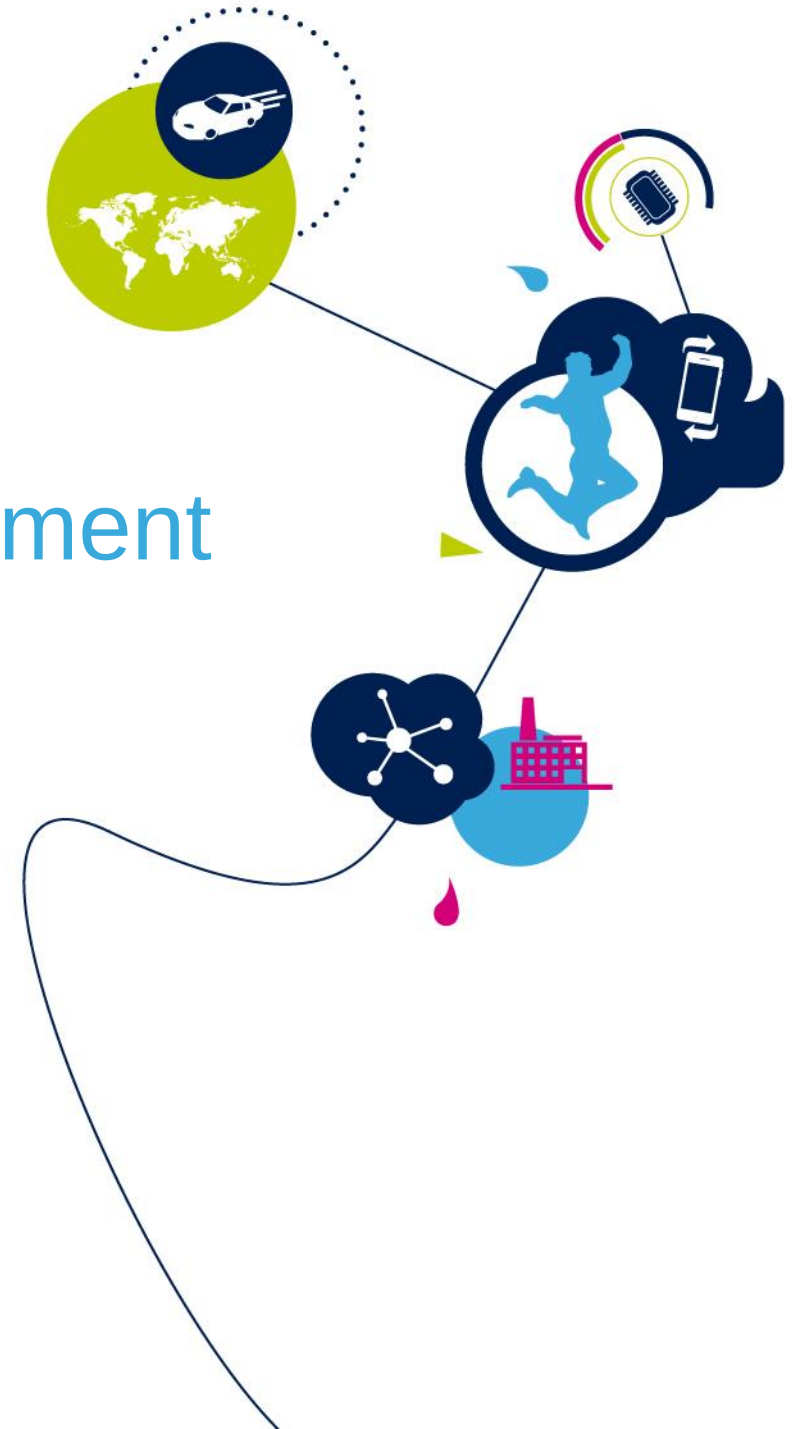
STM32 Open Development Environment

STM32 Open Development Environment

Fast, affordable development and prototyping

Campionato Universitario Makers 2020



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An Application-oriented Approach

Your need

- Sensors
- Connectivity
- Translate
- Motor drivers
- Power
- Processing

Application software
and development tools

The building blocks

Processor boards (Nucleo 64)
Expansion boards (X-NUCLEO)

- Motion
- Environmental
- Bluetooth LE
- Sub-1GHz
- NFC
- Op Amp
- Motor controller
- Power management
- Microcontroller





Integrated Development Environment
and middleware

Our answer

Function Packs (FP)

Ready-to-use
application-oriented package

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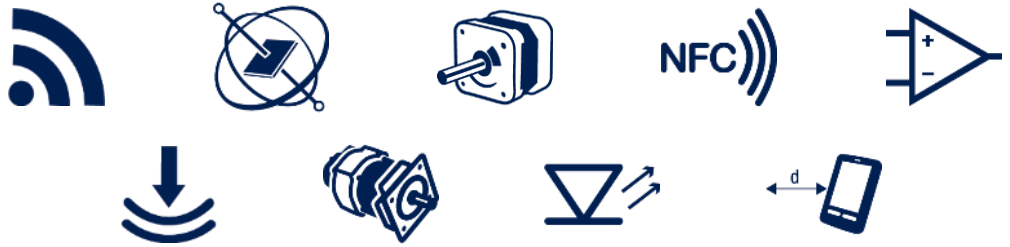
All the Software Needed

