Freescale MKW40Z IEEE® 802.15.4 Software
Quick Start Guide

This document is a brief presentation of the Freescale IEEE® 802.15.4 MACPHY Software for the MKW40Z wireless microcontroller platforms, version 5.2.3. This software package is an add-on for the Kinetis Software Development Kit (KSDK). This document covers installation of the software packages, hardware setup, build and usage of the provided demo applications.

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1 Installation

This section covers the steps for a successful installation of the required software packages: connectivity and Kinetis SDK.

The first step is to download the “KW40Z_Connectivity_Software_1.0.0.exe” installer.

![Figure 1: The KW40Z Connectivity Software Installer](image1)

On the main screen, press the Next button.

![Figure 2: KW40Z Installer main screen](image2)
On the *License Agreement* screen press the *I agree* button to accept the license agreement.

![License agreement screen](image)

**Figure 3:** License agreement screen

On the next screen click *Browse* to select another destination folder for the KW40Z 802.15.4 MAC installation or click the *Next* button to continue.

![Destination folder selection screen](image)

**Figure 4:** Destination folder selection screen
On the following screen uncheck the first two options and press the Next button.

![Component selection screen](image)

**Figure 5:** Component selection screen

Select a Start Menu folder and press the Install button.

![KW40Z installer Start Menu Folder selection screen](image)

**Figure 6:** KW40Z installer Start Menu Folder selection screen
Click Finish to close the installer.

The installer automatically creates or updates the $KSDK\_1\_3\_0\_PATH$ environment variable required by the KW40Z MAC projects.

Once the above steps are performed, you can start using the SMAC Demo Applications. Building the Binaries
2 Building the Binaries

This section details the required steps for obtaining the binary files for usage with the boards.

NOTE

In order to be able to build any of these packages you need a copy of the IAR Embedded Workbench for ARM® version 7.40.2 or higher. This connectivity software package does not include support for any other toolchains.

The packages must be built with the debug configuration in order to enable debugging information.

2.1 Building the KSDK Libraries

This release supports all development platforms based on the KW40Z wireless microcontroller. The KSDK platform libraries are RTOS dependent, so appropriate libraries must be built for the RTOS chosen.

For any connectivity application, the following Kinetis SDK libraries must be built with the IAR Embedded Workbench for ARM® in order to enable the complete board support and RTOS kernel support:

- Platform drivers library

The location of the KSDK platform projects is described using the following placeholders for text:

- <ksdk_path>: represents the root path of the KSDK installation folder
- <device>: represents the board MCU: KW40Z4
- <board>: represents the board: frdmkw40z
- <RTOS>: represents the Real Time Operating System

Using the placeholders, these are the required Kinetis SDK v1.3.0 projects locations:

- <ksdk_path>\lib\ksdk_<RTOS>_lib\iar\<device>\ksdk_<RTOS>_lib.eww
- <ksdk_path>\lib\ksdk_platform_lib\iar\<device>\ksdk_platform_lib.eww

NOTE

The IAR projects for KSDK libraries are included in the IAR workspaces corresponding to the IEEE 802.15.4 demo applications and it is recommended to access them this way.
2.2 Building and Flashing the Freescale IEEE 802.15.4 Software Demo Applications

This package includes various demo applications that can be used as a starting point.

The next section presents the steps required for building the MAC_FSCI_app, using the following placeholders for text:

- `<connectivity_path>` : represents the root path for the Freescale IEEE 802.15.4 software package
- `<board>` : represents the target board for the demo app: “frdmkw40z”
- `<demo_app>` : represents the demo app name
- `<RTOS>` : represents the Real Time Operating System or bare metal scheduler

The demo applications general folder structure is the following:

```
<connectivity_path>\examples\ieee_802_15_4\<demo_app>\<board>\<RTOS>\build\iar
```

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**Freescale IEEE 802.15.4 Software Demo Application Build Example**

Selected app: MAC_FSCI_app
Board: frdmkw40z
Resulting location: `<connectivity_path>\examples\ieee_802_15_4\MAC_FSCI_app\frdmkw40z\FreeRTOS\build\iar`

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**Step 1:**
Navigate to the resulting location.

