LAB 06
THE IKS01A2 MODULE

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PRELIMINARY DOWNLOADS

PRELIMINARY DOWNLOADS

Before we start, please download all the file contained inside the drive folder:

https://drive.google.com/drive/folders/1BfbaYt5Bvy6v2NRF1YHlKbplc5kHMwEZ?usp=sharing

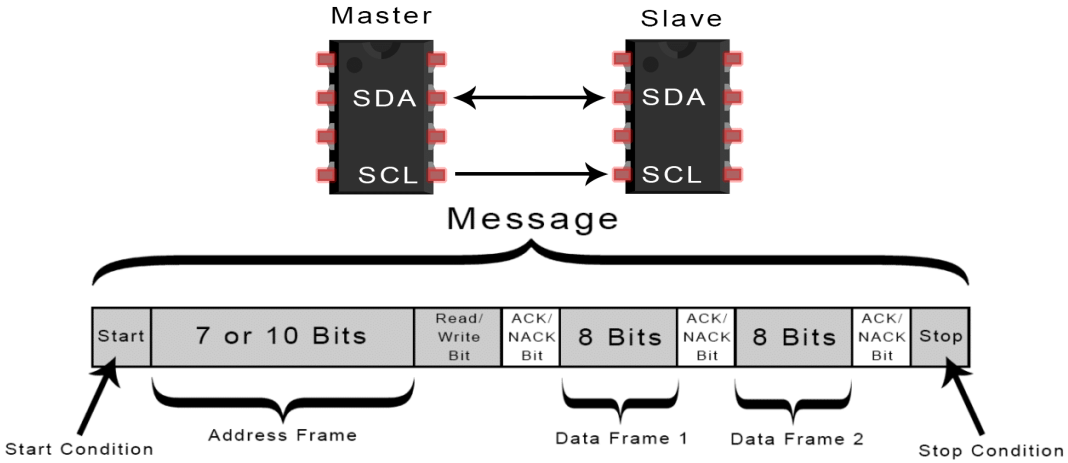
I2C

STM32 I2C

Inter Integrated Circuit (**I2C**) is a serial communication protocol for exchanging data between a **master** and one or more **slaves**.

The **I2C** allows for **synchronous communication** thanks to a line reserved for the clock signal (**SCL – Serial Clock**). Data are exchanged through a second line called **SDA – Serial Data.**

Addressing is done with a single line by using the address slave.

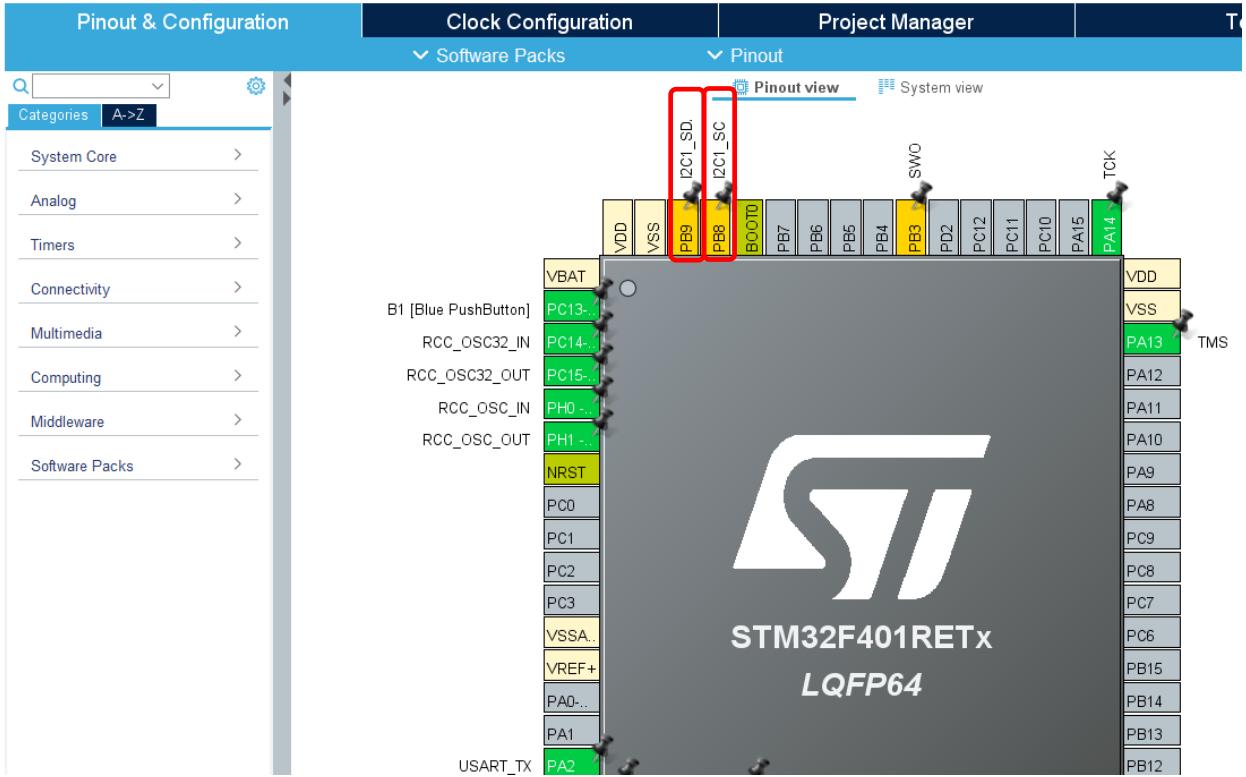


STM32 I2C

Pin PB8 and PB9 can be multiplexed to the SCL and SDA lines.

PB8 = I2C SCL

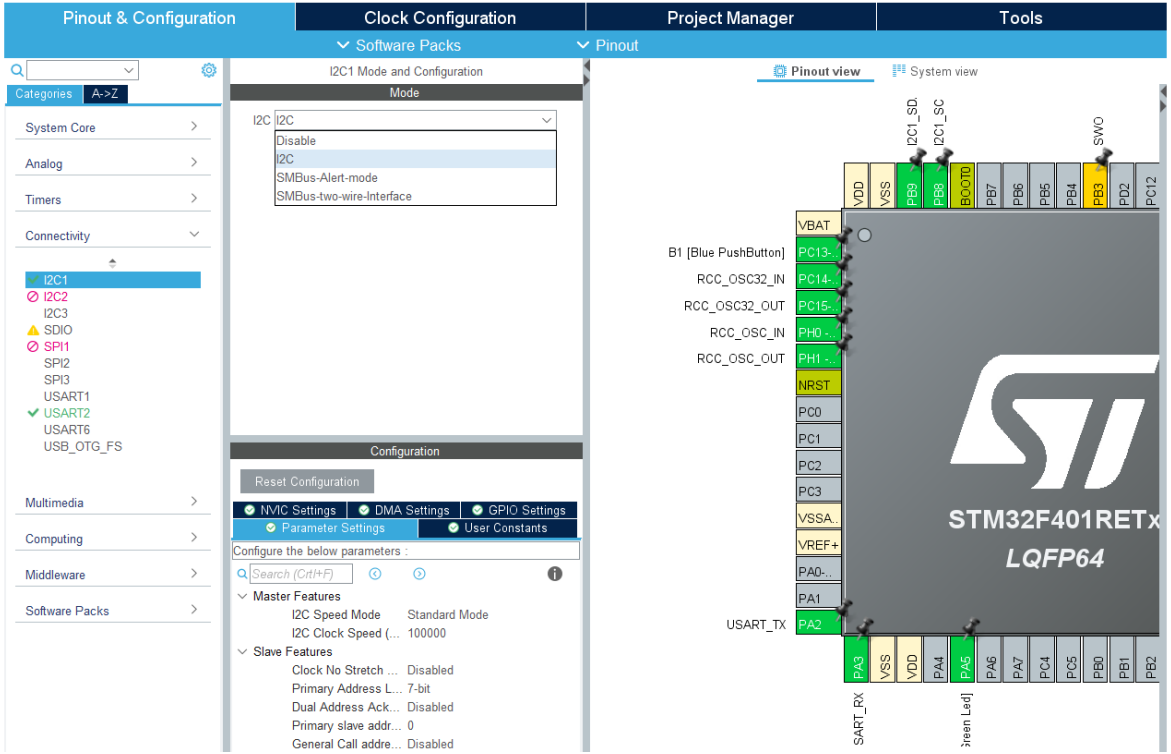
PB9 = I2C SDA



STM32 USART

I2C parameters can be configured as always using CubeMX.

As a first step, set **I2C** as the **I2C1 mode**. We will come back later on this.

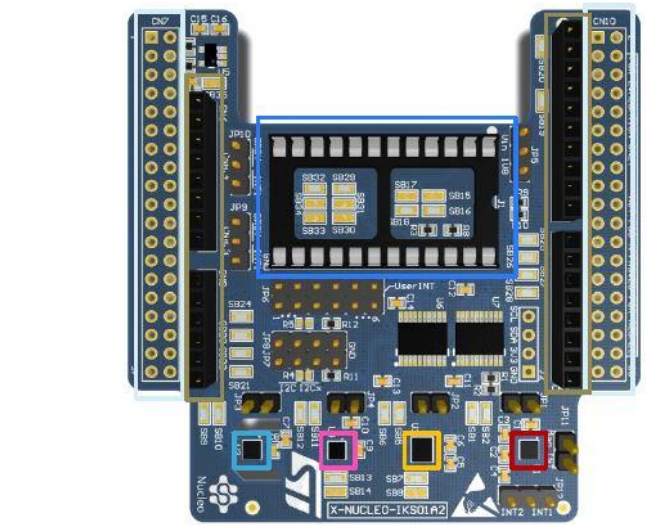


X-NUCLEO-IKS01A2

X-NUCLEO-IKS01A2

The X-NUCLEO-IKS01A2 is a motion MEMS and environmental sensor evaluation board system.

- **LSM6DSL :** MEMS 3D accelerometer (±2/±4/±8/±16 g) + 3D gyroscope (±125/±245/±500/±1000/±2000 dps)
- **LSM303AGR :** MEMS 3D magnetometer (±50 gauss) + MEMS 3D accelerometer (±2/±4/±8/±16 g)
- **LPS22HB :** MEMS pressure sensor, 260-1260 hPa absolute digital output barometer
- **HTS221 : Capacitive digital relative humidity and temperature**
- **DIL 24-pin :** Socket available for additional MEMS adapters and other sensors (UV index)

