



KEIL μ Vision getting started

P. Bernardi



KEIL μ Vision 5

MDK-Arm

Version 5.29 (November 2019)

Development environment for Cortex and Arm devices.

- The Development environment for Cortex and Arm devices (aka MDK) includes the μ Vision Tools.
- The μ Vision IDE combines in a single environment:
 - project management,
 - run-time environment,
 - build facilities,
 - source code editing,
 - and program debugging.
- The μ Vision Debugger provides a single environment in which you may test, verify, and optimize your application code. The debugger includes traditional features like simple and complex breakpoints, watch windows, and execution control and provides full visibility to device peripherals.
- <https://www.keil.com/download/product/>


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**MDK-Arm**
Version 5.29 (November 2019)
Development environment for Cortex and Arm devices.

**C51**
Version 9.60a (May 2019)
Development tools for all 8051 devices.

**C251**
Version 5.60 (May 2018)
Development tools for all 80251 devices.

**C166**
Version 7.57 (May 2018)
Development tools for C166, XC166, & XC2000 MCUs.

Keil products use a [License Management](#) system - without a current license the product runs as a Lite/Evaluation edition with a few [Limitations](#).

Maintenance Status and Previous Versions

Enter a valid Product Serial Number (**PSN**) or License Code (**LIC**) to get access to all product versions available to you, or to check the status of your support and maintenance agreement.

PSN or LIC: Submit

MDK529.EXE Operazione annullata license (6).dat lab_06.zip ITC_2019_Slides.zip Mostra tutto

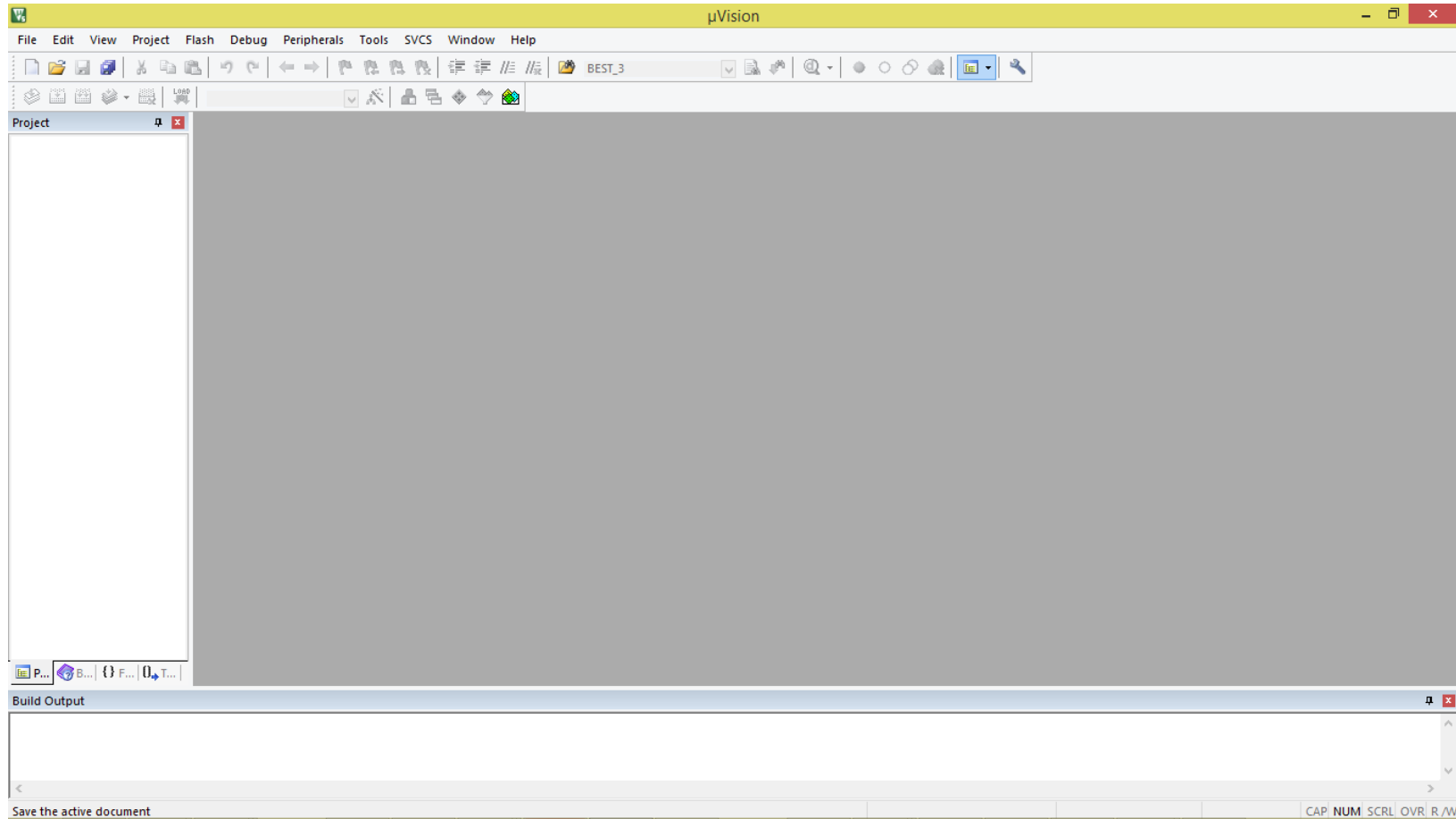
KEIL μ Vision 5 – installation and template

- <https://www.keil.com/download/product/>
- Along the download phase you will be required to enter your affiliation and email address; this is an important information, make sure you enter your institutional account
- <name.surname>@studenti.polito.it
- Affiliation: Politecnico di Torino

