

Microprocessors Lab

Session 1: Introduction

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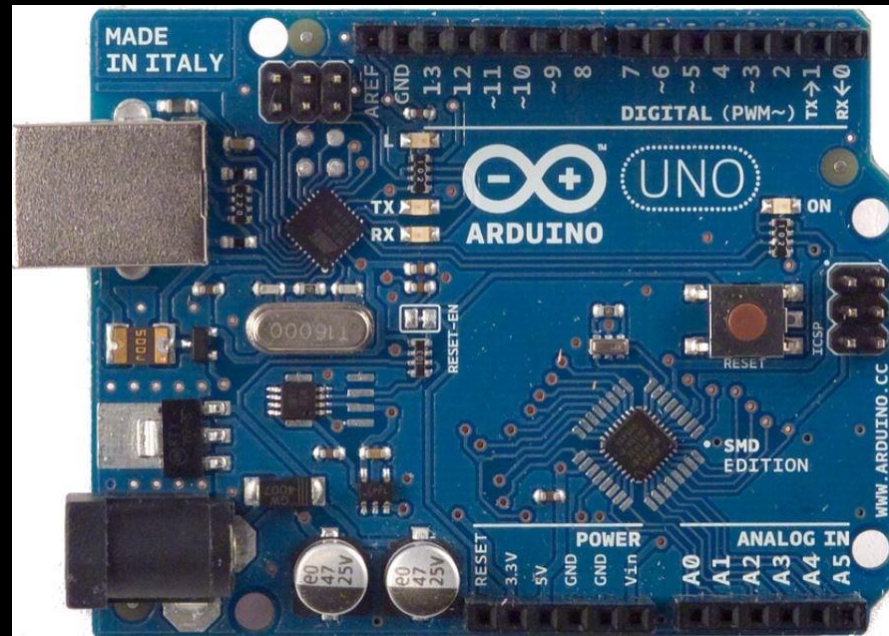
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What is Arduino?

- ❖ *Arduino* is the name of a series of boards that are structurally based on **AVR** or **ARM** microcontrollers.
- ❖ There is a **Microcontroller** on each of these boards as a core and besides that exist other **essential elements**.

For more information, feel free to visit its [official website](http://www.arduino.cc)



Advantages?

- Arduino is **open source**, which means that anyone anywhere in the world can build a library and share it with others for **FREE!**
 - It doesn't require a **surplus hardware** as its programmer.
 - We have access to **all ports**.
 - Supports **all** Operating Systems (**Windows, Mac, Linux**)
 - Huge number of sample **projects** and **examples**.
 - Different **Input/Output** ports (GPIO)
-

Disadvantages?

I searched,
There was none.
Don't search,
There isn't any.



Maybe a little expensive compared to other boards!

Arduino Types



- Each type of Arduino has different applications (usages).
- Arduino Uno and Arduino Mega are the types that most of new comers use.

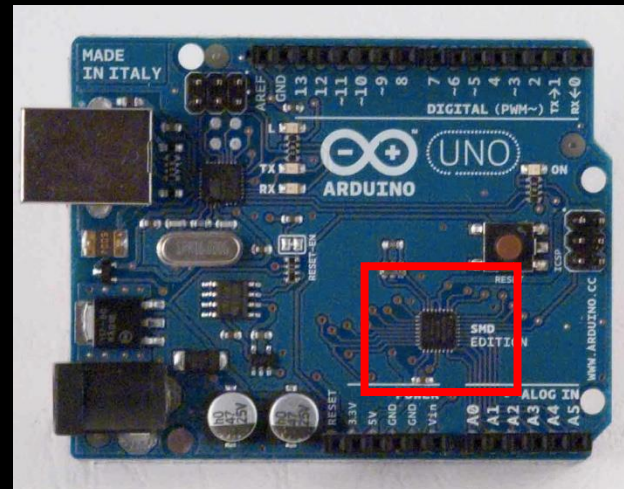
Arduino Uno

Arduino Uno is available in two types: R3 and R3 SMD. The only difference between them is the type of microcontroller that is used as their core (DIP or SMD).

If the **Microcontroller** is **DIP**, it can be **easily removed and replaced** by another microcontroller (**portable**)



But if the microcontroller's type is **SMD**, it cannot be removed but there is a little advantage here; there is a lot **more space** on the board to add other customized elements.



