ED-GWL1010

A COST-EFFECTIVE LORAWAN INDOOR GATEWAY

Shanghai EDA Technology Co.,Ltd
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Contents

1 Product Overview

ED-GWL1010 is a cost-effective LoRaWAN indoor gateway product launched by EDATEC. The ED-GWL1010 is based on EDATEC's brand-new 1(ED-REIMEI1) single-board computer platform, adopting the form of motherboard and expansion board, integrating Semtech's new generation SX1302/SX103 baseband chip and Microchip security encryption chip ATECC608, supporting DC Jack power supply and PoE power supply, and optional sheet metal casing.

1.1 Target Application

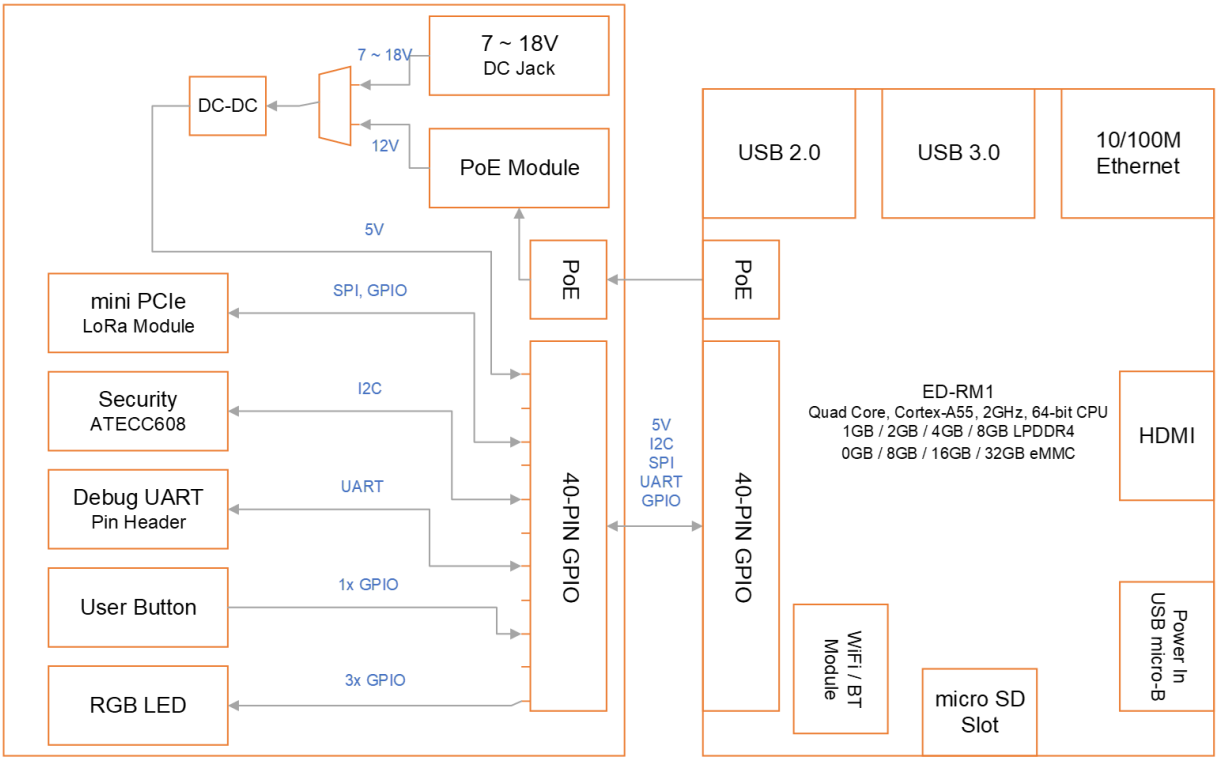
- LoRa intelligent gateway
- Industrial control
- Smart manufacturing
- Smart city
- Smart transportation

1.2 Specifications and Parameters

Function	Parameters
CPU	AMLogic S905X4 4 core, ARM Cortex-A55(ARM v8), 2GHz, 64bit CPU
Memory	Option 1GB / 2GB / 4GB / 8GB LPDDR-3200 SDARM
eMMC flash	Option 0GB / 8GB / 16GB / 32GB
SD card	Can be used with eMMC at the same time, and can be started from SD card
Ethernet	1x 10/100M Ethernet, support PoE
WiFi / Bluetooth	2.4G / 5.8G dual WiFi, bluetooth 5.0
LoRa	LoRa gateway module based on Semtech SX1302+SX1250 has passed CE/FCC certification and can be selected from European version or American version
LoRa Frequency	American version: US915, AU915, AS923
	European version: EU868
USB Host	1x USB 3.0 Type A, 1x USB 2.0 Type A
mini PCIe	1x mini PCIe Slot, support SPI bus，used to extended LoRa gateway module
LED Indicator	1x RGB LED
Button	1x User Button

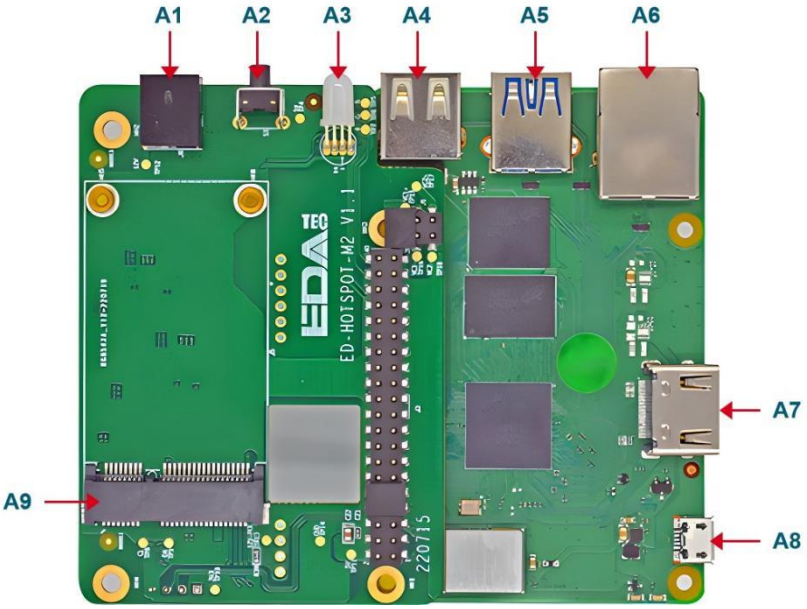
Function	Parameters
Power Input	7V ~ 18V
Dimensions	110 (L) x 90 (W) x 26 mm (H)
case	Desktop type， sheet metal shell
Antenna accessory	1x WiFi / BT External antenna, 1x LoRa External antenna
Working environment temperature	-25 ~ 50°C
OS	Debian 11, Lite, 64-bit OS
Software resources	Provide example guidance for LoRaWAN networks such as ChipStack

