

# Pico Next Gateway User Guide





## Revision History

Revision	Date	Description
.001	Aug. 19, 2021	Browan first release
.002	Feb. 15, 2022	Add Regulatory and change LED function
.003	Apr. 28, 2022	Add WiFi Station configuration
.004	Aug. 5, 2022	Add Packet Forwarder Whitelist Filter, OpenVPN Client configuration, and Professional Installation instructions
.005	Oct. 6, 2022	Add firmware upgrade details. Update Whitelist Filter and Channel Scan
.006	Oct. 31, 2022	Add passive PoE data
.007	Jan. 13, 2023	Add Auto OTA update, file export, PLMN ID for LTE, and packet forwarder restore to default

# **DIREKTRONIK**



## **Browan Communications Inc.**

No.15-1, Zhonghua Rd.,  
Hsinchu Industrial Park,  
Hukou, Hsinchu,  
Taiwan, R.O.C. 30352  
Tel: +886-3-6006899  
Fax: +886-3-5972970

## **Copyright**

© 2023 BROWAN COMMUNICATIONS INC.

This document is copyrighted with all rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form by any means without the written permission of BROWAN COMMUNICATIONS INC.

## **Notice**

BROWAN COMMUNICATIONS INC. reserves the right to change specifications without prior notice.

While this manual has been compiled with great care, it may not be deemed as an assurance of product characteristics. BROWAN COMMUNICATIONS INC. shall be liable only to the degree specified in the terms of sale and delivery.

The reproduction and distribution of the documentation and software supplied with this product and the use of its contents are subject to written authorization from BROWAN COMMUNICATIONS INC.

## **Trademark**

The product described in this document is a licensed product of BROWAN COMMUNICATIONS INC.



## **Regulatory**

### **Federal Communication Commission Statement (FCC, U.S.)**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in an installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

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

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

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

### **Radiation Exposure Statement**

This device complies with RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This device must operate with a minimum distance of 20 cm between the radiator and user body.

### **FCC Caution:**

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



## **IC WARNING**

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

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

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## **Radiation Exposure Statement:**

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

## **Déclaration d'exposition aux radiations:**

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corp.



## **Professional Installation Instructions**

### **1. Installation personal**

This product is designed for specific applications and needs to be installed by a qualified person who has RF and related rules knowledge. The general user shall not attempt to install or change the settings.

### **2. Installation location**

The product shall be installed at a location where the radiating antenna can be kept 20 cm from nearby persons in normal operation conditions to meet regulatory RF exposure requirements.

### **3. External antenna**

Use only the antennas that have been approved by the applicant. Non-approved antenna(s) may produce unwanted spurious or excessive RF transmitting power, which may lead to the violation of FCC/IC limits and is prohibited.

### **4. Installation procedure**

Please refer to user's manual for details.

### **5. Warning**

Please carefully select the installation position and make sure that the final output power does not exceed the limits set forth in relevant rules. Violation of the rules could lead to serious federal penalties.

## **Instructions d'installation professionnelle**

### **1. Installation**

Ce produit est destiné à un usage spécifique et doit être installé par un personnel qualifié maîtrisant les radiofréquences et les règles s'y rapportant. L'installation et les réglages ne doivent pas être modifiés par l'utilisateur final.

### **2. Emplacement d'installation**

En usage normal, afin de respecter les exigences réglementaires concernant l'exposition aux radiofréquences, ce produit doit être installé de façon à respecter une distance de 20 cm entre l'antenne émettrice et les personnes.

### **3. Antenne externe.**

Utiliser uniquement les antennes approuvées par le fabricant. L'utilisation d'autres antennes peut conduire à un niveau de rayonnement essentiel ou non essentiel dépassant les niveaux limites définis par FCC/IC, ce qui est interdit.

### **4. Procédure d'installation**

Consulter le manuel d'utilisation.

### **5. Avertissement**

Choisir avec soin la position d'installation et s'assurer que la puissance de sortie ne dépasse pas les limites en vigueur. La violation de cette règle peut conduire à de sérieuses pénalités fédérales.

# Table of Contents

## Table of Contents

REVISION HISTORY .....	2
COPYRIGHT .....	3
NOTICE .....	3
TRADEMARK .....	3
REGULATORY .....	4
PROFESSIONAL INSTALLATION INSTRUCTIONS .....	6
<b>1 PRODUCT OVERVIEW .....</b>	<b>10</b>
<b>1.1 PRODUCT FEATURES .....</b>	<b>10</b>
<b>1.2 LED FUNCTIONS .....</b>	<b>10</b>
<b>1.3 RESET BUTTON .....</b>	<b>10</b>
<b>1.4 I/O PORTS .....</b>	<b>11</b>
<b>1.5 ACCESSORIES .....</b>	<b>12</b>
<b>2 INSTALLATION .....</b>	<b>12</b>
<b>2.1 POWER UP .....</b>	<b>12</b>
2.1.1 DC Adapter .....	12
2.1.2 Terminal Block .....	12
2.1.3 Ethernet .....	12
2.1.3.1 Passive PoE .....	13
<b>2.2 UPGRADE FIRMWARE .....</b>	<b>14</b>
<b>3 GUI ACCESS .....</b>	<b>14</b>
<b>3.1 OPEN ADMIN GUI .....</b>	<b>14</b>
<b>4 SYSTEM .....</b>	<b>15</b>
<b>4.1 ADMINISTRATION .....</b>	<b>15</b>
<b>4.2 RESTORE .....</b>	<b>16</b>
<b>4.3 SYSTEM FIRMWARE .....</b>	<b>16</b>
<b>4.4 SUPPORT .....</b>	<b>17</b>
<b>5 LORA SETTINGS .....</b>	<b>17</b>
<b>5.1 MODE SELECTION .....</b>	<b>17</b>
5.1.1 Packet Forwarder .....	17
5.1.1.1 Gateway Info .....	19
5.1.1.2 Antenna Gain .....	19
5.1.1.3 Radio and Channel Settings .....	20
5.1.1.4 LBT Settings .....	21





# **BROWAN**

5.1.2	Whitelist Filter .....	21
5.1.2.1	Examples of Whitelist Filter .....	22
5.1.3	Config Restore .....	24
5.1.4	Basic Station .....	25
5.1.4.1	Radio Info .....	26
5.1.4.2	Connection Configuration .....	26
<b>5.2</b>	<b>CHANNEL SCAN .....</b>	<b>28</b>
<b>5.3</b>	<b>LOG .....</b>	<b>29</b>
<b>6</b>	<b>NETWORK .....</b>	<b>29</b>
<b>6.1</b>	<b>WAN .....</b>	<b>29</b>
6.1.1	WAN Status .....	30
6.1.2	WAN Settings .....	31
6.1.2.1	Ethernet WAN .....	31
6.1.2.2	Wireless Station .....	32
6.1.2.3	3G/4G LTE .....	33
6.1.2.4	Dual WAN (Ethernet+3G/4G) .....	33
6.1.2.5	Dual WAN (Ethernet+WiFi) .....	34
6.1.3	3G/4G LTE Log .....	35
<b>6.2</b>	<b>VPN .....</b>	<b>36</b>
6.2.1	VPN Settings .....	36
6.2.2	VPN Log .....	38
<b>6.3</b>	<b>DIAGNOSTICS .....</b>	<b>39</b>

# 1 Product Overview

## 1.1 Product Features

The Pico Next Gateway is a LoRa gateway with GPS, using numerous ways of connection: ethernet, LTE, and Wi-Fi. Depending upon the SKU, some functions might not be available. Pico Next is specifically designed for wide-area IoT applications. Applications include, but are not limited to, home security, automatic meter-reading, monitoring fault-indicators, and monitoring streetlights. This gateway is very suitable for small businesses or private area uses like at parking lots, exhibition centers, and campuses.

