



DLOS8 Outdoor LoRaWAN Gateway User Manual

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1 Introduction

1.1 What is the DLOS8

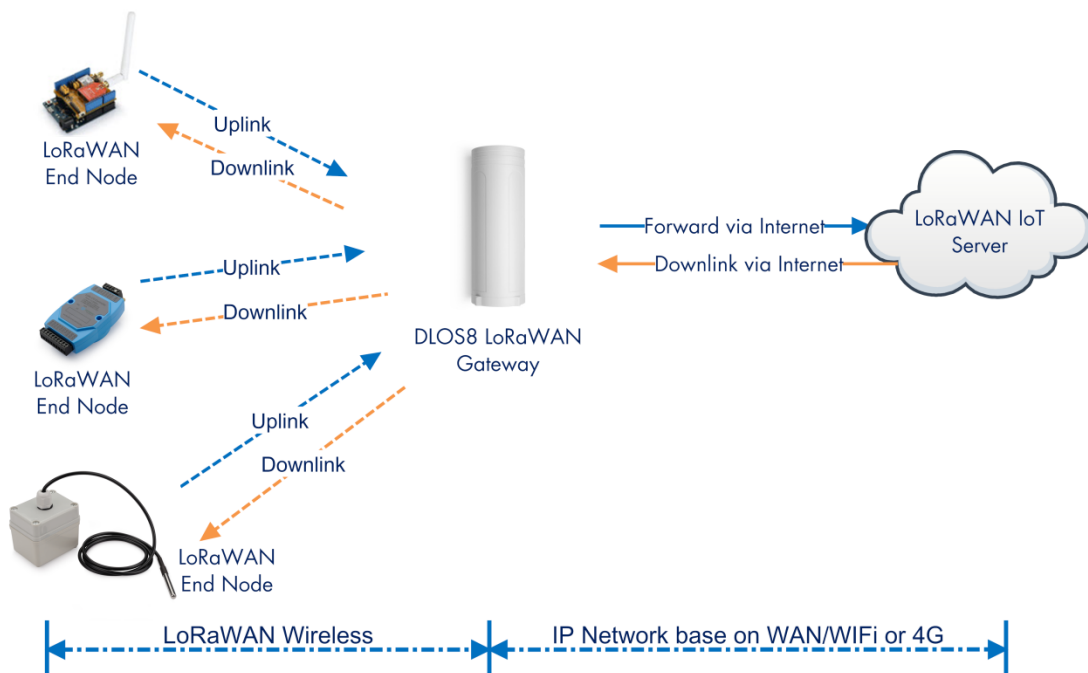
The DLOS8 is an **open source outdoor** LoRaWAN Gateway. It lets you bridge LoRa wireless network to an IP network via WiFi, Ethernet, 3G or 4G cellular. The LoRa wireless allows users to send data and reach extremely long ranges at low data-rates.

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:

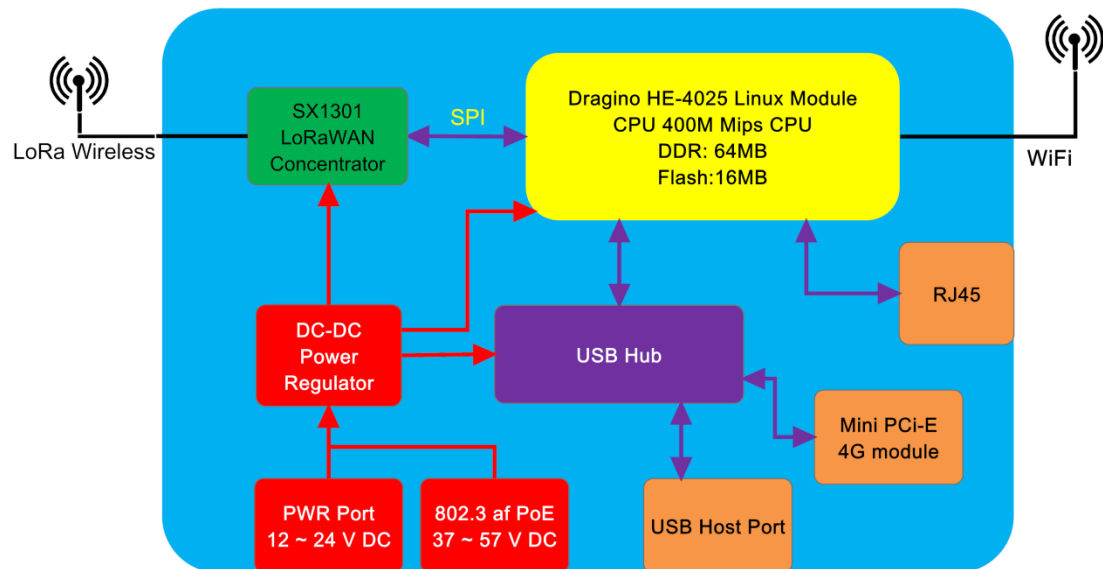
- IEEE 802.3af compliant.
- Support wide input voltage range 37Vdc to 57Vdc.
- Thermal cut off.
- Short circuit protection.
- Over current protection
- Isolation level 4 KVRms.
- Enhanced surge protection

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



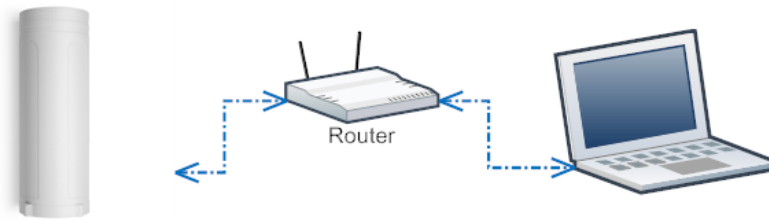
At the first boot of DLOS8, it will auto generate a WiFi network called **dragino-xxxxxx** with password:

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**

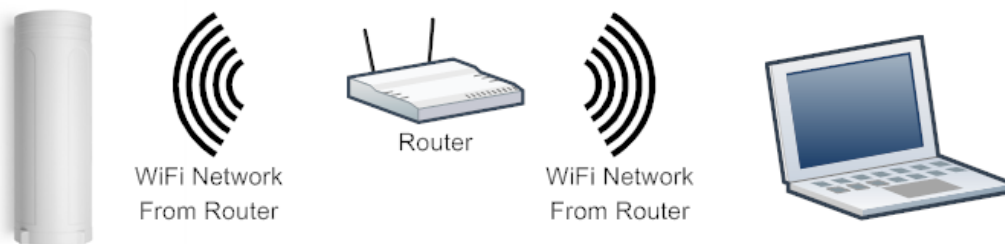


2.1.2 Connect via Ethernet with DHCP IP from router



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

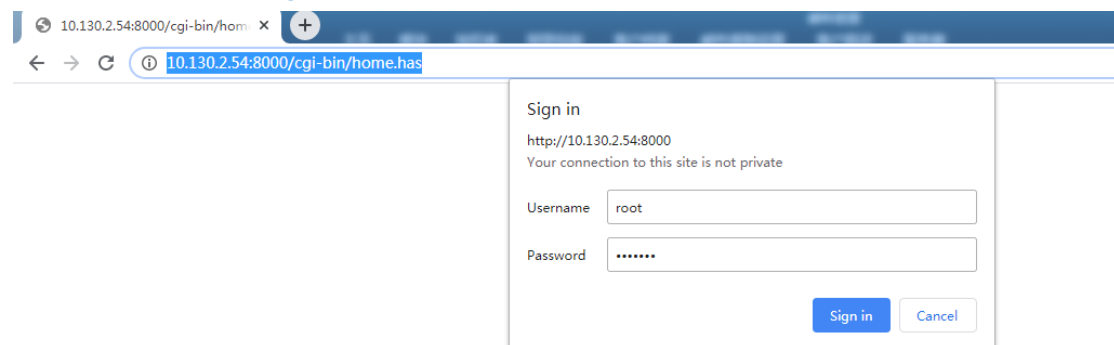
http://IP_ADDRESS or http://IP_ADDRESS:8000

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

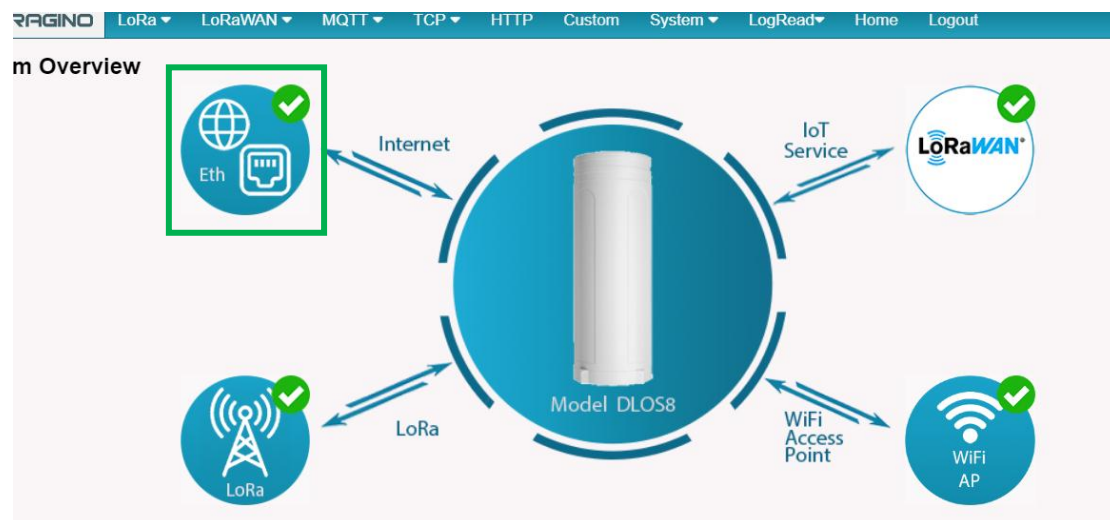
3.1 Overview

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)
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](#)

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

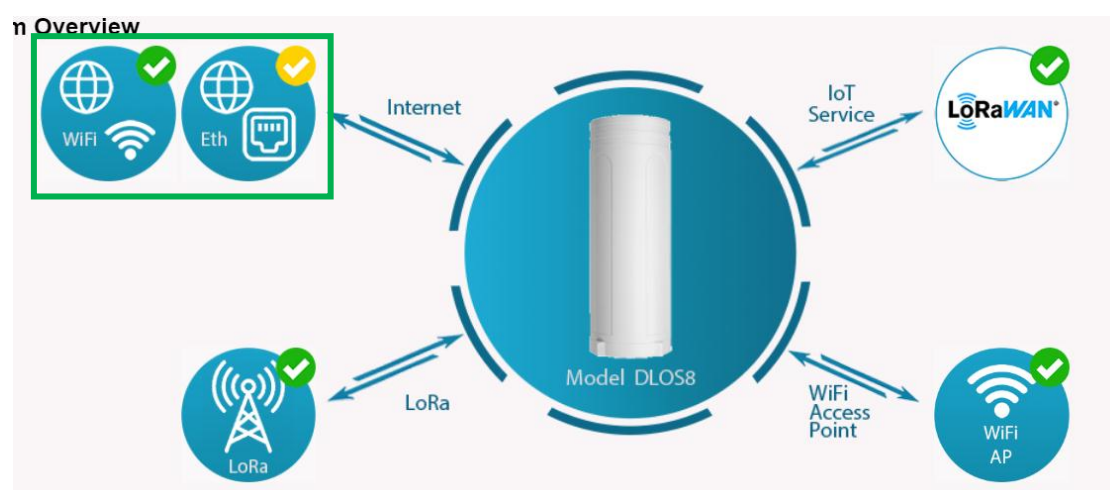
Username

Password [Show](#)

3.5 Check Internet connection

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

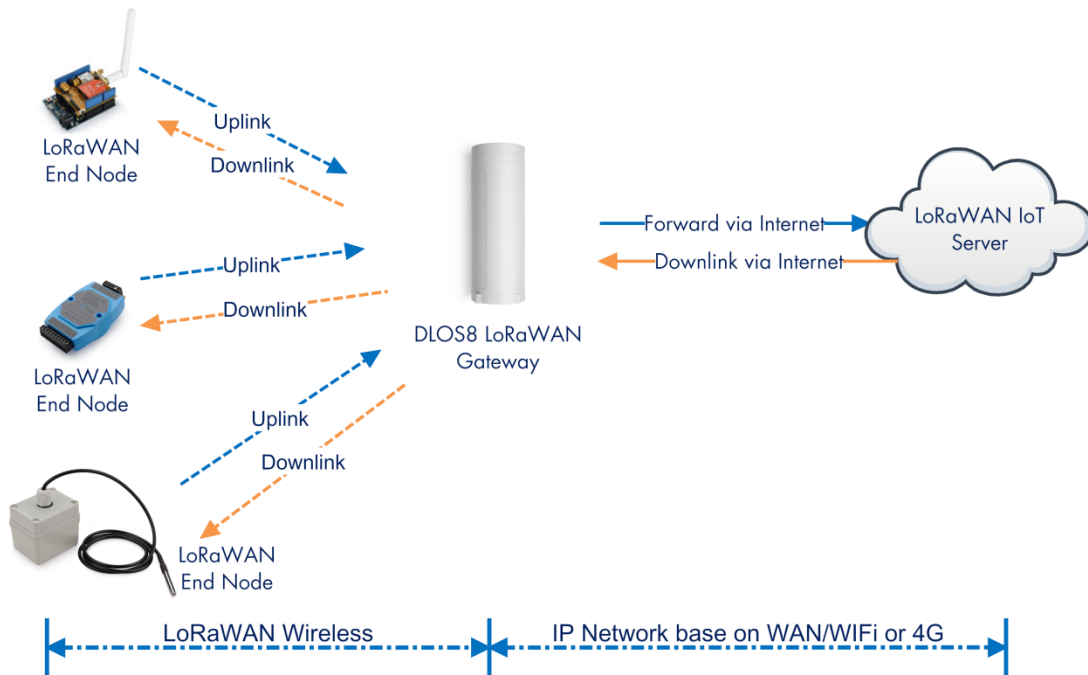
- GREEN Tick  : This interface has Internet connection.
- Yellow Tick  : This interface has IP address but don't use it for internet connection.
- RED Cross  : This interface doesn't connected.



