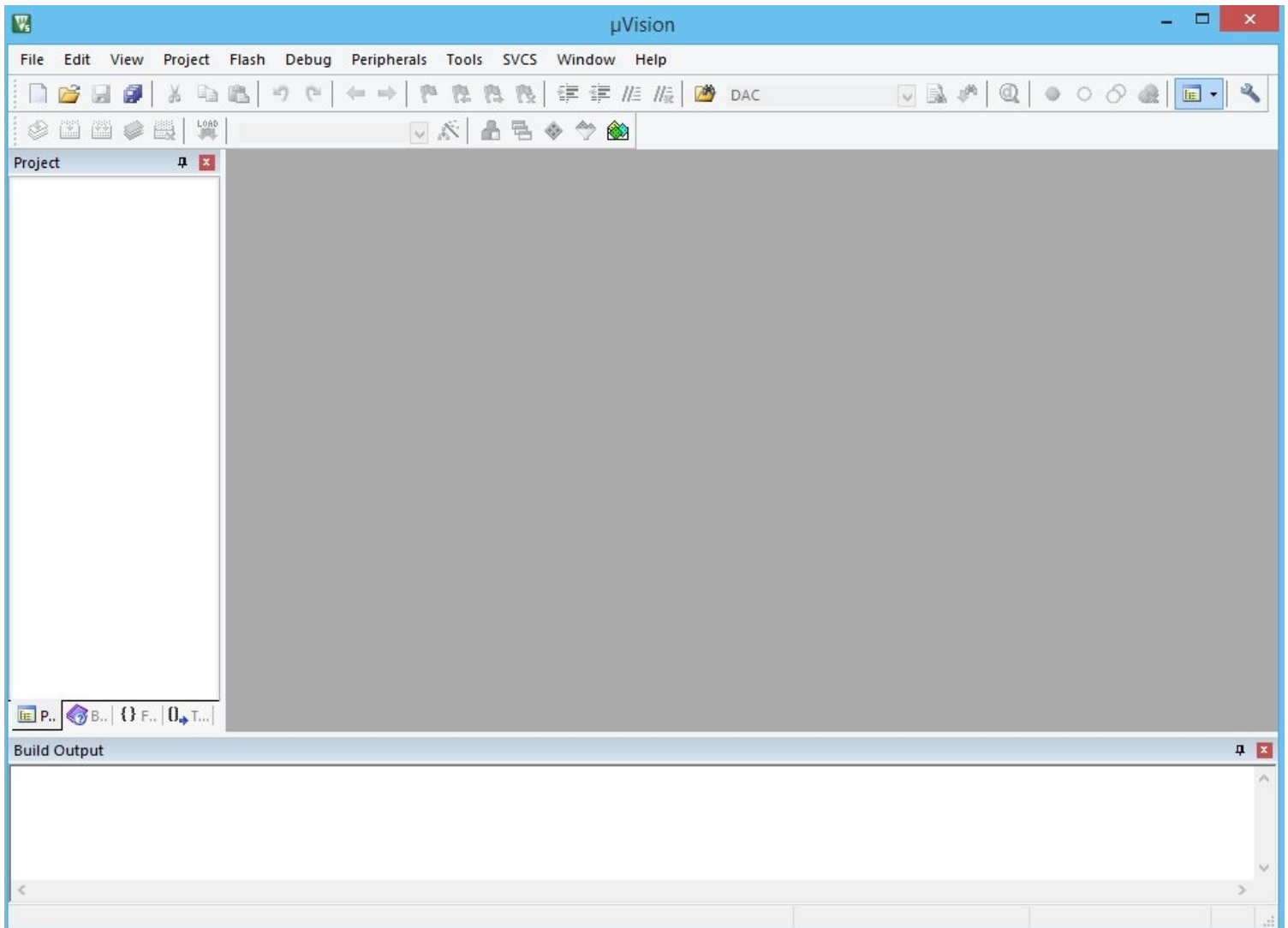


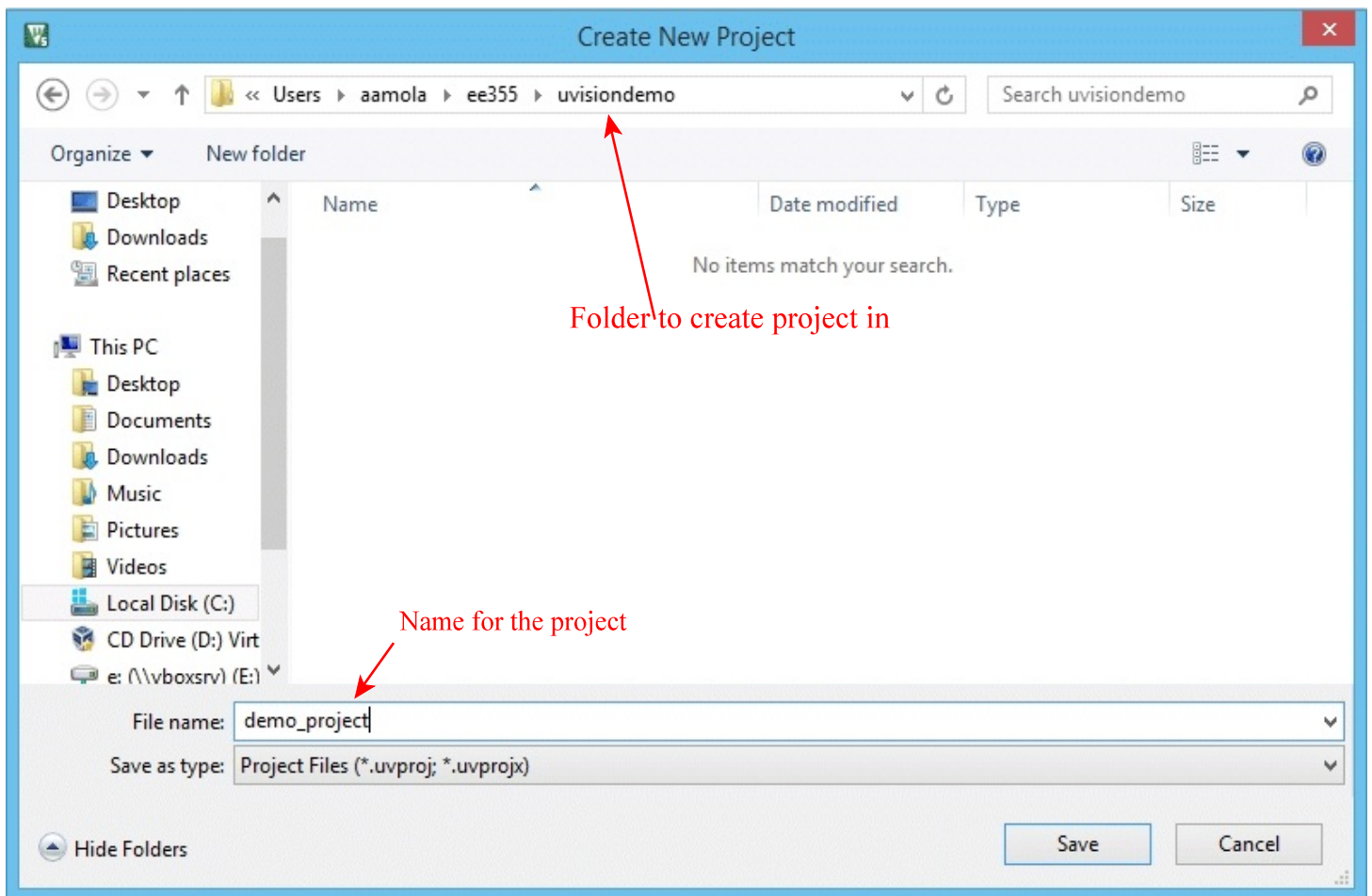
## Keil uVision Quick Start Guide

The goal of this guide is to illustrate the steps needed to create a new uVision project, add an existing source file to the project, build (i.e. compile) the project, and download the new program to a NXP Freedom development board.

