IAR Embedded Workbench for ModusToolbox™ user guide

ModusToolbox™ tools package version 3.3.0

About this document

Scope and purpose

ModusToolbox™ software is a set of tools and libraries that support device configuration and application development. These tools enable you to integrate our devices into your existing development methodology. This document provides information and instructions for using IAR Embedded Workbench with ModusToolbox™ software.

Document conventions

- **Bold** - Emphasizes heading levels, column headings, menus and sub-menus.
- *Italics* - Denotes file names and paths.
- `Monospace` - Denotes APIs, functions, interrupt handlers, events, data types, error handlers, file/folder names, directories, command line inputs, code snippets.
- **File > New** - Indicates that a cascading sub-menu opens when you select a menu item.

Reference documents

Refer to the following documents for more information as needed:

- ModusToolbox™ tools package installation guide – Provides information and instructions about installing the tools package on Windows, Linux, and macOS.
- ModusToolbox™ tools package user guide –Provides information about all the tools included with ModusToolbox™ tools package.
- Project Creator user guide – Provides specific information about the Project Creator tool.

Table of contents

1 Download/install software

1.1 ModusToolbox™ tools package

Refer to the instructions in the ModusToolbox™ tools package installation guide for how to download and install the ModusToolbox™ tools package.

1.2 IAR Embedded Workbench (Windows only)

We support IAR Embedded Workbench version 8.42.2 or later. Recommended version 9.50.1.

The ModusToolbox™ ecosystem assumes that the default installation location for the IAR compiler is *C:/Program Files/IAR Systems/Embedded Workbench 9.1/arm*. To use later versions of IAR Embedded Workbench, set the `CY_COMPILER_IAR_DIR` environment variable to the correct installation path. Alternatively, you can set this variable in the *Makefile* for each application. Refer to the ModusToolbox™ tools package user guide for more details about build system variables.

1.3 J-Link

For J-Link debugging, download and install J-Link software:

https://www.segger.com/downloads/jlink/#J-LinkSoftwareAndDocumentationPack

2 Getting started

This section covers the ways to get started using IAR Embedded Workbench with ModusToolbox™ software.

- Create the new application
- Export the existing application
- Open the application in IAR Embedded Workbench

2.1 Create new application

Creating an application includes several steps:

2.1.1 Step 1: Open Project Creator tool

The ModusToolbox™ Project Creator tool is used to create applications based on code examples and template applications. By default, the tool is installed in the following directory:

<install-path>/ModusToolbox/tools_<version>/project-creator

The tool is provided in GUI form and as a command line interface. For more details, refer to the Project Creator user guide.

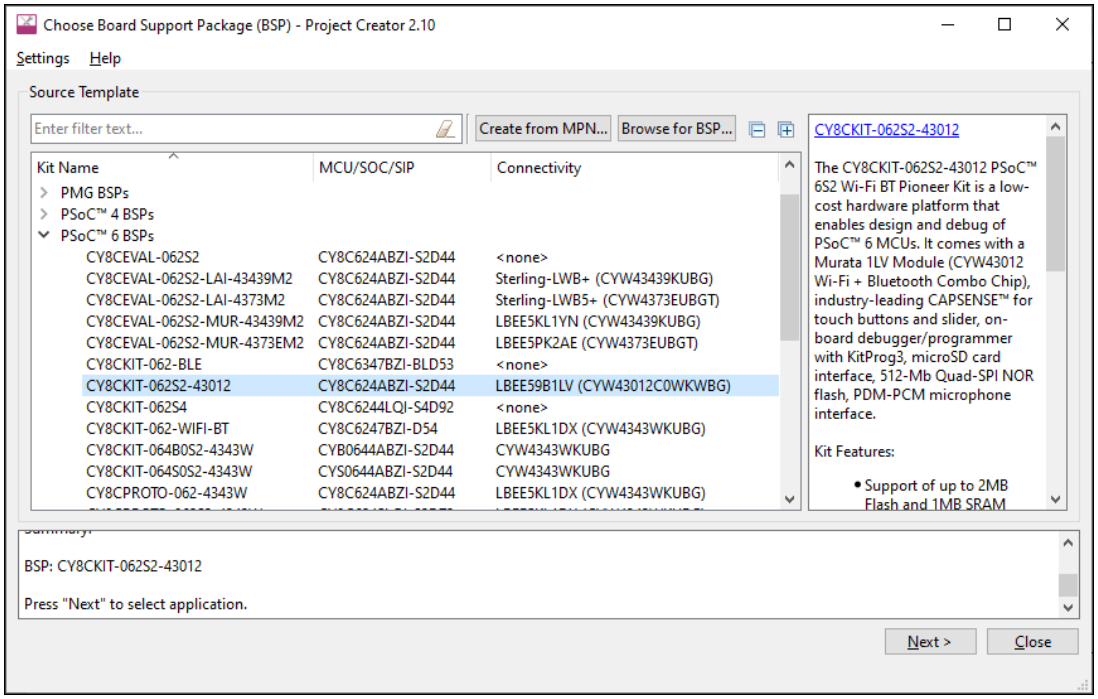
You can open the tool from the Windows **Start** menu, or by launching the executable in the installation directory.

***Note**: You can also launch the Project Creator tool from the ModusToolbox™ Dashboard. Refer to the Dashboard user guide for more details.*

2.1.2 Step 2: Choose Board Support Package (BSP)

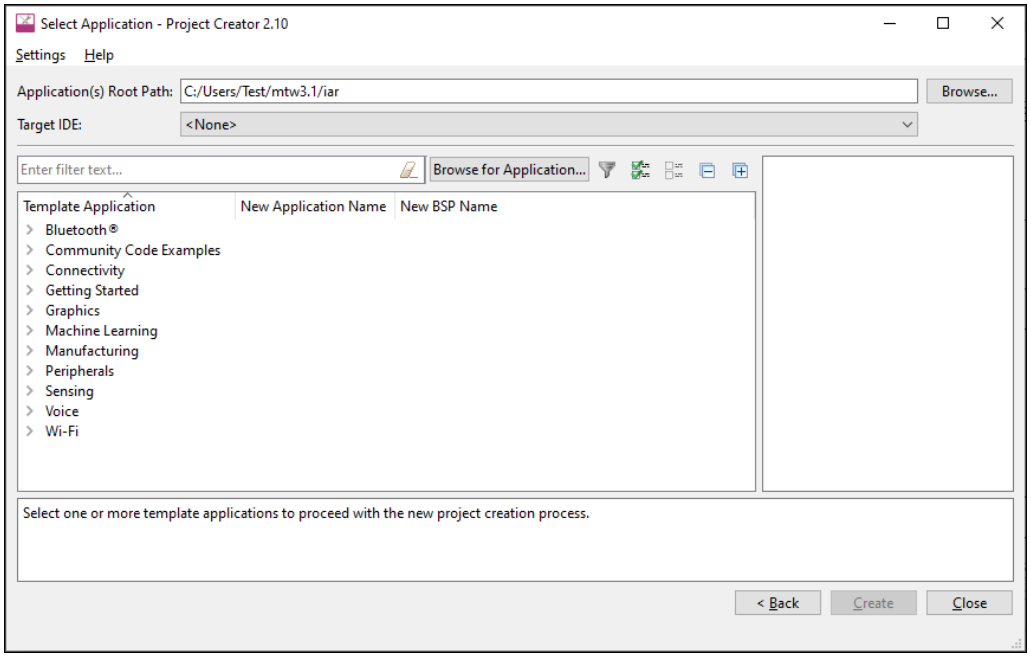
When the Project Creator tool opens, expand one of the BSP categories under **Kit Name** and select an appropriate kit; see the description for it on the right.

For this example, select the **CY8CKIT-062S2-43012** kit. The following image is an example; the precise list of boards available in this version will reflect the platforms available for development.



2.1.3 Step 3: Select application

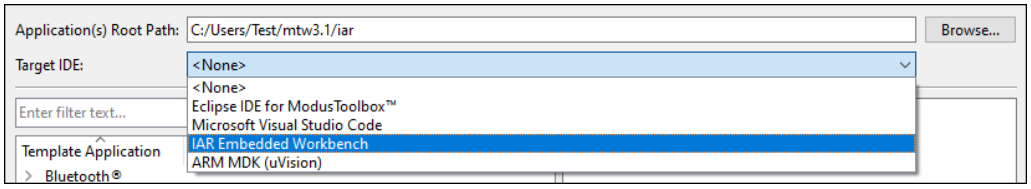
1. Click **Next >** to open the Select Application page.



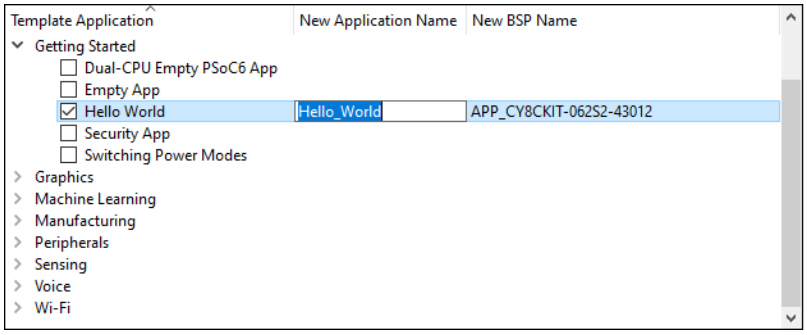
This page displays example applications, which demonstrate different features available on the selected BSP. In this case, the CY8CKIT-062S2-43012 provides the PSoC™ 62 MCU and the AIROC™ CYW43012 Wi-Fi & Bluetooth® combo chip. You can create examples for PSoC™ 6 MCU resources such as CAPSENSE™ and QSPI, as well as numerous examples for other capabilities.

2. Click **Browse…** next to **Application(s) Root Path** to create or specify a folder where the application will be created.

3. Pull down the **Target IDE** menu, and select IAR Embedded Workbench.



4. Under the **Template Application** column, expand **Getting Started** and select Hello World from the list. This example exercise uses the PSoC™ 6 MCU to blink an LED.



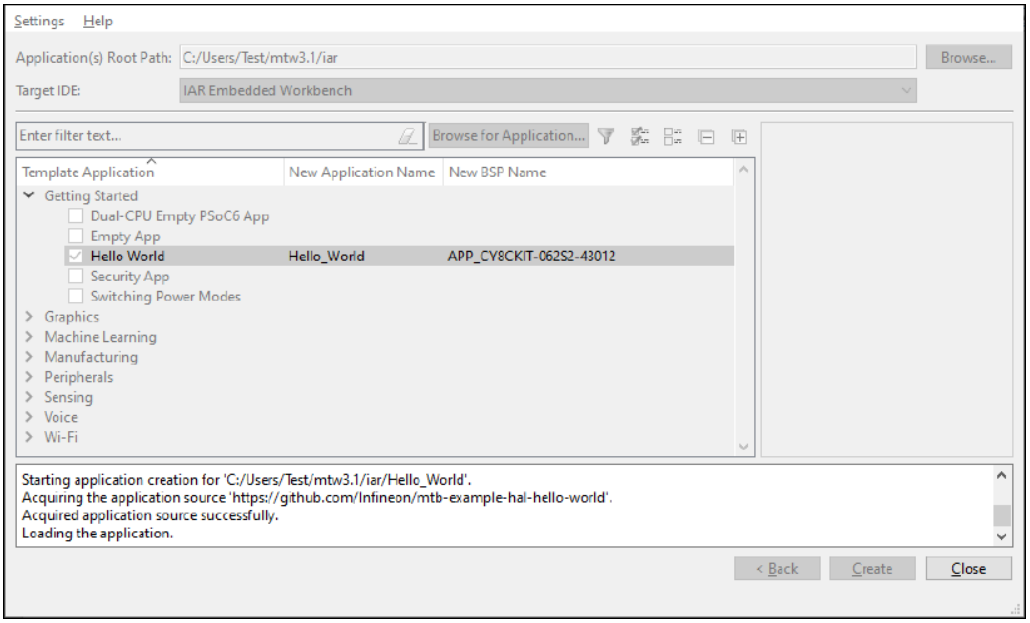
***Note**: The actual application names available might vary.*

5. Type a name for your application and/or BSP or leave the default name. Do not use spaces. Also, do not use common illegal characters, such as:

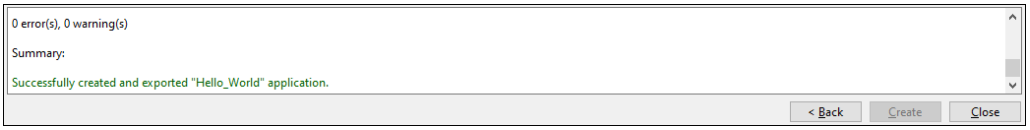
```
* . " ‘ / \ [ ] : ; | = ,
```

2.1.4 Step 4: Create application

1. Click **Create** to start creating the application. The tool displays various messages.



2. When the process completes, a message states that the application was created. Click **Close** to exit the Project Creator tool.



2.2 Export existing application

If you have a ModusToolbox™ application that was created for another IDE or for the command line, you can export that application to be used in IAR. Open a terminal window in the application directory, and run the command make `ewarm TOOLCHAIN=IAR`.

