comnet
Communication Networks

INSTALLATION AND OPERATION MANUAL

netwave®

INDUSTRIAL OUTDOOR ULTRA-HIGH THROUGHPUT, IMPACT RESISTANT HARDENED 802.11AC WIRELESS ETHERNET DEVICE

This manual serves the following ComNet Series:

NW1[IC]
NW2
NWK1[IC]
NWK2
NWK11/M[IC]

Thank you for purchasing NetWave from ComNet. This installation guide applies to all Generation 4 NetWave Radios. NW1 Shown in examples.

The NetWave® NW(1,2)[IC] Industrial Grade high performance wireless radio is ideal for high capacity and scalable deployments where channel overlapping and interference typically cause our discounted competitors radios to become unstable. The wide range of channel spectrum widths available on the NW(1,2)[IC] series of radios gives you the option of narrowing channel bandwidths as your network grows which will increase the number of non-overlapping channels and improve stability.

The NW(1,2)[IC] comes standard with an integrated antenna and an IP67 rated impact resistant polycarbonate enclosure that is designed to survive the most extreme conditions.

The NW1 is FCC certified for use in the United States. The NW2 is ETSI, DFS and TPC certified for use in the European Union. The NW1IC is certified for use in Canada.

About This Guide

This guide is intended for different users such as engineers, integrators, developers, IT managers, and technicians.

It assumes that users have some PC competence and are familiar with Microsoft Windows operating systems and web browsers such as Windows Internet Explorer and Mozilla Firefox, as well as have knowledge of the following:

» Installation of electronic equipment
» Electrical regulations and guidelines
» Knowledge of Local Area Network technology

Related Documentation

The following documentation is also available:

» NW(1,2) Series (Gen 4) Datasheet
» NW(1,2) Series (Gen 4) Quick Start Guide

Website

For information on ComNet's entire product line, please visit the ComNet website at **http://www.comnet.net**

Support

For any questions or technical assistance, please contact your sales person (**sales@comnet.net**) or the customer service support center (**techsupport@comnet.net**)

Safety

» Only ComNet service personnel can service the equipment. Please contact ComNet Technical Support.
» The equipment should be installed in locations with controlled access, or other means of security, and controlled by persons of authority.

Contents

Overview

Regulatory Compliance Statement

Product(s) associated with this publication complies/comply with all applicable regulations. Please refer to the Technical Specification section for more details.

Warranty

ComNet warrants that all ComNet products are free from defects in material and workmanship for a specified warranty period from the invoice date for the life of the installation. ComNet will repair or replace products found by ComNet to be defective within this warranty period, with shipment expenses apportioned by ComNet and the distributor. This warranty does not cover product modifications or repairs done by persons other than ComNet-approved personnel, and this warranty does not apply to ComNet products that are misused, abused, improperly installed, or damaged by accidents.

Please refer to the Technical Specifications section for the actual warranty period(s) of the product(s) associated with this publication.

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1.0 Introduction

The NetWave® ultra-high throughput, impact-resistant hardened wireless Ethernet transmission device can be configured through the embedded User Interface as a Client or as an Access Point. This single radio model was designed for high throughput point-to-point or multipoint applications and comes with an integrated 19dBi, 17° beamwidth antenna. The NetWave Radios supports up to 500 Mbps throughput using 802.11ac MIMO technology. The units can be powered by an 02.3af/at PoE compliant device or through a sold-separately PoE injector with the second Ethernet port serving as an IEEE802.3af power source. NW1 is FCC certified for use in North America, NW1IC is certified for use in Canada, and the NW2 is ETSI, DFS and TPC certified for use in the European Union.

This user manual is a guide for the NetWave Generation 4 wireless Ethernet devices as well as the preconfigured kits. ComNet NetWave Wireless offers OpenWRT with the most advanced Qualcomm Atheros wireless drivers. NetWave now includes a new user-friendly LuCI web interface for configuring the device. OpenWRT is an extensible GNU/Linux distribution for embedded devices. It is built from the ground up to be a full featured, easily modifiable operating system. It is powered by a Linux kernel that's more recent than most other distributions. LuCI is a free, clean, extensible and easily maintainable web user interface for embedded devices. It has high performance, small installation size, fast runtimes, and good maintainability. The units come configured for either point to point or point to multipoint applications. This manual contains detailed operational and configuration information not covered in the quick start guides.

System Requirements

Web Browser:
Mozilla Firefox, Google Chrome, Apple Safari, or Microsoft Internet Explorer 8 or above.

2.0 Deployments

Point to Multi-Point

These individual units allow the user to configure for either multipoint access point or client operation. There is a MAC address lock feature that can be enabled through the user interface but is not enabled by default. The NW(1,2)[IC] radios includes a 19dBi 17° internal antenna. See the ComNet website for the latest information regarding antenna support. Preconfigured NWK kits do not support point-to multipoint topologies out of the box. They will need to add the additional clients to a whitelist on the access point.

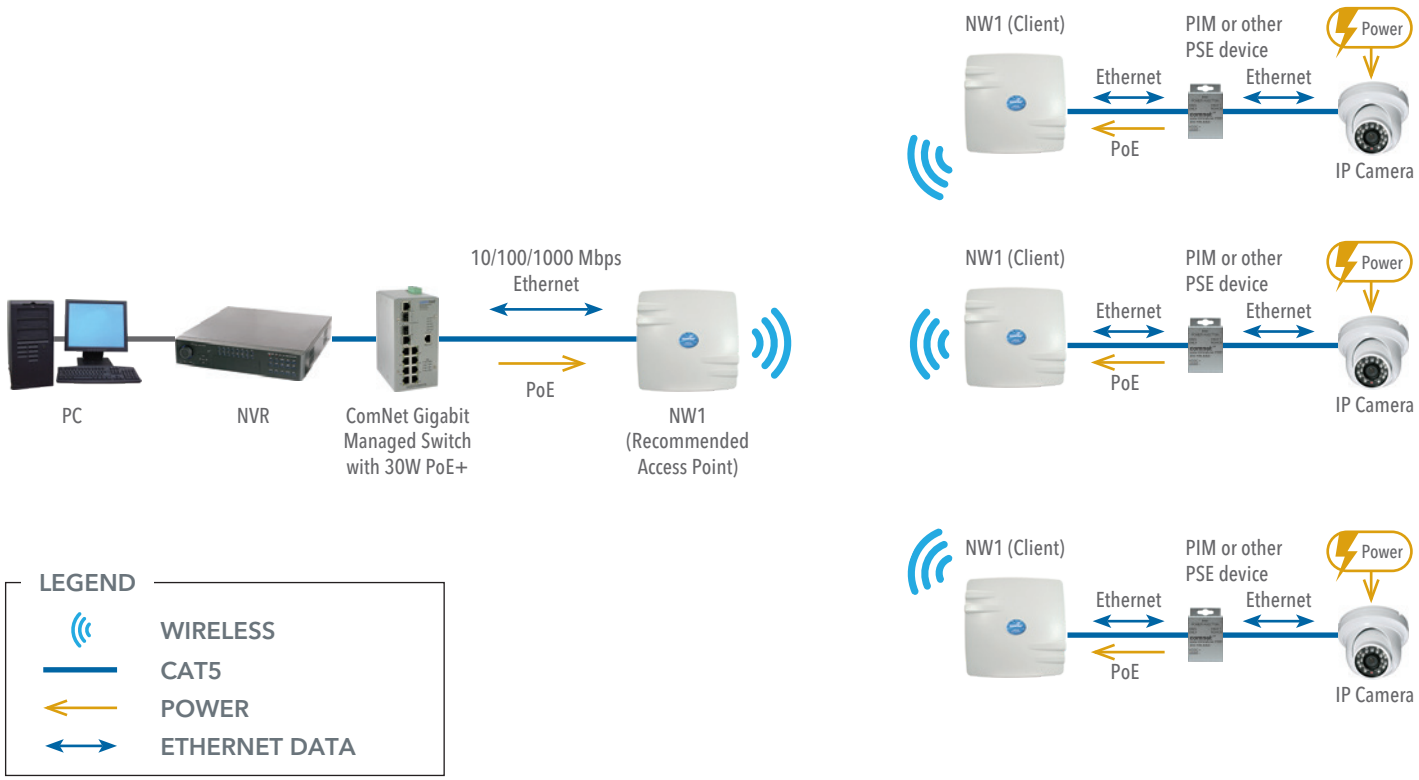


Image 1

Point to Point Topology Utilizing Dual Ports for Passthrough PoE

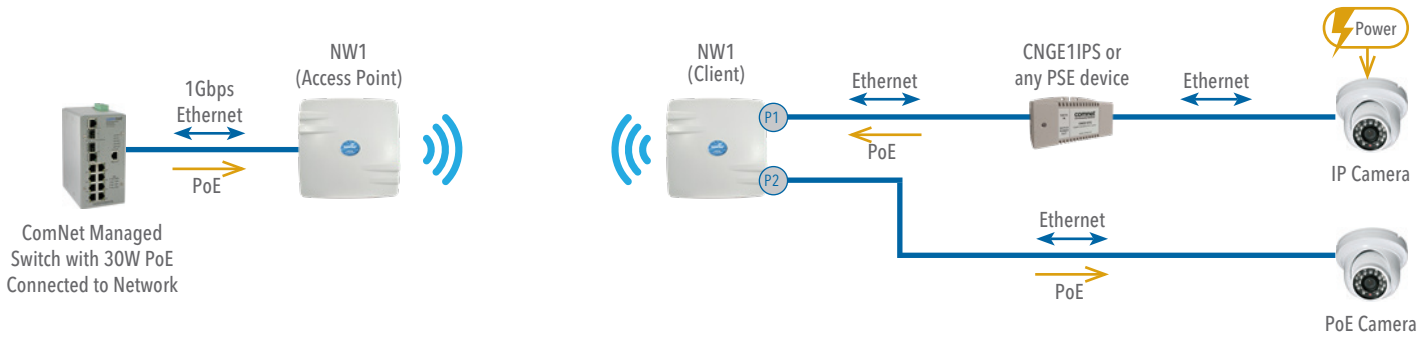


Image 2

4.0 Cabling Requirements

Shielded CAT 5 or better should be used for all out of plant Ethernet connection and should be properly grounded through the PoE AC ground. Industrial grade shielded Ethernet cable is recommended to help prevent ESD damage commonly experienced with outdoor installations. Visit www.comnet.net/comnet-products/cables

5.0 Hardware Installation

Outdoor Ethernet Gland Installation

There will be at least one cable gland included with each outdoor enclosure. Below is an image of the individual parts of the gland with an Ethernet cable routed through.

Note: The split rubber washer allows a pre-terminated Ethernet cable to be used.

Once the cable has been routed through the weather connection, and the RJ45 connection has been made, screw in the gland into the housing making sure it is tight enough for a water tight seal. Push the split rubber gasket into place and loosely screw the cap that goes over the rubber washer.

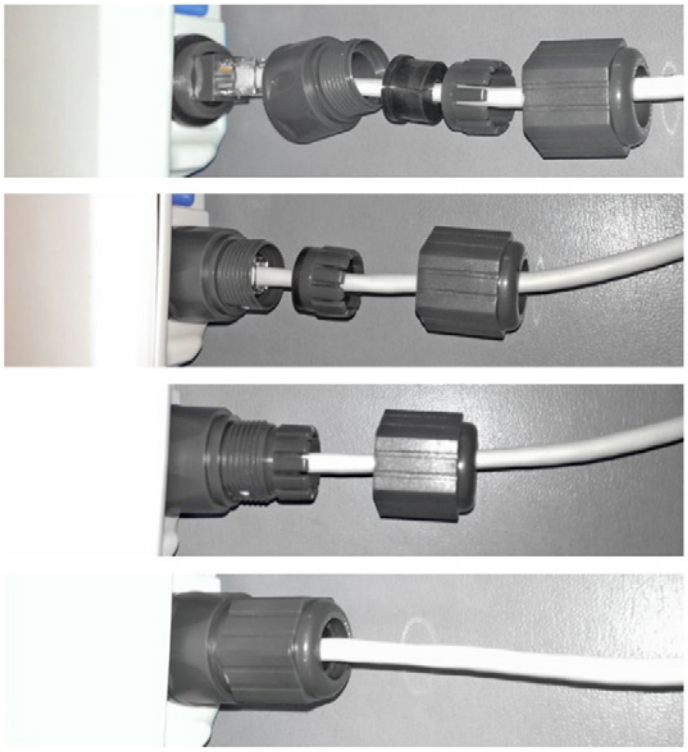


Image 3

Once the gland is tight in the housing, tighten the outer nut/cap making sure the rubber seal squeezes and seals the Ethernet cable to the gland as shown.

Connect one end of an RJ-45 Ethernet cable to the LAN OUT port of the Power Injection Module (PIM) and the other end to LAN of the access point – as sown below.

Note: Maximum length of the RJ-45 CAT5 cable is 90 meters.

Connect the RJ-45 Ethernet cable attached to the PIM to a network device, such as a switch or to the configuration PC. Then plug the power adaptor to an AC power outlet and power plug into the socket of the PIM – as shown in the diagram below.

Note: DC PoE input for the NW(1,2,9) and NWK(1,2,9) is 48 VDC.

