Quick Start Guide

Prerequisites

What do you need?

Before going through each and every step in the installation guide of the RAK5205 WisTrio LPWAN Tracker, make sure to prepare the necessary items listed below:

1. **RAK5205 WisTrio LPWAN Tracker**
2. Micro USB Cable
3. Gateway in Range for Testing
4. Windows PC

> 📝 **NOTE**
>
> This device released by RAKWireless is already pre-loaded with its latest firmware upon manufacturing. If you want to have your device firmware burned or upgraded, refer to the sections below:
>
> 1. Burning the Bootloader
> 2. Upgrading the Firmware

What's Included in the Package?

- 1pc - RAK5205 WisTrio LPWAN Tracker
- 1pc - Micro USB Cable
- 1pc - LoRa Antenna
- 1pc - GPS Antenna
- 1pc - Battery connector cable (JST) - requires soldering
- 5pcs - Jumper Caps
- Male to Female Jumper Wires

Product Configuration

Interfacing with the RAK5205 WisTrio LPWAN Tracker

To interface with the RAK5205 WisTrio LPWAN Tracker with your Windows PC, you need to download the RAK Serial Port Tool.

> ⚠️ **WARNING**
>
> Before powering the RAK5205, you should install the LoRa and GPS antenna first. Not doing so might damage the board.

Use Figure 1 as a reference to connect the antennas.

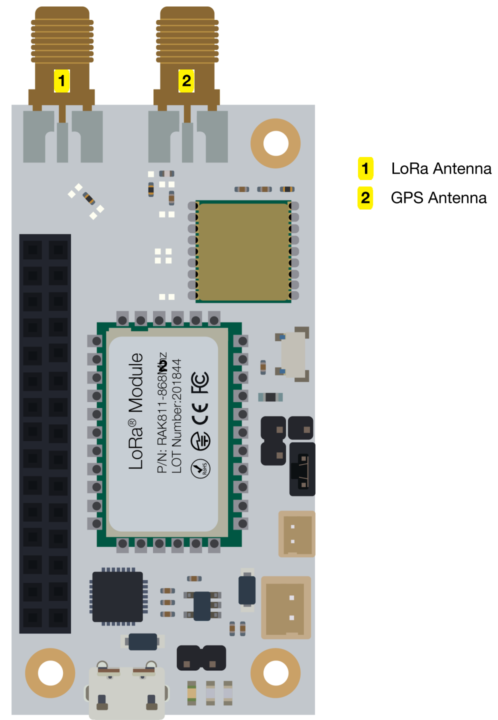

Figure 1: RAK5205 GPS and LoRa antenna

- Connect your RAK5205 WisTrio LPWAN Tracker in your Windows PC using the provided micro-usb cable.
- Open the RAK Serial Port Tool.

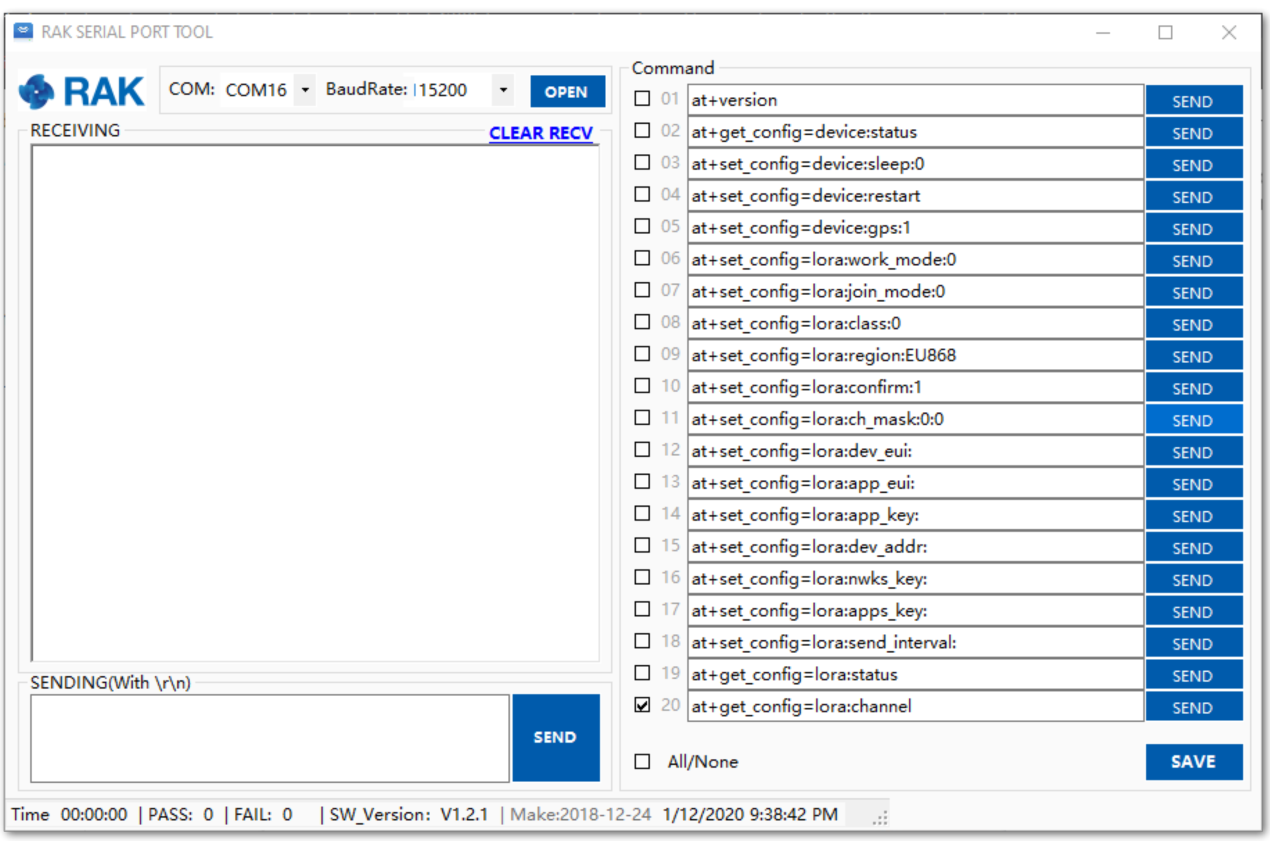

Figure 2: RAK Serial Port Tool

- To setup the correct COM Port number for your device, go to Device Manager by pressing **Windows + R** and type **devmgmt.msc**. Or, search for **devmgmt.msc** in the Start Menu.

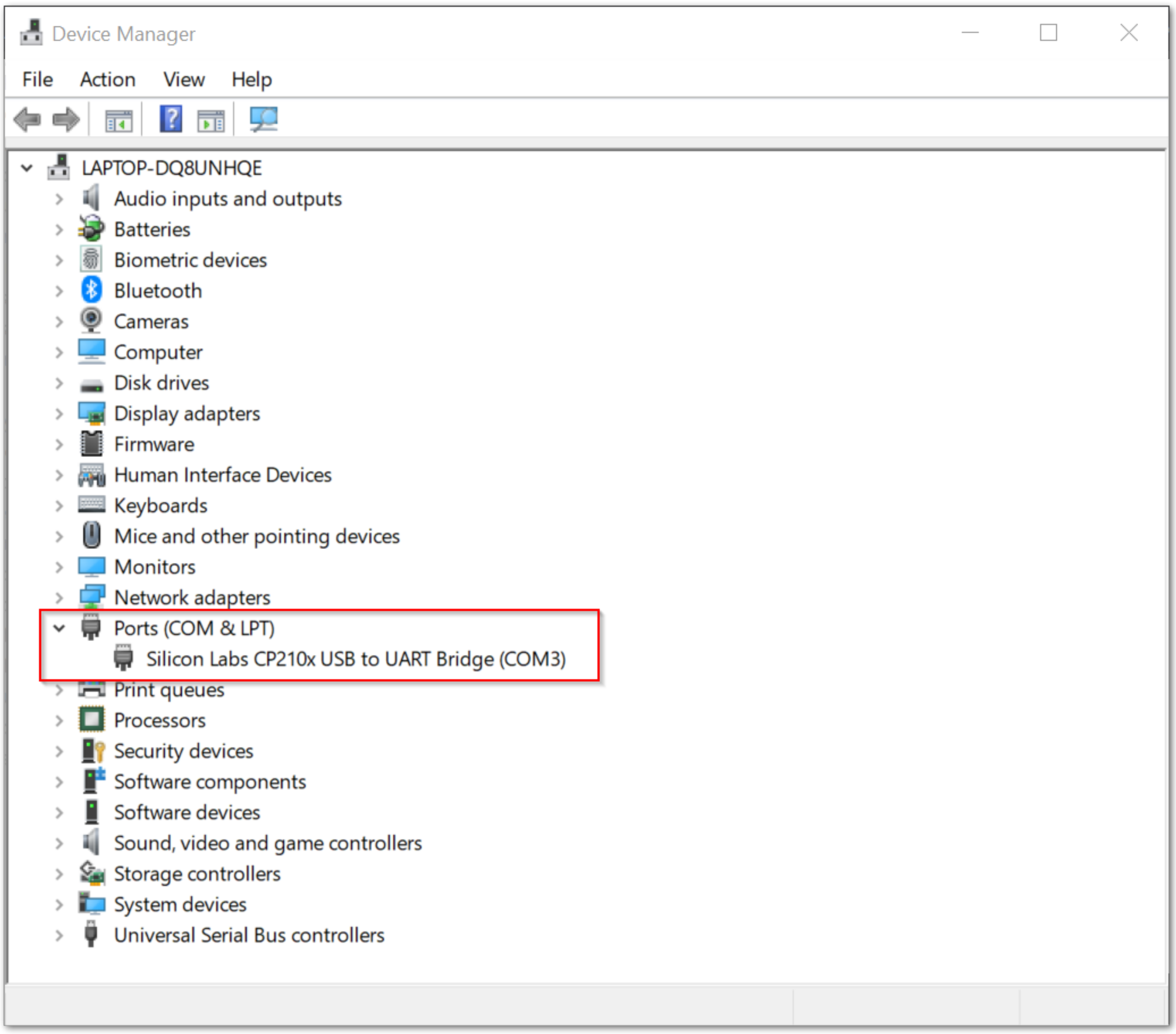

Figure 3: Device Manager

- Look for ports (COM & LPT) and find the name **Silicon Labs CP210X** USB to UART Bridge and take note of the COM Port Number.

> 📝 **NOTE**
>
> If you can't find any port with the name Silicon Labs CP210X, make sure you have installed the **CP210X Drivers** in your Windows PC.

- Choose the correct port number and baud rate from the device manager, then click **Open**.

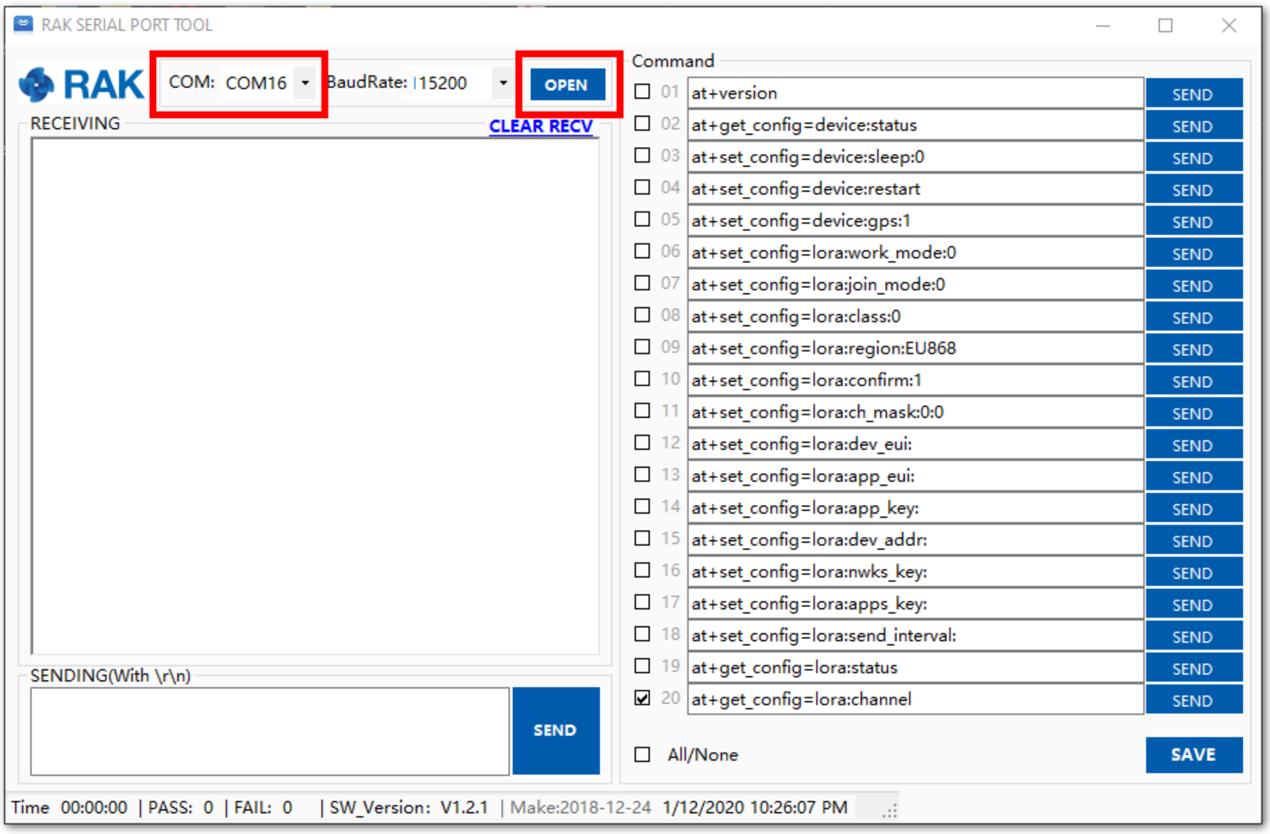

Figure 4: Correct COM Port and Baudrate

Connecting to The Things Network (TTN)

In this section, you will be connecting the RAK5205 WisTrio LPWAN Tracker to The Things Network (TTN). If you don't have an account yet, head on to TTN website and create one. Once done, log in to your account and go to the console.

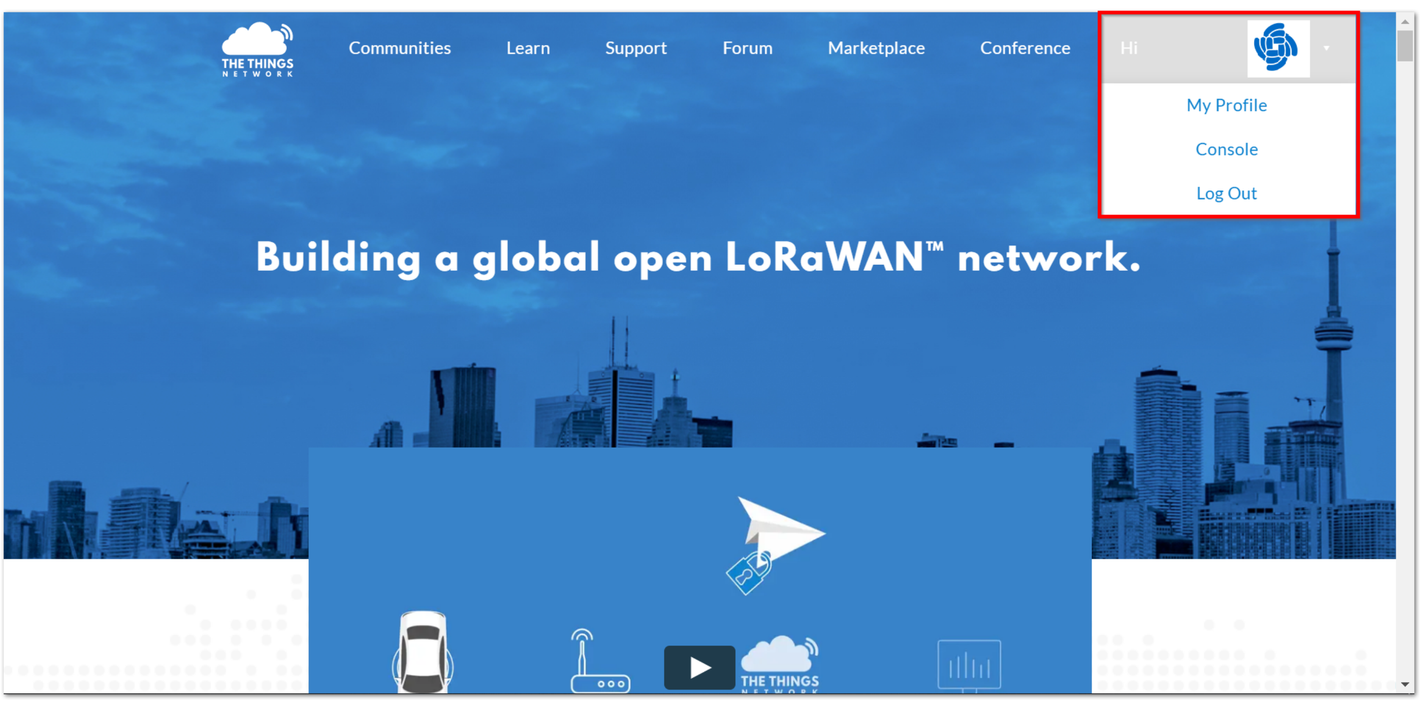

Figure 5: The Things Network Home Page

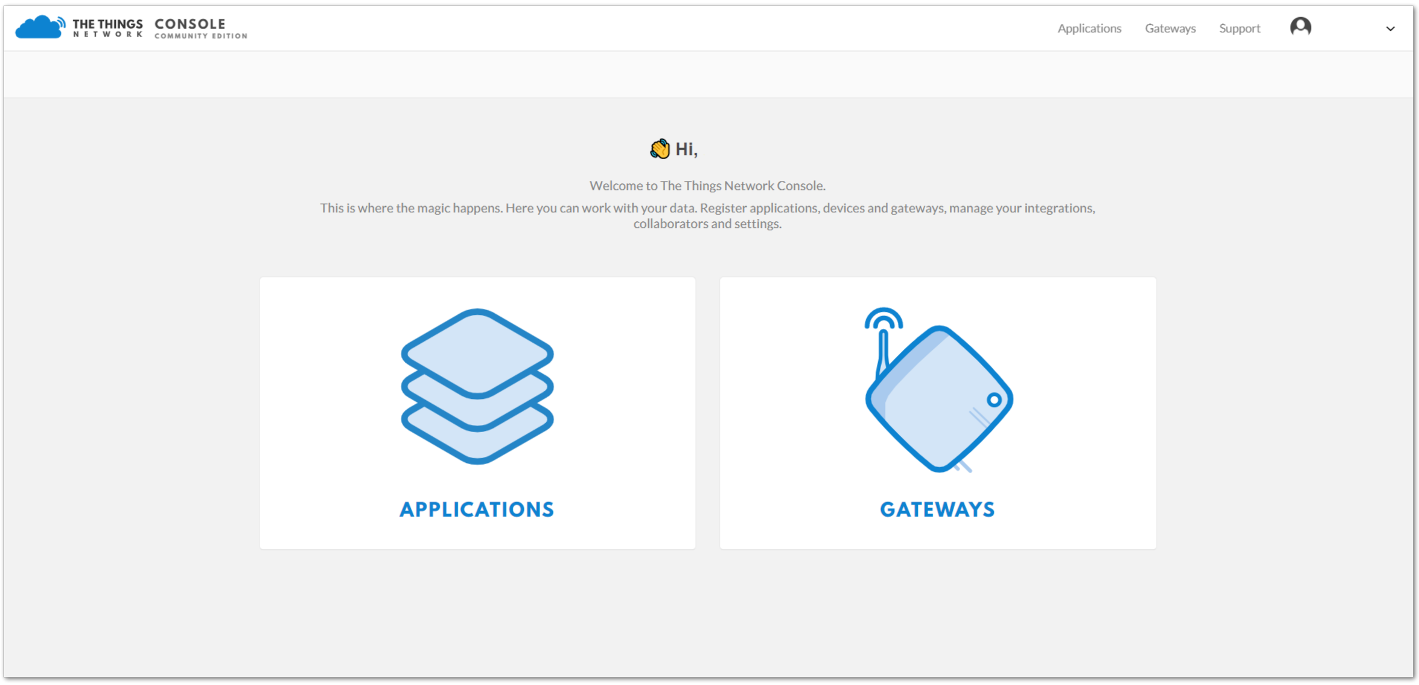

Figure 6: TTN Console Page

- Choose "**APPLICATIONS**".

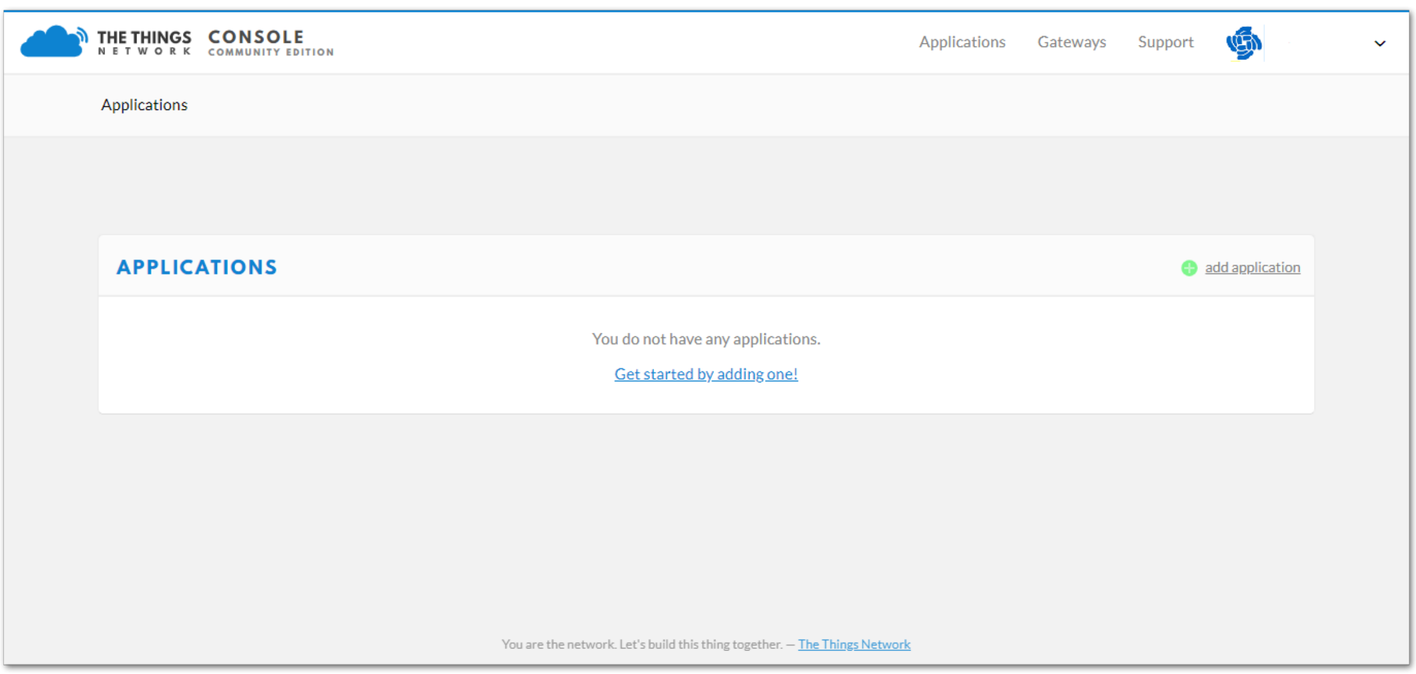

Figure 7: Application Page

Adding An Application

- Click the "**add application**" button.

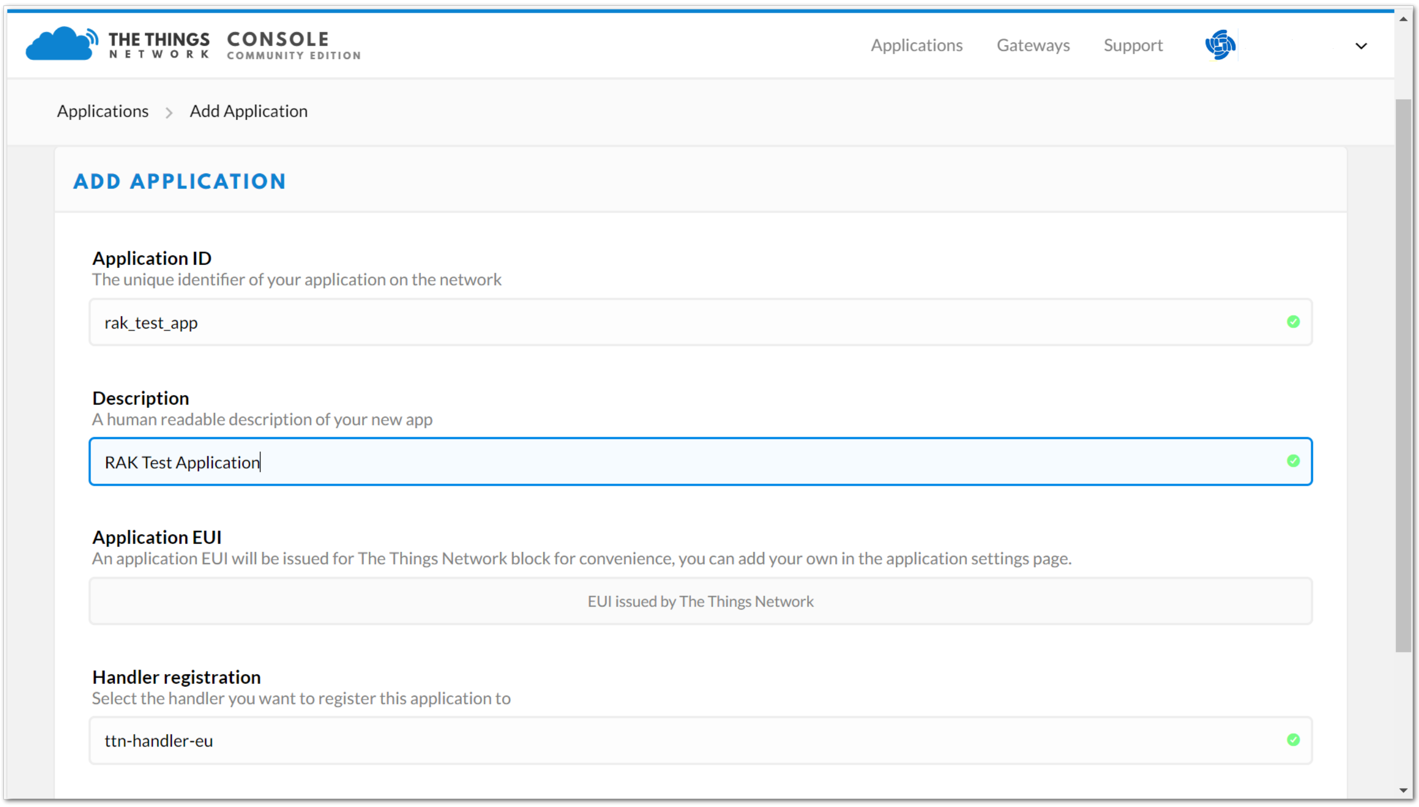

Figure 8: Adding an Application

Here are the things that you should take note in adding an application:

1. **Application ID** - this will be the unique id of your application in the Network. Note that characters should be in lower case, and no spaces are allowed.
2. **Description** - this is a short and concise human readable description of your application.
3. **Application EUI** - this will be generated automatically by The Things Network for convenience.
4. **Handler Registration** - handler you want to register this application to.

- After you fill in the necessary information, press the "**Add application**" button at the bottom of the page. If you see the same page as Figure 9, then this means that you have successfully registered your application.

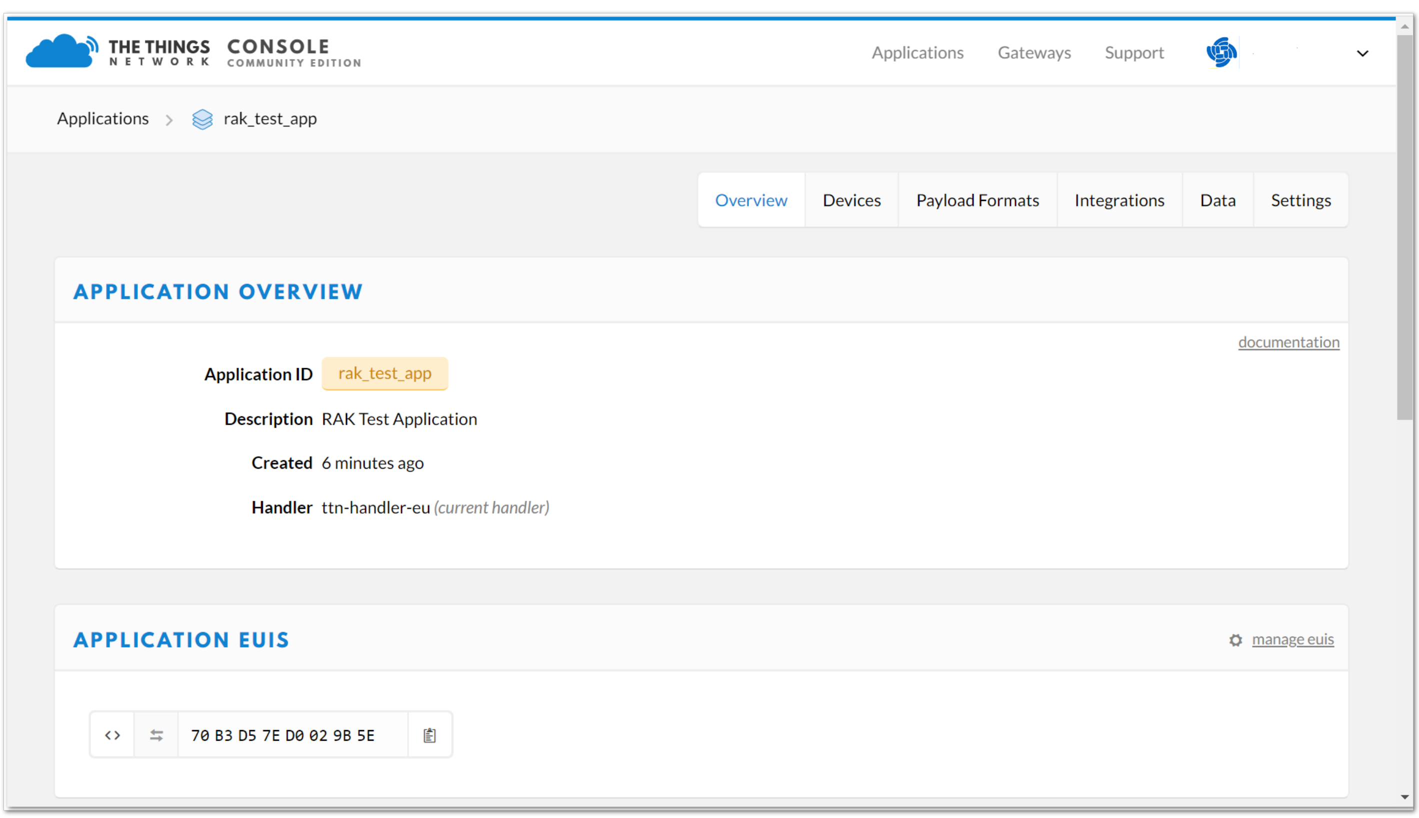

Figure 9: Application Overview

Register Device

- Scroll down until you see the Devices section, or you can also click the "**Devices**" button at the top.

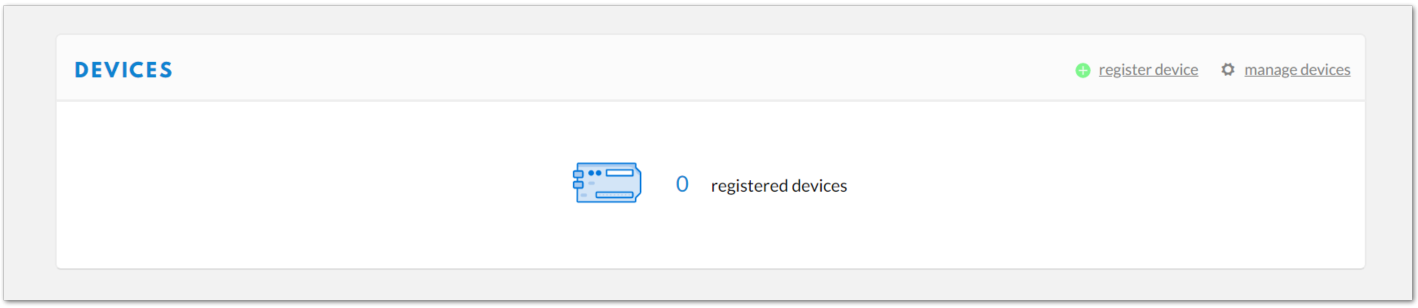

Figure 10: Device Section

- Click "**Register device**".

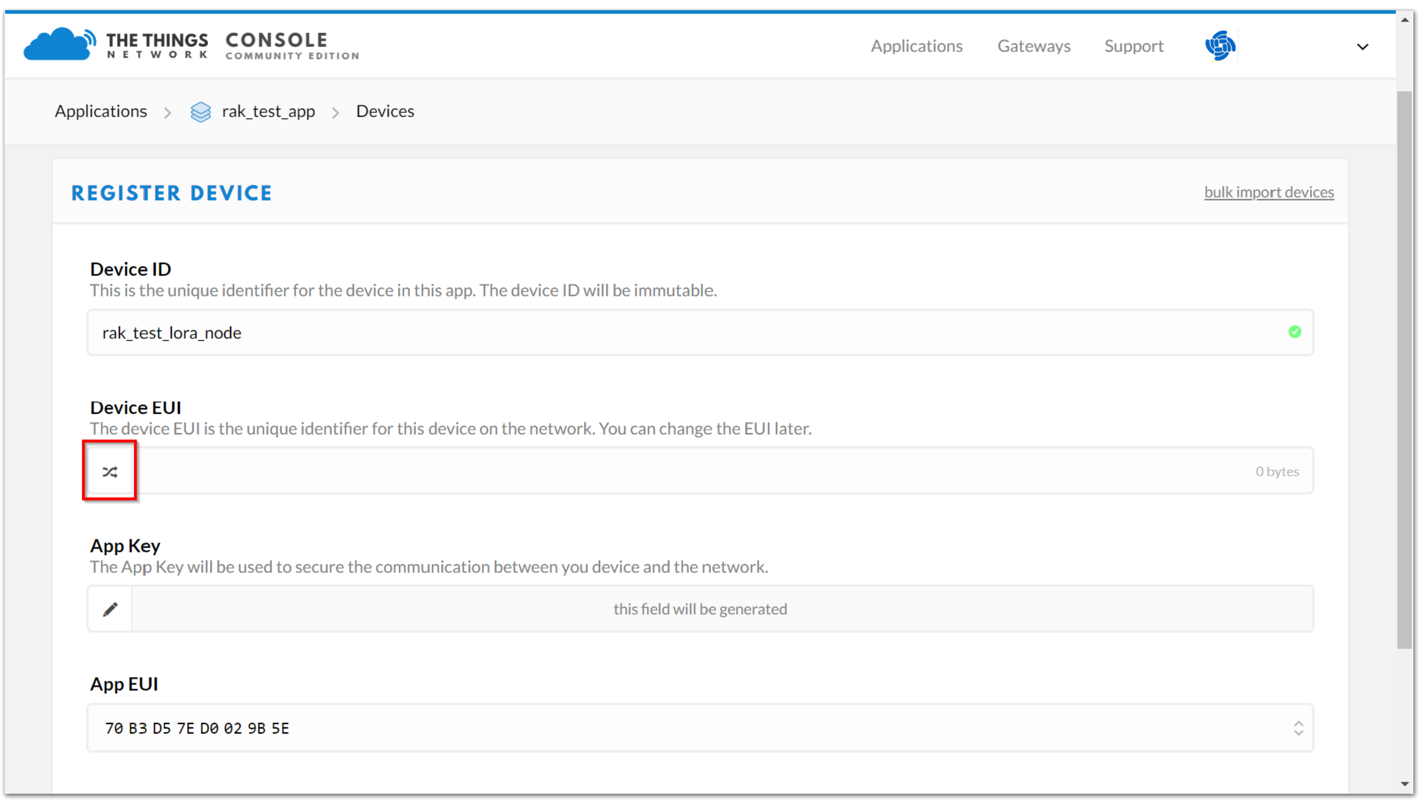

Figure 11: Add your Device

Here are the things that you should take note in registering your device:

1. **Device ID** - this is the unique identifier for your RAK5205 WisTrio LPWAN Tracker in your application. You need to enter this manually.
2. **Device EUI** - Device EUI of RAK5205 can be found on the sticker label of the RAK811 module. This will ensure you have a unique identification across LoRaWAN networks. You can still change it later, if you want.

The App Key should be in auto generation mode by default.

- Lastly, click the Register button. Now, your device is registered under the corresponding application.

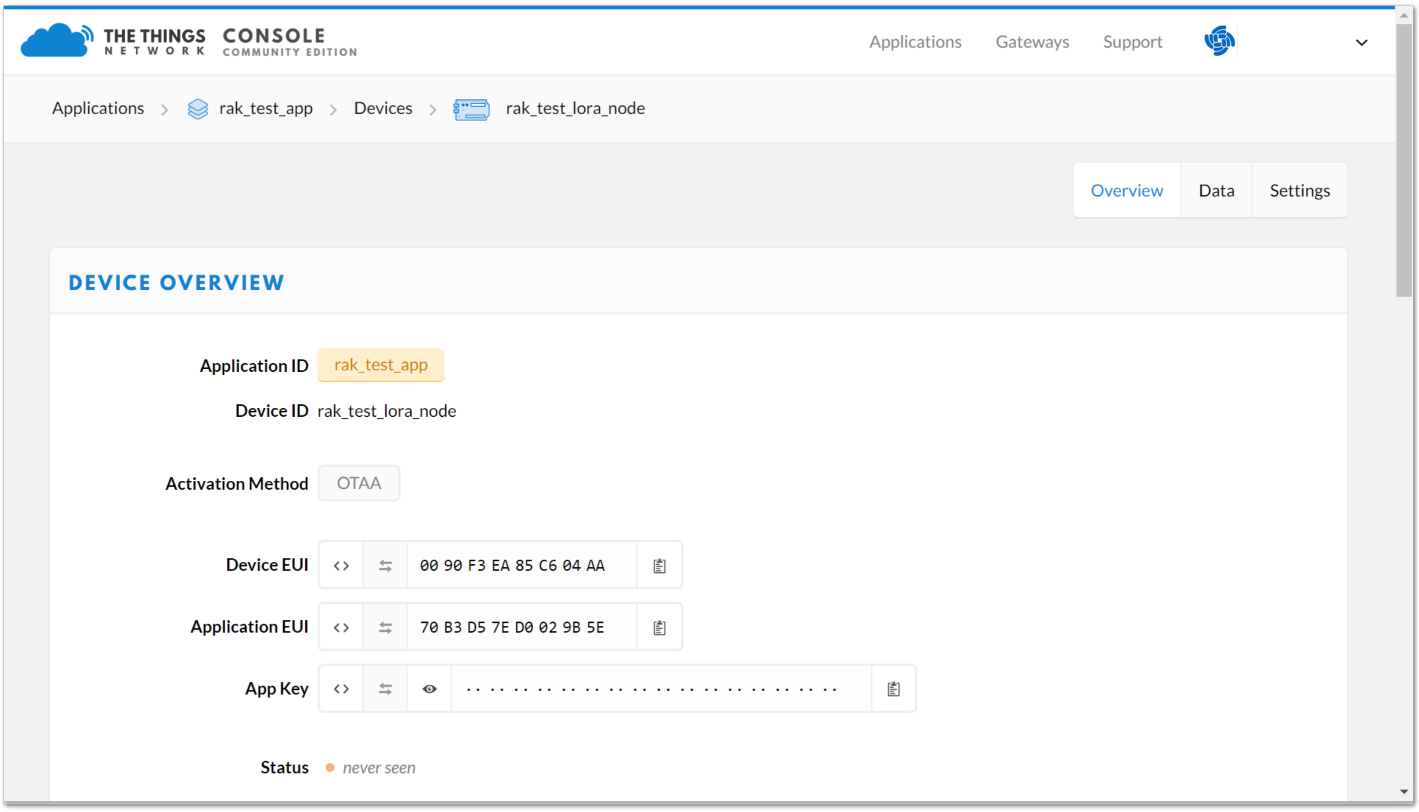

Figure 12: Device Overview

Depending on which authentication method you want to use, proceed to either the **OTAA mode** or **ABP mode** section.

OTAA Mode

When setting up a new device in TTN, its default mode is **OTAA** or **Over-the-Air Activation**. For configuration, you need the following three parameters: **Device EUI, Application EUI**, and **App Key**. You can get them all from the **Overview page**.

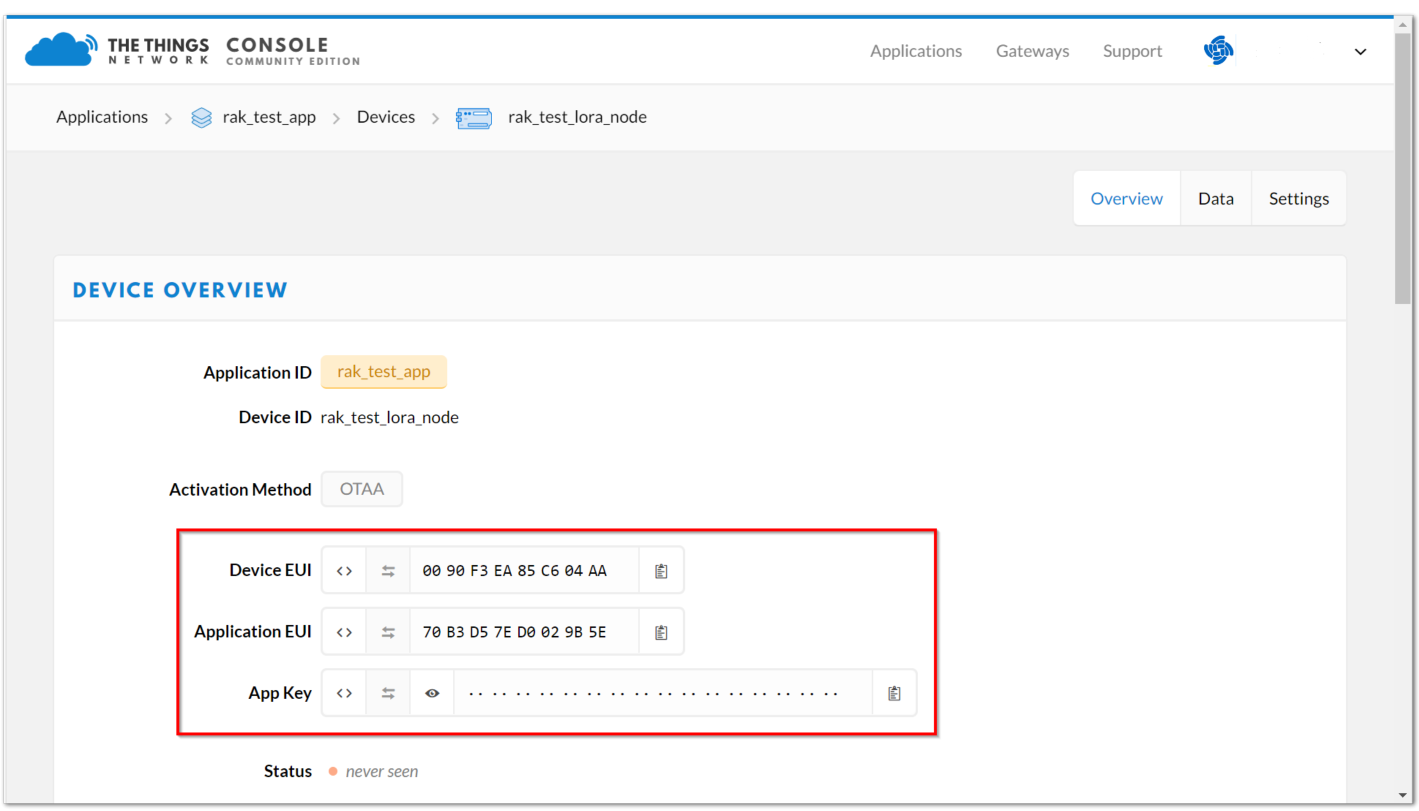

Figure 13: Device OTAA Parameters

Now, configure the RAK5205 to work in OTAA mode in the EU868 band, as an example.

