Freescale Semiconductor, Inc.
User's Guide

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Freescale MKW01 SMAC Software

Quick Start Guide

This document is a brief presentation of the Freescale SMAC Software for the KW01 wireless microcontroller platforms version 3.1.3. This software package contains Kinetis Software Development Kit (KSDK) sources. This document covers installation of the software package, hardware setup, build and usage of the provided demo applications.

Contents

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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 “KW01_Connectivity_Software_1.0.0.exe” installer.

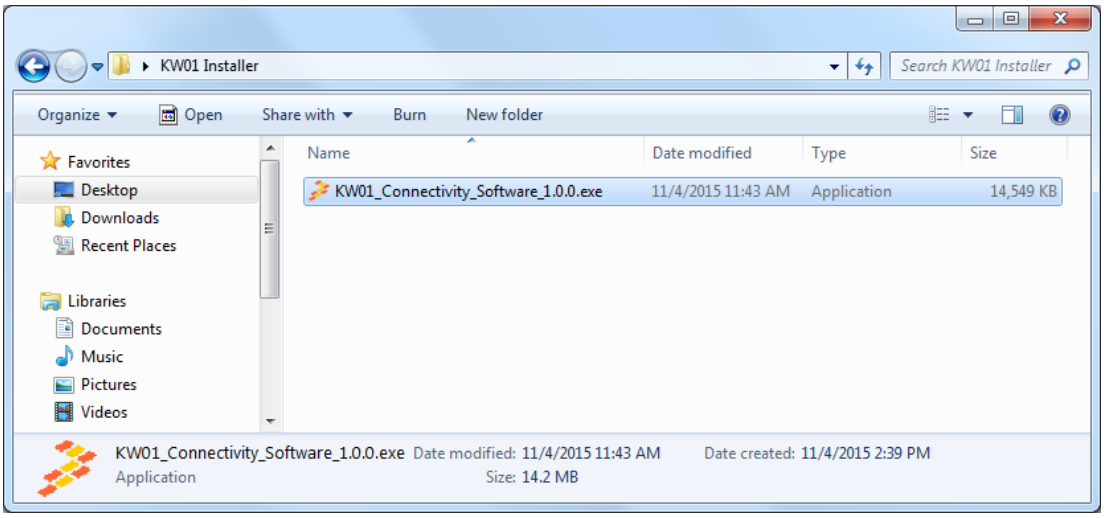

Figure 1: The KW01 Connectivity Software Installer

On the main screen, press the *Next* button.

Figure 2: KW01 Installer main screen

On the *License Agreement* screen press the *I agree* button to accept the license agreement.

Figure 3: License agreement screen

On the next screen click *Browse* to select another destination folder for the KW01 SMAC installation or click the *Next* button to continue.

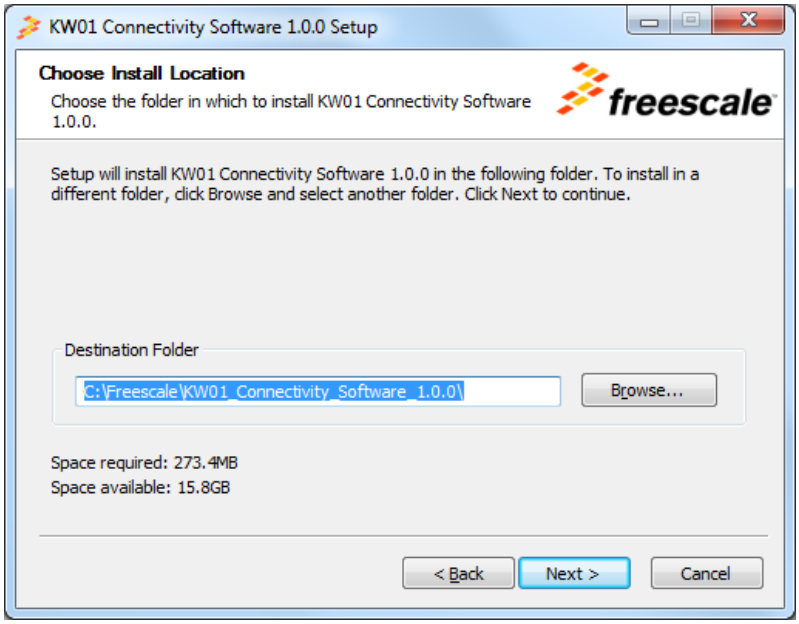

Figure 4: Destination folder selection screen

On the following screen uncheck the first option and press the *Next* button.

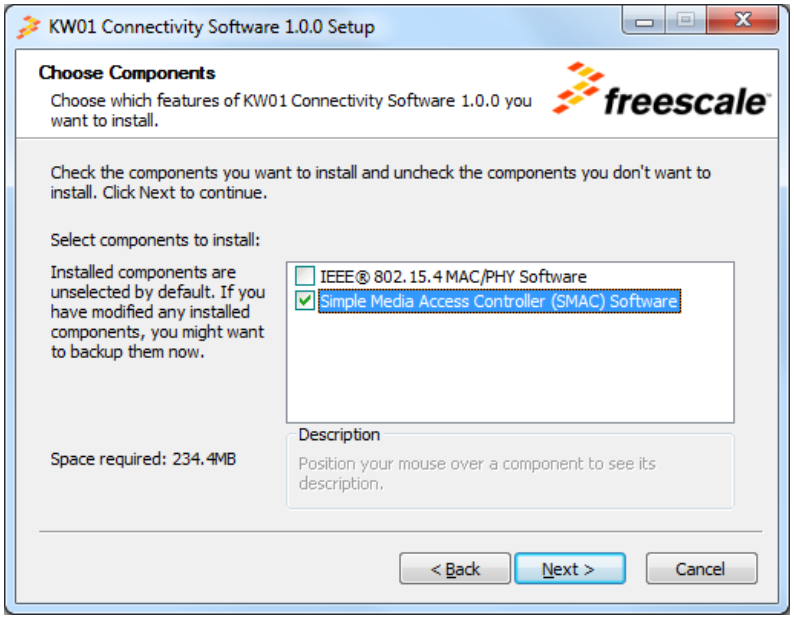

Figure 5: Component selection screen

Select a *Start Menu* folder and press the *Install* button.

