



## DLOS8 Outdoor LoRaWAN Gateway User Manual

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## 1 Introduction

### 1.1 What is the DLOS8

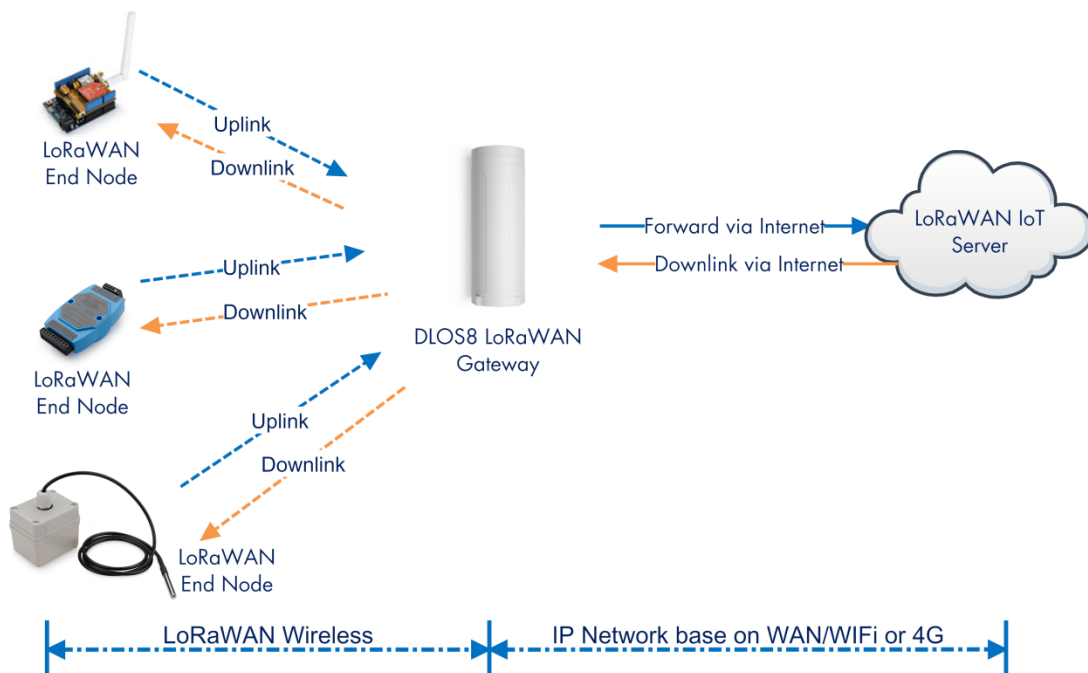
The DLOS8 is an **open source outdoor** LoRaWAN Gateway. It lets you bridge LoRa wireless network to an IP network via WiFi, Ethernet, 3G or 4G cellular. The LoRa wireless allows users to send data and reach extremely long ranges at low data-rates.

The DLOS8 uses Semtech packet forwarder and fully compatible with LoRaWAN protocol. It includes a **SX1301 LoRaWAN concentrator**, which provide 10 programmable parallel demodulation paths.

DLOS8 has pre-configured standard LoRaWAN frequency bands to use for different countries. User can also customized the frequency bands to use in their own LoRaWAN network.

DLOS8 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.

#### DLOS8 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 2
- WiFi : 802.11 b/g/n
- LoRaWAN Wireless
- Power Input: 12 ~ 24 V DC, 1 A
- IEEE 802.3 af compliant PoE port (DC 37 ~ 57 v)
- USB 2.0 host connector x 1
- Mini-PCI E connector x 1
- SX1301 + 2 x SX1257

### 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 with SX1257 Tx/Rx front-end
- 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

### Cellular 4G LTE (optional):

- Quectel [EC25 LTE module](#)
- Standard Size SIM Slot

- 2 x 4G Sticker Antenna.
- Up to 150Mbps downlink and 50Mbps uplink data rates
- Worldwide LTE,UMTS/HSPA+ and GSM/GPRS/EDGE coverage
- MIMO technology meets demands for data rate and link reliability in modem wireless communication systems

**Power over Ethernet:**

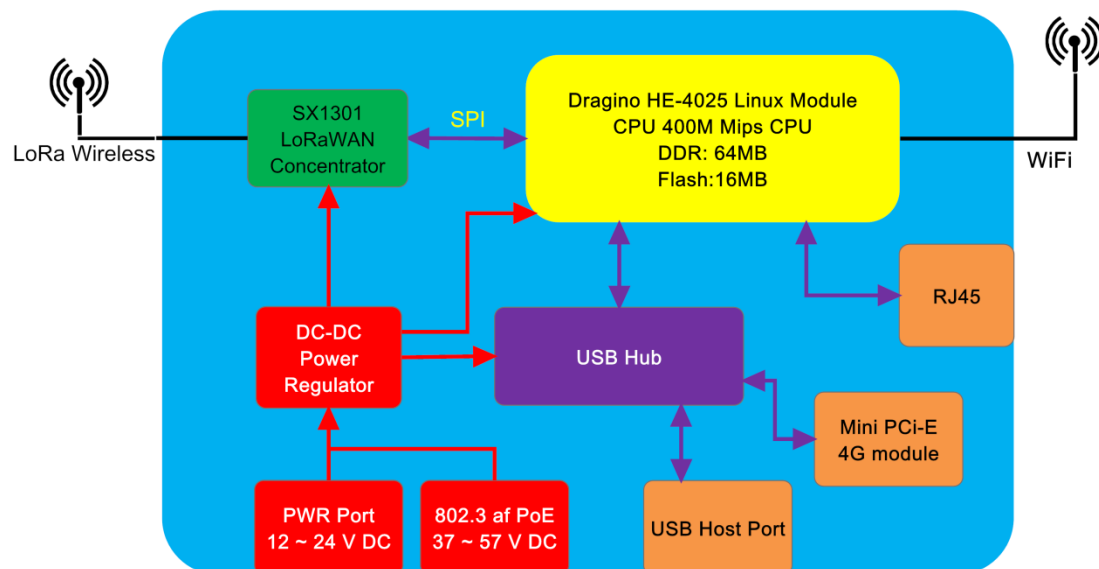
- IEEE 802.3af compliant.
- Support wide input voltage range 37Vdc to 57Vdc.
- Thermal cut off.
- Short circuit protection.
- Over current protection
- Isolation level 4 KVRms.
- Enhanced surge protection

### 1.3 Features

- ✓ Open Source OpenWrt system
- ✓ Managed by Web GUI, SSH via LAN or WiFi
- ✓ Emulates 49x LoRa demodulators
- ✓ Outdoor LoRaWAN Gateway
- ✓ 10 programmable parallel demodulation paths
- ✓ LoRaWAN packet filtering
- ✓ Far seeing LED indicator
- ✓ Built-in GPS module for location & timing
- ✓ External fiber glass antenna
- ✓ 802.3af PoE
- ✓ IP65
- ✓ Lightning Protection
- ✓ Power Consumption:12v 300 ~500mA

## 1.4 Hardware System Structure

### DLOS8 System Overview:



## 1.5 DLOS8 Applications



## 1.6 LED Indicators



There is a waterproof triple color LED on DLOS8 enclosure, the meaning of the LED is:

- ✓ **SOLID GREEN**: DLOS8 is alive with LoRaWAN server connection.
- ✓ **BLINKING GREEN**: a) Device has internet connection but no LoRaWAN Connection. or b) Device is in booting stage, in this stage, it will **BLINKING GREEN** for several seconds and then **RED and YELLOW** will blink together.
- ✓ **SOLID RED**: Device doesn't have Internet connection.

## 2 Access and Configure DLOS8

The DLOS8 is configured as a WiFi Access Point by default. User can access and configure the DLOS8 after connecting to its WiFi network, or via its Ethernet port.

### 2.1 Find IP address of DLOS8

#### 2.1.1 Connect via WiFi



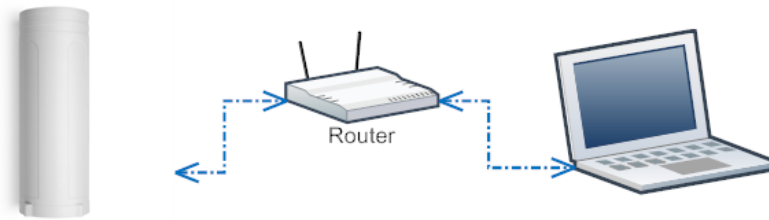
At the first boot of DLOS8, it will auto generate a WiFi network called **dragino-xxxxxx** with password:

**dragino+dragino**

User can use a PC to connect to this WiFi network. The PC will get an IP address 10.130.1.xxx and the DLOS8 has the default IP **10.130.1.1**

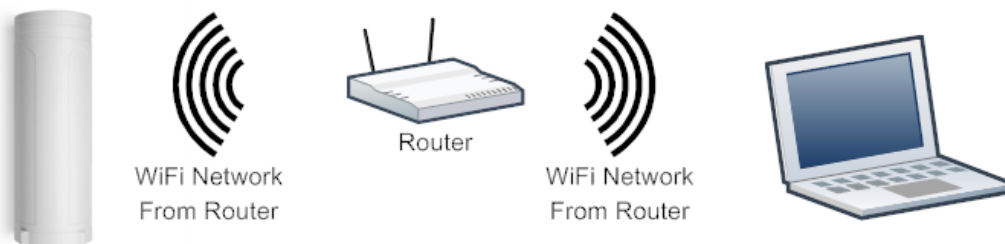


### 2.1.2 Connect via Ethernet with DHCP IP from router



Alternatively, connect the DLOS8 Ethernet port to your router and DLOS8 will 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 DLOS8. You can also use this IP to connect.

### 2.1.3 Connect via WiFi with DHCP IP from router



If the DLOS8 already connect to the router via WiFi, use can use the WiFi IP to connect to DLOS8.

