

Device Firmware Update

There will be situations in that you need to update the firmware of your RAK4630. Also, there are times when you want to reupload the firmware on your device to ensure that everything is set properly. Updating the Firmware of RAK4630 WisDuo can be done via USB connection or wirelessly using BLE via OTA DFU (Over-the-Air Device Firmware Upgrade). These methods are discussed in this guide.

- [Firmware Update via USB](#)
- [Firmware Update via BLE Using OTA DFU](#)

Prerequisites

What Do You Need?

- [nRFutil utility program](#)
- nRF Connect Mobile application
 - [iOS App Store](#)
 - [Android Play Store](#)
- [DFU Distribution Package](#)
- [Latest RAK4630 FW DFU Distribution Package](#)

Firmware Update via USB

You need to have a direct connection to the USB bus of RAK4630 before you can proceed with the update. You can check the minimum schematic required in the [quick start guide hardware setup section](#). This guide covers the three most popular operating systems:

- [Using Windows](#)
- [Using Linux](#)
- [Using MacOS](#)

For Windows

1. Create a new folder in your `C:\` drive named `RAK4631-R Update`.
2. Download the [nRFutil.exe](#) and the [latest DFU Package](#). Once you downloaded both files, put them in the `RAK4631-R Update` folder you created as shown in Figure 1.

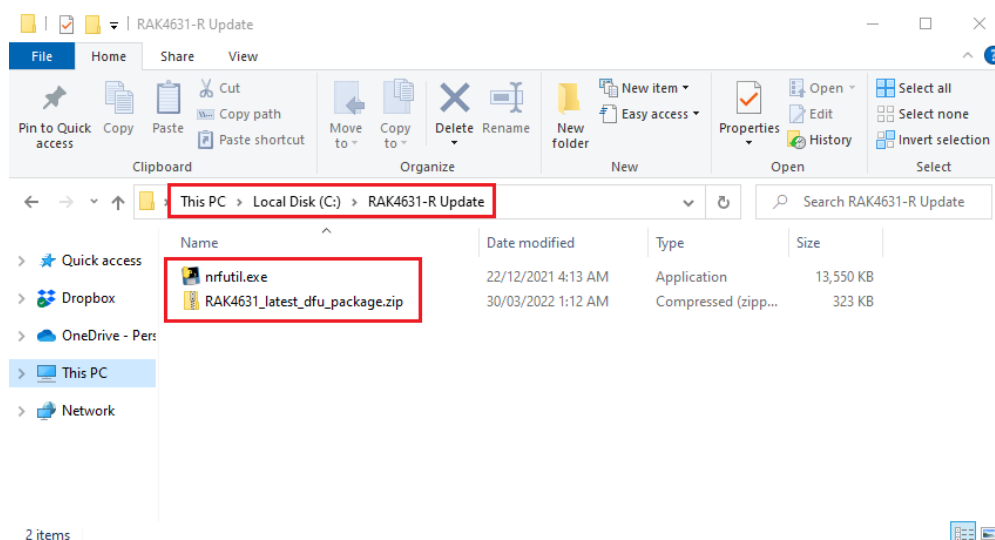


Figure 1: nRFutil.exe and RAK4630 Latest Firmware

3. Connect the RAK4630 via USB and check if port has been detected via device manager. In this guide it is detected as COM32. The COM port number is not fixed and can be different depending on the PC. If no port is shown in device manager, you can try to double click reset button on the WisBlock Base and check again.

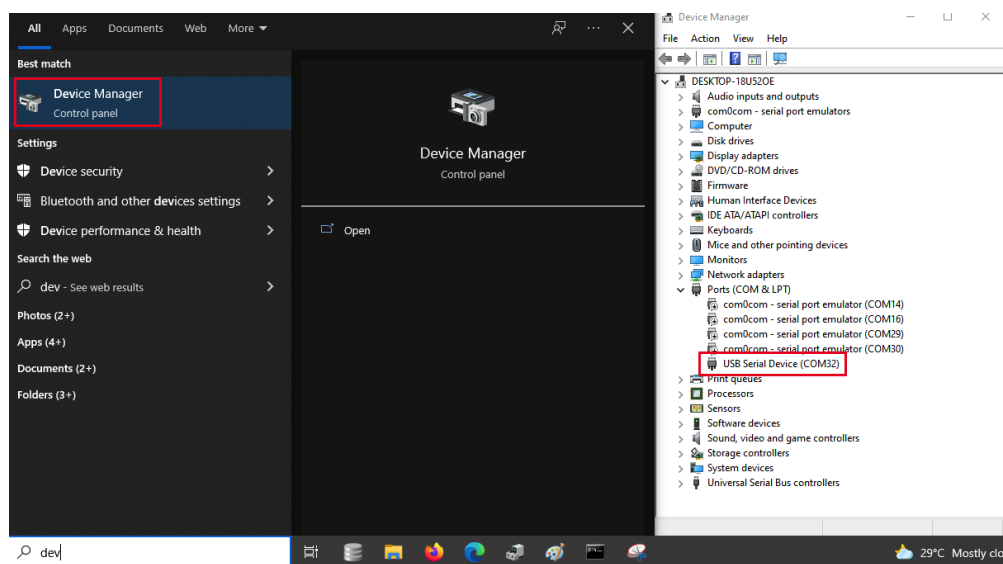


Figure 2: Checking COM Port via Device Manager

4. After that, you need to send `AT+BOOT` command to the device via Serial Terminal software. You can follow the [guide on using Tera Term from RAK4631-R documentation](#) but instead of checking the firmware version, you have to input `AT+BOOT`. You will see no reply since the module will restart then will be disconnected momentarily before re-establishing again the connection to Tera Term.

NOTE

You have to disconnect the device connection to TeraTerm/Serial Terminal software or close it so that the COM port will be free when you do the firmware update on the next step. Else, you will have error during FW update.

WARNING

Recovery Mode

If `AT+BOOT` is not possible to be sent to the device, you can enable DFU mode via UART2_TX pin. You need to connect UART2_TX pin to GND then reset the device to enter DFU mode. You can now proceed on the next step and upload the firmware even without the `AT+BOOT` command.

