

# RAINGUAGE

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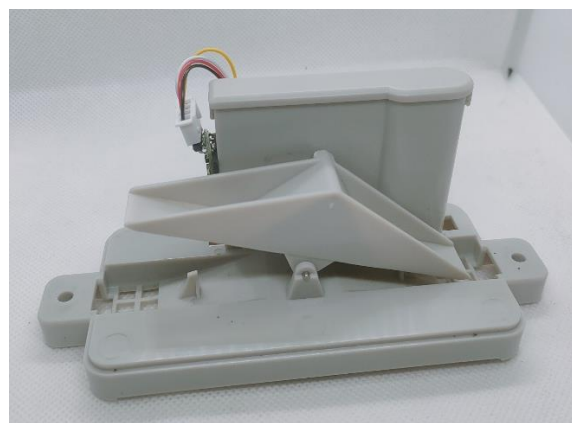
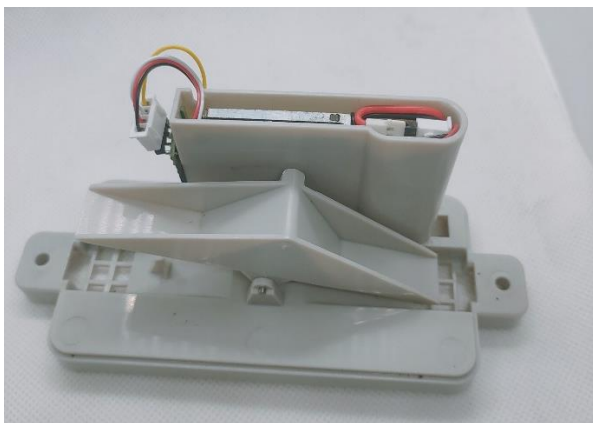
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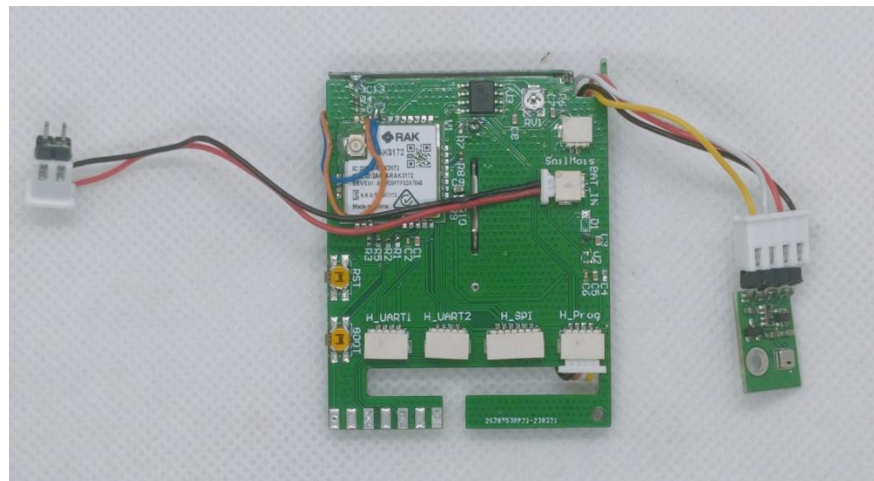
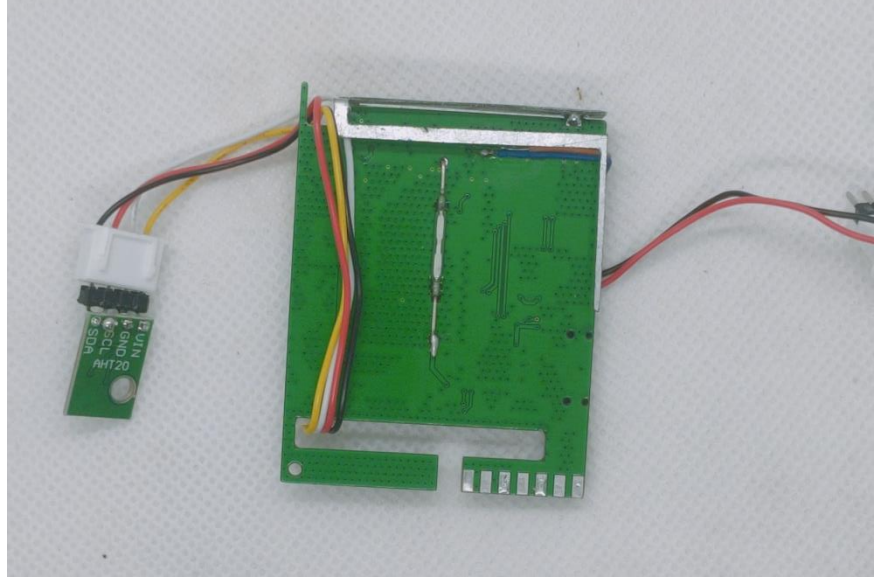
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## 1. Product Overview

RainGUAGE - This is a rainfall device with a built-in temperature and humidity sensor.

