Quick Start Guide for

RAK5205 WisTrio LoRa Tracker

WisDevice RAK**52xx** Series

LoRa Development board

Version V1.0| March 2019

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18 PAGES

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1. Overview

1.1 Introduction to the board

The RAK5205 LoRa Tracker is a board based on the RAK811 (SX1276 by Semtech built-in). At its core it runs an STM32L1 microcontroller. Additionally there is onboard GPS and several sensors built-in.

The board is especially suitable for rapid development of applications such as: asset tracking, Vehicle management, location-based services, etc. The process of connecting it to TTN/Cayenne via the nearest gateway is straightforward and quick. Developing for various use cases is a quick an easy, the board is especially suited for power constraint scenarios as its energy consumption is very low. It is easy to program and control via the built in AT commands (AT command control manual).

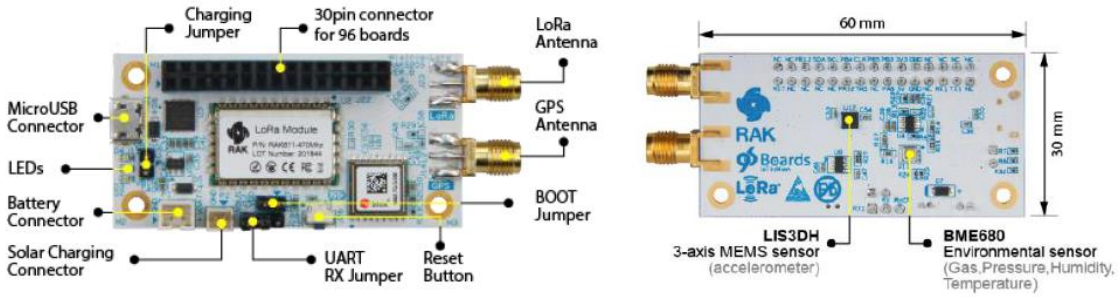
In short the board integrates the following components:

- RAK811 (Built-in Semtech SX1276/78) for LoRa connectivity
- 96Boards Compatible form factor and 30 pin header
- Ublox Max 7Q GPS Module
- BME680 Temperature, Humidity, Air Pressure, Gas
- LIS3DH 3-axis MEMS sensor (accelerometer)
- Support for Battery and Solar power operation
- Sleep mode consumption down to 14.6uA
- Custom AT command firmware
- Packet includes Micro USB cable for power and programming, LoRa Antenna (SMA or iPEX), DuPont Lines (for easy connection to the GPIO header), GPS Antenna (SMA or iPEX)

1.2 Ports, jumpers, etc.

Looking at Figure 1 we can identify the following:

- The Two antenna connectors on the right (SMA or iPEX options are available
- 30 pin header on top
- Micro USB port, status LED and the Charging mode jumper
- Bottom left to right: Battery connector, Solar Charger connector, Boot mode jumper on top of UART jumper, Reset button and the Ublox Max 7Q GPS module
- On the back there are the sensors (LIS3DH accelerometer and BME680 environmental)
- The position of the jumpers needs to be changed for the different operation modes, which will be discussed further down in the corresponding parts of the guide



2. First time setup

2.1 Flashing the latest firmware

Note: Only power the board with the LoRa and GPS antennas connected!!!

- First download the Serial port driver. Extract the archive and install the packet
- Next we download the STM Flashing tool. Extract the archive and install the packet
- Download the latest RAK5205 Firmware from the GIT repository

Make sure to pick the appropriate bin file depending on the region you are in:

"RAK811_HF_trackerboard_Vx.x.x.x" supported regions: IN865, EU868, US915, AU915, KR920, AS923

"RAK811_LF_trackerboard_Vx.x.x.x" supported regions: EU433, CN470

- Insert the provided jumper on the Boot line pins, shorting them. This will allow for the firmware to be uploaded.
- Start the Flash Loader Demonstrator (STM Flashing tool) after you have plugged the board via the Micro USB cable into an USB port

- Configure the parameters as in Figure 2 (port name should correspond to the one assigned to the board) and press Next