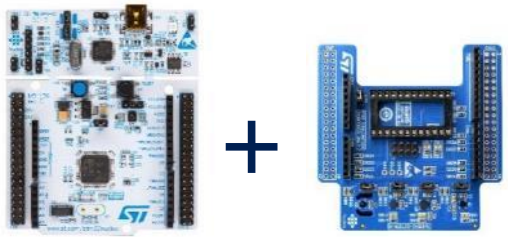
to Start Application Coding from Day One

STM32Cube Expansion SW

- Prototype with a single expansion board

Sample applications

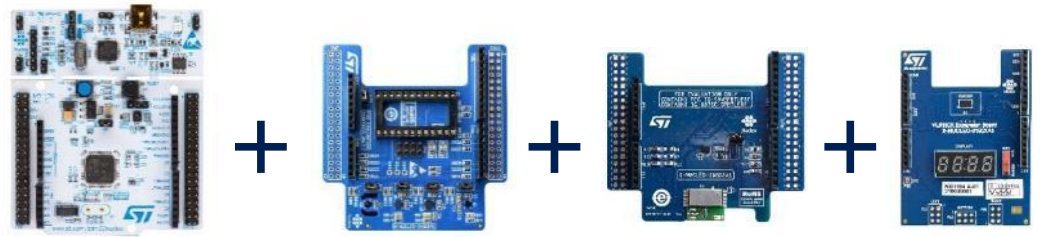




STM32Cube Function Pack

- Create advanced use cases based on multiple expansion boards

Pre-integrated application example



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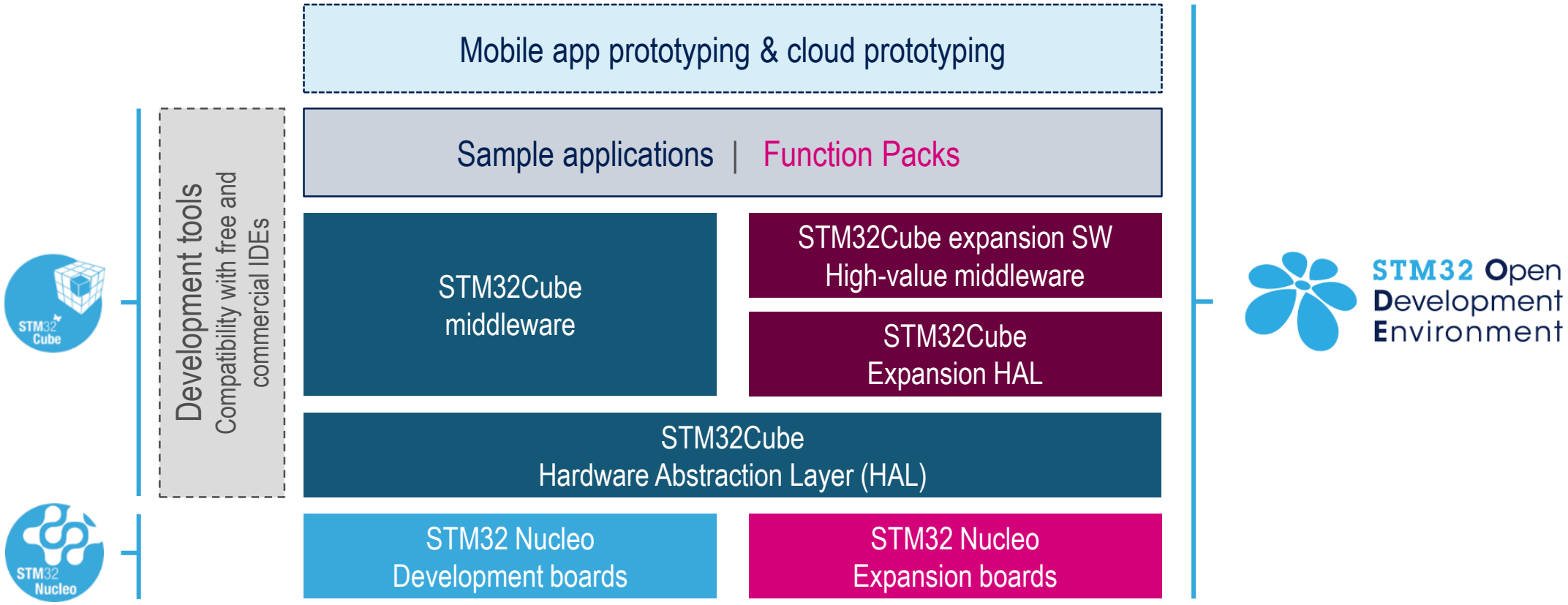
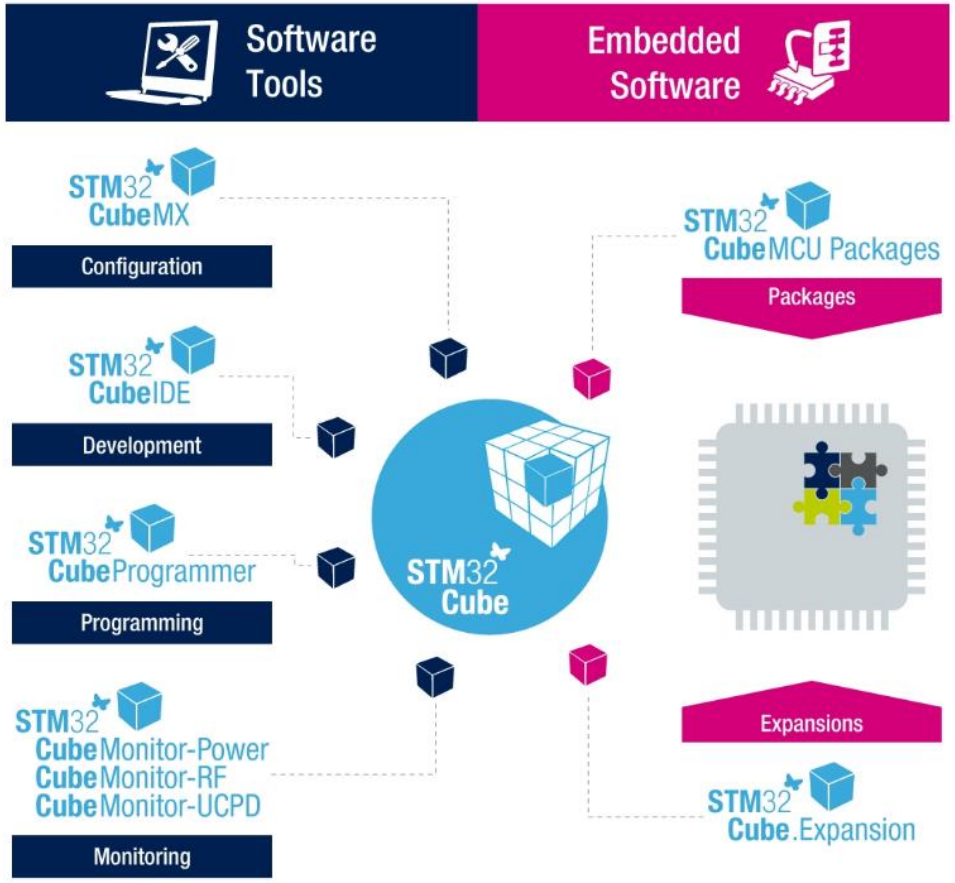
Development Software Architecture



