NEXTIVITY
Smarter by Design

SHIELD MegaFi

Software Guide

Rev Date: 8/6/2024

Table of Contents

Revision History

Rev	Iteration	Description	Incorporated By	Date
1	1	Initial Release	Lorenzo Porchas	1/16/2024
1	2	WiFi encryption enhancements, Passthrough mode feature with introduction of firmware version 2.4.44, and manual software update instructions	Lorenzo Porchas	4/9/2024
1	3	With firmware version release 2.4.95 and above, and the subsequent release of version 2.5.0, this guide includes improvements to GPS, and other minor setting changes	Lorenzo Porchas	7/30/2024

1 | Introduction

The purpose of this guide is to assist the user in operating the SHIELD MegaFi wireless WAN HPUE router. This guide will help the user configure and operate the device using the device's-built Mission Control software.

ⓘ For assistance in implementing or installing the MegaFi device, please refer to the separate *MegaFi User Guide*.

➲ **Note:** All images used in this document are used only for displaying examples of configurations and may not reflect the users' current device.

1.1 Objectives

The objectives of this document are:

- to describe the software environment and basic understanding of interacting and configuring MegaFi for your use.
- to provide the necessary information to understand the device and the options available in the MegaFi, and
- to support implementing the necessary configuration for your communications environment and for your continued use.
- This document expects the user to have basic computer skills and to be familiar with using and navigating with a web browser, to be knowledgeable in networking concepts, and to be able to configure a traditional wired or wireless router for their communications environment.

1.2 Conventions

This document follows certain typographic conventions, outlined below:

Bold
Is used for directories, filenames, commands, and options. All terms shown in bold are typed literally.

Bold Italic
Is used to show generic arguments and options; these should be replaced with user-supplied values.

Italic
Is used to highlight comments in examples.

Constant Width
Is used to show the contents of files or the output from commands.

1.3 Related Documents

- The *MegaFi User Guide:* https://nextivityinc.com/wp-content/uploads/2024/01/SHIELD-MegaFi-User-Guide.pdf
- The *MegaPortal User Guide:* https://go.nextivityinc.com/shield-megaportal-guide
- The *MegaFi Software Update Guide:* https://nextivityinc.com/wp-content/uploads/2023/11/SHIELD-MegaFi-Software-Update-Guide.pdf
- For other MegaFi documentation, go to www.nextivityinc.com/support and select the FirstNet HPUE tab.

1.4 Abbreviations and Acronyms

The following table provides a list of abbreviations and acronyms that are referenced throughout this manual.

APN	Access Point Name	**NTPD**	Network Time Protocol Daemon
DHCP	Dynamic Host Configuration Protocol	**PD**	Prefix Delegation
DNS	Domain Name System	**PID**	Process Identification Number
DDNS	Dynamic Domain Name System	**PIN**	Personal Identification Number
GNSS	Global Navigation Satellite System	**Ping**	Packet Internet Groper
GPS	Global Positioning System	**PoE**	Power over Ethernet
HTTPS	Hypertext Transfer Protocol Secure	**PPP**	Point-to-Point Protocol
ICCID	Integrated Circuit Card Identifier	**PPPoE**	Point-to-Point Protocol over Ethernet
ICMP	Internet Control Message Protocol	**RA**	Route Advertisement
IGMP	Internet Group Management Protocol	**SIM**	Subscriber Identity Module
IMEI	International Mobile Equipment Identity	**SLAAC**	Stateless Address Auto Configuration
IMSI	International Mobile Subscriber Identity	**SSH**	Secure Shell
IP	Internet Protocol	**SSID**	Service Set Identifier
IPSEC	Internet Protocol Security	**STP**	Spanning Tree Protocol
LAN	Local Area Network	**TAIP**	Trimble ASCII Interface Protocol
LTE	Long-Term Evolution	**TFTP**	Trivial File Transfer Protocol
MAC address	Media Access Control address	**UDP**	User Datagram Protocol
MCBV	Modem Configuration Band Values	**UTC**	Coordinated Universal Time

MCLBV	Modem Configuration LTE Band Values	**UUID**	Universally Unique Identifier
MTU	Maximum Transmission Unit	**VLAN**	Virtual LAN
NAT	Network Address Translation	**VPN**	Virtual Private Network
NDP Proxy	Neighbor Discovery Protocol Proxy	**HPUE**	High Power User Equipment

1.5 About OpenWRT and Mission Control

The OpenWRT software that the MegaFi system uses is an open-source project that provides a full-featured operating system for embedded devices. Nextivity's implementation of OpenWRT LuCI—the dashboard that allows you to configure and manage the MegaFi suite of software and devices from a single computer—is known as Mission Control.

1.6 About this Document

This document is in 4 parts: part 1 is the Introduction, part 2 is Mission Control, part 3 is Most Frequent Configuration Settings and part 4 is Expert Configuration Settings.

You are currently in the introduction. Part 2, Mission Control, provides information on accessing, navigating, and working within the system, including how to save your work. We cannot emphasize enough how important it is that you understand how to navigate and work within the system as it is a new experience for many. Indeed, if this is your first time using this document and/or accessing the dashboard, then we recommend reading it in its entirety.

Part 3 is Most Frequent Configuration Settings. Most users can simply use this section to complete the most frequent and basic configuration settings such as password, wi-fi, firmware updates, APN, IP address and others.

Part 4 is Expert Configuration Settings. This is where you will view and manage your device at a more advanced level. The user can schedule tasks, configure interfaces, set firewall rules, etc.

1.7 Support

Nextivity's support desk is always ready to help you with any support issues or requests. If you encounter any problems, need clarification, or have feedback, recommendations, or suggestions then feel free to contact us at support@nextivityinc.com.

For additional assistance: +1 (858) 485-9442 **OPTION 1**
Support Business Hours: 6:00 AM – 5:00 PM PST

We look forward to being of service.

2 | Misson Control

Mission Control is the built-in web interface that provides information about the SHIELD MegaFi router and allows the user to configure settings to their preferences. All configuration and management are done via your computer's web browser, and you will need to be locally connected to the device via Ethernet to a LAN port, or by utilizing its Wi-Fi capability in the admin dashboard.

Refer to the following topics to get started with using Mission Control.

2.1 Accessing Mission Control via Ethernet Connection

To access Mission Control, you will need both your **admin Password**, and the default factory **LAN IP, 192.168.113.1**. The Password is printed on the label on the bottom of your MegaFi.

➲ **Note:** Use the defined password and/or IP address if it has been changed for your environment.

1. Connect an Ethernet cable between your computer and any LAN port (1-4) on the MegaFi.
2. Open a web browser to the following address: https://192.168.113.1
3. The first time you try to connect to MegaFi, a connection warning screen will display as shown below. Accept the connection warning by clicking on '**Advanced**'.

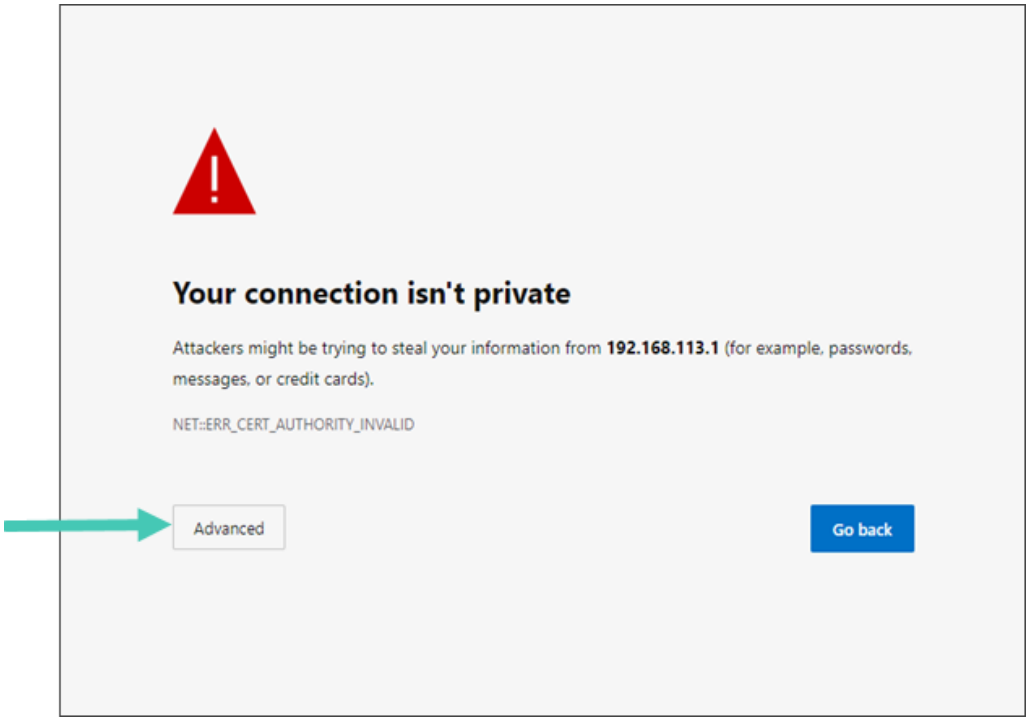


Figure 1: MegaFi connection warning screen

4. A second warning screen will be displayed as shown below. Click on '**Continue to 192.168.113.1 (unsafe)**' link to proceed.

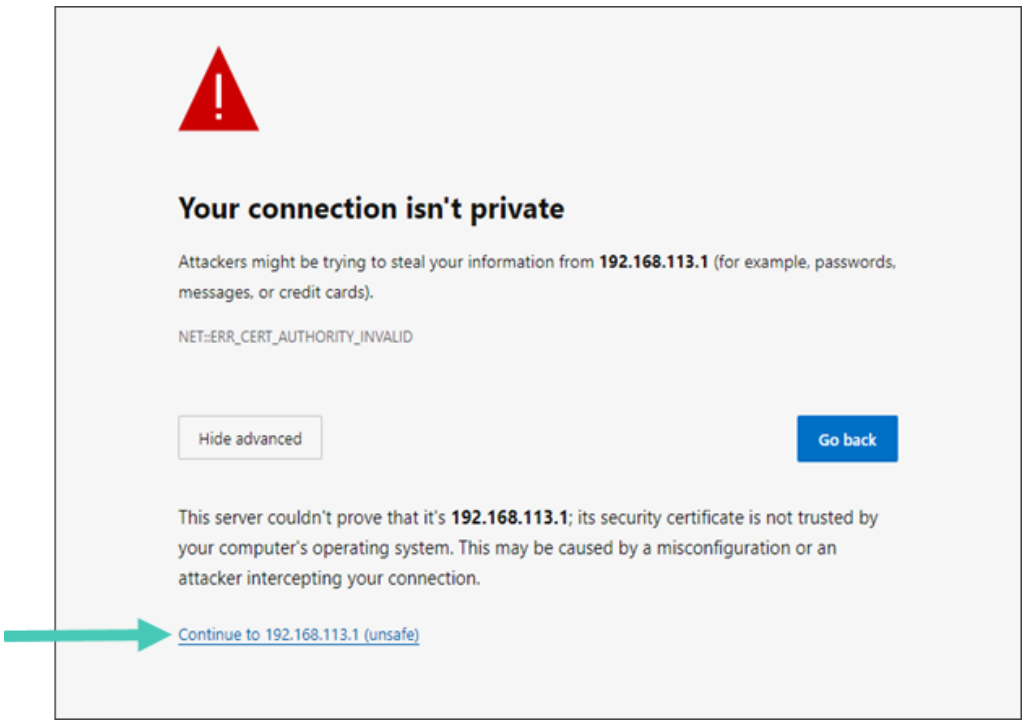


Figure 2: MegaFi connection warning – second screen

5. The MegaFi's Mission Control GUI login page will now be displayed.

   5a. Enter the password as found on the bottom label of the MegaFi on the Mission Control login page.

   ➲ **Note:** username always defaults to '**admin**'.

   5b. Click '**Login**' to proceed.

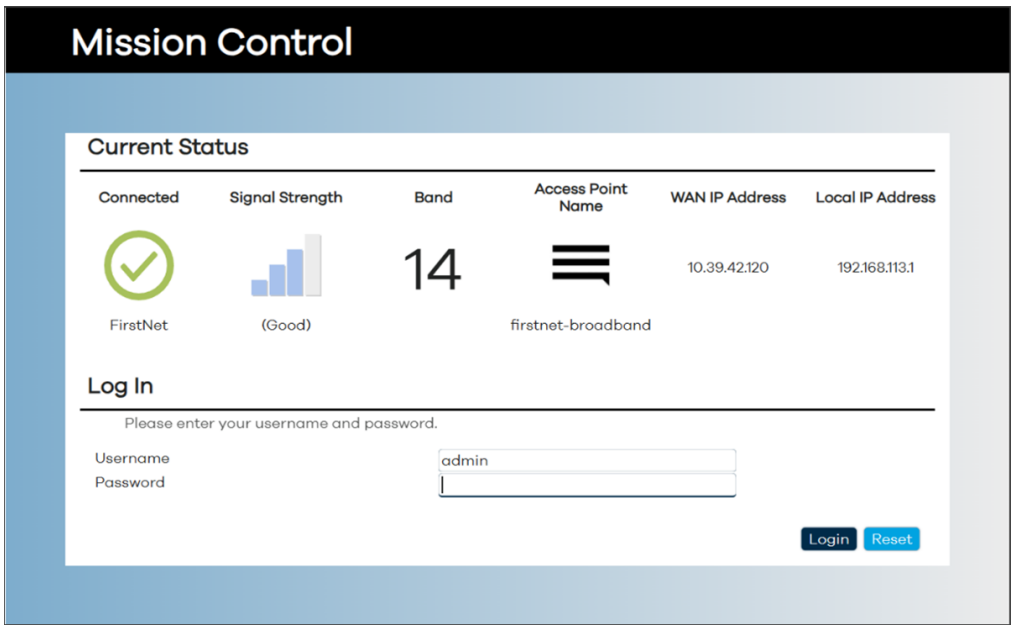


Figure 3: Mission Control login screen

6. When logging in for the first time, the EULA (End User License Agreement) will be displayed.
7. Fill out the requested information and click '**Accept**' to continue.

Figure 4: Nextivity, Inc. End User License Agreement screen

8. Also, part of first-time login to MegaFi, the user will be required to change the default login password.

   8a. Proceed to change the default password to a 'Strong' password.

   ➲ **Note:** The device will not accept weak passwords. Password must meet the following requirements: a minimum length of 10 characters and a randomized complexity of lowercase letters, uppercase letters, and numbers.

   8b. Confirm the new password change by clicking on '**Save'**.

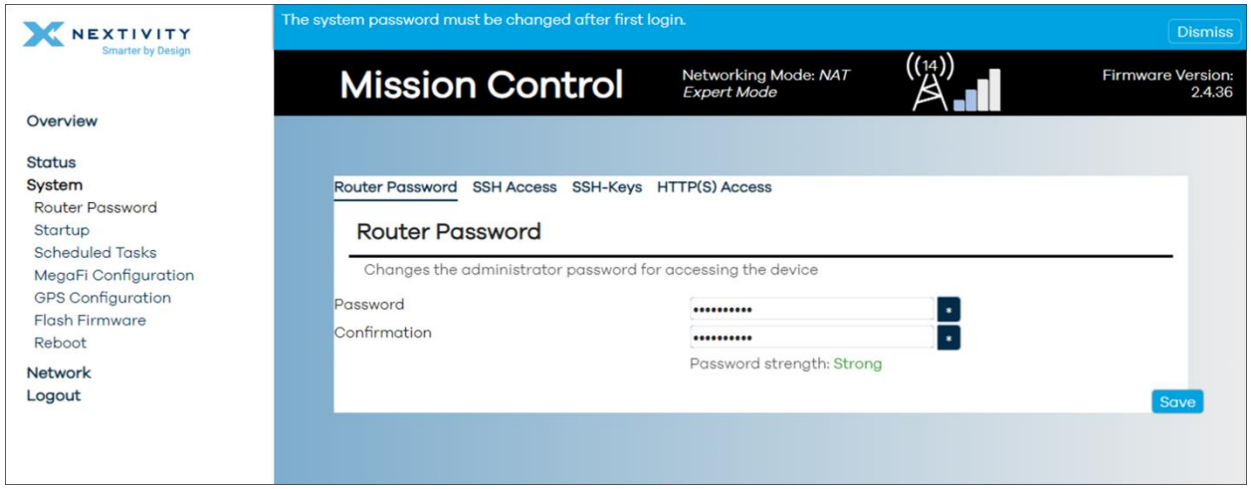


Figure 5: Change router password screen

9. The user will now be re-directed to Mission Control's Overview page.

Figure 6: Mission Control – Overview, Device page

10. First-time router configuration is now complete!

2.2 Initial Connection to MegaFi via Wi-Fi

To access Mission Control, you will need both your admin Password, and the default factory LAN IP, 192.168.113.1. The Password is printed on the label on the bottom of your MegaFi.

Notes:

- Use the defined password and/or IP address if it has been changed for your environment.
- The example shown below was accomplished using a Windows (10/11) PC. The steps should be similar using a different OS.

To connect to MegaFi via Wi-Fi:

1. Go into your PC computer's **Network & internet > Wi-Fi** settings to add a new Wi-Fi connection.
2. Add the MegaFi device by looking for its default SSID under '**Show available networks**' by selecting it. The default SSID and its password are printed on the device's label.

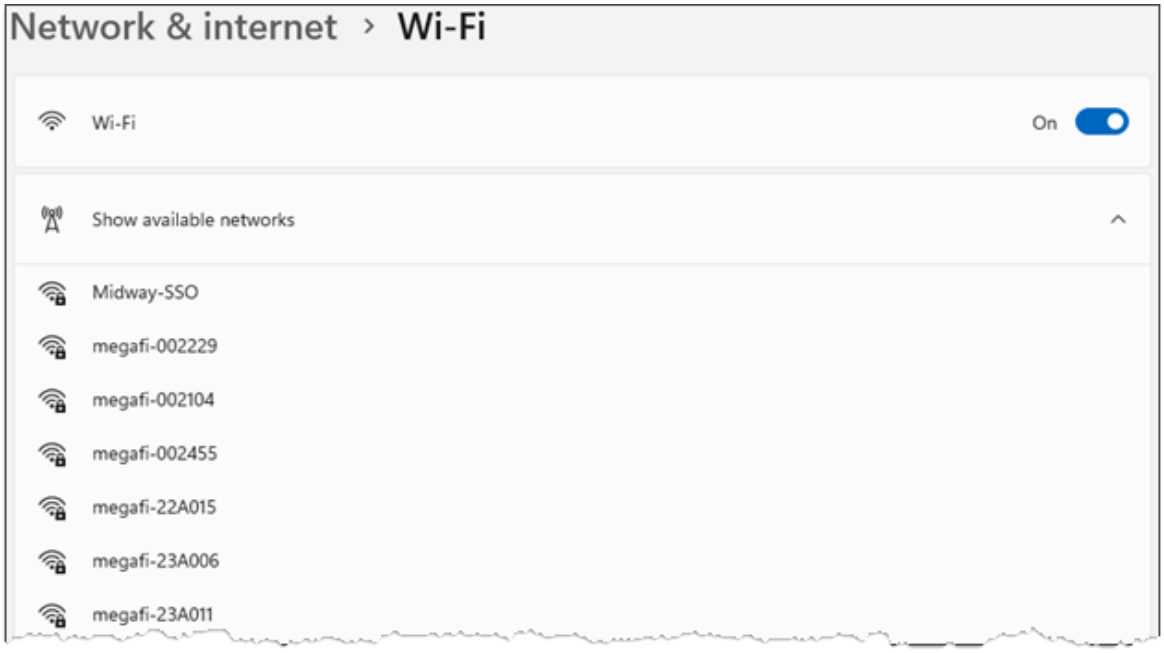


Figure 7: Windows Network & Internet window showing list of available Wi-Fi networks

3. The '**Connect automatically**' box will be checked by default. Click on '**Connect**'.

Figure 8: Wi-Fi Network Connection – Connect automatically option

4. '**Enter the network security key**' (default SSID password), then click on '**Next**'. The default SSID and its password are printed on the device's label.

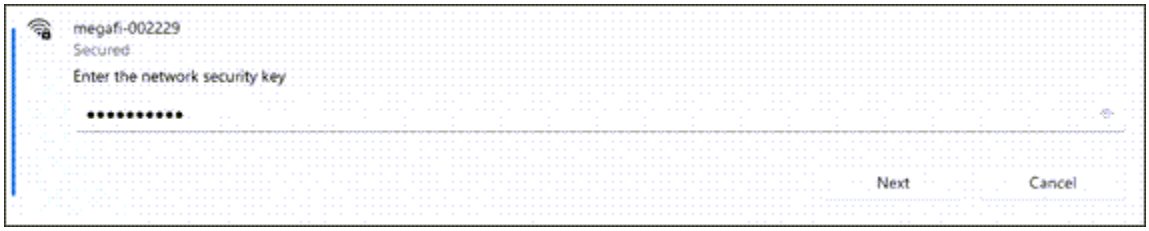


Figure 9: Wi-Fi Network Connection – Enter network security key

5. If the connection is successful, it will say '**Connected, secured**'.

Figure 10: Wi-Fi Network Connection – Successful connection

6. Open a web browser to the following address: https://192.168.113.1

7. The first time you try to connect to MegaFi, a connection warning screen will display as shown below. Accept the connection warning by clicking on '**Advanced**'.

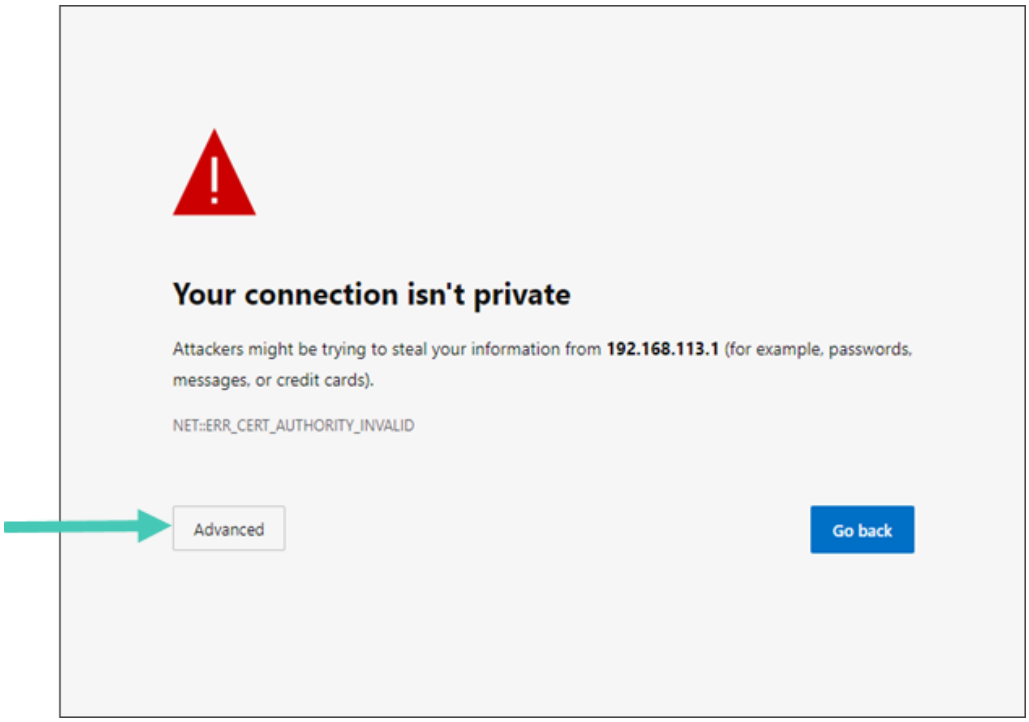


Figure 11: Warning message – Connection not private

8. A second warning screen will be displayed as shown below. Click on '**Continue to 192.168.113.1 (unsafe)**' link to proceed.

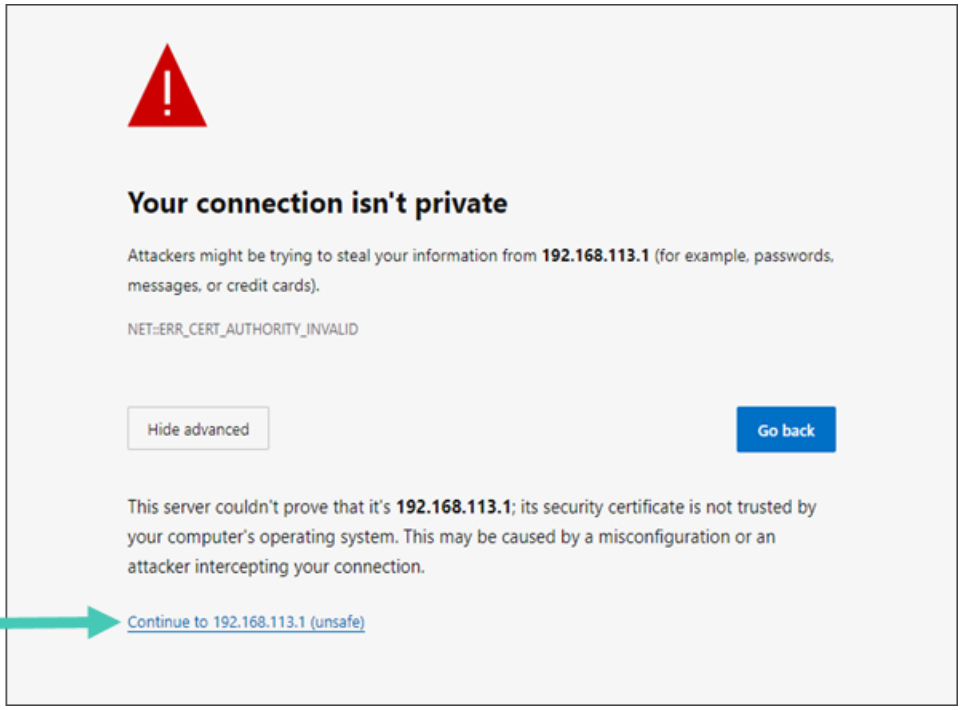


Figure 12: Warning message – Continue to IP address

9. The MegaFi's Mission Control GUI login page will now be displayed.

   9a. Enter the password as found on the bottom label of the MegaFi on the Mission Control login page.

➲ **Note:** username always defaults to 'admin'.

   9b. Click '**Login**' to proceed.

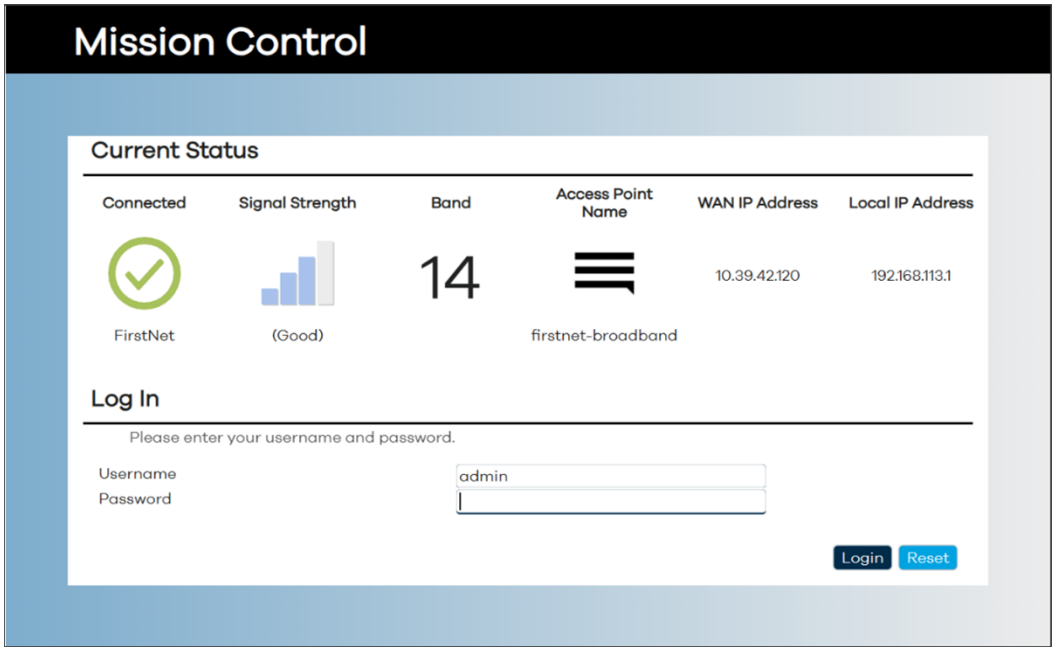


Figure 13: Mission Control – Login page

10. When logging in for the first time, the EULA (End User License Agreement) will be displayed.

   10a. Fill out the requested information and click '**Accept**' to continue.

Figure 14: Nextivity, Inc. End-User License Agreement (EULA)

11. Also, part of first-time login to MegaFi, the user will be required to change the default login password.

11a. Proceed to change the default password to a strong password.

➲ **Note:** The device will not accept weak passwords. Password must meet the following requirements: a minimum length of 10 characters and a randomized complexity of lowercase letters, uppercase letters, and numbers.

12. Confirm the new password change by clicking on '**Save**'.

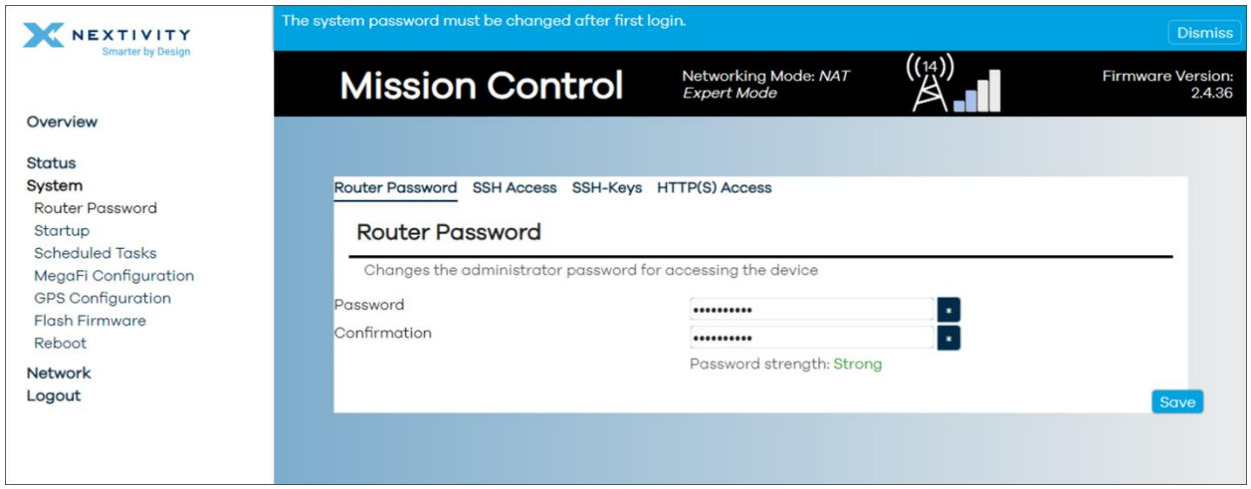


Figure 15: Mission Control – Reset password page

13. The user will now be re-directed to Mission Control's Overview page.

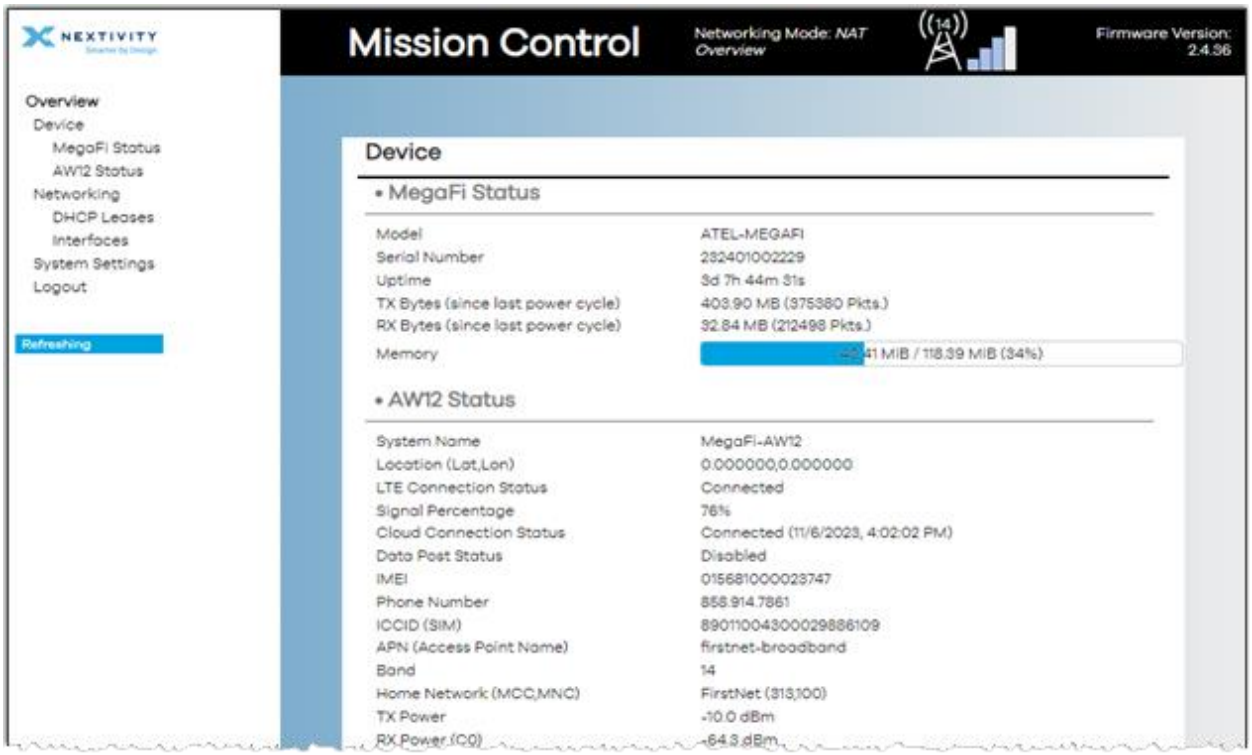


Figure 16: Mission Control – Overview page

14. First-time router configuration is now complete!

2.3 Navigating Mission Control

Once logged in, the first page the user will see is the **Overview** > **Device** page of Mission Control.

Figure 17: Mission Control – Overview, Device page

2.3.1 Top Banner

The top banner area, which is persistent on every and any page the user navigates to, will show the current information:

Figure 18: Mission Control – top banner

a	**Software mode** Overview or Expert ▪ **Overview** mode – In this mode, the user can view status pages, logs, and do certain operations such as upgrading the firmware, change APN, reboot, etc. ▪ **Expert** mode – In this mode, the user can configure more advanced settings such as: Scheduled tasks, interfaces, firewall, etc.
b	**Networking Mode** ▪ **NAT** (default) or **Passthrough** ▪ **Passthrough** replaced Bridge mode in firmware version 2.4.44
c	**Band** The band shows what band the system is currently operating on. Megafi operates on the best band available on the network. In remote areas at the edge of the network, Megafi typically operates on band 14 in High Power mode.
d	**Signal Strength** In bars that should match up with the Signal Strength LED bars on top of the device
e	**Firmware Version** Current running firmware version

2.3.2 Navigation Pane

The navigation pane on the left consists of a 2-level menu system:

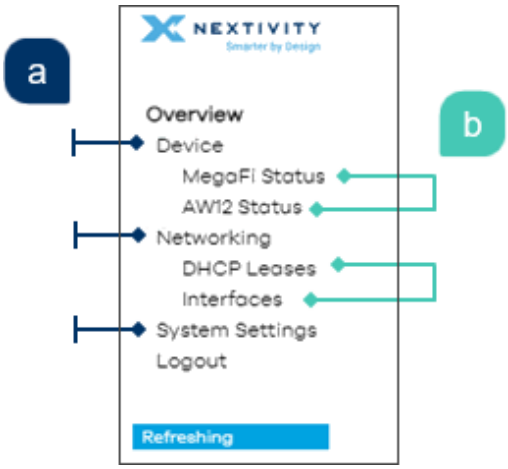


Figure 19: Mission Control Navigation Pane – menus

a: Top-level main menu section consists of 4 topics: **Device**, **Networking**, **System Settings**, and **Logout**.

b: Second–level sub-menu contains a variable number of on-page quick links.

For example, Figure 19 shows the top-level **Device (a)** menu item with its second-level sub menu items of M**egaFi Status** and **AW12 Status (b)**. Where MegaFi Status reflects router status and AW12 Status reflects modem status.

2.4 Working within Mission Control

When working within Mission Control, you will need to perform actions such as edit, save, discard, reset, etc. To both ease this process and to ensure efficiency of workflow, changes made are stored as **unapplied changes** rather than being actioned and implemented immediately. In doing so, if your workflow is interrupted or if you inadvertently navigate away from a page without applying your changes, any work done to date is not discarded and accidentally lost.

Subsequently, when you are ready to apply these unapplied changes, they can either be saved & applied, reset/discarded, or revert/cancelled in one stroke rather than piecemeal, one-at-a-time. This process also lets you check, verify, and manage the list of queued changes prior to updating the system and, depending on the changes required, where updates take time, avoids slowing your workflow.

2.4.1 Save Options

Within Mission Control, all changes and saves must be applied manually—there is no automatic save or apply options. Typically, there are 3 save options: **Save**, **Save & Apply**, and **Apply Unchecked**; plus, non-save options such as **Reset**, **Dismiss**, **Revert**, etc.

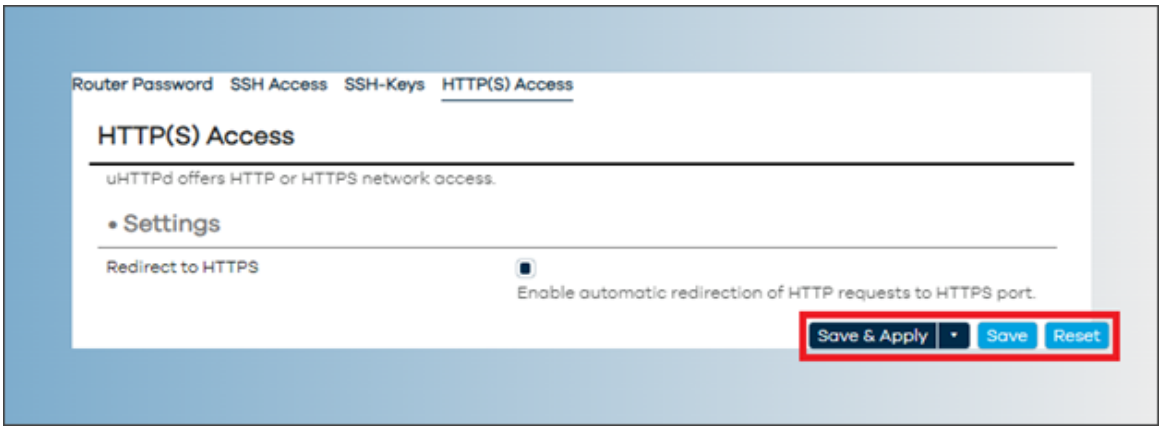


Figure 20: Mission Control – Save options

The action buttons you see will depend on where you are in the system and what changes you have made. We will look at these in more detail, below, starting with **Save**.

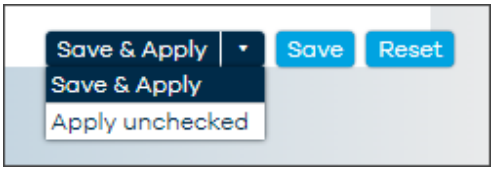


Figure 21: Mission Control – Save options

2.4.2 Save

Though the **Overview** page presents most of the basic admin functionality in a single scrolling page, you may need to navigate between, and make changes to, multiple pages within Mission Control itself. The **Save** button allows you to save your changes as you go. In contrast, without this save option, if you navigated away from a page without saving your changes, these would then be discarded and lost, and current applied settings and values would remain unchanged. However, it is important to note that saving changes *does not* apply/commit them to the system, i.e., no updates occur at this stage.

Instead, saving any changes adds them as pending to the Unapplied Changes list as shown below.

Figure 22: Navigation pane showing pending changes

Once saved as **Unapplied Changes**, you can then:

- carry out additional work on the current page or navigate away to a different page and continue your tasks until you are ready to apply all changes
- manage your unapplied changes
- save and apply your unapplied changes

2.4.3 Managing Unapplied Changes

To view or manage your unapplied changes:

1. Click on the **Unapplied Changes** button and the **Configuration/Changes** dialog will show, listing all queued changes as shown below. Also, the status of each item is determined by its color and as per the legend.
2. From here, you have several buttons: **Close**, **Save & Apply** (Apply unchecked is in the drop-down menu), and **Revert** or **Reset**.

   2a. **Close** – will close this dialog window.

   2b. **Save & Apply** – will apply the changes, clear the Configuration/Changes list, close the dialog window, and you will then see the Apply configuration changes countdown popup.

➲ **Note:** Unlike performing a '**Save & Apply**' from the main dashboard, because these items have already been saved once (the initial save added them to the unapplied changes queue), no second click is required to initiate these changes. A single click on the **Save & Apply** button will commit all changes and the countdown will commence.

   2c. **Revert/Reset** – will cancel all unapplied changes, clear this list, display the changes have been reverted popup, and then take you back to the Mission Control dashboard where all settings remain unchanged.

2.4.4 Save & Apply

When you are ready to apply your unapplied changes, click on **Save & Apply**. This will then apply all unapplied changes to the system and update your current configuration.

※ **IMPORTANT:** Please allow adequate time for changes to update and ensure continuous power is supplied to the MegaFi during any updates.

2.4.5 Apply Unchecked

When updating certain attributes, such as IP or other addresses/configurations, there is often a time-delay between events, (e.g., a change in the LAN IP that uses DHCP) so there may be a delay between connecting to the new IP and subsequent assignment of new DHCP addresses. In such cases, the system will attempt to check that both communication and function is maintained. However, if during this check, the system determines that either would be lost because of the change, it would trigger the "Configuration has been rolled back!" alert. **Apply unchecked** allows us to avert this by applying pending changes without performing communication and function checks.

1. Click on the **Save & Apply** button arrow and the popup, as shown below, will open:
2. Click on **Apply unchecked** and the dropdown will close, the button label will change to **Apply unchecked**, and the button color will change to **red** as shown below.
3. A second click, on the now Apply unchecked button, will apply the changes and the Applying configuration changes countdown will initiate:

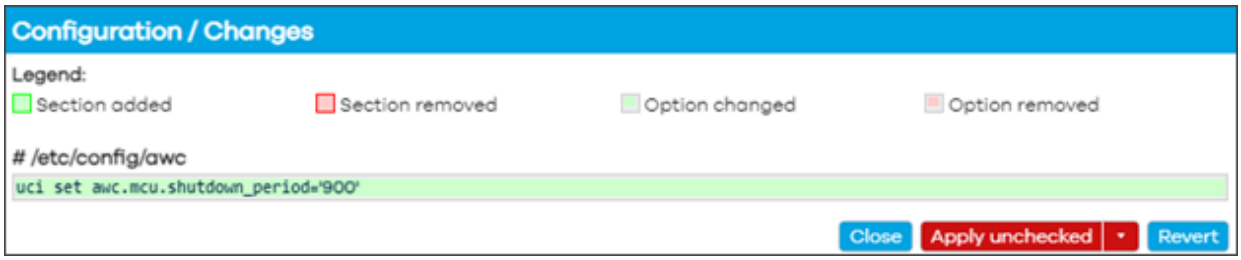


Figure 23: Configuration/Changes showing applied configuration changes

2.4.5.1 Cancelling Apply Unchecked

To cancel the Apply unchecked button (and revert to the default Save & Apply):

1. Click on the arrow on the **Apply unchecked** button to display the popup as shown above.
2. Click on **Save & Apply**. The button's label will revert to **Save & Apply**, and the button's color will change to blue.

2.4.6 Reset or Revert

Clicking on **Reset** or **Revert** will cancel all unapplied changes, clear this list, return on-page settings to their current values, and leave the current settings and configuration in their present state.

2.4.7 Overview Page

As previously pointed out above, the top-level menu, the user can see direct links to **Device**, **Networking**, **System Settings** all listed in the left-hand pane and detailed information and statistics for each of these pages within the main window. The **Logout** button function is also listed at the bottom.

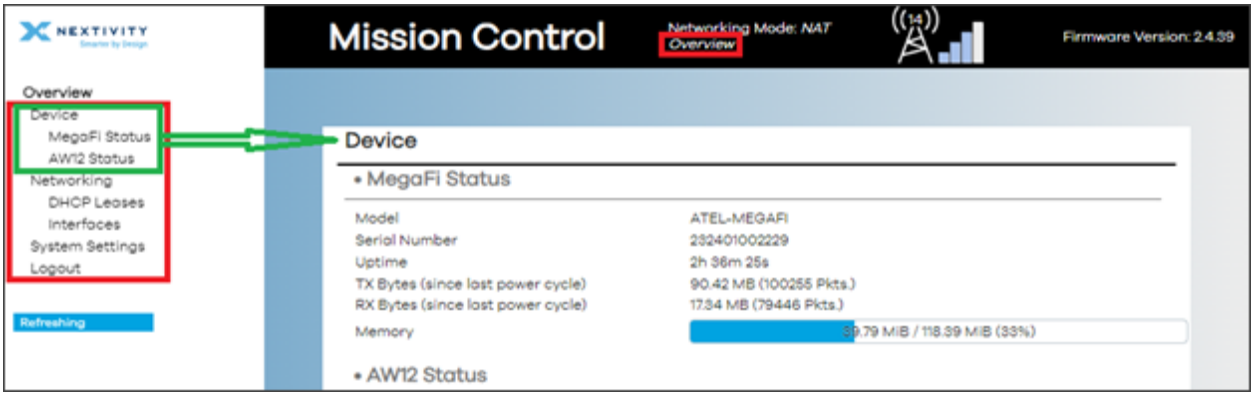


Figure 24: Mission Control – Overview page

The user may need to scroll down the main window to see all that is presented in each page under **Overview**. Each of these pages are detailed below.

2.4.7.1 Device Page

For a detailed summary of the device, this section shows **MegaFi Status**, including the modem's **AW12 Status**, GPS, SIM, cellular network information and other statistics.

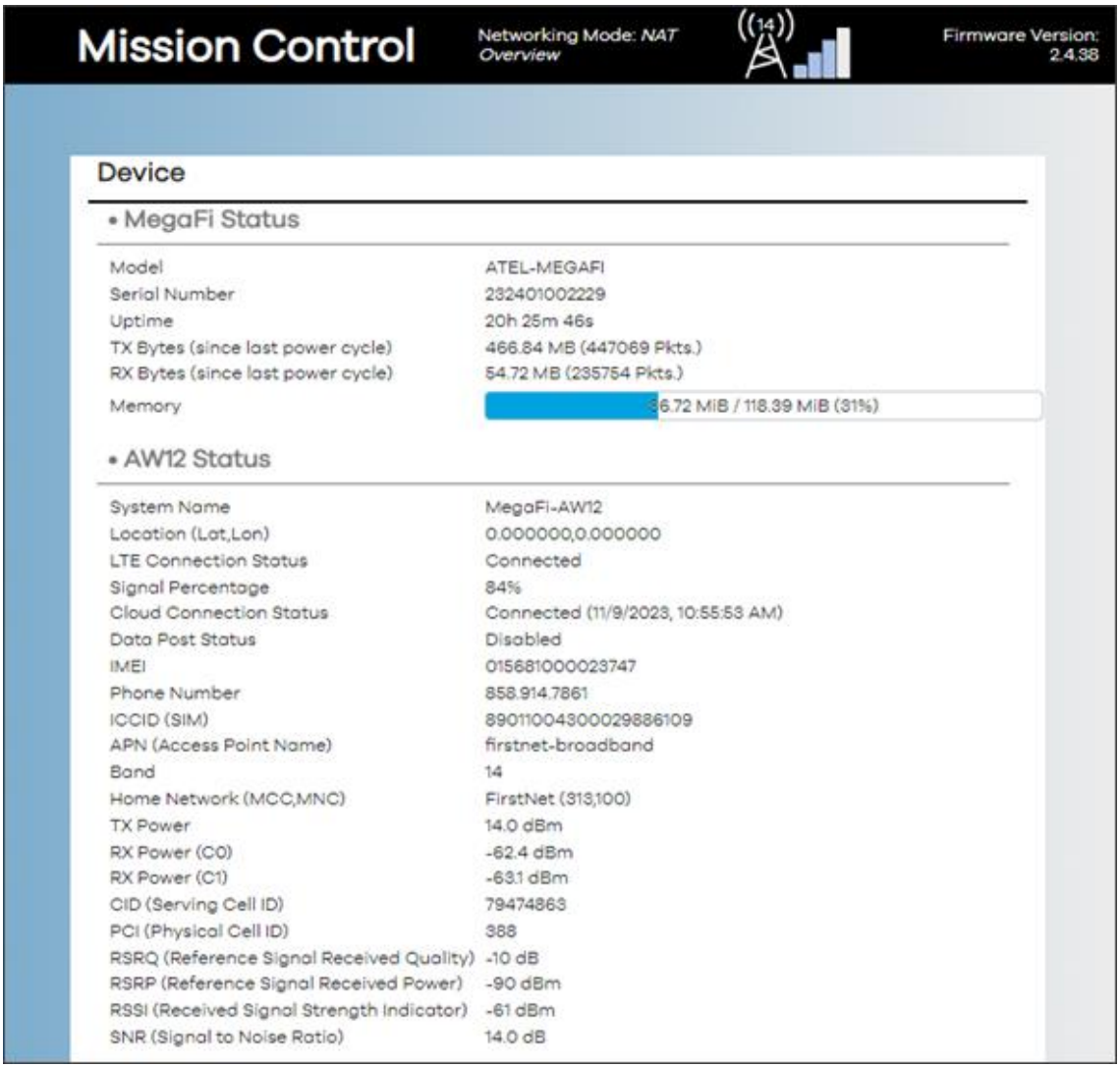


Figure 25: Mission Control – Device page

2.4.7.2 Networking Page

Clicking on **Networking** on the left-hand menu, the main window displays detailed information for **DHCP Leases** for connected hosts and **Interfaces**: LAN, WAN, WWAN, and Active Connections.

Figure 26: Mission Control – Networking page

2.4.7.3 System Settings Page

Clicking on **System Settings** on the left-hand menu, the main window display's Admin Tools for **APN (Access Point Name)**, **LAN IP**, **Cycle LAN upon WWAN IP change**, **Report to Cloud**, **Automatically Update Firmware**, **Automatically Update Configuration**, **Update Firmware**, **Backup Existing Configuration**, **Load Configuration from File**, **Change Password**, **Factory Defaults**, **Vehicle Shutdown Delay**, **Expert Configuration**, and **Reboot**. The user has complete access to all these configuration features from this environment without the need of being in **Expert mode**.

Further details on how to use these settings will be discussed later in this document.

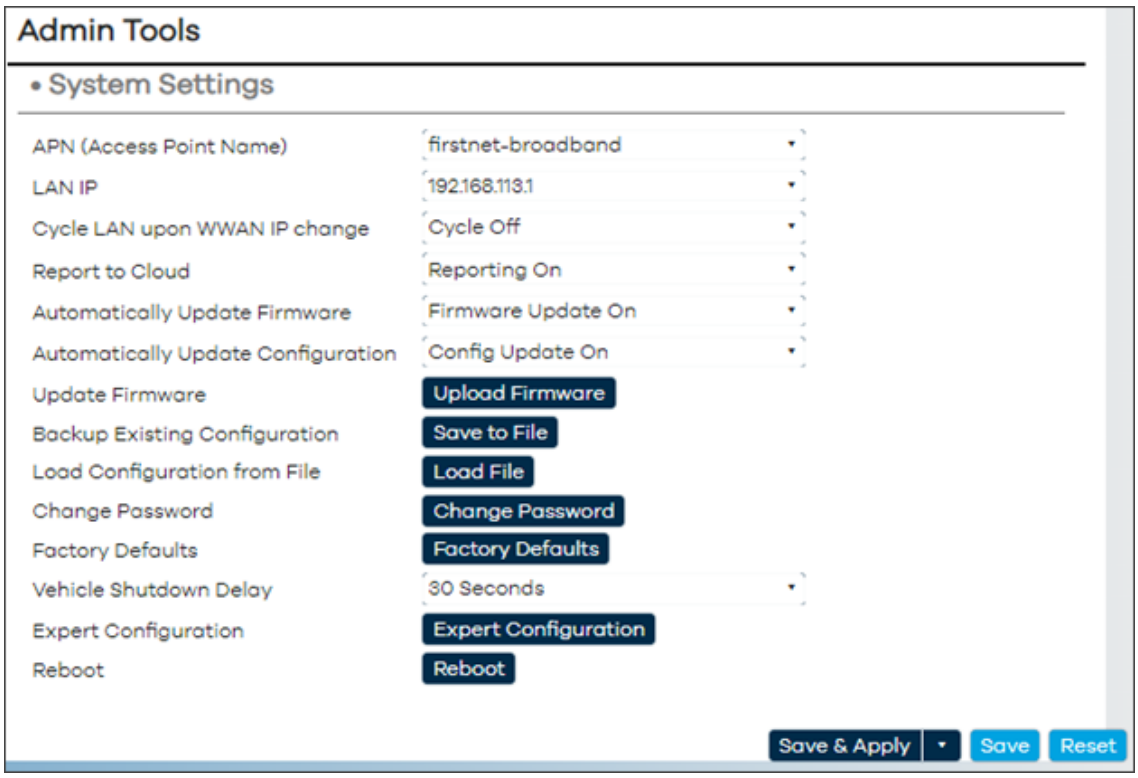


Figure 27: Mission Control – System Settings page

2.4.7.4 Logout

The user can log out of Mission Control by clicking on this button. This button is always visible in either Overview or Expert Mode on the left-hand pane towards the bottom.

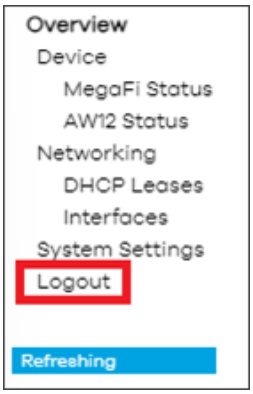


Figure 28: Logout from Overview mode

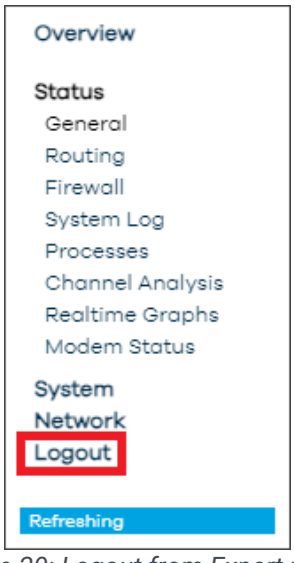


Figure 29: Logout from Expert mode

3 | Basic Configuration Settings

This section details the most frequent configuration settings that typical users need to make.

