MCUXSDKIMX8MMGSUG

Getting Started with MCUXpresso SDK for EVK-MIMX8MM

Rev. 2.14.0 — 27 July 2023 User guide

Document information

Information	Content
Keywords	MCUXSDKIMX8MMGSUG, Getting Started, IMX8MM, EVK-MIMX8MM, MCUXpresso SDK
Abstract	This document describes the steps to get started with MCUXpresso SDK for EVK-MIMX8MM.

1 Overview

The NXP MCUXpresso software and tools offer comprehensive development solutions designed to optimize, ease and help accelerate embedded system development of applications based on general purpose, crossover and Bluetooth-enabled MCUs from NXP. The MCUXpresso SDK includes a flexible set of peripheral drivers designed to speed up and simplify development of embedded applications. Along with the peripheral drivers, the MCUXpresso SDK provides an extensive and rich set of example applications covering everything from basic peripheral use case examples to demo applications. The MCUXpresso SDK also contains optional RTOS integrations such as FreeRTOS and Azure RTOS, and device stack to support rapid development on devices.

For supported toolchain versions, see *MCUXpresso SDK Release Notes Supporting i.MX 8M Mini* (document MCUXSDKIMX8MMRN).

For the latest version of this and other MCUXpresso SDK documents, see the MCUXpresso SDK homepage MCUXpresso-SDK: Software Development Kit for MCUXpresso.

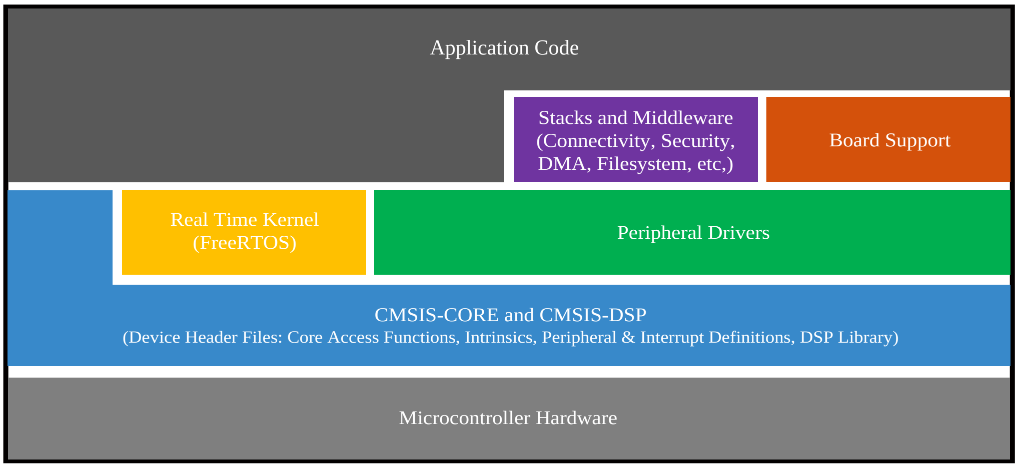


Figure 1. MCUXpresso SDK layers

2 MCUXpresso SDK board support folders

MCUXpresso SDK board support provides example applications for NXP development and evaluation boards for Arm Cortex-M cores. Board support packages are found inside of the top level boards folder, and each supported board has its own folder (MCUXpresso SDK package can support multiple boards). Within each <board_name> folder there are various sub-folders to classify the type of examples they contain. These include (but are not limited to):

- `cmsis_driver_examples`: Simple applications intended to concisely illustrate how to use CMSIS drivers.
- `demo_apps`: Full-featured applications intended to highlight key functionality and use cases of the target MCU. These applications typically use multiple MCU peripherals and may leverage stacks and middleware.
- `driver_examples`: Simple applications intended to concisely illustrate how to use the MCUXpresso SDK's peripheral drivers for a single use case.
- `rtos_examples`: Basic FreeRTOS OS examples showcasing the use of various RTOS objects (semaphores, queues, and so on) and interfacing with the MCUXpresso SDK's RTOS drivers
- `multicore_examples`: Simple applications intended to concisely illustrate how to use middleware/multicore stack.

2.1 Example application structure

This section describes how the various types of example applications interact with the other components in the MCUXpresso SDK. To get a comprehensive understanding of all MCUXpresso SDK components and folder structure, see *MCUXpresso SDK API Reference Manual*.

Each <board_name> folder in the boards directory contains a comprehensive set of examples that are relevant to that specific piece of hardware. Although we use the hello_world example (part of the demo_apps folder), the same general rules apply to any type of example in the <board_name> folder.

In the hello_world application folder you see the following contents:

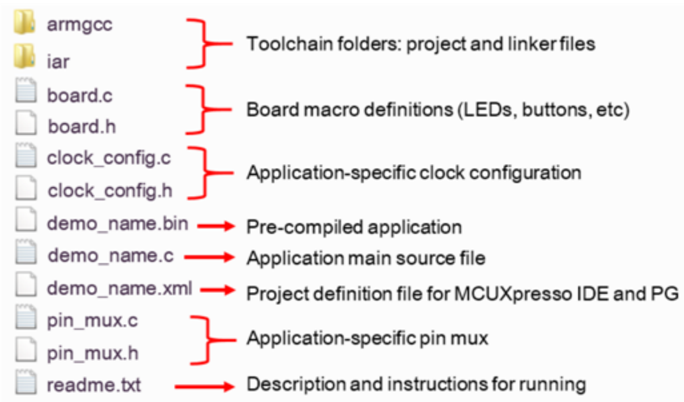


Figure 2. Application folder structure

All files in the application folder are specific to that example, so it is easy to copy and paste an existing example to start developing a custom application based on a project provided in the MCUXpresso SDK.

2.2 Locating example application source files

When opening an example application in any of the supported IDEs, a variety of source files are referenced. The MCUXpresso SDK devices folder is the central component to all example applications. It means the examples reference the same source files and, if one of these files is modified, it could potentially impact the behavior of other examples.

The main areas of the MCUXpresso SDK tree used in all example applications are:

- devices/<device_name>: The device's CMSIS header file, MCUXpresso SDK feature file and a few other files
- devices/<device_name>/drivers: All of the peripheral drivers for your specific MCU
- devices/<device_name>/<tool_name>: Toolchain-specific startup code, including vector table definitions
- devices/<device_name>/utilities: Items such as the debug console that are used by many of the example applications

For examples containing an RTOS, there are references to the appropriate source code. RTOSes are in the rtos folder. The core files of each of these are shared, so modifying one could have potential impacts on other projects that depend on that file.

3 Toolchain introduction

The MCUXpresso SDK release for i.MX 8M Mini includes the build system to be used with some toolchains. In this chapter, the toolchain support is presented and detailed.

3.1 Compiler/Debugger

The release supports building and debugging with the toolchains listed in Table 1.

The user can choose the appropriate one for development.

- Arm GCC + SEGGER J-Link GDB Server. This is a command line tool option and it supports both Windows OS and Linux OS.
- IAR Embedded Workbench for Arm and SEGGER J-Link software. The IAR Embedded Workbench is an IDE integrated with editor, compiler, debugger, and other components. The SEGGER J-Link software provides the driver for the J-Link Plus debugger probe and supports the device to attach, debug, and download.

Table 1. Toolchain information

Compiler/Debugger	Supported host OS	Debug probe	Tool website
ArmGCC/J-Link GDB server	Windows OS/Linux OS	J-Link Plus	developer.arm.com/open-source/gnu-toolchain/gnu-rm www.segger.com
IAR/J-Link	Windows OS	J-Link Plus	www.iar.com www.segger.com

Download the corresponding tools for the specific host OS from the website.

Note: *To support i.MX 8M Mini, the patch for IAR should be installed. The patch named iar_support_patch_imx8mm.zip can be used with MCUXpresso SDK. See the readme.txt in the patch for additional information about patch installation.*

4 Run a demo application using IAR

This section describes the steps required to build, run, and debug example applications provided in the MCUXpresso SDK. The `hello_world` demo application targeted for the i.MX 8MMini EVK hardware platform is used as an example, although these steps can be applied to any example application in the MCUXpresso SDK.

4.1 Build an example application

Do the following steps to build the `hello_world` example application.

1. Open the desired demo application workspace. Most example application workspace files can be located using the following path:

   ```
   <install_dir>/boards/<board_name>/<example_type>/<application_name>/iar
   ```

   Using the i.MX 8MMini EVK hardware platform as an example, the `hello_world` workspace is located in:

   ```
   <install_dir>/boards/evkmimx8mm/demo_apps/hello_world/iar/hello_world.eww
   ```

   Other example applications may have additional folders in their path.
2. Select the desired build target from the drop-down menu.

For this example, select **hello_world** – **debug**.

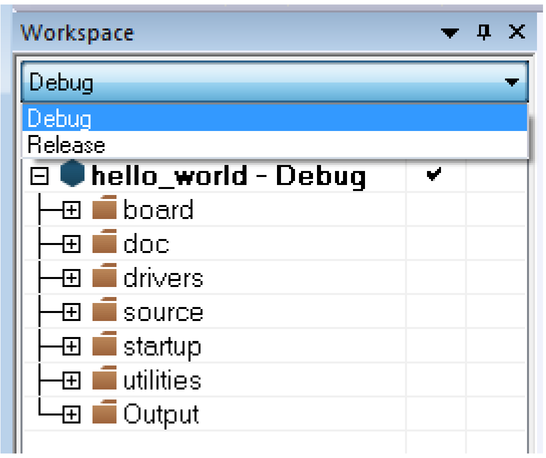


Figure 3. Demo build target selection

3. To build the demo application, click **Make**, highlighted in red in Figure 4.

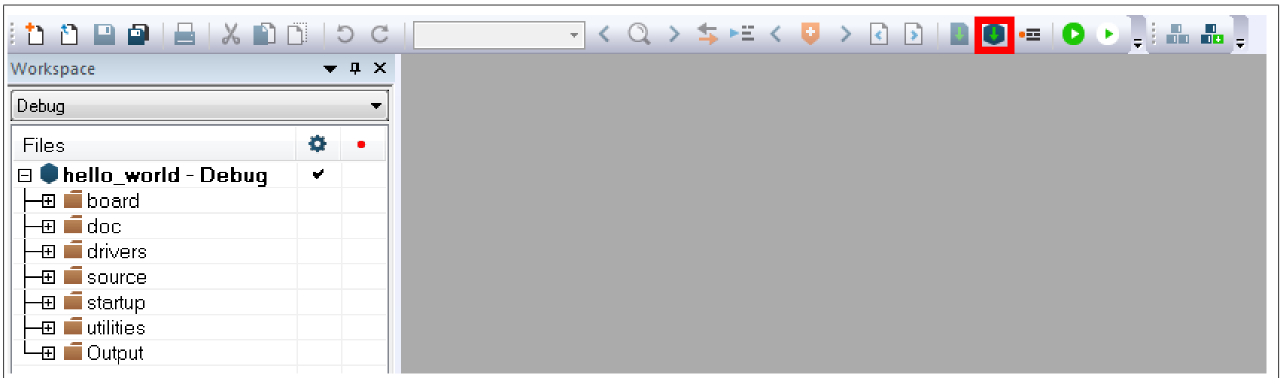


Figure 4. Build the demo application

4. The build completes without errors.

4.2 Run an example application

To download and run the application, perform these steps:

1. This board supports the J-Link PLUS debug probe. Before using it, install SEGGER J-Link software, which can be downloaded from http://www.segger.com/downloads/jlink/.
2. Connect the development platform to your PC via USB cable between the USB-UART MICRO USB connector and the PC USB connector, then connect power supply and J-Link Plus to the device.
3. Open the terminal application on the PC, such as PuTTY or TeraTerm, and connect to the debug COM port (to determine the COM port number, see Section 8). Configure the terminal with these settings:
   a. 115200 baud rate
   b. No parity
   c. 8 data bits
   d. 1 stop bit

