RAK811 TrackerBoard User Manual V1.0

Contents

1. Introduction

RAK811 TrackerBoard is a wireless remote positioning solution based on RAK811 + GPS + MEMS. The RAR811 TrackerBoard uses the latest LoRaWAN1.0.2 protocol and supports LoRaWAN working mode, allowing users to conveniently link to the LoRaWAN network.

RAK811 TrackerBoard is an open all source code products, users can github find all the source code. About parameter configuration, the user can use the source code to develop their own serial AT command, can also be set directly in the program.

RAK811 TrackerBoard battery-powered, greatly increasing the product's application scenarios, in the outdoors can be very easy to use. Built-in 3D acceleration chip, you can detect the user's motion status, determine the device is stationary, it will enter the low-power mode, reducing the overall power consumption and increase battery life.The device with the data visualization interface provided by the Cayenne platform, allowing users to easily know their own trajectory. View your location in real time.

The difference between the RAK811 TrackerBoard and the RAK811 SensorNodeBoard is GPS, and the others are the same.

2. Open Source Project

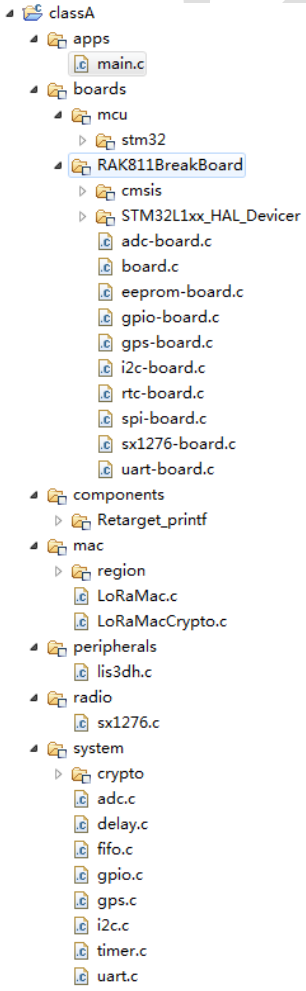
RAK811 TrackerBoard is an open source hardware. So the user can get all the information about the product. Includes schematics and program code. Here for everyone a brief introduction to the structure and basic use of open source code.(The open source code for the RAK811 TrackerBoard and RAK811 SensorNodeBoard is generic, So collectively referred to as BreakBoard.)

About the open source project, we can download it here:
https://github.com/RAKWireless/RAK811_BreakBoard

This open source project is based on the official code LoRaWAN1.0.2 modified to support CoIDE and Keil5. Have ClassA and Ping-Pong two projects, respectively, can be used as LoRaWAN test and LoRaP2P test.

2.1 Project Structure

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



apps

-mcu.c application code

boards

-RAK811BreakBoard

-cmsis stm32lxx platform system initial

-STM32L1xx_HAL_Driver stm32lxx platform peripheral driver

-board.c... peripheral initial and stm32 related pins operate

-mcu

-stm32 stm32lxx platform system interrupted

components

-Retarget_printf printf function configuration

mac

-LoRaMac.c LoRaMacCrypto.c lora mac driver

-region The region defined by LoRaWAN1.0.2

Peripherals

-lis3dh.c Acceleration chip LIS3DH driver files

radio

-sx1276.c support the semtech sx1276 driver

system

-crypto lora transmit security use AES and cmac check

-adc.c delay.c... delay ,timer, support and uart,adc,i2c,gpio Interface rewrite

2.2 Configuration Parameters

In the classA project, if you want to modify the way 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 to join the network, please modify this parameter:

```
17
18 /*!
19  * When set to 1 the application uses the Over-the-Air activation procedure
20  * When set to 0 the application uses the Personalization activation procedure
21  */
22 #define OVER_THE_AIR_ACTIVATION                     1
23
```