Arduino Uno

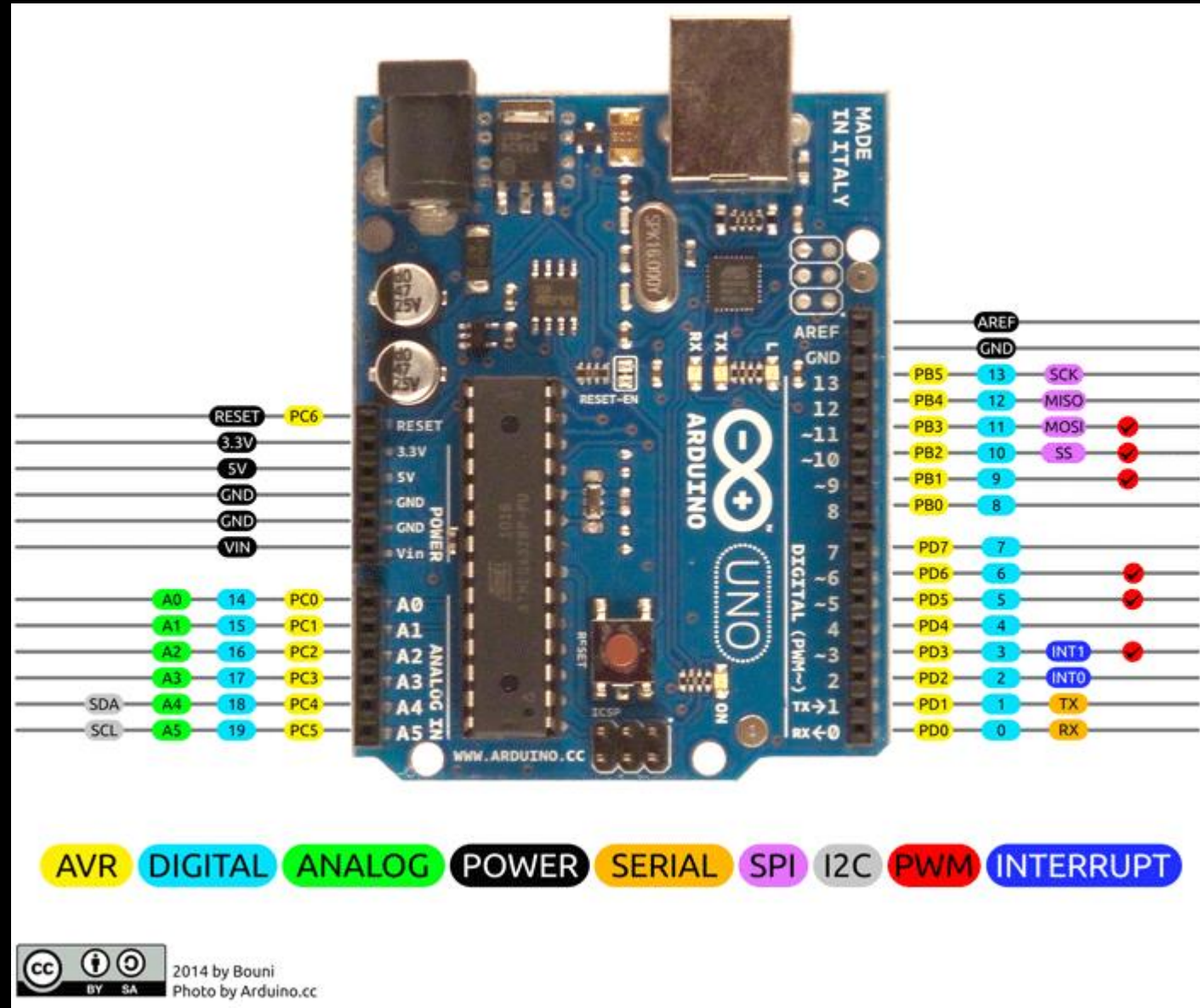
Processor	Atmega328
Source Voltage	5 V
Input Voltage	Between 7 to 12 V
Frequency	16 MGHZ
I/O Ports	14 pins (6 PWM)
Analog Input Pins	6 pins
Flash Size	32 KB (0.5 KB Boot Loader)
SRAM Size	2 KB
EEPROM	1 KB

Arduino Mega (Atmega 2560)

Processor	Atmega2560
Source Voltage	5 V
Input Voltage	Between 7 to 12 V
Frequency	16 MGHZ
I/O Ports	54 pins (15 PWM)
Analog Input Pins	16 pins
Flash Size	256 KB (8 KB Boot Loader)
SRAM Size	8 KB
EEPROM	4 KB