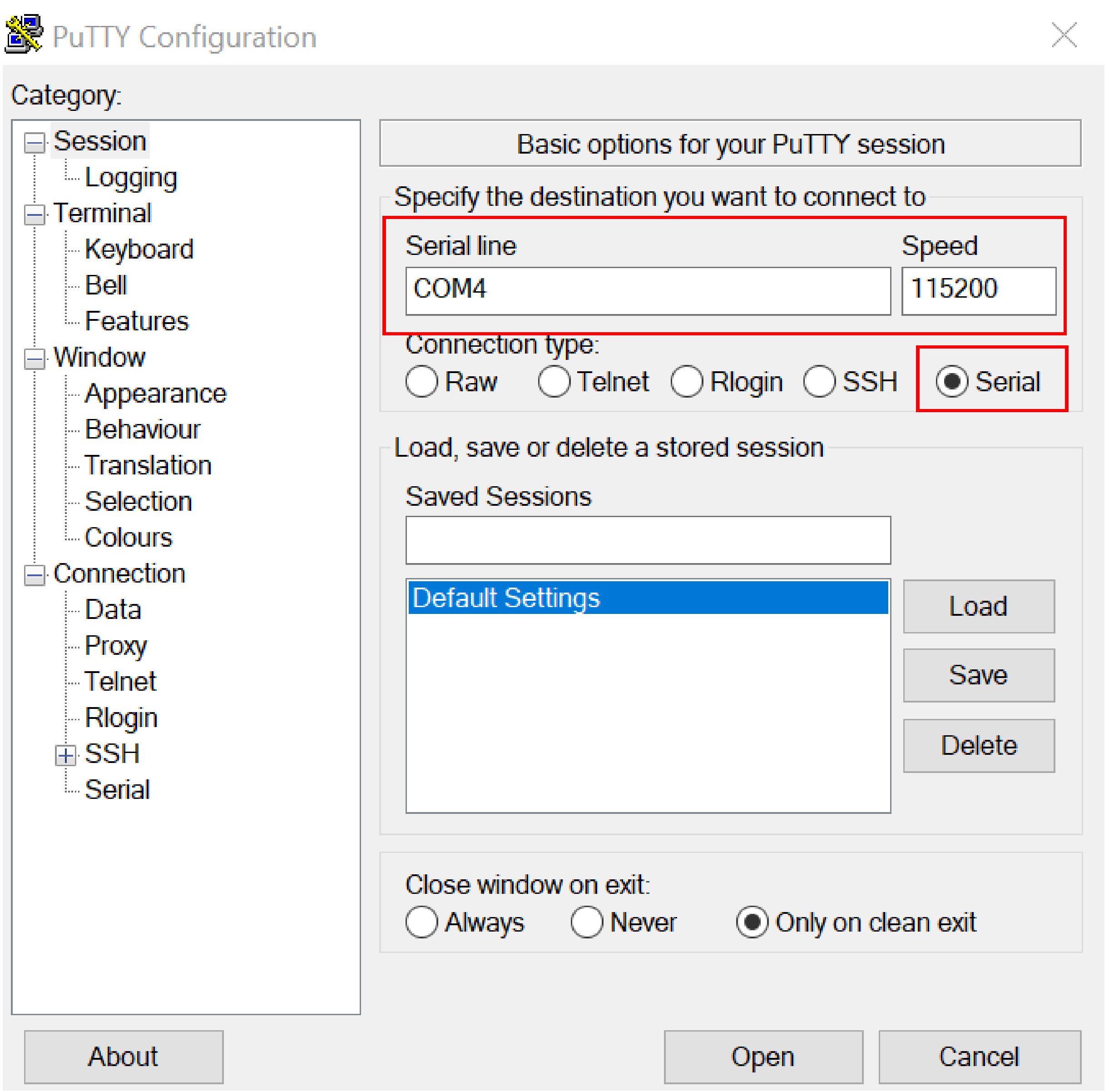


Figure 5. Terminal (PuTTY) configuration

4. In IAR, click **Download and Debug** to download the application to the target.

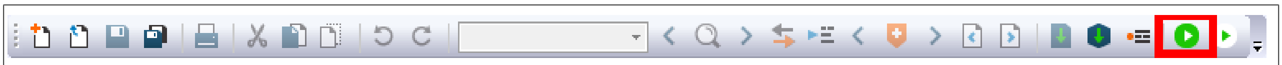


Figure 6. Download and Debug button

5. The application then downloads to the target and automatically runs to the `main()` function.

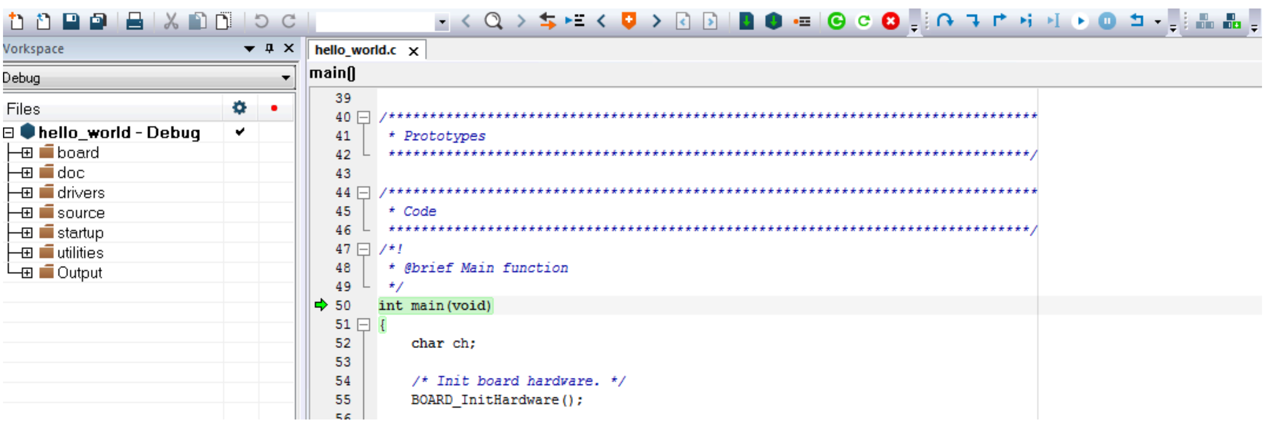


Figure 7. Stop at `main()` when running debugging

6. Run the code by clicking **Go** to start the application.

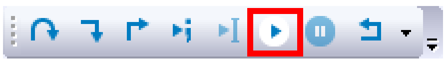


Figure 8. Go button

7. The `hello_world` application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

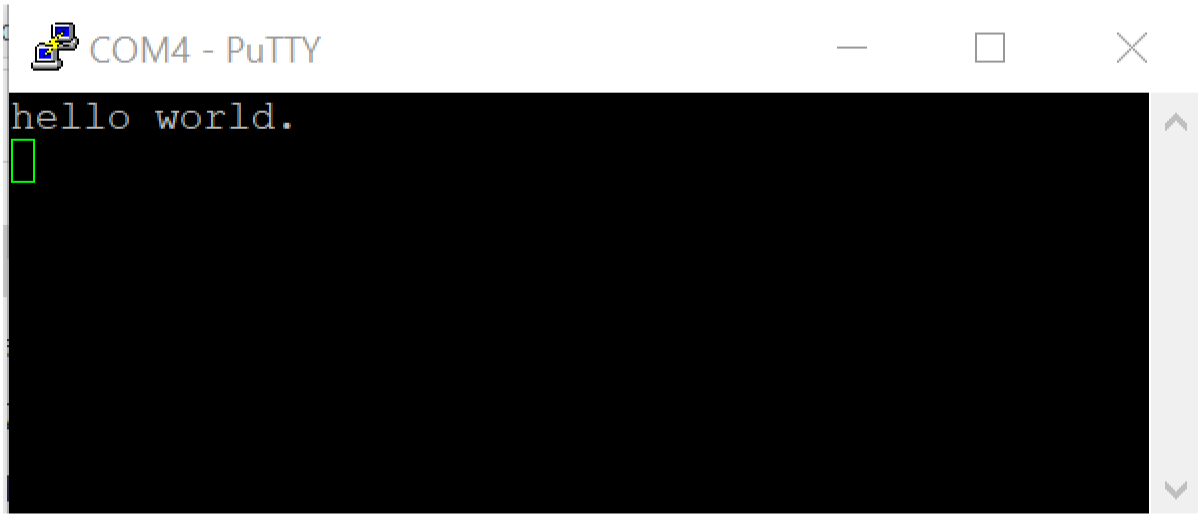


Figure 9. Text display of the `hello_world` demo

***Note:** For downloading the DDR target application, insert one TF card with U-Boot code. This requires both on IAR and GCC.*

5 Run a demo using Arm GCC

This section describes the steps to configure the command line Arm GCC tools to build, run, and debug demo applications and necessary driver libraries provided in the MCUXpresso SDK. The `hello_world` demo application targeted for i.MX 8M Mini is used as an example, though these steps can be applied to any board, demo or example application in the MCUXpresso SDK.

5.1 Linux OS host

The following sections provide steps to run a demo compiled with Arm GCC on Linux host.

5.1.1 Set up toolchain

This section contains the steps to install the necessary components required to build and run a MCUXpresso SDK demo application with the Arm GCC toolchain, as supported by the MCUXpresso SDK.

5.1.1.1 Install GCC Arm embedded tool chain

Download and run the installer from launchpad.net/gcc-arm-embedded. This is the actual toolset (in other words, compiler, linker, and so on). The GCC toolchain should correspond to the latest supported version, as described in the *MCUXpresso SDK Release Notes* (document MCUXSDKRN).

Note: *See Section 10 for Linux OS before compiling the application.*

5.1.1.2 Add a new system environment variable for ARMGCC_DIR

Create a new *system* environment variable and name it `ARMGCC_DIR`. The value of this variable should point to the Arm GCC Embedded tool chain installation path. For this example, the path is:

```
$ export ARMGCC_DIR=/work/platforms/tmp/gcc-arm-none-eabi-<version>
```

```
$ export PATH= $PATH:/work/platforms/tmp/gcc-arm-none-eabi-<version>/bin
```

Note: *If the ArmGCC version is not known, see the corresponding release notes document.*

5.1.2 Build an example application

To build an example application, follow these steps.

1. Change the directory to the example application project directory, which has a path similar to the following: `<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc`
   For this example, the exact path is: `<install_dir>/boards/evkmimx8mm/demo_apps/hello_world/armgcc`
2. Run the `build_debug.sh` script on the command line to perform the build. The output is shown as below:

```
$ ./build_debug.sh
-- TOOLCHAIN_DIR: /work/platforms/tmp/gcc-arm-none-eabi-<version>
-- BUILD_TYPE: debug
-- TOOLCHAIN_DIR: /work/platforms/tmp/gcc-arm-none-eabi-<version>
-- BUILD_TYPE: debug
-- The ASM compiler identification is GNU
-- Found assembler: /work/platforms/tmp/gcc-arm-none-eabi-<version>/bin/arm-none-eabi-gcc
-- Configuring done
-- Generating done
-- Build files have been written to:
/work/platforms/tmp/nxp/SDK_2.x.x_EVK-MIMX8MM/boards/evkmimx8mm/demo_apps/hello_world/armgcc
Scanning dependencies of target hello_world.elf
[ 6%] Building C object CMakeFiles/hello_world.elf.dir/work/platforms/tmp/nxp/SDK_2.x.x_EVK-
MIMX8MM/boards/evkmimx8mm/demo_apps/hello_world/hello_world.c.obj
 < -- skipping lines -- >
[100%] Linking C executable debug/hello_world.elf
[100%] Built target hello_world.elf
```

5.1.3 Run an example application

This section describes steps to run a demo application using J-Link GDB Server application.

After the J-Link interface is configured and connected, follow these steps to download and run the demo applications:

1. Connect the development platform to your PC via USB cable between the USB-UART connector and the PC USB connector. If using a standalone J-Link debug pod, also connect it to the SWD/JTAG connector of the board.
2. Open the terminal application on the PC, such as PuTTY or TeraTerm, and connect to the debug serial port number (to determine the COM port number, see Section 8). Configure the terminal with these settings:
   a. 115200 baud rate, depending on your board (reference `BOARD_DEBUG_UART_BAUDRATE` variable in the `board.h` file)
   b. No parity
   c. 8 data bits
   d. 1 stop bit