What is STM32Cube?

STM32Cube is an STMicroelectronics original initiative to significantly improve designer's productivity 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 the conception to the realization, among which:
  - STM32CubeMX, a graphical software configuration tool that allows the automatic generation of C initialization code using graphical wizards
  - STM32CubeIDE, an all-in-one development tool with peripheral configuration, code generation, code compilation, and debug features
  - STM32CubeProgrammer (STM32CubeProg), a programming tool available in graphical and commandline versions
  - STM32CubeMonitor-Power (STM32CubeMonPwr), a monitoring tool to measure and help in the optimization of the power consumption of the MCU
- STM32Cube MCU & MPU Packages, comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeF4 for the STM32F4 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 the HW
  - A consistent set of middleware components such as RTOS, USB, TCP/IP, and graphics
  - 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 & MPU Packages with:
  - Middleware extensions and applicative layers
  - Examples running on some specific STMicroelectronics development boards



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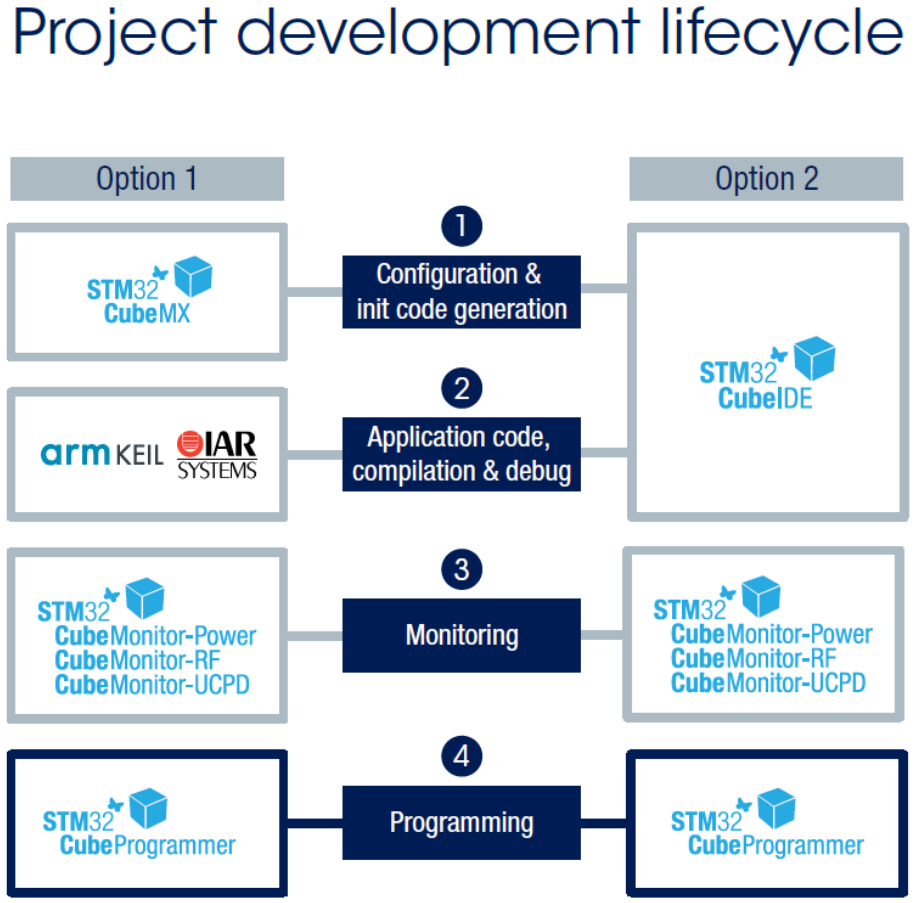
STM32CubeIDE