1.3 System Diagram

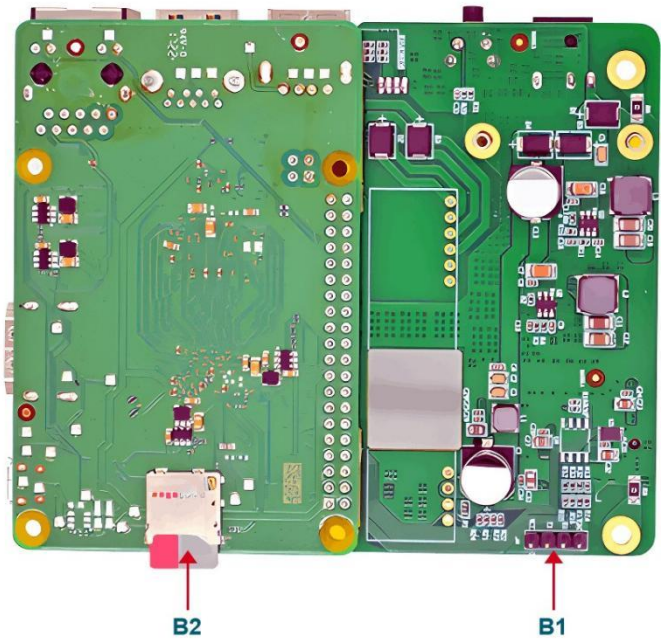


ED-GWL1010 Block Diagram

1.4 Functional Layout



Item	Function Description	Item	Function Description
A1	12V DC power socket	A6	Ethernet RJ45 port
A2	Key	A7	HDMI type A port
A3	RGB LED	A8	Micro USB Power supply port
A4	USB 2.0 port	A9	LoRa mini-PCIe port
A5	USB 3.0 port		

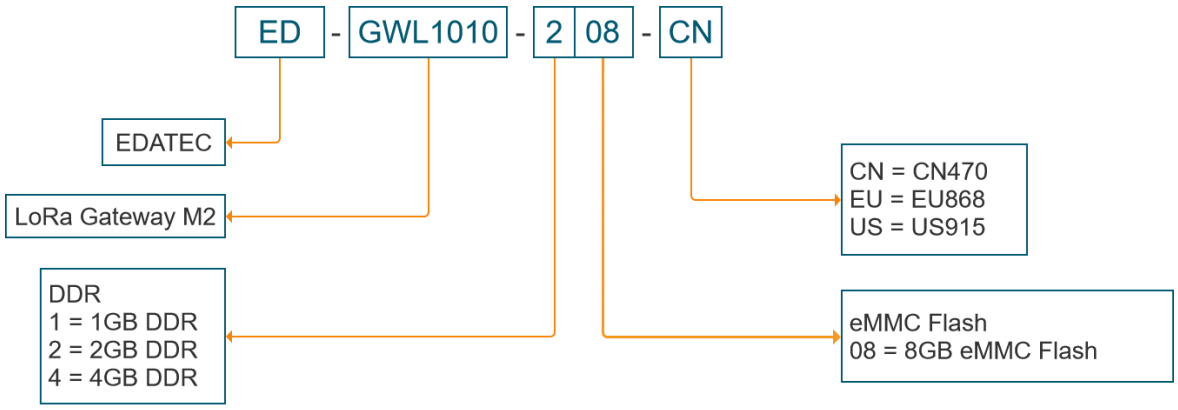


Item	Function Description
B1	Debug serial port
B2	Micro SD card slot

1.5 Packing List

- 1x ED-GWL1010 host
- [option]1x LoRa antenna
- [option]1x 2.4GHz/5GHz WiFi/BT antenna

1.6 Order Code



Example

Part# : ED-GWL1010-208-CN
Configration : GWL1010 LoRa Gateway
1pcs REIMEI1 Computer
2GB DDR and 8GB eMMC Flash
CN470 LoRa Module

2 Quick Start

2.1 Equipment List

- 1x ED-GWL1010 host
- 1x WiFi / BT external antenna
- 1x LoRa external 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. 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.
4.Plug in the DC power input port (+12V DC) of ED-GWL1010 and supply power to the power adapter.

2.3 First Start

ED-GWL1010 has no power switch. Plug in the power cord and the system will start to start.

2.3.1 Use SSH

Enable SSH automatically at startup:
When the device is started, an empty file named ssh is put into the boot partition before booting, and SSH will be automatically enabled after booting.

Command enables SSH:

```
sudo raspi-config
```

After entering the above command, a command line interface will appear. Configure the third interface. Find SSH and select yes to enable SSH function.
3 Interface Options -> 2 SSH -> Yes

2.3.2 SSH Tool

Windows recommends using putty to realize SSH remote connection.

- Putty Download：Download PuTTY - a free SSH and telnet client for Windows

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
```

2.3.4 SSH remote login

