

IwIP TCP/IP Stack and MCUXpresso SDK Integration User's Guide

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1 Overview

This document describes how to compile and run the lwIP TCP/IP stack examples. This document also provides the board-specific information related to the jumper and hardware settings.

2 Release Scope

2.1 Hardware

This release includes support for the TWR-K64F120, TWR-K60D100M, TWR-KV58F220M, TWR-K65F180M, and TWR-K35F180M Tower System modules, FRDM-K64F and FRDM-K66F Freedom development platforms, and LPCXpresso54xxx derivatives.

3 Requirements for Running lwIP Demos

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3.1 Supported hardware platforms

- Tower System development platforms:
 - TWR-SER serial peripheral board
 - TWR-ELEV boards (pair)
 - USB cable
 - Ethernet cable

NOTE

For Tower System boards, extra TWR-SER and TWR-ELEV modules are needed

- Freedom development platforms:
 - USB cable
 - Ethernet cable
- LPCXpresso development platforms:
 - USB cable
 - Ethernet cable

3.2 Software development tools

- MCUXpresso SDK release package that includes the lwIP TCP/IP package
- MCUXpresso IDE
- IAR Embedded Workbench for ARM® version 7.80.2
- Keil® µVision® 5 Integrated Development Environment Version 5.21a
- Kinetis Design Studio IDE Version: 3.2.0

NOTE

MCUXpresso targets only. KDS IDE does not support LPC boards.

- Makefiles support with GCC revision 5-2016-q3-update from GNU ARM Embedded Toolchain

3.3 Board jumper settings

The Ethernet-related jumper settings are described in this document. For other jumper settings, see the board-specific user's guide. By default, the lwIP stack uses RMII mode. Follow the below hardware configuration:

- TWR-K64F120M
 - J32 1-2: Use the external clock from the CLOCKIN0 to keep the synchronization with the external PHY on TWR-SER Tower System module.
- TWR-K65F180M
 - No jumper specifications.
- TWR-SER
 - J2 3-4: Ethernet PHY Clock Select 50 MHz, RMII mode. Cut off other connections on this jumper.
 - J3 2-3: Route 50 MHz clock to CLOCKIN0. Cut off other connections on this jumper.
 - J12 9-10: Ethernet PHY Configuration, pull-up CONFIG0, RMII select. Cut off other connections on this jumper.
- Freedom FRDM-K64F platform
 - No jumper specifications.

4 lwIP code structure

The lwIP code is located in this folder: <install_dir>/middleware/lwip_2.0.0. The lwIP folder includes the source code. There are two subfolders in the lwip folder as shown in the figure.

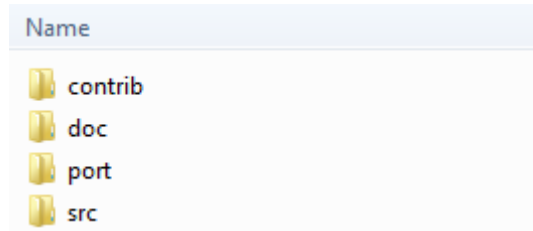


Figure 1. lwIP folder structure

- contrib
 - This subfolder includes third party demo applications provided by the lwIP project (lwIP project has two separate downloads, lwIP and lwIP contrib).
- doc
 - This subfolder includes some readme files and some files for generating Doxygen documentation from lwIP sources.
- src
 - This subfolder includes the lwIP 2.0.0 source code which can be downloaded from this link: savannah.gnu.org
- port
 - This subfolder includes the adapter files which can make the lwIP stack run on the MCUXpresso SDK and different RTOSes.

5 Compiling or Running the lwIP Stack and Demos

5.1 Step-by-step guide for IAR Embedded Workbench for ARM

This section shows how to compile and run demos in IAR Embedded Workbench for ARM.

1. Open the workspace corresponding to different demos and different boards. For example, the lwip_ping_bm.eww on the Freedom FRDM-K64F Platform under <install_dir>/boards/frdmk64f/demo_apps/lwip/lwip_ping/bm/iar/ or the lwip_ping_demo_freertos.eww on the Freedom FRDM-K64F platform under <install_dir>/boards/frdmk64f/demo_apps/lwip/lwip_ping/freertos/iar/. These steps use lwip_ping_demo.eww on FRDM-K64F as an example.