- 0) Create a folder (directory) in which a new project will be created.
- 1) With a browser navigate to the class webpage and download the `flashled2019.c` program source code file into the directory you created for your project (it is at the bottom of the class web page in the Downloads section)
- 2) Start the Keil uVision program. A screen like (or similar) to that below should appear.  
(The screen shots shown in this document were made with uVision version 5.24 )



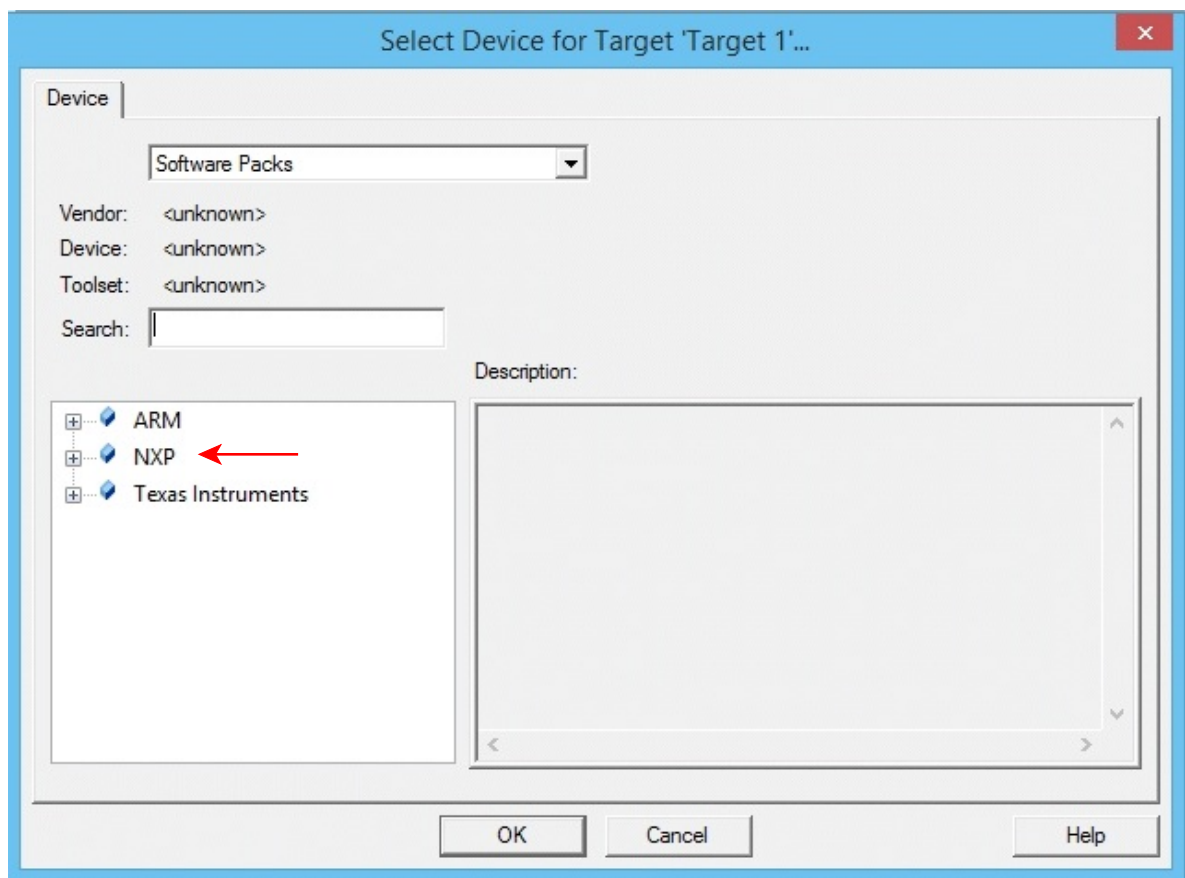
- 3) Click **Project** on the top task bar. A drop-down box will open.
  - Select **New uVision Project** and the *Create New Project* window will open. See below.
  - Navigate to the folder you wish to put the project in.
  - Enter a project name.
  - Click Save.



After clicking Save a new window will open to allow choice of a specific microcontroller that you wish to target with the design (program) you are creating.

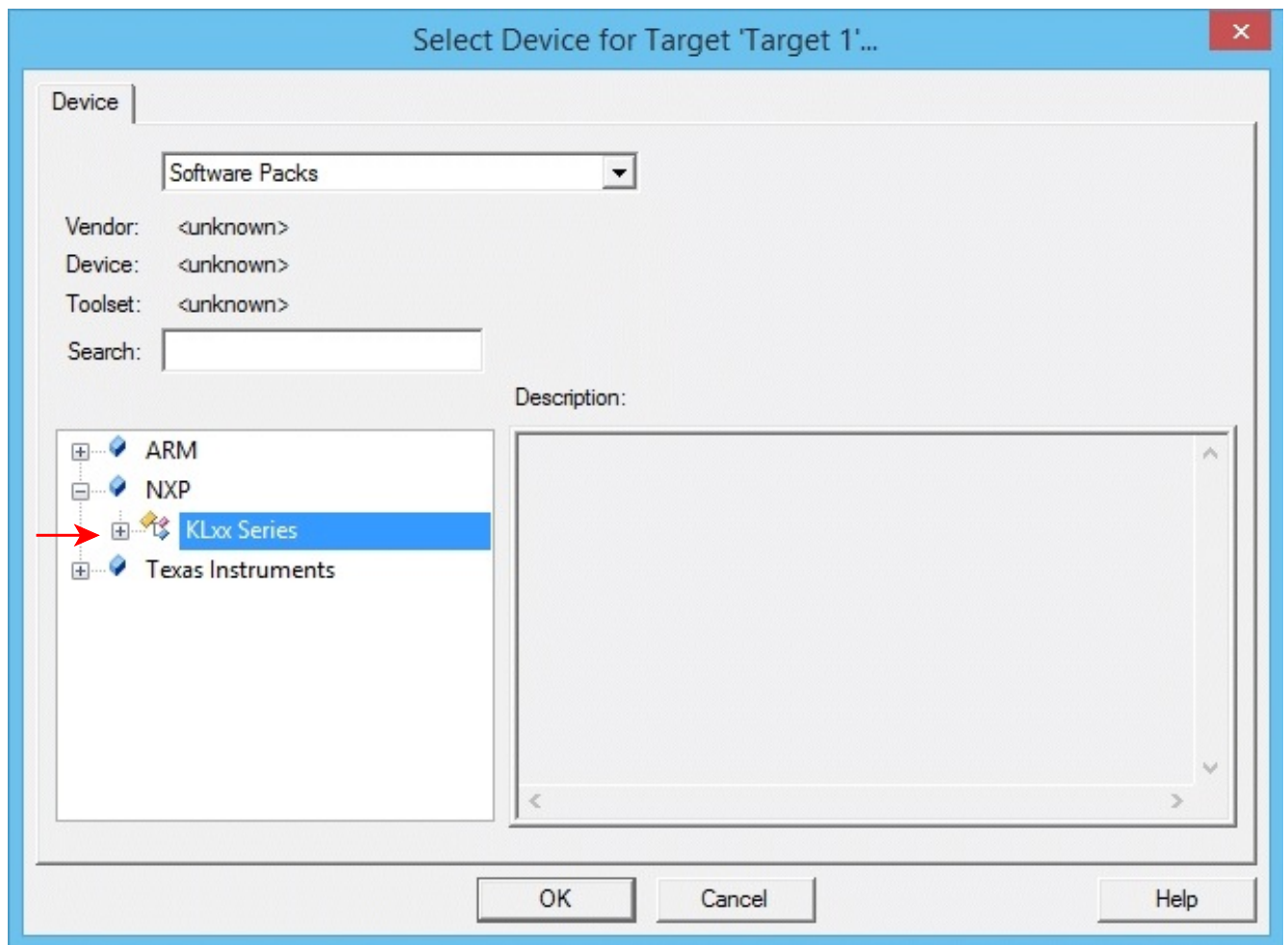
Next page.