```
ssh phantom@<IP>
```

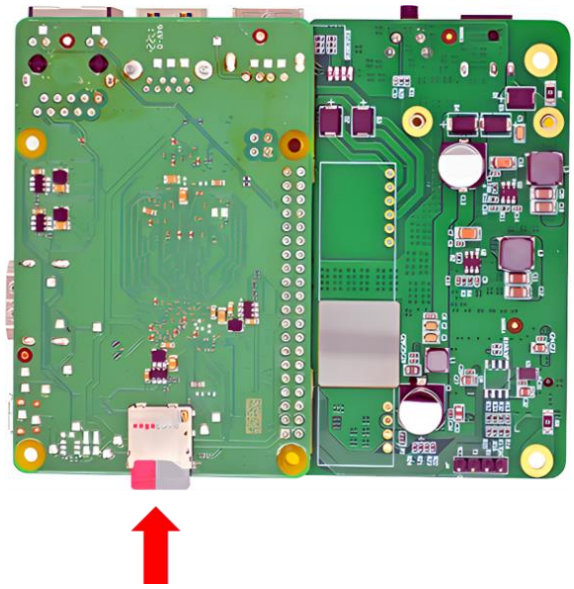
User name：phantom
Password ：phantom
Port：22

3 Wiring Guide

3.1 Internal I/O

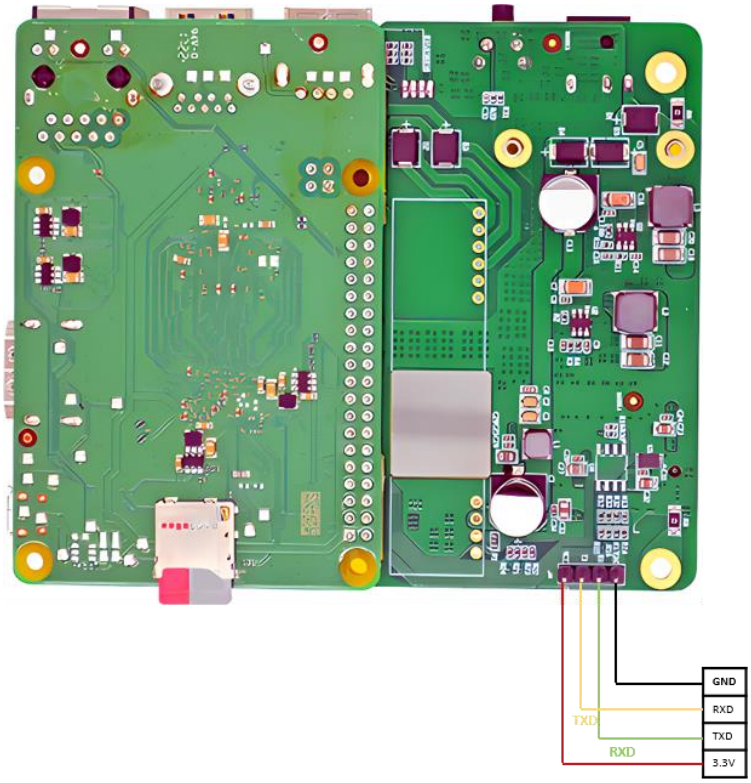
3.1.1 micro-SD Card

The micro SD card slot is located on the back of the motherboard. Please insert the micro SD card slot with the front side facing up in parallel.



3.1.2 TTL Serial Port

The TTL serial port is located on the back of the LoRa interface board. Please connect the serial port as shown in the figure below.



4 Software Operation Guide

4.1 Button

The ED-GWL1010 has a user button, and the user can customize the button function. The button is connected with PIN16, which is high by default, and when the key is pressed, the pin is low.

We use libgpiod library and command line tools to set and read GPIO.

4.1.1 Install libgpiod

Install ligpiod

```
sudo apt-get update
#Install the static library and header file of libgpiod.
sudo apt-get install libgpiod-dev
#Install command-line tools based on libgpiod
sudo apt-get install gpiod
```

libgpiod supports six command-line test commands:

- gpiodetect - List all gpiochips existing on the system, their names, labels and number of GPIO lines.
- gpioinfo - Lists all lines of the specified gpiochips, their names, consumers, directions, activity status and additional flags.
- gpioget - Read the value of the specified GPIO line.
- gpioset - Sets the value of the specified GPIO lines, which may be kept for export and waiting for timeout, user input or signal.
- gpiofind - Find the row offset of the gpiochip name and the given row name.
- gpiomon - Wait for the event on the GPIO line, specify the event to watch, how many events to handle before exiting or how many events should be reported to the console.

Use GPIOinfo command to view gpio information.

```
phantom@phantom:~ $ gpioinfo
gpiochip0 - 87 lines:
        line   0:       "PIN27"         kernel   input   active-high [used]
        line   1:       "PIN28"         kernel   input   active-high [used]
        line   2:  "EMMC_DAT0"          kernel   input   active-high [used]
        line   3:  "EMMC_DAT1"          kernel   input   active-high [used]
        line   4:  "EMMC_DAT2"          kernel   input   active-high [used]
        line   5:  "EMMC_DAT3"          kernel   input   active-high [used]
        line   6:  "EMMC_DAT4"          kernel   input   active-high [used]
        line   7:  "EMMC_DAT5"          kernel   input   active-high [used]
        line   8:  "EMMC_DAT6"          kernel   input   active-high [used]
        line   9:  "EMMC_DAT7"          kernel   input   active-high [used]
        line  10:   "EMMC_CLK"          kernel   input   active-high [used]
        line  11:   "NAND_ALE"          unused   input   active-high
        line  12:   "EMMC_CMD"          kernel   input   active-high [used]
        line  13:              "-"      unused   input   active-high
        line  14:   "EMMC_RST"          unused   input   active-high
        line  15: "EMMC_NAND_DQS" kernel input active-high [used]
        line  16:              "-"      unused   input   active-high
        line  17:              "-"      unused   input   active-high
        line  18:     "SD_DAT0"         kernel   input   active-high [used]
        line  19:     "SD_DAT1"         kernel   input   active-high [used]
        line  20:     "SD_DAT2"         kernel   input   active-high [used]
        line  21:     "SD_DAT3"         kernel   input   active-high [used]
        line  22:      "SD_CLK"         kernel   input   active-high [used]
        line  23:      "SD_CMD"         kernel   input   active-high [used]
        line  24:       "SD_CD"           "cd"   input   active-high [used]
        line  25:     "USB_PSU" "fe03a080.usb3phy" output active-low [used]
        line  26:  "VDDEE_PWM"          unused   input   active-high
        line  27: "VDDCPU_PWM"          kernel   input   active-high [used]
        line  28:          "LED"        "act"  output   active-high [used]
        line  29:   "DEBUG_TX"          kernel   input   active-high [used]
```