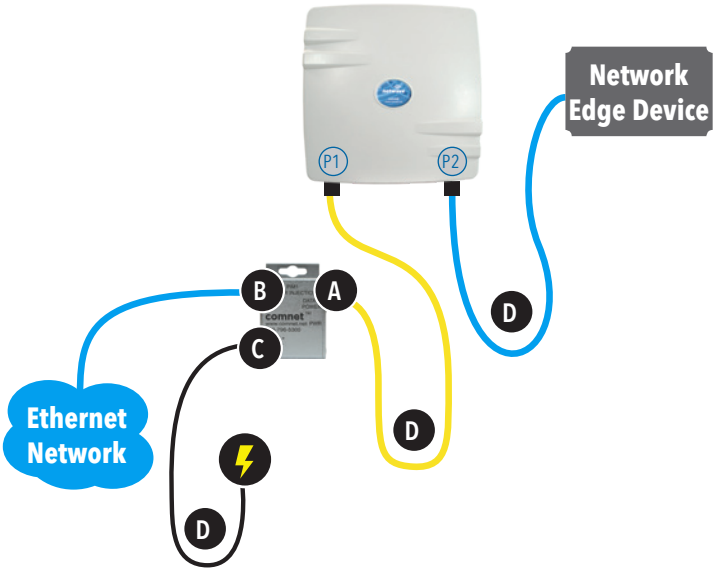


Image 5

A. Connect one end of an RJ-45 Ethernet cable to the OUT port of the Power Injection Module (PIM) and the other end to LAN of the access point.
Maximum length of the RJ-45 CAT5 cable is 100 meters.*

B. Connect the RJ-45 Ethernet cable attached to the PIM to a network device, such as to a switch or to the PC you will use to configure the access point.

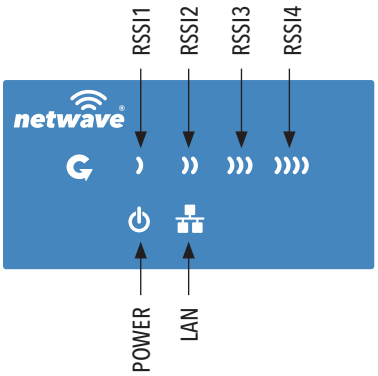
C. Connect the power adaptor to the main electrical supply and the power plug into the socket of the PIM. PoE power input: Passive PoE (range 36 to 48 VDC). The unit can also be powered by a suitable IEEE 802.3af/at PSE device such as a PoE switch or injector.

D. A Drip Loop is recommended as additional precaution against moisture entering the Access Point housing.

** Up to 200mW radio. For higher power radio upgrade to higher rating power adapter.*

IMPORTANT: Only plug PoE power to Port 1.
Connecting a PoE power source to the PSE Port (#2) will cause a major device malfunction and void the warranty.

NetWave Indicating LED Details



LED	VISUAL CUE	INDICATION
POWER	SOLID GREEN	Power is supplied to the unit
	OFF	No power is supplied to the unit or the unit is in reset.
LAN	SOLID GREEN	LAN Connected
	OFF	No Connectivity
RSSI1	SOLID RED	Weak Connection
RSSI2	SOLID ORANGE	Moderate Connection
RSSI3	SOLID GREEN	Solid Connection
RSSI4	SOLID GREEN	Excellent Connection (Advisable to check Status Page to confirm RSSI is > -55)

SIGNAL STRENGTH:

WEAK SIGNAL EXCELLENT SIGNAL

Image 6

Outdoor Standard Mounting Hardware

This mounting hardware will support pole diameters up to 2 in (5.8 cm). Below are the parts contained in the standard mounting hardware.

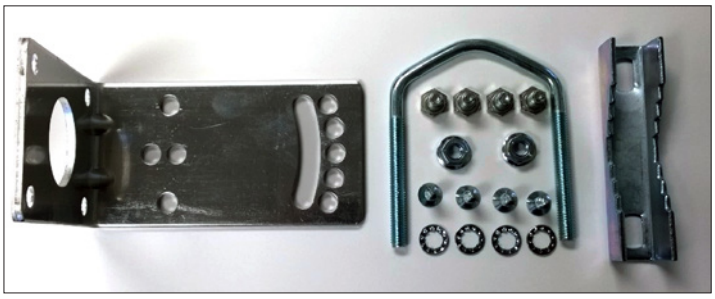


Image 7

Here is the mounting hardware assembled shown with a NW1/M in a +30° and -30°vertical position

Image 8

6.0 Key Default Settings

IP Address

Defaulted Radio	192.168.10.101
IP Address of Web Server	192.168.10.100 (AP) 192.168.10.101 (CL)

Login Credentials

Username	root
Password	root

Default Wireless Settings

SSID	NetWave-1
WPA Pre-shared Key	12345678
Channel-Frequency (AP)	Auto
Channel Spectrum Width	Auto

Note: A Reset to defaults will erase the user config and reset the radio to a 192.168.10.101 address and set the wireless card to Client mode.

7.0 Quick Configuration

1. Connect an Ethernet cable from the port labelled as IN on the power Injection Module to either a laptop or a PC LAN port.
2. Connect the second Ethernet cable from the OUT port on the Power Injection Module to the NetWave LAN port.
3. Apply 48 VDC to the Power Injection Module with the provided power supply. You should notice the green LED illuminate in the Power Injection Module and the power LED on the NetWave unit.
4. Set the IP address of the laptop being used to configure NetWave to static and the subnet to 192.168.10.x/24 subnet.
5. Point the browser to 192.168.10.101. This is the default address.
   For preconfigured kits (NWKX_AP and NWKX_CL) point the Browser to 192.168.10.100 for the Access Point or 192.168.10.101 for the Client.
6. A login prompt will pop up. Enter:
   Username root
   Password root
7. Select the NETWORK » WIFI tab and set the desired network settings.
   Select Apply & Save.

Note: This will be the network address for the NetWave web server. It is not necessary to set to the same subnet as the operating network, but it is recommended.

8. Select the NETWORK -> WIFI tab and set:
   • Wireless mode – Set to AP or Client
   • Country code – Only required if setting up the NW2 (ETSI) model
   Note: It is the user's responsibility to ensure that the correct country is chosen. ComNet accepts no liability for incorrect equipment set up.
   • Output RF power – if received signal strength is greater than 80, it is recommended to reduce RF TX power
   • Set SSID – if changing from the default setting
   • Channel Spectrum Width – May want to reduce to 20M from the default 20/40/80MHz if the 5GHz spectrum is crowded
   • Wireless Security – if changing from default settings
   • Select Apply Settings
   • Select Save

Note: Multipoint nodes will need to have the Wireless Mode set to either AP or Client (default is Client). And the IP addresses will need to be all set to different addresses (default address is 192.168.10.101). Once this is done, all the clients will connect to the multipoint AP with all other setting kept at default.

8.0 Detailed Configuration

Logging Into a Radio

To access the NetWave configuration interface, perform the following steps:

1. Connect an Ethernet cable from the Data In port on the Midspan Injector or Port 2 on the radio directly to your laptop.
2. If you are using a Midspan Power Injector, connect the power cable to an outlet and turn on power.
3. Assign the Ethernet adapter on your computer with a static IP address on the 192.168.1.x network, e.g. 192.168.10.10 and with a subnet mask 255.255.255.0.
4. Launch a web browser and enter the default IP address of the device, 192.168.10.101, into the address bar.

The login page will look like the following image:

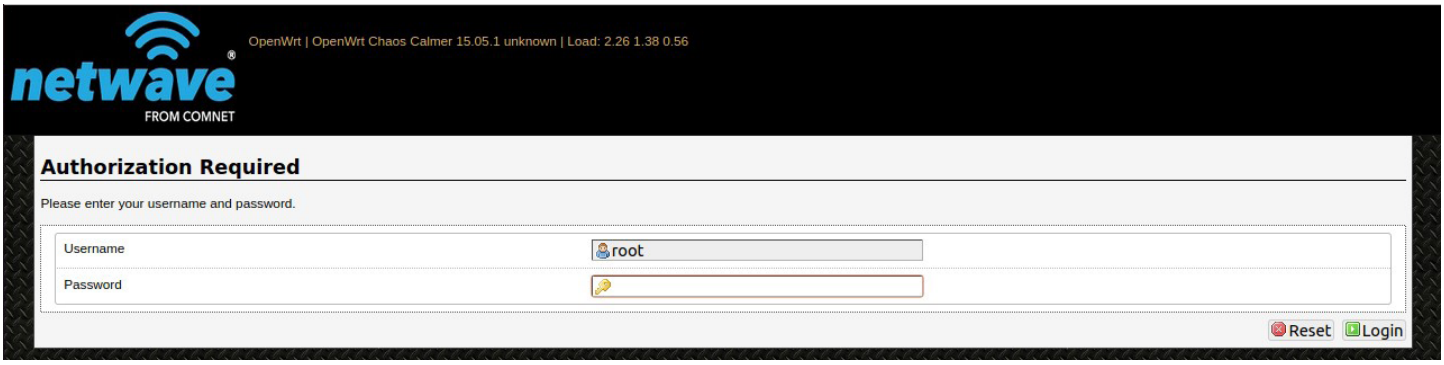


Image 9

The default authorization details are:

Username: root

Password: root

Operating Modes

The Netwave Radio can operate in the following modes:

1. Access Point WDS
2. Client WDS

An Access Point can have multiple clients.

A Client Radio can only link to one access point.

Reset and Save Settings

The buttons are described here.

Image 10

Reset	Undo the changes.
Save	Saves the changes but does not take effect till settings are applied
Save & Apply	Saves and applies the changes. Please use this button so that the changes are applied immediately.

Note: At the top right corner of the NetWave configuration web page, there may be either of the following texts displayed:

Changes: 0: Means that all changes on the configuration web page have been applied to the Wireless Device.

Unsaved Changes: Shows the number of changes that have not yet been Save & Apply.

Logout

There are two ways to logout of the radio, most will simply close the browser or browser tab. There is also a logout button on the navigation bar.

Reset Button

The reset button is a physical hardware button on the enclosure of the radio. Depending on how long the button is pressed, you can reboot the board or reset it to factory default. First make sure, that the power is on and wait a minute for the board to finish starting up. The following table shows the duration of the button press and the corresponding action.

Button Press Duration	Effect
0 - 3 Seconds	Power cycles the radio
5 – 20 Seconds	Reset to factory default

Web GUI

After login, the browser will display the Status – Overview page. This is the default information page that shows your connected stations and their connection quality.

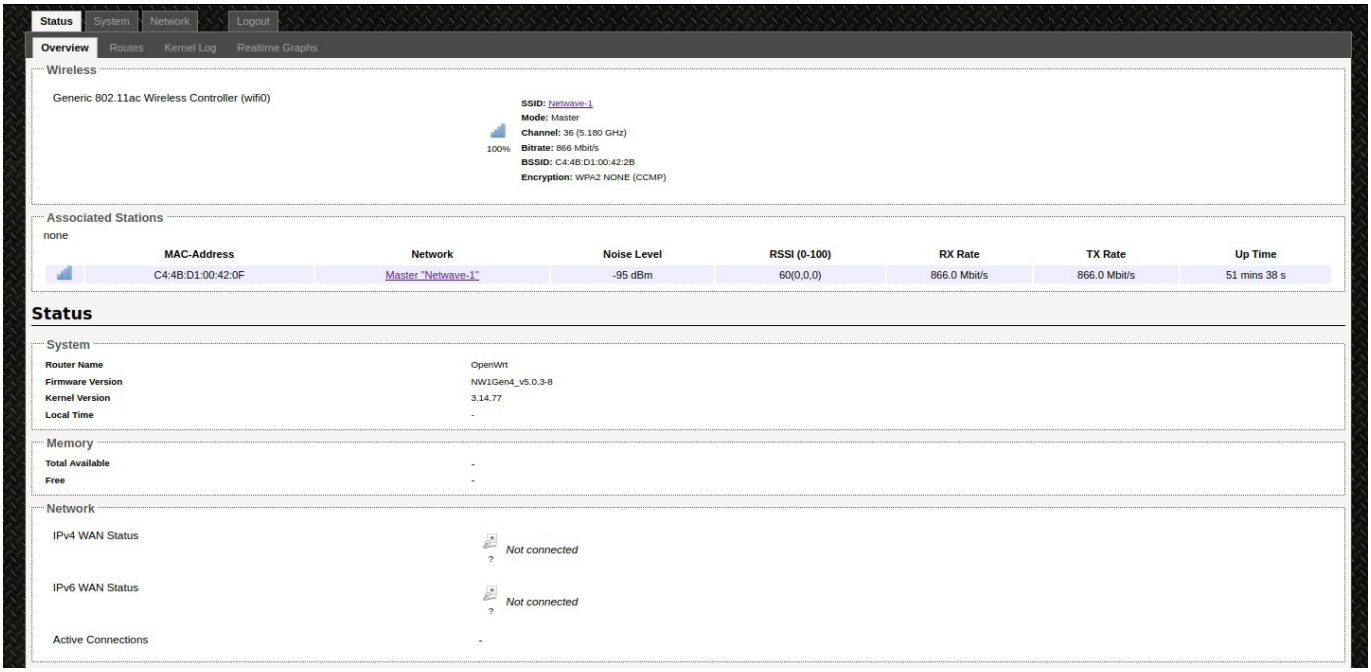


Image 11

Navigation Tabs

The navigation tabs assist with locating the specific settings that need to checked or updated.