All-in-one multi-OS STM32 development tool

- STM32CubeIDE is an advanced C/C++ development platform with STM32 resources and peripherals configuration, code generation, code compilation, and debug features for STM32 microcontrollers. It is based on the ECLIPSE™/CDT framework and GCC toolchain for device development, and GDB for debugging. STM32CubeIDE integrates hundreds of existing plugins that complement the features of the ECLIPSE™ IDE.

- STM32CubeIDE integrates all STM32CubeMX functionalities to offer all-in-one tool experience and save installation and development time. Select either a non-programmed or a board-preconfigured STM32 MCU, create a project and generate an initialization code.



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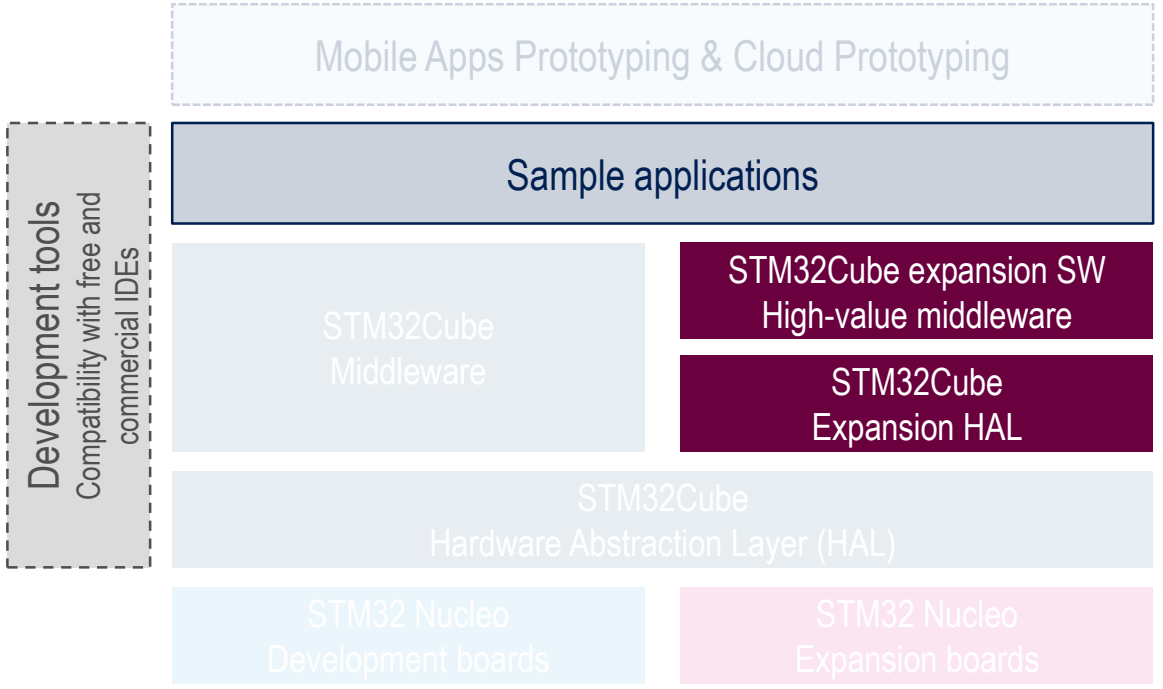
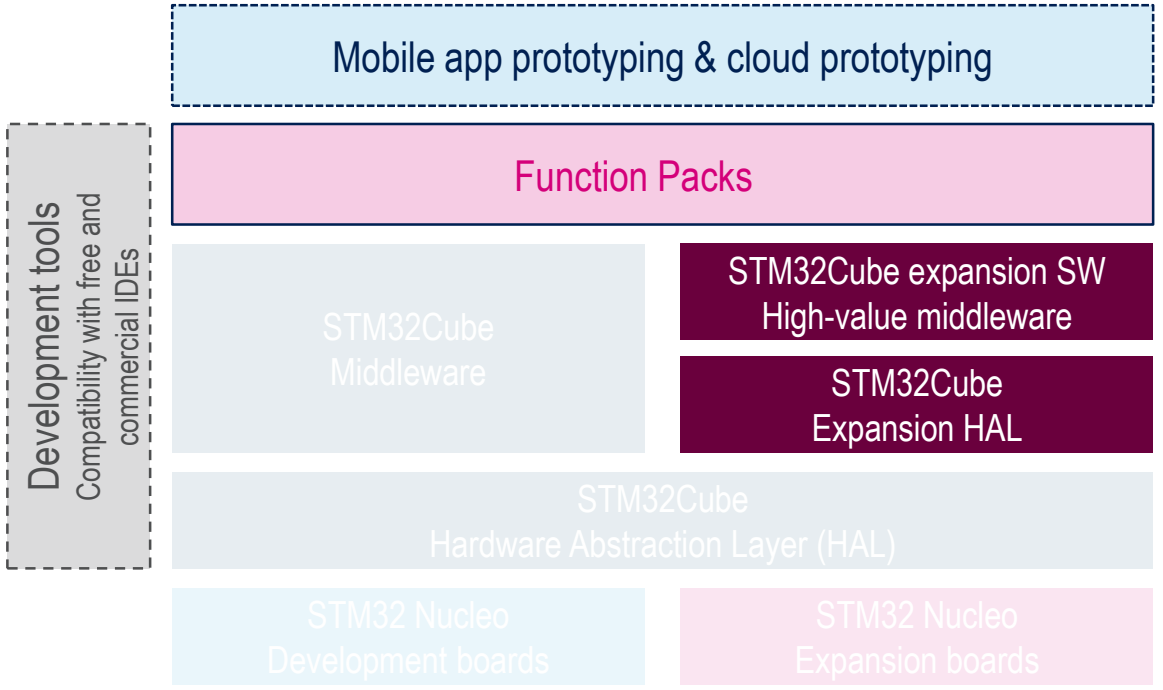
STM32Cube Expansion SW Packages