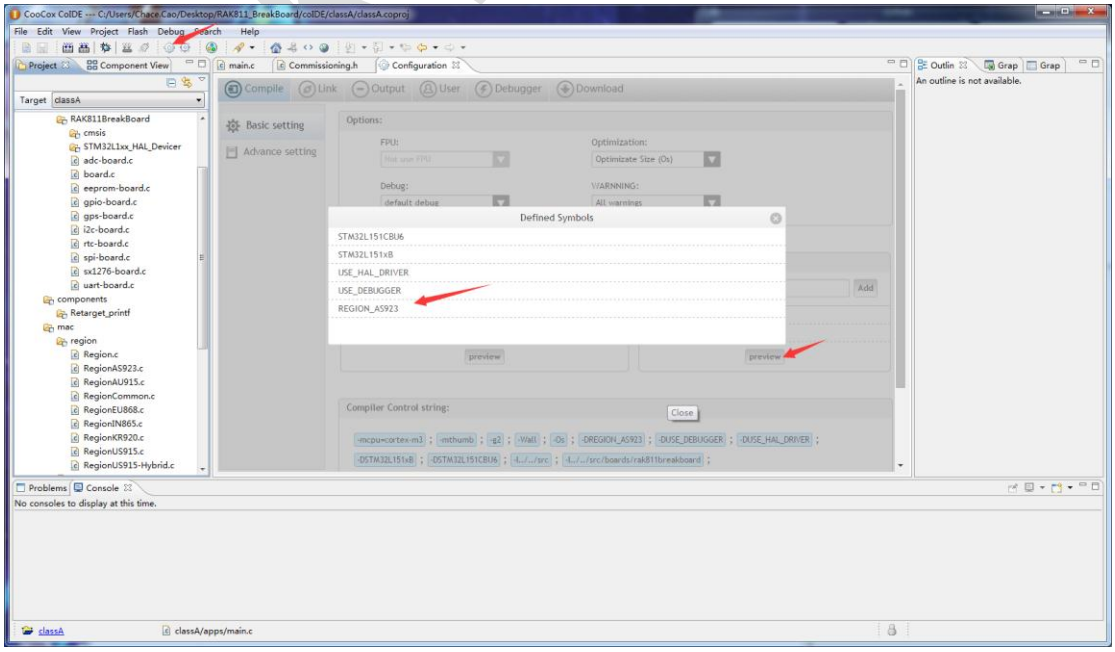
If you want to modify Dev_EUI, APP_EUI, APP_KEY, DEV_ADDR, NWKS_KEY, APPS_KEY these parameters, please modify here:

main.c | Commissioning.h

```
*/
#define IEEE_OUI                                    0x60, 0xC5, 0xA8

/*!
 * Mote device IEEE EUI (big endian)
 *
 * \remark In this application the value is automatically generated by calling
 *         BoardGetUniqueId function
 */
#define LORAWAN_DEVICE_EUI                          { IEEE_OUI, 0xFF, 0xEE, 0x00, 0x00, 0x20 }

/*!
 * Application IEEE EUI (big endian)
 */
#define LORAWAN_APPLICATION_EUI                     { 0x70, 0xB3, 0xD5, 0x7E, 0xD0, 0x00, 0x86, 0xE2 }
                                                     //70b3d57ef00046a4   70B3D57E D0007DFA
/*!
 * AES encryption/decryption cipher application key
 */
#define LORAWAN_APPLICATION_KEY                     { 0x19, 0xA1, 0xE6, 0xF6, 0x77, 0xC4, 0xBE, 0x5E, 0xAC, 0xDE, 0x57, 0x29, 0x1F, 0x86, 0x8C, 0x3B }
                                                     //a6b08140dae1d795ebfa5a6dee1f4dbd    09A503D6256F9EF612A15181F583880A
/*!
 * Current network ID
 */
#define LORAWAN_NETWORK_ID                          ( uint32_t )0

/*!
 * Device address on the network (big endian)
 *
 * \remark In this application the value is automatically generated using
 *         a pseudo random generator seeded with a value derived from
 *         BoardUniqueId value if LORAWAN_DEVICE_ADDRESS is set to 0
 */
#define LORAWAN_DEVICE_ADDRESS                      ( uint32_t )0x00000000

/*!
 * AES encryption/decryption cipher network session key
 */
#define LORAWAN_NWKSKEY                             { 0x2B, 0x7E, 0x15, 0x16, 0x28, 0xAE, 0xD2, 0xA6, 0xAB, 0xF7, 0x15, 0x88, 0x09, 0xCF, 0x4F, 0x3C }

/*!
 * AES encryption/decryption cipher application session key
 */
#define LORAWAN_APPSKEY                             { 0x2B, 0x7E, 0x15, 0x16, 0x28, 0xAE, 0xD2, 0xA6, 0xAB, 0xF7, 0x15, 0x88, 0x09, 0xCF, 0x4F, 0x3C }

#endif // __LORA_COMMISSIONING_H__
```

