

Device Firmware Update UserManual

Rev. 1.0 16 Feb.2023

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Revision History

Revision	Date	Description
1.0	16 Feb.2023	1st edition

1 Introduction

This document describes the DFU (Device Firmware Update) functionality in Bluetooth low energy Application Embedded Module.

2 Overview

2.1 About DFU

The Bluetooth low energy Application Embedded Module has a DFU function. This DFU function can upgrade the firmware in the module to a newer version, or downgrade to an older version via UART or OTA (Over The Air).

The following is a list of modules covered in this user manual.

Table : Module list

Module	Chip
EB2840MA2	nRF52840
EJ2840MA2	nRF52840
EC2820MA2	nRF52820
ES2820MA2	nRF52820

In addition, since this DFU function supports encryption, it is only applicable with our Bluetooth low energy Application Embedded Module. Please note that the application is not able to write to our Bluetooth low energy Basic Module.

2.2 Preparation of DFU

2.2.1 Tools

The DFU of the Bluetooth low energy Application Embedded Module uses the following software and tools.

- nrfutil
- nRF Connect for Desktop/nRF Connect for Mobile

2.2.2 Download

In order to perform DFU, it is necessary to download the zip file of the firmware version you wish to write from the detailed page of each module on our official website in advance.

The links to the detailed pages of each module are as follows.

EB2840MA2: [EB2840MA2 Bluetooth® | KAGA FEI](#)



EJ2840MA2: [EJ2840MA2 Bluetooth® | KAGA FEI](#)



EC2820MA2: [EC2820MA2 Bluetooth® | KAGA FEI](#)



ES2820MA2: [ES2820MA2 Bluetooth® | KAGA FEI](#)



Note : This DFU allows you to upgrade/downgrade the firmware version.

Please confirm the version information before performing DFU.

3 About EB2840MA2/ EJ2840MA2

3.1 DFU Operation

The EB2840MA2/ EJ2840MA2 DFU writes firmware in the Dual Bank.

During the Dual Bank update, existing applications are stored until the new firmware is activated. If the firmware update process fails, the existing applications can still be started by restarting the module.

For more information about Dual Bank, please refer to the following Nordic InfoCenter.

URL :

https://infocenter.nordicsemi.com/topic/sdk_nrf5_v17.1.0/lib_bootloader_dfu_banks.html

3.2 How to switch to DFU Mode

Normally, the Bluetooth low energy Application Embedded Module starts the application, but can be start the DFU mode by resetting the module with the DFU Pin in the low state. No startup event is output when the module is into DFU mode.

When booted in DFU mode, the device name used for advertising is "KFSAB-DFU".

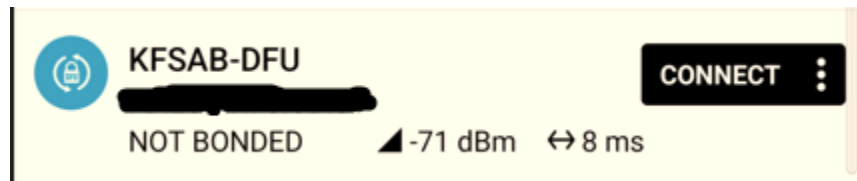


Figure: Example of displaying device name

After the firmware update is complete, make sure the DFU pin is released before resetting to prevent the device from entering DFU mode again. The DFU Pin of each Bluetooth low energy Application Embedded Module is as follows.

Module	DFU Pin
EB2840MA2	P0.16
EJ2840MA2	P0.29

4 About EC2820MA2/ ES2820MA2

4.1 DFU Operation

The EC2820MA2/ ES2820MA2 DFU perform firmware writing with the Single Bank. During a Single Bank update, the existing application area is deleted and then the new firmware is written. Therefore, if an error occurs during the writing process, the module will automatically start in DFU mode because the valid applications in the module will be deleted.

After starting DFU mode, DFU can be performed again.

For more information about Single Bank, please refer to the following Nordic InfoCenter.

URL :

https://infocenter.nordicsemi.com/topic/sdk_nrf5_v17.1.0/lib_bootloader_dfu_banks.html

Also, the DFU of the EC2820MA2/ES2820MA2 can only rewrite the softdevice via UART. In this case, the softdevice is written after the existing application area is deleted, so automatically starts in DFU mode if an error occurs during a write or after a write completes.

