One-Channel Hub EVK

User Guide

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1 Introduction

The One Channel Hub is a low-cost LoRaWAN® access point. It runs like a normal gateway but with only a single channel and a single modem, and therefore offers much less capacity.

The Hub focuses on small-scale, low-density networks, up to 50 end devices, and is compatible with the LoRaWAN Standard and existing LoRaWAN 1.0.x devices. It uses Wi-Fi® as backhaul and is configurable via its accessible embedded webpage.

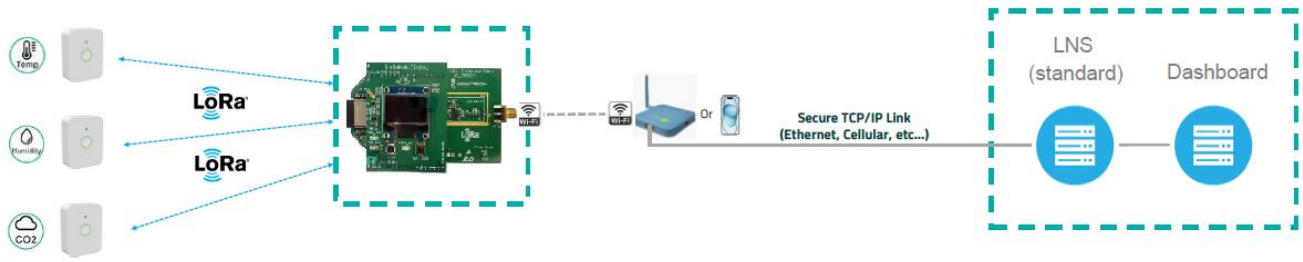

Figure 1: Hub for LoRaWAN Demo

2 Evaluation Hardware

The evaluation hardware for the One Channel Hub consists of:

- ESP32-S3 shield adapter board
- LoRa® radio shield
- OLED display adapter board

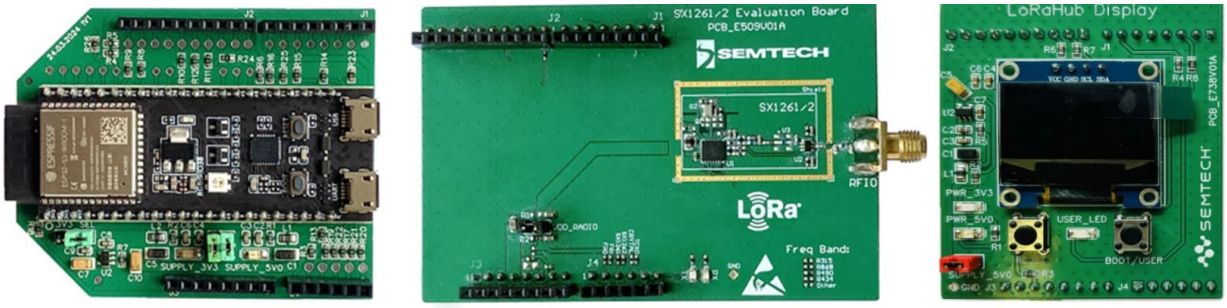

Figure 2: From left to right: ESP32-S3 Shield Adapter Board, LoRa Radio Shield Board, OLED Display Adapter Board

The ESP32 shield adapter and the OLED display adapter board are sold separately in a combo, under the reference: LRWHUB1EVK1A

The center unit, which is the radio shield, can be ordered from our usual catalog distributors:

Table 1: LoRa Radio Shield Board Order Numbers

ID	Region	Radio shield (available in other references)	Ordering P/N	Components
SX1261	EU868	SX1261MB1BAS	SX1261MB1LBAS	E406V03A, XTAL, DC-DC
SX1262	US915	SX1262MB1CAS	SX1262MB1LCAS	E428V03A, XTAL, LDO
SX1268	CN490	SX1268MB1GAS	SX1268MB1LGAS	E512V01A, XTAL, LDO
LLCC68	EU868	LLCC68MB2BAS	LLCC68MB2BAS	E568V01A/E570V01A, LDO **no display headers**
LR1121	EU868	LR1121MB1DIS	Available in LR1121DVK1TBKS	E655V01A, XTAL, DC-DC
LR1121	US915	LR1121MB1DIS	Available in LR1121DVK1TCKS	E655V01A, XTAL, DC-DC
LR1121	CN490	LR1121MB1GIS	Available in LR1121DVK1TGKS	E655V01A, XTAL, DC-DC

Before powering the demo up, please make sure to assemble the three parts in the correct order:

1. Plug the radio shield onto the ESP32-S3 adapter.
2. Connect the OLED display adapter board on top of the radio shield.