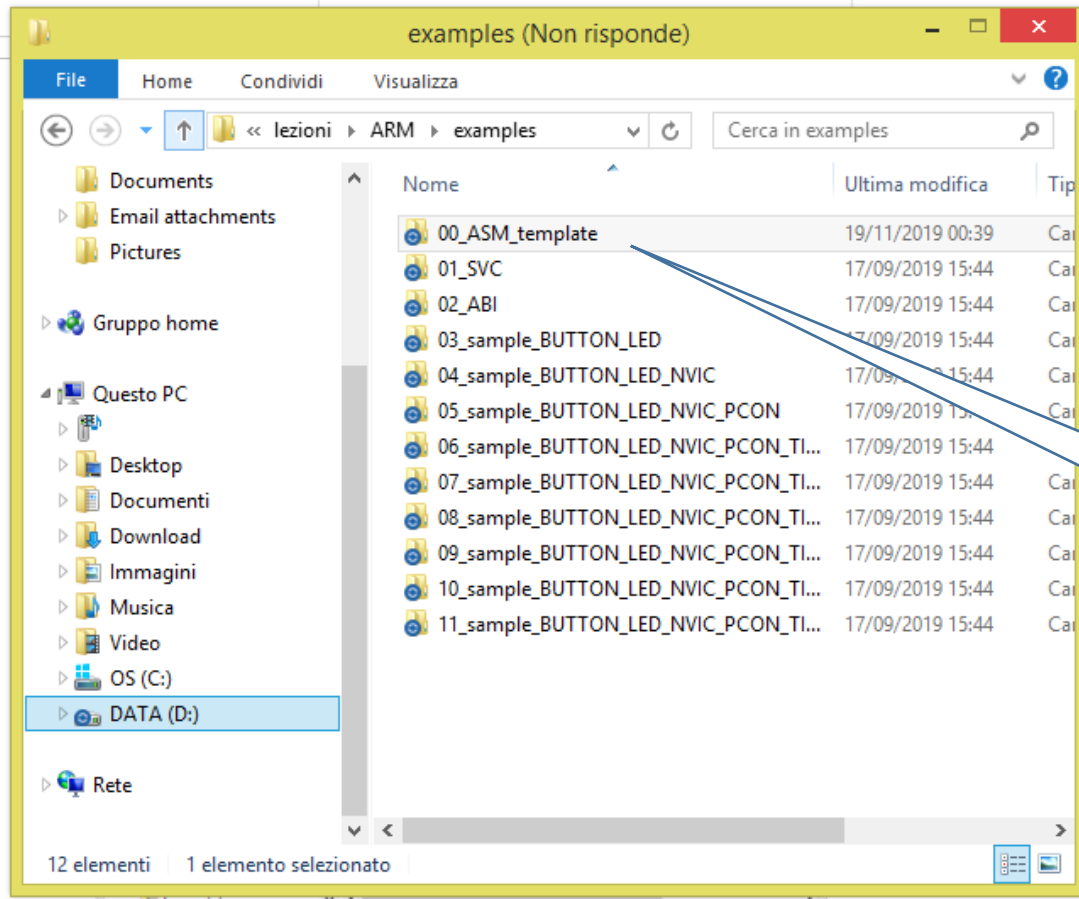
Installation completed



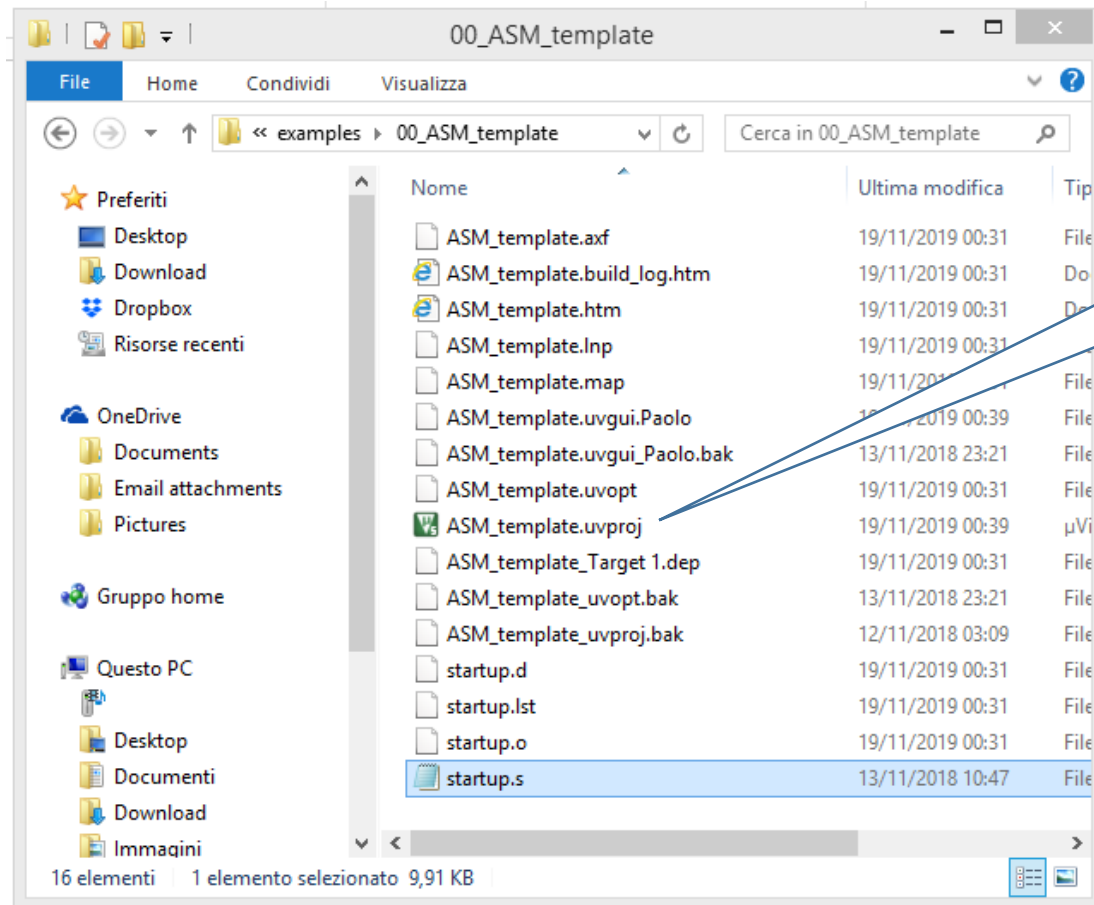
KEIL uVision5



Open the 00_ASM_template project



Open the 00_ASM_template project

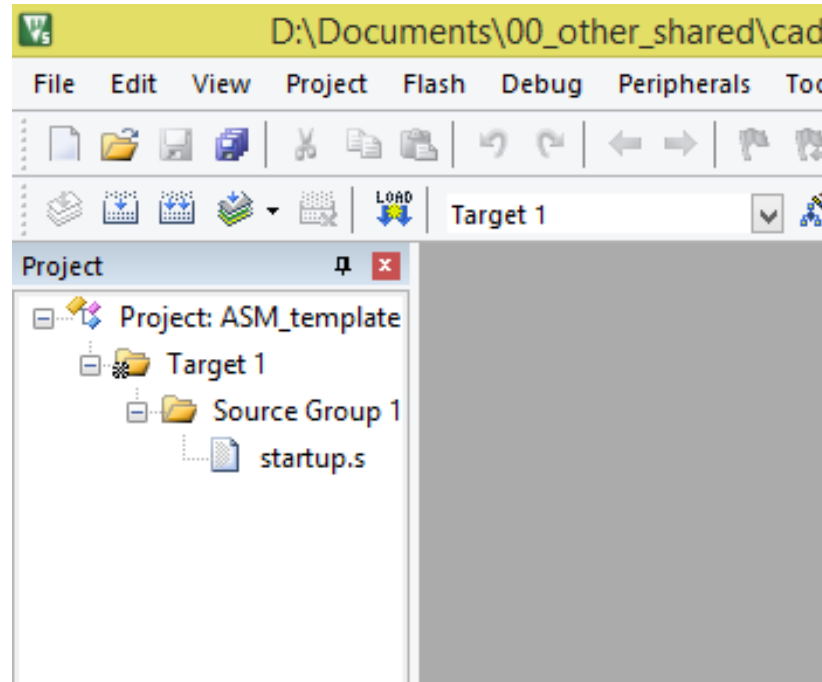


Open the
ASM_template.uvproj file

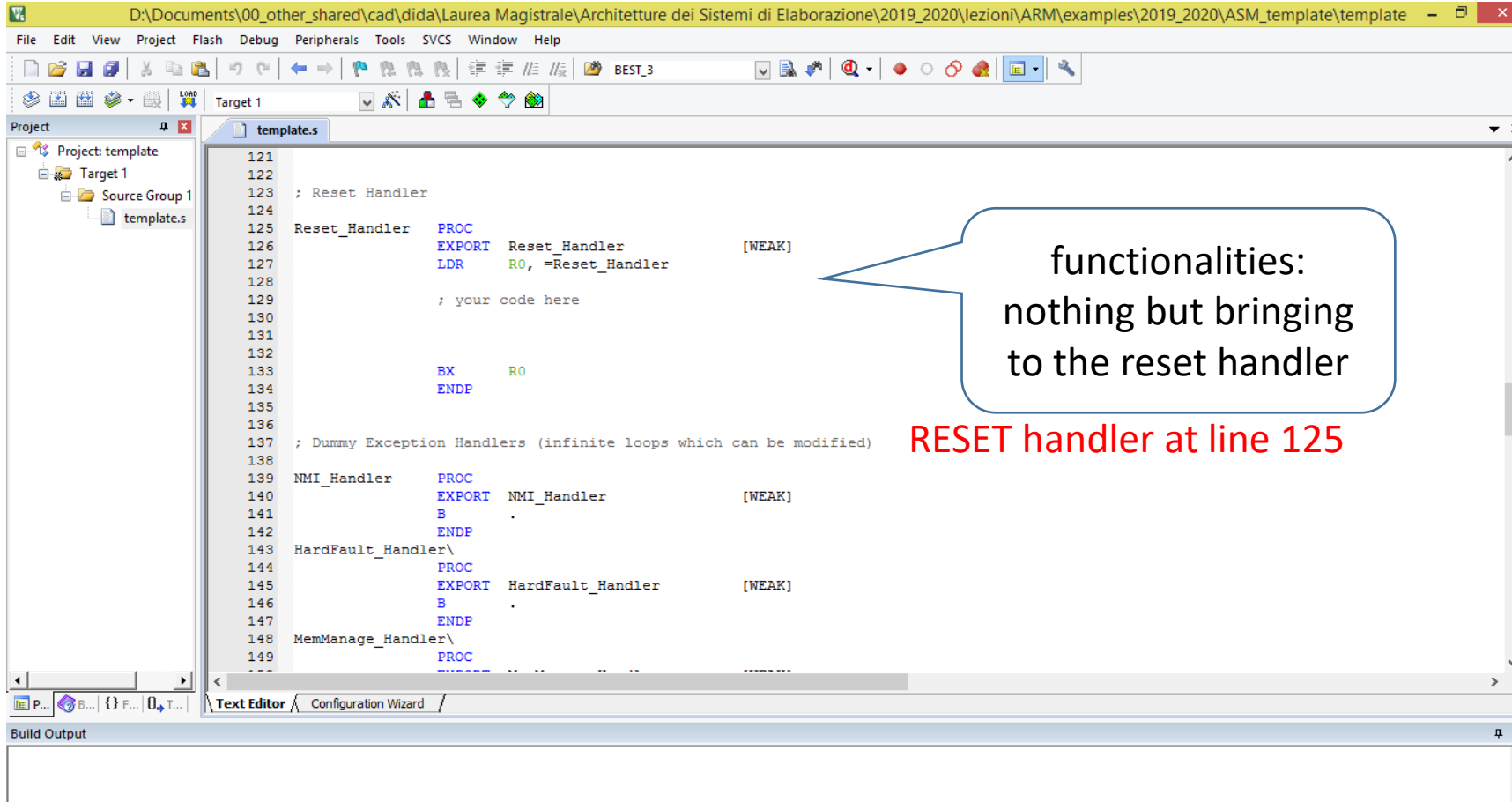
Legacy pack

- Most probably you will not have the correct LPC device environment installed at default
- Dialogs will appear and guide you to the proper website to download installation

Congratulations, your first project is created



startup.s

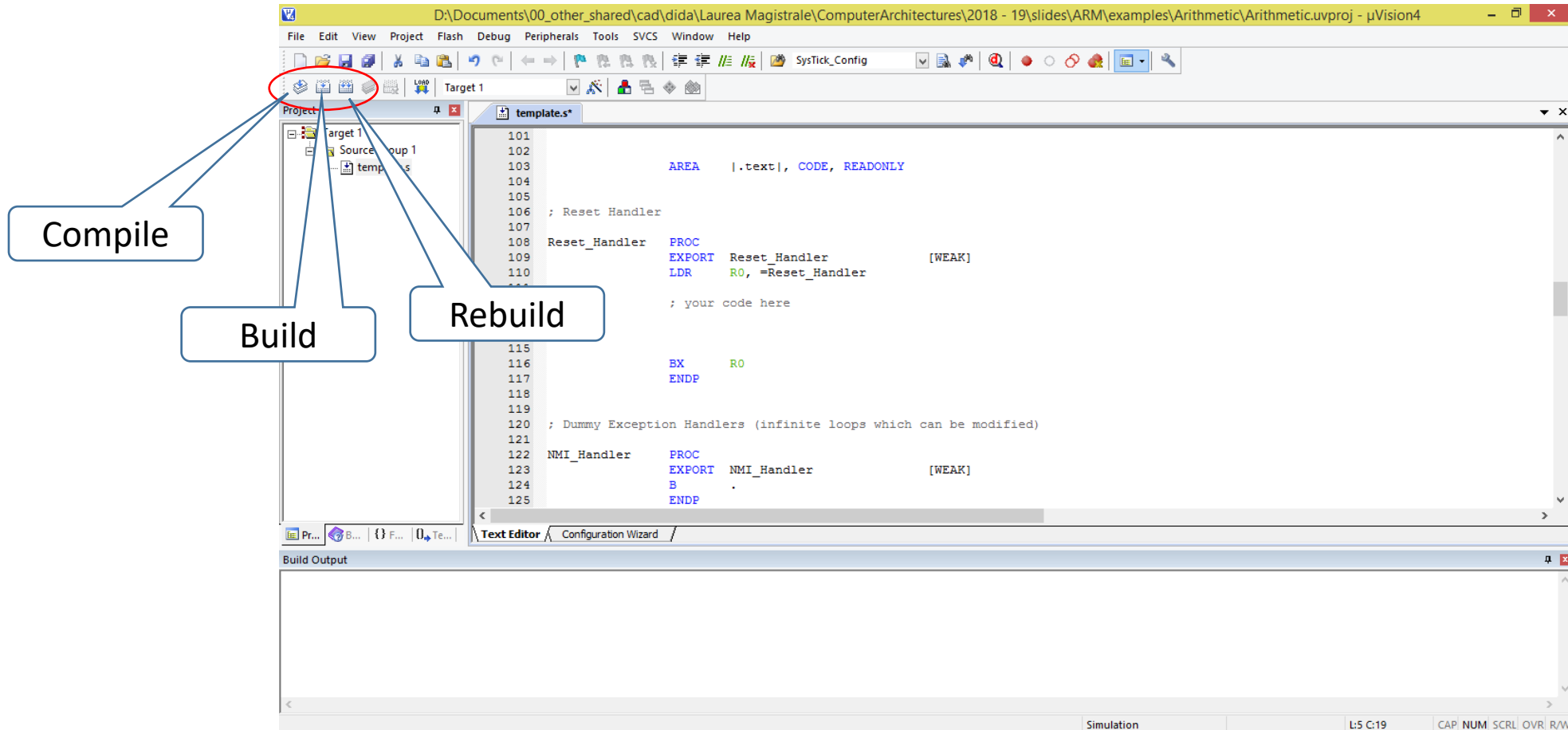


The screenshot shows an IDE window titled "D:\Documents\00_other_shared\cad\did\Laurea Magistrale\Architetture dei Sistemi di Elaborazione\2019_2020\lezioni\ARM\examples\2019_2020\ASM_template\template". The main editor displays the "template.s" file with the following assembly code:

```
121
122
123 ; Reset Handler
124
125 Reset_Handler PROC
126     EXPORT Reset_Handler    [WEAK]
127     LDR     R0, =Reset_Handler
128
129     ; your code here
130
131
132
133     BX      R0
134 ENDP
135
136
137 ; Dummy Exception Handlers (infinite loops which can be modified)
138
139 NMI_Handler PROC
140     EXPORT NMI_Handler    [WEAK]
141     B       .
142 ENDP
143 HardFault_Handler\
144     PROC
145     EXPORT HardFault_Handler    [WEAK]
146     B       .
147 ENDP
148 MemManage_Handler\
149     PROC
150     EXPORT MemManage_Handler    [WEAK]
```