After rewriting the softdevice, be sure to rewrite the application.

4.2 How to switch to DFU Mode

Normally, the Bluetooth low energy Application Embedded Module starts the application, but can be start the DFU mode by resetting the module with the DFU Pin in the low state. No startup event is output when the module is into DFU mode.

When booted in DFU mode, the device name used for advertising is "KFSAB-DFU".

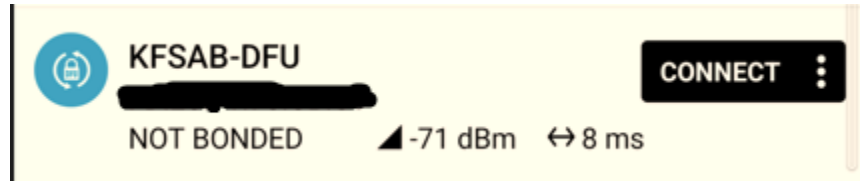


Figure: Example of displaying device name

After the firmware update is complete, make sure the DFU pin is released before resetting to prevent the device from entering DFU mode again. The DFU Pin of each Bluetooth low energy Application Embedded Module is as follows.

Module	DFU Pin
EC2820MA2	P0.14
ES2820MA2	P0.14

In addition, when rewriting the softdevice, the BLE control pin must be set to Low at startup in DFU mode. The BLE control pins of each Bluetooth low energy Application Embedded Module are as follows.

Module	BLE Control Pin
EC2820MA2	P0.28
ES2820MA2	P0.04

5 How to update by DFU

5.1 Writing via UART

For DFU via UART, a PC or external MCU is used for writing.

Note: In the DFU, the write process (UART/OTA) that started the operation first is executed and cannot be changed until the process is completed.

The UART Pin assignments and communication parameter for each module are as follows.

Table: UART Pin Assignment of Modules

Module	RX	TX	CTS	RTS
EB2840MA2	P0.08	P0.06	P0.07	P0.05
EJ2840MA2	P0.08	P0.06	P0.07	P0.05
EC2820MA2	P0.04	P0.05	P0.06	P0.07
ES2820MA2	P0.08	P0.06	P0.07	P0.05

Table: UART Communication Parameter

Module	Baud rate	Data	Parity	Stop	HW flow control
EB2840MA2	115200	8bit	None	1bit	enable
EJ2840MA2	115200	8bit	None	1bit	enable
EC2820MA2	115200	8bit	None	1bit	enable
ES2820MA2	115200	8bit	None	1bit	enable

5.1.1 Writing by PC

The following is the procedure for executing the nrfutil command to write firmware to the module.

1. Starting up DFU mode

- Start the module in DFU mode with reference to chapter 3.2/4.2.

2. Writing firmware

- On the command line, use nrfutil and enter the following command.

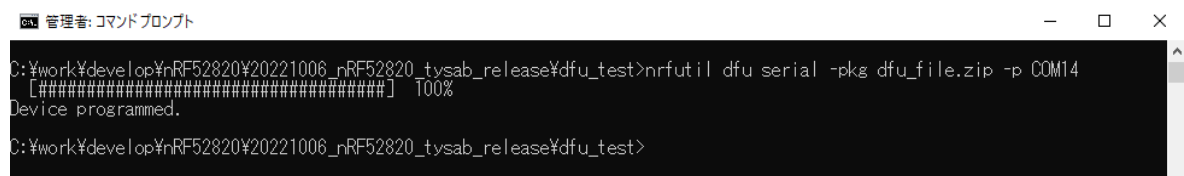
```
nrfutil dfu serial -pkg dfu_file.zip -p PORT
```

dfu_file.zip is specified the zip file containing the firmware update file, and **PORT** is specified the COM Port to which the module is connected.

When the command is executed, a progress bar is displayed and the update result is shown when the update is completed.

Note: After completing DFU, release the DFU pins to avoid entering DFU mode again.

[Example of Execution Screen]



```
管理者: コマンドプロンプト
C:\work\develop\RF52820\20221006_nRF52820_tysab_release\dfu_test>nrfutil dfu serial -pkg dfu_file.zip -p COM14
[#####] 100%
Device programmed.
C:\work\develop\RF52820\20221006_nRF52820_tysab_release\dfu_test>
```

5.1.2 Writing by external MCU

When writing via UART using an external MCU, the external MCU must be controlled to become the DFU Controller and send and receive messages to perform DFU.