Compiling or Running the lwIP Stack and Demos

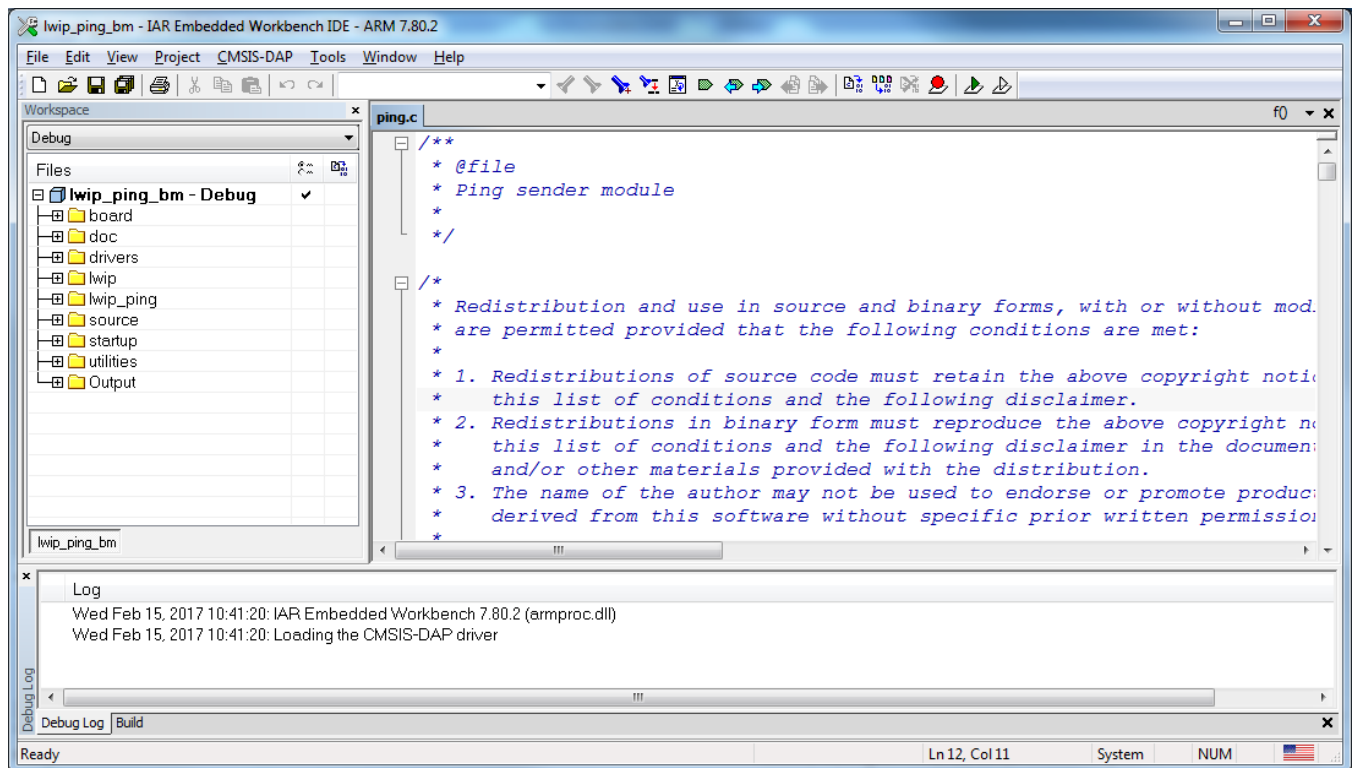


Figure 2. Workspace

2. Build the lwip_ping_bm.

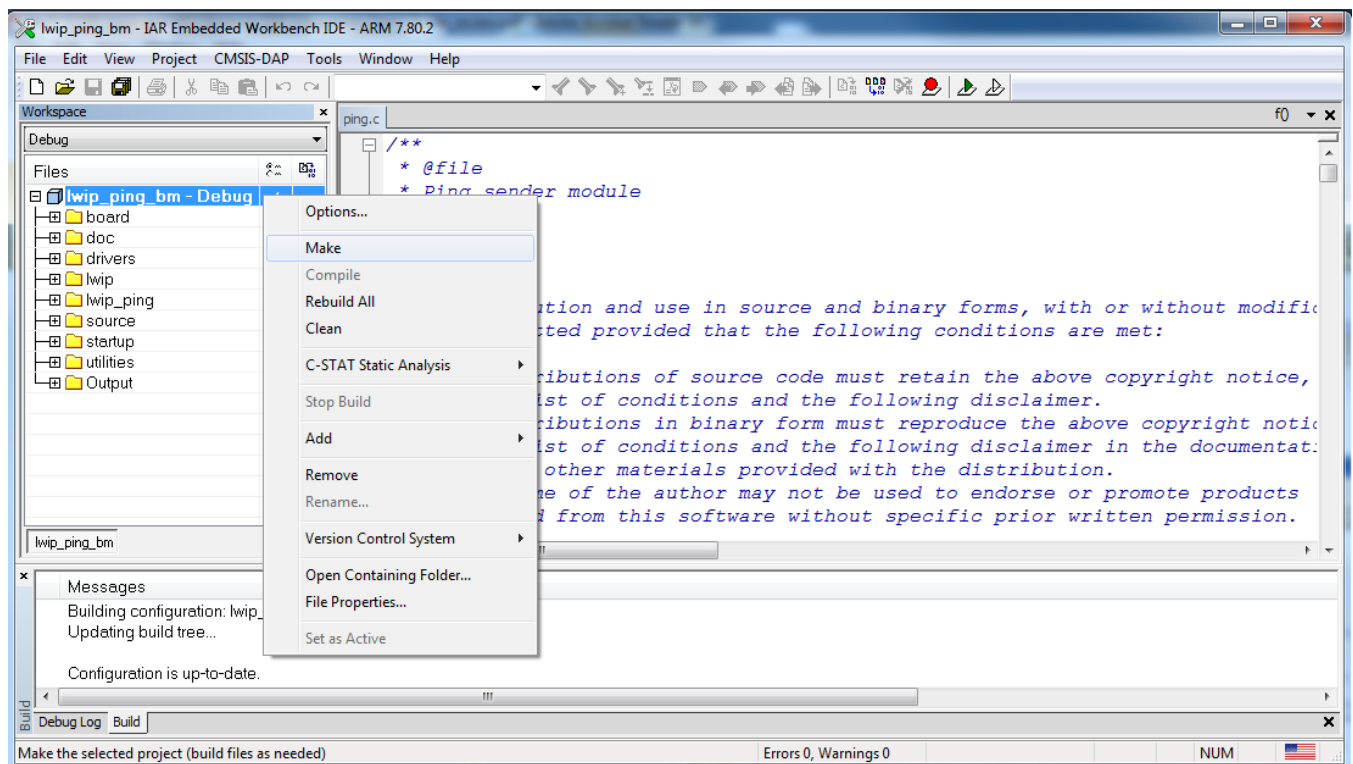


Figure 3. lwip_ping_bm

3. Click the “Download and Debug” button. Wait for the download to finish.
4. Click the “Go” button to run the demo.

5.2 Step-by-step guide for Keil μ Vision 5 IDE

This section shows how to compile and run demos in Keil μ Vision 5 IDE.

1. Open the workspace corresponding to different demos and different boards. For example, the `lwip_ping_bm.uvmpw` on the Freedom FRDM-K64F platform under `<install_dir>/boards/frdmk64f/demo_apps/lwip/lwip_ping/bm/mdk/` or the `lwip_ping_freertos.uvmpw` on the Freedom FRDM-K64F platform under `<install_dir>/boards/frdmk64f/demo_apps/lwip/lwip_ping/freertos/mdk/`. These steps take `lwip_ping_bm.uvmpw` on the Freedom FRDM-K64F platform for an example.