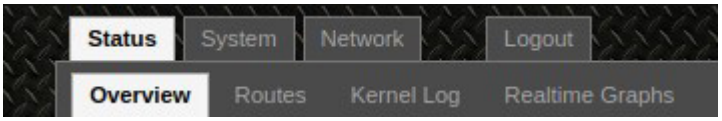


Image 12

The Status – Overview Page is the default page and is divided into the following sections.

Wireless	Displays the wireless settings for the Ath0 wireless card
Associated Stations	Shows connected stations
System	Displays host name, Firmware, and Kernel versions
Memory	Displays total and free onboard memory
Network	Shows WAN configurations if configured
DHCP Leases	Shows IPv4 DHCP Leases
DHCPv6 Leases	Shows IPv6 DHCP Leases

Status – Routes

The Routes page will display current ARP Table, IPv4, and IPv6 Routes.

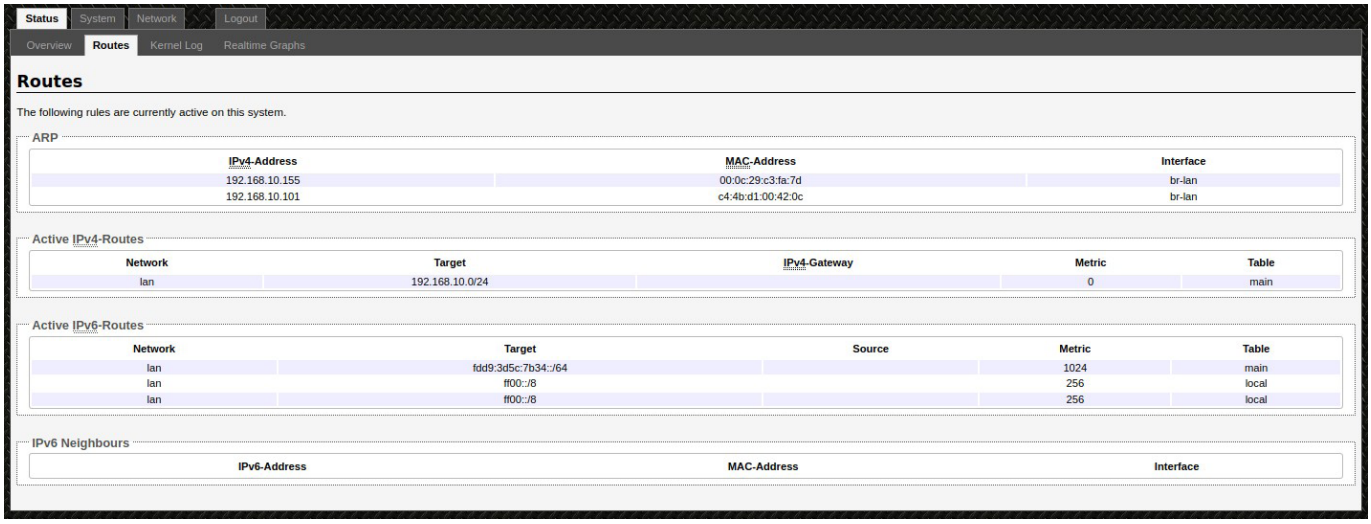


Image 13

Status – Kernel Log

The Kernel Log displays operational messages from the processor.

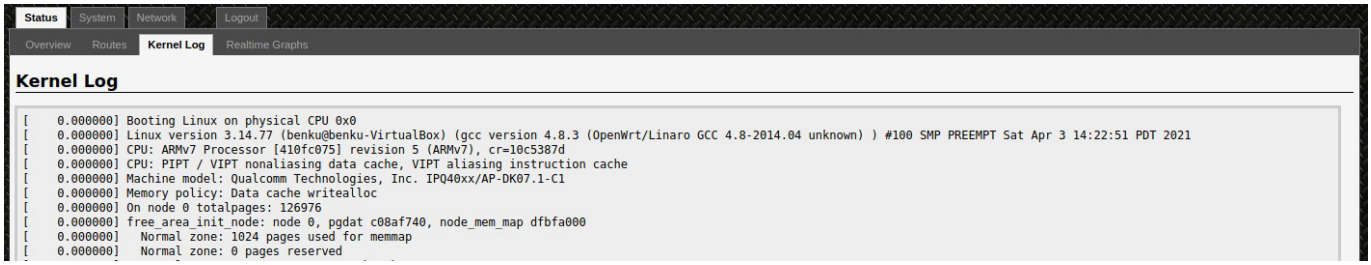


Image 14

Status – Realtime Graphs

Realtime graphs has the 4 following categories: Load, Traffic, Wireless, and Connections.

Load

Realtime Load displays current CPU usae. 1.00 would be considered 100% utilization.

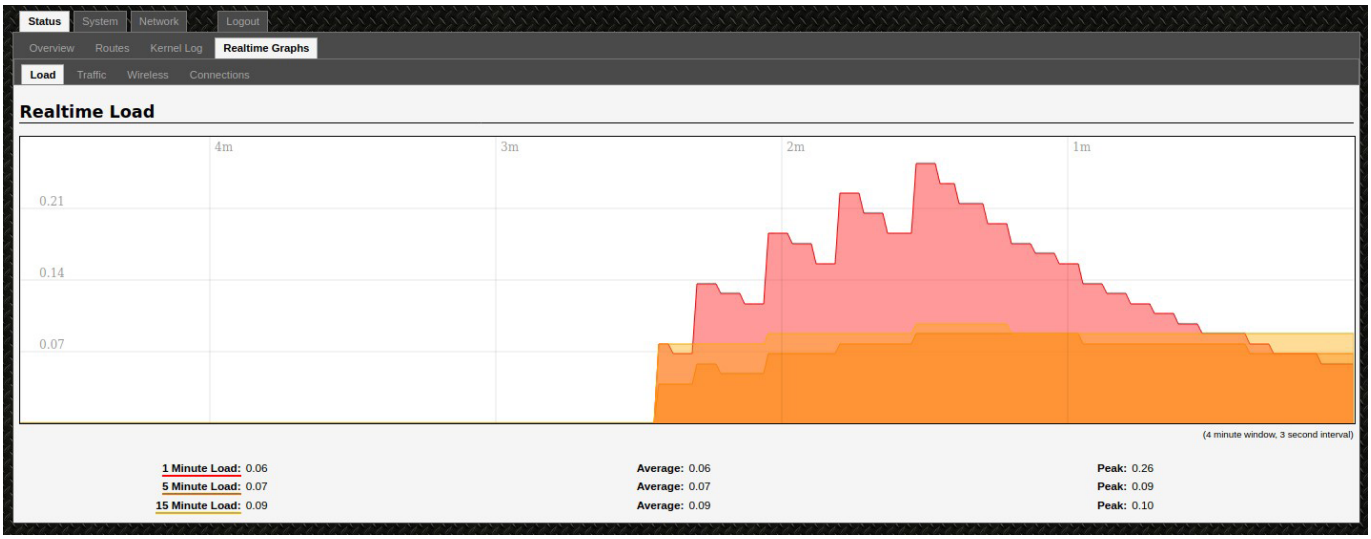


Image 15

Traffic

The Traffic tab displays throughput load for each of the interfaces.

Ath0 is the wireless interface.

Eth0 is port 1.

Eth1 is port 2.

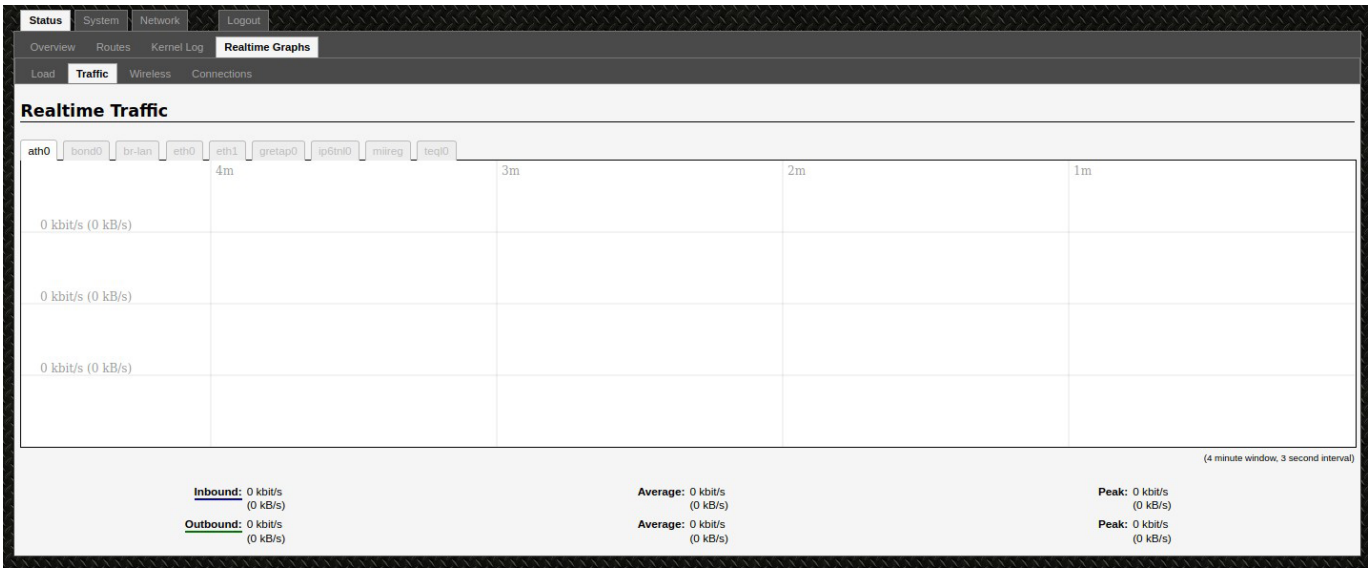


Image 16

Wireless

The Wireless tab has 2 sections. The upper section displays the Signal Strength and Noise Levels in dBm.

- » The Signal Strength is shown as a negative number that ranges from -95 (Weakest) to 0 (Strongest).
- » The Noise Level is also rated from -95 to 0 with -95 being the noise floor (No interference).
- » The Signal to Noise Ratio is also shown and is rated from 0 to 100 with 100 being the strongest signal possible.

The lower section displays the data rate of the wireless connection and varies greatly depending on throughput demand and processor load.

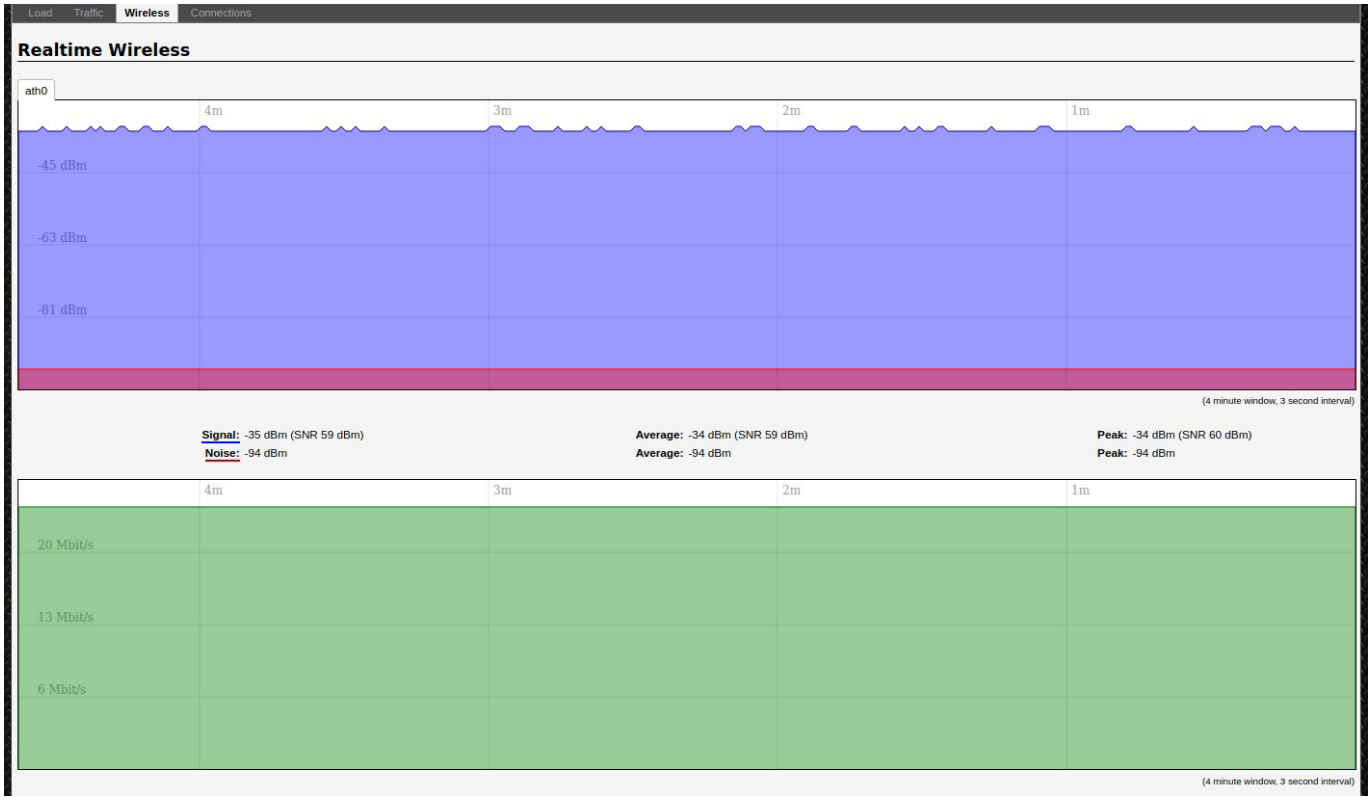


Image 17

Connections

The connections tab is a graphical display of the ARP table and the number of devices connected.