Arduino Internal Units

- PWM
- Serial Communication Unit (USART, UART)
- SPI Unit
- I2C & TWI Unit.
- Interrupt Unit
- Digital/Analog Unit



Part II

- ❖ Set up your IDE
- ❖ Set up the Emulator



I - Required Software and platforms

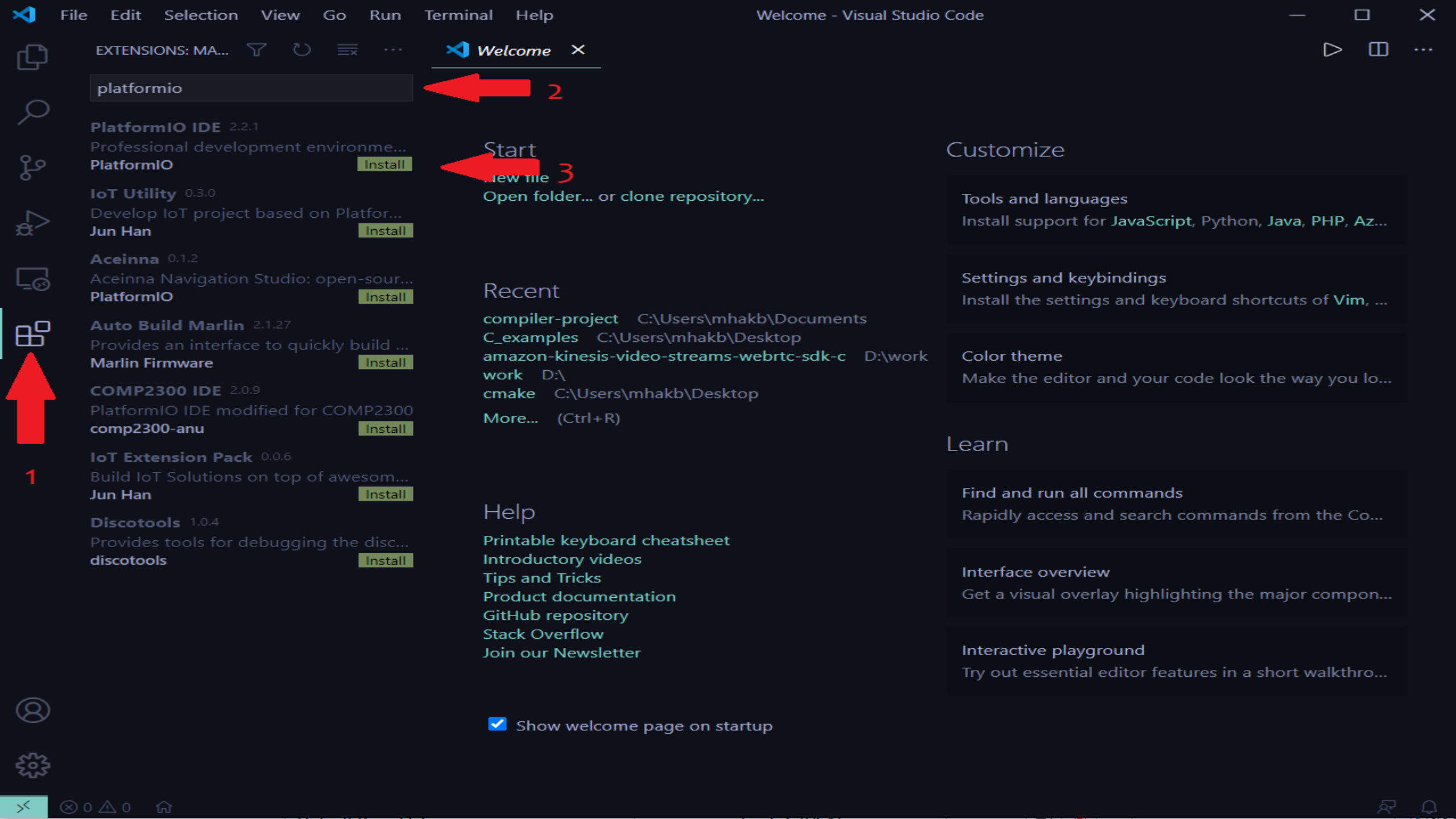
The development environment for this course is **Visual Studio code** and all of the projects should be built and executed using **PlatformIO** extension.

