



NNIONGIN LoRaWAN Gateway User Manual

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1 Introduction

1.1 What is the NNIONGIN

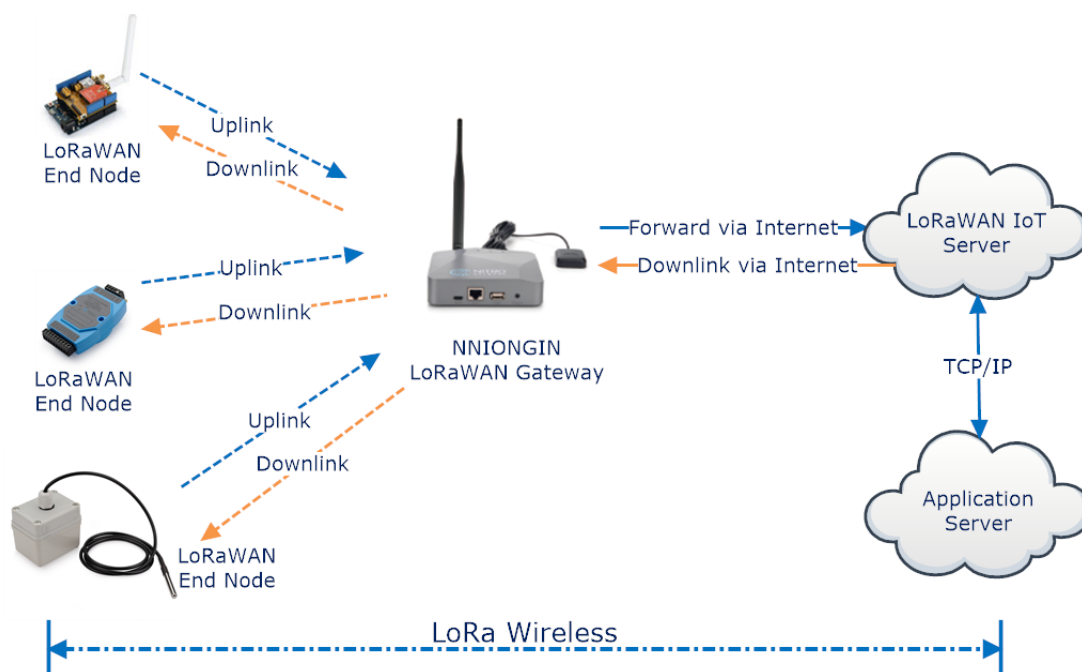
The NNIONGIN is an open source **LoRaWAN Indoor Gateway**. It lets you bridge LoRa wireless network to an IP network via WiFi, Ethernet. The LoRa wireless allows users to send data and reach extremely long ranges at low data-rates.

The NNIONGIN uses **Semtech packet forwarder & LoRaWAN Basic Station** and fully compatible with LoRaWAN protocol. It includes a **SX1302 LoRa concentrator**, which provides 10 programmable parallel demodulation paths.

NNIONGIN has **pre-configured standard LoRaWAN frequency bands** to use for different countries. User can also **customized the frequency bands** to use in their own LoRa network.

NNIONGIN can communicate with ABP LoRaWAN end node without LoRaWAN server. System integrator can use it to integrate with their existing IoT Service without set up own LoRaWAN server or use 3rd party LoRaWAN service.

NNIONGIN In a LoRaWAN IoT Network:



1.2 Specifications

Hardware System:

Linux Part:

- 400Mhz ar9331 processor
- 64MB RAM
- 16MB Flash

Interface:

- 10M/100M RJ45 Ports x 1
- WiFi : 802.11 b/g/n
- LoRaWAN Wireless
- Power Input: 5V DC, 2A, Type C
- USB 2.0 host connector x 1
- Mini-PCI E connector x 1
- SX1302 + 2 x SX1250
- GPS Module L76K

WiFi Spec:

- IEEE 802.11 b/g/n
- Frequency Band: 2.4 ~ 2.462GHz
- Tx power:
 - ✓ 11n tx power : mcs7/15: 11db mcs0 : 17db
 - ✓ 11b tx power: 18db
 - ✓ 11g 54M tx power: 12db
 - ✓ 11g 6M tx power: 18db
- Wifi Sensitivity
 - ✓ 11g 54M : -71dbm
 - ✓ 11n 20M : -67dbm

LoRa Spec:

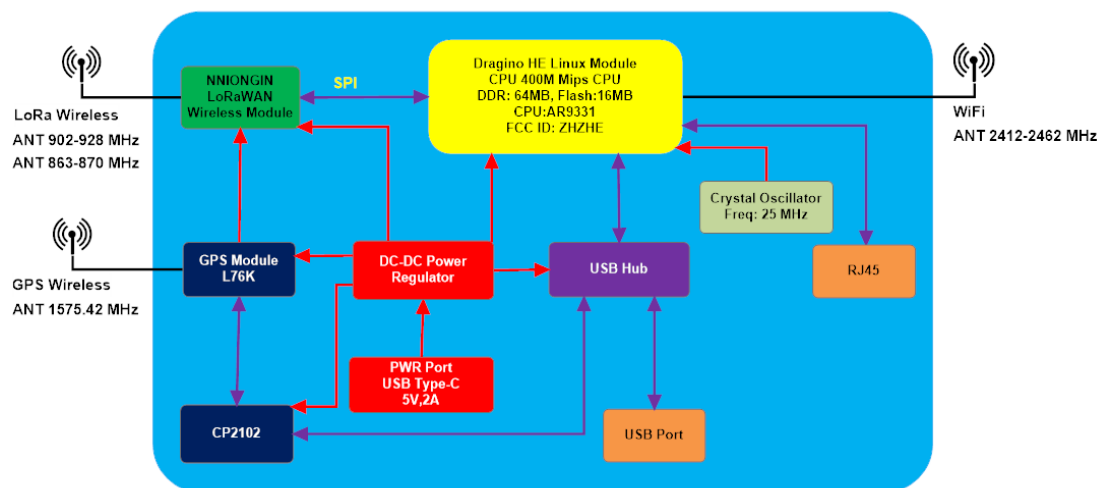
- Up to -140 dBm sensitivity
- 70 dB CW interferer rejection at 1 MHz offset
- Able to operate with negative SNR, CCR up to 9dB
- Emulates 49 x LoRa demodulators and 1 x (G)FSK demodulator
- Dual digital TX & RX radio front-end interfaces
- 10 programmable parallel demodulation paths
- Dynamic data-rate (DDR) adaptation
- True antenna diversity or simultaneous dual-band operation

1.3 Features

- ✓ Open Source OpenWrt system
- ✓ Managed by Web GUI, SSH via WAN or WiFi
- ✓ Remote access with Reverse-SSH or remote.it
- ✓ Emulates 49x LoRa demodulators
- ✓ LoRaWAN Gateway
- ✓ 10 programmable parallel demodulation paths
- ✓ Pre-configure to support different LoRaWAN regional settings.
- ✓ Allow to customize LoRaWAN regional parameters.
- ✓ Support Local decode ABP end node info and transfer to MQTT server
- ✓ Support different level log in.
- ✓ Support Semtech Packet Forwarder
- ✓ Support LoRaWAN basic station.
- ✓ Built-in GPS module for location & timing
- ✓ External fiber glass antenna

1.4 Hardware System Structure

NNIONGIN System Overview:



1.5 NNIONGIN Applications



1.6 LED Indicators

NNIONGIN has totally four LEDs, They are:

- **Power LED** : This **RED LED** will be **solid on** if the device is properly powered.
- **LoRa LED** : This **RGB LED** will **blink GREEN** when LoRaWAN module starts or transmit a packet.
- **SYS LED** : This **RGB LED** will shows different colors on different state:
 - ✓ **SOLID BLUE**: Device is alive with LoRaWAN server connection.
 - ✓ **BLINKING BLUE**: a) Device has internet connection but no LoRaWAN Connection. or b) Device is in booting stage, in this stage, it will **BLINKING BLUE** for several seconds and then with **SOLID RED** and **BLINKING BLUE** together
 - ✓ **SOLID RED**: Device doesn't have Internet connection.
- **ETH LED** : This LED shows the ETH interface connection status.

2 Access and Configure NNIONGIN

The NNIONGIN is configured as a WiFi Access Point by factory default. You can access and configure the NNIONGIN after connecting to its WiFi network, or via its WAN Ethernet port.

2.1 Find IP address of NNIONGIN

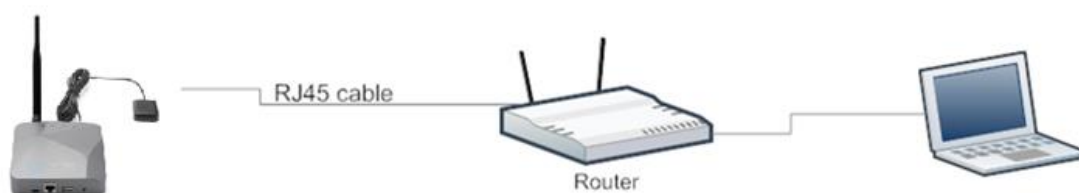
2.1.1 Connect via WiFi



At the first boot of NNIONGIN, it will auto generate a WiFi network called **nitro-xxxxxx** with password: **nitro+nitro**

You can use a PC to connect to this WiFi network. The PC will get an IP address 10.130.1.xxx and the NNIONGIN has the default IP **10.130.1.1**

2.1.2 Connect via Ethernet with DHCP IP from router



Alternatively, connect the NNIONGIN Ethernet port to your router and NNIONGIN can obtain an IP address from your router. In the router's management portal, you should be able to find what IP address the router has assigned to the NNIONGIN. You can also use this IP to connect.

2.1.3 Connect via WiFi with DHCP IP from router



If the NNIONGIN already connect to the router via WiFi, use can use the WiFi IP to connect to NNIONGIN.

2.1.4 Connect via Ethernet with fall back ip

The WAN port also has a [fall back ip address](#) for access if user doesn't connect to uplink router. Click [here to see how to configure](#).

2.2 Access Configure Web UI

Web Interface

Open a browser on the PC and type in the NNIONGIN ip address (depends on your connect method)

<http://10.130.1.1/> (Access via WiFi AP network)

or

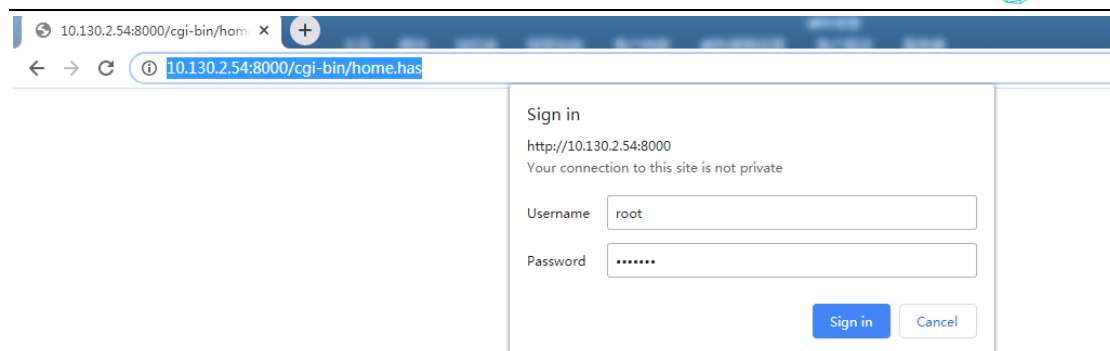
http://IP_ADDRESS or http://IP_ADDRESS:8000 (The web port has been changed to 8000 in **WAN interface**(WAN port or WiFi Client Mode) since firmware 5.3.xxx firmware)

You will see the login interface of NNIONGIN as shown below.

