



# ED-GWL2010

AN INDOOR LIGHT GATEWAY BASED ON RASPBERRY PI 4B

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# 1 Product Overview

ED-GWL2010 is an indoor light gateway designed based on Raspberry Pi 4B. This product uses the LoRa gateway module of the new generation SX1302 and SX1303 baseband chips, which has the characteristics of long transmission distance, large node capacity and high receiving sensitivity. In addition, this gateway has strong performance, light structure and simple deployment, which can greatly simplify and shorten your development threshold and design time.

## 1.1 Target Application

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

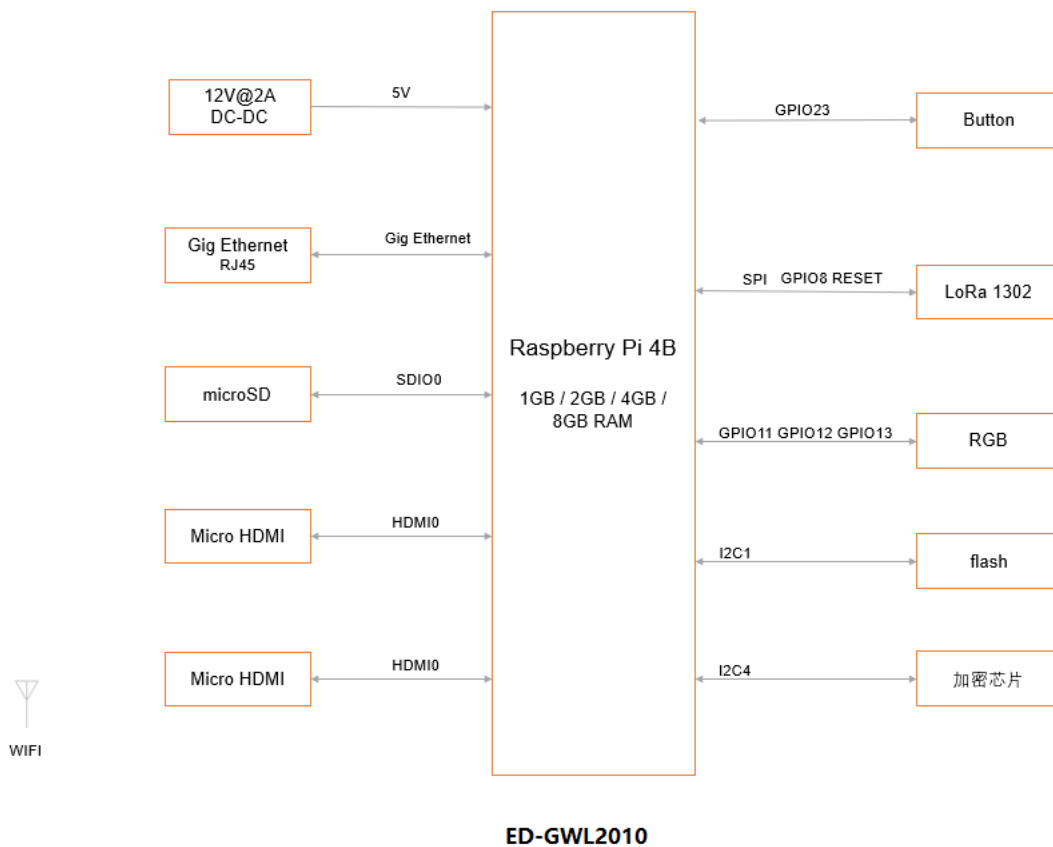
## 1.2 Specifications and Parameters

Function	Parameters
CPU	Broadcom BCM2711 4 core, ARM Cortex-A72(ARM v8), 1.5GHz, 64bit CPU
Memory	1GB / 2GB / 4GB / 8GB option
SD card	8GB / 16GB / 32GB / 64GB option