## 1.2 LED Functions

LED Functions	Constant	Flashing	Off
Power	Power On	Booting /OTA	OFF
Internet	Internet Available	Checking Internet	RFU
Service	LNS Connected	RFU	LNS Not Connected
LoRa	LoRa Working	Initializing	LoRa Not Working

## 1.3 Reset Button

### Reboot:

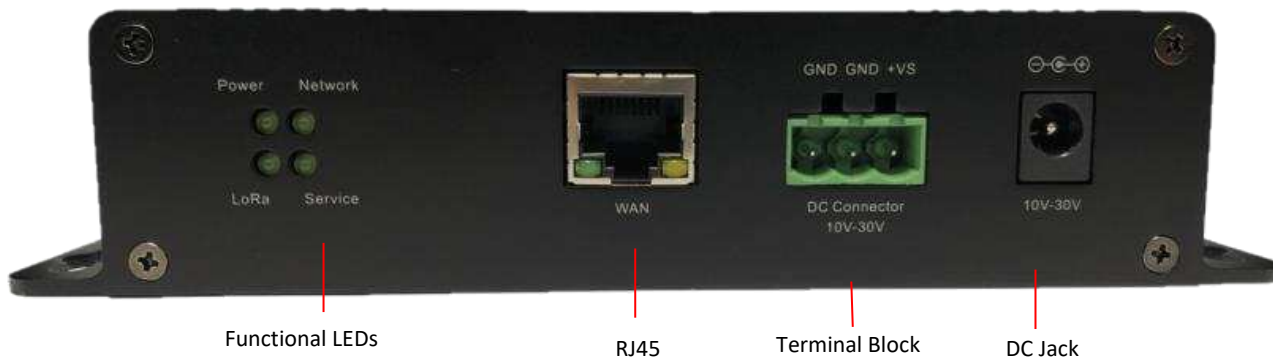
By pressing and holding the RESET Button, the Power LED will start flashing. The “reboot” procedure will be triggered when the RESET Button is released while the Power LED light is flashing.

### Restore to Default:

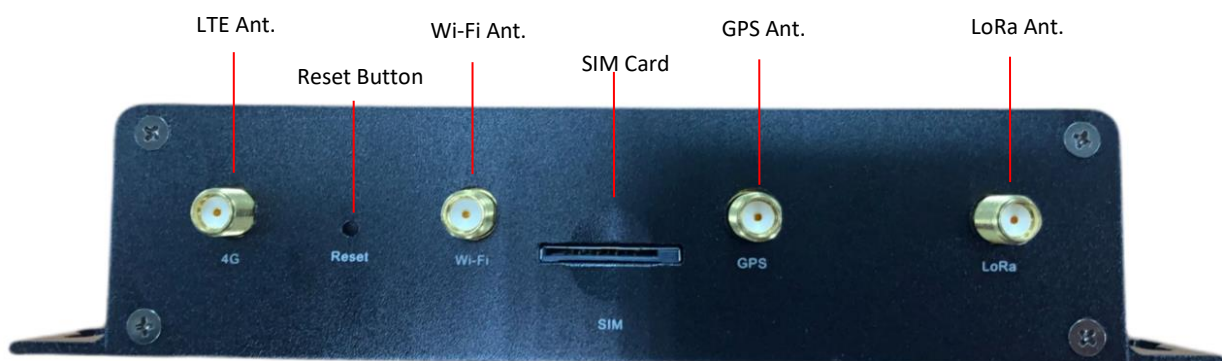
By pressing and holding the RESET Button, the Power LED will start flashing. The “restore to default” procedure will be triggered when the RESET Button released after the Power LED light becomes constant.

## 1.4 I/O Ports

Front Panel -



Back Panel -



## 1.5 Accessories

Different SKUs would provide accessories pertaining to that country or SKU, such as the adapter plug model and GPS antenna. LTE and Wireless antennas are interchangeable; they have the same specifications.

\*Please note that the GPS antenna needs to be purchased separately. \*

Adapter



LoRa Antenna



LTE and Wi-Fi Antenna



GPS Antenna \*



## 2 Installation

### 2.1 Power up

Power up Pico Next through the following ways.

#### 2.1.1 DC Adapter

Connect the power adapter provided to the DC jack In. Pico Next will automatically turn on after powering up.

#### 2.1.2 Terminal Block

Connect a power supply to Pico Next with a 3-pin pluggable male terminal block.

#### 2.1.3 Ethernet

Connect a RJ45 Ethernet cable to Power-over-Ethernet in (WAN port). Connect the other end of the ethernet cable to a passive PoE that ensures a power of 12V / 1.5A DC. Provide power to the passive PoE.

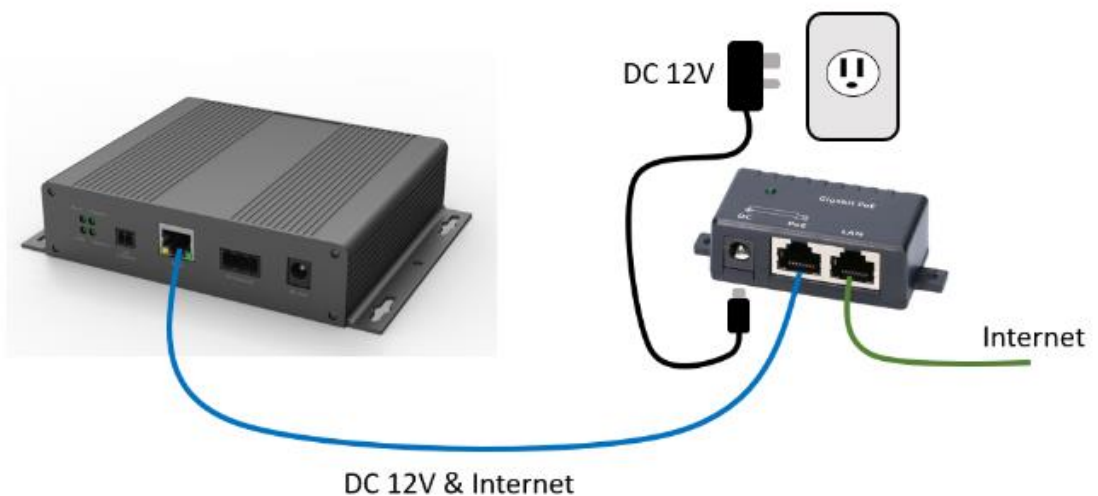


### 2.1.3.1 Passive PoE

Passive PoE, passive Power over Ethernet, is a non-standard PoE. It can deliver power over the Ethernet lines, but without the negotiation or communication process; the power is “always-on”. It requires using passive PoE injectors for networks, which send electric current out over the Ethernet cable at a certain voltage.

Pins at RJ45 Connector	Passive PoE (DC on Spares)
Pin 1	Rx+
Pin 2	Rx-
Pin 3	Tx+
Pin 4	DC +9V~+30V
Pin 5	DC +9V~+30V
Pin 6	Tx-
Pin 7	Ground
Pin 8	Ground

In general, a Passive PoE Injector has three connectors: DC jack, RJ45 for PoE and RJ45 for LAN. Simply connect a power source (output range of power adapter must be between 10V~30V) to the DC jack on the injector and the LED indicator will turn on. Then, use an ethernet cable to connect the LAN port on injector to your network, and use another ethernet cable to connect the PoE port on injector to your PicoNext Gateway.





## 2.2 Upgrade Firmware

Upgrade to the newest firmware with Web GUI following below “3.1 Open Admin GUI” page 13 instructions and upgrading with “4.3 System Firmware” page 15 instructions. By clicking the “ Check New Firmware” button, the gateway may upgrade to the latest firmware version.

Figure 2.2-A Firmware Upgrade

Firmware Information

Current firmware version: 0.1.7

Online OTA Firmware Version: - **CHECK NEW FIRMWARE**

Please select a file to upgrade:  No file chosen **UPGRADE**

## 3 GUI Access

### 3.1 Open Admin GUI

Default mode of Pico Next Gateway is DHCP. Once Pico Next is turned on through plugging in the DC adapter, it will automatically link to available servers. Pico Next’s IP address can be found from the DHCP server. Access Pico Next WebUI via the DHCP IP on Chrome. The default username is “**admin**”, and the password can be found on the back label.

Figure 3.1-A Admin GUI

Pico Next Gateway

### Authorization Required

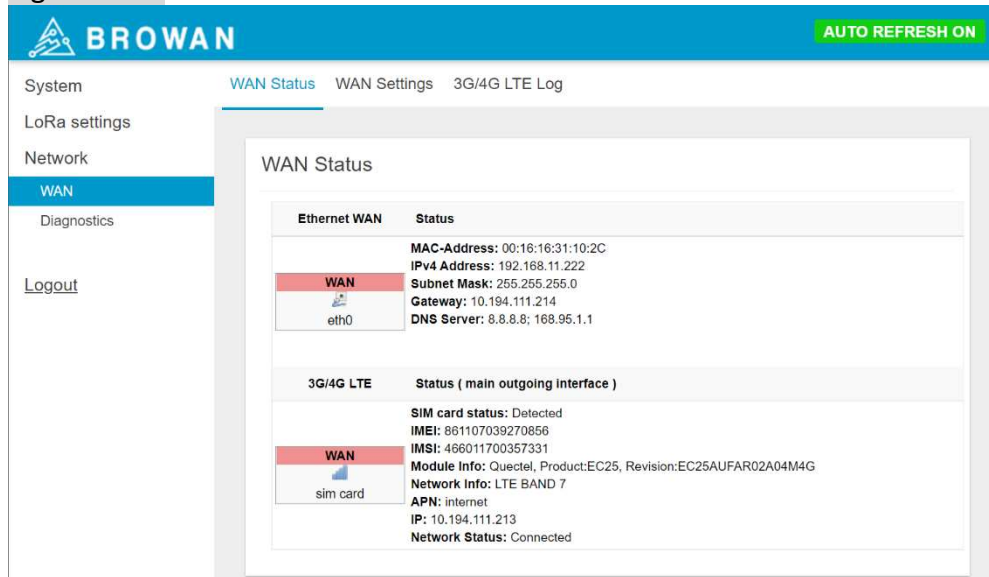
Please enter your username and password.

