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Hello World in C for Bare-Metal Targets

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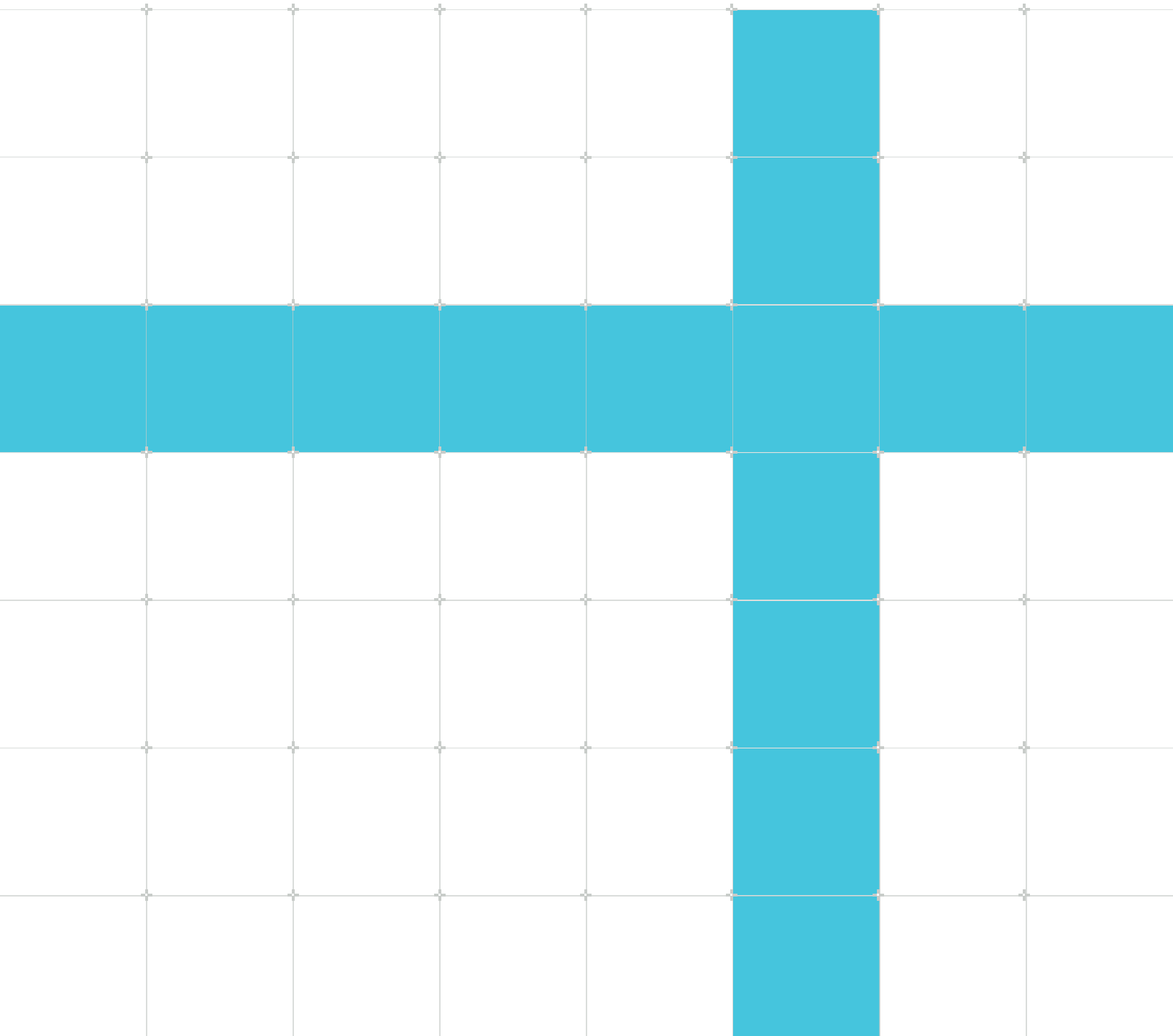

Hello World in C for Bare-Metal Targets

Release information

Document history

Issue	Date	Confidentiality	Change
0100-01	16 September 2022	Non-Confidential	Initial release

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Contents

1. Introduction

This tutorial takes you through creating, configuring, and building a simple bare-metal program using Arm DS-5. To run your application once it is built, the tutorial then takes you through the steps of configuring a debug connection to a system model implemented in software.

