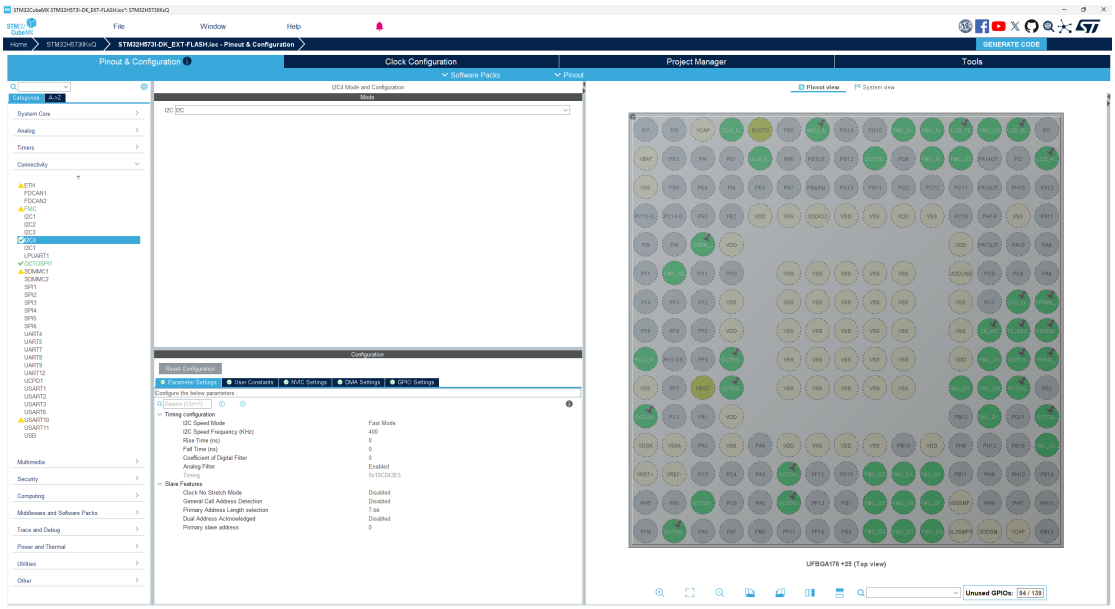
STM32CubeMX

Data brief

STM32 configuration and initialization C code generation



DT33788V3

Product status
STM32CubeMX

Features

- Intuitive STM32 microcontroller and microprocessor selection
- Rich easy-to-use graphical user interface allowing the configuration of:
  - Pinout with automatic conflict resolution
  - Peripherals and middleware functional modes with dynamic validation of parameter constraints for Arm® Cortex®-M core
  - Clock tree with dynamic validation of the configuration
  - Power sequence with estimated consumption results
- Generation of initialization C code project, compliant with IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDE (GCC compilers) for Arm® Cortex®-M core
- Generation of a partial Linux® *Device Tree* for Arm® Cortex®-A core (STM32 microprocessors)
- Development of enhanced STM32Cube Expansion Packages thanks to STM32PackCreator
- Integration of STM32Cube Expansion Packages into the project
- Multi-OS support: Windows®, Linux®, and macOS®

Description

STM32CubeMX is a graphical tool that allows a very easy configuration of STM32 microcontrollers and microprocessors, as well as the generation of the corresponding initialization C code for the Arm® Cortex®-M core or a partial Linux® *Device Tree* for the Arm® Cortex®-A core, through a step-by-step process.

The first step consists in selecting either an STMicroelectronics STM32 microcontroller, microprocessor, or development platform that matches the required set of peripherals, or an example running on a specific development platform.

For microprocessors, the second step allows the user to configure the GPIOs and the clock setup for the whole system, and to assign peripherals interactively either to the Arm® Cortex®-M or to the Cortex®-A world. Specific utilities, such as DDR configuration and tuning, make it easy to get started with STM32 microprocessors. For the Cortex®-M core, the configuration includes additional steps that are exactly similar to those described for microcontrollers.

For microcontrollers, and microprocessor Arm® Cortex®-M, the second step consists in configuring each required embedded software thanks to a pinout-conflict solver, a clock-tree setting helper, a power-consumption calculator, and a utility that configures the peripherals (such as GPIO or USART) and the middleware stacks (such as FreeRTOS™ kernel, USB, TCP/IP, or TouchGFX).