Figure 3: Assembled OLED Display Adapter, Radio Shield, and ESP32-S3 Shield Adapter Board

3 First Use

Before using the Hub EVK for the first time, you should check that the firmware version is the most recent (if an update is required, see section 5), configure it to communicate via USB and Wi-Fi, and register it with the Network Server, as described in this document.

3.1 USB Configuration

To communicate with the Hub through USB, for debug purposes:

I. Install the virtual COM port CP210x driver on the PC. Here is the link to the USB drivers: https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers

II. Power on the demo from the USB port of the ESP32 shield adapter board. The screen must show, "LoRaHub-initializing / not connected":

Figure 4: Information Displayed on the Hub When Powering On

3.2 Wi-Fi Configuration

To connect the ESP32 adapter board to a Wi-Fi access point, install the ESP BLE Provisioning application on your phone from the relevant App link (according to the type of OS installed on your mobile phone):

- https://play.google.com/store/apps/details?id=com.espressif.provble
- https://apps.apple.com/in/app/esp-ble-provisioning/id1473590141

There are two ways to connect the Hub to a Wi-Fi access point:

- Use the serial terminal to get a QR code to identify the Hub.
- Use Bluetooth to scan the Hub, instead of using the serial terminal.

3.2.1 Using the Serial Terminal

I. Open a serial terminal on your PC, with UART set as “115200,8-N1”.
A QR code will appear when the Hub powers on. A URL link is also provided in case the QR code is not correctly shown in the serial terminal:

Figure 5: QR Code and URL Link Shows in Serial Terminal

II. Open the ESP BLE Provisioning APP on your Bluetooth enabled phone, see Figure 6 for images of these steps:

1. Press the `Provision Device` button.
2. Scan the QR code displayed in your serial terminal.
3. Select the Wi-Fi network to join and enter the credentials.
4. After confirming the Wi-Fi connection, press Ok.