2.3 Modify 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.



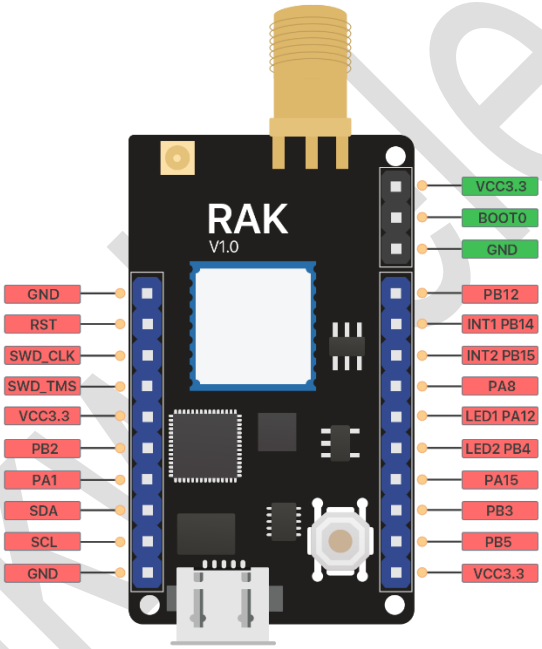
3. Firmware Download

RAK811 BreakBoard open source hardware supports three ways to download the firmware. First of all, it can support CoIDE to download program firmware using SWD interface.Secondly, support Keil5 use SWD interface to download program firmware. Finally, also support serial port BOOT burning firmware.