The message information, control method, sequence, etc. are described in detail at the following URL. Be sure to refer to the URL when writing via UART using an external MCU.

Note : Please refer to Chapter 3.2/4.2 for details on how to start DFU mode.

URL: https://infocenter.nordicsemi.com/topic/sdk_nrf5_v17.1.0/lib_dfu_transport.html

URL:

https://infocenter.nordicsemi.com/topic/sdk_nrf5_v17.1.0/lib_dfu_transport_serial.html

5.2 Writing via OTA (Over The Air)

The procedure for writing firmware to the module via OTA is described below.

Note: In the DFU, the write process (UART/OTA) that started the operation first is executed and cannot be changed until the process is completed.

As a common feature, the device name used for advertising in DFU mode is "KFSAB-DFU". Connect to "KFSAB-DFU" from any of the following applications and follow the instructions to execute DFU.

5.2.1 Writing by nRF Connect for Desktop

In order to perform DFU via OTA using a PC, "nRF Connect for Desktop" must be installed beforehand. Following is the download link.

URL: [nRF Connect for Desktop - Downloads - nordicsemi.com](https://www.nordicsemi.com/Products/Development-hardware/nRF52840-Development-Kit/nRF-Connect-for-Desktop-Downloads)

In addition, when writing with nRF Connect for Desktop, the opposite device will only work with the supported devices provided by Nordic. Supported devices are as follows.

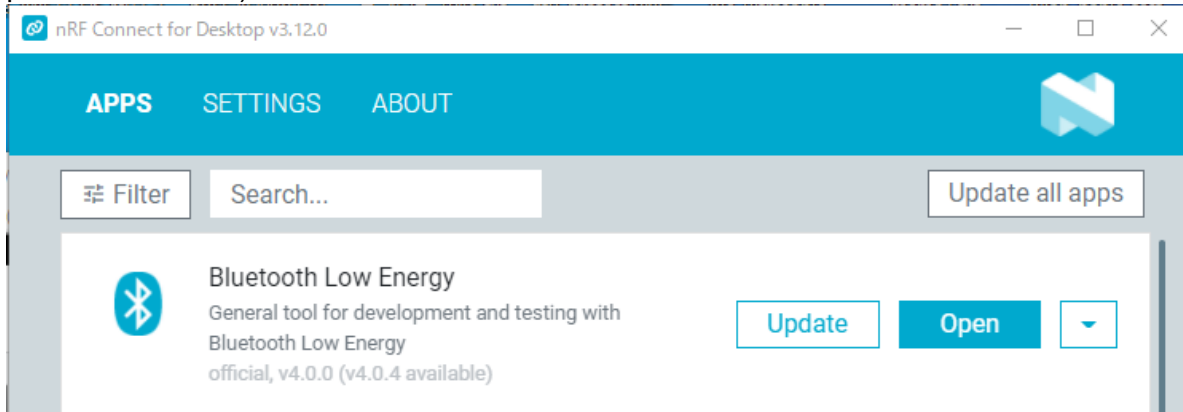
Supported devices
PCA10056 nRF52840 Development Kit
PCA10040 nRF52 Development Kit
PCA10059 nRF52840 Dongle
PCA10028 nRF51 Development Kit
PCA10031 nRF51 Dongle

[Writing procedure]

