



life.augmented

STM32Cube Ecosystem

Fast, affordable development and prototyping

Ing. Salvatore Curti

March 2026



From idea to proof-of-concept electronic design

1

Components

2

Circuit schematic

3

Modeling and simulations

4

Preliminary prototype

5

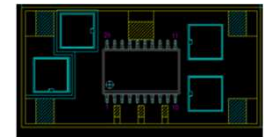
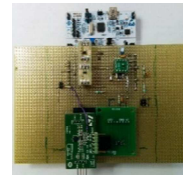
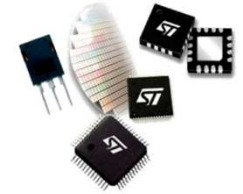
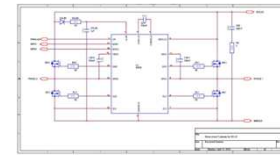
Hardware layout

6

Electronic prototype

7

Certification



What is STM32Cube Ecosystem?

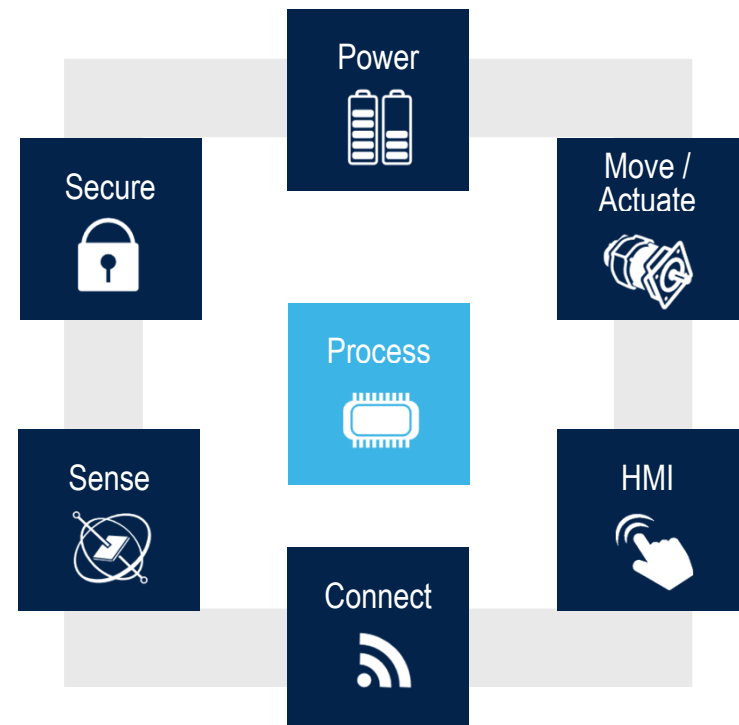
STM32Cube Ecosystem allows developers to verify their design assumptions and move quickly from ideas to a proof-of-concept.

Moreover, STM32Cube offers a comprehensive entry point to choose of hardware, firmware and software from the function requested by the application.

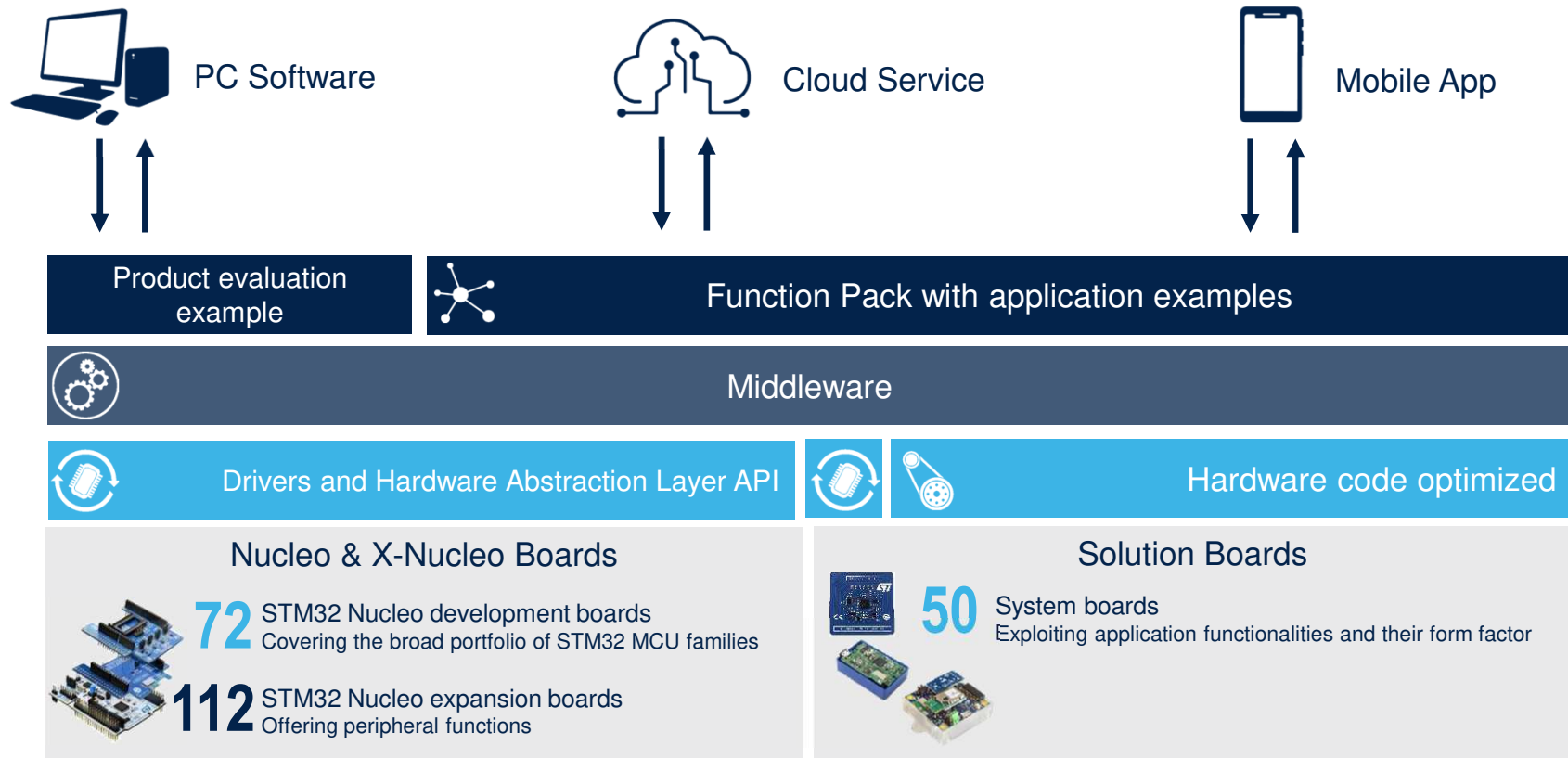
It leverages on the STM32 hardware and software ecosystem.

How STM32Cube addresses developers' needs

- It offers a broad range of microcontrollers from low power to high performance to meet any application needs
- It provides extra functions that cover the main domains
 - Sensing, connectivity, power management, motor control, audio, HMI
- It eases the development up to the production
 - Support of multiple IDEs
 - Free-of-charge tools and embedded software to enable fast and easy development



STM32Cube synopsis



Presentation overview

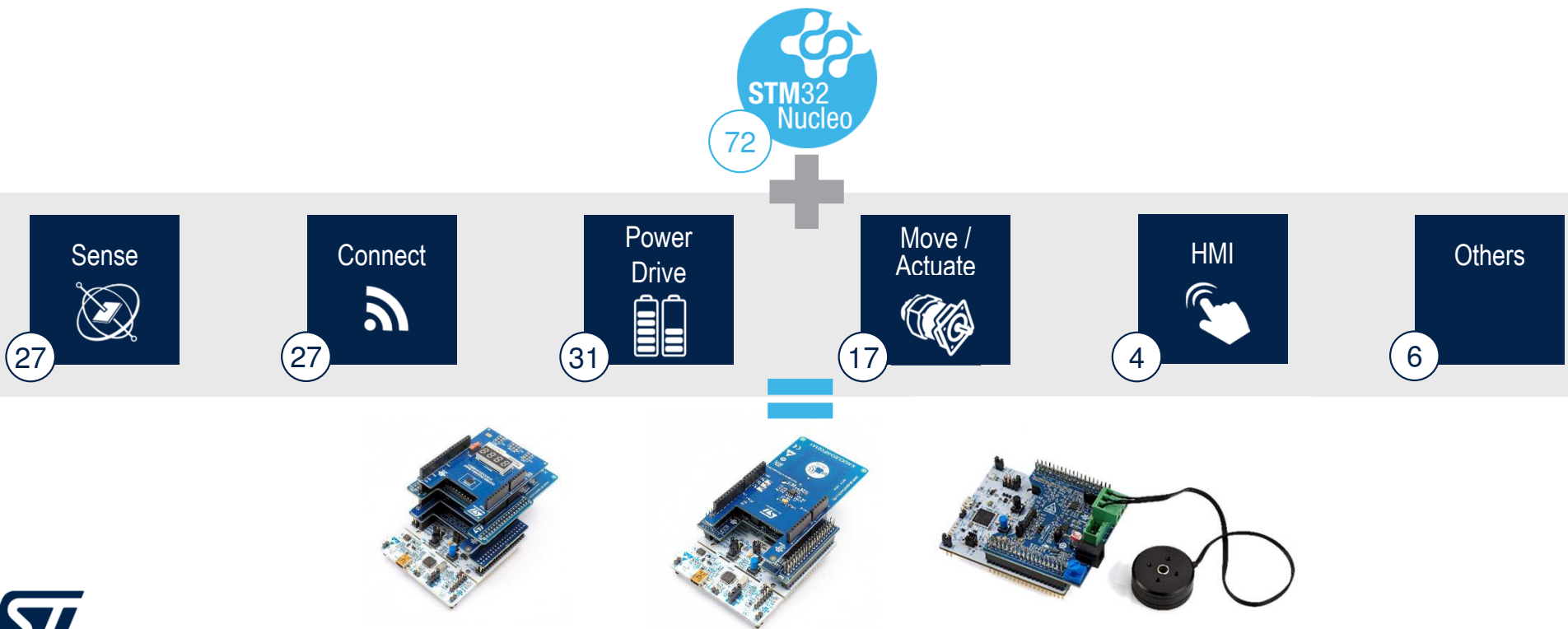
STM32Cube: Hardware Portfolio

STM32Cube: Firmware Portfolio

STM32Cube: Software Portfolio

STM32 Nucleo development and expansion boards

Leveraging on the STM32 hardware and software ecosystem



STM32 Nucleo development boards

72 development boards and growing...
in two flavors (processing & security)

STM32 complete product range
from ultra-low power to high performance

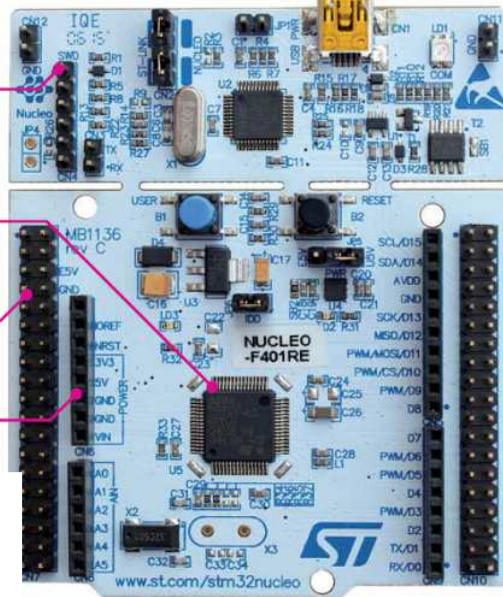
Board power supply
through USB or
external source

Integrated debugging
and programming
ST-LINK probe

STM32
microcontroller

Morpho
extension header

Arduino™
extension header



STM32 portfolio

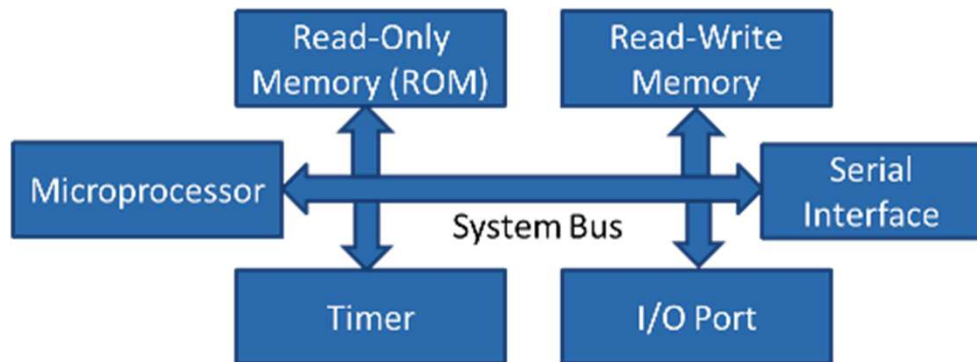
MPU					STM32MP1 1 GHz Cortex®-A7 209 MHz Cortex®-M4	STM32MP2 Dual 1.5 GHz Cortex®-A35 400 MHz Cortex®-M33	
High-performance MCUs					STM32F7 1,082 CoreMark 216 MHz Cortex®-M7	STM32N6 3,360 CoreMark 800 MHz Cortex®-M55 Neural processing unit	STM32V8 Up to 5,072 CoreMark 800 MHz Cortex®-M85
Mainstream MCUs	STM32F2 398 CoreMark 120 MHz Cortex®-M3		STM32F4 608 CoreMark 180 MHz Cortex®-M4		STM32H5 1,023 CoreMark 250 MHz Cortex®-M33	STM32H7 3,347 CoreMark Up to 600 MHz Cortex®-M7 240 MHz Cortex®-M4	
	STM32F3 245 CoreMark 72 MHz Cortex®-M4		STM32G4 569 CoreMark 170 MHz Cortex®-M4		Mixed-signal MCUs		
	STM32C0 114 CoreMark 48 MHz Cortex®-M0+	STM32F0 106 CoreMark 48 MHz Cortex®-M0	STM32G0 142 CoreMark 64 MHz Cortex®-M0+	STM32F1 177 CoreMark 72 MHz Cortex®-M3			
Ultra-low-power MCUs	STM32L0 75 CoreMark 32 MHz Cortex®-M0+	STM32U0 140 CoreMark 56 MHz Cortex®-M0+	STM32L4 273 CoreMark 80 MHz Cortex®-M4	STM32U3 393 CoreMark 96 MHz Cortex®-M33	STM32L4+ 409 CoreMark 120 MHz Cortex®-M4	STM32L5 443 CoreMark 110 MHz Cortex®-M33	STM32U5 651 CoreMark 160 MHz Cortex®-M33
Wireless MCUs	STM32WL 162 CoreMark 48 MHz Cortex®-M4 48 MHz Cortex®-M0+		STM32WB0 156 CoreMark 64 MHz Cortex®-M0+	STM32WB 216 CoreMark 64 MHz Cortex®-M4 32 MHz Cortex®-M0+	STM32WBA 407 CoreMark 100 MHz Cortex®-M33		