3.1 Changing APN (Access Point Name)

By default, the APN (Access Point Name) is set to **firstnet-broadband**. If the user has a custom APN, do the following to make the change.

1. Navigate to **Overview > System Settings**
2. In the **APN (Access Point Name)** field, click on the drop-down arrow and choose custom.

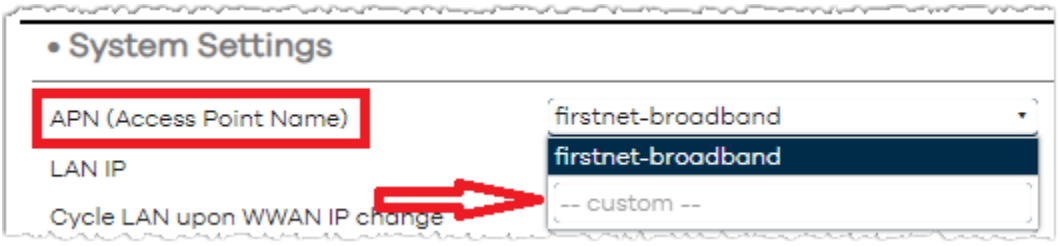


Figure 30: System Settings – APN (Access Point Name)

3. Enter the custom APN in the field and hit '**Enter'**, otherwise it will revert back to its default setting or pre-configured APN.
4. Click on **Save & Apply** to confirm the change.
5. Give the device a few minutes for it to successfully regain network connectivity.
6. After the device becomes available, issue a **Reboot** so the device receives the correct IP address. See Section 3.9 for Reboot procedure.
7. Refer to *Networking page (Section 2.4.7.2)* and verify correct IPv4 address for WWAN or WAN interface.

3.2 Changing LAN IP Address

By default, the LAN IP address is set to 192.168.113.1. If the user needs to configure this setting to fit their network environment, do the following to make the change.

1. Navigate to **Overview > System Settings**.
2. In the **LAN IP** field, click on the drop-down arrow and choose custom.

Figure 31: System Settings – Changing LAN IP Address

3. Enter the new IP address in the field and hit '**Enter**', otherwise it will revert back to its default setting or pre-configured IP address.
4. Click on **Save & Apply** to confirm change.
5. Give the device a few minutes for it to successfully regain network connectivity, and before attempting to reconnect to MegaFi via Mission Control or SSH.

➲ **Note:** In this environment, the system automatically sets a /24 or Class C network and will provide IP addresses to devices within this range.

3.3 Flash/Update Firmware

The user can either use Mission Control, or MegaPortal (Nextivity's Cloud portal for MegaFi), to update MegaFi's firmware.

To update the firmware via Mission Control (manually), the firmware version-specific **BIN** file needs to be downloaded from Nextivity's Support site at https://nextivityinc.com/support/ and locate the firmware under the FirstNet HPUE tab. If manually updating the firmware, it is recommended to also download the **SHIELD MegaFi Software Update Guide** and follow the detailed step-by-step instructions in that guide. This document can be found under the same location as the firmware.

Notes:

➲ To update the device using MegaPortal, please refer to the *MegaPortal User Guide*.

➲ For more details on updating the MegaFi via Mission Control, refer to the *MegaFi Software Update Guide* or contact Nextivity support for further assistance.

By default, the device is set to Automatically Update its firmware whenever there is a new version available in the cloud. This feature does not necessarily auto-update the device, but it acknowledges a new update is available and requires some user intervention to do so.

If the user requires an immediate update, do the following to update the device via Mission Control:

✔ **Assumption:** User has the firmware (BIN file) loaded on a PC and it is directly connected to a LAN port on the MegaFi.

1. Navigate to **Overview > System Settings**.
2. Click on the **Upload Firmware** or **Flash image** button.

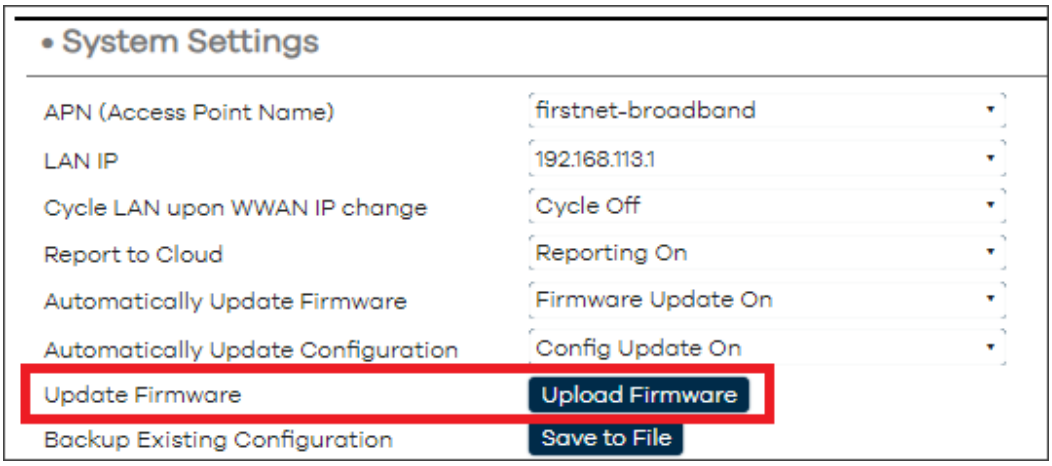


Figure 32: Firmware update – Upload Firmware button

3. On the pop-up **Uploading file…** window, click on **Browse** to locate the firmware file.
4. The firmware file should be the BIN type file and depending on the firmware version, around 14 MB:

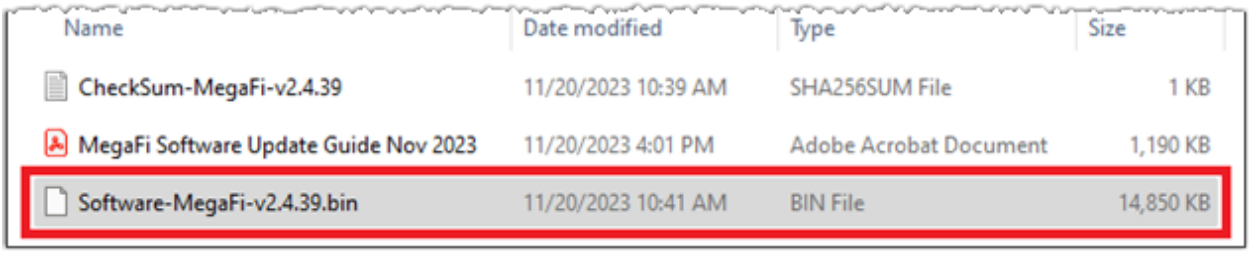


Figure 33: Firmware update – Select the upgrade file

5. Select the firmware file. The **Uploading file…** window now shows the selected file.

Figure 34: Firmware update – Uploading the selected upgrade file

6. Click on **Upload**, the file will begin to upload.

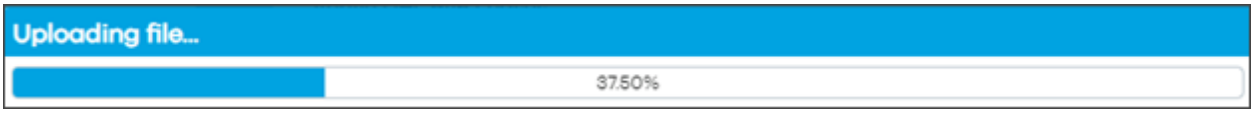


Figure 35: Firmware update – Status of upgrade file upload

7. A new pop-up window **Flash image?** will ask the user to manually verify the checksum **SHA256** value displayed here, with the checksum **SHA256** value displayed next to firmware file from where it was downloaded. Only continue if the values match.

➲ **Note:** The **SHA256** value is unique to each version. In this example, this is the **SHA256** value for firmware version 2.4.39.

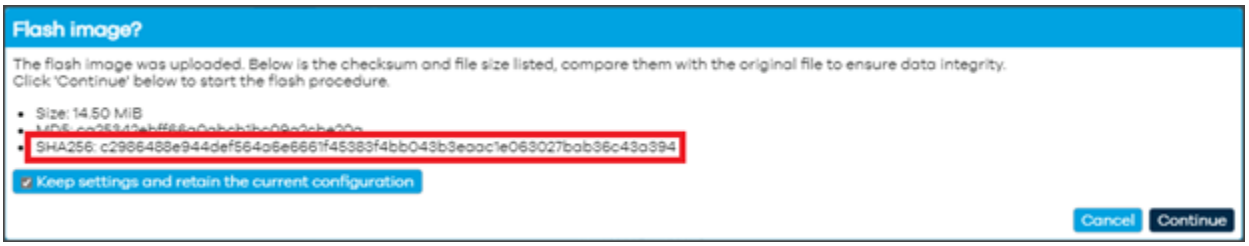


Figure 36: Flash image window – Compare checksum and file size with original

! **WARNING:** If you accidentally try to upload the wrong file to the MegaFi device, a warning screen will be displayed (see example below). If this happens, **STOP - DO NOT PROCEED**. Select '**Cancel**' to back out of this operation and avoid "bricking" your device.

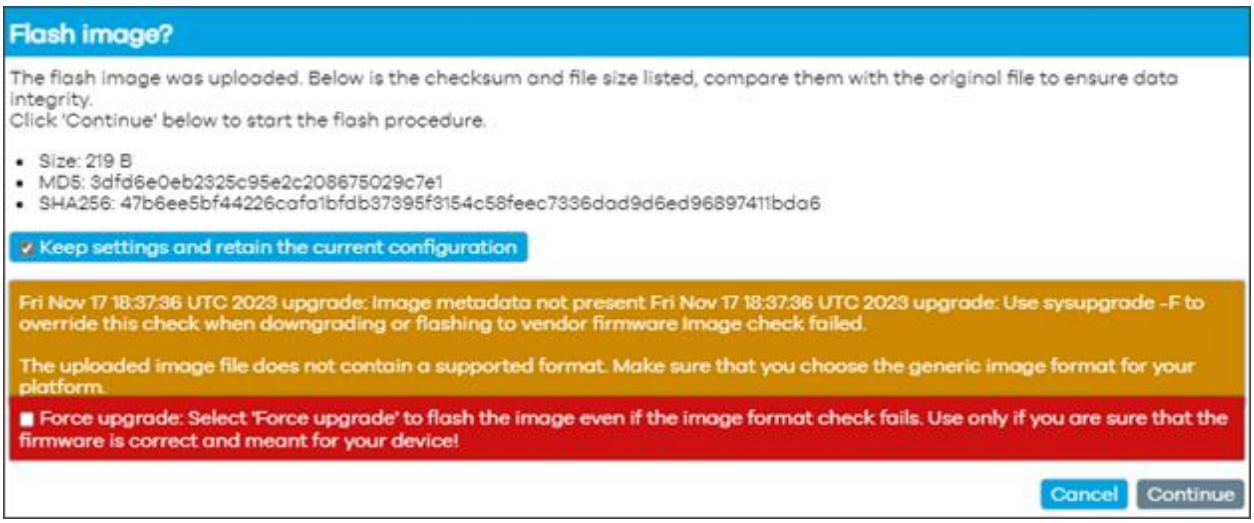


Figure 37: Flash image window – Image format check failure

8. Click on **Continue** on **Flash image?** only after the SHA256 values have been verified to match.
9. The **Flashing…** window will display.

   ! **WARNING:** "Do not power off the unit until the image flashing is complete."

➲ **Note:** The update will take between 5 to 15 minutes.

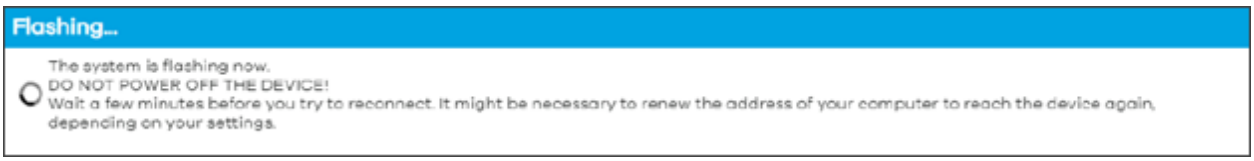


Figure 38: Flashing window – message indicating progress of the system flashing process

10. When the image flash is complete, you will be taken back to the login page.

11. Log in to continue.

➲ **Note:** Current status may initially display 'Not Connected' and no 'Signal Strength'. It will correct itself once the device properly boots up from the upgrade process.

➲ **Note:** Refresh the browser if the device has not gone back to home screen after 10 minutes.

12. Verify that the intended firmware upgrade successfully loaded by looking at the top right cover of Mission Control. Once verified, firmware update is complete.

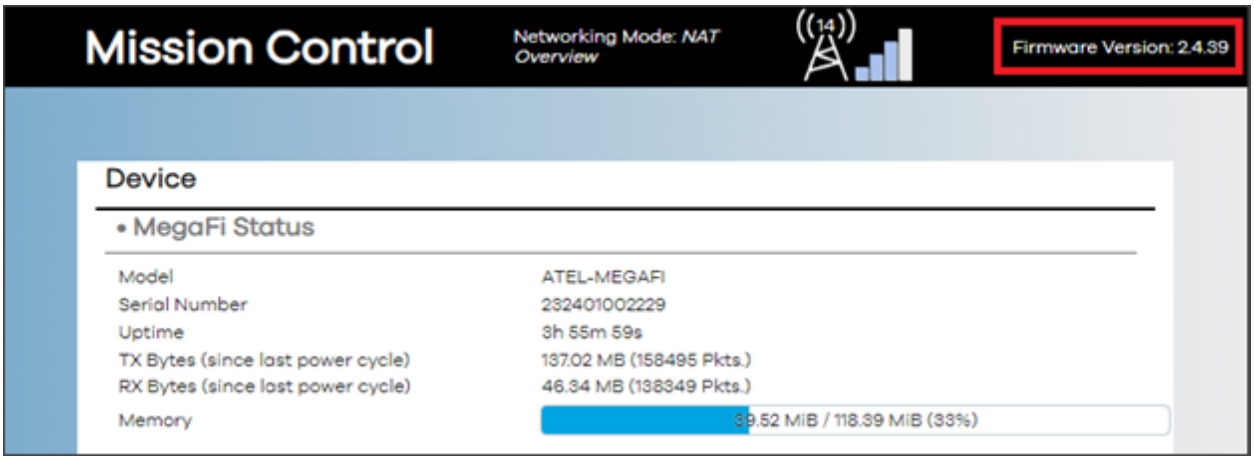


Figure 39: Mission Control page showing Firmware Version

3.4 Backup Existing Configuration

If the user requires to backup an existing configuration, do the following via Mission Control:

1. Navigate to **Overview > System Settings**.
2. Click on the **Save to File** button.

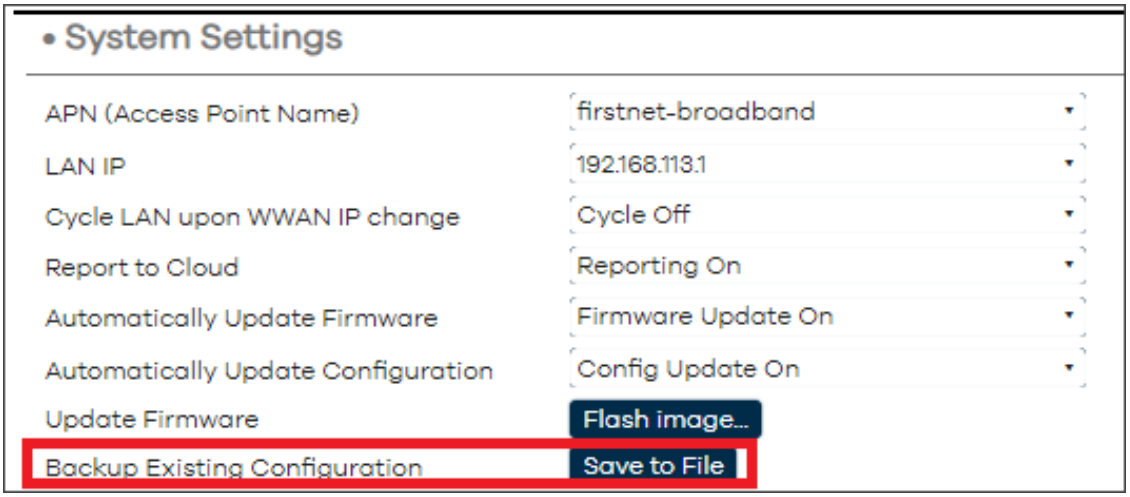


Figure 40: System Settings – Save to File button

3. A tar.gz (tarball) file is created and stored in Downloads. Take note of the date of the file for future reference if needed.

Figure 41: Downloads folder showing downloaded tar.gz file

3.5 Load Configuration from File

If the user requires to load a backup/saved configuration (i.e. duplicate a configuration file onto other MegaFi devices or restore a previous configuration file), do the following via Mission Control:

1. Navigate to **Overview > System Settings**.
2. Click on the **Load File** button, sometimes referred to as **Upload archive…** .

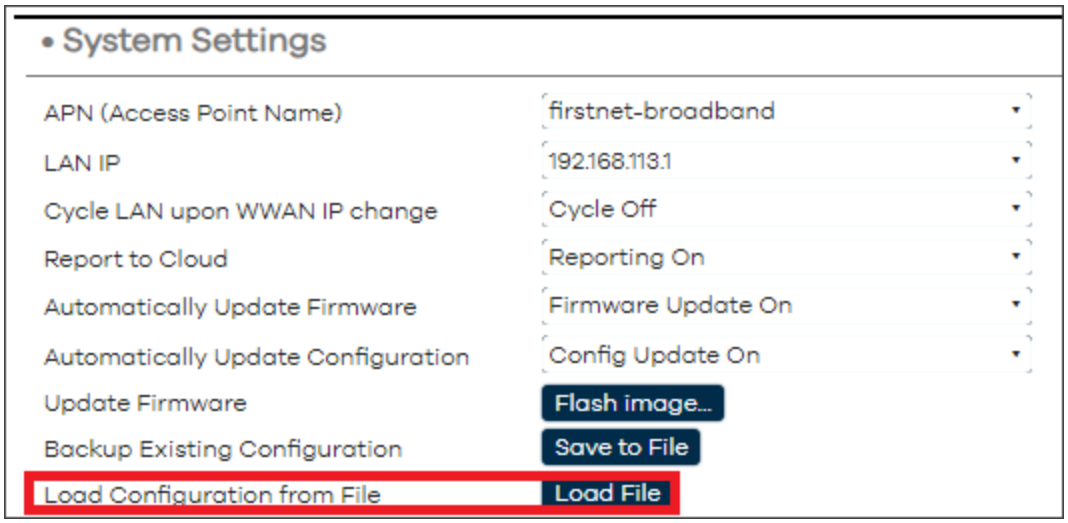


Figure 42: System Settings – Load file button

3. The **Uploading file…** window pop ups, select **Browse** to locate the appropriate tarball file and **Open**.

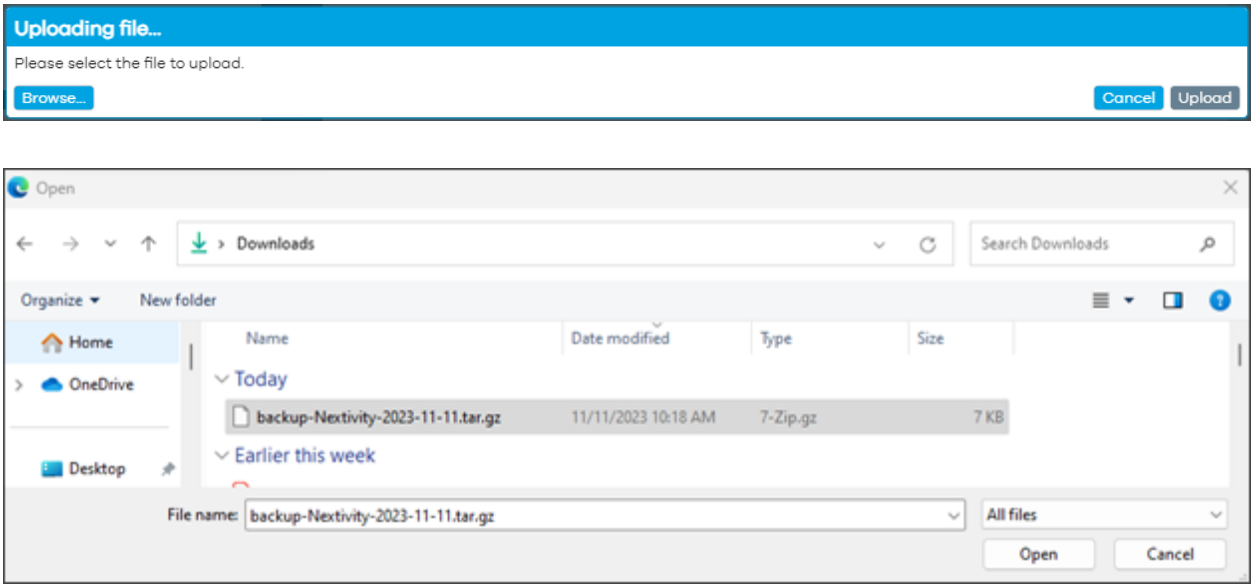


Figure 43: Uploading file and Browse to and select the tarball file

4. The **Uploading file…** pop up window shows the file chosen to load. Verify if it is the intended file before selecting **Upload** to continue with loading the file.

Figure 44: Load Configuration from File – Uploading selected file

5. In the **Apply backup?** pop up window, press **Continue** at the bottom to proceed with restoring the backup file and reboot. Otherwise, **Cancel** to abort the operation.

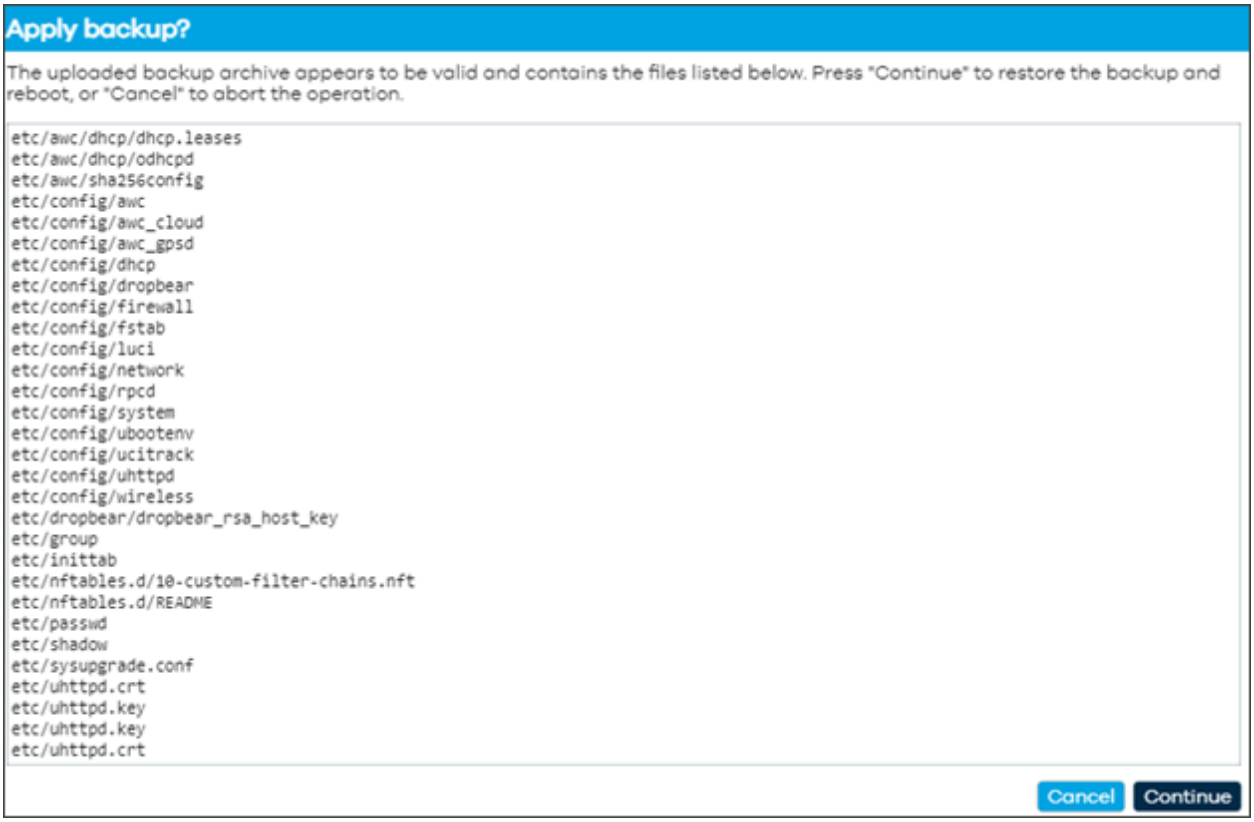


Figure 45: Apply backup – Confirmation to continue

6. Give the backup operation 5-15 minutes to finish.

! **WARNING:** Do not power off the device during this time.

3.6 Change Password

If the user requires to change the current password, do the following via Mission Control:

1. Navigate to **Overview > System Settings**.
2. Click on the **Change Password** button.

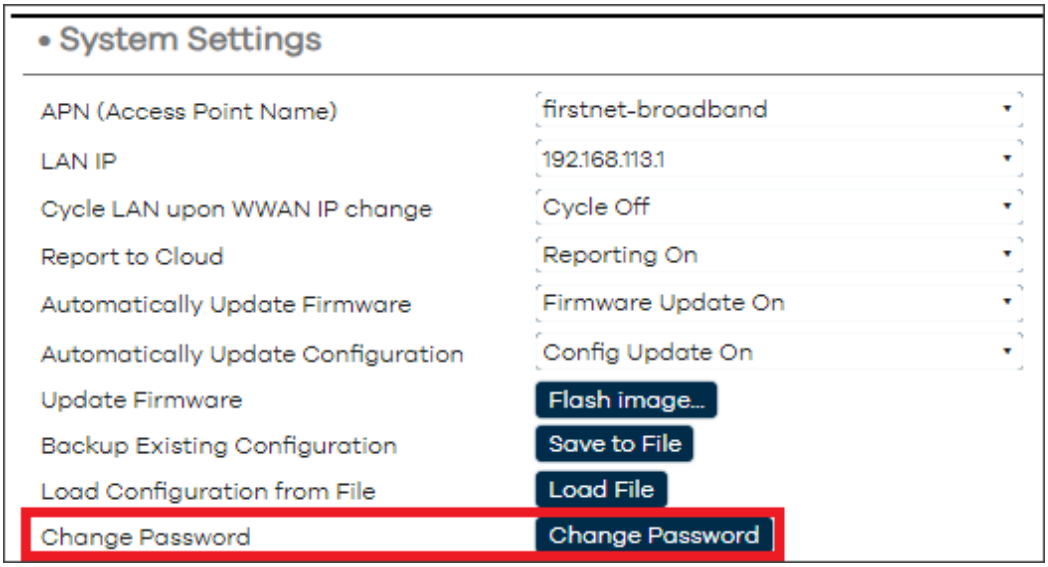


Figure 46: System Settings – Change Password button

3. The user is automatically put into Expert Mode and taken to the **System > Router Password** page.

Figure 47: Router Password page – Expert Mode

4. Enter a new desired password.

➲ **Note:** The device will not accept weak passwords. Password must meet the following requirements: a minimum length of 10 characters and a randomized complexity of lowercase letters, uppercase letters, and numbers.

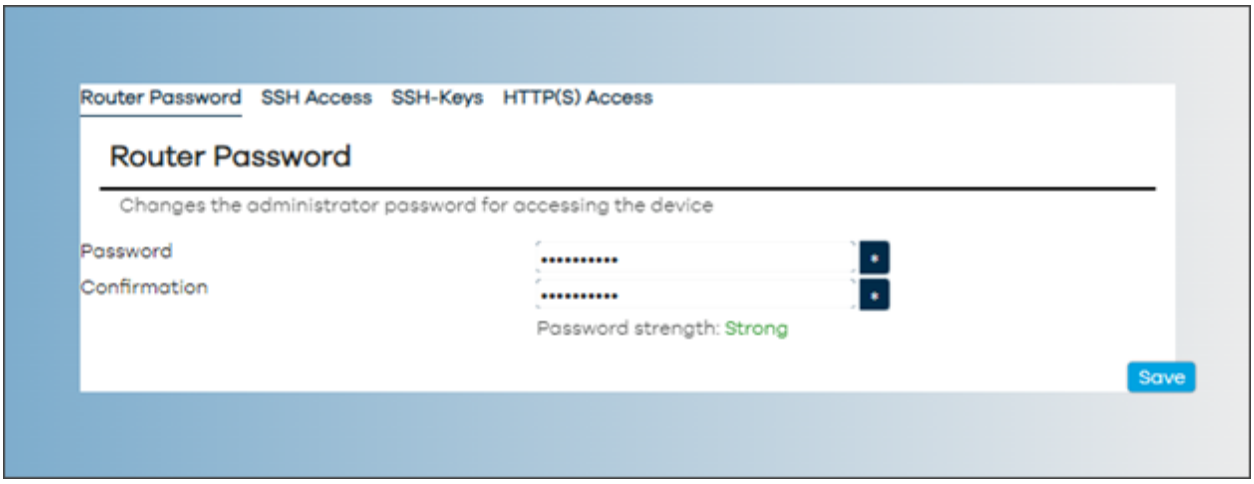


Figure 48: Router Password page – Enter new password

5. Click on the **Save** button.

3.7 Factory Defaults via Mission Control

If the user requires to factory default the MegaFi device, do the following in Mission Control.

➲ **Note:** After a factory reset, the MegaFi's UUID must be reassigned for Cloud support. Contact the support team at support@nextivityinc.com for further assistance.

To Factory Reset MegaFi:

1. Navigate to **Overview > System Settings**.
2. Click on the **Factory Defaults** button.

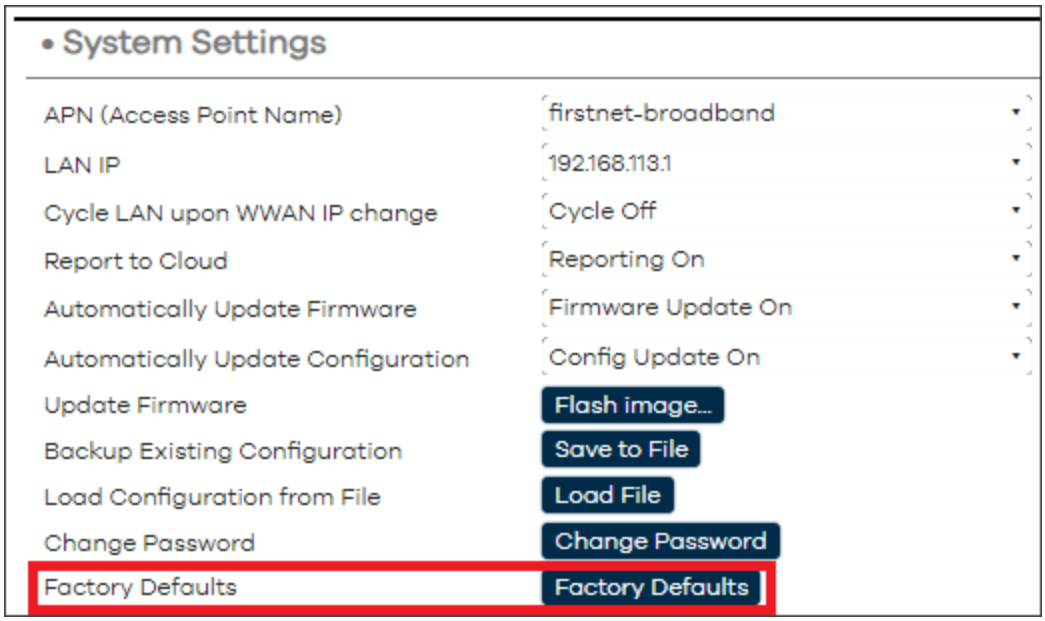


Figure 49: System Settings page – Factory Defaults button

3. A window will pop up and ask the user to confirm the operation. Click **OK** to continue.

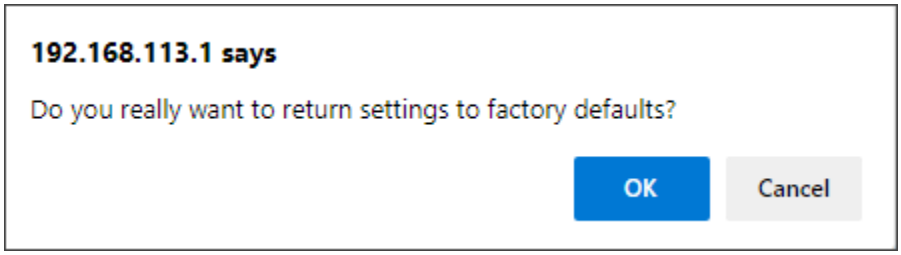


Figure 50: Confirmation to return settings to factory defaults

4. Give the device 5-15 minutes to complete the operation.

5. Once the device recovers, the user will be asked to log in to Mission Control again, using the default password located on the device's label.
6. The user will then be asked to accept the EULA agreement and change the default password.

ⓘ For more details on Factory Defaulting the device via Mission Control or for instructions on how to factory default using the reset button on the device (in case of a forgotten password), refer to the *MegaFi User's Guide* for more information.

3.8 Vehicle Shutdown Delay

If the user requires to change the Vehicle Shutdown Delay (default is set to 30 seconds), do the following in Mission Control:

1. Navigate to **Overview > System Settings**.
2. Click the drop-down arrow to expose the other pre-fined settings and select from 15 minutes, 1 Hour, or 2 Hours.

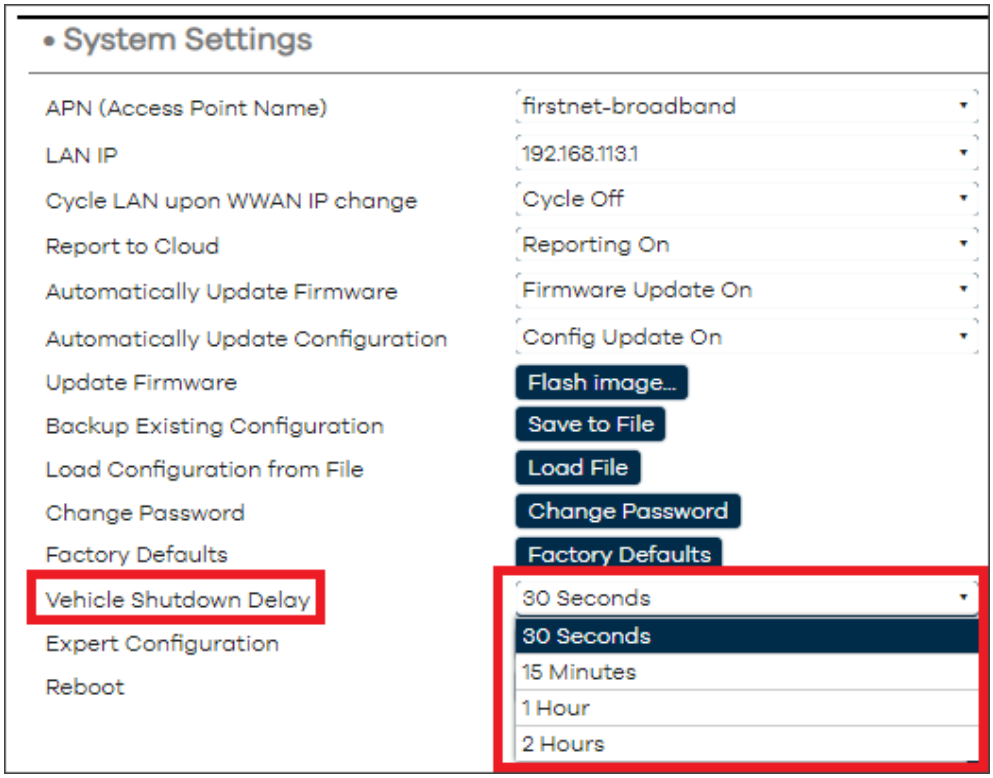


Figure 51: System Settings – Vehicle Shutdown Delay options

3. Click on **Save & Apply** to confirm the new setting.

3.9 Reboot

If the user would like to initiate a reboot of the device, do the following in Mission Control:

1. Navigate to **Overview > System Settings**.
2. Click on the **Reboot** button.

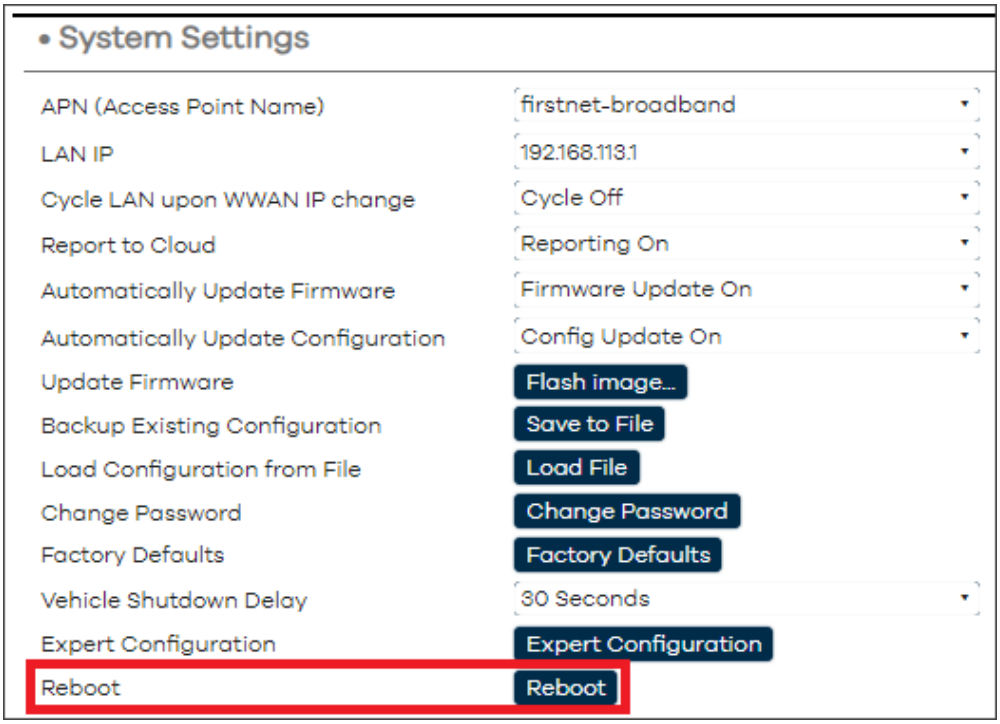


Figure 52: System Settings – Reboot button

3. A pop-up window asks the user to confirm the operation. Click on **OK** to continue.

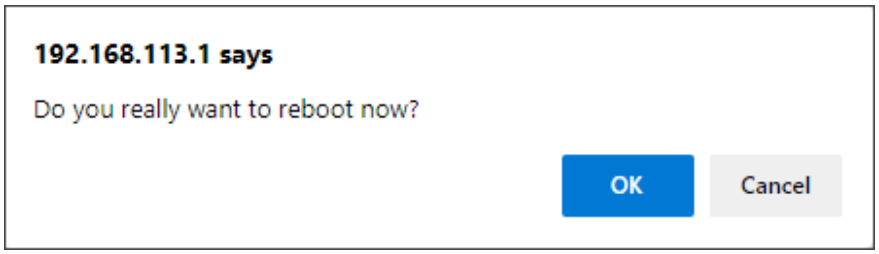


Figure 53: Confirmation message to reboot device

4. Wait for the device to reboot before continuing. The process will take 1 - 5 minutes.

Figure 54: Message indicating device is being rebooted

5. The user will be asked to log in again into Mission Control after the device reboots. Click on the **To login…** button to do so.

Figure 55: Prompt to log in after device reboots

3.10 Wi-Fi Settings

To verify current Wi-Fi settings, do the following in Mission Control:

3.10.1 Verify Wi-Fi Settings

To view current Wi-Fi settings, do the following:

1. Navigate to **Overview > System Settings**.
2. Click on **Expert Configuration** to enter Expert Mode.

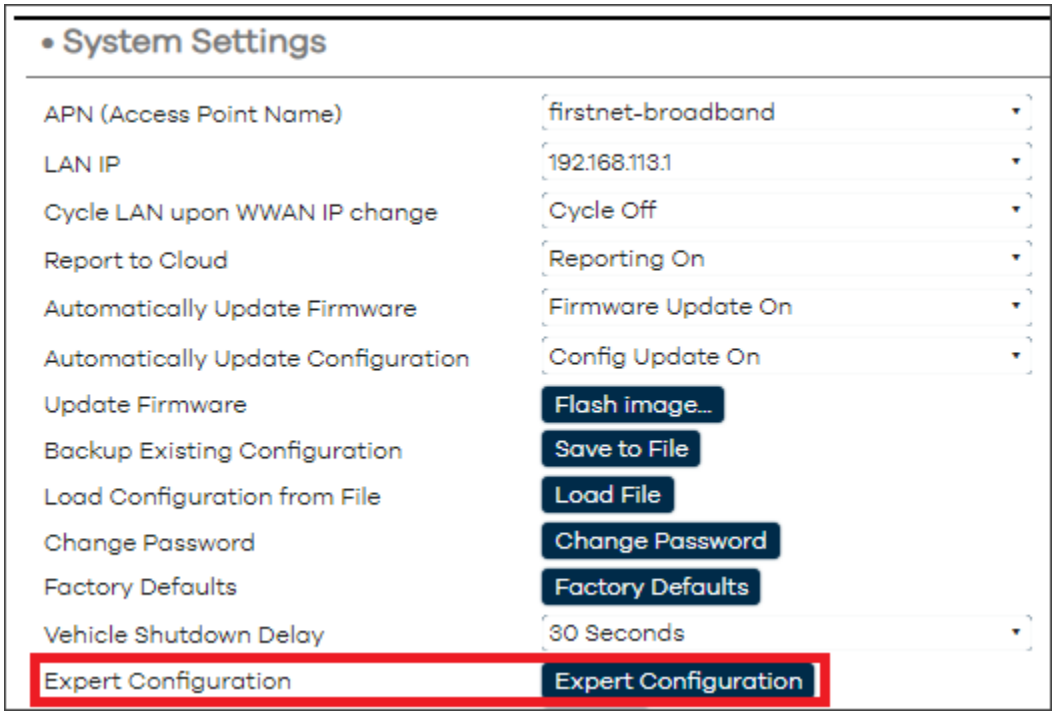


Figure 56: System Settings – Expert Configuration button

3. A pop-up window asks the user to confirm going into Expert Mode. Click **OK** to continue.

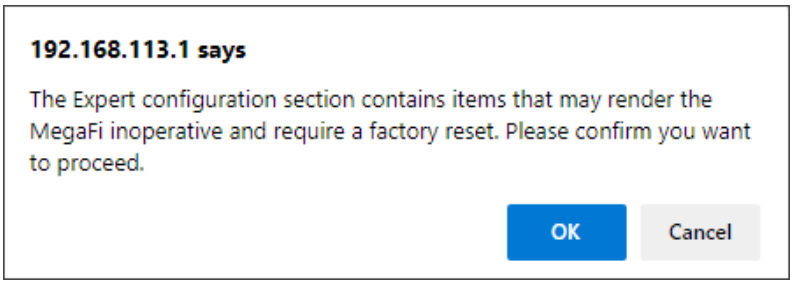


Figure 57: Confirmation message to enter Expert Mode

4. The left-pane menu exposes pages only available in Expert Mode. Navigate to **Network > Wireless**.

   ➲ **Note:** To view the hidden Wi-Fi Key/Password, click on the * (asterisk) button next to the Key field to make it visible for either setting. By default, the key/password is the same for both 2.4 and 5 GHz settings and printed on the label as well.

Figure 58: Mission Control navigation pane showing Expert Mode menu options

5. To make any changes in this page, continue to the next section: **Change Wi-Fi- Settings**.

3.10.2 Change Wi-Fi Settings

The following available options for WiFi 2.4GHz and 5 GHz Settings are:

Wi-Fi Setting	WiFi 2.4 GHz Settings (Default)	WiFi 2.4 GHz Settings -Other Options	WiFi 5 GHz Settings (Default)	WiFi 5 GHz Settings -Other Options
Radio Enabled	Enabled	Disabled	Enabled	Disabled
Channel	1 (2412 Mhz)	Auto and Channels 2-11	36 (5180 Mhz)	Auto and Channels 40, 44, 48, 149, 153, 157, 161
Mode	N	Legacy	AC	Legacy, N
SSID	default SSID name on label		default SSID name on label	
Encryption	WPA2-PSK	WPA2-EAP, WPA3-EAP, WPA2-EAP/WPA3-EAP, WPA2-PSK/WPA3-SAE, WPA3-SAE, and Disabled	WPA2-PSK	WPA2-EAP, WPA3-EAP, WPA2-EAP/WPA3-EAP, WPA2-PSK/WPA3-SAE, WPA3-SAE, and Disabled
Key	default key (password) on label		default key (password) on label	

Table 1: Wi-Fi Settings for 2.4 GHz and 5 GHz

1. For settings with a drop-down menu arrow, click the arrow and choose the preferred setting. For **SSID** and **Key** changes, remove/delete the previous setting and enter the new SSID and/or new and appropriate Key (Must be at least 10 characters long) into their respective fields.
2. Click on **Save** followed by **Save & Apply** to confirm the change(s).
3. When changes have been completed, and to prevent any more setting changes, click on the **Logout** button to exit out of Mission Control and be taken back to the Log In page.

3.11 NAT vs. Passthrough Mode

In the NAT or Passthrough Mode configuration section, the device can be put into NAT (default setting) or Passthrough Mode. Passthrough Mode will disable the router capability of the MegaFi without disabling its modem and pass the carrier assigned IP address to the device directly connected behind the MegaFi.

Prior to implementing Passthrough mode, the user needs to do the following steps:

- **Connection to MegaFi Device** – the user will need to connect a computer via ethernet to LAN port 1. The user will also need to make sure the computer is NOT connected to Wi-Fi.

➲ **Note**: Only LAN port 1 is usable and all other LAN ports are disabled in Passthrough Mode.

- **Implement Custom APN/Static IP first** – Though not always the case, if the user is using a custom APN, the user will need to input the custom APN (Section 3.1), save, and reboot the device to make sure the device receives the correct IP address prior to implementing Passthrough Mode. If the correct IP address does not appear on the device, please review SIM provisioning with the carrier. If the correct IP address does appear, then, the user can implement Passthrough Mode as instructed below.
- **Manually refresh connected computer IP address** – Once in Passthrough Mode, the Mission Control software management interface will briefly be unreachable at https://192.168.113.1 or whatever IP address it has been configured to until the IP address is manually refreshed. If this occurs, go to Step 8 below for options to try to regain connection to Mission Control.

To change between modes, do the following in Mission Control:

1. Navigate to **Overview > System Settings**.
2. Click on **Expert Configuration** to enter *Expert Mode*.

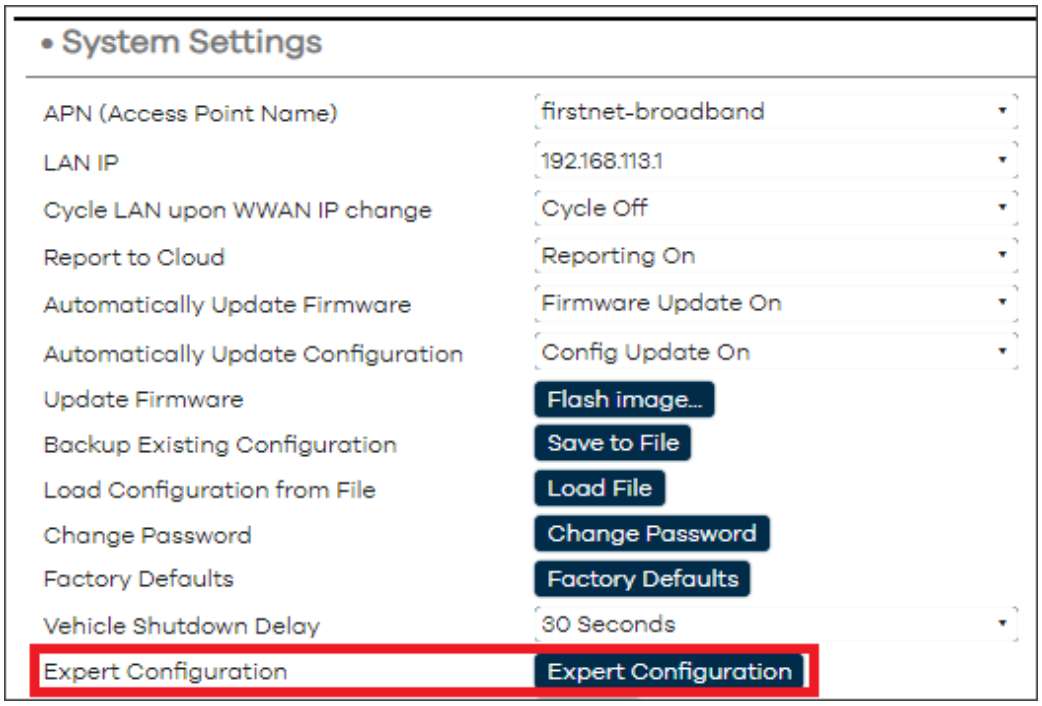


Figure 59: System Settings page – Entering Expert mode

3. A pop-up window asks the user to confirm going into Expert Mode. Click **OK** to continue.

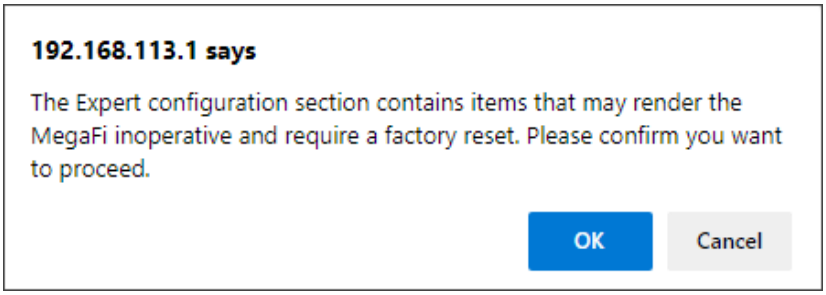


Figure 60: Confirmation message to enter Expert Mode

4. The left-pane menu exposes pages only available in Expert Mode. Navigate to **System > MegaFi Configuration**.

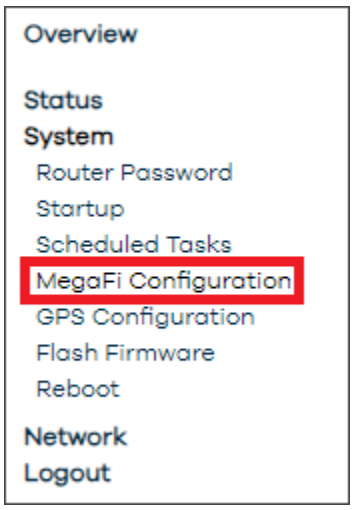


Figure 61: Navigation pane showing options available in Expert Mode

5. Under the NAT or Passthrough Mode area, click on the drop-down arrow and select the desired mode: **NAT Mode** (default), or **Passthrough Mode**.

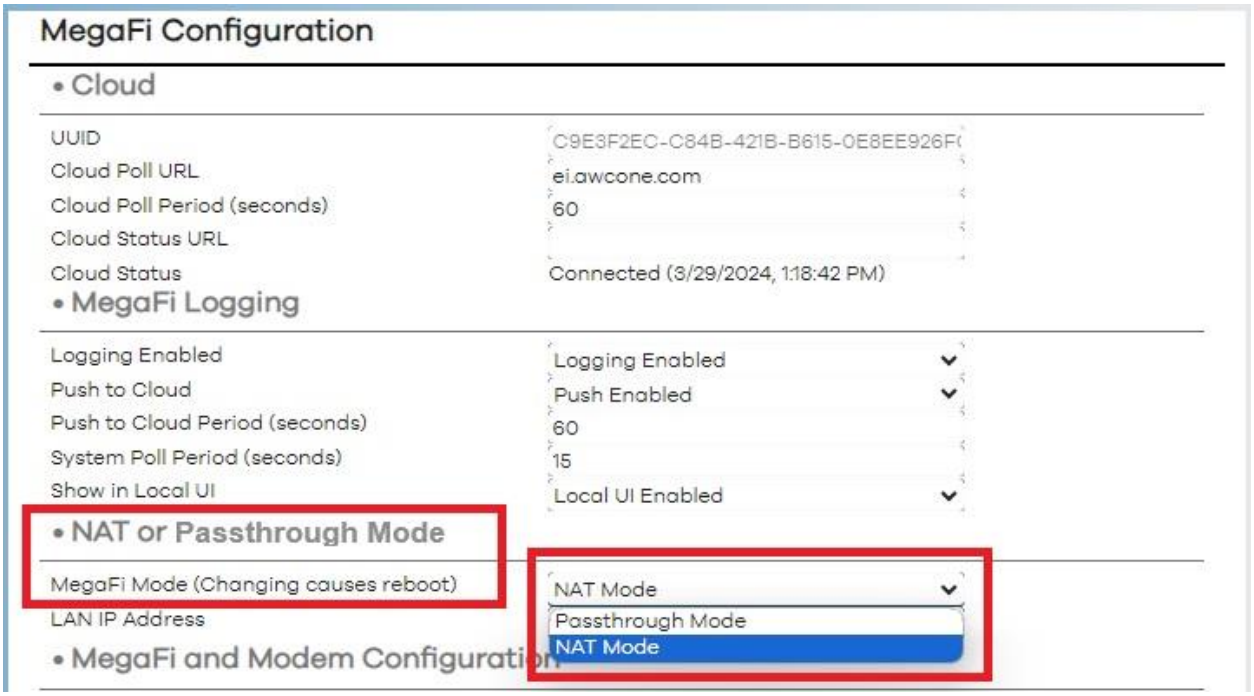


Figure 62: MegaFi Configuration – Change modes (NAT or Passthrough)

6. Click on **Save & Apply** to confirm the change.

! **WARNING:** Internet access, Wireless connectivity and/or access to the MegaFi will become disrupted or unavailable after changing modes. Please allow 1-5 minutes for the configuration to apply.

7. It is highly recommended to issue a **Reboot** (Section 3.9) to make sure the new setting takes hold.
8. If connectivity becomes an issue, try one of the following actions to regain access to MegaFi:

   8a. Refresh the web browser to Mission Control.

   8b. Connect an Ethernet cable to an enabled LAN port (LAN port 1 if in Passthrough) on the MegaFi and re-access Mission Control as usual through a web browser.