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:



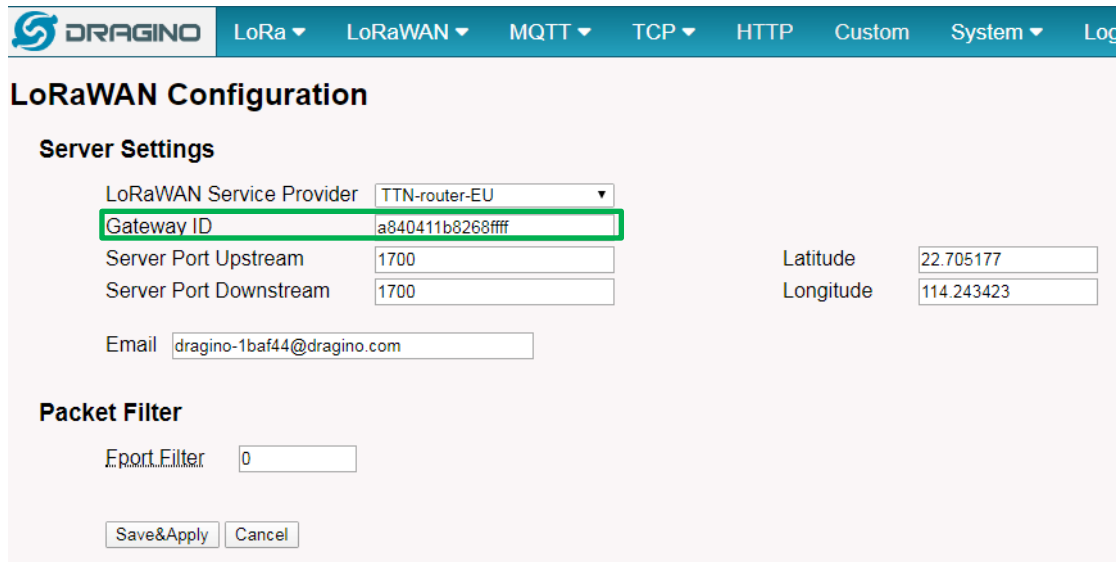
This chapter describes how to use the DLOS8 to work with