- MCU: Rak3172 base on stm32wle5ccu6.
- Sensor: AHT20 humidity & temperatue, Reed sensor.



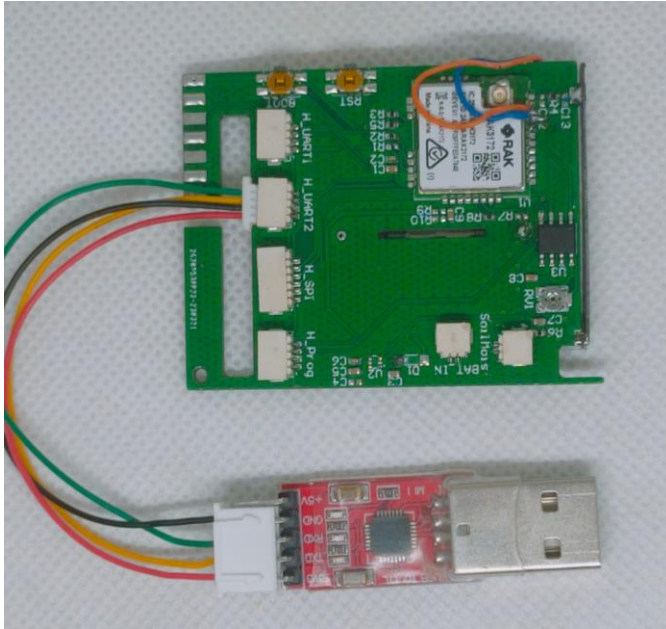


## 2. Load Code With Arduino

### 2.1. Hardware connect

To load the code for the device. Need to connect device to usb uart using grove connector UART2. Connect as shown in the picture below

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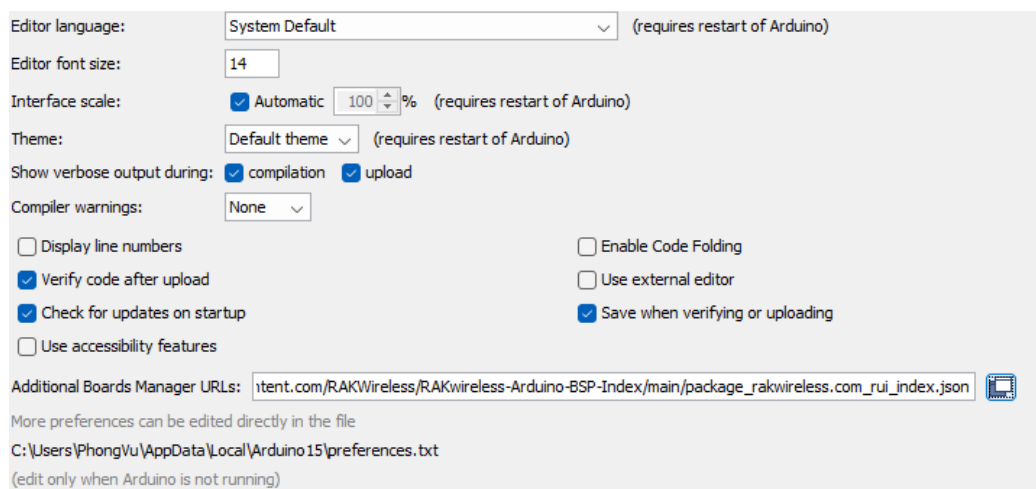