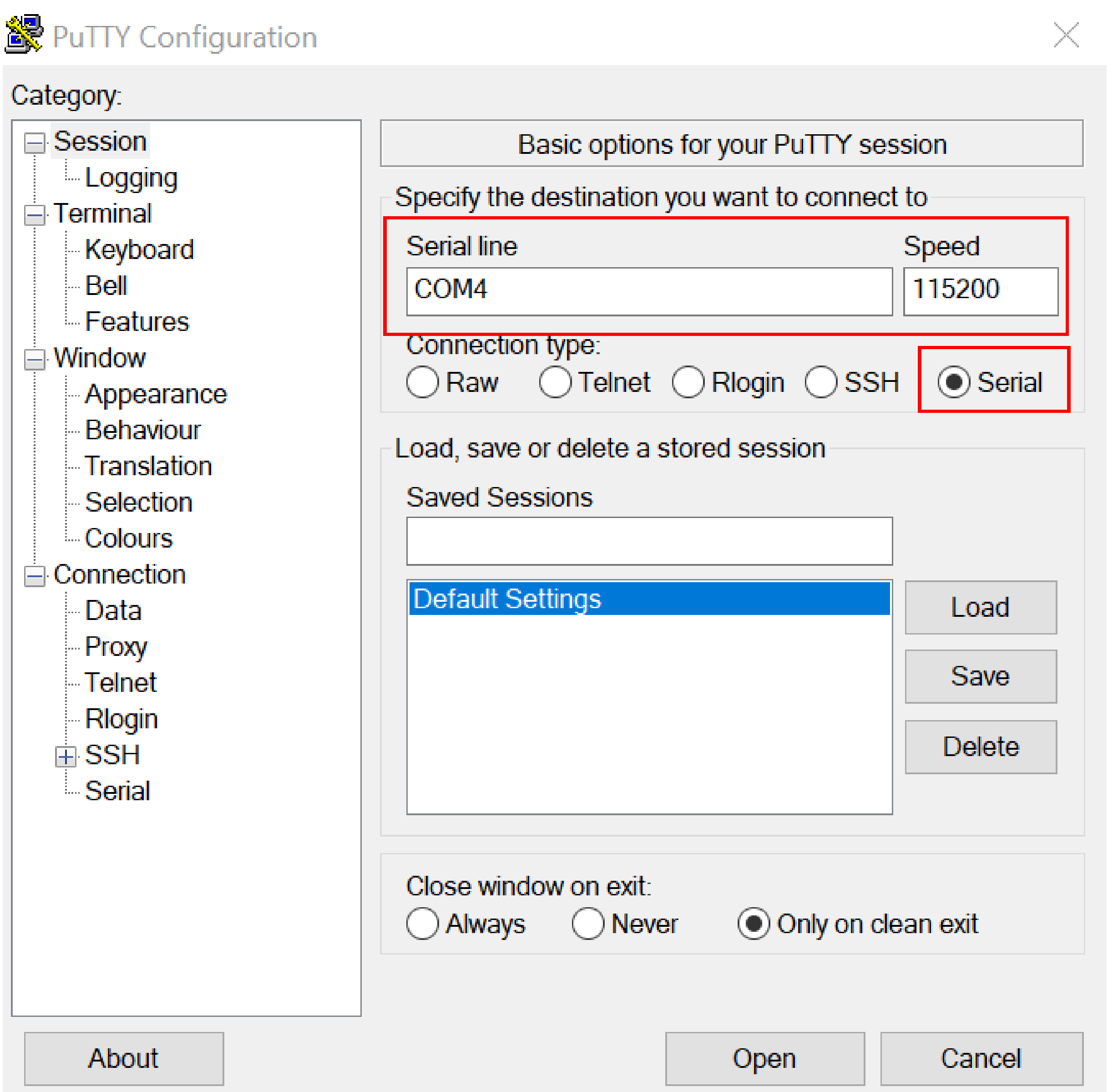


Figure 10. Terminal (PuTTY) configurations

3. Open the J-Link GDB Server application. Assuming the J-Link software is installed, the application can be launched from a new terminal for the MIMX8MM6_M4 device:

```
$ JLinkGDBServer -if JTAG -device
SEGGER J-Link GDB Server  Command Line Version
JLinkARM.dll
Command line: -if JTAG -device MIMX8MM6_M4
-----GDB Server start settings-----
GDBInit file: none
GDB Server Listening port: 2331
SWO raw output listening port: 2332
Terminal I/O port: 2333
Accept remote connection: yes
< -- Skipping lines -- >
Target connection timeout: 0 ms
------J-Link related settings------
J-Link Host interface: USB
J-Link script: none
```

```
J-Link settings file: none
------Target related settings------
Target device:
Target interface: JTAG
Target interface speed: 1000 kHz
Target endian: little
Connecting to J-Link...
J-Link is connected.
Firmware: J-Link V10 compiled Feb 2 2018 18:12:40
Hardware: V10.10
S/N: 600109545
Feature(s): RDI, FlashBP, FlashDL, JFlash, GDB
Checking target voltage...
Target voltage: 1.82 V
Listening on TCP/IP port 2331
Connecting to target...
J-Link found 1 JTAG device, Total IRLen = 4
JTAG ID: 0x5BA00477 (Cortex-M4)
Connected to target
Waiting for GDB connection...
```

4. Change to the directory that contains the example application output. The output can be found in using one of these paths, depending on the build target selected:
   `<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc/debug`
   `<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc/release`
   For this example, the path is:
   `<install_dir>/boards/evkmimx8mm/demo_apps/hello_world/armgcc/debug`
5. Start the GDB client:

```
$ arm-none-eabi-gdb hello_world.elf
GNU gdb (GNU Tools for Arm Embedded Processors 7-2017-q4-major) 8.0.50.20171128-git
Copyright (C) 2017 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law. Type "show copying"
and "show warranty" for details.
This GDB was configured as "--host=x86_64-linux-gnu --target=arm-none-eabi".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.
For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from hello_world.elf...
(gdb)
```

6. Connect to the GDB server and load the binary by running the following commands:
   a. `target remote localhost:2331`
   b. `monitor reset`
   c. `monitor halt`
   d. `load`

```

(gdb) target remote localhost:2331
Remote debugging using localhost:2331
(gdb) monitor reset
Resetting target
(gdb) monitor halt
(gdb) load
Loading section .interrupts, size 0x240 lma 0x1ffe0000
Loading section .text, size 0x3858 lma 0x1ffe0240
Loading section .ARM, size 0x8 lma 0x1ffe3a98
Loading section .init_array, size 0x4 lma 0x1ffe3aa0
Loading section .fini_array, size 0x4 lma 0x1ffe3aa4
Loading section .data, size 0x64 lma 0x1ffe3aa8
Start address 0x1ffe02f4, load size 15116
```

```
Transfer rate: 81 KB/sec, 2519 bytes/write.
(gdb)
```

The application is now downloaded and halted at the reset vector. Execute the `monitor go` command to start the demo application.

```
(gdb) monitor go
```

The `hello_world` application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

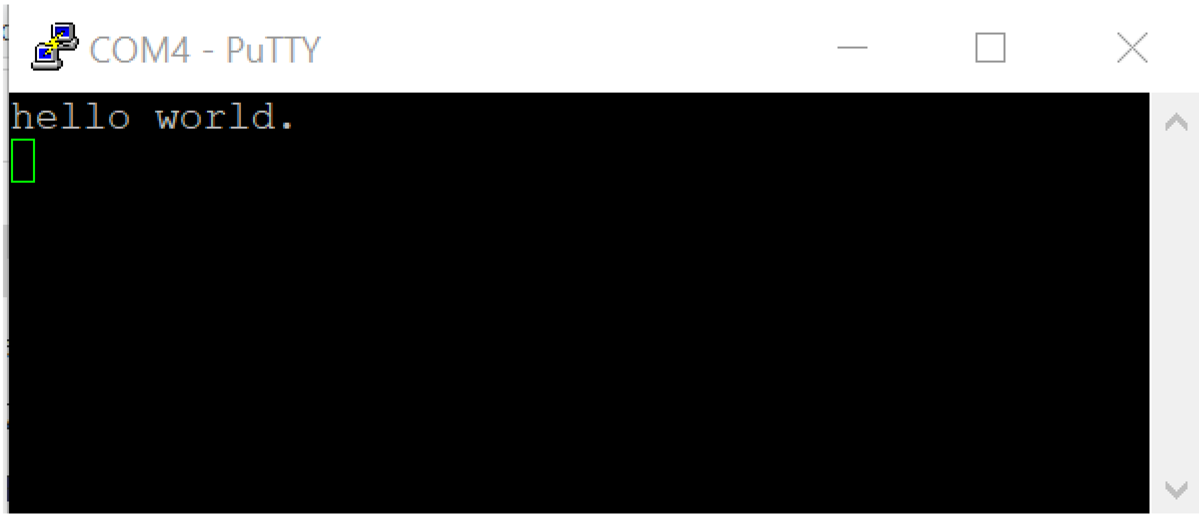


Figure 11. Text display of the hello_world demo

5.2 Windows OS host

The following sections provide steps to run a demo compiled with Arm GCC on Windows OS host.

5.2.1 Set up toolchain

This section contains the steps to install the necessary components required to build and run a MCUXpresso SDK demo application with the Arm GCC toolchain on Windows OS, as supported by the MCUXpresso SDK.

5.2.1.1 Install GCC Arm Embedded tool chain

Download and run the installer from GNU Arm Embedded Toolchain. This is the actual toolset (in other words, compiler, linker, and so on). The GCC toolchain should correspond to the latest supported version, as described in *MCUXpresso SDK Release Notes*.

Note: *See Appendix B for Windows OS before compiling the application.*

5.2.1.2 Add a new system environment variable for ARMGCC_DIR

Create a new *system* environment variable and name it `ARMGCC_DIR`. The value of this variable should point to the Arm GCC Embedded tool chain installation path.

Reference the installation folder of the GNU Arm GCC Embedded tools for the exact path name.

5.2.2 Build an example application

To build an example application, follow these steps.

1. Open a GCC Arm Embedded tool chain command window. To launch the window, from the Windows operating system Start menu, go to **Programs** -> **GNU Tools Arm Embedded <version>** and select **GCC Command Prompt**.

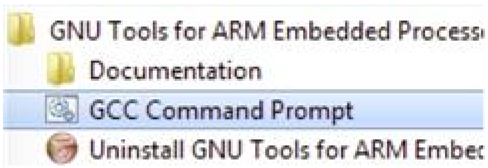


Figure 12. Launch command prompt

2. Change the directory to the example application project directory, which has a path similar to the following:

```
<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc
```

For this example, the exact path is:

```
<install_dir>/boards/evkmimx8mm/demo_apps/hello_world/armgcc
```

3. Type **build_debug.bat** on the command line or double click on the `build_debug.bat` file in Windows Explorer to perform the build. The output is as shown in Figure 13.

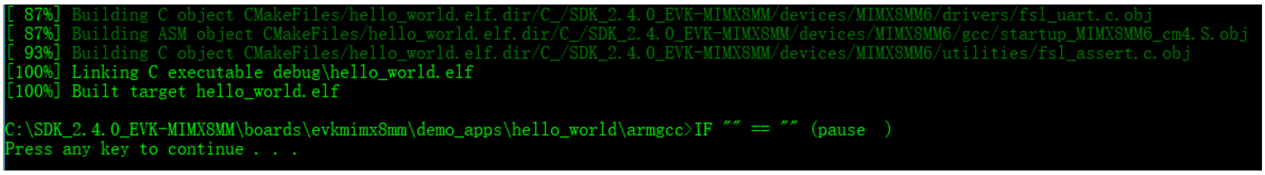


Figure 13. hello_world demo build successful

5.2.3 Run an example application

This section describes steps to run a demo application using J-Link GDB Server application. To perform this exercise, the following step must be done:

- You have a standalone J-Link pod that is connected to the debug interface of your board.

After the J-Link interface is configured and connected, follow these steps to download and run the demo applications:

1. Connect the development platform to your PC via USB cable between the USB-UART connector and the PC USB connector. If using a standalone J-Link debug pod, also connect it to the SWD/JTAG connector of the board.
2. Open the terminal application on the PC, such as PuTTY or TeraTerm, and connect to the debug serial port number (to determine the COM port number, see Section 8). Configure the terminal with these settings:
   a. 115200 baud rate
   b. No parity
   c. 8 data bits
   d. 1 stop bit