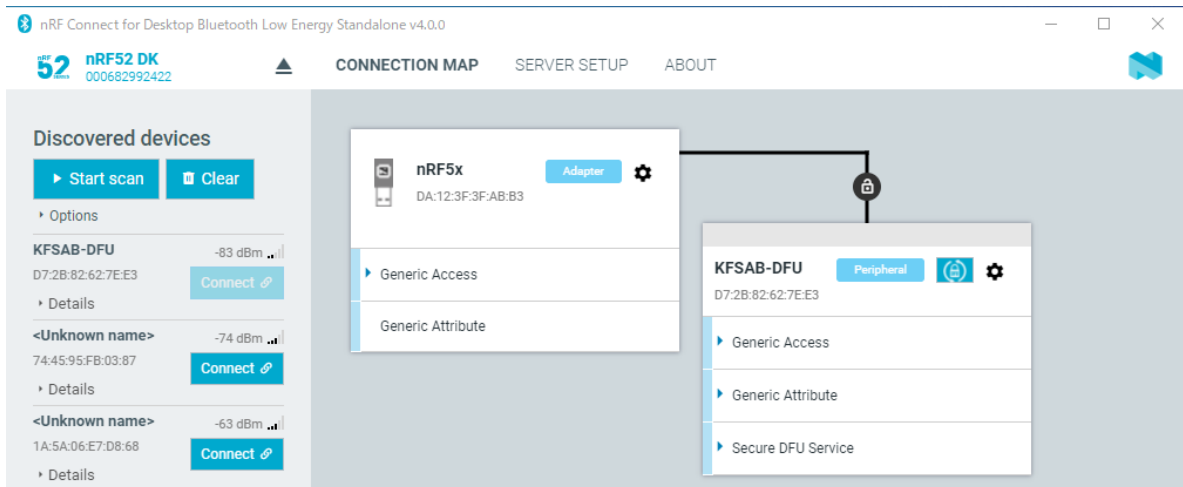
1. Start up DFU mode


•Start the module in DFU mode with reference to chapter 3.2/4.2.

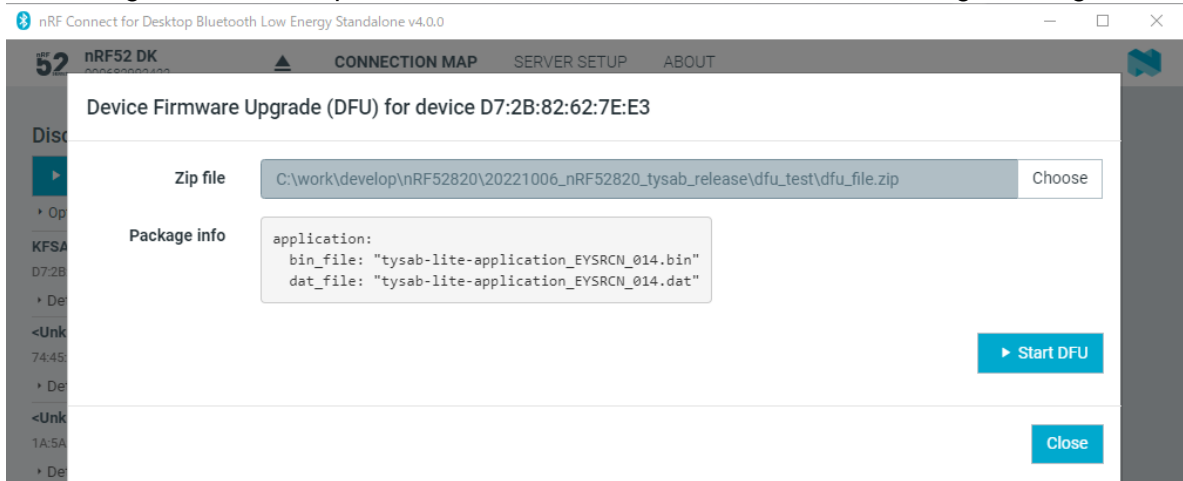
2. Connect the support device provided by Nordic to PC, start nRF Connect for Desktop, and start "Bluetooth Low Energy" (If you use Bluetooth Low Energy for the first time, please do "Install").



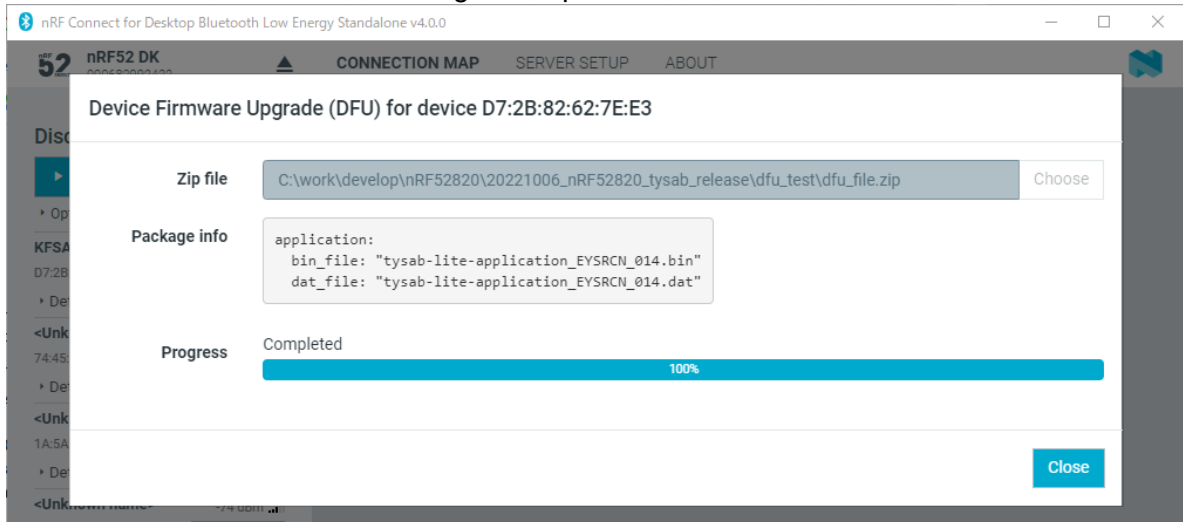
3. Select the support device to be used from "SELECT DEVICE" in the upper left corner, and execute "Start scan" to connect with "KFSAB-DFU".