```
line  30:    "DEBUG_RX"          kernel    input   active-high [used]
line  31:        "PIN40"          unused    input   active-high
line  32:        "PIN31"          unused    input   active-high
line  33:        "PIN12"          unused    input   active-high
line  34:             "-"         unused    input   active-high
line  35:        "PIN32"          unused    input   active-high
line  36:        "PIN29"          unused    input   active-high
line  37:         "PIN8"          kernel    input   active-high [used]
line  38:        "PIN10"          kernel    input   active-high [used]
line  39:             "-"         unused    input   active-high
line  40:        "PIN35"          unused    input   active-high
line  41:    "HDMI_SDA"           kernel    input   active-high [used]
line  42:    "HDMI_SCL"           kernel    input   active-high [used]
line  43:    "HDMI_HPD"           kernel    input   active-high [used]
line  44:    "HDMI_CEC"           kernel    input   active-high [used]
line  45:        "PIN19"          kernel    input   active-high [used]
line  46:        "PIN21"          kernel    input   active-high [used]
line  47:        "PIN24"       "spi0.0"   output   active-high [used]
line  48:        "PIN23"          kernel    input   active-high [used]
line  49: "PCIE_RESET"            unused    input   active-high
line  50: "WIFI_SD_D0"            kernel    input   active-high [used]
line  51: "WIFI_SD_D1"            kernel    input   active-high [used]
line  52: "WIFI_SD_D2"            kernel    input   active-high [used]
line  53: "WIFI_SD_D3"            kernel    input   active-high [used]
line  54: "WIFI_SD_CLK" kernel input active-high [used]
line  55: "WIFI_SD_CMD" kernel input active-high [used]
line  56:             "-"         unused    input   active-high
line  57:             "-"         unused    input   active-high
line  58:             "-"         unused    input   active-high
line  59:             "-"         unused    input   active-high
line  60:        "BT_ON"     "shutdown"    output   active-high [used]
line  61:        "WL_ON"          unused    input   active-high
line  62: "BTUART_A_TX" kernel input active-high [used]
line  63: "BTUART_A_RX" kernel input active-high [used]
line  64: "BTUART_A_CTS_N" kernel input active-high [used]
line  65: "BTUART_A_RTS_N" kernel input active-high [used]
line  66:             "-"         unused    input   active-high
line  67:             "-"         unused    input   active-high
line  68:             "-"         unused    input   active-high
line  69:             "-"         unused    input   active-high
line  70:          "PIN3"         kernel    input   active-high [used]
line  71:          "PIN5"         kernel    input   active-high [used]
line  72:        "PIN18"          unused    input   active-high
line  73:        "PIN22"          unused    input   active-high
```

```
        line  74:        "PIN37"          unused     input   active-high
        line  75:        "PIN13"          unused     input   active-high
        line  76:        "PIN15"          unused     input   active-high
        line  77:        "PIN16"          unused     input   active-high
        line  78:        "PIN26"       "spi0.1"    output   active-high [used]
        line  79:        "PIN11"          unused     input   active-high
        line  80:        "PIN36"          unused     input   active-high
        line  81:        "PIN38"          unused     input   active-high
        line  82:        "PIN33"          unused     input   active-high
        line  83:         "PIN7"          unused     input   active-high
        line  84:    "LAN_LEDG"          kernel     input   active-high [used]
        line  85:    "LAN_LEDY"          kernel     input   active-high [used]
        line  86:           "-"          unused     input   active-high
```

It can be seen that the system has only one gpiochip0 with 87 GPIO pins, and the GPIO that has been driven or occupied by the system will be displayed as [used] in the last column.

4.1.2 Button Test

According to the name of the GPIO pin in the data sheet ED-GWL1010_Datasheet_CN.pdf and the return result of gpioinfo, the corresponding line number is found. The pin name corresponding to GPIO23 is PIN16, and the line number corresponding to PIN16 is 77.

```
phantom@phantom:~ $ gpioinfo | grep PIN16
        line  77:        "PIN16"          unused     input   active-high
```

Configure GPIO input

```
#Read chip0 line77 Pin state
gpioget 0 77
```

When the return value is 1, it means that the pin of line77 or PIN16 is high, and when the return value is 0, it means that the pin of line77 or PIN16 is low.

4.2 LED Indication

The RGB LED of ED-GWL1010 is controlled by three GPIO. The control pins are GPIO16 to control blue, GPIO20 to control green, GPIO21 to control red, and GPIO is active at low level.

According to the GPIO pin name in the data sheet ED-GWL1010_Datasheet_CN.pdf and the return result of gpioinfo, the corresponding line number is found.
The pin name of GPIO16 is PIN36, and the line number of PIN36 is 80.
The pin name of GPIO20 is PIN38, and the line number of PIN38 is 81.
The pin name of GPIO21 is PIN40, and the line number of PIN40 is 31.

Configure the blue light on.

```
#Set the line80 pin of chip0 to low level.
gpioset 0 80=0
```

Configure the blue light off.

```
#Set the line80 pin of chip0 to high level.
gpioset 0 80=1
```

Configure the green light on.

```
#Set the line81 pin of chip0 to low level.
gpioset 0 81=0
```

Configure the green light off.

```
#Set the line81 pin of chip0 to high level.
gpioset 0 81=1
```

Configure the red light on.

```
#Set the line31 pin of chip0 to low level.
gpioset 0 31=0
```

Configure the red light off.

```
#Set the line31 pin of chip0 to high level.
gpioset 0 31=1
```

4.3 USB

ED-GWL1010 具有一个 USB2.0 A 型接口和一个 USB3.0 A 型接口。ED-GWL1010 has a USB2.0 A port and a USB3.0 A port.

4.3.1 Check USB device information

List USB Device

```
lsusb
```

The information displayed is as follows:

```
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 005: ID 1a2c:2d23 China Resource Semico Co., Ltd Keyboard
Bus 001 Device 004: ID 30fa:0300    USB OPTICAL MOUSE
Bus 001 Device 003: ID 0424:9e00 Microchip Technology, Inc. (formerly SMSC)
LAN9500A/LAN9500Ai
Bus 001 Device 002: ID 1a40:0201 Terminus Technology Inc. FE 2.1 7-port Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

4.3.2 USB Storage Device Mounting

You can connect an external hard disk, SSD or USB stick to any USB port on Raspberry Pi and mount the file system to access the data stored on it.

