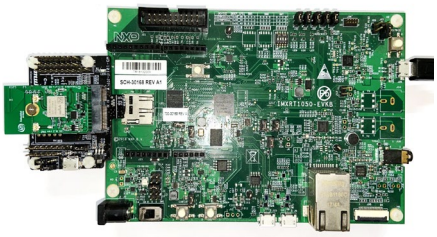
E2B-07-1398

**Murata Wi-Fi/BT (NXP) Solution for i.MX**

**FreeRTOS Quick Start Guide**



## Revision History

| Revision | Date | Author | Change Description |
|---|---|---|---|
| 1.0 | August 30, 2021 | TF | Initial Release |
| 1.1 | Sept 3, 2021 | TF | Fix Murata MCUXpresso 2.10.0 SDK patch link. |

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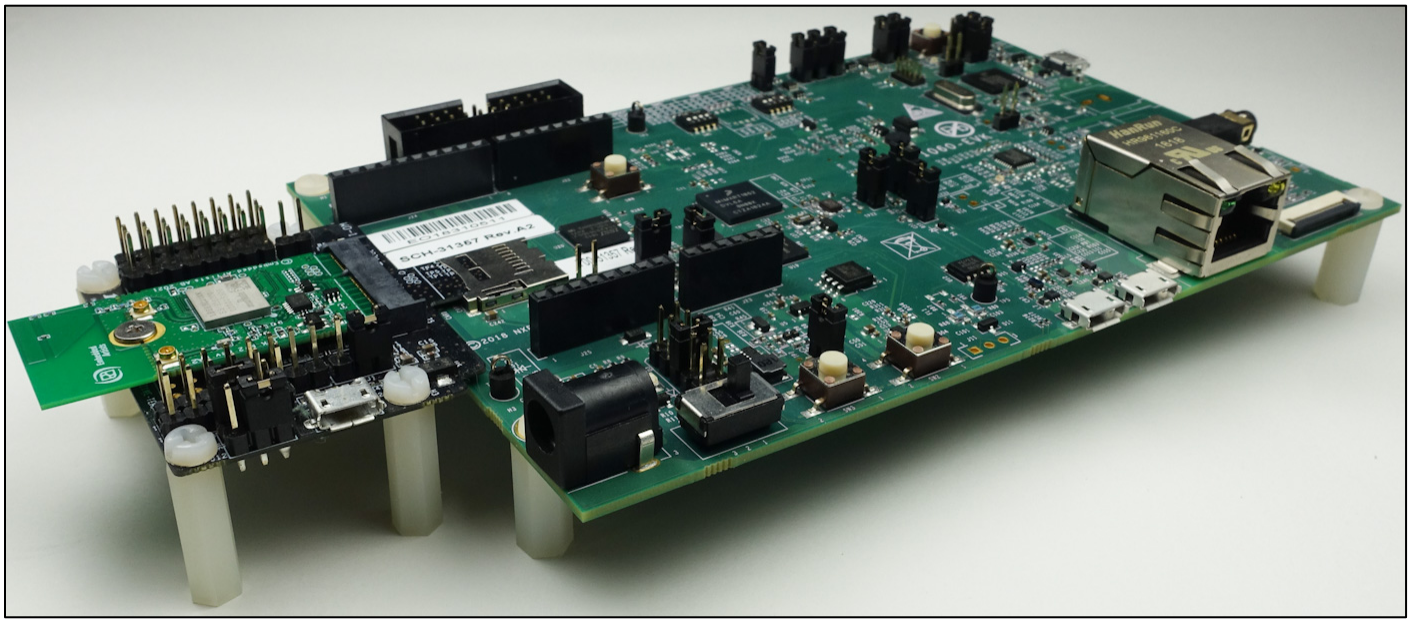
# 1 Introduction

This document details enabling Murata's (NXP-based) Wi-Fi/Bluetooth modules on NXP i.MX RT Evaluation Kits (running FreeRTOS), using Embedded Artists' Wi-Fi/BT M.2 modules. Murata supports several NXP i.MX RT EVK's and Wi-Fi/Bluetooth M.2 modules with a newly released patch for MCUXpresso 2.10.0 SDK. This Quick Start documents only one hardware/software configuration to introduce users to the Murata solution. For more details on different configurations supported, please refer to the Murata Wi-Fi/BT (NXP) Solution for i.MX FreeRTOS User Guide. **Figure 1** below shows one such example – NXP i.MX RT1060 EVK with Type 1XK module (enabled by Murata's uSD-M.2 Adapter and Embedded Artists' 1XK M.2 module).

**Figure 1: NXP i.MX RT1060 with Type 1XK (WLAN-Only)**



The NXP and Embedded Artists platforms currently supported are based on i.MX RT microprocessors. Wireless connection is provided by either the Embedded Artists' Wi-Fi/BT M.2 EVBs directly, or by combining with Murata's uSD-M.2 Adapter.

The example setup used to illustrate the various steps is NXP i.MX RT1050 EVK with Murata Type 1XK module (on Embedded Artists' M.2 module with uSD-M.2 Adapter interconnect), connected to a host PC running Windows®.

**Note that the following parts are used in this quick start guide:**

- NXP IMXRT1050-EVKB
- Embedded Artists EAR00385
- Murata LBEE0ZZ1WE-TEMP (LBEE0ZZ1WE-uSD-M2)

# 2 References

## 2.1 Murata's uSD-M.2 Adapter Landing Page

This website landing page provides latest/comprehensive information on Murata's adapter including links to where it can be purchased.