Image 18

System

Settings for managing the device will be found under the Systems Tab.

Under the Systems Main tab, there are 6 sub-categories: System, Administration, SNMP, LED Configuration, Backup/Flash Firmware, and Reboot.

System Properties

General Settings

The System Properties Section has two tabs, General Settings and Logging.

The General Settings Tab is used to designate a Hostname for the radio and specify a timezone.

You can also sync the radio time with your browser.

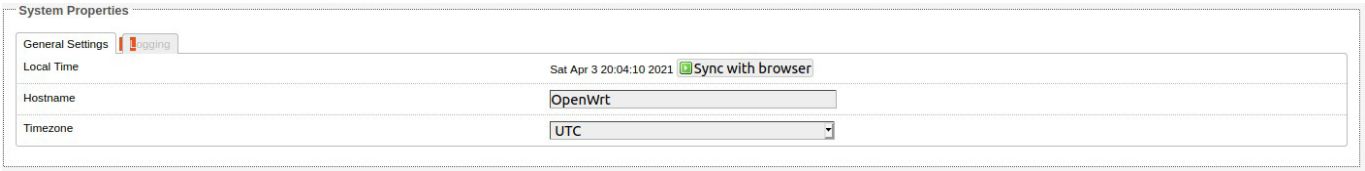


Image 19

Logging

The logging page allows you to configure what type of messages are sent and where to send it to.

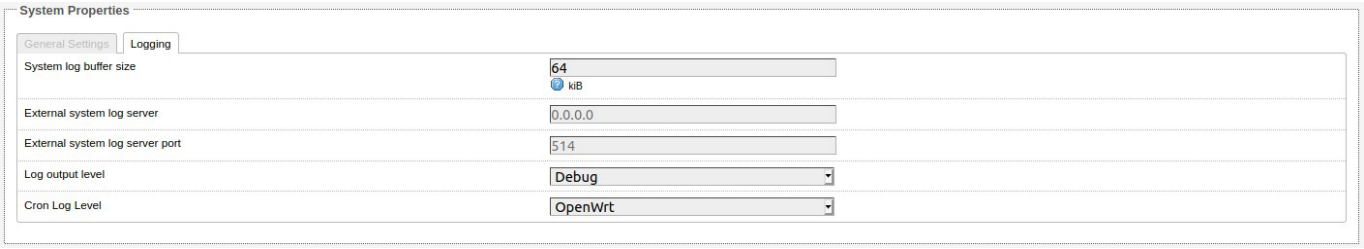


Image 20

Time Synchronization

The NTP Settings are under the Time Synchronization section. The device is able to act as an NTP Client or Server. If connected to the internet, the radio may synchronize with an outside server.

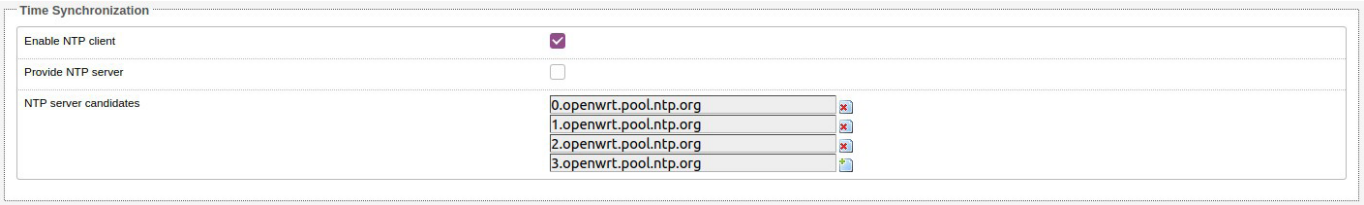


Image 21

System – Administration

The Administration page allows you to change the password to your radio and configure SSH Access.

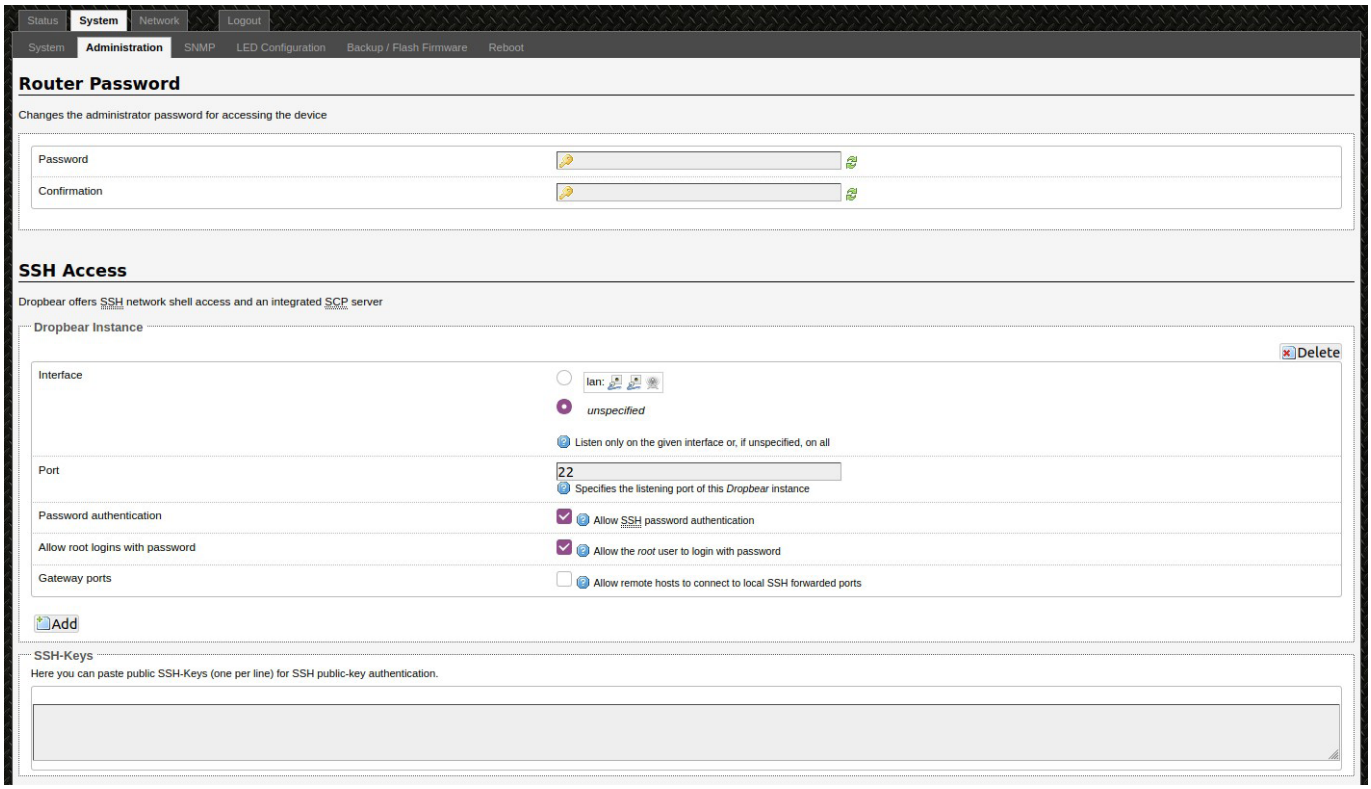


Image 22

Administration – Router Password

To update the device login password, Enter the new password in both the Password and Confirmation sections. The green circular arrows to the right of the input box will reveal/hide the password entered.

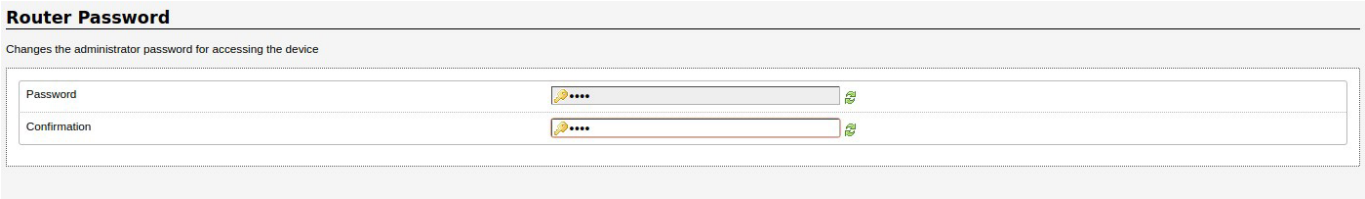


Image 23

Administration – SSH Access

SSH Access is available via Dropbear and an integrated SCP server.

SSH can be disabled by deleting all SSH instances. To delete, select the delete button on the top right.

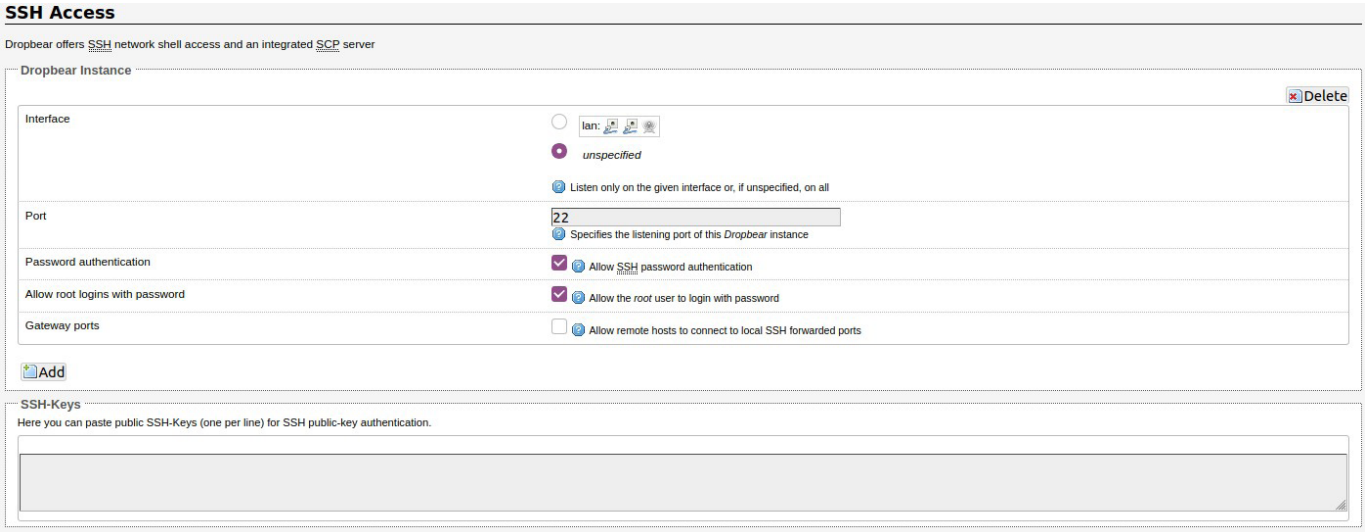


Image 24

SSH	Allows you to access the device's Linux shell and file system using the Secure Shell protocol. For example, the programs PuTTY and WinSCP can be used.
Interface	Lets the device listen on a given interface or all interaces.
Port	Specifies the listening port, the default being 22.
Password Authentication	Allows SSH password authentication.
Allow root logins with password	This is enabled by default.
Gateway ports	Allow remote hosts to connect to local SSH forwarded ports.

System – SNMP

The Simple Network Management Protocol (SNMP) is an Internet-standard protocol for managing devices on IP networks. It consists of a set of standards for network management, including an application layer protocol, a database schema, and a set of data objects. SNMP exposes management data in the form of variables on the managed systems, which describe the system configuration. These variables can then be queried (and sometimes set) by managing applications.

In the System » SNMP Page, you can configure SNMP V2c and SNMP V3.

SNMP Information

In the SNMP Information section, the text fields for the SNMP Enterprise ID, Contact, and Location information is shown.