Latest product generation
 Radio coprocessor only
 New series or lines introduced in 2025
 Preannouncement

8

Latest product generation Radio coprocessor only New series or lines introduced in 2025 Preannouncement

Microcontroller Architecture



Serial Interface:

- Inter Integrated Circuit (I2C)
- Serial Peripheral Interface (SPI)
- Universal Asynchronous Receiver-Transmitter (UART)

STM32 is a family of 32-bit microcontroller integrated circuits by STMicroelectronics. The STM32 chips are grouped into related series that are based around the same 32-bit ARM processor core, such as the Cortex-M7F, Cortex-M4F, Cortex-M3, Cortex-M0+, or Cortex-M0. Internally, each microcontroller consists of the processor core, static RAM, flash memory, debugging interface, and various peripherals

STM32 Nucleo development boards

 STM32L4 MCU Series 32-bit Arm® Cortex®-M4 (DSP + FPU) – 80 MHz 													
Product line	Flash (KB)	RAM (KB)	Memo - ry I/F FSMC	Op-Amp	CAN	Sigma Delta Interface	12-bit ADC 5 Msps 16-bit HW oversampling	DAC	SAI	USB2.0 OTG	USB Device	Segment LCD driver	Chrom-ART Accelerator™
STM32L4x6 - USB OTG + Segment LCD Lines													
STM32L496**	512 to 1024	320	•	2	2	8x ch	3	2	2	•		Up to 8x40	•
STM32L476*	256 to 1024	128	•	2	1	8x ch	3	2	2	•		Up to 8x40	
STM32L4x5 - USB OTG lines													
STM32L475	256 to 1024	128	•	2	1	8x ch	3	2	2	•			
STM32L4x3 - USB Device + Segment LCD lines													
STM32L433*	128 to 256	64		1	1		1	2	1		•	Up to 8x40	
STM32L4x2 - USB Device lines													
STM32L452*	256 to 512	160		1	1	4x ch	1	1	1		•		
STM32L432*	128 to 256	64		1	1		1	2	1		•		
STM32L412*	64 to 128	40		1			2				•		
STM32L4x1 - Access lines													
STM32L471	512 to 1024	128	•	2	1	8x ch	3	2	2				
STM32L451	256 to 512	160		1	1	4x ch	1	1	1				
STM32L431	128 to 256	64		1	1		1	2	1				

Note: * HW crypto/hash functions are available on STM32L486, STM32L443, STM32L462, STM32L442 and STM32L422 - ** on STM32L446

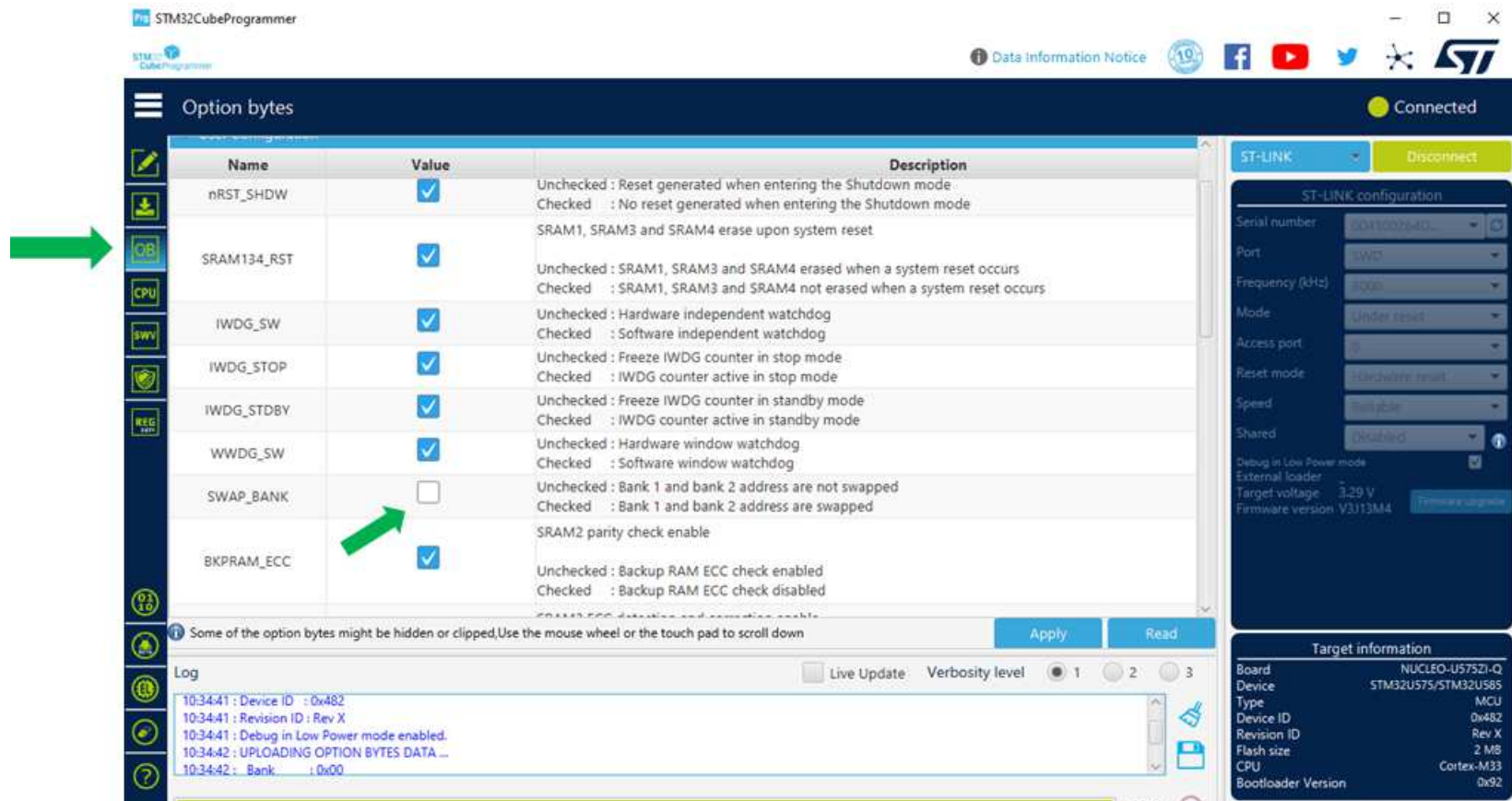
 STM32F4 MCU Series 32-bit Arm® Cortex®-M4 – Up to 180 MHz 													
Product lines	F _{clk} (MHz)	Flash (Kbytes)	RAM (KB)	Ethernet I/F IEEE 1588	2x CAN	Camera I/F	SDRAM I/F	Dual Quad-SPI	SAI	SPI/F RX	Chrom-ART Accelerator™	TFT LCD Controller	MIPI DSI
Advanced lines													
STM32F469 ²	180	512 K to 2056 K	384	•	•	•	•	•	•		•	•	•
STM32F429 ²	180	512 K to 2056 K	256	•	•	•	•		•		•	•	
STM32F427 ²	180	1024 K to 2056 K	256	•	•	•	•		•		•		
Foundation lines													
STM32F446	180	256 K to 512 K	128		•	•	•	•	•	•			
STM32F407 ²	168	512 K to 1024 K	192	•	•	•							
STM32F405 ²	168	512 K to 1024 K	192		•								
Product lines	F _{clk} (MHz)	Flash (Kbytes)	RAM (KB)	RAM current (µA/MHz)	STOP current (µA)	Small package (mm)	FSMC, NOR/PSRAM LCD support	QSPI	DPSIM	DAC	TIMG	DMA Batch Acquisition Mode	USB 2.0 OTG FS
Access lines													
STM32F401	84	128 K to 512 K	up to 96	Down to 128	Down to 10	Down to 3x3							•
STM32F410	100	64 K to 128 K	32	Down to 89	Down to 6	Down to 2.553x 2.579				•	•	BAM	-
STM32F411	100	256 K to 512 K	128	Down to 100	Down to 12	Down to 3.034x 3.22						BAM	•
STM32F412	100	512 K to 1024 K	256	Down to 112	Down to 18	Down to 3.653x 3.651	•	•	•		•	BAM	• +LPM ¹
STM32F413 ²	100	1024 K to 1536 K	320	Down to 115	Down to 18	Down to 3.951x 4.039	•	•	•	•	•	BAM	• +LPM ¹

Notes:

1. Link Power Management

2. The same devices are also found with embedded HW AES encryption (128-/256-bit)

STM32 Nucleo development boards



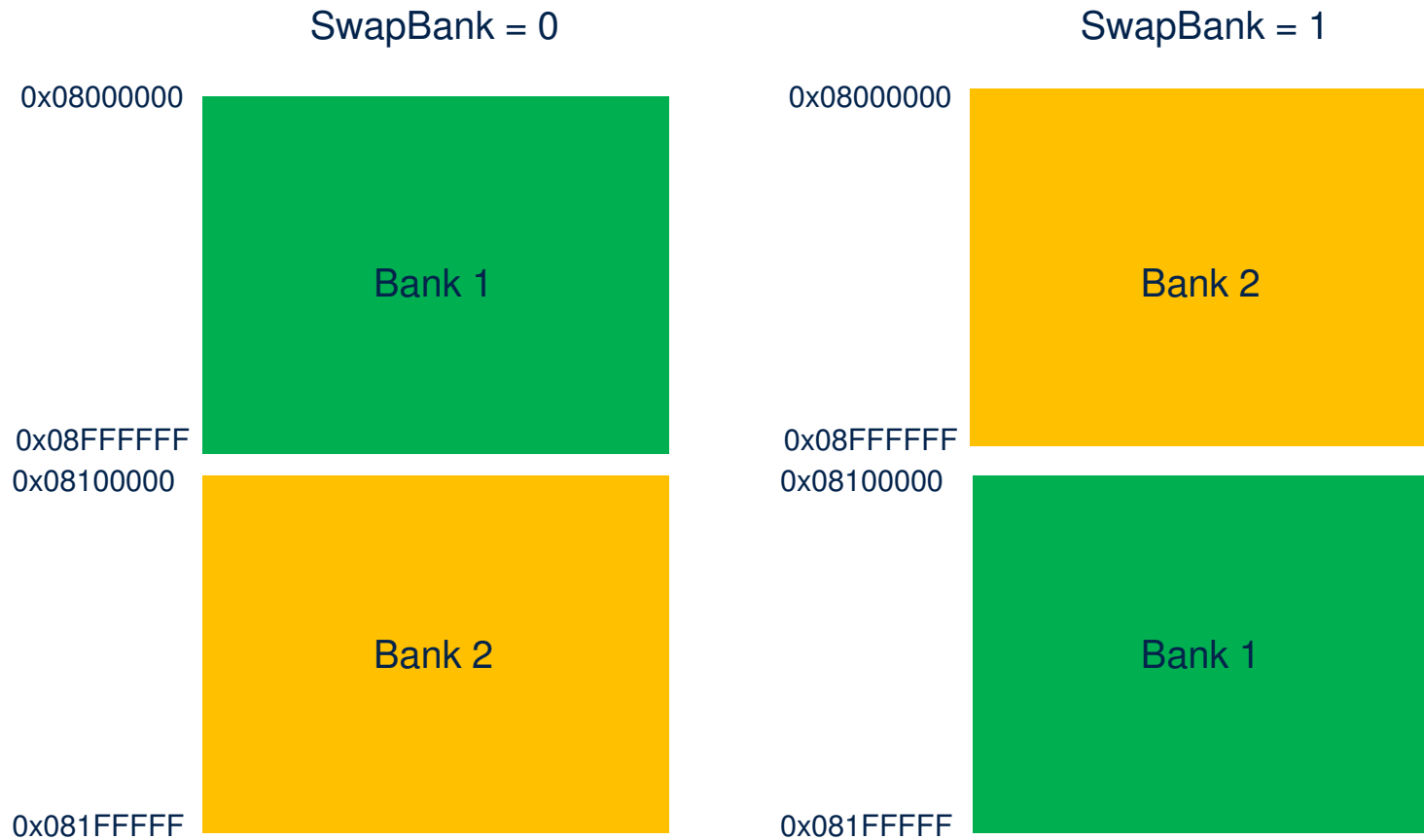
The screenshot displays the STM32CubeProgrammer application window. The 'Option bytes' tab is selected in the left sidebar. The main table lists various option bytes with their names, values (checked/unchecked), and descriptions. The 'SWAP_BANK' option is highlighted with a green arrow, showing it is currently unchecked. The right sidebar shows the 'ST-LINK' configuration and 'Target information' for a NUCLEO-U575ZI-Q board.