### 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 the DLOS8 ip address (depends on your connect method)

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

or

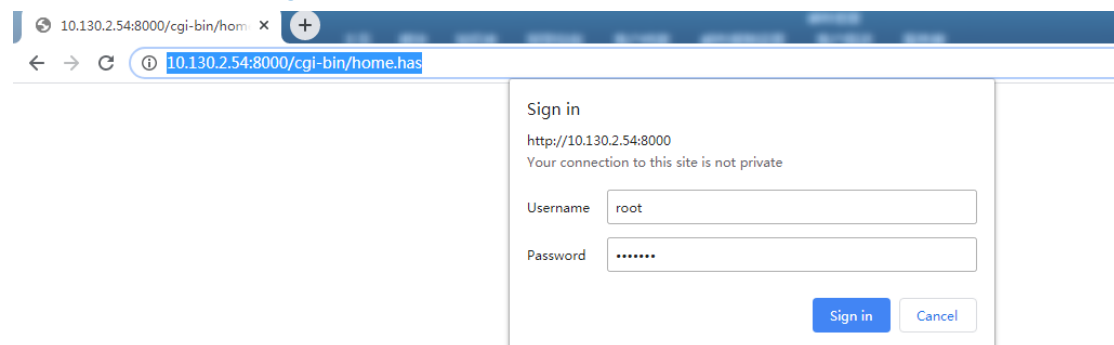
[http://IP\\_ADDRESS](http://IP_ADDRESS) or [http://IP\\_ADDRESS:8000](http://IP_ADDRESS:8000)

You will see the login interface of DLOS8 as shown below.

The account details for Web Login are:

**User Name:** root

**Password:** dragino



## 3 Typical Network Setup

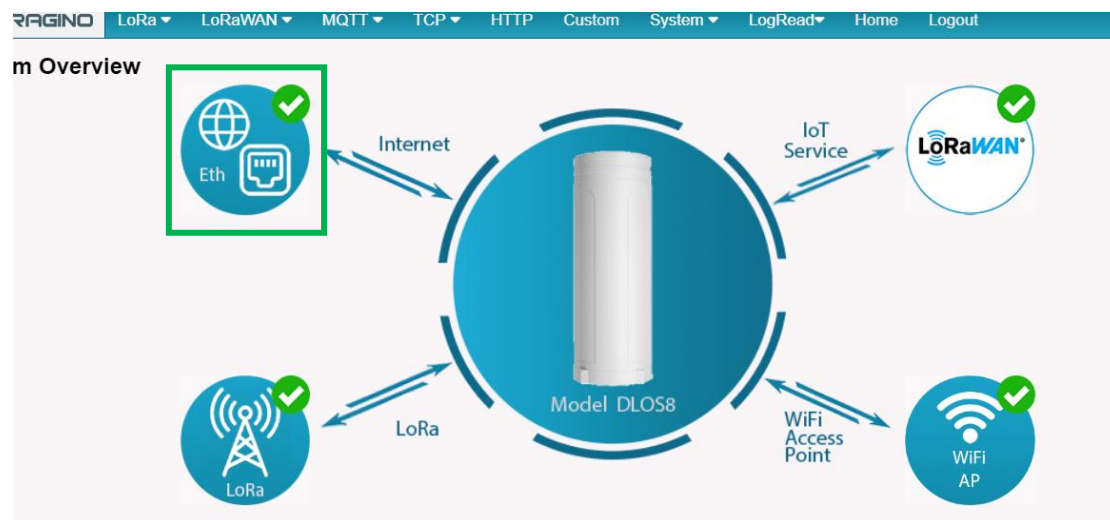
### 3.1 Overview

The DLOS8 supports flexible network set up for different environments. This section describes the typical network topology. The network set up includes:

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

### 3.2 Use WAN port to access Internet

By default, the DLOS8 is set to use the WAN port to connect to an upstream network. When you connect the DLOS8's WAN port to an upstream router, DLOS8 will get an IP address from the router and have Internet access via the upstream router. The network status can be checked in the [home page](#):



### 3.3 Access the Internet as a WiFi Client.

In the WiFi Client Mode, DLOS8 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](#)

#### WiFi

##### Radio Settings

Channel (1-11)

11

Tx Power (0-18) dBm

17

##### WiFi Access Point Settings

Enable WiFi Access Point
☒

WiFi Name SSID

dragino-1baf44

Passphrase (8-32 char)

.....

Show

Encryption

WPA2

##### WiFi WAN Client Settings

Enable WiFi WAN Client
☒

Host WiFi SSID

dragino-RD

Passphrase

.....

Show

WiFi Survey

dragino-RD (Ch: 6 Enc: ..)

Encryption

WPA/WPA2

Save&Apply

Cancel

Refresh

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

### 3.4 Access the Internet via Cellular

If the DLOS8 support 3G/4G Cellular modem option, user can use it as main internet connection or back up.

First, install the SIM card as below:



The set up page is [System](#) → [Cellular](#)

While use the cellular as Backup WAN, device will use Cellular for internet connection while WAN port or WiFi is not valid and switch back to WAN port or WiFi after they recover.

### Cellular Settings

☒ Enable Cellular WAN
 ☒ Use Cellular as Backup WAN

APN

Service

Dial Number

Pincode

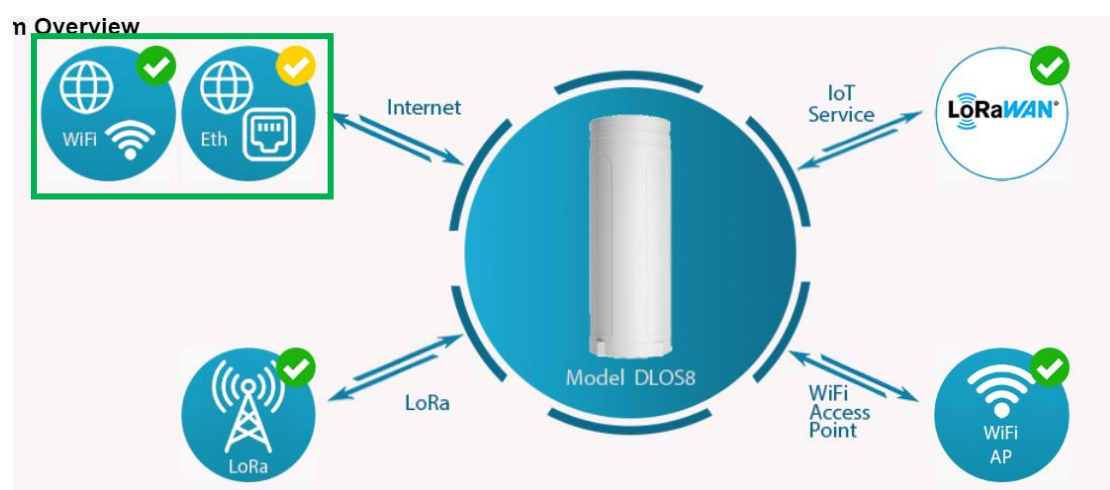
Username

Password  [Show](#)

### 3.5 Check Internet connection

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

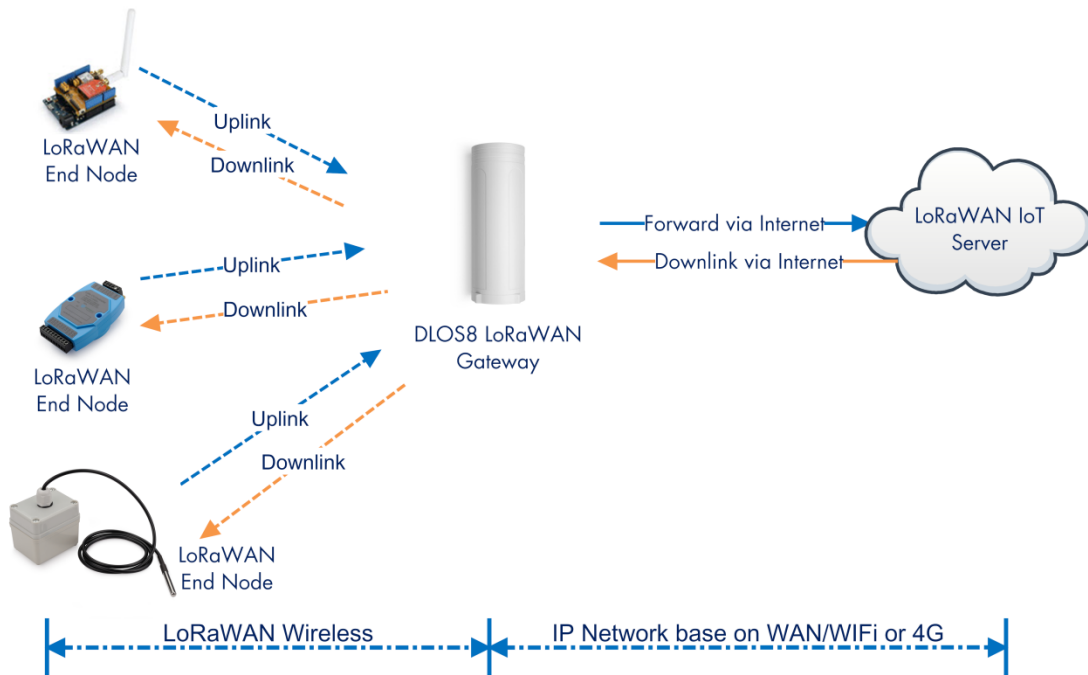
- GREEN Tick  : This interface has Internet connection.
- Yellow Tick  : This interface has IP address but don't use it for internet connection.
- RED Cross  : This interface doesn't connected.



## 4 Example: Configure as a LoRaWAN gateway

DLOS8 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.