- Left-click on the "Start Secure DFU" button  next to Peripheral, select the zip file containing the firmware update file, and left-click on the "Start DFU" to begin writing.



- Left-click on the "close" after writing is complete.



5.2.2 Writing by nRF Connect (smartphone app)

To perform DFU via OTA using a smartphone, "nRF Connect for Mobile" must be installed in advance. nRF Connect for Mobile can be installed from Google store/App store, etc.

In case of iOS

[Writing procedure]

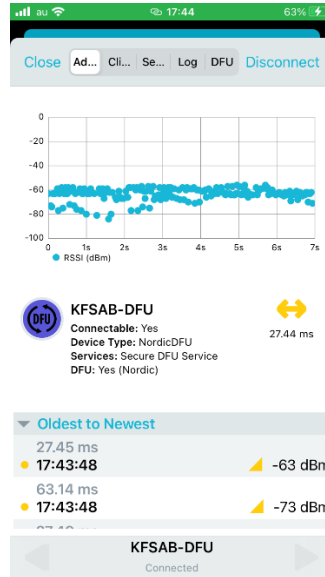
1. Add the zip file containing the firmware update file to the iPhone or the other device you plan to use, using file sharing function of iTunes app, etc.



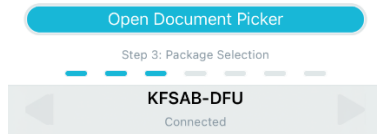
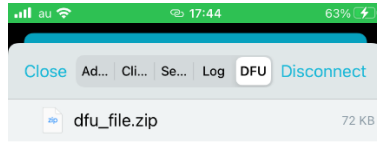
2. Start up DFU mode

- Start the module in DFU mode with reference to chapter 3.2/4.2.

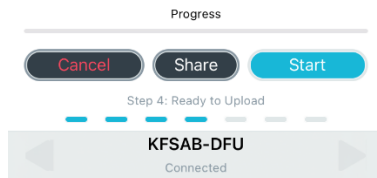
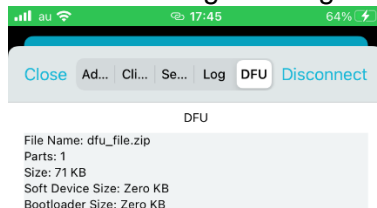
3. Open nRF Connect for Mobile and connect to "KFSAB-DFU".



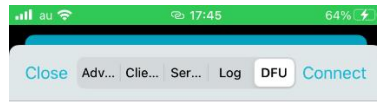
4. Open the "DFU" tab at the top of the screen and select the zip file containing the firmware update file.



5. Tap "Start" at the bottom of the screen to begin writing.



6. After writing is complete, the connection is disconnected.



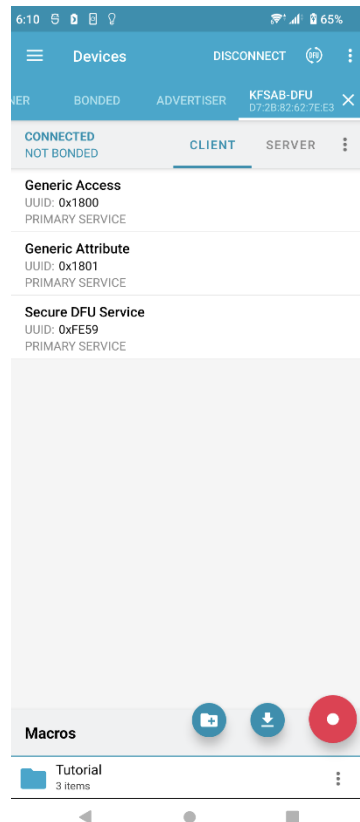
Please connect to this device to confirm its DFU status.



