# EV-COG-AD4050LZ Board Support Pack Users Guide

EV-COG-AD4050LZ Board Support Pack Users Guide
Version 3.0.0, January 2018


http://www.analog.com

# Contents

# 1 Introduction

## 1.1 Purpose

This document describes the EV-COG-AD4050LZ Board Support Pack for CrossCore Embedded Studio® (CCES) and IAR Embedded Workbench for ARM. The EV-COG-AD4050LZ is an evaluation board that contains the ADuCM4050 low-power micro-controller, ADXL362 accelerometer and ADT7420 temperature sensor.

Please refer to the Release Notes published in CMSIS Packs for software and hardware requirements specific to these packs. In this document, any revision number mentioned should be considered as a specific example to illustrate a more general concept, idea or method.

## 1.2 Scope of this Manual

This document describes how to install and work with the Analog Devices EV-COG-AD4050LZ Board Support Pack. It explains how tu run example applications that accompany this package and how to create a project which uses this package.

This document is intended for users who want to write software for the ADuCM4050 processor targeting the EV-COG-AD4050LZ Evaluation Board. It assumes some familiarity with the ADuCM4050 and the C programming language.

## 1.3 Acronyms and Terms

| | |
|---|---|
| ADI | Analog Devices, Inc. |
| API | Application Programming Interface |
| BSP | Board Support Pack |
| CCES | CrossCore Embedded Studio |
| CMSIS | Cortex Microcontroller Software Interface Standard |
| DFP | Device Family Pack |
| HRM | Hardware Reference Manual |
| NoOS | No Operation System |
| RTE | Run-Time Environment |
| SoC | System on a Chip |

## 1.4 Conventions

Throughout this document, we refer to important installation locations. These locations are define here.

- **`<dfp_version>`**
  - The version of the ADuCM4x50 Device Family Pack, e.g. 3.0.0.
- **`<bsp_version>`**
  - The version of the EV-COG-AD4050LZ Board Support Pack, e.g. 3.0.0.

- **<cces_root>**
  - The default CrossCore Embedded Studio installer places the the product at location **C:/Analog Devices/CrossCore Embedded Studio x.y.z**, with **x.y.z** the version number of CrossCore Embedded Studio. Note that this location may vary depending on users' preferences.
  - Analog Devices software packs are installed by default at location **<cces_root>/ARM/PACKS/AnalogDevices**.
- <cces_dfp_root>
  - The directory **<cces_root>/ARM/PACKS/AnalogDevices/ADuCM4x50_DFP/<dfp_version>**.
    The content of a specific Analog Devices ADuCM4x50 Device Family Pack, version **<dfp_version>**, is installed at this location by CrossCore Embedded Studio.
- <cces_bsp_root>
  - The directory **<cces_root>/ARM/PACKS/AnalogDevices/EV-COG-AD4050LZ_BSP/<bsp_version>**.
    The content of a specific Analog Devices EV-COG-AD4050LZ Board Support Pack, version **<bsp_version>**, is installed at this location by CrossCore Embedded Studio.
- <cces_user_space>
  - The directory **C:/Users/<user_name>/cces/x.y.z**, with **x.y.z** the version number of CrossCore Embedded Studio.
    In this path, **C:/Users/<user_name>** is the user's home directory.
- <iar_packrepo>
  - The directory **C:/Users/<user_name>/AppData/Roaming/IAR Embedded Workbench**, where IAR Embedded Workbench installs CMSIS Packs.
    In this path, **C:/Users/<user_name>** is the user's home directory.
- <iar_dfp_root>
  - The directory **<iar_packrepo>/AnalogDevices/ADuCM4x50_DFP/<dfp_version>**.
  - The content of a specific Analog Devices ADuCM4x50 Device Family Pack, version **<dfp_version>**, is installed at this location by IAR Embedded Workbench.

- `<iar_bsp_root>`
  - The directory **`<iar_packrepo>/AnalogDevices/EV-COG-AD4050LZ_BSP/<bsp_version>`**.
    The content of a specific Analog Devices EV-COG-AD4050LZ Board Support Pack, version **`<bsp_version>`**, is installed at this location by IAR Embedded Workbench.
- `<ARM_CMSIS_version>`
  - the version of the ARM CMSIS Pack, e.g. 5.0.1.
- `<cces_ARM_CMSIS_root>`
  - The directory **`<cces_root>/ARM/PACKS/ARM/CMSIS/<ARM_CMSIS_version>`**.
    ARM CMSIS Pack content is installed at this location.

## 1.5 References

1. CrossCore Embedded Studio [http://www.analog.com]
2. IAR Embedded Workbench [http://www.iar.com]
3. ARM CMSIS Pack [http://www.keil.com/cmsis/pack]

## 1.6 Additional Information

For more information on the latest ADI Processors, silicon errata, code examples, development tools, system services and devices drivers, technical support and any other additional information, please visit our website at www.analog.com/processors.

# 2 Product Overview

The EV-COG-AD4050LZ Board Support Package provides the drivers for off-chip peripherals which are on the EV-COG-AD4050LZ Evaluation Board and examples for peripherals on the ADuCM4050 processor. The drivers and examples in a EV-COG-AD4050LZ Board Support Package are designed to work with the ADuCM4x50 Device Family Pack and

- CrossCore Embedded Studio
- IAR Embedded Workbench for ARM

Please, refer to the Release Notes in a specific EV-COG-AD4050LZ Board Support Package version for the products versions required.

# 3 Installation Components

Before installing the EV-COG-AD4050LZ Board Support Package, the following products should be installed:

- CrossCore Embedded Studio
- ADuCM4x50 Device Family Pack

This software is released in the form of a CMSIS Pack file. CrossCore Embedded Studio and IAR Embedded Workbench will extract the contents of the Pack file into CMSIS Pack directories specific to their environment and specific to the packs. This allows for a clean partitioning of software delivered by ADI and software created by users.

## 3.1 CrossCore Embedded Studio CMSIS Pack Installation

CrossCore Embedded Studio places the EV-COG-AD4050LZ Board Support Package contents (device drivers, examples, documentation, etc.) in the `<cces_bsp_root>` directory.

Figure 1 shows the contents that will be placed at this location after the installation has completed.

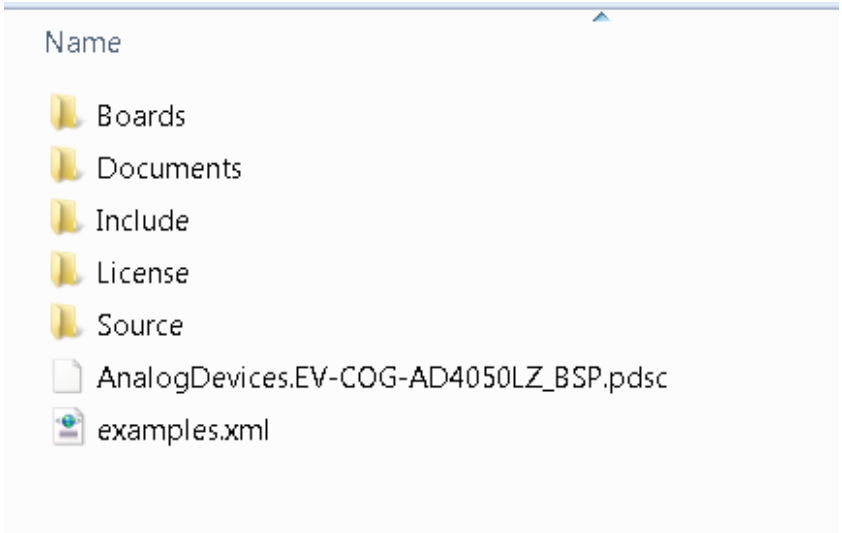


**Figure 1. Installation Directory Structure**

### 3.1.1 Installing a CMSIS Pack with CrossCore Embedded Studio

To install a new EV-COG-AD4050LZ Board Support Package, or update an existing EV-COG-AD4050LZ Board Support Package, go to CMSIS Pack Manager perspective, shown in Figure 2. If the Pack Manager perspective was not opened previously, the CMSIS Pack Manager icon may not be present on the toolbar as shown below. In that case, the Pack Manager perspective can be

opened by clicking *Window Perspective Open Perspective Other Pack Manager*. There are two methods that can used to install the EV-COG-AD4050LZ Board Support Package; these methods are described below.

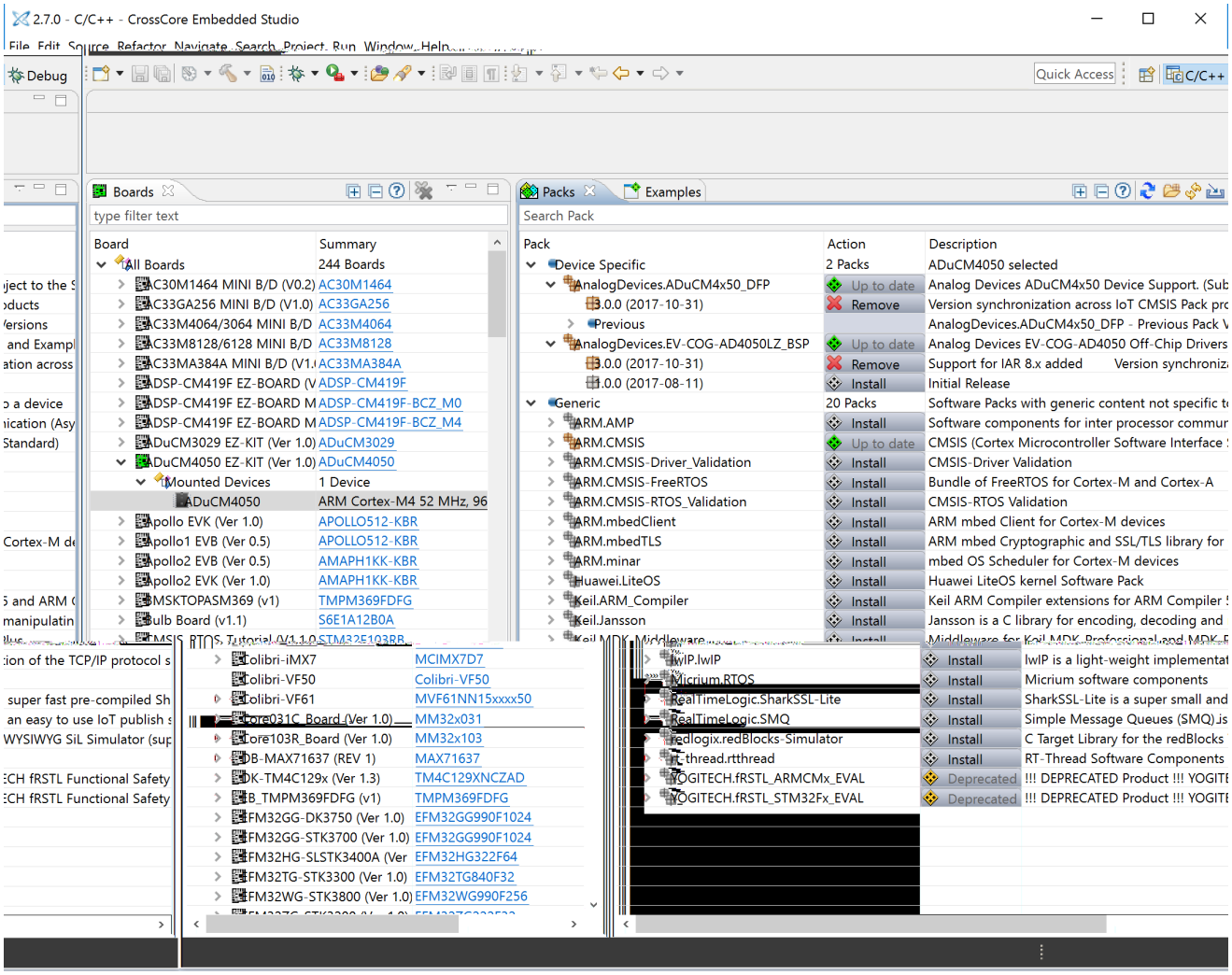


**Figure 2. CMSIS Pack Manager Perspective**

## Web Installation

The CMSIS Pack can be installed directly from the web using CrossCore Embedded Studio; the user does not need to download the file and open it with CrossCore Embedded Studio. This can be done by first refreshing the CMSIS Pack Manager (the blue arrows in the top left of the *Pack* tab). This will display a list of available Pack files as shown in Figure 3. Clicking on the "ADuCM4x50 Series" will show the EV-COG-AD4050LZ Board Support Package in the *Pack* tab as "AnalogDevices.EV-COG-AD4050LZ_BSP". Click "Install" and accept the license agreement in order to install the EV-COG-AD4050LZ Board Support Package.

A specific version of a CMSIS pack or different versions of a CMSIS Pack can be installed.