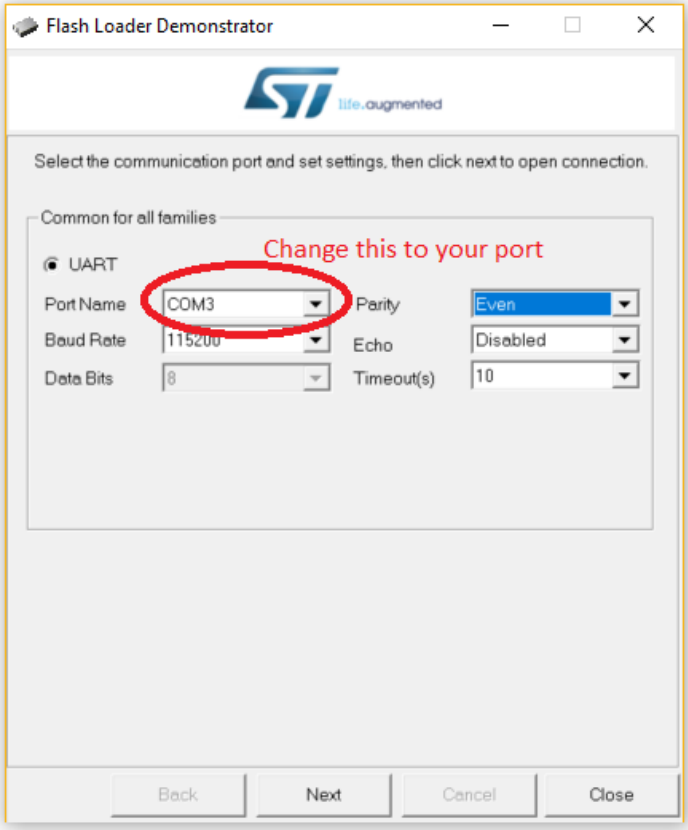


Figure 2 | Flash loader tool

- You should see the image shown in Figure 3 if there are no issues. Press Next

Figure 3 | Flash loader device validation screen

- Again refer to Figure 4 for selecting the appropriate parameters and press Next

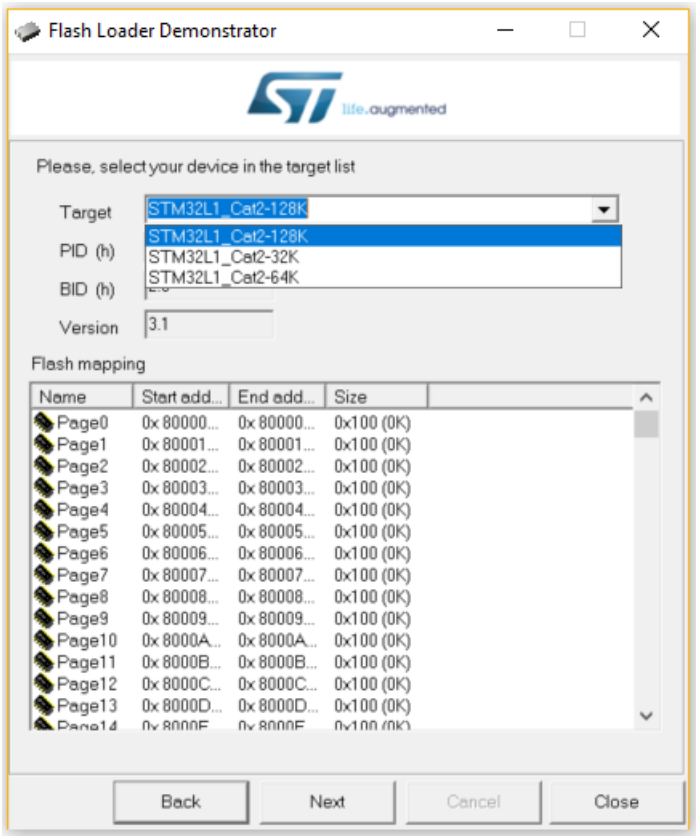


Figure 3 | Device selection

- Now you need to select the *bin* file with the firmware you downloaded. Use the button circled in red in Figure 5 and navigate to the location of the file. Press Next

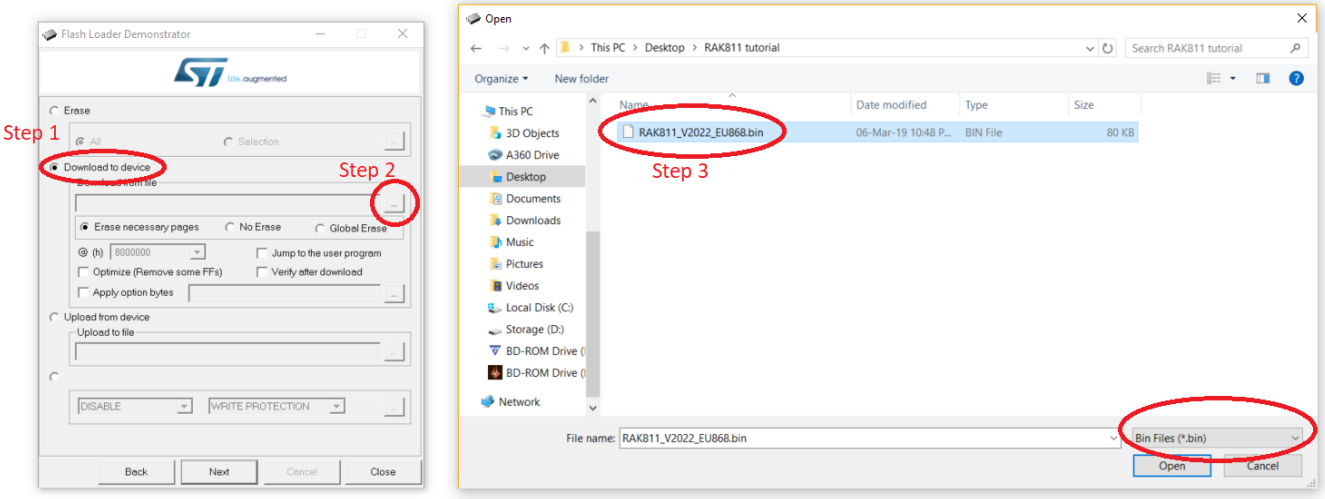


Figure 5 | Firmware file selection

A screen with a loading bar will appear which will turn green if the process completes successfully. You are done with this step, you can close the tool.