After installing and acquiring a license to work with DS-5, this tutorial takes you through creating, configuring, and building a simple bare-metal program.

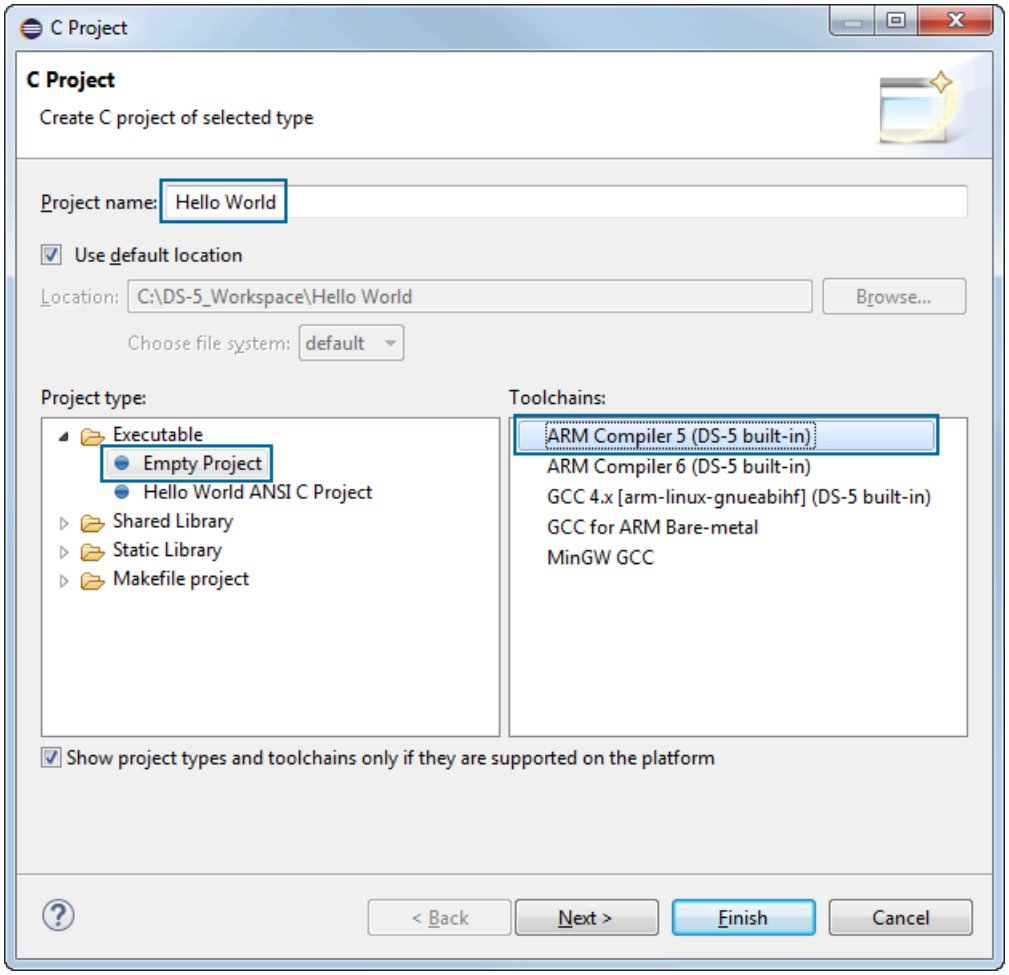
To run your application once it is built, the tutorial then takes you through the steps of configuring a debug connection to a system model implemented in software. These models are called Fixed Virtual Platforms (FVP) and some are provided with DS-5. This tutorial uses the `VE_Cortex_A9x1`FVP model which is based on the Cortex-A9 processor.

