following screen.

Note: This feature is only available if Ethernet WAN > State is enabled.

Figure 81 Network Setting > Broadband > Ethernet WAN



Whenever the WAN connection is down, WAN Backup takes over the job and keeps you online.

WAN Backup Enable: enabled

Primary WAN: Ethernet

The Destination for Connection Check: Google DNS, 8.8.8.8

Connection Check Interval: 60 (30~600 secs)

Check Fail Limit: 3 (1~10 times)

The following table describes the fields in this screen.

Table 39 Network Setting > Broadband> WAN Backup

LABEL	DESCRIPTION
WAN Backup Enable	Select Enable to have the Zyxel Device use the cellular connection as your WAN or a backup when the wired WAN connection fails.
Primary WAN	This field displays the connection the Zyxel Device would use first when the wired WAN connection fails. You can choose Ethernet or Cellular as the primary WAN connection for your Zyxel Device.
The Destination for Connection Check	Configure this field to test your Zyxel Device's WAN accessibility. Enter the IP address of a reliable nearby computer (for example, your ISP's DNS server address). Note: If you activate either traffic redirect or dial backup, you must configure at least one IP address here. When using a WAN backup connection, the Zyxel Device periodically pings the addresses configured here and uses the other WAN backup connection (if configured) if there is no response.
Connection Check Interval	When the Zyxel Device is using a lower priority connection (usually a WAN backup connection), it periodically checks to whether or not it can use a higher priority connection. Enter the number of seconds (30 recommended) for the Zyxel Device to wait between checks. Allow more time if your destination IP address handles lots of traffic.

Table 39 Network Setting > Broadband> WAN Backup (continued)

LABEL	DESCRIPTION
Check Fail Limit	Enter the number of times that your Zyxel Device will ping the IP addresses configured in the Destination for Connection Check field without getting a response before switching to a WAN backup connection (or a different WAN backup connection).
Cancel	Click Cancel to exit this screen without saving.
Apply	Click Apply to save your changes.

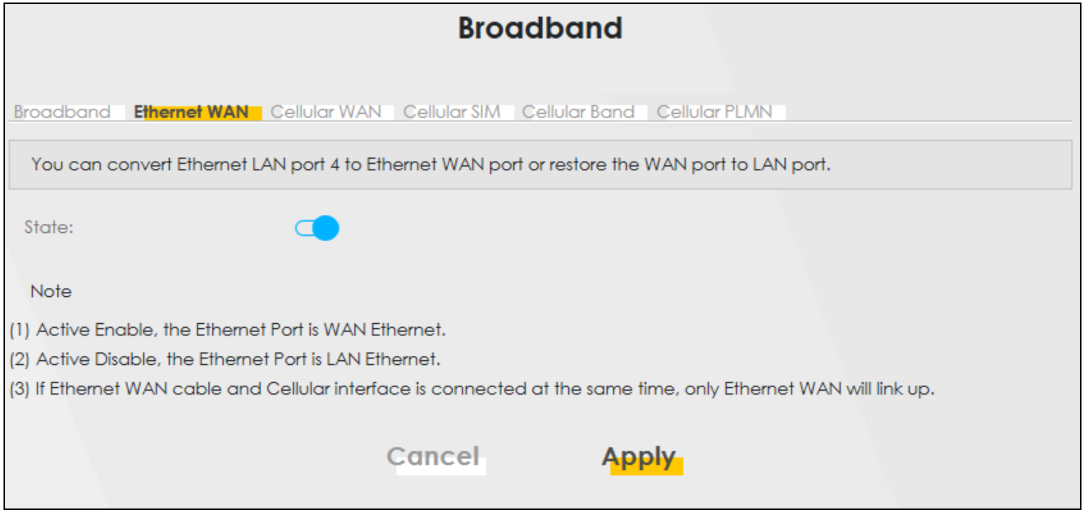
7.4 Ethernet WAN

Use this screen to have a LAN port act as an Ethernet WAN port. When the switch goes to the right, the LAN port acts as an Ethernet WAN port. Otherwise, the LAN port remains as a LAN port. Click Apply to save your changes back to the Zyxel Device. See Section 1.1.1 on page 18 to see if your Zyxel Device supports Ethernet WAN.

Note: The Ethernet WAN has priority over the cellular WAN. When both WAN interfaces are available, the Zyxel Device uses the Ethernet WAN connection. If the Ethernet WAN interface is down, the Zyxel Device will automatically switch to use the cellular WAN.

Click Network Setting > Broadband > Ethernet WAN to display the following screen.

Figure 82 Network Setting > Broadband > Ethernet WAN



You can convert Ethernet LAN port 4 to Ethernet WAN port or restore the WAN port to LAN port.

State: ●

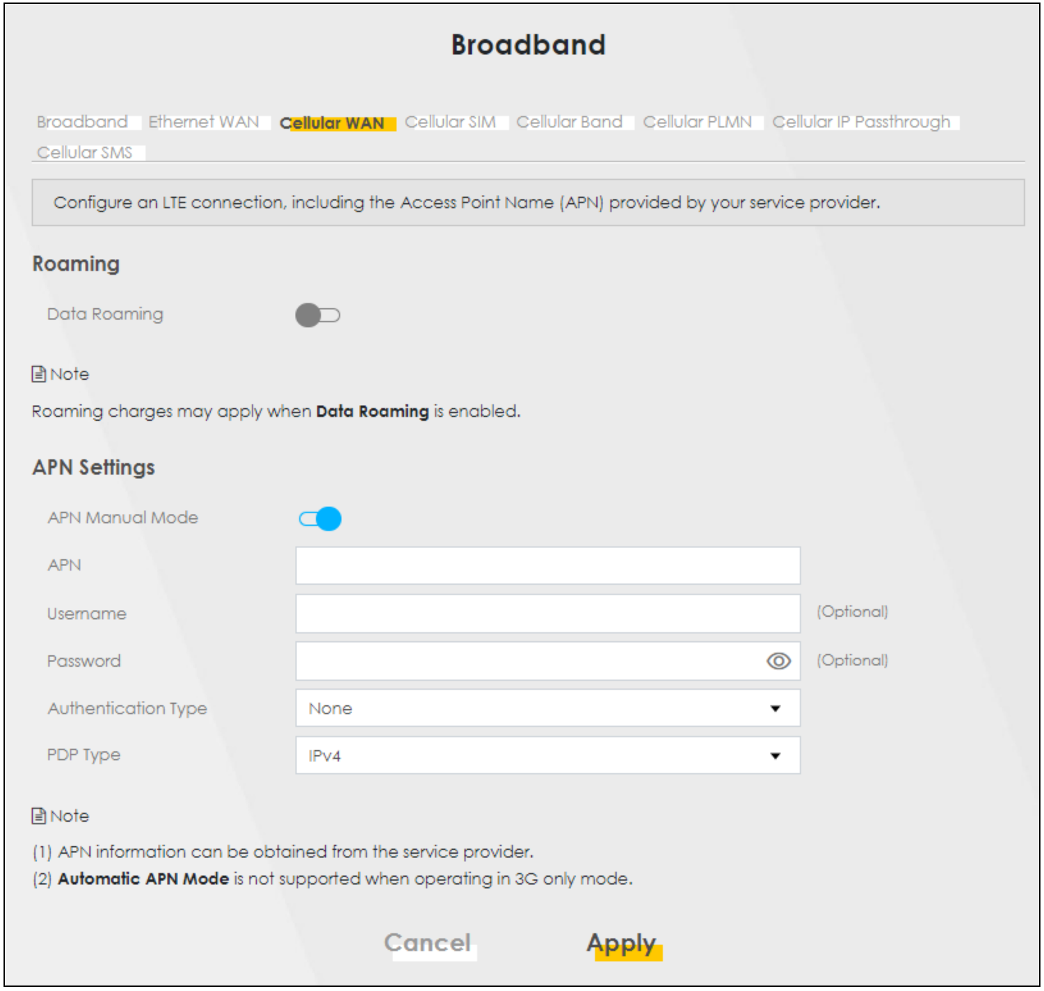
Note
(1) Active Enable, the Ethernet Port is WAN Ethernet.
(2) Active Disable, the Ethernet Port is LAN Ethernet.
(3) If Ethernet WAN cable and Cellular interface is connected at the same time, only Ethernet WAN will link up.

7.5 Cellular WAN

Click Network Setting > Broadband > Cellular WAN to display the following screen. Use this screen to enable data roaming and network monitoring when the Zyxel Device cannot ping a base station.

Note: Roaming charges may apply when Data Roaming is enabled.

Figure 83   Network Setting > Broadband > Cellular WAN



Broadband

Configure an LTE connection, including the Access Point Name (APN) provided by your service provider.

Roaming

Data Roaming

Note

Roaming charges may apply when **Data Roaming** is enabled.

APN Settings

APN Manual Mode

APN

Username (Optional)

Password (Optional)

Authentication Type: None

PDP Type: IPv4

Note

(1) APN information can be obtained from the service provider.

(2) **Automatic APN Mode** is not supported when operating in 3G only mode.

The following table describes the fields in this screen.

Table 40   Network Setting > Broadband > Cellular WAN

LABEL	DESCRIPTION
Data Roaming	Click this to enable (●) data roaming on the Zyxel Device. With cellular roaming, a SIM card works in areas which are not covered by the SIM's service provider. Enable roaming to keep the Zyxel Device connected to the Internet when you are traveling outside the geographical coverage area of the network to which you are registered, such as a different country. Note: Roaming charges may apply when Data Roaming is enabled.
Network Monitoring Feature	
Network Monitoring	Use this field to allow Zyxel Device to try reconnecting to the base station if the cellular connection is lost. After the third try, the Zyxel Device will reboot to try to reconnect with the base station. The LED will blink red to indicate that it is rebooting. Note: This feature only works if there is a previous cellular connection between the Zyxel Device and the base station.
Proxy ARP Feature	
Proxy ARP	Enable this to set your Zyxel Device as a server to handle ARP queries from different subnets. The Zyxel Device will offer Zyxel Device's own MAC address as an reply.

Table 40 Network Setting > Broadband > Cellular WAN (continued)

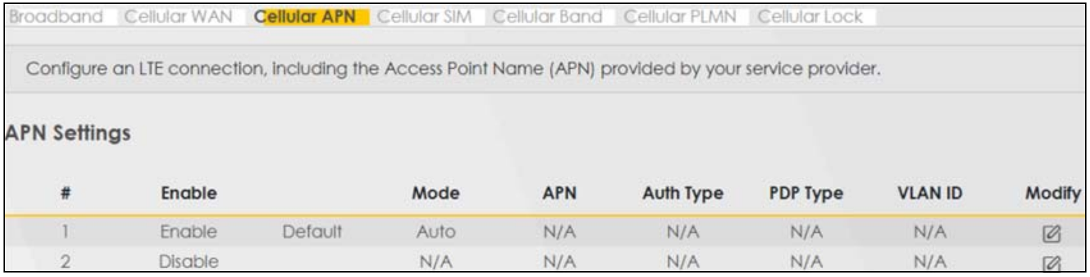
LABEL	DESCRIPTION
FQ_Codel Setting	
FQ_Codel	Select this field to enable FQ_Codel on the Zyxel Device. Clear this field if your network does not have much real-time traffic. Use Fair Queuing with Controlled Delay (FQ_Codel) to reduce delays in traffic that could affect real-time communications, such as video conferencing, live streaming, and voice over Internet phone calls. FQ_Codel limits traffic throughput, by dropping traffic so as to reduce buffer queuing that causes delays. It does not prioritize traffic by type.
APN Manual Mode	Disable this to have the Zyxel Device configure the APN (Access Point Name) of a cellular network automatically. Otherwise, Click this to enable (●) and enter the APN manually in the field below.
APN	This field allows you to display the Access Point Name (APN) in the profile. Enter the Access Point Name (APN) provided by your service provider. Connections with different APNs may provide different services (such as Internet access or MMS (Multi-Media Messaging Service)) and charging method. You can enter up to 64 printable ASCII characters. Spaces are allowed.
Username	Enter the user name. You can enter up to 64 printable ASCII characters. Spaces are allowed.
Password	Enter the password associated with the user name above. You can enter up to 64 printable ASCII characters. Spaces are allowed.
Authentication Type	Select the type of authentication method peers use to connect to the Zyxel Device in cellular connections. In Password Authentication Protocol (PAP) peers identify themselves with a user name and password. In Challenge Handshake Authentication Protocol (CHAP) additionally to user name and password the Zyxel Device sends regular challenges to make sure an intruder has not replaced a peer. Otherwise select PAP/CHAP or None.
PDP Type	Select IPv4 if you want the Zyxel Device to run IPv4 (Internet Protocol version 4 addressing system) only. Select IPv4/IPv6 if you want the Zyxel Device to run both IPv4 and IPv6 (Internet Protocol version 4 and 6 addressing system) at the same time.
Apply	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

7.6 Cellular APN

Click Network Setting > Broadband > Cellular APN to display the following screen. Use this screen to manage the APNs that Zyxel Device is connected to.

Note: This feature is only available on certain models.

Figure 84 Network Setting > Broadband > Cellular APN



Configure an LTE connection, including the Access Point Name (APN) provided by your service provider.

APN Settings

#	Enable		Mode	APN	Auth Type	PDP Type	VLAN ID	Modify
1	Enable	Default	Auto	N/A	N/A	N/A	N/A	✎
2	Disable		N/A	N/A	N/A	N/A	N/A	✎

The following table describes the labels in this screen.

Table 41 Network Setting > Broadband > Cellular APN

LABEL	DESCRIPTION
APN Settings	
#	This is the number of an individual APN.
Enable	This field indicates whether the APN is enabled or disabled.
Mode	This shows Auto when the Zyxel Device configures the APN (Access Point Name) of a cellular network automatically. This shows Manual when the APN is entered manually.
APN	This shows the Access Point Name (APN).
Auth Type	This shows PAP (Password Authentication Protocol) when peers identify themselves with a user name and password. This shows CHAP (Challenge Handshake Authentication Protocol) when additionally to a user name and password, the Zyxel Device sends regular challenges to make sure an intruder has not replaced a peer. This shows PAP/CHAP when either type of authentication can be used. This shows None when no authentication is used.
PDP Type	This shows IPv4 when the Zyxel Device runs IPv4 (Internet Protocol version 4 addressing system) only. This shows IPv4/IPv6 when the Zyxel Device runs IPv4 and IPv6 (Internet Protocol version 4 and 6 addressing system) at the same time.
VLAN ID	This shows the VLAN ID for the APN.
Modify	Click the Edit icon to change the APN settings.

7.6.1 Edit Cellular APN1/APN2

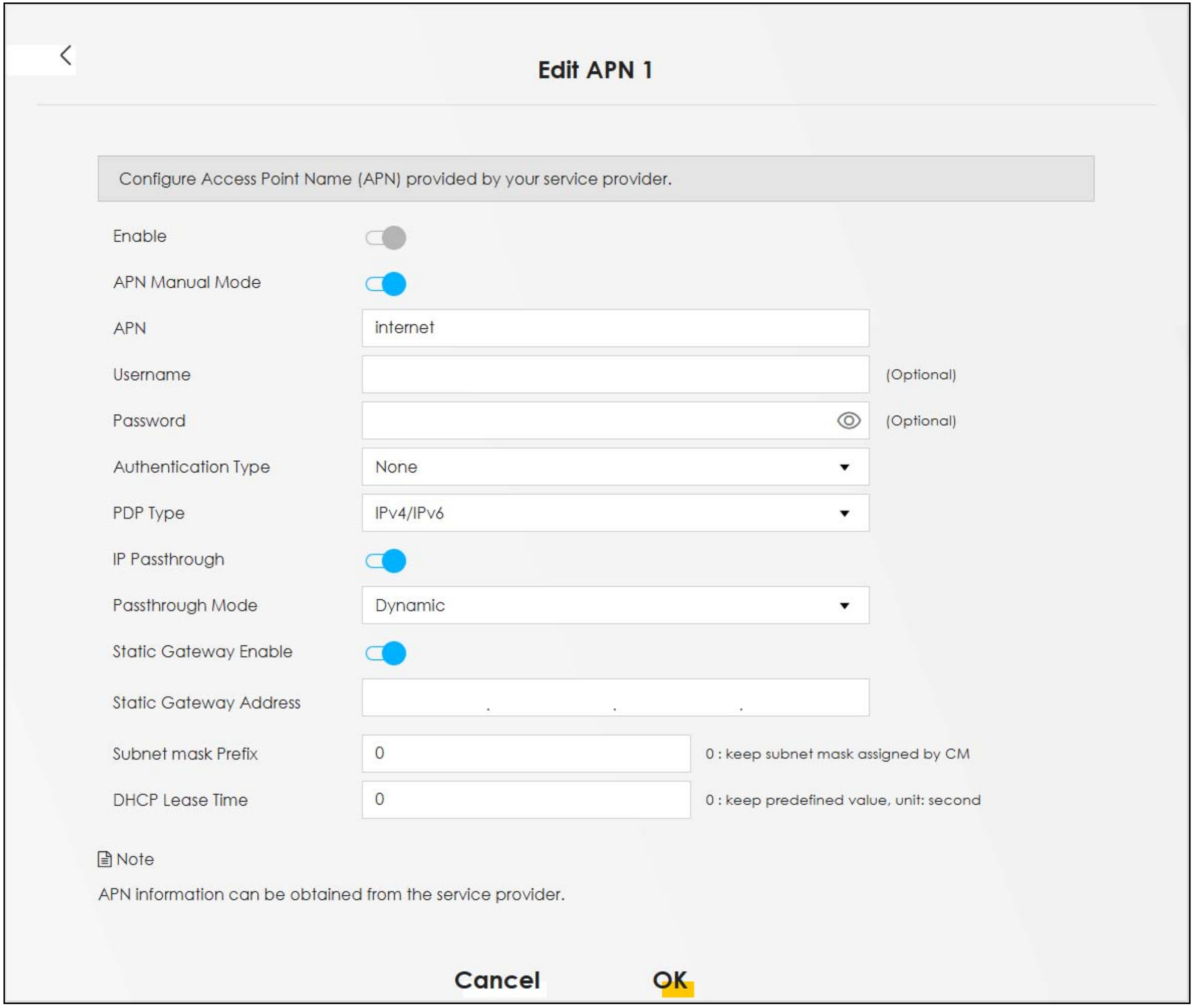
On the Cellular APN screen, click the Edit icon next to an APN to configure its settings.

Note: The IP Passthrough fields are not available for models that support the Network Setting > Broadband > Cellular IP Passthrough screen.

Note: APN information can be obtained from your cellular service provider.

Note: Automatic mode is not supported in all cellular modes.

Figure 85 Network Setting > Broadband > Cellular APN > Edit APN



Edit APN 1

Configure Access Point Name (APN) provided by your service provider.

Enable	○	
APN Manual Mode	●	
APN	internet	
Username		(Optional)
Password		(Optional)
Authentication Type	None ▾	
PDP Type	IPv4/IPv6 ▾	
IP Passthrough	●	
Passthrough Mode	Dynamic ▾	
Static Gateway Enable	●	
Static Gateway Address	. . .	
Subnet mask Prefix	0	0 : keep subnet mask assigned by CM
DHCP Lease Time	0	0 : keep predefined value, unit: second

Note

APN information can be obtained from the service provider.

The following table describes the fields in this screen.

Table 42 Network Setting > Broadband > Cellular APN > Edit APN

LABEL	DESCRIPTION
Enable	Click this to enable (●) the APN on the Zyxel Device
APN Manual Mode	Disable this to have the Zyxel Device configure the APN (Access Point Name) of a cellular network automatically. Otherwise, Click this to enable (●) and enter the APN manually in the field below.
APN	This field allows you to display the Access Point Name (APN) in the profile. Enter the Access Point Name (APN) provided by your service provider. Connections with different APNs may provide different services (such as Internet access or MMS (Multi-Media Messaging Service)) and charging method. You can enter up to 64 printable ASCII characters. Spaces are allowed.
Username	Enter the user name. You can enter up to 64 printable ASCII characters. Spaces are allowed.
Password	Enter the password associated with the user name above. You can enter up to 64 printable ASCII characters. Spaces are allowed.

Table 42 Network Setting > Broadband > Cellular APN > Edit APN

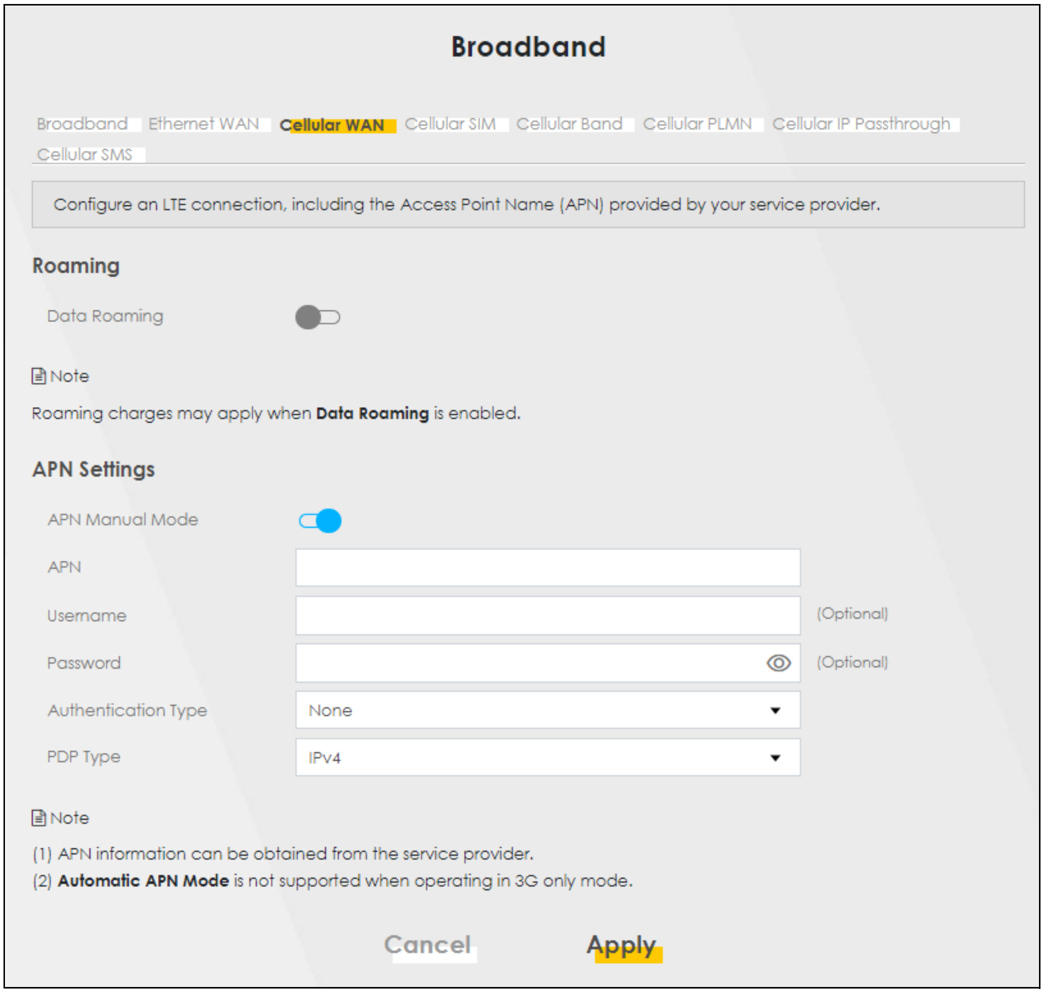
LABEL	DESCRIPTION
Authentication Type	Select the type of authentication method peers use to connect to the Zyxel Device in cellular connections. In Password Authentication Protocol (PAP) peers identify themselves with a user name and password. In Challenge Handshake Authentication Protocol (CHAP) additionally to user name and password the Zyxel Device sends regular challenges to make sure an intruder has not replaced a peer. Otherwise select PAP/CHAP or None.
PDP Type	Select IPv4 if you want the Zyxel Device to run IPv4 (Internet Protocol version 4 addressing system) only. Select IPv4/IPv6 if you want the Zyxel Device to run both IPv4 and IPv6 (Internet Protocol version 4 and 6 addressing system) at the same time.
IP Passthrough	Select IPv4 if your want the Zyxel Device to run IPv4 (Internet Protocol version 4 addressing system) only. Select IPv6 if you want the Zyxel Device to run IPv6 (Internet Protocol version 6 addressing system) only. Select IPv4/IPv6 if you want the Zyxel Device to run both IPv4 and IPv6 (Internet Protocol version 4 and 6 addressing system) at the same time.
Static Gateway Enable	Disable this to use static gateway. Otherwise, click this to enable ( ) to use the IP Passthough mode and enter the below fields. Note: This field will show upon enabling IP Passthrough in the previous field.
Static Gateway Address	This field is only available when you enable IP Passthrough. Note: Enter the IP address of the gateway to route traffic from the Zyxel Device local network to external networks. The Zyxel Device will use this IP address you configured.
Subnet Mask Prefix	Enter the subnet mask prefix of your gateway. A subnet mask prefix is another form to present a subnet mask. Convert a subnet mask address into binary. Count the "1"s in the subnet mask. "/" + the number of "1"s would be the subnet mask prefix. For example, the prefix of the subnet mask 255.255.255.0 is "/24". Note: This field will show upon enabling IP Passthrough in the previous field.
DHCP Lease Time	This field allows you to set the DHCP lease time. DHCP server leases an address to a new device for a period of time, called the DHCP lease time. Note: This field will show upon enabling IP Passthrough in the previous field.
OK	Click OK to save your changes.
Cancel	Click Cancel to return to the previous screen without saving.

7.6.2 Using Separate APNs for Data and Management Traffic

Multiple APN Access allows a cellular device to open data sessions with two or more APNs, and then send data through the APNs simultaneously. If your cellular service provider supports Multiple APN Access, the Zyxel Device can use this feature to segregate cellular traffic.

Follow the steps below to configure the Zyxel Device to use separate APNs for data and management traffic.

1 At Network Setting > Broadband > Cellular WAN, ensure that the Zyxel Device is connected to two data-enabled APNs. If your cellular service provider supports this feature, the Zyxel Device will connect to two APNs automatically.



Broadband

Configure an LTE connection, including the Access Point Name (APN) provided by your service provider.

Roaming

Data Roaming

Note

Roaming charges may apply when **Data Roaming** is enabled.

APN Settings

APN Manual Mode

APN

Username (Optional)

Password (Optional)

Authentication Type: None

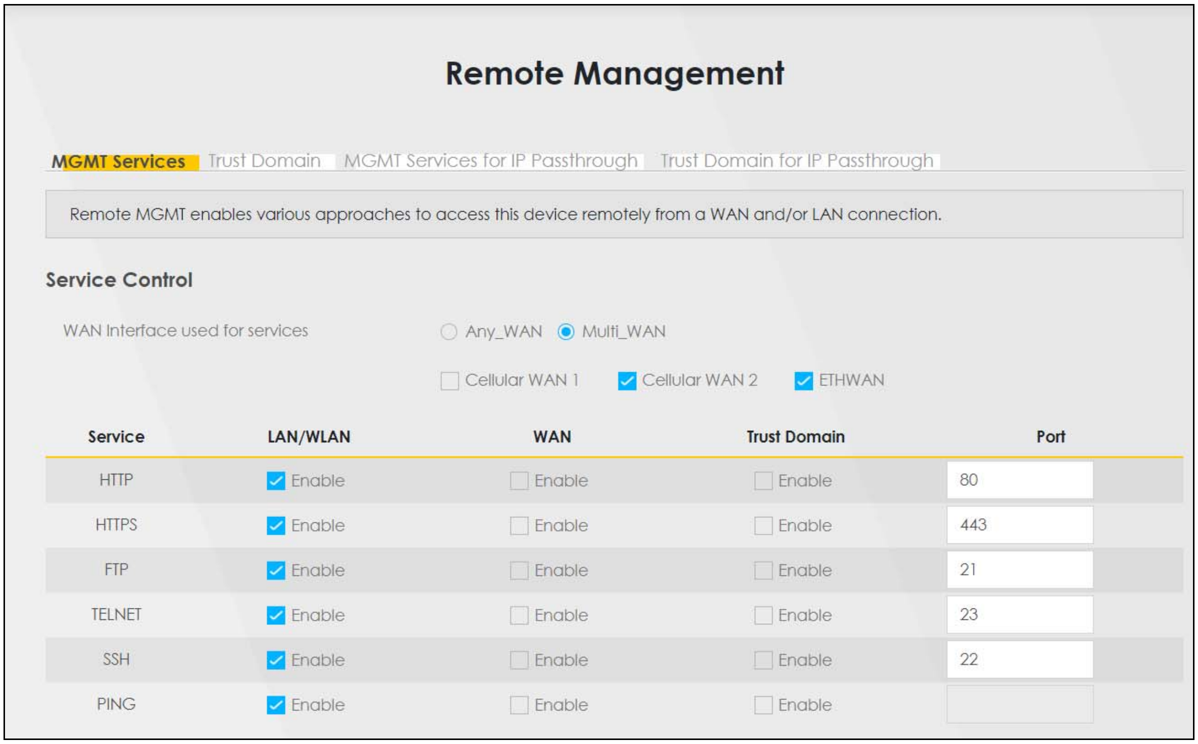
PDP Type: IPv4

Note

(1) APN information can be obtained from the service provider.

(2) **Automatic APN Mode** is not supported when operating in 3G only mode.

2 Go to Maintenance > Remote Management > MGMT Services. Set WAN Interface used for services to Multi_WAN, and then select Cellular WAN 2.



Remote Management

MGMT Services
Trust Domain
MGMT Services for IP Passthrough
Trust Domain for IP Passthrough

Remote MGMT enables various approaches to access this device remotely from a WAN and/or LAN connection.

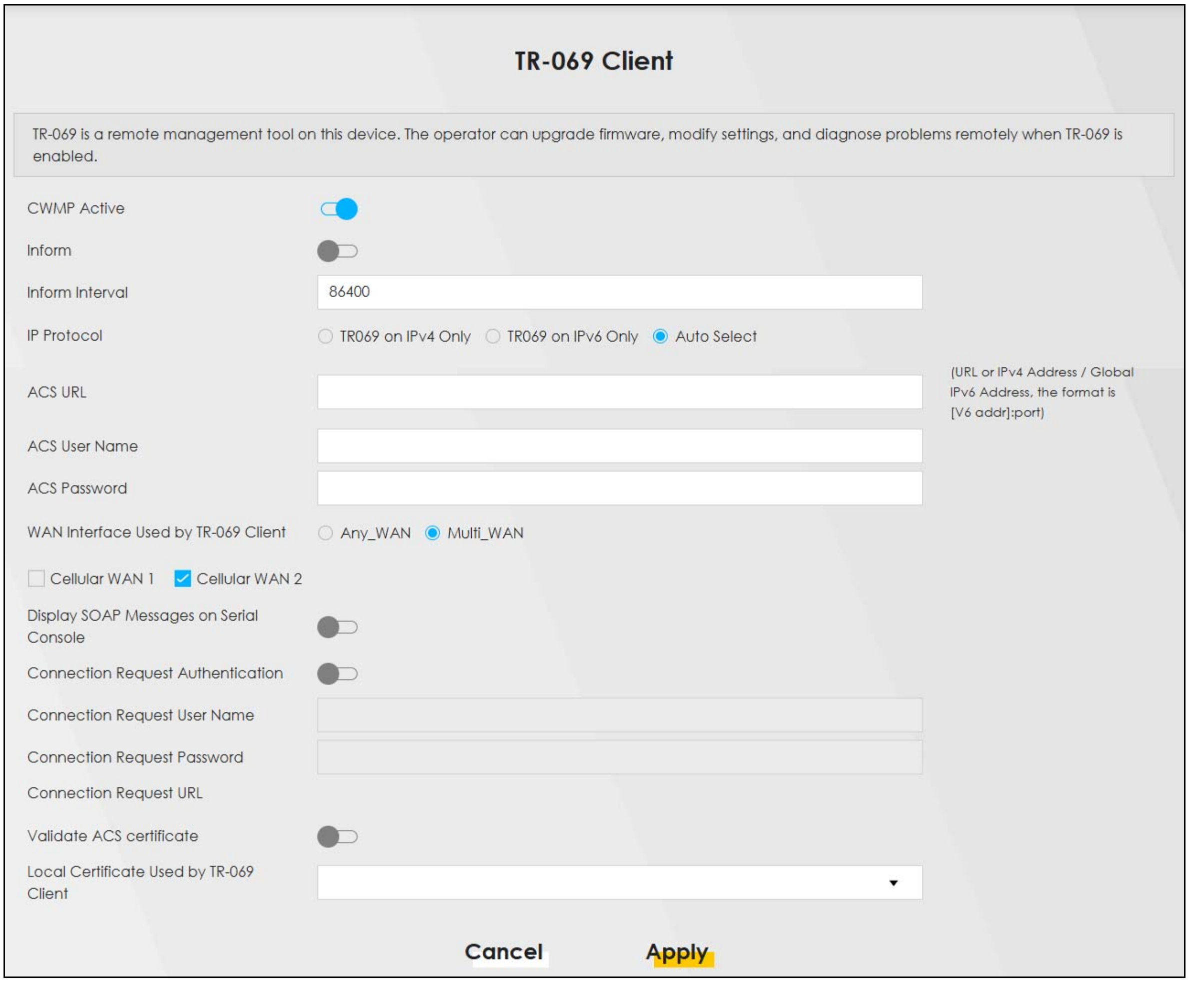
Service Control

WAN Interface used for services ○ Any_WAN ● Multi_WAN

□ Cellular WAN 1 ☑ Cellular WAN 2 ☑ ETHWAN

Service	LAN/WLAN	WAN	Trust Domain	Port
HTTP	☑ Enable	□ Enable	□ Enable	80
HTTPS	☑ Enable	□ Enable	□ Enable	443
FTP	☑ Enable	□ Enable	□ Enable	21
TELNET	☑ Enable	□ Enable	□ Enable	23
SSH	☑ Enable	□ Enable	□ Enable	22
PING	☑ Enable	□ Enable	□ Enable	

3 Go to Maintenance > TR-069 Client. Set WAN Interface used by TR-069 Client to Multi_WAN, and then select Cellular WAN 2.



TR-069 Client

TR-069 is a remote management tool on this device. The operator can upgrade firmware, modify settings, and diagnose problems remotely when TR-069 is enabled.

CWMP Active	● On
Inform	Off
Inform Interval	86400
IP Protocol	○ TR069 on IPv4 Only ○ TR069 on IPv6 Only ● Auto Select
ACS URL	(URL or IPv4 Address / Global IPv6 Address, the format is [V6 addr]:port)
ACS User Name	
ACS Password	
WAN Interface Used by TR-069 Client	○ Any_WAN ● Multi_WAN
□ Cellular WAN 1 ☑ Cellular WAN 2	
Display SOAP Messages on Serial Console	Off
Connection Request Authentication	Off
Connection Request User Name	
Connection Request Password	
Connection Request URL	
Validate ACS certificate	Off
Local Certificate Used by TR-069 Client	

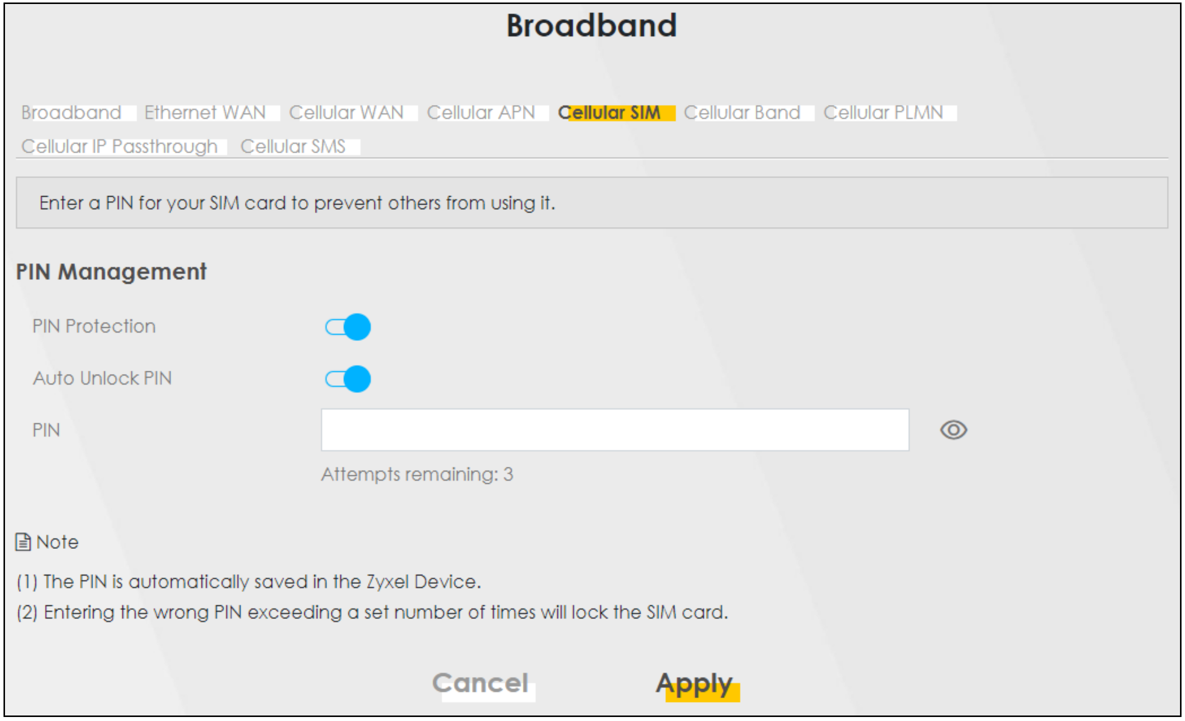
7.7 Cellular SIM Configuration

Use this screen to enter a PIN for your SIM card, in order to prevent others from using it.

Entering the wrong PIN code 3 consecutive times locks the SIM card, after which you need a PUK (Personal Unlocking Key) from the service provider to unlock it.

Click Network Setting > Broadband > Cellular SIM. The following screen opens.

Figure 86 Network Setting > Broadband > Cellular SIM



Broadband

Enter a PIN for your SIM card to prevent others from using it.

PIN Management

PIN Protection ●

Auto Unlock PIN ●

PIN

Attempts remaining: 3

Note

(1) The PIN is automatically saved in the Zyxel Device.

(2) Entering the wrong PIN exceeding a set number of times will lock the SIM card.

Note: The PIN is automatically saved in the Zyxel Device.
Entering the wrong PIN exceeding a set number of times will lock the SIM card.

The following table describes the fields in this screen.

Table 43 Network Setting > Broadband > Cellular SIM

LABEL	DESCRIPTION
PIN Management	
PIN Protection	A PIN (Personal Identification Number) code is a key to a SIM card. Without the PIN code, you cannot use the SIM card. Click to enable (●) if the service provider requires you to enter a PIN to use the SIM card. Click to disable if the service provider lets you use the SIM without inputting a PIN.
Auto Unlock PIN	If PIN Protection is enabled, the SIM card requires a PIN code to unlock the PIN lock. Slide the switch to the right to have the Zyxel Device automatically unlock the PIN lock. Otherwise, slide the switch to the left. You will need to manually enter the PIN every time you reboot the Zyxel Device or reinsert the SIM card to use the SIM card.
PIN Modification	
more...	Click the icon(^) to show fore fields in this section. Click the icon (˅) to hide them. Note: PIN Modification and its following fields will show upon enabling PIN Protection in the previous field.
New PIN	Enter a four-digital code to set as the new PIN code. Note: This field will show upon clicking the icon (^).
PIN	If you enabled PIN verification, enter the 4-digit PIN code (0000 for example) provided by your ISP. If you enter the PIN code incorrectly too many times, the ISP may block your SIM card and not let you use the account to access the Internet.

Table 43 Network Setting > Broadband > Cellular SIM (continued)

LABEL	DESCRIPTION
Attempts Remaining	This is how many more times you can try to enter the PIN code before the ISP blocks your SIM card. If your ISP locks your SIM card, you will need to request a PUK code from them to unlock it.
Apply	Click Apply to save your changes.
Cancel	Click Cancel to return to the previous screen without saving.

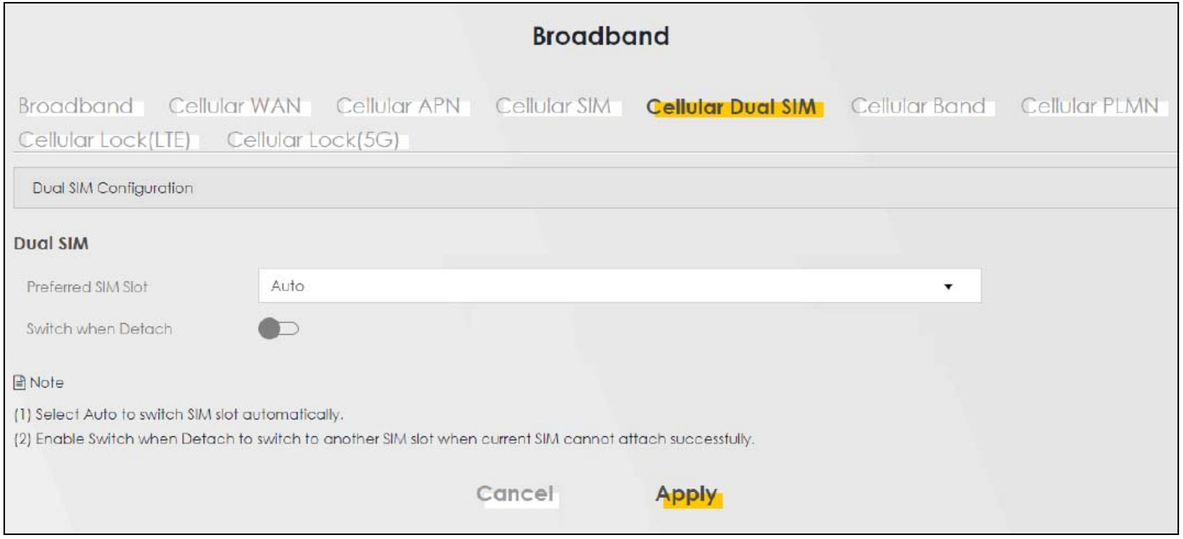
7.8 Cellular Dual SIM

Some Zyxel Devices support dual SIM card slots for cellular backup (failover) to ensure Internet connectivity. To see if your Zyxel Device supports Cellular Dual SIM, see Section 1.1.1 on page 18. Use this screen to set the main SIM card slot and configure cellular backup with dual SIM cards.

To enable cellular backup on the Zyxel Device, select Auto in the Preferred SIM Slot field and enable Switch when Detach.

Click Network Setting > Broadband > Cellular Dual SIM. The following screen opens.

Figure 87 Network Setting > Broadband > Cellular Dual SIM



Preferred SIM Slot: Auto

Switch when Detach: ○

Note

(1) Select Auto to switch SIM slot automatically.

(2) Enable Switch when Detach to switch to another SIM slot when current SIM cannot attach successfully.

The following table describes the fields in this screen.

Table 44 Network Setting > Broadband > Cellular Dual SIM

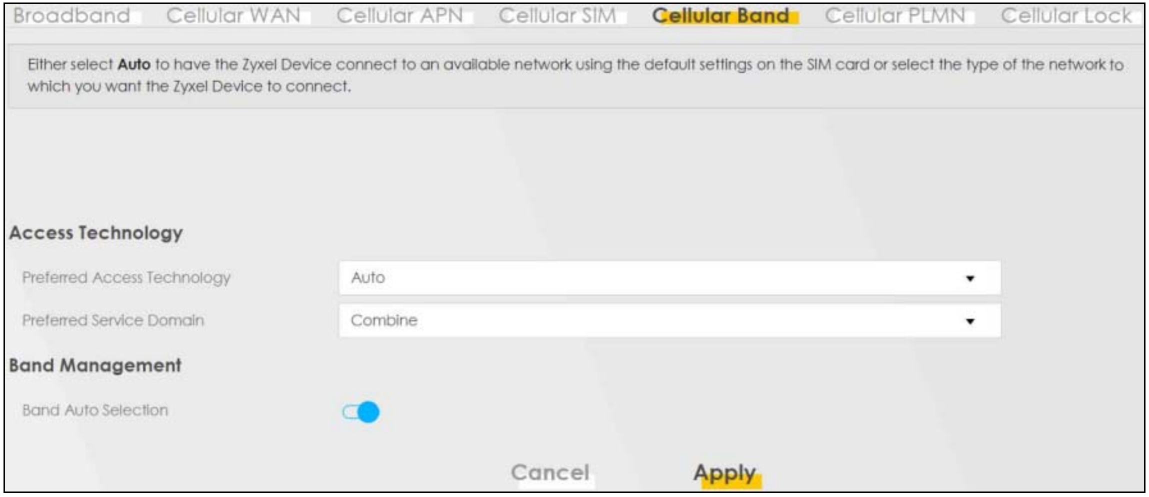
LABEL	DESCRIPTION
Dual SIM	
Preferred SIM Slot	To have the Zyxel Device automatically detect and choose the SIM card slot that has a SIM card inserted, select Auto. If both cards are inserted, the primary Internet connection uses SIM 1, and the cellular backup connection is SIM 2. To have the Zyxel Device only use the SIM card in slot 1, select SIM 1. There is no cellular backup. If the SIM card is in slot 2, then the Zyxel Device won't have Internet access. To have the Zyxel Device only use the SIM card in slot 2, select SIM 2. There is no cellular backup. If the SIM card is in slot 1, then the Zyxel Device won't have Internet access. If you change from SIM 1, SIM 2 to Auto, the Zyxel Device will choose the SIM card slot you previously selected if it has an inserted SIM card.
Switch and Detach	To enable cellular backup on the Zyxel Device, enable the switch (to the right).
Cancel	Click Cancel to return to the previous screen without saving.
Apply	Click Apply to save your changes.

7.9 Cellular Band Configuration

Either select Auto to have the Zyxel Device connect to an available network using the default settings on the SIM card or select the type of the network (NR5G, 4G, 3G) to which you want the Zyxel Device to connect.

Click Network Setting > Broadband > Cellular Band. The following screen opens.

Figure 88 Network Setting > Broadband > Cellular Band



Either select **Auto** to have the Zyxel Device connect to an available network using the default settings on the SIM card or select the type of the network to which you want the Zyxel Device to connect.

Access Technology

Preferred Access Technology: Auto

Preferred Service Domain: Combine

Band Management

Band Auto Selection: ●

The following table describes the fields in this screen.

Table 45 Network Setting > Broadband > Cellular Band

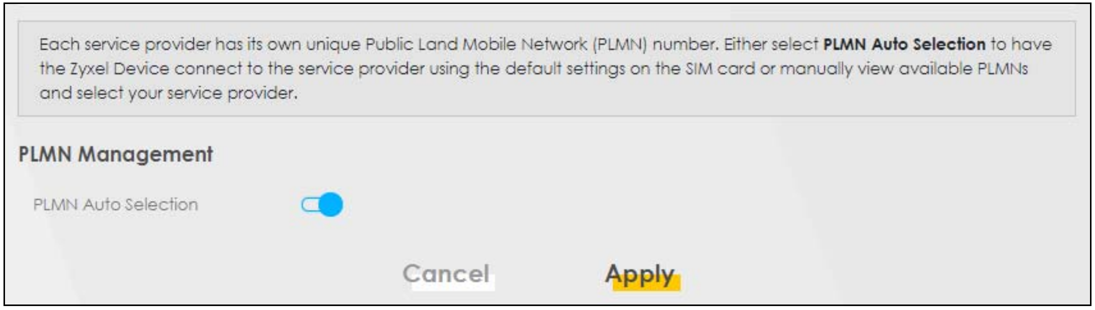
LABEL	DESCRIPTION
Access Technology	
Preferred Access Technology	Select the cellular mode your Zyxel Device supports to which you want the Zyxel Device to connect, and then click Apply to save your settings. Otherwise, select Auto Switch to have the Zyxel Device connect to an available network using the default settings on the SIM card. If the currently registered mobile network is not available or the mobile network's signal strength is too low, the Zyxel Device switches to another available mobile network.
Preferred Service Domain	Choose the service domain you want to use in the mobile network. The CS (Circuit Switching) domain handles voice calls. The PS (Packet Switching) domain handles data sessions. Choose Combine to use both PS and CS domain. Choose PS only to use only the PS domain.
Band Management	
Band Auto Selection	Click to enable (●) automatic frequency band selection for the Zyxel Device's cellular WAN connection as provided by the cellular service provider.
Apply	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

7.10 Cellular PLMN Configuration

Each service provider has its own unique Public Land Mobile Network (PLMN) number. Either select PLMN Auto Selection to have the Zyxel Device connect to the service provider using the default settings on the SIM card, or manually view available PLMNs and select your service provider.

Click Network Setting > Broadband > Cellular PLMN. The screen appears as shown next.

Figure 89 Network Setting > Broadband > Cellular PLMN



Each service provider has its own unique Public Land Mobile Network (PLMN) number. Either select **PLMN Auto Selection** to have the Zyxel Device connect to the service provider using the default settings on the SIM card or manually view available PLMNs and select your service provider.

PLMN Management

PLMN Auto Selection ●

The following table describes the labels in this screen.

Table 46 Network Setting > Broadband > Cellular PLMN

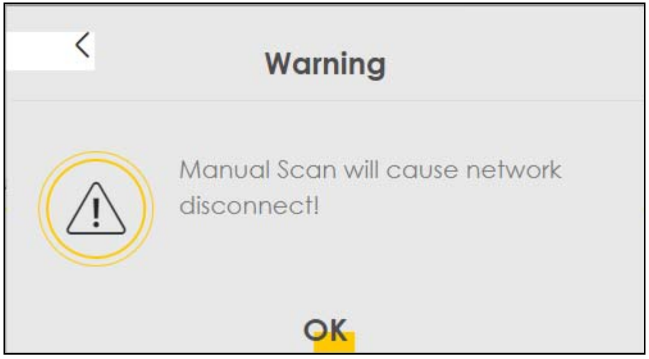
LABEL	DESCRIPTION
PLMN Management	
PLMN Auto Selection	Click to enable (●) and have the Zyxel Device automatically connect to the first available mobile network. Select disabled to display the network list and manually select a preferred network.

Table 46 Network Setting > Broadband > Cellular PLMN (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes back to the Zyxel Device.
Cancel	Click Cancel to exit this screen without saving.

After selecting to disable the following warning appears. Click OK to continue.

Figure 90 Network Setting > Broadband > Cellular PLMN > Manual Scan Warning

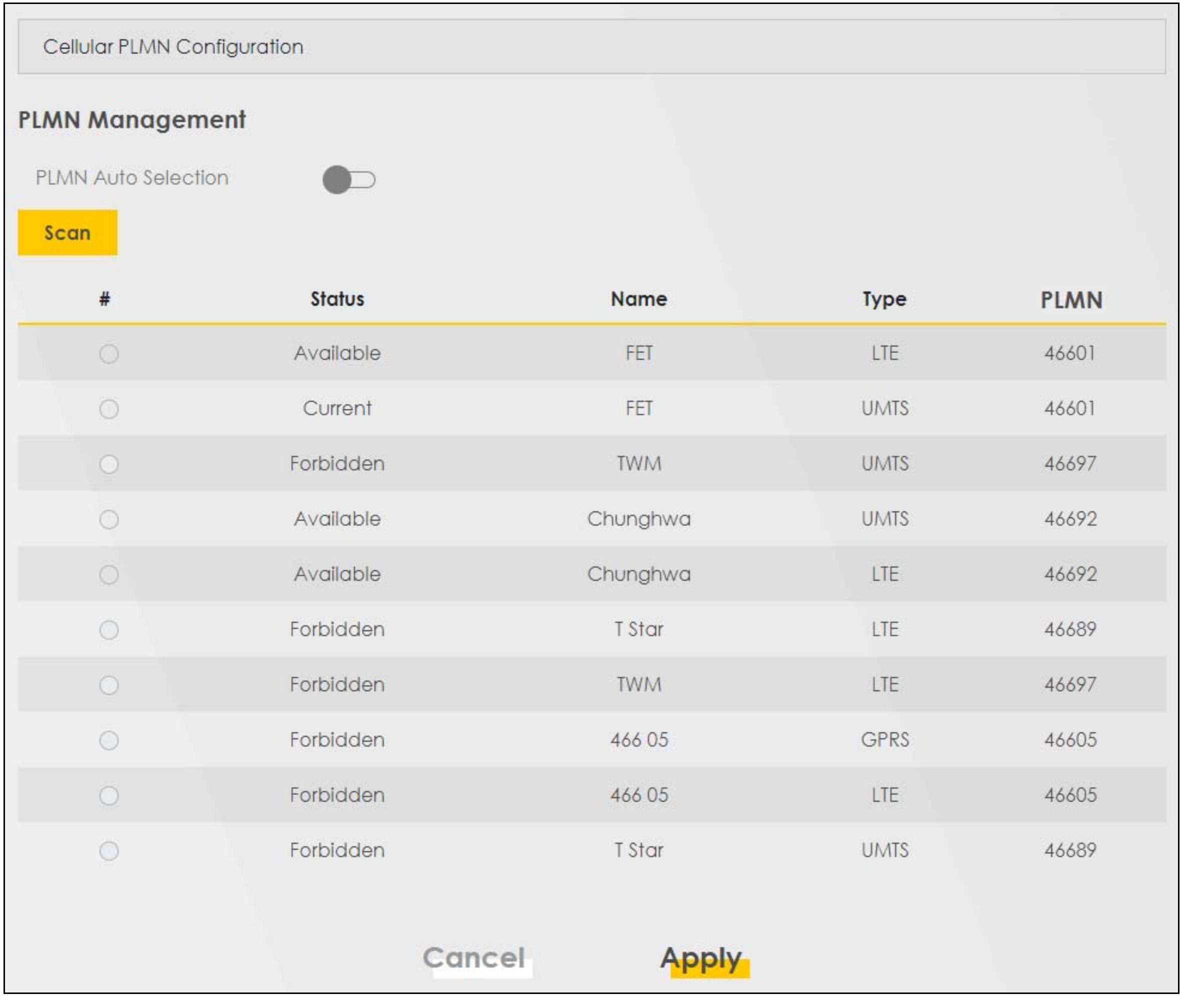


Warning

Manual Scan will cause network disconnect!

Click Scan to check for available PLMNs in the area surrounding the Zyxel Device, and then display them in the network list. Select from the network list and click Apply.

Figure 91 Network Setting > Broadband > Cellular PLMN > PLMN Management



Cellular PLMN Configuration

PLMN Management

PLMN Auto Selection

#	Status	Name	Type	PLMN
○	Available	FET	LTE	46601
○	Current	FET	UMTS	46601
○	Forbidden	TWM	UMTS	46697
○	Available	Chunghwa	UMTS	46692
○	Available	Chunghwa	LTE	46692
○	Forbidden	T Star	LTE	46689
○	Forbidden	TWM	LTE	46697
○	Forbidden	466 05	GPRS	46605
○	Forbidden	466 05	LTE	46605
○	Forbidden	T Star	UMTS	46689

The following table describes the labels in this screen.

Table 47 Network Setting > Broadband > Cellular PLMN > PLMN Management

LABEL	DESCRIPTION
#	Click the radio button so the Zyxel Device connects to this ISP.
Status	This shows Current to show the ISP the Zyxel Device is currently connected to. This shows Forbidden to indicate the Zyxel Device cannot connect to this ISP. This shows Available to indicate an available ISP your Zyxel Device can connect to.
Name	This shows the ISP name.
Type	This shows the type of network the ISP provides.
PLMN	This shows the PLMN number.
Apply	Click Apply to save your changes back to the Zyxel Device.
Cancel	Click Cancel to exit this screen without saving.

7.11 Cellular IP Passthrough

Enable IP Passthrough to allow Internet traffic to go to a LAN computer behind the Zyxel Device without going through NAT.

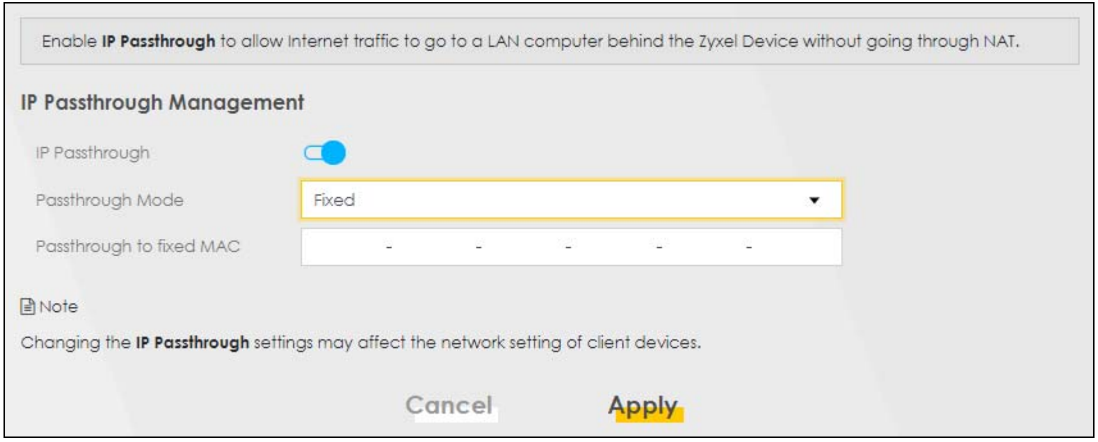
Click Network Setting > Broadband > Cellular IP Passthrough to display the following screen.

Note: This screen is not available when the fourth LAN port acts as an Ethernet WAN port.

Note: This screen is not available for models that support the IP Passthrough settings in the Network Setting > Broadband > Cellular APN > Edit screen.

Note: This screen is not available if Ethernet WAN is enabled at Network Setting > Broadband > Ethernet WAN > State.

Figure 92 Network Setting > Broadband > Cellular IP Passthrough



Enable **IP Passthrough** to allow Internet traffic to go to a LAN computer behind the Zyxel Device without going through NAT.

IP Passthrough Management

IP Passthrough: on

Passthrough Mode: Fixed

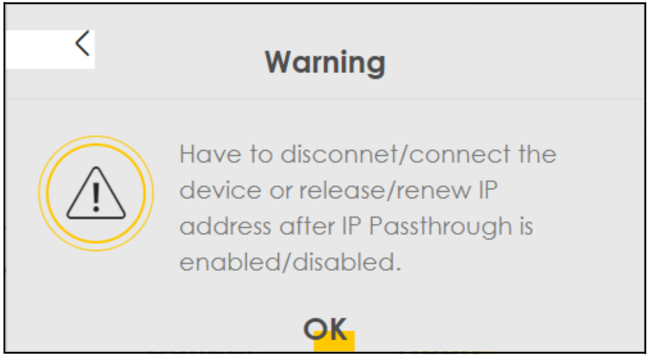
Passthrough to fixed MAC: - - - - -

Note

Changing the **IP Passthrough** settings may affect the network setting of client devices.

Note: Changing the IP Passthrough settings may affect the network setting of client devices. After selecting to enable the following warning appears. Click OK to continue.

Figure 93 Network Setting > Broadband > Cellular IP Passthrough > Enable Warning



Warning

Have to disconnet/connect the device or release/renew IP address after IP Passthrough is enabled/disabled.

The following table describes the fields in this screen.

Table 48 Network Setting > Broadband > Cellular IP Passthrough

LABEL	DESCRIPTION
IP Passthrough Management	
IP Passthrough	IP Passthrough allows a LAN computer on the local network of the Zyxel Device to have access to web services using the public IP address. When IP Passthrough is configured, all traffic is forwarded to the LAN computer and will not go through NAT.
Passthrough Mode	Select Dynamic to allow traffic to be forwarded to the first LAN computer on the local network of the Zyxel Device. Select Fixed to allow traffic to be forwarded to a specific computer (for example, Client A) by entering its MAC address. Note: This field will show after enabling IP Passthrough in the previous field.
Passthrough to fixed MAC	Enter the MAC address of a LAN computer on the local network of the Zyxel Device upon selecting Fixed in the previous field. Note: This field will show after selecting Fixed in the previous field.
Apply	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

7.12 Cellular Lock Overview

Cellular Lock (PCI Lock) locks the Zyxel Device to the base station that it is currently connected to. This is useful if the Zyxel Device is within range of multiple base stations, and you would prefer the Zyxel Device to connect to one base station over the others.

For Zyxel Devices using 4G LTE connections, identify the base station to lock to by Physical Cell ID.

For Zyxel Devices using 5G NR connections, identify the base station to lock to by Physical Cell ID and the frequency band.

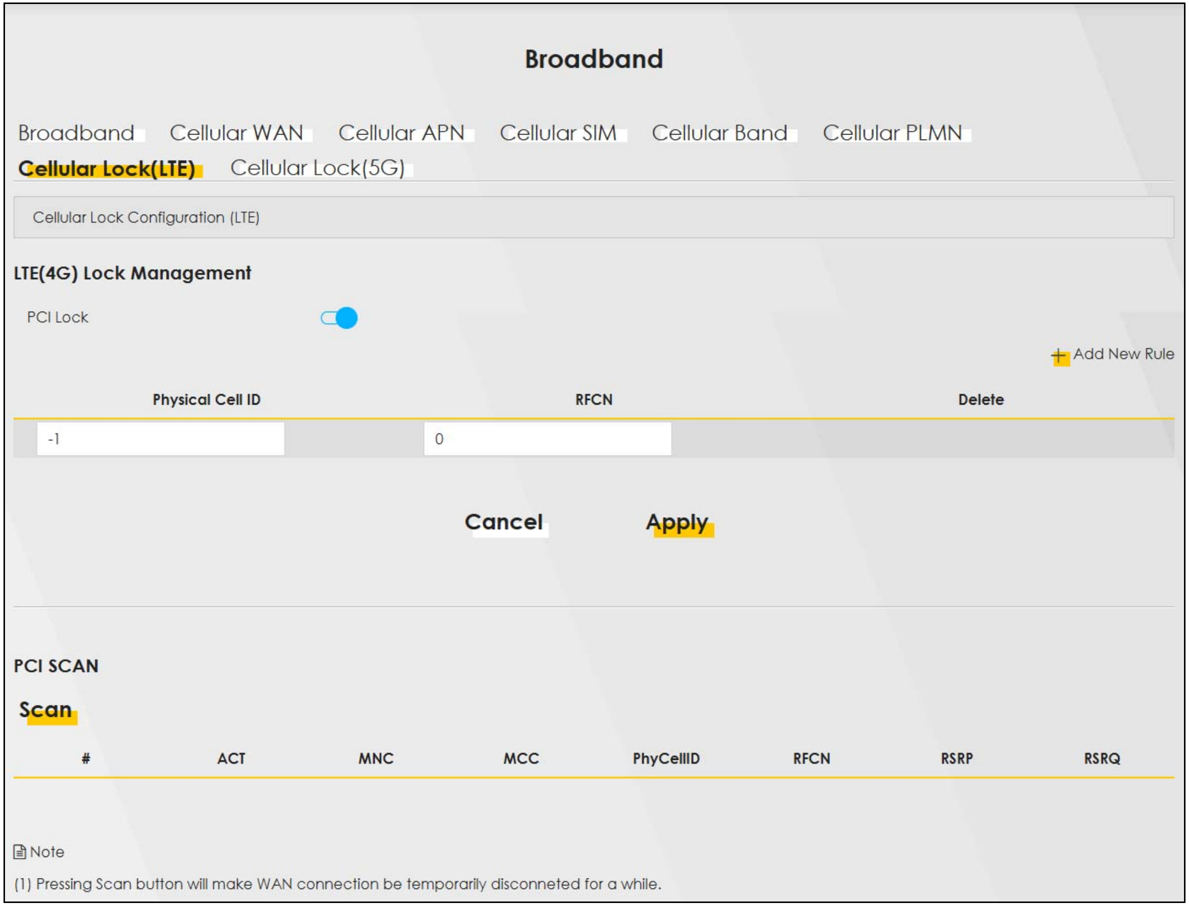
To see the currently connected base station’s Physical Cell ID and RFCN, go to Connection Status > Cellular Info and check the Service Information section.

7.12.1 Cellular Lock (LTE)

Use this screen to configure cellular lock on Zyxel Devices that use 4G LTE connections.

To lock a base station identified by its Physical Cell ID, go to Network Setting > Broadband > Cellular Lock (LTE).

Figure 94 Network Setting > Broadband > Cellular Lock (LTE)



Broadband

Cellular Lock Configuration (LTE)

LTE(4G) Lock Management

PCI Lock ●

Physical Cell ID	RFCN	Delete
-1	0	

PCI SCAN

#	ACT	MNC	MCC	PhyCellID	RFCN	RSRP	RSRQ

Note

(1) Pressing Scan button will make WAN connection be temporarily disconneted for a while.

The following table describes the fields in this screen.

Table 49 Network Setting > Broadband > Cellular Lock (LTE)

LABEL	DESCRIPTION
LTE(4G) Lock Management	
PCI Lock	Click the switch button (to the right) to enable PCI (Physical Cell Identifier) Lock on base stations when the Zyxel Device has 4G LTE connections. Physical Cell ID (PCI) is an identifier for a cell, namely a cellular base station. PCI and Radio Frequency Channel Number (RFCN) are combined to specify the base station.
Add New Rule	Click to add a new cellular lock rule.
Physical Cell ID	Enter the PCI number (0 – 504) of the base station to which you want the Zyxel Device to connect.
RFCN	Enter the RFCN (Radio Frequency Channel Number) for the LTE frequency of the specified PCI (1 – 65535).
Delete	Click the Delete icon to remove an entry.
Cancel	Click this to return to previous settings without saving.
Apply	Click this to save and apply your changes.

7.12.2 Cellular Lock (5G)

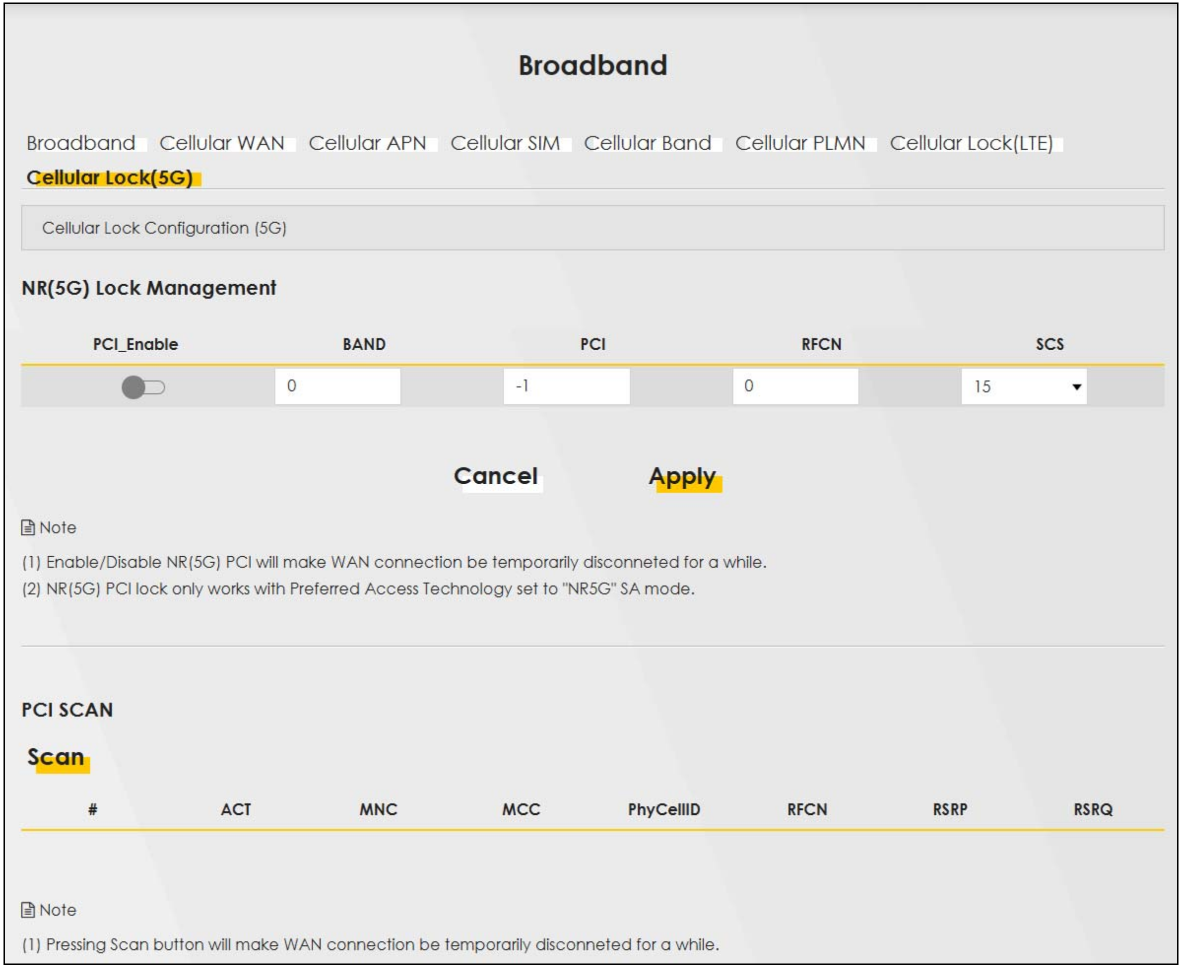
Use this screen to configure cellular lock on Zyxel Devices that use 5G NR connections.

To lock a base station identified by its Physical Cell ID and band, go to Network Setting > Broadband > Cellular Lock (5G).

Note: Enabling/Disabling Cellular Lock will make the WAN connection to be temporarily disconnected.

Note: 5G (NR) Cellular Lock only works when the Zyxel Device is using the NR5G-SA mode. Make sure the Preferred Access Technology on the Network Setting > Broadband > Cellular Band screen is set to NR5G-SA or NR5G-SA/NR5G-NSA/SG (Auto Switch).

Figure 95 Network Setting > Broadband > Cellular Lock (5G)



NR(5G) Lock Management

PCI_Enable	BAND	PCI	RFCN	SCS
	0	-1	0	15

Note

(1) Enable/Disable NR(5G) PCI will make WAN connection be temporarily disconneted for a while.

(2) NR(5G) PCI lock only works with Preferred Access Technology set to "NR5G" SA mode.

PCI SCAN

#	ACT	MNC	MCC	PhyCellID	RFCN	RSRP	RSRQ

Note

(1) Pressing Scan button will make WAN connection be temporarily disconneted for a while.

The following table describes the fields in this screen.

Table 50 Network Setting > Broadband > Cellular Lock (5G)

LABEL	DESCRIPTION
NR(5G) Lock Management	
PCI_Enable	Click the switch button (to the right) to enable PCI (Physical Cell Identifier) Lock on a base station when the Zyxel Device has a 5G NR connection.
Band	Enter the band number to which you choose to connect. Note: Make sure to select the same band in the Network Setting > Broadband > Cellular Band screen so as the Zyxel Device can connect to that band.

Table 50 Network Setting > Broadband > Cellular Lock (5G) (continued)

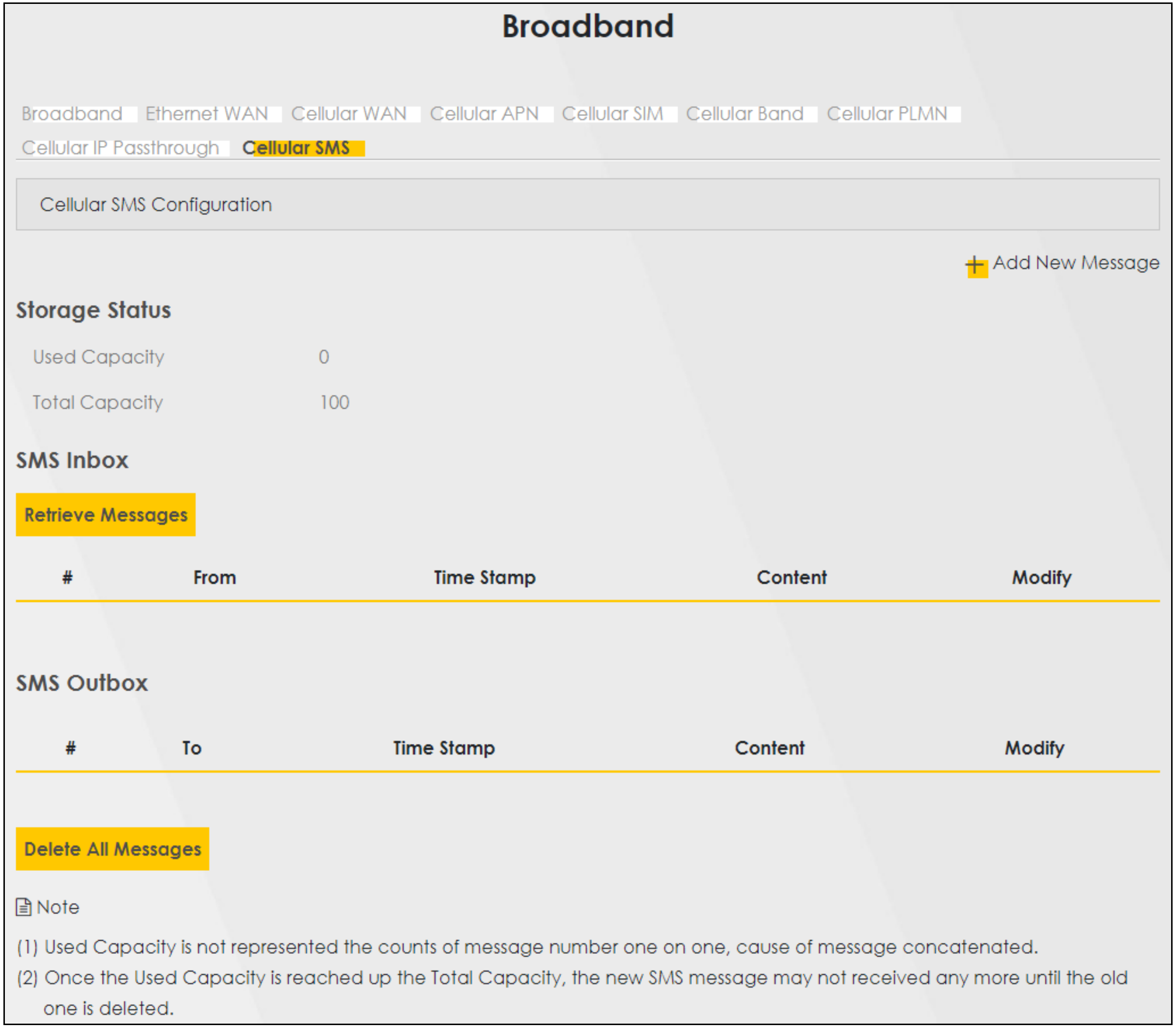
LABEL	DESCRIPTION
PCI	Use this to enter the PCI number of the base station you want the Zyxel Device to connect to (0 – 504).
RFCN	Enter the RFCN (Radio Frequency Channel Number) for the 5G NR frequency of the specified PCI (1 – 65535).
SCS	Select the Subcarrier Spacing (SCS) from the drop-down list. Subcarriers are small signal carriers that divide a frequency channel, which is the main carrier wave. Subcarrier spacing is the space between each subcarrier. At the time of writing, SCS ranges from 15-120 KHz.You should select the same SCS that is used by the ISP.
Cancel	Click this to exit this screen without saving.
Apply	Click this to save your changes.

7.13 Cellular SMS

Use this screen to send and receive SMS messages using the SIM card installed in the Zyxel Device.

Click Network Setting > Broadband > Cellular SMS. The following screen displays.

Figure 96   Network Setting > Broadband > Cellular SMS



Broadband

Cellular SMS Configuration

Storage Status

Used Capacity 0

Total Capacity 100

SMS Inbox

#	From	Time Stamp	Content	Modify

SMS Outbox

#	To	Time Stamp	Content	Modify

Note

(1) Used Capacity is not represented the counts of message number one on one, cause of message concatenated.

(2) Once the Used Capacity is reached up the Total Capacity, the new SMS message may not received any more until the old one is deleted.

The following table describes the fields in this screen.

Table 51   Network Setting > Broadband > Cellular SMS

LABEL	DESCRIPTION
Add New Message	Click this button to open the Send New Message screen and send an SMS message from the Zyxel Device.
Storage Status	
Used Capacity	This displays the used storage capacity of the Zyxel Device to receive SMS messages. Note: The Zyxel Device will stop receiving SMS messages when Used Capacity is the same as Total Capacity. To continue receiving SMS messages, delete old message(s) by clicking the delete icon in Modify, or click Delete All Messages.
Total Capacity	This displays 100. This is the maximum capacity to receive SMS messages on the Zyxel Device.
SMS Inbox	
SMS Inbox Enable	Click this to enable or disable the SMS Inbox. When enabled, the Zyxel Device can receive and display SMS messages.

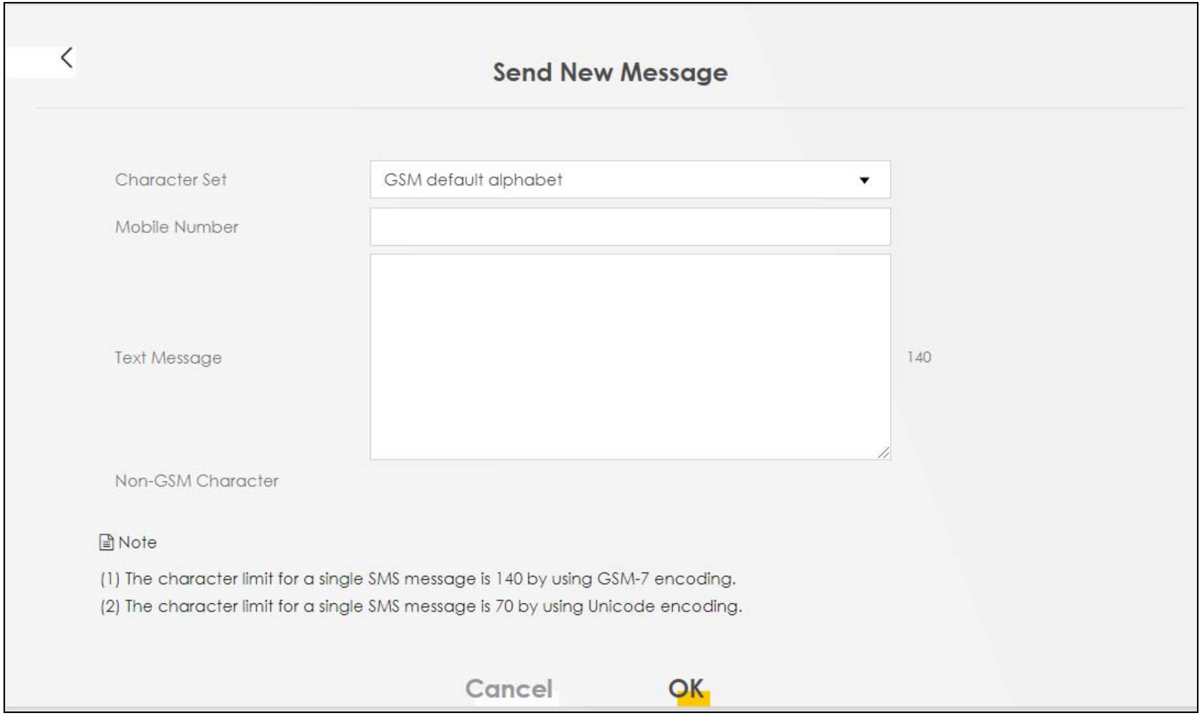
Table 51   Network Setting > Broadband > Cellular SMS (continued)

LABEL	DESCRIPTION
#	This displays the index number of the received message.
From	This displays the phone number that sent the message.
Time Stamp	This displays the time and date that the Zyxel Device received the message.
Content	This displays the content of the message.
Modify	This allows you to delete the message.

7.13.1 Send New Message Screen

Use this screen to send an SMS message from the Zyxel Device. Go to Network Setting > Broadband > Cellular SMS and click Add New Message to view this screen.

Figure 97   Network Setting > Broadband > Cellular SMS > Send New Message



Send New Message

Character Set: GSM default alphabet

Mobile Number

Text Message

Non-GSM Character

Note

(1) The character limit for a single SMS message is 140 by using GSM-7 encoding.

(2) The character limit for a single SMS message is 70 by using Unicode encoding.

The following table describes the fields in this screen.

Table 52   Network Setting > Broadband > Cellular SMS

LABEL	DESCRIPTION
Character Set	Select whether you want to send the SMS message using GSM-7 encoding or unicode. • GSM default alphabet: Use standard ASCII numbers, letters, and special characters. The maximum length of the message is 140 characters. • Unicode alphabet: Use any non-English Unicode characters. The maximum length of the message is 70 characters.
Mobile Number	Specify the cellphone number that you want to send the message to.
Text Message	Specify the content of the message.

Table 52   Network Setting > Broadband > Cellular SMS

LABEL	DESCRIPTION
OK	Click this button to send the message.
Cancel	Click this button to close the window without sending the message.

CHAPTER 8
Wireless

8.1 Wireless Overview

This chapter describes the Zyxel Device’s Network Setting > Wireless screens. Use these screens to set up your Zyxel Device’s Wi-Fi network and security settings.

8.1.1 What You Can Do in this Chapter

This section describes the Zyxel Device’s Wireless screens. Use these screens to set up your Zyxel Device’s Wi-Fi connection.

- Use the General screen to enable the Wireless LAN, enter the SSID and select the Wi-Fi security mode (Wireless General Settings)
- Use the Guest/More AP screen to set up multiple Wi-Fi networks on your Zyxel Device (Guest/More AP Screen).
- Use the MAC Authentication screen to allow or deny Wi-Fi clients based on their MAC addresses from connecting to the Zyxel Device (MAC Authentication).
- Use the WPS screen to enable or disable WPS, view or generate a security PIN (Personal Identification Number) (WPS).
- Use the WMM screen to enable Wi-Fi MultiMedia (WMM) to ensure quality of service in Wi-Fi networks for multimedia applications (WMM).
- Use the Others screen to configure Wi-Fi advanced features, such as the RTS/CTS Threshold (Others).
- Use the Channel Status screen to scan the number of accessing points and view the results (Channel Status).
- Use the WLAN Scheduler screen to create rules to schedule the times to permit Internet traffic from each wireless network interfaces (Section 8.9 on page 216).

8.1.2 What You Need to Know

Wi-Fi Standard / IEEE 802.11

IEEE 802.11 is a set of standards developed by the Institute of Electrical and Electronics Engineers (IEEE) for wireless local area networks (WLANs). These standards define how devices like laptops, smartphones, and routers communicate wirelessly using radio waves.

The following table displays the comparison of the different Wi-Fi standards.

Table 53 Wi-Fi Standards Comparison

WI-FI STANDARD	MAXIMUM LINK RATE *	BAND	SIMULTANEOUS CONNECTIONS
802.11b	11 Mbps	2.4 GHz	1
802.11a/g	54 Mbps	2.4 GHz and 5 GHz	1

Table 53 Wi-Fi Standards Comparison (continued)

WI-FI STANDARD	MAXIMUM LINK RATE *	BAND	SIMULTANEOUS CONNECTIONS
802.11n	600 Mbps	2.4 GHz and 5 GHz	1
802.11ac	6.93 Gbps	5 GHz	4
802.11ax	2.4 Gbps	2.4 GHz	128
	9.61 Gbps	5 GHz and 6 GHz	

Note: * The maximum link rate is for reference under ideal conditions only.

Wi-Fi 6 / IEEE 802.11ax

Wi-Fi 6 is backwards compatible with IEEE 802.11a/b/g/n/ac and is most suitable in areas with a high concentration of users. Wi-Fi 6 devices support Target Wakeup Time (TWT) allowing them to automatically power down when they are inactive.

Finding Out More

See Technical Reference for advanced technical information on Wi-Fi networks.

8.2 Wireless General Settings

Use this screen to enable the Wi-Fi, enter the SSID and select the Wi-Fi security mode. We recommend that you select More Secure to enable WPA3-SAE data encryption.

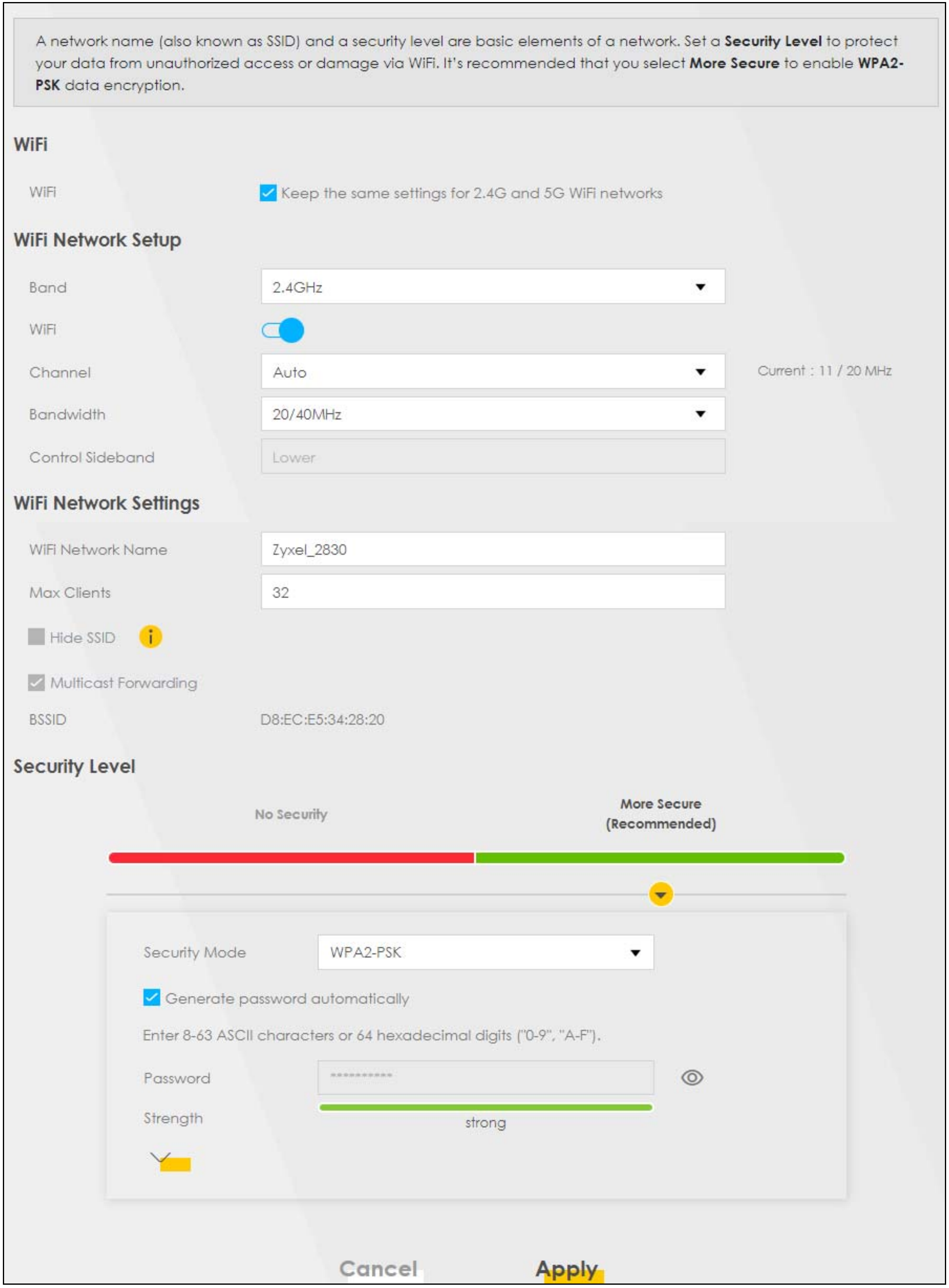
Note: If you are configuring the Zyxel Device from a computer connected by Wi-Fi and you change the Zyxel Device's SSID, channel or security settings, you will lose your Wi-Fi connection when you press Apply. You must change the Wi-Fi settings of your computer to match the new settings on the Zyxel Device.

