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STM32 - First Trial

Dr. Federica Villa



Objective of this first trial is to learn:

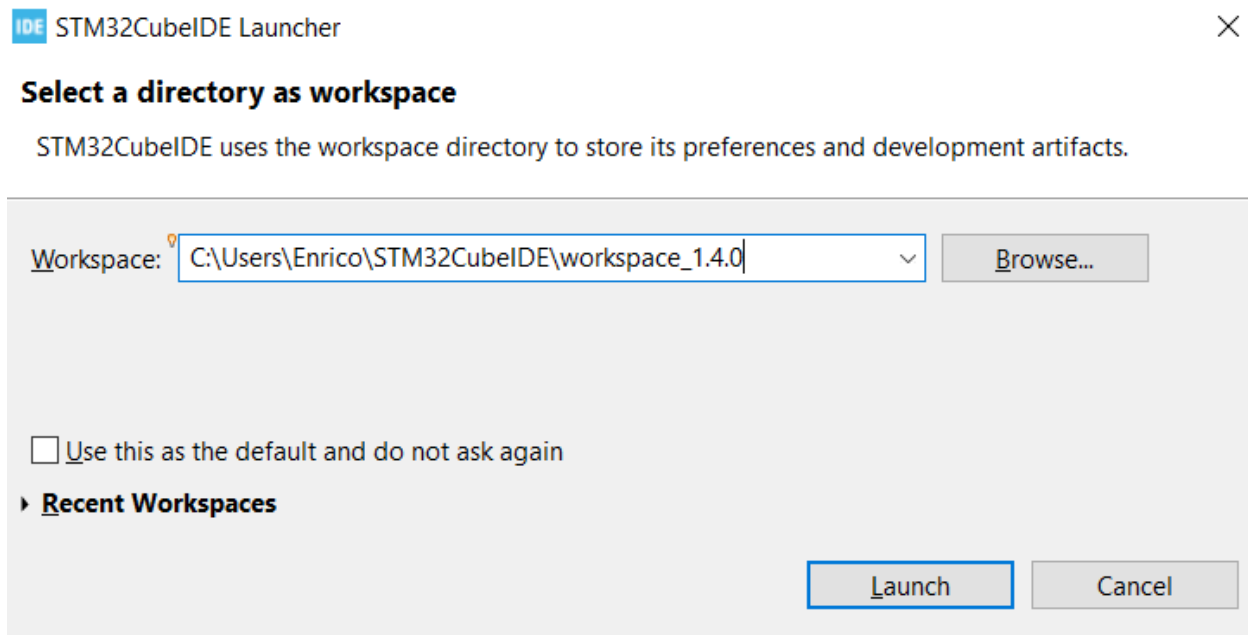
- how to create and configure a new project
- which is the structure of the Cube-generated code
- how to compile and debug a code

Last but not least it is useful to check if all the software and drivers have been correctly installed



New project with Cube

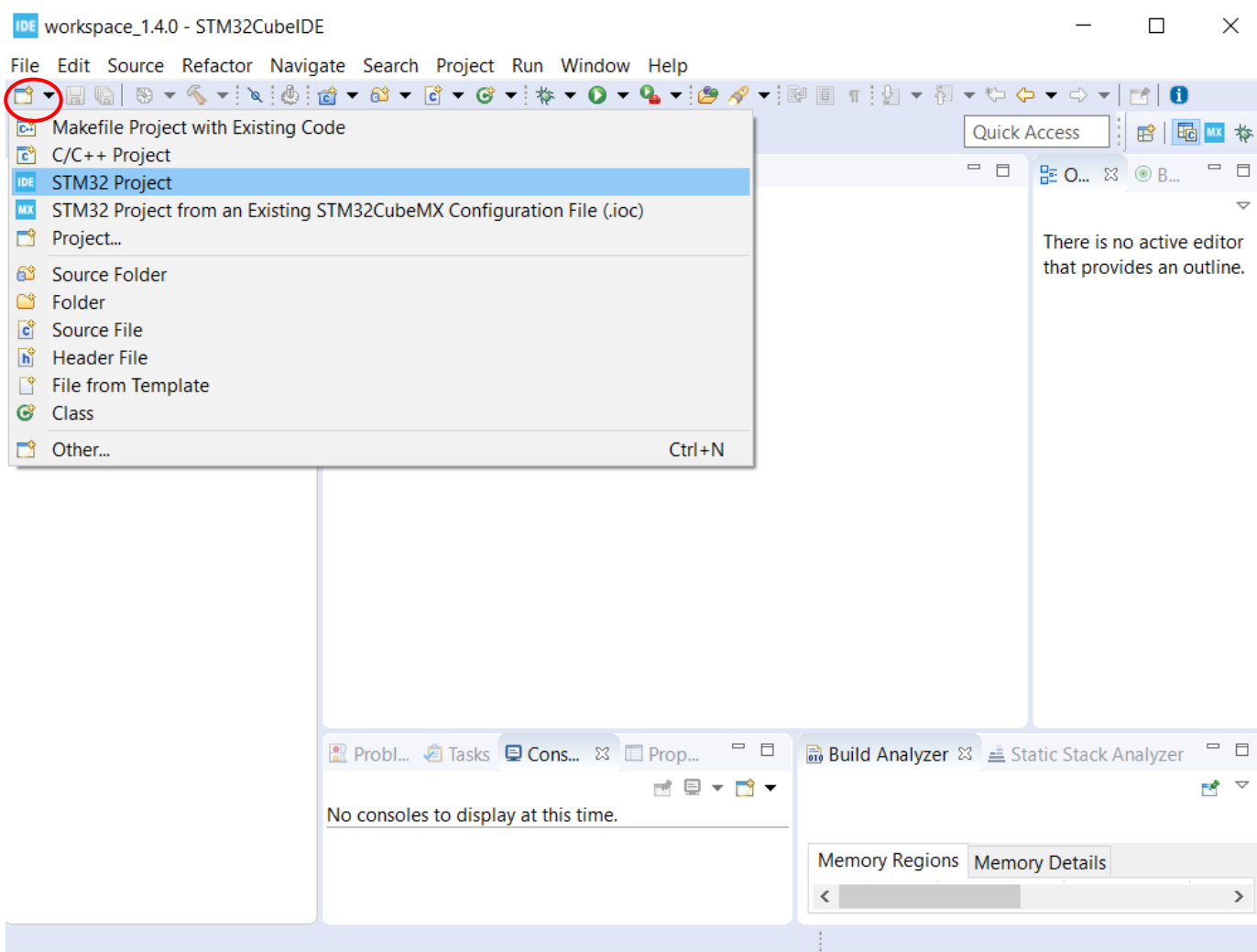
- Open **STM32CubeIDE**
- Select a folder for the workspace and click “Launch”
- Accept to download any eventual new library / update
(the first time you use the SW it might prompt you to download libraries and updates, always accept and wait, they can take some minutes)