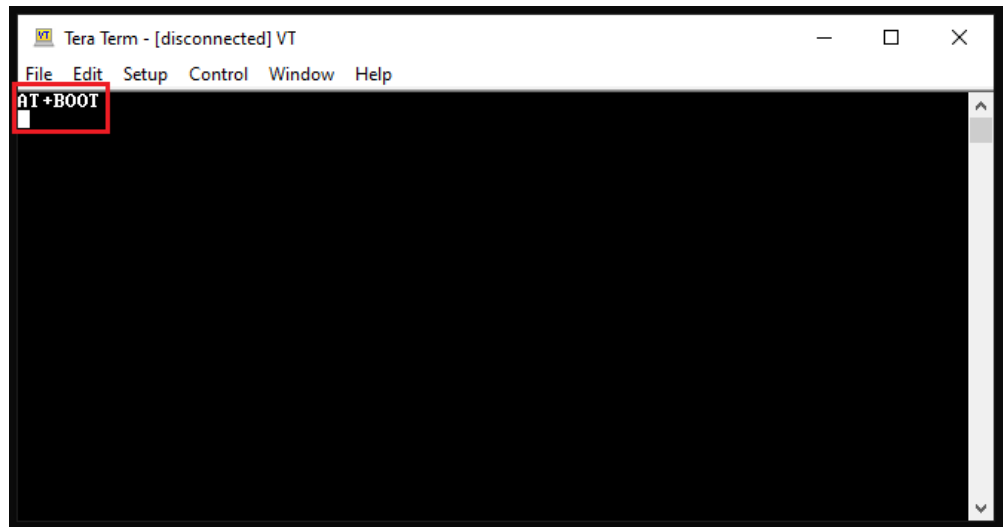


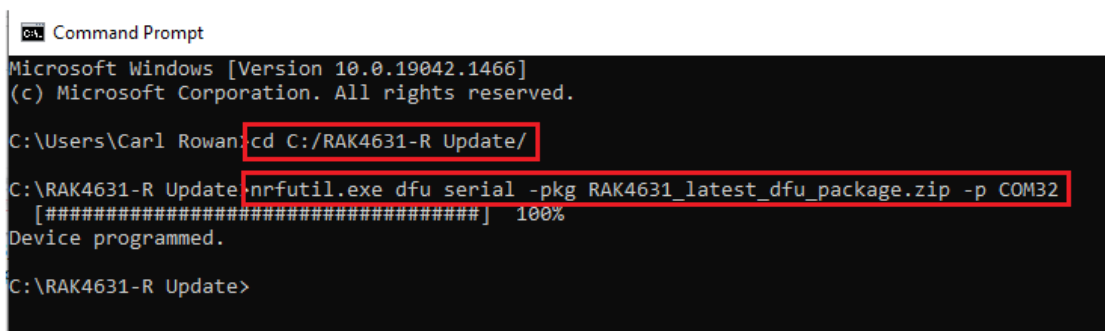
Figure 3: AT+BOOT to Initialize Boot Mode

5. After initiating Boot mode, you can now execute the firmware update. You need to open command prompt and must be in `RAK4631-R Update` folder directory to do the firmware update. This is folder where you place the

nRFutil and the latest firmware. You need to input `cd C:/RAK4631-R Update/` followed by `nrfutil.exe dfu serial -pkg RAK4631_latest_dfu_package.zip -p COM32`. You have to ensure that you have the right .zip file name and COM port number to avoid errors.

NOTE

You need to change the COM port number in the command based on your PC. In this example, it is COM32 but it can be different in your PC.



```

Command Prompt
Microsoft Windows [Version 10.0.19042.1466]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Carl Rowan>cd C:/RAK4631-R Update/

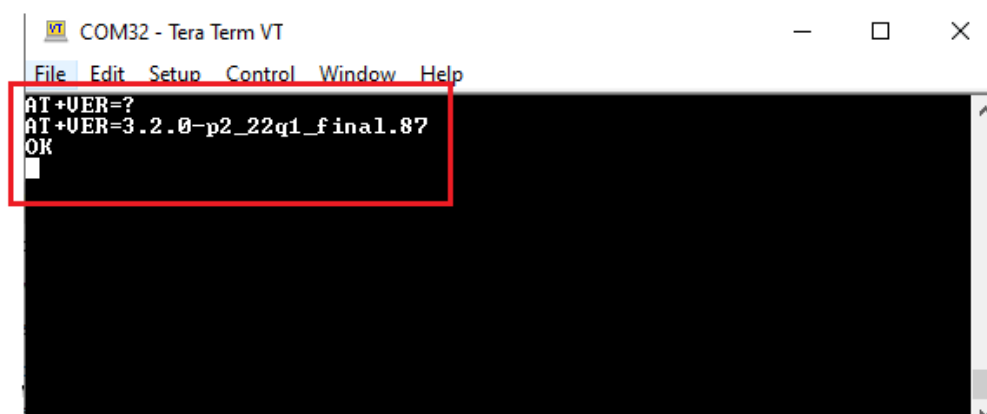
C:\RAK4631-R Update>nrfutil.exe dfu serial -pkg RAK4631_latest_dfu_package.zip -p COM32
[#####] 100%
Device programmed.

C:\RAK4631-R Update>

```

Figure 4: FW Update Using nRFutil

6. Congrats on the 100% firmware upload, you can now check if the firmware is successful updated by using `AT+VER=?` command. You can follow the [guide on Tera Term from RAK4631-R documentation](#) to check the firmware version and to confirm if the device is now updated.



```

COM32 - Tera Term VT
File Edit Setup Control Window Help
AT+VER=?
AT+VER=3.2.0-p2_22q1_final.87
OK

```

Figure 5: RAK4631-R Latest Firmware Version Check

For Linux

Setup the Linux Environment

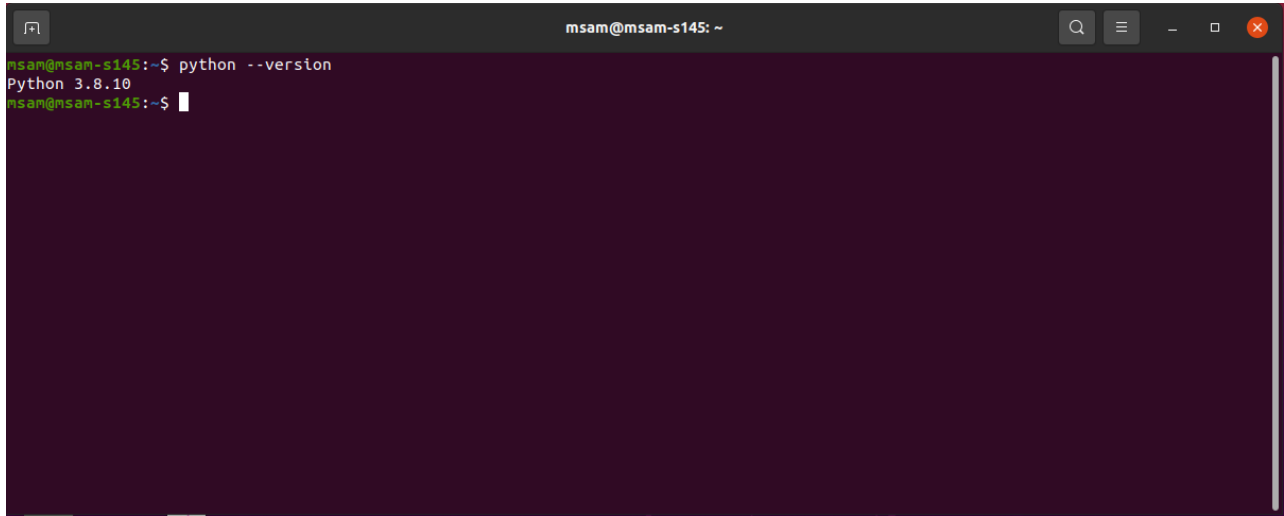
1. First, open a new terminal, then install all dependencies.

```

sudo apt-get update
sudo apt-get install net-tools git curl python xclip python3-pip

```

2. The following prerequisite must be installed: `Python 3.7` or later. Check your Python version, as shown in **Figure 6**.



```
msam@msam-s145: ~$ python --version
Python 3.8.10
msam@msam-s145:~$
```

Figure 6: Check Python version

3. Add `.local` folder to Linux `$PATH` variable.

```
export PATH="$HOME/.local:$PATH"
```

4. Now, you can install `nrfutil`. It is available as a package in the Python Package Index (PyPI). Execute the following commands:

```
sudo apt-get update
pip3 install nrfutil --user
```

Setup the Device Console Port in Linux

1. Install the minicom using the following commands:

```
sudo apt-get update
sudo apt-get install minicom
```

2. To open the minicom terminal utility with the ttyACM0 interface. The correct port name can be determined using `dmesg`, as shown in the [next steps](#).