Note: If upstream or downstream bandwidth is empty, the Zyxel Device sets the value automatically.

Note: Setting a maximum upstream or downstream bandwidth will significantly decrease wireless performance.

Click Network Setting > Wireless to open the General screen.

Figure 98 Network Setting > Wireless > General



A network name (also known as SSID) and a security level are basic elements of a network. Set a **Security Level** to protect your data from unauthorized access or damage via WiFi. It's recommended that you select **More Secure** to enable **WPA2-PSK** data encryption.

WiFi

WiFi ☑ Keep the same settings for 2.4G and 5G WiFi networks

WiFi Network Setup

Band	2.4GHz ▾	
WiFi	●	
Channel	Auto ▾	Current : 11 / 20 MHz
Bandwidth	20/40MHz ▾	
Control Sideband	Lower	

WiFi Network Settings

WiFi Network Name	Zyxel_2830
Max Clients	32

□ Hide SSID

☑ Multicast Forwarding

BSSID D8:EC:E5:34:28:20

Security Level

Security Mode WPA2-PSK ▾

☑ Generate password automatically

Enter 8-63 ASCII characters or 64 hexadecimal digits ("0-9", "A-F").

Password ***********

Strength strong

The following table describes the general Wi-Fi labels in this screen.

Table 54 Network Setting > Wireless > General

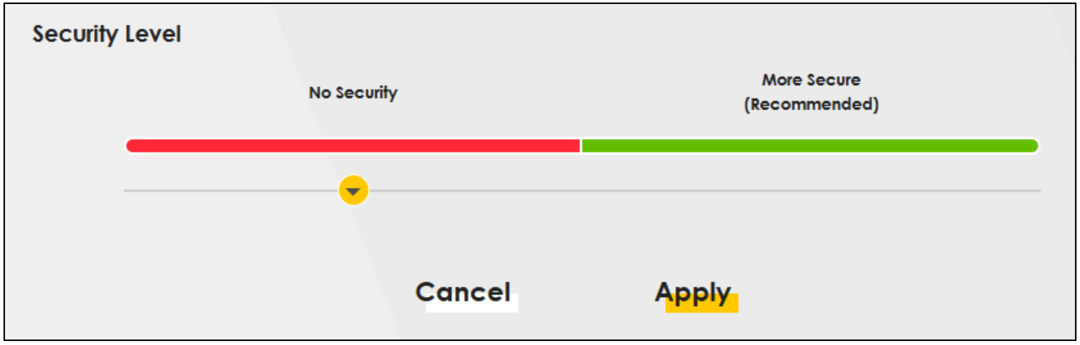
LABEL	DESCRIPTION
Wireless	
Wi-Fi	Select Keep the same settings for 2.4G and 5G Wi-Fi networks and the 2.4 GHz / 5 GHz Wi-Fi networks will use the same SSID and Wi-Fi security settings.
Band	This shows the Wi-Fi band which this radio profile is using. 2.4GHz is the frequency used by IEEE 802.11b/g/n/ax Wi-Fi clients, 5GHz is used by IEEE 802.11a/n/ac/ax Wi-Fi clients.
Wireless or Wi-Fi	Click this switch to enable or disable Wi-Fi network in this field. When the switch turns blue, the function is enabled. Otherwise, it is not. This label displays Wireless or Wi-Fi, depending on the Zyxel Device model.
Channel	Select a channel from the drop-down list box. The options vary depending on the frequency band and the country you are in. Use Auto to have the Zyxel Device automatically determine a channel to use.
Bandwidth	A standard 20 MHz channel offers transfer speeds of up to 150 Mbps whereas a 40 MHz channel uses two standard channels and offers speeds of up to 300 Mbps. 40 MHz (channel bonding or dual channel) bonds two adjacent radio channels to increase throughput. The Wi-Fi clients must also support 40 MHz. It is often better to use the 20 MHz setting in a location where the environment hinders the Wi-Fi signal. An 80 MHz channel groups adjacent 40 MHz channels into pairs to increase bandwidth even higher. Select 20MHz if you want to lessen radio interference with other wireless devices in your neighborhood or the Wi-Fi clients do not support channel bonding. Not all Zyxel Devices support all channels. The Zyxel Device will choose the best bandwidth available automatically depending on the radio you chose and network conditions.
Control Sideband	This is available for some regions when you select a specific channel and set the Bandwidth field to 40MHz or 20/40MHz. Set whether the control channel (set in the Channel field) should be in the Lower or Upper range of channel bands.
Max. Upstream Bandwidth	Max. Upstream Bandwidth allows you to specify the maximum rate for upstream wireless traffic to the WAN from this wireless LAN in kilobits per second (Kbps).
Max. Downstream Bandwidth	Max. Downstream Bandwidth allows you to specify the maximum rate for downstream wireless traffic to this wireless LAN from the WAN in kilobits per second (Kbps).

8.2.1 No Security

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

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

Figure 99 Wireless > General: No Security



The following table describes the labels in this screen.

Table 55 Wireless > General: No Security

LABEL	DESCRIPTION
Security Level	Choose No Security to allow all Wi-Fi connections without data encryption or authentication.

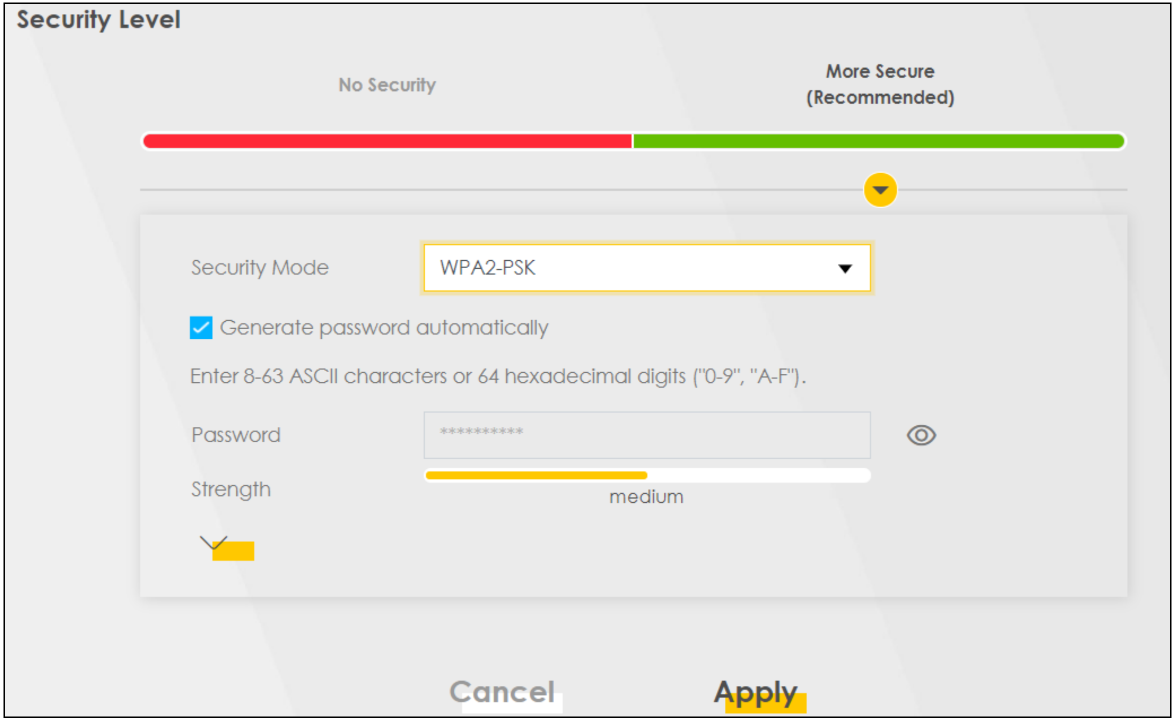
8.2.2 More Secure (Recommended)

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

The WPA3-SAE (Simultaneous Authentication of Equals handshake) security mode protects against dictionary attacks (password guessing attempts). It improves security by requiring a new encryption key every time a WPA3 connection is made. A handshake is the communication between the Zyxel Device and a connecting client at the beginning of a Wi-Fi session.

Click Network Setting > Wireless to display the General screen. Select More Secure as the security level. WPA2-PSK is the default Security Mode.

Figure 100 Wireless > General: More Secure: WPA2-PSK



Security Level

Security Mode: WPA2-PSK

☑ Generate password automatically

Enter 8-63 ASCII characters or 64 hexadecimal digits ("0-9", "A-F").

Password: ***********

Strength: medium

The following table describes the labels in this screen.

Table 56 Wireless > General: More Secure: WPA2-PSK

LABEL	DESCRIPTION
Security Level	Select More Secure to enable data encryption.
Security Mode	Select a security mode from the drop-down list box.
Generate password automatically	Select this option to have the Zyxel Device automatically generate a password. The password field will not be configurable when you select this option.
Password	Select Generate password automatically or enter a Password. The password has two uses. 1. Manual. Manually enter the same password on the Zyxel Device and the client. You can use 8 – 63 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces. 2. WPS. When using WPS, the Zyxel Device sends this password to the client. Note: More than 63 hexadecimal characters are not accepted for WPS. 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.
Click this to show more fields in this section. Click this to hide them.	
Encryption	AES is the default data encryption type, which uses a 128-bit key.
Timer	This is the rate at which the RADIUS server sends a new group key out to all clients. The valid range is 0 to 2,147,483,647 seconds. When the timer is set to "0", it means the same encryption key will be used indefinitely until the session ends.

8.3 Guest/More AP Screen

Use this screen to configure a guest Wi-Fi network that allows access to the Internet through the Zyxel Device. You can use one access point to provide several BSSs simultaneously. You can then assign varying security types to different SSIDs. Wi-Fi clients can use different SSIDs to associate with the same access point.

A Home Guest (H) can access the Internet and other Home Guest (H) Wi-Fi clients on the same Wi-Fi network. They cannot communicate with wired devices connected to the Zyxel Device’s LAN.

An External Guest (E) can access the Internet only. They cannot access other clients on the same Wi-Fi network nor any wired connections from the Zyxel Device.

Click Network Setting > Wireless to display the General screen. Select More Secure as the security level. WPA2-PSK is the default Security Mode.

Click Network Setting > Wireless > Guest/More AP.

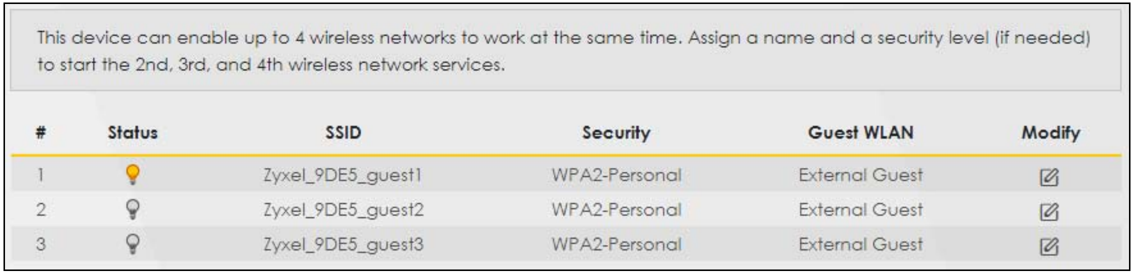
The following table introduces the supported Wi-Fi networks.

Table 57 Supported Wi-Fi Networks

WI-FI NETWORKS	WHERE TO CONFIGURE
Main/1	Network Setting > Wireless > General screen
Guest/3	Network Setting > Wireless > More AP screen

The following screen displays.

Figure 101 Network Setting > Wireless > Guest/More AP



This device can enable up to 4 wireless networks to work at the same time. Assign a name and a security level (if needed) to start the 2nd, 3rd, and 4th wireless network services.

#	Status	SSID	Security	Guest WLAN	Modify
1	💡	Zyxel_9DE5_guest1	WPA2-Personal	External Guest	✎
2	💡	Zyxel_9DE5_guest2	WPA2-Personal	External Guest	✎
3	💡	Zyxel_9DE5_guest3	WPA2-Personal	External Guest	✎

The following table describes the labels in this screen.

Table 58 Network Setting > Wireless > Guest/More AP

LABEL	DESCRIPTION
#	This is the index number of the entry.
Status	This field indicates whether this SSID is active. A yellow bulb signifies that this SSID is active, while a gray bulb signifies that this SSID is not active.
SSID	An SSID profile is the set of parameters relating to one of the Zyxel Device’s BSSs. The SSID (Service Set IDentifier) identifies the Service Set with which a wireless device is associated. This field displays the name of the Wi-Fi profile on the network. When a Wi-Fi client scans for an AP to associate with, this is the name that is broadcast and seen in the Wi-Fi client utility.
Security	This field indicates the security mode of the SSID profile.

Table 58 Network Setting > Wireless > Guest/More AP (continued)

LABEL	DESCRIPTION
Guest WLAN	This displays if the guest WLAN function has been enabled for this WLAN. A Home Guest can access the Internet and other Home Guest Wi-Fi clients on the same Wi-Fi network. They cannot communicate with wired devices connected to the Zyxel Device's LAN. An External Guest can access the Internet only. They cannot access other clients on the same Wi-Fi network nor any wired connections from the Zyxel Device. N/A displays if guest WLAN is disabled.
Modify	Click the Edit icon of an SSID profile to configure the SSID profile.

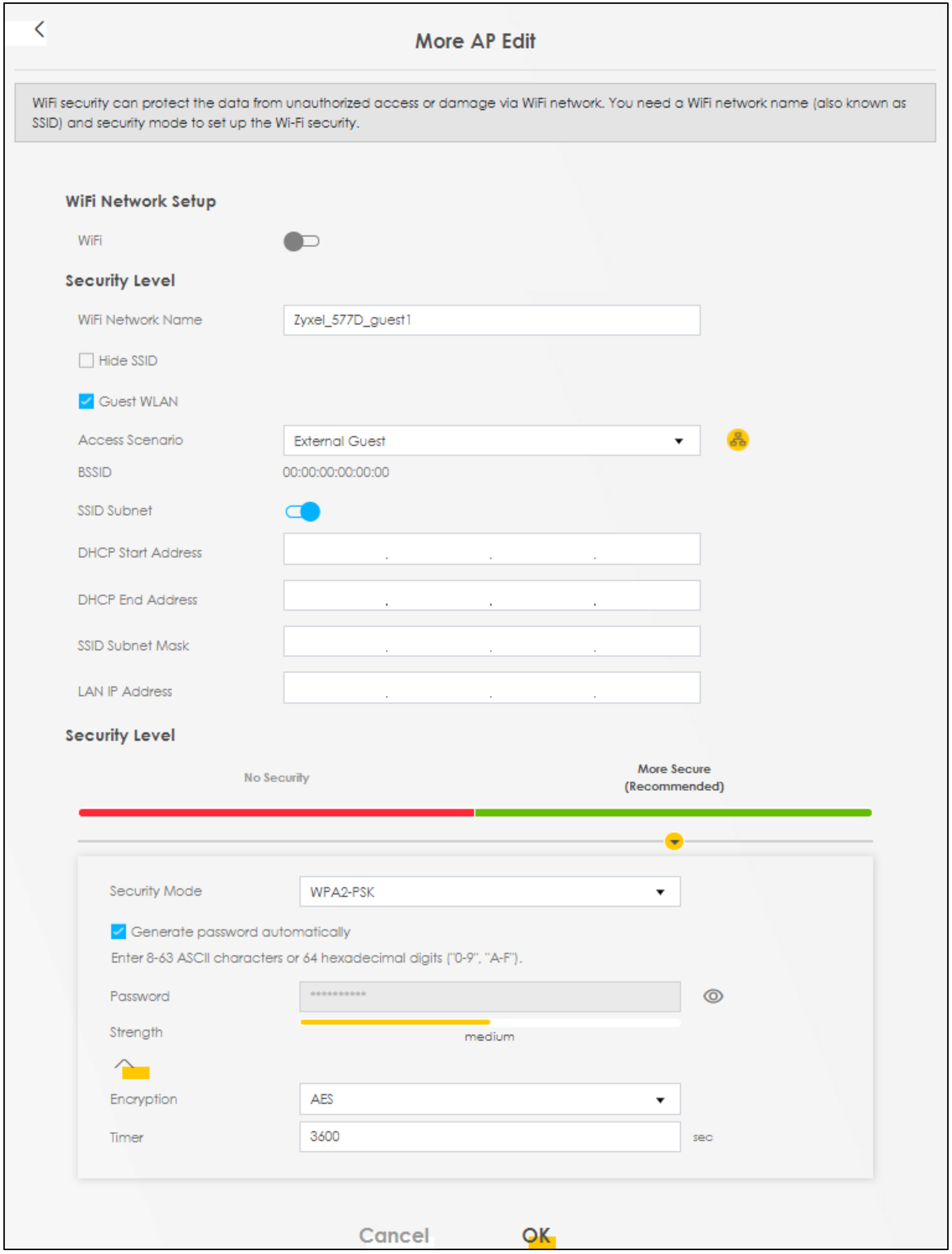
8.3.1 The Edit More AP Screen

Use this screen to create Guest and additional Wi-Fi networks with different security settings.

Note: If upstream/downstream bandwidth is empty, the Zyxel Device sets the value automatically. Setting a maximum upstream/downstream bandwidth will significantly decrease Wi-Fi performance.

Click the Edit icon next to an SSID in the Guest/More AP screen. The following screen displays.

Figure 102   Network Setting > Wireless > More AP > Edit



WiFi security can protect the data from unauthorized access or damage via WiFi network. You need a WiFi network name (also known as SSID) and security mode to set up the Wi-Fi security.

WiFi Network Setup

WiFi

Security Level

WiFi Network Name: Zyxel_577D_guest1

□ Hide SSID

☑ Guest WLAN

Access Scenario: External Guest

BSSID: 00:00:00:00:00:00

SSID Subnet

DHCP Start Address

DHCP End Address

SSID Subnet Mask

LAN IP Address

Security Level

Security Mode: WPA2-PSK

☑ Generate password automatically

Enter 8-63 ASCII characters or 64 hexadecimal digits ("0-9", "A-F").

Password: **********

Strength: medium

Encryption: AES

Timer: 3600 sec

The following table describes the fields in this screen.

Table 59   Network Setting > Wireless > Guest/More AP > Edit

LABEL	DESCRIPTION
Wi-Fi or Wireless Network Setup	
Wi-Fi or Wireless	Click this switch to enable or disable the Wi-Fi in this field. When the switch turns blue ●, the function is enabled; otherwise, it is not.
Wi-Fi or Wireless Network Settings	

Table 59 Network Setting > Wireless > Guest/More AP > Edit (continued)

LABEL	DESCRIPTION
Wi-Fi or Wireless Network Name	The SSID (Service Set Identifier) identifies the service set with which a wireless device is associated. Wireless devices associating to the access point (AP) must have the same SSID. Enter a descriptive name for the Wi-Fi. You can use up to 32 printable characters, including spaces.
Hide SSID	Select this checkbox to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.
Guest WLAN	Select this to create Guest WLANs for home and external clients. Select the WLAN type in the Access Scenario field.
Access Scenario	Select Home Guest or External Guest to provide different levels of access to the Zyxel Device and the other Wi-Fi clients. A Home Guest can access the Internet and other Home Guest Wi-Fi clients on the same Wi-Fi network. They cannot communicate with wired devices connected to the Zyxel Device's LAN. An External Guest can access the Internet only. They cannot access other clients on the same Wi-Fi network nor any wired connections from the Zyxel Device.
Max. Upstream Bandwidth	Specify the maximum rate for upstream wireless traffic to the WAN from this WLAN in kilobits per second (Kbps).
Max. Downstream Bandwidth	Specify the maximum rate for downstream wireless traffic to this WLAN from the WAN in kilobits per second (Kbps).
BSSID	This shows the MAC address of the Wi-Fi interface on the Zyxel Device when Wi-Fi is enabled.
SSID Subnet	Click on this switch to Enable this function if you want the wireless network interface to assign DHCP IP addresses to the associated Wi-Fi clients. This option cannot be used if Keep 2.4G and 5G wireless network name the same is enabled in Network > Wireless > General.
DHCP Start Address	Specify the first of the contiguous addresses in the DHCP IP address pool. The Zyxel Device assigns IP addresses from this DHCP pool to Wi-Fi clients connecting to the SSID.
DHCP End Address	Specify the last of the contiguous addresses in the DHCP IP address pool.
SSID Subnet Mask	Specify the subnet mask of the Zyxel Device for the SSID subnet.
LAN IP Address	Specify the IP address of the Zyxel Device for the SSID subnet.
Security Level	
Security Mode	Select More Secure (Recommended) to add security on this Wi-Fi network. The Wi-Fi clients which want to associate to this network must have the same Wi-Fi security settings as the Zyxel Device. After you select to use a security, additional options appears in this screen. Or you can select No Security to allow any client to associate this network without any data encryption or authentication. See No Security for more details about this field.

Table 59 Network Setting > Wireless > Guest/More AP > Edit (continued)

LABEL	DESCRIPTION
Protected Management Frames	This option is only available when using WPA2-PSK as the Security Mode and AES Encryption in Network Setting > Wireless > General. Management frame protection (MFP) helps prevent Wi-Fi DoS (Denial of Service) attacks. Select Disable if you do not want to use MFP. Select Capable to encrypt management frames of Wi-Fi clients that support MFP. Clients that do not support MFP will still be allowed to join the Wi-Fi network, but remain unprotected. Select Required to allow only clients that support MFP to join the Wi-Fi network. When Mesh is enabled, the settings of Protected Management Frames of 5G will follow 2.4G.
Generate password automatically	Select this option to have the Zyxel Device automatically generate a password. The password field will not be configurable when you select this option.
Password	WPA2-PSK uses a simple common password, instead of user-specific credentials. 1. If you did not select Generate password automatically, you can manually enter a pre-shared key at least 8 characters long, including one uppercase letter, one lowercase letter, one number, and one special character. Click the Eye icon to show or hide the password of your Wi-Fi network. When the Eye icon is slashed , you will see the password in plain text. Otherwise, it is hidden.
Strength	This displays the current password strength – weak, medium, strong.
Click this to show more fields in this section. Click again to hide them.	
Encryption	AES is the default data encryption type, which uses a 128-bit key.
Timer	The Timer is the rate at which the RADIUS server sends a new group key out to all clients. The valid range is 0 to 2,147,483,647 seconds. When the timer is set to “0”, it means the same encryption key will be used indefinitely until the session ends.
Cancel	Click Cancel to exit this screen without saving.
OK	Click OK to save your changes.

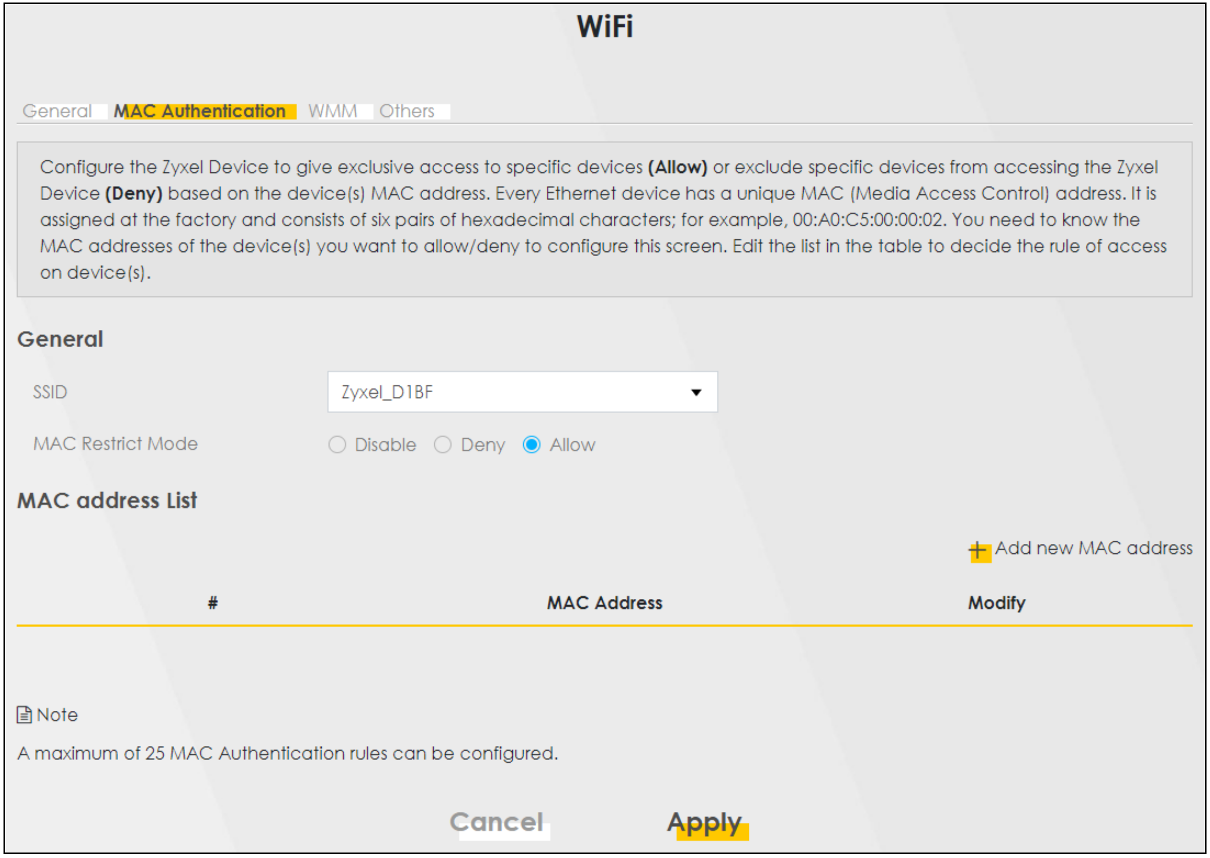
8.4 MAC Authentication

Use this screen to give exclusive access to specific connected devices (Allow) or exclude specific devices from accessing the Zyxel Device (Deny), based on the MAC address of each connected device. Every Ethernet device has a unique factory-assigned MAC (Media Access Control) address, which consists of six pairs of hexadecimal characters, for example: 00:A0:C5:00:00:02. You need to know the MAC addresses of the connected device you want to allow/deny to configure this screen.

Note: You can have up to 25 MAC authentication rules.

Use this screen to view your Zyxel Device’s MAC filter settings and add new MAC filter rules. Click Network Setting > Wireless > MAC Authentication. The screen appears as shown.

Figure 103 Network Setting > Wireless > MAC Authentication



WiFi

Configure the Zyxel Device to give exclusive access to specific devices **(Allow)** or exclude specific devices from accessing the Zyxel Device **(Deny)** based on the device(s) MAC address. Every Ethernet device has a unique MAC (Media Access Control) address. It is assigned at the factory and consists of six pairs of hexadecimal characters; for example, 00:A0:C5:00:00:02. You need to know the MAC addresses of the device(s) you want to allow/deny to configure this screen. Edit the list in the table to decide the rule of access on device(s).

General

SSID: Zyxel_D1BF

MAC Restrict Mode: ○ Disable ○ Deny ● Allow

MAC address List

#	MAC Address	Modify

Note

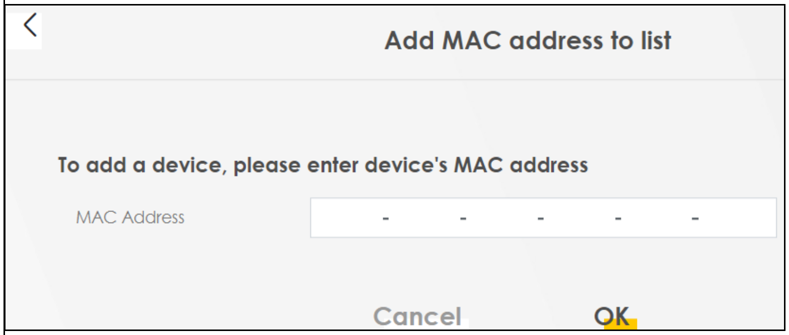
A maximum of 25 MAC Authentication rules can be configured.

The following table describes the labels in this screen.

Table 60 Network Setting > Wireless > MAC Authentication

LABEL	DESCRIPTION
General	
SSID	Select the SSID for which you want to configure MAC filter settings.
MAC Restrict Mode	Define the filter action for the list of MAC addresses in the MAC Address table. Select Disable to turn off MAC filtering. Select Deny to block access to the Zyxel Device. MAC addresses not listed will be allowed to access the Zyxel Device. Select Allow to permit access to the Zyxel Device. MAC addresses not listed will be denied access to the Zyxel Device.
MAC address List	

Table 60   Network Setting > Wireless > MAC Authentication (continued)

LABEL	DESCRIPTION
Add new MAC address	This field is available when you select Deny or Allow in the MAC Restrict Mode field. Click this if you want to add a new MAC address entry to the MAC filter list below. Enter the MAC addresses of the Wi-Fi devices that are allowed or denied access to the Zyxel Device in these address fields. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.  Add MAC address to list To add a device, please enter device's MAC address
#	This is the index number of the entry.
MAC Address	This is the MAC addresses of the devices that are allowed or denied access to the Zyxel Device.
Modify	Click the Edit icon and type the MAC address of the peer device in a valid MAC address format (six hexadecimal character pairs, for example 12:34:56:78:9a:bc). Click the Delete icon to delete the entry.
Cancel	Click Cancel to exit this screen without saving.
Apply	Click Apply to save your changes.

8.5 WPS

Use this screen to configure Wi-Fi Protected Setup (WPS) on your Zyxel Device.

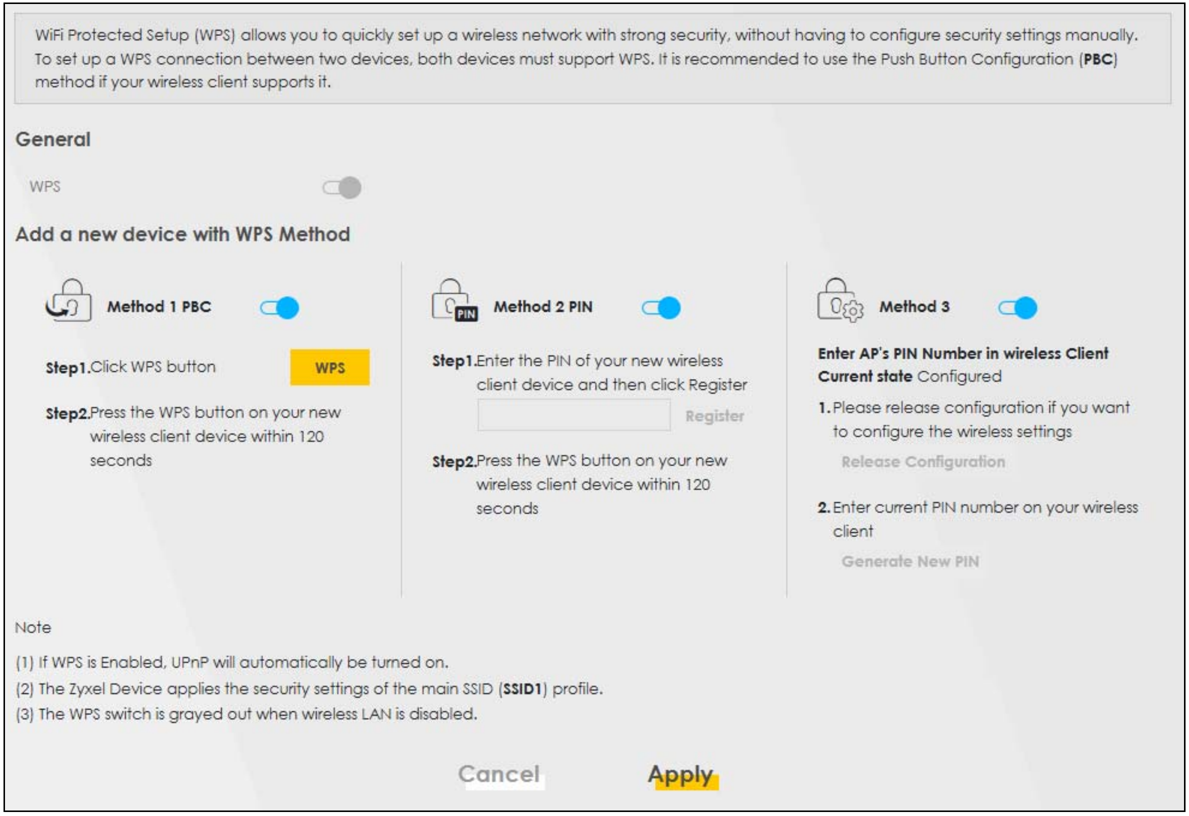
W-iFi Protected Setup (WPS) allows you to quickly set up a Wi-Fi network with strong security, without having to configure security settings manually. Select one of the WPS methods and follow the instructions to establish a WPS connection.Your Wi-Fi devices must support WPS to use this feature. We recommend using Push Button Configuration (PBC) if your Wi-Fi device supports it.

Note: The Zyxel Device applies the security settings of the main SSID (SSID1) profile to the WPS Wi-Fi connection (see Section 8.2.2 on page 201).

Note: The WPS switch is unavailable if the Wi-Fi is disabled.
If WPS is enabled, UPnP will automatically be turned on.

Click Network Setting > Wireless > WPS. The following screen displays. Click this switch and it will turn blue. Click Apply to activate the WPS function. Then you can configure the WPS settings in this screen.

Figure 104 Network Setting > Wireless > WPS



WiFi Protected Setup (WPS) allows you to quickly set up a wireless network with strong security, without having to configure security settings manually. To set up a WPS connection between two devices, both devices must support WPS. It is recommended to use the Push Button Configuration (**PBC**) method if your wireless client supports it.

General

WPS

Add a new device with WPS Method

Method 1 PBC

Step1. Click WPS button

Step2. Press the WPS button on your new wireless client device within 120 seconds

Method 2 PIN

Step1. Enter the PIN of your new wireless client device and then click Register

Step2. Press the WPS button on your new wireless client device within 120 seconds

Method 3

Enter AP's PIN Number in wireless Client
Current state Configured

1.Please release configuration if you want to configure the wireless settings

2.Enter current PIN number on your wireless client

Note

(1) If WPS is Enabled, UPnP will automatically be turned on.
(2) The Zyxel Device applies the security settings of the main SSID (**SSID1**) profile.
(3) The WPS switch is grayed out when wireless LAN is disabled.

The following table describes the labels in this screen.

Table 61 Network Setting > Wireless > WPS

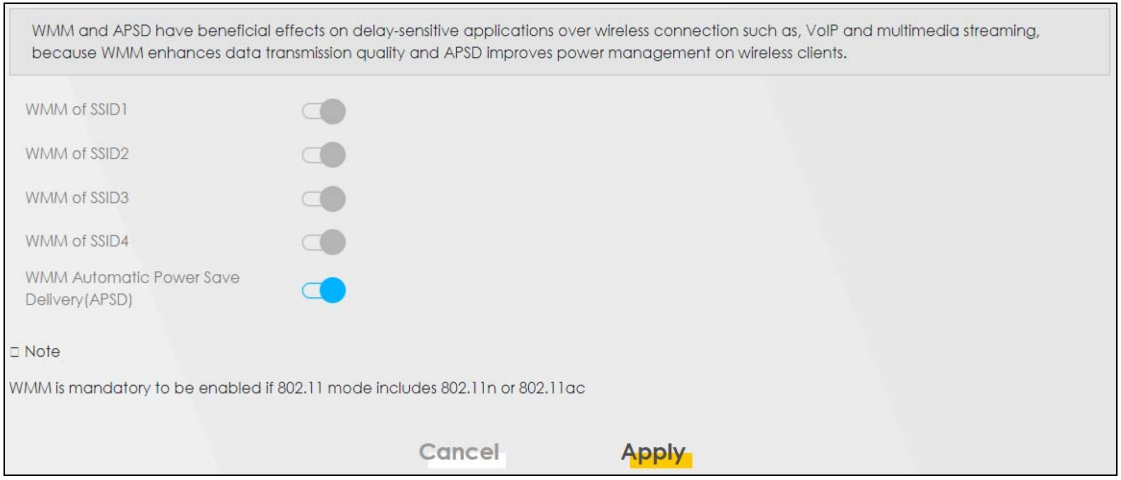
LABEL	DESCRIPTION
General	
WPS	Slide this to the right to enable and have the Zyxel Device activate WPS. Otherwise, it is disabled.
Add a new device with WPS Method	
Method 1 PBC	Use this section to set up a WPS or Wi-Fi network using Push Button Configuration (PBC). Click this switch to make it turn blue. Click Apply to activate WPS method 1 on the Zyxel Device.
WPS	Click this button to add another WPS-enabled Wi-Fi device (within Wi-Fi range of the Zyxel Device) to your Wi-Fi network. This button may either be a physical button on the outside of a Wi-Fi device, or a menu button similar to the WPS button on this screen. Note: You must press the other Wi-Fi device's WPS button within 2 minutes of pressing this button.
Cancel	Click Cancel to restore your previously saved settings.
Apply	Click Apply to save your changes.

8.6 WMM

Use this screen to enable Wi-Fi MultiMedia (WMM) and WMM Automatic Power Save Delivery (APSD) in Wi-Fi networks for multimedia applications. WMM enhances data transmission quality, while APSD improves power management of Wi-Fi clients. This allows time-sensitive applications, such as voice and videos, to run more smoothly.

Click Network Setting > Wireless > WMM to display the following screen.

Figure 105 Network Setting > Wireless > WMM



WMM and APSD have beneficial effects on delay-sensitive applications over wireless connection such as, VoIP and multimedia streaming, because WMM enhances data transmission quality and APSD improves power management on wireless clients.

WMM of SSID1

WMM of SSID2

WMM of SSID3

WMM of SSID4

WMM Automatic Power Save Delivery(APSD)

□ Note

WMM is mandatory to be enabled if 802.11 mode includes 802.11n or 802.11ac

Note: WMM cannot be disabled if 802.11 mode includes 802.11n or 802.11ac.

Note: APSD only affects SSID1. For SSID2 to SSID4, APSD is always enabled.

The following table describes the labels in this screen.

Table 62 Network Setting > Wireless > WMM

LABEL	DESCRIPTION
WMM of SSID	Select On to have the Zyxel Device automatically give the Wi-Fi network (SSIDx) a priority level according to the ToS value in the IP header of packets it sends. WMM QoS (Wi-Fi MultiMedia Quality of Service) gives high priority to video, which makes them run more smoothly. SSID1 is the General Wi-Fi SSID; SSID2 to SSID4 are the Guest Wi-Fi SSIDs. If the 802.11 Mode in Network Setting > Wireless > Others is set to include 802.11n or 802.11ac, WMM cannot be disabled.
WMM Automatic Power Save Delivery (APSD)	Select this option to extend the battery life of your mobile devices (especially useful for small devices that are running multimedia applications). The Zyxel Device goes to sleep mode to save power when it is not transmitting data. The AP buffers the packets sent to the Zyxel Device until the Zyxel Device "wakes up." The Zyxel Device wakes up periodically to check for incoming data. Note: This works only if the Wi-Fi device to which the Zyxel Device is connected also supports this feature.
Cancel	Click Cancel to restore your previously saved settings.
Apply	Click Apply to save your changes.

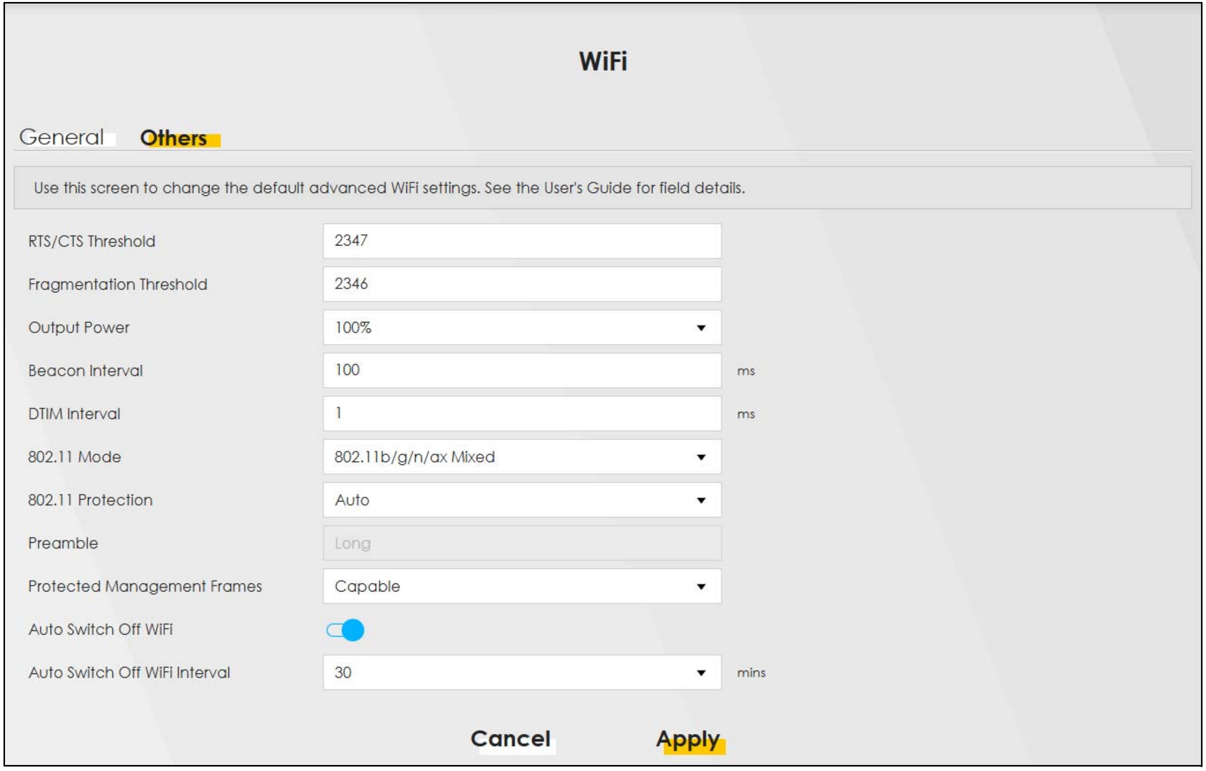
8.7 Others

Use this screen to configure advanced Wi-Fi settings, such as additional security settings, power saving, and data transmission settings. Click Network Setting > Wireless > Others. The screen appears as shown.

Note: This screen is not available when Mesh is enabled in the Network Setting > Wireless > MESH screen.

See Additional Wi-Fi Terms for detailed definitions of the terms listed here.

Figure 106 Network Setting > Wireless > Others



Use this screen to change the default advanced WiFi settings. See the User's Guide for field details.

RTS/CTS Threshold: 2347
Fragmentation Threshold: 2346
Output Power: 100%
Beacon Interval: 100 ms
DTIM Interval: 1 ms
802.11 Mode: 802.11b/g/n/ax Mixed
802.11 Protection: Auto
Preamble: Long
Protected Management Frames: Capable
Auto Switch Off WiFi
Auto Switch Off WiFi Interval: 30 mins

The following table describes the labels in this screen.

Table 63 Network Setting > Wireless > Others

LABEL	DESCRIPTION
RTS/CTS Threshold	Data with its frame size larger than this value will perform the RTS (Request To Send)/CTS (Clear To Send) handshake. Enter a value between 0 and 2347.
Fragmentation Threshold	This is the maximum data fragment size that can be sent. Enter a value between 256 and 2346.
Output Power	Set the output power of the Zyxel Device. If there is a high density of APs in an area, decrease the output power to reduce interference with other APs. Select one of the following: 20%, 40%, 60%, 80% or 100%.
Beacon Interval	When a wirelessly networked device sends a beacon, it includes with it a beacon interval. This specifies the time period before the device sends the beacon again. The interval tells receiving devices on the network how long they can wait in low power mode before waking up to handle the beacon. This value can be set from 50 ms to 1000 ms. A high value helps save current consumption of the access point.
DTIM Interval	Delivery Traffic Indication Message (DTIM) is the time period after which broadcast and Multicast packets are transmitted to mobile clients in the Power Saving mode. A high DTIM value can cause clients to lose connectivity with the network. This value can be set from 1 to 255.

Table 63 Network Setting > Wireless > Others (continued)

LABEL	DESCRIPTION
802.11 Mode	For 2.4 GHz frequency Wi-Fi devices: • Select 802.11b Only to allow only IEEE 802.11b compliant Wi-Fi devices to associate with the Zyxel Device. • Select 802.11g Only to allow only IEEE 802.11g compliant Wi-Fi devices to associate with the Zyxel Device. • Select 802.11n Only to allow only IEEE 802.11n compliant Wi-Fi devices to associate with the Zyxel Device. • Select 802.11b/g Mixed to allow either IEEE 802.11b or IEEE 802.11g compliant Wi-Fi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced. • Select 802.11b/g/n Mixed to allow IEEE 802.11b, IEEE 802.11g or IEEE 802.11n compliant Wi-Fi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced. • Select 802.11b/g/n/ax Mixed to allow IEEE 802.11b, IEEE 802.11g, IEEE 802.11n or IEEE 802.11ax compliant Wi-Fi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced. For 5 GHz frequency Wi-Fi devices: • Select 802.11a Only to allow only IEEE 802.11a compliant Wi-Fi devices to associate with the Zyxel Device. • Select 802.11n Only to allow only IEEE 802.11n compliant Wi-Fi devices to associate with the Zyxel Device. • Select 802.11ac Only to allow only IEEE 802.11ac compliant Wi-Fi devices to associate with the Zyxel Device. • Select 802.11a/n Mixed to allow either IEEE 802.11a or IEEE 802.11n compliant Wi-Fi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced. • Select 802.11n/ac Mixed to allow either IEEE 802.11n or IEEE 802.11ac compliant Wi-Fi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced. • Select 802.11a/n/ac Mixed to allow IEEE 802.11a, IEEE 802.11n or IEEE 802.11ac compliant Wi-Fi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced. • Select 802.11a/n/ac/ax Mixed to allow IEEE 802.11a, IEEE 802.11n, IEEE 802.11ac or IEEE 802.11ax compliant Wi-Fi devices to associate with the Zyxel Device. The transmission rate of your Zyxel Device might be reduced.
802.11 Protection	Enabling this feature can help prevent collisions in mixed-mode networks (networks with both IEEE 802.11b and IEEE 802.11g traffic). Select Auto to have the wireless devices transmit data after a RTS/CTS handshake. This helps improve IEEE 802.11g performance. Select Off to disable 802.11 protection. The transmission rate of your Zyxel Device might be reduced in a mixed-mode network. This field displays Off and is not configurable when you set 802.11 Mode to 802.11b Only.
Preamble	Select a preamble type from the drop-down list box. Choices are Long or Short. See Preamble Type for more information. This field is configurable only when you set 802.11 Mode to 802.11b.
Protected Management Frames	Wi-Fi with Protected Management Frames (PMF) provides protection for unicast and Multicast management action frames. Unicast management action frames are protected from both eavesdropping and forging, and Multicast management action frames are protected from forging. Select Capable if the Wi-Fi client supports PMF, then the management frames will be encrypted. Select Required to force the Wi-Fi client to support PMF; otherwise the authentication cannot be performed by the Zyxel Device. Otherwise, select Disabled.
Auto Switch Off WiFi	Click this to enable Auto Switch Off WiFi and configure the next field.
Auto Switch Off WiFi Interval	Select 0,15, 30, 45 or 60 minutes from the drop down menu. The default setting is 30 minutes. Select 0 minute to disable the Auto Switch Off WiFi Interval.

Table 63   Network Setting > Wireless > Others (continued)

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

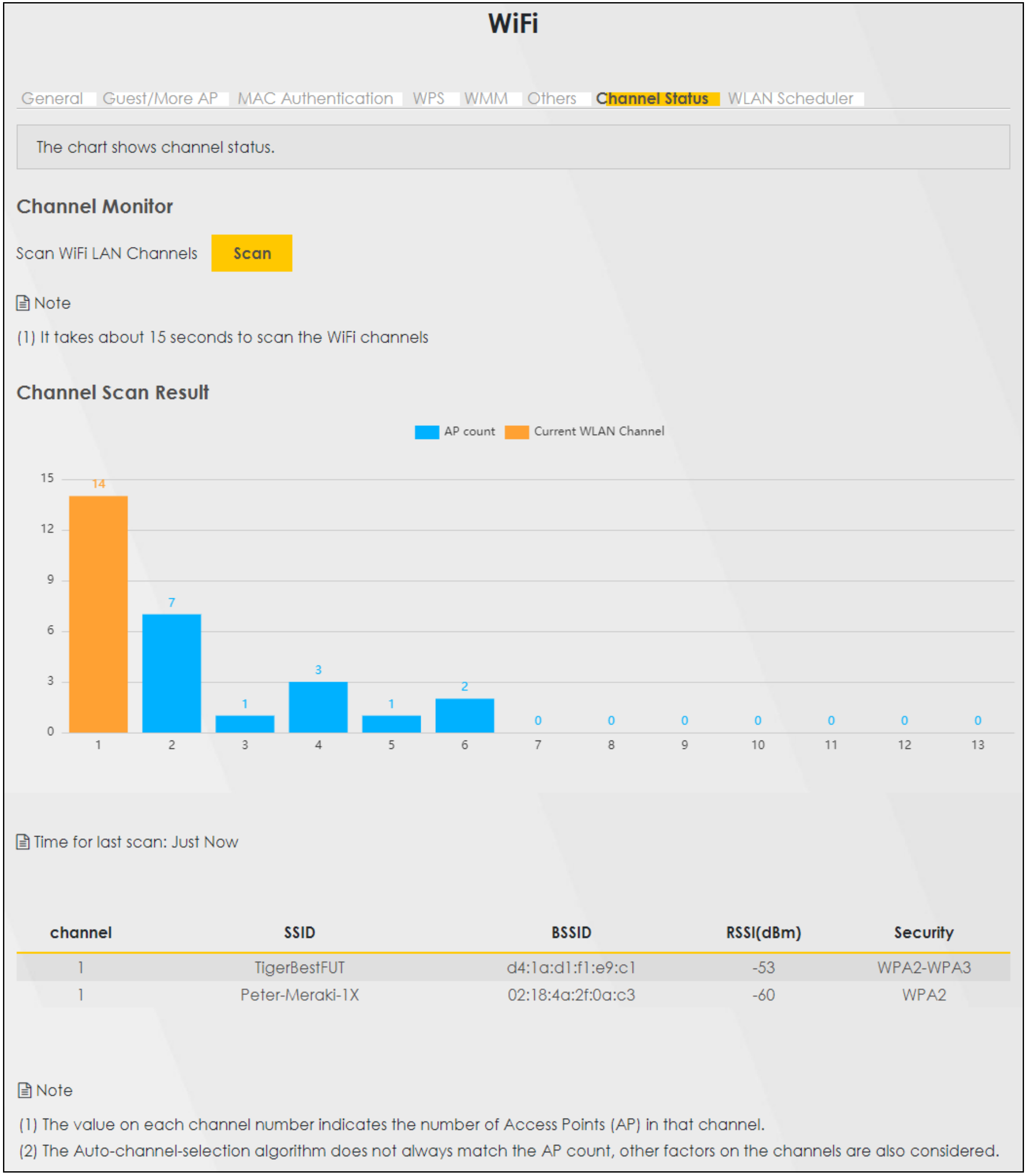
8.8 Channel Status

Use this screen to scan for Wi-Fi channel noise and view the results. Click Scan to start, and then view the results in the Channel Scan Result section. The value on each channel number indicates the number of Access Points (AP) using that channel. The Auto-channel-selection algorithm does not always directly follow the AP count; other factors about the channels are also considered. Click Network Setting > Wireless > Channel Status. The screen appears as shown.

Note: If the current channel is a DFS channel, the warning ‘Channel scan process is denied because current channel is a DFS channel (Channel: 52 to 140). If you want to run channel scan, please select a non-DFS channel and try again.’ appears.

Note: The AP count may not be a real-time value.

Figure 107   Network Setting > Wireless > Channel Status



The chart shows channel status.

Channel Monitor

Scan WiFi LAN Channels

Note

(1) It takes about 15 seconds to scan the WiFi channels

Channel Scan Result

Time for last scan: Just Now

channel	SSID	BSSID	RSSI(dBm)	Security
1	TigerBestFUT	d4:1a:d1:f1:e9:c1	-53	WPA2-WPA3
1	Peter-Meraki-1X	02:18:4a:2f:0a:c3	-60	WPA2

Note

(1) The value on each channel number indicates the number of Access Points (AP) in that channel.

(2) The Auto-channel-selection algorithm does not always match the AP count, other factors on the channels are also considered.

The following table describes the labels in this screen.

Table 64   Network Setting > Wireless > Channel Status

LABEL	DESCRIPTION
Channel Monitor	

Table 64 Network Setting > Wireless > Channel Status (continued)

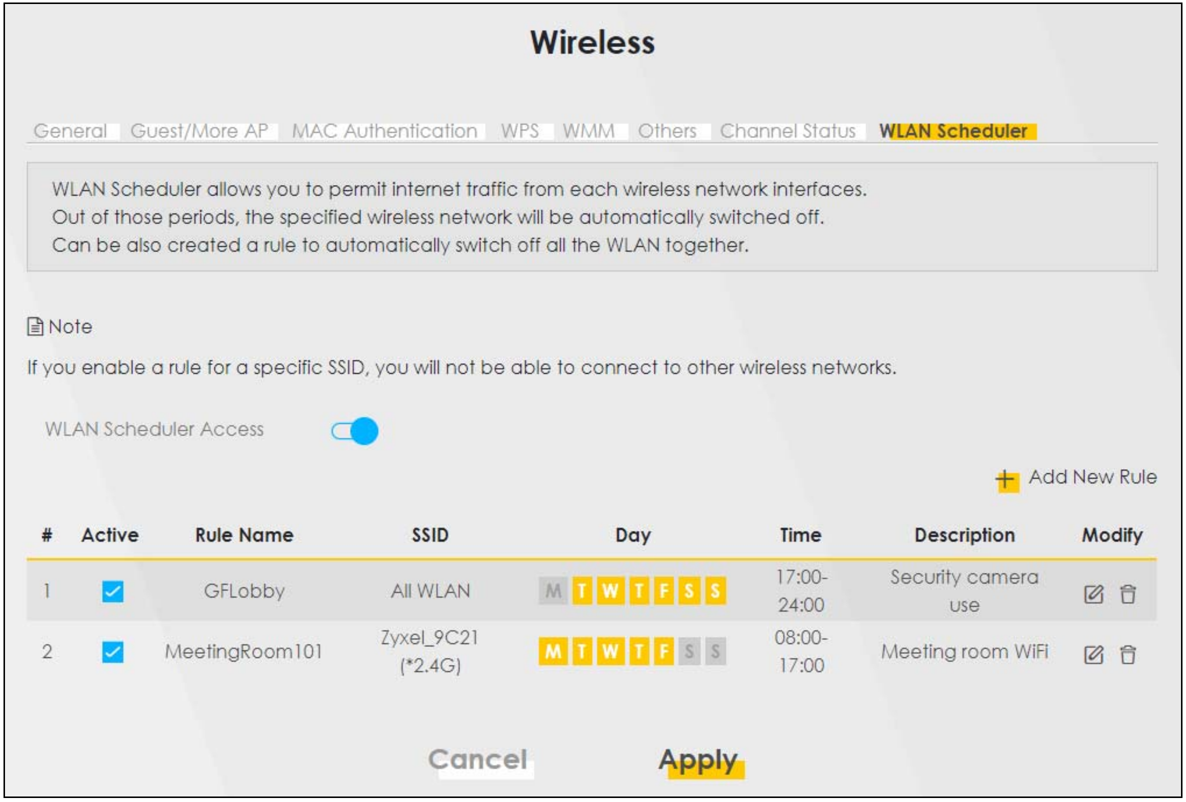
LABEL	DESCRIPTION
Scan wireless LAN Channels	Click the Scan button to scan Wi-Fi channels.
Channel Scan Result	This displays the results of the channel scan. The blue bar displays the number of access points (AP count) in the Wi-Fi channel. The orange bar displays the Wi-Fi channel that the Zyxel Device is now using.

8.9 WLAN Scheduler

Use the WLAN Scheduler screen to create rules to schedule the times to permit Internet traffic from each Wi-Fi network interfaces. Select a specific time and day of a week for scheduling. You can also create a rule to automatically switch off all the WLAN together.

Click Network Setting > Wireless > WLAN Scheduler.

Figure 108 Network Setting > Wireless > WLAN Scheduler



WLAN Scheduler allows you to permit internet traffic from each wireless network interfaces.
Out of those periods, the specified wireless network will be automatically switched off.
Can be also created a rule to automatically switch off all the WLAN together.

Note

If you enable a rule for a specific SSID, you will not be able to connect to other wireless networks.

WLAN Scheduler Access ●

#	Active	Rule Name	SSID	Day	Time	Description	Modify
1	☑	GFLobby	All WLAN	M T W T F S S	17:00-24:00	Security camera use	
2	☑	MeetingRoom101	Zyxel_9C21 (*2.4G)	M T W T F S S	08:00-17:00	Meeting room WiFi	

The following table describes the labels in this screen.

Table 65 Network Setting > Wireless > WLAN Scheduler

LABEL	DESCRIPTION
WLAN Scheduler Access	Click this switch to enable the WLAN scheduler function. This serves as the main switch to allow the individual rules to function.
Add New Rule	Click this to configure a new WLAN scheduler rule.
#	This is the index number of the entry.
Active	Click the checkbox to enable individual rules. Note: Make sure to enable the WLAN Scheduler Access switch for the individual rules to work.
Rule Name	This field displays the name of the rule.
SSID	This is the descriptive name used to identify the wireless network interface that this rule applies to. It will show ALL WLAN if you select All wireless networks in the Add New Rule screen.
Day	This field displays the days of the week that you wish to apply this rule.
Time	This field displays the time of the day that you wish to apply this rule.
Description	This field shows a description of the rule, usually to help identify it.
Modify	Click the Edit icon to configure the rule. Click the Delete icon to remove the rule.

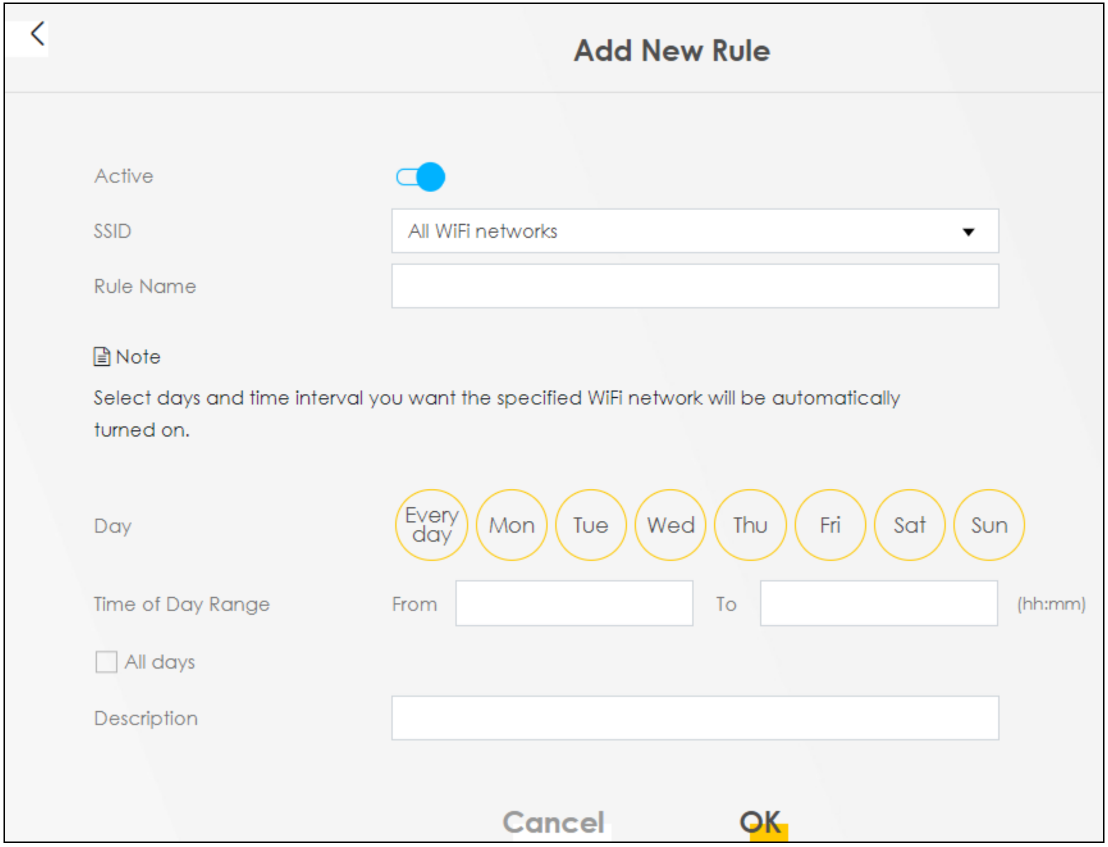
Note: If you enable a rule for a specific SSID, you will not be able to connect to other wireless networks.

8.9.1 Add or Edit Rules

Click Add New Rule in the WLAN Scheduler screen, or click the Edit icon next to a scheduling rule, and the following screen displays.

Use this screen to create a scheduling rule to permit Internet traffic from each wireless network interface.

Figure 109 Network Setting > Wireless > WLAN Scheduler > Add New Rule



Select days and time interval you want the specified WiFi network will be automatically turned on.

The following table describes the labels in this screen.

Table 66 Network Setting > Wireless > WLAN Schedule > Add New Rule

LABEL	DESCRIPTION
Active	Click this switch to enable this WLAN scheduler rule.
SSID	Select All wireless networks if you want the rule to apply to all Wi-Fi network interfaces or select a Wi-Fi network interface to apply the rule to.
Rule Name	Enter a descriptive name for the rule.
Day	Select the days of the week that you wish to apply this rule.
Time of Day Range	Specify the time of the day that you wish to apply to this rule (format hh:mm). Note: Click the checkbox for All days if you wish to apply the rule for the whole day (24 hours).
Description	Enter a description of the rule, usually to help identify it (its purpose).
OK	Click OK to save the changes back to the Zyxel Device.
Cancel	Click Cancel to close the window with changes unsaved.

8.10 Technical Reference

This section discusses Wi-Fi in depth.

8.10.1 Wi-Fi Network Overview

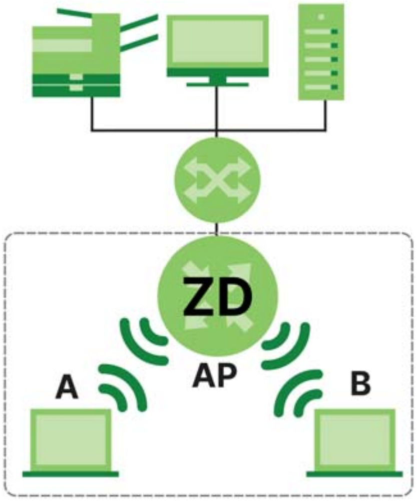
Wi-Fi networks consist of Wi-Fi clients, access points and bridges.

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

Normally, a Wi-Fi network operates in an "infrastructure" type of network. An "infrastructure" type of network has one or more access points and one or more Wi-Fi clients. The Wi-Fi clients connect to the access points.

The following figure provides an example of a Wi-Fi network.

Figure 110 Example of a Wi-Fi Network



The Wi-Fi network is the part in the blue circle. In this Wi-Fi network, devices A and B use the access point (AP) to interact with the other devices (such as the printer) or with the Internet. Your Zyxel Device is the AP.

Every Wi-Fi network must follow these basic guidelines.

- Every Wi-Fi device in the same Wi-Fi network must use the same SSID.

  The SSID is the name of the Wi-Fi network. It stands for Service Set IDentifier.
- If two Wi-Fi networks overlap, they should use a different channel.

  Like radio stations or television channels, each Wi-Fi network uses a specific channel, or frequency, to send and receive information.
- Every Wi-Fi device in the same Wi-Fi network must use security compatible with the AP.

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

8.10.2 Additional Wi-Fi Terms

The following table describes some Wi-Fi network terms and acronyms used in the Zyxel Device's Web Configurator.

Table 67 Additional Wi-Fi Terms

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

8.10.3 Wi-Fi Security Overview

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

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

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

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

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

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

8.10.3.1 SSID

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

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

8.10.3.2 MAC Address Filter

Every device that can use a Wi-Fi network has a unique identification number, called a MAC address.[1] A MAC address is usually written using twelve hexadecimal characters[2]; for example, 00A0C5000002 or 00:A0:C5:00:00:02. To get the MAC address for each Wi-Fi device in the Wi-Fi network, see the Wi-Fi device's User's Guide or other documentation.

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

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

8.10.3.3 Encryption

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

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

Many types of encryption use a key to protect the information in the Wi-Fi network. The longer the key, the stronger the encryption. Every device in the Wi-Fi network must have the same key.

8.10.4 Signal Problems

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

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

[1] Some wireless devices, such as scanners, can detect Wi-Fi networks but cannot use Wi-Fi networks. These kinds of wireless devices might not have MAC addresses.

[2] Hexadecimal characters are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

8.10.5 Preamble Type

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

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

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

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

Use the dynamic setting to automatically use short preamble when all Wi-Fi devices on the network support it, otherwise the Zyxel Device uses long preamble.

Note: The Wi-Fi devices MUST use the same preamble mode in order to communicate.

8.10.6 Wi-Fi Protected Setup (WPS)

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

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

Depending on the devices you have, you can either press a button (on the device itself, or in its configuration utility) or enter a PIN (a unique Personal Identification Number that allows one device to authenticate the other) in each of the two devices. When WPS is activated on a device, it has 2 minutes to find another device that also has WPS activated. Then, the two devices connect and set up a secure network by themselves.

8.10.6.1 Push Button Configuration

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

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

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

1 Ensure that the two devices you want to set up are within Wi-Fi range of one another.

2 Look for a WPS button on each device. If the device does not have one, log into its configuration utility and locate the button (see the device's User's Guide for how to do this – for the Zyxel Device).

3 Press the button on one of the devices (it does not matter which). For the Zyxel Device you must press the Wi-Fi button for more than 5 seconds.

4 Within 2 minutes, press the button on the other device. The registrar sends the network name (SSID) and security key through a secure connection to the enrollee.

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

8.10.6.2 PIN Configuration

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

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

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

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

1 Ensure WPS is enabled on both devices.

2 Access the WPS section of the AP's configuration interface. See the device's User's Guide on how to do this.

3 Look for the client's WPS PIN; it will be displayed either on the device, or in the WPS section of the client's configuration interface (see the device's User's Guide on how to find the WPS PIN – for the Zyxel Device, see Section 8.5 on page 209).

4 Enter the client's PIN in the AP's configuration interface.

5 If the client device's configuration interface has an area for entering another device's PIN, you can either enter the client's PIN in the AP, or enter the AP's PIN in the client – it does not matter which.

6 Start WPS on both devices within two minutes.

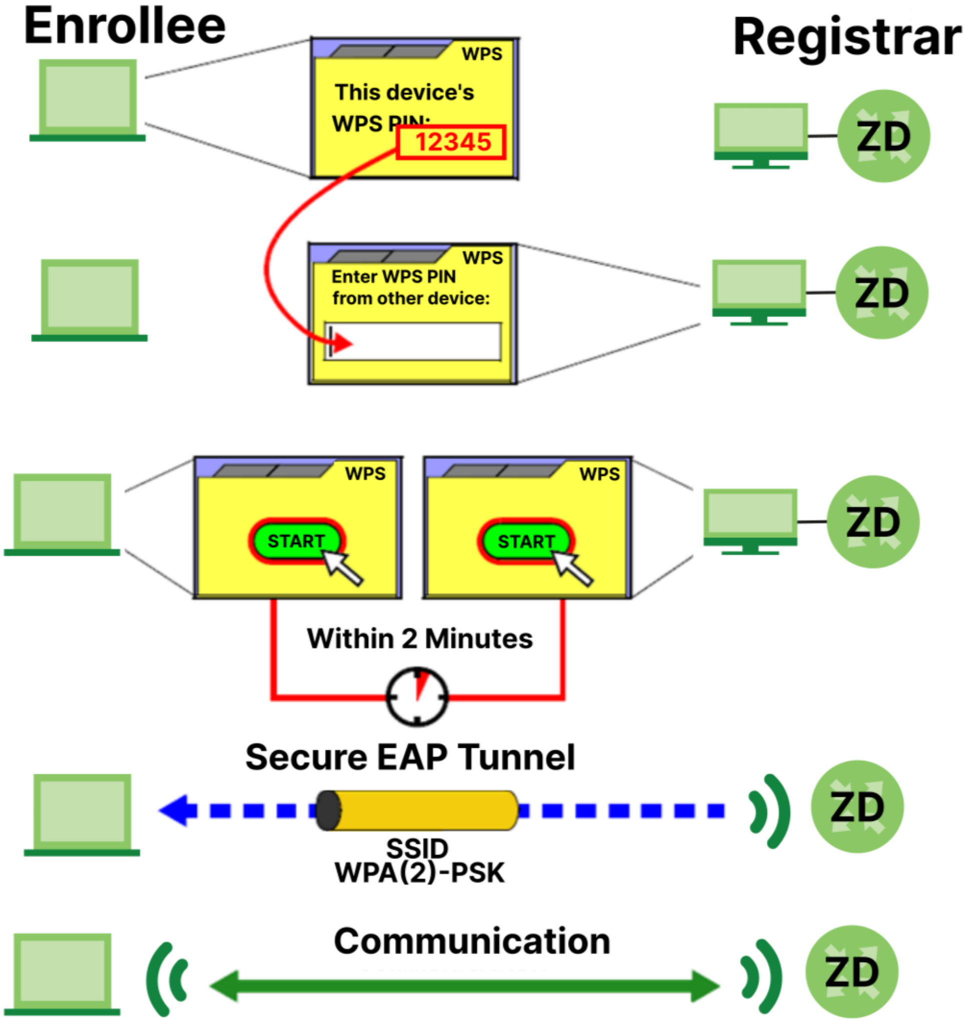
7 Use the configuration utility to activate WPS, not the push-button on the device itself.

8 On a computer connected to the Wi-Fi client, try to connect to the Internet. If you can connect, WPS was successful.

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

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

Figure 111 Example WPS Process: PIN Method

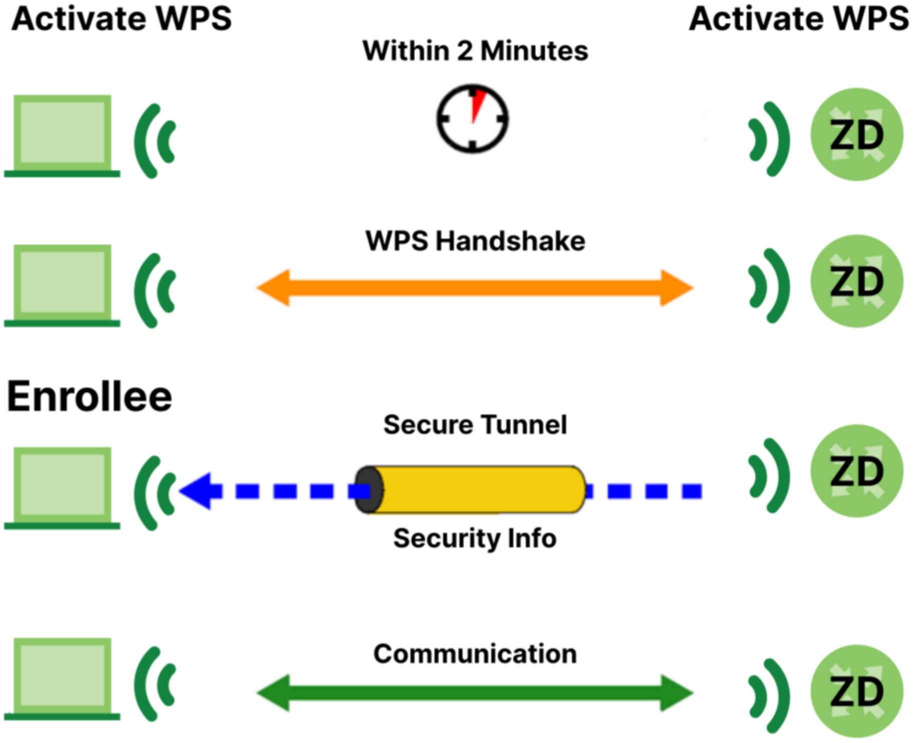


8.10.6.3 How WPS Works

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

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

Figure 112   How WPS Works



The roles of registrar and enrollee last only as long as the WPS setup process is active (2 minutes). The next time you use WPS, a different device can be the registrar if necessary.

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

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

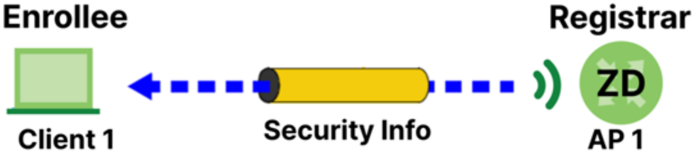
By default, a WPS device is 'un-configured'. This means that it is not part of an existing network and can act as either enrollee or registrar (if it supports both functions). If the registrar is un-configured, the security settings it transmits to the enrollee are randomly-generated. Once a WPS-enabled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

8.10.6.4 Example WPS Network Setup

This section shows how security settings are distributed in a sample WPS setup.

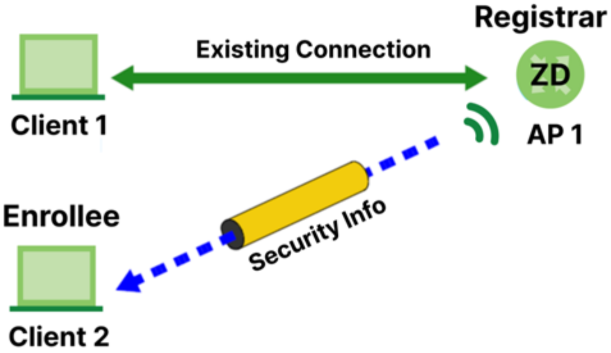
The following figure shows a sample network. In step 1, both AP1 and Client 1 are un-configured. When WPS is activated on both, they perform the handshake. In this example, AP1 is the registrar, and Client 1 is the enrollee. The registrar randomly generates the security information to set up the network,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

Figure 113   WPS: Example Network Step 1



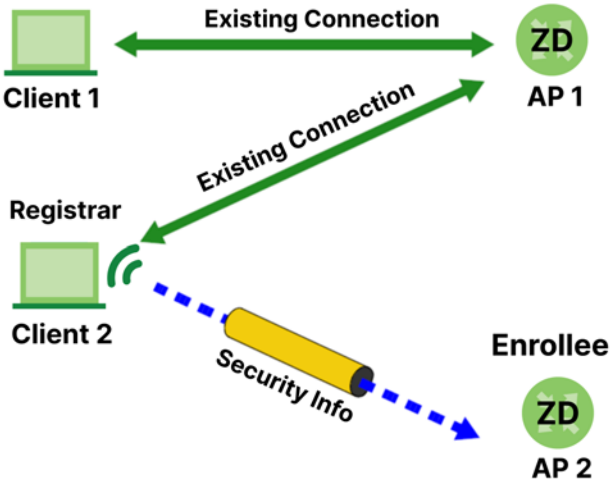
In step 2, you add another Wi-Fi client to the network. You know that Client 1 supports registrar mode, but it is better to use AP1 for the WPS handshake with the new client since you must connect to the access point anyway in order to use the network. In this case, AP1 must be the registrar, since it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

Figure 114   WPS: Example Network Step 2



In step 3, you add another access point (AP2) to your network. AP2 is out of range of AP1, so you cannot use AP1 for the WPS handshake with the new access point. However, you know that Client 2 supports the registrar function, so you use it to perform the WPS handshake instead.

Figure 115   WPS: Example Network Step 3



8.10.6.5 Limitations of WPS

WPS has some limitations of which you should be aware.

- When you use WPS, it works between two devices only. You cannot enroll multiple devices simultaneously, you must enroll one after the other.

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

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

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

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

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

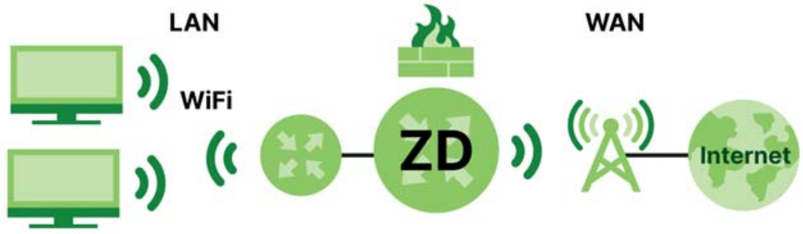
CHAPTER 9
Home Networking

9.1 Home Networking Overview

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

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

Figure 116 Local Area Network of the Zyxel Device



9.1.1 What You Can Do in this Chapter

- Use the LAN Setup screen to set the LAN IP address, subnet mask, and DHCP settings (LAN Setup).
- Use the Static DHCP screen to assign IP addresses on the LAN to specific individual computers based on their MAC addresses (Static DHCP).
- Use the UPnP screen to enable UPnP (UPnP).
- Use the Custom DHCP screen to set additional DHCP options (Section 9.5 on page 235).

9.1.2 What You Need To Know

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

9.1.2.1 About LAN

IP Address

Similar to the way houses on a street share a common street name, so too do computers on a LAN share one common network number. This is known as an Internet Protocol address.

Subnet Mask

The subnet mask specifies the network number portion of an IP address. Your Zyxel Device will compute the subnet mask automatically based on the IP address that you entered. You do not need to change the subnet mask computed by the Zyxel Device unless you are instructed to do otherwise.

DHCP

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

DNS

DNS (Domain Name System) maps a domain name to its corresponding IP address and vice versa. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it. The DNS server addresses you enter when you set up DHCP are passed to the client machines along with the assigned IP address and subnet mask.

RADVD (Router Advertisement Daemon)

When an IPv6 host sends a Router Solicitation (RS) request to discover the available routers, RADVD with Router Advertisement (RA) messages in response to the request. It specifies the minimum and maximum intervals of RA broadcasts. RA messages containing the address prefix. IPv6 hosts can be generated with the IPv6 prefix an IPv6 address.

9.1.2.2 About UPnP

How do I know if I am using UPnP?

UPnP hardware is identified as an icon in the Network Connections folder (Windows 7). Each UPnP compatible device installed on your network will appear as a separate icon. Selecting the icon of a UPnP device will allow you to access the information and properties of that device.

NAT Traversal

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

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

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

Cautions with UPnP

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

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

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

UPnP and Zyxel

Zyxel has achieved UPnP certification from the Universal Plug and Play Forum UPnP™ Implementers Corp. (UIC).

See Turn on UPnP in Windows 10 Example for examples on installing and using UPnP.

9.1.3 Before You Begin

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

9.2 LAN Setup

A LAN IP address is the IP address of a networking device in the LAN. You can use the Zyxel Device's LAN IP address to access its Web Configurator from the LAN. The DHCP server settings define the rules on assigning IP addresses to LAN clients on your network.

Use this screen to set the Local Area Network IP address and subnet mask of your Zyxel Device. Configure DHCP settings to have the Zyxel Device or a DHCP server assign IP addresses to devices. Click Network Setting > Home Networking to open the LAN Setup screen.

Follow these steps to configure your LAN settings.

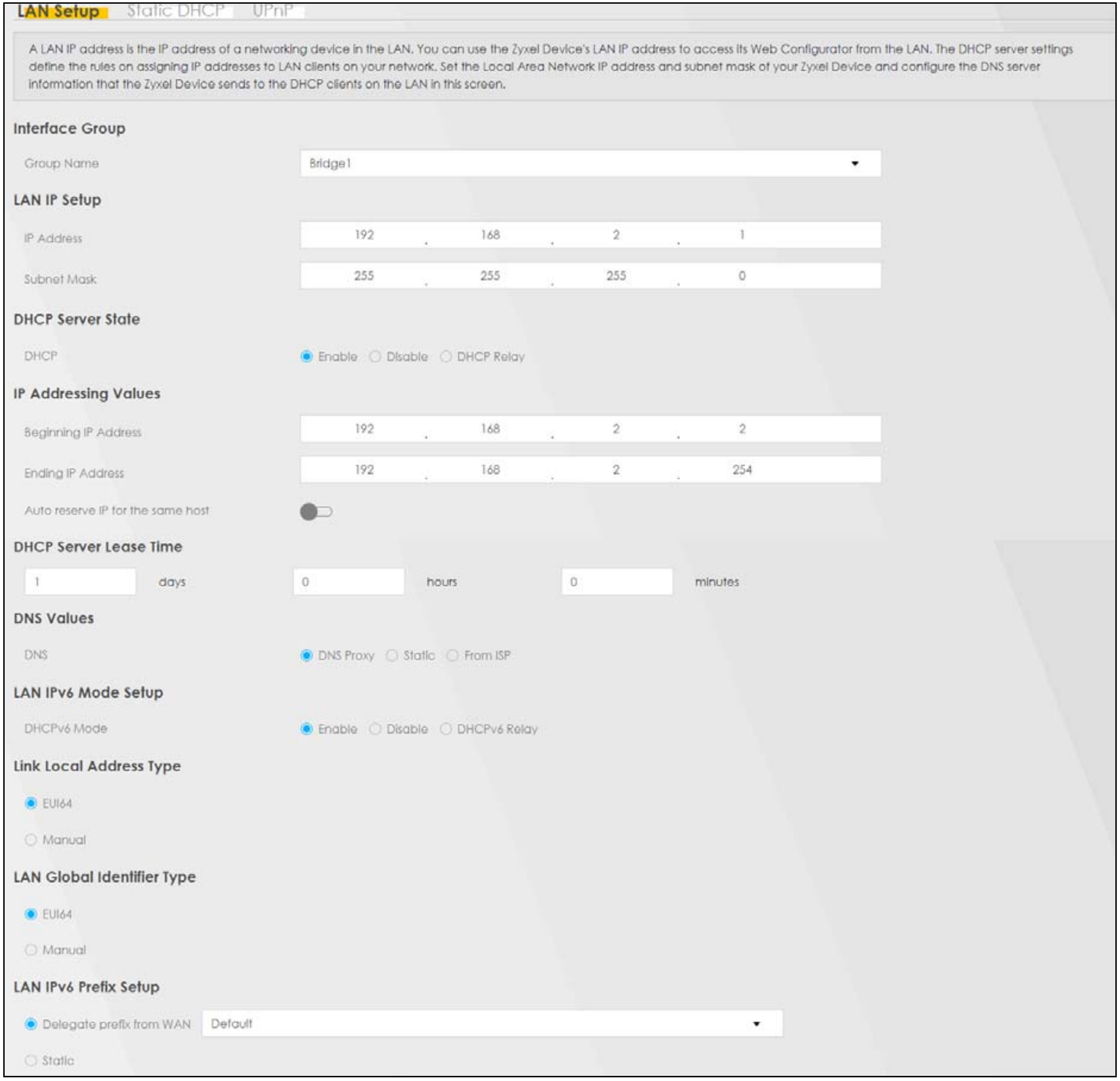
1 Select the Interface Group you want to set up the LAN. To configure an interface group, go to Network Setting > Interface Grouping. See Interface Grouping for more details about interface group.

2 Enter an IP address into the IP Address field. The IP address must be in dotted decimal notation. This will become the IP address of your Zyxel Device.

3 Enter the IP subnet mask into the IP Subnet Mask field. Unless instructed otherwise it is best to leave this alone, the configurator will automatically compute a subnet mask based upon the IP address you entered.

4 Click Apply to save your settings.

Figure 117   Network Setting > Home Networking > LAN Setup



A LAN IP address is the IP address of a networking device in the LAN. You can use the Zyxel Device's LAN IP address to access its Web Configurator from the LAN. The DHCP server settings define the rules on assigning IP addresses to LAN clients on your network. Set the Local Area Network IP address and subnet mask of your Zyxel Device and configure the DNS server information that the Zyxel Device sends to the DHCP clients on the LAN in this screen.