- For each single X-Nucleo board, a STM32Cube Expansion SW package is associated. This SW is validated on several Nucleo boards
  - Example: X-CUBE-BLE1 runs on the X-NUCLEO-IDB05A1
- Sample implementations are included in the package as well as a full documentation set (data brief, user manual, quick start guide and videos)
- These SW extensions are homogeneous in terms of SW structure and API abstraction level to easily combine multiple functions
- All STM32Cube expansion SW packages come with pre-built projects with IAR, Keil and SW4STM32 IDEs, and binaries that can be run out of the box



STM32Cube Function Packs

- A Function Pack is a pre-integrated application SW package including a set of key building blocks used in most popular application domains such as Cloud, Wearables, IoT, Home and Building Automation
- Each Function Pack package is associated to two or more X-NUCLEO boards
  - Example: FP-NET-6LPBLE1 runs on the X-NUCLEO-IDB05A1 and X-NUCLEO-IDS01A4
- When relevant for the application demonstrated by the Function Pack, mobile applications (Android™ and iOS™) are included
- All Function Pack come with pre-built projects with IAR, Keil and SW4STM32 IDEs, and binaries that can be run out of the box



STM32 Education

Online training

Specific modules focused on teaching the skills and knowledge to get the best performance from our MCUs in your applications.

Massive Open Online Courses

SSTM32 online training courses in MOOC format to help you design with ST products, software and tools.

STM32 Community

Join the ST community of developers, makers, schools, universities, customers, partners, ST employees and all STM32 enthusiasts to ask question, find answers, collaborate, connect, communicate, learn and share your project on STM32 MCUs.

Videos

Browse our media library selection of videos on our STM32 platform.

Textbooks

Browse our selection of ST recommended textbooks for microcontrollers. Submit your publication and be part of the selection.

MCU training courses

Our teams of training experts provide free multiday courses for our microcontroller products at locations accross continental Europe. Look at the program.

Partner training courses

Check our list of partners providing quality courses completing ST's training portfolio.

Motor control

STM32 & STM8 Motor Control ecosystem overview. By motor type: SW Tools, FW library, HW boards, Application Notes, Getting Started, Videos, Forum...

