# RAK813 BreakBoard User Manual V1.0

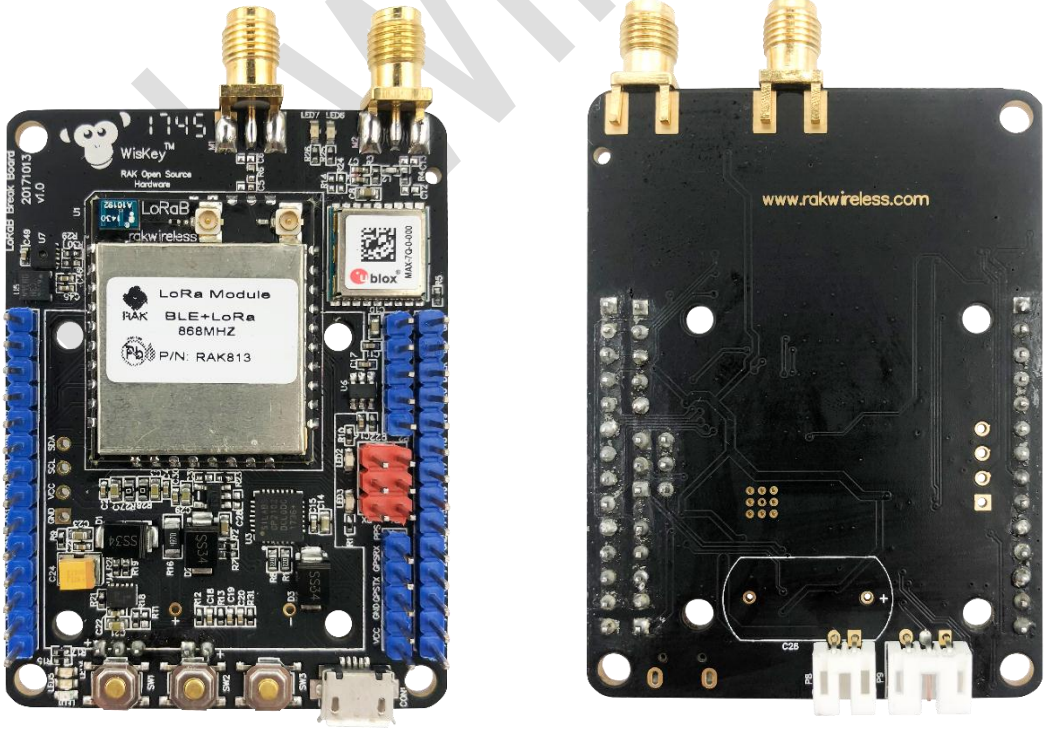
# Contents

# 1. Introduction

RAK813 BreakBoard is a wireless remote solution based on the RAK813 + GPS + MEMS + HT+LCD design. It integrates the latest LoRaWAN 1.0.2 protocol and the latest Bluetooth 5.0 protocol, supports LoRaWAN working mode, supports Bluetooth transparent transmission, Bluetooth up to 300 meters away..

RAK813 BreakBoard built-in GPS, acceleration, temperature and humidity sensors, expanded I2C LCD interface. We provide case applications that can configure LoRaWAN parameters using Bluetooth, display sensor data using LCD, and upload sensor data to the LoRaWAN network. And all the code open source. Users can find all the open source code in github. We also designed three customizable buttons and two customizable LED lights for our users, allowing users to implement they idea with open-source code.

RAK813 BreakBoard is also a support for battery-powered products. Greatly expanded product application scenarios. We also designed the function to enter the low power mode when the device is detected to be stationary to ensure battery life. The device also supports RAK831 + Ri3 gateway to use, you can graphically display the various data of the sensor in the Cayenne platform, but also support the real-time observation of sensor data on the phone.



# 2. Open Source Project

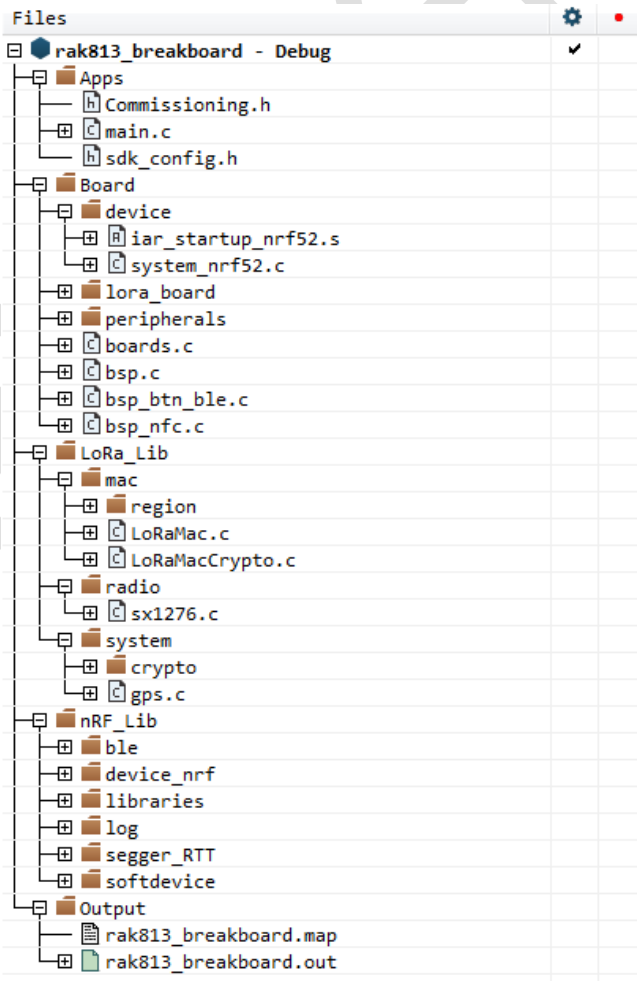
RAK813 BreakBoard is an open source hardware. So the user can get all the information about the product. Includes schematics and program code. Here for everyone a brief introduction to the structure and basic use of open source code.