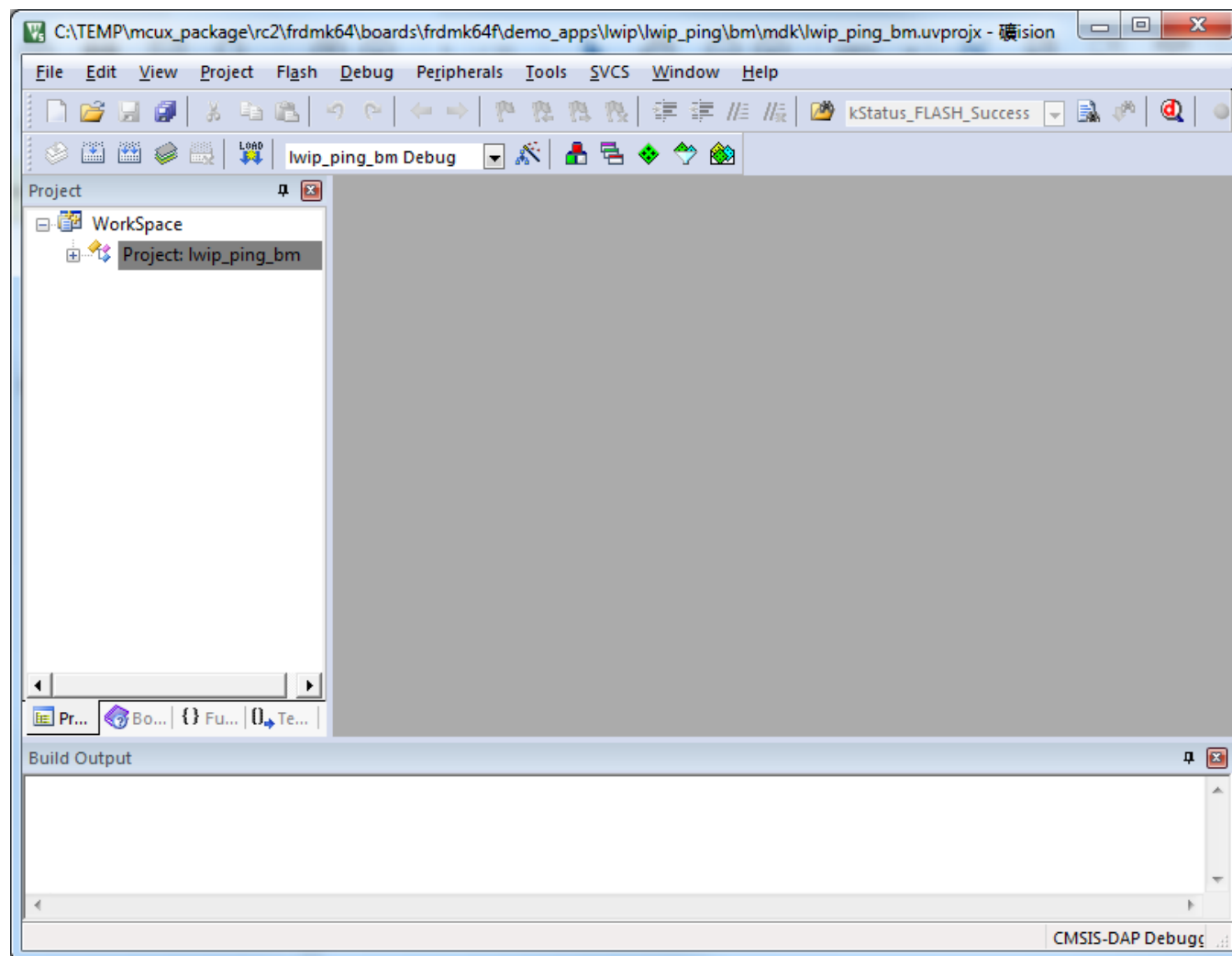


Figure 4. Workspace

2. Build the `lwip_ping_bm`.
3. Click Start/Stop Debug Session. Wait for the download to finish.
4. Click the “Run” button to run the demo.

5.3 Step-by-step guide for the Kinetis Design Studio IDE

Compiling or Running the lwIP Stack and Demos

This section shows how to compile and run demos in the Kinetis Design Studio IDE.

1. The Kinetis Design Studio IDE does not have a workspace. Create a workspace and import the lwIP demos. For example, import the .cproject for lwip_ping_bm on Freedom FRDM-K64F platform under <install_dir>/boards/frdmk64f/demo_apps/lwip/lwip_ping/bm/kds/; or import the lwip_ping_freertos on the Freedom FRDM-K64F platform under <install_dir>/boards/frdmk64f/demo_apps/lwip/lwip_ping/freertos/kds/.