## 2.2 Embedded Artists' M.2 Modules Landing Page

This website landing page provides latest/comprehensive information on Embedded Artists' M.2 modules which enable Murata Wi-Fi/BT modules for easy evaluation.

## 2.3 Murata's i.MX Wireless Solutions Landing Page

This website landing page provides latest/comprehensive information on Murata's i.MX Wireless solutions which use the uSD-M.2 Adapter as a key enabler so customers can easily evaluate Murata's modules on i.MX processors.

## 2.4 Murata's Community Forum Support

Murata's Community provides online support for all of Murata's i.MX Wireless solutions. Refer to this link for existing support threads.

## 2.5 Murata Wi-Fi/BT (NXP) Solution for i.MX FreeRTOS User Guide

This User Guide details steps to get Murata (NXP-based) Wi-Fi/Bluetooth solution up and running quickly on NXP i.MX RT EVK's.

## 2.6 Murata Patching Solution

This archive file contains the files necessary to enable the Murata module for the wifi_iperf example on i.MX RT 1050 EVK. It also patches any other i.MX RT SDK's present with Murata enhancements. The user is prompted to allow overwrite of MCUXpresso SDK source folders.

## 2.7 Murata uSD-M.2 Adapter Datasheet (Rev B1)

This datasheet documents the current version of the Murata's uSD-M.2 adapter hardware and its interfacing options.

## 2.8 Murata Wi-Fi/BT Solution for i.MX Hardware User Manual

This manual describes the Murata uSD-M.2 Adapter hardware. All interface signals to the NXP i.MX RT EVK's are described. Specifics on interfacing each i.MX EVK to Murata uSD-M.2 Adapter are provided.

# 3 Example Setup

## 3.1 Hardware

**Figure 2** below provides a high-level overview of the hardware interconnect. Embedded Artists' 1XK M2 module is connected to NXP's i.MX RT1050 EVK via Murata's uSD-M2 Adapter. To enable an optional "radio enable" line (see **Figure 3**, J22/Pin3 on RT1050 EVK can be connected to J9/Pin3 of the uSD-M.2 Adapter using the included jumper cable in Murata's kit.

**Figure 2: Connecting the Wi-Fi/BT M2 module to the i.MX RT EVK**

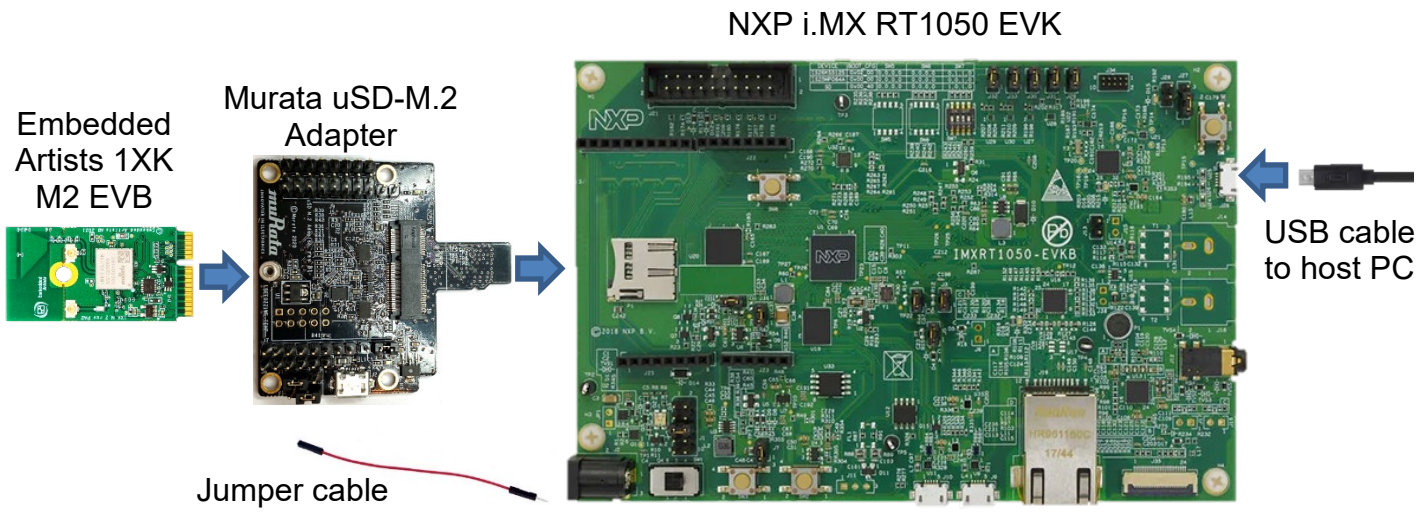
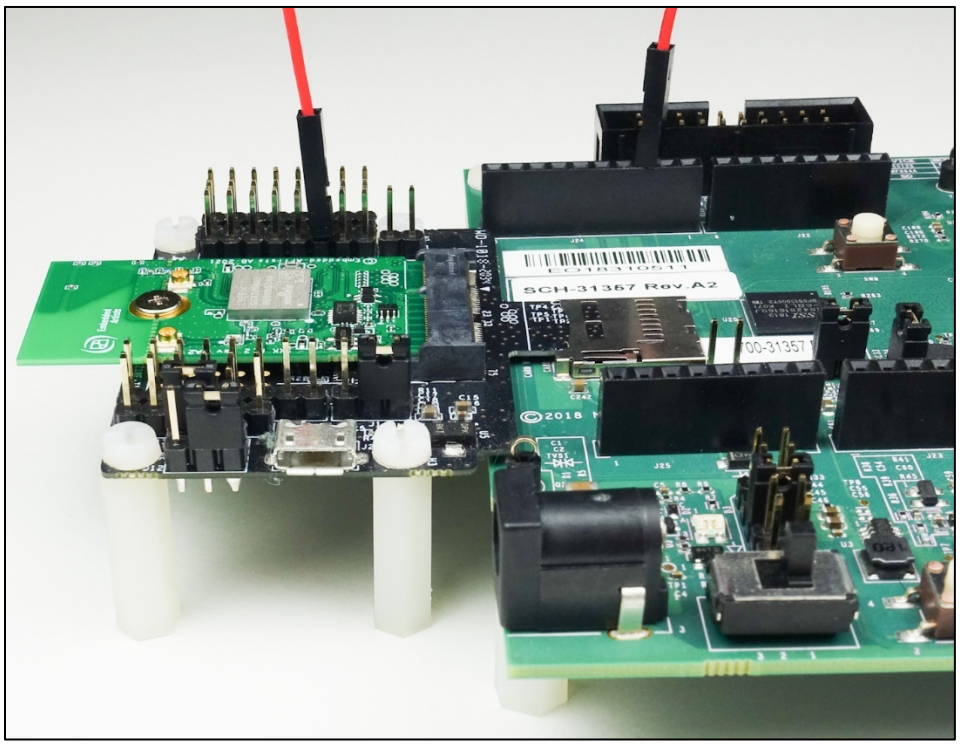