   8c. Manually refresh connected computer IP address by opening a Windows PowerShell, or Command Prompt window on a PC with local access to MegaFi and enter the following commands at the prompt:

   - **ipconfig /release** <enter> - this will release the existing IP addresses

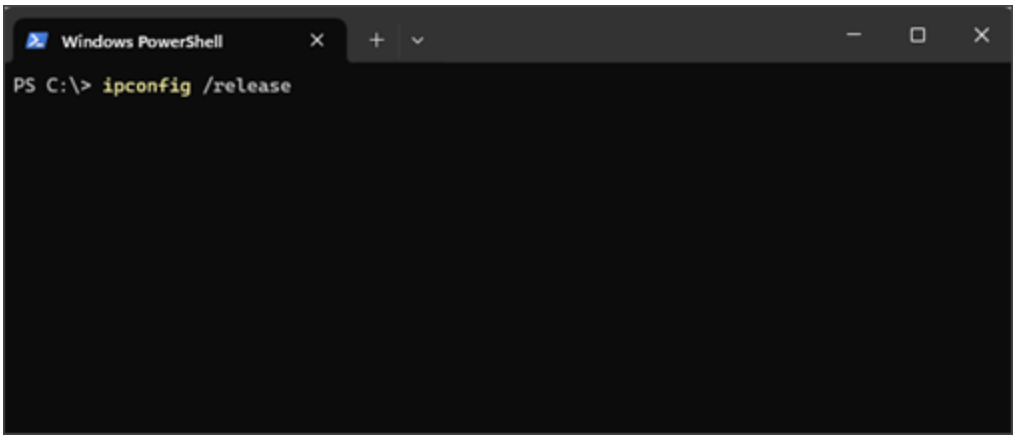


Figure 63: Windows PowerShell window – ipconfig /release <enter>

   - **ipconfig /renew** <enter> - this will refresh the IP addresses on the connected computer.

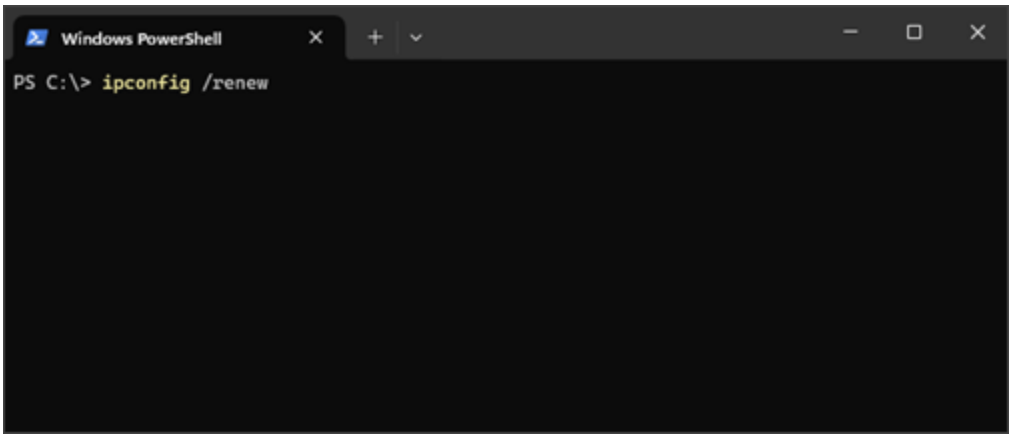


Figure 64: Windows PowerShell window – ipconfig /renew <enter>

9. When changes have been completed, and to prevent any more setting changes, click on the **Logout** button to exit out of Mission Control and be taken back to the Log In page.

3.12 Band Lock

The user may briefly change the Band Lock from **Default Band Configuration** to **LTE B14 Only** until the device is rebooted. Do the following in Mission Control:

1. Navigate to **Overview > System Settings**.
2. Click on **Expert Configuration** to enter Expert Mode.

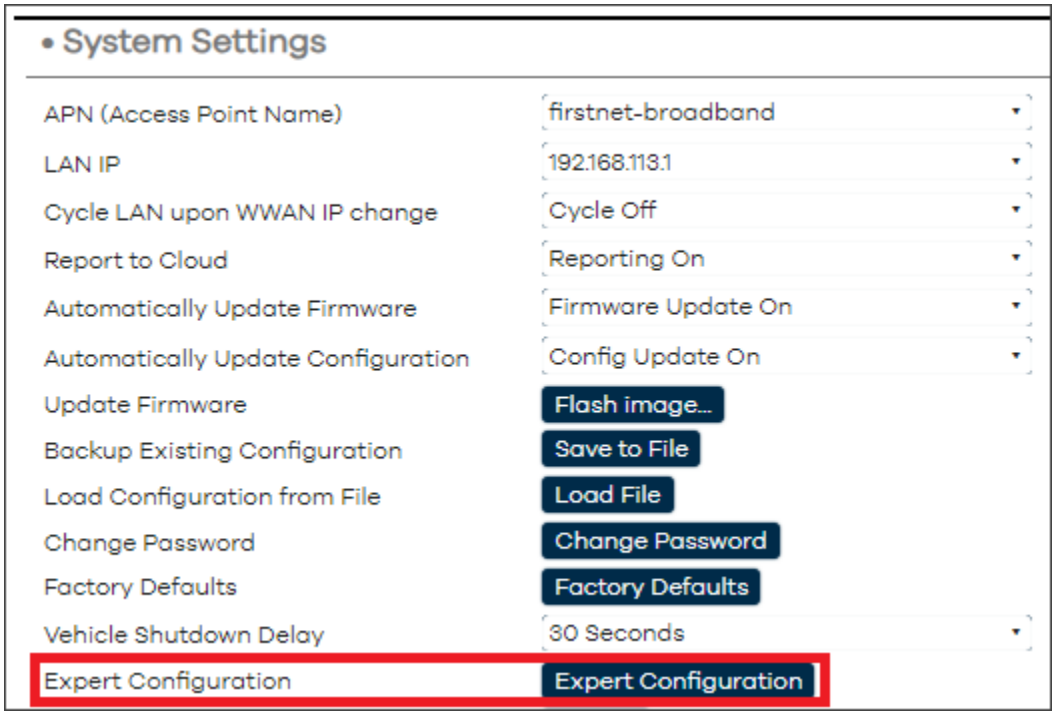


Figure 65: System Settings – Expert Configuration button

3. A pop-up window asks the user to confirm going into Expert Mode. Click **OK** to continue.

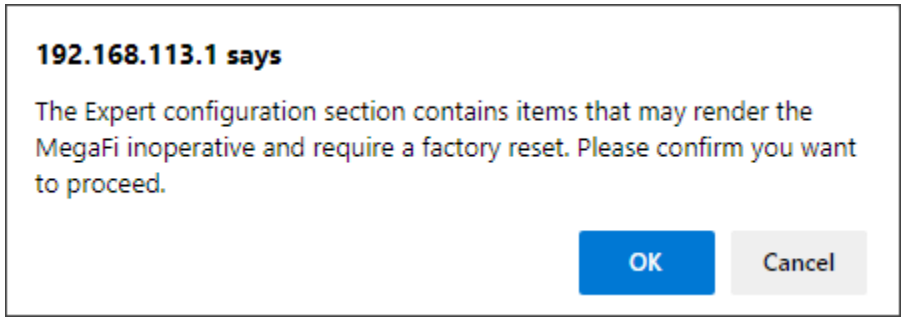


Figure 66: Confirmation to Enter Expert mode

4. The left-pane menu exposes pages only available in Expert Mode. Navigate to **System > MegaFi Configuration**.

5. Under the **MegaFi and Modem Configuration** area, use the drop-down arrow to select **LTE B14 only** or **Default Band Configuration**. Choose the **Set Default Band Configuration** button to set back to default setting in which the device relies on the Network to choose the appropriate band.

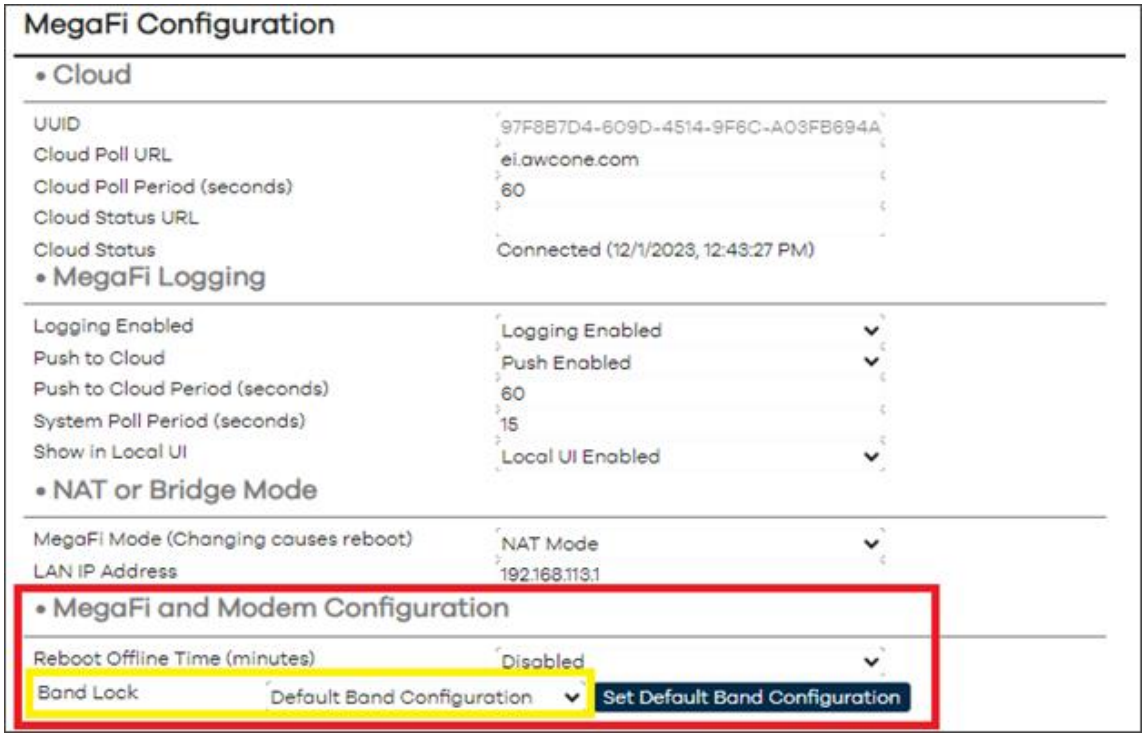


Figure 67: Band Lock Setting

➲ **Note:** Choosing the LTE B14 Only is temporary until the device reboots.

6. Click on **Save & Apply** to confirm the change.
7. When changes have been completed, and to prevent any more setting changes, click on the **Logout** button to exit out of Mission Control and be taken back to the Log In page.

3.13 SSH Access

Access to SSH is turned off by default. To enable command line SSH access to the device, add a Dropbear SSH instance(s) by selecting the **SSH Access** tab and following the menu prompts. The user enabled SSH instance offers SSH network shell access and an integrated SCP server.

➲ **Note:** The default Port is set to 2022, but the user can change it to the typical port of 22. Make sure to Save & Apply to confirm the Dropbear SSH instance and change of port if any.

1. Navigate to **Overview > System Settings**.
2. Click on **Expert Configuration** to enter Expert Mode.

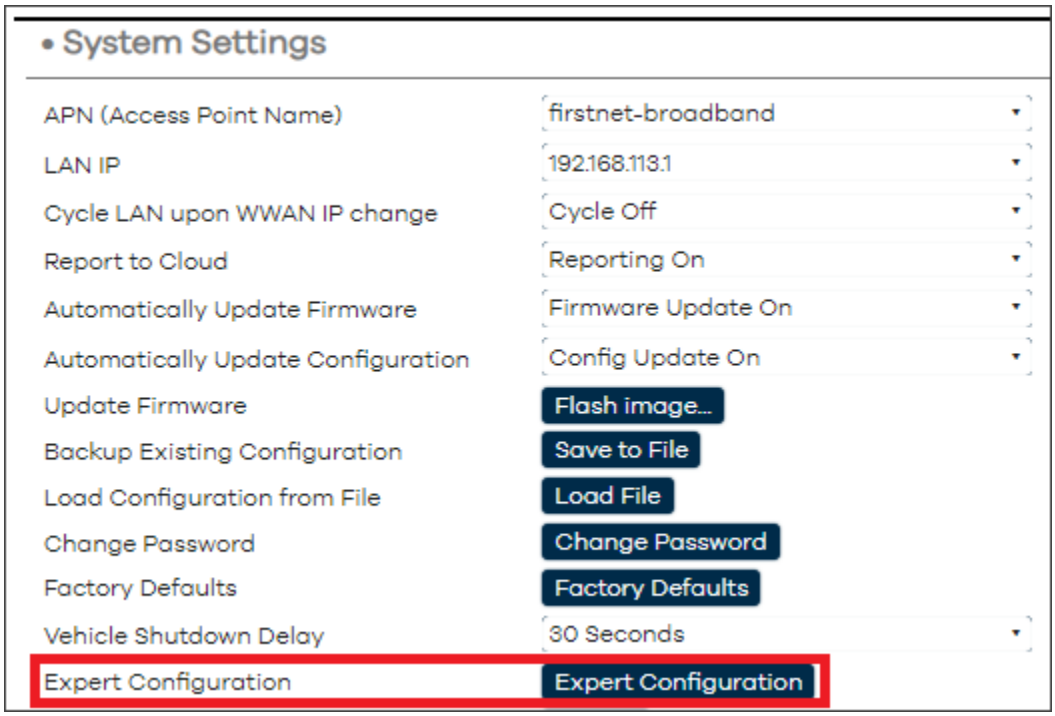


Figure 68: System Settings – Expert Configuration

3. A pop-up window asks the user to confirm going into Expert Mode. Click **OK** to continue.

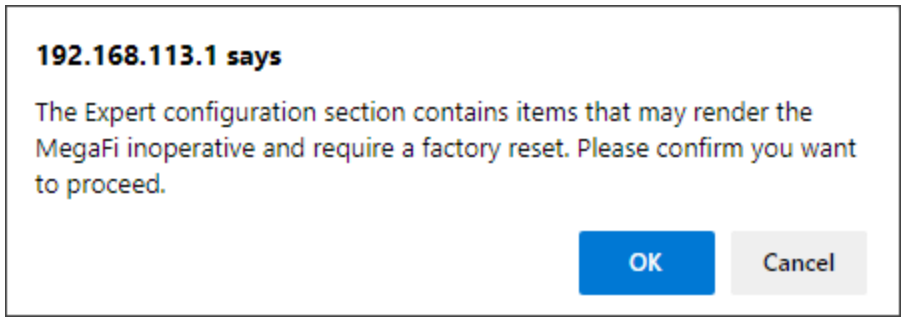


Figure 69: Confirmation to Enter Expert mode

4. The left-pane menu exposes pages only available in Expert Mode. Navigate to **System > Router Password > SSH Access**.

Figure 70: SSH Access page – add new instance

5. Click on the **Add Instance** button.
6. The Interface field will be pre-populated with the lan port by default and is typical when needing local access to the device. The other options in the dropdown menu are wan and wwan when remote SSH access is required.
7. In the **Port** field, change the port number from the default **2022** to **22** (well-known SSH port) and click on **Save & Apply**.

Figure 71: SSH Access page – Change port number from 2022 to 22

8. When changes have been completed, and to prevent any more setting changes, click on the **Logout** button to exit out of Mission Control and be taken back to the **Log In** page.
9. Use your preferred SSH client to access MegaFi on port **22** and use '**root**' as the username along with the current router password.

   ➲ **Note:** The SSH password will be the same as the Router Password.

10. **Optional**: If remote SSH access to the device is required and the device has a custom static/public IP address, do the following:

    10a. **Add Interface** and choose wan or wwan depending on how the device is connected.

    10b. Choose a non-well-known port such as 46556.

    10c. A Firewall Traffic Rule will need to be implemented to allow incoming traffic on this port. An example of this is shown in section 5.1.

3.14 GPS Output Configuration

This is where the user can configure GPS settings for a GPS Server, GPS Internal Reporting, and GPS Output.

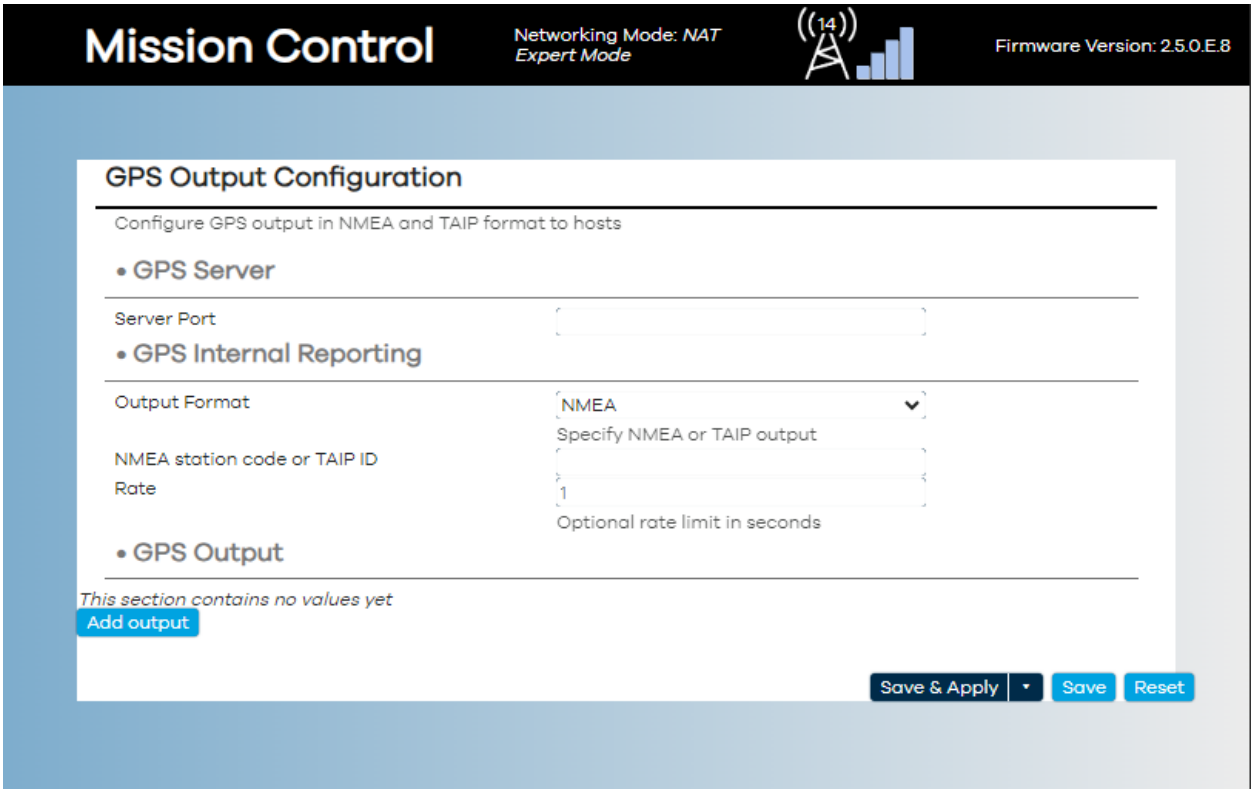


Figure 72: GPS Output Configuration page

3.14.1 GPS Server

To set up the MegaFi to act like a GPS Server to forward the GPS information to GPS Clients, do the following.

1. Navigate to **Overview > System Settings**.
2. Click on **Expert Configuration** to enter Expert Mode.

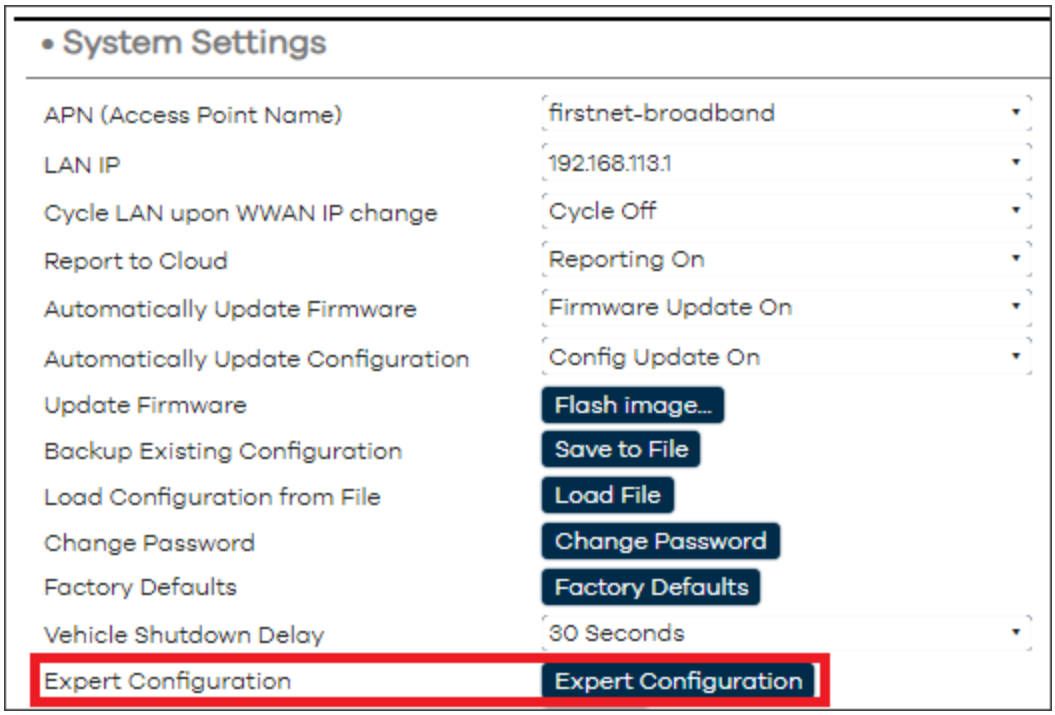


Figure 73: System Settings – Expert Configuration

3. A pop-up window asks the user to confirm going into Expert Mode. Click **OK** to continue.

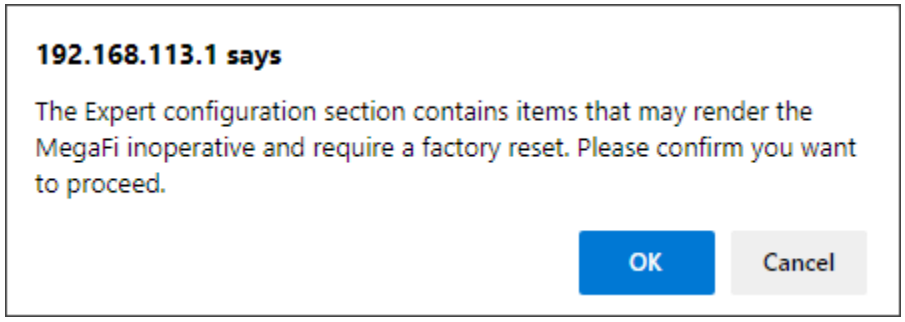


Figure 74: Confirmation to Enter Expert mode

4. The left-pane menu exposes pages only available in Expert Mode. Navigate to **System > GPS Configuration > GPS Server**.
5. Enter the port that the GPS server will be available on in the Server Port field followed by hitting the '**Enter**' button. We entered 21000 as our example:

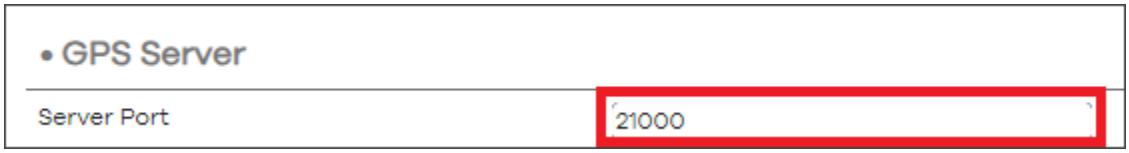


Figure 75: Configuration of GPS Server Port

6. **Save & Apply**.
7. When changes have been completed, and to prevent any more setting changes, click on the **Logout** button to exit out of Mission Control and be taken back to the Log In page.

3.14.2 GPS Internal Reporting

This section modifies the internal GPS formation and how it is reported. This section is discussed in more detail in section 4.3.5.2.

3.14.3 GPS Output

This section will enable the MegaFi to forward GPS information to a server. When adding an output, the available fields are:

- **Host IP Address** – Typically the IP address of the computer running a GPS client
- **Port** – can be any network port number from 1024 on, as long as it is not blocked and not already in use (stay away from well-known port numbers in the range between 0-1023)
- **Output Format** – TAIP or NMEA
- **NMEA station code or TAIP ID** – typically not required, but if needed, enter an appropriate and valid 4-digit number
- **TCP/UDP** – most typical option is UDP (Currently, only UDP works!)
- **Rate** – this parameter is in seconds

1. Navigate to **Overview > System Settings**.
2. Click on **Expert Configuration** to enter Expert Mode.

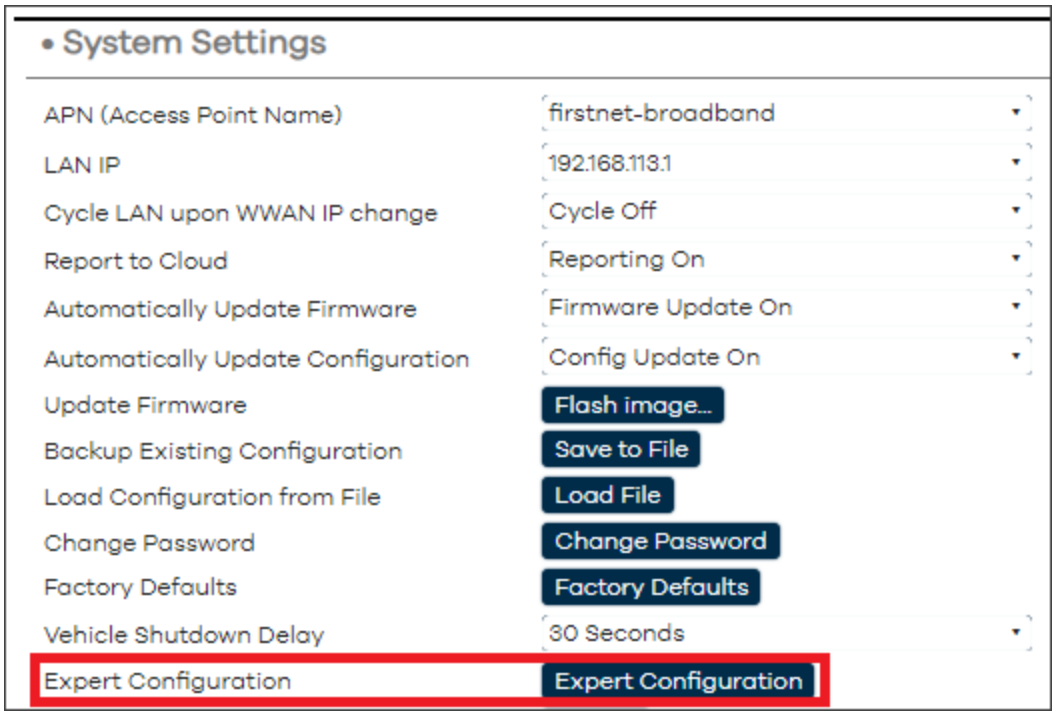


Figure 76: System Settings – Expert Configuration

3. A pop-up window asks the user to confirm going into Expert Mode. Click **OK** to continue.

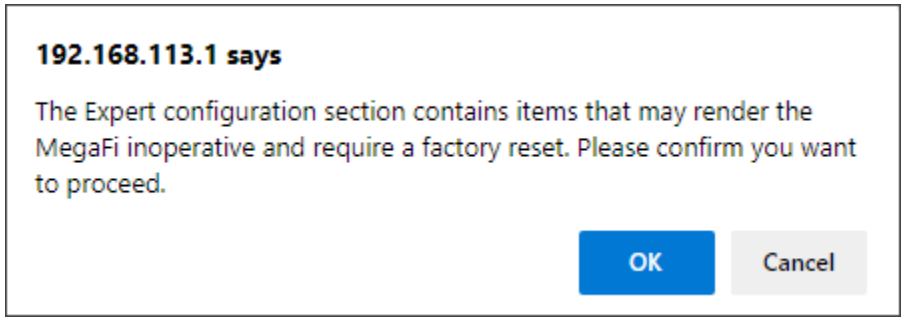


Figure 77: Confirmation to Enter Expert mode

4. The left-pane menu exposes pages only available in Expert Mode. Navigate to **System > GPS Configuration > GPS Output**.

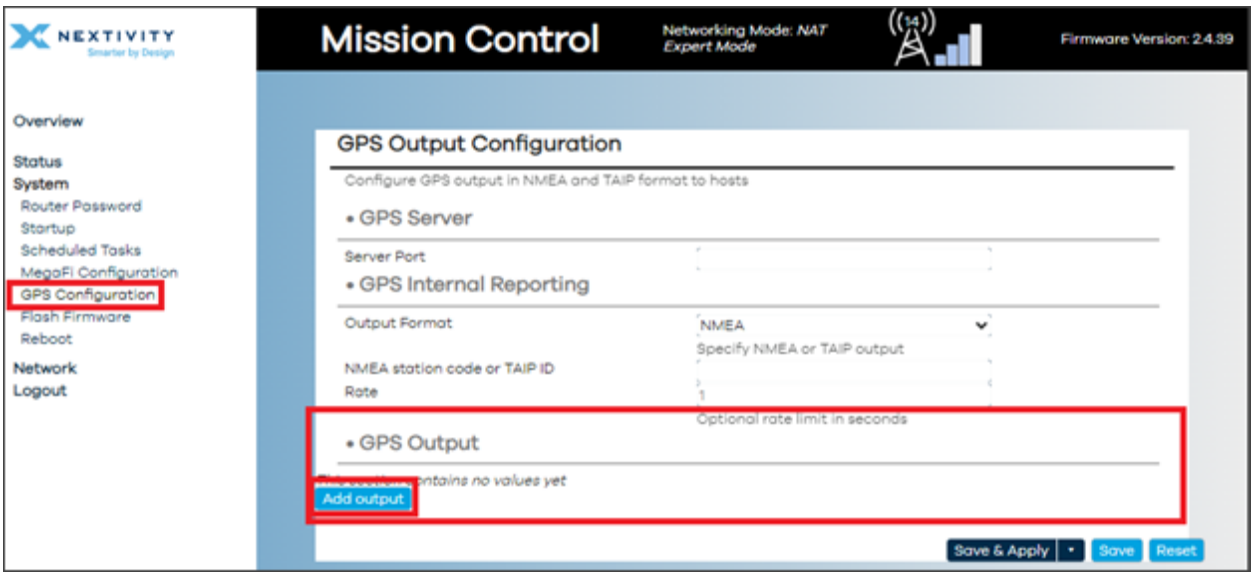


Figure 78: GPS Output Configuration – Add output

5. Select **Add output** and enter the following information:

   5a. **Host IP Address** – Typically the IP address of the computer running a GPS client

   5b. **Port** – can be any network port number from 1024 on, as long as it is not blocked and not already in use (stay away from well-known port numbers in the range between 0-1023)

   5c. **Output Format** – TAIP or NMEA

   5d. **NMEA station code or TAIP ID** – typically not required, but if needed, enter an appropriate and valid 4-digit number

   5e. **TCP/UDP** – most typical option is UDP (Currently, only UDP works!)

   5f. **Rate** – this parameter is in seconds

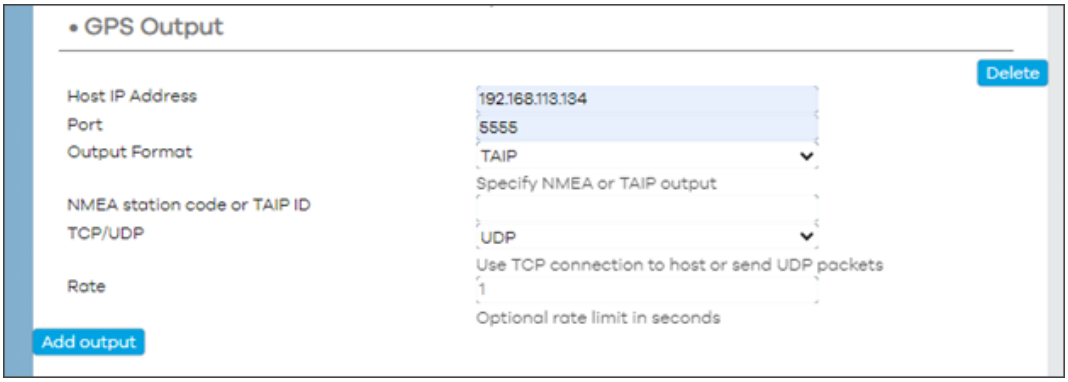


Figure 79: GPS Output page – Values for adding new output

6. **Save & Apply**.

7. When changes have been completed, and to prevent any more setting changes, click on the **Logout** button to exit out of Mission Control and be taken back to the Log In page.

➲ **Note**: Multiple outputs can be configured to multiple clients. Just repeat this process as needed.

4 | Expert Configuration Settings

For more advanced settings, the user will need to first access Expert Mode. More detailed information into other Expert Mode configuration settings not yet discussed will be high-lighted in this section.

4.1 Enter Expert Mode

1. Navigate to **Overview > System Settings**.
2. Click on **Expert Configuration** to enter **Expert Mode**.

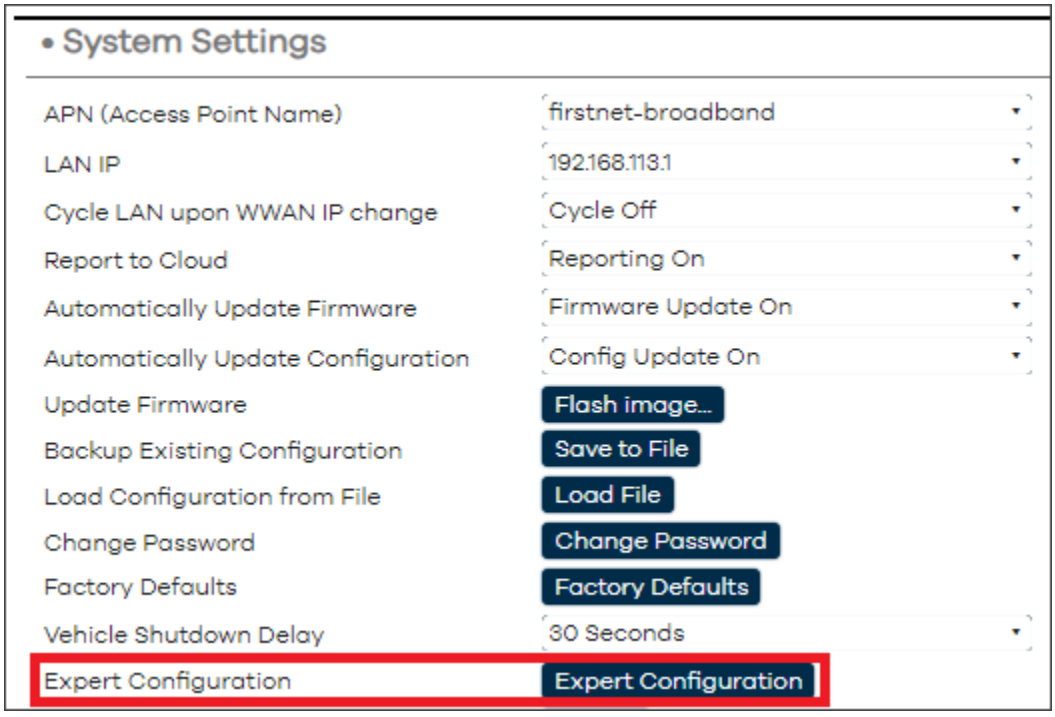


Figure 80: System Settings – Expert Configuration

3. A pop-up window asks the user to confirm going into Expert Mode. Click **OK** to continue.

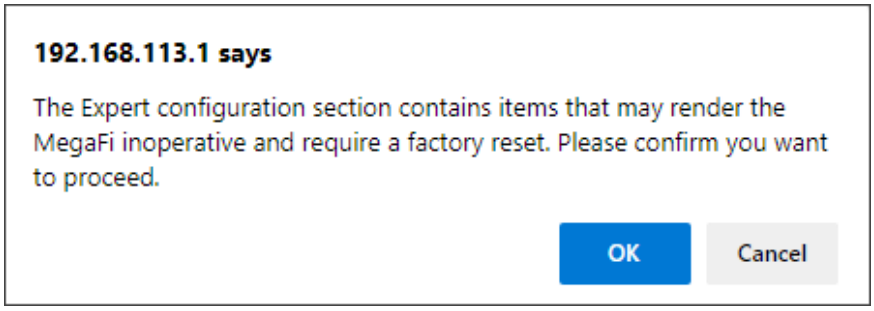


Figure 81: Confirmation message – Enter Expert Mode

4.2 Status

The left-pane menu exposes pages only available in **Expert Mode**. In the main window, the **Status > General** page will be displayed where the Status page provides a quick overview of the device's environment, health, and current standing. Links to sub-sections are **General**, **Routing**, **Firewall**, **System Log**, **Processes**, **Channel Analysis**, **Realtime Graphs**, and **Modem Status**. Each of these pages will be further discussed in detail below.

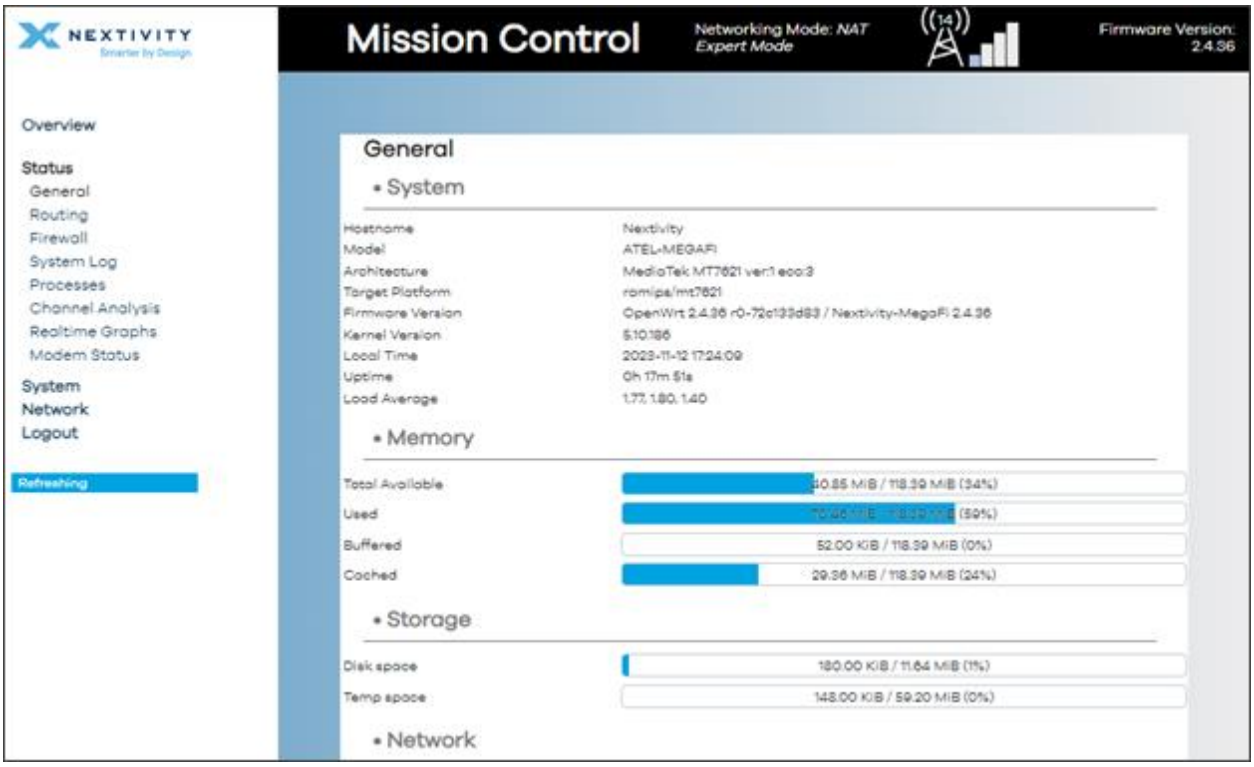


Figure 82: Status page showing overview of the device's environment, health, and current standing

4.2.1 General

The **General** section displays a summary of the devices' **System**, **Memory**, **Storage**, **Network**, **Active DHCP Leases**, and **Wireless** environments.

4.2.1.1 System

The System environment contains a list of attributes and parameters of the device such as:

- Hostname
- Model
- Architecture
- Target Platform
- Firmware Version

- Kernal Version
- Local time
- Uptime
- Load Average

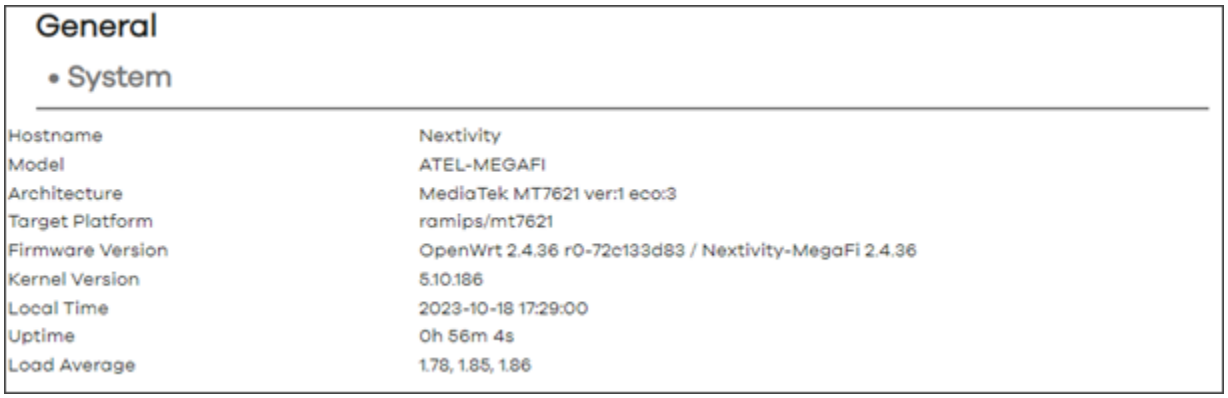


Figure 83: General page – System environment

4.2.1.2 Memory

The Memory environment displays the real time view of the memory of the device. This includes:

- Total Available
- Used
- Buffered
- Cached

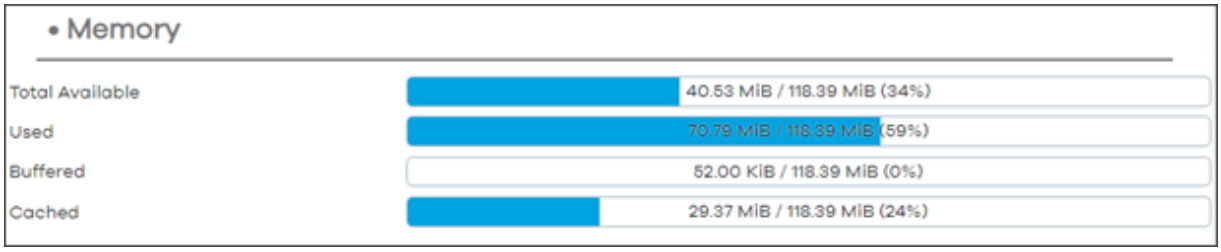


Figure 84: General page – Memory environment

4.2.1.3 Storage

The Storage environment displays disk space and temporary space available on the device.

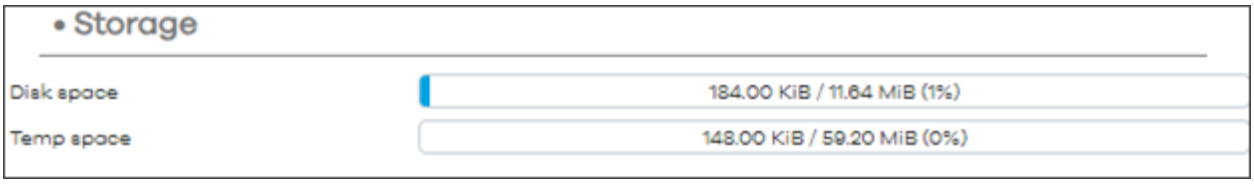


Figure 85: General page – Storage environment

4.2.1.4 Network

The **Network** environment contains:

- Protocol
- Cellular WWAN network connections (specifically IPv4 and IPv6 addresses assigned by the wireless network provider)
- Gateway
- Connected (device connection uptime)
- Device interface name
- MAC address
- Active Connections

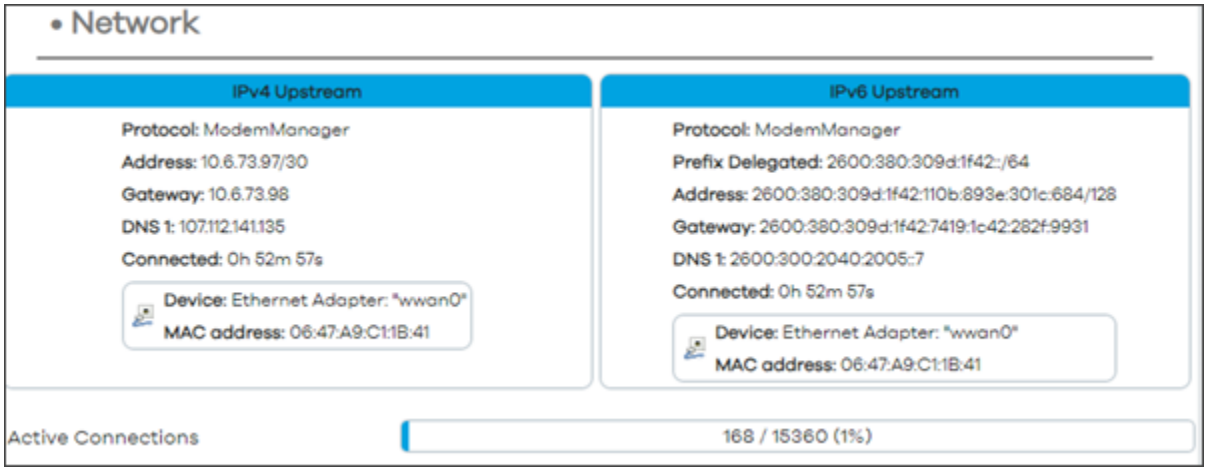


Figure 86: General page – Network environment

4.2.1.5 Active DHCP/DHCPv6 Leases

The Active DHCP/DHCPv6 Leases environments includes the following information:

- Current Active DHCPv4 and Active DHCPv6 leases
- There is a "**Set Static lease**" option which, if selected and applied, will cause the MegaFi to maintain an association between the MAC and IP address assigned by DHCP on the LAN side, creating static routing to the designated device.

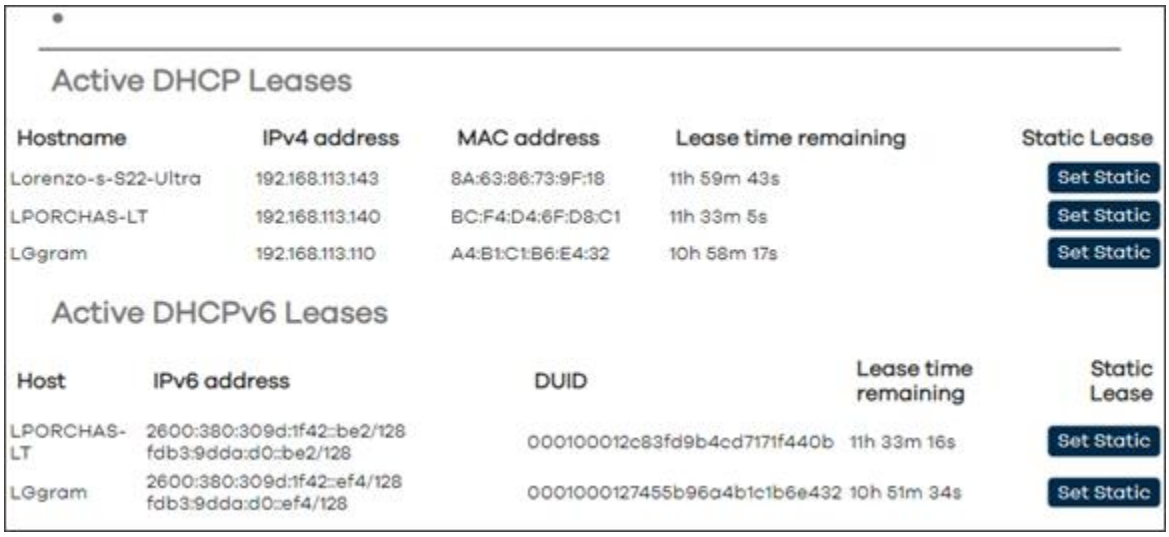


Figure 87: General page – Active DHCP Leases environments

4.2.1.6 Wireless

The **Wireless** environment provides a summary of Wi-Fi details from the 2.4 GHz radio (radio0) and the 5 GHz radio (radio1). In this environment, the user can also see the Associated Stations section which displays a list of Wi-Fi connected devices. Parameters to note are:

- Type – 802.11x
- Channel – 2.4 and 5GHz
- SSID
- Encryption
- Associations – current connections
- MAC Address
- Host
- Signal / Noise
- RX/TX Rates
- Option to Disconnect hosts

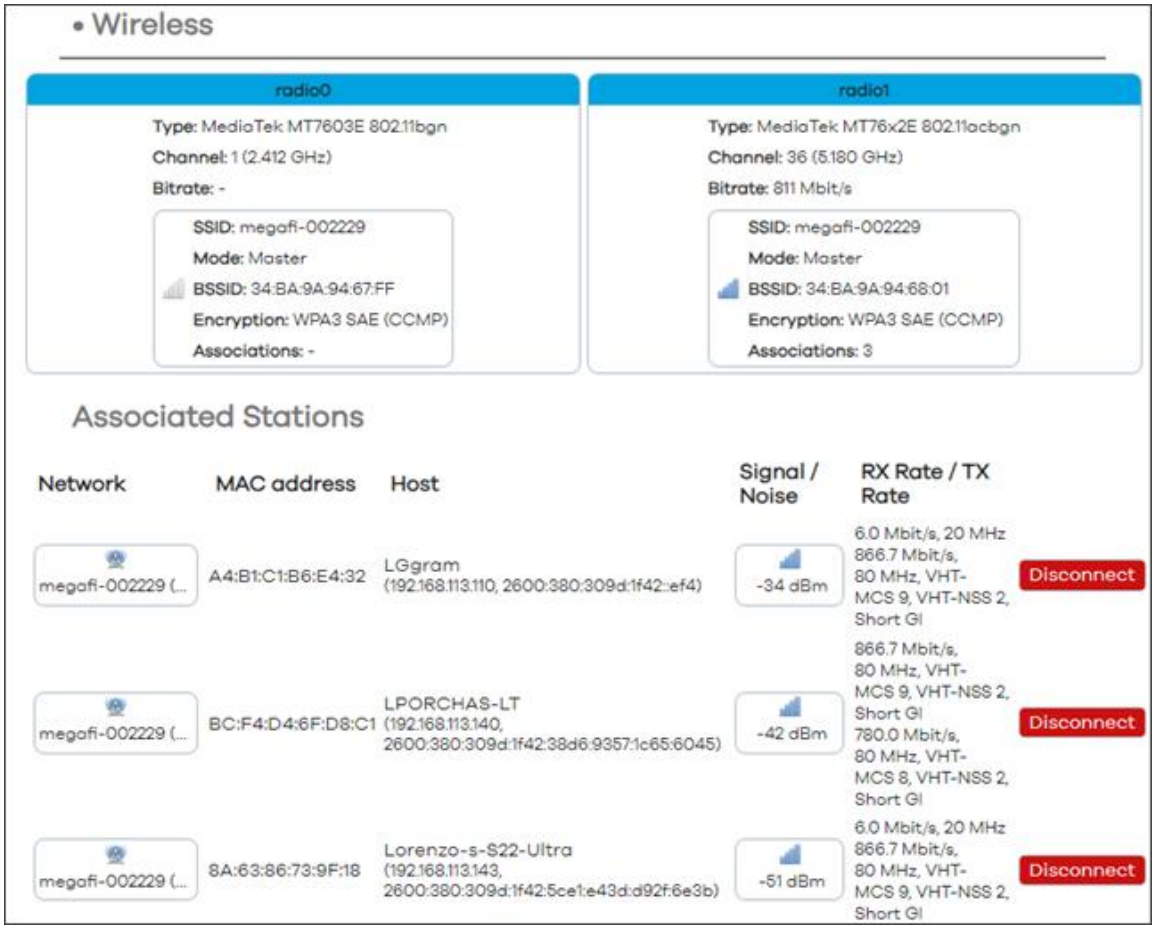


Figure 88: General page – Wireless environment

4.2.2 Routing

In the **Routing** section, the user can track currently active IPv4 and IPv6 routing that shows **Neighbors**, **Routes**, and **Rules** on the system.

