Seminario

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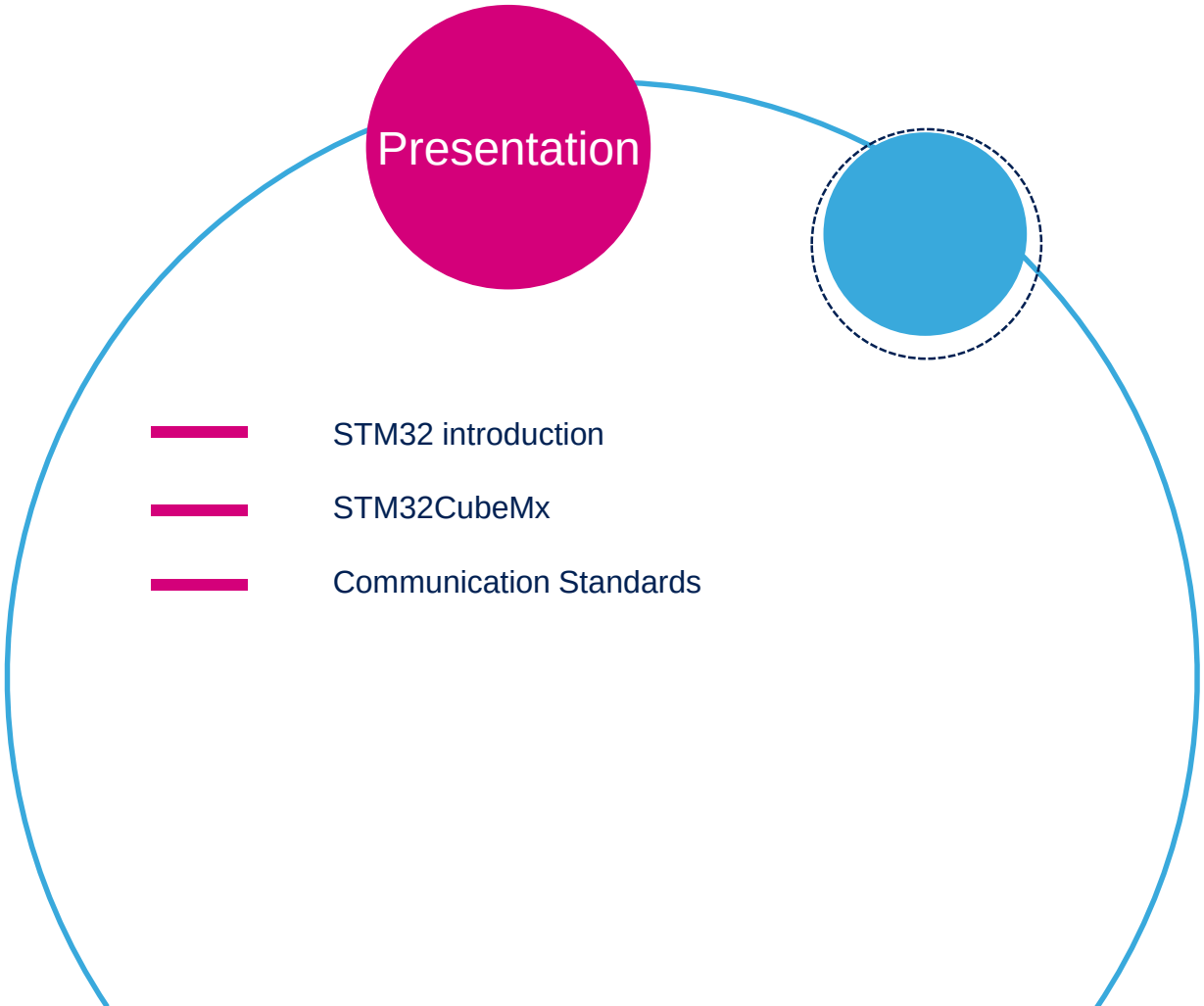
Agenda