SNMP Configuration

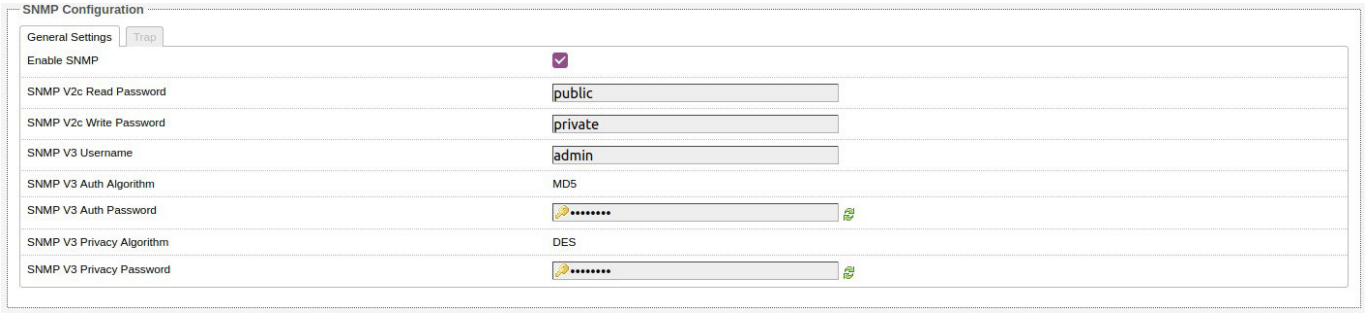


Image 25

Enable SNMP	Enables SNMP
SNMP V2c Read Password	Sets the community string for read-only access (to the variables on the SNMP agent) by the network management station (NMS). The NMS is the software which runs on the SNMP manager. (default: public)
SNMP V2c Write Password	Sets the community string for read-write access by the SNMP manager. (default: private) A community string identifies a group of SNMP agents. It is sent in clear text. It should be changed from the default string “public” or “private”. The variables on the SNMP agent can be classified into read-only or read-write variables.
SNMP V3 Username	Sets the username for authentication. (default: admin)
SNMP V3 Auth Algorithm	Shows the authentication algorithm used e.g. MD5.
SNMP V3 Password	Configures the password for user authentication. (default: password)
SNMP V3 Privacy Algorithm	Shows the data encryption algorithm used e.g. DES.
SNMP V3 Privacy Password	Sets the password for data encryption. (default: password)

SNMP Trap

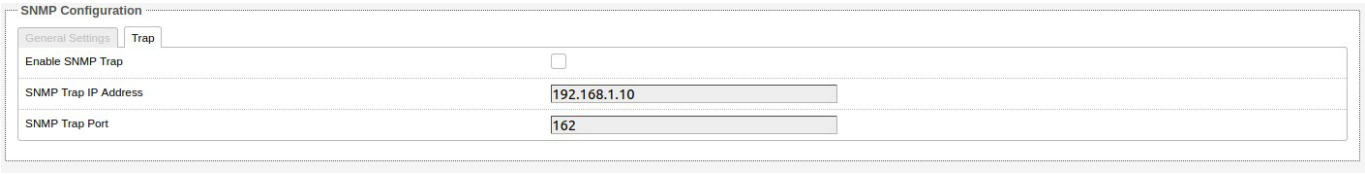


Image 26

Enable SNMP Trap	Allows the SNMP agent to notify the SNMP manager of events.
SNMP Trap IP Address	Sets the IP address of the SNMP Manager which receives the trap messages
SNMP Trap Port	Sets the port number.

System – LED Configuration

Strength indicator for LEDs 1, 2, 3, and 4.

The LED Configuration page customizes how the LEDs indicate the received SNR signal strength (0 to 100 with 0 being weakest).

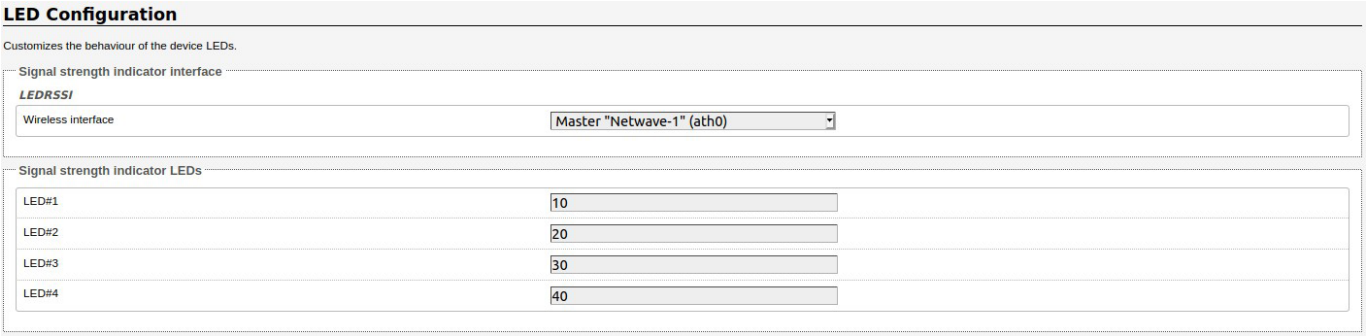
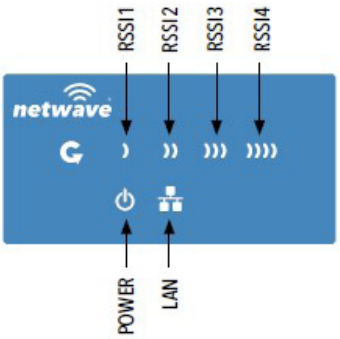


Image 27

Wireless Interface	Chooses the interface which the LEDs will report.
Signal Strength Indicator LEDs	Sets the SNR Values for radio. These values should be adjusted to help fine tune the alignment of the radio.

Summary of LED Indicators



LED	VISUAL CUE	INDICATION
POWER	SOLID GREEN	Power is supplied to the unit
	OFF	No power is supplied to the unit
LAN	SOLID GREEN	LAN Connected
	OFF	No Connectivity
RSSI1	SOLID RED	Weak Connection
RSSI2	SOLID ORANGE	Moderate Connection
RSSI3	SOLID GREEN	Solid Connection
RSSI4	SOLID GREEN	Excellent Connection (Advisable to check Status Page to confirm RSSI is > -55)

SIGNAL STRENGTH:

WEAK SIGNAL EXCELLENT SIGNAL

Image 28

System – Backup / Flash Firmware

The Backup /Flash Firmware Page allows you to download your config, upload a config, load firmware, and reset the radio to factory defaults.

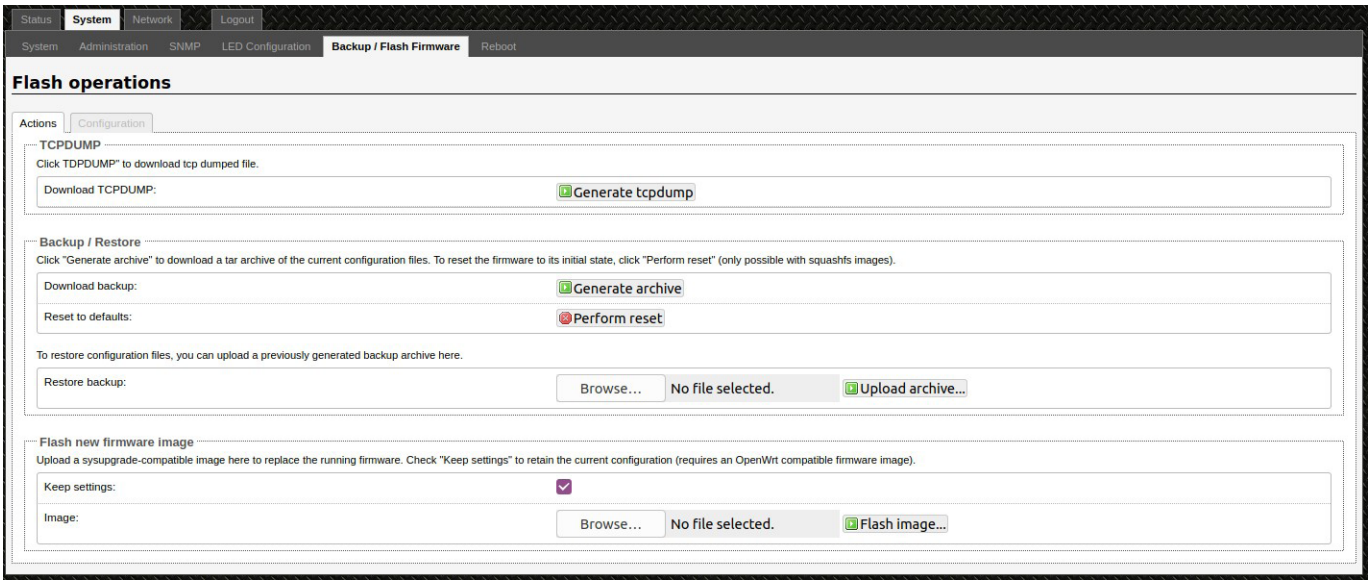


Image 29

Download TCP Dump	Generates a text file with TCP Dump Data.
Download Backup	Generates an archive of your configuration file.
Reset To Defaults	Resets radio to factory defaults.
Restore Backup	Restores config based on the loaded configuration file.
Keep Settings	When checked and image is loaded, the configuration will be preserved when a new image is loaded. Uncheck if the radios should be set to defaults, Recommended.
Image	Loads new software image and installs.

System – Reboots

Power cycles the radio clearing all unsaved changed.

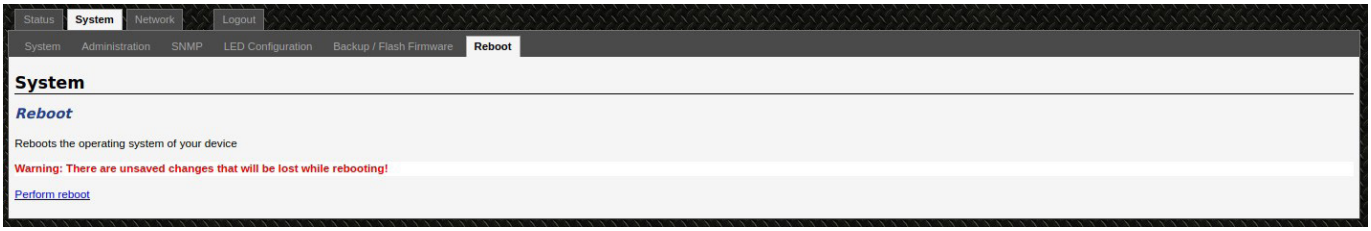


Image 30

Network

You can view and configure the interfaces of the local area network (LAN) zone.

Network address translation (NAT) occurs between these two network zones. The router that performs the NAT is called a gateway. A gateway is a network point that acts as an entrance to another network.

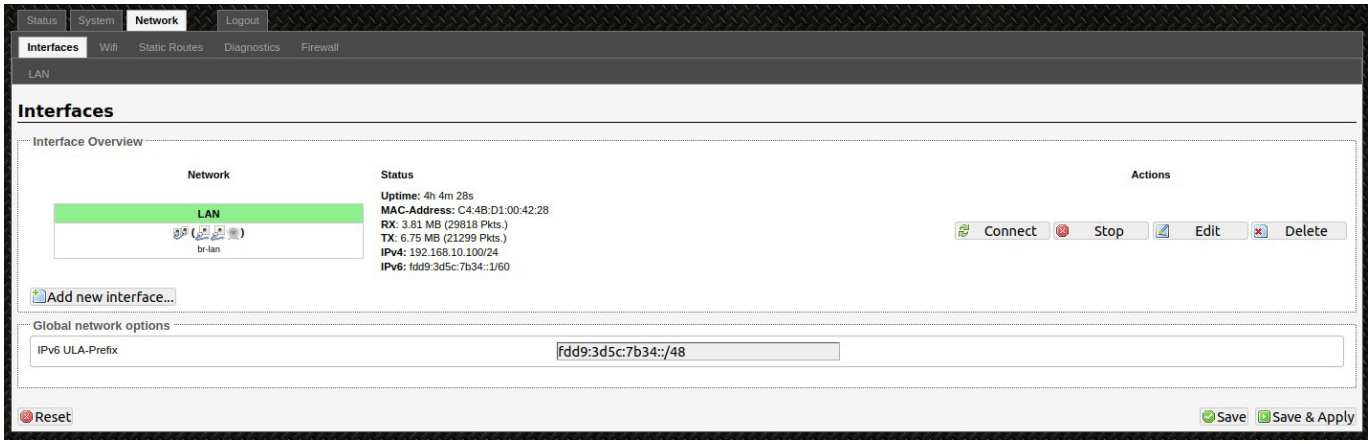


Image 31

The LAN zone (icon with two Ethernet ports) has the bridged interface “br-lan” which consists of one physical port (icon with one Ethernet port) and two wireless networks (each icon looking like a short standing fan) on the device. Hovering the mouse over each icon would give the name of the interface it represents.