**Figure 3: Connected Setup with close-up of radio enable line**



## 3.2 Software

While multiple IDEs can be used to develop on the i.MX RT 1050 EVK, this example uses NXP's MCUXpresso IDE.

1. Download and install the following software.
   a. MCUXpresso IDE (version 11.4.0)
   b. mbed Virtual COM Port Driver (The EVK must be plugged in before installing this)
   c. A terminal application (Tera Term, PuTTY, etc.).
   d. iPerf

   Refer to the NXP i.MX RT 1050 EVK getting started page for more details.

2. Download the latest 2.10 SDK for i.MX RT1050 EVK using the MCUXpresso SDK Builder on NXP website.
   a. Go to SDK Builder homepage here: https://mcuxpresso.nxp.com/en/welcome
   b. Click on "Select Development Board" and sign in with your NXP login credentials.
   c. On the "Select Development" page, enter "EVKB-IMXRT1050" under "Search by Name". This will correctly highlight/select the i.MX RT1050 EVK we are using.
   d. On the right side of the page, click on "Build MCUXpresso SDK v2.10.0".
   e. You will now transition to "Build SDK for EVKB-IMXRT1050" page. Click the "Select All" button followed by the "Download SDK" button. Click on "I Agree" to the EULA.
   f. The i.MX RT1050 SDK is now being downloaded.
   g. Once downloaded, hit the "Close button" on pop-up window.
   h. Examine your "Downloads" folder directory – it should now list "**SDK_2_10_0_EVKB-IMXRT1050.zip**".

3. Launch the installed MCUXpresso IDE 11.4 and select the IDE view.

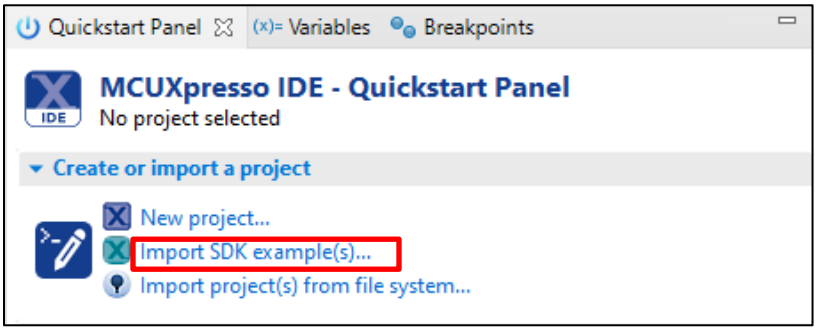
4. Open "Installed SDKs" tab (bottom middle of IDE). Drag and drop the new SDK file into this region. You should then see the SDK zip file being copied over and appear on the "Installed SDK" list.

# 4 Import Example

Various sample applications are provided by the SDK. The wifi_iperf example, which is a performance test for the 1XK module, will be used in this document.