Name	Value	Description
nRST_SHDW	☒	Unchecked : Reset generated when entering the Shutdown mode Checked : No reset generated when entering the Shutdown mode
SRAM134_RST	☒	SRAM1, SRAM3 and SRAM4 erase upon system reset Unchecked : SRAM1, SRAM3 and SRAM4 erased when a system reset occurs Checked : SRAM1, SRAM3 and SRAM4 not erased when a system reset occurs
IWDG_SW	☒	Unchecked : Hardware independent watchdog Checked : Software independent watchdog
IWDG_STOP	☒	Unchecked : Freeze IWDG counter in stop mode Checked : IWDG counter active in stop mode
IWDG_STDBY	☒	Unchecked : Freeze IWDG counter in standby mode Checked : IWDG counter active in standby mode
WWDG_SW	☒	Unchecked : Hardware window watchdog Checked : Software window watchdog
SWAP_BANK	☐	Unchecked : Bank 1 and bank 2 address are not swapped Checked : Bank 1 and bank 2 address are swapped
BKPRAM_ECC	☒	SRAM2 parity check enable Unchecked : Backup RAM ECC check enabled Checked : Backup RAM ECC check disabled

Log:

```
10:34:41 : Device ID : 0x482
10:34:41 : Revision ID : Rev X
10:34:41 : Debug in Low Power mode enabled.
10:34:42 : UPLOADING OPTION BYTES DATA ...
10:34:42 : Bank : 0x00
```

STM32 Nucleo development boards



STM32 Nucleo expansion boards

112 expansion boards and growing... covering all the key functions

Sense



27

Motion & environmental sensors

Proximity sensor

Microphone

Connect



27

BLE

Sub-GHz

NFC

GNSS

Power Drive



31

Industrial input / output

Energy management & battery

USB

Move / Actuate



17

Stepper motor driver

DC motor driver

BLDC motor driver

HMI



4

Touch controller

LED drivers

Others

6

EEPROM

Safe

Interface



STM32Cube X-Nucleo boards

Category	Part number	Specifications
Sense → Proximity / Ranging	X-NUCLEO-6283A1	Expansion board providing a complete evaluation kit allowing anyone to learn, evaluate and develop their applications using the VD6283, a 6-channel ambient light sensor (ALS) color sensor with advanced light flicker frequency extraction.
	P-NUCLEO-6283A1	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-6283A1 expansion board
	X-NUCLEO-53L0A1	Expansion board based on VL53L0CX FightSense Ranging sensor up to 2 meters and gesture detection sensor module
	P-NUCLEO-53L0A1	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L0A1 expansion board
	X-NUCLEO-53L1A1	Expansion board based on VL53L1CX FightSense Long Distance sensor up to 4 meters
	P-NUCLEO-53L1A1	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L0A1 expansion board
	X-NUCLEO-53L1A2	Expansion board based on VL53L1CB FightSense Long Distance + Multi target detection sensor up to 4 meters and field of view (FoV) programming
	P-NUCLEO-53L1A2	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L1A2 expansion board
	X-NUCLEO-53L3A2	Expansion board based on VL53L3CX FightSense Proximity +Multi target detection up to 3 meters
	P-NUCLEO-53L3A2	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L3A2 expansion board
	X-NUCLEO-53L4A1	Expansion board based on the VL53L4CD Time-of-Flight high-accuracy absolute ranging distance proximity sensor
	P-NUCLEO-53L4A1	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L4A1 expansion board
	X-NUCLEO-53L4A2	Expansion board based on the VL53L4CX Time-of-Flight sensor with extended range measurement. Distance measurement from 0 mm up to 6 m, short distance linearity down to 10 mm, histogram-based technology, multiobject detection capability
	P-NUCLEO-53L4A2	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L4A2 expansion board
	X-NUCLEO-53L4A3	Expansion based on the VL53L4ED Time-of-Flight high-accuracy proximity sensor with extended temperature capability.
	P-NUCLEO-53L4A3	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L4A3 expansion board

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Sense → Proximity / Ranging	<u>X-NUCLEO-53L5A1</u>	Expansion board based on VL53L5CX Time-of-Flight 8x8 multizone ranging sensor with wide field of view. It provides accurate ranging up to 400 cm and can work at fast speeds (60 Hz), which makes it the fastest, multizone, miniature ToF sensor on the market. Multizone distance measurements are possible up to 8x8 zones with a wide 63 ° diagonal FoV which can be reduced by software. Thanks to ST Histogram patented algorithms, the VL53L5CX is able to detect different objects within the FoV. The Histogram also provides immunity to cover glass crosstalk beyond 60 cm.
	<u>P-NUCLEO-53L5A1</u>	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L5A1 expansion board
	<u>X-NUCLEO-53L7A1</u>	Expansion board based on the VL53L7CX Time-of-Flight 8x8 multizone ranging sensor with 90° FoV. Accurate absolute ranging distance, independent of the reflectance of the target, up to 350 cm ranging, histogram-based technology, multiobject detection capability
	<u>P-NUCLEO-53L7A1</u>	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L7A1 expansion board
	<u>X-NUCLEO-53L8A1</u>	Expansion board based on the VL53L8 Time-of-Flight series with accurate absolute ranging distance, independent of the reflectance of the target, Histogram-based technology and multiobject detection capability. VL53L8CX Low-power high-performance 8x8 multizone ToF sensor, VL53L8CH Artificial intelligence enabler, high performance 8x8 multizone ToF sensor
	<u>P-NUCLEO-53L8A1</u>	NUCLEO pack build on NUCLEO-F401RE and X-NUCLEO-53L8A1 expansion board
Sense → Motion & environmental	<u>X-NUCLEO-IKS02A1</u>	Industrial motion MEMS sensor expansion board: ISM330DHCX MEMS 3D accelerometer + 3D gyroscope, IIS2MDC MEMS 3D magnetometer, IIS2DLPC MEMS 3D accelerometer low power, IMP34DT05 MEMS digital omnidirectional microphone
	<u>X-NUCLEO-IKS4A1</u>	Motion MEMS and environmental sensor expansion board: LSM6DSO16IS: MEMS 3D accelerometer + 3D gyroscope with ISPU (Intelligent Processing Unit), LIS2MDL: MEMS 3D magnetometer, LIS2DUXS12 Ultra low-power MEMS 3D accelerometer with Qvar, AI, & anti-aliasing, LPS22DF Low-power and high-precision MEMS pressure sensor and absolute digital output barometer, SHT40AD1B, STTS22H Low-voltage, ultralow-power, 0.5 °C accuracy temperature sensor, LSM6DSV16X MEMS 3D accelerometer + 3D gyroscope with embedded sensor fusion, AI, Qvar, DIL 24-pin socket available for additional MEMS adapters and other sensors, equipped with Qvar touch/swipe electrode
	<u>X-NUCLEO-IKS5A1</u>	Industrial motion MEMS and environmental sensor evaluation board: ISM6HG256X: intelligent IMU with simultaneous low-g and high-g acceleration detection; ISM330IS: 6-axis IMU, always-on 3-axis accelerometer and 3-axis gyroscope with ISPU; IIS2DULPX: intelligent ultralow power accelerometer for industrial applications; ILPS22QS: dual full-scale, 1260 hPa and 4060 hPa, absolute digital output barometer; IIS2MDC: high accuracy, ultralow power, 3-axis digital output magnetometer

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Sense → Audio & Mics	<u>X-NUCLEO-CCA02M2</u>	Expansion board embedding two MP34DT06J microphones. 6 slots to plug in digital microphone coupon boards such as STEVAL-MIC001V1, STEVAL-MIC002V1 and STEVAL-MIC003V1. Synchronized acquisition and streaming of up to 4 mics
Sense → Gas	<u>P-NUCLEO-IKA02A1</u>	Evaluation pack build on NUCLEO-L053R8 and providing a reference design for various gas electrochemical sensors like CO, SO2, NO and CL2. Specifically, the P-NUCLEO-IKA02A1 evaluation pack features a Carbon monoxide sensor Figaro TGS5141, a STLM20 temperature sensor and two TSU111 operational amplifiers providing signal conditioning.
Connect → BLE	<u>X-NUCLEO-67W61M1</u>	Expansion board for STM32 Nucleo boards based on ST67W611M1 Wi-Fi & Bluetooth LE module
	<u>X-NUCLEO-BNRG2A1</u>	Expansion board that features the Bluetooth® v5.0 compliant and FCC certified BlueNRG-M2SP application processor module based on the ST BlueNRG-2SoC
	<u>X-NUCLEO-IDB05A2</u>	Expansion board based on the BlueNRG-M0 BLE network processor module
	<u>X-NUCLEO-WB05KN1</u>	Bluetooth® Low Energy expansion board based on the STM32WB05KN with preloaded network coprocessor firmware with UART interface for STM32 Nucleo boards. Bluetooth® v5.4 compliant
Connect → GNSS	<u>X-NUCLEO-GNSS1A1</u>	Expansion board based on the Teseo-LIV3F tiny GNSS module
	<u>X-NUCLEO-GNSS2A1</u>	Expansion board based on the Teseo-VIC3DA tiny dead-reckoning GNSS module. It represents an affordable, easy-to-use, global navigation satellite system (GNSS) module, which embeds a TeseoIII single die standalone positioning receiver IC, usable in different configurations in your STM32 Nucleo project
	<u>X-NUCLEO-LIV4A1</u>	Expansion board is based on the Teseo-LIV4F tiny dual-band GNSS Low power and measurement engine modules.
Connect → Sub-1 GHz	<u>X-NUCLEO-S2868A2</u>	Expansion board based on the S2-LP narrow band ultra-low power sub-1 GHz transceiver operating in the 868 MHz ISM band (Europe).
	<u>X-NUCLEO-S2915A1</u>	Expansion board based on the S2-LP narrow band ultra-low power sub-1 GHz transceiver operating in the 915 MHz ISM band (Australia / North America)
	<u>X-NUCLEO-IDS01A4</u>	Expansion board based on the SPSGRF-868 operating in the 868 MHz ISM band (Europe) and is ETSI certified
	<u>X-NUCLEO-IDS01A5</u>	Expansion board based on the SPSGRF-915 operating in the 915 MHz ISM band (Australia and North America) and is FCC certified (FCC ID: S9NSPSGRF) and IC certified (IC:8976C-SPSGRF)

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Connect → NFC	<u>X-NUCLEO-NFC01A1</u>	Expansion board based on the M24SR64-Y device, a ISO14443-A 106-kbps dynamic Type IV NFC/RFID tag IC with a dual interface 64 Kbit EEPROM memory Features an I ² C interface supporting 1 MHz protocol, preformatted for NFC transactions. Can be protected by a unique, flexible 128-bit password scheme
	<u>X-NUCLEO-NFC05A1</u>	Expansion board based on the ST25R3911B. The expansion board is configured to support ISO14443A/B, ISO15693, FeliCa™ and AP2P communication. By default, a VHBR compatible matching is populated to achieve bit rates up to 3.4 Mbps. The ST25R3911B manages frame coding and decoding in reader mode for standard applications, such as NFC, proximity and vicinity HF RFID standards. The ST25R3911B supports ISO/IEC 14443 Type A and B, ISO/IEC 15693 (single Subcarrier only) and ISO/IEC 18092 communication protocols. It also supports the detection, reading and writing of NFC Forum Type 1, 2, 3, 4 and 5 tags. It contains a low power capacitive sensor that can be used for ultra-low power wake-up without switching the reader field on.
	<u>X-NUCLEO-NFC07A1</u>	Dynamic NFC/RFID tag IC expansion board is based on the ST25DV64KC dynamic NFC/RFID tag IC with a 64-Kbit dual interface EEPROM and fast transfer mode feature. It can be powered through the STM32 Nucleo development board or directly through the received carrier electromagnetic field
	<u>X-NUCLEO-NFC08A1</u>	Card reader expansion board is based on the ST25R3916B device. The expansion board is configured to support ISO14443A/B, ISO15693, FeliCa™, and AP2P communication
	<u>X-NUCLEO-NFC09A1</u>	NFC card reader expansion board based on ST25R100 for STM32 Nucleos. The expansion board is configured to support ISO14443A/B, ISO15693. The ST25R100 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/B and ISO/IEC 15693 RF communication protocols as well as the detection, reading and writing of NFC Forum type 1, 2, 4, and 5 tags.
	<u>X-NUCLEO-NFC10A1</u>	NFC card reader expansion board based on ST25R200 for STM32 Nucleos. The expansion board is configured to support ISO14443A/B, ISO15693. The ST25R200 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/B and ISO/IEC 15693 RF communication protocols as well as the detection, reading and writing of NFC Forum type 1, 2, 4, and 5 tags.
	<u>X-NUCLEO-NFC12A1</u>	Expansion board is based on the ST25R300 device to manage frame coding and decoding in reader mode for standard applications. It supports ISO/IEC 14443 type A/B and 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. Integrated HF reader/NFC initiator/NFC target IC with an antenna etched on the PCB and the related tuning circuit.

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Connect → Powerline	X-NUCLEO-PLM01A1	Expansion board based on the ST7580 FSK, PSK multi-mode power line networking system-on-chip
Connect → Industrial link	X-NUCLEO-IOD02A1	Expansion board for STM32 Nucleo is based on the L6364Q dual channel SIO and IO-Link PHY device transceiver embedding 50 mA 3.3 V and 5.0 V voltage regulators, DC-DC converter and M-sequence management for the development of industrial sensor applications
	P-NUCLEO-IOD02A1	Nucleo pack composed of the X-NUCLEO-IOD02A1 and X-NUCLEO-IKS02A1 expansion boards stacked on the NUCLEO-L452RE development board.
	P-NUCLEO-IOD3A1	Nucleo pack composed of the STEVAL-IOD003V1 and X-NUCLEO-OUT03A1 expansion boards stacked on the NUCLEO-L073RZ development board.
	P-NUCLEO-IOD5A1	Nucleo pack composed of the X-NUCLEO-IOD02A1 and X-NUCLEO-DO40A1 expansion boards stacked on the NUCLEO-G071RB development board.
	P-NUCLEO-IOD04A1	Nucleo pack composed of the X-NUCLEO-IOD02A1 and X-NUCLEO-OUT04A1 expansion boards stacked on the NUCLEO-L073RZ development board.
	P-NUCLEO-IOD7A1	Nucleo pack composed of the X-NUCLEO-IOD02A1 and X-NUCLEO-OUT07A1 expansion boards stacked on the NUCLEO-G071RB development board.
	P-NUCLEO-IOM01M1	Nucleo pack for IO-Link master with IO-Link v1.1 PHY and stack build on NUCLEO-F446RE board and STEVAL-IOM001V1. The STEVAL-IOM001V1 is a single IO-Link master PHY layer (L6360) while the NUCLEO- F446RE runs an IO-Link stack rev 1.1
Connect → GHz	X-NUCLEO-60K1A1	Kit composed of two expansion boards, an X-NUCLEO-60L1A1 expansion board, and an X-NUCLEO-60R1A1 expansion board, working as a pair, which can be plugged onto most STM32 Nucleo board equipped with the Arduino R3 connectors. It provides a complete evaluation kit that allows you to learn, evaluate, and develop applications based on the ST60A3H1 transceiver, for contactless connectivity up to 480 Mbit/s. The ST60A3H1 is a full RF transceiver with a dual-linear-polarization integrated antenna, operating in half-duplex mode. It provides an optimized solution for a high-speed, low-power, short-range point to point 60 GHz RF link.
Power → Meter	X-NUCLEO-IKA01A1	Multifunctional expansion board based on STMicroelectronics operational amplifiers. Thanks to its current-sensing configuration, it allows current measurement of any device that has a Micro-USB port. It can be used as an analog front-end by conditioning signals as actuator to drive LEDs or coils, or in a comparator architecture.

