ED-GWL2110

AN OUTDOOR GATEWAY BASED ON RASPBERRY PI CM4

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EDA Technology Co.,LTD– Electronics Development Accelerator

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Contents

1 Product Overview

ED-GWL2110 is an outdoor gateway. The whole machine is sealed with all-aluminum alloy outer box, which has good waterproof, moisture-proof, insect-proof and lightning-proof performance. It is designed based on CM4. It has SATA interface specially used for LoRa module, and supports LoRa modules with different frequency bands (external antennas with different frequency bands are required); It has a 4G module to ensure that outdoor equipment can upload and download data normally; The equipment has onboard GPS module, which can easily meet the positioning requirements; The watchdog module is provided, which can effectively prevent the equipment from being stuck and greatly increase the stability of the equipment operation; Moreover, this device is equipped with a special encryption chip, which is mounted on the I2C bus to ensure the information security of the device. The equipment is also equipped with RTC module to ensure the reliability.

1.1 Target Application

- LoRa intelligent gateway
- Smart manufacturing
- Smart city
- Smart transportation

1.2 Specifications and Parameters

Function	Parameters
CPU	Broadcom BCM2711 4core, ARM Cortex-A72(ARM v8), 1.5GHz, 64Bit CPU
Memory	1GB / 2GB / 4GB / 8GB option
Dual micro SD Card	SD card system card
	option 8GB / 16GB / 32GB / 64GB
	Extend SD card storage card(option)
	option 8GB / 16GB / 32GB / 64GB
HDMI	1x standard HDMI
Ethernet	1x Gigabit Ethernet
WiFi	2.4G / 5.8G dual WiFi, compatible IEEE 802.11 b/g/n/ac
Bluetooth	Standard 5.0，support BLE
4G	1x 4G/LTE module(option), Full netcom, supporting mobile, Unicom and telecom network standards.
LoRa	Support LoRa WAN protocol
	Support frequency band
	- 868MHz(EU868,RU864)

Function	Parameters
	- 915MHz(US915,AS923-1/2/3,AU915)
	- 470MHz(CN470)
GPS	Support multi-satellite system
	- GPS L1 C/A：1575.42 ±1.023 MHz
	- BeiDou B1I：1561.098 ±2.046 MHz
	- GLONASS L1：1597.78~1605.66 MHz
Serial(TTL)	1x Serial(TTL)，available for the system default console.
Real clock	1x RTC，Use CR1220 button cell
Independent key	1x User-defined key
LED	1x RGB three-colour LED
Watchdog	Support watchdog function to prevent the system from being stuck.
Encryption chip	On-board encryption chip
Power input	POE power supply 40V~57V
Dimensions	195(L) x 195(W) x 65(H) mm
Case	Cast aluminum waterproof shell, IP24 waterproof grade.
Working environment temperature	-25 ~ 60°C environment temperature

1.3 System Diagram
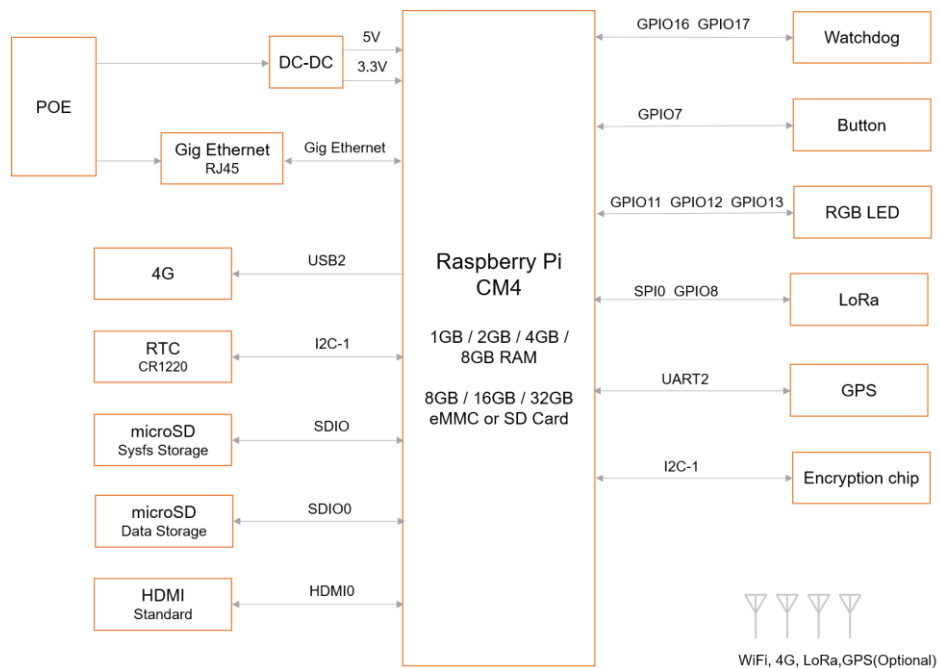
ED-GWL2110

1.4 Functional Layout
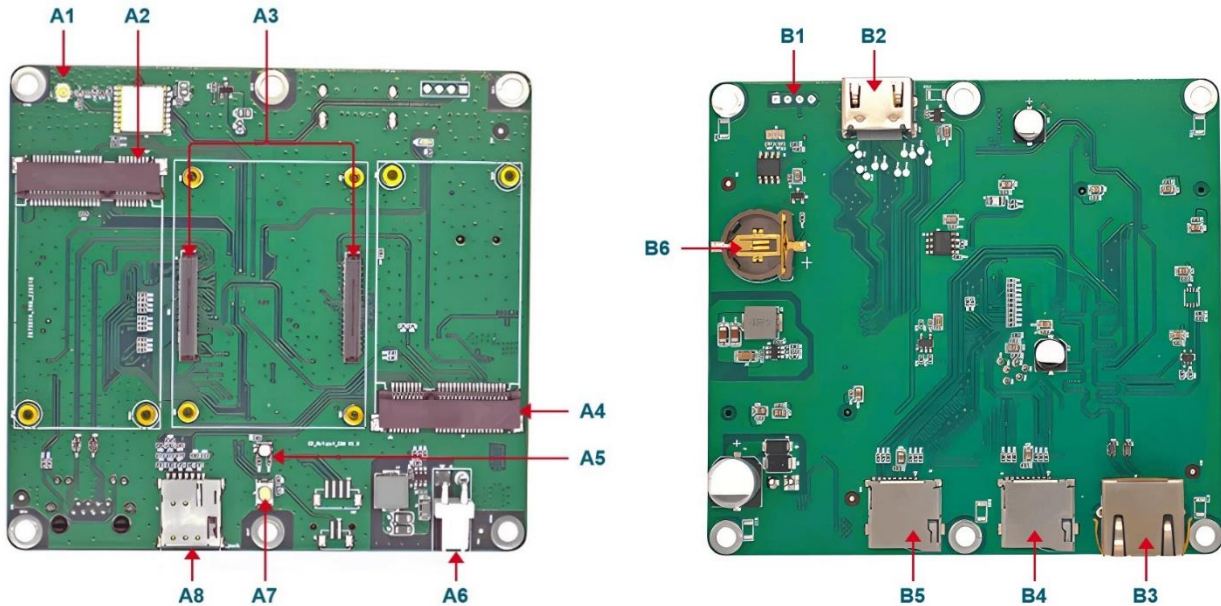
Item	Function Description	Item	Function Description
A1	GPS antenna IPX port	A5	RGB LED
A2	LoRa mini-PCIe port	A6	12V power connector
A3	CM4 slot	A7	Button
A4	4G mini-PCIe port	A8	Nano SIM slot