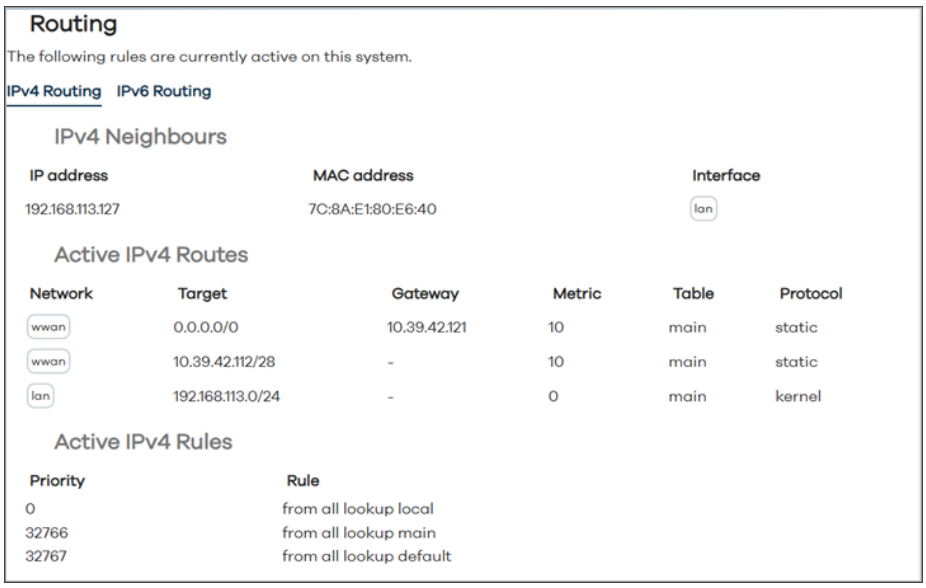


Figure 89: Routing page – IPv4 routing

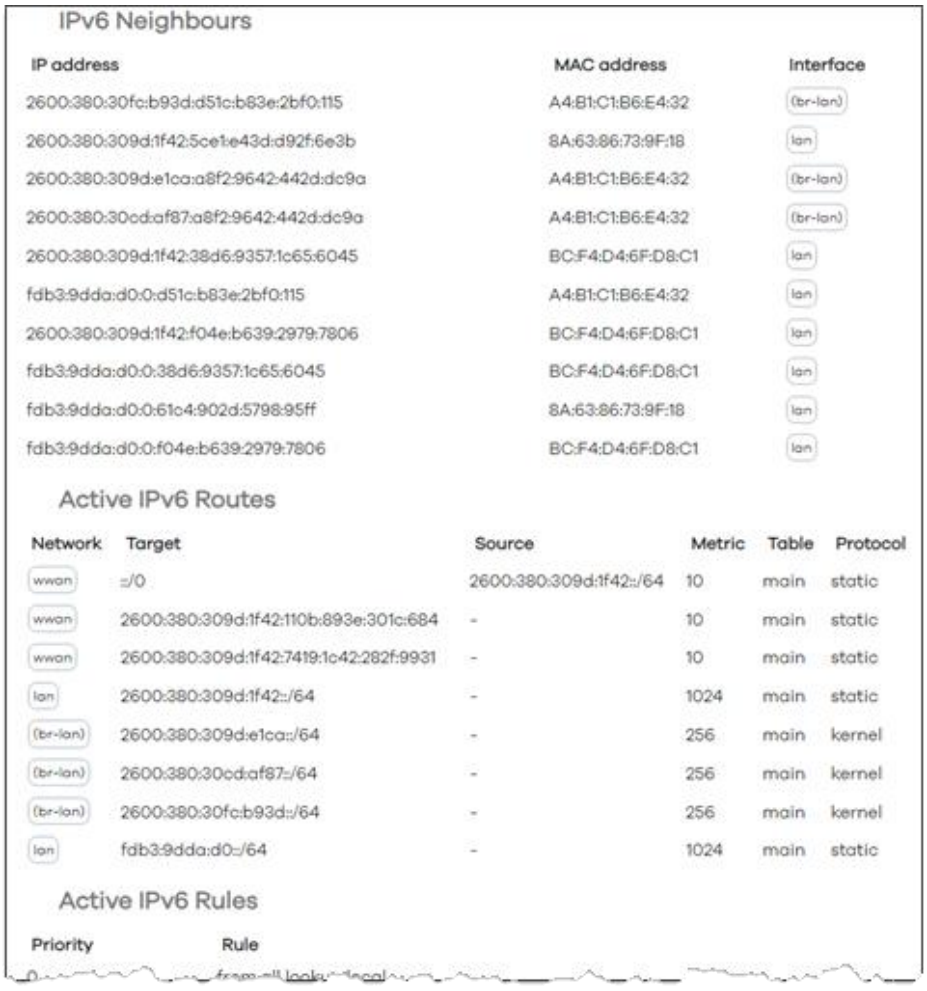


Figure 90: Routing page – IPv6 routing

4.2.3 Firewall

The **Firewall** section displays the list of active chains across both IPv4 and IPv6 firewalls.

➲ **Note:** Hover over '#' with the mouse pointer for rule comments that gives more information on each rule.

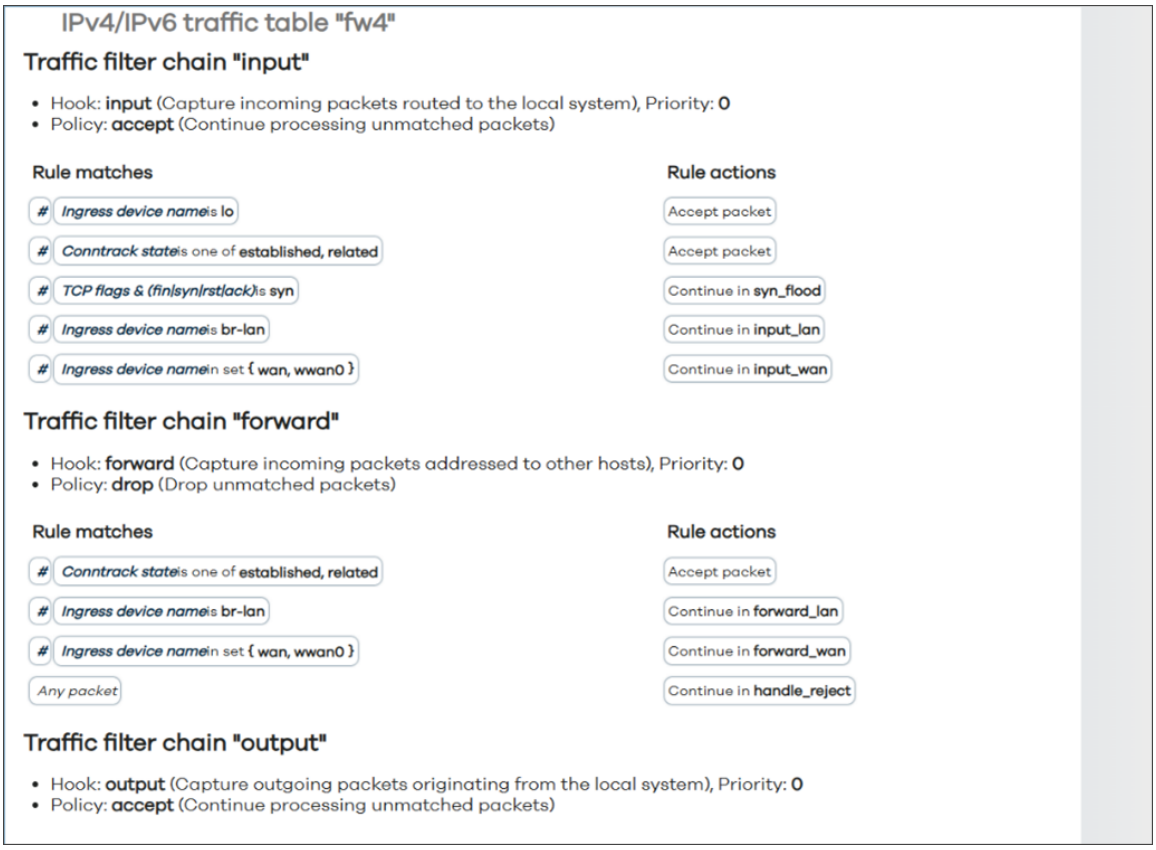


Figure 91: Firewall page – IPv4 and IPv6 firewalls

4.2.4 System Log

The **System Log** page provides a list of notifications within the system and the kernal. These entries are important for troubleshooting and understanding the state of the device.

➲ **Note:** If asked to provide a log for troubleshooting purposes, the user can select the entire log by hovering over the entries in the log, and right click the mouse, and then select all from the list. Then, right click again and select copy to make it available on the clipboard. Then open Notepad, or a similar text program, and press control-V to paste the log. Then, save the pasted log as a text file on your PC. The text file can then be emailed as needed. This is true for either the System or Kernal logs.

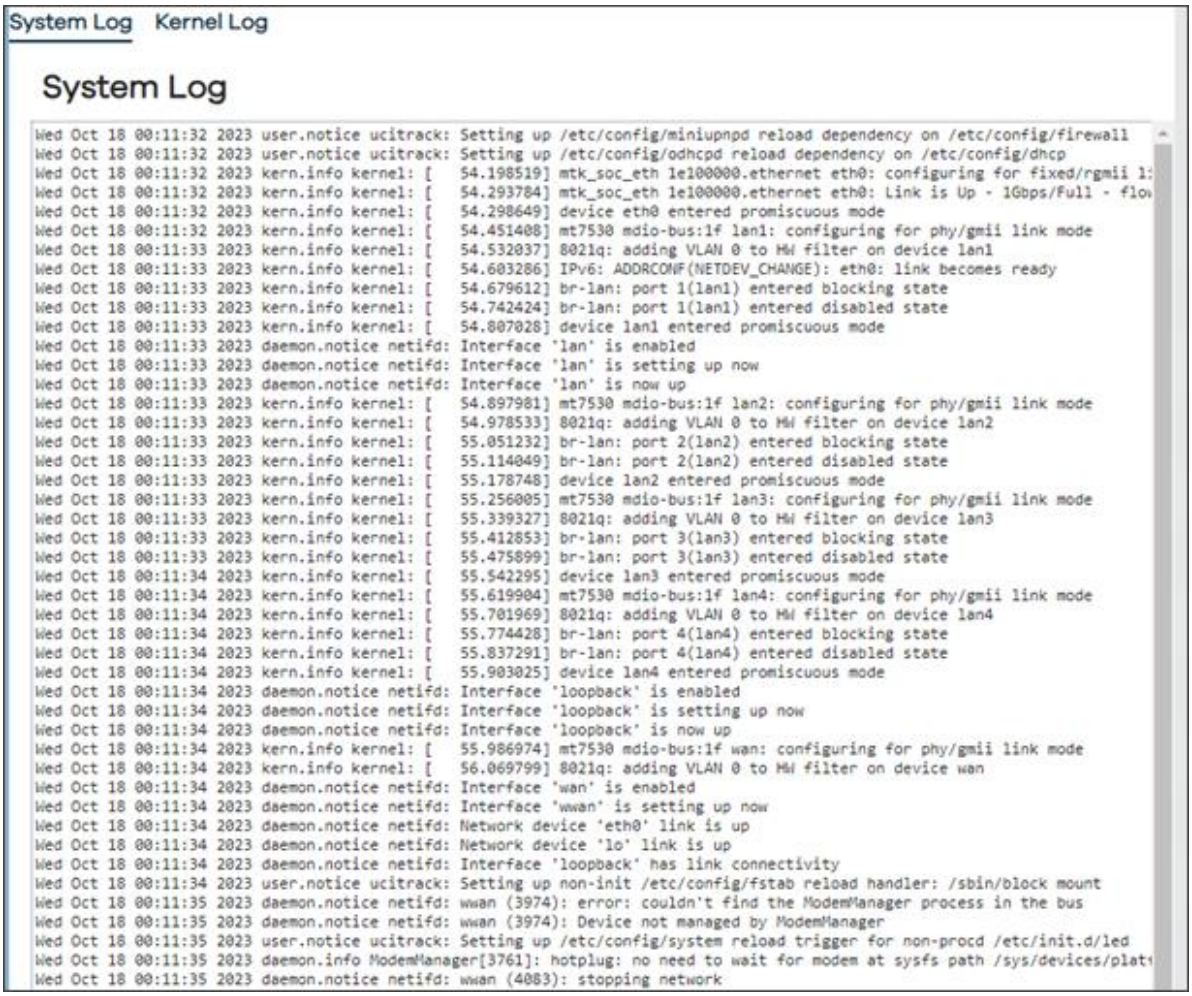


Figure 92: System Log page

4.2.4.1 Kernal Log

The Kernel Log can be found as a tab to the right of the System Log in the middle of the screen and displays kernel information such as:

- Operating system and version
- Data cache
- Type information
- Memory
- Nodes

Figure 93: Kernel Log page

4.2.5 Processes

The **Processes** section provides an overview list of all currently running system processes and their status, which include:

- PID
- Owner
- Command
- CPU usage (%)
- Memory usage (%)

There are three (3) action options for each process:

- **Hang Up**: shut down the process and restart it
- **Terminate**: shut down the process
- **Kill**: the kernel will stop the process

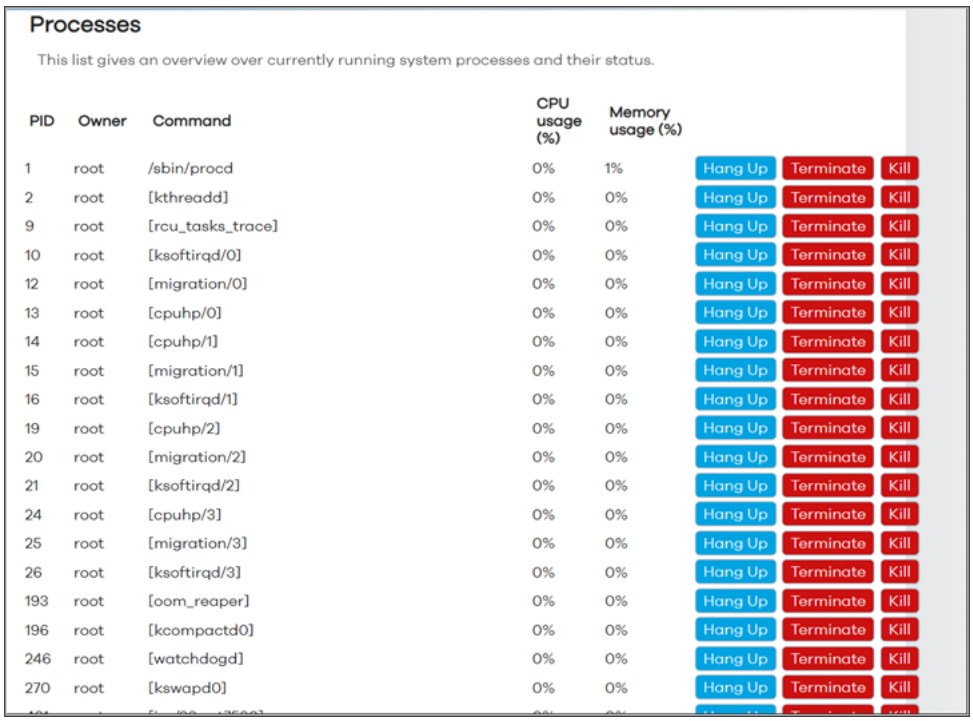
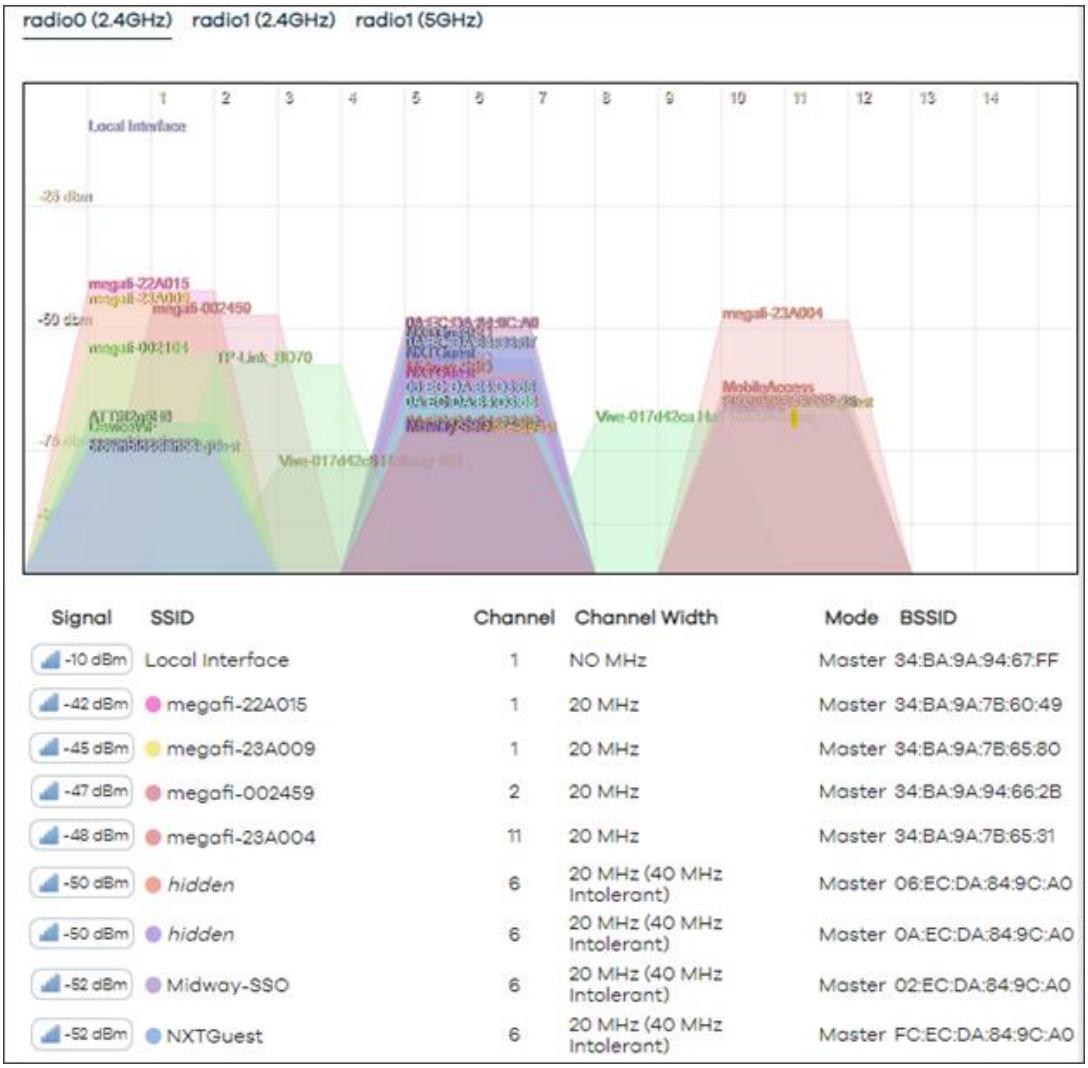


Figure 94: Process page showing system processes and status

4.2.6 Channel Analysis

In the **Channel Analysis** section, a graphing environment of each radio is shown and displays all available Wi-Fi routers available nearby. The radios are radio0 (2.4 GHz), radio1 (2.4GHz), and radio1 (5 GHz). In each radio graph, the user can see each router's **Signal**, **SSID**, **Channel**, **Channel Width**, **Mode**, and **BSSID** along with other Wi-Fi radios currently online and their frequencies. The radio1 (2.4GHz) radio only shows your device.

Utilizing this tool can reveal which channels are used least, allowing the user to switch to a less crowded part of the spectrum. Doing so will help to reduce interference, increasing speed, and enhance overall network reliability. If there is significant contention noted, the MegaFi Wi-Fi channel assignment can be updated. See section *3.10.2 Change Wi-Fi Settings*.



Signal	SSID	Channel	Channel Width	Mode	BSSID
-10 dBm	Local Interface	1	NO MHz	Master	34:BA:9A:94:67:FF
-42 dBm	megafi-22A015	1	20 MHz	Master	34:BA:9A:7B:60:49
-45 dBm	megafi-23A009	1	20 MHz	Master	34:BA:9A:7B:65:80
-47 dBm	megafi-002459	2	20 MHz	Master	34:BA:9A:94:66:2B
-48 dBm	megafi-23A004	11	20 MHz	Master	34:BA:9A:7B:65:31
-50 dBm	*hidden*	6	20 MHz (40 MHz Intolerant)	Master	06:EC:DA:84:9C:A0
-50 dBm	*hidden*	6	20 MHz (40 MHz Intolerant)	Master	0A:EC:DA:84:9C:A0
-52 dBm	Midway-SSO	6	20 MHz (40 MHz Intolerant)	Master	02:EC:DA:84:9C:A0
-52 dBm	NXTGuest	6	20 MHz (40 MHz Intolerant)	Master	FC:EC:DA:84:9C:A0

Figure 95: Channel Analysis showing graph radio0 (2.4GHz)

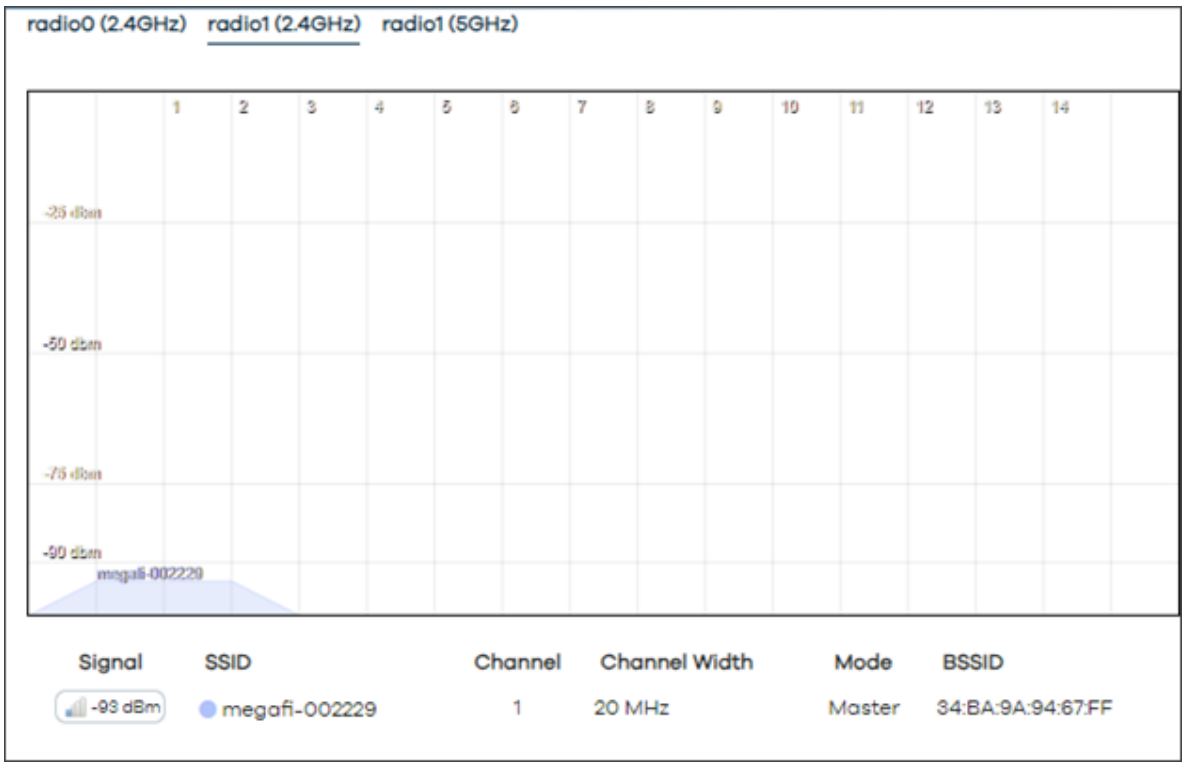
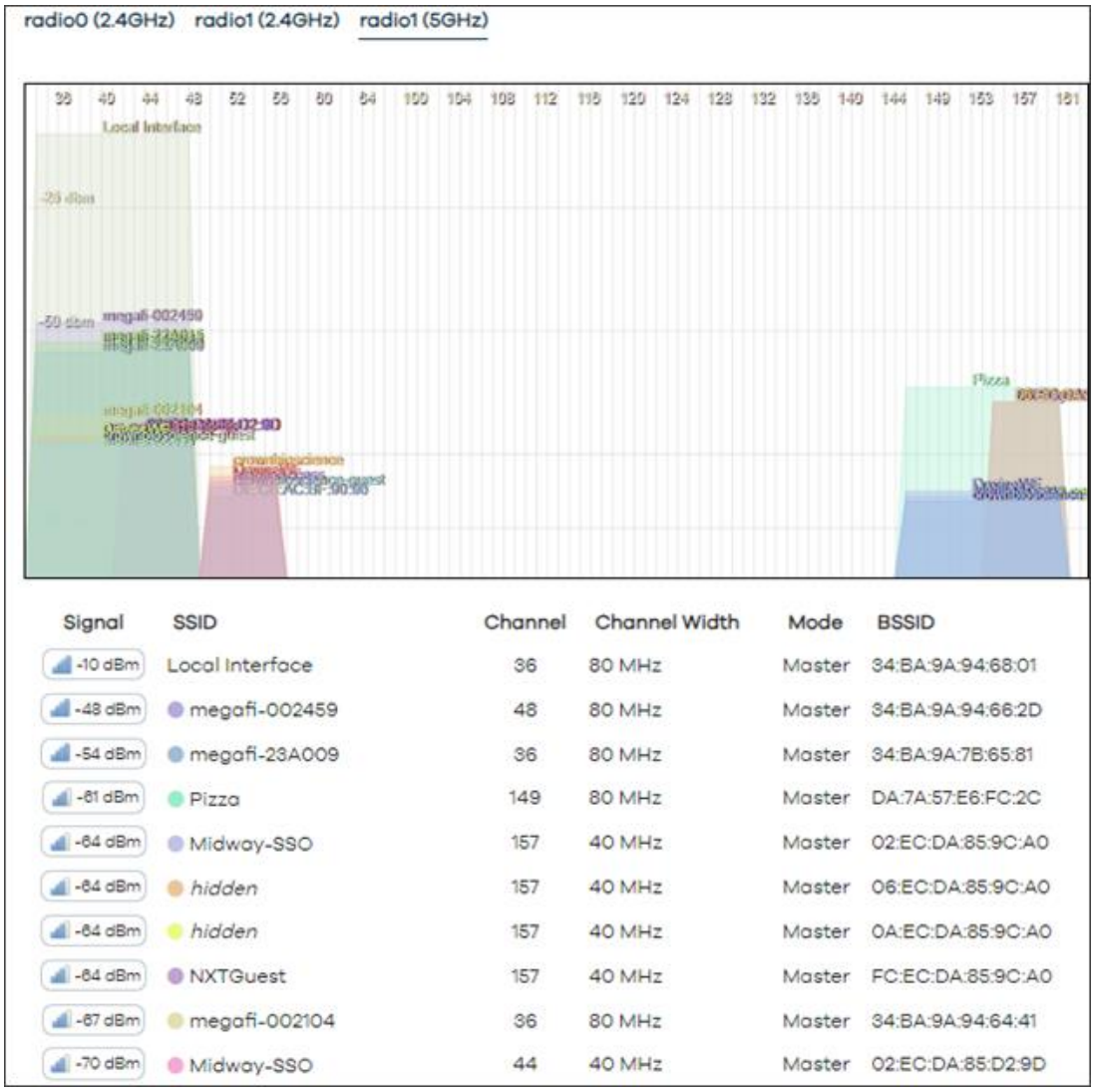


Figure 96: Channel Analysis showing graph for radio1 (2.4GHz)



Signal	SSID	Channel	Channel Width	Mode	BSSID
-10 dBm	Local Interface	36	80 MHz	Master	34:BA:9A:94:68:01
-48 dBm	megafi-002459	48	80 MHz	Master	34:BA:9A:94:66:2D
-54 dBm	megafi-23A009	36	80 MHz	Master	34:BA:9A:7B:65:81
-61 dBm	Pizza	149	80 MHz	Master	DA:7A:57:E6:FC:2C
-64 dBm	Midway-SSO	157	40 MHz	Master	02:EC:DA:85:9C:A0
-64 dBm	*hidden*	157	40 MHz	Master	06:EC:DA:85:9C:A0
-64 dBm	*hidden*	157	40 MHz	Master	0A:EC:DA:85:9C:A0
-64 dBm	NXTGuest	157	40 MHz	Master	FC:EC:DA:85:9C:A0
-67 dBm	megafi-002104	36	80 MHz	Master	34:BA:9A:94:64:41
-70 dBm	Midway-SSO	44	40 MHz	Master	02:EC:DA:85:D2:9D

Figure 97: Channel Analysis showing graph for radio1 (5GHz)

4.2.7 Realtime Graphs

The Realtime Graphs section provides more aid in information gathering and diagnostic evaluations. The graphs provides:

- **Load**: network load is shown as filled colored elements in 1, 5, and 15 minute load segments.

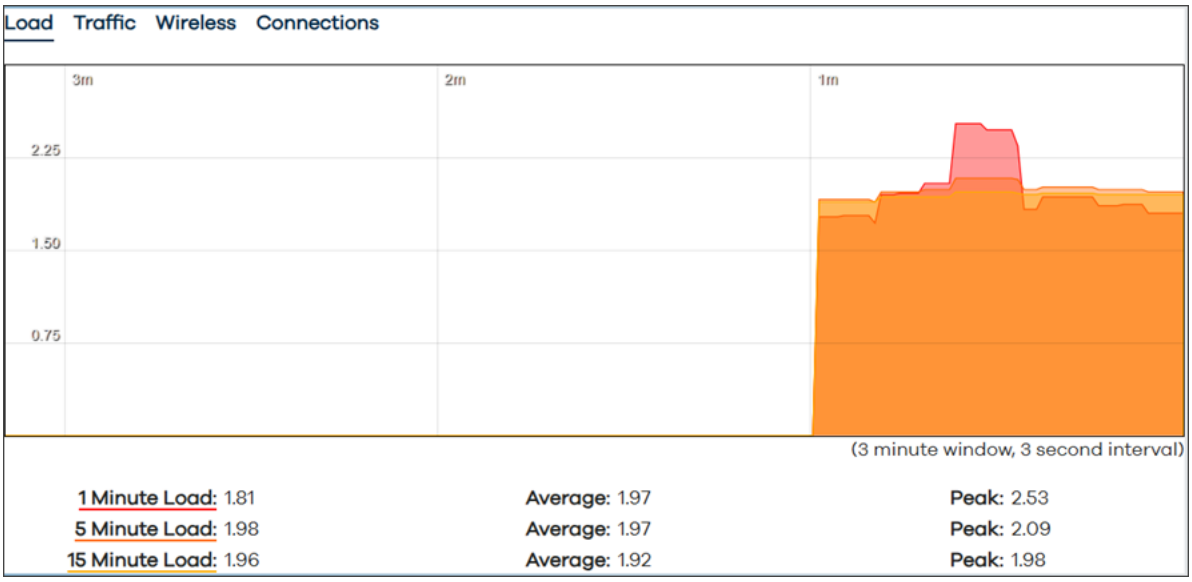


Figure 98: Realtime Graphs – Load graph

- **Traffic**: real time information about the current traffic load is shown for each interface with inbound and outbound traffic statistics available in graph and tabular form. The Traffic tab section below shows route segments configured: br-LAN, erspan0, eth0, LAN1, LAN2, LAN3, LAN4, wan, wwan0, wLAN0, and wLAN1, however, the user may have more, or fewer segments based upon their implementation.

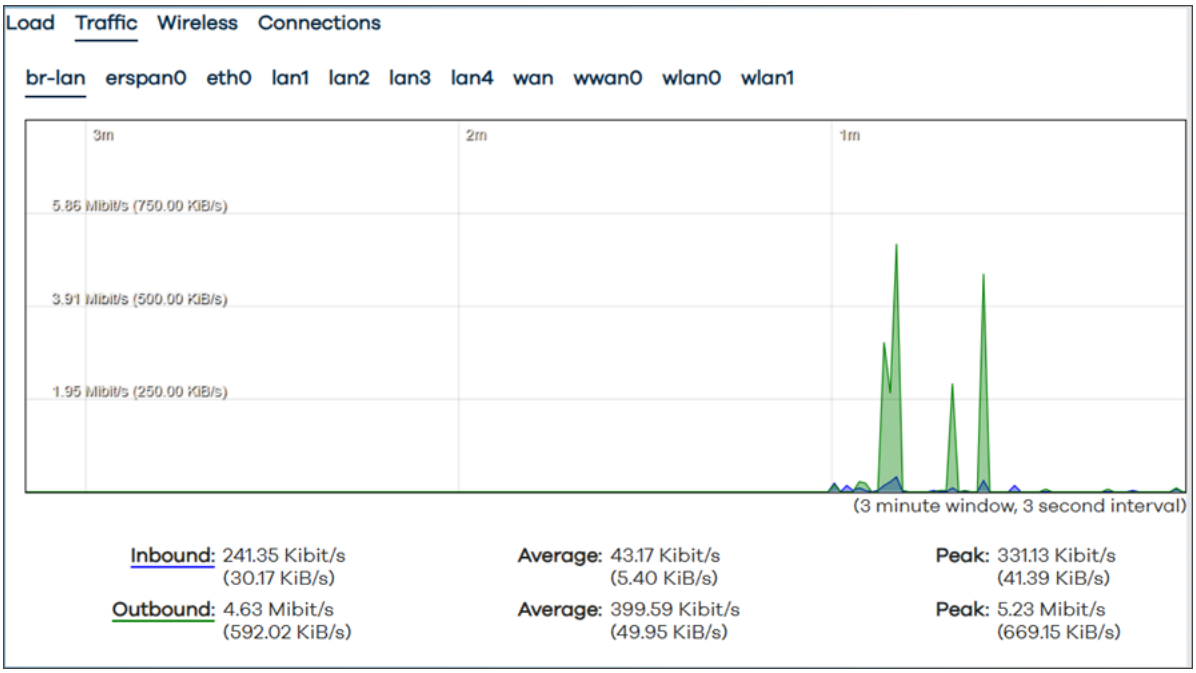


Figure 99: Realtime Graphs – Traffic graph

- **Wireless**: provides Signal and Noise graphs (peak and averages) as well as peak and average use for the 2.4GHz Wi-Fi (wLAN0) and 5GHz Wi-Fi (wLAN1).

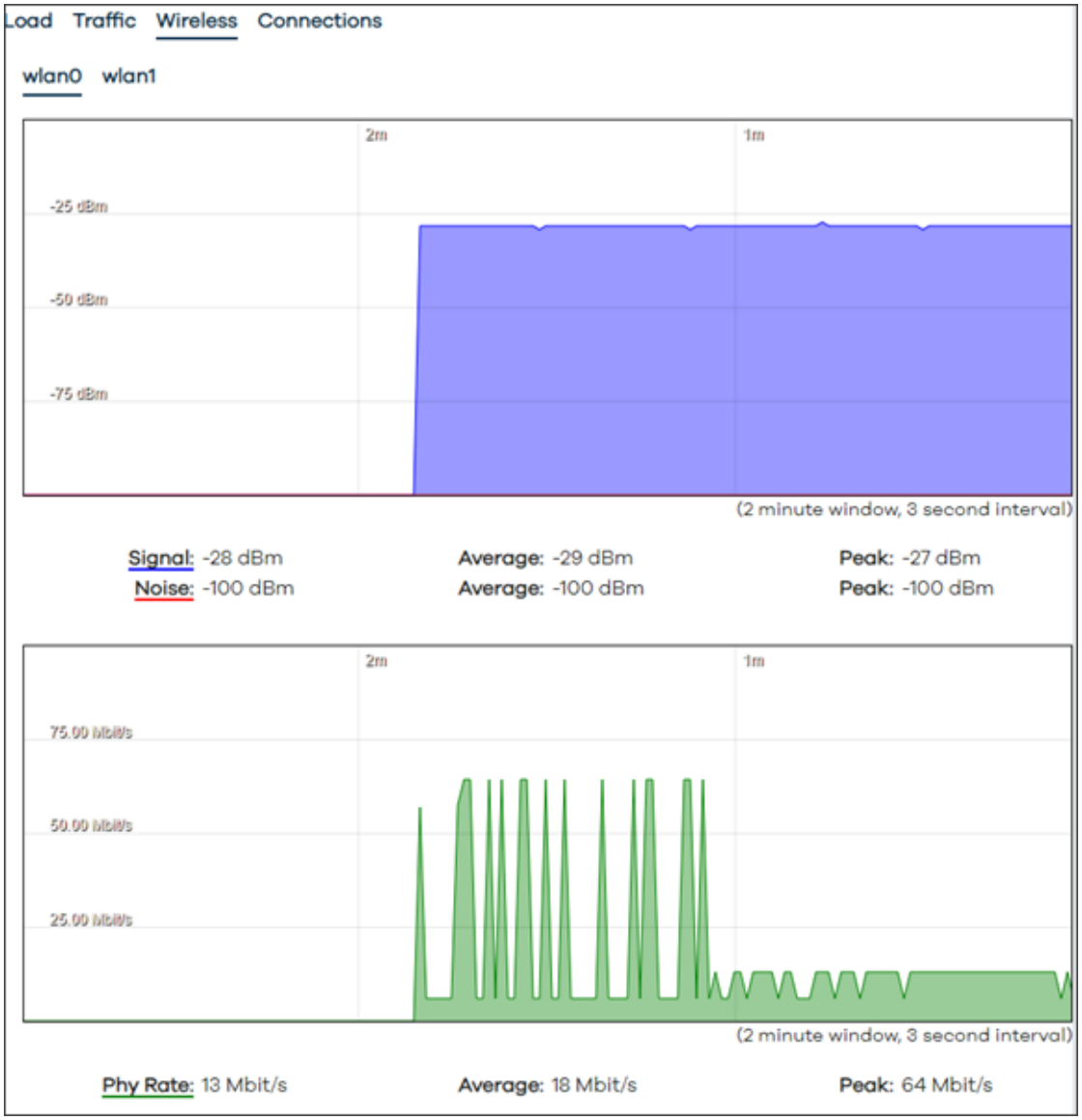


Figure 100: Realtime Graphs – Wireless graph

- **Connections**: real time numbers of current active connections. Provides a summary of connections by protocol (UDP, TCP, or Other) with peaks and averages. Other packet traversal information such as Network, Protocol, Source, Destination, and Transfer is available.

There is button to **Enable DNS lookups** if needed.

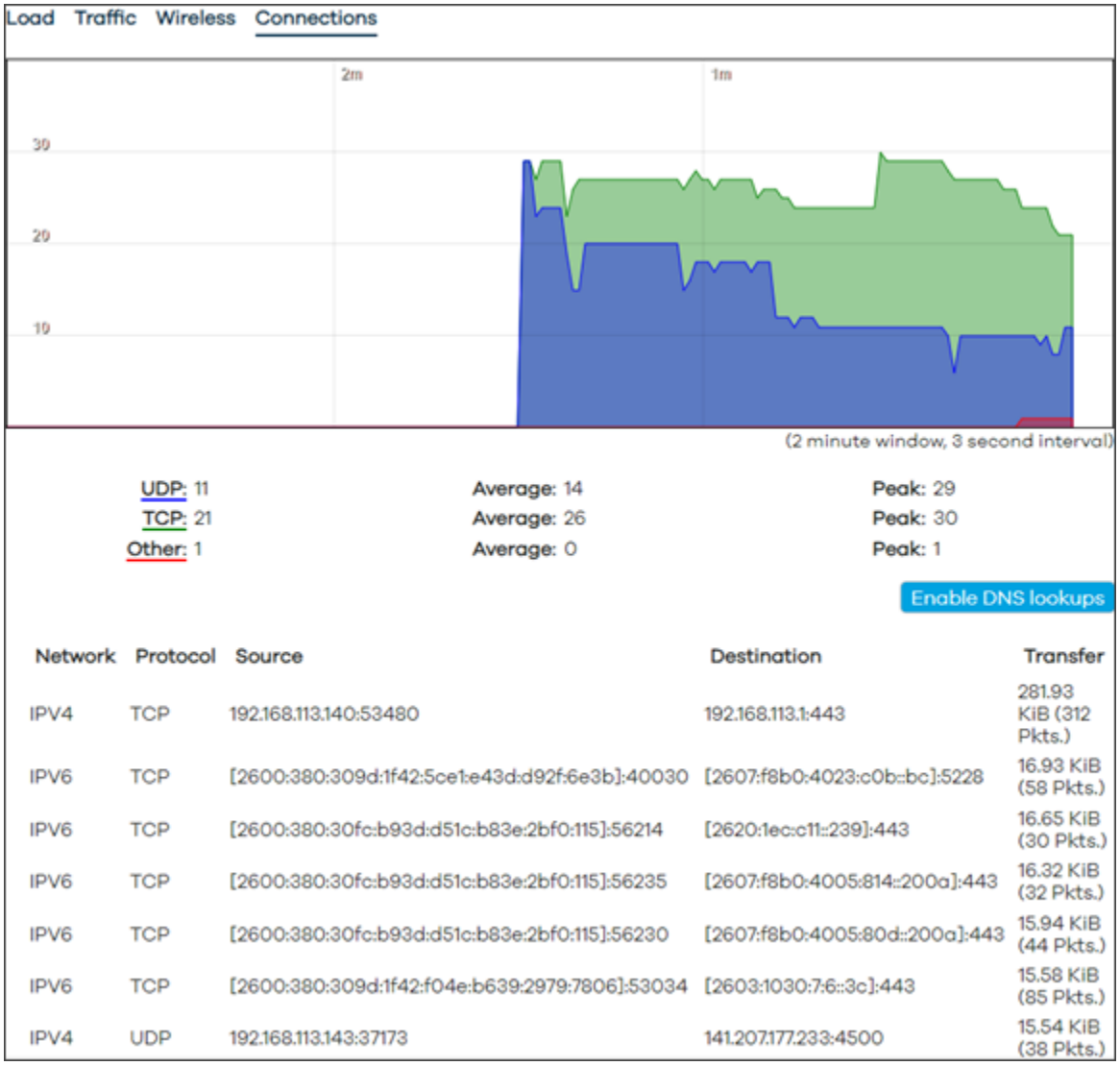


Figure 101: Realtime Graphs – Connections graph

4.2.8 Modem Status

The **Modem Status** page lists the information based on the latest polling of the modem. The most important details that most users will be interested in are **IMEI**, **Phone Number**, **LTE Connection State**, **Signal Percentage**, **Tx** and **Rx Bytes**, **GPS**, **APN**, **Band**, **Tx Power**, **RSRP**, **RSRQ**, **RSSI**, and **SINR** values.

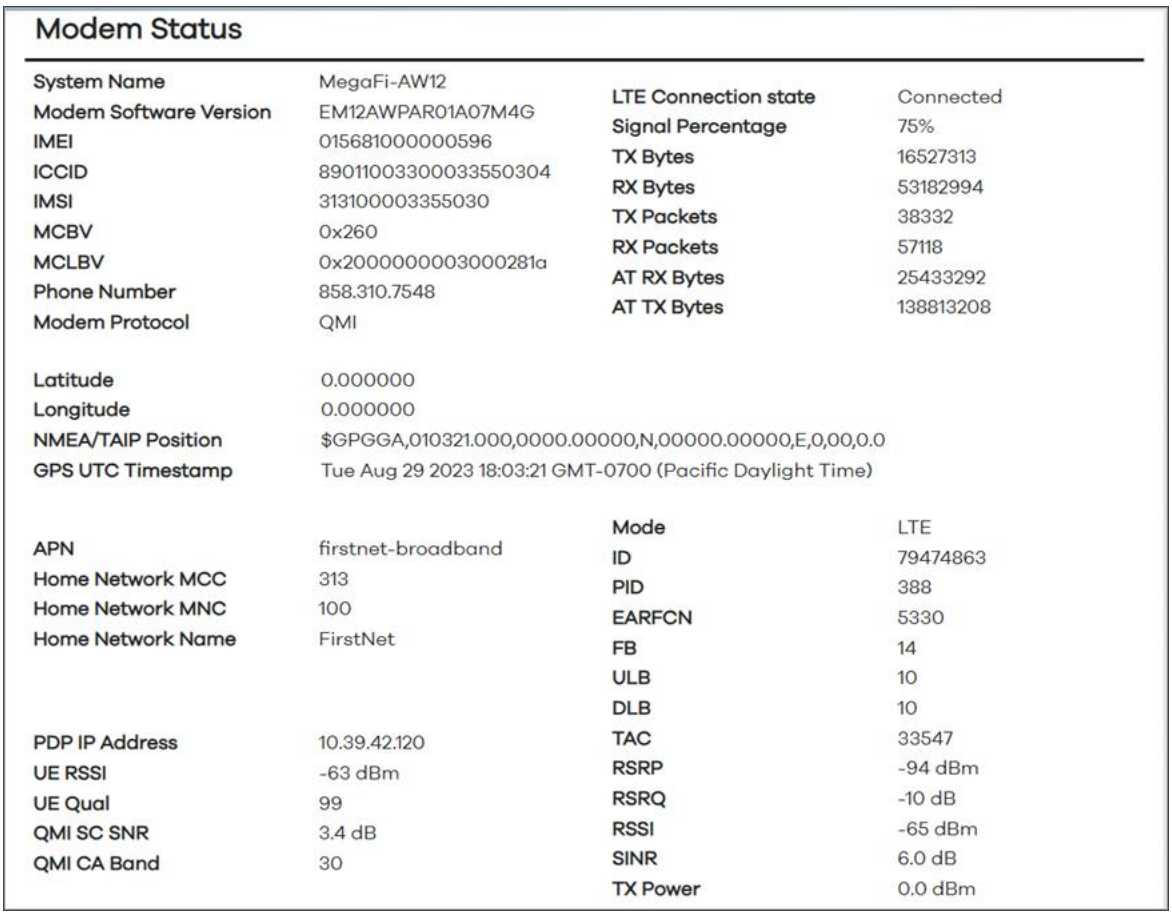


Figure 102: Modem Status – Latest modem polling information

4.3 System

The **System** section provides the user with the ability to configure the internal settings of the MegaFi. Sub-sections under System include **Router Password**, **Startup**, **Scheduled Tasks**, **MegaFi Configuration**, **GPS Configuration**, **Flash Firmware**, and **Reboot**.

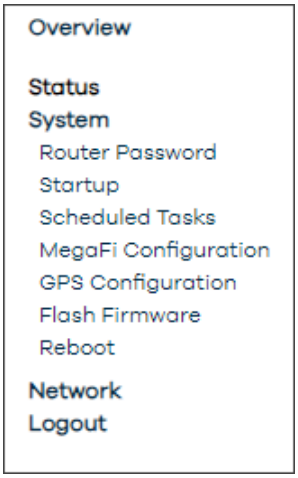


Figure 103: Navigation pane – System menu

4.3.1 Router Password

The user will be able to change or reset the device password, as well as manage **SSH Access**, **SSH Keys**, and **HTTP(S) Access**. Please note the additional tabs for SSH Access, SSH Keys, and HTTP(S) Access are shown to the right of the Router Password, not in the list on menu on the left side of the screen.

! **WARNING:** If the user has forgotten the password set, a reset of the unit is available. However, this will revert the password to the default password, which can be found on the label beneath the device. All other settings will also default to factory settings.

4.3.1.1 Change Password

Refer to section *3.6 Change Password* for details on changing the Router Password.

4.3.1.2 SSH Access

Access to SSH is turned off by default. To enable command line SSH access to the device, add a Dropbear SSH instance(s) by selecting the **SSH Access** tab and following the menu prompts. The user enabled SSH instance offers SSH network shell access and an integrated SCP server. Refer to section *3.13 SSH Access* for more details on setting up SSH Access.

4.3.1.3 SSH-Keys

For higher security, **SSH-Keys**, an OpenSSH public key line or .pub file, can be required.

Paste or drag the SSH key file into the supplied field and click on '**Add Key**' to upload the required keys and enable empty password SSH logins with higher security.

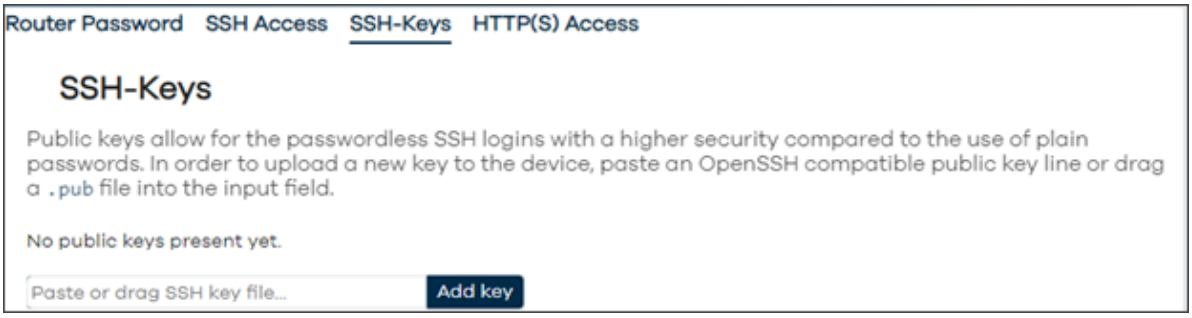
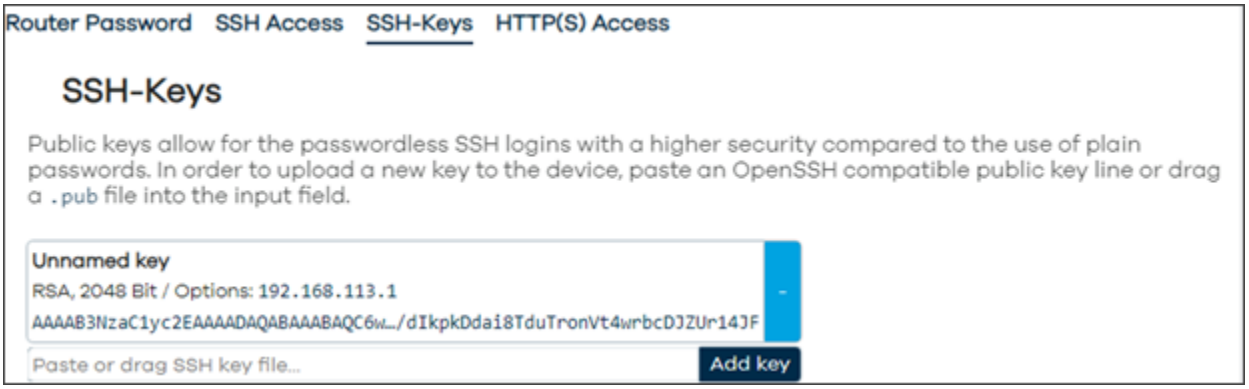


Figure 104: SSH-Keys section – Adding a key

If an SSH-Key is no longer needed, or needs to be updated, simply click on the '**-**' button, followed by '**Delete key**' to delete it.



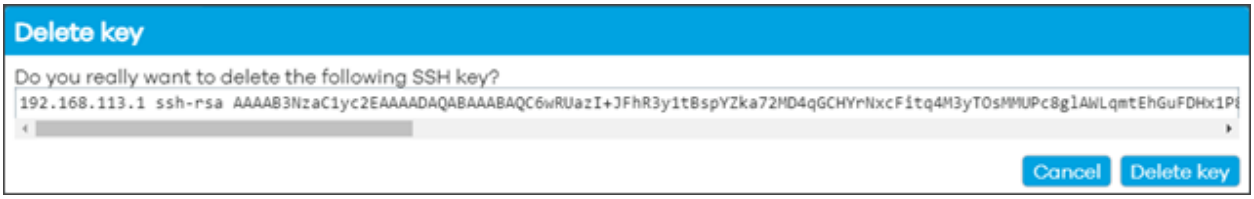


Figure 105: SSH-Keys – Delete key

4.3.1.4 HTTP(S) Access

HTTP(S) Access causes a redirect from HTTP to HTTPS for access to the device. It is highly recommended that this be left checked as included in the default configuration.

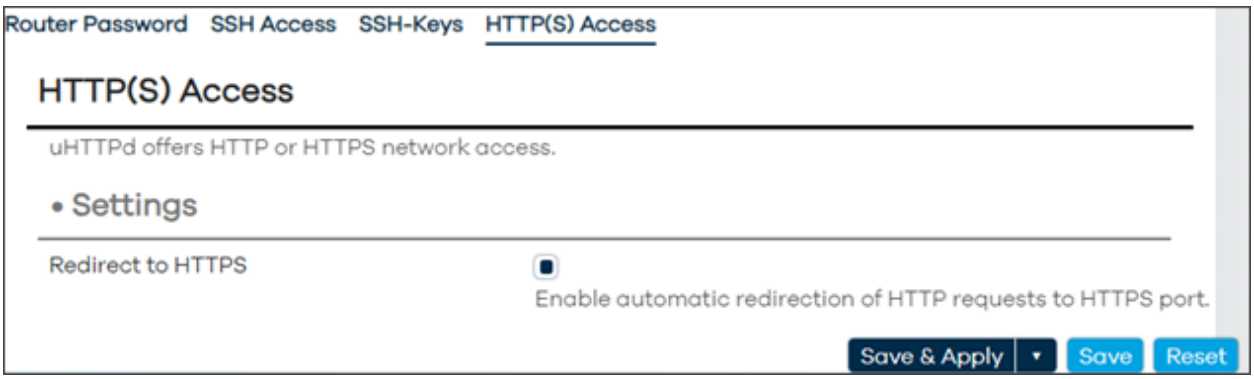


Figure 106: HTTPS Access

4.3.2 Startup

The **Startup** page shows the user the scripts that run when the system loads. There are two scripts on this page: **Initscripts** and **Local Startup** scripts.

4.3.2.1 Initscripts

In the Initscripts tab, there are some action buttons such as:

- **Enabled** – click once to disable the script and again to enable
- **Start** – initiates a stopped service
- **Restart** – stops and then starts the selected service
- **Stop** – stops a started service

Figure 107: Startup page – Initscripts

4.3.2.2 Local Startup

In the Local Startup scripts tab, the user can add their own custom scripts or commands to the system.

! **WARNING:** Any additional scripts or commands should only be added by very experienced users.

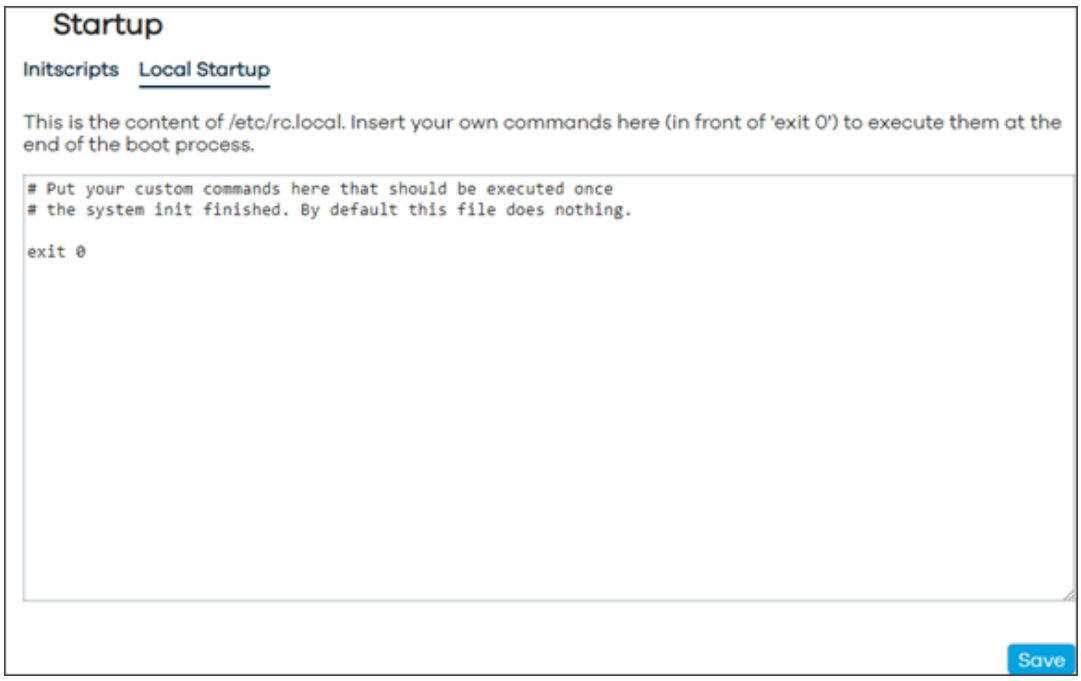


Figure 108: Startup page – Local Startup

4.3.3 Scheduled Tasks

The **Scheduled Tasks** page allows the user to add their own cron jobs.