**Step 2:**
Open the highlighted IAR workspace file (*.eww file format):

![MAC_FSCI_app.ewd](image1.png)
![MAC_FSCI_app.epw](image2.png)
![MAC_FSCI_app.eww](image3.png)

<table>
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<td>IAR IDE Workspace</td>
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</table>

*Figure 7: “MAC_FSCI_app” demo project location*
Step 3:
Select the KSDK FreeRTOS platform library project.

![Image of project selection](image)

*Figure 8: KSDK FreeRTOS platform library IAR project*

Step 4:
Build the KSDK FreeRTOS platform library project.

![Image of project build](image)

*Figure 9: KSDK FreeRTOS platform library build*
Step 5:
Select the MAC_FSCI_App project.

![Figure 10: MAC_FSCI_App FreeRTOS IAR project](image1)

Step 6:
Build the MAC_FSCI_App project.

![Figure 11: MAC_FSCI_APP FreeRTOS build](image2)
Step 7:
Make the appropriate debugger settings in the project options window:

![Figure 12: Debugger Settings](image)

Step 8:
Click the “Download and Debug” button to flash the executable onto the board.

![Figure 13: MAC_FSCI_App Download and Debug](image)
NOTE
The projects are configured with “CMSIS-DAP” firmware as the default debug configuration. Please make sure that your board’s OpenSDA chip contains a CMSIS-DAP firmware or that the debugger selection corresponds to the physical interface used to interface to the boards. See the section below for more information.
3 Hardware Setup

The hardware setup in this example uses a FRDM-KW40Z development platform shown in the figure below:

![FRDM-KW40Z](image)

**Figure 14: FRDM-KW40Z**

The FRDM-KW40Z should have its OpenSDA (OpenLink) USB port connected via micro-USB cable to a Windows PC. The OpenSDA chip on the freedom platform should have appropriate firmware flashed, with debugging and virtual serial COM port capabilities. For more information on OpenSDA please refer to the following webpage: [www.freescale.com/opensda](http://www.freescale.com/opensda).

Variants of embedded firmware for the OpenSDA chip can be downloaded from:

- [https://www.segger.com/opensda.html](https://www.segger.com/opensda.html)

CMSIS-DAP is the default interface selected in the IAR Embedded Workbench for ARM® projects included in this release.
4 Example: Running the MyWirelessApp Demo Application

The MAC “MyWirelessApp” demo application requires a serial terminal program to connect to the boards. For this example, Tera Term was chosen.

Step 1:

Load the applications on the boards using IAR Embedded Workbench for ARM®. This demo has two configurations: a “coordinator” and an “end device”.

![Figure 15: MyWirelessApp coordinator project](image)

![Figure 16: MyWirelessApp end device project](image)
Figure 17: MyWirelessApp end device loading stage example

Figure 18: MyWireless app end device application loaded
Step 2:
After loading both applications check “Device Manager” to get the serial ports numbers. These should appear with the prefix “mbed Serial Port”.

![Figure 19: Device Manager serial port look up](image)

Step 3:
Using the port numbers specified in Device Manager, open two Tera Term instances and connect to the devices using the 115200 baud rate. To change the baud rate of the terminal go to “Setup-> Serial Port” menu.

![Figure 20: Select mbed serial connection COM port](image)
Step 4:

Start the applications by pressing any available key on the FRDM boards: first the coordinator and then the end device.

The coordinator performs an energy detect scan to determine the least occupied channel and then selects it to start the network. The end device performs an active scan and after receiving a beacon from a coordinator, it issues an association request.
After the association procedure completes, in the two terminal windows messages can be written to be exchanged by the two wireless nodes.

The previous section demonstrates the basic steps to run a demo application. For detailed information about the demo applications, please refer the Demo Applications User’s Guide included in the installer (802154MPDAUG.pdf).