The account details for Web Login are:

User Name: root

Password: nitro



3 Typical Network Setup

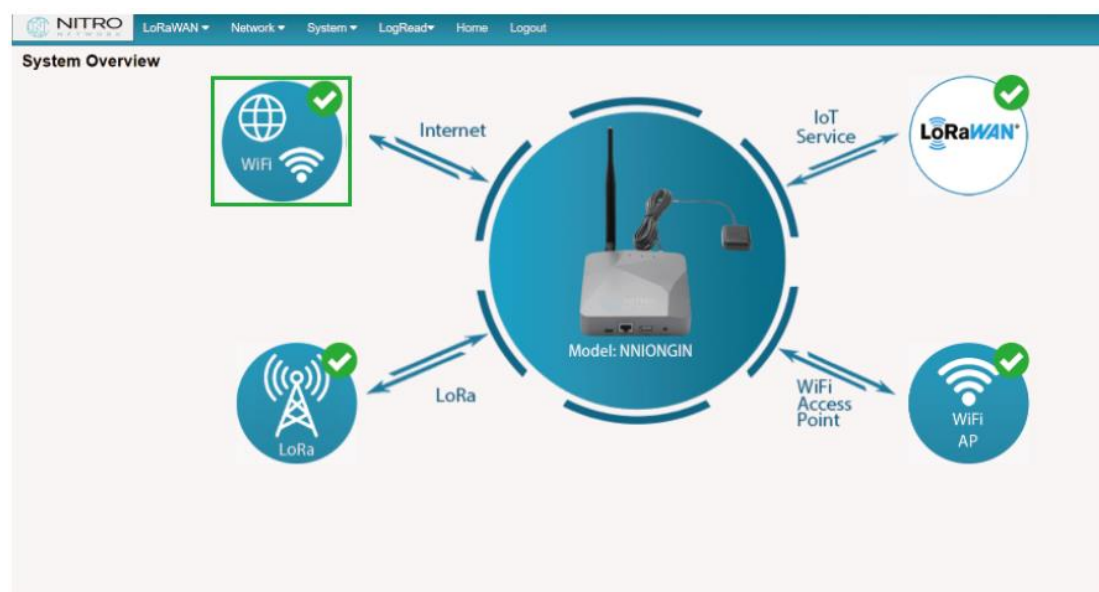
3.1 Overview

The NNIONGIN supports flexible network set up for different environments. This section describes the typical network topology can be set in NNIONGIN. The network set up includes:

- ✓ **WAN Port Internet Mode**
- ✓ **WiFi Client Mode**
- ✓ **WiFi AP Mode**

3.2 Use WAN port to access Internet

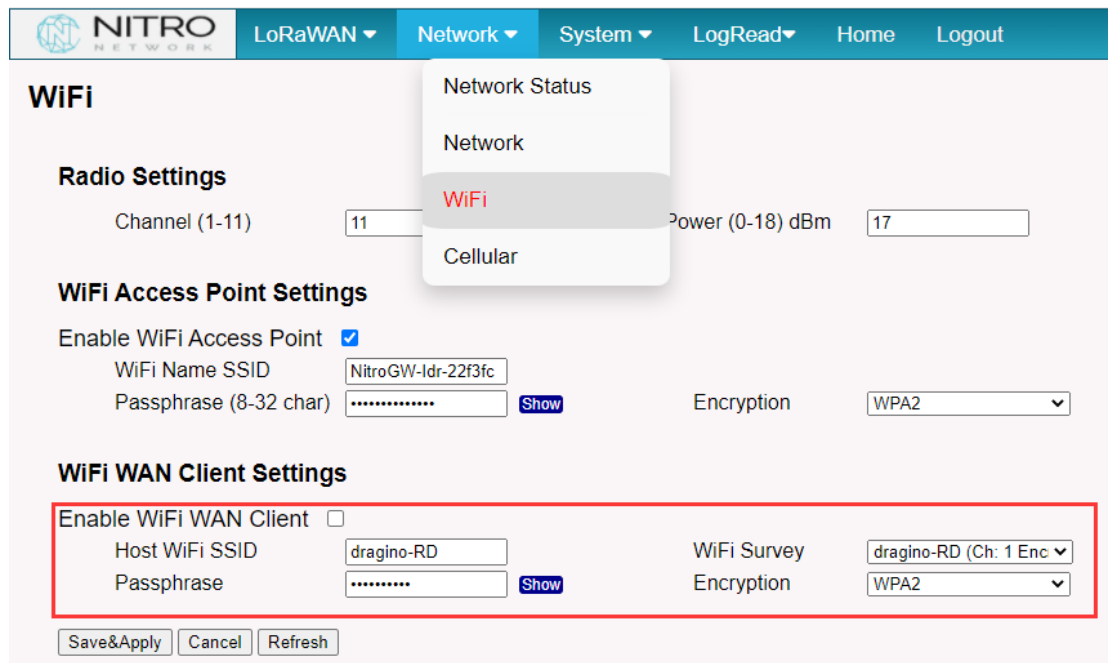
By default, the NNIONGIN is set to use the WAN port to connect to an upstream network. When you connect the NNIONGIN's WAN port to an upstream router, NNIONGIN will get an IP address from the router and have Internet access via the upstream router. The network status can be checked as below:



3.3 Access the Internet as a WiFi Client.

In the WiFi Client Mode, NNIONGIN acts as a WiFi client and gets DHCP from an upstream router via WiFi.

The settings for WiFi Client is under page [System](#) → [WiFi](#) → [WiFi WAN Client Settings](#)



The screenshot shows the NITRO NETWORK web interface. The top navigation bar includes links for LoRaWAN, Network, System, LogRead, Home, and Logout. The 'Network' dropdown menu is open, showing options for Network Status, Network, WiFi (highlighted in red), and Cellular. The main content area is titled 'WiFi' and contains three sections: 'Radio Settings' with fields for Channel (1-11) and Power (0-18) dBm; 'WiFi Access Point Settings' with a checkbox for 'Enable WiFi Access Point', fields for 'WiFi Name SSID' and 'Passphrase', and a dropdown for 'Encryption'; and 'WiFi WAN Client Settings' which is highlighted with a red box. This section includes a checkbox for 'Enable WiFi WAN Client', fields for 'Host WiFi SSID' and 'Passphrase', and a dropdown for 'WiFi Survey'. At the bottom are buttons for 'Save&Apply', 'Cancel', and 'Refresh'.

In the WiFi Survey Choose the WiFi AP, and input the Passphrase then click Save & Apply to connect.

3.4 Check Internet connection

In the [Home](#) page, we can check the Internet connection.

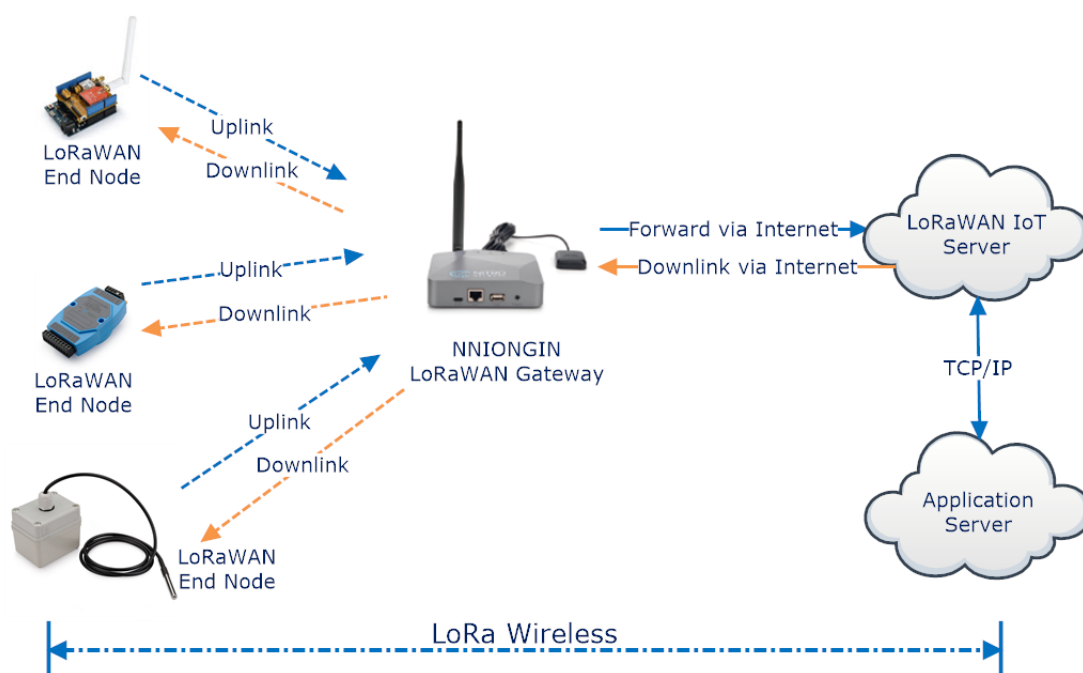
- GREEN Tick  : This interface has Internet connection.
- Yellow Tick  : This interface has IP address but don't use it for internet connection.
- RED Cross  : This interface doesn't connected.



4 Example: Configure as a LoRaWAN gateway

NNIONGIN is fully compatible with LoRaWAN protocol. It uses the legacy Semtech Packet forwarder to forward the LoRaWAN packets to server. The structure is as below.