- Finally remove the Boot jumper and reset via the button

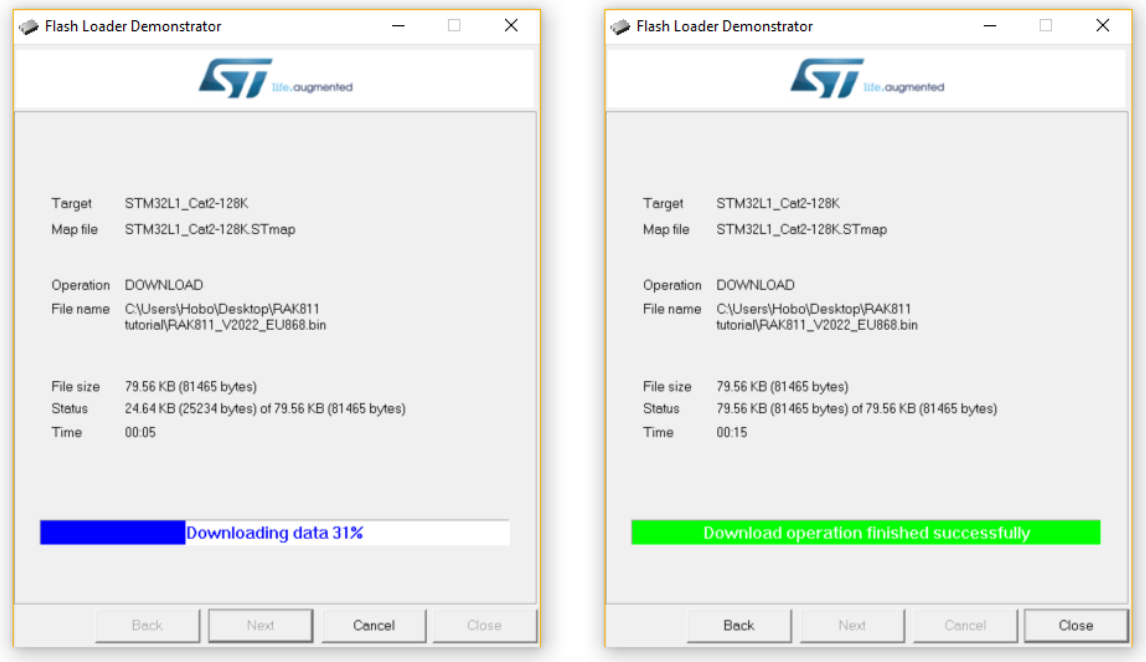


Figure 6 | Firmware upload progress

2.2 Setting up the node for connecting to TTN

Now that you have removed the Boot jumper in the previous step, the node is in operational mode and you can set it up to work with TTN. The example is for the case of OTAA.

- Download the RAK serial port tool:

RAK serial port tool

Start the *exe* file, select the correct COM port and open it as shown in the Figure 7. You should see the info shown in the window on the left in Figure 7. The uppermost row is the Firmware version. The rest is data from the onboard sensors, validating that they have been initialized successfully. (Commands on the right are just an example, actual ones are further down in the manual)