New project with Cube

- Click on the downwards arrow next to “New” → STM32 Project
[Setup from existing STM32CubeMX projects can be imported by choosing “STM32 Project from an Existing STM32CubeMX Configuration file (.ioc)”]





Board Selection

NUCLEO-F401RE

STM32 Project

Target Selection

STM32 target or STM32Cube example selection is required

MCU/MPU Selector **Board Selector** Example Selector Cross Selector

Board Filters

- Commercial Part Number: F401RE (selected), NUCLEO-F401RE
- Vendor: >
- Type: >
- MCU/MPU Series: >
- Other: >
- Peripheral: >

Features Large Picture Docs & Resources **Datasheet**

Boards List: 1 item

	Overview	Conversion	Time	Marketing Stat...	Unit Price (US\$)	Mounted Device
☆		NUCLEO-F401RE	Nucleo-64	Active	13.0	STM32F401RETx

< Back Next > Finish Cancel

- Select **NUCLEO-F401RE**
- If you need, download **datasheet** and other documentation
- Click “Next”



Board selection

STM32 Project

Target Selection

STM32 target or STM32Cube example selection is required

MCU/MPU Selector Board Selector Example Selector Cross Selector

Board Filters

Commercial Part Number: F401RE
Vendor: NUCLEO-F401RE

Type: >
MCU/MPU Series: >
Other: >
Peripheral: >

Features Large Picture Docs & Resources Datasheet

Boards List: 1 item

	Overview	Commercial P...	Type	Marketing Stat...	Unit Price (US\$)	Mounted Device
		NUCLEO-F401RE	Nucleo-64	Active	13.0	STM32F401RETx

< Back Next > Finish Cancel

- **DO NOT SELECT THE BOARD USING THIS LINK**
- Otherwise you are selecting an uninitialized version of the board which will not work.



Project generation

IDE STM32 Project

✖ Empty project name is not supported

Project

Project Name:

☒ Use default location

Location:

Options

Targeted Language
☒ C ☐ C++

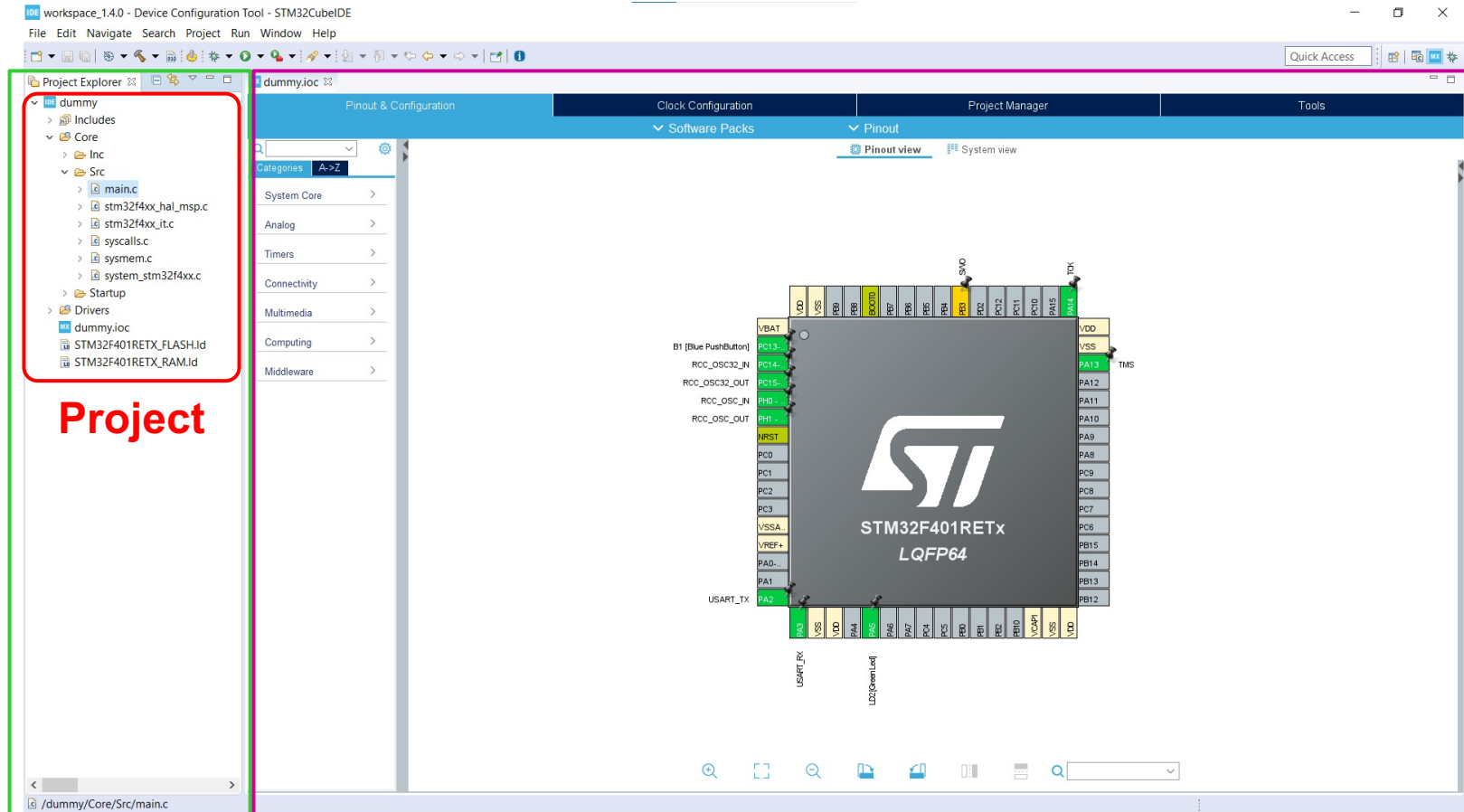
Targeted Binary Type
☒ Executable ☐ Static Library