📝 **NOTE**

The default LoRa working mode for the RAK5205 is LoRaWAN 1.0.2, while the default LoRa join mode is OTAA, and the default LoRa class is Class A.

1. Set mode to OTAA, device class to Class A and your LoRaWAN region to your correct frequency band, with the following set of commands below. Remember to replace XXX with the your LoRaWAN region. Refer to RAK5205 Datasheet for your frequency plan.

```
at+set_config=lora:join_mode:0
```

```
at+set_config=lora:class:0
```

```
at+set_config=lora:region:XXX
```

📝 **NOTE**

RAK5205 will be sleeping most of the time. You need to input again the command if the reply you get is **Wake up**.

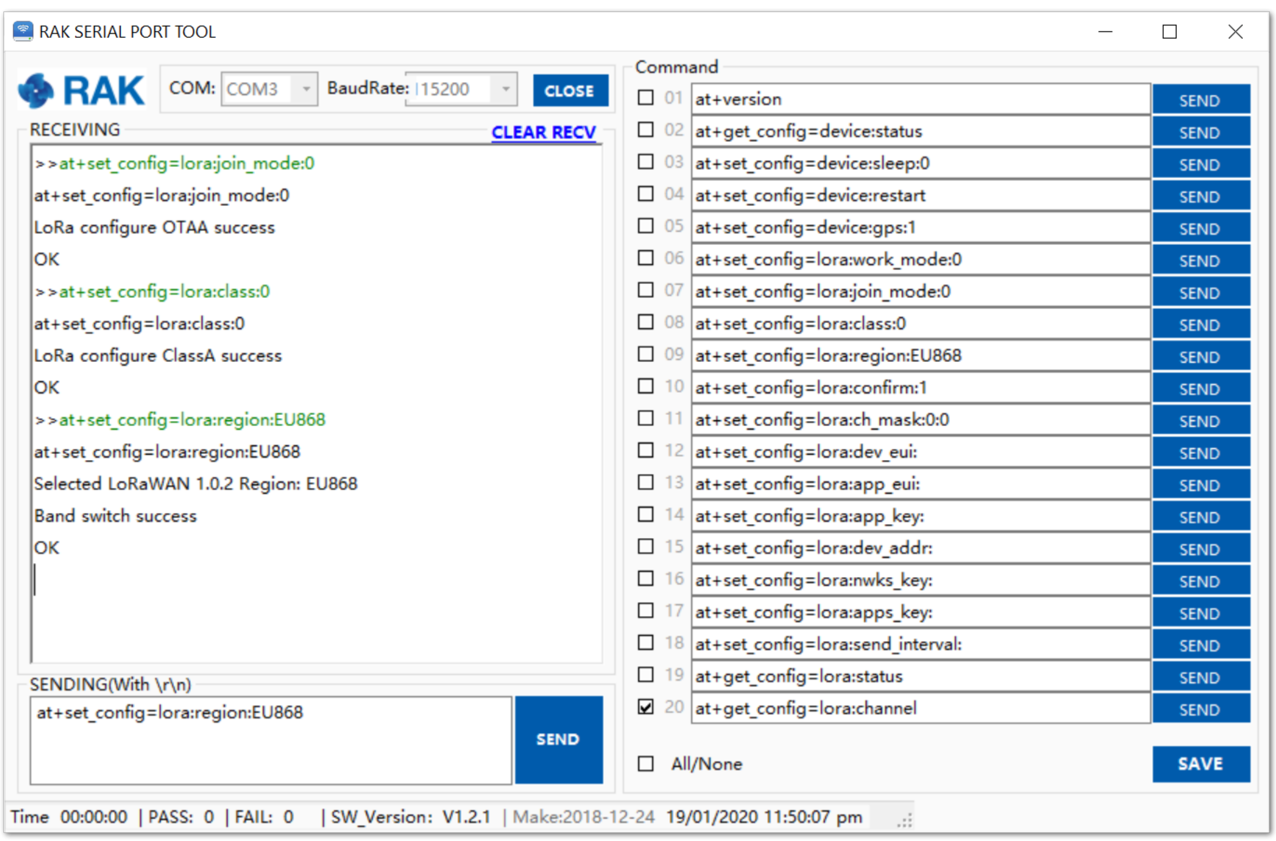

Figure 14: Setting up the RAK5205 operation mode

2. Now that RAK5205 is configured to be activated via OTAA, enter these parameters: **Device EUI, Application EUI**, and **App Key** using the commands below. Remember to replace the **"XXXX"** with the corresponding parameter value that matches the LoRaWAN network server.

```
at+set_config=lora:dev_eui:XXXX
```

```
at+set_config=lora:app_eui:XXXX
```

```
at+set_config=lora:app_key:XXXX
```

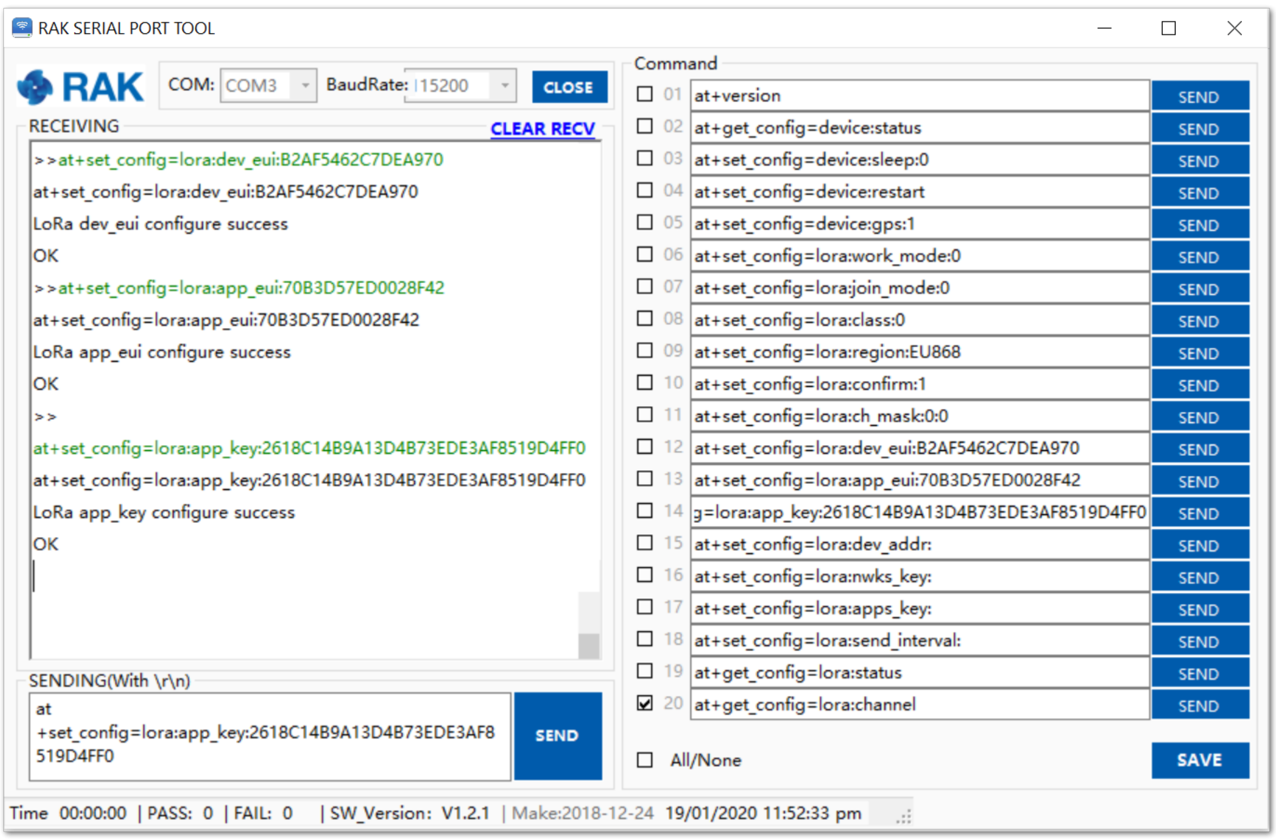

Figure 15: Setting up the RAK5205 OTAA parameters

You should end up with a window as the one in **Figure 15** with **a series of OK messages**.

3. Finally, execute the join command.

```
at+join
```

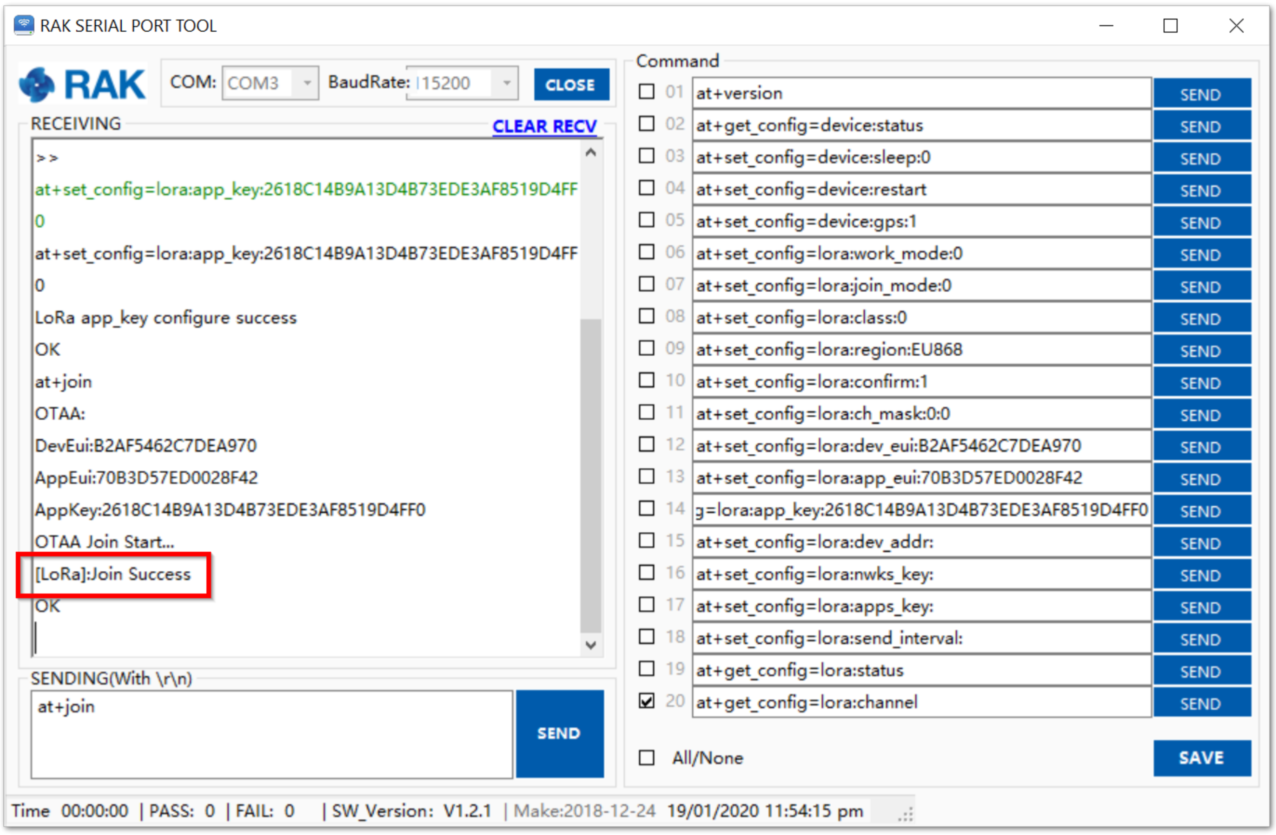

Figure 16: Join command

4. You can test the connection by sending an uplink frame. Use the following as an example:

```
at+send=lora:1:12345678
```

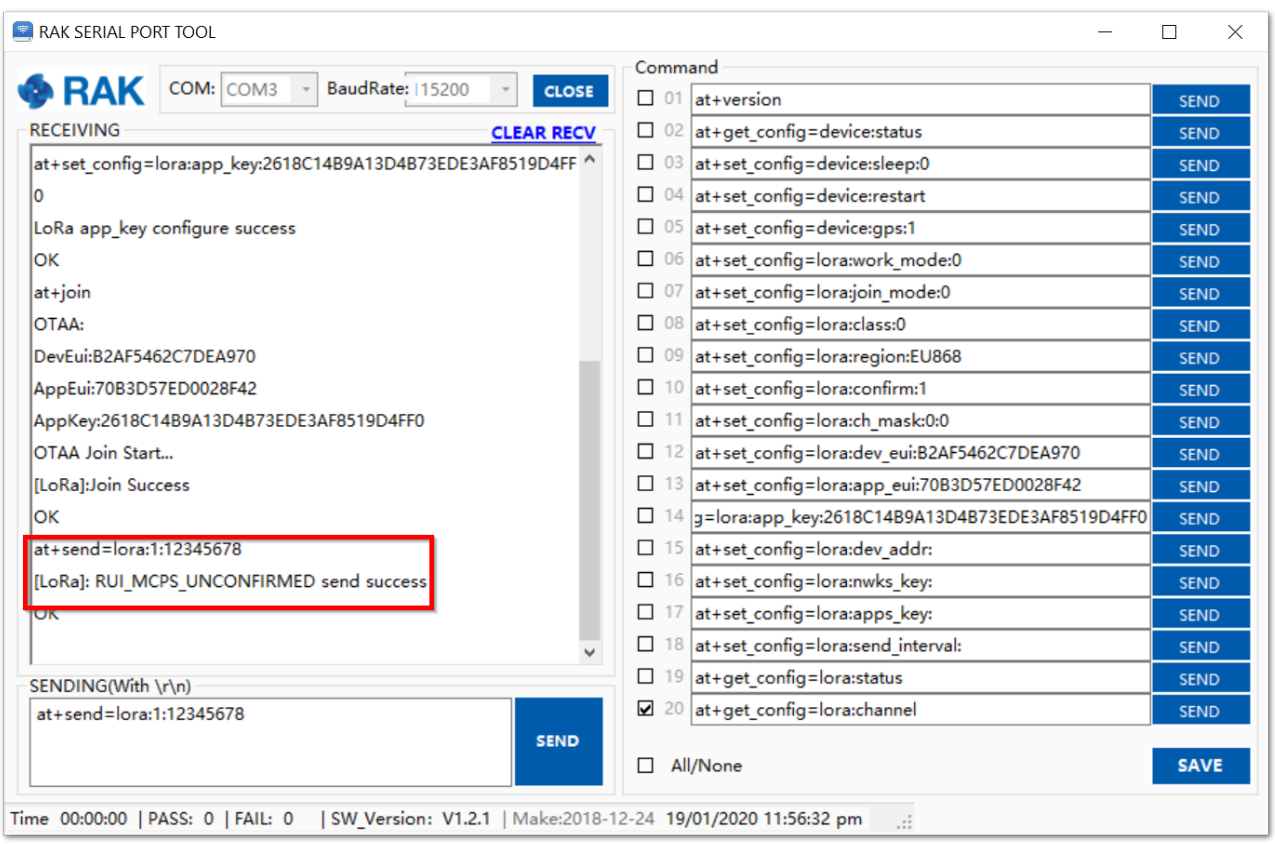

Figure 17: Sending an uplink frame

5. If you get a response in your TTN live data feed as shown in Figure 18, then you are all set.

> 📝 **NOTE**
>
> Be sure to have the TTN console open prior to sending data through the RAK Serial Port. Else, you will not be able to see the packet sent.

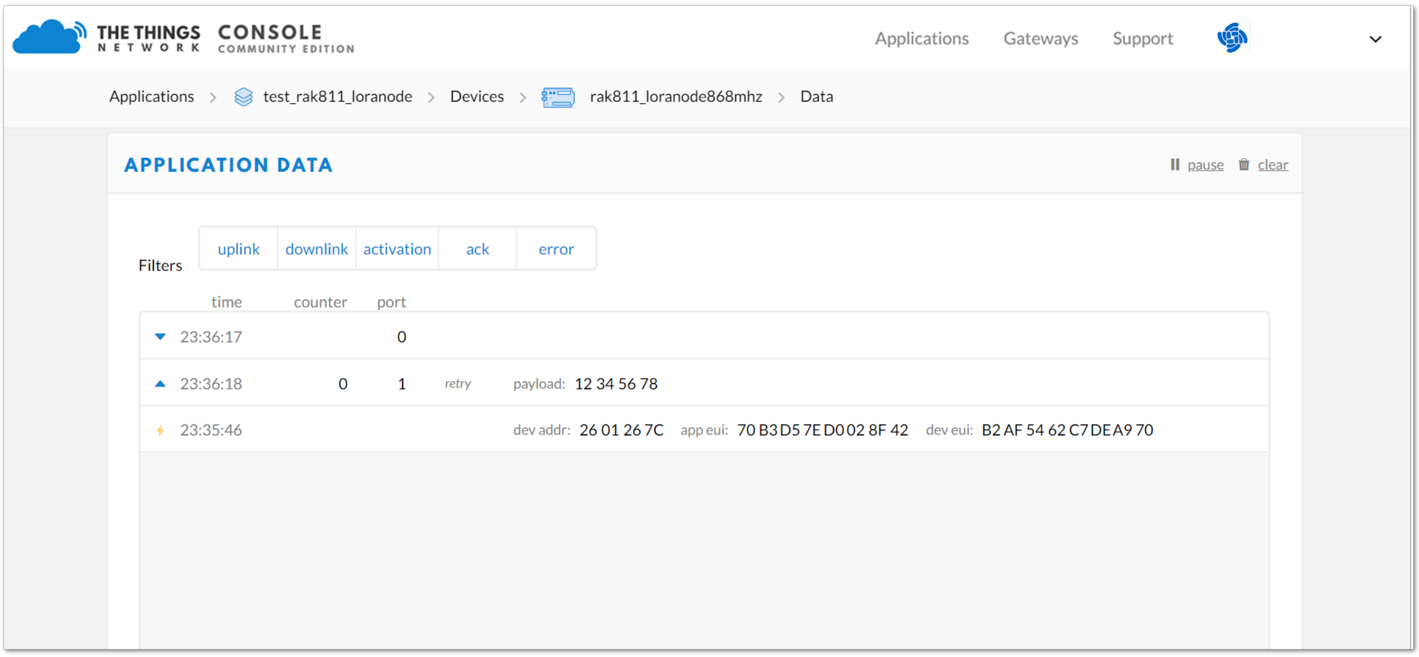

Figure 18: Sending Data to TTN from RAK5205

ABP Mode

1. To join the ABP mode, go to device settings and switch the activation method to **ABP**.
2. By default, the **Device Address**, **Network Session Key**, and **App Session Key** will be generated automatically.

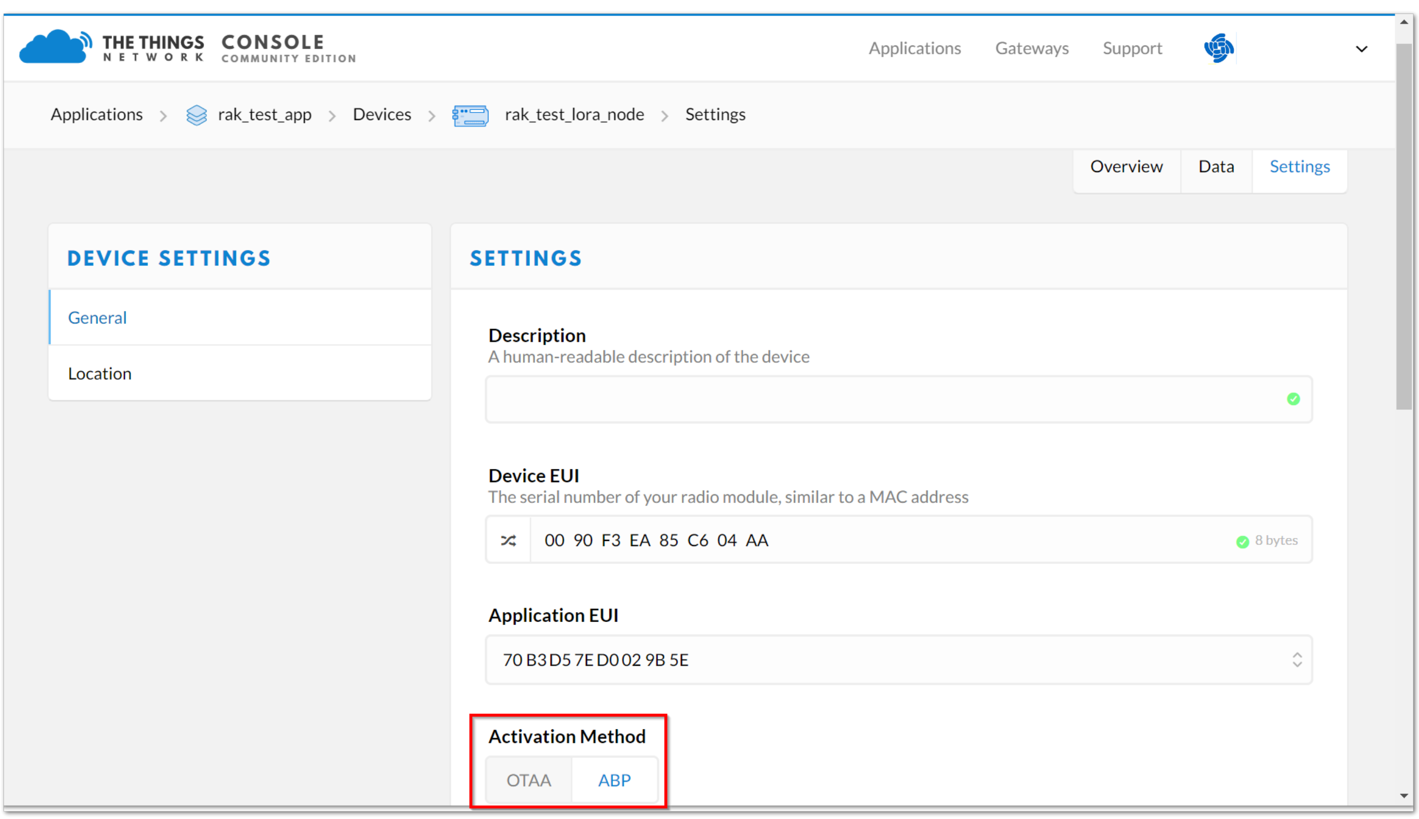

Figure 19: Switching to ABP mode

3. Save the mode change and return to the **Device Overview page**. You can copy the keys by pressing the button after the value fields marked in red in Figure 20.

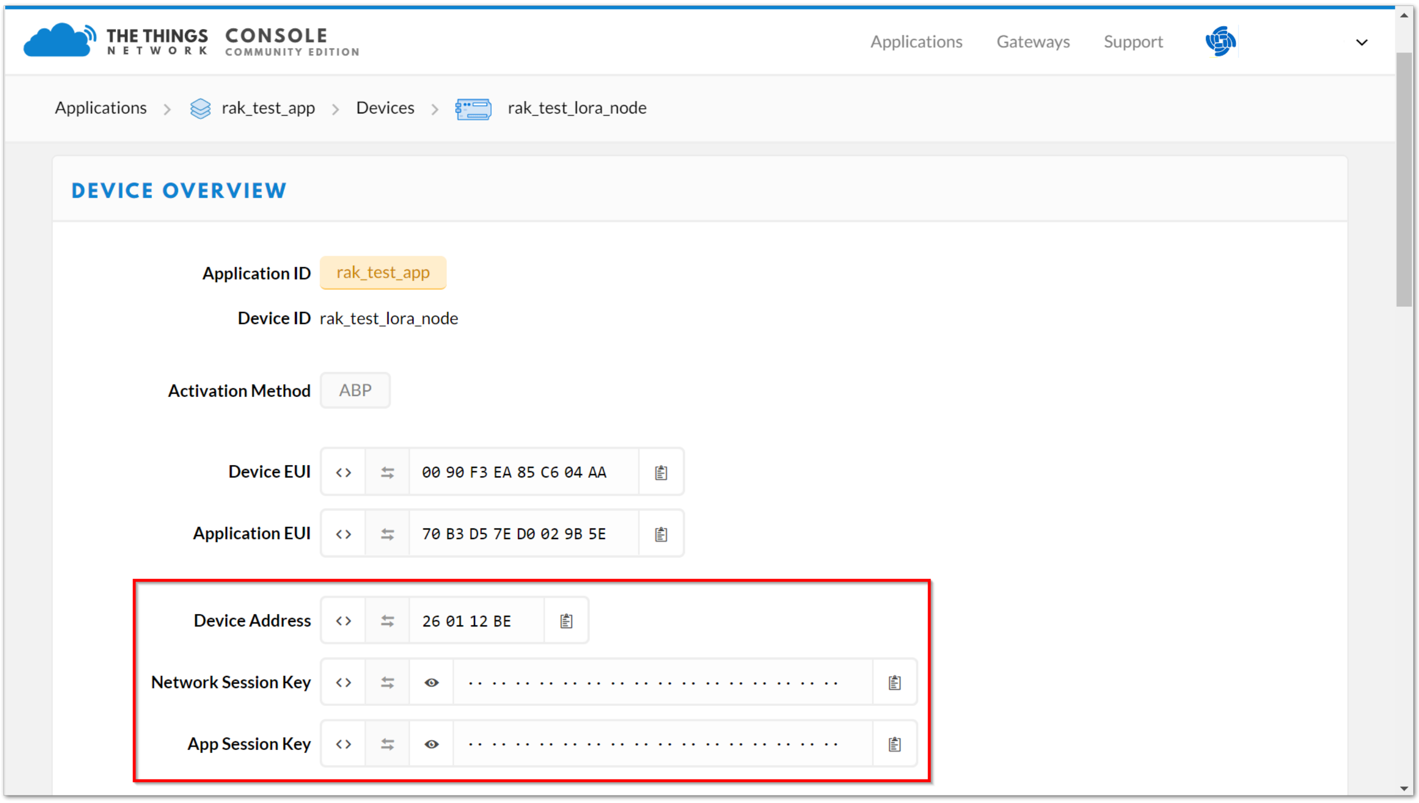

Figure 20: ABP parameters screen

4. Now, you need to update the RAK5205 configuration (mode and parameters). Open the Serial Tool and type the command below to change the region (in case you have not done so already):

```
at+set_config=lora:region:EU868
```

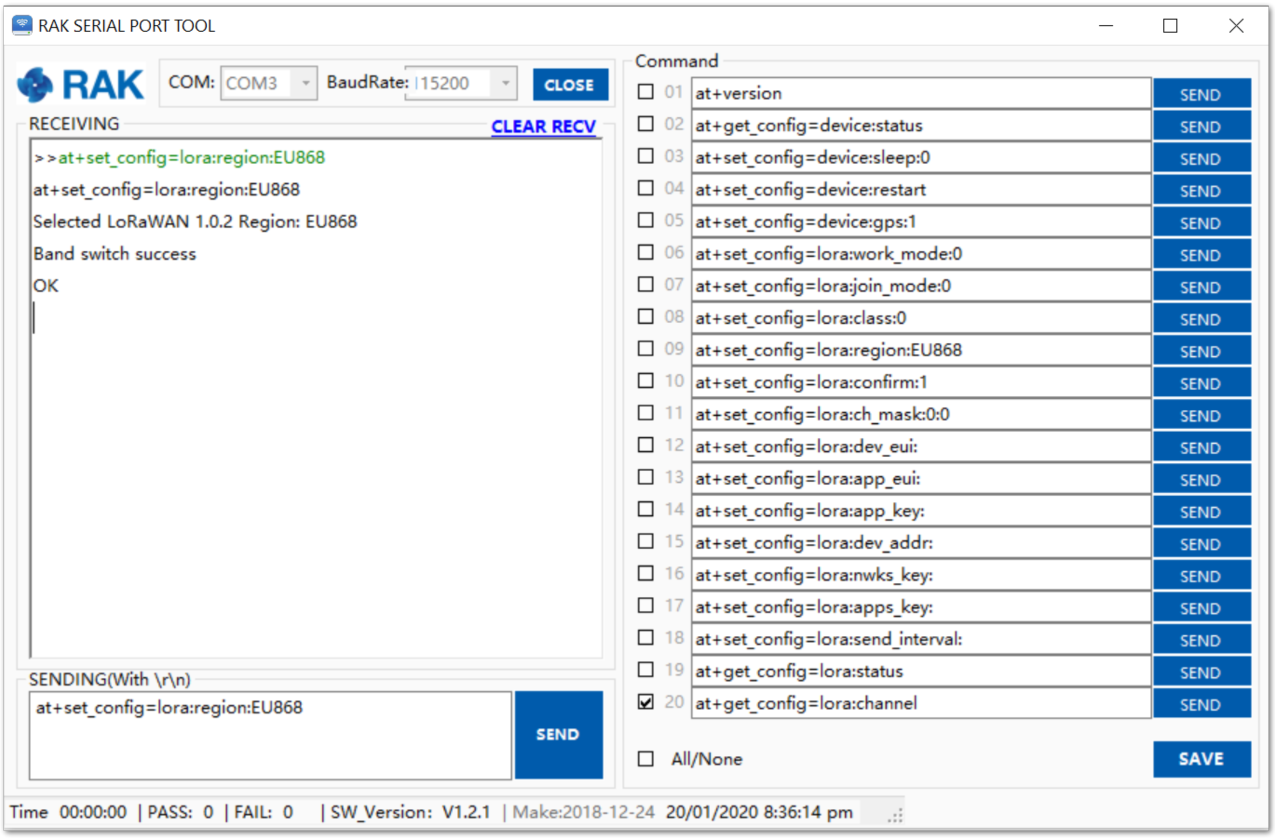

Figure 21: Region setup

5. Change the mode to **ABP** with the command:

```
at+set_config=lora:join_mode:1
```

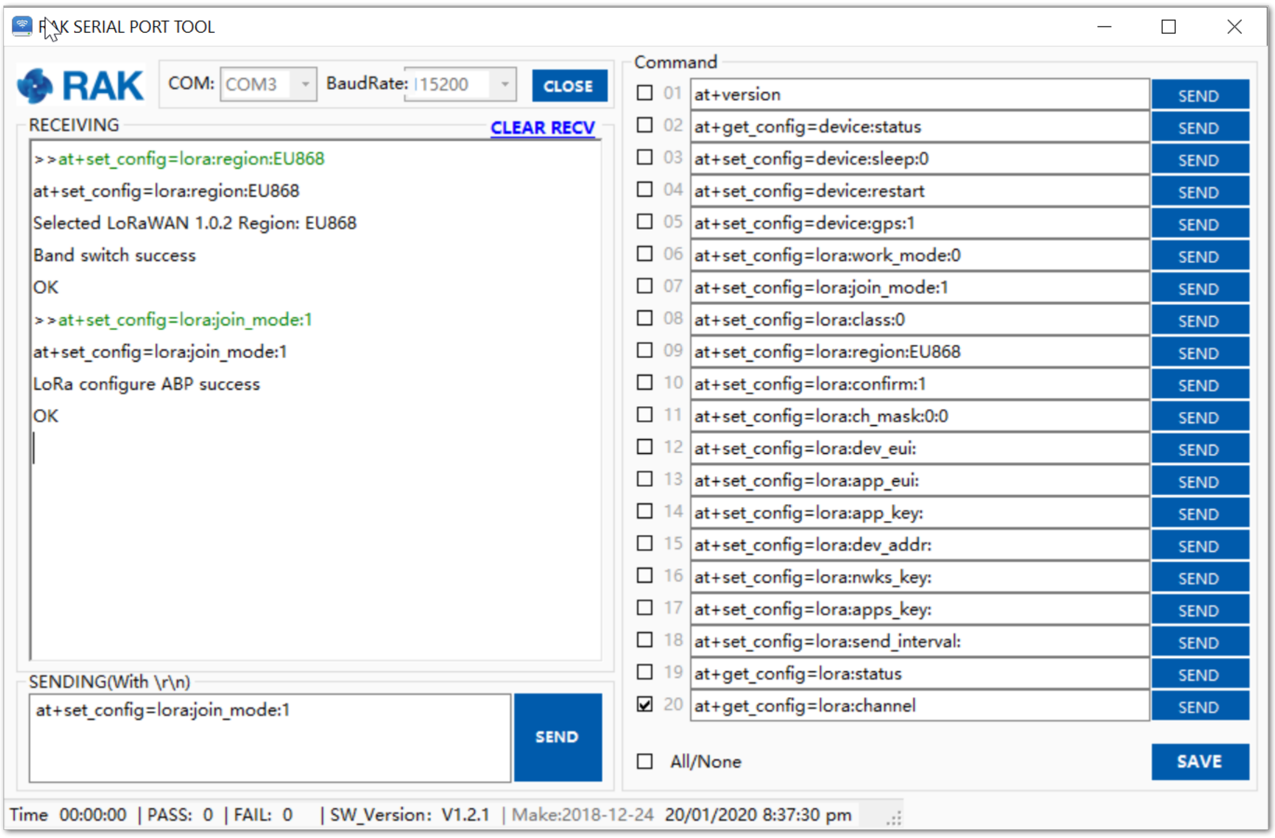

Figure 22: Join mode setup

6. Now that the mode has been changed, enter the parameters listed below which are needed for ABP activation (**Device Address**, **Network Session Key**, and **Application Session Key**). Remember to replace the **"XXXX"** with the corresponding parameter value that matches the LoRaWAN network server. Refer to Figure 20 for the parameters.

```
at+set_config=lora:dev_addr:XXXX
```

```
at+set_config=lora:nwks_key:XXXX
```

```
at+set_config=lora:apps_key:XXXX
```

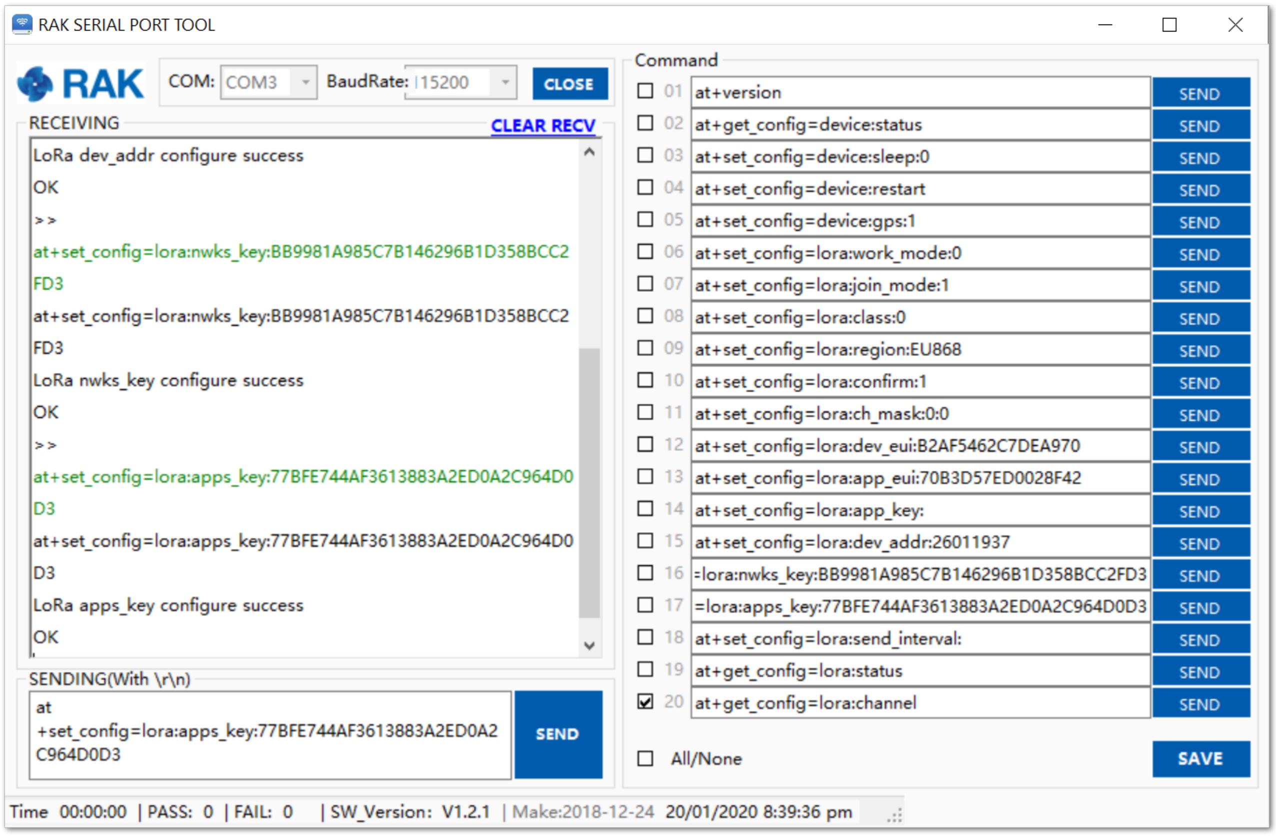

Figure 23: Setting up the RAK5205 ABP parameters

You should end up with a similar window shown in **Figure 23** with **a series of OK messages**.

7. Finally, execute the join command:

```
at+join
```

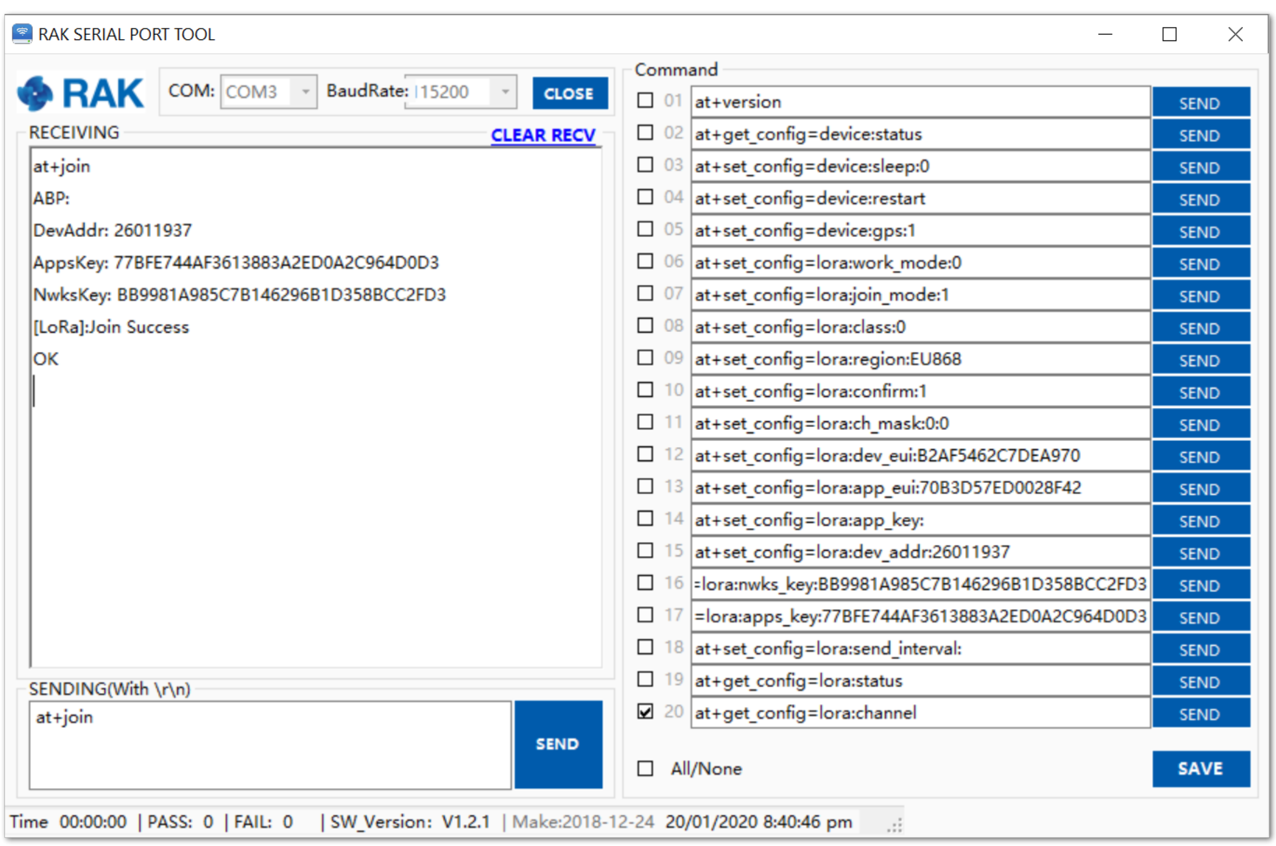

Figure 24: Join command

8. You can test the connection by sending an uplink frame. Use the following as an example:

```
at+send=lora:1:12345678
```

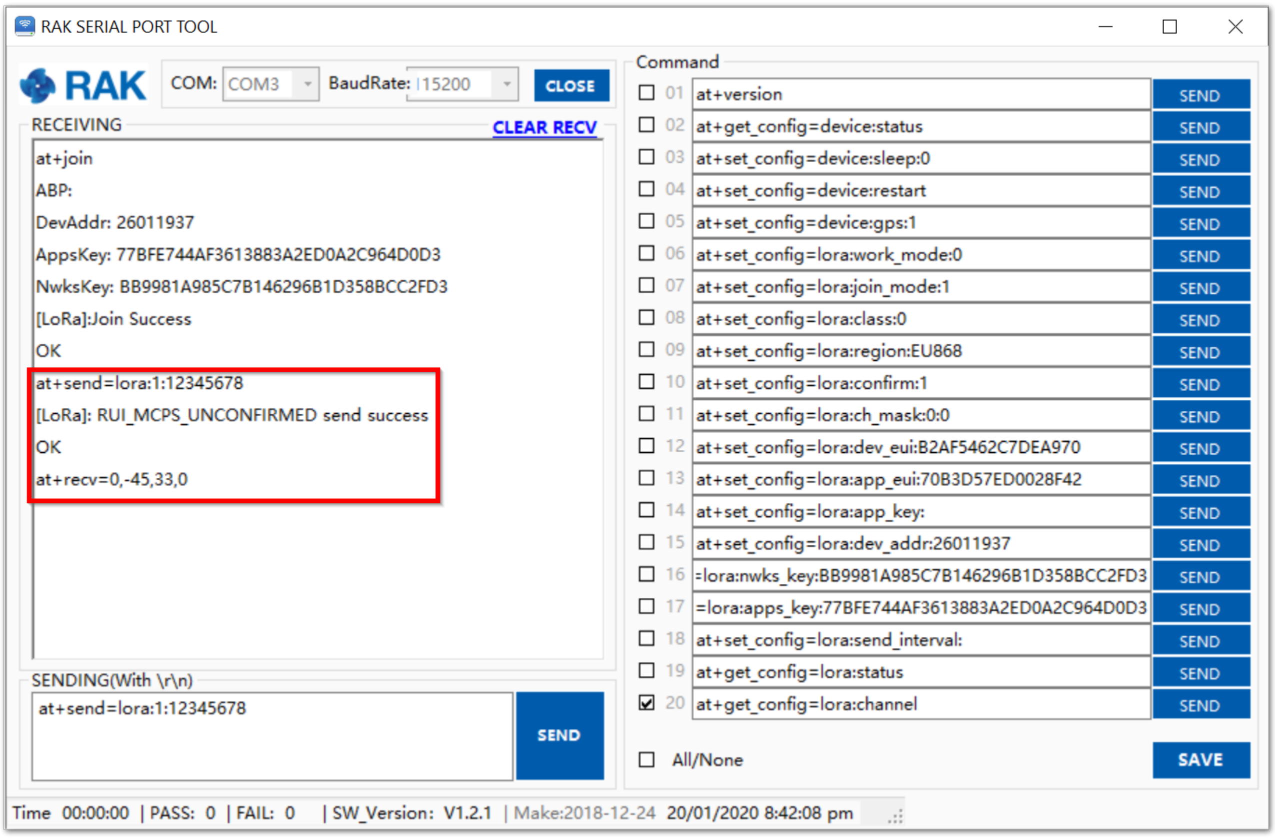

Figure 25: Sending an uplink frame

If you get the same response in your TTN live data feed as shown in Figure 26, then you are all set.