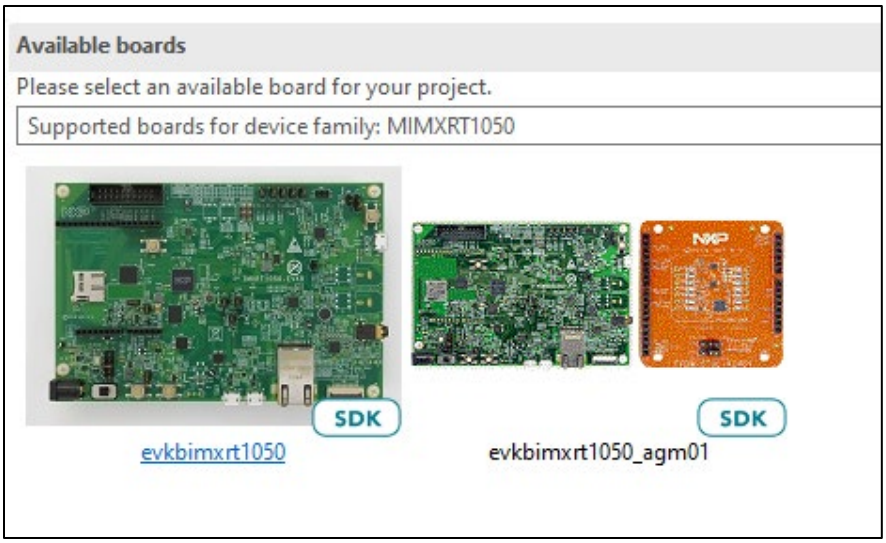
1. Click on **Import SDK example(s)…** in the "Quickstart" Panel.

**Figure 4: Import SDK**



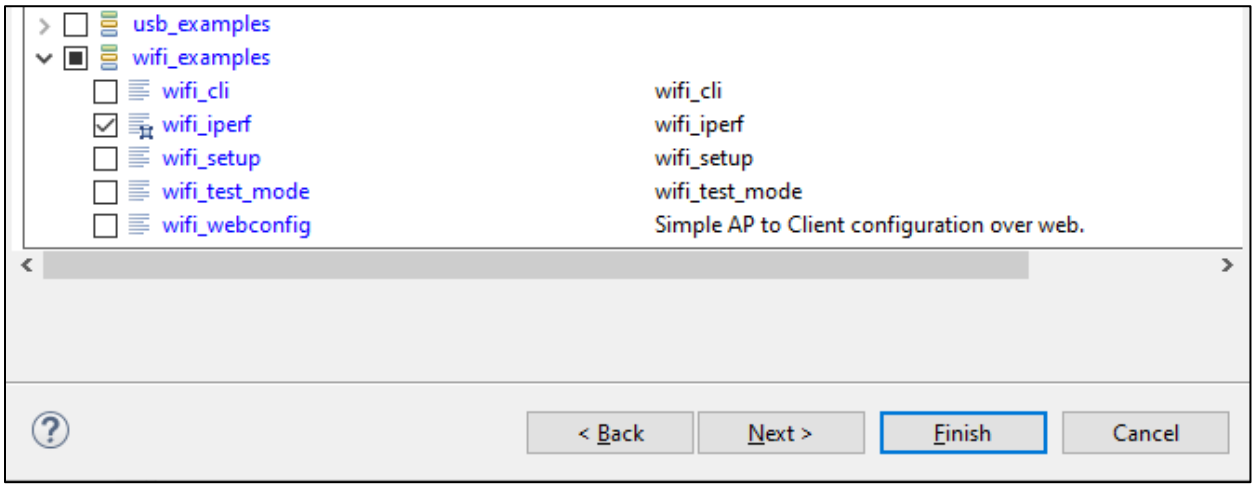
2. Select **evkbimxrt1050** board and click the **Next** button.