Interface Group

Group Name: Bridge1

LAN IP Setup

IP Address: 192 . 168 . 2 . 1

Subnet Mask: 255 . 255 . 255 . 0

DHCP Server State

DHCP: ● Enable ○ Disable ○ DHCP Relay

IP Addressing Values

Beginning IP Address: 192 . 168 . 2 . 2

Ending IP Address: 192 . 168 . 2 . 254

Auto reserve IP for the same host

DHCP Server Lease Time

1 days 0 hours 0 minutes

DNS Values

DNS: ● DNS Proxy ○ Static ○ From ISP

LAN IPv6 Mode Setup

DHCPv6 Mode: ● Enable ○ Disable ○ DHCPv6 Relay

Link Local Address Type

● EUI64

○ Manual

LAN Global Identifier Type

● EUI64

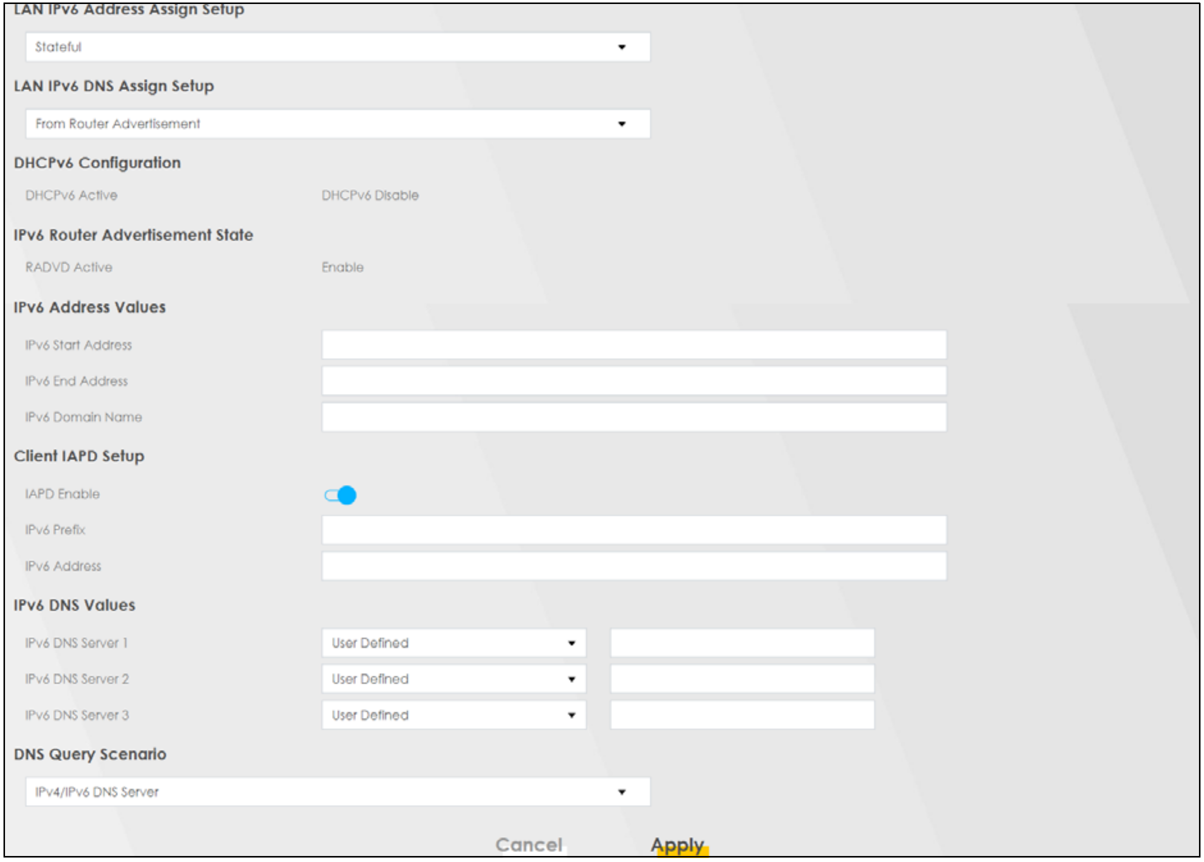
○ Manual

LAN IPv6 Prefix Setup

● Delegate prefix from WAN: Default

○ Static

Figure 118   Network Setting > Home Networking > LAN Setup (continued)



LAN IPv6 Address Assign Setup

Stateful

LAN IPv6 DNS Assign Setup

From Router Advertisement

DHCPv6 Configuration

DHCPv6 Active: DHCPv6 Disable

IPv6 Router Advertisement State

RADVD Active: Enable

IPv6 Address Values

IPv6 Start Address

IPv6 End Address

IPv6 Domain Name

Client IAPD Setup

IAPD Enable

IPv6 Prefix

IPv6 Address

IPv6 DNS Values

IPv6 DNS Server 1: User Defined

IPv6 DNS Server 2: User Defined

IPv6 DNS Server 3: User Defined

DNS Query Scenario

IPv4/IPv6 DNS Server

The following table describes the fields in this screen.

Table 68   Network Setting > Home Networking > LAN Setup

LABEL	DESCRIPTION
IP Address	Enter the LAN IP address you want to assign to your in dotted decimal notation, for example, (factory default).
DHCP Server State	
DHCP	Select Enable to have your Zyxel Device assign IP addresses, an IP default gateway and DNS servers to LAN computers and other devices that are DHCP clients. If you select Disable, you need to manually configure the IP addresses of the computers and other devices on your LAN. If you select DHCP Relay, the Zyxel Device acts as a surrogate DHCP server and relays DHCP requests and responses between the remote server and the clients.
DHCP Relay Server Address This field is only available when you select DHCP Relay in the DHCP field.	
IP Address	Enter the IPv4 IP address of the actual remote DHCP server in this field.
IPv6 Address Values	
IPv6 Start Address	This field specifies the first of the contiguous addresses in the IPv6 address pool.
IPv6 End Address	This field specifies the last of the contiguous addresses in the IPv6 address pool.
IPv6 Domain Name	The field specifies the domain name of the IPv6 address.

9.3 Static DHCP

When any of the LAN clients in your network want an assigned fixed IP address, add a static lease for each LAN client. Knowing the LAN client's MAC addresses is necessary. This table allows you to assign IP addresses on the LAN to individual computers based on their MAC addresses.

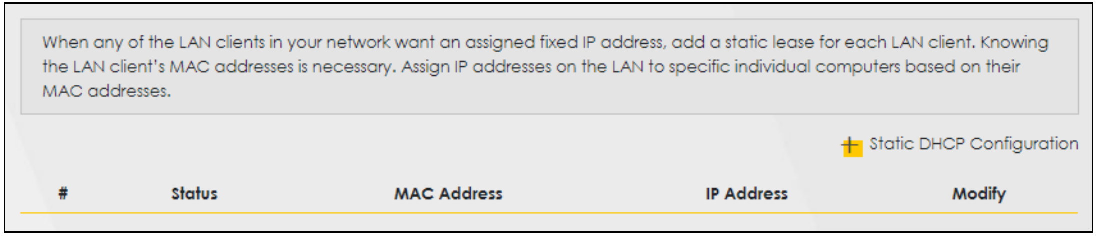
Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02.

9.3.1 Before You Begin

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

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

Figure 119 Network Setting > Home Networking > Static DHCP



When any of the LAN clients in your network want an assigned fixed IP address, add a static lease for each LAN client. Knowing the LAN client's MAC addresses is necessary. Assign IP addresses on the LAN to specific individual computers based on their MAC addresses.

#	Status	MAC Address	IP Address	Modify

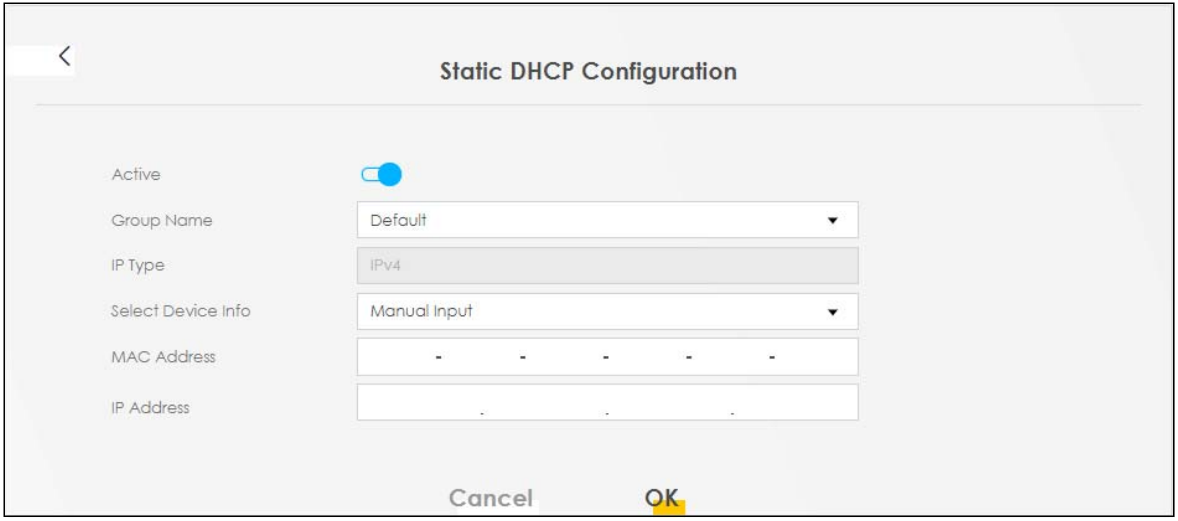
The following table describes the labels in this screen.

Table 69 Network Setting > Home Networking > Static DHCP

LABEL	DESCRIPTION
Static DHCP Configuration	Click this to configure a static DHCP entry.
#	This is the index number of the entry.
Status	This field displays whether the client is connected to the Zyxel Device.
MAC Address	The MAC (Media Access Control) or Ethernet address on a LAN (Local Area Network) is unique to your computer (six pairs of hexadecimal notation). A network interface card such as an Ethernet adapter has a hardwired address that is assigned at the factory. This address follows an industry standard that ensures no other adapter has a similar address.
IP Address	This field displays the IP address relative to the # field listed above.
Modify	Click the Edit icon to configure the connection. Click the Delete icon to remove the connection.

If you click Static DHCP Configuration in the Static DHCP screen, the following screen displays. Using a static DHCP means a LAN client will always have the same IP address assigned to it by the DHCP server. Assign a fixed IP address to a client device by selecting the interface group of this client device and its IP address type and selecting the device/computer from a list or manually entering its MAC address and assigned IP address.

Figure 120 Network Setting > Home Networking > Static DHCP: Static DHCP Configuration



Static DHCP Configuration

Active: ●

Group Name: Default

IP Type: IPv4

Select Device Info: Manual Input

MAC Address: - - - - -

IP Address: . . .

The following table describes the labels in this screen.

Table 70 Network Setting > Home Networking > Static DHCP: Static DHCP Configuration

LABEL	DESCRIPTION
Active	Select Enable to activate static DHCP in your Zyxel Device.
Group Name	Select the interface group for which you want to configure the static DHCP settings.
IP Type	The IP Type is normally IPv4 (non-configurable).
Select Device Info	Select between Manual Input which allows you to enter the next two fields (MAC Address and IP Address); or select an existing LAN device to show its MAC address and IP address.
MAC Address	Enter the MAC address of a computer on your LAN if you select Manual Input in the previous field.
IP Address	Enter the IP address that you want to assign to the computer on your LAN with the MAC address that you will also specify if you select Manual Input in the previous field.
OK	Click OK to save your changes.
Cancel	Click Cancel to exit this screen without saving.

9.4 UPnP

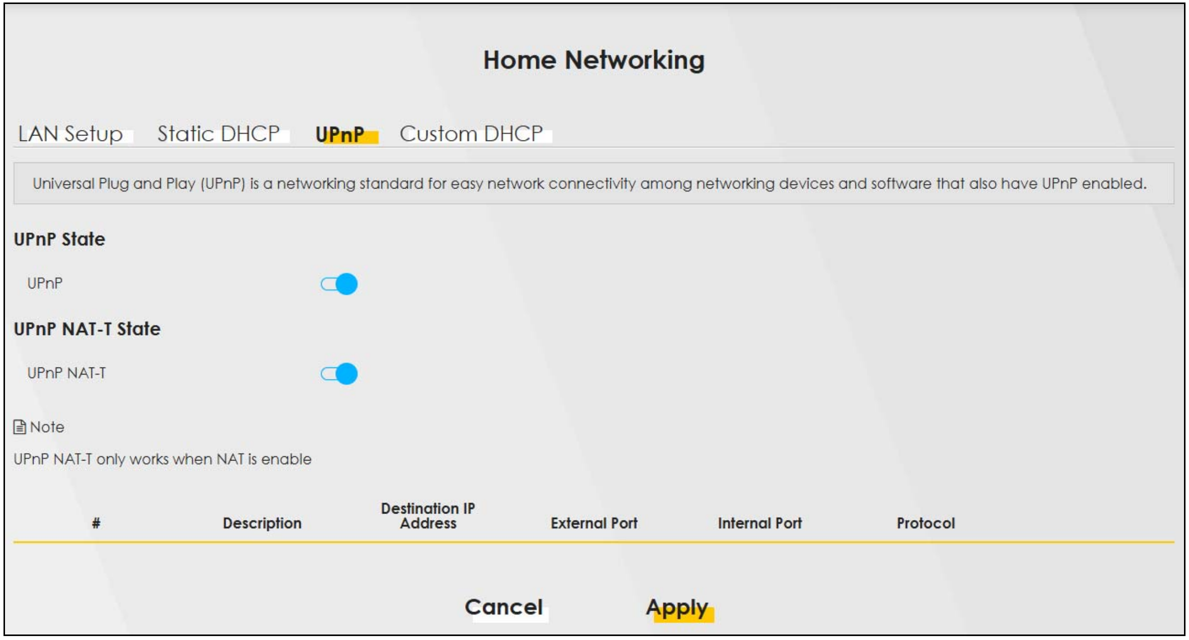
Universal Plug and Play (UPnP) is an open networking standard that uses TCP/IP for simple peer-to-peer network connectivity between networking devices or software applications which have UPnP enabled. A UPnP device can dynamically join a network, obtain an IP address, advertise its services, and learn about other devices on the network. A device can also leave a network automatically when it is no longer in use.

See Turn on UPnP in Windows 10 Example for more information on UPnP.

Note: To use UPnP NAT-T, enable NAT in the Network Setting > Broadband > Edit or Add New WAN Interface screen.

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

Figure 121 Network Setting > Home Networking > UPnP



Home Networking

Universal Plug and Play (UPnP) is a networking standard for easy network connectivity among networking devices and software that also have UPnP enabled.

UPnP State

UPnP ●

UPnP NAT-T State

UPnP NAT-T ●

Note

UPnP NAT-T only works when NAT is enable

#	Description	Destination IP Address	External Port	Internal Port	Protocol

The following table describes the labels in this screen.

Table 71 Network Settings > Home Networking > UPnP

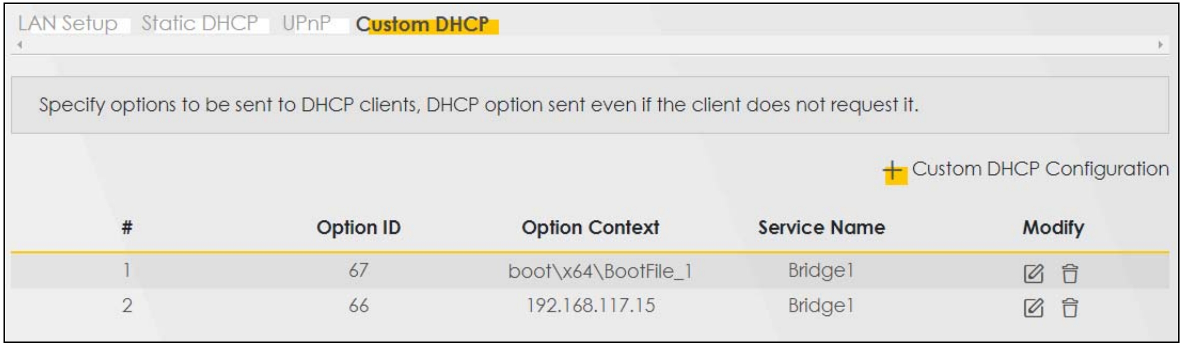
LABEL	DESCRIPTION
UPnP State	
UPnP	Select Enable to activate UPnP. Be aware that anyone could use a UPnP application to open the Web Configurator's login screen without entering the Zyxel Device's IP address (although you must still enter the password to access the Web Configurator).
UPnP NAT-T State	
UPnP NAT-T	Select Enable to activate UPnP with NAT enabled. UPnP NAT traversal automates the process of allowing an application to operate through NAT. UPnP network devices can automatically configure network addressing, announce their presence in the network to other UPnP devices and enable exchange of simple product and service descriptions.
#	This field displays the index number of the entry.
Description	This field displays the description of the UPnP NAT-T connection.
Destination IP Address	This field displays the IP address of the other connected UPnP-enabled device.
External Port	This field displays the external port number that identifies the service.
Internal Port	This field displays the internal port number that identifies the service.
Protocol	This field displays the protocol of the NAT mapping rule. Choices are TCP or UDP.
Apply	Click Apply to save your changes.
Cancel	Click Cancel to restore your previously saved settings.

9.5 Custom DHCP

DHCP options are additional configurations that DHCP clients can receive from a DHCP server. You can configure the Zyxel Device, as a DHCP server, to send the parameters you configured as DHCP options to your DHCP clients. For example, DHCP option 6 can tell the DHCP client which DNS (Domain Name Server) to use for name resolution along with its IP configuration.

Use the following screen to configure custom DHCP option on your Zyxel Device. Click Network Setting > Home Networking > Custom DHCP to display the screen shown next.

Figure 122 Network Setting > Home Networking > Custom DHCP



Specify options to be sent to DHCP clients, DHCP option sent even if the client does not request it.

#	Option ID	Option Context	Service Name	Modify
1	67	boot\x64\BootFile_1	Bridge1	✎ 🗑
2	66	192.168.117.15	Bridge1	✎ 🗑

The following table describes the labels in this screen.

Table 72 Network Settings > Home Networking > Custom DHCP

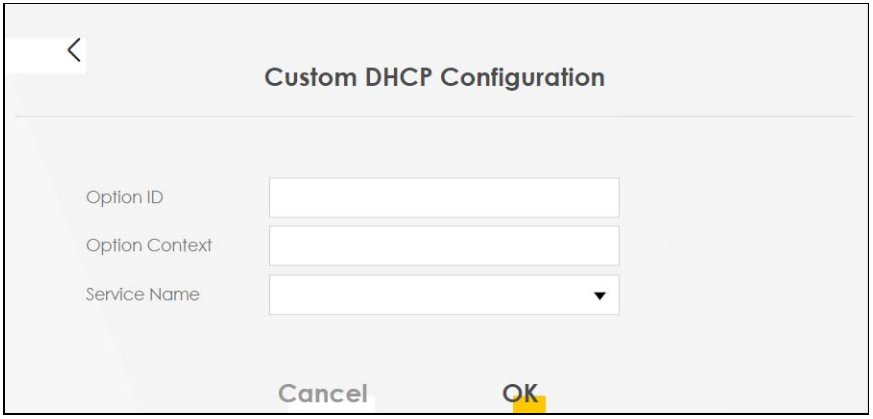
LABEL	DESCRIPTION
Custom DHCP Configuration	Click this to add a DHCP option you want to sent to your DHCP clients.
#	This field displays the index number of the entry.
Option ID	This field displays the DHCP option ID.
Option Context	This field displays the content of the DHCP option.
Service Name	This field displays the interface group that the DHCP option is sent on.
Modify	Click the Modify icon to edit an existing entry. Click the Delete icon to remove an existing entry.

9.5.1 Custom DHCP Configuration

Use this screen to add a DHCP option, as defined in the RFC protocols, and set its content.

Click Custom DHCP Configuration on the Network Setting > Home Networking > Custom DHCP screen to display the following screen.

Figure 123 Network Setting > Home Networking > Custom DHCP



The following table describes the labels in this screen.

Table 73 Network Settings > Home Networking > Custom DHCP

LABEL	DESCRIPTION
Option ID	Enter the option ID for the additional configuration that DHCP clients can receive from a DHCP server. For example, enter ‘6’ for DNS server configuration.
Option Context	Enter additional configuration details. For example, for DHCP option 6, enter the DNS server IP address. You can enter up to 257 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;].
Service Name	Select an interface group from the drop-down list. The Zyxel Device will add this DHCP option to DHCP packets sent on the selected service interface group. You can configure interface groups in the Network Setting > Interface Grouping screen.
Cancel	Click Cancel to not save your settings and return to the previous screen.
OK	Click OK to save your changes and return to the previous screen.

9.6 Technical Reference

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

LANs, WANs and the Zyxel Device

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

9.6.1 DHCP Setup

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

IP Pool Setup

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

9.6.2 DNS Server Addresses

DNS (Domain Name System) maps a domain name to its corresponding IP address and vice versa. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it. The DNS server addresses you enter when you set up DHCP are passed to the client machines along with the assigned IP address and subnet mask.

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

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

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

9.6.3 LAN TCP/IP

The Zyxel Device has built-in DHCP server capability that assigns IP addresses and DNS servers to systems that support DHCP client capability.

IP Address and Subnet Mask

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

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

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

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

The subnet mask specifies the network number portion of an IP address. Your Zyxel Device will compute the subnet mask automatically based on the IP address that you entered. You do not need to change the subnet mask computed by the Zyxel Device unless you are instructed to do otherwise.

Private IP Addresses

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

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

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

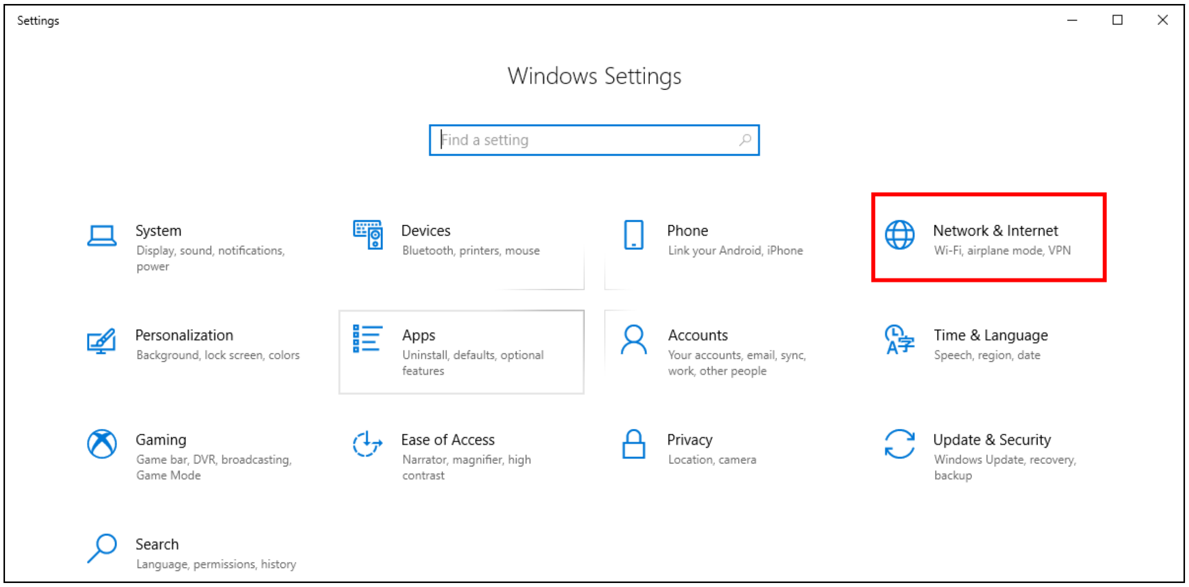
Note: Regardless of your particular situation, do not create an arbitrary IP address; always follow the guidelines above. For more information on address assignment, please refer to RFC 1597, “Address Allocation for Private Internets” and RFC 1466, “Guidelines for Management of IP Address Space”.

9.7 Turn on UPnP in Windows 10 Example

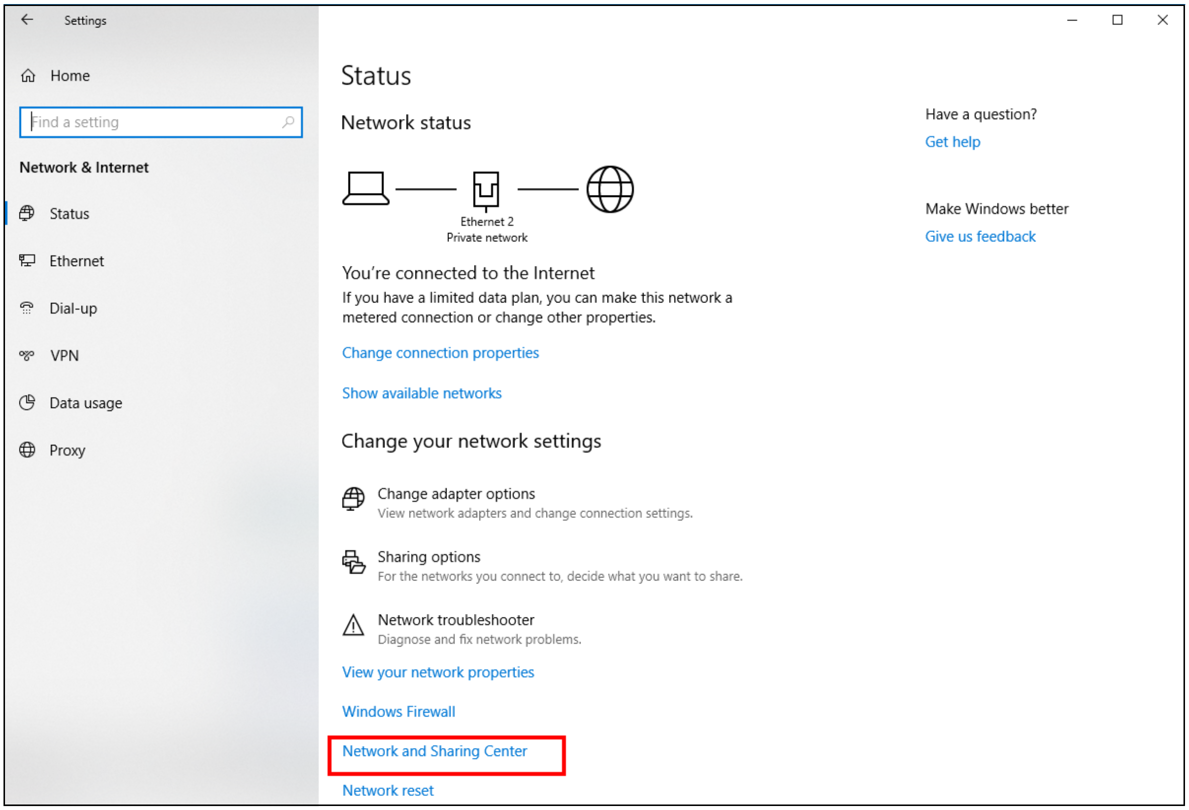
This section shows you how to use the UPnP feature in Windows 10. UPnP server is installed in Windows 10. Activate UPnP on the Zyxel Device by clicking Network Setting > Home Networking > UPnP.

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

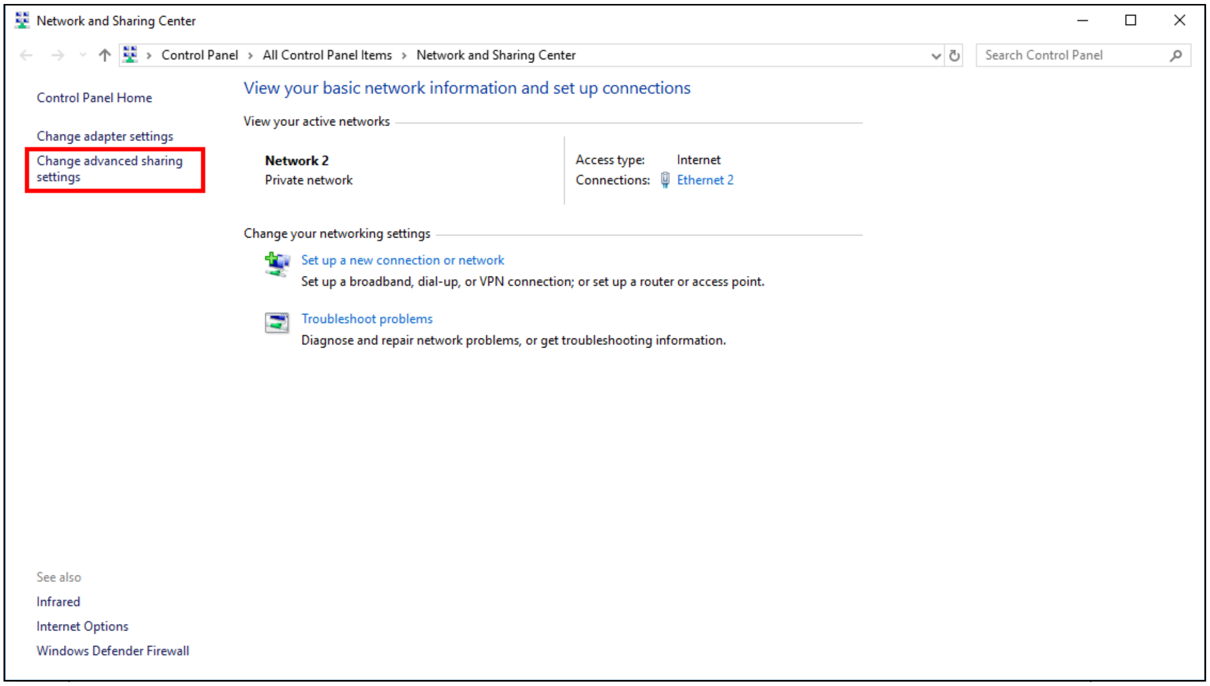
1 Click the start icon, Settings and then Network & Internet.


Settings
Windows Settings
Find a setting
System
Display, sound, notifications, power
Devices
Bluetooth, printers, mouse
Phone
Link your Android, iPhone
Network & Internet
Wi-Fi, airplane mode, VPN
Personalization
Background, lock screen, colors
Apps
Uninstall, defaults, optional features
Accounts
Your accounts, email, sync, work, other people
Time & Language
Speech, region, date
Gaming
Game bar, DVR, broadcasting, Game Mode
Ease of Access
Narrator, magnifier, high contrast
Privacy
Location, camera
Update & Security
Windows Update, recovery, backup
Search
Language, permissions, history

2 Click Network and Sharing Center.


Settings
Home
Find a setting
Network & Internet
Status
Ethernet
Dial-up
VPN
Data usage
Proxy
Status
Network status
Ethernet 2
Private network
You're connected to the Internet
If you have a limited data plan, you can make this network a metered connection or change other properties.
Change connection properties
Show available networks
Change your network settings
Change adapter options
View network adapters and change connection settings.
Sharing options
For the networks you connect to, decide what you want to share.
Network troubleshooter
Diagnose and fix network problems.
View your network properties
Windows Firewall
Network and Sharing Center
Network reset
Have a question?
Get help
Make Windows better
Give us feedback

3 Click Change advanced sharing settings.



Network and Sharing Center

Control Panel > All Control Panel Items > Network and Sharing Center

View your basic network information and set up connections

View your active networks

Network 2
Private network

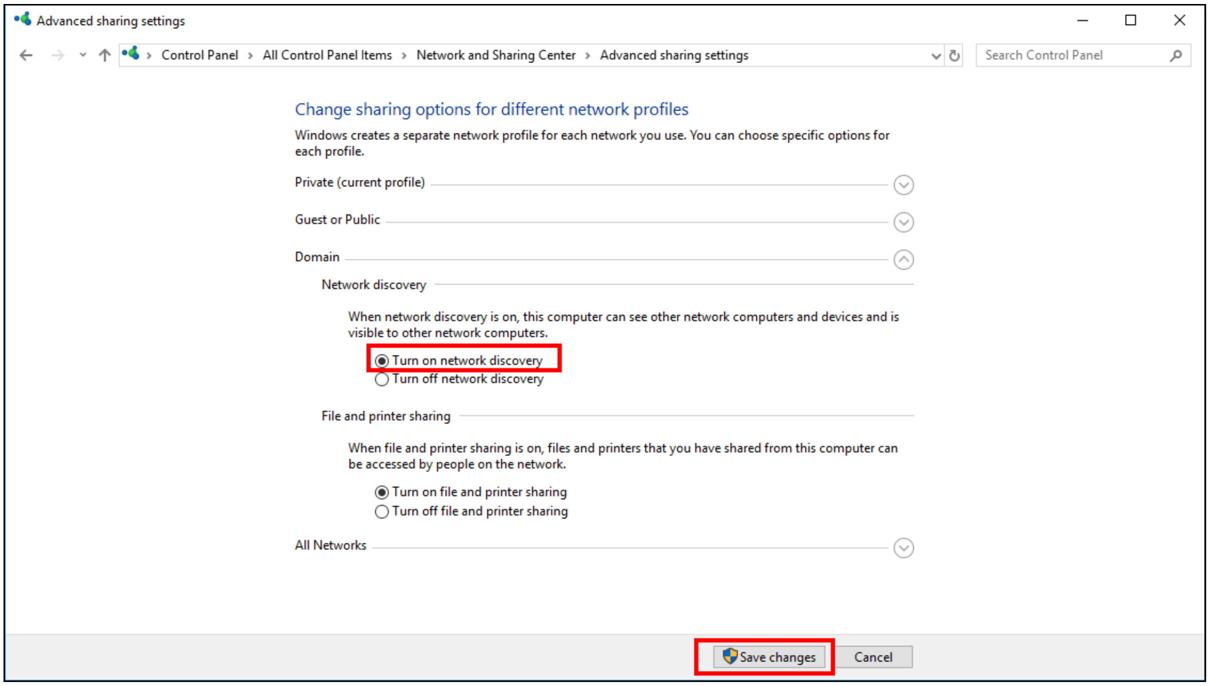
Access type: Internet
Connections: Ethernet 2

Change your networking settings

Set up a new connection or network
Set up a broadband, dial-up, or VPN connection; or set up a router or access point.

Troubleshoot problems
Diagnose and repair network problems, or get troubleshooting information.

4 Under Domain, select Turn on network discovery and click Save Changes. Network discovery allows your computer to find other computers and devices on the network and other computers on the network to find your computer. This makes it easier to share files and printers.



Advanced sharing settings

Control Panel > All Control Panel Items > Network and Sharing Center > Advanced sharing settings

Change sharing options for different network profiles

Windows creates a separate network profile for each network you use. You can choose specific options for each profile.

Private (current profile)

Guest or Public

Domain

Network discovery

When network discovery is on, this computer can see other network computers and devices and is visible to other network computers.

● Turn on network discovery
○ Turn off network discovery

File and printer sharing

When file and printer sharing is on, files and printers that you have shared from this computer can be accessed by people on the network.

● Turn on file and printer sharing
○ Turn off file and printer sharing

All Networks

9.7.1 Auto-discover Your UPnP-enabled Network Device

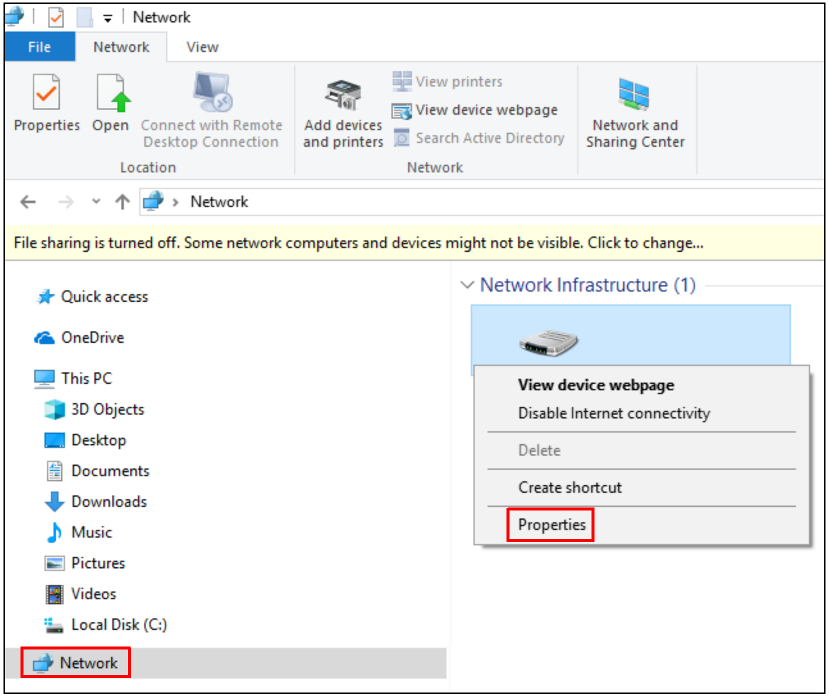
Before you follow these steps, make sure you already have UPnP activated on the Zyxel Device and in your computer.

Make sure your computer is connected to the LAN port of the Zyxel Device.

1 Open File Explorer and click Network.

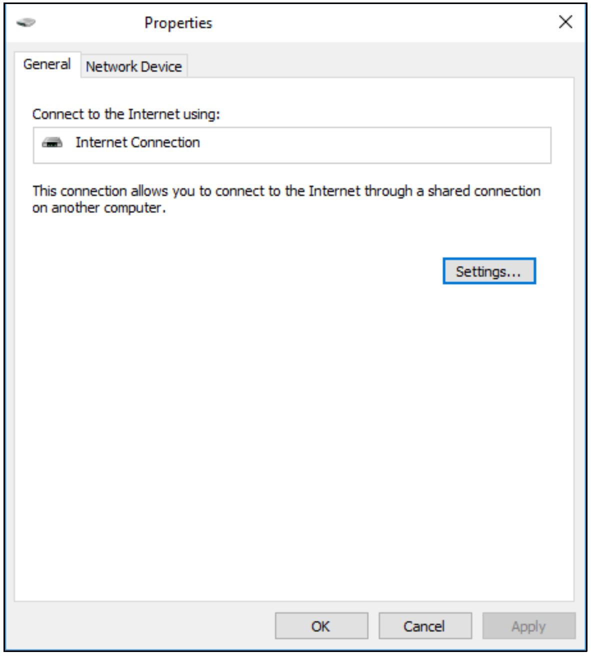
2 Right-click the Zyxel Device icon and select Properties.

Figure 124 Network Connections



3 In the Internet Connection Properties window, click Settings to see port mappings.

Figure 125 Internet Connection Properties



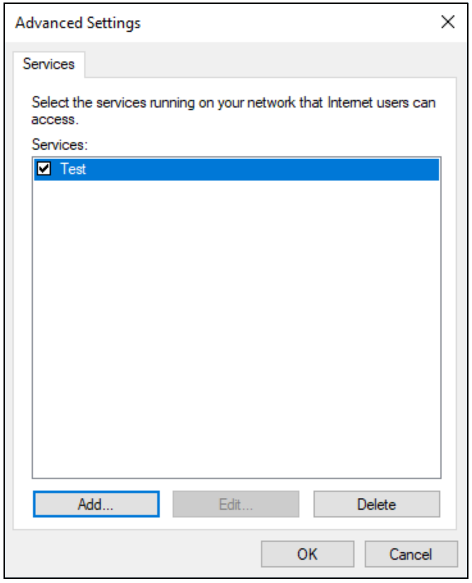
Connect to the Internet using:

Internet Connection

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

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

Figure 126   Internet Connection Properties: Advanced Settings


Advanced Settings

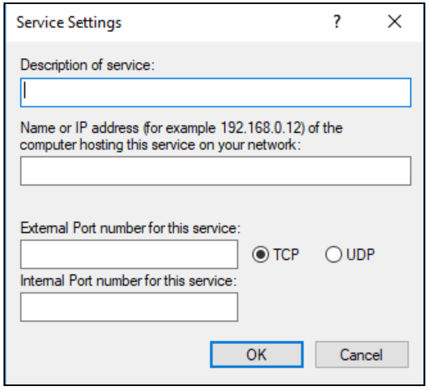
Services

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

Services:

☑ Test

Figure 127   Internet Connection Properties: Advanced Settings: Add


Service Settings

Description of service:

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

External Port number for this service:

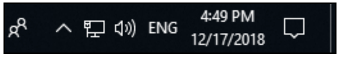
● TCP ○ UDP

Internal Port number for this service:

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

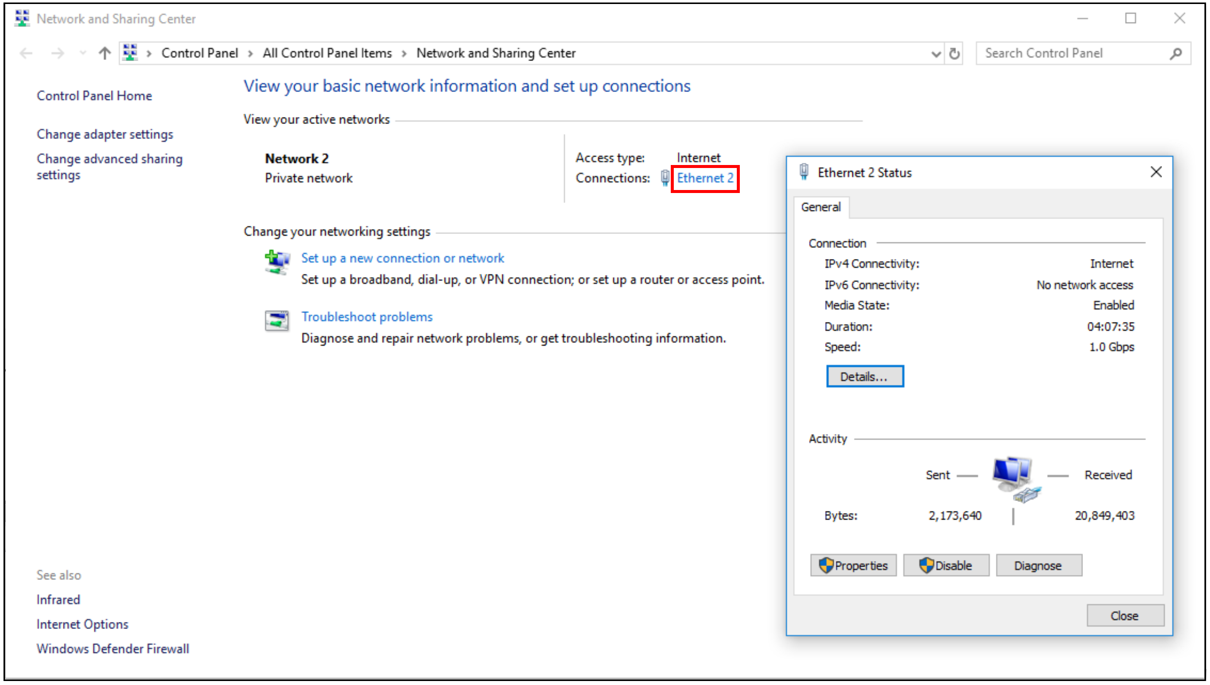
5 Click OK. Check the network icon on the system tray to see your Internet connection status.

Figure 128   System Tray Icon



6 To see more details about your current Internet connection status, right click the network icon in the system tray and click Open Network & Internet settings. Click Network and Sharing Center and click the Connections.

Figure 129 Internet Connection Status



Network and Sharing Center

Control Panel > All Control Panel Items > Network and Sharing Center

Search Control Panel

Control Panel Home

Change adapter settings

Change advanced sharing settings

View your basic network information and set up connections

View your active networks

Network 2
Private network

Access type: Internet
Connections: Ethernet 2

Change your networking settings

Set up a new connection or network
Set up a broadband, dial-up, or VPN connection; or set up a router or access point.

Troubleshoot problems
Diagnose and repair network problems, or get troubleshooting information.

See also

Infrared

Internet Options

Windows Defender Firewall

Ethernet 2 Status

General

Connection

IPv4 Connectivity:	Internet
IPv6 Connectivity:	No network access
Media State:	Enabled
Duration:	04:07:35
Speed:	1.0 Gbps

Details...

Activity

	Sent	Received
Bytes:	2,173,640	20,849,403

Properties Disable Diagnose

Close

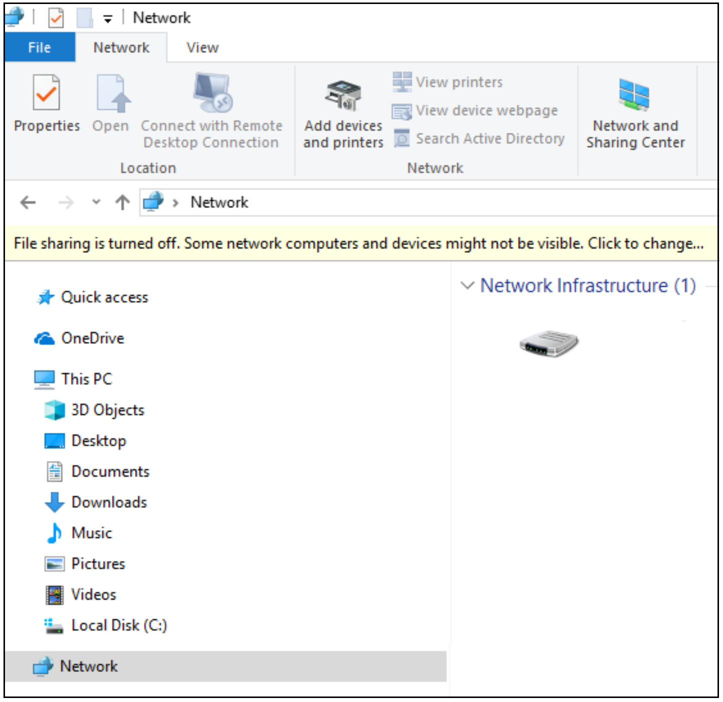
9.8 Web Configurator Access with UPnP in Windows 10

Follow the steps below to access the Web Configurator.

1 Open File Explorer.

2 Click Network.

Figure 130 Network Connections

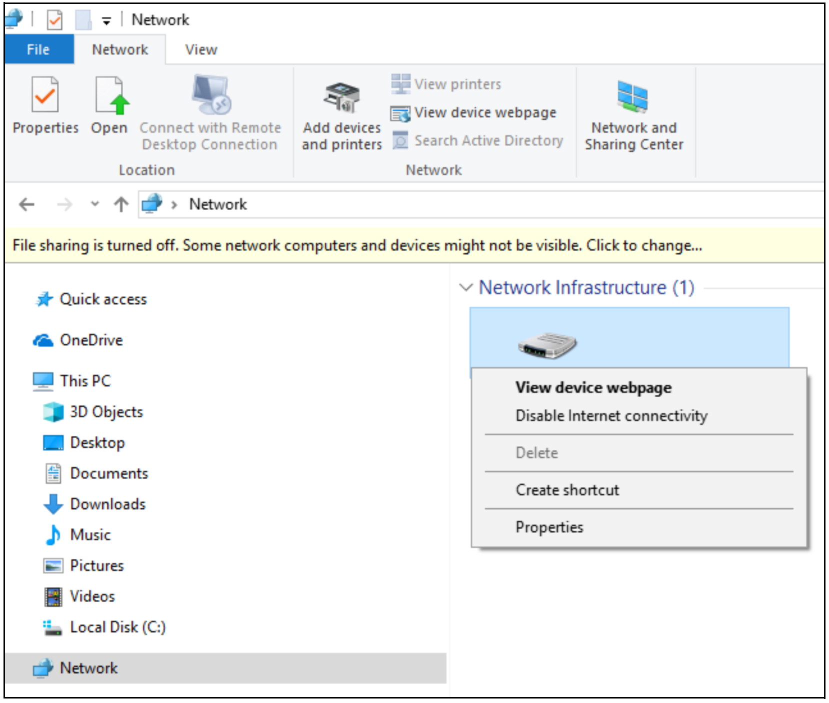


File sharing is turned off. Some network computers and devices might not be visible. Click to change...

3 An icon with the description for each UPnP-enabled device displays under Network Infrastructure.

4 Right-click the icon for your Zyxel Device and select View device webpage. The Web Configurator login screen displays.

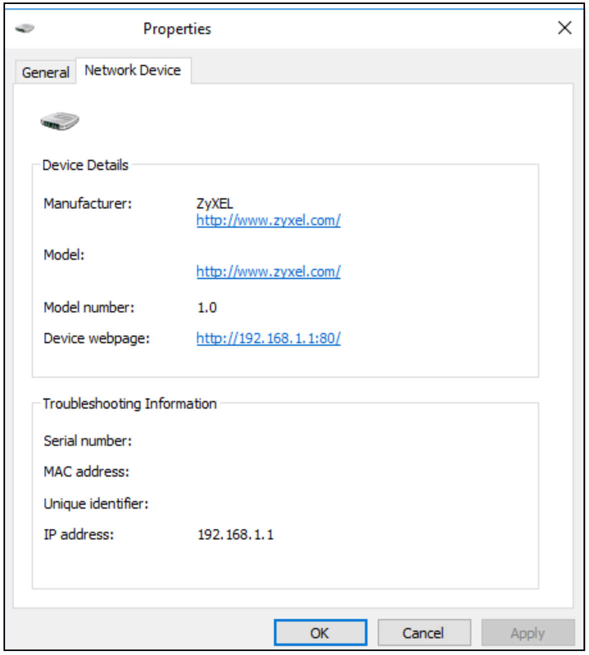
Figure 131 Network Connections: Network Infrastructure



File sharing is turned off. Some network computers and devices might not be visible. Click to change...

5 Right-click the icon for your Zyxel Device and select Properties. Click the Network Device tab. A window displays information about the Zyxel Device.

Figure 132 Network Connections: Network Infrastructure: Properties: Example



Device Details

Manufacturer: ZyXEL
http://www.zyxel.com/

Model:
http://www.zyxel.com/

Model number: 1.0

Device webpage: http://192.168.1.1:80/

Troubleshooting Information

Serial number:

MAC address:

Unique identifier:

IP address: 192.168.1.1

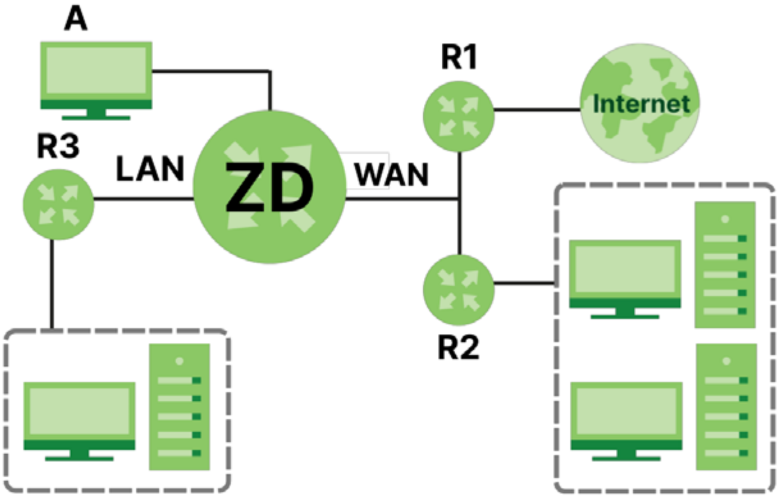
CHAPTER 10 Routing

10.1 Routing Overview

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

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

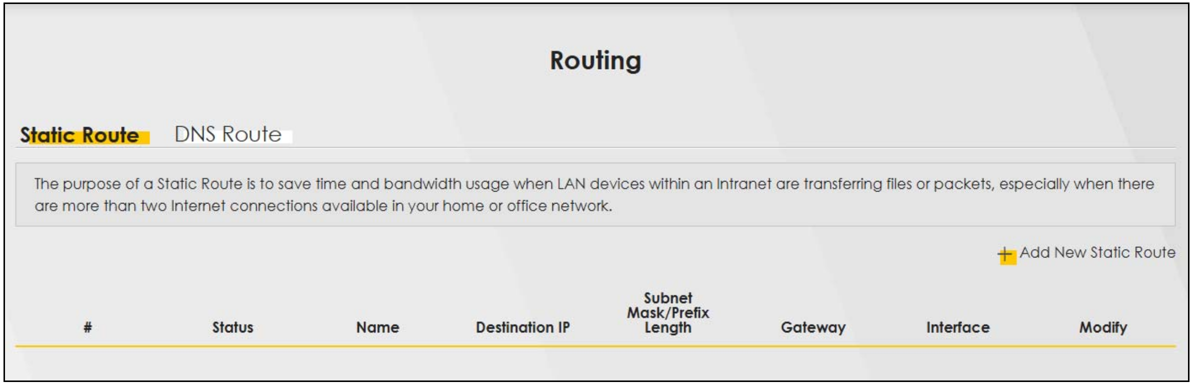
Figure 133 Example of Static Routing Topology



10.2 Configure Static Route

Use this screen to view and configure static route rules on the Zyxel Device. A static route is used to save time and bandwidth usage when LAN devices within an Intranet are transferring files or packets, especially when there are more than two Internet connections in your home or office network. Click Network Setting > Routing to open the Static Route screen.

Figure 134 Network Setting > Routing > Static Route



Routing

Static Route DNS Route

The purpose of a Static Route is to save time and bandwidth usage when LAN devices within an Intranet are transferring files or packets, especially when there are more than two Internet connections available in your home or office network.

The following table describes the labels in this screen.

Table 74 Network Setting > Routing > Static Route

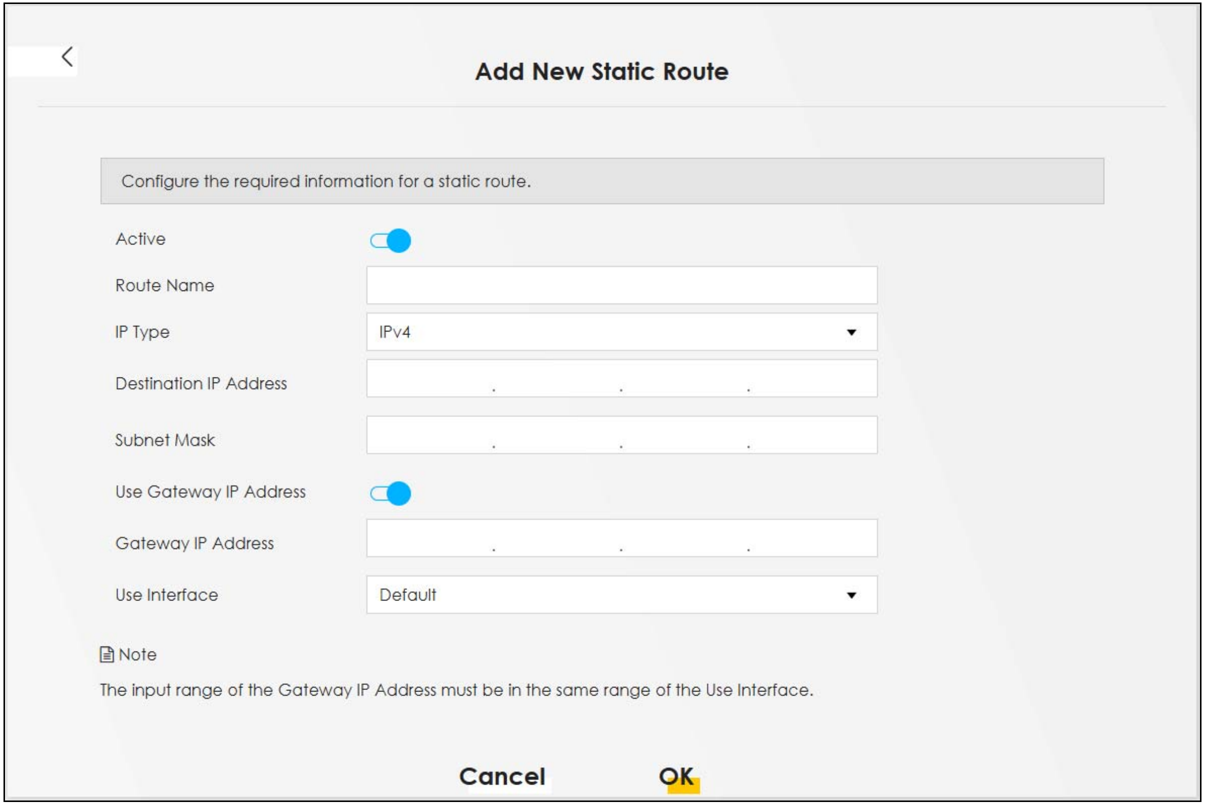
LABEL	DESCRIPTION
Add New Static Route	Click this to set up a new static route on the Zyxel Device.
#	This is the number of an individual static route.
Status	This field indicates whether the rule is active (yellow bulb) or not (gray bulb).
Name	This is the name of the static route.
Destination IP	This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

10.2.1 Add or Edit Static Route

Use this screen to add or edit a static route. Click Add New Static Route in the Static Route screen, the following screen appears. Configure the required information for a static route.

Note: The Gateway IP Address must be within the range of the selected interface in Use Interface.

Figure 135 Network Setting > Routing > Static Route > Add New Static Route



Add New Static Route

Configure the required information for a static route.

Active

Route Name

IP Type: IPv4

Destination IP Address

Subnet Mask

Use Gateway IP Address

Gateway IP Address

Use Interface: Default

Note

The input range of the Gateway IP Address must be in the same range of the Use Interface.

The following table describes the labels in this screen.

Table 75 Network Setting > Routing > Static Route > Add New Static Route

LABEL	DESCRIPTION
Active	Click this switch to activate static route. Otherwise, click to disable.
Route Name	Enter a name for your static route. You can use up to 15 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
IP Type	Select between IPv4 or IPv6. Compared to IPv4, 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 x 1038 IP addresses. The Zyxel Device can use IPv4/IPv6 dual stack to connect to IPv4 and IPv6 networks, and supports IPv6 rapid deployment (6RD).
Destination IP Address	This parameter specifies the IP network address of the final destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID.
Subnet Mask	If you are using IPv4 and need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID. Enter the IP subnet mask here. Note: This field appears only when you select IPv4 in the IP Type field.
Prefix Length	If you are using IPv6, enter the address prefix length to specify how many most significant bits in an IPv6 address compose the network address. Note: This field appears only when you select IPv6 in the IP Type field.

Table 75 Network Setting > Routing > Static Route > Add New Static Route (continued)

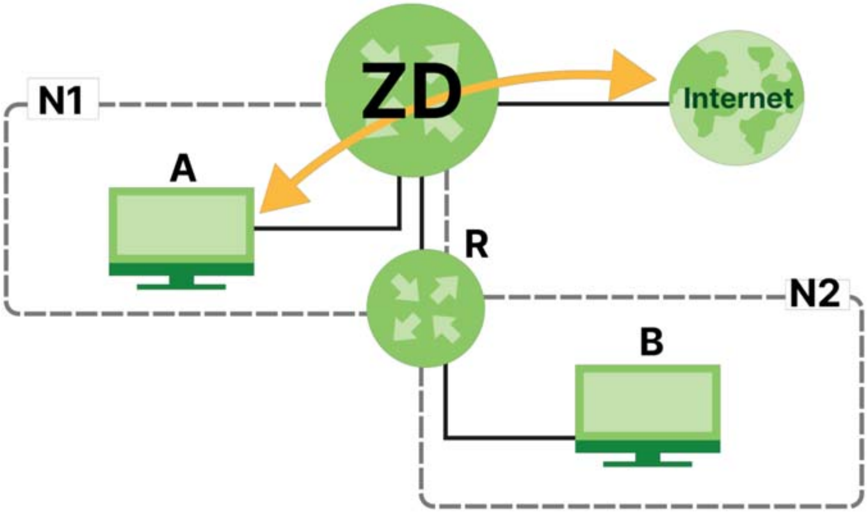
LABEL	DESCRIPTION
Use Gateway IP Address	The gateway is a router or switch on the same network segment as the device's LAN or WAN port. The gateway helps forward packets to their destinations. Click this switch to enable or disable the gateway IP address. When the switch goes to the right, the function is enabled. Otherwise, it is not.
OK	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

10.2.1.1 An Example of Adding a Static Route

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

In the following figure, router R is connected to the Zyxel Device’s LAN. R connects to two networks, N1 (192.168.1.x/24) and N2 (192.168.10.x/24). If you want to send traffic from computer A (in N1 network) to computer B (in N2 network), the traffic is sent to the Zyxel Device’s WAN default gateway by default. In this case, B will never receive the traffic.

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



This tutorial uses the following example IP settings:

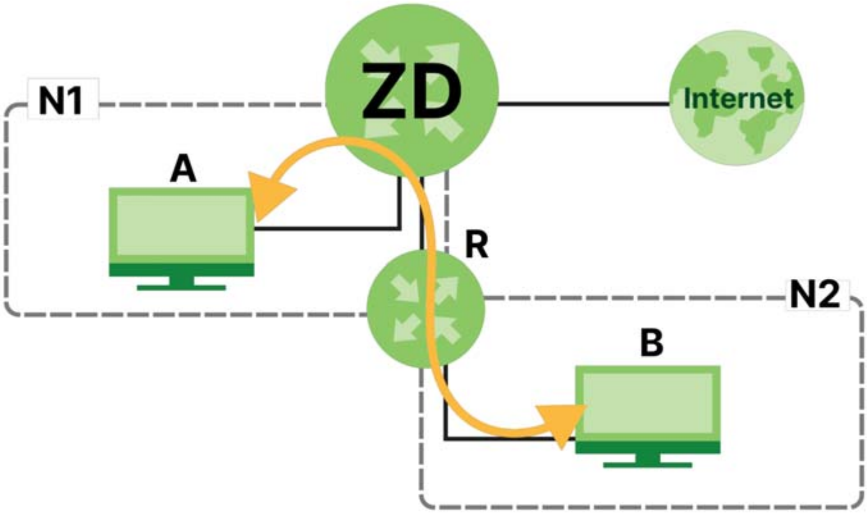


Table 76 IP Settings in this Tutorial

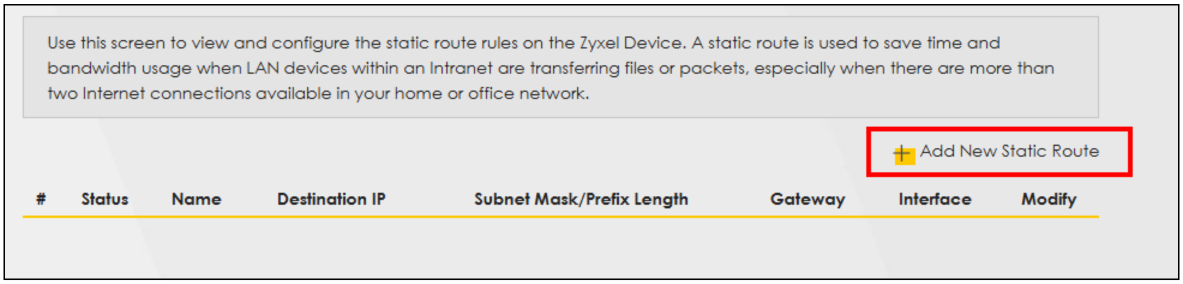
DEVICE / COMPUTER	IP ADDRESS
The Zyxel Device's WAN	172.16.1.1
The Zyxel Device's LAN	
IP Type	IPv4
Use Interface	Default
A	192.168.1.34
R's N1	192.168.1.253
R's N2	192.168.10.2
B	192.168.10.33

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

1 Log into the Zyxel Device's Web Configurator.

2 Click Network Setting > Routing.

3 Click Add new Static Route in the Static Route screen.



Use this screen to view and configure the static route rules on the Zyxel Device. A static route is used to save time and bandwidth usage when LAN devices within an Intranet are transferring files or packets, especially when there are more than two Internet connections available in your home or office network.

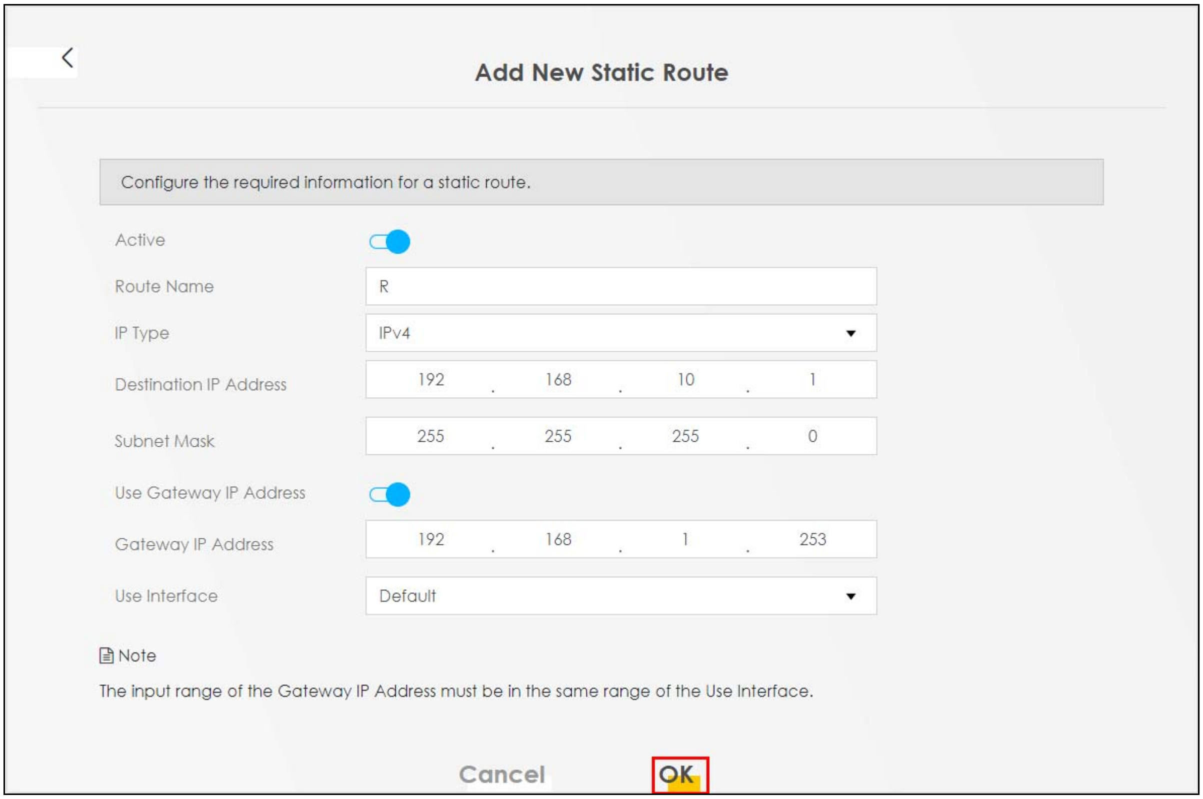
Add New Static Route
# Status Name Destination IP Subnet Mask/Prefix Length Gateway Interface Modify

4 Configure the Static Route Setup screen using the following settings:

- Click the Active button to enable this static route. When the switch goes to the right, the function is enabled. Enter the Route Name as R.
- Set IP Type to IPv4.

- Enter the Destination IP Address 192.168.10.1 and IP Subnet Mask 255.255.255.0 for the destination, N2.
- Click the Use Gateway IP Address button to enable this function. When the switch goes to the right, the function is enabled. Enter 192.168.1.253 (R's N1 address) in the Gateway IP Address field.
- Select Default as the Use Interface.
- Click OK.

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



Add New Static Route

Configure the required information for a static route.

Active	●
Route Name	R
IP Type	IPv4
Destination IP Address	192 . 168 . 10 . 1
Subnet Mask	255 . 255 . 255 . 0
Use Gateway IP Address	●
Gateway IP Address	192 . 168 . 1 . 253
Use Interface	Default

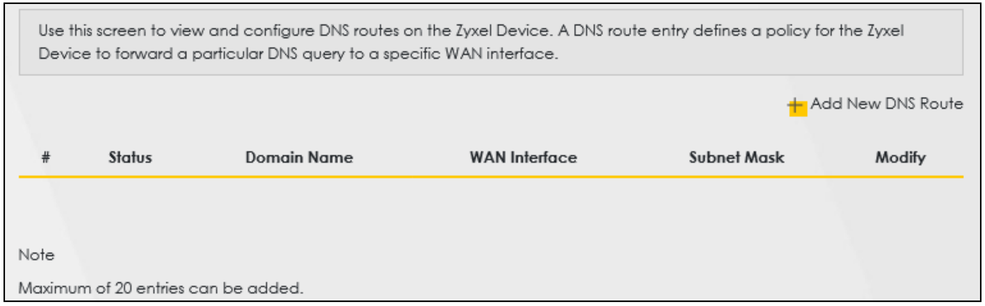
Note

The input range of the Gateway IP Address must be in the same range of the Use Interface.

10.3 DNS Route

Use this screen to view and configure DNS routes on the Zyxel Device. A DNS route entry defines a policy for the Zyxel Device to forward a particular DNS query to a specific WAN interface. Click Network Setting > Routing > DNS Route to open the DNS Route screen.

Figure 136 Network Setting > Routing > DNS Route



Use this screen to view and configure DNS routes on the Zyxel Device. A DNS route entry defines a policy for the Zyxel Device to forward a particular DNS query to a specific WAN interface.

Note

Maximum of 20 entries can be added.

The following table describes the labels in this screen.

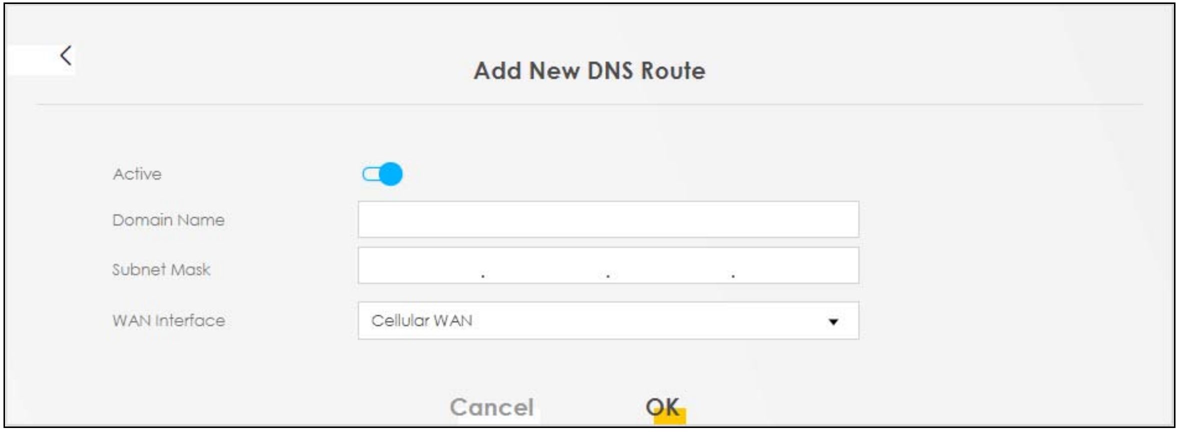
Table 77 Network Setting > Routing > DNS Route

LABEL	DESCRIPTION
Add New DNS Route	Click this to create a new entry.
#	This is the number of an individual DNS route.
Status	This field indicates whether the rule is active (yellow bulb) or not (gray bulb).
Domain Name	This is the domain name to which the DNS route applies.
WAN Interface	This is the WAN interface through which the matched DNS request is routed.
Subnet Mask	This parameter specifies the IP network subnet mask.
Modify	Click the Edit icon to configure a DNS route on the Zyxel Device. Click the Delete icon to remove a DNS route from the Zyxel Device.

10.3.1 Add or Edit DNS Route

You can manually add the Zyxel Device’s DNS route entry. Click Add New DNS Route in the DNS Route screen, use this screen to configure the required information for a DNS route.

Figure 137 Network Setting > Routing > DNS Route > Add New DNS Route



WAN Interface: Cellular WAN

The following table describes the labels in this screen.

Table 78 Network Setting > Routing > DNS Route

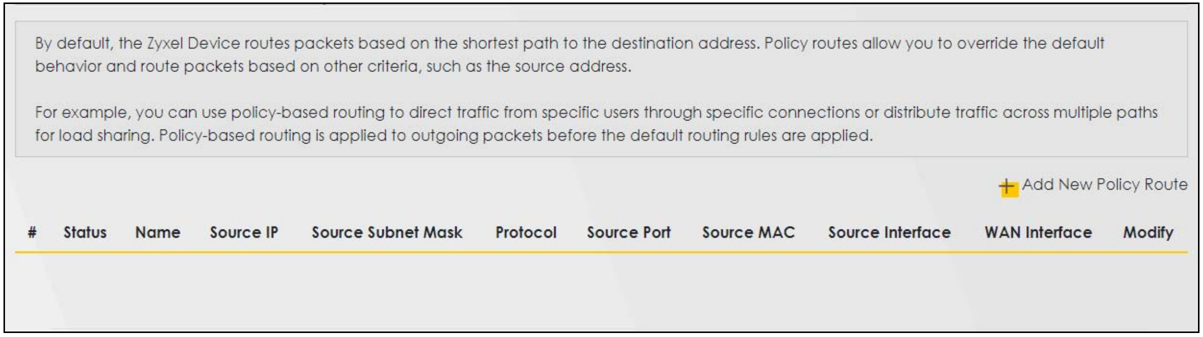
LABEL	DESCRIPTION
Active	Enable DNS route in your Zyxel Device.
Domain Name	Enter the domain name you want to resolve. You can use up to 64 alphanumeric (0-9, a-z, A-Z) characters with hyphens [–] and periods [.]. You can use the wildcard character, an "*" (asterisk) as the left most part of a domain name, such as *.example.com. The Zyxel Device forwards DNS queries for any domain name ending in example.com to the WAN interface specified in this route.
WAN Interface	Select a WAN interface through which the matched DNS query is sent. You must have the WAN interfaces already configured in the Broadband screen.
OK	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

10.4 Policy Route

By default, the Zyxel Device routes packets are based on the shortest path to the destination address. Policy routes allow you to override the default behavior and route packets based on other criteria, such as the source address. For example, you can use policy-based routing to direct traffic from specific users through specific connections or distribute traffic across multiple paths for load sharing. Policy-based routing is applied to outgoing packets before the default routing rules are applied.

The Policy Route screen lets you view and configure routing policies on the Zyxel Device. Click Network Setting > Routing > Policy Route to open the following screen.

Figure 138 Network Setting > Routing > Policy Route



By default, the Zyxel Device routes packets based on the shortest path to the destination address. Policy routes allow you to override the default behavior and route packets based on other criteria, such as the source address.

For example, you can use policy-based routing to direct traffic from specific users through specific connections or distribute traffic across multiple paths for load sharing. Policy-based routing is applied to outgoing packets before the default routing rules are applied.

#	Status	Name	Source IP	Source Subnet Mask	Protocol	Source Port	Source MAC	Source Interface	WAN Interface	Modify

The following table describes the labels in this screen.

Table 79 Network Setting > Routing > Policy Route

LABEL	DESCRIPTION
Add New Policy Route	Click this to create a new policy forwarding rule.
#	This is the index number of the entry.
Status	This field displays whether the DNS route is active or not. A yellow bulb signifies that this DNS route is active. A gray bulb signifies that this DNS route is not active.
Name	This is the name of the rule.
Source IP	This is the source IP address.

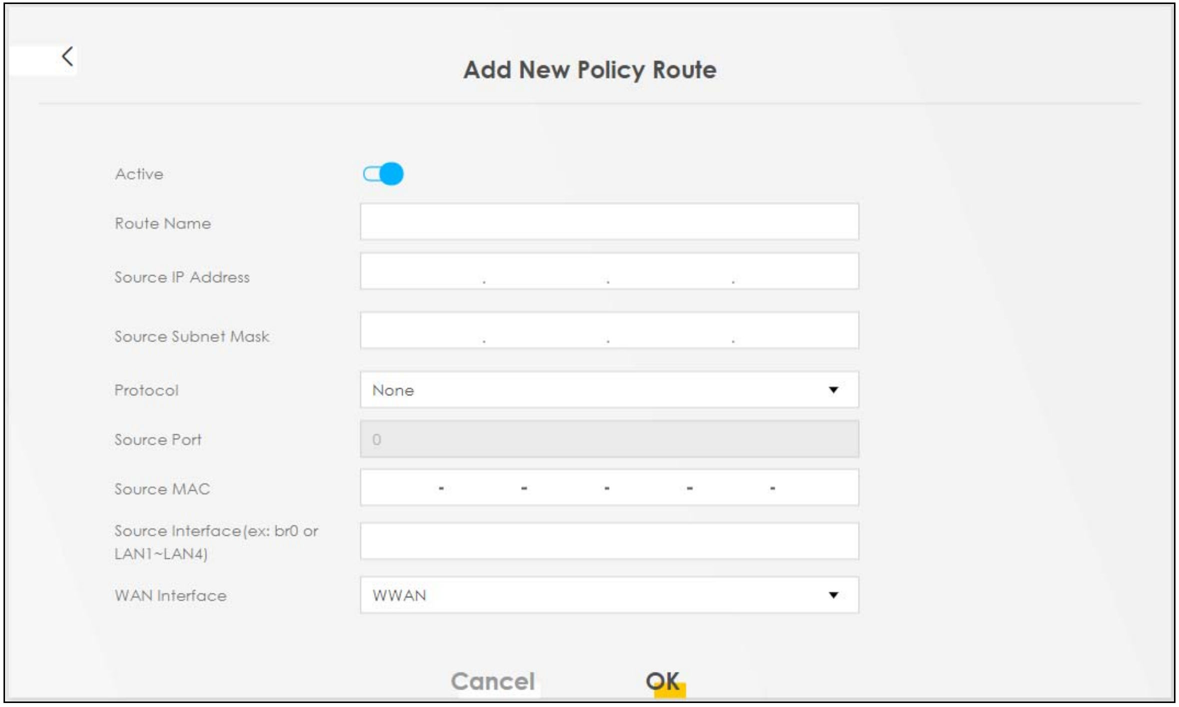
Table 79 Network Setting > Routing > Policy Route (continued)

LABEL	DESCRIPTION
Source Subnet Mask	This is the source subnet mask address.
Protocol	This is the transport layer protocol.
Source Port	This is the source port number.
Source MAC	This is the source MAC address.
Source Interface	This is the interface from which the matched traffic is sent.
WAN Interface	This is the WAN interface through which the traffic is routed.
Modify	Click the Edit icon to edit this policy. Click the Delete icon to remove a policy from the Zyxel Device. A window displays asking you to confirm that you want to delete the policy.

10.4.1 Add or Edit Policy Route

Click Add New Policy Route in the Policy Route screen or click the Edit icon next to a policy. Use this screen to configure the required information for a policy route.

Figure 139 Network Setting > Routing > Policy Route: Add or Edit



Add New Policy Route

Active	●
Route Name	
Source IP Address	. . .
Source Subnet Mask	. . .
Protocol	None
Source Port	0
Source MAC	- - - - -
Source Interface(ex: br0 or LAN1~LAN4)	
WAN Interface	WWAN

The following table describes the labels in this screen.

Table 80 Network Setting > Routing > Policy Route: Add or Edit

LABEL	DESCRIPTION
Active	Click this switch to activate this policy route. Otherwise, click to disable.
Route Name	Enter a descriptive name of this policy route. You can use up to 15 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.

Table 80 Network Setting > Routing > Policy Route: Add or Edit (continued)

LABEL	DESCRIPTION
Source IP Address	Enter the source IP address.
Source Subnet Mask	Enter the source subnet mask address.
Protocol	Select the transport layer protocol (TCP, UDP, or None).
Source Port	Enter the source port number.
Source MAC	Enter the source MAC address.
Source Interface (example: br0 or LAN1 – LAN4)	Enter the name of the interface from which the matched traffic is sent.
WAN Interface	Select a WAN interface through which the traffic is sent. You must have the WAN interfaces already configured in the Broadband screens.
Cancel	Click Cancel to exit this screen without saving.
OK	Click OK to save your changes.

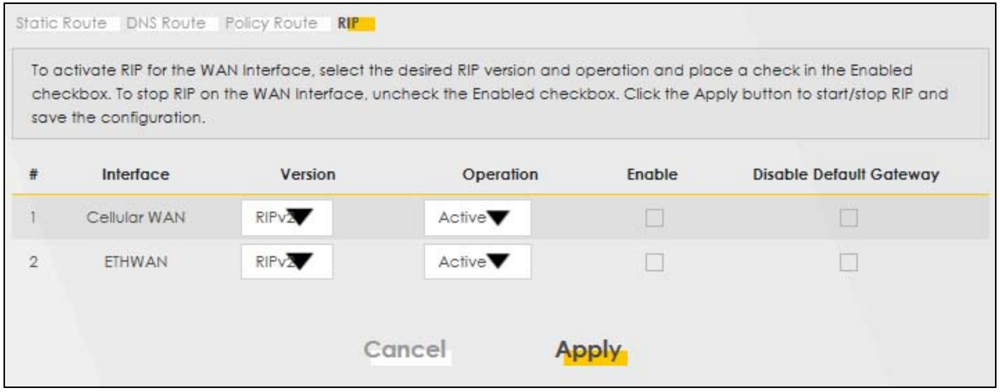
10.5 RIP Overview

Routing Information Protocol (RIP, RFC 1058 and RFC 1389) allows the Zyxel Device to exchange routing information with other routers. To activate RIP for the WAN interface, select the supported RIP version and operation.

10.5.1 RIP

Click Network Setting > Routing > RIP to open the RIP screen. Select the desired RIP version and operation by clicking the checkbox. To stop RIP on the WAN interface, clear the checkbox. Click the Apply button to start or stop RIP and save the configuration.

Figure 140 Network Setting > Routing > RIP



To activate RIP for the WAN Interface, select the desired RIP version and operation and place a check in the Enabled checkbox. To stop RIP on the WAN Interface, uncheck the Enabled checkbox. Click the Apply button to start/stop RIP and save the configuration.

#	Interface	Version	Operation	Enable	Disable Default Gateway
1	Cellular WAN	RIPv2	Active	□	□
2	ETHWAN	RIPv2	Active	□	□

The following table describes the labels in this screen.

Table 81 Network Setting > Routing > RIP

LABEL	DESCRIPTION
#	This is the index of the interface in which the RIP setting is used.
Interface	This is the name of the interface in which the RIP setting is used.
Version	The RIP version controls the format and the broadcasting method of the RIP packets that the Zyxel Device sends (it recognizes both formats when receiving). RIPv1 is universally supported but RIPv2 carries more information. RIPv1 is probably adequate for most networks, unless you have an unusual network topology. When set to Both, the Zyxel Device will broadcast its routing table periodically and incorporate the RIP information that it receives.
Operation	Select Passive to have the Zyxel Device update the routing table based on the RIP packets received from neighbors but not advertise its route information to other routers in this interface. Select Active to have the Zyxel Device advertise its route information and also listen for routing updates from neighboring routers.
Enable	Select the checkbox to activate the settings.
Disable Default Gateway	Select the checkbox to set the Zyxel Device to not send the route information to the default gateway.
Cancel	Click Cancel to exit this screen without saving.
Apply	Click Apply to save your changes back to the Zyxel Device.

CHAPTER 11 Network Address Translation (NAT)

11.1 NAT Overview

NAT (Network Address Translation – NAT, RFC 1631) is the translation of a public IP address from the Internet to multiple private IP addresses in your local network. The NAT network appears as a single host on the Internet.

Use Port Forwarding to forward packets to computers on a private network behind the Zyxel Device. Suppose you have a Doom gaming server (port 666) on your network with IP address 192.168.1.111 that you want users to be able to access from the Internet. Internet users will send port 666 traffic to the Zyxel Device's public IP address. The Zyxel Device will then forward this traffic to the Doom server at 192.168.1.111.

11.1.1 What You Can Do in this Chapter

- Use the Port Forwarding screen to configure forward incoming service requests to the servers on your local network (Port Forwarding).
- Use the Port Triggering screen to add and configure the Zyxel Device's trigger port settings (Port Triggering).
- Use the DMZ screen to configure a default server (DMZ).
- Use the ALG screen to enable or disable the SIP ALG (ALG).

11.1.2 What You Need To Know

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

Inside/Outside and Global/Local

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

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

NAT

In the simplest form, NAT changes the source IP address in a packet received from a subscriber (the inside local address) to another (the inside global address) before forwarding the packet to the WAN side.

When the response comes back, NAT translates the destination address (the inside global address) back to the inside local address before forwarding it to the original inside host.

Port Forwarding

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

11.2 Port Forwarding

Use Port Forwarding to forward incoming service requests from the Internet to the servers on your local network. Port forwarding is commonly used when you want to host online gaming, P2P file sharing, or other servers on your network.

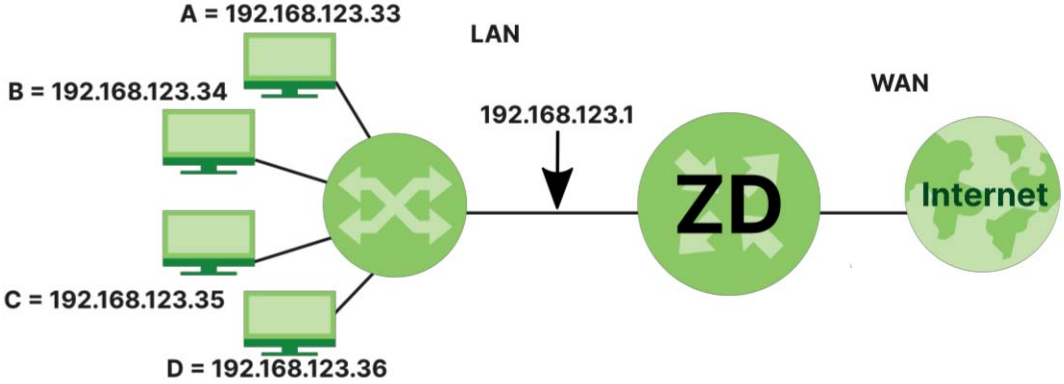
You may enter a single port number or a range of port numbers to be forwarded, and the local IP address of the desired server. The port number identifies a service; for example, web service is on port 80 on port 21. In some cases, such as for unknown services or where one server can support more than one service (for example web service), it might be better to specify a range of port numbers. You can allocate a server IP address that corresponds to a port or a range of ports. Please refer to RFC 1700 for further information about port numbers.

Note: Many residential broadband ISP accounts do not allow you to run any server processes (such as a Web server) from your location. Your ISP may periodically check for servers and may suspend your account if it discovers any active services at your location. If you are unsure, refer to your ISP.

Configure Servers Behind Port Forwarding (Example)

Let's say you want to assign ports 21-25 to one Telnet and SMTP server (A in the example), port 80 to another (B in the example), a default server IP address of 192.168.1.35 to a third (C in the example), and a default server IP address of 192.168.1.36 to a fourth (D in the example). You assign the LAN IP addresses and the ISP assigns the WAN IP address. The NAT network appears as a single host on the Internet.