I.I - Installing Visual Studio code

- Microsoft Visual studio code can be downloaded from Microsoft's official website.
- The installation process is explained in this [link](#).

I.II - Installing PlatformIO

For installing **PlatformIO**, you need to open **Visual studio** code and search '**platformio**' in the extensions section as described below:



1

2

Start

3

I.III - Simulating Arduino Board

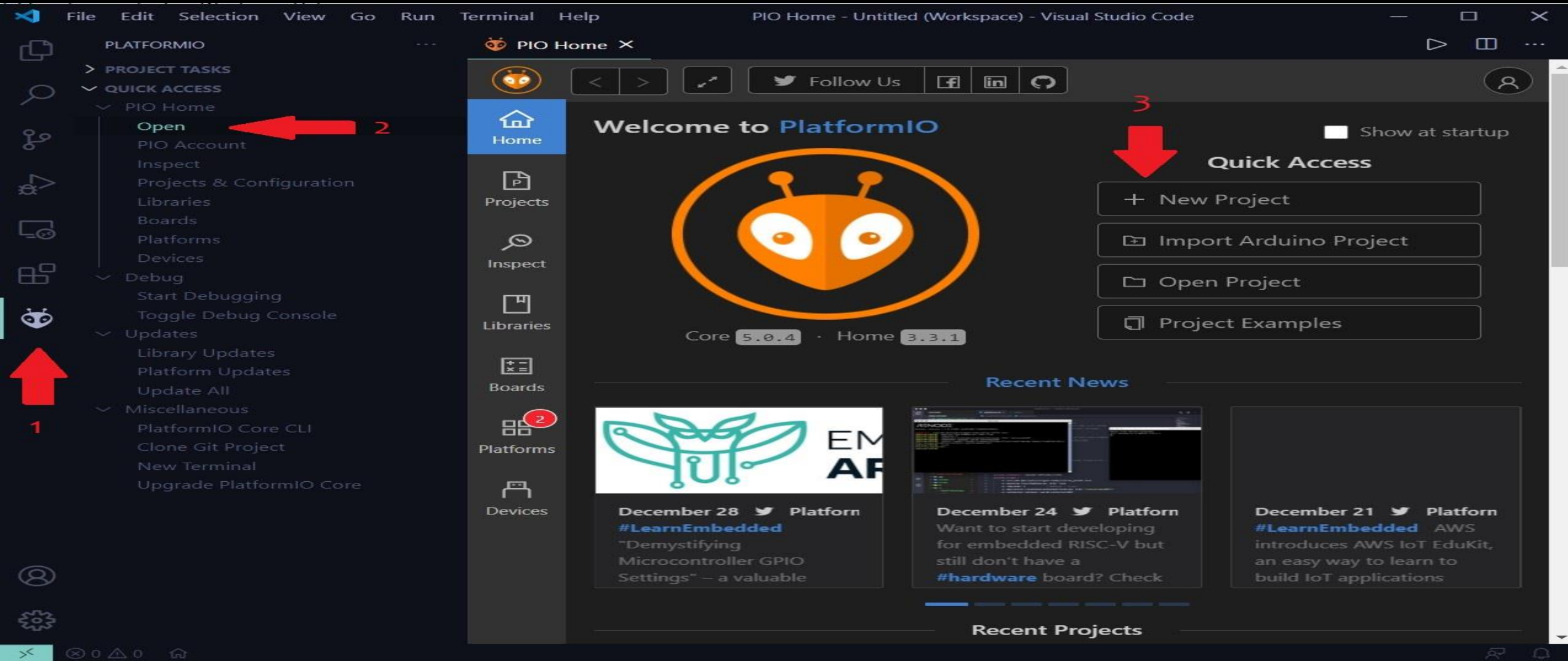
In order to execute your Arduino programs you'll need an Arduino simulator. For simulating the Arduino board you can **install Proteus** and add the following library to the **Proteus** library. Description and download link is available in the [Link](#)

After downloading the library, copy its content and paste it in the following path:

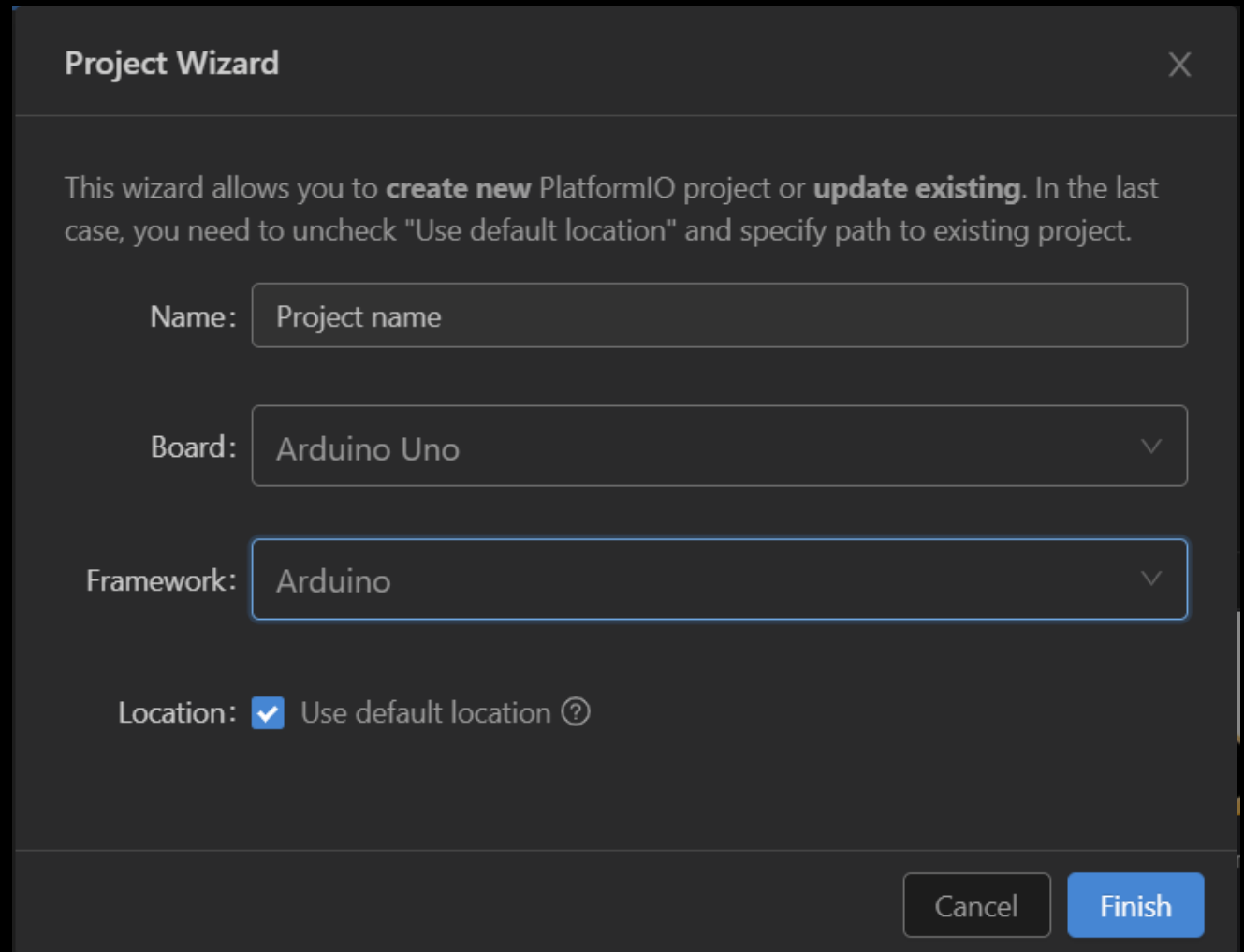
Ex : `E:\Programs\Proteus_8_11_DataPath\Library`

II. Creating your first project

After the installation is complete you should be able to see the PlatformIO's icon on the Visual studio code's sidebar. Click on it's icon, select **open** and after the menu appeared select '+New project' as described in the picture:



*After pressing the new project card a pop screen will appear and asks you to enter the **project name** and the **desired board**. Select the values according to the picture and press finish.*



The image shows a 'Project Wizard' dialog box with a dark theme. It has a title bar with 'Project Wizard' and a close button. The main text explains that the wizard can create a new PlatformIO project or update an existing one, with instructions to uncheck 'Use default location' for existing projects. There are three input fields: 'Name' with the placeholder 'Project name', 'Board' with 'Arduino Uno' selected, and 'Framework' with 'Arduino' selected. A 'Location' section has a checked checkbox and the text 'Use default location' with a help icon. At the bottom right are 'Cancel' and 'Finish' buttons.