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

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

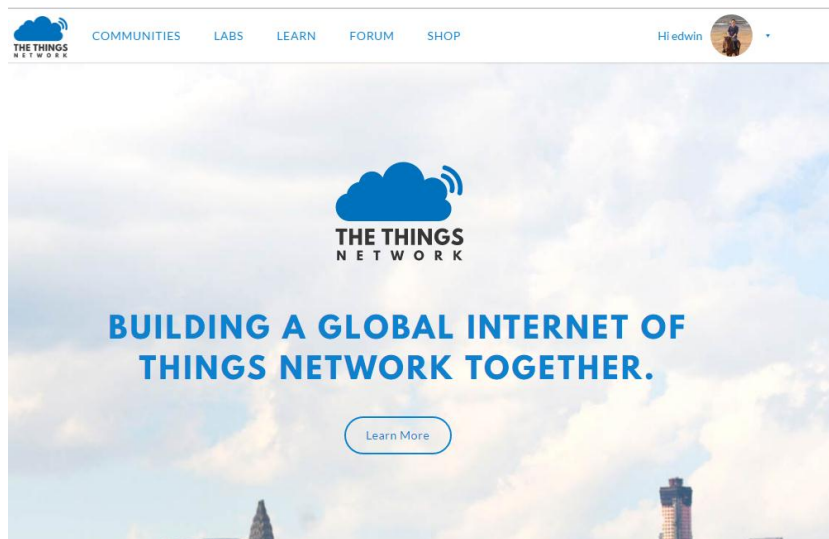
Packet Filter

Eport Filter: 0

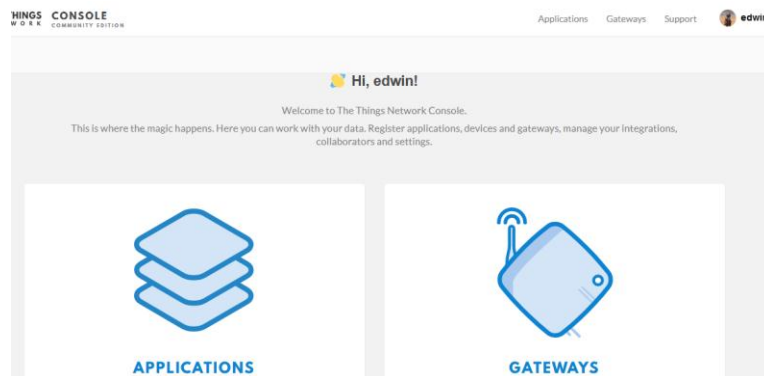
Save&Apply Cancel

The example gateway id is: **a840411b8268ffff**

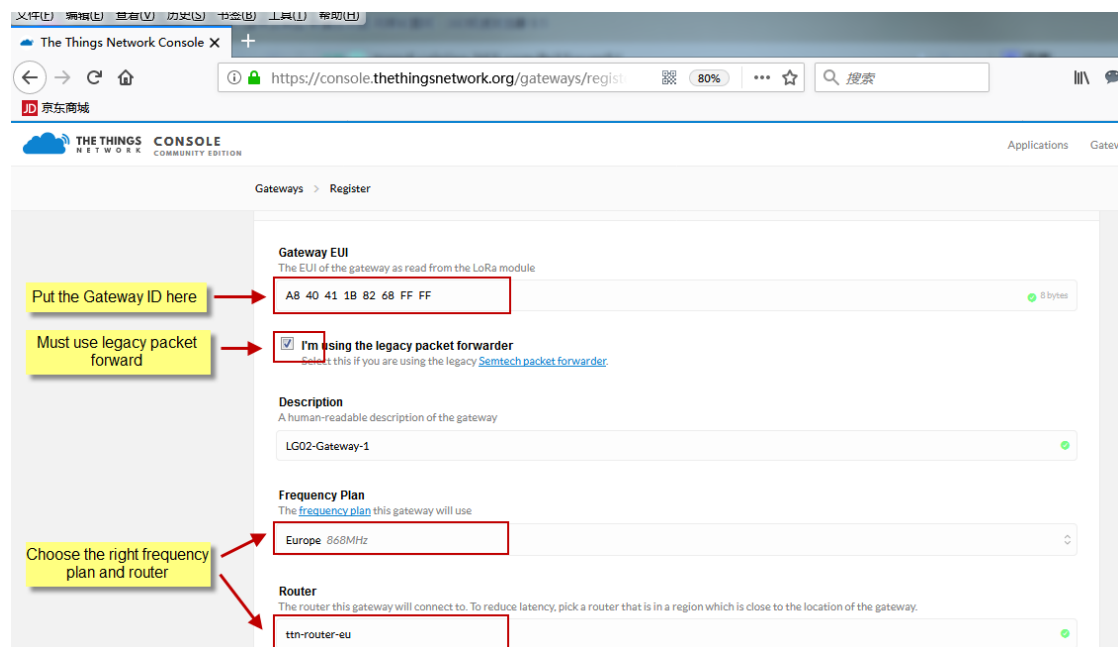
Step 2: Sign up a user account in TTN server



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


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**


LoRa ▼ LoRaWAN ▼ MQTT ▼ TCP ▼ HTTP Custom System ▼ Log

LoRaWAN Configuration

Server Settings

LoRaWAN Service Provider	TTN-router-EU ▼		
Gateway ID	a840411b8268ffff		
Server Port Upstream	1700	Latitude	22.705177
Server Port Downstream	1700	Longitude	114.243423

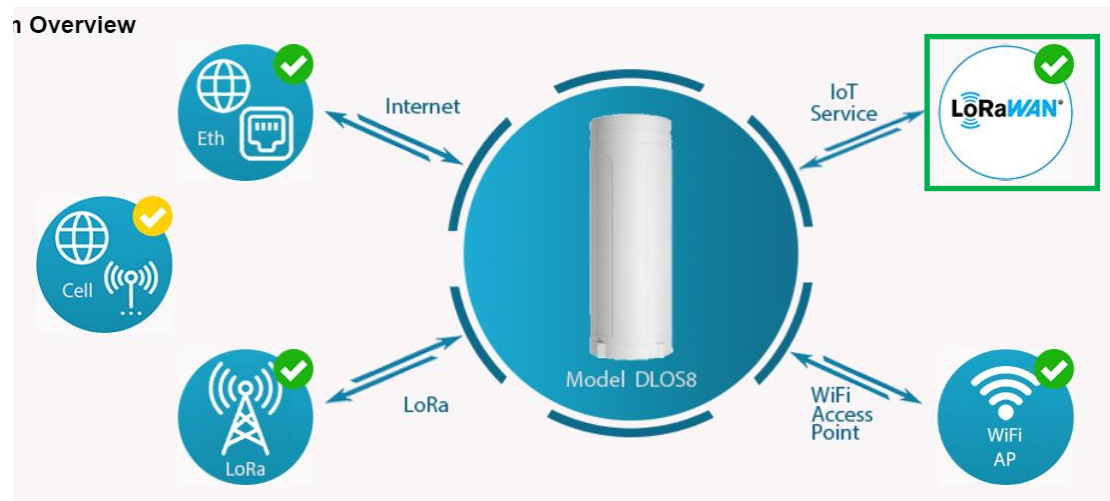
Email

Packet Filter

Port Filter

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.

CONSOLE
COMMUNITY EDITION

Applications Gateways Su


Gateways >  eui-a840411b8268fff

Overview Traffic Settings

GATEWAY OVERVIEW  settings

Gateway ID eui-a840411b8268fff




Description Gateway-1

Owner  edwin [Transfer ownership](#)