### DLOS8 In a LoRaWAN IoT Network:



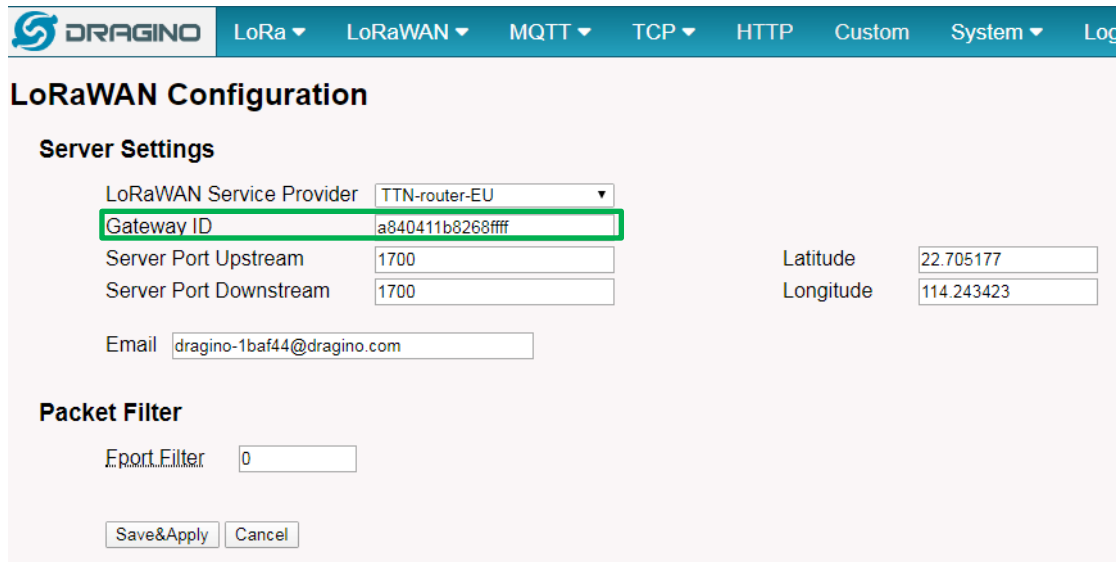
This chapter describes how to use the DLOS8 to work with

[TheThingsNetwork \(TTN\) LoRaWAN Server](http://www.thethingsnetwork.org) ([www.thethingsnetwork.org](http://www.thethingsnetwork.org))

## 4.1 Create a gateway in TTN Server

### Step 1: Get a Unique gateway ID.

Every DLOS8 has a unique gateway id. The ID can be found at LoRaWAN page:



**LoRaWAN Configuration**

**Server Settings**

LoRaWAN Service Provider: TTN-router-EU

**Gateway ID**: a840411b8268ffff

Server Port Upstream: 1700

Server Port Downstream: 1700

Latitude: 22.705177

Longitude: 114.243423

Email: dragino-1baf44@dragino.com

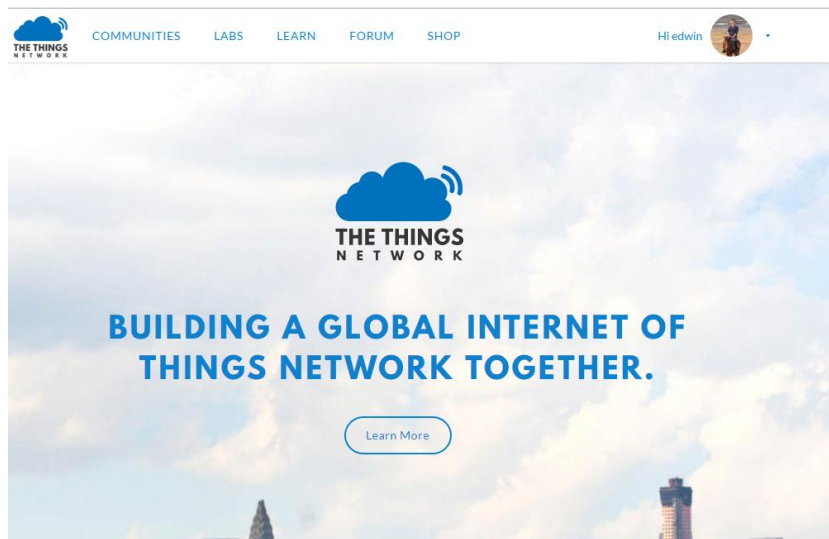
**Packet Filter**

Eport Filter: 0

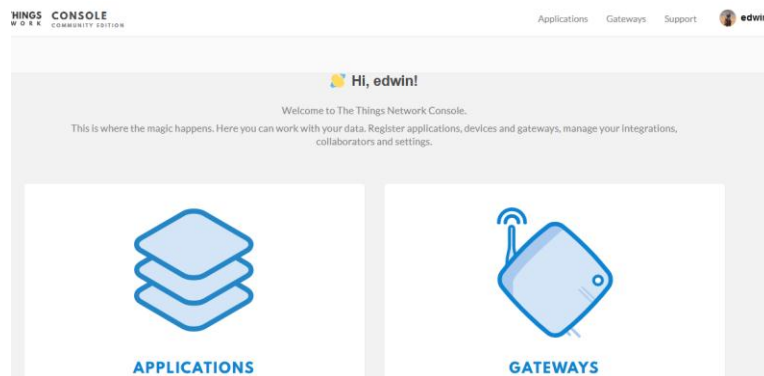
Save&Apply Cancel

The example gateway id is: **a840411b8268ffff**

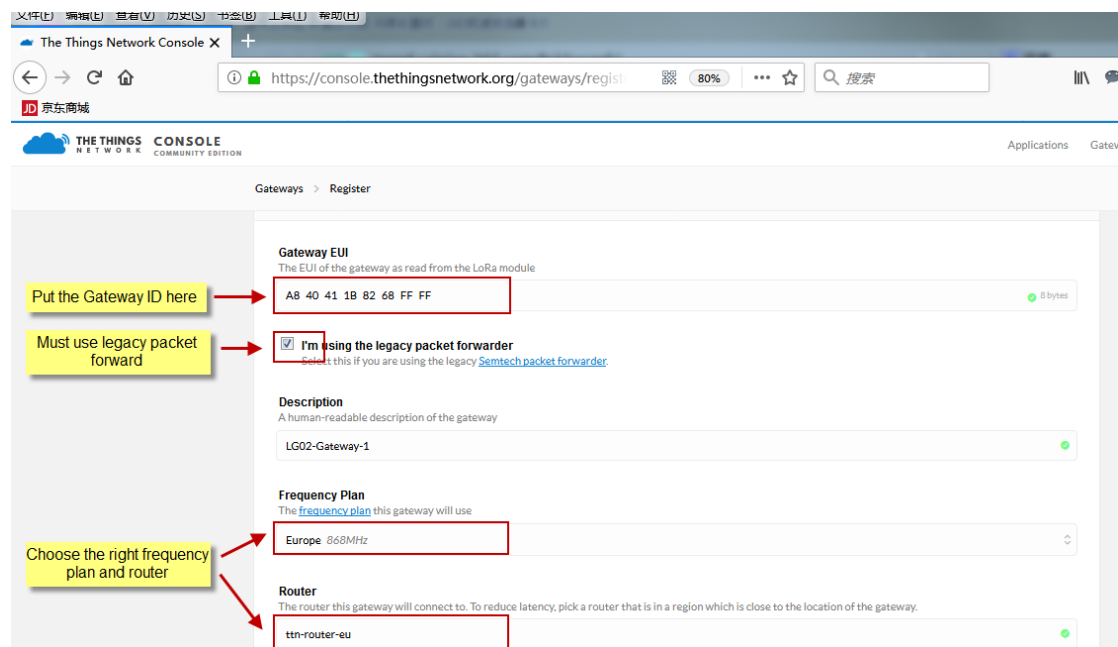
### Step 2: Sign up a user account in TTN server



### Step 3: Create a Gateway



Click on the Gateways icon to open the page below:



**Notice:** The TTN router should match the Frequency Plan you choose, otherwise you will have problem for End Node to join the network. If you don't know which router you need to select, please check: [https://www.thethingsnetwork.org/docs/gateways/packet-forwarder/semtech-udp.html#connect-a-gateway\\_server-addresses](https://www.thethingsnetwork.org/docs/gateways/packet-forwarder/semtech-udp.html#connect-a-gateway_server-addresses)

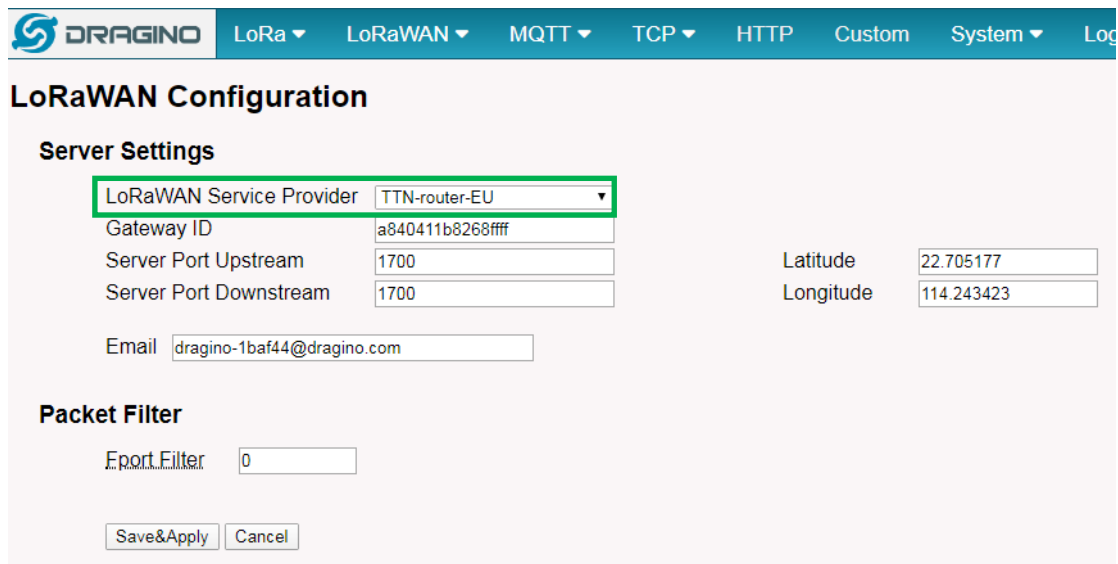
After creating the gateway, you can see the gateway info, as below.



## 4.2 Configure DLOS8 to connect to TTN

You can now configure the DLOS8 to let it connect to TTN network.  
Make sure your DLOS8 has a working Internet Connection first.