About the open source project, we can download it here:
https://github.com/RAKWireless/RAK813-BreakBoard

This open source project is based on the official code LoRaWAN1.0.2 and Nordic nRF5 SDK 14.0.0 modified to support IAR8.11 and Keil5. The project mainly provides how to read the sensor data and turn on the Bluetooth transparent transmission function to receive the LoRaWAN configuration data. After the LoRaWAN connection is successful, the sensor data is uploaded to the LoRaWAN server.

## 2.1 Project Structure

Because of the similar project structure of IAR8.11 and Keil5, we introduce the project structure of IAR8.11 as an example.



Apps

-main.c application code

-Commissioning.h LoRaWAN parameter configuration file

-sdk_config.h nRF52832 chip configuration file

Board

-device

- iar_startup_nrf52.s system_nrf52.c nRF52832 startup file

-lora_board

-./* Control LoRa chip hardware related file

-peripherals

-./* Driver peripheral related file

-boards.c bsp.c... nRF52832 Hardware related files

LoRa_Lib

-mac

-LoRaMac.c LoRaMacCrypto.c lora mac driver

-region

-./* The region defined by LoRaWAN1.0.2

radio

-sx1276.c support the semtech sx1276 driver

system

-crypto

-./* lora transmit security use AES and cmac check

-gps.c Parse GPS data files

nRF_Lib

-ble

-./* Driver Bluetooth library related files

-device_nrf

-./* nRF52832 interface library files

-libraries

-./* nRF52832 function use case library files

-log

-./* nRF52832 log print information related files

-segger_RTT

-./* Use j-link RTT to print log related files

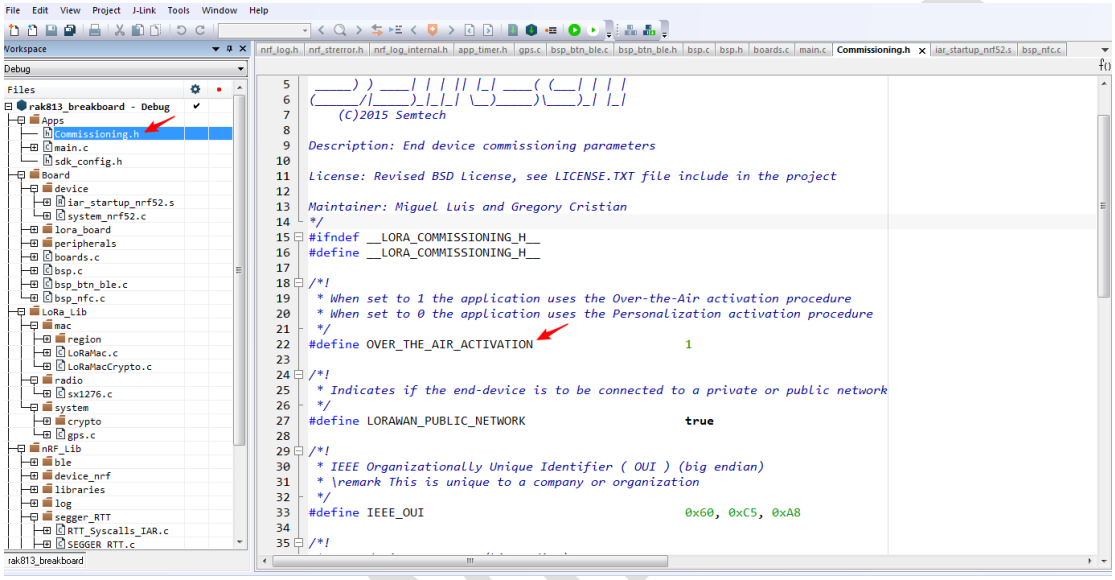
-softdevice

-./* Bluetooth protocol stack driver files

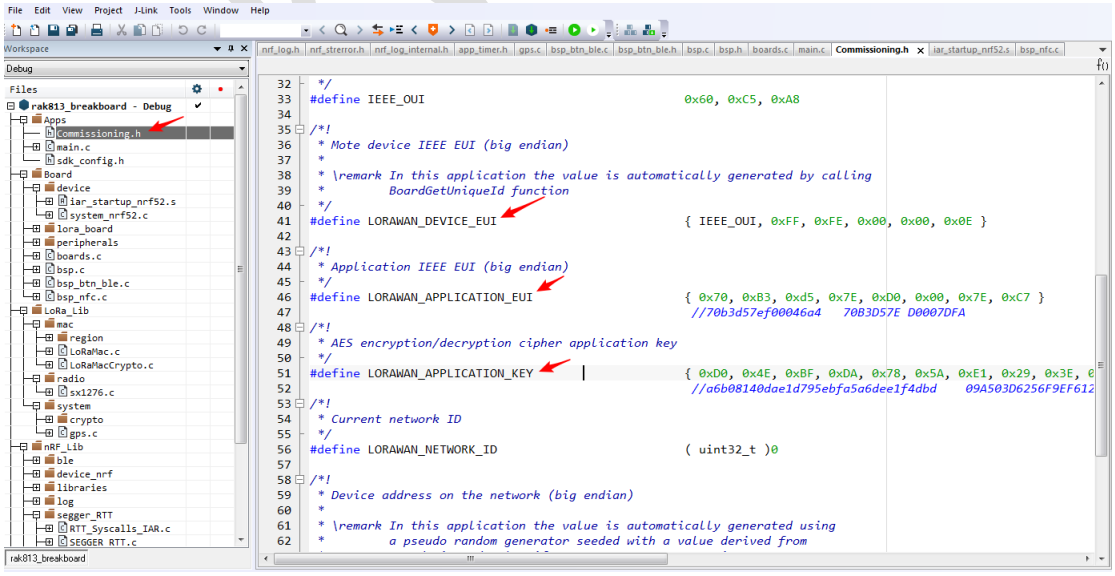
## 2.2 Configuration LoRaWAN Parameters

In the project, if you want to modify the way(OTAA or ABP) the device joins the network and the parameters of joining the network, these parameters include Dev_EUI, APP_EUI, APP_KEY, DEV_ADDR, NWKS_KEY, APPS_KEY. You can modify it in the Commissioning.h file.

If you want to modify the way(OTAA or ABP) to join the network, please modify this parameter:



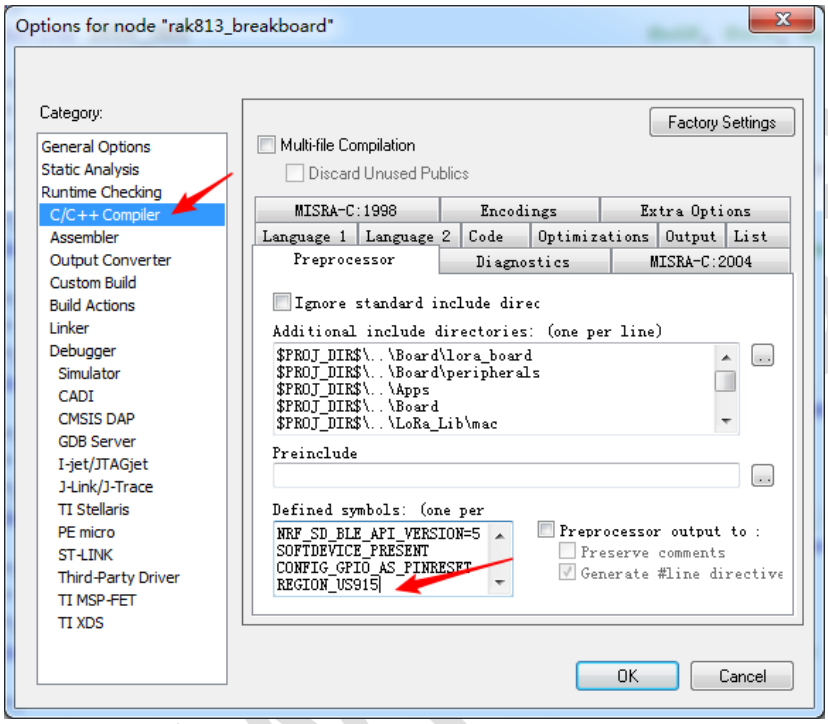

If you want to modify Dev_EUI, APP_EUI, APP_KEY, DEV_ADDR, NWKS_KEY, APPS_KEY these parameters, please modify here:



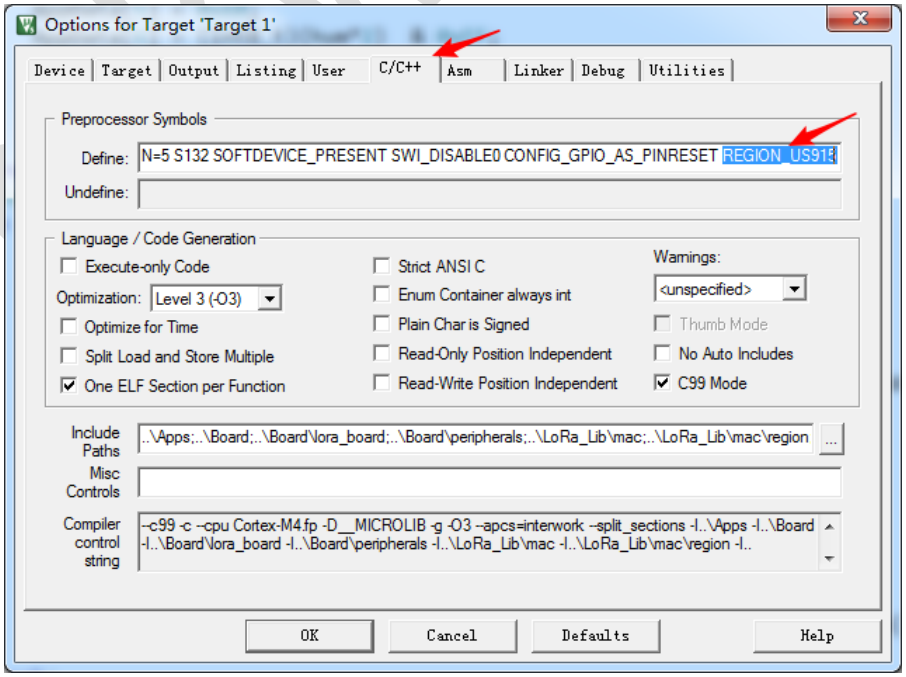
## 2.3 Modify LoRaWAN Region

The open source code is based on LoRaWAN1.0.2 modified from, so the supported regions have: EU868, US915, AS923, AU915, IN865, KR920. If you want to modify the region, you can modify the macro definition.

IAR:

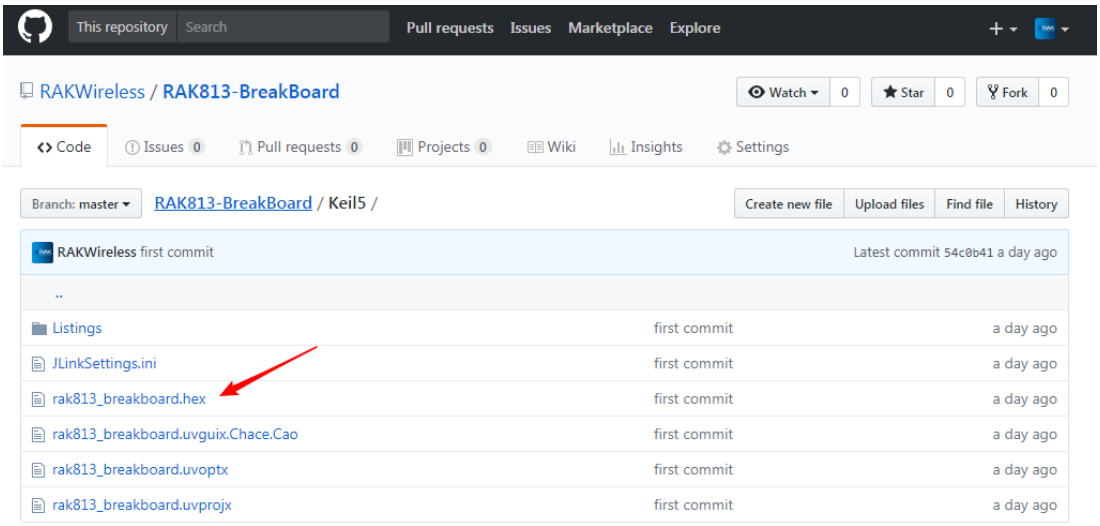



Keil:



# 3. Demo instructions

The following describes the use of open source project demo. The Demo firmware see the open source project. How to download the open source project firmware, Please see RAK813 BreakBoard Firmware download manual document.

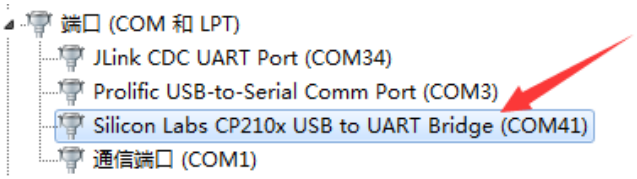



## 3.1 Log Information

When you finish writing Demo firmware. You can view the Log information through the serial port defined by Demo firmware. But first, you need to connect Pin3-> Pin5, Pin4-> Pin6 on the UART switch interface(see RAK813 BreakBoard Datasheet).

