UG10181

KW45, K32W1, MCXW71, KW47, MCXW72 Bluetooth Low Energy Software Quick Start Guide

Rev. 1.1 — 20 December 2024 **User guide**

Document information

Information	Content
Keywords	UG10181, Software Quick Start Guide, EVK, (Evaluation Kit), kw45b41zevk, kw45b41zloc, k32w148evk, frdmmcxw71, kw47evk, kw47loc, mcxw72evk, frdmmcxw72, Wireless UART application, NXP IoT Toolbox mobile application, Bluetooth Low Energy (BLE), IAR Embedded Workbench, MCUXpresso IDE, Visual Studio Code
Abstract	This document briefly describes the process of using NXP Bluetooth Low Energy software for the KW45, K32W1, MCXW71, KW47, and MCXW72 wireless microcontroller platforms

1 Introduction

This document briefly describes the process of using NXP Bluetooth Low Energy Software for the KW45, K32W1, MCXW71, KW47, or MCXW72 wireless microcontroller platforms (version 1.1.0). It lists the hardware setup and steps for building and usage of the provided demo applications.

2 Hardware setup

The examples described in this document use a KW45B41Z-EVK, KW45B41Z-LOC, K32W148-EVK, FRDM-MCXW71, KW47-EVK, KW47-LOC, MCX-W72-EVK, or FRDM-MCXW72 as the development platform, as shown in the Figure 1, Figure 2, and Figure 3.

- The default interface selected in the IAR Embedded Workbench for Arm projects included in this release is below:
  - CMSIS-DAP for kw45b41zevk, kw45b41zloc, k32w148evk, frdmmcxw71
  - JLink for kw47evk, kw47loc, mcxw72evk, and frdmmcxw72 platforms
- Use jumpers to configure the boards in one of the available power configurations (refer to the specific board documentation).
- On all boards, the OpenSDA USB port is connected to a Windows PC. The OpenSDA chip on the board requires flashing with appropriate firmware with debugging and virtual serial COM port capabilities.

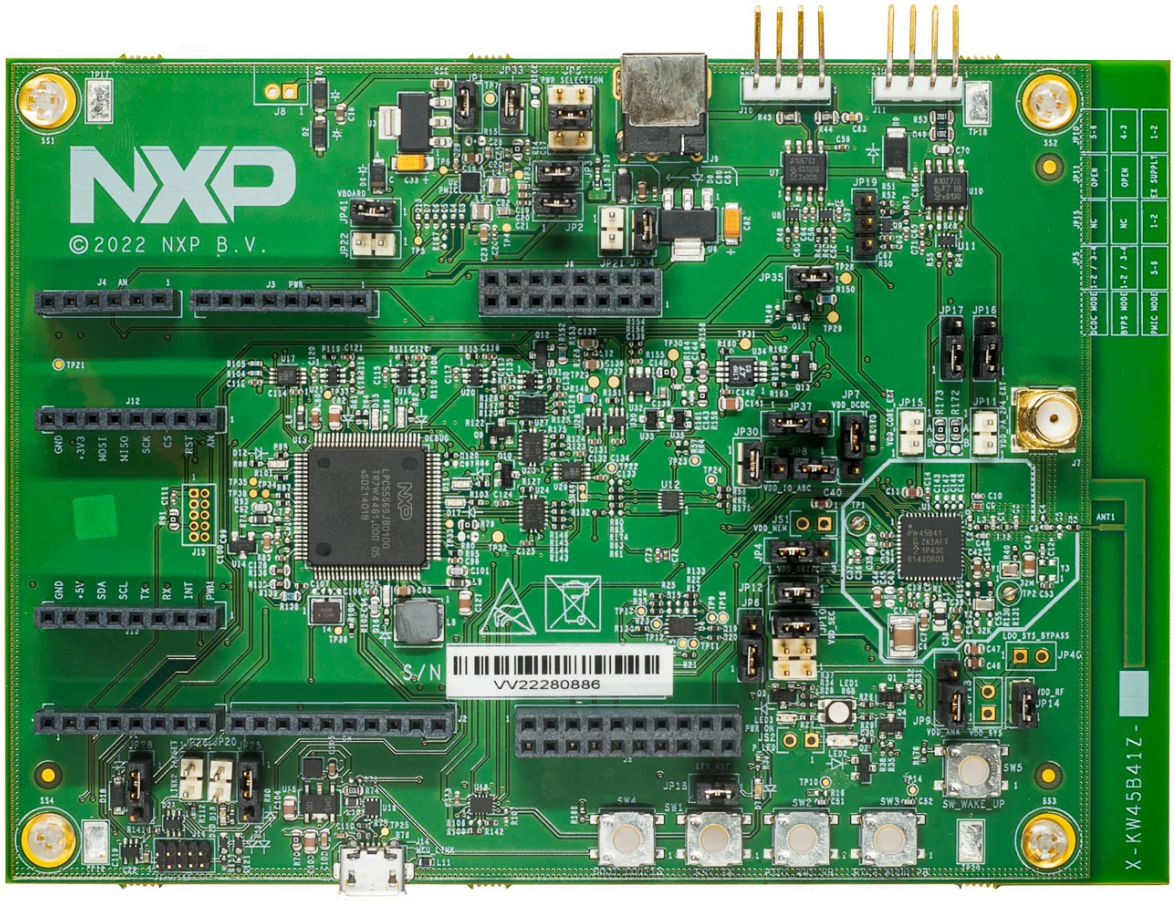

Figure 1. KW45B41Z-EVK / K32W148-EVK board

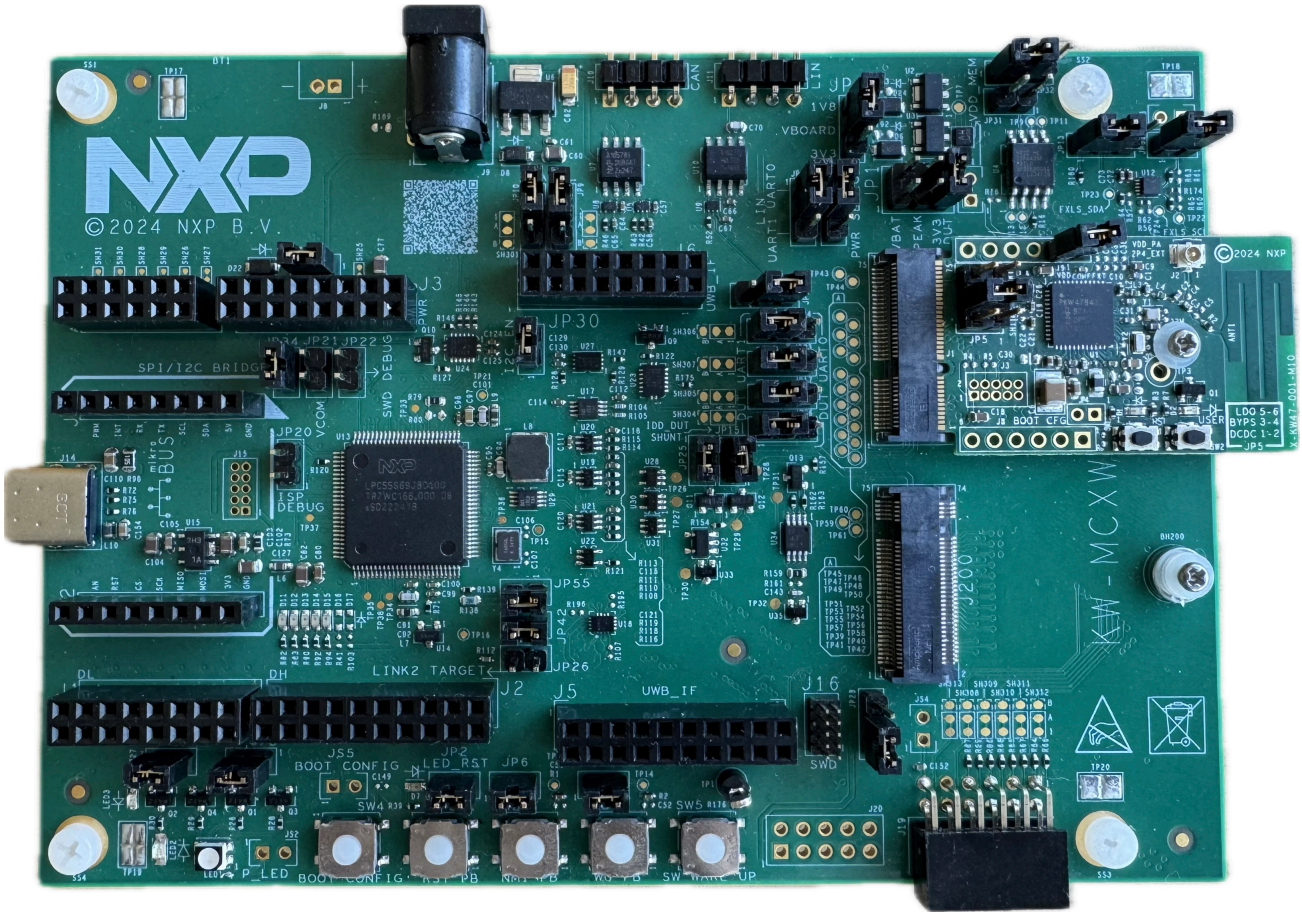

Figure 2. KW47-EVK / MCX-W72-EVK board

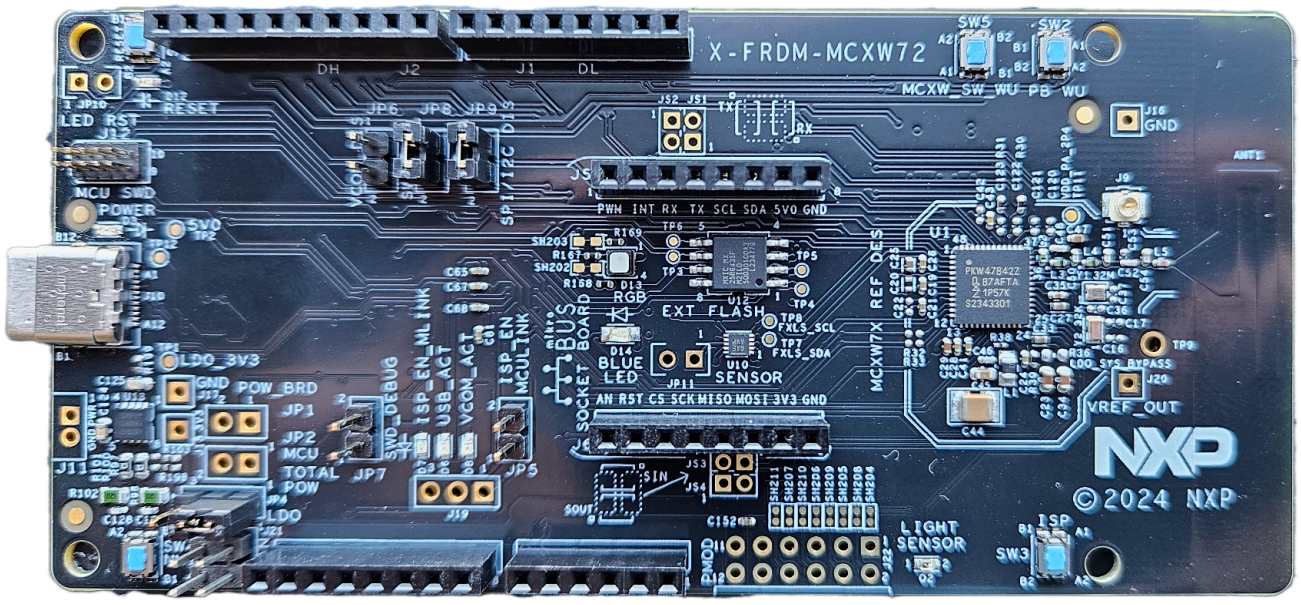

Figure 3. FRDM-MCXW71/FRDM-MCXW72 board

3 Installing the Connectivity Package

To install the Connectivity Package, configure and download the package archive from the staging system on the https://mcuxpresso.nxp.com website. You can simply download the precreated package archive if it is available on the same website.

