Quick Start Guide

What do you need?

Before going through the configuration guide of the RAK4600 Evaluation Board, make sure to prepare the items listed below:

1. **RAK4600 Evaluation Board**
2. Micro USB cable
3. LoRA Gateway in Range for testing (not provided)
4. RAKDAP1 DapLink tool (not provided)
5. Windows PC

> 📝 **NOTE**
>
> This device released by RAKWireless is already pre-loaded with its latest firmware upon manufacture. If you want to have your device's firmware burned or upgraded, please refer to the links below:
>
> 1. Device Firmware Setup
> 2. Device Firmware Upgrading
> 3. Open Source Framework Development

What's Included in the Package?

- 1pc - RAK4600 Evaluation Board
- 1pc - Micro USB cable
- 1pc - LoRa Antenna (iPEX)
- 1pc - BLE Antenna (iPEX)
- 2pcs - 4-pin Header (not soldered)
- 9pcs - Dupont Lines

Interfacing with RAK4600

In order to interface with the Evaluation Board, using a Windows PC, you need to install the RAK Serial Port Tool here ⌐ .

> ⚠️ **WARNING**
>
> Before powering the RAK4600 Evaluation Board , you should install the LoRa and BLE Antenna first. Not doing so might damage the board.
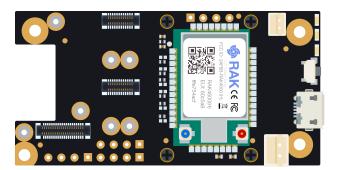

Figure 1: LoRa and BLE Antennas

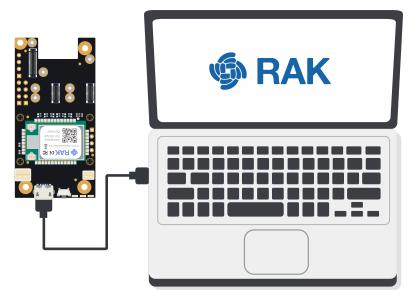- Connect your RAK4600 Evaluation Board to your Windows PC using the provided micro USB cable.

Figure 2: RAK4600 Evaluation Board to Windows PC Connection

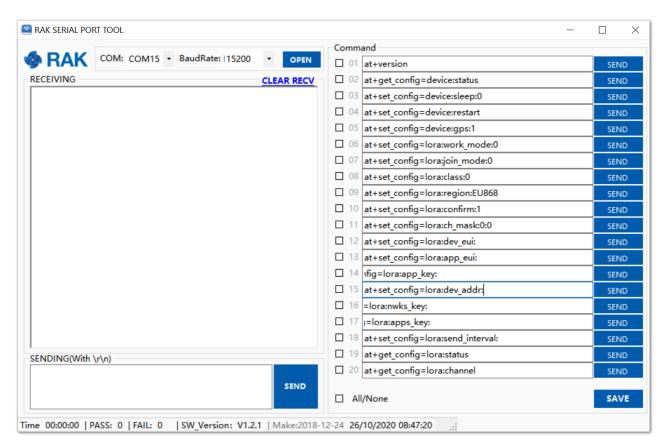- Open the RAK Serial Port Tool :