NNIONGIN In a LoRaWAN IoT Network:

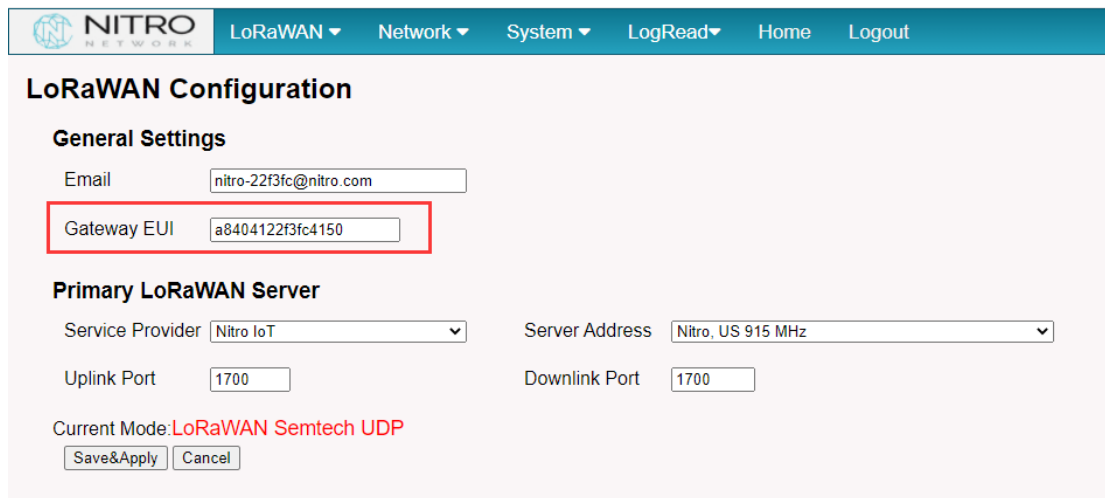


This chapter describes how to use the NNIONGIN to work with ([TTN v3](https://www.thethingsnetwork.org/)).
(www.thethingsnetwork.org)

4.1 Create a gateway in TTN V3 Server

Step 1: Get a Unique gateway ID.

Every NNIONGIN has a unique gateway id. The ID can be found at LoRaWAN page:



NITRO NETWORK LoRaWAN Network System LogRead Home Logout

LoRaWAN Configuration

General Settings

Email:

Gateway EUI:

Primary LoRaWAN Server

Service Provider: Server Address:

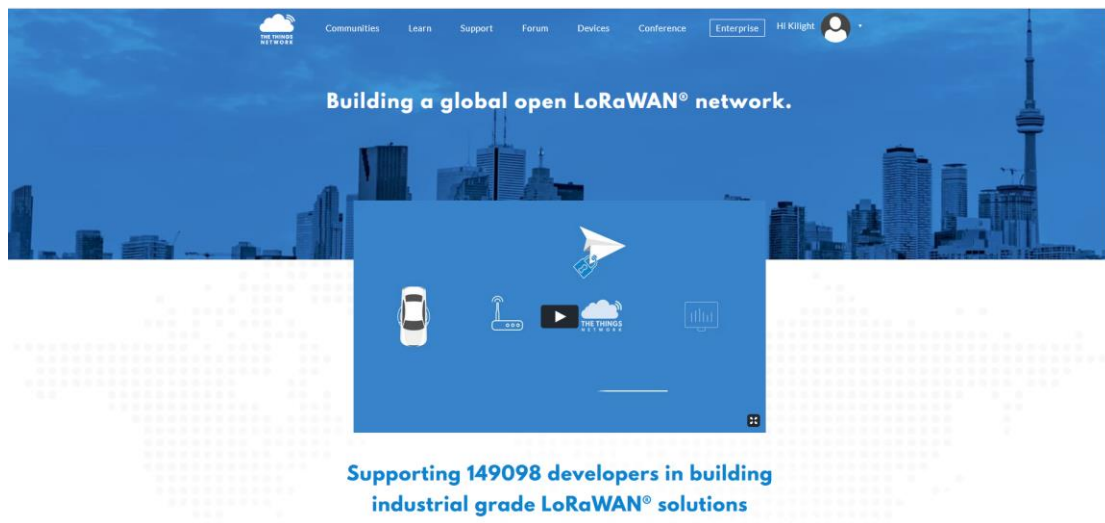
Uplink Port: Downlink Port:

Current Mode: **LoRaWAN Semtech UDP**

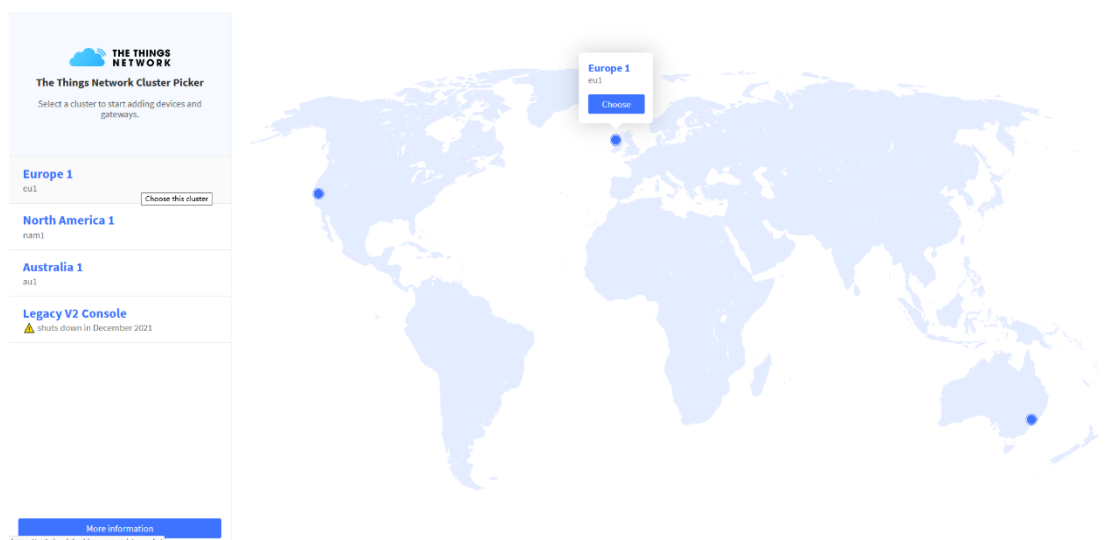
The example gateway id is: **a8404122f3fc4150**

Step 2: Sign up a user account in TTN server

<https://account.thethingsnetwork.org/register>



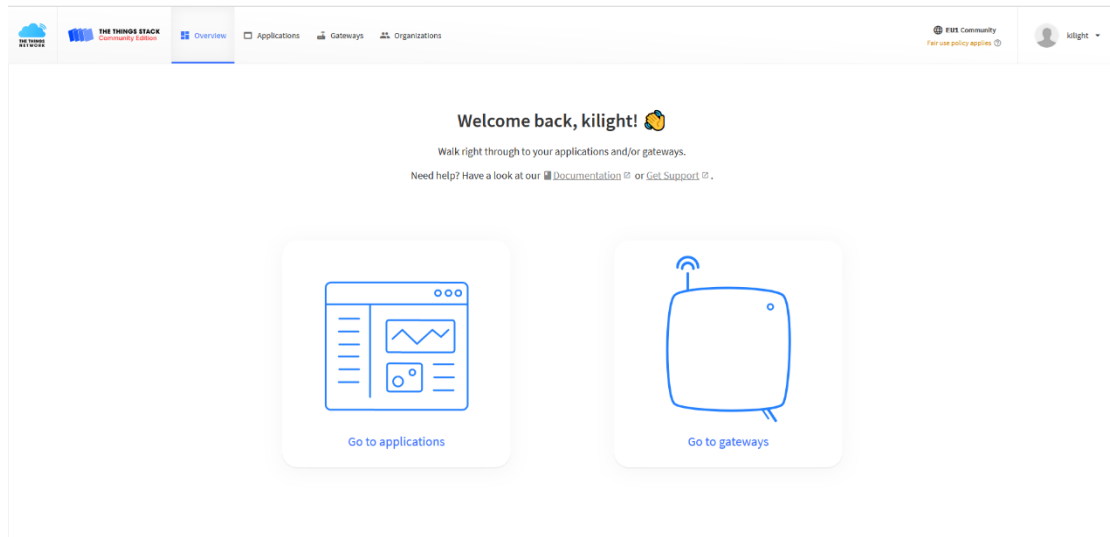
Step 3: Choose the TTNv3 Cluster Picker



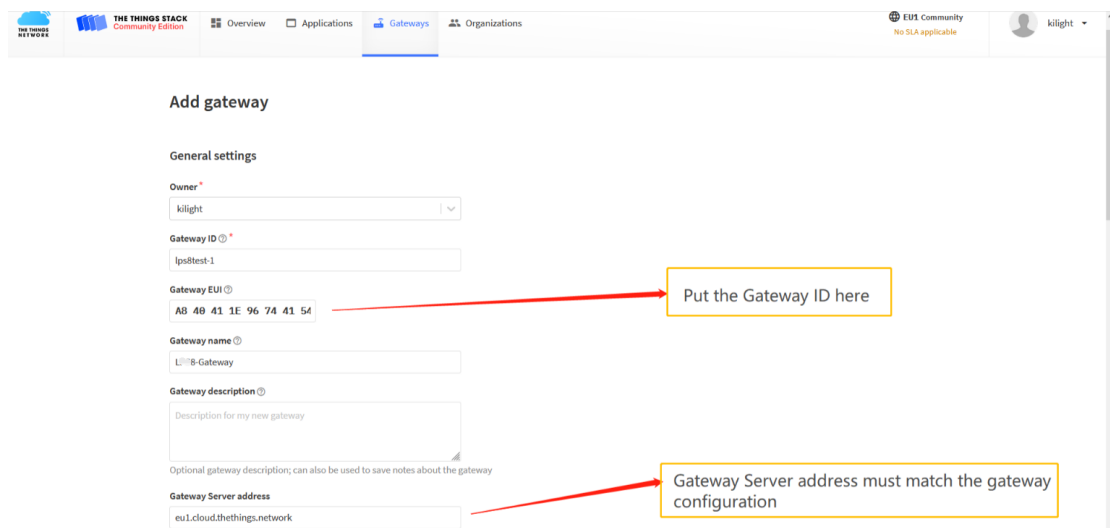
Note: Choose the cluster corresponds to a specific Gateway server address

- Europe 1 **corresponding Gateway server address:** eu1.cloud.thethings.network
- North America 1 **corresponding Gateway server address:** nam1.cloud.thethings.network
- Australia 1 **corresponding Gateway server address:** au1.cloud.thethings.network
- Legacy V2 Console : **TTN v2 shuts down in December 2021**

Step 4: Create a Gateway



Click the Gateway icon and then click Add gateway.
Open the following page:



The screenshot shows the 'Add gateway' form. The 'General settings' section includes the following fields:

- Owner:** A dropdown menu showing 'kilight'.
- Gateway ID:** A text input field containing 'lps8test-1'.
- Gateway EUI:** A text input field containing 'AB 40 41 1E 96 74 41 54'. A red arrow points from this field to a yellow box with the text 'Put the Gateway ID here'.
- Gateway name:** A text input field containing 'LPS-8-Gateway'.
- Gateway description:** A text area with the placeholder text 'Description for my new gateway'.
- Optional gateway description:** A note below the description field stating 'Optional gateway description; can also be used to save notes about the gateway'.
- Gateway Server address:** A text input field containing 'eu1.cloud.thethings.network'. A red arrow points from this field to a yellow box with the text 'Gateway Server address must match the gateway configuration'.

Notice: Gateway Server address must match the gateway configuration, otherwise you will have problem for End Node to join the network.

