RAK815(RAK813 BreakBoard) Firmware Download Manual V1.1

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rakwireless

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1. Introduction

RAK815(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..

RAK815(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.

RAK815(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.

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2. Open Source Project

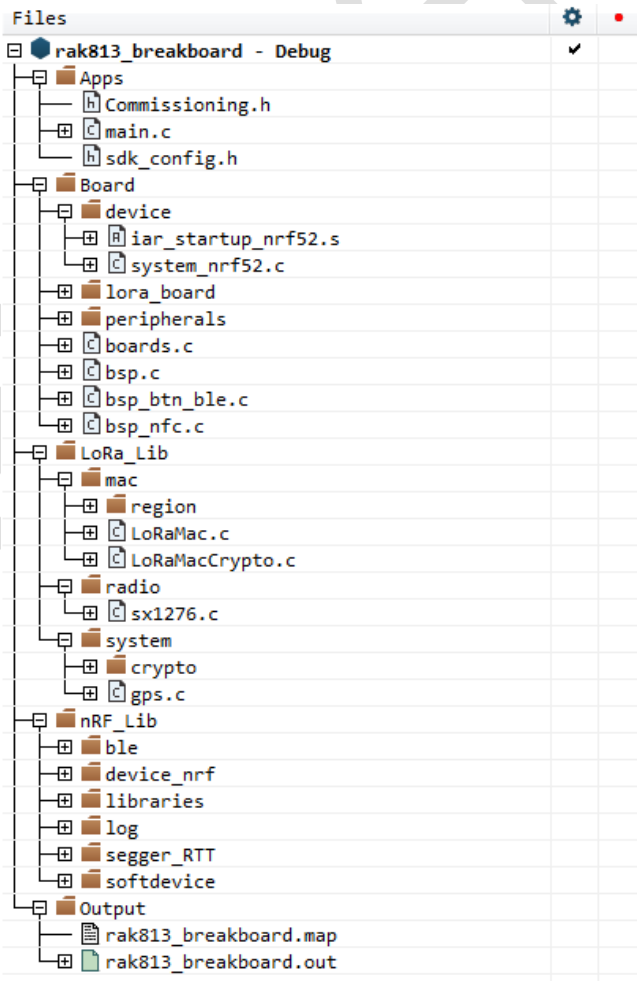
RAK815(RAK813 BreakBoard) is an open source hardware. So the user can get all the information about the product. Includes schematics and program code. Here for everyone a brief introduction to the structure and basic use of open source code.

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.



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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

3. Firmware Download

This section describes how to download the firmware. The MCU of RAK815(RAK813 BreakBoard) is nRF52832. If you need to use Bluetooth, you must first write the Bluetooth protocol stack and use the official nRFgo Studio tool. After writing the Bluetooth protocol stack, there are three ways to download the application code: using the nRFgo Studio tool, using the IAR compiler, and using the Keil compiler. However, it must be noted that J-LINK

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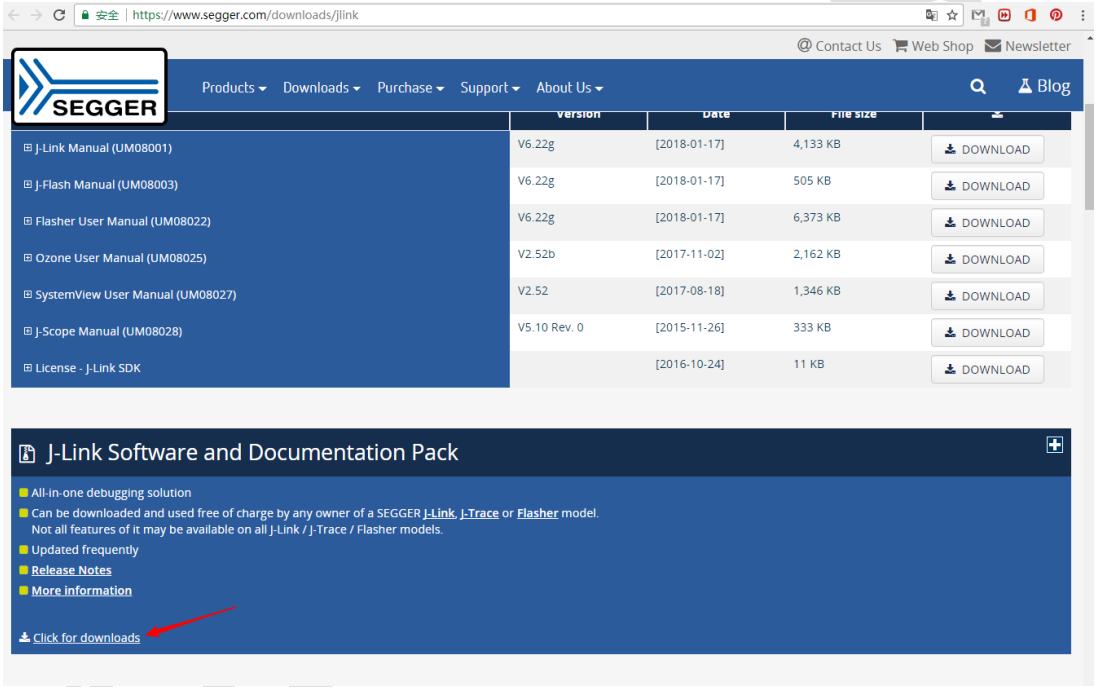
devices are required for all modes.