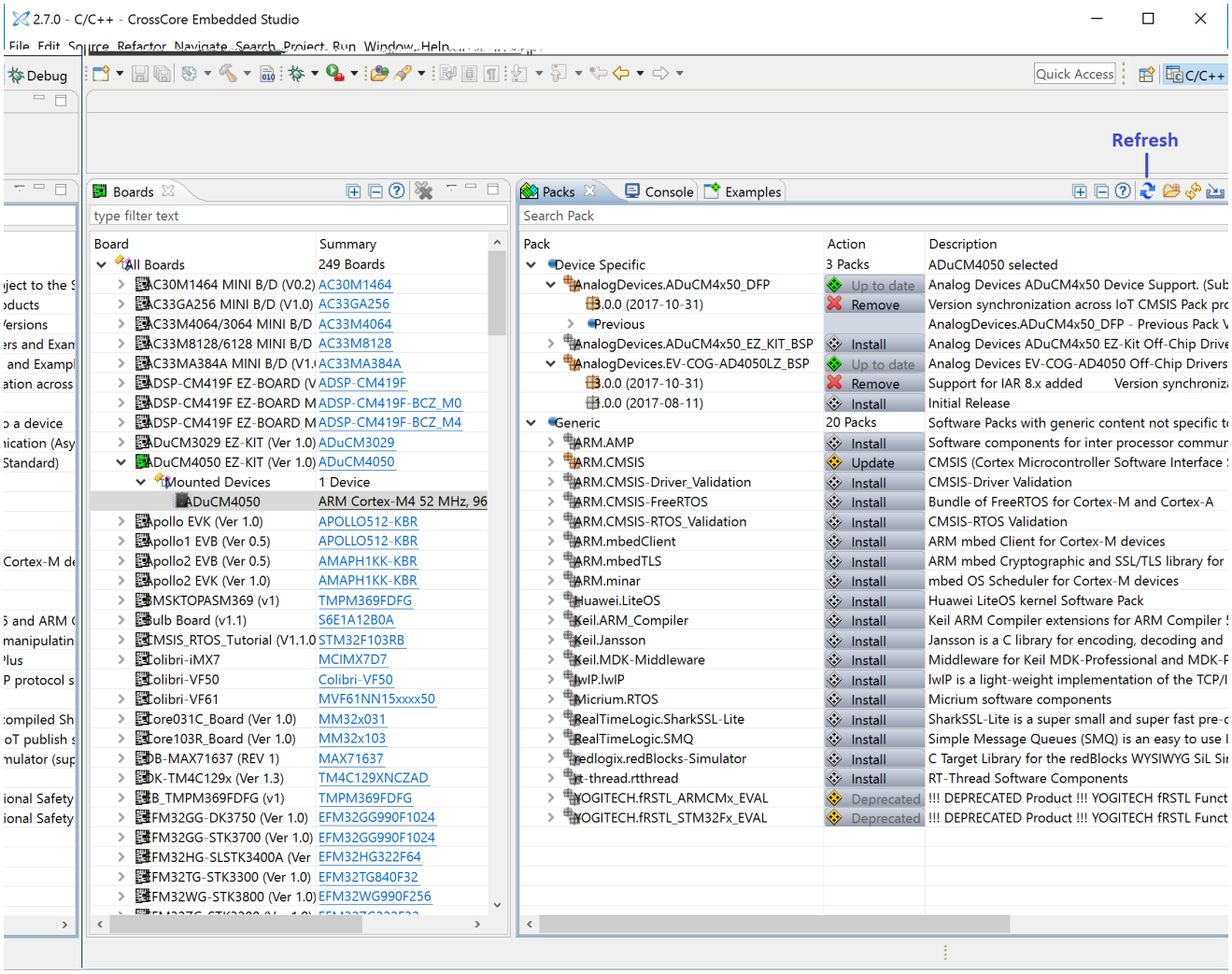


**Figure 3. Available Pack Files**

### Local Installation

If the user has already obtained a CMSIS Pack file, it can be installed without using the method described above. Click "Import Existing Packs" (the folder icon in the *Pack* tab) and then browse to the Pack file.

## 3.2 IAR Embedded Workbench CMSIS Pack Installation

IAR Embedded Workbench places the EV-COG-AD4050LZ Board Support Package contents (device drivers, examples, documentation, etc.) in the `<iar_bsp_root>` directory.

### 3.2.1 Installing a CMSIS Pack with IAR Embedded Workbench

To install a new EV-COG-AD4050LZ Board Support Package, or update an existing EV-COG-AD4050LZ Board Support Package, select *Project CMSIS Pack Pack Installer* (fig. 4). There are two methods that can used to install the EV-COG-AD4050LZ Board Support Package; these methods are described below.

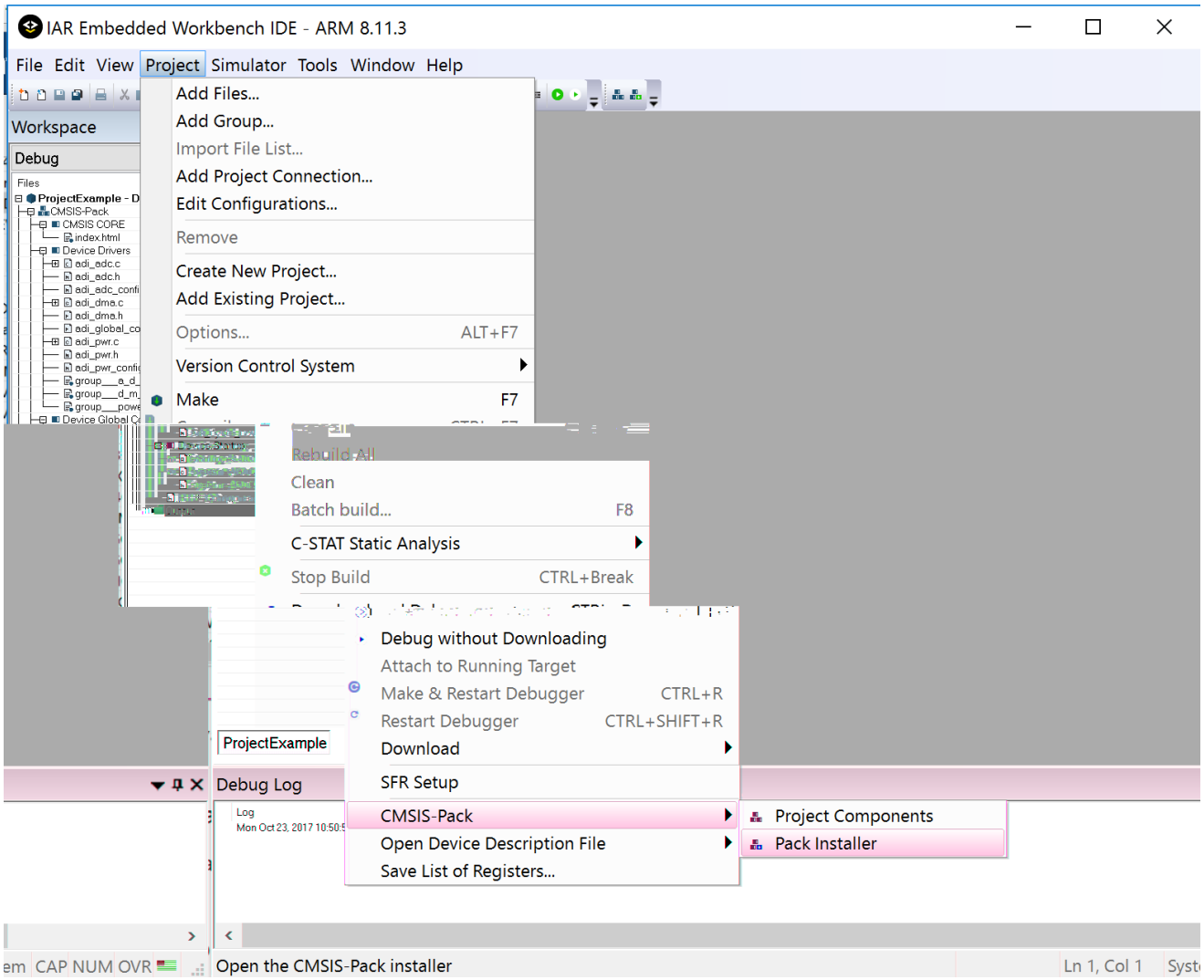


**Figure 4. Open the CMSIS-Pack Installer with IAR Embedded Workbench**

#### Web Installation

When installing CMSIS Packs from the Web, click "Search for updates" to update the list of CMSIS Pack published and available (fig. 5).

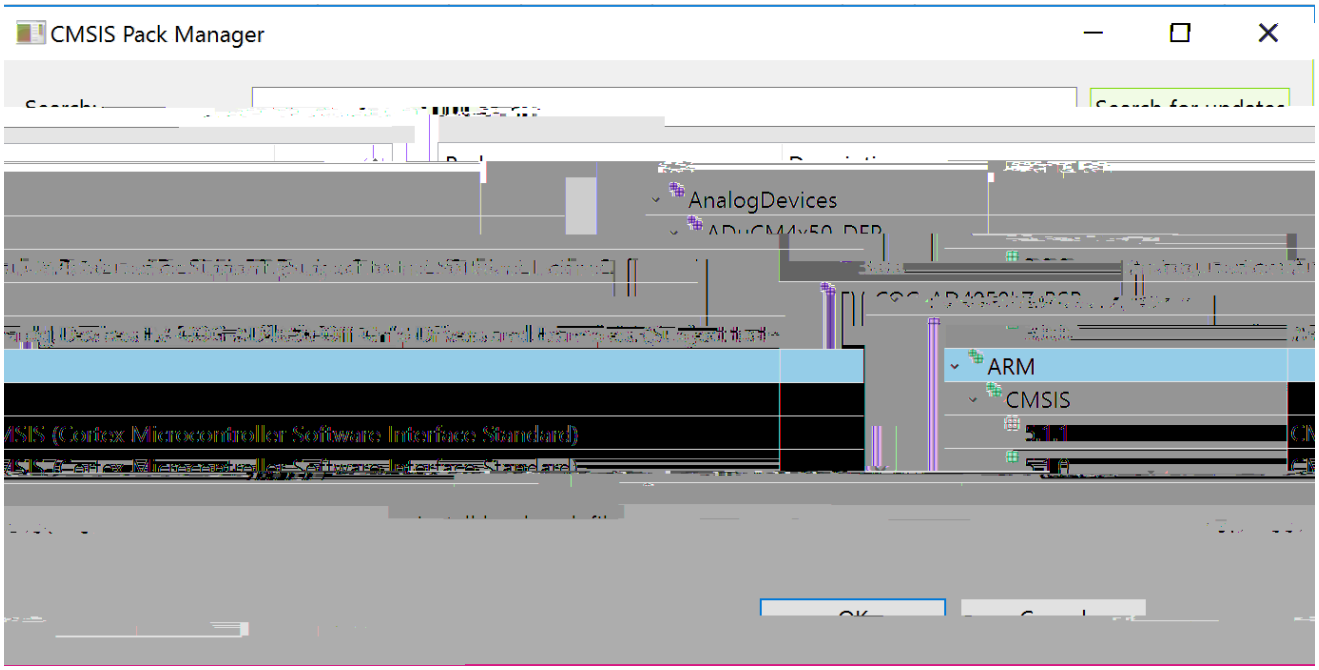


**Figure 5. Search for CMSIS Packs Updates**

Select the version of the CMSIS Pack that must be installed, and with the right click button, select "Install" (fig. 6)

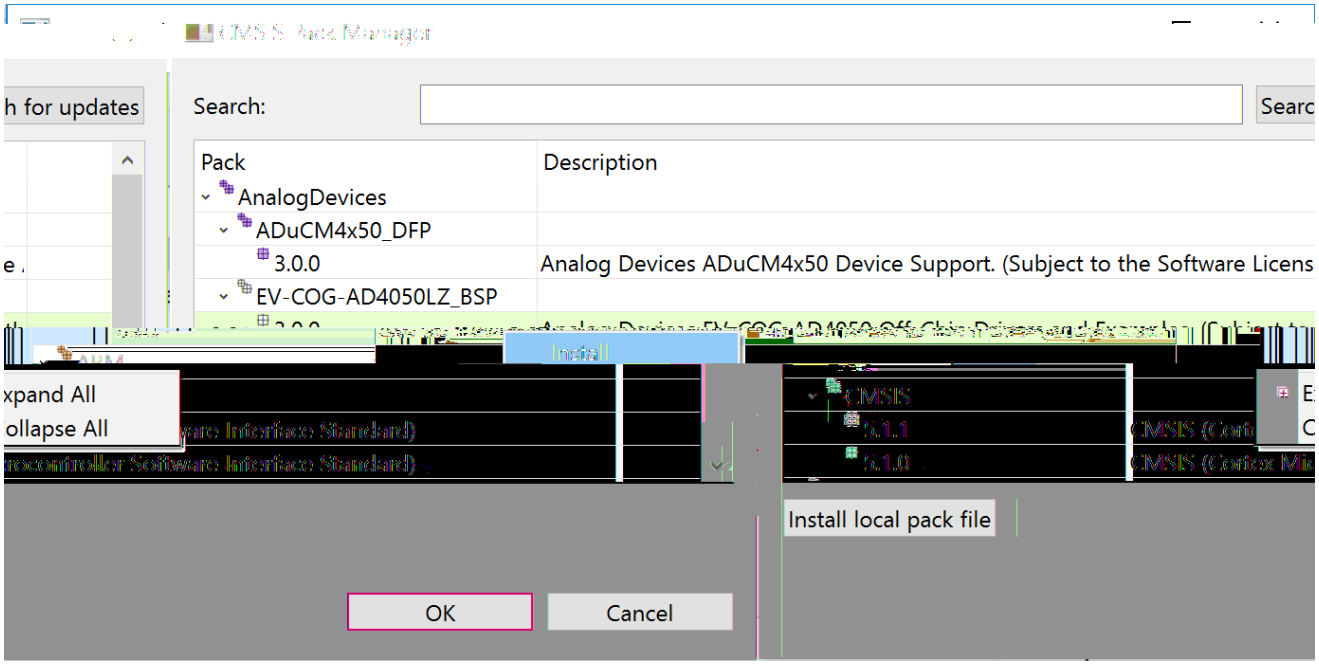


**Figure 6. Install a CMSIS Pack from the Web**

## Local Installation

When installing CMSIS Packs from locally downloaded CMSIS Packs, click "Install local pack file" (fig. 6).