Note: *Use the default location for the package (`C:\NXP`) and create a subfolder there specific to each device and release.*

Note: *Prior to loading any wireless SDK example, update your NBU image with the provided binaries in the following folder of the SDK: `../middleware/wireless/ble_controller/bin`*

4 Building the binaries

This section describes the necessary steps for obtaining the binary files for usage with the boards.

4.1 Prerequisites

To build any of the demo applications, you need the following toolchain:

- IAR Embedded Workbench for Arm (details in release note)
- MCUXpresso IDE (details in release note)
- Visual Studio Code with "*MCUXpresso for Visual Studio Code*" extension (details in release note)
- Teraterm (version 4.105 or higher)

The Connectivity Software Package does not include support for any other toolchains. The packages must be built with the debug configuration to enable debugging information. This package includes various sample applications that can be used as a starting point.

4.2 Conventions for building the *wireless_UART* application.

The following sections present the steps required for building the *wireless_UART* application. All applications can be found using the following placeholders for text:

- `<connectivity_path>`: represents the root path for the SDK.
- `<board>`: represents the target board for the demo app, “`kw47evk`” in this case.
- `<RTOS>`: represents the scheduler or RTOS used by the app; it can be either “`bm`” or “`freertos`”.
- `<demo_app>`: represents the demo application name.
- `<IDE>`: represents the integrated development environment used to build projects; “iar” in this case.
- `<core_id>`: represents the target CPU on which the application will run, "`cm33_core0`" in this case (applicable only on KW47-EVK, KW47-LOC, MCX-W72-EVK and FRDM-MCXW72 boards).
- The general folder structure of the demo applications is the following: `<connectivity_path>\boars\<board>\wireless_examples\bluetooth\<demo_app>\<core_id>\<RTOS>\<IDE>`

Selected application: w_uart

Board: One of the following boards:

- kw45b41zevk
- kw45b41zloc
- k32w148evk
- frdmmcxw71
- kw47evk
- kw47loc
- mcxw72evk
- frdmmcxw72

RTOS: FreeRTOS

Resulting location:

`<connectivity_path>\boards\<kw45b41zevk / kw45b41zloc / k32w148evk / frdmmcxw71 / kw47evk / kw47loc / mcxw72evk / frdmmcxw72>\wireless_examples\bluetooth\w_uart\freertos\<IDE>`

4.3 Building and flashing the BLE software demo applications using IAR Embedded Workbench

Use the following steps in order to build and flash the BLE software demo applications using the IAR Embedded Workbench:

1. First unpack the contents of the archive to a folder on the local disk. Then, navigate to the resulting location starting from the SDK root directory.
2. Open the IAR workspace file (`*.eww` file format) highlighted file in Figure 4.

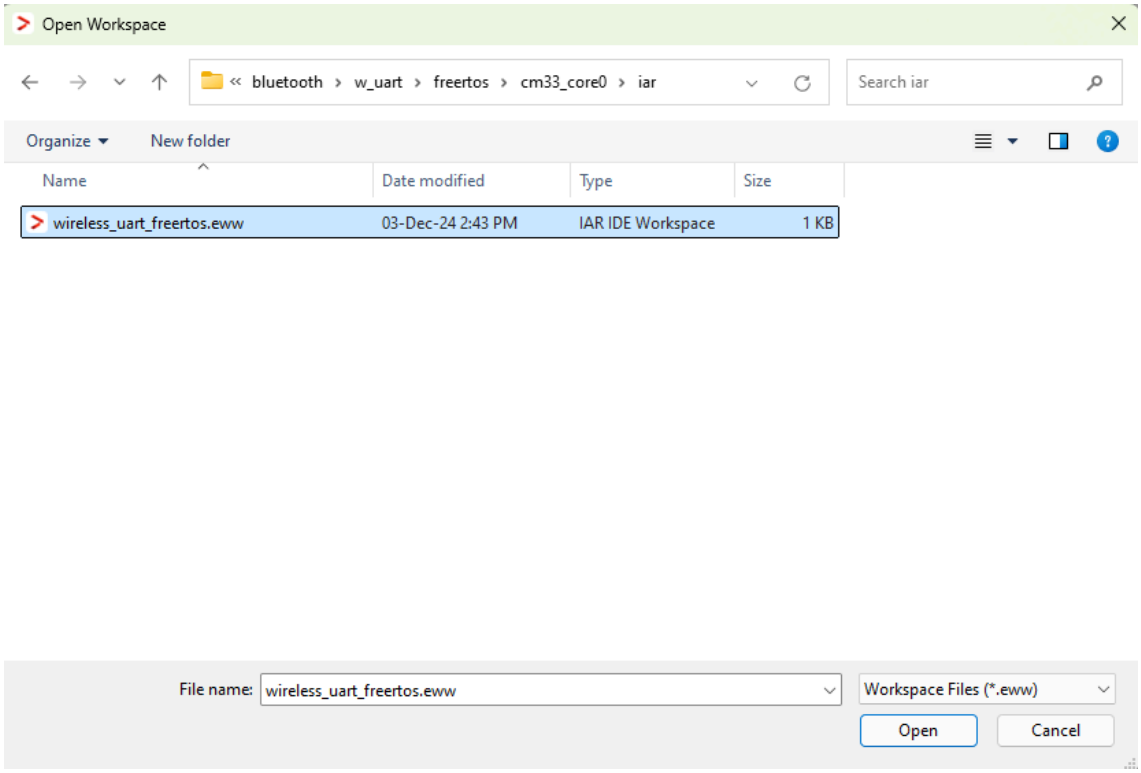

Figure 4. Wireless UART IAR demo project location

3. Choose between Debug and Release configurations in the drop-down selector above the project tree in the workspace, as seen in Figure 5.

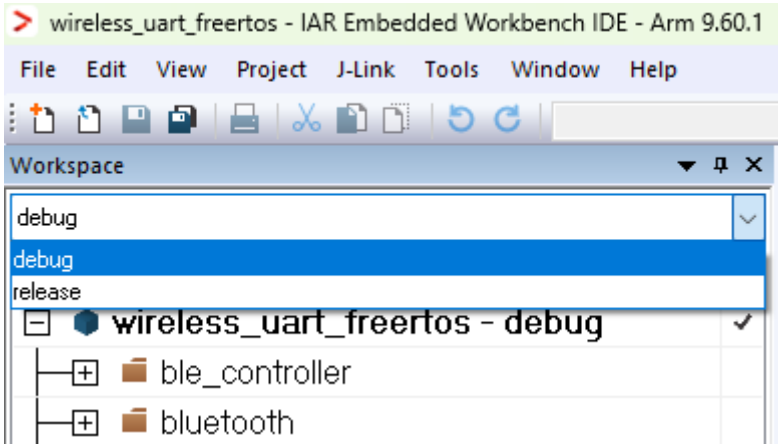

Figure 5. Select the desired configuration (Debug or Release)

Figure 6 shows the Wireless UART - IAR workspace.