3.1 Use nRFgo Studio

You can download the Tool in the Nordic official website:
http://www.nordicsemi.com/eng/Products/Bluetooth-low-energy/nRF52832
If you can not find the tool, you can also download it from the RAK data center:
http://www.rakwireless.com/en/download/RAK813%20BreakBoard/Tools

3.1.1 Install J-LINK Driver

1. Navigate to https://www.segger.com/downloads/jlink
2. Click “Click for downloads” under “J-Link Software and Documentation Pack”



3. Download the appropriate package for your OS.
4. Accept the License Agreement.
5. Run the installation program with default configurations.

3.1.2 Download Bluetooth protocol station

1. Connect the RAK815(RAK813 BreakBoard) SWD interface(See RAK815(RAK813 BreakBoard) Datasheet) with the J-LINK device SWD interface. And then Use the USB interface to Connect the J-LINK device with Windows PC.

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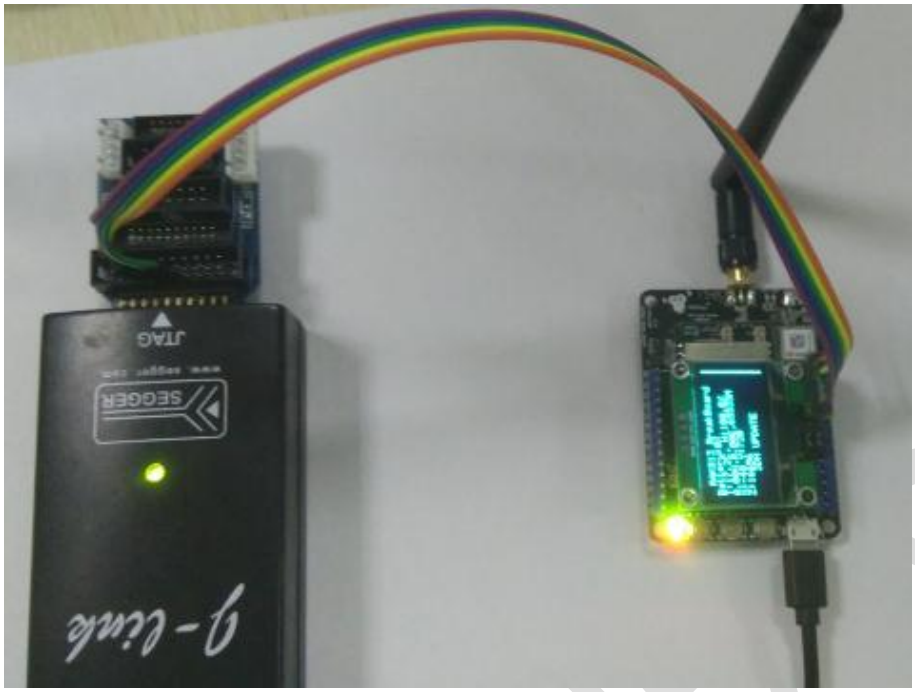
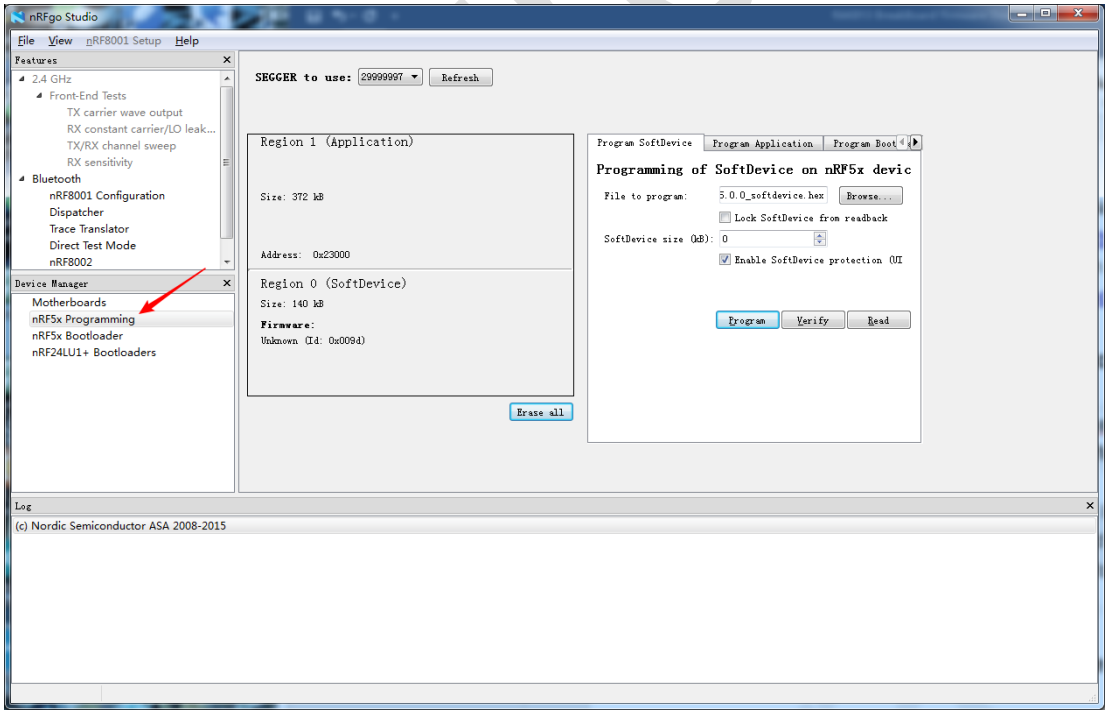