Figure 3: RAK Serial Port Tool

- In order to choose the correct COM Port number for your device you need to open your Device Manager by pressing : Windows + R and typing `devmgmt.msc` or search in the Start Menu
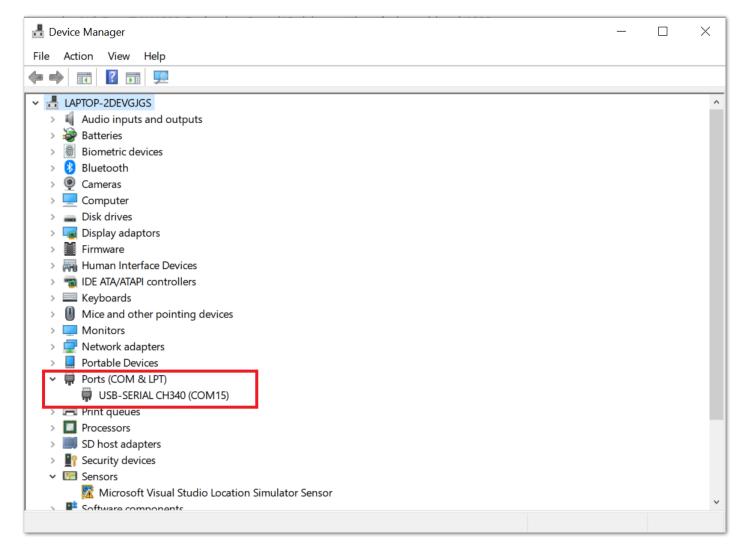
Figure 4: Device Manager

- Look for Ports (COM & LPT) and find the name **USB-SERIAL CH340** . Take note of the COM Port Number.

> 📝 **NOTE**
>
> If you didn't find any Port with the name USB-Serial CH340, make sure you have installed the the CH340 Drivers⧉ on your Windows PC.

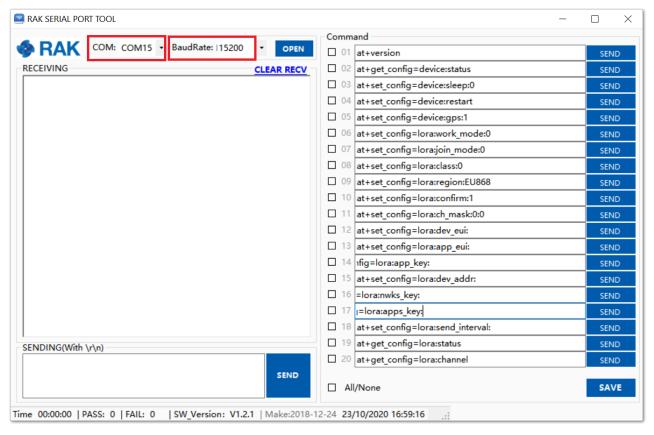- Choose the Correct Port Number and Baud Rate from the device manager then click Open:

Figure 5: Correct Port Number and Baud rate

Checking Device Logs

1. Open the RAK Serial Port Tool

2. Press the reset button on the RAK4600 Evaluation Board then you will see the following contents in the Serial Port Tool.
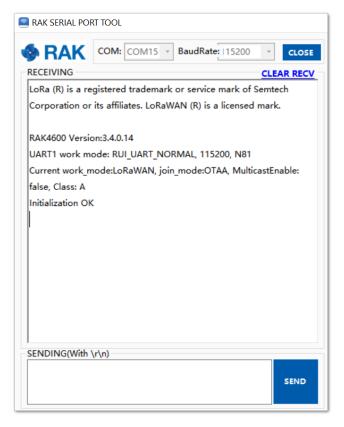

Figure 6: Log Checking through UART

📝 **NOTE**

You still have to connect the micro usb cable to the RAK4600 Evaluation Board to power the board.

Configuring RAK4600

You can configure your RAK4600 Evaluation Board by sending AT Commands either through BLE or through micro USB.

> 📝 **NOTE:**
>
> For the full list of AT Commands available for configuring your RAK4600, please refer to the AT Command Manual.

Through Micro USB

1. As mentioned in Checking Device Logs, if you want to use RAK4600 Evaluation Board through UART, you should connect the RAK4600 to Windows PC as shown in the image below:
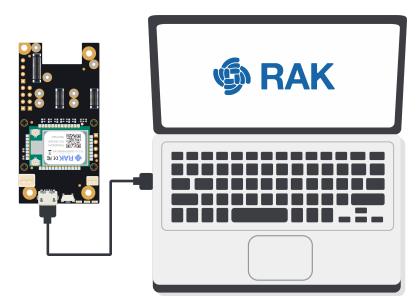