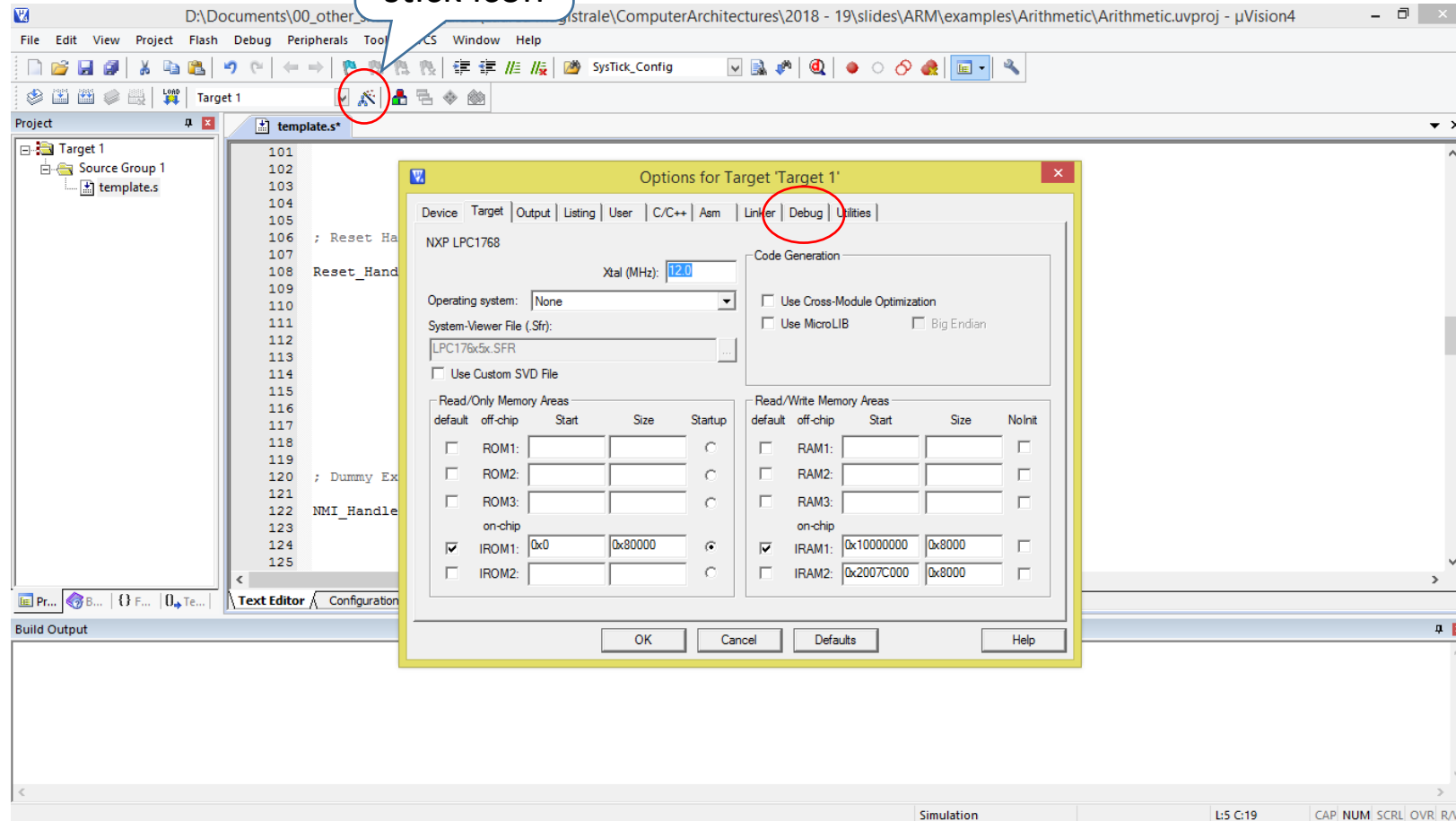
A callout box points to line 125, containing the text: "functionalities: nothing but bringing to the reset handler". Below the callout box, the text "RESET handler at line 125" is written in red.