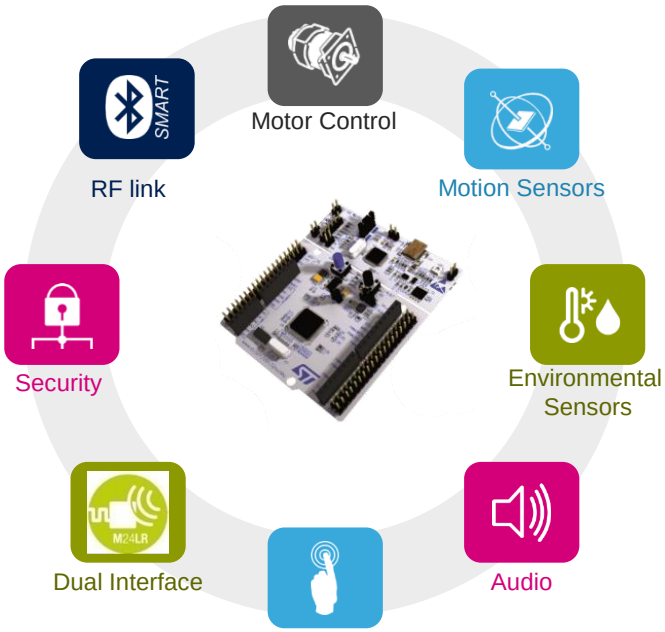


- STM32 introduction
- STM32CubeMx
- Communication Standards

STM32 Introduction

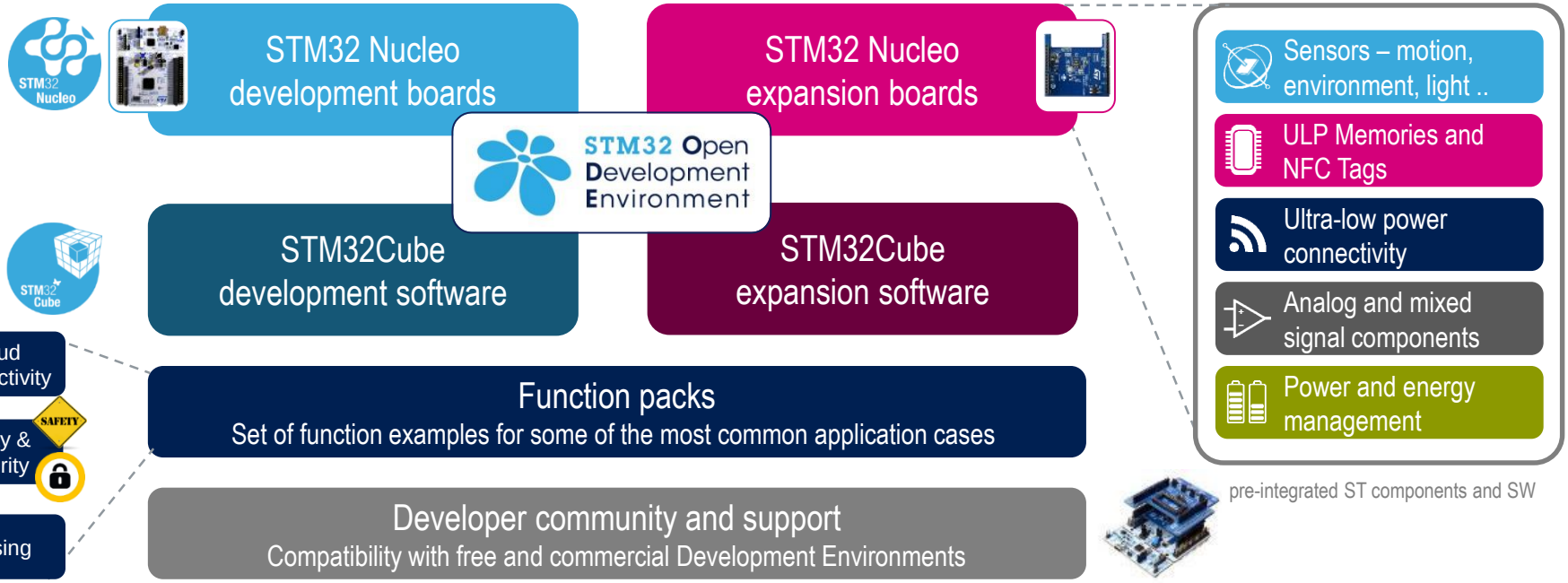
The needs of developers

- A microcontroller is usually the first choice of developers when designing a new application
  - Need to pick from low power to high performance microcontroller based on application needs
- A set of extra functions are keys to implement the system
  - Sensing, data conversion, processing, connectivity, power management, …
- Easy to use Integrated Development Environment to allow fast development and production
  - Support of multiple IDE
  - Free of charge tools and embedded software to enable fast and easy development



STM32 Open Development Environment

Fast, affordable prototyping & development



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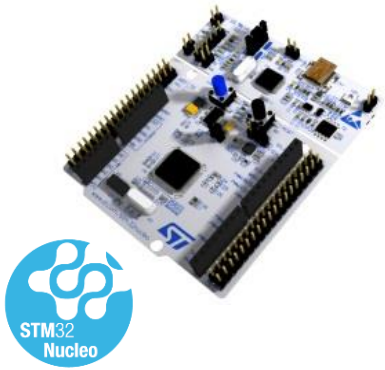
STM32 Open Development Environment
Hardware Components

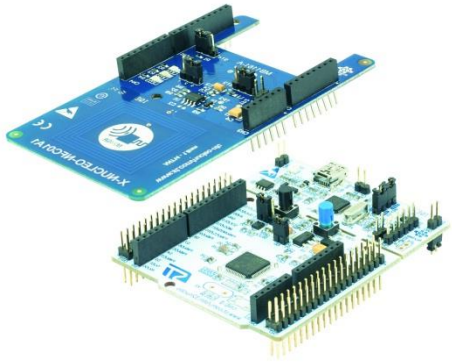
STM32 Nucleo Development Boards

- Based on ST's 32-bit ARM Cortex-M based STM32 microprocessors
- Development boards for all STM32 families available or planned



STM32 Nucleo Expansion Boards

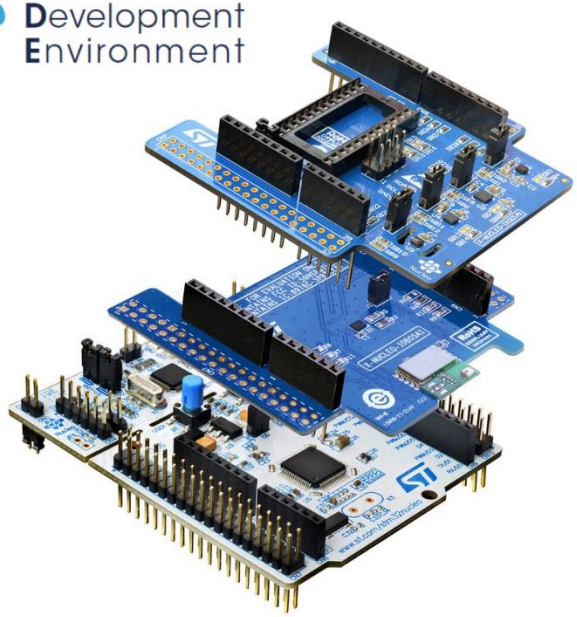
- Boards with additional functionality: sensing, connectivity, power, analog
- Plugged on top of the STM32 Nucleo developer board or stacked on top of other expansion boards
- Leverage ST wide product portfolio



Going beyond with the STM32 Open Development Environment

www.st.com/stm32ode
www.st.com/stm32ode-fp

STM32 Open Development Environment



Several expansion boards covering all the key functions

Sense	Connect	Power Drive	Move Actuate	Translate
Motion & environmental sensors Proximity sensor Microphone	BLE Wi-Fi Sub-GHz NFC	Power management LED Boost	Motor drive Actuator	Audio OpAmp