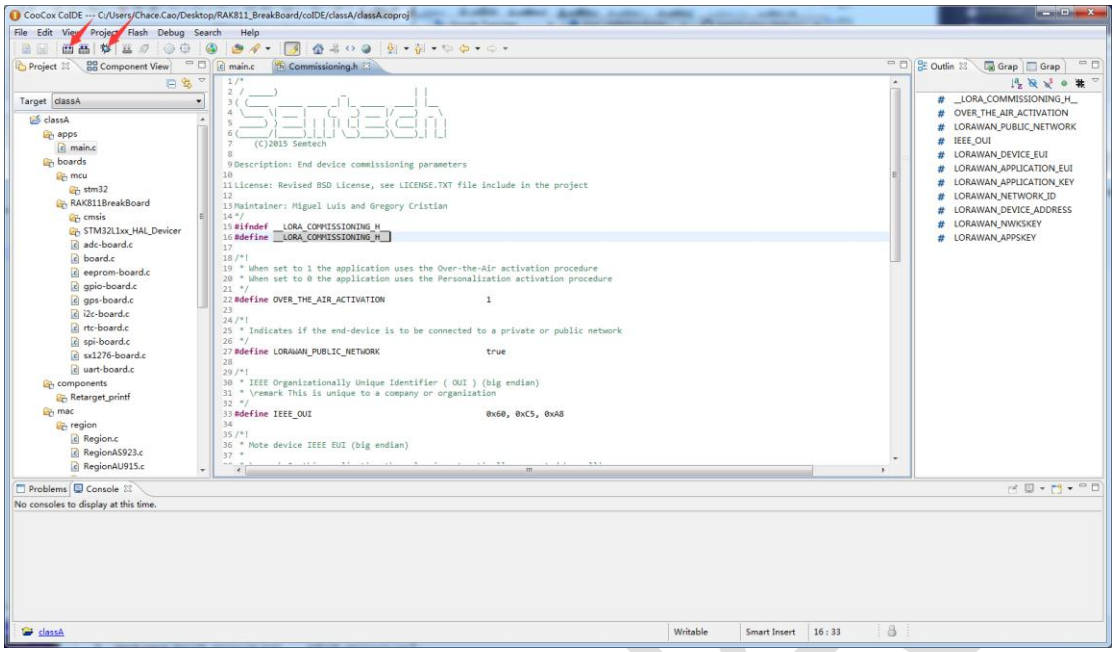
3.1 Use CoIDE

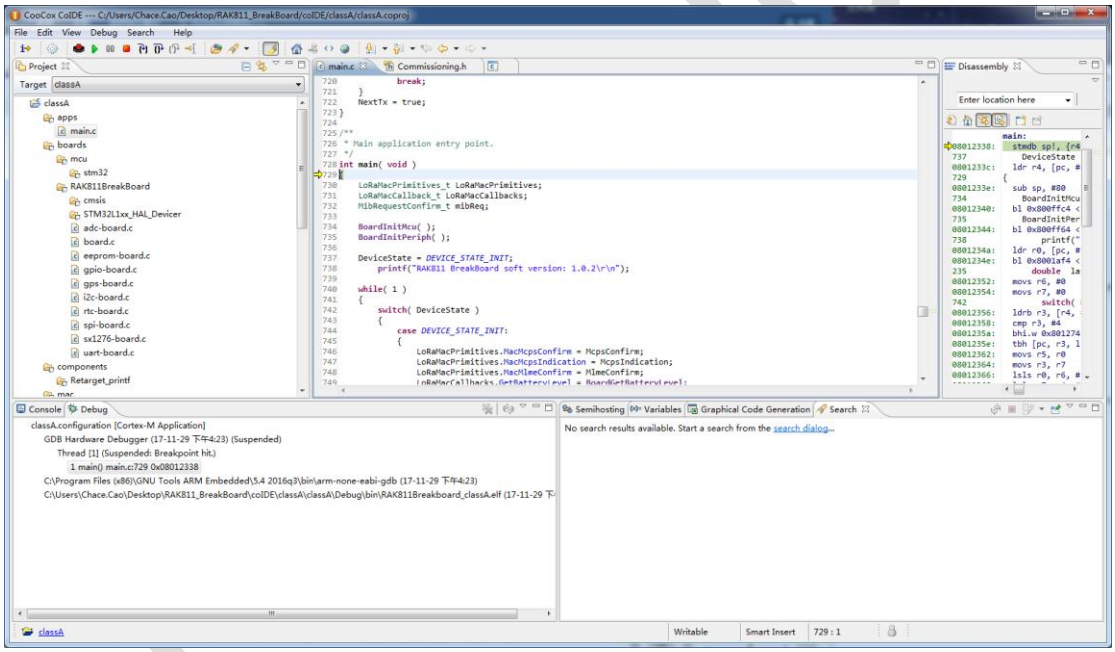
Use CoIDE to download the program, need to use J-link, through the J-link connected to the device's SWD interface for online debugging.

The SWD interface of RAK811 TrackerBoard is shown below:



After connecting the SWD interface, open CoIDE project, click compile, debug to download debugger, See below:

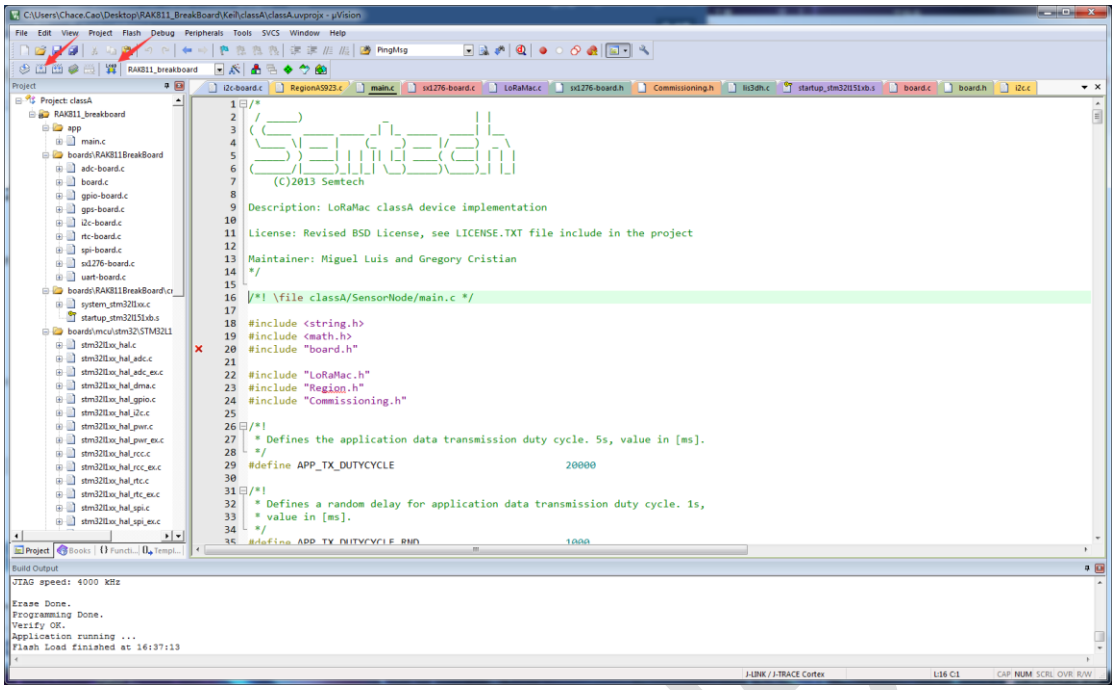




3.2 Use Keil5

Use Keil5 download program and use CoIDE is similar, also need J-link, also need to connect the SWD interface.

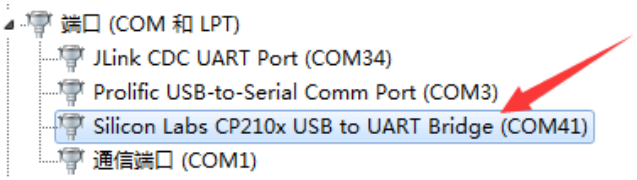
Open Keil5 project, click compile, download the program.



3.3 Use the Serial Port

3.3.1 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%20TrackerBoard/Tool/CP210x_Windows_Drivers.zip



3.3.2 Start Upgrade

This device also supports the use of serial BOOT upgrade, This need to use the BOOT0 pin.

If the BOOT0 pin is connected to GND, the device will normally run the application code. So the BOOT0 pin will be connected to GND by default

If the BOOT0 pin is connected to VCC, the device will enter the BOOT mode, then use ST's official upgrade tool Flash Loader Demonstrator burn bin file used to update the firmware. Upgrade tools, see the link to download:

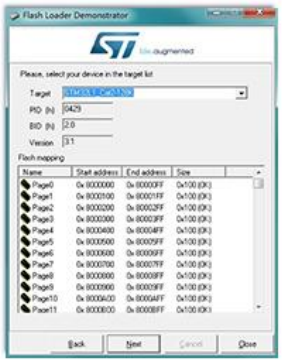
http://passport.rakwireless.com/stat/en/RAK811%20LoRa%20Module/Firmware%20upgrade/Flash%20Loader%20Demonstrator.zip

The steps shown below:

1.Open the Flash Loader Demonstrator tool, Set the serial port parameters;

2.Click the "NEXT" button, arrive the following interface;

The again the "Next" button, Choose STM32L1_Cat2–128K;



4.Choose "Download to device", Set the path to the new firmware, and click "NEXT" button.