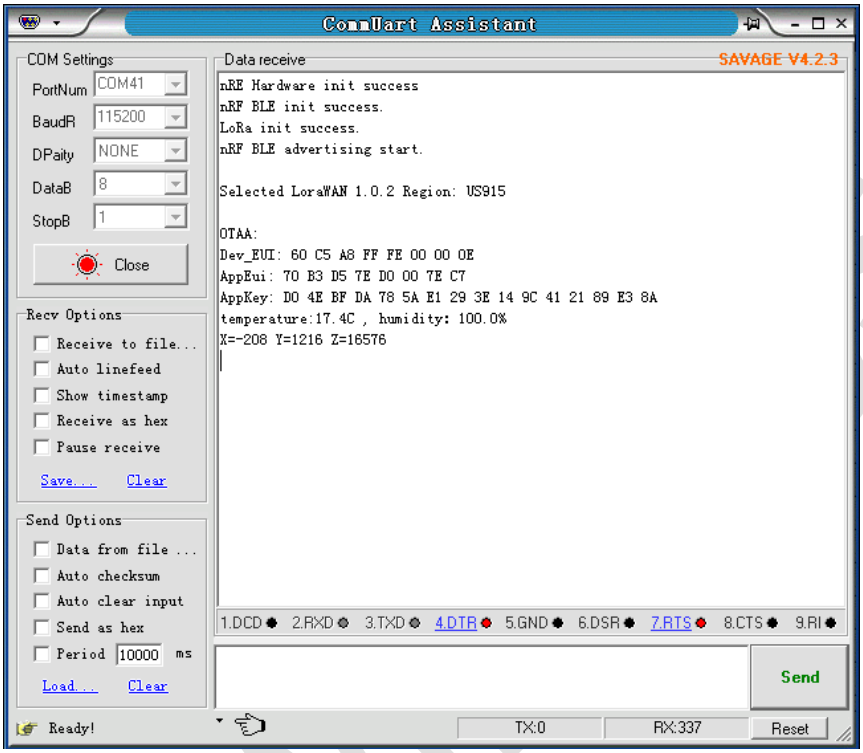
### 3.1.1 Install Serial Port Driver

This device uses USB to serial port chip CP2102, so after the device is connected to the computer, the driver will usually be installed automatically, if you find that your computer is not automatically installed, please go to this link to download the driver: http://passport.rakwireless.com/stat/en/RAK811%20BreakBoard/Tool/CP210x_Windows_Drivers.zip



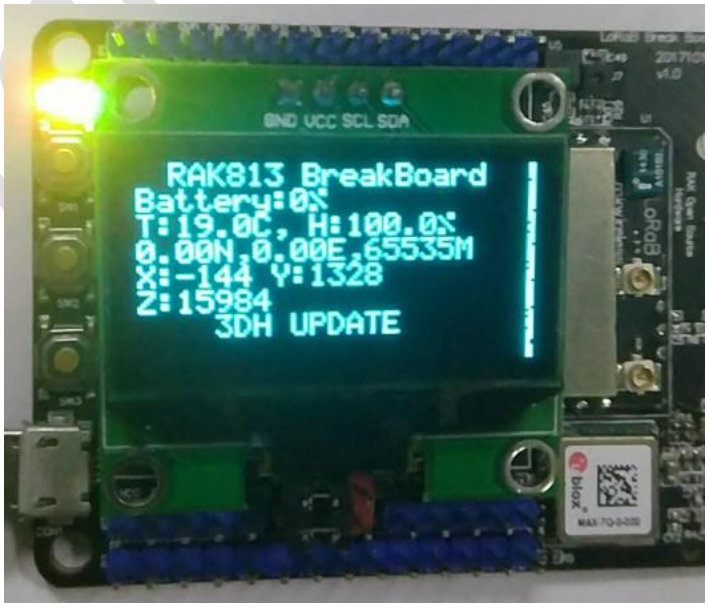
### 3.3.2 See Log infomation

After the driver is installed successfully, Connect the device to the PC via the Micro USB connector. then reset(The reset Butten is defined SW3) device will see the following log information in the serial port.



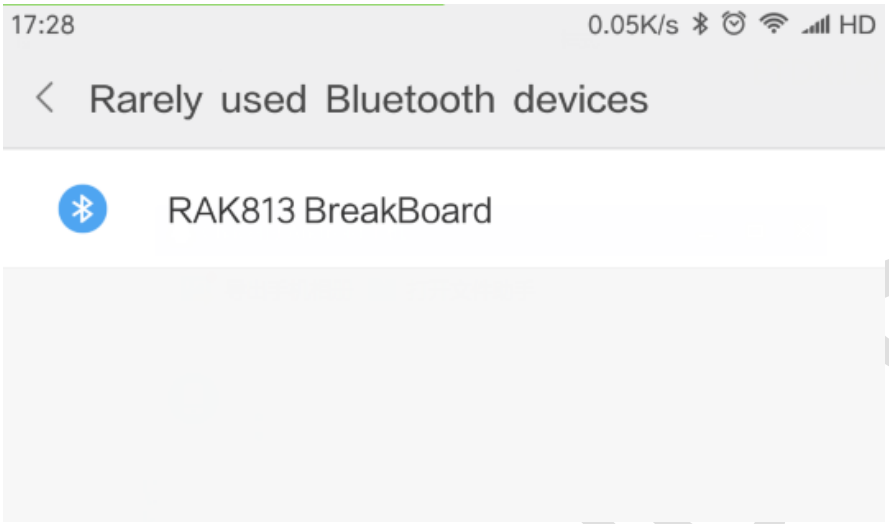

## 3.2 LCD Display

If you have access to the LCD, you will see all of the sensor's data on the LCD.