12 processor boards from 9 families

STM32 F0 · STM32 F1 · STM32 F2 · STM32 F3 · STM32 F4 · STM32 F7
STM32 L0 · STM32 L1 · STM32 L4

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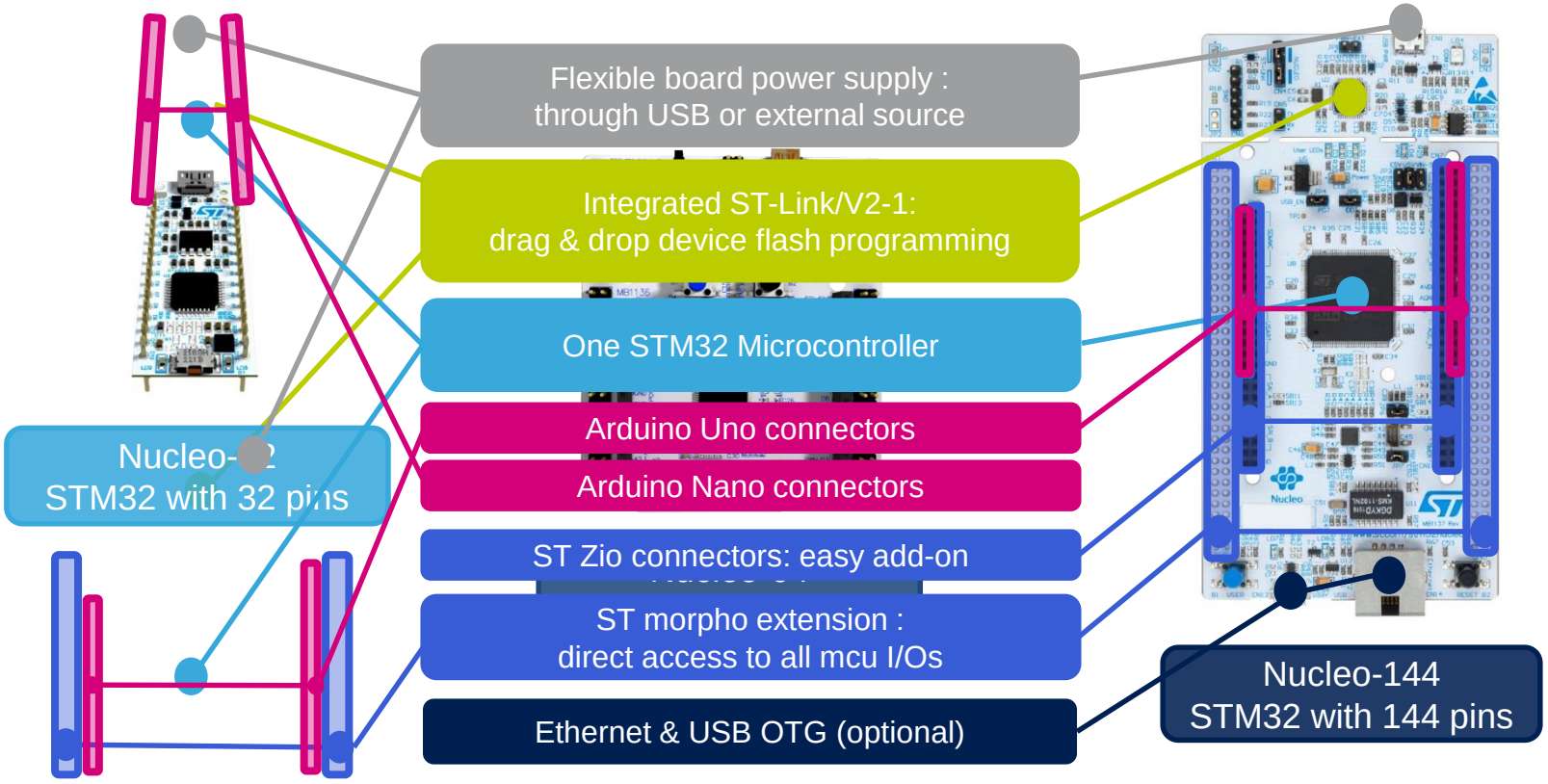
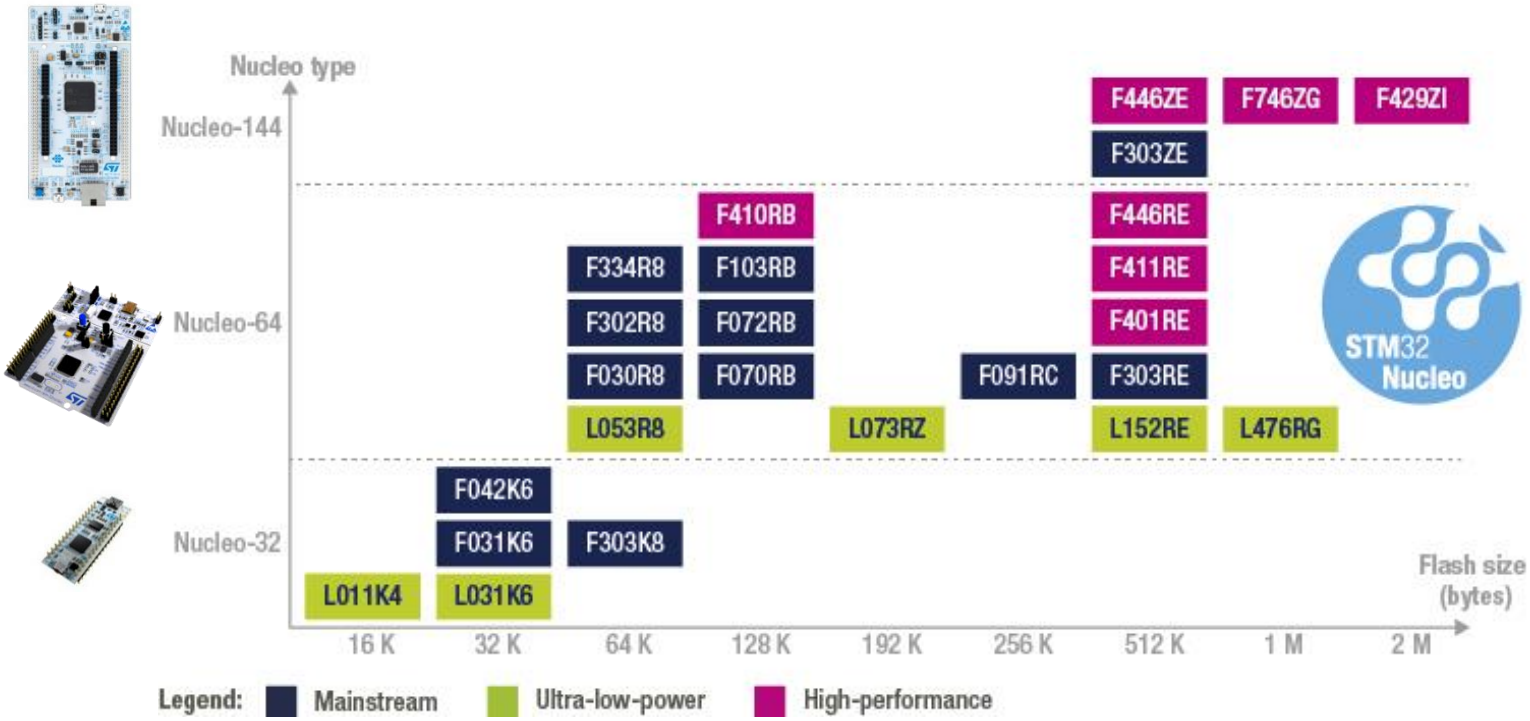
STM32Nucleo Boards