***Note**: For applications that were created using core-make-3.0 or older, you must use the `make ewarm8` command instead.*

*This sets the `TOOLCHAIN` to IAR in the Embedded Workbench configuration files but **not** in the ModusToolbox™ application's Makefile. Therefore, builds inside IAR Embedded Workbench will use the IAR toolchain, while builds in the ModusToolbox™ environment will continue to use the toolchain that was previously specified in the Makefile. You can edit the Makefile's `TOOLCHAIN` variable if you also want ModusToolbox™ builds to use the IAR toolchain.*

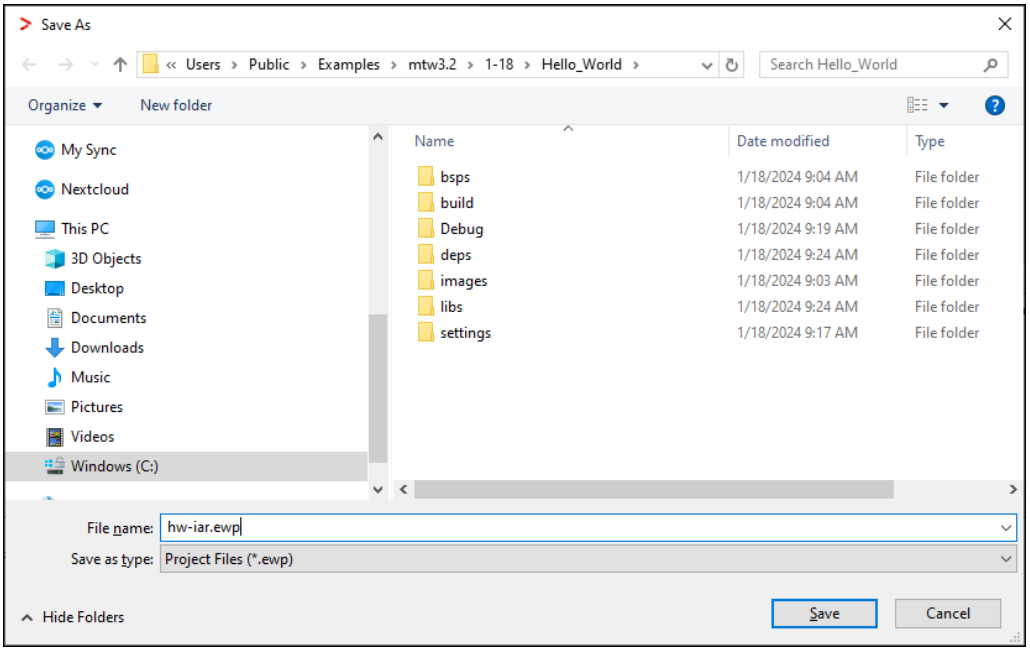
Check the output log for instructions and information about various flags.

2.3 Open application in IAR Embedded Workbench

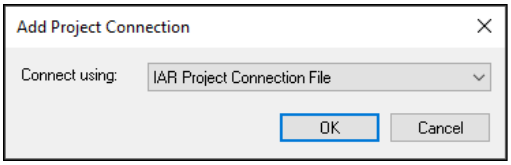
After creating or exporting an application, an IAR project connection file (.ipcf) appears in the ModusToolbox™ application directory This an XML file that contains the hierarchy of all the files and directories from the original ModusToolbox™ application. For example: *Hello_World.ipcf*

1. Start IAR Embedded Workbench.

   If you have a previous Embedded Workbench workspace (.eww) open, close it and create a new one inside the ModusToolbox™ application directory.
2. On the main menu, select **Project > Create New Project > Empty project** and click **OK**.
3. Browse to the ModusToolbox™ application directory, enter a desired IAR Embedded Workbench project (*.ewp*) name, and click **Save**.

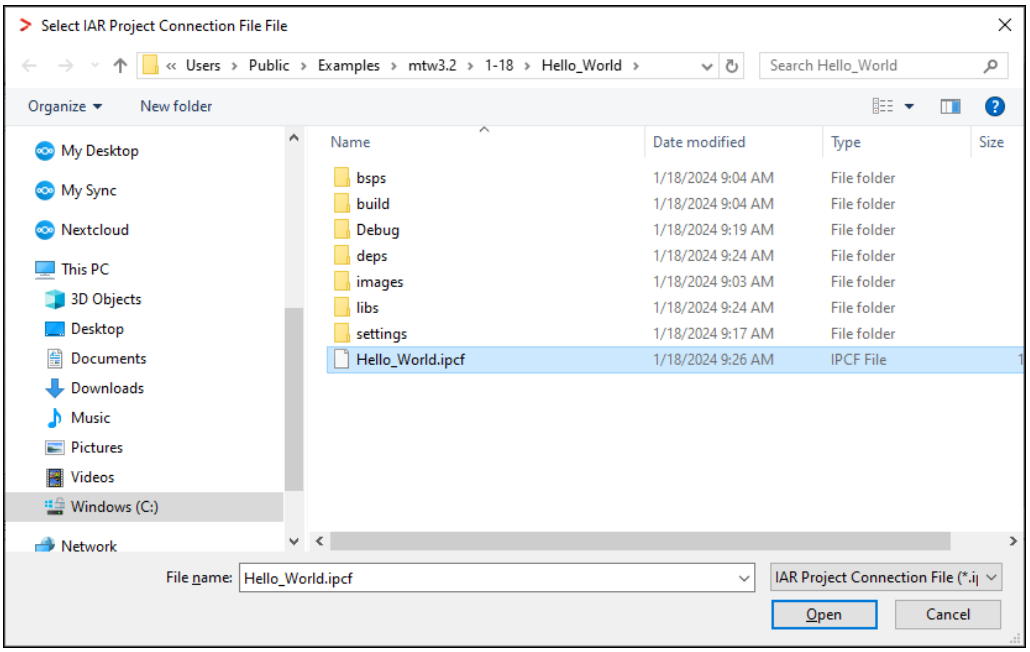


4. Select **Project > Add Project Connection** and on the dialog ensure that "IAR Project Connection File" is selected; click **OK**.



5. On the Select IAR Project Connection File dialog, select the *.ipcf* file and click **Open**:

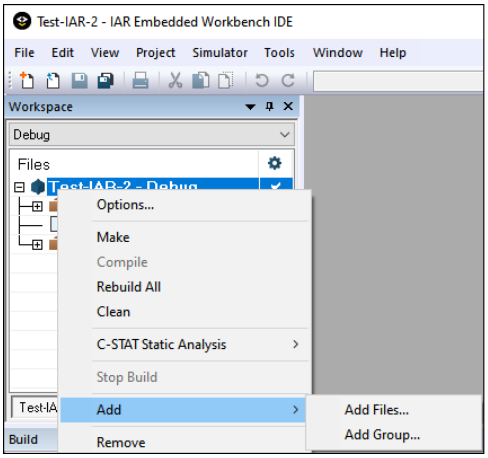
2 Getting started



***Note**:* *If you add more files and libraries in the ModusToolbox™ environment, you need to run "make ewarm" again to update the .ipcf file in the IAR Embedded Workbench project. For example:*
`make ewarm TOOLCHAIN=IAR CY_IDE_PRJNAME=Hello_World`

If you don't care about staying connected to the ModusToolbox™ tools that generate the project files, you can delete the .ipcf file from the workspace and restart IAR Embedded Workbench.

*If you want to make changes in IAR Embedded Workbench, you need to do that at the workspace level using the **Add** option. These additions will not be included in the .ipcf file.*

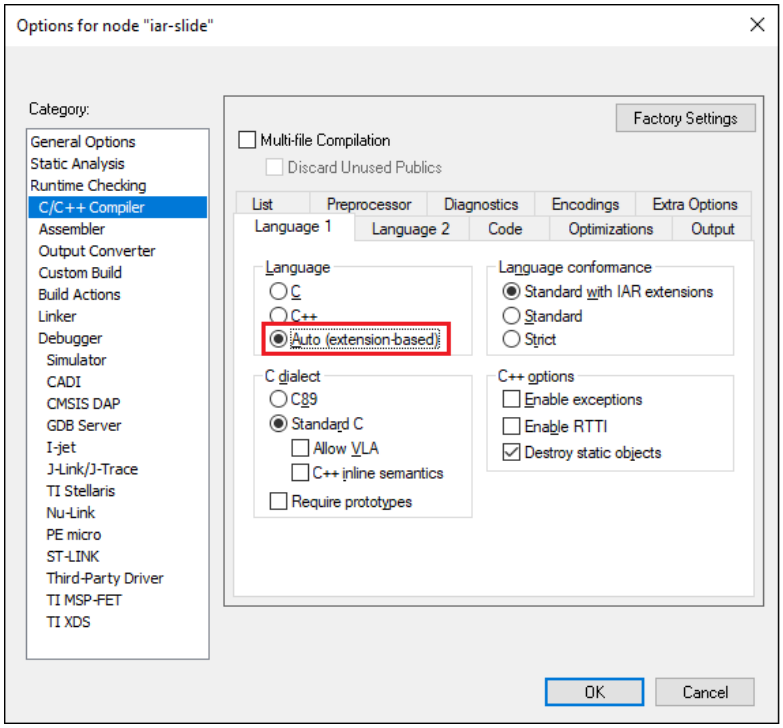


6. After the project has been created, select **File > Save Workspace**. Then if needed, enter a desired workspace name (*.eww*).

3 Configure and build the application

3.1 Configure applications with C++ files

In cases where your application includes C++ files, you need to configure the C/C++ Compiler option. Right-click on the project and select **Options > C/C++ Compiler > Language 1**, select **Auto (extension-based)**, and click **OK**.



3.2 Build options, and prebuild/postbuild settings

To set various build options, use the sections on the IAR Embedded Workbench Project Options dialog where you can enter command-line options:

- **C / C++ Compiler > Extra Options**
- **Assembler > Extra Options**
- **Linker > Extra Options**

Prebuild and postbuild steps from a ModusToolbox application are not included in the export process by default. If your original application has these steps, you must include them in the IAR Embedded Workbench manually as follows:

1. On the Project Options dialog, select the **Build Actions** category.
2. Click the **New** button to open the New Build Action dialog.
3. On the New Build Action dialog, enter a command-line argument, output and/or input files, the working directory, and the build order.
4. Click **OK**.

Refer to the IAR Embedded Workbench Help for more details.

3.3 RTOS settings

If your application includes an RTOS, you will need to update compiler and linker settings in IAR Embedded Workbench. This is needed to make the C/C++ library implementation thread safe. This process is described in the IAR C/C++ Development Guide

1. Open **Project > Options > General Options > Library Configuration**.
2. In the **Library** menu, select "Full".
3. Select the **Enable thread support in library** check box.
4. Click **OK**.

Once enabled, this will require implementations of functions that perform the locking that are provided by the clib-support library that we provide. https://github.com/Infineon/clib-support/blob/master/README.md

***Note**: This is not specific to Infineon devices but more about how the IAR compiler/linker and C library implementation work. All compilers have similar enabling needed*

3.4 Build the application

When you have made all the necessary configuration changes, you can build the application.

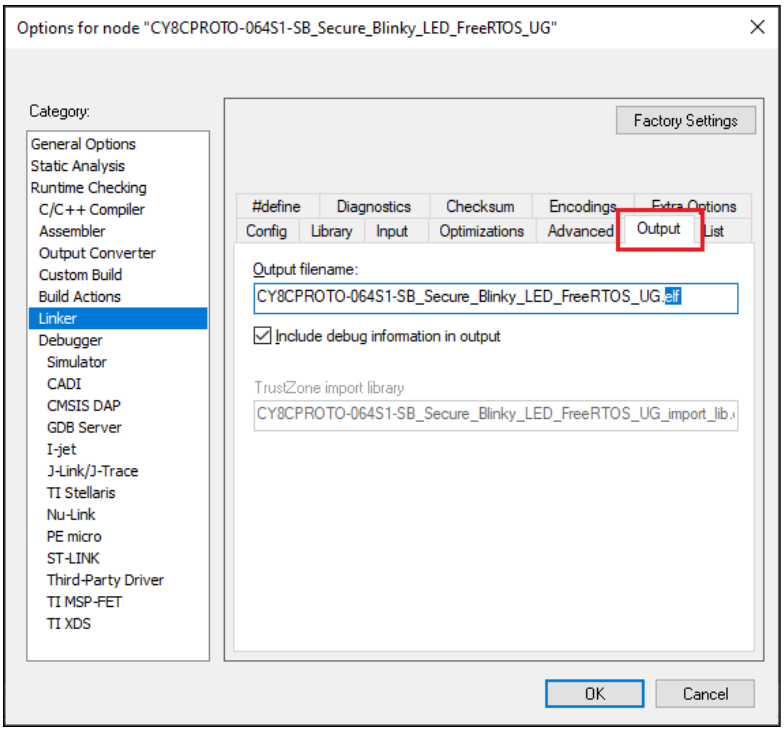
***Note**: For applications using the PSoC™ 64 MCU or AIROC™ (PSoC™ 64 application configuration) CYW20829 device (AIROC™ CYW20829 device configuration), skip the next step. Instead, perform the steps outlined in the applicable section.*

On the IAR Embedded Workbench main menu, select **Project > Make**.

3.5 PSoC™ 64 application configuration

Before building an application for a PSoC™ 64 secure MCU in IAR, you must perform the following configuration steps.