! **WARNING:** Cron jobs should only be added by experienced users.

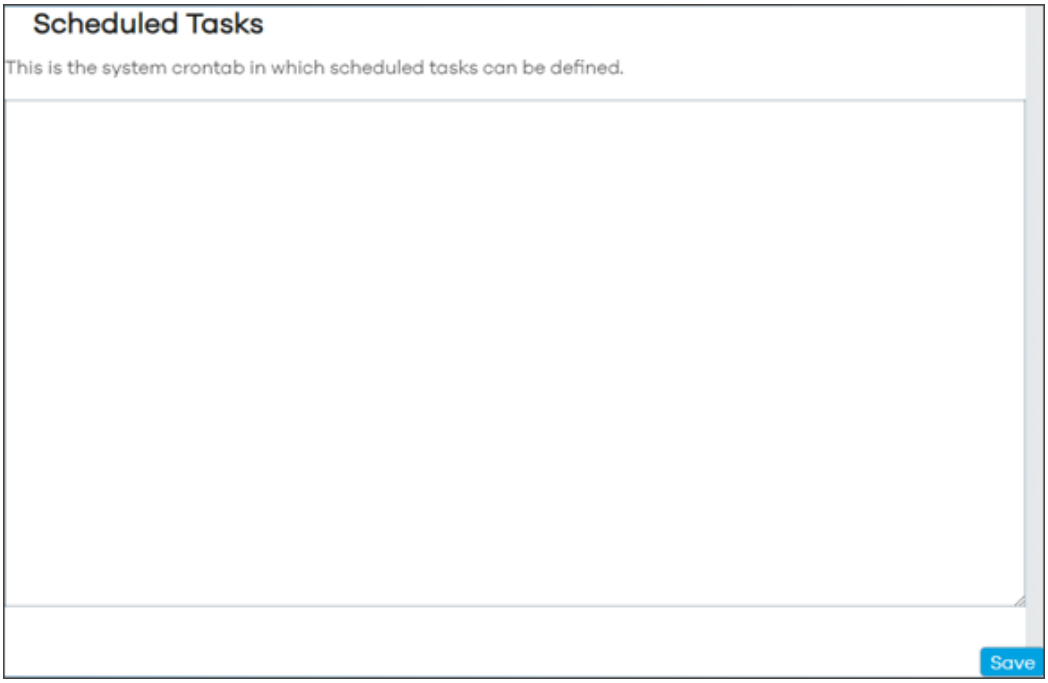


Figure 109: Scheduled Tasks page

4.3.4 MegaFi Configuration

This page is where the MegaFi device has most of its user configurations. There are eight sections: **Cloud**, **MegaFi Logging**, **IP Configuration**, **MegaFi and modem Configuration**, **API Configuration**, **Configuration**, **Serial Number**, and **Build Information**.

4.3.4.1 Cloud

In the Cloud section, there are multiple configurations that include:

- **UUID** – this is the device's Universally Unique Identifier. This is a one-time assignment by the Nextivity cloud service and cannot be changed. If no UUID is present and the user wants to work with the device in the cloud, the user can contact Nextivity support team at support@nextivityinc.com.
- **Cloud Poll URL** – a URL is assigned prior to the user receiving their device and should not be changed.
- **Cloud Poll Period (seconds)** - time delay between polls. The default value is 60 seconds which is the recommended interval.
- **Cloud Status URL** – is not currently used and should be blank.
- **Cloud Status** – current connection status and reports if the Cloud is enabled and communicating.

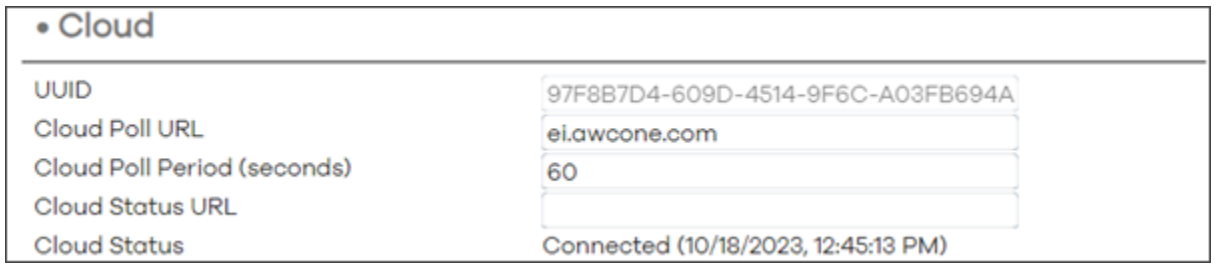


Figure 110: MegaFi Configuration – Cloud section

4.3.4.2 MegaFi Logging

In the **MegaFi Logging** section, there are different types of logging settings that can be enabled/disabled. Though these default settings can be changed, it is strongly recommended to leave them as is:

- **Logging Enabled**: Logging enabled is the default setting
- **Push to Cloud**: Push Enabled is the default setting
- **Push to Cloud Period (seconds)**: 60 seconds is the default setting
- **System Poll Period (seconds)**: 15 seconds is the default setting
- **Show in Local UI**: Local UI Enabled is the default setting

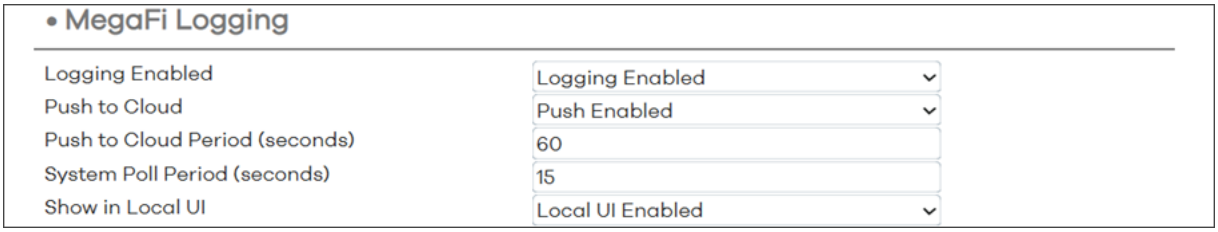


Figure 111: MegaFi Configuration – MegaFi Logging

4.3.4.3 NAT or Passthrough Mode

In the NAT or Passthrough Mode configuration section, the device can be put into NAT (default setting) or Passthrough Mode and the user can also update the devices' LAN IP address which sets the range.

➲ **Note:** Refer to section *3.11 NAT vs. Passthrough Mode* for detailed information on configuring the mode of MegaFi.

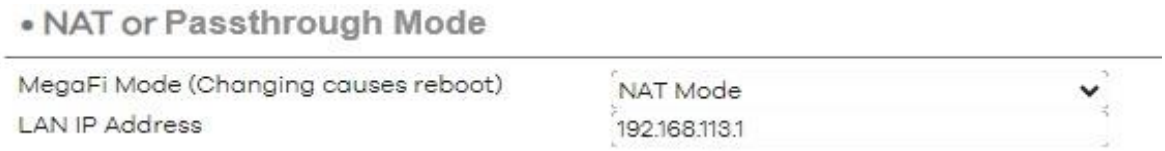


Figure 112: MegaFi Configuration – NAT or Passthrough Mode

4.3.4.4 LAN IP Address

The LAN IP address can be updated by entering the new LAN IP address in the field.

➲ **Note**: Changing the LAN IP Address in this area is the same procedure that was described in *Section 3.2 Changing LAN IP Address*.

1. Enter the new IP Address in the field and hit '**Enter**', otherwise it will revert back to default or pre-configured setting.
2. Click on **Save & Apply** to confirm change.
3. Give the device a few minutes for it to successfully regain network connectivity, and before attempting to reconnect to MegaFi via Mission Control or SSH.

➲ **Note:** The system automatically sets a Class C network and will provide IP Addresses to devices within that range as it is set as a DHCP server by default.

4.3.4.5 MegaFi and Modem Configuration

In the **MegaFi and Modem Configuration** section, the **Band Lock** can be configured to either "LTE B14 Only" or "Default Band Configuration" (default setting and involves other bands corresponding to FirstNet). Changing this setting using the '**Set Default Band Configuration**'

button will require confirmation from the user to proceed since it will cause a brief connection interruption.

➲ **Note:** Refer to section *3.12 Band Lock* for more detailed information for Band Locking.

The Reboot Offline Time can be configured here 3, 5, or 10 minutes. It is disabled by default.

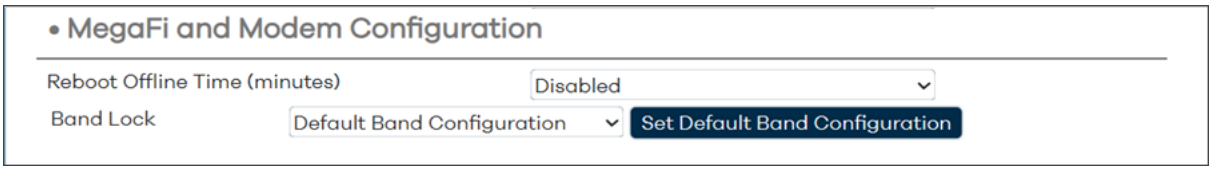


Figure 113: MegaFi Configuration – MegaFi and Modem Configuration

4.3.4.6 API Configuration

In the **API Configuration** section, there are three options that can be enabled/disabled. These APIs allow external systems to use https to gather modem status, reboot, or power cycle the MegaFi.

- **MegaFi Reboot API Enabled**: Disabled by default
- **Modem power Cycle API Enabled**: Disabled by default
- **Modem Status API Enabled**: Disabled by default

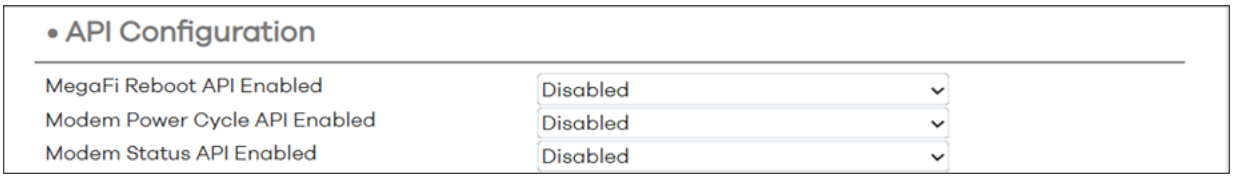


Figure 114: MegaFi Configuration – API Configuration

Each of these settings can be enabled via the dropdown menu and applied as follows. To change:

1. Click on the dropdown for the settings you wish to change and select the required option of **Enabled** or **Disabled**.
2. Click on the **Save** button to add this change to the list of **Unapplied Changes** and carry on making additional modifications as required; or on the **Save & Apply** button to commit the changes.
3. Once the desired API has been enabled, append the appropriate string to the end of the MegaFi's url's on a web browser or to the following curl command as follows.
   - **/cgi-bin/actions/reboot** – (will reboot MegaFi and power cycle modem)
   - **/cgi-bin/actions/power-cycle** – (will power cycle modem)

- **/cgi-bin/actions/modem-status** – (will return modem status as json)

4. Example: To get modem status with default MegaFi IP address:

   4a. Open a web browser and enter the following url: https://192.168.113.1/cgi-bin/actions/modem-status

   4b. In an ssh session, enter the following command: curl – *k https://192.168.113.1/cgi-bin/actions/modem-status*

4.3.4.7 Configuration

In the **Configuration** section, the user can restore the device to default factory settings. This is the same procedure as described in *Factory Defaults via Mission Control Section 3.7*.

➲ **Note:** After a factory reset, the MegaFi's UUID must be reassigned for Cloud support. Contact the support team at support@nextivityinc.com for further assistance.

To Factory Reset MegaFi:

1. Click on the **Factory Defaults** button.

Figure 115: MegaFi Configuration – Configuration

2. Confirm on the pop-up window by clicking on '**Ok**'.

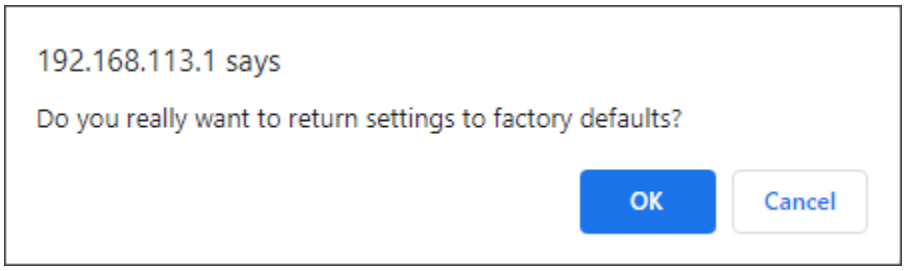


Figure 116: Confirmation message – Return to factory defaults

3. Give the device 5-15 minutes to complete the operation.
4. Once the device recovers, the user will be asked to log in to Mission Control again, using the default password located on the device's label.
5. The user will then be asked to accept the EULA agreement and change the default password.

➲ **Note:** For more details on Factory Defaulting the device via Mission Control or for instructions on how to factory default using the reset button on the device (in case of a forgotten password), refer to the *MegaFi User's Guide* for more information.

4.3.4.8 Serial Number

The Serial Number section provides the devices' serial number.

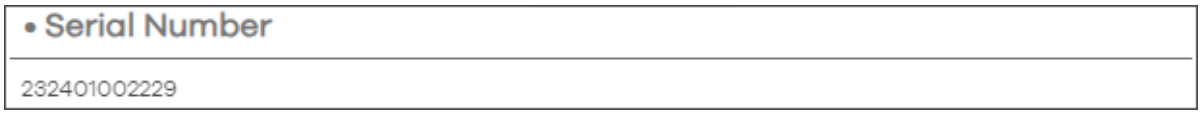


Figure 117: MegaFi Configuration – Serial Number

4.3.4.9 Build Information

The Build Information section provides the user with where the device was built, when it was built, skin, firmware version, git tag, and other related information.

Figure 118: MegaFi Configuration – Build Information

4.3.5 GPS Output Configuration

On this page, the user will be able to configure **GPS Server**, **GPS Internal Reporting**, and **GPS Output** (multiple outputs can be added).

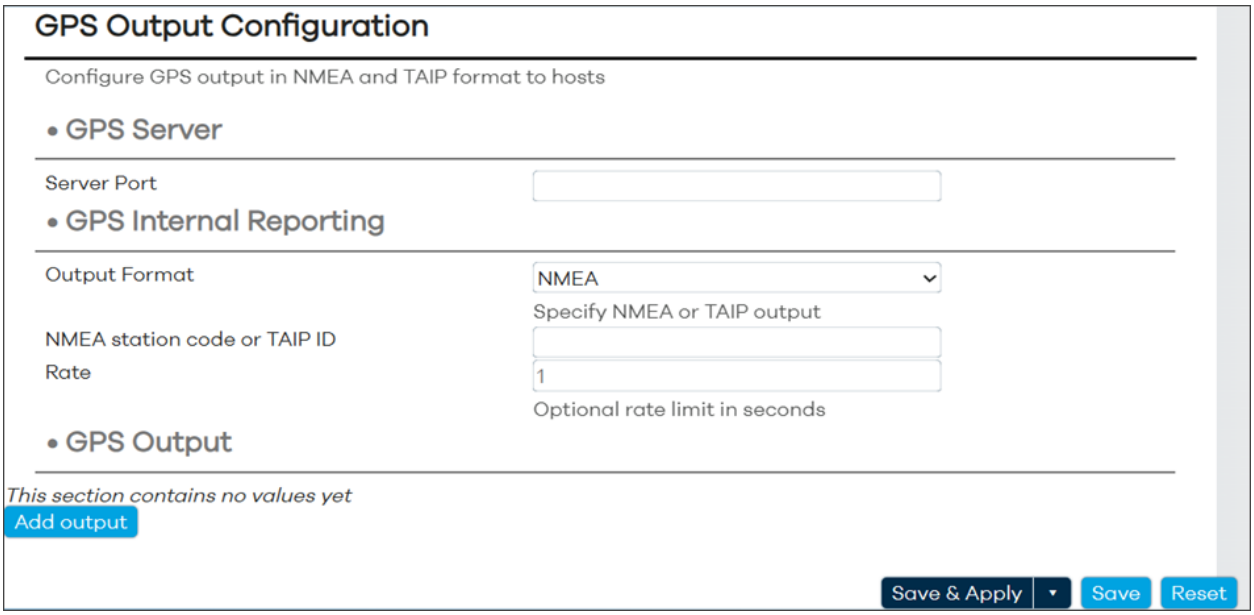


Figure 119: GPS Output Configuration page

4.3.5.1 GPS Server

The user can configure a GPS Server Port in the field provided. Make sure to '**Save & Apply**' after doing so.

➲ **Note:** Refer to section *3.14.1 GPS Output Configuration* for detailed instructions on how to configure a GPS Server.

4.3.5.2 GPS Internal Reporting

In this section, the user can configure the GPS Internal Reporting within MegaFi to output the GPS format in either NMEA or TAIP format, NMEA station code or TAIP ID, and Rate in seconds. By default the output format is NMEA.

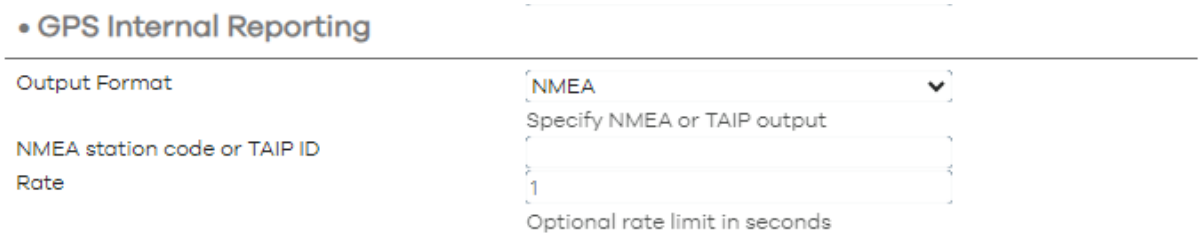


Figure 120: GPS Internal Reporting

1. If the user prefers to see the output format in TAIP format, click on the drop-down menu and select TAIP. The other option is Disabled.
2. To add a NMEA station code or TAIP ID, add a digit number in this field, and hit the 'Enter' button.
3. To change the rate, enter the desired rate in this field in seconds, and hit the 'Enter' button.
4. After any modifications above, click on '**Save & Apply**' to commit the changes.
5. To verify any changes made above or if in fact the output format is set to the desired language, do the following:

   5a. In **Expert mode**, go to **Status**, then **Modem Status**. Towards the middle of this page the information is being reported in **NMEA/TAIP Position**.

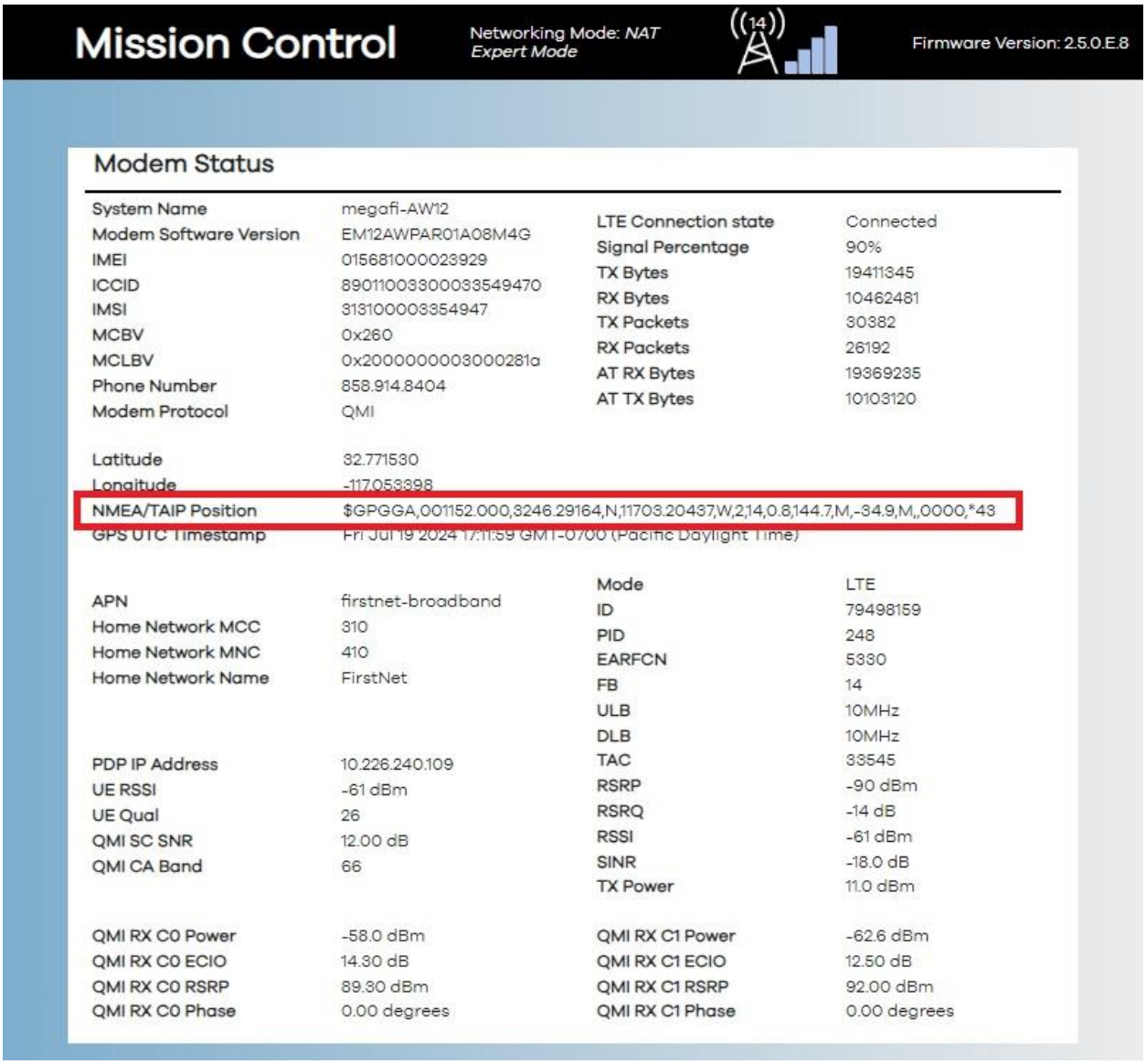


Figure 121: NMEA/TAIP Position

4.3.5.3 GPS Output

To enable a remote server to receive the GPS information, start by clicking the '**Add output**' as shown in light blue on the lower left of the screen and follow the prompts to implement the format needed for your remote server environment. When adding an output, the available fields are:

➲ **Note:** Refer to section *3.14.3 GPS Output* for detailed instructions on how to configure a GPS Output.

4.3.6 Flash Firmware

All firmware-related actions can be performed on this page and is similar to another area withing Mission Control where these same actions can be accomplished.

➲ **Note**: Backup, Restore, and Flash new firmware image were already previously described in sections 3.4 – Backup Existing Configuration, 3.5 – Load Configuration from File, and 3.3 – Flash/Update Firmware.

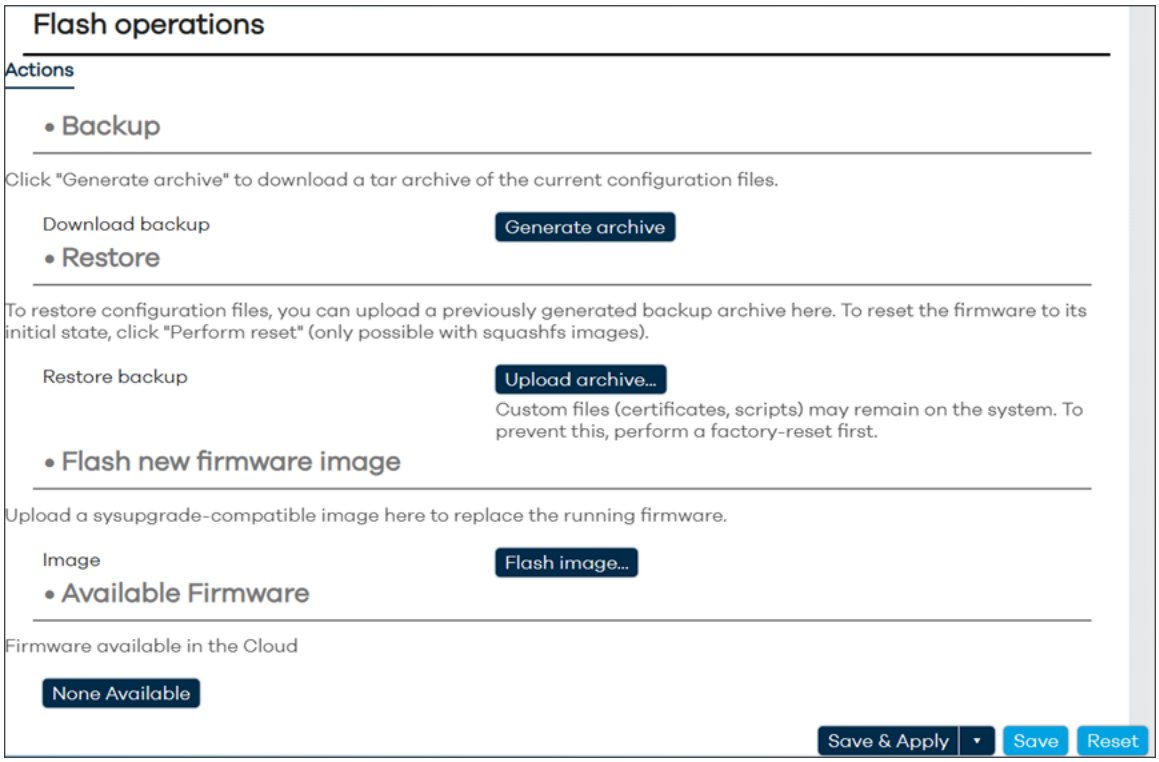


Figure 122: Flash Operations page

4.3.6.1 Backup

Backup – generate a backup and download/save current configuration files. The '**Generate archive**' button will compile the configuration files as a .tar file and will automatically download to the default download folder.

4.3.6.2 Restore

Restore – user can restore from a previously generated backup. The user would simply browse for the .tar file that was generated during a Backup action as previously shown. Click on **Upload archive** button, browse for the preferred .tar file and select 'Upload' to start the process.

Figure 123: Flash Firmware – After clicking Upload Archive button

The system validates the contents of the archive and asks the user to confirm by selecting '**Continue**'.

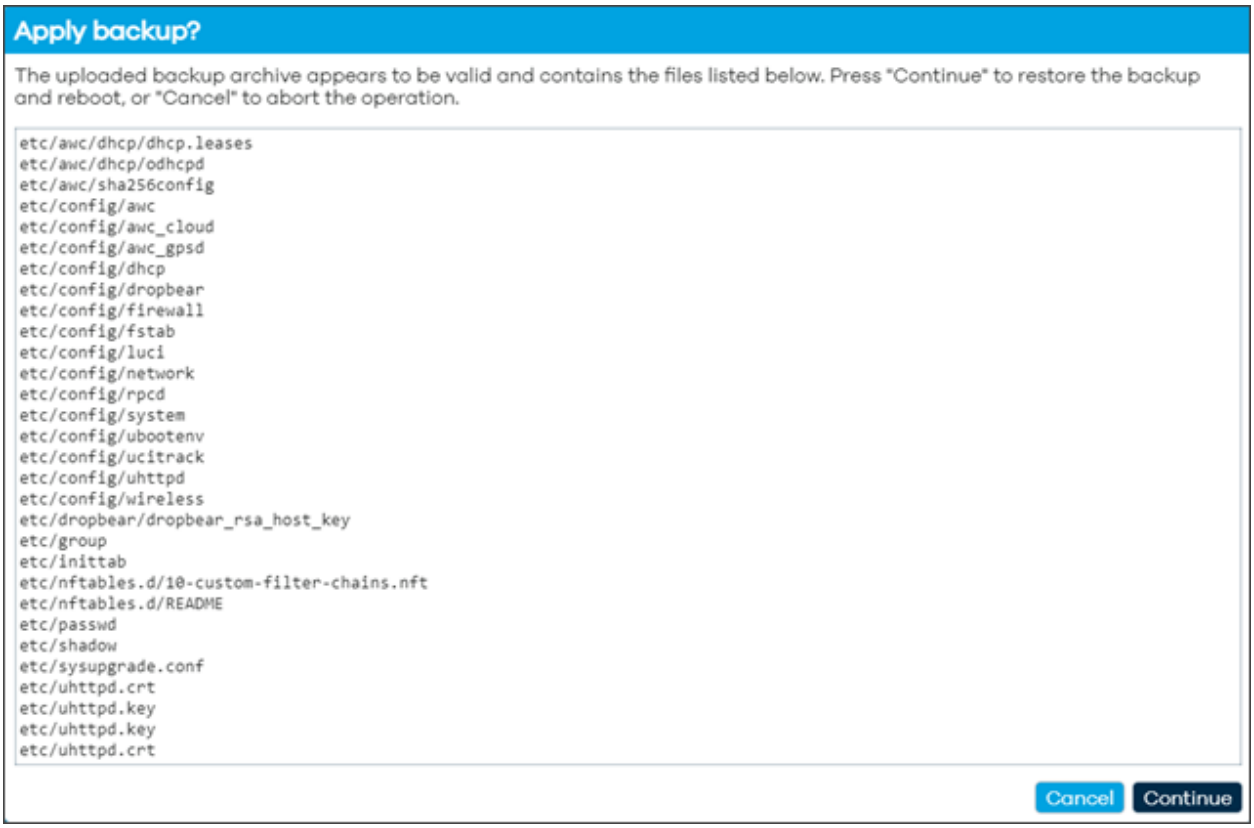


Figure 124: Apply backup? page – prompting to continue to restore the backup

➲ **Note:** Some custom files, such as certificates or scripts, may remain on the system; therefore, it is recommended to perform a Factory Reset before restoring/deploying a backup.

4.3.6.3 Flash new firmware image

The user will be able to update firmware manually if they have an available firmware file downloaded onto their personal computer. To do so:

1. Click on **Flash image...** .
2. Select **Browse** to locate the appropriate firmware file on your computer (BIN file).

Figure 125: Uploading file window prompting user to select the file to upload

3. Select **Upload** to begin the update.
4. A status bar will briefly indicate the upload of the file, followed by a '**Flash image?**' pop-up message. The pop-up cautions the user to validate that the firmware file is corrupt-free by comparing the original file size and SHA256 checksum. Select **Continue** only if the file size and SHA256 checksum match. Notice that by default, the 'Keep settings and retain the current configuration' box is checked. It is recommended to leave this box checked.

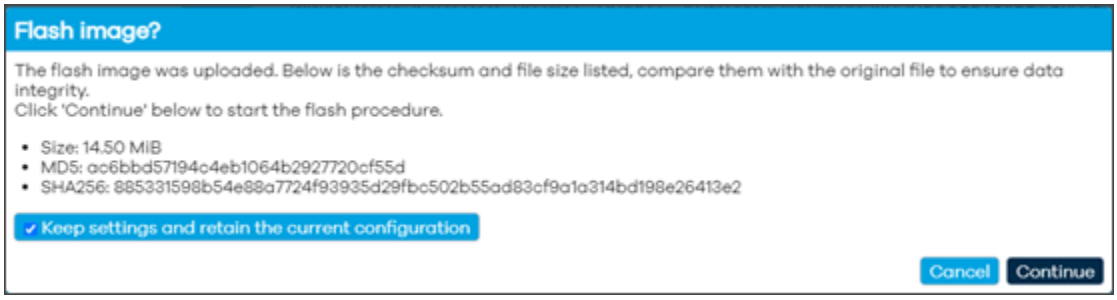


Figure 126: Message prompting user to compare original file size and checksum

5. The unit will begin 'Flashing…'

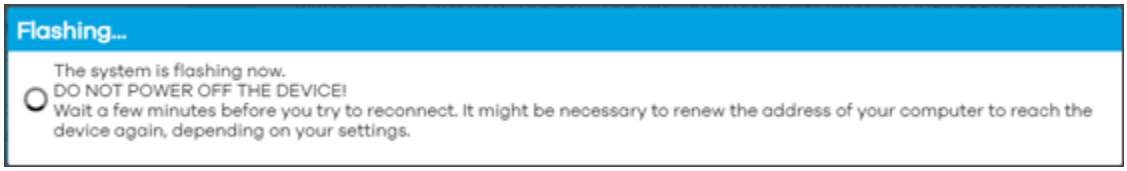


Figure 127: Message indicating flashing is in progress

! **WARNING:** DO NOT POWER OFF THE DEVICE! – The update process will take about 5 minutes to complete.

6. After the upload completes, the user may need to refresh their web browser and/or reconnect to MegaFi's Wi-Fi connection to regain access.

4.3.6.4 Available Firmware

If there is a new version of firmware available to download from the cloud, it will show up listed here. Follow the prompts to update the firmware of the device. Otherwise, the button will be labeled as '**None Available**'.

4.3.7 Reboot

This page contains a “Perform reboot” option that will restart the unit.

- **Note:** Clicking the **Perform reboot** button will perform an immediate reboot with no warning.
- **Note:** This is similar to what was previously detailed in section 3.9.

Figure 128: Reboot page – Perform reboot button

If there are unsaved changes, a message will indicate this as such:

Figure 129: Warning Message – Unsaved changes

4.4 Network

The **Network** section will allow the user to setup, configure, and manage the devices' network. Sub-sections under this page include **Interfaces**, **Wireless**, **Routing**, **DHCP and DNS**, **Diagnostics**, and **Firewall**.

Figure 130: Navigation pane – Network menu

4.4.1 Interfaces

The Interfaces page has three tabs: **Interfaces**, **Devices**, and **Global network options**.

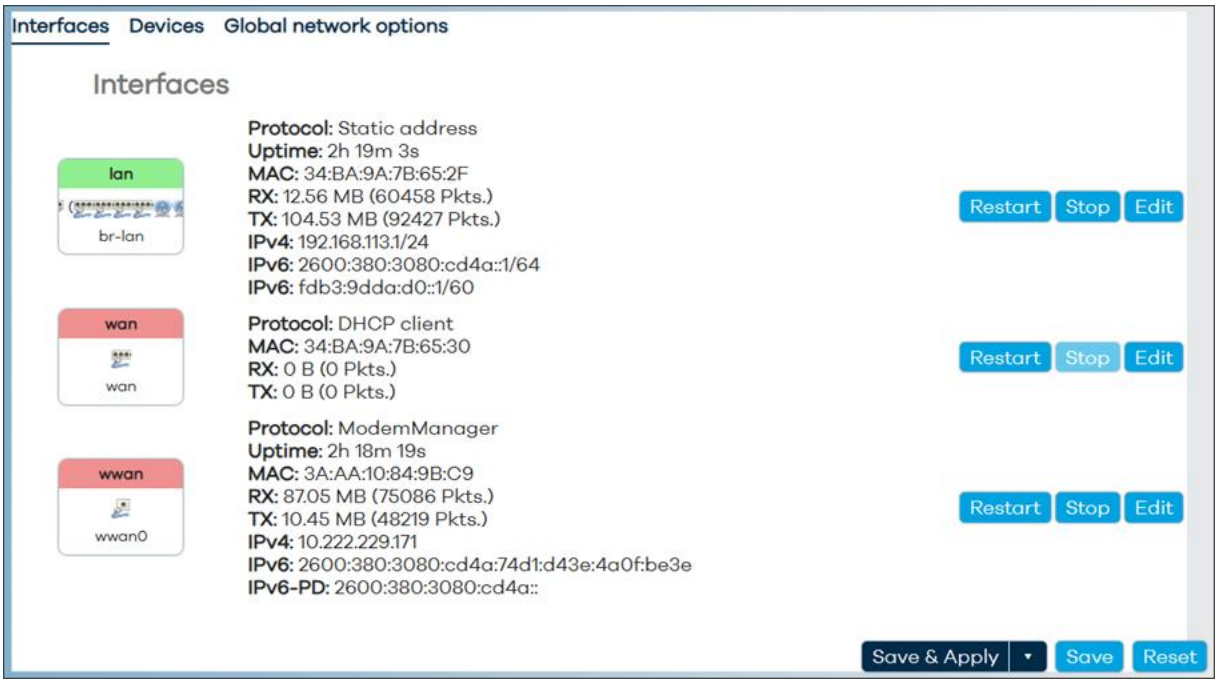


Figure 131: Interfaces page – Interfaces tab

4.4.1.1 Interfaces

Within the **Interfaces** tab, there should be a **lan**, **wan**, and **wwan** interface shown by default. Each interface will show some statistics for each interface such as:

- **Protocol** currently configured for the interface
- **Uptime** for the interface
- **MAC** address for the interface
- **RX** and **TX** data
- **IPv4** and **IPv6** addresses if any

Next to each interface, there are three actions that are available: **Restart**, **Stop**, and **Edit**.

- **Restart**: selecting this option will immediately reconnect that interface – take caution before selecting this option as it will momentarily disrupt connectivity.
- **Stop**: selecting this option will immediately shut down that particular – take caution as this will disrupt connectivity.
- **Edit**: choose this option to edit the port

lan Edit

Under **Edit**, there are four tabs available: **General Settings**, **Advanced Settings**, **Firewall Settings**, and **DHCP Server** for each interface.

In **General Settings** for the LAN interface, it shows the following information:

! **WARNING:** This is an Edit page from the LAN interface. The other interfaces (WAN and WWAN) have a number of different configuration options under their respective **Edit** pages and should only be updated by experienced users.

- **Status**: Device, Uptime, MAC address, RX and TX data, IPv4 and IPv6 IP addresses
- **Protocol**: defaults to the Static address of **192.168.113.1**.
  - Other options are **DHCP client**, **DHCPv6 client**, **GRE tunnel over IPv4**, **GRETAP tunnel over IPv4**, **GRE tunnel over IPv6**, **GRETAP tunnel over IPv6**, **ModemManager**, and **Unmanaged**.
- **Device:** defaults to **Bridge: "br-lan" (LAN)**. Other options are available to change the type of interface, though it is not recommended to make any changes as doing so may render your device unusable.
- **Bring up on boot**: checked by default
- IPv4 address: default is **192.168.113.1/24**
- **IPv4 netmask**: default is **255.255.255.0**. Other options are available in the drop-down menu as well as configuring a custom netmask.
- **IPv4 gateway**: this is automatically derived from the carrier and not configurable
- **IPv4 broadcast**: this is automatically derived from the IPv4 address setting above and not configurable.

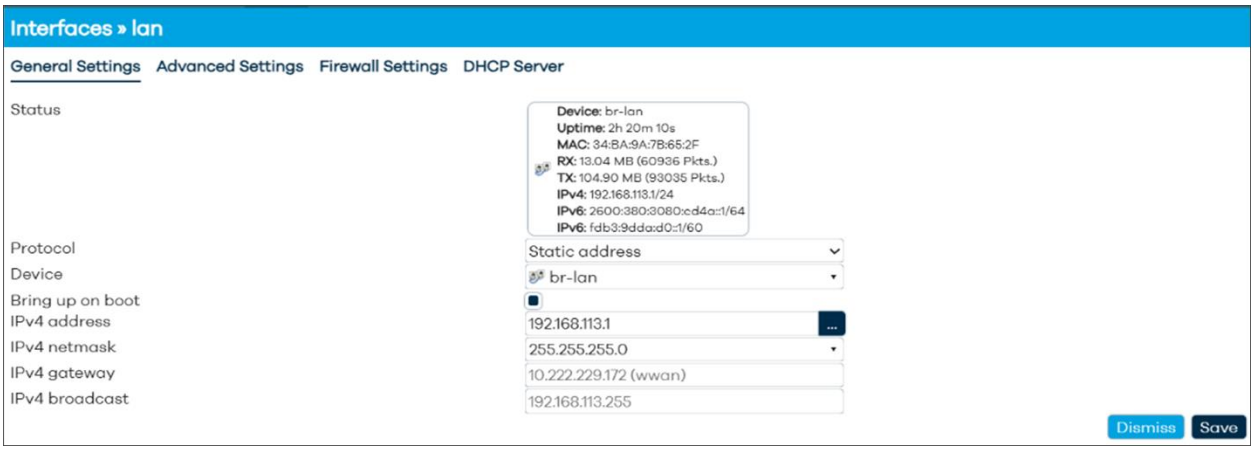


Figure 132: Interfaces > lan – General Settings tab

In **Advanced Settings** for the LAN interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Force link**: box is checked by default. Set interface properties regardless of the link carrier (If set, carrier sense events do not invoke hotplug handlers).
- **Use default gateway**: box is checked by default. If unchecked, no default route is configured.
- **Use custom DNS servers**: None configured by default
- **DNS search domains**: None configured by default
- **DNS weight**: set to 0 by default. The DNS server entries in the local resolv.conf are primarily sorted by the weight specified here.
- **Use gateway metric**: set to **0** by default
- Override IPv4 routing table: set to '**unspecified**' by default. Other options are: **prelocal (128)**, **local (255)**, **main (254)**, **default (253)**, and custom setting
- **Override IPv6 routing table**: set to 'unspecified' by default. Other options are: **prelocal (128)**, **local (255)**, **main (254)**, **default (253)**, and custom setting
- **Delegate IPv6 prefixes**: checked by default. Enable downstream delegation of IPv6 prefixes available on this interface.
- IPv6 assignment length: set to **60** by default.
  - Other options are: disabled, 64, or custom setting. Assign a part of given length of every public IPv6-prefix to this interface.
- **IPv6 assignment hint**: set to **0** by default. Assign prefix parts using this hexadecimal subprefix ID for this interface.
- **IPv6 prefix filter**: no value set by default. Options are **local (Local ULA)**, **wwan**, or custom setting. If set, downstream subnets are only allocated from the given IPv6 prefix classes.
- **IPv6 suffix**: set to **::1** by default. Optional. Allowed values: 'eui64', 'random', fixed value like '::1' or '::1:2'. When IPv6 prefix (like 'a:b:c:d::') is received from a delegating server, use the suffix (like '::1') to form the IPv6 address ('a:b:c:d::1') for the interface.
- **IPv6 preference**: set to **0** by default. When delegating prefixes to multiple downstreams, interfaces with a higher preference value are considered first when allocating subnets.

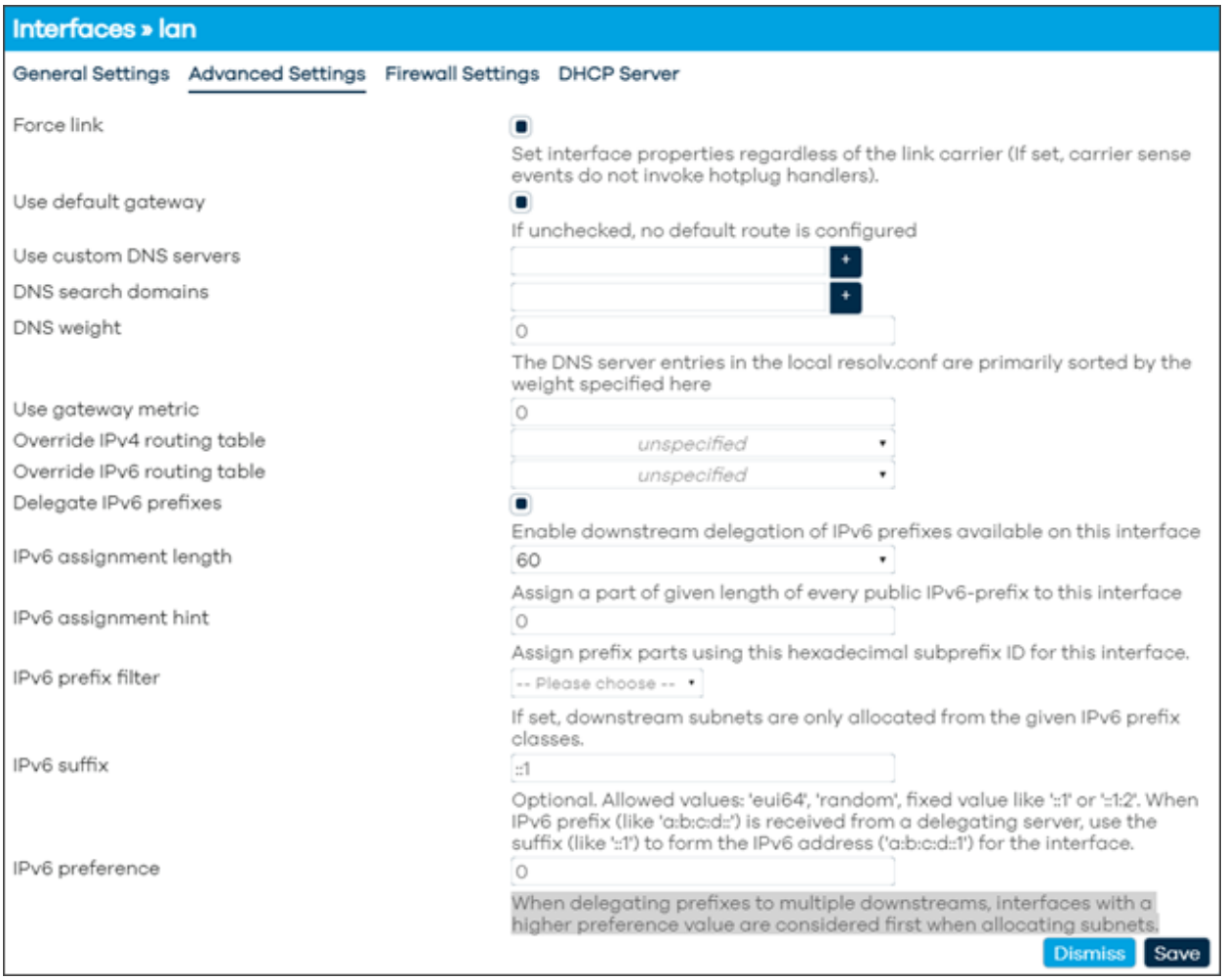


Figure 133: Interfaces > lan – Advanced Settings

In **Firewall Settings** for the lan interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Create/Assign firewall-zone**: set to **lan** by default. Other options are: **wan**, **wwan**, **unspecified**, and custom setting. Choose the firewall zone you want to assign to this interface. Select unspecified to remove the interface from the associated zone or fill out the custom field to define a new zone and attach the interface to it.

Figure 134: Interfaces > lan – Firewall Settings

In **DHCP Server, General Setup** settings for the lan interface, it shows the following information:

! WARNING: Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Ignore interface**: unchecked by default. If checked, disables DHCP for this interface.
- **Start**: set to 100 by default. Lowest leased address as offset from the network address.
- **Limit**: set to 150 by default. Maximum number of leased addresses.
- **Lease time**: set to 12h by default. Expiry time of leased addresses, minimum is 2 minutes (2m).

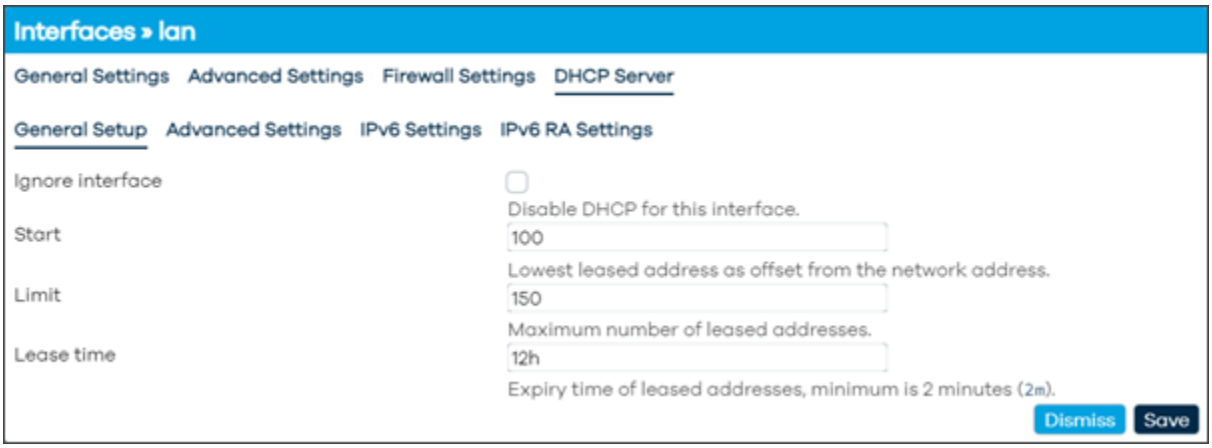


Figure 135: Interfaces > lan – DHCP Server, General Setup

In **DHCP Server**, **Advanced Settings** for the **lan** interface, it shows the following information:

! WARNING: Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Dynamic DHCP**: checked by default. Dynamically allocate DHCP addresses for clients. If disabled, only clients having static leases will be served.
- **Force**: unchecked by default. Force DHCP on this network even if another server is detected.

- **IPv4-Netmask**: set to **255.255.255.0** by default. Override the netmask sent to clients. Normally it is calculated from the subnet that is served.
- **DHCP-Options**: left blank by default. Define additional DHCP options, for example "6,192.168.2.1,192.168.2.2" which advertises different DNS servers to clients.

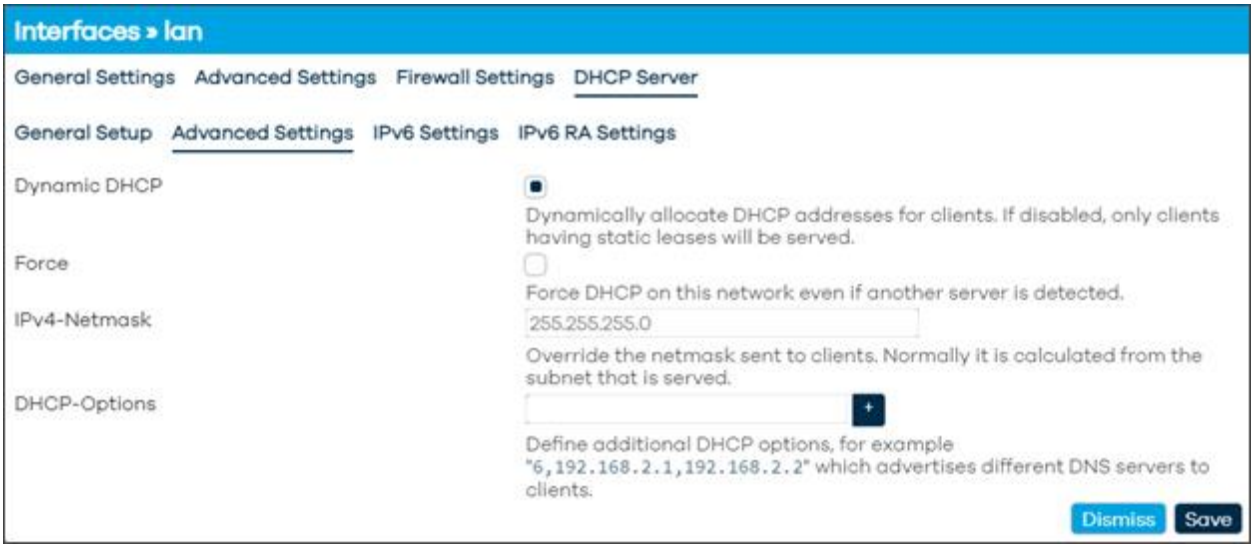


Figure 136: Interfaces > lan – DHCP Server, Advanced Settings

In **DHCP Server**, **IPv6 Settings** for the **lan** interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Designated master**: unchecked by default. Set this interface as master for RA and DHCPv6 relaying as well as NDP proxying.
- **RA-Servic**: set to **server mode** by default which sends RA messages advertising this device as IPv6 router.
  - Other options are: **disabled** which does not send any RA messages on this interface; **relay mode** which forwards RA messages received on the designated master interface to downstream interfaces; **hybrid mode** which operates in **relay mode** if a designated master interface is configured and active, otherwise fall back to server mode.
- **DHCPv6-Service**: set to server mode by default which provides a DHCPv6 server on this interface and reply to DHCPv6 solicitations and requests.
  - Other options are: **disabled** which does not offer DHCPv6 service on this interface; **relay mode** which forwards DHCPv6 messages between the designated master interface and downstream interfaces; **hybrid mode** which operates in **relay mode** if a designated master interface is configured and active, otherwise fall back to server mode.

- **Announced IPv6 DNS servers**: left blank by default. Specifies a fixed list of IPv6 DNS server addresses to announce via DHCPv6. If left unspecified, the device will announce itself as IPv6 DNS server unless the Local IPv6 DNS server option is disabled.
- **Local IPv6 DNS server**: checked by default. Announce this device as IPv6 DNS server.
- **Announced DNS domains** – left blank by default. Specifies a fixed list of DNS search domains to announce via DHCPv6. If left unspecified, the local device DNS search domain will be announced.
- **NDP-Proxy**: Configures the operation mode of the NDP proxy service on this interface. Set to disabled by default which does not proxy any NDP packets.
  - Other options are: **relay mode** which forwards NDP NS and NA messages between the designated master interface and downstream interfaces; **hybrid mode** which operates in **relay mode** if a designated master interface is configured and active, otherwise disable NDP proxying.