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Power → Meter	<u>X-NUCLEO-LPM01A</u>	Expansion board with 1.8 V to 3.3 V programmable power supply source and advanced power consumption measurement capability.
	<u>X-NUCLEO-PM33A1</u>	Electricity metering IC expansion board is based on the STPM33 electricity metering IC with a capability of measuring both AC and DC sources with accuracy of 0.1%.
Power → In / Out	<u>X-NUCLEO-DO40A1</u>	Industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the IPS4140HQ quad high-side smart power solid state relay, in a digital output module connected to ≤ 0.6 A industrial loads.
	<u>X-NUCLEO-DO41A1</u>	Industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the IPS4140HQ-1 quad high-side smart power solid state relay, in a digital output module connected to ≤ 1 A industrial loads.
	<u>X-NUCLEO-DOL10A1</u>	Industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the IPS1050LQ single low-side smart power solid state relay, with configurable smart overload protection. The digital isolators STISO620 (featuring 2.8 kVRMS galvanic isolation) and the isolated dc-dc DC1 (featuring 3 kVDC isolation) protects the logic side from the typical harsh environment on the process side.
	<u>X-NUCLEO-OUT01A2</u>	Industrial Digital output expansion board based on ISO8200BQ galvanic isolated octal high-side smart power solid state-relay with SPI interface enabling industrial programmable logic controller (PLC) capabilities. Operating voltage from 10.5 V to 36 V, maximum operating output current per channel IOUT = 700 mA
	<u>X-NUCLEO-OUT02A1</u>	Industrial digital output expansion board based on the ISO8200AQ galvanic isolated octal high-side smart power solid state-relay. 10.5 to 33 V operating voltage range, 0.7A current per channel
	<u>X-NUCLEO-OUT03A1</u>	Industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the IPS2050H (dual high-side smart power solid state relay) in a digital output module connected to 2.5 A (max.) industrial loads
	<u>X-NUCLEO-OUT04A1</u>	Industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the IPS2050H-32 (dual high-side smart power solid state relay) in a digital output module connected to 5.7 A (max.) industrial loads

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Power → In / Out	<u>X-NUCLEO-OUT05A1</u>	Industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the IPS1025H single high-side smart power solid state relay, in a digital output module connected to 2.5 A industrial loads
	<u>X-NUCLEO-OUT06A1</u>	Industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the IPS1025H-32 single high-side smart power solid state relay, in a digital output module connected to 5.7 A industrial loads
	<u>X-NUCLEO-OUT07A1</u>	Industrial digital output expansion board for STM32 Nucleo provides a powerful and flexible environment for the evaluation of the driving and diagnostic capabilities of the IPS4260LM quad low-side smart power solid state relay, in a digital output module connected to 0.5 A industrial loads.
	<u>X-NUCLEO-OUT08A1</u>	Industrial digital output expansion board featuring the safe driving and smart diagnostic capabilities of the IPS160HF single high-side switch allowing to evaluate a dual channel digital output module with 2 A (typ.) capability each, or a 2 A (typ.) single channel safety digital output module. Operation up to 60V
	<u>X-NUCLEO-OUT09A1</u>	Industrial digital output expansion board for the evaluation of the driving and diagnostic capabilities of the IPS8160HQ octal high-side smart power solid state relay, in a digital output module connected to 0.7 A industrial loads. Operating range 10.5 to 36 V, 3 kV galvanic isolation
	<u>X-NUCLEO-OUT10A1</u>	Industrial digital output expansion board featuring the safe driving and smart diagnostic capabilities of the IPS160HF single high-side switch allowing to evaluate a dual channel digital output module with 0,5 A (typ.) capability each, or a 0,5 A (typ.) single channel safety digital output module. Operation up to 60V
	<u>X-NUCLEO-OUT11A1</u>	Industrial digital output expansion board featuring the driving and diagnostic capabilities of the ISO808 octal high-side smart power solid state relay, with embedded 2kV galvanic isolation, in a digital output module connected to 0.7 A industrial loads, operating range from 9.2 to 36 V
	<u>X-NUCLEO-OUT12A1</u>	Industrial digital output expansion board featuring the driving and diagnostic capabilities of the ISO808A octal high-side smart power solid state relay, with embedded 2kV galvanic isolation and 20 MHz SPI control interface, in a digital output module connected to 0.7 A industrial loads. Operating range 9.2 to 36 V

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Power → In / Out	<u>X-NUCLEO-OUT13A1</u>	Industrial digital output expansion featuring the driving and diagnostic capabilities of the ISO808-1 octal high-side smart power solid state relay, with embedded 2kV galvanic isolation, in a digital output module connected to 1.0 A industrial loads. Operating range 9.2 to 36 V
	<u>X-NUCLEO-OUT14A1</u>	Industrial digital output expansion board featuring the driving and diagnostic capabilities of the ISO808A-1 octal high-side smart power solid state relay, with embedded 2kV galvanic isolation and 20MHz SPI control interface, in a digital output module connected to 1.0 A industrial loads. Operating range 9.2 to 36 V
	<u>X-NUCLEO-OUT15A1</u>	Industrial digital output expansion board for the evaluation of the driving and diagnostic capabilities of the IPS1025HF single high-side, smart power, solid-state relay in a digital output module connected to 2.5 A industrial loads
	<u>X-NUCLEO-OUT16A1</u>	Industrial digital output expansion board for the evaluation of the driving and diagnostic capabilities of the IPS8200HQ octal high-side smart power solid state relay, in a digital output module connected to 0.7 A industrial loads. The on-board digital isolators (STISO620 and STISO621) feature the 2.8k VRMS (4k VPK) galvanic isolation between the two application sides: Logic and process sides. Operating range 10.5 to 36 V
	<u>X-NUCLEO-OUT17A1</u>	Industrial digital output expansion board for the evaluation of the driving and diagnostic capabilities of the IPS8200HQ-1 octal high-side, smart power, solid-state relay in a digital output module connected to 1.0 A industrial loads. The on-board digital isolators (STISO620 and STISO621) feature the 2.8k VRMS (4k VPK) galvanic isolation between the two application sides: logic and process sides. Operating range 10.5 to 36 V
	<u>X-NUCLEO-OUT19A1</u>	Industrial digital output expansion board for the evaluation of the driving and diagnostic capabilities of the IPS8160HQ-1 octal high-side smart power solid state relay, in a digital output module connected to 1 A industrial loads. 5 kV galvanic isolation, operating range 10.5 to 36 V
	<u>X-NUCLEO-PLC01A1</u>	Industrial input/output expansion board with a PLC (programmable logic controller) designed around 8x output VNI8200XP (solid state relay) and 8x input CLT01-38SQ7 (octal digital termination array)
	<u>X-NUCLEO-CCA01M1</u>	Expansion board based on the STA350BW Sound Terminal® 2.1-channel high-efficiency digital audio output system

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Power → USB-PD	<u>X-NUCLEO-SRC1M1</u>	Expansion board which allows evaluating the features of the TCPP02-M18 for USB Type-C and protections for VBUS and CC lines suitable for source applications. The board is certified by the USB Implementers Forum and has a Test ID (TID 7884) number that confirms compliance with the USB Type-C Power Delivery specification
	<u>X-NUCLEO-SNK1M1</u>	USB-C PD Sink expansion board based on our TCPP01-M12 Type-C port protection IC, includes USB 2.0 data and example code compliant with all STM32 Nucleo-64 platform
	<u>X-NUCLEO-DRP1M1</u>	Expansion board allows evaluating the features of TCPP03-M20 and the USB Type-C™ features and protections required for VBUS and CC lines suitable for dual role power (DRP) applications. The expansion board can be stacked on top of any STM32 Nucleo-64 with Power Delivery (UCPD) peripheral embedded in their microcontrollers.
HMI	<u>X-NUCLEO-GFX01M2</u>	Expansion boards (X-NUCLEO-GFX01Mx) add graphic user interface (GUI) capability to STM32 Nucleo-64 boards. It features a 2.2" SPI QVGA TFT display as well as a 64-Mbit SPI NOR Flash memory for storing graphic images, texts and texture. The expansion boards also offer a joystick for GUI navigation
	<u>X-NUCLEO-GFX02Z1</u>	Expansion board to add graphic user interface (GUI) capability to STM32 Nucleo-144 boards. It features a 2.2" 8-bit parallel interface TFT display as well as a 64-Mbit Q-SPI NOR Flash memory for storing graphic images, texts and texture. The expansion board also offers a joystick for GUI navigation
	<u>X-NUCLEO-LED61A1</u>	DC-DC LED driver expansion board designed to provide a sample application for the compact LED driver based on LED6001. The expansion board is equipped with a single-channel, constant-current LED driver for boost or SEPIC topologies.
	<u>X-NUCLEO-LED12A1</u>	Expansion board featuring four LED1202 devices that can drive up to 48 LEDs. The LED1202 is a 12-channel low quiescent current LED driver, which guarantees 5 V output driving capability. Each channel is able to provide up to 20 mA with a headroom voltage of 350 mV (typ.) only. The output current can be adjusted separately for each channel through an 8-bit analog and 12-bit digital dimming control.
Other → Safe	<u>X-NUCLEO-SAFEA1</u>	Expansion board is based on the STSAFE-A110 secure element that acts as a secure element providing authentication and secure data management services to a local or remote host. It allows to evaluate its authentication and data management services connected to a local or remote host. Can be used in IoT (Internet of things) devices, smart-home, smart-city and industrial applications, consumer electronics devices, consumables and accessories. SPL02 and SPL03 personalization profiles are supported.
	<u>X-NUCLEO-ESE01A1</u>	Expansion board is based on the STSAFE-A120 secure element.
	<u>X-NUCLEO-ESE02A1</u>	Expansion board is based on the STSAFE-L010 secure element.

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Other → EEPROM	<u>X-NUCLEO-EEICA1</u>	Expansion board is designed for M24256E-F and M24M01E-F series I2C EEPROM for data reading and writing. It acts as an external storage device that can be used to store data such as manufacturing traceability, calibration, user settings, error flags, data logs, and monitoring data to make applications more flexible and accurate.
	<u>X-NUCLEO-EEPRMA2</u>	Expansion board based on M24xx I ² C and M95xx SPI EEPROM. Up to 1-Mbit serial I ² C bus embedded EEPROM, up to 4-Mbit SPI bus embedded EEPROM
	<u>X-NUCLEO-PGEEZ1</u>	Expansion board is designed for the M95P32 series SPI page EEPROM for data reading and writing. It acts as an external storage device that can be used to store data, such as manufacturing traceability, calibration, user settings, error flags, data logs, and monitoring data to build more flexible and accurate applications
Move → Stepper motors	<u>X-NUCLEO-IHM01A1</u>	Stepper motor driver expansion board based on L6474 micro-stepping motor driver; 16usteps. Operative range: 8–45 V _{DC} , up to 3 A _{rms}
	<u>X-NUCLEO-IHM02A1</u>	Two axis stepper motor driver expansion. board based on two L6470s, a fully-integrated micro stepping motor driver; 128usteps. Operative range: 8–45 V _{DC} , up to 3 A _{rms}
	<u>X-NUCLEO-IHM03A1</u>	High power stepper motor driver expansion. board based on powerSTEP01 driver for high current bipolar steppers; 128 usteps. Operative range: 10.5–85 V _{DC} , up to 10 A _{rms}
	<u>X-NUCLEO-IHM05A1</u>	Bipolar stepper motor driver expansion board based on L6208 driver for bipolar stepper motors. Operative range: 8–50 V _{DC} , up to 2.8 A _{rms}
	<u>X-NUCLEO-IHM06A1</u>	Low voltage stepper motor driver exp. board based on the STSPIN220, very compact 256usteps capable ultra low-power micro-stepping driver. Operative range: 1.8–10 V _{DC} , up to 1.3 A _{rms}
	<u>X-NUCLEO-IHM14A1</u>	Stepper motor driver exp. board based on STSPIN820, cost optimized 256usteps capable and compact microstepping driver. Op. range: 7–45 V _{DC} , up to 1.5 A _{rms}
Move → Brushed DC motors	<u>X-NUCLEO-IHM04A1</u>	Dual brushed DC motor driver expansion board based on L6206, versatile general purpose dual full bridge driver for dual bipolar DC or quad unipolar DC motors. Thanks to the parallel operation, it can be easily converted to a single brushed DC driver with double current capability. Operative range: 8–50 V _{DC} , 2.8 A _{rms} (5.6 A _{rms} in parallel mode, single driver)
	<u>X-NUCLEO-IHM12A1</u>	Low voltage dual brushed DC motor driver expansion board based on STSPIN240, very compact and ultra low-power dual brushed DC motor driver. Operative range: 1.8–10 V _{DC} , up to 1.3 A _{rms}