In general, you can directly use the following commands to mount or unmount external storage devices.

```
lsblk

NAME          MAJ:MIN RM   SIZE RO TYPE MOUNTPOINT
sda             8:0    1 29.1G  0 disk
└─sda1          8:1    1 29.1G  0 part
mmcblk0       179:0    0 59.5G  0 disk
├─mmcblk0p1 179:1    0   256M  0 part /boot
└─mmcblk0p2 179:2    0 59.2G  0 part /
```

Use the mount command to mount sda1 to the /mnt directory. After the mount is completed, users can directly operate storage devices in the /mnt directory.

```
sudo mount /dev/sda1 /mnt
```

After using, use the command umount to uninstall the storage device.

```
sudo umount /mnt
```

4.3.2.1 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 the system:
   ```
   sudo lsblk -o UUID,NAME,FSTYPE,SIZE,MOUNTPOINT,LABEL,MODEL
   ```
   The file system 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,mmcblk0.
4. The FSTYPE column contains file system types. If your storage device uses the exFAT file system, please install the exFAT driver:
   ```
   sudo apt update
   sudo apt install exfat-fuse
   ```
5. If your storage device uses NTFS file system, you will have read-only access to it. If you want to write to the device, you can install the ntfs-3g driver:
   ```
   sudo apt update
   sudo apt install ntfs-3g
   ```

6. Run the following command to get the location of the disk partition:

```
sudo blkid
```

like, /dev/sda1

7. 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
```

8. Mount the storage device at the mount point you created:

```
sudo mount /dev/sda1 /mnt/mydisk
```

9. Verify that the storage device has been successfully mounted by listing the following:

```
ls /mnt/mydisk
```

4.3.2.2 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.

4.3.2.3 Set Up 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, adding umask = 000 immediately after nofail will allow all users full read/write access to every file on the storage device.

Can use man fstab to learn more information about fstab.

4.4 Ethernet Configuration

The system uses dhcpcd for network management by default.

Configure static IP, set the static IP of eth0 network card to 192.168.168.108, set the default route to 192.168.168.1, and set DNS to 192.168.168.1(DNS can be omitted):

```
sudo nano /etc/dhcpcd.conf

interface eth0
static ip_address=192.168.168.108/24
static route=192.168.168.1
static domain_name_servers=192.168.168.1
```

4.5 WiFi

4.5.1.1 Scans Available WiFi Networks.

```
sudo iwlist wlan0 scan
```

4.5.1.2 Connect to WiFi

Method 1:

```
sudo raspi-config
```

Select 1 System Options to find S1 Wireless LAN. For the first time, you need to select a country, and China is CN. Then you will be asked to enter the WiFi name, then enter the WiFi password, and then save and exit. If the country code is set, it needs to be restarted.

Method 2:

```
sudo nano /etc/wpa_supplicant/wpa_supplicant.conf
```

Add the following to the file

```
country=CN
network={
      ssid="WiFi_SSID"
      psk="Password"
}
```

Ctrl+X exits and returns to save.

4.6 Bluetooth

Bluetooth function is enabled by default. If you need to set Bluetooth, you can use the bluetoothctl command to set Bluetooth.

Scan

```
bluetoothctl scan on/off
```

Find device

```
bluetoothctl discoverable on/off
```

Truct device

```
bluetoothctl trust [MAC]
```

Pair

```
bluetoothctl pair [MAC]
```

Connect

```
bluetoothctl connect [MAC]
```

Disconnect

```
bluetoothctl disconnect [MAC]
```

More buletooth configuration command

```
bluetoothctl
help
```

4.7 Serial Communication

ED-GWL1010 has a TTL level serial port, and the interface name is J4, which is used as the debugging serial port by default.

4.7.1 Install picocom Tool

Picocom serial terminal can be debugged conveniently in Linux environment.
First install picocom

```
sudo apt-get install picocom
```

After opening the corresponding serial port with picocom, you can type Ctrl+a and then Ctrl+h to see the available commands.

```
*** Picocom commands (all prefixed by [C-a])

*** [C-x] : Exit picocom
*** [C-q] : Exit without reseting serial port
*** [C-b] : Set baudrate
*** [C-u] : Increase baudrate (baud-up)
*** [C-d] : Decrease baudrate (baud-down)
*** [C-i] : Change number of databits
*** [C-j] : Change number of stopbits
*** [C-f] : Change flow-control mode
*** [C-y] : Change parity mode
*** [C-p] : Pulse DTR
*** [C-t] : Toggle DTR
```

```
*** [C-g] : Toggle RTS
*** [C-|] : Send break
*** [C-c] : Toggle local echo
*** [C-w] : Write hex
*** [C-s] : Send file
*** [C-r] : Receive file
*** [C-v] : Show port settings
*** [C-h] : Show this message
```

Type Ctrl+a first, then Ctrl+c to switch the local echo mode.

Type Ctrl+a first, then Ctrl+q to exit picocom.

4.7.2 Debug UART

To enable debugging serial port, you need to modify the config.txt configuration file.

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

Add at the end

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

The default baud rate of debugging serial port is 115200. You can check the current baud rate of debugging serial port through cmdline.txt file.

```
sudo nano /boot/cmdline.tx
```

4.8 LoRaWAN

ED-GWL1010 supports LoRaWAN open source service platform ChipStack. Please refer to the following steps for installation and configuration.

4.8.1 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
```

ED-GWL1010 uses i2c-1 and spiderv0.0

4.8.2 Configuring LoRa Service

4.8.2.1 Pktfwd Config

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

pktfwd use 1700 as UDP port

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

4.8.2.2 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.

4.8.2.3 Reboot

```
$ sudo reboot
```

4.8.3 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
```

4.8.3.1 Config chirpstack-docker

We use docker container to deploy ChirpStack server.

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

Need to config chirpstack-docker and docker-compose.yml

```
$ 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
```

4.8.3.2 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:

```
user: admin
psw : admin
```

4.8.4 Adding LoRa Gateway and Terminal

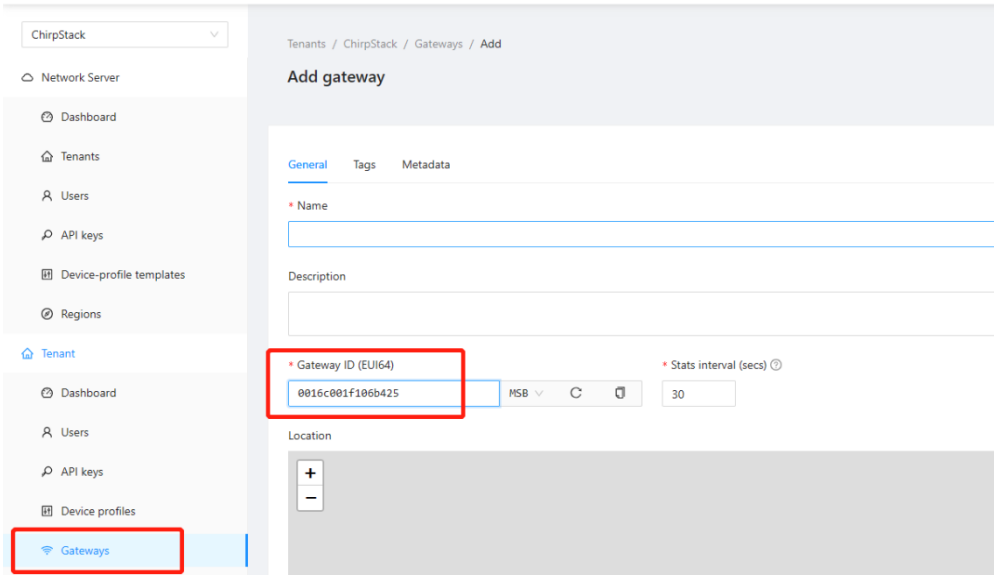
4.8.4.1 Gets LoRa Gateway ID

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
```