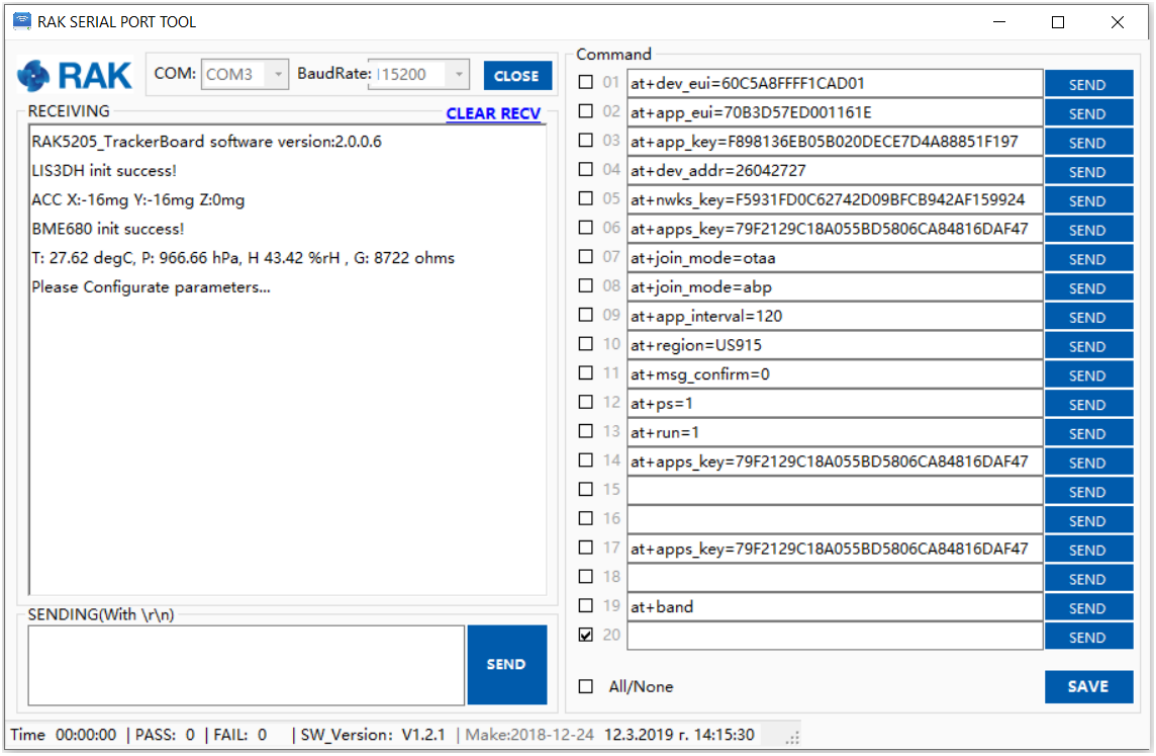


Figure 7 | Node EUI retrieval

Now you can start creating your application / registering your device in TTN. Do so by going to the TTN console as shown in Figure 8, going to the application section and registering your device.

Create a new application first. Enter an ID, Description and select the Handler for your location (example is for EU).

Next register a new device (see Figure 9) and configure its parameters (Figure10).