Targeted Project Type
☒ STM32Cube ☐ Empty

- Choose a **Project Name**
- Click **“Finish”**
- Click **“Yes”** on the prompt **“Initialize all peripherals with their default mode?”**
- Let the code generator run



STM32CubeIDE interface



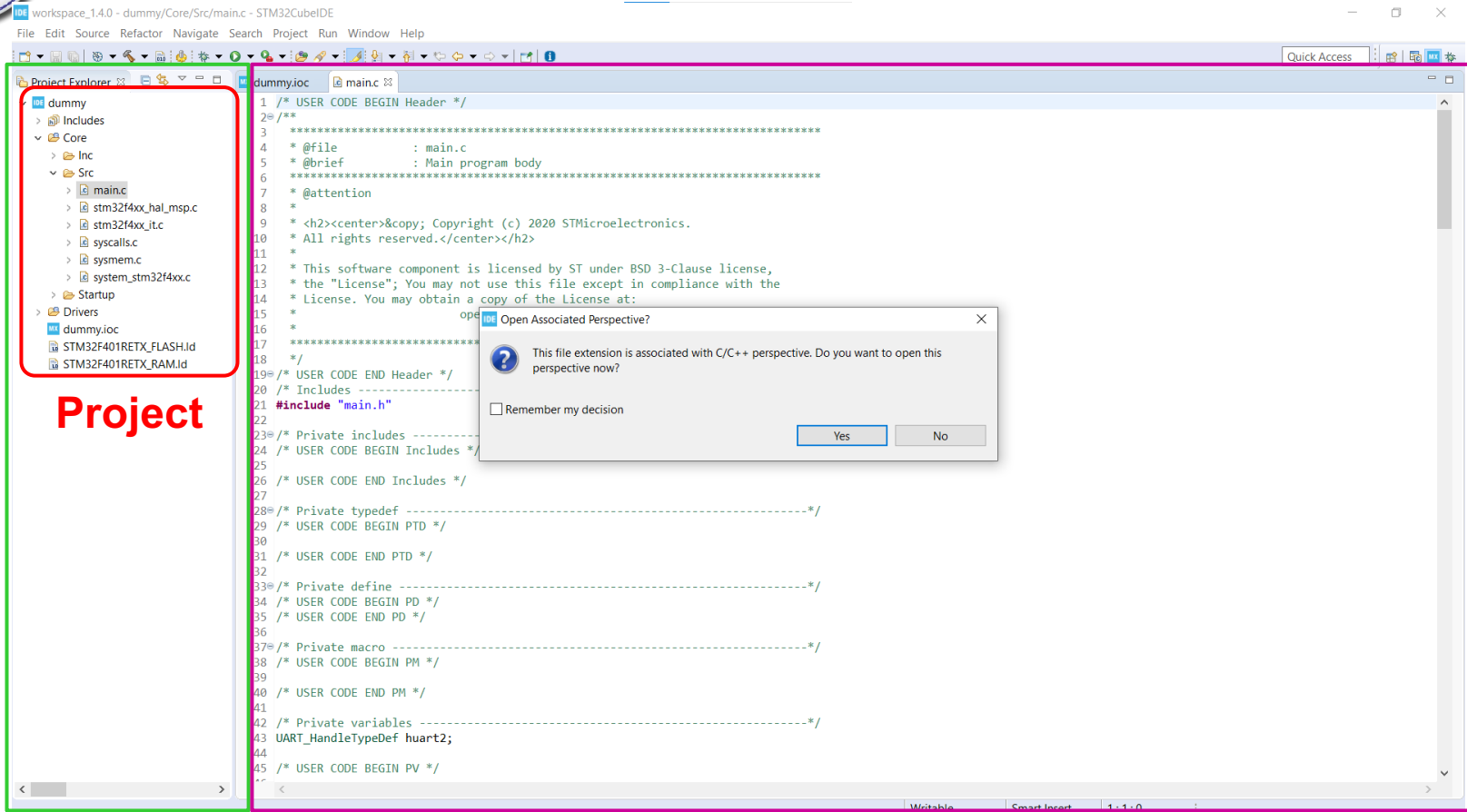
Workspace

Device configurator
(STM32CubeMX)

- Double click “main.c”



STM32CubeIDE interface



Project

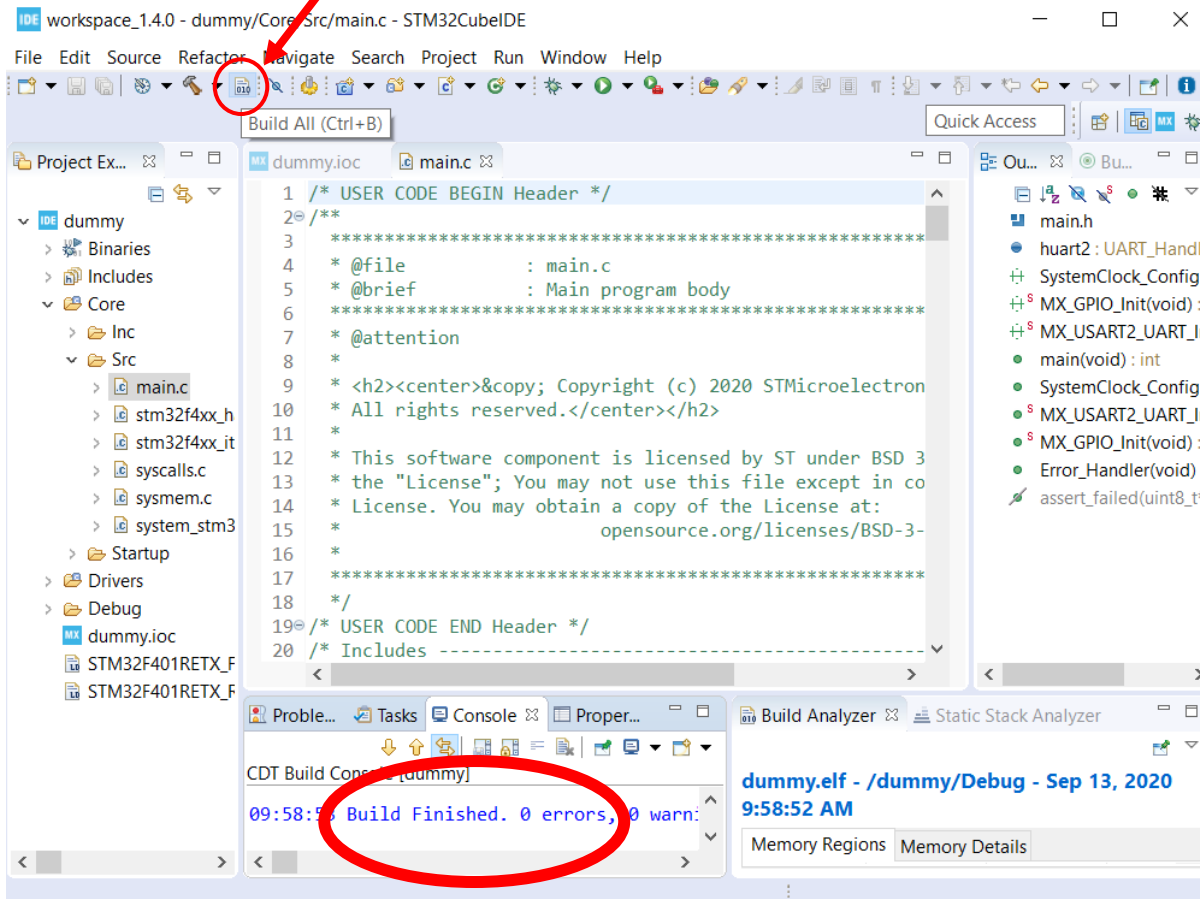
Workspace

The IDE layout dynamically changes depending on the action being performed (coding, debugging, etc...)
Answer “Yes” when prompted to change perspective



Project code

Build All

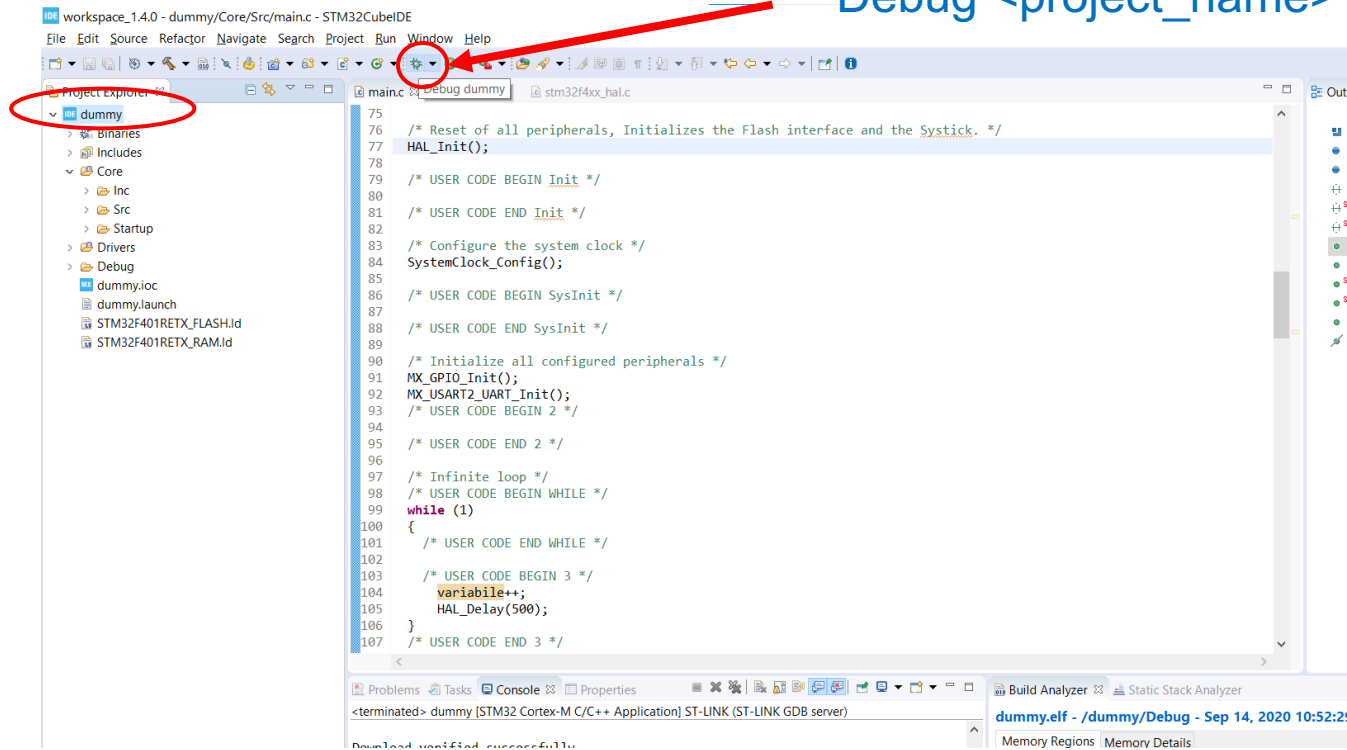


- Some parts of the code are already written (based on user settings selected with Cube)
- Between */*USER CODE BEGIN* and */*USER CODE END* it is possible to add code, which will be not modified even in case the settings in Cube are modified and code is generated again.
- Click **Build All**
- Check in the *Console* if the code has been built with **"0 Error(s)"**