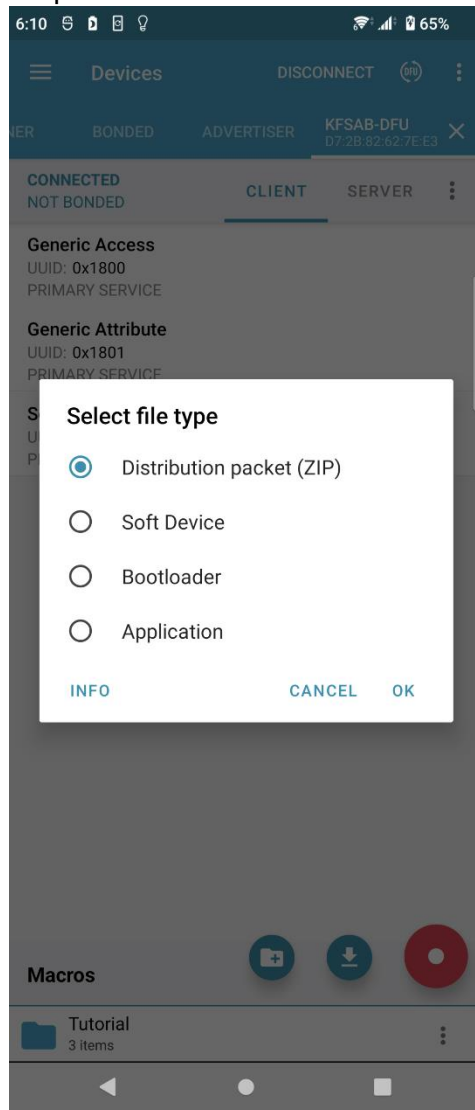
In case of Android

[Writing procedure]

1. Save the zip file containing the firmware update file to any directory in the Android device you plan to use in advance.
2. Start up DFU mode
 - Start the module in DFU mode with reference to chapter 3.2/4.2.
3. Open nRF Connect for Mobile and connect to "KFSAB-DFU".

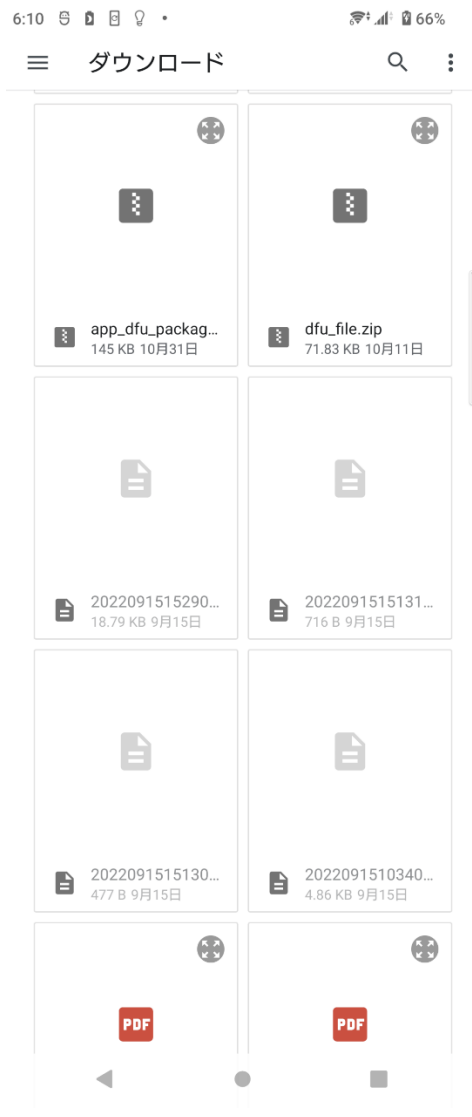


4. Tap the DFU button at the top of the screen, select "Distribution packet (ZIP)" in the "Select file type" field, and tap "OK".



5. Tap the zip file saved in the directory to start writing.

Note: After the write is complete, it will be reconnected if the DFU Pin has not been released.



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