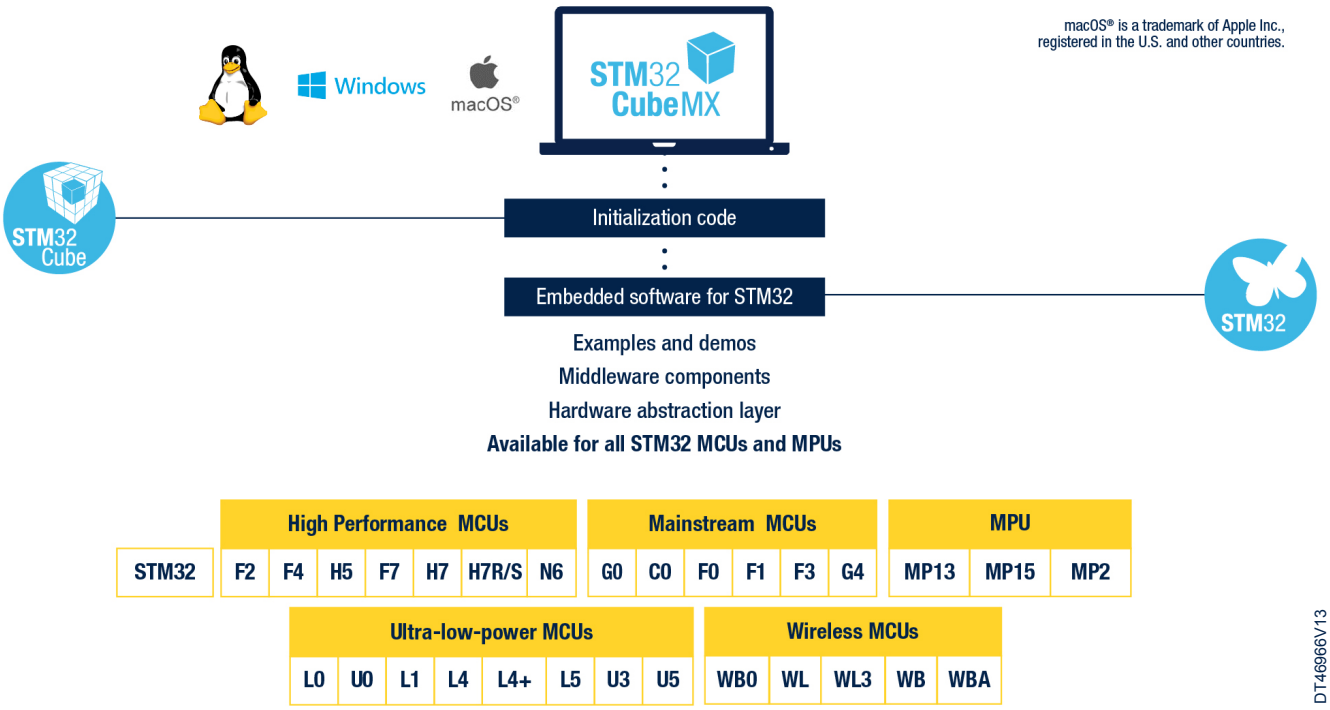
The default software and middleware stacks can be extended thanks to enhanced STM32Cube Expansion Packages. STMicroelectronics or STMicroelectronics' partner packages can be downloaded directly from a dedicated package manager available within STM32CubeMX, while the other packages can be installed from a local drive.

Moreover, a unique utility in STM32CubeMX delivery, STM32PackCreator, helps developers to build their own enhanced STM32Cube Expansion Packages.

Eventually the user launches the generation that matches the selected configuration choices. This step provides the initialization C code for the Arm® Cortex®-M, ready to be used within several development environments, or a partial Linux® *Device Tree* for the Arm® Cortex®-A.

STM32CubeMX is delivered within STM32Cube.

Figure 1. STM32CubeMX within STM32Cube



1 What is STM32Cube?

STM32Cube is an STMicroelectronics original initiative to improve designer productivity significantly by reducing development effort, time, and cost. STM32Cube covers the whole STM32 portfolio.

STM32Cube includes:

- A set of user-friendly software development tools to cover project development from conception to realization, among which are:
  - STM32CubeMX, a graphical software configuration tool that allows the automatic generation of C initialization code using graphical wizards
  - STM32CubeIDE, an Eclipse®-based IDE, providing code edition, compilation, programming, and debugging capabilities
  - STM32CubeCLT, an all-in-one command-line development toolset with code compilation, board programming, and debug features
  - STM32CubeIDE for Visual Studio Code (STM32VSCode), a complete IDE based on VS Code® platform
  - STM32CubeProgrammer (STM32CubeProg), a programming tool available in graphical and command-line versions
  - STM32CubeMonitor (STM32CubeMonitor, STM32CubeMonPwr, STM32CubeMonRF, STM32CubeMonUCPD), powerful monitoring tools to fine-tune the behavior and performance of STM32 applications in real time
  - STM32CubeWiSE (STM32CubeWiSEcg, STM32CubeWiSEre), graphical tools designed to evaluate and test the capabilities of sub-GHz radios and protocols
- STM32Cube MCU and MPU Packages, comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeH5 for the STM32H5 series), which include:
  - STM32Cube hardware abstraction layer (HAL), ensuring maximized portability across the STM32 portfolio
  - STM32Cube low-layer APIs, ensuring the best performance and footprints with a high degree of user control over hardware
  - A consistent set of middleware components such as ThreadX, FileX, LevelX, NetX Duo, USBX, USB PD, mbed-crypto, MCUboot, and OpenBL
  - All embedded software utilities with full sets of peripheral and applicative examples
- STM32Cube Expansion Packages, which contain embedded software components that complement the functionalities of the STM32Cube MCU and MPU Packages with:
  - Middleware extensions and applicative layers
  - Examples running on some specific STMicroelectronics development boards

2 Ordering information

STM32CubeMX is available for free download from STMicroelectronics website:

- From the product page, at www.st.com/en/product/stm32cubemx
- From the Developer Zone, at www.st.com/stm32cubemx

3 License

STM32CubeMX is delivered under the SLA0048 software license agreement and its Additional License Terms.

STM32CubeMX runs on computers with Windows®, Linux®, or macOS® operating systems for the configuration of STM32 microcontrollers and microprocessors based on Arm® cores.

Note:

- *Windows is a trademark of the Microsoft group of companies.*
- *Linux® is a registered trademark of Linus Torvalds.*
- *macOS® is a trademark of Apple Inc., registered in the U.S. and other countries and regions.*
- *Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.*

Revision history

Table 1. **Document revision history**

Date	Revision	Changes
14-Feb-2014	1	Initial release.
19-Jun-2014	2	Updated *Section Description* and *Figure 1. STM32CubeMX within STM32Cube*.
16-Jan-2015	3	STM32CubeMX extended to all STM32 series.
08-Feb-2016	4	Added Windows® and Linux® operating systems in *Section Features*. Removed mention of MicroXplorer tool in *Section Description*. Updated *Figure 1. STM32CubeMX within STM32Cube*.
29-Apr-2016	5	Added OS X operating system.
28-Jun-2017	6	Added low-layer APIs. Replaced OS X by macOS operating system. Updated *Figure 1. STM32CubeMX within STM32Cube*.
04-Jul-2017	7	The footnote on cover page related to macOS has been embedded in the list of features.
14-Nov-2017	8	Updated *Section Description* and *Figure 1. STM32CubeMX within STM32Cube*.
03-Jul-2018	9	Updated *Section Description*. Added *Section 3 License*.
20-Nov-2018	10	Added STM32CubeMX logo on cover page. Updated *Section Features* and *Section Description*. Updated STM32CubeMX GUI on cover page and *Figure 1. STM32CubeMX within STM32Cube*. Updated web page url in *Section 2 Ordering Information*.
13-Dec-2018	11	Updated *Section Description* and *Figure 1. STM32CubeMX within STM32Cube*. Added *Section 1 What is STM32Cube?*
22-Feb-2019	12	Updated the whole document to support STM32MP1 microprocessor series. Updated *Figure 1. STM32CubeMX within STM32Cube* to add STM32WB microcontroller.
03-Jun-2019	13	Added STM32G4 microcontroller series.
08-Oct-2019	14	Added STM32L5 microcontroller series.
09-Jul-2020	15	Updated *Section Features* and *Section Description*.
12-Nov-2020	16	Replaced Keil® by MDK-ARM, and IAR Systems® by IAR Embedded Workbench®. Added STM32WL series in *Figure 1. STM32CubeMX within STM32Cube*. Replaced STM32CubeMonitor-Power by STM32CubeMonitor in *Section 1 What is STM32Cube?*
08-jul-2021	17	Added STM32U5 series in *Figure 1. STM32CubeMX within STM32Cube*. Updated *Section 3 License*.
11-Feb-2022	18	Added STM32C0 series in *Figure 1. STM32CubeMX within STM32Cube*.
22-Feb-2023	19	Updated *Figure 1. STM32CubeMX within STM32Cube* to add STM32H5 and STM32WBA series.
02-Dec-2025	20	Updated Figure 1. STM32CubeMX within STM32Cube to add the STM32MP2, STM32N6, STM32U0, STM32U3, and STM32WB0 series, and the STM32H7Rx/7Sx, STM32MP13x, STM32MP15x, and STM32WL3x product lines. Updated the cover image, Ordering information, License, and What is STM32Cube? Applied minor text edits across the document.