Figure 6: KW01 installer Start Menu Folder selection screen

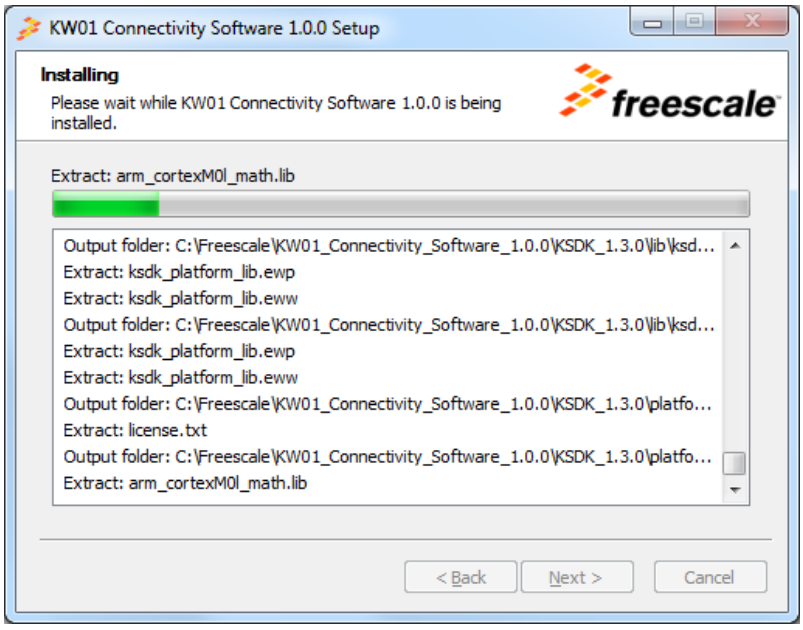

Figure 7: KW01 installation process

Click *Finish* to close the installer.

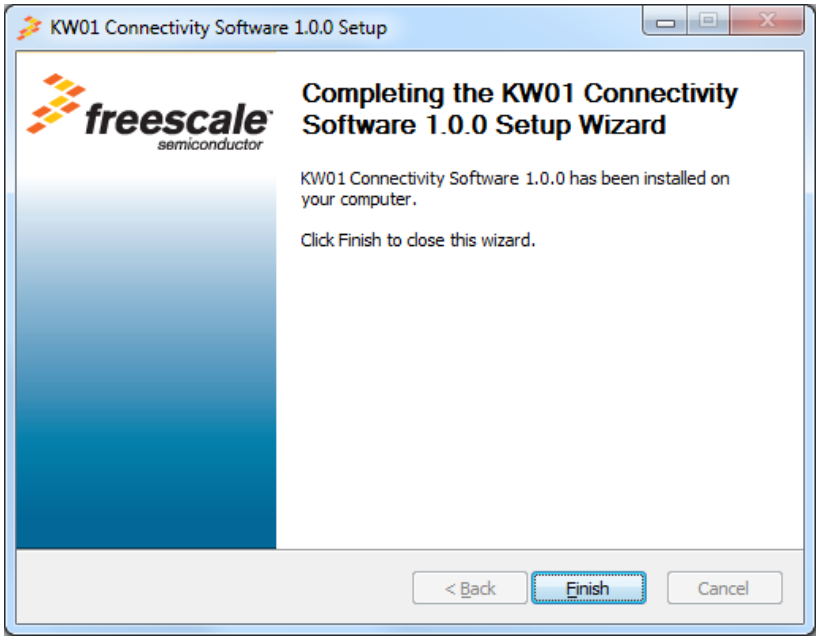

Figure 8: KW01 SMAC installation complete

The installer automatically creates or updates the *KSDK13_FWK513_PATH* environment variable required by the KW01 SMAC projects.

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

2 Cloning a project

Navigate to the KW01 Connectivity Software installation folder and run the Project Cloner application (**ConnSw\tools\project_cloner\project_cloner.exe**).

The cloner detects the **Codebase path** and displays all the Connectivity Software example applications.