This is the first of several windows used to specify the specific brand and model of microcontroller that you wish to use for this project.

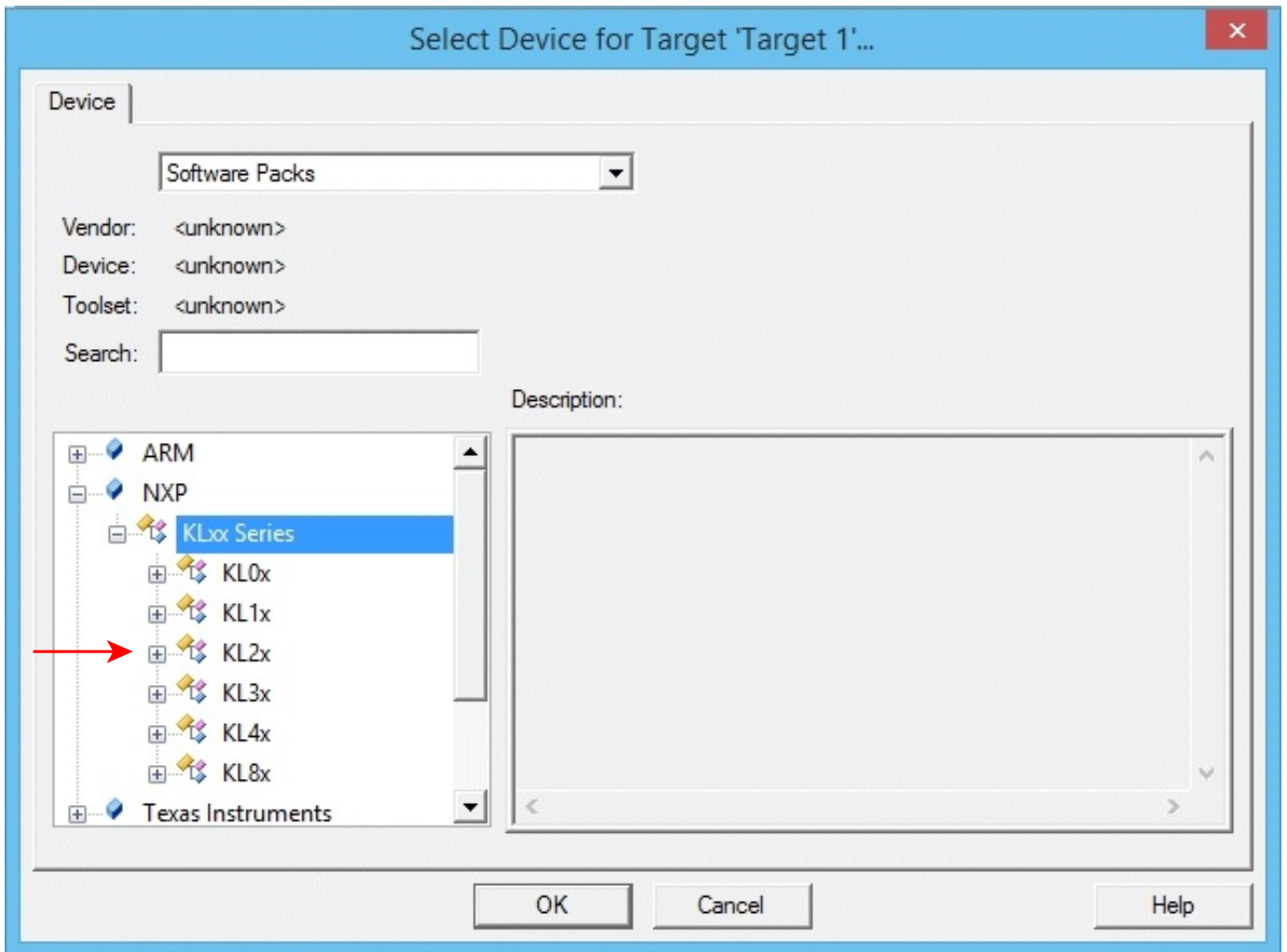


Click the + box left of NXP

We are interested in using the KLxx series of microcontrollers

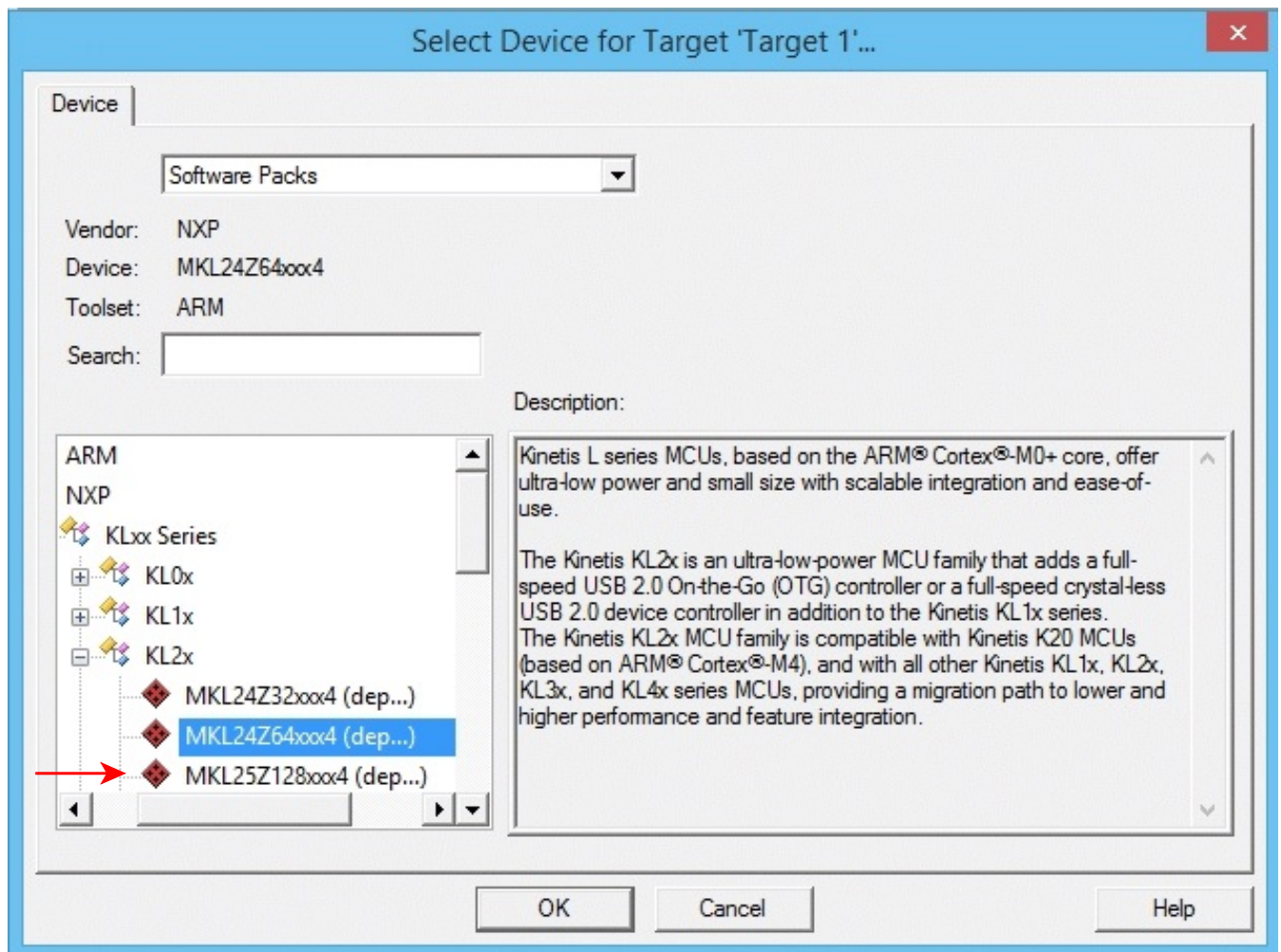


Expand the KLxx series options by clicking on the + box to its left.