## 2.2. Install on arduino

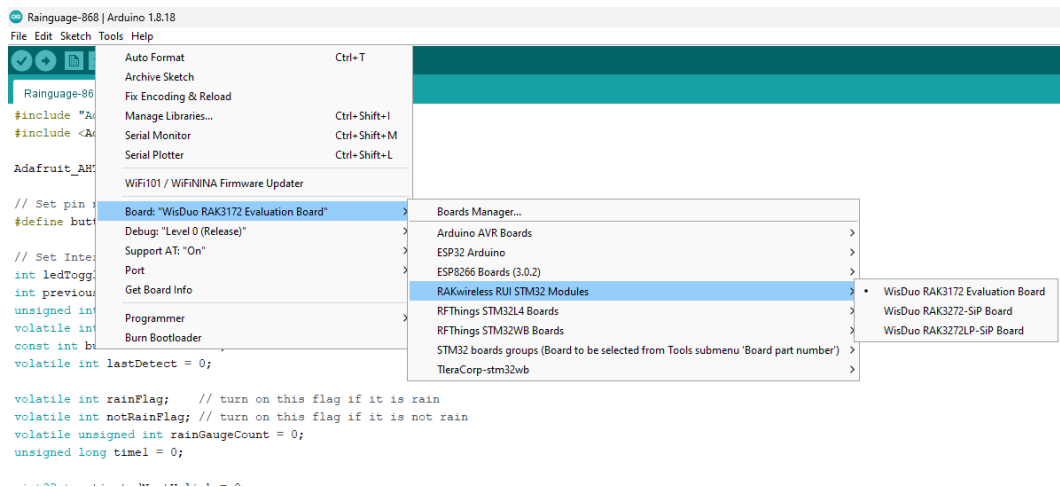
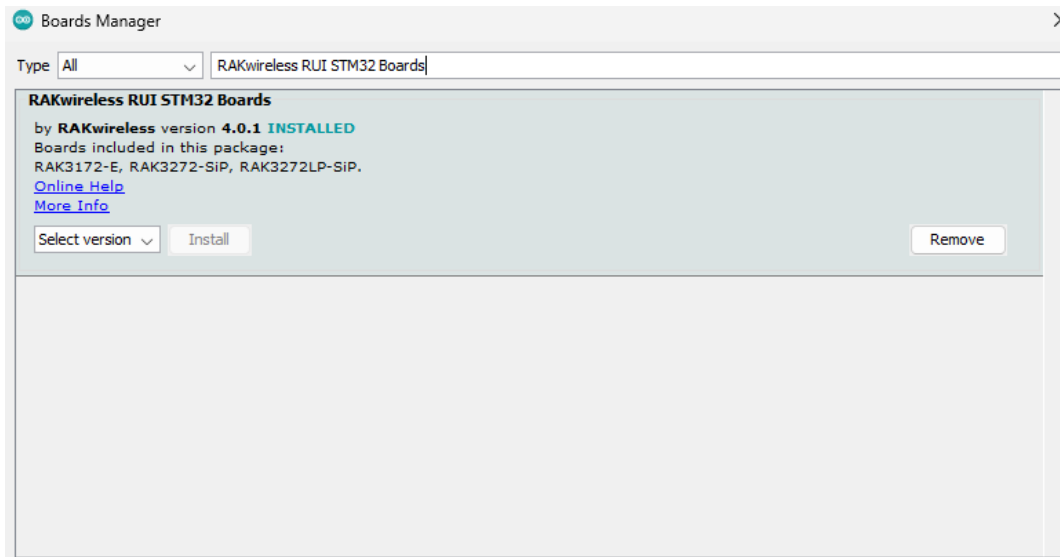
Add RAK3172 as a supported board in Arduino IDE by updating Board Manager URLs in Preferences settings of Arduino IDE with the JSON URL below.

[https://raw.githubusercontent.com/RAKWireless/RAKwireless-Arduino-BSP-Index/main/package\\_rakwireless.com\\_rui\\_index.json](https://raw.githubusercontent.com/RAKWireless/RAKwireless-Arduino-BSP-Index/main/package_rakwireless.com_rui_index.json)

After that, you can then add RAKwireless RUI STM32 Boards via Arduino board manager.