Item	Function Description	Item	Function Description
B1	UART port	B5	Storage expansion SD slot
B2	HDMI type A port	B6	RTC Battery slot
B3	Ethernet RJ45 port		
B4	System micro SD slot		

1.5 Packing List

- 1x ED-GWL2110 host
- [option]1x LoRa antenna
- [option WiFi/BT version]1x 2.4GHz/5GHz WiFi/BT antenna
- [option 4G version]1x 4G/LTE antenna

1.6 Order Code

ED - GWL2110 - 0 2 32 - 4 C - CN

EDATEC

LoRa Gateway CM4

WiFi & BT Module
0 = Without WiFi & BT
1 = With WiFi & BT

DDR
1 = 1GB DDR
2 = 2GB DDR
4 = 4GB DDR
8 = 8GB DDR

CN = CN470
EU = EU868
US = US915

Case
Blank = No Case
C = With Case

4G / LTE Module
Blank = No 4G / LTE
4 = With 4G / LTE

eMMC Flash
08 = 8GB eMMC Flash
16 = 16GB eMMC Flash
32 = 32GB eMMC Flash
64 = 64GB eMMC Flash
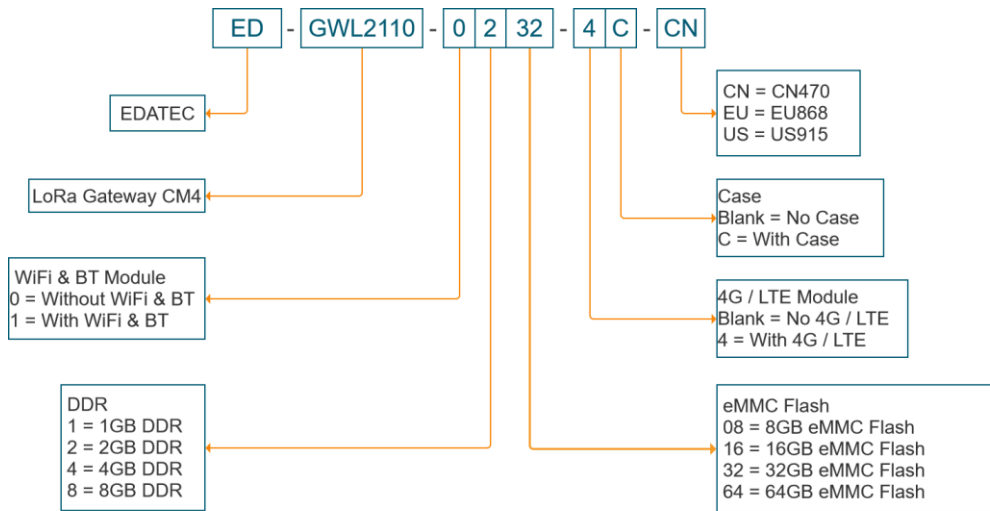
Example

Part# : ED-GWL2110-1232-4C-CN
Configration : GWL2110 LoRa Gateway
1pcs Raspberry Pi certified WiFi/Bluetooth Antenna
CM4102032 Compute Module with Wireless, 2GB DDR and 32GB eMMC Flash
4G Module with 1pcs 4G antenna
Metal Case
CN470 LoRa Module

2 Quick Start

2.1 Equipment List

- 1x ED-GWL2110 host
- 1x WiFi / BT external antenna
- 1x LoRa external antenna
- 1x GPS antenna
- 1x net cable
- 1x 12V@2A power supply

2.2 Hardware Connection

1. Install the WiFi external antenna.
2. Install LoRa external antenna.
3. Install the GPS external antenna and place it outdoors.
4. Insert the network cable into the Ethernet port, and the network cable is connected with network

devices such as routers and switches that can access the Internet.

5.Plug in the DC power input port (+12V DC) of ED-GWL2110 and supply power to the power adapter.

2.3 First Start

ED-GWL2110 has no power switch. Plug in the power cord and the system will start.

2.3.1 Raspberry Pi OS (Lite)

If you use the system image provided by us, after the system starts, you will automatically log in with the user name pi, and the default password is raspberry.

If you use the official system image, and the image is not configured before burning, the configuration window will appear when you start it for the first time. You need to configure the keyboard layout, set the user name and the corresponding password in turn.

● Set the configuration keyboard layout

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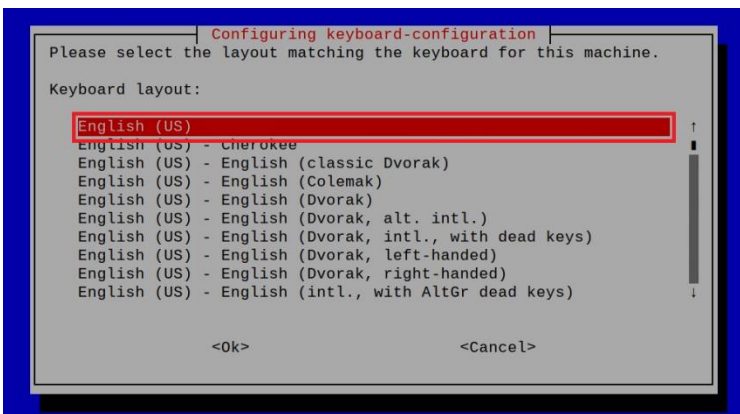
● Create a new user name
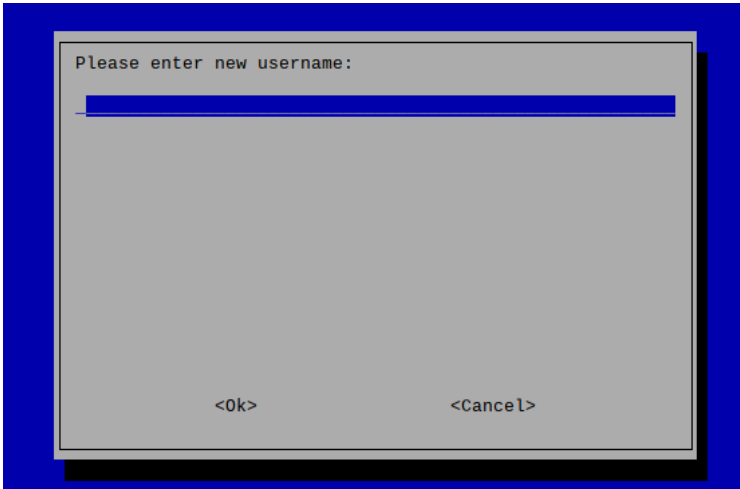
Then set the password corresponding to the user according to the prompt, and enter the password again for confirmation. At this point, you can log in with the user name and password you just set.