Figure 7: RAK4600 Evaluation Board to Windows PC Connection

2. Try to send a simple AT command to RAK4600 to get the current firmware's version by sending the command below using the RAK Serial Port Tool. Similarly, you can send other AT commands of RAK4600 in the same way.

```sh
at+version
```

Figure 8: AT command for Firmware Version

Through BLE

1. In order to configure the RAK4600 through BLE, download and install **nRF Connect for Mobile**. This tool is developed by Nordic Semiconductor and is available on the App Store and Google Play Store.
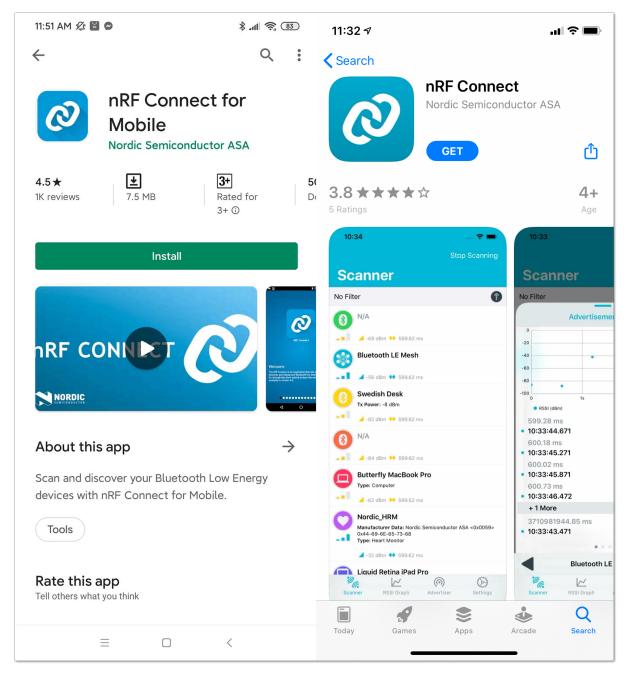
Figure 9: nRF Connect App in Android and IOS

2. Make sure the Bluetooth on your mobile is turned on. Open the application and scan for BLE devices. You will see all BLE devices in range in the scan list:
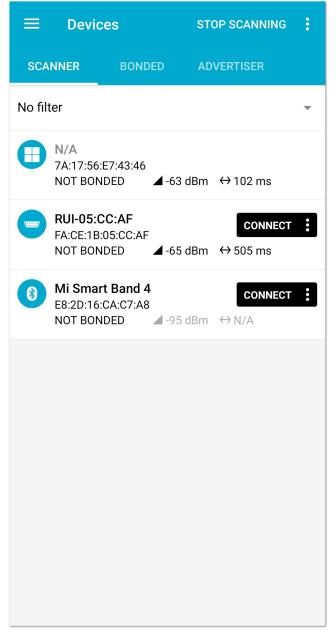
Figure 10: Available Bluetooth Devices in the Nordic App

3. Press the reset button on the RAK4600 Evaluation Board and wait for a couple of seconds. Look for a BLE Device named "RUI-..." in the scan list of the app. Connect to this device and click "**Nordic UART Service**"
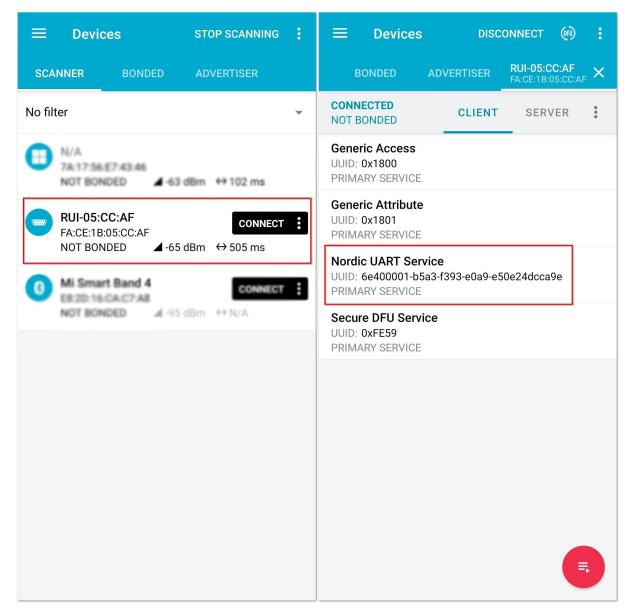
Figure 11: Nordic UART Service in the Nordic App