Selecting Edit or The Lan tab will direct you to the Network Interfaces Tab

Network - General Setup

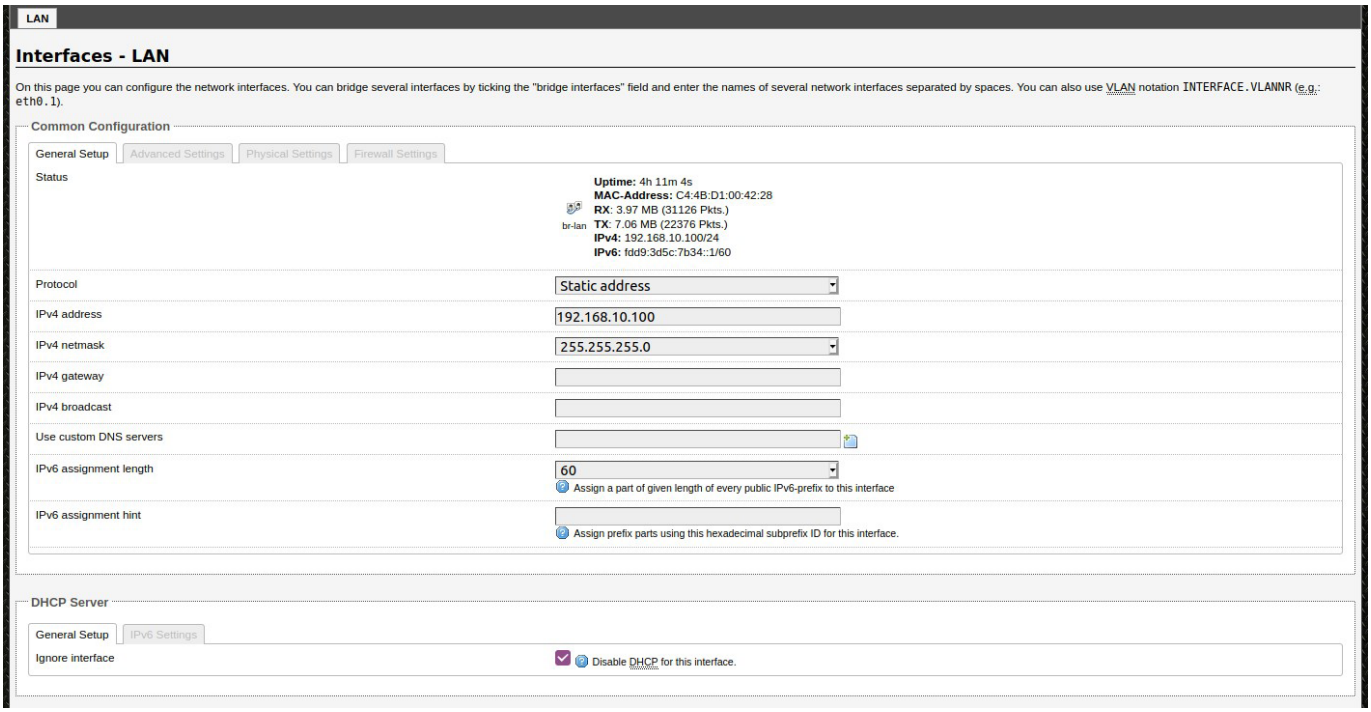


Image 32

Common Configuration

Status	Shows a summary of the interface for the LAN zone. This includes uptime, MAC address, bytes and packets received by the device, bytes and packets transmitted by the device, and its IPv4 and IPv6 addresses.
Protocol	Choose between various networking protocols. Static is most common but DHCP is also supported.
IPv4 Address	Static IP Address
IPv4 Netmask	Static Subnet Mask
IPv4 Gateway	Static Gateway Address
IPv4 Broadcast	Static Broadcast Address
Custom DNS	DNS Server Address
IPv6 Assignment Length	Assigns a part of a given length of every public IPv6-prefix to this interface.
IPv6 Assignment Hint	Assign a prefix using hexadecimal subprefix ID for this interface.

DHCP Server – General Setup

Ignore Interface	Disabled by default, when unchecked it will provide DHCP to your network.

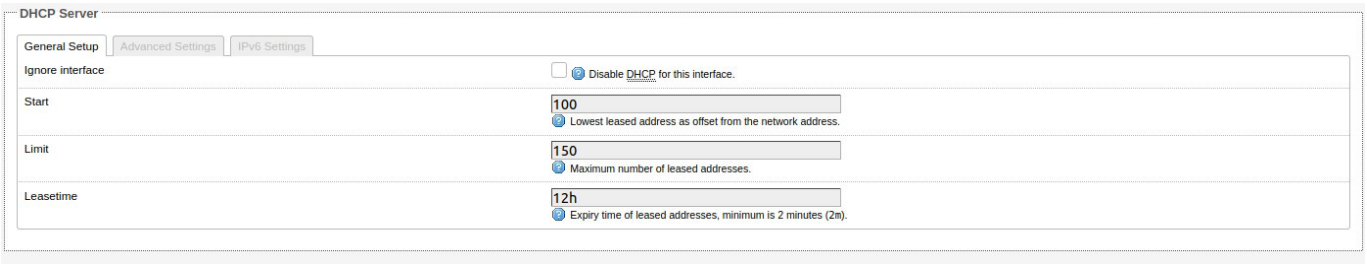


Image 33

With DHCP Enabled (unchecked).

Start	Lowest leased address in your DHCP pool.
Limit	Maximum number of leased addresses.
Lease time	Expiration time of leases.

DHCP Advanced Settings

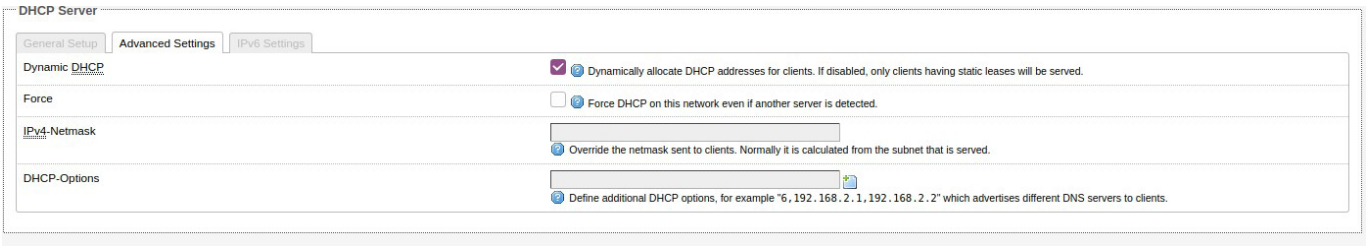


Image 34

Dynamic DHCP	Dynamically allocate DHCP Addresses for clients, if disabled, only clients having static leases will be served.
Force	Force DHCP ont his network even if another server is detected.
IPv4 Network	Override the netmask sent to clients.
DHCP Options	Define additional DHCP Options.

DHCP IPv6 Settings

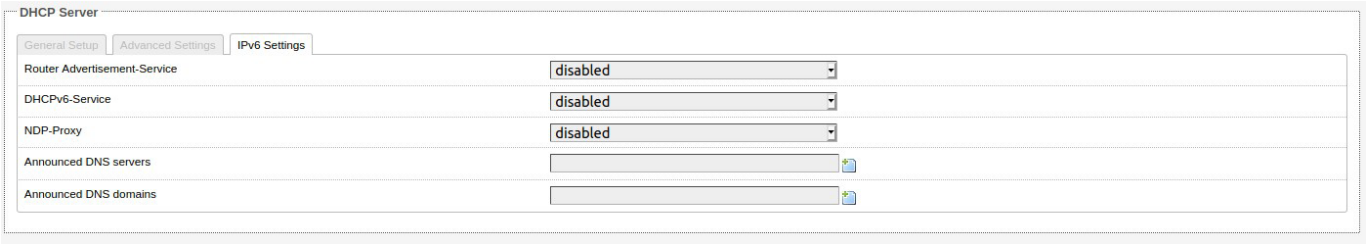


Image 35

Router Advertisement	Router Advertisement service enable and select mode; Server, Relay, or Hybrid.
DHCPv6-Service	DHCPv6 service enable and select mode; Server, Relay, or Hybrid.
NDP-Proxy	NDP Proxy enable and select mode, Relay or Hybrid.
Announced DNS Servers	List of available DNS Servers used.
Announced DNS Domain	List of domains available.

Network - LAN - Advanced Settings

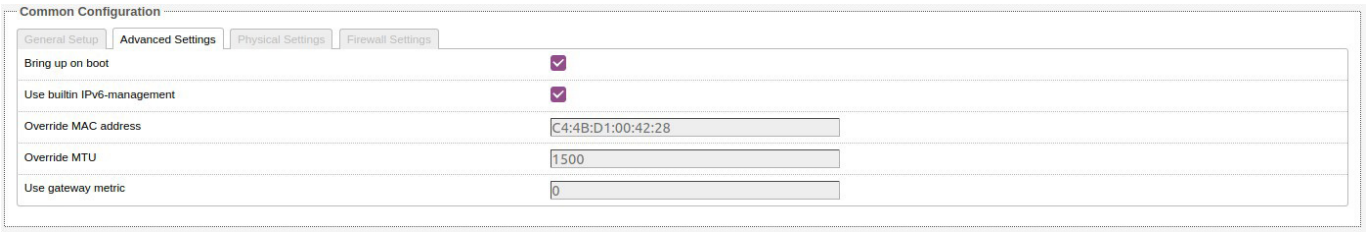


Image 36

Note: Advanced settings should only be changed by Network Engineers familiar with the settings and typically do not need to be changed.

Bring up on boot	Enables the LAN interface on boot. Radio will be inaccessible if this is changed.
Use IPv6 Management	Uses the default IPv6 script for configuration.
Override MAC Address	Disabled by default, Overrides the Eth0 LAN MAC
Override MTU	Disable by default, Overwide MTU Size.
Use gateway metric	Sets the cost of using the device as a gateway.

Network – LAN – Physical Settings

Note: Physical settings should only be changed by Network Engineers familiar with the settings and typically do not need to be changed.

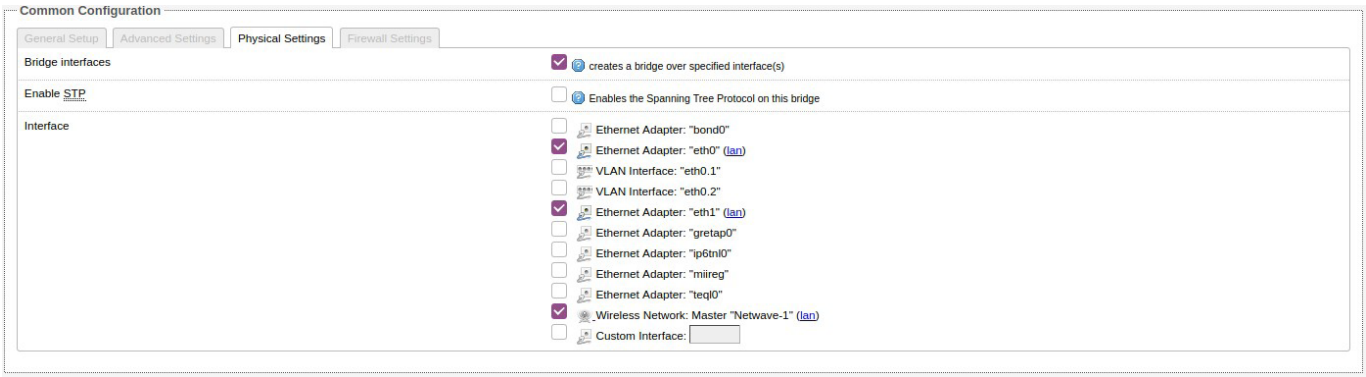


Image 37

Bridge Interfaces	Allows communication between interfaces.
Enable STP	Enables Spanning Tree Protocol over the interfaces
Interfaces	List of all interfaces, please leave as defaults!

Network – LAN – Firewall Settings

Firewall settings page assigns your Firewall Rules to a particular interface. Almost all applications will want the LAN Interface checked.

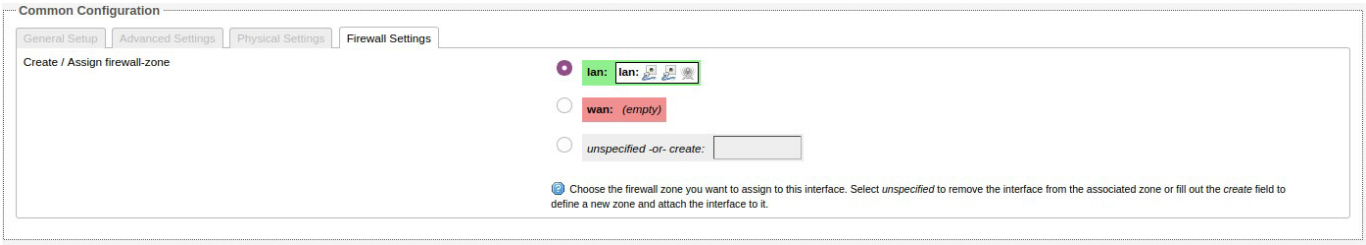


Image 38

Network – Wifi

The Network – Wifi tab is the most used tab on this webserver. All wireless provisioning will start on this page. The wireless overview page will highlight the radios current performance which helpful when configuring the devices.

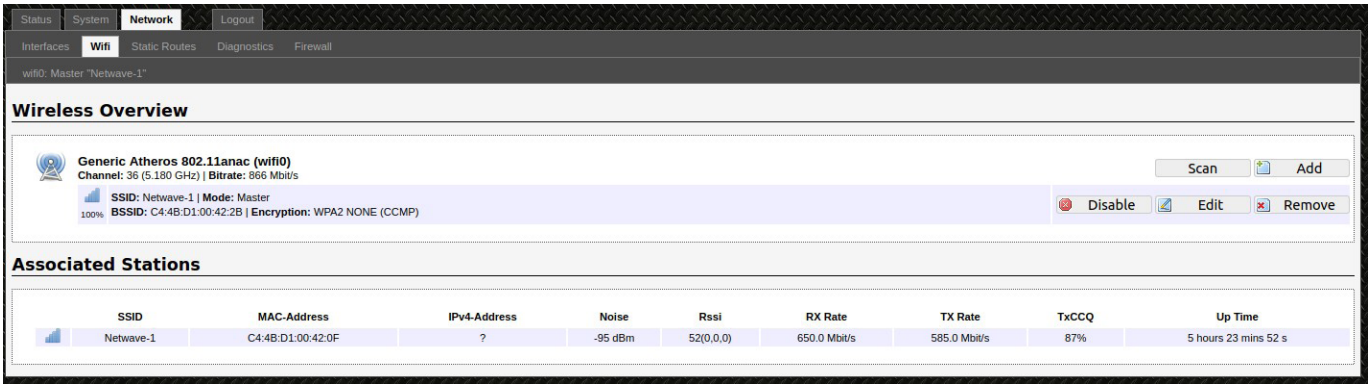


Image 39

Network – Wifi - Wireless Overview

The Wireless Overview page will show the current wireless interface (Ath0) and its settings.