1. Select **Project > Options > Linker > Output** and change file extension from ".out" to ".elf" in **Output filename** field:



2. Click **OK** to close the dialog.
3. Build the application using the ModusToolbox™ `make build` command.
   You can do this by using a Terminal or exporting the application to Eclipse or VS Code.
4. Copy the post-build command from the log. For example:

```
<path-to-python>/python.exe C:/UG/CY8CPROTO-064S1-SB_Secure_Blinky_LED_FreeRTOS_UG/bsps/
TARGET_APP_CY8CPROTO-064S1-SB/psoc64_postbuild.py --core CM4 --secure-boot-stage
single --policy policy_single_CM0_CM4 --target cyb06xx7 --toolchain-path C:/
Infineon/Tools/ModusToolbox/tools_<version>/gcc --toolchain GCC_ARM --build-dir C:/UG/
CY8CPROTO-064S1-SB_Secure_Blinky_LED_FreeRTOS_UG/build/APP_CY8CPROTO-064S1-SB/Debug --app-
name mtb-example-psoc6-secure-blinkyled-freertos --cm0-app-path ../mtb_shared/cat1cm0p/
release-v1.0.0/COMPONENT_CAT1A/COMPONENT_CM0P_SECURE --cm0-app-name psoc6_01_cm0p_secure
```

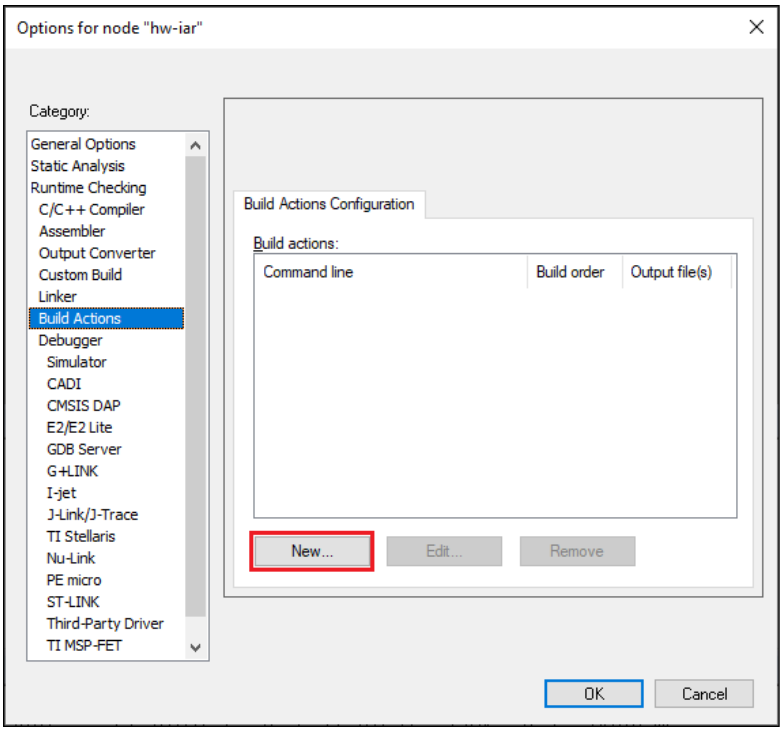
5. Paste the command into an appropriate editor, and make the following edits:
   - Add path to the policy file e.g.: `--policy-path ../policy`
   - Change `--build-dir` parameter to `Exe`
   - Change `--app-name` to you project in IAR name

   Example of command after edit:

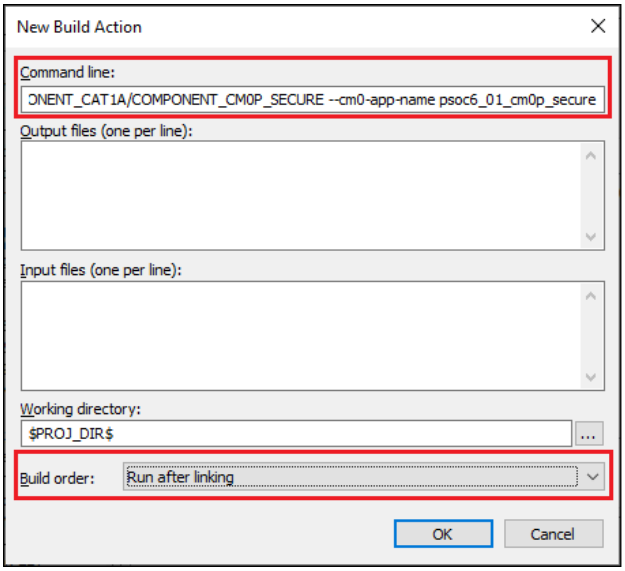
```
<path-to-python>/python.exe C:/UG/CY8CPROTO-064S1-SB_Secure_Blinky_LED_FreeRTOS_UG/bsps/
TARGET_APP_CY8CPROTO-064S1-SB/psoc64_postbuild.py --core CM4 --secure-boot-stage single
--policy-path ../policy --policy policy_single_CM0_CM4 --target cyb06xx7 --toolchain-
path C:/Infineon/Tools/ModusToolbox/tools_<version>/gcc --toolchain GCC_ARM --build-
dir Exe --app-name CY8CPROTO-064S1-SB_Secure_Blinky_LED_FreeRTOS_UG --cm0-app-path ../
mtb_shared/cat1cm0p/release-v1.0.0/COMPONENT_CAT1A/COMPONENT_CM0P_SECURE --cm0-app-name
psoc6_01_cm0p_secure
```

6. Copy the edited command.
7. In IAR, select **Project > Options > Build Actions** and click **New**:

3 Configure and build the application

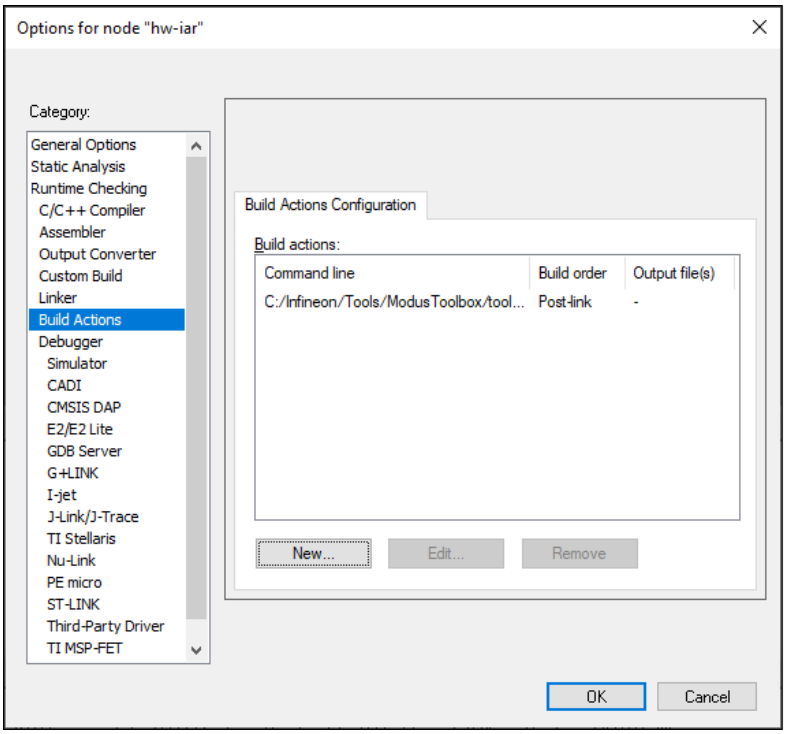


8. On the New Build Action dialog, paste the edited command in the **Command line** field, select "Run after linking" in the **Build order** field, and click **OK**:

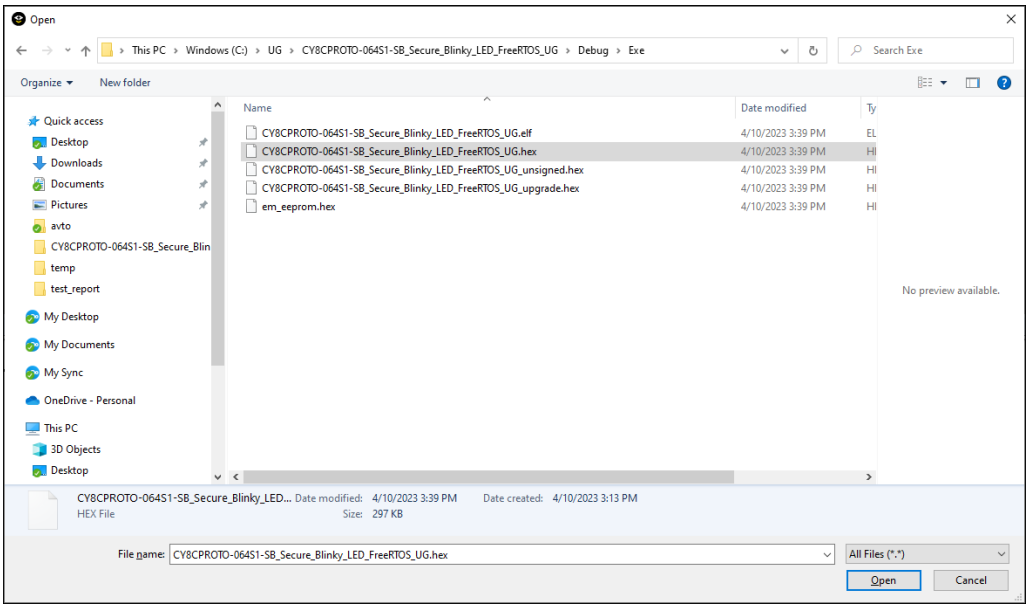


9. Click **OK** to close the dialog.

3 Configure and build the application



10. On the IAR main menu, select **Project > Make** to build the application.
11. Select **Project > Download > Download file...** and select the *<project_name>.hex* file in *<project_root >\Debug\Exe*.

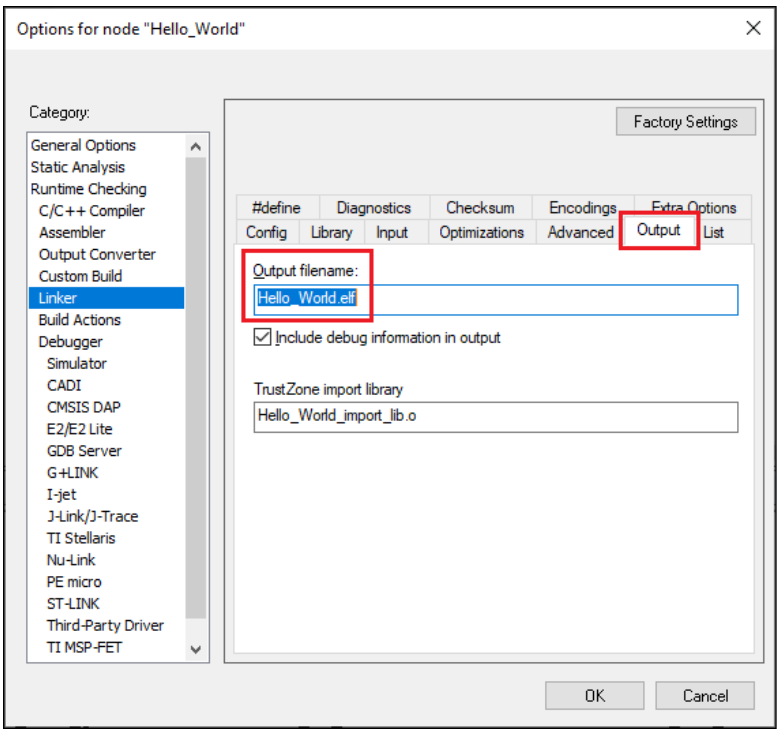


12. Select **Project > Debug without Downloading**.

3.6 AIROC™ CYW20829 device configuration

Before building an application for an AIROC™ CYW20829 device in IAR Embedded Workbench, you must perform the following configuration steps:

1. Select **Project > Options > Linker > Output** and change the file extension from ".out" to ".elf" in the **Output filename** field:



2. Create a *postbuild.bat* file in root directory of the project.
3. Add `SET PATH=%PATH%;"/usr/bin"` at the start of file.
4. Build the application using the ModusToolbox™ `make build` command. For example:

```
make build -j8 TOOLCHAIN=IAR
```

You can do this by using a Terminal or exporting the application to Eclipse or VS Code.