2. Creating a New C Project

The following steps help you create a new C Project.

1. From the DS-5 main menu, select File > New > C Project to display the C Project dialog.
2. In the C Project dialog:
   a. In Project name field, enter HelloWorld as the name of your project.
   b. Under Project type, select Executable > Empty Project. When selecting the Executable option, the toolchain assumes that the application is executed directly on the hardware instead of on top of a complex operating system such as Linux.
   c. Under Toolchains, select Arm Compiler 5.

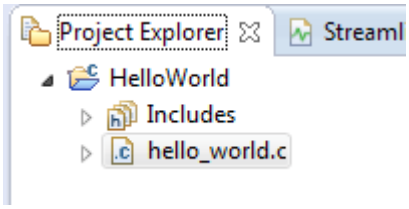
Figure 2-1: C project dialog options set v5211



Learn more about the Arm Compiler toolchain.

   d. Click Finish to create a C project called Hello World. You can view the project in the Project Explorer view.

Figure 2-2: HelloWorld File In Project Explorer



3. Specifying a RAM Base Address

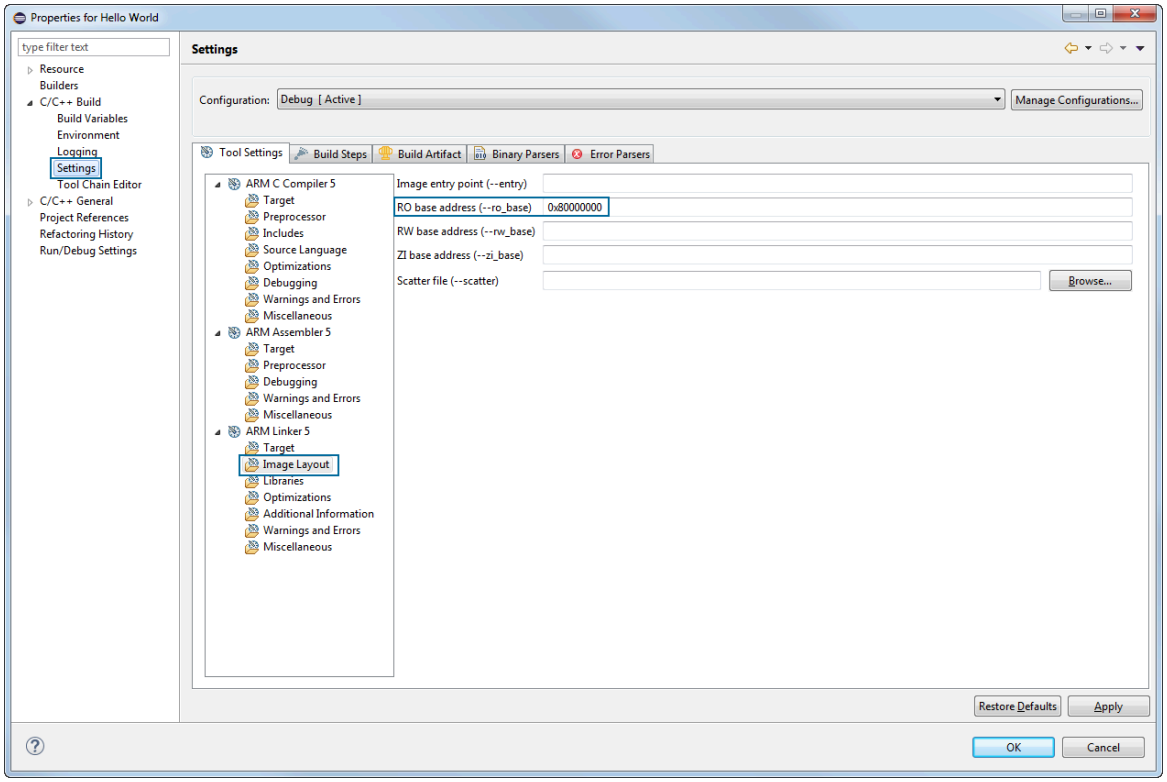
To load and execute the application on the target, before compiling the application, we need to tell the linker the target RAM base address. This ensures that the application is built correctly for the particular target.