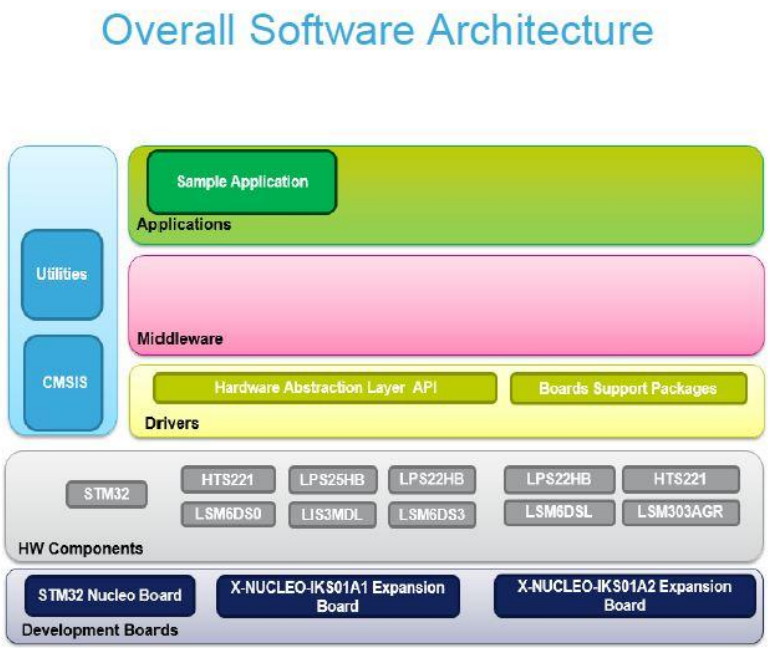


X-CUBE-MEMS1

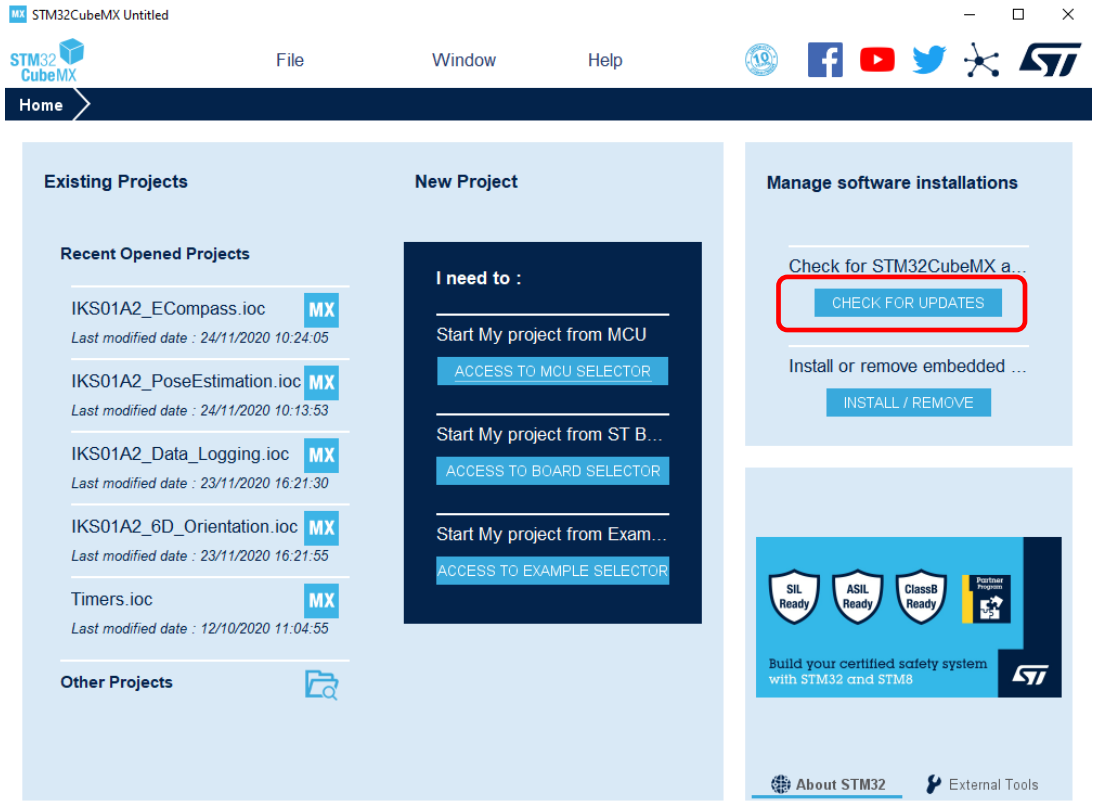
X-CUBE-MEMS1

The X-CUBE-MEMS1 software package is an expansion for STM32Cube, associated with the X-NUCLEO-IKS01A2 expansion board.

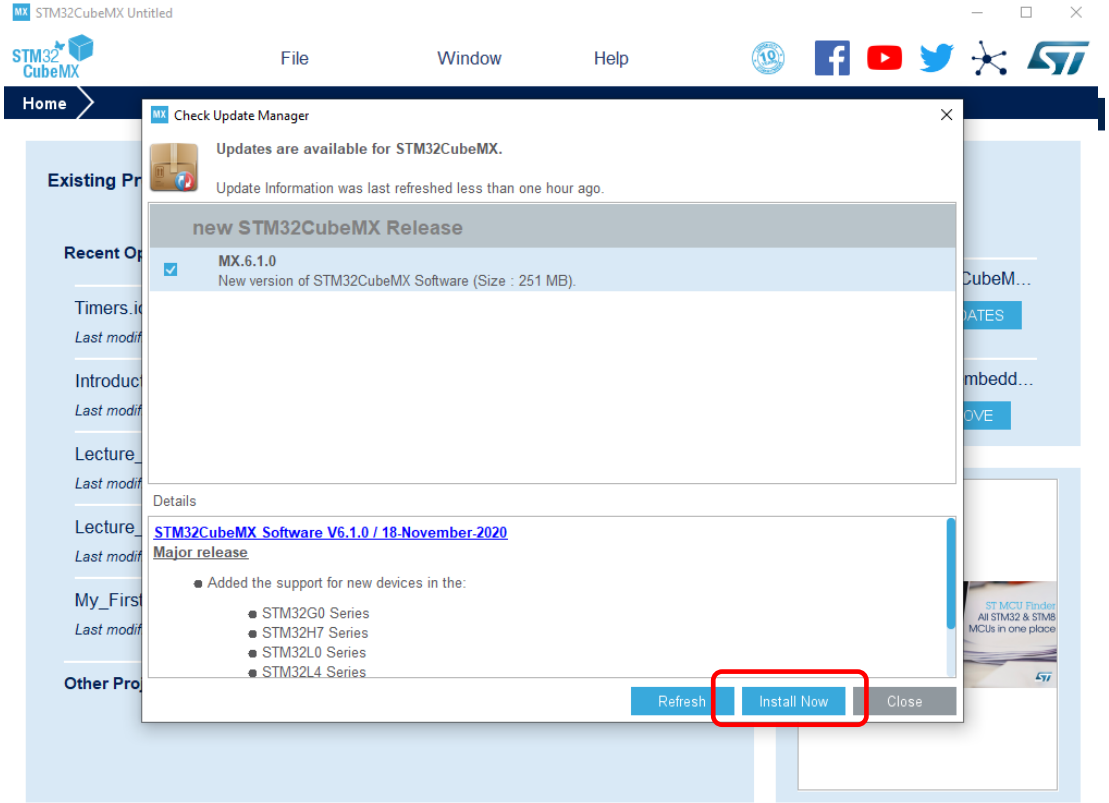
- Complete middleware to build applications using temperature and humidity sensors (HTS221), pressure sensor (LPS22HB) and motion sensors (LSM303AGR and LSM6DSL)
- Sample application to transmit real-time sensor data to a PC
- PC-based application (Windows®) to log sensor data
- Low-power optimization (suitable for the STM32L0 MCU family)
- Free, user-friendly license terms