Enlarging the STM32Nucleo family to cover whole STM32 portfolio



STM32Nucleo Boards

Enlarging the STM32Nucleo family to cover whole STM32 portfolio



STM32 Open Development Environment

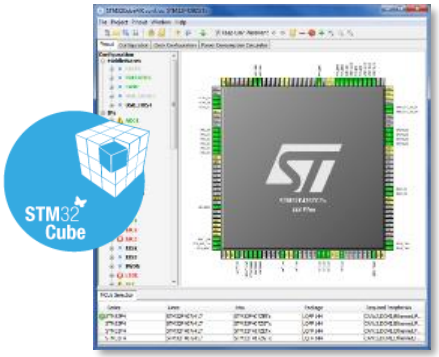
Software Components

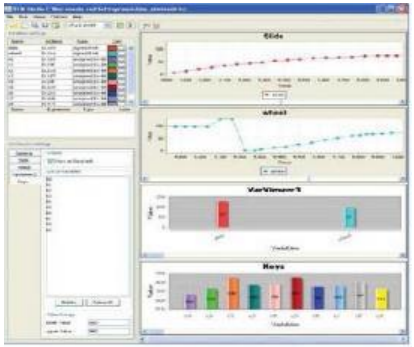
- **STM32Cube**
  - A set of free of charge tools and embedded Software bricks to enable fast and easy development on the STM32
    - PC-based STM32CubeMX for graphical configuration of the STM32
    - Hardware Abstraction Layer for easy porting from one STM32 device to another
    - Middleware bricks for the most common functions
    - Hundreds of code use examples are also included.
- **STM32Cube Expansion software**
  - Free of charge for every STM32 Nucleo expansion boards
- **Multiple Development Environments**
  - Compatible with a number of Development Environments including IAR EWARM, Keil MDK, mbed and GCC-based IDEs

Software Development Tools

C/C++ Focus

A complete flow, from configuration up to monitoring



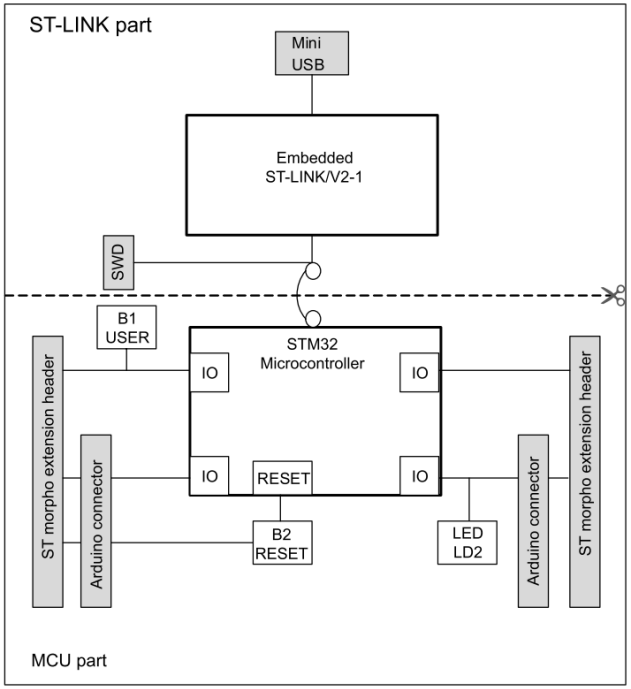


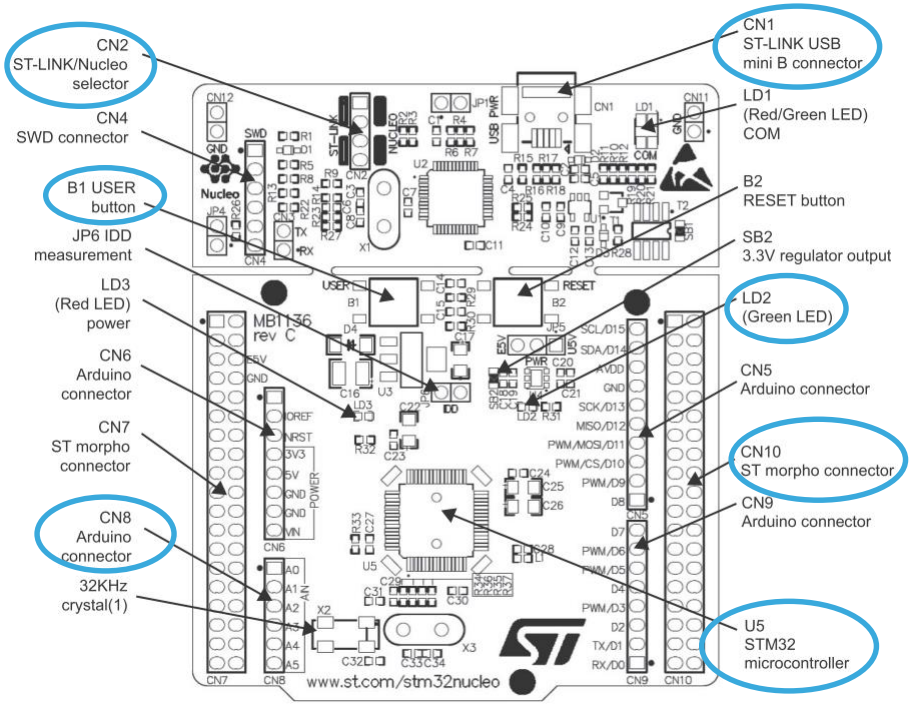
STM32CubeMX
Configure & Generate Code

Partners IDEs
Compile and Debug

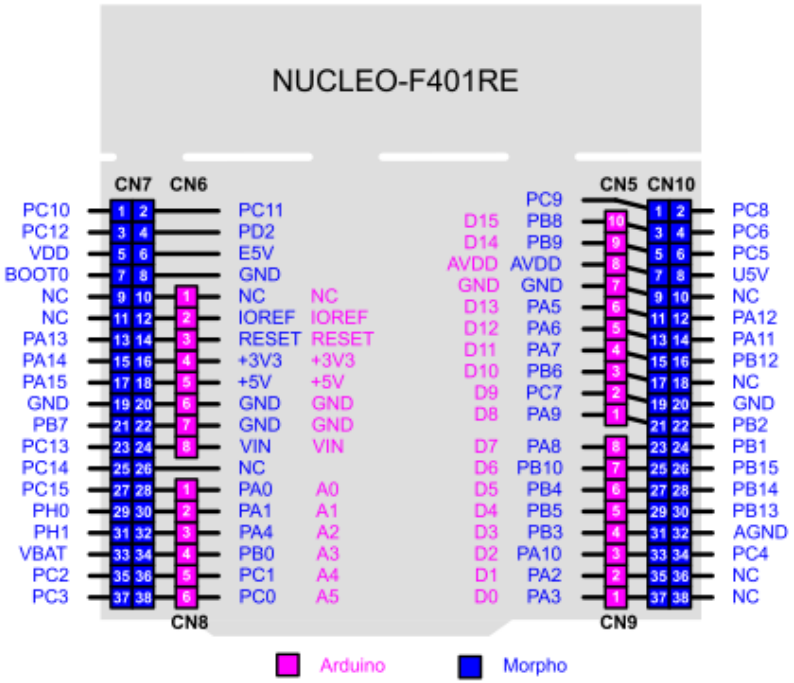
STMStudio
Monitor

Hardware Block Diagram



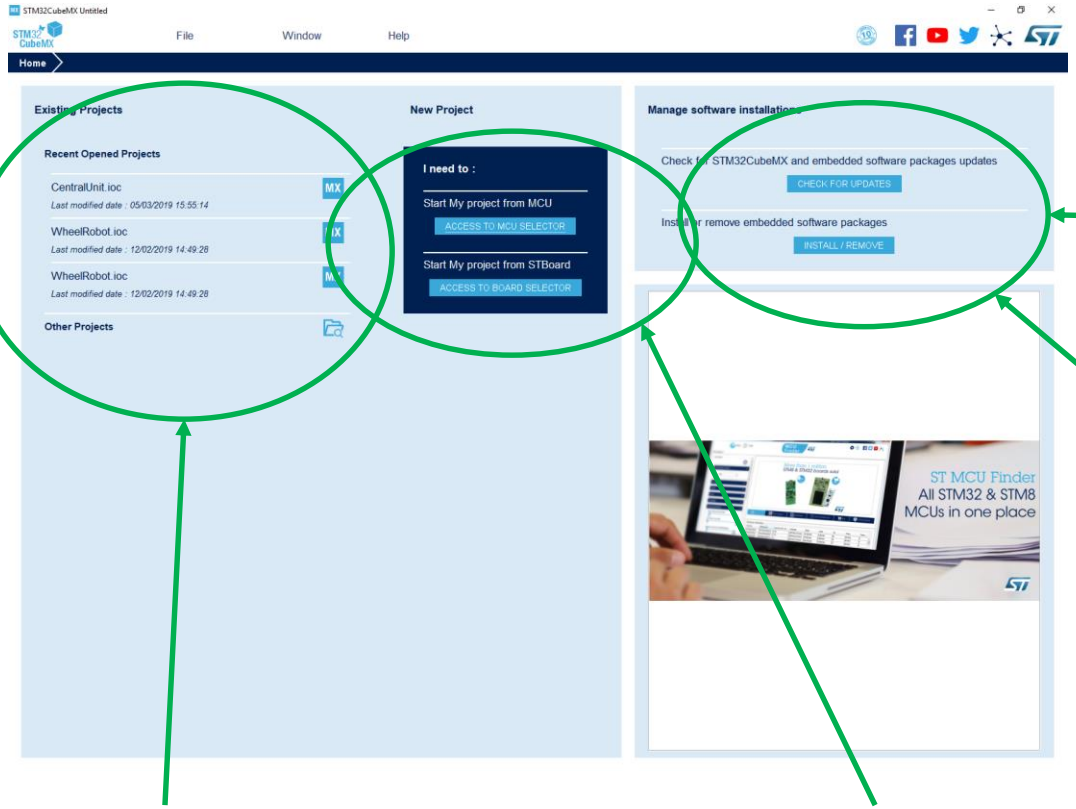


Hardware Layout and Configuration



STM32CubeMX

STM32CubeMX – Main Page



SW updater

Additional packages
(MCU, AI, BLE, MEMS, etc)

Last projects

MCU or
board selector

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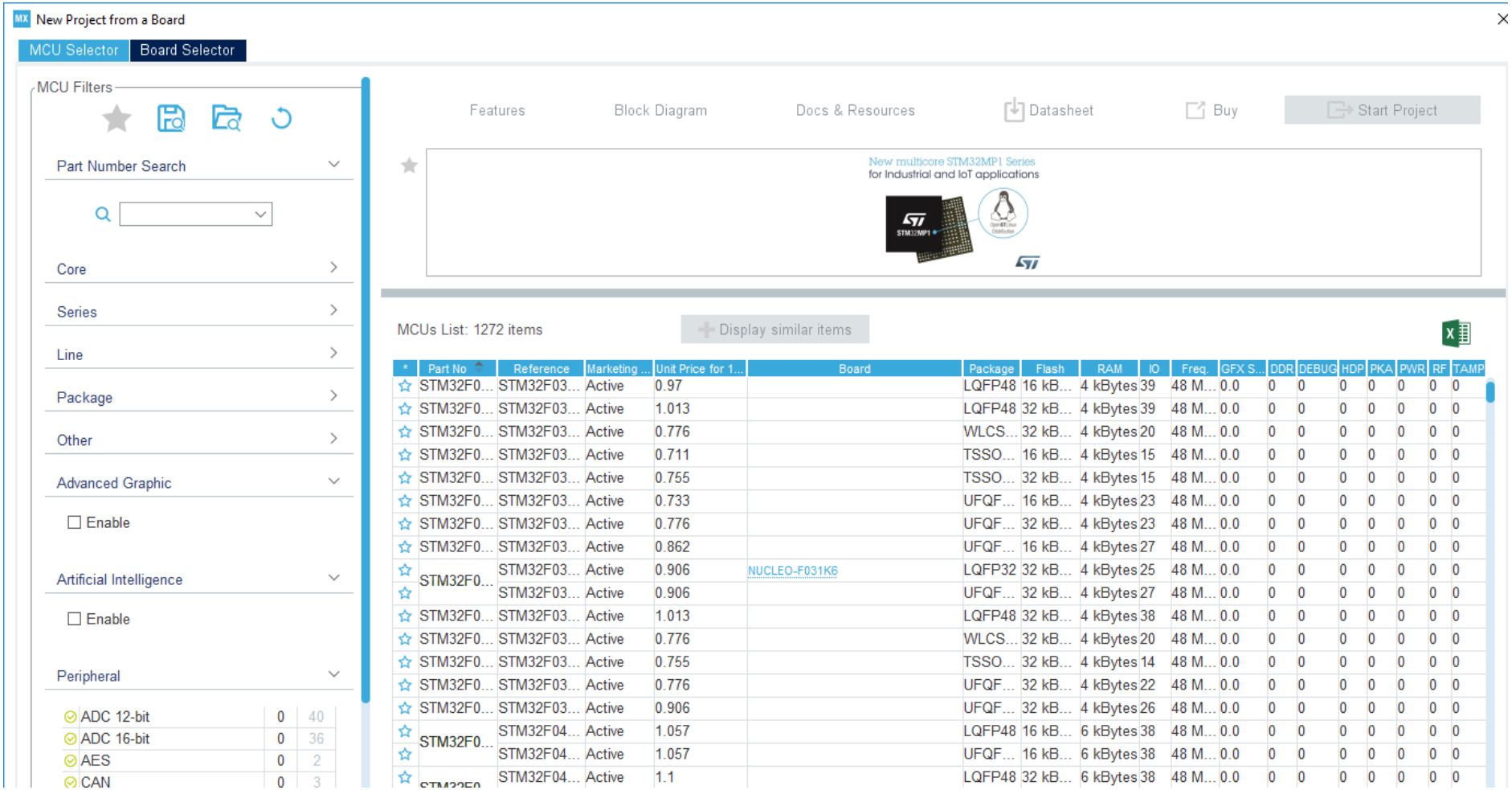
STM32CubeMX – MCU/Board selector