STM32Cube X-Nucleo boards

Category	Part number	Specifications
Move → Brushed DC motors	X-NUCLEO-IHM13A1	Low voltage brushed DC motor driver expansion board based on the STSPIN250, very compact and ultra low-power single brushed DC motor driver. Operative range: 1.8–0 V _{DC} , up to 2.6 A _{rms}
	X-NUCLEO-IHM15A1	Dual brushed DC motor driver expansion board based on STSPIN840, cost optimized, compact dual brushed DC motor driver able to drive 2 bi-directional brushed DC motors simultaneously. Thanks to the parallel operation, it can be easily converted to a single brushed DC driver with double current capability. Operative range: 7–45 V _{DC} , up to 1.5 A _{rms} (3 A _{rms} in parallel mode, single driver)
Move → Brushless DC motors	X-NUCLEO-IHM07M1	Three-phase brushless DC motor driver expansion board based on L6230, versatile fully integrated driver for three-phase brushless DC motors driver. Operative range: 8–48 V _{DC} , 1.4 A _{rms}
	X-NUCLEO-IHM08M1	Low-Voltage BLDC motor driver expansion board based 3x L6398 a high voltage single-chip half bridge gate drivers and on 6x STL220N6F7 STripFET™ F7 Power MOSFET three-phase brushless DC motors driver in single shunt and 3 shunt topology. The L6398 gate driver plus STL220N6F7 Power MOSFET combination forms the high current power platform for the BLDC motor. Operative range: 10–48 V _{DC} , 15 A _{rms}
	X-NUCLEO-IHM11M1	Low voltage three-phase brushless DC motor driver expansion board based on STSPIN230, very compact and ultra low-power triple half-bridge motor driver for BLDC motors; 6 INx driving mode. Operative range: 1.8–10 V _{DC} , up to 1.3 A _{rms}
	X-NUCLEO-IHM16M1	Three-phase brushless DC motor driver expansion board based on STSPIN830, cost optimized, compact three-phase and three-sense BLDC motors driver. Operative range: 7–45 V _{DC} , up to 1.5 A _{rms}
	X-NUCLEO-IHM17M1	Low voltage three-phase brushless DC motor driver expansion board based on STSPIN233, very compact and ultra low-power three phase and three sense motor driver; 3 INx driving mode. Operative range: 1.8–10 V _{DC} , up to 1.3 A _{rms}
	P-NUCLEO-IHM002	Nucleo pack build on NUCLEO-F302R8, X-NUCLEO-IHM07M1 and a Bull-Running model BR2804-1700 kV motor with power supply
	P-NUCLEO-IHM03	Nucleo pack build on NUCLEO-G431RB, X-NUCLEO-IHM16M1 and a Gimbal motor GBM2804H-100T with power supply
Move → Interface	X-NUCLEO-IHM09M2	Motor control connector expansion board to evaluate motor control solutions for three-phase motors with an external ST motor control power board, thanks to ST morpho and 34-pin motor control connector, allowing to extend the STM32Cube motor control support to high-voltage STEVAL and EVAL Brushless Motors boards



STM32 Motor Control ecosystem web page:

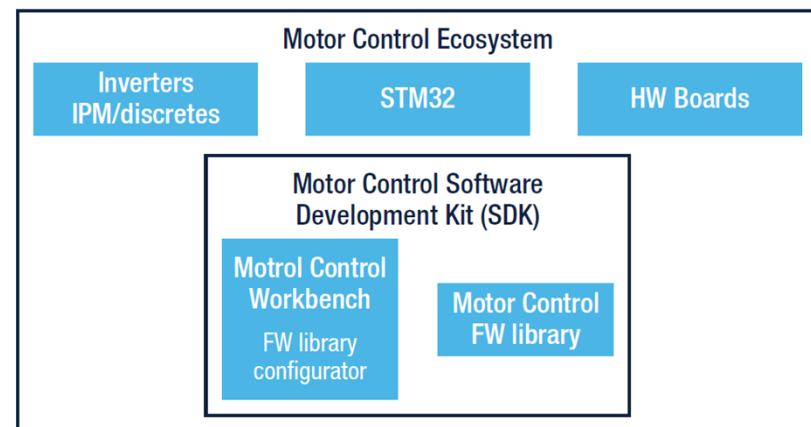
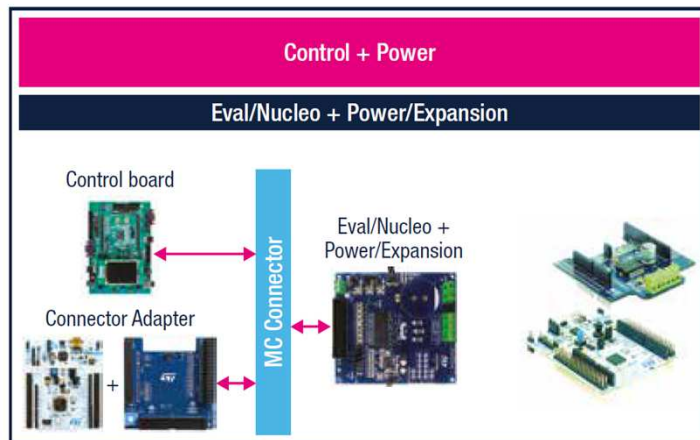
https://www.st.com/content/st_com/en/stm32-motor-control-ecosystem.html

STM32Cube Motor Control ecosystem

ST proposes a broad range of evaluation boards for comprehensive evaluation of ST's products and solutions while reducing your development time. All microcontroller evaluation boards have ST's standard MC connector on-board allowing the use of the board in conjunction with any of the power stage evaluation boards.

STM32 MC SDK (motor control software development kit) firmware (**X-CUBE-MCSDK**) includes the permanent-magnet synchronous motor (PMSM) firmware library and the STM32 Motor Control Workbench to configure the firmware library parameters through its graphical user interface. All the Brushless DC motor control X-NUCLEO expansion boards are supported

STM32 Motor Control Workbench is PC software that reduces the design effort and time needed for the firmware configuration: The user generates a project file through the GUI and initializes the library according to the application needs. Some of the variables of the algorithm being used can be monitored and changed in real time.



STM32Cube solution boards

8 Solution boards to meet customer expectation in term of form factor



STEVAL-ASTRA1B

Development kit and reference design that simplifies prototyping, testing and evaluating advanced asset tracking applications such as livestock monitoring, fleet management, and logistics.



STEVAL-SMARTAG1

Smart and flexible NFC Tracker evaluation board with sensors includes a comprehensive software library and a sample application to monitor and log sensor data over NFC from an Android or iOS device.



STEVAL-SMARTAG2

NFC-enabled sensor node with inertial MEMS sensors and environmental sensors, an STM32 microcontroller, and a dynamic NFC tag for communication with NFC readers, such as tablets and smartphones

STM32Cube solution boards

8 Solution boards to meet customer expectation in term of form factor



STEVAL-BFA001V2B

An industrial reference design kit designed for condition monitoring (CM) and predictive maintenance (PdM).



STEVAL-PROTEUS1

Evaluation tool designed for temperature and vibration monitoring to address machine or facility condition monitoring for industrial applications. It simplifies the prototyping, evaluation and development of wireless industrial sensor nodes.



STEVAL-STWINKT1B

The STWIN SensorTile wireless industrial node is a development kit and reference design that simplifies prototyping and testing of advanced industrial IoT applications such as condition monitoring and predictive maintenance.

STM32Cube solution boards

To meet customer expectation in terms of form factor. Their functionality is identical to stacking a STM32 Nucleo board & X-Nucleo expansion boards but integrated in a compact form factor

Category	Part number	Specifications
LoRa® IoT tracker	STEVAL-ASTRA1B	Development kit and reference design that simplifies prototyping, testing and evaluating advanced asset tracking applications such as livestock monitoring, fleet management, and logistics. It is built around the STM32WB5MMG module and the STM32WL55JC MCUs SoC for short and long range connectivity (BLE, LoRa, and 2.4 GHz and sub 1-GHz proprietary protocols) . ST25DV64K for NFC connectivity is also available. The on-board STSAFE-A110 enhances security features . The kit embeds a complete set of environmental and motion sensors (LIS2DTW12, LSM6DSO32X, HTS221, STTS22H, LPS22HH). Moreover, the Teseo-LIV3F GNSS module provides outdoor positioning
NFC Dynamic Tag sensor node	STEVAL-SMARTAG1	Smart and flexible NFC tracker evaluation board with sensors with a comprehensive software library and a sample application to monitor and log sensor data over NFC from an Android or iOS device. STM32L031K6 MCU , ST25DV64K dynamic NFC tag based on 64K-bit EEPROM , LIS2DW12 ultra-low-power high-performance 3-axis linear accelerometer , LPS22HB ultra-compact piezo-resistive absolute pressure sensor which functions as a digital output barometer, HTS221 capacitive digital sensor for relative humidity and temperature , STLQ015 low drop linear regulator power management, CR2032 Battery powered (not included)
	STEVAL-SMARTAG2	NFC-enabled sensor node with inertial MEMS sensors and environmental sensors, an STM32L4P5-CGU6 microcontroller, and a dynamic NFC tag for communication with NFC readers, such as tablets and smartphones. Equipped with ST25DV64KCJF6D3 dynamic NFC/RFID tag IC with 64-Kbit EEPROM and fast transfer mode capability, STM32L4P5-CGU6 ultra-lowpower Arm® Cortex®-M4 32-bit MCU+FPU, 150 DMIPS, up to 1-MB flash memory, 320-KB SRAM, LCD-TFT, external SMPS, LSM6DSO32X iNEMO 6 DoF inertial module with 32 g accelerometer and embedded machine learning core, LIS2DUXS12 ultra-low-power 3-axis smart accelerometer with machine learning core and Qvar , H3LIS331DL MEMS motion sensor : low-power high-g 3-axis digital accelerometer , LPS22DF low-power and high-precision MEMS nano pressure sensor : 260-1260 hPa absolute digital output barometer , STTS22H low-voltage, ultra-low-power, 0.5 °C accuracy I²C/SMBus 3.0 temperature sensor , VD6283TX Ambient Light Sensor with Hybrid filter multispectral and with embedded light flicker engine

STM32Cube solution boards

To meet customer expectation in terms of form factor. Their functionality is identical to stacking a STM32 Nucleo board & X-Nucleo expansion boards but integrated in a compact form factor

Category	Part number	Specifications
Predictive maintenance kit	STEVAL-BFA001V2B	An industrial reference design kit designed for condition monitoring (CM) and predictive maintenance (PdM). STM32F469AI, iNEMO 6DoF (ISM330DLC), Absolute digital pressure sensor (LPS22HB), Relative humidity and temperature sensors (HTS221), Digital microphone sensors (MP34DT05-A), IO-Link PHY device (L6362A), EEPROM (M95M01-DF) for data storage, Step-down switching regulator and LDO regulator (L6984 and LDK220)
Industrial sensor evaluation kit for condition monitoring	STEVAL-PROTEUS1	Evaluation tool designed for temperature and vibration monitoring in the time and frequency domain, machine learning, and AI to address industrial asset monitoring. It is based on a 2.4 GHz multiprotocol wireless SoC to address machine or facility condition monitoring for industrial applications. The evaluation board simplifies the prototyping, evaluation and development of wireless industrial sensor nodes to enable the predictive maintenance. It comes with a LiPo battery and a plastic case. All components are mounted exclusively on the top side of the PCB to ensure an easy mounting on other equipment. The included comprehensive software and the firmware libraries with time and frequency domain vibration analysis ease your software customization and can reliably improve your time-to-market. The main board includes the STM32WB5MMG ultra-low-power dual core 32-bit MCU and small form factor wireless radio module , ultra-wide bandwidth up to 6 kHz, low noise, 3-axis digital accelerometer (IIS3DWB), iNEMO inertial module with machine learning core and finite state machine with digital output (ISM330DHCX), high-performance ultra-low-power 3-axis digital accelerometer (IIS2DLPC), low-voltage, ultra-low-power, 0.5°C accuracy I ² C/SMBus 3.0 temperature sensor (STTS22H), 2Gb QSPI NOR flash memory for data storage, secure element (STSAFE-A110), Li-Ion linear battery charger with LDO (STBC02), This module is FCC and IC certified (FCC ID: YCP-STM32WB5M001 and IC: 8976A-STM32WB5M01). It is based on the STM32WB55VGY wireless SoC, compliant with the Bluetooth® Low Energy SIG specification v5.2, ZigBee 3.0, and IEEE 802.15.4-2011

STM32Cube solution boards

To meet customer expectation in terms of form factor. Their functionality is identical to stacking a STM32 Nucleo board & X-Nucleo expansion boards but integrated in a compact form factor

Category	Part number	Specifications
STWIN SensorTile Wireless Industrial Node	<u>STEVAL-STWINKT1B</u>	Development kit and reference design that simplifies prototyping and testing of advanced industrial IoT applications such as condition monitoring and predictive maintenance. STM32L4R9 MCU, Wide range of industrial IoT sensors: ultra-wide bandwidth (up to 6 kHz), low-noise, 3-axis digital vibration sensor (IIS3DWB), 3D accelerometer + 3D Gyro iNEMO inertial measurement unit (ISM330DHCX) with machine learning core, ultra-low-power high performance motion sensor (IIS2DH), ultra-low-power 3-axis magnetometer (IIS2MDC), digital absolute pressure sensor (LPS22HH), relative humidity and temperature sensor (HTS221), low-voltage digital local temperature sensor (STTS751), industrial grade digital MEMS microphone (IMP34DT05), wideband analog MEMS microphone (MP23ABS1), Micro SD Card slot for standalone data logging applications, Wireless BLE4.2 (on-board) and Wi-Fi (with STEVAL-STWINWFV1 expansion board), and wired RS485 and USB OTG connectivity, Li-Po battery 480 mAh, STLINK-V3MINI debugger with programming cable, Plastic box
STWIN.box - SensorTile Wireless Industrial Node Development Kit	<u>STEVAL-STWINBX1</u>	It is an evolution of the original STWIN kit (STEVAL-STWINKT1B) and features a higher mechanical accuracy in the measurement of vibrations, an improved robustness, an updated BoM to reflect the latest and best-in-class STM32U585AI MCU and industrial sensors, and an easy-to-use interface for external add-ons. Industrial IoT sensors: Ultra-wide bandwidth (up to 6 kHz), low-noise, 3-axis digital vibration sensor (IIS3DWB), 3D accelerometer + 3D gyro iNEMO inertial measurement unit (ISM330DHCX) with Machine Learning Core, High-performance ultra-low-power 3-axis accelerometer for industrial applications (IIS2DLPC), Ultra-low power 3-axis magnetometer (IIS2MDC), High-accuracy, high-resolution, low-power, 2-axis digital inclinometer with Embedded Machine Learning Core (IIS2ICLX), Dual full-scale, 1.26 bar and 4 bar, absolute digital output barometer in full-mold package (ILPS22QS), Low-voltage, ultra low-power, 0.5°C accuracy I ² C/SMBus 3.0 temperature sensor (STTS22H), digital MEMS microphone (IMP34DT05). Analog MEMS microphone with frequency response up to 80 kHz (IMP23ABSU), MicroSD card slot for standalone data logging applications, on-board Bluetooth® low energy v5.0 wireless technology

STM32Cube solution boards

To meet customer expectation in terms of form factor. Their functionality is identical to stacking a STM32 Nucleo board & X-Nucleo expansion boards but integrated in a compact form factor

Category	Part number	Specifications
SensorTile.box PRO	STEVAL-MKBOXPRO	New ready-to-use programmable wireless box kit for developing any IoT application based on remote data gathering and evaluation, exploit the full kit potential by leveraging both motion and environmental data sensing, along with a digital microphone, and enhance the connectivity and smartness of whatever environment you find yourself into. STM32U585AI Ultra-low-power MCU, Low-voltage local digital temperature sensor (STTS22H), Six-axis inertial measurement unit (LSM6DSV16X), Three-axis low-power accelerometer (LIS2DU12), 3-axis magnetometer (LIS2MDL), Pressure sensor (LPS22DF), Digital microphone/audio sensor (MP23DB01HP), Socket for DIL24 sensor adapters, Qvar with electrodes for user interface experience, 5 W wireless charging <u>Entry mode</u>: run a wide range of already embedded IoT applications on your box with the STBLESensor app. <u>Expert Mode</u>: STBLESensor helps you develop your own app or customize an existing one by selecting specific input data and operating parameters from corresponding available in-box sensors, functions to assess/compute those data, and output types that you need, while leveraging on the available powerful algorithms. <u>Pro Mode</u>: SensorTile.box PRO is fully compatible with the STM32Cube for developers to customize the firmware and ST function pack libraries, including sensing AI function pack with neural network libraries, without the need to perform any coding activity.