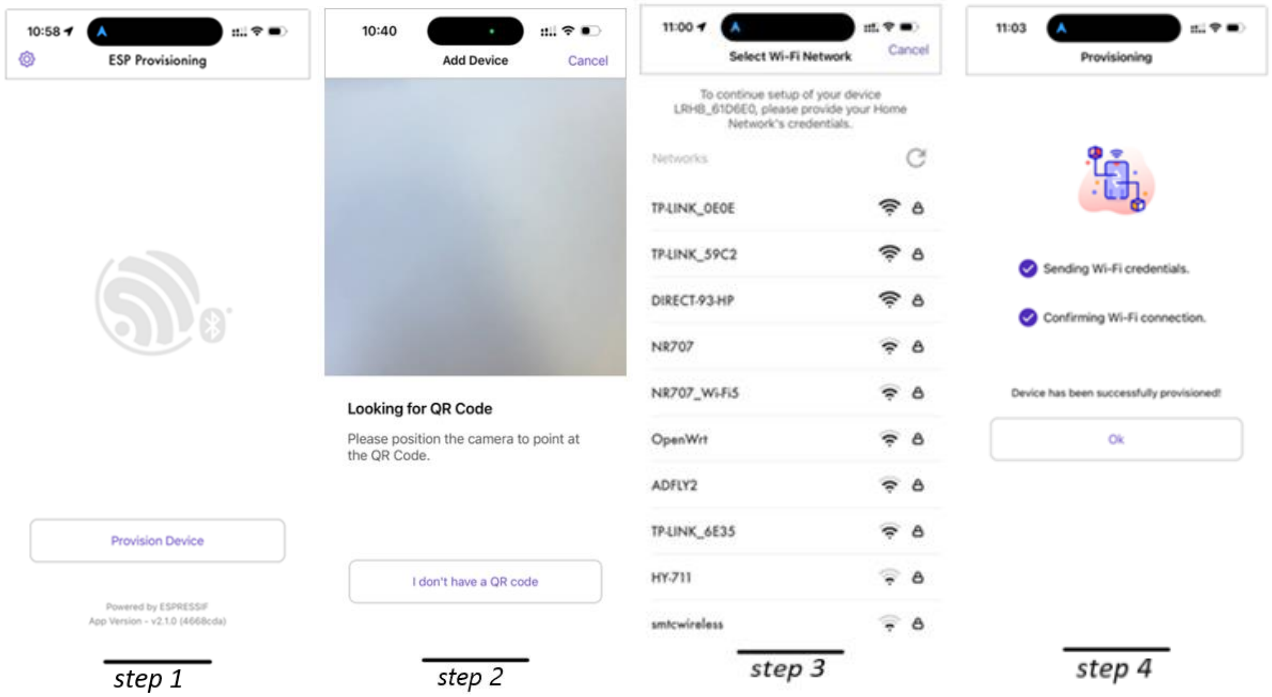

Figure 6: ESP BLE Provisioning Steps for Serial Terminal Configuration

III. Once the Hub is successfully connected to the network, the IP address and the Hub ID will scroll on the display of the Hub, for example 192.168.1.xxx – 744DBDFFFEXXXXXX.

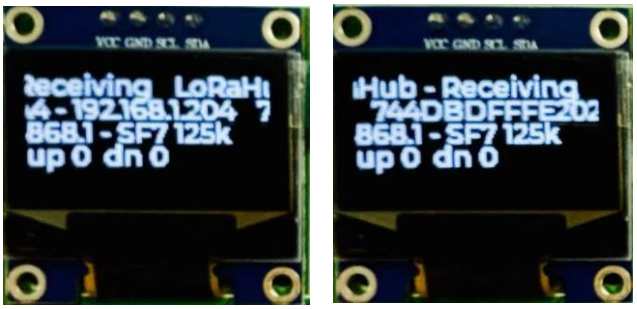

Figure 7: One channel Hub IP Address and ID

3.2.2 Using Bluetooth

I. Power on the Hub.

II. Open the ESP BLE Provisioning APP on your Bluetooth enabled phone, see Figure 8 for images of these steps:

1. Press the `Provision Device` button.
2. Press the button 'I don't have a QR code'.
3. Change the default 'PREFIX' to 'LRHB_', then search for Devices like 'LRHB_617C30'.
4. Press 'Next'.
5. Select the Wi-Fi network to join and enter the credentials.
6. After confirming the Wi-Fi connection, press Ok.

III. Once the Hub is successfully connected to the network, the IP address and the Hub ID will also scroll on the display of the Hub (see Figure 7).