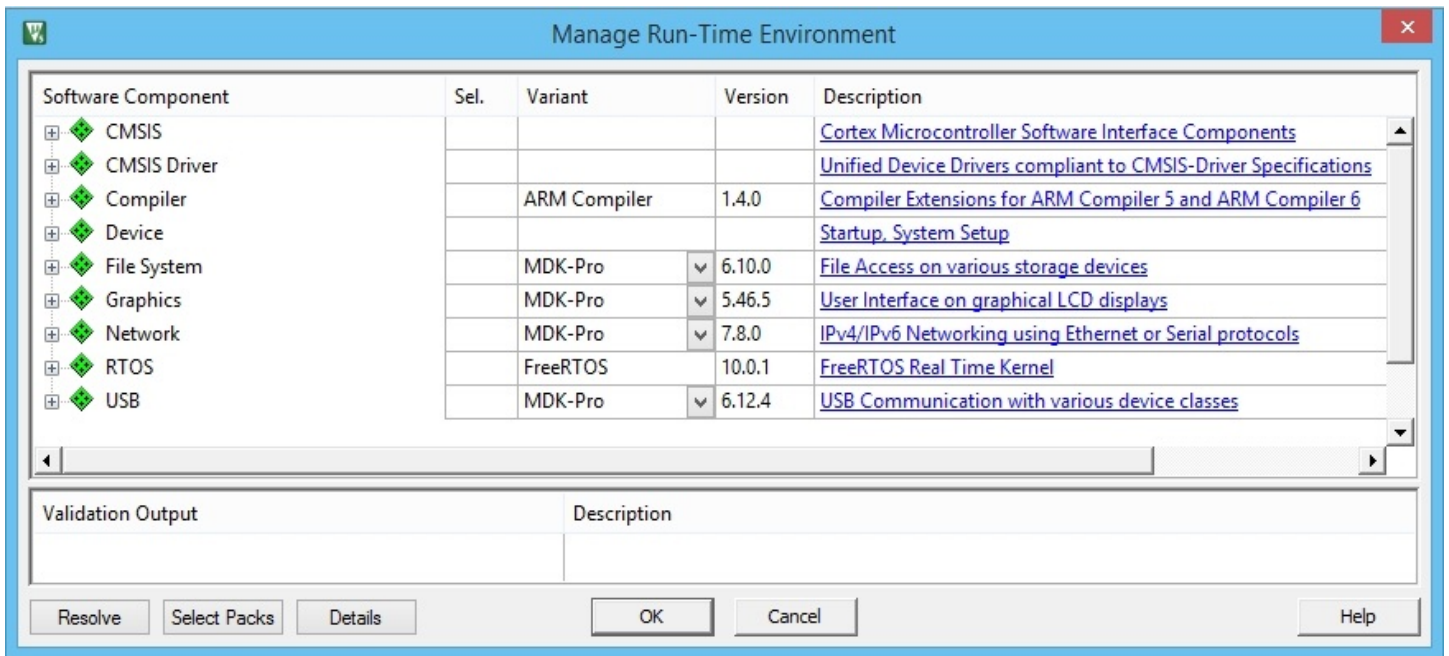
Expand the selection of KL2x microcontrollers by clicking on the + box to its left.

Once a specific device (microcontroller chip) is selected, a high level summary of its characteristics is displayed. For class you need to select the MKL25Z128xxx4 device pointed to with the red arrow in the picture below:

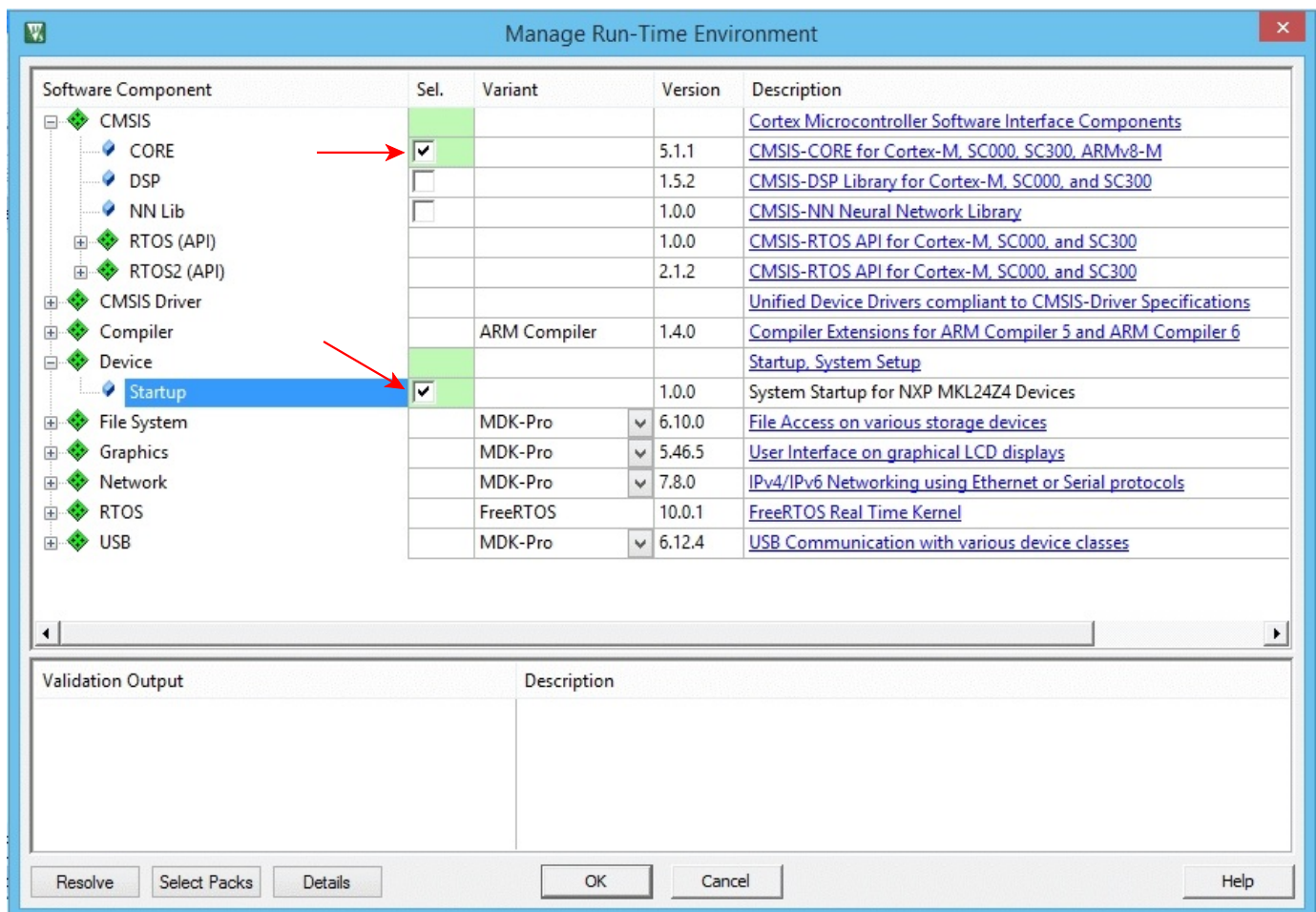


Click OK and the highlighted device will be the target for this project.

Next the libraries that will be used in this design are chosen. Only two are needed.

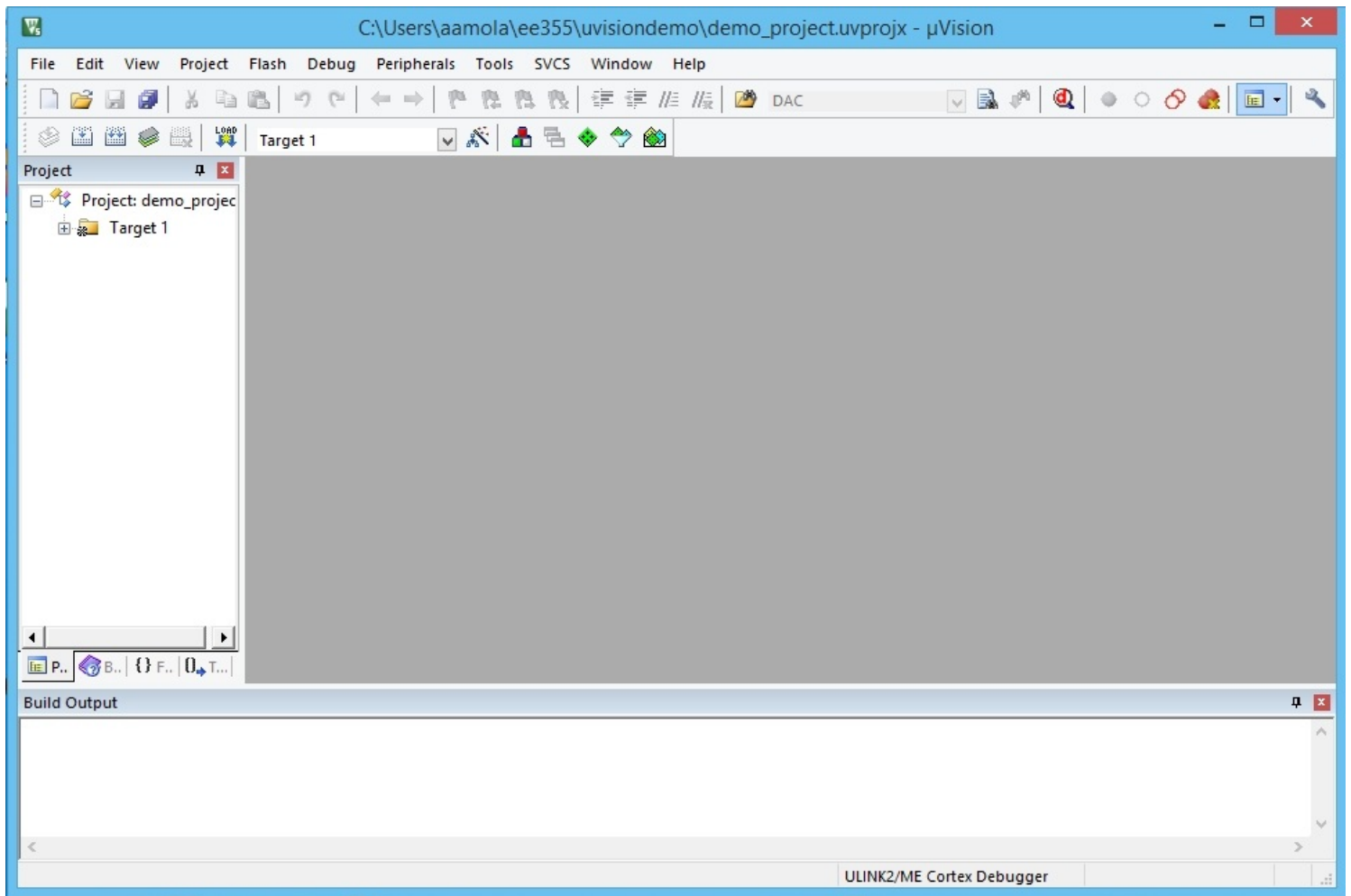


Click on CMSIS and Device.



Note the select boxes and click those for CORE under CMSIS and Startup under Device. The other libraries are not needed.

The uVision screen should now look something like this:



Note that the left panel titled Project has in it icons and the name of the project created above. Also, there is an icon and the text Target 1.

Expand the Target item (click on the + box to its left). A Source Group icon will appear.

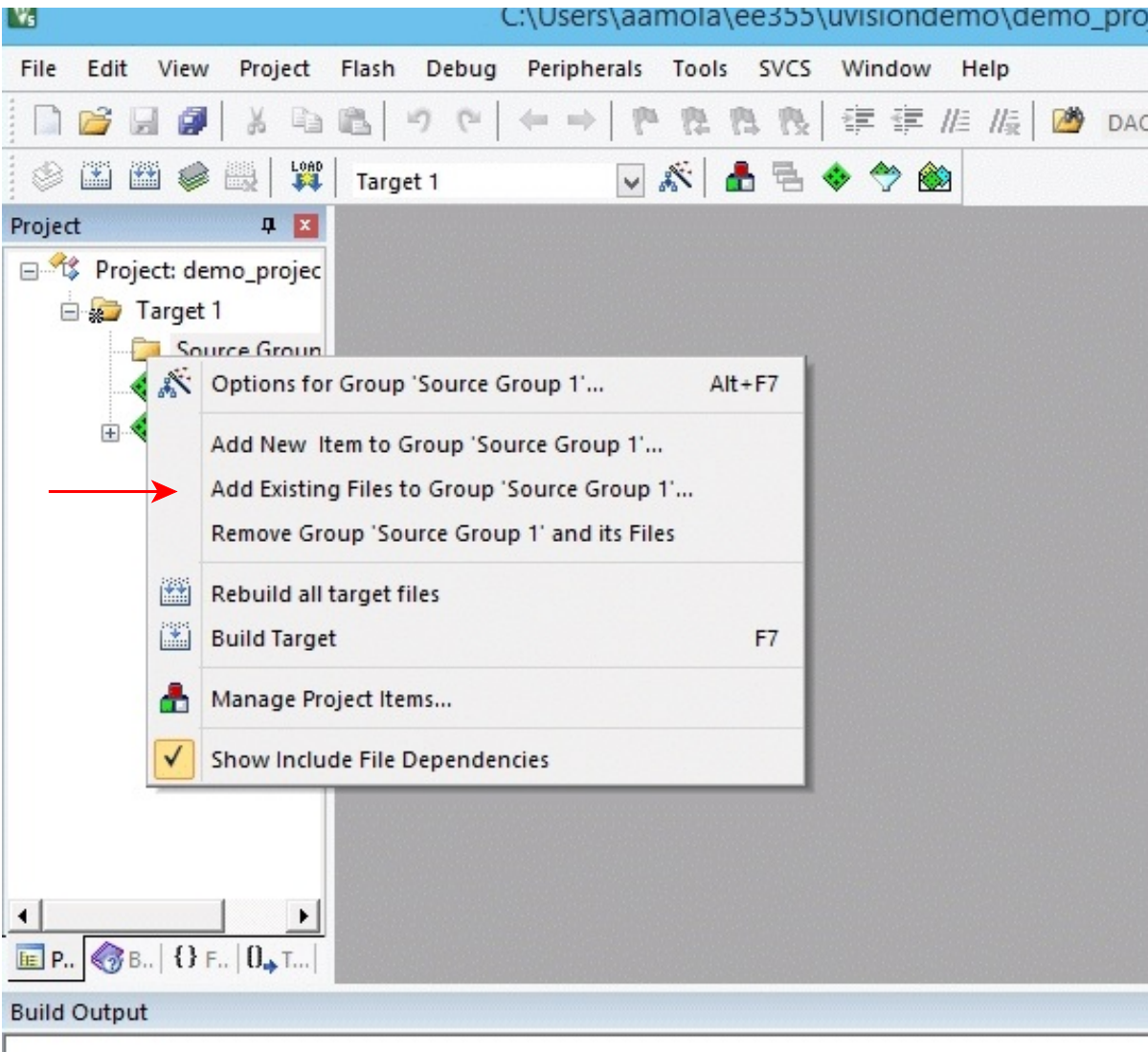
Right click on the folder symbol to the left of Source Group text.

This will open a menu box as shown on the next page.



## Select Add Existing Files to Group

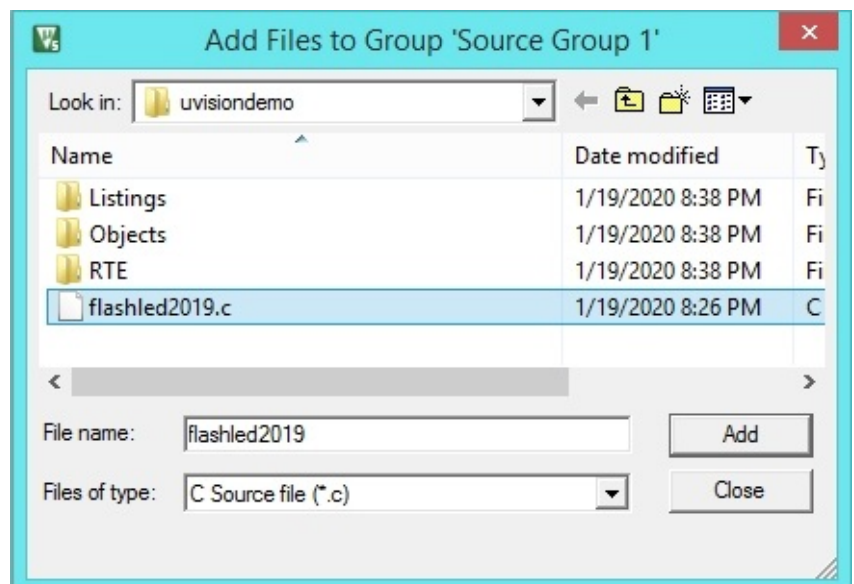
A new box will appear: ----->



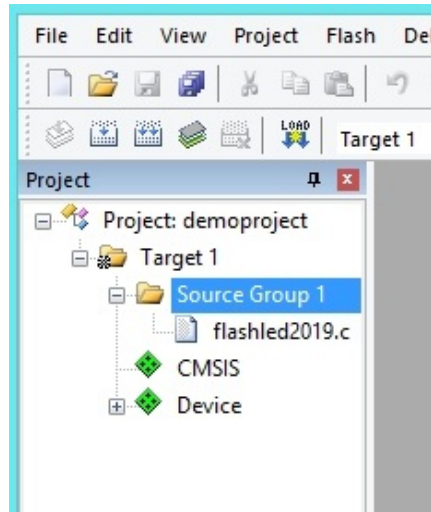
Click on a source file.

Click **Add**

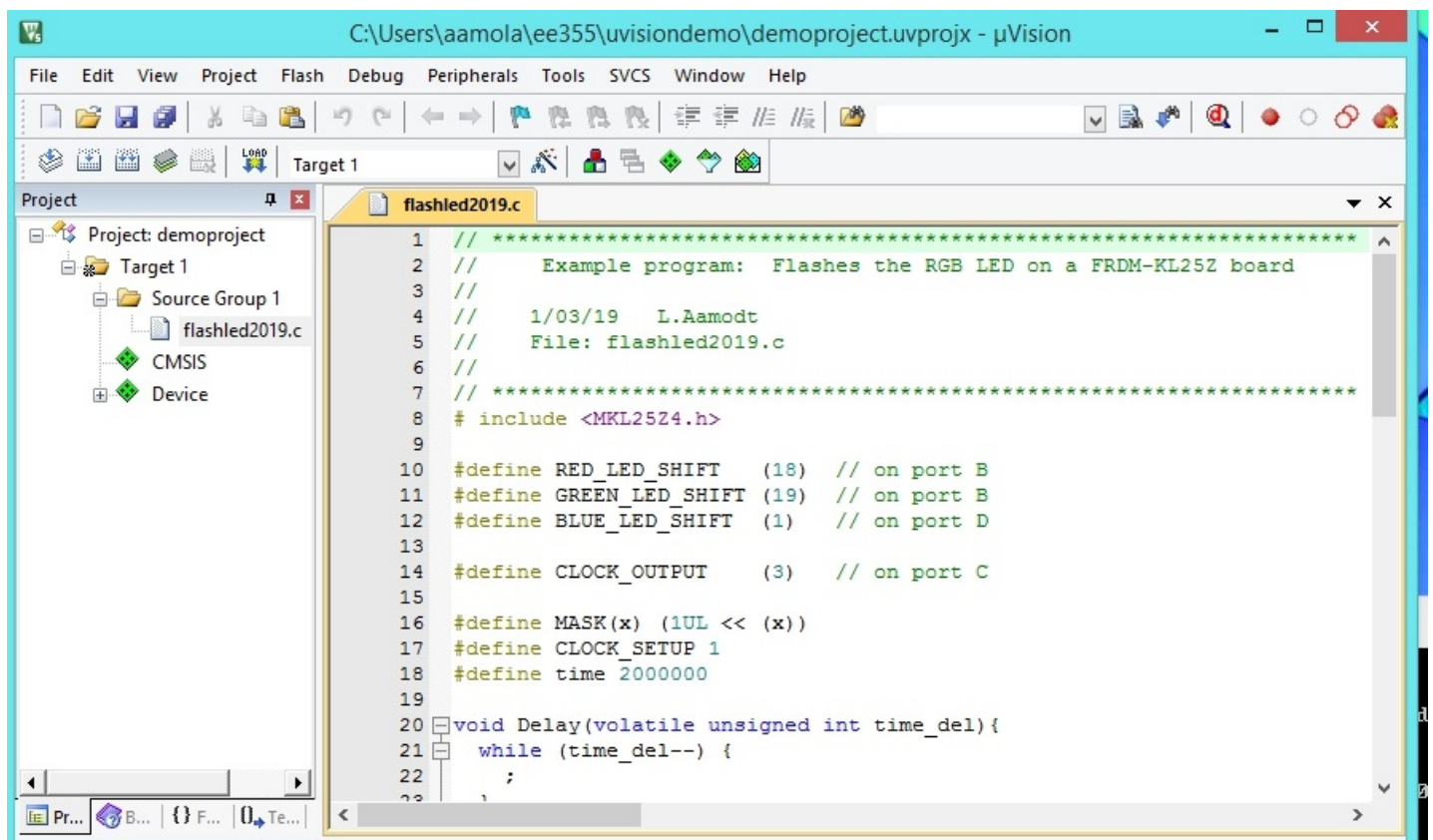
Click **Close**



The left (Project) panel should look something like this after adding a source file:



If you double click on the source file flashled2019.c it will open the file in a text editor like this:



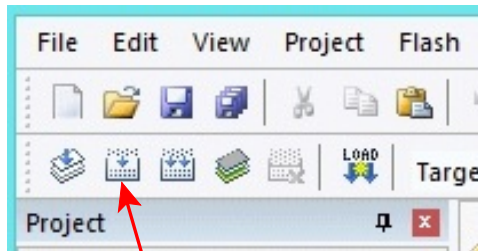
If there are additional source or header files you can open several and there will be a tab for each in the edit window area allowing one at a time to be open for editing.

If you are starting a new project without an existing source file (or files) then instead of adding existing file(s) you would select Add New Item to the source files and an empty file will be created. You then can use the editor and write a program.

## BUILDING A PROJECT

Once a program is added to the project or is written it needs to be built. During the build process a system startup C-file, an assembly file, some library files, and header files will be added to the project. During the build process source files will be compiled and linked together to create a binary file to be downloaded to the microcontroller.