Build your code

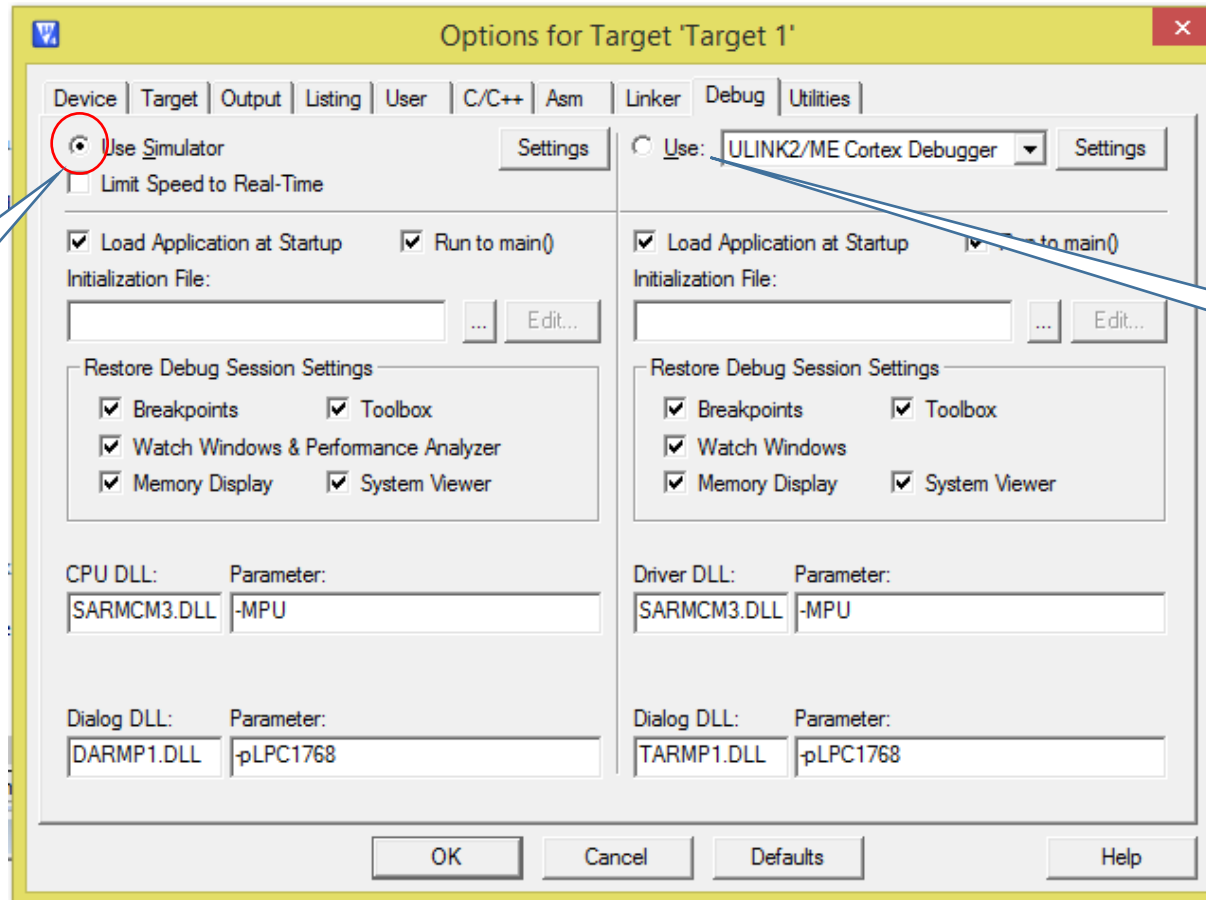


Debug setup

Magical
stick icon



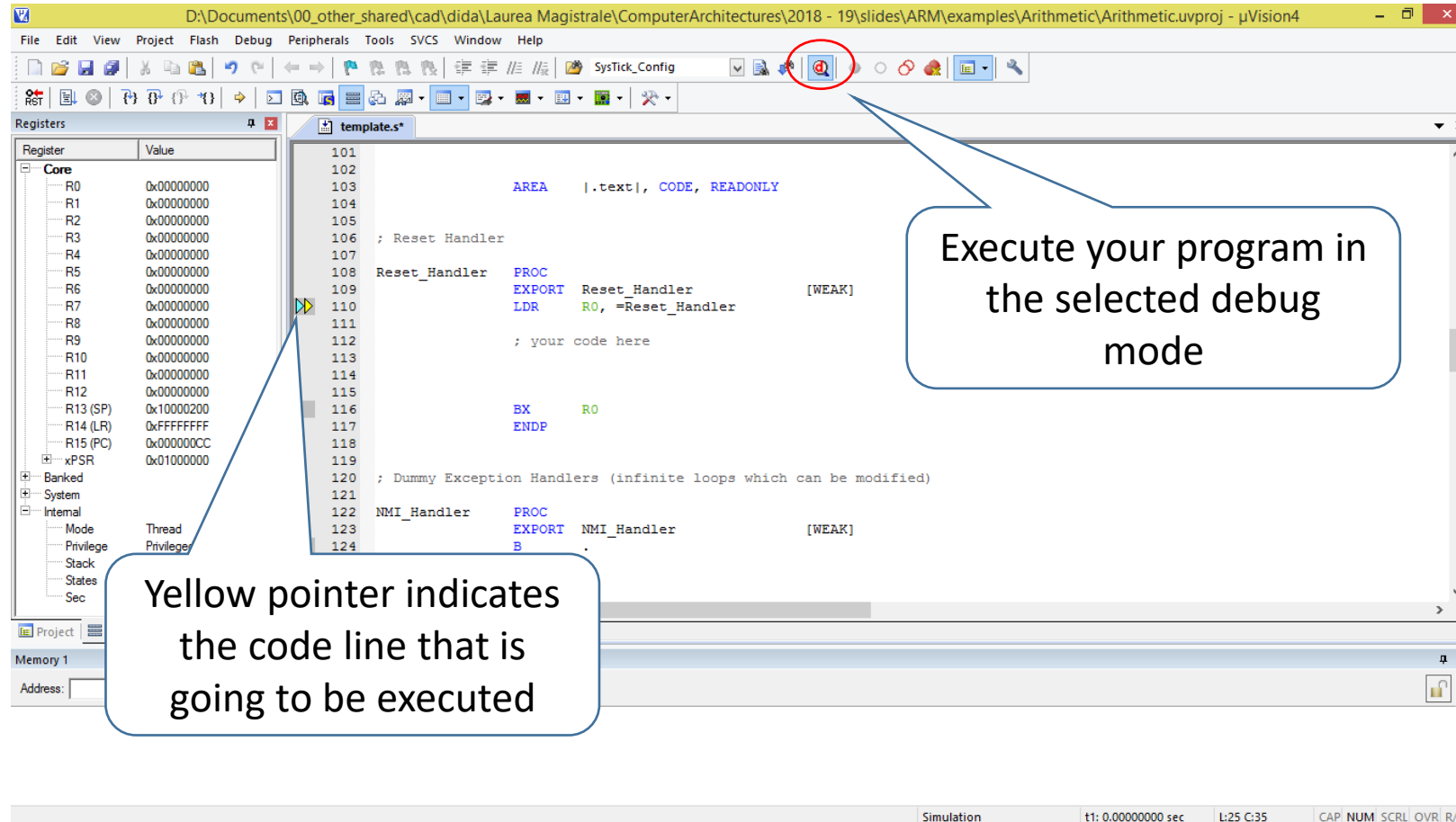
Select type of debug



Software debug
(emulated
functionalities)

Hardware debug
(with board)

Debug: (1) setup breakpoint (2) run debug



Debug execution

The screenshot displays the µVision4 IDE interface with several annotations explaining debugging features:

- RESET: it resets the device**: Points to the 'RESET' button in the top toolbar.
- STEP INTO (F11) STEP OVER (F10)**: Points to the 'Step Into' and 'Step Over' buttons in the top toolbar.
- Breakpoint (set by double click on the gray area close to code line)**: Points to a red dot breakpoint set on line 116 of the code editor.
- RUN TO CURSOR: execution stops only at a breakpoint**: Points to the 'Run to Cursor' button in the top toolbar.
- Execution time**: Points to the 't1: 0.00000000 sec' value in the bottom status bar.