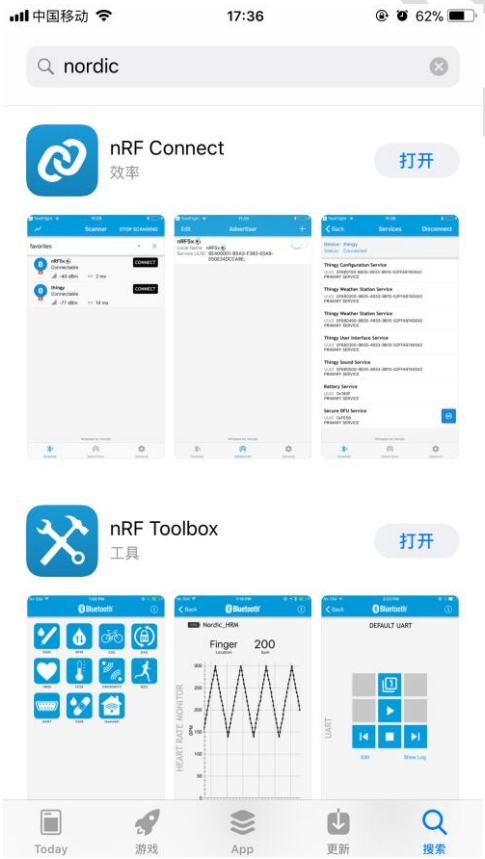


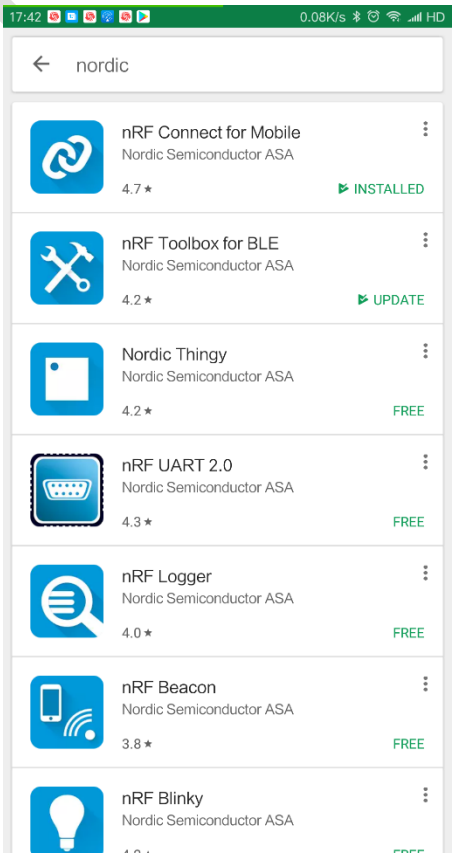
## 3.3 Bluetooth Transmission Data

When the device is activated, a Bluetooth radio with the device name "RAK813 BreakBoard" will be activated. You can view the device via the phone's Bluetooth.

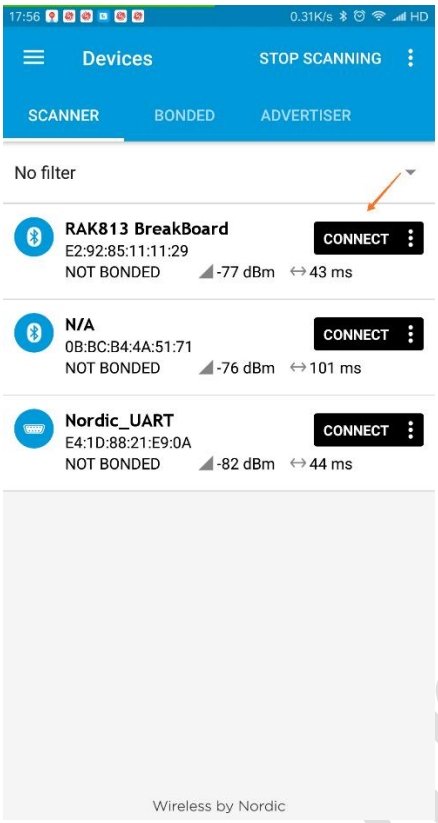


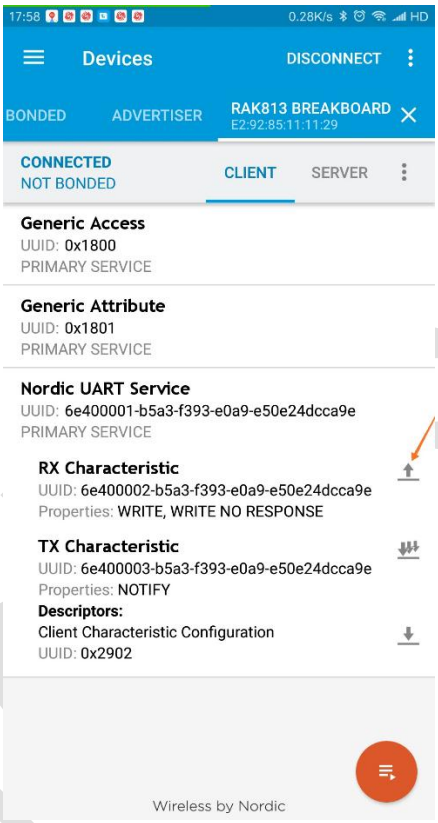

If you want to achieve Bluetooth transmission data capabilities, you need to download Nordic official mobile APP “nRF Connect”. If you are an Apple phone, Directly search for "nordic" at the Apple Store, if you are an Android phone, you also can search for "nordic" from the Google Store. For details, please refer to the official website: http://www.nordicsemi.com/eng/Products/Nordic-mobile-Apps