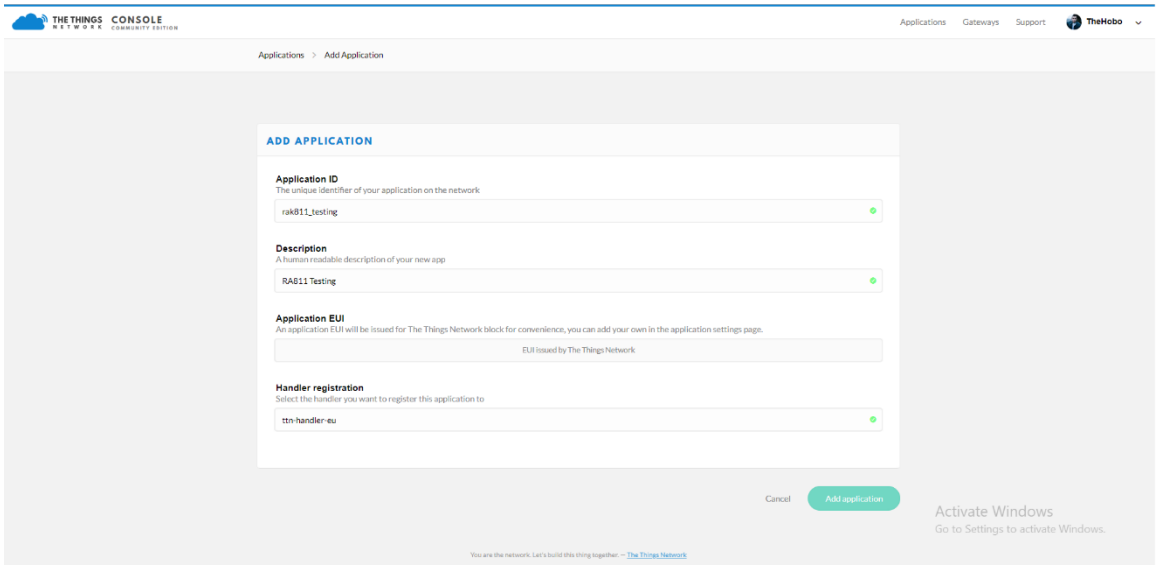


Figure 8 | Application registration

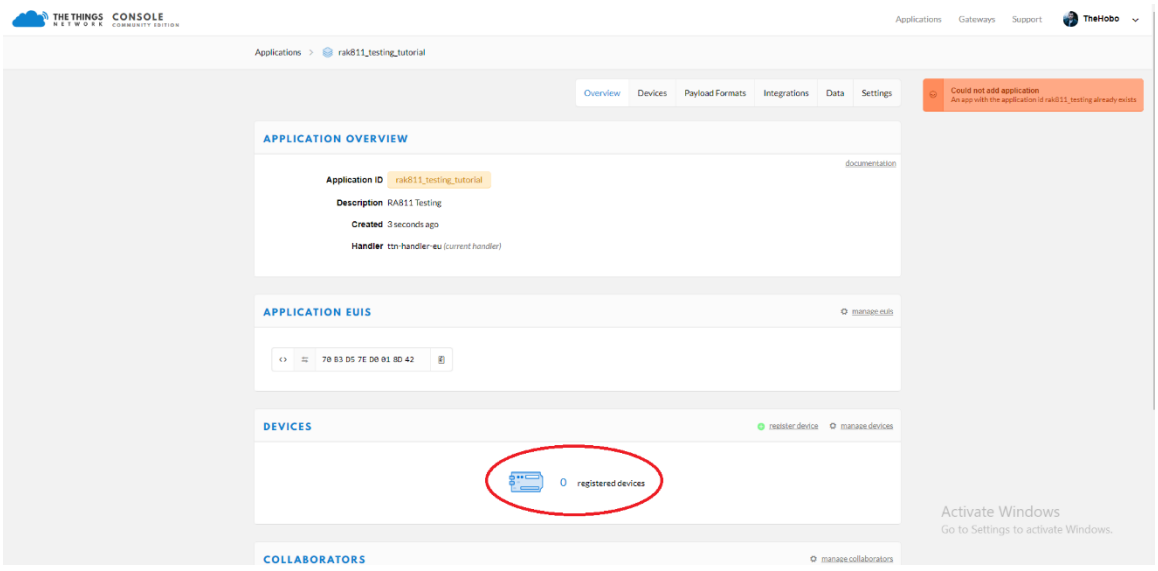


Figure 9 | Device registration

Make sure you set the Device EUI to be generated automatically by pressing the generate button in front of the (circled in red). The App Key should be in auto generation mode by default.

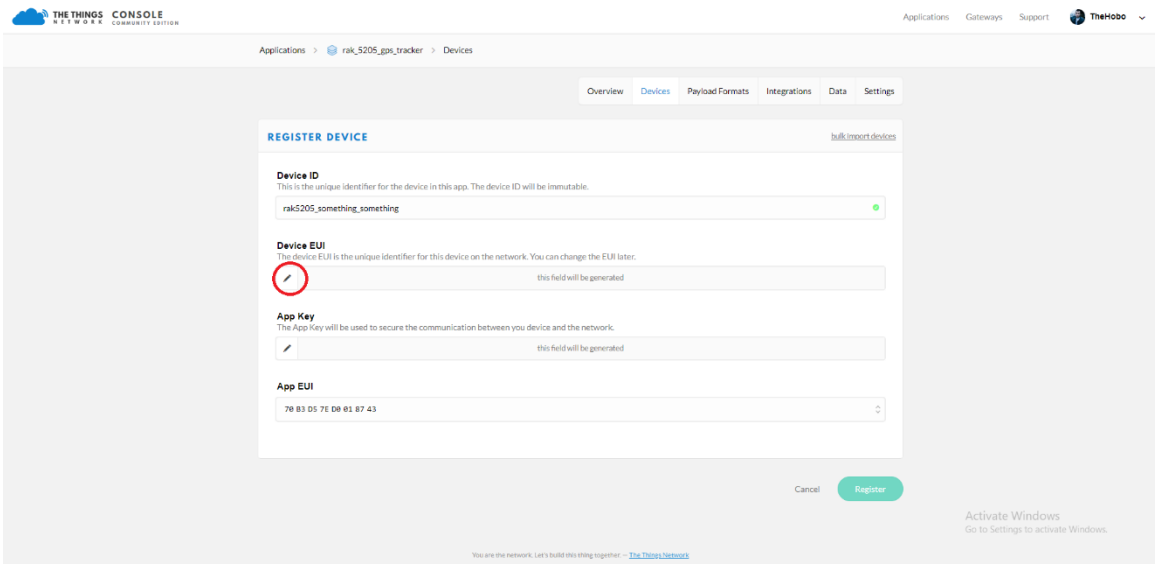


Figure 10 | Device parameters setting

Finish by pressing the Register button, now you devices should be registered under the corresponding application.

Now a window will open, much like the one in Figure 11. You have several parameters there you need to note.

The values shown in Figure 11 are examples and will be different for your application and device.

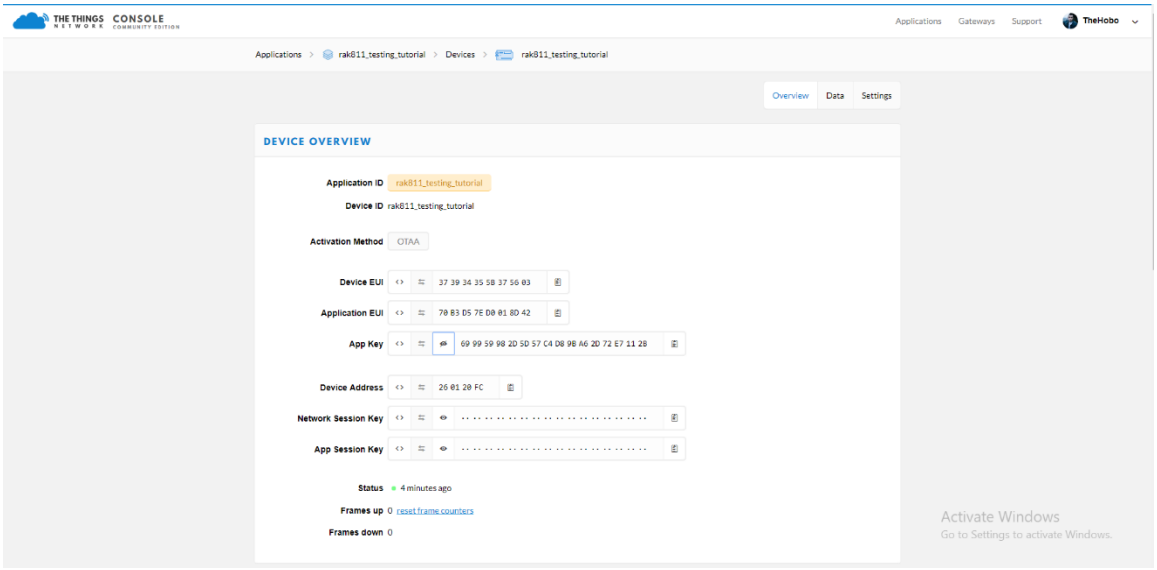


Figure 11 | Device EUI, Application EUI and App Key

Return to the serial tool and execute the following in order (copying the corresponding values that we mentioned in Figure 11:

*at+dev_eui=**DEV_EUI***

*at+app_eui=**APP_EUI***

*at+app_key= **APP_KEY***

DEV_EUI – the Device EUI copied from TTN

APP_EUI – the Application EUI copied from TTN

APP_KEY – the App key copied from TTN

Next execute the following:

at+join_mode=otaa

(This will perform OTAA activation with the 3 parameters from the previous commands)

Finally execute the following:

at+region=EU868

(This will set the frequency band to the 868MHz for the EU region, you need to enter the one corresponding to your location)

An example is shown in Figure 12. By executing the commands on the right (values are exemplary) in order you should an *OK* message after each one in the windows to the right as in the figure.

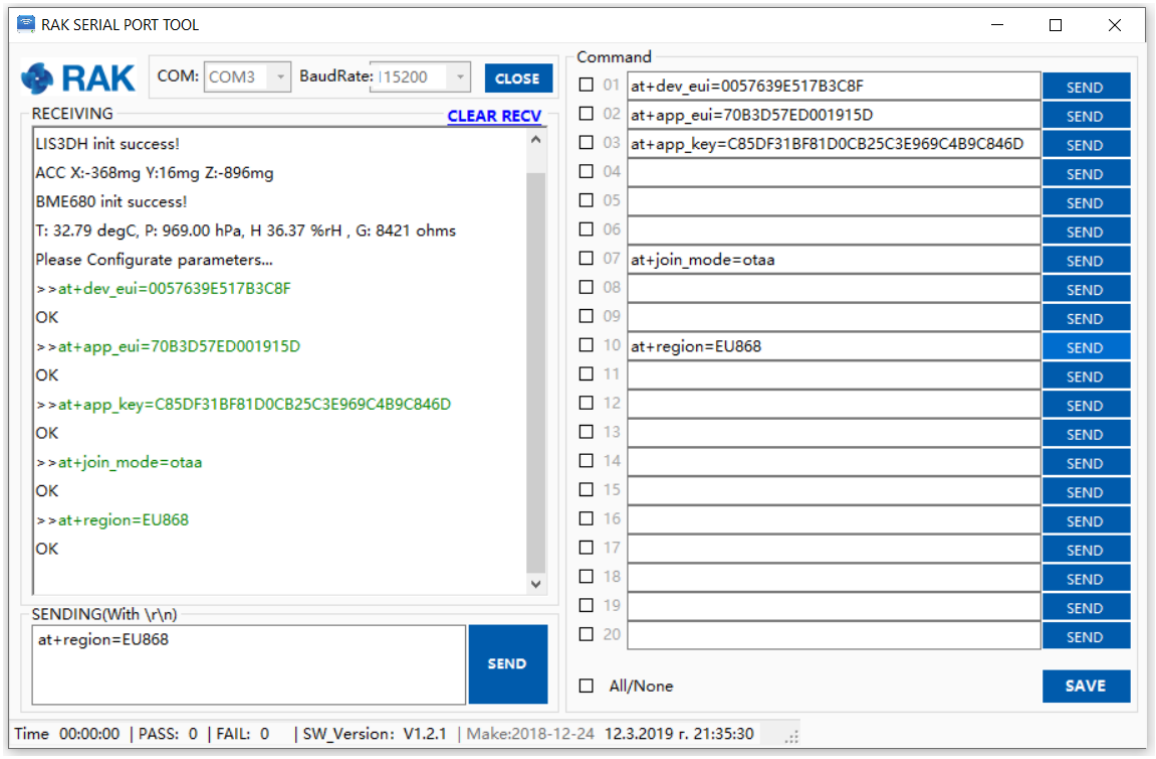


Figure 12 | Device Application EUI and Key

This will perform OTAA (Over the air activation) and authenticate the node with TTN. It should now be registered and you can send and receive data. Finally reset the node via the *Reset* button. Is there are no issues you should see a windows like the one in Figure 13.