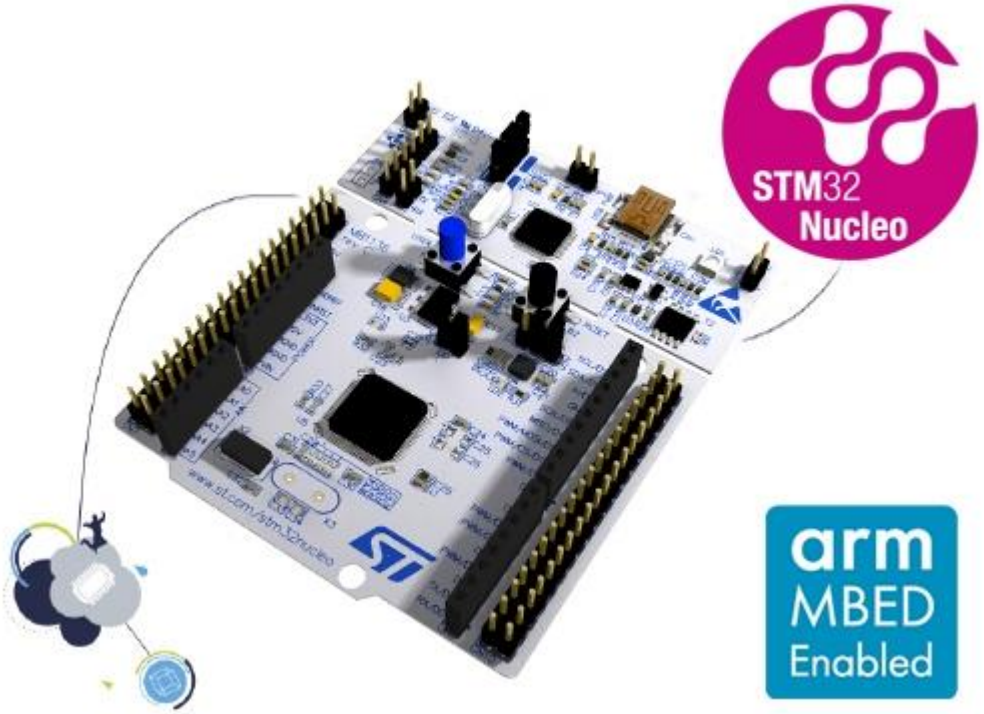
Useful links

- STM32 Open Development Environment
- STM32Cube Ecosystem
- STM32CubeIDE
- STM32CubeIDE databrief
- STM32Cube: Tools to support STM32 development
- Getting started with STM32 Nucleo board software development tools
- STM32 Education

STM32 ODE boards

NUCLEO-F401RE

- The STM32 Nucleo-64 boards provide an affordable and flexible way for users to try out new concepts and build prototypes by choosing from the various combinations of performance and power consumption features, provided by the STM32 microcontroller.
  - Cortex®-M4 core with floating point unit, running at 84 MHz
  - 512 Kbytes
  - STM32 microcontroller in LQFP64 package
  - 1 user LED shared with Arduino™
  - 1 user and 1 reset push-buttons
  - 32.768 kHz crystal oscillator
  - Board connectors: Arduino™ Uno V3 expansion connector ST morpho extension pin headers for full access to all STM32 I/Os
  - Flexible power-supply options: ST-LINK, USB V_{BUS} or external sources



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Embedded Software

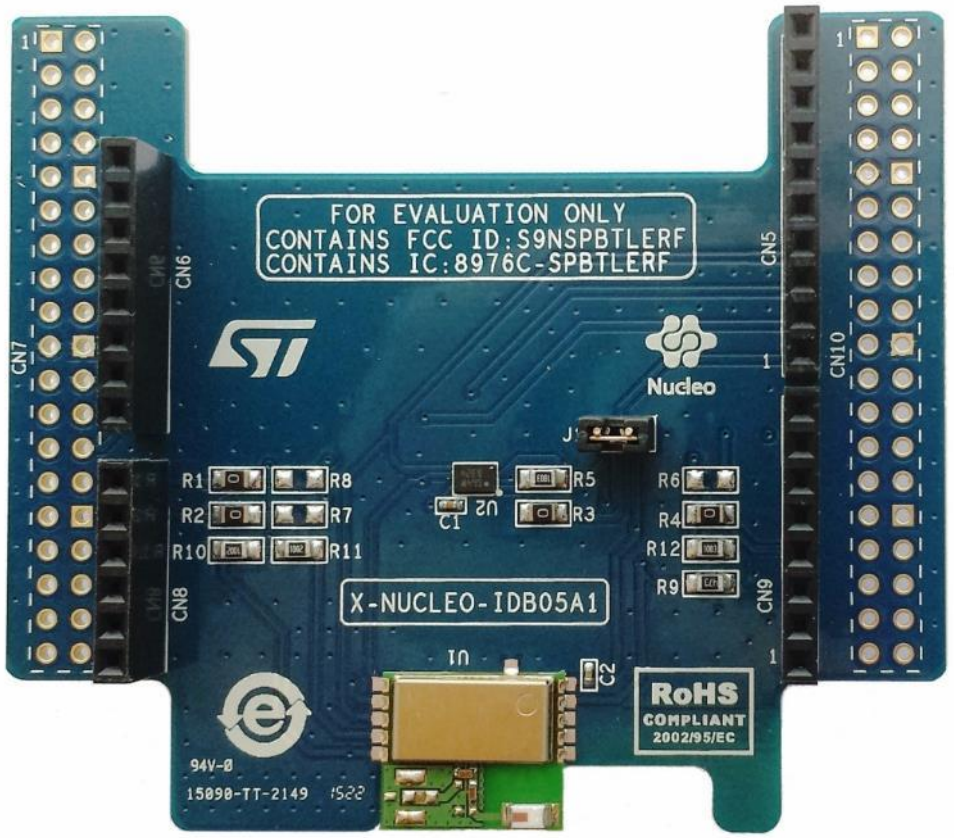
Function	X-Nucleo boards	Application case	Software	Apps iOS / Android
STM32 F4	NUCLEO-F401RE	STM32CubeMX is a graphical tool that allows a very easy configuration of STM32 microcontrollers and microprocessors, as well as the generation of the corresponding initialization C code for the Arm® Cortex®-M core or a partial Linux® Device Tree for Arm® Cortex®-A core), through a step-by-step process.	STM32CubeMX	
		The ST-LINK server is an application to share the debug interface of a single ST-LINK board among several host applications, typically a debugging tool and a monitoring tool. Of course, two debugging tools cannot simultaneously control the same target, but both may have access to it, if appropriate connection settings are chosen.	ST-LINK-SERVER	
		This application, called STSW-LINK007, is used to upgrade the firmware of the ST-LINK, ST-LINK/V2 and ST-LINK/V2-1 boards through the USB port.	STSW-LINK007	
		This USB driver (STSW-LINK009) is for ST-LINK/V2, ST-LINK/V2-1 and STLINK-V3 boards and derivatives (STM8/STM32 discovery boards, STM8/STM32 evaluation boards and STM32 Nucleo boards). It declares to the system the USB interfaces possibly provided by the ST-LINK: ST Debug, Virtual COM port and ST Bridge interfaces.	STSW-LINK009	
		STM32Cube MCU Package for STM32F4 series (HAL, Low-Layer APIs and CMSIS (CORE, DSP, RTOS), USB, TCP/IP, File system, RTOS, Graphic - coming with examples running on ST boards: STM32 Nucleo, Discovery kits and Evaluation boards)	STM32CubeF4	