Start debug session

Debug <project_name>



- Connect the Nucleo board to the PC through the USB link
- Select the project name on the left panel
- Click on “Debug <project_name>”
- If prompted, update the ST-Link firmware, wait for completion, reconnect the USB port and re-launch the debug session



Debug session

Edit Configuration

Edit launch configuration properties

Name: dummy

Main | Debugger | Startup | Source | Common

GDB Connection Settings

☒ Autostart local GDB server Host name or IP address: localhost

☐ Connect to remote GDB server Port number: 61234

Debug probe: ST-LINK (ST-LINK GDB server)

GDB Server Command Line Options

Interface

☒ SWD ☐ JTAG

☐ ST-LINK S/N: [] Scan

Frequency (kHz): Auto

Access port: 0 - Cortex-M4

Reset behaviour

Type: **Software system reset**

Serial Wire Viewer (SWV)

☐ Enable

Clock Settings

Core Clock: 16.0 MHz

SWO Clock: 2000 kHz

Port number: 61235

☒ Wait for sync packet

Device settings

Debug in low power modes: Enable

Suspend watchdog counters while halted: No configuration

Misc

☒ Verify flash download

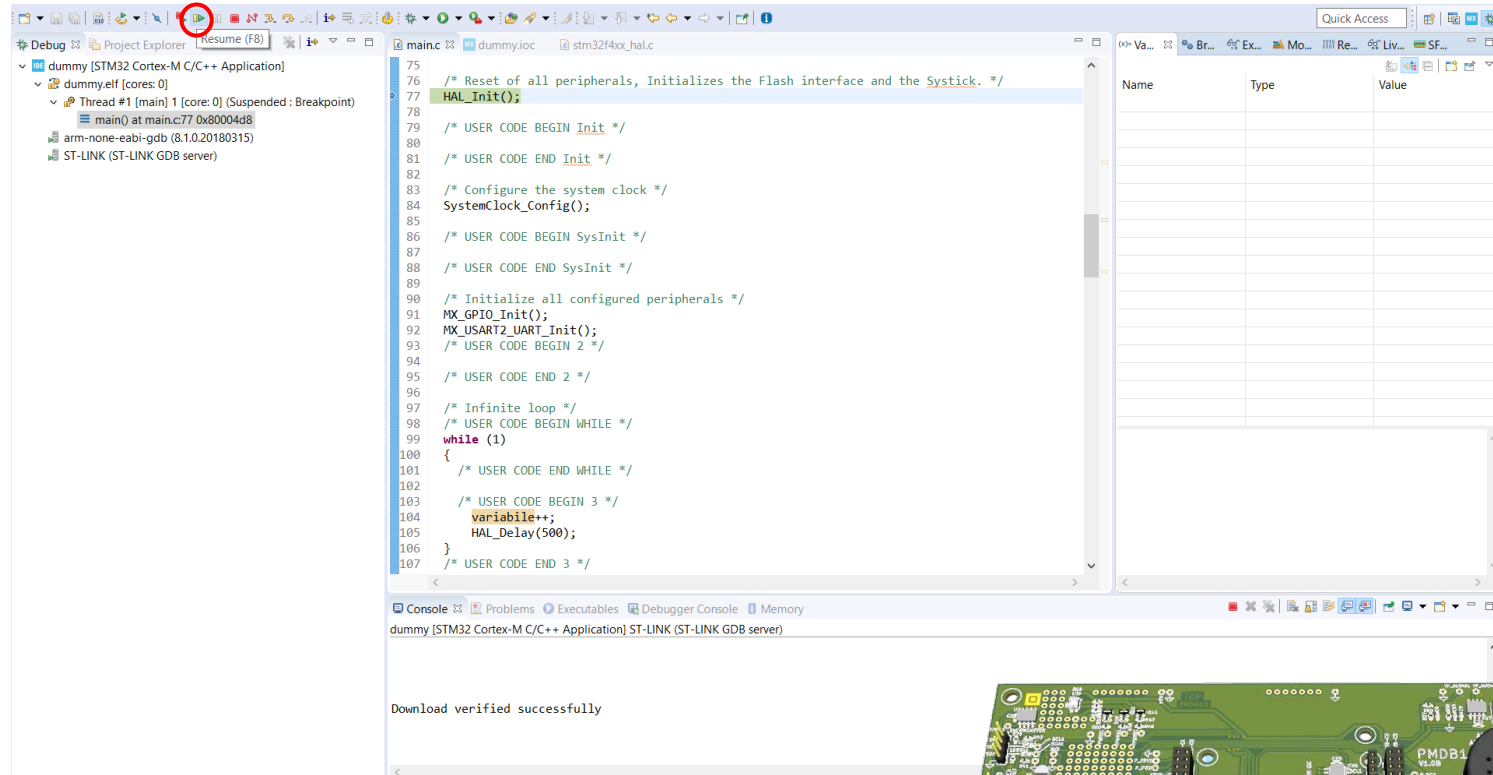
Revert Apply

OK Cancel

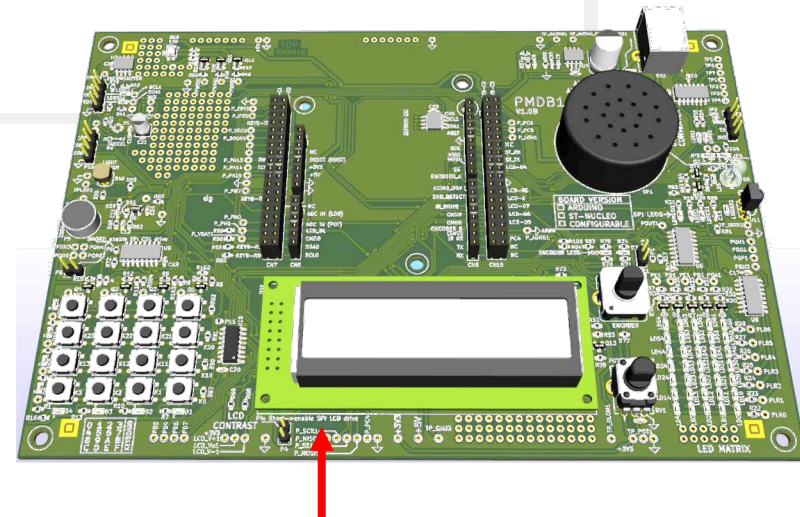
- Configure the debugger as shown on the left
- Most configuration are at their default value, except "Reset behaviour"



Debug software execution



- Start code execution by pressing “Resume” [F8]
- Global variables can be monitored in real time by adding them to the “Live expression” pane on the right



Red LED



End

Congratulations!
**Your tools have been
correctly installed!**



STM32CubeMX + Keil workflow



Objective of this first trial is to learn:

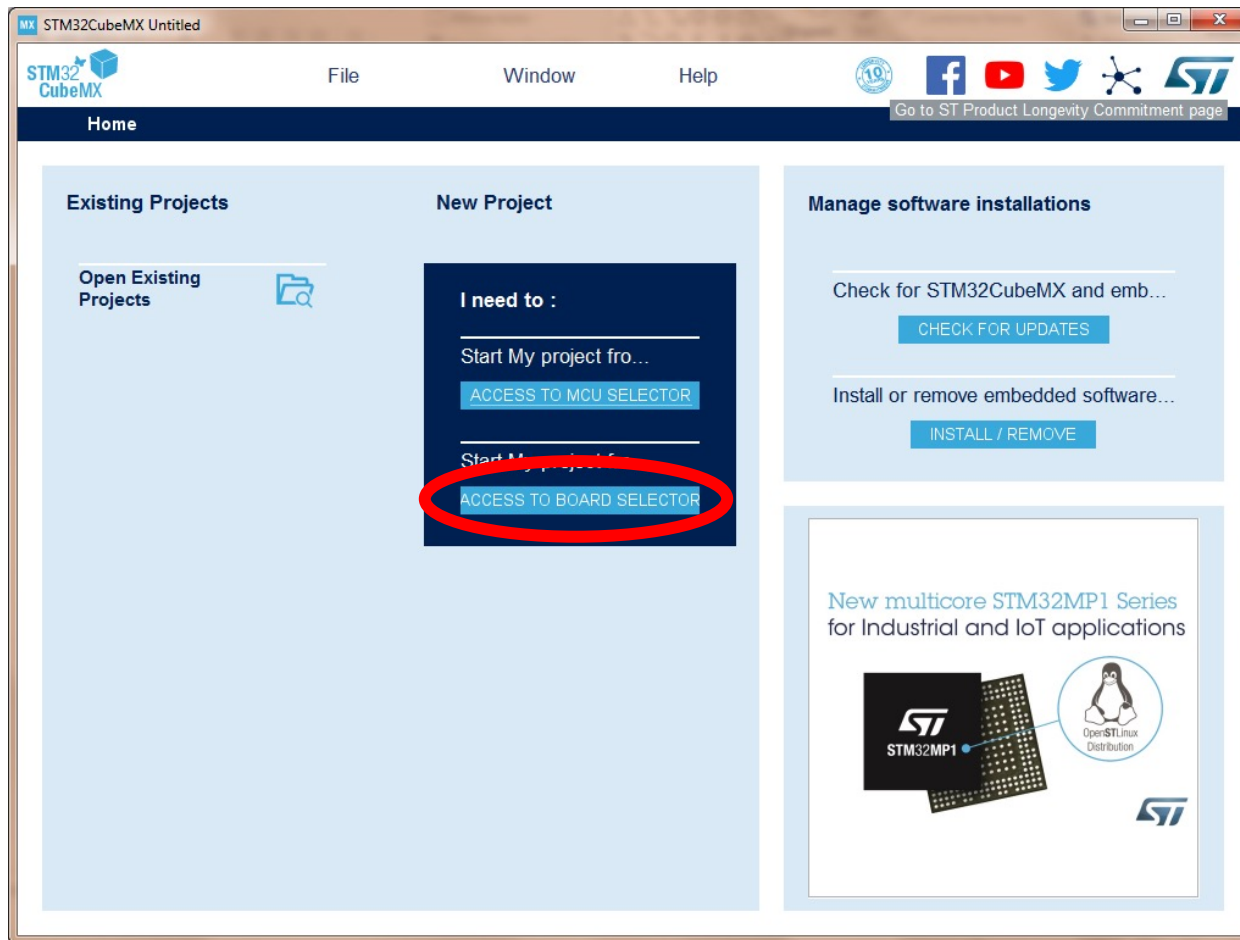
- how to create a new project with Cube
- how to generate a code for Keil
- which is the structure of the Cube-generated Keil code
- how to compile and debug a code

Last but not least it is useful to check if all the software and drivers have been correctly installed



New project with Cube

- Open **STM32CubeMX**
- **New Project**, select **“ACCESS TO BOARD SELECTOR”**
- Accept to download any eventual new library / update
(the first time you use Cube it will prompt you to download libraries and updates, always accept and wait, they can take some minutes)





Board Selection

NUCLEO-F401RE

Board Filters

Part Number Search

Vendor

Type

MCU Series

Other

Price = 13.0

Oscillator Freq. = 0 (MHz)

Peripheral

Boards List: 1 item

	Overview	Part No	Type	Marketing Status	Unit Price (US\$)	Mounted Device
★		NUCLEO-F401RE	Nucleo64	Active	13.0	STM32F401RETx

- Select **NUCLEO-F401RE**
- If you need, download datasheet and other documentation
- **Start Project**
- Initialize peripherals with their default Mode? **YES**

Project

Project Settings

Project Name

first_trial

Project Location

C:\Users\MiSPIA\Dropbox (DEIB)

Browse

Application Structure

Basic

☐ Do not generate the ma...