Username

Password

**LOGIN**

Figure 3.1-B Admin GUI



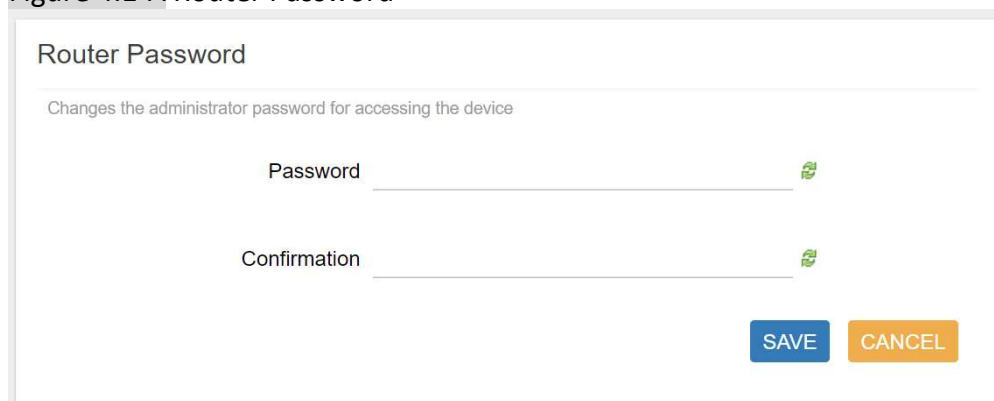
## 4 System

The System menu consists of the following categories: **Administration**, **Restore**, **System Firmware** and **Support**. An introduction of each category will be distinctly stated in individual paragraphs.

### 4.1 Administration

Pico Next login password can be configured on this page.

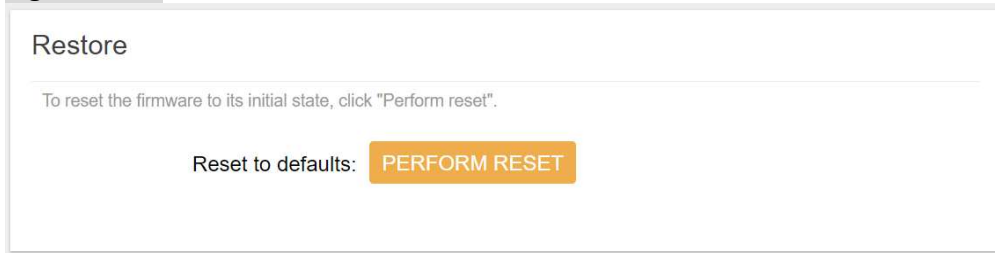
Figure 4.1-A Router Password



## 4.2 Restore

Restore the **Password Credential**, **LoRa Setting** and **Network Setting** to the default configurations.

Figure 4.2-A Restore



Restore

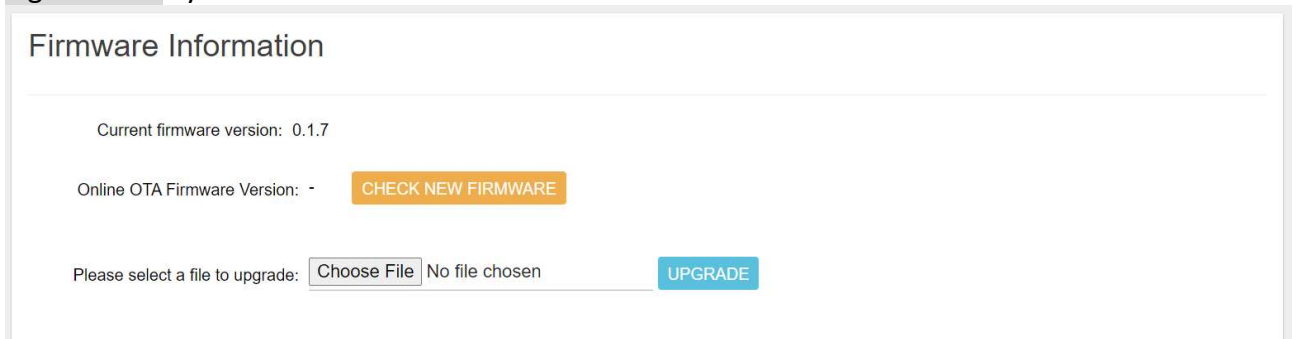
To reset the firmware to its initial state, click "Perform reset".

Reset to defaults: **PERFORM RESET**

## 4.3 System Firmware

Here the current firmware version can be found. Click the "Choose File" button to upload the newest system firmware. Click the "UPGRADE" button to upgrade the system firmware.

Figure 4.3-A System Firmware



Firmware Information

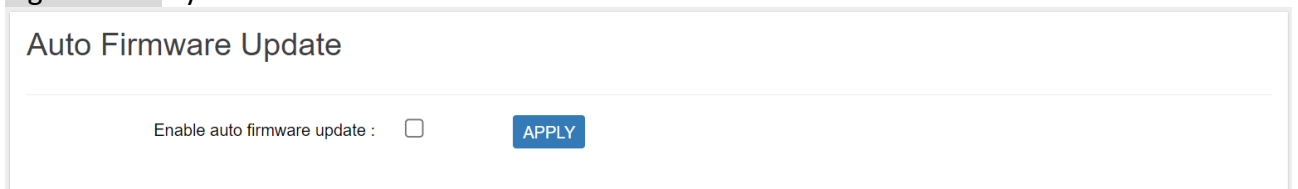
Current firmware version: 0.1.7

Online OTA Firmware Version: - **CHECK NEW FIRMWARE**

Please select a file to upgrade:  No file chosen **UPGRADE**

The Auto Firmware Update can be enabled, and the device will check the OTA server for new firmware versions daily.

Figure 4.3-B System Firmware



Auto Firmware Update

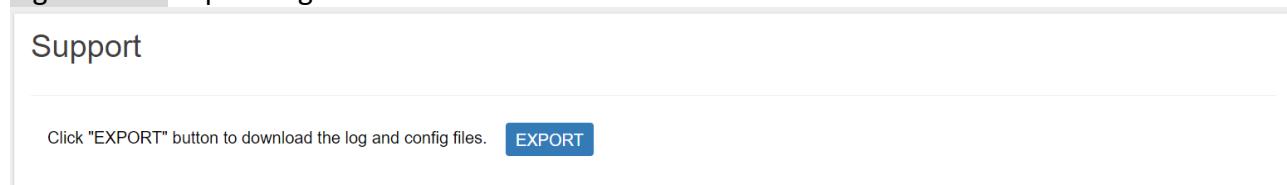
Enable auto firmware update :  **APPLY**



## 4.4 Support

Click the "EXPORT" button to download the log and config files.

Figure 4.4-A Export Log



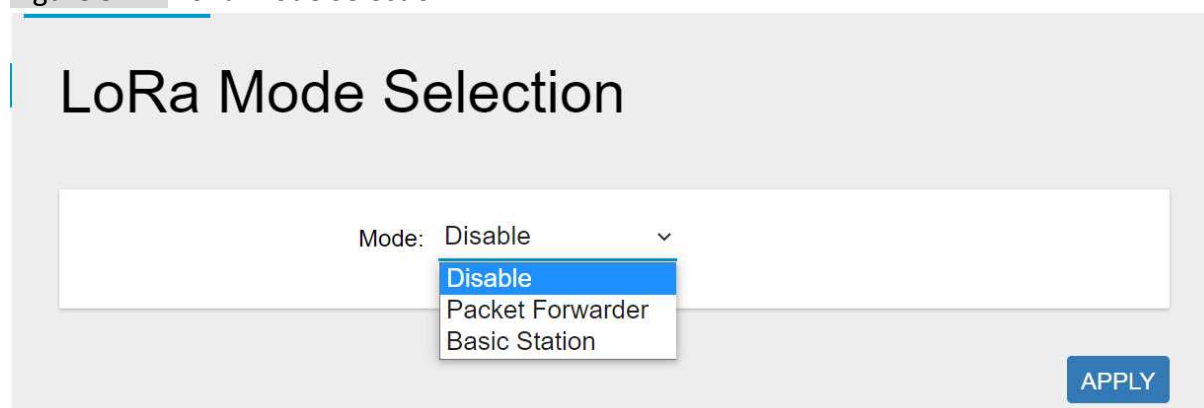
## 5 LoRa Settings

The LoRa menu consists of the following categories: **Mode Selection**, **Channel Scan** and **Log**. An introduction of each category will be distinctly stated in individual paragraphs.