After creating the gateway, you can see the gateway info, as below.

4.2 Configure NNIONGIN to connect to TTN v3

You can now configure the NNIONGIN to let it connect to TTN network V3.
Make sure your NNIONGIN has a working Internet Connection first.

Choose the right server provider and click **Save&Apply**

LoRaWAN
Network
System
LogRead
Home
Logout

LoRaWAN Configuration

General Settings

Email

Gateway EUI

Primary LoRaWAN Server

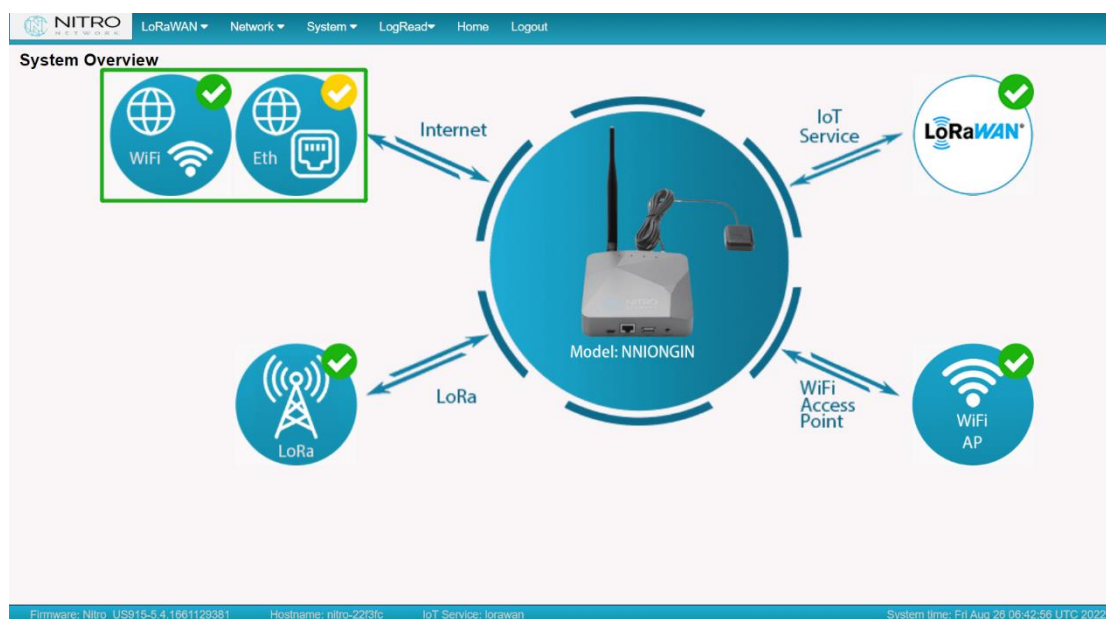
Service Provider
Nitro IoT
Server Address
Nitro, US 915 MHz

Uplink Port Downlink Port

Current Mode: **LoRaWAN Semtech UDP**

Note: The server address must match the Gateway server address you choose in TTN V3.

In the home page, we can see the LoRaWAN connection is ready now.



In TTN v3 portal, we can also see the gateway is connected.




[Overview](#)
[Applications](#)
[Gateways](#)
[Organizations](#)




[Gateways](#) > [A-Getway](#)


[Overview](#)

[Live data](#)
[Location](#)
[Collaborators](#)
[API keys](#)
[General settings](#)



A-Getway

ID: `est-1`

Last seen 3 seconds ago ↑ 38 ↓ 0 1 Collaborator 0 API keys Created 1 hour ago

General information

Gateway ID	<code>est-1</code>
Gateway EUI	<code>AB 40 41 1E 96 74 41 54</code>
Gateway description	None
Created at	Jul 5, 2021 11:24:53
Last updated at	Jul 5, 2021 11:24:53
Gateway Server address	<code>eu1.cloud.thethings.network</code>

LoRaWAN information

Frequency plan	<code>EU_863_870</code>
----------------	-------------------------

Live data

See all activity →

12:28:10	Receive gateway status	Metrics: { ackr: 0, rxfw: 4, rxin: 4,
12:28:00	Receive uplink message	DevAddr: 40 00 00 00 FCnt: 1100 F
12:27:51	Receive uplink message	DevAddr: 40 00 00 00 FCnt: 1096 F
12:27:47	Receive uplink message	DevAddr: 40 00 00 00 FCnt: 1095 F
12:27:42	Receive uplink message	DevAddr: 40 00 00 00 FCnt: 1094 F
12:27:00	Receive gateway status	Metrics: { ackr: 0, rxfw: 4, rxin: 6,

Location

Change location settings →



[Hide sidebar](#)

4.3 Add a LoRaWAN End Device

This section shows how to add a LoRaWAN End device to a LoRaWAN network and see the data from TTN web site.

We use [LT-2222-L](#) IO Controller as a reference device - the setup for other LoRaWAN devices will be similar.



Step 1: Create a Device definition in TTN v3 with the OTAA keys from the example LT-2222-L IO Controller device.

Three codes are required to define the device in TTN v3:

- ✓ DEV EUI - Unique ID code for a particular device.
- ✓ APP EUI - ID code for an Application defined in TTN v3.
- ✓ APP Key - Unique key to secure communications with a particular device.

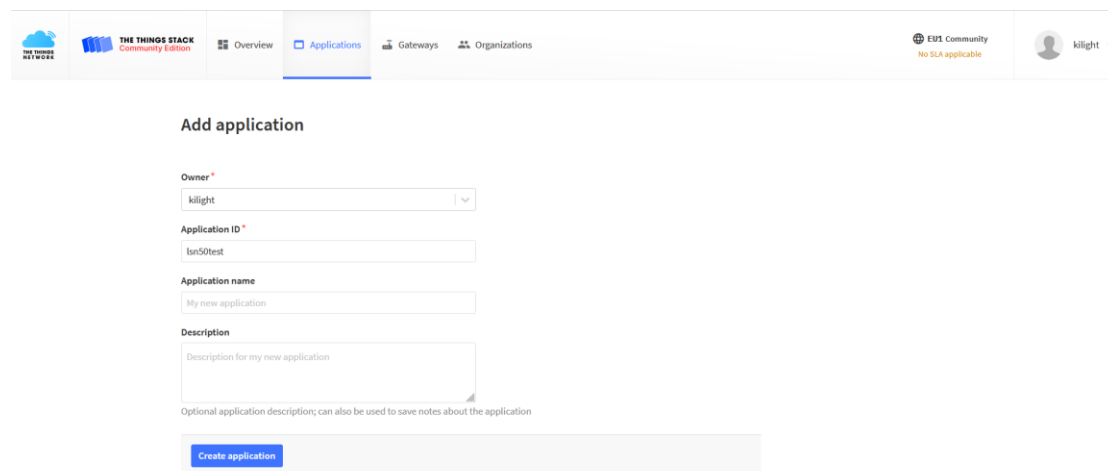
A set of these codes are stored in each device by the manufacturer as the default codes for that particular device. Each device is shipped with a sticker with the default Device EUI as shown below.



Note: You may be able to change these codes in a device by using a configuration facility on the device e.g. the LT-2222 uses a serial port access and a series of AT commands. Changing the codes may be necessary in the case where you have to use codes assigned by a LoRa WAN server.

For the TTN v3 server, you can use the codes set in the device as in the following example.

Select **Add Application** to open the screen below.



Add application

Owner ^{*}
kilight

Application ID ^{*}
lan50test

Application name
My new application

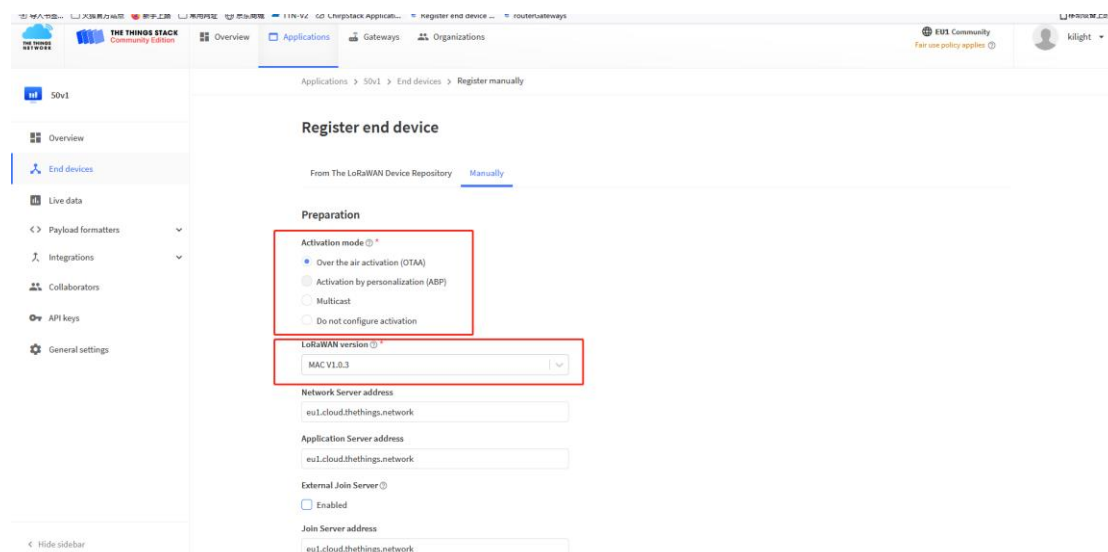
Description
Description for my new application

Optional application description; can also be used to save notes about the application

Create application

Open the **Application** select **Add end device**

Start Register the end device



Register end device

From The LoRaWAN Device Repository **Manually**

Preparation

Activation mode ^{*}
☒ Over the air activation (OTAA)
☐ Activation by personalization (ABP)
☐ Multicast
☐ Do not configure activation

LoRaWAN version ^{*}
MAC V1.0.3

Network Server address
eu1.cloud.thethings.network

Application Server address
eu1.cloud.thethings.network

External Join Server
☐ Enabled

Join Server address
eu1.cloud.thethings.network

Select OTAA activation mode

The LoRaWAN version for your device should be provided by the manufacturer in a datasheet as LoRaWAN version or LoRaWAN specification. The most commonly used LoRaWAN versions are v1.0.2 and v1.0.3.