2. Open the nRFgo Studio Tool, In the Device Manager frame select the “nRF5X Programming”. If you have completed the first step and the J-LINK device driver is installed, you will see that the tool has found the nRF52832 chip.



3. First click "Erase all" to erase the entire program of the chip. Then select "Program SoftDevice".

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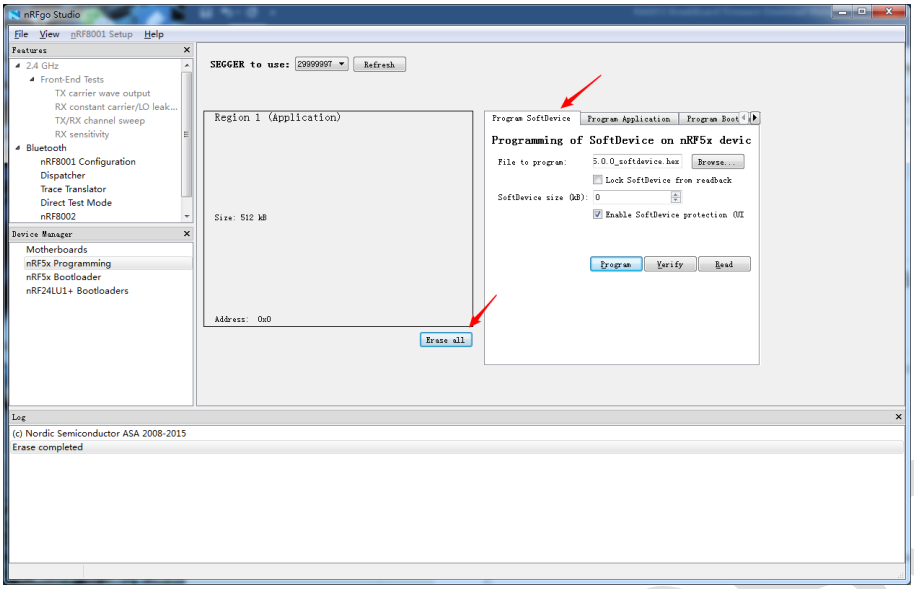
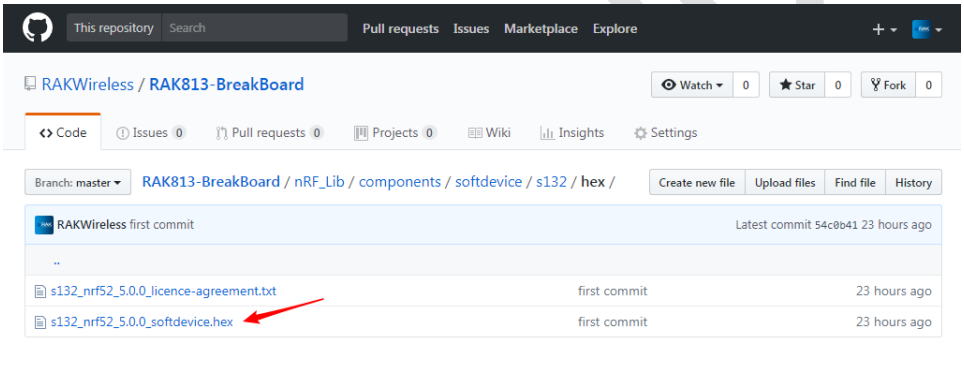
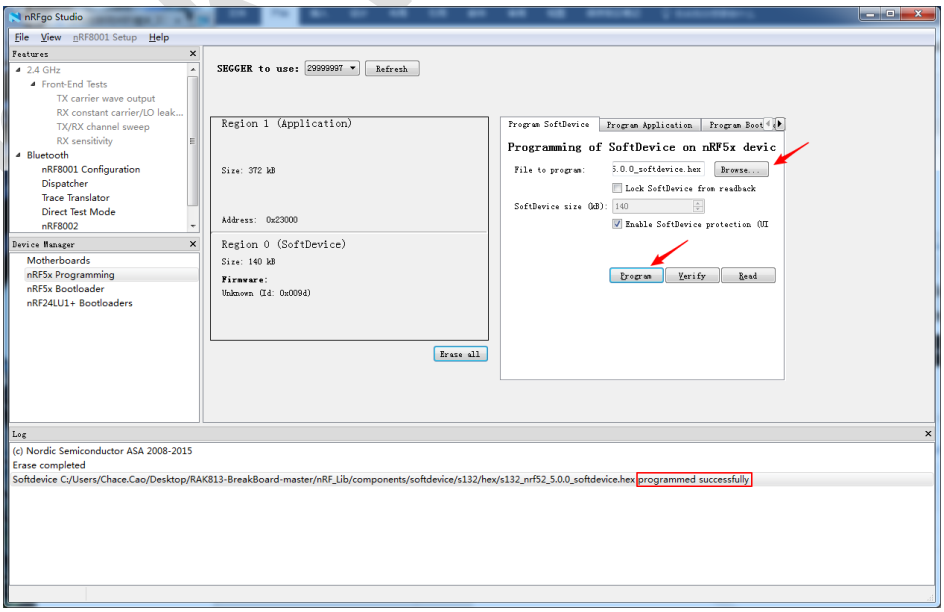