### 5.1 Mode Selection

By default, the LoRa Mode is disabled. Configure the "**Packet Forwarder**" or "**Basic Station**" by using the dropdown list.

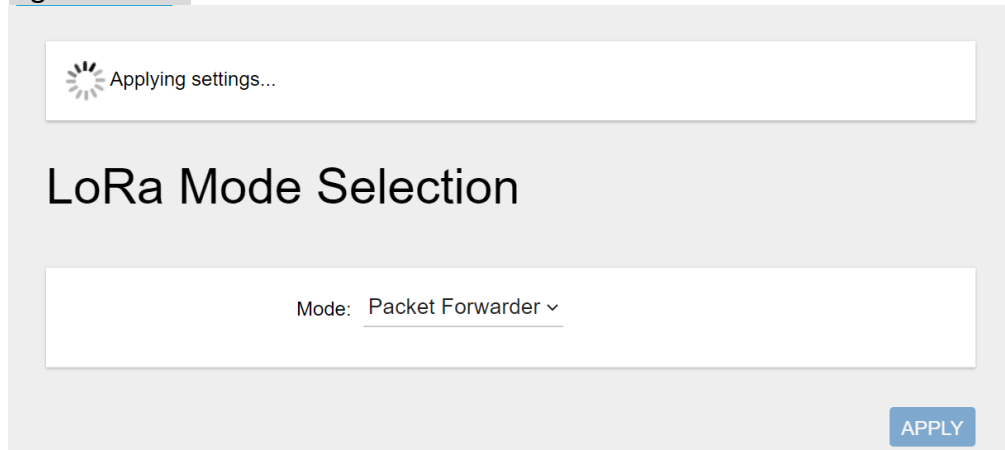
Figure 5.1-A LoRa Mode Selection



#### 5.1.1 Packet Forwarder

Choose the "**Packet Forwarder**" option and click the "**APPLY**" button to Enable the Packet Forwarder mode. After applying the setting, the "Packet Forwarder" field can be found on the left menu.

Figure 5.1.1-A LoRa Mode Selection - Packet Forwarder



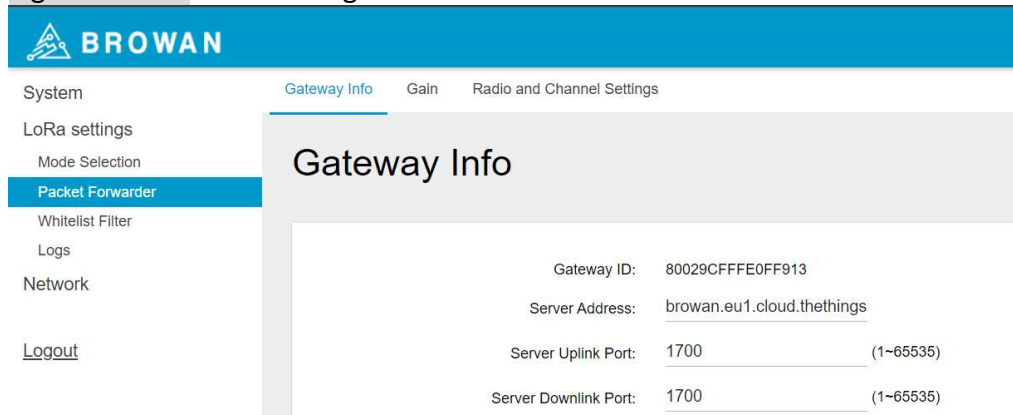
Applying settings...

## LoRa Mode Selection

Mode: Packet Forwarder ▾

**APPLY**

Figure 5.1.1-B LoRa Settings - Packet Forwarder menu



**BROWAN**

System Gateway Info Gain Radio and Channel Settings

LoRa settings

- Mode Selection
- Packet Forwarder**
- Whitelist Filter
- Logs

Network

[Logout](#)

## Gateway Info

Gateway ID:	80029CFFFE0FF913
Server Address:	browan.eu1.cloud.thethings
Server Uplink Port:	1700 (1-65535)
Server Downlink Port:	1700 (1-65535)

### 5.1.1.1 Gateway Info

This page is for setting up the LoRa configuration including **Gateway ID**, **Server Address**, **Server Uplink Port**, **Server Downlink Port**, **Keep-Alive Interval**, **Statistics Display Interval**, and **Push Timeout**.

Figure 5.1.1.1-A Gateway Info

### Gateway Info

Gateway ID:	<input type="text" value="1c497bffffeb5e56"/>	
Server Address:	<input type="text" value="browan.eu1.cloud.thethings"/>	
Server Uplink Port:	<input type="text" value="1700"/>	(1~65535)
Server Downlink Port:	<input type="text" value="1700"/>	(1~65535)
Keep Alive Interval:	<input type="text" value="10"/>	(seconds)
Statistics display Interval:	<input type="text" value="30"/>	(seconds)
Push Timeout:	<input type="text" value="100"/>	(milliseconds)

### 5.1.1.2 Antenna Gain

This page is for setting up the **antenna gain** of Lora.

Figure 5.1.1.2-A Antenna Gain

Antenna Gain:	<input type="text" value="0"/>	(0 ~ 15)
---------------	--------------------------------	----------

### 5.1.1.3 Radio and Channel Settings

This page is for configuring the radio 0 and radio 1 configurations of Lora, including **Central Frequency**, **Channel Status**, and **Center frequency offset**.

Figure 5.1.1.3-A Radio and Channel Settings

## Radio Settings

Here you can modify Central frequency of Radio 0 or Radio 1 to change channel frequencies.

Radio 0	Radio 1
Central Frequency: <input type="text" value="867400000"/> (Hz)	Central Frequency: <input type="text" value="868200000"/> (Hz)
RSSI Offset: <input type="text" value="-167"/> (dBm)	RSSI Offset: <input type="text" value="-167"/> (dBm)

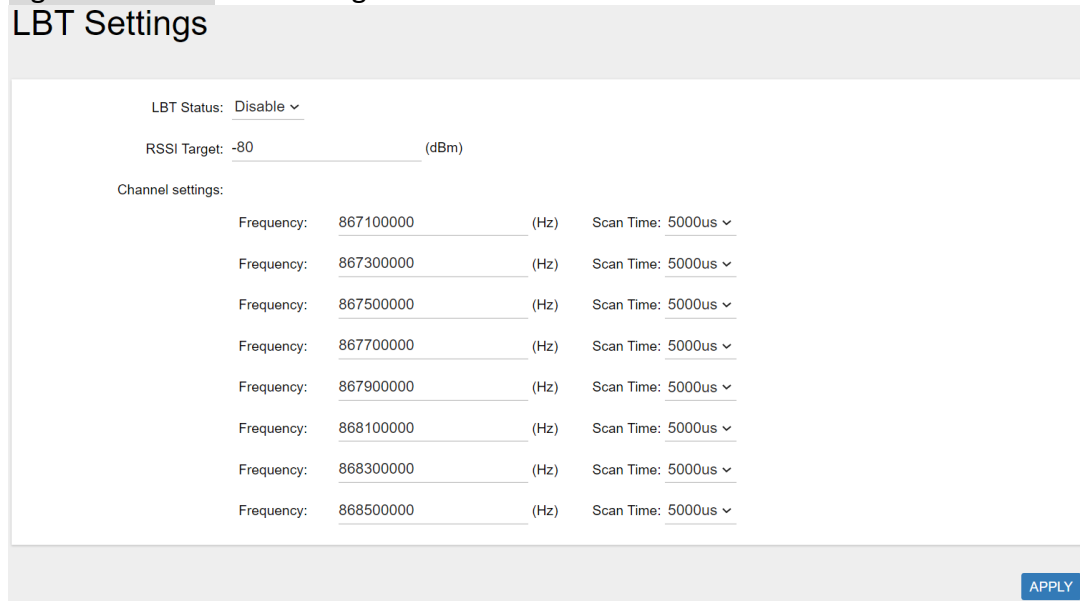
## Channel Assignment

CH 0 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 0	CenterFreqOffset: <input type="text" value="-300000"/> (-400000~+400000)
CH 1 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 0	CenterFreqOffset: <input type="text" value="-100000"/> (-400000~+400000)
CH 2 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 0	CenterFreqOffset: <input type="text" value="100000"/> (-400000~+400000)
CH 3 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 0	CenterFreqOffset: <input type="text" value="300000"/> (-400000~+400000)
CH 4 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 1	CenterFreqOffset: <input type="text" value="-300000"/> (-400000~+400000)
CH 5 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 1	CenterFreqOffset: <input type="text" value="-100000"/> (-400000~+400000)
CH 6 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 1	CenterFreqOffset: <input type="text" value="100000"/> (-400000~+400000)
CH 7 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 1	CenterFreqOffset: <input type="text" value="300000"/> (-400000~+400000)
CH 8 Status: <input type="checkbox"/> Enable	Radio Interface: <input type="checkbox"/> 1	CenterFreqOffset: <input type="text" value="100000"/> (-375000~+375000) Channel Bandwidth: 250K

### 5.1.1.4 LBT Settings

For some regions (i.e. Japan), the Listen Before Talk (LBT) function is a must. This page is for setting up the LBT configuration of Lora, including **LBT Status**, **RSSI Target**, **Channel settings**.