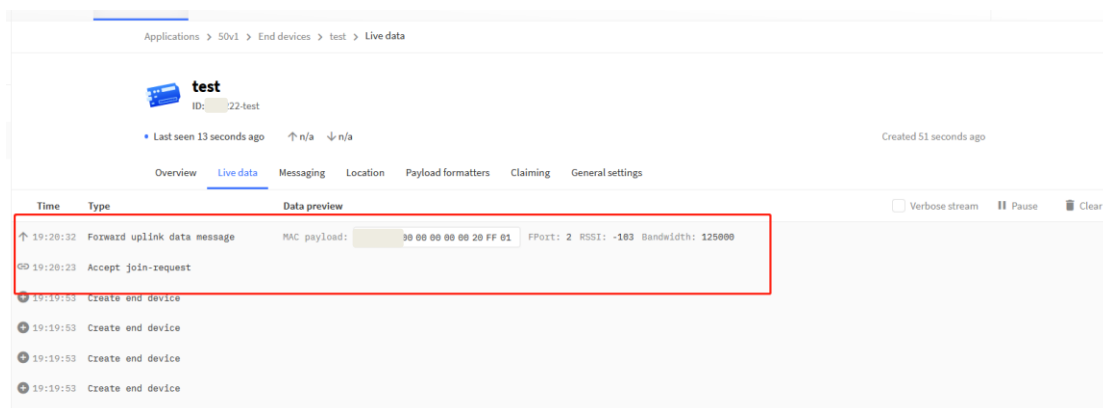
First, input the End device ID, AppEUI and DevEUI.

Secondly, choose the corresponding frequency and LoRaWAN class capabilities.

Finally, Application layer settings input the corresponding AppKey. Before saving the configuration, check that the data matches the device.

Step 2: Power on LT-22222-L device and it will automatically join the TTN network. After joining successfully, it will start to upload messages to the TTN v3. Select the Live data tab and you will see the data appearing in the panel.

Note that it may take some time for the device data to appear in the TTN v3 display.



5 Web Configure Pages

5.1 Home

Shows the system running status:



5.2 LoRaWAN Settings

5.2.1 LoRaWAN --> LoRaWAN

This page is for the connection set up to a general LoRaWAN Network server such as: [TTN](#), [ChirpStack](#) etc.


LoRaWAN ▾
Network ▾
System ▾
LogRead ▾
Home
Logout

LoRaWAN Configuration

General Settings

Email

Gateway EUI

Primary LoRaWAN Server

Service Provider

Server Address

Uplink Port

Downlink Port

Current Mode: **LoRaWAN Semtech UDP**

Note : User can ignore the latitude and longitude settings here, NNIONGIN will use the actually value from GPS module.

5.3 Network

5.3.1 Network --> Network Status


NITRO
 NETWORK

LoRaWAN ▾
 Network ▾
 System ▾
 LogRead ▾
 Home
 Logout

System Status

Network Status
 Network
 WiFi
 Cellular

Network / WiFi Status

```

Network
-----
Lan IP Address:
    inet addr: 10.130.76.1  Bcast: 10.130.76.255  Mask: 255.255.255.0

Eth WAN IP Address:
    inet addr: 192.168.123.147  Bcast: 192.168.123.255  Mask: 255.255.255.0
    inet addr: 172.31.255.254  Bcast: 172.31.255.255  Mask: 255.255.255.252
WiFi WAN IP Address:
Cellular:

Bridge:
bridge name      bridge id      STP enabled    interfaces
br-lan           7fff.a8404122f3ff  no             eth0
                                                         wlan0

WiFi
----
wlan0    ESSID: "NitroGW-Idr-22f3fc"
        Access Point: A8:40:41:22:F3:FC
        Mode: Master  Channel: 11 (2.462 GHz)
        Tx-Power: 17 dBm  Link Quality: unknown/70
        Signal: unknown  Noise: -95 dBm
        Bit Rate: unknown
        Encryption: WPA2 PSK (CCMP)
        Type: nl80211  HW Mode(s): 802.11bgn
      
```

Refresh

5.3.2 Network --> Network

 NITRO
NETWORK
 LoRaWAN ▾ Network ▾ System ▾ LogRead ▾ Home Logout

Network

LAN Settings

IP Address
 Gateway

Netmask
 DNS

WAN Settings

Enable DHCP ▾

WiFi WAN Settings

Enable DHCP ▾

LAN Settings:

When the NNIONGIN has the AP enable, LAN settings specify the network info for NNIONGIN's own network.

WAN Settings:

Setting for NNIONGIN WAN port

WiFi Settings:

Setting for NNIONGIN WiFi IP when use it as WiFi Client

5.3.3 Network --> WiFi

NNIONGIN WiFi Settings.


LoRaWAN ▾
Network ▾
System ▾
LogRead ▾
Home
Logout

WiFi

Radio Settings

Channel (1-11)
Tx Power (0-18) dBm

WiFi Access Point Settings

Enable WiFi Access Point ☒

WiFi Name SSID

Passphrase (8-32 char)
Show

Encryption
 ▾

WiFi WAN Client Settings

Enable WiFi WAN Client ☐

Host WiFi SSID

Passphrase
Show

WiFi Survey
 ▾

Encryption
 ▾

Save&Apply
Cancel
Refresh

5.4 System

5.4.1 System --> System Overview

Shows the system info:


LoRaWAN ▾
Network ▾
System ▾
LogRead ▾
Home
Logout

System Overview

Device Model:	NNIONGIN
Hostname:	nitro-22f3fc
Firmware:	Nitro_US915-5.4.1661129381
Build Time:	Build Mon 22 Aug 2022 08:49:41 AM CST
FWD version:	Release:2022-07-23 02:29:28, Version:2.0.6
Cellular :	Not Detected
System Time:	Fri Aug 26 06:42:28 UTC 2022
Uptime:	4 min
Load Avg:	2.62, 1.64, 0.69
Memory:	Free Memory: 20356 / Total Memory: 60192kB
IoT Service:	lorawan
ETH0 MAC:	A8:40:41:22:F3:FF
ETH1 MAC:	A8:40:41:22:F3:FE
WiFi MAC:	AA:40:41:22:F3:FC

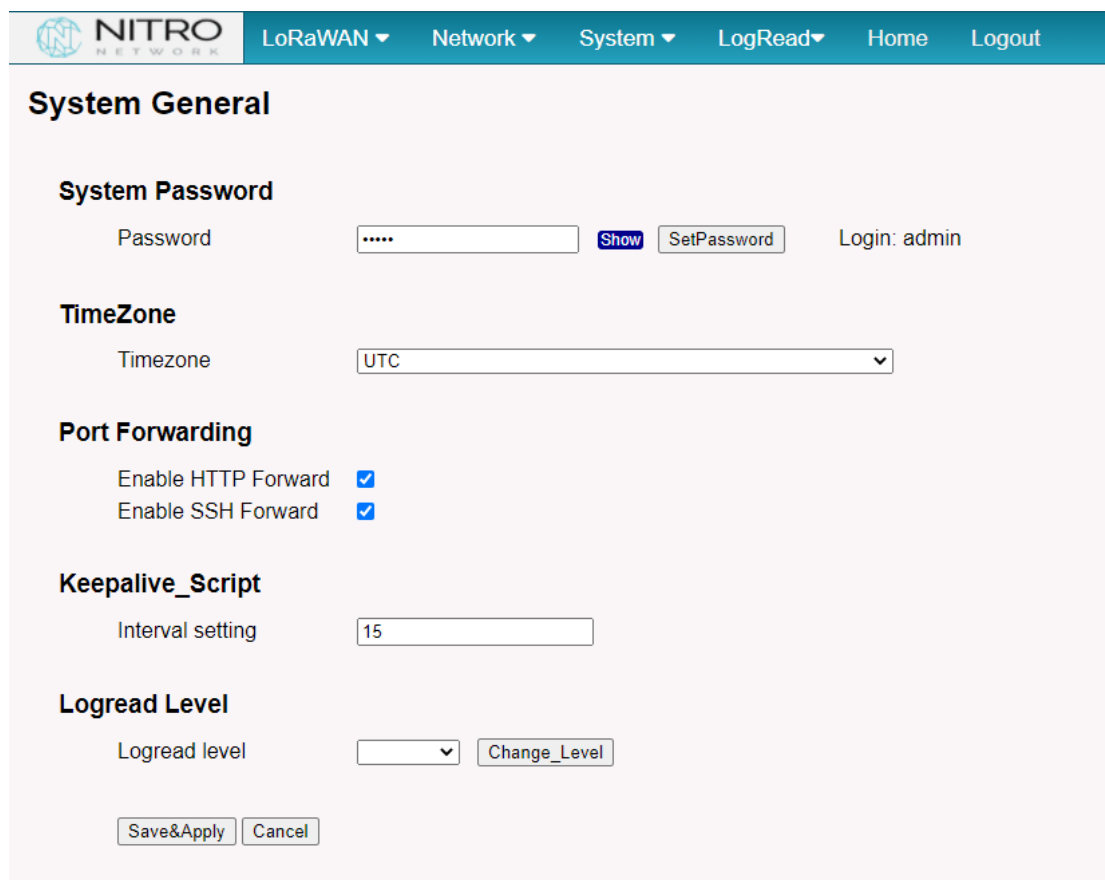
Internet Connection OK



LoRaWAN Connection OK



5.4.2 System --> General (login settings)



System General

System Password

Password [Show](#) [SetPassword](#) Login: admin

TimeZone

Timezone

Port Forwarding

Enable HTTP Forward ☒

Enable SSH Forward ☒

Keepalive_Script

Interval setting

Logread Level

Logread level [Change_Level](#)

[Save&Apply](#) [Cancel](#)

System Password:

There are two logins for NNIONGIN: **admin /nitro**. Both root and admin have the same right for WEB access. But root user has also the right to access via SSH to Linux system. admin only able to access WEB interface.

This page can be used to set the password for them.

Timezone:

Set device timezone.

Port forwarding:

Enable/Disable the HTTP and SSH access via WAN interface.

5.4.3 System --> Back Up/Restore Config

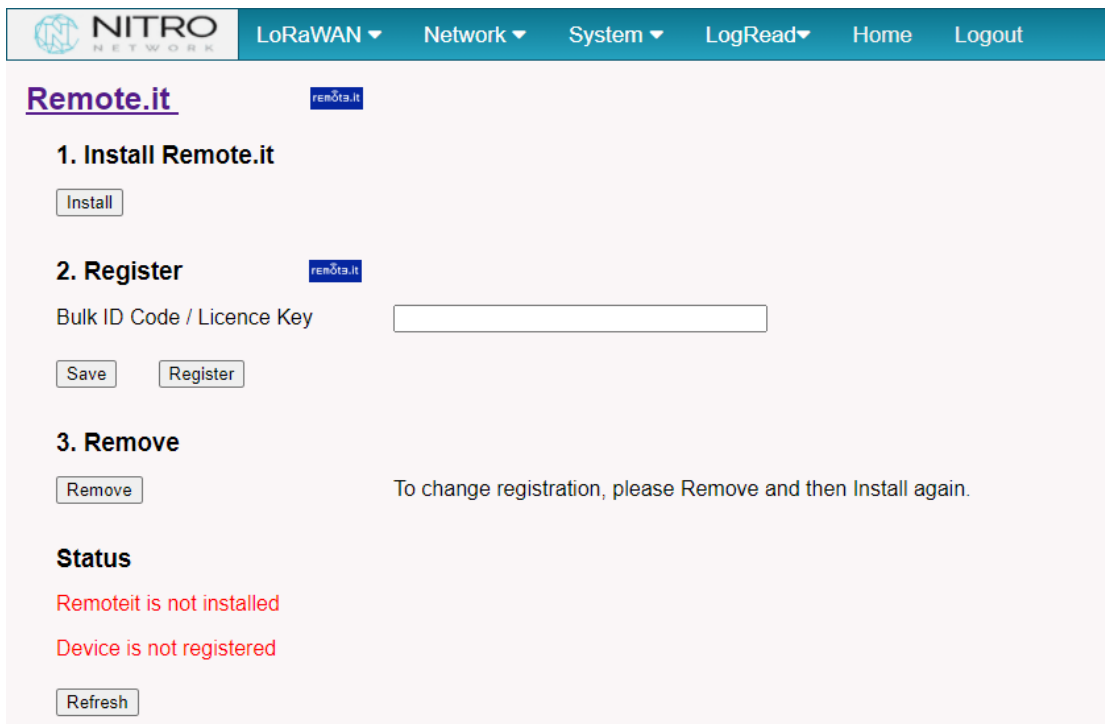
For backup or restore configuration.