Figure 141   Multiple Servers Behind NAT Example

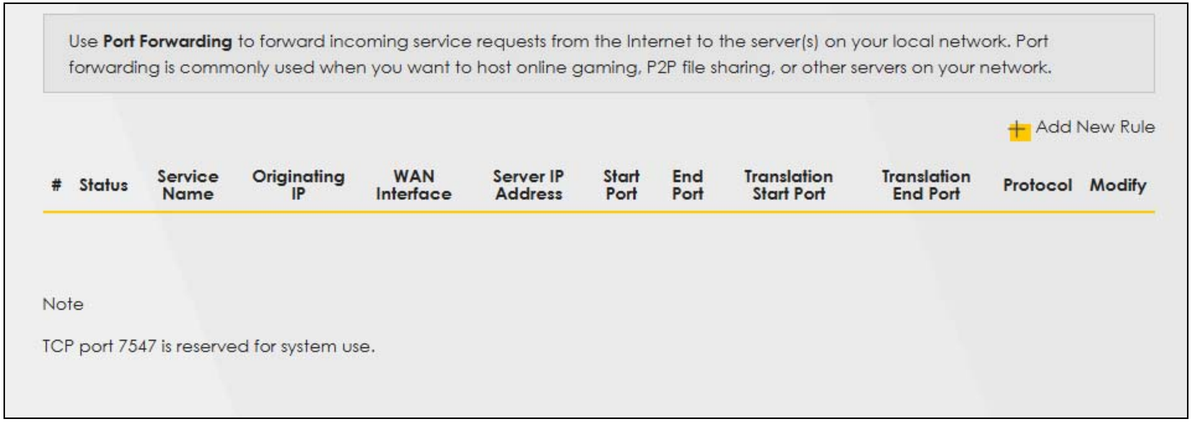


11.2.1 Port Forwarding

Click Network Setting > NAT to open the Port Forwarding screen.

Note: TCP port 7547 is reserved for system use.

Figure 142 Network Setting > NAT > Port Forwarding



Use **Port Forwarding** to forward incoming service requests from the Internet to the server(s) on your local network. Port forwarding is commonly used when you want to host online gaming, P2P file sharing, or other servers on your network.

#	Status	Service Name	Originating IP	WAN Interface	Server IP Address	Start Port	End Port	Translation Start Port	Translation End Port	Protocol	Modify

Note

TCP port 7547 is reserved for system use.

The following table describes the fields in this screen.

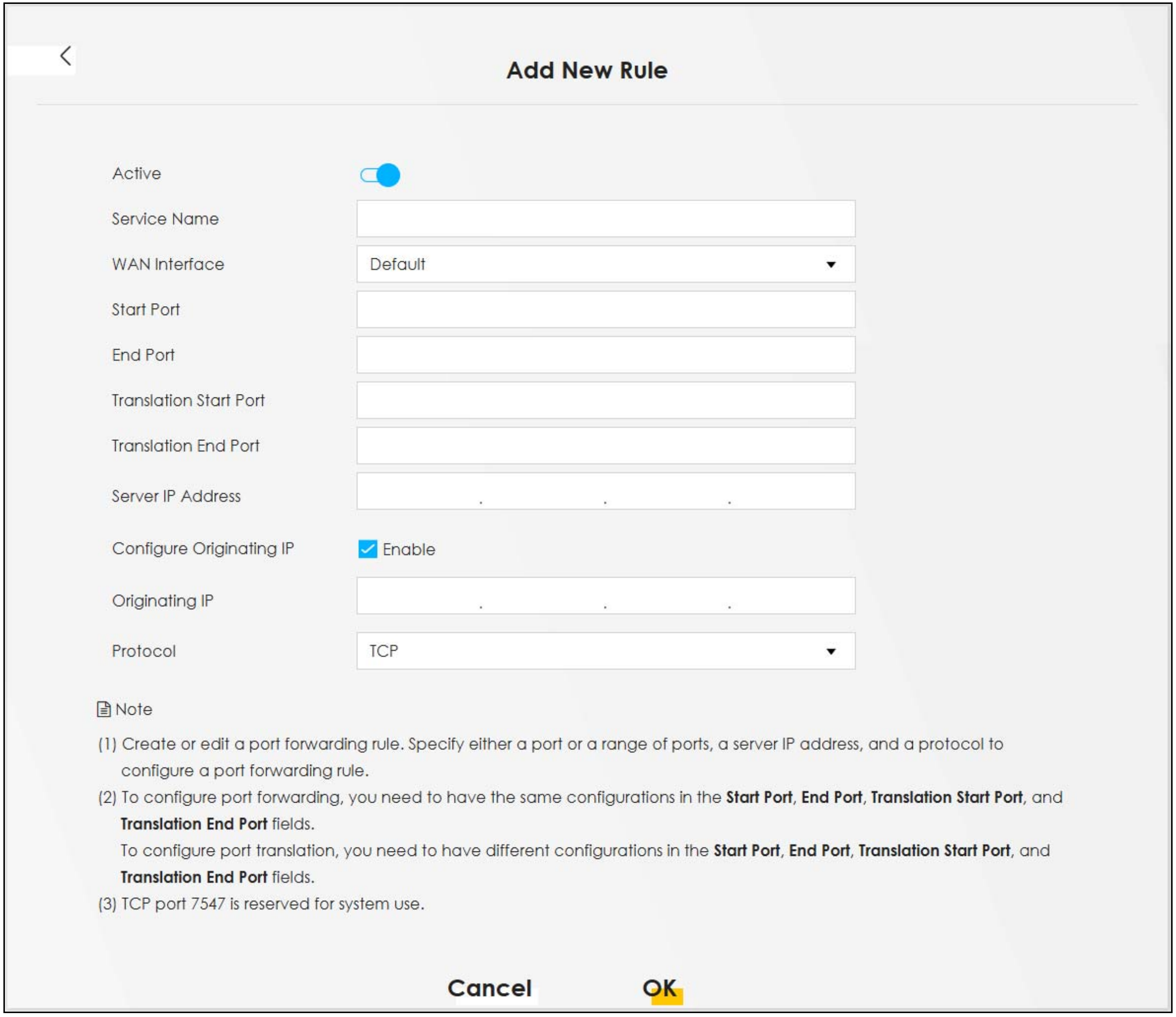
Table 82 Network Setting > NAT > Port Forwarding

LABEL	DESCRIPTION
Add New Rule	Click this to add a new port forwarding rule.
#	This is the index number of the entry.
Status	This field indicates whether the rule is active or not. A yellow bulb signifies that this rule is active. A gray bulb signifies that this rule is not active.
Service Name	This is the service's name. This shows User Defined if you manually added a service. You can change this by clicking the edit icon.
Originating IP	This is the source's IP address.
WAN Interface	Select the WAN interface for which to configure NAT port forwarding rules.
Server IP Address	This is the server's IP address.
Start Port	This is the first external port number that identifies a service.
End Port	This is the last external port number that identifies a service.
Translation Start Port	This is the first internal port number that identifies a service.
Translation End Port	This is the last internal port number that identifies a service.
Protocol	This field displays the protocol (TCP, UDP, TCP+UDP) used to transport the packets for which you want to apply the rule.
Modify	Click the Edit icon to edit the port forwarding rule. Click the Delete icon to delete an existing port forwarding rule. Note that subsequent address mapping rules move up by one when you take this action.

11.2.2 Add or Edit Port Forwarding

Create or edit a port forwarding rule. Specify either a port or a range of ports, a server IP address, and a protocol to configure a port forwarding rule. Click Add New Rule in the Port Forwarding screen or the Edit icon next to an existing rule to open the following screen.

Figure 143 Network Setting > NAT > Port Forwarding: Add or Edit



Add New Rule

Active	●
Service Name	
WAN Interface	Default ▾
Start Port	
End Port	
Translation Start Port	
Translation End Port	
Server IP Address	. . .
Configure Originating IP	☑ Enable
Originating IP	. . .
Protocol	TCP ▾

Note

(1) Create or edit a port forwarding rule. Specify either a port or a range of ports, a server IP address, and a protocol to configure a port forwarding rule.

(2) To configure port forwarding, you need to have the same configurations in the **Start Port**, **End Port**, **Translation Start Port**, and **Translation End Port** fields.
To configure port translation, you need to have different configurations in the **Start Port**, **End Port**, **Translation Start Port**, and **Translation End Port** fields.

(3) TCP port 7547 is reserved for system use.

Note: To configure port forwarding, you need to have the same configurations in the Start Port, End Port, Translation Start Port, and Translation End Port fields.
To configure port translation, you need to have different configurations in the Start Port, End Port, Translation Start Port, and Translation End Port fields.
Here is an example to configure port translation. Configure Start Port to 100, End Port to 120, Translation Start Port to 200, and Translation End Port to 220.

Note: TCP port 7547 is reserved for system use.

The following table describes the labels in this screen.

Table 83 Network Setting > NAT > Port Forwarding: Add or Edit

LABEL	DESCRIPTION
Active	Click to turn the port forwarding rule on or off.
Service Name	Enter a name for the service to forward. You can use up to 256 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
WAN Interface	Select the WAN interface for which to configure NAT port forwarding rules.

Table 83 Network Setting > NAT > Port Forwarding: Add or Edit (continued)

LABEL	DESCRIPTION
Start Port	Configure this for a user-defined entry. Enter the original destination port for the packets. To forward only one port, enter the port number again in the End Port field. To forward a series of ports, enter the start port number here and the end port number in the End Port field.
End Port	Configure this for a user-defined entry. Enter the last port of the original destination port range. To forward only one port, enter the port number in the Start Port field above and then enter it again in this field. To forward a series of ports, enter the last port number in a series that begins with the port number in the Start Port field above.
Translation Start Port	Configure this for a user-defined entry. This shows the port number to which you want the Zyxel Device to translate the incoming port. For a range of ports, enter the first number of the range to which you want the incoming ports translated.
Translation End Port	Configure this for a user-defined entry. This shows the last port of the translated port range.
Server IP Address	Enter the inside IP address of the virtual server here.
Configure Originating IP	Click the Enable checkbox to enter the source IP in the next field.
Originating IP	Enter the source IP address here.
Protocol	Select the protocol supported by this virtual server. Choices are TCP, UDP, or TCP/UDP.
OK	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

11.3 Port Triggering

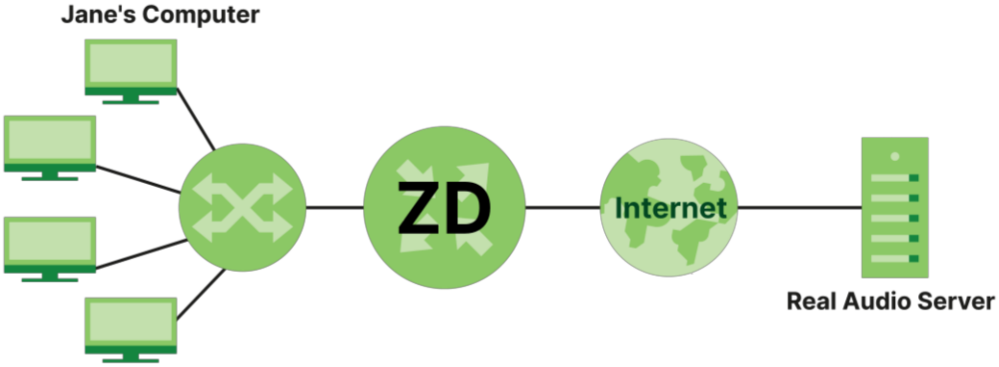
Some services use a dedicated range of ports on the client side and a dedicated range of ports on the server side. With regular port forwarding, you set a forwarding port in NAT to forward a service (coming in from the server on the WAN) to the IP address of a computer on the client side (LAN). The problem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

Trigger port forwarding allows computers on the LAN to dynamically take turns using the service.

The Zyxel Device records the IP address of a LAN computer that sends traffic to the WAN to request a service with a specific port number and protocol (a \"trigger\" port). When the Zyxel Device's WAN port receives a response with a specific port number and protocol (\"open\" port), the Zyxel Device forwards the traffic to the LAN IP address of the computer that sent the request. After that computer’s connection for that service closes, another computer on the LAN can use the service in the same manner. This way you do not need to configure a new IP address each time you want a different LAN computer to use the application.

For example:

Figure 144 Trigger Port Forwarding Process: Example



1 Jane requests a file from the Real Audio server (port 7070).

2 Port 7070 is a "trigger" port and causes the Zyxel Device to record Jane's computer IP address. The Zyxel Device associates Jane's computer IP address with the "open" port range of 6970 – 7170.

3 The Real Audio server responds using a port number ranging between 6970 – 7170.

4 The Zyxel Device forwards the traffic to Jane's computer IP address.

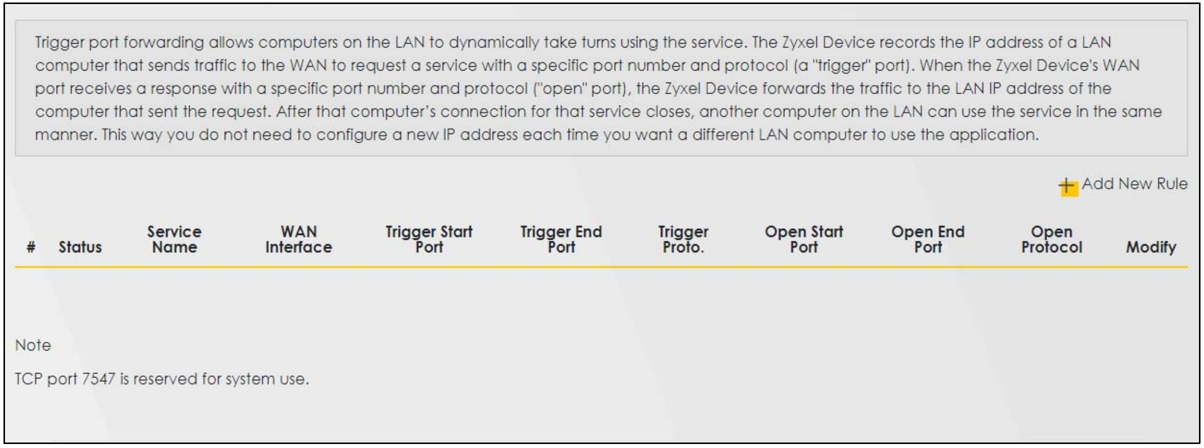
5 Only Jane can connect to the Real Audio server until the connection is closed or times out. The Zyxel Device times out in 3 minutes with UDP (User Datagram Protocol) or 2 hours with TCP/IP (Transfer Control Protocol/Internet Protocol).

Click Network Setting > NAT > Port Triggering to open the following screen. Use this screen to view your Zyxel Device's trigger port settings.

Note: TCP port 7547 is reserved for system use.

Note: The sum of trigger ports in all rules must be less than 1000 and every open port range must be less than 1000. When the protocol is TCP/UDP, the ports are counted twice.

Figure 145 Network Setting > NAT > Port Triggering



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

#	Status	Service Name	WAN Interface	Trigger Start Port	Trigger End Port	Trigger Proto.	Open Start Port	Open End Port	Open Protocol	Modify

Note

TCP port 7547 is reserved for system use.

The following table describes the labels in this screen.

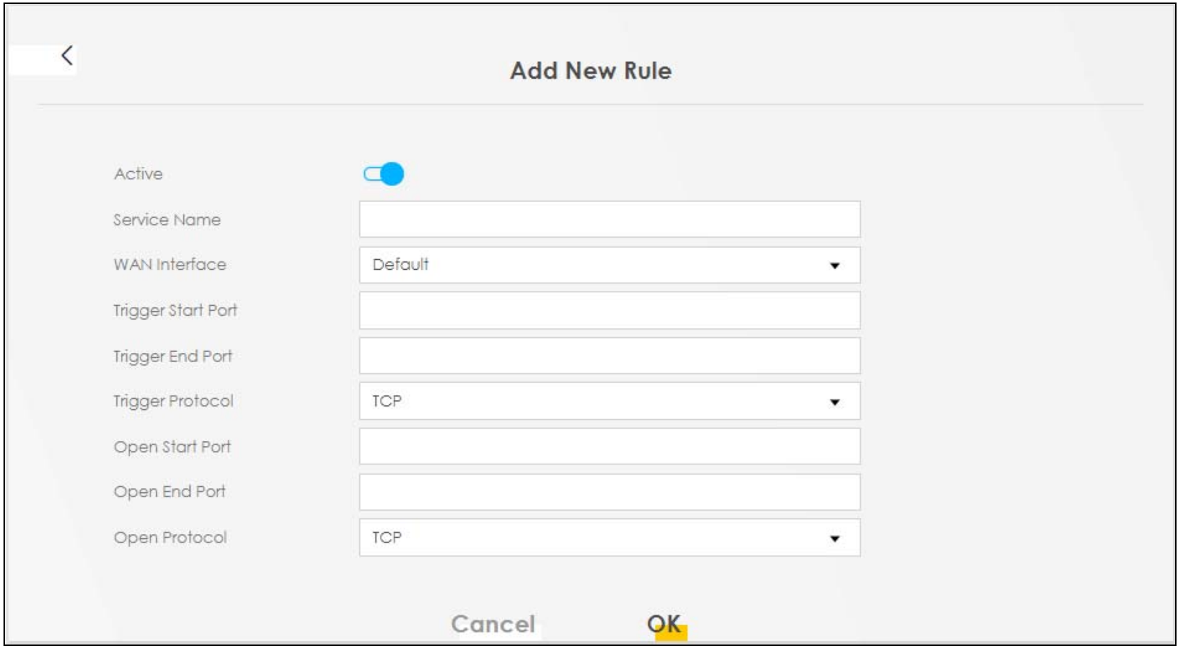
Table 84 Network Setting > NAT > Port Triggering

LABEL	DESCRIPTION
Add New Rule	Click this to create a new rule.
#	This is the index number of the entry.
Status	This field displays whether the port triggering rule is active or not. A yellow bulb signifies that this rule is active. A gray bulb signifies that this rule is not active.
Service Name	This field displays the name of the service used by this rule.
WAN Interface	This field shows the WAN interface through which the service is forwarded.
Trigger Start Port	The trigger port is a port (or a range of ports) that causes (or triggers) the Zyxel Device to record the IP address of the LAN computer that sent the traffic to a server on the WAN. This is the first port number that identifies a service.
Trigger End Port	This is the last port number that identifies a service.
Trigger Proto.	This is the trigger transport layer protocol.
Open Start Port	The open port is a port (or a range of ports) that a server on the WAN uses when it sends out a particular service. The Zyxel Device forwards the traffic with this port (or range of ports) to the client computer on the LAN that requested the service. This is the first port number that identifies a service.
Open End Port	This is the last port number that identifies a service.
Open Protocol	This is the open transport layer protocol.
Modify	Click the Edit icon to edit this rule. Click the Delete icon to delete an existing rule.

11.3.1 Add or Edit Port Triggering Rule

This screen lets you create new port triggering rules. Click Add New Rule in the Port Triggering screen or click a rule’s Edit icon to open the following screen. Use this screen to configure a port or range of ports and protocols for sending out requests and for receiving responses.

Figure 146 Network Setting > NAT > Port Triggering: Add or Edit



Add New Rule

Active	●
Service Name	
WAN Interface	Default
Trigger Start Port	
Trigger End Port	
Trigger Protocol	TCP
Open Start Port	
Open End Port	
Open Protocol	TCP

The following table describes the labels in this screen.

Table 85 Network Setting > NAT > Port Triggering: Add or Edit

LABEL	DESCRIPTION
Active	Click this switch to activate this rule.
Service Name	Enter a name to identify this rule. You can use up to 256 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
WAN Interface	Select a WAN interface for which you want to configure port triggering rules.
Trigger Start Port	The trigger port is a port (or a range of ports) that causes (or triggers) the Zyxel Device to record the IP address of the LAN computer that sent the traffic to a server on the WAN. Enter a port number or the starting port number in a range of port numbers.
Trigger End Port	Enter a port number or the ending port number in a range of port numbers.
Trigger Protocol	Select the transport layer protocol from TCP, UDP, or TCP/UDP.
Open Start Port	The open port is a port (or a range of ports) that a server on the WAN uses when it sends out a particular service. The Zyxel Device forwards the traffic with this port (or range of ports) to the client computer on the LAN that requested the service. Enter a port number or the starting port number in a range of port numbers.
Open End Port	Enter a port number or the ending port number in a range of port numbers.
Open Protocol	Select the transport layer protocol from TCP, UDP, or TCP/UDP.
Cancel	Click Cancel to exit this screen without saving.
OK	Click OK to save your changes.

11.4 DMZ

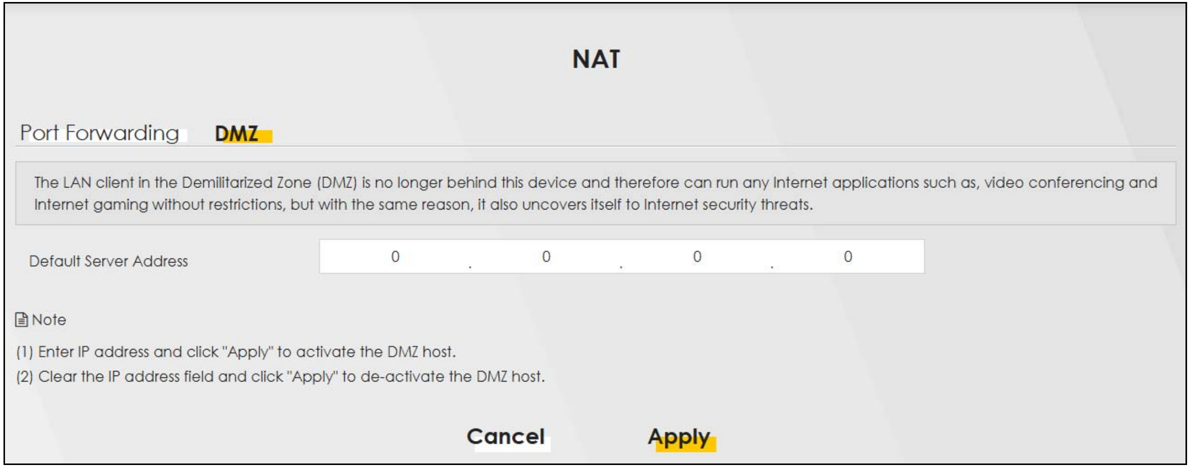
Use this screen to specify the IP address of a default server to receive packets from ports not specified in the Port Triggering screen. The DMZ (DeMilitarized Zone) is a network between the WAN and the LAN that is accessible to devices on both the WAN and LAN with firewall protection. Devices on the WAN can initiate connections to devices on the DMZ but not to those on the LAN.

You can put public servers, such as email and web servers, on the DMZ to provide services on both the WAN and LAN. To use this feature, you first need to assign a DMZ host. Click Network Setting > NAT > DMZ to open the DMZ screen.

Note: Use an IPv4 address for the DMZ server.

Note: Enter the IP address of the default server in the Default Server Address field, and click Apply to activate the DMZ host. Otherwise, clear the IP address in the Default Server Address field, and click Apply to deactivate the DMZ host.

Figure 147 Network Setting > NAT > DMZ



The LAN client in the Demilitarized Zone (DMZ) is no longer behind this device and therefore can run any Internet applications such as, video conferencing and Internet gaming without restrictions, but with the same reason, it also uncovers itself to Internet security threats.

Default Server Address: 0 . 0 . 0 . 0

Note

(1) Enter IP address and click "Apply" to activate the DMZ host.

(2) Clear the IP address field and click "Apply" to de-activate the DMZ host.

The following table describes the fields in this screen.

Table 86 Network Setting > NAT > DMZ

LABEL	DESCRIPTION
Default Server Address	Enter the IP address of the default server which receives packets from ports that are not specified in the Port Forwarding screen. Note: If you do not assign a default server, the Zyxel Device discards all packets received for ports not specified in the virtual server configuration.
Apply	Click this to save your changes back to the Zyxel Device.
Cancel	Click Cancel to restore your previously saved settings.

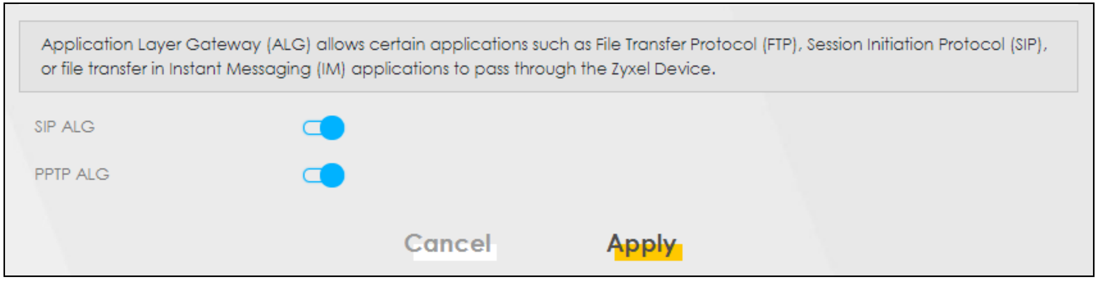
11.5 ALG

Application Layer Gateway (ALG) allows customized NAT traversal filters to support address and port translation for certain applications such as Session Initiation Protocol (SIP) or file transfer in Instant Messaging (IM) applications. It allows SIP calls to pass through the Zyxel Device. When the Zyxel Device registers with the SIP register server, the SIP ALG translates the Zyxel Device’s private IP address inside the SIP data stream to a public IP address. You do not need to use STUN or an outbound proxy if your Zyxel Device is behind a SIP ALG.

Click Network Setting > NAT > ALG to open the ALG screen. Use this screen to enable and disable the NAT Application Layer Gateway (ALG) in the Zyxel Device.

Application Layer Gateway (ALG) allows certain applications such as Session Initiation Protocol (SIP) or file transfer in Instant Messaging (IM) applications to pass through the Zyxel Device.

Figure 148 Network Setting > NAT > ALG



Application Layer Gateway (ALG) allows certain applications such as File Transfer Protocol (FTP), Session Initiation Protocol (SIP), or file transfer in Instant Messaging (IM) applications to pass through the Zyxel Device.

SIP ALG ●

PPTP ALG ●

The following table describes the fields in this screen.

Table 87 Network Setting > NAT > ALG

LABEL	DESCRIPTION
SIP ALG	Click this switch to enable SIP ALG to make sure SIP (VoIP) works correctly with port-forwarding and address-mapping rules.
PPTP ALG	Click this switch to enable the PPTP ALG on the Zyxel Device to detect PPTP traffic and help build PPTP sessions through the Zyxel Device’s NAT.
Apply	Click Apply to save your changes back to the Zyxel Device.
Cancel	Click Cancel to restore your previously saved settings.

11.6 Technical Reference

This part contains more information regarding NAT.

11.6.1 NAT Definitions

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

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

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

Table 88 NAT Definitions

ITEM	DESCRIPTION
Inside	This refers to the host on the LAN.
Outside	This refers to the host on the WAN.

Table 88 NAT Definitions (continued)

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

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

11.6.2 What NAT Does

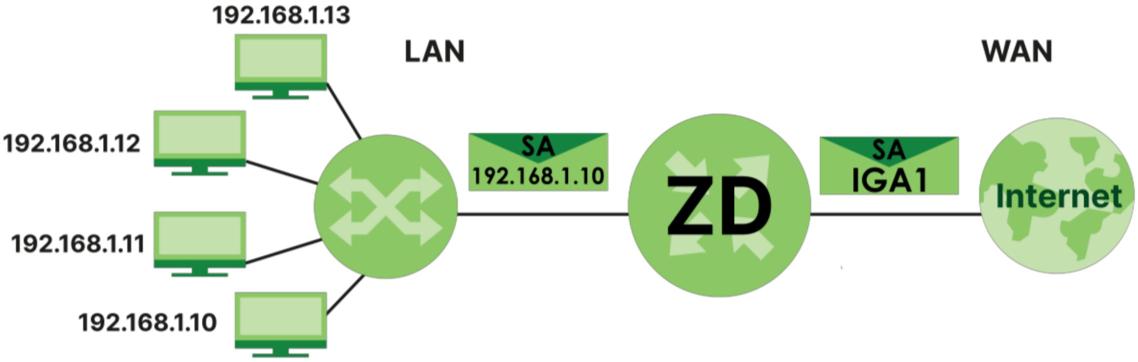
In the simplest form, NAT changes the source IP address in a packet received from a subscriber (the inside local address) to another (the inside global address) before forwarding the packet to the WAN side. When the response comes back, NAT translates the destination address (the inside global address)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

The global IP addresses for the inside hosts can be either static or dynamically assigned by the ISP. In addition, you can designate servers, for example, a web server and a telnet server, on your local network and make them accessible to the outside world. If you do not define any servers (for Many-to-One and Many-to-Many Overload mapping), NAT offers the additional benefit of firewall protection. With no servers defined, your Zyxel Device filters out all incoming inquiries, thus preventing intruders from probing your network. For more information on IP address translation, refer to *RFC 1631*, *The IP Network Address Translator (NAT)*.

11.6.3 How NAT Works

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

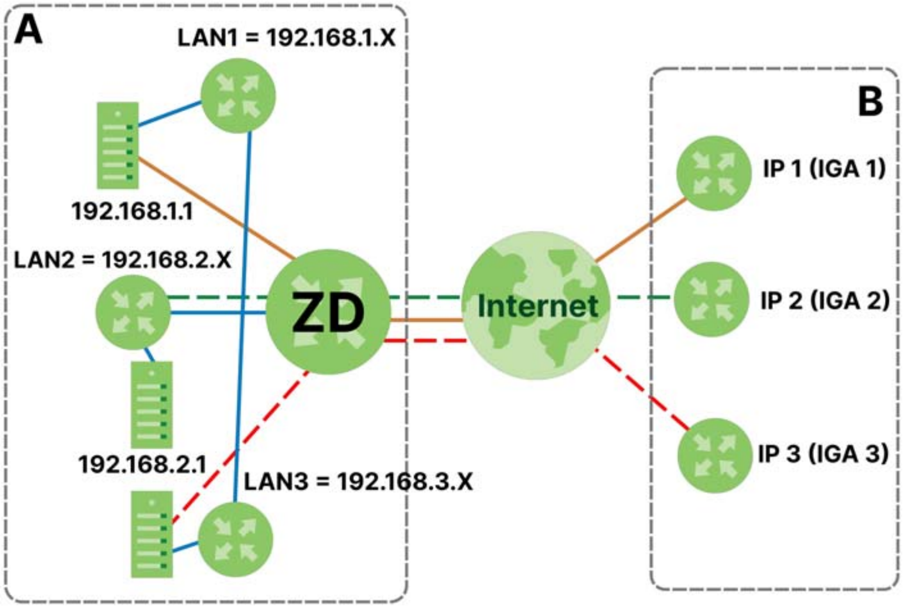
Figure 149 How NAT Works



11.6.4 NAT Application

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

Figure 150 NAT Application With IP Alias



Port Forwarding: Services and Port Numbers

The most often used port numbers are shown in the following table. Please refer to RFC 1700 for further information about port numbers. Please also refer to the Supporting CD for more examples and details on port forwarding and NAT.

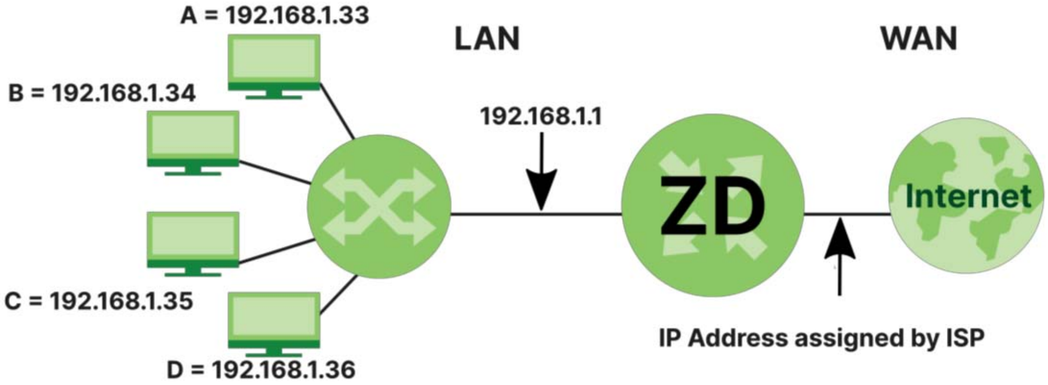
Table 89 Services and Port Numbers

SERVICES	PORT NUMBER
ECHO	7
SMTP (Simple Mail Transfer Protocol)	25
DNS (Domain Name System)	53
Finger	79
HTTP (Hyper Text Transfer protocol or WWW, Web)	80
POP3 (Post Office Protocol)	110
NNTP (Network News Transport Protocol)	119
PPTP (Point-to-Point Tunneling Protocol)	1723

Port Forwarding Example

Let's say you want to assign ports 21 – 25 to one Telnet and SMTP server (A in the example), port 80 to another (B in the example) and assign a default server IP address of 192.168.1.35 to a third (C in the example). You assign the LAN IP addresses and the ISP assigns the WAN IP address. The NAT network appears as a single host on the Internet.

Figure 151 Multiple Servers Behind NAT Example



CHAPTER 12 DNS

12.1 DNS Overview

DNS

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

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

Dynamic DNS

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

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

12.1.1 What You Can Do in this Chapter

- Use the DNS Entry screen to view, configure, or remove DNS routes (DNS Entry (DNS)).
- Use the Dynamic DNS screen to enable DDNS and configure the DDNS settings on the Zyxel Device (Dynamic DNS).

12.1.2 What You Need To Know

DYNDNS Wildcard

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

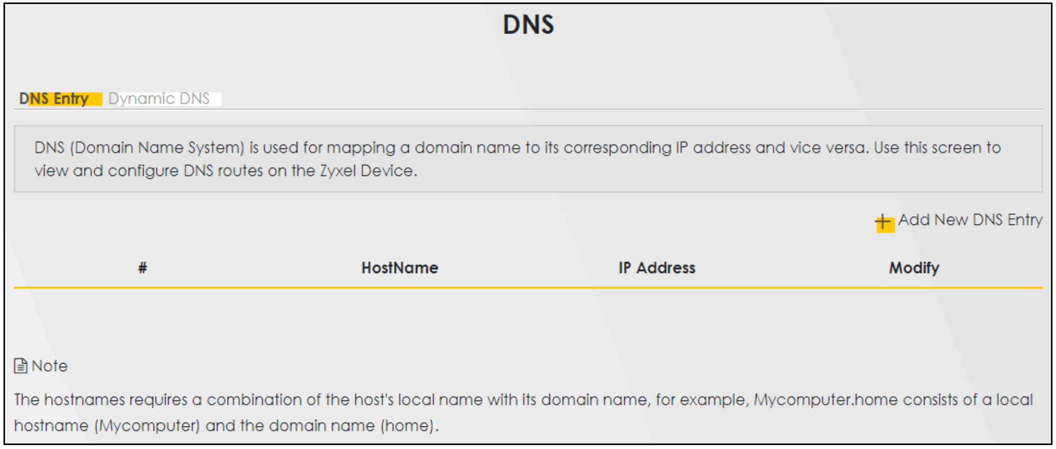
If you have a private WAN IP address, then you cannot use Dynamic DNS.

12.2 DNS Entry (DNS)

DNS (Domain Name System) is used for mapping a domain name to its corresponding IP address and vice versa. Use this screen to view and configure manual DNS entires on the Zyxel Device. Click Network Setting > DNS to open the DNS Entry screen.

Note: The host name should consist of the host's local name and the domain name. For example, Mycomputer.home is a host name where Mycomputer is the host's local name, and .home is the domain name.

Figure 152 Network Setting > DNS > DNS Entry



DNS (Domain Name System) is used for mapping a domain name to its corresponding IP address and vice versa. Use this screen to view and configure DNS routes on the Zyxel Device.

#	HostName	IP Address	Modify

Note

The hostnames requires a combination of the host's local name with its domain name, for example, Mycomputer.home consists of a local hostname (Mycomputer) and the domain name (home).

The following table describes the fields in this screen.

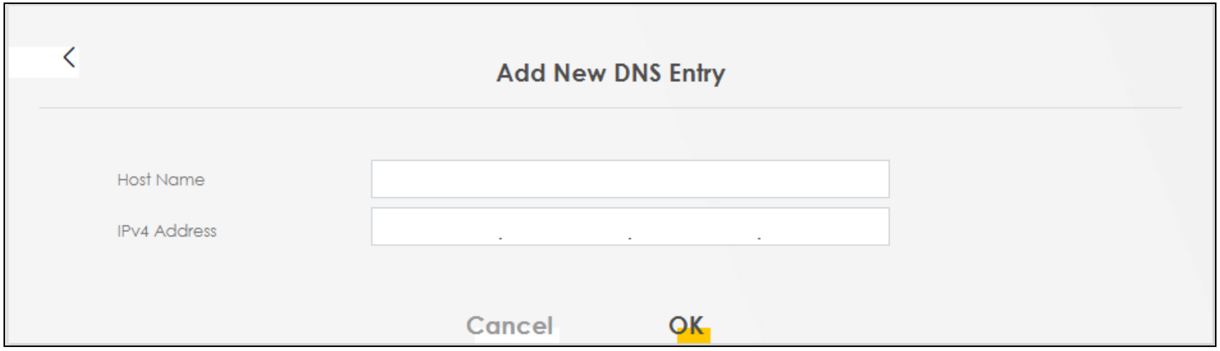
Table 90 Network Setting > DNS > DNS Entry

LABEL	DESCRIPTION
Add New DNS Entry	Click this to create a new DNS entry.
#	This is the index number of the entry.
HostName	This indicates the host name or domain name.
IP Address	This indicates the IP address assigned to this computer.
Modify	Click the Edit icon to edit the rule. Click the Delete icon to delete an existing rule.

12.2.1 Add or Edit DNS Entry

You can manually add or edit the Zyxel Device's DNS name and IP address entry. Click Add New DNS Entry in the DNS Entry screen or the Edit icon next to the entry you want to edit. The screen shown next appears.

Figure 153   Network Setting > DNS > DNS Entry: Add



Add New DNS Entry

Host Name

IPv4 Address

The following table describes the labels in this screen.

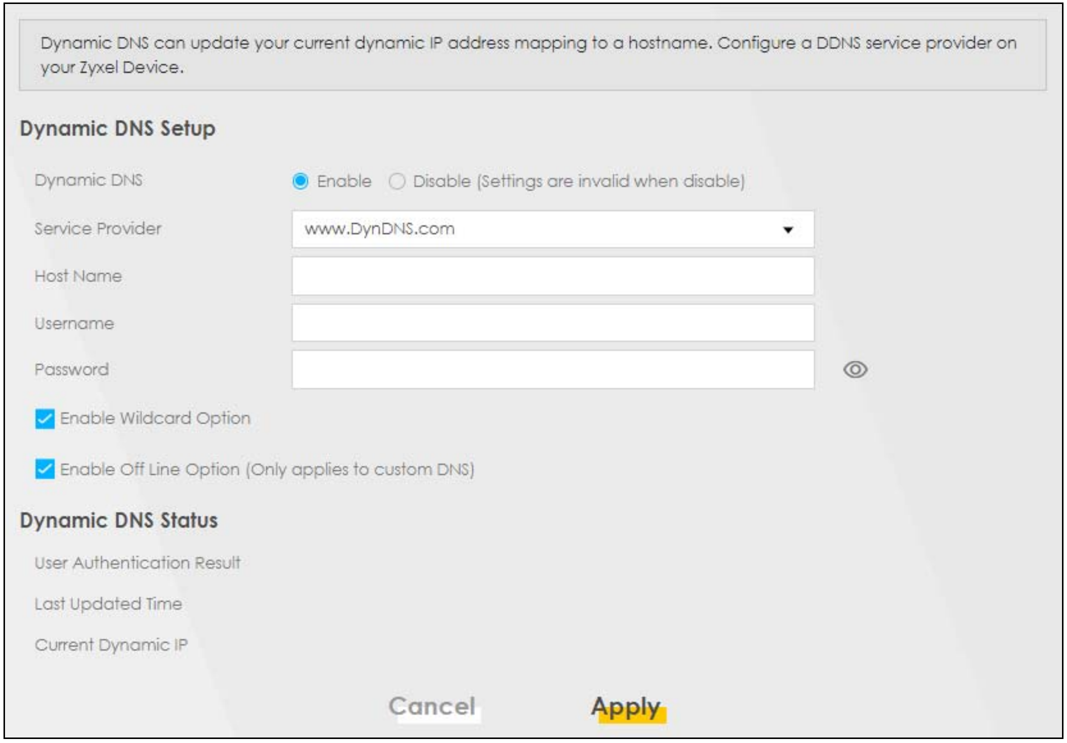
Table 91   Network Setting > DNS > DNS Entry: Add or Edit

LABEL	DESCRIPTION
Host Name	Enter the host name of the DNS entry. You can use up to 256 alphanumeric (0-9, a-z, A-Z) characters with hyphens [-] and periods [.]. You can use the wildcard character, an "*" (asterisk) as the left most part of a domain name, such as *.example.com.
IPv4 Address	Enter the IPv4 address of the DNS entry.
Cancel	Click Cancel to exit this screen without saving.
OK	Click OK to save your changes.

12.3 Dynamic DNS

Dynamic DNS can update your current dynamic IP address mapping to a hostname. Configure a DDNS service provider on your Zyxel Device. Click Network Setting > DNS > Dynamic DNS. The screen appears as shown.

Figure 154 Network Setting > DNS > Dynamic DNS



Dynamic DNS can update your current dynamic IP address mapping to a hostname. Configure a DDNS service provider on your Zyxel Device.

Dynamic DNS Setup

Dynamic DNS	● Enable ○ Disable (Settings are invalid when disable)
Service Provider	www.DynDNS.com ▾
Host Name	
Username	
Password	

☑ Enable Wildcard Option

☑ Enable Off Line Option (Only applies to custom DNS)

Dynamic DNS Status

User Authentication Result

Last Updated Time

Current Dynamic IP

The following table describes the fields in this screen.

Table 92 Network Setting > DNS > Dynamic DNS

LABEL	DESCRIPTION
Dynamic DNS Setup	
Dynamic DNS	Select Enable to use dynamic DNS.
Service Provider	Select your Dynamic DNS service provider from the drop-down list box.
Host Name	Enter the domain name assigned to your Zyxel Device by your Dynamic DNS provider. You can use up to 256 alphanumeric (0-9, a-z, A-Z) characters with hyphens [-] and periods [.]. You can specify up to two host names in the field separated by a comma (",").
Username	Enter your user name.
Password	Enter the password assigned to you.
Use IPv6	Make sure IPv6 is enabled in Network Setting > Broadband. Select this checkbox if your Dynamic DNS service provider supports IPv6 and has currently associated your account's IPv6 address with the hostname.
Enable Wildcard Option	Select the checkbox to enable DynDNS Wildcard.
Enable Off Line Option (Only applies to custom DNS)	Check with your Dynamic DNS service provider to have traffic redirected to a URL (that you can specify) while you are off line.
Dynamic DNS Status	
User Authentication Result	This shows Success if the account is correctly set up with the Dynamic DNS provider account.
Last Updated Time	This shows the last time the IP address the Dynamic DNS provider has associated with the hostname was updated.

Table 92 Network Setting > DNS > Dynamic DNS (continued)

LABEL	DESCRIPTION
Current Dynamic IP	This shows the IPv4 address your Dynamic DNS provider has currently associated with the hostname.
Current Dynamic IPv6	This shows the IPv6 address your Dynamic DNS service provider has currently associated with the hostname.
Cancel	Click Cancel to exit this screen without saving.
Apply	Click Apply to save your changes.

CHAPTER 13 VLAN Group

13.1 VLAN Group Overview

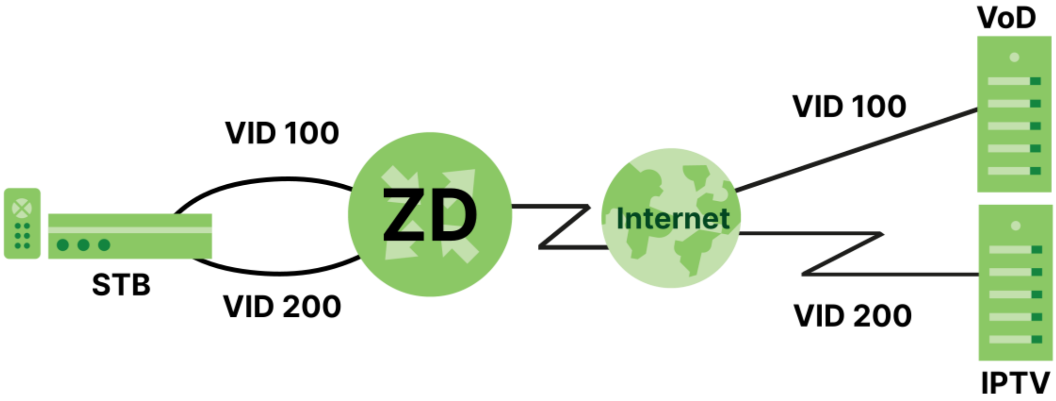
A VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same groups;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

Ports in the same VLAN group share the same frame broadcast domain thus increase network performance through reduced broadcast traffic. Shared resources such as a server can be used by all ports in the same VLAN as the server. Ports can belong to other VLAN groups too. VLAN groups can be modified at any time by adding, moving or changing ports without any re-cabling.

A tagged VLAN uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across bridges. The VLAN ID associates a frame with a specific VLAN and provides the information that switches the need to process the frame across the network.

In the following example, VLAN IDs (VIDs) 100 and 200 are added to identify Video-on-Demand and IPTV traffic respectively coming from the VoD and IPTV multicast servers. The Zyxel Device can also tag outgoing requests to the servers with these VLAN IDs.

Figure 155   VLAN Group Example



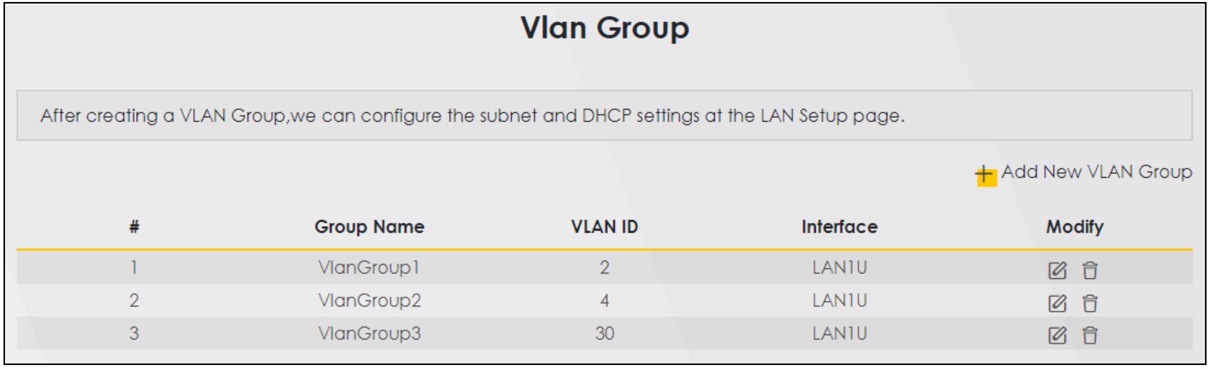
13.1.1 What You Can Do in this Chapter

Use these screens to manage VLAN groups on the Zyxel Device.

13.2 VLAN Group Settings

This screen shows the VLAN groups created on the Zyxel Device. Click Network Setting > VLAN Group to open the following screen.

Figure 156 Network Setting > VLAN Group



Vlan Group

After creating a VLAN Group,we can configure the subnet and DHCP settings at the LAN Setup page.

#	Group Name	VLAN ID	Interface	Modify
1	VlanGroup1	2	LAN1U	
2	VlanGroup2	4	LAN1U	
3	VlanGroup3	30	LAN1U	

The following table describes the fields in this screen.

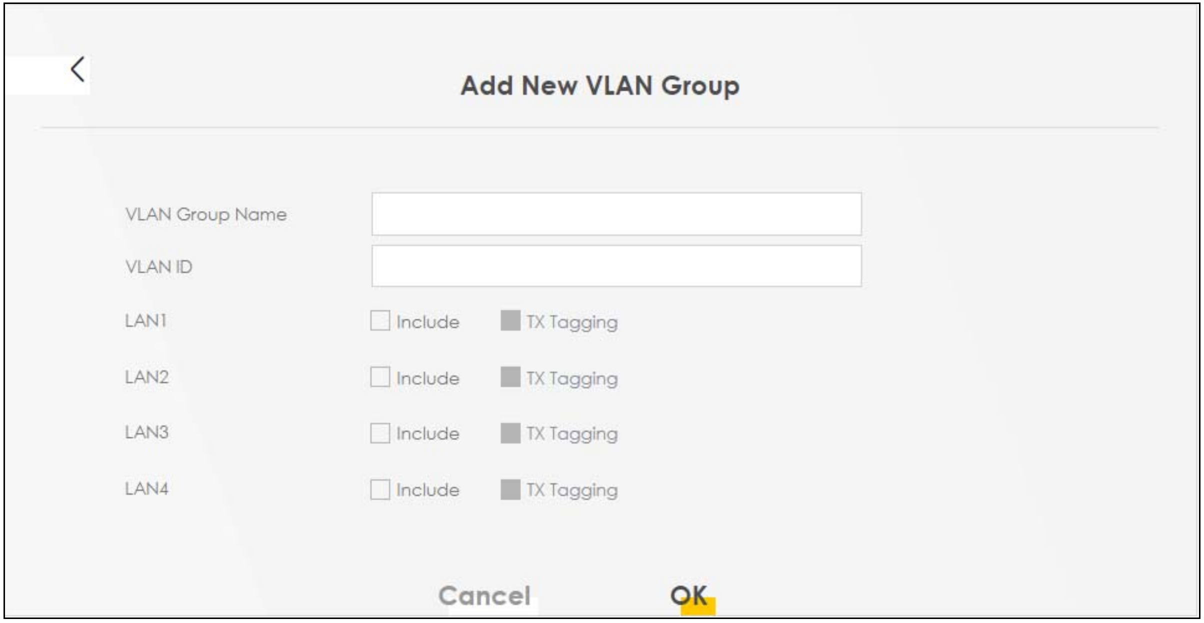
Table 93 Network Setting > VLAN Group

LABEL	DESCRIPTION
Add New VLAN Group	Click this button to create a new VLAN group.
#	This is the index number of the VLAN group.
Group Name	This shows the descriptive name of the VLAN group.
VLAN ID	This shows the unique ID number that identifies the VLAN group.
Interface	This shows the LAN ports included in the VLAN group and if traffic leaving the port will be tagged with the VLAN ID.
Modify	Click the Edit icon to change an existing VLAN group setting or click the Delete icon to remove the VLAN group.

13.2.1 Add or Edit a VLAN Group

Click the Add New VLAN Group button in the VLAN Group screen to open the following screen. Use this screen to create a new VLAN group.

Figure 157 Network Setting > VLAN Group > Add New VLAN Group/Edit



Add New VLAN Group

VLAN Group Name		
VLAN ID		
LAN1	□ Include	■ TX Tagging
LAN2	□ Include	■ TX Tagging
LAN3	□ Include	■ TX Tagging
LAN4	□ Include	■ TX Tagging

The following table describes the fields in this screen.

Table 94 Network Setting > VLAN Group > Add New VLAN Group/Edit

LABEL	DESCRIPTION
VLAN ID	Enter a unique ID number, from 1 to 4,094, to identify this VLAN group. Outgoing traffic is tagged with this ID if TX Tagging is selected below.
LAN	Select Include to add the associated LAN interface to this VLAN group. Note: Select TX Tagging to tag outgoing traffic from the associated LAN port with the VLAN ID number entered above.

CHAPTER 14 Interface Grouping

14.1 Interface Grouping Overview

By default, all LAN and WAN interfaces on the Zyxel Device are in the default group. Client devices in the default group can communicate with all devices in the default and other groups. Create interface groups to have the Zyxel Device assign IP addresses in different domains. Each group acts as an independent network on the Zyxel Device. Client devices in the same group can communicate with each other directly. Interfaces that do not belong to any user-defined group belong to the default group.

14.1.1 What You Can Do in this Chapter

The Interface Grouping screen lets you create multiple networks on the Zyxel Device (Interface Grouping).

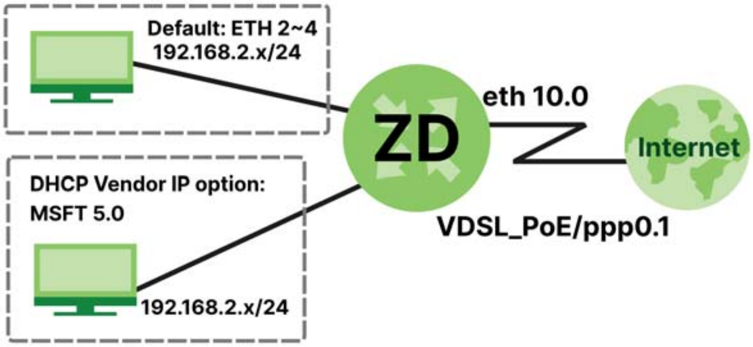
14.2 Interface Grouping

You can manually add a LAN interface to a new group. Alternatively, you can have the Zyxel Device automatically add the incoming traffic and the LAN interface on which traffic is received to an interface group when its DHCP Vendor ID option information matches one listed for the interface group.

Use the LAN Setup screen to configure the private IP addresses the DHCP server on the Zyxel Device assigns to the clients in the default and/or user-defined groups. If you set the Zyxel Device to assign IP addresses based on the client's DHCP Vendor ID option information, you must enable DHCP server and configure LAN TCP/IP settings for both the default and user-defined groups. See Home Networking for more information.

In the following example, the client that sends packets with the DHCP Vendor ID option set to MSFT 5.0 (meaning it is a Windows 2000 DHCP client) is assigned the IP address 192.168.2.2 and uses the WAN VDSL_PoE/ppp0.1 interface.

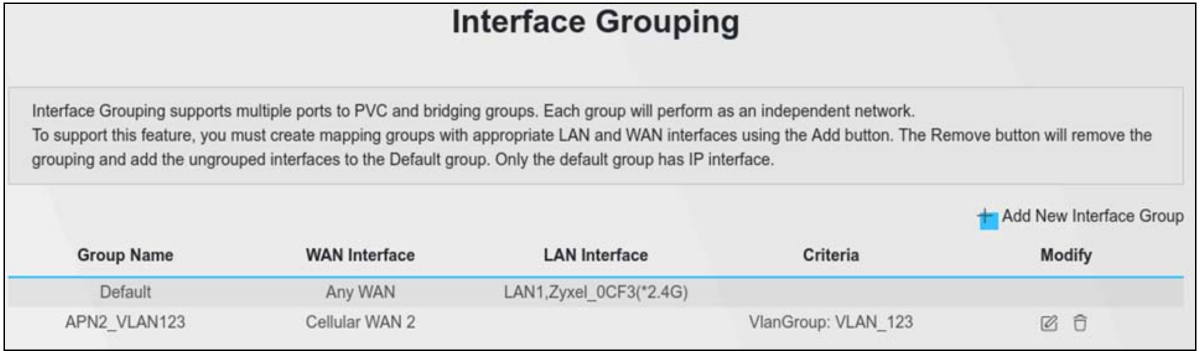
Figure 158 Interface Grouping Application



You can use this screen to create new user-defined interface groups or modify existing ones. Interfaces that do not belong to any user-defined group always belong to the default group.

Click Network Setting > Interface Grouping to open the following screen.

Figure 159 Network Setting > Interface Grouping



Interface Grouping

Interface Grouping supports multiple ports to PVC and bridging groups. Each group will perform as an independent network.
To support this feature, you must create mapping groups with appropriate LAN and WAN interfaces using the Add button. The Remove button will remove the grouping and add the ungrouped interfaces to the Default group. Only the default group has IP interface.

Group Name	WAN Interface	LAN Interface	Criteria	Modify
Default	Any WAN	LAN1,Zyxel_0CF3(*2.4G)		
APN2_VLAN123	Cellular WAN 2		VlanGroup: VLAN_123	

The following table describes the fields in this screen.

Table 95 Network Setting > Interface Grouping

LABEL	DESCRIPTION
Add New Interface Group	Click this button to create a new interface group.
Group Name	This shows the descriptive name of the group.
WAN Interface	This shows the WAN interfaces in the group.
LAN Interfaces	This shows the LAN interfaces in the group.
Criteria	This shows the filtering criteria for the group.
Modify	Click the Edit icon to modify an existing Interface group setting or click the Delete icon to remove the Interface group.

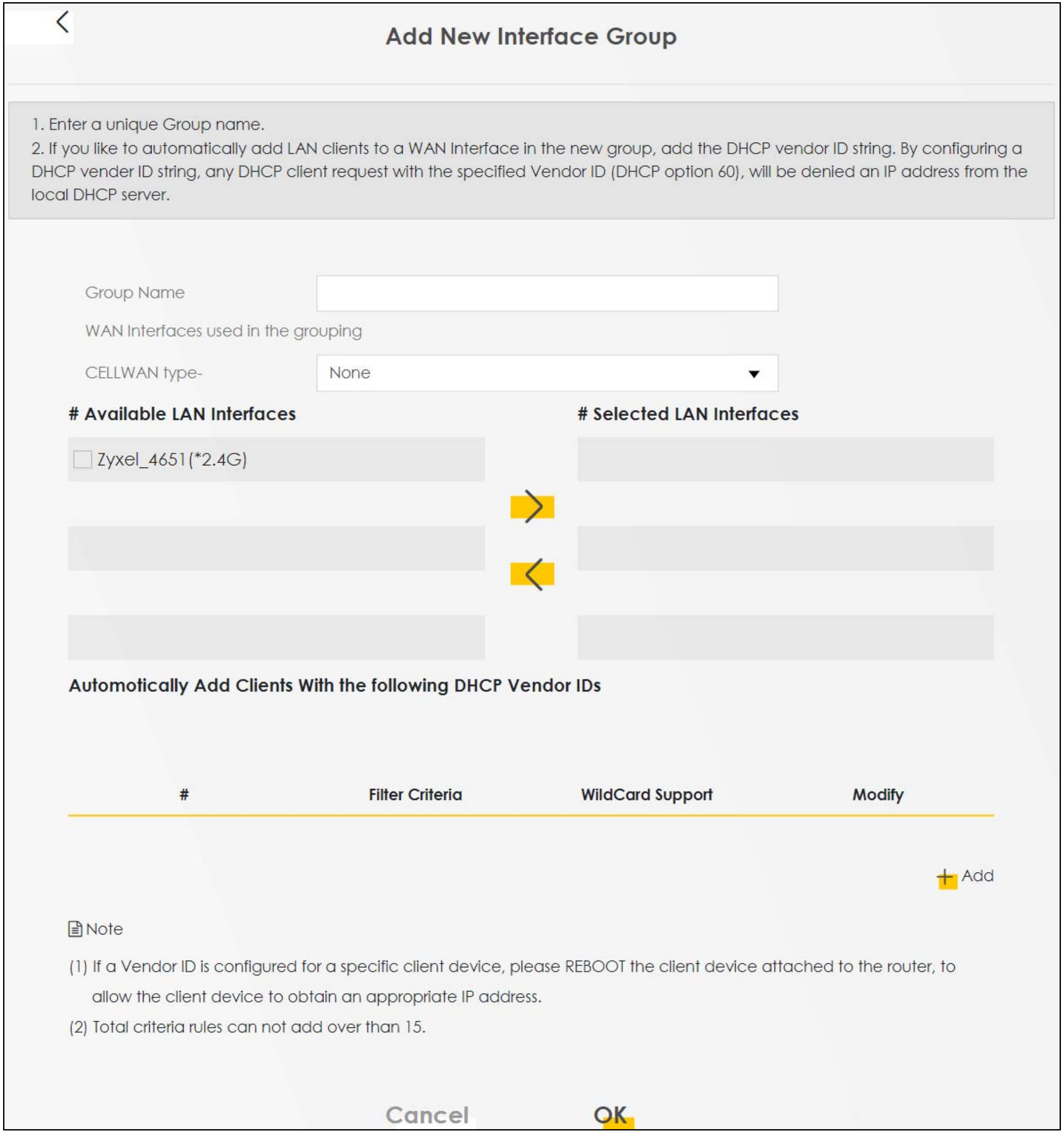
14.2.1 Interface Group Configuration

Click the Add New Interface Group button in the Interface Grouping screen to open the following screen. Use this screen to create a new interface group. If you want to automatically add LAN clients to a new group, use filtering criteria.

Note: An interface can belong to only one group at a time.

Note: After configuring a vendor ID, reboot the client device attached to the Zyxel Device to obtain an appropriate IP address.

Figure 160   Network Setting > Interface Grouping > Add New Interface Group/Edit



Add New Interface Group

1. Enter a unique Group name.
2. If you like to automatically add LAN clients to a WAN Interface in the new group, add the DHCP vendor ID string. By configuring a DHCP vender ID string, any DHCP client request with the specified Vendor ID (DHCP option 60), will be denied an IP address from the local DHCP server.

Group Name

WAN Interfaces used in the grouping

CELLWAN type- None

Available LAN Interfaces

□ Zyxel_4651(*2.4G)

Selected LAN Interfaces

Automotically Add Clients With the following DHCP Vendor IDs

#	Filter Criteria	WildCard Support	Modify

Note

(1) If a Vendor ID is configured for a specific client device, please REBOOT the client device attached to the router, to allow the client device to obtain an appropriate IP address.

(2) Total criteria rules can not add over than 15.

The following table describes the fields in this screen.

Table 96   Network Setting > Interface Grouping > Add New Interface Group/Edit

LABEL	DESCRIPTION
Group Name	Enter a descriptive name for this interface group. You can use up to 32 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
WAN Interfaces used in the grouping	Select the WAN interface this group uses. The group can have up to one PTM interface, up to one ATM interface, up to one ETH interface, and up to one WWAN interface. Select None to not add a WAN interface to this group.

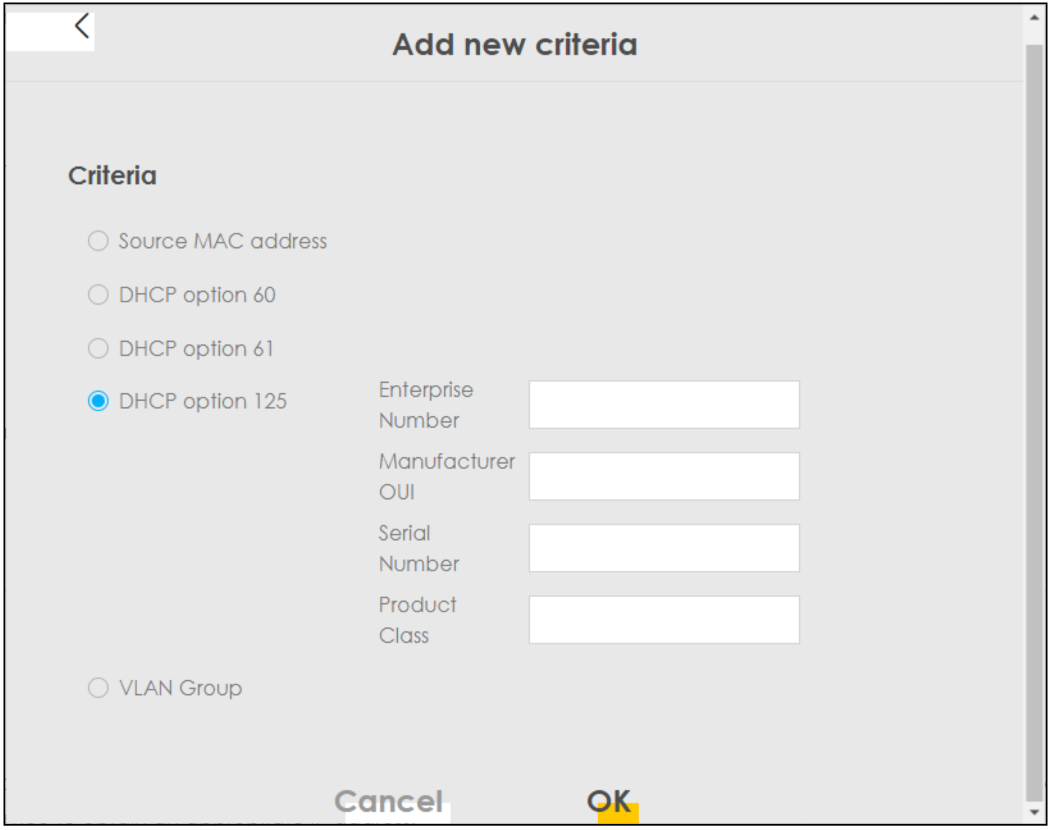
Table 96 Network Setting > Interface Grouping > Add New Interface Group/Edit (continued) (continued)

LABEL	DESCRIPTION
Selected LAN Interfaces Available LAN Interfaces	Select one or more interfaces (Ethernet LAN, wireless LAN) in the Available LAN Interfaces list and use the right arrow to move them to the Selected LAN Interfaces list to add the interfaces to this group. To remove a LAN or wireless LAN interface from the Selected LAN Interfaces, use the left arrow.
Automatically Add Clients With the following DHCP Vendor IDs	Click Add to identify LAN hosts to add to the interface group by criteria such as the type of the hardware or firmware. See Interface Grouping Criteria for more information.
#	This shows the index number of the rule.
Filter Criteria	This shows the filtering criteria. The LAN interface on which the matched traffic is received will belong to this group automatically.
WildCard Support	This shows if wildcard on DHCP option 60 is enabled.
Modify	Click the Edit icon to change the group setting. Click the Delete icon to delete this group from the Zyxel Device.
Cancel	Click Cancel to exit this screen without saving.
OK	Click OK to save your changes.

14.2.2 Interface Grouping Criteria

Click the Add button in the Interface Grouping Configuration screen to open the following screen. Use this screen to automatically add clients to an interface group based on specified criteria. You can choose to define a group based on a MAC address, a vendor ID (DHCP option 60), an Identity Association Identifier (DHCP option 61), vendor specific information (DHCP option 125), or a VLAN group.

Figure 161 Network Setting > Interface Grouping > Interface Group Configuration: Add



Add new criteria

Criteria

○ Source MAC address

○ DHCP option 60

○ DHCP option 61

● DHCP option 125

Enterprise Number

Manufacturer OUI

Serial Number

Product Class

○ VLAN Group

The following table describes the fields in this screen.

Table 97 Network Setting > Interface Grouping > Interface Group Configuration: Add

LABEL	DESCRIPTION
Source MAC Address	Enter the source MAC address of the packet.
DHCP Option 60	Select this option and enter the Vendor Class Identifier (VCID) of the matched traffic, such as the type of the hardware or firmware.
Enable wildcard	Select this option to be able to use wildcards in the Vendor Class Identifier configured for DHCP option 60.
DHCP Option 61	Select this and enter the device identity of the matched traffic.
	Enter the Identity Association Identifier (IAID) of the device, for example, the WAN connection index number.
DHCP Option 125	Select this and enter vendor specific information of the matched traffic.
Enterprise Number	Enter the vendor's 32-bit enterprise number registered with the IANA (Internet Assigned Numbers Authority).
Manufacturer OUI	Specify the vendor's OUI (Organization Unique Identifier). It is usually the first 3 bytes of the MAC address.
Serial Number	Enter the serial number of the device.
Product Class	Enter the product class of the device.
VLAN Group	Select this and the VLAN group of the matched traffic from the drop-down list box. A VLAN group can be configured in Network Setting > VLAN Group.

Table 97   Network Setting > Interface Grouping > Interface Group Configuration: Add (continued)

LABEL	DESCRIPTION
Cancel	Click Cancel to exit this screen without saving.
OK	Click OK to save your changes.

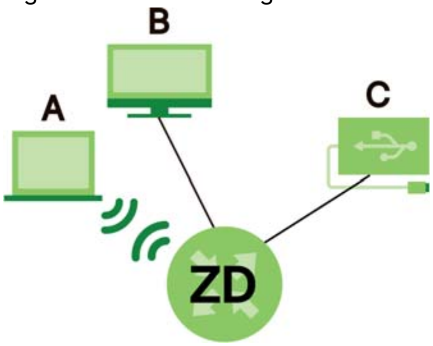
CHAPTER 15 USB Service

15.1 USB Service Overview

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

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

Figure 162 File Sharing Overview



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

15.1.1 What You Need To Know

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

Note: To see how to use the USB port to do the cellular backup, please refer to Cellular Backup.

15.1.2 File Sharing

Workgroup Name

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

Shares

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

File Systems

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

Common Internet File System

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

15.1.3 Before You Begin

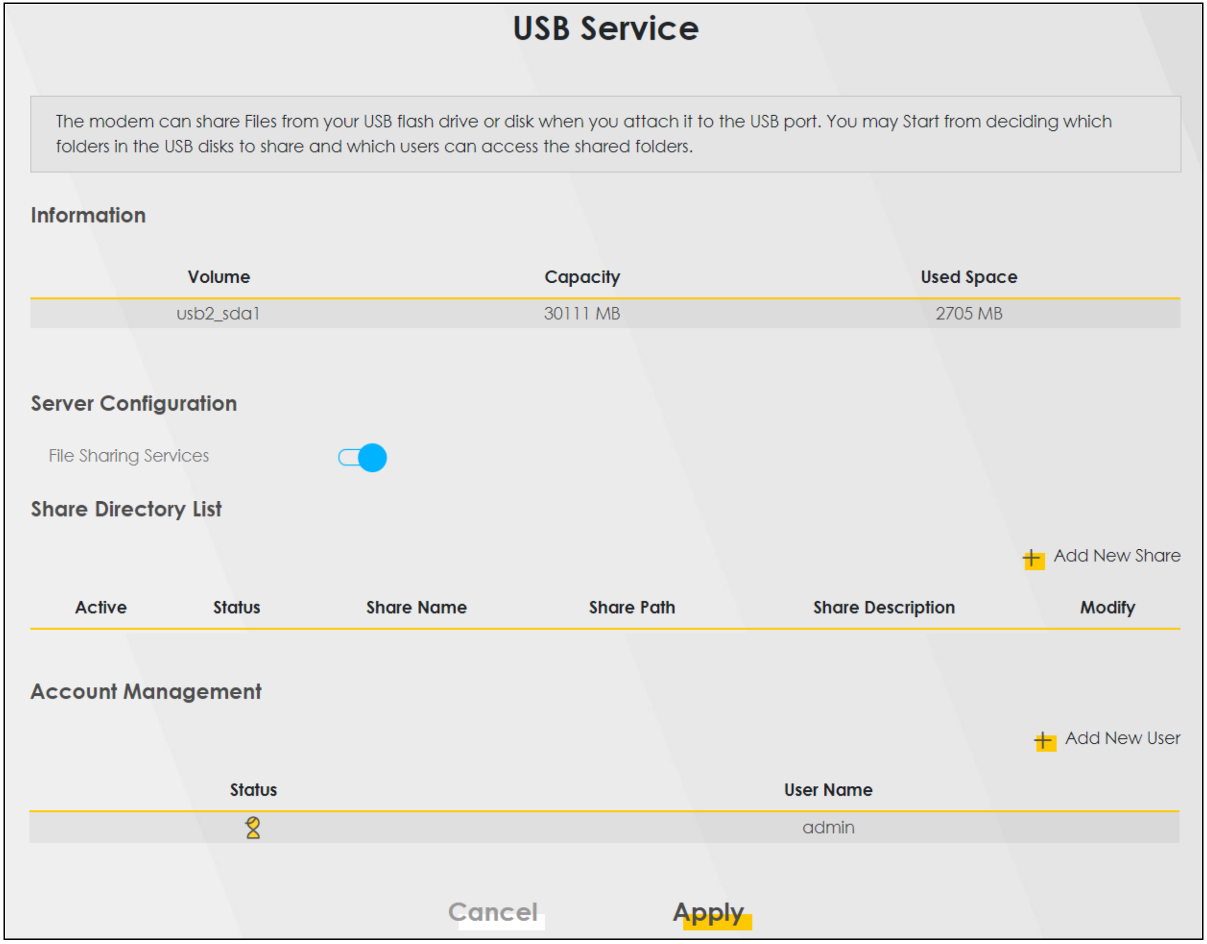
1. Make sure the Zyxel Device is connected to your network and turned on.
2. Connect the USB device to one of the Zyxel Device’s USB port. If you are connecting a USB hard drive that comes with an external power supply, make sure it is connected to an appropriate power source.
3. The Zyxel Device detects the USB device and makes its contents available for browsing.

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

15.2 USB Service

Use this screen to set up file sharing through the Zyxel Device. The Zyxel Device’s LAN users can access the shared folder (or share) from the USB device inserted in the Zyxel Device. To access this screen, click Network Setting > USB Service.

Figure 163 Network Setting > USB Service



USB Service

The modem can share Files from your USB flash drive or disk when you attach it to the USB port. You may Start from deciding which folders in the USB disks to share and which users can access the shared folders.

Information

Volume	Capacity	Used Space
usb2_sda1	30111 MB	2705 MB

Server Configuration

File Sharing Services

Share Directory List

Active	Status	Share Name	Share Path	Share Description	Modify

Account Management

Status	User Name
	admin

Note: The Share Directory List is only visible when you connect a USB device.

Each field is described in the following table.

Table 98 Network Setting > USB Service

LABEL	DESCRIPTION
Information	
Volume	This is the volume name the Zyxel Device gives to an inserted USB device.
Capacity	This is the total available memory size (in megabytes) on the USB device.
Used Space	This is the memory size (in megabytes) already used on the USB device.
Server Configuration	
File Sharing Services	Click this switch to enable file sharing through the Zyxel Device.
Share Directory List This only appears when you have inserted a USB device.	
Add New Share	Click this to set up a new share on the Zyxel Device.
Active	Select this to allow the share to be accessed.

Table 98   Network Setting > USB Service (continued)

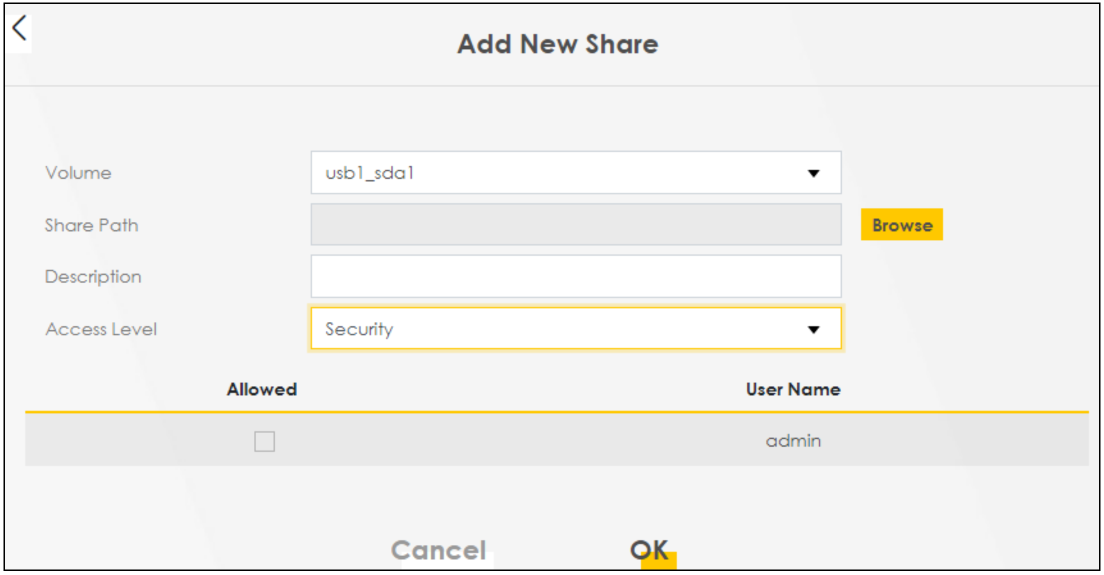
LABEL	DESCRIPTION
Status	This field displays the status of the share. 💡: The share is not activated. 💡: The share is activated.
Share Name	This field displays the name of the file you shared.
Share Path	This field displays the location in the USB of the file you shared.
Share Description	This field displays a description of the file you shared.
Modify	Click the Edit icon to change the settings of an existing share. Click the Delete icon to delete this share in the list.
Account Management	
Add New User	Click this button to create a user account to access the secured shares. This button redirects you to Maintenance > User Account.
Status	This field displays the status of the user. 👤: The user account is not activated for the share. 👤: The user account is activated for the share.
User Name	This is the name of a user who is allowed to access the secured shares on the USB device.
Cancel	Click this to restore your previously saved settings.
Apply	Click this to save your changes to the Zyxel Device.

15.2.1 Add New Share

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

Please note that you need to set up shared folders on the USB device before enabling file sharing in the Zyxel Device. Spaces and the following special characters, ["], [`], ['], [<], [>], [^], [$], [|], [&], [;], are not allowed for the USB share name.

Figure 164 Network Setting > USB Service > Add New Share



Add New Share

Volume	usb1_sda1 ▾
Share Path	
Description	
Access Level	Security ▾

Allowed	User Name
□	admin

The following table describes the labels in this menu.

Table 99 Network Setting > USB Service > Add New Share

LABEL	DESCRIPTION
Volume	Select the volume in the USB storage device that you want to add as a share in the Zyxel Device. This field is read-only when you are editing the share.
Share Path	Manually enter the file path for the share, or click the Browse button and select the folder that you want to add as a share. This field is read-only when you are editing the share.
Description	You can either enter a short description of the share, or leave this field blank. You can use up to 128 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
Access Level	Select Public if you want the share to be accessed by users connecting to the Zyxel Device. Otherwise, select Security.
Allowed	If Security is selected in the Access Level field, select this checkbox to allow/prohibit access to the share.
User Name	This field specifies the user for which the Allowed setting applies. Users can be added or modified in Maintenance > User Account.
Cancel	Click Cancel to return to the previous screen.
OK	Click OK to save your changes.

15.2.2 Add New User Screen

Once you click the Add New User button, you will be directed to the User Account screen. To create a user account that can access the secured shares on the USB device, click the Add New Account button in the Network Setting > USB Service > User Account screen.

Please see User Account, for detailed information about User Account screen.

CHAPTER 16 Nebula

16.1 Nebula Overview

You can manage the Zyxel Device through the Nebula Control Center (NCC), see Section 1.2 on page 22 for more information.

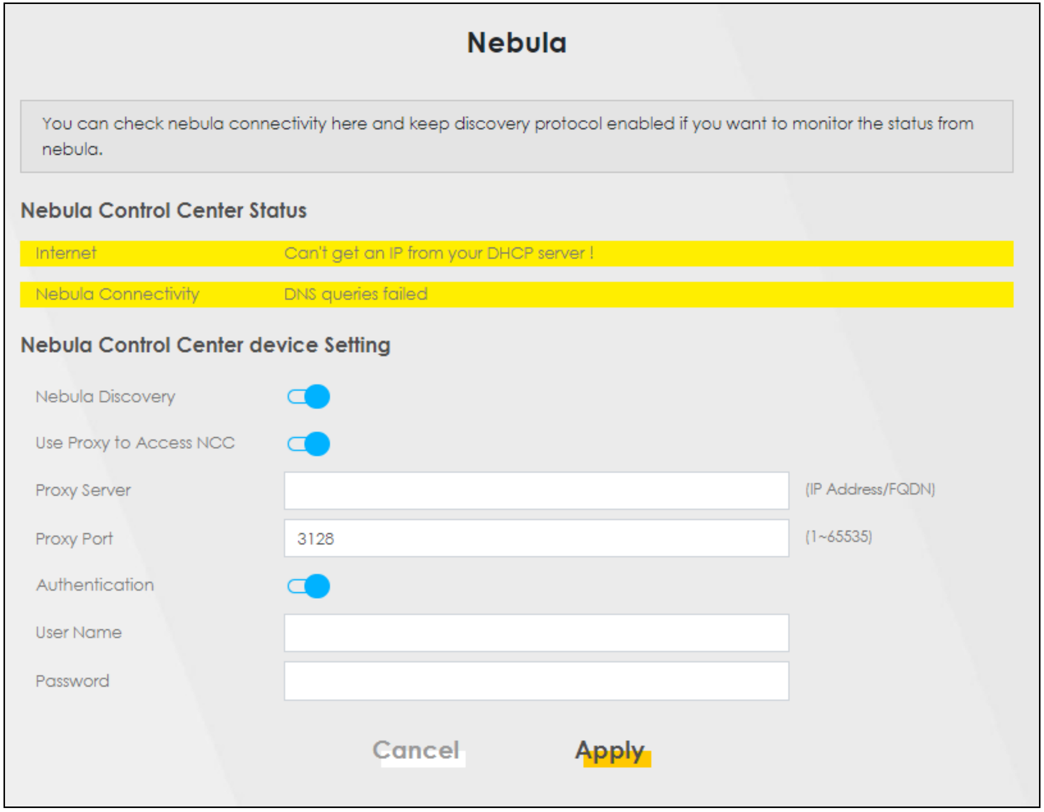
16.2 Nebula

Use this screen to:

- Enable Nebula Discovery to have the Zyxel Device to try to connect to the NCC.
- Configure the proxy server settings if the Zyxel Device is behind a proxy server.

To access this screen, click Network Setting > Nebula.

Figure 165 Network Setting > Nebula



Nebula

You can check nebula connectivity here and keep discovery protocol enabled if you want to monitor the status from nebula.

Nebula Control Center Status

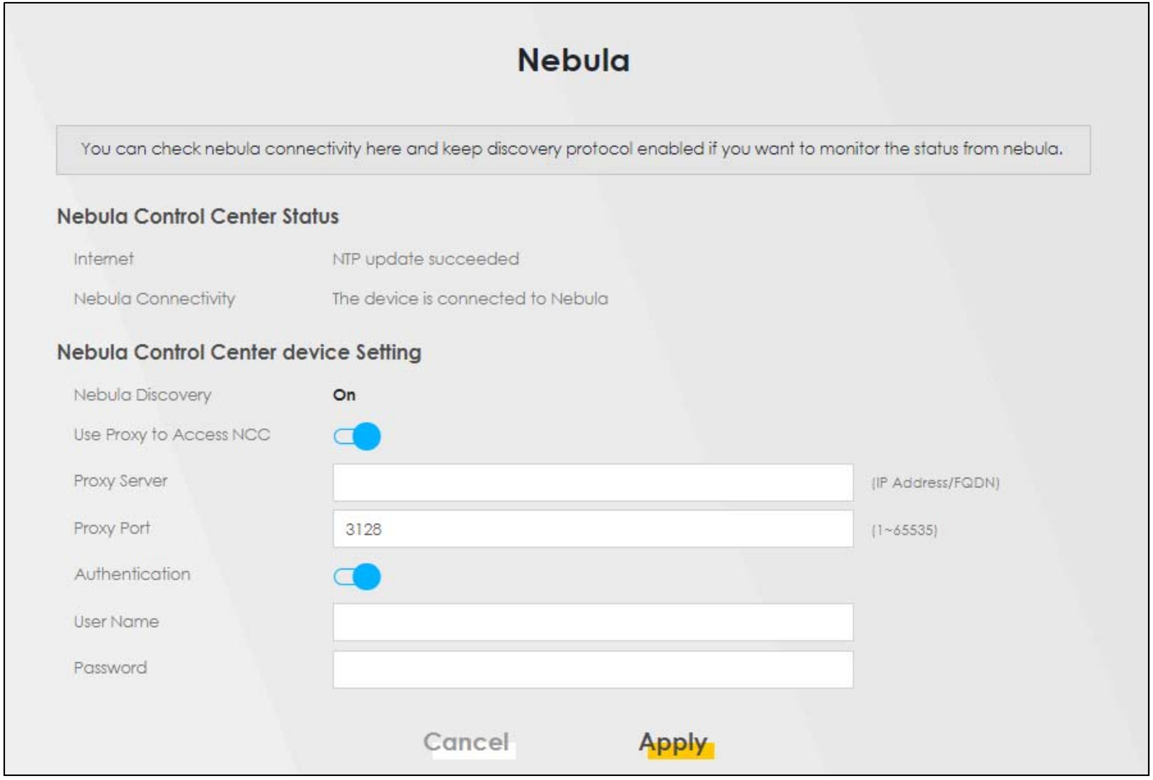
Internet	Can't get an IP from your DHCP server !
Nebula Connectivity	DNS queries failed

Nebula Control Center device Setting

Nebula Discovery	●	
Use Proxy to Access NCC	●	
Proxy Server		(IP Address/FQDN)
Proxy Port	3128	(1~65535)
Authentication	●	
User Name		
Password		

If the Zyxel Device is connected and registered with the Nebula Control Center, the screen appears as below.

Figure 166 Network Setting > Nebula (with registration in the Nebula Control Center)



Nebula

You can check nebula connectivity here and keep discovery protocol enabled if you want to monitor the status from nebula.

Nebula Control Center Status

Internet: NTP update succeeded

Nebula Connectivity: The device is connected to Nebula

Nebula Control Center device Setting

Nebula Discovery: On

Proxy Port: 3128

Each field is described in the following table.

Table 100 Network Setting > Nebula

LABEL	DESCRIPTION
Nebula Discovery	Slide the switch to the right to enable Nebula Discovery to have the Zyxel Device try to connect to the NCC. Once the Zyxel Device is connected to and has registered in the NCC, it'll go into the Nebula cloud management mode. If Nebula Discovery is disabled, the Zyxel Device will not discover the NCC and remain in standalone operation. This is not configurable and will only display ON when your Zyxel Device is being managed by NCC. See Figure 166 on page 291.
Use Proxy to Access to NCC	If the Zyxel Device is behind a proxy server, slide the switch to the right to enable this feature. Configure the proxy server settings so the Zyxel Device can access the NCC through the proxy server.
Proxy Server	Enter the IP address of the proxy server.
Proxy Port	Enter the service port number used by the proxy server.
Authentication	Enable this if the proxy server requires authentication before it grants access to the NCC.
User Name	Enter you proxy user name.
Password	Enter your proxy password.
Apply	Click Apply to save your changes back to the Zyxel Device.
Cancel	Click Cancel to set the settings in this screen back to default.

CHAPTER 17 Firewall

17.1 Firewall Overview

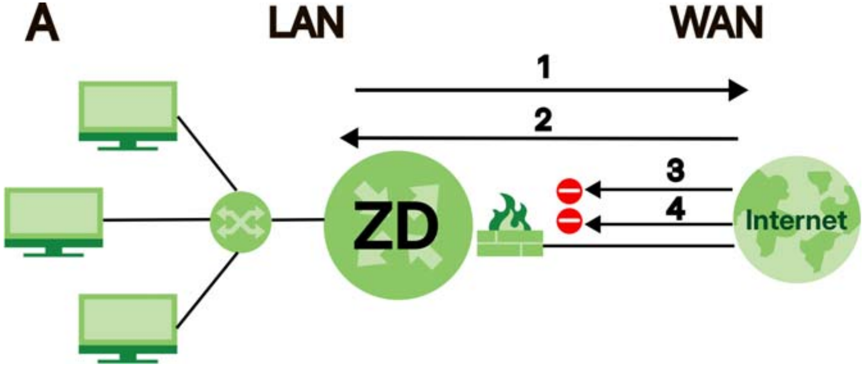
This chapter shows you how to enable the Zyxel Device firewall. Use the firewall to protect your Zyxel Device and network from attacks by hackers on the Internet and control access to it. The firewall:

- allows traffic that originates from your LAN computers to go to all other networks.Nebula Mobile Router Series User's Guide
- blocks traffic that originates on other networks from going to the LAN.