4. Choose Bluetooth protocol stack file, this file you can find in the open source project. Then click on "Program" to complete the download.





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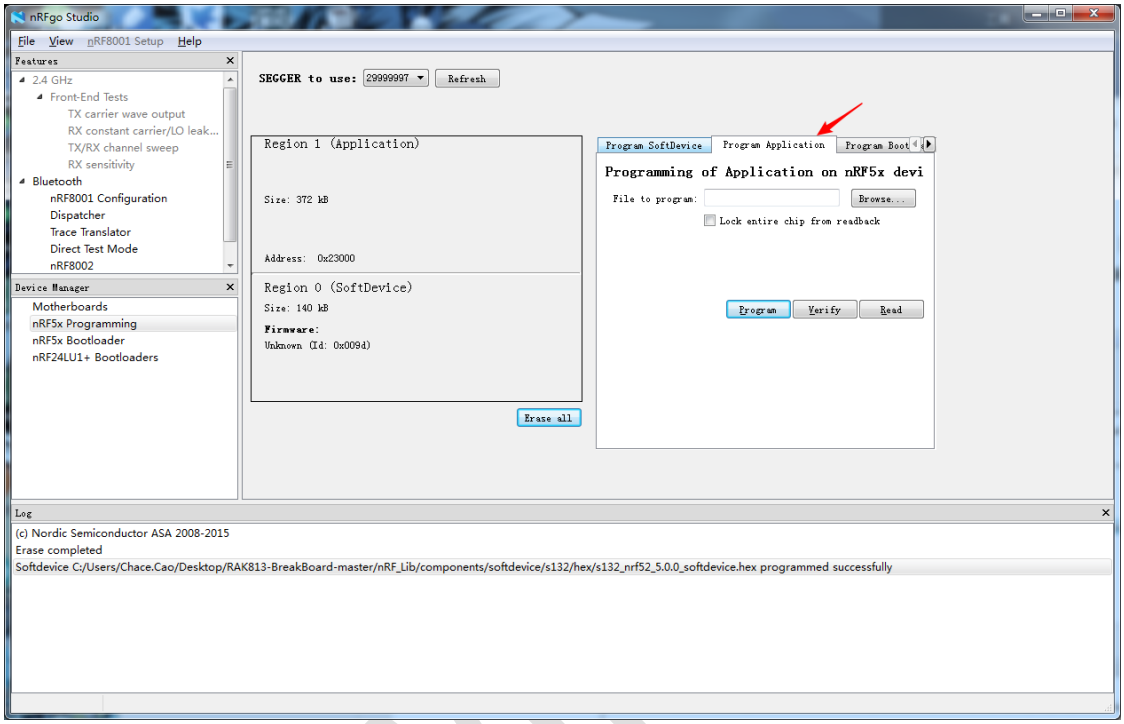
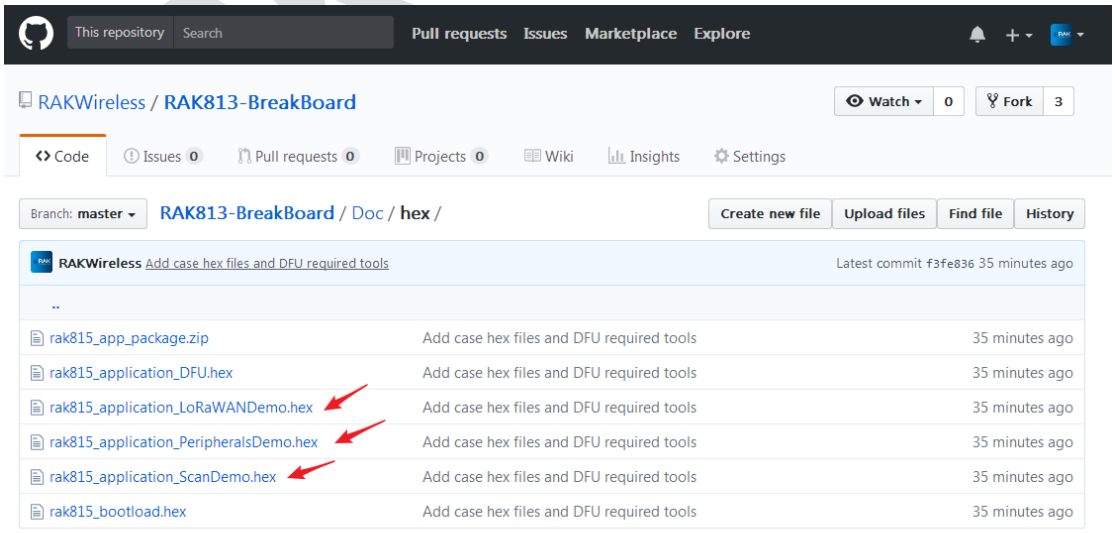
3.1.3 Download application code

1. After completing the Bluetooth protocol station programming, and then click "Program Application". Be careful not to click on "Erase all", otherwise the programmed Bluetooth protocol stack will be erased.