The code editor shows the following assembly code:

```
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103  
104  
105  
106 ; Reset_Handler  
107  
108 Reset_Handler PROC  
109 EXPORT Reset_Handler [WEAK]  
110 LDR R0, =Reset_Handler  
111  
112 ; your code here  
113  
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116 BX R0  
117 ENDP  
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```


Peripherals modules

Open the needed peripheral windows

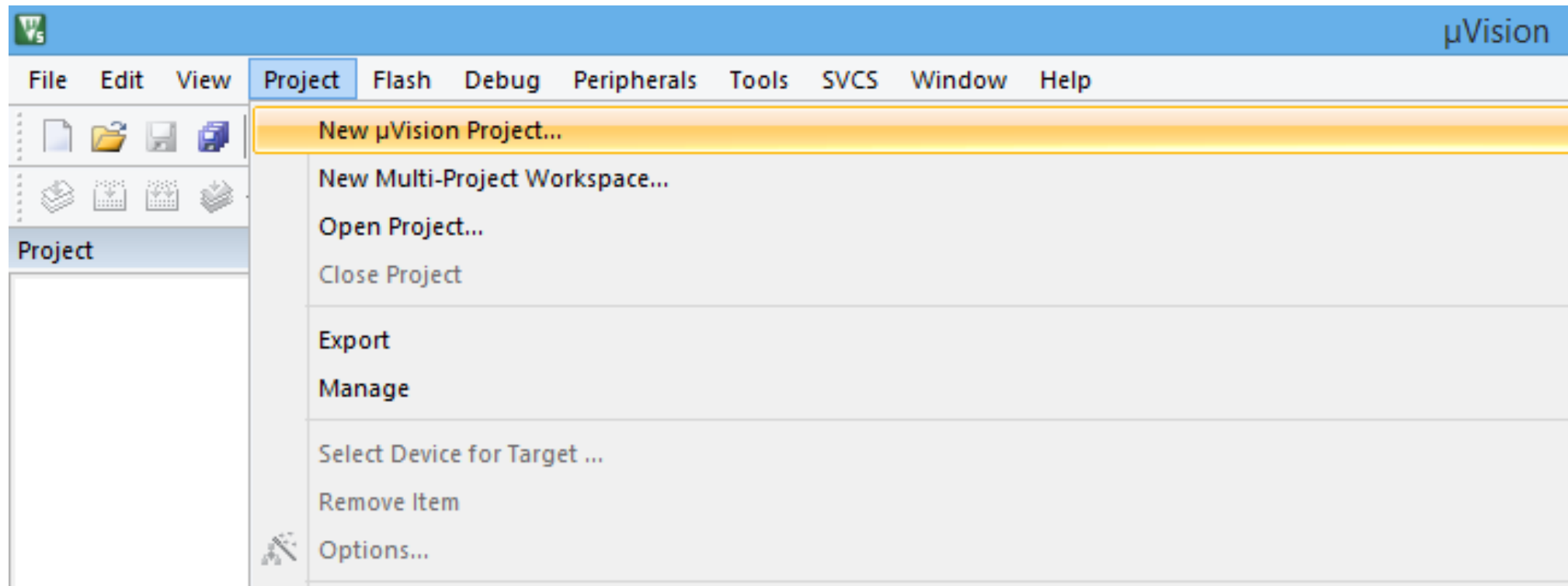
The screenshot displays the Keil uVision IDE interface. The **Peripherals** window is open, showing a list of system components. The **Clocking & Power Control** section is expanded, and the **Clock Generation Schematic** is selected. A callout bubble points to this selection with the text "Open the needed peripheral windows".

The **Clock Generation Schematic** window shows the following components and connections:

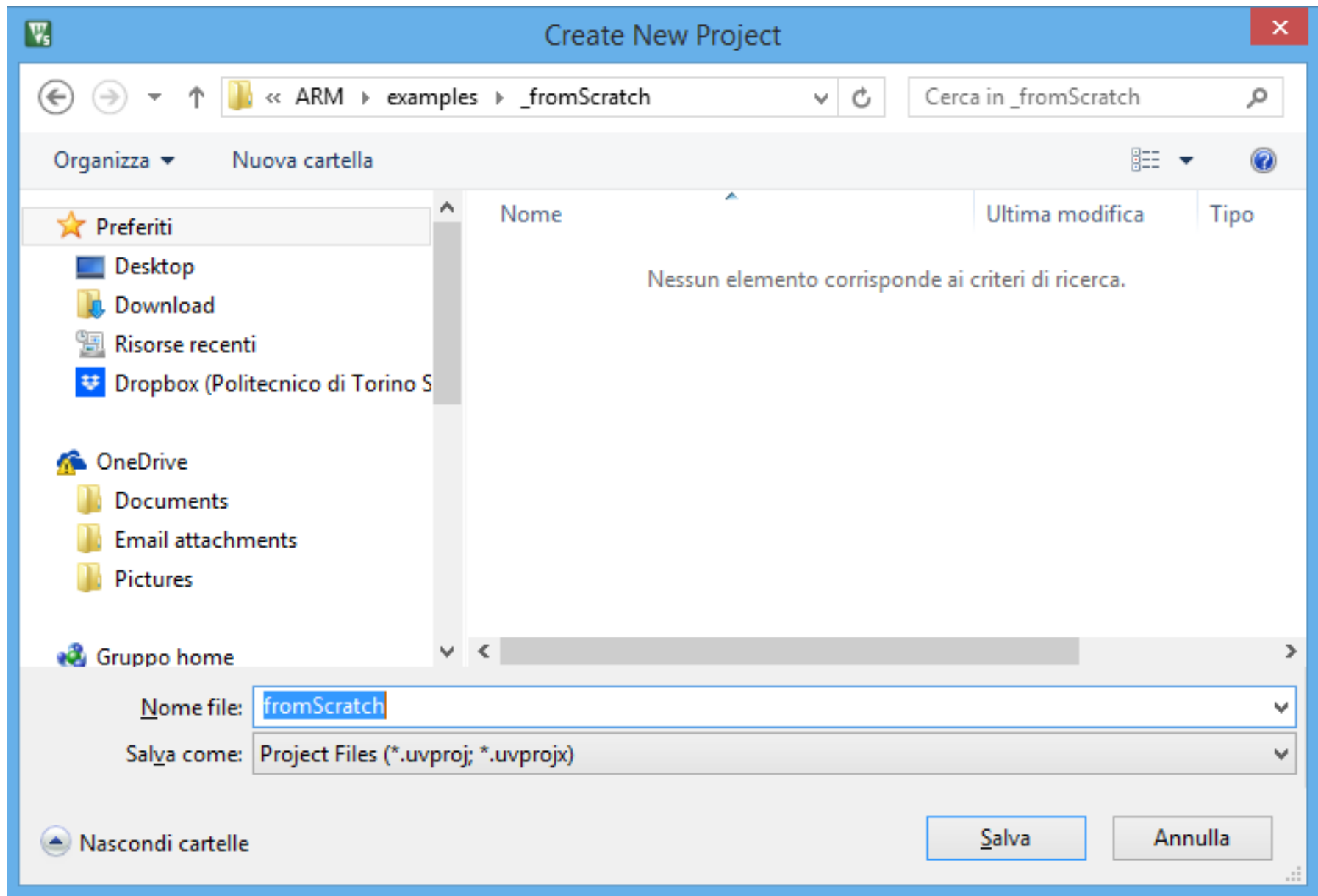
- System clock select (CLKSRCSEL)**: Receives inputs from 4.000 MHz, 0.000 MHz, and 32.768 kHz. Its output goes to the **Main PLL (PL150M)**.
- USB PLL (PL160M)**: Receives input from the **USB PLL settings (PLL1...)**. Its output goes to the **USB PLL select (PLL1CON)**.
- Main PLL (PL150M)**: Receives input from the **System clock select (CLKSRCSEL)**. Its output goes to the **CPU PLL select (PLL0CON)**.
- USB PLL select (PLL1CON)**: Receives input from the **USB PLL (PL160M)**. Its output goes to the **USB Clock Divider**.
- CPU PLL select (PLL0CON)**: Receives input from the **Main PLL (PL150M)**. Its output goes to the **CPU Clock Divider**.