By default, the Zyxel Device blocks DoS attacks whether the firewall is enabled or disabled.

The following figure illustrates the firewall action. User A can initiate an IM (Instant Messaging) session from the LAN to the WAN (1). Return traffic for this session is also allowed (2). However other traffic initiated from the WAN is blocked (3 and 4).

Figure 167 Default Firewall Action



17.1.1 What You Need to Know About Firewall

SYN Attack

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

DoS

Denial-of-Service (DoS) attacks are aimed at devices and networks with a connection to the Internet. Their goal is not to steal information, but to disable a device or network so users no longer have access to network resources. The Zyxel Device is pre-configured to automatically detect and thwart all known DoS attacks.

DoS Thresholds

For DoS attacks, the Zyxel Device uses thresholds to determine when to drop sessions that do not become fully established. These thresholds apply globally to all sessions. You can use the default threshold values, or you can change them to values more suitable to your security requirements.

DDoS

A Distributed Denial-of-Service (DDoS) attack is an attack in which multiple compromised systems attack a single target, thereby causing denial of service for users of the targeted system.

ICMP

Internet Control Message Protocol (ICMP) is a message control and error-reporting protocol between a host server and a gateway to the Internet. ICMP uses Internet Protocol (IP) datagrams, but the messages are processed by the TCP/IP software and directly apparent to the application user.

LAND Attack

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

Ping of Death

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

SPI

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

17.2 Firewall

Use the firewall to protect your Zyxel Device and network from attacks by hackers on the Internet and control access to it.

17.2.1 What You Can Do in this Chapter

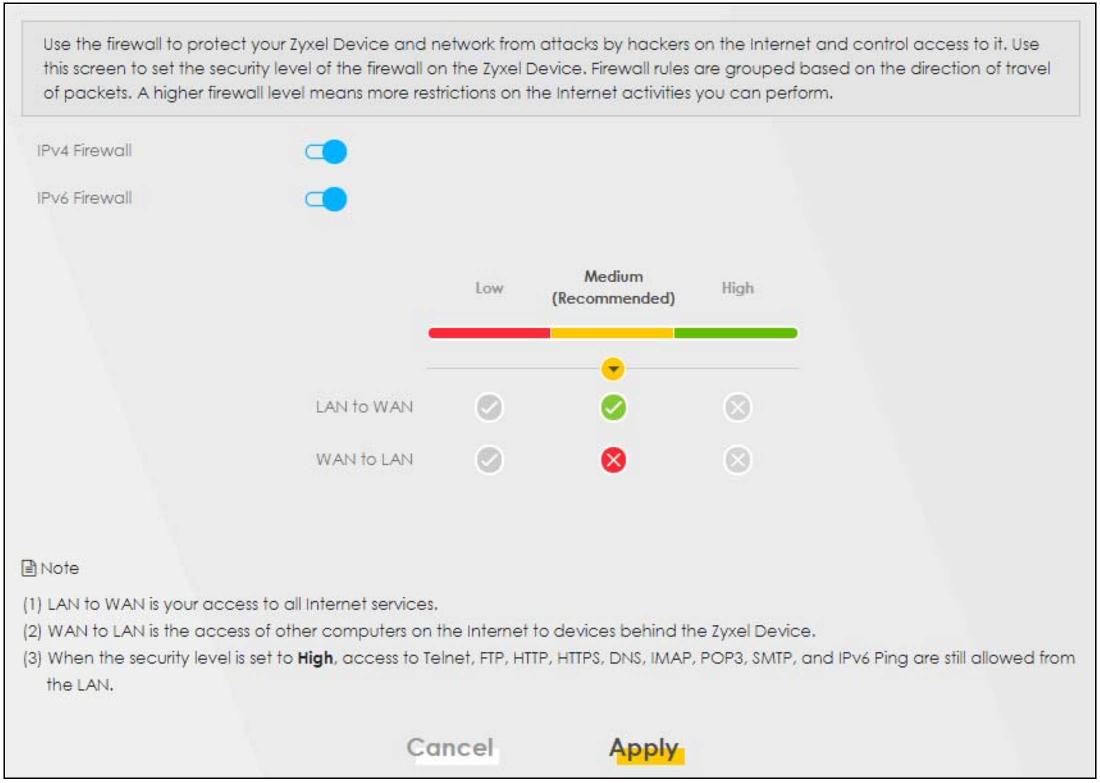
- Use the General screen to configure the security level of the firewall on the Zyxel Device (General).
- Use the Protocol screen to add or remove predefined Internet services and configure firewall rules (Protocol (Customized Services)).

- Use the Access Control screen to view and configure incoming or outgoing filtering rules (Access Control (Rules)).
- Use the DoS screen to activate protection against Denial of Service (DoS) attacks (DoS).

17.3 General

Use the firewall to protect your Zyxel Device and network from attacks by hackers on the Internet and control access to it. Use this screen to set the security level of the firewall on the Zyxel Device. Firewall rules are grouped based on the direction of travel of packets. A higher firewall level means more restrictions on the Internet activities you can perform. Click Security > Firewall > General to display the following screen. Use the slider to select the level of firewall protection.

Figure 168 Security > Firewall > General



Use the firewall to protect your Zyxel Device and network from attacks by hackers on the Internet and control access to it. Use this screen to set the security level of the firewall on the Zyxel Device. Firewall rules are grouped based on the direction of travel of packets. A higher firewall level means more restrictions on the Internet activities you can perform.

Note

(1) LAN to WAN is your access to all Internet services.

(2) WAN to LAN is the access of other computers on the Internet to devices behind the Zyxel Device.

(3) When the security level is set to **High**, access to Telnet, FTP, HTTP, HTTPS, DNS, IMAP, POP3, SMTP, and IPv6 Ping are still allowed from the LAN.

Note: LAN to WAN is your access to all Internet services. WAN to LAN is the access of other computers on the Internet to devices behind the Zyxel Device.
When the security level is set to High, Telnet, HTTP, HTTPS, DNS, IMAP, POP3, SMTP, and/or IPv6 ICMPv6 (Ping) traffic from the LAN are still allowed.

The following table describes the labels in this screen.

Table 101 Network Setting > USB Service > Media Server

LABEL	DESCRIPTION
IPv4 Firewall	Enable firewall protection when using IPv4 (Internet Protocol version 4).
IPv6 Firewall	Enable firewall protection when using IPv6 (Internet Protocol version 6).

Table 101 Network Setting > USB Service > Media Server (continued)

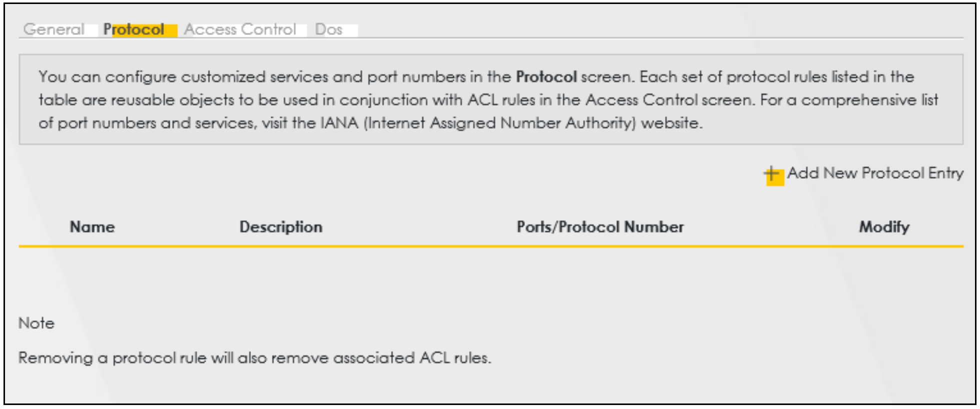
LABEL	DESCRIPTION
High	This setting blocks all traffic to and from the Internet. Only local network traffic and LAN to WAN service (Telnet, HTTP, HTTPS, DNS, POP3, SMTP) is permitted.
Medium	This is the recommended setting. It allows traffic to the Internet but blocks anyone from the Internet from accessing any services on your local network.
Low	This setting allows traffic to the Internet and also allows someone from the Internet to access services on your local network. This would be used with Port Forwarding, Default Server.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

17.4 Protocol (Customized Services)

You can configure customized services and port numbers in the Protocol screen. Each set of protocol rules listed in the table are reusable objects to be used in conjunction with ACL rules in the Access Control screen. For a comprehensive list of port numbers and services, visit the IANA (Internet Assigned Number Authority) website. Click Security > Firewall > Protocol to display the following screen.

Note: Removing a protocol rule will also remove associated ACL rules.

Figure 169 Security > Firewall > Protocol



You can configure customized services and port numbers in the **Protocol** screen. Each set of protocol rules listed in the table are reusable objects to be used in conjunction with ACL rules in the Access Control screen. For a comprehensive list of port numbers and services, visit the IANA (Internet Assigned Number Authority) website.

Name	Description	Ports/Protocol Number	Modify

Note

Removing a protocol rule will also remove associated ACL rules.

The following table describes the labels in this screen.

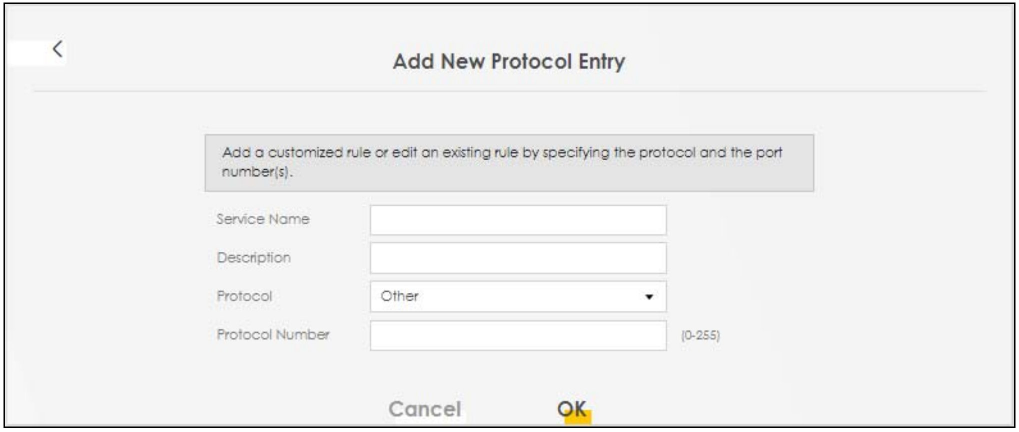
Table 102 Security > Firewall > Protocol

LABEL	DESCRIPTION
Add New Protocol Entry	Click this to configure a customized service.
Name	This is the name of your customized service.
Description	This is a description of your customized service.
Ports/Protocol Number	This shows the port number or range and the IP protocol (TCP or UDP) that defines your customized service.
Modify	Click this to edit a customized service.

17.4.1 Add Customized Service

Add a customized rule or edit an existing rule by specifying the protocol and the port numbers. Click Add New Protocol Entry in the Protocol screen to display the following screen.

Figure 170 Security > Firewall > Protocol: Add New Protocol Entry



Add a customized rule or edit an existing rule by specifying the protocol and the port number(s).

Protocol: Other

The following table describes the labels in this screen.

Table 103 Security > Firewall > Protocol: Add New Protocol Entry

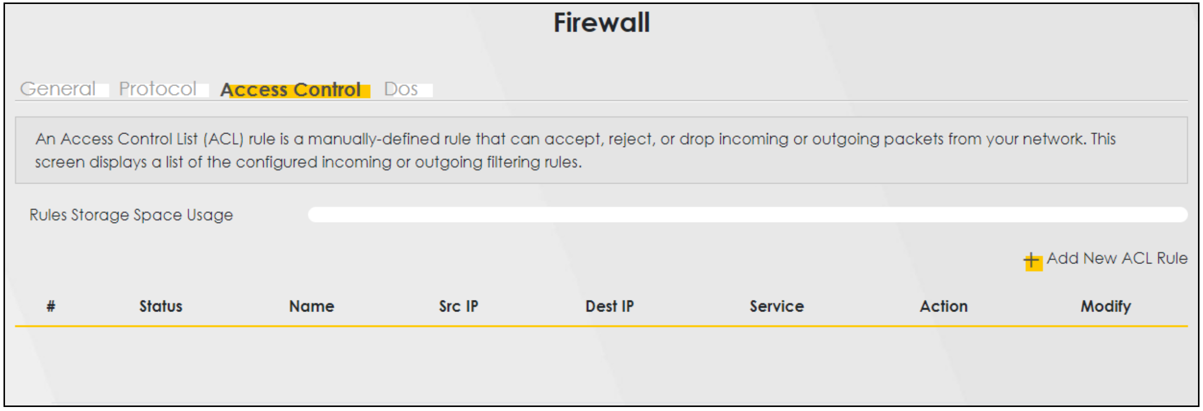
LABEL	DESCRIPTION
Service Name	Enter a descriptive name for your customized service. You can use up to 16 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
Description	Enter a description for your customized service. You can use up to 16 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
Protocol	Select the protocol (TCP, UDP, ICMP, ICMPv6, or Other) that defines your customized port from the drop down list box.
Protocol Number	Enter a single port number or the range of port numbers (0 – 255) that define your customized service.
OK	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

17.5 Access Control (Rules)

An Access Control List (ACL) rule is a manually-defined rule that can accept, reject, or drop incoming or outgoing packets from your network. This screen displays a list of the configured incoming or outgoing filtering rules. Note the order in which the rules are listed. Click Security > Firewall > Access Control to display the following screen.

Note: The ordering of your rules is very important as rules are applied in turn.

Figure 171 Security > Firewall > Access Control



An Access Control List (ACL) rule is a manually-defined rule that can accept, reject, or drop incoming or outgoing packets from your network. This screen displays a list of the configured incoming or outgoing filtering rules.

Rules Storage Space Usage

+ Add New ACL Rule

#	Status	Name	Src IP	Dest IP	Service	Action	Modify

The following table describes the labels in this screen.

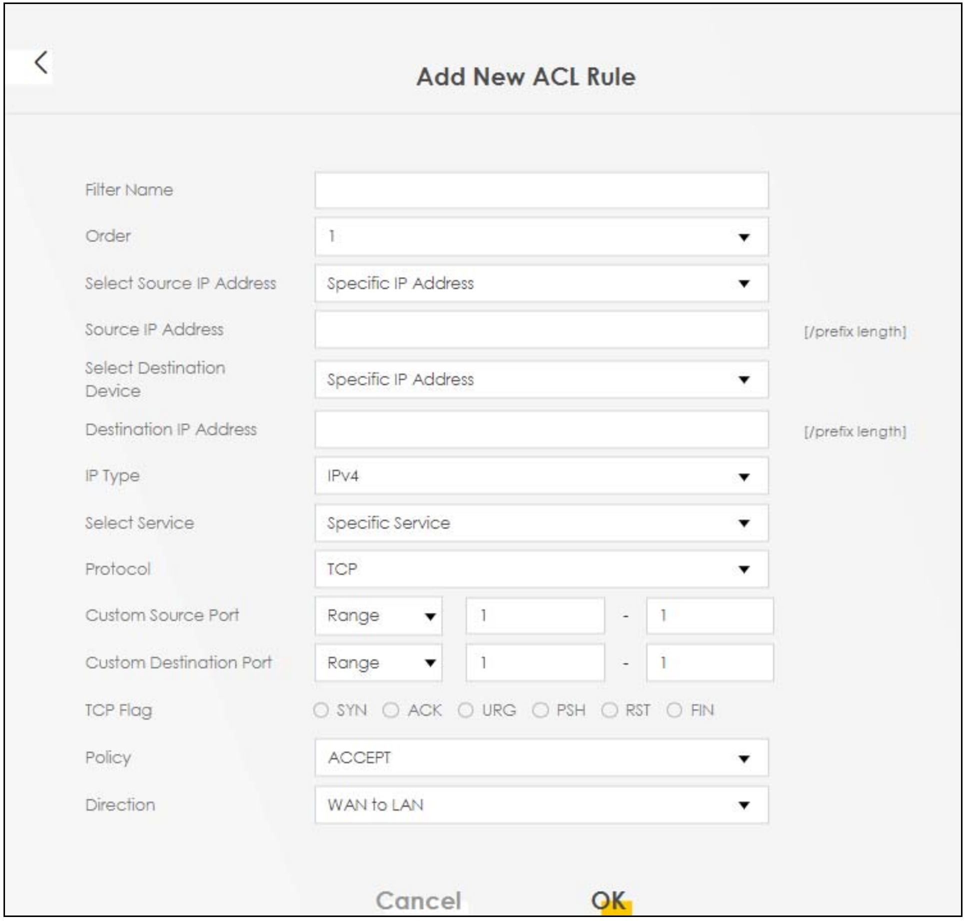
Table 104 Security > Firewall > Access Control

LABEL	DESCRIPTION
Rules Storage Space Usage	This read-only bar shows how much of the Zyxel Device's memory is in use for recording firewall rules. When you are using 80% or less of the storage space, the bar is green. When the amount of space used is over 80%, the bar is red.
Add New ACL Rule	Select an index number and click Add New ACL Rule to add a new firewall rule after the selected index number. For example, if you select “6”, your new rule becomes number 7 and the previous rule 7 (if there is one) becomes rule 8.
#	This field displays the rule index number. The ordering of your rules is important as rules are applied in turn.
Name	This field displays the rule name.
Src IP	This field displays the source IP addresses to which this rule applies.
Dest IP	This field displays the destination IP addresses to which this rule applies.
Service	This field displays the protocol (All, TCP, UDP, TCP/UDP, ICMP, ICMPv6, or any) used to transport the packets for which you want to apply the rule.
Action	Displays whether the firewall silently discards packets (Drop), discards packets and sends a TCP reset packet or an ICMP destination-unreachable message to the sender (Reject), or allow the passage of (Accept) packets that match this rule.
Modify	Click the Edit icon to edit the firewall rule. Click the Delete icon to delete an existing firewall rule.

17.5.1 Add New ACL Rule

Click Add new ACL rule or the Edit icon next to an existing ACL rule in the Access Control screen. The following screen displays. Use this screen to accept, reject, or drop packets based on specified parameters, such as source and destination IP address, IP Type, service, and direction. You can also specify a limit as to how many packets this rule applies to at a certain period of time or specify a schedule for this rule.

Figure 172 Security > Firewall > Access Control > Add New ACL Rule



Filter Name		
Order	1	
Select Source IP Address	Specific IP Address	
Source IP Address		[/prefix length]
Select Destination Device	Specific IP Address	
Destination IP Address		[/prefix length]
IP Type	IPv4	
Select Service	Specific Service	
Protocol	TCP	
Custom Source Port	Range 1 - 1	
Custom Destination Port	Range 1 - 1	
TCP Flag	○ SYN ○ ACK ○ URG ○ PSH ○ RST ○ FIN	
Policy	ACCEPT	
Direction	WAN to LAN	

The following table describes the labels in this screen.

Table 105 Security > Firewall > Access Control > Add New ACL Rule

LABEL	DESCRIPTION
Filter Name	Enter a descriptive name for your filter rule. You can use up to 16 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
Order	Assign the order of your rules as rules are applied in turn.
Select Source IP Address	If you want the source to come from a particular (single) IP, select Specific IP Address. If not, select from a detected device.
Source IP Address	If you selected Specific IP Address in the previous item, enter the source device's IP address here. Otherwise this field will be hidden if you select the detected device.
Select Destination Device	If you want your rule to apply to packets with a particular (single) IP, select Specific IP Address. If not, select a detected device.
Destination IP Address	If you selected Specific IP Address in the previous item, enter the destination device's IP address here. Otherwise this field will be hidden if you select the detected device.
IP Type	Select between IPv4 or IPv6. Compared to IPv4, 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 x 1038 IP addresses. The Zyxel Device can use IPv4/IPv6 dual stack to connect to IPv4 and IPv6 networks, and supports IPv6 rapid deployment (6RD).
Select Service	Select a service from the Select Service box.
Protocol	Select the protocol (ALL, TCP/UDP, TCP, UDP, ICMP, or ICMPv6) used to transport the packets for which you want to apply the rule.

Table 105 Security > Firewall > Access Control > Add New ACL Rule (continued)

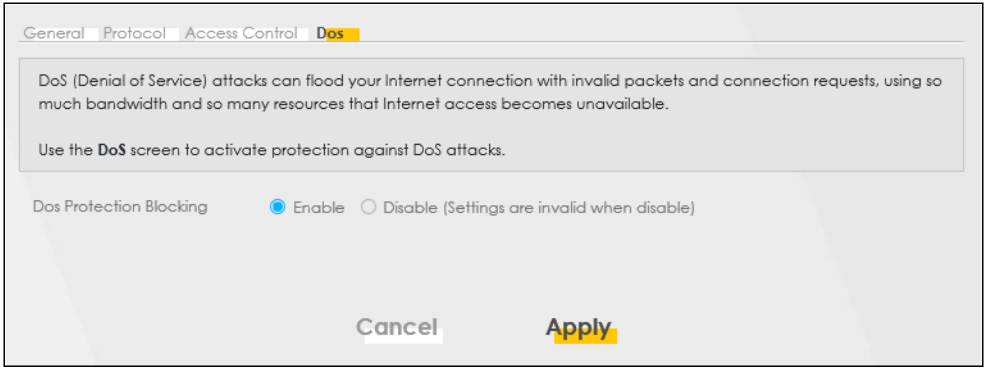
LABEL	DESCRIPTION
Custom Source Port	This is a single port number or the starting port number of a range that defines your rule.
Custom Destination Port	This is a single port number or the ending port number of a range that defines your rule.
TCP Flag	Select the TCP Flag (SYN, ACK, URG, PSH, RST, FIN). This appears when you select TCP/UDP or TCP in the Protocol field.
Type	This field is displayed only when you select Specific Protocol in Select Service and ICMP/ICMPv6 in the protocol field. From the drop-down list box, select which ICMP/ICMPv6 type you would like to use.
Policy	Use the drop-down list box to select whether to discard (Drop), deny and send an ICMP destination-unreachable message to the sender (Reject), or allow the passage of (Accept) packets that match this rule.
Direction	Select WAN to LAN to apply the rule to traffic from WAN to LAN. Select LAN to WAN to apply the rule to traffic from LAN to WAN. Select WAN to Router to apply the rule to traffic from WAN to router. Select LAN to Router to apply the rule to traffic from LAN to router.
Enable Rate Limit	Click this switch to enable the setting of maximum number of packets per maximum number of minute or second to limit the throughput of traffic that matches this rule. If not, the next item will be disabled.
Scheduler Rules	Select a schedule rule for this ACL rule form the drop-down list box. You can configure a new schedule rule by clicking Add New Rule. This will bring you to the Security > Scheduler Rules screen.
packet(s) per (1–512)	Enter the maximum number of packets (1 – 512) per minute or second.
Add New Rule	Select a schedule rule for this ACL rule from the drop-down list box. You can configure a new schedule rule by clicking Add New Rule.
OK	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

17.6 DoS

DoS (Denial of Service) attacks can flood your Internet connection with invalid packets and connection requests, using so much bandwidth and so many resources that Internet access becomes unavailable. Use the DoS screen to activate protection against DoS attacks.

Click Security > Firewall > DoS to display the following screen.

Figure 173 Security > Firewall > DoS



DoS (Denial of Service) attacks can flood your Internet connection with invalid packets and connection requests, using so much bandwidth and so many resources that Internet access becomes unavailable.

Use the **DoS** screen to activate protection against DoS attacks.

Dos Protection Blocking ● Enable ○ Disable (Settings are invalid when disable)

The following table describes the labels in this screen.

Table 106 Security > Firewall > DoS

LABEL	DESCRIPTION
DoS Protection Blocking	Enable this to protect against DoS attacks. The Zyxel Device will drop sessions that surpass maximum thresholds.
Apply	Click this to save your changes.
Cancel	Click this to restore your previously saved settings.

17.7 Firewall Technical Reference

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

17.7.1 Firewall Rules Overview

Your customized rules take precedence and override the Zyxel Device's default settings. The Zyxel Device checks the source IP address, destination IP address and IP protocol type of network traffic against the firewall rules (in the order you list them). When the traffic matches a rule, the Zyxel Device takes the action specified in the rule.

Firewall rules are grouped based on the direction of travel of packets to which they apply:

- LAN to Router
- LAN to WAN
- WAN to LAN
- WAN to Router

By default, the Zyxel Device's stateful packet inspection allows packets traveling in the following directions:

- LAN to Router

  These rules specify which computers on the LAN can manage the Zyxel Device (remote management).

Note: You can also configure the remote management settings to allow only a specific computer to manage the Zyxel Device.

- LAN to WAN

  These rules specify which computers on the LAN can access which computers or services on the WAN.

By default, the Zyxel Device's stateful packet inspection drops packets traveling in the following directions:

- WAN to LAN

  These rules specify which computers on the WAN can access which computers or services on the LAN.

Note: You also need to configure NAT port forwarding (or full featured NAT address mapping rules) to allow computers on the WAN to access devices on the LAN.

- WAN to Router

  By default the Zyxel Device stops computers on the WAN from managing the Zyxel Device. You could configure one of these rules to allow a WAN computer to manage the Zyxel Device.

Note: You also need to configure the remote management settings to allow a WAN computer to manage the Zyxel Device.

You may define additional rules and sets or modify existing ones but please exercise extreme caution in doing so.

For example, you may create rules to:

- Block certain types of traffic, such as IRC (Internet Relay Chat), from the LAN to the Internet.
- Allow certain types of traffic, such as Lotus Notes database synchronization, from specific hosts on the Internet to specific hosts on the LAN.
- Allow everyone except your competitors to access a web server.
- Restrict use of certain protocols, such as Telnet, to authorized users on the LAN.

These custom rules work by comparing the source IP address, destination IP address and IP protocol type of network traffic to rules set by the administrator. Your customized rules take precedence and override the Zyxel Device's default rules.

17.7.2 Guidelines For Security Enhancement With Your Firewall

1 Change the default password through the Web Configurator.

2 Think about access control before you connect to the network in any way.

3 Limit who can access your router.

4 Do not enable any local service (such as telnet) that you do not use. Any enabled service could present a potential security risk. A determined hacker might be able to find creative ways to misuse the enabled services to access the firewall or the network.

5 For local services that are enabled, protect against misuse. Protect by configuring the services to communicate only with specific peers, and protect by configuring rules to block packets for the services at specific interfaces.

6 Protect against IP spoofing by making sure the firewall is active.

7 Keep the firewall in a secured (locked) room.

17.7.3 Security Considerations

Note: Incorrectly configuring the firewall may block valid access or introduce security risks to the Zyxel Device and your protected network. Use caution when creating or deleting firewall rules and test your rules after you configure them.

Consider these security ramifications before creating a rule:

1 Does this rule stop LAN users from accessing critical resources on the Internet? For example, if IRC (Internet Relay Chat) is blocked, are there users that require this service?

2 Is it possible to modify the rule to be more specific? For example, if IRC is blocked for all users, will a rule that blocks just certain users be more effective?

3 Does this rule conflict with any existing rules?

Once these questions have been answered, adding rules is simply a matter of entering the information into the correct fields in the Web Configurator screens.

CHAPTER 18
MAC Filter

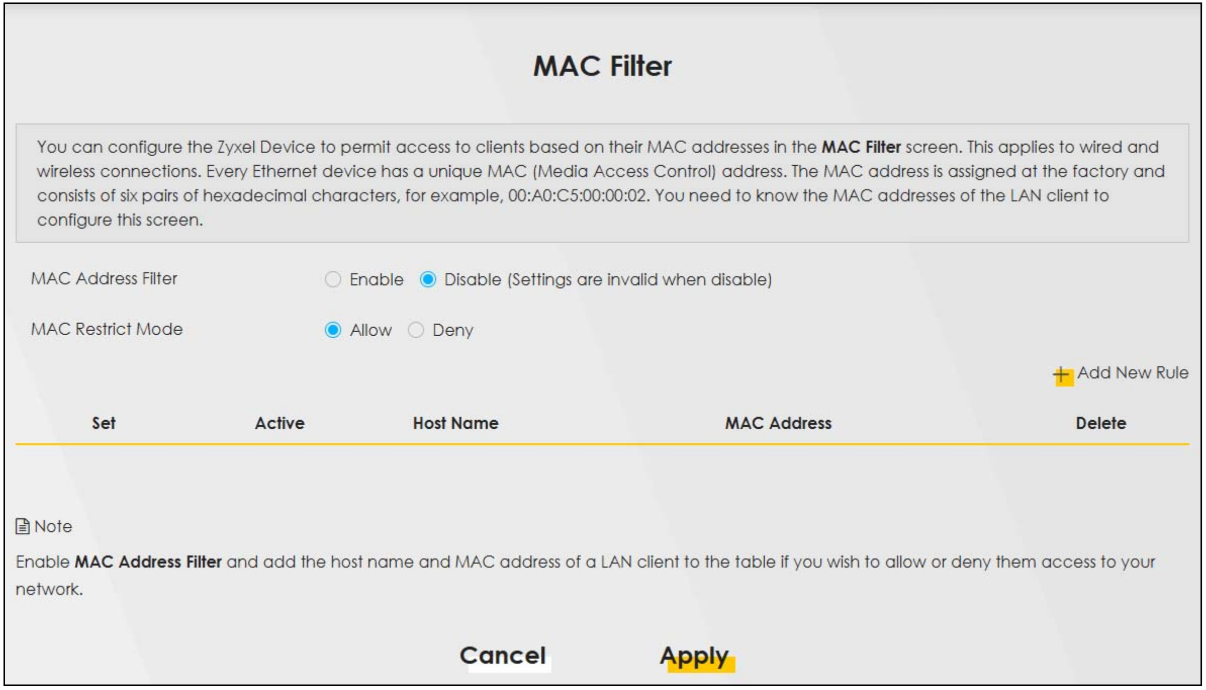
18.1 MAC Filter Overview

You can configure the Zyxel Device to permit access to clients based on their MAC addresses in the MAC Filter screen. This applies to wired connections. Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02. You need to know the MAC addresses of wired LAN client to configure this screen.

18.2 MAC Filter

Enable MAC Address Filter and add the host name and MAC address of a wired LAN client to the table if you wish to allow or deny them access to your network. You can choose to enable or disable the filters per entry; make sure that the checkbox under Active is selected if you want to use a filter. Select Security > MAC Filter. The screen appears as shown.

Figure 174   Security > MAC Filter



MAC Filter

You can configure the Zyxel Device to permit access to clients based on their MAC addresses in the **MAC Filter** screen. This applies to wired and wireless connections. Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02. You need to know the MAC addresses of the LAN client to configure this screen.

MAC Address Filter ○ Enable ● Disable (Settings are invalid when disable)

MAC Restrict Mode ● Allow ○ Deny

Set	Active	Host Name	MAC Address	Delete

Note

Enable **MAC Address Filter** and add the host name and MAC address of a LAN client to the table if you wish to allow or deny them access to your network.

The following table describes the labels in this screen.

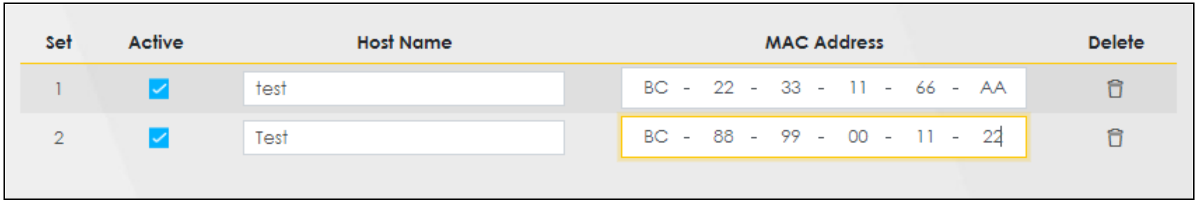
Table 107 Security > MAC Filter

LABEL	DESCRIPTION
MAC Address Filter	Select Enable to activate the MAC filter function.
MAC Restrict Mode	Select Allow to only permit the listed MAC addresses access to the Zyxel Device. Select Deny to permit anyone access to the Zyxel Device except the listed MAC addresses.
Add New Rule	Click the Add button to create a new entry.
Set	This is the index number of the MAC address.
Active	Select Active to enable the MAC filter rule per entry. The rule will not be applied if the Active check box is not selected.
Host Name	Enter the host name of a wired LAN client that you want to allow access to the Zyxel Device. You can use up to 17 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
MAC Address	Enter the MAC address of a wired LAN client that you want to allow access to the Zyxel Device. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.
Delete	Click the Delete icon to delete an existing rule.
Cancel	Click Cancel to restore your previously saved settings.
Apply	Click Apply to save your changes.

18.2.1 Add New Rule

You can choose to enable or disable the filters per entry; make sure that the checkbox under Active is selected if you want to use a filter, as shown in the example below. Select Security > MAC Filter > Add New Rule. The screen appears as shown.

Figure 175 Security > MAC Filter > Add New Rule



Set	Active	Host Name	MAC Address	Delete
1	☑	test	BC - 22 - 33 - 11 - 66 - AA	🗑
2	☑	Test	BC - 88 - 99 - 00 - 11 - 22	🗑

The following table describes the labels in this screen.

Table 108 Security > MAC Filter > Add New Rule

LABEL	DESCRIPTION
Set	This is the index number of the MAC address.
Active	Select Active to enable the MAC filter rule per entry. The rule will not be applied if the Active check box is not selected.
Host Name	Enter the host name of a wired LAN client that you want to allow access to the Zyxel Device. You can use up to 17 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
MAC Address	Enter the MAC addresses of a wired LAN client that you want to allow access to the Zyxel Device in these address fields. Enter the MAC addresses in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.
Delete	Click the Delete icon to delete an existing rule.

Table 108   Security > MAC Filter > Add New Rule (continued)

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

CHAPTER 19 Certificates

19.1 Certificates Overview

The Zyxel Device can use certificates (also called digital IDs) to authenticate users. Certificates are based on public-private key pairs. A certificate contains the certificate owner's identity and public key. Certificates provide a way to exchange public keys for use in authentication.

19.1.1 What You Can Do in this Chapter

- Use the Local Certificates screen to view and import the Zyxel Device's CA-signed (Certification Authority) certificates (Local Certificates).
- Use the Trusted CA screen to save the certificates of trusted CAs to the Zyxel Device. You can also export the certificates to a computer (Trusted CA).

19.2 What You Need to Know

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

Certification Authority

A Certification Authority (CA) issues certificates and guarantees the identity of each certificate owner. There are commercial certification authorities like CyberTrust or VeriSign and government certification authorities. The certification authority uses its private key to sign certificates. Anyone can then use the certification authority's public key to verify the certificates. You can use the Zyxel Device to generate certification requests that contain identifying information and public keys and then send the certification requests to a certification authority.

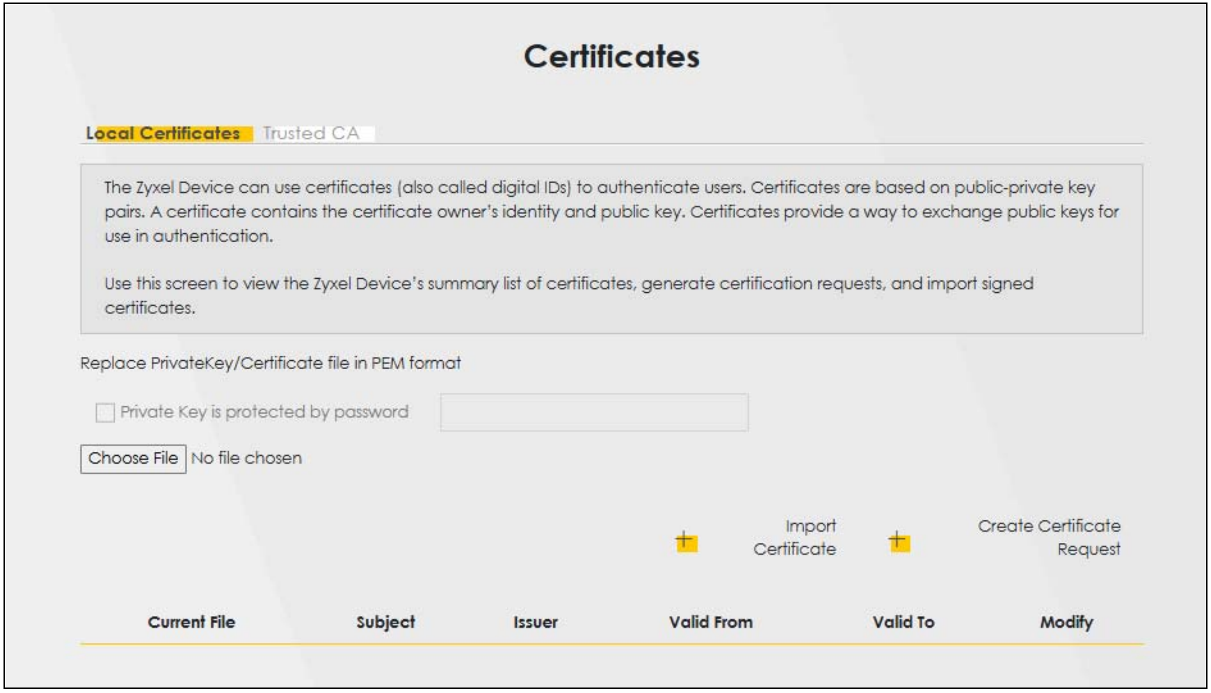
19.3 Local Certificates

Use this screen to view the Zyxel Device's summary list of certificates, generate certification requests, and import signed certificates. You can import the following certificates to your Zyxel Device:

- Web Server – This certificate secures HTTP connections.
- SSH – This certificate secures remote connections.

Click Security > Certificates to open the Local Certificates screen.

Figure 176 Security > Certificates > Local Certificates



Certificates

Local Certificates | Trusted CA

The Zyxel Device can use certificates (also called digital IDs) to authenticate users. Certificates are based on public-private key pairs. A certificate contains the certificate owner's identity and public key. Certificates provide a way to exchange public keys for use in authentication.

Use this screen to view the Zyxel Device's summary list of certificates, generate certification requests, and import signed certificates.

Replace PrivateKey/Certificate file in PEM format

□ Private Key is protected by password

Choose File No file chosen

Current File	Subject	Issuer	Valid From	Valid To	Modify

The following table describes the labels in this screen.

Table 109 Security > Certificates > Local Certificates

LABEL	DESCRIPTION
Replace Private Key/Certificate file in PEM format	
Private Key is protected by password	Select the checkbox and enter the private key into the text box to store it on the Zyxel Device. You can use up to 63 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces.
Choose File/ Browse	Click this button to find the certificate file you want to upload.
Import Certificate	Click this button to save the certificate that you have enrolled from a certification authority from your computer to the Zyxel Device.
Create Certificate Request	Click this button to go to the screen where you can have the Zyxel Device generate a certification request.
Current File	This field displays the name used to identify this certificate. It is recommended that you give each certificate a unique name.
Subject	This field displays identifying information about the certificate's owner, such as CN (Common Name), OU (Organizational Unit or department), O (Organization or company) and C (Country). It is recommended that each certificate have a unique subject information.
Issuer	This field displays identifying information about the certificate's issuing certification authority, such as a common name, organizational unit or department, organization or company and country.
Valid From	This field displays the date that the certificate becomes applicable. The text displays in red and includes a Not Yet Valid! message if the certificate has not yet become applicable.

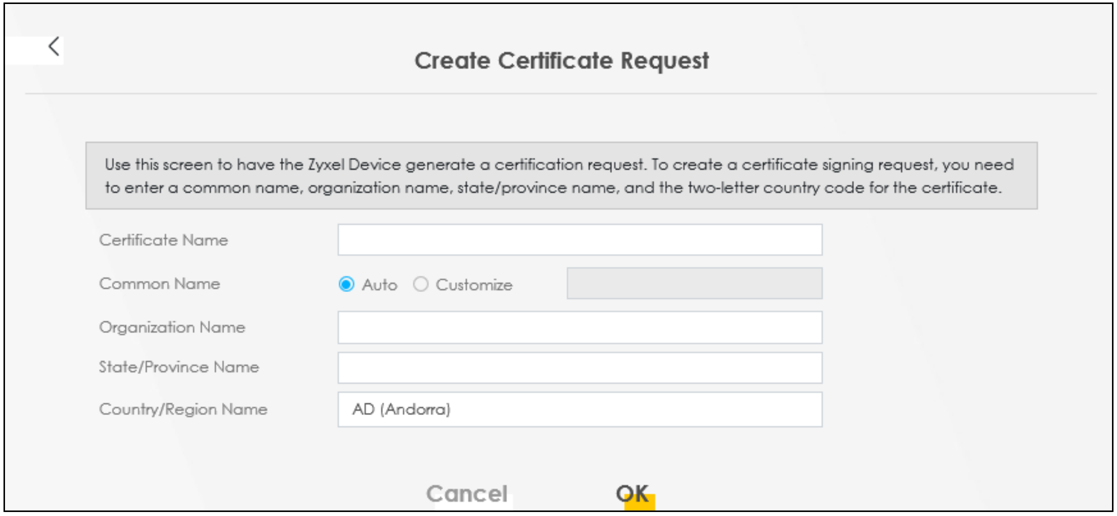
Table 109 Security > Certificates > Local Certificates (continued)

LABEL	DESCRIPTION
Valid To	This field displays the date that the certificate expires. The text displays in red and includes an Expiring! or Expired! message if the certificate is about to expire or has already expired.
Modify	Click the View icon to open a screen with an in-depth list of information about the certificate. For a certification request, click Load Signed to import the signed certificate. Click the Remove icon to remove the certificate (or certification request). A window displays asking you to confirm that you want to delete the certificate. Note that subsequent certificates move up by one when you take this action.

19.3.1 Create Certificate Request

Click Security > Certificates > Local Certificates and then Create Certificate Request to open the following screen. Use this screen to have the Zyxel Device generate a certification request. To create a certificate signing request, you need to enter a common name, organization name, state or province name, and the default US two-letter country code (The US country code is by default and not changeable when sold in the U.S.) for the certificate.

Figure 177 Security > Certificates > Local Certificates: Create Certificate Request



Create Certificate Request

Use this screen to have the Zyxel Device generate a certification request. To create a certificate signing request, you need to enter a common name, organization name, state/province name, and the two-letter country code for the certificate.

Certificate Name	
Common Name	● Auto ○ Customize
Organization Name	
State/Province Name	
Country/Region Name	AD (Andorra)

The following table describes the labels in this screen.

Table 110 Security > Certificates > Local Certificates: Create Certificate Request

LABEL	DESCRIPTION
Certificate Name	Enter a descriptive name to identify this certificate. You can use up to 63 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
Common Name	Select Auto to have the Zyxel Device configure this field automatically. Or select Customize to enter it manually. Enter the IP address (in dotted decimal notation), domain name or email address in the field provided. You can use up to 63 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed. The domain name or email address is for identification purposes only and can be any string.
Organization Name	Enter a descriptive name to identify the company or group to which the certificate owner belongs. You can use up to 32 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.

Table 110   Security > Certificates > Local Certificates: Create Certificate Request (continued)

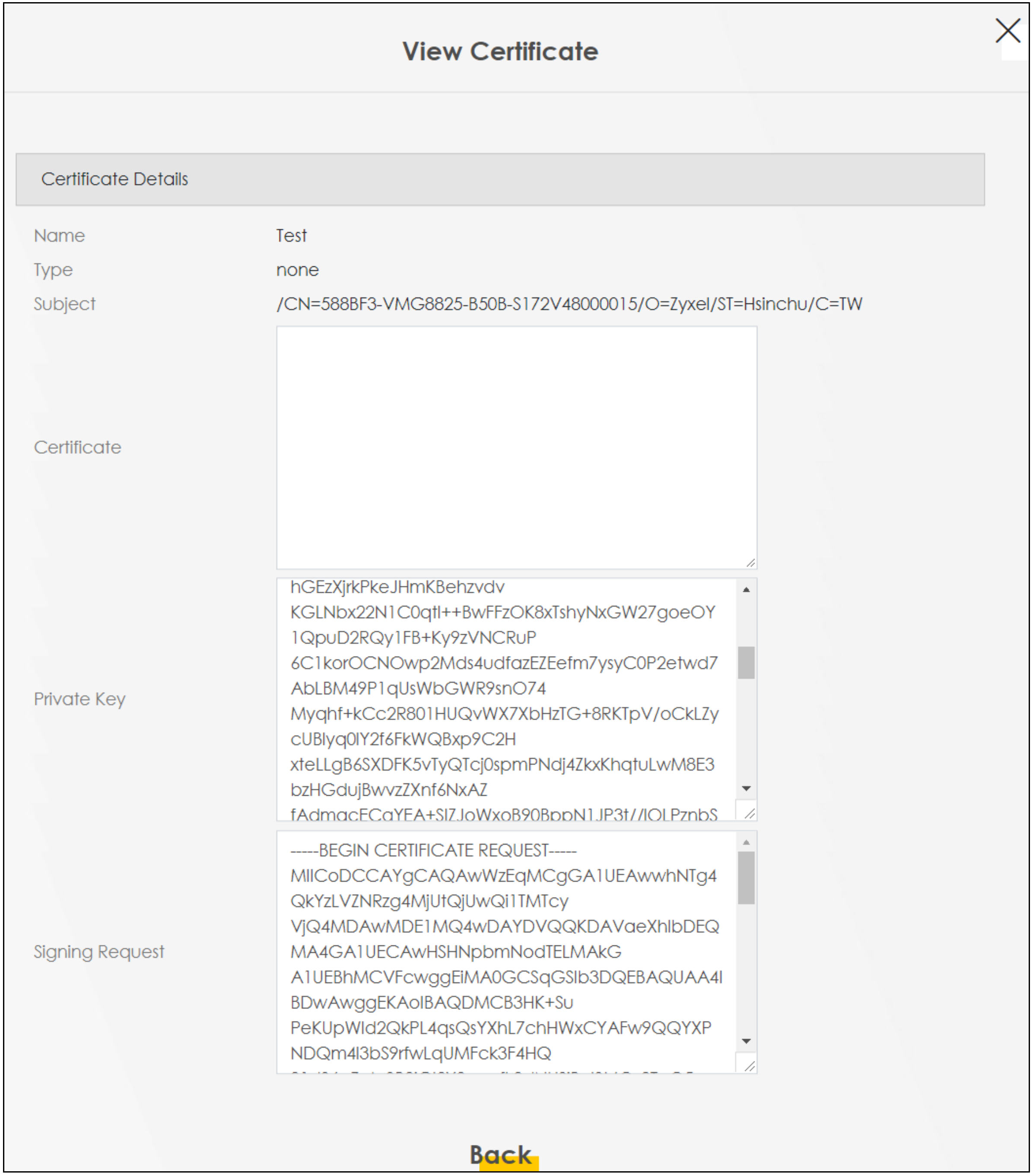
LABEL	DESCRIPTION
State/Province Name	Enter a descriptive name to identify the state or province where the certificate owner is located. You can use up to 32 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
Country/Region Name	Select a country to identify the nation where the certificate owner is located.
Cancel	Click Cancel to exit this screen without saving.
OK	Click OK to save your changes.

19.3.2 View Certificate Request

Use this screen to view in-depth information about the certificate request. The Certificate is used to verify the authenticity of the certification authority. The Private Key serves as your digital signature for authentication and must be safely stored. The Signing Request contains the certificate signing request value that you will copy upon submitting the certificate request to the CA (certificate authority).

Click the View icon in the Local Certificates screen to open the following screen.

Figure 178   Security > Certificates > Local Certificates: View Certificate



View Certificate

Certificate Details

Name: Test

Type: none

Subject: /CN=588BF3-VMG8825-B50B-S172V48000015/O=Zyxel/ST=Hsinchu/C=TW

Certificate:

Private Key:

```
hGEzXjrkPkeJHmKBehzvdv
KGLNbx22N1C0qtl++BwFFzOK8xTshyNxGW27goeOY
1QpuD2RQy1FB+Ky9zVNCRuP
6C1korOCNOwp2Mds4udfazEZEefm7ysyC0P2etwd7
AbLBM49P1qUsWbGWR9snO74
Myqhf+kCc2R801HUQvWX7XbHzTG+8RKTpV/oCkLZy
cUBlyq0lY2f6FkWQBxp9C2H
xteLLgB6SXDFK5vTyQTcj0spmPNdj4ZkxKhqtuLwM8E3
bzHGdujBwvzZXnf6NxAZ
fAdmacECaYEA+SIZJoWxoB90BppN1JP3t//IOLPznbS
```

Signing Request:

```
-----BEGIN CERTIFICATE REQUEST-----
MIICoDCCAYgCAQAwWzEqMCgGA1UEAwwhNTg4
QkYzLVZNRzg4MjUtQjUwQi1TMTcy
VjQ4MDAwMDE1MQ4wDAYDVQQKDAVaeXhlbDEQ
MA4GA1UECAwHSHNpbmNodTELMAkG
A1UEBhMCVFcwggEiMA0GCSqGSIb3DQEBAQUAA4I
BDwAwggEKAoIBAQDMCB3HK+Su
PeKUpWld2QkPL4qsQsYXhL7chHWxCYAFw9QQYXP
NDQm4l3bS9rfwLqUMFck3F4HQ
```

The following table describes the fields in this screen.

Table 111   Security > Certificates > Local Certificates: View Certificate

LABEL	DESCRIPTION
Name	This field displays the identifying name of this certificate.
Type	This field displays general information about the certificate. ca means that a Certification Authority signed the certificate.
Subject	This field displays information that identifies the owner of the certificate, such as Common Name (CN), Organizational Unit (OU), Organization (O) and Country (C).

Table 111 Security > Certificates > Local Certificates: View Certificate (continued)

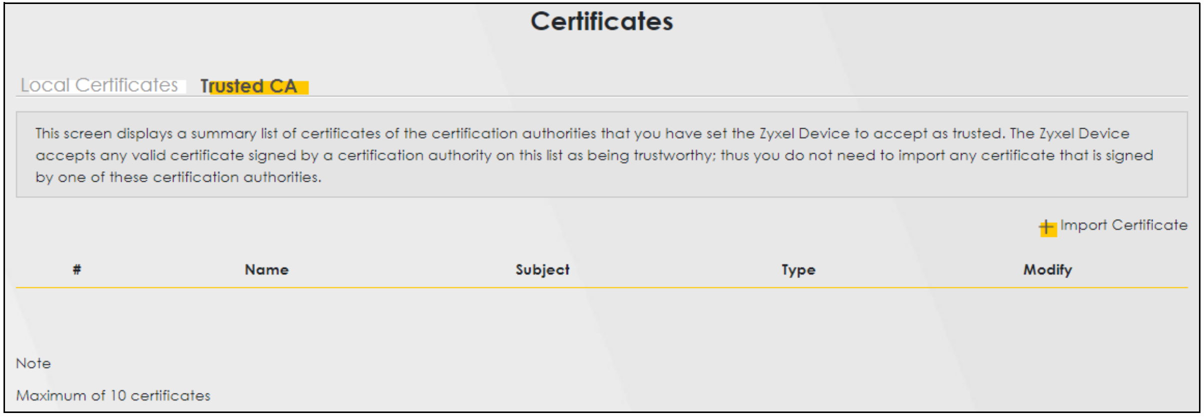
LABEL	DESCRIPTION
Certificate	This read-only text box displays the certificate in Privacy Enhanced Mail (PEM) format. PEM uses base 64 to convert the binary certificate into a printable form. You can copy and paste the certificate into an email to send to friends or colleagues or you can copy and paste the certificate into a text editor and save the file on a management computer for later distribution.
Private Key	This field displays the private key of this certificate.
Signing Request	This field displays the CSR (Certificate Signing Request) information of this certificate. The CSR will be provided to a certificate authority, and it includes information about the public key, organization name, domain name, location, and country of this certificate.
Back	Click Back to return to the previous screen.

19.4 Trusted CA

Click Security > Certificates > Trusted CA to open the following screen. This screen displays a summary list of certificates of the certification authorities that you have set the Zyxel Device to accept as trusted. The Zyxel Device accepts any valid certificate signed by a certification authority on this list as being trustworthy, which means you do not need to import any certificate that is signed by one of these certification authorities.

Note: A maximum of ten certificates can be added. For NR5309, a maximum of four certificates can be added.

Figure 179 Security > Certificates > Trusted CA



Certificates

This screen displays a summary list of certificates of the certification authorities that you have set the Zyxel Device to accept as trusted. The Zyxel Device accepts any valid certificate signed by a certification authority on this list as being trustworthy; thus you do not need to import any certificate that is signed by one of these certification authorities.

#	Name	Subject	Type	Modify

Note

Maximum of 10 certificates

The following table describes the labels in this screen.

Table 112 Security > Certificates > Trusted CA

LABEL	DESCRIPTION
Import Certificate	Click this to open a screen where you can save the certificate of a certification authority that you trust to the Zyxel Device.
#	This is the index number of the entry.
Name	This field displays the name used to identify this certificate.
Subject	This field displays information that identifies the owner of the certificate, such as Common Name (CN), OU (Organizational Unit or department), Organization (O), State (ST) and Country (C). It is recommended that each certificate have a unique subject information.

Table 112 Security > Certificates > Trusted CA (continued)

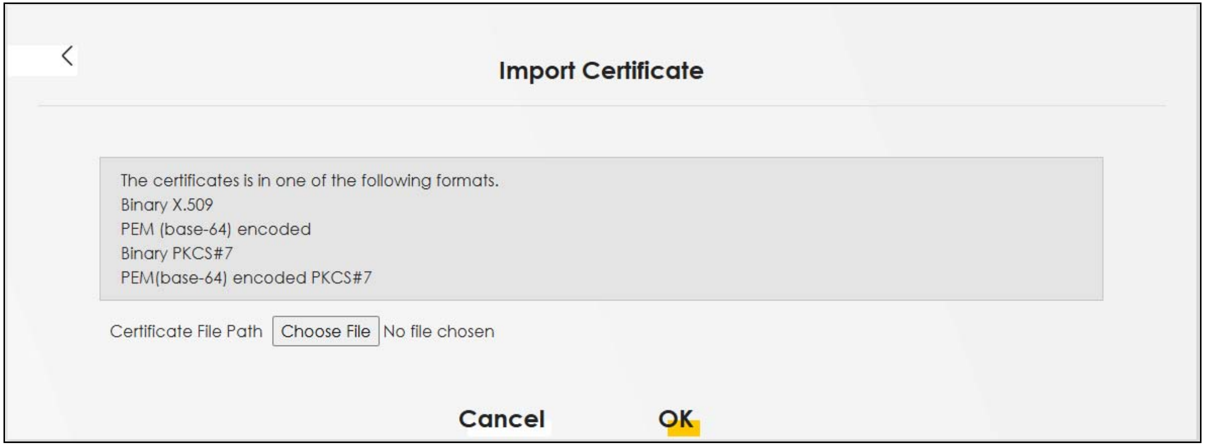
LABEL	DESCRIPTION
Type	This field displays general information about the certificate. ca means that a Certification Authority signed the certificate.
Modify	Click the View icon to open a screen with an in-depth list of information about the certificate (or certification request). Click the Remove icon to delete the certificate (or certification request). You cannot delete a certificate that one or more features is configured to use.

19.5 Import Trusted CA Certificate

Click Import Certificate in the Trusted CA screen to open the Import Certificate screen. The Zyxel Device trusts any valid certificate signed by any of the imported trusted CA certificates. Certificates should be in one of the following formats: Binary X.509, PEM (base-64) encoded, Binary PKCS#7, or PEM (base-64) encoded PKCS#7.

Note: You must remove any spaces from the certificate's filename before you can import the certificate.

Figure 180 Security > Certificates > Trusted CA > Import Certificate



Import Certificate

The certificates is in one of the following formats.
Binary X.509
PEM (base-64) encoded
Binary PKCS#7
PEM(base-64) encoded PKCS#7

Certificate File Path Choose File No file chosen

The following table describes the labels in this screen.

Table 113 Security > Certificates > Trusted CA > Import Certificate

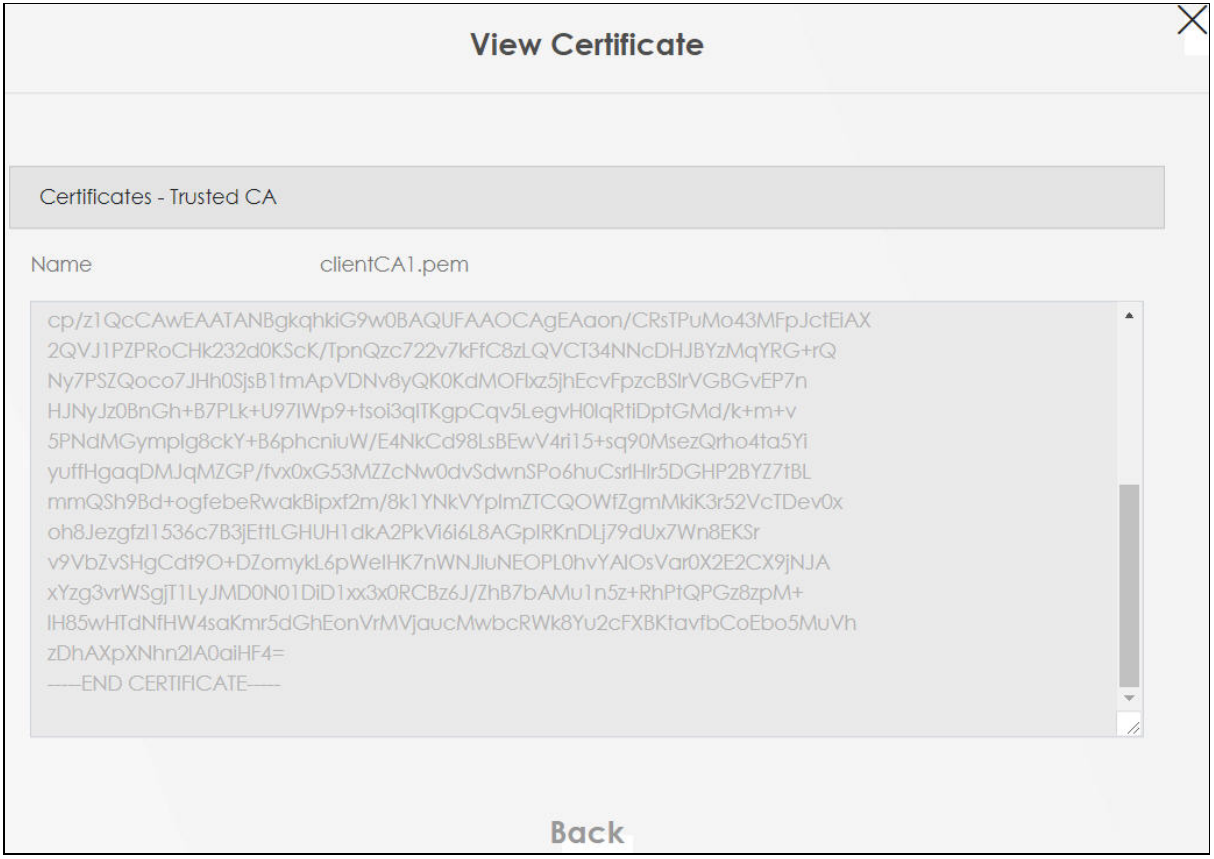
LABEL	DESCRIPTION
Certificate File Path	Enter the location of the file you want to upload in this field or click Choose File/Browse to find it.
Choose File/ Browse	Click this to find the certificate file you want to upload.
OK	Click this to save the certificate on the Zyxel Device.
Cancel	Click this to exit this screen without saving.

19.6 View Trusted CA Certificate

Use this screen to view in-depth information about the certification authority's certificate. The certificate text box is read-only and can be distributed to others.

Click Security > Certificates > Trusted CA to open the Trusted CA screen. Click the View icon to open the View Certificate screen.

Figure 181 Security > Certificates > Trusted CA > View Certificate



Name clientCA1.pem

```
cp/z1QcCAwEAATANBgkqhkiG9w0BAQUFAAOCAgEAaon/CRsTPuMo43MFpJctEiAX
2QVJ1PZPRoCHk232d0KScK/TpnQzc722v7kFfC8zLQVCT34NNcDHJBYzMqYRG+rQ
Ny7PSZQoco7JHh0SjsB1tmApVDNv8yQK0KdMOFlxz5jhEcvFpzcBSlrVGBGvEP7n
HJNyJz0BnGh+B7PLk+U97IWp9+tsoi3qlTKgpCqv5LegvH0lqRtiDptGMd/k+m+v
5PNdMGymplg8ckY+B6phcniuW/E4NkCd98LsBEwV4ri15+sq90MsezQrho4ta5Yi
yuffHgaqDMJqMZGP/fvx0xG53MZZcNw0dvSdwnSPo6huCsrlHlr5DGHP2BYZ7tBL
mmQSh9Bd+ogfebeRwakBipxf2m/8k1YNkVYplmZTCQOWfZgmMkiK3r52VcTDev0x
oh8Jezgfzl1536c7B3jEttLGHUH1dkA2PkVi6i6L8AGplRKnDLj79dUx7Wn8EKSr
v9VbZvSHgCdt9O+DZomykL6pWelHK7nWNJluNEOPL0hvYAlOsVar0X2E2CX9jNJA
xYzg3vrWSgjT1LyJMD0N01DiD1xx3x0RCBz6J/ZhB7bAMu1n5z+RhPtQPGz8zpM+
lH85wHTdNfHW4saKmr5dGhEonVrMVjaucMwbcRWk8Yu2cFXBKtavfbCoEbo5MuVh
zDhAXpXNhn2lA0aiHF4=
-----END CERTIFICATE-----
```

The following table describes the labels in this screen.

Table 114 Security > Certificates > Trusted CA > View Certificate

LABEL	DESCRIPTION
Name	This field displays the identifying name of this certificate.
	This read-only text box displays the certificate or certification request in Privacy Enhanced Mail (PEM) format. PEM uses 64 ASCII characters to convert the binary certificate into a printable form. You can copy and paste the certificate into an email to send to friends or colleagues or you can copy and paste the certificate into a text editor and save the file on a management computer for later distribution (through USB thumb drive for example).
Back	Click this to return to the previous screen.

19.7 Certificates Technical Reference

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

Certification Authorities

A Certification Authority (CA) issues certificates and guarantees the identity of each certificate owner. There are commercial certification authorities like CyberTrust or VeriSign and government certification authorities.

Public and Private Keys

When using public-key cryptology for authentication, each host has two keys. One key is public and can be made openly available; the other key is private and must be kept secure. Public-key encryption in general works as follows.

1. Tim wants to send a private message to Jenny. Tim generates a public-private key pair. What is encrypted with one key can only be decrypted using the other.
2. Tim keeps the private key and makes the public key openly available.
3. Tim uses his private key to encrypt the message and sends it to Jenny.
4. Jenny receives the message and uses Tim’s public key to decrypt it.
5. Additionally, Jenny uses her own private key to encrypt a message and Tim uses Jenny’s public key to decrypt the message.

The Zyxel Device uses certificates based on public-key cryptology to authenticate users attempting to establish a connection. The method used to secure the data that you send through an established connection depends on the type of connection. For example, a VPN tunnel might use the triple DES encryption algorithm.

The certification authority uses its private key to sign certificates. Anyone can then use the certification authority’s public key to verify the certificates.

Advantages of Certificates

Certificates offer the following benefits.

- The Zyxel Device only has to store the certificates of the certification authorities that you decide to trust, no matter how many devices you need to authenticate.
- Key distribution is simple and very secure since you can freely distribute public keys and you never need to transmit private keys.

Certificate File Format

The certification authority certificate that you want to import has to be in PEM (Base-64) encoded X.509 file format. This Privacy Enhanced Mail format uses 64 ASCII characters to convert a binary X.509 certificate into a printable form.

19.7.1 Verify a Certificate

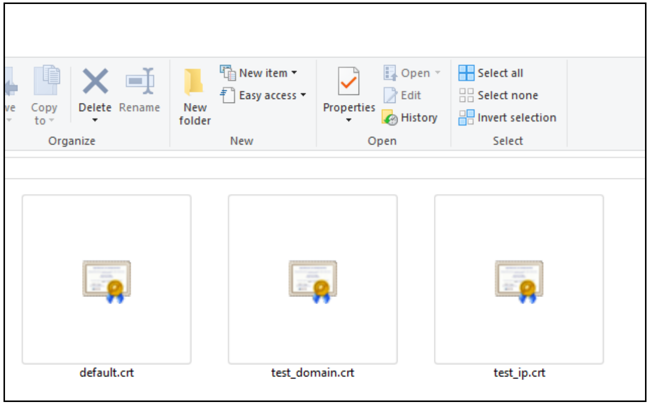
Before you import a trusted CA or trusted remote host certificate into the Zyxel Device, you should verify that you have the actual certificate. This is especially true of trusted CA certificates since the Zyxel Device also trusts any valid certificate signed by any of the imported trusted CA certificates.

You can use a certificate's fingerprint to verify it. A certificate's fingerprint is a message digest calculated using the MD5 or SHA1 algorithms. The following procedure describes how to check a certificate's fingerprint to verify that you have the actual certificate.

1 Browse to where you have the certificate saved on your computer.

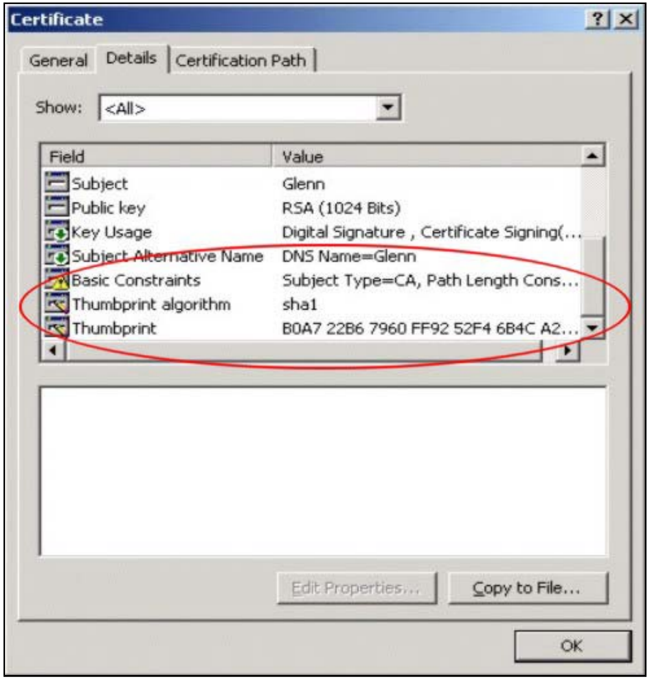
2 Make sure that the certificate has a ".cer" or ".crt" file name extension.

Figure 182 Certificates on Your Computer



3 Double-click the certificate's icon to open the Certificate window. Click the Details tab and scroll down to the Thumbprint Algorithm and Thumbprint fields.

Figure 183 Certificate Details



Field	Value
Subject	Glenn
Public key	RSA (1024 Bits)
Key Usage	Digital Signature , Certificate Signing(...
Subject Alternative Name	DNS Name=Glenn
Basic Constraints	Subject Type=CA, Path Length Cons...
Thumbprint algorithm	sha1
Thumbprint	B0A7 22B6 7960 FF92 52F4 6B4C A2...

Use a secure method to verify that the certificate owner has the same information in the Thumbprint Algorithm and Thumbprint fields. The secure method may vary based on your situation. Possible examples would be over the telephone or through an HTTPS connection.

CHAPTER 20
Log

20.1 What You Need To Know

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

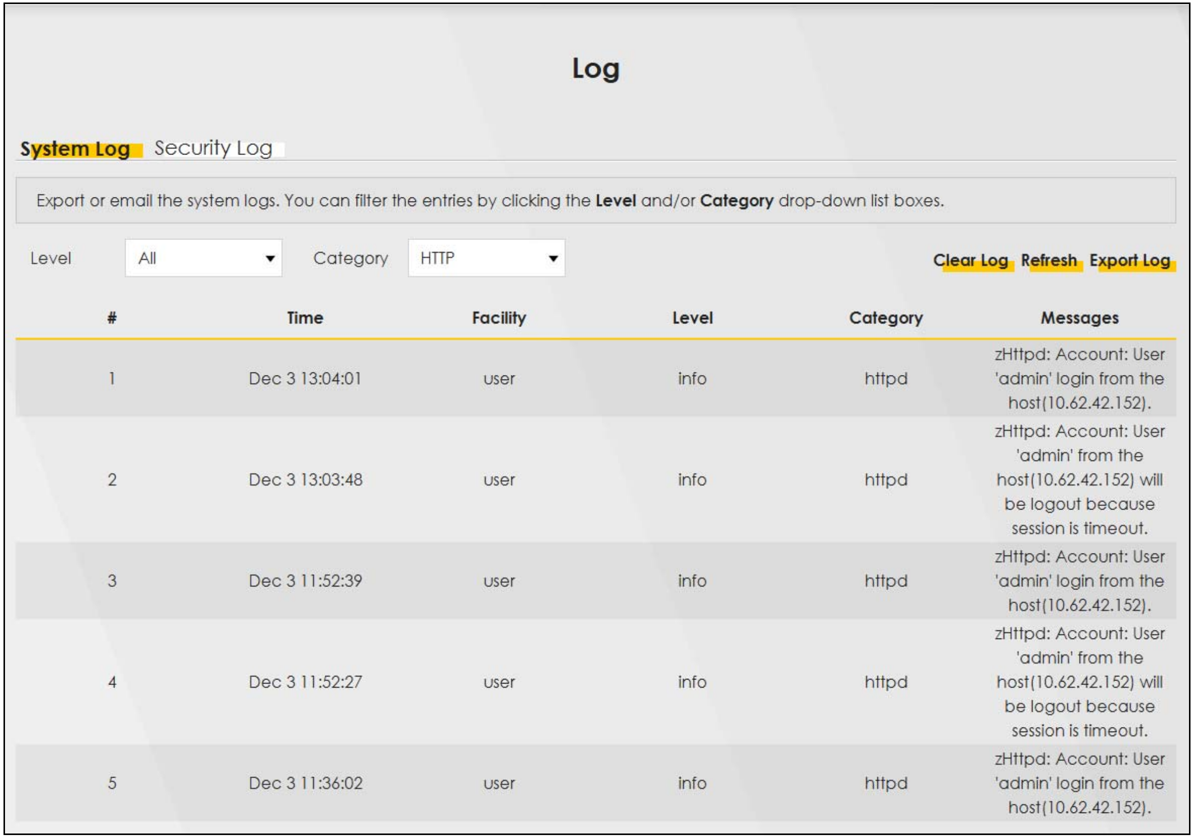
Alerts and Logs

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

20.2 System Log

Use the System Log screen to see the system logs. You can filter the entries by selecting a severity level and/or category. Click System Monitor > Log to open the System Log screen.

Figure 184   System Monitor > Log > System Log



Export or email the system logs. You can filter the entries by clicking the **Level** and/or **Category** drop-down list boxes.

Level: All
Category: HTTP

#	Time	Facility	Level	Category	Messages
1	Dec 3 13:04:01	user	info	httpd	zHttpd: Account: User 'admin' login from the host(10.62.42.152).
2	Dec 3 13:03:48	user	info	httpd	zHttpd: Account: User 'admin' from the host(10.62.42.152) will be logout because session is timeout.
3	Dec 3 11:52:39	user	info	httpd	zHttpd: Account: User 'admin' login from the host(10.62.42.152).
4	Dec 3 11:52:27	user	info	httpd	zHttpd: Account: User 'admin' from the host(10.62.42.152) will be logout because session is timeout.
5	Dec 3 11:36:02	user	info	httpd	zHttpd: Account: User 'admin' login from the host(10.62.42.152).

The following table describes the fields in this screen.

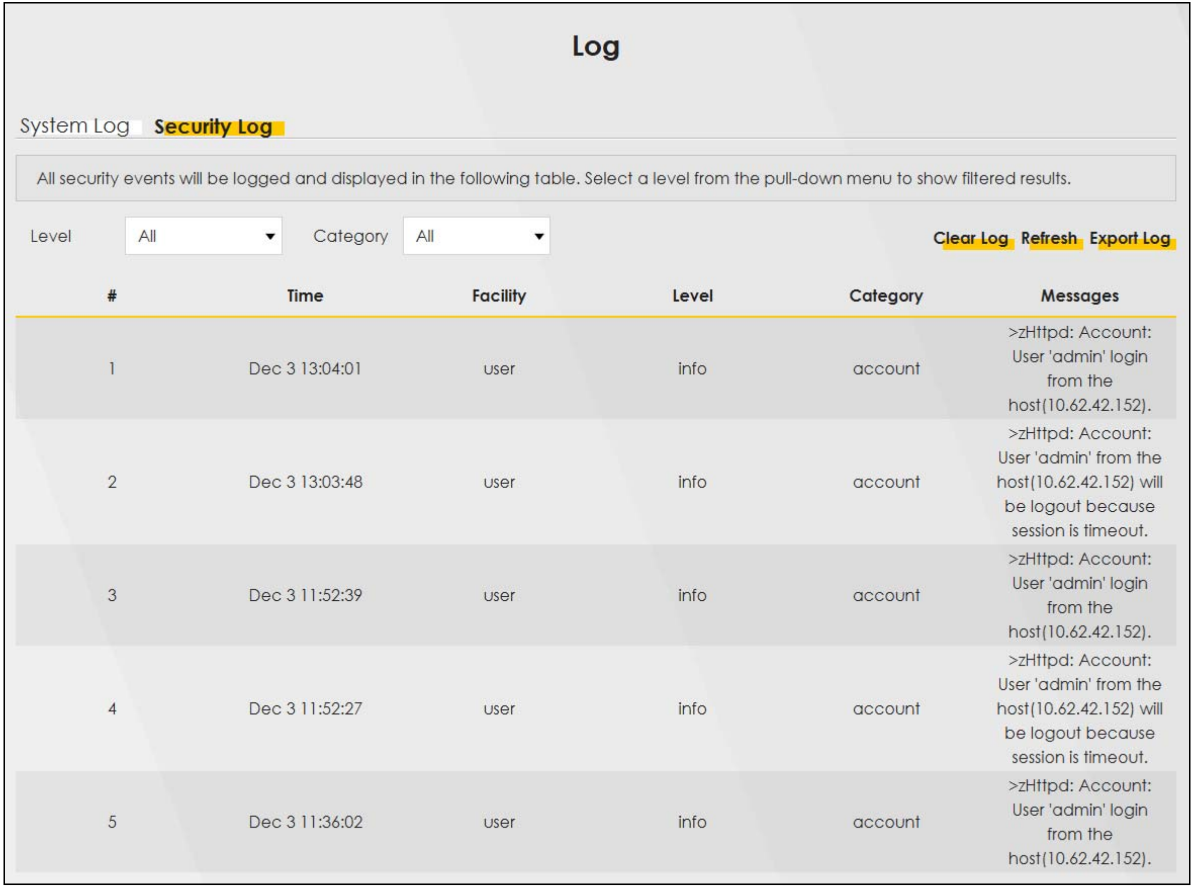
Table 115   System Monitor > Log > System Log

LABEL	DESCRIPTION
Level	Select a severity level from the drop-down list box. This filters search results according to the severity level you have selected. When you select a severity, the Zyxel Device searches through all logs of that severity or higher.
Category	Select the type of logs to display.
Clear Log	Click this to delete all the logs.
Refresh	Click this to renew the log screen.
Export Log	Click this to export the selected logs.
E-mail Log Now	Click this to send the log files to the email address you specify in the Maintenance > Log Setting screen.
#	This field is a sequential value and is not associated with a specific entry.
Time	This field displays the time the log was recorded.
Facility	The log facility allows you to send logs to different files in the syslog server. Refer to the documentation of your syslog program for more details.
Level	This field displays the severity level of the log that the Zyxel Device is to send to this syslog server.
Category	This field displays the type of the log.
Messages	This field states the reason for the log.

20.3 Security Log

Use the Security Log screen to see the security-related logs for the categories that you select. You can filter the entries by selecting a severity level and/or category. Click System Monitor > Log > Security Log to open the following screen.

Figure 185 System Monitor > Log > Security Log



All security events will be logged and displayed in the following table. Select a level from the pull-down menu to show filtered results.

Level: All
Category: All

#	Time	Facility	Level	Category	Messages
1	Dec 3 13:04:01	user	info	account	>zHttpd: Account: User 'admin' login from the host(10.62.42.152).
2	Dec 3 13:03:48	user	info	account	>zHttpd: Account: User 'admin' from the host(10.62.42.152) will be logout because session is timeout.
3	Dec 3 11:52:39	user	info	account	>zHttpd: Account: User 'admin' login from the host(10.62.42.152).
4	Dec 3 11:52:27	user	info	account	>zHttpd: Account: User 'admin' from the host(10.62.42.152) will be logout because session is timeout.
5	Dec 3 11:36:02	user	info	account	>zHttpd: Account: User 'admin' login from the host(10.62.42.152).

The following table describes the fields in this screen.

Table 116 System Monitor > Log > Security Log

LABEL	DESCRIPTION
Level	Select a severity level from the drop-down list box. This filters search results according to the severity level you have selected. When you select a severity, the Zyxel Device searches through all logs of that severity or higher.
Category	Select the type of logs to display.
Clear Log	Click this to delete all the logs.
Refresh	Click this to renew the log screen.
Export Log	Click this to export the selected logs.
E-mail Log Now	Click this to send the log files to the email address you specify in the Maintenance > Log Setting screen.
#	This field is a sequential value and is not associated with a specific entry.
Time	This field displays the time the log was recorded.

Table 116   System Monitor > Log > Security Log (continued)

LABEL	DESCRIPTION
Facility	The log facility allows you to send logs to different files in the syslog server. Refer to the documentation of your syslog program for more details.
Level	This field displays the severity level of the log that the Zyxel Device is to send to this syslog server.
Category	This field displays the type of the log.
Messages	This field states the reason for the log.

CHAPTER 21 Traffic Status

21.1 Traffic Status Overview

Use the Traffic Status screens to look at the network traffic status and statistics of the WAN/LAN interfaces and NAT.

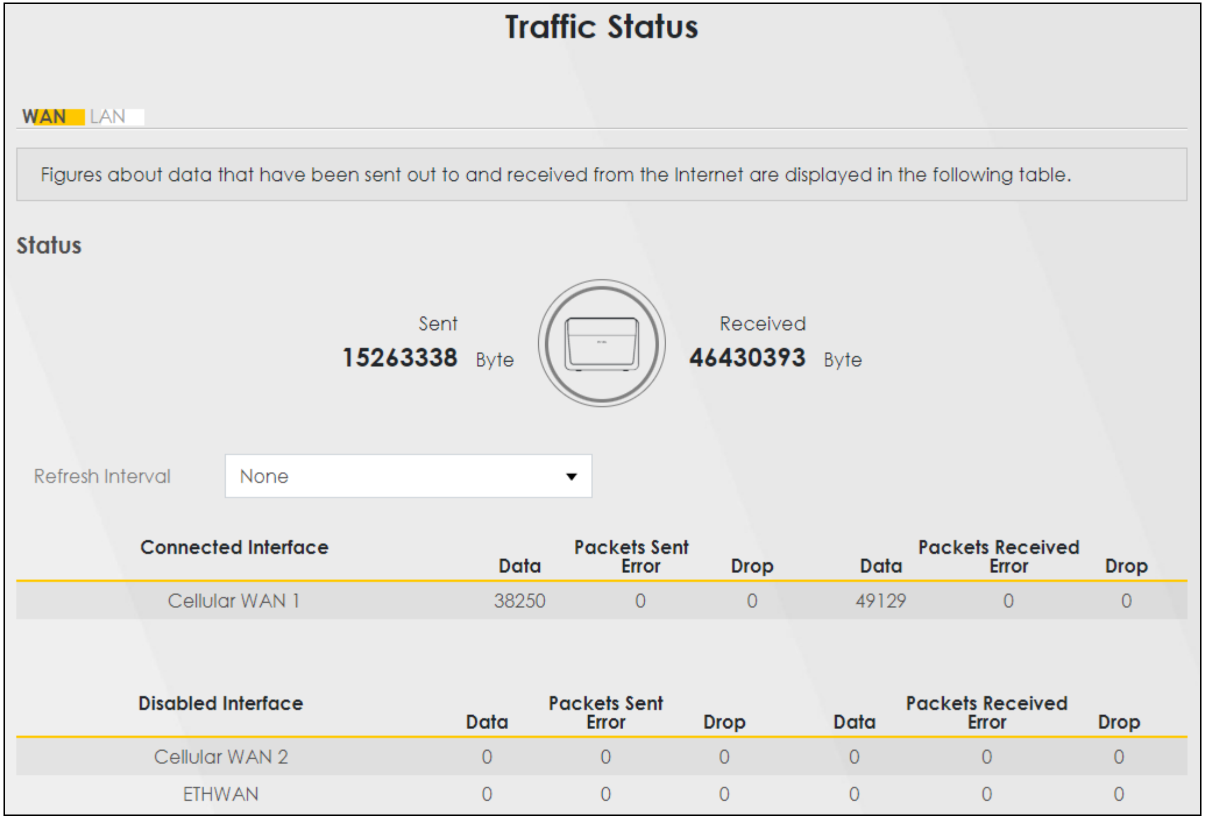
21.1.1 What You Can Do in this Chapter

- Use the WAN screen to view the WAN traffic statistics (WAN Status).
- Use the LAN screen to view the LAN traffic statistics (LAN Status).

21.2 WAN Status

Click System Monitor > Traffic Status to open the WAN screen. The figures in this screen show the number of bytes received and sent through the Zyxel Device's WAN interface. The table below shows packet statistics for each WAN interface.

Figure 186 System Monitor > Traffic Status > WAN



Traffic Status

Figures about data that have been sent out to and received from the Internet are displayed in the following table.

Status

Sent 15263338 Byte

Received 46430393 Byte

Refresh Interval: None

Connected Interface	Packets Sent Data	Packets Sent Error	Packets Sent Drop	Packets Received Data	Packets Received Error	Packets Received Drop
Cellular WAN 1	38250	0	0	49129	0	0

Disabled Interface	Packets Sent Data	Packets Sent Error	Packets Sent Drop	Packets Received Data	Packets Received Error	Packets Received Drop
Cellular WAN 2	0	0	0	0	0	0
ETHWAN	0	0	0	0	0	0

The following table describes the fields in this screen.

Table 117 System Monitor > Traffic Status > WAN

LABEL	DESCRIPTION
Status	
Refresh Interval	Select how often you want the Zyxel Device to update this screen.
Connected Interface	This shows the name of the WAN interface that is currently connected.
Packets Sent	
Data	This indicates the number of transmitted packets on this interface.
Error	This indicates the number of frames with errors transmitted on this interface.
Drop	This indicates the number of outgoing packets dropped on this interface.
Packets Received	
Data	This indicates the number of received packets on this interface.
Error	This indicates the number of frames with errors received on this interface.
Drop	This indicates the number of received packets dropped on this interface.
Disabled Interface	This shows the name of the WAN interface that is currently disabled.
Packets Sent	
Data	This indicates the number of transmitted packets on this interface.
Error	This indicates the number of frames with errors transmitted on this interface.
Drop	This indicates the number of outgoing packets dropped on this interface.

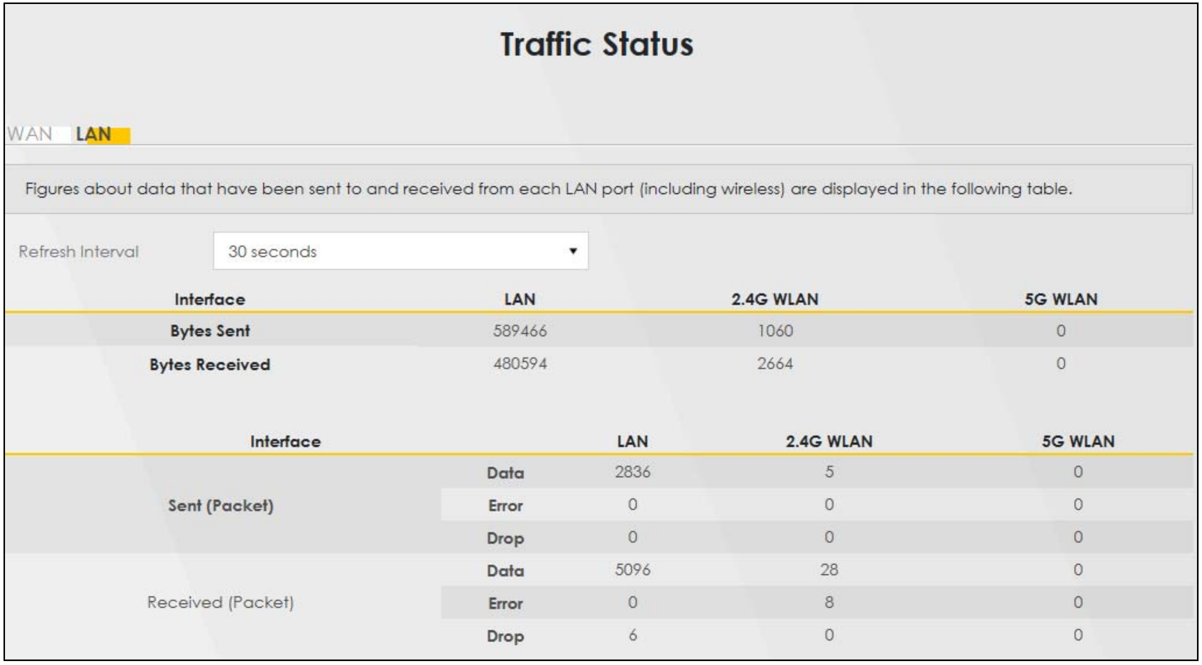
Table 117 System Monitor > Traffic Status > WAN (continued)

LABEL	DESCRIPTION
Packets Received	
Data	This indicates the number of received packets on this interface.
Error	This indicates the number of frames with errors received on this interface.
Drop	This indicates the number of received packets dropped on this interface.

21.3 LAN Status

Click System Monitor > Traffic Status > LAN to open the following screen. This screen allows you to view packet statistics for each LAN or WLAN interface on the Zyxel Device.

Figure 187 System Monitor > Traffic Status > LAN



Traffic Status

Figures about data that have been sent to and received from each LAN port (including wireless) are displayed in the following table.