STM32Cube discovery kits

40 All-in-One IoT development platform

STM32 discovery kits provide affordable and complete solutions to evaluate the application-specific features of STM32 MCUs and MPUs.

These hardware tools allow modular designs and customization, thanks to extension connectors that enable access to most device I/Os. Several STM32 discovery kits come with application-specific features. They also integrate on-board debuggers and programmers, making them ideal for project prototyping and evaluation.

STM32 discovery kits come with comprehensive software examples, which allow developers to leverage device features and benefits.

Find out more at

<https://www.st.com/en/evaluation-tools/stm32-discovery-kits.html>



Motion sensors



Environmental sensors



MEMS Microphones



Proximity sensor



Dynamic NFC Tag



Low Power MCU



Sensors Fusion



Bluetooth Low Energy



Sub 1GHz



Wi-Fi

STM32Cube development platforms

1 Tiny boards to accelerate the solution development



STEVAL-BCNKT01V1 (Development Kit)



Motion sensors



Pressure sensor



4x MEMS Microphones



2 x Proximity sensors



High performance MCU



Bluetooth Low Energy

STM32Cube development platforms

Tiny boards to accelerate the solution development

Category	Part number	Specifications
BlueCoin	<u>STEVAL-BCNKT01V1</u>	Integrated development and prototyping platform for augmented acoustic and motion sensing for IoT applications builds on the listening and balancing capabilities of the human ear. STM32F446 MCU , 3D digital accelerometer and a 3D digital gyroscope LSM6DSM, MEMS 3D accelerometer + MEMS3D magnetometer LSM303AGR, ultra-compact piezoresistive absolute pressure sensor LPS22HB, 4x MP34DT06J microphones , Bluetooth low energy connectivity BlueNRG-MS, linear battery charger STBC03JR. The kit includes BlueCoin module, CoinStation board, BlueCoin Cradle, 130 mAh Li-Po battery, Plastic box for housing the BlueCoin cradle and the battery, SWD programming cable

Presentation overview

STM32Cube: Hardware Portfolio

STM32Cube: Firmware Portfolio

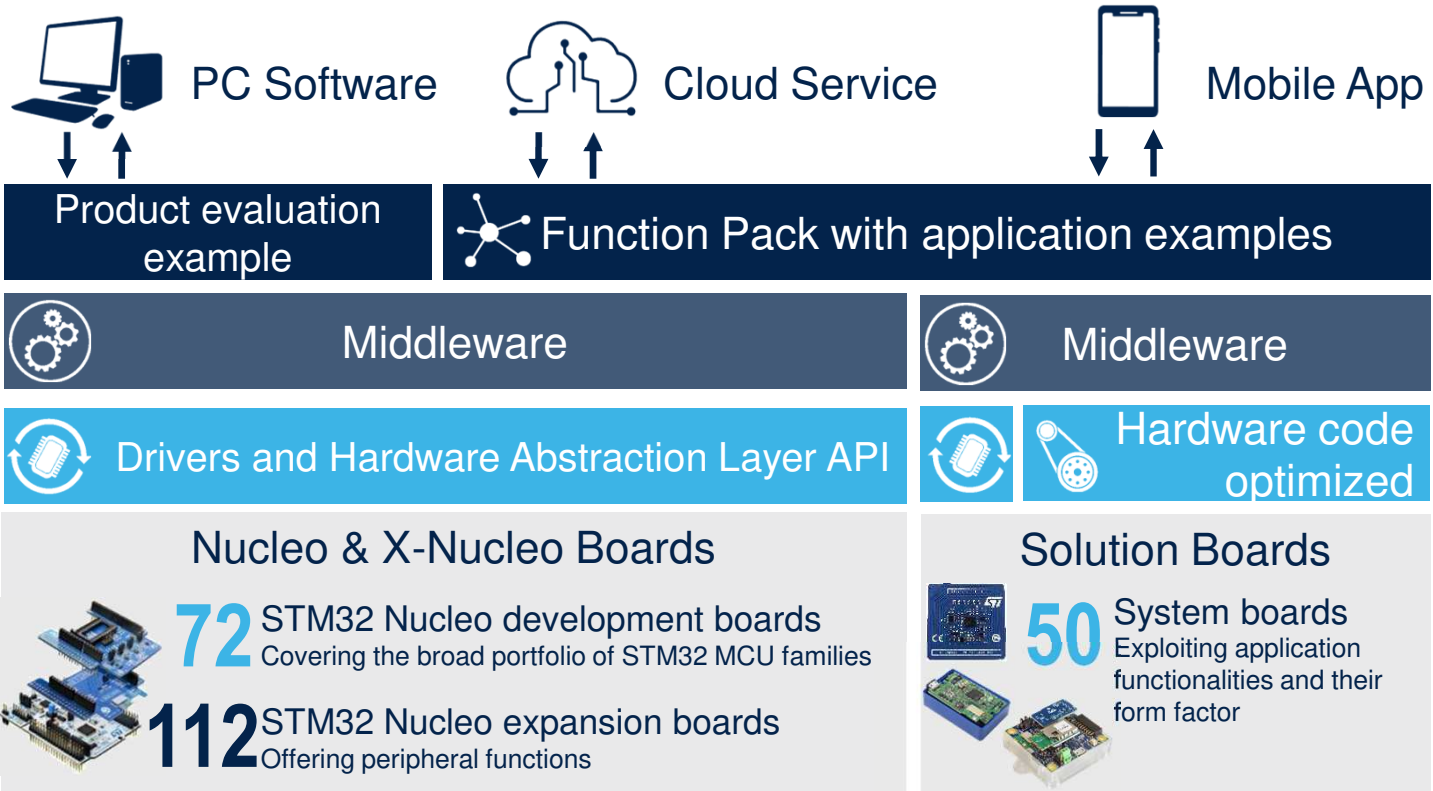
STM32Cube: Software Portfolio

STM32Cube: firmware architecture

All the firmware in your hands



Development tools
Compatibility with free
and commercial IDEs

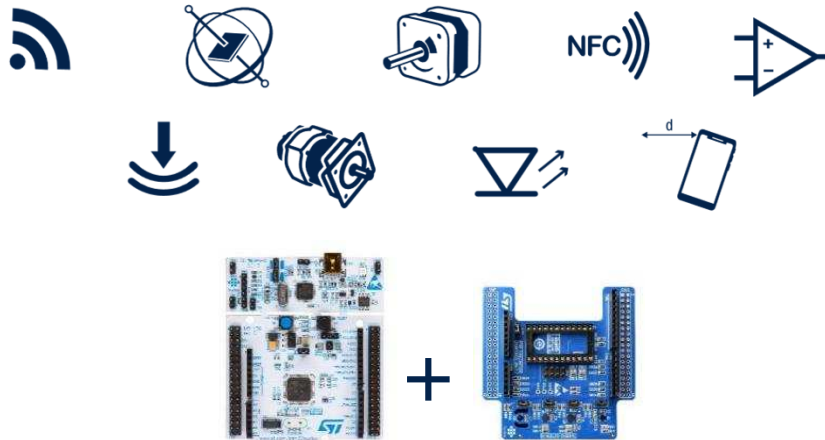


STM32Cube: firmware overview

STM32Cube Expansion SW

Prototype with a single expansion board

Sample applications

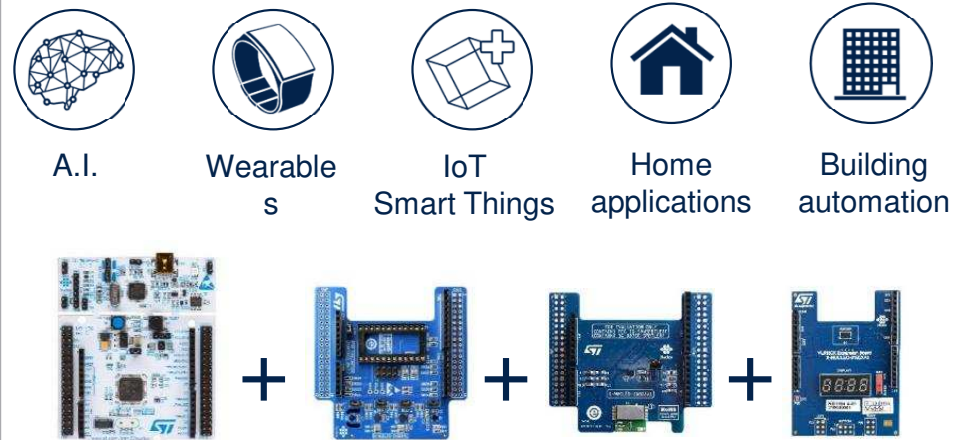


Part Numbering: X-CUBE-xxx

STM32Cube Function Pack

Create advanced use cases based on multiple expansion boards

Pre-integrated application example

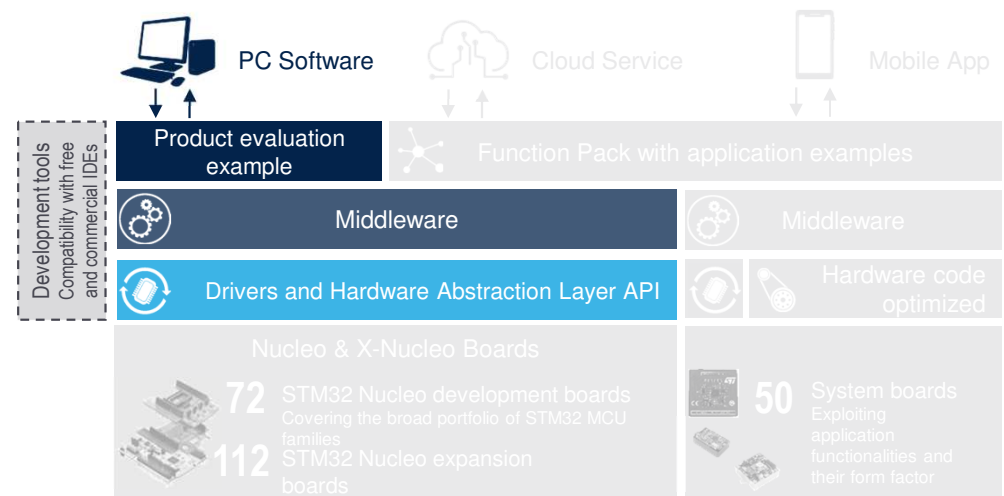


Part Numbering: FP-xxx-yyy

STM32Cube expansion FW packages

Any X-NUCLEO board has its own X-CUBE Firmware

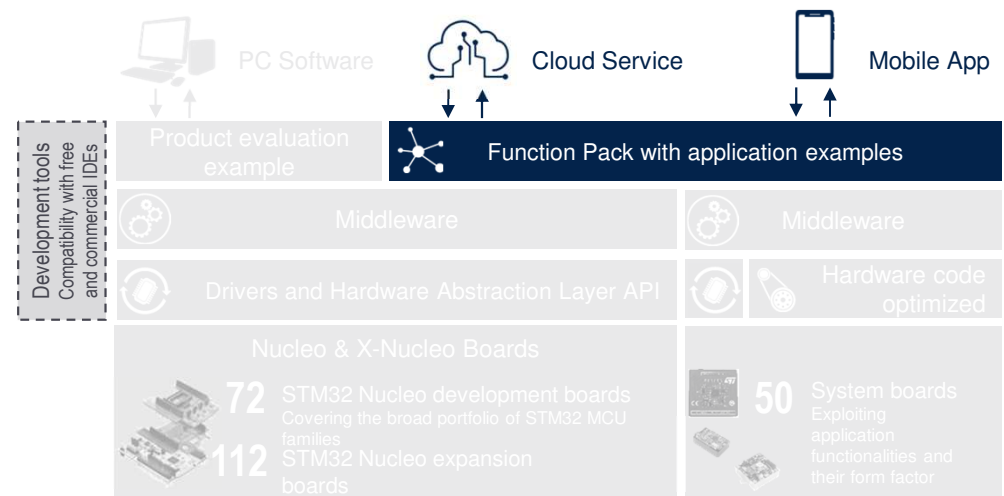
- The X-CUBEs are validated on several STM32 Nucleo boards
- All the X-CUBE firmware packages are homogeneous in terms of Structure and API abstraction level to easily combine multiple functions
- The X-CUBE packages come with pre-built projects with IAR Embedded Workbench, Keil Microcontroller Development Kit, System Workbench for STM32 and STM32CubeIDE*.