- USB Clock Divider**: Receives input from the **USB PLL select (PLL1CON)**. Its output goes to the **USBCLK** (12.000 MHz) and the **USB clock divider setting (USBCLKCFG)**.
- CPU Clock Divider**: Receives input from the **CPU PLL select (PLL0CON)**. Its output goes to the **CCLK** (12.000 MHz) and the **CPU clock divider setting (CCLKCFG)**.
- Peripheral Clock Divider**: Receives input from the **CPU Clock Divider**. Its output goes to the **PCLK/1** (12.000 MHz), **PCLK/2** (6.000 MHz), **PCLK/4** (3.000 MHz), **PCLK/8** (1.500 MHz), and **wd_clk**.
- Watchdog clock select (WDCLKSEL)**: Receives input from the **System clock select (CLKSRCSEL)**. Its output goes to the **watchdog pclk**.

The bottom status bar shows the simulation time: **t1: 0.00000000 sec**.

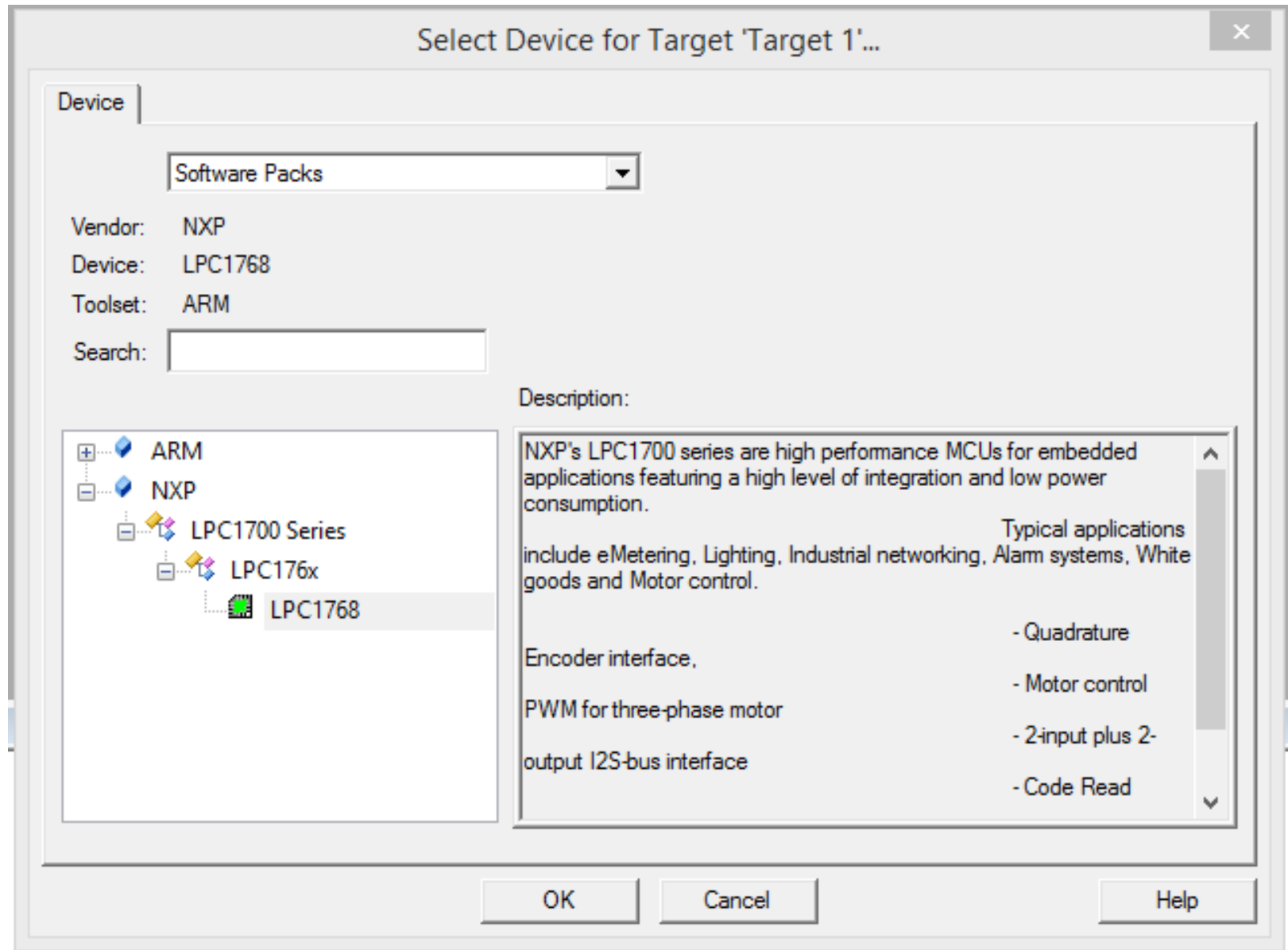
Create your own project from scratch



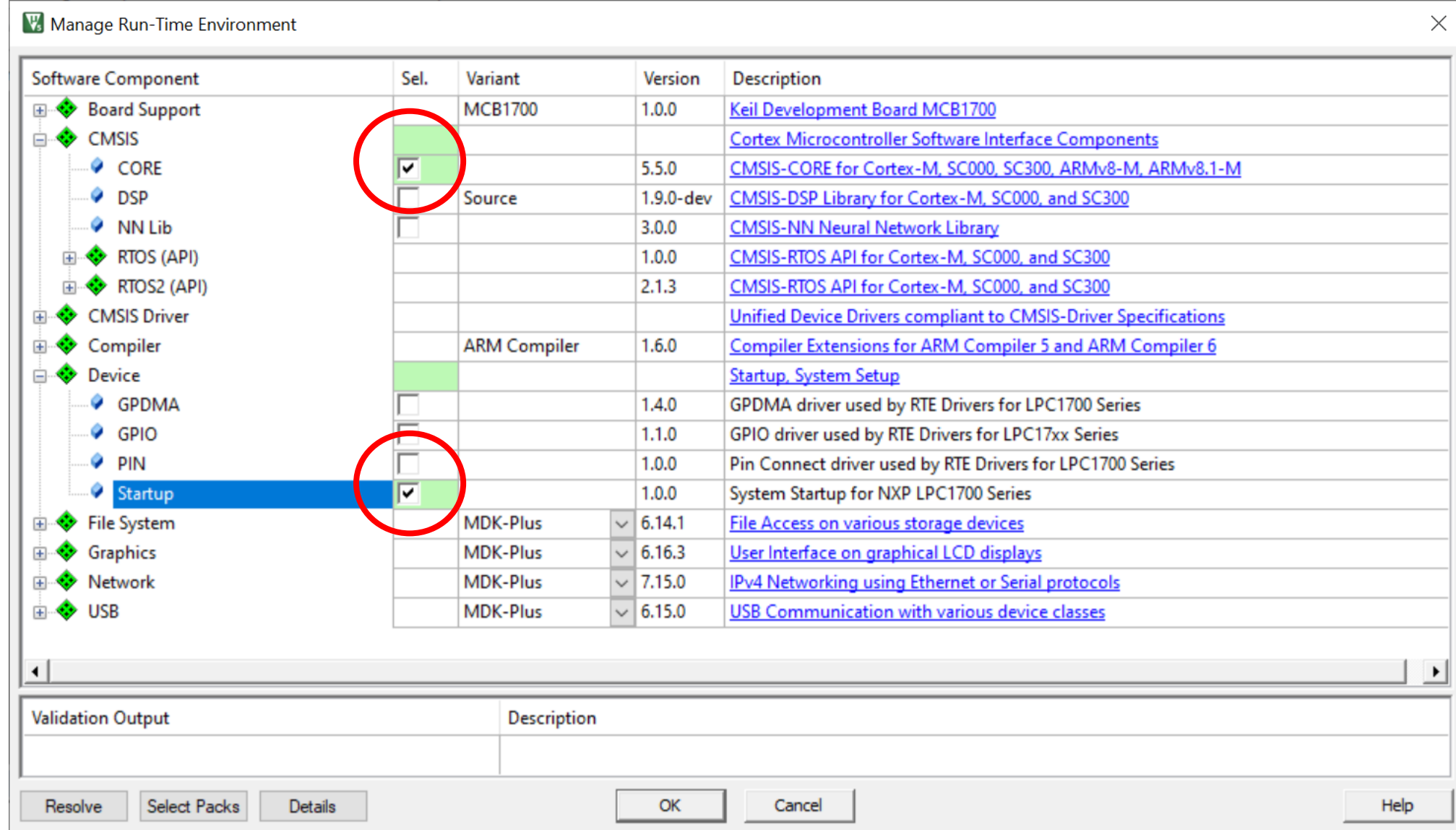
Select a folder and a name



Select the device



Request inclusion of startup files



Request inclusion of startup files

The screenshot shows the uVision IDE interface. On the left, the 'Project' window displays the project structure for 'from_scratch'. Under 'Target 1', there is a 'Source Group 1' containing 'CMSIS' and 'Device'. The 'Device' folder is expanded, showing 'RTE_Device.h (Startup)', 'startup_LPC17xx.s (Startup)', and 'system_LPC17xx.c (Startup)'. A blue callout bubble points to the 'startup_LPC17xx.s' file with the text 'add a main.c'.

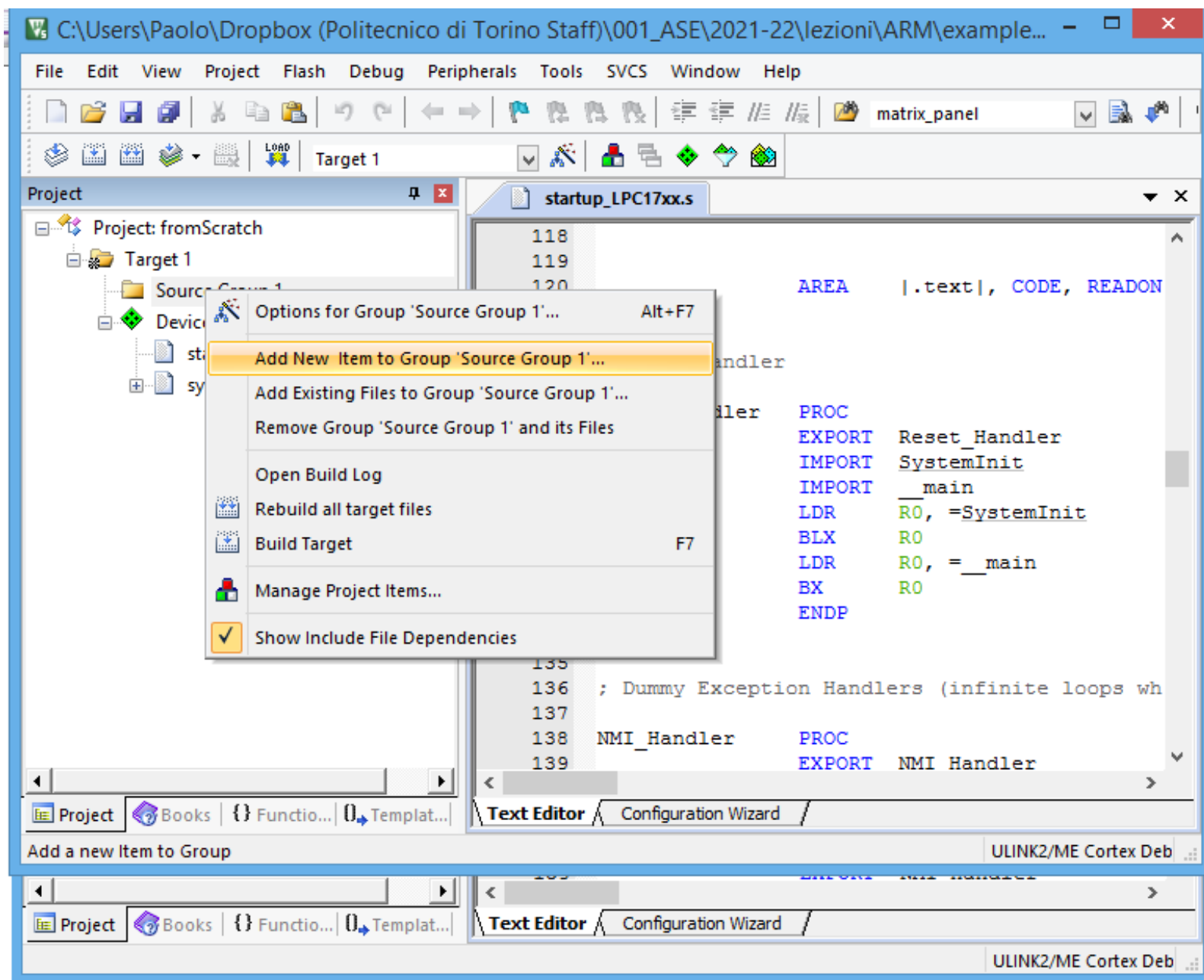
The main editor window displays the assembly code for 'startup_LPC17xx.s'. The code includes a 'Reset_Handler' section and 'Dummy Exception Handlers'. A blue callout bubble points to the 'Reset_Handler' section with the text 'Comment to programming ASM'.