Ethernet	1x Gigabit Ethernet
WiFi / Bluetooth	2.4G / 5.8G dual WiFi, bluetooth 5.0
Frequency	Support 868MHz(EU868,RU864)、915MHz(US915,AS923-1/2/3,AU915)、470MHz(CN470)
Button	Support custom function
RGB	RGB, Support a variety of custom displays.
Encryption chip	Support encryption function
HDMI	2x Micro-HDMI
HDMI FPC touch screen	1x FPC HDMI, support USB touch, PWM aiming
DSI	1x DSI, Support Raspberry Pi 7 inch official touch.
USB Host	2x USB 2.0 Type A, 2x USB 2.0
Power input	12V 2A
Case	Full Metal Jacket
Dimensions	95(L) x 95(W) x 24(H) mm

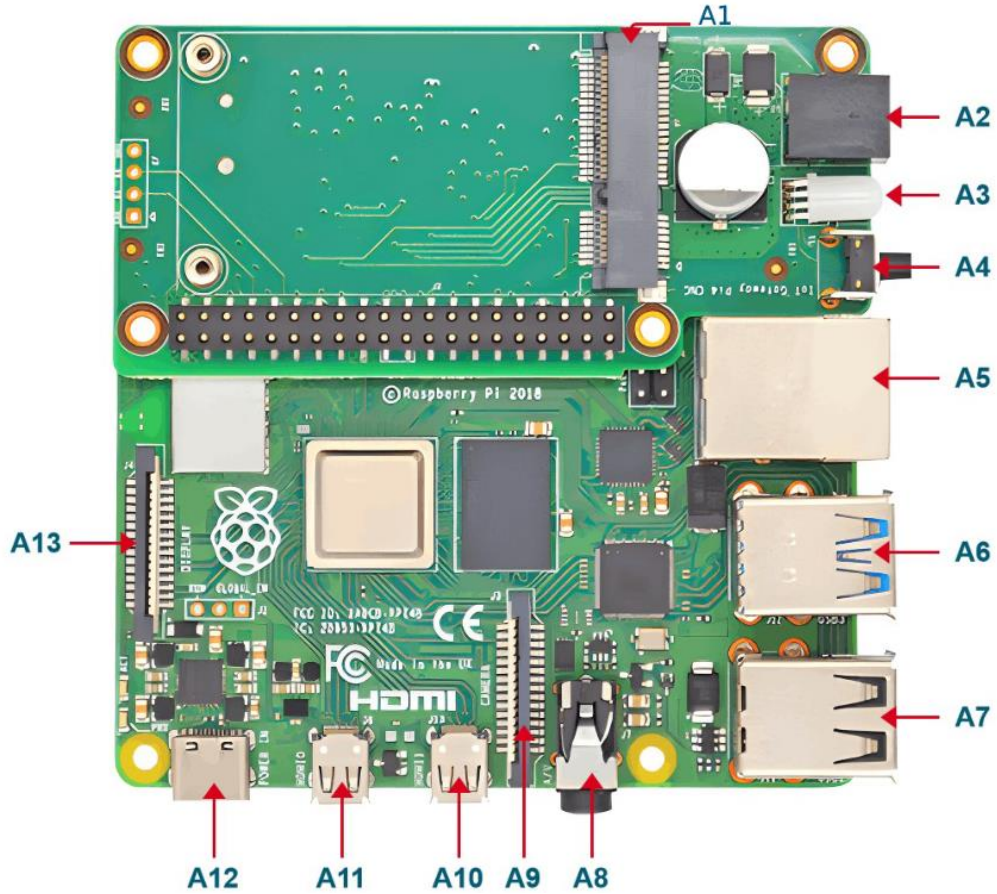
Antenna accessory	Support optional WiFi/BT external antenna, which has passed wireless authentication together with Raspberry Pi CM4, and LoRa external antenna.
Working environment temperature	Running at full speed at ambient temperature of -25 ~ 50 C.
OS	Compatible with official Raspberry Pi OS and Ubuntu.