2.3.2 Enable SSH

All the images we provide have turned on the SSH function. If you use the official image, you need to use a method to turn on the SSH function.

2.3.2.1 raspi-config

```
sudo raspi-config
```

1. Choose 3 Interface Options
2. Choose I2 SSH
3. Would you like the SSH server to be enabled? Select Yes
4. Choose Finish

2.3.2.2 Add Empty File to Enable SSH
Put an empty file named ssh in the boot partition, and the SSH function will be automatically enabled after the device is powered on.

2.3.3 Get The Device IP

● If the display screen is connected, you can use the ifconfig command to find the current device IP.
● If there is no display screen, you can view the assigned IP through the router.
● If there is no display screen, you can download the nmap tool to scan the IP under the current network.
  Nmap supports Linux, macOS, Windows and other platforms. If you want to use nmap to scan the network segments from 192.168.3.0 to 255, you can use the following command：

```
nmap -sn 192.168.3.0/24
```

After waiting for a period of time, the result will be output:

```
Starting Nmap 7.92 ( https://nmap.org ) at 2022-12-30 21:19 中国标准时间
Nmap scan report for 192.168.3.1 (192.168.3.1)
Host is up (0.0010s latency).
MAC Address: XX:XX:XX:XX:XX:XX (Phicomm (Shanghai))
Nmap scan report for DESKTOP-FGEOUUK.lan (192.168.3.33)
Host is up (0.0029s latency).
MAC Address: XX:XX:XX:XX:XX:XX (Dell)
Nmap scan report for 192.168.3.66 (192.168.3.66)
Host is up.
Nmap done: 256 IP addresses (3 hosts up) scanned in 11.36 seconds
```

3 Software Operation Guide

3.1 Button

ED-GWL2110 has a user-defined button. On the back of GWL2110 PCBA, it is connected to the GPIO23 pin of CPU, which is high by default and low when the button is pressed.

We use the raspi-gpio command to test, and query the GPIO23 pin when the key is not pressed.

```
raspi-gpio get 23
GPIO 23: level=1 fsel=0 func=INPUT
```

Level of 1 indicates that the GPIO23 pin is high.

When the key is pressed, query the GPIO23 pin.

```
raspi-gpio get 23
GPIO 23: level=0 fsel=0 func=INPUT
```

Level of 0 indicates that the GPIO23 pin is low.

3.2 LED Indication

ED-GWL2110 has an RGB tricolor LED indicator. Corresponding to the GPIO pin of CPU is as follows:

RGB LED PIN	GPIO
Blue	GPIO16
Green	GPIO20
Red	GPIO21

When the GPIO output is low, the corresponding LED is valid.
We use the raspi-gpio command to operate, and the configuration parameter is op, which means output

setting, dl setting pin is low level, and dh setting pin is high level.

The LED is displayed in blue

```
sudo raspi-gpio set 16 op dl
sudo raspi-gpio set 20 op dh
sudo raspi-gpio set 21 op dh
```

The LED is displayed in green

```
sudo raspi-gpio set 16 op dh
sudo raspi-gpio set 20 op dl
sudo raspi-gpio set 21 op dh
```

The LED is displayed in red

```
sudo raspi-gpio set 16 op dh
sudo raspi-gpio set 20 op dh
sudo raspi-gpio set 21 op dl
```

The LED is displayed in yellow

```
sudo raspi-gpio set 16 op dh
sudo raspi-gpio set 20 op dl
sudo raspi-gpio set 21 op dl
```

3.3 Ethernet Configuration

ED-GWL2110 has an adaptive 10/100/1000 Mbsp Ethernet interface.

The official system of Raspberry Pi uses dhcpcd as the network management tool by default.

Static IP can be set by modifying/etc/dhcpcd.conf. For example, eth0 can be set, and users can set wlan0 and other network interfaces according to their different needs.

```
interface eth0
static ip_address=192.168.0.10/24
static routers=192.168.0.1
static domain_name_servers=192.168.0.1 8.8.8.8 fd51:42f8:caae:d92e::1
```

3.4 LTE 4G

Before using 4G, we need to add our APT library first. All the images given by our company have been added with this library, so users don't need to add it manually.

```
sudo apt update
sudo apt install ed-ec20-qmi
```

Automatic dialing is not started by default. If users want to start automatic dialing, they need to enable LTE lte-reconnect.service service.

```
sudo systemctl enable lte-reconnect.service
sudo systemctl start lte-reconnect.service
```

After successful dialing, you can use the ifconfig command to see the wwan0 network port.

If you need to set APN additionally, you need to modify the dialing command in/usr/share/ed-ec20-qmi/LTE-reconnect.sh.

```
$BSP_HOME_PATH/quectel-CM -4 -f $LOGFILE &
```

The quectel-CM dialing configuration information is as follows:

```
$BSP_HOME_PATH/quectel-CM -4 -f $LOGFILE -s <APN> &
```

Restart lte-reconnect.service after setting.

```
sudo systemctl restart lte-reconnect.service
```

Reset 4G module

```
raspi-gpio set 10 pd
raspi-gpio set 10 op dl
sleep 0.5
raspi-gpio set 10 dh
sleep 0.5
raspi-gpio set 10 dl
```

3.5 WiFi

ED-GWL2110 support 2.4 /5.8 GHz IEEE 802.11 b/g/n WiFi。

The official system of Raspberry Pi uses dhcpcd as the network management tool by default.

```
sudo raspi-config
```

1. Choose 1 System Options。
2. Choose S1 Wireless LAN。
3. Select your country in the Select the country in which the pi is to be used window, and then select OK. This prompt only appears when setting up WIFI for the first time.
4. Please enter SSID，input WIFI SSID name。
5. Please enter passphrase. Leave it empty if none，input password and then restart the device。

3.6 Bluetooth

ED-GWL2110 supports Bluetooth 4.2 and Bluetooth Low Power Consumption (BLE), and the Bluetooth function is turned on by default.

Bluetoothctl can be used to scan, pair and connect Bluetooth devices. Please refer to the ArchLinux-Wiki-Bluetooth guide to configure and use Bluetooth.