Enter the following code: `minicom -D /dev/ttyACM0`

Execute the Firmware Update via USB

1. Download the zip file [DFU Distribution Package](#)  .

When you plug in the RAK4630 through the USB to Linux, you will see the related information "**cdc_acm 1-1:1.0: ttyACM0: USB ACM device**" from the `dmesg` command.

```
msam@msam-s145: ~
[ 163.690859] Initializing XFRM netlink socket
[ 199.110082] audit: type=1400 audit(1638784766.011:56): apparmor="STATUS" operation="profile_load" profile="unconfined" name="dock
er-default" pid=1555 comm="apparmor_parser"
[ 298.652852] bridge: filtering via arp/ip/ip6tables is no longer available by default. Update your scripts to load br_netfilter if
you need this.
[ 298.876107] Bridge firewalling registered
[ 350.269699] rkill: input handler disabled
[ 415.618125] rkill: input handler enabled
[ 416.146774] Bluetooth: RFCOMM TTY layer initialized
[ 416.146786] Bluetooth: RFCOMM socket layer initialized
[ 416.146803] Bluetooth: RFCOMM ver 1.11
[ 465.420096] rkill: input handler disabled
[ 526.479576] sdb: detected capacity change from 4005560320 to 0
[ 532.698542] usb 1-1: USB disconnect, device number 5
[ 565.291187] usb 1-1: new full-speed USB device number 6 using xhci_hcd
[ 565.442216] usb 1-1: New USB device found, idVendor=1915, idProduct=521f, bcdDevice= 1.00
[ 565.442222] usb 1-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 565.442226] usb 1-1: Product: Rak4631 Serial COM
[ 565.442229] usb 1-1: Manufacturer: Nordic Semiconductor
[ 565.442231] usb 1-1: SerialNumber: F609CFA2CD24
[ 565.899684] cdc_acm 1-1:1.0: ttyACM0: USB ACM device
[ 565.900410] usbcore: registered new interface driver cdc_acm
[ 565.900412] cdc_acm: USB Abstract Control Model driver for USB modems and ISDN adapters
msam@msam-s145:~$
```

Figure 7: Checking USB CDC device using dmesg command

In this case, the RAK4630 **USB CDC** device name is `/dev/ttyACM0`.

2. Perform the steps described in the section [Setup the Device Console Port in Linux](#).
3. On minicom, enter the following AT command:

```
AT+B00T
```

4. Now, open the terminal shell and go to the directory where you put the DFU Distribution Package. After that, execute the following command:

```
nrfutil dfu usb-serial -pkg RAK4631_latest_dfu_package.zip -p /dev/ttyACM0
```

5. To check the device firmware version in the minicom console, enter the following AT command:

```
AT+VER=?
```

You should see then the current FW version of the module.

For MacOS

1. Download [nrfutil](#). Usually, the `nrfutil-mac.1` file will go to the downloads folder. This section assumes any downloaded file goes to the downloads folder.
2. Open the terminal and go to the downloads directory or the location where you put the downloaded file. You have to change the `username` based on your machine. In this guide, `apple` is used as the user.

```
cd /Users/username/Downloads
```

3. Make the `nrfutil-mac.1` executable.

```
chmod +x nrfutil-mac.1
```

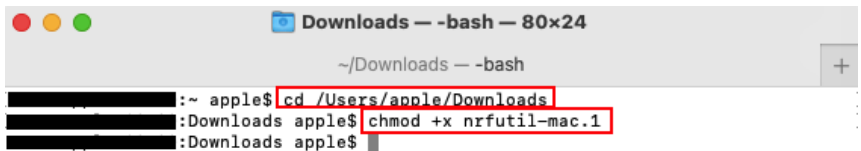


Figure 8: Download nrfutil for macOS

4. You also need to determine the port name of the RAK4630 using the command:

```
ls /dev/cu.*
```




Figure 9: Check the port

5. Download the [RAK4630 Firmware](#) . Usually, the `RAK4631_latest_dfu_package.zip` file will go to the downloads folder.
6. Open a serial terminal software and run `AT+BOOT` to enable the bootloader mode of RAK4630.

```
AT+BOOT
```

7. You can now execute the firmware update.


NOTE

- The `nrfutil-mac.1` must be on the same folder as the `RAK4631_latest_dfu_package.zip` . In this guide, it is the **Downloads** folder.
- You should be connected to the right port. The port name in your computer might be different than the one in this guide.
- It might take a while for the update. Do not remove the USB or terminate the terminal application while doing the uploading process.

```
./nrfutil-mac.1 dfu usb-serial -pkg RAK4631_latest_dfu_package.zip -p /dev/cu.usbmodemC0D048F6604
```

Firmware Update Using BLE via OTA DFU

This section covers how to update your RAK4630 firmware wirelessly via BLE. First, you need to download and install the nRF Connect developed by Nordic Semiconductor. The App is available both in [Play Store](#) and [App Store](#) .

- [DFU OTA Using iOS](#)
- [DFU OTA Using Android](#)

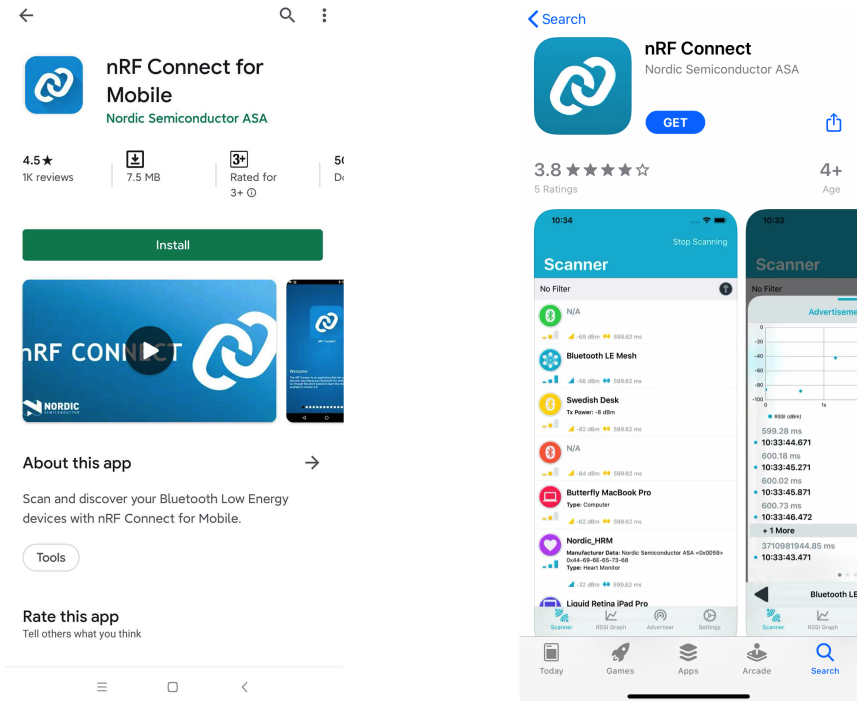



Figure 10: nRF Connect App available in Play Store and App Store

For iOS

OTA DFU over BLE

- 1. Download the [DFU package](#) of the RAK4630 and save it on your mobile phone.

 **NOTE**

You can upload the Distribution packet (ZIP) file to [iCloud Services](#) and download it to your smartphone.

Make sure the Bluetooth on your mobile is on.

- 2. Press the reset button and wait for a couple of seconds.
- 3. Open the nRF Connect mobile application. You will see all the BLE devices in range in the Scanner list.