A build can be started from the Project tab on the upper tool bar or by clicking an icon on a lower tool bar:

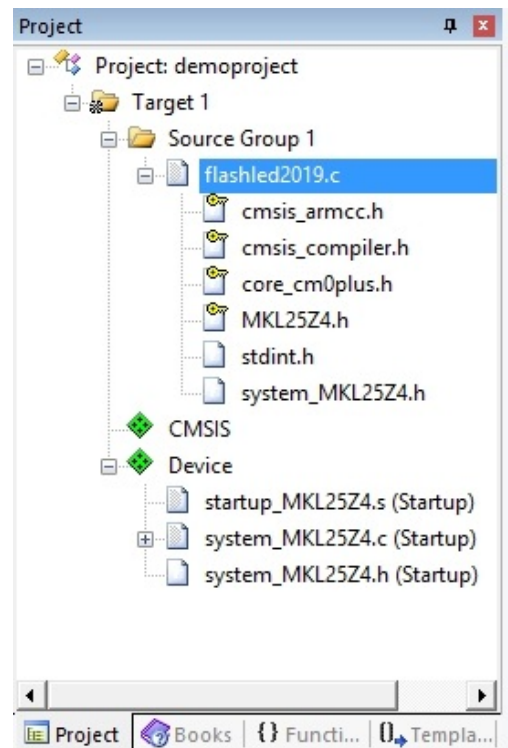


The build button

During and at completion of the build, information will be displayed in the Build Output window at the bottom of the uVision window. Here is an example after building the flashed program:

```
Build Output
*** Using Compiler 'V5.06 update 5 (build 528)', folder: 'C:\Keil
Build target 'Target 1'
compiling flashed2019.c...
assembling startup_MKL25Z4.s...
compiling system_MKL25Z4.c...
linking...
Program Size: Code=704 RO-data=336 RW-data=0 ZI-data=352
".\Objects\demoproject.axf" - 0 Error(s), 0 Warning(s).
Build Time Elapsed: 00:00:09
```

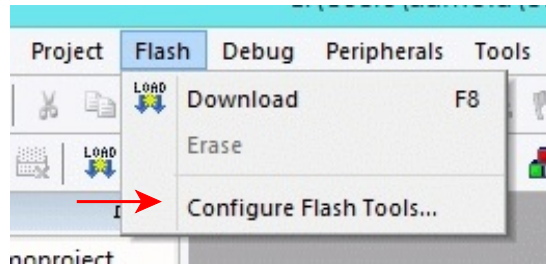
After building you can see names of additional files added to the project during the build process. Click on the + boxes left of flashed2019.c and the Device item. ----->



The next step is to download to the target processor.

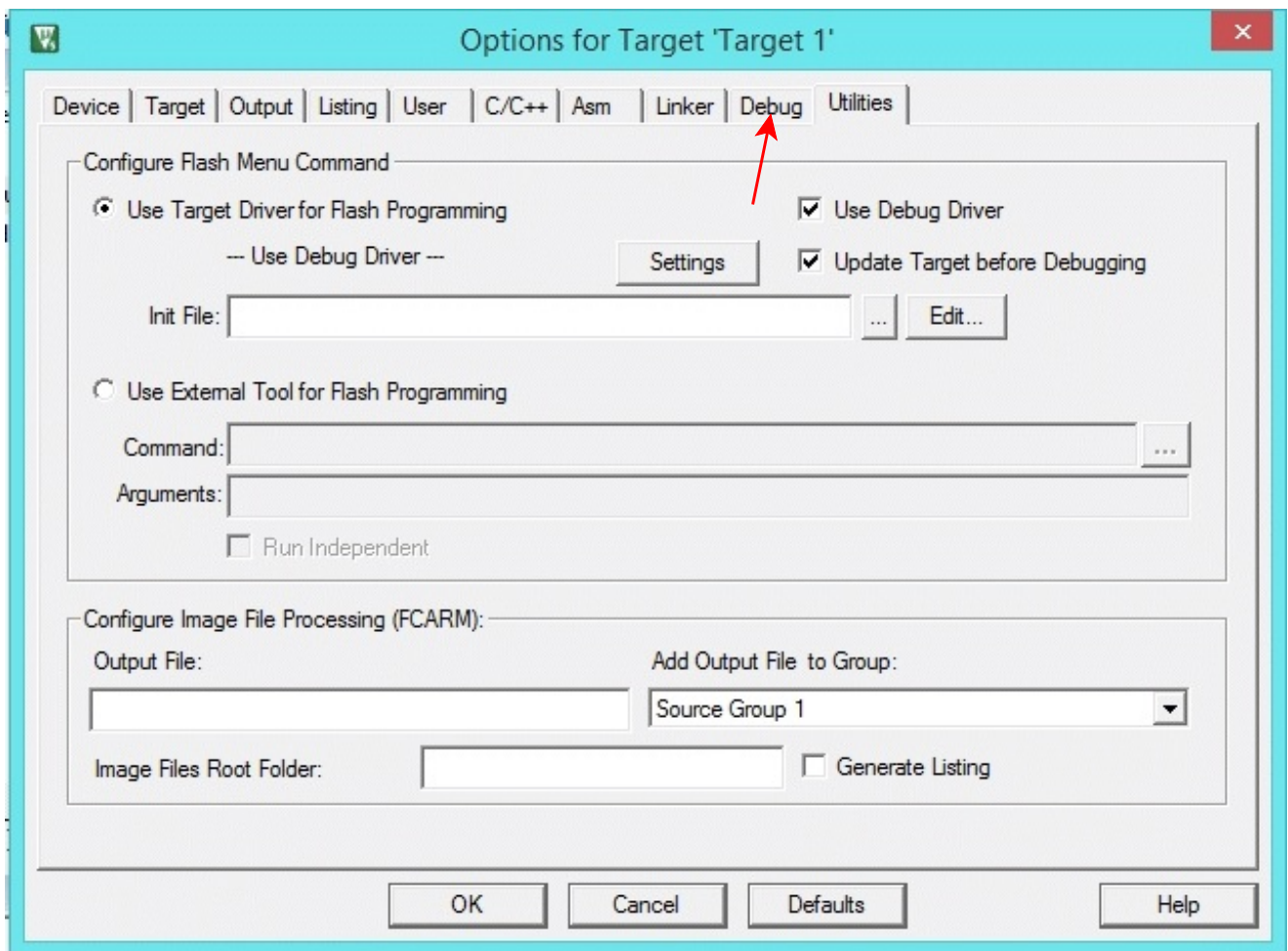
But before download will work a little setup must be done.

Click the **Flash** tab on the top tool bar to get a drop-down menu:

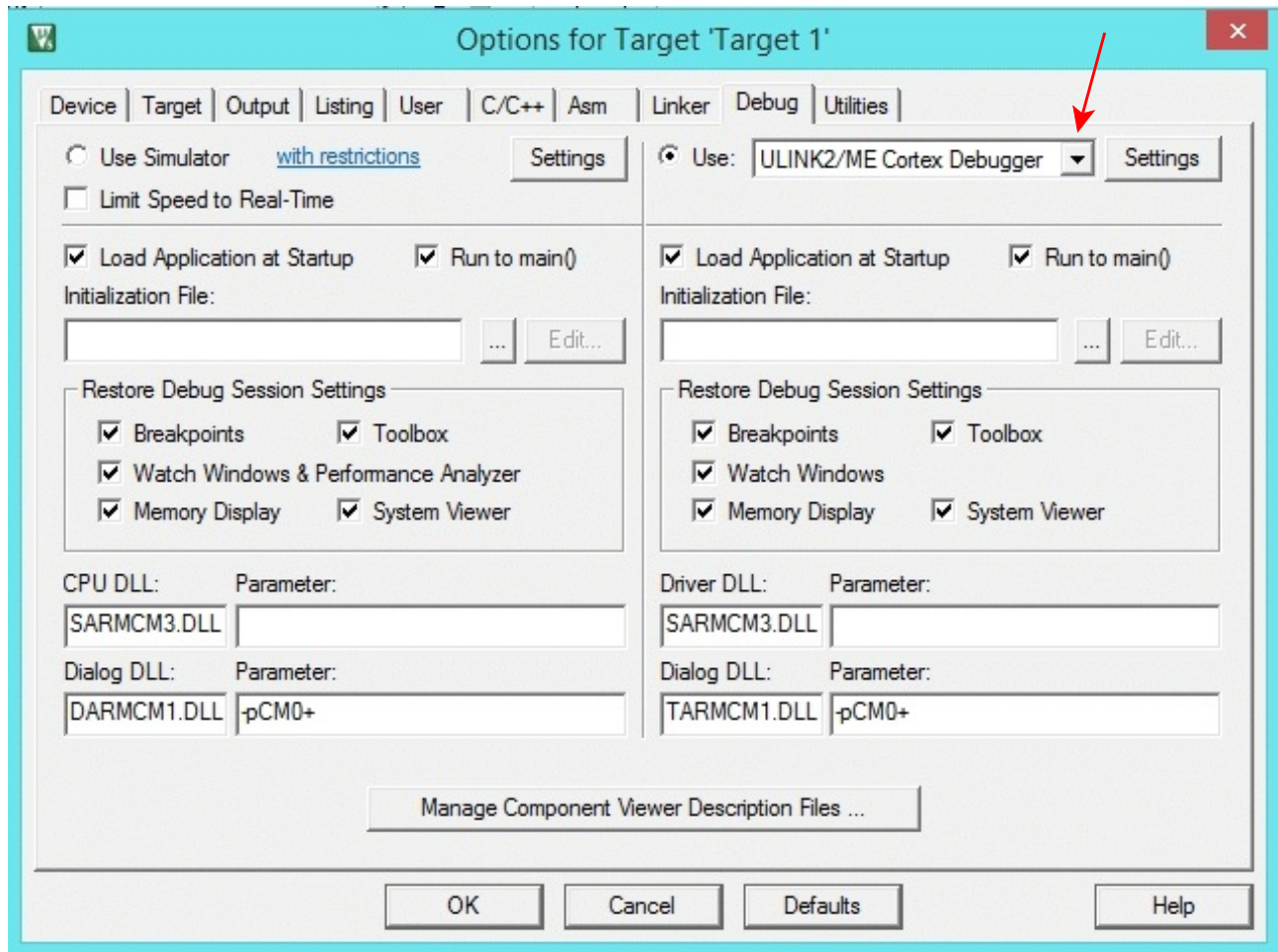


Click on **Configure Flash Tools**

A window similar to that below will appear. Tabs across the top select various screens for configuring options. If the Debug tab is not highlighted then click on it (the Utilities tab is active as shown below):



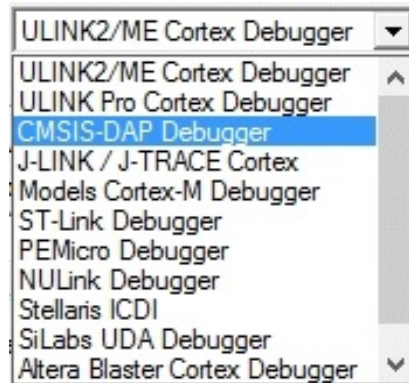
Here is the Debug screen with default options showing:



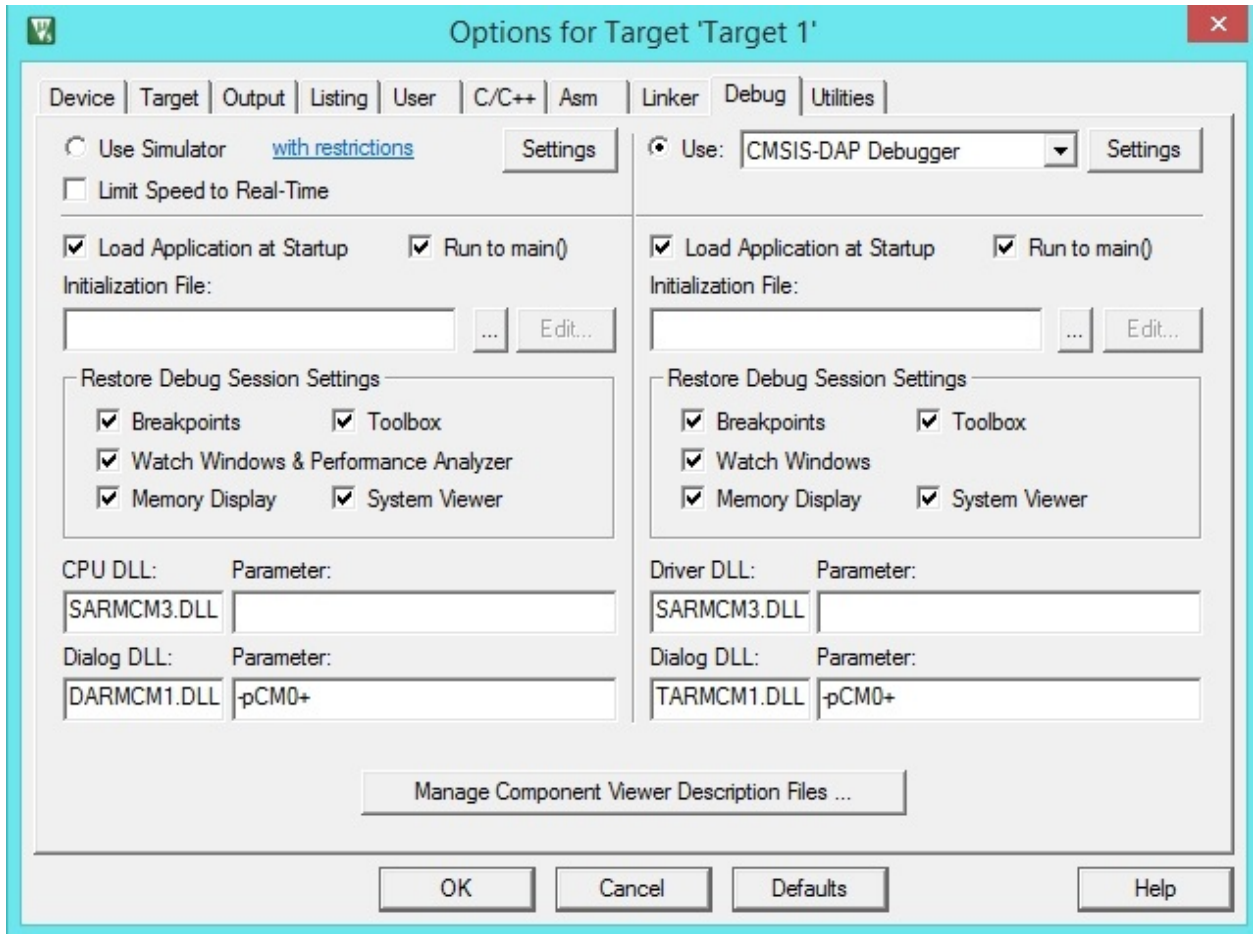
Click the down arrow to the right of the little window with the text  
ULINK2/ME Cortex Debugger

A drop-down menu will open with these options:

Select **CMSIS-DAP Debugger**



The Debug window should now look like this:



The default options are ok for all the other fields on this screen as well as screens opened under the other tabs.

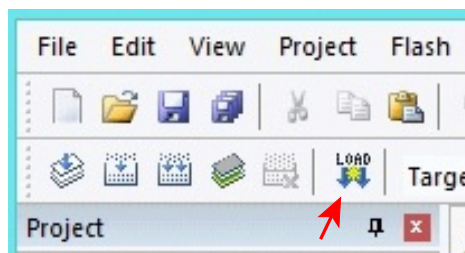
Click **OK**

## NOW THE EXCITING PART - **DOWNLOADING**

Plug in a USB cable between the SDA connector on the Freedom board and a USB port on the computer running uVision.

Click on the **LOAD** icon.

Download should start.



(remember that the OpenSDA program has to be installed on the Freedom board before download will work)

As download proceeds there will be messages displayed in the Output window at the bottom of the screen. If errors occur they will be displayed. An example successful download is this:

```
Build Output
Load "C:\\Users\\aamola\\ee355\\uvisiondemo\\Objects\\demoproject.axf"
Erase Done.
Programming Done.
Verify OK.
Flash Load finished at 21:21:51
```

To start running the program downloaded onto the Freedom board press and release the pushbutton that is on the Freedom board.

That's it. Of course there are lots of features of the uVision program including debugging that can and should be explored as needed.