X-CUBE-MEMS1 - INSTALLATION

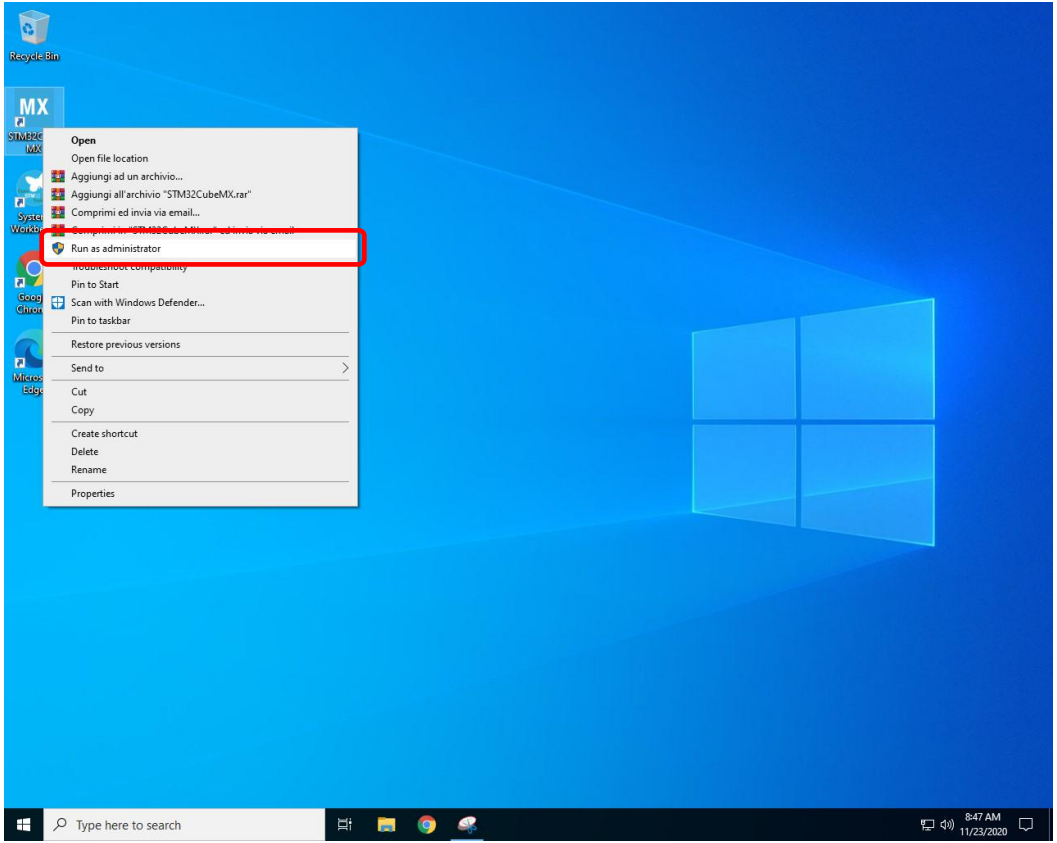


X-CUBE-MEMS1 - INSTALLATION

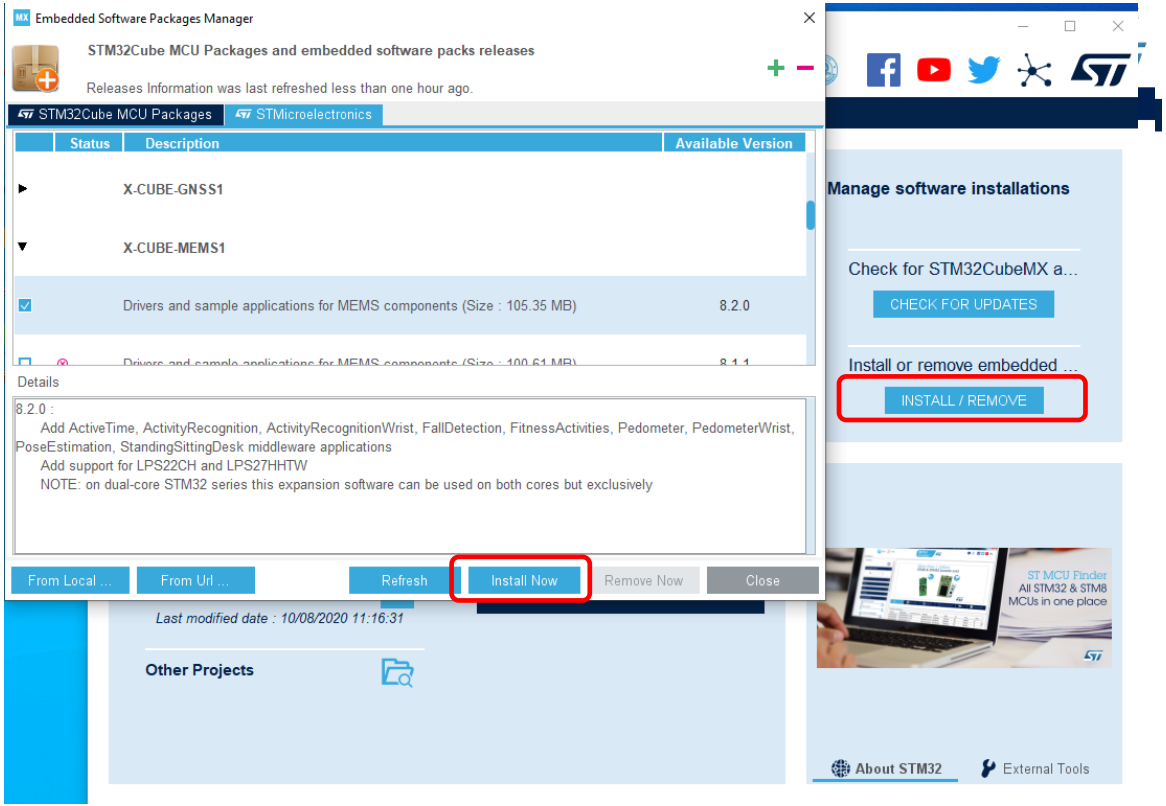


X-CUBE-MEMS1 - INSTALLATION

Once updated, close it and re open it as an administrator



X-CUBE-MEMS1 - INSTALLATION



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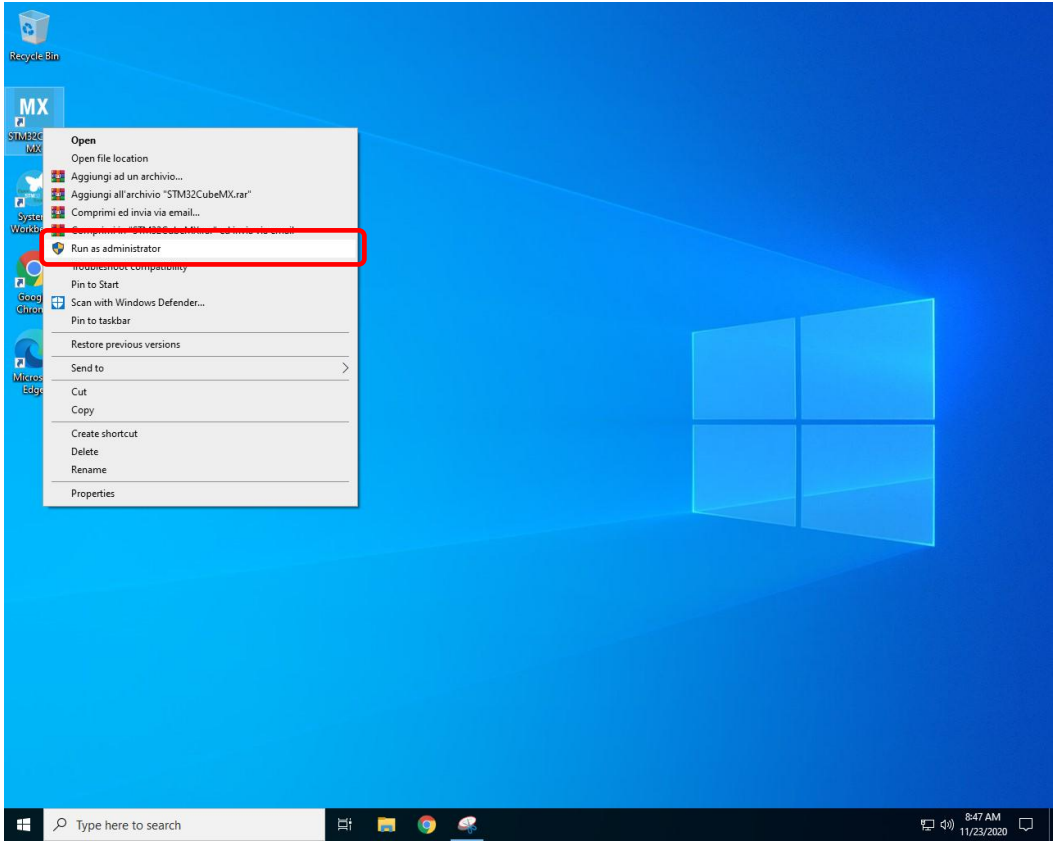
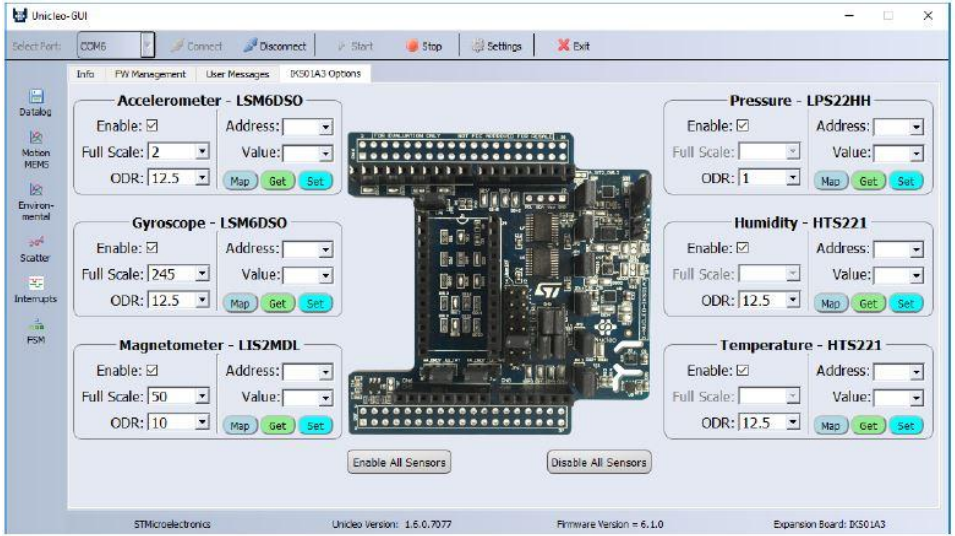


X-CUBE-MEMS1 – UNICLEO GUI

Unicleo-GUI is a graphical user interface (GUI) for the X-CUBE-MEMS1 software expansions and STM32 Nucleo expansion boards like the X-NUCLEO-IKS01A1.

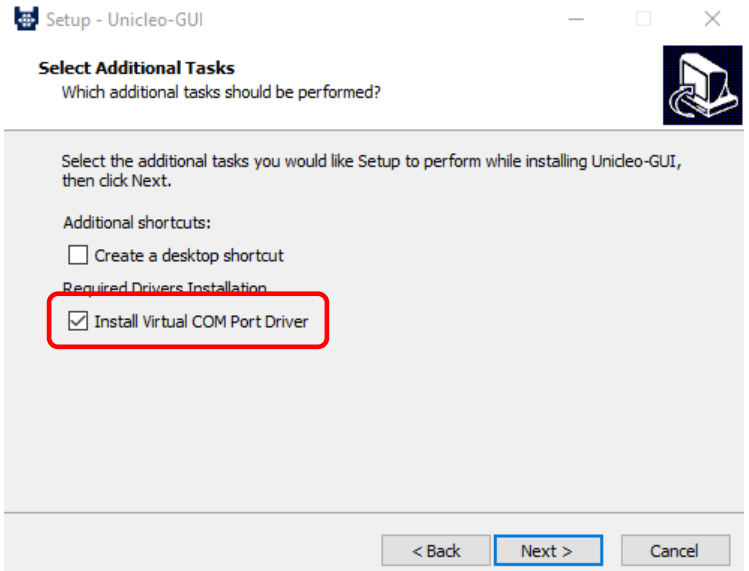
The main objective of this application is to demonstrate the functionality of the embedded ST sensors and algorithms.



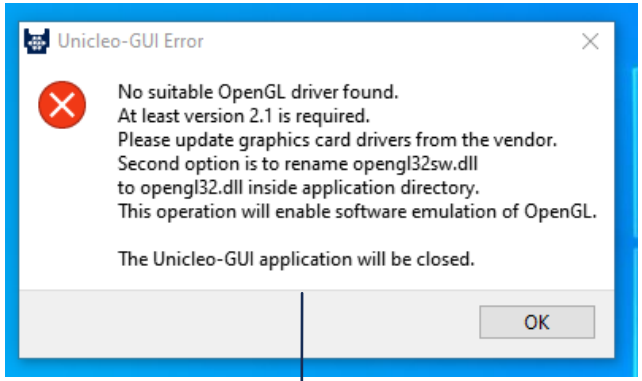
X-CUBE-MEMS1 – UNICLEO GUI

Install it by unzipping the **en.Setup_Unicleo.zip** archive and **run the executable.**

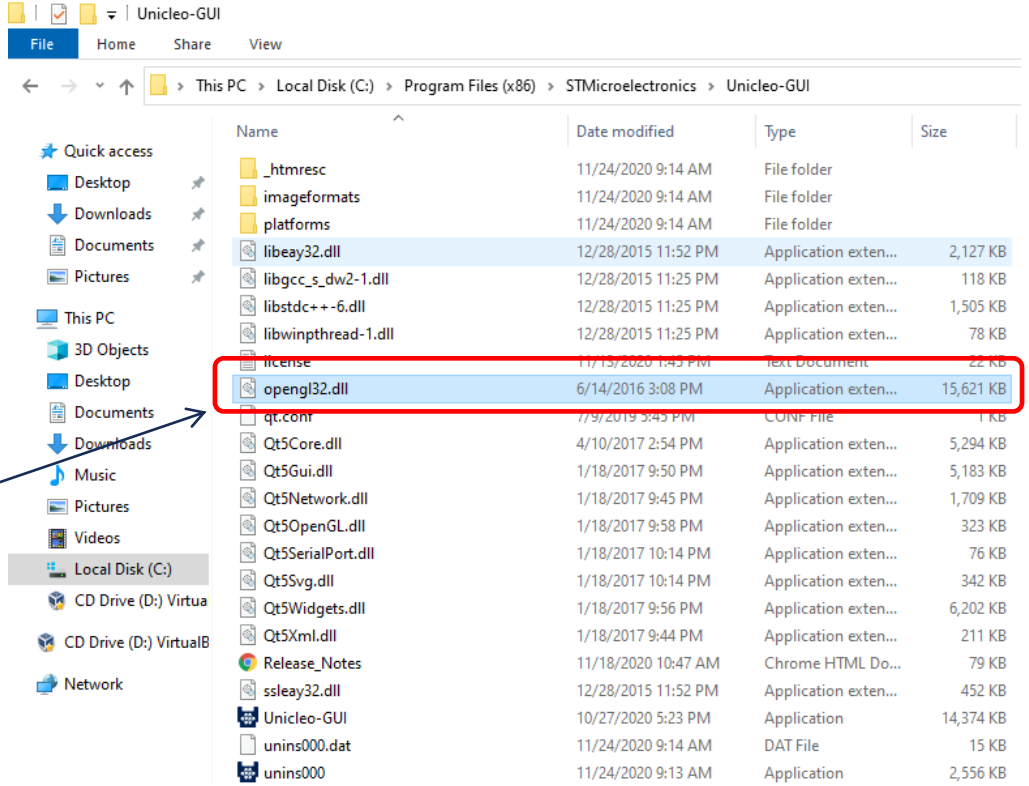
Be sure to check the *Install Virtual COM Port Driver* option.



X-CUBE-MEMS1 – UNICLEO GUI



If you get this error, just browse for the path were you installed the Unicleo-GUI, look for the **opengl32sw.dll** file and rename it as **opengl32.dll**



IKS01A2 – DATA LOG TERMINAL

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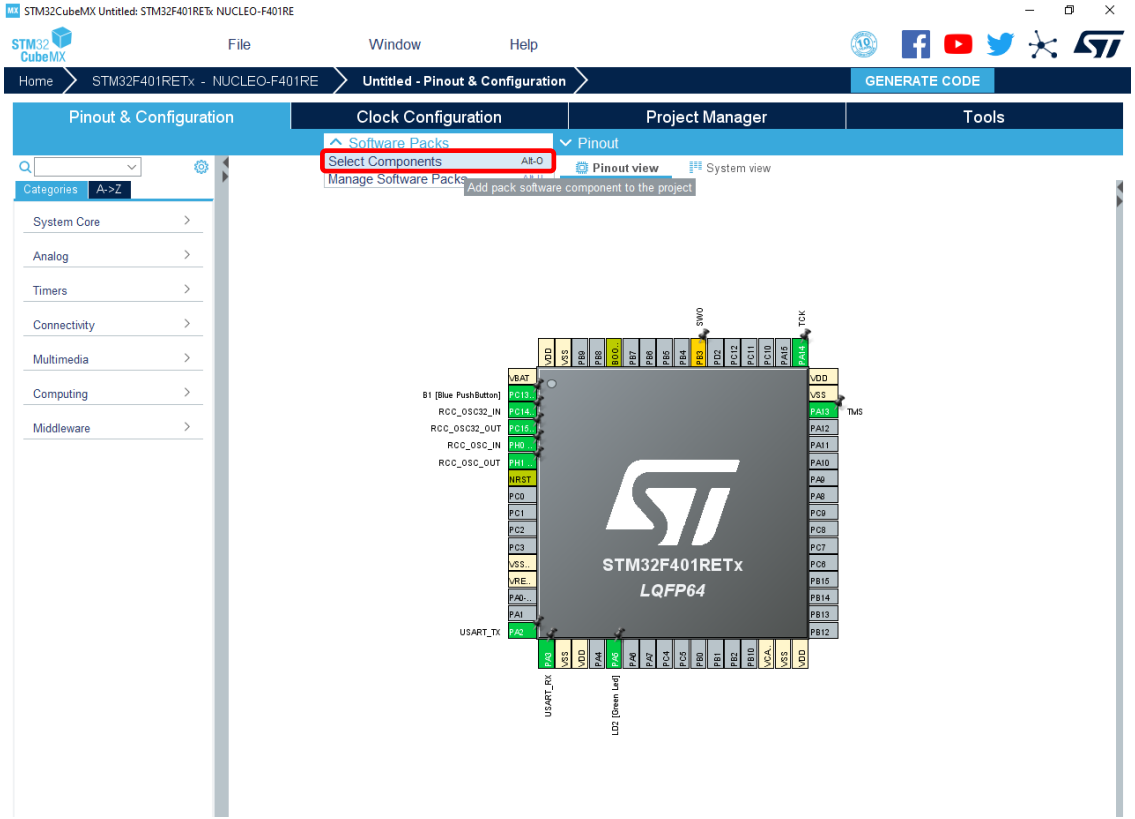

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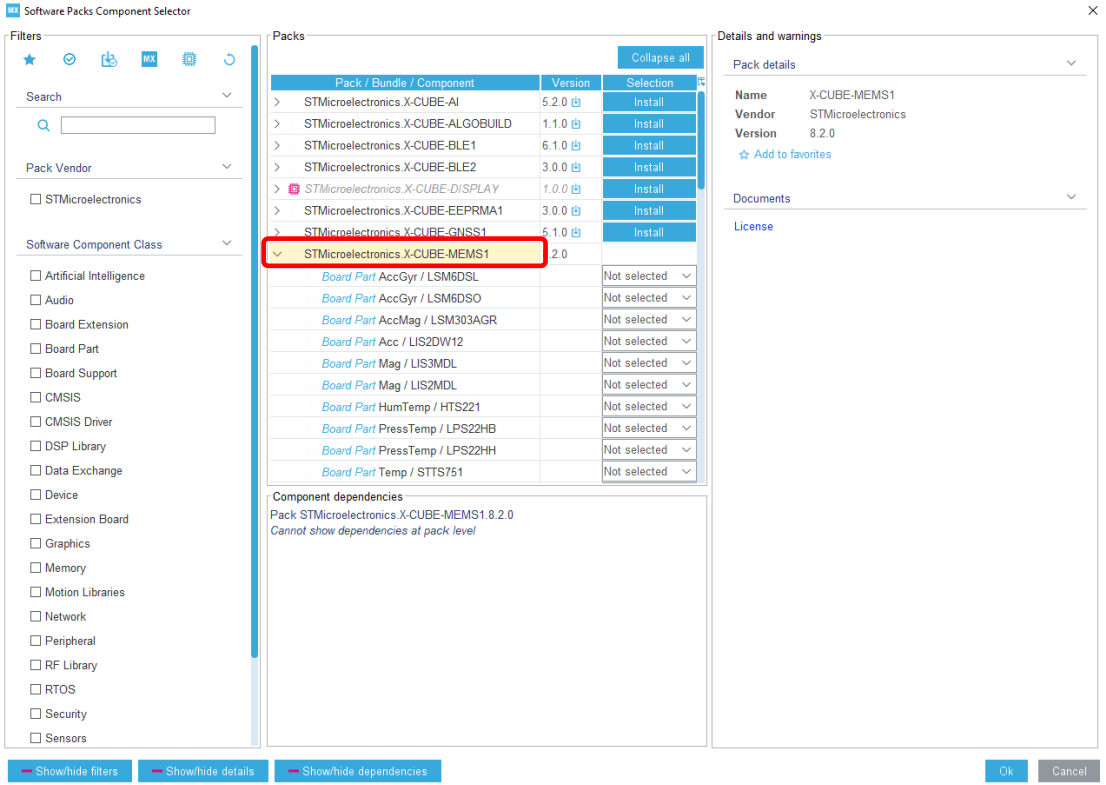
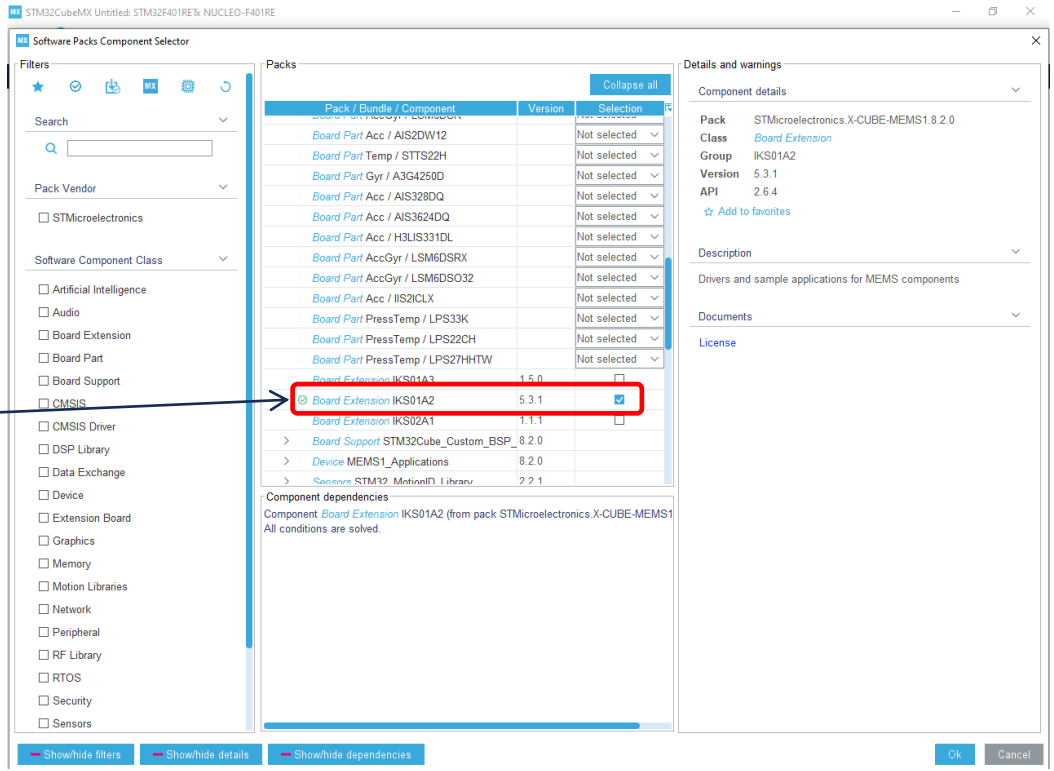


IKS01A2 – DATA LOG TERMINAL

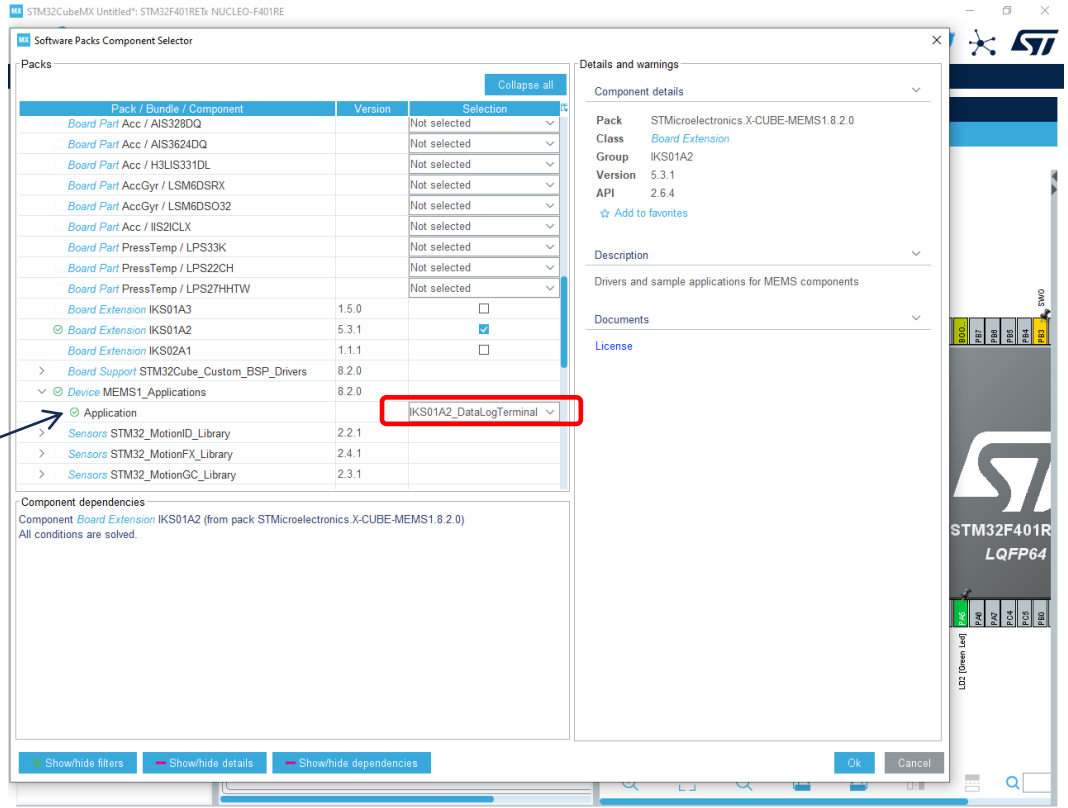
Scroll down and check
IKS01A2 as Board Extension



IKS01A2 – DATA LOG TERMINAL

Here you can select the pre-compiled application to test.

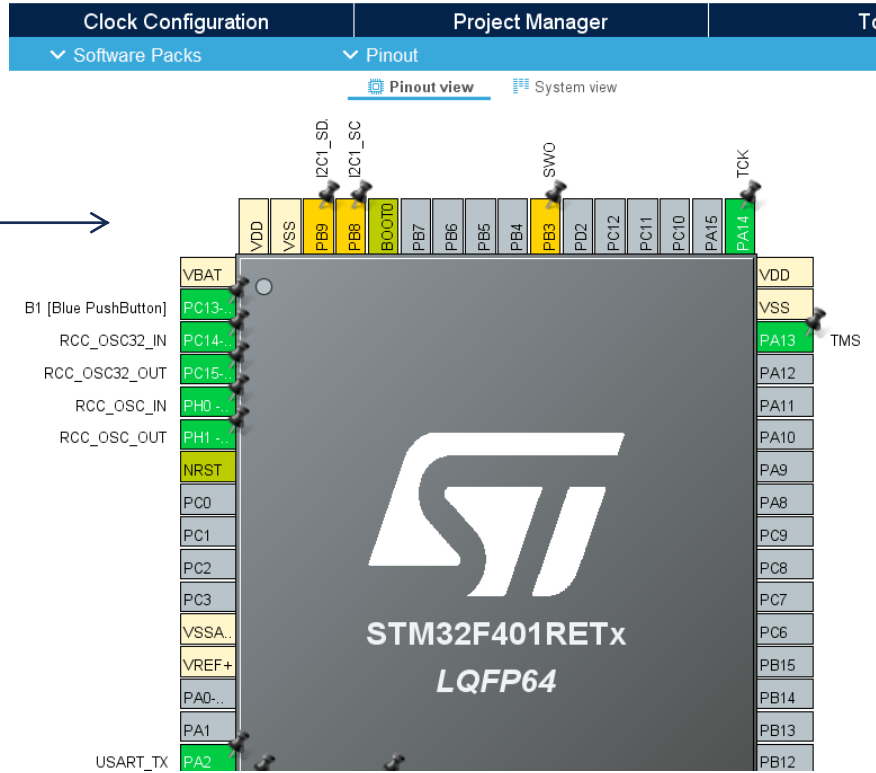
Select **IKS01A2_DataLogTerminal**



IKS01A2 – DATA LOG TERMINAL

From the **Pinout** scheme, if not already set, set:

Nucleo 64		
PIN	*Mode*	*Label*
PB5	GPIO_EXTI5	
PB4	GPIO_EXTI4	
PB10	GPIO_EXTI10	
PA2	USART2_TX	USART_TX
PA3	USART2_RX	USART_RX
PA5	GPIO_Output	LD2 [Green Led]
PC13	GPIO_EXTI13	B1 [Blue PushButton]



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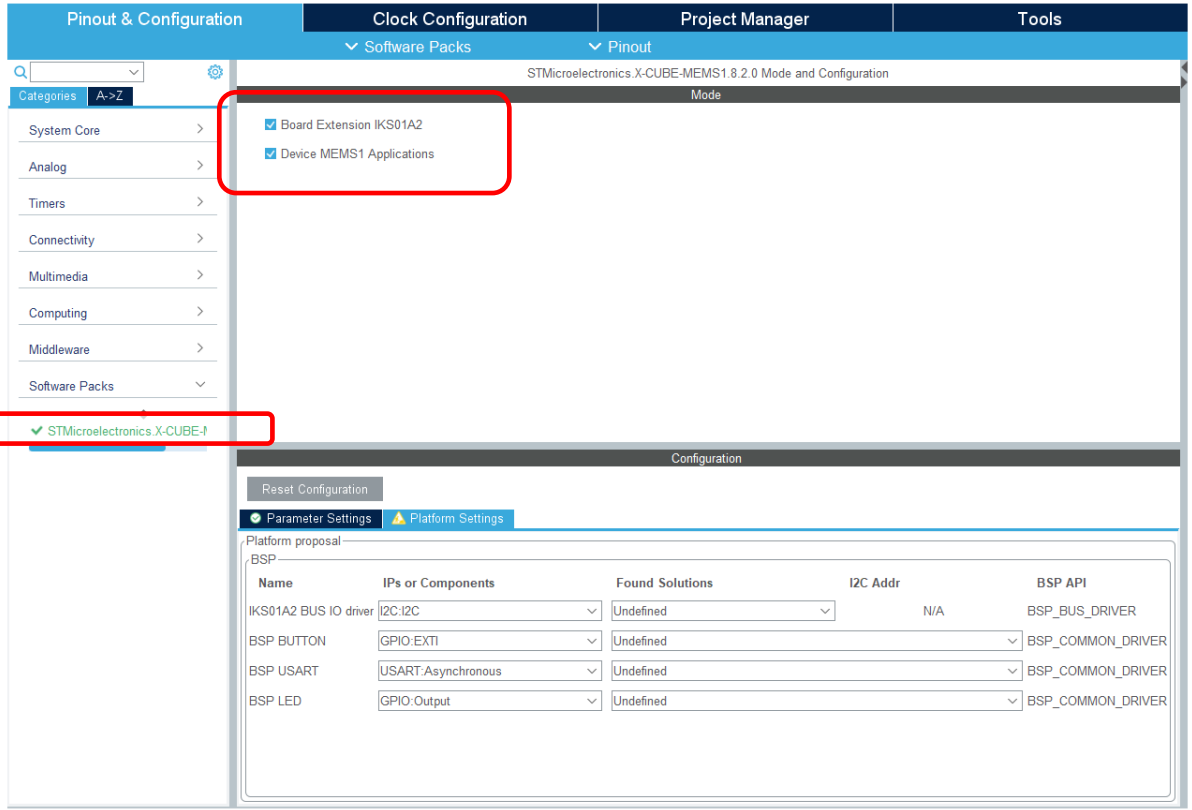

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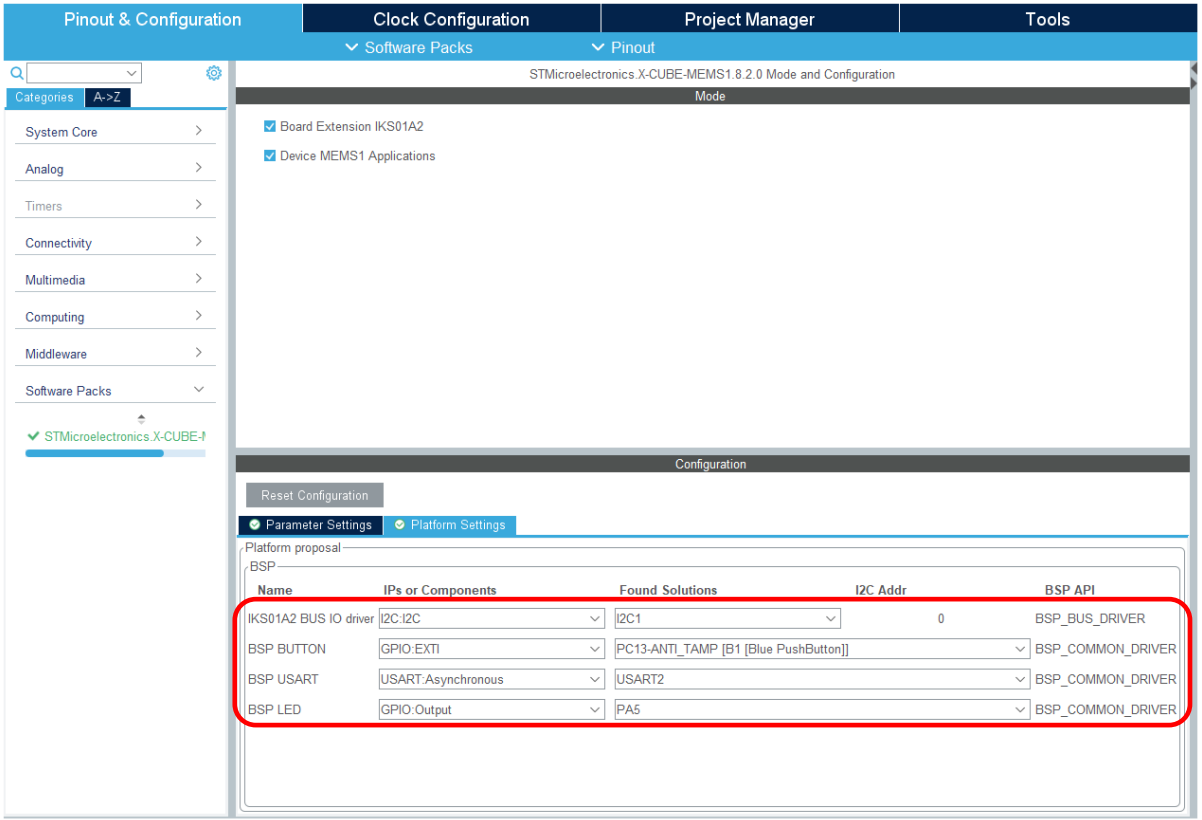

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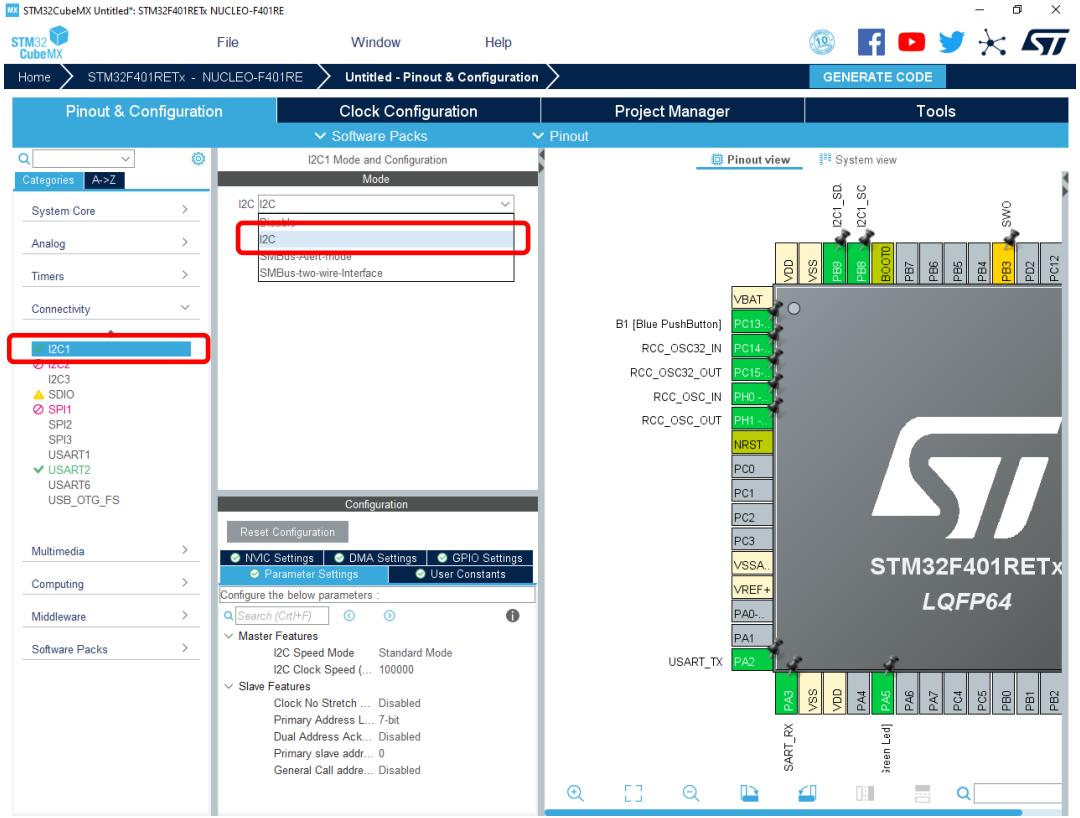

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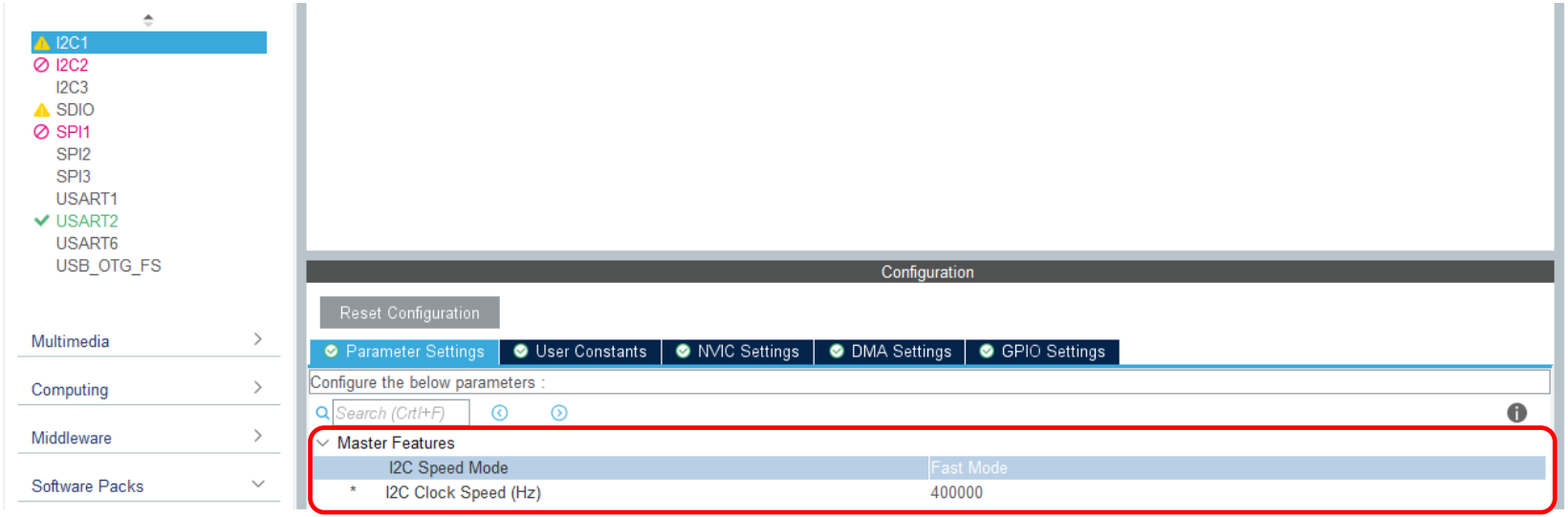

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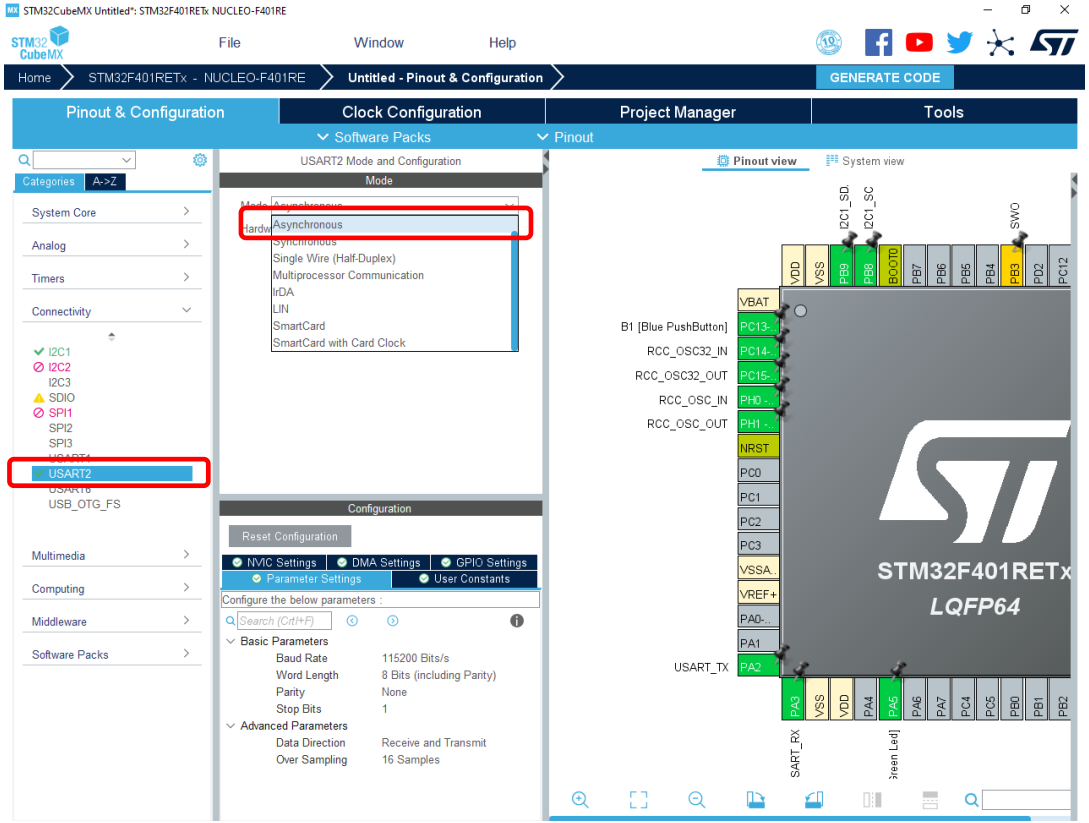

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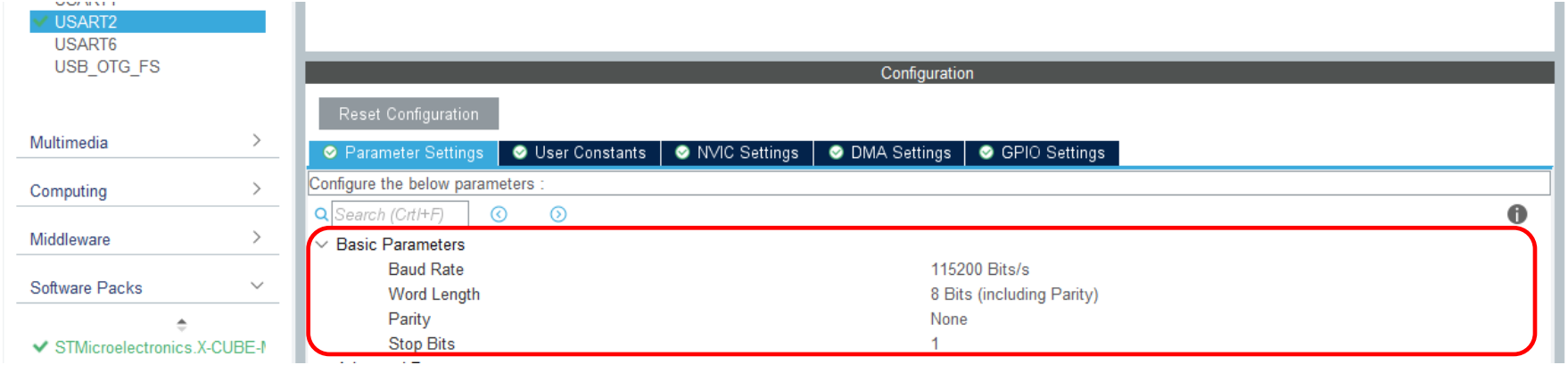

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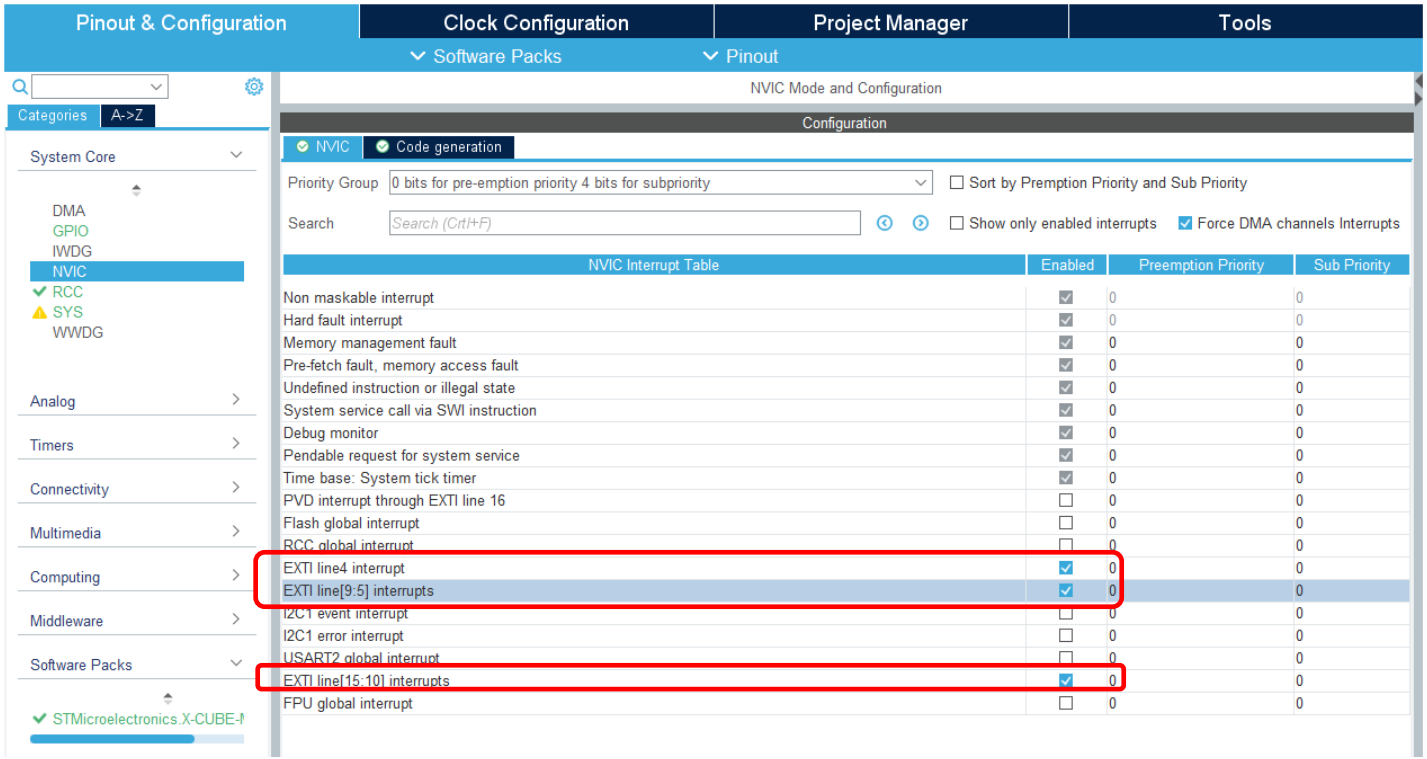

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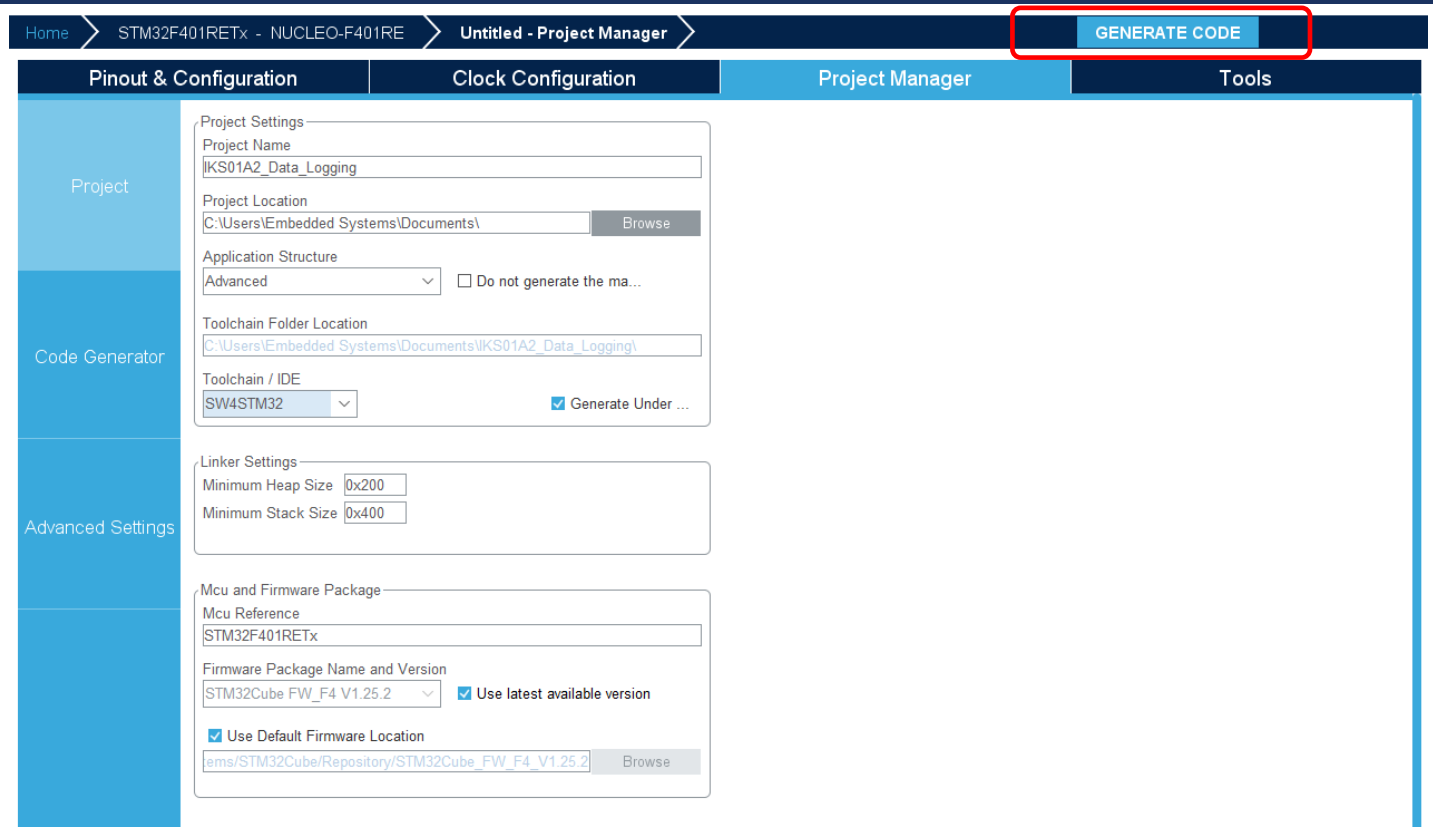
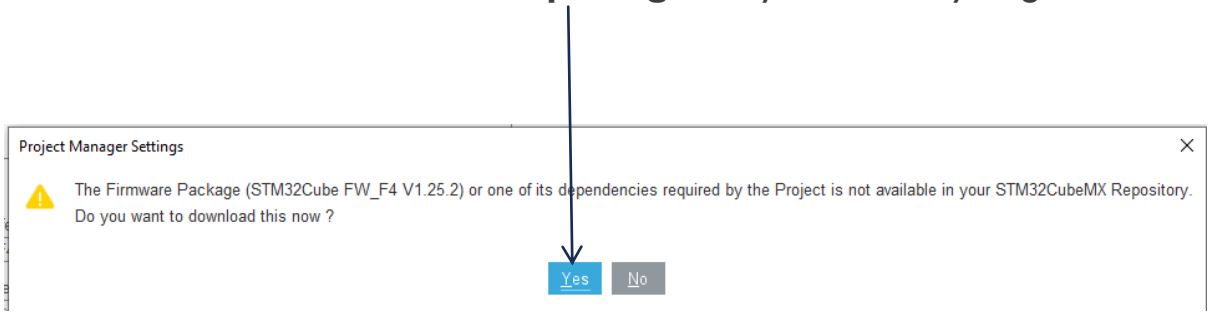


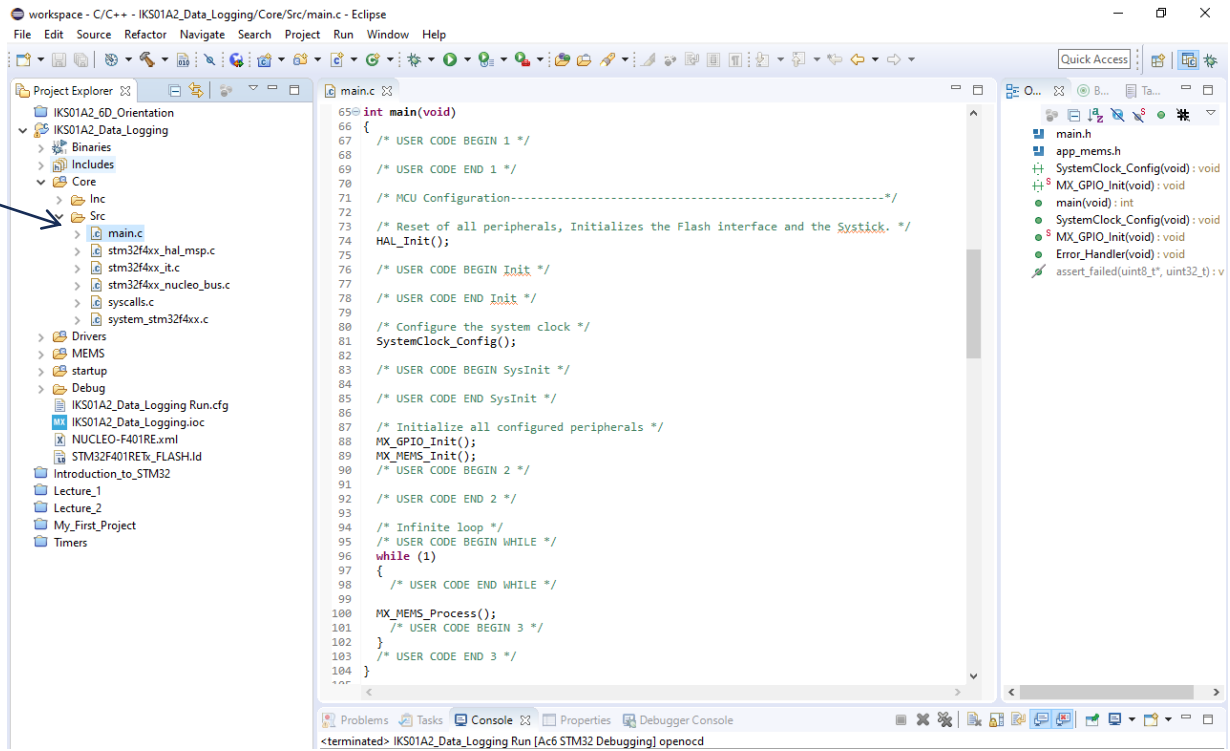
IKS01A2 – DATA LOG TERMINAL

Download the **Firmware package** and you are ready to go!