Project Wizard [X]

This wizard allows you to **create new** PlatformIO project or **update existing**. In the last case, you need to uncheck "Use default location" and specify path to existing project.

Name:

Board:

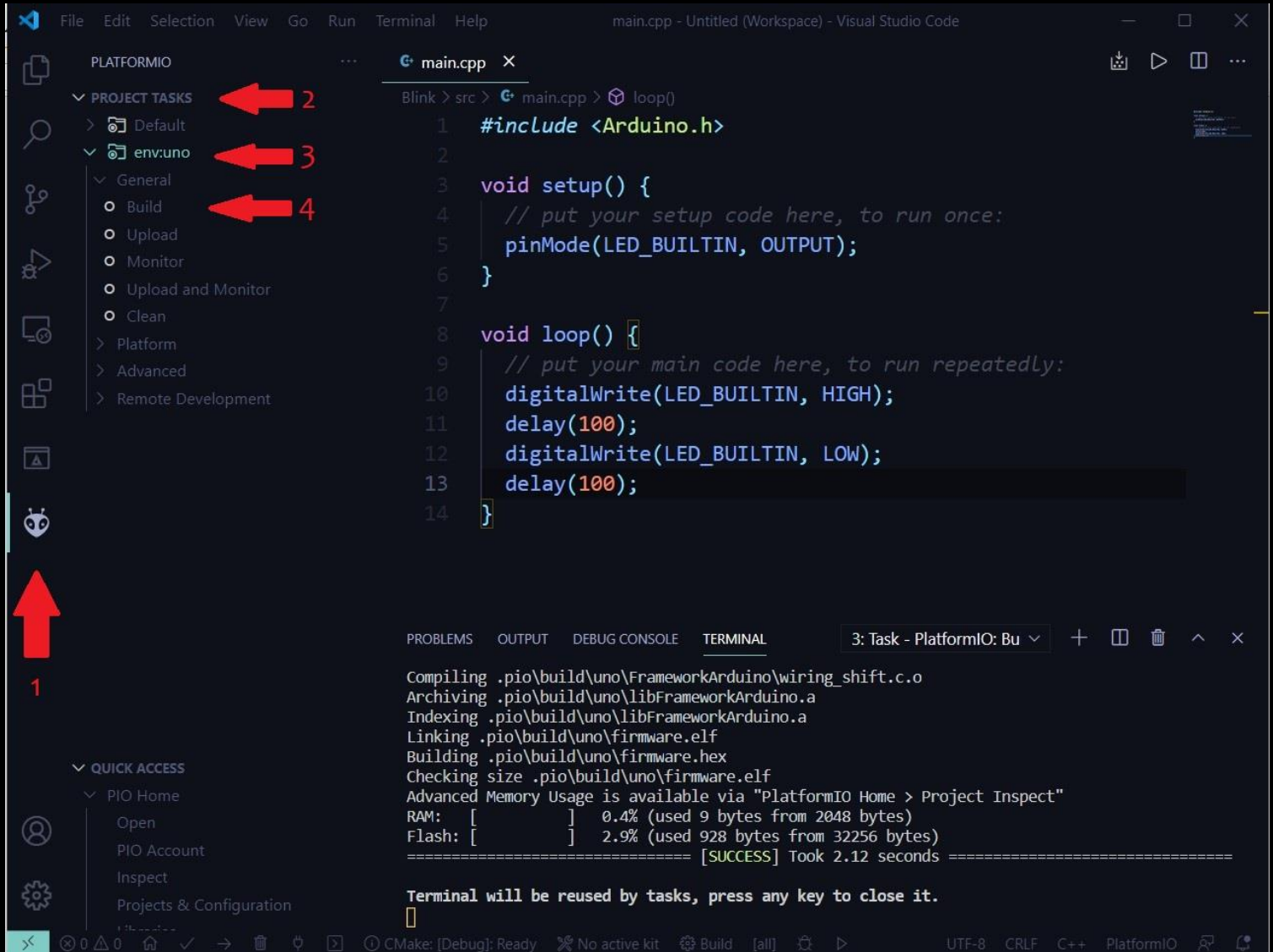
Framework:

Location: ☒ Use default location (?)