> ⚠️ **WARNING**
>
> By default, the BLE signal of the RAK4600 is turned off automatically if no connection is established after 60 seconds. Connect to RAK4600 over BLE immediately after pressing the reset button.

4. Click on the arrow which is marked by the red box in the picture below, you will see the following page:
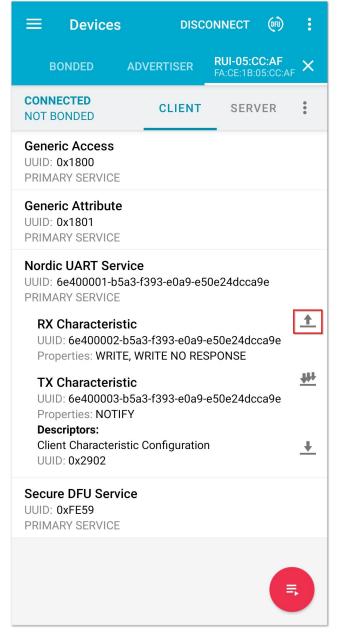
Figure 12: RX Characteristic in the Nordic UART Service

5. You can now send AT commands to the RAK4600.

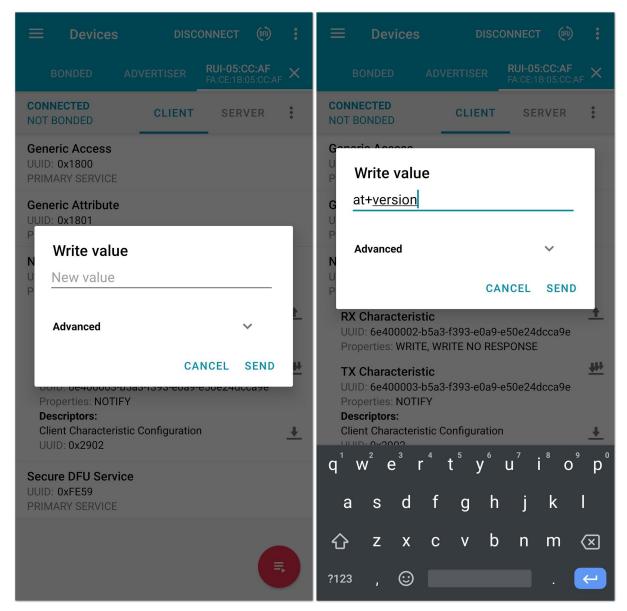- For example, if you want to check the current firmware's version send the following command:

Figure 13: Sending AT Command via Nordic App

6. Check the AT command response on Nordic UART Service Tx Characteristic.
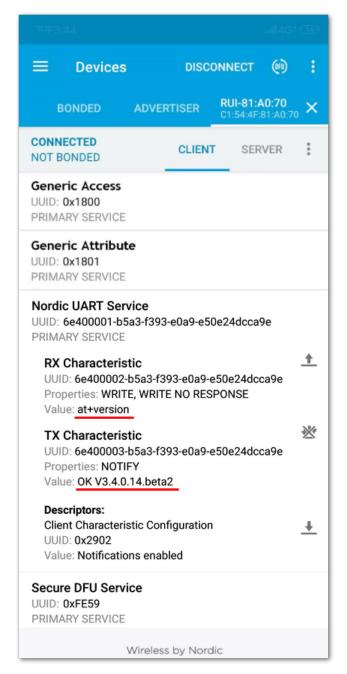
Figure 14: AT response over BLE

Open Source Framework

Before using RAK4600 on Arduino IDE you need to flash a new bootloader using RAKDAP1 Tool and pyOCD.