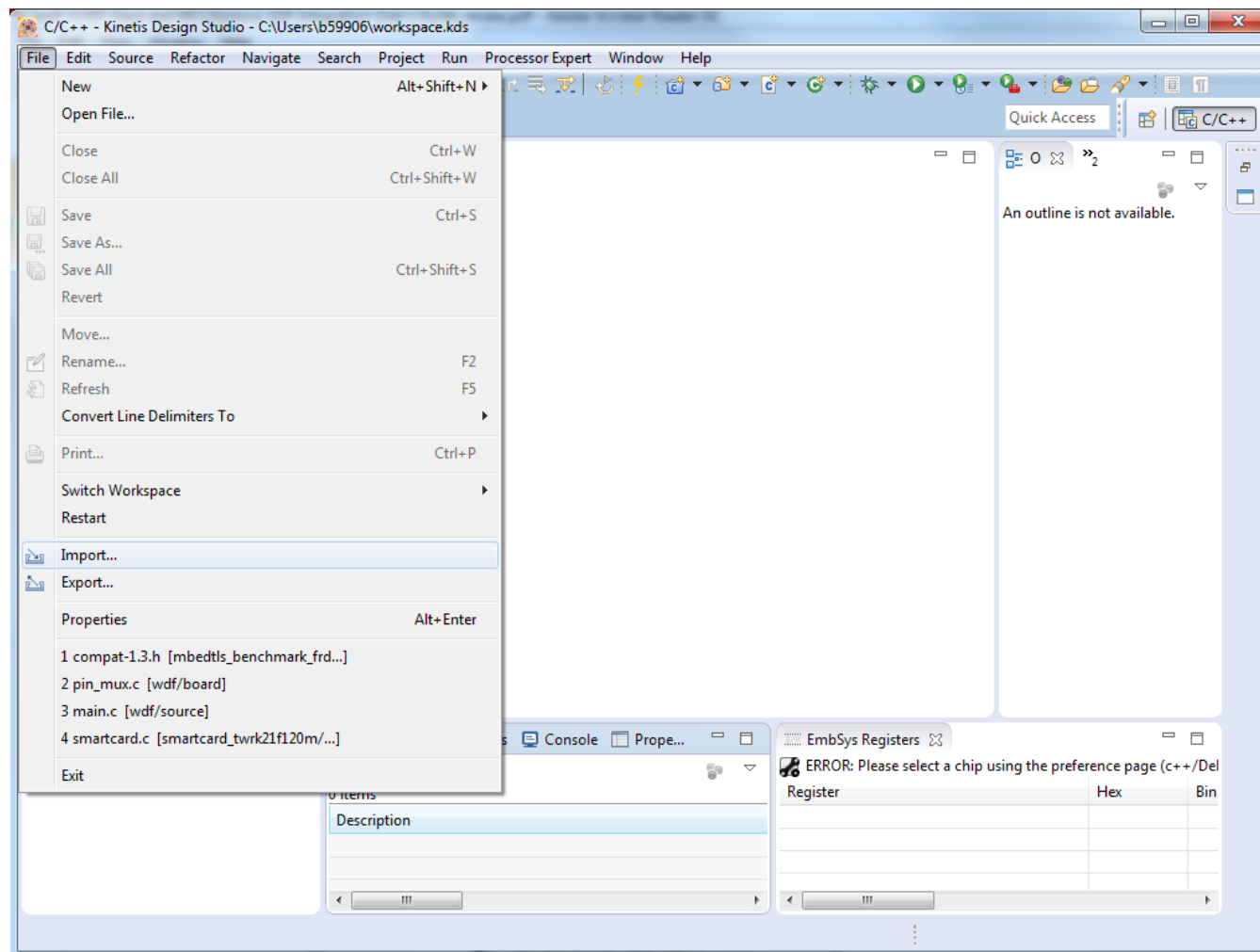


Figure 5. Import project with KDS IDE

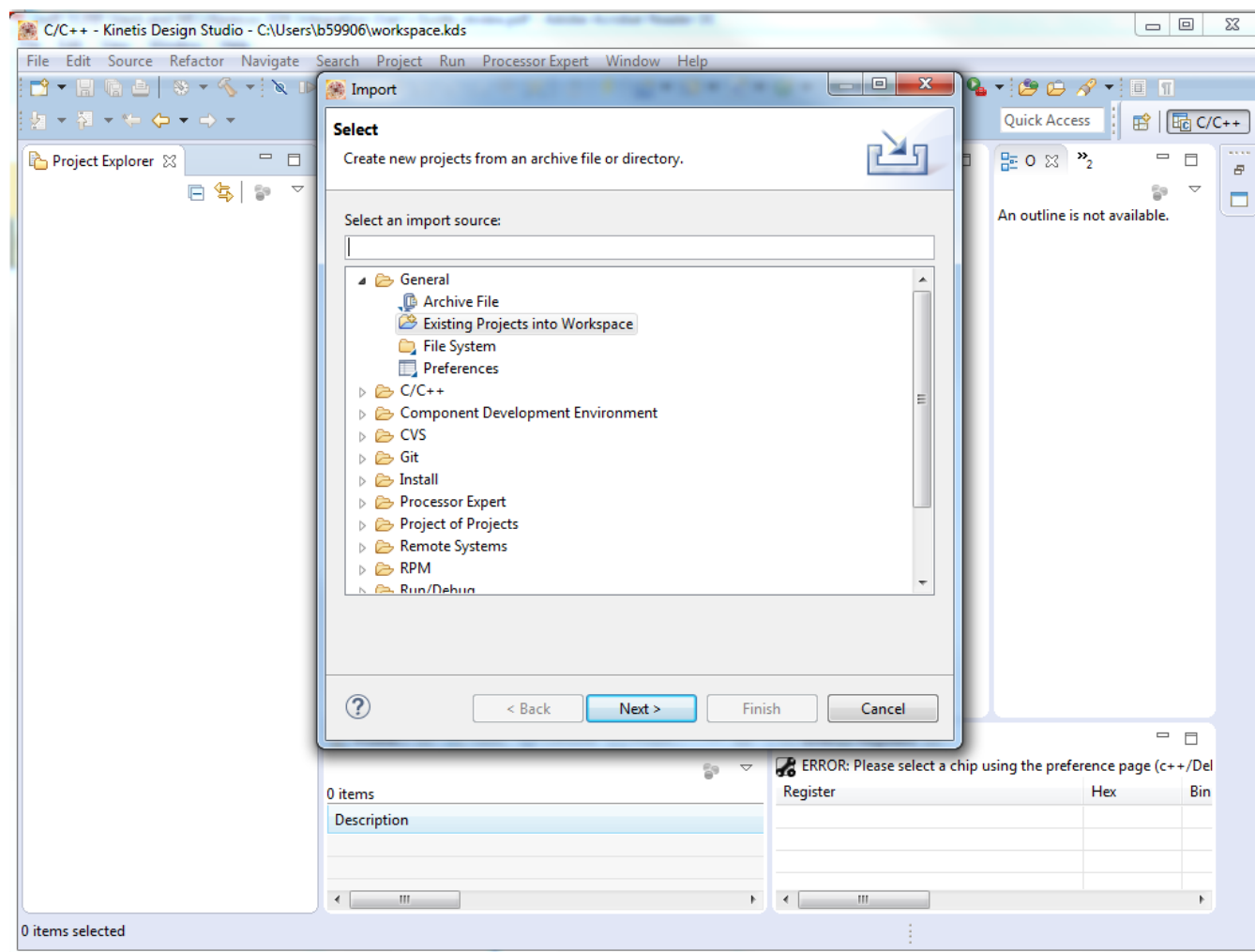


Figure 6. Import project select

Compiling or Running the lwIP Stack and Demos

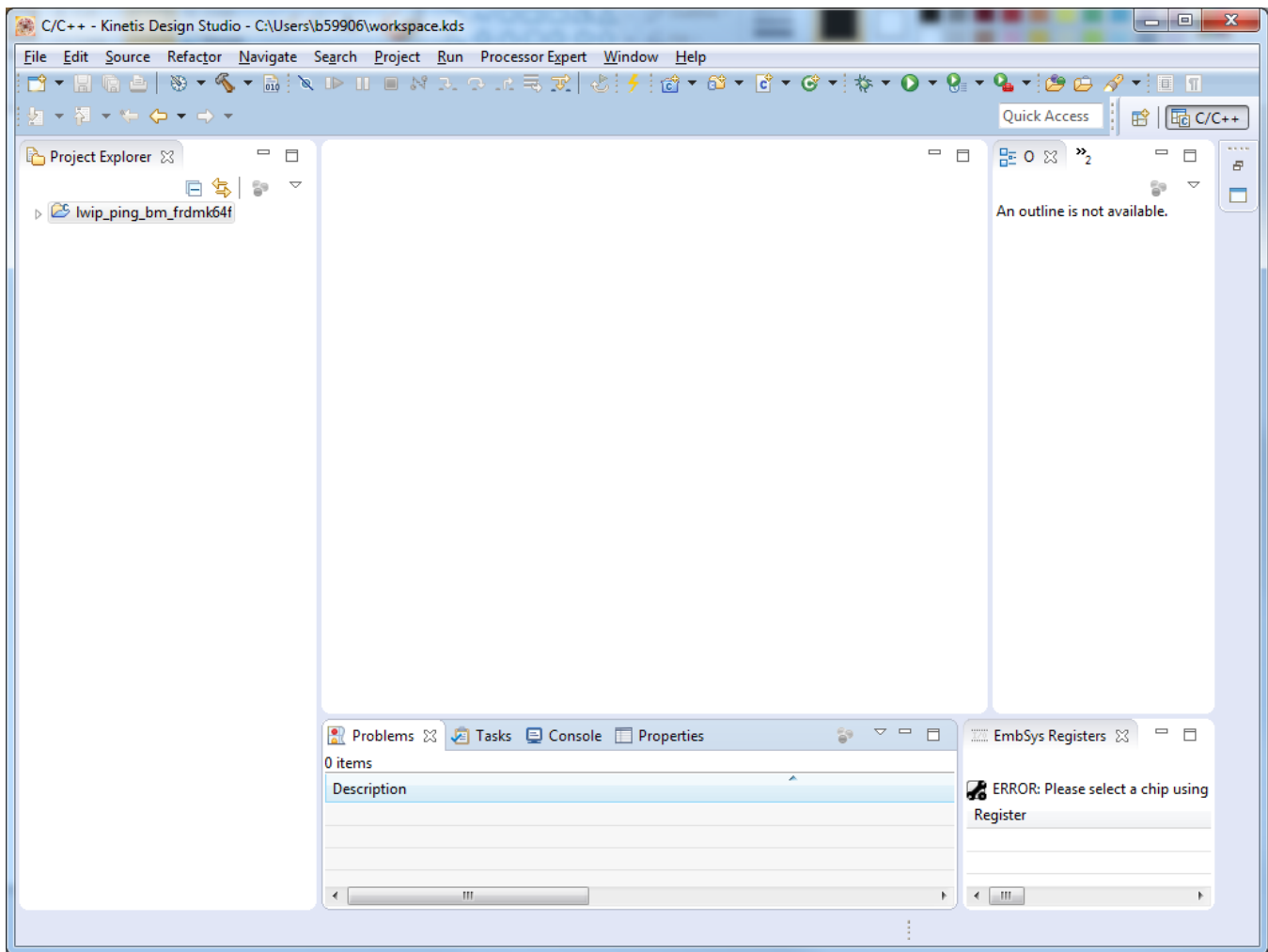


Figure 7. Demo project

2. Build the lwip_ping_bm.
3. Open debug configurations and choose J-Link Debugging.

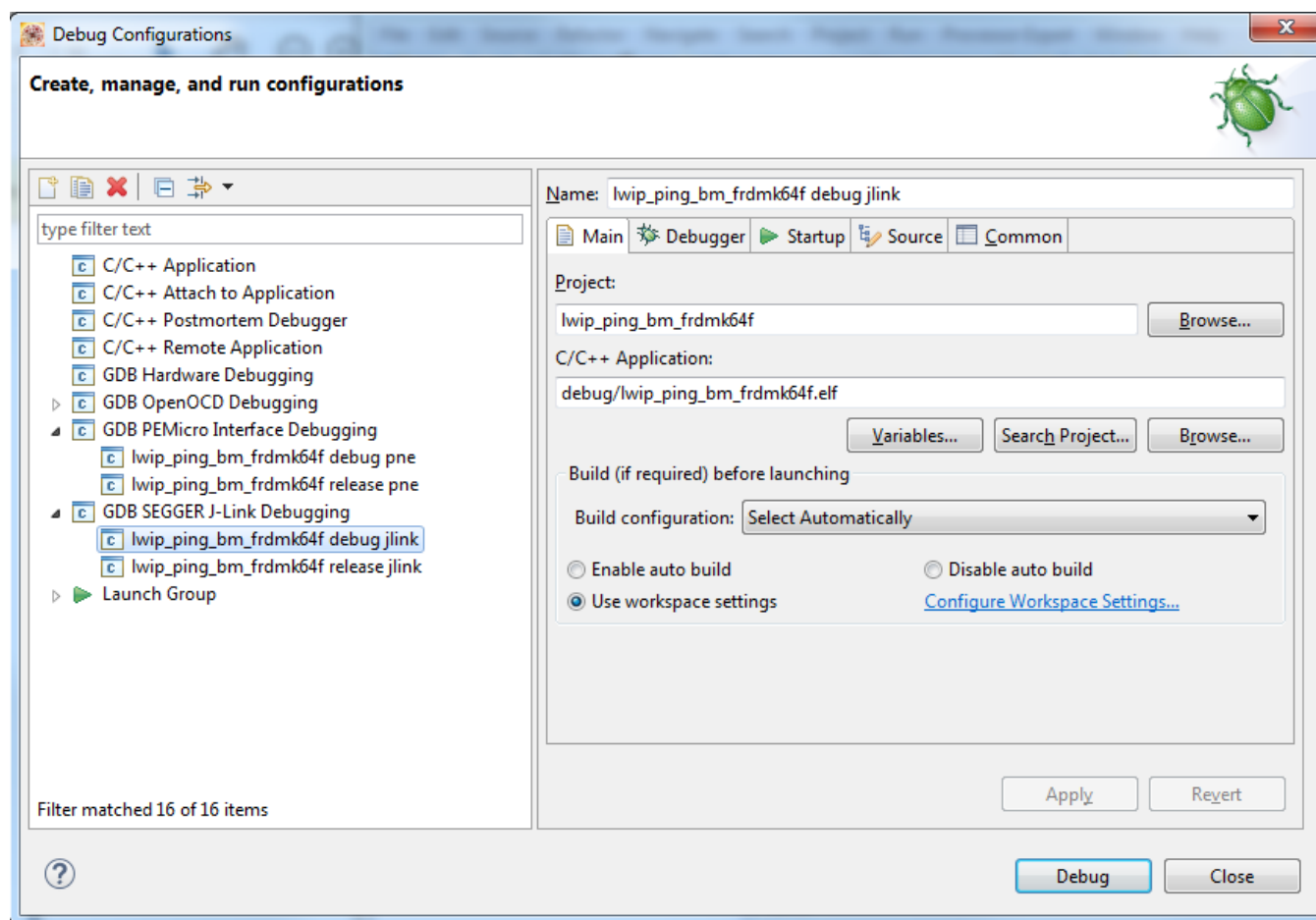


Figure 8. Debug Configurations

4. Click the “Debug” button. Wait for the download to finish.
5. Click the “Resume” button to run the demo.

5.4 Step-by-step guide for ARMGCC and KDSGCC

1. ARMGCC and KDSGCC both use cMake to generate makefiles. Run the batch file (in the Windows® operating system) or sh file (in Linux® operating system) to build projects. These steps use ARMGCC as an example.
2. Change to the demo directory. For example: <install_dir>/boards/frdmk64f/demo_apps/lwip/lwip_ping/bm/armgcc
3. Run build_all.bat to build both debug and release projects.
4. Go to the debug/release directory to download and run the elf file using gdb.

5.5 Step-by-step guide for MCUXpresso IDE

This section shows how to compile and run demos in the MCUXpresso IDE.

1. After opening an existing or creating a new workspace, drag and drop the SDK zip file into the "Installed SDKs" view to install an SDK. Next, import the lwIP demos.