The VE global model memory map contains the memory address details required for the VE FVP model used in this tutorial.

We can see that the memory address range for VE FVP models (4GB DRAM (in 32-bit address space)) is between `80000000` and `FFFFFFFF`. This gives us the RAM base address as `0x80000000`.

1. In Project Explorer, right-click the project and select Properties.
2. In the Properties dialog:
   a. Browse to C/C++ Build > Settings.
   b. Under the Tool Settings tab, browse to Arm Linker 5 > Image Layout.
   c. In the RO base address (–ro_base) field, enter `0x80000000`.

Figure 3-1: RO base address `0x80000000`



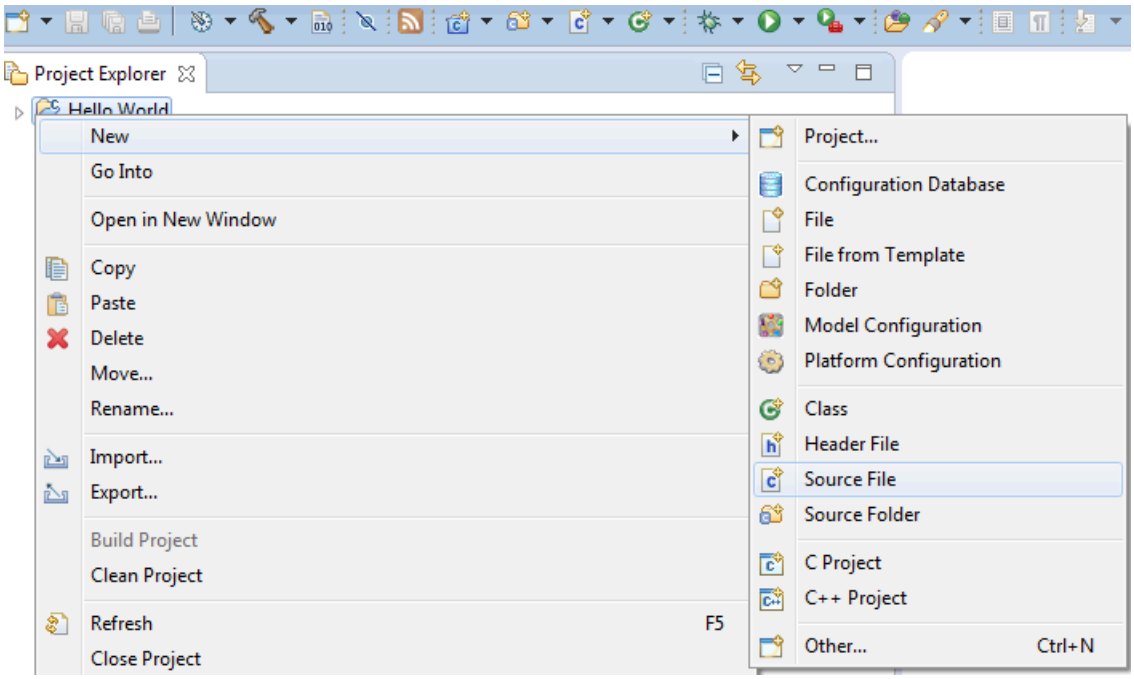
   d. Click OK to close the dialog and apply the changes.