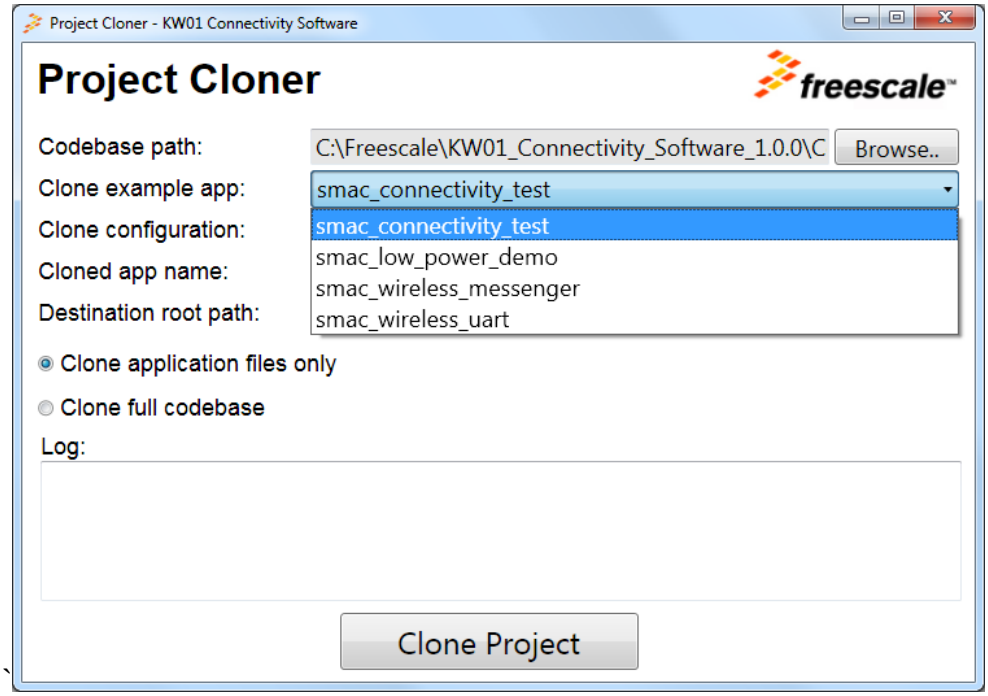

Figure 9: Connectivity Software example applications

Next select the example application to be cloned (**Clone example app**), and the desired configuration (**Clone Configuration**).

After this, the **Cloned app name** text box will contain a default name for the selected application. This name can be modified to any value.

The default **Destination root path** for the cloned application is the Documents folder of the current user. To change this path click the **Browse** button to select a new location.

By default the Project Cloner will clone only application files (board specific files and example app files). To clone all the files, select the **Clone full codebase** radio button.

Now press the **Clone Project** button to start the cloning process. The log window will display “Cloning completed” when the process ends.