Useful links

- NUCLEO-F401RE Overview
- STM32F401 intro page
- STM32 Nucleo-64 boards

X-NUCLEO-IDB05A1

- The X-NUCLEO-IDB05A1 is a Bluetooth Low Energy evaluation board based on the SPBTLE-RF BlueNRG-MS RF module to allow expansion of the STM32 Nucleo boards.
- The SPBTLE-RF module is FCC (FCC ID: S9NSPBTLERF) and IC certified (IC: 8976C-SPBTLERF).
- SPBTLE-RF:
  - Bluetooth Low Energy FCC and IC certified module based on Bluetooth® SMART 4.1 network processor BlueNRG-MS
  - Integrated Balun (BALF-NRG-01D3)
  - Chip antenna
- *Example of application: enable Bluetooth connection*



Embedded Software

Function	X-Nucleo boards	Application case	Software	Apps iOS / Android
Bluetooth	X-NUCLEO-IDB05A1	STM32 ODE function pack that performs voice streaming over Bluetooth low energy in a half-duplex configuration. The application runs on the STM32 Nucleo and includes drivers and middleware for Bluetooth low energy (BlueNRG-MS) and MP34DT01-M or MP34DT04-C1 digital MEMS microphones.	FP-AUD-BVLINK1	STBLESensor
		STM32Cube function pack which lets you connect your IoT node in a BLE sensor network to the Internet via a Wi-Fi network.	FP-NET-BLESTAR1	STBLEStarNet
		The X-CUBE-BLE1 expansion software package for STM32Cube runs on the STM32 and includes drivers for BlueNRG-MS Bluetooth low energy device.	X-CUBE-BLE1	STBLESensor

Learn how to use the X-CUBE-BLE1 expansion software package for STM32Cube. Discover the steps required to generate a BLE sample application with STM32CubeMX using a NUCLEO-F401RE, a X-NUCLEO-IDB05A1 and the STBLESensor app for Android and iOS.