The screenshot shows the 'Backup/Restore' page in the NITRO NETWORK interface. The top navigation bar includes 'LoRaWAN', 'Network', 'System', 'LogRead', 'Home', and 'Logout'. The main content area has a heading 'Backup/Restore' and a note: 'Click "Generate archive" to download a tar archive of the current configuration files.' Below this, there are two sections: 'Download backup:' with a 'Generate_archive' button and a link 'Download Backup File'; and 'Restore backup:' with a file selection button (显示文件) and an 'Upload_archive' button.

5.4.4 System --> Remote.it

Install Remote.it



The screenshot shows the 'Remote.it' page in the NITRO NETWORK interface. The top navigation bar is the same as in the previous screenshot. The main content area has a heading 'Remote.it' and three numbered steps: 1. Install Remote.it with an 'Install' button; 2. Register with a 'Bulk ID Code / Licence Key' input field, 'Save', and 'Register' buttons; 3. Remove with a 'Remove' button. Below these steps is a 'Status' section showing 'Remoteit is not installed' and 'Device is not registered' in red text, with a 'Refresh' button at the bottom.

5.4.5 System --> Remote Mgmt

Auto Provision is the feature for batch configure and remote management.

R-SSH is for remote access device and management


NITRO
NETWORK

LoRaWAN ▾
Network ▾
System ▾
LogRead ▾
Home
Logout

Auto Provision

Provision Server

Configure Version: 0

R-SSH Host Settings

Connection Type
 ▾

Login ID

Host Address
RSSH ID: a8404122f3fc4150

Connect at Startup ☐

Connection Status: **Not connected to RSSH Host**

Note: Auto connection after startup may take up to 5 minutes to clear previous connection

Generate New Keys

Current Key ID: **No keyfile present**

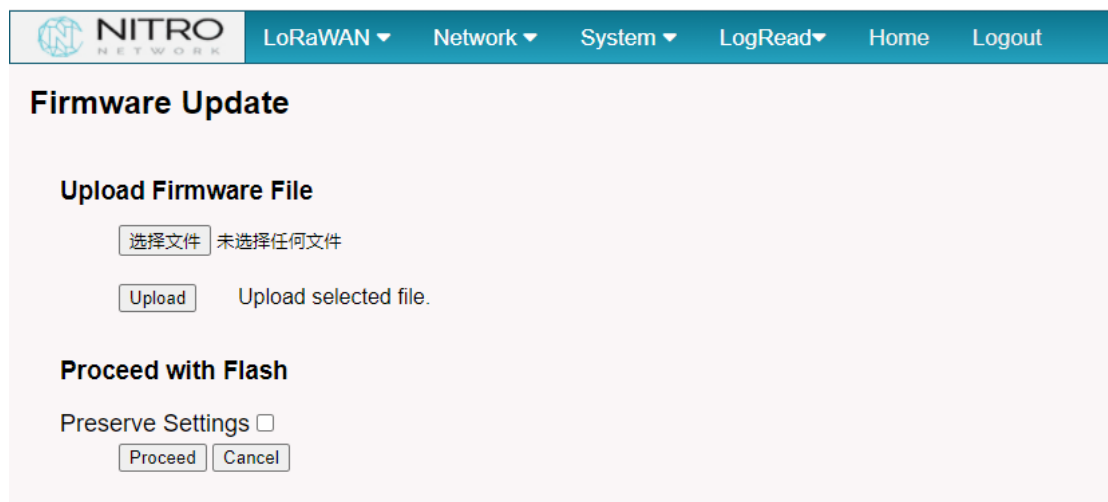
Caution: Generating new keys will break any existing server connections!!

[Download Public Key](#)

5.4.6 System --> Firmware Upgrade

We keep improving the NNIONGIN firmware for new features and bug fixes.

Web → System → Firmware Upgrade



Firmware Update

Upload Firmware File

选择文件 未选择任何文件

Upload Upload selected file.

Proceed with Flash

Preserve Settings ☐

Proceed Cancel

Select the required image and click **Upload**. The image will be uploaded to the device, and then click **Process** to upgrade.

NOTE : You normally need to **uncheck** the **Preserve Settings** checkbox when doing an upgrade to ensure that there is no conflict between the old settings and the new firmware. The new firmware will start up with its default settings.

The system will automatically boot into the new firmware after upgrade.

Note *: User can also upgrade firmware via Linux console

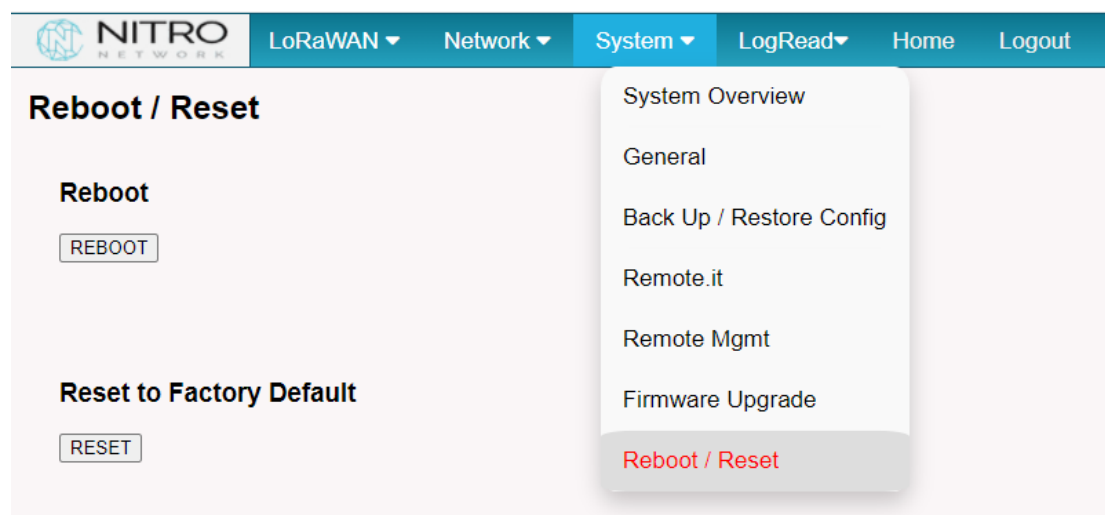
SCP the firmware to the system **/var** directory and then run

```
root@OpenWrt:~# /sbin/sysupgrade -n /var/Your_Image
```

NOTE: it is important to transfer the image in the /var directory, otherwise it may exceed the available flash size.

5.4.7 System --> Reboot/Reset

Restart or restore factory settings.



5.5 LogRead

5.5.1 LogRead --> LoRa Log

 NITRO
NETWORK

LoRaWAN ▾
 Network ▾
 System ▾
 LogRead ▾
 Home
 Logout

LogRead

FreqINFO:

Gateway Channels frequency

chan_multSF_0
Lora MAC, 125kHz, all SF, 903.9 MHz

chan_multSF_1
Lora MAC, 125kHz, all SF, 904.1 MHz

chan_multSF_2
Lora MAC, 125kHz, all SF, 904.3 MHz

chan_multSF_3
Lora MAC, 125kHz, all SF, 904.5 MHz

chan_multSF_4
Lora MAC, 125kHz, all SF, 904.7 MHz

chan_multSF_5
Lora MAC, 125kHz, all SF, 904.9 MHz

chan_multSF_6
Lora MAC, 125kHz, all SF, 905.1 MHz

chan_multSF_7
Lora MAC, 125kHz, all SF, 905.3 MHz

chan_Lora_std
Lora MAC, 500kHz, SF8, 904.6 MHz

chan_FSK

GPS INFO:

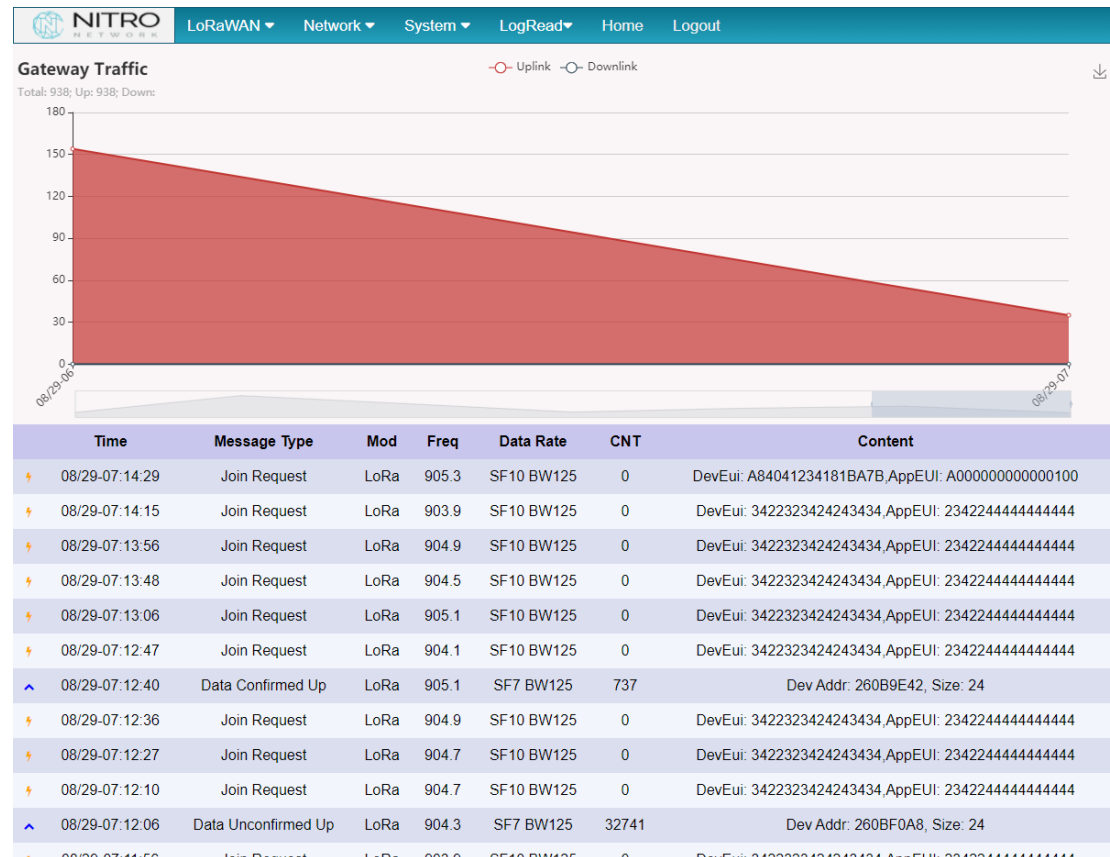
Mon Aug 29 07:00:08 2022 daemon.info fwd[1615]: PKTUP~ [server] JSON: {"stat":{"time":"2022-08-29 07:00:08 UTC""lati":22.70593"long":114.24301"alti":93

Mon Aug 29 07:00:38 2022 daemon.info fwd[1615]: PKTUP~ [server] JSON: {"stat":{"time":"2022-08-29 07:00:38 UTC""lati":22.70596"long":114.24297"alti":90

Show the frequency for LoRa Radio and traffics.