1. Install pyOCD.

Please refer to RAKDAP1 Flash and Debug Tool

2. Check pyOCD installation

```sh
pyocd list
```

3. Clone RAK repository

```sh
git clone https://github.com/RAKWireless/RAK4600_Arduino
```

4. Flash bootloader

```sh
cd RAK4600_Arduino
pyocd flash -t nrf52 feather_nrf52832_bootloader.hex
```

5. Install BSP support for Arduino as described on section BSP Installation

https://github.com/RAKWireless/RAK4600_Arduino#bsp-installation

> 📝 **NOTE:**
>
> Before upload any Arduino example make sure that the RAK4600 is on DFU mode.
>
> 1. Connect the RX pin of RAK4600 to GND.
> 2. Press the reset button and then disconnect RX pin from GND. Now the RAK4600 is on DFU mode.

Connecting to The Things Network (TTN)

Please refer to Connecting to The Things Network (TTN)

Connecting with Chirpstack

Please refer to Connecting with ChirpStack

Miscellaneous

RAK5005 Core Module Slot Connection to RAK4601

The RAK5005 is the base board that connects the RAK4600 Core Module. It creates the power supply for the attached module, and provides additional IO and Sensor support for your project needs.

> 📝 **NOTE**
>
> RAK4601 is a circuit board module for RAK5005 with pre-soldered RAK4600 LPWAN Module.

Listed below are the accessible pins and data bus of attached RAK5005 base board on the RAK4600 EVB:

RAK4601 Pin Definition	Function Name of WisBase	Pin Number	Pin Number	Function Name of WisBase	RAK4601 Pin Definition
NC	VBAT	1	2	VBAT	NC
GND	GND	3	4	GND	GND
3V3	3V3	5	6	3V3	3V3
NC	USB+	7	8	USB-	NC
NC	VBUS	9	10	SW1	NC
UART1_TX/P0.23	TXD0	11	12	RXD0	UART1_RX/P0.22
MCU_RST	RESET	13	14	LED1	NC
NC	LED2	15	16	LED3	NC
3V3	VDD	17	18	VDD	3V3
I2C1_SDA/P0.13	I2C1_SDA	19	20	I2C1_SCL	I2C1_SCL/P0.12
NC	AIN0	21	22	AIN1	NC
NC	BOOT0	23	24	NC	NC
NC	SPI_CS	25	26	SPI_CLK	NC
NC	SPI_MISO	27	28	SPI_MOSI	NC
IO1/RESERVED	IO1	29	30	IO2	IO2/RESERVED
NFC1/P0.09	IO3	31	32	IO4	NFC2/P0.10
UART2_TX/P0.19	TXD1	33	34	RXD1	UART2_RX/P0.18
NC	I2C2_SDA	35	36	I2C2_SCL	NC
NC	IO5	37	38	IO6	NC
GND	GND	39	40	GND	GND

Bluetooth Connection Modes

There are three BLE modes in RAK4600 from the firmware V3.0.0.6 on, the **Peripheral Mode**, the **Central Mode** and the **Beacon Scan Mode**. You can change the work mode of RAK4600's BLE using the commands provided below which is defined here

```sh
at+set_config=ble:work_mode:X:Y
```

Description: Set the work mode for BLE.

- **X** - 0: BLE peripheral mode, 1: BLE central mode. 2: Beacon scan mode.
- **Y** - 0: normal range, 1: BLE long range.

BLE Peripheral Mode

For the Peripheral Mode, you can scan RAK4600's BLE and connect with it using your mobile device.