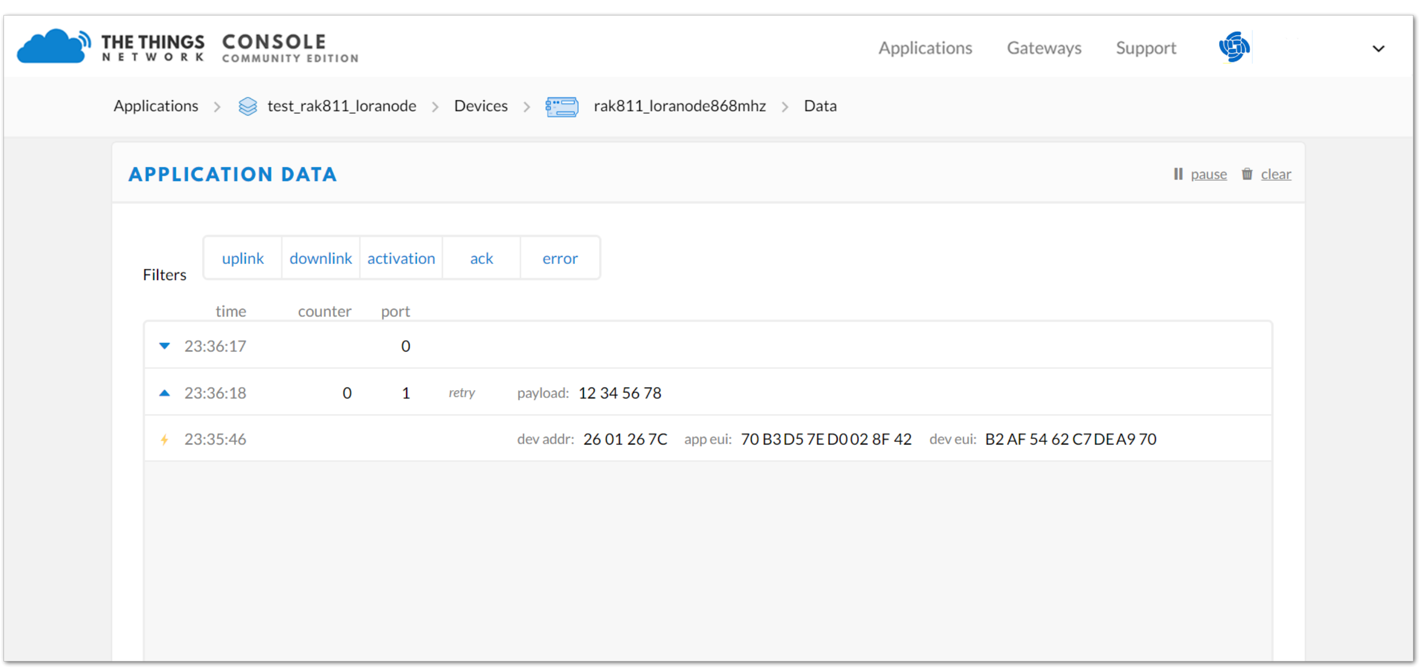

Figure 26: Sending Data to TTN from RAK5205

Connecting to ChirpStack

The **ChirpStack** or previously known as LoRaServer project provides open-source components for building LoRaWAN networks. To learn more about ChirpStack, visit their **website**.

You can use RAK5205 to connect with ChirpStack according to the following steps:

📝 **NOTE**

In this section, it is assumed that you have already connected your gateway to ChirpStack correctly. If not, look into the RAK Documentation Center of your RAK Gateway in hand.

1. Open the web page of the ChirpStack which you want to connect with and login.

2. By default, there is already one or more items in this page. You can either use it or create a new item, but for this, create a new item by clicking the "**CREATE**" button.

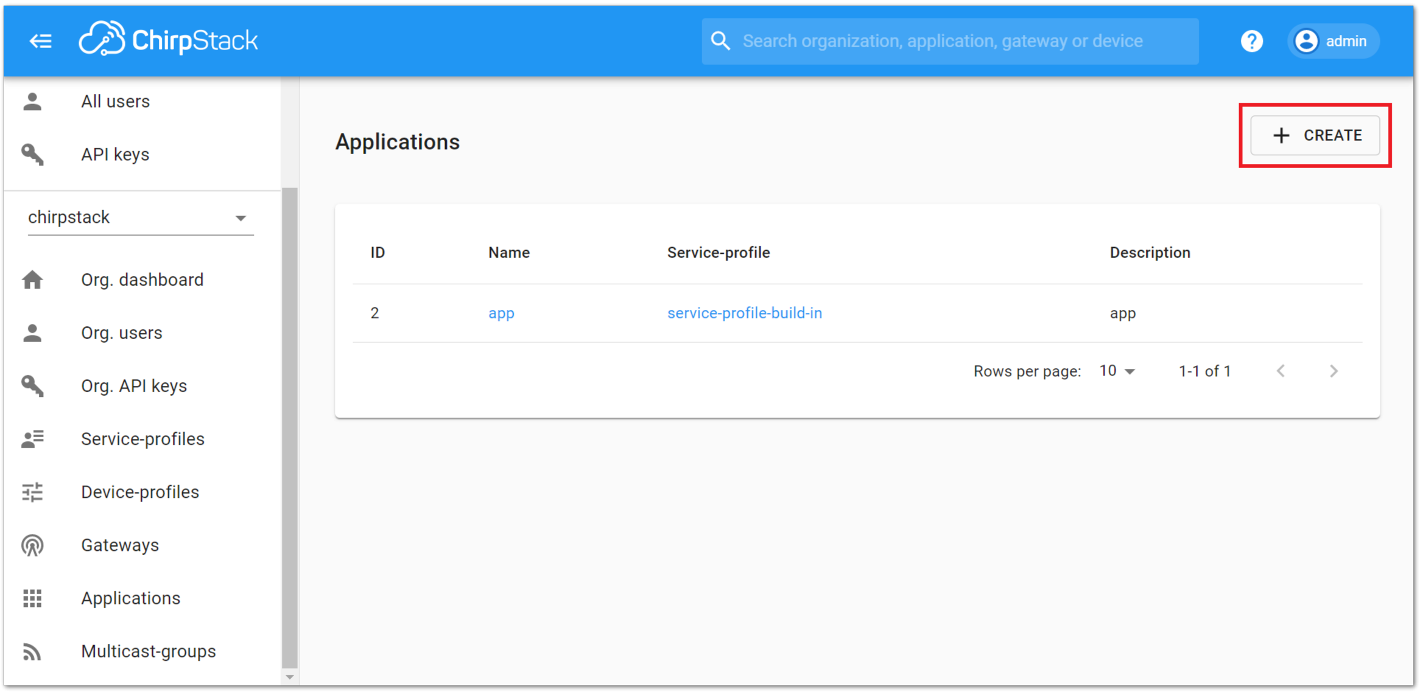

Figure 27: ChirpStack Applications

3. Fill up the necessary information, then click "**CREATE APPLICATION**".

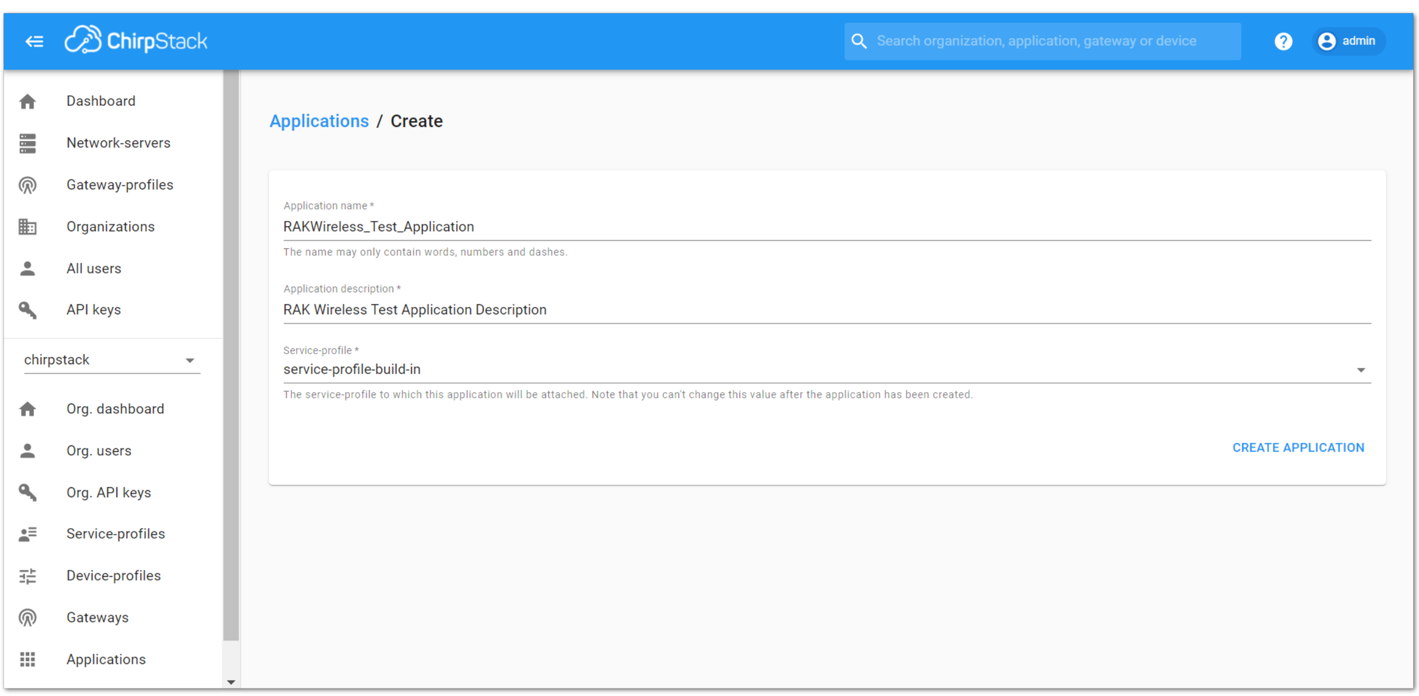

Figure 28: Creating the Application

4. Click the new item name "**RAKwireless_Test_Application**".

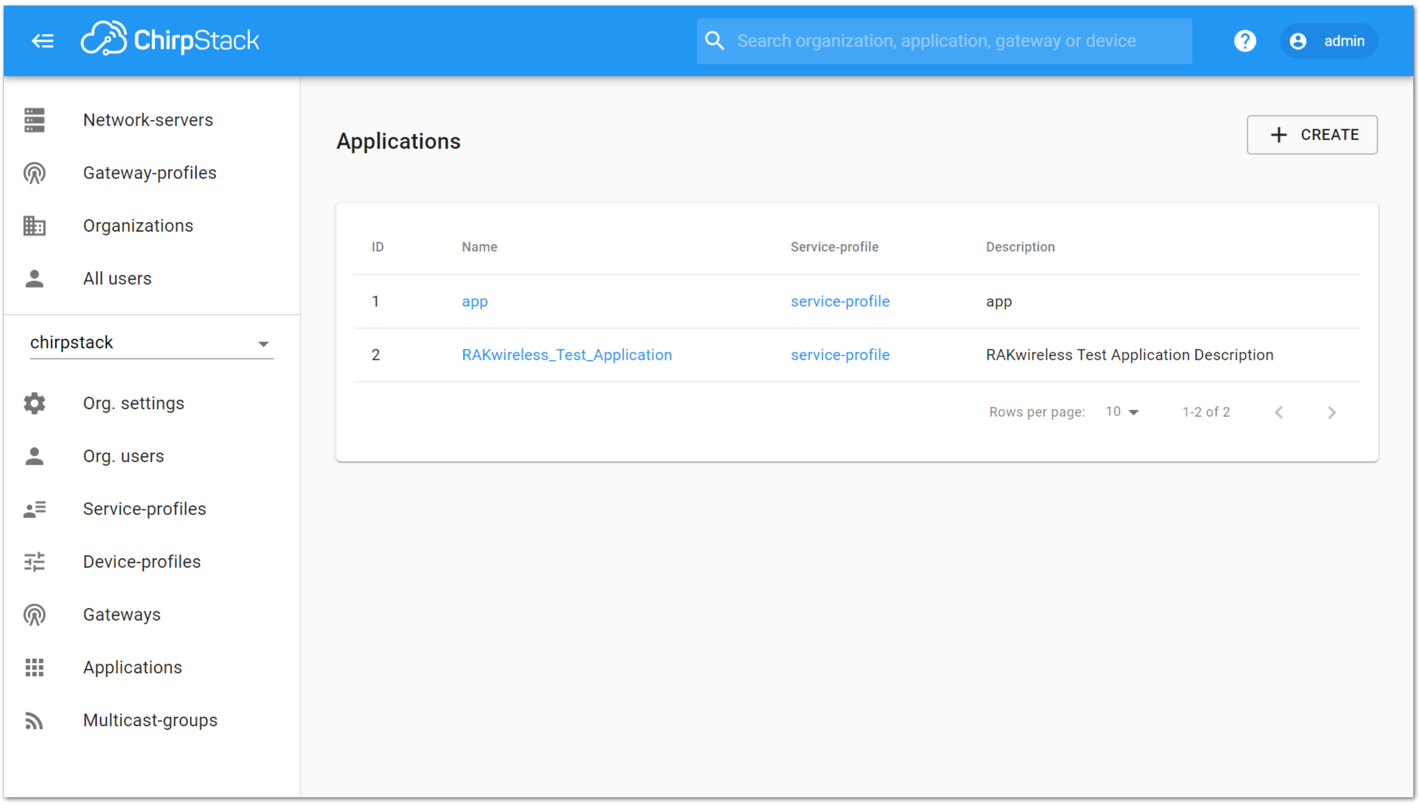

Figure 29: Applications page in ChirpStack

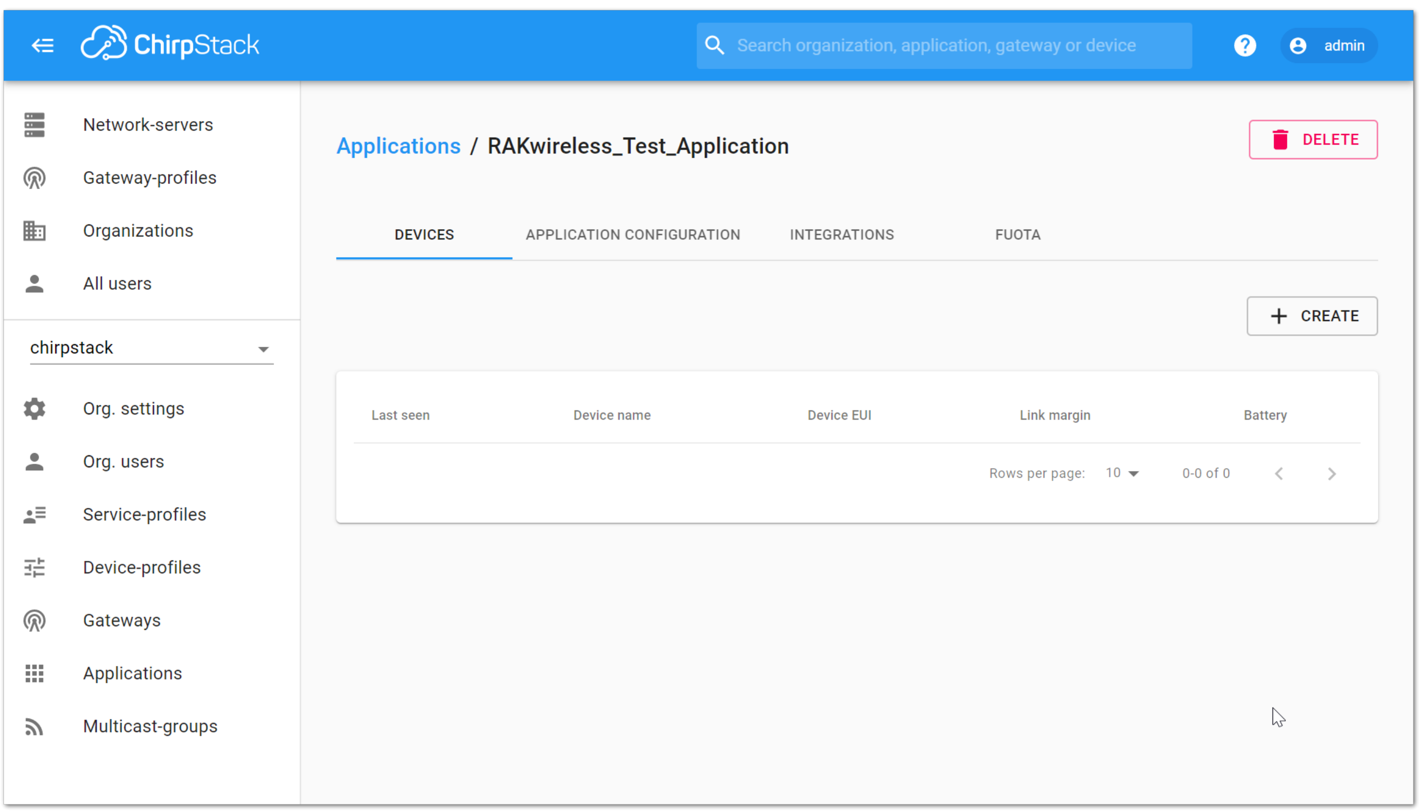

Figure 30: RAKwireless Test Application

5. Add a LoRa node device into ChirpStack by clicking the “**+ CREATE**” button.

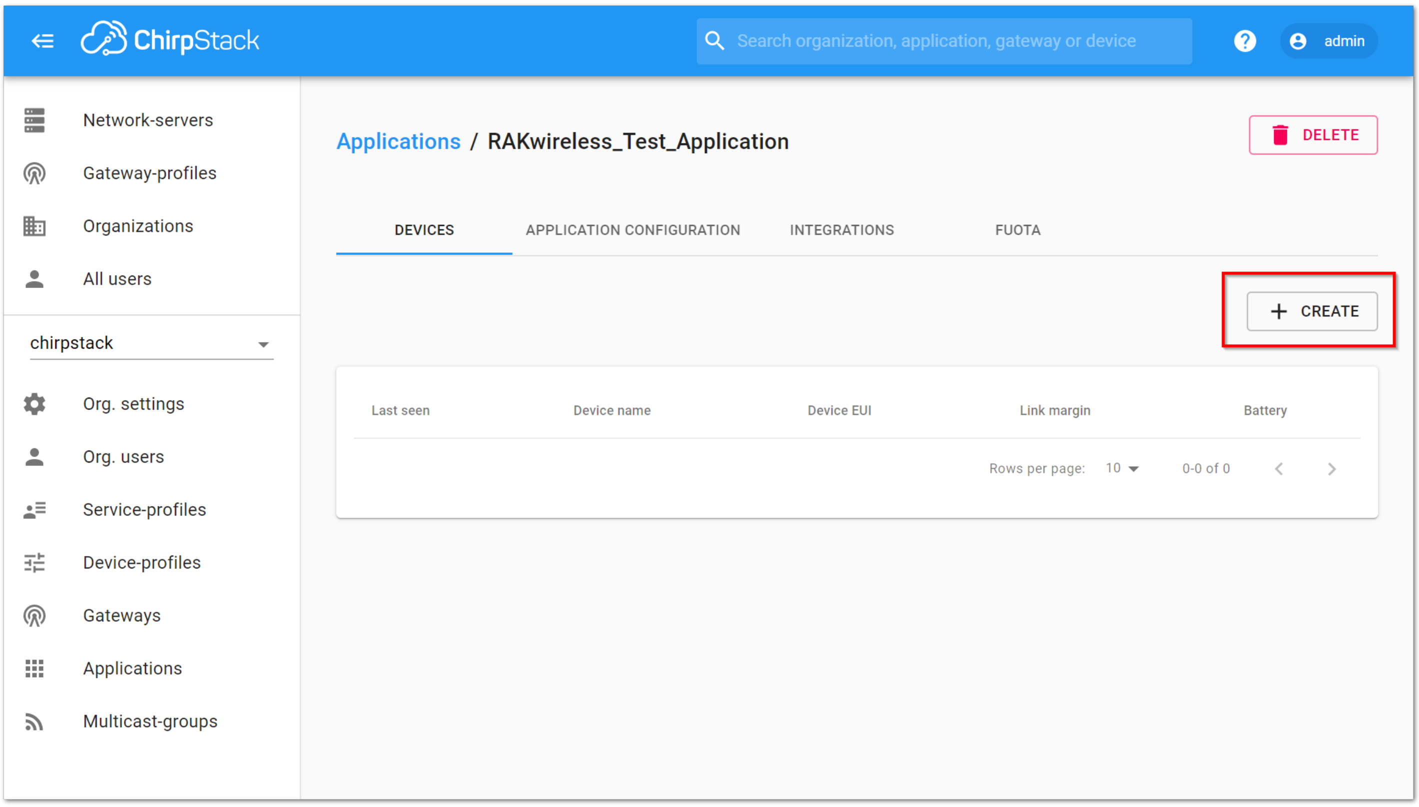

Figure 31: Adding a Node Device

6. Fill them in. The Device EUI of RAK5205 can be found on the sticker label of the RAK811 module. Use this to ensure that you have a unique identification across LoRaWAN networks. You can also generate a random **Device EUI** automatically by clicking the Device EUI icon.

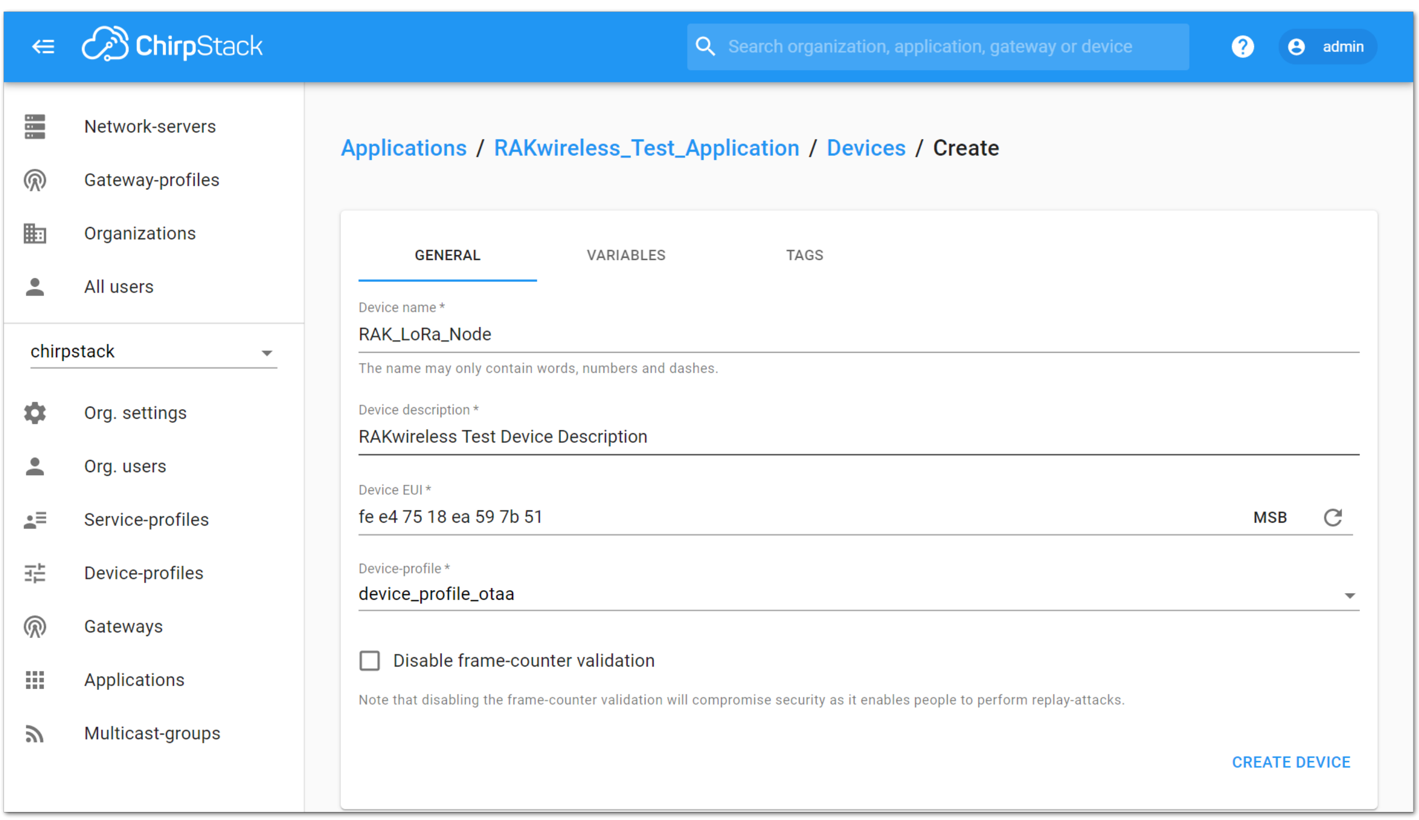

Figure 32: Filling the Device Parameters

📝 **NOTE**

- If you want to join in OTAA mode, select “**device_profile_otaa**” in the “Device-profile” item.
- If you want to join in ABP mode and CN470 frequency, select “**DeviceProfile_ABP_CN470**” in the “Device-Profile” item.
- If you want to join in ABP mode and other frequencies except AS923 and CN470, select “**device_profile_abp**” in the “Device-profile” item.

OTAA Mode

1. To join ChirpStack in OTAA mode, select "**device_profile_otaa**".

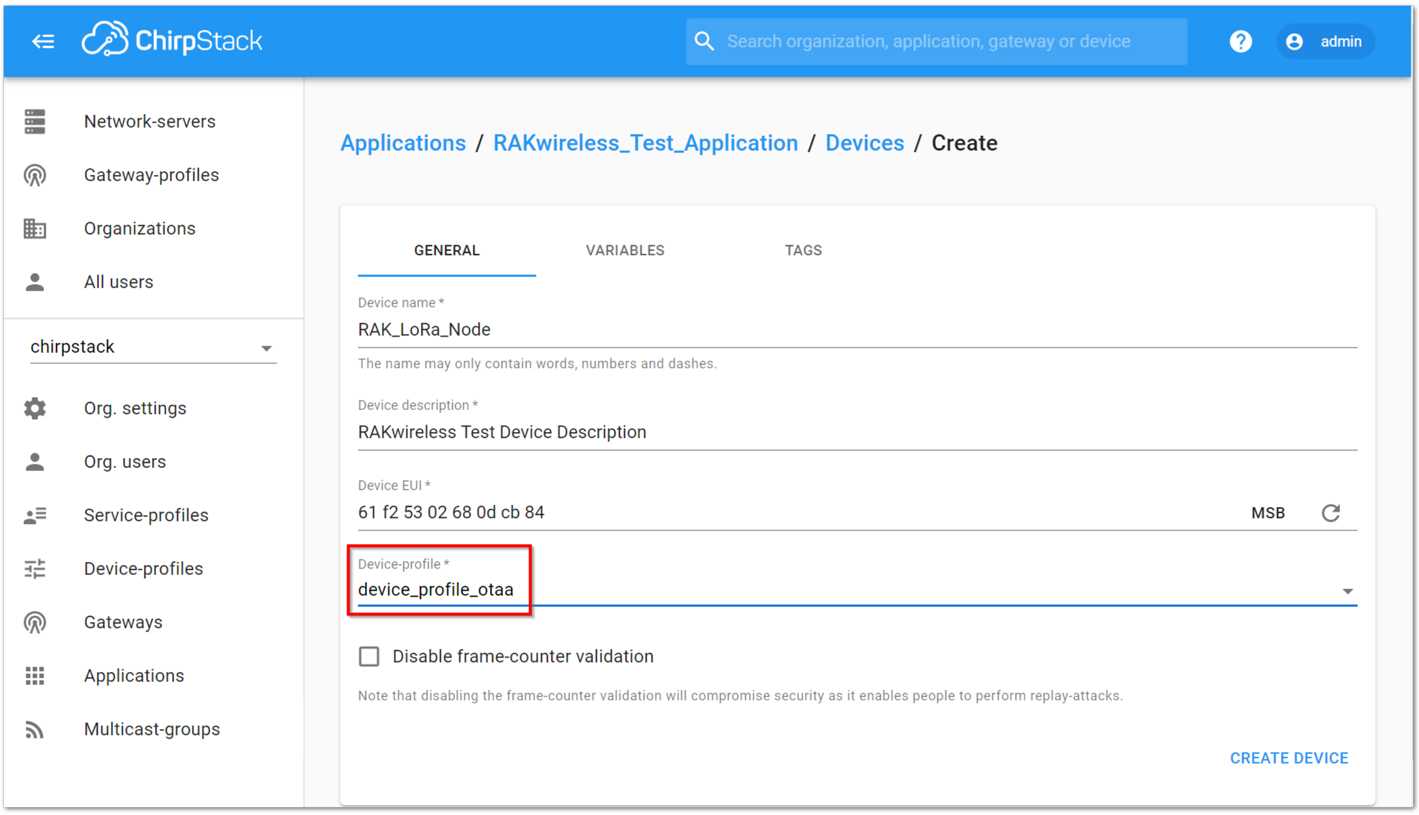

Figure 33: Selecting OTAA Activation Mode in ChirpStack

2. Press "**CREATE DEVICE**" button. You may write the application key by yourself or generate it automatically by clicking the icon highlighted in Figure 34.

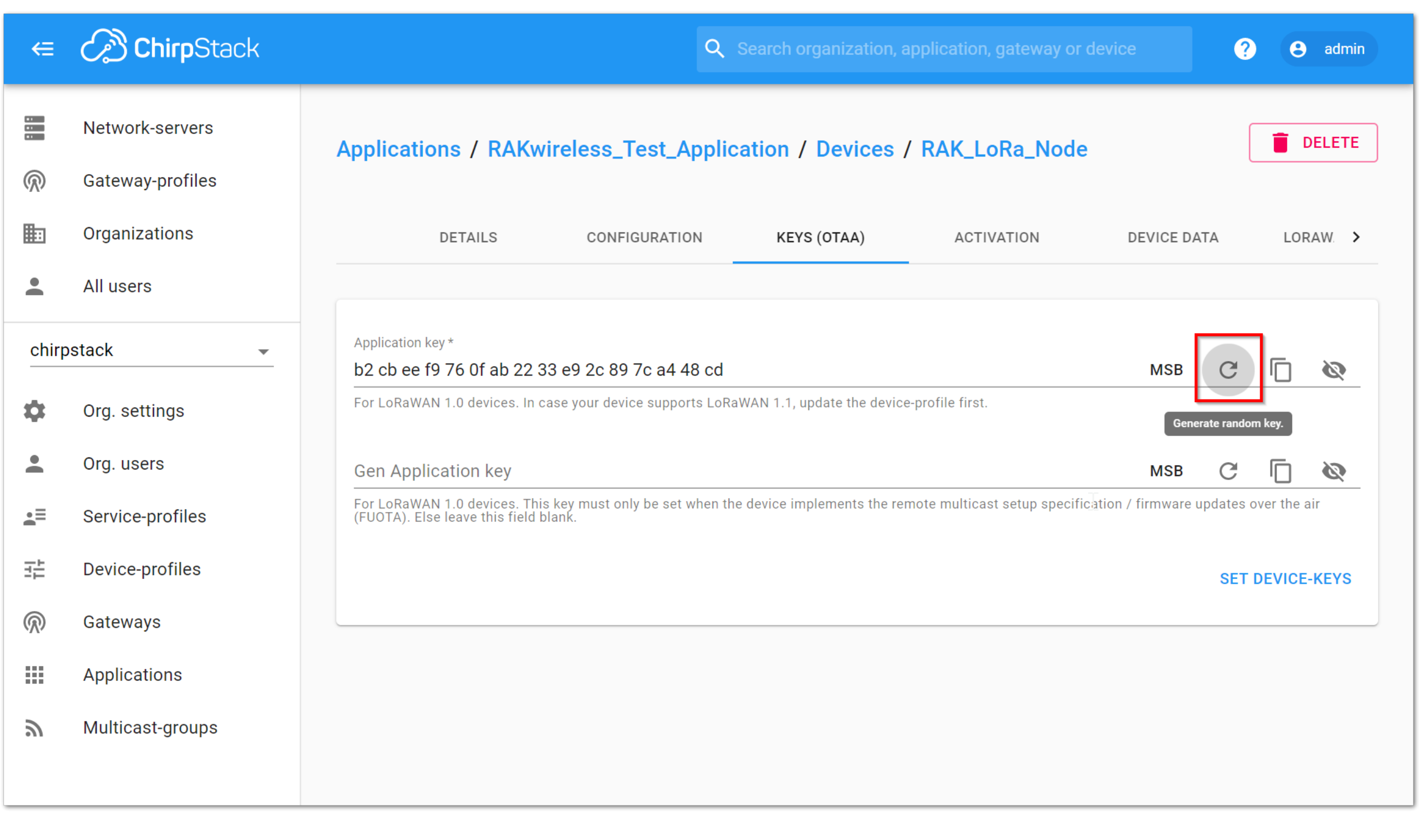

Figure 34: Application Key Generation

3. Click "**SET DEVICE KEYS**" button. Now, you've completed the configuration on ChirpStack.

- The Device EUI, which was set in the previous section to your RAK5205 WisTrio LPWAN Tracker as "dev_eui" is the same as highlighted in Figure 35.

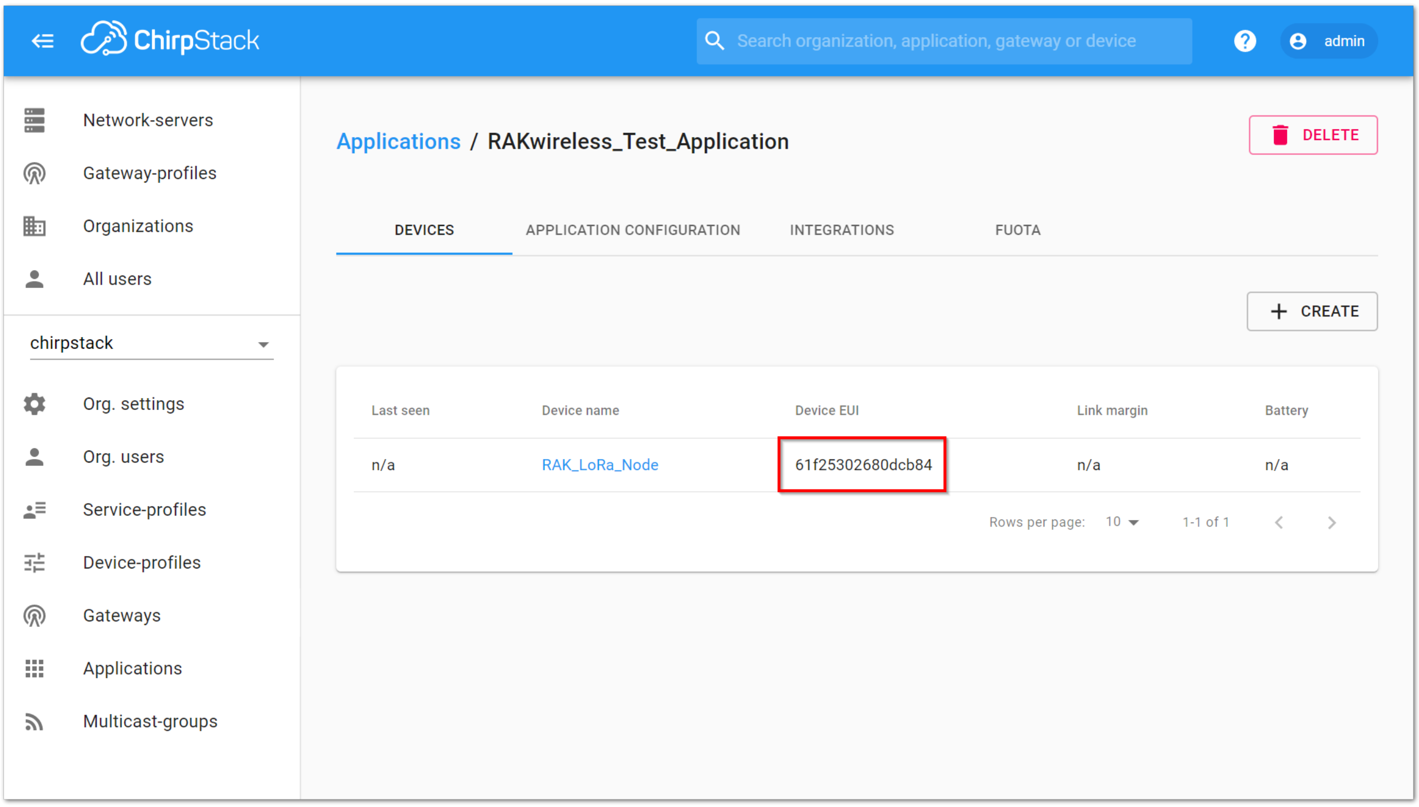

Figure 35: Device EUI Code

- The same with the Application Key, which was set in the previous section as "app_key" is the same as highlighted in Figure 36.

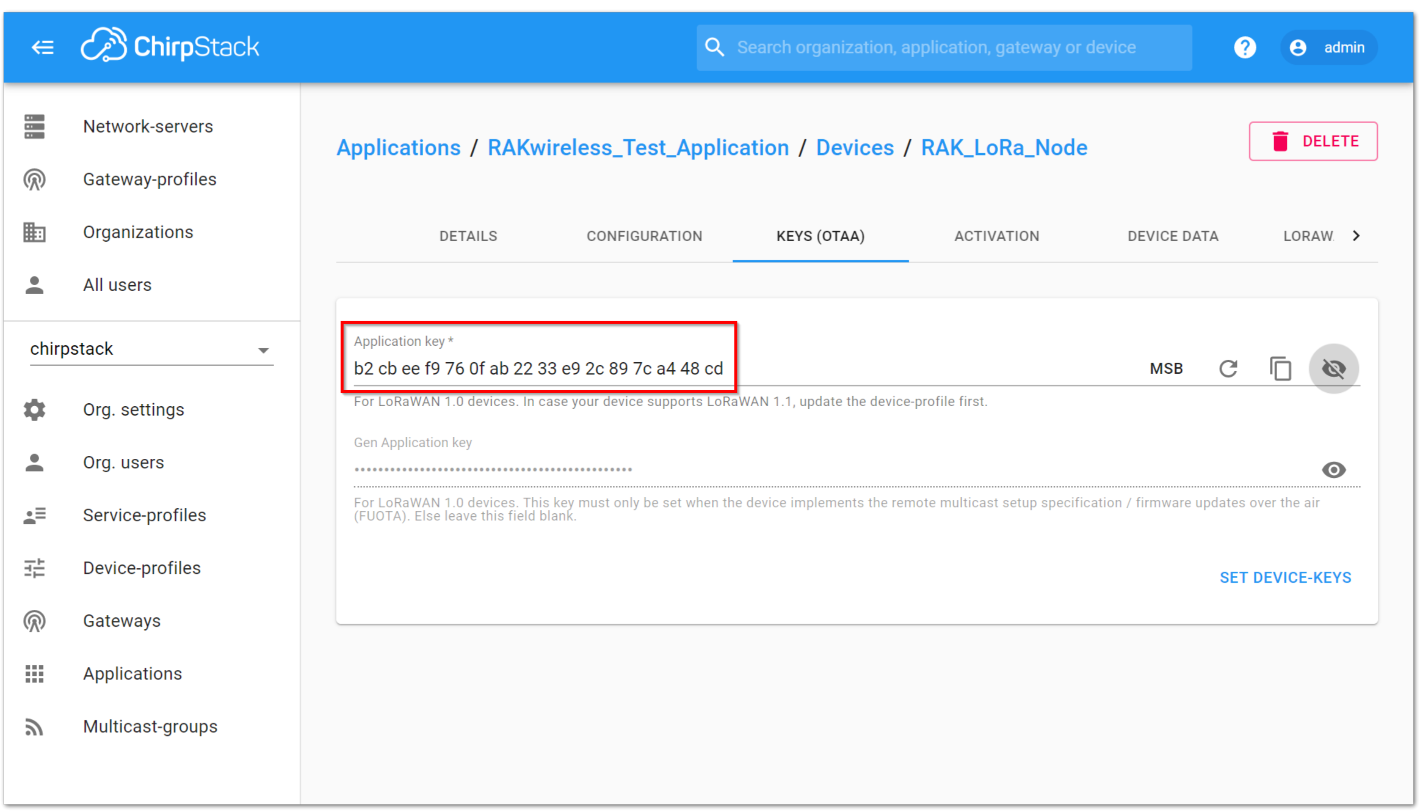

Figure 36: Application Key LoRaWAN

> 📝 **NOTE:**
>
> The Application EUI which is set into RAK5205 via AT Command as “**app_eui**” is not needed for ChirpStack.