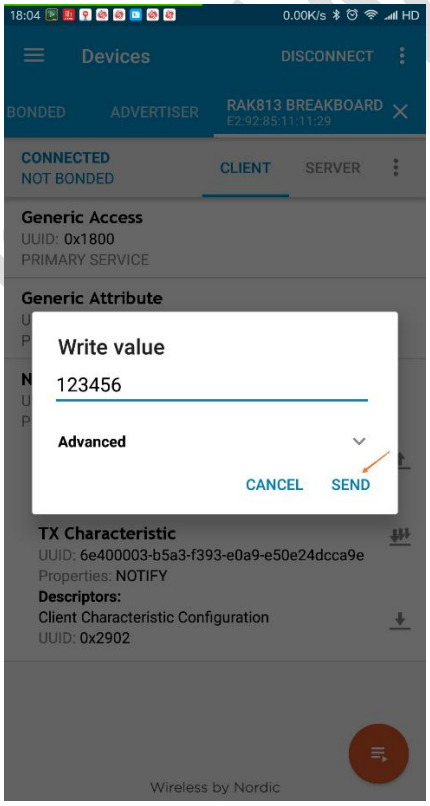



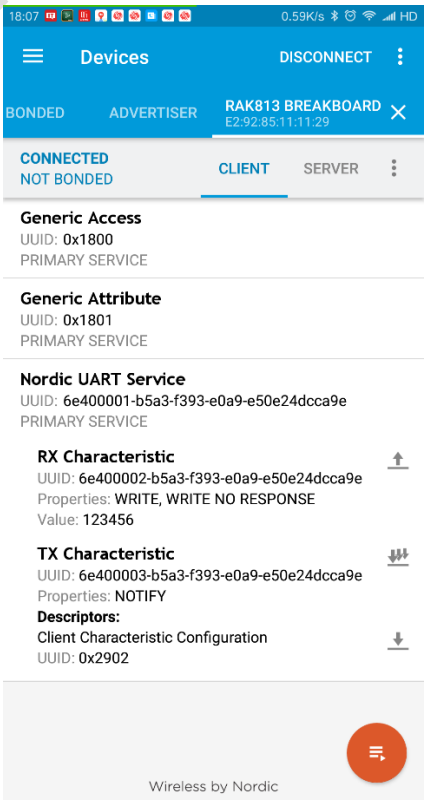
After installing APP, open the APP, select the device's Bluetooth radio "RAK813 BreakBoard" connection. After the connection is successful, click RX Characteristic to send the data.



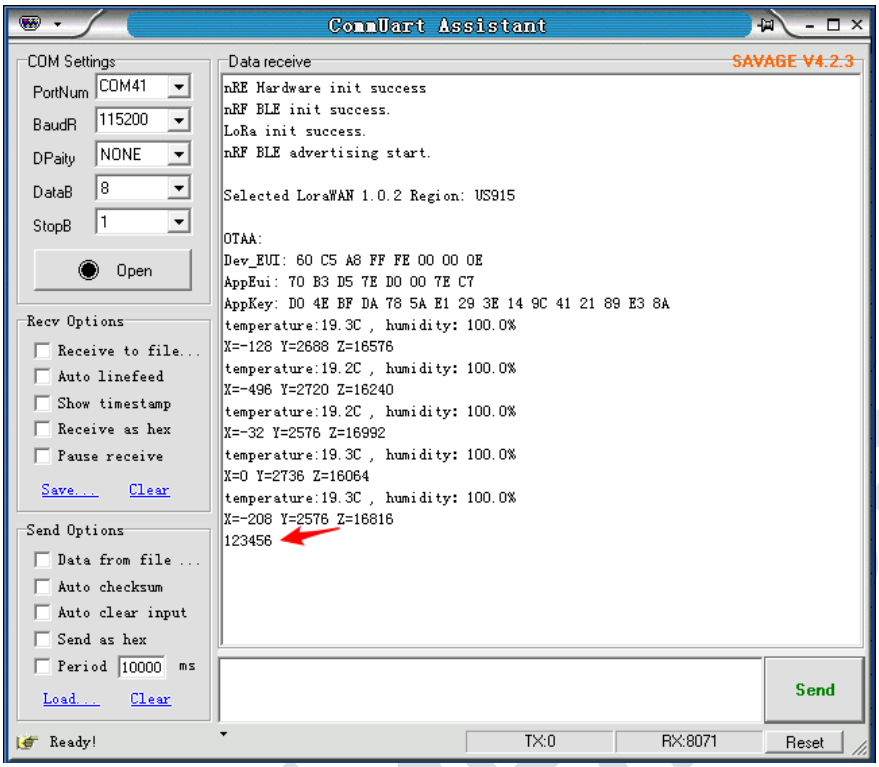




Here to send 123456 as an example to demonstrate.



After sending, you will see the data in the serial port of Log information of the device.