Refresh Interval: 30 seconds ▾

Interface	LAN	2.4G WLAN	5G WLAN
Bytes Sent	589466	1060	0
Bytes Received	480594	2664	0

Interface		LAN	2.4G WLAN	5G WLAN
Sent (Packet)	Data	2836	5	0
	Error	0	0	0
	Drop	0	0	0
Received (Packet)	Data	5096	28	0
	Error	0	8	0
	Drop	6	0	0

The following table describes the fields in this screen.

Table 118 System Monitor > Traffic Status > LAN

LABEL	DESCRIPTION
Refresh Interval	Select how often you want the Zyxel Device to update this screen.
Interface	This shows the LAN or WLAN interface.
Bytes / KB / MB / GB Sent	Byte: This indicates the number of bytes sent on this interface. KB: This indicates the number of kilobytes sent on this interface. MB: This indicates the number of megabytes sent on this interface. GB: This indicates the number of gigabytes sent on this interface.

Table 118 System Monitor > Traffic Status > LAN (continued)

LABEL	DESCRIPTION
Bytes / KB / MB / GB Received	Byte: This indicates the number of bytes received on this interface. KB: This indicates the number of kilobytes received on this interface. MB: This indicates the number of megabytes received on this interface. GB: This indicates the number of gigabytes received on this interface.
Interface	This shows the LAN or WLAN interfaces.
Sent (Packets)	
Data	This indicates the number of transmitted packets on this interface.
Error	This indicates the number of frames with errors transmitted on this interface.
Drop	This indicates the number of outgoing packets dropped on this interface.
Received (Packets)	
Data	This indicates the number of received packets on this interface.
Error	This indicates the number of frames with errors received on this interface.
Drop	This indicates the number of received packets dropped on this interface.

CHAPTER 22
ARP Table

22.1 ARP Table Overview

Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol (IP) address to a physical machine address, known as a Media Access Control (MAC) address, on the local area network.

An IP version 4 address is 32 bits long. MAC addresses are 48 bits long. The ARP table maintains an association between each MAC address and its corresponding IP address.

22.1.1 How ARP Works

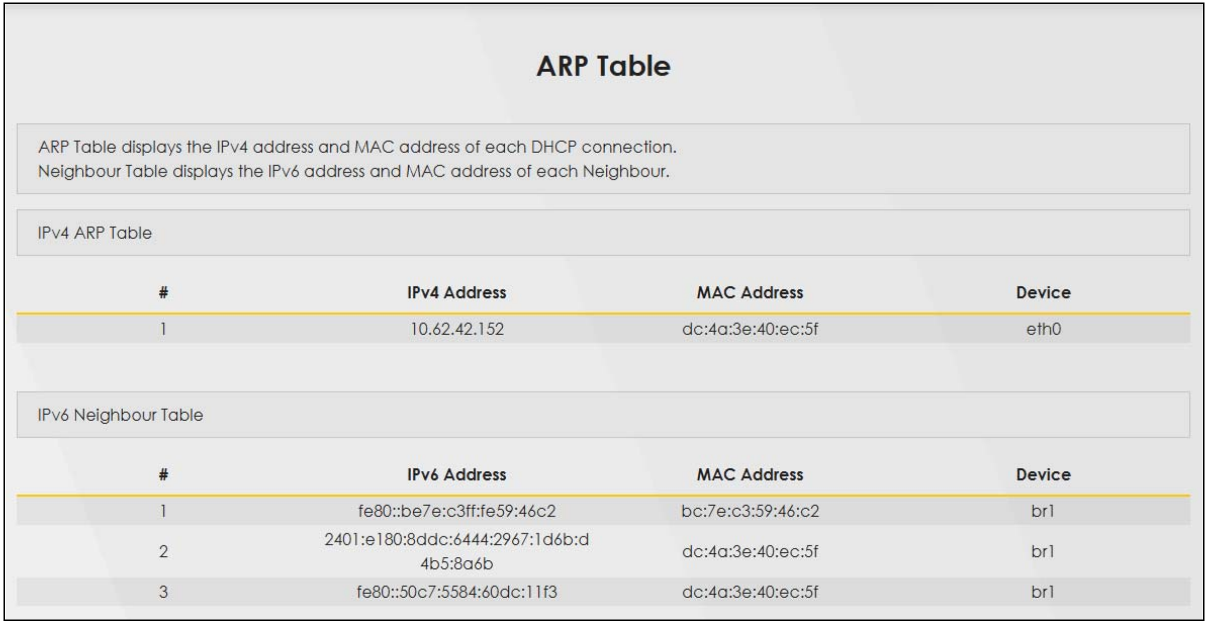
When an incoming packet destined for a host device on a local area network arrives at the device, the device's ARP program looks in the ARP table and, if it finds the address, sends it to the device.

If no entry is found for the IP address, ARP broadcasts the request to all the devices on the LAN. The device fills in its own MAC and IP address in the sender address fields, and puts the known IP address of the target in the target IP address field. In addition, the device puts all ones in the target MAC field (FF.FF.FF.FF.FF.FF is the Ethernet broadcast address). The replying device (which is either the IP address of the device being sought or the router that knows the way) replaces the broadcast address with the target's MAC address, swaps the sender and target pairs, and unicasts the answer directly back to the requesting machine. ARP updates the ARP table for future reference and then sends the packet to the MAC address that replied.

22.2 ARP Table

Use the ARP table to view the IPv4-to-MAC address mappings for each device connected to the Zyxel Device. The neighbor table shows the IPv6-to-MAC address mappings of each IPv6 neighbor. To open this screen, click System Monitor > ARP Table.

Figure 188 System Monitor > ARP Table



ARP Table

ARP Table displays the IPv4 address and MAC address of each DHCP connection.
Neighbour Table displays the IPv6 address and MAC address of each Neighbour.

IPv4 ARP Table

#	IPv4 Address	MAC Address	Device
1	10.62.42.152	dc:4a:3e:40:ec:5f	eth0

IPv6 Neighbour Table

#	IPv6 Address	MAC Address	Device
1	fe80::be7e:c3ff:fe59:46c2	bc:7e:c3:59:46:c2	br1
2	2401:e180:8ddc:6444:2967:1d6b:d4b5:8a6b	dc:4a:3e:40:ec:5f	br1
3	fe80::50c7:5584:60dc:11f3	dc:4a:3e:40:ec:5f	br1

The following table describes the labels in this screen.

Table 119 System Monitor > ARP Table

LABEL	DESCRIPTION
#	This is the ARP table entry number.
IPv4 / IPv6 Address	This is the learned IPv4 or IPv6 IP address of a device connected to the Zyxel Device.
MAC Address	This is the MAC address of the connected device with the listed IP address.
Device	This is the type of interface used by the connected device. You can click the device type to go to its configuration screen.

CHAPTER 23 Routing Table

23.1 Routing Table Overview

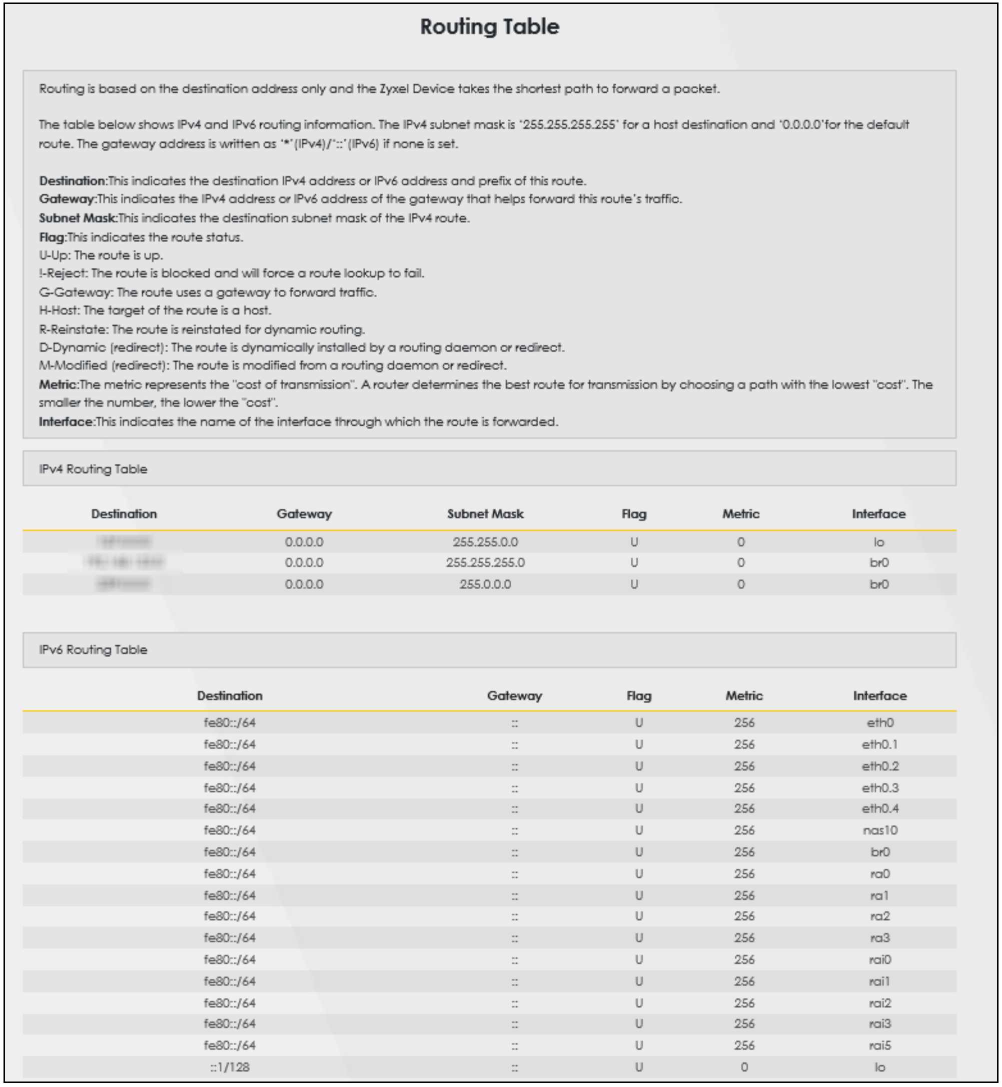
Routing is based on the destination address only and the Zyxel Device takes the shortest path to forward a packet.

23.2 Routing Table

The table below shows IPv4 and IPv6 routing information. The IPv4 subnet mask is '255.255.255.255' for a host destination and '0.0.0.0' for the default route. The gateway address is written as '*'(IPv4)/'::'(IPv6) if none is set.

Click System Monitor > Routing Table to open the following screen.

Figure 189   System Monitor > Routing Table



Routing Table

Routing is based on the destination address only and the Zyxel Device takes the shortest path to forward a packet.

The table below shows IPv4 and IPv6 routing information. The IPv4 subnet mask is '255.255.255.255' for a host destination and '0.0.0.0'for the default route. The gateway address is written as '*'(IPv4)/'::'(IPv6) if none is set.

Destination: This indicates the destination IPv4 address or IPv6 address and prefix of this route.
Gateway: This indicates the IPv4 address or IPv6 address of the gateway that helps forward this route's traffic.
Subnet Mask: This indicates the destination subnet mask of the IPv4 route.
Flag: This indicates the route status.
U-Up: The route is up.
!-Reject: The route is blocked and will force a route lookup to fail.
G-Gateway: The route uses a gateway to forward traffic.
H-Host: The target of the route is a host.
R-Reinstate: The route is reinstated for dynamic routing.
D-Dynamic (redirect): The route is dynamically installed by a routing daemon or redirect.
M-Modified (redirect): The route is modified from a routing daemon or redirect.
Metric: The metric represents the "cost of transmission". A router determines the best route for transmission by choosing a path with the lowest "cost". The smaller the number, the lower the "cost".
Interface: This indicates the name of the interface through which the route is forwarded.

IPv4 Routing Table

Destination	Gateway	Subnet Mask	Flag	Metric	Interface
[redacted]	0.0.0.0	255.255.0.0	U	0	lo
[redacted]	0.0.0.0	255.255.255.0	U	0	br0
[redacted]	0.0.0.0	255.0.0.0	U	0	br0

IPv6 Routing Table

Destination	Gateway	Flag	Metric	Interface
fe80::/64	::	U	256	eth0
fe80::/64	::	U	256	eth0.1
fe80::/64	::	U	256	eth0.2
fe80::/64	::	U	256	eth0.3
fe80::/64	::	U	256	eth0.4
fe80::/64	::	U	256	nas10
fe80::/64	::	U	256	br0
fe80::/64	::	U	256	ra0
fe80::/64	::	U	256	ra1
fe80::/64	::	U	256	ra2
fe80::/64	::	U	256	ra3
fe80::/64	::	U	256	rai0
fe80::/64	::	U	256	rai1
fe80::/64	::	U	256	rai2
fe80::/64	::	U	256	rai3
fe80::/64	::	U	256	rai5
::1/128	::	U	0	lo

The following table describes the labels in this screen.

Table 120   System Monitor > Routing Table

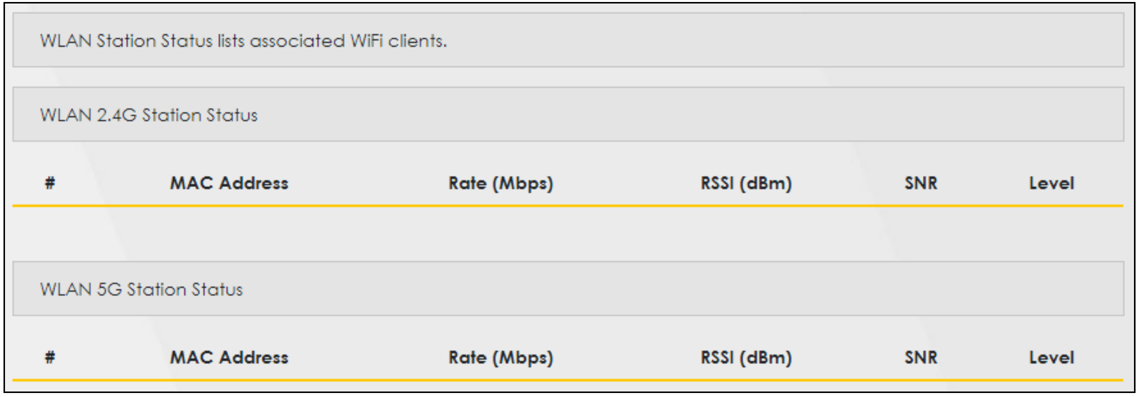
LABEL	DESCRIPTION
Destination	This indicates the destination IPv4 address or IPv6 address and prefix of this route.
Gateway	This indicates the IPv4 address or IPv6 address of the gateway that helps forward this route's traffic.
Subnet Mask	This indicates the destination subnet mask of the IPv4 route.
Interface	This indicates the name of the interface through which the route is forwarded. • brx indicates a LAN interface where x can be 0 – 3 to represent LAN1 to LAN4 respectively. • ethx indicates an Ethernet WAN interface using IPoE or in bridge mode. • ppp0 indicates a WAN interface using PPPoE. • wlx indicates a wireless interface where x can be 0 – 1.

CHAPTER 24 WLAN Station Status

24.1 WLAN Station Status Overview

Click System Monitor > WLAN Station Status to open the following screen. Use this screen to view information and status of the Wi-Fi stations (Wi-Fi clients) that are currently associated with the Zyxel Device. Being associated means that a Wi-Fi client (for example, your computer with a Wi-Fi network card installed) has connected successfully to an AP (or Wi-Fi router) using the same SSID, channel, and Wi-Fi security settings.

Figure 190 System Monitor > WLAN Station Status



WLAN Station Status lists associated WiFi clients.

WLAN 2.4G Station Status

#	MAC Address	Rate (Mbps)	RSSI (dBm)	SNR	Level

WLAN 5G Station Status

#	MAC Address	Rate (Mbps)	RSSI (dBm)	SNR	Level

The following table describes the labels in this screen.

Table 121 System Monitor > WLAN Station Status

LABEL	DESCRIPTION
#	This is the index number of an associated Wi-Fi station.
MAC Address	This field displays the MAC address of an associated Wi-Fi station.
Rate (Mbps)	This field displays the transmission rate of Wi-Fi traffic between an associated Wi-Fi station and the Zyxel Device.
RSSI (dBm)	The RSSI (Received Signal Strength Indicator) field shows the Wi-Fi signal strength of the station's Wi-Fi connection. The normal range is –30dBm to –79dBm. If the value drops below –80dBm, try moving the associated Wi-Fi station closer to the Zyxel Device to get better signal strength.

Table 121 System Monitor > WLAN Station Status (continued)

LABEL	DESCRIPTION
SNR	The Signal-to-Noise Ratio (SNR) is the ratio between the received signal power and the received noise power. The greater the number, the better the quality of Wi-Fi. The normal range is 15 to 40. If the value drops below 15, try moving the associated Wi-Fi station closer to the Zyxel Device to get better quality Wi-Fi.
Level	This field displays a number which represents the strength of the Wi-Fi signal between an associated Wi-Fi station and the Zyxel Device. The Zyxel Device uses the RSSI and SNR values to determine the strength of the Wi-Fi signal. 5 means the Zyxel Device is receiving an excellent Wi-Fi signal. 4 means the Zyxel Device is receiving a very good Wi-Fi signal. 3 means the Zyxel Device is receiving a weak Wi-Fi signal, 2 means the Zyxel Device is receiving a very weak Wi-Fi signal. 1 means the Zyxel Device is not receiving a Wi-Fi signal.

CHAPTER 25
Cellular WAN Status

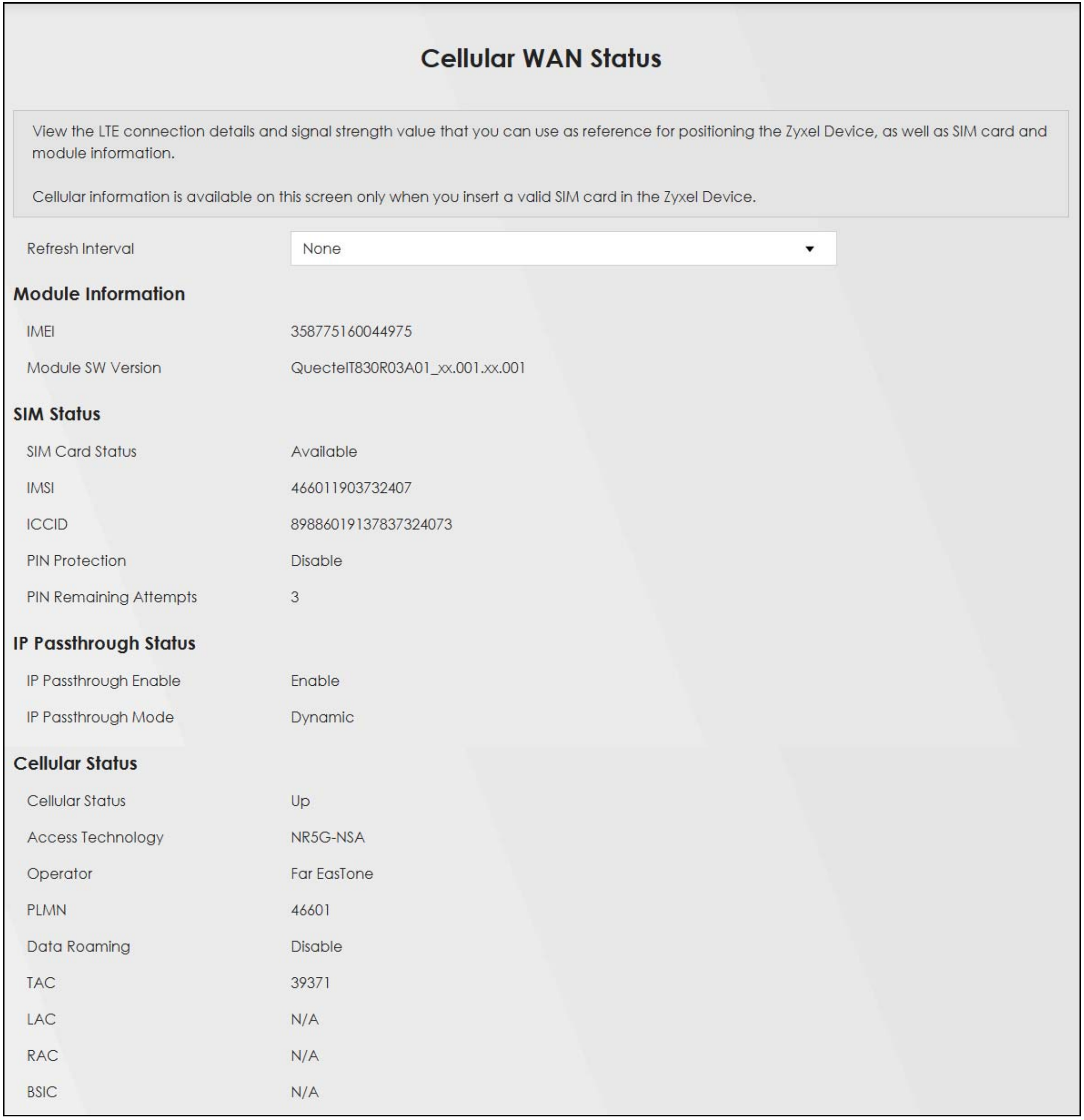
25.1 Cellular WAN Status Overview

View the cellular connection details and signal strength value that you can use as reference for positioning the Zyxel Device, as well as SIM card and module information.

25.2 Cellular WAN Status

To open this screen, click System Monitor > Cellular WAN Status. Cellular information is available on this screen only when you insert a valid SIM card in the Zyxel Device.

Figure 191 System Monitor > Cellular WAN Status



Cellular WAN Status

View the LTE connection details and signal strength value that you can use as reference for positioning the Zyxel Device, as well as SIM card and module information.

Cellular information is available on this screen only when you insert a valid SIM card in the Zyxel Device.

Refresh Interval	None ▾

Module Information

IMEI	358775160044975
Module SW Version	QuectelT830R03A01_xx.001.xx.001

SIM Status

SIM Card Status	Available
IMSI	466011903732407
ICCID	89886019137837324073
PIN Protection	Disable
PIN Remaining Attempts	3

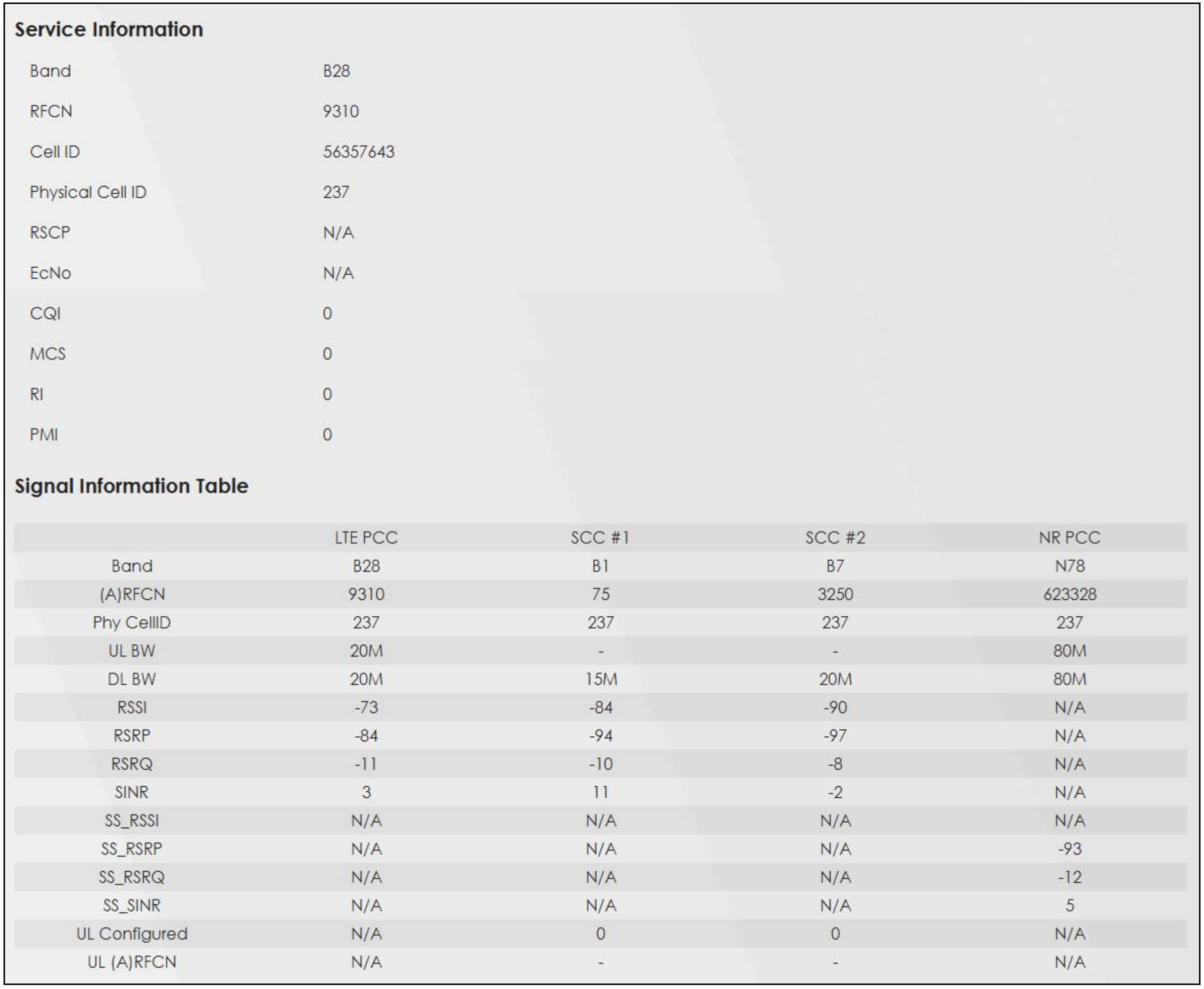
IP Passthrough Status

IP Passthrough Enable	Enable
IP Passthrough Mode	Dynamic

Cellular Status

Cellular Status	Up
Access Technology	NR5G-NSA
Operator	Far EasTone
PLMN	46601
Data Roaming	Disable
TAC	39371
LAC	N/A
RAC	N/A
BSIC	N/A

Figure 192   System Monitor > Cellular WAN Status (continued)



Service Information

Band	B28
RFCN	9310
Cell ID	56357643
Physical Cell ID	237
RSCP	N/A
EcNo	N/A
CQI	0
MCS	0
RI	0
PMI	0

Signal Information Table

	LTE PCC	SCC #1	SCC #2	NR PCC
Band	B28	B1	B7	N78
(A)RFCN	9310	75	3250	623328
Phy CellID	237	237	237	237
UL BW	20M	-	-	80M
DL BW	20M	15M	20M	80M
RSSI	-73	-84	-90	N/A
RSRP	-84	-94	-97	N/A
RSRQ	-11	-10	-8	N/A
SINR	3	11	-2	N/A
SS_RSSI	N/A	N/A	N/A	N/A
SS_RSRP	N/A	N/A	N/A	-93
SS_RSRQ	N/A	N/A	N/A	-12
SS_SINR	N/A	N/A	N/A	5
UL Configured	N/A	0	0	N/A
UL (A)RFCN	N/A	-	-	N/A

Note: The fields in the screen may differ slightly based on the Access Technology your Zyxel Device supports.

Note: The value is ‘0’ (zero) or ‘N/A’ if the Access Technology the Zyxel Device is currently connected to doesn’t have this value in that specific parameter field or there is no network connection.

The following table describes the labels in this screen.

Table 122   System Monitor > Cellular WAN Status

LABEL	DESCRIPTION
Refresh Interval	Select the time interval the Zyxel Device will check and refresh the fields shown on this screen. Select None to stop detection.
Module Information	
IMEI	This shows the International Mobile Equipment Identity of the Zyxel Device.
Module SW Version	This shows the software version of the cellular module.
SIM Status	

Table 122 System Monitor > Cellular WAN Status (continued)

LABEL	DESCRIPTION
SIM Card Status	This displays the SIM card status: None – the Zyxel Device does not detect that there is a SIM card inserted. Waiting SIM Available – the SIM card is detected but not available yet. Available – the SIM card Locked – the SIM card has PIN code security, but you did not enter the PIN code yet. Blocked – you entered an incorrect PIN code too many times, so the SIM card has been locked; call the ISP for a PUK (Pin Unlock Key) to unlock the SIM card. Error - the Zyxel Device detected that the SIM card has errors.
IMSI	This displays the International Mobile Subscriber Identity (IMSI) of the installed SIM card. An IMSI is a unique ID used to identify a mobile subscriber in a mobile network.
ICCID	Integrated Circuit Card Identifier (ICCID). This is the serial number of the SIM card.
PIN Protection	A PIN (Personal Identification Number) code is a key to a SIM card. Without the PIN code, you cannot use the SIM card. Shows Enable if the service provider requires you to enter a PIN to use the SIM card and PIN Protection is enabled. Shows Disable if the service provider lets you use the SIM without inputting a PIN.
PIN Remaining Attempts	This is how many more times you can try to enter the PIN code before the ISP blocks your SIM card.
IP Passthrough Status	
IP Passthrough Enable	This displays if IP Passthrough is enabled on the Zyxel Device. IP Passthrough allows a LAN computer on the local network of the Zyxel Device to have access to web services using the public IP address. When IP Passthrough is configured, all traffic is forwarded to the first LAN computer on the local network and will not go through NAT.
IP Passthrough Mode	This displays the IP Passthrough mode. This displays Dynamic and the Zyxel Device will allow traffic to be forwarded to the first LAN computer requesting an IP address from the Zyxel Device. This displays Fixed and the Zyxel Device will allow traffic to be forwarded to a specific LAN computer on the local network of the Zyxel Device.
Cellular Status	
Cellular Status	This displays the status of the cellular Internet connection.
Data Roaming	This displays if data roaming is enabled on the Zyxel Device. Data roaming is to use your Zyxel Device in an area which is not covered by your service provider. Enable roaming to ensure that your Zyxel Device is kept connected to the Internet when you are traveling outside the geographical coverage area of the network to which you are registered.
Operator	This displays the name of the service provider.
PLMN	This displays the PLMN number.
Antenna Status	This displays Internal when the INT EXT switch is set to INT. Use the Zyxel Device’s internal antenna to get cellular signal. This displays External when the INT EXT switch is set to EXT. Connect external antennas to the Zyxel Device’s to strengthen the cellular signal. See Section 2.3 on page 37 for more information.
Service Information	
Access Technology	This displays the type of the mobile network to which the Zyxel Device is connecting.
Band	This displays the current cellular band of your Zyxel Device.

Table 122 System Monitor > Cellular WAN Status (continued)

LABEL	DESCRIPTION
RSSI (dBm)	This displays the strength of the WiFi signal between an associated wireless station and an AP. The normal range is –30 dBm to –79 dBm. If the value drops below –80 dBm, try moving the associated wireless station closer to the Zyxel Device to get better signal strength.
Cell ID	This shows the cell ID, which is a unique number used to identify the Base Transceiver Station to which the Zyxel Device is connecting. The value depends on the Current Access Technology: • For GPRS, it is the Cell Identity as specified in 3GPP-TS.25.331. • For UMTS, it is the Cell Identity as defined in SIB3 3GPP-TS.25.331, 3GPP-TS.24.008. • For LTE, it is the 28-bit binary number Cell Identity as specified in SIB1 in 3GPP-TS.36.331. The value is ‘0’ (zero) or ‘N/A’ if there is no network connection.
Physical Cell ID	This shows the Physical Cell ID (PCI), which are queries and replies between the Zyxel Device and the mobile network it is connecting to. The normal range is 1 to 504.
UL Bandwidth (MHz)	This shows the cellular channel bandwidth from the Zyxel Device to the base station. According to 3GPP specifications, the bandwidths defined by the standard are 1.4, 3, 5, 10, 15, and 20 MHz. The wider the bandwidth the higher the throughput.
DL Bandwidth (MHz)	This shows the cellular channel bandwidth from the base station to the Zyxel Device. According to 3GPP specifications, the bandwidths defined by the standard are 1.4, 3, 5, 10, 15, and 20 MHz. The wider the bandwidth the higher the throughput.
RFCN	This displays the Radio Frequency Channel Number of DL carrier frequency used by the mobile network to which the Zyxel Device is connecting. The value depends on the Current Access Technology: • For GPRS, it is the ARFCN (Absolute Radio-Frequency Channel Number) as specified in 3GPP-TS.45.005. • For UMTS, it is the UARFCN (UTRA Absolute Radio-Frequency Channel Number) as specified in 3GPP-TS.25.101. • For LTE, it is the EARFCN (E-UTRA Absolute Radio-Frequency Channel Number) as specified in 3GPP-TS.36.101. The value is ‘0’ (zero) or ‘N/A’ if there is no network connection.
RSRP (dBm)	This displays the Reference Signal Receive Power (RSRP), which is the average received power of all Resource Element (RE) that carry cell-specific Reference Signals (RS) within the specified bandwidth. The received RSRP level of the connected E-UTRA cell, in dBm, is as specified in 3GPP-TS.36.214. The reporting range is specified in 3GPP-TS.36.133. An undetectable signal is indicated by the lower limit, example –140 dBm. This parameter is for LTE only. The normal range is –30 to –140. The value is –140 if the Current Access Technology is not LTE. The value is ‘N/A’ if there is no network connection.
RSRQ (dB)	This displays the Reference Signal Receive Quality (RSRQ), which is the ratio of RSRP to the E-UTRA carrier RSSI and indicates the quality of the received reference signal. The received RSRQ level of the connected E-UTRA cell, in 0.1 dB, is as specified in 3GPP-TS.36.214. An undetectable signal is indicated by the lower limit, example -240. This parameter is for LTE only. The normal range is –30 to –240. The value is –240 if the Current Access Technology is not LTE. The value is ‘N/A’ if there is no network connection.
SINR (dB)	This displays the Signal to Interference plus Noise Ratio (SINR) in dB. This is also a measure of signal quality and used by the UE (User Equipment) to calculate the Channel Quality Indicator (CQI) that it reports to the network. A negative value means more noise than signal.

Table 122 System Monitor > Cellular WAN Status (continued)

LABEL	DESCRIPTION
RSCP	This displays the Received Signal Code Power, which measures the power of channel used by the Zyxel Device. The received signal level, in dBm, is of the CPICH channel (Ref. 3GPP TS 25.133). An undetectable signal is indicated by the lower limit, example –120 dBm. This parameter is for UMTS only. The normal range is –30 to –120. The value is –120 if the Current Access Technology is not UMTS. The value is 'N/A' if there is no network connection.
EcNo	This displays the ratio (in dB) of the received energy per chip and the interference level. The measured EcNo is in 0.1 dB and is received in the downlink pilot channel. An undetectable signal is indicated by the lower limit, for example, –240 dB. This parameter is for UMTS only. The normal range is –30 to –240. The value is –240 if the Current Access Technology is not UMTS or there is no network connection.
Primary Scrambling Code	This displays a unique scrambling code used by the Nebula Device to identify a base station in a cellular network. A primary scrambling code is the product of the scrambling code and 16. Therefore, the primary scrambling code set contains all multiples of 16 from 0 through 8176. This only appears in UMTS mode. Otherwise, this field is blank.
LAC	This displays the 2-octet Location Area Code (LAC), which is used to identify a location area within a PLMN. The LAC of the connected cell is as defined in SIB 1 [3GPP-TS.25.331]. The concatenation of PLMN ID (MCC+MNC) and LAC uniquely identifies the LAI (Location Area ID) [3GPP-TS.23.003]. This parameter is for UMTS or GPRS. The value is '0' (zero) if the Current Access Technology is not UMTS or GPRS. The value is 'N/A' if there is no network connection.
RAC	This displays the RAC (Routing Area Code), which is used in mobile network "packet domain service" (PS) to identify a routing area within a location area. In a mobile network, it uses LAC (Location Area Code) to identify the geographical location for the old 3G voice only service, and use RAC to identify the location of data service like HSDPA or LTE. The RAC of the connected UTRAN cell is as defined in SIB 1 [3GPP-TS.25.331]. The concatenation of PLMN ID (MCC+MNC), LAC, and RAC uniquely identifies the RAI (Routing Area ID) [3GPP-TS.23.003]. This parameter is for UMTS or GPRS. The value is '0' (zero) if the Current Access Technology is not UMTS or GPRS. The value is 'N/A' if there is no network connection.
BSIC	The Base Station Identity Code (BSIC), which is a code used in GSM to uniquely identify a base station. This parameter is for GPRS only. The value is '0' (zero) if the Current Access Technology is not GPRS. The value is 'N/A' if there is no network connection.
TAC	This displays the Tracking Area Code (TAC), which is used to identify the country of a mobile subscriber. The physical cell ID of the connected E-UTRAN cell, is as specified in 3GPP-TS.36.101. This parameter is for LTE only. The value is '0' (zero) or 'N/A' if the Current Access Technology is not LTE or there is no network connection.
SINR	This displays the Signal to Interference plus Noise Ratio (SINR) in dB. This is also a measure of signal quality and used by the UE (User Equipment) to calculate the Channel Quality Indicator (CQI) that it reports to the network. A negative value means more noise than signal.
CQI	This displays the Channel Quality Indicator (CQI). It is an indicator carrying the information on how good/bad the communication channel quality is.
MCS	MCS stands for modulation coding scheme. The base station selects MCS based on current radio conditions. The higher the MCS the more bits can be transmitted per time unit.

Table 122   System Monitor > Cellular WAN Status (continued)

LABEL	DESCRIPTION
RI	This displays the Rank Indication, one of the control information that a UE will report to eNodeB (Evolved Node-B) on either PUCCH (Physical Uplink Control Channel) or PUSCH (Physical Uplink Shared Channel) based on uplink scheduling.
PMI	This displays the Precoding Matrix Indicator (PMI). PMI is for transmission modes 4 (closed loop spatial multiplexing), 5 (multi-user MIMO), and 6 (closed loop spatial multiplexing using a single layer). PMI determines how cellular data are encoded for the antennas to improve the downlink rate.
Neighbor Cells	This displays the type of the neighbor cell's carrier frequency detected by the Zyxel Device. Intra-Frequency – when the current cell and target cell operate on the same carrier frequency. Inter-Frequency – when the current cell and target cell operate on different carrier frequencies.
#	This is the index number of the entry.
Connection Mode	This displays the connection mode of the detected neighbor cell.
NR Physical Cell ID	This shows the Physical Cell ID (PCI), which are queries and replies between the Zyxel Device and the 5G mobile network it is connecting to. The normal range is 0 to 503.
RFCN	This displays the Radio Frequency Channel Number (RFCN) of the detected base station. This is the carrier frequency designated by EARFCN. The range is 0 – 65535.
RSSI	This displays the Received Signal Strength Indicator (RSSI) level of the detected base station. RSSI is an indicator of the signal strength, including signals and noises received by the target cell. The normal range is –30 dBm to –79 dBm.
NR RSRP	This displays the Reference Symbol Received Power (RSRP) level of the detected base station. RSRP is the average signal strength of the target station and is usually measured during a handover. The normal range is –140dBm to –44dBm.
NR RSRQ	This displays the Reference Signal Received Quality (RSRQ) level of the detected base station. RSRQ is the indicator of the signal quality of data transmission. The normal range is –24.0 dB to 0 dB. RSRQ is defined as RSRP/RSSI*N. N is the number of resource blocks. A resource block is the smallest unit of radio resources allocated to a user and contains twelve sub-carriers in frequency and 0.5 ms in time.
NR SINR (dBm)	This displays the Signal to Interference plus Noise Ratio (SINR) in dB. This is also a measure of signal quality and used by the UE (User Equipment) to calculate the Channel Quality Indicator (CQI) that it reports to the 5G network. A negative value means more noise than signal.

CHAPTER 26
System

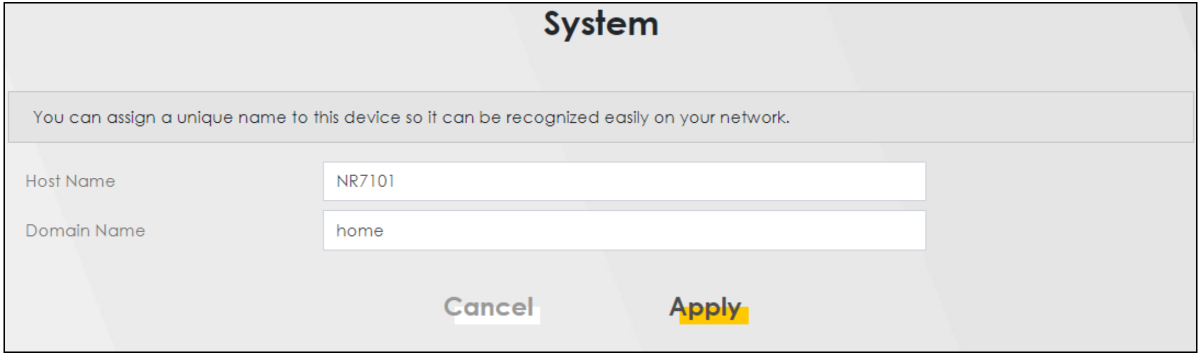
26.1 System Overview

Use this screen to name your Zyxel Device (Host) and give it an associated domain name for identification purposes.

26.2 System

Click Maintenance > System to open the following screen. Assign a unique name to the Zyxel Device so it can be easily recognized on your network.

Figure 193 Maintenance > System



System

You can assign a unique name to this device so it can be recognized easily on your network.

Host Name: NR7101

Domain Name: home

The following table describes the labels in this screen.

Table 123 Maintenance > System

LABEL	DESCRIPTION
Host Name	Enter a descriptive host name for your Zyxel Device. You can use up to 30 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed. For some models, the supported maximum input length is 16 alphanumeric characters.
Domain Name	Enter a domain name for your host Zyxel Device. You can use up to 30 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.
Cancel	Click Cancel to abandon this screen without saving.
Apply	Click Apply to save your changes.

CHAPTER 27 User Account

27.1 User Account Overview

In the User Account screen, you can view the settings of the admin that you use to log into the Zyxel Device to manage it.

The total number of accounts you can create for each group type:

Administrator Account	4
User Account	4

Note: An admin or user account cannot belong to more than one group.

The privileges of administrator and user accounts differ. Some features are available only to the administrator accounts but are not accessible to user accounts.

Below is an example of the account privilege.

Table 124 Account Privilege Comparison Table - Example

	ADMINISTRATOR	USER
Wizard		
Quick Start	YES	NO
Configuration		
Connection Status	YES	YES
Network		
Broadband	YES	NO
Wireless	YES	NO
Home Networking	YES	NO
Routing	YES	NO
QoS	YES	NO
NAT	YES	NO
DNS	YES	NO
IGMP/MLD	YES	NO
Interface Grouping	YES	NO
USB Service	YES	NO
Security		
Firewall	YES	NO
Mac Filter	YES	NO
Home Security	YES	NO

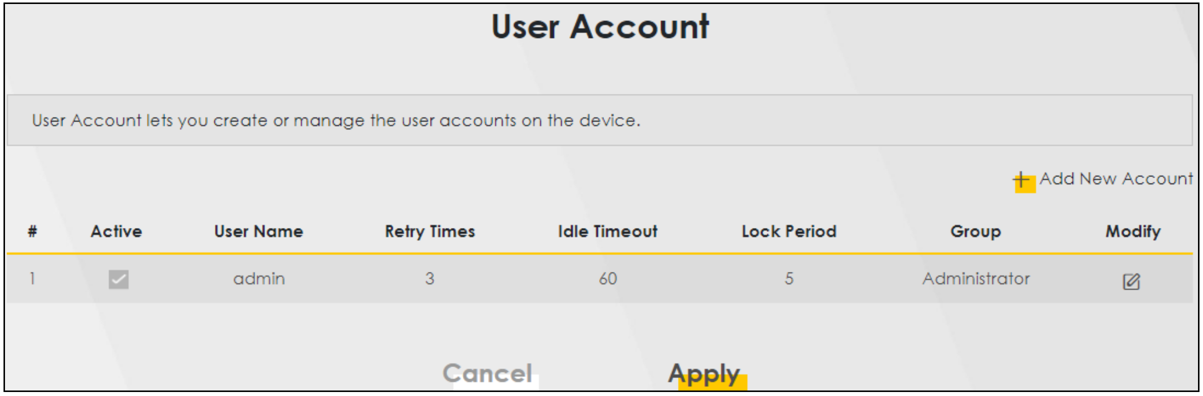
Table 124 Account Privilege Comparison Table - Example (continued)

	ADMINISTRATOR	USER
Parental Control	YES	NO
Scheduler Rule	YES	NO
Certificates	YES	NO
VoIP		
Phone	YES	NO
Call Rule	YES	NO
Call History	YES	NO
System Monitor		
Log	YES	YES
Traffic Status	YES	YES
VoIP Status	YES	NO
ARP Table	YES	YES
Routing Table	YES	YES
xDSL Statistics	YES	YES
Multicast Status	YES	YES
WLAN Station Status	YES	YES
Maintenance		
System	YES	NO
User Account	YES	YES
Remote Management	YES	YES
Time	YES	YES
Email Notification	YES	YES
Log Setting	YES	YES
Firmware Upgrade	YES	YES
Backup/Restore	YES	YES
Reboot	YES	YES
Diagnostic	YES	YES

27.2 User Account

Click Maintenance > User Account to open the following screen. Use this screen to create and manage user accounts and their privileges on the Zyxel Device.

Figure 194   Maintenance > User Account



User Account

User Account lets you create or manage the user accounts on the device.

#	Active	User Name	Retry Times	Idle Timeout	Lock Period	Group	Modify
1	☑	admin	3	60	5	Administrator	

The following table describes the labels in this screen.

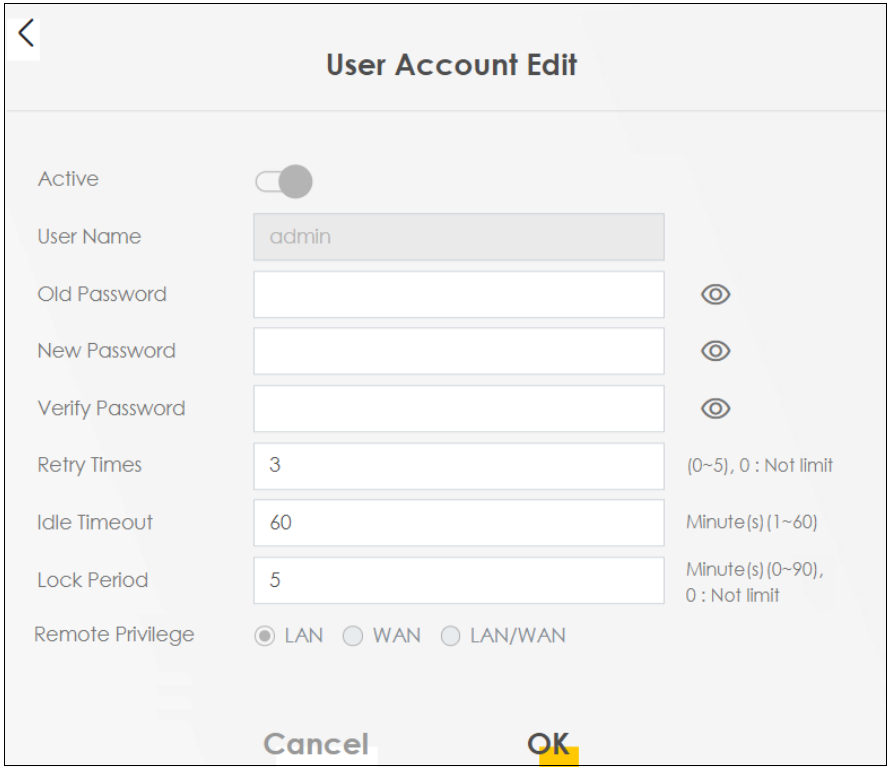
Table 125   Maintenance > User Account

LABEL	DESCRIPTION
Add New Account	Click this button to add a new user account. You can create up to four accounts in total for the admin and user groups. An admin or user account cannot belong to more than one group.
#	This is the index number.
Active	This indicates whether the user account is active or not. The checkbox is selected when the user account is enabled. It is cleared when it is disabled.
User Name	This displays the name of the account used to log into the Zyxel Device Web Configurator.
Retry Times	This displays the number of times consecutive wrong passwords can be entered for this account. 0 means there is no limit.
Idle Timeout	This displays the length of inactive time before the Zyxel Device will automatically log the user out of the Web Configurator.
Lock Period	This field displays the length of time a user must wait before attempting to log in again after a number of consecutive wrong passwords have been entered as defined in Retry Times.
Group	This field displays this user has Administrator privileges.
Modify	Click the Edit icon to configure the entry. Click the Delete icon to remove the entry.
Cancel	Click Cancel to restore your previously saved settings.
Apply	Click Apply to save your changes.

27.2.1 User Account Add or Edit

Add or change the name of the user account, set the security password and the retry times, and whether this user will have Administrator or User privileges. Click Add New Account or the Edit icon of an existing account in the Maintenance > User Account to open the following screen.

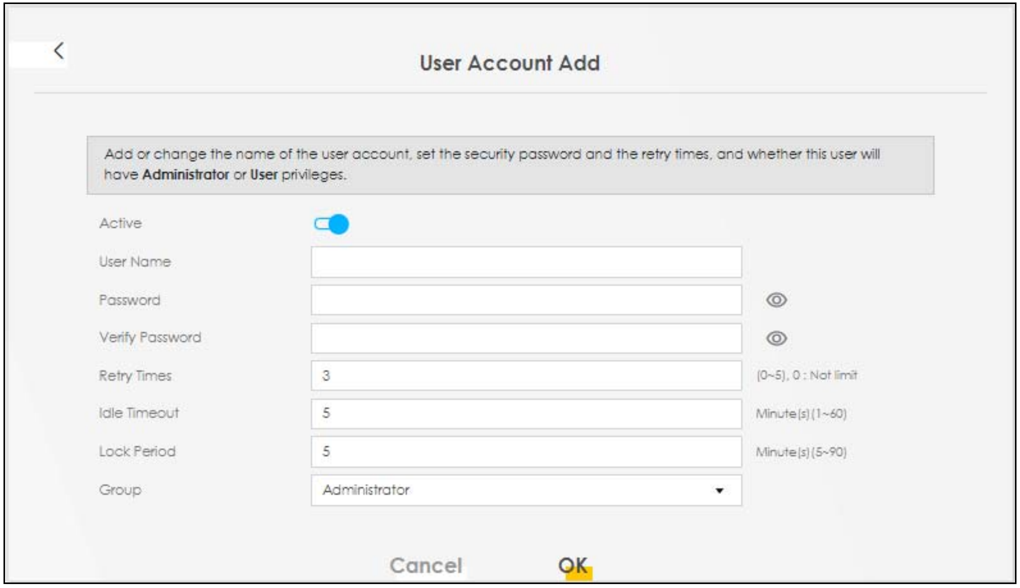
Figure 195 Maintenance > User Account: Edit



User Account Edit

Active	●	
User Name	admin	
Old Password		
New Password		
Verify Password		
Retry Times	3	(0~5), 0 : Not limit
Idle Timeout	60	Minute(s) (1~60)
Lock Period	5	Minute(s) (0~90), 0 : Not limit
Remote Privilege	● LAN ○ WAN ○ LAN/WAN	

Figure 196 Maintenance > User Account > Add



User Account Add

Add or change the name of the user account, set the security password and the retry times, and whether this user will have **Administrator** or **User** privileges.

Active	●	
User Name		
Password		
Verify Password		
Retry Times	3	(0~5), 0 : Not limit
Idle Timeout	5	Minute(s) (1~60)
Lock Period	5	Minute(s) (5~90)
Group	Administrator	

The following table describes the labels in this screen.

Table 126 Maintenance > User Account > User Account Add/Edit

LABEL	DESCRIPTION
Active	Click to enable (switch turns blue) or disable (switch turns gray) to activate or deactivate the user account.
User Name	Enter a name for this account. You can use up to 31 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed.

Table 126   Maintenance > User Account > User Account Add/Edit (continued)

<table>
<tr><th>LABEL</th><th colspan="2">DESCRIPTION</th></tr>
<tr><td>Verify Password</td><td colspan="2">Enter the new password again for confirmation.</td></tr>
<tr><td>Retry Times</td><td colspan="2">Enter the number of times consecutive wrong passwords can be entered for this account. 0 means there is no limit.</td></tr>
<tr><td>Idle Timeout</td><td colspan="2">Enter the length of inactive time before the Zyxel Device will automatically log the user out of the Web Configurator.</td></tr>
<tr><td>Lock Period</td><td colspan="2">Enter the length of time a user must wait before attempting to log in again after a number of consecutive wrong passwords have been entered as defined in Retry Times.</td></tr>
<tr><td rowspan="10">Group</td><td colspan="2">Specify whether this user will have Administrator or User privileges. An Administrator account can access all Web Configurator menus. A User account can only access System Monitor and Maintenance menus.
The maximum account number of Administrator and User are both four. The total number of the users allowed to log in the Zyxel Device at the same time is eight.</td></tr>
<tr><td colspan="2">An Administrator account can configure the following menus:</td></tr>
<tr><td>Wizard</td><td></td></tr>
<tr><td>Network Setting</td><td>Broadband, Wireless, Home Networking, Routing, NAT, DNS</td></tr>
<tr><td>Security</td><td>Firewall, MAC Filter, Parental Control, Certificates</td></tr>
<tr><td>System Monitor</td><td>Log, Traffic Status, ARP Table, Routing Table, WLAN Station Status, Cellular WAN Status,</td></tr>
<tr><td>Maintenance</td><td>System, User Account, Remote Management, TR-069 Client, Time, Email Notification, Log Setting, Firmware Upgrade, Backup/Restore, Reboot, Diagnostic</td></tr>
<tr><td colspan="2">A User account can configure the following menus:</td></tr>
<tr><td>System Monitor</td><td>Log, Traffic Status, ARP Table, Routing Table, WLAN Station Status, Cellular WAN Status,</td></tr>
<tr><td>Maintenance</td><td>User Account, Remote Management, Time, Email Notification, Log Setting, Firmware Upgrade, Backup/Restore, Reboot, Diagnostic</td></tr>
<tr><td>Remote Privilege</td><td colspan="2">Select whether this user can access the Zyxel Device with HTTP, Telnet or SSH through the WAN, LAN or LAN/WAN. Only the Administrator is allowed to use Telnet and SSH for remote management.</td></tr>
<tr><td>Cancel</td><td colspan="2">Click Cancel to restore your previously saved settings.</td></tr>
<tr><td>OK</td><td colspan="2">Click OK to save your changes.</td></tr>
</table>

CHAPTER 28 Remote Management

28.1 Remote Management Overview

Use Remote Management to control web services (HTTP, HTTPS, SSH, SNMP, and Ping) can access the Zyxel Device through which interfaces.

Note: Use the Web Configurator (HTTP) to manage the Zyxel Device.

28.1.1 What You Can Do in this Chapter

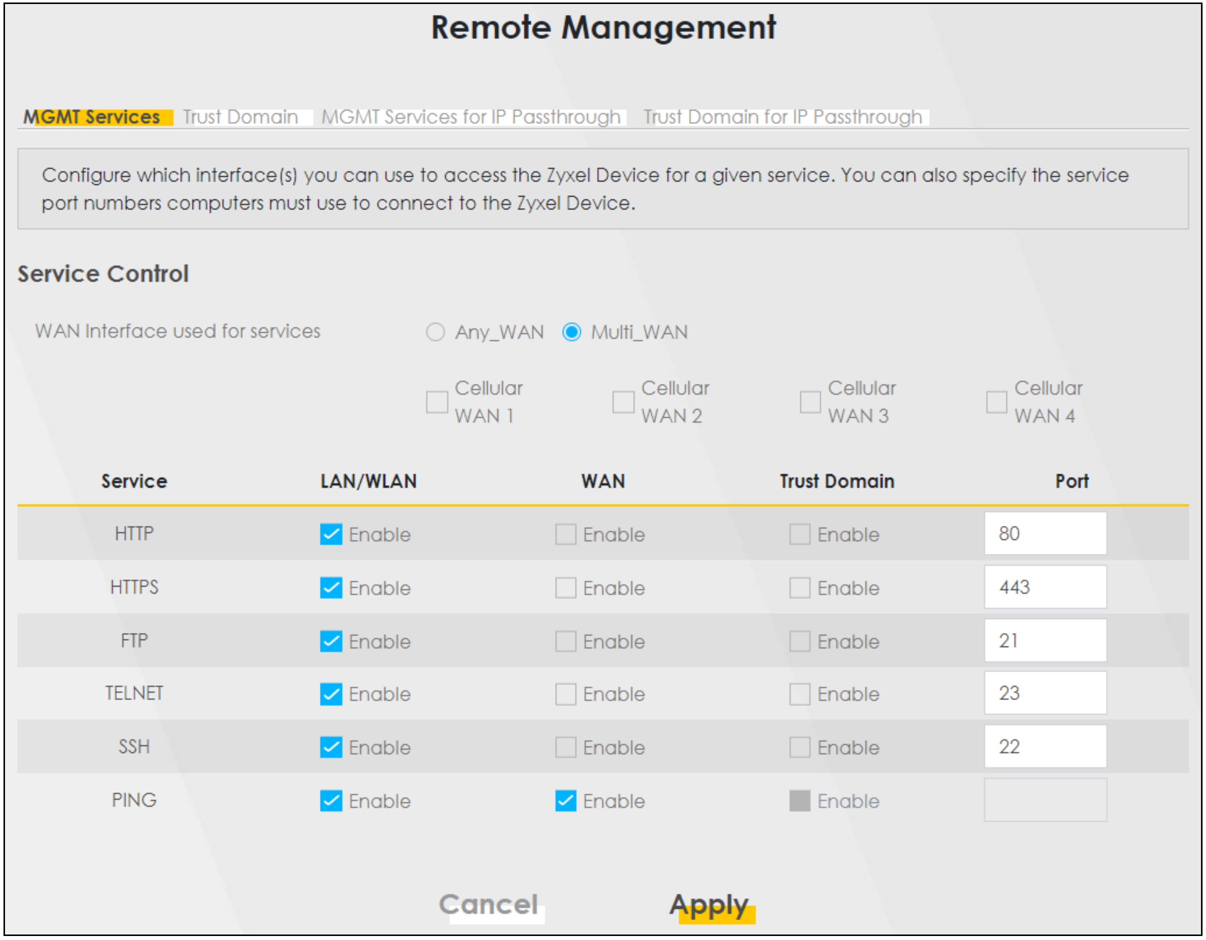
- Use the MGMT Services screen to allow various approaches to access the Zyxel Device remotely from a WAN and/or LAN connection (MGMT Services).
- Use the Trust Domain screen to enable users to permit access from local management services by entering specific IP addresses (Trust Domain).
- Use MGMT Services for IP Passthrough to configure which interfaces you can use to access the Zyxel Device for a given service (Section 28.4 on page 347).
- Use Trust Domain for IP Passthrough to view a list of public IP addresses and complete domain names which are allowed to access the Zyxel Device (Section 28.5 on page 348),

28.2 MGMT Services

Note: The MGMT Services screen will be hidden if you enable the IP Passthrough function in Network Setting > Broadband > Cellular IP Passthrough screen.

Use this screen to configure the interfaces through which services can access the Zyxel Device. You can also specify service port numbers computers must use to connect to the Zyxel Device. Click Maintenance > Remote Management > MGMT Services to open the following screen.

Figure 197 Maintenance > Remote Management > MGMT Services


Remote Management
MGMT Services
Trust Domain
MGMT Services for IP Passthrough
Trust Domain for IP Passthrough
Cancel
Apply

Configure which interface(s) you can use to access the Zyxel Device for a given service. You can also specify the service port numbers computers must use to connect to the Zyxel Device.

Service Control

WAN Interface used for services ○ Any_WAN ● Multi_WAN

□ Cellular WAN 1 □ Cellular WAN 2 □ Cellular WAN 3 □ Cellular WAN 4

Service	LAN/WLAN	WAN	Trust Domain	Port
HTTP	☑ Enable	□ Enable	□ Enable	80
HTTPS	☑ Enable	□ Enable	□ Enable	443
FTP	☑ Enable	□ Enable	□ Enable	21
TELNET	☑ Enable	□ Enable	□ Enable	23
SSH	☑ Enable	□ Enable	□ Enable	22
PING	☑ Enable	☑ Enable	■ Enable	

The following table describes the fields in this screen.

Table 127 Maintenance > Remote Management > MGMT Services

LABEL	DESCRIPTION
Service Control	
WAN Interface used for services	Select Any_WAN to have the Zyxel Device automatically activate the remote management service when any WAN connection is up. Select Multi_WAN and then select one or more WAN connections to have the Zyxel Device activate the remote management service when the selected WAN connections are up.
Cellular WAN	Enable the cellular WAN connection configured in Network Setting > Broadband > Cellular WAN to access the service on the Zyxel Device. If there are multiple cellular WANs configured on the Zyxel Device, you can select which to use for the Zyxel Device management.
ETHWAN	Enable the Ethernet WAN connection configured in Network Setting > Broadband > Ethernet WAN to access the service on the Zyxel Device.
Service	This is the service you may use to access the Zyxel Device.
LAN/WLAN	Select the Enable checkbox for the corresponding services that you want to allow access to the Zyxel Device from the LAN or WLAN.
WAN	Select the Enable checkbox for the corresponding services that you want to allow access to the Zyxel Device from all WAN connections.

Table 127 Maintenance > Remote Management > MGMT Services (continued)

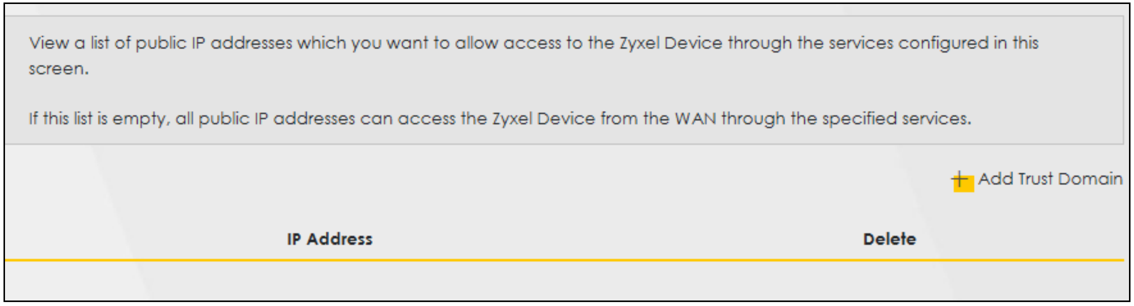
LABEL	DESCRIPTION
Trust Domain	Select the Enable checkbox for the corresponding services that you want to allow access to the Zyxel Device from the trusted host IP address.
Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Redirect	To allow only secure Web Configurator access, select this to redirect all HTTP connection requests to the HTTPS server. For example, if you enter http://192.168.1.1 in your browser to access the Web Configurator, then the Zyxel Device will automatically change this to the more secure https://192.168.1.1 for access.
Apply	Click Apply to save your changes back to the Zyxel Device.
Cancel	Click Cancel to restore your previously saved settings.

28.3 Trust Domain

Use this screen to view a list of public IP addresses which are allowed to access the Zyxel Device through the services configured in the Maintenance > Remote Management > MGMT Services screen. Click Maintenance > Remote Management > Trust Domain to open the following screen.

Note: Enter the IP address of the management station permitted to access the local management services. If specific services from the trusted hosts are allowed access but the trust domain list is empty, all public IP addresses can access the Zyxel Device from the WAN using the specified services.

Figure 198 Maintenance > Remote Management > Trust Domain



View a list of public IP addresses which you want to allow access to the Zyxel Device through the services configured in this screen.

If this list is empty, all public IP addresses can access the Zyxel Device from the WAN through the specified services.

The following table describes the fields in this screen.

Table 128 Maintenance > Remote Management > Trust Domain

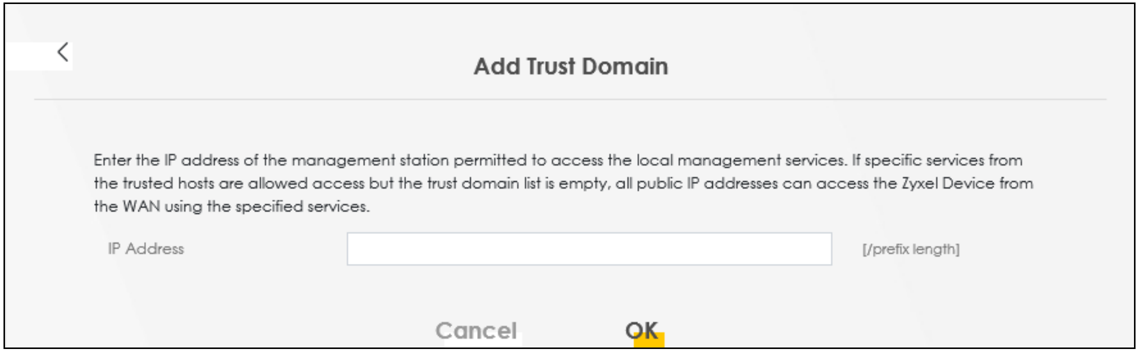
LABEL	DESCRIPTION
Add Trust Domain	Click this to add a trusted host IP address.
IP Address	This field shows a trusted host IP address.
Delete	Click the Delete icon to remove the trusted host IP address.

28.3.1 Add Trust Domain

Use this screen to add a public IP addresses or a complete domain name of a device which is allowed to access the Zyxel Device. Enter the IP address of the management station permitted to access the local management services. If specific services from the trusted-hosts are allowed access but the trust domain list is empty, all public IP addresses can access the Zyxel Device from the WAN using the specified services.

Click the Add Trust Domain button in the Maintenance > Remote Management > Trust Domain screen to open the following screen.

Figure 199 Maintenance > Remote Management > Trust Domain > Add Trust Domain



Add Trust Domain

Enter the IP address of the management station permitted to access the local management services. If specific services from the trusted hosts are allowed access but the trust domain list is empty, all public IP addresses can access the Zyxel Device from the WAN using the specified services.

IP Address [/prefix length]

The following table describes the fields in this screen.

Table 129 Maintenance > Remote Management > Trust Domain > Add Trust Domain

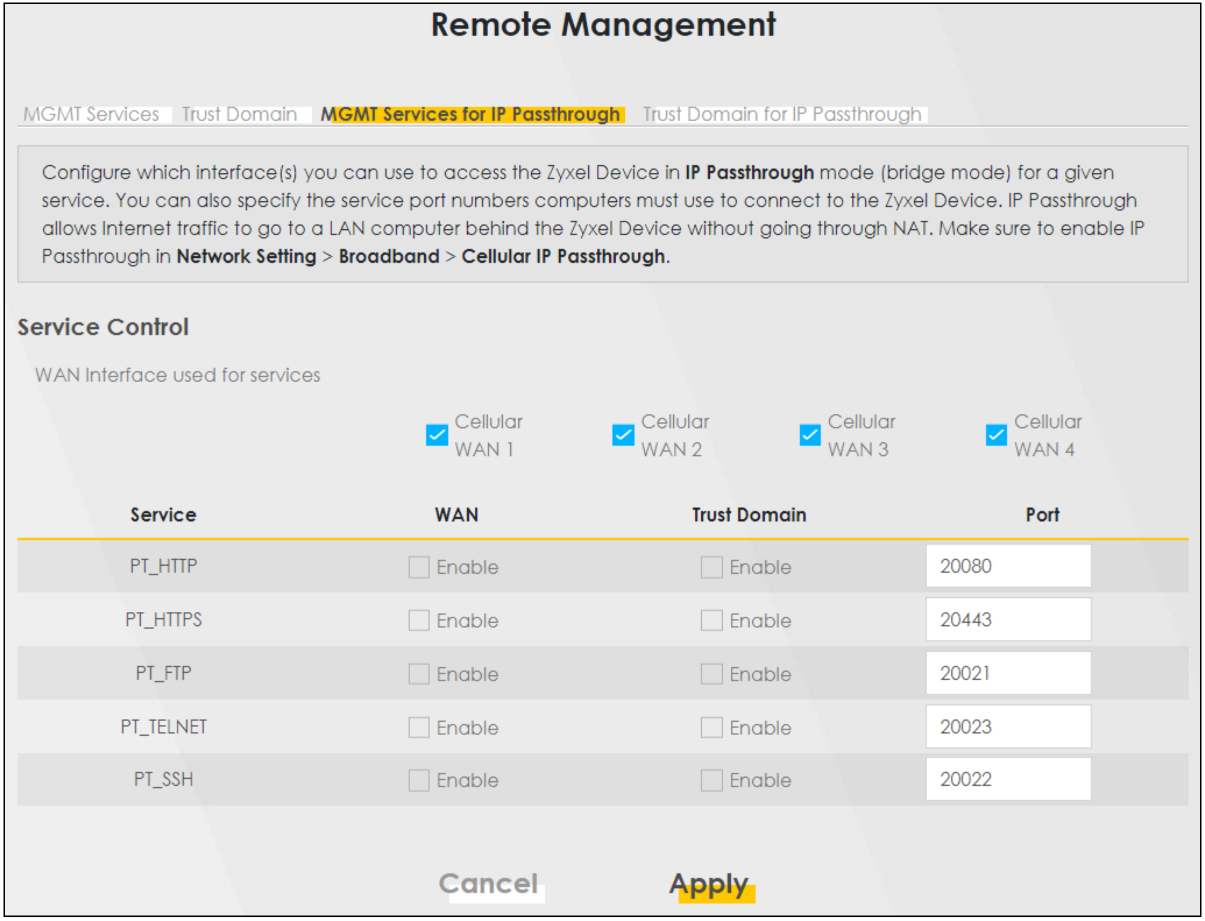
LABEL	DESCRIPTION
IP Address	Enter a public IPv4/IPv6 IP address which is allowed to access the service on the Zyxel Device from the WAN.
OK	Click OK to save your changes back to the Zyxel Device.
Cancel	Click Cancel to restore your previously saved settings.

28.4 MGMT Services for IP Passthrough

Configure which interfaces you can use to access the Zyxel Device when IP Passthrough is enabled for a given service. You can also specify the service port numbers computers must use to connect to the Zyxel Device. IP Passthrough allows Internet traffic to go to a LAN computer behind the Zyxel Device without going through NAT. Make sure to enable IP Passthrough in Network Setting > Broadband > Cellular IP Passthrough.

Click Maintenance > Remote Management > MGMT Services for IP Passthrough to open the following screen.

Figure 200 Maintenance > Remote Management > MGMT Services for IP Passthrough


Remote Management
MGMT Services
Trust Domain
MGMT Services for IP Passthrough
Trust Domain for IP Passthrough
Cancel
Apply

Configure which interface(s) you can use to access the Zyxel Device in **IP Passthrough** mode (bridge mode) for a given service. You can also specify the service port numbers computers must use to connect to the Zyxel Device. IP Passthrough allows Internet traffic to go to a LAN computer behind the Zyxel Device without going through NAT. Make sure to enable IP Passthrough in **Network Setting** > **Broadband** > **Cellular IP Passthrough**.

Service Control

WAN Interface used for services

☑ Cellular WAN 1 ☑ Cellular WAN 2 ☑ Cellular WAN 3 ☑ Cellular WAN 4

Service	WAN	Trust Domain	Port
PT_HTTP	□ Enable	□ Enable	20080
PT_HTTPS	□ Enable	□ Enable	20443
PT_FTP	□ Enable	□ Enable	20021
PT_TELNET	□ Enable	□ Enable	20023
PT_SSH	□ Enable	□ Enable	20022

The following table describes the fields in this screen.

Table 130 Maintenance > Remote Management > MGMT Services for IP Passthrough

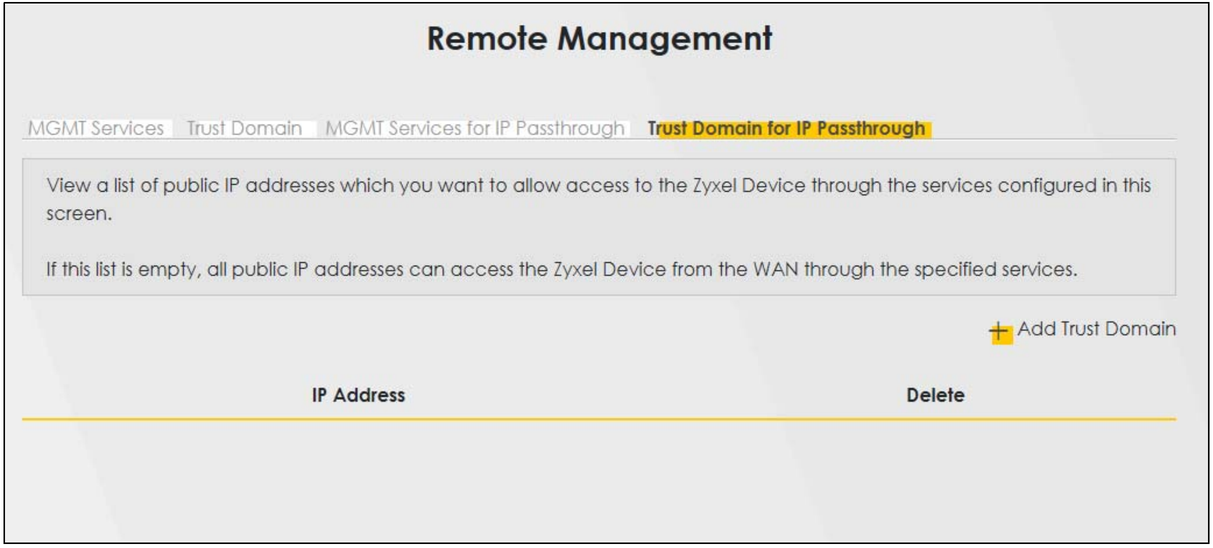
LABEL	DESCRIPTION
Service	This is the service you may use to access the Zyxel Device.
WAN	Select the Enable checkbox for the corresponding services that you want to allow access to the Zyxel Device from all WAN connections.
Trust Domain	Select the Enable checkbox for the corresponding services that you want to allow access to the Zyxel Device from the trusted host IP address.
Port	You may change the server port number for a service if needed, however you must use the same port number in order to use that service for remote management.
Apply	Click Apply to save your changes back to the Zyxel Device.
Cancel	Click Cancel to restore your previously saved settings.

28.5 Trust Domain for IP Passthrough

Use this screen to view a list of public IP addresses/complete domain names which are allowed to access the Zyxel Device when IP Passthrough is enabled. IP Passthrough allows Internet traffic to go to a LAN computer behind the Zyxel Device without going through NAT. Make sure to enable IP Passthrough in Network Setting > Broadband > Cellular IP Passthrough.

Click Maintenance > Remote Management > Trust Domain for IP Passthrough to open the following screen.

Figure 201 Maintenance > Remote Management > Trust Domain for IP Passthrough


Remote Management
MGMT Services
Trust Domain
MGMT Services for IP Passthrough
Trust Domain for IP Passthrough

View a list of public IP addresses which you want to allow access to the Zyxel Device through the services configured in this screen.

If this list is empty, all public IP addresses can access the Zyxel Device from the WAN through the specified services.

The following table describes the fields in this screen.

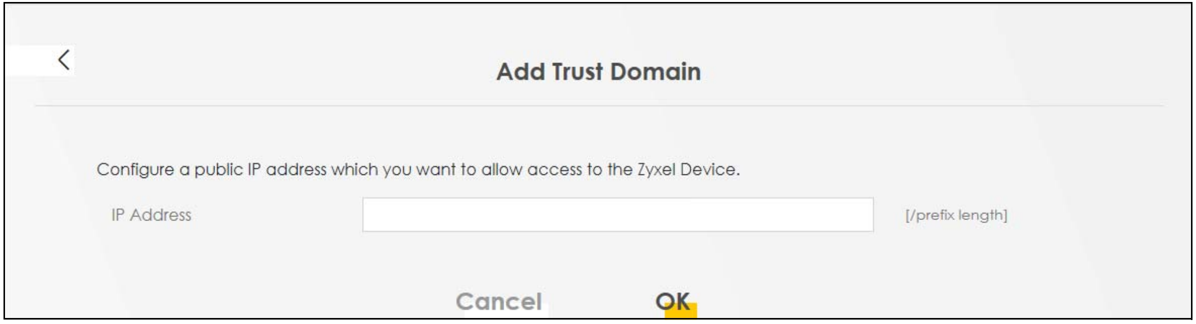
Table 131 Maintenance > Remote Management > Trust Domain for IP Passthrough

LABEL	DESCRIPTION
Add Trust Domain	Click this to add a trusted host IP address.
IP Address	This field shows a trusted host IP address.
Delete	Click the Delete icon to remove the trusted host IP address.

28.5.1 Add Trust Domain

Use this screen to add a public IP address or a complete domain name of a device which is allowed to access the Zyxel Device. Click the Add Trust Domain button in the Maintenance > Remote Management > Trust Domain for IP Passthrough screen to open the following screen.

Figure 202 Maintenance > Remote Management > Trust Domain for IP Passthrough > Add Trust Domain



Configure a public IP address which you want to allow access to the Zyxel Device.

The following table describes the fields in this screen.

Table 132 Maintenance > Remote Management > Trust Domain for IP Passthrough > Add Trust Domain

LABEL	DESCRIPTION
IP Address	Enter a public IPv4/IPv6 IP address which is allowed to access the service on the from the WAN.
Cancel	Click Cancel to restore your previously saved settings.
OK	Click OK to save your changes.

CHAPTER 29
TR-069 Client

29.1 TR-069 Overview

This chapter explains how to configure the Zyxel Device's TR-069 auto-configuration settings.

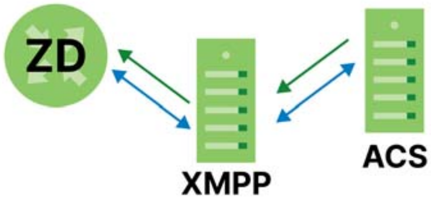
29.1.1 TR-069 Client

TR-069 is a protocol that defines how your Zyxel Device can be managed via a management server. TR-069 is based on sending Remote Procedure Calls (RPCs) between an (Auto-Configuration Server) ACS and a client device. RPCs are sent in Extensible Markup Language (XML) format over HTTP or HTTPS. You can use a management server to remotely set up the Zyxel Device, modify settings, perform firmware upgrades as well as monitor and diagnose the Zyxel Device.

29.1.2 XMPP

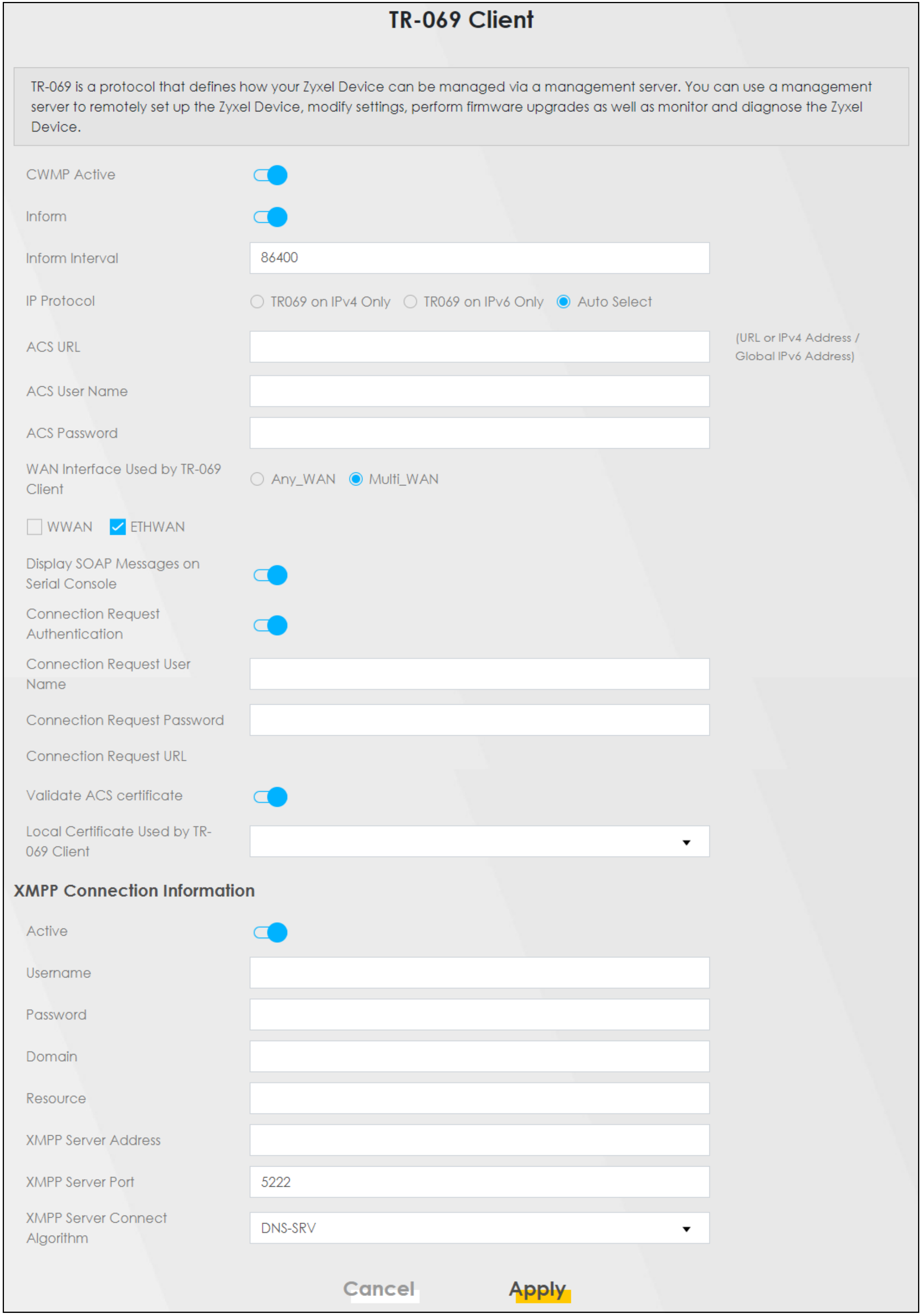
If a remotely-managed Zyxel Device is behind a NAT router and has a private IP address, then the ACS cannot communicate directly with the Zyxel Device. In this case, the Zyxel Device needs to communicate with the ACS through an XMPP server.

Figure 203 XMPP Connection Request



Click Maintenance > TR-069 Client to open the following screen.

Figure 204 Maintenance > TR-069 Client



TR-069 Client

TR-069 is a protocol that defines how your Zyxel Device can be managed via a management server. You can use a management server to remotely set up the Zyxel Device, modify settings, perform firmware upgrades as well as monitor and diagnose the Zyxel Device.

CWMP Active	●	
Inform	●	
Inform Interval	86400	
IP Protocol	○ TR069 on IPv4 Only ○ TR069 on IPv6 Only ● Auto Select	
ACS URL		(URL or IPv4 Address / Global IPv6 Address)
ACS User Name		
ACS Password		
WAN Interface Used by TR-069 Client	○ Any_WAN ● Multi_WAN	
☐ WWAN ☑ ETHWAN		
Display SOAP Messages on Serial Console	●	
Connection Request Authentication	●	
Connection Request User Name		
Connection Request Password		
Connection Request URL		
Validate ACS certificate	●	
Local Certificate Used by TR-069 Client	▾	

XMPP Connection Information

Active	●
Username	
Password	
Domain	
Resource	
XMPP Server Address	
XMPP Server Port	5222
XMPP Server Connect Algorithm	DNS-SRV ▾

The following table describes the fields in this screen.

Table 133 Maintenance > TR-069 Client

LABEL	DESCRIPTION
CWMP Active	CPE WAN Management Protocol (CWMP) enables the Zyxel Device to be remotely configured through a WAN link. Communication between the Zyxel Device and the management server is conducted through SOAP/HTTP(S) in the form of remote procedure calls (RPC). Click to enable (switch turns blue) to allow the Zyxel Device to be managed by a management server. Otherwise, click to disable (switch turns gray) to disallow the Zyxel Device to be managed by a management server.
Inform	Click to enable (switch turns blue) the Zyxel Device to send periodic inform through TR-069 on the WAN. Otherwise, click to disable (switch turns gray).
Inform Interval	Enter the time interval (in seconds) at which the Zyxel Device sends information to the auto-configuration server.
IP Protocol	Select the type of IP protocol to allow TR-069 to operate on.
ACS URL	Enter the URL or IP address of the auto-configuration server.
ACS User Name	Enter the TR-069 user name for authentication with the auto-configuration server.
ACS Password	Enter the TR-069 password for authentication with the auto-configuration server.
WAN Interface Used by TR-069 Client	Select a WAN interface through which the TR-069 traffic passes. If you select Any_WAN, the Zyxel Device automatically passes the TR-069 traffic when any WAN connection is up. If you select Multi_WAN, you also need to select two or more pre-configured WAN interfaces. The Zyxel Device automatically passes the TR-069 traffic when one of the selected WAN connections is up.
Display SOAP Messages on Serial Console	Click to enable (switch turns blue) the dumping of all SOAP messages during the ACS server communication with the CPE.
Connection Request User Name	Enter the connection request user name. When the ACS makes a connection request to the Zyxel Device, this user name is used to authenticate the ACS.
Connection Request Password	Enter the connection request password. When the ACS makes a connection request to the Zyxel Device, this password is used to authenticate the ACS.
Connection Request URL	This shows the connection request URL. The ACS can use this URL to make a connection request to the Zyxel Device.
Supplementary ACS URL	Enter the URL or IP address of an additional TR-069 auto-configuration server.
Supplementary ACS User Name	Enter the user name of an additional TR-069 auto-configuration server for authentication.
Supplementary ACS Password	Enter the password of an additional TR-069 auto-configuration server for authentication.
Validate ACS Certificate	Click to enable (switch turns blue) the validation of a local certificate used by TR-069 client.
Local Certificate Used by TR-069 Client	You can choose a local certificate used by TR-069 client. The local certificate should be imported in the Security > Certificates > Local Certificates screen.
XMPP Server Address	Enter the IP address of the XMPP server. The Zyxel Device will use the address to connect to the XMPP server.
XMPP Server Port	Enter the TCP port reserved for the XMPP server. The default is 5222. (1 – 65535)

Table 133 Maintenance > TR-069 Client (continued)

LABEL	DESCRIPTION
Apply	Click Apply to save your changes.
Cancel	Click Cancel to restore the screen’s last saved settings.