4. Next, **configure** RAK5205 WisTrio LPWAN Tracker by using **AT commands**. To do this, connect your RAK5205 WisTrio LPWAN Tracker to a PC, power it on and open **RAK Serial Port Tool** on your computer.

```
at+version
```

Figure 37: RAK Serial Port Tool

5. If the join mode is not in OTAA, just set the LoRa join mode to **OTAA** and LoRa class to **Class A** by typing the AT commands shown in Figure 38.

```
at+set_config=lora:join_mode:0
```

```
at+set_config-lora:class:0
```

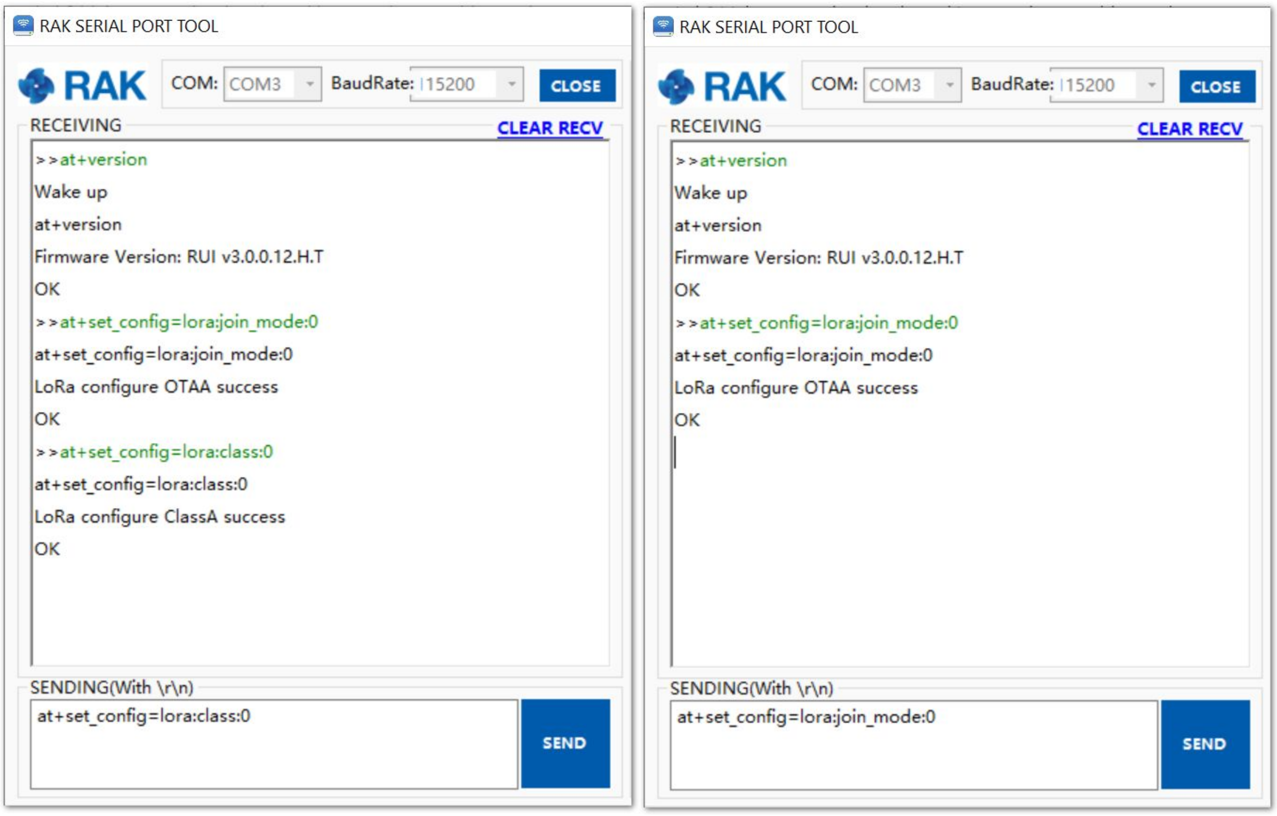

Figure 38: Setting of LoRaWAN mode and class

6. Type the following AT command to set the **Frequency/Region**, **Device EUI**, **Application EUI**, and **Application Key.** Remember to replace the **"XXXX"** with the corresponding parameter value that matches the LoRaWAN network server.

```
at+set_config=lora:region:XXX
```

```
at+set_config=lora:dev_eui:XXXX
```

```
at+set_config=lora:app_eui:XXXX
```

```
at+set_config=lora:app_key:XXXX
```

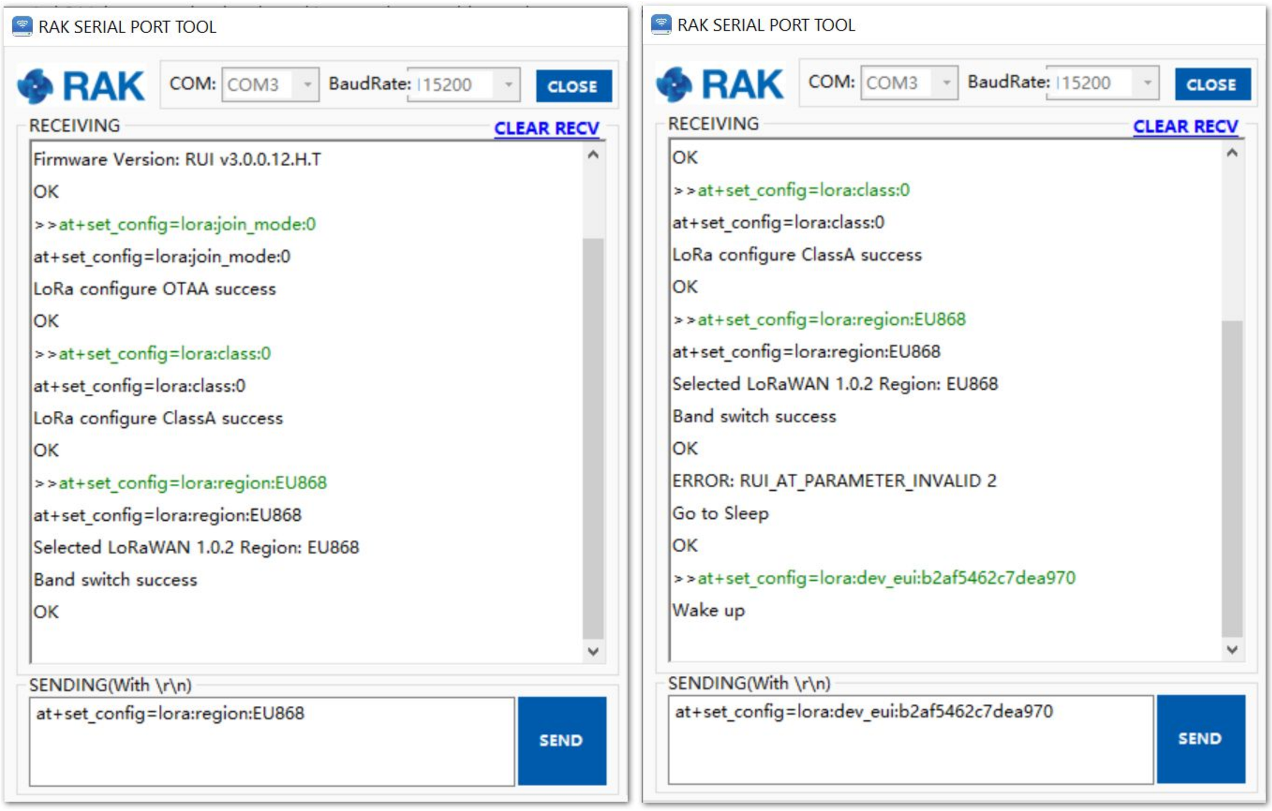

Figure 39: Setting of Frequency and Device EUI

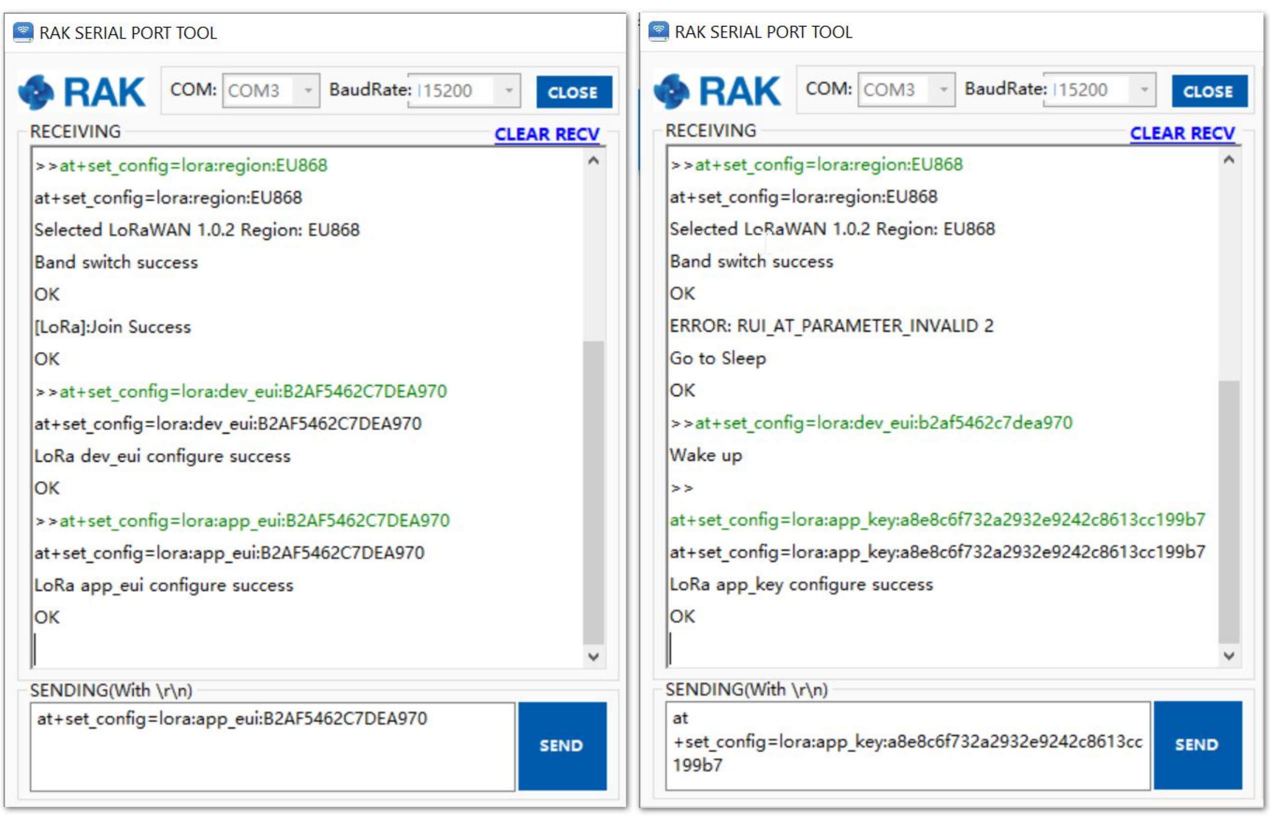

Figure 40: Setting of Application EUI and Key

7. Then, **join** in OTAA mode.

```
at+join
```

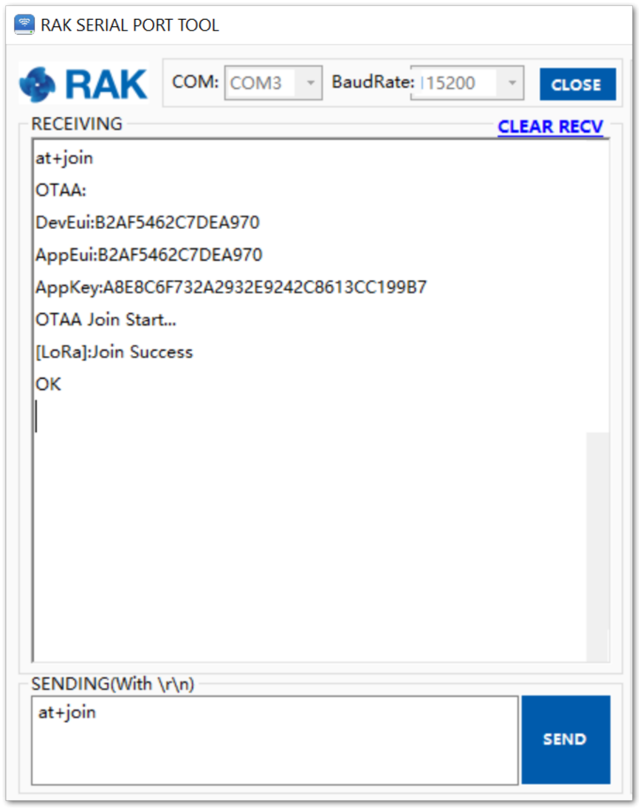

Figure 41: Joining in OTAA

8. You can view the "**JoinRequest**" and "**JoinAccept**" on ChirpStack console.

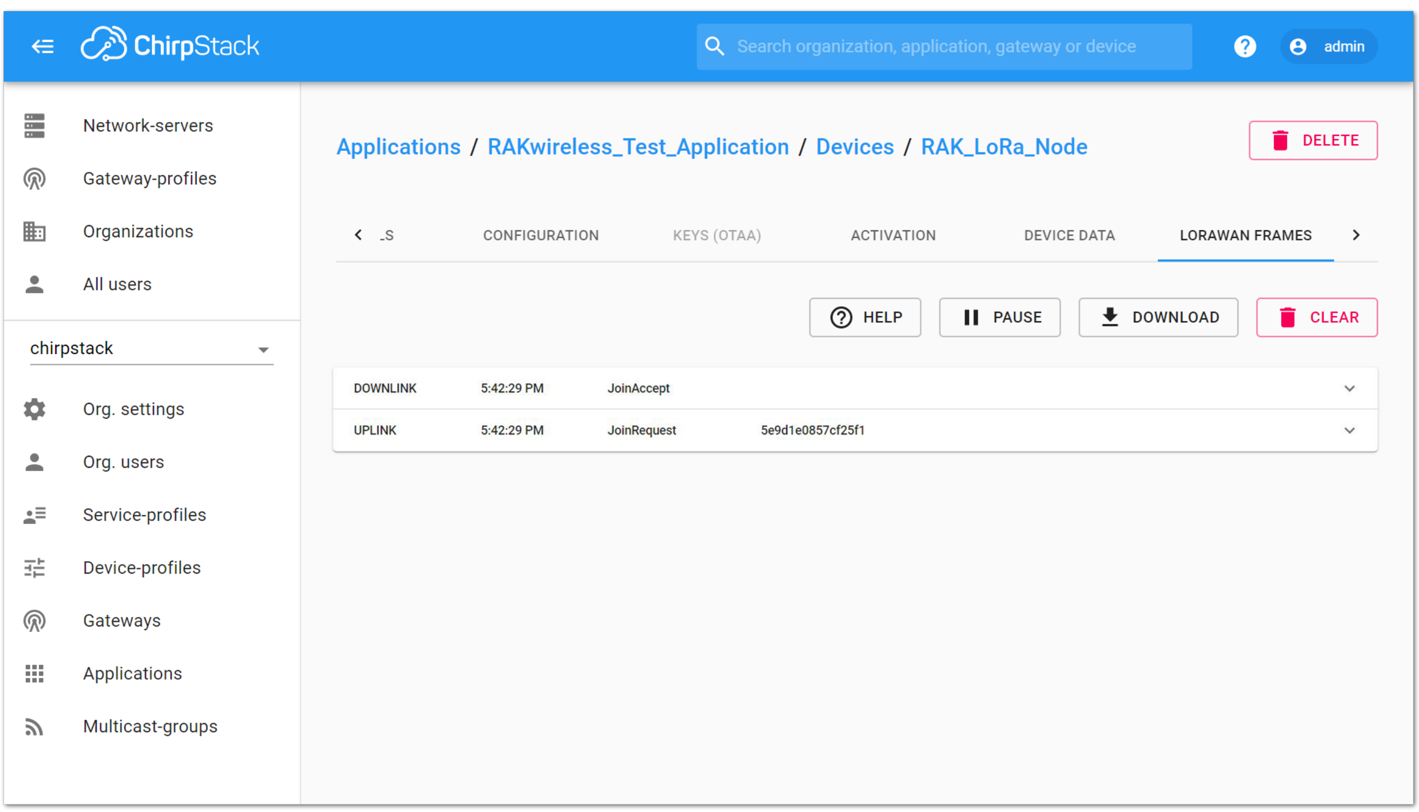

Figure 42: Join Request of the Device in the ChirpStack

9.Try sending data from our RAK5205 WisTrio LPWAN Tracker to the ChirpStack by typing the command below in the serial port.

```
at+send=lora:2:1234567890
```

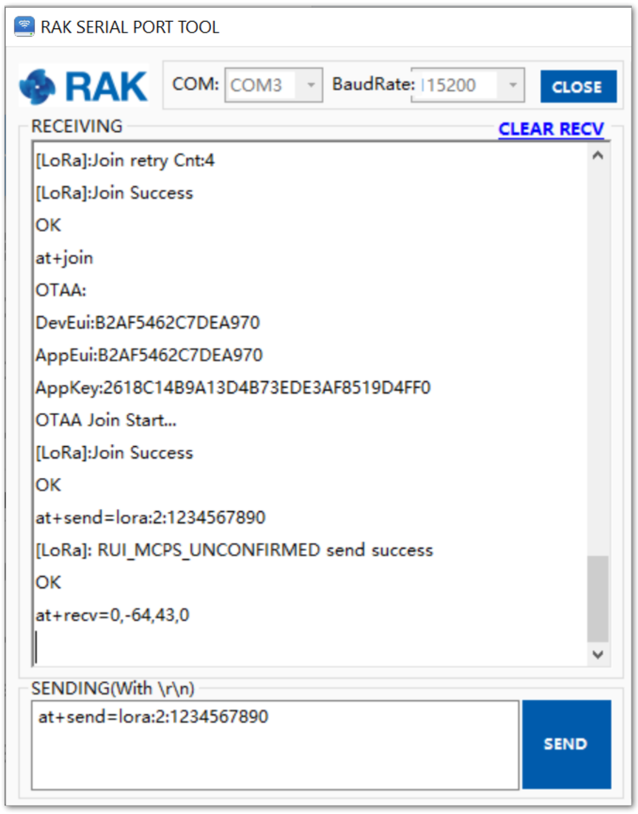

Figure 43: Sending Data to ChirpStack

You can see the message on ChirpStack page as shown in Figure 44.

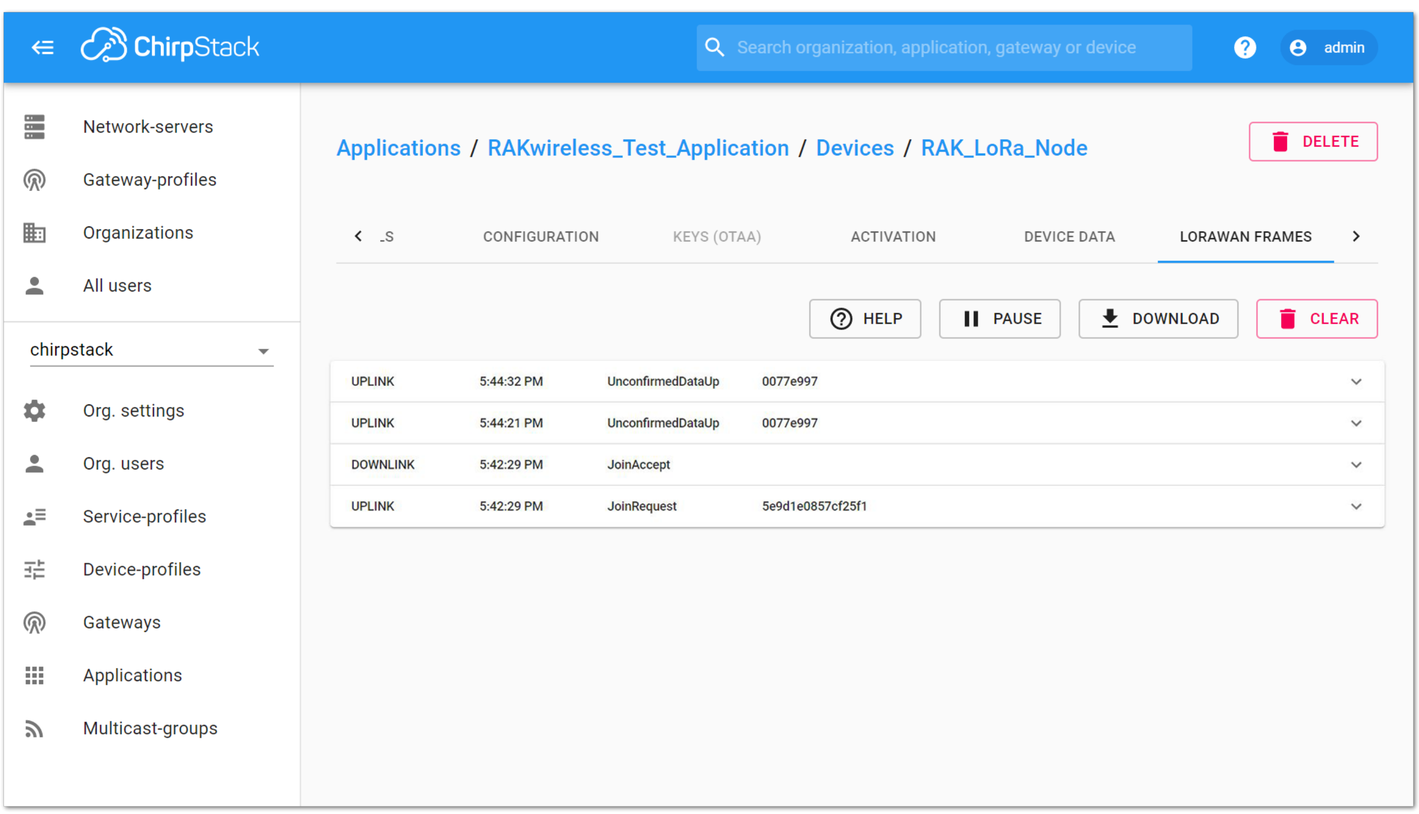

Figure 44: Message Received in ChirpStack

ABP Mode

1. If you select “**device_profile_abp**” or “**device_profile_abp_cn470**”, it means you want to join ChirpStack in “**ABP mode**”. Fill the parameters “**Device name**” and “**Device description**” then click on “**CREATE DEVICE**” button.

> ⚠️ **WARNING**
>
> Frequency AS923 in ABP Mode is not supported in Chirpstack.

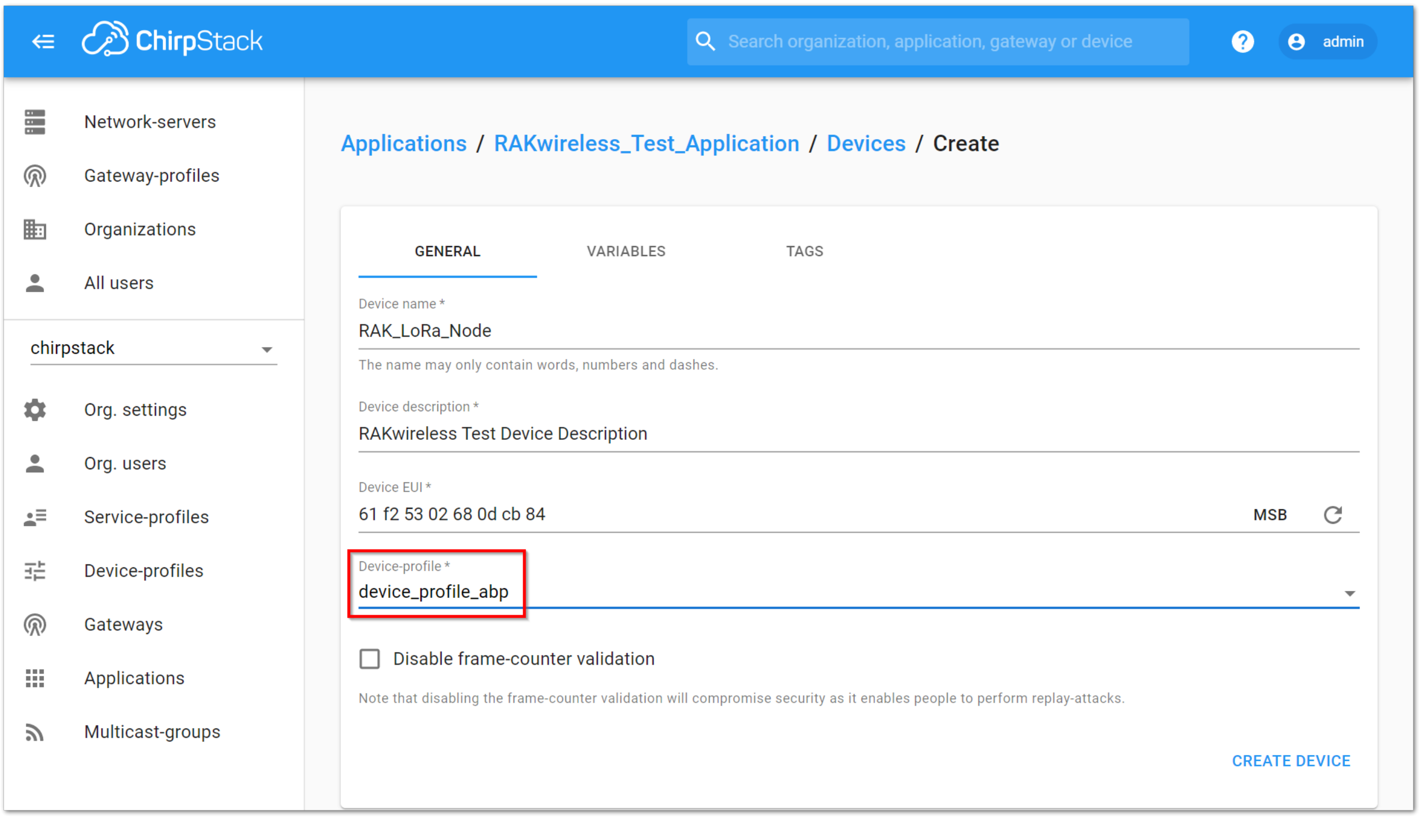

Figure 45: Chirpstack ABP Activation

2. Then, you can see that there are some parameters for ABP in the "**ACTIVATION**" tab.

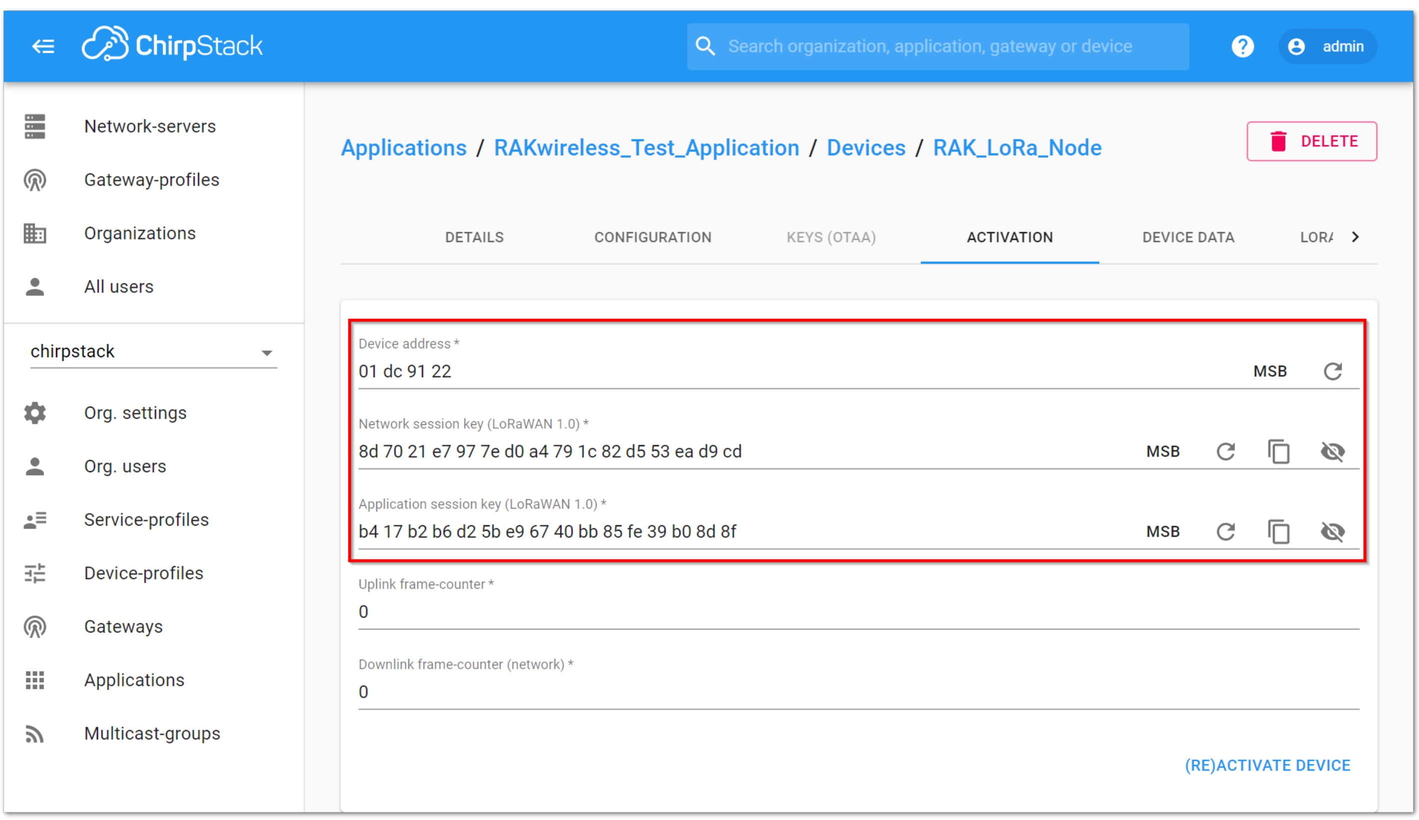

Figure 46: Chirpstack ABP Activation Parameters Needed

3. Use these parameters to set RAK5205 WisTrio LPWAN Tracker by using AT command. To set **LoRa join** mode to **ABP**, type the following command:

```
at+set_config=lora:join_mode:1
```

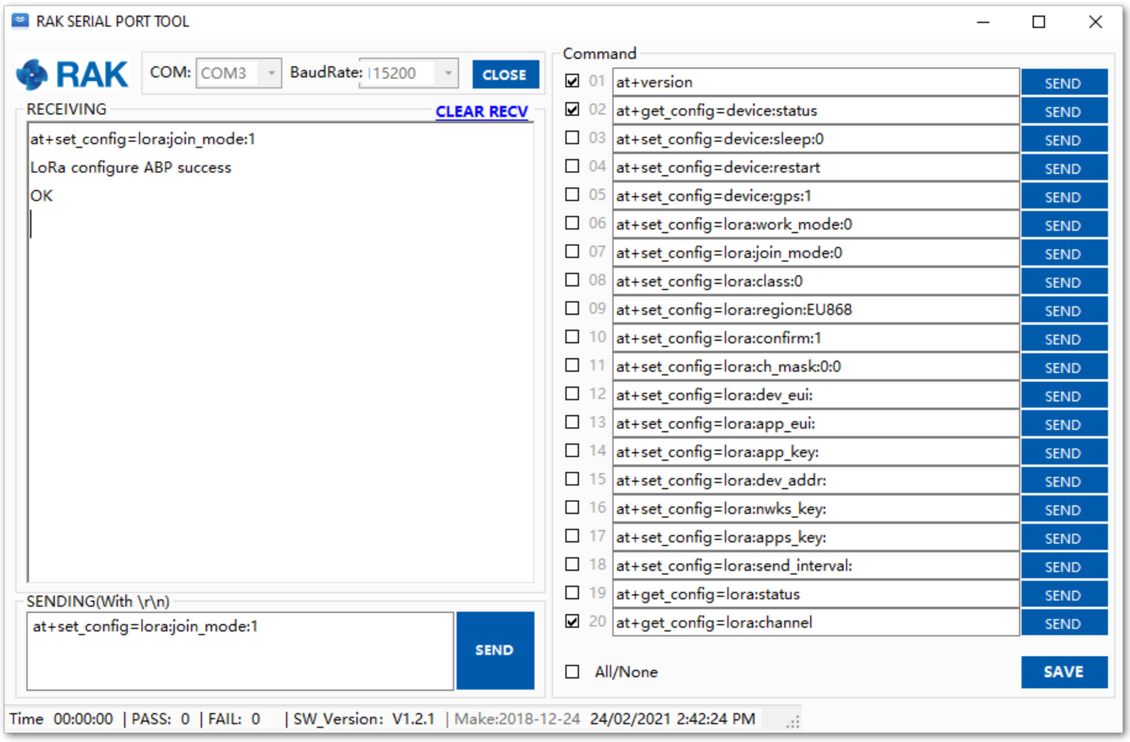

Figure 47: Chirpstack ABP Join Mode via RAK Serial Port Tool

4. Set LoRa class to **Class A**.

```
at+set_config=lora:class:0
```

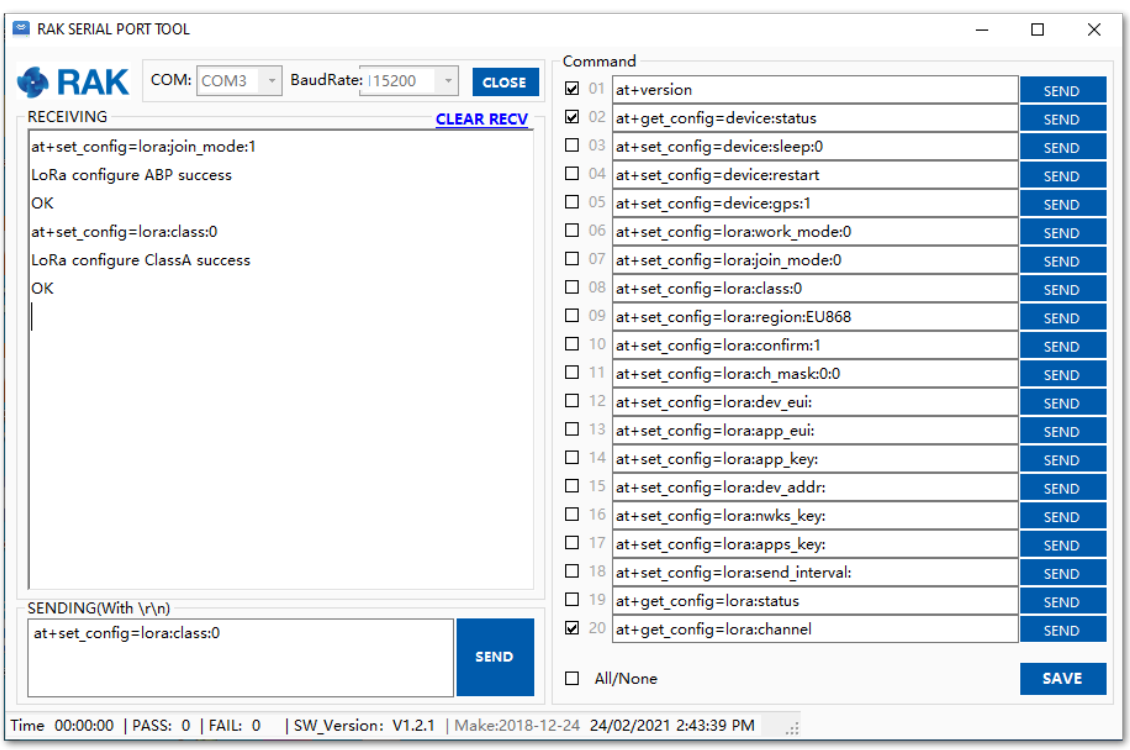

Figure 48: Chirpstack ABP Set Class via RAK Serial Port Tool

5. Set the frequency/region to **EU868**.

```
at+set_config=lora:region:EU868
```

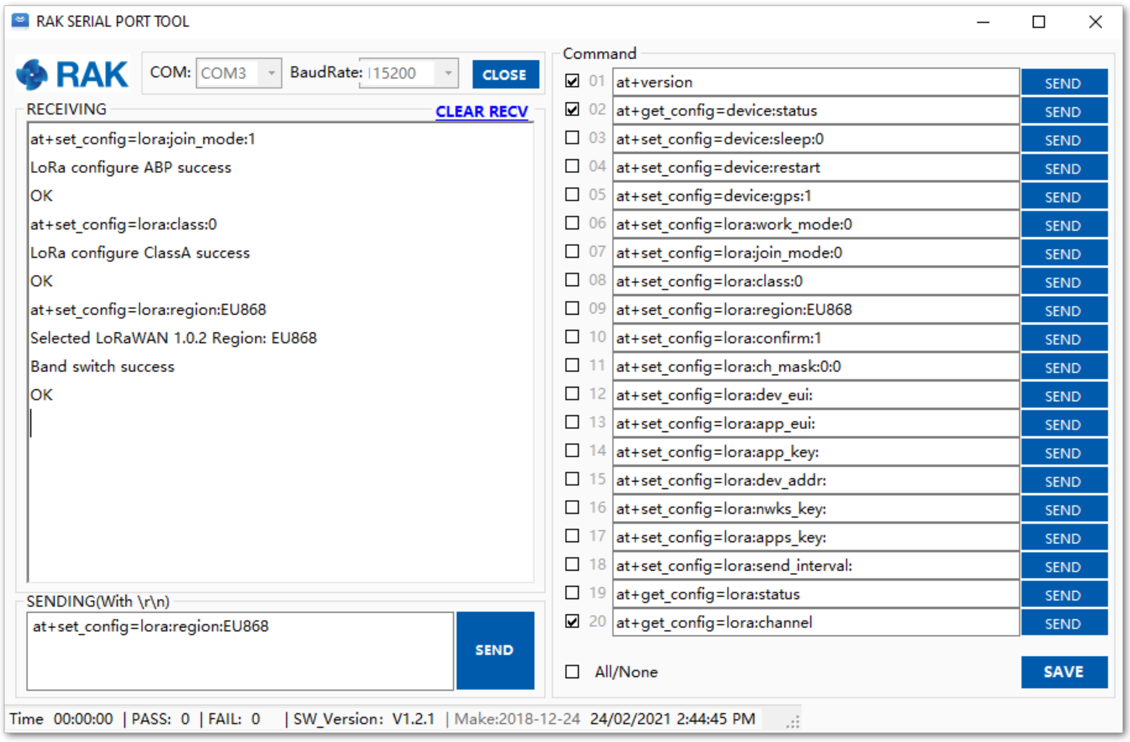

Figure 49: Chirpstack ABP Set Region/Frequency via RAK Serial Port Tool

6. Set the **Device Address**.

```
at+set_config=lora:dev_addr:XXXX
```

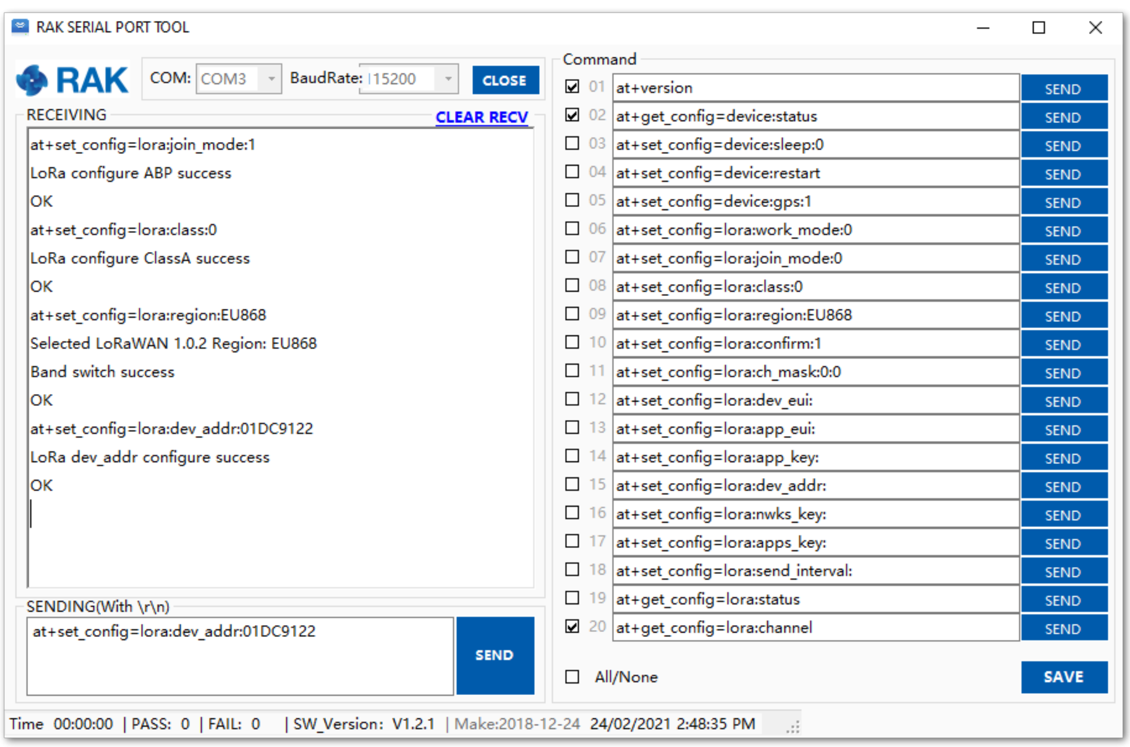

Figure 50: Chirpstack ABP Set Device Address via RAK Serial Port Tool

7. Set the **Network Session Key**.

```
at+set_config=lora:nwks_key:XXXX
```

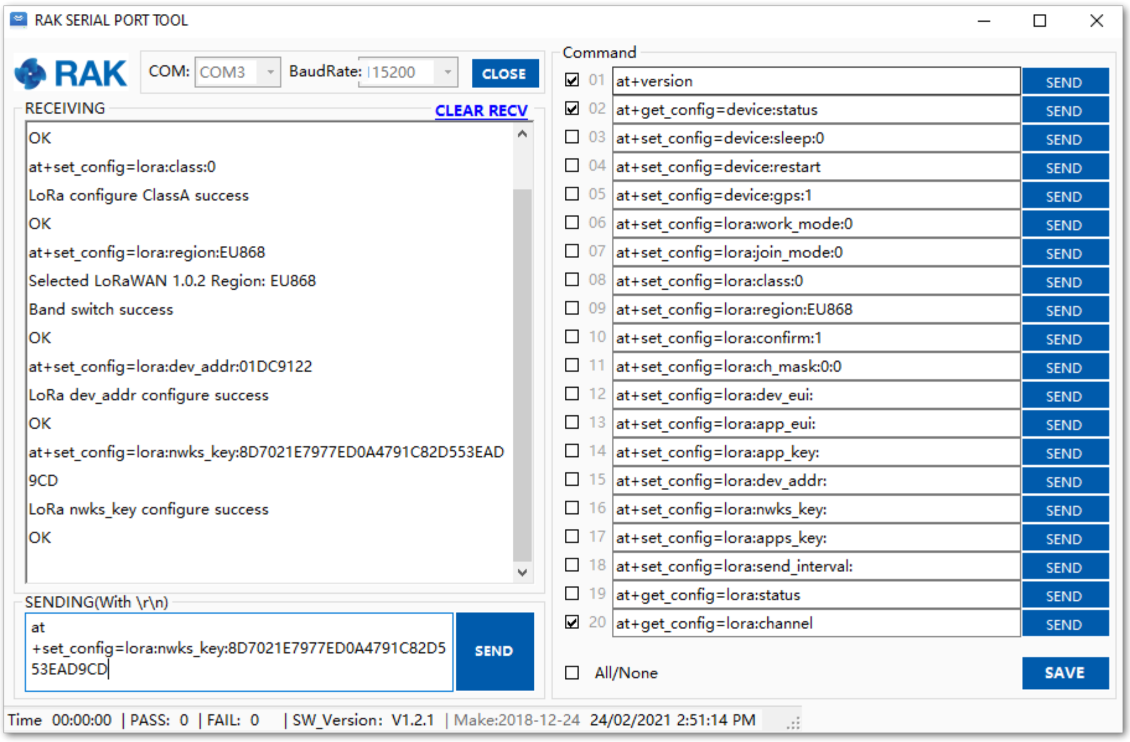

Figure 51: Chirpstack ABP Set Network Session Key via RAK Serial Port Tool

8. Set the **Application Session Key**.

```
at+set_config=lora:apps_key:XXXX
```

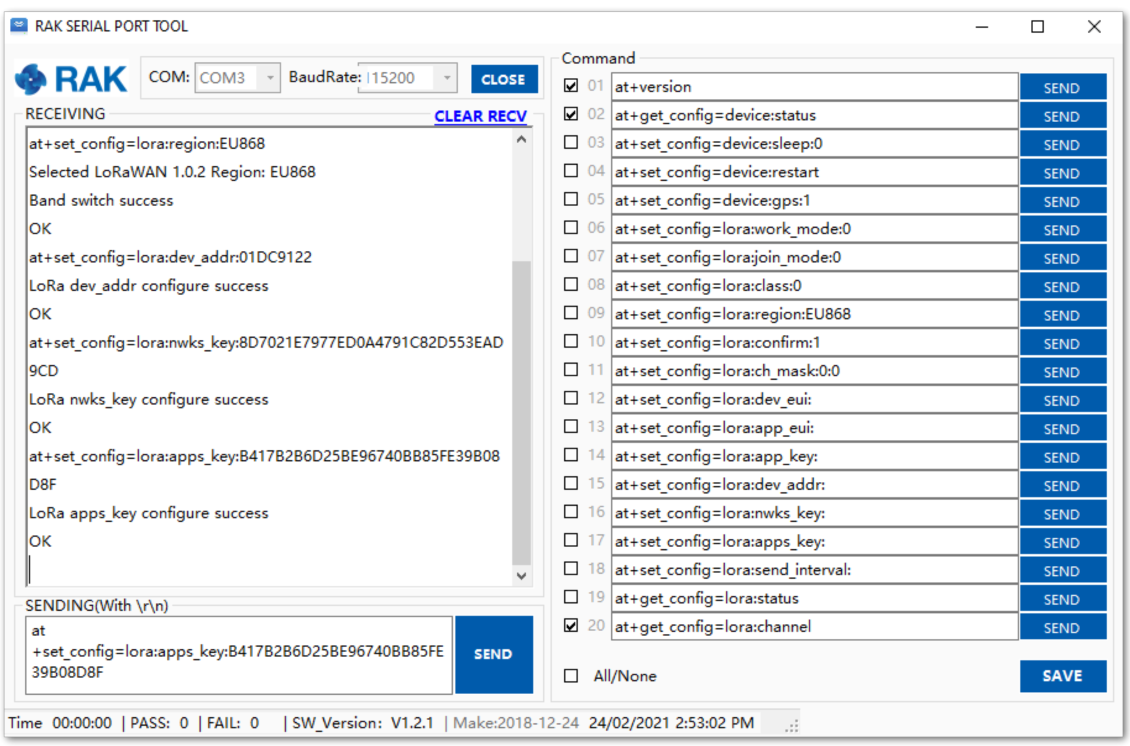

Figure 52: Chirpstack ABP Set Application Session Key via RAK Serial Port Tool

> 📝 **NOTE:**
>
> After configuring all parameters, you need to reset RAK5205 WisTrio LPWAN Tracker to save the parameters.