5.5.2 LogRead --> Gateway Traffic

Gateway Traffic



5.5.3 LogRead --> System Log

Show the system log



LoRaWAN
Network
System
LogRead
Home
Logout

System Log

USB Devices:

```

Bus 001 Device 003: ID 10c4:ea60 Cygnal Integrated Products, Inc. CP2102/CP2109 UART Bridge Controller [CP210x family]
Bus 001 Device 002: ID 1a40:0101 Terminus Technology Inc. Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
  
```

Boot Info:

```

Linux version 4.9.109 (root@DraginoHK) (gcc version 7.3.0 (OpenWrt GCC 7.3.0 r7360-e15565a)) #0 Fri Jun 29 16:58:53 2018
MyLoader: sysp=7019fff, boardp=354ef92d, parts=fd77b9fd
bootconsole [early0] enabled
CPU0 revision is: 00019374 (MIPS 24Kc)
SoC: Atheros AR9330 rev 1
Determined physical RAM map:
 memory: 04000000 @ 00000000 (usable)
Initrd not found or empty - disabling initrd
Primary instruction cache 64KB, VIPT, 4-way, linesize 32 bytes.
Primary data cache 32KB, 4-way, VIPT, cache aliases, linesize 32 bytes
  
```

Previous Log: lorawan

```

Mon Aug 29 07:01:34 2022 daemon.info fwd[1615]: INFO [server-up] received packages from mote: 00000000 (fcnt=0)
Mon Aug 29 07:01:34 2022 daemon.info fwd[1615]: PKTUP [server] JSON: [{"rxpk":{"jver":1,"tast":1725589010,"time":"1999-11-30T00:28:45.589009Z","tms":1345793436589,"chan":0,"rfch":0,"freq":903.900000,"mid":8,"stat":1,"modu":"LORA","dadr":"SF10BW125","cdcr":"4/5","rssi":-105,"lsnr":10.2,"foff":11,"rssi":-104,"size":23,"data":"AEREREREJEIjNDQkJDQyIjRC8ZWjN/o="}}]
Mon Aug 29 07:01:34 2022 daemon.info fwd[1615]: INFO [server2-up] received packages from mote: 00000000 (fcnt=0)
Mon Aug 29 07:01:34 2022 daemon.info fwd[1615]: PKTUP [server2] JSON: [{"rxpk":{"jver":1,"tast":1725589010,"time":"1999-11-30T00:28:45.589009Z","tms":1345793436589,"chan":0,"rfch":0,"freq":903.900000,"mid":8,"stat":1,"modu":"LORA","dadr":"SF10BW125","cdcr":"4/5","rssi":-105,"lsnr":10.2,"foff":11,"rssi":-104,"size":23,"data":"AEREREREJEIjNDQkJDQyIjRC8ZWjN/o="}}]
Mon Aug 29 07:01:34 2022 daemon.info fwd[1615]: JOIN_REQ: {"Size":23, "Rssi":-104, "snr":10, "AppEUI":"2342244444444444", "DevEUI":"3422323424243434"}
Mon Aug 29 07:01:36 2022 daemon.info fwd[1615]: INFO [server-down] FULL_ACK received in 228 ms
Mon Aug 29 07:01:39 2022 daemon.info fwd[1615]: #####[PKT_SERV] no report of this service #####
Mon Aug 29 07:01:39 2022 daemon.info fwd[1615]: PKTUP [server] JSON: {"stat":{"time":"2022-08-29 07:01:39 UTC","lati":22.70603,"long":114.24292,"alti":85,"rxnb":2,"rxok":2,"rxfw":2,"ackr":0.0,"dnwb":0,"txnb":0,"pfrm":"SX1302","mail":"nitro-22f3fo@nitro.com","desc":"Nitro LoRaWAN Gateway"}}
Mon Aug 29 07:01:39 2022 daemon.info fwd[1615]: PKTUP [server2] JSON: {"stat":{"time":"2022-08-29 07:01:39 UTC","lati":22.70603,"long":114.24292,"alti":85,"rxnb":2,"rxok":2,"rxfw":2,"ackr":0.0,"dnwb":0,"txnb":0,"pfrm":"SX1302","mail":"nitro-22f3fo@nitro.com","desc":"Nitro LoRaWAN Gateway"}}
  
```

5.5.4 LogRead --> Record Log

Record Log.



LoRaWAN
Network
System
LogRead
Home
Logout

Record Log

StartLog
StopLog
ResetLog

[Download Log File](#)

6 Linux System

The NNIONGIN is based on the OpenWrt Linux system. It is open source, and users are free to configure and modify the Linux settings.

6.1 SSH Access for Linux console

User can access the Linux console via the SSH protocol. Make sure your PC and the NNIONGIN are connected to the same network, then use a SSH tool (such as [putty](#) in Windows) to access it.

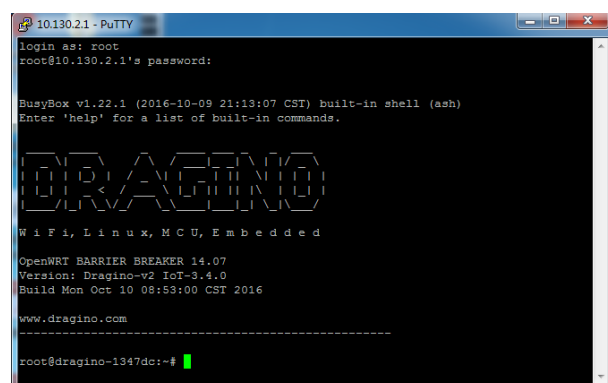
IP address: IP address of NNIONGIN

Port: 22 or 2222 (SSH port in WAN interface has been change to 2222 since firmware 5.3.xx, for security reason)

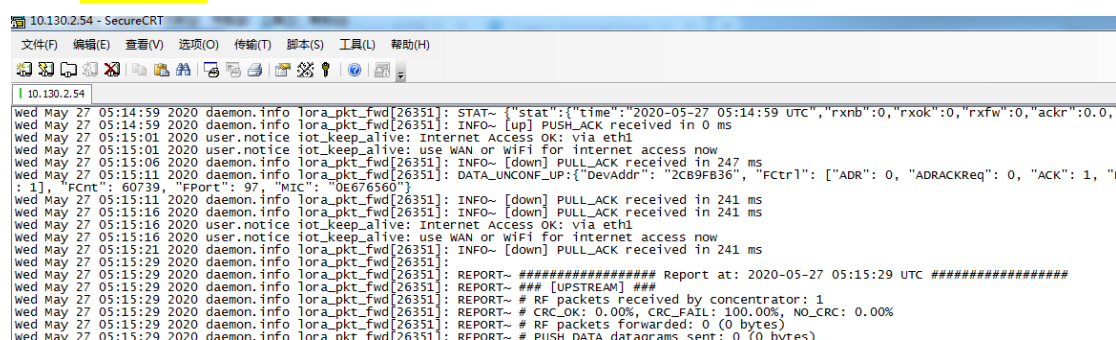
User Name: **root**

Password: **nitro** (default)

After logging in, you will be in the Linux console and can enter commands as shown below.



The **“logread -f”** command can be used to debug how system runs.

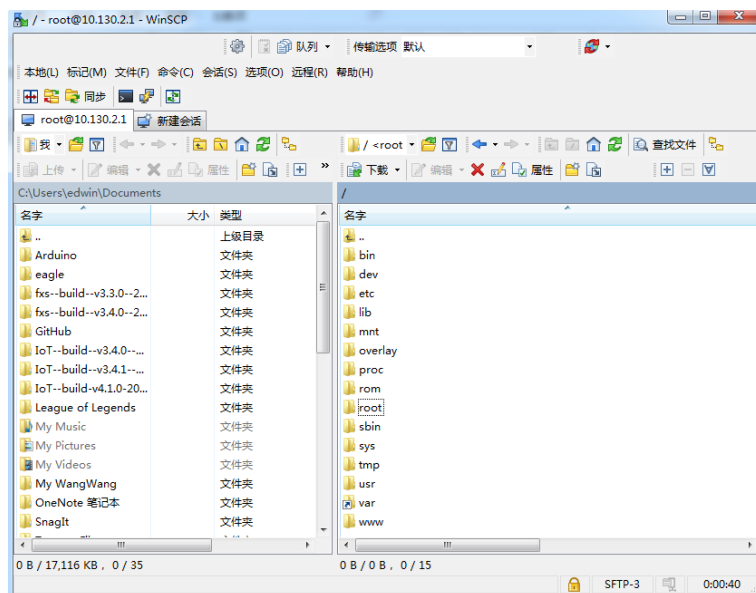


6.2 Edit and Transfer files

The NNIONGIN supports the **SCP protocol** and has a built-in **SFTP server**. There are many ways to edit and transfer files using these protocols.

In Windows, one of the easiest methods is using the [WinSCP](#) utility. After establishing access via WinSCP to the device, you can use an FTP style window to drag / drop files to the NNIONGIN, or edit the files directly in the windows.

Screenshot is as below:



6.3 File System

The NNIONGIN has a 16MB flash and a 64MB RAM. The /var and /tmp directories are in the RAM, so contents stored in /tmp and /var will be erased after rebooting the device. Other directories are in the flash and will remain after reboot.

The Linux system uses around 8MB ~10MB flash size which means there is not much room for user to store data in the NNIONGIN flash.

You can use an external USB flash memory device to extend the size of flash memory for storage.

6.4 Package maintenance system

NNIONGIN uses the OpenWrt [OPKG package maintenance system](#). There are more than 3000+ packages available in our package server for users to install for their applications. For example, if you want to add the *iperf* tool, you can install the related packages and configure NNIONGIN to use *iperf*.