- User can filter results by part number, Core, Series, Peripherals, etc
- Choice can be performed on several ST boards, too

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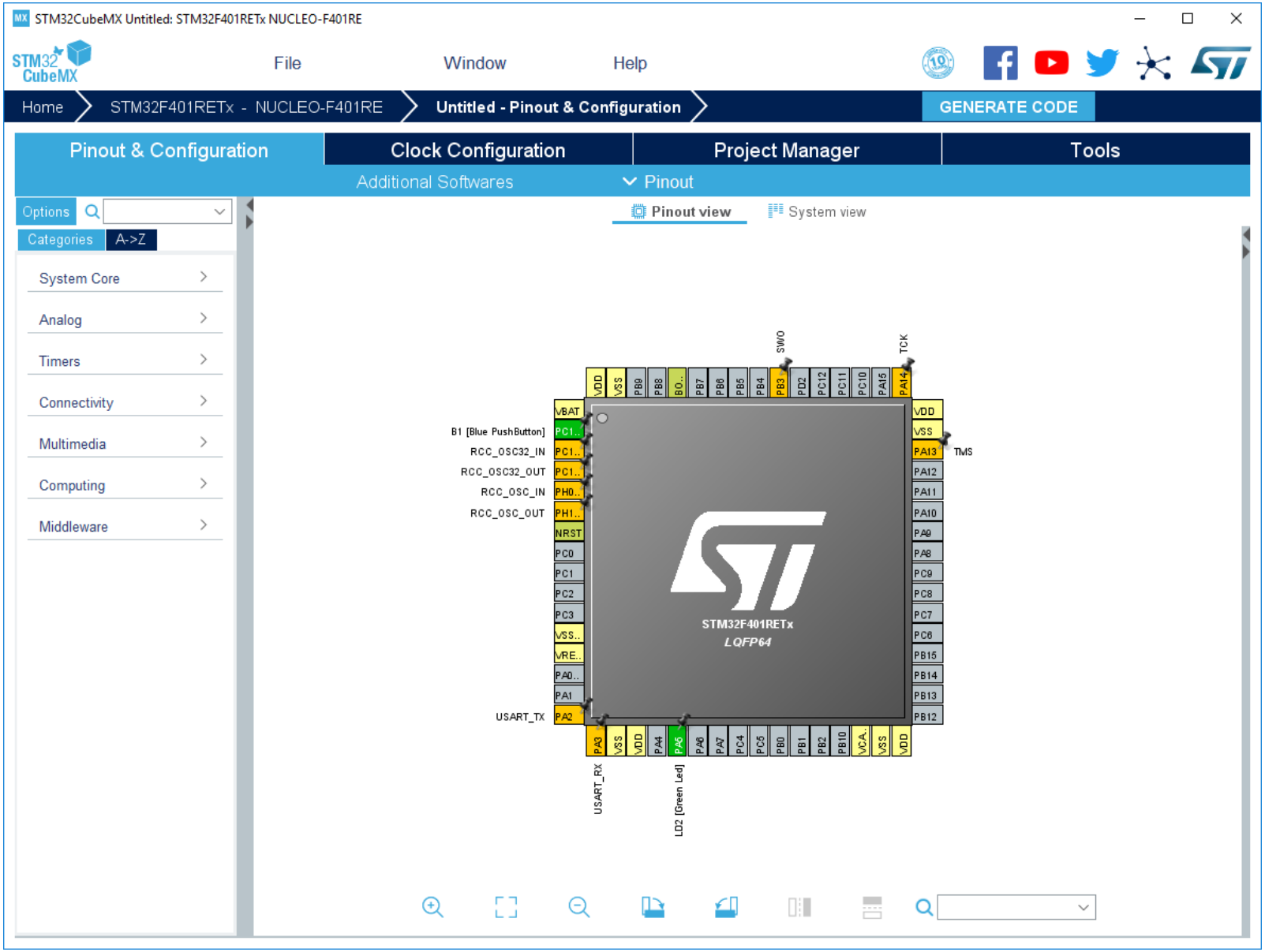
STM32CubeMX – Pinout & Configuration