**NOTE: Most of the interfaces are hidden in the case, only the power interface, RGB indicator light and network port are left on the case.**

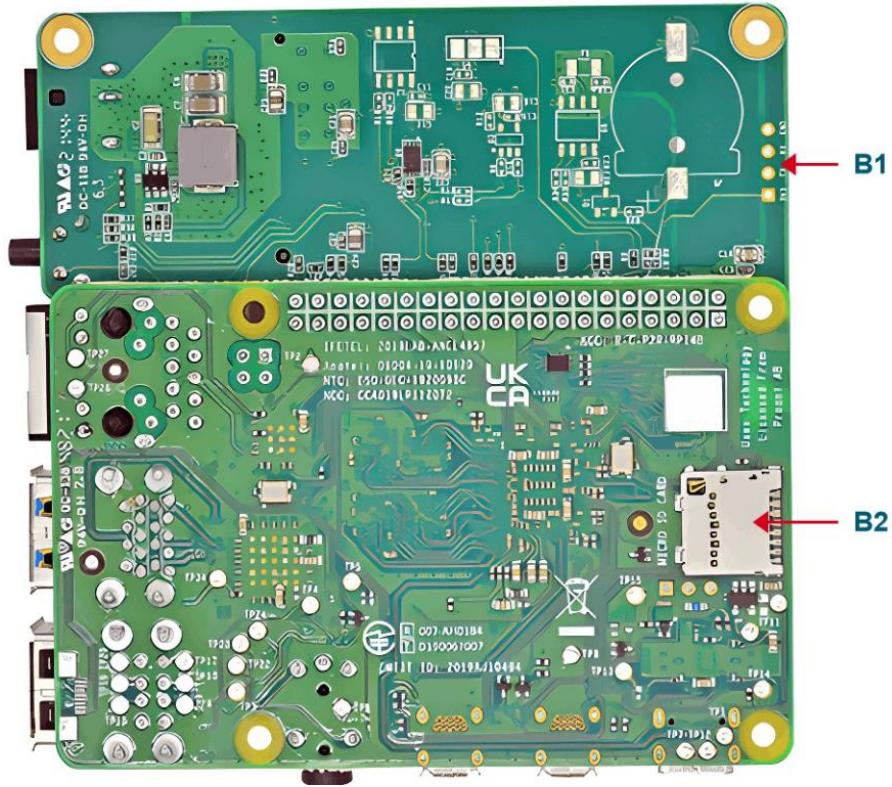
## 1.3 System Diagram



## 1.4 Functional Layout



Item	Function Description	Item	Function Description
A1	Mini PCIe	A2	Power interface
A3	Indicator light	A4	User-defined key
A5	RJ45 network port	A6	USB 3.0
A7	USB 2.0	A8	3.5mm earphone port
A9	CSI	A10	Micro HDMI
A11	Micro HDMI	A12	Pi4 power interface(no need to use)
A13	HDMI DSI		