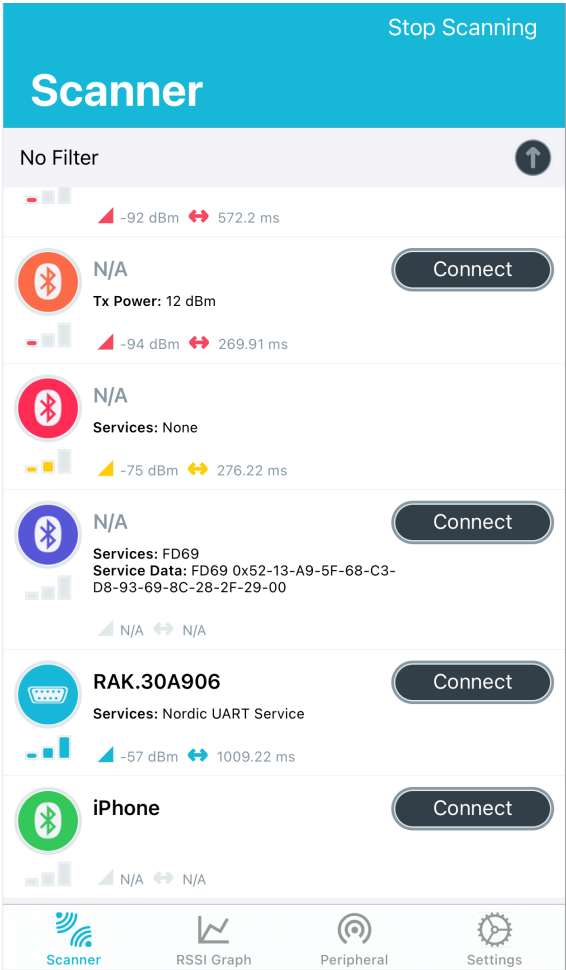



Figure 11: Available Bluetooth Devices

4. Look for a BLE Device named **RAK.XXXXXX** in the scanner list of the app. Connect to this device and then click on the **Client** tab.

 **NOTE**

By default, the BLE signal of the RAK4630 is turned off automatically if no connection is established after 60 seconds. Connect to **RAK.XXXXXX** immediately after pressing the reset button.

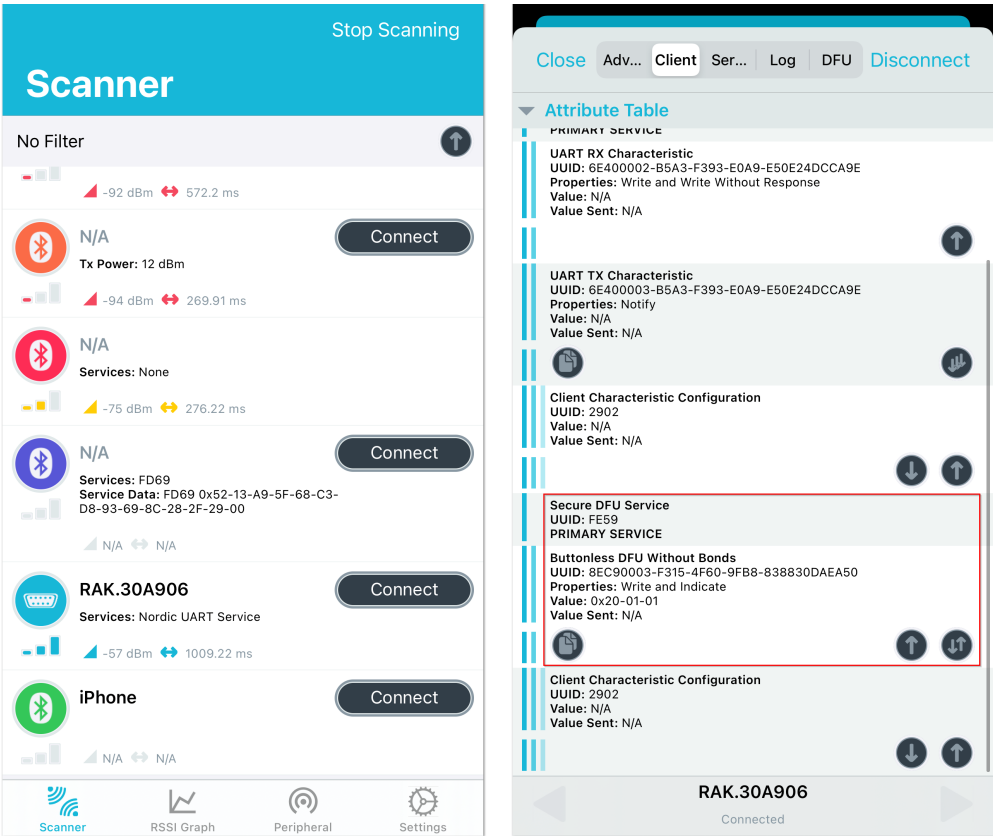


Figure 12: Secure DFU service

5. Choose "**Secure DFU Service**" and click the button highlighted in red, as shown in Figure 13.

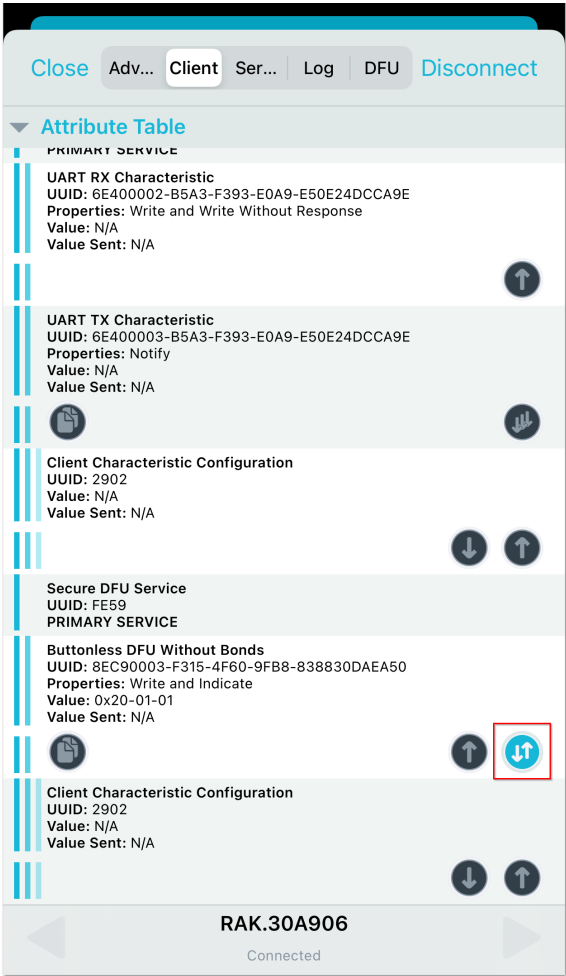


Figure 13: Buttonless DFU

7. A **Write Value** window will pop up. Select **Bool** tab, move the switch from **False** to **True** then press **Write** button.