[Cancel] [Finish]

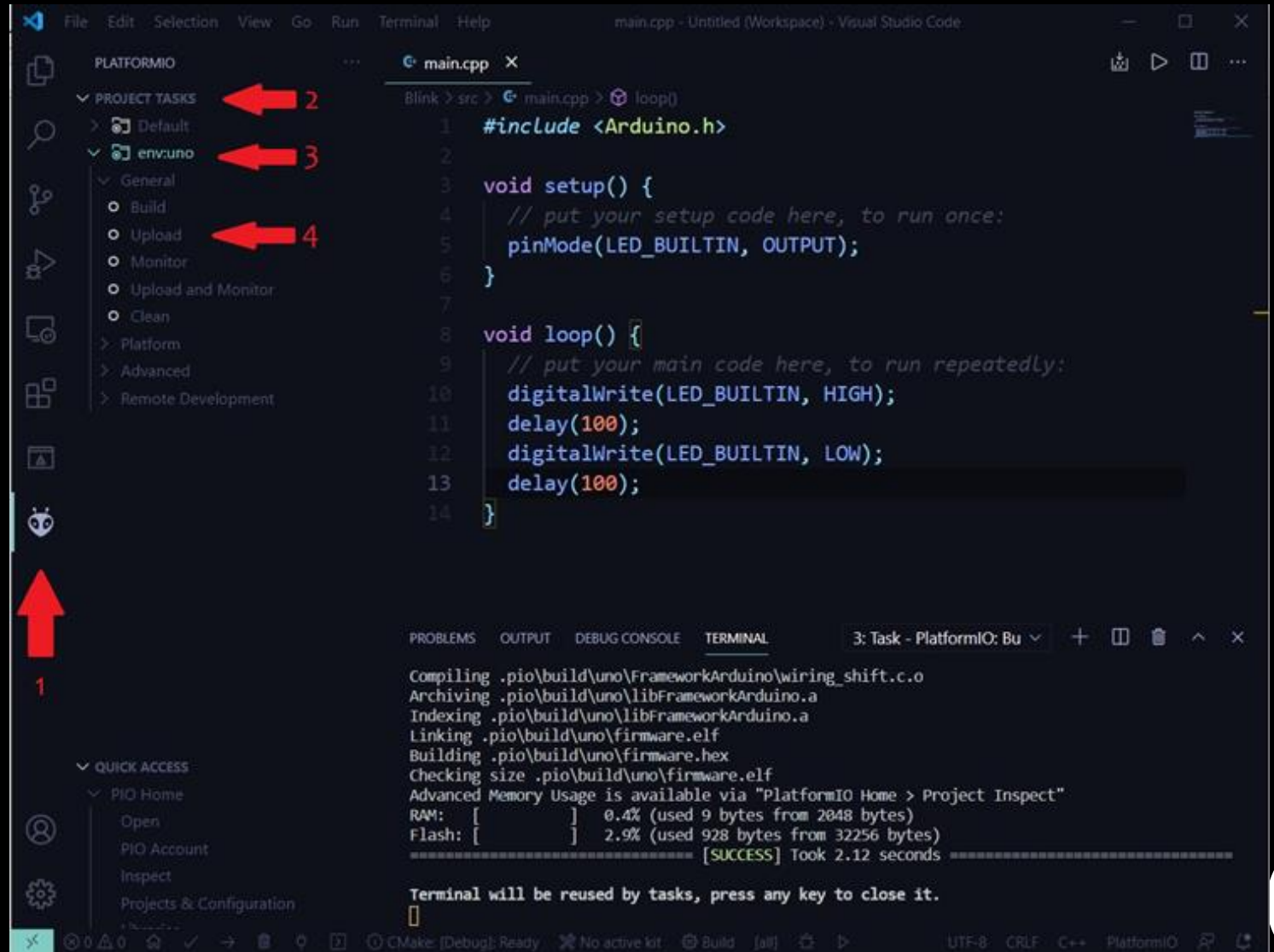
III - Compiling and executing the sketch

*In order to execute your code you will first need to **build** your project and then feed it's **executable file** to the **Arduino simulator** in **Proteus**. For building your project follow these instructions:*