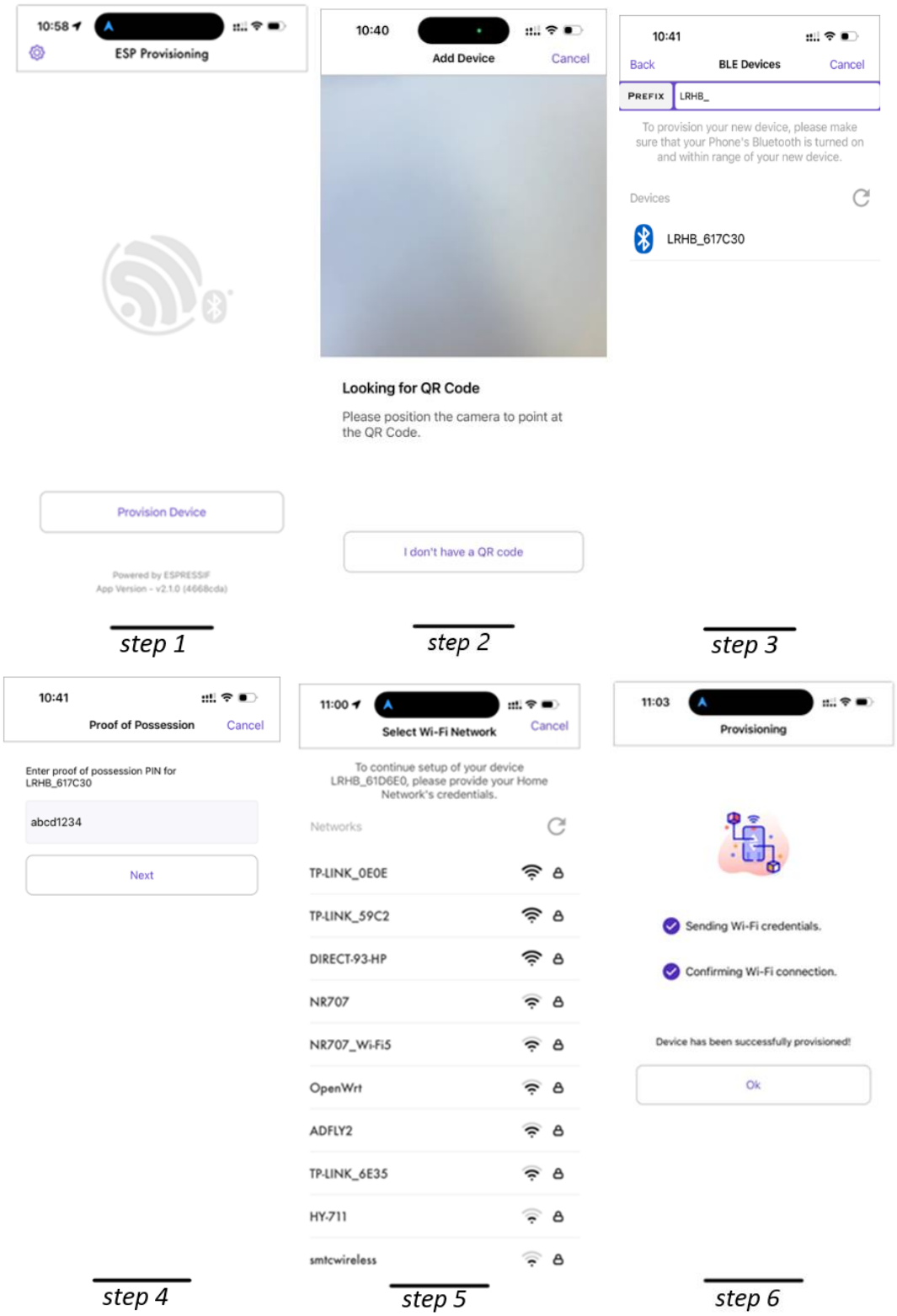

Figure 8: ESP BLE Provisioning Steps for USB Configuration

4 Using the Hub

4.1 Configure the Hub on Web UI

The Hub settings can be modified via a web page:

1. Connect your PC to the same WAN as the Hub.
2. Access the web page using the IP address displayed on the Hub and port 8000, in our example the URL would be: http://192.168.1.xxx:8000/.

A default configuration is shown on the screen, see figure below. You can modify any of these settings, then :

1. Click “configure” to save them.
2. Press “reboot” for the Hub to apply the settings.

The Hub is configured.

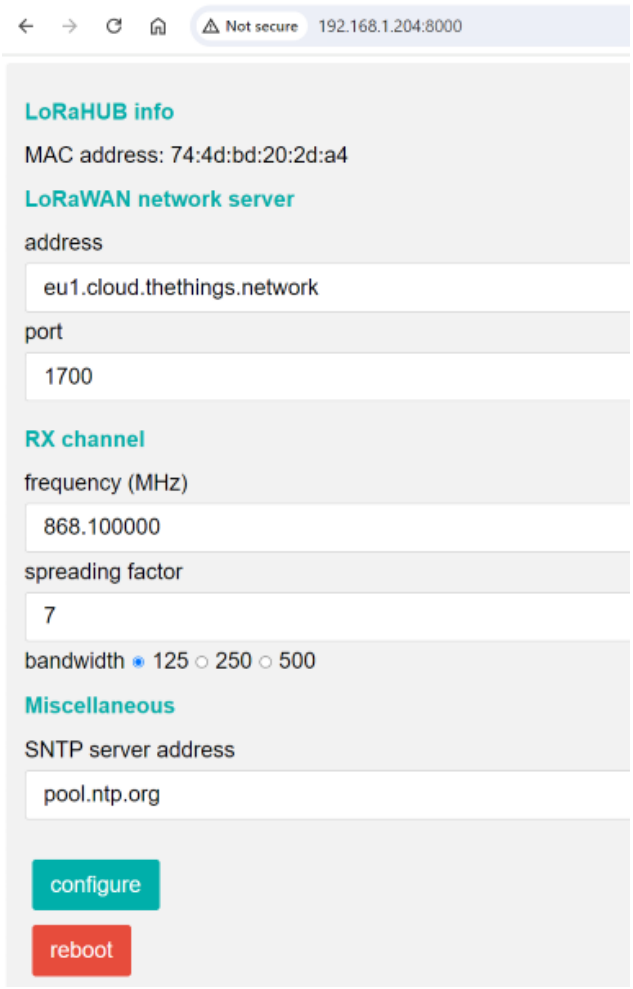

Figure 9: Hub Configuration Web UI

4.2 Register the Hub on the Network Server

I. Get the Hub ID using one of these methods:

1. Serial terminal.
2. 

3. Display screen, see in Figure 7.
4. Hub configuration web UI shows the MAC address, see in Figure 9. The Hub ID is the MAC address with FFFE added in the middle.