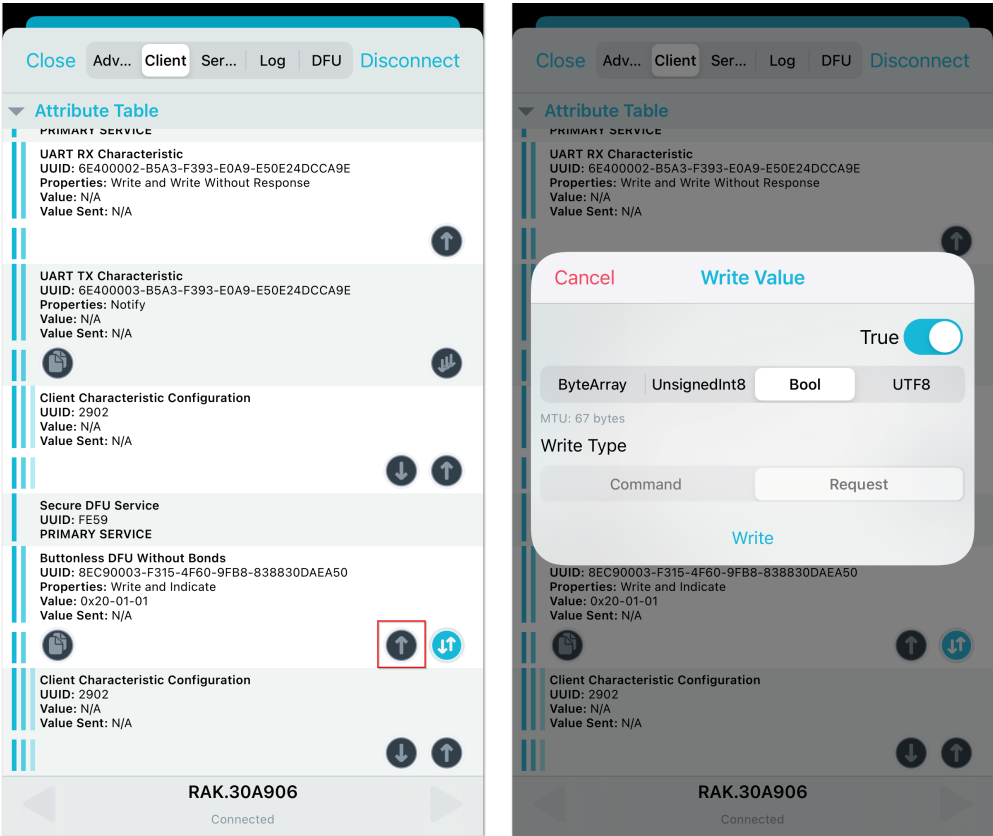


Figure 14: Resetting the bootloader via Bluetooth

8. Now, the RAK4630 is now working in DFU Mode. In the application, you will see the default status overview of RAK4630.

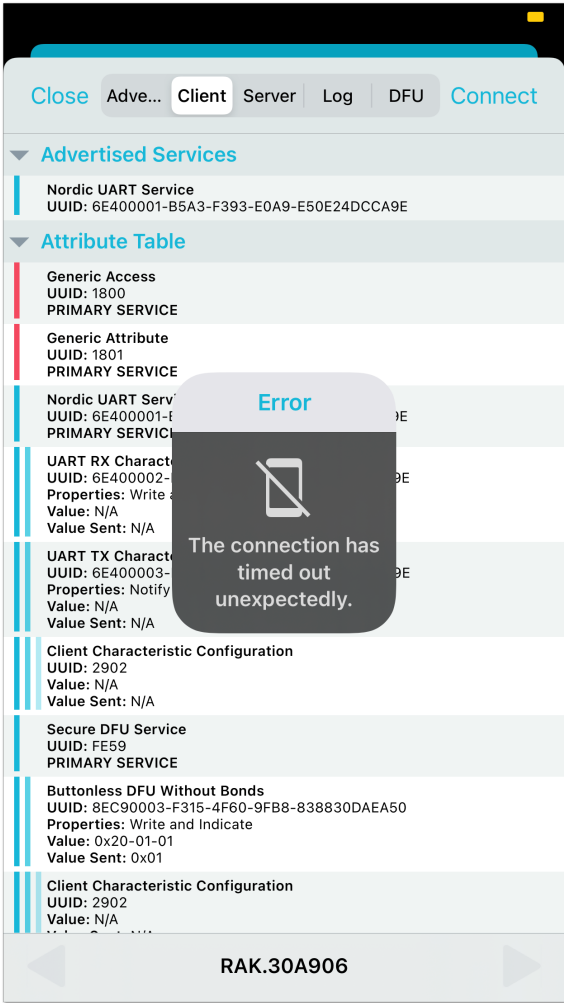


Figure 15: RAK4630 default status overview after resetting

9. In the Scanner list, find a BLE device named **DfuTarg** and then click the **Connect** button.

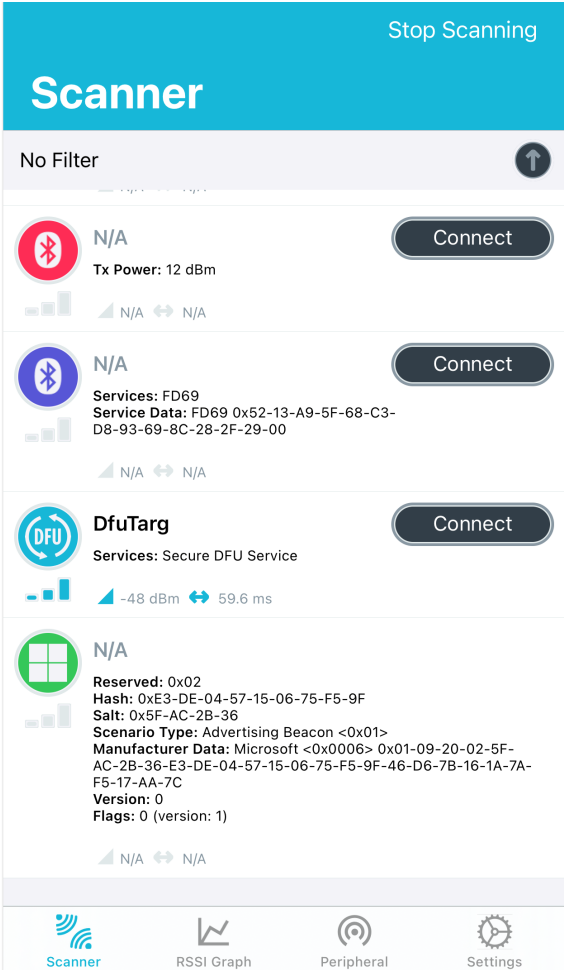


Figure 16: RAK4630 Default Bluetooth ID after Resetting

10. After connected, select the **DFU** tab, then click **Open Document Picker**. This will prompt you to select the Distribution packet zip file of the firmware you have downloaded. Press **OK**, and it will automatically start to upgrade the firmware of your RAK4630 through DFU over BLE.

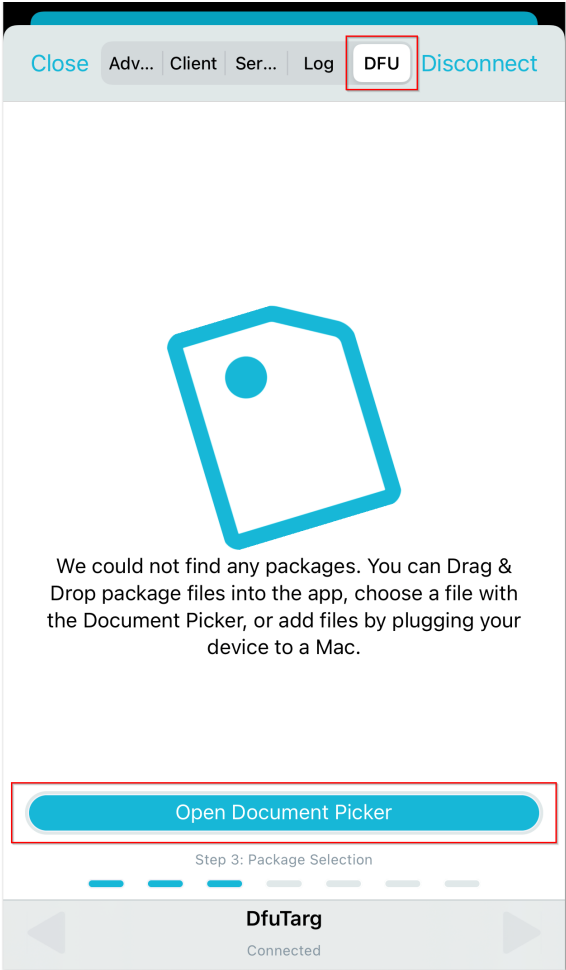



Figure 17: Distribution Packet File Type under DFU

 **NOTE**

You can upload the Distribution packet (ZIP) file to [iCloud Services](#) and download it to your smartphone.

11. After upgrading, the module restarts, and the DFU connection will be disconnected. Now, you can use your RAK4630 with the latest firmware.

