

STM32CubeMX

This page: the short, concrete workflow for using STM32CubeMX to configure an STM32 project and generate init code without accidentally nuking your work.

Download: <https://www.st.com/en/development-tools/stm32cubemx.html>

1) What is it

“**STM32CubeMX** is a graphical tool that simplifies the configuration of STM32 products, and generates the corresponding initialization code through a guided step-by-step process.

> [st.com](https://www.st.com)

In the embedded subteam, we use STM32 Nucleos to make our robot come to life. We use CubeMX to enable these boards to do what we want by **setting the pins** on the physical board and **generating code** that we can use to drive those pins.

2) Starting a (new) project

Once you have successfully installed CubeMX, you can either create or open a project. You will most likely be working with already existing CubeMX projects. **You can open any project by finding the `.ioc` file.** This is the configuration file for any CubeMX project.

However, there are some **important settings** that any project needs.

a. New project

When creating a NEW project make sure you use the **board selector and NOT the MCU selector** to start your project (given the fact that you will be working with a board). If you don't do this, it will cause problems down the line.

b. Project Settings

Project Manager > Project

Once you have your project open, navigate to the project manager.

- It is important that your **project name is "firmware"**, since this is the name the folder is supposed to have in the embedded structure. (This is platformio configuration related.)
- **Do not generate main()**. You should only generate a main function to check what is in there and use it as an example, but when you want to build, you can not have a main function in your auto-generated code. It will conflict with your own main function.
- Set the toolchain to **Makefile**. You should not use another toolchain, because the post code generation script uses information from the Makefile!

Project Settings

Project Name:

Project Location:

Application Structure: Do not generate the main()

Toolchain Folder Location:

Toolchain / IDE: Generate Under Root

Project Manager > Code Generator

- Click the box to generate **separate files per peripheral**. Otherwise you will encounter errors surrounding missing libraries when building.
- Set the after code generation script. It can be found in `scripts/post_code_generation.bash`.
More information in [Post-Generation Scripts](#).

NOTE for Windows users: the post generation script will NOT automatically be ran for you. Instead, you will have to run the script by hand in the **git bash** terminal.

Generated files

- Generate peripheral initialization as a pair of '.c/.h' files per peripheral
- Backup previously generated files when re-generating
- Keep User Code when re-generating
- Delete previously generated files when not re-generated

HAL Settings

- Set all free pins as analog (to optimize the power consumption)
- Enable Full Assert

User Actions

Before Code Generation

After Code Generation

3) Typical Workflow

a. Configure pins & peripherals

- In **Pinout & Configuration**: enable the peripherals you need (UART/SPI/I2C/CAN/Timers/ADC/etc.).
- Assign pins and resolve conflicts (CubeMX will warn you).
- Configure DMA + NVIC if needed (especially for high-rate IO or RTOS systems).

b. Set up the clocks

- Go to **Clock Configuration** and set your clock source (HSI/HSE) and PLL to the target system frequency.
- Verify peripheral clocks (UART baud rates and timer frequencies depend on this).
- If USB is used, make sure USB clock requirements are satisfied (CubeMX will usually flag invalid setups).

c. Code generation

Do not write custom code in CubeMX-generated files.

CubeMX will overwrite generated files during regeneration. Any custom code placed there **will be lost**, even if it appears to work temporarily.

Rule:

- Generated code is **read-only**.
- Your code lives **outside** of it.

What to do instead:

- Put all application logic in your own source files (`src/`, modules, drivers, etc.).
- Only use generated code as initialization and hardware configuration.
- Call your own code from the appropriate entry points (e.g. after init in `main()`).

Bottom line:

If your code depends on surviving a “Generate Code” click, it’s in the wrong place.

d. Generate code, then build & verify

- Open **Project Manager** and confirm the project type/toolchain and output path are correct.
- Click **Generate Code**.
- Immediately review changes (e.g. `git diff`). If CubeMX changed a lot more than expected, stop and investigate before committing.
- Build the firmware and run a basic smoke test (UART prints, LED blink, peripheral init success, etc.)

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