2. Choose the application firmware you wrote. Then click on "Program" to complete the download. We provide demo application firmware for open source projects for testing.



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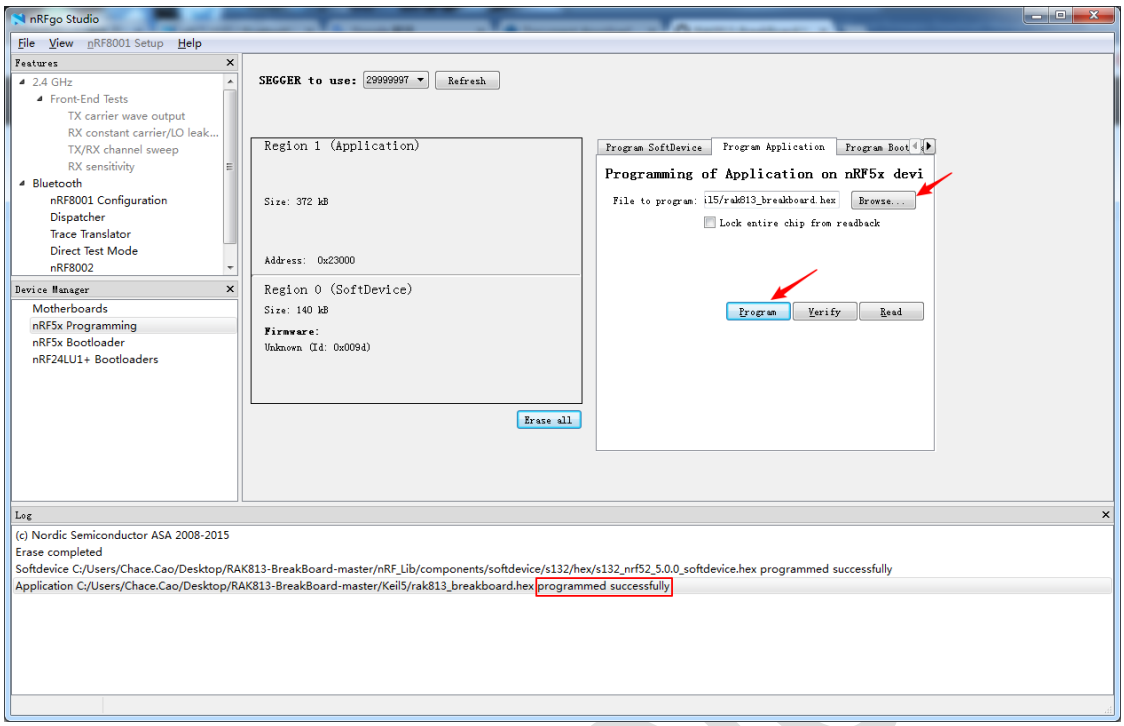
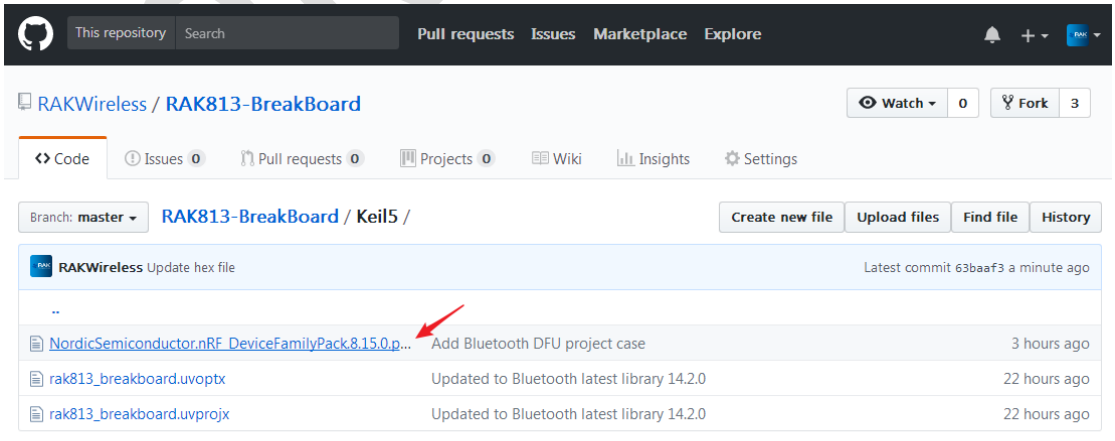


3.2 Use Keil5 Program

Open Source project provides two compiler environments to develop the RAK815(RAK813 BreakBoard) program. Here to introduce the use of Keil to program the method, the best version of Keil can not be less than 5.15.

If your Keil is not installed nRF52832 compiler environment, please install. We have provided in the open source project nRF52832 compiler environment, download and install it.



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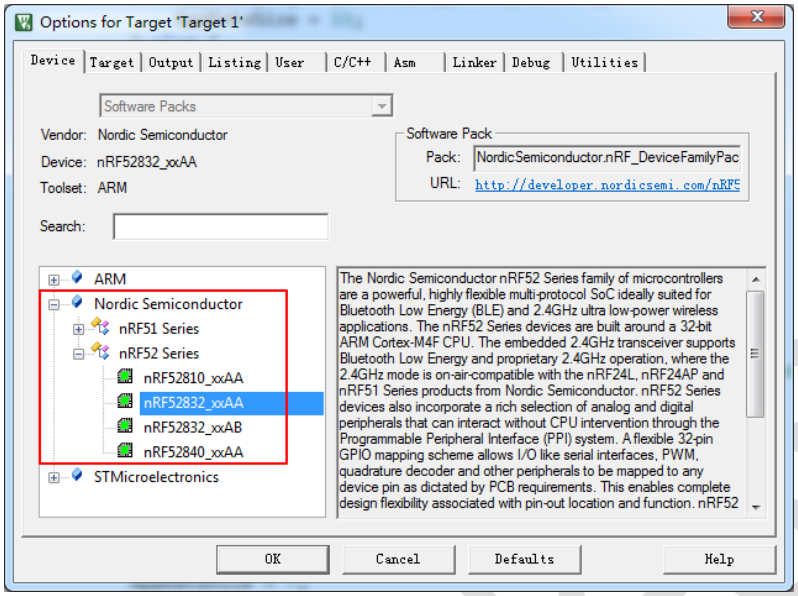
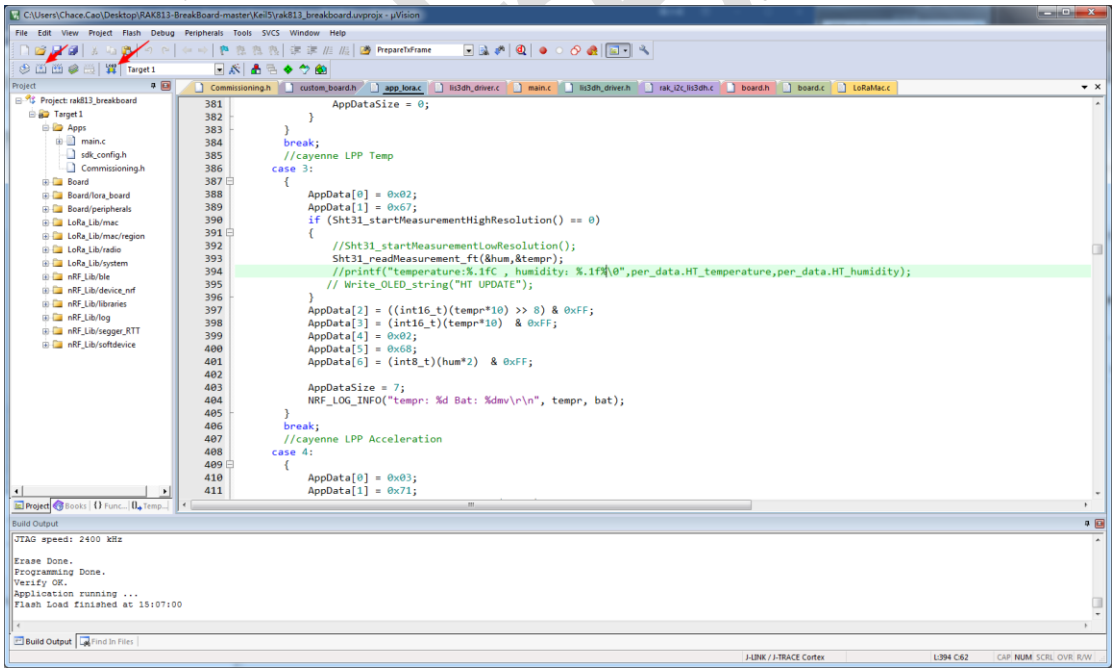
If you have installed it, you will see Nordic chip information in your Options -> Device



Use the J-LINK device to connect the RAK815(RAK813 BreakBoard) and PC, Then open Keil5 project, click “Build”, and then “Download” the program.



If you choose to “Create HEX file” in the Keil tool's options then you can see the HEX file in Keil's output directory. This file can be used by nRFgo Stdio Tool.