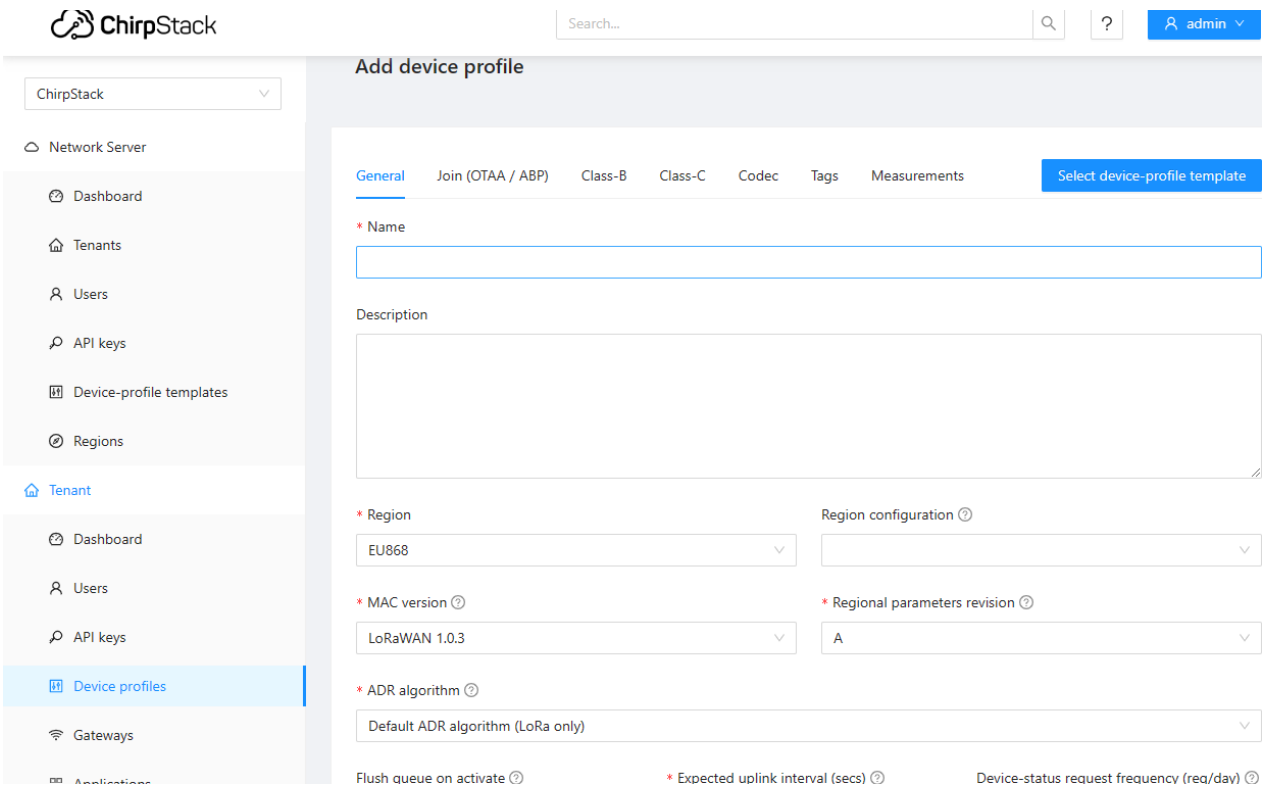
4.8.4.2 Add LoRa Gateway

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.