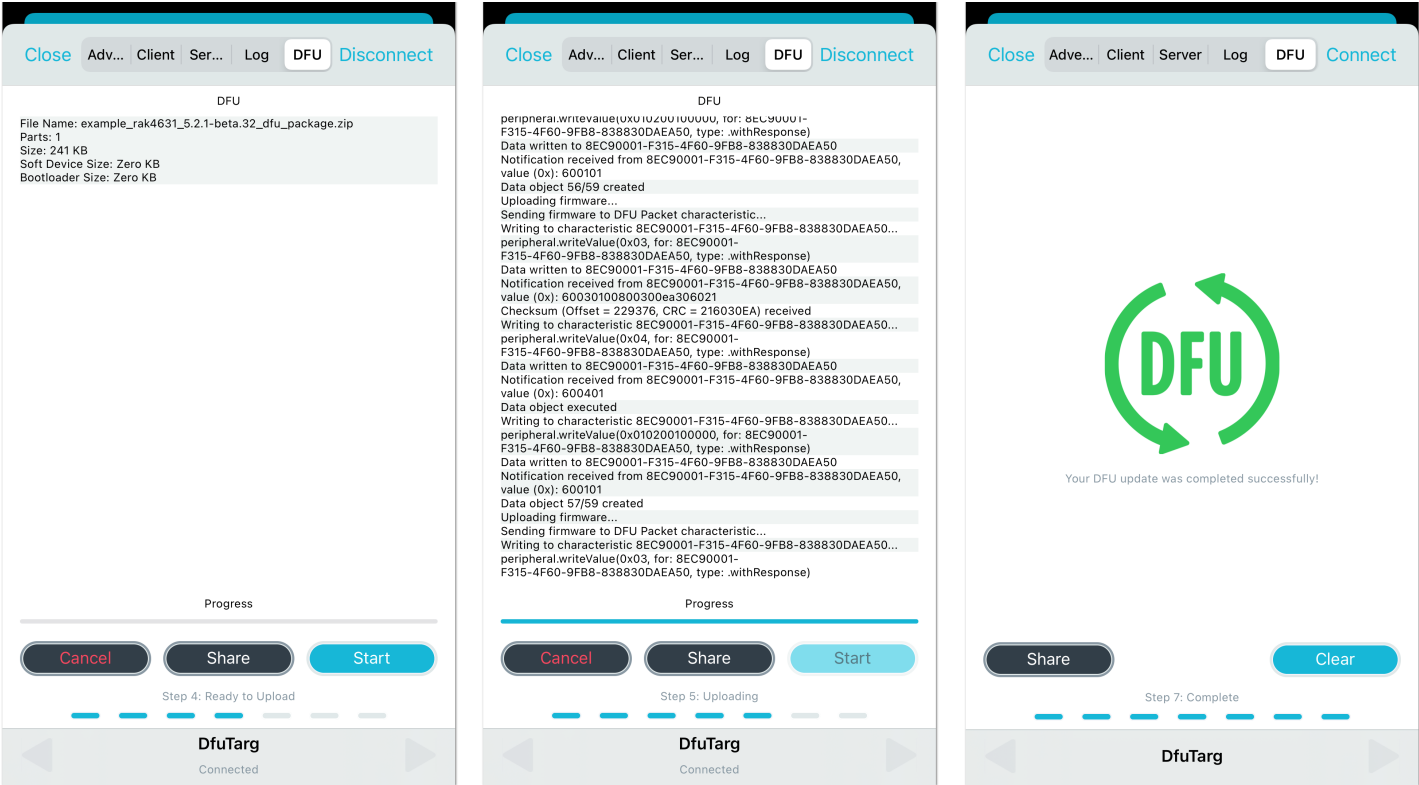



Figure 18: DFU upgrading of RAK4630 firmware via BLE

For Android

OTA DFU Over BLE

1. Download the [DFU package of the RAK4630](#) and save it on your mobile phone.

 **NOTE**

You can upload the Distribution packet (ZIP) file to Google Drive and download it to your smartphone.

Make sure the Bluetooth on your mobile is on.

2. Press the reset button and wait for a couple of seconds.
3. Open the nRF Connect mobile application. You will see all the BLE devices in range in the Scanner list.

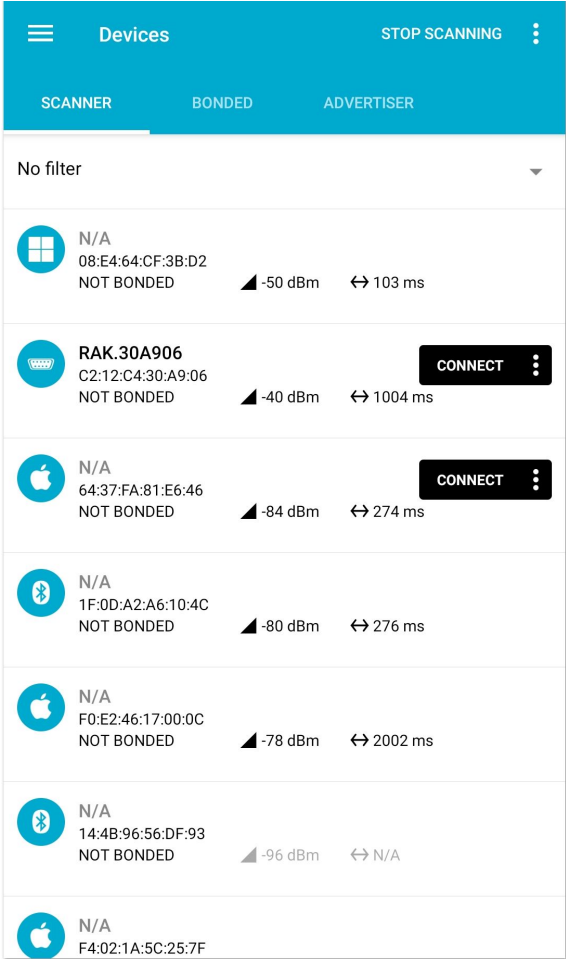



Figure 19: Available Bluetooth Devices in the Nordic App

4. Look for a BLE Device named **RAK.XXXXXX** in the scanner list of the app. Connect to this device and then click the **Client** tab.

 **NOTE**

By default, the BLE signal of the RAK4630 is turned off automatically if no connection is established after 60 seconds. Connect to **RAK.XXXXXX** immediately after pressing the reset button.