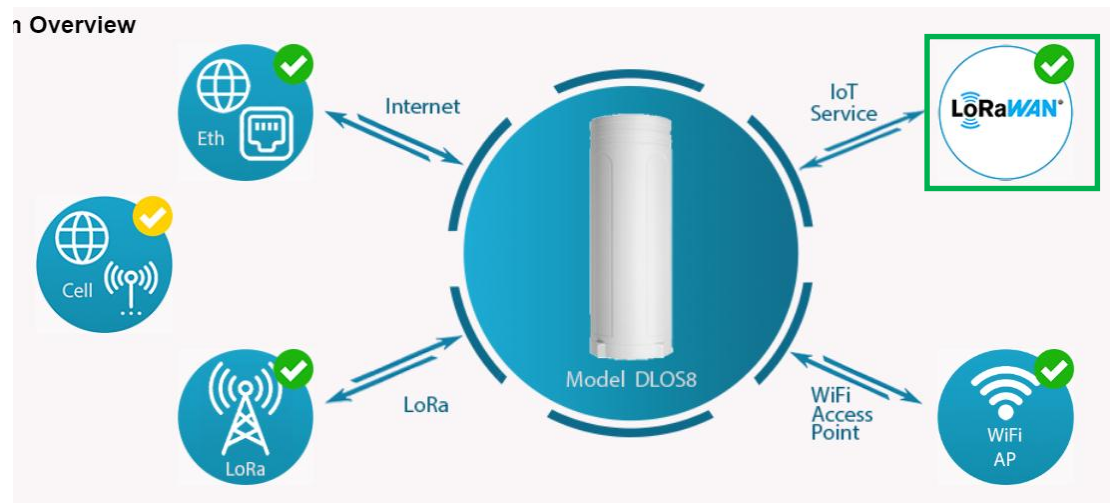
Choose the right server provider and click [Save&Apply](#)



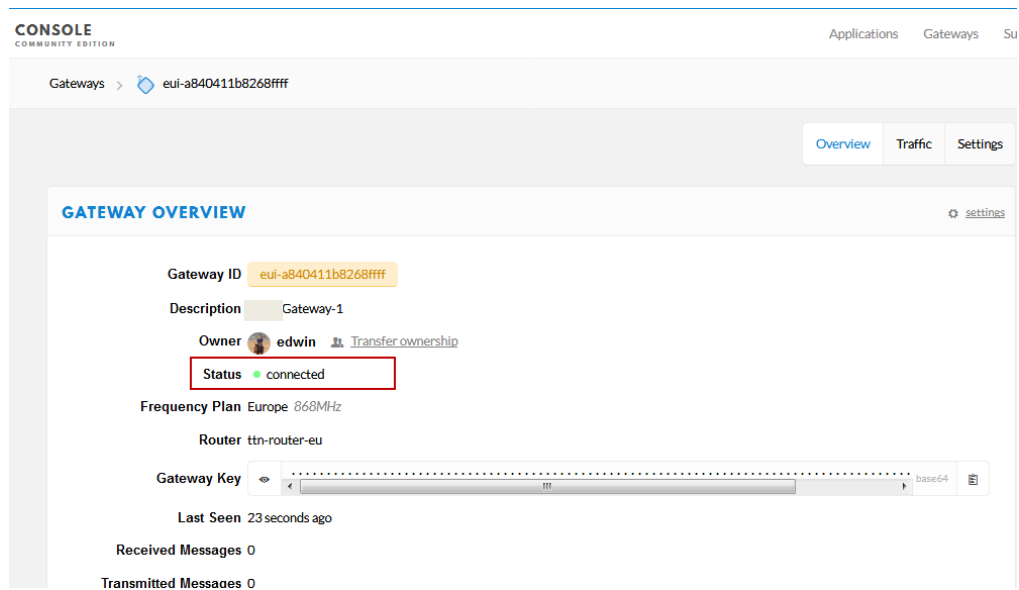
The screenshot shows the 'LoRaWAN Configuration' page. At the top is a navigation bar with tabs: LoRa, LoRaWAN, MQTT, TCP, HTTP, Custom, System, and Log. The 'LoRaWAN' tab is selected. Below the navigation bar is the 'LoRaWAN Configuration' section. Under 'Server Settings', there is a dropdown menu for 'LoRaWAN Service Provider' set to 'TTN-router-EU'. Below this are input fields for 'Gateway ID' (a840411b8268ffff), 'Server Port Upstream' (1700), 'Server Port Downstream' (1700), 'Latitude' (22.705177), and 'Longitude' (114.243423). There is also an 'Email' field with the value 'dragino-1baf44@dragino.com'. Below the 'Server Settings' section is the 'Packet Filter' section with a 'Port Filter' input field set to '0'. At the bottom of the configuration section are 'Save&Apply' and 'Cancel' buttons.

**Note:** The server address must match the router you choose in TTN.

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



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

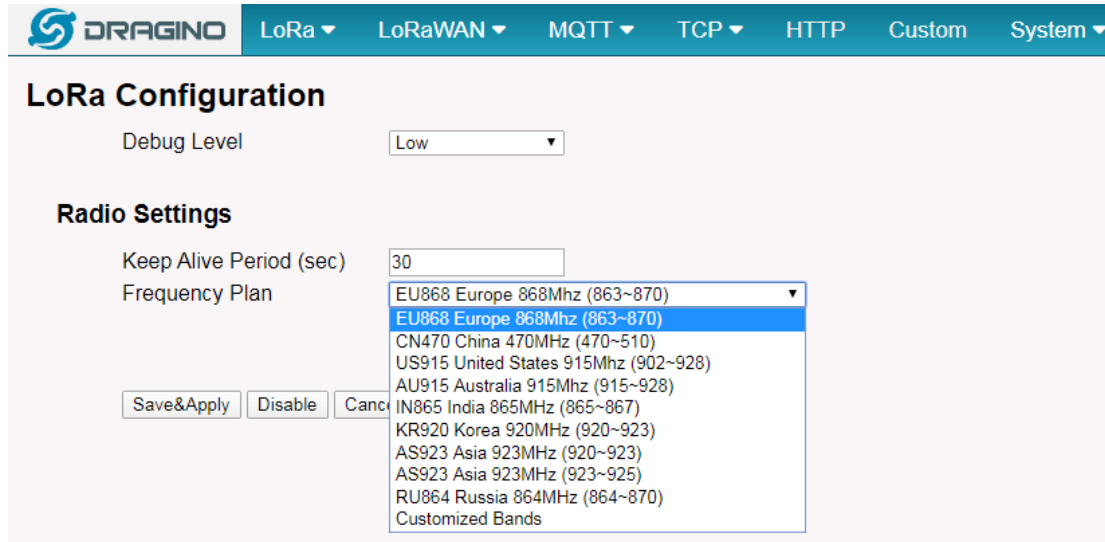


The screenshot shows the TTN Console interface for a specific gateway. The breadcrumb navigation is 'Gateways > eui-a840411b8268fff'. The page has tabs for 'Overview', 'Traffic', and 'Settings', with 'Overview' selected. The 'GATEWAY OVERVIEW' section displays the following information:

- Gateway ID:** eui-a840411b8268fff
- Description:** Gateway-1
- Owner:** edwin (with a 'Transfer ownership' link)
- Status:** connected (highlighted with a red box)
- Frequency Plan:** Europe 868MHz
- Router:** ttn-router-eu
- Gateway Key:** A visual representation of the key, with 'base64' and a copy icon on the right.
- Last Seen:** 23 seconds ago
- Received Messages:** 0
- Transmitted Messages:** 0

### 4.3 Configure frequency

We also need to set the frequency plan in DLOS8 to match the LoRaWAN end node we use, so to receive the LoRaWAN packets from the LoRaWAN sensor.



**LoRa Configuration**

Debug Level:

**Radio Settings**

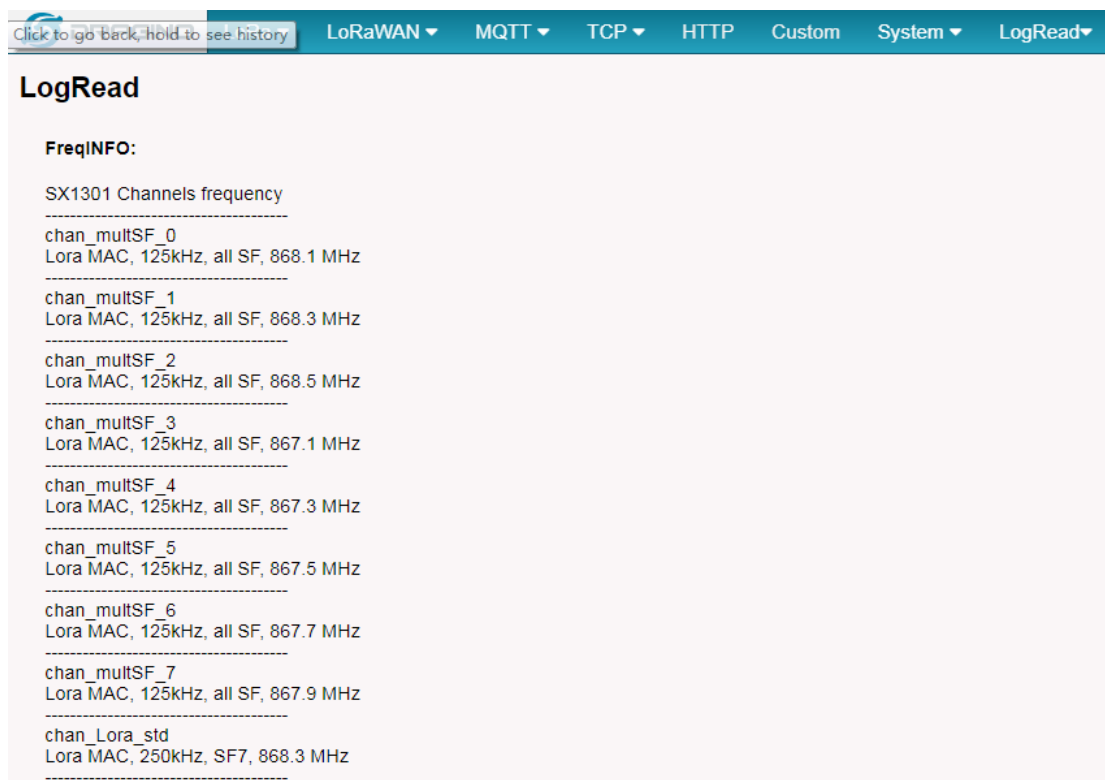
Keep Alive Period (sec):

Frequency Plan:

Save&Apply Disable Cancel

- EU868 Europe 868Mhz (863~870)
- EU868 Europe 868Mhz (863~870)
- CN470 China 470MHz (470~510)
- US915 United States 915Mhz (902~928)
- AU915 Australia 915Mhz (915~928)
- IN865 India 865MHz (865~867)
- KR920 Korea 920MHz (920~923)
- AS923 Asia 923MHz (920~923)
- AS923 Asia 923MHz (923~925)
- RU864 Russia 864MHz (864~870)
- Customized Bands

In logread page, user can check the frequency actually used.