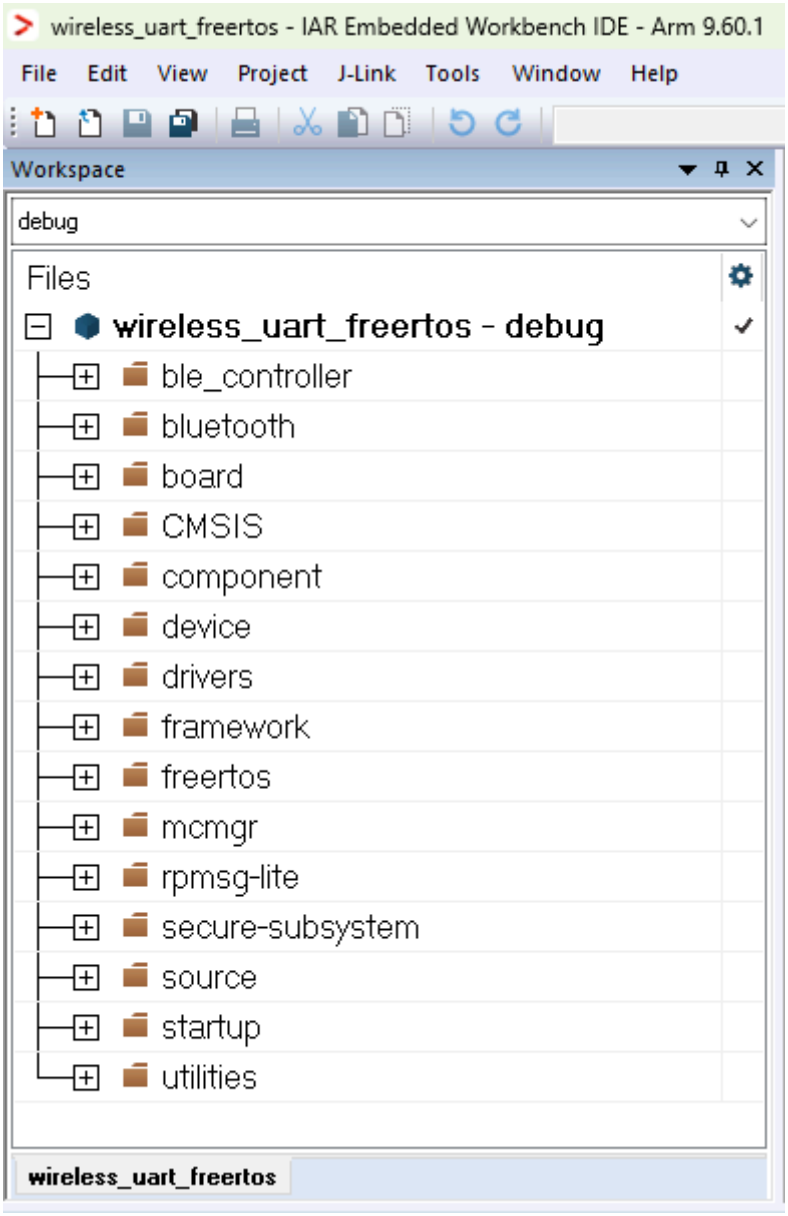

Figure 6. Wireless UART - IAR workspace

4. Build the Wireless UART project using the options shown in Figure 7.

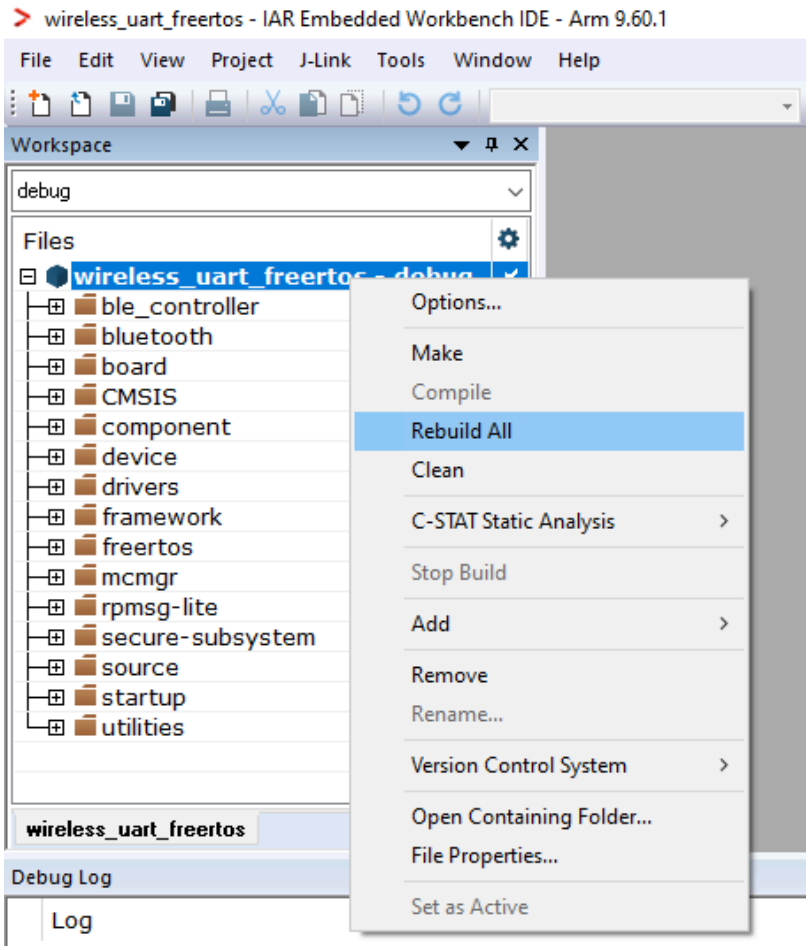

Figure 7. Build Wireless UART application

5. Make the appropriate debugger settings in the project options window, as seen in Figure 8.
   Project > Options (Alt+F7) > Debugger > Setup (tab) > Driver > J-Link/J-Trace

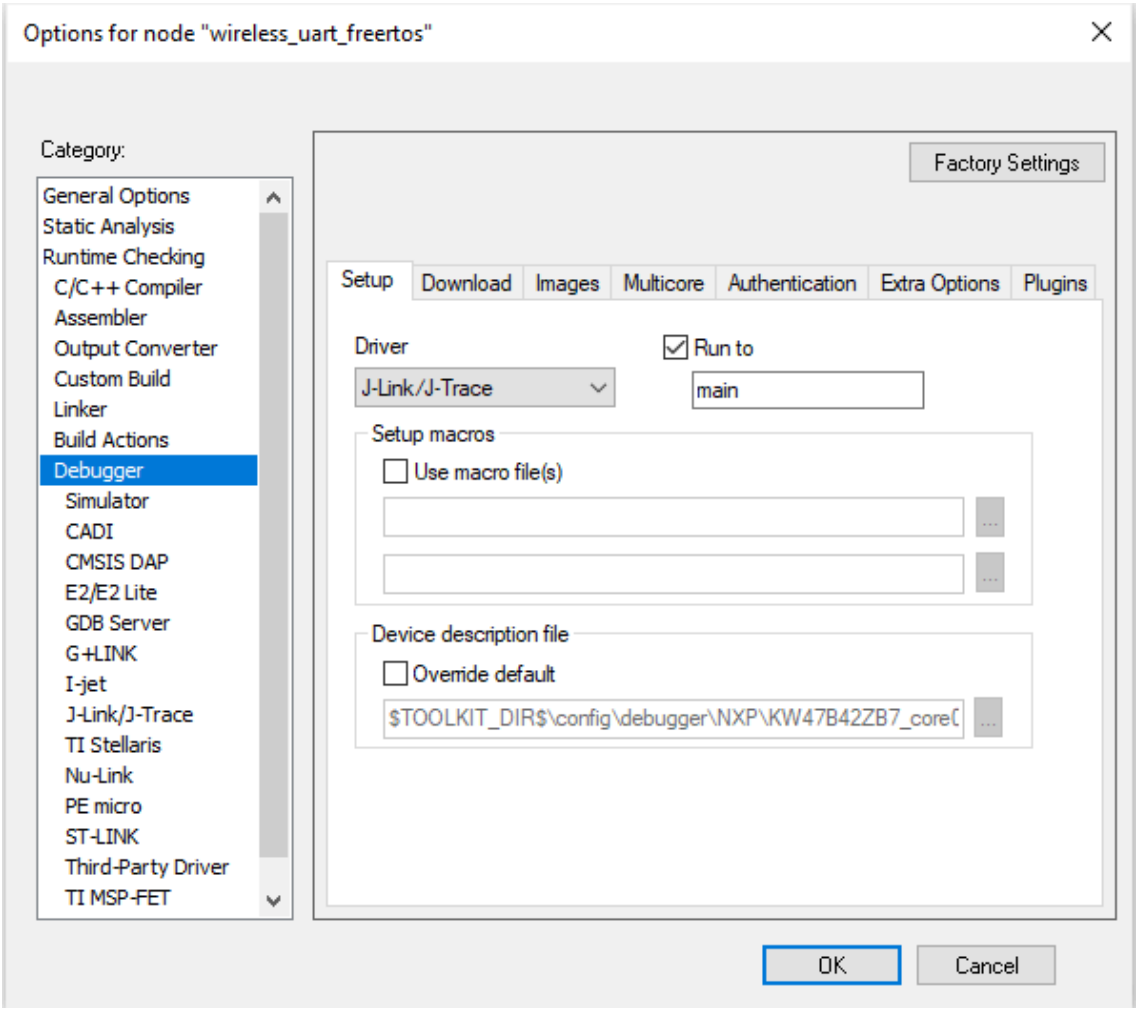

Figure 8. Debugger Settings for the Wireless UART project

6. Click the "**Download and Debug**" button (or **CTRL+D**) to flash the executable onto the board, as seen in Figure 9.

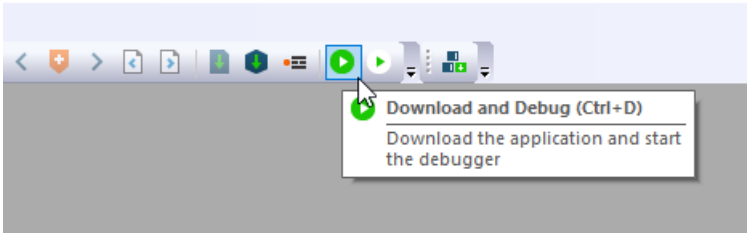

Figure 9. Download and Debug the Wireless UART application

7. Press **Go** (**F5**). At this moment, the board starts running the application as shown in Figure 10.

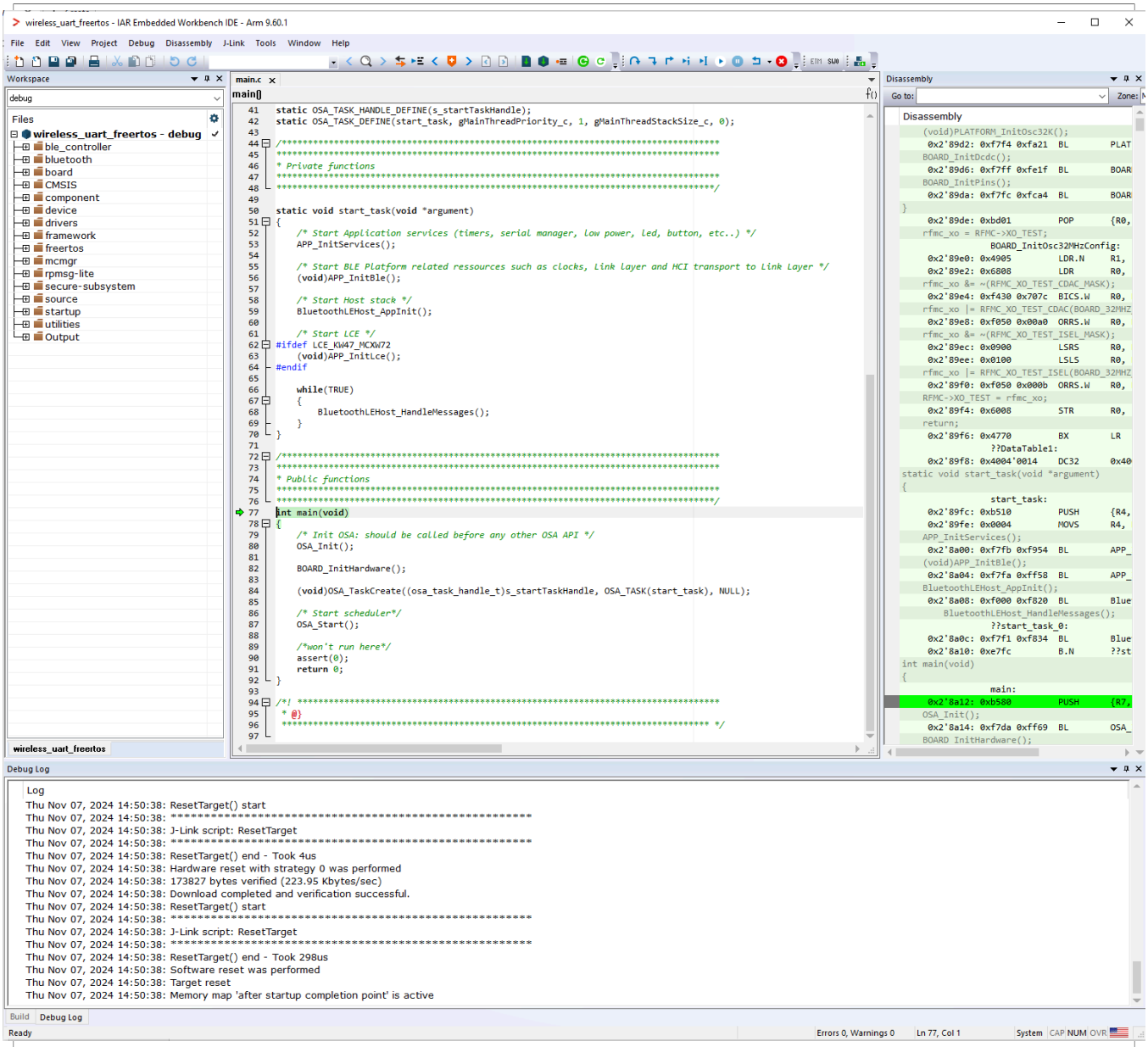

Figure 10. Running the code on IAR

4.4 Building and flashing the BLE Software Demo applications using MCUXpresso IDE

To build and flash the BLE software demo applications using MCUXpresso IDE, follow the steps listed below:

1. Open MCUXpresso IDE and open an existing or new workspace location.

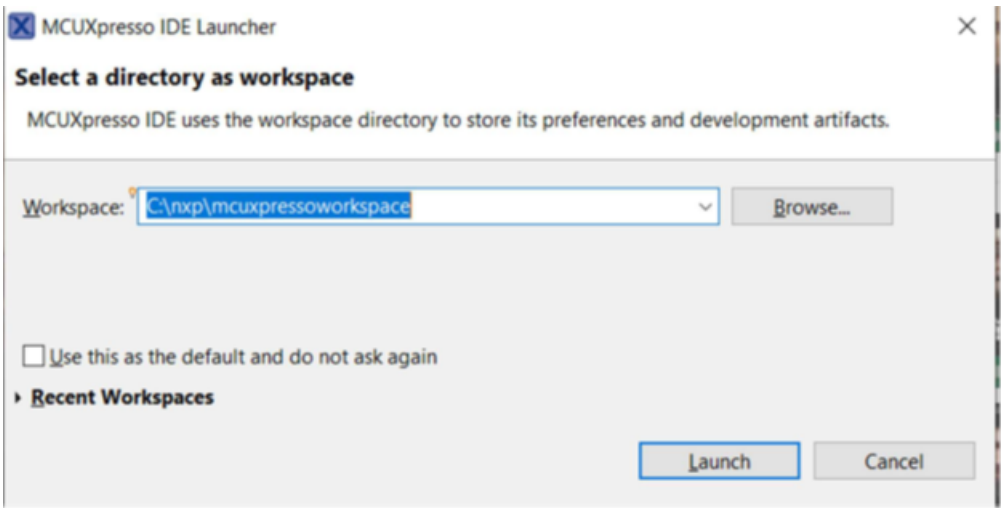

Figure 11. Select MCUXpresso IDE workspace

2. Drag and drop the package archive into the **MCUXpresso Installed SDKs** area in the lower right of the main window.

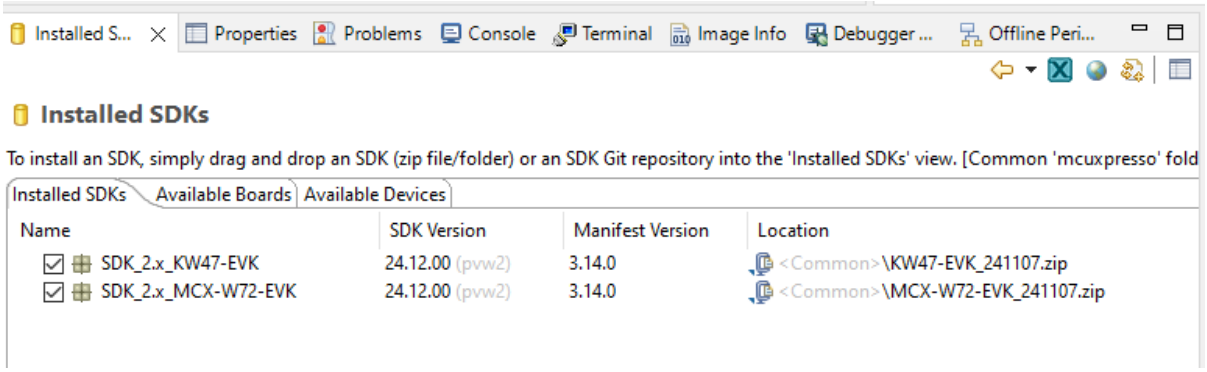

Figure 12. Installed SDKs in MCUXpresso IDE workspace

3. After the SDK is loaded successfully, select the "**Import the SDK examples(s)…**" to add examples to your workspace.

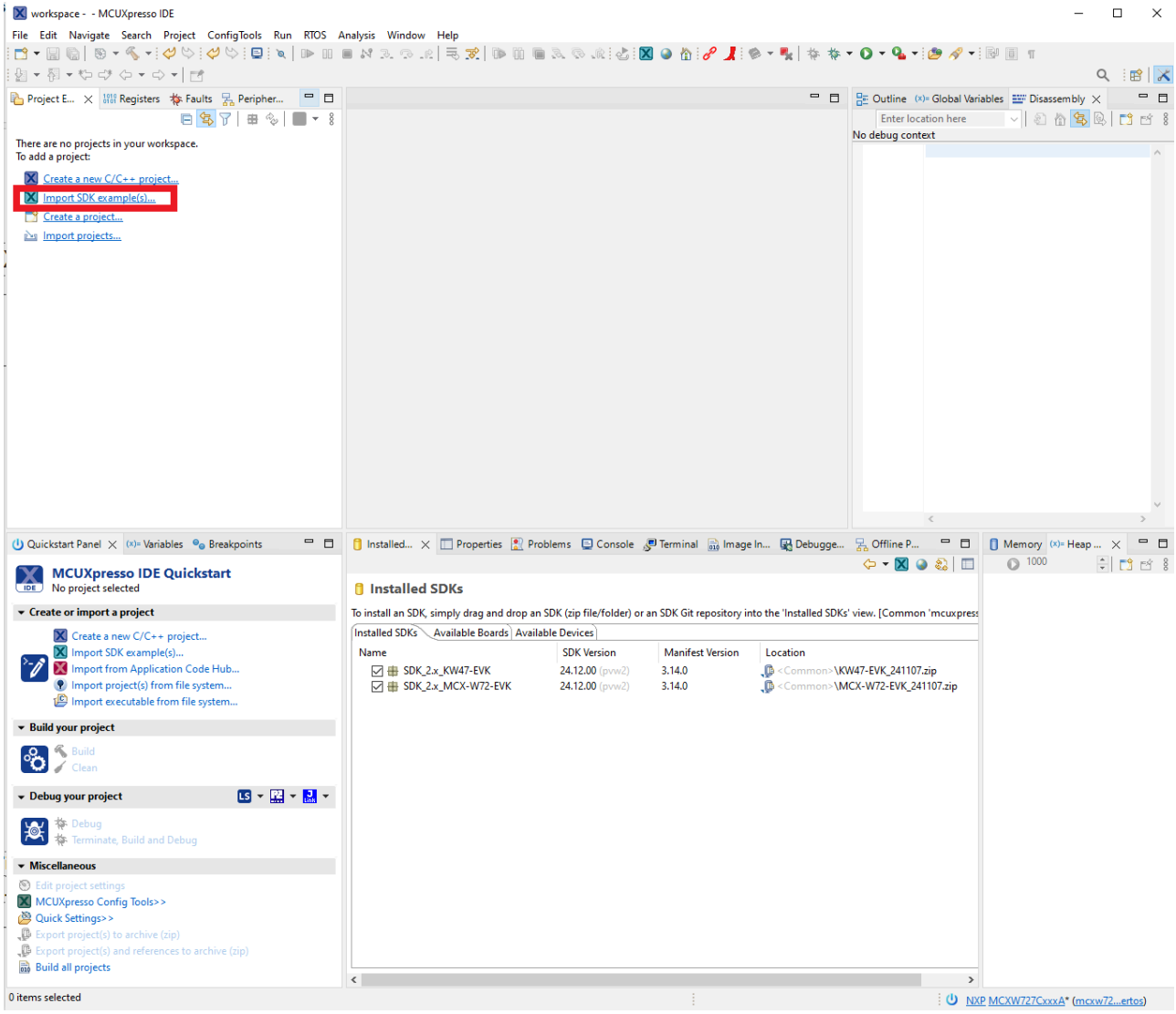

Figure 13. Importing SDK example(s)

4. To select the desired example(s), select the *kw45b41zevk / kw45b41zloc / k32w148evk / kw47evk / frdmmcxw71 / frdmmcxw72 / mcxw72evk / kw47loc* board and then click the "**Next**" button:

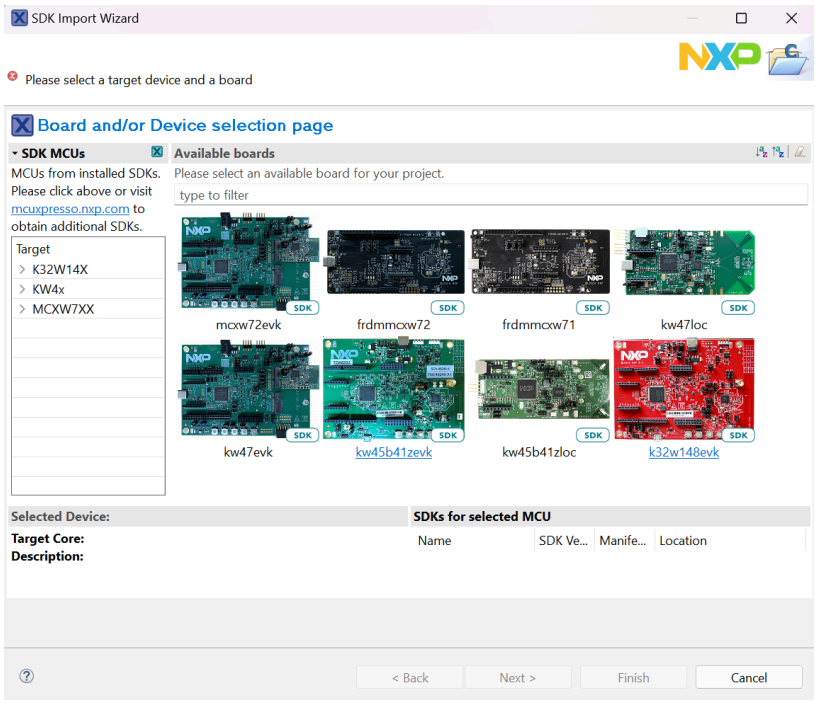

Figure 14. Selecting the KW47-EVK board

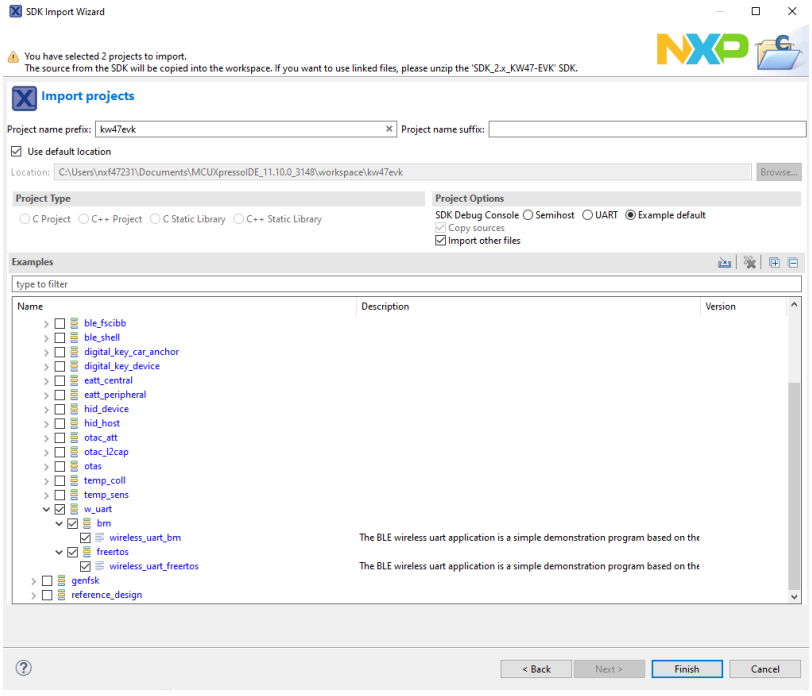

Figure 15. Select Wireless UART FreeRTOS project

5. Build the `wireless_uart_freertos` project.

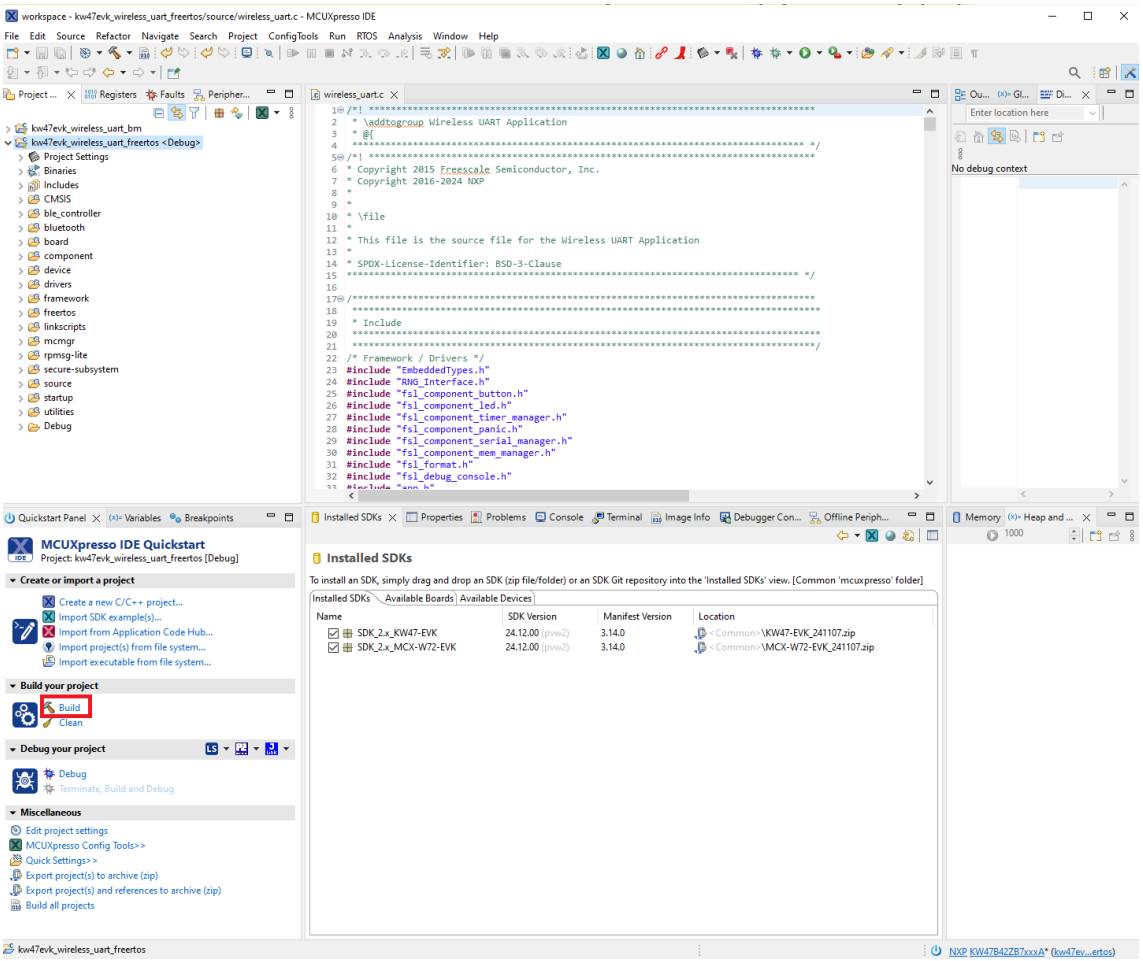

Figure 16. Build the Wireless UART FreeRTOS project

6. Click the "**Debug**" button to download the executable onto the board. Make sure you select the appropriate device to flash.

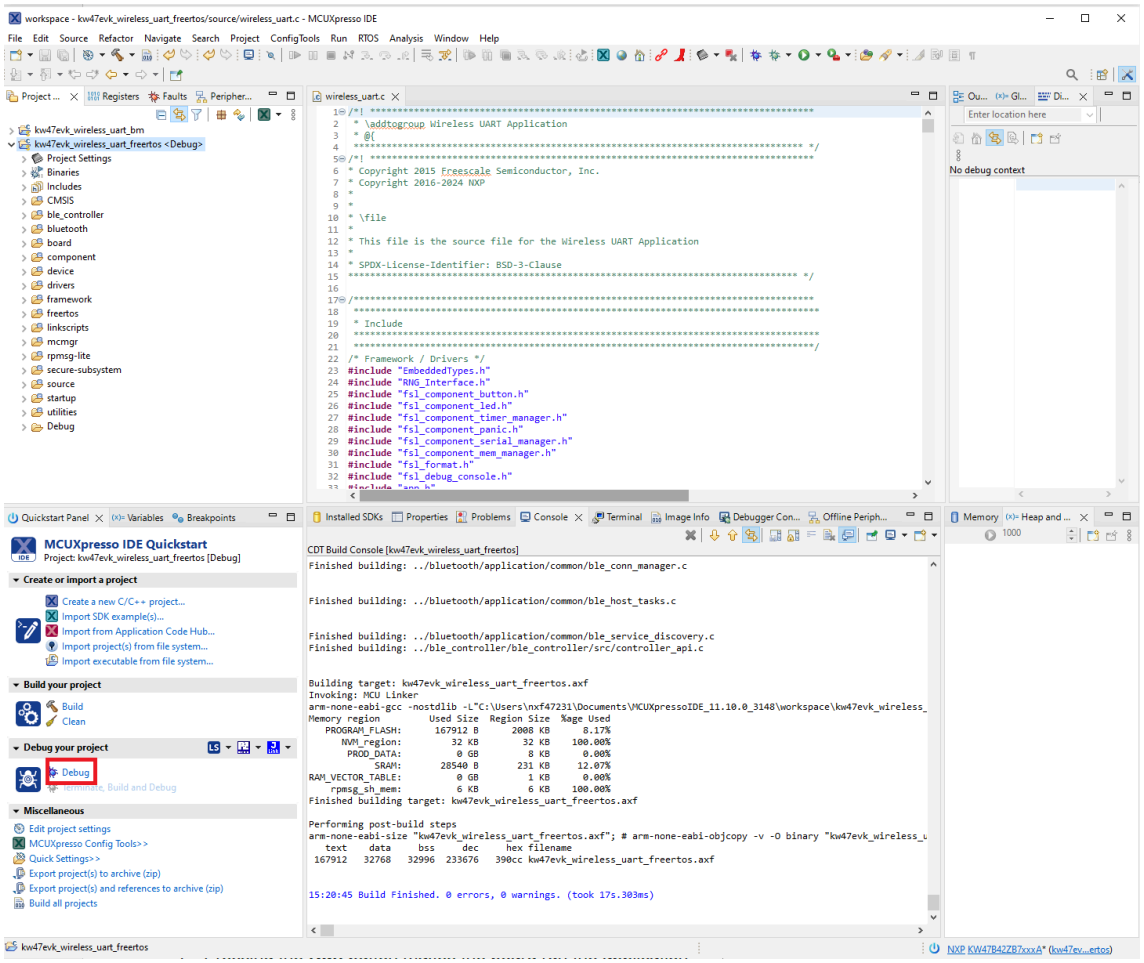

Figure 17. Download and debug the Wireless UART FreeRTOS project

7. Pressing the **Run** button makes the board run the application.

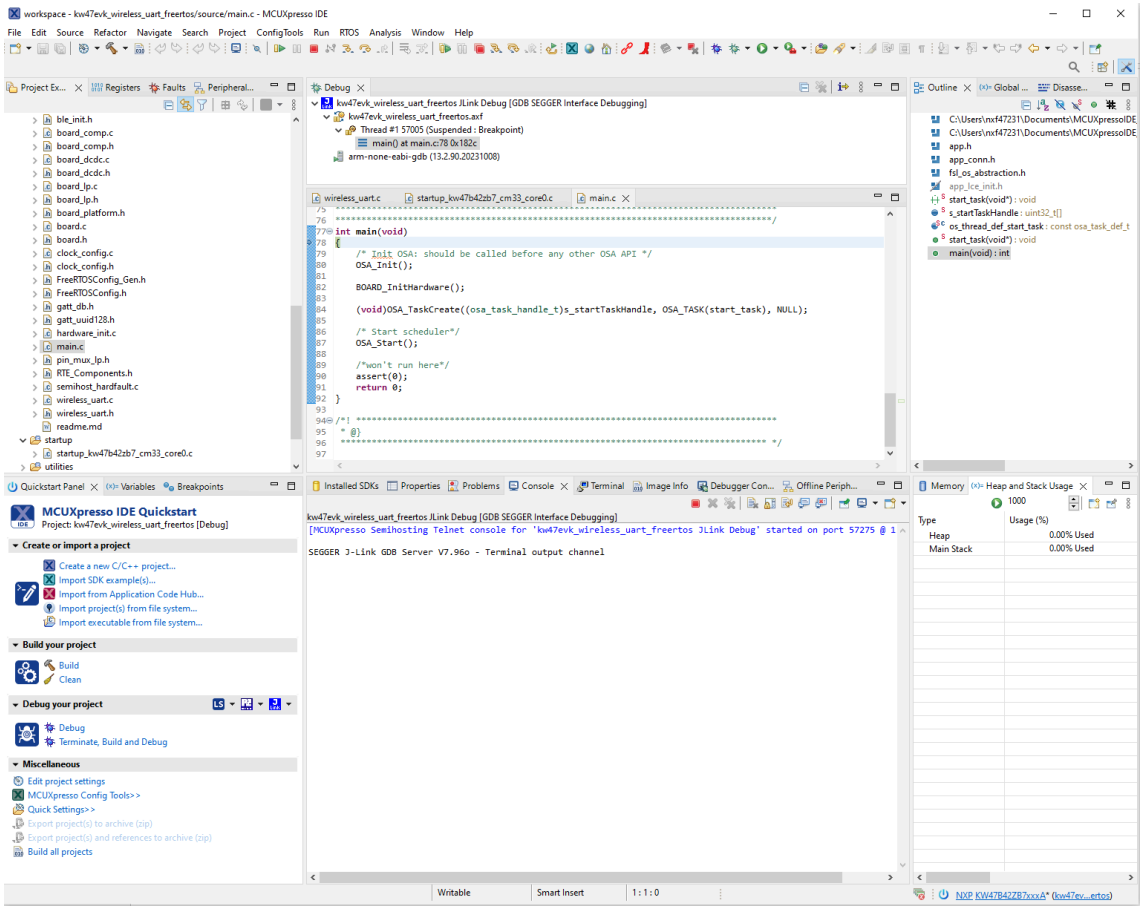

Figure 18. Running the code on MCUXpresso IDE

4.5 Building and flashing the BLE software demo applications using Visual Studio Code

To build and flash the BLE software demo applications using Visual Studio Code, follow the steps listed below:

1. Open Visual Studio Code and open the MCUXpresso for Visual Studio Code extension.

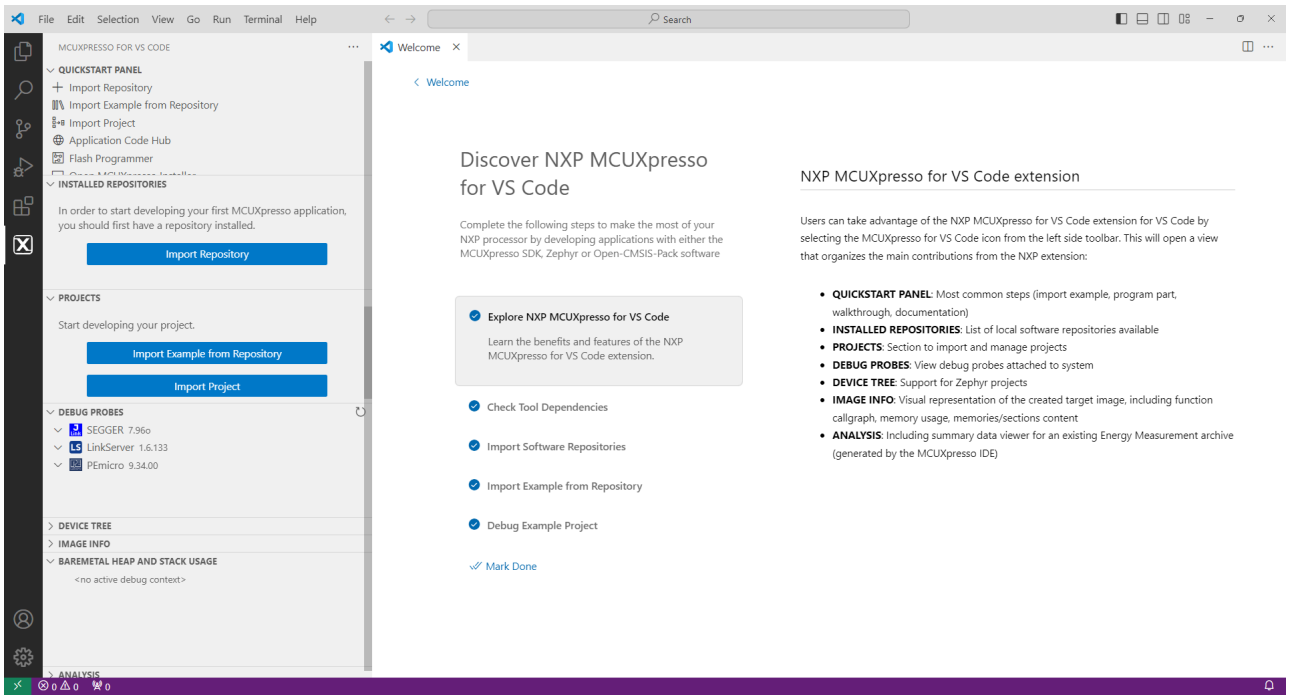

Figure 19. MCUXpresso for Visual Studio Code extension

2. Import the SDK package: click “**Import Repository**”. Then, choose the “**Local**” option (if the SDK is archived use “**Local archive**”), browse to the path of the SDK you want, and click “**Import**”.

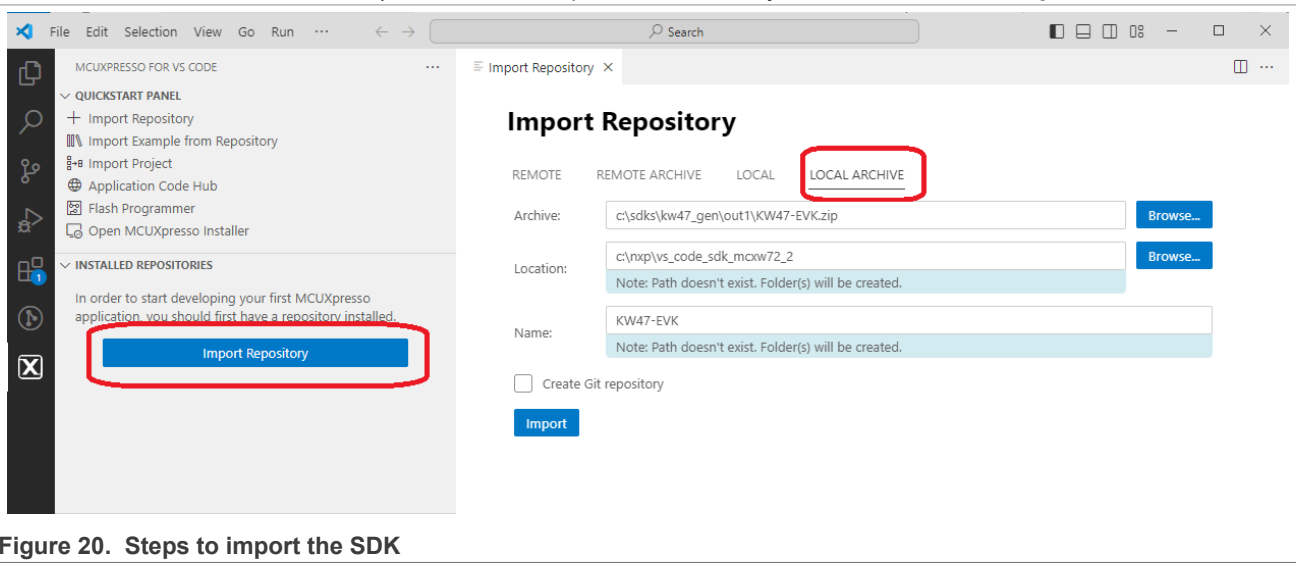

Figure 20. Steps to import the SDK

3. After the SDK is loaded successfully, select the “**Import Example from Repository**” to add an application to your workspace. Choose the repository, toolchain (Arm GNU), board, example you want to add, and the location where the VS Code project would be created. Then click “**Create**”.

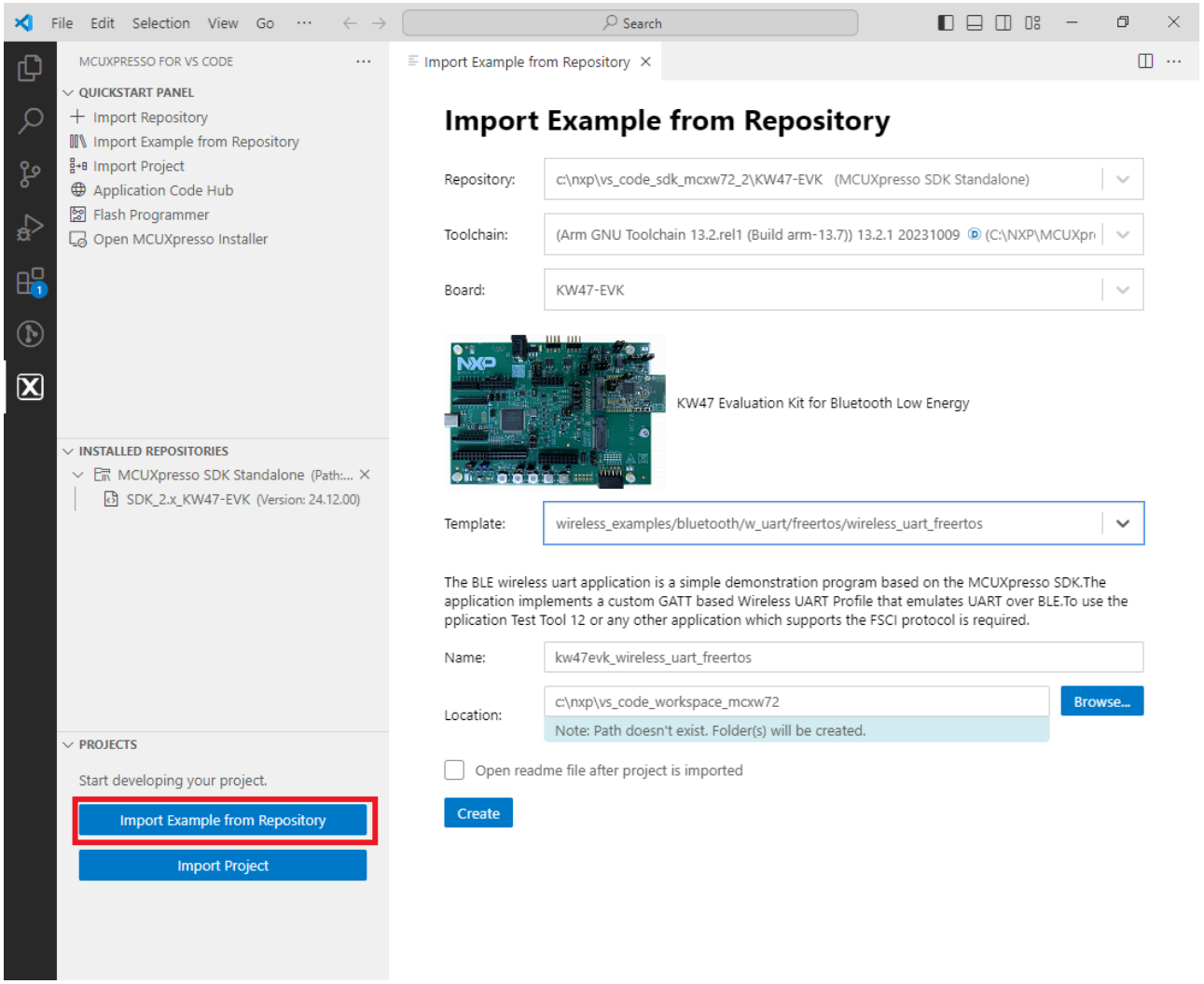

Figure 21. Steps to import the example application

4. The application now appears in the "**Projects**" tab on the left. Build the application by pressing the "**Build selected**" button.