**Figure 5: Select EVK to use**



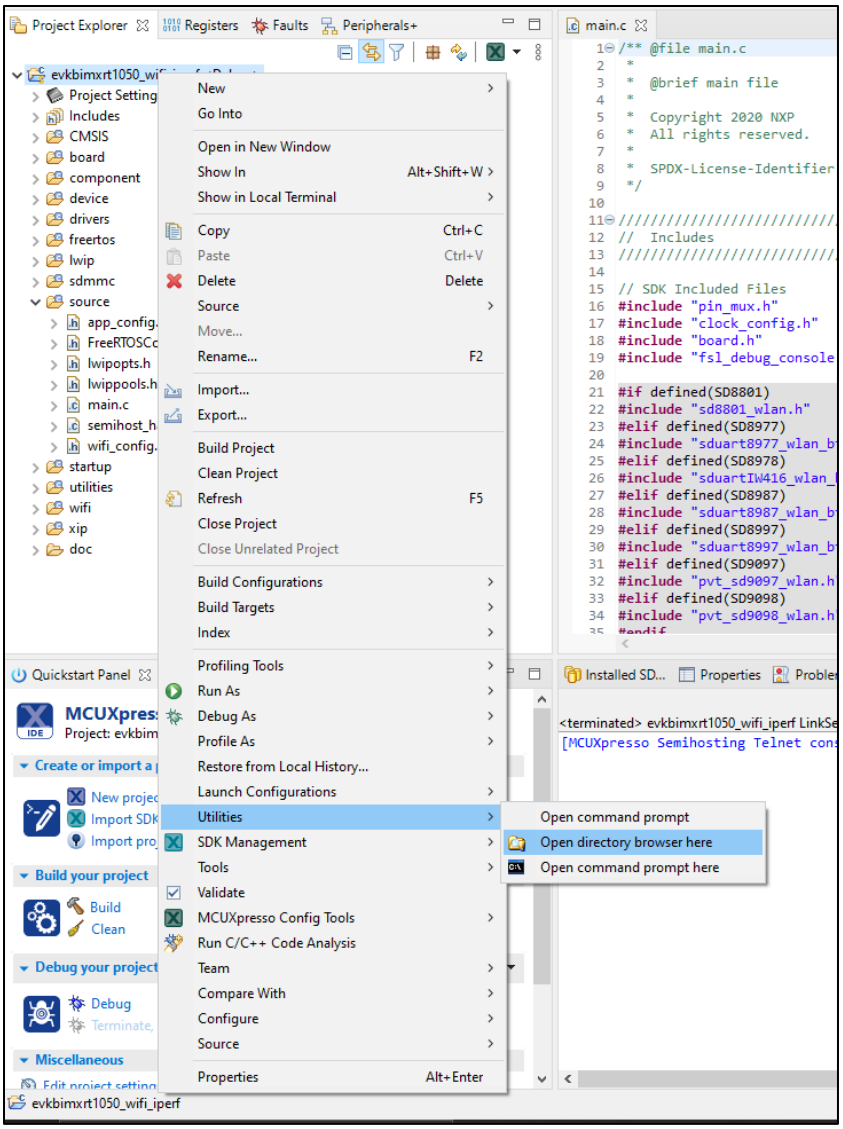

3. Expand **wifi_examples** and select **wifi_iperf**. Click **Finish**. Ensure **SDK Debug Console** is set as **UART** in **Project Options**.

**Figure 6: Import example**



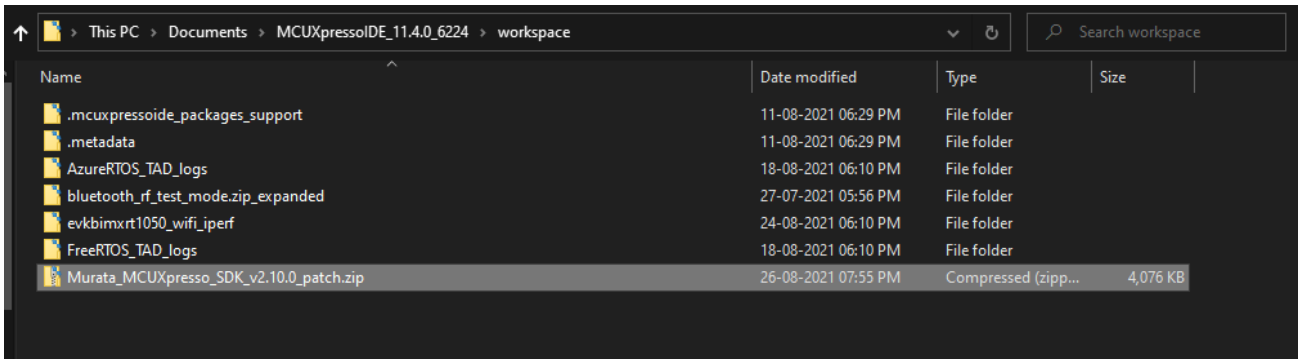
4. Right click on the imported project in the Project Explorer and select **Utilities -> Open directory browser here**.

**Figure 7: Access project source**



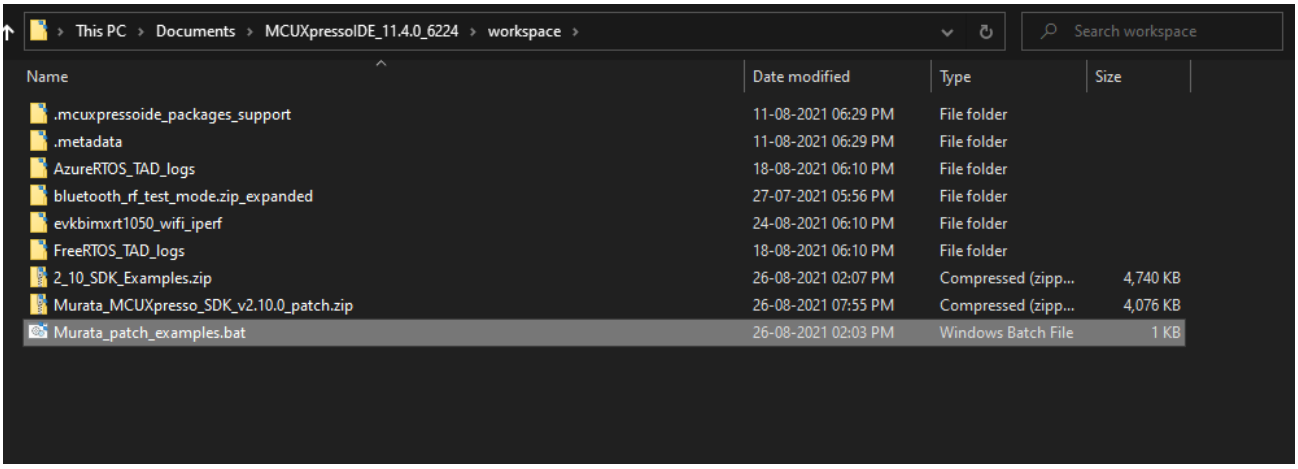

5. The project source folder will open. Go to the parent folder (one level up). This is the workspace folder used by MCUXpresso. Download the Murata [released patch] for SDK 2.10.

**Figure 8: Get the patched files**



6. Extract the downloaded file. Double click on the Murata_patch_examples.bat file. This will replace all the example files necessary to enable Murata modules.