[Click to go back, hold to see history](#) LoRaWAN MQTT TCP HTTP Custom System LogRead

**LogRead**

**FreqINFO:**

SX1301 Channels frequency

chan\_multSF\_0  
Lora MAC, 125kHz, all SF, 868.1 MHz

chan\_multSF\_1  
Lora MAC, 125kHz, all SF, 868.3 MHz

chan\_multSF\_2  
Lora MAC, 125kHz, all SF, 868.5 MHz

chan\_multSF\_3  
Lora MAC, 125kHz, all SF, 867.1 MHz

chan\_multSF\_4  
Lora MAC, 125kHz, all SF, 867.3 MHz

chan\_multSF\_5  
Lora MAC, 125kHz, all SF, 867.5 MHz

chan\_multSF\_6  
Lora MAC, 125kHz, all SF, 867.7 MHz

chan\_multSF\_7  
Lora MAC, 125kHz, all SF, 867.9 MHz

chan\_Lora\_std  
Lora MAC, 250kHz, SF7, 868.3 MHz

#### 4.4 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-22222-L](#) IO Controller as a reference device - the setup for other LoRaWAN devices will be similar.



**Step 1:** Create a Device definition in TTN with the OTAA keys from the example LT-33222-L IO Controller device.

Three codes are required to define the device in TTN:

- ✓ DEV EUI - Unique ID code for a particular device.
- ✓ APP EUI - ID code for an Application defined in TTN.
- ✓ 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.

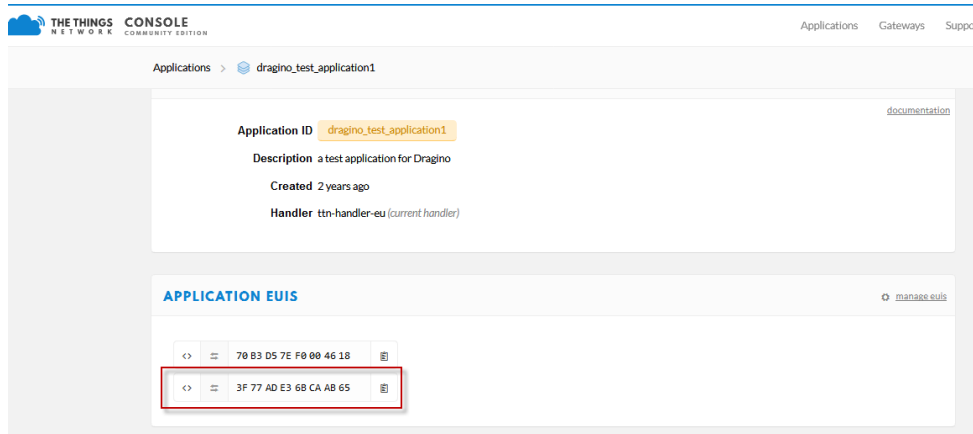


Note: You may be able to change these codes in a device by using a configuration facility on the device e.g. the LT-22222 uses a serial port access and a series of AT commands. Changing the codes may be necessary in the case where you have to use codes assigned by a LoRa WAN server.

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

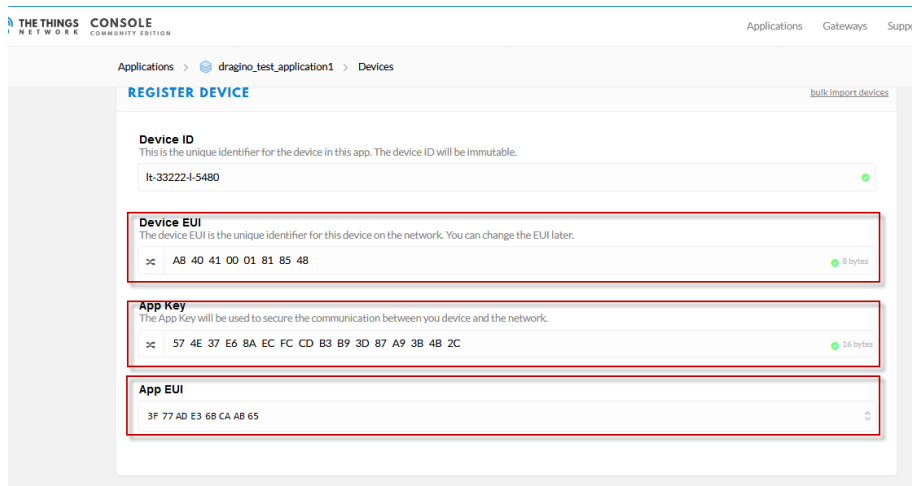
Select **Add Application** to open the screen below.

Note that there is an APP EUI already created by TTN, but this is not the one set in the device. To add the APP EUI for the LT-2222-L device, select **Manage EUIs** and **Add EUI**, then enter the required code.



Select **Devices** and **Register Device** to open the screen below.

Enter the **Device EUI** and **APP KEY** codes, then select the App EUI from the list. Check that all three codes match those shown on the device label before saving the configuration.



**Step 2:** Power on LT-2222-L device and it will automatically join the TTN network. After joining successfully, it will start to upload messages to the TTN. Select the 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 display.

[Applications](#) > [dragino\\_test\\_application1](#) > [Devices](#) > [It-33222-I-5362](#) > [Data](#)
[Overview](#) [Data](#) [Settings](#)
**APPLICATION DATA**

|| pause || clear

 Filters [uplink](#) [downlink](#) [activation](#) [ack](#) [error](#)

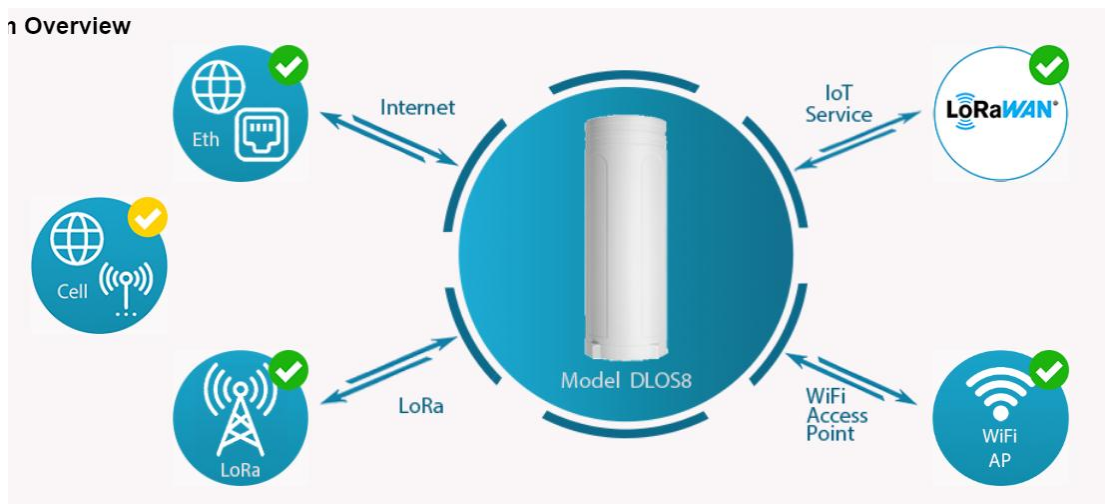
| time     | counter | port |                                                                       |
|----------|---------|------|-----------------------------------------------------------------------|
| 16:54:53 | 0       | 2    | retry payload: 00 02 01 36 04 C1 04 C2 38                             |
| 16:54:47 |         |      | dev addr: 26 01 2C 6B app eui: FCDEC9B2D32FA6 61 dev eui: A8 40 41 00 |
| 16:54:40 |         |      | dev addr: 26 01 2C 85 app eui: FCDEC9B2D32FA6 61 dev eui: A8 40 41 00 |
| 16:54:33 |         |      | dev addr: 26 01 2E EC app eui: FCDEC9B2D32FA6 61 dev eui: A8 40 41 00 |

## 5 Web Configure Pages

### 5.1 Home

Shows the system running status.

#### 1 Overview



## 5.2 LoRa Settings

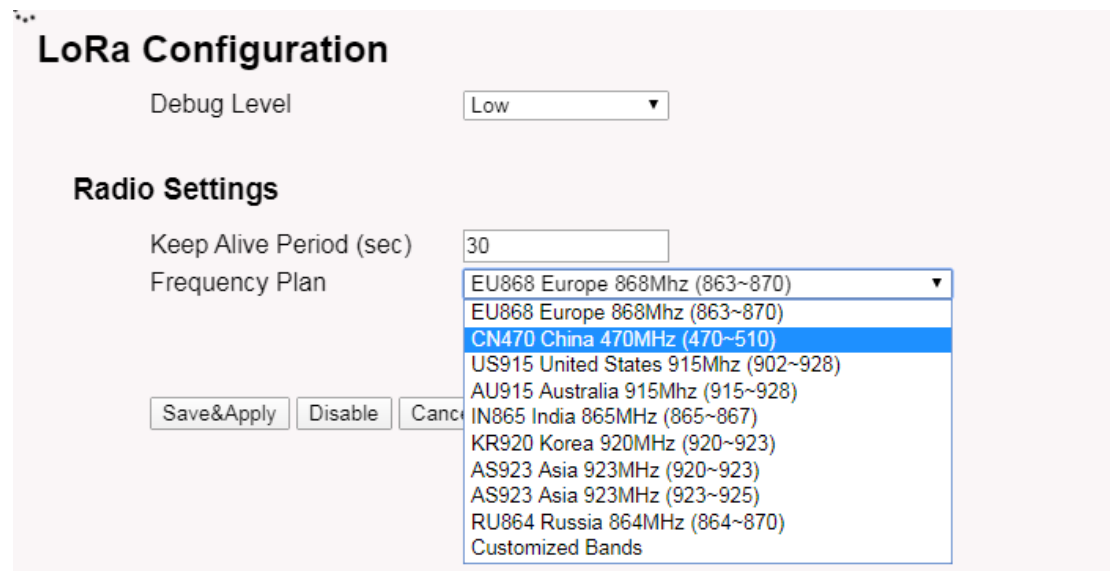
### 5.2.1 LoRa --> LoRa

This page shows the LoRa Radio Settings. There are a set of default frequency band according to LoRaWAN protocol, and user can customized the band\* as well.