5. Copy the post-build output from the log. For example:

```
"C:/Program Files/IAR Systems/Embedded Workbench 9.2/arm/bin/
ielftool" C:/Users/Public/mtw3.2/20829-eclipse/Hello_World/build/APP_CYW920829M2EVK-02/
Debug/mtb-example-hal-hello-world.elf --bin-multi C:/Users/Public/mtw3.2/20829-
eclipse/Hello_World/build/APP_CYW920829M2EVK-02/Debug/mtb-example-hal-hello-world.bin;
"C:/Program Files/IAR Systems/Embedded Workbench 9.2/arm/bin/ielfdumparm"
-a C:/Users/Public/mtw3.2/20829-eclipse/Hello_World/build/APP_CYW920829M2EVK-02/Debug/
mtb-example-hal-hello-world.elf > C:/Users/Public/mtw3.2/20829-eclipse/Hello_World/
build/APP_CYW920829M2EVK-02/Debug/mtb-example-hal-hello-world.dis; "C:/Users/Public/
ModusToolbox/tools_<version>/modus-shell/bin/bash.exe" --norc --noprofile ../
mtb_shared/recipe-make-cat1b/release-v2.2.1/make/scripts/20829/flash_postbuild.sh
"IAR" "C:/Users/Public/mtw3.2/20829-eclipse/Hello_World/build/APP_CYW920829M2EVK-02/
Debug" "mtb-example-hal-hello-world" "C:/Users/Public/ModusToolbox/tools_<version>/gcc/
bin" "C:/Users/Public/ModusToolbox/tools_<version>/srecord/bin/srec_cat.exe"
"0x00003A00"; "C:/Users/Public/ModusToolbox/tools_<version>/modus-shell/bin/bash.exe"
--norc --noprofile ../mtb_shared/recipe-make-cat1b/release-v2.2.1/make/scripts/20829/
run_toc2_generator.sh "NORMAL_NO_SECURE" "C:/Users/Public/mtw3.2/20829-eclipse/
Hello_World/build/APP_CYW920829M2EVK-02/Debug" "mtb-example-hal-hello-world" "flash"
"bsps/TARGET_APP_CYW920829M2EVK-02" "NONE" "C:/Users/Public/ModusToolbox/tools_<version>/
gcc" "" 0x20000 0 "" "0x00003A00" "256";
C:/Users/Public/ModusToolbox/tools_<version>/srecord/bin/srec_cat.exe C:/Users/
Public/mtw3.2/20829-eclipse/Hello_World/build/APP_CYW920829M2EVK-02/Debug/mtb-example-hal-
hello-world.final.bin -Binary -offset 0x60000000 -o C:/Users/Public/mtw3.2/20829-eclipse/
Hello_World/build/APP_CYW920829M2EVK-02/Debug/mtb-example-hal-hello-world.final.hex
-Intel -Output_Block_Size=16; rm -rf C:/Users/Public/mtw3.2/20829-eclipse/Hello_World/
build/APP_CYW920829M2EVK-02/Debug/mtb-example-hal-hello-world.bin;
```

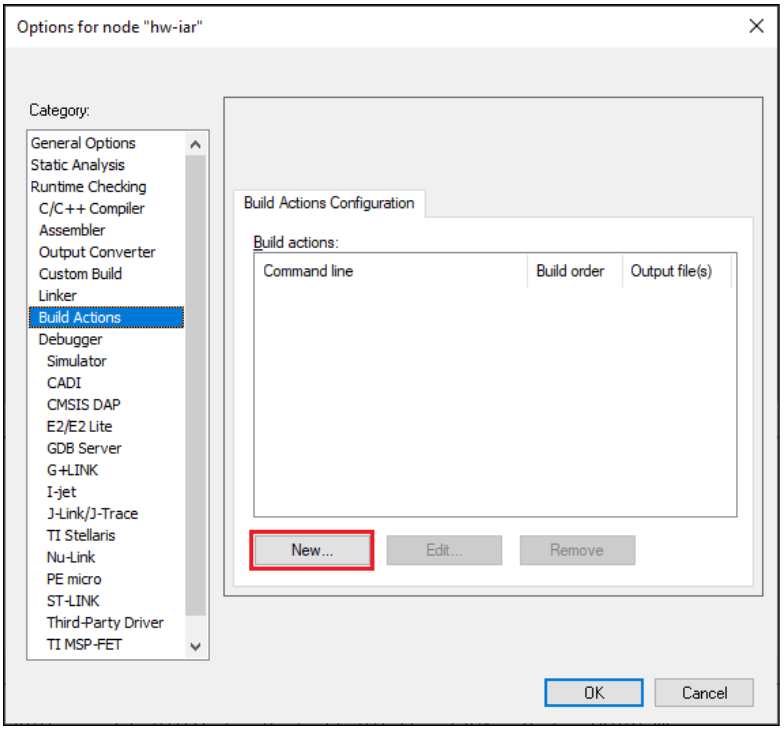
6. Paste the post-build output into the *postbuild.bat* file, and make the following edits:

- Change the path and names of files from "build/APP…" to "Debug/Exe/…".
- Remove the semi-colons.
- Delete un-needed commands (e.g., ielfdumparm, rm -rf).

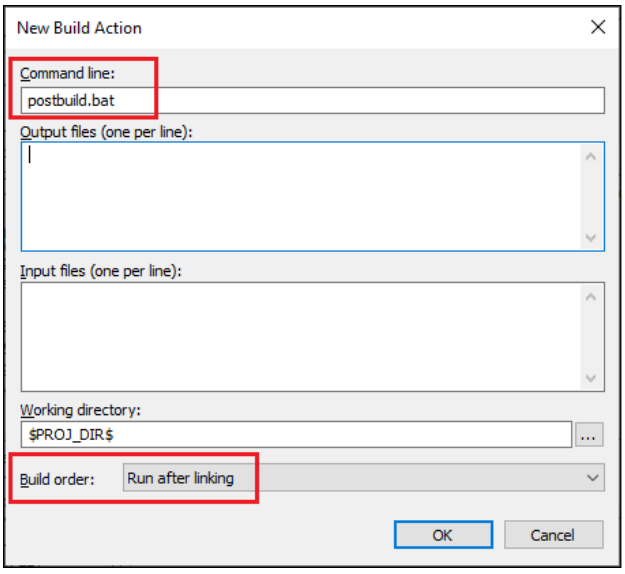
Example edited file:

```
SET PATH=%PATH%;"/usr/bin"
"C:/Program Files/IAR Systems/Embedded Workbench 9.2/arm/bin/ielftool" C:/Users/
Public/20829_iar_secure/Hello_World/Debug/Exe/Hello_World.elf --bin-multi C:/Users/Public/
20829_iar_secure/Hello_World/Debug/Exe/Hello_World.bin
"C:/Users/Public/ModusToolbox/tools_<version>/modus-shell/bin/bash.exe" --
norc --noprofile ../mtb_shared/recipe-make-cat1b/release-v2.2.1/make/scripts/20829/
flash_postbuild.sh "IAR" "C:/Users/Public/20829_iar_secure/Hello_World/Debug/Exe"
"Hello_World" "C:/Users/Public/ModusToolbox/tools_<version>/gcc/bin" "C:/Users/
Public/ModusToolbox/tools_<version>/srecord/bin/srec_cat.exe" "0x00003A00" "C:/Users/
Public/ModusToolbox/tools_<version>/modus-shell/bin/bash.exe" --norc --noprofile ../
mtb_shared/recipe-make-cat1b/release-v2.2.1/make/scripts/20829/run_toc2_generator.sh
"NORMAL_NO_SECURE" "C:/Users/Public/20829_iar_secure/Hello_World/Debug/Exe" "Hello_World"
"flash" "bsps/TARGET_APP_CYW920829M2EVK-02" "NONE" "C:/Users/Public/ModusToolbox/
tools_<version>/gcc" "" 0x20000 0 "" "0x00003A00" "256"
C:/Users/Public/ModusToolbox/tools_<version>/srecord/bin/srec_cat.exe "Debug/Exe/
Hello_World.final.bin" -Binary -offset 0x60000000 -o "Debug/Exe/Hello_World.final.hex"
-Intel -Output_Block_Size=16
```

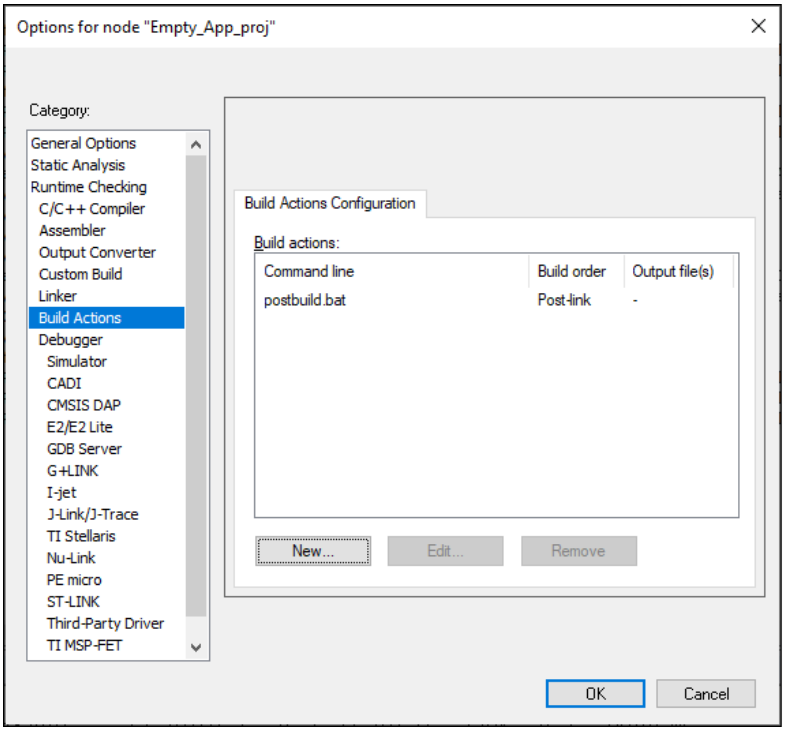
7. In IAR, select **Project > Options > Build Actions** and click **New**:



8. On the New Build Action dialog, type the *postbuild.bat* file in the **Command line** field, select "Run after linking" in the **Build order** field, and click **OK**:



9. Click **OK** to close the New Build Action dialog.



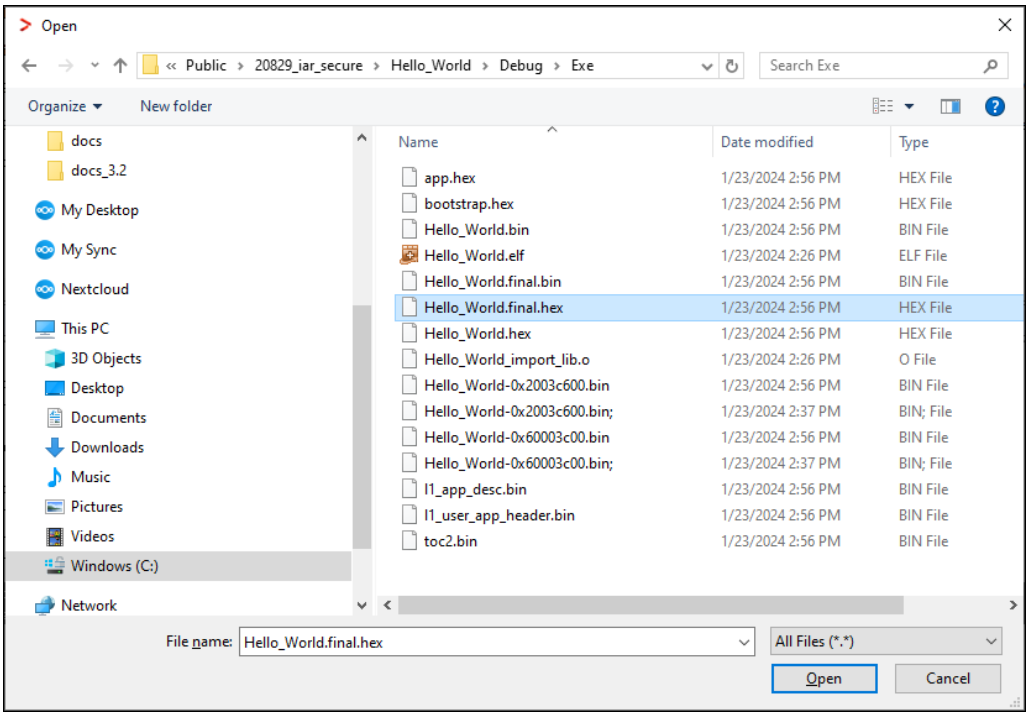
10. Click **OK** to close the Options dialog.

3 Configure and build the application

11. On the IAR main menu, select `Project > Make` to build the application.

```
C:\Users\Public\20829_iar_secure\Hello_World>C:/Users/Public/ModusToolbox/tools_3.2/
srecord/bin/srec_cat.exe "Debug/Exe/Hello_World.final.bin" -Binary -offset 0x60000000
-o "Debug/Exe/Hello_World.final.hex" -Intel -Output_Block_Size=16
Total number of errors: 0
Total number of warnings: 0
Resolving dependencies...
Using C:\Program Files\IAR Systems\Embedded Workbench 9.2\common\bin\ninja.exe
for the build
Build succeeded
```

12. Select **Project > Download > Download file...** and select the *<project_name>.final.hex* file in *<project_root>\Debug\Exe* [you might have to switch to All Files (*.*)].



13. Select **Project >Debug without Downloading**.

4 Programming/Debugging

Connect the development kit to the host PC.

4.1 XMC7000 and TRAVEO™ II specific steps

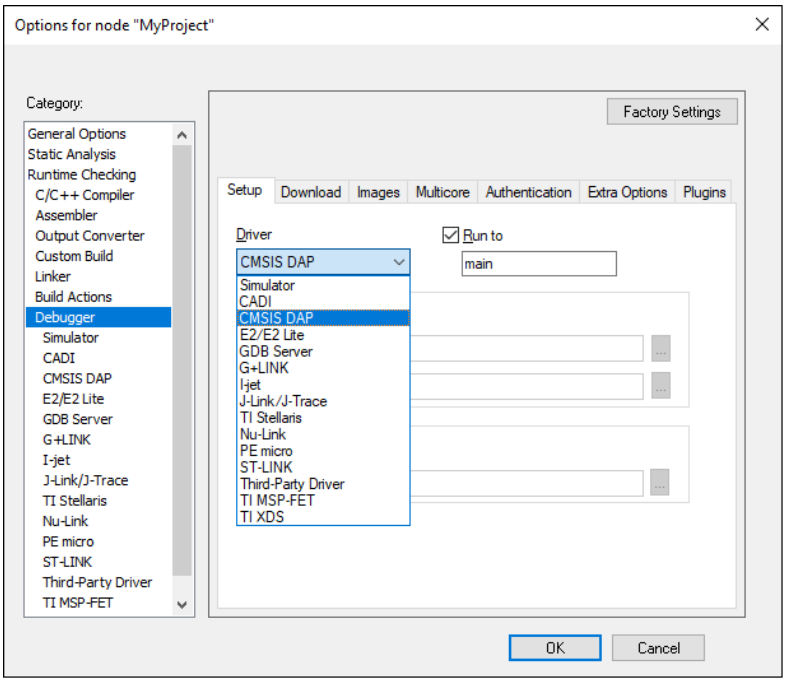
Because the XMC7000 and TRAVEO™ II devices have multiple cores – even if they are not used in a single-core application – you must perform special steps to modify the linker script for the IAR project. See XMC7000/ TRAVEO™ II specific steps for more details.