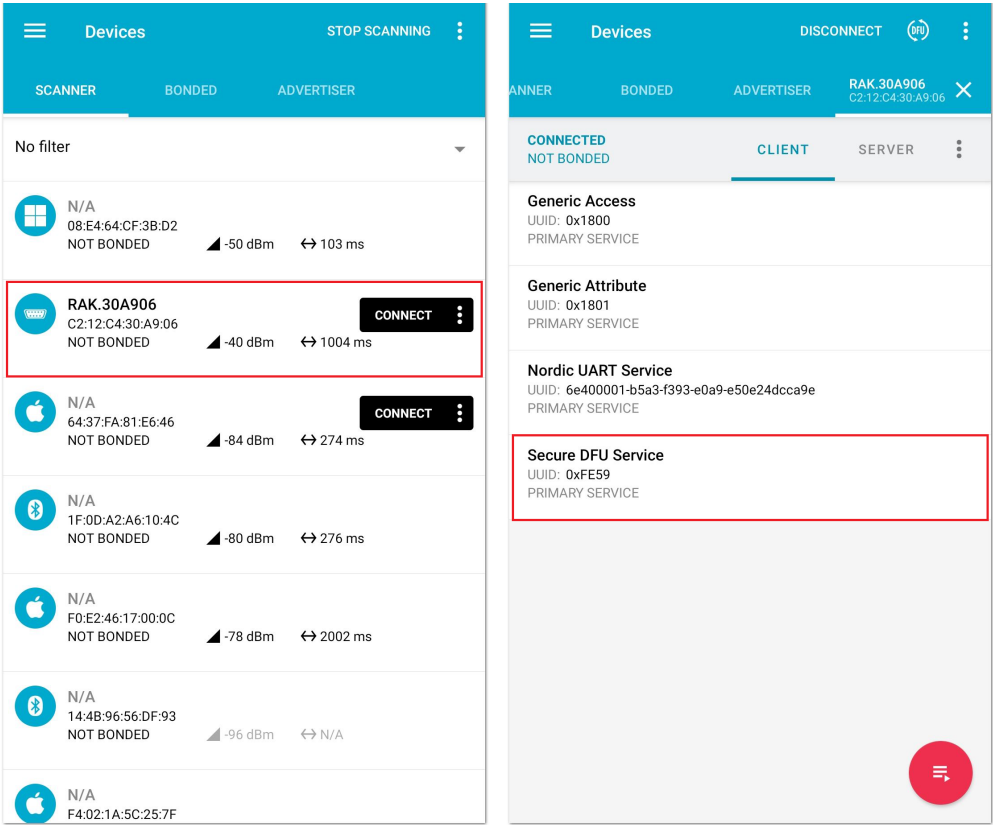


Figure 20: Secure DFU service in the Nordic App

5. Choose "Secure DFU Services" and click the button highlighted in red, as shown in Figure 21.

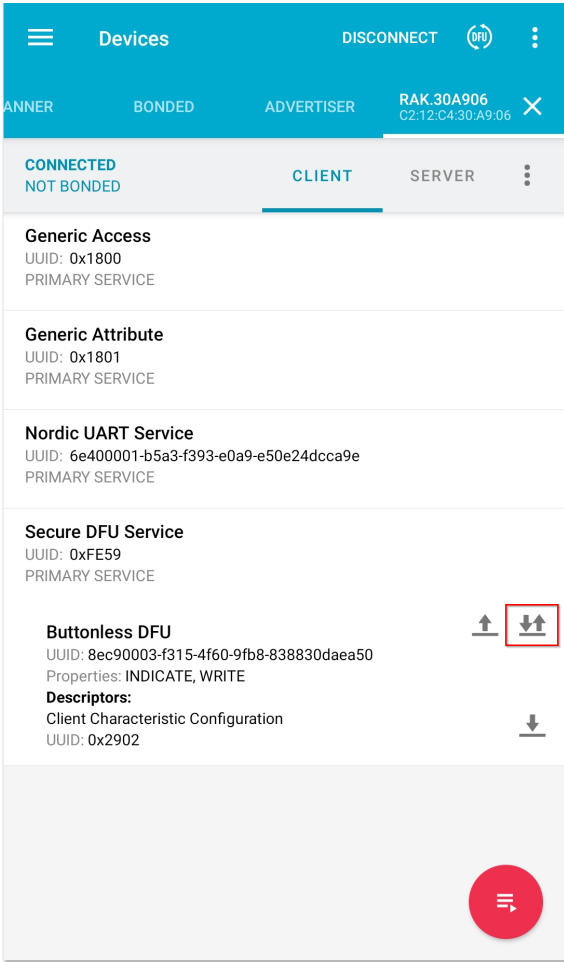


Figure 21: Buttonless DFU

6. Click the arrow up button highlighted in a red box.
7. A **Write value** window will pop up. Press the **SEND** button.