Different DLOS8 hardware version can support different frequency range:

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

After user choose the frequency plan, he can see the actually frequency in used by checking the page **LogRead --> LoRa Log**



**LoRa Configuration**

Debug Level:

**Radio Settings**

Keep Alive Period (sec):

Frequency Plan:

Save&Apply Disable Cancel

- EU868 Europe 868Mhz (863~870)
- EU868 Europe 868Mhz (863~870)
- CN470 China 470MHz (470~510)**
- US915 United States 915Mhz (902~928)
- AU915 Australia 915Mhz (915~928)
- IN865 India 865MHz (865~867)
- KR920 Korea 920MHz (920~923)
- AS923 Asia 923MHz (920~923)
- AS923 Asia 923MHz (923~925)
- RU864 Russia 864MHz (864~870)
- Customized Bands

Note \*: See this instruction for how to customize frequency band:

[http://wiki.dragino.com/index.php?title=Customized\\_Frequency\\_Band\\_for\\_Gateway](http://wiki.dragino.com/index.php?title=Customized_Frequency_Band_for_Gateway)

### 5.2.2 LoRa --> ABP Decryption

The DLOS8 can communicate with LoRaWAN ABP End Node without the need of LoRaWAN server. It can be used in some cases such as:

- No internet connection.
- User wants to get data forward in gateway and forward to their server based on MQTT/HTTP, etc. (Combine ABP communication method and MQTT forward together).

Detail of this feature:

[http://wiki.dragino.com/index.php?title=Communication with ABP End Node](http://wiki.dragino.com/index.php?title=Communication_with_ABP_End_Node)

#### Decrypt ABP End Node Packets

Enable ABP Decryption ☐

SAVE

##### Add Key

Dev ADDR:

MSB,4 Bytes

APP Session Key:

MSB,16 Bytes

Network Session Key:

MSB,16 Bytes

ADD\_KEY

Delete Key

Dev ADDR:

DELETE

##### ABP Keys:

Dev ADDR | APP Session Key | Network Session Key

## 5.3 LoRaWAN Settings

### 5.3.1 LoRaWAN --> LoRaWAN

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

### LoRaWAN Configuration

**Server Settings**

LoRaWAN Service Provider

Gateway ID

Server Port Upstream

Server Port Downstream

Latitude

Longitude

Email

**Packet Filter**

Eport Filter

#### Note

\*: User can ignore the latitude and longitude settings here, DLOS8 will use the actually value from GPS module.

\*\* : Packet filter is to drop the unwanted LoRaWAN packet, instruction see here:

See [http://wiki.dragino.com/index.php?title=Main\\_Page#Filter\\_unwanted\\_LoRaWAN\\_packets](http://wiki.dragino.com/index.php?title=Main_Page#Filter_unwanted_LoRaWAN_packets)

### 5.3.2 LoRaWAN --> LORIIOT

Settings to communicate to LORIIOT LoRaWAN Network Server: <https://www.loriot.io/>

Instruction: [http://wiki.dragino.com/index.php?title=Notes\\_for\\_LORIIOT](http://wiki.dragino.com/index.php?title=Notes_for_LORIIOT)

### LORIIOT Client Configuration

**LORIIOT software not installed.**

Server Address

Server Port

Client Certificate

Client Key

CA File

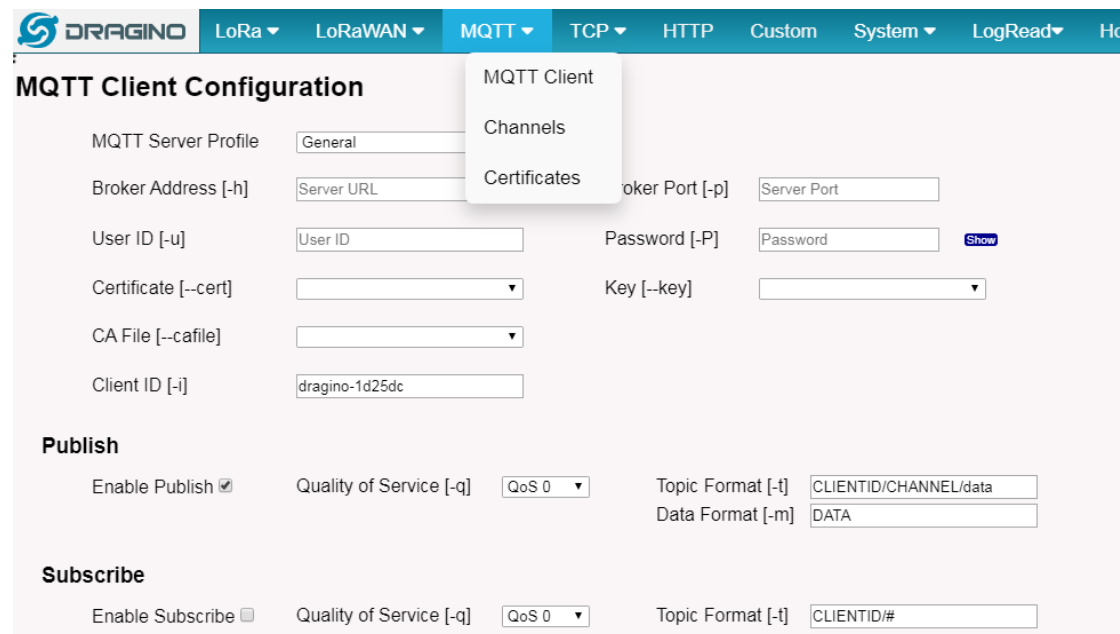
Device EUI: A840411D25DF

[Certificate Management](#)

## 5.4 MQTT Settings

If end nodes works in ABP mode, user can configure DLOS8 to transfer the data to MQTT broker, Instruction:

[http://wiki.dragino.com/index.php?title=Main\\_Page#MQTT\\_Forward\\_Instruction](http://wiki.dragino.com/index.php?title=Main_Page#MQTT_Forward_Instruction)



The screenshot shows the 'MQTT Client Configuration' page in the Dragino web interface. The top navigation bar includes tabs for LoRa, LoRaWAN, MQTT (selected), TCP, HTTP, Custom, System, LogRead, and Help. A dropdown menu for 'MQTT Client' is open, showing options for 'Channels' and 'Certificates'. The configuration form includes fields for MQTT Server Profile (General), Broker Address [-h] (Server URL), User ID [-u] (User ID), Password [-P] (Password), Certificate [--cert], Key [--key], CA File [--cafile], and Client ID [-i] (dragino-1d25dc). Below these are sections for 'Publish' and 'Subscribe' settings, including checkboxes for enabling, Quality of Service (QoS 0), and Topic Format (-t).

## 5.5 System

### 5.5.1 System --> System Overview

Shows the system info:



The screenshot shows the 'System Overview' page. It displays various system information: Firmware (Dragino-v2 LG02\_LG08-5.4.1592278488), System ("OpenWrt 18.06-SNAPSHOT r5-ce45a50"), Hostname (dragino-1d25dc), Device Model (DLOS8), System Time (Tue Jun 16 06:24:30 UTC 2020), Uptime (27 min), Load Avg (0.40, 0.51, 0.43), Memory (Free Memory: 27984 / Total Memory: 60192kB), and IoT Service (lorawan). At the bottom, there are status indicators for 'Internet Connection OK' and 'LoRaWAN Connection OK' with corresponding icons.

### 5.5.2 System --> General ( login settings)

#### System General

##### System Password

Password

Show

SetPassword

Login: root

Password (admin)

Show

SetAdminPassword

##### TimeZone

Timezone

UTC

##### Port Forwarding

Enable HTTP Forward

☒

Enable SSH Forward

☒

Save&Apply

Cancel

#### **System Password:**

There are two login for DLOS8: **root /dragino** or **admin /dragino**. Both root and admin has 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.

### 5.5.3 System --> Network

#### Network

##### LAN Settings

|            |                                            |         |                                              |
|------------|--------------------------------------------|---------|----------------------------------------------|
| IP Address | <input type="text" value="10.130.1.1"/>    | Gateway | <input type="text" value="255.255.255.255"/> |
| Netmask    | <input type="text" value="255.255.255.0"/> | DNS     | <input type="text" value="8.8.8.8"/>         |

##### WAN Settings

Enable DHCP

##### WiFi WAN Settings

Enable DHCP

#### LAN Settings:

When the DLOS8 has the AP enable, LAN settings specify the network info for DLOS8's own network.

#### WAN Settings:

Setting for DLOS8 WAN port

#### WiFi Settings:

Setting for DLOS8 WiFi IP when use it as WiFi Client

### 5.5.4 System --> WiFi

DLOS8 WiFi Settings.

**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](#)

### 5.5.5 System --> Cellular

While use the cellular as Backup WAN, device will use Cellular for internet connection while WAN port or WiFi is not valid and switch back to WAN port or WiFi after they recover.

**Cellular Settings**

☒ Enable Cellular WAN

☒ Use Cellular as Backup WAN

APN

Service

Dial Number

Pincode

Username

Password  [Show](#)

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

Note \*: For DLOS8 which doesn't have the cellular module, this page will shows Cellular not detected.

### 5.5.6 System --> Network Status

#### System Status

##### Network / WiFi Status

```
Network
-----
Lan IP Address:
  inet addr:10.130.1.1 Bcast:10.130.1.255 Mask:255.255.255.0

Eth WAN IP Address:
  inet addr:10.130.2.207 Bcast:10.130.2.255 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.a840411d25df      no      eth0
                                wlan0

WiFi
----
wlan0  ESSID: "dragino-1d25dc"
        Access Point: A8:40:41:1D:25:DC
        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
```

### 5.5.7 System --> Remote Mgmt

R-SSH is for remote access device and management, introduction for how to use:

[http://wiki.dragino.com/index.php?title=Main\\_Page#Remote\\_Access\\_Gateway\\_via\\_Reverse\\_SSH](http://wiki.dragino.com/index.php?title=Main_Page#Remote_Access_Gateway_via_Reverse_SSH)

#### R-SSH Host Settings

|                                                                                                                                                                                                              |                                                  |                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------|
| Login ID                                                                                                                                                                                                     | <input type="text" value="sshuser"/>             |                                |
| Host Address                                                                                                                                                                                                 | <input type="text" value="support.dragino.com"/> | Host Port <input type="text"/> |
| Connect at Startup <input type="checkbox"/>                                                                                                                                                                  | GWID: a84041ffff1d25dc                           |                                |
| Connection Status: <b>Not connected to RSSH Host</b>                                                                                                                                                         |                                                  |                                |
| <input type="button" value="Save"/> <input type="button" value="Connect"/> <input type="button" value="Disconnect"/> <input type="button" value="SetDefault"/> <input type="button" value="Cancel/Refresh"/> |                                                  |                                |

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](#)

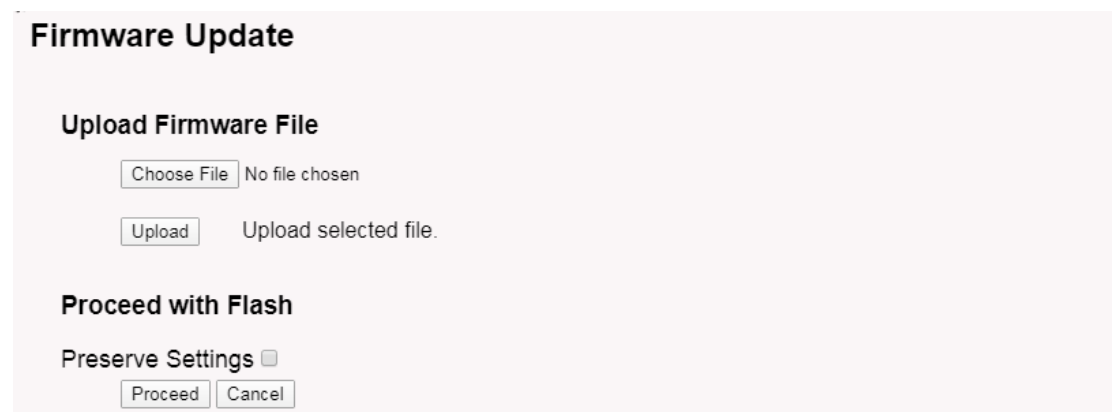
### 5.5.8 System --> Firmware Upgrade

We keep improving the DLOS8 Linux side firmware for new features and bug fixes. Below are the links for reference.