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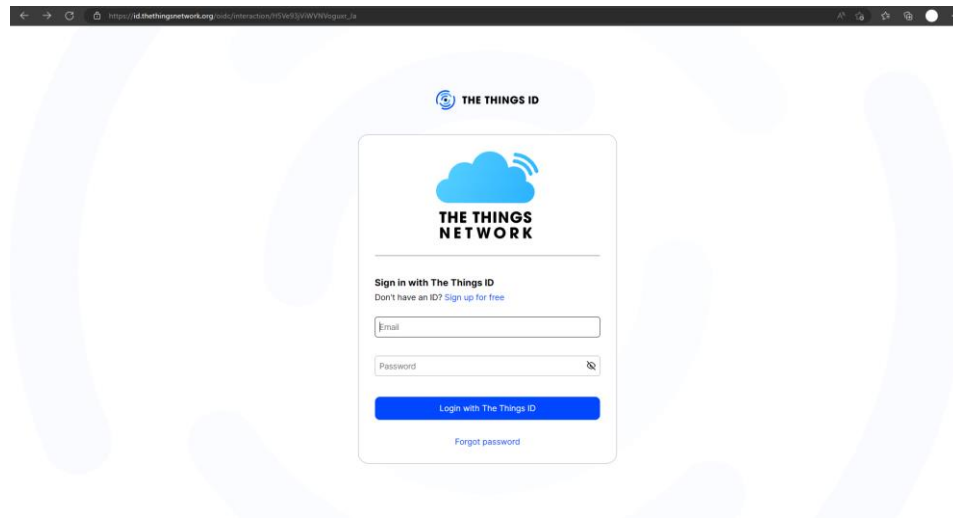
After completing the config on the arduino you can start programming.

## 2.3. The things network

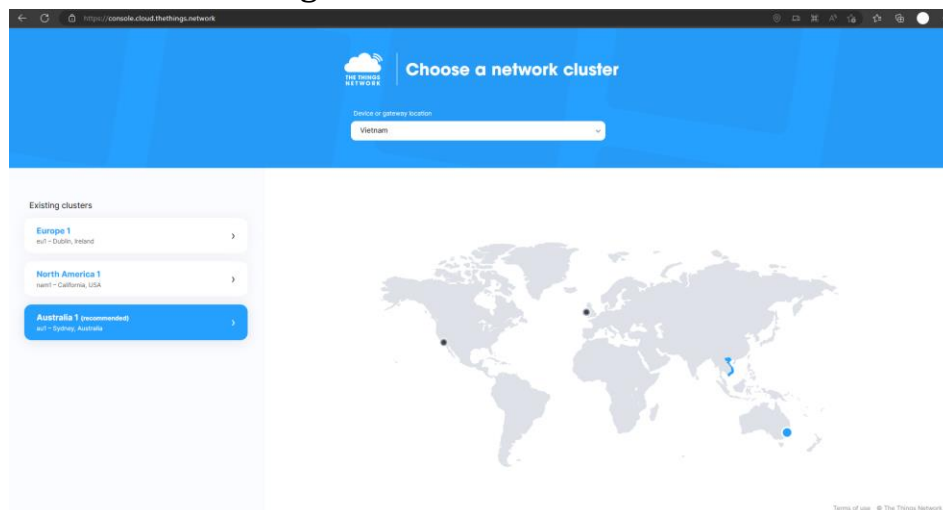
To use TheThingsNetwork server

- Create an account on the TTN website.

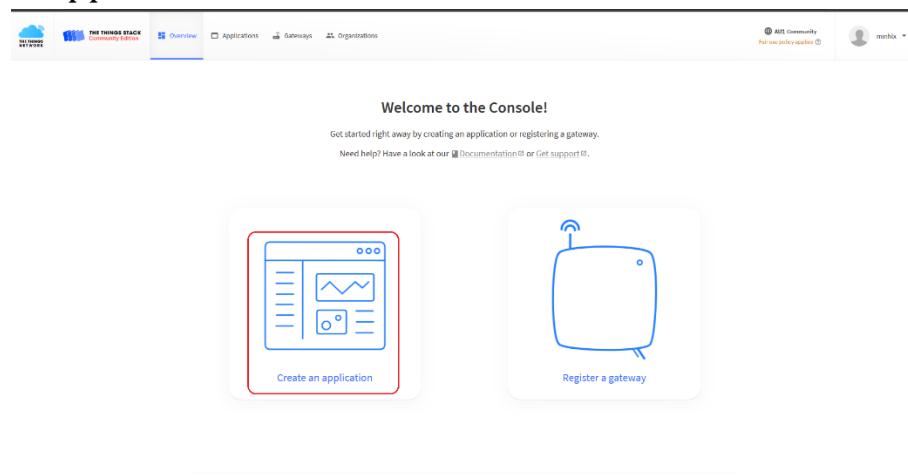
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- If you already have an account, go to:  
<https://console.cloud.thethings.network/> choose your region . I choose the au1 region here because I'm in Vietnam



- Create an application on TTN.