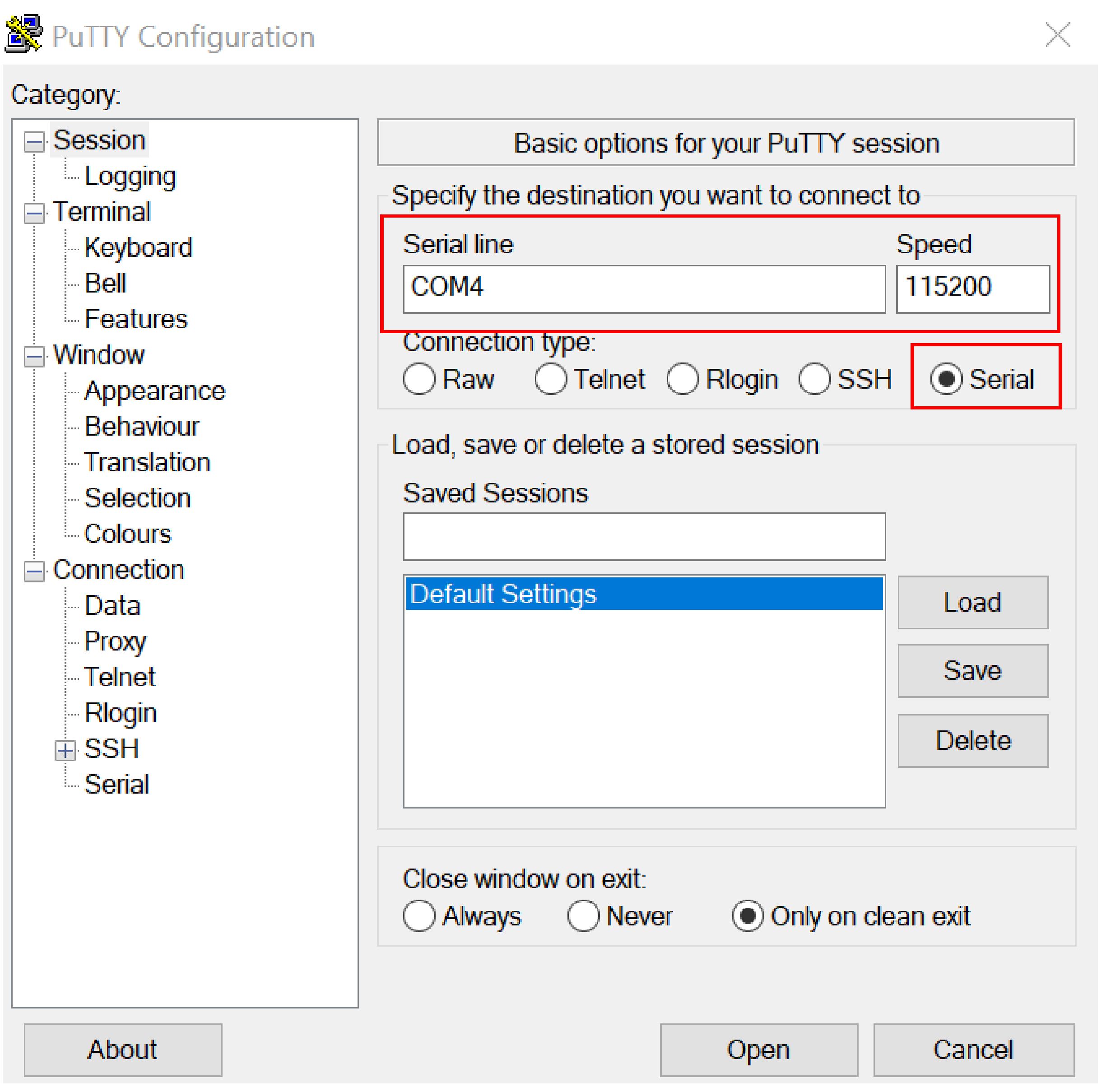


Figure 14. Terminal (PuTTY) configurations

3. After GDB server is running, the screen should resemble Figure 15:

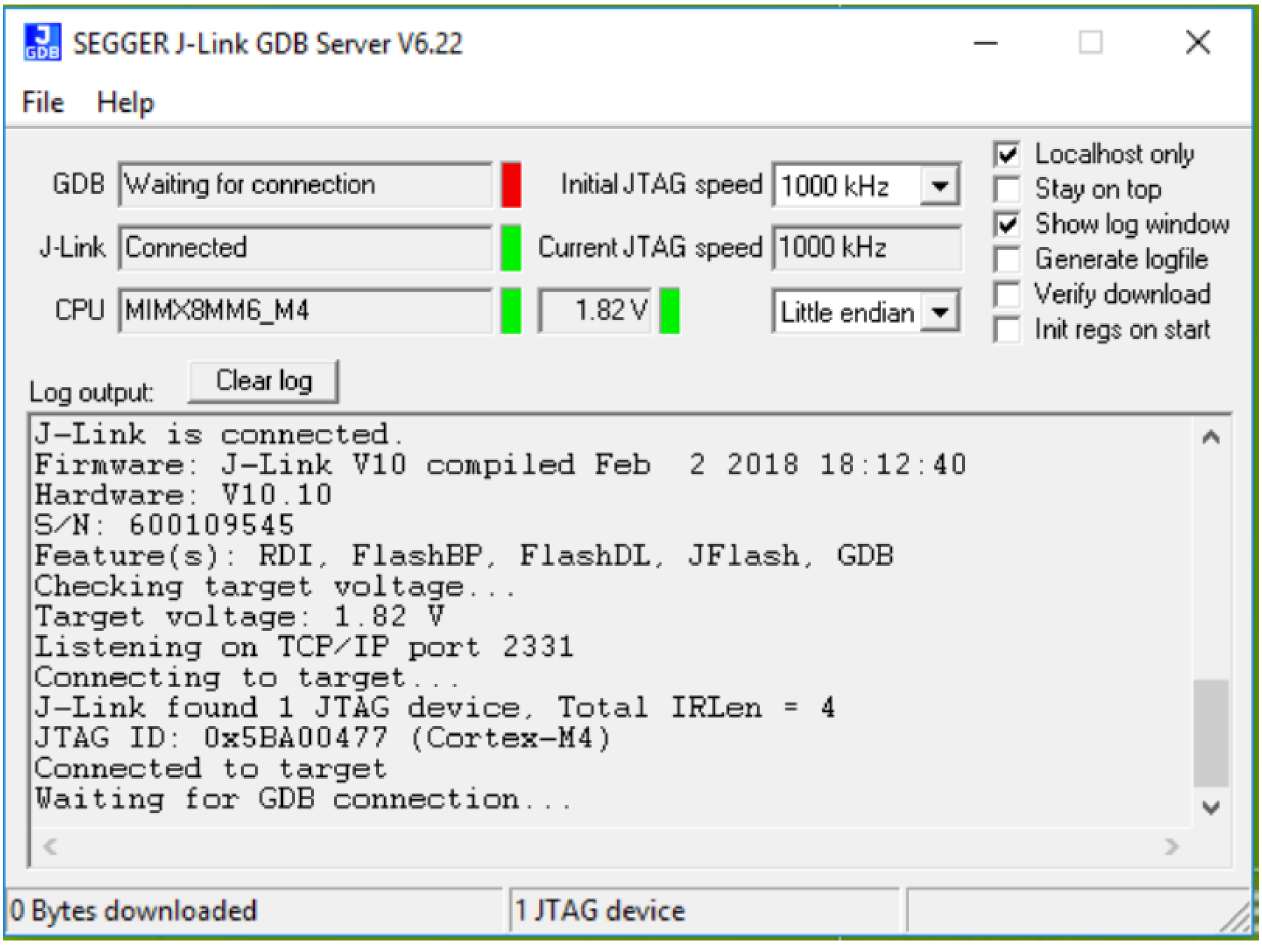


Figure 15. SEGGER J-Link GDB server screen after successful connection

4. If not already running, open a GCC Arm Embedded tool chain command window. To launch the window, from the Windows operating system **Start** menu, go to **Programs** -> **GNU Tools Arm Embedded <version>** and select **GCC Command Prompt**.

Figure 16. Launch command prompt

5. Change to the directory that contains the example application output. The output can be found in using one of these paths, depending on the build target selected:

```
<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc/debug
```

```
<install_dir>/boards/<board_name>/<example_type>/<application_name>/armgcc/release
```

For this example, the path is:

```
<install_dir>/boards/evkmimx8mm/demo_apps/hello_world/armgcc/debug
```

6. Run the command of `arm-none-eabi-gdb.exe <application_name>.elf`. For this example, it is `arm-none-eabi-gdb.exe hello_world.elf`.

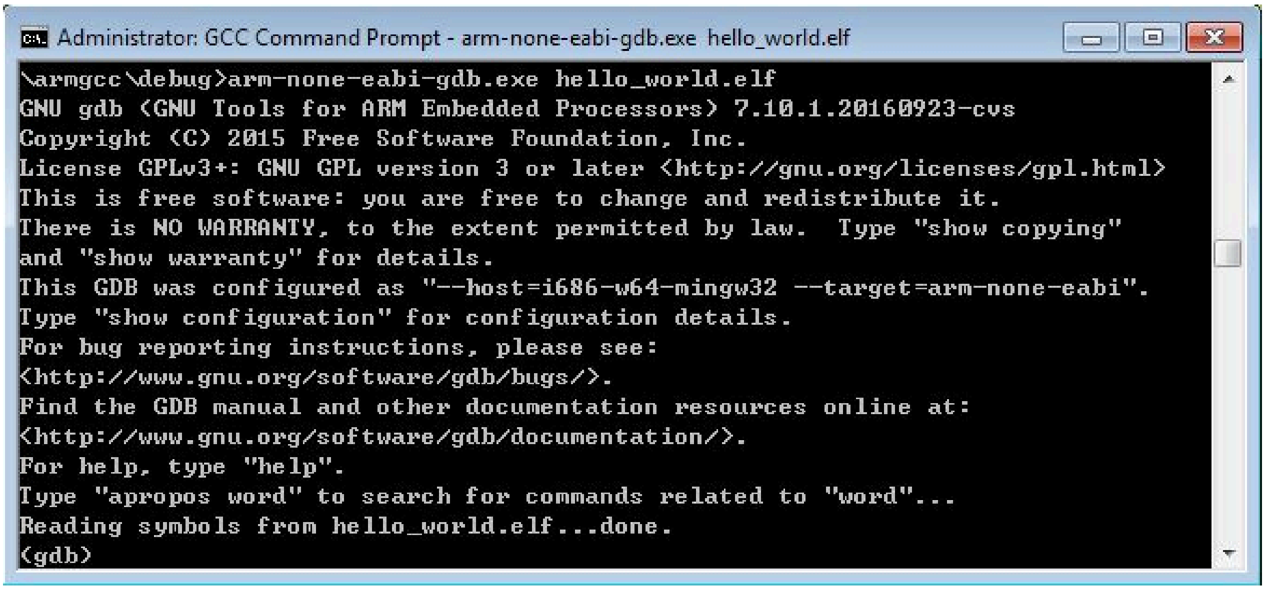


Figure 17. Run arm-none-eabi-gdb

7. Run these commands:
   a. `target remote localhost:2331`
   b. `monitor reset`
   c. `monitor halt`
   d. `load`
8. The application is now downloaded and halted at the reset vector. Execute the `monitor go` command to start the demo application.

The `hello_world` application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

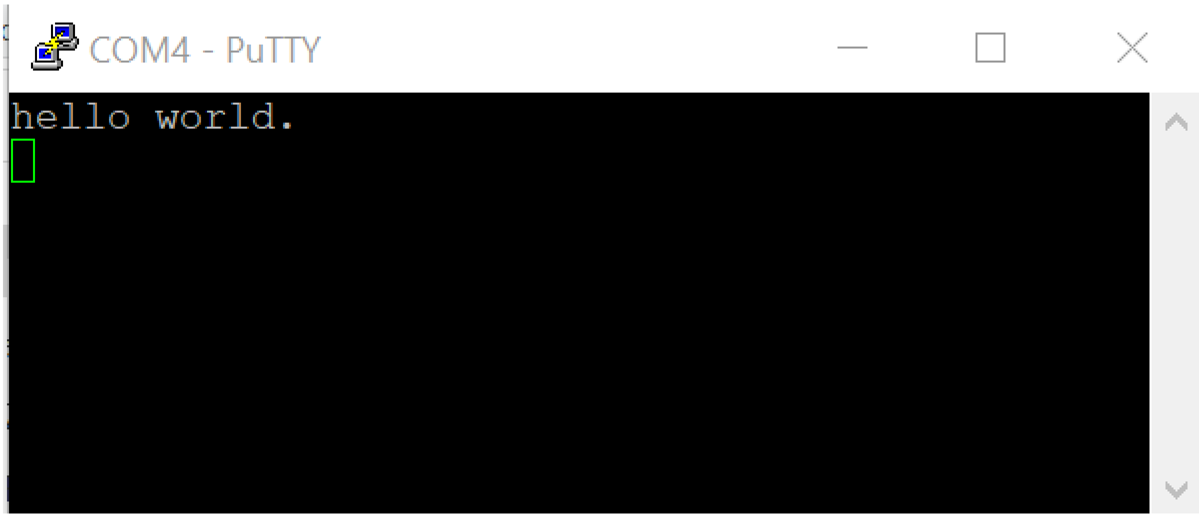


Figure 18. Text display of the hello_world demo

6 Running an application by U-Boot

This section describes the steps to write a bootable SDK bin file to TCM or DRAM with the prebuilt U-Boot image for the i.MX processor. The following steps describe how to use the U-Boot:

1. Connect the **DEBUG UART** slot on the board to your PC through the USB cable. The Windows OS installs the USB driver automatically, and the Ubuntu OS finds the serial devices as well.
2. On Windows OS, open the device manager, find **USB serial Port** in **Ports (COM and LPT)**. Assume that the ports are COM9 and COM10. One port is for the debug message from the Cortex-A53 and the other is for the Cortex-M7. The port number is allocated randomly, so opening both is beneficial for development. On Ubuntu OS, find the TTY device with name `/dev/ttyUSB*` to determine your debug port. Similar to Windows OS, opening both is beneficial for development.