3.6.1 Basic Usage

Scan:

```
bluetoothctl scan on/off
```

Find device:

```
bluetoothctl discoverable on/off
```

Truct device:

```
bluetoothctl trust [MAC]
```

Connect:

```
bluetoothctl connect [MAC]
```

Disconnect:

```
bluetoothctl disconnect [MAC]
```

3.6.2 Example

Into bluetootch shell

```
sudo bluetoothctl
```

Enable Bluetooth

```
power on
```

Scan Device

```
scan on

Discovery started
[CHG] Controller B8:27:EB:85:04:8B Discovering: yes
[NEW] Device 4A:39:CF:30:B3:11 4A-39-CF-30-B3-11
```

Find the name of the turned-on Bluetooth device, where the name of the turned-on Bluetooth device is test.

```
devices

Device 6A:7F:60:69:8B:79 6A-7F-60-69-8B-79
Device 67:64:5A:A3:2C:A2 67-64-5A-A3-2C-A2
```

Device 56:6A:59:B0:1C:D1 Lefun
Device 34:12:F9:91:FF:68 test

Pair device

pair 34:12:F9:91:FF:68
Attempting to pair with 34:12:F9:91:FF:68
[CHG] Device 34:12:F9:91:FF:68 ServicesResolved: yes
[CHG] Device 34:12:F9:91:FF:68 Paired: yes
Pairing successful

Add as trusted device

trust 34:12:F9:91:FF:68
[CHG] Device 34:12:F9:91:FF:68 Trusted: yes
Changing 34:12:F9:91:FF:68 trust succeeded

3.7 SD Card Extended Storage

3.7.1 Mount

You can install the storage device in a specific folder location. It is usually done in the /mnt folder, such as /mnt/mydisk. Please note that the folder must be empty.

1. Insert the storage device into the USB port on the device.
2. Use the following command to list all disk partitions on Raspberry Pi:

   sudo lsblk -o UUID,NAME,FSTYPE,SIZE,MOUNTPOINT,LABEL,MODEL

   Raspberry Pi uses mount points/and /boot. Your storage device will appear in this list, along with any other connected storage devices.
3. Use the Size, Label and Model columns to identify the name of the disk partition that points to your storage device. For example, sda1'.
4. Run the following command to get the location of the disk partition:

   sudo blkid

   For example, display, /dev/sda1
5. Create a target folder as the mount point of the storage device. The mount point name used in this example is mydisk. You can specify a name of your choice:

   sudo mkdir /mnt/mydisk
6. Mount the storage device at the mount point you created:

   sudo mount /dev/sda1 /mnt/mydisk
7. Verify that the storage device has been successfully mounted by listing the following:

   ls /mnt/mydisk

tip：No-Desktop system will not automatically mount external storage devices.

3.7.2 Unmount

When the device is turned off, the system will unmount the storage device so that it can be pulled out safely. If you want to uninstall the device manually, you can use the following command:

```
sudo umount /mnt/mydisk
```

If you receive a "destination busy" error, it means that the storage device has not been unmounted. If no error is displayed, you can safely unplug the device now.

3.7.3 Set Automatic Mount in The Command Line.

You can modify the fstab setting to mount automatically.
1. First, you need to get the disk UUID.
   ```
   sudo blkid
   ```
2. Find the UUID of the mounted device, such as 5C24-1453.
3. Open the fstab file
   ```
   sudo nano /etc/fstab
   ```
4. Add the following to the fstab file
   ```
   UUID=5C24-1453 /mnt/mydisk fstype defaults,auto,users,rw,nofail 0 0
   ```
   Replace fstype with the type of your file system, which you can find in step 2 of "Mounting storage devices" above, for example, ntfs.
5. If the file system type is FAT or NTFS, add umask = 000 immediately after nofail, which will allow all users to have full read/write access to every file on the storage device.

Information about more fstab commands can be viewed using man fstab.

3.8 RTC

The default shipping system image will integrate the RTC automatic synchronization service we wrote, so guests can automatically synchronize the clock without setting it, and can use RTC without feeling. The general principle is:

- When the system is turned on, the service automatically reads the saved time from RTC and synchronizes it to the system time.
- If there is an Internet connection, the system will automatically synchronize the time from the NTP server and update the local system time with Internet time.
- When the system is shut down, the service automatically writes the system time into RTC and updates the RTC time.
- Because button cell is installed, although the equipment is powered off, RTC is still working to time.

In this way, we can ensure that our time is accurate and reliable.

WARN：If it is the first time to boot, because there is no effective time in RTC, synchronization

may fail, so just restart it directly. When rebooting, the system time will be written into RTC for normal use.

If you don't want to use this service, you can turn it off manually:

```
sudo systemctl disable rtc
sudo reboot
```

Re-enable this service:

```
sudo systemctl enable rtc
sudo reboot
```

Time to read RTC manually:

```
sudo hwclock -r
2022-11-09 07:07:30.478488+00:00
```

Manually synchronize RTC time to the system:

```
sudo hwclock -s
```

Write the system time into RTC:

```
sudo hwclock -w
```

Trouble Shooting

Please first check whether there is an rtc device (/dev/rtc0) mounted:

```
ls /dev/rtc0
```

If not, maybe you used the official standard system, but didn't install our BSP package. Please install ed-rtc package to enable RTC automatic synchronization.

Other possible checkpoints:

- Is CR1220 installed in button cell?
- NTP network time protocol, you need to connect to the Internet to synchronize the time automatically, and you need to open the port (UDP, 123), otherwise the synchronization will fail.

3.9 Watch Dog

ED-GWL2110 is equipped with watchdog module to prevent the system from being stuck.

Watchdog logic table

GPIOx	pin	H/L	H/L	H/L
GPIO17	OE	H	H	L
GPIO16	A	H	L	X
output	Y	H	L	Z

You need to install ed-gwl2100-wdt.dtbo to use watchdog module. File link: todo.

Users need to put it on the device after downloading it. You can use scp command to copy the file to the device directory:

```
scp /path/ed-gwl2100-wdt.dtbo pi@ip-address:/home/pi
sudo cp /home/pi/ed-gwl2100-wdt.dtbo /boot/overlays
sudo chmod +x /boot/overlays/ed-gwl2100-wdt.dtbo
```

And add the following at the end of /boot/config.txt:

```
sudo nano /boot/config.txt

dtoverlay=ed-gwl2100-wdt
```

3.10 GPS

ED-GWL2110 gateway integrates L76K GPS module, which is connected with UART0 serial port of CPU. The module reports GNSS information through NMEA 0183 general protocol output statement.

3.10.1 Pin Configuration

The WakeUp signal of L76K GPS module is connected to GPIO4. If the pin module is pulled down, it will enter standby mode, and if it is pulled up or suspended, it will return to continuous mode. The Reset signal is connected to GPIO5. Pulling this pin low for 100ms will reset the module. SET signal is connected with GPIO6, which is used to configure the satellite combination. When the pin is suspended or high level, the satellite combination is GPS and Beidou, and when the pin is low level, the satellite combination is GPS and GLONASS.