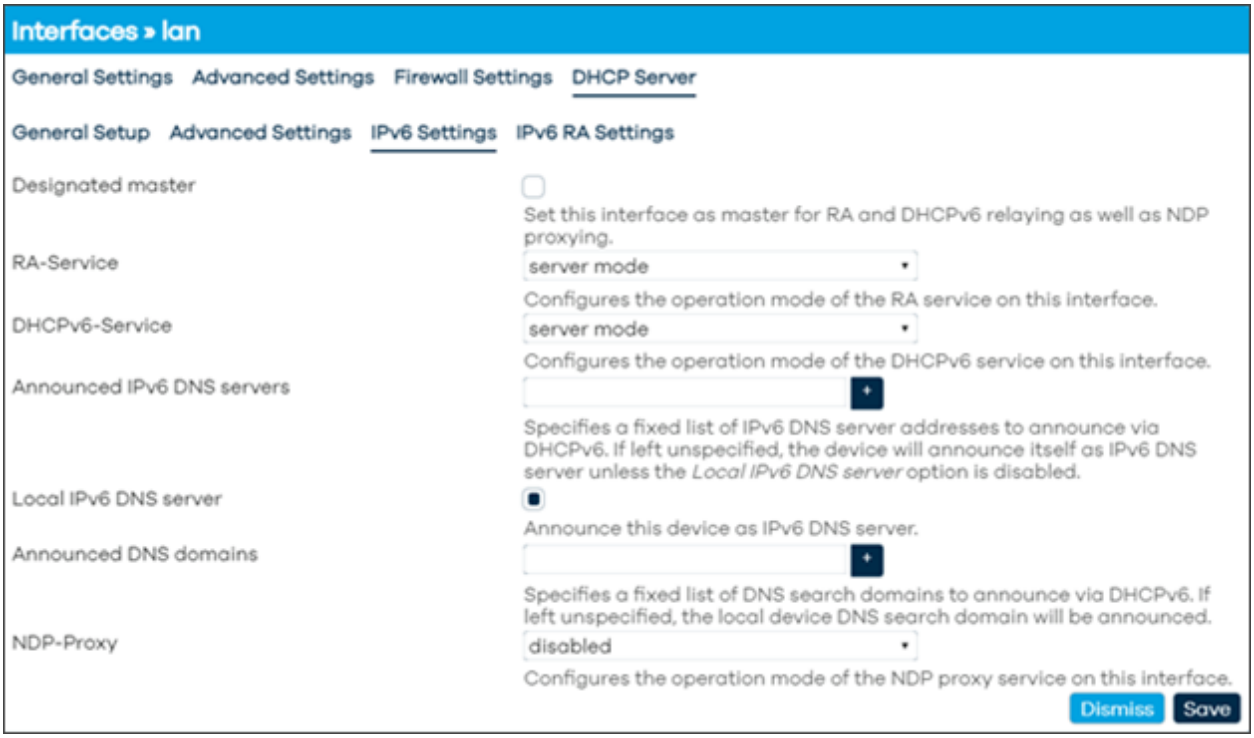


Figure 137: Interfaces > lan – DHCP Server, IPv6 Settings

In **DHCP Server**, **IPv6 RA Settings** for the **lan** interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Default router** - Configures the default router advertisement in RA messages. Set to automatic by default which announces this device as the default router if a local IPv6 default route is present.
  - Other options are: **on available prefix** which announces this device as default router if a public IPv6 prefix is available, regardless of local default router availability; **forced** which announces this device as default router regardless of whether a prefix or default route is present.
- **Enable SLAAC**: checked by default. Set the autonomous address-configuration flag in the prefix information options of sent RA messages. When enabled, clients will perform stateless IPv6 address autoconfiguration.
- **RA Flags**: Specifies the flags sent in RA messages, for example to instruct clients to request further information via stateful DHCPv6. Is set to both **managed config (M)** which indicates that the IPv6 addresses are available via DHCPv6 and **other (O)** which indicates that other information, such as DNS servers, is available via DHCPv6 by default.
  - Other option is: **mobile home agent (H)** which indicates that the device is also acting as Mobile IPv6 home agent on this link.
- **Max RA interval** (seconds) : set to **600** by default. Maximum time allowed between sending unsolicited RA.
- **Min RA interval** (seconds) : set to **200** by default. Minimum time allowed between sending unsolicited RA.
- **RA Lifetime** (seconds) : set to **1800** by default. Router Lifetime published in RA messages. Maximum is 9000 seconds.
- **RA MTU** (bytes) : set to **1342** by default. The MTU to be published in RA messages. Minimum is 1280 bytes.
- **RA Hop Limit**: set to **64** by default. The maximum hops to be published in RA messages. Maximum is 255 hops.

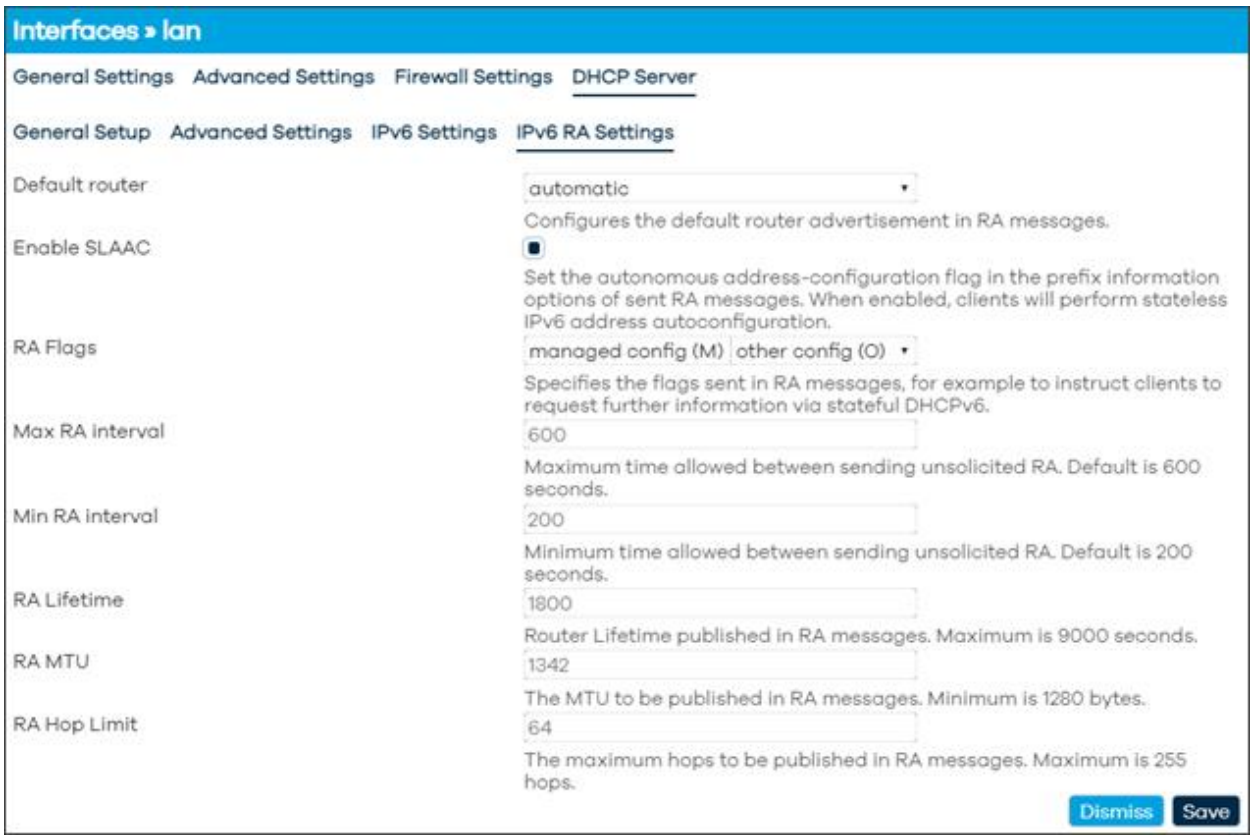


Figure 138: Interfaces > lan – DHCP Server, IPv6 RA Settings tab

wan Edit

In **General Settings** for the wan interface, it shows the following information:

! **WARNING:** This is an **Edit** page from the WAN interface. The other interfaces (LAN and WWAN) have a number of different configuration options under their respective Edit pages and should only be updated by experienced users.

- **Status:** Device, MAC address, RX and TX data
- **Protocol:** Defaults to **DHCP client**.
  - Other options are **DHCPv6 client**, **GRE tunnel over IPv4**, **GRETAP tunnel over IPv4**, **GRE tunnel over IPv6**, **GRETAP tunnel over IPv6**, **ModemManager**, **Unmanaged**, and **Static Address**.
- **Device:** Defaults to **Switch port: "wan" (wan)**. Other options are available to change the type of interface, though it is not recommended to make any changes as doing so may render your device unusable.
- **Bring up on boot:** Box is checked by default.
- **Hostname to send when requesting DHCP:** Default value is '**Send the hostname of this device**'.

- Other options are '**Do not send a hostname**' and the user can specify a custom value a well.

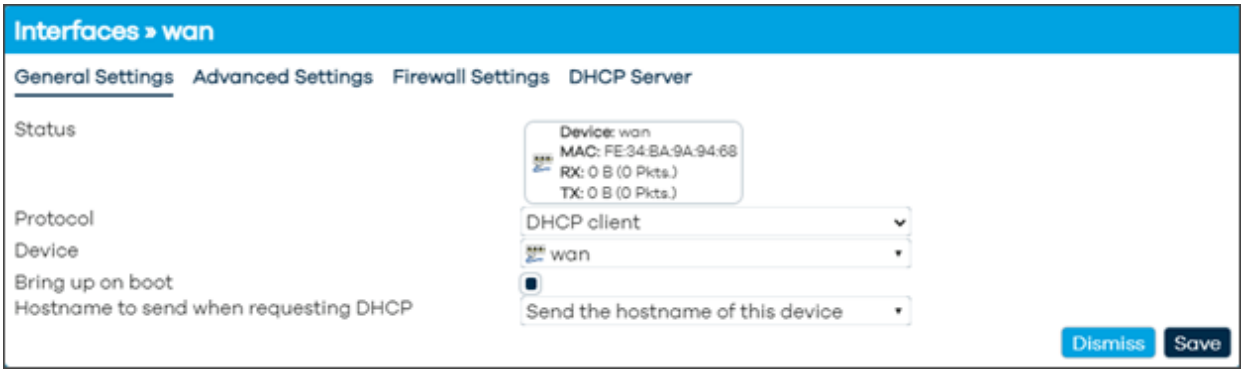


Figure 139: Interfaces > wan– General Settings tab

In **Advanced Settings** for the wan interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Force link:** box is unchecked by default. Set interface properties regardless of the link carrier (If set, carrier sense events do not invoke hotplug handlers).
- **Use broadcast flag**: box is unchecked by default. Required for certain ISPs, e.g. Charter with DOCSIS 3.
- **Client ID to send when requesting DHCP:** left blank by default
- **Vendor Class to send when requesting DHCP:** left blank by default
- **Use default gateway:** box is checked by default. If unchecked, no default route is configured.
- **Use DNS servers advertised by peers:** box is checked by default. If unchecked, the advertised DNS server addresses are ignored.
- **DNS weight:** set to **0** by default. The DNS server entries in the local resolv.conf are primarily sorted by the weight specified here.
- **Use gateway metric:** set to **0** by default
- **Override IPv4 routing table:** set to '**unspecified**' by default. Other options are: prelocal (128), local (255), main (254), default (253), and custom setting
- **Override IPv6 routing table:** set to '**unspecified**' by default. Other options are: prelocal (128), local (255), main (254), default (253), and custom setting
- **Delegate IPv6 prefixes:** box is checked by default. Enable downstream delegation of IPv6 prefixes available on this interface.
- **IPv6 assignment length:** set to **disabled** by default. Other options are: 64, or custom setting. Assign a part of given length of every public IPv6-prefix to this interface.

- **IPv6 prefix filter:** no value set by default. Options are local (Local ULA), wwan, or custom setting. If set, downstream subnets are only allocated from the given IPv6 prefix classes.
- **IPv6 suffix:** set to **::1** by default. Optional. Allowed values: 'eui64', 'random', fixed value like '::1' or '::1:2'. When IPv6 prefix (like 'a:b:c:d::') is received from a delegating server, use the suffix (like '::1') to form the IPv6 address ('a:b:c:d::1') for the interface.
- **IPv6 preference:** set to **0** by default. When delegating prefixes to multiple downstreams, interfaces with a higher preference value are considered first when allocating subnets.

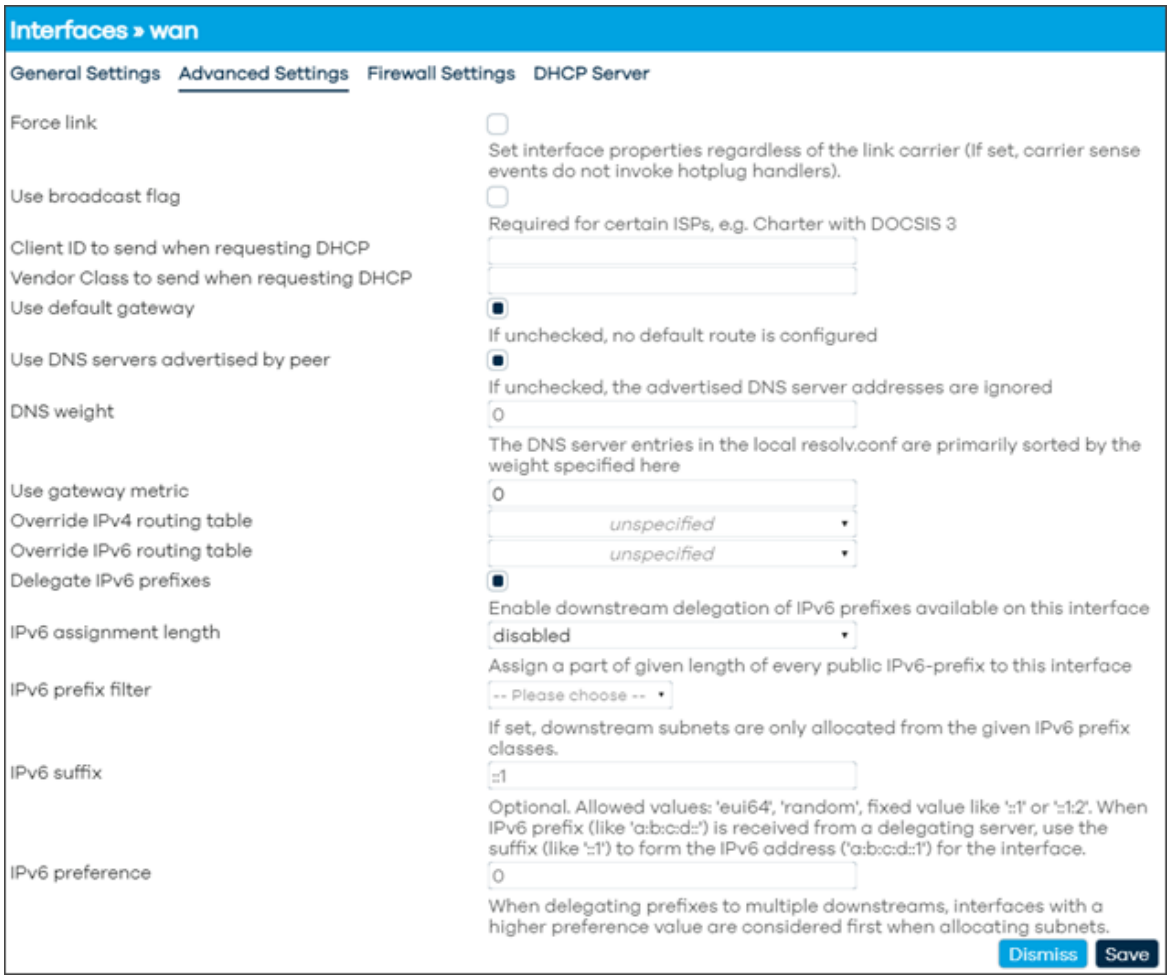


Figure 140: Interfaces > wan – Advanced Settings tab

In **Firewall Settings** for the **wan** interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

Create/Assign firewall-zone: set to **wan** and **wwan** by default. Other options are: **lan**, **unspecified**, and custom setting. Choose the firewall zone you want to assign to this interface. Select unspecified to remove the interface from the associated zone or fill out the custom field to define a new zone and attach the interface to it.

Figure 141: Interfaces > wan page – Firewall Settings tab

In **DHCP Server**, **General Setup** settings for the wan interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Ignore interface**: box is checked by default. If checked, disables DHCP for this interface.

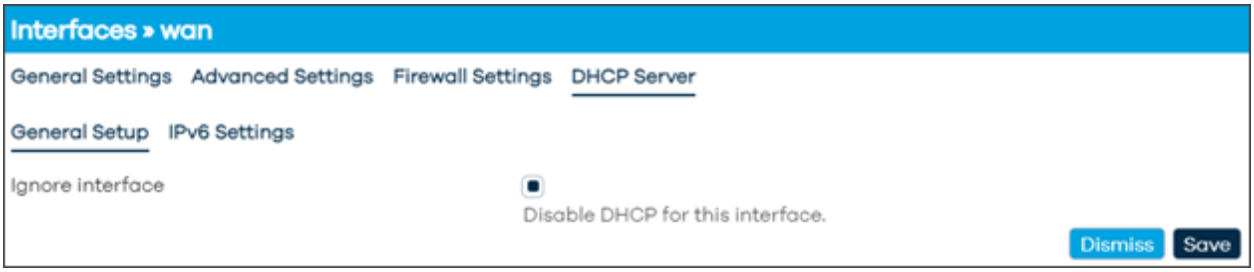


Figure 142: Interfaces > wan page – DHCP Server tab

In **DHCP Server**, **IPv6 Settings** for the wan interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Designated master:** box is unchecked by default. Set this interface as master for RA and DHCPv6 relaying as well as NDP proxying.

- **RA-Service:** set to disabled by default which does not send any RA messages on this interface. Other options are: server mode which sends RA messages advertising this device as IPv6 router; relay mode which forwards RA messages received on the designated master interface to downstream interfaces; hybrid mode which operates in relay mode if a designated master interface is configured and active, otherwise fall back to server mode.
- **DHCPv6-Service:** set to disabled by default which does not offer DHCPv6 service on this interface. Other options are: server mode which provides a DHCPv6 server on this interface and reply to DHCPv6 solicitations and requests; relay mode which forwards DHCPv6 messages between the designated master interface and downstream interfaces; hybrid mode which operates in relay mode if a designated master interface is configured and active, otherwise fall back to server mode.
- **NDP-Proxy:** Configures the operation mode of the NDP proxy service on this interface. Set to disabled by default which does not proxy any NDP packets.
  - Other options are: **relay mode** which forwards NDP NS and NA messages between the designated master interface and downstream interfaces; **hybrid mode** which operates in **relay mode** if a designated master interface is configured and active, otherwise disable NDP proxying.

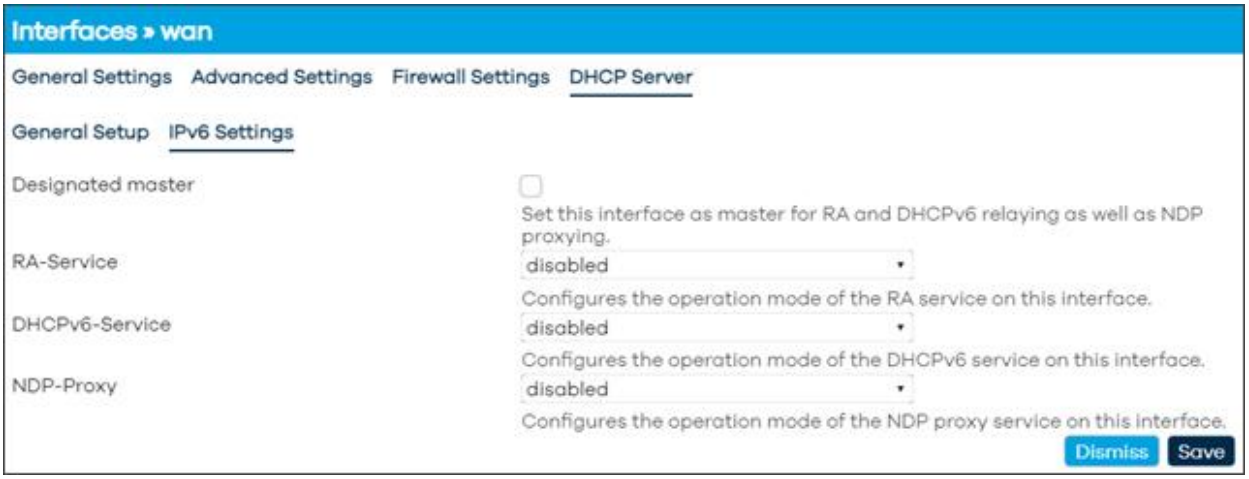


Figure 143: Interfaces > wan – DHCP Server – IPv6 Settings tab

wwan Edit

In **General Settings** for the **wwan** interface, it shows the following information:

! **WARNING:** This is an Edit page from the WWAN interface. The other interfaces (LAN and WAN) have a number of different configurations under their respective Edit pages and should only be updated by experienced users.

- Status: Device, Uptime, MAC address, RX and TX data, IPv4, IPv6, and IPv6-PD
- **Protocol:** defaults to **ModemManager**.
  - Other options are **DHCP clien**t, **DHCPv6 client**, **GRE tunnel over IPv4**, **GRETAP tunnel over IPv4**, **GRE tunnel over IPv6**, **GRETAP tunnel over IPv6**, **Unmanaged**, and **Static Address**
- **Bring up on boot:** box is checked by default
- **Modem device:** defaults to Nextivity Inc. – AW-12
- **APN:** firstnet-broadnet or user may configure to a customer specific APN
- **PIN:** default is blank
- **Authentication Type:** default is set to 'None'.
  - Other choices are: **PAP/CHAP(both)**, **PAP**, or **CHAP**
- **IP Type:** default is **IPv4/IPv6 (both – defaults to IPv4**).
  - Other choices are: **IPv4 only**, **IPv6 only**
- **Signal Refresh Rate (in seconds):** default is blank.

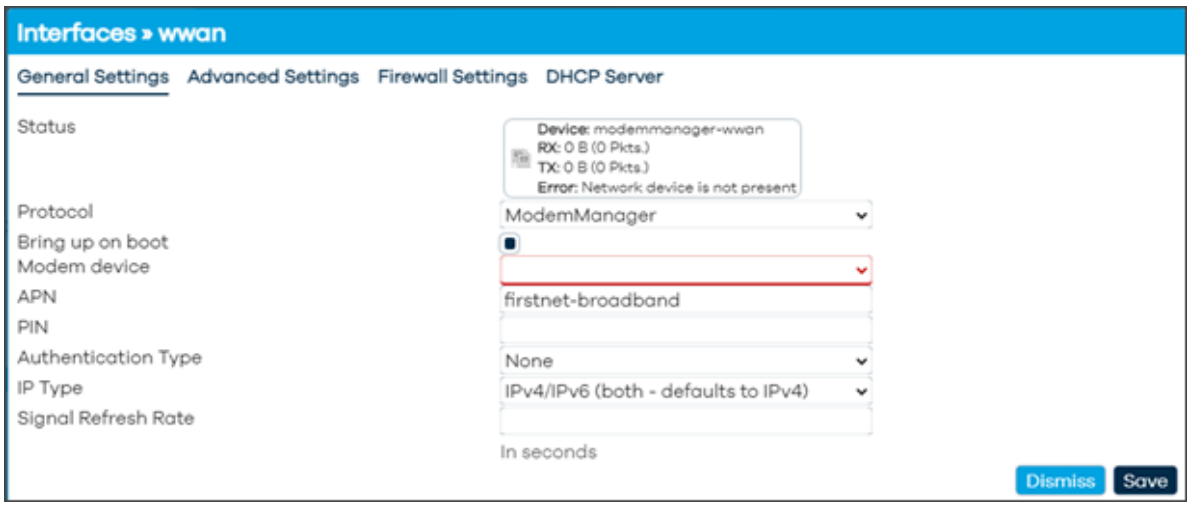


Figure 144: Interfaces > wwan page – General Settings tab

In **Advanced Settings** for the **wwan** interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Force link:** box is unchecked by default. Set interface properties regardless of the link carrier (If set, carrier sense events do not invoke hotplug handlers).
- **Override MTU:** default is set to **1342**
- **Use default gateway:** box is checked by default. If unchecked, no default route is configured.
- **Use custom DNS servers:** left blank by default
- **DNS weight:** set to **0** by default. The DNS server entries in the local resolv.conf are primarily sorted by the weight specified here.
- **Use gateway metric:** set to **10** by default
- **Override IPv4 routing table:** set to '**unspecified**' by default. Other options are: **prelocal (128)**, **local (255)**, **main (254)**, **default (253)**, and custom setting
- **Override IPv6 routing table:** set to '**unspecified**' by default. Other options are: **prelocal (128)**, local (255), main (254), default (253), and custom setting
- **Delegate IPv6 prefixes:** box is checked by default. Enable downstream delegation of IPv6 prefixes available on this interface.
- **IPv6 assignment length**: set to disabled by default. Other options are: 64, or custom setting. Assign a part of given length of every public IPv6-prefix to this interface.
- **IPv6 prefix filter:** no value set by default. Options are local (Local ULA), wwan, or custom setting. If set, downstream subnets are only allocated from the given IPv6 prefix classes.
- **IPv6 suffix:** set to **::1** by default. Optional.
  - Allowed values: 'eui64', 'random', fixed value like '::1' or '::1:2'. When IPv6 prefix (like 'a:b:c:d::') is received from a delegating server, use the suffix (like '::1') to form the IPv6 address ('a:b:c:d::1') for the interface.
- **IPv6 preference:** set to **0** by default. When delegating prefixes to multiple downstreams, interfaces with a higher preference value are considered first when allocating subnets.

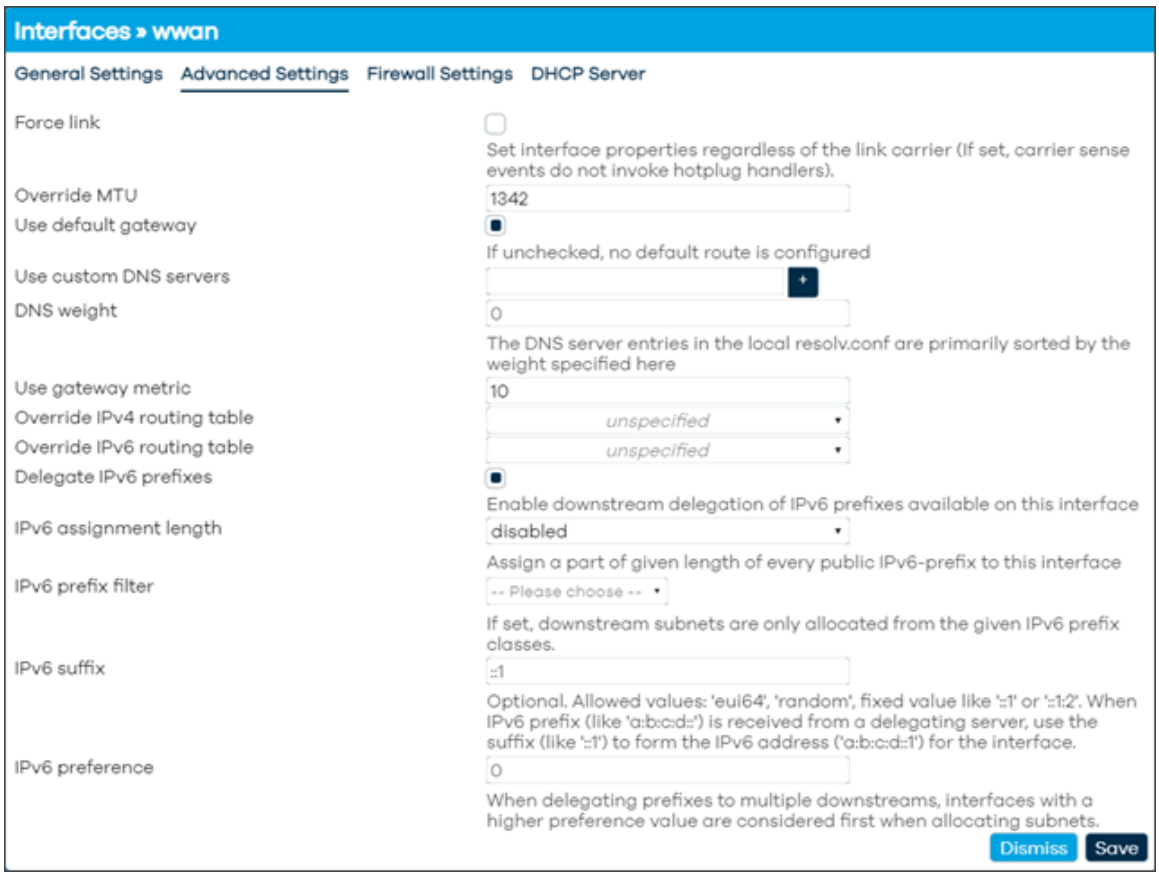


Figure 145: Interfaces > wwan page – Advanced Settings tab

In **Firewall Settings** for the **wwan** interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Create/Assign firewall-zone:** set to **wan** and **wwan** by default. Other options are: **lan**, **unspecified**, and custom setting. Choose the firewall zone you want to assign to this interface. Select unspecified to remove the interface from the associated zone or fill out the custom field to define a new zone and attach the interface to it.

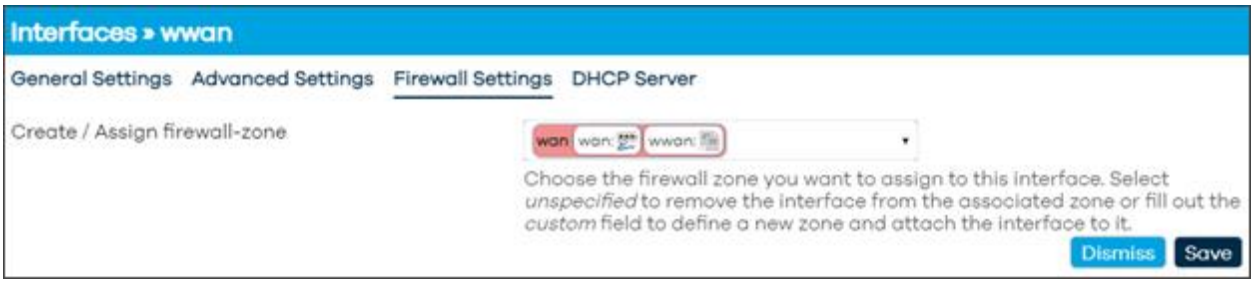


Figure 146: Interfaces > wwan page – Firewall Settings tab

In **DHCP Server** settings for the **wwan** interface, there is no DHCP Server configured for this interface by default.

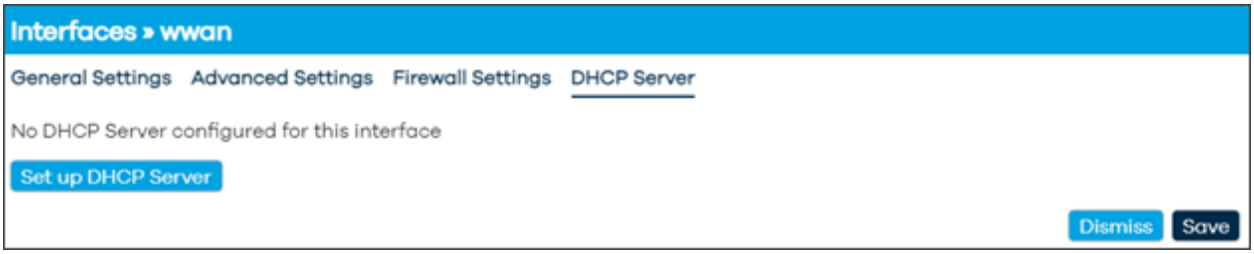


Figure 147: Interfaces > wwan page – DHCP Server settings tab

However, a user can configure one if they wish. They may do so by clicking on '**Set up DHCP Server**'.

The **DHCP Server**, **General Setup** settings for the **wwan** interface, shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Ignore interface:** box is checked by default. If checked, disables DHCP for this interface.

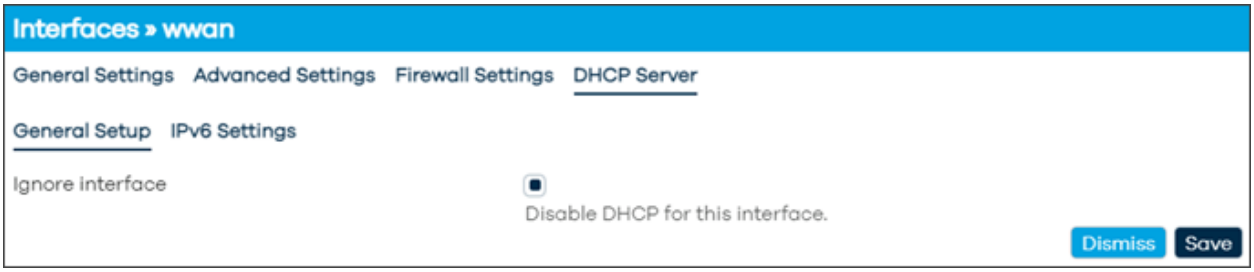


Figure 148: Interfaces > wwan page – General Setup for DHCP Server

In **DHCP Server**, **IPv6 Settings** for the **wwan** interface, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Designated master:** box is unchecked by default. Set this interface as master for RA and DHCPv6 relaying as well as NDP proxying.
- **RA-Service:** set to **disabled** by default which does not send any RA messages on this interface.
  - Other options are: **server mode** which sends RA messages advertising this device as IPv6 router; relay mode which forwards RA messages received on the designated master interface to downstream interfaces; hybrid mode which operates in relay mode if a designated master interface is configured and active, otherwise fall back to server mode.
- **DHCPv6-Service:** set to **disabled** by default which does not offer DHCPv6 service on this interface.
  - Other options are: **server mode** which provides a DHCPv6 server on this interface and reply to DHCPv6 solicitations and requests; relay mode which forwards DHCPv6 messages between the designated master interface and downstream interfaces; **hybrid mode** which operates in **relay mode** if a designated master interface is configured and active, otherwise fall back to server mode.
- **NDP-Proxy**: Configures the operation mode of the NDP proxy service on this interface. Set to **disabled** by default which does not proxy any NDP packets.
  - Other options are: **relay mode** which forwards NDP NS and NA messages between the designated master interface and downstream interfaces; hybrid mode which operates in **relay mode** if a designated master interface is configured and active, otherwise disable NDP proxying.

4.4.1.2 Devices

In the **Devices** tab, there are listed devices that have corresponding information that include: Device name, Type, MAC Address, MTU. Next to each device, there are some action buttons such as Configurations and Unconfigure (and "Add device configuration..." at the bottom). By default, **br-lan** and **wan** are hi-lighted.

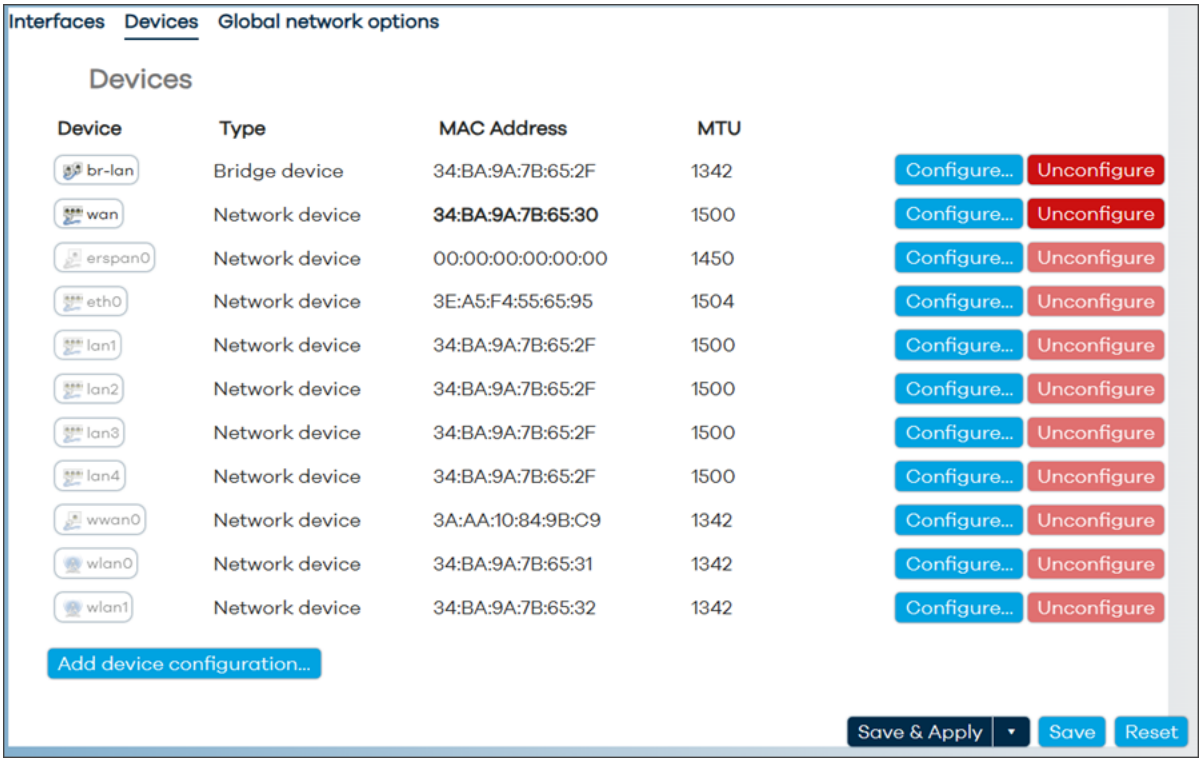


Figure 149: Devices tab showing list of device properties

br-lan Configure

Each device has its own configuration, and after selecting "**Configure**...," a configurations page will be displayed with 3-tabs of settings if applicable: **General device options**, **Advanced device options**, and **Bridge VLAN filtering**.

! **WARNNG:** The **Unconfigure** option can lead to unfavorable results. Only use this if you are an experienced user.

In **General device options** for **br-lan**, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Device type**: Bridge device is set by default
- **Device name**: br-lan

- **Bridge ports**: Lists: lan1, lan2, lan, lan4. Specifies the wired ports to attach to this bridge. In order to attach wireless networks, choose the associated interface as network in the wireless settings.
- **Bring up empty bridge**: box not checked by default.
- **MTU**: set to **1342** by default
- **MAC address**: mac address of the device
- **TX queue length**: set to **1000** by default.
- **Enable IPv6**: set to automatic (enabled) by default. Other option is disabled.
- **IPv6 MTU**: set to **1342**
- **DAD transmits**: set to **1** by default. Amount of Duplicate Address Detection probes to send.

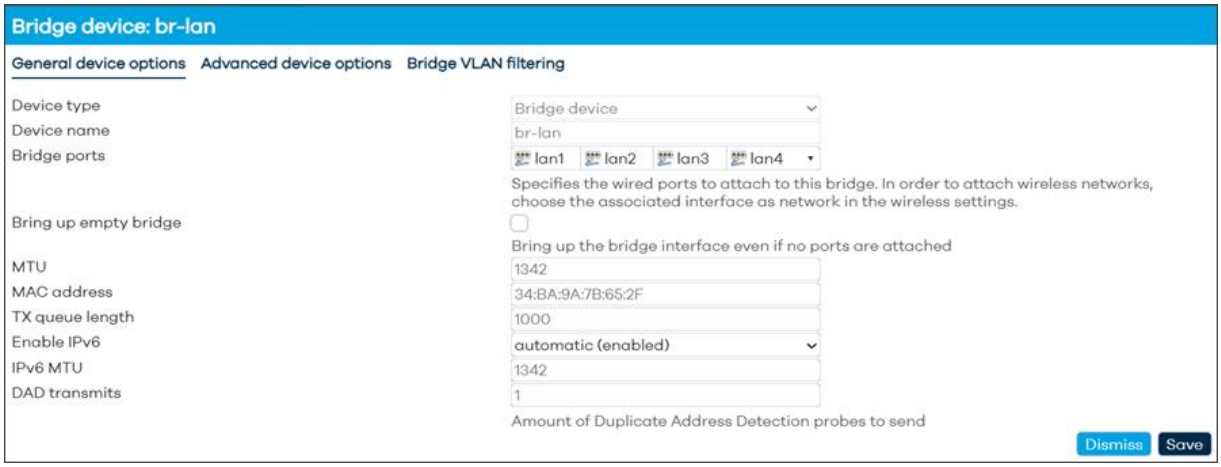


Figure 150: Configuration page for br-lan device – General device options tab

In **Advanced** device options for **br-lan**, it shows the following information:

! WARNING: Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Priority**: set to **32767**
- **Ageing time**: **30**. Timeout in seconds for learned MAC addresses in the forwarding database.
- **Enable STP**: box unchecked by default. Enables the Spanning Tree Protocol on this bridge if checked.
- **Enable IGMP snooping**: box unchecked by default. Enables IGMP snooping on this bridge if checked.
- Enable multicast querier: box unchecked by default.

- **Enable promiscuous mode**: set to automatic (disabled) by default. Other option is **enabled**.
- **Reverse path filter**: set to **disabled** by default. Other options are: Loose filtering and Strict filtering.
- **Accept local**: set to **automatic (disabled)** by default. Other option is **enabled**. Accept packets with local source addresses.
- **Send ICMP redirects**: set to **automatic (enabled)** by default. Other option is disabled.
- **Honor gratuitous ARP**: set to **automatic (disabled)** by default. Other option is enabled. When enabled, new ARP table entries are added from received gratuitous APR requests or replies, otherwise only preexisting table entries are updated, but no new hosts are learned.
- **Drop gratuitous ARP**: set to **automatic (disabled)** by default. Other option is enabled. Drop all gratuitous ARP frames, for example if there's a known good ARP proxy on the network and such frames need not be used or in the case of 802.11, must not be used to prevent attacks.
- **Neighbor cache validity**: set to **30000**. Time in milliseconds
- **Stale neighbor cache timeout**: set to **60**. Timeout in seconds
- **Minimum ARP validity time**: set to **0**. Minimum required time in seconds before an ARP entry may be replaced. Prevents ARP cache thrashing.
- **Enable IPv6 segment routing**: set to **automatic (disabled)** by default. Other option is enabled.
- **Drop unsolicited NA**: set to **automatic (disabled)** by default. Other option is enabled. Drop all unsolicited neighbor advertisements, for example if there's a known good NA proxy on the network and such frames need not be used or in the case of 802.11, must not be used to prevent attacks.
- **Enabled multicast support**: set to **automatic (enabled)** by default. Other option is disabled.
- **Force IGMP version**: set to **No enforcement** by default. Other options are Enforce IGMPv1, Enforce IGMPv2, and Enforce IGMPv3.
- **Force MLD version**: set to **No enforcement by default**. Other options are Enforce MLD version 1, and Enforce MLD version 2.

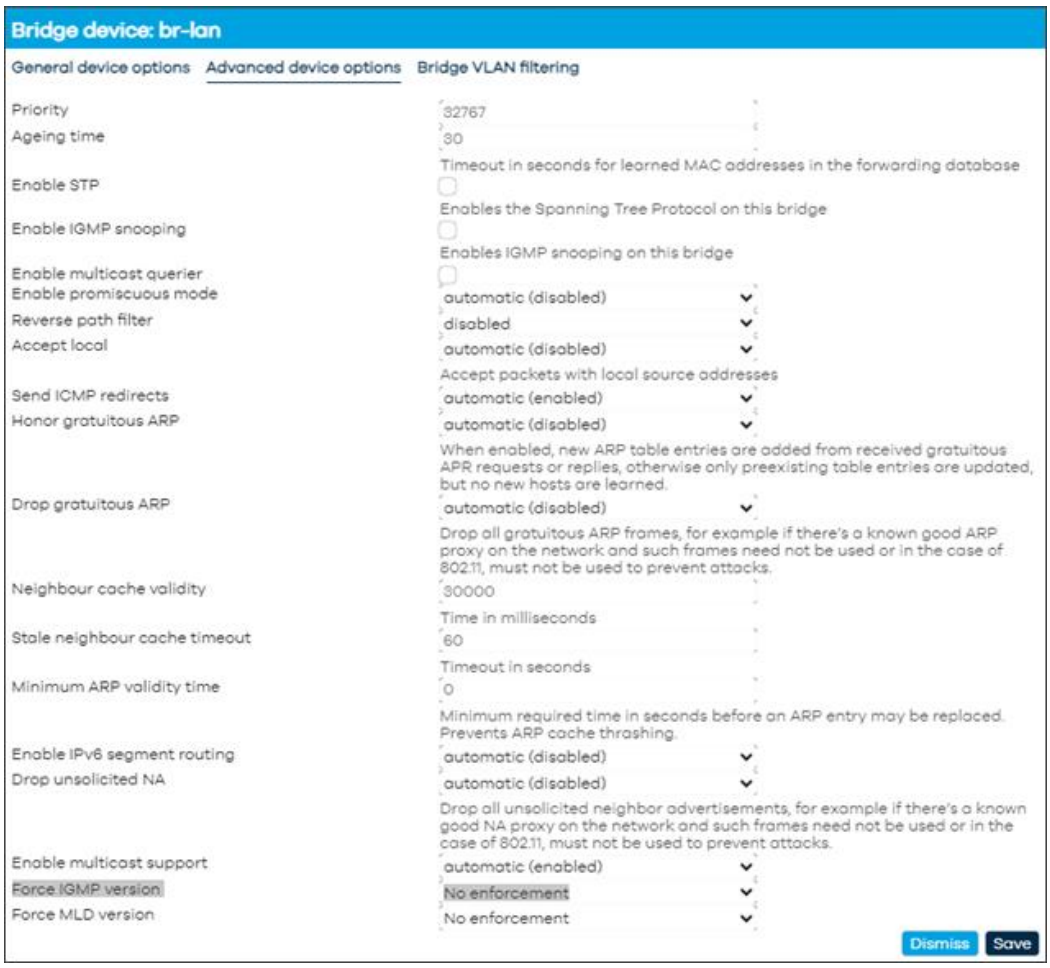


Figure 151: Configuration page for br-lan device – Advanced device options tab

In **Bridge VLAN filtering** for **br-lan**, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Enable VLAN filtering**: box is unchecked by default and no VLAN values are set. Other option is to enable by checking the box which turns on this feature on.
- The **Add** button below allows the user to add ports to a VLAN to the users' discretion with options to create VLAN ID number, whether it is Not a member, Untagged, Tagged, or Is Primary VLAN.

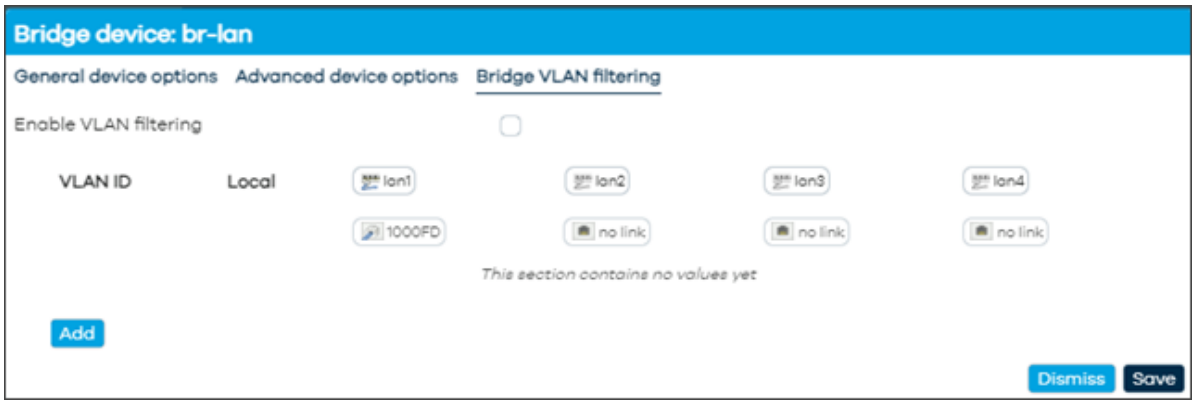


Figure 152: Configuration page for br-lan device – Bridge VLAN Filtering

wan Configure

In **General device options** for **wan**, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Device type**: Network device is set by default
- **Existing device**: wan
- **MTU**: set to 1500 by default
- **MAC address**: mac address of the device
- **TX queue length**: set to 1000 by default.
- **Enable IPv6**: set to automatic (enabled) by default. Other option is disabled.
- **IPv6 MTU**: set to 1500
- **DAD transmits**: set to 1 by default. Amount of Duplicate Address Detection probes to send.

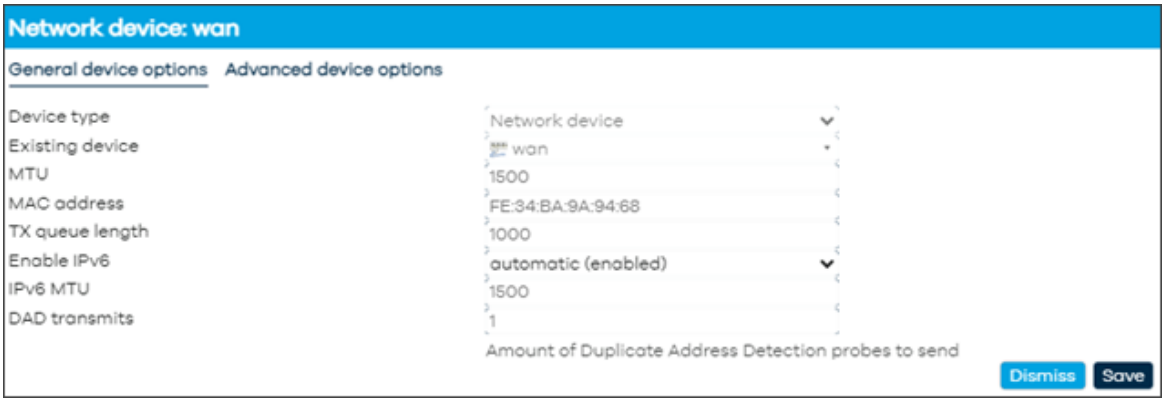


Figure 153: General device options for wan

In **Advanced device options** for **wan**, it shows the following information:

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

- **Enable promiscuous mode**: set to **automatic (disabled)** by default. Other option is enabled.
- **Reverse path filter**: set to **disabled** by default. Other options are: Loose filtering and Strict filtering.
- **Accept local**: set to **automatic (disabled)** by default. Other option is enabled. Accept packets with local source addresses.
- **Send ICMP redirects**: set to **automatic (enabled)** by default. Other option is disabled.
- **Honor gratuitous ARP** - set to **automatic (disabled)** by default. Other option is enabled. When enabled, new ARP table entries are added from received gratuitous APR requests or replies, otherwise only preexisting table entries are updated, but no new hosts are learned.
- **Drop gratuitous ARP** - set to **automatic (disabled)** by default. Other option is enabled. Drop all gratuitous ARP frames, for example if there's a known good ARP proxy on the network and such frames need not be used or in the case of 802.11, must not be used to prevent attacks.
- **Neighbor cache validity**: set to **30000**. Time in milliseconds
- **Stale neighbor cache timeout**: set to **60**. Timeout in seconds
- **Minimum ARP validity time**: set to **0**. Minimum required time in seconds before an ARP entry may be replaced. Prevents ARP cache thrashing.
- **Enable IPv6 segment routing**: set to **automatic (disabled)** by default. Other option is enabled.
- **Drop unsolicited NA**: set to **automatic (disabled)** by default. Other option is enabled. Drop all unsolicited neighbor advertisements, for example if there's a known good NA proxy on the network and such frames need not be used or in the case of 802.11, must not be used to prevent attacks.
- **Enabled multicast support**: set to **automatic (enabled)** by default. Other option is disabled.
- **Force IGMP version**: set to **No enforcement** by default. Other options are Enforce IGMPv1, Enforce IGMPv2, and Enforce IGMPv3.
- **Force MLD version**: set to **No enforcement** by default. Other options are Enforce MLD version 1 and Enforce MLD version 2.

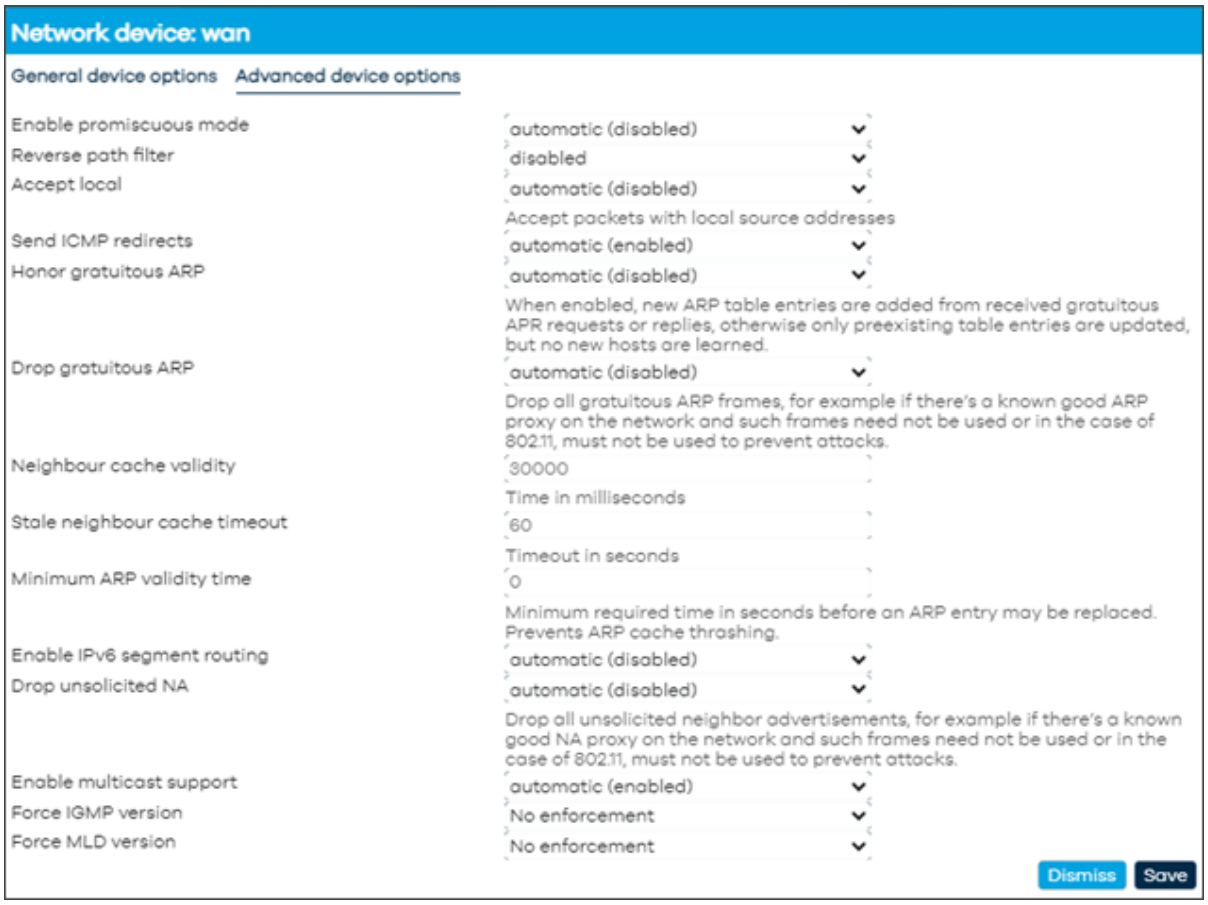


Figure 154: Advanced device options for wan

4.4.1.3 Global network options

In the **Global network options** tab, there are two settings that can be configured:

- **IPv6 ULA-Prefix**: prepopulated by default. Unique Local Address - in the range fc00::/7. Typically only within the 'local' half fd00::/8. ULA for IPv6 is analogous to IPv4 private network addressing. This prefix is randomly generated at first install.
- **Packet Steering**: box checked by default. Enable packet steering across all CPUs. May help or hinder network speed.