BLE Central Mode

For the Central Mode, RAK4600's BLE will not broadcast so that your mobile devices will not be able to scan it. This is very useful if you want to make the RAK4600 act as a BLE Gateway wherein BLE Sensor Nodes (up to 20 Devices) can send sensor data.

Beacon Scan Mode

For the Beacon Scan mode, RAK4600 can scan around the Beacon signal, it is useful for Beacon use case like iBeacon.

RAK4600 BLE Default Settings

By default, the RAK4600 Evaluation Board will work on **Peripheral Mode.** In this mode users can configure it through BLE including DFU easily. It should be noted that after resetting the RAK4600, the user has only 60 seconds to establish a connection with your Mobile Device through BLE based on its power consumption settings. If no connection has been established within 60 seconds, the RAK4600's BLE signal will not be broadcasted and it will enter power saving mode. On the other hand, there is no limitation once you are already connected with the RAK4600's BLE.

If you set the RAK4600 to work in Central Mode, the RAK4600 will work first on Peripheral Mode for 30 seconds and if no connection is established after 30 seconds, it will automatically work in **Central Mode.** In this mode,the BLE signal of the RAK4600 will stop broadcasting and will not be visible on your mobile devices up until you change the work mode to peripheral mode or reset the RAK4600 again.

Burning the Firmware

If you want to get a pre-compiled firmware instead of compiling the source code by yourself, you can find the latest firmware on RAK website after it is released here⧉.

Flash the firmware using DAPLink and RAKDAP

Please refer to RAKDAP1 Flash and Debug Tool

Upgrading Firmware through DFU using BLE

1. Download the DFU package of the RAK4600 Evaluation Board **here**⧉ and save it on your mobile phone.

2. Make sure the Bluetooth on your mobile is turned on. Open the **nRF Connect** Mobile application and you will see all BLE devices in range in the scan list:
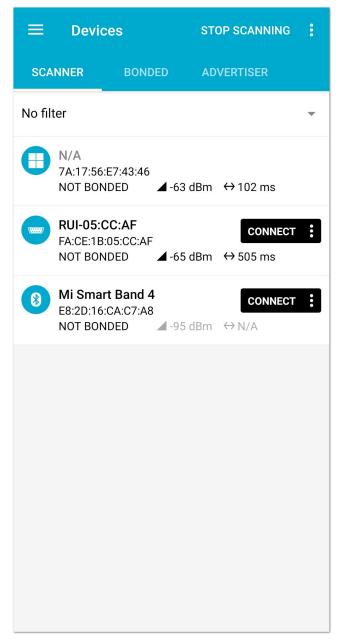
Figure 15: Available Bluetooth Devices in the Nordic App

3. Press the reset button on the RAK4600 and wait for a couple of seconds. Look for a BLE Device named "RUI-..." in the scan list of the app. Connect to this device and click on "**Secure DFU Service**"

📝 **NOTE:**

This will be only visible for 60 seconds. More information about Bluetooth Connection Guide can be found here in here
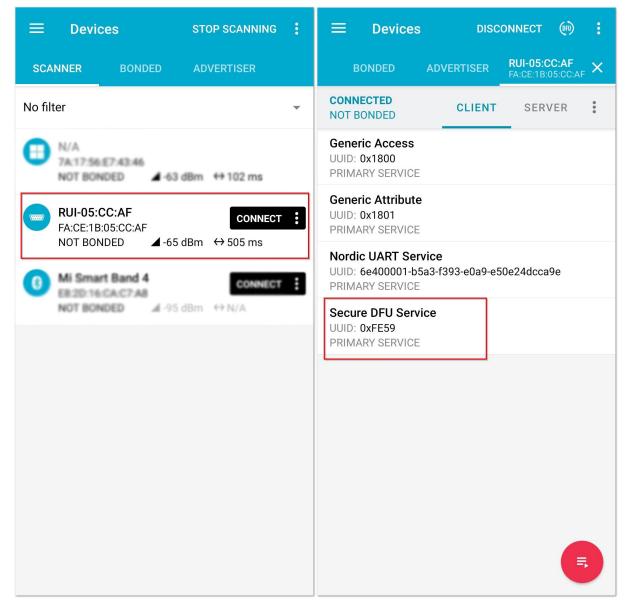
Figure 16: Secure DFU Service in the Nordic App