Status ● connected

Frequency Plan Europe 868MHz

Router ttn-router-eu

Gateway Key   base64 

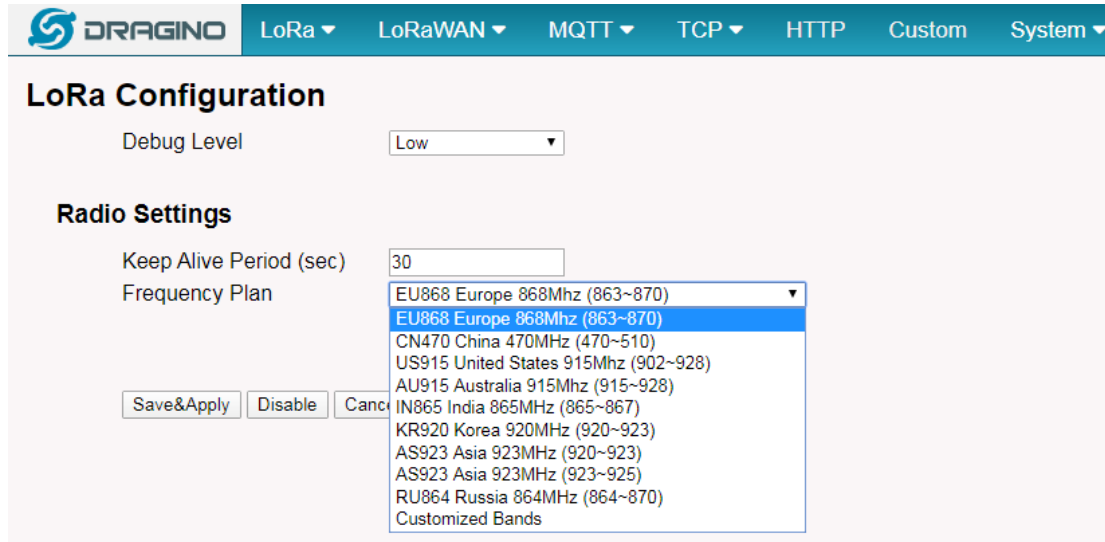
Last Seen 23 seconds ago

Received Messages 0

Transmitted Messages 0

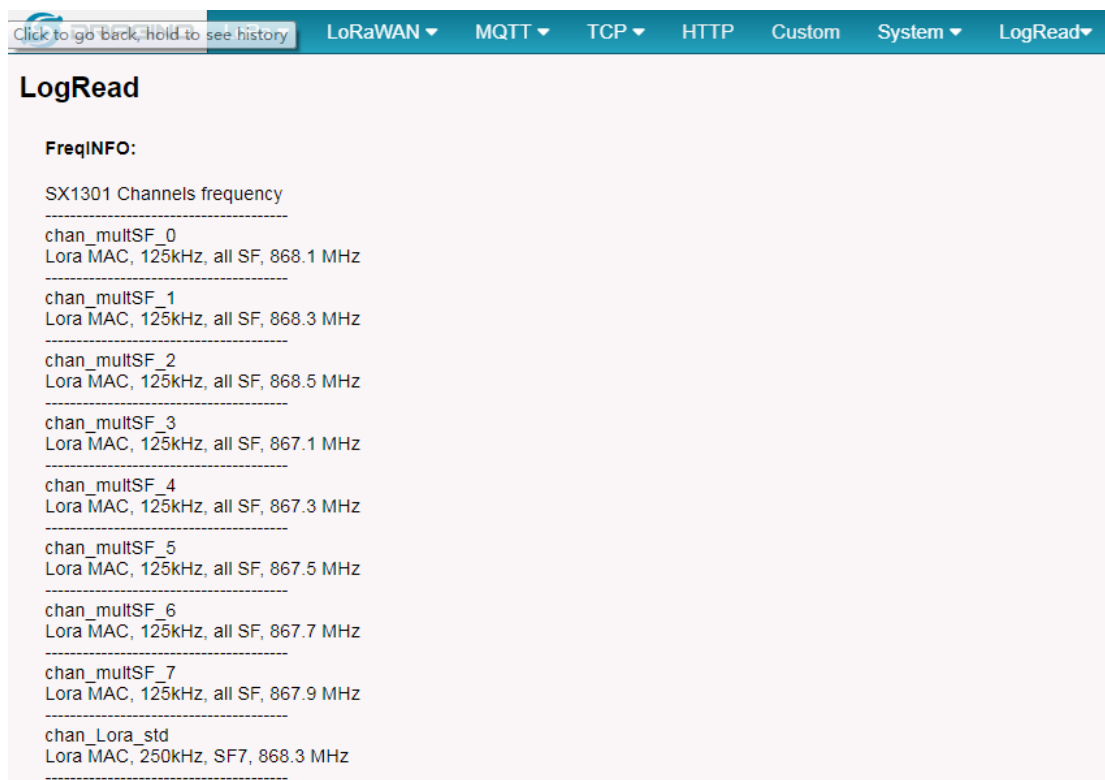
4.3 Configure frequency

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.



The screenshot shows the 'LoRa Configuration' page in the DLOS8 web interface. The 'Radio Settings' section is active. The 'Keep Alive Period (sec)' is set to 30. The 'Frequency Plan' dropdown menu is open, showing a list of options: 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), and Customized Bands. The 'EU868 Europe 868Mhz (863~870)' option is selected. Below the dropdown are buttons for 'Save&Apply', 'Disable', and 'Cancel'.