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The screenshot shows the 'Create application' page in The Things Stack Community Edition. The top navigation bar includes 'Overview', 'Applications' (selected), 'Gateways', and 'Organizations'. The main heading is 'Create application'. Below it, a paragraph explains that within applications, users can register and manage end devices and their network data, and provides a link to 'Adding Applications'. The form contains three fields: 'Application ID' with the value 'rthings-raingauge', 'Application name' with the value 'RFThings Product', and 'Description' with the value 'Description for my new application'. A 'Create application' button is at the bottom.

**Create application**

Within applications, you can register and manage end devices and their network data. After setting up your device fleet, use one of our many integration options to pass relevant data to your external services.  
Learn more in our guide on [Adding Applications](#).

Application ID \*

Application name

Description

Optional application description; can also be used to save notes about the application

Create application

- Register your device on TTN.

The screenshot shows the 'RFThings Product Raingauge' application page in The Things Stack Community Edition. The left sidebar shows the 'End devices' tab selected. The main content area displays the application details, including the application ID 'rthings-raingauge-device', creation and update timestamps, and a table for 'End devices (0)'. The top right shows the user 'minthick' and the 'Register end device' button highlighted with a red box.

RFThings Product Raingauge

Overview

End devices

Live data

Payload formatters

Integrations

Collaborators

API keys

General settings

Applications > RFThings Product Raingauge

**RFThings Product Raingauge**

ID: rthings-raingauge-device

No recent activity

General information

Application ID

Created at

Last updated at

End devices (0)

ID

Name

Join EU

Last activity

ms found

Import end devices

Register end device

- Configure your device to communicate with TTN.

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## Register end device

Does your end device have a LoRaWAN® Device Identification QR Code? Scan it to speed up onboarding.

[Scan end device QR code](#) [Device registration help](#)

### End device type

#### Input method

- ☐ Select the end device in the LoRaWAN Device Repository
- ☒ Enter end device specifics manually

#### Frequency plan

South Korea 920-923 MHz

#### LoRaWAN version

LoRaWAN Specification 1.0.3

#### Regional Parameters version

RP001 Regional Parameters 1.0.3 revision A

[Show advanced activation, LoRaWAN class and cluster settings](#)

#### Activation mode

- ☒ Over the air activation (OTAA)
- ☐ Activation by personalization (ABP)
- ☐ Define multicast group (ABP & Multicast)

#### Additional LoRaWAN class capabilities

None (class A only)

### Provisioning information

#### JoinEUI

00 00 00 00 00 00 00 01

Reset

This end device can be registered on the network

#### DevEUI

70 B3 D5 7E D0 05 D0 F2

Generate

1/50 used

#### AppKey

7C 72 8A 7F CA 20 5A 4D 4E A4 AF 95 33 DA 38 48

Generate

#### End device ID

raingauge-device

This value is automatically prefilled using the DevEUI

#### After registration

- ☒ View registered end device
- ☐ Register another end device of this type

Register end device

- Set up integrations to connect your device data to other systems.