4. On "**Secure DFU Service**" click on the button highlighted in red.
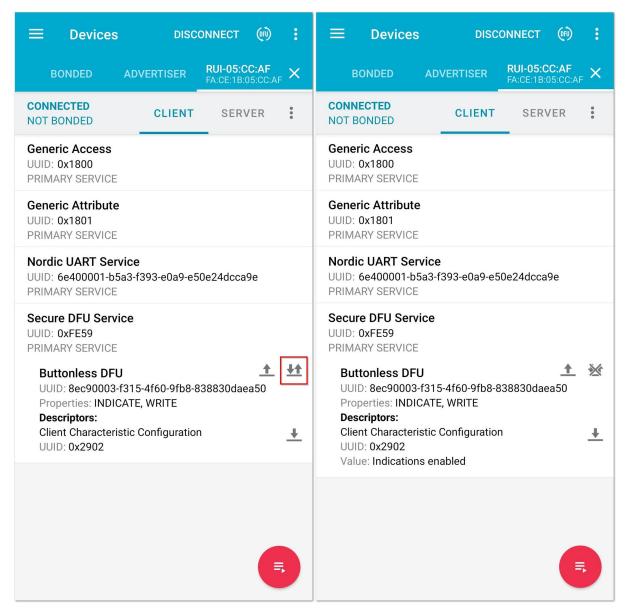
Figure 17: Buttonless DFU

5. Now, click on the **red box button** as shown below and press "**Send**" in the **Write Value** pop-up window.
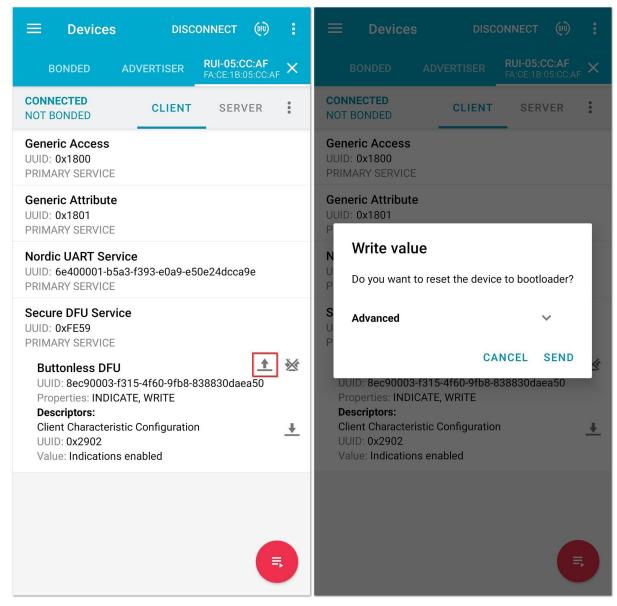
Figure 18: Resetting the Bootloader via Bluetooth

6. Great! Now the RAK4600 is now working in DFU Mode. In the application, you will see the following:
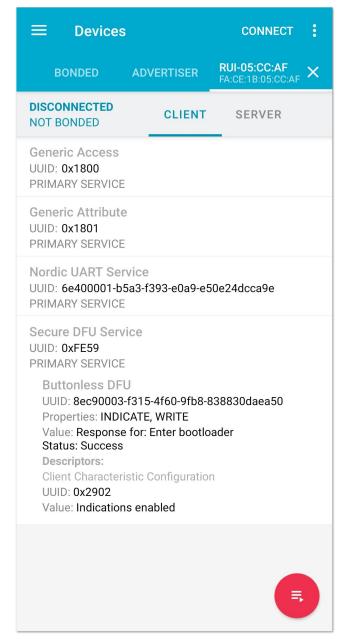
Figure 19: RAK4600 Default Status Overview after Resetting

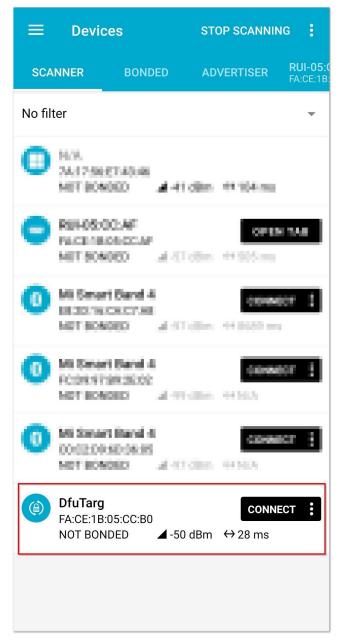7. In the device list, find a BLE device named "**DfuTarg**" and then click on Connect.

Figure 20: RAK4600 Default Bluetooth ID after Resetting

8. After connected, select the DFU Icon. On Select file type choose **Distribution packet (ZIP)** and press OK. This will then prompt you to select the zip file of the firmware that you have downloaded.

9. The DFU application automatically start to upgrade the firmware of your RAK4600 through DFU over BLE. After upgrading, the application restart the RAK4600 and the DFU mode is disabled. Now you can use the RAK4600 with the latest firmware!
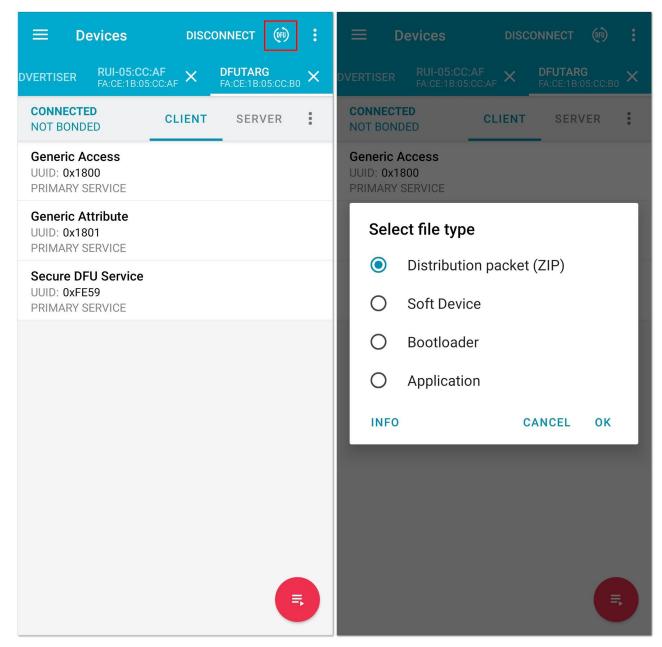
Figure 21: Distribution Packet File Type under DFU

9. The DFU application automatically start to upgrade the firmware of your RAK4600 through DFU over BLE. After upgrading, the application restart the RAK4600 and the DFU mode is disabled. Now you can use the RAK4600 with the latest firmware!
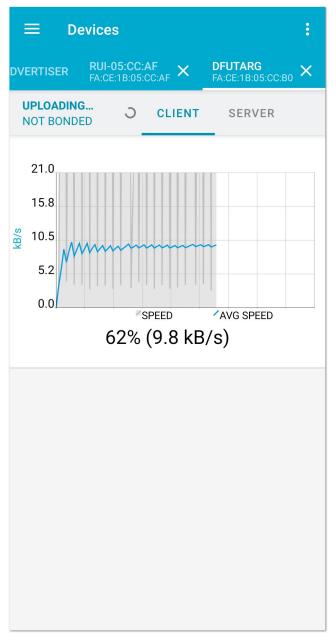
Figure 22: DFU Upgrading of RAK4600 Firmware via BLE