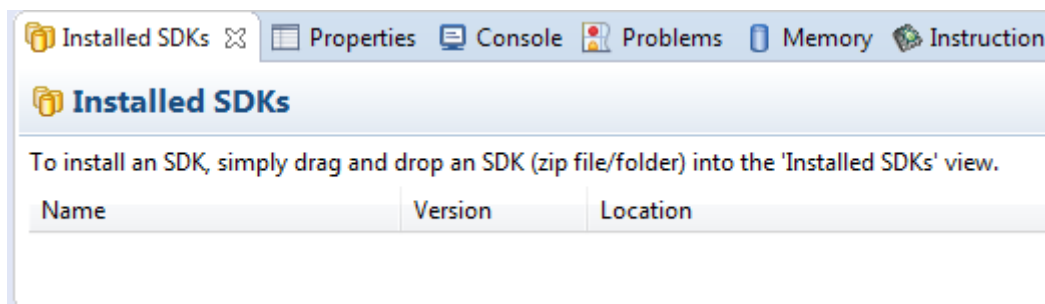


Figure 9. Install SDKs view



Figure 10. Import project

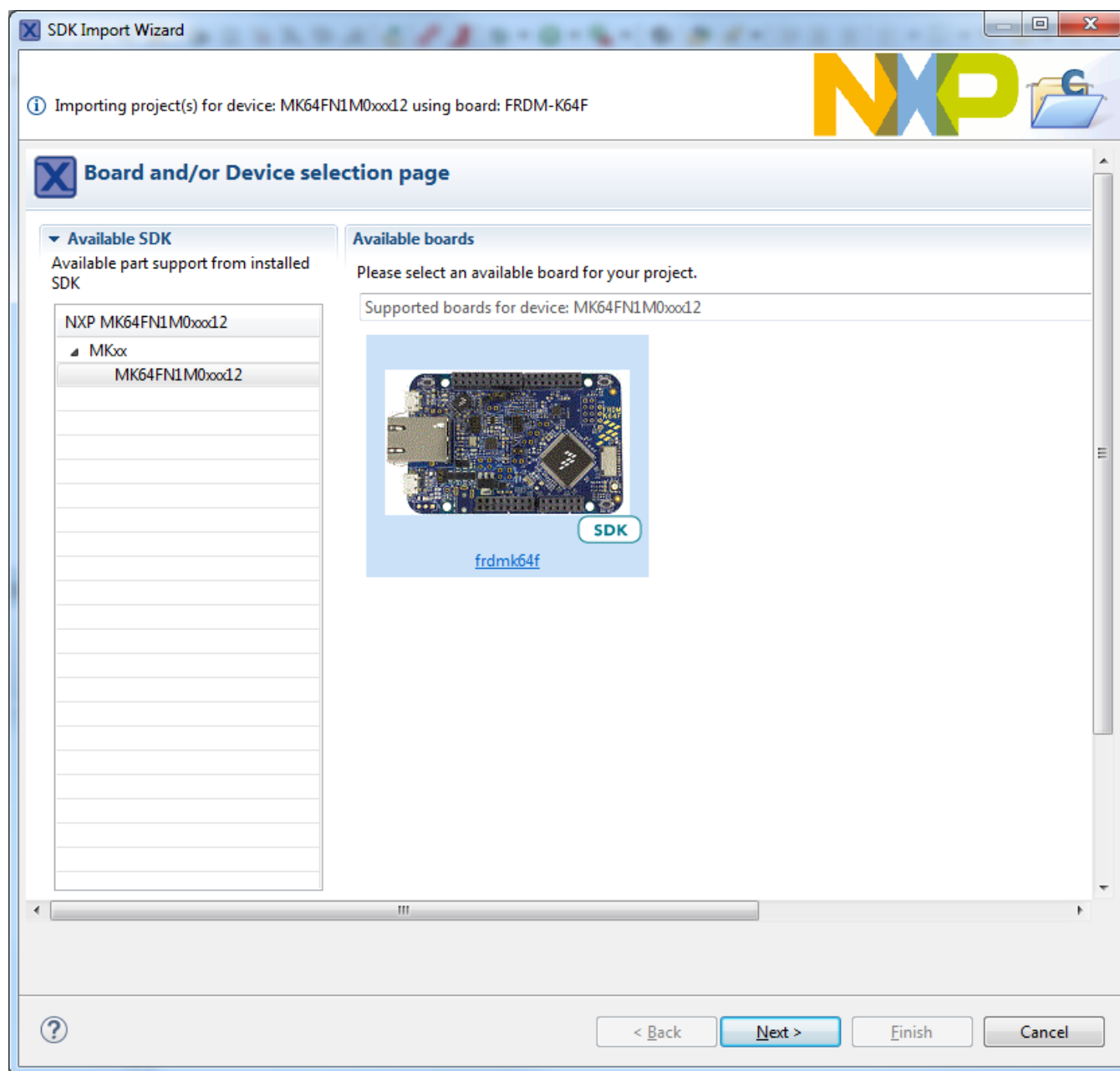


Figure 11. Select the board

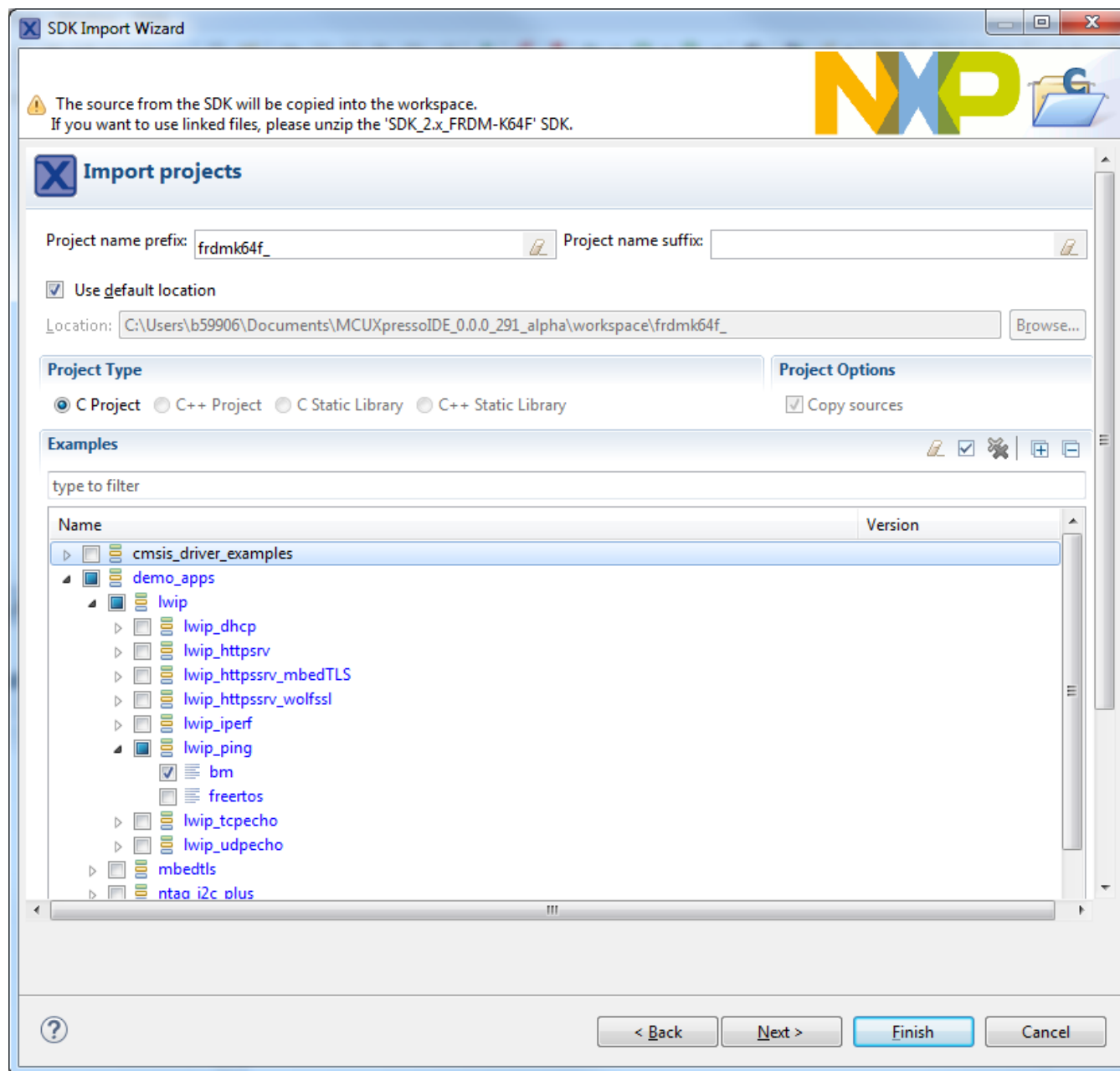


Figure 12. Select the path of lwip_ping_bm

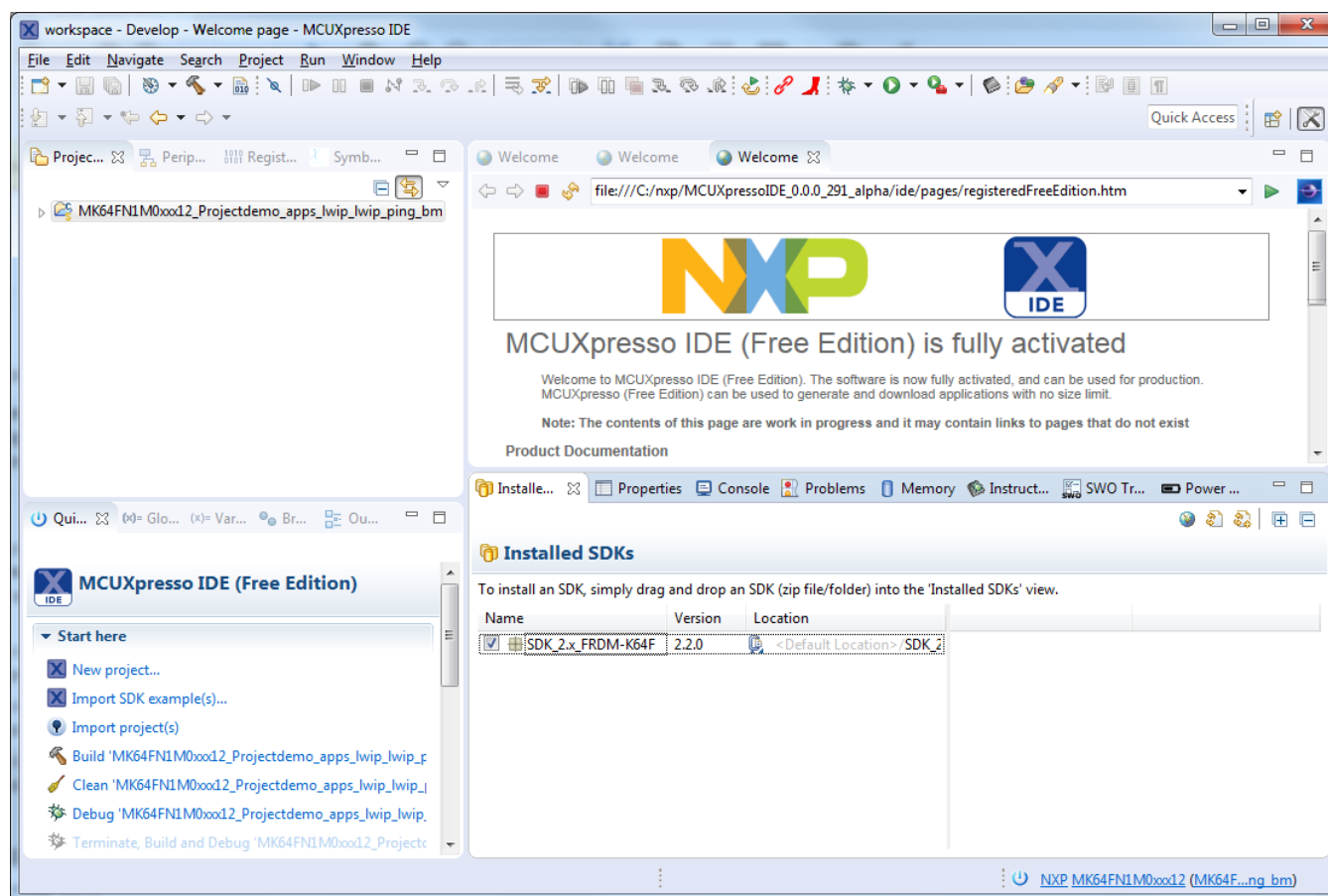


Figure 13. Demo project

2. Build the `lwip_ping_bm` using [Build] on the Quickstart panel.
3. Select “Debug ‘MK64FN1M0xxx12_Projectdemo_apps_lwip_ping_bm’ [Debug]” on the Quickstart Panel. Wait for the download to finish.

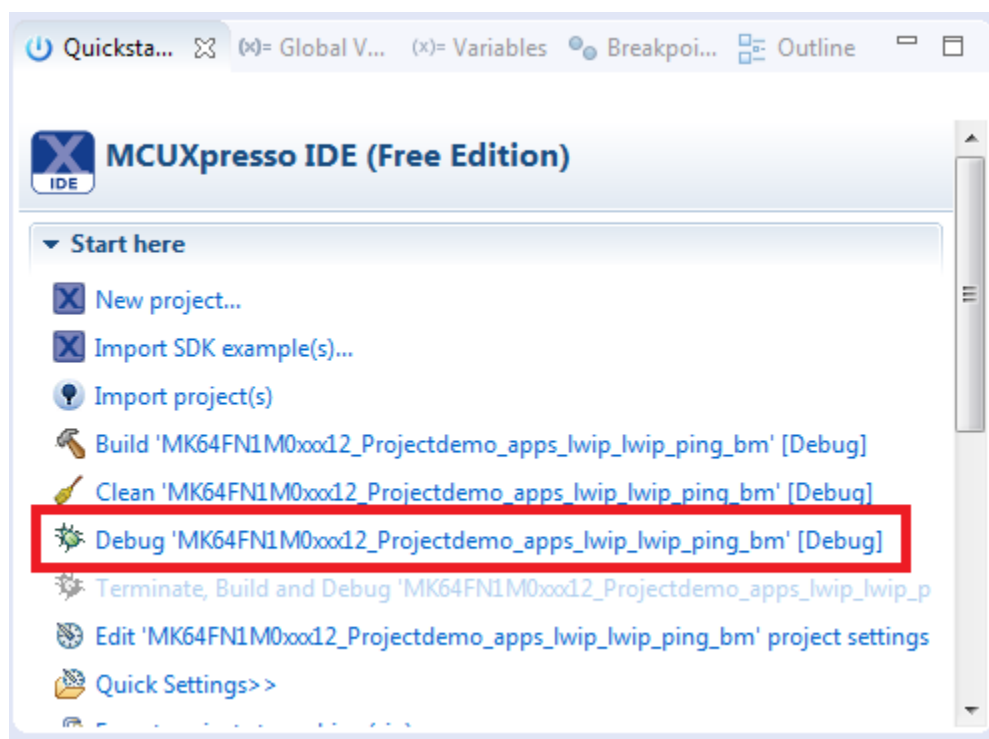


Figure 14. Debug the demo

4. Click the “Resume” button to run the demo.

6 Revision History

This table summarizes revisions to this document.

Table 1. Revision History

Revision number	Date	Substantive changes
2	09/2015	Updated tool versions in Section 3.2 and updated Section 5.2
3	11/2015	Updated Section 1
4	01/2016	Updated Section 1 and Section 3.2
5	10/2016	Updated Section 2.1 and Section 3.1
6	03/2017	Updated for MCUXpresso SDK

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Document Number SDKLWIPUG
Revision 6, 03/2017