#	Signal	CM4 Pinout
1	GPS_WakeUp	GPIO4
2	GPS_Reset	GPIO5
3	GPS_Set	GPIO6

3.10.2 Modify config.txt to Enable Serial Port.

```
sudo nano /boot/config.txt
```

Add at the end

```
[all]
enable_uart=1
```

3.10.3 Check GNSS information

```
sudo cat /dev/ttyS0
```

Display GPS data as follows:

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```
$BDGSV,3,1,11,04,29,117,20,10,,,19,16,75,160,,24,51,328,,0*4C
$BDGSV,3,2,11,25,,,27,26,,,21,34,12,198,,35,45,063,,0*76
$BDGSV,3,3,11,39,62,159,17,41,,,25,59,44,137,,0*7A
$GNRMC,053557.000,A,3027.47401,N,11424.34027,E,1.17,186.64,070223,,,A,V*05
$GNVTG,186.64,T,,M,1.17,N,2.17,K,A*2D
$GNZDA,053557.000,07,02,2023,00,00*4F
$GPTXT,01,01,01,ANTENNA OPEN*25
$GNGGA,053558.000,3027.47438,N,11424.34119,E,1,07,1.5,75.0,M,-14.1,M,,*52
$GNGLL,3027.47438,N,11424.34119,E,053558.000,A,A*4F
$GNGSA,A,3,07,08,16,31,195,,,,,,,,2.1,1.5,1.5,1*05
$GNGSA,A,3,04,39,,,,,,,,,,,2.1,1.5,1.5,4*39
$GPGSV,3,1,12,04,54,241,16,07,19,314,15,08,63,208,15,09,38,291,,0*67
$GPGSV,3,2,12,16,51,029,17,18,07,046,,21,08,175,,26,24,063,,0*6A
$GPGSV,3,3,12,27,77,065,,31,09,122,22,194,61,058,,195,46,125,21,0*66
```

NMEA 0183 general statement is described as follows:

$BDGSV   Visible Beidou satellite information

$GNRMC   Recommended GNSS data

$GNVTG   Relative ground heading and speed information

$GNZDA   Time and date, UTC format

$GPTXT   Text transmission

$GNGGA   Multi-satellite joint positioning data

$GNGLL   Geographical location, latitude and longitude

$GNGSA   Represents GNSS accuracy factor and effective satellite.

$GPGSV   Visible GNSS satellite

3.10.4 Use the u-center tool to view positioning information.

3.10.4.1 Installs serial port to network tool ser2net.

```
sudo apt-get update
sudo apt-get install ser2net
```

Enable ser2net service

Ser2net configuration file is/etc/ser2net.yaml. By default, /dev/ttyS0 is configured, baud rate is 9600, and there is no check, and the corresponding TCP port is 2000.

```
connection: &con0096
    accepter: tcp,2000
    enable: on
    options:
      banner: *banner
      kickolduser: true
      telnet-brk-on-sync: true
    connector: serialdev,
            /dev/ttyS0,
```

9600n81,local

3.10.4.2 Checks ser2net Port Forwarding Service.

Use the following instructions to query whether ser2net has started 2000 port forwarding.

sudo netstat -ltnp	grep 2000

If port forwarding has been started, the following message will be displayed

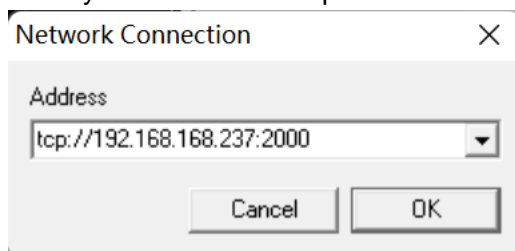| tcp6	0	0 :::2000	:::*	LISTEN	720/ser2net

If not, restart the ser2net service.

sudo systemctl restart ser2net

Download and install the u-center tool. If you are prompted that the MSVCR120.dll file is missing, please install vcredist_x86.exe.
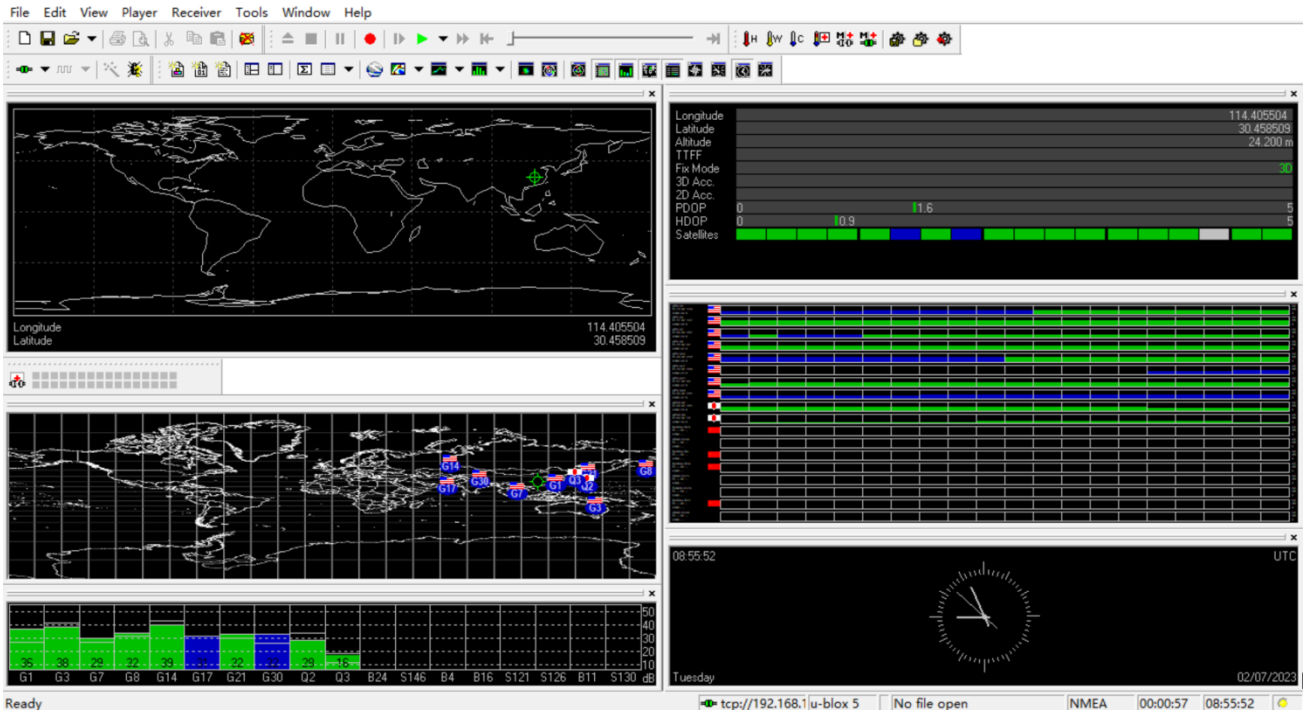
Open u-center，Choose Receiver->Port->Network connection->New…
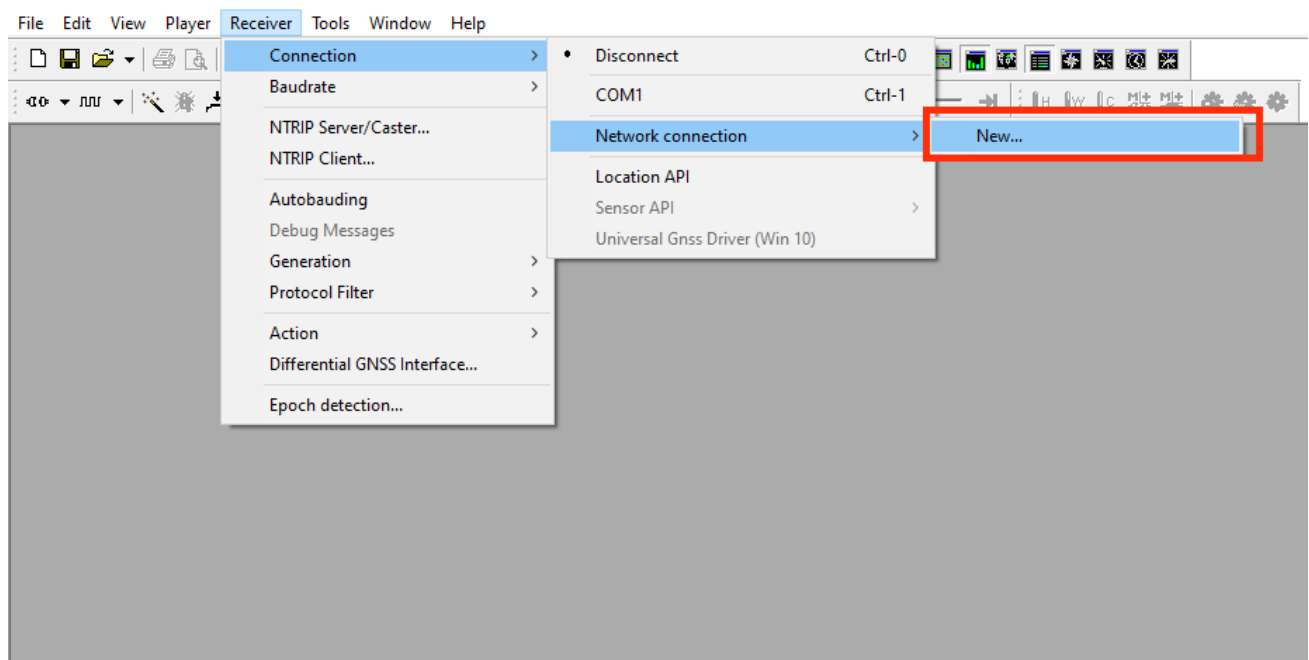
Enter your device IP and port number 2000.

You will see the GPS positioning information immediately after the configuration is completed.

If the Fix Mode is displayed as No Fix, it means that the positioning failed, which is usually caused by the antenna being indoors. Please put the module or antenna outdoors for testing.
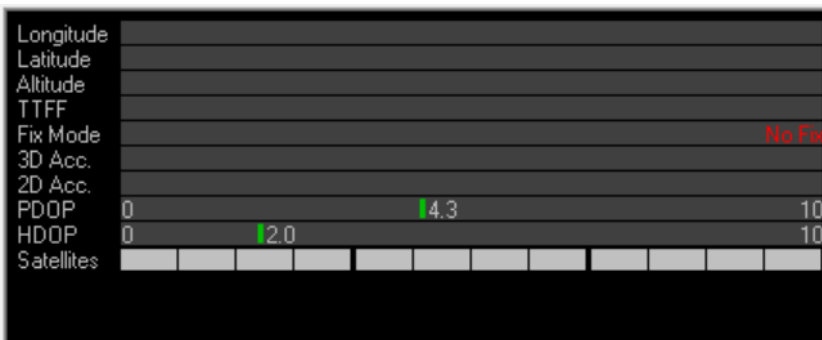
NOTE: For the first time, it takes about 30 seconds to locate the module successfully when there is no large building outside. If the weather conditions are bad, it may take longer or it may not be possible to locate it.

3.11 LoRaWAN

ED-GWL2110 supports LoRaWAN open source service platform ChirpStack. Please refer to the following steps for installation and configuration.

3.11.1 Install LoRa Service and ChirpStack Client.

We install it by APT.

- Add edatec APT warehouse