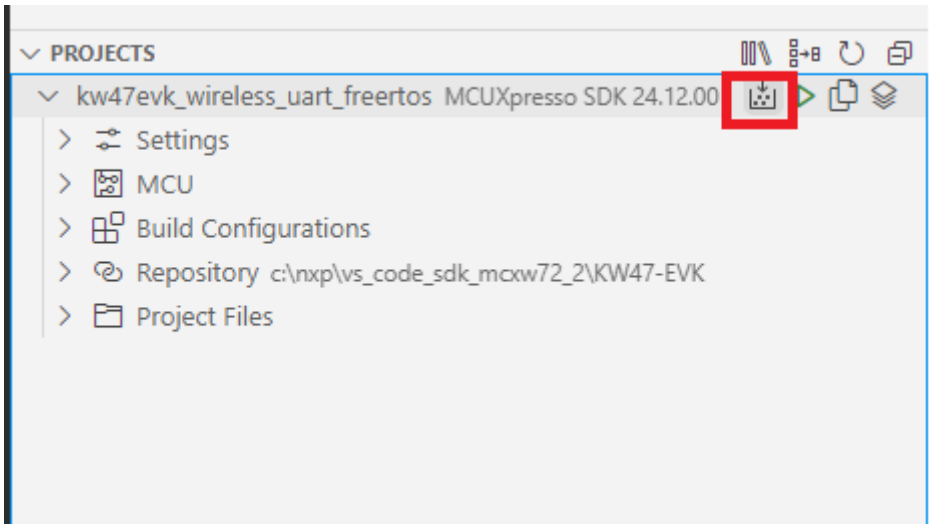

Figure 22. Building the Wireless UART FreeRTOS application

5. After the build is completed successfully, debug the application by clicking the "**Debug**" button.

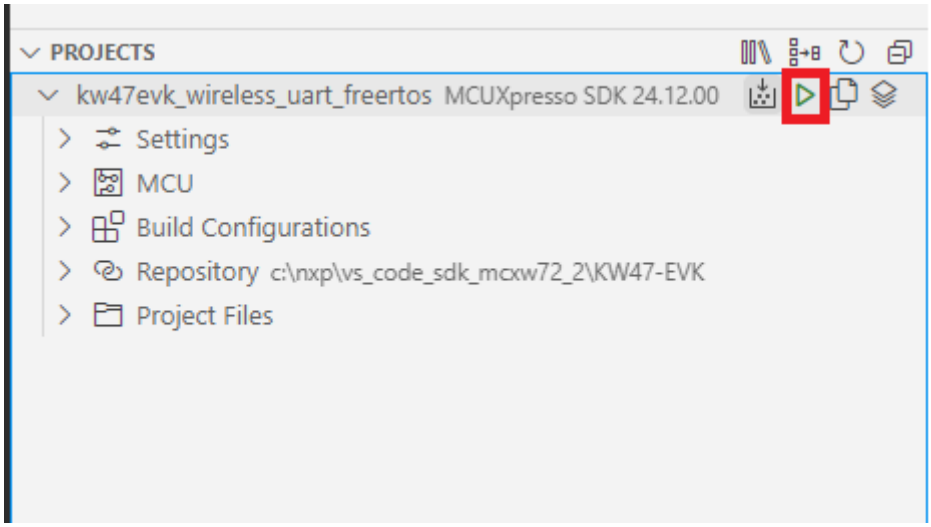

Figure 23. Debug the Wireless UART FreeRTOS application

6. Press the run ("**Continue**") button twice to run the application on the board.

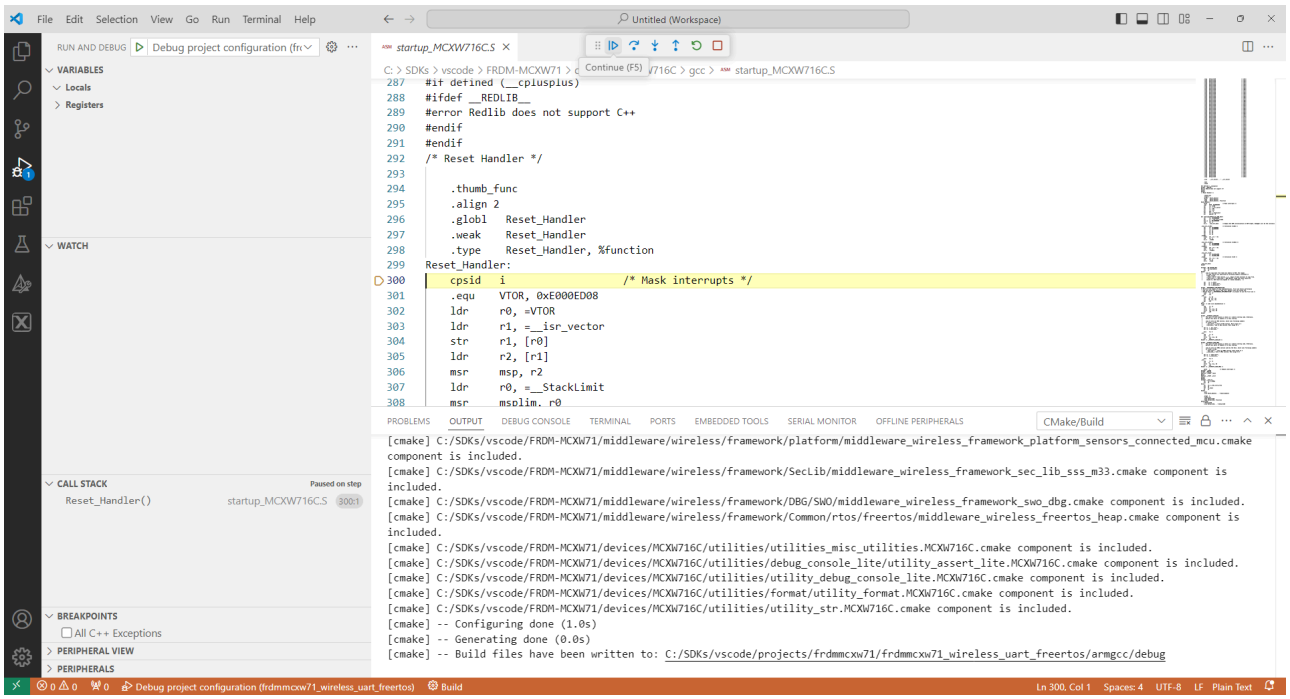

Figure 24. Running the Wireless UART FreeRTOS application

5 Running the Wireless UART application using NXP IoT Toolbox mobile application

To run the Wireless UART application using NXP IoT Toolbox mobile application, follow the steps as listed below:

Note: *Before working on these steps, ensure to install the latest version of the NXP IoT Toolbox mobile application from the application store.*

1. Flash the board with the Wireless UART application as previously described.
2. Open Tera Term (or any other Serial Communication software) and choose **Serial**. Then choose the port of your board and click **OK**. See Figure 25.

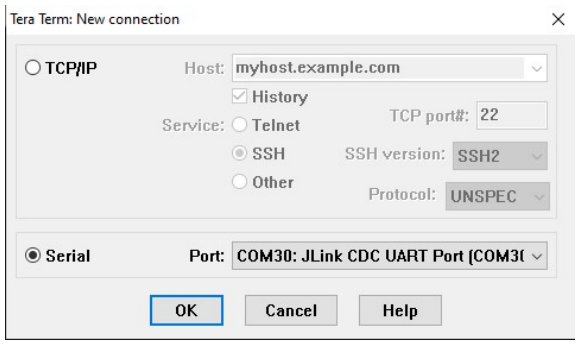

Figure 25. Setting up a new Tera Term connection for Wireless UART application

3. Stop running the code on the board. Go to **Setup >Serial Port**. See Figure 26.

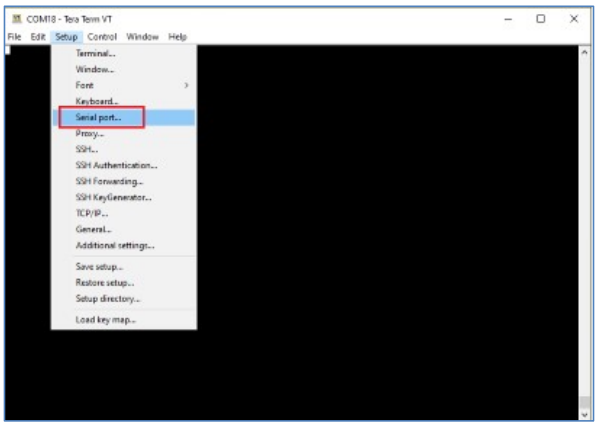

Figure 26. Setting the serial port

4. Choose the required Speed (baud rate) and Flow Control values. Here, the baud rate should be 115200 and the Flow control mode should be set to **Xon/Xoff**.

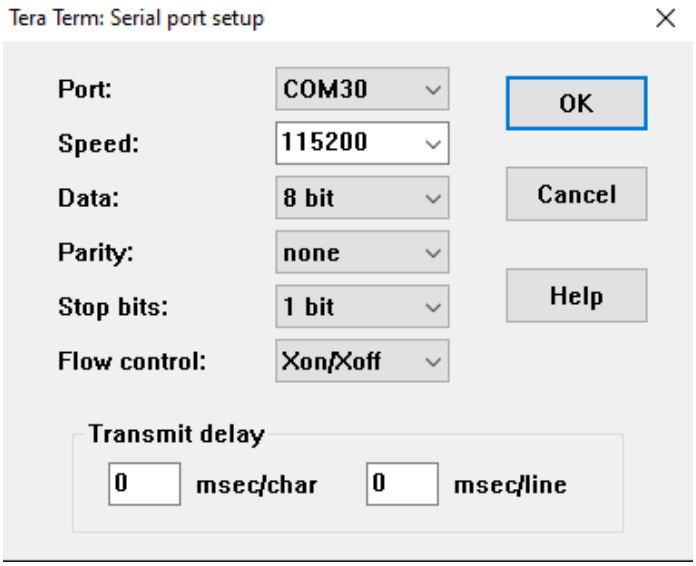

Figure 27. Setting the baud rate

5. Ensure that the Bluetooth device of your phone is enabled.
6. Open the *IoT Toolbox* application and select the ***Wireless UART*** icon, as shown in Figure 28.

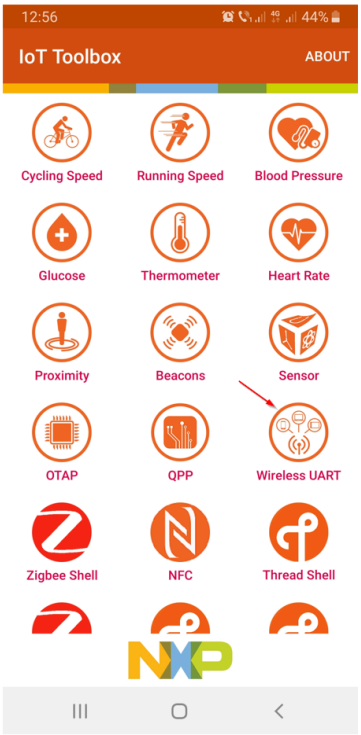

Figure 28. NXP IoT Toolbox application

7. Now run the application on the board. On this step, the RGB LED blinks white quickly. Press the button **SW3** to switch to Peripheral (Central) mode, then press **SW2** to start Advertising (scanning). The Tera Term terminal shows the message shown in Figure 29.

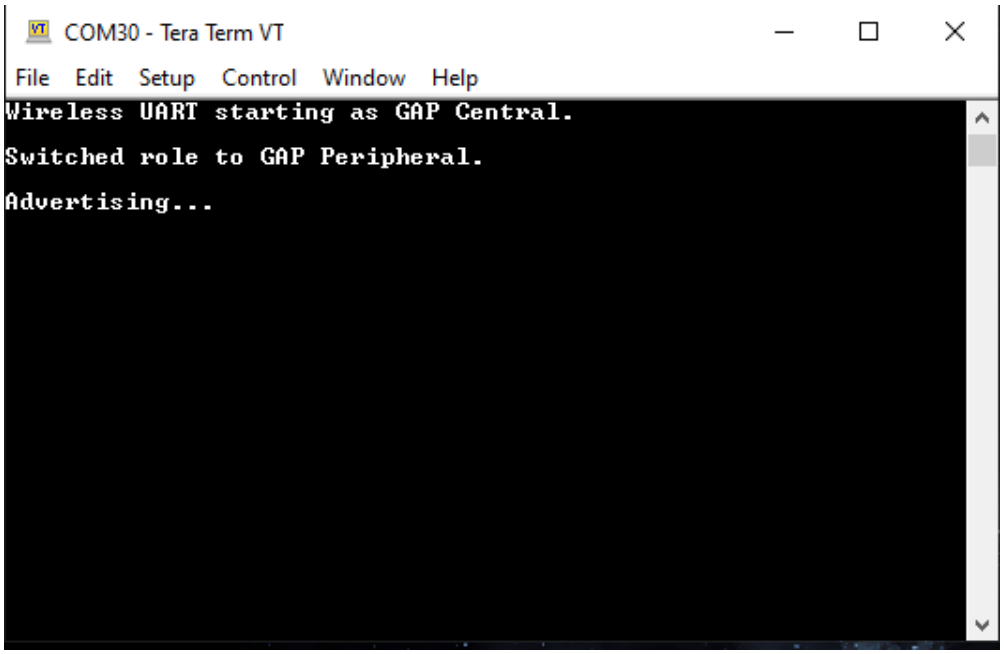

Figure 29. Tera Term console

8. The device should become visible for the Wireless UART mobile application, as shown in Figure 30.

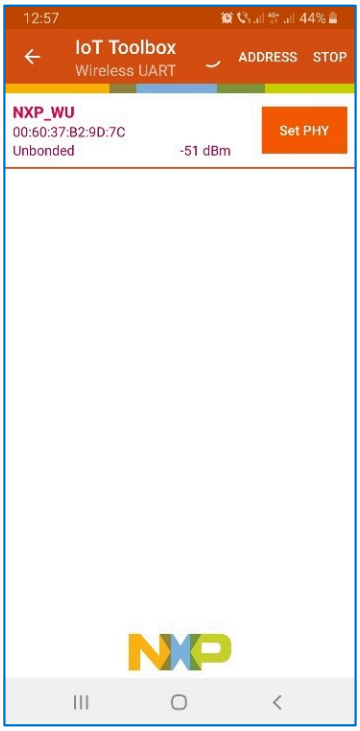

Figure 30. NXP Wireless UART scanned by IoT toolbox app

9. Select the device that appears in the **Wireless UART** tab to connect to it. After connecting, the mobile application shows the console, as shown below. Users can choose between the Wireless Console and Wireless UART tabs.
   The device should become visible for the Wireless UART mobile application, as shown in Figure 31.

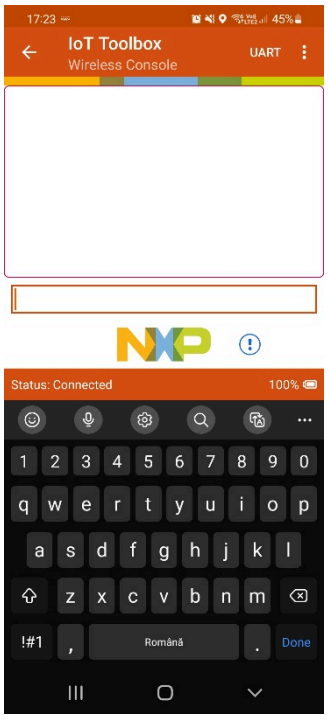

Figure 31. Wireless UART working in Connected mode

10. On the IoT Toolbox Wireless application console, the message is introduced in one line and sent to the peer. If Wireless UART mode is used, communication is done character by character. On Tera Term, the message received is displayed. One character at a time can be sent from Tera Term to the peer. When the mobile application receives the character, it displays it.
    The Figure 32 shows the board acting as a peripheral, connected to a phone using IoT Toolbox in Wireless Console and Wireless UART modes.

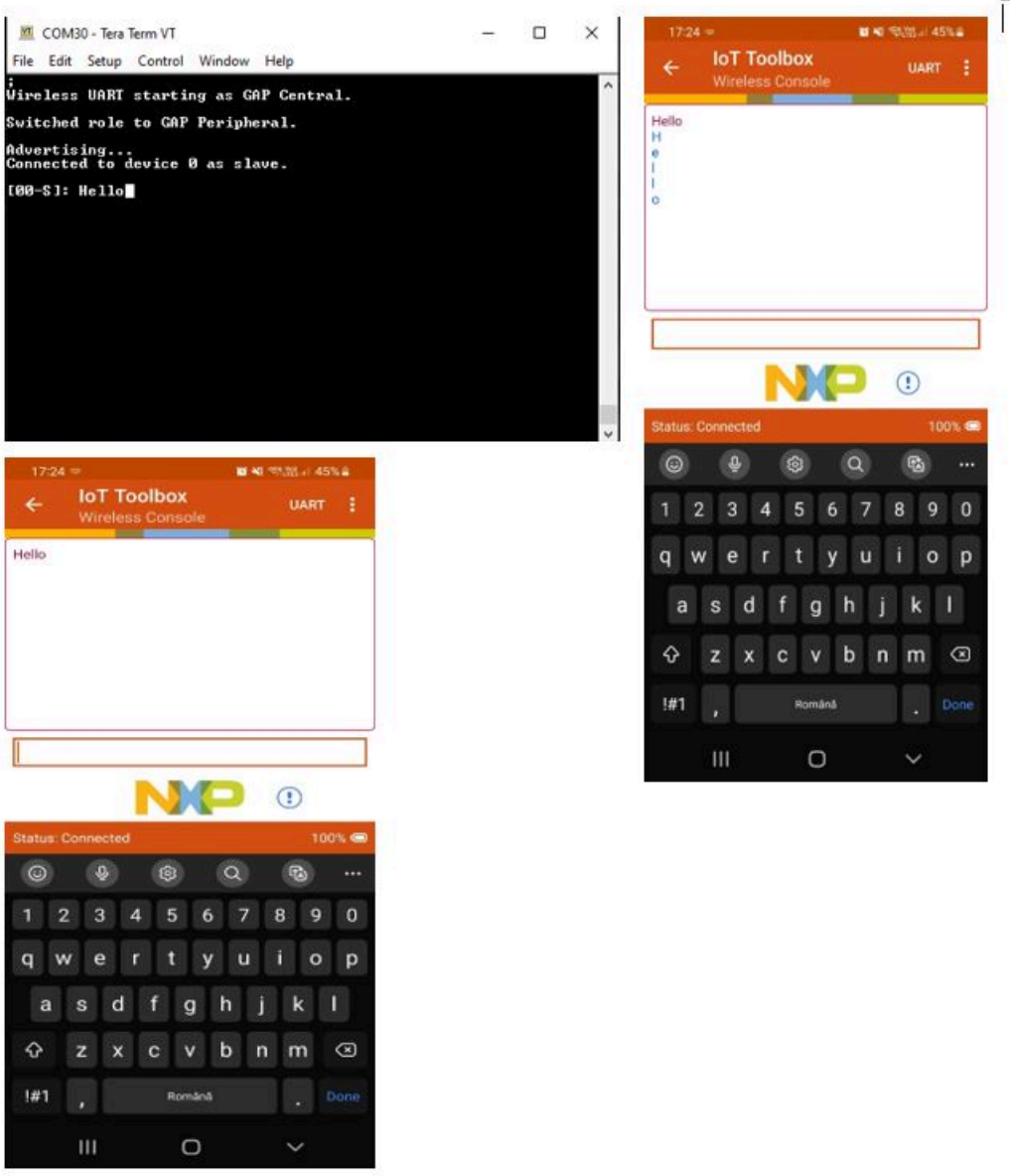

Figure 32. Exchanging messages between the phone and Wireless UART Console

6 References

For more information, refer to the NXP website or contact your local Field Application Engineer (FAE).

7 Acronyms and abbreviations

The following acronyms are used in this document.

Table 1. Acronyms and abbreviations

Acronym	Description
Bluetooth LE	Bluetooth Low Energy
EVK	Evaluation Kit
IDE	Integrated Design Environment
ISP	In-system Programming
IoT	Internet of Things
RTOS	Real-time Operating System
SDK	Software Development Kit
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

8 Note about the source code in the document

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9 Revision history

Table 2 summarizes the revisions to this document.

Table 2. Revision history

Document ID	Release date	Description
UG10181 v.1.1	23 December 2024	Updated for SDK 24.12.00 release
UG10181 v.1.0	26 November 2024	Initial release for KW47 EAR 2.1 milestone
KW45_K32W1_BLESWQSG v.1.3	20 September 2024	Updated for SDK 2.16.100 release. Updates in Section 4.5
KW45_K32W1_BLESWQSG v.1.2	26 June 2024	• Updated for SDK 2.16.000 release. • Added Figure 3.
KW45_K32W1_BLESWQSG v.1.1	5 April 2024	• Updated for SDK_2_15_000 release. • Figures updated in Section 2.
KW45_K32W1_BLESWQSG v.1.0	25 October 2023	Initial release for MR3 milestone

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