II. Register it on the NS. It will be shown on the NS.

5 Upgrading the Firmware

When the Hub EVK is delivered, the ESP32 is already flashed with a default firmware. If you need to update or reflash this firmware, follow these steps.

1. Download the ESP tools from this location: https://github.com/espressif/esptool.
2. Run the following command line to download the appropriate 3 bin files into the Hub.
   The file paths marked in blue should be modified according to the customer environment.
   If the esptool and bin files are in the same directory, just remove the file paths.
   The **bin files** also need to be modified according to the shield, see **Error! Reference source not found.**.

```
esptool.exe --chip esp32s3 --port COMxx --baud 460800 --before=default_reset --after=hard_reset write_flash --flash_mode dio --flash_freq 80m --flash_size 2MB 0x0 /path/to/xxx_bootloader.bin 0x10000 /path/to/xxx_lorahub.bin 0x8000 /path/to/xxx_partition-table.bin
```

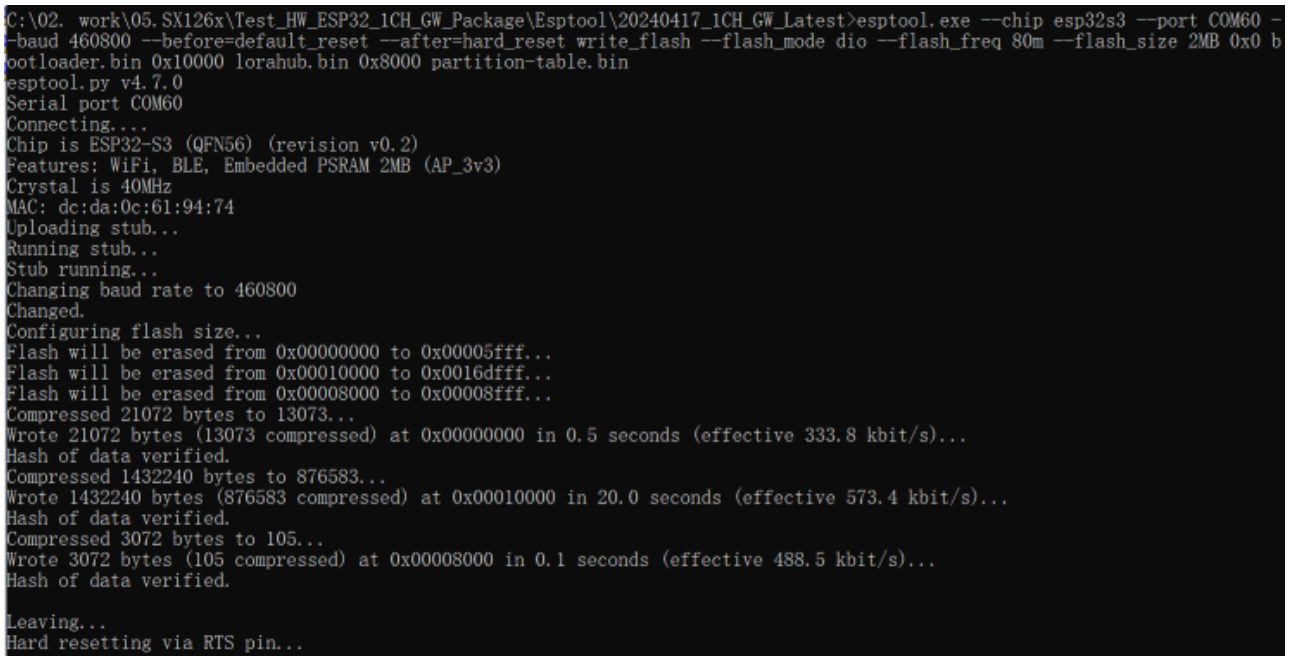

Figure 10: Information Shown After Downloading the Bin Files

All the binary files for different platforms and shields are located in the project repository, under the /bin directory：

https://github.com/Lora-net/one_channel_hub/bin

When the FW upgrade is finished, the screen will look like the figure below.

Figure 11: Display Information After Downloading the Bin Files

6 Glossary

Term	Description
LoRa®	Long Range Communication The LoRa® Mark is a registered trademark of the Semtech Corporation
LoRaWAN®	LoRa® Wide Area Network Standard The LoRaWAN® mark is used under license from the LoRa Alliance®
NS	Network Server
SF	LoRa® modulation Spreading Factor

7 Revision History

Version	Date	Changes and/or Modifications
01.00	Sept 2024	Initial Release

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