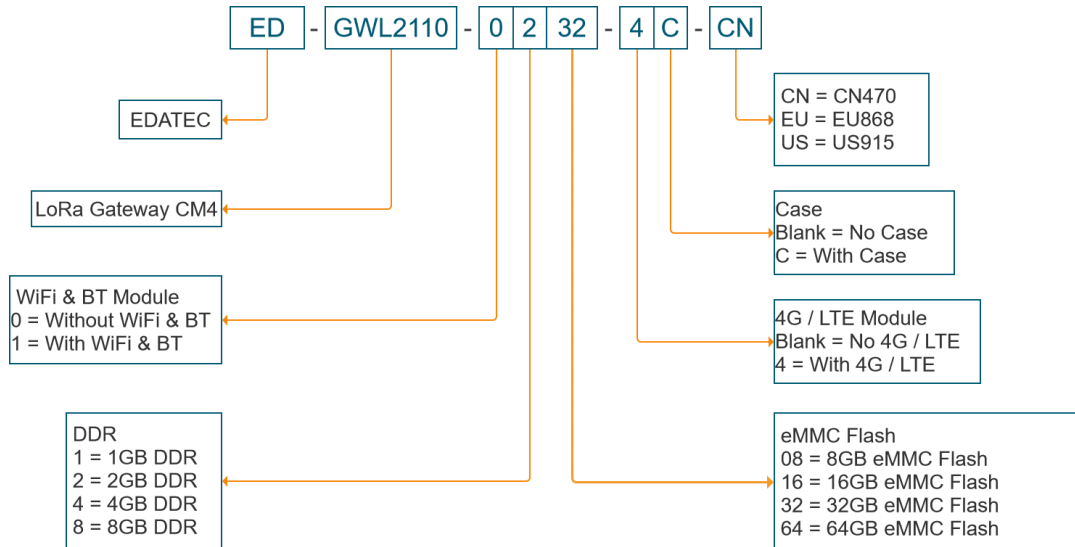


Item	Function Description	Item	Function Description
B1	Debug serial port	B2	SD card slot

## 1.5 Packing List

- 1x ED-GWL2010 host
- [option]1x LoRa antenna
- [option]1x 2.4GHz/5GHz WiFi/BT antenna

## 1.6 Order Code



### Example

**Part# :** ED-GWL2110-1232-4C-CN

**Configuration :** 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-GWL2010 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-GWL2010 and supply power to the power adapter.

## 2.3 First Start

ED-GWL2010 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.

```
[ OK ] Started User Login Management.
[ OK ] Finished Permit User Sessions.
[ OK ] Started Getty on tty1.
[ OK ] Reached target Login Prompts.
[ OK ] Started OpenBSD Secure Shell server.
[ OK ] Started Modem Manager.
[ OK ] Started Hostname Service.
Starting Network Manager Script Dispatcher Service...
[ OK ] Started Network Manager Script Dispatcher Service.
[ OK ] Listening on Load/Save RF Kill Switch Status /dev/rfkill Match.
Starting Load/Save RF Kill Switch Status...
[ OK ] Started LSB: Switch to on (unless shift key is pressed).
[ OK ] Started Load/Save RF Kill Switch Status.
Starting Save/Restore Sound Card State...
[ OK ] Finished Save/Restore Sound Card State.
[ OK ] Reached target Sound Card.

Debian GNU/Linux 11 raspberrypi tty1
raspberrypi login: pi (automatic login)

Linux raspberrypi 5.15.32-080 #1530 SMP PREEMPT Thu Mar 31 19:40:39 BST 2022 aarch64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

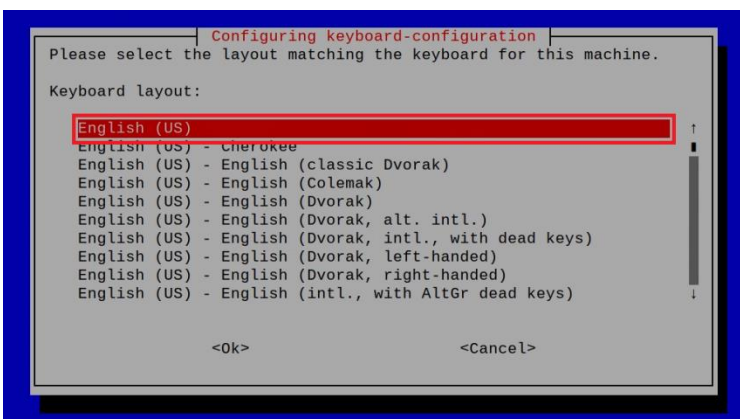
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Jan 31 03:52:21 GMT 2023 from 192.168.168.211 on pts/0

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set a new password.

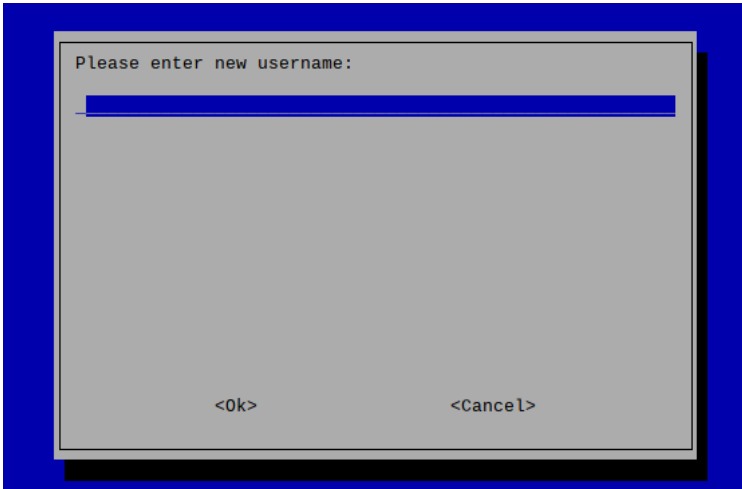
pi@raspberrypi:~$
```