4.2 To use KitProg3/MiniProg4

As needed, run the fw-loader tool to make sure the board firmware is upgraded to KitProg3. See the KitProg3 User Guide for details. The tool is in the following directory by default:

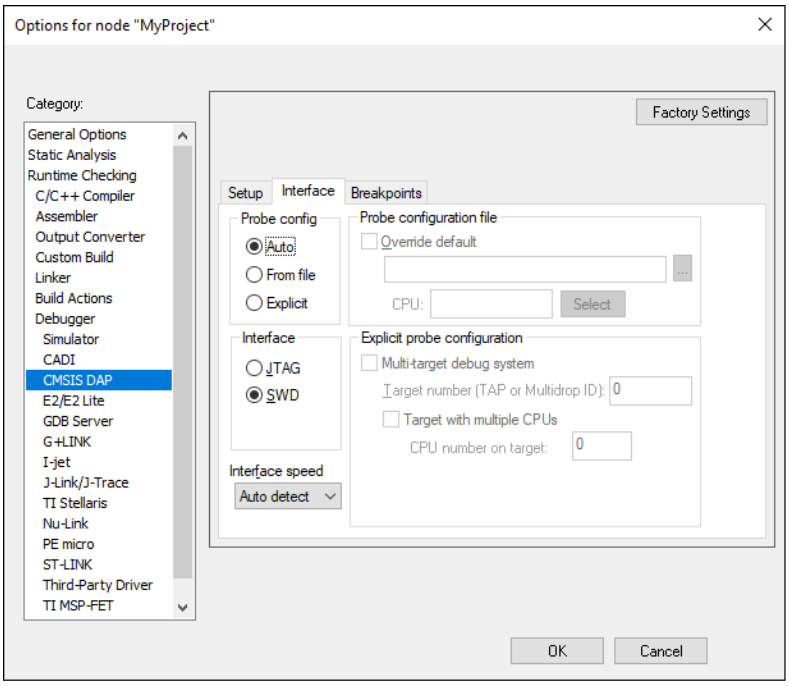
<user_home>/ModusToolbox/tools_<version>/fw-loader/bin/

1. Select **Project > Options > Debugger** and select CMSIS-DAP in the Driver list:



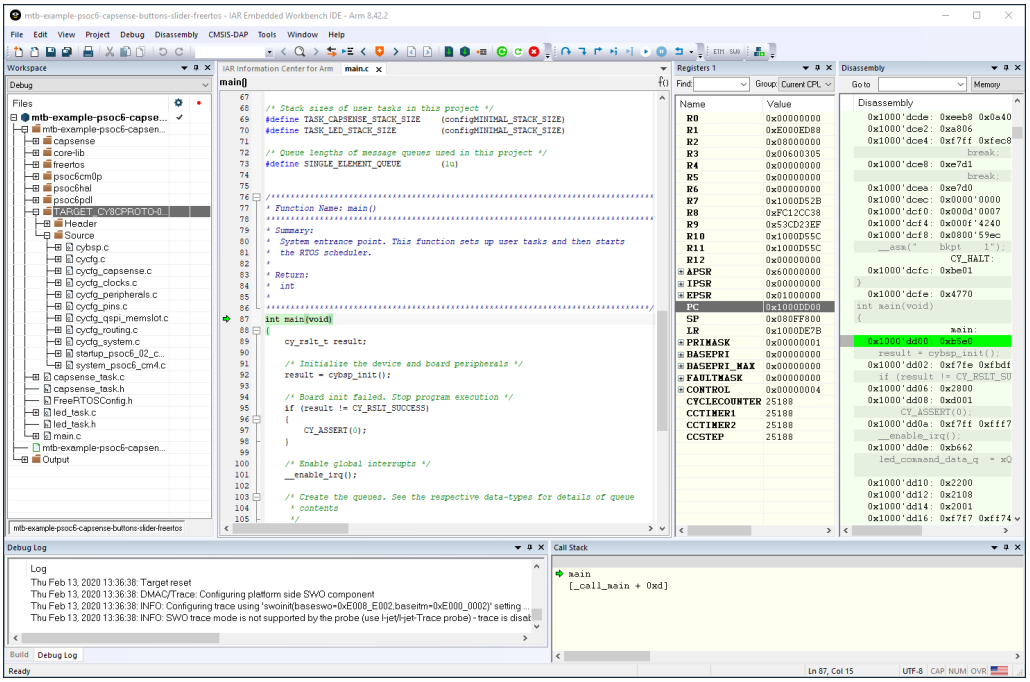
2. Select the **CMSIS-DAP** node, switch the interface from **JTAG** to **SWD**, and set the Interface speed to **2MHZ**.

4 Programming/Debugging



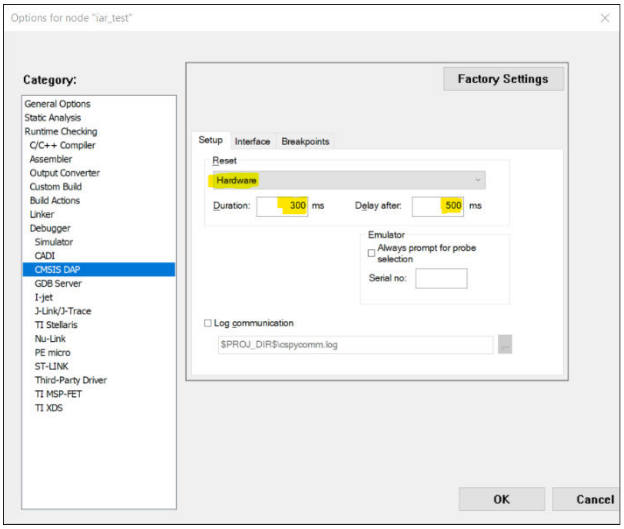
3. Click **OK**.
4. Select **Project > Download and Debug**.

   The IAR Embedded Workbench starts a debugging session and jumps to the main function.



4.3 To use MiniProg4 with PSoC™ 6 single core and PSoC™ 6 256K

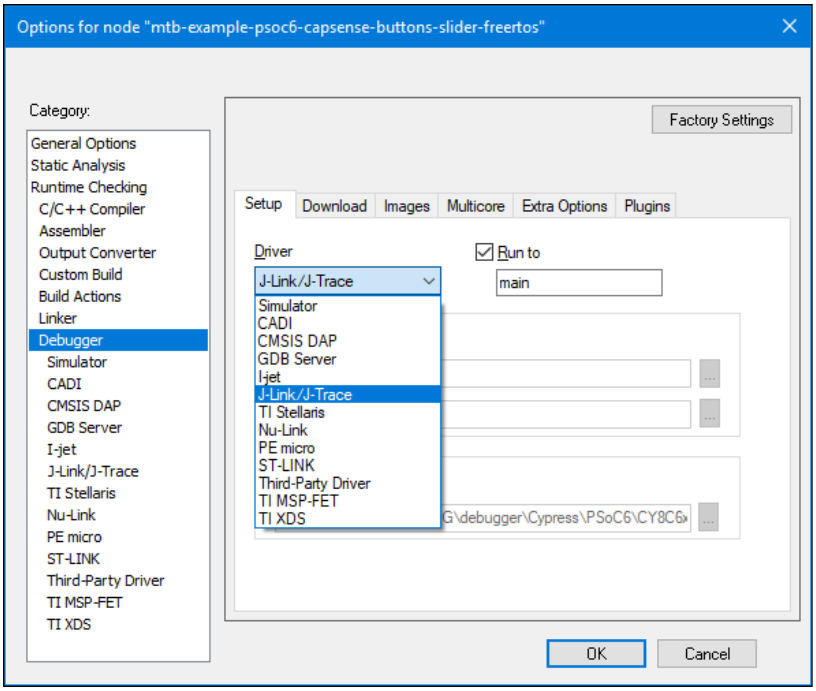
For a single-core PSoC™ 6 MCU, you must specify a special type of reset, as follows:



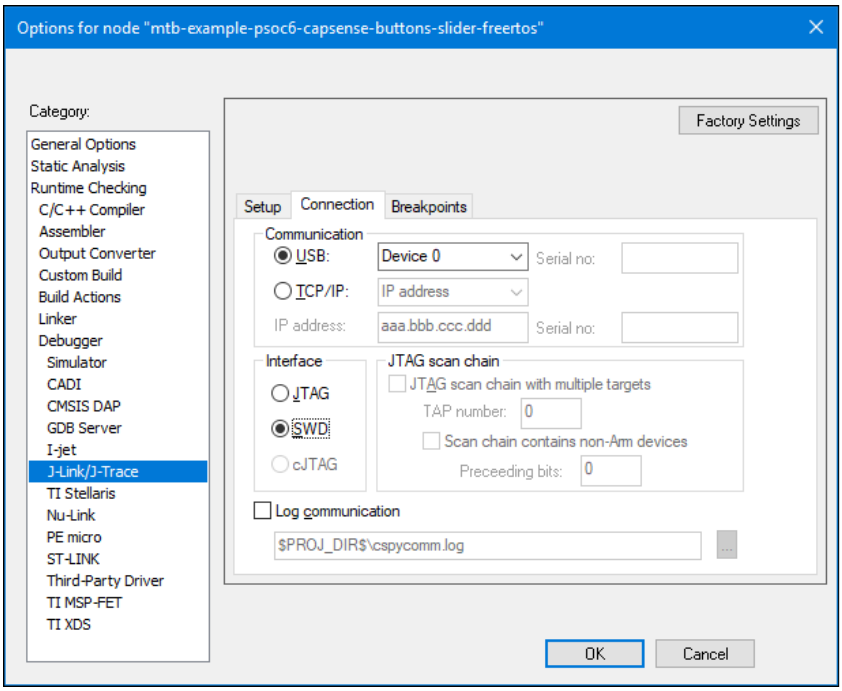
4.4 To use J-Link

You can use a J-Link debugger probe to debug the application.

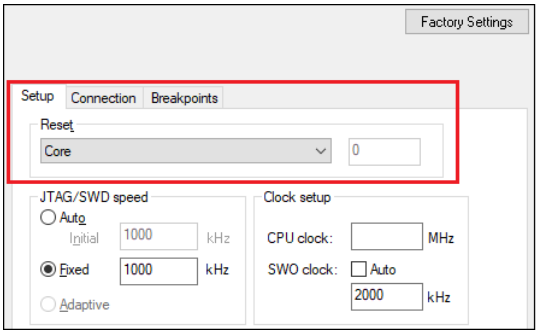
1. Open the Options dialog and select the **Debugger** item under **Category**.
2. Then select **J-Link/J-Trace** as the active driver:



3. Select the **J-Link/J-Trace** item under **Category**, and under the **Connection** tab, switch the interface to **SWD**:



***Note**: For PSoC™ 64 "Secure Boot" MCU, you must specify a special type of reset, as shown:*



4. Connect a J-Link debug probe to the 10-pin adapter (this needs to be soldered on the prototyping kits), and start debugging.

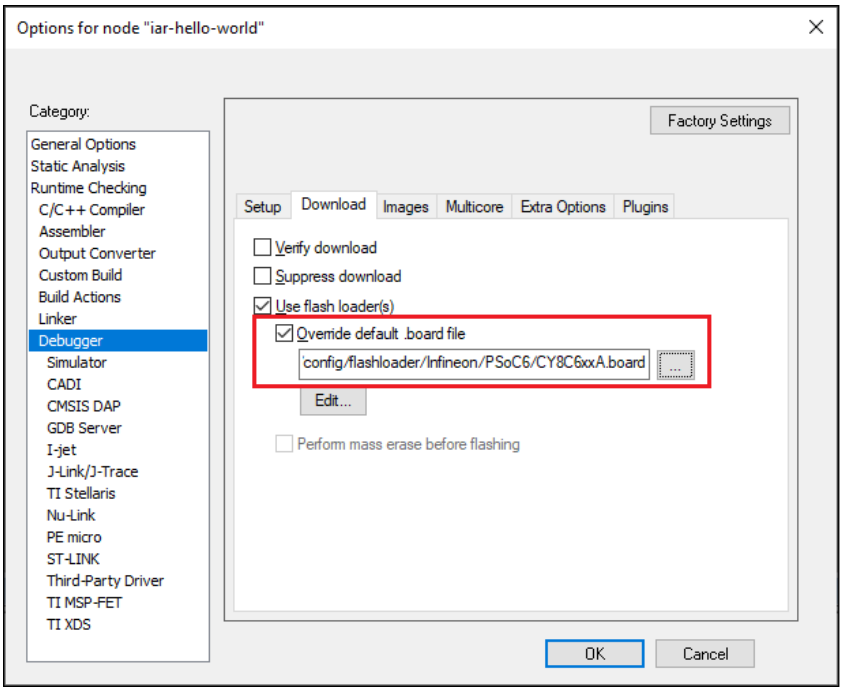
4.5 Perform ETM/ITM trace

Refer application note AN235279 - Performing ETM and ITM trace on PSoC™ 6 MCU for details.