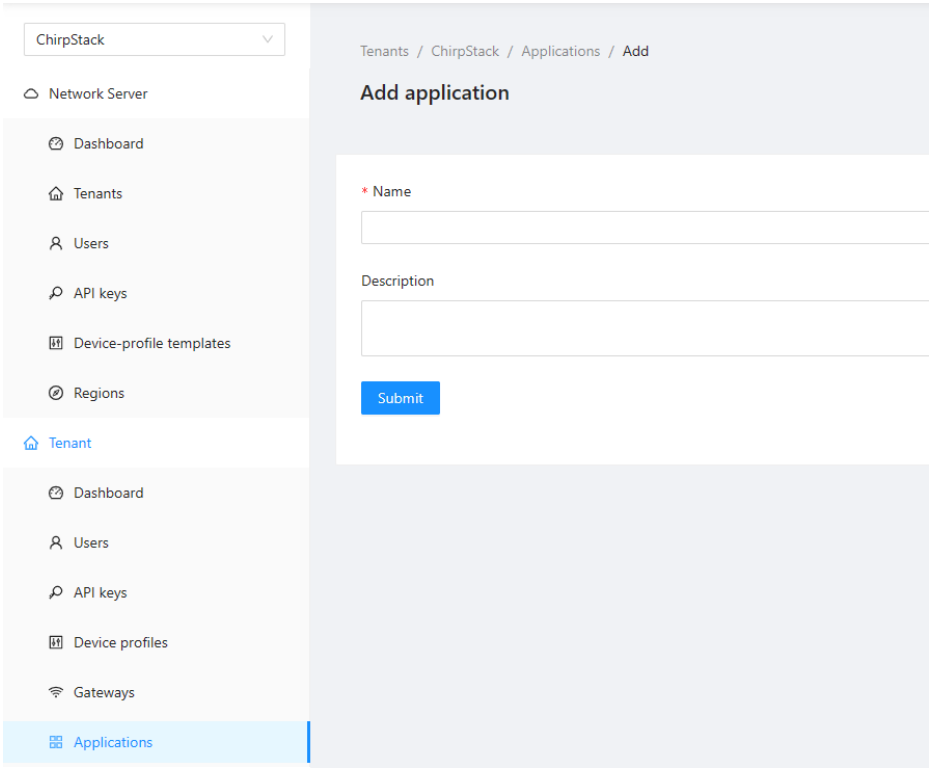
4.8.4.3 Add Device Profile

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



4.8.4.4 Add Application

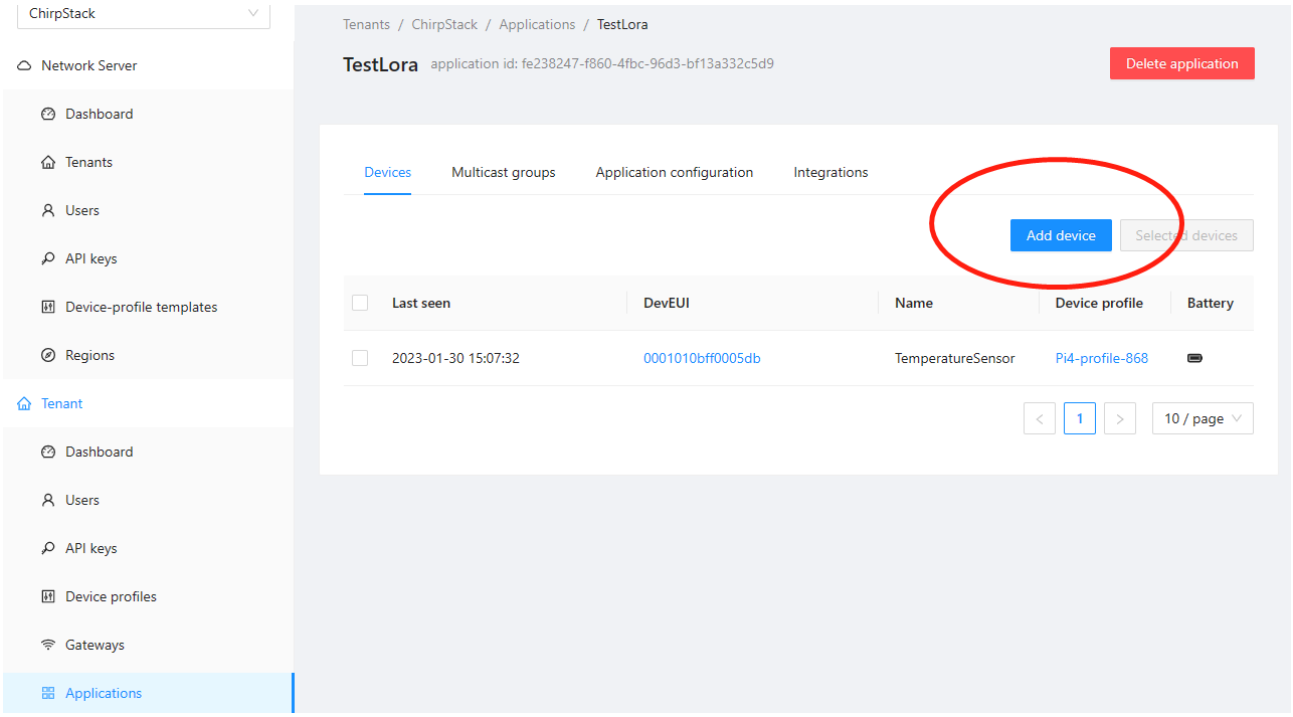
Click Applications -> Add application

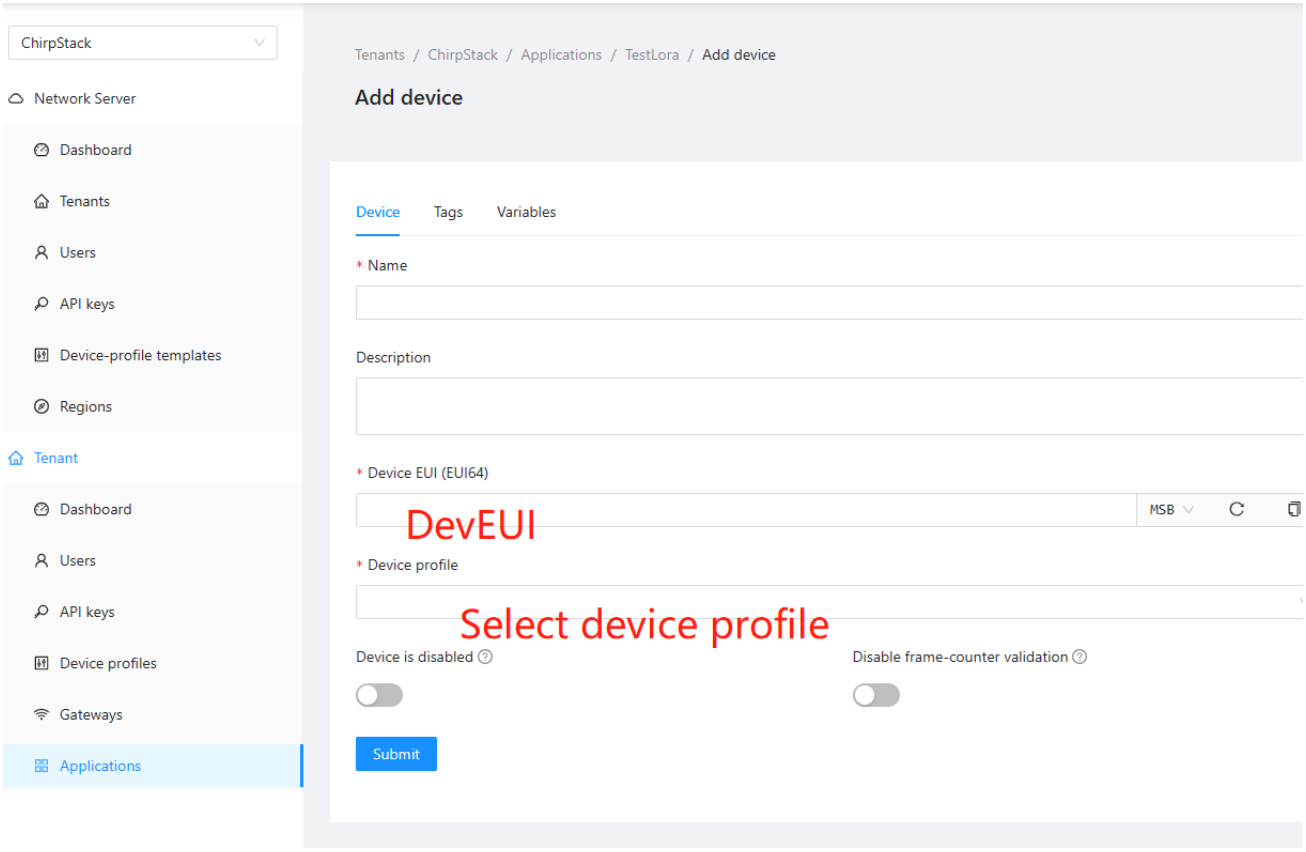


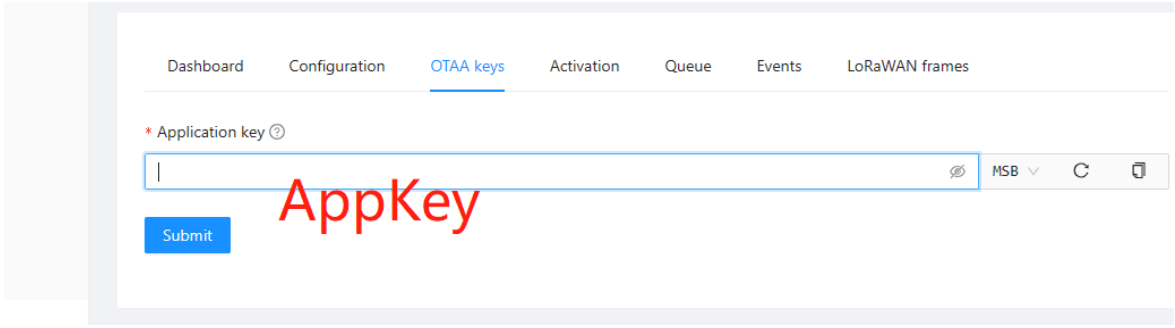
4.8.4.5 Add Device

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.

5 Operating System Installation

5.1 Image Download

At the factory, we have burned the system in eMMC, and users can use it directly.
We have provided the factory image. If the system is restored to factory settings, please click the following link to download the factory image.

Download Link: https://1drv.ms/f/s!Au060HUAtEYBgRl4XvZeFGCVrZvt?e=H91zTs

5.2 System Flash

ED-GWL1010 supports dual booting of SD card and eMMC system, and SD card has higher priority.

If you want to burn the system to eMMC, you need to start the system through SD card, and then indirectly burn eMMC through dd command.

5.2.1 Flash from SD card

Install the burning tool, and recommend balenaEtcher:

- balenaEtcher：https://www.balena.io/etcher/
- SD card: use an SD card with a capacity of at least 8GB (if you plan to burn eMMC with an SD card, the capacity of the SD card should be at least 16GB).

Flash steps:

1. Open balenaEtcher and select the file to burn.
2. Select the SD card to burn.
3. Wait for the burning to be completed

Enable SSH：

By default, the image disables ssh function. If you want to connect to the device remotely by SSH after booting, you need to create an empty file named SSH in the boot partition before booting, so as to ensure that the SSH function is automatically enabled after the device boots.

5.2.2 eMMC Flash

At present, eMMC only supports burning from SD card. By default, the image has been burned in eMMC when leaving the factory, and users can use it directly. If the device cannot be started and the green indicator light does not flash, it means that the system cannot be started at this time, and the image needs to be burned into eMMC with SD card.

```
lsblk

NAME             MAJ:MIN RM    SIZE RO TYPE MOUNTPOINT
mmcblk0          179:0       0 14.8G    0 disk
 ├──mmcblk0p1    179:1       0    256M    0 part /boot
 └──mmcblk0p2    179:2       0 14.6G    0 part /
mmcblk1          179:32      0    7.3G    0 disk
 └──mmcblk1p1    179:33      0    7.3G    0 part
mmcblk1boot0 179:64      0       4M    0 disk
mmcblk1boot1 179:96      0       4M    0 disk