Channel	Channel the radio is communicating on.
Bitrate	Data Rate the radio is transmitting. This will adjust depending on signal quality.
SSID	Service Set Identifier is the broadcast ID Access Points transmit and clients receive.
BSSID	MAC Address of the AP that is broadcasting the SSID.
Encryption	Current encryption used.
Scan	(Client Only) Scans channels in the selected scanlist to find available AP's.
Add	Adds a wireless interface, for future use.
Remove	Deletes the selected interface.
Disable/Enable	Disable/Enable the wireless interface.
Edit	Brings you to the Wireless Interface Settings page.

Network – Wifi – Associated Stations

Lists the stations connected to the device. Clients will only have one associated station, the AP. AP's can have multiple Associated Stations.

Image 40

WiFi Configuration

General Setup

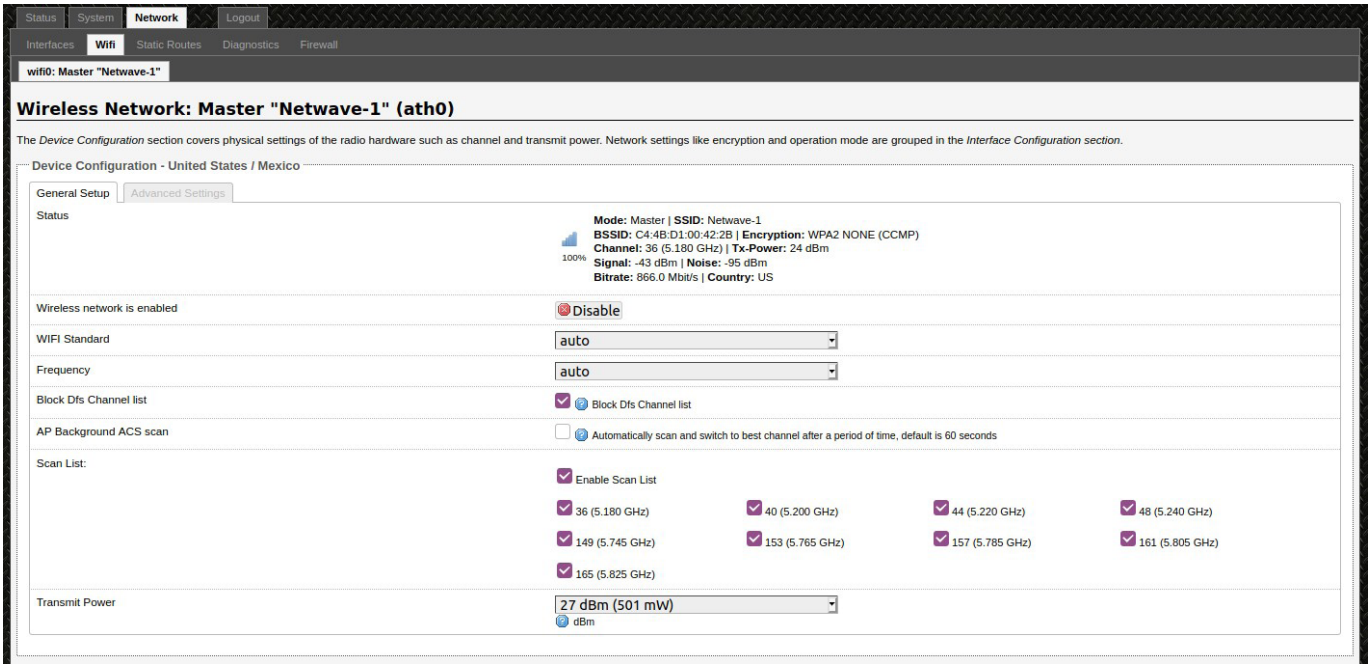


Image 41

Status	Shows current radio settings with connection quality icon.
Enable/Disable Wireless	Should read “Wireless network is enabled” if enabled.
WIFI Standard	Auto, 802.11a, 802.11an, 802.11ac
Spectrum Width	20,40,80MHz (Depending on Standard) *Only shown if Wifi Standard isn’t in Auto.
Frequency	Select broadcast channel, leave to auto if you would like to use the Scan List.
Block DFS	Blocks DFS Channels for quicker boot.
AP Background Scan	Automatically scan and switch to best channel. Only recommended for European Countries using DFS.
Scan List	If enabled, allows you to select which channels are available to use.
Transmit Power	Sets the output power of the radio.

Wifi Advanced Settings

Image 42

Distance Optimization	Specify the distance of the link to increase stability. 1000 equal 1 kilometer. Only needs to be adjusted for long range links over 1 km

Wifi – Interface Configuration

The Interface Configuration section contains the section tabs for General Setup, Wireless Security, MAC-Filter, and Advanced Settings

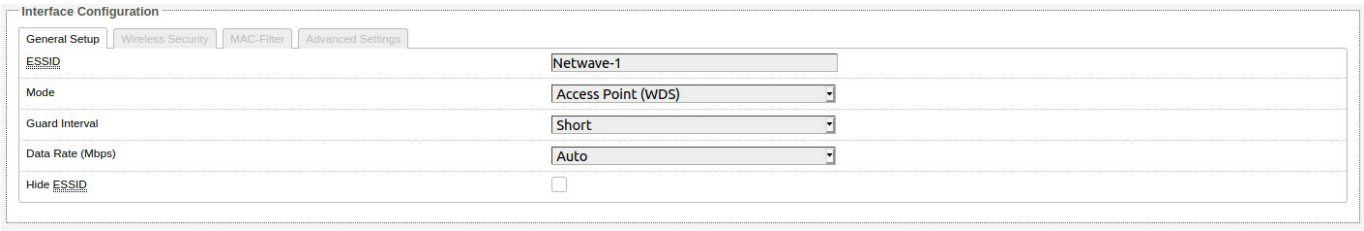


Image 43

ESSID	Specifies the name or extended service set identifier (ESSID) of the wireless network as it is provided in the beacon message. The network name can be up to 32 characters in length and can contain spaces. When running in AP mode, it is the name of the network as advertised in the beacon message. In Client mode, it is the network name that the client associates with.
Mode	Selects whether the device is operating as an Access Point WDS or Client WDS
BSSID	Sets the MAC address of the AP. This option is available for a device operating as a client. This is useful because there can be multiple APs with the same ESSID. Setting the MAC address would prevent the client from roaming to other APs. (Client Mode Only)
Guard Interval	Chooses between Short and Long guard intervals. Guard intervals are used to ensure that distinct transmissions do not interfere with one another. Data rate is improved in downlink and uplink if both AP and client use the Short Guard Interval.
Data Rate (Mbps)	Selects the data rate or the modulation and coding scheme (MCS). The default setting of Auto is recommended. The MCS and data rates are adjusted automatically depending on the wireless channel conditions.
Hide ESSID	Hides the network name (ESSID) from being broadcast publicly. (This option is for a device operating as an AP.)

Note: If the goal is securing your network, use WPA or preferably WPA2 encryption. Hiding the ESSID does not provide complete security.

Wireless Security

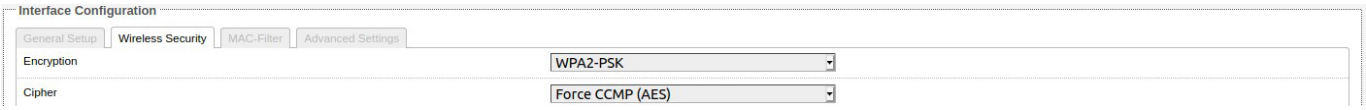


Image 44

Encryption	Chooses between No Encryption (open) and the following encryptions: WPA-PSK, WPA2-PSK, WPAPSK/ WPA2-PSK Mixed Mode.

WPA or WPA2 with PSK

Wifi protected access (WPA) is a stronger encryption than WEP.

Furthermore, WPA2 was developed to strengthen the security of WPA and is stronger than WPA and WEP.

For WPA-PSK, WPA2-PSK, WPA-PSK/WPA2-PSK Mixed Mode encryptions, we have the following options.

Cipher	Set to Forced CCMP (AES)
Key	The pre-shared key (PSK) is the password for the wireless network. This may consist of 8 to 63 ASCII characters. (Default: 123455678)

MAC-Filter

MAC Filter allows you to Whitelist (Allow Listed Only) or Blacklist (Allow All Except Listed) stations.

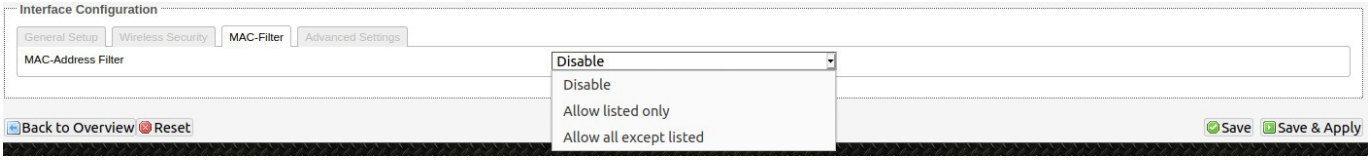


Image 45

Interface Configuration – Advanced Settings

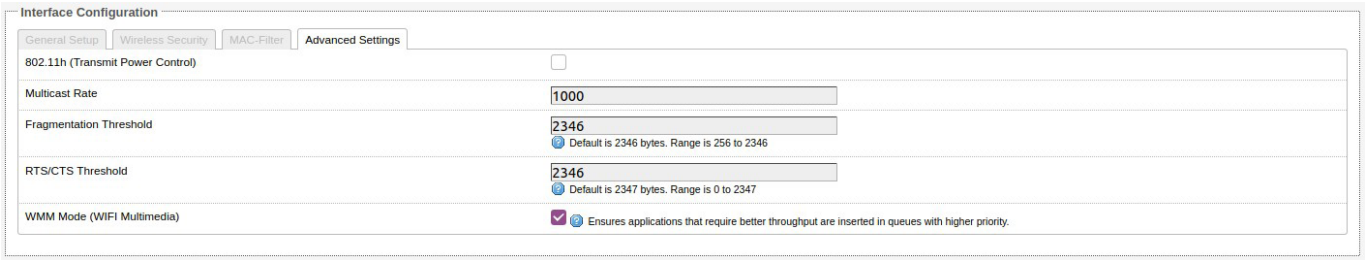


Image 46

802.11H	Transmit Power Control, can modulate power based on interference with satellites and radar.
Multicast Rate	Set a baseline for wifi devices to be able to connect to router.
Fragmentation Threshold	The default size of the fragmentation threshold is 2346 bytes and the standard range is 256 – 2346 bytes. It is used to specify the maximum size for a data packet before being fragmented into multiple packets.
RTS/CTS Threshold	The RTS/CTS packet size threshold is 0–2347 octets. Typically, sending RTS/CTS frames does not occur unless the packet size exceeds this threshold. If the packet size that the node wants to transmit is larger than the threshold, the RTS/CTS handshake gets triggered. Otherwise, the data frame gets sent immediately.
WMM Mode	Provides Quality of Service (QoS) features, checked by default. Wireless multimedia enables the classification of the network traffic into 4 main types, voice, video, best effort, and background, in decreasing order of priority. Higher priority traffic has a higher transmission opportunity and would have to wait less time to transmit. As a result, an existing video stream would not be interrupted by additional background processes.

Routing

The NetWave radio is a full gateway with Static Route capabilities.

Routing should be configured by certified Network Professionals.

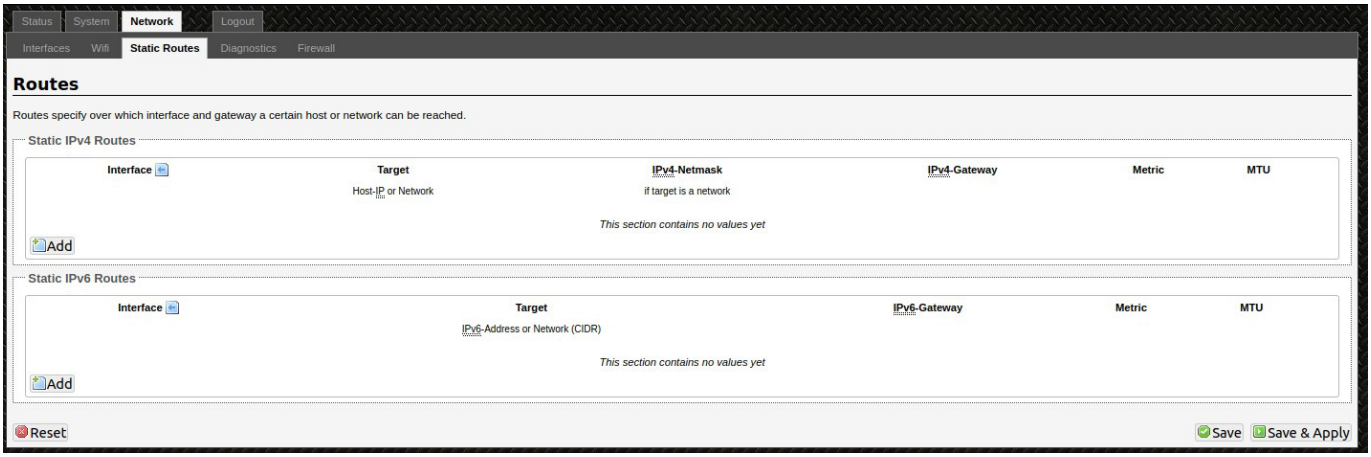


Image 47

Diagnostic Tools

The following Diagnostic tools are available:

» Ping
» TraceRoute
» NSLookup

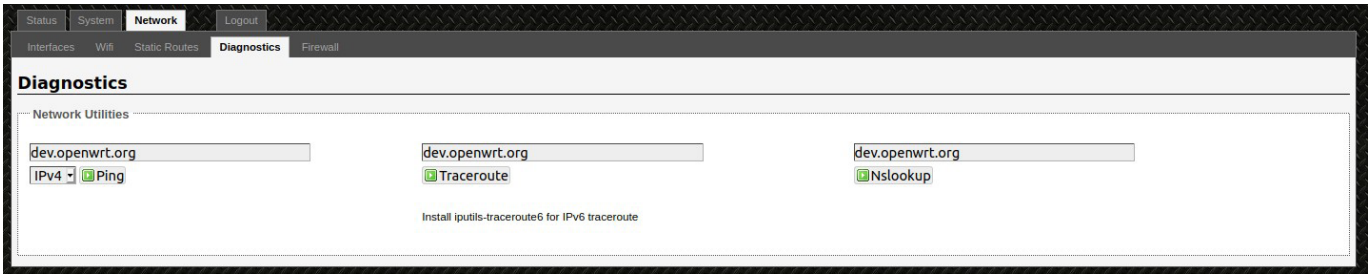


Image 48

Firewall

The Network – Firewall page contains the subpages for General Firewall Settings, Port Forwards, and Traffic Rules.