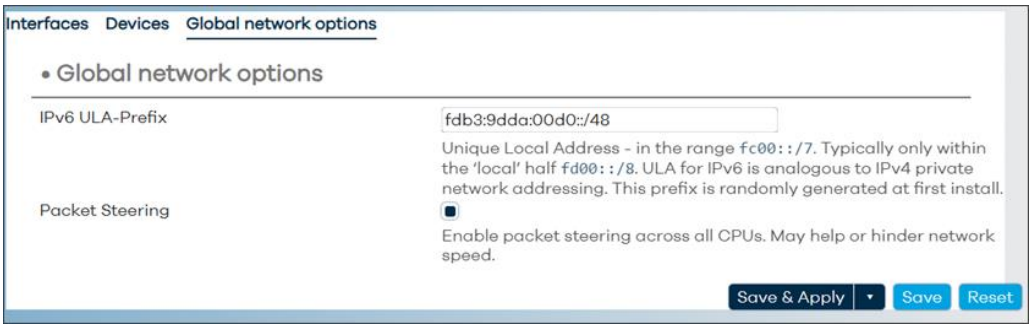


Figure 155: Global network options

4.4.2 Wireless

On this page, Wi-Fi settings can be configured based on the users' preferences. There are two available Wi-Fi radios, one for 2.4 GHz and one for 5 GHz. In each setting, the user has the option to enable the radio, change the channel, configure the mode, change the SSID, configure the encryption, and configure the key.

➲ **Note**: Please refer to section *3.10 Wi-Fi Settings* for details on verifying and changing these settings.

4.4.3 Routing

On this page, the user will be able to route over which interface and gateway a certain host or network can be reached. There are four tabs: **Static IPv4 Routes**, **Static IPv6 Routes, IPv4 Rules**, and **IPv6 Rules**.

These sections contain no values by default. The **Static IPv4** and **IPv6 Routes** tabs are similar as are the IPv4 and IPv6 Rules tabs.

There is an **Add** button at the bottom to add routes and rules as needed.

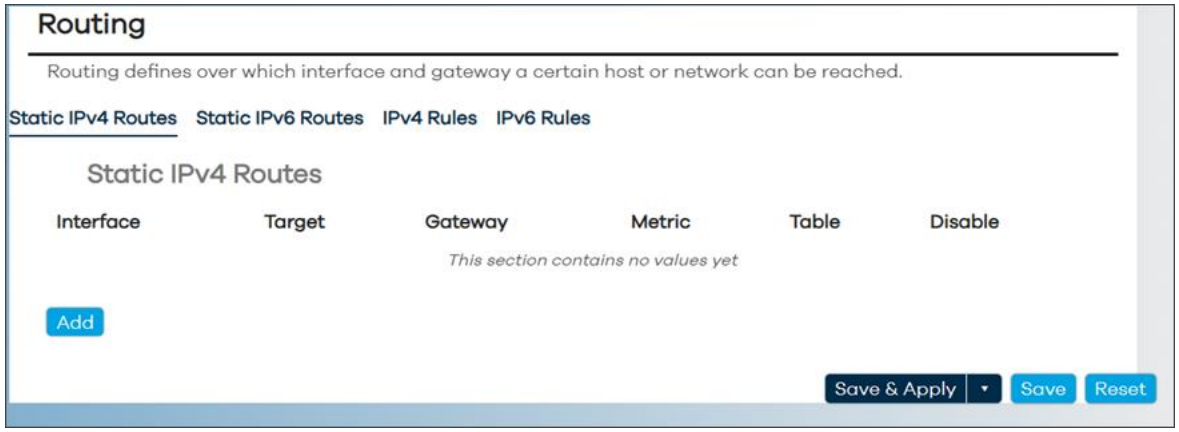


Figure 156: Routing page – Static IPv4 Routes

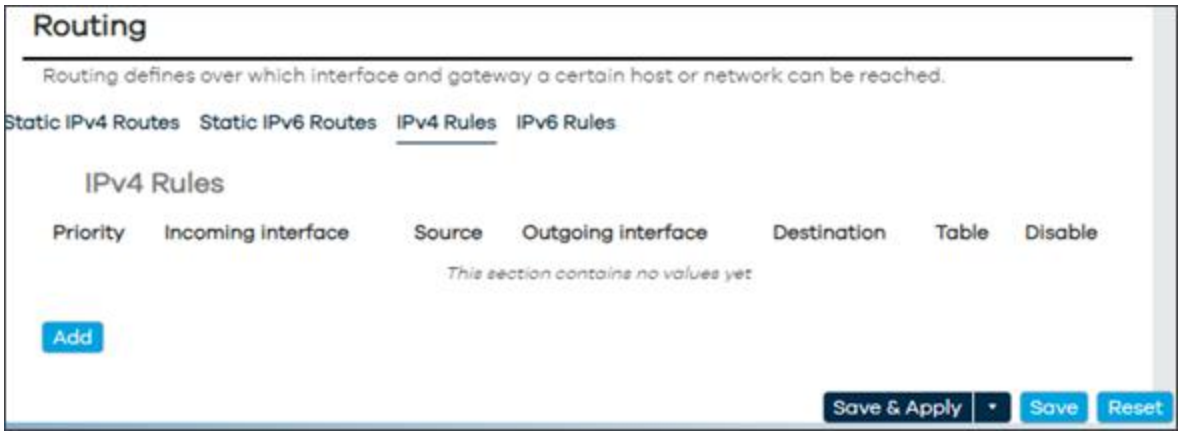


Figure 157: Routing page – IPv4 Rules tab

4.4.3.1 Adding Routes

When adding routes, the user will be presented with **General Settings** and **Advanced Settings**.

! **WARNING:** Settings in this area should be left at default values and any changes should only be made by experienced users.

Under **General Settings**, the following parameters are available:

- **Interface**: set to **unspecified**. Options are lan, loopback, wan, and wwan. Specifies the logical interface name of the parent (or master) interface this route belongs to.
- **Route Type**: set to **unicast**. Options are: local, broadcast, multicast, unreachable, prohibit, blackhole, and anycast. Specifies the route type to be created.
- **Target**: set to **0.0.0.0/0**. Network address.
- **Gateway**: set to **192.168.0.1**. Specifies the network gateway. If omitted, the gateway from the parent interface is taken if any, otherwise creates a link scope route. If set to 0.0.0.0 no gateway will be specified for the route.

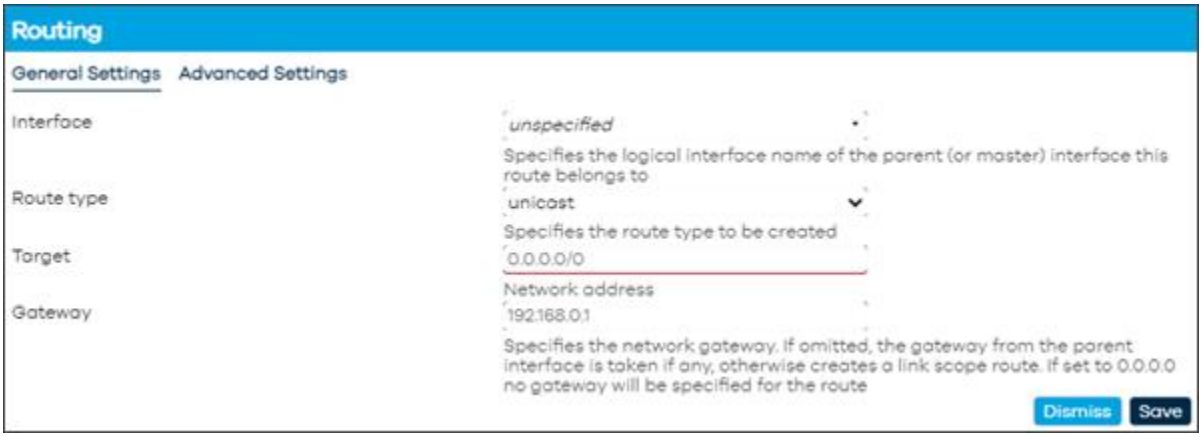


Figure 158: Routing page – General Settings tab

Under **Advanced Settings**, the following parameters are available:

- **Metric**: set to **0**. Specifies the route metric to use.
- **MTU**: set to **1500**. Defines a specific MTU for this route.
- **Table**: set to **unspecified**. Options are: prelocal (128), local (255), main (254), default (253), and custom. The rule target is a table lookup ID: a numeric table index ranging from 0 to 65535 or symbol alias declared in /etc/iproute2/rt_tables. Special aliases local (255), main (254) and default (253) are also valid.
- **Source**: set to **auto**. Options are 192.168.113.1 or local IP address of device, derived IP address for wwan, or custom. Specifies the preferred source address when sending to destinations covered by the target.
- **On-Link**: box is unchecked. When enabled, gateway is on-link even if the gateway does not match any interface prefix.

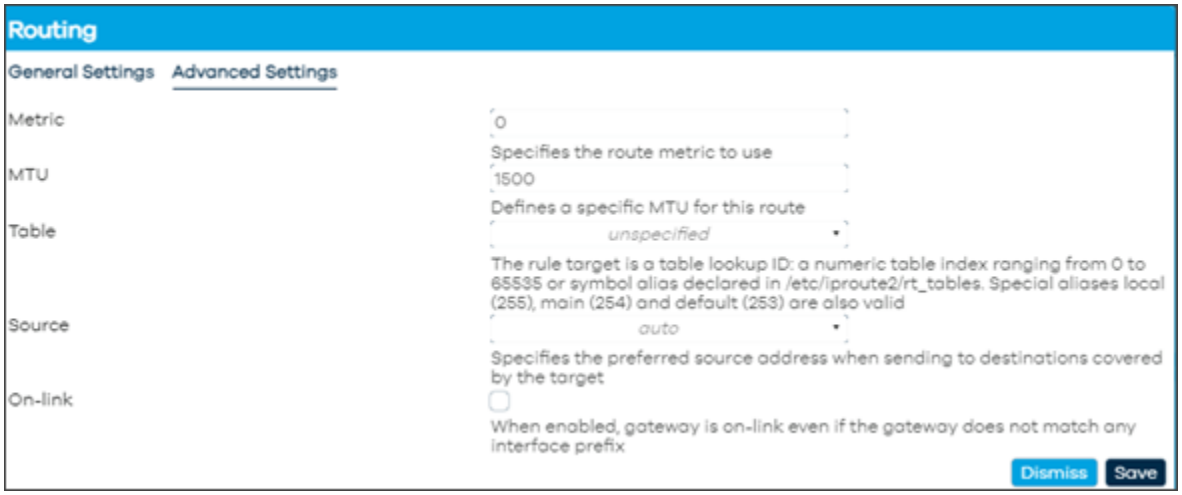


Figure 159: Routing page – Advanced Settings tab

4.4.3.2 Adding Rules

When adding rules, the user will be presented **General Settings** and **Advanced Settings**.

! WARNING: Settings in this area should be left at default values and any changes should only be made by experienced users.

Under **General Settings**, the following parameters are available:

- **Priority**: set to **30000**
- **Rule type**: set to **unicast**. Specifies the ordering of the IP rules. Other options are: unreachable, prohibit, blackhole, and throw.
- **Incoming interface**: set to **unspecified**. Other options are: lan, loopback, wan, and wwan. Specifies the incoming logical interface name.
- **Source**: set to **0.0.0.0/0**. Specifies the source subnet to match (CIDR notation).

- **Outgoing interface**: set to unspecified. Specifies the outgoing logical interface name.
- **Destination**: set to **0.0.0.0/0**. Specifies the destination subnet to match (CIDR notation).
- **Table**: set to **unspecified**. Options are: prelocal (128), local (255), main (254), default (253), and custom. The rule target is a table lookup ID: a numeric table index ranging from 0 to 65535 or symbol alias declared in /etc/iproute2/rt_tables. Special aliases local (255), main (254) and default (253) are also valid.

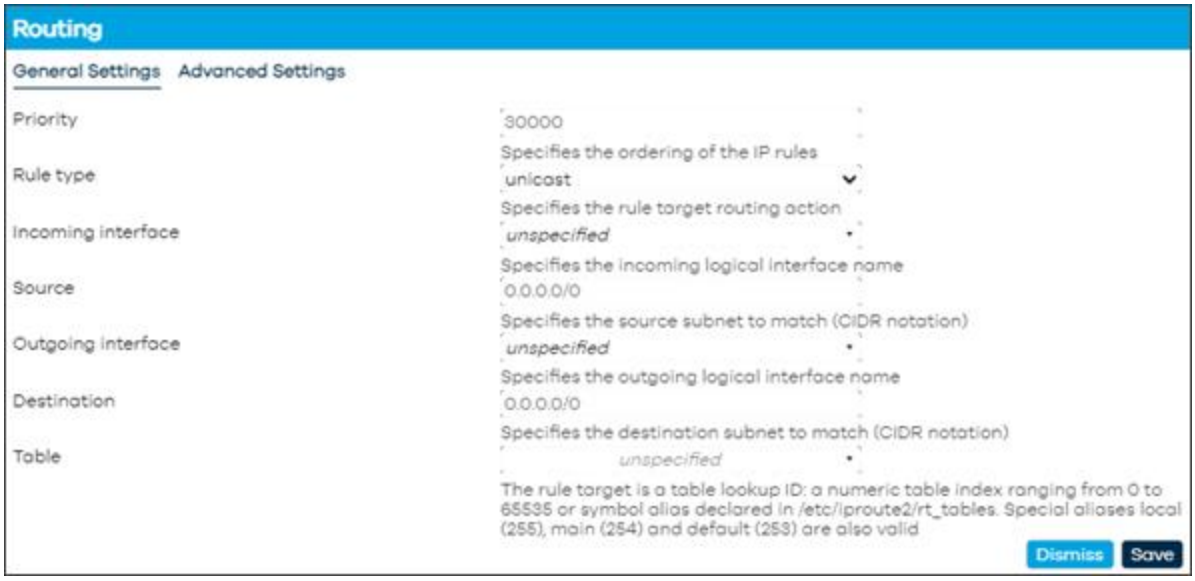


Figure 160: Routing page – General settings tab

Under **Advanced Settings**, the following parameters are available:

- **Jump to rule**: set to **80000**. The rule target is a jump to another rule specified by its priority value.
- **Firewall mark**: set to **0x1/0xf**. Specifies the fwmark and optionally its mask to match, e.g. 0xFF to match mark 255 or 0x0/0x1 to match any even mark value.
- **Type of service**: set to **10**. Specifies the TOS value to match in IP headers.
- **User identifier**: set to **1000-1005**. Specifies an individual UID or range of UIDs to match, e.g. 1000 to match corresponding UID or 1000-1005 to inclusively match all UIDs within the corresponding range.
- **Prefix suppressor**: set to **24**. Reject routing decisions that have a prefix length less than or equal to the specified value.
- **Invert match**: box is unchecked. If set, the meaning of the match options is inverted.

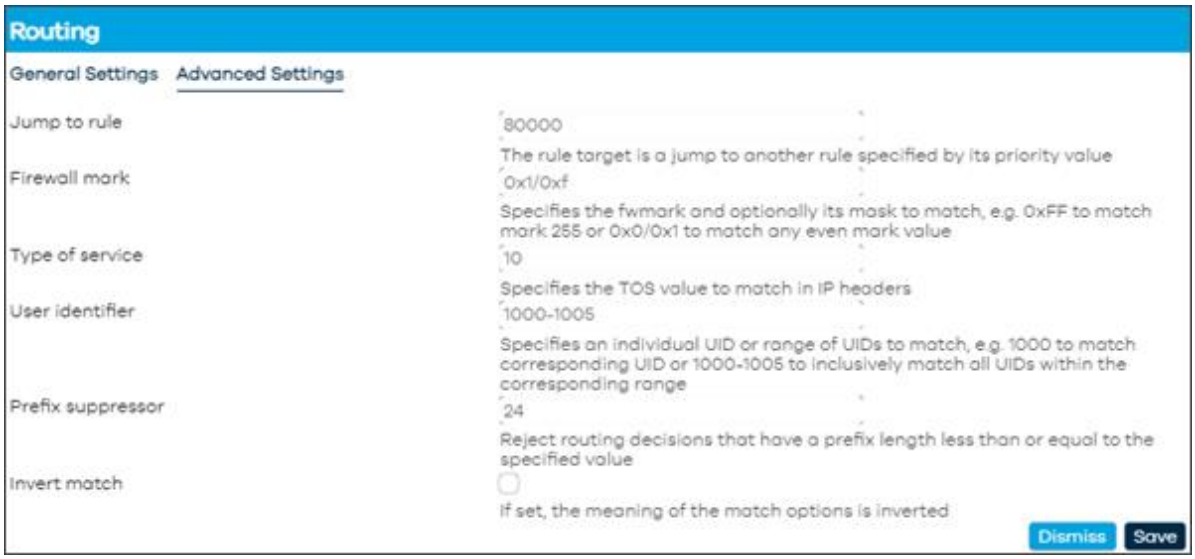


Figure 161: Routing page – Advanced Settings

4.4.4 DHCP and DNS

This page contains all the device information and attributes to manage servers, leases, and other settings:

In **General Settings**, configurable options are:

- **Domain required**: boxed is checked by default. Do not forward DNS queries without dots or domain parts.
- **Authoritative**: boxed is checked by default. This is the only DHCP server in the local network.
- **Local server**: set to **/lan/**. Never forward matching domains and subdomains, resolve from DHCP or hosts files only.
- **Local domain**: set to **lan**. Local domain suffix appended to DHCP names and hosts file entries.
- **Log queries**: boxed unchecked by default. Write received DNS queries to syslog.
- **DNS forwardings**: set to **/example/10.1.2.3**. Can add more as needed. List of upstream resolvers to forward queries to.
- **Addresses**: set to **/router.local/router.lan/192.168.0.1**. Resolve specified FQDNs to an IP.
  - Syntax: /fqdn[/fqdn…]/[ipaddr].
  - /#/ matches any domain. /example.com/ returns NXDOMAIN.
  - /example.com/# returns NULL addresses (0.0.0.0 and ::) for example.com and its subdomains. Can add more as needed.
- **IP sets**: set to **/example.org/ipset6**. List of IP sets to populate with the IPs of DNS lookup results of the FQDNs also specified here. Can add more as needed.
- **Rebind protection**: box is unchecked by default. Discard upstream responses containing RFC1918 addresses.
- **Local service only**: box is checked by default. Accept DNS queries only from hosts whose address is on a local subnet.
- **Non-wildcard**: box is checked by default. Bind dynamically to interfaces rather than wildcard address.
- **Listen interfaces**: set to **lan** by default. Listen only on the specified interfaces, and loopback if not excluded explicitly. Can add more as needed.
- **Exclude interfaces**: set to **loopback**. Do not listen on the specified interfaces. Can add more as needed.

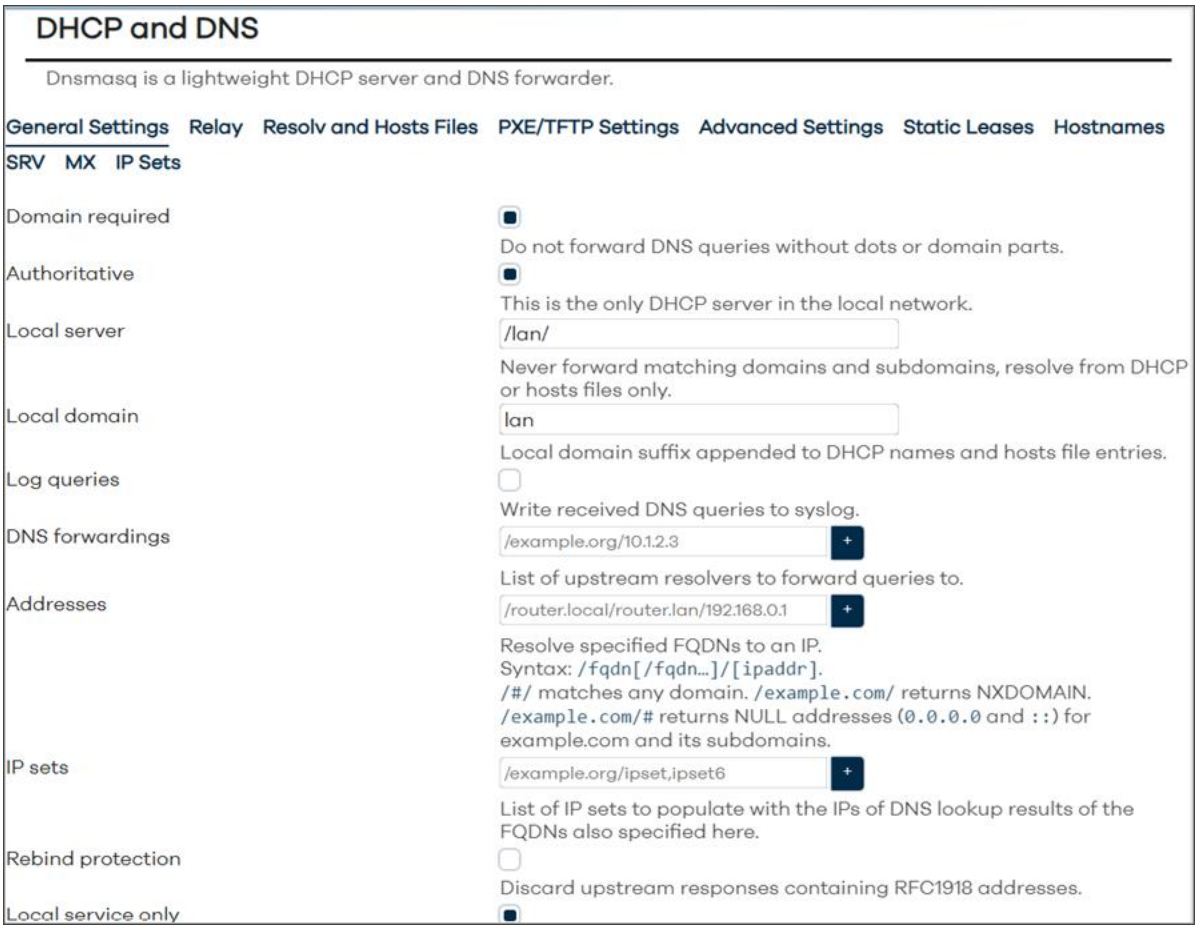


Figure 162: DHCP and DNS page – General Settings

In **Relay**, there are no values set by default.

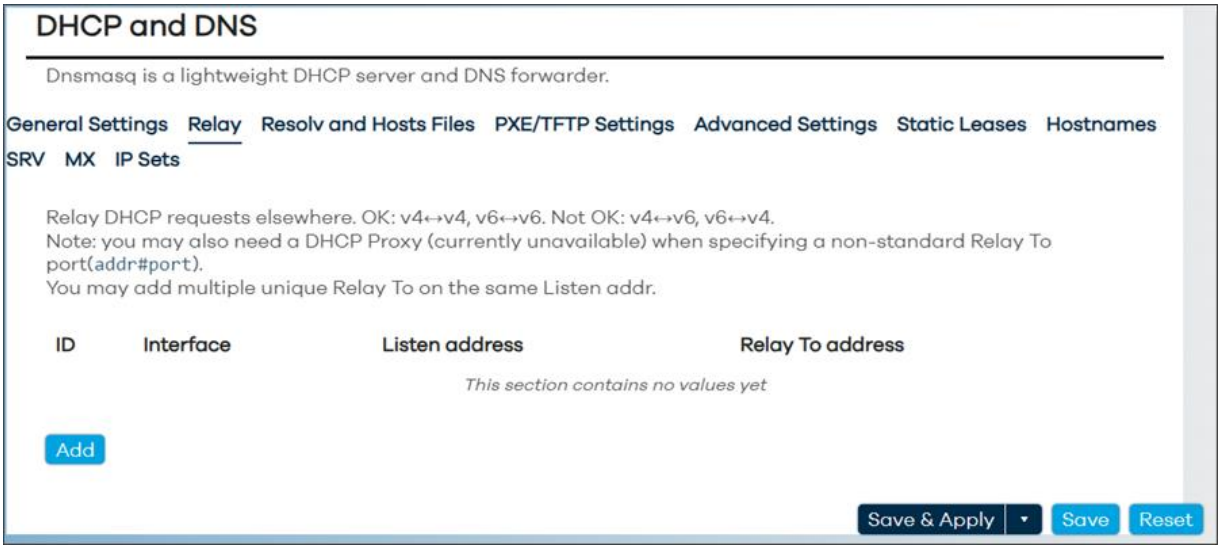


Figure 163: DHCP and DNS page – Relay tab

There is the ability to Add relay entries as follows:

- **ID**: Enter the ID
- **Interface**: set to unspecified. Options are lan, wan, wwan, and custom.
- **Listen address**: choose an IP address or mac address from the drop-down menu or enter a custom one.
- **Relay To address**: set to 192.168.10.1#535. Change as necessary.

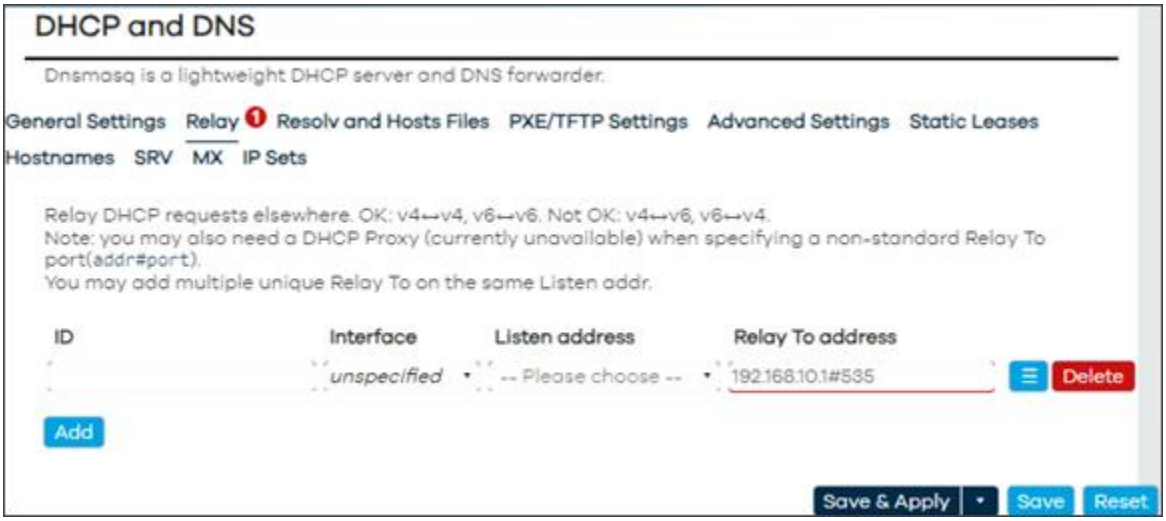


Figure 164: DHCP page – Add Relay

In **Resolv** and **Hosts Files**, these are the parameters that are configurable:

- **Use /etc/ethers**: box is checked by default. Read /etc/ethers to configure the DHCP server.
- **Lease file**: set to **/etc/awc/dhcp/dhcp.leases**. File to store DHCP lease information.
- **Ignore resolv file**: box is unchecked by default.
- **Resolv file**: set to **/tmp/resolv.conf.d/resolv.conf.auto**. File with upstream resolvers.
- **Ignore /etc/hosts**: box is unchecked by default.
- **Additional hosts files**: set to /etc/dnsmasq.hosts, Can add more as needed.

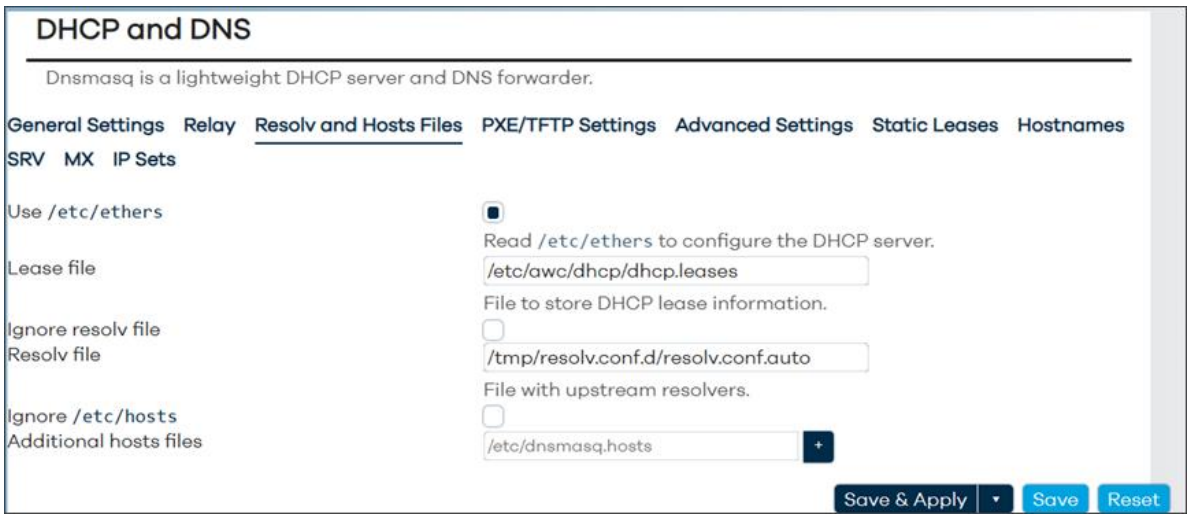


Figure 165: DHCP and DNS page – Resolv and Hosts Files tab

In **PXE/TFTP Settings**, these are the parameters that are configurable:

- **Enable TFTP server**: box is not checked by default. Check the box to enable the built-in single-instance TFTP server.

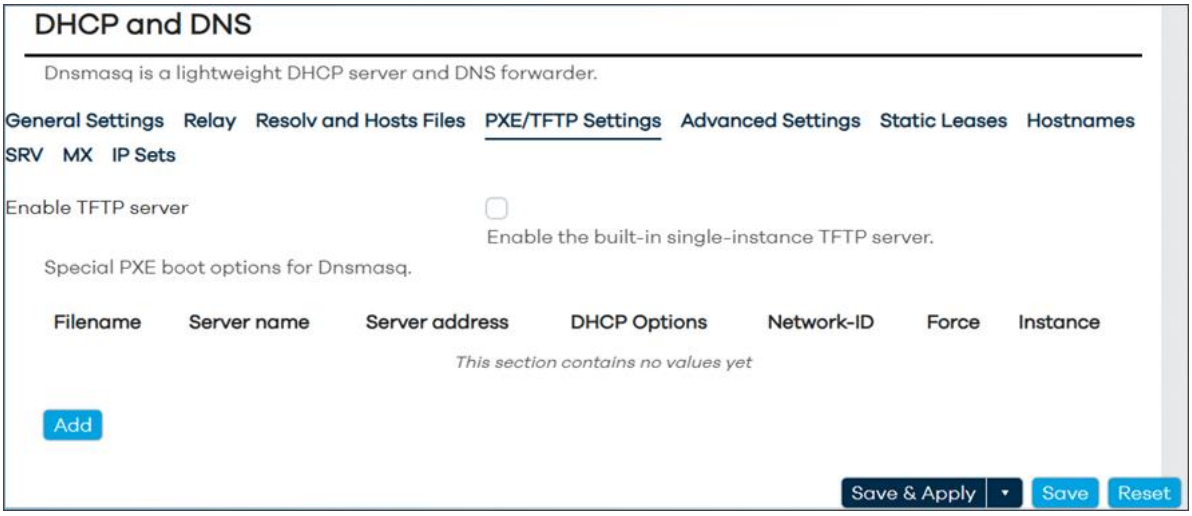


Figure 166: DHCP and DNS page – PXE/TFTP Settings tab

- **Special PXE boot options for Dnsmasq**: there are no values in this area. The ability to add will provide further configuration options:
  - **Filename**: set to **pxelinux.0**. Host requests this filename from the boot server.
  - **Server name**: set to myNAS. The hostname of the boot server.
  - **Server address**: set to **192.168.1.2**. The IP address of the boot server.

- **DHCP Options**: set to **42.192.168.14**. Options for the Network-ID. (Note: needs also Network-ID.) E.g. "42,192.168.1.4" for NTP server, "3,192.168.4.4" for default route. 0.0.0.0 means "the address of the system running dnsmasq". Can add more as needed.
- **Network-ID**: set to **unspecified**. Use the drop-down menu to choose a specific option. Apply DHCP Options to this net. (Empty = all clients).
- **Force**: box is unchecked. Always send DHCP Options. Sometimes needed, with e.g. PXELinux.
- **Instance**: set to **unspecified**. Options are 0 (Domain: lan, Local: /lan/), or custom. Dnsmasq instance to which this boot section is bound. If unspecified, the section is valid for all dnsmasq instances.

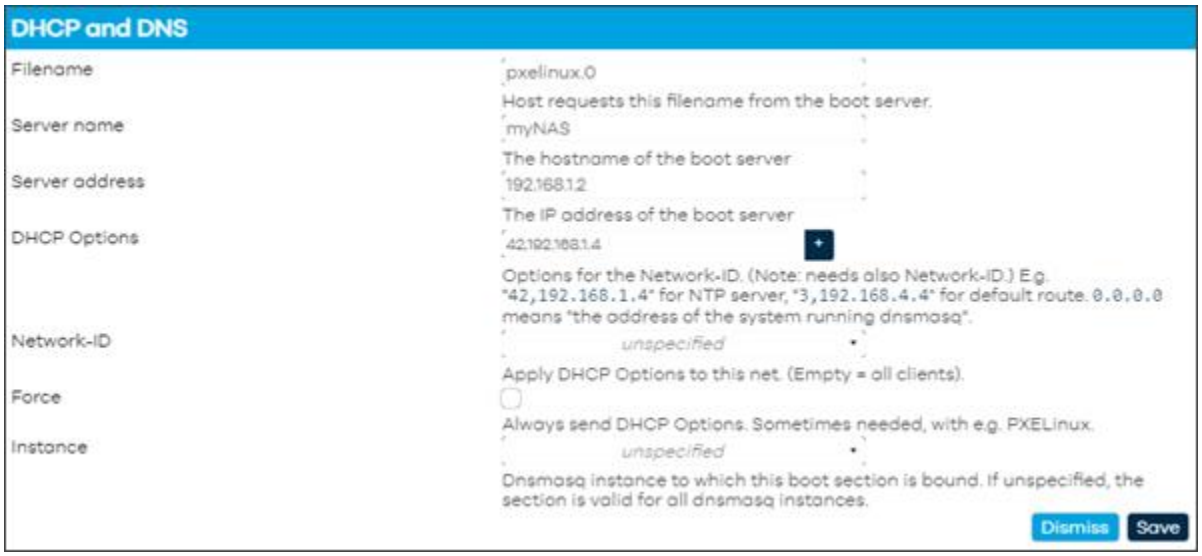


Figure 167: DHCP and DNS page – Special PXE boot options for Dnsmasq

In **Advanced Settings**, these are the available configuration options:

- **Suppress logging**: box unchecked by default. Suppress logging of the routine operation for the DHCP protocol.
- **Allocate IPs sequentially**: box unchecked by default. Allocate IP addresses sequentially, starting from the lowest available address.
- **Filter private** - box checked by default. Do not forward reverse lookups for local networks.
- **Filter SRV/SOA service discovery** - box unchecked by default. Filters SRV/SOA service discovery, to avoid triggering dial-on-demand links. May prevent VoIP or other services from working.
- **Filter IPv6 AAAA records** - box unchecked by default. Remove IPv6 addresses from the results and only return IPv4 addresses. Can be useful if ISP has IPv6 nameservers but does not provide IPv6 routing.
- **Filter IPv4 A records**: box unchecked by default. Remove IPv4 addresses from the results and only return IPv6 addresses.

- **Localise queries**: box checked by default. Return answers to DNS queries matching the subnet from which the query was received if multiple IPs are available.
- **Expand hosts**: box checked by default. Add local domain suffix to names served from hosts files.
- **No negative cache**: box unchecked by default. Do not cache negative replies, e.g. for non-existent domains.
- **Additional servers file**: set to **/etc/dnsmasq.servers**. File listing upstream resolvers, optionally domain-specific, e.g. server=1.2.3.4, server=/domain/1.2.3.4.
- **Strict order** - box unchecked by default. Upstream resolvers will be queried in the order of the resolv file.
- **All servers** - box unchecked by default. Query all available upstream resolvers.
- **Ips to override with NXDOMAIN**: set to 64.94.110.11. List of IP addresses to convert into NXDOMAIN responses. Can add more as needed.
- **DNS server port**: set to **53**. Listening port for inbound DNS queries.
- **DNS query port**: set to **any**. Fixed source port for outbound DNS queries.
- **Max. DHCP leases**: set to **unlimited**. Maximum allowed number of active DHCP leases.
- **Max. EDNS0 packet size**: set to **1232**. Maximum allowed size of EDNS0 UDP packets.
- **Max. concurrent queries**: set to **1024**. Maximum allowed number of concurrent DNS queries.
- **Size of DNS query cache**: set to **1024**. Number of cached DNS entries, 10000 is maximum, 0 is no caching.

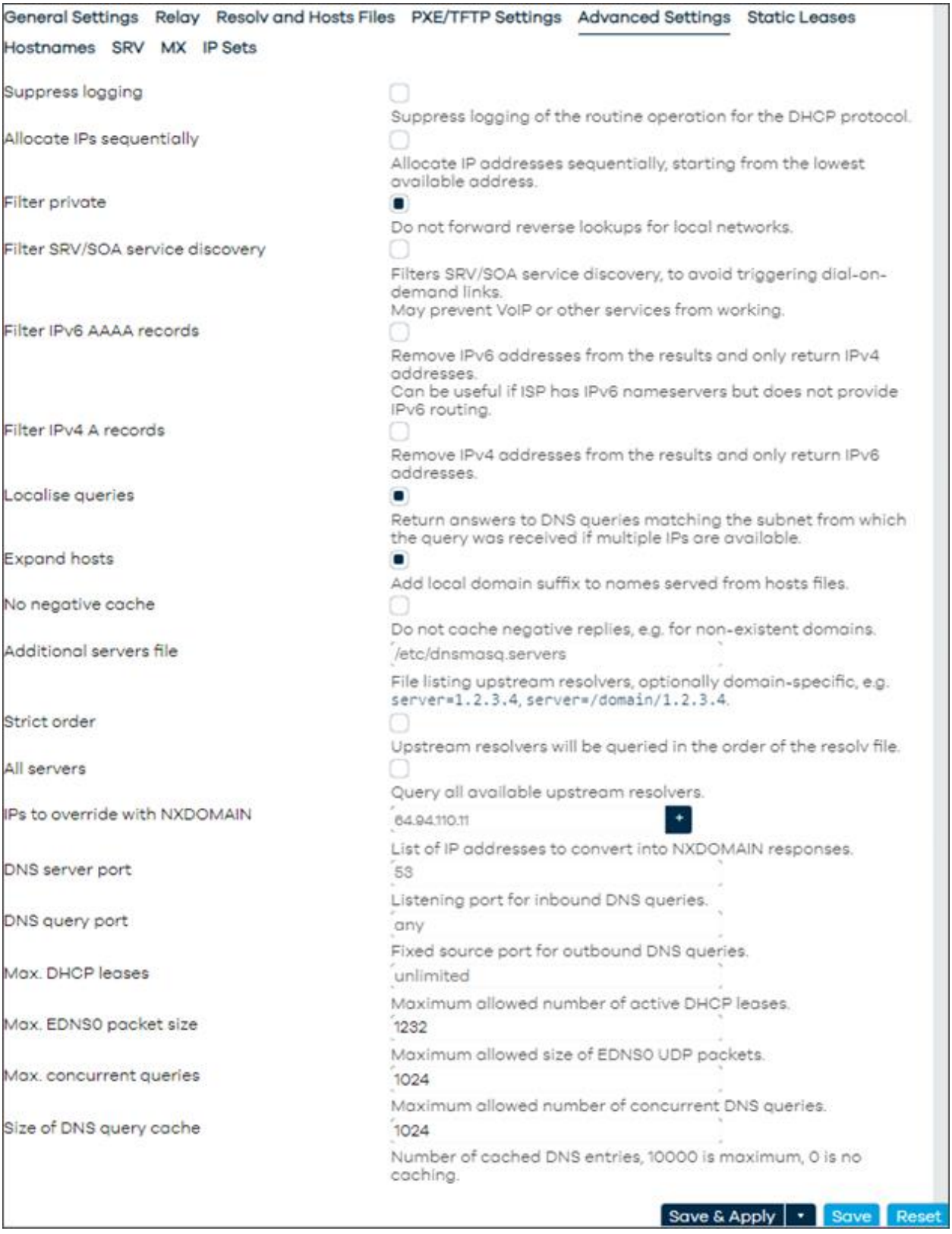


Figure 168: DHCP and DNS page – Advanced Settings tab

In **Static Leases**, there is a list of Active DHCP and DHCPv6 Leases.

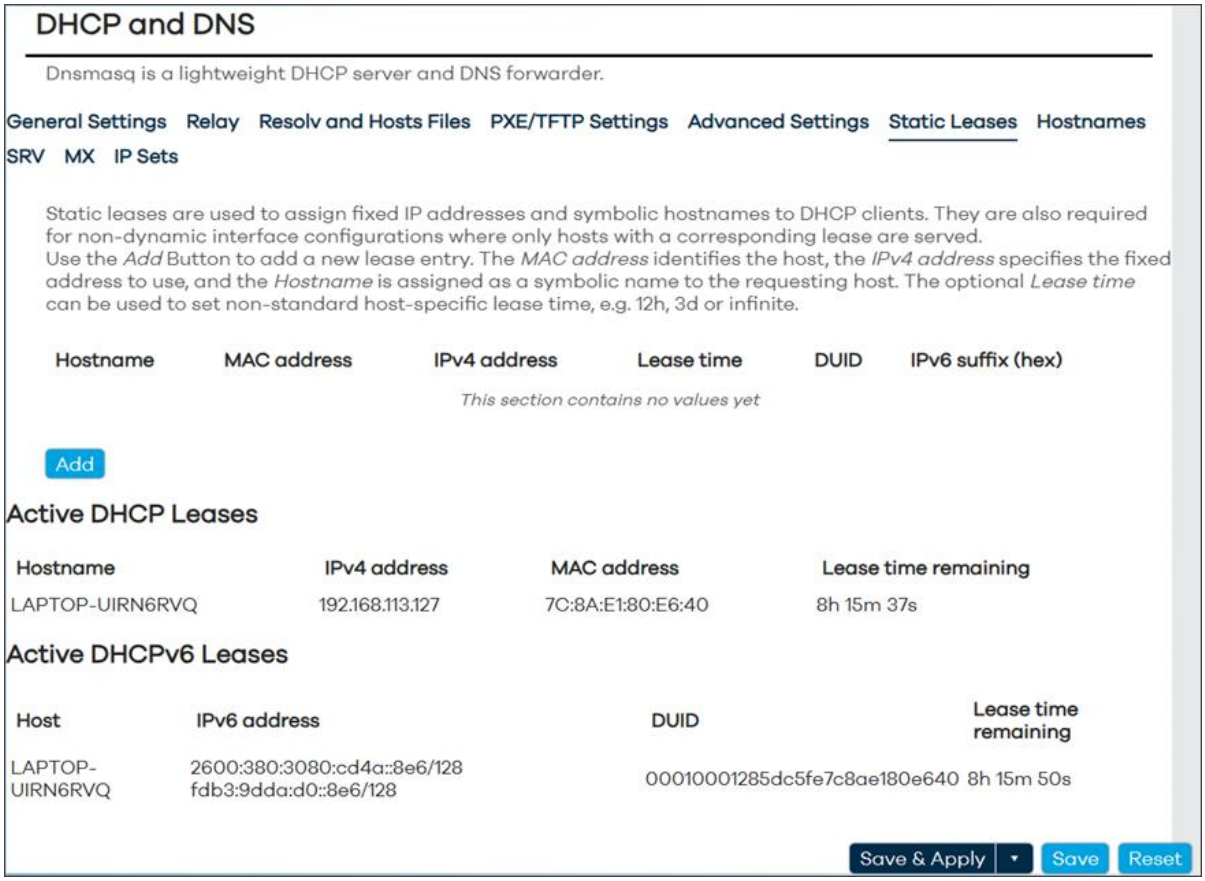


Figure 169: DHCP and DNS page – Static Leases tab

There are values configured in this area by default, but there is an option to **Add** as follows:

- **Hostname**: enter hostname
- **MAC address**: set to unspecified. Choose one from the drop-down menu or choose custom.
- **IPv4 address**: set to unspecified. Choose one from the drop-down menu or choose custom.
- **Lease time**: set the lease time
- **DUID**: set to unspecified. Choose one from the drop-down menu or choose custom.
- **IPv6 suffix (hex)**: enter the IPv6 suffix in hex value.

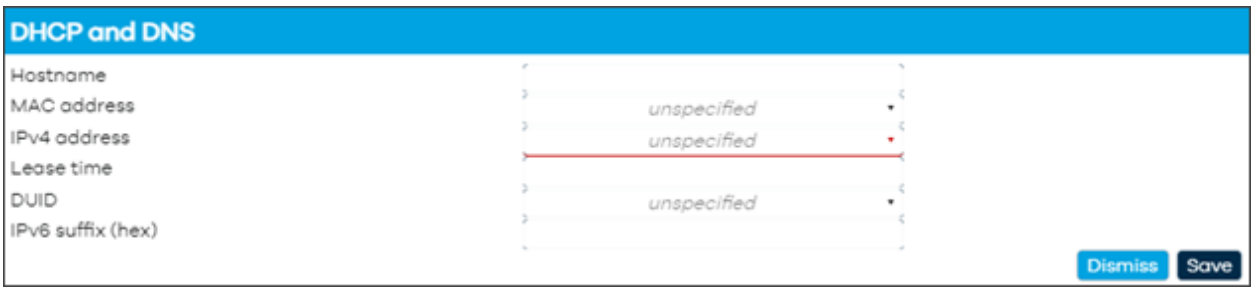


Figure 170: DHCP and DNS page – Add Static Lease

In **Hostnames**, there are no values configured.

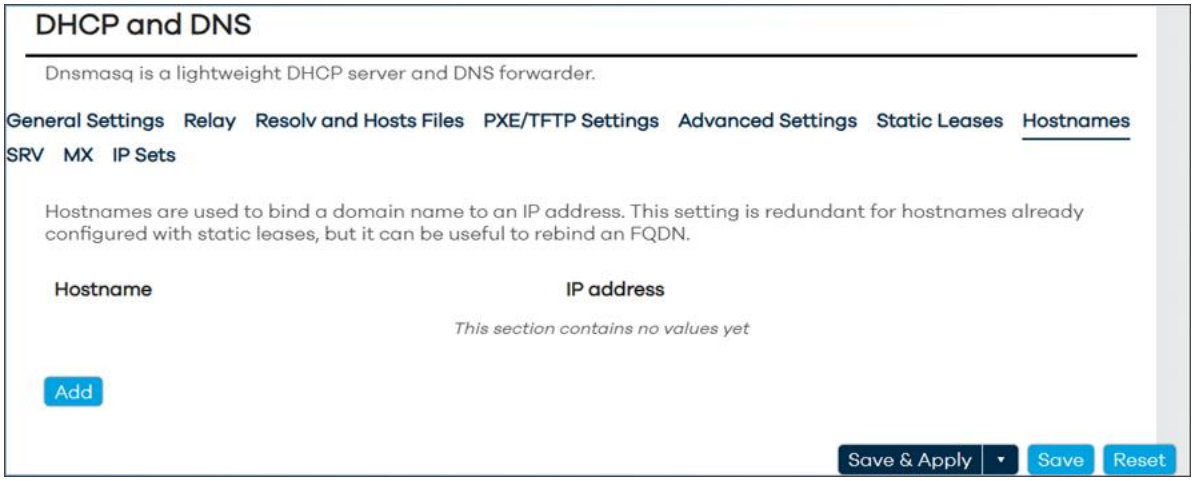


Figure 171: DHCP and DNS page – Hostnames tab

There is an option to Add as follows:

- **Hostname**: enter the hostname
- **IP address** - Choose one from the drop-down menu or choose custom.

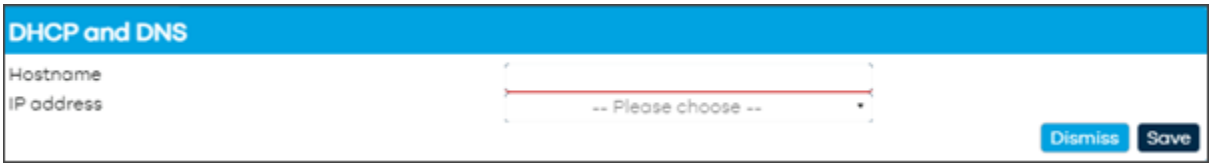


Figure 172: DHCP and DNS page – Adding a hostname

In **SRV**, there are no values configured in this area by default.

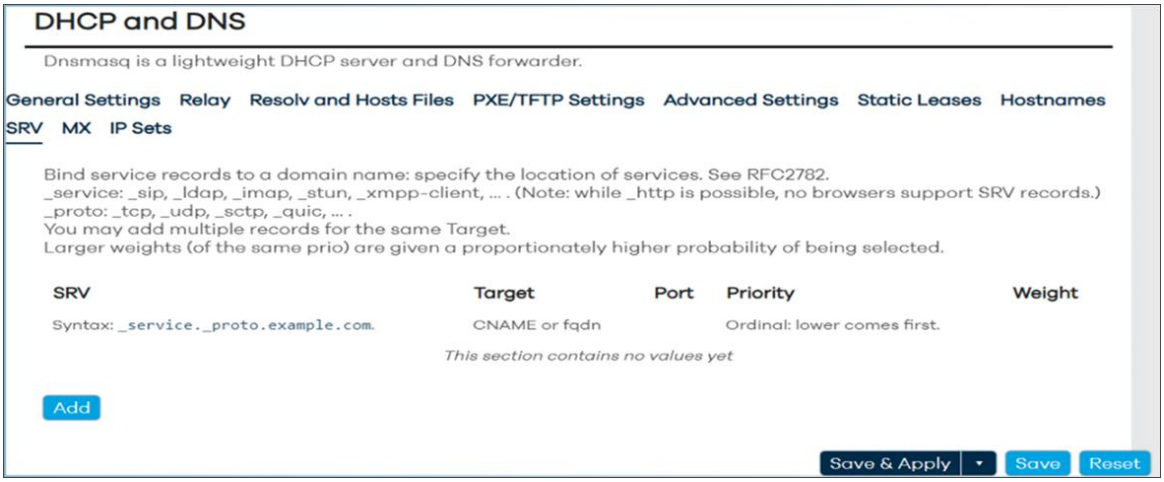


Figure 173: DHCP and DNS page – SRV tab

There is an option to Add as follows:

- **SRV**: example is given. Enter appropriate domain
- **Target**: enter target value (CNAME or fqdn)
- **Port**: set to 5060
- **Priority**: set to 10
- **Weight**: set to 50

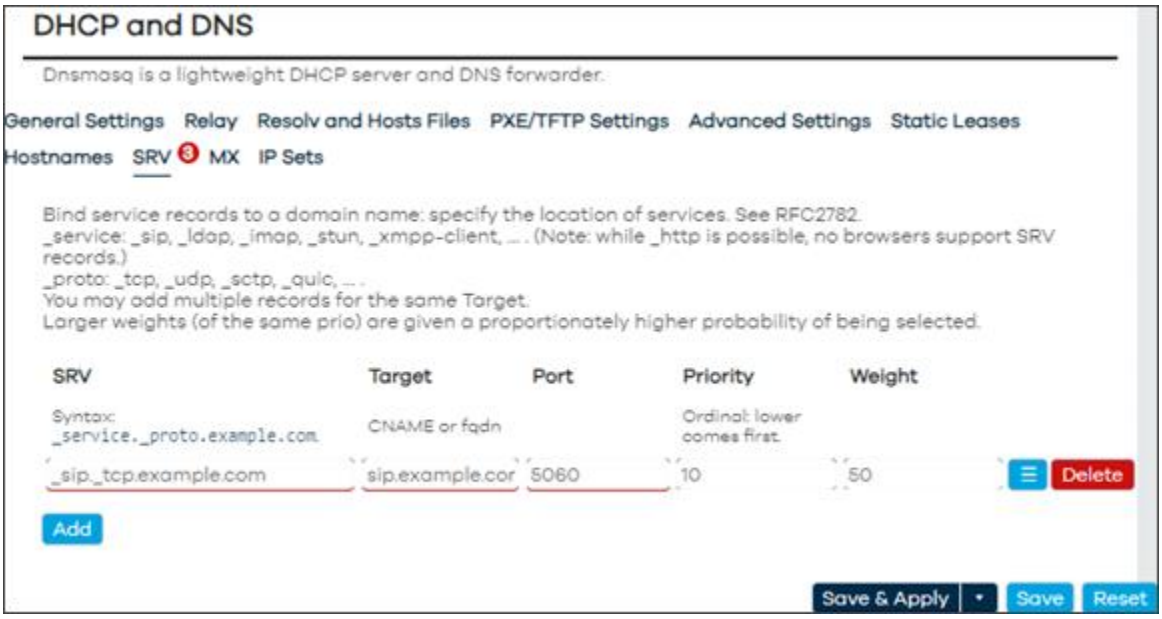


Figure 174: DHCP and DNS page – SRV tab

In **MX**, there are no values configured in this area by default.

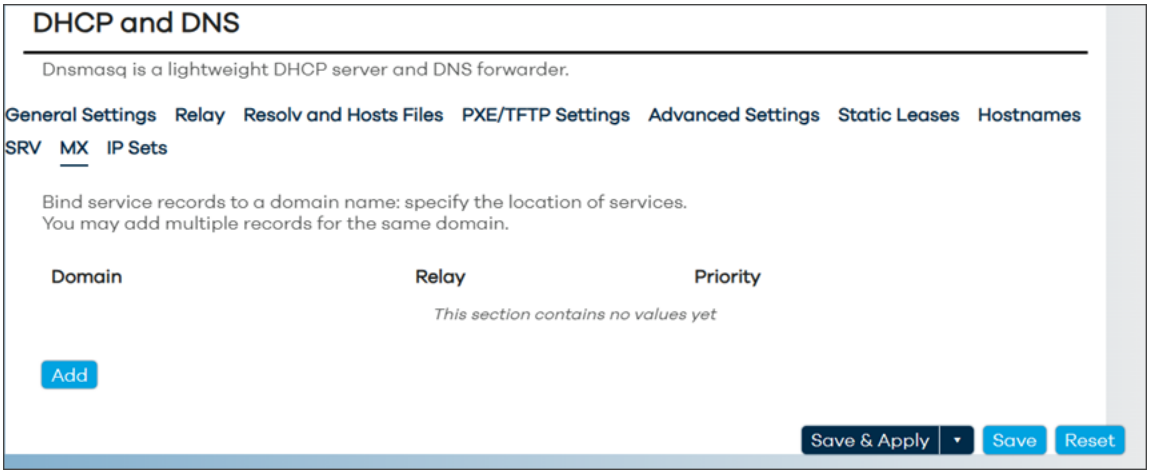


Figure 175: DHCP and DNS page – MX tab

There is an option to Add as follows:

- **Domain**: enter domain
- **Relay**: enter relay
- **Priority**: set to 0

In **IP Sets**, there are no values configured in this area by default.