```

The partition name of SD card is mmcblk0. You can see that SD card has two partitions, one is

mmcblk0p1 and the other is mmcblk0p2.
The second partition is eMMC. Because there is no burning system by default, there is only one partition mmcblk1p1.
If the second partition has burned the system, the following will be displayed after using the lsblk command.

```
lsblk

NAME            MAJ:MIN RM   SIZE RO TYPE MOUNTPOINT
mmcblk0         179:0    0 14.8G  0 disk
 ├─mmcblk0p1    179:1    0   256M  0 part /boot
 └─mmcblk0p2    179:2    0 14.6G  0 part /
mmcblk1          179:32   0   7.3G  0 disk
 ├─mmcblk1p1    179:33   0   256M  0 part
 └─mmcblk1p2    179:34   0   5.9G  0 part
mmcblk1boot0    179:64   0     4M  0 disk
mmcblk1boot1    179:96   0     4M  0 disk
```

Flash preparation

EMMC burning can only be written through SD card, so first you need an SD card that has burned the system, start the system, and put the system to be burned into the SD card. In the example, the image is directly placed in the folder of the default user phantom, and the absolute path of the folder is /home/phantom.

Flash system to eMMC：

```
sudo dd if=<img_path> of=/dev/mmcblk1 bs=4MiB
#示例
sudo dd if=/home/phantom/phantom_2022-12-03.img of=/dev/mmcblk1 bs=4MiB
sync
```

Wait patiently for the command to be executed.
After the execution, the following contents will be displayed:

```
1483+1 records in
1483+1 records out
```

Using lsblk, we can see that mmcblk1 has two partitions, p1 and p2:

```
lsblk

NAME            MAJ:MIN RM   SIZE     RO TYPE MOUNTPOINT
mmcblk0         179:0    0    14.8G    0   disk
 ├─mmcblk0p1    179:1    0    256M     0   part     /boot
```

```
└─mmcblk0p2  179:2    0   14.6G  0 part /
mmcblk1      179:32   0    7.3G  0 disk
├─mmcblk1p1  179:33   0    256M  0 part
└─mmcblk1p2  179:34   0    5.9G  0 part
mmcblk1boot0 179:64   0    4M    0 disk
mmcblk1boot1 179:96   0    4M    0 disk
```

Enable SSH：

SSH service is not enabled for the default image. If you want to connect to the device remotely by SSH when you start the machine, please follow the following steps:

```
sudo mount /dev/mmcblk1p1 /mnt
sudo touch /mnt/ssh
sudo umount /mnt
```

6 FAQ

6.1.1 Default Username and Password

The default user name of our factory image is pi, and the default password is raspberry.

7 About Us

7.1 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.

7.2 Contact Us

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