4.6 Program external memory

IAR Embedded Workbench has disabled external memory programming by default. The SMIF region in the *.board file must be enabled manually for PSoC™ 6 devices. To do that:

1. Open the Options dialog and select the **Debugger** item under **Category**.
2. Click the **Download** tab and select the **Override default .board file** check box.
3. Identify the default *.board* file currently used for this project.



4. Copy the default *.board* file from the IAR Installation directory and paste it next to the IAR project file.
5. Use a text editor to remove comment tags for the SMIF region around the `<pass>` element, and then comment out the ignore element for the XIP region in the recently copied file.

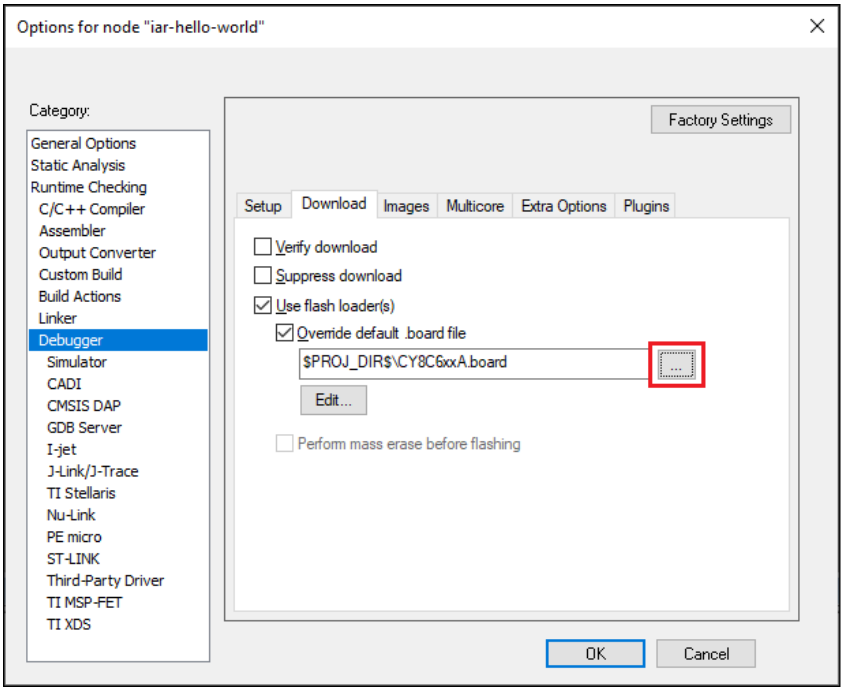
   Original file:

```
<?xml version="1.0" encoding="iso-8859-1"?>
<!--                                                    -->
<!-- Infineon PSoC6A-2M (CY8C6xxA), 2048K of Main Flash -->
<!--                                                    -->
<flash_board>
  <!-- Programming steps -->
  <pass> <!-- Flash Main Region -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA.flash</loader>
    <range>CODE 0x10000000 0x101FFFFF</range>
  </pass>
  <pass> <!-- Flash Work Region -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_WFLASH.flash</loader>
    <range>CODE 0x14000000 0x14007FFF</range>
  </pass>
  <pass> <!-- SFLASH: User Data -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SFLASH.flash</loader>
    <range>CODE 0x16000800 0x16000FFF</range>
  </pass>
  <pass> <!-- SFLASH: NAR -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SFLASH.flash</loader>
    <range>CODE 0x16001A00 0x16001BFF</range>
  </pass>
  <pass> <!-- SFLASH: Public Key -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SFLASH.flash</loader>
    <range>CODE 0x16005A00 0x160065FF</range>
  </pass>
  <pass> <!-- SFLASH: Public TOC2 -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SFLASH.flash</loader>
    <range>CODE 0x16007C00 0x16007FFF</range>
  </pass>
  <!-- <pass> --><!-- SMIF (XIP Region) -->
    <!-- <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SMIF.flash</loader> -->
    <!-- <range>CODE 0x18000000 0x1FFFFFFF</range> -->
  <!-- </pass> -->
  <!-- Exclude regions -->
  <ignore>CODE 0x08000000 0x080FFFFF</ignore> <!-- Exclude SRAM Region -->
  <ignore>CODE 0x16000000 0x160007FF</ignore> <!-- Exclude SFLASH [SFLASH Start - User Data Start] -->
  <ignore>CODE 0x16001000 0x160019FF</ignore> <!-- Exclude SFLASH [User Data End - NAR Start] -->
  <ignore>CODE 0x16001C00 0x160059FF</ignore> <!-- Exclude SFLASH [NAR End - Public Key Start] -->
  <ignore>CODE 0x16006600 0x16007BFF</ignore> <!-- Exclude SFLASH [Public Key End - TOC2 Start] -->
  <ignore>CODE 0x90300000 0x903FFFFF</ignore> <!-- Exclude Cy Checksum Region -->
  <ignore>CODE 0x90500000 0x905FFFFF</ignore> <!-- Exclude Cy Metadata Region -->
  <ignore>CODE 0x90700000 0x907FFFFF</ignore> <!-- Exclude eFuse Region -->
  <ignore>CODE 0x18000000 0x1FFFFFFF</ignore> <!-- Exclude XIP Region -->
</flash_board>
```

   Edited file:

```
<?xml version="1.0" encoding="iso-8859-1"?>
<!--                                                    -->
<!-- Infineon PSoC6A-2M (CY8C6xxA), 2048K of Main Flash -->
<!--                                                    -->
<flash_board>
  <!-- Programming steps -->
  <pass> <!-- Flash Main Region -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA.flash</loader>
    <range>CODE 0x10000000 0x101FFFFF</range>
  </pass>
  <pass> <!-- Flash Work Region -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_WFLASH.flash</loader>
    <range>CODE 0x14000000 0x14007FFF</range>
  </pass>
  <pass> <!-- SFLASH: User Data -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SFLASH.flash</loader>
    <range>CODE 0x16000800 0x16000FFF</range>
  </pass>
  <pass> <!-- SFLASH: NAR -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SFLASH.flash</loader>
    <range>CODE 0x16001A00 0x16001BFF</range>
  </pass>
  <pass> <!-- SFLASH: Public Key -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SFLASH.flash</loader>
    <range>CODE 0x16005A00 0x160065FF</range>
  </pass>
  <pass> <!-- SFLASH: Public TOC2 -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SFLASH.flash</loader>
    <range>CODE 0x16007C00 0x16007FFF</range>
  </pass>
  <pass><!-- SMIF (XIP Region) -->
    <loader>$TOOLKIT_DIR$/config/flashloader/Infineon/PSoC6/CY8C6xxA_SMIF.flash</loader>
    <range>CODE 0x18000000 0x1FFFFFFF</range>
  </pass>
  <!-- Exclude regions -->
  <ignore>CODE 0x08000000 0x080FFFFF</ignore> <!-- Exclude SRAM Region -->
  <ignore>CODE 0x16000000 0x160007FF</ignore> <!-- Exclude SFLASH [SFLASH Start - User Data Start] -->
  <ignore>CODE 0x16001000 0x160019FF</ignore> <!-- Exclude SFLASH [User Data End - NAR Start] -->
  <ignore>CODE 0x16001C00 0x160059FF</ignore> <!-- Exclude SFLASH [NAR End - Public Key Start] -->
  <ignore>CODE 0x16006600 0x16007BFF</ignore> <!-- Exclude SFLASH [Public Key End - TOC2 Start] -->
  <ignore>CODE 0x90300000 0x903FFFFF</ignore> <!-- Exclude Cy Checksum Region -->
  <ignore>CODE 0x90500000 0x905FFFFF</ignore> <!-- Exclude Cy Metadata Region -->
  <ignore>CODE 0x90700000 0x907FFFFF</ignore> <!-- Exclude eFuse Region -->
  <!-- <ignore>CODE 0x18000000 0x1FFFFFFF</ignore> --> <!-- Exclude XIP Region -->
</flash_board>
```

6. Save the file.
7. In IAR, click the **Browse [...]** button, then navigate to and select the edited *.board* file.

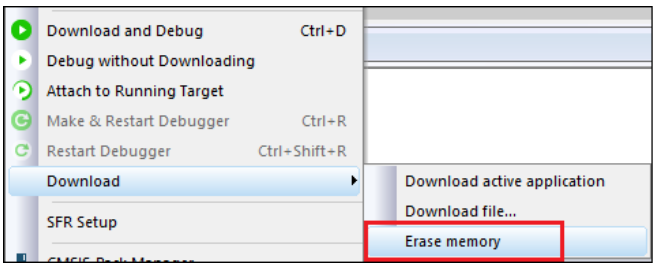


8. Click **OK** when you are finished.

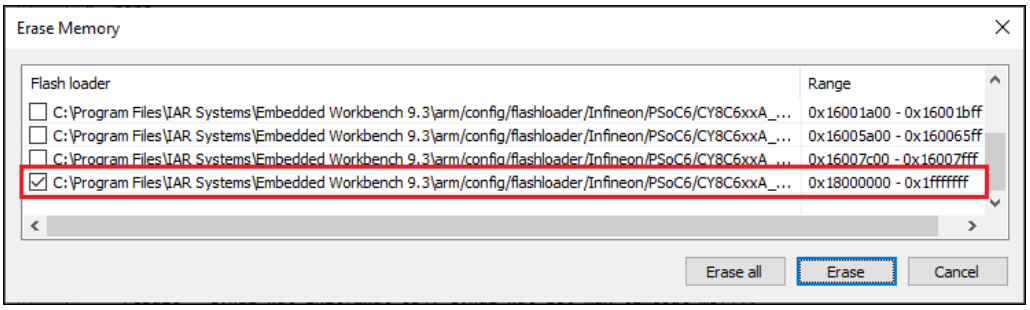
4.7 Erase PSoC™ 6 MCU with external memory enabled

To successfully erase external memory using flashloaders on PSoC™ 6 MCUs, the device's internal flash must contain valid QSPI configuration data. It may be part of a previously programmed application, such as the QSPI_XIP example. For more details, review section 7 of application note AN228740.

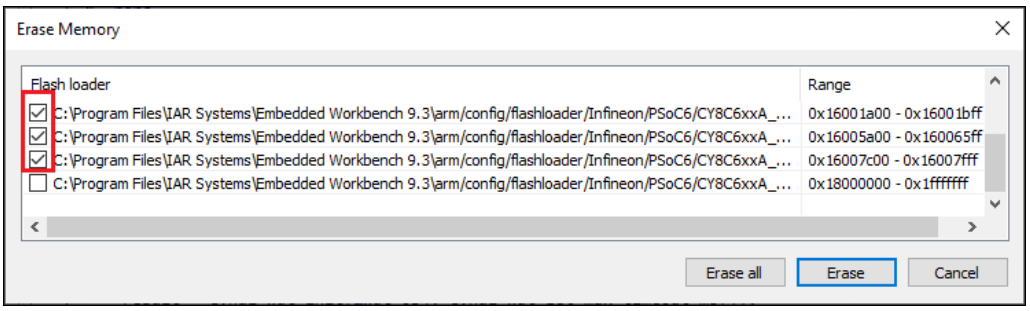
1. Select **Project > Download > Erase memory**.



2. Deselect the check boxes for all regions, except for 0x18000000-0x1fffffff.



3. Click **Erase**.
4. Select **Project > Download > Erase memory** again.
5. Select all other regions and deselect 0x18000000-0x1fffffff.



6. Click **Erase**.

5 Multi-core debugging

This section describes how to set up multi-core debugging in IAR Embedded Workbench for Arm IDE (IAR). For this purpose, we need to create an IAR workspace containing a few projects (one project per MCU core).

5.1 Supported debugger probes

- KitProg3 onboard programmer
- MiniProg4
- IAR I-jet
- J-Link

5.2 Create IAR workspace and projects

After creating a ModusToolbox™ multi-core application for use with IAR, do the following:

1. Launch IAR.
2. On the main menu, select **Project > Create New Project > Empty project** and click **OK**.
3. Browse to the ModusToolbox™ project directory for one of the cores, enter a desired project name, and click **Save**.
4. After the project is created, select **ile > Save Workspace**F. Then, enter a desired workspace name.
5. Select **Project > Add Project Connection** and click **OK**.
6. On the Select IAR Project Connection File dialog, select the *.ipcf* file located in the project directory for CM0+ core and click **Open**.
7. Repeat steps 2-3 and 5-6 for all other core projects in the application.
8. Once you have a working workspace, you need to properly configure IAR projects in order to be able to establish a multi-core debug session. Also, for some MCUs you must edit linker scripts in order to organize flash allocation properly.

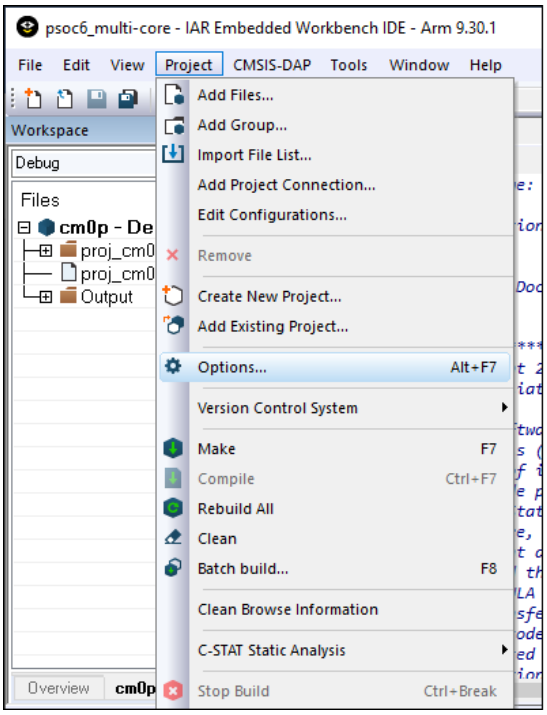
5.3 Configuring IAR projects

To launch a multi-core debug session, all projects within the workspace must be properly configured. In IAR there is a concept of 'master' and 'slave' projects. Configure the CM0+ core project as the master project, and configure the other cores (CM4 for PSoC™ 6 and CM7 for XMC7000) as slave projects.

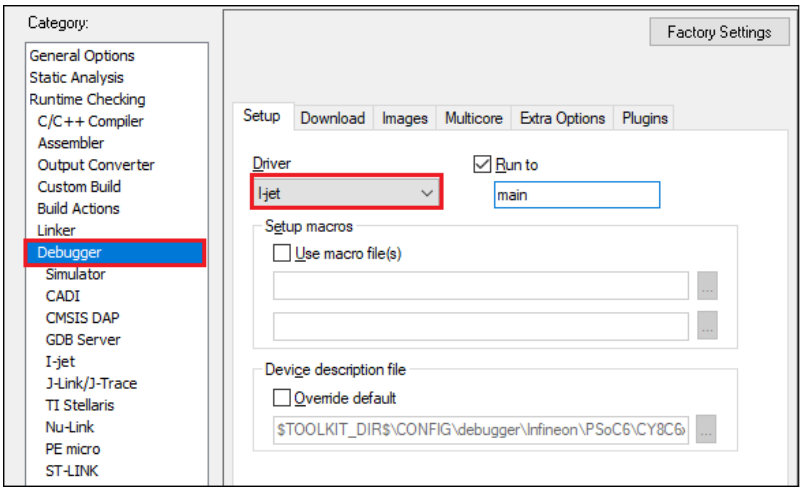
5.3.1 Project configuration for CM4/CM7 (slave) core(s)

1. Select the CM4/CM7 core project and go to **Project > Options**:

5 Multi-core debugging



2. On the dialog, select the **Debugger** category in the **Setup** tab, and then select the appropriate Driver (I-jet, CMSIS-DAP, J-Link):



3. Enable hex file generation.

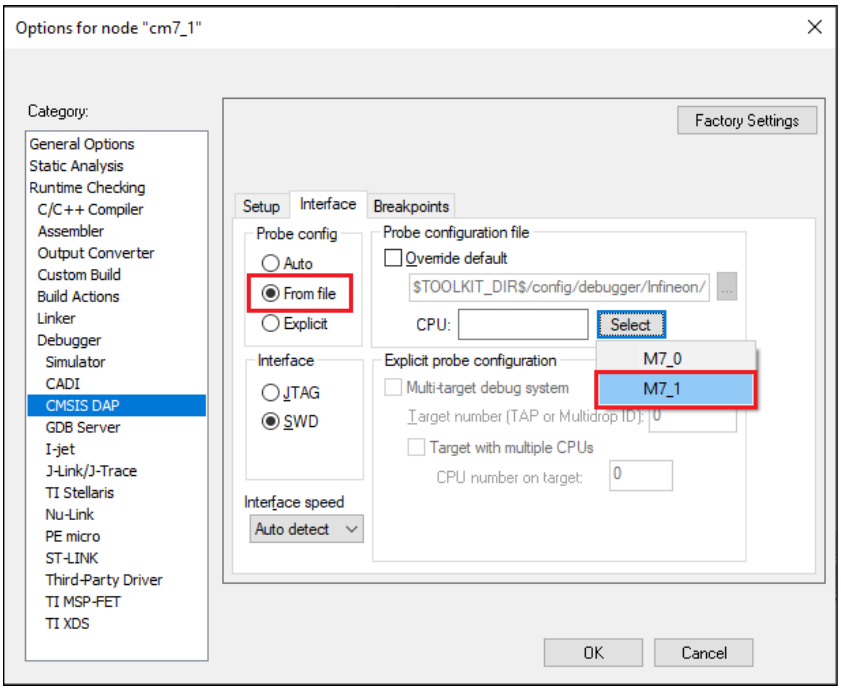
- In the **Runtime Checking > Output Converter** category, select the **Generate additional output** check box.
- Ensure **Output format** is set to **Intel Extended hex**.
- Click **OK**.

4. Repeat these steps for your all projects for CM4/CM7 (for triple-core MCUs),

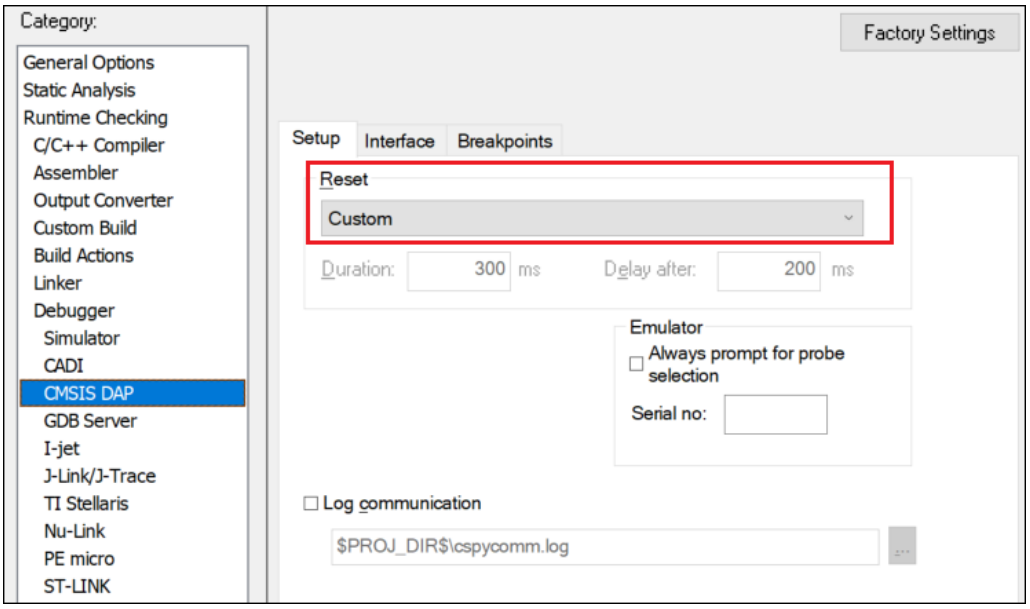
5.3.2 XMC7000/TRAVEO™ II specific steps

Some XMC7000 MCUs are triple-core devices. If you are going to use a second CM7 core in your IAR workspace, you need to implicitly set the target core in project settings so that IAR understands this project is targeting a second CM7 core. By default, IAR connects to the first CM7 core, so specifying the target core for it can be skipped.

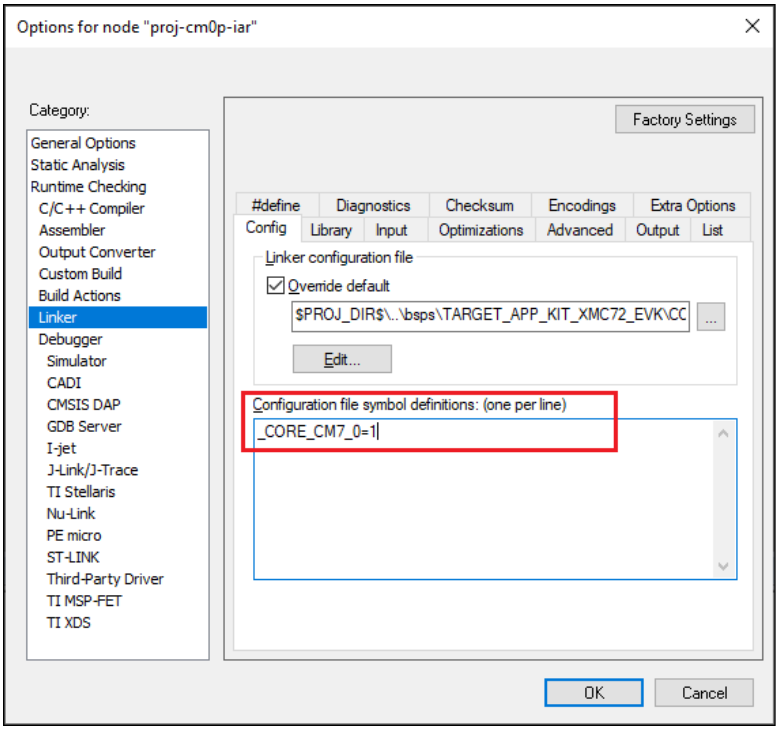
1. Select the project for the second CM7 core and go to **Project > Options**.
2. Select the probe in the **Debugger** category, and switch to the **Interface** tab.
3. Select the **From file** radio button, click **Select** next to the **CPU** label, and choose **M7_1**:



4. Switch to the **Setup** tab, and select "Custom" from the **Reset** pull-down menu.



5. In addition, specify a special linker script symbol in the project settings to distinguish CM7_0 from CM7_1, since there is a single linker script for the two CM7 cores:
   a. Select the project for the first CM7 core and go to **Project > Options > Linker**.
   b. Add `_CORE_CM7_0_=1` in the **Configuration file symbol definitions** field, and click **OK**.



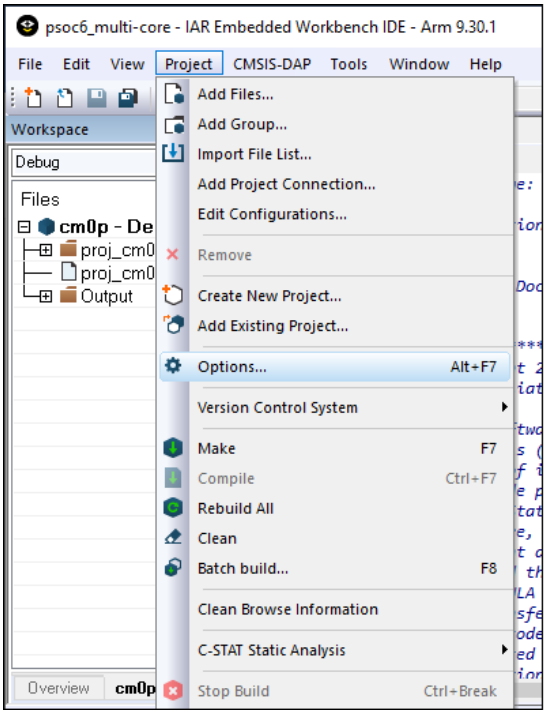
6. Do the same for the second CM7 core:
   a. Select the project for the second CM7 core and go to **Project > Options > Linker**.
   b. Add `_CORE_CM7_1_=1` in the **Configuration file symbol definitions field**, and click **OK**.

   ***Note**: When debugging CM4/CM7 core stand-alone, make sure to rebuild the CM0+ project in case any changes were made, since launching a debug session only loads the CM0+ image, but does not build that CM0+ project.*

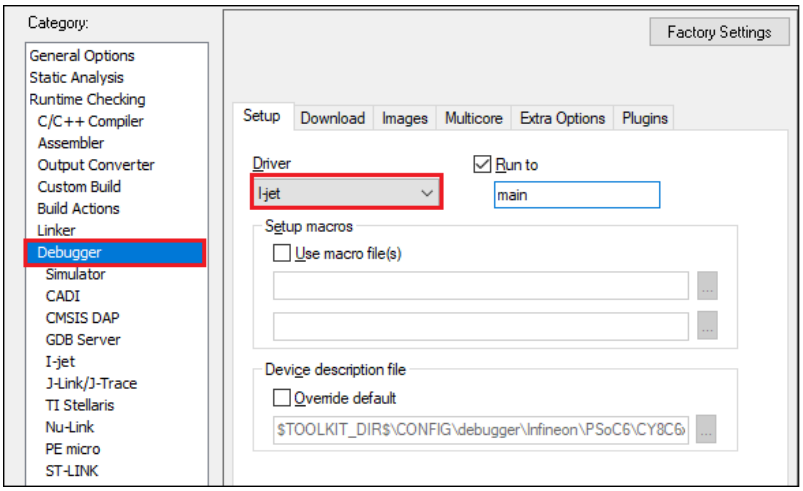
7. Build your CM4/CM7 project(s) before moving forward.

5.3.3 Project configuration for CM0+ (master) core

1. Select the CM0+ project and go to **Project > Options**:

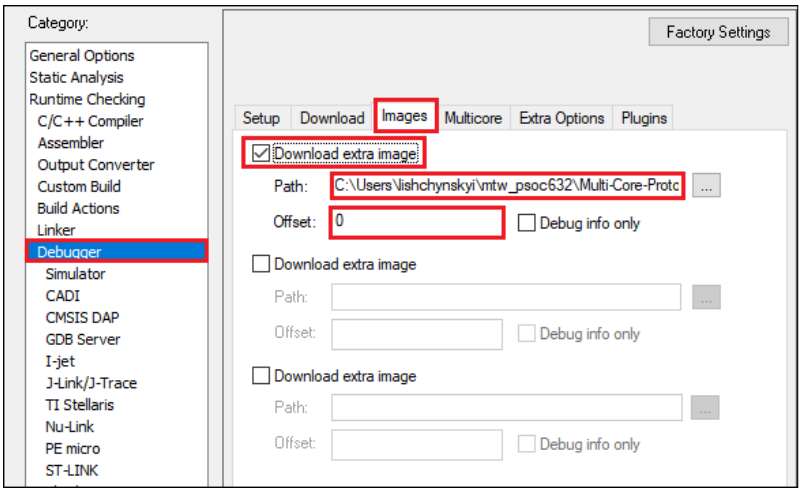


2. On the dialog, select the **Debugger** category in the **Setup** tab, and then select the applicable **Driver** (I-jet, CMSIS-DAP, J-Link):



3. Switch to the **Images** tab to specify the extra image to be downloaded prior to debugging in order to download images of all projects in one process.