```
$ curl -sS https://apt.edatec.cn/pubkey.gpg | sudo apt-key add -
$ echo "deb https://apt.edatec.cn/raspbian stable main" | sudo tee /etc/apt/sources.list.d/edatec.list
$ sudo apt update
$ sudo apt install -y ed-gwl-pktfwd
```

- Install ChirpStack

```
$ sudo apt install -y apt-transport-https dirmngr
$ sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys 1CE2AFD36DBCCA00
$ echo "deb https://artifacts.chirpstack.io/packages/4.x/deb stable main" | sudo tee
/etc/apt/sources.list.d/chirpstack.list
$ sudo apt update

$ sudo apt install -y chirpstack-gateway-bridge
```

- Modify config.txt

```
[all]
dtparam=i2c_arm=on
dtparam=spi=on

gpio=16=op,dl
gpio=20=op,dl
gpio=21=op,dl
```

Modify /etc/modules，add i2c-dev at the end

```
i2c-dev
```

ED-GWL2110 use i2c-1 and spidev0.0。

3.11.2 Configuring LoRa Service

3.11.2.1 Pktfwd Config

```
# update region
$ cat /etc/ed_gwl/region
EU868     # EU868 / US915
```

pktfwd use 1700 as UDP port

```
$ sudo systemctl restart ed-pktfwd.service
```

3.11.2.2 chirpstack-gateway-bridge Configuration

You can use nano to edit the configuration file chirpstack-gateway-bridge.toml.

```
$ sudo nano /etc/chirpstack-gateway-bridge/chirpstack-gateway-bridge.toml
```

```
# This configuration provides a Semtech UDP packet-forwarder backend and
 # integrates with a MQTT broker. Many options and defaults have been omitted
 # for simplicity.
 #
 # See https://www.chirpstack.io/gateway-bridge/install/config/ for a full
 # configuration example and documentation.


# Gateway backend configuration.
[backend]
# Backend type.
type="semtech_udp"

    # Semtech UDP packet-forwarder backend.
    [backend.semtech_udp]

    # ip:port to bind the UDP listener to
    #
    # Example: 0.0.0.0:1700 to listen on port 1700 for all network interfaces.
    # This is the listener to which the packet-forwarder forwards its data
    # so make sure the 'serv_port_up' and 'serv_port_down' from your
    # packet-forwarder matches this port.
    udp_bind = "0.0.0.0:1700"

# Integration configuration.
[integration]
# Payload marshaler.
#
# This defines how the MQTT payloads are encoded. Valid options are:
# * protobuf:   Protobuf encoding
# * json:        JSON encoding (easier for debugging, but less compact than 'protobuf')
marshaler="protobuf"

    # MQTT integration configuration.
    [integration.mqtt]
    # Event topic template.
    event_topic_template="eu868/gateway/{{ .GatewayID }}/event/{{ .EventType }}"

    # Command topic template.
    command_topic_template="eu868/gateway/{{ .GatewayID }}/command/#"

    # MQTT authentication.
```

```
[integration.mqtt.auth]
# Type defines the MQTT authentication type to use.
#
# Set this to the name of one of the sections below.
type="generic"

  # Generic MQTT authentication.
  [integration.mqtt.auth.generic]
  # MQTT server (e.g. scheme://host:port where scheme is tcp, ssl or ws)
  server="tcp://127.0.0.1:1883"

  # Connect with the given username (optional)
  username=""

  # Connect with the given password (optional)
  password=""
```

- 'event_topic_template / command_topic_template' needs to modify the prefix with gateway zone.
  Example:

```
event_topic_template="eu868/gateway/{{ .GatewayID }}/event/{{ .EventType }}"
```

If you use the US915 or CN470 module, please change the prefix eu868 to us915_0/cn470_10.