raingauge-device

ID: raingauge-device

↑ n/a ↓ n/a No activity yet

Overview Live data Messaging Location Payload formatters Claiming

### General information

End device ID: raingauge-device

Frequency plan: South Korea 920-923 MHz

LoRaWAN version: LoRaWAN Specification 1.0.3

Regional Parameters version: RP001 Regional Parameters 1.0.3 revision A

Created at: Apr 27, 2023 15:31:09

### Activation information

AppEUI: 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x01

DevEUI: 0x70, 0xB3, 0xD5, 0x7E, 0xD0, 0x05, 0xD0, 0xF2

AppKey: 0x7C, 0x72, 0x8A, 0x7F, 0xCA, 0x20, 0x5A, 0x4D, 0x4E, 0xA4, 0xAF, 0x95, 0x33, 0xDA, 0x38, 0x48

```

#define OTAA_PERIOD (900000)
// #define RAIN_STOP_TIME (6000)
/*****

LoRaWAN band setting:
RAF_REGION_EU433
RAF_REGION_CN470
RAF_REGION_RU864
RAF_REGION_IN865
RAF_REGION_EU868
RAF_REGION_US915
RAF_REGION_AU915
RAF_REGION_KR920
RAF_REGION_AS923

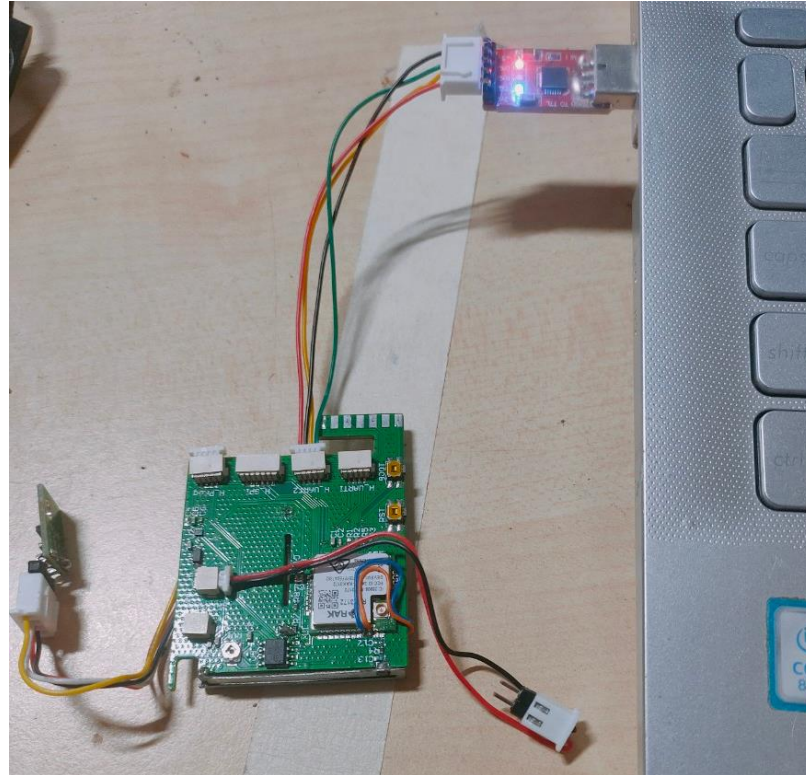
*****/

#define OTAA_BAND (RAF_REGION_KR920)
#define OTAA_DEVEUI {0x70, 0xB3, 0xD5, 0x7E, 0xD0, 0x05, 0xD0, 0xF2}
#define OTAA_APEEUI {0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x01}
#define OTAA_APPKEY {0x7C, 0x72, 0x8A, 0x7F, 0xCA, 0x20, 0x5A, 0x4D, 0x4E, 0xA4, 0xAF, 0x95, 0x33, 0xDA, 0x38, 0x48}
    
```

- Test and verify that your device is successfully sending data to TTN.



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Rainguage-868

```
uint32_t estimatedNextUplink = 0;

// Set sensor variables
int temper;
int humi;

// Rain Stop Time
uint64_t lastRain = 0; // the last time when it was rain
uint64_t elapsedRain;
uint64_t spendTime; // the remaining time before wake up in period OTAA

bool bucketPositionA = false; // one of the two positions of tipping-bucket
// const double bucketAmount = 0.01610595; // inches equivalent of ml to trip tipping-bucket

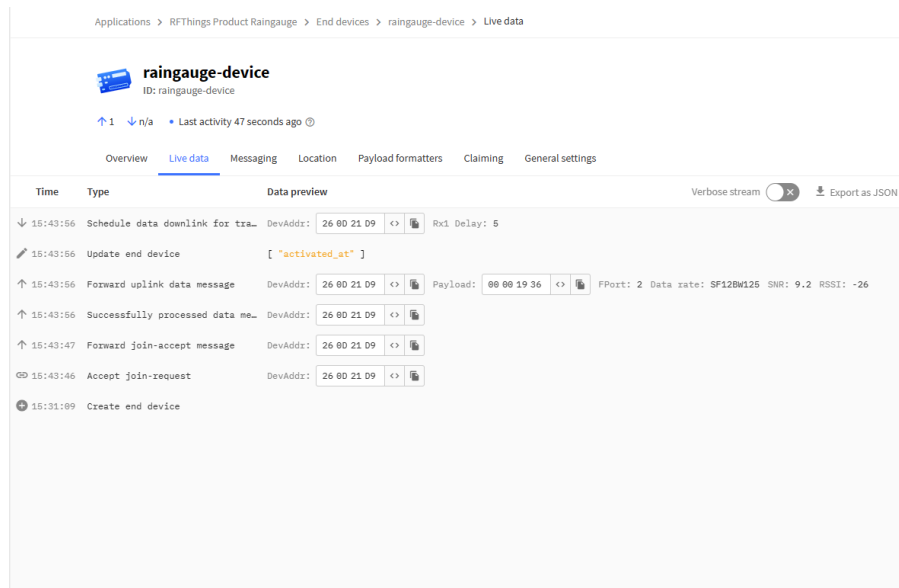
#define OTAA_PERIOD (900000)
// #define RAIN_STOP_TIME (6000)
/*****

LoRaWAN band setting:
RAK_REGION_EU433
RAK_REGION_CN470
RAK_REGION_RU864
RAK_REGION_IN865
RAK_REGION_EU868
RAK_REGION_US915
RAK_REGION_AUS15
RAK_REGION_KR920
RAK_REGION_47023
```

```
Done uploading.
[S] TRANSMISSION: block 188 (seq=189) sent
[S] TRANSMISSION: block 189 (seq=190) sent
[S] TRANSMISSION: block 190 (seq=191) sent
[S] TRANSMISSION: Reached EOF
[S] TRANSMISSION: EOT sent and awaiting ACK
[S] TRANSMISSION: Finished (ACK received)
[S] TRANSMISSION: SEND NULL

Entering boot mode
Device is in boot mode
Upgrade Complete
```