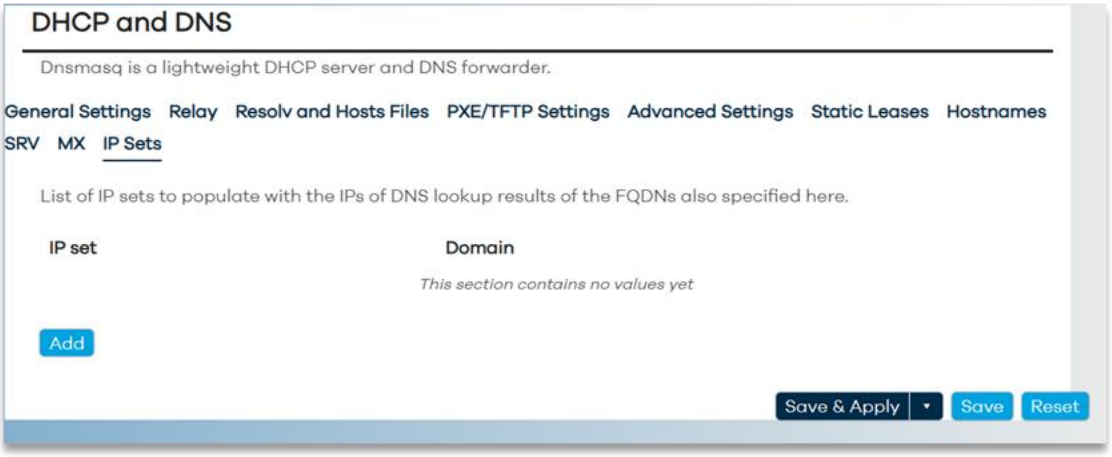


Figure 176: DHCP and DNS page – IP Sets tab

There is an option to Add as follows:

- **IP set**: add IP sets as needed
- **Domain**: add domains as needed

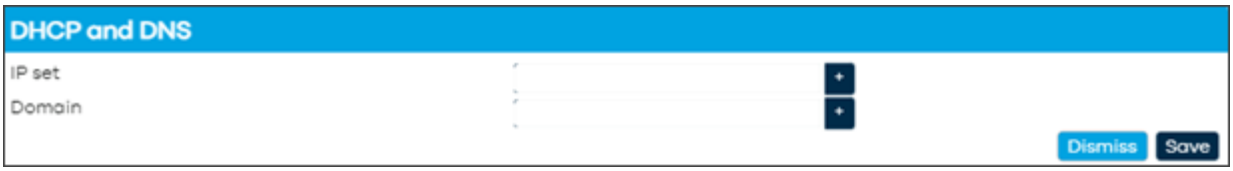


Figure 177: DHCP and DNS page – Adding an IP Set

4.4.5 Diagnostics

This page will allow the user to execute various network commands to check the connection and name resolution to other systems.

The options are:

- **IPv4 Ping**: ping remote device to verify connectivity
- **IPv4 Traceroute**: traceroute to remote device to verify connectivity, hops, etc
- **Nslookup**: verify name resolution

➲ **Note**: the default server in the fields "openwrt.org", can be modified as needed.

Figure 178: Diagnostics page – Checking connection and name resolution to other systems

4.4.6 Firewall

This page has five tabs: **General Settings**, **Port Forwards**, **Traffic Rules**, **NAT Rules**, and **IP Sets**.

4.4.6.1 Firewall – Zone Settings

The firewall creates zones over your network interfaces to control network traffic flow.

In **General Settings**, the following settings are:

- **Enable SYN-flood protection**: box checked by default
- **Drop invalid packets**: box unchecked by default
- **Input**: set to accept. Other options are to reject or drop.
- **Output**: set to accept. Other options are to reject or drop.
- **Forward**: set to reject. Other options are to accept or drop.

➲ **Note:** The following are experimental features. Not fully compatible with QoS/SQM:

- **Software flow offloading**: box unchecked by default.
- **Zone forwardings setup:**
  - **lan → wan**: Adjust Input, Output, Forward, and Masquerading as needed.
  - **wan → REJECT**

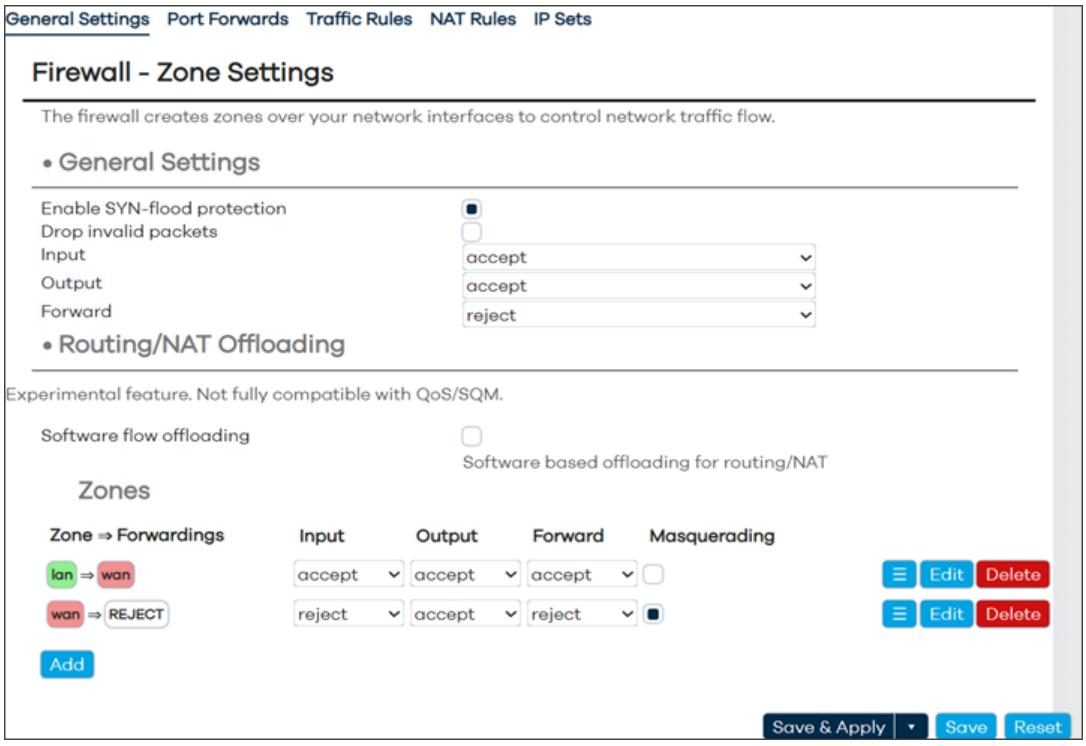


Figure 179: Firewall – Zone Settings page – General Settings tab

Edit button these zone forwards reveals further settings: **General Settings**, **Advanced Settings** and **Conntrack Settings**.

In **General Settings**:

- **Name**: set to **lan**.
- **Input**: set to **accept**. Other options are reject and drop.
- **Output**: set to **accept**. Other options are reject and drop.
- **Forward**: set to **accept**. Other options are reject and drop.
- **Masquerading**: box is unchecked. Enable network address and port translation IPv4 (NAT4 or NAPT4) for outbound traffic on this zone. This is typically enabled on the wan zone.
- **MSS clamping** - box is unchecked
- **Covered networks**: set to **lan**. Other options are wan, wwan, and custom.

➲ **Note:** The options below control the forwarding policies between this zone (lan) and other zones. Destination zones cover forwarded traffic originating from lan. Source zones match forwarded traffic from other zones targeted at lan. The forwarding rule is unidirectional, e.g. a forward from lan to wan does not imply a permission to forward from wan to lan as well.

- **Allow forward from destination zones**: set to **wan** and **wwan**
- **Allow forward from source zones**: set to **unspecified**. Other options are: wan and wwan.

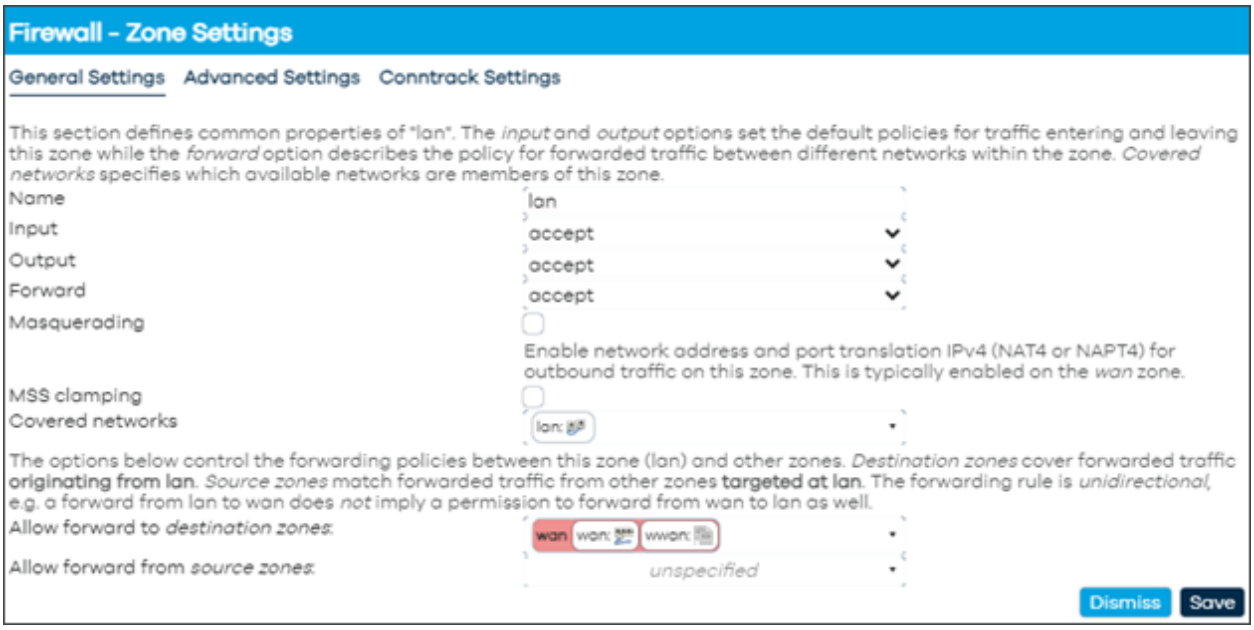


Figure 180: Firewall Zone – Zone properties

In **Advanced Settings**:

➲ **Note:** The options below control the forwarding policies between this zone (lan) and other zones. Destination zones cover forwarded traffic originating from lan. Source zones match forwarded traffic from other zones targeted at lan. The forwarding rule is unidirectional, e.g. a forward from lan to wan does not imply a permission to forward from wan to lan as well.

- **Covered devices**: set to **unspecified**. Choose from drop-down menu to choose device. Use this option to classify zone traffic by raw, non-uci managed network devices.
- **Covered subnets**: Use this option to classify zone traffic by source or destination subnet instead of networks or devices. Add as needed.
- **IPv6 Masquerading**: box is unchecked by default. Enable network address and port translation IPv6 (NAT6 or NAPT6) for outbound traffic on this zone.
- **Restrict to address family**: set to **IPv4** and **IPv6**. Other options IPv4 only or IPv6 only.
- **Restrict Masquerading to given source subnets**: set to **0.0.0.0/0**. Can add subnets as needed.
- **Restrict Masquerading to given destination subnets**: set to **0.0.0.0/0**. Can add subnets as needed.
- **Enable logging on this zone**: box is unchecked by default

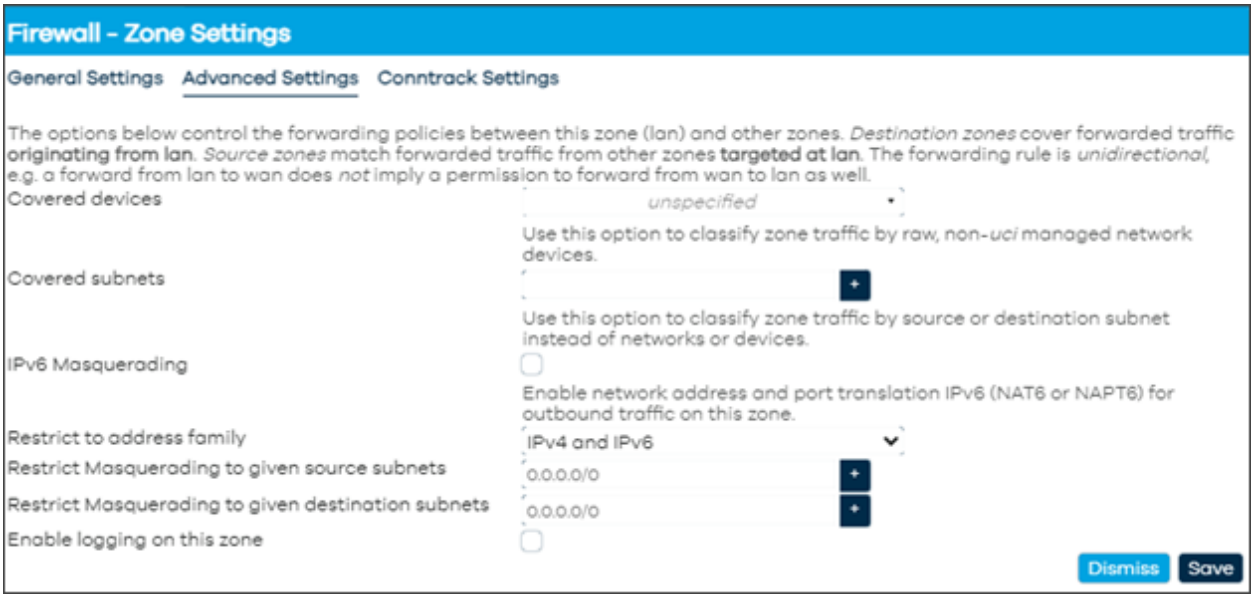


Figure 181: Firewall Zone Settings – Advanced Settings tab

In **Conntrack Settings**:

- **Allow "invalid" traffic**: box is unchecked by default. Do not install extra rules to reject forwarded traffic with conntrack state invalid. This may be required for complex asymmetric route setups.
- **Automatic helper assignment**: box is checked by default. Automatically assign conntrack helpers based on traffic protocol and port.

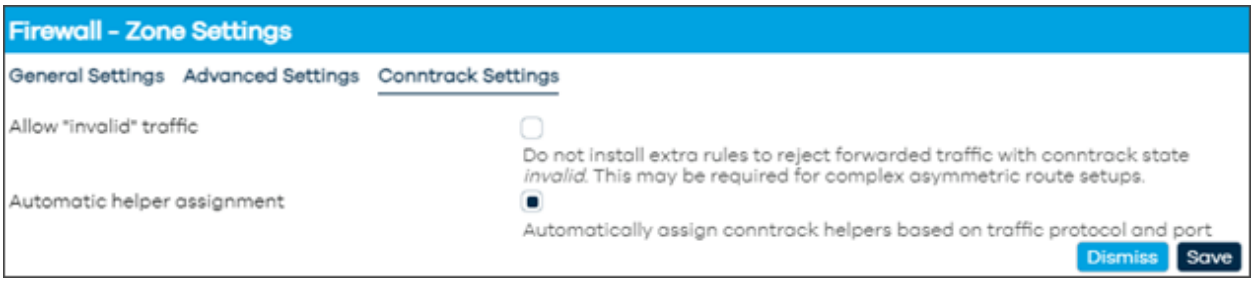


Figure 182: Firewall Zone Settings – Conntrack Settings tab

More Zones can be added as needed using the **Add** button and will be similar configuration pages as just discussed in *4.4.6.1* Firewall – Zone Settings.

4.4.6.2 Firewall – Port Forwards

In Port Forwards, the user can add the ability to allow remote computers on the Internet to connect to a specific computer or service within the private LAN.

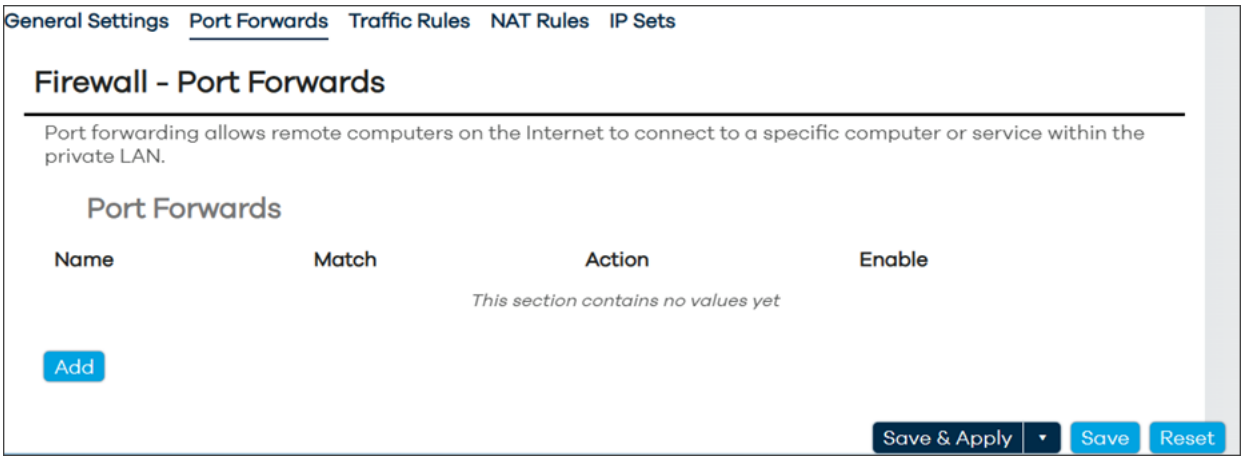


Figure 183: Firewall – Port Forwards page

Click on the '**Add**' button to enter Port Forwarding rule. Settings in **General Settings**:

- **Name**: Enter a name for the Port Forwarding rule
- **Restrict to address family**: set to **automatic**. Other options are IPv4 only and IPv6 only
- **Protocol**: set to **TCP** and **UDP**. Other options are Any, ICMP and custom

- **Source zone**: set to **wan** and **wwan**. Other options are unspecified and lan.
- **External port**: set the external port. Match incoming traffic directed at the given destination port or port range on this host.
- **Destination zone**: set to **lan**. Other options are unspecified, wan, and wwan
- **Internal IP address**: set to **any**. Other options are specified in the drop down menu. Redirect matched incoming traffic to the specified internal host.
- **Internal port**: set to **any**. Redirect matched incoming traffic to the given port on the internal host.

Figure 184: Firewall Port Forwards – General Settings tab

In **Advanced Settings**, the following settings are:

- **Use ipset**: enter ipset to use
- **Source MAC address**: choose from drop down menu. Only match incoming traffic from these MACs.
- **Source IP address**: set to **any**. Other options are displayed in the drop-down menu. Only match incoming traffic from this IP or range.
- **Source port**: set to **any**. Only match incoming traffic originating from the given source port or port range on the client host.
- **External IP address**: set to **any**. Other options are displayed in the drop-down menu.
- **Enable NAT Loopback**: box checked by default.
- **Loopback source IP**: set to **Use internal IP address**. Other option is external IP address
- **Match helper**: set to **any**. Other options in the drop-down menu are: AMANDA, FTP, RAS, Q.931, IRC, NETBIOS-NS, PPTP, SANE, SIP, SNMP, TFTP, RSTP, or custom. Match traffic using the specified connection tracking helper.

- **Match mark**: enter a match mark that matches a specific firewall mark or a range of different marks.
- **Limit matching**: set to **unlimited**. Other options are 10/second, 60/minute, 3/hour, 500/day, or custom. Limits traffic matching to the specified rate.

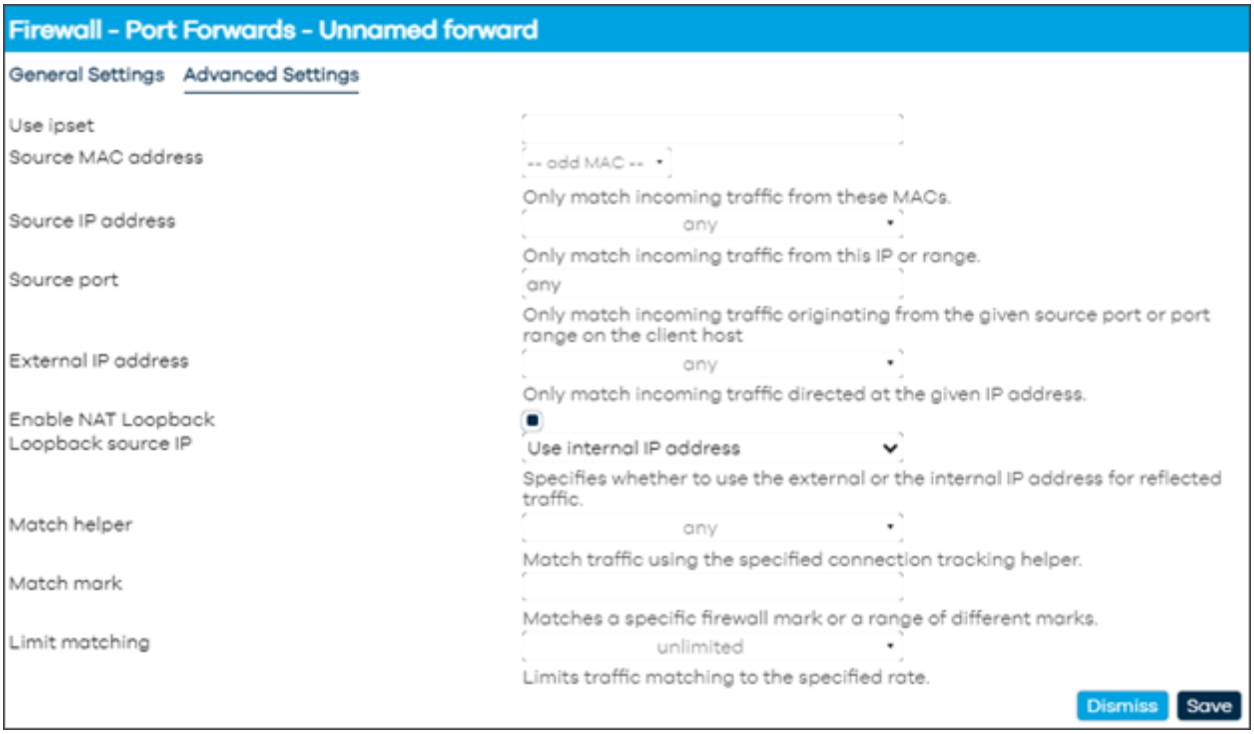


Figure 185: Firewall Port Forwards – Advanced Settings tab

4.4.6.3 Firewall – Traffic Rules

In **Traffic Rules**, define policies for packets traveling between different zones, for example to reject traffic between certain hosts or to open WAN ports on the router. Traffic Rule options are:

- **Allow-DHCP-Renew**: set to match incoming **IPv4**, protocol **UDP** from **wan** to this device, port **68**. Action set to **Accept** input and **Enabled** (box checked).
- **Allow-Ping**: set to match incoming **IPv4**, protocol **ICMP** from **wan** to *this device*. Action set to **Accept input** and **Enabled** (box checked).
- **Allow-IGMP**: set to match incoming **IPv4**, protocol IGMP from wan to this device. Action set to **Accept input** and **Enabled** (box checked).
- **Allow-DHCPv6**: set to match incoming **IPv6**, protocol **UDP** from **wan**, IP **fc00::/6** to this device, IP fc00::/6, port 546. Action set to **Accept input** and **Enabled** (box checked).
- **Allow-MLD**: set to match incoming **IPv6**, protocol **ICMP** from **wan**, IP **fe80::/10** to this device. Action set to **Accept input** and **Enabled** (box checked).

- **Allow-ICMPv6-Input**: set to match incoming **IPv6**, protocol **ICMP** from **wan** to this device. Limit matching to 1000 packets per second. Action set to **Accept input** and **Enabled** (box checked).
- **Allow-ICMPv6-Forward**: set to match incoming **IPv6**, protocol **ICMP** from **wan** to **any zone**. Limit matching to 1000 packets per second. Action set to **Accept input** and **Enabled** (box checked).
- **Allow-IPSEC-ESP**: set to match Forwarded **IPv4** and **IPv6**, protocol IPSEC-ESP from **wan** to **lan**. Action set to Accept input and Enabled (box checked).
- **Allow-ISAKMP**: set to match Forwarded **IPv4** and **IPv6**, protocol **UDP** from **wan** to **lan**, port **500**. Action set to Accept input and Enabled (box checked).
- **Add** your own: select to add a rule not listed above.

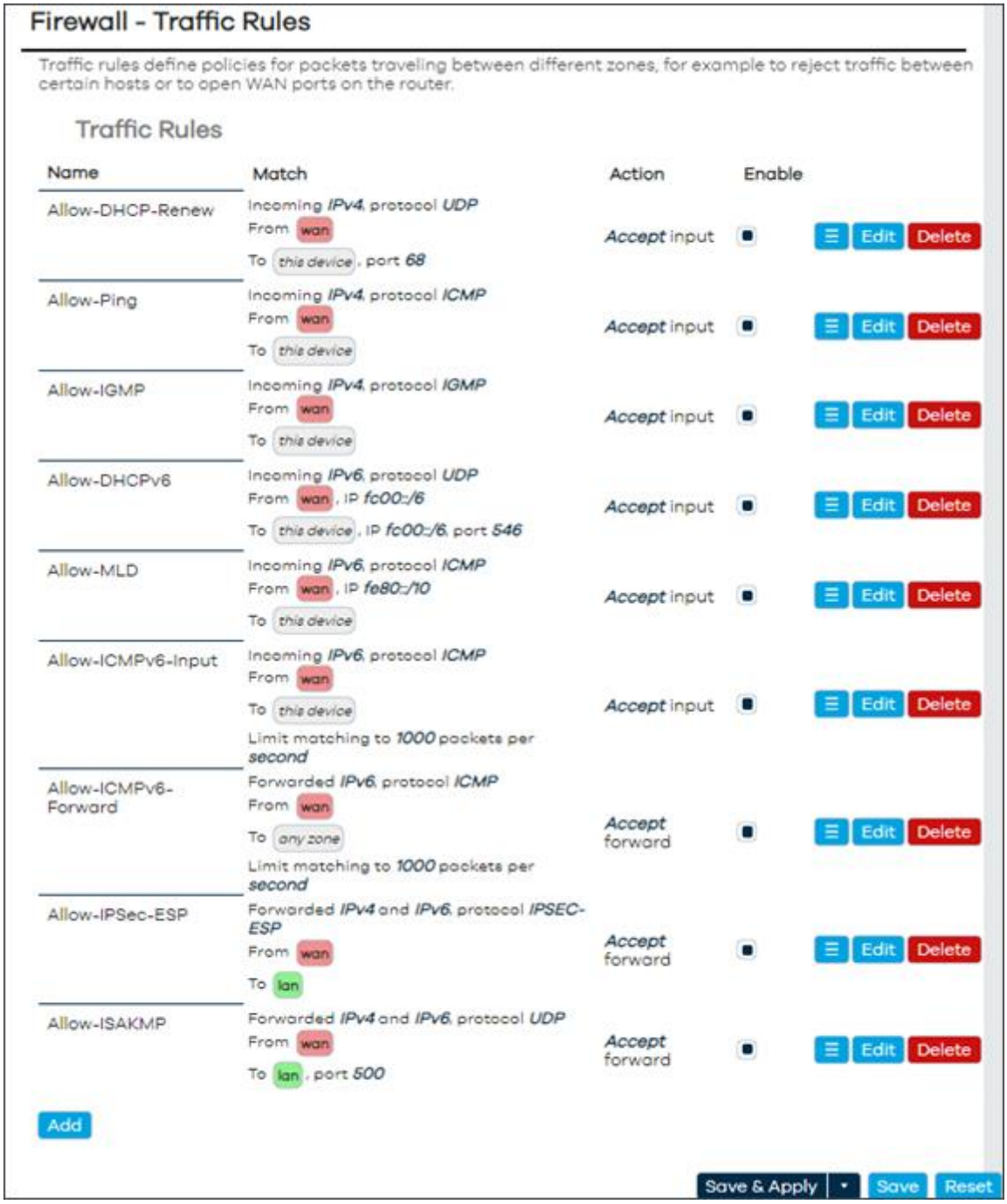


Figure 186: Firewall Traffic Rules page

Use the **Edit** button next to a specific Traffic Rule to adjust and fine tune:

General Settings:

Figure 187: Firewall Traffic Rules – Showing the Allow DHCP Renew rule General Settings

Advanced Settings:

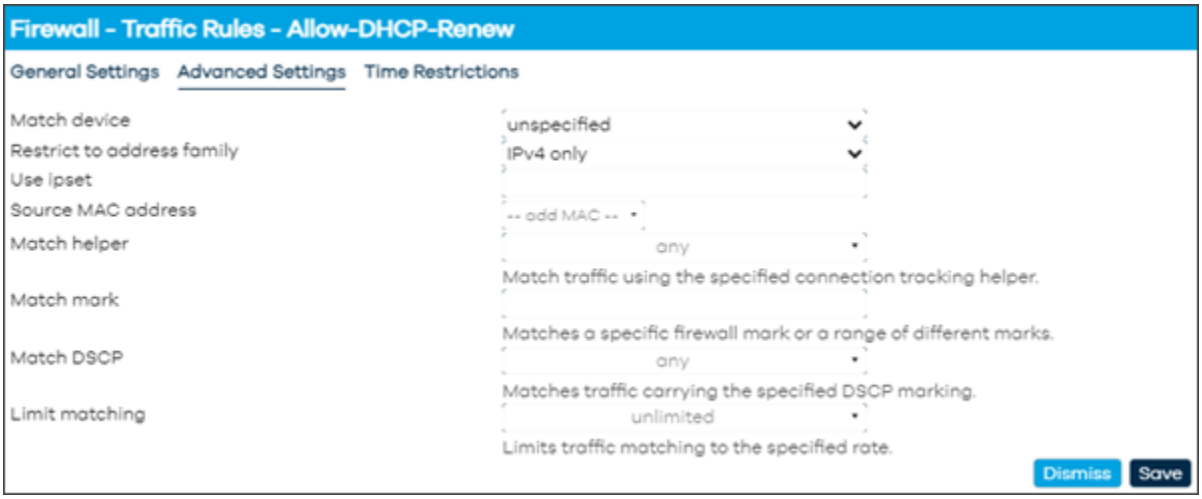


Figure 188: Firewall Traffic Rules – Showing the Allow DHCP Renew rule Advanced Settings

Time Restrictions:

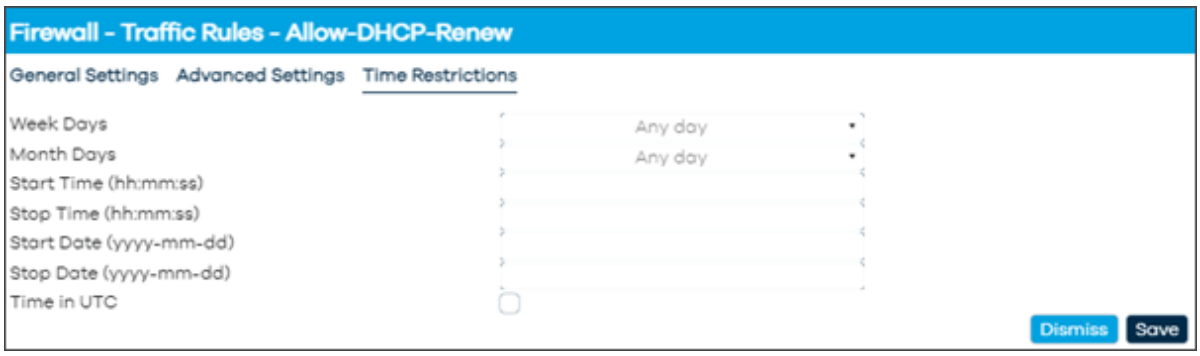


Figure 189: Firewall Traffic Rules Showing the Allow DHCP Renew rule Time Restrictions

4.4.6.4 Firewall – NAT Rules

In **NAT Rules**, allows fine grained control over the source IP to use for outbound or forwarded traffic.

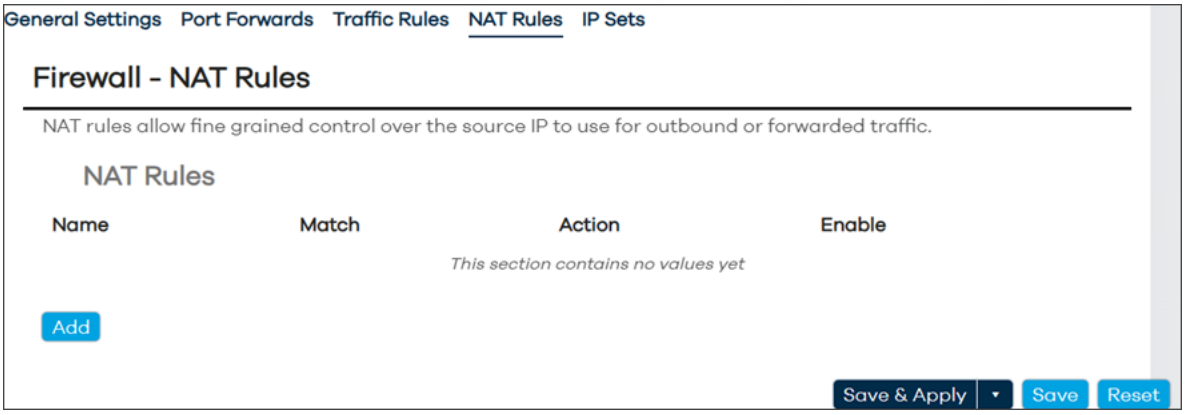


Figure 190: Firewall NAT Rules page

Click on the '**Add**' button to enter a NAT Rule. Settings in **General Settings**:

- **Name**: Enter a name for the NAT rule
- **Restrict to address family**: set to **automatic**. Other options are IPv4 only and IPv6 only
- **Protocol**: set to **ANY**. Other options are TCP, UDP, ICMP, and custom
- **Outbound zone**: set to **lan**. Other options are Any zone, wan, and wwan.
- **Source address**: set to **any**. Other options are displayed in the drop-down menu.
- **Destination address**: set to **any**. Other options are displayed in the drop-down menu. Match forwarded traffic directed at the given IP address.
- **Action**: set to **SNAT** – Rewrite to specific source IP or port. Other options are MASQUERADE – Automatically rewrite to outbound interface IP, or ACCEPT – Disable address rewriting.

- **Rewrite IP address**: set to **unspecified**. Other options are specified in the drop-down menu. Redirect matched incoming traffic to the specified internal host.

Figure 191: Firewall NAT Rules – General Settings tab

In **Advanced Settings**:

- **Outbound device**: set to **unspecified**. Other options are displayed in the drop-down menu. Matches forwarded traffic using the specified outbound network device.
- **Match mark**: enter a match mark that matches a specific firewall mark or a range of different marks.
- **Limit matching**: set to **unlimited**. Other options are **10/second, 60/minute**, **3/hour**, **500/day**, or **custom**. Limits traffic matching to the specified rate.

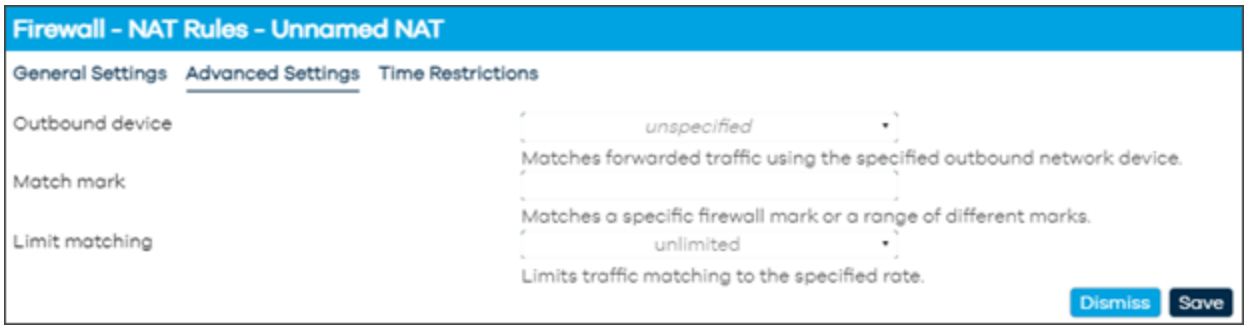


Figure 192: Firewall NAT Rules – Advanced Settings tab

In **Time Restrictions**:

- **Week Days**: set to **Any day**. Choose specific days in the drop-drop menu.
- **Month Days** - set to **Any day**. Choose specific days in the drop-drop menu.
- **Start Time (hh:mm:ss)** – enter start time
- **Stop time (hh:mm:ss)** – enter stop time
- **Start Date (yyyy-mm-dd)** – enter start date
- **Stop Date (yyyy-mm-dd)** – enter stop date
- **Time in UTC** – Check box to set time in UTC

Figure 193: Firewall NAT Rules – Time Restrictions tab

4.4.6.5 Firewall – IP Sets

In IP Sets, firewall4 supports referencing and creating IP sets to simplify matching of large address lists without the need to create one rule per item to match. Port ranges in ipsets are unsupported by firewall4.

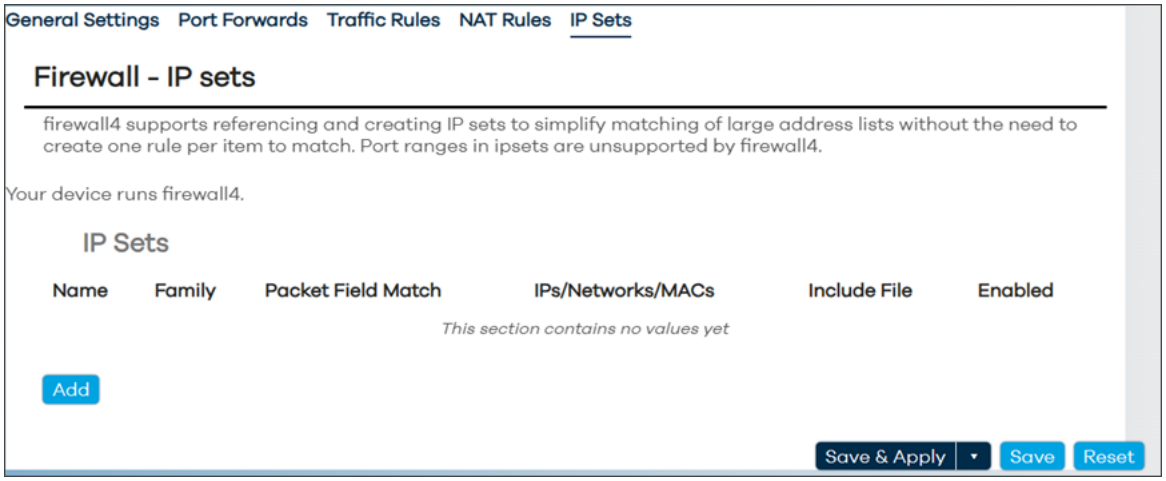


Figure 194: Firewall IP Sets

Click '**Add**' to add an IP Set rule.

- **Name**: enter a name for the IP Set
- **Comment**: add a comment
- **Family**: set to **IPv4**. Other option is **IPv6**
- **Packet Field Match**: Choose an option from the drop-down menu. Packet fields to match upon.
  - Syntax: direction_datatype. e.g.: src_port, dest_net.
  - Directions: src, dst. Datatypes: ip, port, mac, net, set.
  - Direction prefixes are optional.

➲ **Note:** datatype set is unsupported in fw4.

- **IPs/Networks/MACs**: enter a mac address: macaddr|ip[/cidr]
- **Max Entries**: enter max entries up to 65536
- **Include File**: Select file and upload. Path to file of CIDRs, subnets, host Ips, etc.
- **Timeout**: set timeout. Unit: seconds. Default 0 means the entry is added permanently to the set. Max: 2147483 seconds.
- **Counters**: check box to enable packet and byte count tracking for the set.

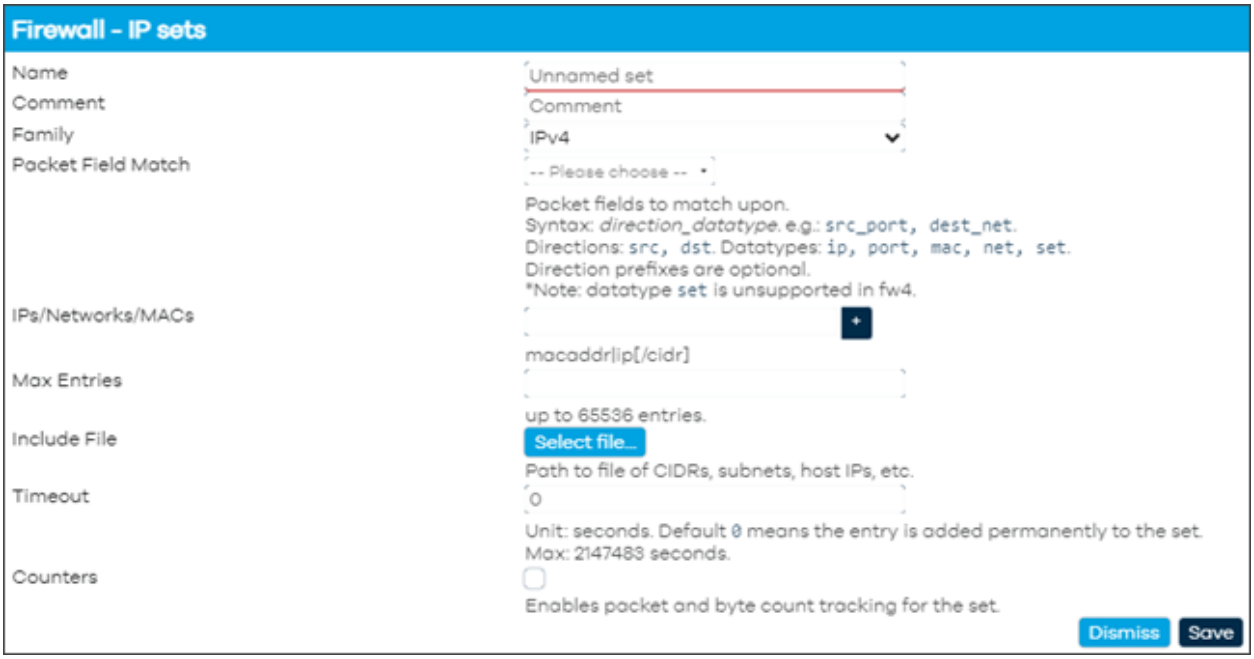


Figure 195: Firewall IP Sets – Adding a new IP Set

4.5 Logout

The user can log out of Mission Control by clicking on this button. This button is always visible in either **Overview** or **Expert Mode** on the left-hand pane towards the bottom.

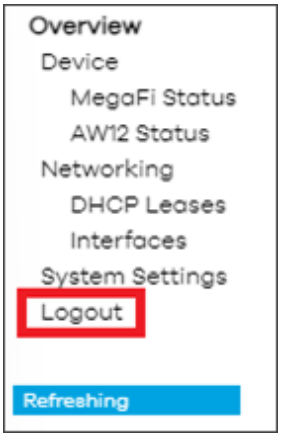


Figure 196: Overview menu in Overview mode

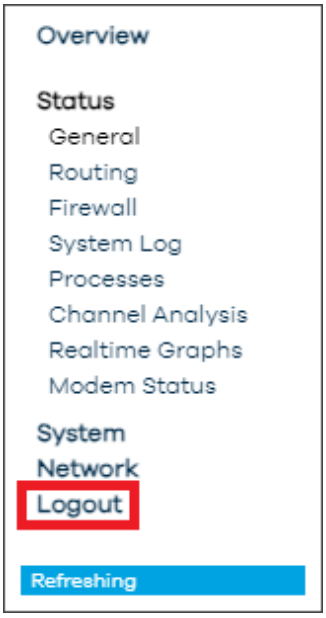


Figure 197: Overview menu in Expert mode

5.1 Appendix 1 – Firewall Traffic Rule for Remote SSH Example

If remote SSH access to the device is required and the device has a custom static/public IP address, do the following.

The first piece of setting remote SSH Access was described in section 3.13. The following will finalize what is required to allow traffic on this port to pass through the Firewall.

1. Navigate to **Overview > System Settings**.
2. Click on **Expert Configuration** to enter Expert Mode.

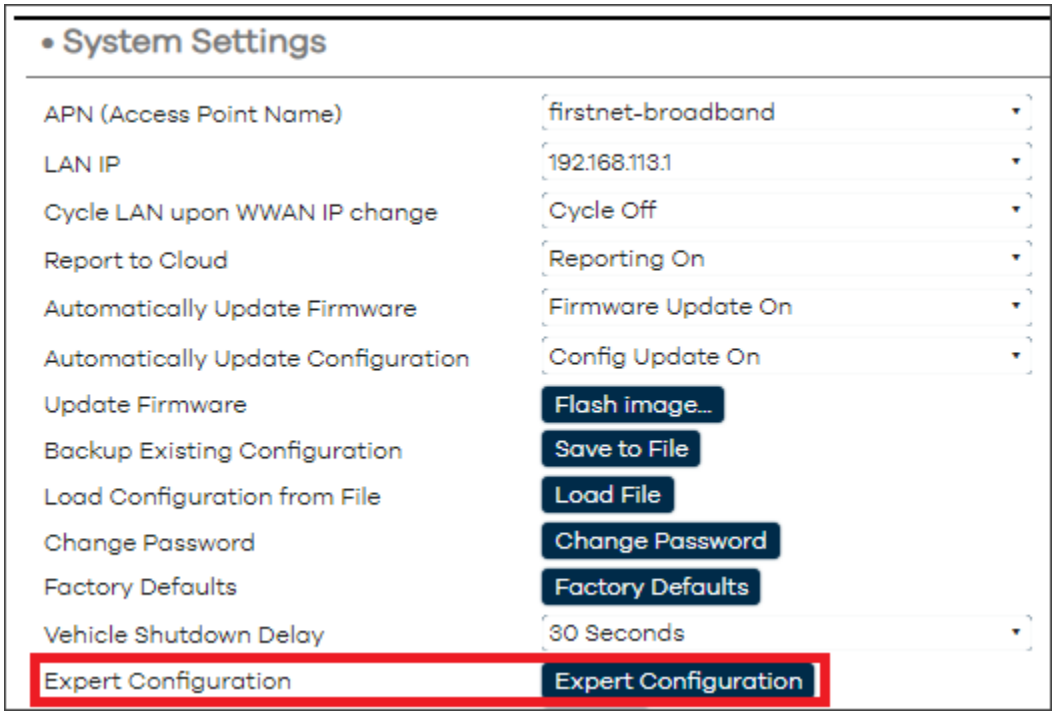


Figure 198: System Settings – Expert Configuration

3. A pop-up window asks the user to confirm going into Expert Mode. Click **OK** to continue.

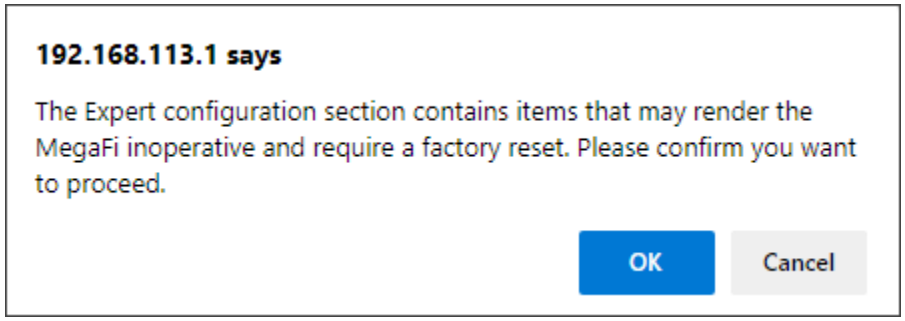


Figure 199: Confirmation to Enter Expert mode

The left-pane menu exposes pages only available in Expert Mode. Navigate to **Network > Firewall > Traffic Rules**.

4. Click on '**Add**' at the bottom.

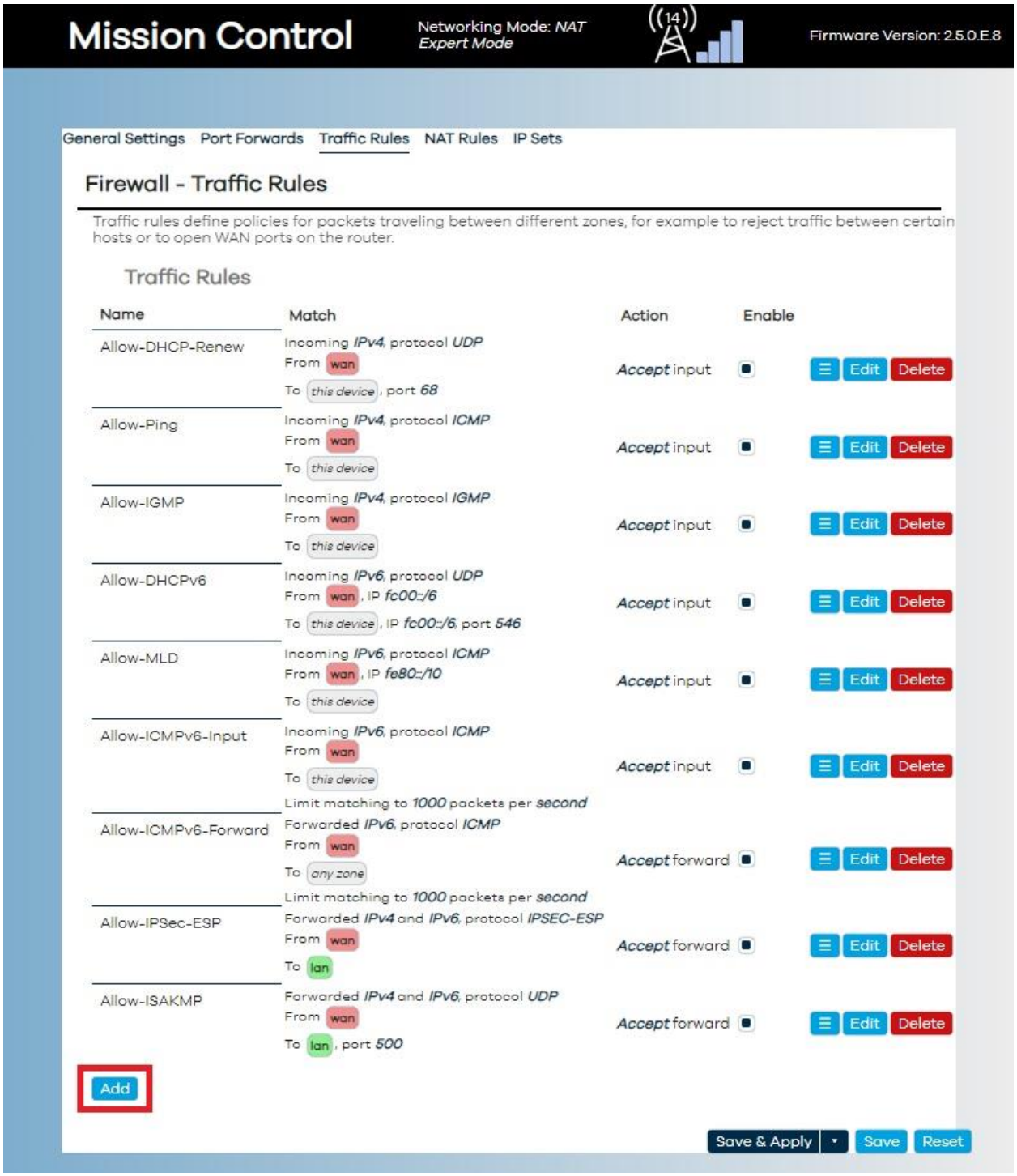


Figure 200: Firewall – Traffic Rules page

5. In **General Settings**, enter the following parameters:
   - Give the Firewall Traffic Rule a descriptive name. We named it “Remote SSH”.
   - Choose only **TCP** for the Protocol in the drop-down menu. Un-check **UDP** from its drop-down menu.
   - Choose **wan/wwan** for Source zone in the drop-down menu.
   - Choose **Device(input)** for Destination zone from the drop-down menu.
   - For Destination address, select the drop-down arrow and enter the static/public IP address in the ‘—custom—’ field box at the bottom. Hit ‘Enter’ after entering the IP address.
   - Enter port number **46556** in the Destination port field.
   - **Save**
   - **Save & Apply**

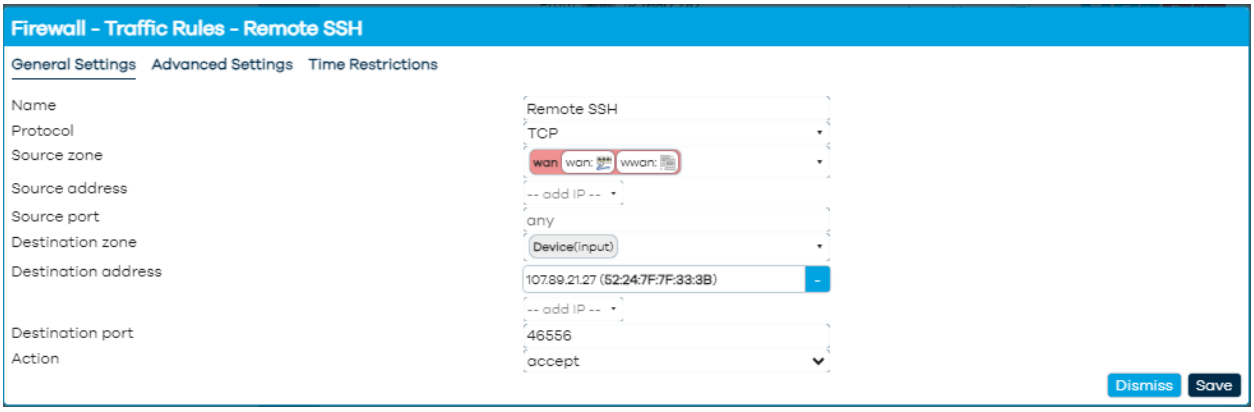


Figure 201: Firewall – Traffic Rules – Remote SSH

6. Once this is done, a remote client should be able to connect via a terminal, PowerShell, or Command prompt window with the following command:
   - ssh root@*<static ip>* -p *<chosen port>*
   - When prompted for the password, use the same password used to login to Misson Control.