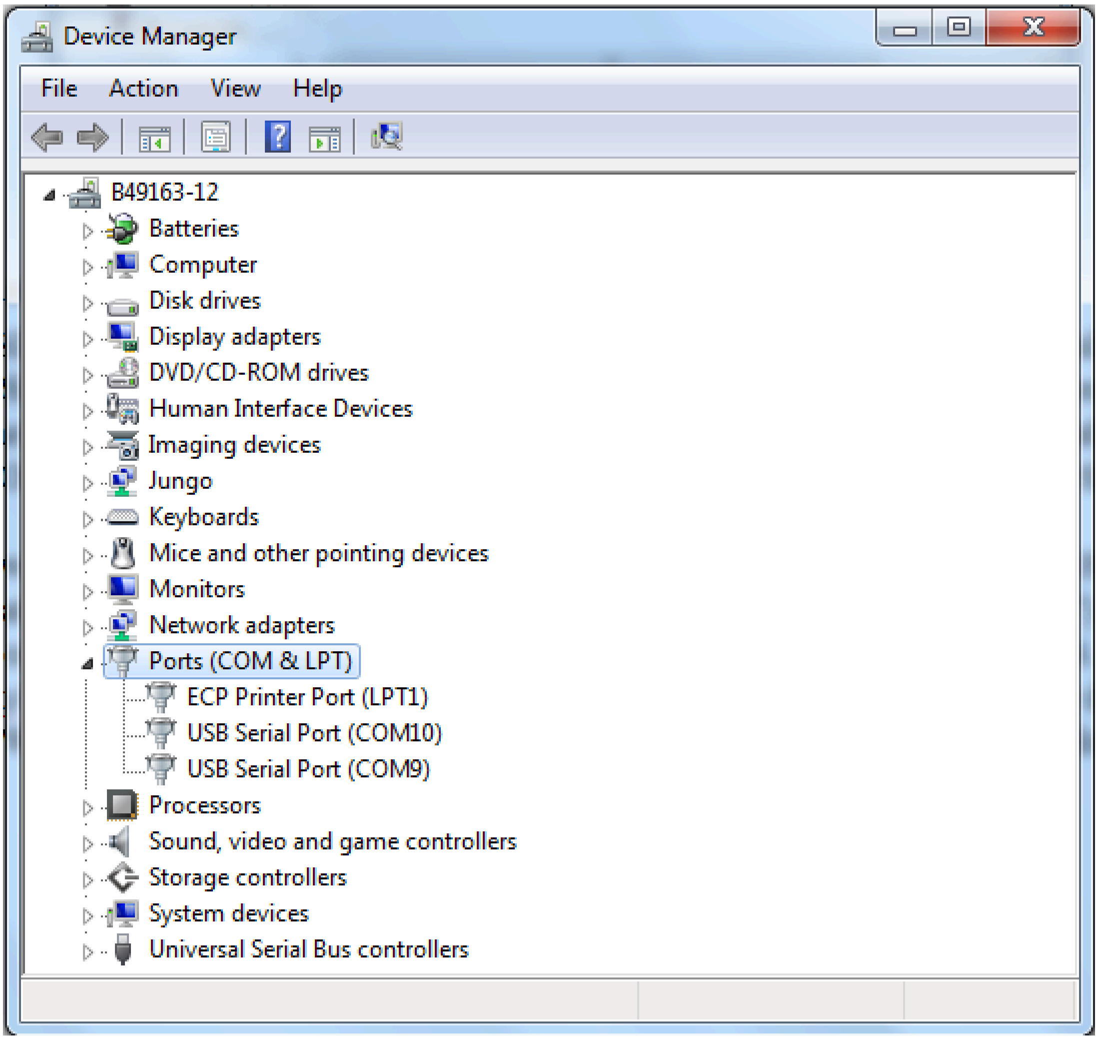


Figure 19. Determining the COM Port of target board

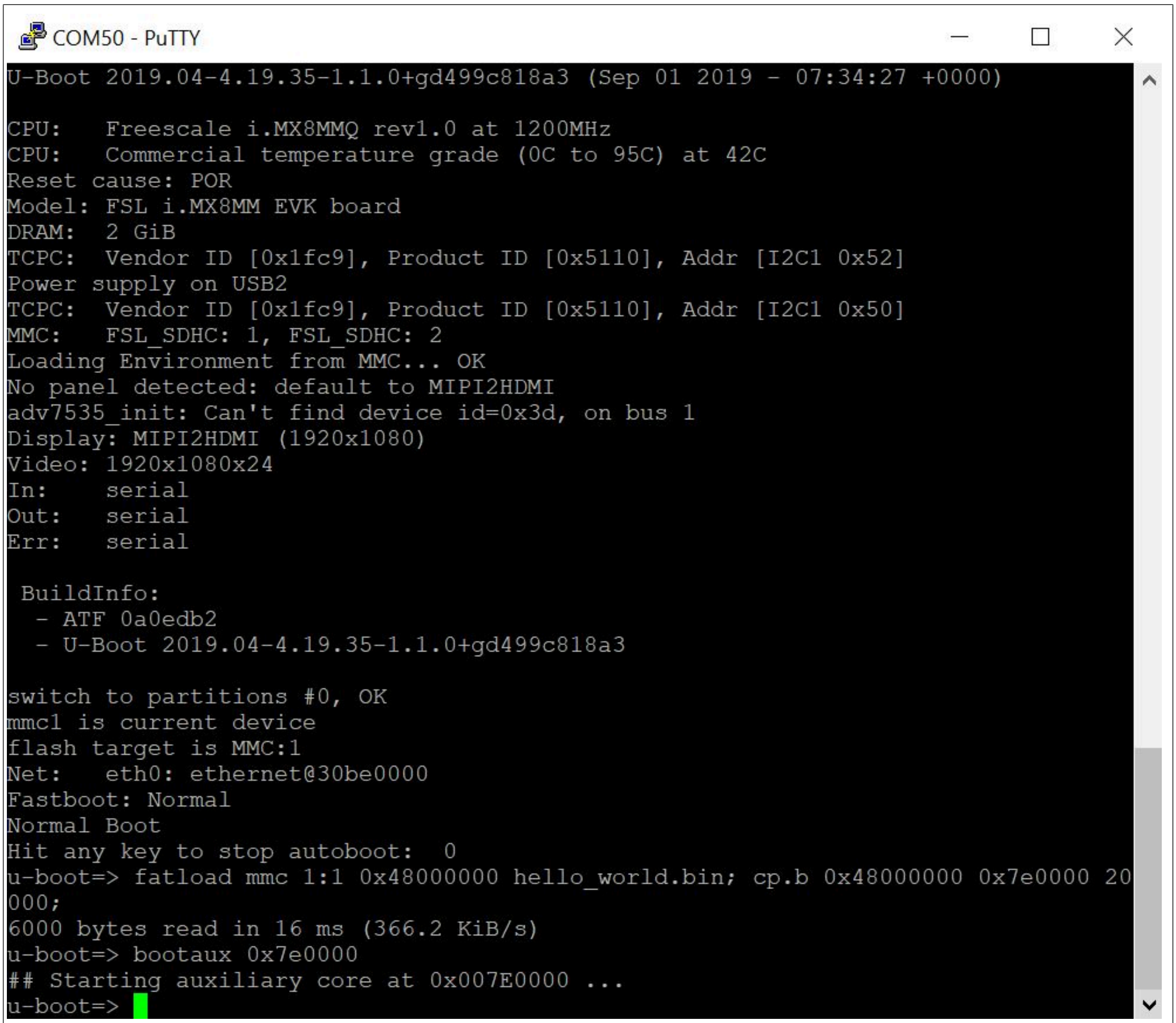
3. Build the application (for example, `hello_world`) to get the bin file (`hello_world.bin`).
4. Prepare an SD card with the prebuilt U-Boot image and copy bin file (`hello_world.bin`) into the SD card. Then, insert the SD card to the target board. Make sure to use the default boot SD slot and check the dipswitch configuration.

5. Open your preferred serial terminals for the serial devices, setting the speed to 115200 bps, 8 data bits, 1 stop bit (115200, 8N1), no parity, then power on the board.
6. Power on the board and hit any key to stop autoboot in the terminals, then enter to U-Boot command line mode. You can then write the image and run it from TCM or DRAM with the following commands:
   a. If the `hello_world.bin` is made from the debug/release target, which means the binary file will run at TCM, use the following commands to boot:
      - `fatload mmc 1:1 0x48000000 hello_world.bin`
      - `cp.b 0x48000000 0x7e0000 0x20000`
      - `bootaux 0x7e0000`
   b. If the `hello_world.bin` is made from the `ddr_debug`/`ddr_release` target, which means the binary file runs at DRAM, use the following commands:
      - `fatload mmc 1:1 0x80000000 hello_world.bin`
      - `dcache flush`
      - `bootaux 0x80000000`
   c. If the hello_world.bin is made from the `flash_debug/flash_release`target, which means the binary file runs at nor_flash, use the following commands:
      - `sf probe`
      - `sf read 0x80000000 0 4`
      - `fatload mmc 1:1 0x80000000 flash.bin`
      - `dcache flush`
      - `sf erase 0 0x20000`
      - `sf write 0x80000000 0 0x20000`
      - `bootaux 0x8000000`

   Note: *If the Linux OS kernel runs together with M4, make sure the correct dtb file is used. This `dtb` file reserves resources used by M4 and avoids the Linux kernel from configuring them. Use the following command in U-Boot before running the kernel:*

   ```
   setenv fdtfile 'fsl-imx8mm-evk-m4.dtb'
         save
   ```

   Note: *For Linux release version L5.15.71-2.2.0 and later, the `run prepare_mcore` command must run before the `bootaux` command.*



```
COM50 - PuTTY
U-Boot 2019.04-4.19.35-1.1.0+gd499c818a3 (Sep 01 2019 - 07:34:27 +0000)

CPU:   Freescale i.MX8MMQ rev1.0 at 1200MHz
CPU:   Commercial temperature grade (0C to 95C) at 42C
Reset cause: POR
Model: FSL i.MX8MM EVK board
DRAM:  2 GiB
TCPC:  Vendor ID [0x1fc9], Product ID [0x5110], Addr [I2C1 0x52]
Power supply on USB2
TCPC:  Vendor ID [0x1fc9], Product ID [0x5110], Addr [I2C1 0x50]
MMC:   FSL_SDHC: 1, FSL_SDHC: 2
Loading Environment from MMC... OK
No panel detected: default to MIPI2HDMI
adv7535_init: Can't find device id=0x3d, on bus 1
Display: MIPI2HDMI (1920x1080)
Video: 1920x1080x24
In:    serial
Out:   serial
Err:   serial

 BuildInfo:
  - ATF 0a0edb2
  - U-Boot 2019.04-4.19.35-1.1.0+gd499c818a3

switch to partitions #0, OK
mmc1 is current device
flash target is MMC:1
Net:   eth0: ethernet@30be0000
Fastboot: Normal
Normal Boot
Hit any key to stop autoboot:  0
u-boot=> fatload mmc 1:1 0x48000000 hello_world.bin; cp.b 0x48000000 0x7e0000 20
000;
6000 bytes read in 16 ms (366.2 KiB/s)
u-boot=> bootaux 0x7e0000
## Starting auxiliary core at 0x007E0000 ...
u-boot=>
```

Figure 20. U-Boot command to run application on TCM

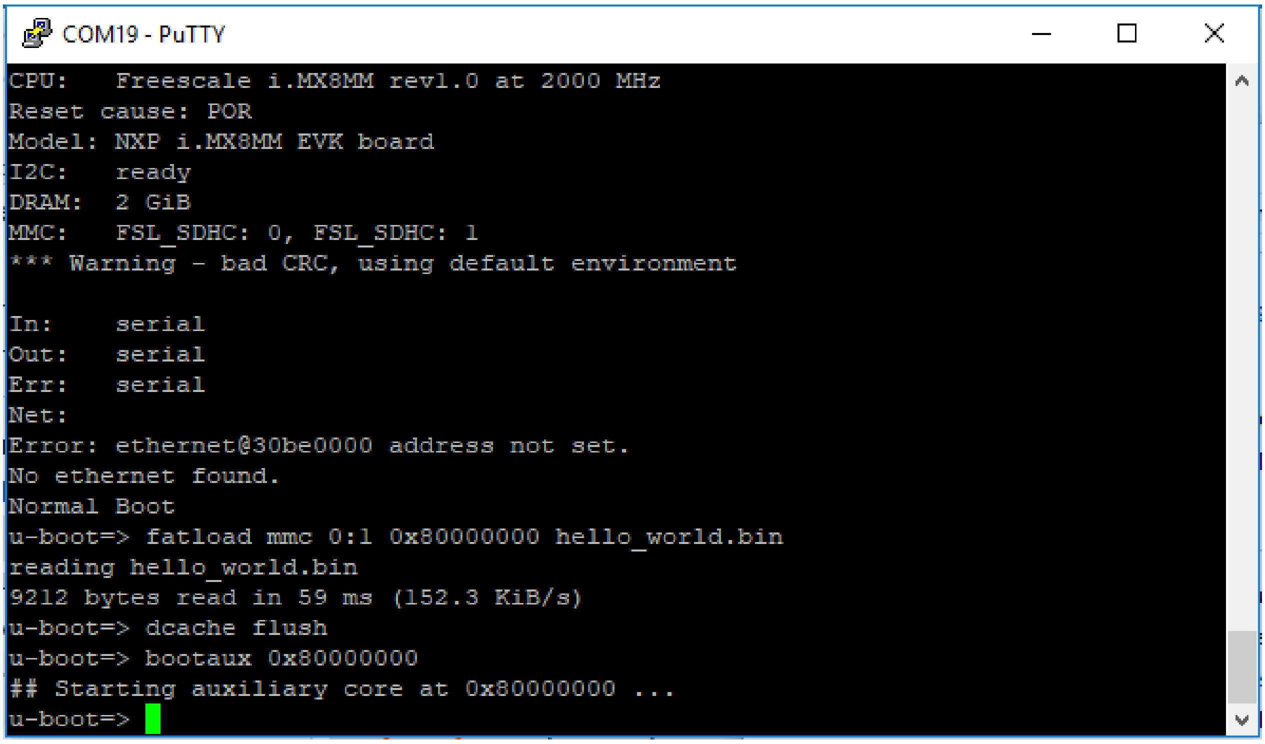


Figure 21. U-Boot command to run application on DRAM

7. Open another terminal application on the PC, such as PuTTY and connect to the debug COM port (to determine the COM port number, see Section 8). Configure the terminal with these settings:
   - 115200
   - No parity
   - 8 data bits
   - 1 stop bit
8. The `hello_world` application is now running and a banner is displayed on the terminal. If this is not true, check your terminal settings and connections.

