Creating Firmware Update Image for MCX W71 using OTAP Tool Rev. 1.0 — 19 September 2024 App

**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.

AN14394

Creating Firmware Update Image for MCX W71 using OTAP Tool



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.

#### Creating Firmware Update Image for MCX W71 using OTAP Tool



### 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.

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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 -0 srec --only-section=.text --only-section=.data --
```

```
only-section=.ARM.exidx
"${BuildArtifactFileName}"
```

```
"${BuildArtifactFileBaseName}.srec"
```

#### Creating Firmware Update Image for MCX W71 using OTAP Tool

A snapshot of this window is shown in Figure 4.

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## 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.

🛃 Over The Air Programming					-	
Select OTA Protocol:	💾 Browse File	💾 Clear File	Save File	e as Binary		ิ ขึ่ เ
STAP Bluetooth LE -		D	rag & drop .b	oin/.srec files here		
Select Server Port:			5 1			
🔅 No Serial Ports Detected	OTA Header Upgrade File Identifier:	0xB1EF11E	^	OTA Transfer Details		
Select Baud Rate:	Header Version:	0x0100				
115200	Header Length: Header Field Control:	0x0 0x0000				
Filter Binaries by Processor Type:	Manufacturer Code: Image Type:	0x01FF 0x0001				
NE NONE	Image Version: Stack Version:	0x0111111141000005 0x0002				
✓ Filter:	Header String: Total Image Size:	NXP BLE OTAP Demo Imag	9			
	Security Credential Version:	0x01	linclude			
	Upgrade File Destination:	0xFFFF	Include			
	Minimum HW Version:	0x1				
	Maximum HW Version:	0x2028	✓ Include	Save Session Lo	og Clear I	og
	Co	nnect to OTAP Serve	er	Start OTA	Cance	l Transfer
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Figure 5. Over The Air Programming tool

2. Drag and drop your .s19 /.srec /.bin.

3. To process the binary, select MCX W71.

#### Creating Firmware Update Image for MCX W71 using OTAP Tool

	🕌 Processor Selection			_		×
	A binary or S-record firm Select the development b	ware file has been select	ted. litional options, if av	vailable:		
	O KW45/K32W148	MCXW71	○ KW36/KW38	⊖ KW41Z		
	O QN9080	O QN9090/K32W061				
	Selected Processor: MCX	W71				
	Contains bootloader					
	✓ Preserve NVM					
	Store OTAP file on se	rver.				
				OK	Cance	el
Figure 6. Proces	ssor selection for th	e 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.

🕌 Images Information			_		×			
Application Core (MCU) settir	ngs							
Selected file:	frdmmcxw71_wireless_uart_bm.srec							
Will update:	Application Core (MCU)				v			
Start address:	0x0000000	Image size:	1040384 byt	es				
Radio Core (NBU) settings —					_			
Selected file:	Drag & drop files here		Clear	Brows	e			
Will update:	Radio Core (NBU)				~			
Start address:	0x48800000	Image size:	0 bytes					
Secured transfer settings —								
Enable secured transfer	✓ Enable secured transfer:							
The key used to encrypt the image can be modified below:								
0x7AA7EF9813B3561257B	8837DAB26225301DF3511217F2733C71DADCD447722D1							
External Flash Settings					_			
Use External Flash								
Make sure that the "OTA C	lient" application is also configured to place the OTA storage in th	ne INTERNAL flas	h !					
			OK	Can	el			
e information for the	he 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**.

Creating Firmware Update Image for MCX W71 using OTAP Tool



AN14394 Application note

- 3:49 PM 🎌 🐨 📸 💩 🛥 & .... � IoT Tool ... File Information File Name FSL BLE OTAP Damp Image Fil File Version 01111111410000 File Size 1000 KE Statue Firmware Update 🌣 6310.25 0 ۲ 4
- 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.

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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

#### Creating Firmware Update Image for MCX W71 using OTAP Tool

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AN14394

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Creating Firmware Update Image for MCX W71 using OTAP Tool

### Contents

Introduction	2
Prerequisites	2
Software setup with IAR	2
OTAP image format file	3
Software setup with MCUXpresso	5
How to create an image with OTAP tool	6
Testing the OTAP software	7
Note about the source code in the	
document	9
Revision history	10
Legal information	11
	Introduction Prerequisites Software setup with IAR OTAP image format file Software setup with MCUXpresso How to create an image with OTAP tool Testing the OTAP software Note about the source code in the document Revision history Legal information

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