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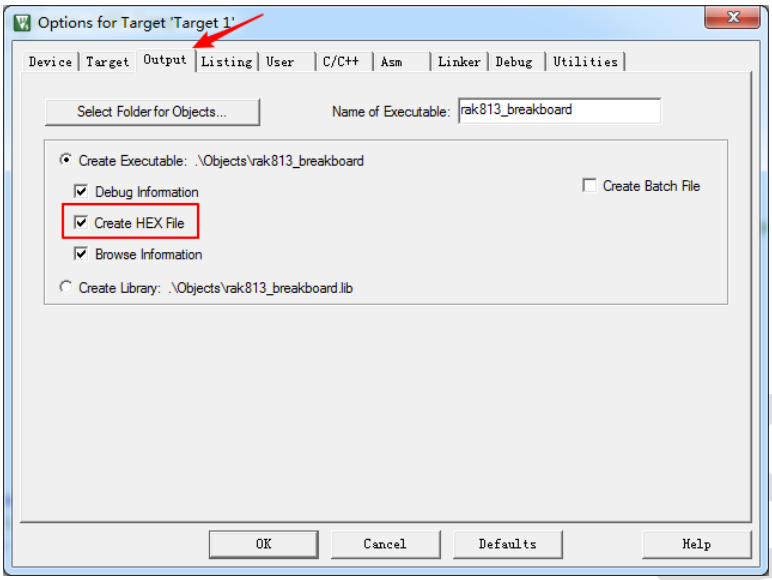

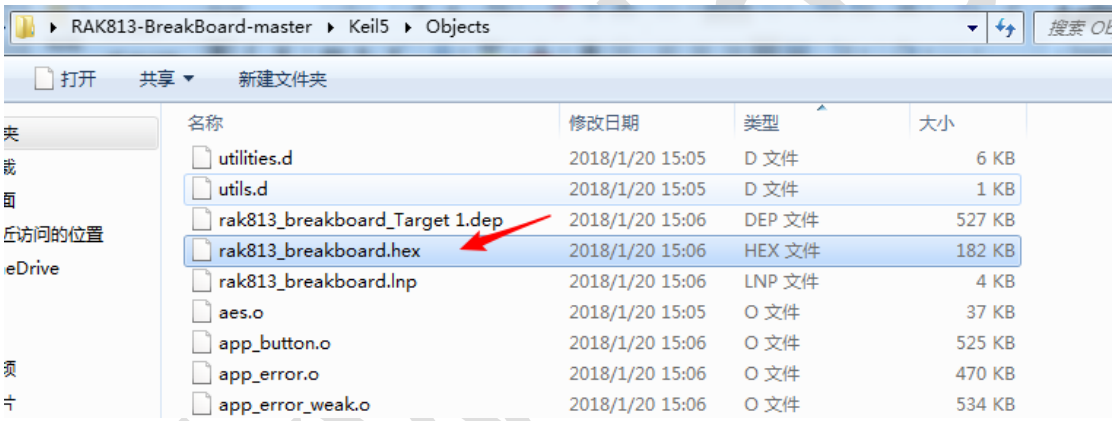

3.3 Use IAR8.11 Program

Writing programs using the IAR compiler is similar to using Keil. All need to connect RAK815(RAK813 BreakBoard) and PC with J-LINK Device. Note the version of IAR best use of the 8.11.1 version, if you encounter problems with other versions, please google or Baidu.

Use the J-LINK device to connect the RAK815(RAK813 BreakBoard) and PC, Then open IAR project, Click the “Make” menu.

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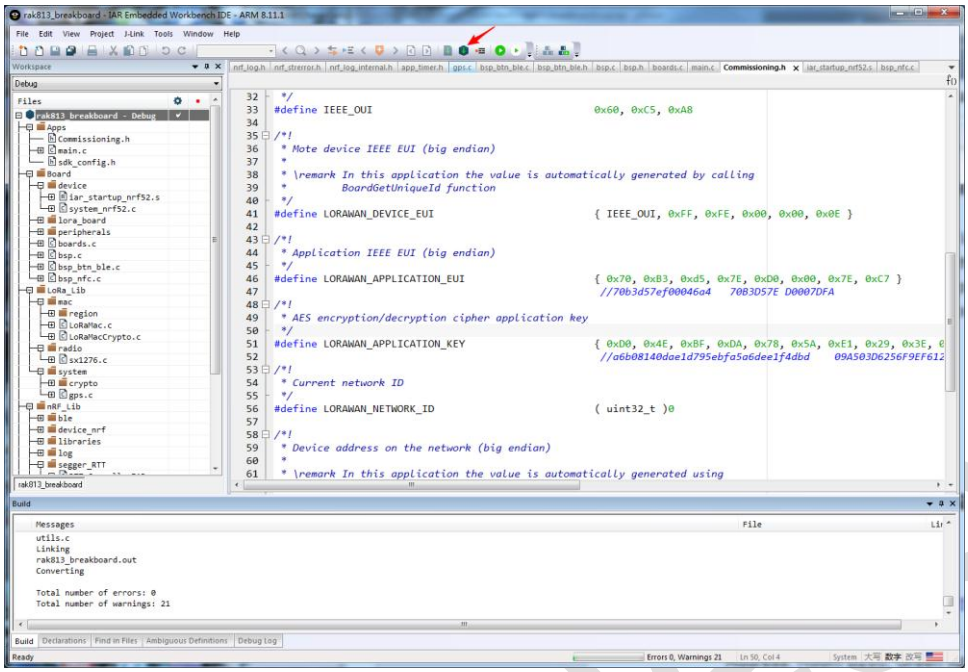
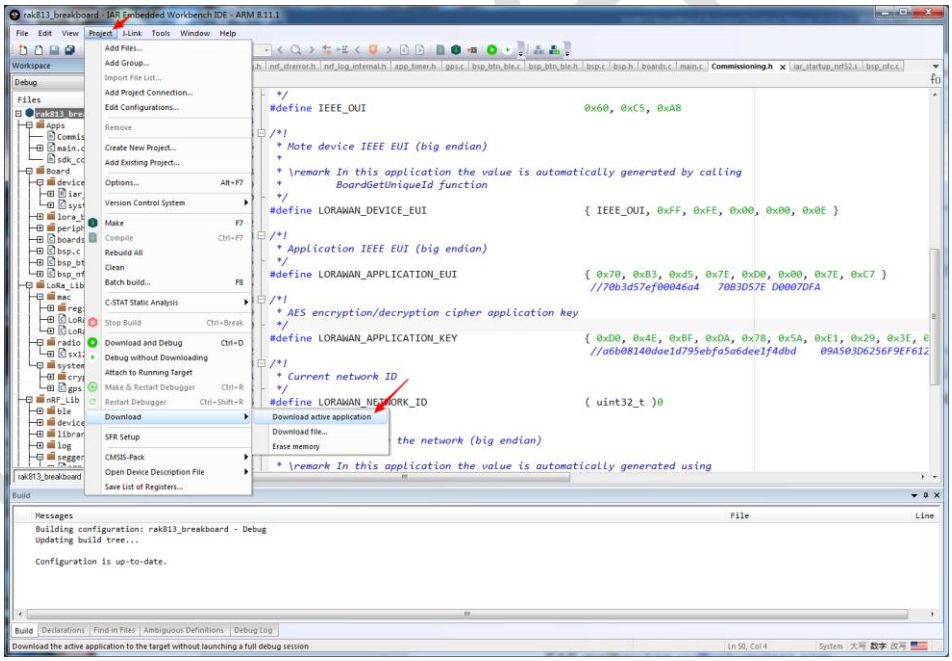