CHAPTER 30
TR-369 Local Agent

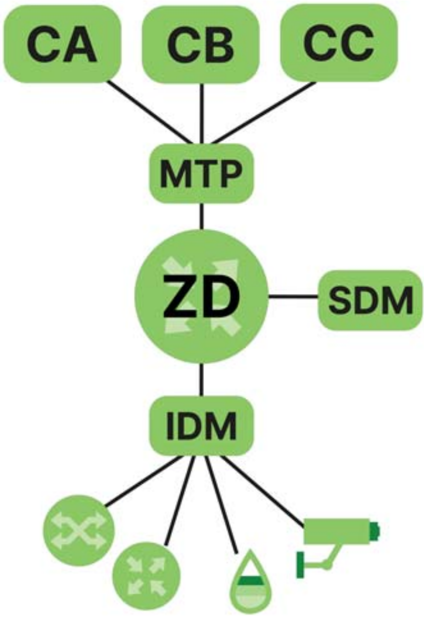
30.1 TR-369 Local Agent

TR-369 or USP (User Services Platform) is a standardized protocol for managing, monitoring, upgrading, and controlling connected network devices. It can manage Wi-Fi, mesh networks, or IoT devices in smart homes. The TR-369 agent collects and analyzes data from network devices to identify potential problems and generate reports and alerts and sends them to a controller.

A service element refers to the set of objects, commands, events, and parameters that represent a specific set of functionality that can be modified by a controller on an agent. An agent, the Zyxel Device, ZD in the following example figure, exposes service elements to one or more controllers (CA, CB, CC in the example figure below). A controller manipulates service elements through one or more agents. The Instantiated Data Model (IDM) of an agent represents the current status of service elements that are exposed to one or more controllers. The Supported Data Model (SDM) of an agent represents the complete set of service elements it is capable of exposing to a controller.

A message refers to the contents of a TR-369 communication. A Message Transfer Protocol (MTP) is the protocol that carries a message. The endpoint must be identified by a locally or globally unique endpoint identifier depending on the scheme used for assignment.

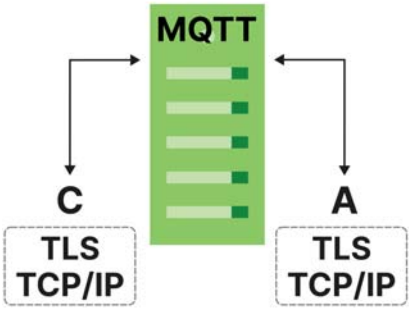
Figure 205 Example TR-369 Topology



30.1.1 MQTT

The Zyxel Device supports MQ Telemetry Transport (MQTT) to send messages for always-on, direct communications between an agent (A, the Zyxel Device, ZD), controller (C), the MQTT broker (MQTT) and other clients. The MQTT broker (MQTT) routes and delivers messages between the controller and agent. Messages can be encrypted with TLS (Transport Layer Security) for end-to-end message security and integrity.

Figure 206 MQTT Broker



30.1.2 Topics

An agent exposes a service element to a controller by publishing a topic. Controllers use topic filters to subscribe to specific published topics that they can manage.

A topic uses a hierarchical structure with forward slash "/" characters for organizing topics and to identify the exact location of a service element. For example, “myhome/livingroom/temperature”, “myhome/bedroom/temperature”, “myoffice/meetingroom/temperature”.

Note: Response Topic in the Controller screen is a topic filter where you can subscribe to multiple topics at once using wildcards.

Note: Topic in the Controller screen is a topic name used to publish a topic. It must not contain wildcards.

30.1.2.1 Topic Filter Wildcards

Wildcard characters can be used in topic filters, but not in topic names. [MQTT-4.7.1-1].

The number sign (‘#’ U+0023) is a wildcard character that matches any number of levels within a topic. The multi-level wildcard represents the parent and any number of child levels. The multi-level wildcard character must be specified either on its own or following a topic level separator. In either case it must be the last character specified in the topic filter [MQTT-4.7.1-2]

For example, if a client subscribes to “sport/tennis/player1/#”, it would receive messages published using these topic names:

- “sport/tennis/player1”
- “sport/tennis/player1/ranking”
- “sport/tennis/player1/score/wimbledon”
- “sport/#” also matches the singular “sport”, since # includes the parent level.
- “#” is valid and will receive every Application Message
- “sport/tennis/#” is valid
- “sport/tennis#” is not valid
- “sport/tennis/#/ranking” is not valid

The plus sign (‘+’ U+002B) is a wildcard character that matches only one topic level. The single-level wildcard can be used at any level in the topic filter, including first and last levels. Where it is used it must occupy an entire level of the filter [MQTT-4.7.1-3]. It can be used at more than one level in the topic filter and can be used in conjunction with the multilevel wildcard.

For example, “sport/tennis/+” matches “sport/tennis/player1” and “sport/tennis/player2”, but not “sport/tennis/player1/ranking”. Also, because the single-level wildcard matches only a single level, “sport/+” does not match “sport” but it does match “sport/”.

- “+” is valid
- “+/tennis/#” is valid
- “sport+” is not valid
- “sport/+/player1” is valid
- “/finance” matches “+/+” and “/+”, but not “+”

30.1.2.2 Rules for Topic Names and Topic Filters

- All topic names and topic filters must be at least one character long.
- Topic names and topic filters are case sensitive.
- Topic names and topic filters can include the space character.
- A topic name or topic filter can have just the ‘/’ character, but you should make the topic as clear as possible.
- Topic names and topic filters must not include the null character (Unicode U+0000).
- Topic names and topic filters are UTF-8 encoded strings, and must not encode to more than 65,535 bytes.
- There is no limit to the number of levels in a topic name but the total length must be under 65,535 bytes.

30.2 Configuration Overview

Make sure the below prerequisites are done before configuring TR-369 on the Zyxel Device.

30.2.1 Prerequisites

Register with an MQTT broker. You may need to configure the following items.

Table 134 MQTT Broker Registration

ITEM	DESCRIPTION
Username	If this is required, note it and enter the same on the Zyxel Device.
Password	If this is required, note it and enter the same on the Zyxel Device.
Port	The default port is 1883. If the broker uses a different port, you must enter that different port number on the Zyxel Device.
TLS	If this is configured on the broker, you must also configure it on the Zyxel Device.
Protocol Version	Note whether the broker uses version 3.11 or 5.0, then select the same on the Zyxel Device.

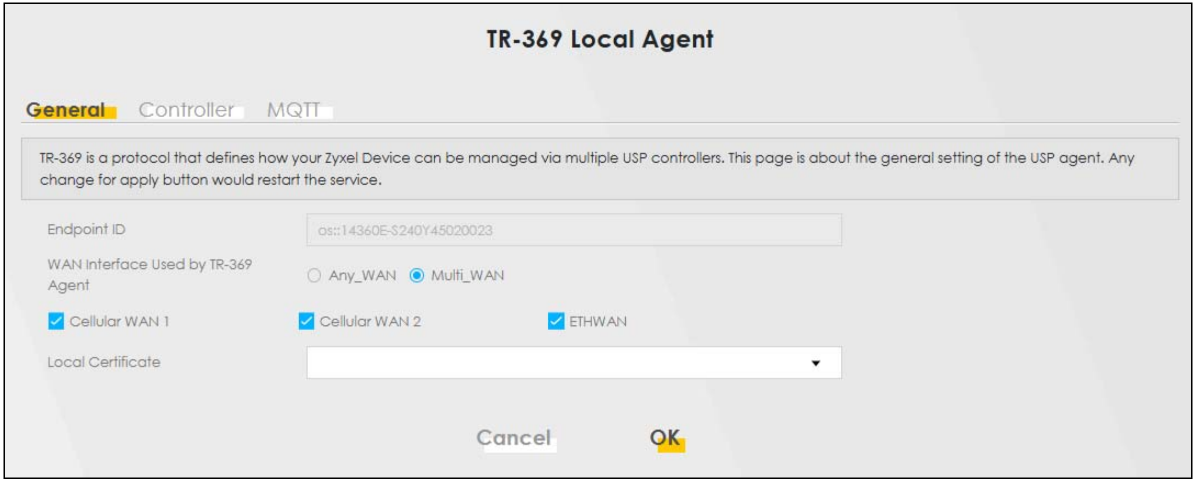
30.2.2 Configuring TR-369 on the Zyxel Device

1. First, configure the General screen. This Endpoint ID should identify the Zyxel Device acting as an agent.
2. Then, configure the Controller screen. This Endpoint ID should identify the controller. The Alias is a friendly name for the controller.
3. Configure the MQTT screen in Maintenance > TR-369 Local Agent. Each client connecting to the same MQTT broker must have a unique Client ID. Select the Reference to be the MQTT client you configured in the MQTT screen. For example, Device.MQTT.Client.1.
4. Finally, set the Topic as the topic name for the Zyxel Device to publish USP messages to the controller. For example, /usp/controller/Zyxel. Set the Response Topic as the topic name for the Zyxel Device to receive USP messages from controllers.

30.3 General

To enable TR-369, click Maintenance > TR-369 Local Agent > General to open the following screen.

Figure 207 Maintenance > TR-369 Local Agent > General



TR-369 Local Agent

TR-369 is a protocol that defines how your Zyxel Device can be managed via multiple USP controllers. This page is about the general setting of the USP agent. Any change for apply button would restart the service.

Endpoint ID: os::14360E-S240Y45020023

WAN Interface Used by TR-369 Agent: ○ Any_WAN ● Multi_WAN

☑ Cellular WAN 1 ☑ Cellular WAN 2 ☑ ETHWAN

Local Certificate:

The following table describes the fields in this screen.

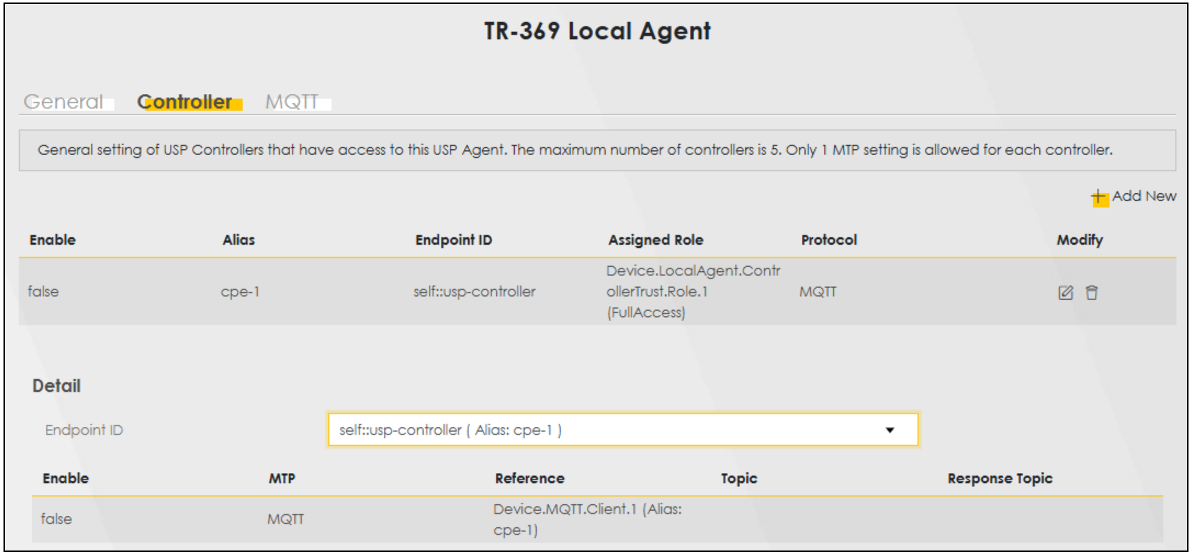
Table 135 Maintenance > TR-369 Local Agent > General

LABEL	DESCRIPTION
Enable	Slide this to the right to enable the Zyxel Device as a TR-369 agent.
Endpoint ID	This identifies the Zyxel Device acting as an agent. The Endpoint Identifier (ID) is used in the USP Record and various Parameters in a USP Message to uniquely identify agent endpoints. It can be globally or locally unique, either among all endpoints or among all controllers or all agents, depending on the scheme used for assignment. It has two mandatory and one optional components: authority-scheme, authority-id, and instance-id. These three components are combined as: authority-scheme ":" [authority-id] ":" instance-id. The format of the authority-id is dictated by the authority-scheme. The format of the instance-id is dictated either by the authority-scheme or by the entity identified by the authority-id. When used in a certificate, an Endpoint ID is expressed as a urn in the bbf namespace as: "urn:bbf:usp:id:" authority-scheme ":" [authority-id] ":" instance-id When used anywhere else (for example, in the to_id and from_id of a USP Record), the namespace information is omitted, and the Endpoint ID is expressed as: authority-scheme ":" [authority-id] ":" instance-id.
WAN Interface Used by TR-369 Agent	Select a WAN interface through which the TR-369 traffic passes. If you select Any_WAN, the Zyxel Device automatically passes the TR-369 traffic when any WAN connection is up. If you select Multi_WAN, you also need to select two or more pre-configured WAN interfaces. The Zyxel Device automatically passes the TR-369 traffic when one of the selected WAN connections is up.
Local Certificate	Select the USP server certificate for the Zyxel Device used by TR-369. To import the local certificate, go to Security > Certificates > Local Certificates.

30.4 Controller

Click Maintenance > TR-369 Local Agent > Controller to open the following screen. Use this screen to configure controller settings for topics the Zyxel Device agent should publish to this controller.

Figure 208 Maintenance > TR-369 Local Agent > Controller



General setting of USP Controllers that have access to this USP Agent. The maximum number of controllers is 5. Only 1 MTP setting is allowed for each controller.

Enable	Alias	Endpoint ID	Assigned Role	Protocol	Modify
false	cpe-1	self::usp-controller	Device.LocalAgent.ControllerTrust.Role.1 (FullAccess)	MQTT	

Endpoint ID: self::usp-controller (Alias: cpe-1)

Enable	MTP	Reference	Topic	Response Topic
false	MQTT	Device.MQTT.Client.1 (Alias: cpe-1)		

The following table describes the fields in this screen.

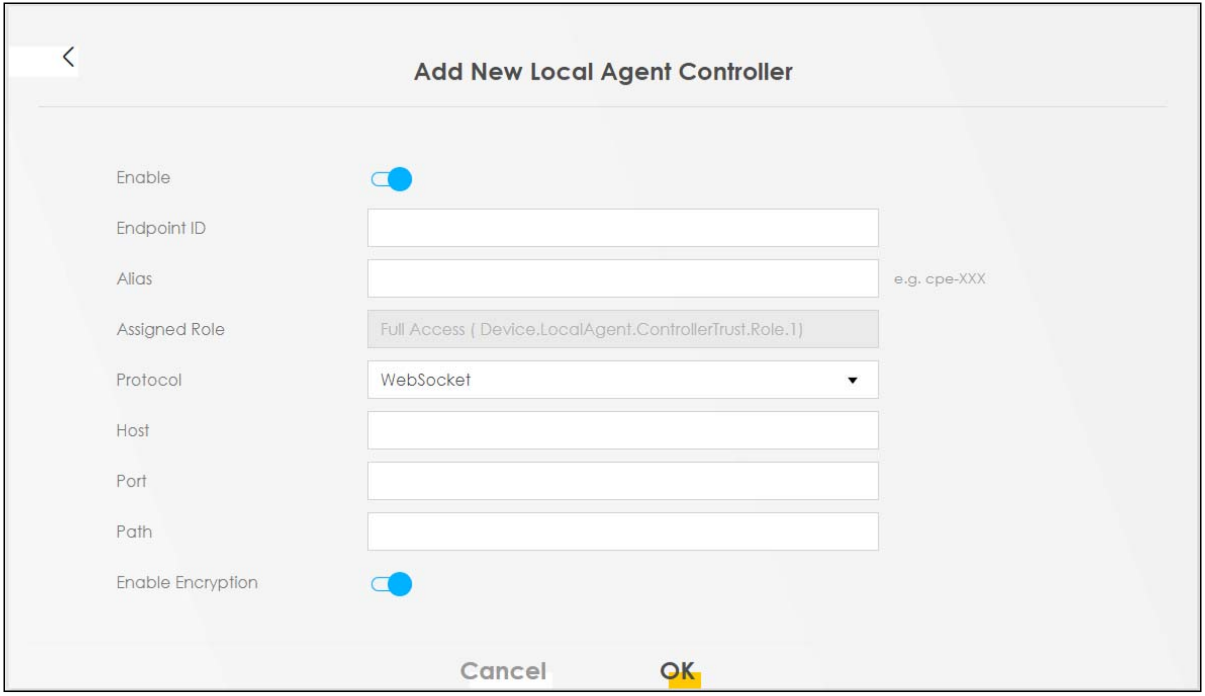
Table 136 Maintenance > TR-369 Local Agent > Controller

LABEL	DESCRIPTION
Add New	Click this button to add a new controller entry. See Section 30.4.1 on page 360 for details on configuring the required information for a controller. Note: At the time of writing, you can add up to 5 controller entries.
Enable	This displays if the controller is enabled.
Alias	This displays a friendly name for the controller.
Endpoint ID	This identifies the controller.
Assigned Role	Note: This field is not available at the time of writing.
Modify	Click the Edit icon to configure an entry. Click the Delete icon to remove an entry.
Detail	
Enable	This displays if the configuration for the controller is enabled (true). Otherwise, it is false.
Reference	This displays the MQTT client / STOMP server / WebSocket client you configured in the TR-369 Local Agent > Controller: Add or Edit screen. For example, Device.MQTT.Client.1.
Topic	This displays the topic name for the Zyxel Device to publish USP messages to the controller. For example, /usp/controller.
Response Topic	This displays the topic name for the Zyxel Device to receive USP messages from controllers. For example, /usp/endpoint.

30.4.1 Add or Edit Controller

Click Add New in the Controller screen or click the Edit icon next to a controller. Use this screen to configure the required information for a controller.

Figure 209   Maintenance > TR-369 Local Agent > Controller: Add or Edit



Add New Local Agent Controller

Enable	On
Endpoint ID	
Alias	e.g. cpe-XXX
Assigned Role	Full Access (Device.LocalAgent.ControllerTrust.Role.1)
Protocol	WebSocket
Host	
Port	
Path	
Enable Encryption	On

The following table describes the fields in this screen.

Table 137   Maintenance > TR-369 Local Agent > Controller: Add or Edit

LABEL	DESCRIPTION
Enable	Slide this to the right to enable the controller.
Endpoint ID	This identifies the device acting as a controller. The Endpoint Identifier (ID) is used in the USP Record and various parameters in a USP Message to uniquely identify Controller Endpoints. It can be globally or locally unique, either among all Endpoints or among all controllers or all agents, depending on the scheme used for assignment. It has two mandatory and one optional components: authority-scheme, authority-id, and instance-id. These three components are combined as: authority-scheme ":" [authority-id] ":" instance-id. The format of the authority-id is dictated by the authority-scheme. The format of the instance-id is dictated either by the authority-scheme or by the entity identified by the authority-id. When used in a certificate, an Endpoint ID is expressed as a urn in the bbf namespace as: "urn:bbf:usp:id:" authority-scheme ":" [authority-id] ":" instance-id When used anywhere else (for example, in the to_id and from_id of a USP Record), the namespace information is omitted, and the Endpoint ID is expressed as: authority-scheme ":" [authority-id] ":"instance-id.
Alias	Enter a unique name to identify the device acting as the controller. Please note the following: • The value must not be empty. • The value must start with a letter. • If the value is not assigned by the controller at creation time, you must assign a value with a "cpe-" prefix. If the value is not assigned by the controller on creation, you must choose an initial value that does not conflict with any existing entries.
Assigned Role	Note: This field is not available at the time of writing.

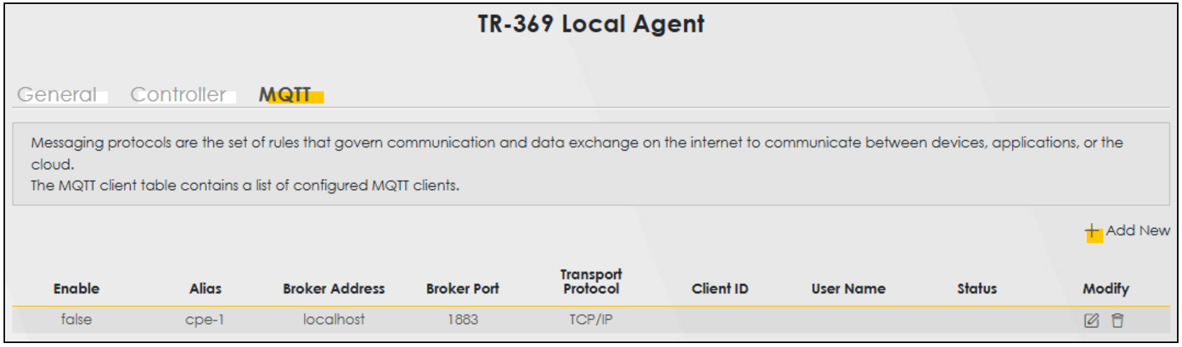
Table 137   Maintenance > TR-369 Local Agent > Controller: Add or Edit (continued)

LABEL	DESCRIPTION
Topic	Set this as the topic name for the Zyxel Device to publish USP messages to the controller. It must not contain wildcards. See Section 30.1.2.2 on page 357. For example, /usp/controller/Zyxel. Note: This field appears only when you select MQTT in Protocol.
Response Topic	Set this as the topic name for the Zyxel Device to receive USP messages from controllers.You can subscribe to multiple topics at once using wildcards. See Section 30.1.2.1 on page 356. Note: This field appears only when you select MQTT in Protocol.
Host	Enter the hostname or IPv4 address of the destination of the WebSocket connection. Make sure the network client is reachable from the Zyxel Device. Note: This field appears only when you select WebSocket in Protocol.
Port	This is the port used for the WebSocket connection. The default port is shown here. If the connection uses a different port, enter that port number here. Note: This field appears only when you select WebSocket in Protocol.
Path	Enter the URL of the of the destination of the WebSocket connection. Note: This field appears only when you select WebSocket in Protocol.
Enable Encryption	Slide this switch to the right to enable data encryption for this WebSocket connection. Note: This field appears only when you select WebSocket in Protocol.
OK	Click OK to save your changes.
Cancel	Click Cancel to restore the screen’s last saved settings.

30.5 MQTT

Use this screen to manage the profile settings that the Zyxel Device will use to register with an MQTT broker. Click Maintenance > TR-369 Local Agent > MQTT to open the following screen.

Figure 210   Maintenance > TR-369 Local Agent > MQTT



Messaging protocols are the set of rules that govern communication and data exchange on the internet to communicate between devices, applications, or the cloud.
The MQTT client table contains a list of configured MQTT clients.

Enable	Alias	Broker Address	Broker Port	Transport Protocol	Client ID	User Name	Status	Modify
false	cpe-1	localhost	1883	TCP/IP				✎ 🗑

The following table describes the fields in this screen.

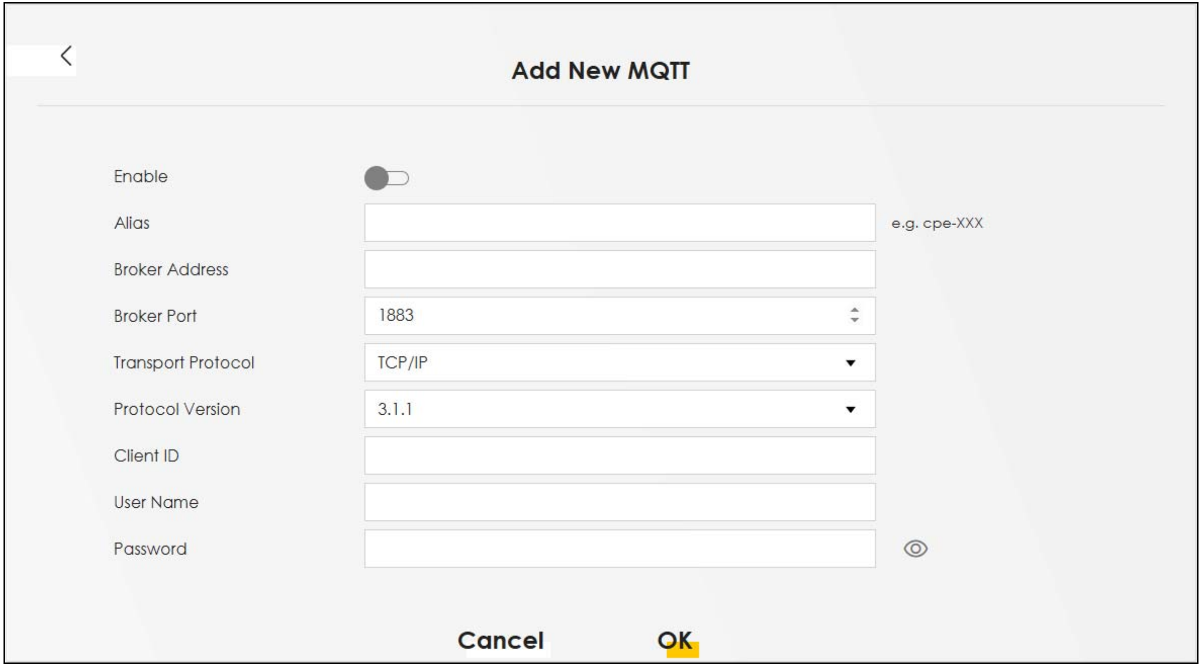
Table 138   Maintenance > TR-369 Local Agent > MQTT

LABEL	DESCRIPTION
+ Add New	Click this button to add a new MQTT client. Note: At the time of writing, you can add up to 5 MQTT clients.
Enable	This displays if the MQTT client is enabled.
Alias	This displays a friendly name to identify the MQTT client.
Broker Address	This displays the URL of the MQTT broker.
Broker Port	This displays the port used for registration with the broker.
Transport Protocol	This displays the transport protocol (TCP/IP or TLS) for the Zyxel Device to send messages to the broker.
Client ID	This displays the unique Client ID of the client connecting to the MQTT broker.
User Name	This displays the user name if the MQTT broker requires it for login.
Modify	Click the Edit icon to configure an entry. Click the Delete icon to remove an entry.

30.5.1 Add or Edit MQTT

Click Add New in the MQTT screen or click the Edit icon next to a controller. Use this screen to configure the required information for the MQTT broker.

Figure 211   Maintenance > TR-369 Local Agent > MQTT: Add or Edit



Add New MQTT

Enable ○
Alias e.g. cpe-XXX
Broker Address
Broker Port 1883
Transport Protocol TCP/IP
Protocol Version 3.1.1
Client ID
User Name
Password

The following table describes the fields in this screen.

Table 139 Maintenance > TR-369 Local Agent > Add or Edit

LABEL	DESCRIPTION
Enable	Slide this to the right to enable this MQTT client.
Alias	Enter a friendly name to identify the MQTT client. Enter 0 – 255 printable characters including special characters and spaces.
Broker Address	Enter the URL of the MQTT broker. Make sure the broker is reachable from the Zyxel Device.
Broker Port	Enter the port used for registration with the broker. The default port is shown here. If the broker is using a different port, enter that port number here.
Transport Protocol	Select the transport protocol (TCP/IP or TLS) for the Zyxel Device to send messages. Select TLS is you want MTP message encryption using a certificate in TLS. Make sure the broker also supports TLS.
Protocol Version	Select the version which the MQTT broker is using.
Client ID	Enter the unique Client ID of the MQTT client connecting to the MQTT broker if required. Enter between 1 and 23 UTF-8 encoded case-sensitive alpha-numeric characters. The MQTT broker determines the characters allowed for the Client ID.
User Name	Enter the user name if the MQTT broker requires it for login. Enter 0 – 255 printable characters including special characters and spaces.
Password	Enter the password if the MQTT broker requires it for login. Enter 0 – 255 printable characters including special characters and spaces.
OK	Click OK to save your changes.
Cancel	Click Cancel to discard your changes and return to the previous screen.

CHAPTER 31
Time Settings

31.1 Time Settings Overview

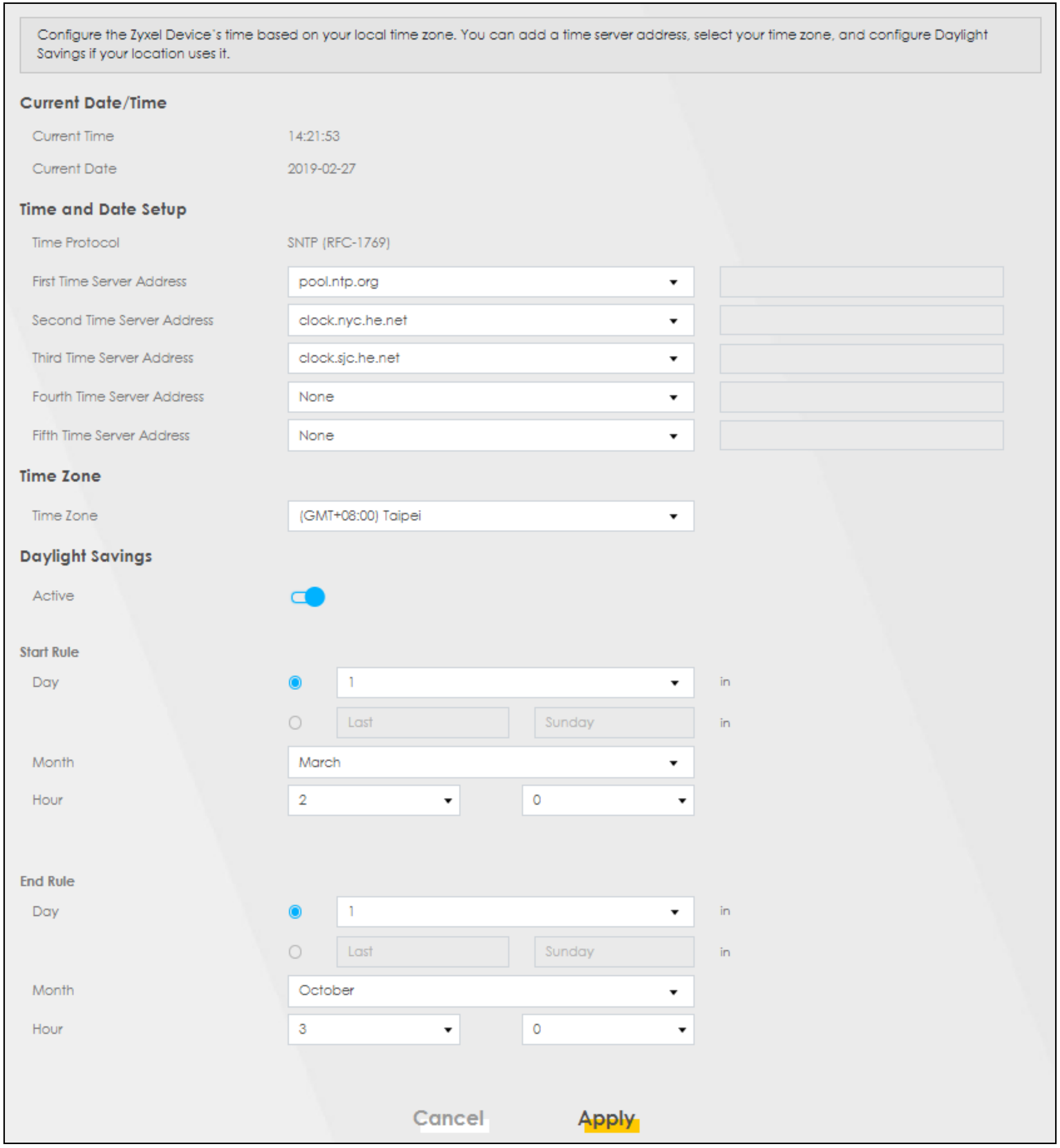
This chapter shows you how to configure system related settings, such as system date and time.

31.2 Time

For effective scheduling and logging, the Zyxel Device system time must be accurate. Use this screen to configure the Zyxel Device's time based on your local time zone. You can enter a time server address, select the time zone where the Zyxel Device is physically located, and configure Daylight Savings settings if needed.

To change your Zyxel Device's time and date, click Maintenance > Time. The screen appears as shown.

Figure 212 Maintenance > Time



Configure the Zyxel Device's time based on your local time zone. You can add a time server address, select your time zone, and configure Daylight Savings if your location uses it.

Current Date/Time

Current Time 14:21:53

Current Date 2019-02-27

Time and Date Setup

Time Protocol SNTP (RFC-1769)

First Time Server Address pool.ntp.org

Second Time Server Address clock.nyc.he.net

Third Time Server Address clock.sjc.he.net

Fourth Time Server Address None

Fifth Time Server Address None

Time Zone

Time Zone (GMT+08:00) Taipei

Daylight Savings

Active

Start Rule

Day ● 1 in

○ Last Sunday in

Month March

Hour 2 0

End Rule

Day ● 1 in

○ Last Sunday in

Month October

Hour 3 0

The following table describes the fields in this screen.

Table 140 Maintenance > Time

LABEL	DESCRIPTION
Current Date/Time	
Current Time	This displays the time of your Zyxel Device. Each time you reload this screen, the Zyxel Device synchronizes the time with the time server.
Current Date	This displays the date of your Zyxel Device. Each time you reload this screen, the Zyxel Device synchronizes the date with the time server.
Time and Date Setup	
Time Protocol	This displays the time protocol used by your Zyxel Device.

Table 140 Maintenance > Time (continued)

LABEL	DESCRIPTION
First – Fifth Time Server Address	Select an NTP time server from the drop-down list box for the first to fifth time servers. Otherwise, select Other and enter the IP address or URL (up to 29 printable characters in length) of your time server. Select None if you do not want to configure the time server. Check with your ISP/network administrator if you are unsure of this information. The Zyxel Device uses the time servers as shown in the web configurator by default.
Time Zone	
Time zone	Choose the time zone of your location. This will set the time difference between your time zone and Greenwich Mean Time (GMT).
Daylight Savings Daylight Saving Time is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daytime light in the evening.	
Active	Click this switch to enable or disable Daylight Saving Time. When the switch turns blue, the function is enabled. Otherwise, it is not.
Start Rule	Configure the day and time when Daylight Saving Time starts if you enabled Daylight Saving. You can select a specific date in a particular month or a specific day of a specific week in a particular month. The Time field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time starts in most parts of the United States on the second Sunday of March. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States, set the day to Second, Sunday, the month to March and the time to 2 in the Hour field. Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would set the day to Last, Sunday and the month to March. The time you select in the o'clock field depends on your time zone. In Germany for instance, you would select 2 in the Hour field because Germany's time zone is one hour ahead of GMT or UTC (GMT+1). For example, if you are in the United States and Daylight Saving Time starts on March 28th, the Zyxel Device time of 6 a.m will become 7 a.m.
End Rule	Configure the day and time when Daylight Saving Time ends if you enabled Daylight Saving. You can select a specific date in a particular month or a specific day of a specific week in a particular month. The Time field uses the 24 hour format. Here are a couple of examples: Daylight Saving Time ends in the United States on the first Sunday of November. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would set the day to First, Sunday, the month to November and the time to 2 in the Hour field. Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would set the day to Last, Sunday, and the month to October. The time you select in the o'clock field depends on your time zone. In Germany for instance, you would select 2 in the Hour field because Germany's time zone is one hour ahead of GMT or UTC (GMT+1). For example, if you are in the United States and Daylight Saving Time ends on October 31, the Zyxel Device time of 6 a.m will become 5 a.m.
Cancel	Click Cancel to exit this screen without saving.
Apply	Click Apply to save your changes.

CHAPTER 32 Email Notification

32.1 Email Notification Overview

A mail server is an application or a computer that can receive, forward and deliver email messages.

To have the Zyxel Device send reports, logs or notifications through email, you must specify an email server and the email addresses of the sender and receiver.

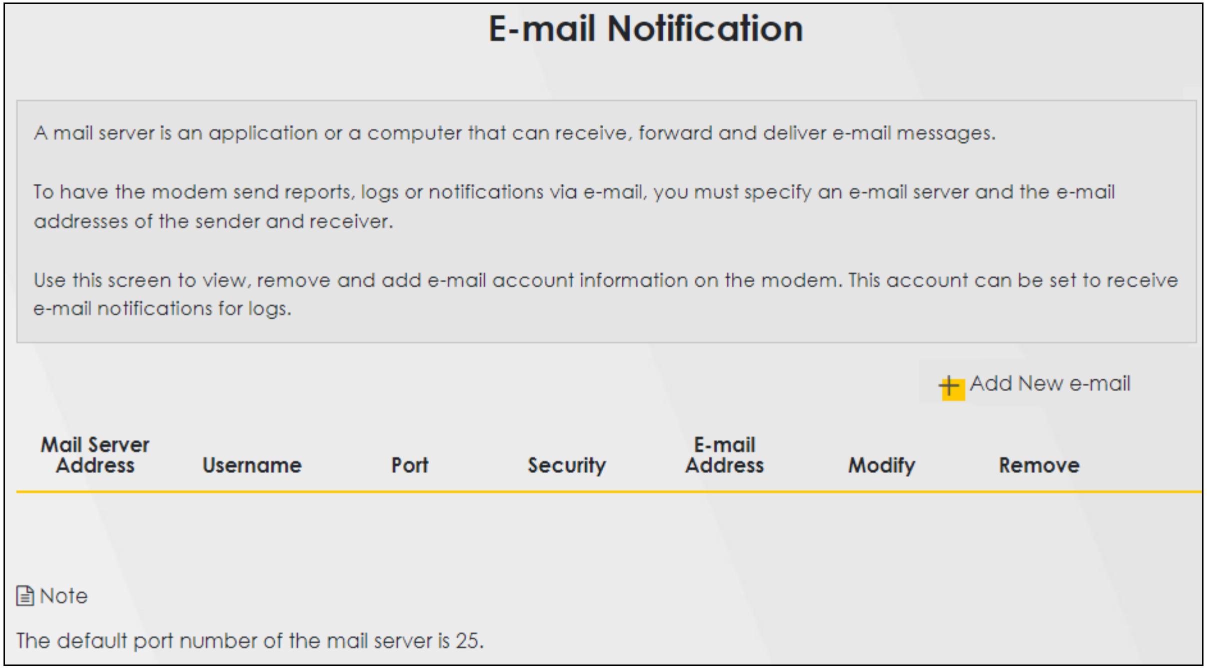
32.2 Email Notification

Use this screen to view, remove and add email account information on the Zyxel Device. This account can be set to send email notifications for logs.

Click Maintenance > E-mail Notification to open the E-mail Notification screen.

Note: The default port number of the mail server is 25.

Figure 213 Maintenance > E-mail Notification



E-mail Notification

A mail server is an application or a computer that can receive, forward and deliver e-mail messages.

To have the modem send reports, logs or notifications via e-mail, you must specify an e-mail server and the e-mail addresses of the sender and receiver.

Use this screen to view, remove and add e-mail account information on the modem. This account can be set to receive e-mail notifications for logs.

Mail Server Address	Username	Port	Security	E-mail Address	Modify	Remove

Note

The default port number of the mail server is 25.

The following table describes the labels in this screen.

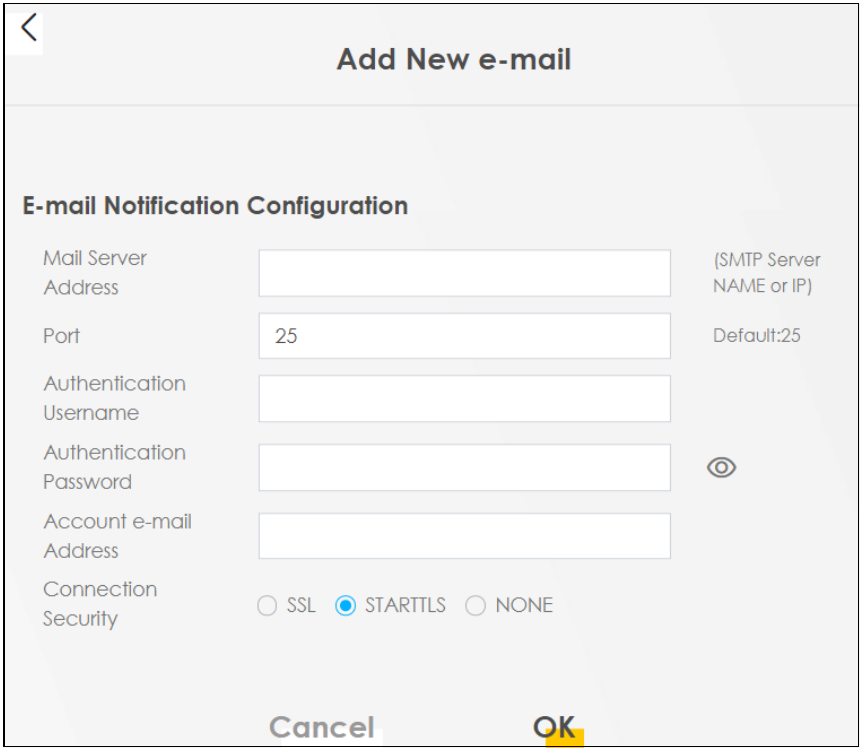
Table 141 Maintenance > E-mail Notification

LABEL	DESCRIPTION
Add New e-mail	Click this button to create a new entry (up to 32 can be created).
Mail Server Address	This displays the server name or the IP address of the mail server.
Username	This displays the user name of the sender's mail account.
Port	This field displays the port number of the mail server.
Security	This field displays the protocol used for encryption.
E-mail Address	This field displays the email address that you want to be in the from or sender line of the email that the Zyxel Device sends.
Modify	Click the Edit icon to configure the entry. Click the Delete icon to remove the entry.
Remove	Click this button to delete the selected entries.
Test	Click this to send a test email to the configured email address.

32.2.1 E-mail Notification Edit

Click the Add button in the E-mail Notification screen. Use this screen to configure the required information for sending email through a mail server.

Figure 214 Maintenance > E-mail Notification > Add



Add New e-mail

E-mail Notification Configuration

Mail Server Address		(SMTP Server NAME or IP)
Port	25	Default:25
Authentication Username		
Authentication Password		
Account e-mail Address		
Connection Security	○ SSL ● STARTTLS ○ NONE	

The following table describes the labels in this screen.

Table 142 Maintenance > E-mail Notification > Add

LABEL	DESCRIPTION
Mail Server Address	Enter the server name or the IP address of the mail server for the email address specified in the Account e-mail Address field. If this field is left blank, reports, logs or notifications will not be sent through email.
Port	Enter the same port number here as is on the mail server for mail traffic.
Authentication Username	Enter the user name. You can use up to 32 printable characters except ["], [`], ['], [<], [>], [^], [$], [|], [&], or [;]. Spaces are allowed. This is usually the user name of a mail account you specified in the Account email Address field.
Authentication Password	Enter the password associated with the user name above.
Account e-mail Address	Enter the email address that you want to be in the from or sender line of the email notification that the Zyxel Device sends. If you activate SSL/TLS authentication, the email address must be able to be authenticated by the mail server as well.
Connection Security	Select SSL to use Secure Sockets Layer (SSL) or Transport Layer Security (TLS) if you want encrypted communications between the mail server and the Zyxel Device. Select STARTTLS to upgrade a plain text connection to a secure connection using SSL/TLS. Select NONE to disable the connection security.
Cancel	Click this button to begin configuring this screen afresh.
OK	Click this button to save your changes and return to the previous screen.

CHAPTER 33
Log Setting

33.1 Log Setting Overview

You can configure where the Zyxel Device sends logs and which type of logs the Zyxel Device records in the Log Setting screen.

33.1.1 What You Can Do in this Chapter

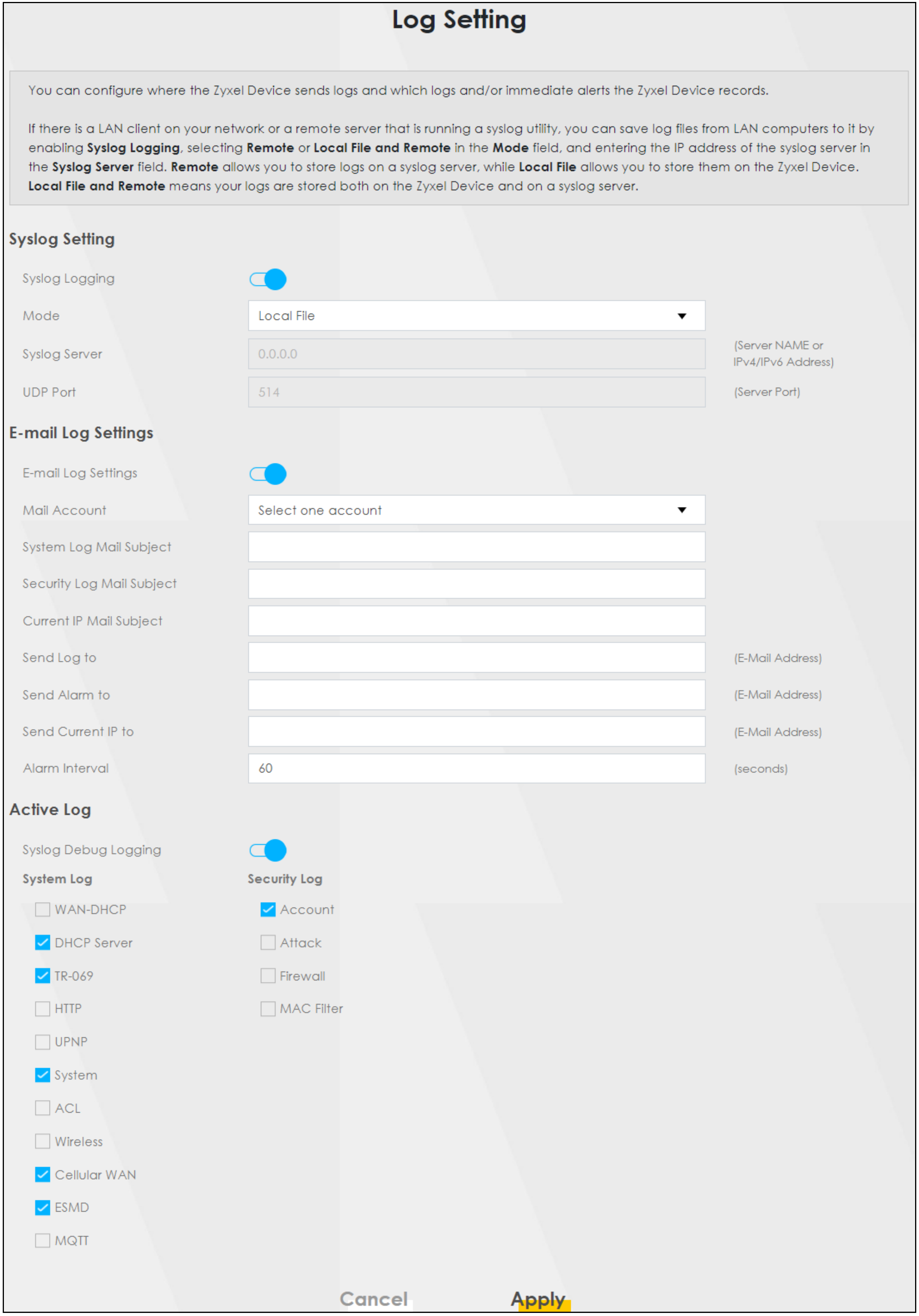
- Use the Log Setting screen to defines the types of logs and the log levels you want to record. (Log Setting).

33.2 Log Setting

Use this screen to configure where the Zyxel Device sends logs, and which type of logs the Zyxel Device records.

If you have a server that is running a syslog service, you can also save log files to it by enabling Syslog Logging, and then entering the IP address of the server in the Syslog Server field. Select Remote to store logs on the syslog server, or select Local File to store logs on the Zyxel Device. Select Local File and Remote to store logs on both the Zyxel Device and the syslog server. To change your Zyxel Device's log settings, click Maintenance > Log Setting. The screen appears as shown.

Figure 215 Maintenance > Log Setting



Log Setting

You can configure where the Zyxel Device sends logs and which logs and/or immediate alerts the Zyxel Device records.

If there is a LAN client on your network or a remote server that is running a syslog utility, you can save log files from LAN computers to it by enabling **Syslog Logging**, selecting **Remote** or **Local File and Remote** in the **Mode** field, and entering the IP address of the syslog server in the **Syslog Server** field. **Remote** allows you to store logs on a syslog server, while **Local File** allows you to store them on the Zyxel Device. **Local File and Remote** means your logs are stored both on the Zyxel Device and on a syslog server.

Syslog Setting

Syslog Logging	● On	
Mode	Local File ▼	
Syslog Server	0.0.0.0	(Server NAME or IPv4/IPv6 Address)
UDP Port	514	(Server Port)

E-mail Log Settings

E-mail Log Settings	● On	
Mail Account	Select one account ▼	
System Log Mail Subject		
Security Log Mail Subject		
Current IP Mail Subject		
Send Log to		(E-Mail Address)
Send Alarm to		(E-Mail Address)
Send Current IP to		(E-Mail Address)
Alarm Interval	60	(seconds)

Active Log

Syslog Debug Logging ● On

System Log

- □ WAN-DHCP
- ☑ DHCP Server
- ☑ TR-069
- □ HTTP
- □ UPNP
- ☑ System
- □ ACL
- □ Wireless
- ☑ Cellular WAN
- ☑ ESMD
- □ MQTT

Security Log

- ☑ Account
- □ Attack
- □ Firewall
- □ MAC Filter

The following table describes the fields in this screen.

Table 143 Maintenance > Log Setting

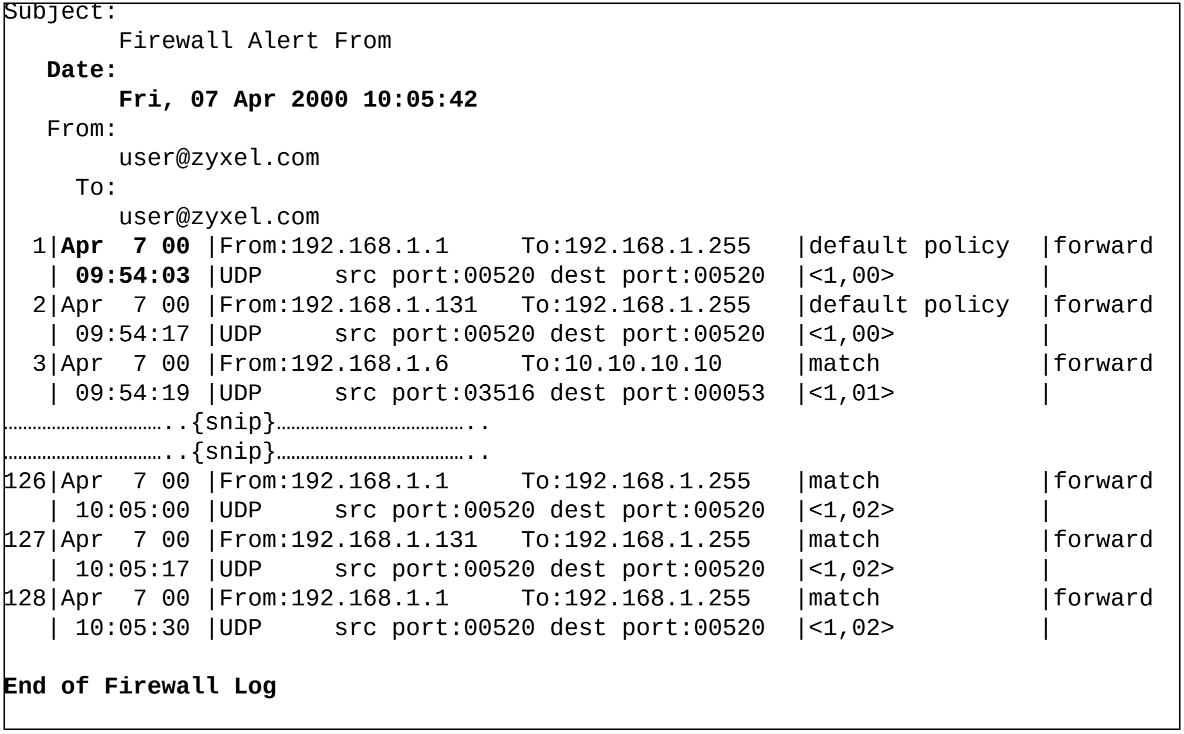
LABEL	DESCRIPTION
Syslog Settings	
Syslog Logging	Slide the switch to the right to enable syslog logging.
Mode	Select Remote to have the Zyxel Device send to an external syslog server. Select Local File to have the Zyxel Device save the log file on the Zyxel Device itself. Select Local File and Remote to have the Zyxel Device save the log file on the Zyxel Device itself and send it to an external syslog server. Note: A warning appears upon selecting Remote or Local File and Remote. Just click OK to continue.
Syslog Server	Enter the server name or IP address of the syslog server that will log the selected categories of logs.
UDP Port	Enter the port number used by the syslog server.
E-mail Log Settings	
E-mail Log Settings	Slide the switch to the right to allow to the email address specified in Send Log to. Note: Make sure that the Mail Server Address field is not left blank in the Maintenance > E-mail Notifications screen.
Mail Account	Select a server specified in Maintenance > E-mail Notifications to send the logs to.
System Log Mail Subject	This field allows you to enter a descriptive name for the system log email (for example Zyxel System Log). Up to 127 printable characters are allowed for the System Log Mail Subject including special characters inside the square brackets [!#%()*+,–./:=?@[]\{}~].
Security Log Mail Subject	This field allows you to enter a descriptive name for the security log email (for example Zyxel Security Log). Up to 127 printable characters are allowed for the Security Log Mail Subject including special characters inside the square brackets [!#%()*+,–./:=?@[]\{}~].
Send Log to	This field allows you to enter the log's designated email recipient. The log's format is plain text file sent as an email attachment.
Send Alarm to	This field allows you to enter the alarm's designated e-mail recipient. The alarm's format is plain text file sent as an email attachment.
Alarm Interval	Select the frequency of showing of the alarm.
Active Log	
System Log	Select the categories of System Logs that you want to record.
Security Log	Select the categories of Security Logs that you want to record.
Apply	Click Apply to save your changes.
Cancel	Click Cancel to restore your previously saved settings.

33.2.1 Example Email Log

An 'End of Log' message displays for each mail in which a complete log has been sent. The following is an example of a log sent by email.

- You may edit the subject title.
- The date format here is Day-Month-Year.
- The date format here is Month-Day-Year. The time format is Hour-Minute-Second.
- '`End of Log`' message shows that a complete log has been sent.

Figure 216   Email Log Example



```
Subject:
        Firewall Alert From
   Date:
        Fri, 07 Apr 2000 10:05:42
   From:
        user@zyxel.com
     To:
        user@zyxel.com
  1|Apr  7 00 |From:192.168.1.1     To:192.168.1.255   |default policy  |forward
   | 09:54:03 |UDP     src port:00520 dest port:00520  |<1,00>          |
  2|Apr  7 00 |From:192.168.1.131   To:192.168.1.255   |default policy  |forward
   | 09:54:17 |UDP     src port:00520 dest port:00520  |<1,00>          |
  3|Apr  7 00 |From:192.168.1.6     To:10.10.10.10     |match           |forward
   | 09:54:19 |UDP     src port:03516 dest port:00053  |<1,01>          |
.................................{snip}.....................................
.................................{snip}.....................................
126|Apr  7 00 |From:192.168.1.1     To:192.168.1.255   |match           |forward
   | 10:05:00 |UDP     src port:00520 dest port:00520  |<1,02>          |
127|Apr  7 00 |From:192.168.1.131   To:192.168.1.255   |match           |forward
   | 10:05:17 |UDP     src port:00520 dest port:00520  |<1,02>          |
128|Apr  7 00 |From:192.168.1.1     To:192.168.1.255   |match           |forward
   | 10:05:30 |UDP     src port:00520 dest port:00520  |<1,02>          |

End of Firewall Log
```

CHAPTER 34 Firmware Upgrade

34.1 Firmware Upgrade Overview

This chapter explains how to upload new firmware to your Zyxel Device if you get new firmware releases from your service provider.

34.2 Firmware Upgrade

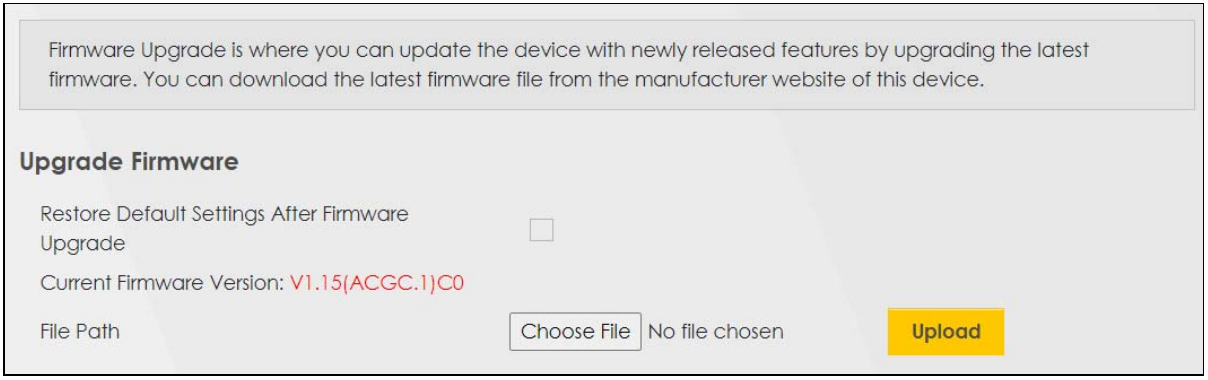
This screen lets you upload new firmware to your Zyxel Device.

Get the latest firmware from your service provider. Then upload the firmware file to your Zyxel Device. The upload process uses HTTP (Hypertext Transfer Protocol). The upload may take up to 3 minutes. After a successful upload, the Zyxel Device will reboot.

Click Maintenance > Firmware Upgrade to open the following screen.

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

Figure 217 Maintenance > Firmware Upgrade



Firmware Upgrade is where you can update the device with newly released features by upgrading the latest firmware. You can download the latest firmware file from the manufacturer website of this device.

Upgrade Firmware

Restore Default Settings After Firmware Upgrade □

Current Firmware Version: V1.15(ACGC.1)C0

File Path

The following table describes the labels in this screen.

Table 144 Maintenance > Firmware Upgrade

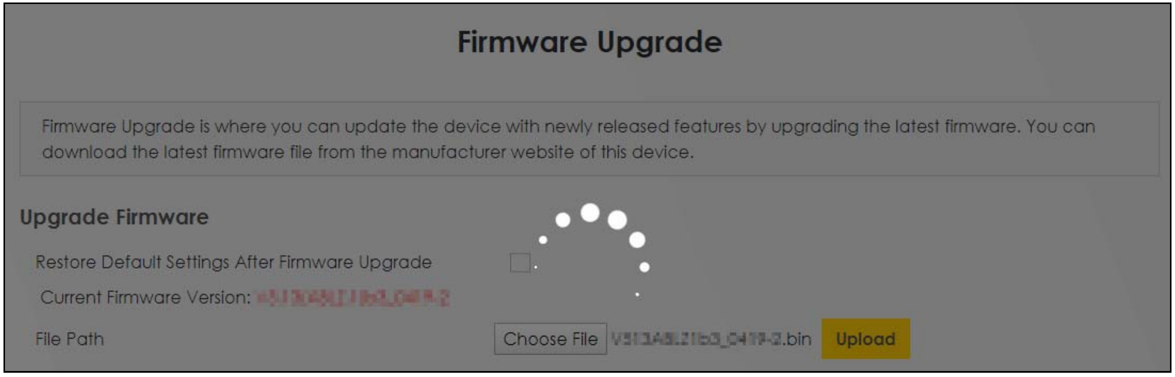
LABEL	DESCRIPTION
Upgrade Firmware	
Restore Default Settings After Firmware Upgrade	Select this to reset all your configurations, including Mesh Wi-Fi settings, to the factory defaults after firmware upgrade. Otherwise, make sure this is cleared if you do not want the Zyxel Device to lose all its current configurations and return to the factory defaults. Note: Make sure to back up the Zyxel Device's configuration settings first in case the reset all settings process is not successful.

Table 144 Maintenance > Firmware Upgrade (continued)

LABEL	DESCRIPTION
Current Firmware Version	The firmware on each Zyxel Device is identified by the firmware trunk version, followed by a unique code which identifies the model, and then the release number after the period. For example, V5.66 (ACQZ.0) is a firmware for the 5.66 version trunk, the ACQZ code identifies the DE3301-00 model, and .0 is the first firmware release for the model.
File Path	Enter the location of the file you want to upload in this field or click Choose File/Browse to find it.
Choose File/ Browse	Click this to find the .bin file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Upload	Click this to begin the upload process. This process may take up to 3 minutes. Note: Only use firmware for your Zyxel Device's specific model. Refer to the label on the bottom of your Zyxel Device. For example, if the Zyxel Device's current firmware version is V5.70(ACDZ.0)B4, you must upload the firmware file containing "ACDZ".

After you see the firmware updating screen, wait a few minutes before logging into the Zyxel Device again.

Figure 218 Firmware Uploading



Firmware Upgrade

Firmware Upgrade is where you can update the device with newly released features by upgrading the latest firmware. You can download the latest firmware file from the manufacturer website of this device.

Upgrade Firmware

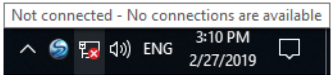
Restore Default Settings After Firmware Upgrade □

Current Firmware Version: [redacted]

File Path [redacted].bin

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

Figure 219 Network Temporarily Disconnected

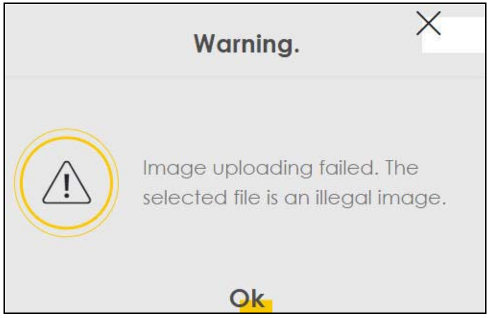


Not connected - No connections are available

After 2 minutes, log in again and check your new firmware version in the Connection Status screen.

If the upload was not successful, an error screen will appear. Click OK to go back to the Firmware Upgrade screen.

Figure 220 Error Message



Warning.

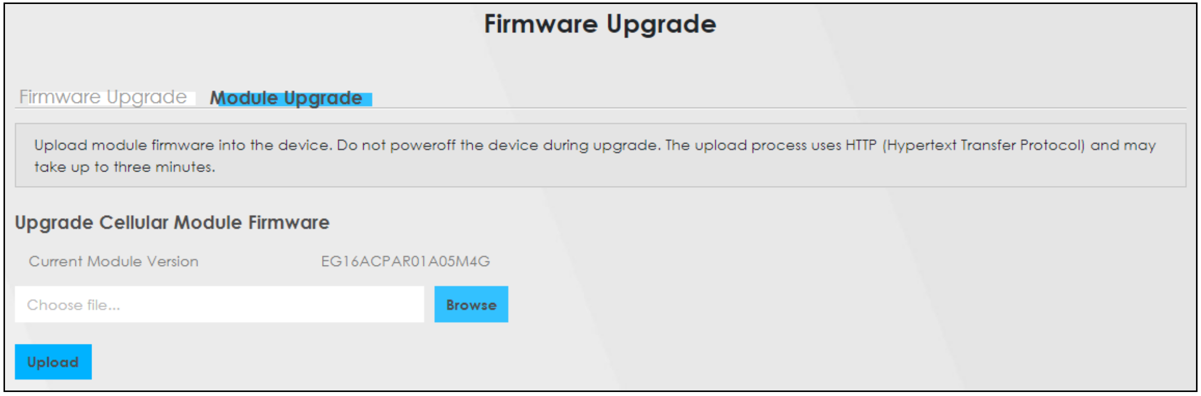
Image uploading failed. The selected file is an illegal image.

34.3 Module Upgrade

This screen lets you upload new firmware specific to the built-in LTE module in order to improve the LTE module's reliability and performance. The upload process uses HTTP (Hypertext Transfer Protocol) and may take more than 3 minutes. After a successful upload, the Zyxel Device will reboot.

Click Maintenance > Firmware Upgrade > Module Upgrade to open the following screen.

Figure 221 Maintenance > Firmware Upgrade > Module Upgrade



Firmware Upgrade

Upload module firmware into the device. Do not poweroff the device during upgrade. The upload process uses HTTP (Hypertext Transfer Protocol) and may take up to three minutes.

Upgrade Cellular Module Firmware

Current Module Version EG16ACPAR01A05M4G

Choose file...

The following table describes the labels in this screen.

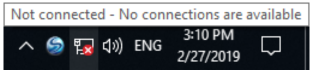
Table 145 Maintenance > Firmware Upgrade > Module Upgrade

LABEL	DESCRIPTION
Upgrade Cellular Module Firmware	
Current Module Version	This is the current module firmware version.
Choose file...	Enter the location of the file you want to upload in this field or click Choose File/Browse to find it.
Choose File/ Browse	Click this to find the .bin file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Upload	Click this to begin the upload process. This process may take more than 3 minutes.

After you see the module updating screen, wait about 20 minutes before logging into the Zyxel Device again.

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

Figure 222 Network Temporarily Disconnected



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

If the upload was not successful, an error screen will appear. Click OK to go back to the Module Upgrade screen.

CHAPTER 35 Backup/Restore

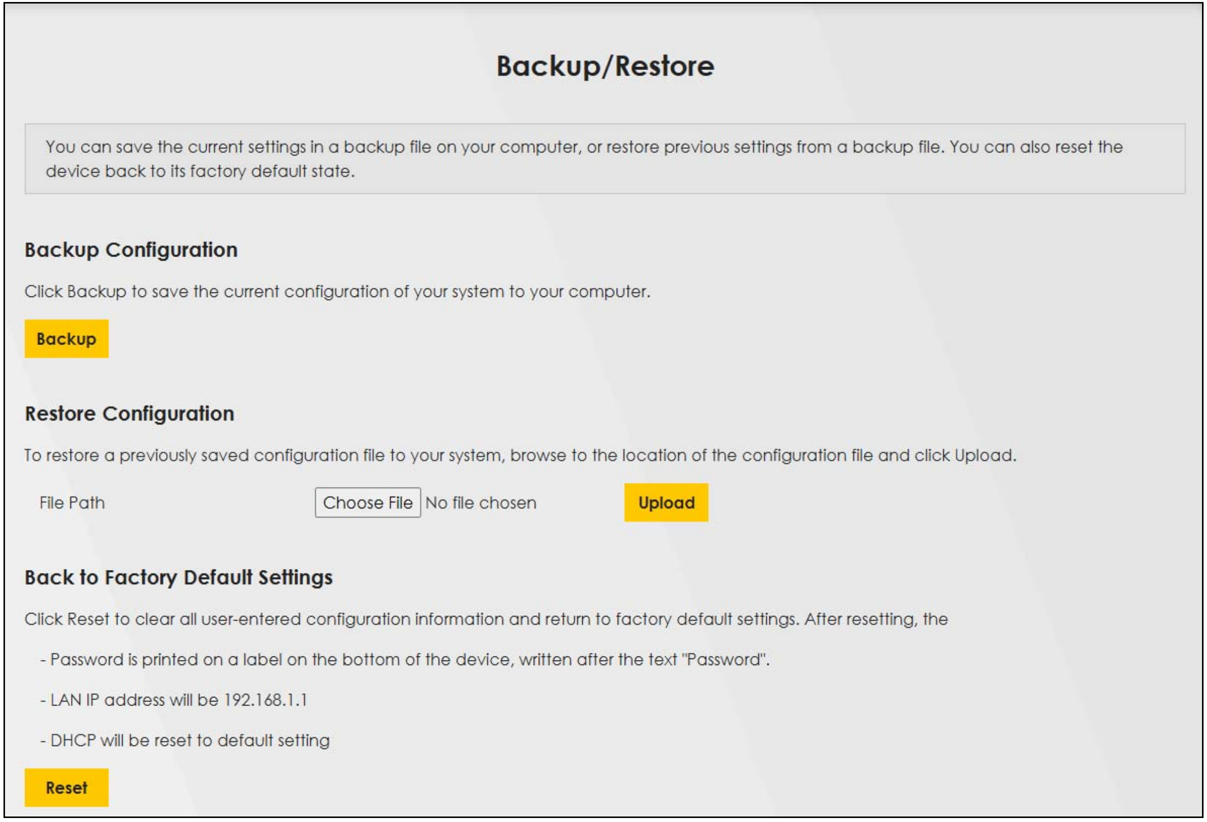
35.1 Backup/Restore Overview

Information related to factory default settings and backup configuration are shown in this screen. You can also use this to restore Zyxel Device's previous configurations.

35.2 Backup/Restore

Click Maintenance > Backup/Restore. Information related to factory defaults, backup configuration, and restoring configuration appears in this screen, as shown next.

Figure 223 Maintenance > Backup/Restore



Backup/Restore

You can save the current settings in a backup file on your computer, or restore previous settings from a backup file. You can also reset the device back to its factory default state.

Backup Configuration

Click Backup to save the current configuration of your system to your computer.

Restore Configuration

To restore a previously saved configuration file to your system, browse to the location of the configuration file and click Upload.

File Path: Choose File No file chosen

Back to Factory Default Settings

Click Reset to clear all user-entered configuration information and return to factory default settings. After resetting, the

- Password is printed on a label on the bottom of the device, written after the text "Password".
- LAN IP address will be 192.168.1.1
- DHCP will be reset to default setting

Backup Configuration

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

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

Restore Configuration

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

Table 146 Maintenance > Backup/Restore: Restore Configuration

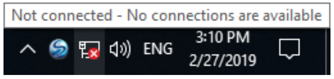
LABEL	DESCRIPTION
File Path	the location of the file you want to upload in this field or click Choose File / Browse to find it.
Choose File / Browse	Click this to find the file you want to upload. Remember that you must decompress compressed (.ZIP) files before you can upload them.
Upload	Click this to begin the upload process.
Reset	Click this to reset your Zyxel Device settings back to the factory default.

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

After the Zyxel Device configuration has been restored successfully, the login screen appears. Login again to restart the Zyxel Device.

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

Figure 224 Network Temporarily Disconnected

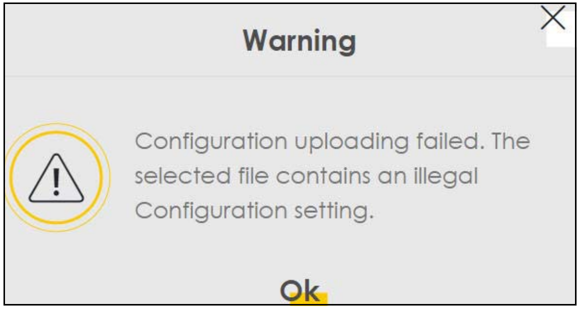


Not connected - No connections are available

If you restore the default configuration, you may need to change the IP address of your computer to be in the same subnet as that of the default Zyxel Device IP address (192.168.1.1 – 192.168.1.254).

If the upload was not successful, an error screen will appear. Click OK to go back to the Configuration screen.

Figure 225 Configuration Upload Error



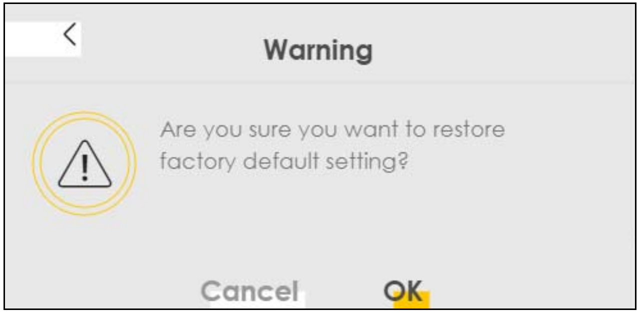
Warning

Configuration uploading failed. The selected file contains an illegal Configuration setting.

Back to Factory Default Settings

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

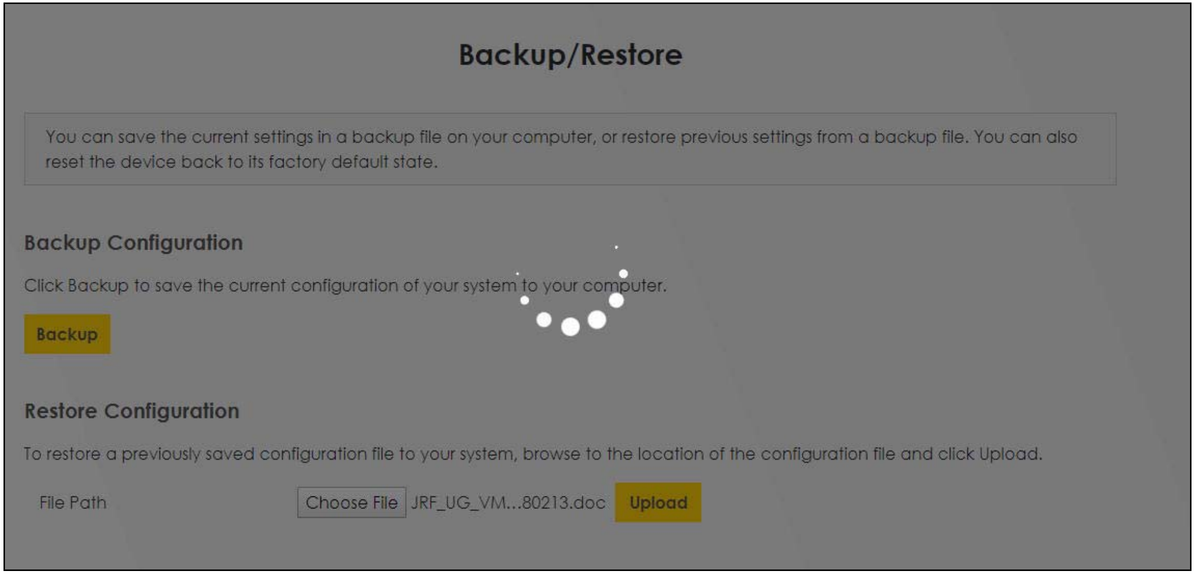
Figure 226 Reset Warning Message



Warning

Are you sure you want to restore factory default setting?

Figure 227 Reset In Progress



Backup/Restore

You can save the current settings in a backup file on your computer, or restore previous settings from a backup file. You can also reset the device back to its factory default state.

Backup Configuration

Click Backup to save the current configuration of your system to your computer.

Restore Configuration

To restore a previously saved configuration file to your system, browse to the location of the configuration file and click Upload.

File Path Choose File JRF_UG_VM...80213.doc

You can also press the Reset button on the Zyxel Device to reset the Zyxel Device to the factory defaults.

35.3 Reboot

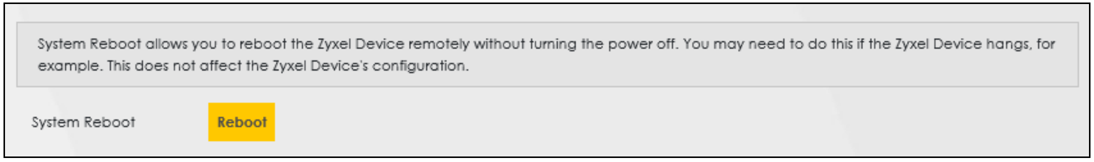
For Zyxel Device supports mesh, this page displays Mesh Reboot. For Zyxel Device doesn’t not support mesh, this page displays System Reboot,

35.3.1 System Reboot

System Reboot allows you to restart the Zyxel Device remotely without turning the power off. You may need to do this if the Zyxel Device hangs, for example. This does not affect the Zyxel Device's configuration.

Go to Maintenance > Reboot. Click Reboot to have the Zyxel Device restart.

Figure 228 Maintenance > Reboot > System Reboot



System Reboot allows you to reboot the Zyxel Device remotely without turning the power off. You may need to do this if the Zyxel Device hangs, for example. This does not affect the Zyxel Device's configuration.

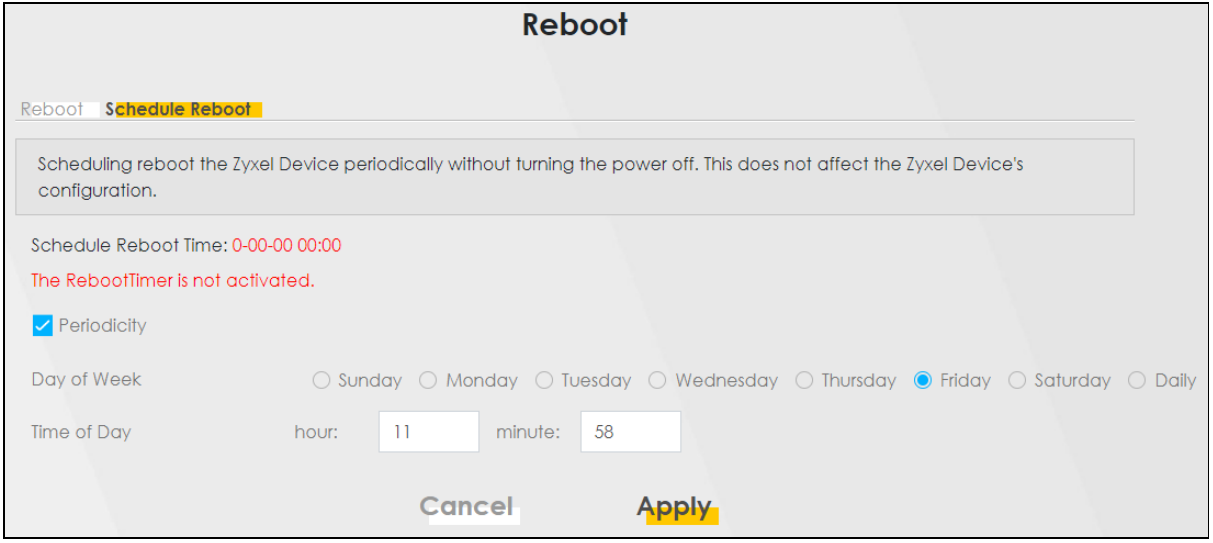
System Reboot **Reboot**

35.4 Schedule Reboot

Use the Schedule Reboot screen to schedule the date and time to reboot the Zyxel Device remotely without turning the power off. You can also select a specific day of the week and time to periodically reboot the Zyxel Device remotely.

Click Maintenance > Reboot > Schedule Reboot to open the following screen.

Figure 229 Maintenance > Reboot > Schedule Reboot



Reboot

Reboot **Schedule Reboot**

Scheduling reboot the Zyxel Device periodically without turning the power off. This does not affect the Zyxel Device's configuration.

Schedule Reboot Time: 0-00-00 00:00

The RebootTimer is not activated.

☑ Periodicity

Day of Week ○ Sunday ○ Monday ○ Tuesday ○ Wednesday ○ Thursday ● Friday ○ Saturday ○ Daily

Time of Day hour: 11 minute: 58

Cancel Apply

The following table describes the labels in this screen.

Table 147 Maintenance > Reboot > Schedule Reboot

LABEL	DESCRIPTION
Periodicity	Select this to have the Zyxel Device periodically.
Day of Week	Select the day of the week to apply periodic rebooting. Day of Week is not available when the previous field is not selected.
Time of Date	Select the date of the year that you plan to reboot the Zyxel Device remotely.
Time of Day	Select the time of the day that you plan to reboot the Zyxel Device remotely.
Cancel	Click Cancel to close the window with changes unsaved.
Apply	Click Apply to save the changes back to the Zyxel Device.

CHAPTER 36
Diagnostic

36.1 Diagnostic Overview

The Diagnostic screen displays information to help you identify Internet connection problems with the Zyxel Device.

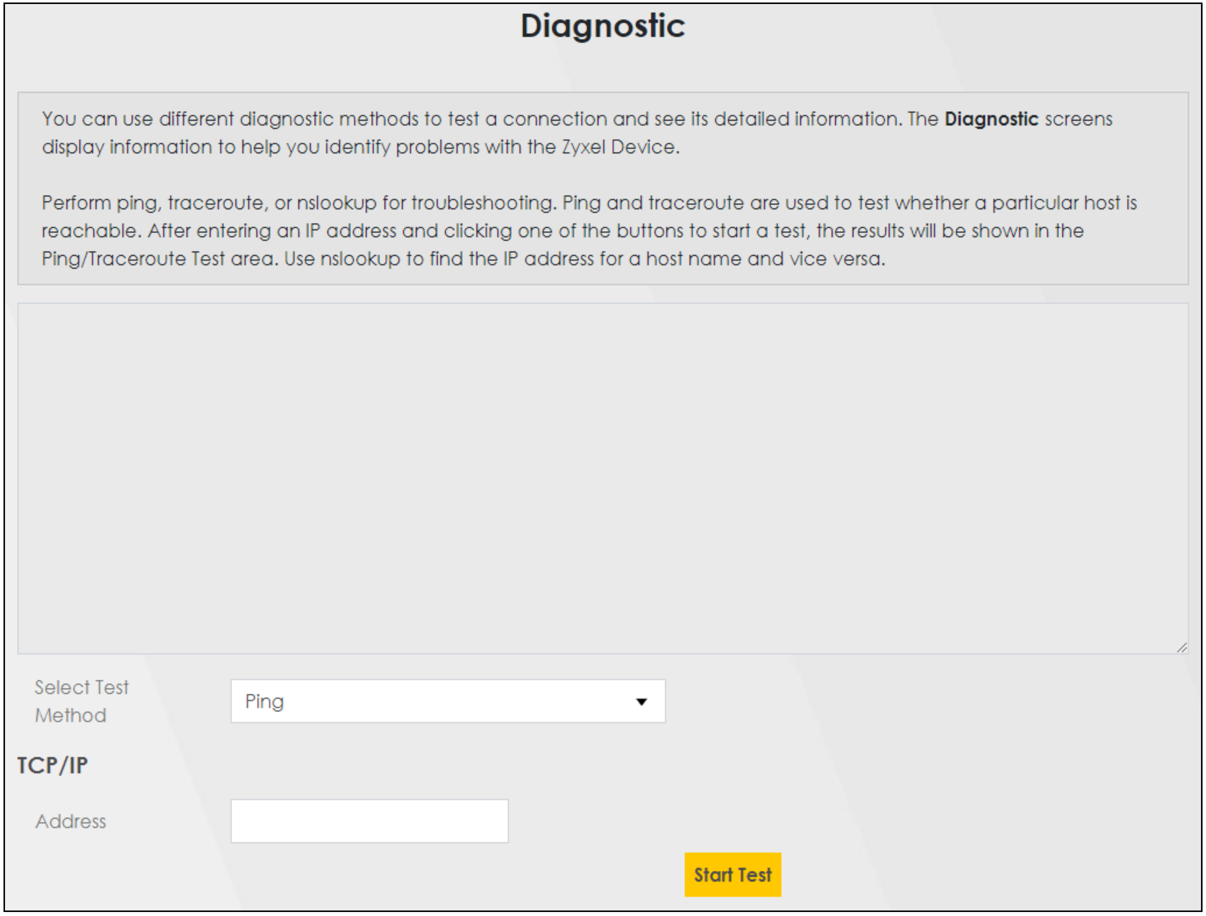
36.1.1 What You Can Do in this Chapter

36.2 Diagnostic

Use this screen to ping, traceroute or nslookup for troubleshooting. Ping and traceroute are used to test whether a particular host is reachable. After entering an IP address and clicking one of the buttons to start a test, the results will be shown in the screen. Use nslookup to find the IP address for a host name and the host name for an IP address. Use TR-471 test to perform an Internet connection quality test through a TR-471 test server for applications such as live streaming, online games and VoIP.

Click Maintenance > Diagnostic to open the following screen.

Figure 230 Maintenance > Diagnostic



Diagnostic

You can use different diagnostic methods to test a connection and see its detailed information. The **Diagnostic** screens display information to help you identify problems with the Zyxel Device.

Perform ping, traceroute, or nslookup for troubleshooting. Ping and traceroute are used to test whether a particular host is reachable. After entering an IP address and clicking one of the buttons to start a test, the results will be shown in the Ping/Traceroute Test area. Use nslookup to find the IP address for a host name and vice versa.

Select Test Method: Ping

TCP/IP

Address

The following table describes the fields in this screen.

Table 148 Maintenance > Diagnostic

LABEL	DESCRIPTION
Ping/TraceRoute Test	The result of tests is shown here in the info area.
Select Test Method	
Ping	Select this to perform a ping test on the IPv4 address or host name in order to test a connection. The ping statistics will show in the info area.
Ping 6	Select this to perform a ping test on the IPv6 address or host name in order to test a connection. The ping statistics will show in the info area.
Trace Route	Select this to perform the IPv4 trace route function. This determines the path a packet takes to the specified host.
Trace Route 6	Select this to perform the IPv6 trace route function. This determines the path a packet takes to the specified host.
Nslookup	Select this to perform a DNS lookup on the IP address or host name.
TCP/IP	
Address	Enter the IP address of a computer that you want to perform ping, trace route or nslookup in order to test a connection.

CHAPTER 37 Legal and Regulatory

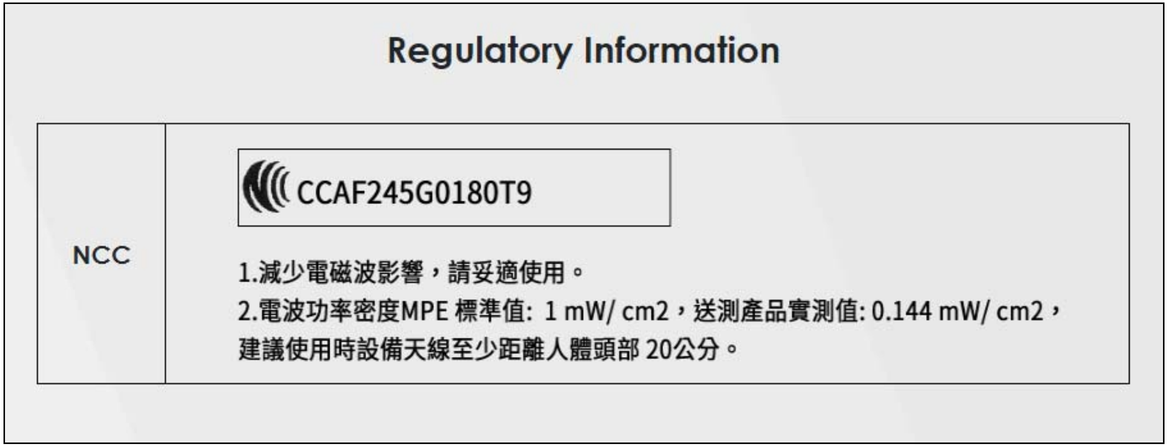
37.1 Overview

Use this screen to view the regulatory information for your Zyxel Device.