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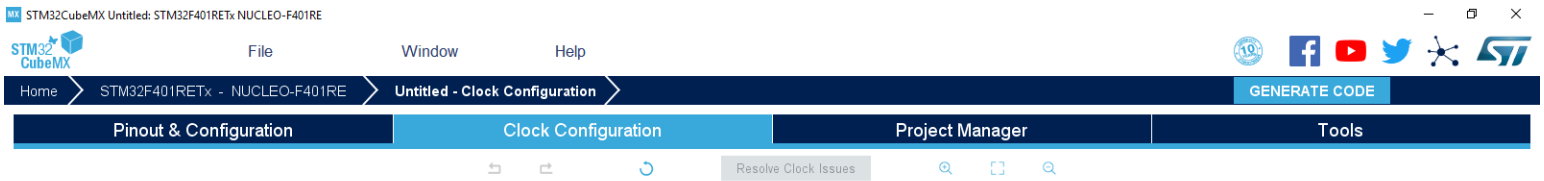
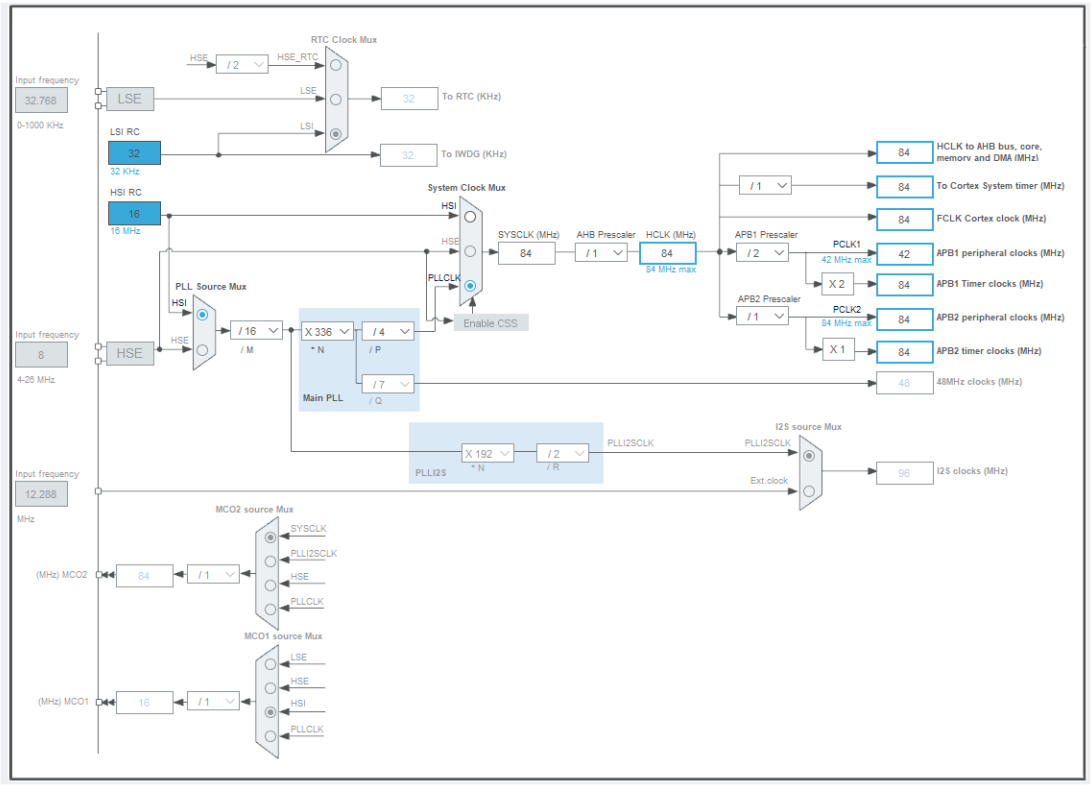
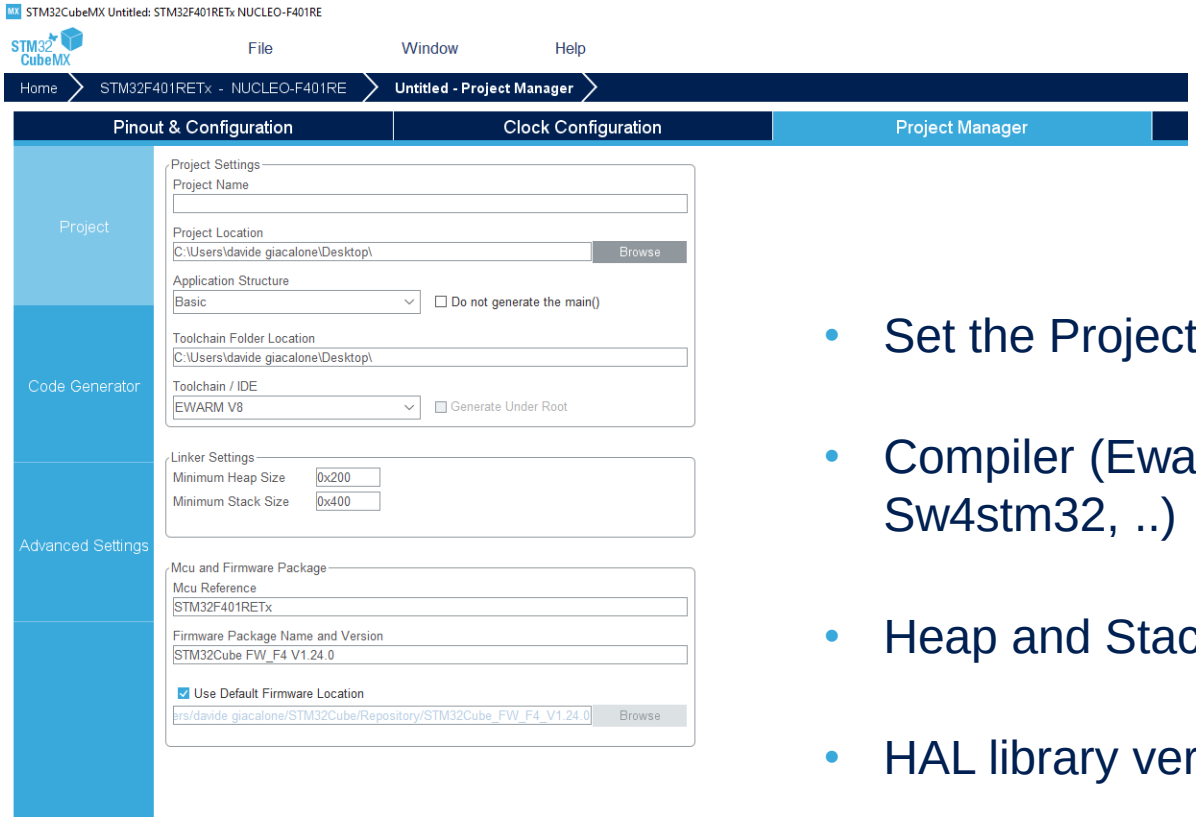
STM32CubeMX – Clock Configuration





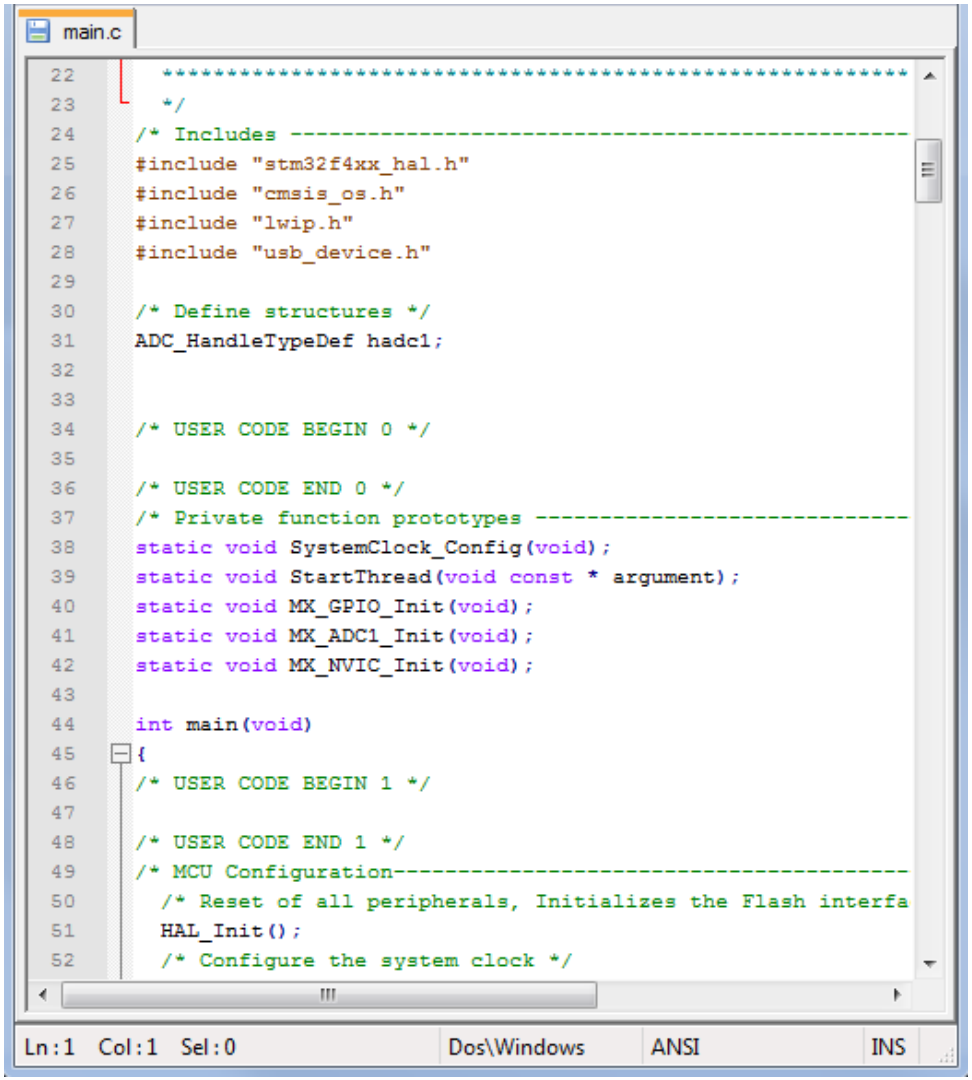
STM32CubeMX – Project Manager



- Set the Project name
- Compiler (Ewarm, TrueStudio Sw4stm32, ..)
- Heap and Stack Size
- HAL library version
- ..

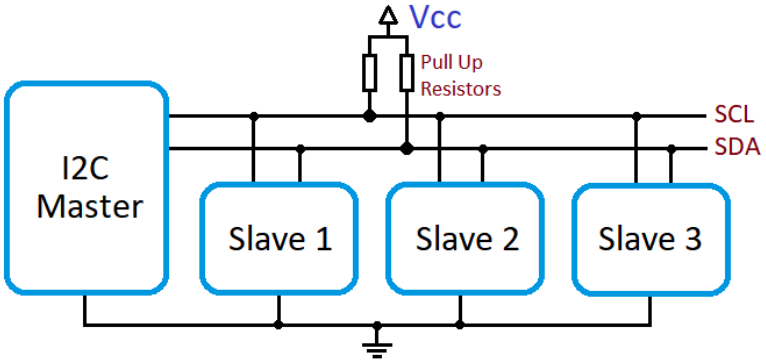
STM32CubeMX: Code generation

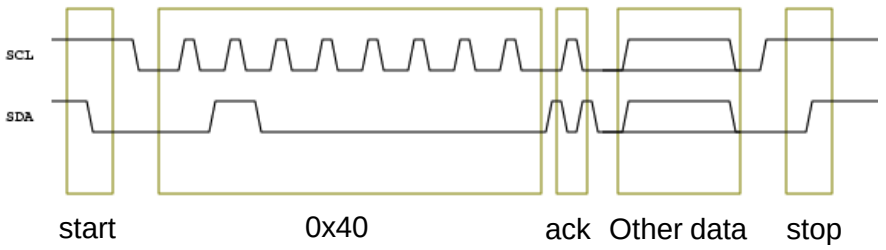
- Generation of all the C initialization code
- Automatic integration with partners toolchains
- User code can be added in dedicated sections and will be kept upon regeneration
- Required library code is automatically copied or referenced in the project (updater)



Communication Standards

- **I²C** (Inter-Integrated Circuit) is a synchronous, multi-master, multi-slave, serial computer bus invented in 1982 by Philips Semiconductor
- It is widely used for attaching lower-speed peripheral ICs to processors and microcontrollers in short-distance, intra-board communication
- I²C uses Serial Data Line (**SDA**) and Serial Clock Line (**SCL**), pulled up with resistors.
- Typically 7-bit address space, rarely-used 10-bit extension.
- Common I²C bus speeds:
  - 100 kbit/s (Standard mode)
  - 400 kbit/s (Fast mode)
- The bus has two roles for nodes: master and slave
  - Master node – node that generates the clock and initiates communication with slaves.
  - Slave node – node that receives the clock and responds when addressed by the master.

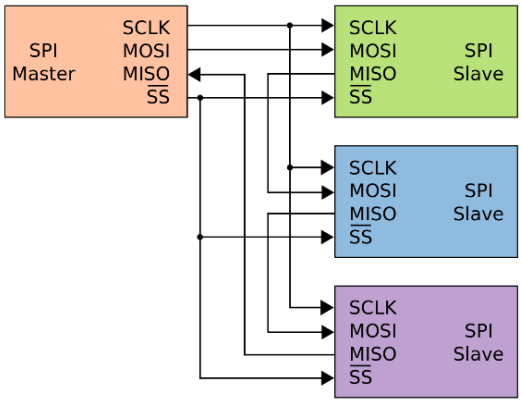


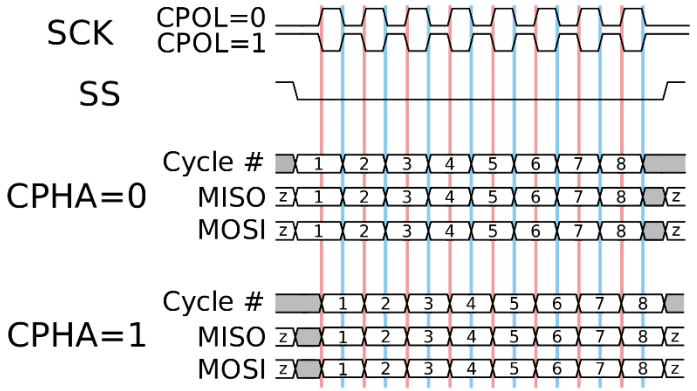


Source: *wikipeda.org*

SPI

- The Serial Peripheral Interface is a synchronous serial communication interface specification used for short-distance communication, developed by Motorola in the mid-1980s.
- Typical applications include Secure Digital cards and liquid crystal displays.
- SPI devices communicate in full duplex mode using a **master-slave** architecture with a single master. The master device originates the frame for reading and writing. Multiple slave-devices are supported through selection with individual slave select (SS) lines.
- The SPI bus specifies four logic signals:
  - **SCLK**: Serial Clock (output from master)
  - **MOSI**: Master Output Slave Input, or Master Out Slave In (data output from master)
  - **MISO**: Master Input Slave Output, or Master In Slave Out (data output from slave)
  - **SS**: Slave Select (often active low, output from master)
- The master must configure clock speed, polarity (**CPOL**) and phase (**CPHA**) with respect to the data.





Source: *wikipeda.org*

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