9. After resetting RAK5205 WisTrio LPWAN Tracker, join in ABP mode.

```
at+join
```

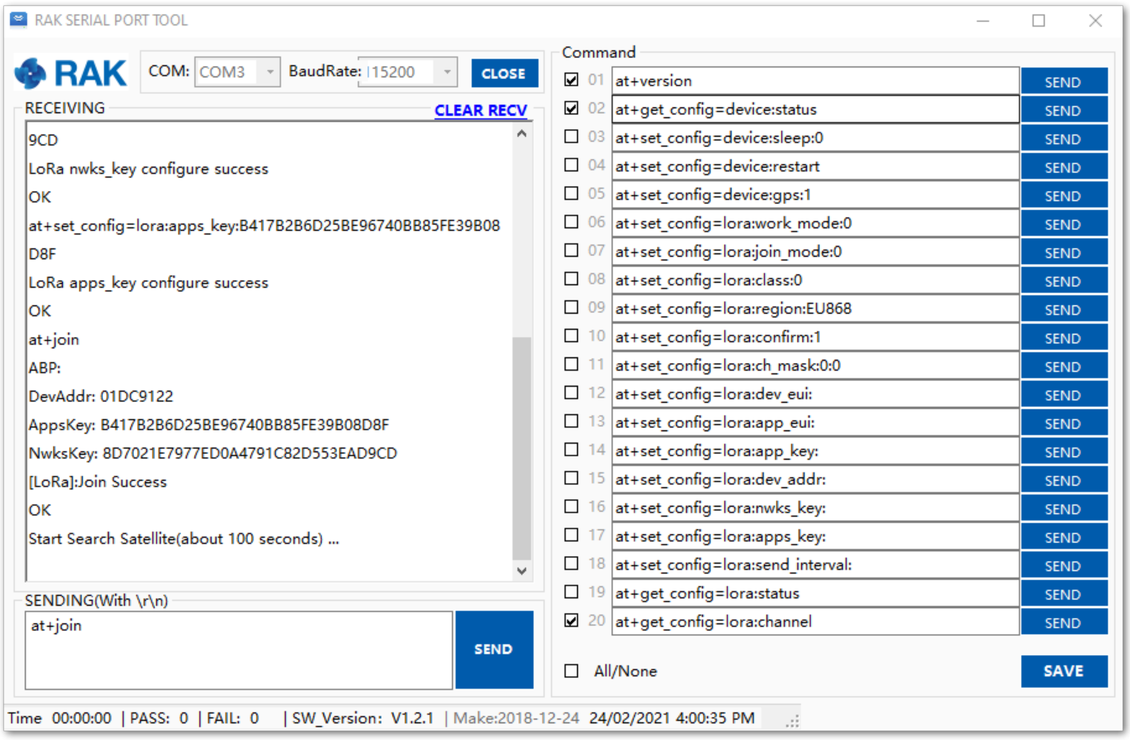

Figure 53: Chirpstack ABP Join via RAK Serial Port Tool

📝 **NOTE:**

Actually, it is not needed to join in ABP mode. But you still need to set this AT command to validate the parameters which you just set for ABP mode.

10. Try to send data from RAK5205 WisTrio LPWAN Tracker to ChirpStack.

```
at+send=lora:2:1234567890
```

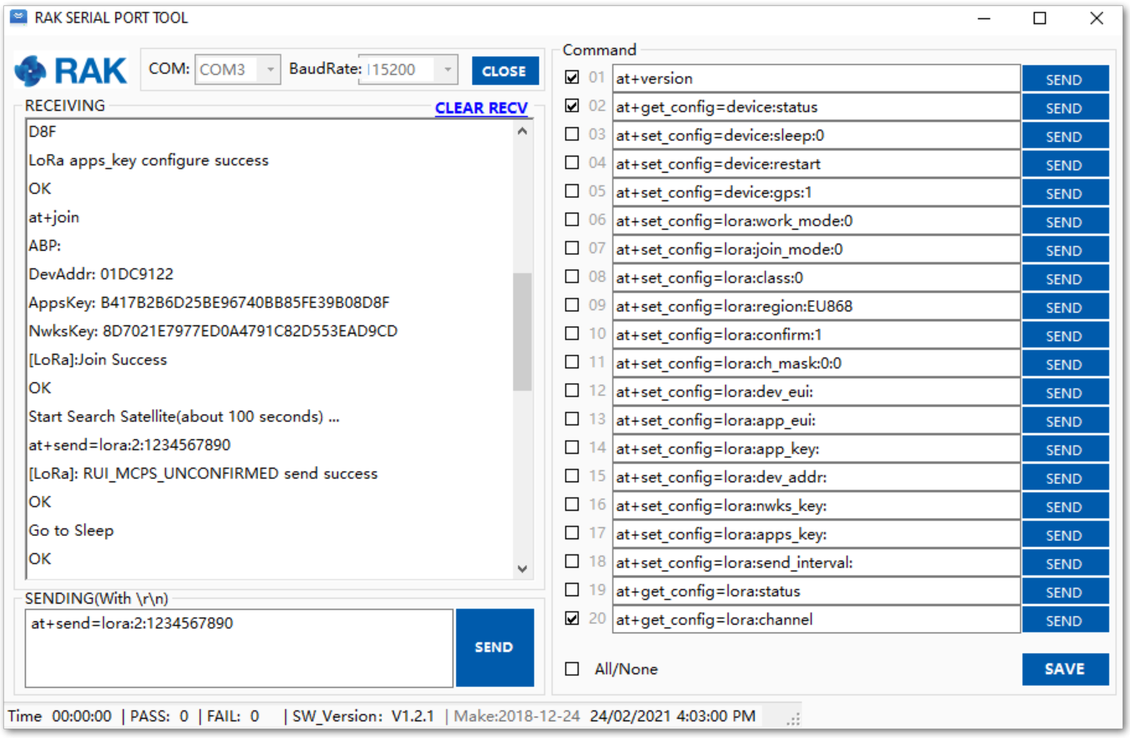

Figure 54: Chirpstack Sample Data Sent via RAK Serial Port Tool

- You can then see the data which is just sent from RAK5205 WisTrio LPWAN Tracker on ChirpStack console.

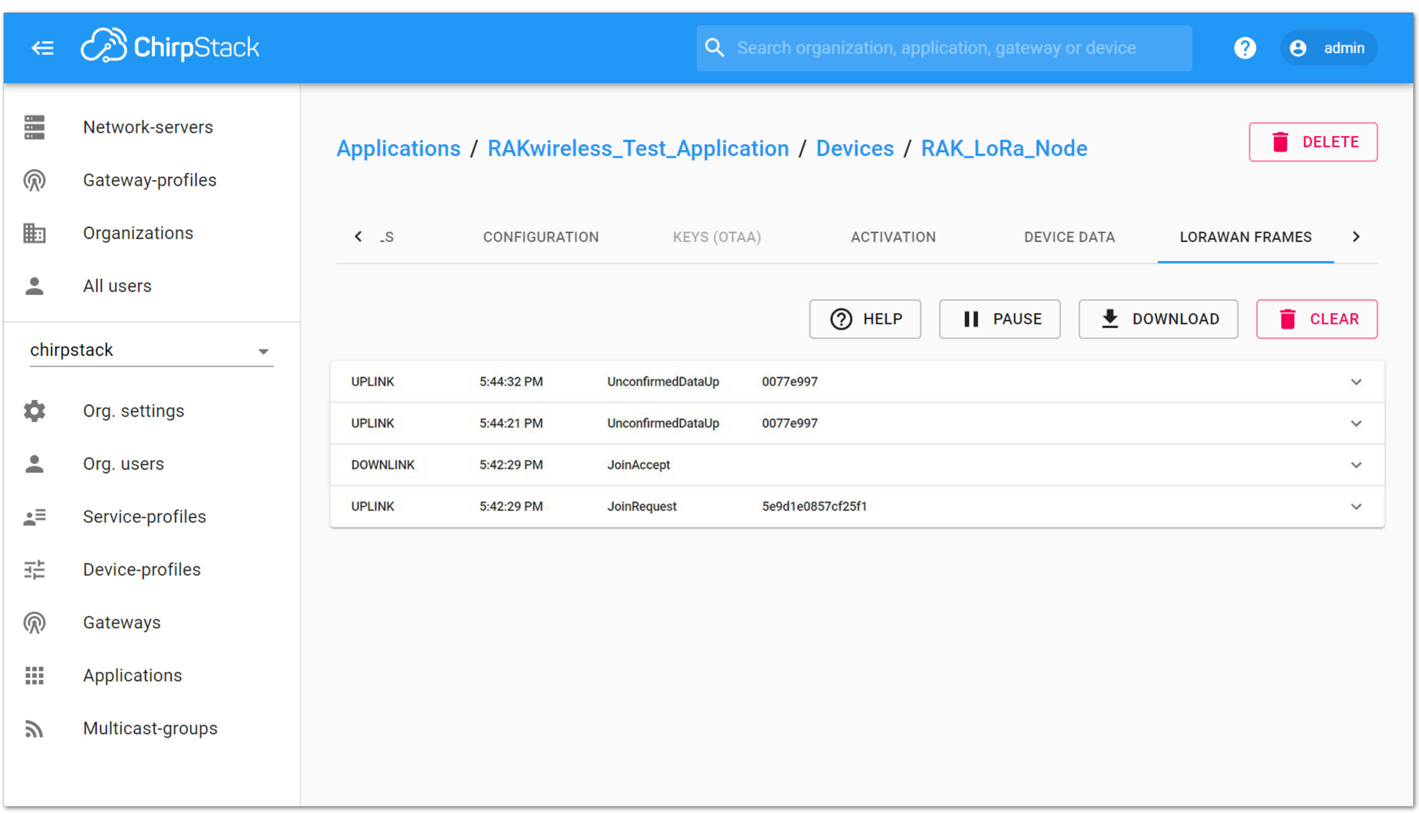

Figure 55: Chirpstack Data Received Preview

Configuration of GPS and Sensor Data Transmit Interval

With your RAK5205 already connected to the network server, you can set the interval of sending GPS coordinates and sensor data using the following command:

```
at+set_config=lora:send_interval:1:Y
```

- where **Y** represents the time interval is seconds.

GPS Satellite Scan Time and Accuracy

The GPS module will try to get a fix from GPS satellites to get the location coordinates. You can modify the satellite scan time of RAK5205. In addition, you can also set the accuracy of GPS coordinates to 4-digit or 6-digit decimal places.

To set the GPS satellite scan time where **X** is in seconds:

```
at+set_config=device:gps_timeout:X
```

To set the GPS accuracy to 4-digit if **X** is 0 and 6-digit if **X** is 1:

```
at+set_config=device:gps_format:X
```

Decoding Sensor Data on ChirpStack and TTN

Analyzing Sensor Data from RAK5205

In the previous section, you have successfully sent some raw data from our RAK5205 LPWAN Tracker to The Things Network, but the problem is that you can't really see the actual sensor data from the payload. In this section, you will solve that and understand what each payload means.

> 📝 **NOTE:**
>
> Depending on the GPS coordinates accuracy configured on RAK5205 (either 4-digit or 6-digit), you must use the right decoder that can be downloaded on the RAKwireless Github repository.

Take the payload data in Figure 56, for example.

Payload: **01 88 05 37 97 10 9D 59 00 DC 14 08 02 01 7A 07 68 58 06 73 25 6D 02 67 01 1D 04 02 14 AF 03 71 FF FF FF DD FC 2E**

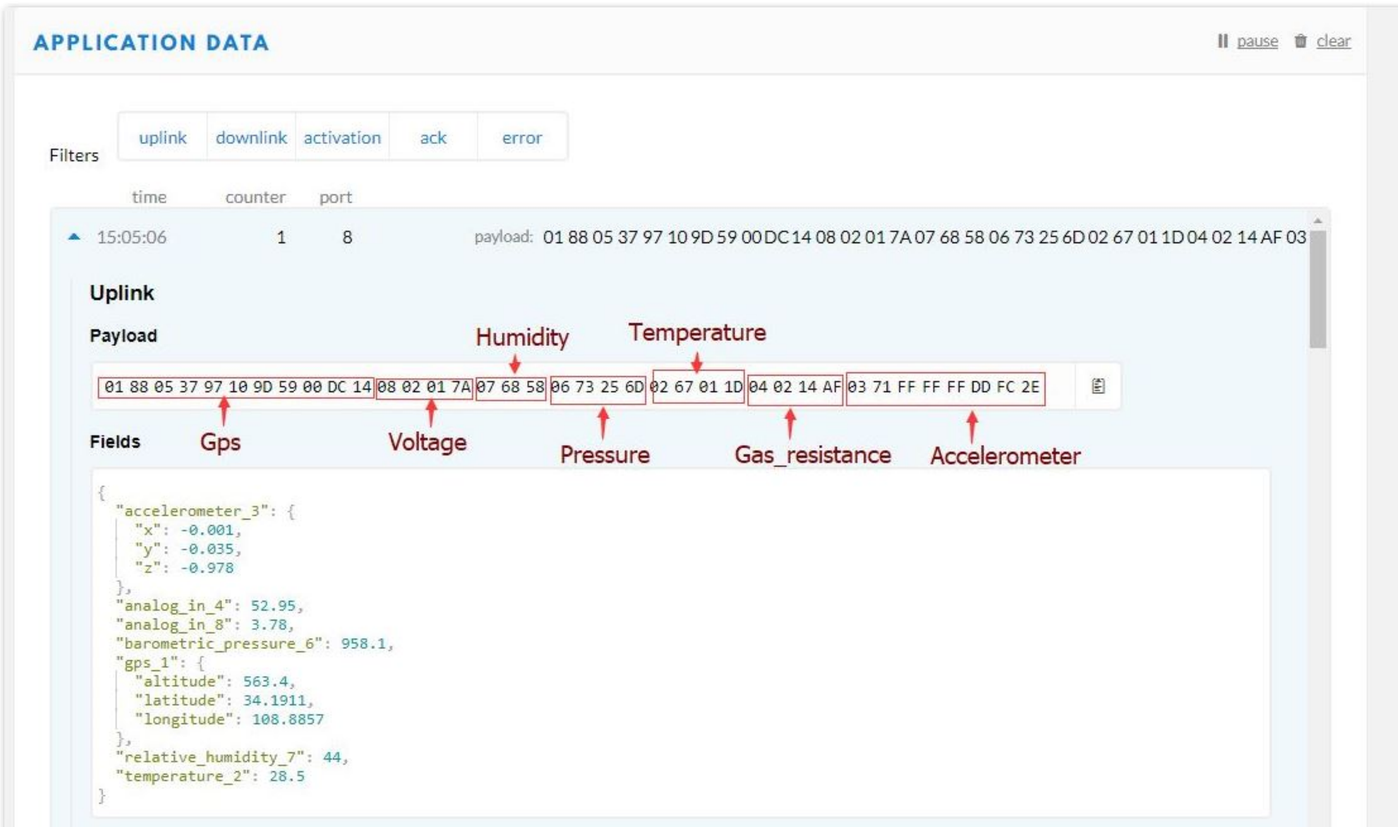

Figure 56: Sample Payload

Now, analyze each data which is in Hexadecimal Format. You will be using the data mentioned above as an example and convert the Hexadecimal Data into Decimal Data using a converter to understand it.

Figure 57: Hexadecimal to Decimal converter

1. GPS Data

Example data: **01 88 05 37 97 10 9D 59 00 DC 14**

Parameter	Hex Data	Decimal Equivalent	Multiplier	True Value
Data Flag	01 88			
Latitude	05 37 97	341911	0.0001° Signed MSB	34.1911°
Longitude	10 9D 59	1088857	0.0001° Signed MSB	108.8857°
Altitude	00 DC 14	56340	0.01 m Signed MSB	563.4 m

2. Battery Voltage

Example Data: **08 02 01 7A**

Parameter	Hex Data	Decimal Equivalent	Multiplier	True Value
Data Flag	08 02			
Battery Voltage	01 7A	378	0.01 Signed	3.78 V

3. Humidity

Example Data: **07 68 58**

Parameter	Hex Data	Decimal Equivalent	Multiplier	True Value
Data Flag	07 68			
Humidity	58	88	0.5% Unsigned	44.0% RH

4. Pressure

Example Data: **06 73 25 6D**

Parameter	Hex Data	Decimal Equivalent	Multiplier	True Value
Data Flag	06 73			
Pressure	25 6D	9581	0.1 hPa Unsigned MSB	958.1 hPa

5. Temperature

Example Data: **02 67 01 1D**

Parameter	Hex Data	Decimal Equivalent	Multiplier	True Value
Data Flag	02 67			
Temperature	01 1D	285	0.1 °C Signed MSB	28.5 ℃

6. Gas Resistance

Example Data: **04 02 14 AF**

Parameter	Hex Data	Decimal Equivalent	Multiplier	True Value
Data Flag	04 02			
Gas Resistance	14 AF	5295	0.01 kΩ Signed	52.95 kΩ

7. Accelerometer

Example Data: **03 71 FF FF FF DD FC 2E**

Parameter	Hex Data	Decimal Equivalent	Multiplier	True Value
Data Flag	03 71			
Acceleration X	FF FF	-1	0.001 g Signed MSB	-0.001 g
Acceleration Y	FF DD	-35	0.001 g Signed MSB	-0.035 g
Acceleration Z	FC 2E	-978	0.001 g Signed MSB	-0.978 g

Decoding Sensor Data in TTN

Input Decoding Function in TTN

1. To start with, download the **decoding function**.

2. From your TTN console, go to application page and click the "**Payload Formats**" tab as shown in Figure 58.

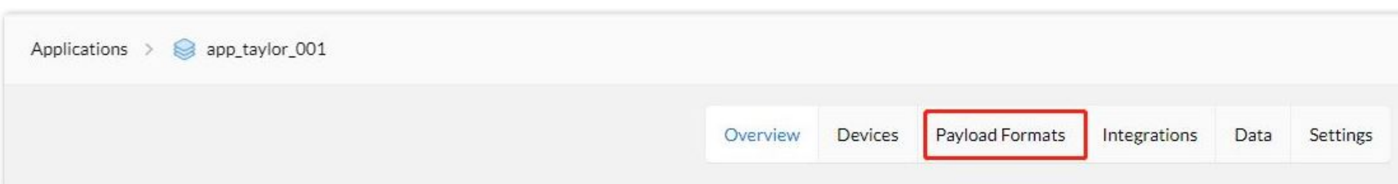

Figure 58: Payload Format at TTN Application Page

3. Next, select "**Payload Format**" as "**Custom**". Then, from the decoder tab, copy and paste the decoder function from **step 1**.

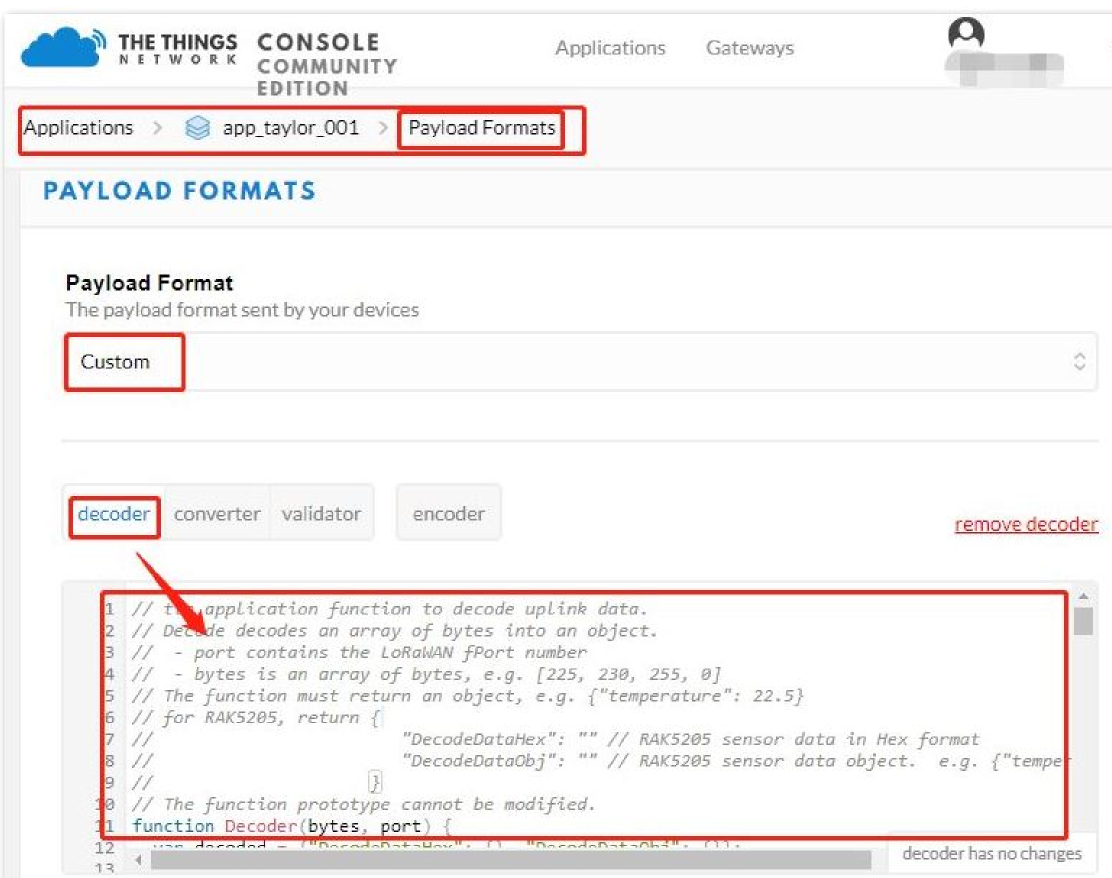

Figure 59: Inputting the Decoder Function

Testing the Validity of Decoding Sensor Data in TTN

Input the listed data below in the "**Payload**" box as shown in Figure 60.

Payload data: **01 88 05 37 97 10 9D 59 00 DC 14 08 02 01 7A 07 68 58 06 73 25 6D 02 67 01 1D 04 02 14 AF 03 71 FF FF FF DD FC 2E**

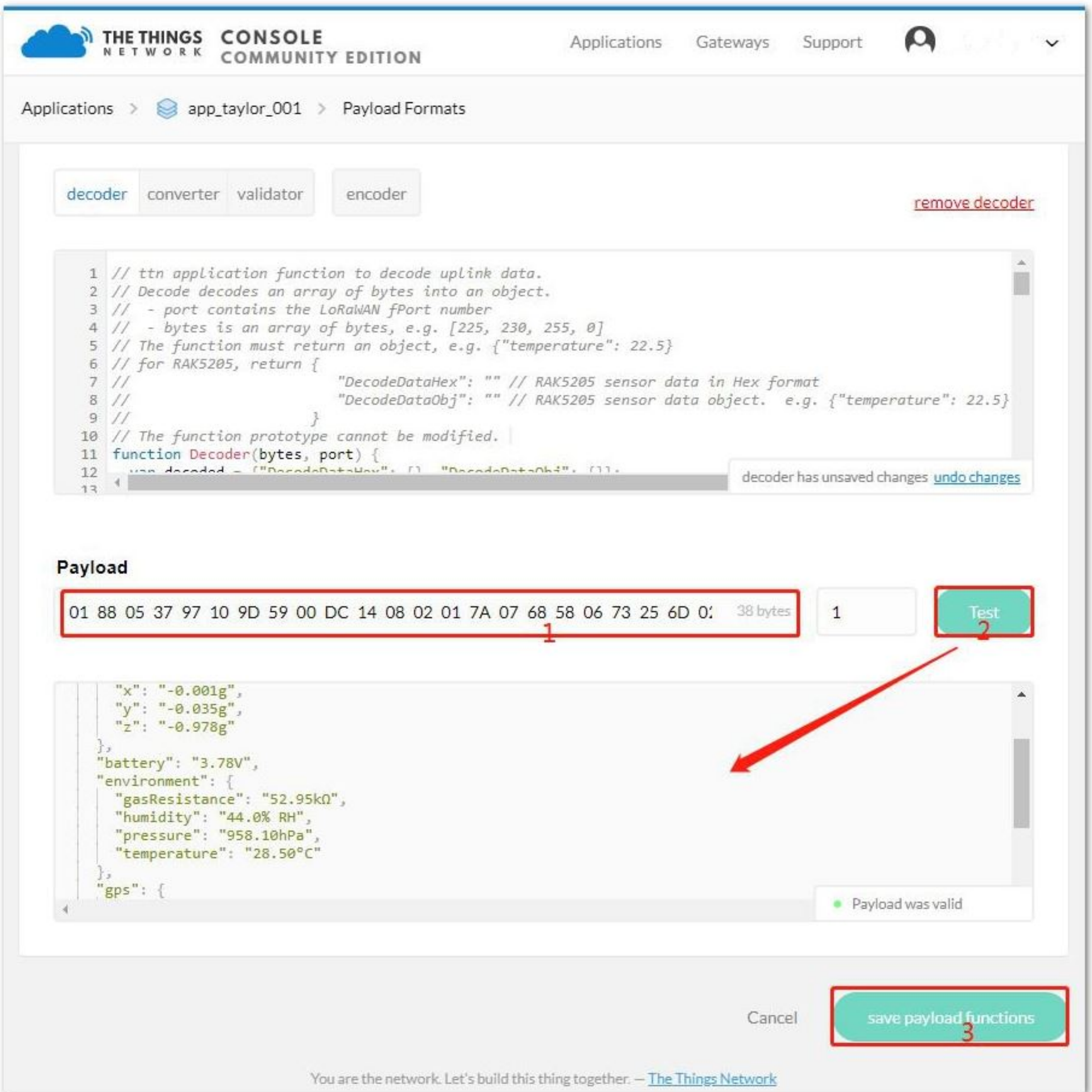

Figure 60: Testing Payload Data

- Then, click "**Test**" and it will generate a code with the decoded data as shown in Figure 60.

```json
{
  "DecodeDataHex": "0188053797109d5900dc140802017a0768580673256d0267011d040214af0371ffffffddfc2e"
  "DecodeDataObj": {
    "acceleration": {
      "x": "-0.001g",
      "y": "-0.035g",
      "z": "-0.978g"
    },
    "battery": "3.78V",
    "environment": {
      "gasResistance": "52.95kΩ",
      "humidity": "44.0% RH",
      "pressure": "958.10hPa",
      "temperature": "28.50°C"
    },
      "gps": {
      "altitude": "563.4m",
      "latitude": "34.1911°",
      "longitude": "108.8857°"
    }
  }
}
```

- Click "**save payload functions**" button to save the decoding function.

Testing in Real System in TTN

After the gateway and node go online, click the **uplink data record** from the application data tab to check the decode status. In Figure 61, you can see the data decoded successfully in TTN.

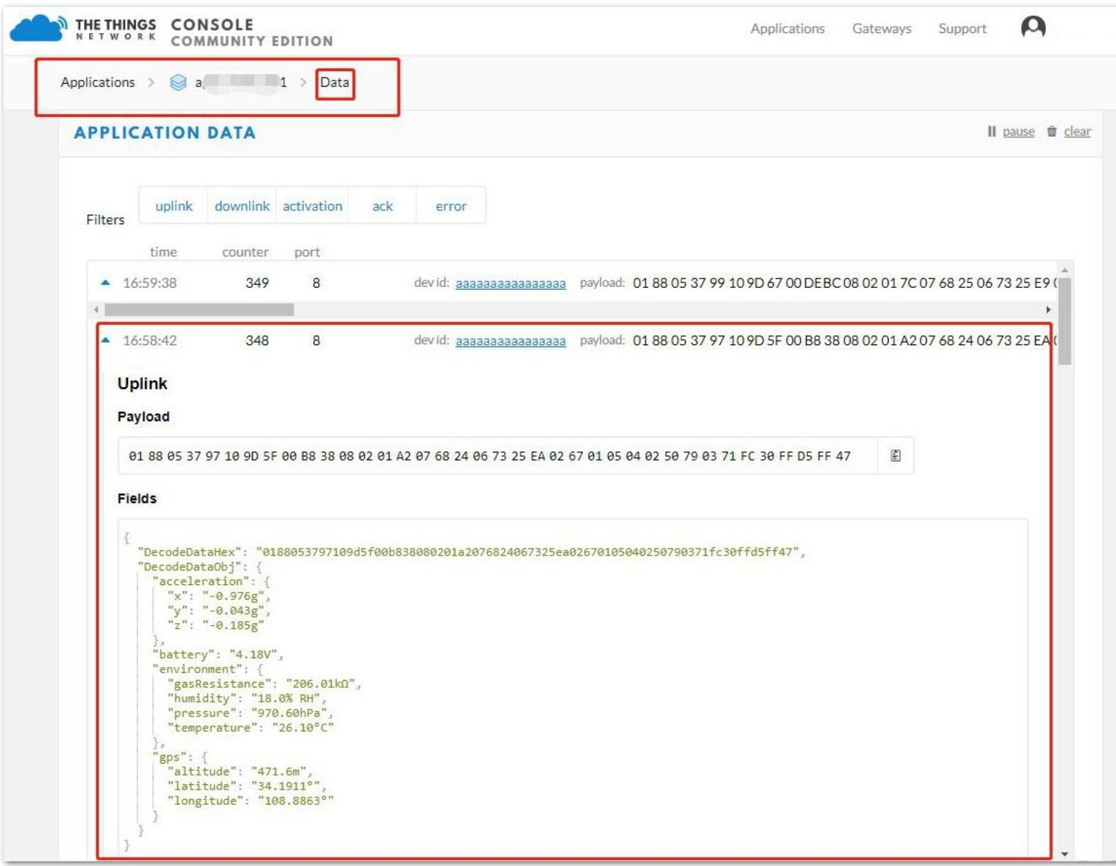

Figure 61: Uplink Decoded Data

Decoding Sensor Data in ChirpStack

Input Decoding Function in ChirpStack

1. To start with, download the **decoding function**.

2. From your ChirpStack, go to application page and click the "**APPLICATION CONFIGURATION**" tab as shown in Figure 62.

Figure 62: Application Configuration Tab

3. Next, select "**Payload codec**" as "**Custom JavaScript codec functions**". Then, from the decoder tab, copy and paste the decoder function from **step 1**.

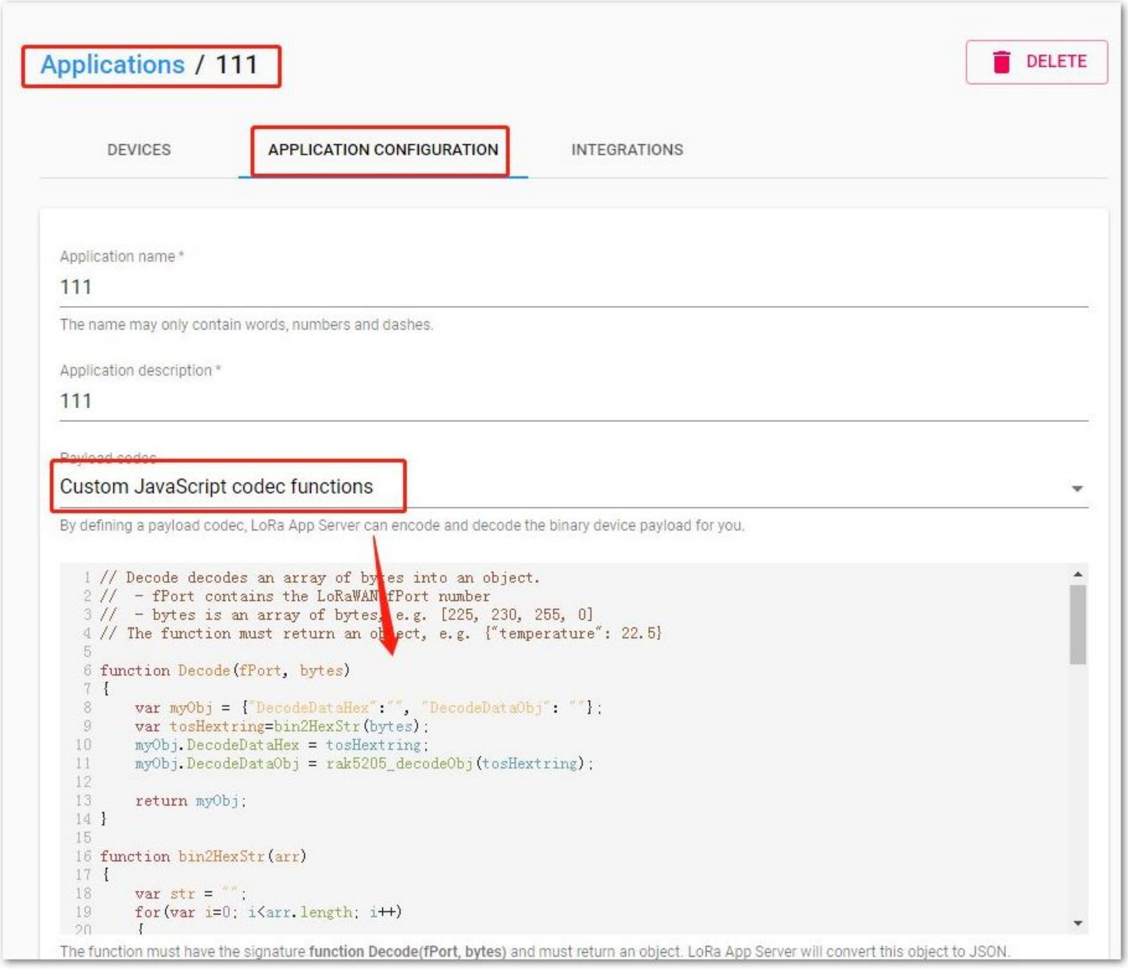

Figure 63: Decoded Function in Chirpstack

4. Click "**UPDATE APPLICATION**" button to save decoding function.

Testing in Real System in ChirpStack

After the gateway and node go online, click the uplink data record from the application data at "**LIVE DEVICE DATA**" tab to check the decode status. In Figure 64, you can see the data decoded successfully in ChirpStack.

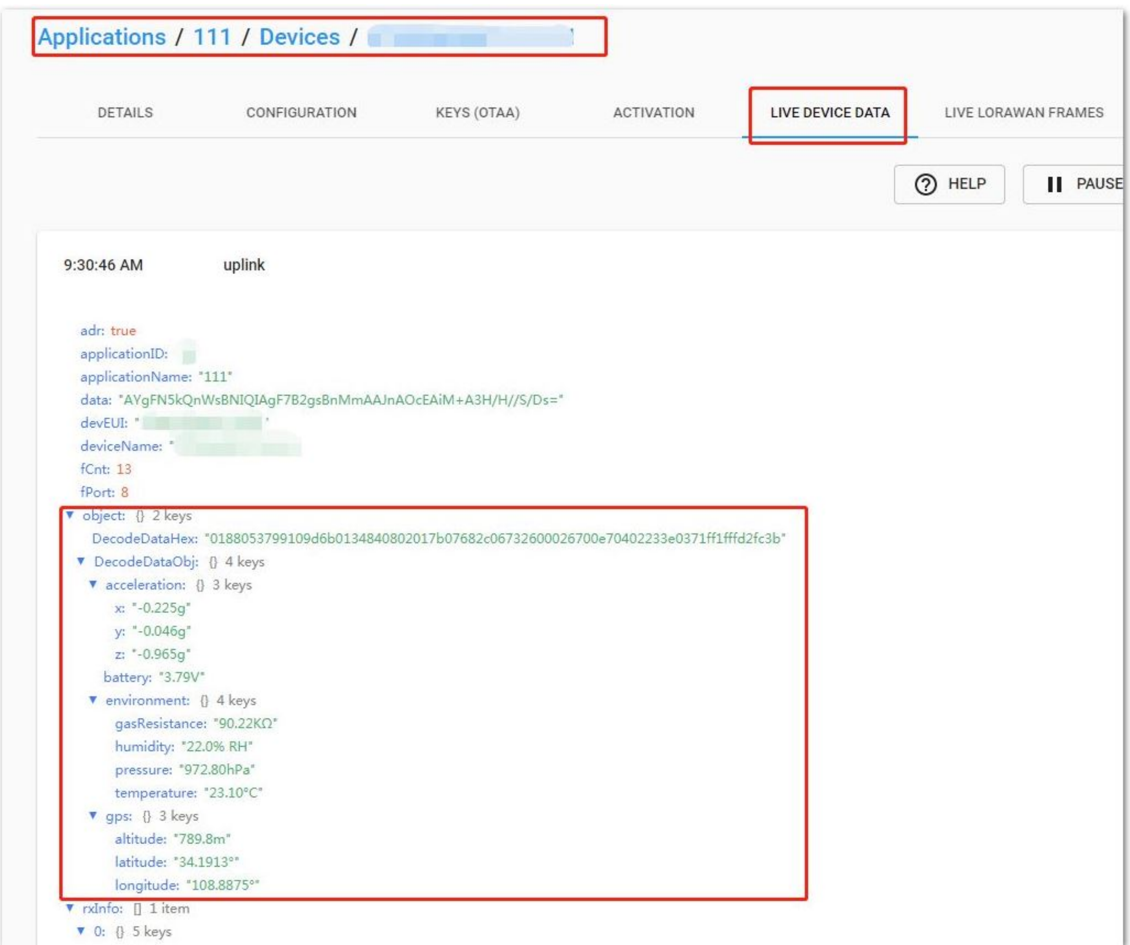

Figure 64: Decode Status in ChirpStack

Cayenne Integration

MyDevice/Cayenne is a service that allows one to monitor node data in real time and can also send downlink control messages. Additionally, it has a wide range of integrations for alerts, notifications, and alarms. Its visualization tools provide various ways of representing both real time and statistical data such as graphs, dials, gauges, scales, and charts.

The Things Network Configuration

Before you can use Cayenne, you need to configure our Application in TTN to properly work with it.

1. Log into your TTN Console and navigate to the desired application and RAK5205 device.
2. Go to the **Payload Formats** tab as seen in Figure 65 and choose **"Cayenne LPP**".

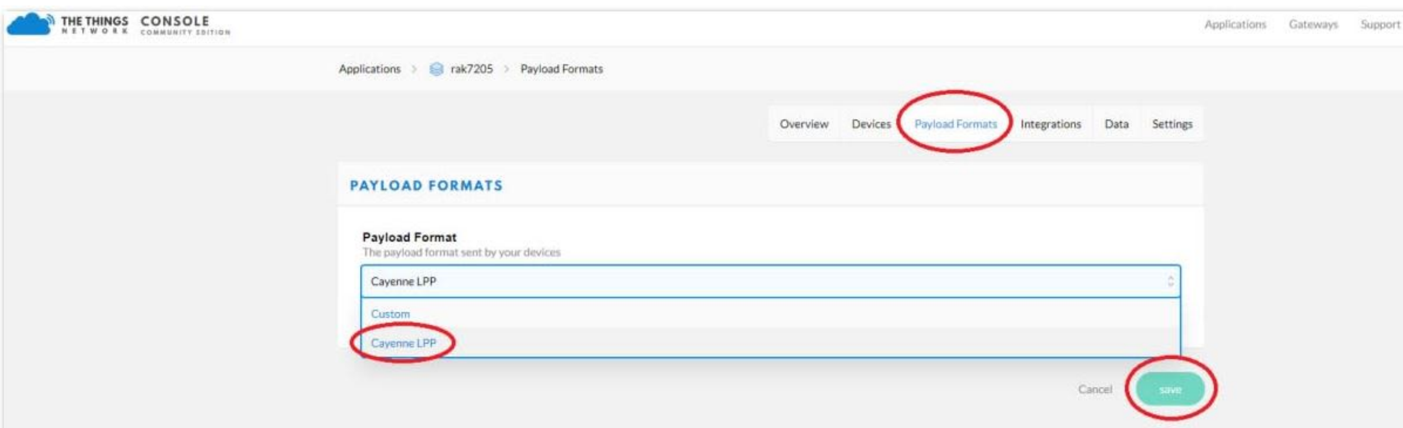

Figure 65: Device Payload Formats

3. Next, go to the **Integrations Tab** and press the "**add integration**" button.

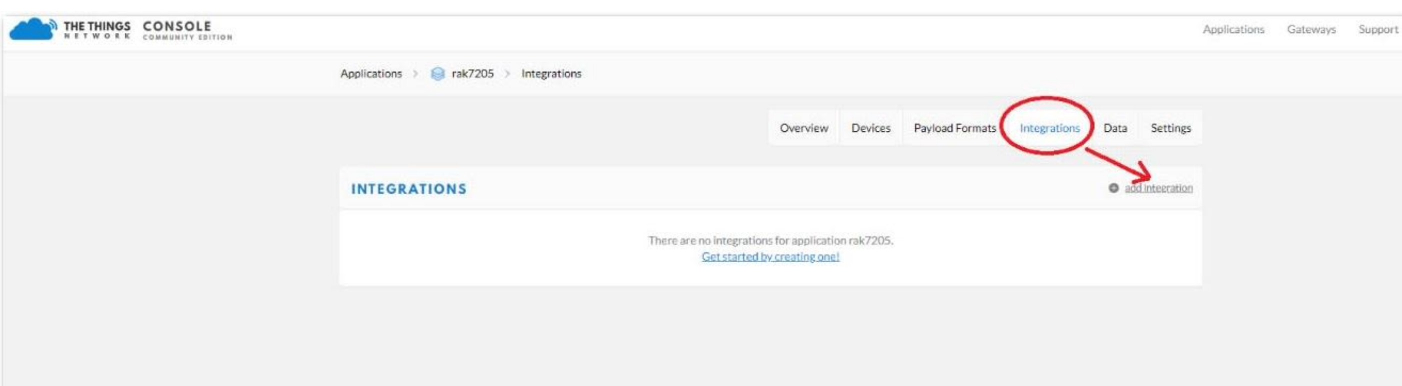

Figure 66: Device Integration

4 Select the **MyDevices** icon.

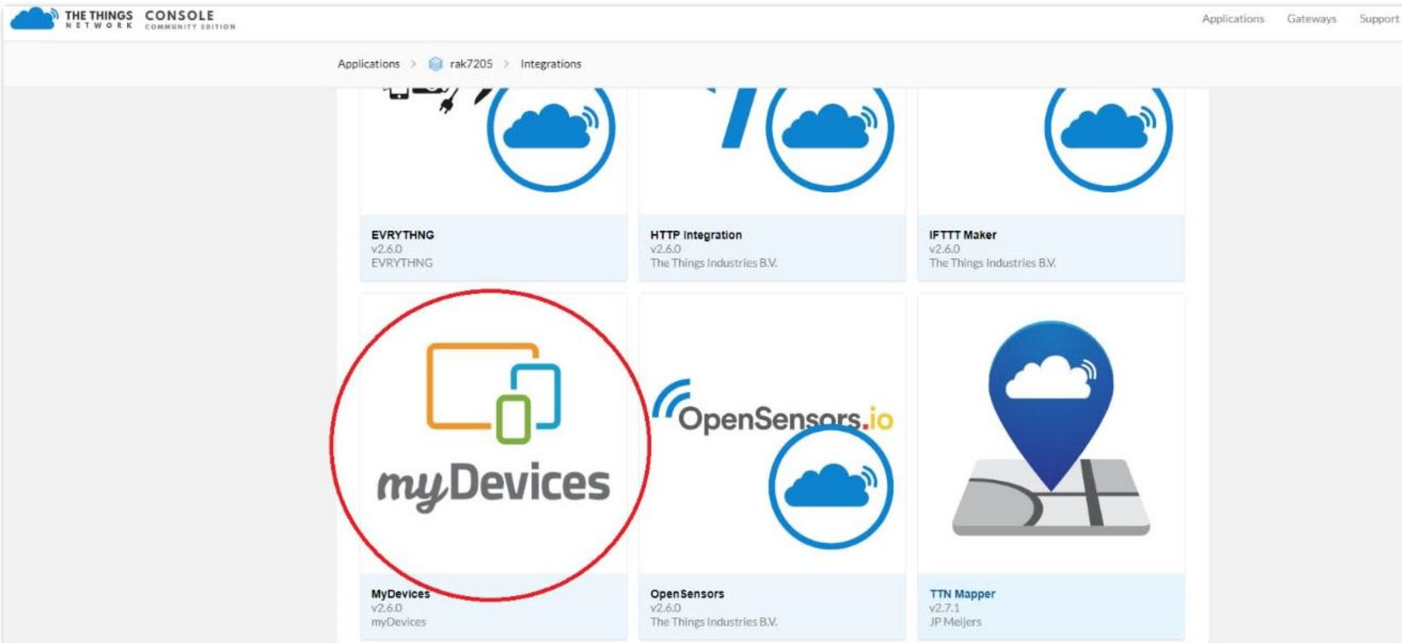

Figure 67: My Devices Integration

5. You will be redirected to a page the same as shown in Figure 68, where you need to enter a Process ID and select an Access Key (Choose the default key).

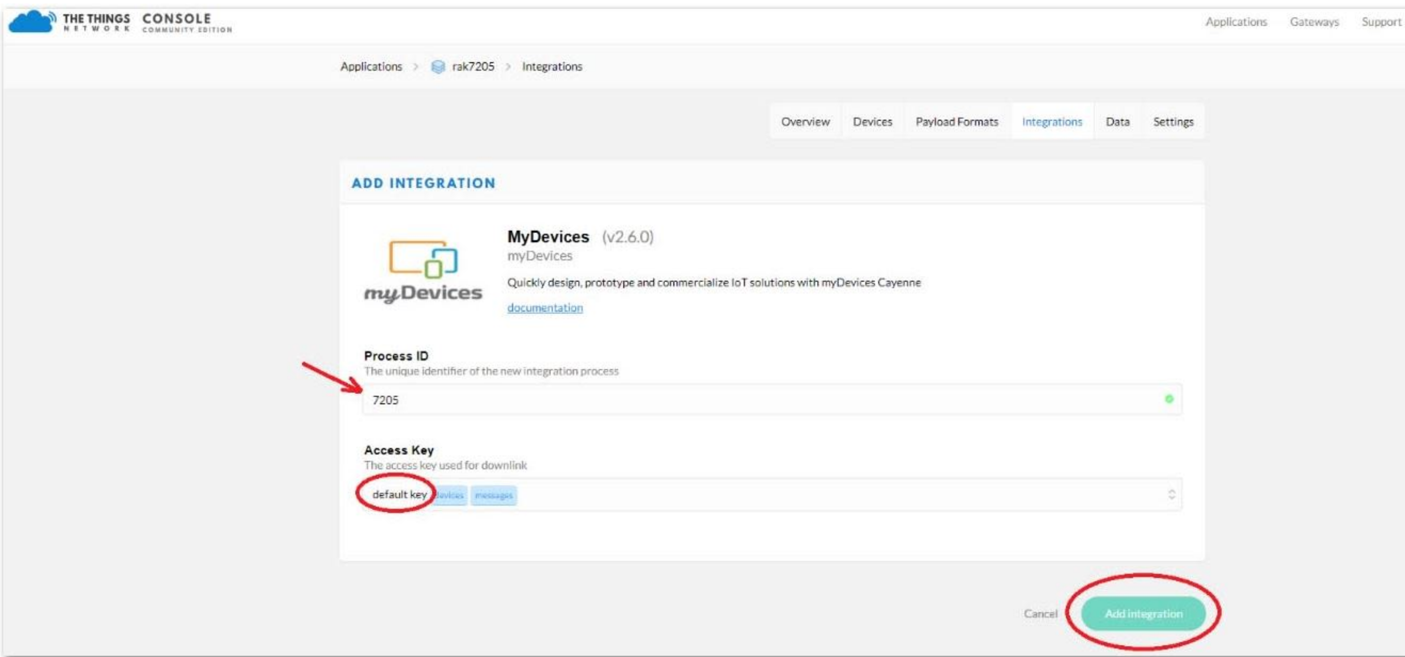

Figure 68: myDevices Integration Configuration

Cayenne Configuration

If you don't have an account in Cayenne, head on to https://mydevices.com/cayenne/signup/ and create an account for free.

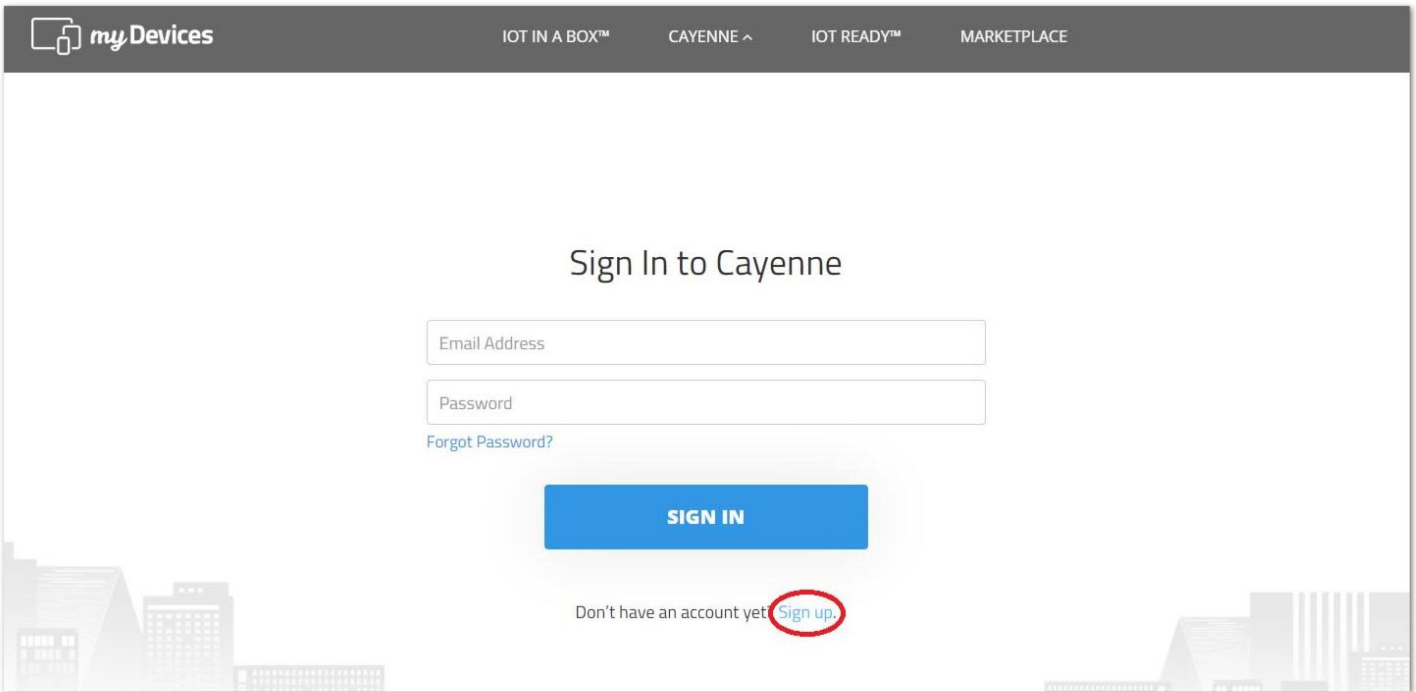

Figure 69: Cayenne start screen

1. Once logged in, navigate to the "**Add New**" drop down menu in the upper left corner and choose "**Device/Widget**".

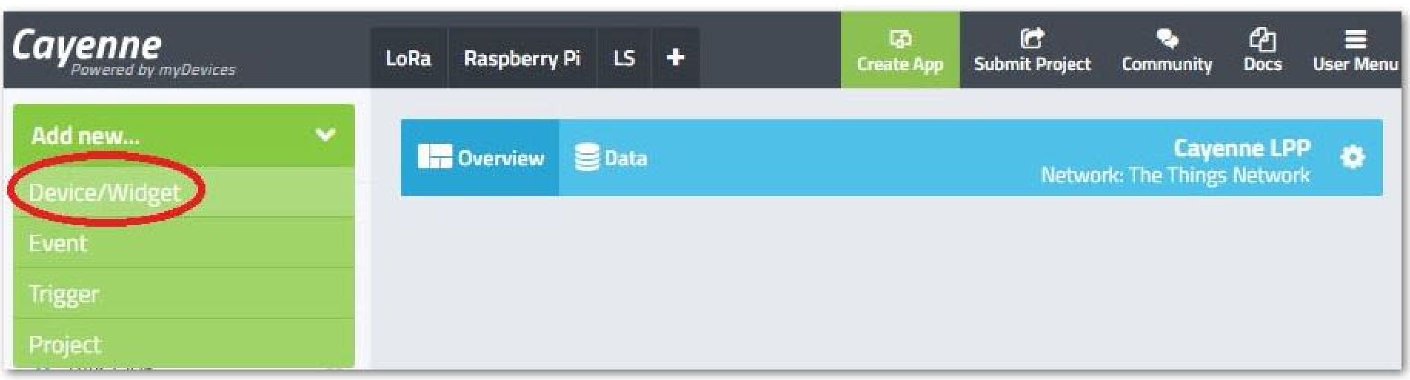

Figure 70: Adding a device

2. Select **LoRa** in the list of Devices and Widgets and navigate to The Things Network at the end of the list.

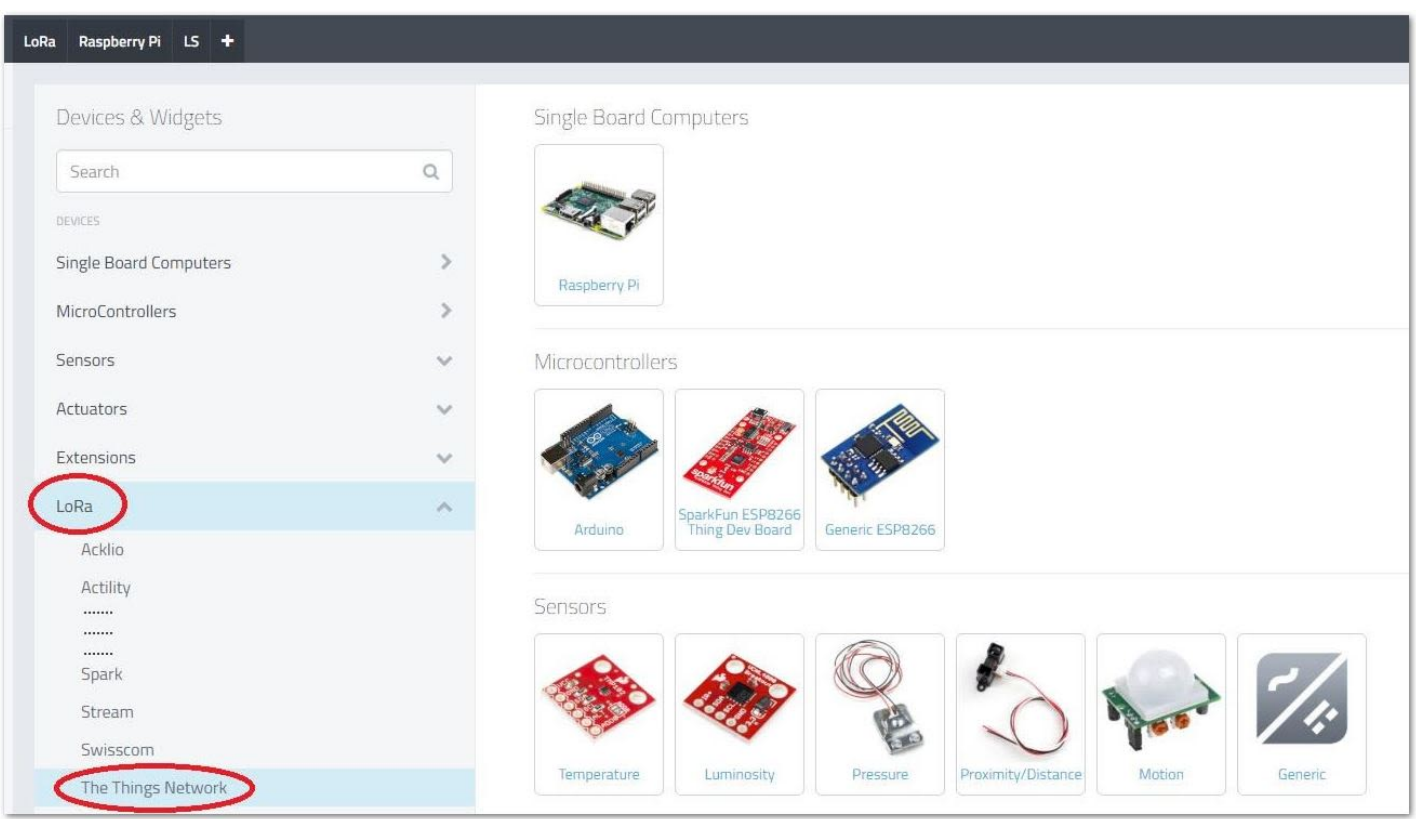

Figure 71: Choosing your device from the list

3. A list of LoRa Products and Widgets are now displayed. Scroll down and look for "**Cayenne LPP**".

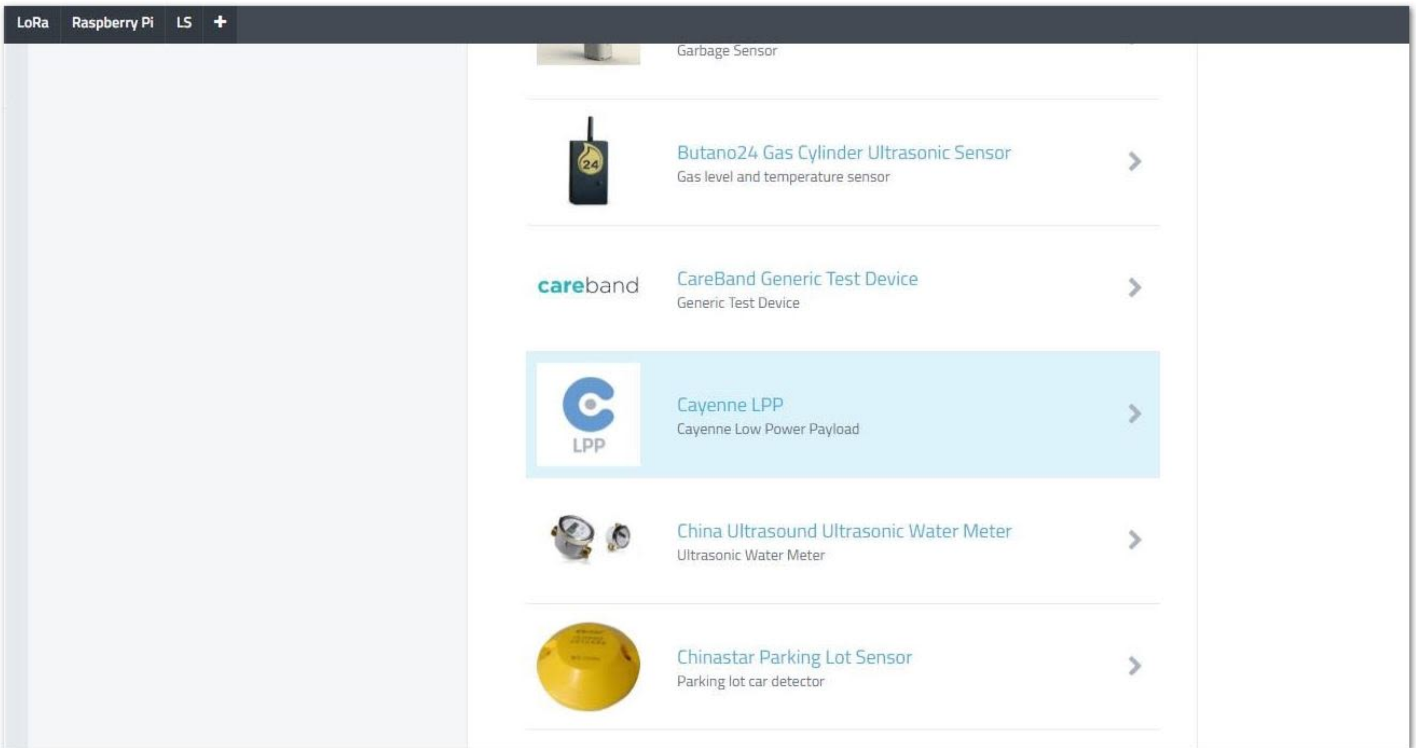

Figure 72: Cayenne LPP device selection

4. Lastly, input the Device EUI and optionally set if your device is moving or stationary.

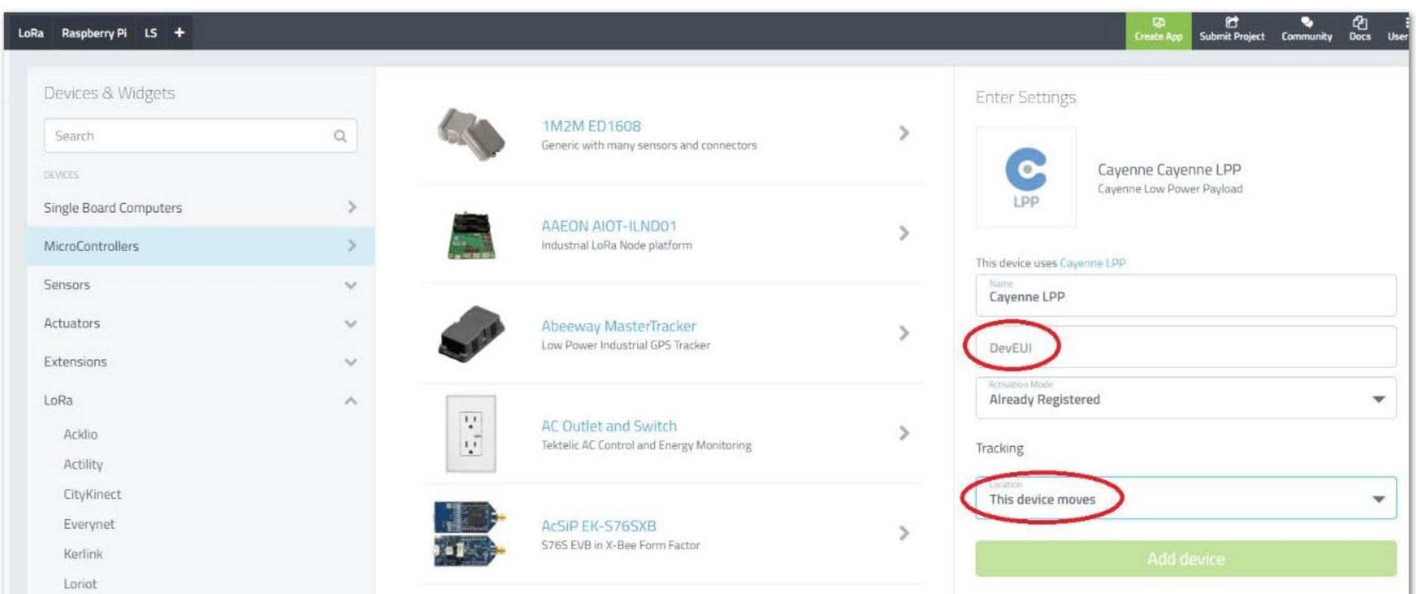

Figure 73: Setting device parameters

- If everything went well, you should end up with a screen the same as Figure 74.

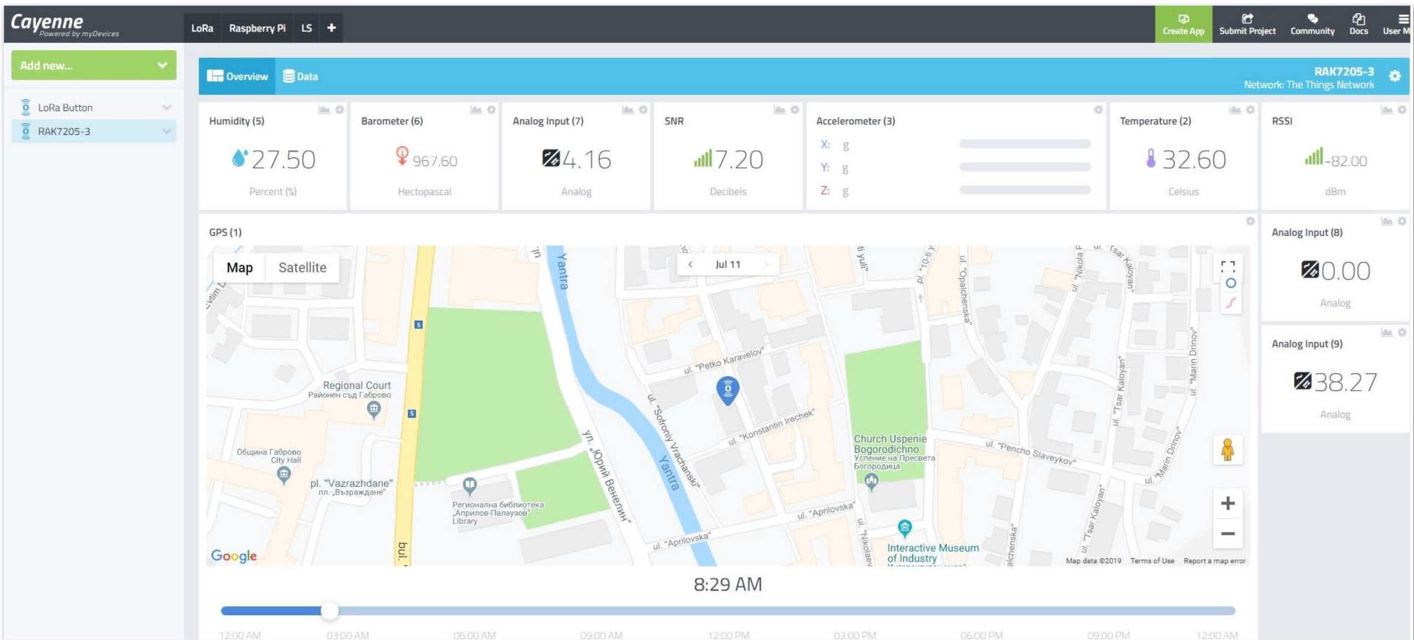

Figure 74: Dashboard live view of RAK5205

> 📝 **NOTE**
>
> There are two widgets that appear as general Analog ones. The first one on channel 8 is the **speed** as measured by the GPS receiver. The second one on channel 9 is the **Air Quality Index** (AQI). You need to edit the names and choose an appropriate UI representation by hand. Because, as of this moment, LPP doesn't support data of such type, and they are transmitted as general analog values. In Rev2 of the LPP standard, it is expected these issues will be addressed.

LoRa P2P Mode

This section shows how to use LoRa P2P mode. You will be using EU868 as the frequency, although it is applicable to other standard bands.

1. First, find two **RAK5205 LoRa Tracker** which can work on EU868 frequency and make sure their firmware version isn't less than **V3.0.0.1**.

2. Next, connect these two RAK5205 LoRa Tracker with PC through UART, and open two serial port tool on PC.

3. Now, configure them to both work in LoRaP2P mode as follow:

```
at+set_config=lora:work_mode:1
```

> 📝 **NOTE**
>
> The device will automatically restart when mode is set to LoRa P2P.

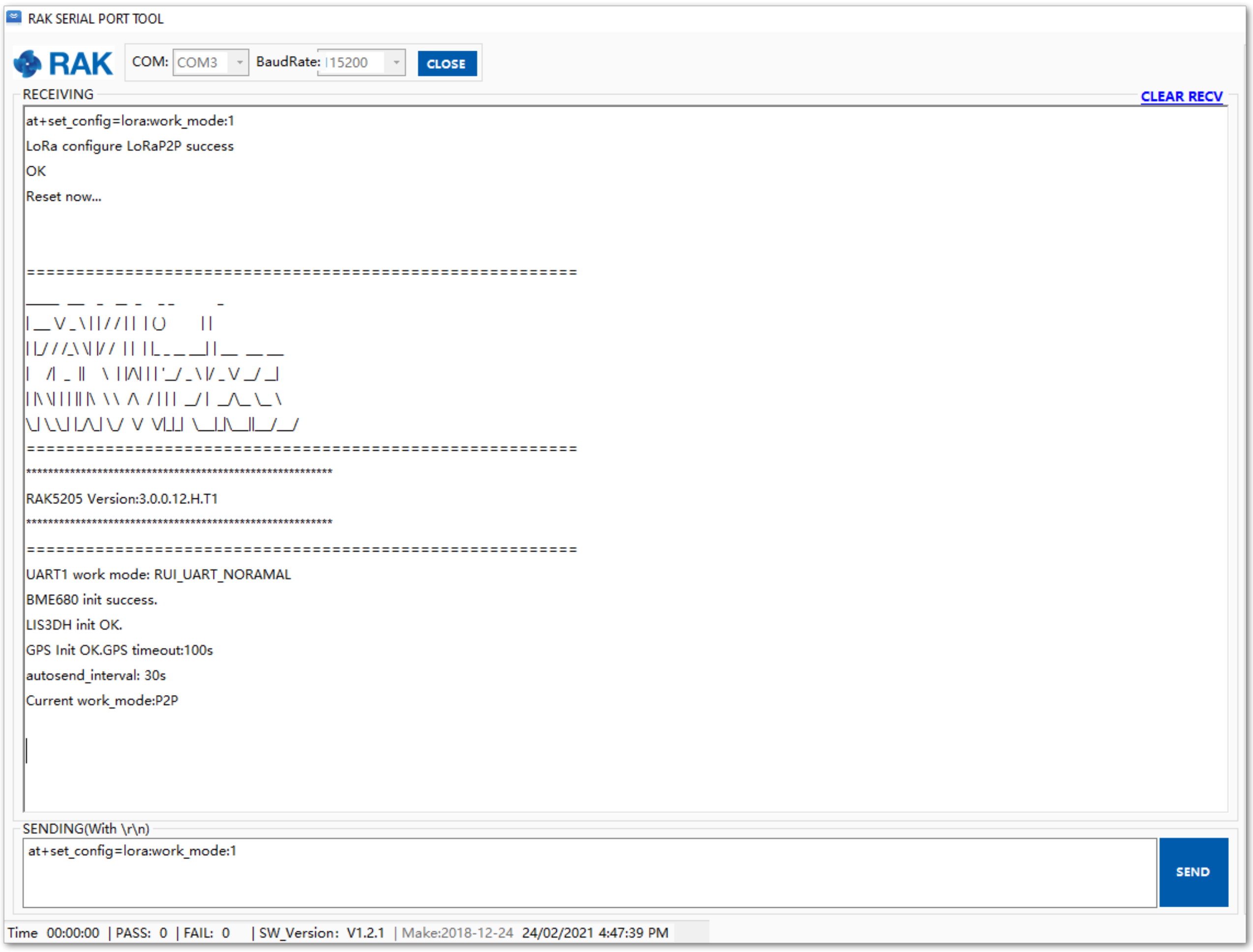

Figure 75: P2P Initialization

4. Then configure LoRaP2P parameters for both of them as follow, for example:

```
at+set_config=lorap2p:869525000:7:0:1:5:5
```

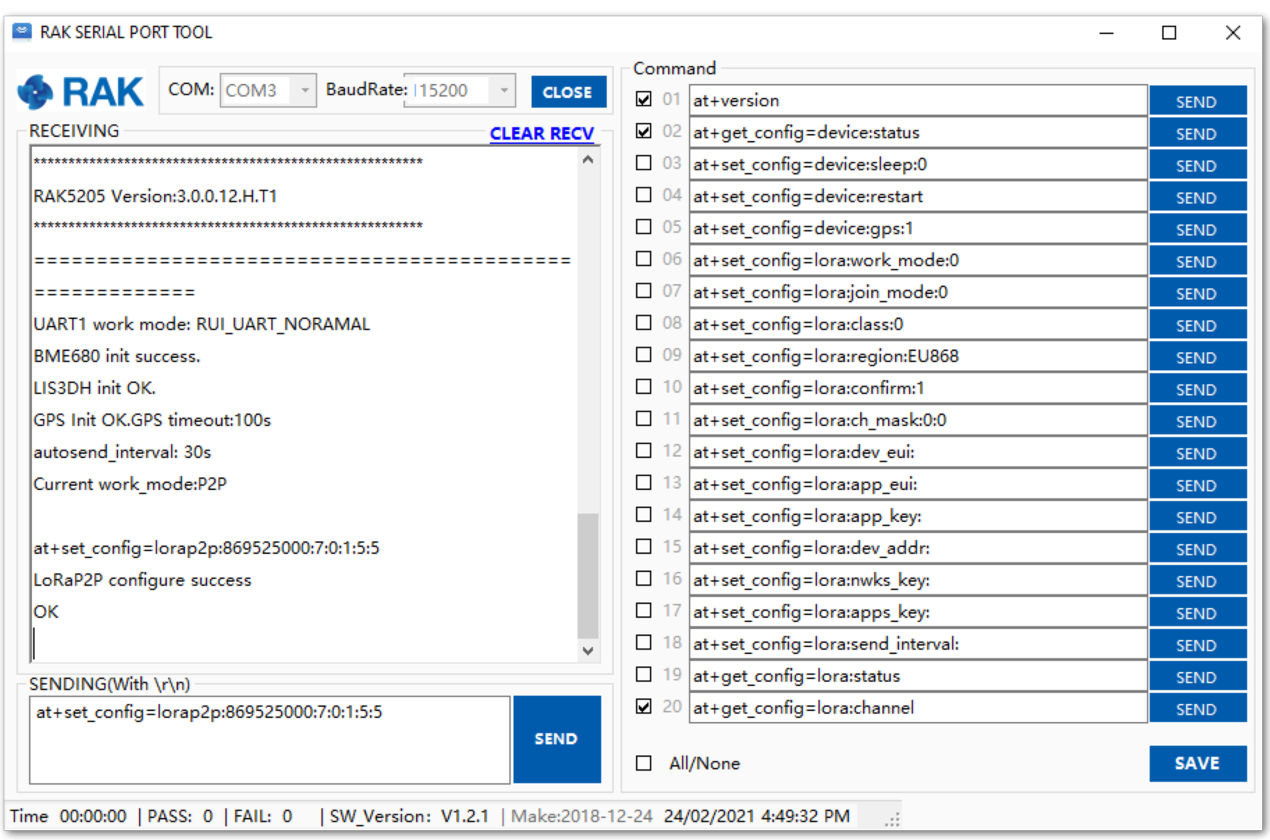

Figure 76: Configuring P2P in both RAK5205 Nodes

5. Try to send a message from LoRa Tracker 1 (the left one) to LoRa Tracker 2 (the right one):

```
at+send=lorap2p:1234567890
```

> 📝 **NOTE**
>
> In LoRa P2P mode, RAK5205 is in RX mode by default and will automatically switch to TX mode when it needs to transmit data. After the successful transmission, it will go back again to RX mode. You cannot set RAK5202 exclusively as RX or TX mode.

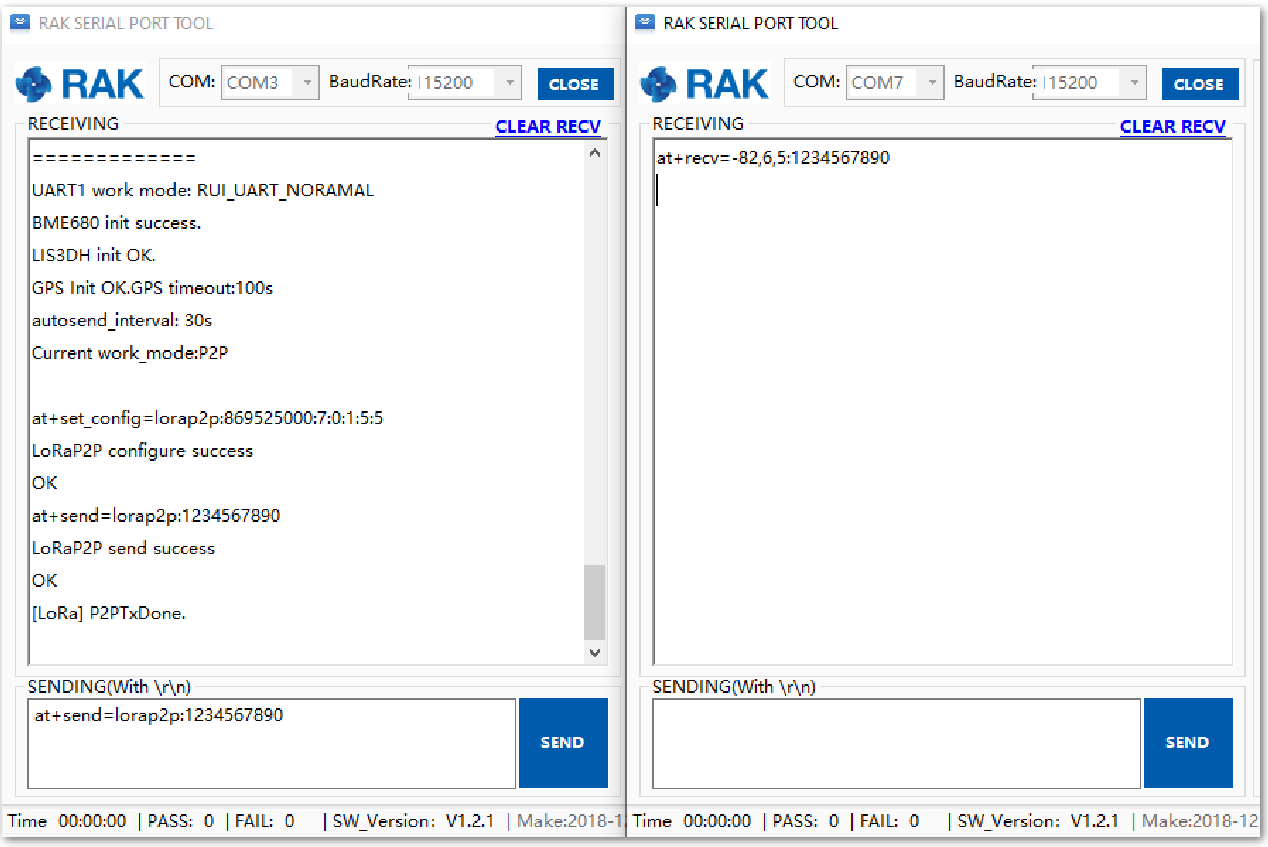

Figure 77: Message sent and received status in the two Nodes

6. You can send more messages.

```
at+send=lorap2p:12345678901234567890
```

> 📝 **NOTE**
>
> RAK5205 in LoRa P2P mode of operation is also compatible to other RUI based devices like WisDuo modules and others as long as the modules are configured in P2P mode as well.

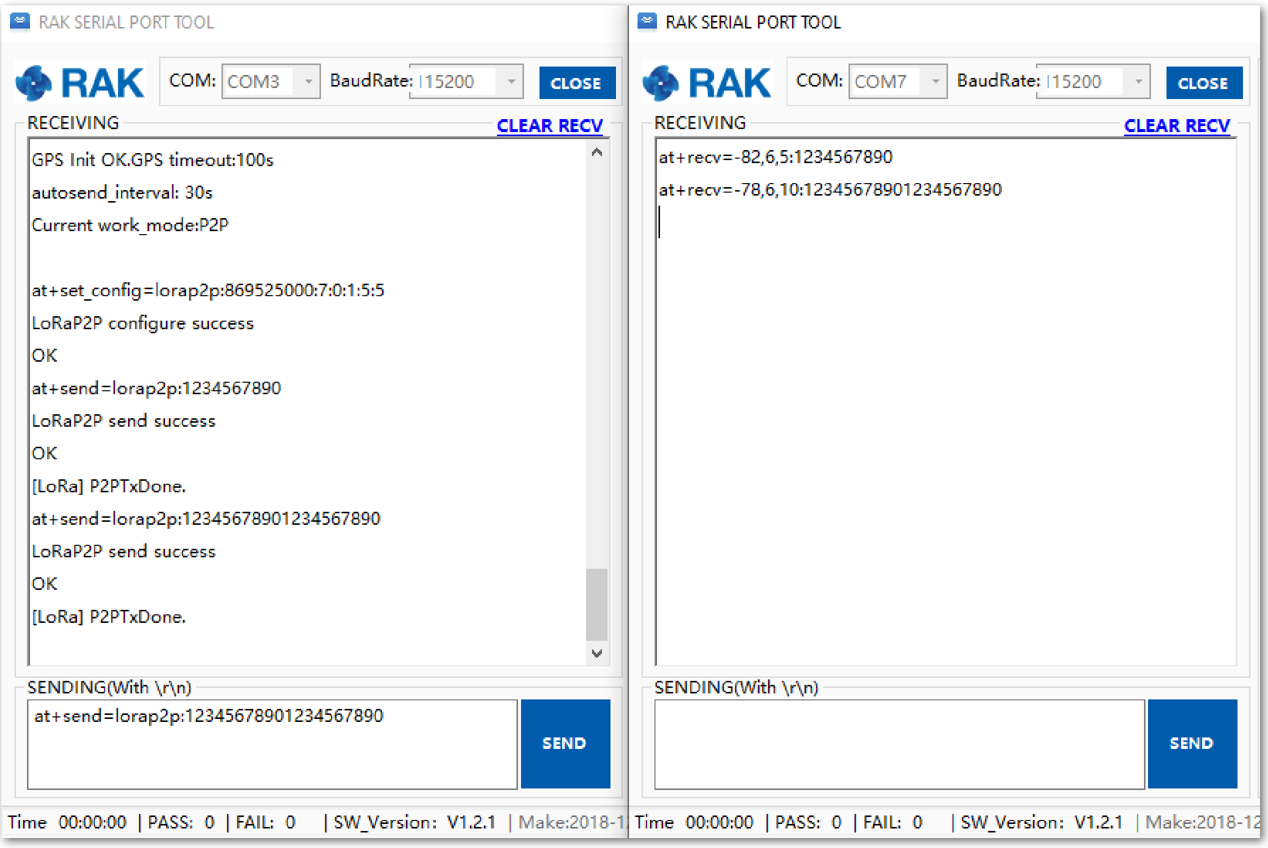

Figure 78: Succeeding Messages sent to the other Node

Now, you have successfully finished your RAK5205 LPWAN Tracker set up.

Miscellaneous

Burning Bootloader into the Device

Get the Bootloader Firmware for the RAK5205 WisTrio LPWAN Tracker from RAKwireless download site. Burning the Bootloader into the device is done as follows:

> ⚠️ **WARNING**
>
> Skip this section if you have a RAK5205 V3.0.0.0 firmware or newer, for it already has a bootloader.

You need to make sure you have the latest firmware on your device. To be able to do this, you need to follow these steps:

1. To start with, download and install the **STM32CubeProgrammer** tool in your PC. You can also get it in the RAK directory.

2. Then, configure your RAK5205 by jumping the “**BOOT**” pin and “**VCC**” pin for boot mode. Refer to Figures 79 and 80.

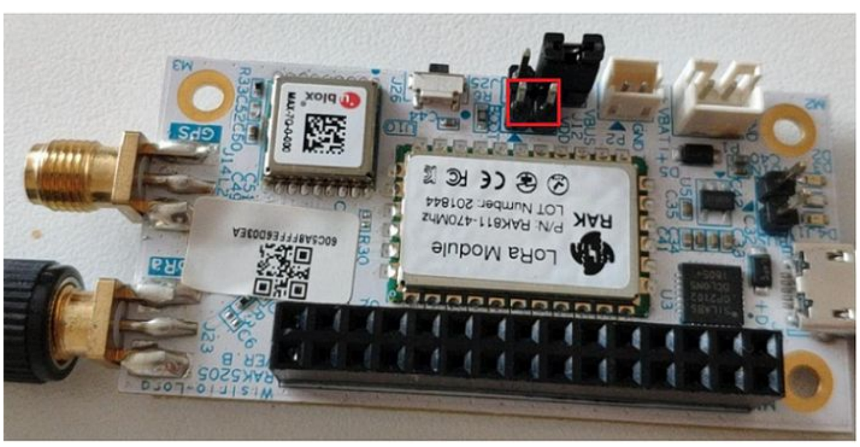

Figure 79: Boot and VCC Pins

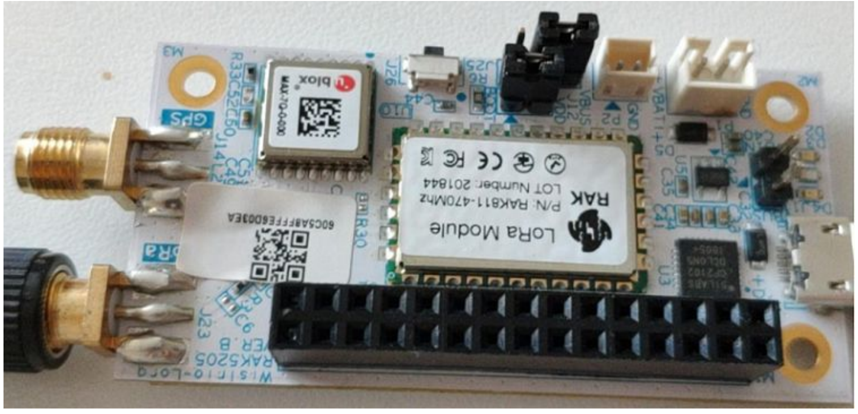

Figure 80: Jumper at Boot and VCC pins

3. Connect your RAK5205 to your PC using the USB cable.

> 📝 **NOTE**
>
> The jumper on the BOOT pin must be placed first before connecting to the USB Cable.

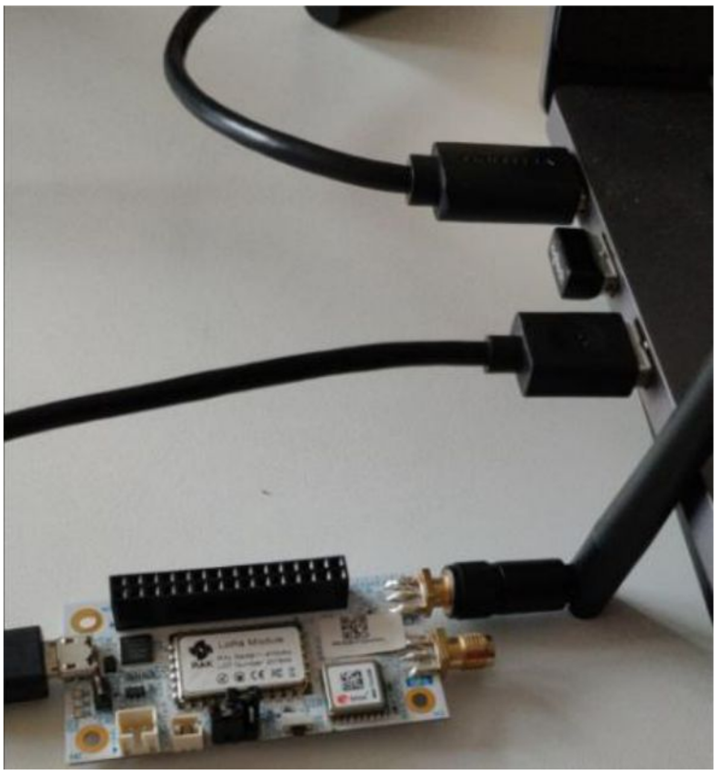

Figure 81: RAK5205 connected to your PC via USB cable

4. Choose the correct port number in the **COM Port** field. You can check this in the **Device Manager**.

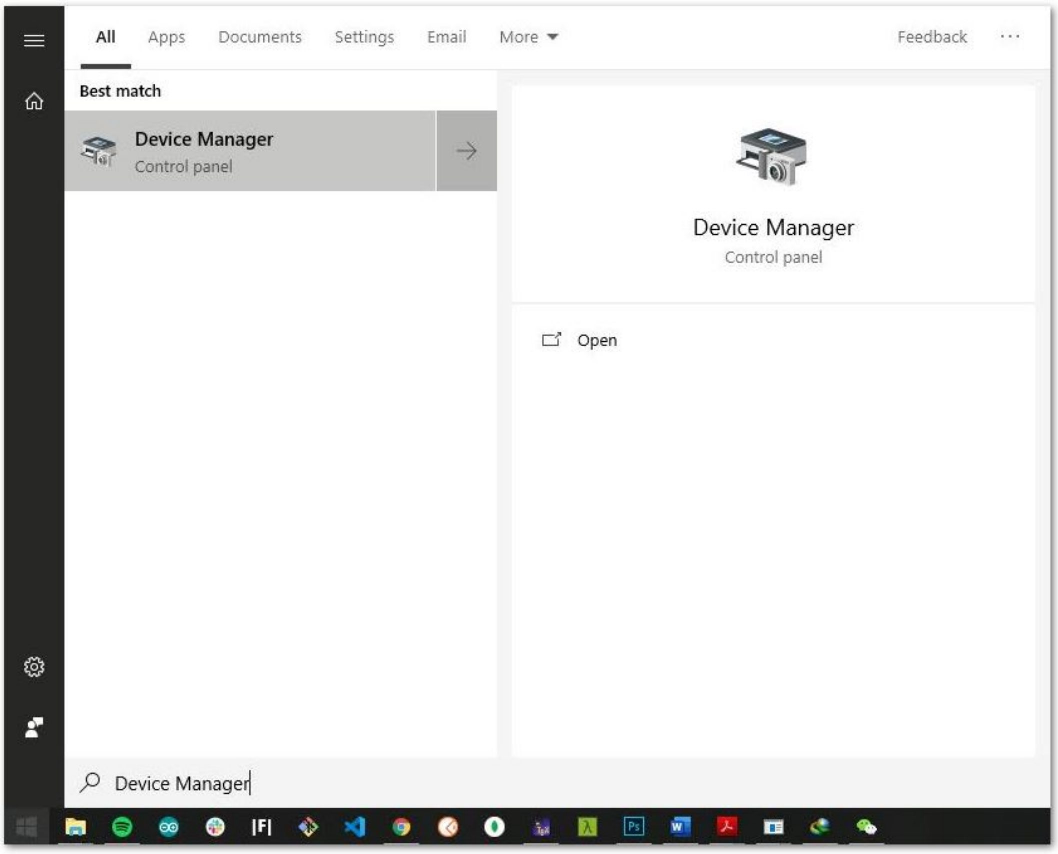

Figure 82: Checking COM Port through Device Manager

5. Open the **STM32CubeProgrammer** tool.

6. Select **UART type**. Go to COM Port and look for your RAK5205 Board COM Port (example: COM5).

7. Configure the **baud rate** and **parity**.

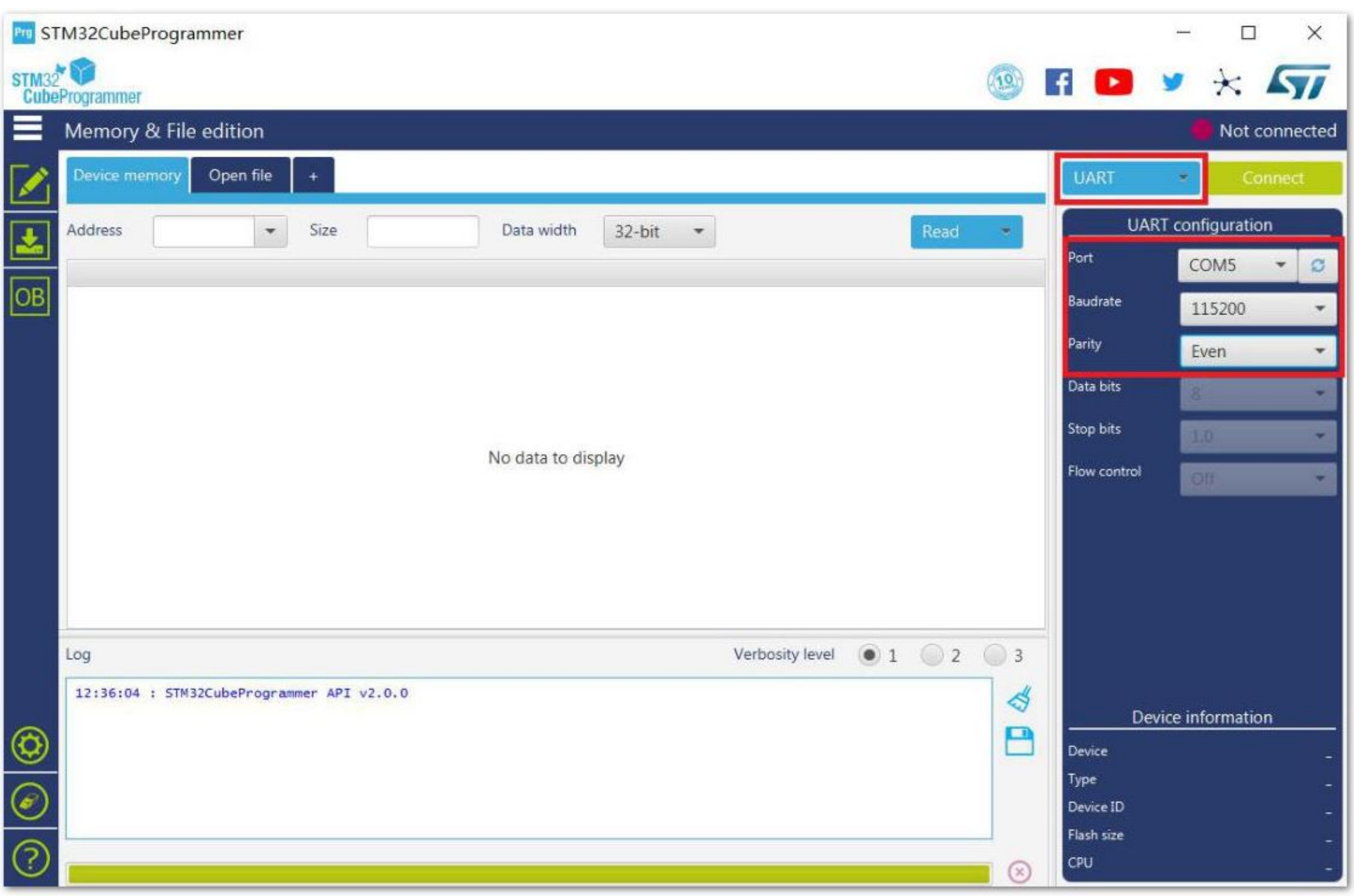

Figure 83: UART Settings in STM32CubeProgrammer

8. Then, press the “**Connect**” button at the top right corner.

⚠ **WARNING**

If there are some errors in the Log box or it can't connect, close the STM32CubeProgrammer and reset RAK5205. Then, open the STM32CubeProgrammer and connect again.

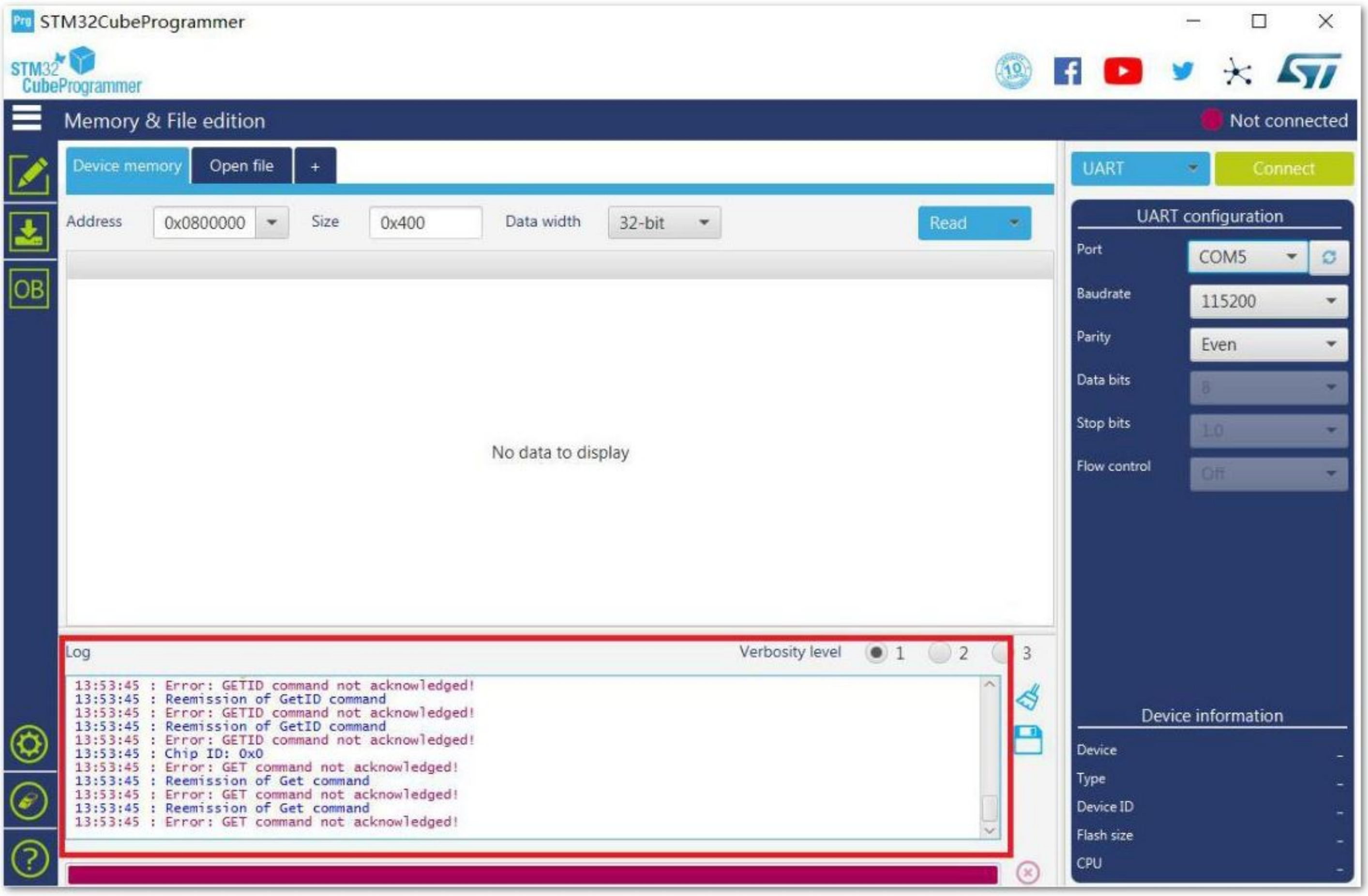

Figure 84: Errors Occurred During Connecting

- You should see a similar log as shown in Figure 85.

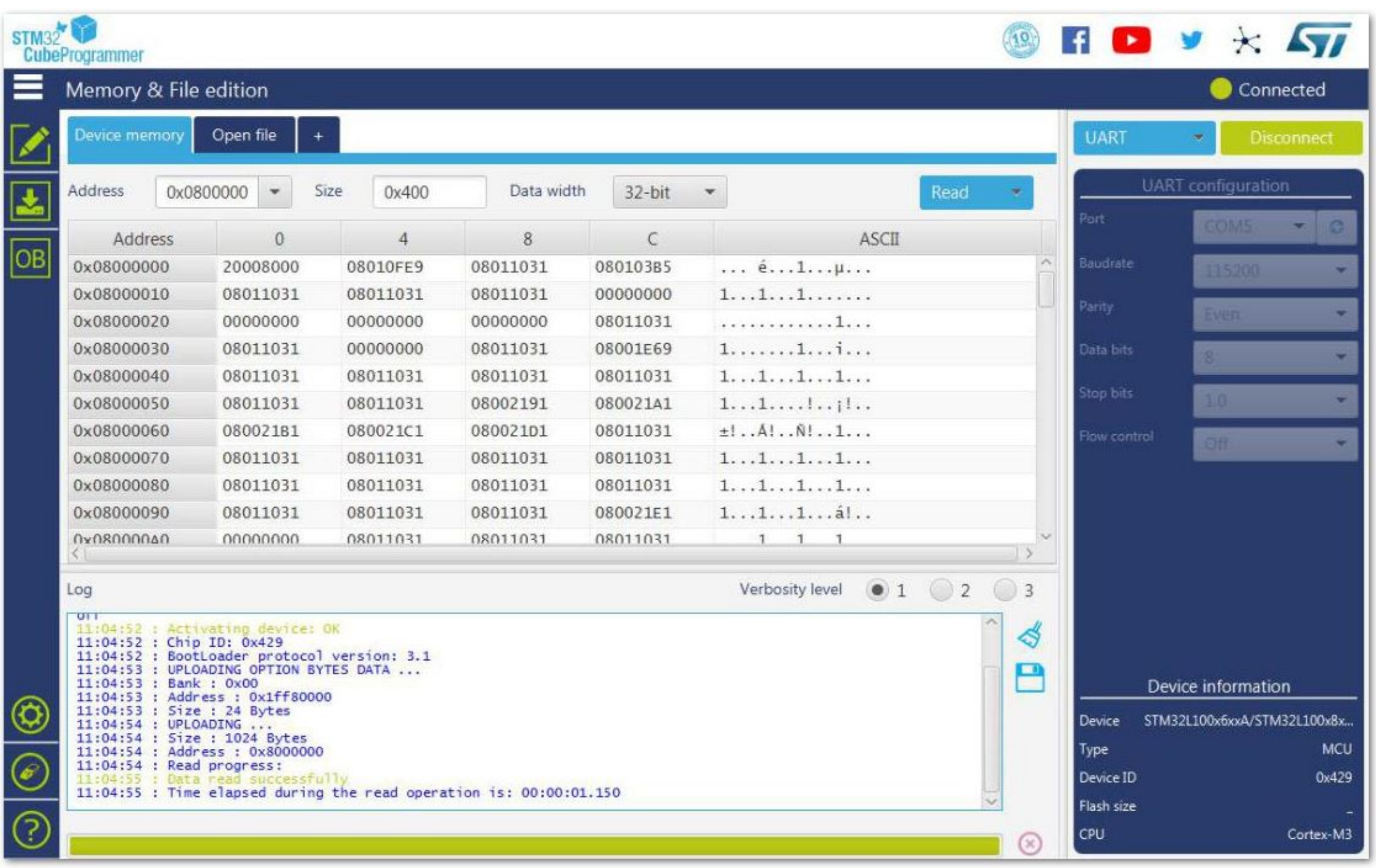

Figure 85: Successful Connection Log to your Device

9. Before uploading the firmware, **erase all data** on the RAK5205 WisTrio LPWAN Tracker as shown on Figure 86.

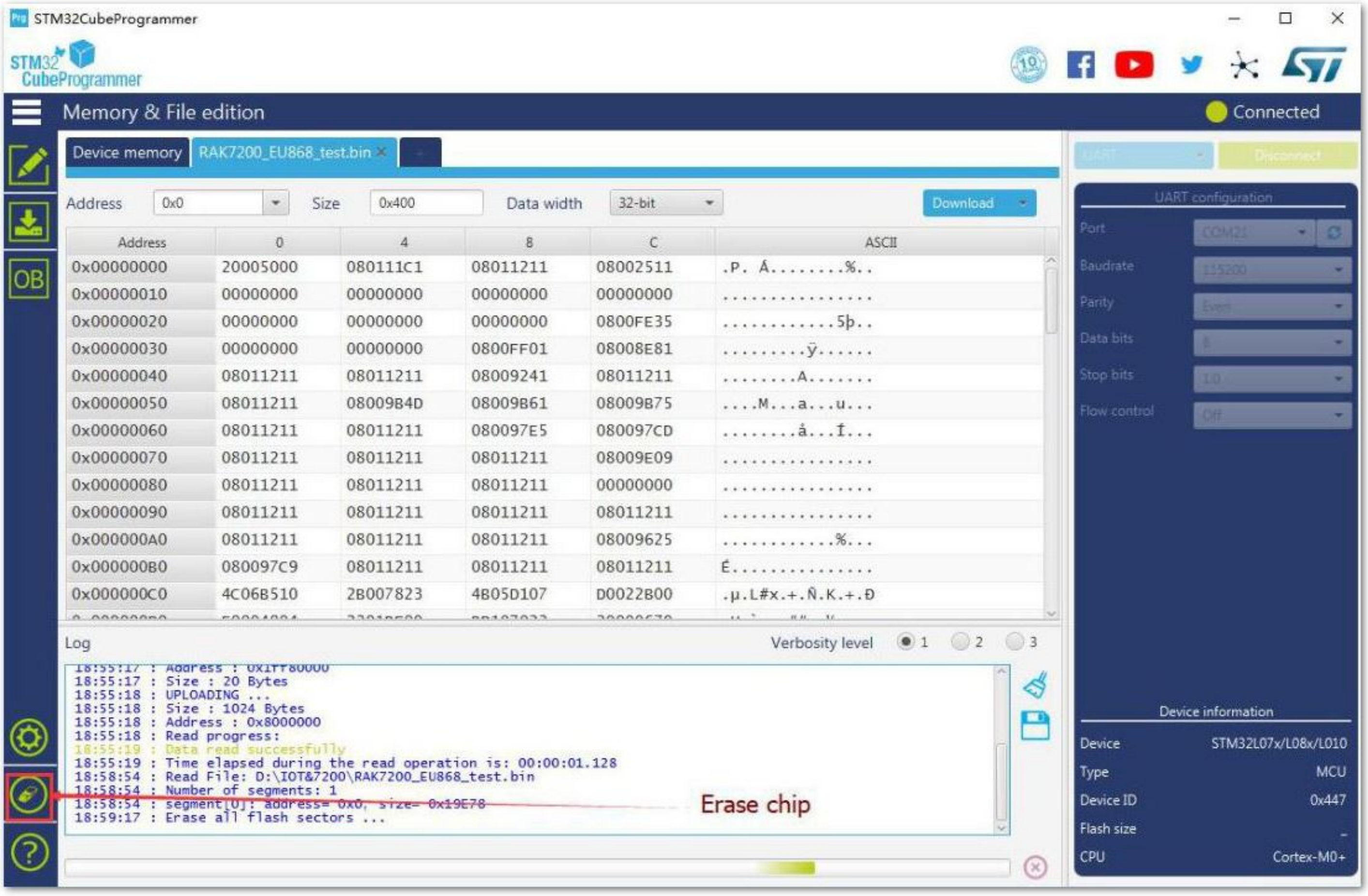

Figure 86: Erasing the Data in the Chip

10. Press "**Open file**" and select the bootloader file in the pop-up window.

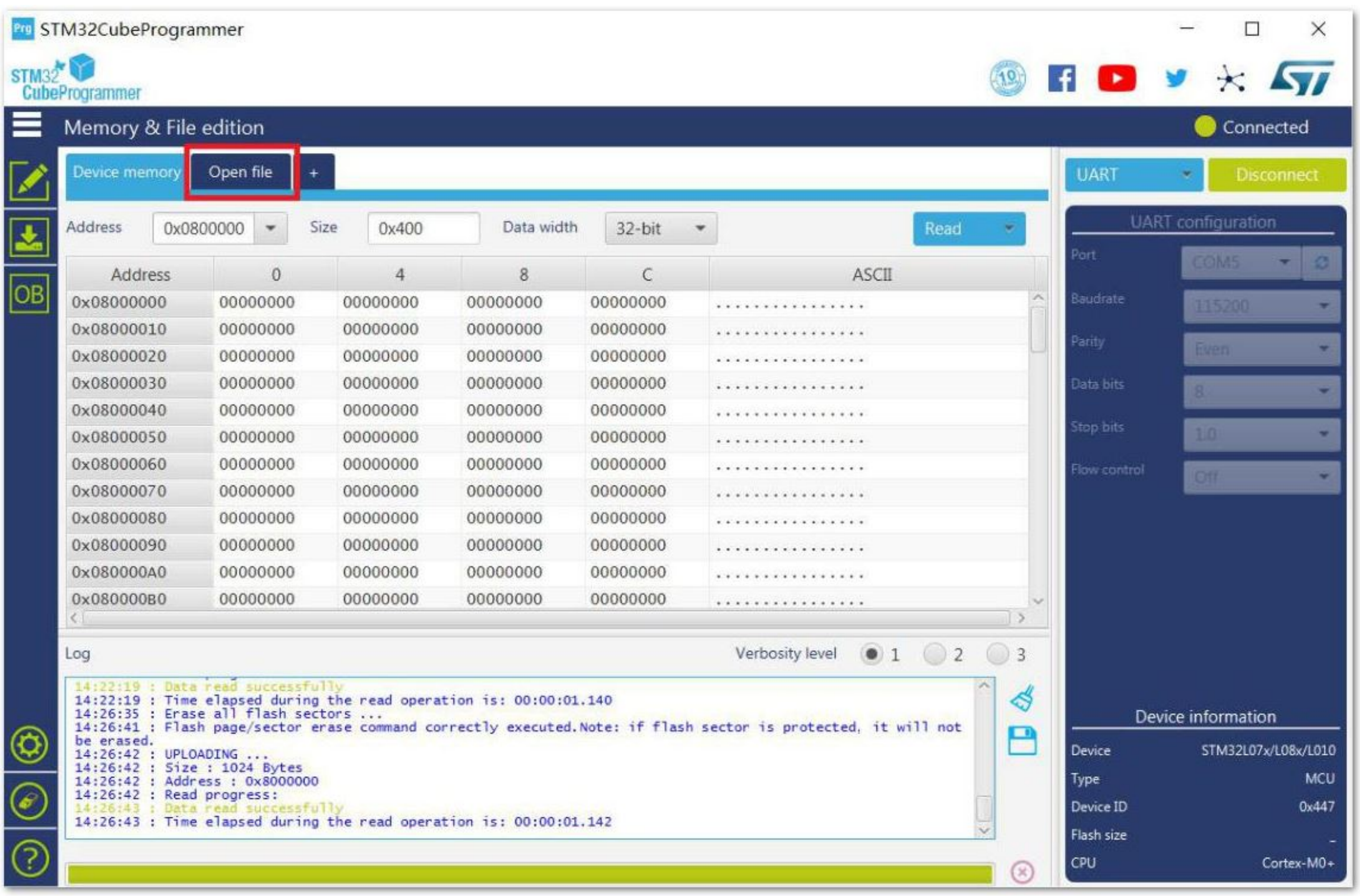

Figure 87: Opening the Bootloader file

11. Click the "**Download**" button to start the burning process.

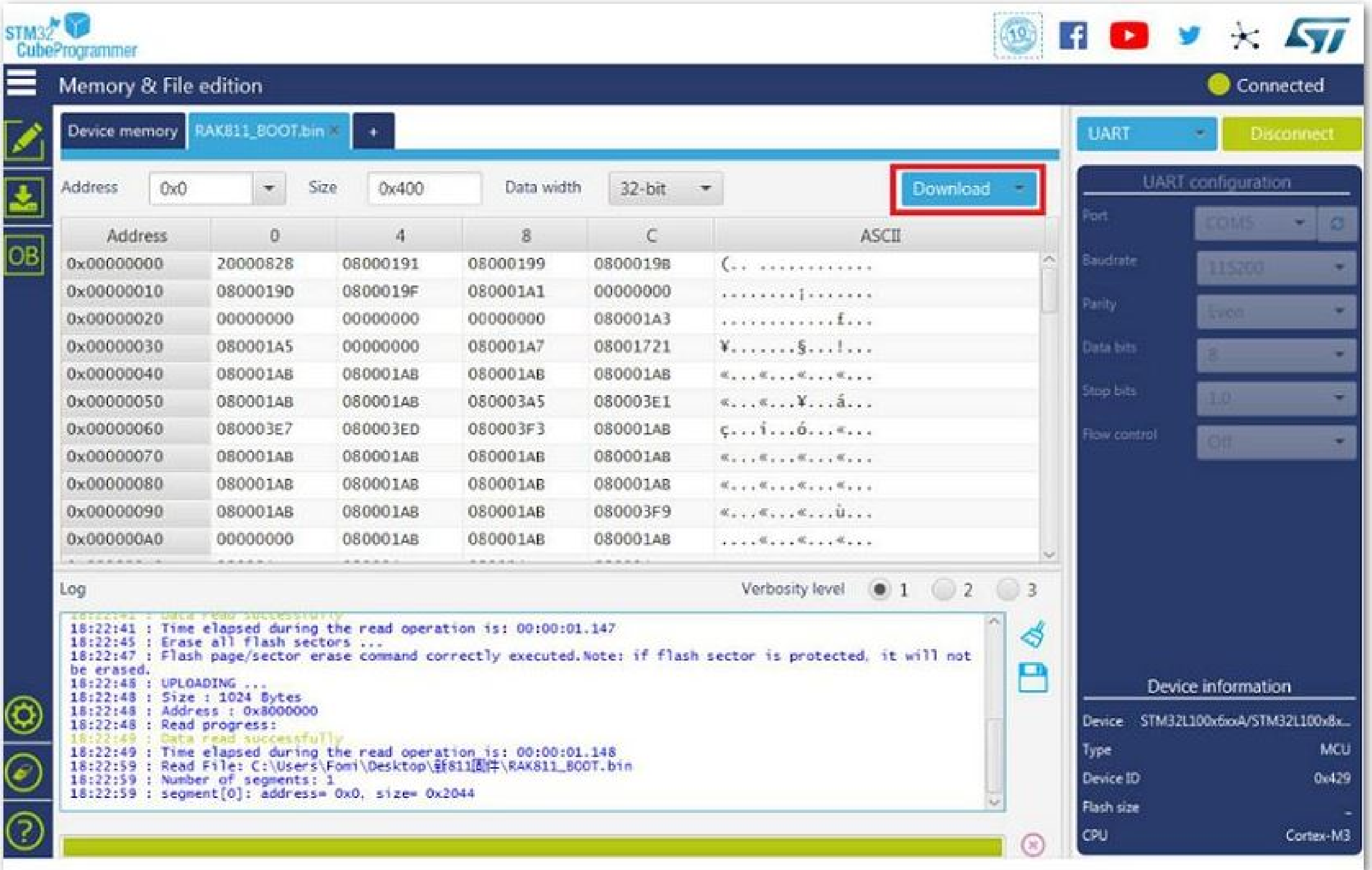

Figure 88: Downloading of Bootloader to the device

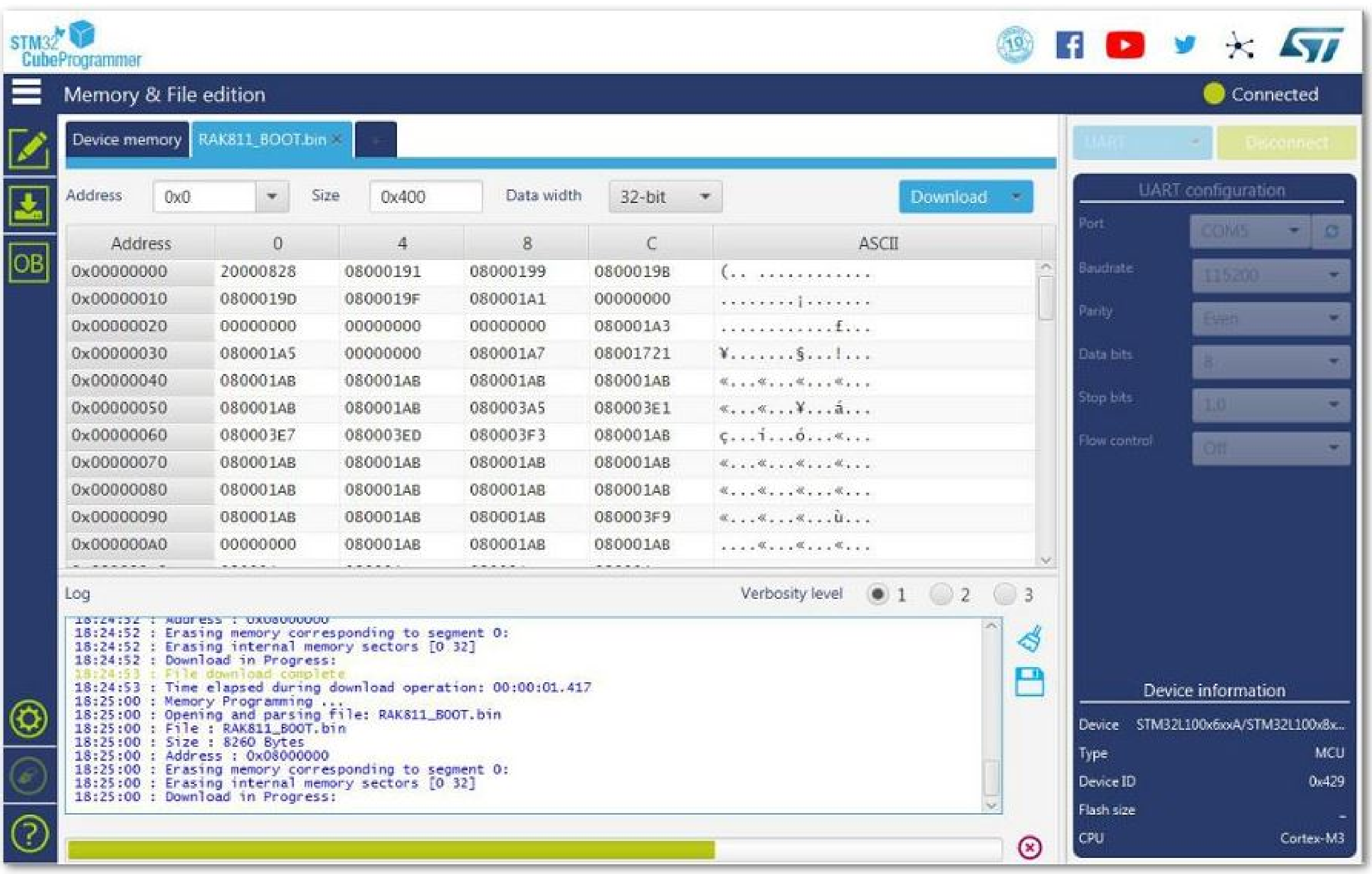

Figure 89: Completing the Download of Bootloader into the device

12. Now, you have successfully burned the firmware into RAK5205 WisTrio LPWAN Tracker.

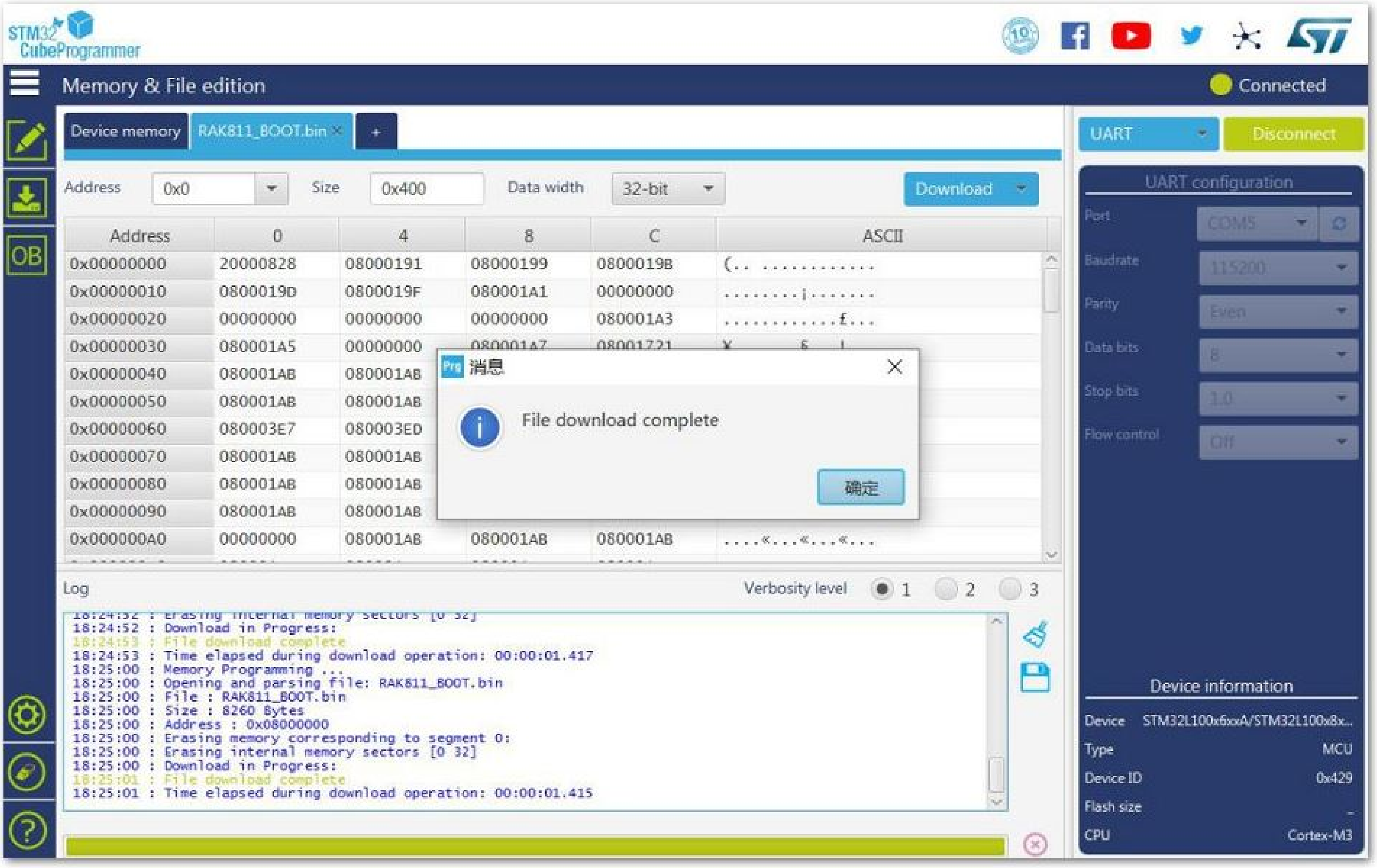

Figure 90: Successfully Burned the Bootloader to the device

13. **Disconnect** and close the **STM32CubeProgrammer** tool. Then, power down and remove the connection between BOOT pin and VCC pin to let RAK5205 WisTrio LPWAN Tracker work in normal mode.

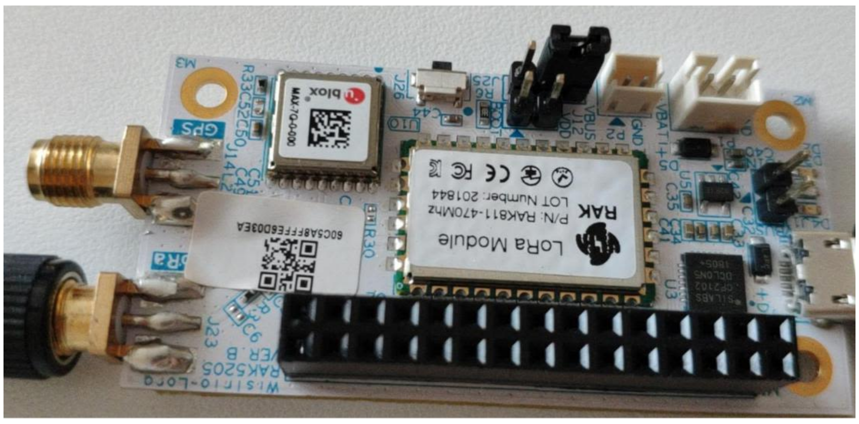

Figure 91: Jumper connection removed

14. Connect RAK5205 with your PC’s USB interface again. Open your serial port tool and if you can see boot mode as shown in Figure 92.

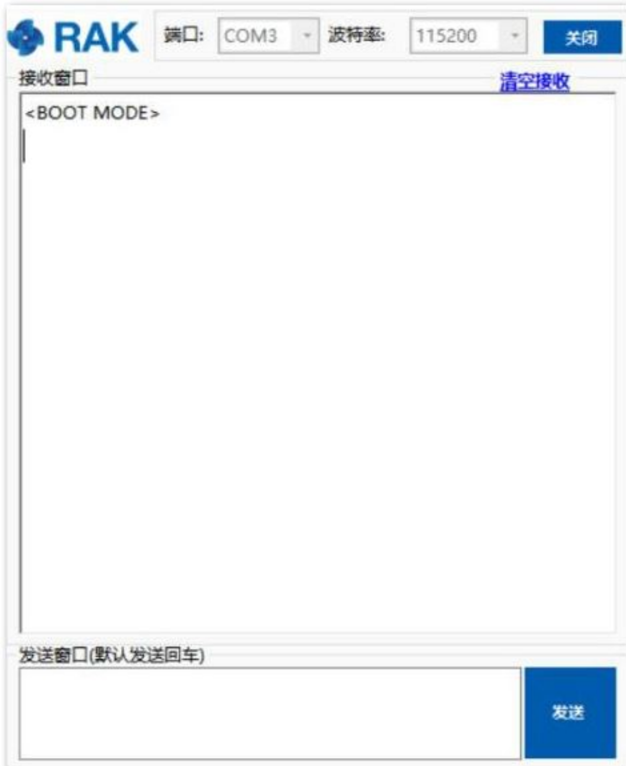

Figure 92: Successfully Downloading the Bootloader

You can now start burning the firmware into RAK5205 WisTrio LPWAN Tracker.

Upgrading the Firmware

If the firmware version of your RAK5205 WisTrio LPWAN Tracker is newer than V3.0.0.0 or you have just burned the bootloader into RAK5205 WisTrio LPWAN Tracker according to the Burning Bootloader into the Device section, then you just need to burn the upgrade firmware by executing the following steps:

1. Type the command to let the RAK5205 WisTrio LPWAN Tracker work in boot mode.

> 📝 **NOTE**
>
> If you have just burned the bootloader by yourself according to the section 2, it works in boot mode now. If the current version of the RAK5205 firmware is newer than V3.0.0.0, you need to set an AT command to let it work in boot mode.

```
at+set_config=device:boot
```

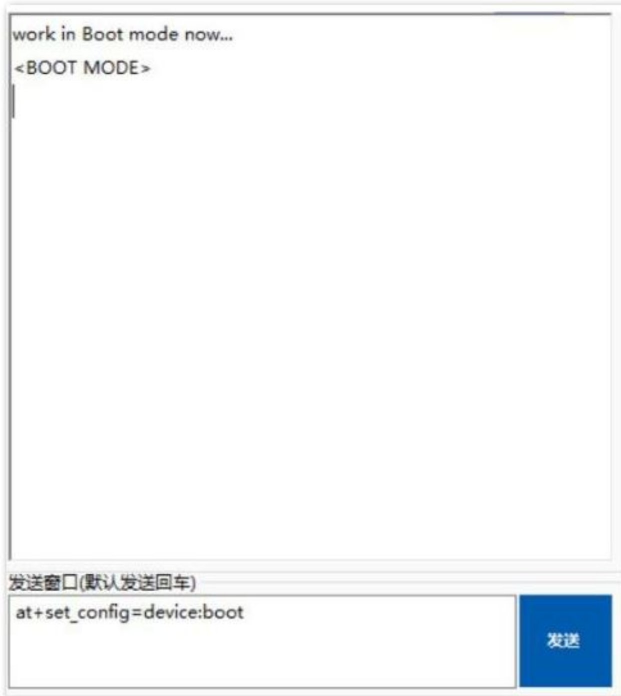

Figure 93: Turning the Boot Mode on

2. Close the serial port tool and download the **RAK Upgrade Tool V1.0**. Then, extract and open the tool.

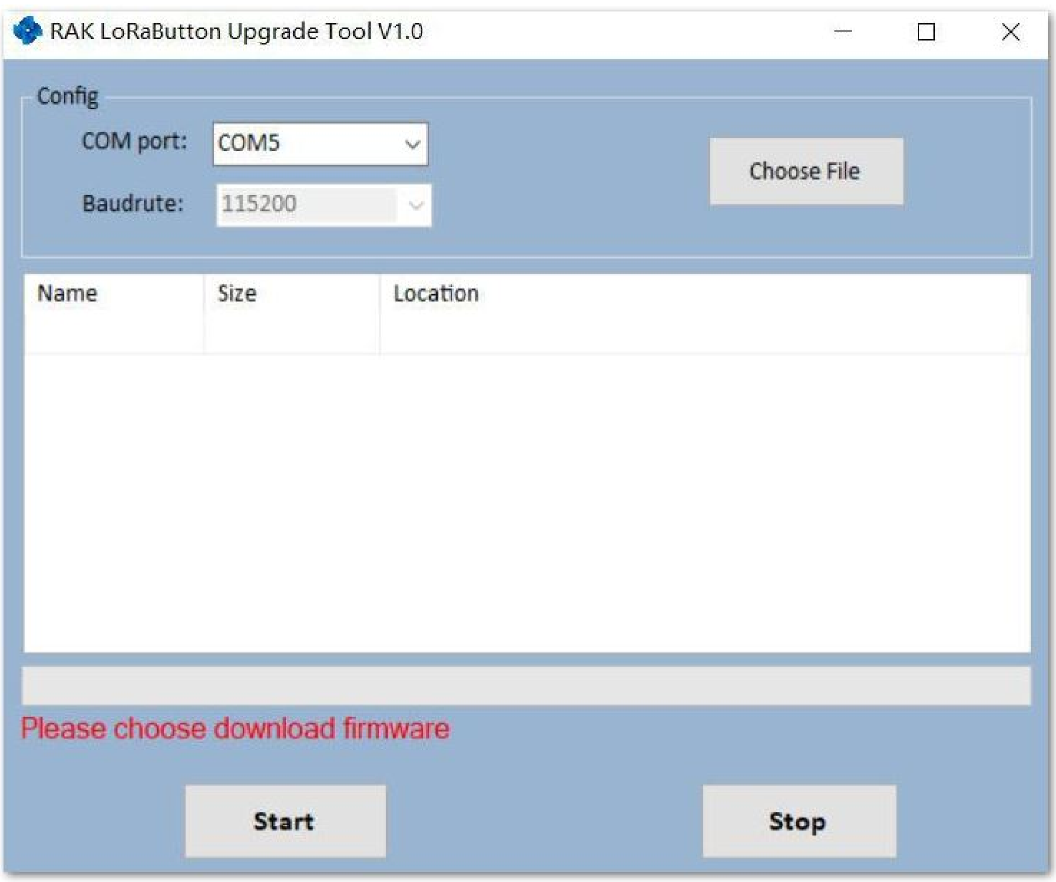

Figure 94: RAK Upgrade Tool

3. Get the RAK5205 Firmware from RAKwireless download site and click “**Choose File**” button to select the firmware file.

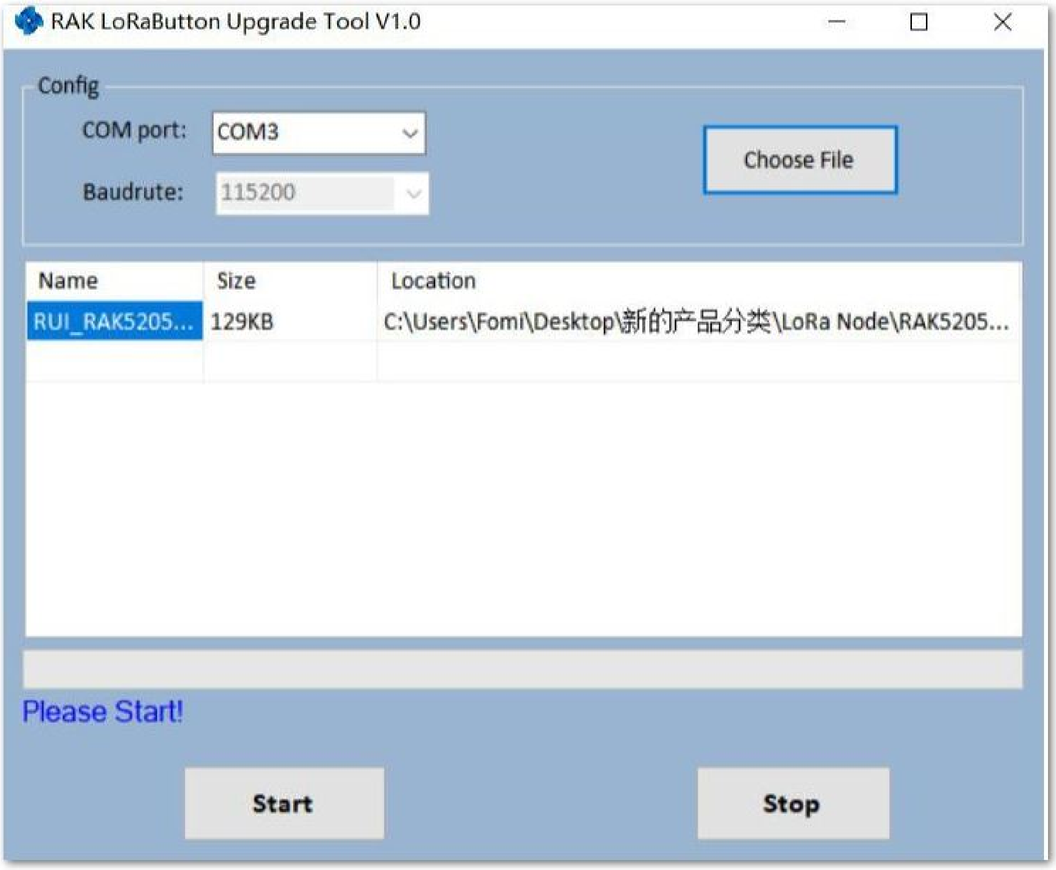

Figure 95: Choosing the Correct Upgrade file

4. Click “**Start**” to upgrade. This may take a minute.

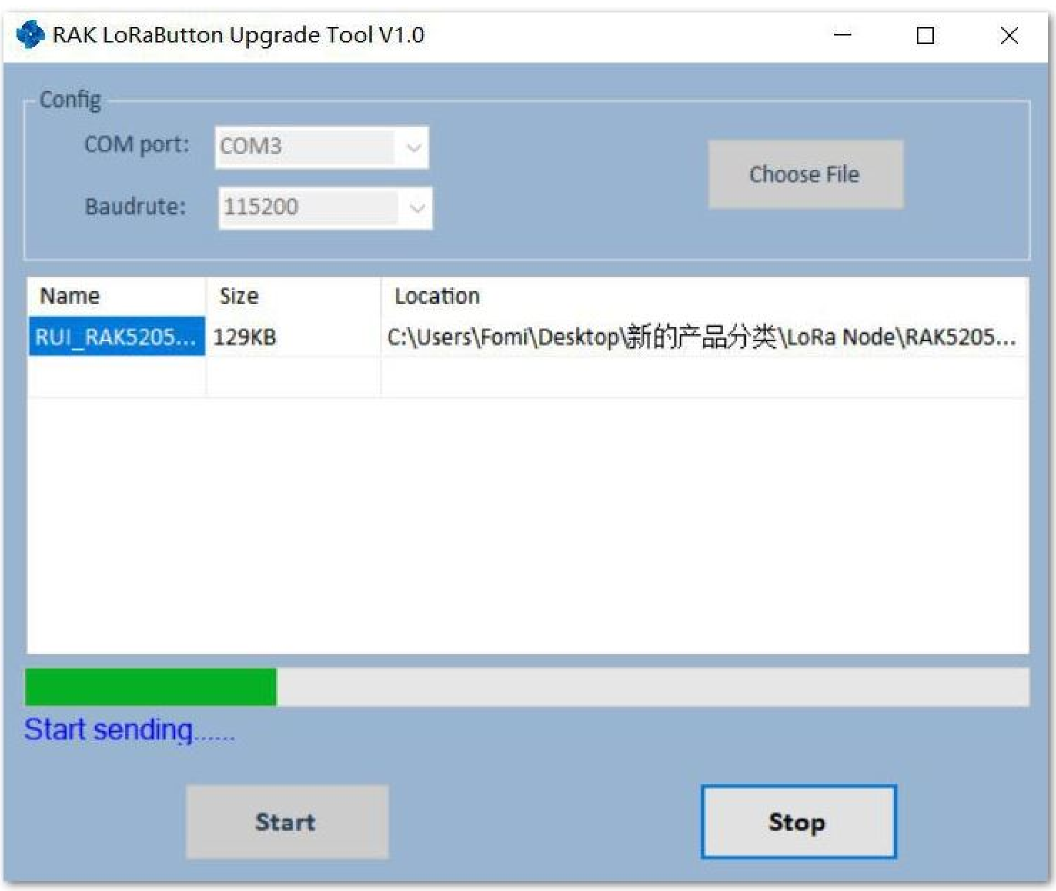

Figure 96: Start Upgrading your Firmware

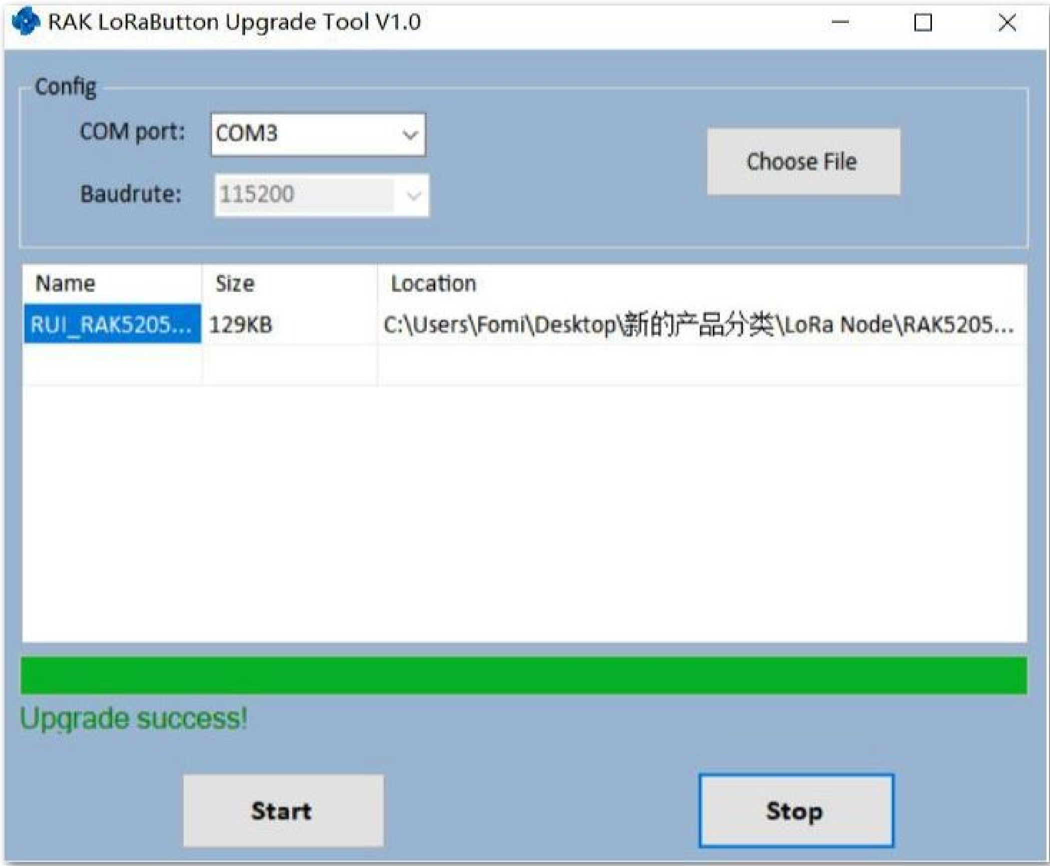

Figure 97: Successfully Upgraded your Firmware

5. Now, close the upgrade tool and open a serial port tool to configure your RAK5205.

- It is recommended to use the **RAK Serial Port Tool** because there are some ready AT commands in this tool which very useful for you. You can get it from the **RAK directory** for free.
- Choose the correct **COM port** and set the baud rate to **115200**. Then open the serial port and enter the AT command to restart.

```
at+set_config=device:restart
```

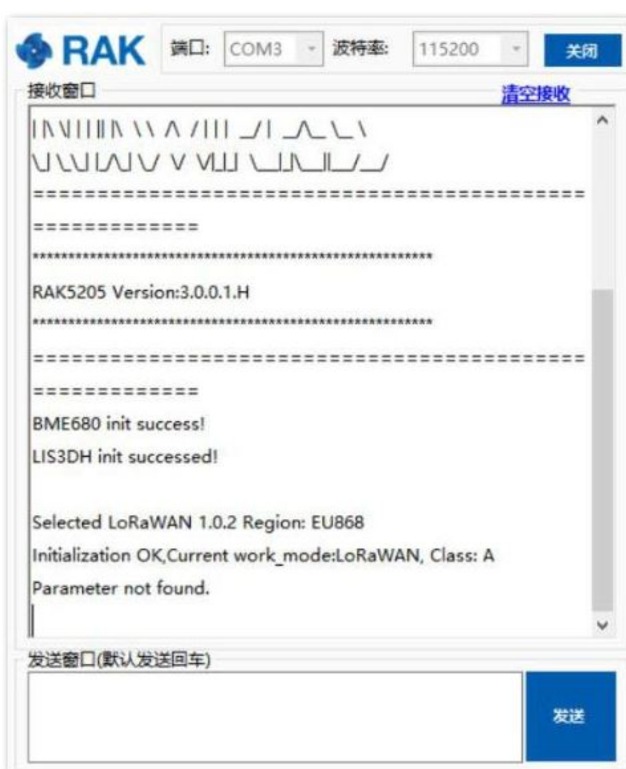

Figure 98: Restarting your Firmware

You have successfully upgraded the new firmware.

Assembly Guide for RAK5205 Enclosure

This section provides you assistance when installing the Tracker Node Enclosure of your RAK5205.

Assembly List

The assembly includes the following

- **1x Enclosure**
- **1x Installation Kit**
- **1x LoRa Antenna**
- **1x GPS Antenna**
- **1x Supporting Plate**
- **4x M16, 2x M12 Cable Gland Covers**
- **1x PCB**
- **Battery and Adhesive**

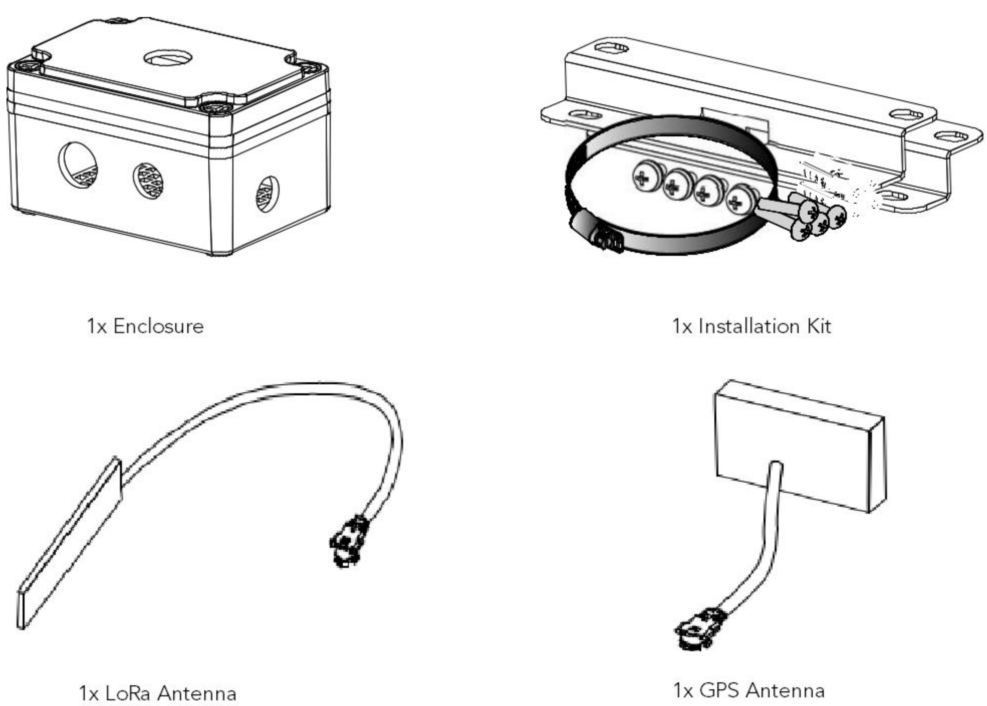

Figure 99: Assembly List

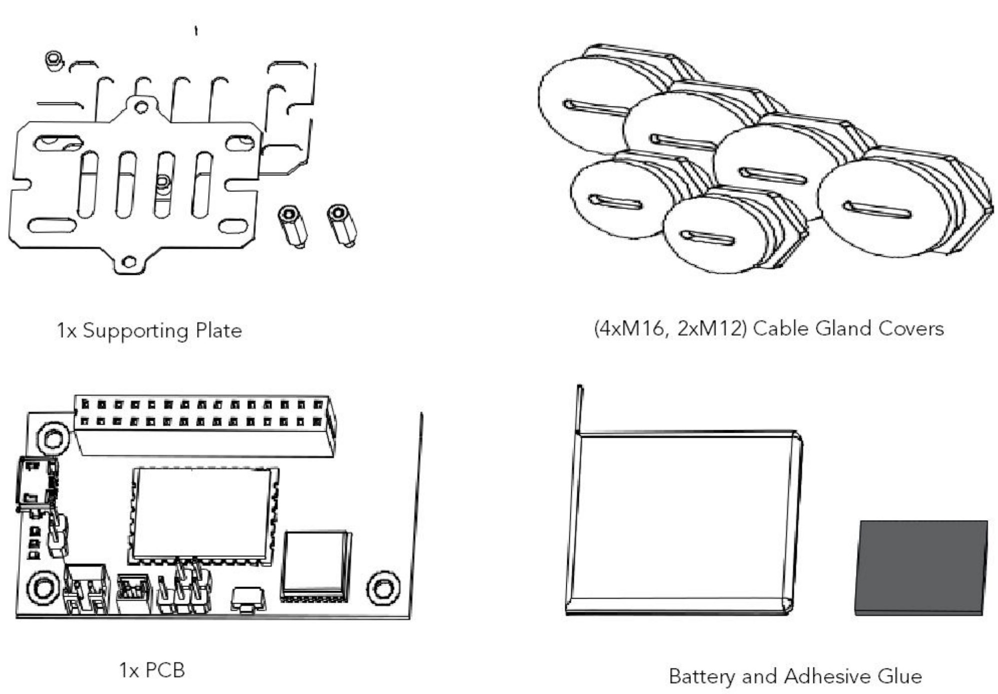

Figure 100: Assembly List

1. To start with, assemble the cover of your RAK5205 enclosure.

   a. If a solar panel is necessary, attached it to the cover, as shown in Figure 101, using silicon glue.

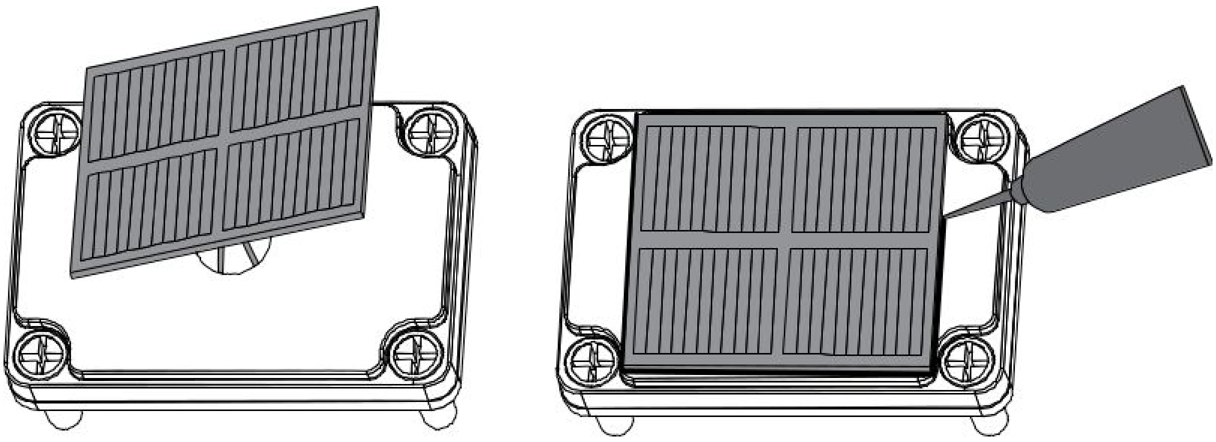

Figure 101: Attached Solar Panel in Cover

b. If not, then directly plug the opening cover with M16 Dome plug.

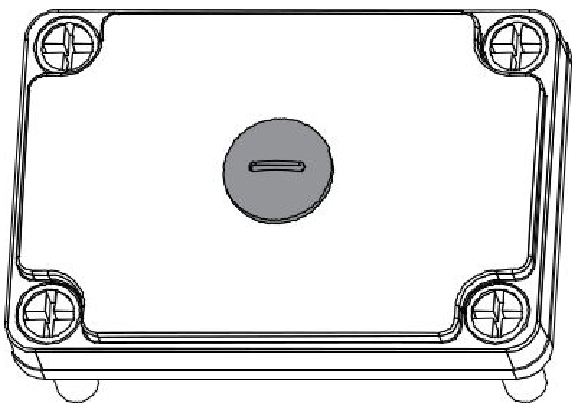

Figure 102: Inserting Plug in Cover with no Solar Panel

2. Install the Supporting Plate along with the two M4x5 screws as shown in Figure 103.

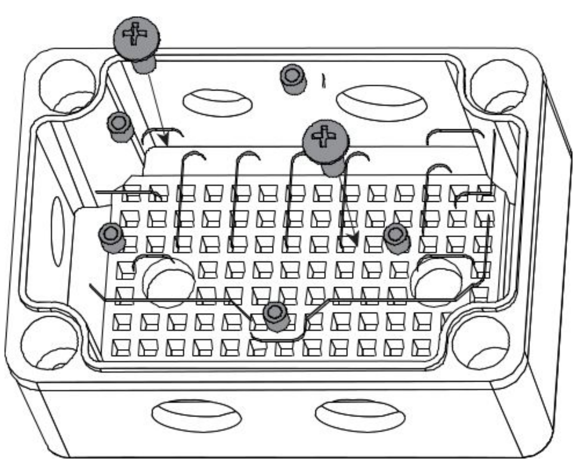

Figure 103: Installed Supporting Plate

3. Using the three M16 Dome plugs and two M12 Dome plugs, plug the opening of the bottom shell (left of Figure 104). Then, if an external antenna or an external interface is needed, replace the corresponding hole with the corresponding cable (right).

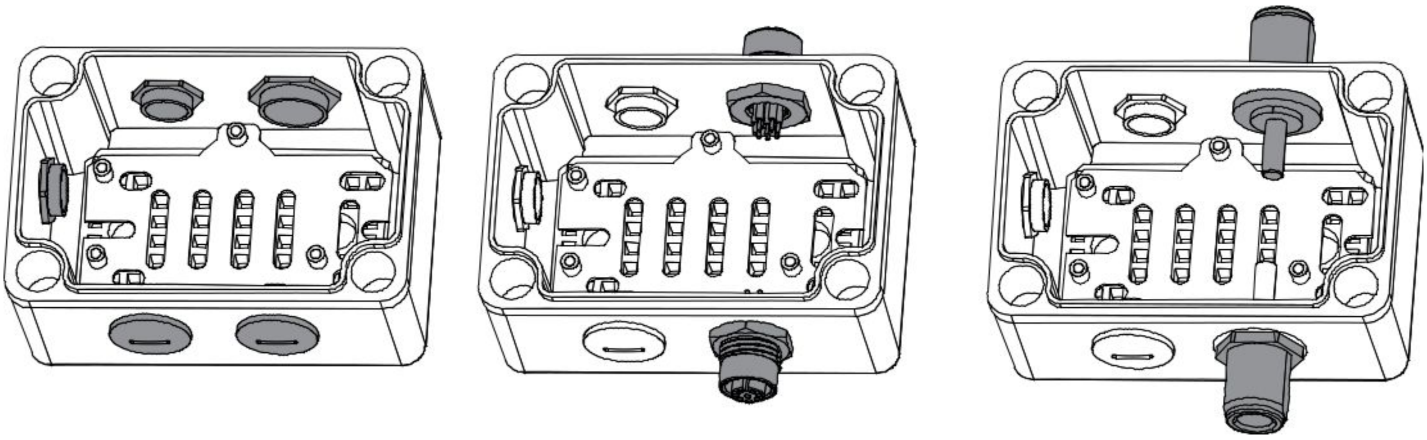

Figure 104: Opening for External Antenna

4. Fix the PCB in the enclosure using the three M2.5x4 screws.

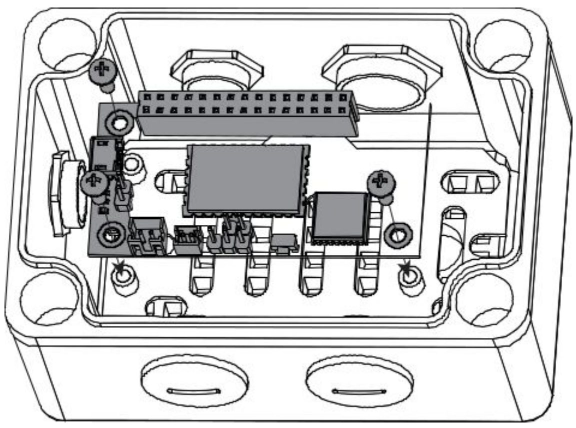

Figure 105: Fixing of RAK5205 in Enclosure

5. Attach the LoRa and GPS antenna at the bottom shell. The LoRa antenna is glued above the M12 Dome plug while the GPS is on the shorter side, as shown in Figure 106.

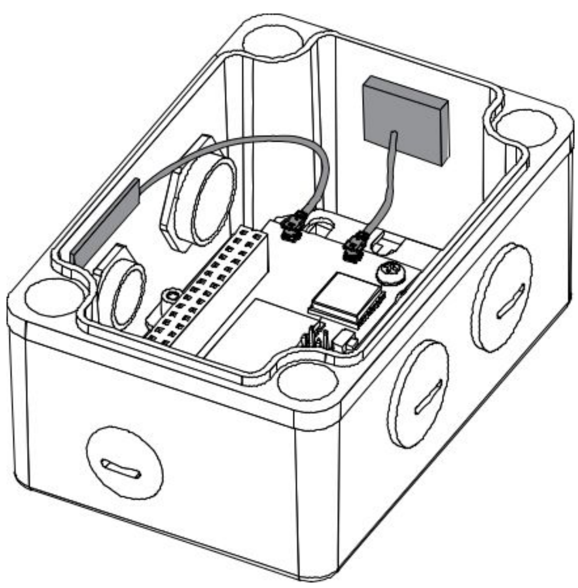

Figure 106: Attached GPS and LoRa Antenna

6. Install two M2.5x15 hexagonal standoffs.

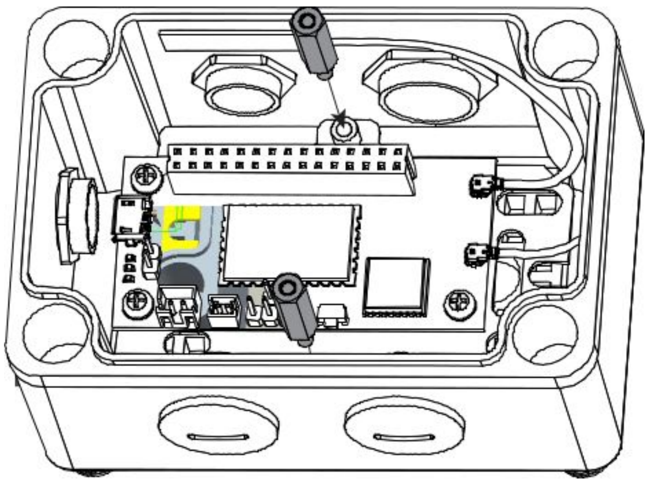

Figure 107: Installed Hexagonal Standoffs

7. Plug the connector of the battery into the socket of the PCB. If you use solar panels, then connect the cable to the PCB. After that, fix the supporting plate on the standoff with two M2.5x4 screws.

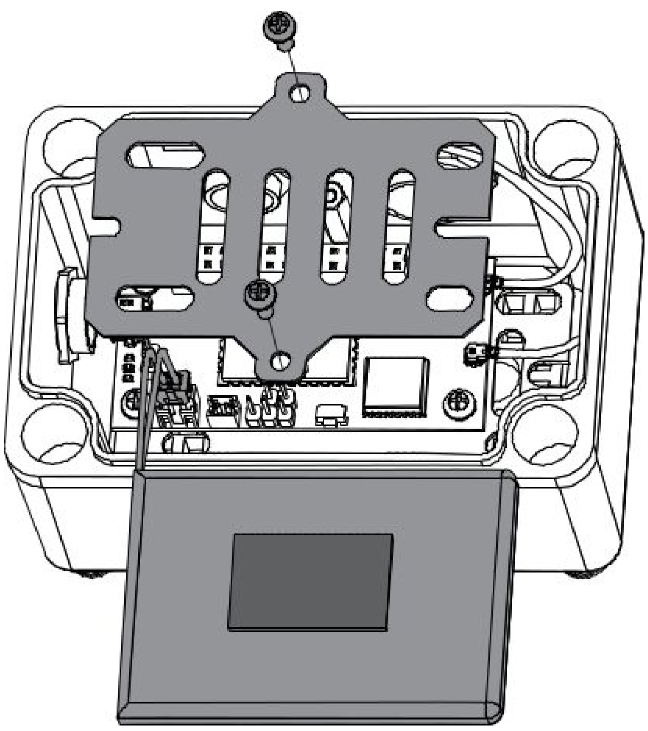

Figure 108: Fixed Supporting Plate and Battery Cable Connected

8. Remove the double-sided adhesive on the surface of the battery and attached it to the supporting plate.

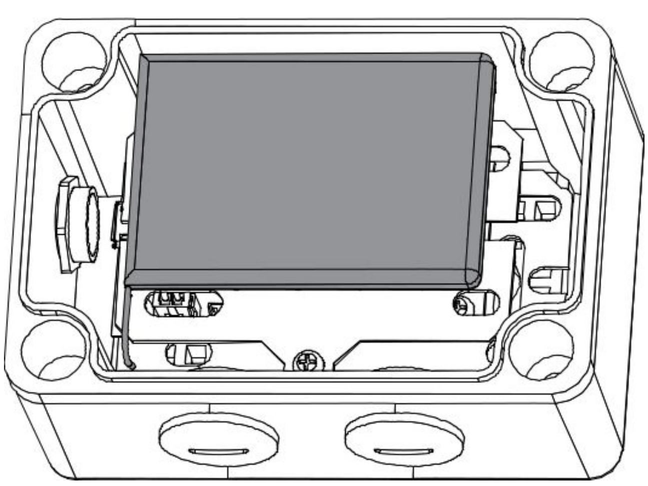

Figure 109: Attaching of Battery in Supporting Plate

9. Lastly, install the cover.

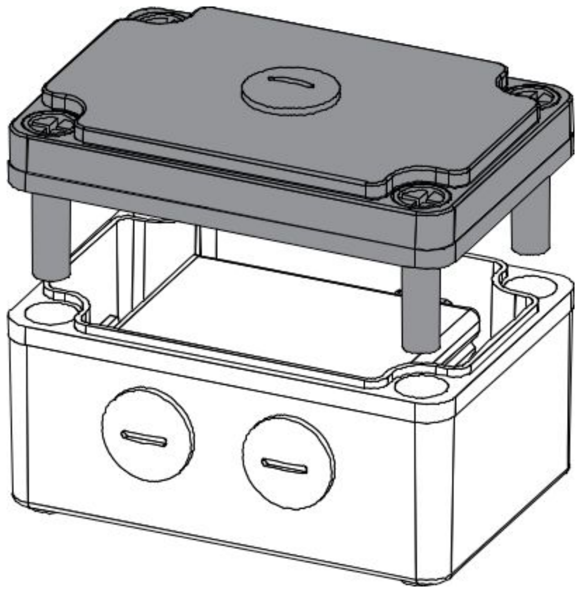

Figure 110: Enclosure Cover Installed

Installation

Wall Mounting

1. Fix the installation kit on the bottom of the enclosure with four M5x10 screws.

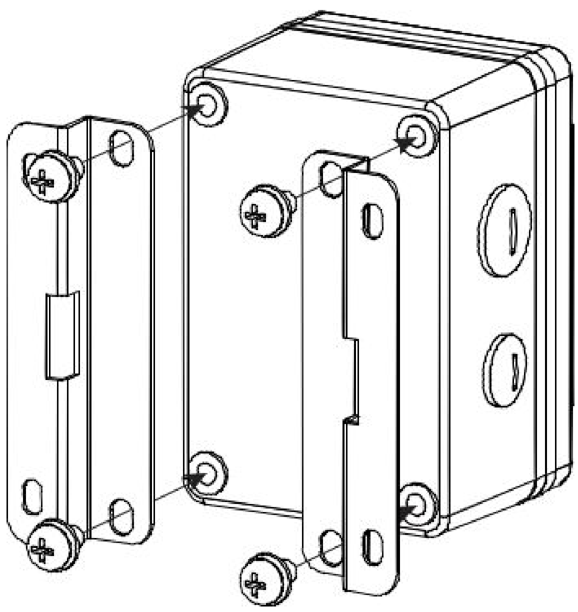

Figure 111: Fixing Installation Kit

2. Using a **Ø5mm drill head**, drill four holes on the wall according to the dimension shown in Figure 112, and then plug the screw anchors in the wall.

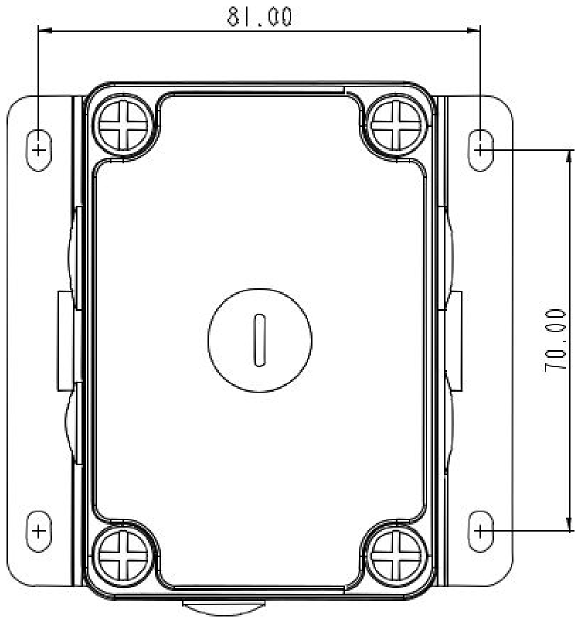

Figure 112: Drill Holes into Wall according to this Dimension

3. Using the tapping screws, attach the device to the wall.

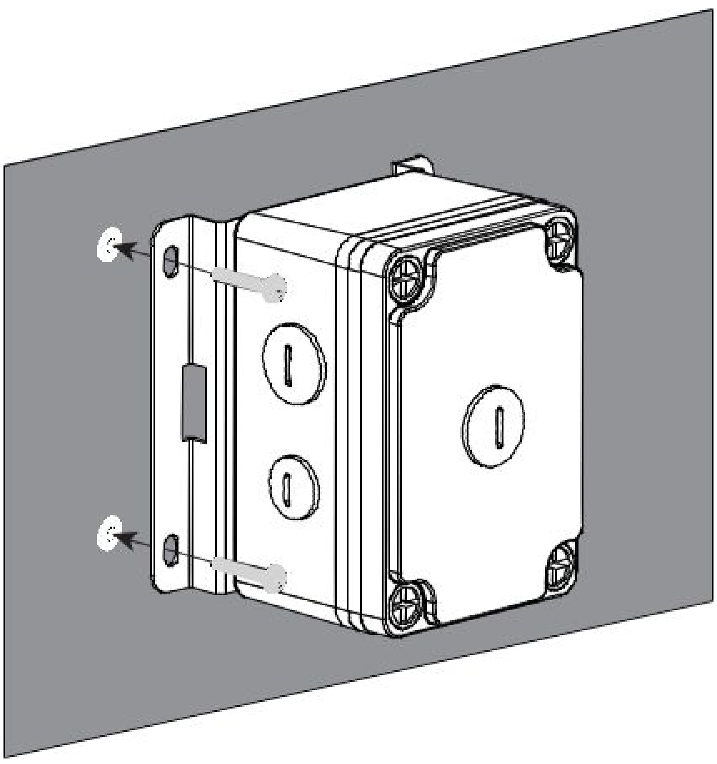

Figure 113: Mounting of Enclosure in Wall

Pole Mounting

1. The same with wall mounting, first, fix the installation kit on the bottom of the enclosure with four M5x10 screws.

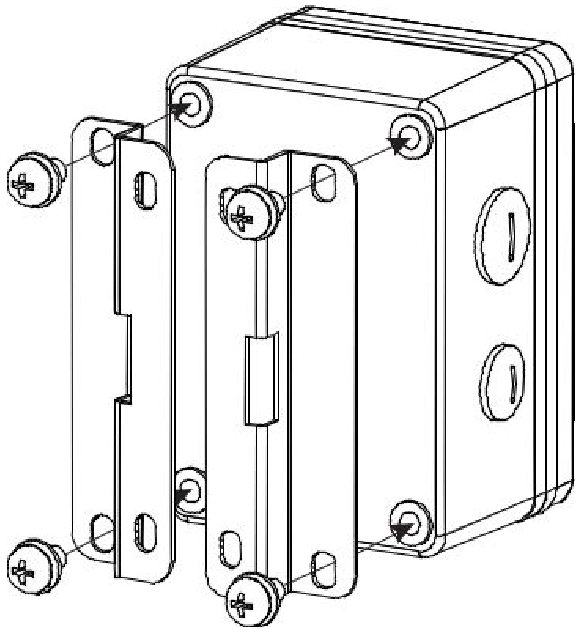

Figure 114: Installation Kit Attached in Enclosure

2. Slide the steel band clamps through the rectangular hole of the mount kit. Then, wrap the band clamps around the pole, lock them, and tighten the clamps using a screwdriver.

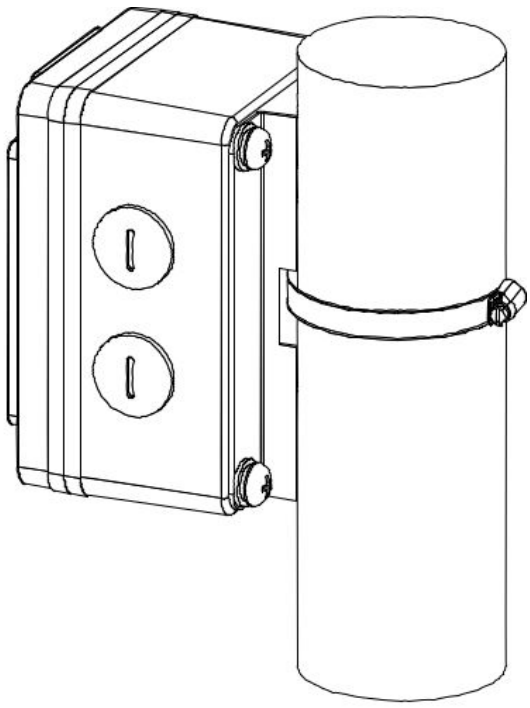

Figure 115: Enclosure Clamped around the Pole