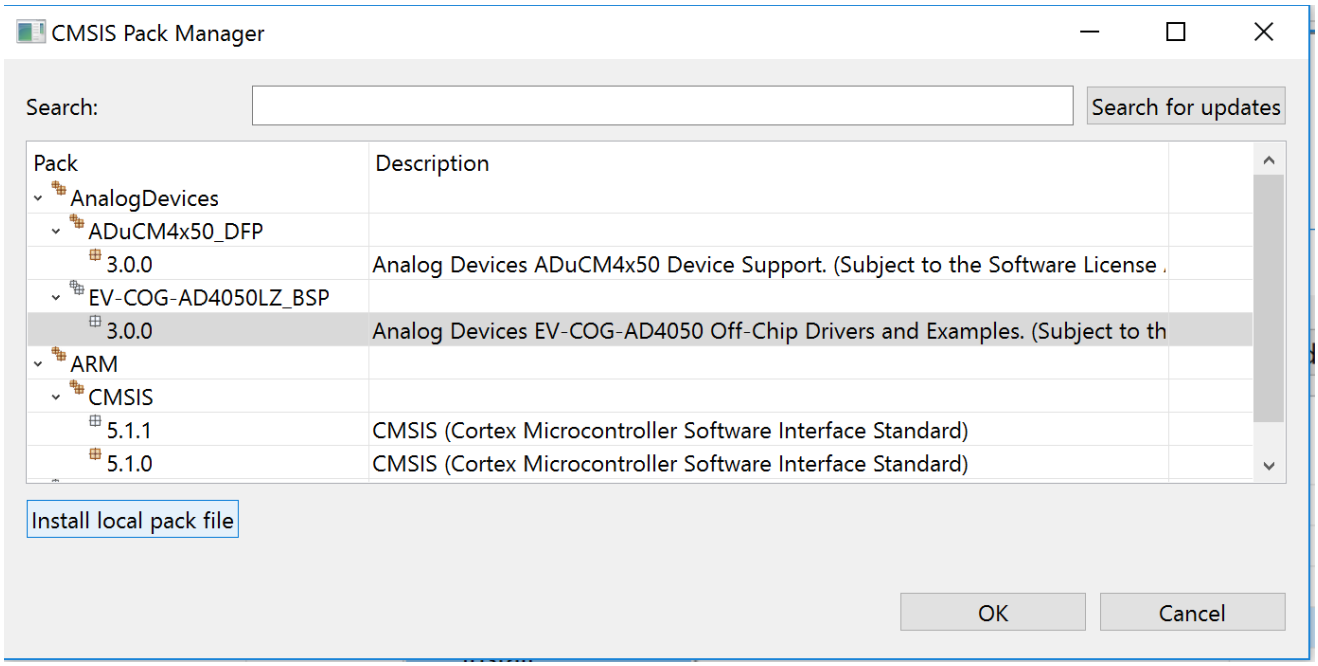


**Figure 7. Click "Install a local pack file"**

A window pops up to select the CMSIS Pack file to be installed; select the file and click "Open" (fig. 8)

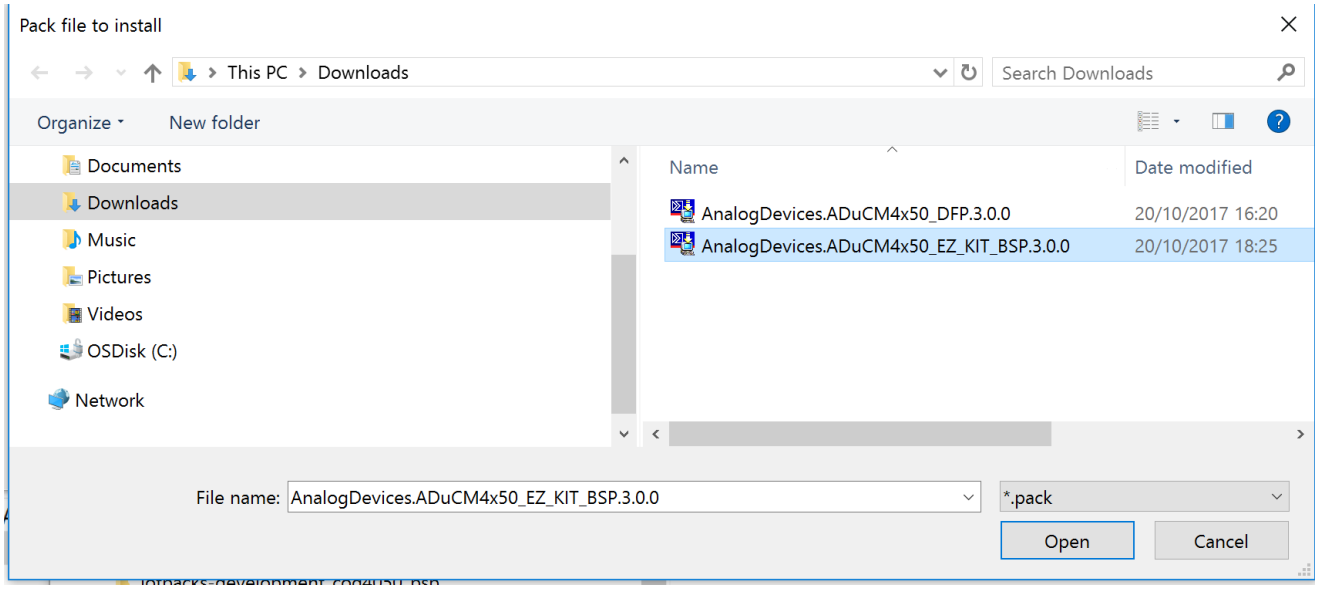


**Figure 8. Select a local pack file and click "Open"**

The color of the CMSIS Pack version installed changes from white (fig. 7) to yellow (fig. 9): the CMSIS Pack is installed and ready to be used.

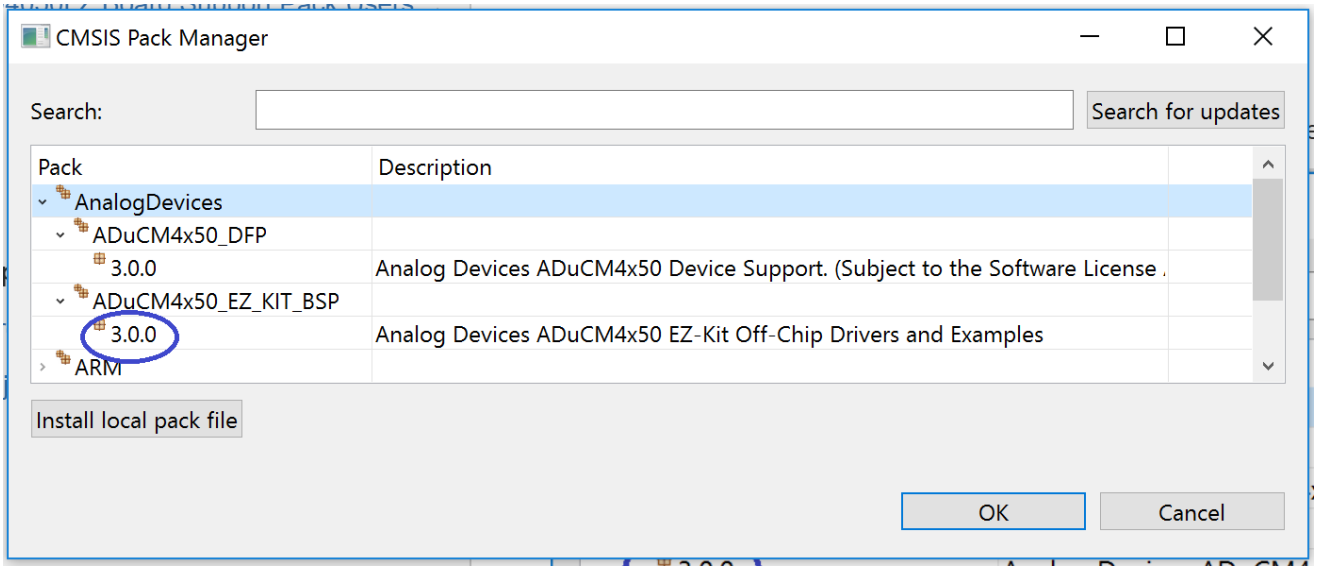


**Figure 9. CMSIS Pack installed**

# 4 Using Example Projects

The recommended way of getting familiar with the software in the EV-COG-AD4050LZ Board Support Pack is by using example projects. Example projects show the user how to use the on-chip drivers in the ADuCM4x50 Device Family Pack, the off-chip drivers in the EV-COG-AD4050LZ Board Support Pack, and how to configure the CrossCore Embedded Studio or IAR Embedded Workbench for ARM environments to build and run applications on the EV-COG-AD4050LZ Evaluation Board.

To open and/or run examples, they should be copied to a work-space (i.e. a location on the user's machine that is different than the installation). This allows users to alter the sources if needed and keep the original sources safe. The next section will explain how to do this in CrossCore Embedded Studio and IAR Embedded Workbench for ARM.

## 4.1 CrossCore Embedded Studio Example Browser

The CrossCore Embedded Studio "Example Browser" allows the user to easily survey the example projects delivered in a CMSIS Pack. *Help Browse Examples* opens the Example Browser (fig. 10).

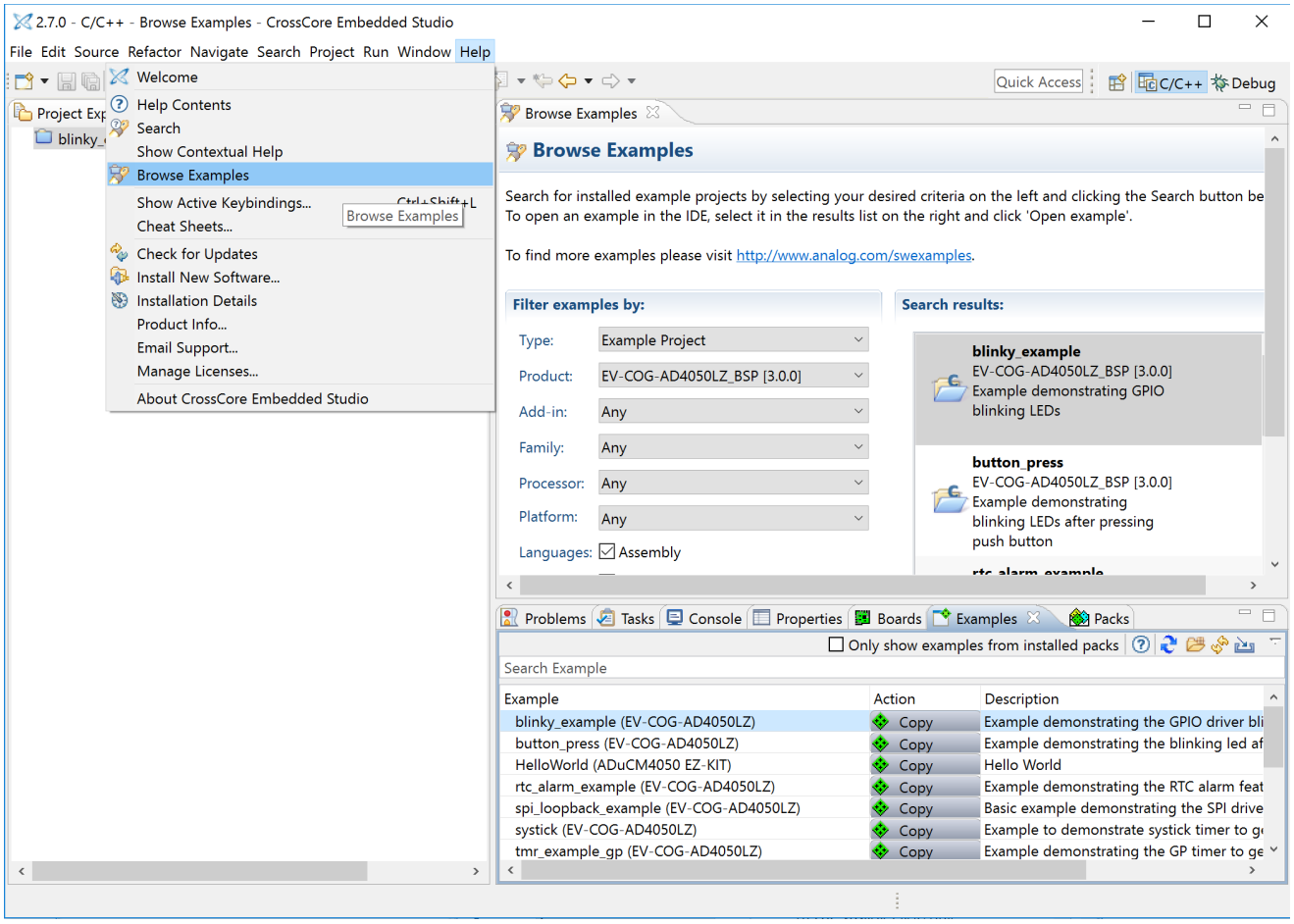

**Figure 10. Opening Example Browser**

Next, choose "Example Project" as "Type" and "EV-COG-AD4050LZ_BSP[3.0.0]" as "Product". Select an example and then click "Open example" (fig. 11).

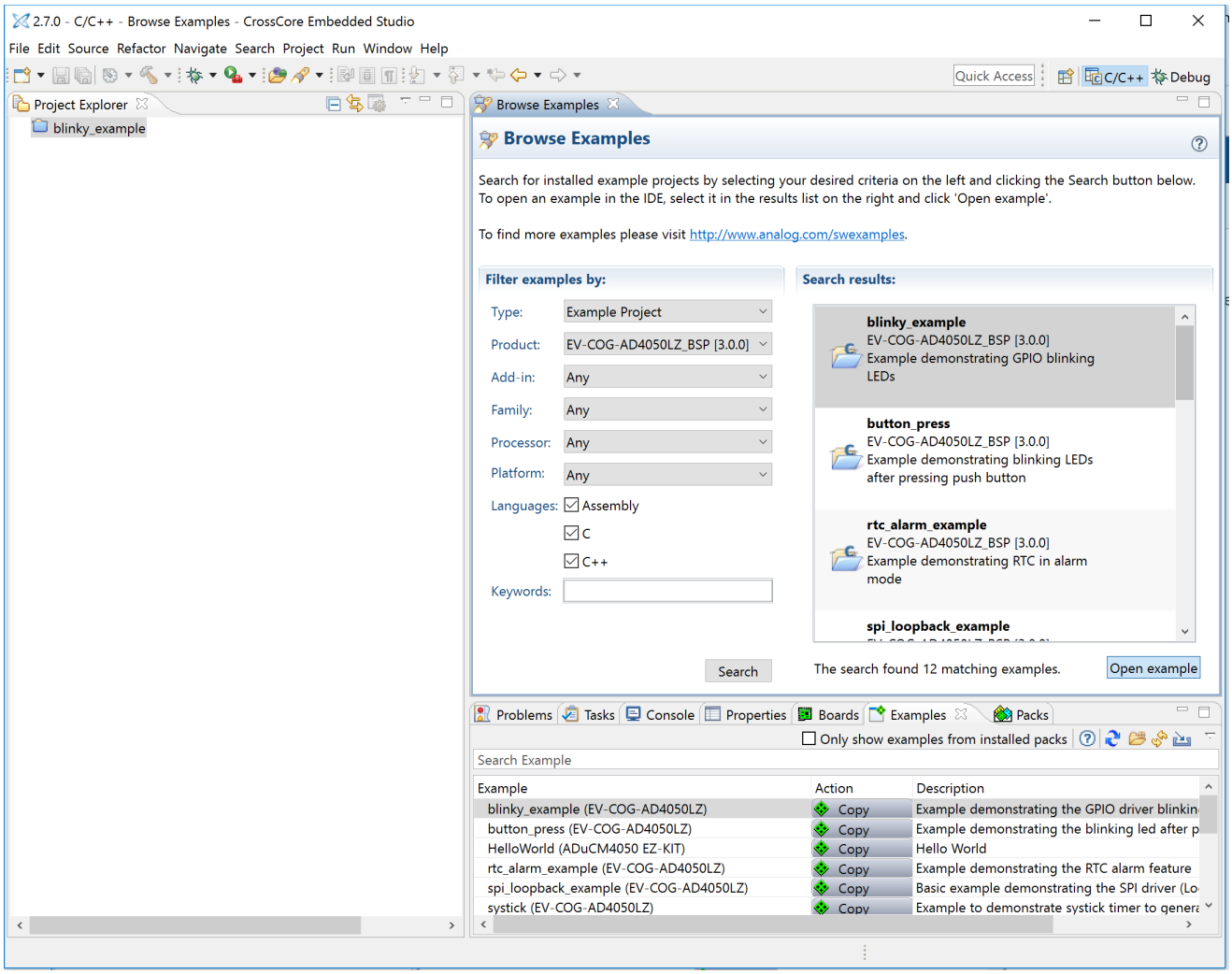


**Figure 11. Using Example Browser**

This will copy the example project to your CCES workspace. This is generally located in `<cces_user_space>` but may vary depending on the system. The example project will be added to the "Project Explorer" window in CCES and the user can build and run the project. Note that only the top-level application C and header files will be copied into the user's workspace, along with any static configuration header files. The peripheral drivers are not copied and remain in the CCES installation.

## 4.2 IAR Embedded Workbench Example Browser

To browse and select examples with IAR Embedded Workbench, Click on *Project Create New Project* (fig. 12).

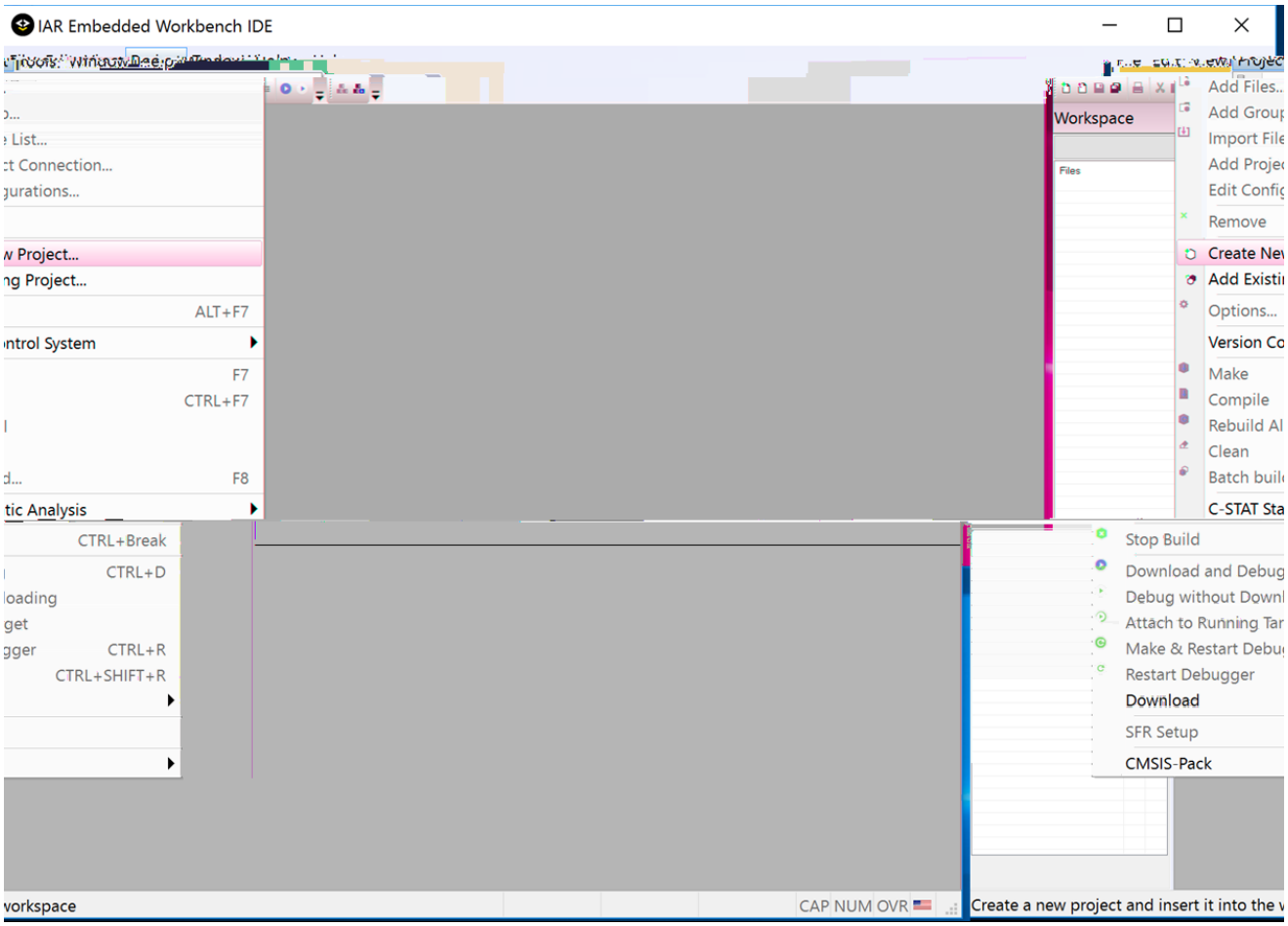


**Figure 12. Create an IAR Embedded Workbench project.**

Then select CMSIS Pack Examples and click "OK" (fig. 13).

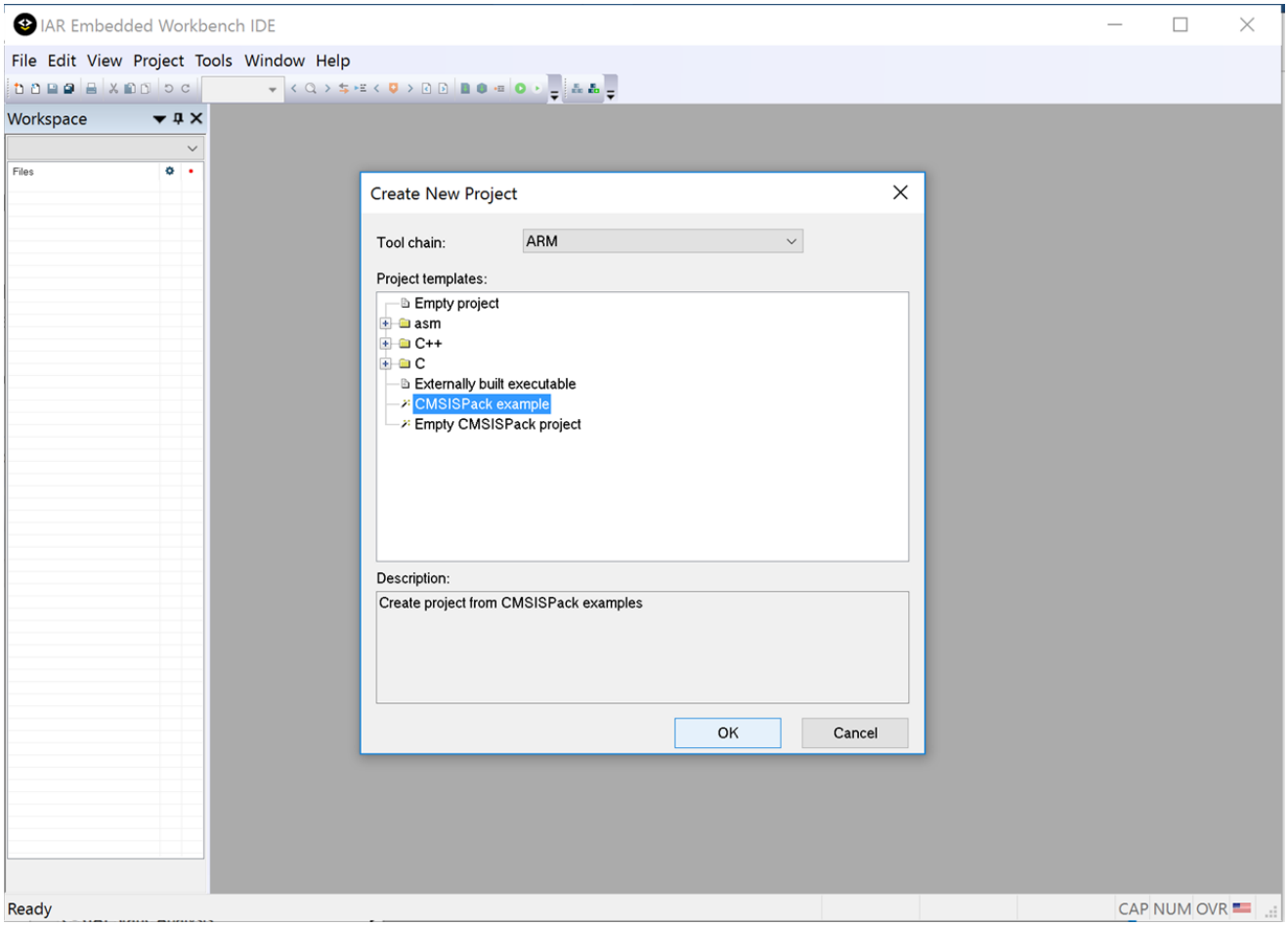


**Figure 13. Set the New Project as a CMSIS Pack Example**

Next, select *Analog Devices ADuCM4x50 Series ADuCM4050* and click "Next" (fig. 14).

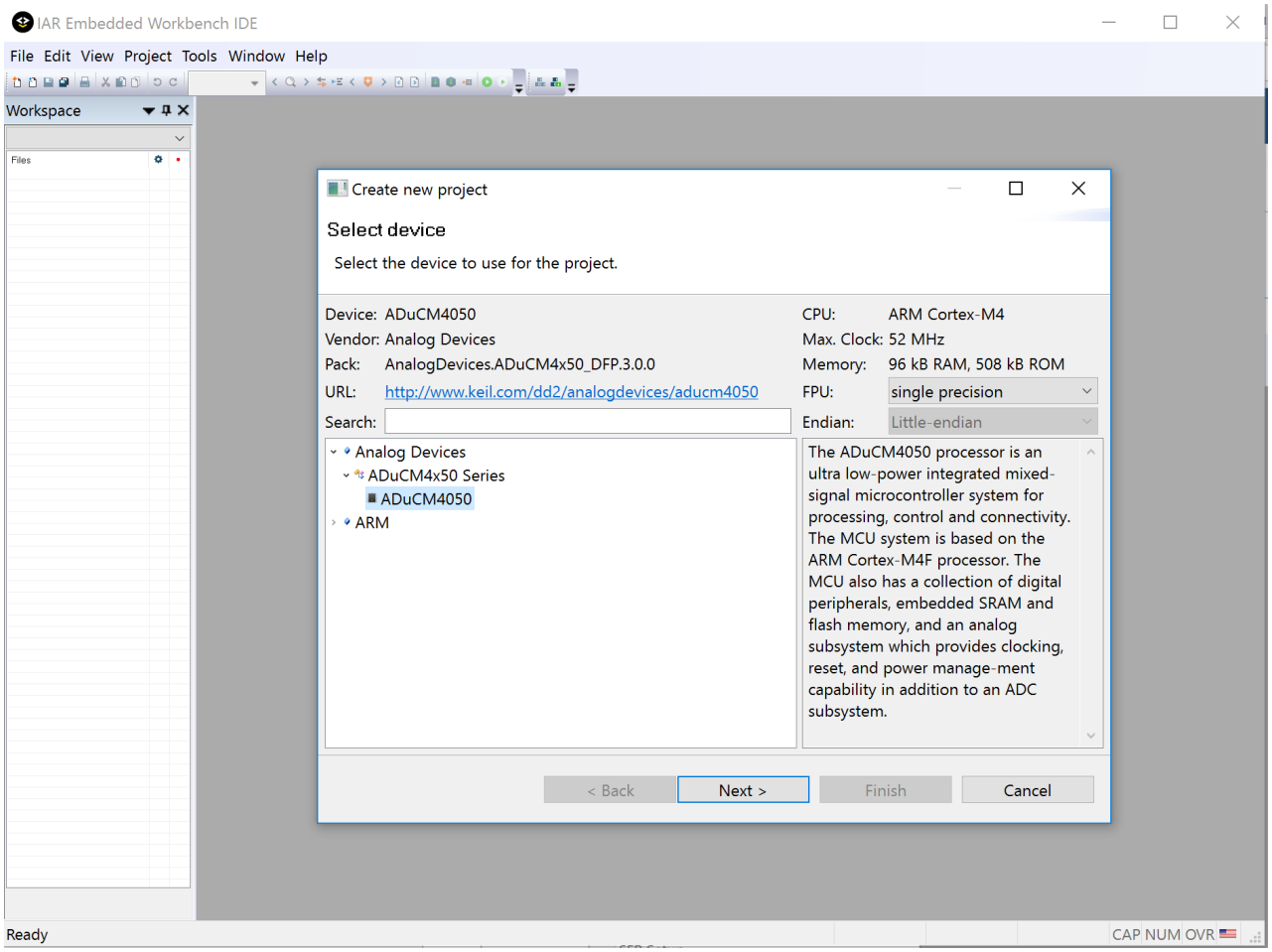


**Figure 14. Select the Processor**

Finally, select the example you want to use, e.g. blinky_example: a description appears, then click "Finish" (fig. 15).

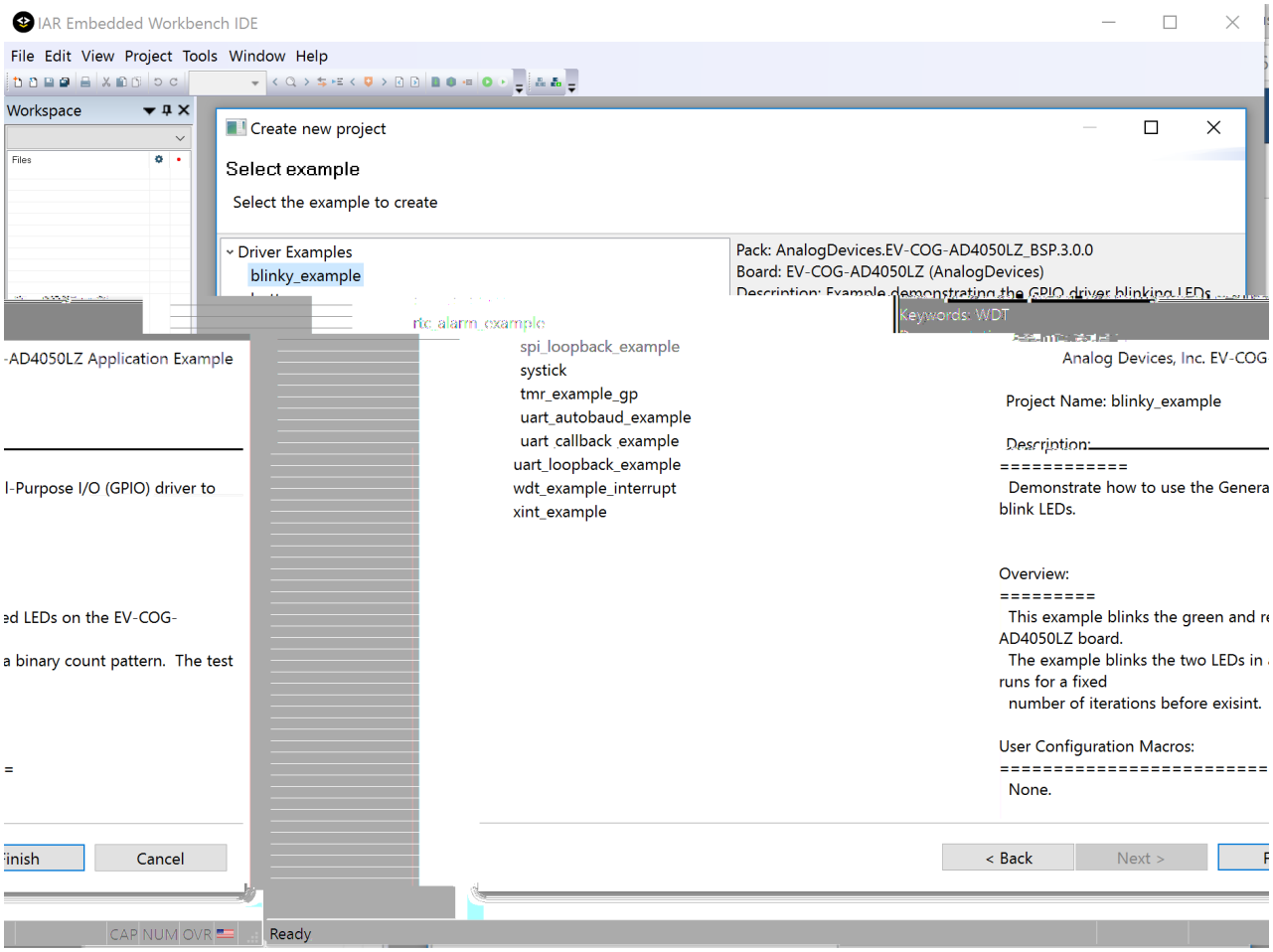


**Figure 15. Select the Example**

## 4.3 Example Readme Files

Each example contains a readme file explaining the operation of the example the expected outcome. The file is located in the CrossCore Embedded Studio and IAR Embedded Workbench project explorers. Please see this file for details about each example project.

# 5 Creating New Projects

New projects that use the on-chip drivers delivered in the ADuCM4x50 Device Family Pack and the off-chip drivers delivered in the EV-COG-AD4050LZ Board Support Pack can easily be created.

## 5.1 CrossCore Embedded Studio Project Creation

To create a new project for the EV-COG-AD4050LZ Evaluation Board with CCES, select *File New CrossCore Project* and then provide a name for the project. In the "Processor Type" dialog, select the ADuCM4050 and choose a silicon revision (choose "any" if it does not matter). In the "Project configuration" window, select any Add-ins or template code you may want for your new project and then click "Finish".

### 5.1.1 Run-Time Environment Configuration

The new project will be added to the "Project Explorer". The software to interface with the on and off-chip peripherals on the EV-COG-AD4050LZ Evaluation Board are organized as "components" in the Run-Time Environment. Within the context of this product, a component contains one or more source files, and can also contain a static configuration header file. To add components to the Run-Time Environment for your new project, open the *system.rteconfig* file in the "Project Explorer". The on-chip drivers for the ADuCM4x50 are located in the "Device" class. Click these components to add them to the project. Components will have dependencies on other components. (Fig. 16)

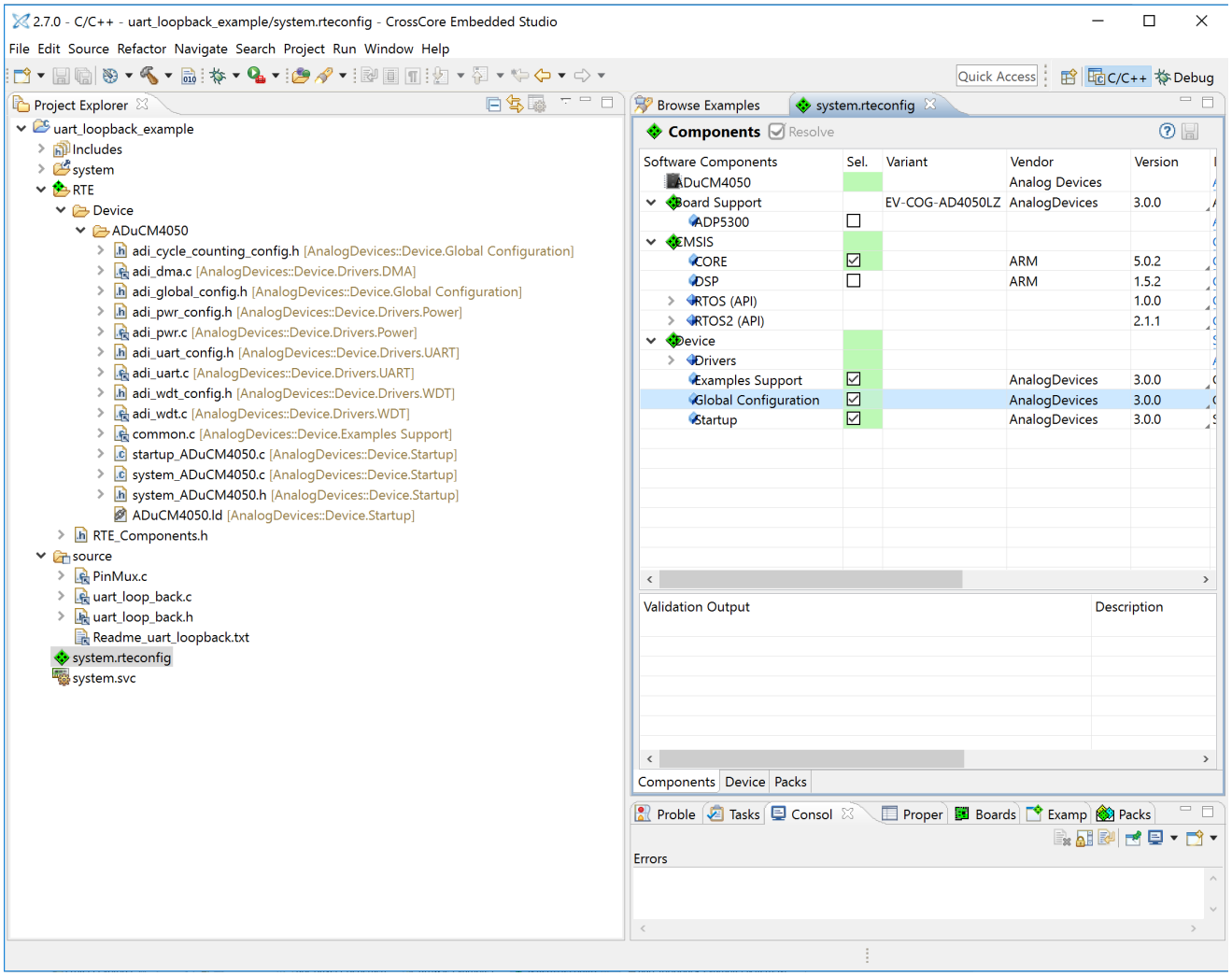


**Figure 16. RTE Configuration**

If these dependencies are not met, the needed component will be highlighted in yellow, with indications in the *Validation Output* window (fig. 17). Note that the most minimal project will *Device Startup, Device Global* Configuration, and *CMSIS Core.*The components in the "Board Support" class will be explained in greater detail in the next section. For more information about the components in the "Device" class, please see the ADuCM4x50 Device Family Pack.

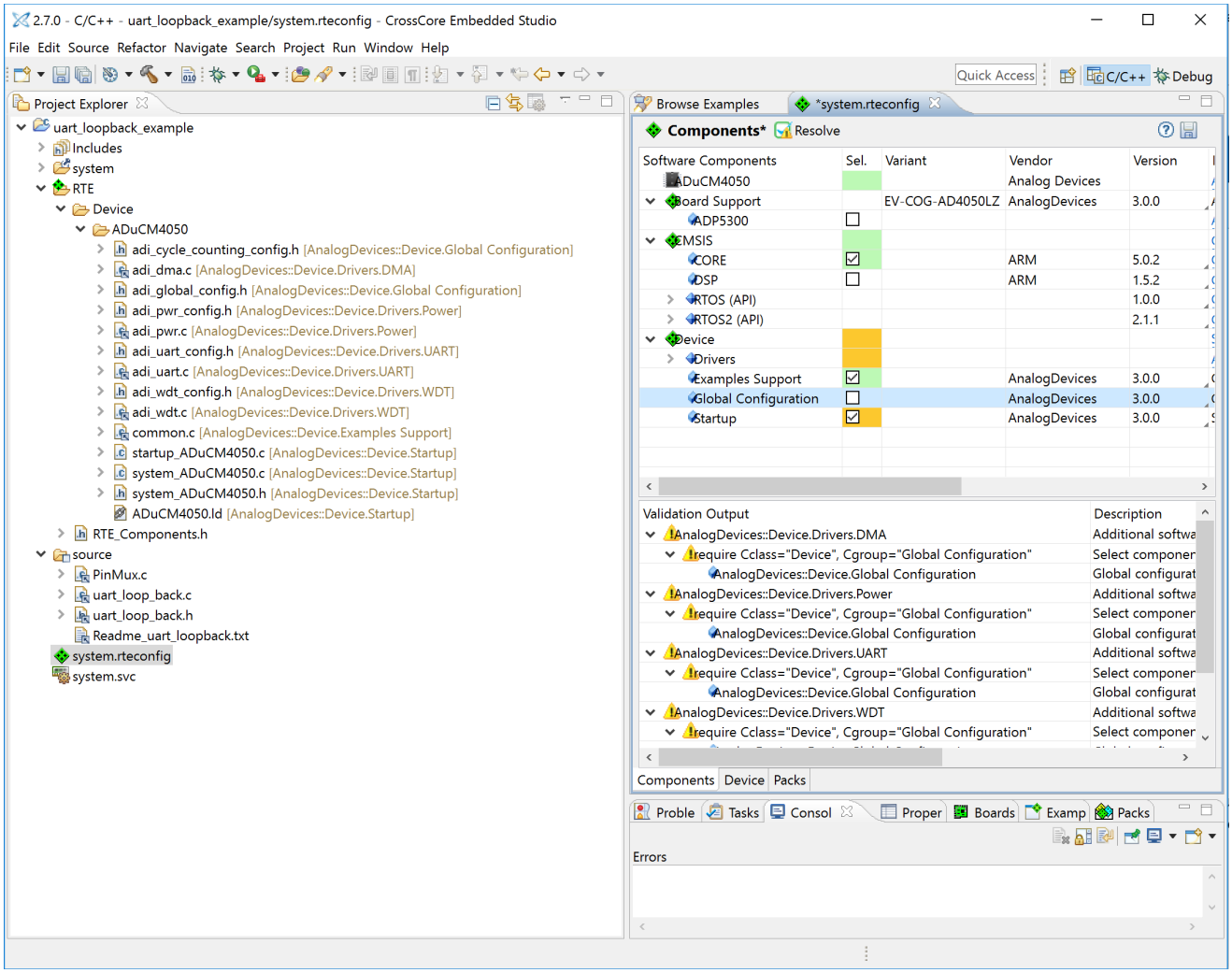


**Figure 17. RTE dependencies not met**

## 5.1.2 Debug Configuration

The user will need to create a debug configuration from scratch. Go to *Run Debug Configurations* to create a configuration. Click "Emulator" and then click the "New" (small white page icon in top left corner). Configure the settings to match figure 18.

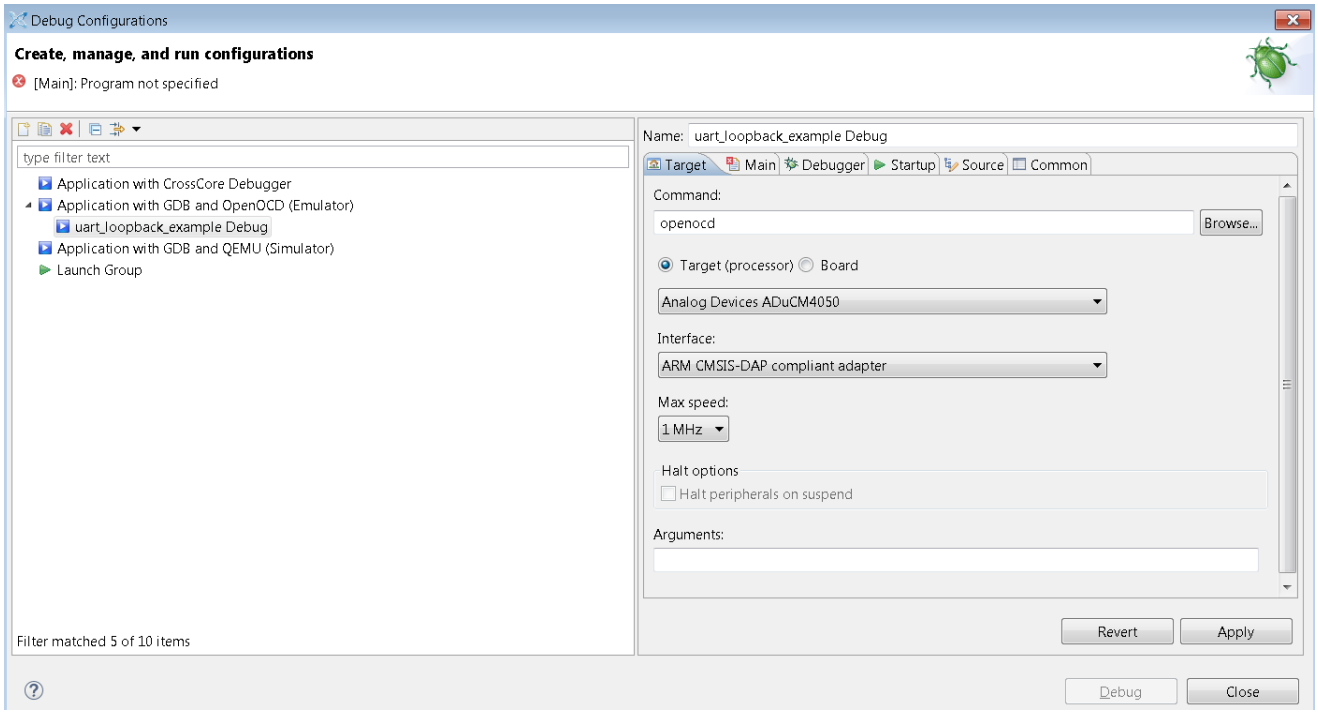


**Figure 18. EV-COG-AD4050LZ Debug Configuration**

## 5.2 IAR Embedded Workbench Project Creation

To create a new project in IAR Embedded Workbench, targeting the EV-COG-AD4050LZ Evaluation Board, select *Project Create New Project* (fig. 19).

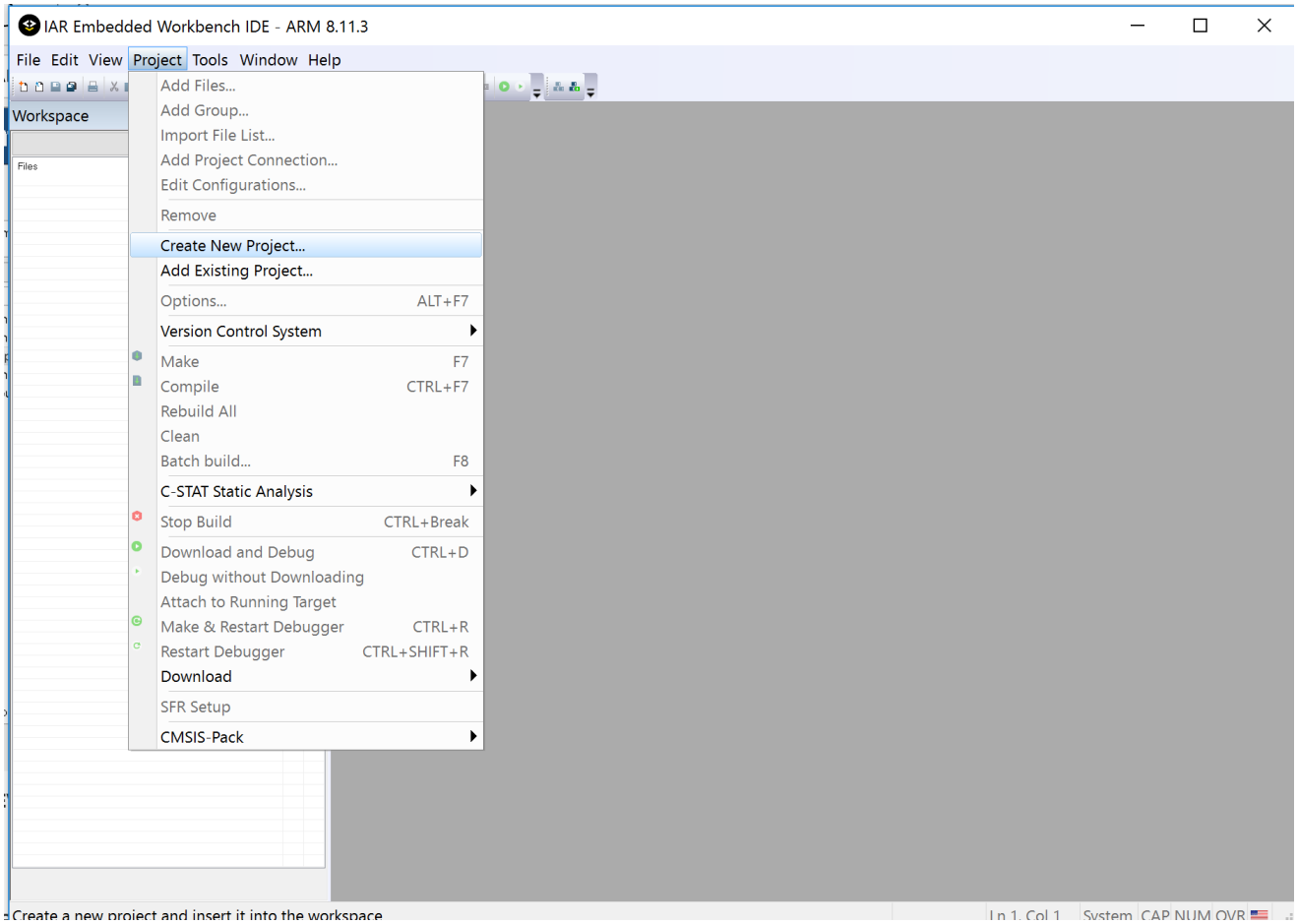


**Figure 19. Create a new project with IAR Embedded Workbench**

Then select *Empty CMSIS Pack Project* and click "OK" (fig. 20).

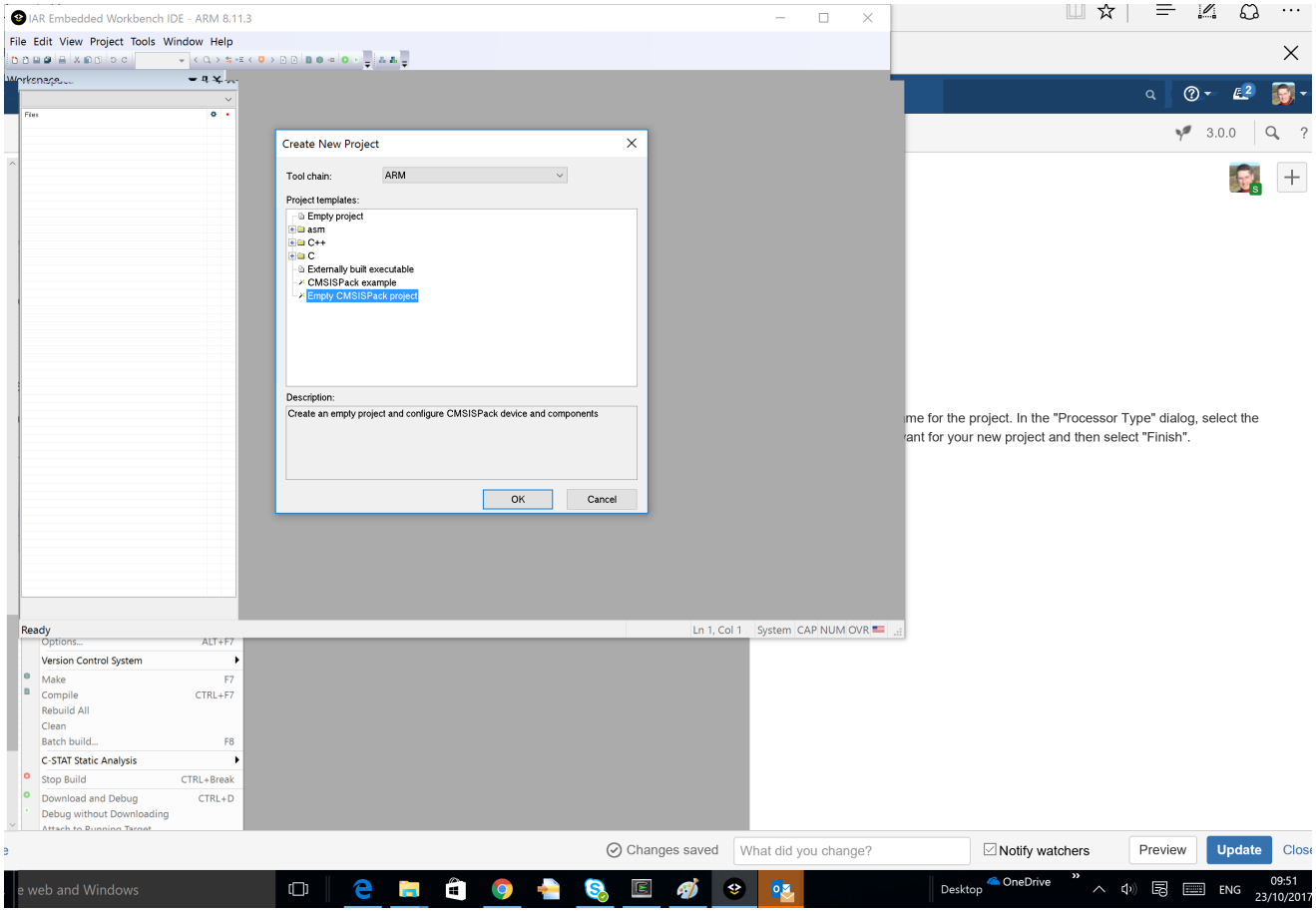


**Figure 20. Select CMSIS Pack project**

In the *Select device...* window which pops up, select the ADuCM4050 processor and click "OK" (fig. 21).

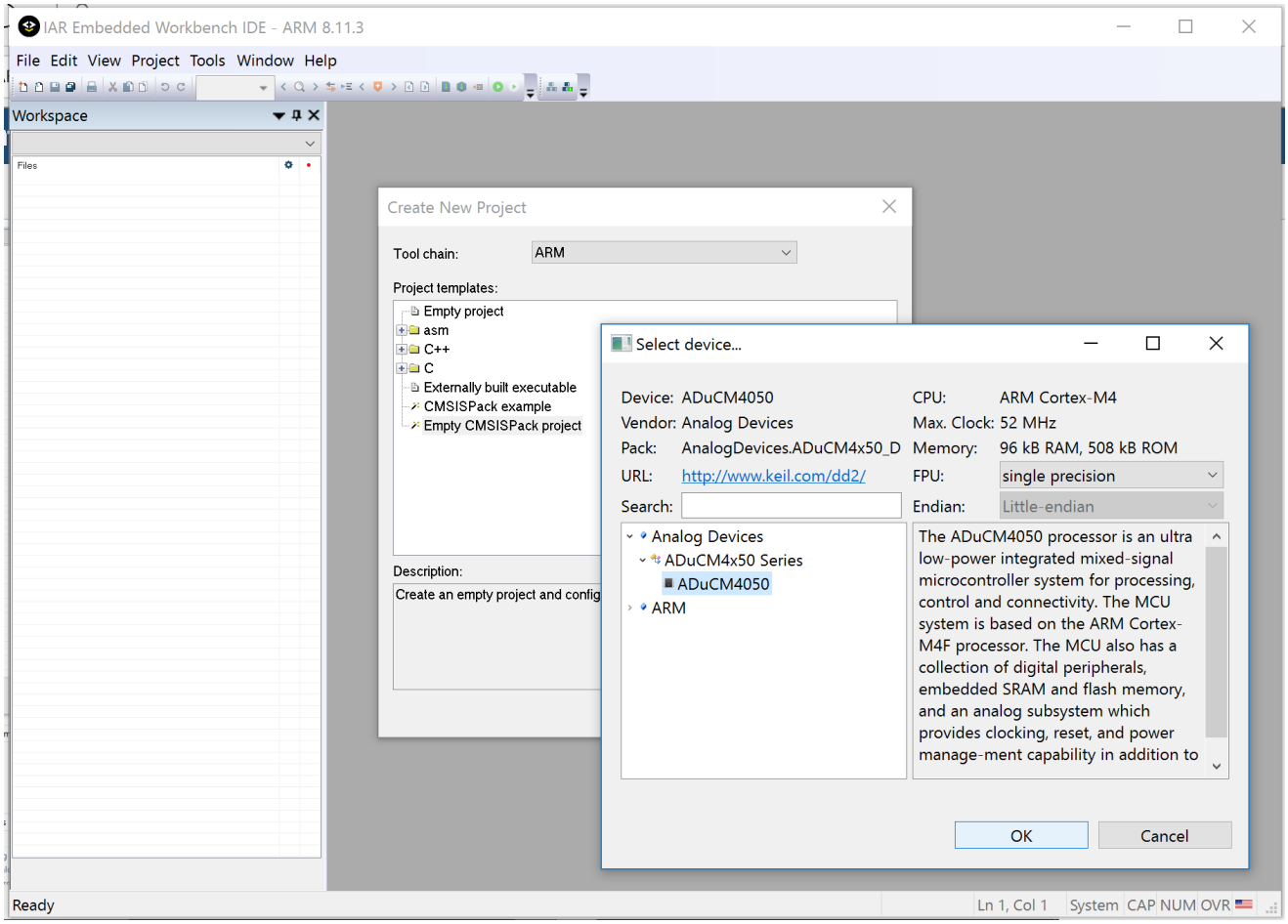


**Figure 21. Select the targeted processor**

The new project can now get its run-time environment configured.

## 5.2.1 Run-Time Environment Configuration

When the *Project CMSIS Component Manager* window pops up, select the CMSIS Pack components that are required for your project as illustrated in figure 22. These components are grouped per pack, with *Device* components gathering all the components for the ADuCM4x50 processor, and the *Board Support - EV-COG-AD4050LZ* grouping the components specific to the EV-COG-AD4050LZ Evaluation Board, e.g. AD5300.

If CMSIS Pack components depend on components that have not been selected, they appear in yellow and information about the missing components is displayed in the *Validation Output* area.

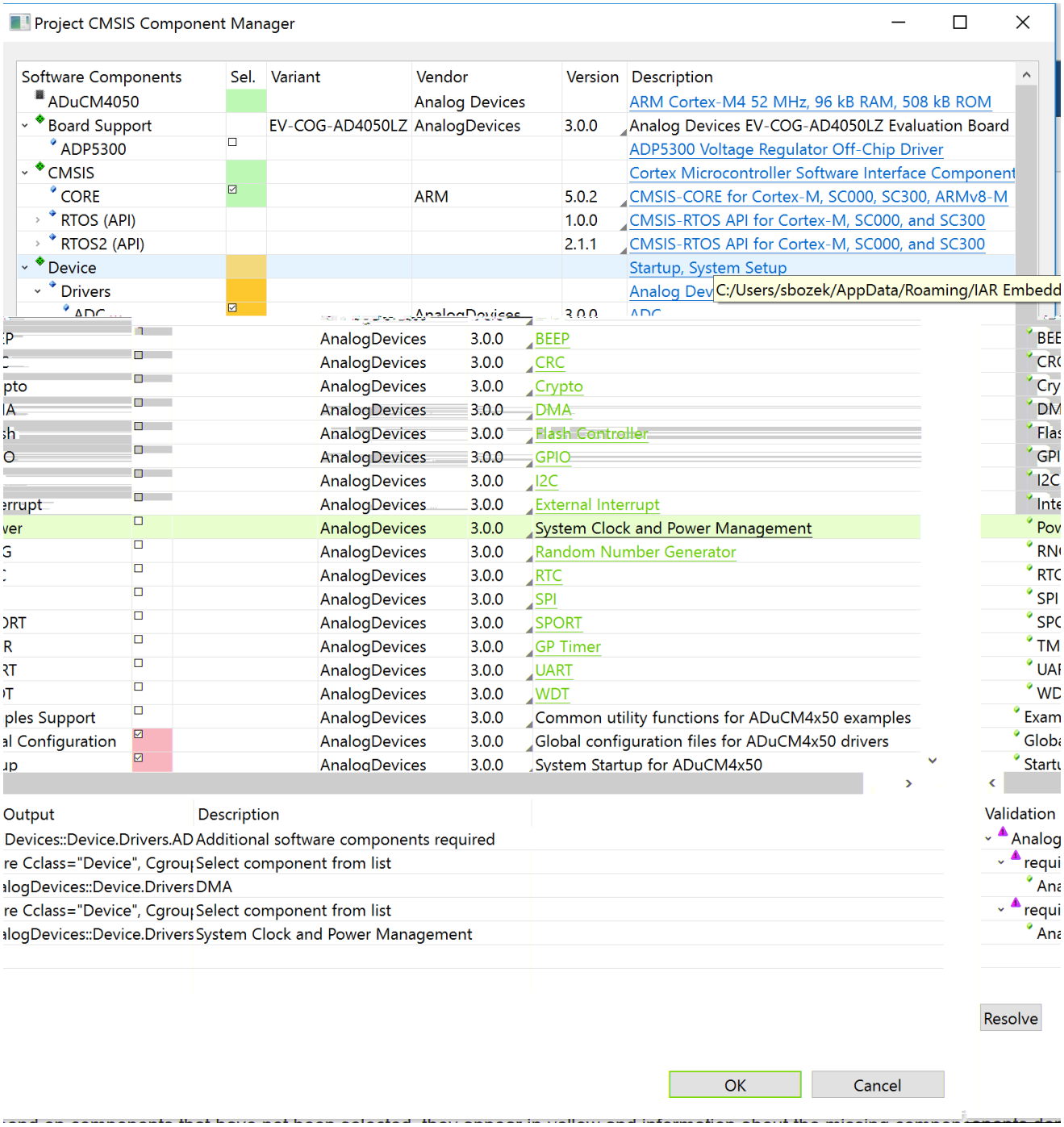


**Figure 22. Select CMSIS Pack Components**

Simply click "Resolve" for all the missing components to be added to the new project: the missing components are automatically added to the project and all the components appear in green; the *Validation Output* area is now empty (fig. 23). Button "OK" can be clicked.

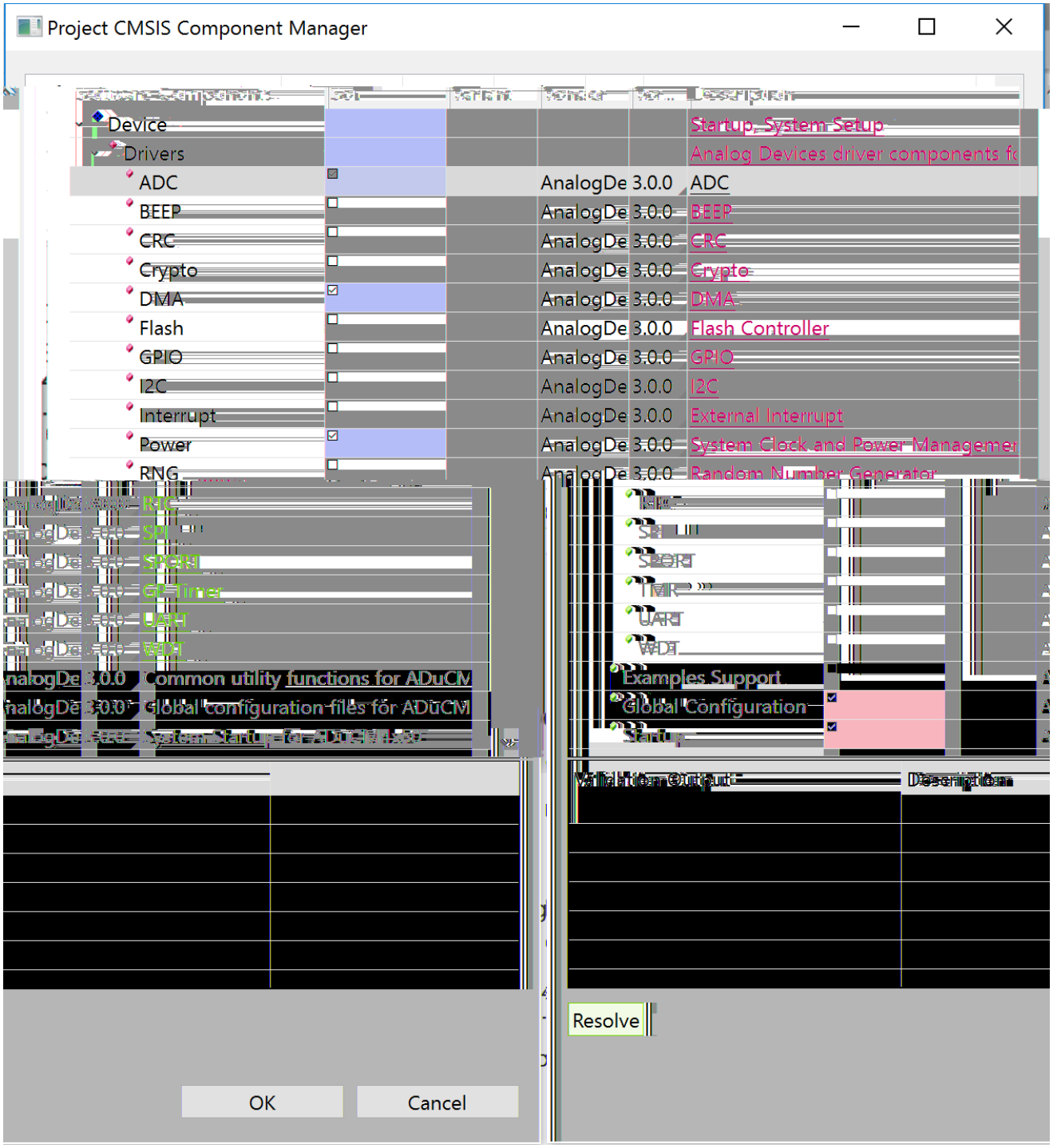


**Figure 23. CMSIS Pack Components Resolved**

Enter the name of the project to be created and select the directory where it will be saved in the window that pops up, click "Save" (fig. 24).

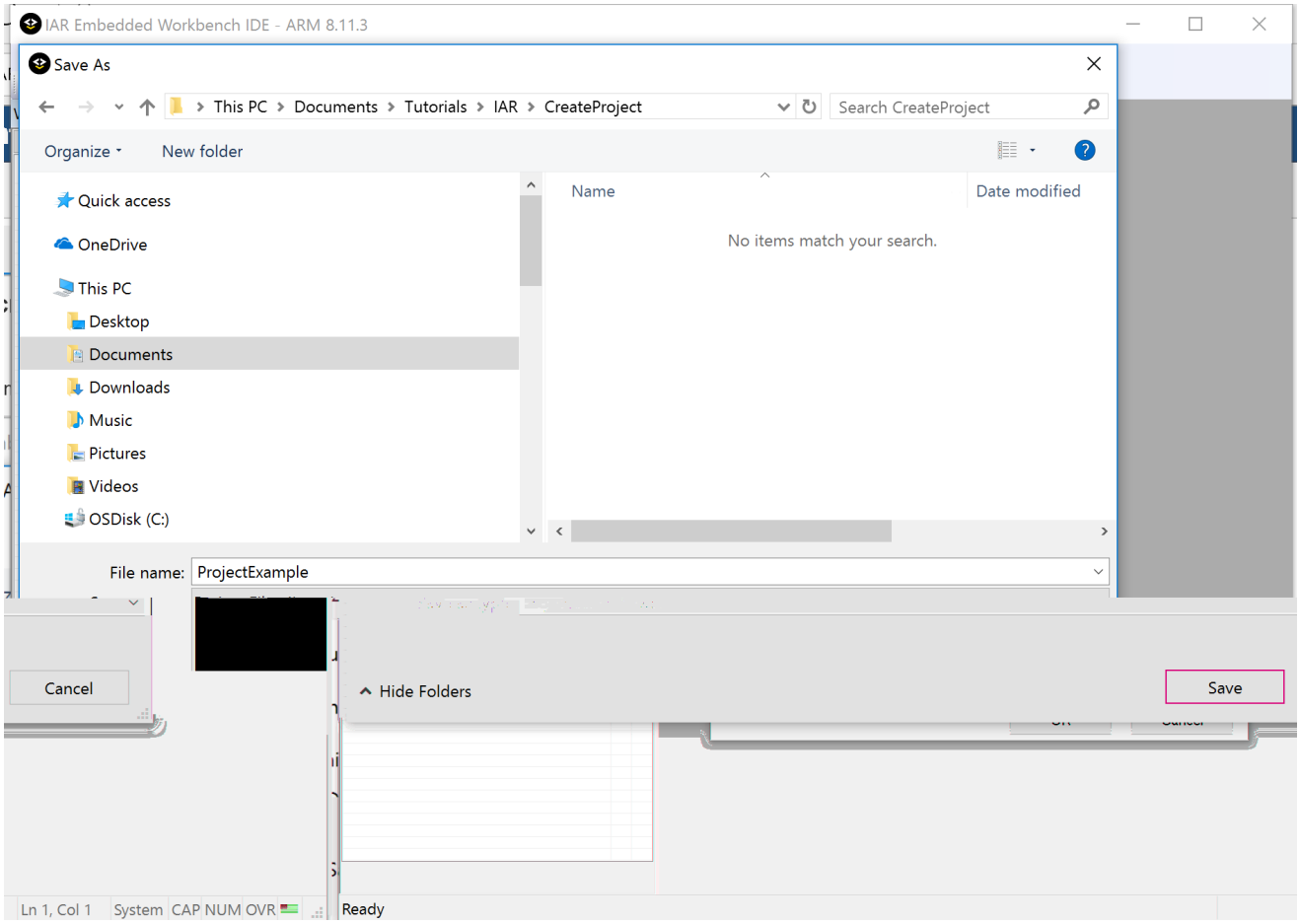


**Figure 24. Name and Save New Projects**

The project is now ready to be used, with the files required by the selected CMSIS Pack Components listed in the files window (fig. 25).

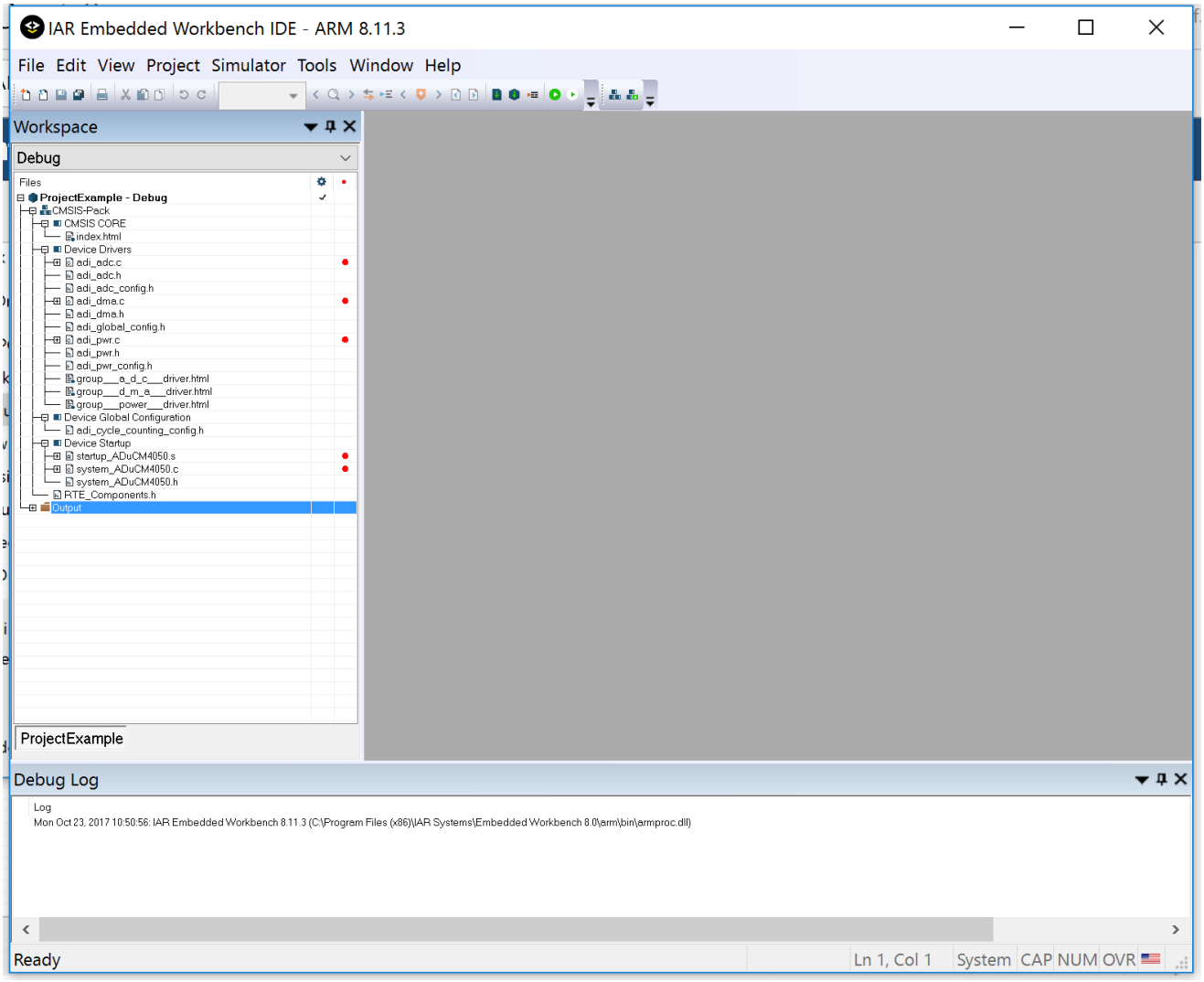


**Figure 25. Project ready to be worked on.**

If the selected CMSIS Pack components must be modified, click the "Project CMSIS-Pack configuration" icon (fig. 26), and select/deselect/resolve the components.

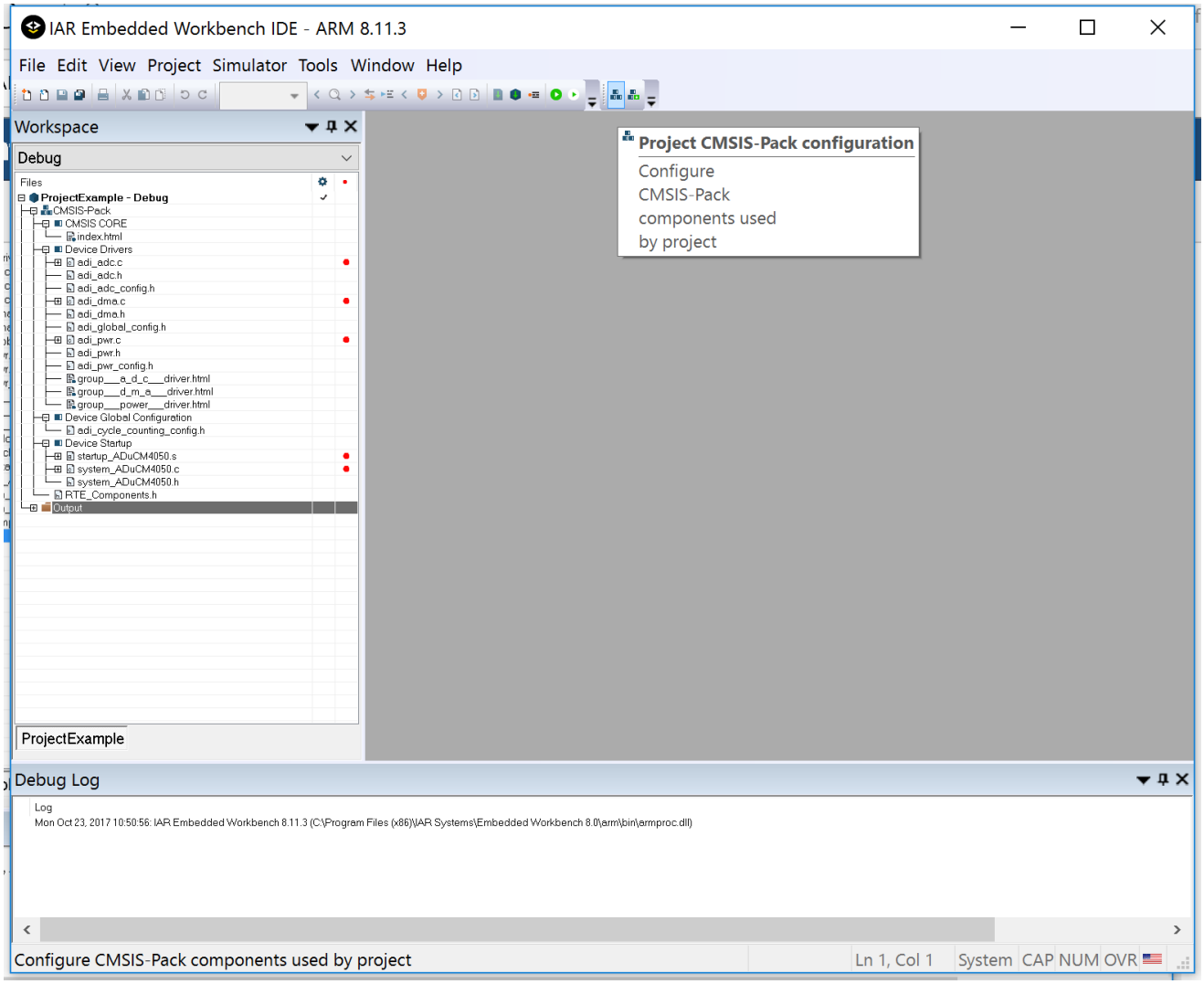


**Figure 26. Modify a CMSIS Pack configuration.**