- Select the **Download extra image** check box.
- Provide a **Path** to the CM4/CM7's **HEX** image.
- Enter 0 for **Offset**.

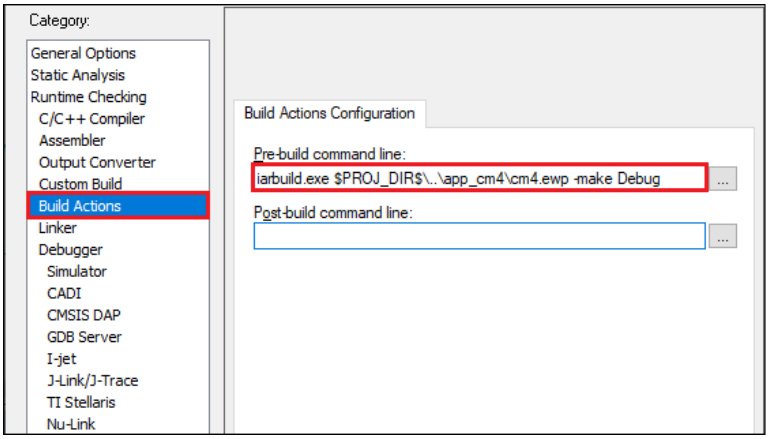


If you provide an OUT file instead of a HEX file, the IAR IDE will fail to halt at the beginning of `main()` due to the main function present in both the CM0+ and CM4/CM7 OUT files.

***Note**: For triple-core MCUs you should download two extra images.*

4. Add a prebuild command to build all projects prior to programming/debugging. In the **Build Actions** category set **Pre-build command line** to:

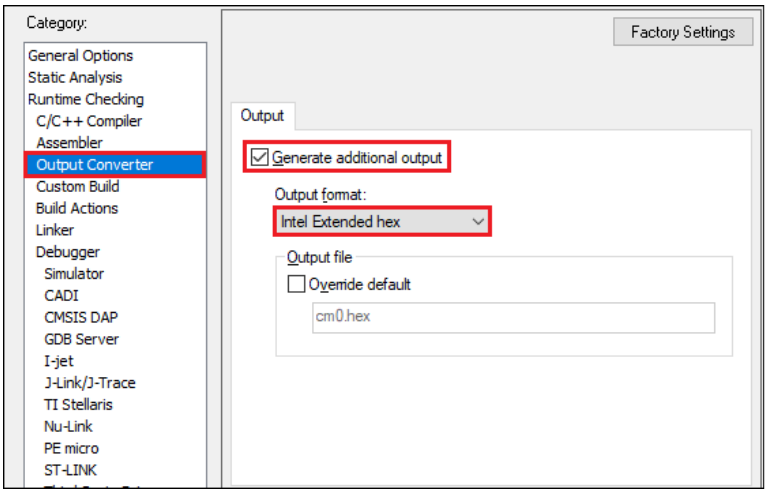
```
iarbuild.exe "<cm4/cm7_proj_loc>.ewp" -make Debug
```



5. If your MCU has three cores, you might want to also specify a post-build action to build the project for the third core in the same manner.

6. Enable hex file generation. In the **Runtime Checking > Output Converter** category:

- Select the **Generate additional output** check box.
- Ensure **Output format** is set to **Intel Extended hex**.



7. Click **OK**, and then select **File > Save All** to save all the changes.
8. Build the project.

IAR does not provide native multi-core debugging support when using a J-Link probe. This means that in order to launch multi-core debugging, you must open a few IAR IDE instances manually (one instance per core). Also, multi-core debugging with a J-Link probe lacks some features available with CMSIS-DAP and I-Jet probes. Therefore, depending on the target probe, you need to configure projects slightly differently.

5.3.4 CMSIS-DAP/I-Jet-specific configuration

1. Create a session configuration file.

This is an xml file containing a projects list that should be launched in a multi-core debug session. The following shows an example for a triple-core device. For a dual-core device, remove the third partner node.

```
<?xml version="1.0" encoding="utf-8"?>

<sessionSetup>
    <partner>
        <name>cm0</name>
        <workspace>C:\Users\mtw-multi-core\Multicore_App\multi-core_workspace.eww</
workspace>
        <project>cm0</project>
        <config>Debug</config>
        <numberOfCores>1</numberOfCores>
        <attachToRunningTarget>false</attachToRunningTarget>
    </partner>
    <partner>
        <name>cm7_0</name>
        <workspace>C:\Users\mtw-multi-core\Multicore_App\multi-core_workspace.eww</
workspace>
        <project>cm7_0</project>
        <config>Debug</config>
        <numberOfCores>1</numberOfCores>
        <attachToRunningTarget>true</attachToRunningTarget>
    </partner>
    <partner>
        <name>cm7_1</name>
        <workspace>C:\Users\mtw-multi-core\Multicore_App\multi-core_workspace.eww</
workspace>
        <project>cm7_1</project>
        <config>Debug</config>
        <numberOfCores>1</numberOfCores>
        <attachToRunningTarget>true</attachToRunningTarget>
    </partner>
</sessionSetup>
```

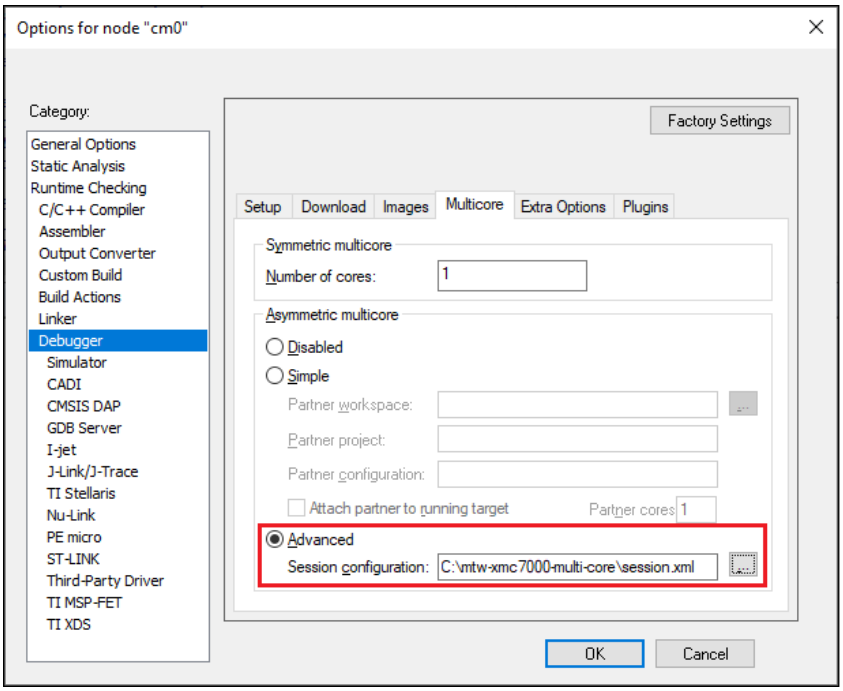
2. Configure multi-core debugging for the CM0+ project.

a. Go to **Project > Options -> Debugger**.

b. Switch to the **Multicore** tab.

c. Select the **Advanced** radio button and specify a path to the session configuration file in the **Session configuration** field.

d. Click **OK**.

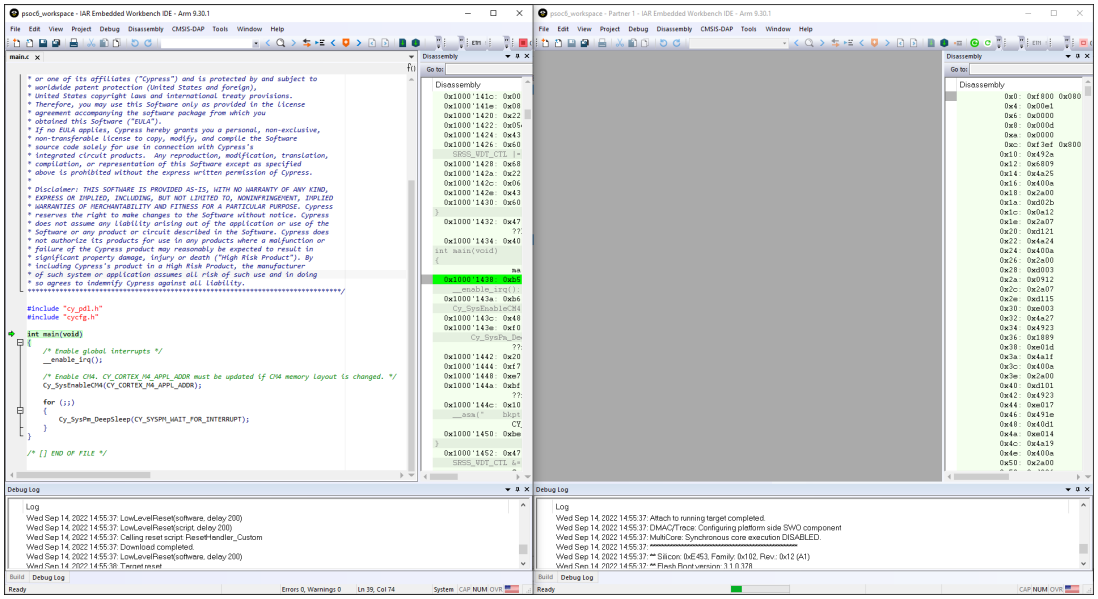


3. Save the workspace.

5.4 Launch multi-core debug session with CMSIS-DAP/I-Jet

Select the CM0 project and click the **Download and debug** button.

IAR builds all projects, programs all the separate images, and launches a multi-core debug session. IAR opens a separate IDE instance for each project specified in the session file. For dual-core MCUs, it should look like to this:



The left side of the screen shows the IAR IDE instance attached to the CM0+ core. The right side shows the CM4 core not started yet. Once the `Cy_SysEnableCM4()` function is executed on the CM0+ core, the CM4 will start executing its application.

You can step through the code by switching back and forth between the two IAR IDE instances.

5.5 Launch multi-core debug session with J-Link

The IAR IDE does not have native support for the J-Link driver, which imposes some limitations:

- IAR will not automatically open separate IDE instances for each core, thus you need to do it manually.
- Some enhanced features are not available; see the Multi-core toolbar and CTI usage section for more details.

To launch multi-core debugging with J-Link:

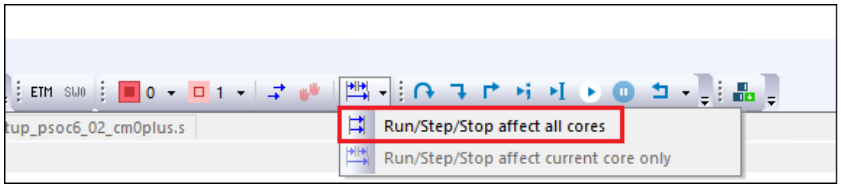
1. Open your multi-core IAR workspace in separate IDE instances (the number of IDE instances should be equal to the number of cores on your MCU).
2. Select the CM0+ project in the first IDE instance and click **Download and Debug**. The debugger will download all images, reset the target, and halt at the beginning of the CM0+ project's `main()`.
3. Switch to the other IDE instances and select: **Project > Attach to Running Target**.

5.6 Multi-core toolbar and CTI usage (I-Jet and CMSIS-DAP only)

When multi-core debugging is established through I-Jet or CMSIS-DAP drivers, a multi-core toolbar becomes available. It allows you to halt and resume all/single core(s) from within a single IDE instance.

Also, there is a feature called cross trigger interface (CTI). This allows you to immediately halt/resume one core when another core is halted/resumed. For example, this might be useful if you need to check what code is executing one of your cores when another hits a breakpoint. To use CTI, select the **Run/Step/Stop affect all cores** option available for multi-core applications:

5 Multi-core debugging



6 Patched flashloaders for AIROC™ CYW208xx and XMC7000 devices

To enable support for different QSPI settings, the ModusToolbox™ QSPI Configurator patches flashloader files and stores them in the application directory. When exporting such applications to IAR EWARM, these patched flashloader files must be copied into the appropriate directory.

Copy the *.*out* file located in the *<app-dir\bsps\<Kit-Name>\config\GeneratedSource* directory.

Paste the flashloader file to the *C:\Program Files\IAR Systems\Embedded Workbench 9.0\arm\config\flashloader\Infineon\CYW208XX* (or *XMC7000*) directory.

Revision history

Revision	Date	Description
**	2023-05-15	New document.
*A	2023-06-02	Removed obsolete instructions for customizing linker scripts.
*B	2024-01-24	Updated for ModusToolbox version 3.2. Updated recommended version. Removed Python. Added instructions for projects with C++ files. Added instructions for AIROC™ CYW20829 devices.
*C	2024-09-27	Updated for ModusToolbox version 3.3.

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