STM32Cube function packs

Function Packs offer an easy way to get a proof of concept of the application

- 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 and to the equivalent solution board
 - Example: FP-SNS-MOTENV1 runs on the NUCLEO-U575ZJ-Q and X-NUCLEO-BNRRG2A1 and X-NUCLEO-IKS4A1.
- All Function Pack come with pre-built projects with following IDEs: IAR EWARM, Keil MDK-ARM, STM32CubeIDE*, and binaries that can be run out of the box



STM32Cube Firmware Distribution Channels

- st.com web page
- Download <package>.zip

FP-SNS-MOTENV1 ACTIVE

STM32Cube function pack for IoT node with BLE connectivity and environmental and motion sensors

Get Software Download databrief

Product overview

Description All features Get Software Recommended for you

Description

FP-SNS-MOTENV1 is an STM32Cube function pack, which lets you connect your IoT node to a smartphone via BLE and uses a suitable Android™ or iOS™ application, such as the STBLESensor app, to view real-time motion and environmental (such as temperature and relative humidity) sensor data.

Application	FP-SNS-MOTENV1
Middleware	BLE BLE_Manager MotionAR MotionCP MotionFS MotionGR

This package also enables advanced functions such as the sensor data fusion and accelerometer-based real-time activity recognition, carry position, gesture recognition, motion intensity recognition, and real-time information about the number of steps and cadence which the user just performed with the device, that is, a cell phone.

Together with the suggested combination of STM32 and ST devices, it

Get Software

Part Number	Download	All versions
FP-SNS-MOTENV1	Get latest Get from GitHub	Select version

General Description

STM32Cube function pack for IoT node with BLE connectivity and environmental and motion sensors

Latest version

Supplier: ECCN (EU), ECCN (US)

Product Specifications (1)

Part Number	Version	Date
DB2852 STM32Cube function pack for IoT node with BLE connectivity and environmental and motion sensors	14.0	28 Mar 2024

User Manuals (1)

Part Number	Version	Date
UM2016 Getting started with the STM32 ODE function pack for IoT node with BLE connectivity and environmental and motion sensors	13.0	28 Mar 2024

Presentations (4)

Part Number	Version	Date
FP-SNS-MOTENV1 quick start guide	3.1	28 Mar 2024
MadeForSTM32™ Label - Proven Quality for STM32-based Applications	1.0	10 Aug 2022
STM32 and STM8 embedded software solutions	22.08	10 Aug 2022
STM32Cube ecosystem overview - Making STM32 development easier	1.0	10 Aug 2022

License Agreement (1)

Part Number	Version	Date
SLA0077 SOFTWARE LICENSE AGREEMENT ("Agreement")	2.24	08 Sep 2023

Additional License Terms (1)

Part Number	Version	Date
FP-SNS-MOTENV1 ADDITIONAL LICENSE TERMS	5.0.0	28 Mar 2024

STM32Cube Firmware Distribution Channels

- GitHub

The screenshot displays the GitHub repository page for **FP-SNS-MOTENV1**, a public repository by **SalvoCurti**. The repository is described as an "Officiale Release version 4.3.2".

Repository Structure:

- `.github` (Added FP-S)
- `Documentation` (Officiale Rel)
- `Drivers` (Officiale Rel)
- `Middleware` (Officiale Rel)
- `Projects` (Officiale Rel)
- `Utilities` (Officiale Rel)
- `_htmresc` (Officiale Rel)
- `CODE_OF_CONDUCT.md` (Added FP-S)
- `CONTRIBUTING.md` (Updated CC)
- `LICENSE.md` (Official rele)
- `README.md` (Officiale Rel)
- `Release_Notes.html` (Officiale Rel)
- `SECURITY.md` (Added SECI)

FP-SNS-MOTENV1 Firmware Package

The FP-SNS-MOTENV1 is an STM32Cube function pack which lets you connect your IoT node to a smartphone via BLE and use a suitable Android or iOS app like the ST BLE Sensor app to view real-time environmental sensor data and motion sensor data. The package also enables advanced functionality such as sensor data fusion and accelerometer-based real-time activity recognition, carry position, gesture recognition, pedometer, motion intensity and compass. This package, together with the suggested combination of STM32 and ST devices can be used to develop specific wearable applications, or smart things applications in general.

The software runs on the STM32 microcontroller and includes all the necessary drivers to recognize the devices on the STM32 Nucleo development board and expansion boards.

The expansion is built on STM32Cube software technology to ease portability across different STM32 microcontrollers.

FP-SNS-MOTENV1 software features:

- Complete firmware to develop an IoT node with BLE connectivity, environmental and motion sensors
- For Nucleo-F401RE and Nucleo-L476RG, middleware libraries for sensor data fusion and accelerometer-based real-time activity recognition, carry position, gesture recognition, motion intensity recognition and pedometer.
- Firmware compatible with ST BLE Sensor applications for Android/iOS, to perform sensor data reading, motion algorithm features demo and firmware update (FOTA - For Nucleo-F401RE and Nucleo-L476RG) (Version 4.20.0/4.20.0 or higher)
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

This firmware package includes Components Device Drivers, Board Support Package and example application for the STM32 microcontrollers:

- M0111EQ, E401DE nucleon development board and expansion boards

Releases: v4.3.2 (Latest) on Jul 4, 2023. + 4 releases.

Packages: No packages published. [Publish your first package](#)

Contributors: SalvoCurti, mgrella Marco Grella, stmicroelectronics-github STM32Cube...

Languages:

Language	Percentage
C	77.1%
HTML	17.8%
Assembly	2.7%
CSS	1.3%
JavaScript	1.1%
CMake	0.0%

STM32Cube Firmware Distribution Channels

- STM32CubeMX

- the advantages to generate the packs from STM32CubeMX is to obtain the code always with the latest version of the drivers and middlewares.

The screenshot displays the STM32CubeMX interface. On the left, the 'Embedded Software Packages Manager' window shows a table of available packages. On the right, the 'Software Packs Component Selector' window shows a tree view of installed and available components.

Embedded Software Packages Manager Table:

Status	Description	Available Version
☒	FP-SNS-MOTENV1	5.0.0
☐	The FP-SNS-MOTENV1 is an STM32Cube function pack which lets you connect your IoT node	4.3.2

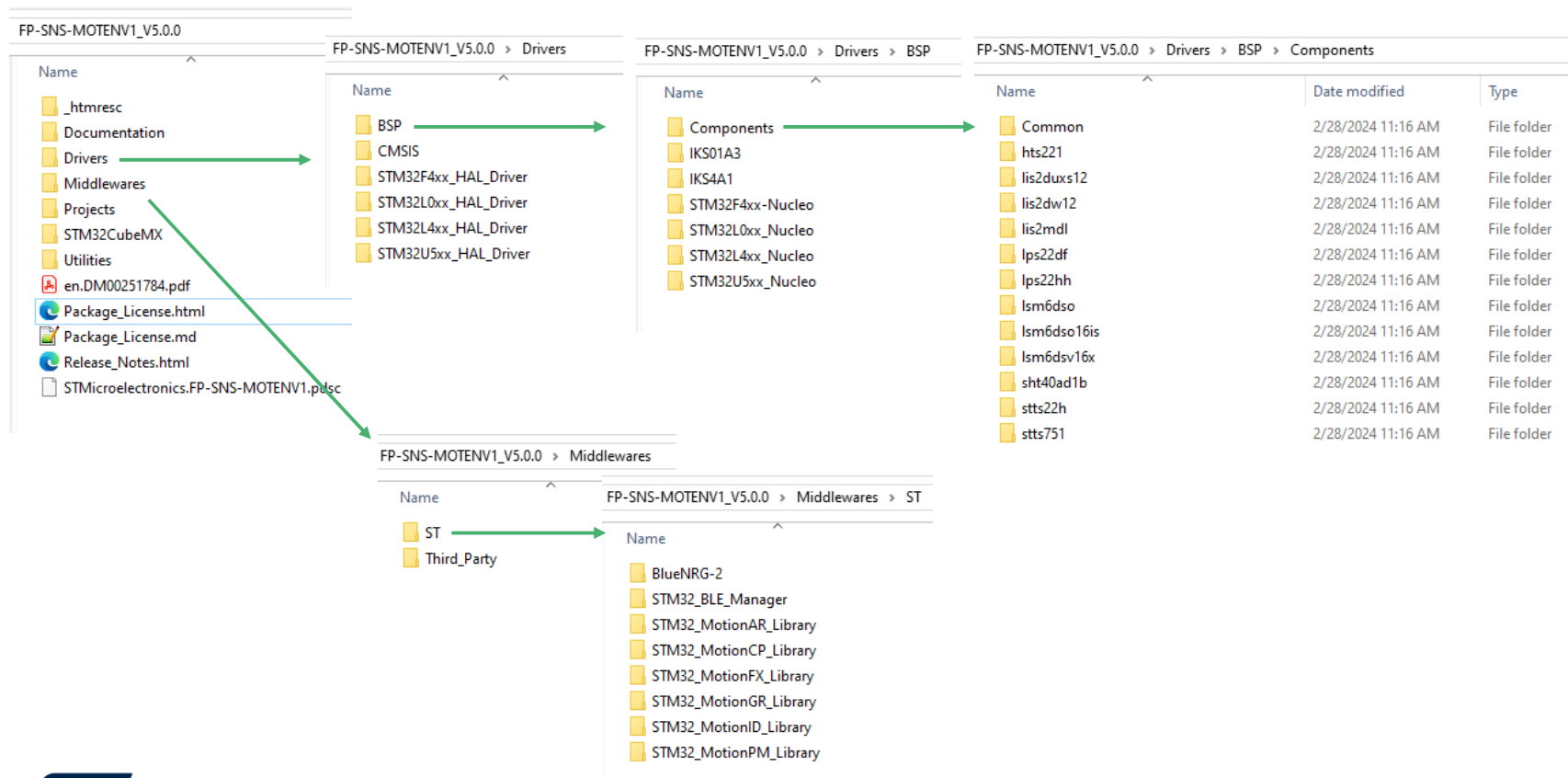
Software Packs Component Selector Table:

Pack / Bundle / Component	Status	Version	Selection
ITTA_DB-I-CUBE-ITTIADB		8.8.0	Install
Infineon.AROC-Wi-Fi-Bluetooth-STM32		1.5.1	Install
SEGGER-I-CUBE-embOS		1.3.1	Install
STMicroelectronics.FP-ATR-ASTRA1		2.0.0	Install
STMicroelectronics.FP-ATR-SIGFOX1		3.2.0	Install
STMicroelectronics.FP-SNS-FLIGHT1		5.0.2	Install
STMicroelectronics.FP-SNS-MOTENV1		5.0.0	Install
Device MOTENV1_Applications		5.0.0	Not selected
Application		Not selected	
STMicroelectronics.FP-SNS-MOTENVWB1		1.3.1	Install
STMicroelectronics.FP-SNS-SMARTAG2		1.2.0	Install
STMicroelectronics.FP-SNS-STBOX1		2.0.0	Install
STMicroelectronics.X-CUBE-AI		8.1.0	Install
STMicroelectronics.X-CUBE-ALGOBUILD		1.3.0	Install
STMicroelectronics.X-CUBE-ALS		1.0.1	Install
STMicroelectronics.X-CUBE-AZRTOS-F4		1.1.0	Install
STMicroelectronics.X-CUBE-AZRTOS-F7		1.1.0	Install
STMicroelectronics.X-CUBE-AZRTOS-G0		1.1.0	Install
STMicroelectronics.X-CUBE-AZRTOS-G0		2.0.0	Install
STMicroelectronics.X-CUBE-AZRTOS-H7		3.2.0	Install

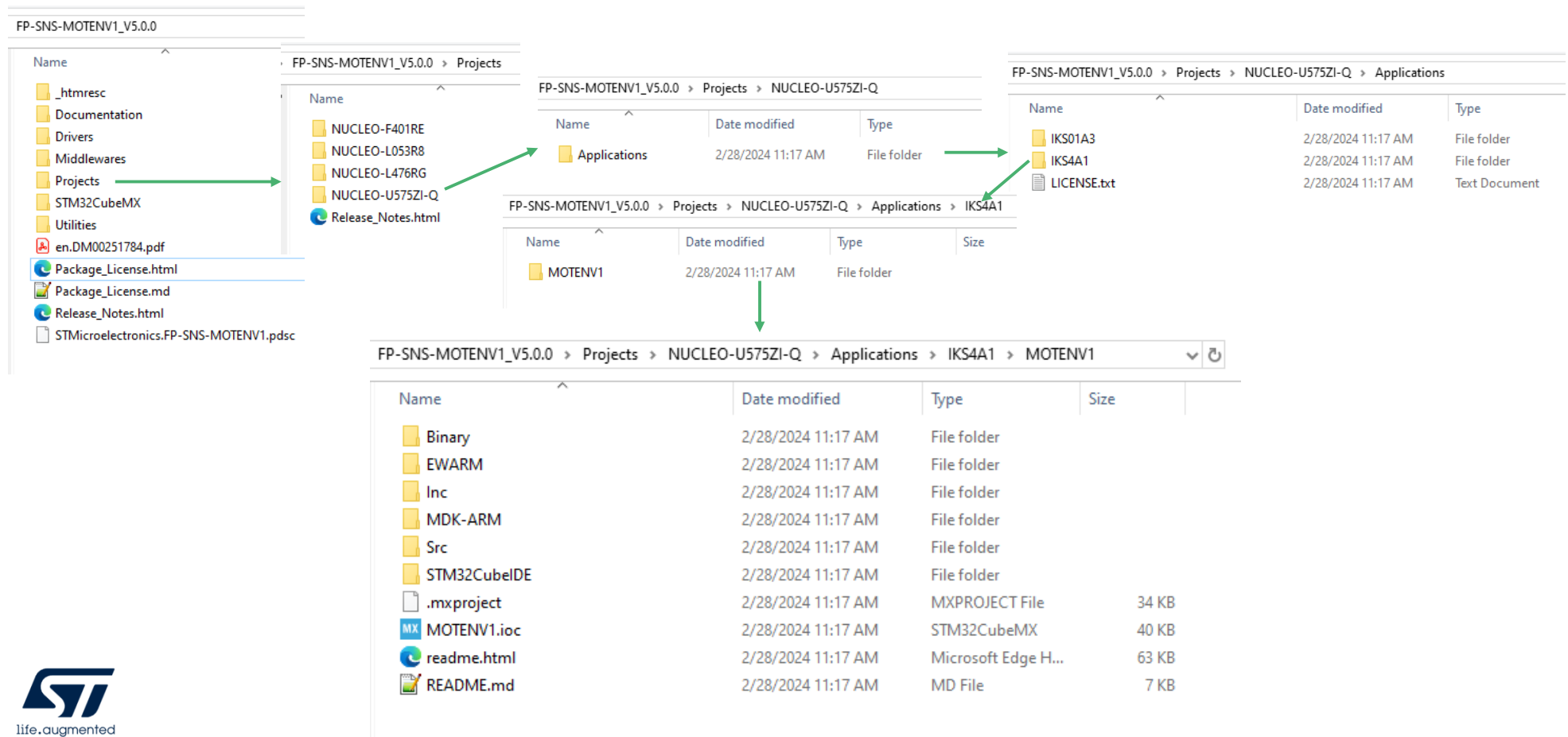
Software Packs Component Selector Table (Expanded):