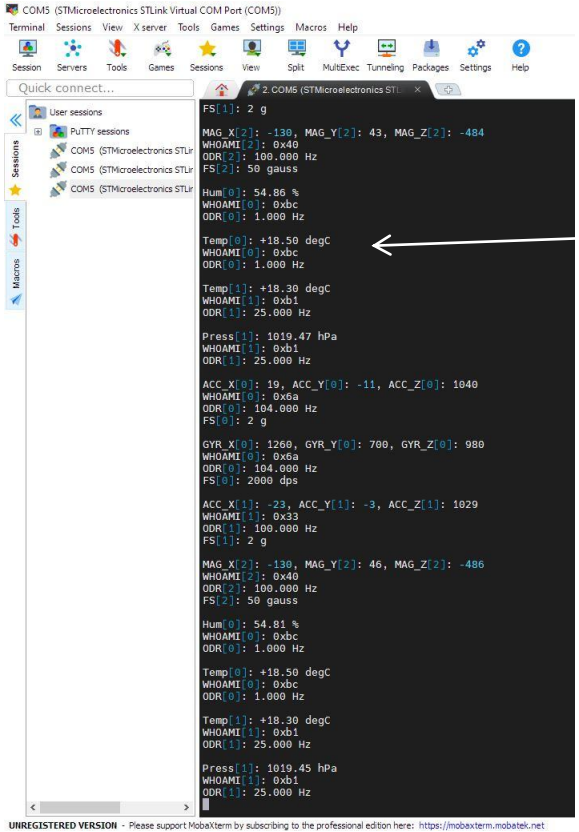


IKS01A2 – DATA LOG TERMINAL

You can find the **main.c** file in *Core->Src*



IKS01A2 – DATA LOG TERMINAL



Once you flash the firmware, you can visualize the streaming data through MobaXTerm by setting a **Serial session with Baudrate 115200**

IKS01A2 – 6D ORIENTATION ESTIMATOR

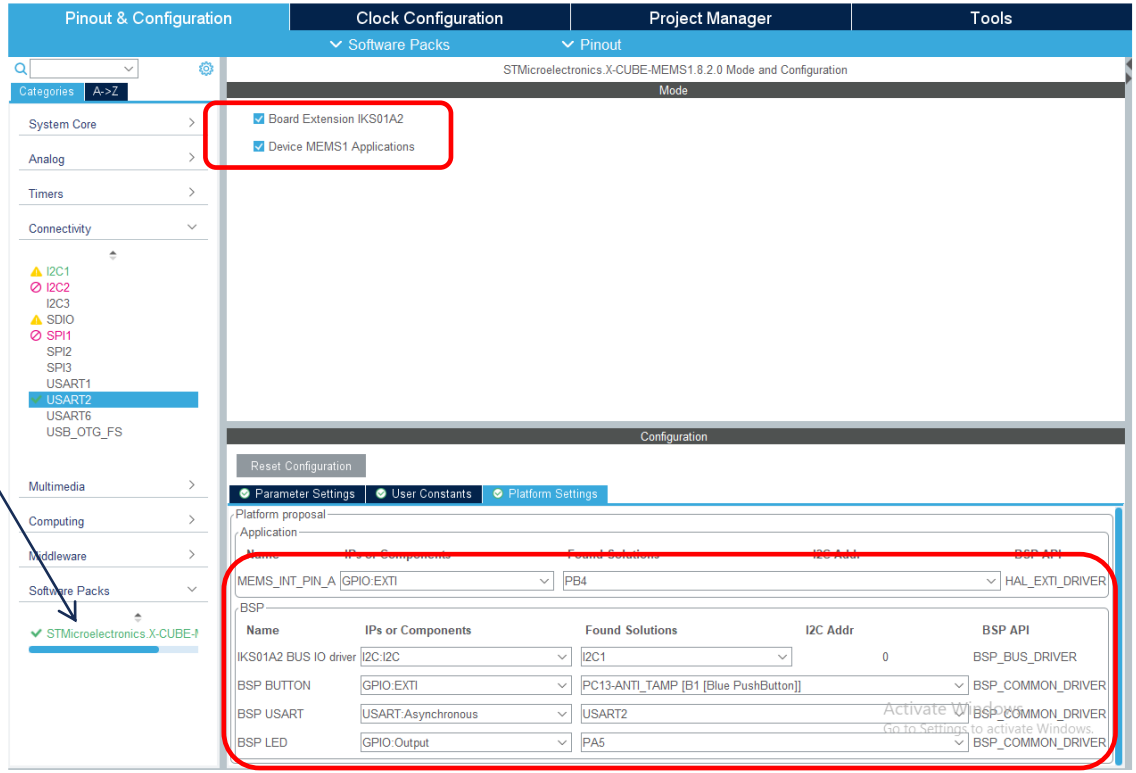
6D ORIENTATION ESTIMATOR

Import the 6D Orientation estimator application and flash it on your Nucleo board.

1. Use CubeMX to select the **IKS01A2_LSM6DSL_6DOrientation** in Software Packs->Select Components as we have done for the datalogger.
2. **Set the Platform settings as shown in the next slide**
3. Flash your Nucleo board.
4. Look at the data streaming using MobaXTerm.

6D ORIENTATION ESTIMATOR

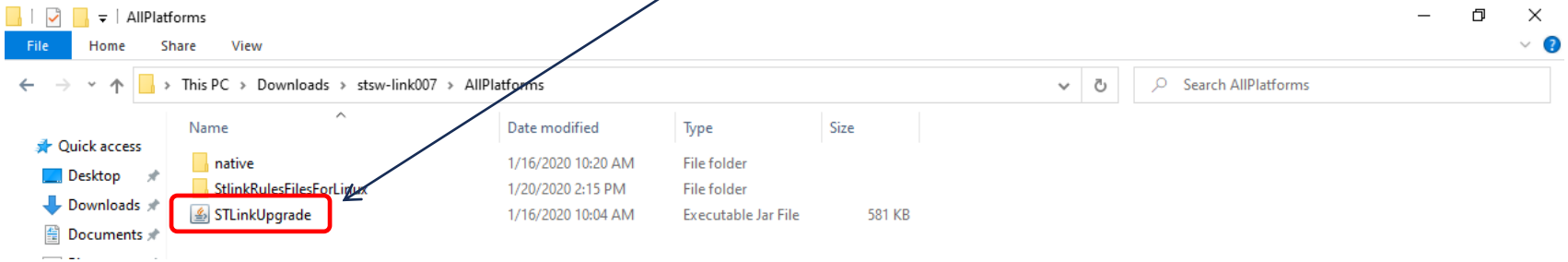
Access the X-Cube-MEMS Software pack



IKS01A2 – TESTING APPLICATIONS WITH THE UNICLEO GUI

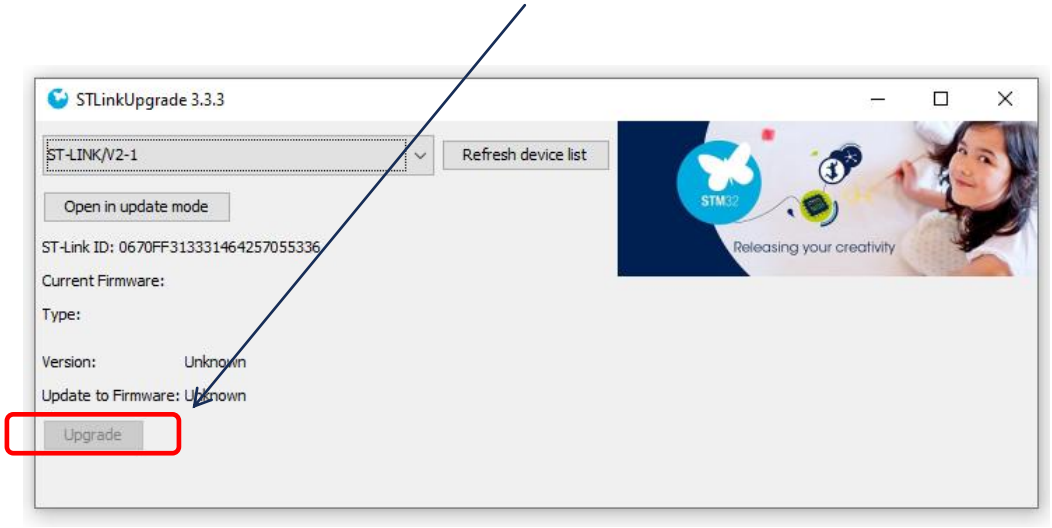
UNICLEO GUI AND APPLICATIONS

Extract the archive *en.stsw-link007_V2-36-26.zip* and run the **STLinkUpgrade** file in *stsw-link007->AllPlatforms*