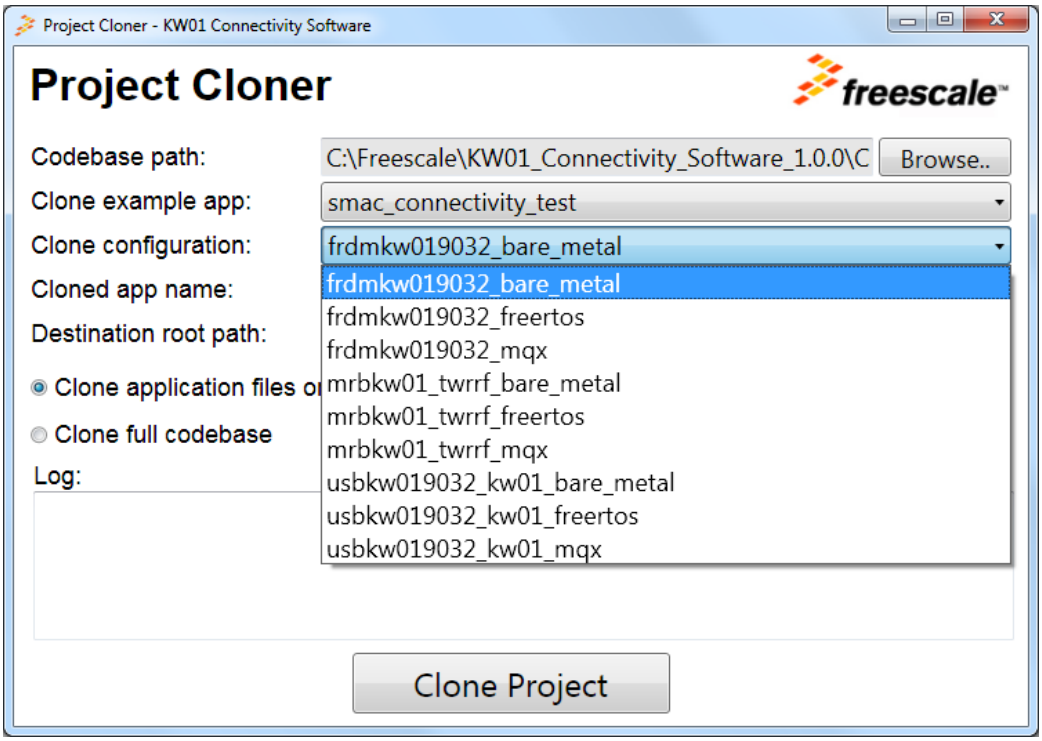

Figure 10: Available configurations for the selected example application

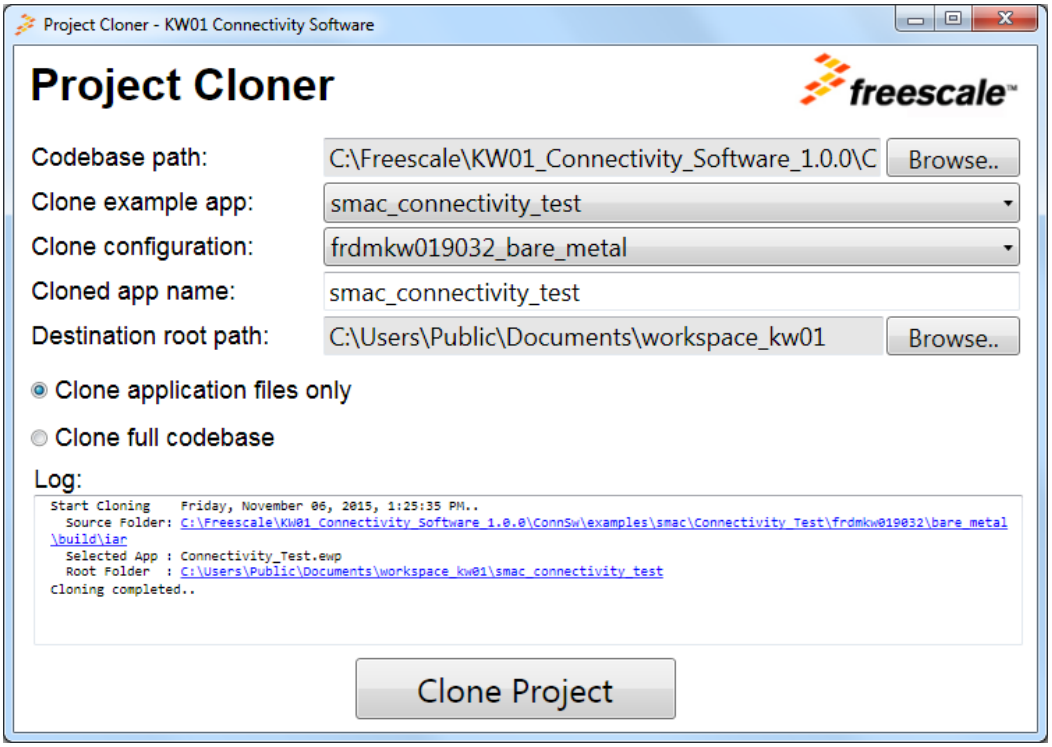

Figure 11: Application cloning done

3 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.

3.1 Building the KSDK Libraries

This release supports all development platforms based on the MKW01 wireless microcontroller. The KSDK platform libraries are RTOS dependent, so appropriate libraries must be built for the selected RTOS.

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
- MQX RTOS library

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

- <KSDK13_FWK513_PATH> : represents the root path of the KSDK installation folder
- <device> : represents the board MCU: KW01Z4
- <board> : represents the board: frdmkw019032

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

- <KSDK13_FWK513_PATH>\lib\ksdk_freertos_lib\iar\<device>\ksdk_freertos_lib.eww
- <KSDK13_FWK513_PATH>\lib\ksdk_platform_lib\iar\<device>\ksdk_platform_lib.eww
- <KSDK13_FWK513_PATH>\lib\ksdk_mqx_lib\iar\<device>\ksdk_mqx_lib.eww
- <KSDK13_FWK513_PATH>\rtos\mqx\mqx\build\iar\mqx_<board>\mqx_<board>.eww

NOTE

The IAR projects for KSDK libraries are included in the IAR workspaces corresponding to the SMAC demonstration applications and it is recommended to access them this way.

3.2 Building and Flashing the Freescale SMAC Software Demo Applications

The package contains various demo applications that can be used to get a first feel for the software.

In this section you will be guided through building the Connectivity Test Application. After you select the configuration you want to clone, locate the destination folder and follow the steps bellow.

Freescale SMAC Software Demo Application Build Example

Selected app: smac_connectivity_test

Board: frdmkw019032

RTOS: bare-metal scheduler

Destination root path: C:\Users\Public\Documents\workspace_kw01

Resulting location:

C:\Users\Public\Documents\workspace_kw01\smac_connectivity_test

Step 1:

Navigate to the resulting location.

Step 2:

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

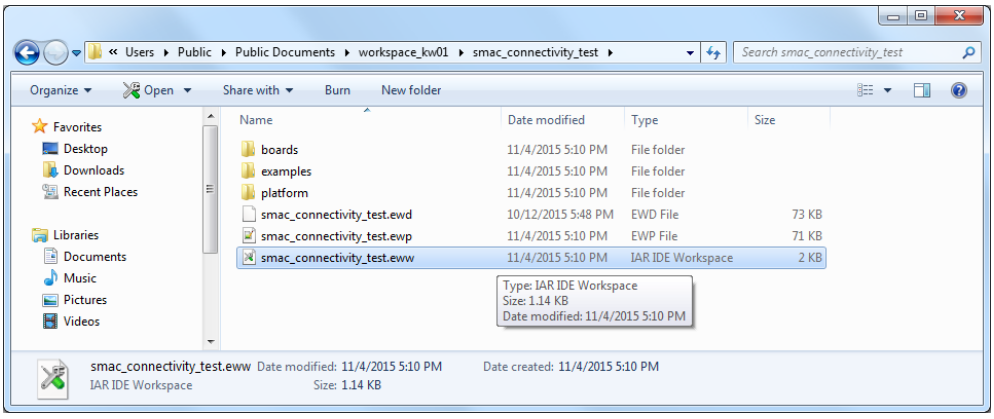

Figure 12: "Connectivity Test" Demo Application - project location

Step 3:

Select the KSDK platform (bare-metal) library project.