Then click the “Project” menu, Select the download directory in the "Download Activities Application" option to complete the download.



If you choose to export the HEX file in the IAR options menu, you can also see the HEX file in the IAR output folder, This file can be used by nRFgo Stdio Tool.

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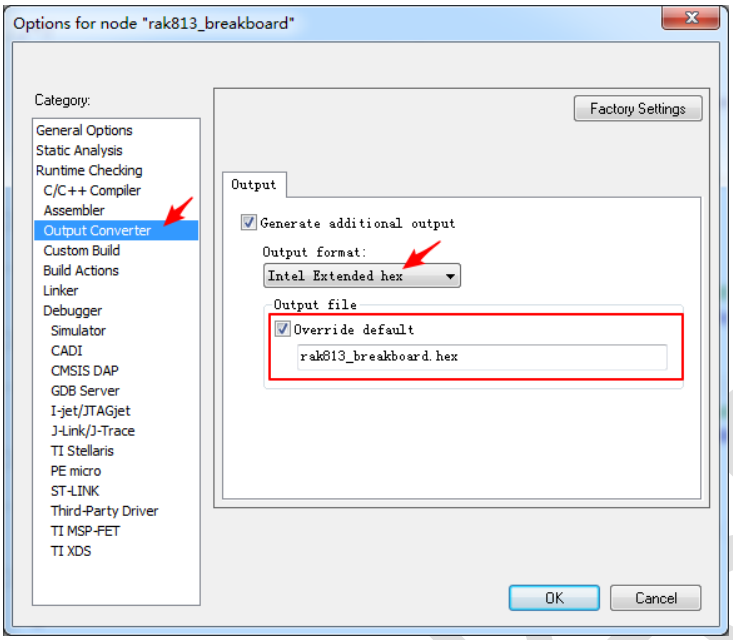

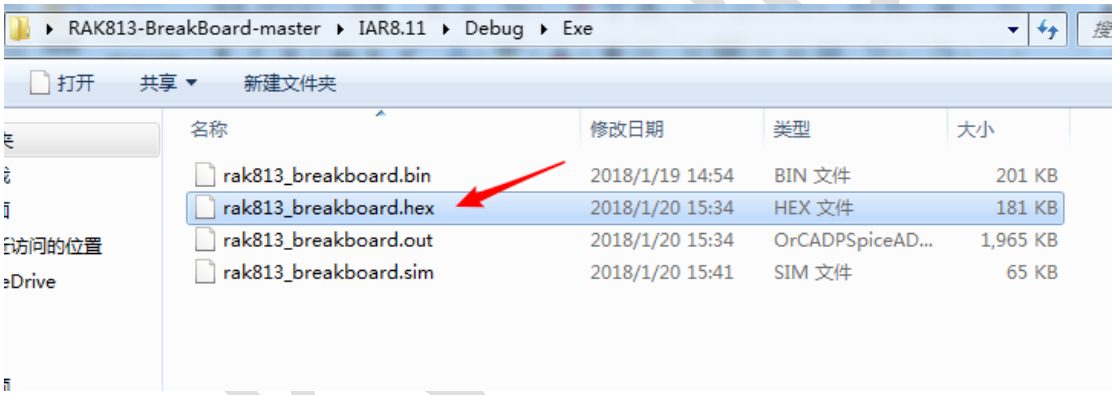

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4 Revision History

Version	Date	Change	Author
V1.0	2018-01-19	First release	Chace
V1.1	2018-03-08	Modify the product model name	Chace

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