**Figure 9: Run the script**

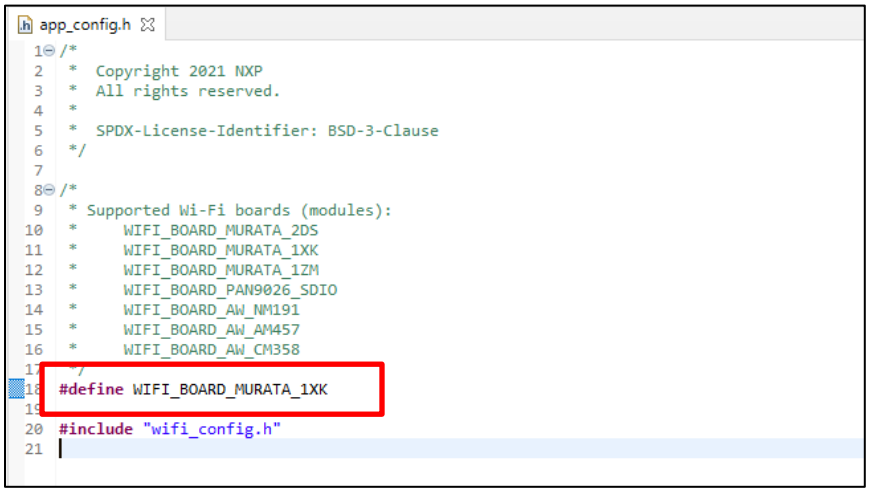



**Note:** This will patch all the valid examples in the workspace, including ones that may be present other than the wifi_iperf example referred here.

7. Open evkbimxrt1050_wifi_iperf/source/app_config.h file and change the enabled compiler flag as per the module name. In this example (using Murata 1XK module), the **WIFI_BOARD_MURATA_1XK** flag needs to be set.

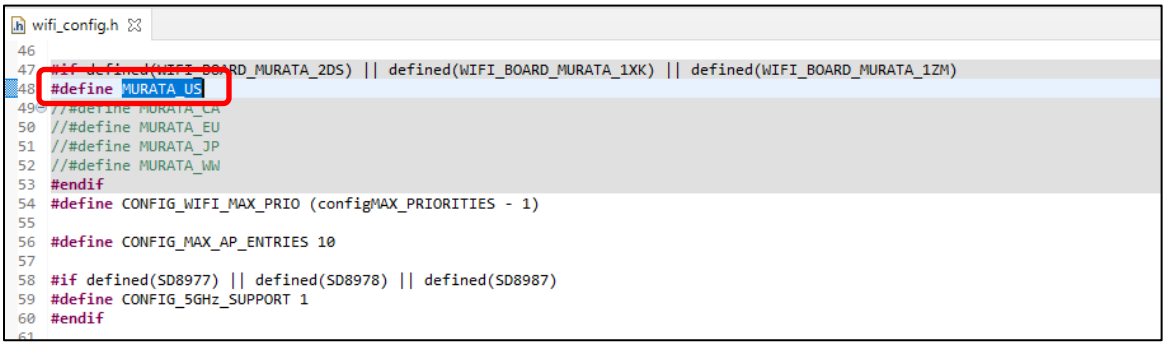
**Note:** It is possible to build the example for modules 2DS and 1ZM as well using the same files. Just replace the compiler flag **WIFI_BOARD_MURATA_1XK** in file source/app_config.h to **WIFI_BOARD_MURATA_2DS** or **WIFI_BOARD_MURATA_1ZM** respectively.

**Figure 10: Enable Murata module**



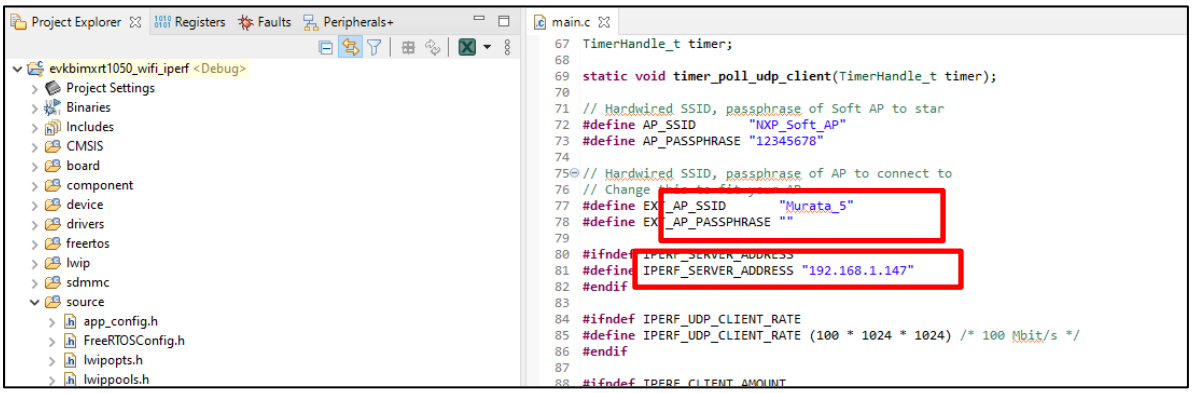
8. Optionally, change the country/region specific TX power setting by editing the file source/wifi_config.h and select the required macro from the selection (**MURATA_US**, **MURATA_EU**, **MURATA_CA**, **MURATA_JP, MURATA_WW**).

**Figure 11: Select region**




9. Open evkbimxrt1050_wifi_iperf/source/main.c file and modify the **EXT_AP_SSID**, **EXT_AP_PASSPHRASE** and **IPERF_SERVER_ADDRESS** macros as per your setup.