37.2 The Regulatory Information Screen

Go to Maintenance > Legal and Regulatory to check the applicable regulatory information for your Zyxel Device.

Figure 231 Maintenance > Legal and Regulatory > Regulatory Information



Regulatory Information

NCC	CCAF245G0180T9 1.減少電磁波影響，請妥適使用。 2.電波功率密度MPE 標準值: 1 mW/ cm2，送測產品實測值: 0.144 mW/ cm2，建議使用時設備天線至少距離人體頭部 20公分。

The following table describes the labels in this screen.

Table 149 Maintenance > Legal and Regulatory > Regulatory Information

LABEL	DESCRIPTION
Regulatory Information	
NCC	This field displays the certification from the National Communications Commission (NCC).

Part III

Troubleshooting and Appendices

Appendices contain general information. Some information may not apply to your Zyxel Device.

CHAPTER 38 Troubleshooting

38.1 Troubleshooting Overview

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

- Accessibility and Compatibility Problems
- Power and Hardware Problems
- Device Access Problems
- Cellular Problems
- Internet Problems
- Wi-Fi Problems
- USB Problems
- UPnP Problems

38.2 Accessibility and Compatibility Problems

Screen reader not reading content.

- Ensure the latest version of the screen reader is installed.
- Check if the screen reader's accessibility settings are enabled.

Web browser not displaying correctly.

- Clear your web browser cache.
- Ensure that JavaScript is enabled.
- Try using a different supported web browser.

38.3 Power and Hardware Problems

The Zyxel Device does not turn on.

Non-PoE Devices

1 Make sure you are using the power adapter included with the Zyxel Device.

2 Make sure the power adapter is connected to the Zyxel Device and plugged in to an appropriate power source. Make sure the power source is turned on.

3 Disconnect and re-connect the power adapter to the Zyxel Device.

4 Make sure you have pressed the POWER button to turn on the Zyxel Device.

5 If the problem continues, contact the vendor.

PoE Devices

1 Make sure you are using the power adapter included with the Zyxel Device.

2 Make sure the PoE is connected to the Zyxel Device and plugged in to an appropriate power source.

3 Make sure the power source is turned on.

4 Turn the Zyxel Device off and on.

5 If the problem continues, contact the vendor.

The LED does not behave as expected.

1 Make sure you understand the normal behavior of the LED.

2 Check the hardware connections.

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

4 Turn the Zyxel Device off and on.

5 If the problem continues, contact the vendor.

38.4 Device Access Problems

I do not know the IP address of the Zyxel Device.

1 The default IP address is 192.168.1.1.

2 If you changed the IP address, you might be able to find the IP address of the Zyxel Device by looking up the IP address of your computer's default gateway. To do this in Microsoft Windows, click Start > Run, enter cmd, and then enter ipconfig. The IP address of the Default Gateway might be the IP address of the Zyxel Device, depending on your network environment.

3 If this does not work, reset the Zyxel Device to its factory defaults.

- Locate a small hole labeled RESET on the Zyxel Device.
- Use a paperclip or a similar tool to press and hold the RESET button for more than 5 seconds.
- Release the button, and the Zyxel Device will reset to its default settings, including the default IP address, user name, and password.

Note: Resetting the Zyxel Device will erase all your custom settings, so you need to reconfigure it.

I forgot the admin password.

1 See the Zyxel Device label or this document's cover page for the default admin password.

2 If you changed the password from default and cannot remember the new one, you have to reset the Zyxel Device to its factory default settings.

I cannot access the Web Configurator login screen.

1 Make sure you are using the correct IP address.

- The default IP address is 192.168.1.1.
- If you changed the IP address, use the new IP address.
- If you changed the IP address and have forgotten the new address, see the troubleshooting suggestions for I do not know the IP address of the Zyxel Device.

2 Check the hardware connections, and make sure the LEDs are behaving as expected.

3 Make sure your Internet browser does not block pop-up windows and has JavaScript and Java enabled.

4 Clear the Internet browser cache and try accessing the Web Configurator login screen again. Outdated browser data can cause login issues. If the problem persists, try logging into the Web Configurator using a different browser. (For example, Chrome, Firefox, Edge.)

5 If it is possible to log in from another interface, check the service control settings for HTTP and HTTPS (Maintenance > Remote Management).

6 Reset the Zyxel Device to its factory default, and try to access the Zyxel Device with the default IP address.

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

Advanced Suggestions

- Make sure you have logged out of any earlier management sessions using the same user account even if they were through a different interface or using a different browser.
- Try to access the Zyxel Device using another service, such as Telnet. If you can access the Zyxel Device, check the remote management settings and firewall rules to find out why the Zyxel Device does not respond to HTTP.

I cannot log into the Zyxel Device.

1 For first-time Zyxel Device logins, after using the label password to access the Web Configurator, ensure your new password meets the requirements on the screen. For example, some models require the new password to be at least 8 characters long and include at least one uppercase letter, one lowercase letter, one number, and one special character.

2 Make sure you have entered the user name and password correctly. The default user name is admin. These both user name and password are case-sensitive, so make sure [Caps Lock] is not on.

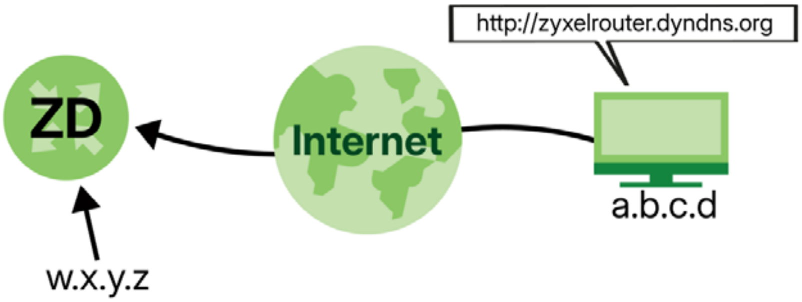
3 You cannot log in to the Web Configurator while someone is using Telnet to access the Zyxel Device. Log out of the Zyxel Device in the other session, or ask the person who is logged in to log out.

4 Turn the Zyxel Device off and on.

5 If this does not work, you have to reset the Zyxel Device to its factory default. To reset the Zyxel Device, press the RESET button until the POWER LED begins to blink and then release it.

I cannot log into the Zyxel Device using DDNS.

If you connect your Zyxel Device to the Internet and it uses a dynamic WAN IP address, it is inconvenient for you to manage the Zyxel Device from the Internet. The Zyxel Device’s WAN IP address changes dynamically. Dynamic DNS (DDNS) allows you to access the Zyxel Device using a domain name.



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

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

Here are the three steps to use a domain name to log in the Web Configurator:

Step 1 Register for a DDNS Account on www.dyndns.org

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

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

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

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

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

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

Step 2 Configure DDNS on Your Zyxel Device

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

- Select Enable Dynamic DNS.
- Select www.DynDNS.com as the service provider.
- Enter zyxelrouter.dyndns.org in the Host Name field.
- Enter the user name (UserName1) and password (12345). Click Apply.

Step 3 Test the DDNS Setting

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

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

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

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

I cannot connect to the Zyxel Device using Telnet, SSH, or Ping.

1 See the Remote Management section for details on allowing web services (such as HTTPS, Telnet, SSH and Ping) to access the Zyxel Device.

2 Check the server Port number field for the web service in the Maintenance > Remote Management screen. You must use the same port number in order to use that web service for remote management.

3 Try the troubleshooting suggestions for I cannot access the Web Configurator login screen. Ignore the suggestions about your browser.

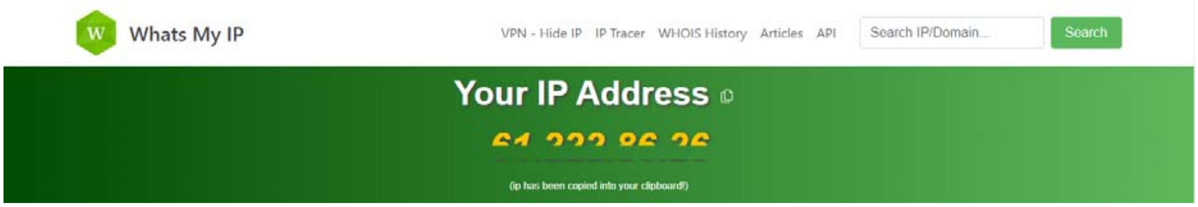
I cannot access the Zyxel Device from outside the network (WAN).

To test if this is due to CGNAT, follow these steps:

1 Log in to your Zyxel Device's Web Configurator using the default IPv4 address (for example, 192.168.1.1).

2 Locate the WAN IP address on the Dashboard screen. You can find this information in the Network or WAN settings.

3 Go to a website that can show you the public IP address of your network (for example, https://whatsmyip.com). When you access this site, it will display your public IP address.



4 Compare the WAN IP address displayed on the Dashboard screen with the public IP address shown on the https://whatsmyip.com website.

- If both IP addresses are the same, your ISP is not using Carrier-Grade NAT, and you should be able to access your Zyxel Device from the WAN (outside).
- If the IP addresses are different, it indicates that your ISP is using Carrier-Grade NAT, and your Zyxel Device has a shared public IP address. As a result, remote access to your Zyxel Device from the WAN will not be possible.

If you discover that your Zyxel Device is behind a Carrier-Grade NAT and you need remote access, you must contact your ISP and request a public IP address for your SIM card or Zyxel Device.

I cannot use my Zyxel Device to assign IP addresses.

There are two modes you can select for the Zyxel Device: Router Mode and IP Passthrough Mode. In Router Mode, the Zyxel Device can assign IP addresses to LAN clients. In IP Passthrough Mode, the Zyxel Device passes the public IP address assigned by the ISP directly to LAN clients.

If you want the Zyxel Device to assign IP addresses, you need to set the Zyxel Device to Router Mode and enable DHCP.

1 Checking Router Mode

To check if your Zyxel Device is in Router Mode, go to the Home screen. In the Cellular Info section, check if the Mode field displays Router Mode. If the Mode field displays IP Passthrough Mode, follow the steps below to change to Router Mode:

- Click the menu icon (☰) and go to Network Setting > Broadband > Cellular APN.
- Click the Modify icon in the row of the APN that is enabled and currently active. The Edit APN screen will appear.
- Click the IP Passthrough switch to the left to turn off IP Passthrough Mode. Click OK.
- Go to the Home screen and check the Cellular Info section. The Mode field should now display Router Mode.

2 Enabling DHCP

DHCP (Dynamic Host Configuration Protocol) is a protocol that automatically assigns IP addresses to LAN clients. To enable DHCP on your Zyxel Device:

- Go to Network Setting > Home Networking > LAN Setup.
- Select Enable in the DHCP Server State. Click Apply.

Your Zyxel Device should now be able to assign IP addresses to LAN clients on your network.

I cannot assign a public IP address to my client devices.

Use IP Passthrough mode when you want the Zyxel Device to pass the public IP address from your ISP directly to another device behind the Zyxel Device. This device can be a firewall behind the Zyxel Device, which will handle NAT and routing functions. You want to avoid double NAT (on both the Zyxel Device and the firewall), which can cause issues with VPNs, VoIP, and online gaming. The device behind the Zyxel Device may need a public IP address directly for:

- IPSec (IP Security Protocol) VPNs - to establish a secure tunnel directly to a public IP address.
- Remote access - to make the device directly accessible from the Internet.
- Hosting services (e.g., web or mail servers) - to ensure the servers are reachable from the Internet on a fixed public IP address.

1 Outdoor Zyxel Device: IP Passthrough Mode

To set an outdoor Zyxel Device to IP Passthrough mode, follow the steps below:

- Log into the Web Configurator.

- Go to Network Setting > Broadband > Cellular APN. In APN Settings, select the client device that you want to receive the public IP address assigned by the ISP. Click the Modify icon ✎
- The Edit APN screen appears. Click the IP Passthrough switch to the right to enable IP Passthrough mode on the Zyxel Device for the selected client device.
- In the Passthrough Mode drop-down list, you have two options:

  Dynamic: This option forwards traffic to any LAN computer on the Zyxel Device's local network.

  Fixed: This option forwards traffic to a specific computer by entering its MAC address. When you select Fixed, the Passthrough to fixed MAC field appears. This allows you to enter the MAC address of the specific computer.
- Click OK to save the settings.

2 Indoor Zyxel Device: IP Passthrough Mode

To set an indoor Zyxel Device to IP Passthrough mode, follow the steps below:

- Log into the Web Configurator.
- Go to Network Setting > Broadband > Cellular IP Passthrough.
- In IP Passthrough Management, click the IP Passthrough switch to the right to enable IP Passthrough on the Zyxel Device.
- In Passthrough Mode, you have two options: Dynamic and Fixed.

  Dynamic: This option forwards traffic to any LAN computer on the Zyxel Device's local network.

  Fixed: This option forwards traffic to a specific computer by entering its MAC address. When you select Fixed, the Passthrough to fixed MAC field appears. This allows you to enter the MAC address of the specific computer.
- Click Apply to save the settings.

I need more than one account on my Zyxel Device.

To let multiple users access the Web Configurator, you can create more than one Administrator or User account. A total of eight users can log in to the Zyxel Device at the same time.

The total number of accounts you can create for each group type:

Administrator Account	4
User Account	4

Follow the steps below to create Administrator or User accounts:

1 Log in to the Web Configurator. Go to Maintenance > User Account. Click the + icon on the right to Add New Account.

2 Enter the information for the new account in the appropriate fields. In the Group drop-down list, select Administrator or User to assign different privileges to the account. For more details about the privileges of Administrator and User accounts, please refer to User Account. Click OK.

3 In the Maintenance > User Account screen, the newly created account will be displayed. Click Apply to save the new accounts.

38.5 Cellular Problems

The SIM card cannot be detected.

1. Disconnect the Zyxel Device from the power supply.
2. Remove the SIM card from its slot.
3. Clean the SIM card slot of any loose debris using compressed air.
4. Clean the gold connectors on the SIM card with a clean lint-free cloth.
5. Insert the SIM card into its slot and connect the Zyxel Device to the power supply to restart it.

I get an Invalid SIM card alert.

1. Make sure you have an active plan with your ISP.
2. Make sure that the Zyxel Device is in the coverage area of a cellular network.
3. Enable Data Roaming in Network Setting > Broadband > Cellular WAN to keep the Zyxel Device connected to the Internet when you are traveling outside the geographical coverage area of the network to which you are registered, such as a different country. Then, restart the Zyxel Device.

I get a weak cellular signal.

1. Check the signal strength. Look at the LEDs, and check the LED section for more information. If the signal strength is low, try moving the Zyxel Device closer to the ISP's base station if possible, and look around to see if there are any devices that might be interfering with the wireless network (such as microwaves, other wireless networks).
2. Select Auto in Network Setting > Broadband > Cellular Band: Preferred Access Technology and slide the switch to the right to enable Band Auto Selection.
3. Find the location of your nearest cellular base stations, then install the Zyxel Device towards the direction of those sites. The nearest site or site with a direct line-of-sight is usually preferred.

   Note: It is best to test towards more than one cellular site, as the nearest site / line-of-sight is not always the best due to the terrain, interference, density of usage, and so on. All of these factors influence the stability, availability and throughput of the link to the Zyxel Device.

4. Conduct test measurements using the Web Configurator's System Monitor > Cellular WAN Status screen to obtain a report of the cellular network signal strength and quality at various test positions.

Note: It is best to reboot the Zyxel Device before each test measurement is taken to ensure that it is not camping on the previous cellular site. This is because the Zyxel Device can 'lock' onto the previous cellular site even when the new cellular site is at a much better signal level and quality.

5 Although installing the Zyxel Device as high as possible is the usual rule of thumb, it is sometimes possible that the Zyxel Device is in a weak coverage spot at that specific height. Adjust the height to achieve the best service possible. Use app to determine the best location for your Zyxel Device.

It is possible that the current serving cellular site has become over utilized or is out-of-service. In this case, you may need to reposition the Zyxel Device to the direction with the strongest cellular signal. Use app to determine the best location for your Zyxel Device.

I don't want to enter the SIM card PIN code every time I reboot the Zyxel Device.

A PIN (Personal Identification Number) code is the key to a SIM card. The PIN code for your SIM card protects against unauthorized users. When the Internet connection is down, users may need to reboot the Zyxel Device. Enabling PIN Protection allows the Zyxel Device to prompt you for the PIN code every time the Zyxel Device reboots. If you don't want to enter the PIN code every time the Zyxel Device reboots, follow the steps below:

1 Click the menu icon (☰) and go to Broadband > Cellular SIM > PIN Management.

2 Click the Auto Unlock PIN switch to the right to enable Auto Unlock PIN. Enter the PIN code and click Apply. For more details about Auto Unlock PIN, please refer to Section 7.7 on page 182.

Now, you don't need to enter the PIN code every time you reboot the Zyxel Device.

38.6 Internet Problems

I cannot access the Internet.

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

2 Check the SIM card. Maybe it has wrong settings, the account has expired, it needs to be removed and reinserted (refer to the Quick Start Guide), or it is missing. See Section 38.8 on page 400 for possible SIM card problems.

3 Make sure you entered your ISP account information correctly on the Network Setting > Broadband screen. Fields on this screen are case-sensitive, so check if [Caps Lock] is on of off.

4 Check that the WAN interface you are connected to is in the same interface group as the Ethernet connection (Network Setting > Interface Group).

5 Make sure you have the Ethernet WAN port connected to a Modem or Router.

6 If you set up a WAN connection using bridging service, make sure you turn off the DHCP feature in the Network Setting > Home Networking > LAN Setup screen to have the clients get WAN IP addresses directly from your ISP's DHCP server.

7 For models that have optional dual LAN/WAN ports, make sure you converted the LAN port to a WAN port by clicking Enable on the Network Setting > Broadband > Ethernet WAN screen. Then make sure you have the Ethernet WAN port connected to a modem or router.

8 If you are trying to access the Internet wirelessly, make sure that you enabled the Wi-Fi in the Zyxel Device and your Wi-Fi client and that the Wi-Fi settings in the Wi-Fi client are the same as the settings in the Zyxel Device.

9 Disconnect all the cables from your Zyxel Device and reconnect them.

10 Check that the network monitoring feature of the Zyxel Device is enabled. Network monitoring helps identify issues with Internet connection and allows the Zyxel Device to attempt reconnection to the base station if the cellular connection is lost. To enable Network Monitoring, Go to Network Settings > Broadband > Cellular WAN. See Cellular WAN for more information about network monitoring.

11 If you want to use the 5 Ghz Wi-Fi network, check with your ISP for the 5G bands supported in your area. Go to Networking > Broadband > Cellular Band > Band Management, switch Band Auto Selection to the left to manually select the cellular bands. Choose the specific 5G bands provided by your ISP for a stable Internet connection, and click Apply. For example, you might select n77, n78, and n79 for 5G. Note that cellular bands vary by country.

12 If the problem continues, contact your ISP.

How to verify if my WAN connection is active?

1 Check the WAN LED indicator on the Zyxel Device to see if the WAN connection is active.

2 Log into the Web Configurator. In Connection Status, if the WAN connection is down, the WAN Status field displays Connection down. If there is an active WAN connection, the WAN Status field shows the type and speed of the connection. For example, Ethernet WAN 1000/Full means the Zyxel Device's Ethernet WAN link speed is 1000 megabits per second (1 Gbps) in full duplex mode. Full duplex means the Zyxel Device can transmit and receive data at the same time.

I cannot connect to the Internet using an Ethernet connection.

1 Make sure you have the Ethernet WAN port connected to a Modem or Router.

2 Make sure you configured a proper Ethernet WAN interface (Network Setting > Broadband screen) with the Internet account information provided by your ISP and that it is enabled.

3 Check that the WAN interface you are connected to is in the same interface group as the Ethernet connection (Network Setting > Interface Group).

4 If you set up a WAN connection using bridging service, make sure you turn off the DHCP feature in the Network Setting > Home Networking > LAN Setup screen to have the clients get WAN IP addresses directly from your ISP's DHCP server.

The Internet connection is slow or intermittent.

1 There might be a lot of traffic on the network. If the Zyxel Device is sending or receiving a lot of information, try closing some programs that use the Internet, especially peer-to-peer applications.

2 For models that support external antennas, see Section 1.1.1 on page 18. Connect two external antennas to improve the cellular WAN signal strength. Then, set the INT / EXT / INT EXT / EXT INT switch to EXT. Point the antennas to the base stations directions if you know where they are, or try pointing the antennas in different directions and check which provides the strongest signal to the Zyxel Device. Use app to determine the best location for your Zyxel Device.

3 If your Zyxel Device keeps alternating between ISPs, then choose a fixed ISP. Go to the Network Setting > Cellular PLMN screen, disable PLMN Auto Selection and then choose your preferred ISP.

4 Turn the Zyxel Device off and on.

5 If the problem continues, contact the network administrator or vendor, or try the advanced suggestions in I cannot access the Web Configurator login screen.

Note: If your Zyxel Device is an outdoor-type, inclement weather like rain and hot weather may affect cellular signals.

What should I do if my Zyxel Device is under attack?

A slow Internet speed, a web browser that keeps redirecting you, suspicious activity alerts from your ISP, and increased pop-ups on the Zyxel Device; could be signs that your Zyxel Device is under attack. If you suspect that your Zyxel Device is under attack, do the following:

1 Create an ACL (Access Control List) rule to block the ports being targeted. See Access Control (Rules) for more information on using ACL. See also Configure a Firewall Rule for more information on configuring a firewall rule. Go to System Monitor > Log > Security Log to view the security-related logs to determine which ports are being targeted. See Security Log for more information on security logs.

2 Contact your ISP to report the attack and seek assistance.

3 When possible, turn off the Zyxel Device for 24 hours, then turn it on again.

4 Request the ISP to change your IP address.

My 5G connection is not available.

1 Check with your ISP to see if your SIM card supports 5G service.

2 Check the local 5G signal using the *nPerf website* by selecting your country, choosing your carrier, and entering your address. You can also ask your ISP about the availability of 5G signals in your area.

3 Go to Networking > Broadband > Cellular Band > Access Technology. Make sure that the Preferred Access Technology includes the 5G option. For example, choose NR5G. See Section 7.9 on page 185 for more information about cellular band configuration.

4 Go to Networking > Broadband > Cellular Band > Band Management. Switch the Band Auto Selection to the right to enable automatic band selection. If you want to manually select specific 5G bands provided by your ISP, switch the Band Auto Selection to the left. For example, you might select n77, n78, and n79 for 5G. Note that cellular bands vary by country. See Section 7.9 on page 185 for more information about cellular band configuration.

38.7 Wi-Fi Problems

I cannot connect to the Zyxel Device Wi-Fi.

1 Check the Wi-Fi LED status to make sure the Zyxel Device Wi-Fi is on.

2 Make sure your Wi-Fi client is within transmission range of the Zyxel Device.

3 Make sure you entered the correct SSID and password. See the Zyxel Device back label for the default SSID and password.

4 Make sure your Wi-Fi client is using the same Wi-Fi security type (WPA2-PSK, WPA3-SAE, or none) as the Zyxel Device.

5 Make sure the Wi-Fi adapter on your Wi-Fi client is working properly. Right-click your computer's network adapter then select Properties to check your network adapter status.

6 Make sure the Wi-Fi adapter on your Wi-Fi client is IEEE 802.11-compatible and supports the same Wi-Fi standard as the Zyxel Device radio.

Note: To check if it is your Zyxel Device that is causing the problem and not your Wi-Fi connection, try using a wired connection.

The Wi-Fi connection is slow and intermittent.

The following factors may cause interference:

- Obstacles: walls, ceilings, furniture, and so on.
- Building Materials: metal doors, aluminum studs.

- Electrical devices: microwaves, monitors, electric motors, cordless phones, and other wireless devices.

To optimize the speed and quality of your Wi-Fi connection, you can:

- Move your wireless device closer to the AP if the signal strength is low.
- Reduce wireless interference that may be caused by other Wi-Fi networks or surrounding wireless electronics such as cordless phones.
- Place the AP where there are minimum obstacles (such as walls and ceilings) between the AP and the Wi-Fi client.
- Reduce the number of Wi-Fi clients connecting to the same AP simultaneously, or add additional APs if necessary.
- Try closing some programs that use the Internet, especially peer-to-peer applications. If the Wi-Fi client is sending or receiving a lot of information, it may have too many programs open that use the Internet.
- Place the Zyxel Device where there are minimum obstacles (such as walls and ceilings) between the Zyxel Device and the Wi-Fi client. Avoid placing the Zyxel Device inside any type of box that might block Wi-Fi signals.

I can't find my Zyxel Device's Wi-Fi network name (SSID).

To easily identify your Zyxel Device's Wi-Fi network among the available networks, you can change the default Wi-Fi network name.

To modify the Wi-Fi network name:

- Log into the Web Configurator.
- Go to Network Setting > Wireless > General.
- In Wireless Network Settings, enter the new Wi-Fi network name in the Wireless Network Name field. You can use up to 32 printable characters, including spaces.
- When finished, scroll down and click Apply.

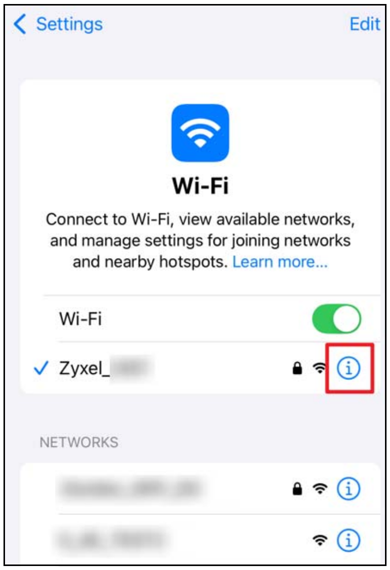
Your new Wi-Fi network name is now set.

I blocked a smartphone using the MAC Authentication screen, but it can still access the Zyxel Device's Wi-Fi network. Why?

Nowadays, many smartphones use a private (randomized) MAC address for each Wi-Fi network instead of the device's actual MAC address.

To block a smartphone effectively, you need to find the private MAC address it uses for the specific Wi-Fi network. Follow the steps below to locate it:

1 For iOS devices, go to Settings > Wi-Fi, click the information icon next to the Wi-Fi network you want to block.



Connect to Wi-Fi, view available networks, and manage settings for joining networks and nearby hotspots. Learn more...

Wi-Fi: on

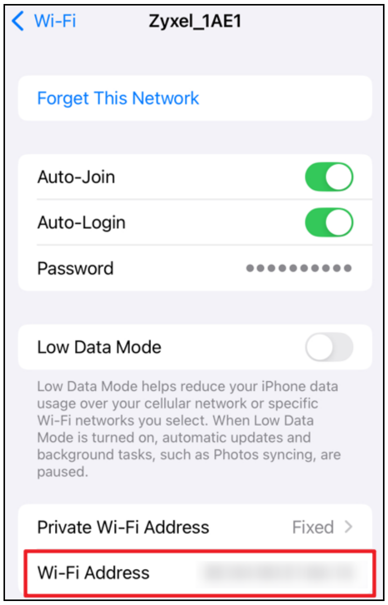
✓ Zyxel_[redacted]

NETWORKS

[redacted]

[redacted]

2 Look for the Wi-Fi Address. This is the private MAC address that the smartphone is using to connect to that Wi-Fi network. Add this address to the MAC Authentication deny list to block the device.



Auto-Join: on

Auto-Login: on

Password: ●●●●●●●●●●●

Low Data Mode: off

Low Data Mode helps reduce your iPhone data usage over your cellular network or specific Wi-Fi networks you select. When Low Data Mode is turned on, automatic updates and background tasks, such as Photos syncing, are paused.

Private Wi-Fi Address: Fixed

Wi-Fi Address: [redacted]

38.8 USB Problems

The Zyxel Device fails to detect my USB device.

1 Disconnect the USB device.

2 Reboot the Zyxel Device.

3 If you are connecting a USB hard drive that comes with an external power supply, make sure it is connected to an appropriate power source that is on.

4 Reconnect your USB device to the Zyxel Device.

38.9 UPnP Problems

My computer cannot detect UPnP settings from the Zyxel Device.

1 Make sure that UPnP is enabled in your computer.

2 On the Zyxel Device, make sure that UPnP is enabled on the Network Settings > Home Networking > UPnP screen.

3 Disconnect the Ethernet cable from the Zyxel Device’s Ethernet port or from your computer.

4 Reconnect the Ethernet cable.

5 Restart your computer.

38.10 Getting More Troubleshooting Help

Search for support information for your model at *support.zyxel.com* and *community.zyxel.com* for more troubleshooting suggestions.

APPENDIX A
Customer Support

In the event of problems that cannot be solved by using this manual, you should contact your vendor. If you cannot contact your vendor, then contact a Zyxel office for the region in which you bought the Zyxel Device.

For Zyxel Communication offices, see *https://service-provider.zyxel.com/global/en/contact-us* for the latest information.

For Zyxel Network offices, see *https://www.zyxel.com/index.shtml* for the latest information.

Please have the following information ready when you contact an office.

Required Information

- Product model and serial number.
- Warranty Information.
- Date that you received your device.
- Brief description of the problem and the steps you took to solve it.

Corporate Headquarters (Worldwide)

Taiwan

- Zyxel Communications (Taiwan) Co., Ltd.
- *https://www.zyxel.com*

Asia

China

- Zyxel Communications Corporation–China Office
- *https://www.zyxel.com/cn/sc*

India

- Zyxel Communications Corporation–India Office
- *https://www.zyxel.com/in/en-in*

Kazakhstan

- Zyxel Kazakhstan
- *https://www.zyxel.com/ru/ru*

Korea

- Zyxel Korea Co., Ltd.
- *http://www.zyxel.kr/*

Malaysia

- Zyxel Communications Corp.
- *https://www.zyxel.com/global/en*

Philippines

- Zyxel Communications Corp.
- *https://www.zyxel.com/global/en*

Singapore

- Zyxel Communications Corp.
- *https://www.zyxel.com/global/en*

Taiwan

- Zyxel Communications (Taiwan) Co., Ltd.
- *https://www.zyxel.com/tw/zh*

Thailand

- Zyxel Thailand Co., Ltd.
- *https://www.zyxel.com/th/th*

Vietnam

- Zyxel Communications Corporation–Vietnam Office
- *https://www.zyxel.com/vn/vi*

Europe

Belarus

- Zyxel Communications Corp.
- *https://www.zyxel.com/ru/ru*

Belgium (Netherlands)

- Zyxel Benelux
- *https://www.zyxel.com/nl/nl*
- *https://www.zyxel.com/fr/fr*

Bulgaria

- Zyxel Bulgaria

- *https://www.zyxel.com/bg/bg*

Czech Republic

- Zyxel Communications Czech s.r.o.
- *https://www.zyxel.com/cz/cs*

Denmark

- Zyxel Communications A/S
- *https://www.zyxel.com/dk/da*

Finland

- Zyxel Communications
- *https://www.zyxel.com/fi/fi*

France

- Zyxel France
- *https://www.zyxel.com/fr/fr*

Germany

- Zyxel Deutschland GmbH.
- *https://www.zyxel.com/de/de*

Hungary

- Zyxel Hungary & SEE
- *https://www.zyxel.com/hu/hu*

Italy

- Zyxel Communications Italy S.r.l.
- *https://www.zyxel.com/it/it*

Norway

- Zyxel Communications A/S
- *https://www.zyxel.com/no/no*

Poland

- Zyxel Communications Poland
- *https://www.zyxel.com/pl/pl*

Romania

- Zyxel Romania
- *https://www.zyxel.com/ro/ro*

Russian Federation

- Zyxel Communications Corp.
- *https://www.zyxel.com/ru/ru*

Slovakia

- Zyxel Slovakia
- *https://www.zyxel.com/sk/sk*

Spain

- Zyxel Iberia
- *https://www.zyxel.com/es/es*

Sweden

- Zyxel Communications A/S
- *https://www.zyxel.com/se/sv*

Switzerland

- Studerus AG
- *https://www.zyxel.com/ch/de-ch*
- *https://www.zyxel.com/fr/fr*

Turkey

- Zyxel Turkey A.S.
- *https://www.zyxel.com/tr/tr*

UK

- Zyxel Communications UK Ltd.
- *https://www.zyxel.com/uk/en-gb*

Ukraine

- Zyxel Ukraine
- *https://www.zyxel.com/ua/uk-ua*

South America

Argentina

- Zyxel Communications Corp.
- *https://www.zyxel.com/co/es-co*

Brazil

- Zyxel Communications Brasil Ltda.

- *https://www.zyxel.com/br/pt*

Colombia

- Zyxel Communications Corp.
- *https://www.zyxel.com/co/es-co*

Ecuador

- Zyxel Communications Corp.
- *https://www.zyxel.com/co/es-co*

South America

- Zyxel Communications Corp.
- *https://www.zyxel.com/co/es-co*

Middle East

Israel

- Zyxel Communications Corp.
- *https://il.zyxel.com*

North America

USA

- Zyxel Communications, Inc. – North America Headquarters
- *https://www.zyxel.com/us/en-us*

APPENDIX B Wireless LANs

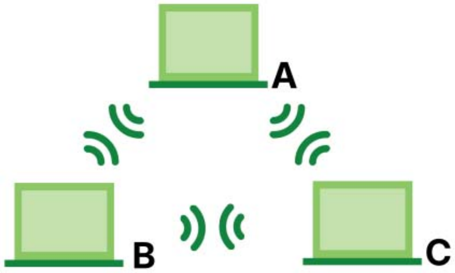
Wireless LAN Topologies

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

Ad-hoc Wireless LAN Configuration

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

Figure 232 Peer-to-Peer Communication in an Ad-hoc Network

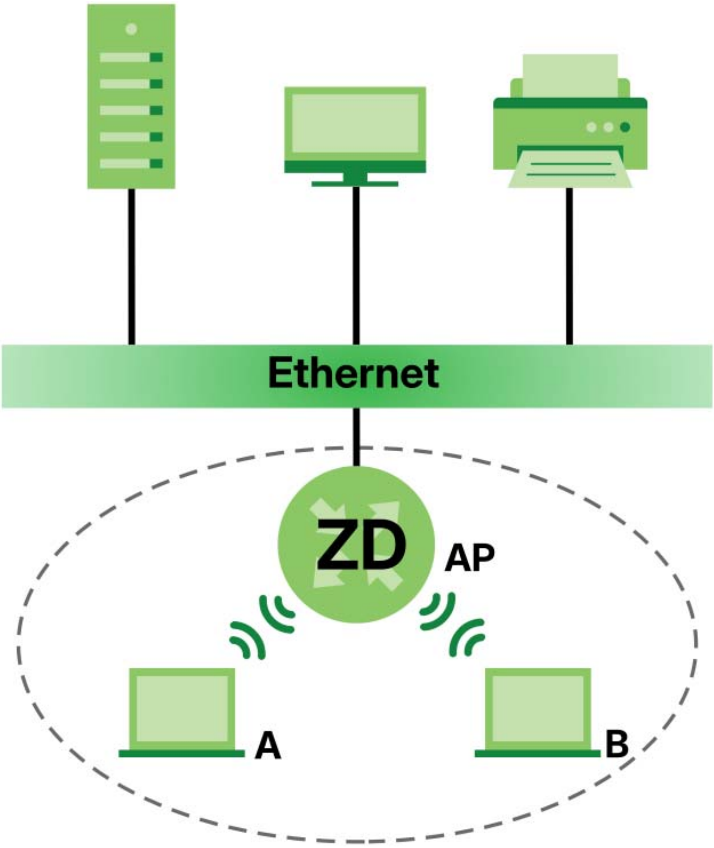


BSS

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

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

Figure 233   Basic Service Set



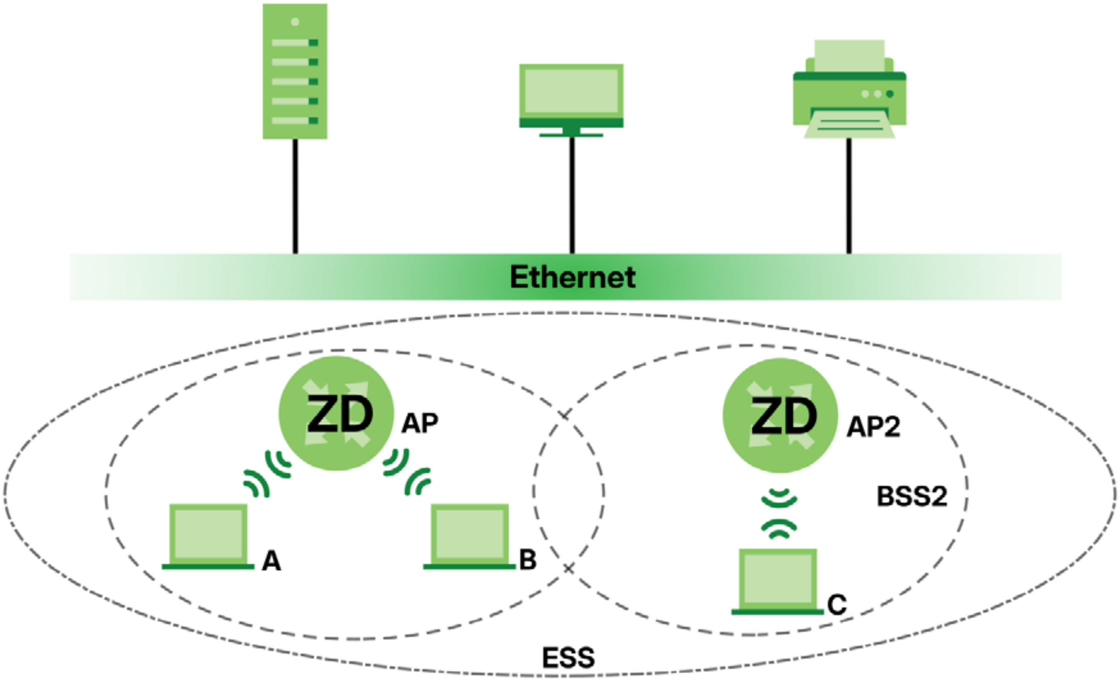
ESS

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

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

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

Figure 234 Infrastructure WLAN



Channel

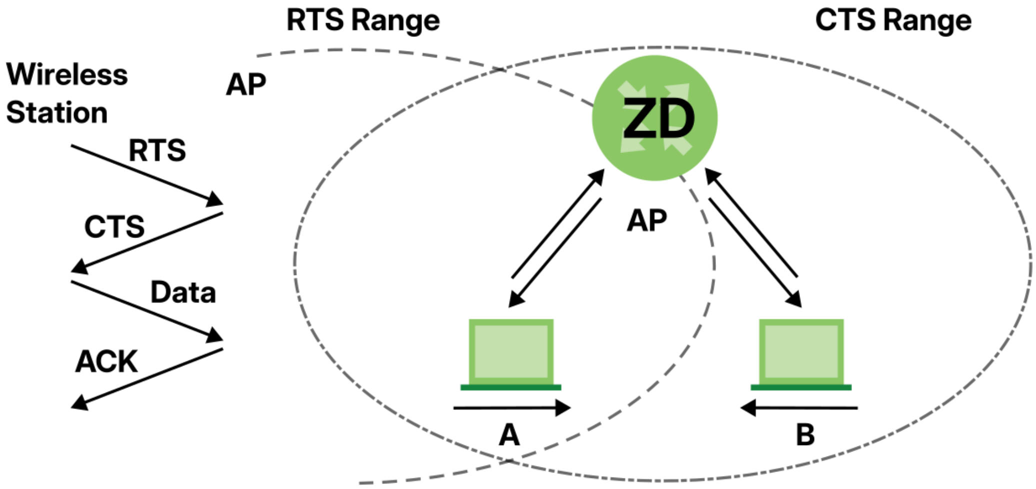
A channel is the radio frequency(ies) used by wireless devices to transmit and receive data. Channels available depend on your geographical area. You may have a choice of channels (for your region) so you should use a channel different from an adjacent AP (access point) to reduce interference. Interference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

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

RTS/CTS

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

Figure 235 RTS/CTS



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

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

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

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

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

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

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

Fragmentation Threshold

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

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

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

IEEE 802.11g Wireless LAN

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

Table 150 IEEE 802.11g

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

Wireless Security Overview

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

Wireless security methods available on the Zyxel Device are data encryption, Wi-Fi client authentication, restricting access by device MAC address and hiding the Zyxel Device identity.

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

Table 151 Wireless Security Levels

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

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

IEEE 802.1x

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

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

RADIUS

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

- Authentication

  Determines the identity of the users.
- Authorization

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

  Keeps track of the client's network activity.

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

Types of RADIUS Messages

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

- Access-Request

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

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

  Sent by a RADIUS server allowing access.
- Access-Challenge

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

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

- Accounting-Request

  Sent by the access point requesting accounting.
- Accounting-Response

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

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

Types of EAP Authentication

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

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

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

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

EAP-MD5 (Message-Digest Algorithm 5)

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

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

EAP-TLS (Transport Layer Security)

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

EAP-TTLS (Tunneled Transport Layer Service)

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

PEAP (Protected EAP)

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

LEAP

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

Dynamic WEP Key Exchange

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

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

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

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

Table 152 Comparison of EAP Authentication Types

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

WPA and WPA2

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

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

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

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

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

Encryption

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

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

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

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

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

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

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

User Authentication

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

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

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

Wi-Fi Client WPA Supplicants

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

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

WPA(2) with RADIUS Application Example

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

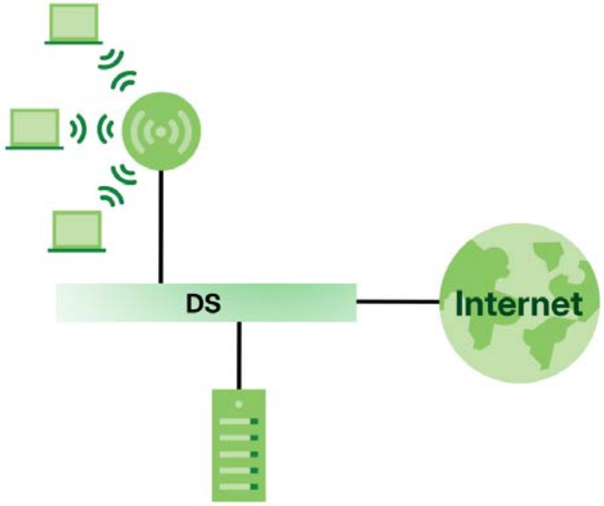
1 The AP passes the Wi-Fi client's authentication request to the RADIUS server.

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

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

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

Figure 236 WPA(2) with RADIUS Application Example



WPA(2)-PSK Application Example

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

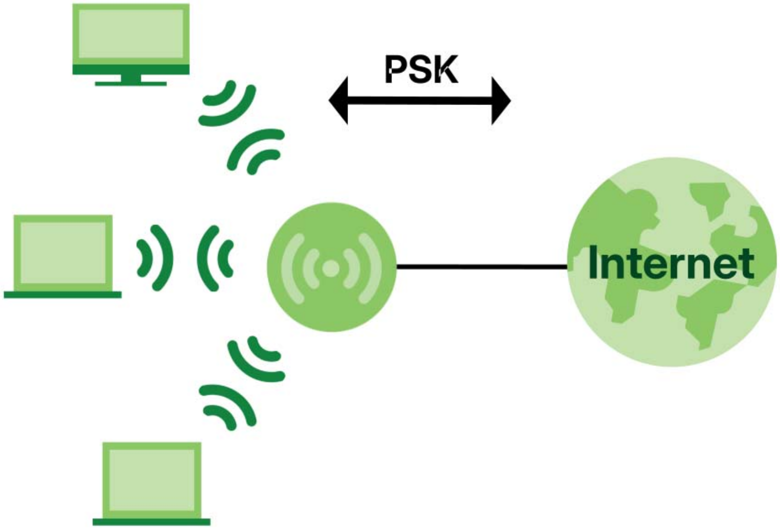
1 First enter identical passwords into the AP and all Wi-Fi clients. The Pre-Shared Key (PSK) must consist of between 8 to 63 alphanumeric (0-9, a-z, A-Z) and special characters, including spaces.

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

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

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

Figure 237 WPA(2)-PSK Authentication



Security Parameters Summary

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

Table 153 Wireless Security Relational Matrix

AUTHENTICATION METHOD/ KEY MANAGEMENT PROTOCOL	ENCRYPTIO N METHOD	ENTER MANUAL KEY	IEEE 802.1X
Open	None	No	Disable
			Enable without Dynamic WEP Key
Open	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable

Table 153 Wireless Security Relational Matrix (continued)

AUTHENTICATION METHOD/ KEY MANAGEMENT PROTOCOL	ENCRYPTIO N METHOD	ENTER MANUAL KEY	IEEE 802.1X
Shared	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
WPA	TKIP/AES	No	Enable
WPA-PSK	TKIP/AES	Yes	Disable
WPA2	TKIP/AES	No	Enable
WPA2-PSK	TKIP/AES	Yes	Disable

Antenna Overview

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

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

Antenna Characteristics

Frequency

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

Radiation Pattern

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

Antenna Gain

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

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

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

Types of Antennas for Wi-Fi

There are two types of antennas used for Wi-Fi applications.

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

Positioning Antennas

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

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

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

Appendix C
IPv6

Overview

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 x 10^{38} IP addresses.

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`.

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.

Link-local Address

A link-local address uniquely identifies a device on the local network (the LAN). It is similar to a “private IP address” in IPv4. You can have the same link-local address on multiple interfaces on a device. A link-local unicast address has a predefined prefix of fe80::/10. The link-local unicast address format is as follows.

Table 154 Link-local Unicast Address Format

1111 1110 10	0	Interface ID
10 bits	54 bits	64 bits

Global Address

A global address uniquely identifies a device on the Internet. It is similar to a “public IP address” in IPv4. A global unicast address starts with a 2 or 3.

Unspecified Address

An unspecified address (0:0:0:0:0:0:0:0 or ::) is used as the source address when a device does not have its own address. It is similar to “0.0.0.0” in IPv4.

Loopback Address

A loopback address (0:0:0:0:0:0:0:1 or ::1) allows a host to send packets to itself. It is similar to “127.0.0.1” in IPv4.

Multicast Address

In IPv6, Multicast addresses provide the same functionality as IPv4 broadcast addresses. Broadcasting is not supported in IPv6. A Multicast address allows a host to send packets to all hosts in a Multicast group.

Multicast scope allows you to determine the size of the Multicast group. A Multicast address has a predefined prefix of ff00::/8. The following table describes some of the predefined Multicast addresses.

Table 155 Predefined Multicast Address

MULTICAST ADDRESS	DESCRIPTION
FF01:0:0:0:0:0:0:1	All hosts on a local node.
FF01:0:0:0:0:0:0:2	All routers on a local node.
FF02:0:0:0:0:0:0:1	All hosts on a local connected link.
FF02:0:0:0:0:0:0:2	All routers on a local connected link.
FF05:0:0:0:0:0:0:2	All routers on a local site.
FF05:0:0:0:0:0:1:3	All DHCP severs on a local site.

The following table describes the Multicast addresses which are reserved and cannot be assigned to a Multicast group.

Table 156 Reserved Multicast Address

MULTICAST ADDRESS
FF00:0:0:0:0:0:0:0
FF01:0:0:0:0:0:0:0
FF02:0:0:0:0:0:0:0
FF03:0:0:0:0:0:0:0
FF04:0:0:0:0:0:0:0
FF05:0:0:0:0:0:0:0
FF06:0:0:0:0:0:0:0
FF07:0:0:0:0:0:0:0
FF08:0:0:0:0:0:0:0
FF09:0:0:0:0:0:0:0
FF0A:0:0:0:0:0:0:0
FF0B:0:0:0:0:0:0:0
FF0C:0:0:0:0:0:0:0
FF0D:0:0:0:0:0:0:0
FF0E:0:0:0:0:0:0:0
FF0F:0:0:0:0:0:0:0

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.

Interface ID

In IPv6, an interface ID is a 64-bit identifier. It identifies a physical interface (for example, an Ethernet port) or a virtual interface (for example, the management IP address for a VLAN). One interface should have a unique interface ID.

EUI-64

The EUI-64 (Extended Unique Identifier) defined by the IEEE (Institute of Electrical and Electronics Engineers) is an interface ID format designed to adapt with IPv6. It is derived from the 48-bit (6-byte) Ethernet MAC address as shown next. EUI-64 inserts the hex digits fffe between the third and fourth bytes of the MAC address and complements the seventh bit of the first byte of the MAC address. See the following example.

Table 157

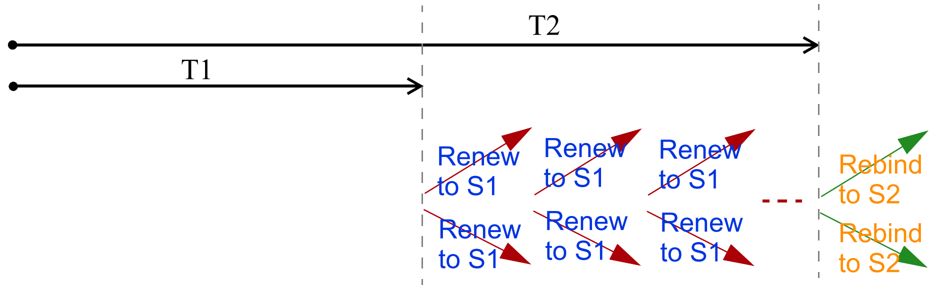
MAC	00	:	13	:	49 : 12	:	34	:	56

Table 158

EUI-64	02	:	13	:	49 :	FF	:	FE	: 12	:	34	:	56

Identity Association

An Identity Association (IA) is a collection of addresses assigned to a DHCP client, through which the server and client can manage a set of related IP addresses. Each IA must be associated with exactly one interface. The DHCP client uses the IA assigned to an interface to obtain configuration from a DHCP server for that interface. Each IA consists of a unique IAID and associated IP information.
The IA type is the type of address in the IA. Each IA holds one type of address. IA_NA means an identity association for non-temporary addresses and IA_TA is an identity association for temporary addresses. An IA_NA option contains the T1 and T2 fields, but an IA_TA option does not. The DHCPv6 server uses T1 and T2 to control the time at which the client contacts with the server to extend the lifetimes on any addresses in the IA_NA before the lifetimes expire. After T1, the client sends the server (S1) (from which the addresses in the IA_NA were obtained) a Renew message. If the time T2 is reached and the server does not respond, the client sends a Rebind message to any available server (S2). For an IA_TA, the client may send a Renew or Rebind message at the client's discretion.



DHCP Relay Agent

A DHCP relay agent is on the same network as the DHCP clients and helps forward messages between the DHCP server and clients. When a client cannot use its link-local address and a well-known multicast address to locate a DHCP server on its network, it then needs a DHCP relay agent to send a message to a DHCP server that is not attached to the same network.

The DHCP relay agent can add the remote identification (remote-ID) option and the interface-ID option to the Relay-Forward DHCPv6 messages. The remote-ID option carries a user-defined string, such as the system name. The interface-ID option provides slot number, port information and the VLAN ID to the DHCPv6 server. The remote-ID option (if any) is stripped from the Relay-Reply messages before the relay agent sends the packets to the clients. The DHCP server copies the interface-ID option from the Relay-Forward message into the Relay-Reply message and sends it to the relay agent. The interface-ID should not change even after the relay agent restarts.

Prefix Delegation

Prefix delegation enables an IPv6 router to use the IPv6 prefix (network address) received from the ISP (or a connected uplink router) for its LAN. The Zyxel Device uses the received IPv6 prefix (for example, 2001:db2::/48) to generate its LAN IP address. Through sending Router Advertisements (RAs) regularly by Multicast, the Zyxel Device passes the IPv6 prefix information to its LAN hosts. The hosts then can use the prefix to generate their IPv6 addresses.

ICMPv6

Internet Control Message Protocol for IPv6 (ICMPv6 or ICMP for IPv6) is defined in RFC 4443. ICMPv6 has a preceding Next Header value of 58, which is different from the value used to identify ICMP for IPv4. ICMPv6 is an integral part of IPv6. IPv6 nodes use ICMPv6 to report errors encountered in packet processing and perform other diagnostic functions, such as "ping".

Neighbor Discovery Protocol (NDP)

The Neighbor Discovery Protocol (NDP) is a protocol used to discover other IPv6 devices and track neighbor’s reachability in a network. An IPv6 device uses the following ICMPv6 messages types:

- Neighbor solicitation: A request from a host to determine a neighbor’s link-layer address (MAC address) and detect if the neighbor is still reachable. A neighbor being “reachable” means it responds to a neighbor solicitation message (from the host) with a neighbor advertisement message.
- Neighbor advertisement: A response from a node to announce its link-layer address.
- Router solicitation: A request from a host to locate a router that can act as the default router and forward packets.
- Router advertisement: A response to a router solicitation or a periodical Multicast advertisement from a router to advertise its presence and other parameters.

IPv6 Cache

An IPv6 host is required to have a neighbor cache, destination cache, prefix list and default router list. The Zyxel Device maintains and updates its IPv6 caches constantly using the information from response messages. In IPv6, the Zyxel Device configures a link-local address automatically, and then sends a neighbor solicitation message to check if the address is unique. If there is an address to be resolved or verified, the Zyxel Device also sends out a neighbor solicitation message. When the Zyxel Device receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor cache. When the Zyxel Device uses a router solicitation message to query for a router and receives a router advertisement message, it adds the router's information to the neighbor cache, prefix list and destination cache. The Zyxel Device creates an entry in the default router list cache if the router can be used as a default router.

When the Zyxel Device needs to send a packet, it first consults the destination cache to determine the next hop. If there is no matching entry in the destination cache, the Zyxel Device uses the prefix list to determine whether the destination address is on-link and can be reached directly without passing through a router. If the address is unlink, the address is considered as the next hop. Otherwise, the Zyxel Device determines the next-hop from the default router list or routing table. Once the next hop IP address is known, the Zyxel Device looks into the neighbor cache to get the link-layer address and sends the packet when the neighbor is reachable. If the Zyxel Device cannot find an entry in the neighbor cache or the state for the neighbor is not reachable, it starts the address resolution process. This helps reduce the number of IPv6 solicitation and advertisement messages.

Multicast Listener Discovery

The Multicast Listener Discovery (MLD) protocol (defined in RFC 2710) is derived from IPv4's Internet Group Management Protocol version 2 (IGMPv2). MLD uses ICMPv6 message types, rather than IGMP message types. MLDv1 is equivalent to IGMPv2 and MLDv2 is equivalent to IGMPv3.

MLD allows an IPv6 switch or router to discover the presence of MLD listeners who wish to receive Multicast packets and the IP addresses of Multicast groups the hosts want to join on its network.

MLD snooping and MLD proxy are analogous to IGMP snooping and IGMP proxy in IPv4.

MLD filtering controls which Multicast groups a port can join.

MLD Messages

A Multicast router or switch periodically sends general queries to MLD hosts to update the Multicast forwarding table. When an MLD host wants to join a Multicast group, it sends an MLD Report message for that address.

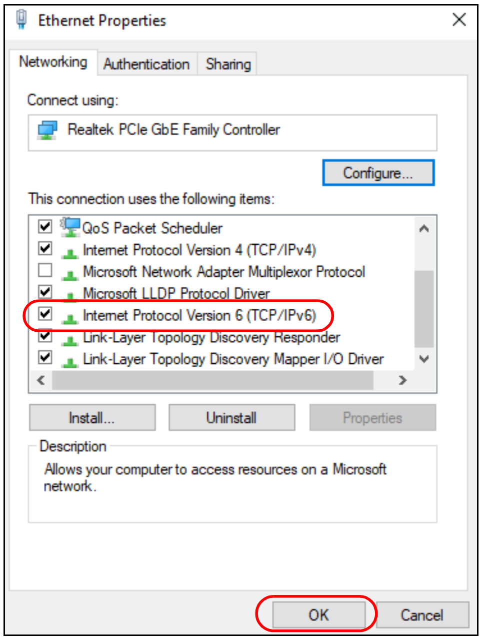
An MLD Done message is equivalent to an IGMP Leave message. When an MLD host wants to leave a Multicast group, it can send a Done message to the router or switch. The router or switch then sends a group-specific query to the port on which the Done message is received to determine if other devices connected to this port should remain in the group.

Example – Enabling IPv6 on Windows 10

Windows 10 supports IPv6 by default. DHCPv6 is also enabled when you enable IPv6 on a Windows 10 computer.

To enable IPv6 in Windows 10:

1. Click the start icon, Settings and then Network & Internet.
2. Select the Internet Protocol Version 6 (TCP/IPv6) checkbox to enable it.
3. Click OK to save the change.



Connect using:

Realtek PCIe GbE Family Controller

This connection uses the following items:

- ☑ QoS Packet Scheduler
- ☑ Internet Protocol Version 4 (TCP/IPv4)
- □ Microsoft Network Adapter Multiplexor Protocol
- ☑ Microsoft LLDP Protocol Driver
- ☑ Internet Protocol Version 6 (TCP/IPv6)
- ☑ Link-Layer Topology Discovery Responder
- ☑ Link-Layer Topology Discovery Mapper I/O Driver

Allows your computer to access resources on a Microsoft network.

4 Click the Search icon (🔍) and then enter “cmd” in the search box.

5 Use the `ipconfig` command to check your dynamic IPv6 address. This example shows a global address (2001:b021:2d::1000) obtained from a DHCP server.

```
C:\>ipconfig

Windows IP Configuration


Ethernet adapter Local Area Connection:

   Connection-specific DNS Suffix  . :
   IPv6 Address. . . . . . . . . . . : 2001:b021:2d::1000
   Link-local IPv6 Address . . . . . : fe80::25d8:dcab:c80a:5189%11
   IPv4 Address. . . . . . . . . . . : 172.16.100.61
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::213:49ff:f
```

APPENDIX D
Services

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

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

Table 159 Examples of Services

NAME	PROTOCOL	PORT(S)	DESCRIPTION
AH (IPSEC_TUNNEL)	User-Defined	51	The IPSEC AH (Authentication Header) tunneling protocol uses this service.
AIM	TCP	5190	AOL's Internet Messenger service.
AUTH	TCP	113	Authentication protocol used by some servers.
BGP	TCP	179	Border Gateway Protocol.
BOOTP_CLIENT	UDP	68	DHCP Client.
BOOTP_SERVER	UDP	67	DHCP Server.
CU-SEEME	TCP/UDP TCP/UDP	7648 24032	A popular videoconferencing solution from White Pines Software.
DNS	TCP/UDP	53	Domain Name Server, a service that matches web names (for instance *www.zyxel.com*) to IP numbers.
ESP (IPSEC_TUNNEL)	User-Defined	50	The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service.
FINGER	TCP	79	Finger is a UNIX or Internet related command that can be used to find out if a user is logged on.
H.323	TCP	1720	NetMeeting uses this protocol.
HTTP	TCP	80	Hyper Text Transfer Protocol – a client/server protocol for the world wide web.
HTTPS	TCP	443	HTTPS is a secured http session often used in e-commerce.
ICMP	User-Defined	1	Internet Control Message Protocol is often used for diagnostic purposes.
ICQ	UDP	4000	This is a popular Internet chat program.
IGMP (MULTICAST)	User-Defined	2	Internet Group Multicast Protocol is used when sending packets to a specific group of hosts.
IKE	UDP	500	The Internet Key Exchange algorithm is used for key distribution and management.
IMAP4	TCP	143	The Internet Message Access Protocol is used for email.
IMAP4S	TCP	993	This is a more secure version of IMAP4 that runs over SSL.
IRC	TCP/UDP	6667	This is another popular Internet chat program.
MSN Messenger	TCP	1863	Microsoft Networks' messenger service uses this protocol.
NetBIOS	TCP/UDP TCP/UDP TCP/UDP TCP/UDP	137 138 139 445	The Network Basic Input/Output System is used for communication between computers in a LAN.
NEW-ICQ	TCP	5190	An Internet chat program.
NEWS	TCP	144	A protocol for news groups.
NFS	UDP	2049	Network File System – NFS is a client/server distributed file service that provides transparent file sharing for network environments.
NNTP	TCP	119	Network News Transport Protocol is the delivery mechanism for the USENET newsgroup service.

Table 159 Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
PING	User-Defined	1	Packet INternet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable.
POP3	TCP	110	Post Office Protocol version 3 lets a client computer get email from a POP3 server through a temporary connection (TCP/IP or other).
POP3S	TCP	995	This is a more secure version of POP3 that runs over SSL.
PPTP	TCP	1723	Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel.
PPTP_TUNNEL (GRE)	User-Defined	47	PPTP (Point-to-Point Tunneling Protocol) enables secure transfer of data over public networks. This is the data channel.
RCMD	TCP	512	Remote Command Service.
REAL_AUDIO	TCP	7070	A streaming audio service that enables real time sound over the web.
REXEC	TCP	514	Remote Execution Daemon.
RLOGIN	TCP	513	Remote Login.
ROADRUNNER	TCP/UDP	1026	This is an ISP that provides services mainly for cable modems.
RTELNET	TCP	107	Remote Telnet.
RTSP	TCP/UDP	554	The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet.
SFTP	TCP	115	The Simple File Transfer Protocol is an old way of transferring files between computers.
SMTP	TCP	25	Simple Mail Transfer Protocol is the message-exchange standard for the Internet. SMTP enables you to move messages from one email server to another.
SMTPS	TCP	465	This is a more secure version of SMTP that runs over SSL.
SNMP	TCP/UDP	161	Simple Network Management Program.
SNMP-TRAPS	TCP/UDP	162	Traps for use with the SNMP (RFC:1215).
SQL-NET	TCP	1521	Structured Query Language is an interface to access data on many different types of database systems, including mainframes, midrange systems, UNIX systems and network servers.
SSDP	UDP	1900	The Simple Service Discovery Protocol supports Universal Plug-and-Play (UPnP).
SSH	TCP/UDP	22	Secure Shell Remote Login Program.
STRM WORKS	UDP	1558	Stream Works Protocol.
SYSLOG	UDP	514	Syslog allows you to send system logs to a UNIX server.
TACACS	UDP	49	Login Host Protocol used for (Terminal Access Controller Access Control System).

Table 159   Examples of Services (continued)

NAME	PROTOCOL	PORT(S)	DESCRIPTION
TELNET	TCP	23	Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems.
VDOLIVE	TCP UDP	7000 user-defined	A videoconferencing solution. The UDP port number is specified in the application.

APPENDIX E
Legal Information

Copyright

Disclaimer

Zyxel does not assume any liability arising out of the application or use of any products, or software described herein. Neither does it convey any license under its patent rights nor the patent rights of others. Zyxel further reserves the right to make changes in any products described herein without notice. This publication is subject to change without notice.

Regulatory Notice and Statement

United States of America (Nebula LTE7461-M602)

The following information applies if you use the product within USA area.

Federal Communications Commission (FCC) EMC Statement

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

  (1) This device may not cause harmful interference, and

  (2) This device must accept any interference received, including interference that may cause undesired operation.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the device.
- This product has been tested and complies with the specifications for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

- This device generates, uses, and can radiate radio frequency energy and, if not installed and used according to the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.
- If this device does cause harmful interference to radio or television reception, which is found by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Reorient or relocate the receiving antenna
  - Increase the separation between the devices
  - Connect the equipment to an outlet other than the receiver's
  - Consult a dealer or an experienced radio/TV technician for assistance

FCC Radiation Exposure Statement

The following information applies to products with wireless functions.

- This device complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.
- This transmitter must be at least 30 cm from the user and must not be co-located or operating in conjunction with any other antenna or transmitter.
- Operation of this device is restricted to indoor use only, except for relevant user's manual mention that this device can be installed into the external environment. (For indoor devices only)
- Country Code selection feature to be disabled for products marketed to the US/CANADA.

Canada (Nebula LTE7461-M602)

The following information applies if you use the product within Canada area.

Innovation, Science and Economic Development Canada ICES Statement

CAN ICES(B)/NMB(B)

Innovation, Science and Economic Development Canada RSS-GEN & RSS-247 Statement

- For indoor use only. (For indoor devices only)
- This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
- This radio transmitter (2468C-LTE7461M602) has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for any type listed, are strictly prohibited for use with this device.

Antenna Information

TYPE	NO.	TYPE	FREQUENCY RANGE	WIFI GAIN (DBI)	LTE GAIN (DBI)	CONNECTOR	IMPEDANCE
WLAN-ANT0	1	PIFA	2.4 – 2.4835 GHz	6	N.A.	iPEX	50 ohm
WLAN-ANT1	1	PIFA	2.4 – 2.4835 GHz	5	N.A.	iPEX	50 ohm
WWAN	1	Dipole	2500 – 2570 MHz	N.A.	9	iPEX	50 ohm
			698 – 716 MHz	N.A.	3.5	iPEX	50 ohm
			777 – 787 MHz	N.A.	3	iPEX	50 ohm
			1850 – 1915 MHz	N.A.	8	iPEX	50 ohm
			814 – 849 MHz	N.A.	3.6	iPEX	50 ohm
			2305 – 2315 MHz	N.A.	9	iPEX	50 ohm
			1710 – 1780 MHz	N.A.	6	iPEX	50 ohm

If the product with 5G wireless function operating in 5150-5250 MHz and 5725-5850 MHz, the following attention must be paid,

- The device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.
- For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and
- Where applicable, antenna type(s), antenna models(s), and the worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in Section 6.2.2.3 of RSS 247 shall be clearly indicated.

If the product with 5G wireless function operating in 5250-5350 MHz and 5470-5725 MHz, the following attention must be paid.

- For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit.

Innovation, Sciences et Développement économique Canada RSS-GEN & RSS-247

- Pour une utilisation en intérieur uniquement. (sauf modèle extérieur)
- L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage; (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.
- Le présent émetteur radio (2468C-LTE7461M602) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

informations antenne

CHAÎNE NB.	NB.	TYPE	GAMME DE FRÉQUENCES	WIFI GAIN (DBI)	LTE GAIN (DBI)	CONNECTEUR	IMPEDANCE
WLAN-ANT0	1	PIFA	2.4 – 2.4835 GHz	6	N.A.	iPEX	50 ohm
WLAN-ANT1	1	PIFA	2.4 – 2.4835 GHz	5	N.A.	iPEX	50 ohm
WWAN	1	Dipole	2500 – 2570 MHz	N.A.	9	iPEX	50 ohm
			698 – 716 MHz	N.A.	3.5	iPEX	50 ohm
			777 – 787 MHz	N.A.	3	iPEX	50 ohm
			1850 – 1915 MHz	N.A.	8	iPEX	50 ohm
			814 – 849 MHz	N.A.	3.6	iPEX	50 ohm
			2305 – 2315 MHz	N.A.	9	iPEX	50 ohm
			1710 – 1780 MHz	N.A.	6	iPEX	50 ohm

Lorsque la fonction sans fil 5G fonctionnant en 5150-5250 MHz and 5725-5850 MHz est activée pour ce produit, il est nécessaire de porter une attention particulière aux choses suivantes.

- Les dispositifs fonctionnant dans la bande de 5 150 à 5 250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;
- Pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis (pour les dispositifs utilisant la bande de 5 725 à 5 850 MHz) doit être conforme à la limite de la p.i.r.e. spécifiée, selon le cas;
- Lorsqu'il y a lieu, les types d'antennes (s'il y en a plusieurs), les numéros de modèle de l'antenne et les pires angles d'inclinaison nécessaires pour rester conforme à l'exigence de la p.i.r.e. applicable au masque d'élévation, énoncée à la section 6.2.2.3 du CNR-247, doivent être clairement indiqués.

Lorsque la fonction sans fil 5G fonctionnant en 5250-5350 MHz et 5470-5725 MHz est activée pour ce produit , il est nécessaire de porter une attention particulière aux choses suivantes.

- Pour les dispositifs munis d’antennes amovibles, le gain maximal d'antenne permis pour les dispositifs utilisant les bandes de 5 250 à 5 350 MHz et de 5 470 à 5 725 MHz doit être conforme à la limite de la p.i.r.e.

Industry Canada radiation exposure statement

This device complies with ISED radiation exposure limits set forth for an uncontrolled environment. This device should be installed and operated with a minimum distance of 30 cm between the radiator and your body.

Déclaration d’exposition aux radiations:

Cet équipement est conforme aux limites d’exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 30 cm de distance entre la source de rayonnement et votre corps.

Europe and the United Kingdom

The following information applies if you use the product within the European Union and United Kingdom.

Declaration of Conformity with Regard to EU Directive 2014/53/EU (Radio Equipment Directive, RED) and UK Regulation

- Compliance information for wireless products relevant to the EU, United Kingdom and other Countries following the EU Directive 2014/53/EU (RED) and UK regulation. And this product may be used in all EU countries (and other countries following the EU Directive 2014/53/EU) and United Kingdom without any limitation except for the countries mentioned below table:
- In the majority of the EU, United Kingdom and other European countries, the 5 GHz bands have been made available for the use of wireless local area networks (LANs). Later in this document you will find an overview of countries in which additional restrictions or requirements or both are applicable. The requirements for any country may evolve. Zyxel recommends that you check with the local authorities for the latest status of their national regulations for the 5 GHz wireless LANs.
- If this device for operation in the band 5150 – 5350 MHz, it is for indoor use only.
- This equipment should be installed and operated with a minimum distance of 20 cm between the radio equipment and your body.
- The maximum RF operating power for each band is as follows:

FREQUENCY	MAXIMUM POWER
2,400 MHz to 2,483.5 MHz	< 100mW
5,150 MHz to 5,350 MHz	< 200mW
5,470 MHz to 5,725 MHz	< 1000mW
5,945 MHz to 6,425 MHz (For device with 6 GHz function)	< 200mW

Belgium (English) België (Flemish) Belgique (French)	National Restrictions • The Belgian Institute for Postal Services and Telecommunications (BIPT) must be notified of any outdoor wireless link having a range exceeding 300 meters. Please check http://www.bipt.be for more details. • Draadloze verbindingen voor buitengebruik en met een reikwijdte van meer dan 300 meter dienen aangemeld te worden bij het Belgisch Instituut voor postdiensten en telecommunicatie (BIPT). Zie http://www.bipt.be voor meer gegevens. • Les liaisons sans fil pour une utilisation en extérieur d'une distance supérieure à 300 mètres doivent être notifiées à l'Institut Belge des services Postaux et des Télécommunications (IBPT). Visitez http://www.ibpt.be pour de plus amples détails.
Čeština (Czech)	Zyxel tímto prohlašuje, že tento zařízení je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 2014/53/EU.
Dansk (Danish)	Undertegnede Zyxel erklærer herved, at følgende udstyr udstyr overholder de væsentlige krav og øvrige relevante krav i direktiv 2014/53/EU.
Deutsch (German)	Hiermit erklärt Zyxel, dass sich das Gerät Ausstattung in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 2014/53/EU befindet.

Eesti keel (Estonian)	Käesolevaga kinnitab Zyxel seadme seadmed vastavust direktiivi 2014/53/EL põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
Ελληνικά (Greek)	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Zyxel ΔΗΛΩΝΕΙ ΟΤΙ εξοπλισμός ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 2014/53/EE.
English	Hereby, Zyxel declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.
Español (Spanish)	Por medio de la presente Zyxel declara que el equipo cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 2014/53/UE.
Français (French)	Par la présente Zyxel déclare que l'appareil équipements est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 2014/53/UE.
Hrvatski (Croatian)	Zyxel ovime izjavljuje da je radijska oprema tipa u skladu s Direktivom 2014/53/UE.
Íslenska (Icelandic)	Hér með lýsir, Zyxel því yfir að þessi búnaður er í samræmi við grunnkröfur og önnur viðeigandi ákvæði tilskipunar 2014/53/UE.
Italiano (Italian)	Con la presente Zyxel dichiara che questo attrezzatura è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 2014/53/UE. National Restrictions • This product meets the National Radio Interface and the requirements specified in the National Frequency Allocation Table for Italy. Unless this wireless LAN product is operating within the boundaries of the owner's property, its use requires a “general authorization.” Please check *https://www.mise.gov.it/it/* for more details. • Questo prodotto è conforme alla specifiche di Interfaccia Radio Nazionali e rispetta il Piano Nazionale di ripartizione delle frequenze in Italia. Se non viene installato all 'interno del proprio fondo, l'utilizzo di prodotti Wireless LAN richiede una “Autorizzazione Generale”. Consultare *https://www.mise.gov.it/it/* per maggiori dettagli.
Latviešu valoda (Latvian)	Ar šo Zyxel deklarē, ka iekārtas atbilst Direktīvas 2014/53/ES būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių kalba (Lithuanian)	Šiuo Zyxel deklaruoja, kad šis įranga atitinka esminius reikalavimus ir kitas 2014/53/ES Direktyvos nuostatas.
Magyar (Hungarian)	Alulírott, Zyxel nyilatkozom, hogy a berendezés megfelel a vonatkozó alapvetõ követelményeknek és az 2014/53/EU irányelv egyéb előírásainak.
Malti (Maltese)	Hawnhekk, Zyxel, jiddikjara li dan tagħmir jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 2014/53/UE.
Nederlands (Dutch)	Hierbij verklaart Zyxel dat het toestel uitrusting in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 2014/53/EU.
Norsk (Norwegian)	Erklærer herved Zyxel at dette utstyret er I samsvar med de grunnleggende kravene og andre relevante bestemmelser I direktiv 2014/53/EU.
Polski (Polish)	Niniejszym Zyxel oświadcza, że sprzęt jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 2014/53/UE.
Português (Portuguese)	Zyxel declara que este equipamento está conforme com os requisitos essenciais e outras disposições da Directiva 2014/53/UE.
Română (Romanian)	Prin prezenta, Zyxel declară că acest echipament este în conformitate cu cerinţele esenţiale şi alte prevederi relevante ale Directivei 2014/53/UE.
Slovenčina (Slovak)	Zyxel týmto vyhlasuje, že zariadenia spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 2014/53/EÚ.
Slovenščina (Slovene)	Zyxel izjavlja, da je ta oprema v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 2014/53/EU.
Suomi (Finnish)	Zyxel vakuuttaa täten että laitteet tyyppinen laite on direktiivin 2014/53/EU oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.

Svenska (Swedish)	Härmed intygar Zyxel att denna utrustning står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 2014/53/EU.
Български (Bulgarian)	С настоящото Zyxel декларира, че това оборудване е в съответствие със съществените изисквания и другите приложими разпоредбите на Директива 2014/53/ЕС.

Notes:

- Not all European states that implement EU Directive 2014/53/EU are European Union (EU) members.
- The regulatory limits for maximum output power are specified in EIRP. The EIRP level (in dBm) of a device can be calculated by adding the gain of the antenna used (specified in dBi) to the output power available at the connector (specified in dBm).

List of national codes

COUNTRY	ISO 3166 2 LETTER CODE	COUNTRY	ISO 3166 2 LETTER CODE
Austria	AT	Liechtenstein	LI
Belgium	BE	Lithuania	LT
Bulgaria	BG	Luxembourg	LU
Croatia	HR	Malta	MT
Cyprus	CY	Netherlands	NL
Czech Republic	CZ	Norway	NO
Denmark	DK	Poland	PL
Estonia	EE	Portugal	PT
Finland	FI	Romania	RO
France	FR	Serbia	RS
Germany	DE	Slovakia	SK
Greece	GR	Slovenia	SI
Hungary	HU	Spain	ES
Iceland	IS	Switzerland	CH
Ireland	IE	Sweden	SE
Italy	IT	Turkey	TR
Latvia	LV	United Kingdom	GB

Safety Warnings

- Do not put the device in a place that is humid, dusty, has extreme temperatures, or that blocks the device ventilation slots. These conditions may harm your device.
- Please refer to the device back label, datasheet, box specifications or catalog information for the power rating of the device and operating temperature.
- Do not use this product near water, for example, in a wet basement or near a swimming pool.
- The Power Supply is not waterproof, avoid contact with liquid. Handle the Power Supply with care; do not pry open, nor pull or press the pins on it.
- There is a remote risk of electric shock from lightning: (1) Do not use the device outside, and make sure all the connections are indoors. (For indoor devices only) (2) Do not install or service this device during a thunderstorm.
- Do not expose your Zyxel Device to dampness, dust or corrosive liquids.

- Do not store things on the Zyxel Device.
- Do not obstruct the Zyxel Device ventilation slots as insufficient airflow may harm your Zyxel Device. For example, do not place the Zyxel Device in an enclosed space such as a box or on a very soft surface such as a bed or sofa.
- Connect ONLY suitable accessories to the Zyxel Device.
- Do not open the Zyxel Device or unit. Opening or removing the Zyxel Device covers can expose you to dangerous high voltage or other risks.
- Only qualified service personnel should service or disassemble this Zyxel Device. Please contact your vendor for further information.
- Make sure to connect the cables to the correct ports.
- Place connecting cables carefully so that no one will step on them or stumble over them.
- Always disconnect all cables from this Zyxel Device before servicing or disassembling.
- Do not remove the plug and connect it to a power outlet by itself; always attach the plug to the power adapter first before connecting it to a power outlet.
- Do not allow anything to rest on the power adapter or cord and do NOT place the product where anyone can walk on the power adapter or cord.
- Please use the provided or designated connection cables/power cables/adapters. Connect it to the right supply voltage (for example, 120V AC in North America or 230V AC in Europe). If the power adapter or cord is damaged, it might cause electrocution. Remove it from the Zyxel Device and the power source, repairing the power adapter or cord is prohibited. Contact your local vendor to order a new one.
- The following warning statements apply, where the disconnect device is not incorporated in the Zyxel Device or where the plug on the power supply cord is intended to serve as the disconnect device,

  – For a permanently connected Zyxel Device, a readily accessible disconnected device shall be incorporated externally to the Zyxel Device;

  – For a pluggable device, the socket-outlet shall be installed near the Zyxel Device and shall be easily accessible.
- CAUTION: There is a risk of explosion if you replace the device battery with an incorrect one. Dispose of used batteries according to the instructions. Dispose them at the applicable collection point for the recycling of electrical and electronic devices. For detailed information about recycling of this product, please contact your local city office, your household waste disposal service or the store where you purchased the product.
- This device must be grounded by qualified service personnel. Never defeat the ground conductor or operate the device in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. (For devices that require grounding)

  - If your device has an earthing screw (frame ground), connect the screw to a ground terminal using an appropriate AWG ground wire. Do this before you make other connections.

  - If your device has no earthing screw, but has a 3-prong power plug, make sure to connect the plug to a 3-hole earthed socket.
- Do not leave a battery in an extremely high temperature environment or surroundings since it can result in an explosion or the leakage of flammable liquid or gas. (For devices with a battery)
- Do not subject a battery to extremely low air pressure since it may result in an explosion or the leakage of flammable liquid or gas. (For devices with a battery)
- Fuse Warning! Replace a fuse only with a fuse of the same type and rating. (For devices with a fuse)
- To avoid possible eye injury, do not look into an operating fiber-optic module’s connector. (For devices with fiber)
- Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019. (For devices with fiber)

- Conforme à 21 CFR 1040.10 et 1040.11 sauf pour la conformité à la norme CEI 60825-1 Ed. 3., comme décrit dans la notice laser Numéro 56 du 8 mai 2019. (For devices with fiber)
- CLASS 1 LASER PRODUCT & "IEC 60825-1:2014" (For devices with fiber)
- APPAREIL À LASER DE CLASS 1 (For devices with fiber)
- CLASS 1 CONSUMER LASER PRODUCT & “EN 50689:2021” (For devices with fiber)

Environment Statement

ErP (Energy-related Products)

Zyxel products put on the EU and United Kingdom market in compliance with the requirement of the European Parliament and the Council published Commission Regulation (EU) 2023/826 and UK regulation establishing a framework for the setting of ecodesign requirements for energy-related products (recast), so called as "ErP Directive (Energy-related Products directive) as well as ecodesign requirement laid down in applicable implementing measures, power consumption has satisfied regulation requirements which are:

- Network standby power consumption < 8W, and/or
- Off mode power consumption < 0.5W, and/or
- Standby mode power consumption < 0.5W.

Disposal and Recycling Information

The symbol below means that according to local regulations your product and/or its battery shall be disposed of separately from domestic waste. If this product is end of life, take it to a recycling station designated by local authorities. At the time of disposal, the separate collection of your product and/or its battery will help save natural resources and ensure that the environment is sustainable development.

Die folgende Symbol bedeutet, dass Ihr Produkt und/oder seine Batterie gemäß den örtlichen Bestimmungen getrennt vom Hausmüll entsorgt werden muss. Wenden Sie sich an eine Recyclingstation, wenn dieses Produkt das Ende seiner Lebensdauer erreicht hat. Zum Zeitpunkt der Entsorgung wird die getrennte Sammlung von Produkt und/oder seiner Batterie dazu beitragen, natürliche Ressourcen zu sparen und die Umwelt und die menschliche Gesundheit zu schützen.

El símbolo de abajo indica que según las regulaciones locales, su producto y/o su batería deberán depositarse como basura separada de la doméstica. Cuando este producto alcance el final de su vida útil, llévelo a un punto limpio. Cuando llegue el momento de desechar el producto, la recogida por separado éste y/o su batería ayudará a salvar los recursos naturales y a proteger la salud humana y medioambiental.

Le symbole ci-dessous signifie que selon les réglementations locales votre produit et/ou sa batterie doivent être éliminés séparément des ordures ménagères. Lorsque ce produit atteint sa fin de vie, amenez-le à un centre de recyclage. Au moment de la mise au rebut, la collecte séparée de votre produit et/ou de sa batterie aidera à économiser les ressources naturelles et protéger l'environnement et la santé humaine.

Il simbolo sotto significa che secondo i regolamenti locali il vostro prodotto e/o batteria deve essere smaltito separatamente dai rifiuti domestici. Quando questo prodotto raggiunge la fine della vita di servizio portarlo a una stazione di riciclaggio. Al momento dello smaltimento, la raccolta separata del vostro prodotto e/o della sua batteria aiuta a risparmiare risorse naturali e a proteggere l'ambiente e la salute umana.

Symbolen innebär att enligt lokal lagstiftning ska produkten och/eller dess batteri kastas separat från hushållsavfallet. När den här produkten når slutet av sin livslängd ska du ta den till en återvinningsstation. Vid tiden för kasseringen bidrar du till en bättre miljö och mänsklig hälsa genom att göra dig av med den på ett återvinningsställe.

台灣

以下訊息僅適用於產品具有無線功能且銷售至台灣地區

- 取得審驗證明之低功率射頻器材，非經核准，公司，商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
- 低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
- 前述合法通信，指依電信管理法規定作業之無線電通信。 低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。
- 無線資訊傳輸設備忍受合法通信之干擾且不得干擾合法通信；如造成干擾，應立即停用，俟無干擾之虞，始得繼續使用。
- 使用無線產品時，應避免影響附近雷達系統之操作。
- 高增益指向性天線只得應用於固定式點對點系統。

以下訊息僅適用於產品屬於專業安裝並銷售至台灣地區

- 本器材須經專業工程人員安裝及設定，始得設置使用，且不得直接販售給一般消費者。

以下訊息僅適用於產品屬於行動通信電信終端設備並銷售至台灣地區

- 減少電磁波影響，請妥適使用
- Nebula NR5101
- 電波功率密度 MPE 標準值 : 1 mW/ cm2，送測產品實測值 : 0.116 mW/ cm2，建議使用時設備天線至少距離人體 20 公分
- Nebula LTE3301-PLUS
- 電波功率密度 MPE 標準值 : 1 mW/ cm2，送測產品實測值 : 0.141 mW/ cm2，建議使用時設備天線至少距離人體 20 公分

安全警告 - 為了您的安全，請先閱讀以下警告及指示 :

- 請勿將此產品接近水、火焰或放置在高溫的環境。
- 避免設備接觸 :
  – 任何液體 - 切勿讓設備接觸水、雨水、高濕度、污水腐蝕性的液體或其他水份。
  – 灰塵及污物 - 切勿接觸灰塵、污物、沙土、食物或其他不合適的材料。
- 雷雨天氣時，不要安裝或維修此設備。有遭受電擊的風險。
- 切勿重摔或撞擊設備，並勿使用不正確的電源變壓器。

- 若接上不正確的電源變壓器會有爆炸的風險。
- 請勿隨意更換產品內的電池。
- 如果更換不正確之電池型式，會有爆炸的風險，請依製造商說明書處理使用過之電池。
- 請將廢電池丟棄在適當的電器或電子設備回收處。
- 請勿將設備解體。
- 請勿阻礙設備的散熱孔，空氣對流不足將會造成設備損害。
- 請使用隨貨提供或指定的連接線 / 電源線 / 電源變壓器，將其連接到合適的供應電壓 (如：台灣供應電壓 110 伏特) 。
- 假若電源變壓器或電源變壓器的纜線損壞，請從插座拔除，若您還繼續插電使用，會有觸電死亡的風險。
- 請勿試圖修理電源變壓器或電源變壓器的纜線，若有毀損，請直接聯絡您購買的店家，購買一個新的電源變壓器。
- 請勿將此設備安裝於室外，此設備僅適合放置於室內。
- 請勿隨一般垃圾丟棄。
- 請參閱產品背貼上的設備額定功率。
- 請參考產品型錄或是彩盒上的作業溫度。
- 產品沒有斷電裝置或者採用電源線的插頭視為斷電裝置的一部分，以下警語將適用：
  – 對永久連接之設備，在設備外部須安裝可觸及之斷電裝置；
  – 對插接式之設備，插座必須接近安裝之地點而且是易於觸及的。

About the Symbols

Various symbols are used in this product to ensure correct usage, to prevent danger to the user and others, and to prevent property damage. The meaning of these symbols are described below. It is important that you read these descriptions thoroughly and fully understand the contents.

Explanation of the Symbols

SYMBOL	EXPLANATION
∼	Alternating current (AC): AC is an electric current in which the flow of electric charge periodically reverses direction.
⎓	Direct current (DC): DC is the unidirectional flow or movement of electric charge carriers.
⏚	Earth; ground: A wiring terminal intended for connection of a Protective Earthing Conductor.
⧈	Class II equipment: The method of protection against electric shock in the case of class II equipment is either double insulation or reinforced insulation.

Viewing Certifications

Go to *www.zyxel.com* to view this product's documentation and certifications.

Zyxel Limited Warranty

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

Note

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

To obtain the services of this warranty, contact your vendor. You may also refer to the warranty policy for the region in which you bought the Zyxel Device at *https://www.zyxel.com/global/en/support/warranty-information*.

Open Source Licenses

This product may contain in part some free software distributed under GPL license terms and/or GPL-like licenses.

To request the source code covered under these licenses please go to: *https://www.zyxel.com/form/gpl_oss_software_notice.shtml*

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