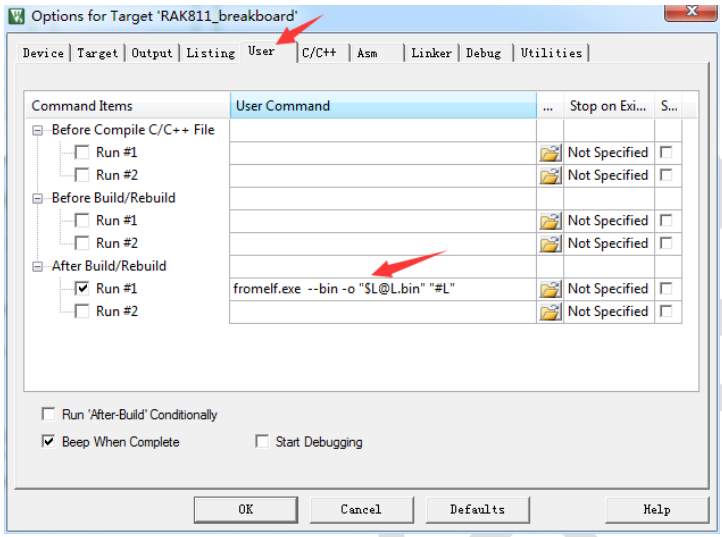
5.Upgrading:

6.Upgrade Successful.

Bin file needed for the upgrade can be compiled using keil5 or CoIDE tools. Of course, RAK company will also launch its own specific function of the bin file for users to upgrade and used.

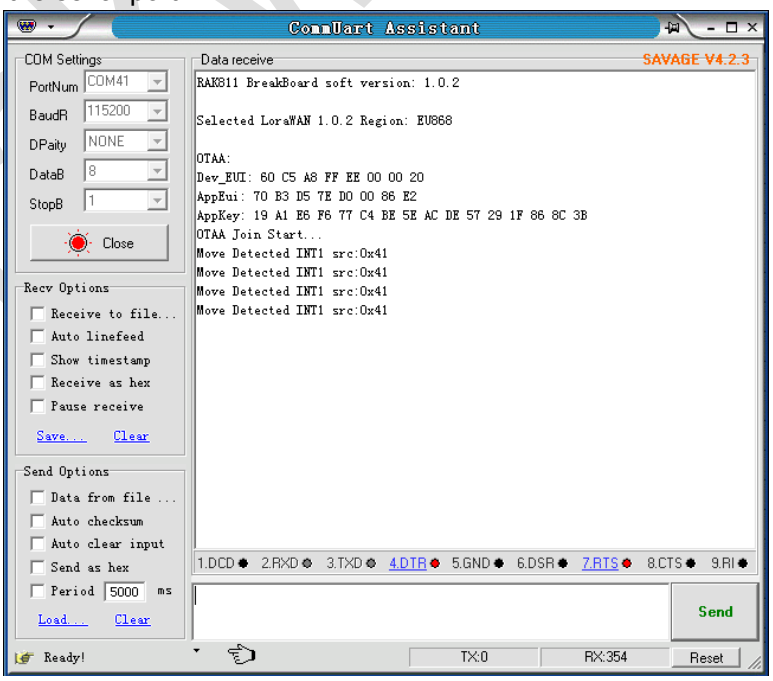
If you want to compile the bin file using Keil5, you need to add these as shown below:

fromelf.exe --bin -o "$L@L.bin" "#L"



3.4 Reset and Run

After the user upgrades the firmware, the reset device will see the following log information in the serial port.



4. Contact information

Shanghai

FAE mailbox:allan.jin@rakwireless.com

Tel : 185-1082-5762

Address: Room B205, Green light kechuang garden, 2588 Lane, Hongmei South road, Minhang District, Shanghai

Shenzhen

FAE mailbox: steven.tang@rakwireless.com

Tel : 0755-26506594

Fax: 0755-86152201

Address: Room 802, Yongfu building, No.1s06, Yongfu road, Baoan District , Shengzhen

5. Revision History

Version	Date	Change	Author
V1.0	2017-11-29	First release	Chace