- **Latest firmware:** [LoRa Gateway Firmware](http://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LG02-OLG02/Firmware),  
( [http://www.dragino.com/downloads/index.php?dir=LoRa\\_Gateway/LG02-OLG02/Firmware](http://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LG02-OLG02/Firmware) )
- **Change Log:** [Firmware Change Log](http://www.dragino.com/downloads/downloads/LoRa_Gateway/LG02-OLG02/Firmware/ChangeLog).  
( [http://www.dragino.com/downloads/downloads/LoRa\\_Gateway/LG02-OLG02/Firmware/ChangeLog](http://www.dragino.com/downloads/downloads/LoRa_Gateway/LG02-OLG02/Firmware/ChangeLog) )

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

#### Web → System → Firmware Upgrade

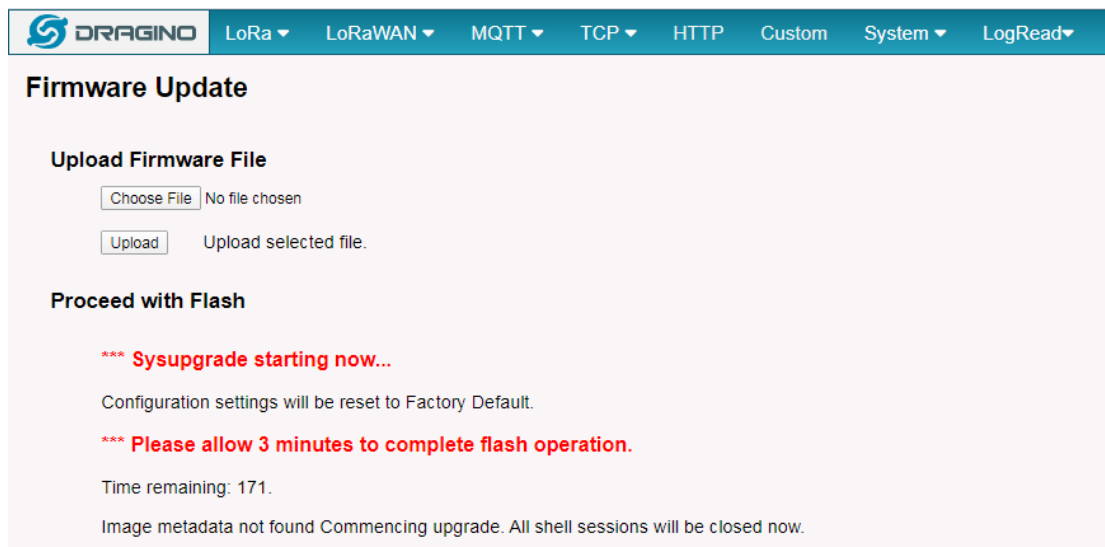


The screenshot shows a web interface titled "Firmware Update". It contains two main sections. The first section, "Upload Firmware File", has a "Choose File" button next to the text "No file chosen", and an "Upload" button next to the text "Upload selected file.". The second section, "Proceed with Flash", has a "Preserve Settings" checkbox which is currently unchecked, and two buttons: "Proceed" and "Cancel".

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 **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.



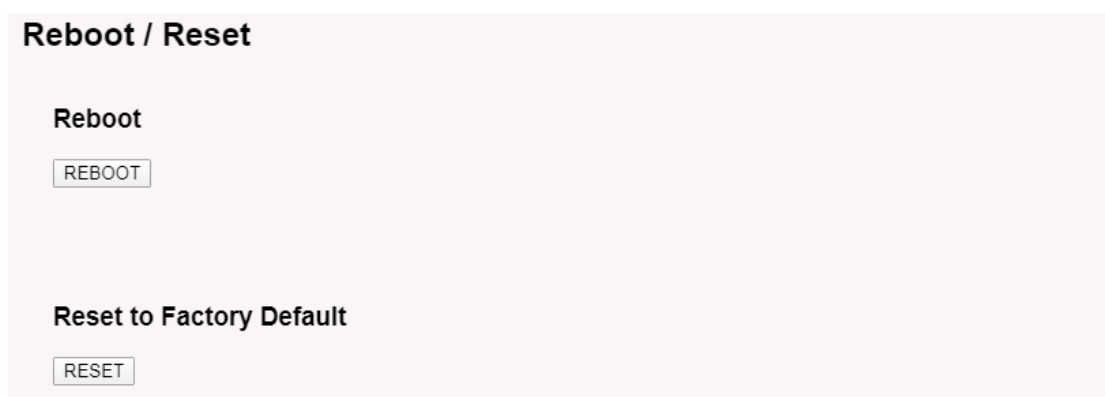
Note \*: User can also upgrade firmware via Linux console

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.

### 5.5.9 System --> Reboot/Reset



## 5.5.10 System --> Package Maintain

**Package Management**

**Package List**

Package data is not loaded. Click on Reload to download package data.

Click Reload to download package list. This will take a while.

**Installed Package List**

```
atftp - 0.7.1-5
base-files - 190-r5-ce45a50
bikid - 2.32-2
block-mount - 2018-04-16-e2436836-1
busybox - 1.28.3-4
ca-certificates - 20180409
dhcpcd - 7.0.1-1
```

Place to show what package has installed and possible to upgrade packages.

## 5.6 LogRead

### 5.6.1 LogRead --> LoRa Log

#### LogRead

##### FreqINFO:

SX1301 Channels frequency

chan\_multSF\_0  
Lora MAC, 125kHz, all SF, 868.1 MHz

chan\_multSF\_1  
Lora MAC, 125kHz, all SF, 868.3 MHz

chan\_multSF\_2  
Lora MAC, 125kHz, all SF, 868.5 MHz

chan\_multSF\_3  
Lora MAC, 125kHz, all SF, 867.1 MHz

chan\_multSF\_4  
Lora MAC, 125kHz, all SF, 867.3 MHz

chan\_multSF\_5  
Lora MAC, 125kHz, all SF, 867.5 MHz

chan\_multSF\_6

Show the frequency for LoRa Radio and traffics.

### 5.6.2 LogRead --> System Log

Show the system log

#### System Log

##### USB Devices:

```
Bus 001 Device 003: ID 0403:6001 Future Technology Devices International, Ltd FT232 Serial (UART) IC
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=aaaaaaaa, boardp=2aabaab, parts=aaaa2aab
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:

## **6 More features**

### **6.1 More instructions**

[http://wiki.dragino.com/index.php?title=Main\\_Page#LoRa.2FLoRaWAN\\_Gateway\\_Instruction](http://wiki.dragino.com/index.php?title=Main_Page#LoRa.2FLoRaWAN_Gateway_Instruction)

## 7 Linux System

The DLOS8 is based on the OpenWrt Linux system. It is open source, and users are free to configure and modify the Linux settings.

### 7.1 SSH Access for Linux console

User can access the Linux console via the SSH protocol. Make sure your PC and the DLOS8 are connected to the same network, then use a SSH tool (such as [putty](#) in Windows) to access it.

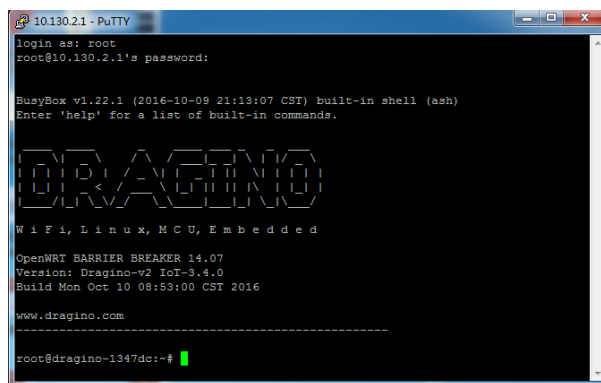
IP address: IP address of DLOS8

Port: 22 (via WiFi AP mode) or 2222 (via WAN Interface)

User Name: **root**

Password: **dragino** (default)

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



```

10130.21 - PuTTY
login as: root
root@10.130.2.1's password:

BusyBox v1.22.1 (2016-10-09 21:13:07 CST) built-in shell (ash)
Enter 'help' for a list of built-in commands.