4. Creating the Source Code and Building the Project

The following steps helps you create the source code and build the project:

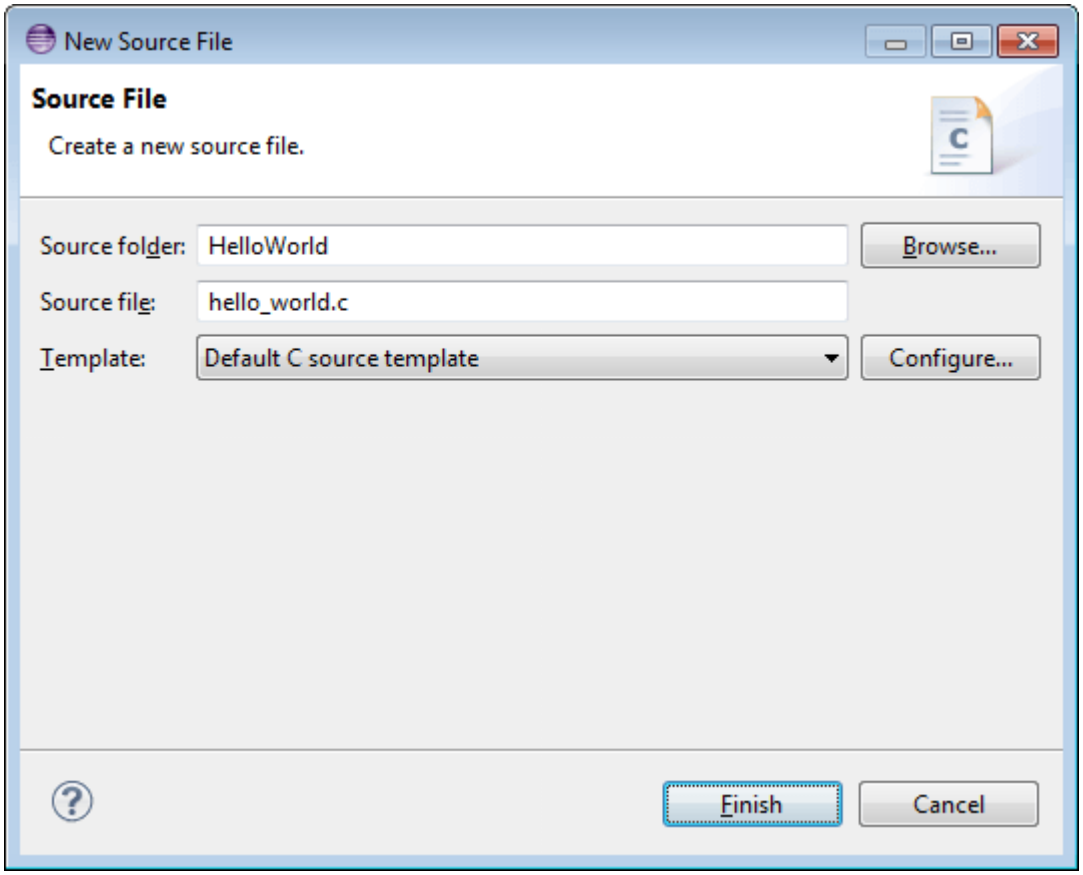
1. In the Project Explorer view, right-click the Hello World project and select New > Source File.

Figure 4-1: New Source File



2. In the New Source File dialog, enter the file name `hello_world.c`.

Figure 4-2: HelloWorld Enter FileName

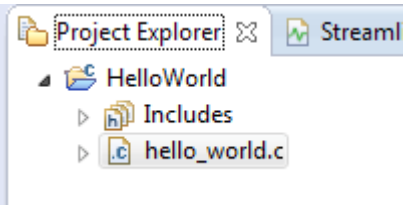


3. Click Finish to create the source file and open it in the code editing view.

Figure 4-3: Code Editing View

The source file is also visible in the Project Explorer view, under the Hello World project.

Figure 4-4: Hello World File In Project Explorer



4. Add the following code to the new source file, and press CTRL+S to save it.

```
#include <stdio.>

 int main() {
   printf("Hello World\n");
 }
```

1. In the Project Explorer view, right-click on the Hello World project and select Build Project.

You can view the output image `hello_world.axf` in the Debug folder under the HelloWorldproject.

The `.axf` file contains both the object code and debug symbols that enable the debugger to perform source-level debugging.