```
event_topic_template="us915_0/gateway/{{ .GatewayID }}/event/{{ .EventType }}"
```

- The server address of integration.mqtt needs to be your chirpstack server.

```
$ sudo systemctl restart chirpstack-gateway-bridge.service
```

After modify chirpstack-gateway-bridge.toml config，need restart chirpstack-gateway-bridge service.

3.11.2.3 Reboot

```
$ sudo reboot
```

3.11.3 Install ChirpStack Server

To configure a cloud server, docker needs to be installed on the server before configuration.
Install docker：https://docs.docker.com/get-docker/
Install docker-compose

```
sudo apt install docker-compose
```

3.11.3.1 Config chirpstack-docker

We use docker container to deploy ChirpStack server.

```
$ git clone https://github.com/chirpstack/chirpstack-docker.git
```

The dock-combination. yml of chirpstack dock needs to be configured.

```
$ cd chirpstack-docker
$ nano docker-compose.yml
# Remove the chirpstack-gateway-bridge, because we run the bridge on gateway.
```

Delete the red font part.

```
$ nano docker-compose.yml

version: "3"

services:
  chirpstack:
    image: chirpstack/chirpstack:4
    command: -c /etc/chirpstack
    restart: unless-stopped
    volumes:
      - ./configuration/chirpstack:/etc/chirpstack
      - ./lorawan-devices:/opt/lorawan-devices
    depends_on:
      - postgres
      - mosquitto
      - redis
    environment:
      - MQTT_BROKER_HOST=mosquitto
      - REDIS_HOST=redis
      - POSTGRESQL_HOST=postgres
    ports:
      - 8080:8080

  chirpstack-gateway-bridge-eu868:
    image: chirpstack/chirpstack-gateway-bridge:4
    restart: unless-stopped
    ports:
      - 1700:1700/udp
    volumes:
      - ./configuration/chirpstack-gateway-bridge:/etc/chirpstack-gateway-bridge
    depends_on:
      - mosquitto

  chirpstack-rest-api:
```

```
        image: chirpstack/chirpstack-rest-api:4
        restart: unless-stopped
        command: --server chirpstack:8080 --bind 0.0.0.0:8090 --insecure
        ports:
          - 8090:8090
        depends_on:
          - chirpstack


    postgres:
        image: postgres:14-alpine
        restart: unless-stopped
        volumes:
          - ./configuration/postgresql/initdb:/docker-entrypoint-initdb.d
          - postgresqldata:/var/lib/postgresql/data
        environment:
          - POSTGRES_PASSWORD=root


    redis:
        image: redis:7-alpine
        restart: unless-stopped
        volumes:
          - redisdata:/data


    mosquitto:
        image: eclipse-mosquitto:2
        restart: unless-stopped
        ports:
          - 1883:1883
        volumes:
          - ./configuration/mosquitto/mosquitto.conf:/mosquitto/config/mosquitto.conf


volumes:
    postgresqldata:
    redisdata:
```

Start chirpstack service

```
$ docker-compose up -d
```

3.11.3.2 Logs Into chirpstack Service Management Interface.

Enter the server's IP address and port number 8080 in the PC browser, and the login interface will appear when the network is normal.

The default administrator user name and password are as follows:

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user: admin
psw : admin

3.11.4 Adding LoRa Gateway and Terminal

3.11.4.1 Gets LoRa Gateway ID

Execute the following command to get the ID of LoRa gateway. When adding LoRa gateway to chirpstack server, you need to add the corresponding gateway ID.