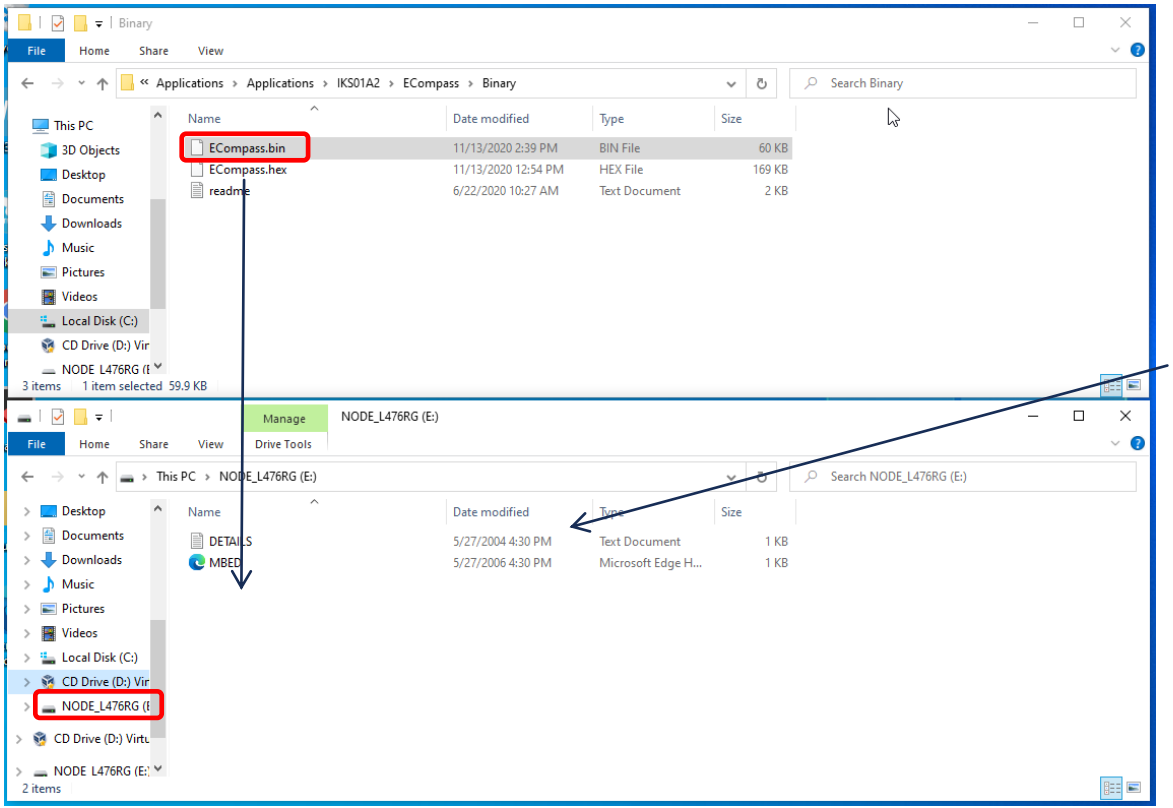


UNICLEO GUI AND APPLICATIONS

If not greyed out, hit the **Upgrade** option to upgrade your ST-LINK firmware



UNICLEO GUI AND APPLICATIONS

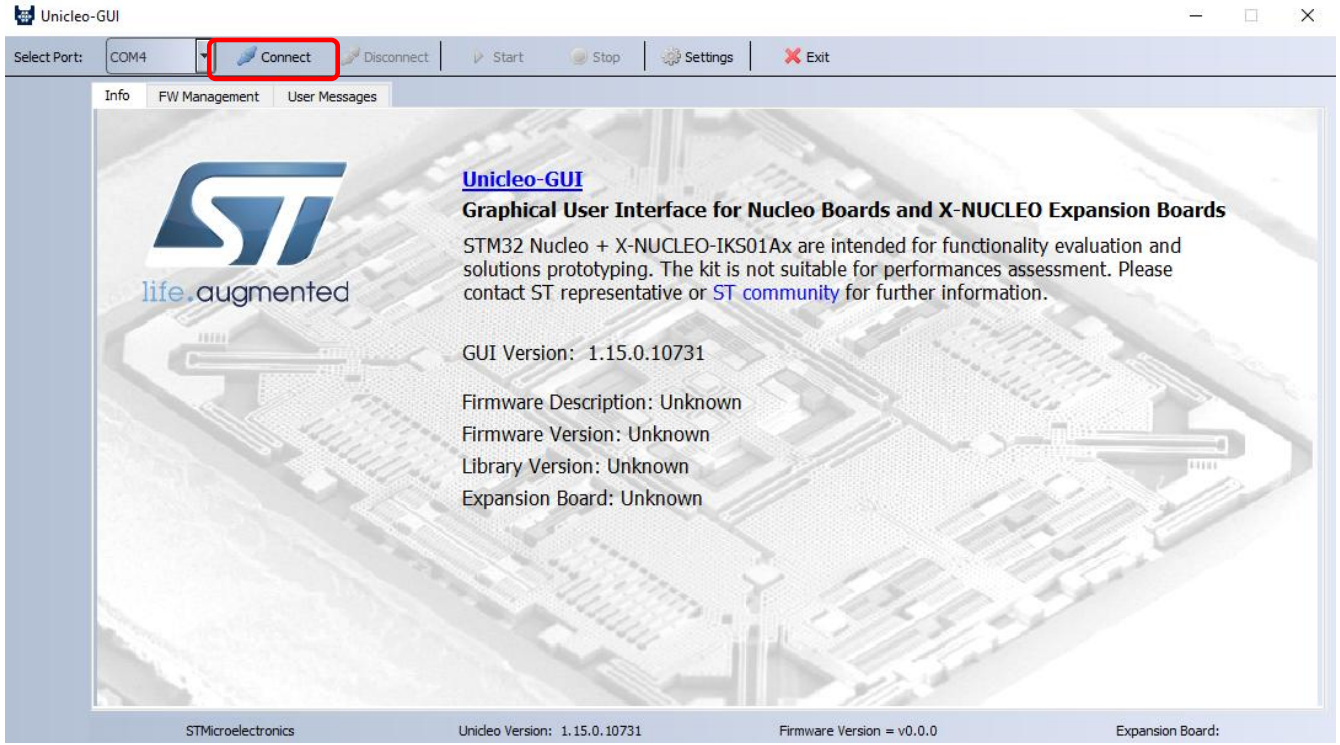


Unzip the *Applications_L476RG.rar* archive, enter the *IKS01A2* folder and click on the folder of the application you want to flash onto the Nucleo board.

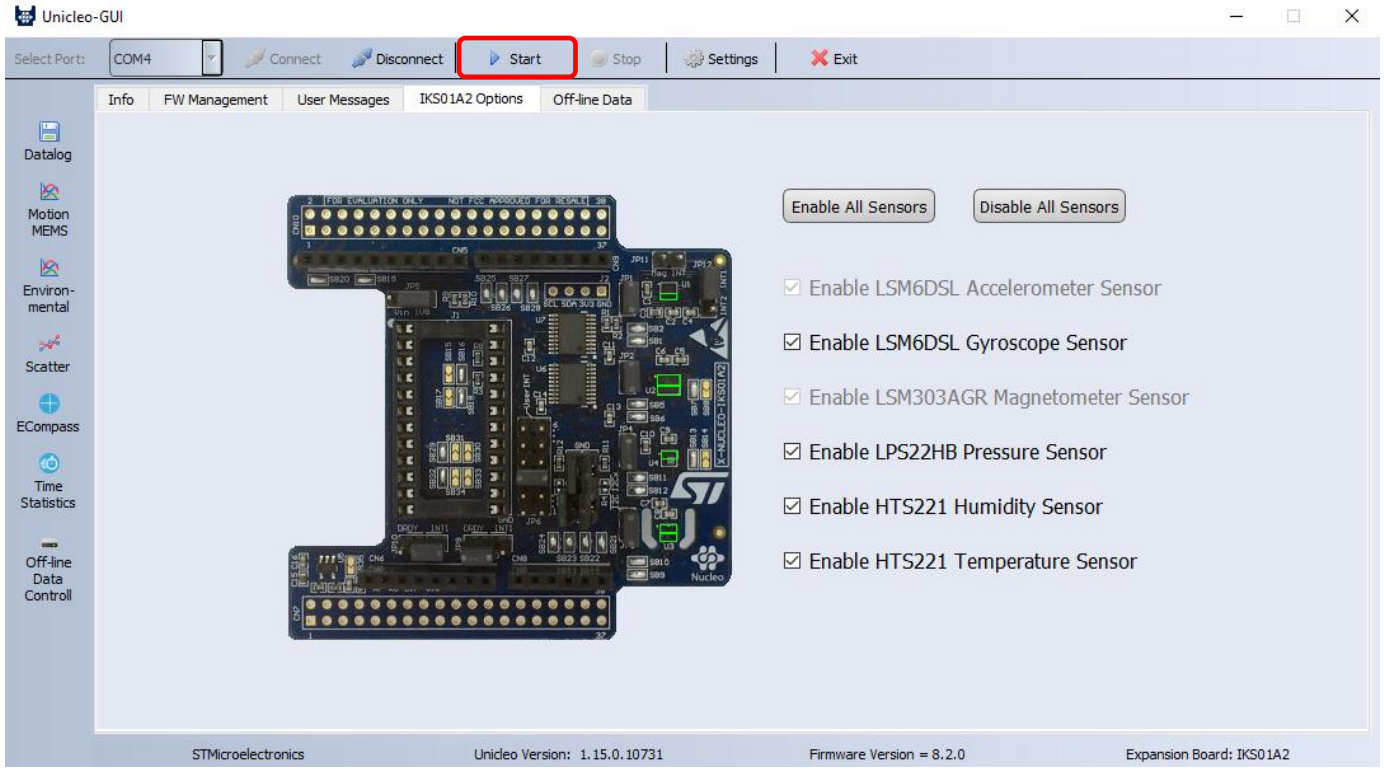
Then enter the *Binary* folder and copy the .bin file onto your Nucleo board (access your board by clicking on the NODE_L476RG drive)

UNICLEO GUI AND APPLICATIONS

Run the Unicleo-GUI, select the proper COM port and hit **Connect**

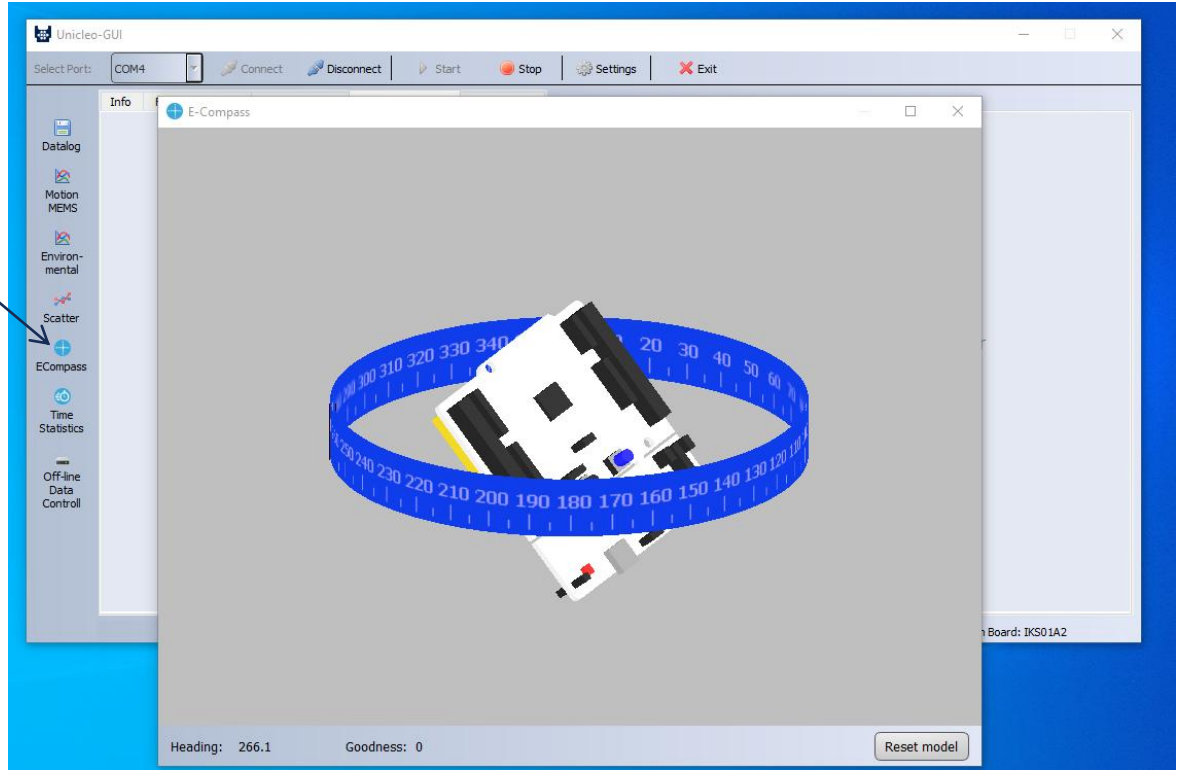


UNICLEO GUI AND APPLICATIONS



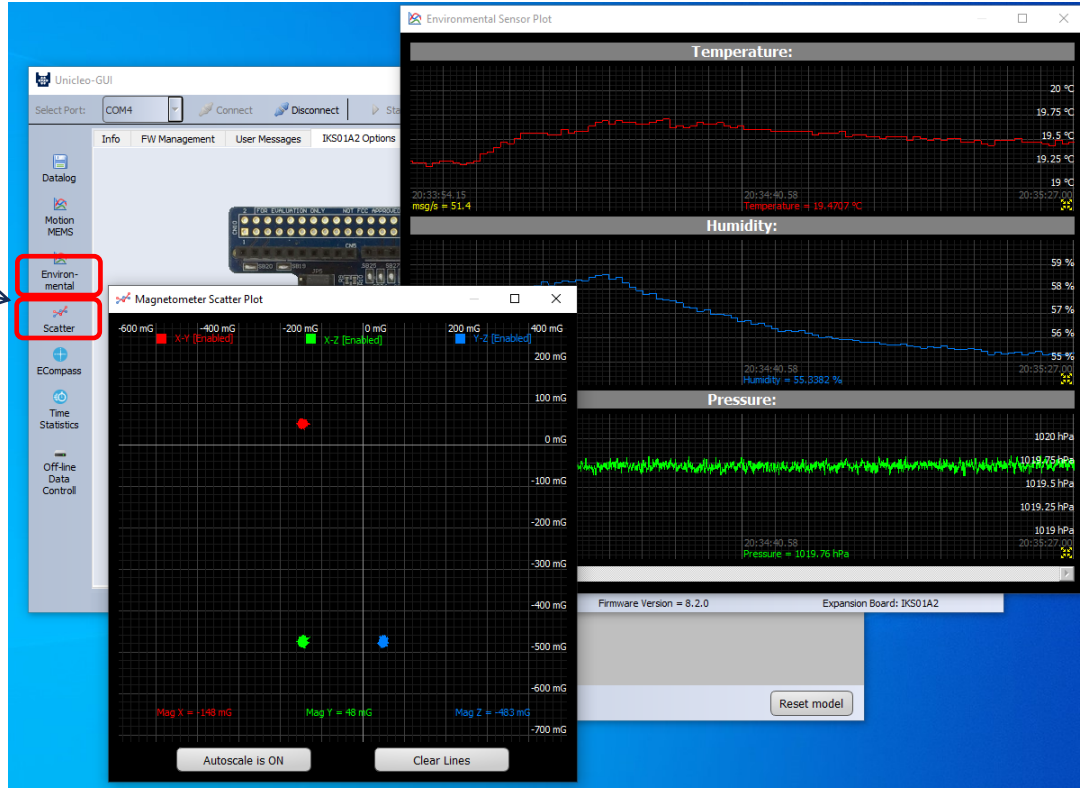
UNICLEO GUI AND APPLICATIONS

Click on the icon with the name of the flashed application to **visualize its HMI**



UNICLEO GUI AND APPLICATIONS

You can even visualize additional data



ADDITIONAL RESOURCES

You can find a complete overview of Cube MEMS as well as all the details for the applications contained in the *Applications.rar* archive in the pdf **STMicroelectronics.X-CUBE-MEMS1_GettingStarted**.

You can find a complete overview of the Unicleo-GUI in the pdf **dm00337036**

This two pdf as well as all the file mentioned in these slides are contained in the drive folder:

https://drive.google.com/drive/folders/1BfbaYt5Bvy6v2NRF1YHlKbplc5kHMwEZ?usp=sharing