Toolchain Folder Location

C:\Users\MiSPIA\Dropbox (DEIB)\first_trial\

Toolchain / IDE

MDK-ARM V5

☐ Generate Under Root

Code Generator

Advanced Settings

Linker Settings

Minimum Heap Size 0x200

Minimum Stack Size 0x400

Mcu and Firmware Package

Mcu Reference

STM32F401RETx

Firmware Package Name and Version

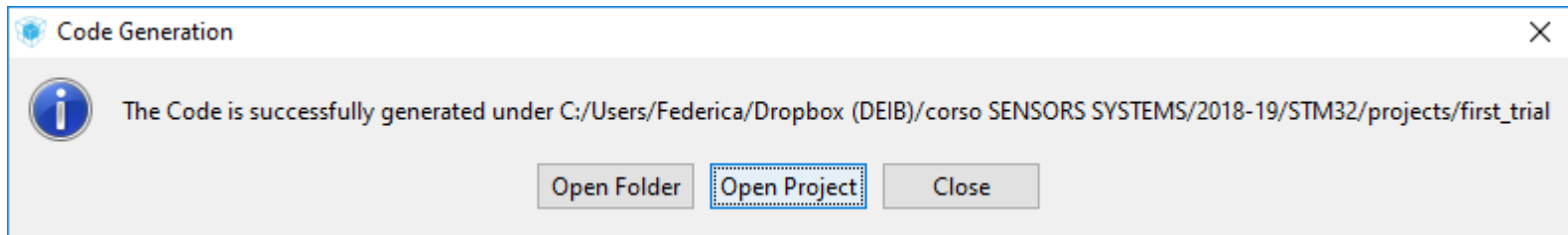
STM32Cube FW_F4 V1.23.0

☒ Use latest available version☒ Use Default Firmware Location

- In the Project manager tab:
 - project name
 - project location
 - MDK-ARM V5
- **GENERATE CODE**, the code will be generated (the first time you generate it requires to install libraries through Pack-Installer).



Open Keil project

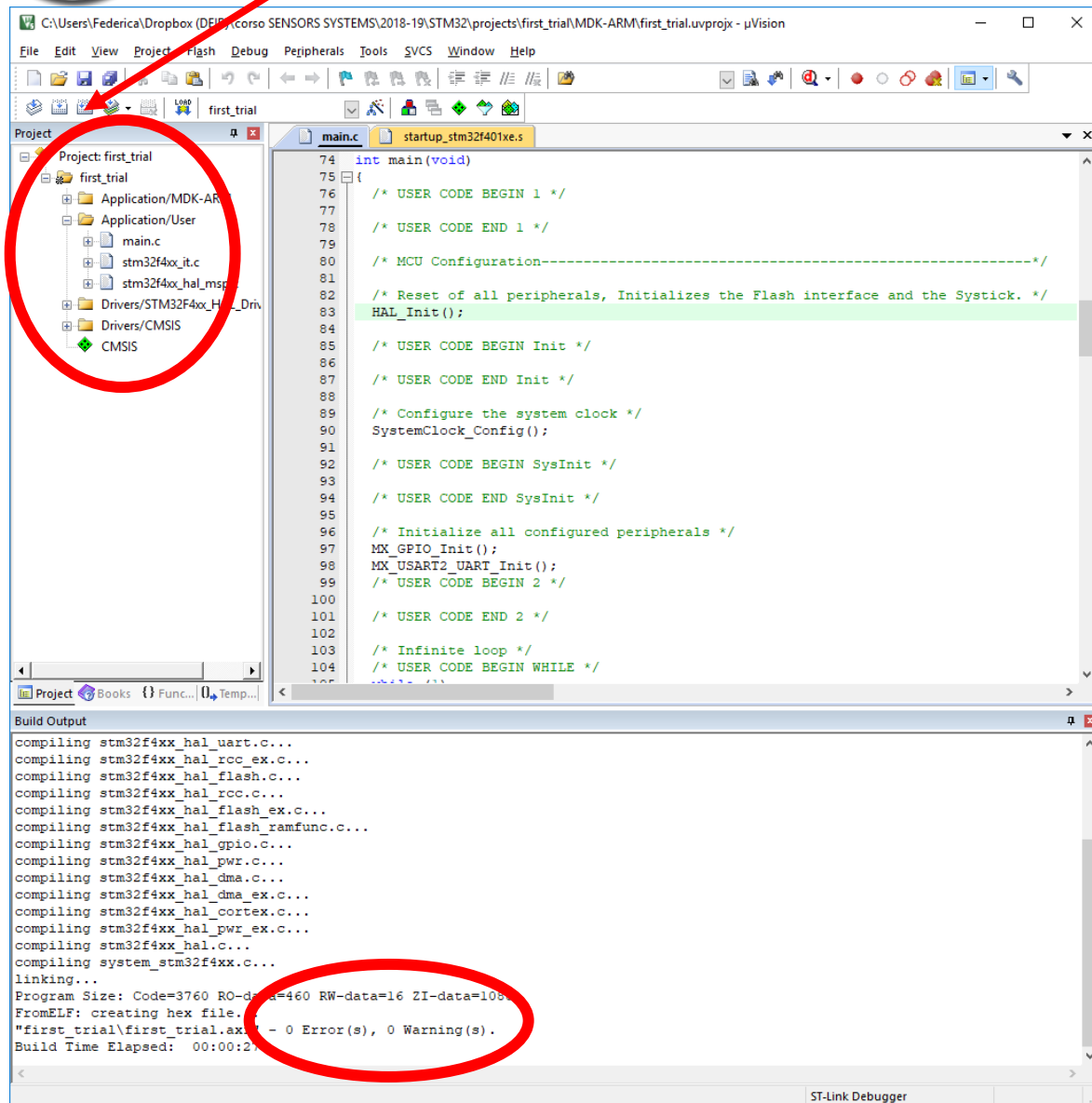


- Select **Open Project**
- In the future if you need to generate the code again and you already have the project open in Keil, select **Close**, and in Keil accept to reload the project