```
$ /opt/ed-gwl-pktfwd/ed-gateway_id
```

3.11.4.2 Add LoRa Gateway

Open chirpstack management interface in PC browser, click Gateway -> Add gateway, fill in the Gateway ID corresponding to the device, set the Name, and then click Submit. If the network connection is correct, wait a moment to see that the added gateway becomes Online.

3.11.4.3 Add Device Profile

Click device profile-> add device profile to further improve the device information.

3.11.4.4 Add Application

Click Applications -> Add application
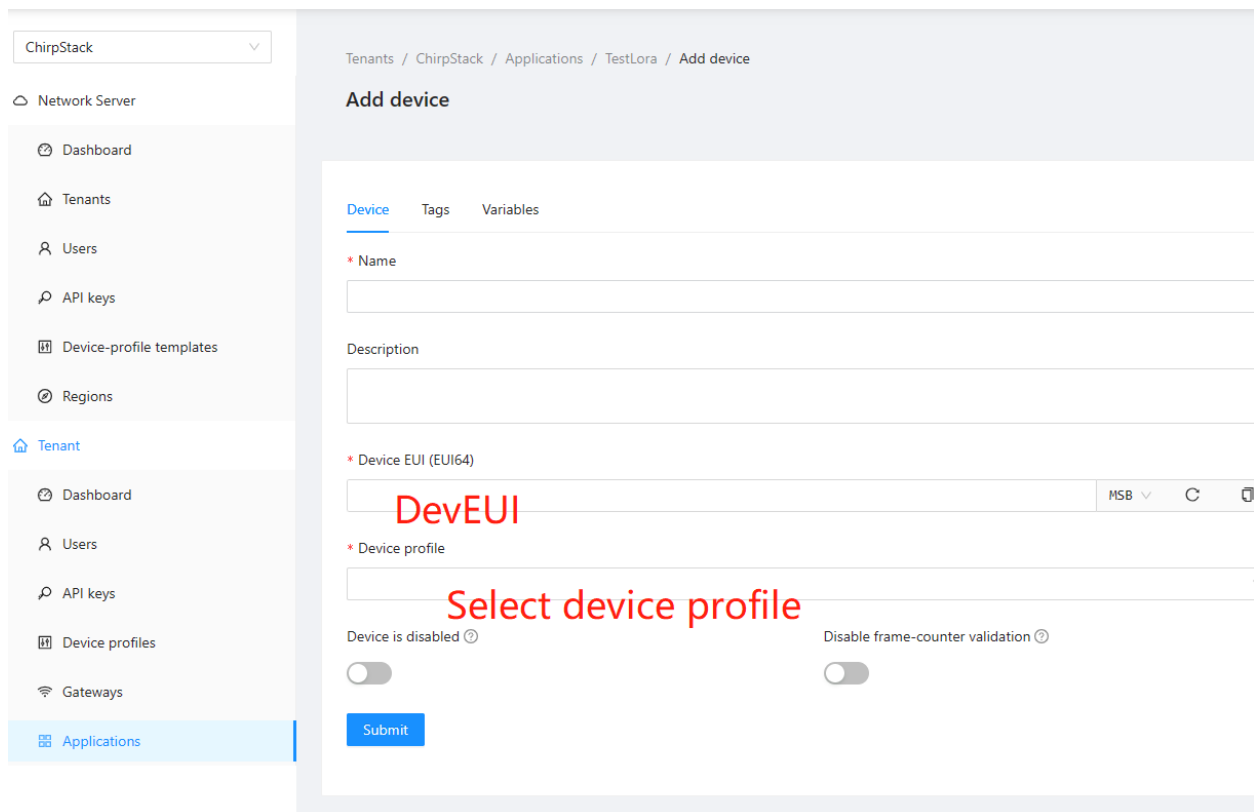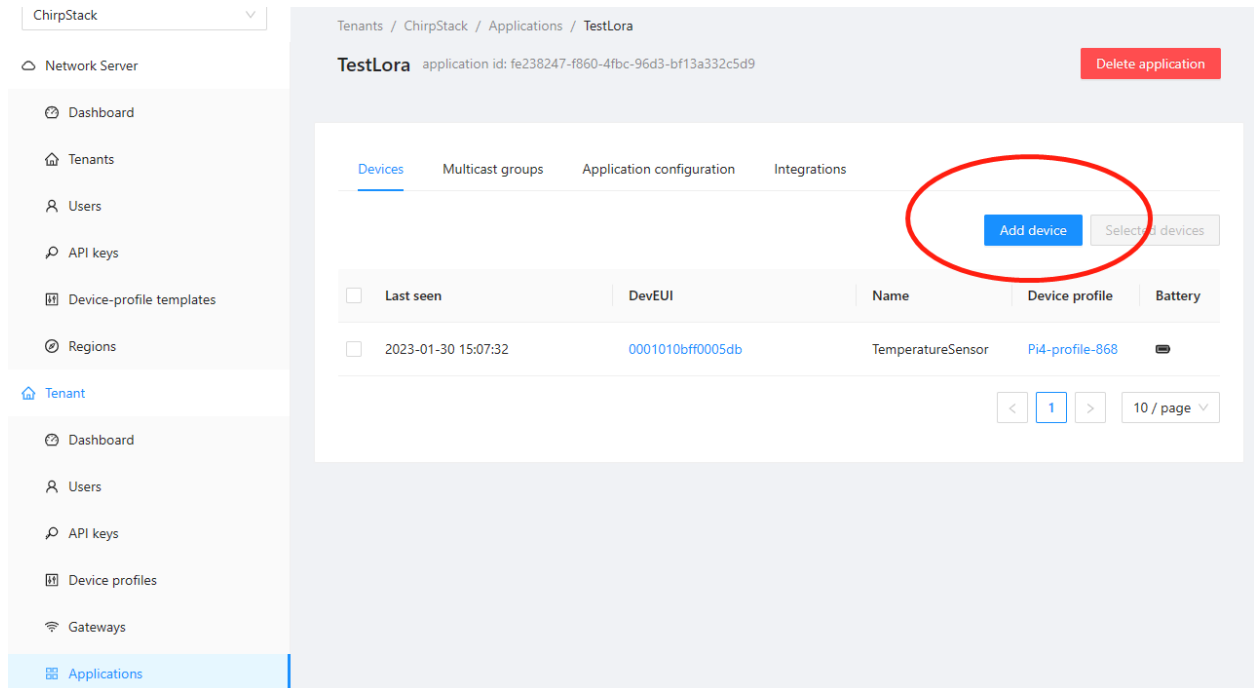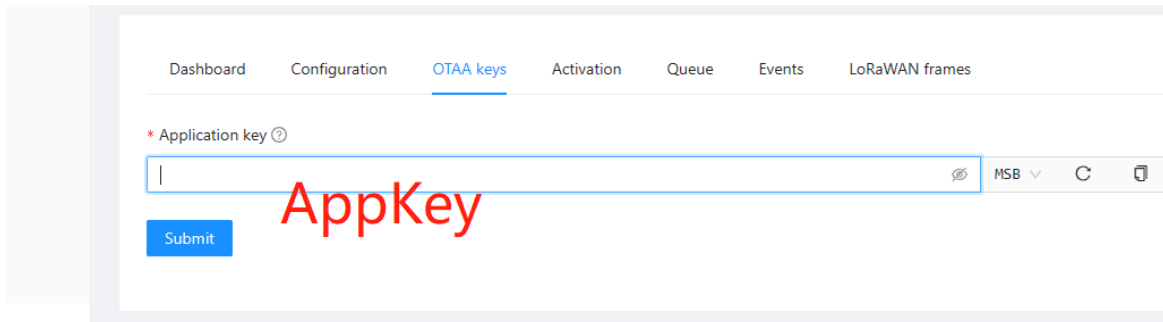
3.11.4.5 Add Device

You should know the DevEUI and AppKey of LoRa terminal products, which are provided by LoRa terminal equipment manufacturers.

Click Application -> your application -> Add device to add LoRa terminal device

Wait a few minutes to see the device become online.

3.12 Encryption chip

ED-GWL2110 is equipped with ATECC608 encryption chip, which is connected to i2c-1 bus, and the default address of the device is 0x60.

atecc: https://github.com/wirenboard/atecc-util

```
atecc -b 1 -c 'serial'
```

4 OS Installation

4.1 Image Download

We have provided the factory image. If the system is restored to factory settings, please click the following link to download the factory image.

Raspberry Pi OS Lite, 32-bit

- Release date: 2023-02-10
- System: 32-bit
- Kernel version: 5.15
- Debian version: 11 (bullseye)
- Downloads: https://1drv.ms/u/s!Au060HUAtEYBgQG59MKsXapwhB5B?e=mGLFx5

4.2 System Flash

ED-GWL2110 uses CM4 Lite version by default, and starts the system through SD card. The system burning of ED-GWL501 means burning SD card.

● Download and install Raspberry Pi Imager or balenaEtcher mirror writing tool.

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- Insert the micro SD card into the card reader, and then insert the card reader into the USB port of the computer.
- Open the mirror burning tool and select the mirror you want to burn. The path is the path of the identified mass storage device.
- Click Burn, wait for burn and verification to be completed, and pop up the card reader device.
- Open the top cover of the ED-GWL2110 device and insert the micro SD card with burned image into the corresponding card slot.
- Just re-power the device.

5 FAQ

5.1.1 Default Username and Password

User name：pi
Password： raspberry

6 About Us

6.1 About EDATEC

EDATEC, located in Shanghai, is one of Raspberry Pi's global design partners. Our vision is to provide hardware solutions for Internet of Things, industrial control, automation, green energy and artificial intelligence based on Raspberry Pi technology platform.

We provide standard hardware solutions, customized design and manufacturing services to speed up the development and time to market of electronic products.

6.2 Contact Us

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