Figure 5.1.1.4-A LBT Settings  
LBT Settings



LBT Status: Disable ▾

RSSI Target:  (dBm)

Channel settings:

Frequency:	<input type="text" value="867100000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="867300000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="867500000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="867700000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="867900000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="868100000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="868300000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾
Frequency:	<input type="text" value="868500000"/>	(Hz)	Scan Time: <input type="text" value="5000us"/> ▾

APPLY

### 5.1.2 Whitelist Filter

To reduce unnecessary data traffic, this page configures the whitelist filter for the Packet Forwarder through **Fport Filter** and **DevAddr Filter**.

If the “FPort” or the “DevAddr” of an end-device matches with the information on the whitelist, the lora package will then be forwarded to the network server. On the other hand, Join-Request packages are always allowed to be forwarded to the network server.

#### FPort:

The filter port range is from 1 to 223. Fill in with “-1” if Fport checking is not needed.

#### DevAddr:

If the end-device is activated by OTAA, the DevAddr can usually be found on the network server. Each DevAddr (4 bytes) can be split into 64 bits. Every 4 bits form a group which is called “NABBLE”. The DevAddr filter will check each “NABBLE” individually. Fill in with the alphabet “X” if DevAddr checking is not needed.

Figure 5.1.2-A Whitelist Filter

### Whitelist Filter

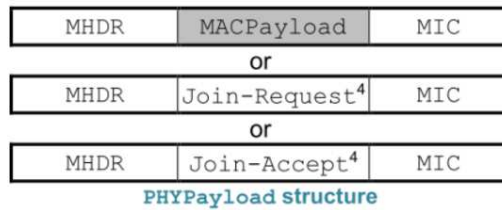
Enable <input checked="" type="checkbox"/>	Fport Filter	<input type="text" value="-1"/>	(-1 or 1~223)	DevAddr Filter	<input type="text" value="27XXXXXX"/>
Enable <input checked="" type="checkbox"/>	Fport Filter	<input type="text" value="100"/>	(-1 or 1~223)	DevAddr Filter	<input type="text" value="48009527"/>
Enable <input checked="" type="checkbox"/>	Fport Filter	<input type="text" value="136"/>	(-1 or 1~223)	DevAddr Filter	<input type="text" value="XXXXXXXX"/>

**Note:**

1. The value in "DevAddr Filter" should be a Hex format (but allow X).
2. X is for don't care bit, for example, if you want to filter all devices end with AABBCCD, you can set it with XAABBCCD in DevAddr Filter.

Figure 5.1.2-B LoRaWAN frame format elements

PHYPayload:



MACPayload:



FHDR:



### 5.1.2.1 Examples of Whitelist Filter

#### Case 1:

Only forward messages from Fport=120 to the network server. DevAddr is not checked in this case.

Figure 5.1.2.1-A Whitelist Filter Case 1

Enable <input checked="" type="checkbox"/>	Fport Filter	<input type="text" value="120"/>	(-1 or 1~223)	DevAddr Filter	<input type="text" value="XXXXXXXX"/>
Enable <input type="checkbox"/>	Fport Filter	<input type="text" value="0"/>	(-1 or 1~223)	DevAddr Filter	<input type="text" value="XXXXXXXX"/>
Enable <input type="checkbox"/>	Fport Filter	<input type="text" value="0"/>	(-1 or 1~223)	DevAddr Filter	<input type="text" value="XXXXXXXX"/>

Figure 5.1.2.1-B Network Server Case 1

Time	Type	Data preview
13:56:21	Receive uplink message	DevAddr: 88 88 88 88 <> FCnt: 1 FPort: 120 Data rate: SF7BW125 SNR: 9.3 RSSI: -83
13:56:15	Receive uplink message	JoinEUI: 00 16 16 00 00 00 00 02 <> DevEUI: 00 16 16 00 00 00 24 5A <> Data rate: SF7BW125 SNR: 10 RSSI: -97
13:56:13	Receive uplink message	DevAddr: 99 99 99 99 <> FCnt: 3 FPort: 120 Data rate: SF7BW125 SNR: 9 RSSI: -80
13:56:01	Receive uplink message	JoinEUI: 00 16 16 00 00 00 00 02 <> DevEUI: 00 16 16 00 00 00 24 5A <> Data rate: SF7BW125 SNR: 10 RSSI: -92

**Case 2:**

Only forward the messages from DevAddr: "XX1122XX" to the network server. Fport is not checked in this case.

Figure 5.1.2.1-C Whitelist Filter Case 2

### Whitelist Filter

Enable <input checked="" type="checkbox"/>	Fport Filter	-1	(-1 or 1~223)	DevAddr Filter	XX1122XX
Enable <input type="checkbox"/>	Fport Filter	0	(-1 or 1~223)	DevAddr Filter	XXXXXXXX
Enable <input type="checkbox"/>	Fport Filter	0	(-1 or 1~223)	DevAddr Filter	XXXXXXXX

Figure 5.1.2.1-D Network Server Case 2

Time	Type	Data preview
14:16:08	Receive uplink message	DevAddr: CC 11 22 DD <> FCnt: 2 FPort: 100 Data rate: SF7BW125 SNR: 9.3 RSSI: -61
14:16:05	Receive uplink message	JoinEUI: 00 16 16 00 00 00 00 02 <> DevEUI: 00 16 16 00 00 00 24 5A <> Data rate: SF7BW125 SNR: 9.3 RSSI: -94
14:15:59	Receive uplink message	DevAddr: CC 11 22 DD <> FCnt: 1 FPort: 22 Data rate: SF7BW125 SNR: 9.8 RSSI: -58
14:15:51	Receive gateway status	Metrics: { rxin: 18, rxok: 17, rxfw: 17, ackr: 0, txin: 0, txok: 0 } Versions: { ttn-lw-gateway-server: "3.21.2-rc1-SNAP
14:15:51	Receive uplink message	JoinEUI: 00 16 16 00 00 00 00 02 <> DevEUI: 00 16 16 00 00 00 24 5A <> Data rate: SF7BW125 SNR: 9.5 RSSI: -91
14:15:37	Receive uplink message	JoinEUI: 00 16 16 00 00 00 00 02 <> DevEUI: 00 16 16 00 00 00 24 5A <> Data rate: SF7BW125 SNR: 7.5 RSSI: -92
14:15:30	Receive uplink message	DevAddr: AA 11 22 BB <> FCnt: 2 FPort: 22 Data rate: SF7BW125 SNR: 9.5 RSSI: -60
14:15:23	Receive uplink message	JoinEUI: 00 16 16 00 00 00 00 02 <> DevEUI: 00 16 16 00 00 00 24 5A <> Data rate: SF7BW125 SNR: 10 RSSI: -97
14:15:21	Receive gateway status	Metrics: { ackr: 0, txin: 0, txok: 0, rxin: 11, rxok: 10, rxfw: 10 } Versions: { ttn-lw-gateway-server: "3.21.2-rc1-SNAP
14:15:16	Receive uplink message	DevAddr: AA 11 22 BB <> FCnt: 1 FPort: 123 Data rate: SF7BW125 SNR: 7.5 RSSI: -56
14:15:13	Console: Events cleared	The events list has been cleared

### Case 3:

Only forward the messages from DevAddr=0922ABCD and Fport=99 to the network server.