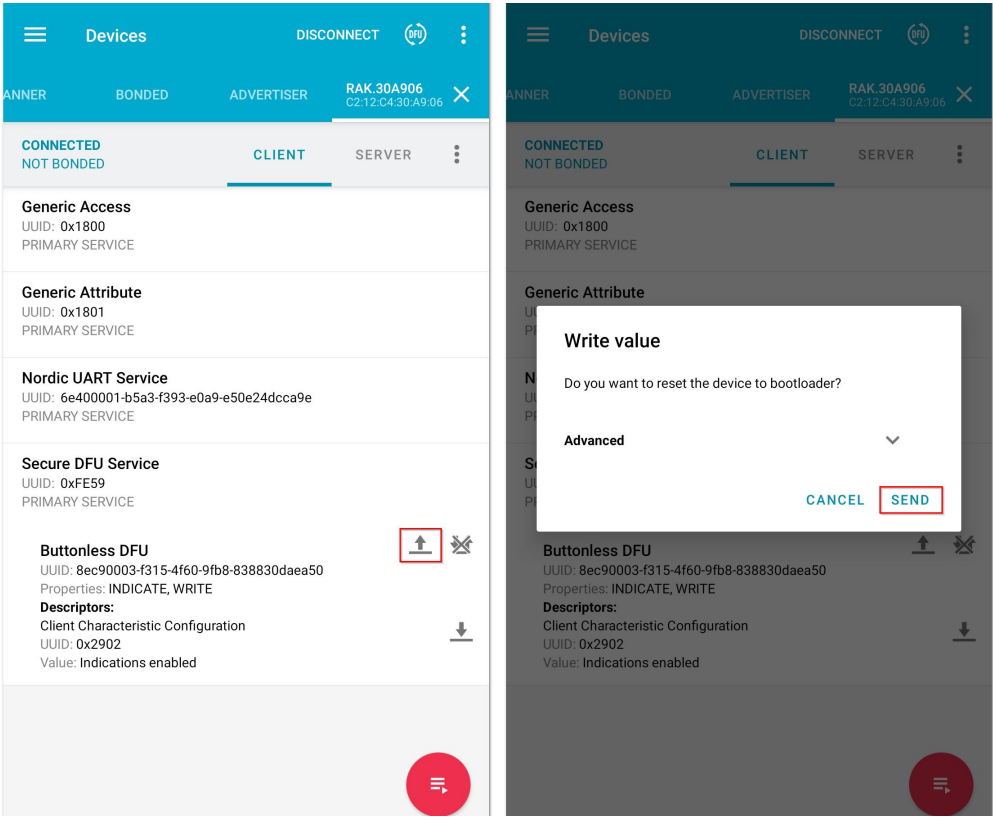


Figure 22: Resetting the Bootloader via Bluetooth

8. Now, the RAK4630 is now working in DFU Mode. In the application, you will see the default status overview of RAK4630.

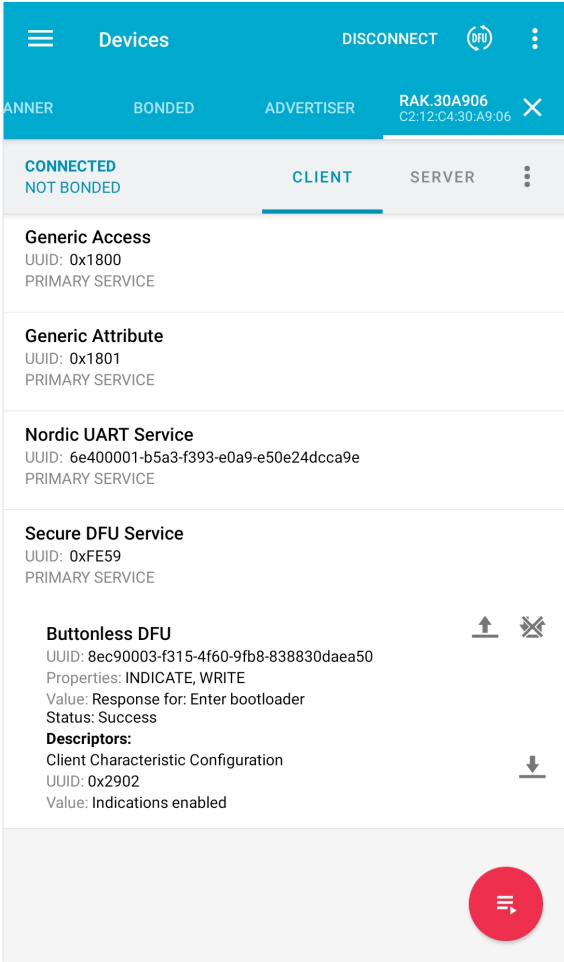


Figure 23: RAK4630 default status overview after resetting

9. In the Devices list, find a BLE device named **DfuTarg** and click on the **Connect** button.

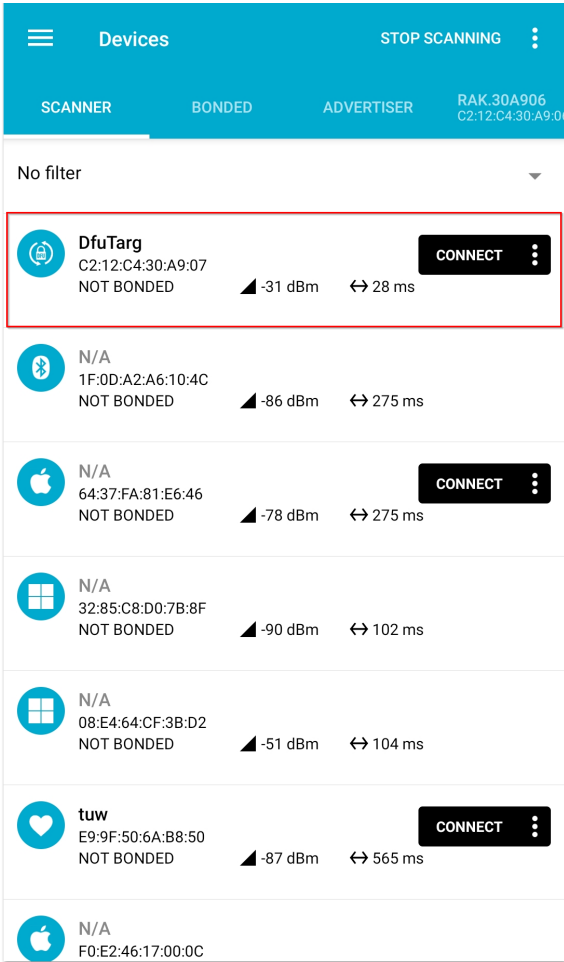


Figure 24: RAK4630 default Bluetooth ID after resetting

After connecting, click on the **DFU** icon highlighted in red, as shown below.

10. Select the **Distribution packet (ZIP)** and press **OK**. This will prompt you to select the zip file of the firmware that you have downloaded. It will automatically start to upgrade the firmware of your RAK4630 through DFU over BLE.

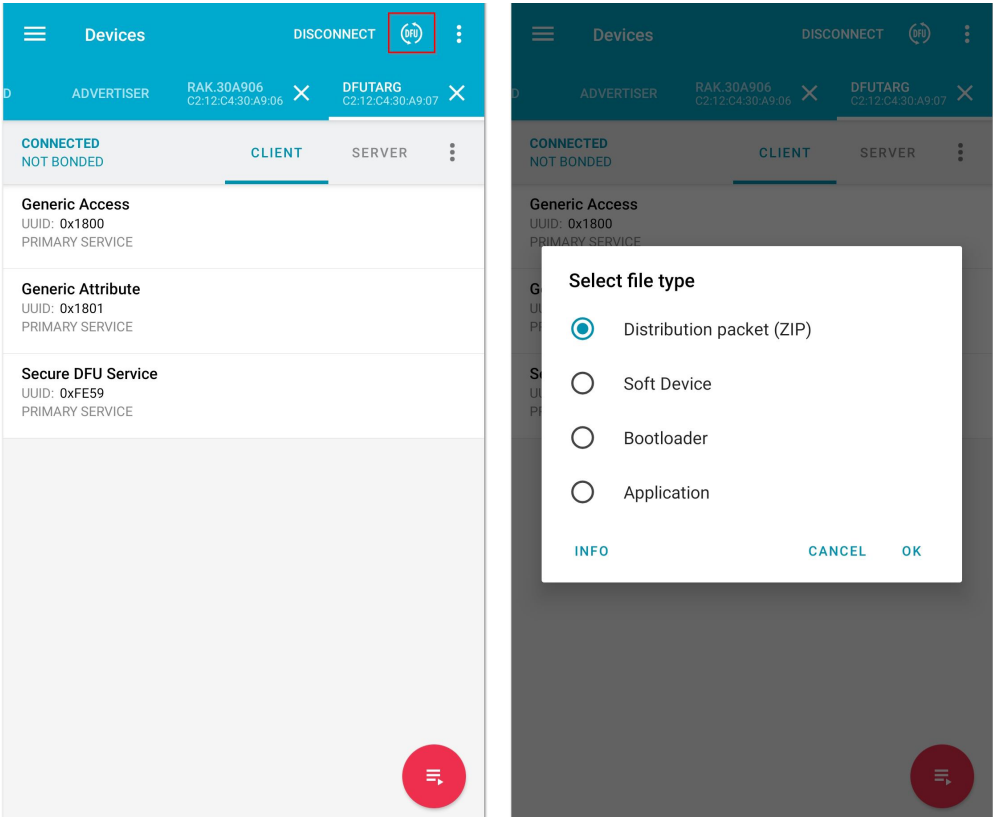



Figure 25: Distribution packet file type under DFU

 **NOTE**

You can upload the Distribution packet (ZIP) file to Google Drive and download it to your smartphone.

11. After upgrading, the module restarts, and the DFU connection will be disconnected. Now, you can use your RAK4630 with the latest firmware.

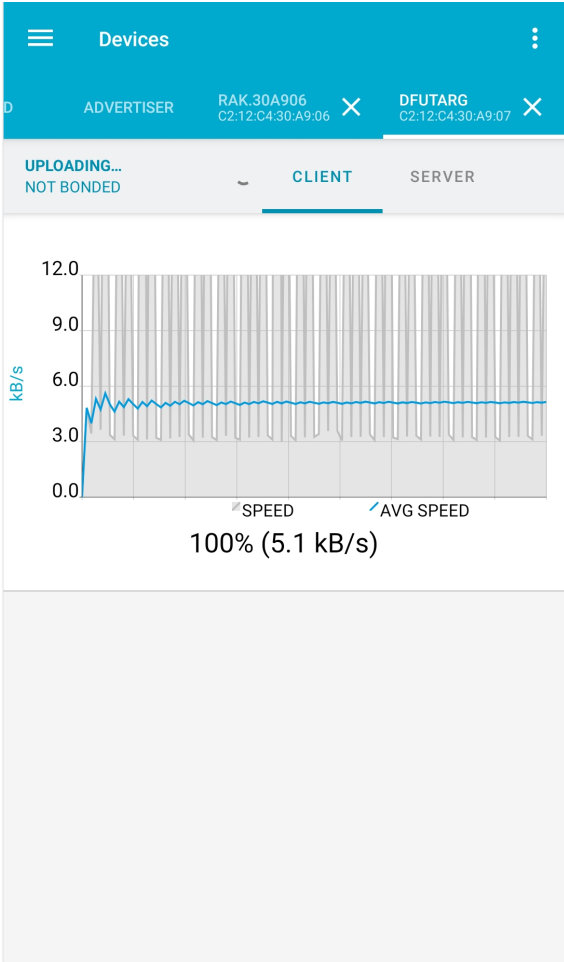


Figure 26: DFU upgrading of RAK4630 firmware via BLE