```
121
122
123 ; Reset_Handler
124
125 Reset_Handler PROC
126     EXPORT Reset_Handler
127     IMPORT SystemInit
128     IMPORT __main
129     LDR R0, =SystemInit
130     BLX R0
131     LDR R0, =__main
132     BX R0
133     ENDP
134
135
136 ; Dummy Exception Handlers (infinite loops which can be modified)
137
138 NMI_Handler PROC
139     EXPORT NMI_Handler [WEAK]
140     B .
141     ENDP
142 HardFault_Handler\
143     PROC
144     EXPORT HardFault_Handler [WEAK]
```

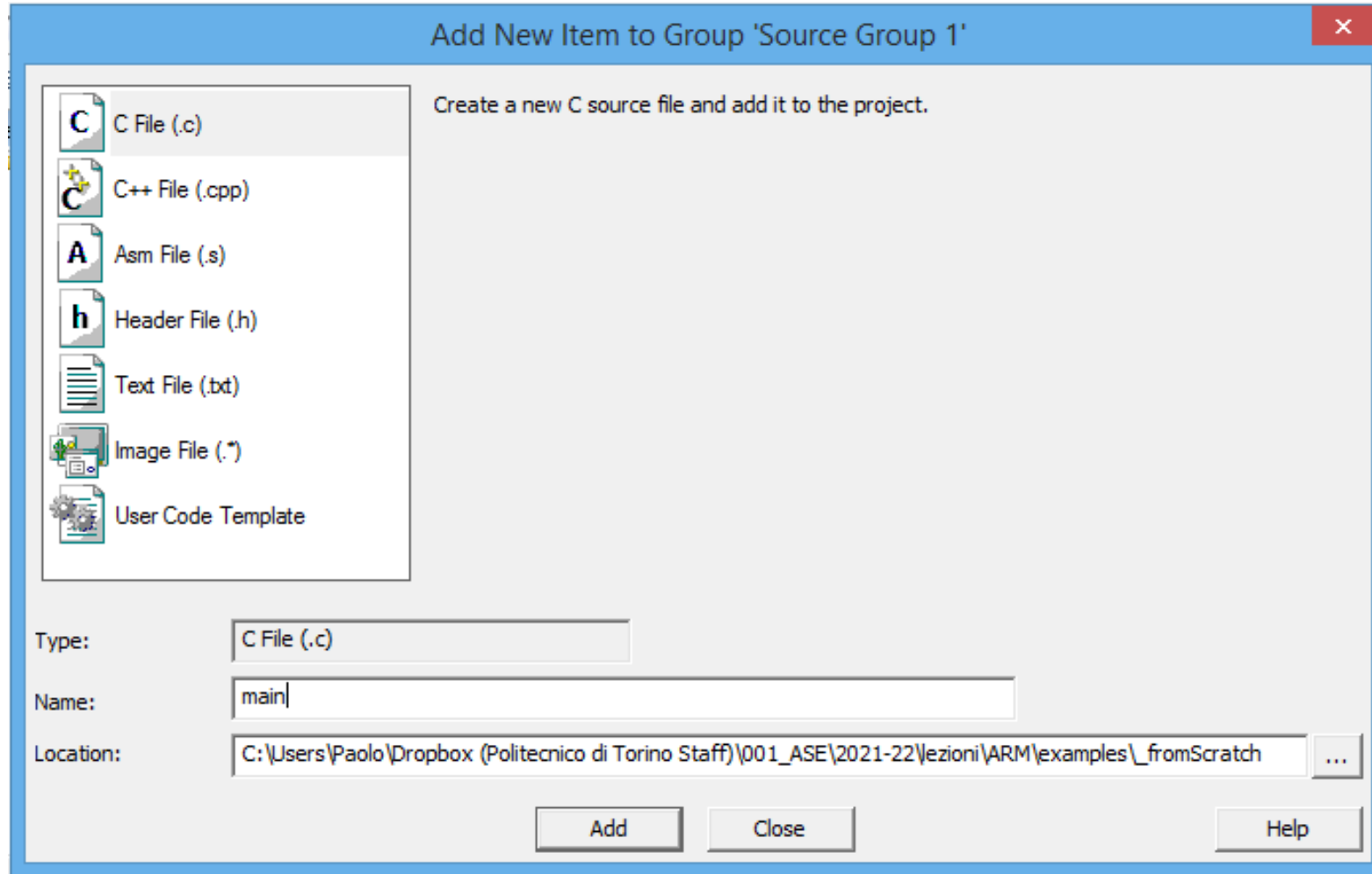
Build Output

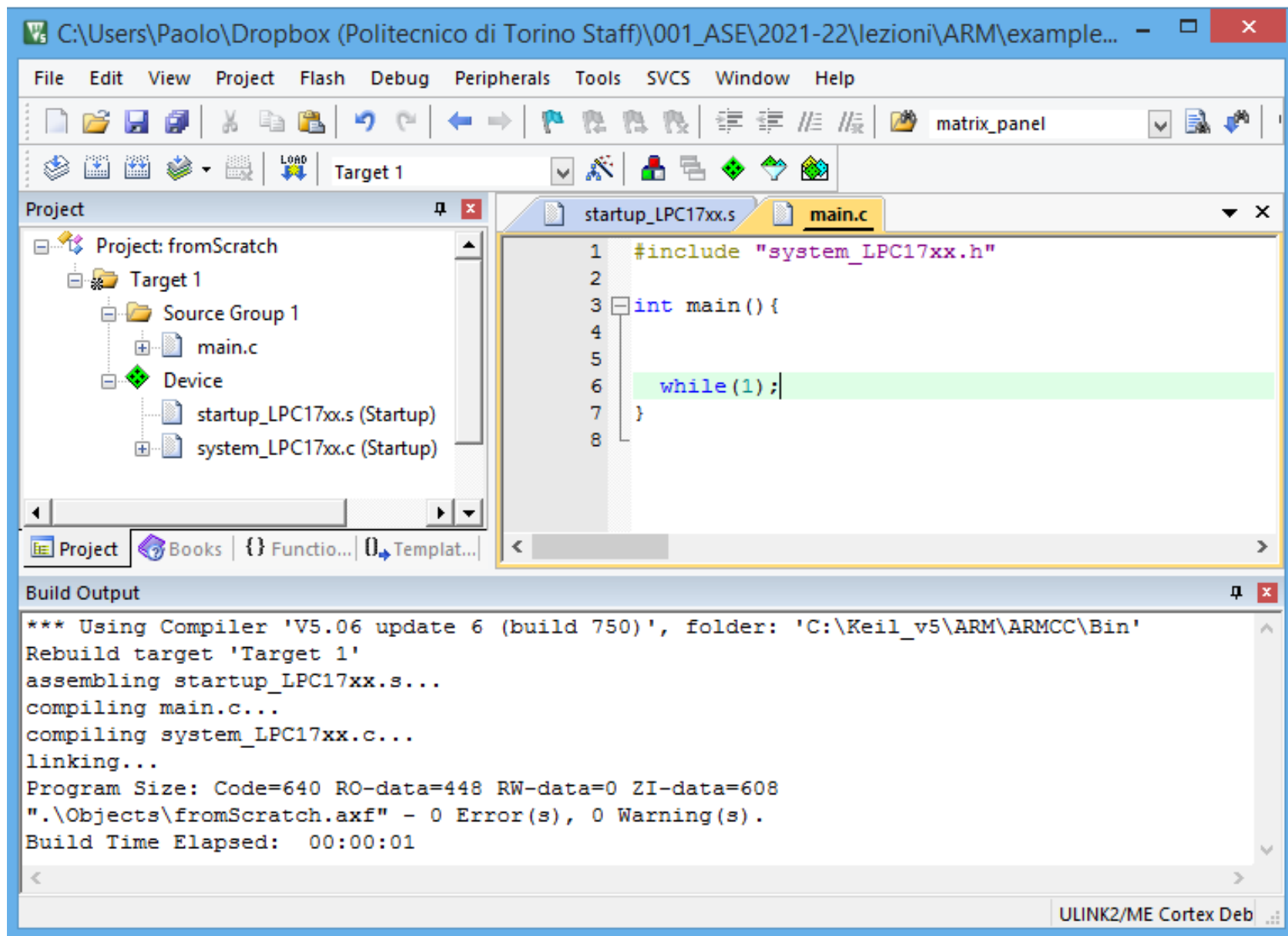
ULINK2/ME Cortex Debugger L:1 C:1 CAP NUM SCRL OVR R/W

Add main file



Add main file





Check for correct device peripherals simulation

Change the Dialog DLL and Parameter values as follows:

