AN14394

Creating Firmware Update Image for MCX W71 using OTAP Tool

Rev. 1.0 — 19 September 2024 Application note

Document information

Information	Content
Keywords	AN14394, OTAP, MCX W71, FRDM-MCXW71 Bluetooth LE
Abstract	This application note describes the steps to create and upgrade the image on the MCX W71 boards.

1 Introduction

This document provides the steps to create and upgrade the image on the MCX W71 board.

The demo can be run using two applications:

- Over The Air Programming (OTAP) Client-embedded application
- OTAP PC application

The OTAP Client-embedded application has two versions: ATT version and L2CAP version. Each version uses a different transfer method.

The OTAP Client is a GAP peripheral, which advertises the Bluetooth Low Energy (Bluetooth LE) OTAP service and waits for a connection from an OTAP server. After an OTAP server connects, the OTAP Client waits for it to write the OTAP control point CCCD, and then starts sending commands via ATT indications.

The demo applications use external storage by default. The internal storage is viable only if there is enough space in the internal flash for the upgrade image. The flash in this case must be at least twice the size of the largest application.

2 Prerequisites

To create an image to upgrade, the following prerequisites are required:

- MCUXpresso IDE v11.10.0 or later or IAR EW for Arm, which can be downloaded from MCUXpresso-IDE
- Over the Air Programming tool the latest version, which can be downloaded from Over the Air Programming
- MCX W71 board
- A smartphone with IoT toolbox NXP app, which is available for Android and iOS

3 Software setup with IAR

To configure the software, follow the steps below:

1. To use the external storage, make some changes. Several configuration options must be set up in both the source files and the linker options of the toolchain:
   a. On the `app_preinclude.h`, make sure that `gAppOtaExternalStorage_c` is set to **1**.
   b. The OTAP demo applications for IAR EW IDE have some settings in the linker options, as shown in Figure 1.

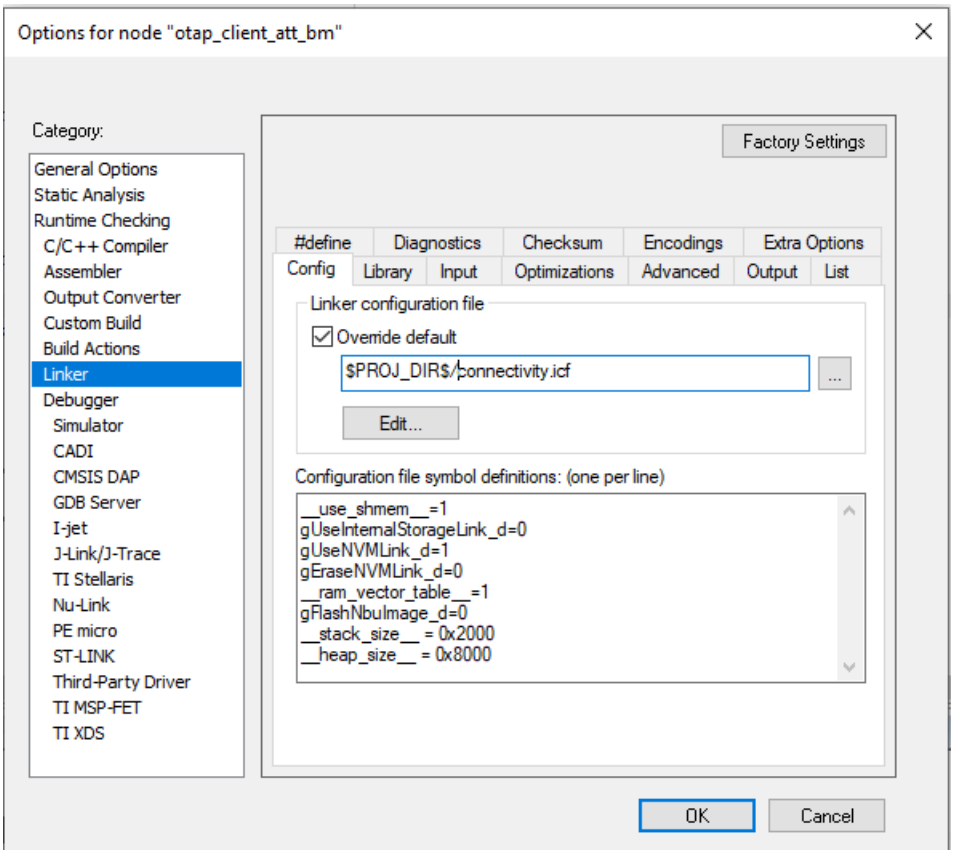


Figure 1. Configuration file symbol definitions

2. To use the internal storage, set up the `gUseInternalStorageLink_d=1` symbol in the linker configuration and set the `gAppOtaExternalStorage_` value to "0".

Note:

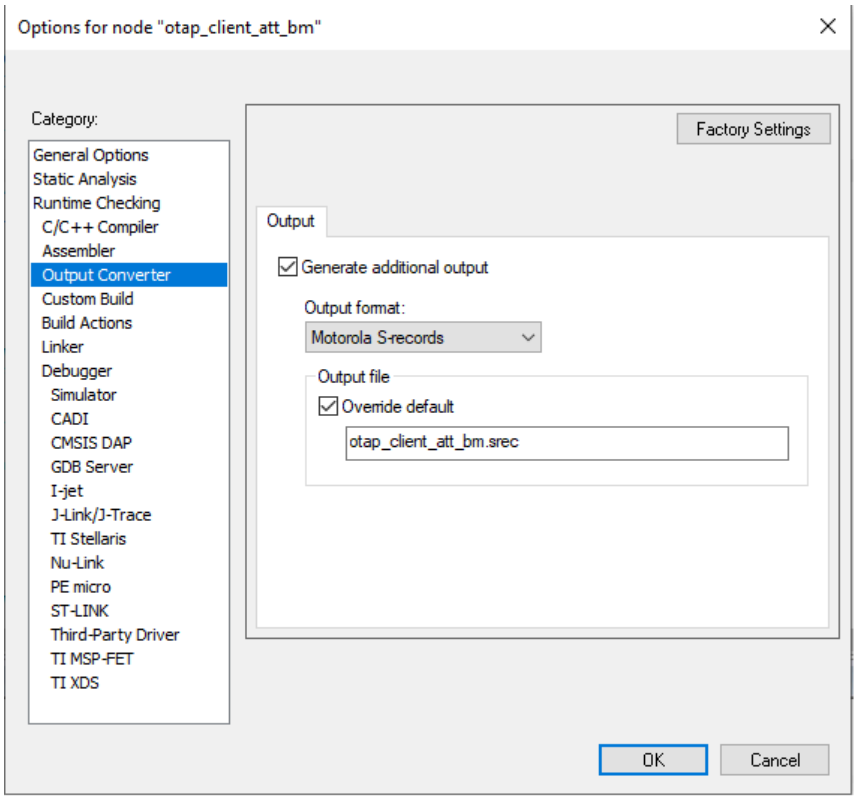
*The `gEraseNVMLink_d=1` IAR linker flag places some dummy bytes into the NVM region to invalidate the data and force the application to erase the entire NVM region. When generating an image for the OTA upgrade, set this flag to **0**, and the `gUseNvmLink_d` flag. Therefore, resulting in a smaller image size being transferred and lower power consumption. If the NVM region must be erased after the upgrade process, the erased sector bitmap must be used to mark the NVM sectors as erasable.*

3.1 OTAP image format file

The Bluetooth LE OTAP image file has a binary file format. It is composed of a header followed by several subelements. The header describes general information about the file. There are some predefined subelements of a file but an end manufacturer may add manufacturer-specific subelements. The header does not have details of the subelements. The type of each piece is described.

To enable the creation of a SREC and BIN file for your embedded application in IAR Embedded Workbench, the steps are described as follows:

1. Open the target properties.
2. Go to the **Output Converter** tab.
3. Activate the **Generate additional output** checkbox.
4. Select the **Motorola or Raw Binary** option from the **Output format** drop-down menu.



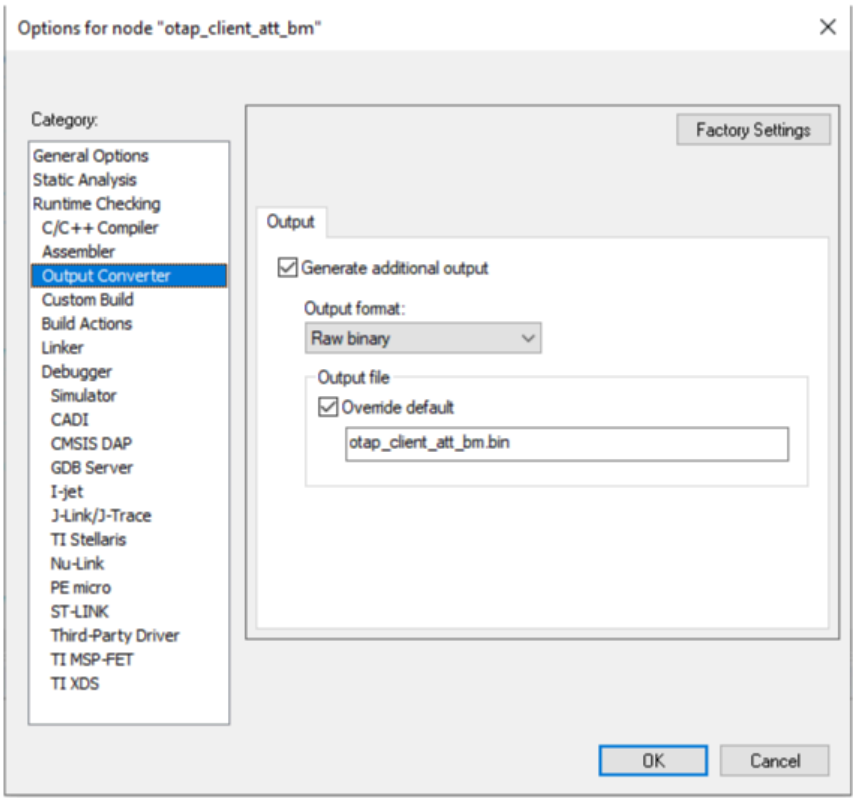


Figure 2. Output format for the new image

4 Software setup with MCUXpresso

To create the image for the application, you must deploy the **Binaries** icon in the workspace. Click the right mouse button on the `.axf` file and select **Binary Utilities** > **Create S-Record**. The S-Record file is saved at the Debug folder in the workspace with `.srec` extension.

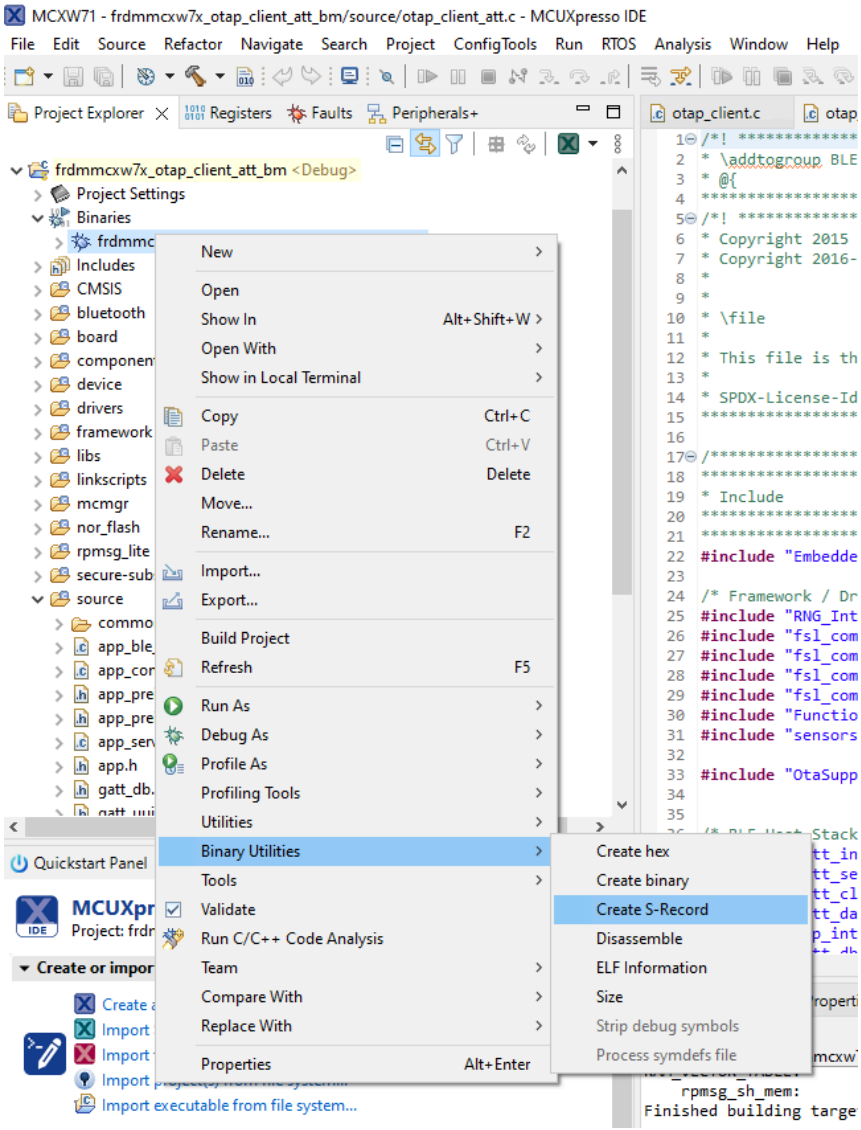


Figure 3. Binary utilities to create the image

A Motorola S-record (SREC) file is an ASCII format file, which contains binary information. Common file extensions are `.srec`, `.s19`, `.s28`, `.s37`, and others. Most modern compiler toolchains can generate an SREC format executable. In MCUXpresso IDE, go to the **Project properties** > **Settings** > **Build steps** window and press the **Edit** button for the Post-build steps. A **Post-build steps** window shows up, in which the following command must be added:

```
arm-none-eabi-objcopy -v -O srec --only-section=.text --only-section=.data --
only-section=.ARM.exidx
"${BuildArtifactFileName}"
"${BuildArtifactFileBaseName}.srec"
```

A snapshot of this window is shown in Figure 4.

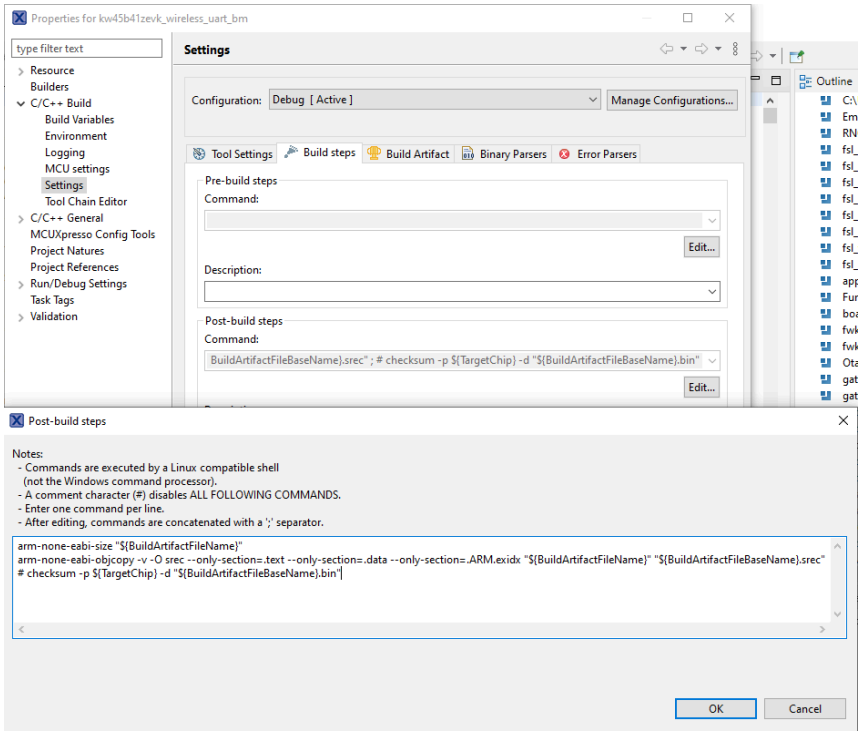


Figure 4. Build steps for creating the SREC format file

5 How to create an image with OTAP tool

This section provides the steps required to create an image for the MCX W71:

1. Navigate to the **Over The Air Programming** tool.

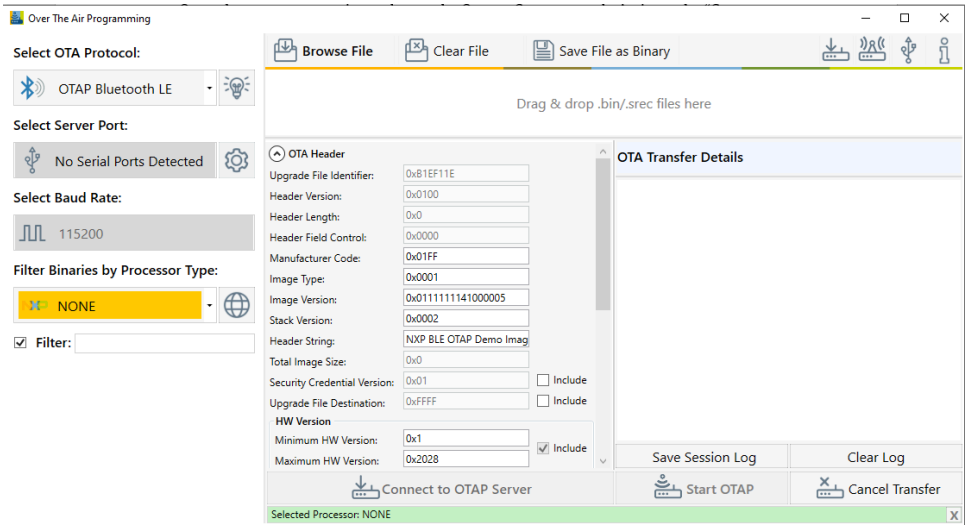


Figure 5. Over The Air Programming tool

2. Drag and drop your `.s19 /.srec /.bin`.
3. To process the binary, select **MCX W71**.

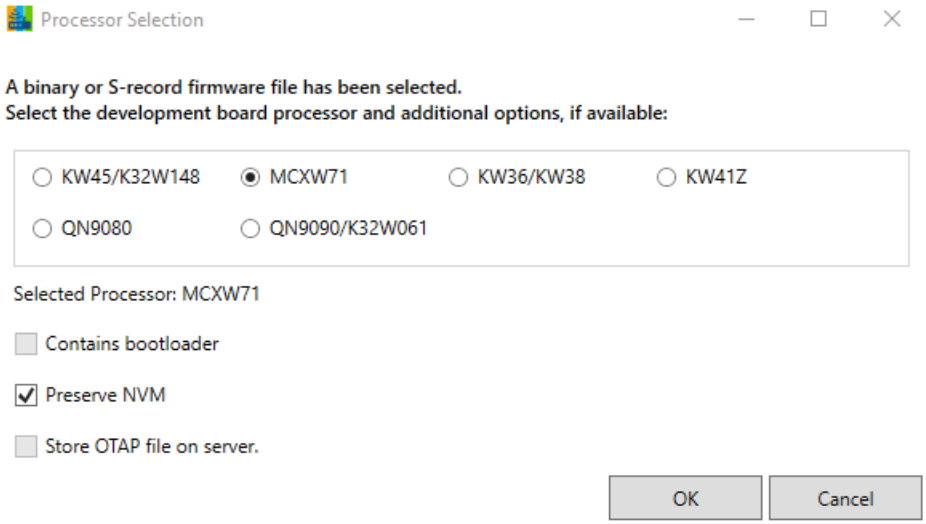


Figure 6. Processor selection for the MCX W71

4. You can now select the type of image you want to upgrade. The type can either be the application (**M33**) or the MCX W71 radio (**M3**), or both.

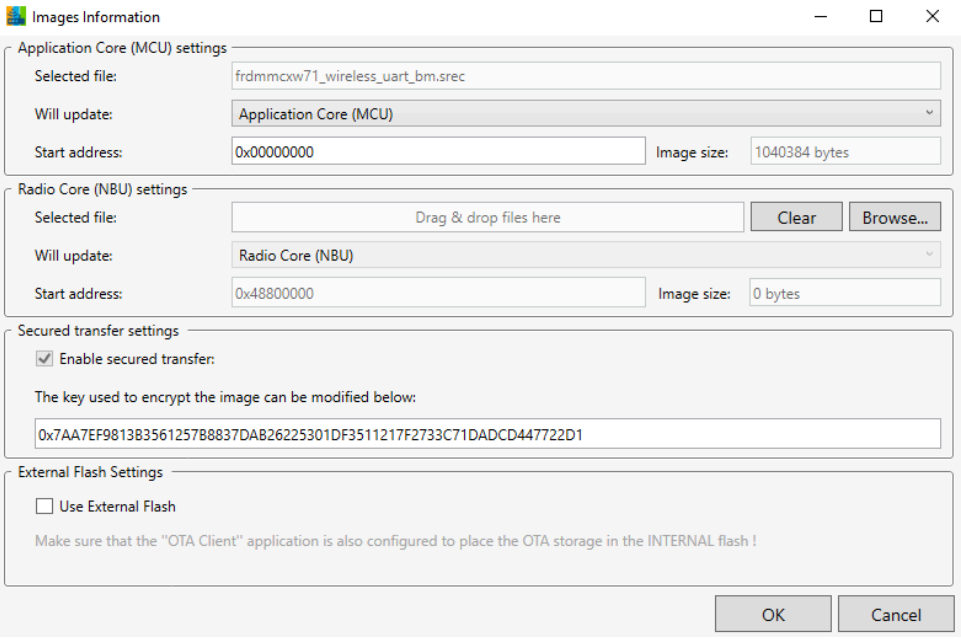


Figure 7. Image information for the MCX W71

5. Save this file in a known location.

6 Testing the OTAP software

To test the OTAP software, the steps are as follows:

1. Open the **IoT Toolbox** app and select the **OTAP** demo.
2. To start scanning for a suitable advertiser, click **SCAN**.

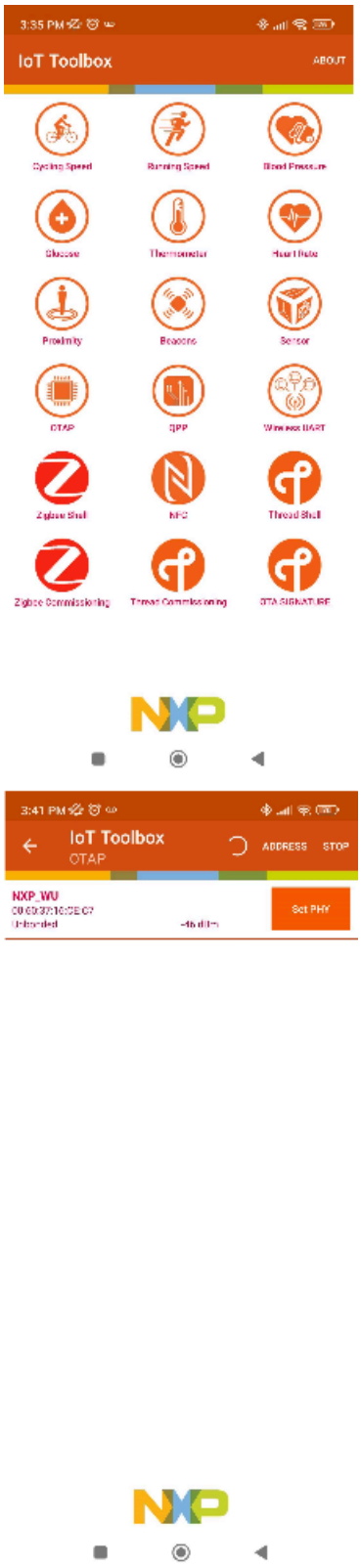


Figure 8. IoT Toolbox

3. Click the **Open** button and search for the Wireless OTAP OTABLE file.

4. To start the transfer, click **Upload**. Wait until the confirmation message is displayed.

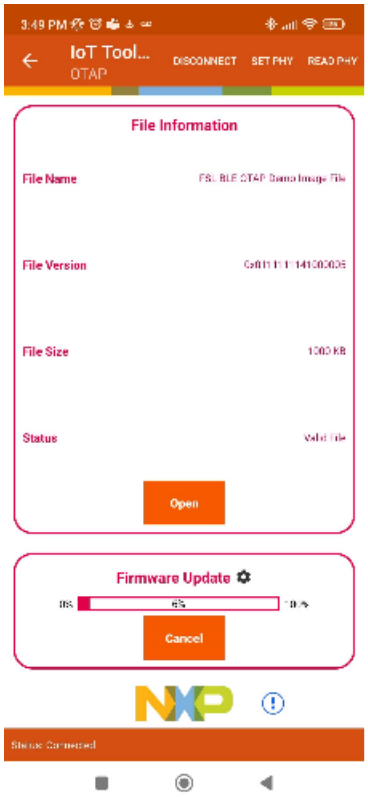


Figure 9. Uploaded image using IoT Toolbox

5. Wait a few seconds until the OTAP bootloader has finished programming the new image. The wireless UART application starts automatically, with the RGB LED blinking.

7 Note about the source code in the document

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8 Revision history

Table 1 summarizes the revisions to this document.

Table 1. Revision history

Document ID	Release date	Description
AN14394 v.1.0	19 September 2024	Initial public release

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