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



The screenshot shows the 'LogRead' page in the DLOS8 web interface. The 'FreqINFO:' section displays the following information:

```

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.

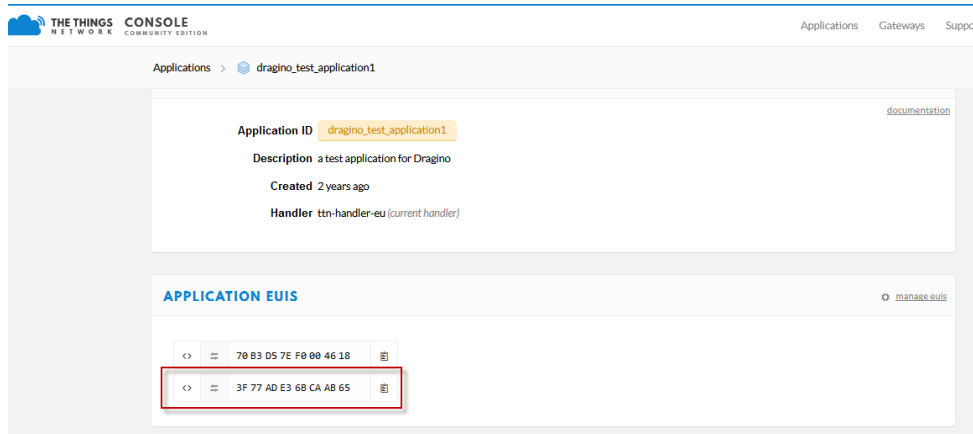


Note: You may be able to change these codes in a device by using a configuration facility on the device e.g. the LT-22222 uses a serial port access and a series of AT commands. Changing the codes may be necessary in the case where you have to use codes assigned by a LoRa WAN server.

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

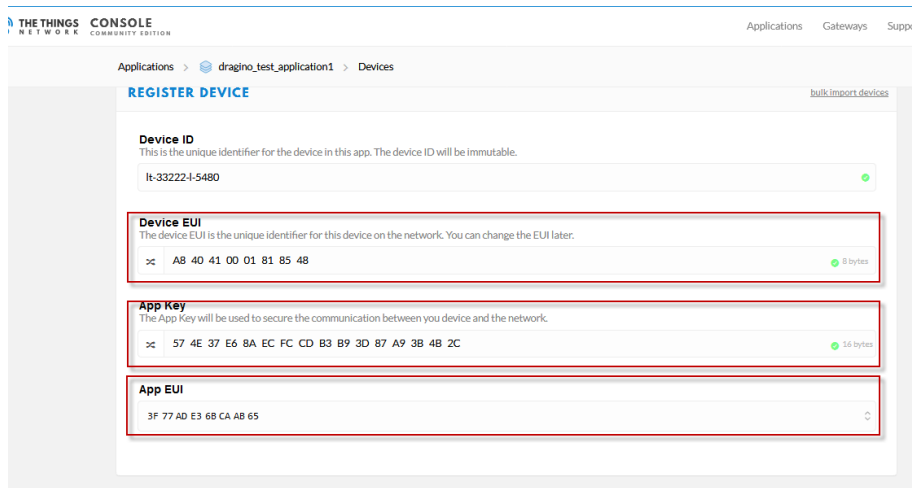
Select **Add Application** to open the screen below.

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](#)

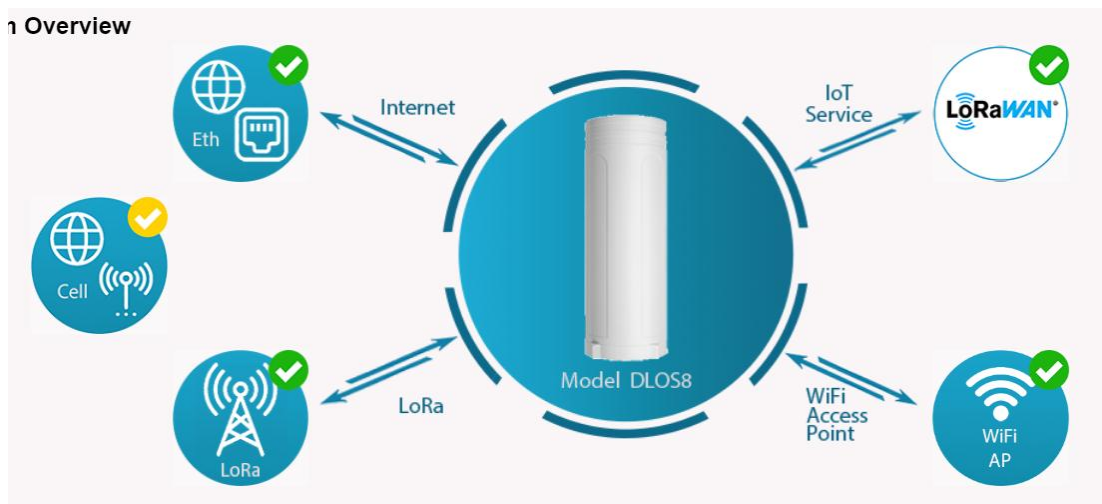
time	counter	port	
16:54:53	0	2	retry payload: 00 02 01 36 04 C1 04 C2 38
16:54:47			dev addr: 26 01 2C 6B app eui: FCDEC9B2D32FA6 61 dev eui: A8 40 41 00
16:54:40			dev addr: 26 01 2C 85 app eui: FCDEC9B2D32FA6 61 dev eui: A8 40 41 00
16:54:33			dev addr: 26 01 2E EC app eui: FCDEC9B2D32FA6 61 dev eui: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

5 Web Configure Pages

5.1 Home

Shows the system running status.

1 Overview



5.2 LoRa Settings

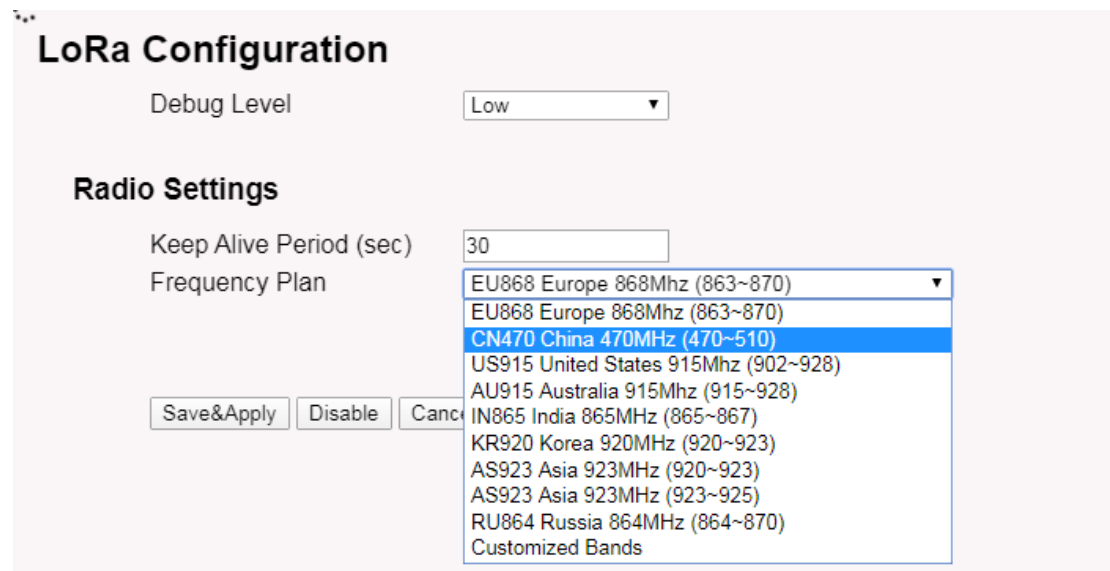
5.2.1 LoRa --> LoRa

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

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

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	<input type="text" value="TTN-router-EU"/>		
Gateway ID	<input type="text" value="a84041ffff1d25dc"/>		
Server Port Upstream	<input type="text" value="1700"/>	Latitude	<input type="text" value="22.705177"/>
Server Port Downstream	<input type="text" value="1700"/>	Longitude	<input type="text" value="114.243423"/>
Email	<input type="text" value="dragino-1d25dc@dragino.com"/>		

Packet Filter

Port Filter	<input type="text" value="0"/>
-------------	--------------------------------

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

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

LORIIOT Client Configuration

LORIIOT software not installed.

Server Address	<input type="text" value="Sydney - au1.loriot.io"/>	Server Port	<input type="text" value="Default"/>
Client Certificate	<input type="text"/>	Client Key	<input type="text"/>
CA File	<input type="text"/>		

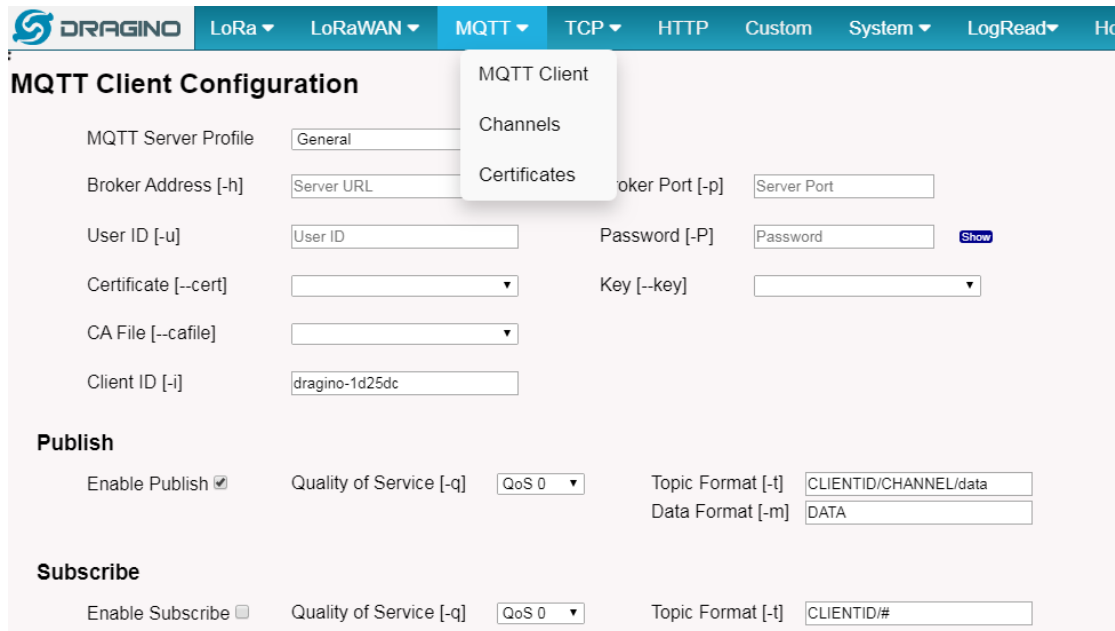
Device EUI: A840411D25DF

[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



The image shows the 'MQTT Client Configuration' web interface. At the top is a navigation bar with tabs: LoRa, LoRaWAN, MQTT (selected), TCP, HTTP, Custom, System, LogRead, and Help. Below the tabs, a dropdown menu for 'MQTT Client' is open, showing options: MQTT Client, Channels, and Certificates. The main configuration area is titled 'MQTT Client Configuration' and contains several sections:

- MQTT Server Profile:** A dropdown menu set to 'General'.
- Broker Address [-h]:** A text input field labeled 'Server URL'.
- Broker Port [-p]:** A text input field labeled 'Server Port'.
- User ID [-u]:** A text input field labeled 'User ID'.
- Password [-P]:** A text input field labeled 'Password' with a 'Show' button.
- Certificate [--cert]:** A dropdown menu.
- Key [--key]:** A dropdown menu.
- CA File [--cafile]:** A dropdown menu.
- Client ID [-i]:** A text input field containing 'dragino-1d25dc'.

Below these fields are two sections: 'Publish' and 'Subscribe'.

- Publish:**
 - Enable Publish:** A checked checkbox.
 - Quality of Service [-q]:** A dropdown menu set to 'QoS 0'.
 - Topic Format [-t]:** A text input field containing 'CLIENTID/CHANNEL/data'.
 - Data Format [-m]:** A text input field containing 'DATA'.
- Subscribe:**
 - Enable Subscribe:** An unchecked checkbox.
 - Quality of Service [-q]:** A dropdown menu set to 'QoS 0'.
 - Topic Format [-t]:** A text input field containing 'CLIENTID/#'.

5.5 System

5.5.1 System --> System Overview

Shows the system info:



The image shows the 'System Overview' web interface. It displays various system information in a list format:

- 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
- IoT Service:** lorawan

Below the system info, there are two status indicators:

- Internet Connection OK:** Indicated by a green checkmark icon.
- LoRaWAN Connection OK:** Indicated by a green checkmark icon and the LoRaWAN logo.

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

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: Not connected to RSSH Host		
<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](#)

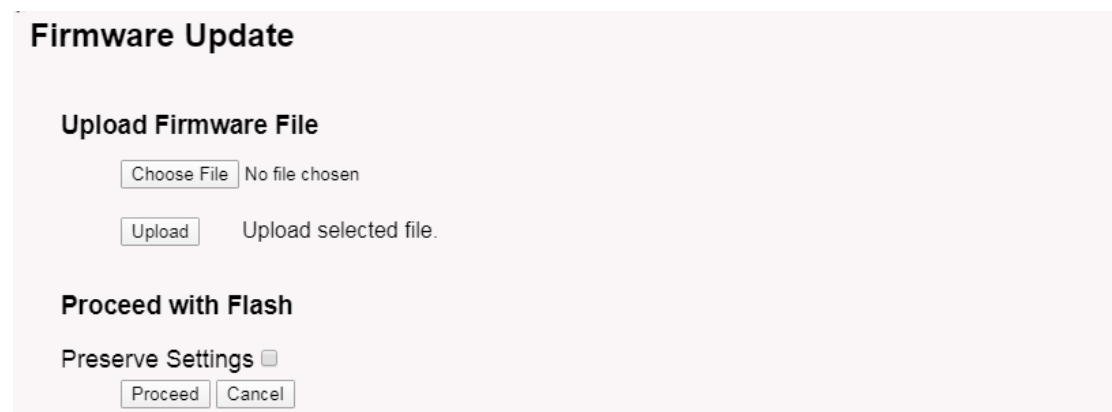
5.5.8 System --> Firmware Upgrade

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)
- **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)

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

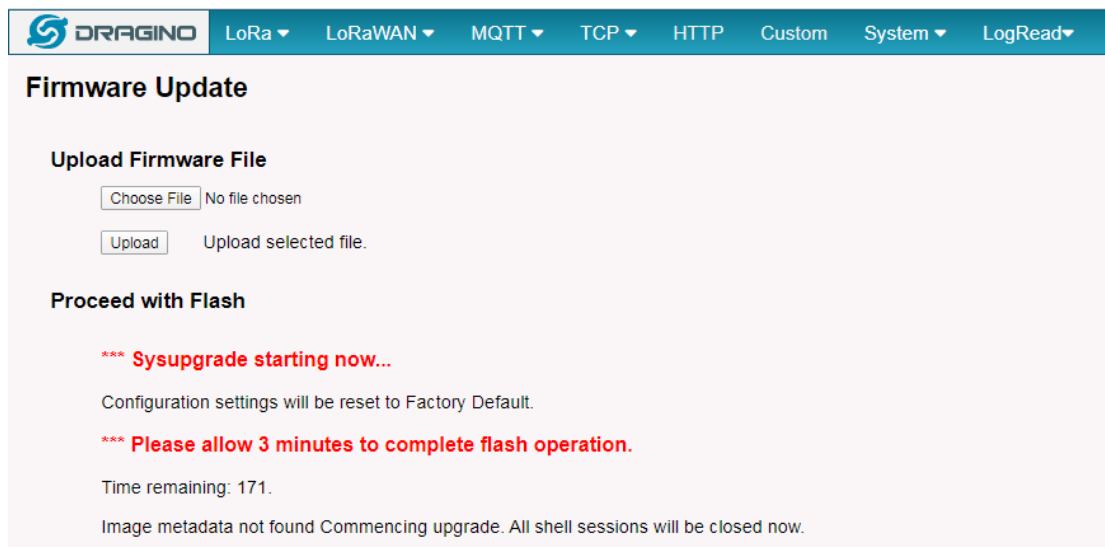


The screenshot shows a web interface titled "Firmware Update". It contains two main sections. The first section, "Upload Firmware File", has a "Choose File" button next to the text "No file chosen", and an "Upload" button next to the text "Upload selected file.". The second section, "Proceed with Flash", 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.



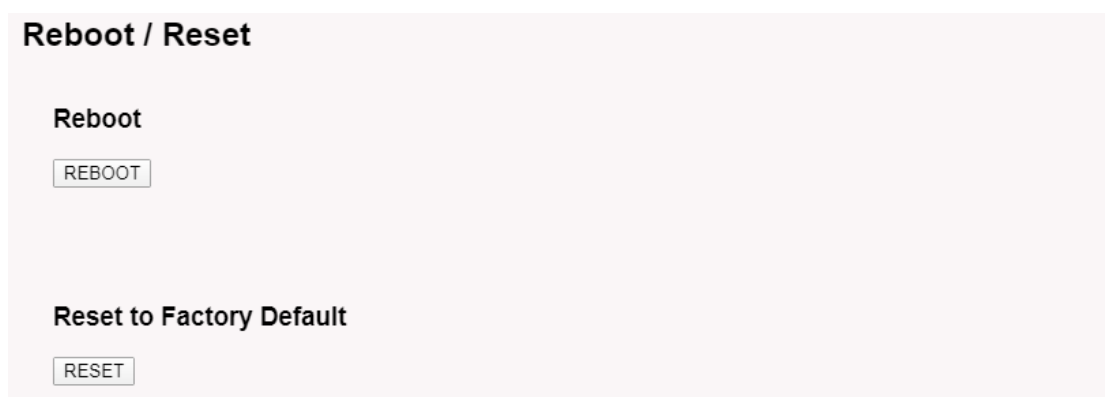
Note *: User can also upgrade firmware via Linux console

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

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.

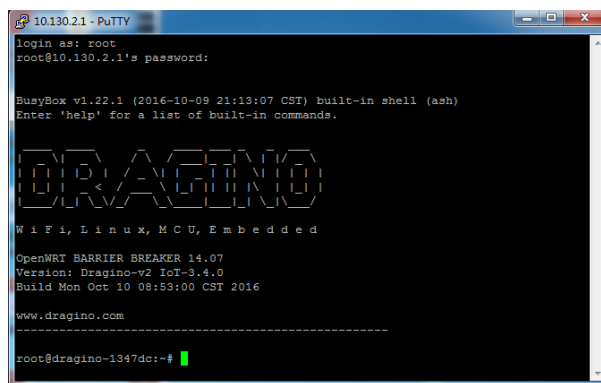
IP address: IP address of DLOS8

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.

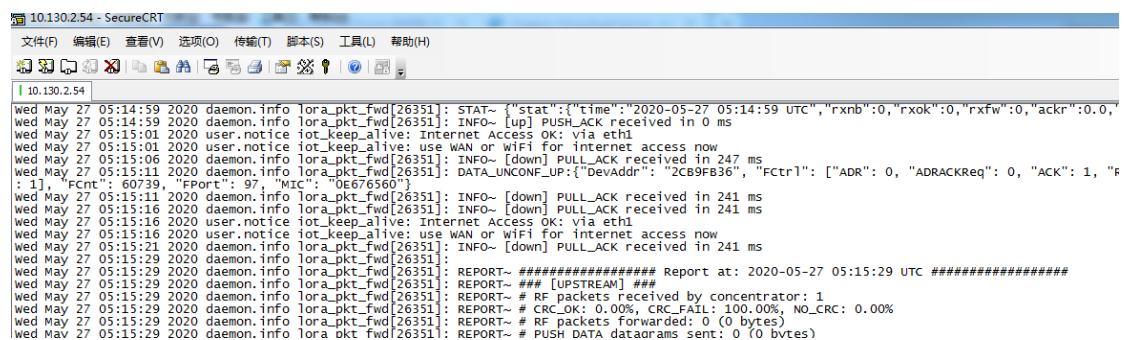
DRAGINO
WiFi, Linux, MCU, Embedded

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, "MIC": "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)
  