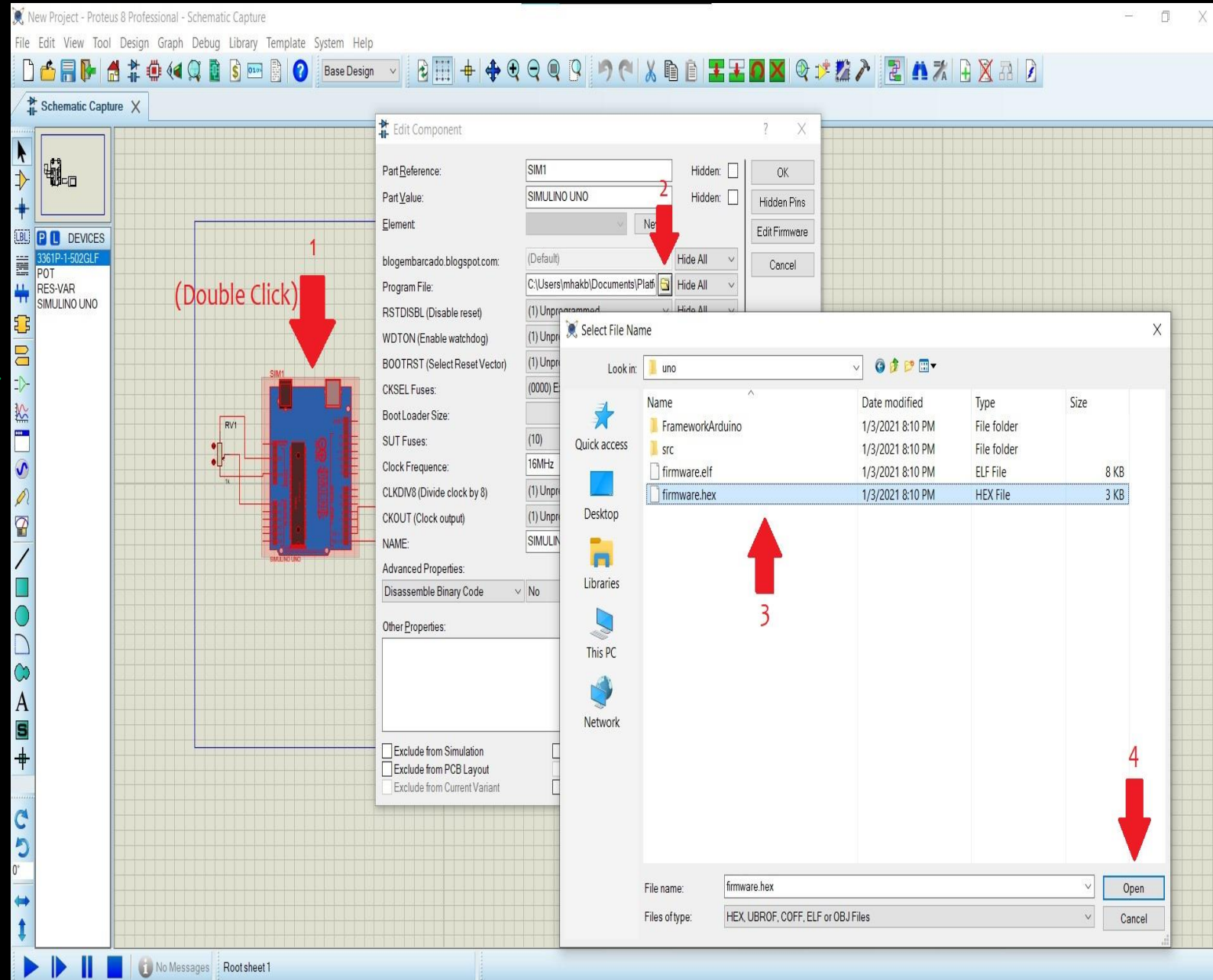
III(For real boards) - Compiling and executing the sketch

In order to upload your code on an Arduino board you will need to hit the upload button. You can also use upload and monitor option to see UART output or send data to Arduino. For flashing your project follow these instructions:



Now in order to execute your program you will need to open **Proteus**, select the **Arduino Uno** board and select the **hex file** in the path :

YourProjectName/.pio/build/uno/firmware.hex
as the executable.



If you had any questions :

1. **Google** is your friend, use it.
2. If you did not find your answer on **Google**, search it on **YouTube**. There is definitely an Indian fellow answering your questions.
3. If your answer was not on the internet, try hard! You will find it.
4. If you didn't find it after all, ask your graders **BUT** if the graders search the question on the internet and find the answer in the first link suggested by **Google**, they have the right to **KILL** you ☺. Just kidding. Ask us if you had any questions.

Good Luck,
Have Fun