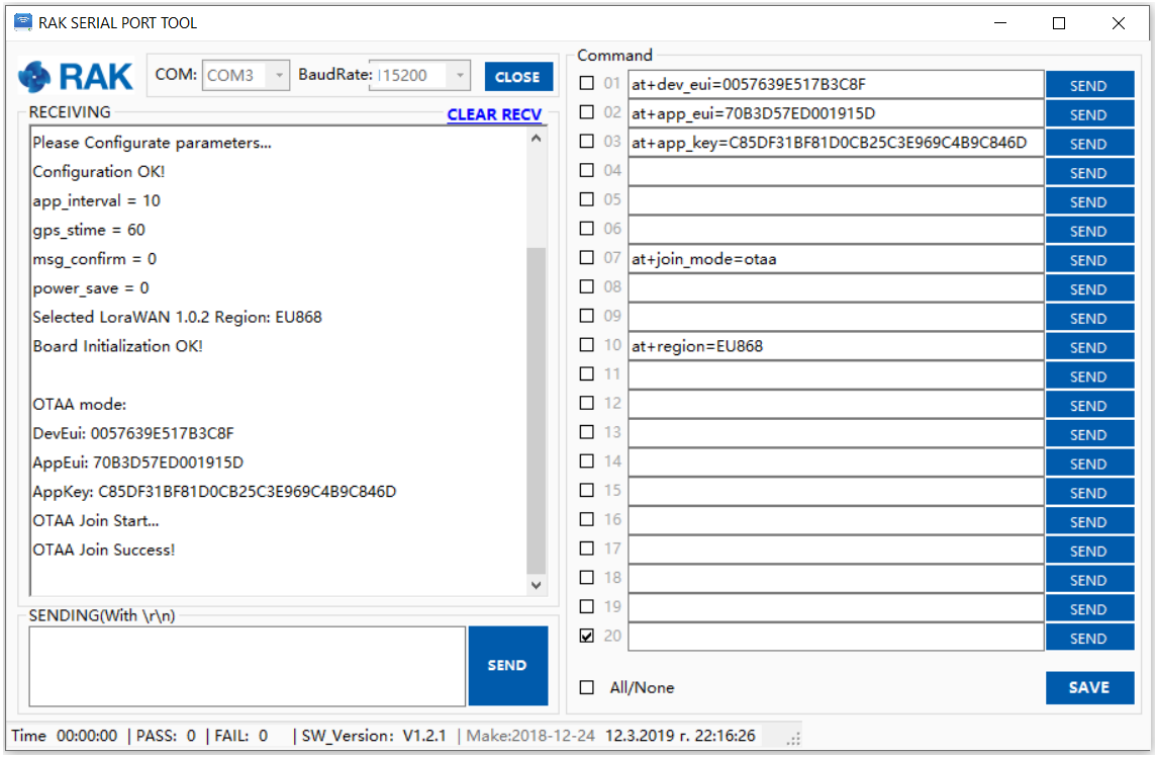


Figure 13 | Successful node OTAA join procedure

Now your device is online and is visible as such (Status is green, red circle) in TTN (Figure 14)

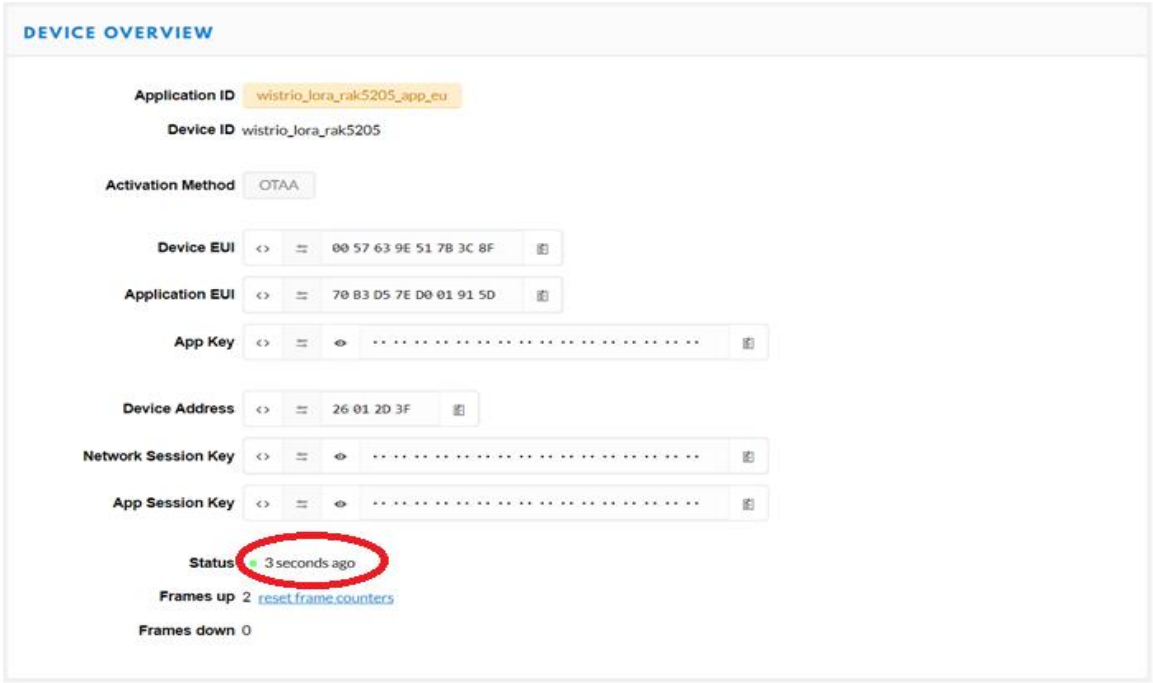


Figure 14 | Device active status

Now your RAK5205 is transmitting sensor data to TTN. You can see it in its raw form in TTN, by going to the *Data* tab (circled in red in the image) under your RAK5205 device as shown in Figure 15 and 16