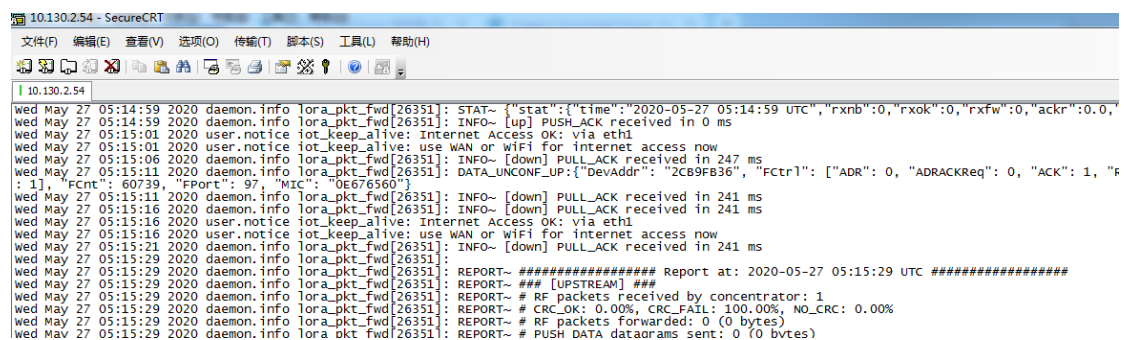
DRAGINO
WiFi, Linux, MCU, Embedded

OpenWRT BARRIER BREAKER 14.07
Version: Dragino-v2 IoT-3.4.0
Build Mon Oct 10 08:53:00 CST 2016

www.dragino.com

root@dragino-1347dc:~#
  
```

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



```

10.130.2.54 - SecureCRT
文件(F) 编辑(E) 查看(V) 选项(O) 传输(T) 脚本(S) 工具(L) 帮助(H)

Wed May 27 05:14:59 2020 daemon.info lora_pkt_fwd[26351]: STAT~ {"stat":{"time":"2020-05-27 05:14:59 UTC","rxnb":0,"rxok":0,"rxfw":0,"ackr":0.0,
Wed May 27 05:14:59 2020 daemon.info lora_pkt_fwd[26351]: INFO~ [up] PUSH_ACK received in 0 ms
Wed May 27 05:15:01 2020 user.notice iot_keep_alive: Internet Access OK: via eth1
Wed May 27 05:15:01 2020 user.notice iot_keep_alive: use WAN or WiFi for internet access now
Wed May 27 05:15:06 2020 daemon.info lora_pkt_fwd[26351]: INFO~ [down] PULL_ACK received in 247 ms
Wed May 27 05:15:11 2020 daemon.info lora_pkt_fwd[26351]: DATA_UNCONF_UP:{"DevAddr": "2C89FB36", "FCtrl1": ["ADR": 0, "ADRACKReq": 0, "ACK": 1, "F
: 1], "FCtrl": 60739, "Report": 97, "Mtc": "06676360"}
Wed May 27 05:15:11 2020 daemon.info lora_pkt_fwd[26351]: INFO~ [down] PULL_ACK received in 241 ms
Wed May 27 05:15:16 2020 daemon.info lora_pkt_fwd[26351]: INFO~ [down] PULL_ACK received in 241 ms
Wed May 27 05:15:16 2020 user.notice iot_keep_alive: Internet Access OK: via eth1
Wed May 27 05:15:16 2020 user.notice iot_keep_alive: use WAN or WiFi for internet access now
Wed May 27 05:15:21 2020 daemon.info lora_pkt_fwd[26351]: INFO~ [down] PULL_ACK received in 241 ms
Wed May 27 05:15:29 2020 daemon.info lora_pkt_fwd[26351]:
Wed May 27 05:15:29 2020 daemon.info lora_pkt_fwd[26351]: REPORT~ ##### Report at: 2020-05-27 05:15:29 UTC #####
Wed May 27 05:15:29 2020 daemon.info lora_pkt_fwd[26351]: REPORT~ ### [UPSTREAM] ###
Wed May 27 05:15:29 2020 daemon.info lora_pkt_fwd[26351]: REPORT~ # RF packets received by concentrator: 1
Wed May 27 05:15:29 2020 daemon.info lora_pkt_fwd[26351]: REPORT~ # CRC_OK: 0.00%, CRC_FAIL: 100.00%, NO_CRC: 0.00%
Wed May 27 05:15:29 2020 daemon.info lora_pkt_fwd[26351]: REPORT~ # RF packets forwarded: 0 (0 bytes)
Wed May 27 05:15:29 2020 daemon.info lora_pkt_fwd[26351]: REPORT~ # PUSH DATA datagrams sent: 0 (0 bytes)
  
```

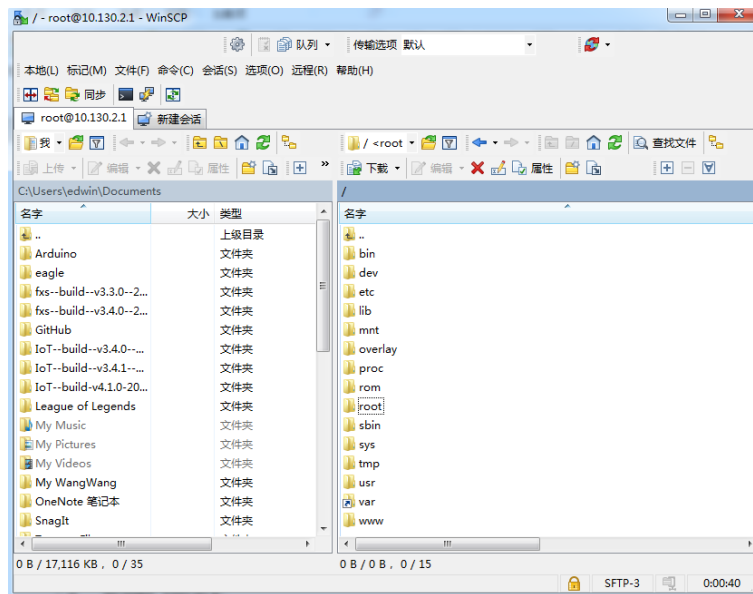
## 7.2 Edit and Transfer files

The DLOS8 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 DLOS8, or edit the files directly in the windows.

Screenshot is as below:



## 7.3 File System

The DLOS8 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 DLOS8 flash.

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

## 7.4 Package maintenance system

DLOS8 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 DLOS8 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.
```

## **8 Upgrade Linux Firmware**

## 9 FAQ

### 9.1 How can I configure for a customized frequency band?

See below link for how to customize frequency band:

[http://wiki.dragino.com/index.php?title=Customized\\_Frequency\\_Band\\_for\\_Gateway](http://wiki.dragino.com/index.php?title=Customized_Frequency_Band_for_Gateway)

### 9.2 Can I connect DLOS8 to LORIIOT?

Yes, the set up instruction is here:

[http://wiki.dragino.com/index.php?title=Notes\\_for\\_LORIIOT](http://wiki.dragino.com/index.php?title=Notes_for_LORIIOT)

### 9.3 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 DLOS8 for branding purposes or to add customized applications.

The source code and compile instructions can be found at:

[https://github.com/dragino/openwrt\\_lede-18.06](https://github.com/dragino/openwrt_lede-18.06)

### 9.4 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.

## 10 Trouble Shooting

### 10.1 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@dragino-16c538:~# opkg install kmod-dragino2-si3217x_3.10.49+0.2-1_ar71xx.ipk
Installing kmod-dragino2-si3217x (3.10.49+0.2-1) to root...
Collected errors:
* satisfy_dependencies_for: Cannot satisfy the following dependencies for kmod-dragino2-si3217x:
*   kernel (= 3.10.49-1-4917516478a753314254643facdf360a) *
* opkg_install_cmd: Cannot install package kmod-dragino2-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.

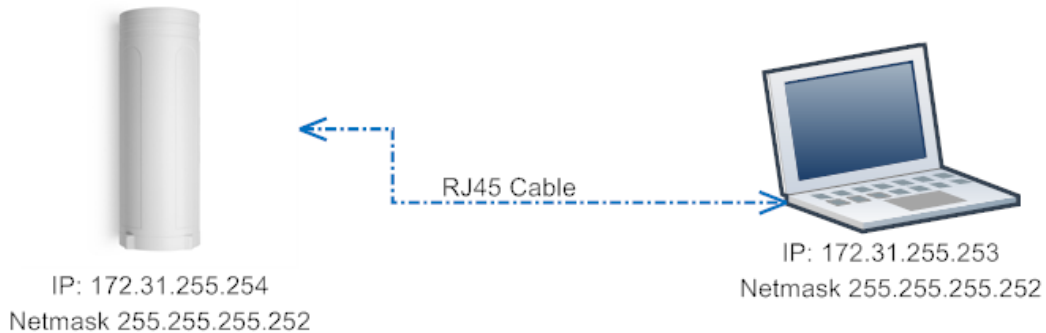
```
Opkg install kmod-dragino2-si3217x_3.10.49+0.2-1_ar71xx.ipk --force-depends
```

### 10.2 How to recover the DLOS8 if the firmware crashes

Please follow this instruction to recover your gateway:

[http://wiki.dragino.com/index.php?title=Recover\\_Gateway](http://wiki.dragino.com/index.php?title=Recover_Gateway)

### 10.3 I configured DLOS8 for WiFi access and lost its IP. What to do now?



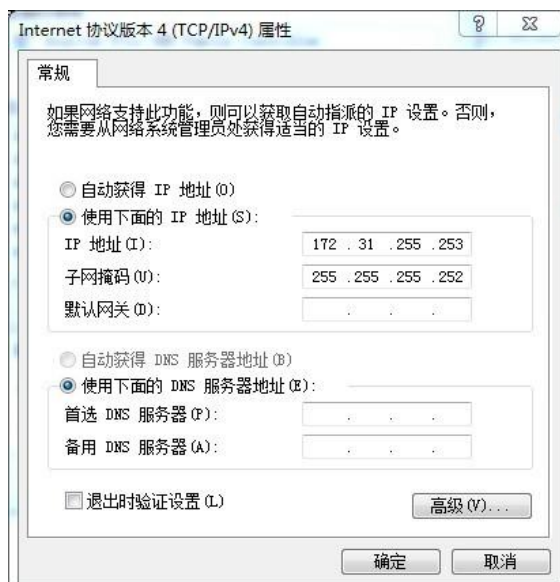
The DLOS8 has a fall-back IP address on its WAN port. This IP is always enabled so you can use the fall-back IP to access DLOS8 no matter what the WiFi IP is. The fall back IP is useful for connecting and debug the unit.

(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 DLOS8'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 DLOS8 via Web or Console.  
Please note the latest firmware uses port 8000 for http and 2222 for ssh access.

## 11 Order Info

**PART: DLOS8-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

## 12 Packing Info

### Package Includes:

- ✓ DLOS8 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

### Dimension and weight:

- ✓ Device Size: 12 x 12 x 3 cm
- ✓ Weight: 187g
- ✓ Package Size: 14.5 x 13.5 x 6 cm
- ✓ Weight: 300g

## 13 Support

- Try to see if your questions already answered in the [wiki](#).
- Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8.  
Due to different timezones we cannot offer live support. However, your questions will be answered as soon as possible in the before mentioned schedule.
- Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to:

[support@dragino.com](mailto:support@dragino.com)

### *FCC Statement*

*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.*

*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.*

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

*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.*