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- In case of loading the code for the device, there is an error:

```
Done uploading.
Sketch uses 164216 bytes (81%) of program storage space. Maximum is 200704 bytes.
Global variables use 28704 bytes (59%) of dynamic memory, leaving 19936 bytes for local variables. Maximum is 48640 bytes.
Device is not in boot mode
Detecting baudrate.....
Detect baudrate fail, can not get the baudrate
```

You need to double-check your code, which may cause the MCU to stop and not be able to load the code.

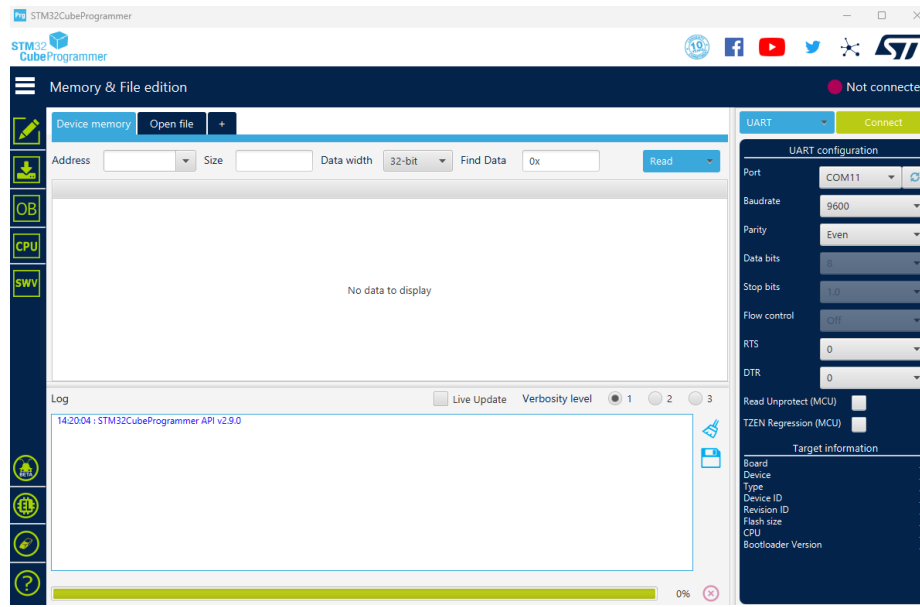
To be able to reload the code you need to reload the firmware for your device