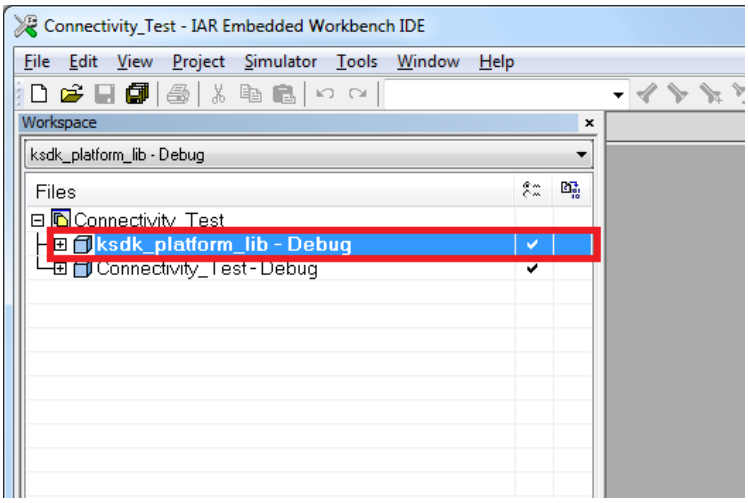

Figure 13: IAR project for KSDK platform (bare-metal) library

Step 4:

Build the KSDK platform library project.

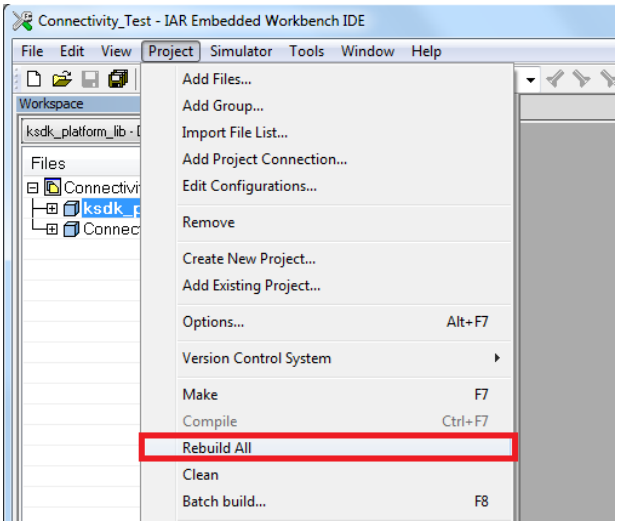

Figure 14: KSDK platform library build

Step 5:

Select the Connectivity Test project.

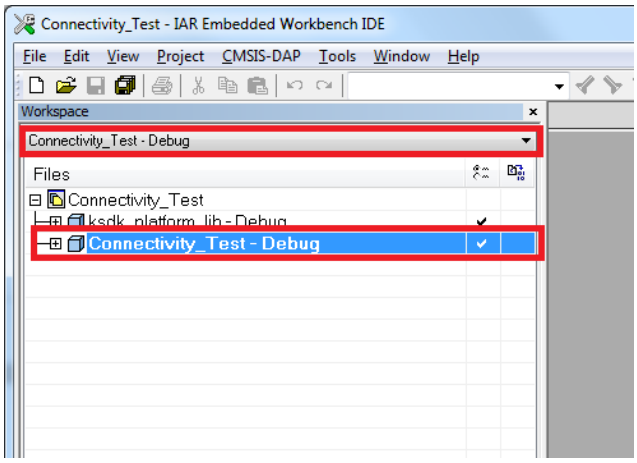

Figure 15: IAR project for Connectivity Test with bare-metal scheduler

Step 6:

Build the Connectivity Test project.

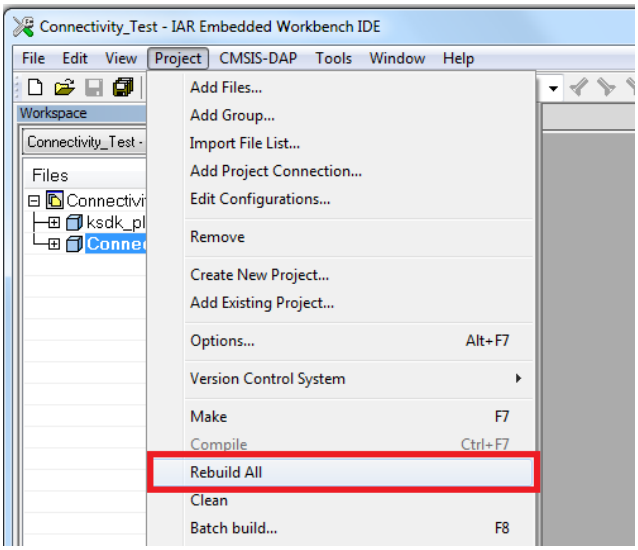

Figure 16: Connectivity Test Bare-Metal Build

Step 7:

Make the appropriate debugger settings in the project options window:

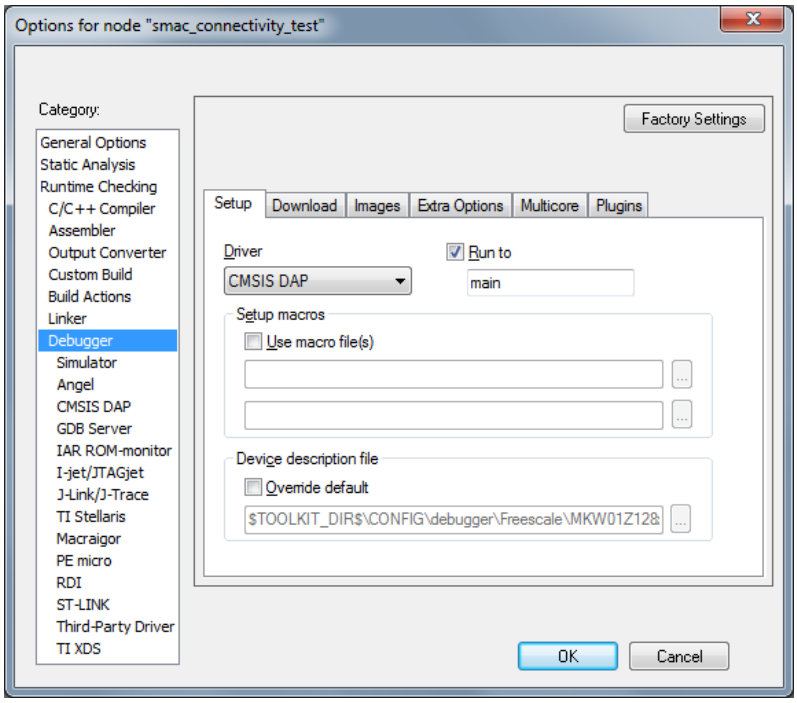

Figure 17: Debugger Settings

Step 8:

Click the "Download and Debug" button to flash the executable onto the board.

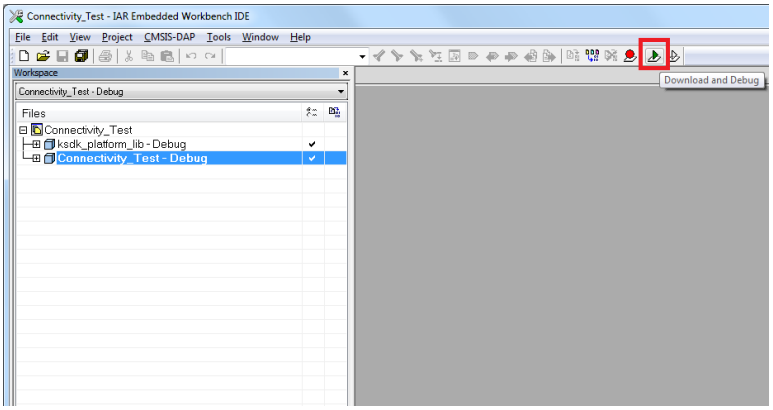

Figure 18: Connectivity Test Download and Debug

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 connect to the boards. See the section below for more information.

3.3 Flashing a Binary Image File Without Using an IDE

The KW01 connectivity software package contains in the ConnSw\tools\binaries folder a series of pre-compiled binary applications that can be flashed onto a development board.

In order to flash the corresponding binaries to the FRDM-KW019032 board, the best approach is to use the OpenSDA on-board interface CMSIS-DAP Mass Storage Device functionality, by simply dragging and dropping the binary image in the mass storage drive exposed by this OpenSDA firmware. For more information, see the CMSIS-DAP firmware github project: https://github.com/mbedmicro/CMSIS-DAP.

In order to flash the firmware on the USB-KW019032, for either the KW01 or the K22F silicon on board, a J-Link probe is needed along with the latest J-Link software from www.segger.com.

Run the *jlink.exe* executable provided in the J-Link software installation and type the commands below for flashing the image on the microcontroller. Make sure that the binary file is in the same folder with the *jlink.exe* executable, or specify the absolute path to the file.

```
unlock kinetis
device mkw01z128xxx4
loadbin Connectivity_Test_902-928MHz.bin 0
```

4 Hardware Setup

The hardware setup in this example uses a FRDM-KW019032 development platform shown in the figure below:

Figure 19: FRDM-KW019032

The FRDM-KW019032 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.

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

https://github.com/mbedmicro/CMSIS-DAP
https://www.segger.com/opensda.html
http://www.pemicro.com/opensda/

CMSIS-DAP is the default interface selected in the IAR Embedded Workbench for ARM® projects included in this release.

5 Example: Running the Connectivity Test Demo Application

The SMAC based "Connectivity Test" demo application requires a serial terminal program to communicate with the FRDM-KW019032 board. Any serial port terminal program is suitable, but for the purposes of this demo, Tera Term was chosen.

Step 1:

Download the application on the target board using IAR Embedded Workbench for ARM® by clicking the "Download and Debug" button as presented in *Figure 11*. You should see a progress bar that shows the status of the download.