```

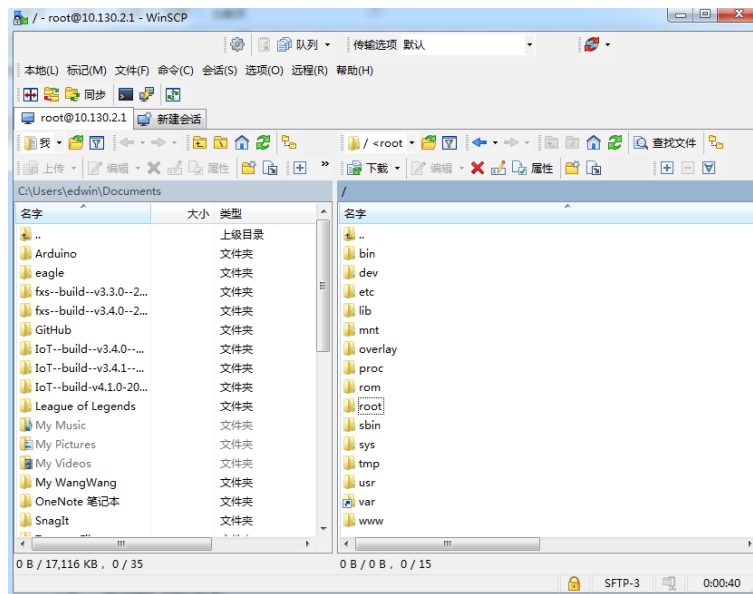
7.2 Edit and Transfer files

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

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

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

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.

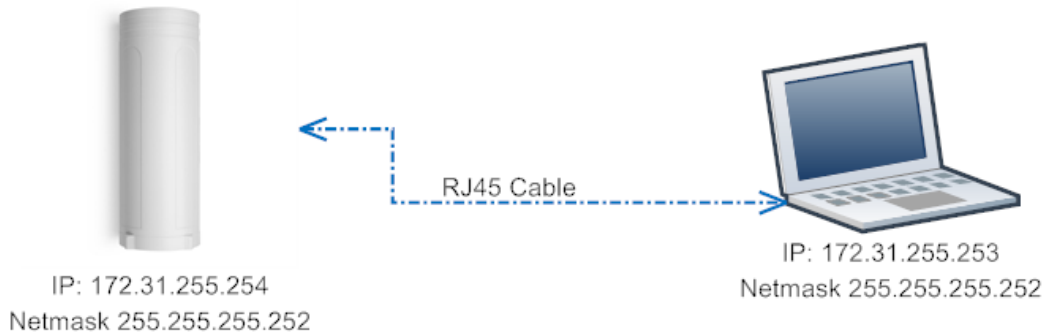
```
Opkg install kmod-dragino2-si3217x_3.10.49+0.2-1_ar71xx.ipk --force-depends
```

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

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



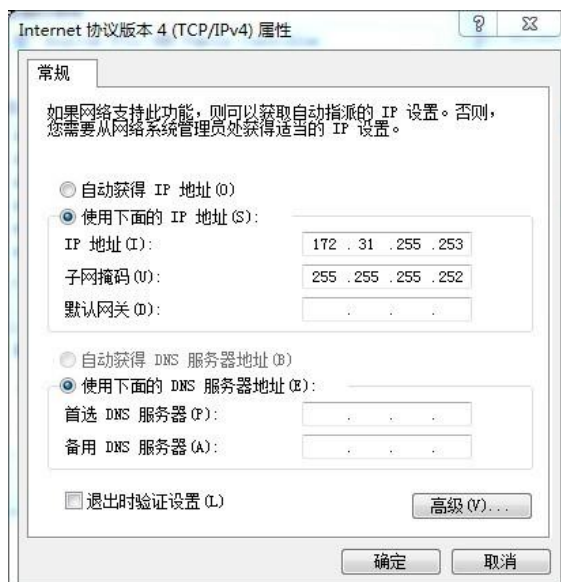
The DLOS8 has a fall-back IP address on its WAN port. This IP is always enabled so you can use the fall-back IP to access DLOS8 no matter what the WiFi IP is. The fall back IP is useful for connecting and debug the unit.

(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