**Figure 12: Customize example**

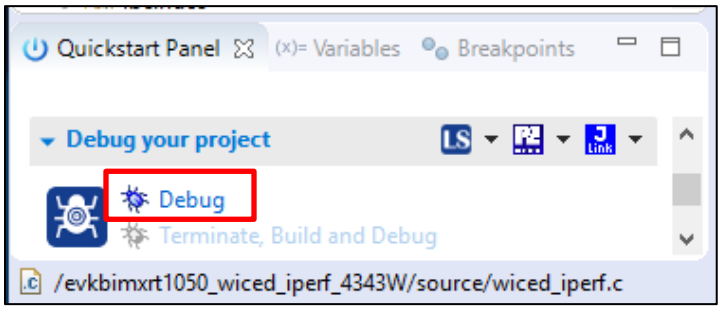



10. Save the changes.

# 5 Build and Run

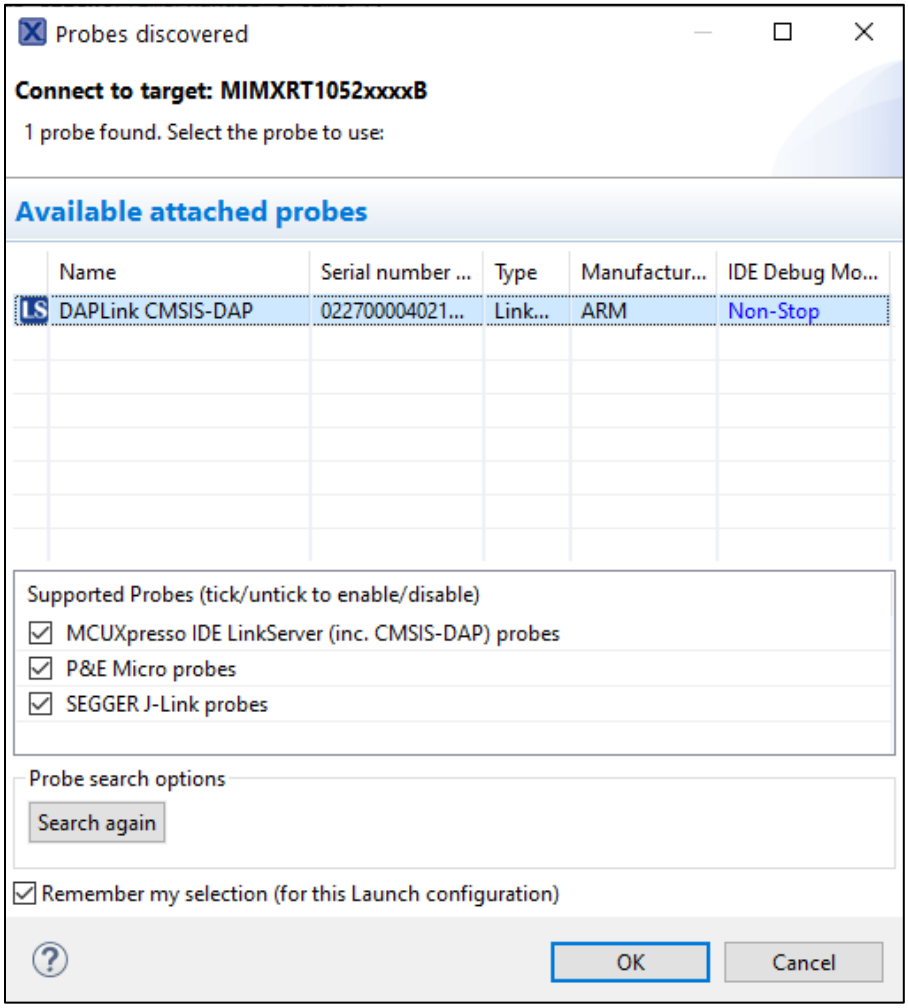
1. Click Debug in the QuickStart Panel. This will start the build and once completed start the deployment automatically.

**Figure 13: Build example**



2. A probe selection window may show, if this is the first time an example is being run. Select the correct probe (there should only be one if just one EVK is connected) and click **OK**.

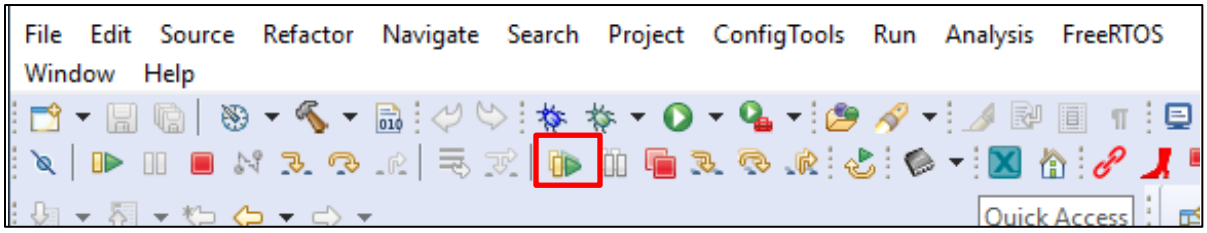
**Figure 14: Probe discovered windows**




3. Once the build completes, open the terminal application (e.g. Tera Term) on the appropriate COM port (you can check the port number in Windows Device Manager, under **Ports (COM & LPT)**). Configure port for 115200 bps, 8 bits data, no parity, and 1 stop bit (115200/8/N/1).