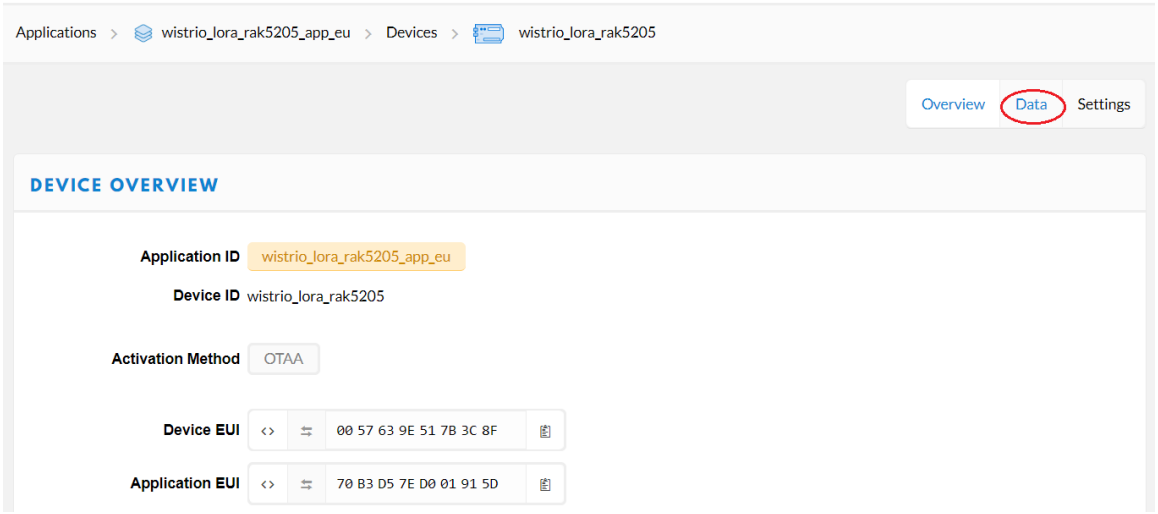


Figure 15 | Device data tab

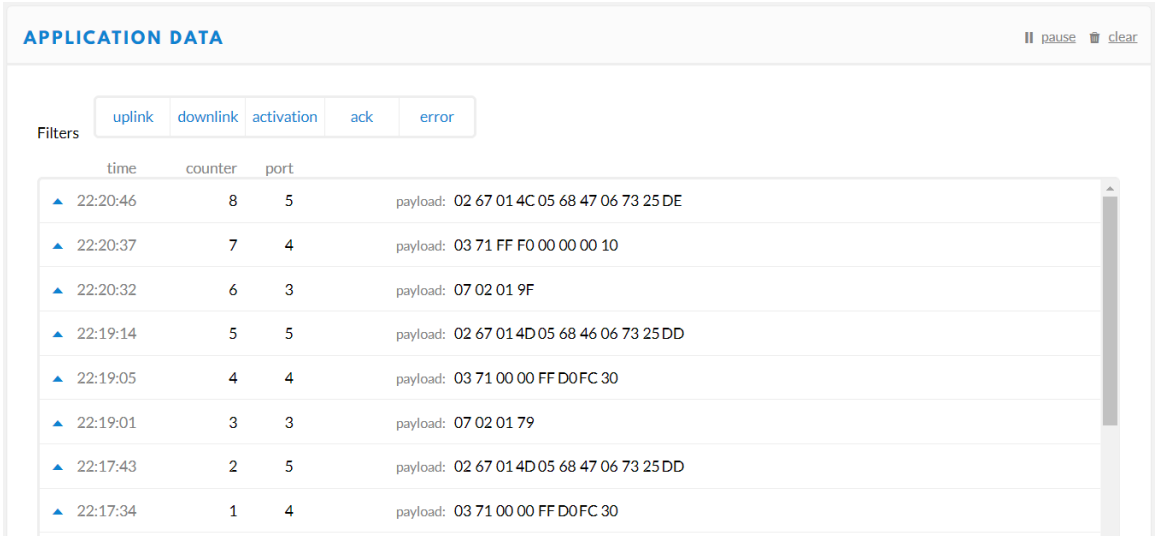


Figure 16 | Raw device data

Note: This is only the case if you are in range of a TTN gateway. The tutorial assumes this to be the case.

In case you need more detailed information about node parameters and their configuration please refer to the AT Command Manual.

This concludes the node configuration and connection to TTN part of the tutorial.

3. Contact Information

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4. Revision History

Revision	Description	Date
1.0	Initial version	2018-12-21
1.1	Update the description, some pictures and cellular antenna parameter	2019-01-15
1.11	Minor updates in some images and the configuration part	2019-03-03

2.0	Update of procedure due to TTN Console changes	2019-03-07

5. Document Summary

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About RAKwireless:

RAKwireless is the pioneer in providing innovative and diverse cellular and LoRa connectivity solutions for IoT edge devices. It's easy and modular design can be used in different IoT applications and accelerate time-to-market.
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