X-NUCLEO-NFC06A1

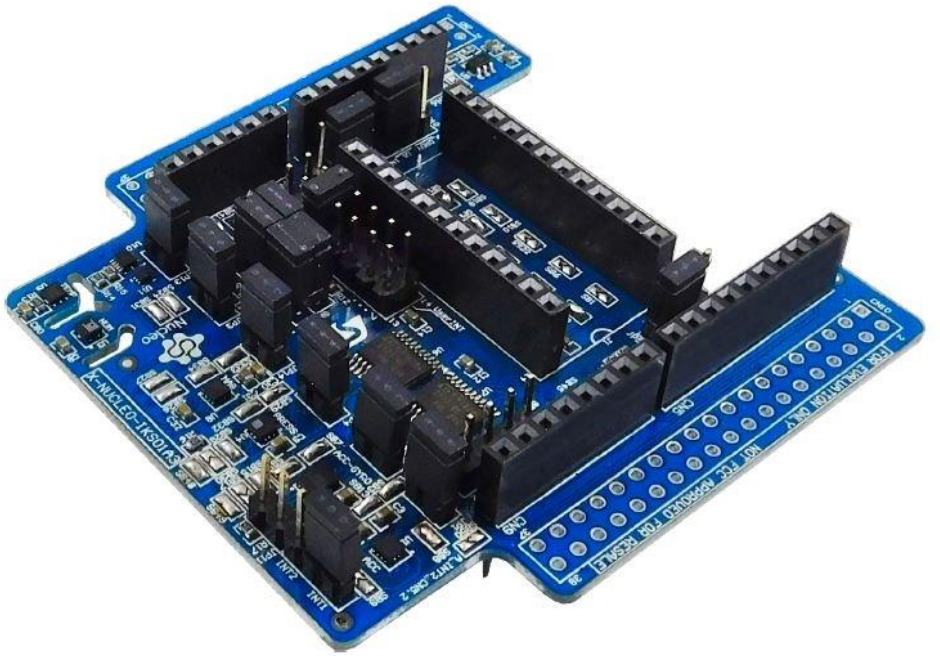
- The X-NUCLEO-NFC06A1 NFC card reader expansion board is based on the ST25R3916 device
- The expansion board is configured to support ISO14443A/B, ISO15693, FeliCa™ and AP2P communication.
- The ST25R3916 manages frame coding and decoding in reader mode for standard applications, such as NFC, proximity and vicinity HF RFID standards.
- It supports ISO/IEC 14443 Type A and B, ISO/IEC 15693 (single subcarrier only) and ISO/IEC 18092 communication protocols as well as the detection, reading and writing of NFC Forum Type 1, 2, 3, 4 and 5 tags.
- *Example of application: tag/card reader, NFC and RFID proximity based applications*

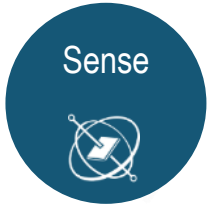
Embedded Software

Function	X-Nucleo boards	Application case	Software	Apps iOS / Android
NFC	X-NUCLEO-NFC06A1	The X-CUBE-NFC6 software expansion for STM32Cube provides complete middleware for STM32 to control applications using the ST25R3916 high performance NFC front-end IC supporting NFC initiator, target, reader, and card emulation modes.	X-CUBE-NFC6	

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) and 3D gyroscope (±125/±245/±500/±1000/±2000 dps)
  - LSM303AGR MEMS 3D accelerometer (±2/±4/±8/±16 g) and MEMS3D magnetometer (±50 gauss)
  - LPS22HB MEMS pressure sensor, 260-1260 hPa absolute digital output barometer
  - HTS221: capacitive digital relative humidity and temperature
  - DIL24 socket for additional MEMS adapters and other sensors
  -
- *Example of application: multi-dimensional sensing (e.g. monitoring, activity recognition, environmental sensing, …)*





Embedded Software

Function	X-Nucleo boards	Application case	Software	Apps iOS / Android
Sense	X-NUCLEO-IKS01A2	Unicleo-GUI is a graphical user interface (GUI) for the X-CUBE-MEMS1 and X-CUBE-MEMS-XT1 software expansions and STM32 Nucleo expansion boards (X-NUCLEO-IKS01A1, X-NUCLEO-IKS01A2 and X-NUCLEO-IKS01A3).	Unicleo-GUI	
		STM32Cube function pack which lets you connect your IoT node to a smartphone via BLE and use a suitable Android™ or iOS™ application, like the STBLESensor app, to view real-time environmental and motion sensor data, digital microphone and battery levels.	FP-SNS-ALLMEMS2	STBLESensor
		STM32Cube runs on the STM32 and includes drivers that recognize the sensors and collect temperature, humidity, pressure and motion data.	X-CUBE-MEMS1	
		STM32Cube function pack including dedicated algorithms for advanced time and frequency domain signal processing and analysis of 3D digital accelerometers with flat bandwidth up to 5 kHz.	FP-IND-PREDMNT1	

Sense ToF

X-NUCLEO-53L1A1

- The X-NUCLEO-53L1A1 is an expansion board for the NUCLEO-F401RE and NUCLEO-L476RG development boards. It provides a complete evaluation kit allowing anyone to learn, evaluate, and develop their applications using the VL53L1X ToF, long-distance ranging sensor technology.
- VL53L1X Time-of-Flight (ToF), long-distance ranging sensor module
- Accurate absolute ranging distance, independent of the reflectance of the target
- Accurate ranging up to 4 m and fast ranging frequency up to 50 Hz.
- Two different cover windows
- Two VL53L1X breakout boards
- *Example of application: proximity detection, obstacle avoidance, indoor navigation, presence detection*

Sense ToF

Embedded Software

Function	X-Nucleo boards	Application case	Software	Apps iOS / Android
Sense ToF	X-NUCLEO-53L1A1	Long Distance Ranging sensor software expansion for STM32Cube	X-CUBE-53L1A1	
		Windows Graphical User Interface (GUI) for VL53L1X Nucleo packs. Works with P-NUCLEO-53L1A1	STSW-IMG008	

Thank You

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