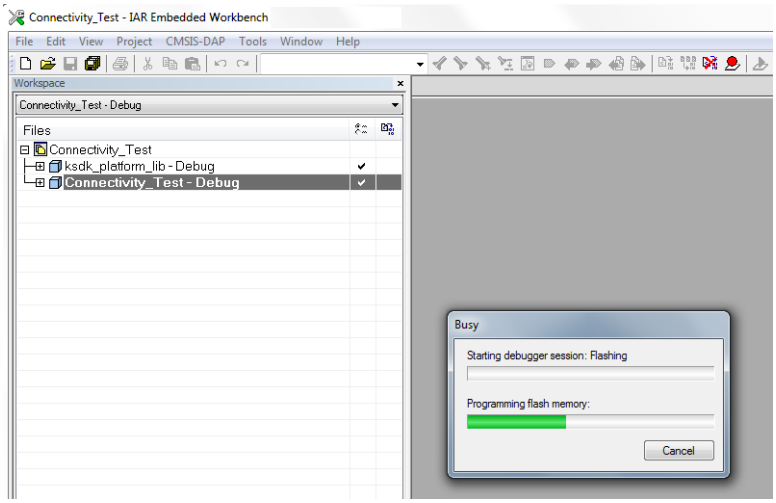

Figure 20: Connectivity Test loading stage example

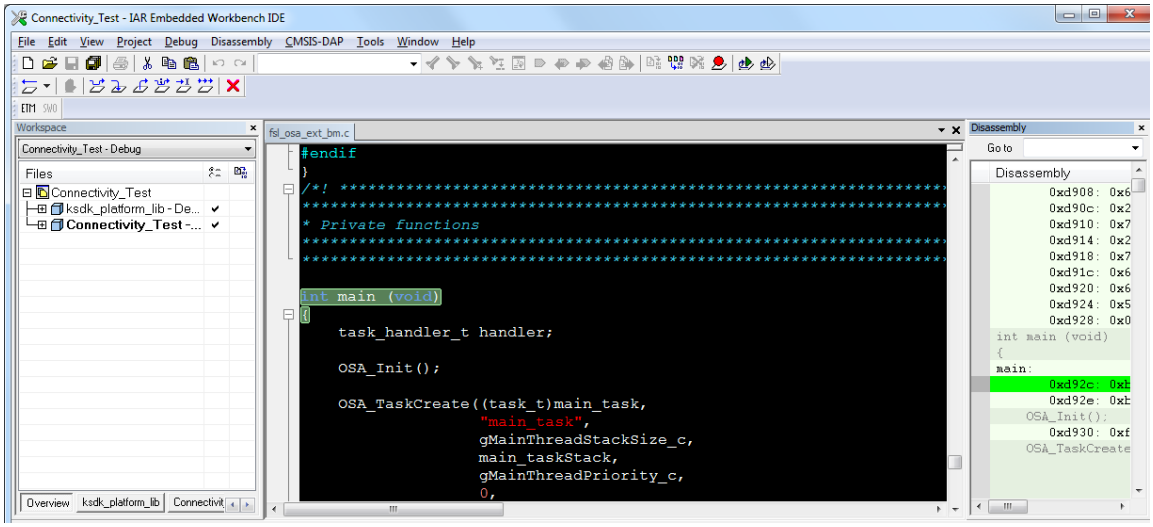

Figure 21: Connectivity Test application loaded – halted at main

Step 2:

After loading the application, go to “Device Manager” to get the serial port number. It should appear with the prefix “mbed Serial Port”.

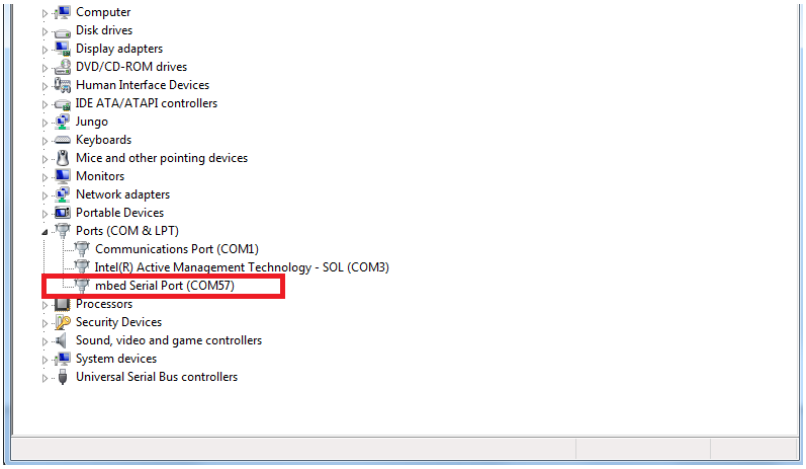

Figure 22: Device Manager serial port look up

Step 3:

Using the port number discovered in “Device Manager”, open a Tera Term instance and connect to the device using the 115200 baud rate. To change the baud rate of the terminal go to “Setup-> Serial Port” menu.