Figure 5.1.2.1-E Whitelist Filter Case 3

#### Whitelist Filter

Enable <input checked="" type="checkbox"/>	Fport Filter	99	(-1 or 1~223)	DevAddr Filter	0922ABCD
Enable <input type="checkbox"/>	Fport Filter	0	(-1 or 1~223)	DevAddr Filter	XXXXXXXX
Enable <input type="checkbox"/>	Fport Filter	0	(-1 or 1~223)	DevAddr Filter	XXXXXXXX

Figure 5.1.2.1-F Network Server Case 3

Gateways > pico-5813D3FFFE2984D2 > Live data

Time	Type	Data preview	Verbose stream <input type="checkbox"/>	Export as JSON <input type="button" value="↓"/>
↑ 14:21:52	Receive uplink message	DevAddr: 09 22 AB CD <> FCnt: 3 FPort: 99 Data rate: SF8BW125 SNR: 11 RSSI: -59		
↑ 14:21:43	Receive uplink message	DevAddr: 09 22 AB CD <> FCnt: 2 FPort: 99 Confirmed uplink Data rate: SF8BW125 SNR: 9.5 RSSI: -58		
↑ 14:21:41	Receive uplink message	JoinEUI: 00 16 16 00 00 00 00 02 <> DevEUI: 00 16 16 00 00 24 5A <> Data rate: SF7BW125 SNR: 7.5		
📶 14:21:38	Receive gateway status	Metrics: { ackr: 0, txin: 0, txok: 0, rxin: 10, rxok: 10, rxfw: 10 } Versions: { ttn-lw-gateway-server: *3.2		
↑ 14:21:34	Receive uplink message	DevAddr: 09 22 AB CD <> FCnt: 2 FPort: 99 Confirmed uplink Data rate: SF7BW125 SNR: 9.5 RSSI: -59		
↑ 14:21:25	Receive uplink message	DevAddr: 09 22 AB CD <> FCnt: 1 FPort: 99 Data rate: SF7BW125 SNR: 7.5 RSSI: -58		

### 5.1.3 Config Restore

Click the “APPLY” button to restore LoRa Packet Forwarder settings to the default value.

Figure 5.1.3-A LoRa Packet Forwarder Config Restore

#### LoRa Packet Forwarder Config Restore

To restore LoRa Packet Forwarder settings to default, click "APPLY".

Restore LoRa settings to default:





### 5.1.4 Basic Station

Choose the "**Basic Station**" option and click the "**APPLY**" button to Enable the Basic Station mode. After applying the setting, the "Basic Station" field can be found on the left menu.

Figure 5.1.4-A LoRa Mode Selection - Basic Station

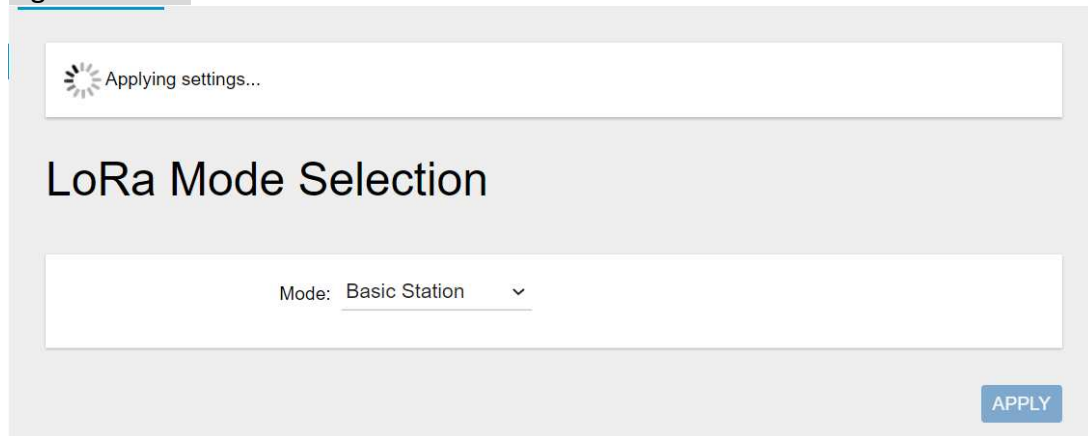
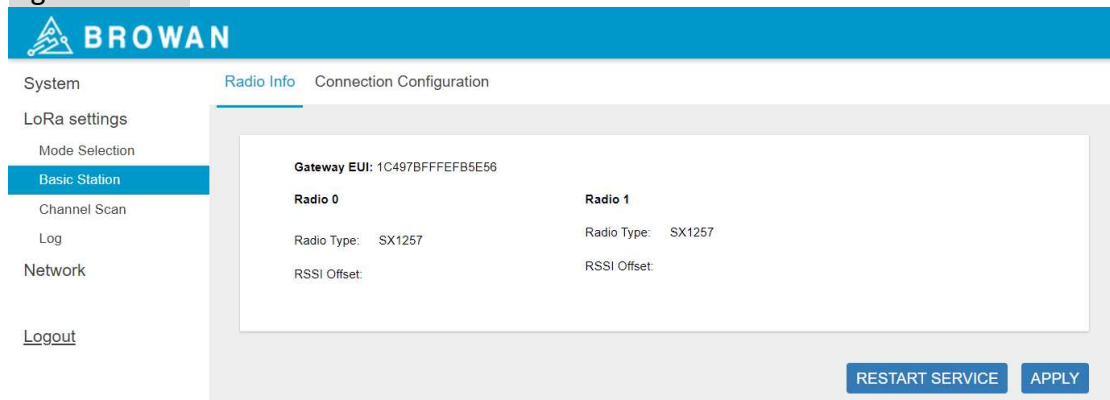


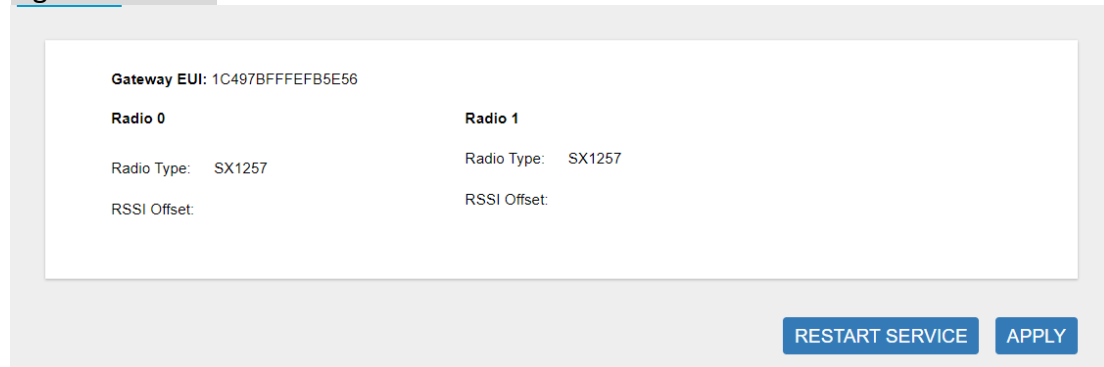
Figure 5.1.4-B LoRa Mode Selection - Basic Station menu



#### 5.1.4.1 Radio Info

This page shows the **Gateway EUI** information.

Figure 5.1.4.1-A Radio Info



The screenshot shows a configuration page for radio information. At the top, it displays the Gateway EUI: 1C497BFFFEFB5E56. Below this, there are two columns for Radio 0 and Radio 1. Both radio types are set to SX1257, and the RSSI Offset field is empty. At the bottom right, there are two buttons: 'RESTART SERVICE' and 'APPLY'.

Gateway EUI: 1C497BFFFEFB5E56	
<b>Radio 0</b>	<b>Radio 1</b>
Radio Type: SX1257	Radio Type: SX1257
RSSI Offset:	RSSI Offset:

RESTART SERVICE   APPLY

#### 5.1.4.2 Connection Configuration

This page is for setting up the basic station configuration, including **Basic Station Mode, Protocol, Server Address, Server Port** and **Credentials**.

##### - LNS Mode

Configure the LNS Mode settings and click the "APPLY" button.

Figure 5.1.4.2-A LNS Mode

Basic Station Mode: LNS Mode ▾

Protocol: WebSocket Secure ▾

Server Address: browan.eu1.cloud.thethings.

Server Port: 8887

Trust:  No file chosen

Trust Status: Installed

CRT:  No file chosen (Optional)

CRT Status: Not Installed

Key:  No file chosen (Optional)

Key Status: Installed

## - CUPS Mode

Configure the CUPS Mode settings and click the "APPLY" button.

Figure 5.1.4.2-B CUPS Mode

Basic Station Mode: CUPS Mode ▾

Protocol: HTTPS ▾

Type: Boot ▾

Server Address: browan.eu1.cloud.thethings.

Server Port: 443

Trust:  No file chosen

Trust Status: Installed

CRT:  No file chosen (Optional)

CRT Status: Not Installed

Key:  No file chosen (Optional)

Key Status: Installed


## 5.2 Channel Scan

Click the "SCAN" button to scan the RF signal. Then click the "EXPORT" button to export the scan result.