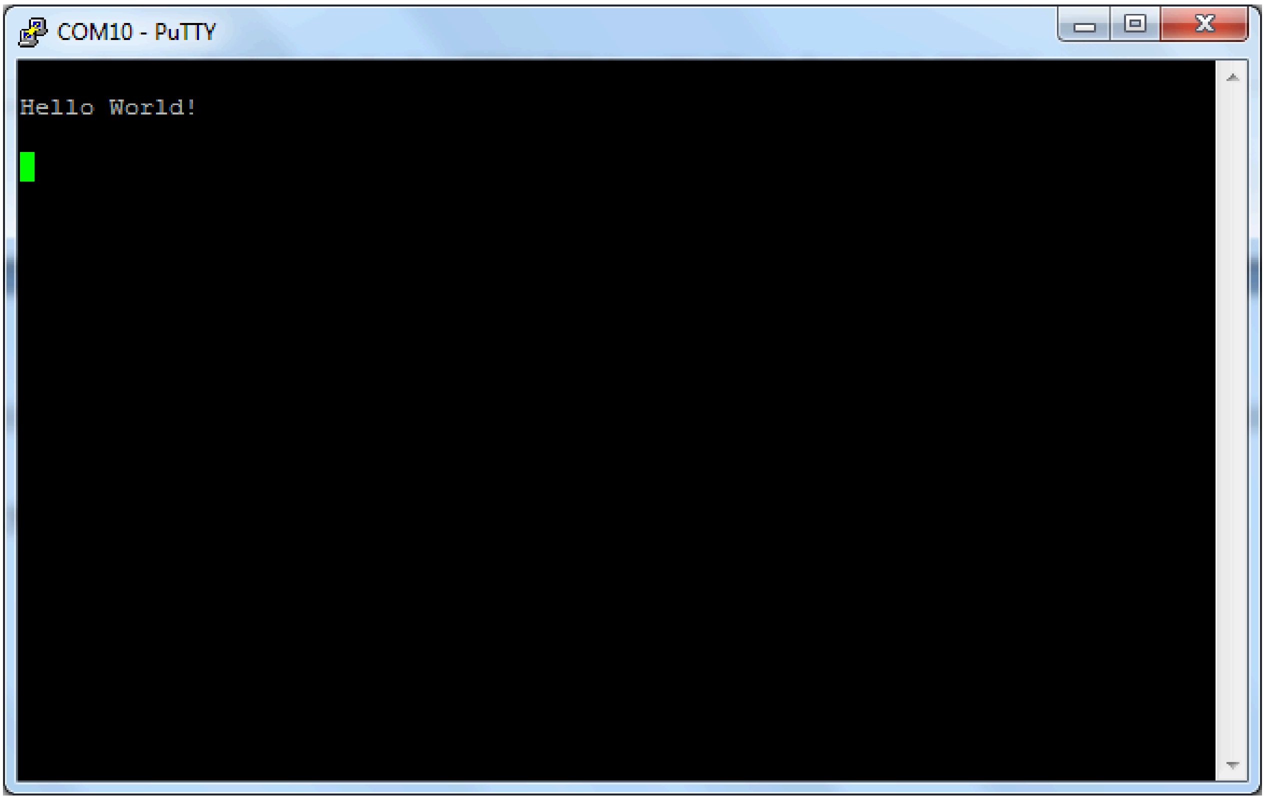


Figure 22. Hello world demo running on Cortex-M7 core

7 Run a flash target demo by UUU

This section describes the steps to use the UUU to build and run example applications provided in the MCUXpresso SDK. The `hello_world` demo application targeted for the i.MX 8M Mini EVK hardware platform is used as an example, although these steps can be applied to any example application in the MCUXpresso SDK.

7.1 Set up environment

This section contains the steps to install the necessary components required to build and run a MCUXpresso SDK demo application, as supported by the MCUXpresso SDK.

7.1.1 Download the MfgTool

The Universal Upgrade Utility (UUU) is an upgraded version of MfgTool. It is a command line tool that aims at installing the bootloader to various storage including SD, QSPI, and so on, for i.MX series devices with ease.

The tool can be downloaded from github. Use version 1.1.81 or higher for full support for the M4 image. Download `libusb-1.0.dll and uuu.exe` for Windows OS, or download UUU for Linux. Configure the path so that the executable can later be called anywhere in the command line.

7.1.2 Switch to Download Mode

The board needs to be in Download Mode mode for UUU to download images:

1. Set the board boot mode to Download Mode [SW1101:1000[1-4]].
2. Connect the development platform to your PC via USB cable between the SERIAL port and the PC USB connector. The SERIAL port is J301 on the base board.
3. The PC recognizes the i.MX 8M Mini device as (VID:PID)=(1FC9:013E), as shown in Figure 23.

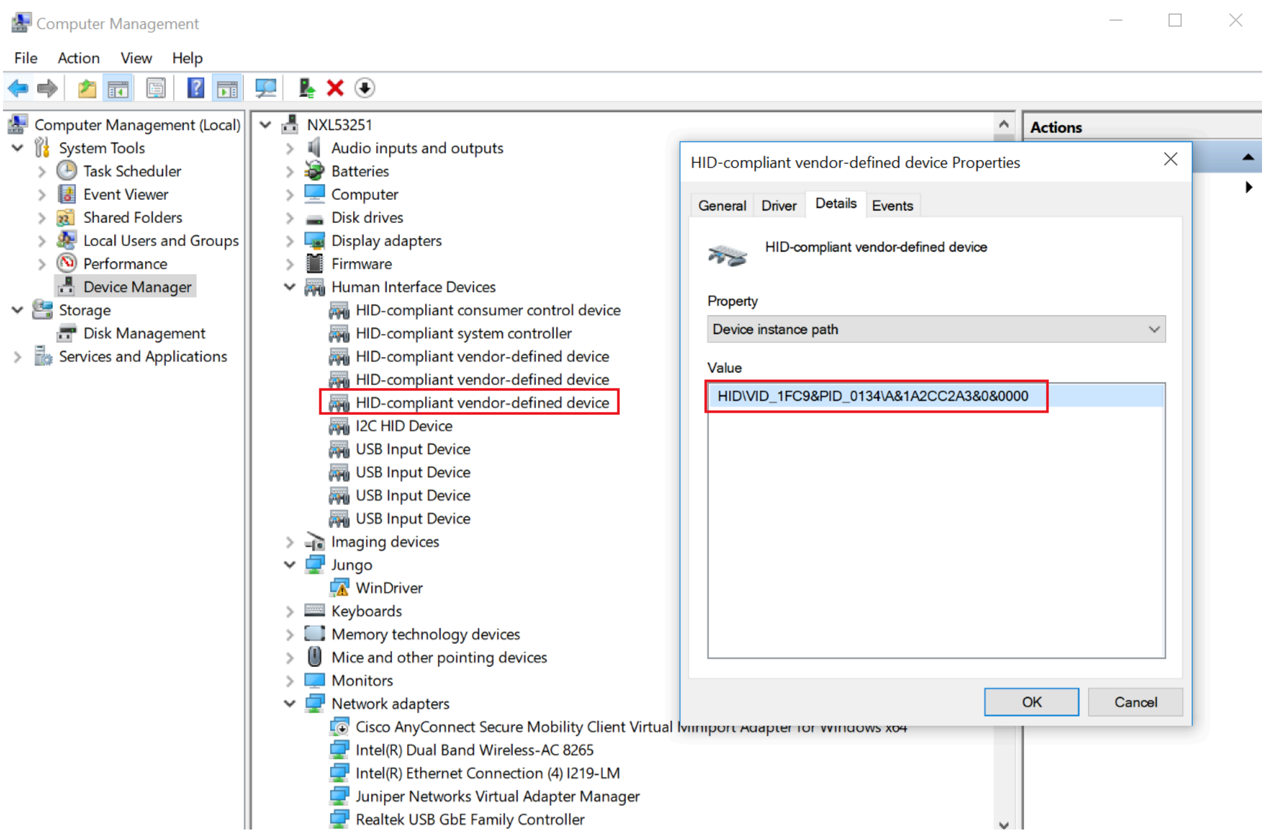


Figure 23. Device as shown in Device Manager

7.2 Build an example application

The following steps guide you through opening the `hello_world` example application. These steps may change slightly for other example applications, as some of these applications may have additional layers of folders in their paths.

1. If not already done, open the desired demo application workspace. Most example application workspace files can be located using the following path:

```
<install_dir>/boards/<board_name>/<example_type>/<application_name>/iar
```

Using the i.MX 8M Mini EVK board as an example, the `hello_world` workspace is located in:

```
<install_dir>/boards/evkmimx8mm/demo_apps/hello_world/iar/hello_world.eww
```

2. Select the desired build target from the drop-down. For this example, select **hello_world – flash_debug**.

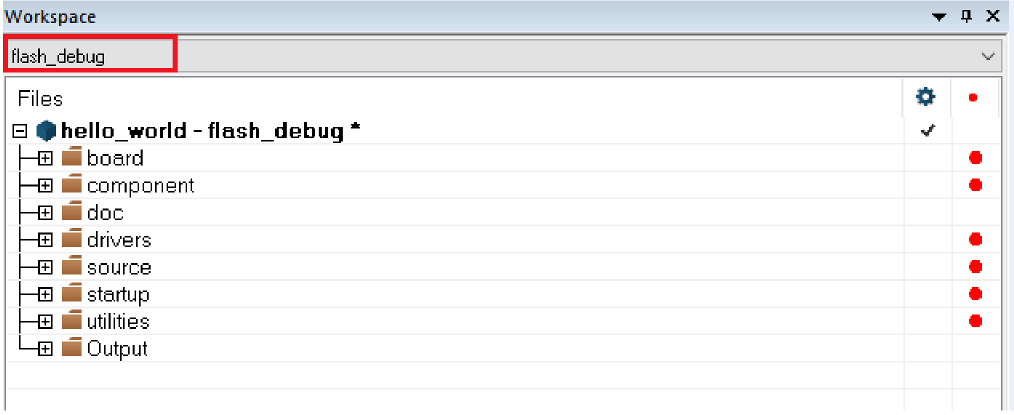


Figure 24. Demo build target selection

3. To build the demo application, click **Make**, highlighted in red in Figure 25.

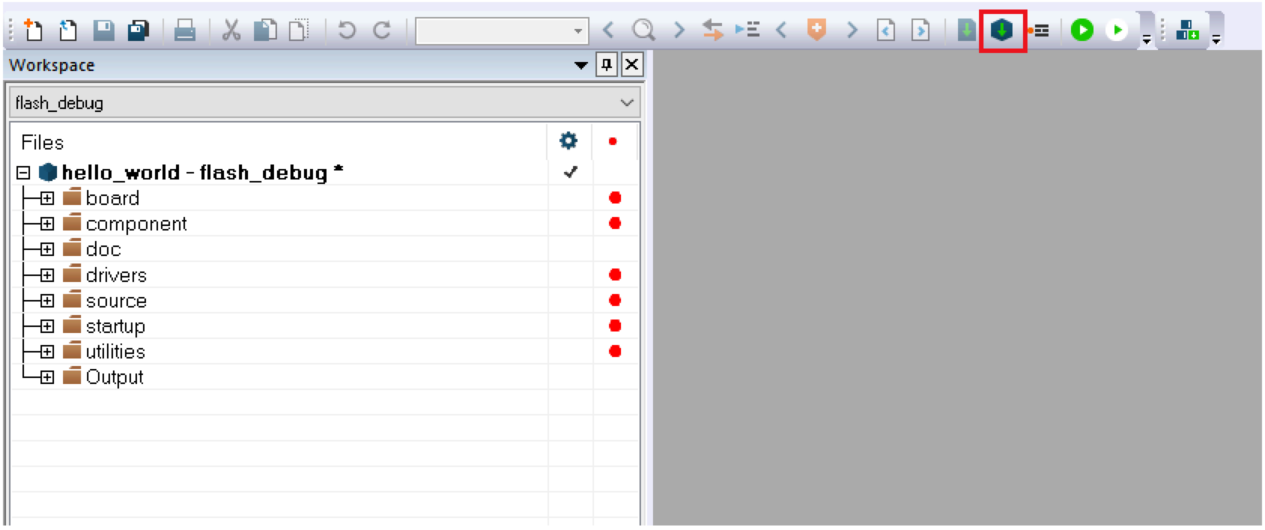


Figure 25. Building the demo application

4. The build completes without errors.
5. Rename the generated `hello_world.bin` to `m4_flash.bin`, then copy it to the uuu tool directory.