Below are some example *opkg* commands. For more information please refer to the [OPKG package maintain system](#) (<https://wiki.openwrt.org/doc/techref/opkg>)

In Linux Console run:

```
root@dragino-169d30:~# opkg update // to get the latest packages list
```

```
root@dragino-169d30:~# opkg list //shows the available packages
```

```
root@dragino-169d30:~# opkg install iperf // install iperf
```

The system will automatically install the required packages as shown below.

```
root@dragino-169d30:/etc/opkg# opkg install iperf
```

```
Installing iperf (2.0.12-1) to root...
```

```
Downloading http://downloads.openwrt.org/snapshots/packages/mips\_24kc/base/iperf\_2.0.12-1\_mips\_24kc.ipk
```

```
Installing uclibcxx (0.2.4-3) to root...
```

```
Downloading http://downloads.openwrt.org/snapshots/packages/mips\_24kc/base/uclibcxx\_0.2.4-
```

```
3\_mips\_24kc.ipk
```

```
Configuring uclibcxx.
```

```
Configuring iperf.
```

7 Upgrade Linux Firmware

We keep improving the NNIONGIN Linux side firmware for new features and bug fixes.

The file named as **xxxxx-xxxxx-squashfs-sysupgrade.bin** is the upgrade Image. There are different methods to upgrade, as below.

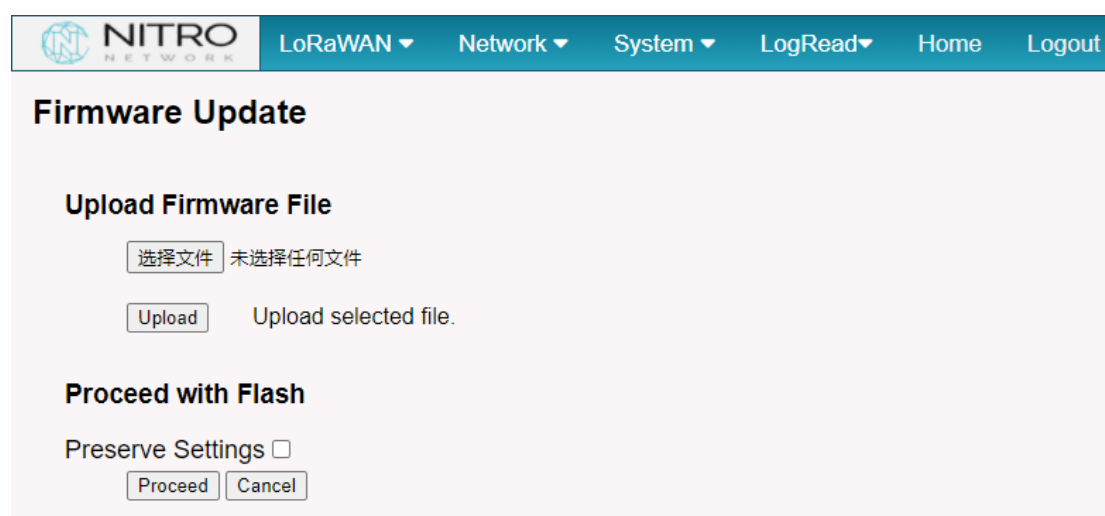
7.1 Upgrade via Web UI

Go to the page: **Web → System → Firmware Upgrade**

Select the required image and click **Flash Image**. The image will be uploaded to the device, and then click **Process Update** to upgrade.

NOTE: You normally need to **unchecked** the **Preserve Settings** checkbox when doing an upgrade to ensure that there is no conflict between the old settings and the new firmware. The new firmware will start up with its default settings.

The system will automatically boot into the new firmware after upgrade.



7.2 Upgrade via Linux console

SCP the firmware to the system **/var** directory and then run

```
root@OpenWrt:~# /sbin/sysupgrade -n /var/Your_Image
```

NOTE: it is important to transfer the image in the **/var** directory, otherwise it may exceed the available flash size.

8 FAQ

8.1 Can I make my own firmware for the gateway, Where can I find the source code?

Yes, You can make your own firmware for the NNIONGIN for branding purposes or to add customized applications.

8.2 Can I use 868Mhz version for 915Mhz bands?

It is possible but the distance will be very short, you can select US915 frequency band in 868Mhz version hardware. It will work but you will see the performance is greatly decreased because the 868Mhz version has an RF filter for band 863~870Mhz, all other frequencies will have high attenuation.

9 Trouble Shooting

9.1 I get kernel error when install new package, how to fix?

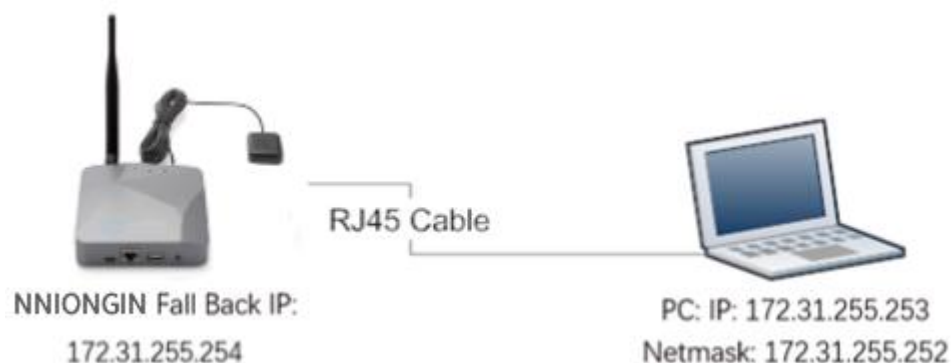
In some cases, when installing a package with **opkg**, it will generate a kernel error such as below due to a mismatch I the kernel ID:

```
root@nitro-16c538:~# opkg install kmod-nitro2-si3217x_3.10.49+0.2-1_ar71xx.ipk
Installing kmod-nitro2-si3217x (3.10.49+0.2-1) to root...
Collected errors:
* satisfy_dependencies_for: Cannot satisfy the following dependencies for kmod-nitro2-si3217x:
*   kernel (= 3.10.49-1-4917516478a753314254643facdf360a) *
* opkg_install_cmd: Cannot install package kmod-nitro2-si3217x.
```

In this case, you can use the `--force-depends` option to install such package as long as the actual kernel version is the same.

```
Opkg install kmod-nitro2-si3217x_3.10.49+0.2-1_ar71xx.ipk --force-depends
```

9.2 I configured NNIONGIN for WiFi access and lost its IP. What to do now?



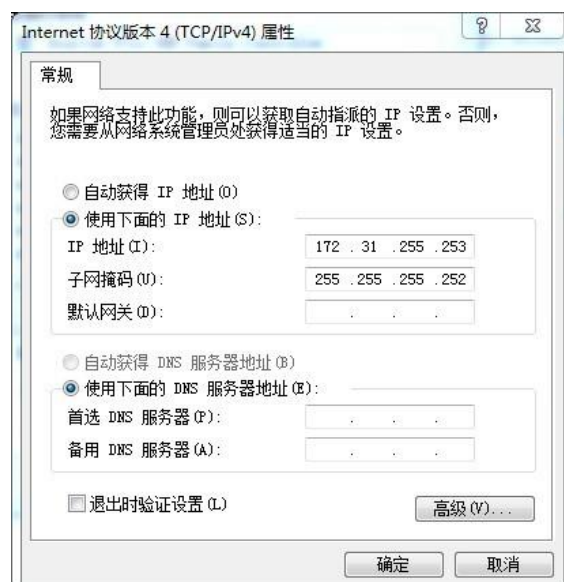
The NNIONGIN has a fall-back IP address on its WAN port. This IP is always enabled so you can use the fall-back IP to access NNIONGIN no matter what the WiFi IP is. The fall back IP is useful for connecting and debug the unit.

(Note: fallback IP can be disabled in the WAN and DHCP page)

Steps to connect via fall back IP:

1. Connect PC's Ethernet port to LG01's WAN port
2. Configure PC's Ethernet port has
IP: 172.31.255.253 and
Netmask: 255.255.255.252

As below photo:



3. In the PC, use IP address 172.31.255.254 to access the NNIONGIN via Web or Console. Please note the latest firmware uses port 8000 for http and 2222 for ssh access.

9.3 I connect to the NNIONGIN's SSID but NNIONGIN didn't assign DHCP IP to my laptop?

This is a known bug for the firmware version before 2019-09-23 for LPS, the issue was fixed since version: LG02_LG08--build-v5.2.1569218466-20190923-1402.

In the old version, user can use the [fall back ip method](#) to access and configure the device.

10 Order Info

PART: NNIONGIN-XXX-YYY:

XXX: Frequency Band

- **868**: valid frequency: 863Mhz ~ 870Mhz. for bands EU868, RU864, IN865 or KZ865.
- **915**: valid frequency: 902Mhz ~ 928Mhz. for bands US915, AU915, AS923 or KR920

YYY: Antenna model

- fiber glass antenna
- Rubber rod antenna
- GPS antenna

11 Packing Info

Package Includes:

- ✓ NNIONGIN LoRaWAN Gateway x 1
- ✓ Stick Antenna for LoRa RF part. Frequency is one of 470 or 868 or 915Mhz depends the model ordered
- ✓ Packaging with environmental protection paper box

12 FCC Warning

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 a particular 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 or more 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.

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

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

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

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

NOTE: The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

13 Fiber Glass Antenna Installation Steps

Fiber Glass Antenna Installation Steps as below:

Step 1: Prepare the Accessories.



Step 2: Loosen the screws in Figure 1, then put the antenna into the slot and tighten the screws as shown in Figure 2.

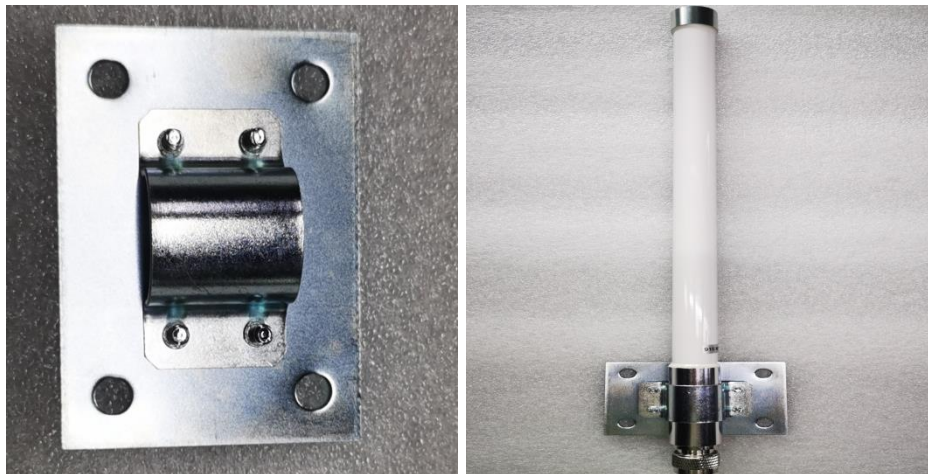


Figure 1

Figure 2

Step 3: Fix the above figure 2 to the bracket as shown in the following figure.