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



- 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 Wiring Guide

### 3.1 Internal I/O

#### 3.1.1 micro-SD Card

ED-GWL2010 is internally integrated with Raspberry Pi 4B, which has a micro SD card slot. Please insert the micro SD card of the burned system into the micro SD card slot.

#### 3.1.2 Antenna

ED-GWL2010 has two external antennas, namely WIFI/BT antenna and LoRa antenna, which are not universal, so they cannot be mixed.



According to the icon next to the antenna, install WIFI/BT antenna on the left and LoRa antenna on the right. A paper logo is also attached to the antenna.

## 4 Software Operation Guide

## 4.1 Button

ED-GWL2010 has a user-defined button, which is connected to the GPIO23 of CPU. By default, it is at high level, and when the key is pressed, the pin is at low level.

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.

## 4.2 LED Indication

ED-GWL2010 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
```

## 4.3 Ethernet Configuration

ED-GWL2010 has an adaptive 10/100/1000 Mbps 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
```

## 4.4 WiFi

ED-GWL2010 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.

## 4.5 Bluetooth

ED-GWL2010 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.

## 4.5.1 Basic Usage

### Scan:

```
bluetoothctl scan on/off
```

### Find device:

```
bluetoothctl discoverable on/off
```

### Trust device:

```
bluetoothctl trust [MAC]
```

### Connect:

```
bluetoothctl connect [MAC]
```

### Disconnect:

```
bluetoothctl disconnect [MAC]
```

## 4.5.2 Example

Into bluetooth 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
```

## 4.6 LoRaWAN

ED-GWL2010 supports LoRaWAN open source service platform ChirpStack. Please refer to the following steps for installation and configuration.

### 4.6.1 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-GWL2010 use i2c-1 and spidev0.0.

## 4.6.2 Configuring LoRa Service

### 4.6.2.1 Pktfwd Config

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

pktfwd use 1700 as UDP port

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

### 4.6.2.2 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.

### 4.6.2.3 Reboot

```
$ sudo reboot
```

## 4.6.3 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
```

### 4.6.3.1 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
- POSTGRES\_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
```

#### 4.6.3.2 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
```