7.3 Run an example application

To download and run the application via UUU, perform these steps:

1. Connect the development platform to your PC via USB cable between the J901 USB DEBUG connector and the PC. It provides console output while using UUU.
2. Connect the J301 USB Type-C connector and the PC. It provides the data path for UUU.
3. Open the terminal application on the PC, such as PuTTY or TeraTerm, and connect to the debug COM port (to determine the COM port number, see Section 8). Configure the terminal with these settings:
   a. 115200 baud rate
   b. No parity
   c. 8 data bits
   d. 1 stop bit

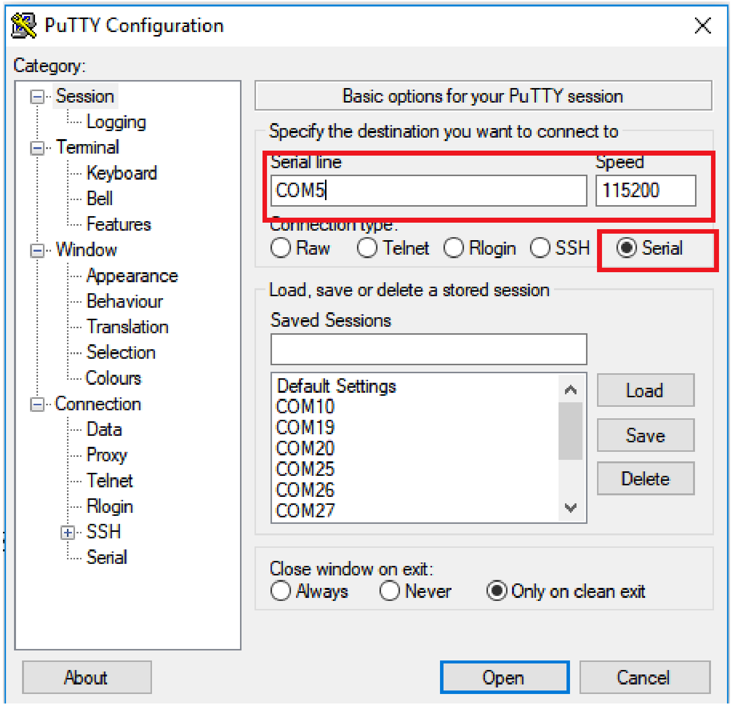


Figure 26. Terminal (PuTTY) configuration

4. Get the fspi version U-Boot image from release package and rename it to `uboot_flash.bin`.
5. In the command line, execute uuu with the *-b qspi* switch: `uuu -b qspi m4_flash.bin`.
   The UUU puts the platform into fast boot mode and automatically flashes the target bootloader to QSPI. The command line and fast boot console is as shown in Figure 27.

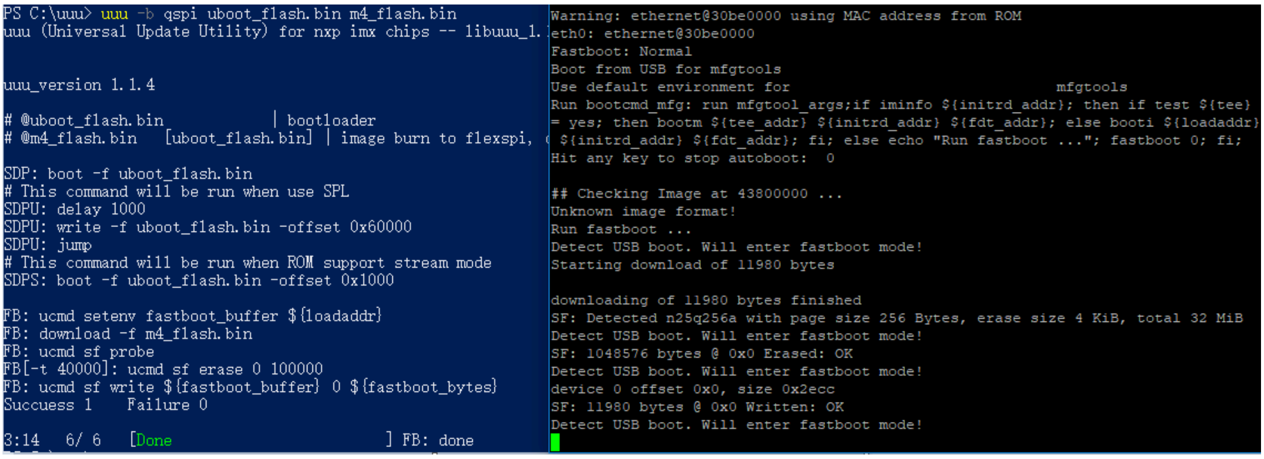


Figure 27. Command line and fast boot console output when executing UUU

6. Then, power off the board and change the boot mode to `NAND Flash [SW1101:0110000000, SW1102:1000111100]`, and power on the board again.

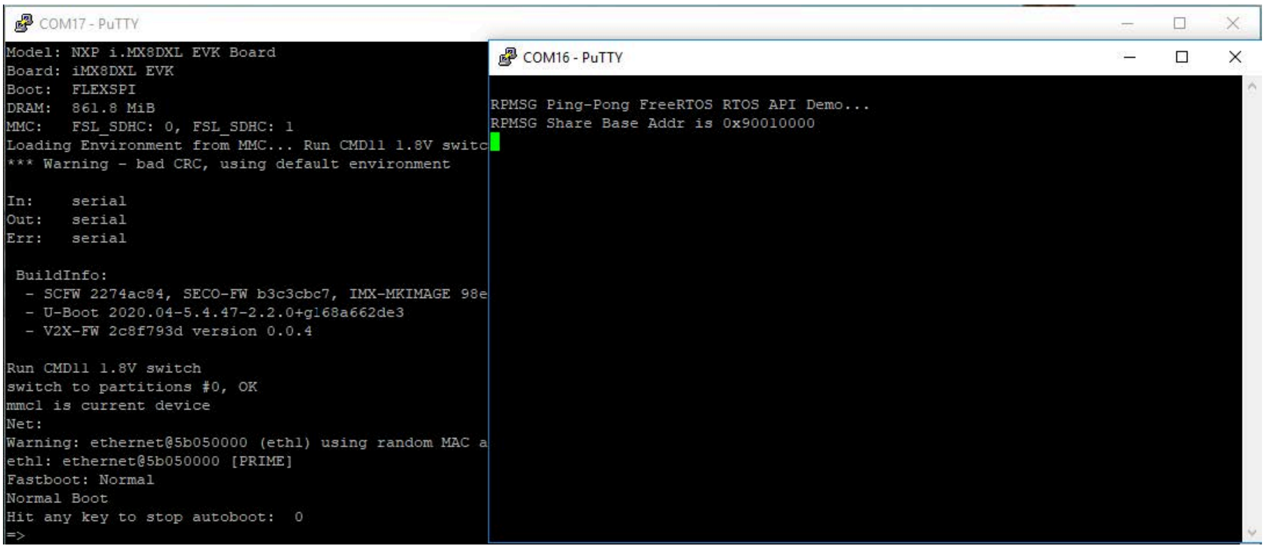


Figure 28. U-Boot and M4 demo output

7. Use following command in U-Boot to kickoff m7:

```
sf probe
sf read ${loadaddr} 0 4
bootaux 0x8000000
```

8 How to determine COM port

This section describes the steps necessary to determine the debug COM port number of your NXP hardware development platform.

1. To determine the COM port, open the Windows operating system Device Manager. This can be achieved by going to the Windows operating system Start menu and typing **Device Manager** in the search bar, as shown in Figure 29.

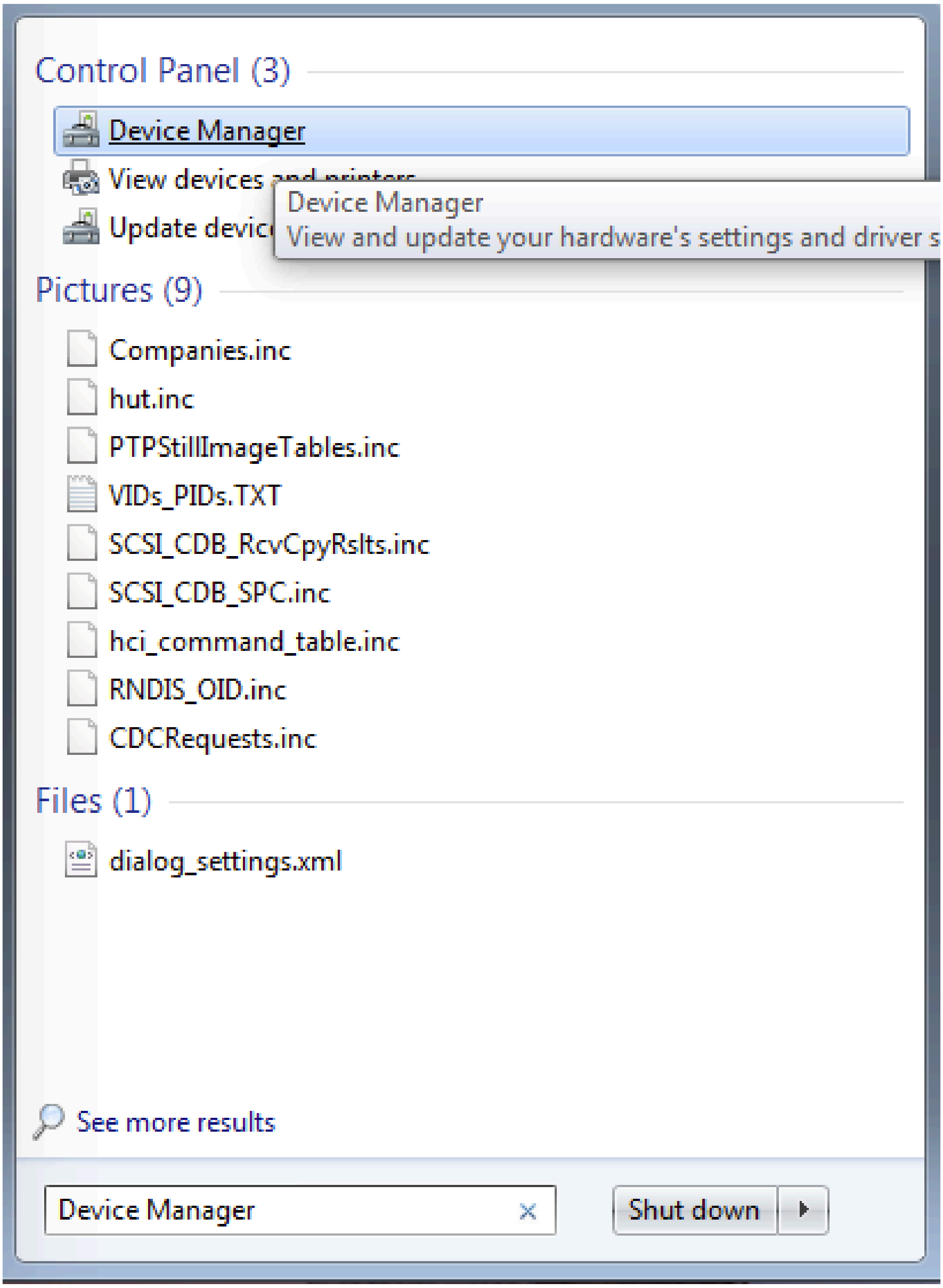


Figure 29. Device manager

2. In the **Device Manager**, expand the **Ports (COM & LPT)** section to view the available ports. Depending on the NXP board you're using, the COM port can be named differently.

9 How to define IRQ handler in CPP files

With MCUXpresso SDK, users could define their own IRQ handler in application level to

override the default IRQ handler. For example, to override the default `PIT_IRQHandler` define in `startup_DEVICE.s`, application code like app.c can be implement like:

```
c
void PIT_IRQHandler(void)
{
    // Your code
}
```

When application file is CPP file, like app.cpp, then `extern "C"` should be used to ensure the function prototype alignment.

```
cpp
extern "C" {
    void PIT_IRQHandler(void);
}
void PIT_IRQHandler(void)
{
    // Your code
}
```

10 Host setup

An MCUXpresso SDK build requires that some packages are installed on the Host. Depending on the used Host operating system, the following tools should be installed.

Linux:

- Cmake

```
$ sudo apt-get install cmake
$ # Check the version >= 3.0.x
$ cmake --version
```

Windows:

- MinGW
  The Minimalist GNU for Windows OS (MinGW) development tools provide a set of tools that are not dependent on third party C-Runtime DLLs (such as Cygwin). The build environment used by the SDK does not utilize the MinGW build tools, but does leverage the base install of both MinGW and MSYS. MSYS provides a basic shell with a Unix-like interface and tools.
  1. Download the latest MinGW mingw-get-setup installer from sourceforge.net/projects/mingw/files/Installer/.
  2. Run the installer. The recommended installation path is `C:\MinGW`, however, you may install to any location.
     Note: *The installation path cannot contain any spaces.*
  3. Ensure that **mingw32-base** and **msys-base** are selected under **Basic Setup**.