4. Click resume button in MCUXpresso.

**Figure 15: Run example**



5. You should see this output on the terminal.

**Figure 16: Output on EVK terminal**

```
COM18 - Tera Term VT
File  Edit  Setup  Control  Window  Help
========================================
wifi iperf demo
========================================
Initialize WLAN Driver
Setting up new cal data
MAC Address: 2C:4C:C6:F4:D4:40
========================================
For Soft AP demonstration
Start a Soft AP using option "A" in WPA2 security mode from menu
This also starts DHCP Server with IP 192.168.10.1, NETMASK 255.255.255.0
========================================
For Station demonstration
Start an External AP with SSID as "Murata_5" in Open mode
Start DHCP Server on External AP
Station network is configured with Dynamic address assignment
Application provides IPerf support
Set IPERF_SERVER_ADDRESS while using as IPerf Client
========================================
  A  Start Soft AP
  S  Stop Soft AP
  s  Start Scan for external APs
  c  Connect to External AP (SSID='Murata_5')
  D  Disconnect from External AP
  I  Enable IEEE PS on Station
  i  Disable IEEE PS on Station
  d  Enable Deep sleep on Station
  e  Disable Deep sleep on Station
  p  Print All Network info
  P  Print DHCP Server info
  1  TCP server mode (RX only test)
  2  TCP client mode (TX only test)
  3  TCP client dual mode (TX and RX in parallel)
  4  TCP client tradeoff mode (TX and RX sequentially)
  5  UDP server mode (RX only test)
  6  UDP client mode (TX only test)
  7  UDP client dual mode (TX and RX in parallel)
  8  UDP client tradeoff mode (TX and RX sequentially)
  h  Help (print this menu)
  H  Print extended help
[net] Initialized TCP/IP networking stack
========================================
app_cb: WLAN: received event 10
========================================
app_cb: WLAN initialized
========================================
WLAN Driver Version   : v1.3.r33.p2
WLAN Firmware Version : IW416-V0, RF878X, FP91, 16.91.10.p214, WPA2_CVE_FIX 1, PVE_FIX 1
========================================
```

6. Enter mode ‘c’ to run to connect to the AP.

**Figure 17: Connection output on EVK terminal**

```
========================================
Key 'c': Connect to External AP (SSID='Murata_5')
Connecting to Murata_5 .....========================================
app_cb: WLAN: received event 0
========================================
app_cb: WLAN: connected to network
Connected to following BSS:
SSID = [Murata_5], IP = [192.168.1.142]
========================================
```

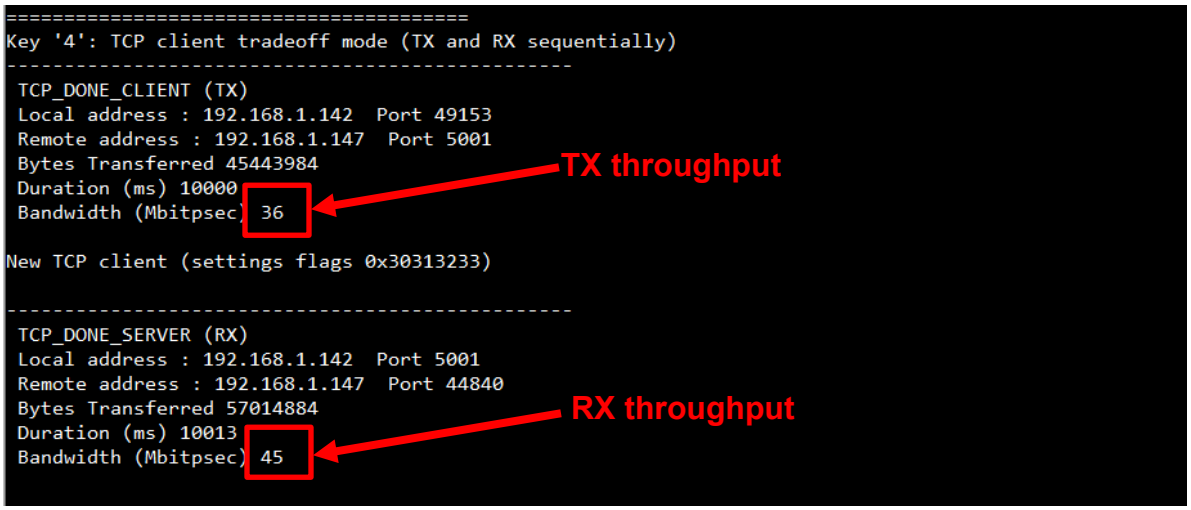
7. Connect the host PC to the same Wi-Fi network as the EVK (**Murata_5** in this example).

8. Run iperf on the host PC in server mode.

```
iperf -s -i 1
```

9. On the EVK terminal, enter mode number ‘4’ to select TCP client tradeoff mode (TX and RX sequentially). The test will start. A 10 second TX test will be followed by a 10 second TX test and the results will be printed.

**Figure 18: Test output on EVK terminal**




# 6 Murata Community Forum

For more support, please go to Murata’s Wireless Community Forum at https://community.murata.com/.

Special announcements and deep dives are hosted on our Community Blog pages here: https://community.murata.com/s/community-blog.

For MCUXpresso/FreeRTOS-specific examples, please refer to this section of the Forum.

Find out more about our Wi-Fi / BT hardware solutions

Type 2DS

Type 1XK

Type 1ZM

uSD-M.2 Adapter