Figure 5.2-A Channel RSSI Scan

### Channel Scan

The device can scan all supported channels based on ISM band regulation.  
 Note: The scanning process may take few minutes to complete, please wait until the end of process.

 Scanning channel now...

Channel Index	Channel Frequency	Noise indication

Figure 5.2-B Scan Result

### Channel Scan

The device can scan all supported channels based on ISM band regulation.  
 Note: The scanning process may take few minutes to complete, please wait until the end of process.

Select your target scan range : US915 ▾

Channel Index	Channel Frequency(Hz)	Noise indication(dBm)
Channel 0	902300000	-103
Channel 1	902500000	-103
Channel 2	902700000	-103
Channel 3	902900000	-103
Channel 4	903100000	-103
Channel 5	903300000	-103
Channel 6	903500000	-103
Channel 7	903700000	-103
Channel 8	903900000	-101
Channel 9	904100000	-100

### 5.3 Log

The LoRa logs will be shown on this page, showing recent LoRa logs with a maximum limit of 500 lines.

Figure 5.3-A Logs

## LoRa Logs

```

2021-07-08 08:29:31.591 [TCE:VERB] Connected to MUXS.
2021-07-08 08:29:31.775 [RAL:INFO] Lora gateway library version: Version: 5.0.1;
2021-07-08 08:29:31.830 [RAL:VERB] Connecting to device: /dev/spidev1.0
2021-07-08 08:29:31.830 [RAL:DEBU] SX130x txlut table (0 entries)
2021-07-08 08:29:31.830 [RAL:VERB] SX1301 rxrfchain 0: enable=1 freq=867.5MHz rssi_offset=-166.000000 type=2 tx_enab
2021-07-08 08:29:31.831 [RAL:VERB] SX1301 rxrfchain 1: enable=1 freq=868.5MHz rssi_offset=-166.000000 type=2 tx_enab
2021-07-08 08:29:31.831 [RAL:VERB] SX1301 ifchain 0: enable=1 rf_chain=1 freq=-400000 bandwidth=0 datarate=0 sync_wc
2021-07-08 08:29:31.831 [RAL:VERB] SX1301 ifchain 1: enable=1 rf_chain=1 freq=-200000 bandwidth=0 datarate=0 sync_wc
2021-07-08 08:29:31.832 [RAL:VERB] SX1301 ifchain 2: enable=1 rf_chain=1 freq=0 bandwidth=0 datarate=0 sync_word=0/6
2021-07-08 08:29:31.832 [RAL:VERB] SX1301 ifchain 3: enable=1 rf_chain=0 freq=-400000 bandwidth=0 datarate=0 sync_wc
2021-07-08 08:29:31.832 [RAL:VERB] SX1301 ifchain 4: enable=1 rf_chain=0 freq=-200000 bandwidth=0 datarate=0 sync_wc
2021-07-08 08:29:31.832 [RAL:VERB] SX1301 ifchain 5: enable=1 rf_chain=0 freq=0 bandwidth=0 datarate=0 sync_word=0/6
2021-07-08 08:29:31.833 [RAL:VERB] SX1301 ifchain 6: enable=1 rf_chain=0 freq=200000 bandwidth=0 datarate=0 sync_wor
2021-07-08 08:29:31.833 [RAL:VERB] SX1301 ifchain 7: enable=1 rf_chain=0 freq=400000 bandwidth=0 datarate=0 sync_wor
2021-07-08 08:29:31.833 [RAL:VERB] SX1301 ifchain 8: enable=1 rf_chain=1 freq=-200000 bandwidth=2 datarate=2 sync_wc
  
```

## 6 Network

The Network menu consists of the following categories: **WAN** and **Diagnostics**. Introduction and input procedures for each category are described in the following paragraphs.

### 6.1 WAN

The purpose of this category is to view current WAN settings. This category is further divided into three sectors: **WAN Status**, **Wan Settings** and **3G/4G LTE Log**. These individual options are lodged and labeled above the main content.



### 6.1.1 WAN Status

The current network status will be shown on this page.

Figure 6.1.1-A WAN Status

#### WAN Status

Ethernet WAN	Status
	<b>MAC-Address:</b> 00:16:16:31:10:2C <b>IPv4 Address:</b> 192.168.11.222 <b>Subnet Mask:</b> 255.255.255.0 <b>Gateway:</b> 10.248.18.17 <b>DNS Server:</b> 8.8.8.8; 168.95.1.1
<b>WAN</b>  eth0	
3G/4G LTE	Status ( main outgoing interface )
	<b>SIM card status:</b> Detected <b>IMEI:</b> 861107039270856 <b>IMSI:</b> 466011700357331 <b>Module Info:</b> Quectel, Product:EC25, Revision:EC25AUFAR02A04M4G <b>Network Info:</b> LTE BAND 3 <b>APN:</b> internet <b>IP:</b> 10.248.18.16 <b>Network Status:</b> Connected
<b>WAN</b>  sim card	

---

#### LTE

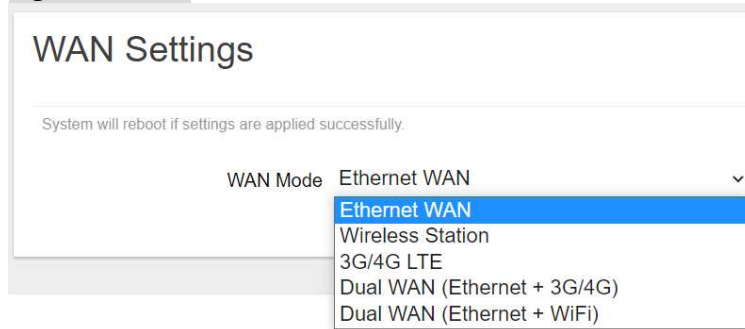
<b>General Information</b>	<b>State:</b> Connected <b>Network Operator:</b> Far EasTone <b>Technology:</b> NA <b>Uptime:</b> 0 day 0 hr 57 min 8 sec <b>Signal Strength:</b> 29 (dBm)
<b>LTE Information</b>	<b>Downlink Bandwidth:</b> 20 (MHz) <b>Uplink Bandwidth:</b> 20 (MHz) <b>RSRP:</b> -88 (dBm) <b>RSRQ:</b> -12 (dBm) <b>SINR:</b> 10 (dB) <b>PCI:</b> 503 <b>Cell ID:</b> 36C040C
<b>Uplink Status</b>	<b>Tx Date Rate:</b> 20 (MHz) <b>Tx bytes:</b> 635 (bytes) <b>Tx Packets:</b> 52074
<b>Downlink Status</b>	<b>Rx Date Rate:</b> 20 (MHz) <b>Rx bytes:</b> 630 (bytes) <b>Rx Packets:</b> 35936



## 6.1.2 WAN Settings

Pico Next supports 5 WAN Modes: **Ethernet WAN**, **3G/4G LTE**, **Wi-Fi Station**, **Dual WAN (Ethernet+3G/4G)** and **Dual WAN(Ethernet+WiFi)**.

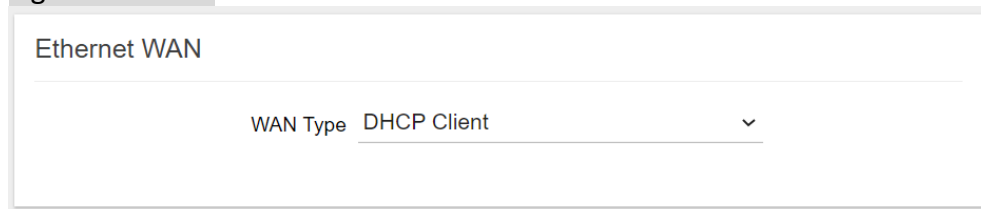
Figure 6.1.2-A WAN Mode



### 6.1.2.1 Ethernet WAN

- DHCP Client

Figure 6.1.2.1-A DHCP Client



- Static IP

Figure 6.1.2.1-B Static IP

Ethernet WAN

---

WAN Type Static IP ▼

IP Address 192.168.11.222

Subnet Mask 255.255.255.0

Gateway 192.168.11.1

DNS Server 8.8.8.8  
168.95.1.1 (optional)

**6.1.2.2 Wireless Station**

Configure “WiFi Access Point” information.