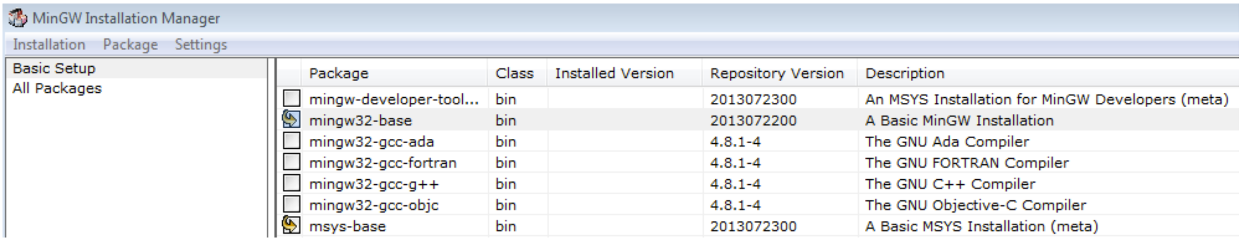


Figure 30. Setup MinGW and MSYS

4. Click **Apply Changes** in the **Installation** menu and follow the remaining instructions to complete the installation.

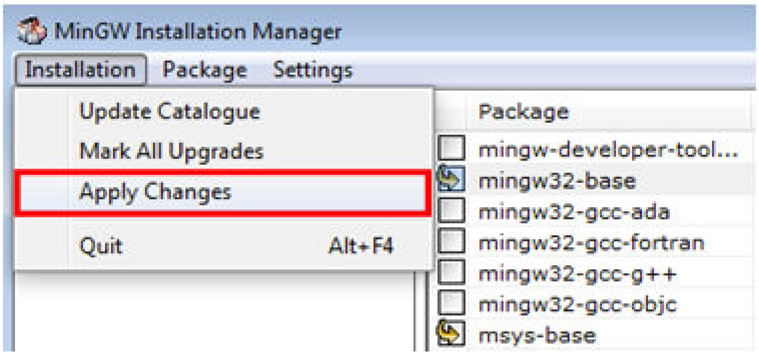


Figure 31. Complete MinGW and MSYS installation

5. Add the appropriate item to the Windows operating system path environment variable. It can be found under **Control Panel**->**System and Security**->**System**->**Advanced System Settings** in the **Environment Variables...** section. The path is: `<mingw_install_dir>\bin`.
Assuming the default installation path, `C:\MinGW`, an example is as shown in Figure 32. If the path is not set correctly, the toolchain does not work.
Note: *If you have `C:\MinGW\msys\x.x\bin` in your PATH variable (as required by KSDK 1.0.0), remove it to ensure that the new GCC build system works correctly.*

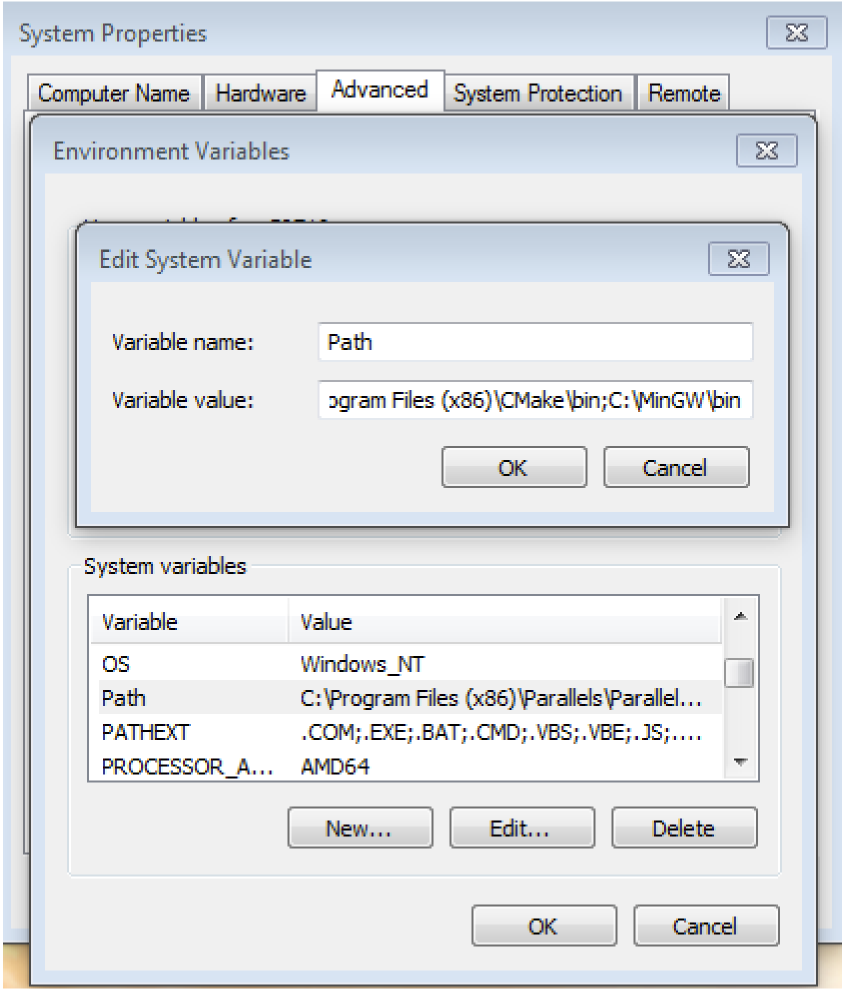


Figure 32. Add Path to systems environment

- Cmake
  1. Download CMake 3.0.x from www.cmake.org/cmake/resources/software.html.
  2. Install CMake, ensuring that the option **Add CMake to system PATH** is selected when installing. The user chooses to select whether it is installed into the PATH for all users or just the current user. In this example, it is installed for all users.

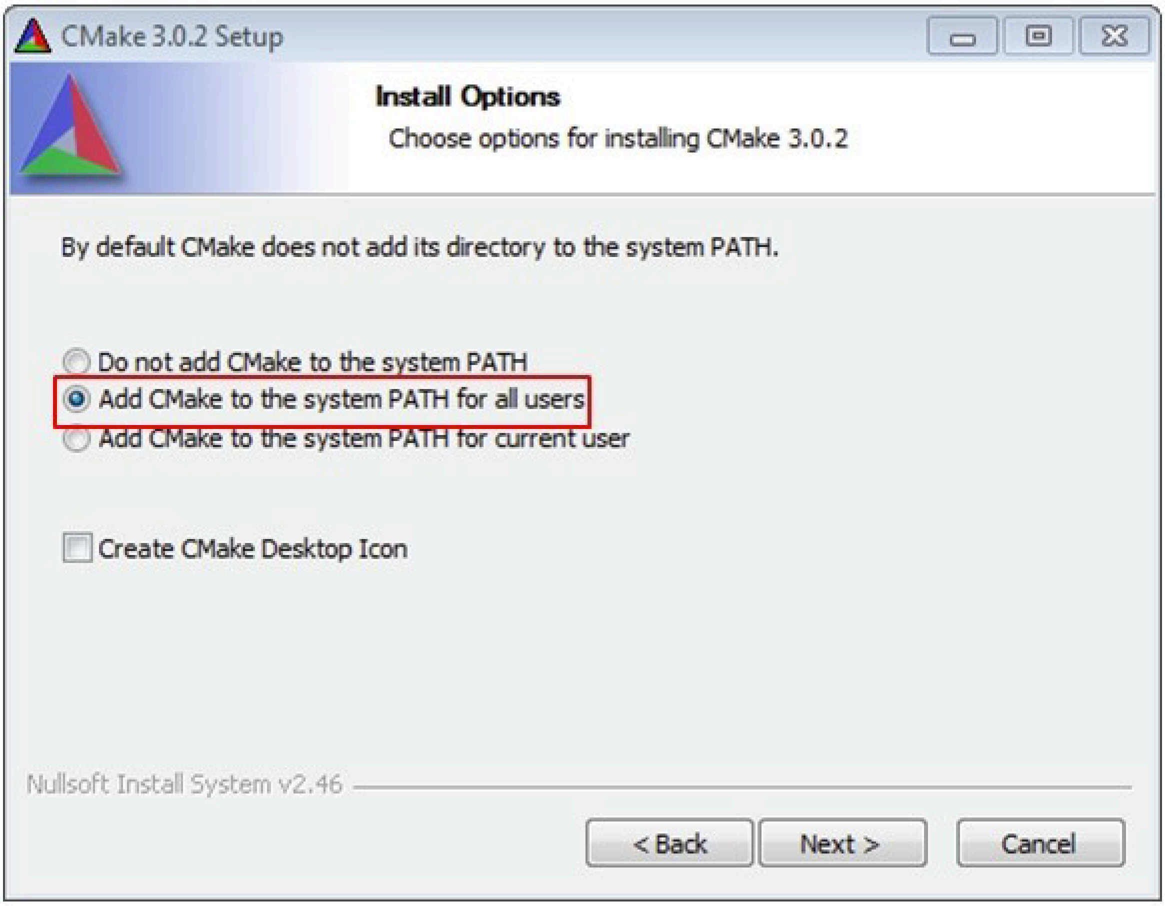


Figure 33. Install CMake

3. Follow the remaining instructions of the installer.
4. You may need to reboot your system for the PATH changes to take effect.

11 Revision history

This table summarizes revisions to this document.

Table 2. Revision history

Revision number	Date	Substantive changes
0	February 2018	Initial Release
1	15 January 2021	Updated for MCUXpresso SDK v2.9.0
2.10.0	10 July 2021	Updated for MCUXpresso SDK v2.10.0
2.11.0	11 November 2021	Updated for MCUXpresso SDK v2.11.0
2.11.1	11 March 2022	Updated for MCUXpresso SDK v2.11.1
2.12.0	01 June 2022	Updated for MCUXpresso SDK v2.12.0
2.12.1	19 September 2022	Updated for MCUXpresso SDK v2.12.1
2.13.0	30 November 2022	Updated for MCUXpresso SDK v2.13.0

Table 2. Revision history *...continued*

Revision number	Date	Substantive changes
2.14.0	27 July 2023	Updated ArmGCC toolchain information in Add a new system environment variable for ARMGCC_DIR and Build an example application.

12 Legal information

12.1 Definitions

Draft — A draft status on a document indicates that the content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included in a draft version of a document and shall have no liability for the consequences of use of such information.

12.2 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nxp.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Suitability for use in non-automotive qualified products — Unless this document expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

Translations — A non-English (translated) version of a document, including the legal information in that document, is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Security — Customer understands that all NXP products may be subject to unidentified vulnerabilities or may support established security standards or specifications with known limitations. Customer is responsible for the design and operation of its applications and products throughout their lifecycles to reduce the effect of these vulnerabilities on customer's applications and products. Customer's responsibility also extends to other open and/or proprietary technologies supported by NXP products for use in customer's applications. NXP accepts no liability for any vulnerability. Customer should regularly check security updates from NXP and follow up appropriately.

Customer shall select products with security features that best meet rules, regulations, and standards of the intended application and make the ultimate design decisions regarding its products and is solely responsible for compliance with all legal, regulatory, and security related requirements concerning its products, regardless of any information or support that may be provided by NXP.

NXP has a Product Security Incident Response Team (PSIRT) (reachable at PSIRT@nxp.com) that manages the investigation, reporting, and solution release to security vulnerabilities of NXP products.

NXP B.V. — NXP B.V. is not an operating company and it does not distribute or sell products.

12.3 Trademarks

Notice: All referenced brands, product names, service names, and trademarks are the property of their respective owners.

NXP — wordmark and logo are trademarks of NXP B.V.

AMBA, Arm, Arm7, Arm7TDMI, Arm9, Arm11, Artisan, big.LITTLE, Cordio, CoreLink, CoreSight, Cortex, DesignStart, DynamIQ, Jazelle, Keil, Mali, Mbed, Mbed Enabled, NEON, POP, RealView, SecurCore, Socrates, Thumb, TrustZone, ULINK, ULINK2, ULINK-ME, ULINK-PLUS, ULINKpro, μVision, Versatile — are trademarks and/or registered trademarks of Arm Limited (or its subsidiaries or affiliates) in the US and/or elsewhere. The related technology may be protected by any or all of patents, copyrights, designs and trade secrets. All rights reserved.

Bluetooth — the Bluetooth wordmark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by NXP Semiconductors is under license.

Cadence — the Cadence logo, and the other Cadence marks found at www.cadence.com/go/trademarks are trademarks or registered trademarks of Cadence Design Systems, Inc. All rights reserved worldwide.

EdgeLock — is a trademark of NXP B.V.

Freescale — is a trademark of NXP B.V.

Kinetis — is a trademark of NXP B.V.

NTAG — is a trademark of NXP B.V.

Contents

Date of release: 27 July 2023
Document identifier: MCUXSDKIMX8MMGSUG