## 3. Firmware reload for rak3172

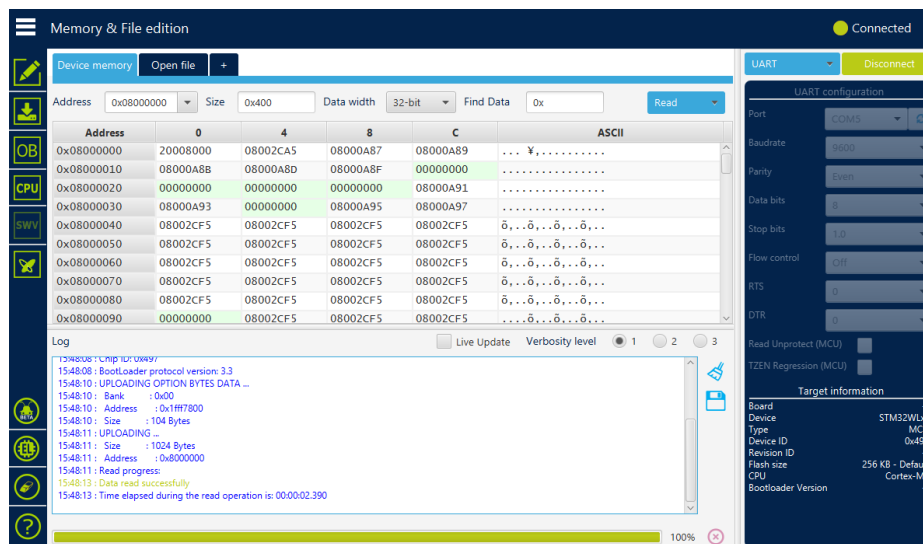
Using stm32progaming 2.9.0 to upload firmwave RUI3 for rak3172

<https://www.st.com/en/development-tools/stm32cubeprog.html>

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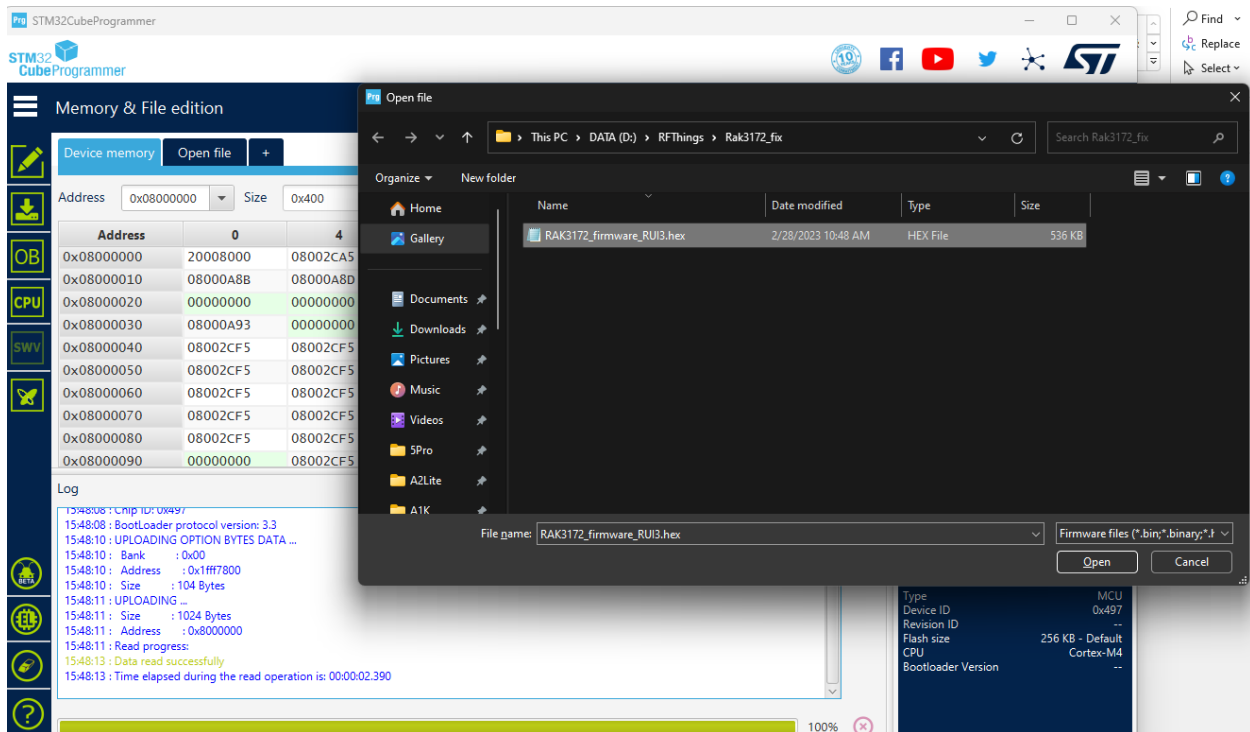


To upload firmware, you must leave the device in boot state, hold down the boot button and press reset.



Select Open file -> rak3172\_firmwave\_RUI3.hex-> download

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Now you can use the arduino IDE to load the device code.