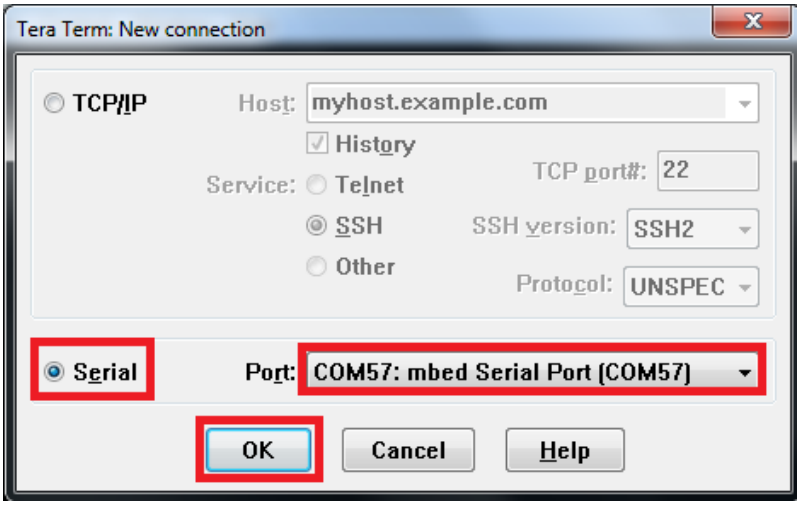

Figure 23: Select mbed Serial Connection COM port

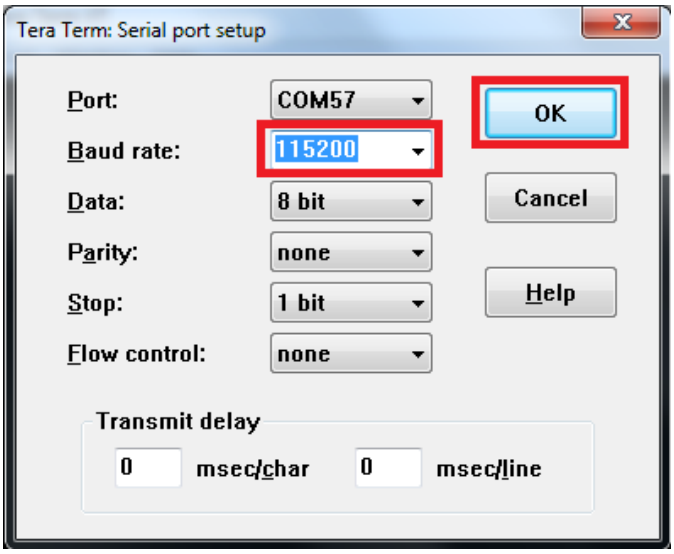

Figure 24: Setting the correct baud rate

Step 4:

Click "Go" to run the application.

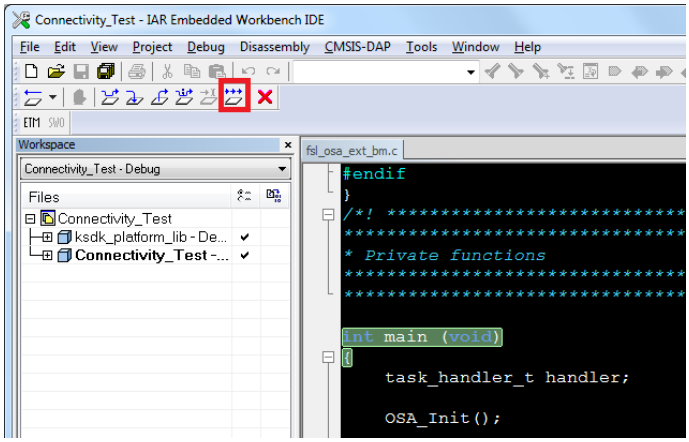

Figure 25: Connectivity Test App resuming execution

Step 5:

The application displays a logo screen and waits for user intervention. When the [ENTER] key is pressed, the application will show the main menu. If any other key is pressed, the logo screen is redisplayed with on-screen instructions.

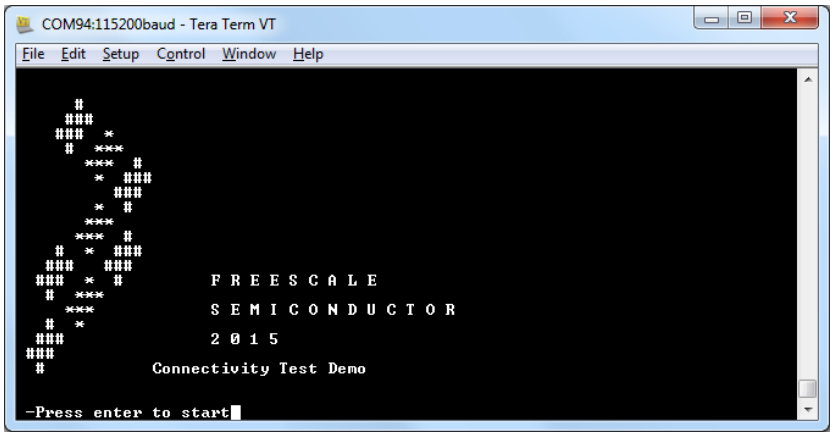

Figure 26: Connectivity Test after reset or after pressing any key except [ENTER] (return) key

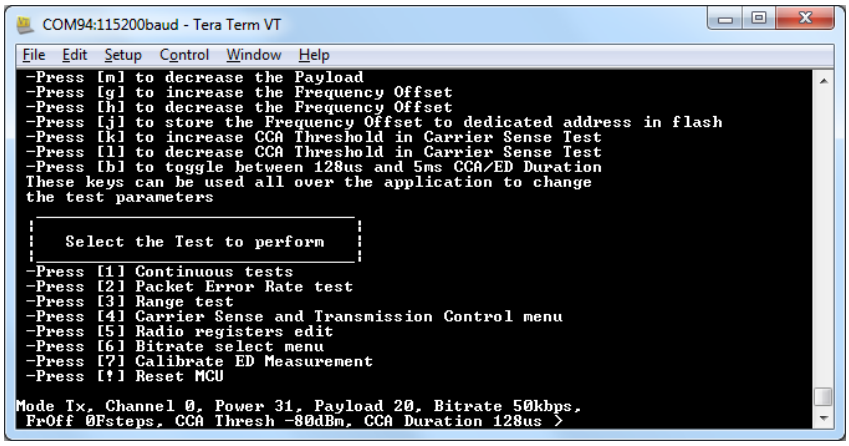

Figure 27: Connectivity Test after pressing the [ENTER] (return) key

To start any test, you can follow the on-screen instructions. In case a test needs a second FRDM-KW019032 platform, redo the previous steps to connect to the PC, flash and run the application on it.

The previous section demonstrates only the basic steps to run a demo application. For detailed information about the demo applications themselves, please refer the Demo Applications User's Guide included in the installer (*MKW01SMACDAUG.pdf*).

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