General Settings

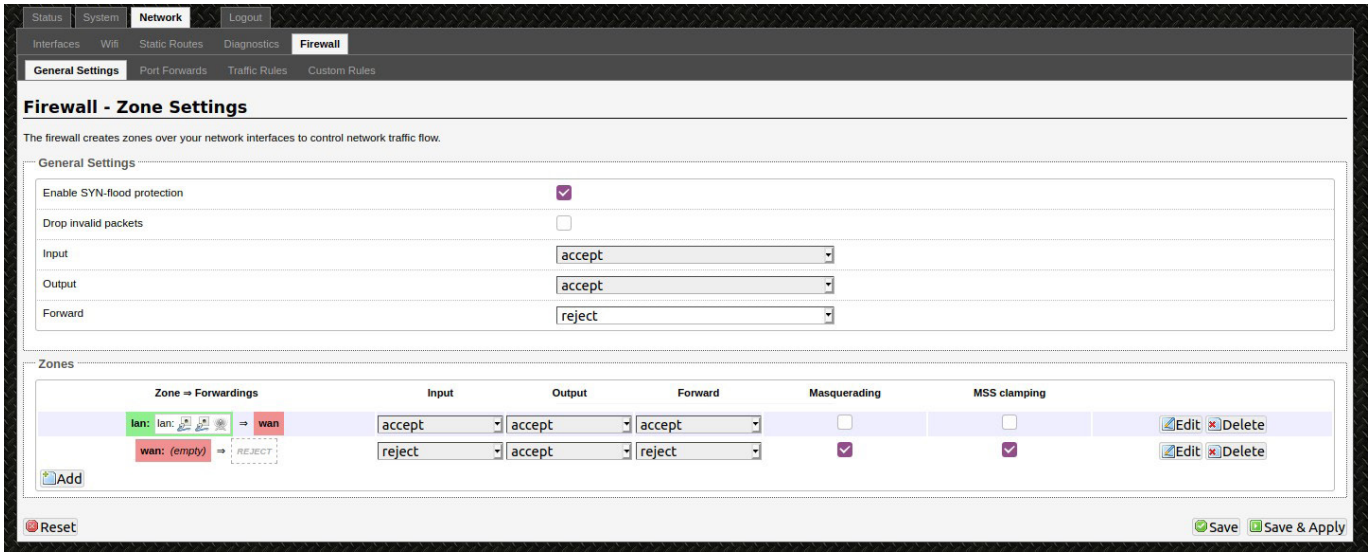


Image 49

Enable SYN-Flood	Prevents SYN DDoS Attacks
Drop invalid Packets	Blocked forged packets
Input	Accept Inbound traffic
Output	Forward outbound traffic
Forward	Forward all traffic

Zones

Specify your network zone rules.

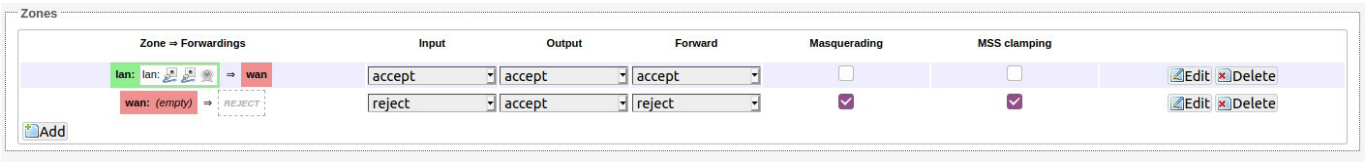


Image 50

Firewall Port Forward

Port forwarding allows remote computers on the Internet to connect to a specific computer or service within the private LAN.

The Network » Firewall » Port Forwards page lets you define the protocol and port number to access an internal IP address.

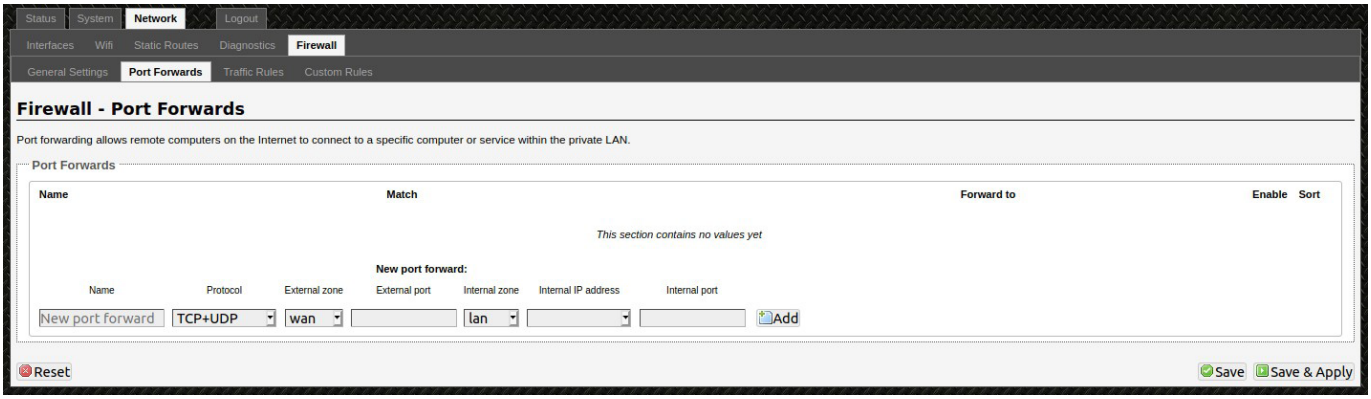


Image 51

Traffic Rules

Traffic rules define policies for packets travelling between different zones, for example to reject traffic between certain hosts or to open WAN ports on the router.

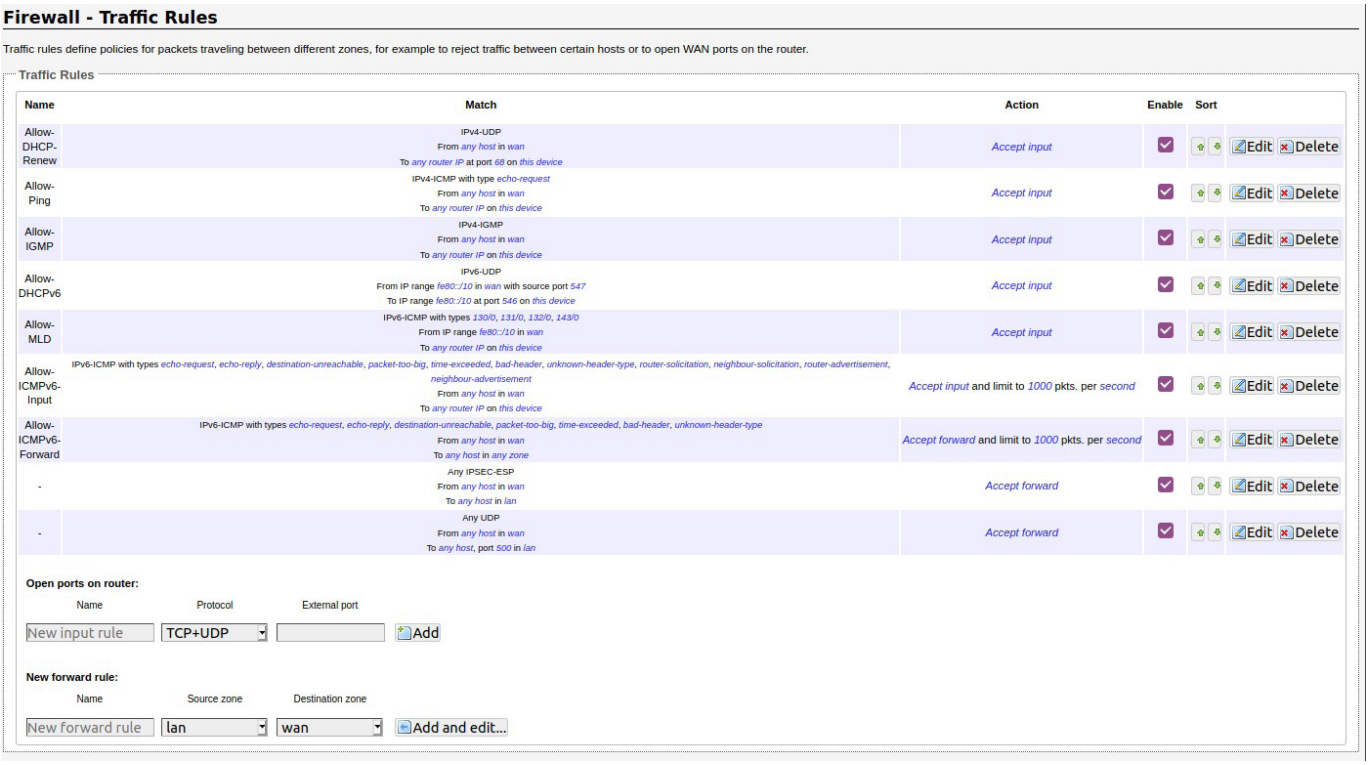


Image 52

Agency Compliance

FCC

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a Industrial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operations of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Industry Canada

This Class A digital apparatus complies with Canadian ICES-003. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that permitted for successful communication. This device complies with Industry Canada license-exempt RSS standard(s).

Operation is subject to the following two conditions:

- This device may not cause interference, and
- This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil numérique de la classe A est confrome à la norme NMB-003 Canada. Pour réduire le risque d'interférence aux autres utilisateurs, le type d'antenne et son gain doivent être choisies de façon que la puissance isotrope rayonnée équivalente (PIRE) ne dépasse pas ce qui est nécessaire

pour une communication réussie. Cet appareil est conforme à la norme RSS Industrie Canada exempts de licence norme(s). Son fonctionnement est soumis aux deux conditions suivantes:

17 Compliance

- Cet appareil ne peut pas provoquer d'interférences et
- Cet appareil doit accepter toute interférence, y compris les interférences qui peuvent

causer un mauvais fonctionnement du dispositif.

RF Exposure Warning

The antennas used for this transmitter must be installed to provide a separation distance of at least 2.52m from all persons and must not be located or operating in conjunction with any other antenna or transmitter.

Les antennes utilisées pour ce transmetteur doivent être installé en considérant une distance de séparation de toute personnes d'au moins 2.52m et ne doivent pas être localisé ou utilisé en conflit avec tout autre antenne ou transmetteur.

CE Marking

CE marking on this product represents the product is in compliance with all directives that are applicable to it.

This equipment may be operated in the following countries:

Great Britain and Northern Ireland, Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Romania, Switzerland, Sweden

Installer Compliance Responsibility

Devices must be professionally installed and it is the professional installer's responsibility to make sure the device is operated within local country regulatory requirements.

RoHS/WEEE Compliance Statement

European Directive 2002/96/EC requires that the equipment bearing this symbol on the product and/or its packaging must not be disposed of with unsorted municipal waste. The symbol indicates that this product should be disposed of separately from regular household waste streams. It is your responsibility to dispose of this and other electric and electronic equipment via designated collection facilities appointed by the government or local authorities. Correct disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about the disposal of your old equipment, please contact your local authorities, waste disposal service, or the shop where you purchased the product.

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Contact information:

Email: techsupport@comnet.net

Tel: 203-796-5300

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3 CORPORATE DRIVE | DANBURY, CT 06810 | USA
T: 203.796.5300 | F: 203.796.5303
TECH SUPPORT: 1.888.678.9427
INFO@COMNET.NET

SUITE 7, CASTLEGATE BUSINESS PARK
CALDICOT | SOUTH WALES, UK | NP26 5AD
T: +44 (0) 2036 300 695 | F: +44 (0)113 253 7462
INFO-EUROPE@COMNET.NET