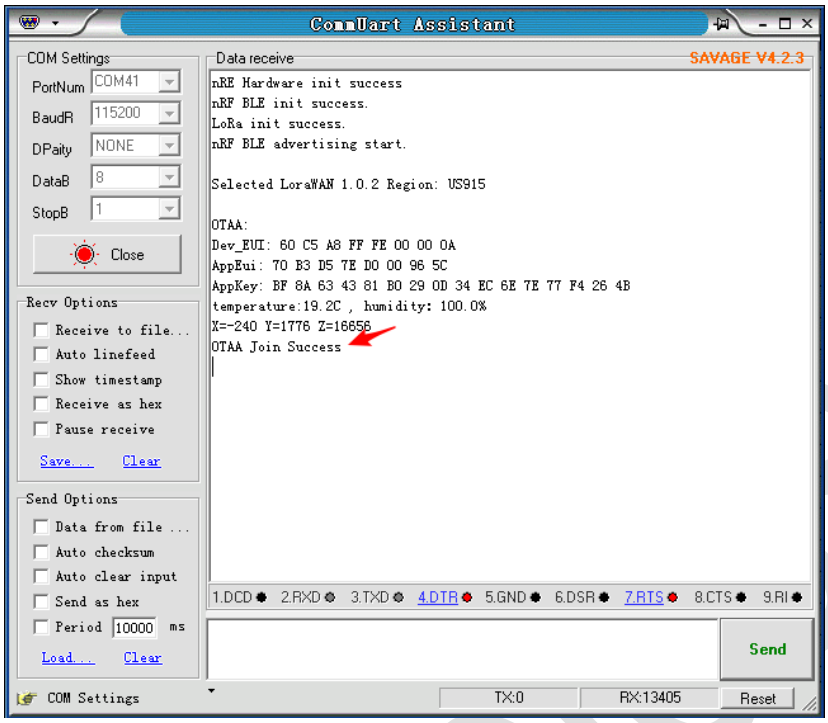



## 3.4 Connect LoRaWAN Network

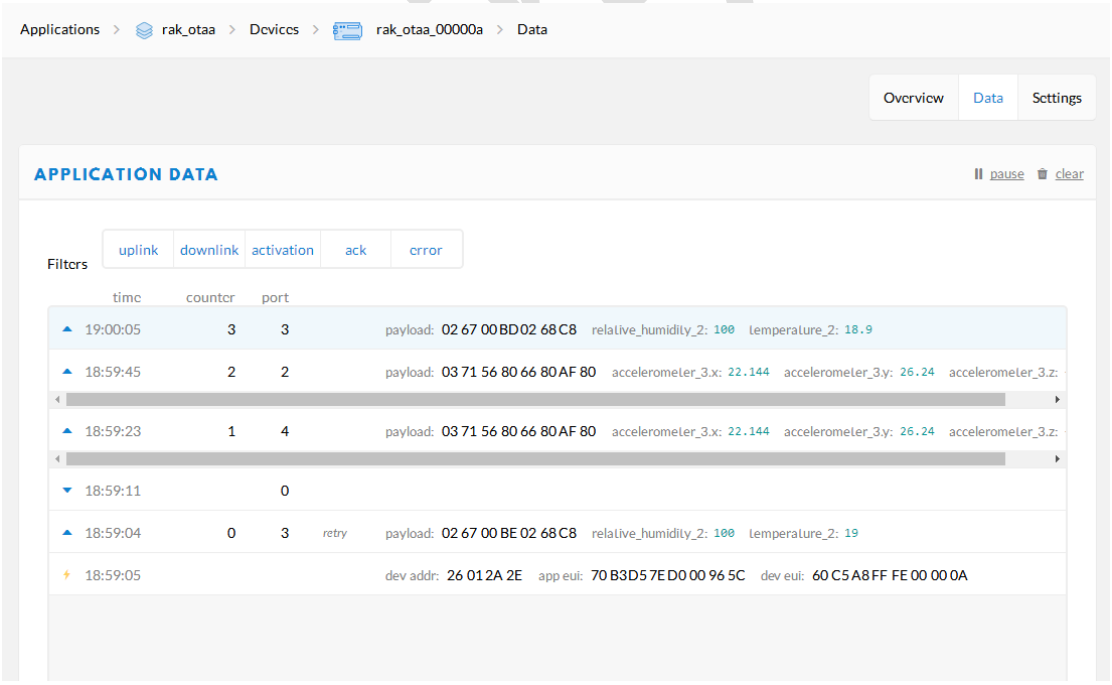
The LoRaWAN web server provider selected for this case is TTN and if you do not know how to set up a LoRa gateway device to connect to the TTN, check here:
https://www.thethingsnetwork.org/labs/story/rak831-lora-gateway-from-package-to-online

After getting OTAA or ABP parameters of LoRa device from TTN. You can write data into the flash of RAK813 BreakBoard by the function of transmitting data through Bluetooth, The format of the data you are sending must be as shown below:
lora_cfg:dev_eui=xxxxxxxxxxxxxxxx&app_eui=xxxxxxxxxxxxxxxx&app_key=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx&dev_addr=xxxxxxxx&nwkskey=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx&appskey=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
(Log information serial port will not print the information of this configuration because the information is too long.)

When the device parameters are configured successfully, reset the device, if your LoRa gateway device is ready, then RAK813 BreakBoard will send join request to LoRaWAN network server. You can in the Log information Serial to see the success of joining the information.




You can also see the data sent by the device on the TTN:



# 4. Contact information

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# 5. Revision History

| Version | Date | Change | Author |
|---|---|---|---|
| V1.0 | 2018-01-19 | First release | Chace |