Project code

Rebuild



- Open **main.c** from the *Project window* (on the left)
- Some parts of the code are already written (based on user settings selected with Cube)
- Between */*USER CODE BEGIN* and */*USER CODE END* it is possible to add code, which will be not modified even in case the settings in Cube are modified and code is generated again.
- Click **Rebuild**
- Check in the *Build Output window* if the code has been build with **0 –Error(s)**

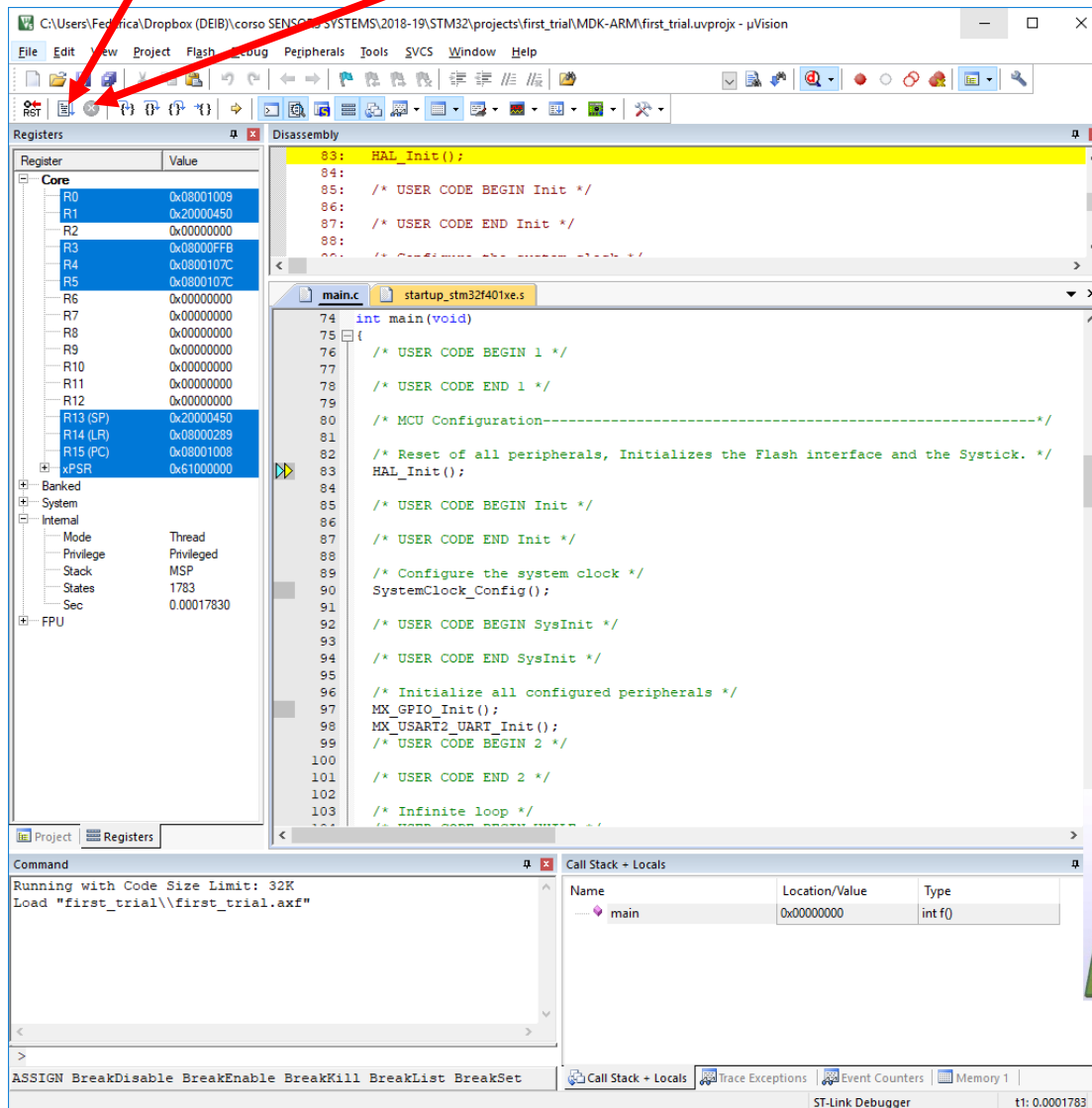


- Connect the Nucleo board to the PC through the USB link
- Click **Start/Stop debug session**
- If asked, update the ST-link drivers
- Evaluation Mode → OK

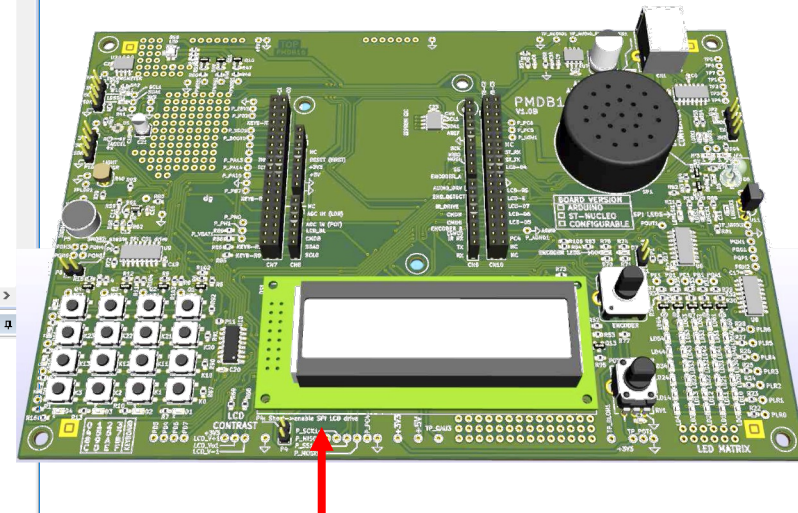


Debug session

Run (F5) Stop



- Click **Run (F5)** to run the code
- In this first trial a red LED on the Sensors Board should switch on
- **Stop** and click on **Start/Stop debug session** to come back to the code.



Red LED



End

Congratulations!
**Your tools have been
correctly installed!**