EDA ED-GWL2010 Indoor Light Gateway Based User Manual

User Manual of ED-GWL2010

ED-GWL2010
An indoor light gateway based on Raspberry Pi 4B
EDA Technology Co.,Ltd
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EDA Technology Co.,LTD– Electronics Development Accelerator

Contents

ED-GWL2010 Indoor Light Gateway Based

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Product Overview

ED-GWL2010 is an indoor light gateway designed based on Raspberry Pi 4B. This product uses the new generation of SX1302 and SX1303 baseband chip LoRa gateway modules, which have 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.

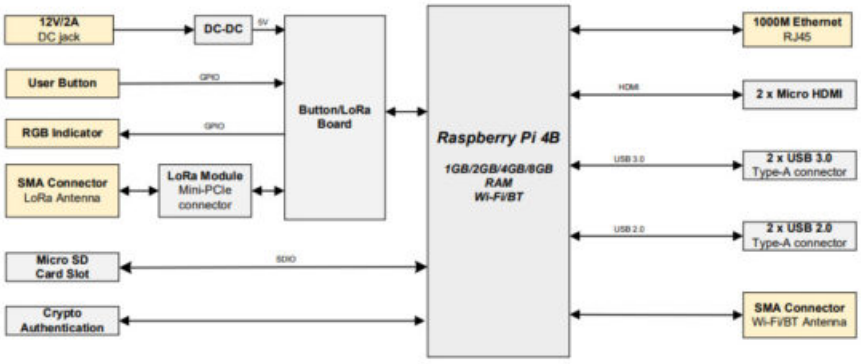
1.1 Target Application

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

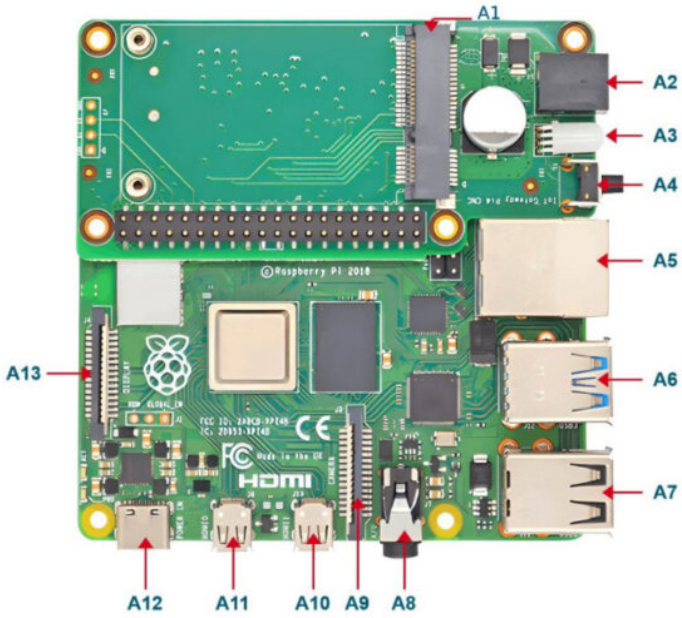
1.2 Specifications and Parameters

Function	Parameters
CPU	Broadcom BCM2711, quad core Arm Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
Memory	Options for 1GB, 2GB, 4GB, 8GB LPDDR4-3200 SDRAM
OS	Compatible with official Raspberry Pi OS
SD card	Options for 32GB, 64GB
Ethernet	lx Gigabit Ethernet
Wi-Fi/Bluetooth	2.4GHz & 5GHz dual-band Wi-Fi and Bluetooth 5.0
LoRa Frequency	Support optional 868MHz(EU868)/915MHz(US915)/470MHz(CN470)
User Button	Support custom function
RGB LED	Support multiple custom displays
Power Supply	DC 12V/2A
Internal 10	2x Micro-HDMI lx CSI, support extended connection to Camera lx DSI, support extended connection to Raspberry Pi 7-inch LCD screen 2x USB 2.0, type A connector 2x USB 3.0, type A connector
Expansion Perfor mance	Built-in Crypto Authentication
Case Material	Metal Case
Dimensions	95mm(W) x 95mm(D) x 24mm(H)
Antenna	Supports optional Wi-Fi/BT external antenna Standard LoRa extemal antenna
Working Temperat ure	-25 – 50 C

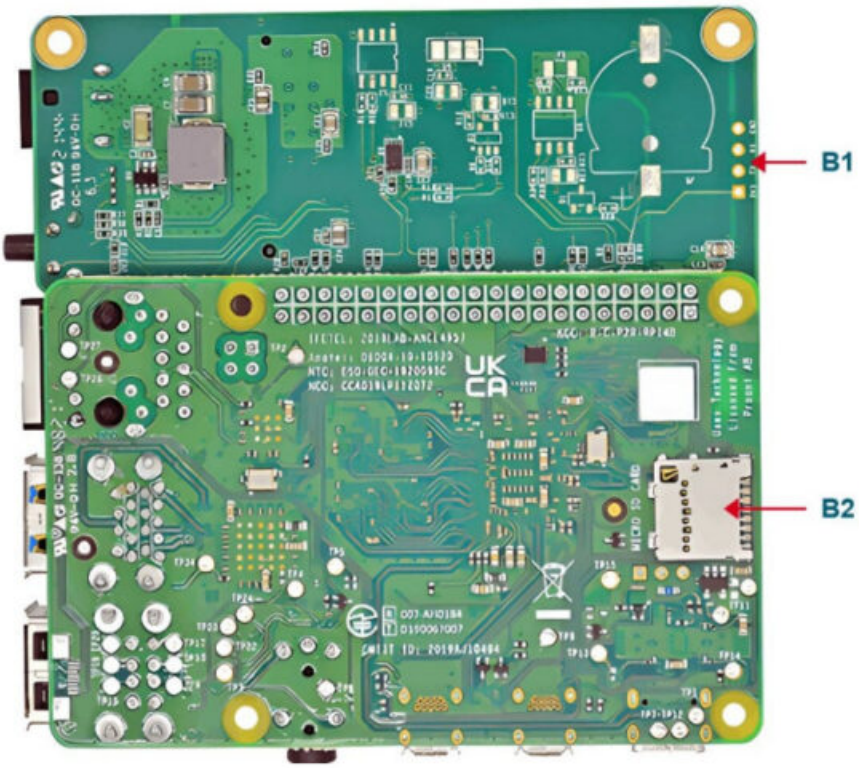
1.3 System Diagram



1.4 Functional Layout



Item	Function Description	Item	Function Description
Al	Mini PCIe	A2	Power interface
A3	RGB LED	A4	User-defined Button
AS	Gigabit Ethernet	A6	USB 3.0
A7	USB 2.0	A8	3.5mm audio jack connector
A9	CSI	A10	Micro HDMI
All	Micro HDMI	Al2	Pi4 power interface (no need to use)
A13	DSI	/	/

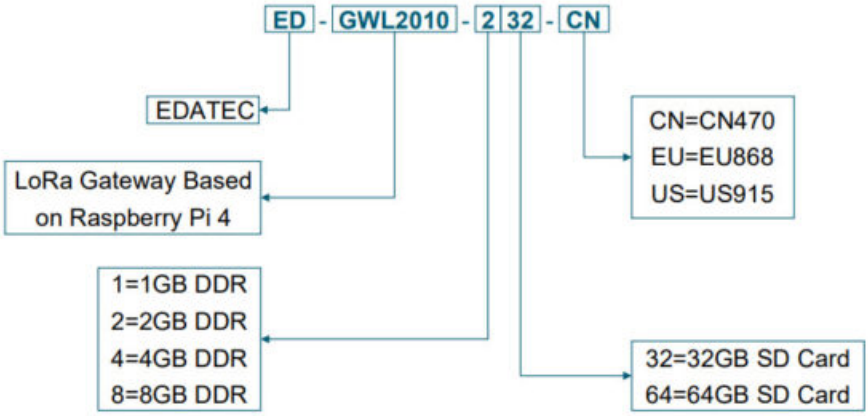


Item	Function Description	Item	Function Description
B1	Debug UART Port	B2	SD Card Slot

1.5 Packing List

- 1x ED-GWL2010 Unit
- [option]1x LoRa Antenna
- [optional]1x 2.4GHz&5GHz Wi-Fi/BT Antenna

1.6 Ordering Code



Example
P/N: ED-GWL2010-232-CN
Configuration: An indoor light gateway based on Raspberry Pi 4, with 2GB DDR, 32GB SD card and CN470 LoRa frequency.

Quick Start

2.1 Equipment List

- 1x ED-GWL2010 Unit
- 1x Wi-Fi/BT external antenna
- 1x LoRa external antenna
- 1x network cable
- 1x 12V@2A power supply

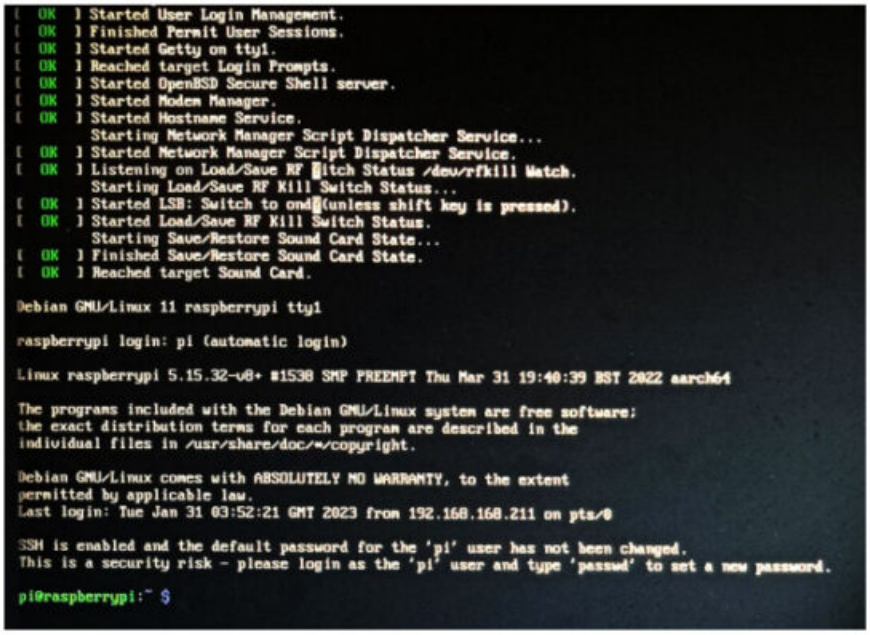
2.2 Hardware Connection

1. Install the Wi-Fi/BT 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.

ED-GWL2010 does not have a power switch. After connecting to the power supply, the system will start to boot.

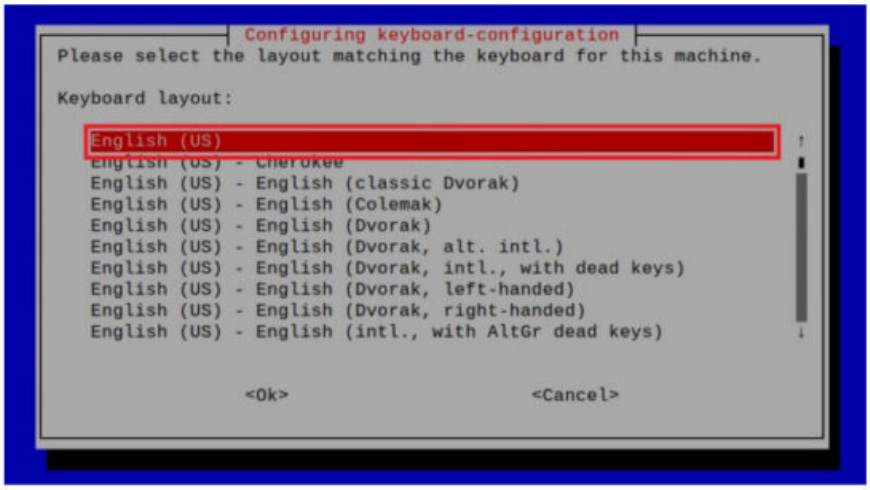
2.3.1 Raspberry Pi OS (Lite)

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

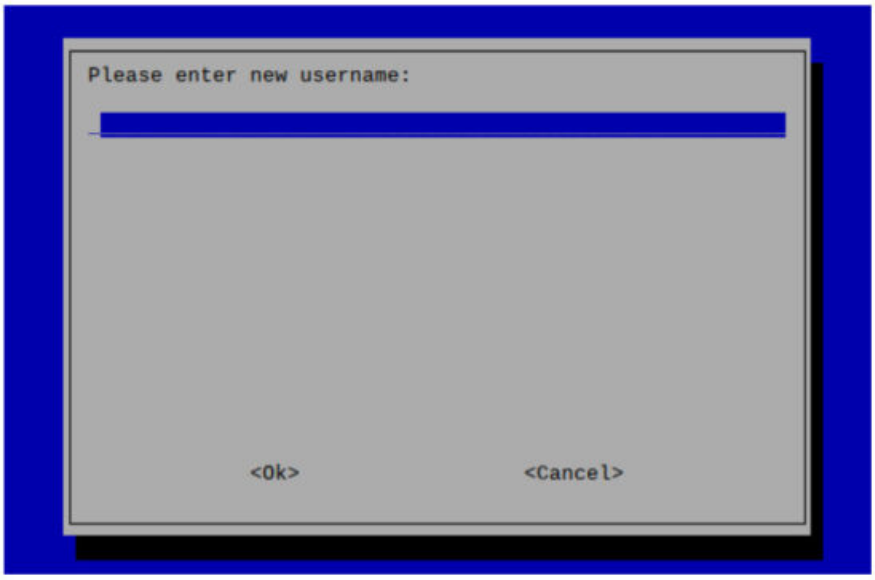


If you use the official OS, and OS is not configured before flashing to SD card, the configuration window will appear when you start it for the first time. You need to configure the keyboard layout, set the username and the corresponding password in turn.

1. Set the configuration keyboard layout



2. 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 OS we provide have been enabled the SSH. If you use the official OS, you need to use a method to enable the SSH function.

2.3.2.1 Enable SSH via raspi-config command

1. Execute “sudo raspi-config” command
2. Choose 3 Interface Options
3. Choose I2 SSH
4. Would you like the SSH server to be enabled? Select Yes
5. Choose Finish

2.3.2.2 Add Empty File to Enable SSH

Creat an empty file named ssh in the boot partition, and the SSH will be automatically enabled after the device is powered on.

2.3.3 Get The Device IP

- After the device is started, if the display screen is connected, you can use the ifconfig command to view the current device IP.
- After the device is started, if there is no display connected, you can check the IP assigned to the device through the router.
- After the device is started, if there is no display screen connected, 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
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

Wiring Guide

3.1 Internal I/O

3.1.1 Micro-SD Card

ED-GWL2010 contains a micro-SD card slot. Before powering on the device, please insert the micro-SD card with OS into the micro-SD card slot.

3.1.2 Antenna

ED-GWL2010 contains two external antennas, one is a Wi-Fi/BT antenna and the other is a LoRa antenna, which can be distinguished by the antenna labels.

According to the silk-screen instructions on the antenna interface on the device side, install the Wi-Fi/BT antenna on the left and the LoRa antenna on the right as shown in the above figure.

Software Operation Guide

4.1 Button

ED-GWL2010 contains a user-defined button inside the device, which is connected to the GPIO23 pin of CPU. It is at a high level by default. When the button is pressed, the pin is at a low level.

You can use the raspi-gpio command to test.

- Query the GPIO23 pin when the button 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.

- Query the GPIO23 pin When the button is pressed.

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 includes an RGB 3-color LED indicator, and the corresponding GPIO pins are as follows:

RGB LED PIN	GPIO
Blue	GPIO16
Green	GPIO20
Red	GPIO21

When the GPIO output is low, the corresponding LED is valid.
You can 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 includes one adaptive 10/100/1000M Ethernet interface.
The official OS 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 Wi-Fi
ED-GWL2010 supports 2.4GHz&5GHz IEEE 802.11 b/g/n dual-band Wi-Fi.

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

1. Execute “sudo raspi-config” command.
2. Choose 1 System Options
3. Choose S1 Wireless LAN
4. 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 Wi-Fi for the first time.
5. Please enter SSID input WIFI SSID name.
6. Please enter passphrase. Leave it empty if none, input password and then restart the device

4.5 Bluetooth

ED-GWL2010 supports Bluetooth 5.0 and Bluetooth Low Energy (BLE). The Bluetooth function is enabled by default.

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

4.5.1 Basic Configuration Commands

Command	Function Description
bluetoothctl scan on	Enable Bluetooth scanning
bluetoothctl scan off	Disable Bluetooth scanning
bluetoothctl discoverable on	Enable Bluetooth discovery (which can be discovered by the other p arty)
bluetoothctl discoverable off	Disable Bluetooth discovery
bluetoothctl trust device MAC	Trust device
bluetoothctl connect device MAC	Connect device
bluetoothctl disconnect device MAC	Disconnect device

4.5.2 Configuration Example

This chapter introduces how to configure Bluetooth through a configuration example.

Preparation:

The Bluetooth to be paired has been enabled and its name has been determined.

Steps:

1. Enter the Bluetooth view.

   sudo bluetoothctl
2. Enable bluetooth.

   power on
3. Scan Bluetooth device.

   scan on

   Returned display information:

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

4. Find the name of the turned-on Bluetooth device.

   devices

   Returned display information:

   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

5. Pairing target devices.

   pair 34:12:F9:91:FF:68

   34:12:F9:91:FF:68 is target device's device_MAC

   Returned display information:

   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

   TIP:

   The Bluetooth device to be connected also needs to confirm the pairing request, otherwise the pairing will fail.

6. Add as trusted device.

   trust 34:12:F9:91:FF:68

   34:12:F9:91:FF:68 is target device's device_MAC

   Returned display information:

   [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 “docker-compose.yml” of “chirpstack-docker”.
$ 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

4.6.3.2 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

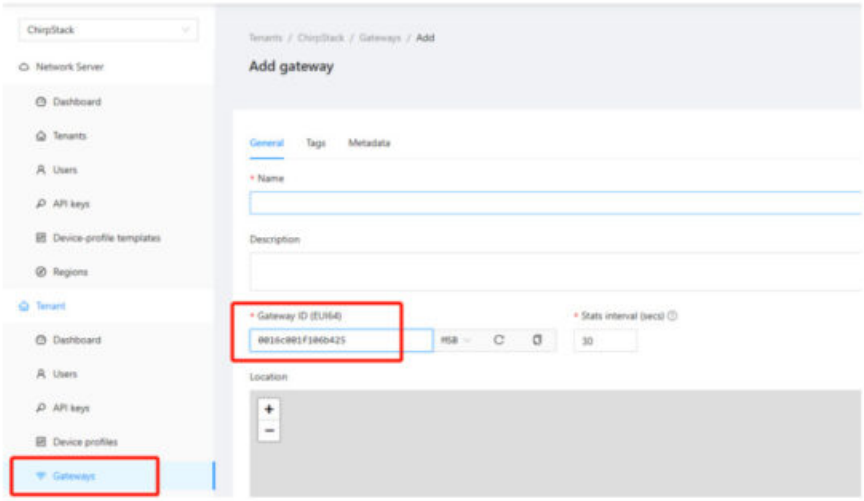
4.6.4.1 Gets LoRa Gateway ID

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

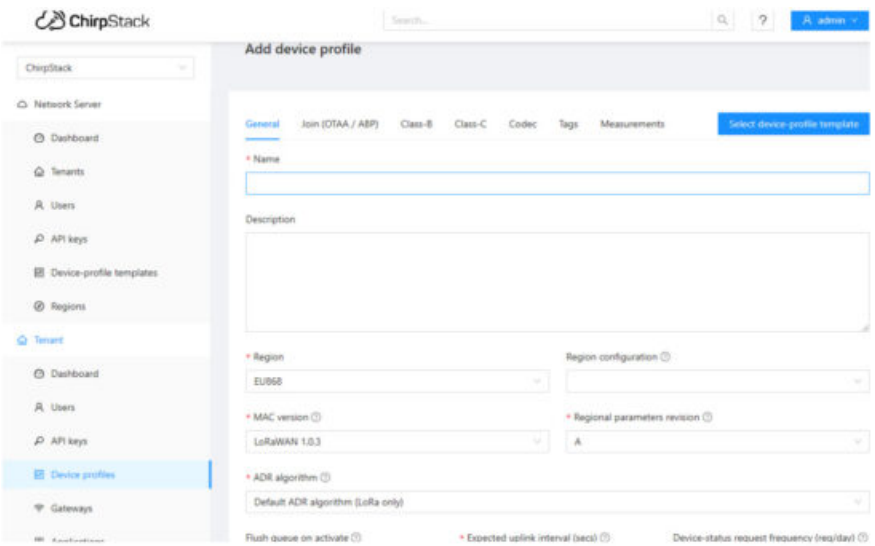
4.6.4.2 Add LoRa Gateway

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.



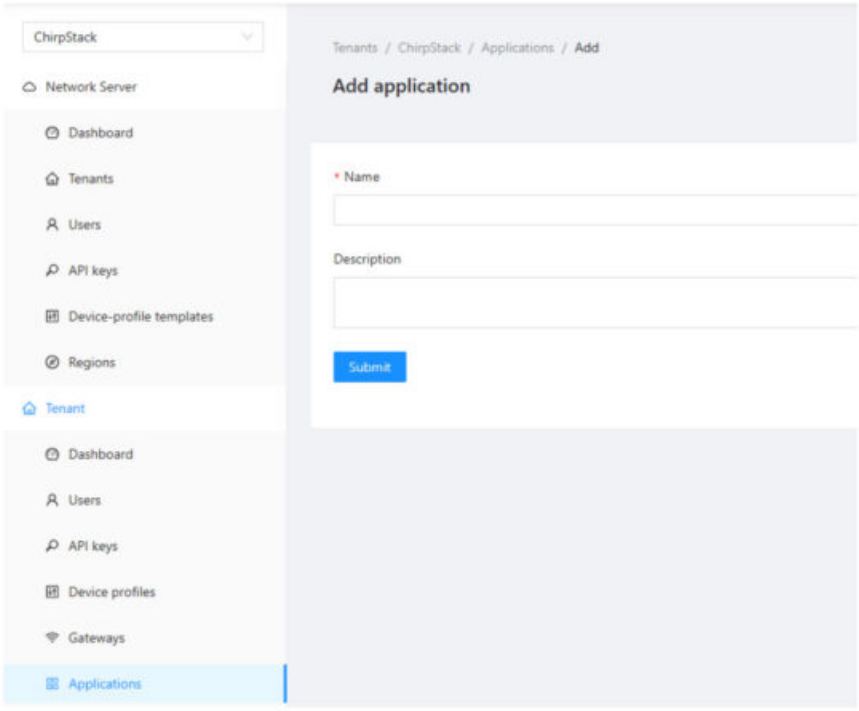
4.6.4.3 Add Device Profile

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

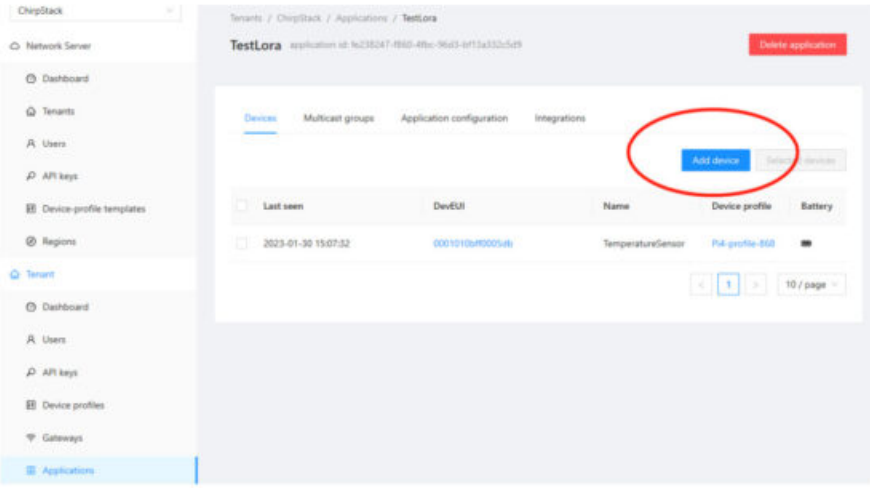


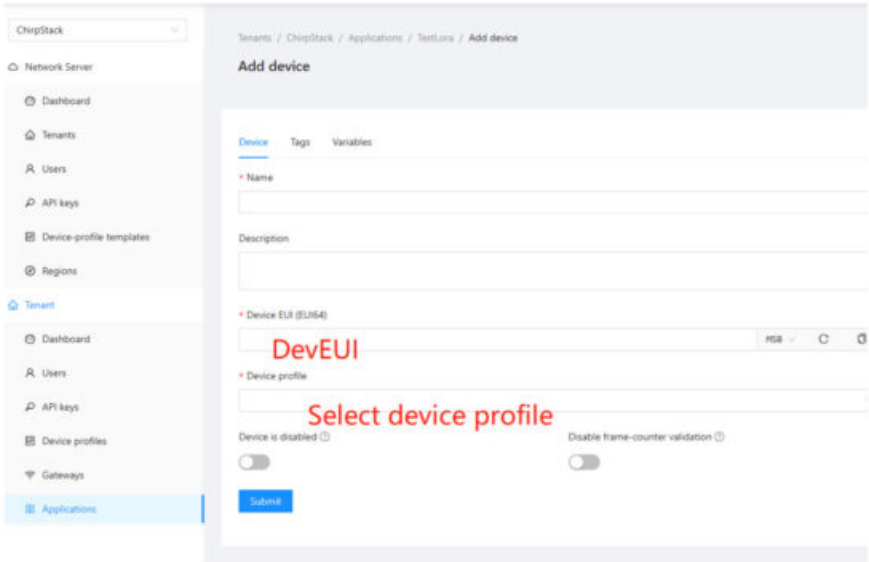
4.6.4.4 Add Application

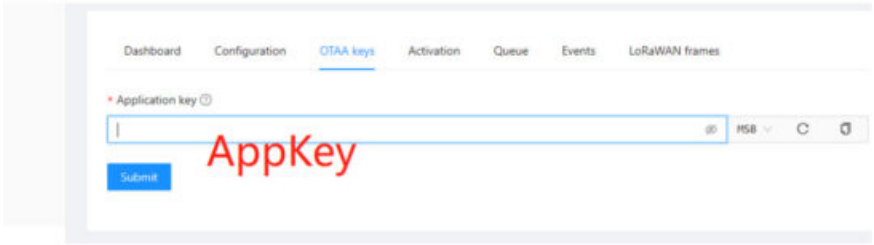
Click Applications -> Add application



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.

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**)
Formatting tool:
SD Card Formatter (**https://www.sdcardformatter.com/download/**)

5.2.2 Flash

1. Download the image.
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.

FAQ

6.1.1 Default Username and Password
User name pi
Password raspberry

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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EDA Technology Co.,LTD– Electronics Development Accelerator

Documents / Resources

	**EDA ED-GWL2010 Indoor Light Gateway Based** [pdf] User Manual ED-GWL2010 Indoor Light Gateway Based, ED-GWL2010, Indoor Light Gateway Based, Light Gateway Based, Gateway Based

References

- OpenPGP Keyserver
- Microsoft OneDrive
- apt.edatec.cn/pubkey.gpg
- Index of /raspbian/
- Index of /packages/4.x/deb/
- downloads.raspberrypi.org/imager/imager_latest.exe
- GitHub - chirpstack/chirpstack-docker: Setup ChirpStack using Docker Compose
- Nmap: the Network Mapper - Free Security Scanner
- Configuration - ChirpStack open-source LoRaWAN® Network Server
- ____
- Download SD Card Formatter for Windows and Mac (UPDATED)
- User Manual