Figure 6.1.2.2-A Wireless Station Settings

## Wireless Station

---

Click "Scan" to get Access Point List

SSID: Box\_Box

Security: WPA/WPA2-PSK ▼

KEY: ••••••

SCAN Box\_Box ▼



### 6.1.2.3 3G/4G LTE

Configure “APN” information according to mobile service provider requirements. **The PLMN ID also can be supported.**

Figure 6.1.2.3-A LTE Settings

#### 3G/4G LTE

---

APN

Use PLMN ID  \* PLMN ID = MCC (3 digits) + MNC (2 or 3 digits)

MCC

MNC

PIN  (optional)

Authentication  (optional)

Username  (optional)

Debug mode

(After enabling this feature, you can export the debug log in "3G/4G LTE Log" section when you have connection issues.)

### 6.1.2.4 Dual WAN (Ethernet+3G/4G)

Configure the Ethernet Setting and LTE Setting at the same time. If the Dual WAN mode is selected, the primary interface needs to be specified by default. Pico Next Gateway will automatically set the other workable interface to be the backhaul.

Figure 6.1.2.4-A Network Primary

#### WAN Settings

---

System will reboot if settings are applied successfully.

WAN Mode  (optional)

Network priority  (Specify which WAN is Primary, the other one will be backup)

**Figure 6.1.2.4-B Ethernet and LTE Configuration**

### Ethernet WAN

---

WAN Type DHCP Client ▼

---

### 3G/4G LTE

---

APN internet

Use PLMN ID  \* PLMN ID = MCC (3 digits) + MNC (2 or 3 digits)

MCC

MNC

PIN  (optional) 🔒

Dial number  ▼ (optional)

Authentication NONE ▼ (optional)

Username  (optional)

Password  (optional) 🔒

Debug mode Disable ▼

(After enabling this feature, you can export the debug log in "3G/4G LTE Log" section when you have connection issues.)

### 6.1.2.5 Dual WAN (Ethernet+WiFi)

Configure the Ethernet Setting and Wi-Fi Station Setting at the same time. If the Dual WAN mode is selected, the primary interface needs to be specified by default. Pico Next Gateway will automatically set the other workable interface to be the backhaul.

**Figure 6.1.2.5-A Network Primary**

### WAN Settings

---

System will reboot if settings are applied successfully.

WAN Mode Dual WAN (Ethernet + WiFi) ▼

Network priority WiFi ▼ (Specify which WAN is Primary, the other one will be backup.)

Figure 6.1.2.5-B Ethernet and WiFi Station Configuration

### Ethernet WAN

WAN Type DHCP Client ▼

---

### Wireless Station

Click "Scan" to get Access Point List

SSID: Box\_Box

Security: WPA/WPA2-PSK ▼

KEY: \*\*\*\*\*

--- select one --- ▼

### 6.1.3 3G/4G LTE Log

If LTE Debug Mode is enabled, the LTE connection logs will be shown on this page. Click the "EXPORT" button to export the log.

Figure 6.1.3-A 3G/4G LTE Log

## 3G/4G LTE Log

```

[2021-07-09 17:48:33] 0 day 1 hr 2 min 3 sec
[2021-07-09 17:48:44] 0 day 1 hr 2 min 14 sec
[2021-07-09 17:49:58] ServingCell: +QENG: "servingcell", "NOCONN", "LTE", "FDD", 466, 01, 36C040C, 503, 1550,
[2021-07-09 17:50:07] LTE AT port no response this moment! Please wait for next retry!
[2021-07-09 17:50:08] LTE continuesly connect for: 0 day 1 hr 3 min 38 sec
[2021-07-09 17:54:50] ServingCell: +QENG: "servingcell", "NOCONN", "LTE", "FDD", 466, 01, 36C040C, 503, 1550,
[2021-07-09 17:54:57] LTE AT port no response this moment! Please wait for next retry!
[2021-07-09 17:54:58] LTE continuesly connect for: 0 day 1 hr 8 min 28 sec
[2021-07-09 17:58:58] 0 day 1 hr 12 min 28 sec
[2021-07-09 17:59:36] ServingCell: +QENG: "servingcell", "NOCONN", "LTE", "FDD", 466, 01, 36C040C, 503, 1550,
[2021-07-09 17:59:43] RSSI: 29,99
[2021-07-09 17:59:44] LTE continuesly connect for: 0 day 1 hr 13 min 14 sec
[2021-07-09 18:04:27] ServingCell: +QENG: "servingcell", "NOCONN", "LTE", "FDD", 466, 01, 36C040C, 503, 1550,
[2021-07-09 18:04:33] LTE AT port no response this moment! Please wait for next retry!
[2021-07-09 18:04:34] LTE continuesly connect for: 0 day 1 hr 18 min 4 sec

```

## 6.2 VPN

The VPN menu consists of the following categories: **VPN Settings** and **VPN Log**. An introduction for each category and input procedures are described in the following paragraphs.

### 6.2.1 VPN Settings

This page is for configuring OpenVPN Client settings, including **Import a config file** or **Customize a config file**.

Figure 6.2.1-A Import a config file

### OpenVPN Client Settings

Here you can import a config file or manually config a VPN setting file.

Service State Enable ▼

Config Type Import a config file ▼

Import config file: Choose File No file chosen UPLOAD

Username/Password Authentication  (Please add "auth-user-pass /etc/openvpn/auth.cfg" in the imported config file while enabling this.)

Username

Password  🗑️

Config Status Installed DELETE

Note: Due to dual WAN mode is running, gateway info pushed from VPN server will be ignored

Figure 6.2.1-B Customize a config file

### OpenVPN Client Settings

Here you can import a config file or manually config a VPN setting file.

Service State Enable ▼

Config Type Customize a config file ▼

Interface Type TUN ▼

Protocol UDP ▼

Server Hostname/IP 172.16.99.111

Server Port 1194

Username/Password Authentication

Encryption Cipher AES-256-CBC ▼

Minimum TLS Version Default ▼

Certificate and Keys [CONFIGURE](#)

Other settings (Optional, max 1024 characters)

```
persist-tun
remote-cert-tls server
auth SHA256
data-ciphers AES-256-CBC
route 10.99.1.0 255.255.255.0
route-metric 50
comp-lzo
verb 3
allow-compression yes
```

**Note: Due to dual WAN mode is running, gateway info pushed from VPN server will be ignored**



## 6.2.2 VPN Log

The VPN connection log will be shown on this page.

**Figure 6.2.2-A VPN Log**

VPN Settings    VPN Log

```
2022-07-05 10:59:21 Incoming Data Channel: Cipher 'AES-128-CBC' initialized with 128 bit key
2022-07-05 10:59:21 Incoming Data Channel: Using 160 bit message hash 'SHA1' for HMAC authentication
2022-07-05 10:59:21 net_route_v4_best_gw query: dst 0.0.0.0
2022-07-05 10:59:21 net_route_v4_best_gw result: via 192.168.11.244 dev eth0
2022-07-05 10:59:21 ROUTE_GATEWAY 192.168.11.244/255.255.255.0 IFACE=eth0 HWADDR=00:16:16:2b:aa:ac
2022-07-05 10:59:21 TUN/TAP device tun0 opened
2022-07-05 10:59:21 net_iface_mtu_set: mtu 1500 for tun0
2022-07-05 10:59:21 net_iface_up: set tun0 up
2022-07-05 10:59:21 net_addr_ptp_v4_add: 10.99.1.6 peer 10.99.1.5 dev tun0
2022-07-05 10:59:21 net_route_v4_add: 10.99.1.0/24 via 10.99.1.5 dev [NULL] table 0 metric 50
2022-07-05 10:59:21 GID set to nogroup
2022-07-05 10:59:21 UID set to nobody
2022-07-05 10:59:21 WARNING: this configuration may cache passwords in memory -- use the auth-nocache option to prevent this
2022-07-05 10:59:21 Initialization Sequence Completed
```



### 6.3 Diagnostics

Input a specific URL in the text field. Click the “PING” button to ping the URL specified

Figure 6.3-A Network Utilities

The screenshot shows a web interface titled "Network Utilities". It includes a "Note" section with instructions on what to do if a ping test fails. Below the note is a text input field containing "www.browan.com" and a blue "PING" button. The bottom section, titled "Collecting data", displays the output of a successful ping test, including individual packet results and summary statistics.

```
Network Utilities

Note :
If the ping test is fail, please check your network setting.
- Ethernet: Please make sure your backhaul network is available.

www.browan.com
PING

Collecting data

PING www.browan.com (44.241.247.162): 56 data bytes
64 bytes from 44.241.247.162: seq=0 ttl=219 time=197.869 ms
64 bytes from 44.241.247.162: seq=1 ttl=225 time=154.677 ms
64 bytes from 44.241.247.162: seq=2 ttl=219 time=189.352 ms
64 bytes from 44.241.247.162: seq=3 ttl=225 time=154.293 ms
64 bytes from 44.241.247.162: seq=4 ttl=219 time=187.985 ms

--- www.browan.com ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 154.293/176.835/197.869 ms
```