### 4.6.4 Adding LoRa Gateway and Terminal

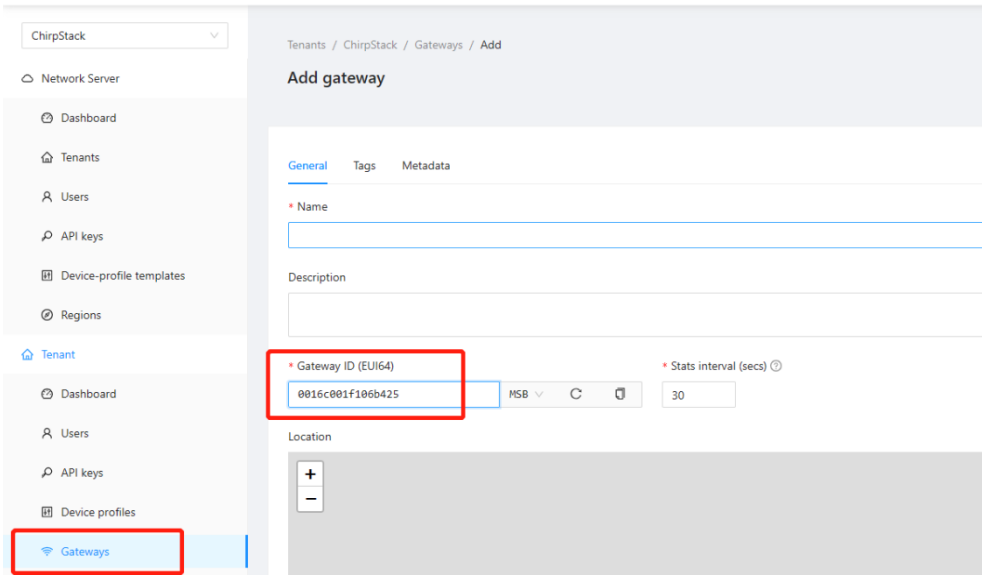
#### 4.6.4.1 Gets LoRa Gateway ID

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
```

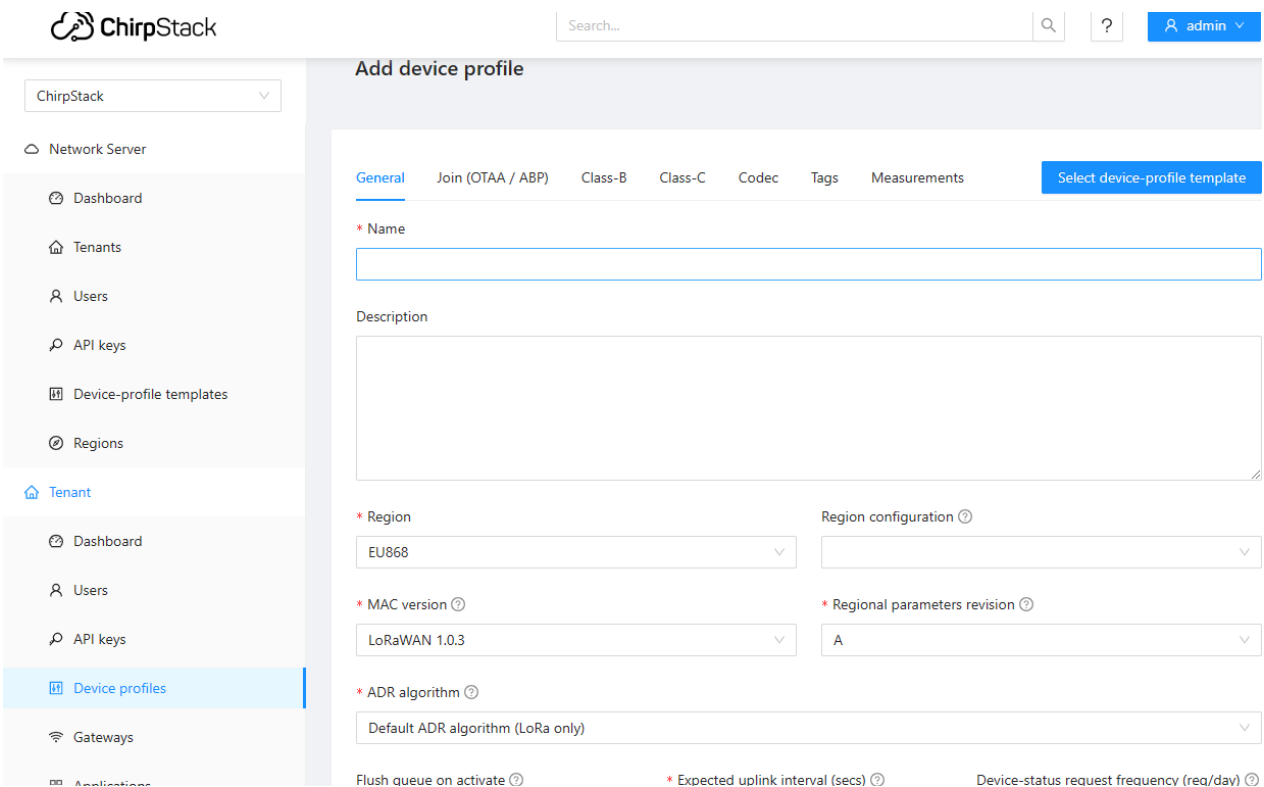
#### 4.6.4.2 Add LoRa Gateway

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.



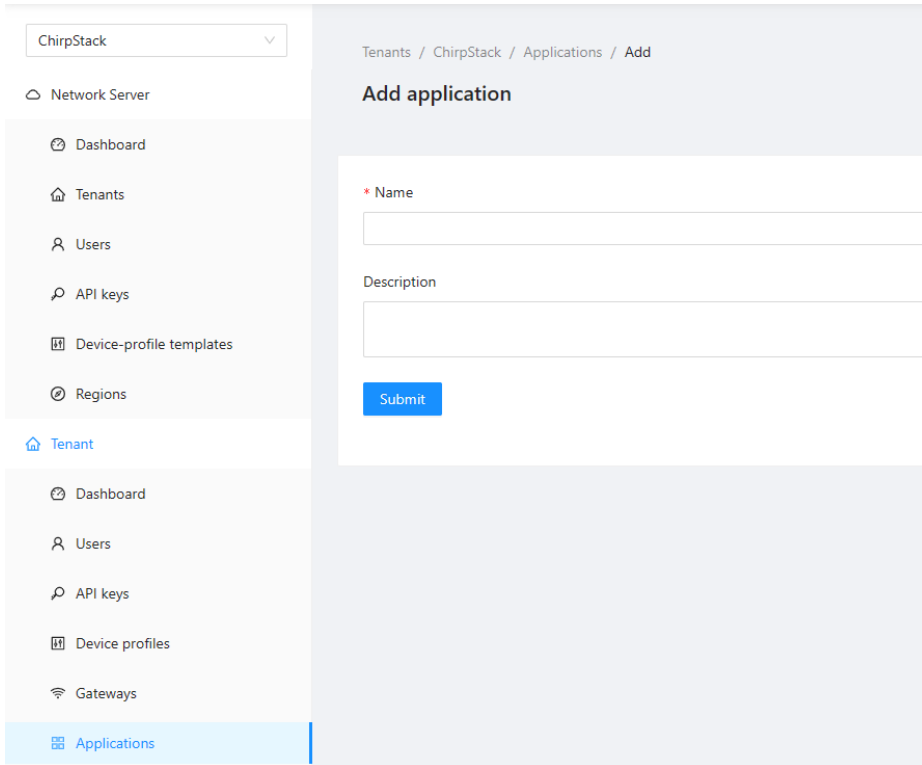
### 4.6.4.3 Add Device Profile

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



### 4.6.4.4 Add Application

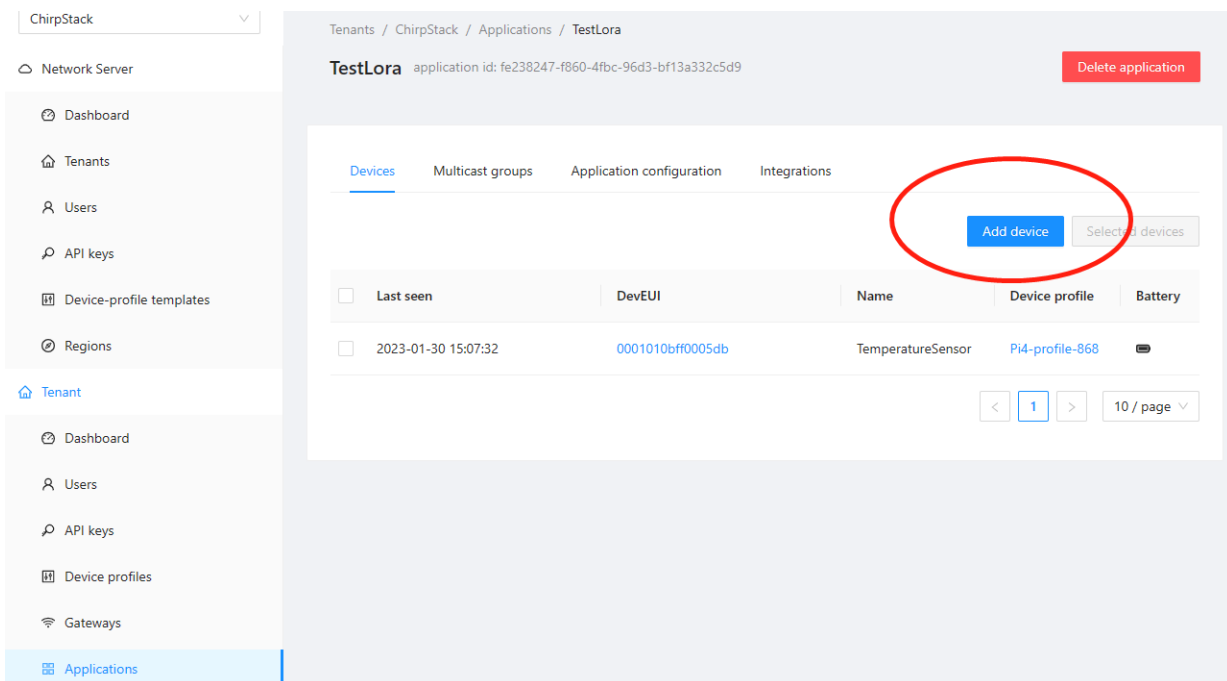
Click Applications -> Add application



#### 4.6.4.5 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

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: February 9th, 2023
- System: 32-bit

- Kernel version: 5.15
- Debian version: 11 (bullseye)
- Downloads: <https://1drv.ms/f/s!Au060HUAtEYBgQDcbpWTP7mNb88L?e=cFOdiM>

## 5.2 System Flash

### 5.2.1 Tool Preparation

It is recommended to use the official burning tool of Raspberry Pi:

Raspberry Pi Imager ([https://downloads.raspberrypi.org/imager/imager\\_latest.exe](https://downloads.raspberrypi.org/imager/imager_latest.exe))

Formatting tool:

SD Card Formatter (<https://www.sdcardformatter.com/download/>)

### 5.2.2 Flash

1. Download the image you want to burn.
2. Connect the SD card to the computer through the card reader.
3. Open SD Card Formatter, select SD card letter, and click Format below to format.
4. After formatting, open Raspberry Pi Imager, select the image you want to burn in the first item, select the custom image for the local image, and select the memory card for the second item.
5. Click Burn after setting, and wait for the burn to end.
6. After burning, remove the SD card and insert the device to start.

## 5.3 Install BSP Online Based on The Original Raspberry Pi OS.

Refer to chapter [4.6 LoRaWAN](#) for installation of lorawan.

# 6 FAQ

### 6.1.1 Default Username and Password

User name: pi

Password: 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  
EDA Technology Co.,LTD– Electronics Development Accelerator



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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