Pack / Bundle / Component	Status	Version	Selection
STMicroelectronics.FP-SNS-FLIGHT1		5.0.2	Install
STMicroelectronics.FP-SNS-MOTENV1		5.0.0	Install
Device MOTENV1_Applications		5.0.0	MOTENV1_IKS4A1_FOTA
Application		5.0.0	MOTENV1_IKS4A1_FOTA
STMicroelectronics.FP-SNS-MOTENVWB1		1.3.1	Install
STMicroelectronics.FP-SNS-SMARTAG2		1.2.0	Install

Package Structure



Package Structure



STM32Cube Function Packs

Category	Part number	Specifications	Associated PN
AI	<u>FP-AI-PDMWBSOC</u>	Function pack able to get motion sensor data, process them for anomaly detection, and send the results to the STBLESensor mobile app or a PC terminal console. The function pack helps to explore the implementation and development of a predictive maintenance application that embeds the NanoEdge AI library middleware, capable to provide an AI-based predictive maintenance solution (the NanoEdge AI library is generated using NanoEdgeAIStudio)	<u>STEVAL-PROTEUS1</u> <u>NanoEdgeAIStudio</u> <u>STBLESensor</u>
	<u>FP-AI-PDMWBSOC2</u>	Function pack for STEVAL-PROTEUS1 for AI anomaly detection and classification based on AzureRTOS. The function pack helps to explore the implementation and development of a predictive maintenance application that embeds the NanoEdge AI library middleware, capable to provide an AI-based solution (the NanoEdge AI libraries are generated using NanoEdgeAIStudio). Porting to ThreadX	<u>STEVAL-PROTEUS1</u> <u>NanoEdgeAIStudio</u> <u>STBLESensor</u>
	<u>FP-AI-SENSING1</u>	The package enables advanced applications such as human activity recognition or audio scene classification, on the basis of outputs generated by neural networks (NN). The NN are implemented by a multi-network library supporting both floating and fixed point arithmetics, generated by the X-CUBE-AI extension for STM32CubeMX tool	<u>STBLESensor</u> <u>X-CUBE-AI</u>
	<u>FP-AI-CTXAWARE1</u>	Ultra-low power context awareness with distributed artificial intelligence (AI): acoustic analysis with NN on MCU and motion analysis with ML on IMU	<u>STBLESensor</u>
	<u>FP-AI-MONITOR1</u>	Artificial intelligence (AI) monitoring application based on a wide range of sensors. It covers the entire design of the Machine Learning cycle from the data set acquisition to the integration on a physical node	<u>STEVAL-STWINKT1B</u> <u>NanoEdgeAIStudio</u>
	<u>FP-AI-MONITOR2</u>	Monitoring applications powered by Artificial Intelligence (AI) and optimized for latest ultra-low power STM32. It covers the entire design of the machine learning development workflow from the data set acquisition to the integration on a physical node. Porting to ThreadX	<u>STEVAL-STWINBX1</u> <u>NanoEdgeAIStudio</u>
	<u>FP-AI-FACEREC</u>	Software for face recognition application on the STM32H7 microcontroller and STM32MP1 microprocessor. FP-AI-FACEREC is composed of software components generated by the X-CUBE-AI STM32Cube Expansion Package for Artificial Intelligence (AI) complemented with application software components dedicated to the face recognition application. FP-AI-FACEREC enables the development of advanced features based on face recognition on STM32H7 MCU or STM32MP1 MPU-based products using STMicroelectronics optimized solution.	<u>STM32H747I-DISCO</u> <u>B-CAMS-OMV</u> <u>STM32MP157F-DK2</u>

STM32Cube Function Packs

Category	Part number	Specifications	Associated PN
Asset tracking	<u>FP-ATR-ASTRA1</u>	Function pack that implements a complete asset tracking application, which supports long-range connectivity and short-range connectivity. This application reads the data from the environmental and motion sensors, retrieves the geo-position from GNSS and sends them to the cloud using Bluetooth® Low Energy and LoRaWAN connectivity	<u>DSH-ASSETTRACKING</u> <u>STAssetTracking</u> <u>STEVAL-ASTRA1B</u>
	<u>FP-ATR-LORA1</u>	Read data from environmental and motion sensors, retrieve geo-position from GNSS and send collected data via LoRaWAN connectivity	<u>X-NUCLEO-GNSS1A1</u> <u>DSH-ASSETTRACKING</u>
	<u>FP-ATR-SIGFOX1</u>	Read data from environmental and GNSS sensors and send collected data via Sigfox connectivity	<u>X-NUCLEO-IDB05A2</u> <u>X-NUCLEO-GNSS1A1</u> <u>X-NUCLEO-S2868A2</u> <u>X-NUCLEO-S2915A1</u> <u>DSH-ASSETTRACKING</u> <u>STAssetTracking</u>
	<u>FP-ATR-BLE1</u>	Asset tracking using BLE connectivity for SensorTile.box wireless multi sensor development kit	<u>STEVAL-MKBOXPRO</u> <u>STAssetTracking</u> <u>DSH-ASSETTRACKING</u>
	<u>FP-ATR-LTE1</u>	Asset tracking with LTE connectivity, GNSS and MEMS sensors	<u>X-NUCLEO-GNSS1A1</u> <u>DSH-ASSETTRACKING</u>

STM32Cube Function Packs

Category	Part number	Specifications	Associated PN
Local and Cloud connectivity	FP-CLD-AWS1	Safely connect your IoT node to Amazon AWS IoT service, transmit sensor data and receive commands from AWS-based cloud applications	DSH-ASSETTRACKING STEVAL-STWINKT1B
Industrial	FP-IND-IODOUT1	Function pack for P-NUCLEO-IOD04A1, with IO-Link stack v2.1.0, IODD and control software for IPS2050H-32 high-side switch	P-NUCLEO-IOD3A1 P-NUCLEO-IOD04A1 P-NUCLEO-IOD5A1 P-NUCLEO-IOD7A1
	FP-IND-IODSNS1	Enable IO-Link communication between P-NUCLEO-IOD02A1 kit and an IO-Link master through the L6364Q transceiver mounted on the X-NUCLEO-IOD02A1	P-NUCLEO-IOD02A1 X-NUCLEO-IKS02A1 X-NUCLEO-IOD02A1
	FP-IND-DATALOGMC	Function pack derived from a FP-SNS-DATALOG2 function pack and it allows the collection of heterogeneous data, combining STWIN.box sensor information with STSPIN32G4 motor control data and it provides a comprehensive view of the system's operational conditions. This enables both real-time monitoring and accurate performance assessment.	STEVAL-STWINBX1

STM32Cube Function Packs

Category	Part number	Specifications	Associated PN
Lighting	FP-LIT-BLEMESH1	Function pack which lets you connect Bluetooth® Low Energy nodes to a smartphone via Bluetooth® Low Energy, through a suitable Android™ or iOS™ application, to set the HSL values and send the data to the lighting hardware using the Bluetooth® Low Energy mesh lighting model. The software lets you easily create your own application for extending Bluetooth® mesh networks (by offering a ready-to-use mesh core library), a complete set of compatible APIs and a lighting demo application.	X-NUCLEO-BNRG2A1 X-NUCLEO-LED12A1 X-NUCLEO-6283A1
Sensing	FP-SNS-AGNSS1	Connect your IoT node to a cellular network and enable Assisted-GNSS applications	X-NUCLEO-GNSS1A1
	FP-SNS-DATALOG1	High Speed Datalog application which provides a comprehensive solution to save data from any combination of sensors and microphones configured up to the maximum sampling rate. Sensor data can be stored onto a micro-SD card (Secure Digital High Capacity - SDHC) formatted with the FAT32 file system or streamed to a PC via USB (WinUSB class) using the companion host software (cli_example) provided for Windows and Linux.	STEVAL-STWINKT1B STEVAL-MKBOXPRO STBLESensor
	FP-SNS-DATALOG2	Function pack for high speed datalogging and ultrasound processing. allows storing sensor data onto a microSD™ card (secure digital high capacity - SDHC) formatted with the FAT32 file system, or stream to a PC via USB (WinUSB class) using the companion host software (cli_example) provided for Windows and Linux. It can also configure the ISM330DHCX and the LSM6DSV16X machine learning core unit (MLC) and the ISM330IS intelligent sensor processing unit (ISPU) to read the output of the selected algorithm.	X-NUCLEO-IKS02A1 X-NUCLEO-IKS4A1 X-NUCLEO-IKS5A1 STEVAL-MKBOXPRO STEVAL-STWINBX1 STEVAL-PDETECT1 STEVAL-STWINKT1B STBLESensor

STM32Cube Function Packs

Category	Part number	Specifications	Associated PN
Sensing	<u>FP-SNS-DATAPRO1</u>	Function pack for the STEVAL-PROTEUS1 that provides a data logging of the embedded sensors, supporting wired or wireless connectivity. Sensor data can be stored into the embedded NOR flash memory formatted as FatFs or streamed to a PC via USB (WCID device)	<u>STEVAL-PROTEUS1</u> <u>STBLESensor</u>
	<u>FP-SNS-BLEMESH1</u>	Connect an IoT node with BLE Mesh connectivity and sensor model	<u>X-NUCLEO-BNRG2A1</u> <u>STEVAL-MKBOXPRO</u> <u>ST BLE Mesh</u>
	<u>FP-SNS-ALLMEMS1</u>	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 sensor data, motion sensor data, digital microphone levels and battery level	<u>X-NUCLEO-BNRG2A1</u> <u>X-NUCLEO-CCA02M2</u> <u>X-NUCLEO-IKS4A1</u> <u>STEVAL-BCNKT01V1</u> <u>STEVAL-MKBOXPRO</u> <u>STBLESensor</u>
	<u>FP-SNS-ALLMEMS2</u>	Connect an ultra-low power IoT node with BLE connectivity, digital microphone, environmental and motion sensors	<u>X-NUCLEO-BNRG2A1</u> <u>X-NUCLEO-CCA02M2</u> <u>STEVAL-BCNKT01V1</u> <u>STEVAL-MKBOXPRO</u> <u>STBLESensor</u>
	<u>FP-SNS-FLIGHT1</u>	IoT node with NFC, BLE connectivity and environmental, motion and time-of-flight sensors. Connect to a smartphone via BLE and uses a suitable Android™ or iOS™ application like the STBLESensor app to view real-time object distance data read by the time-of-flight sensor.	<u>X-NUCLEO-53L3A2</u> <u>X-NUCLEO-IDB05A2</u> <u>STEVAL-BCNKT01V1</u> <u>STBLESensor</u>

STM32Cube Function Packs

Category	Part number	Specifications	Associated PN
Sensing	<u>FP-SNS-MOTENV1</u>	Connect your IoT node to a smartphone via BLE and uses a suitable Android™ or iOS™ application, such as the STBLESensor app, to view real-time motion and environmental (such as temperature, relative humidity, carbon monoxide) sensor data	<u>X-NUCLEO-BNRG2A1</u> <u>X-NUCLEO-IKS4A1</u> <u>STBLESensor</u>
	<u>FP-SNS-MOTENVWB1</u>	Connect your IoT node to a smartphone via Bluetooth Low Energy (BLE) and use a suitable Android or iOS application such as the STBLESensor app to view real-time motion and environmental (temperature, relative humidity, carbon monoxide) sensor data. Includes all the necessary drivers to recognize the devices on the STM32WB55 Nucleo development board (P-NUCLEO-WB55)	<u>X-NUCLEO-53L3A2</u> <u>X-NUCLEO-IKS4A1</u> <u>P-NUCLEO-WB55</u> <u>STBLESensor</u>
	<u>FP-SNS-SMARTAG1</u>	Read the motion and environmental sensor data on your IoT node via an NFC enabled reader such as a mobile phone or a tablet. The package supports energy harvesting (enabled by NFC) and battery operated use cases.	<u>STEVAL-SMARTAG1</u> <u>DSH-ASSETTRACKING</u> <u>STAssetTracking</u>
	<u>FP-SNS-SMARTAG2</u>	Function pack that allows you to read the ambient light, the motion, and the environmental sensor data on the STEVAL-SMARTAG2 evaluation board. These functions are performed via an NFC-enabled reader, such as a mobile phone or a tablet. The package supports battery operated use cases. This software can be used to develop tracking, cold chain, medical, smart sensing, smart home, city, and building applications. The package contains also a simple example that shows how to update the firmware using the NFC and ST25 NFC tag application for Android/iOS.	<u>STEVAL-SMARTAG2</u> <u>DSH-ASSETTRACKING</u> <u>STAssetTracking</u>
	<u>FP-SNS-STBOX1</u>	For the Pro Mode of the SensorTile.box wireless multi sensor development kit. The package includes pressure, relative humidity, temperature, accelerometer, gyroscope and magnetometer sensors, as well as an analog microphone and the Bluetooth low energy system-on-chip application processor.	<u>STEVAL-MKBOXPRO</u> <u>STEVAL-STWINBX1</u> <u>STBLESensor</u>
	<u>FP-SNS-STAIOTCFT</u>	Function pack for STM32CubeMX enables AI-based inertial applications on STM32 microcontrollers. It offers three main functionalities: AI inference on the MCU, machine learning core (MLC), and intelligent sensor processing unit (ISPU). The pack includes sample applications for vibration monitoring and smart asset tracking, utilizing sensors like the ISM330DHCX and LSM6DSV16X.	<u>STEVAL-MKBOXPRO</u> <u>STEVAL-STWINBX1</u> <u>STEVAL-STWINKT1B</u>

Presentation overview

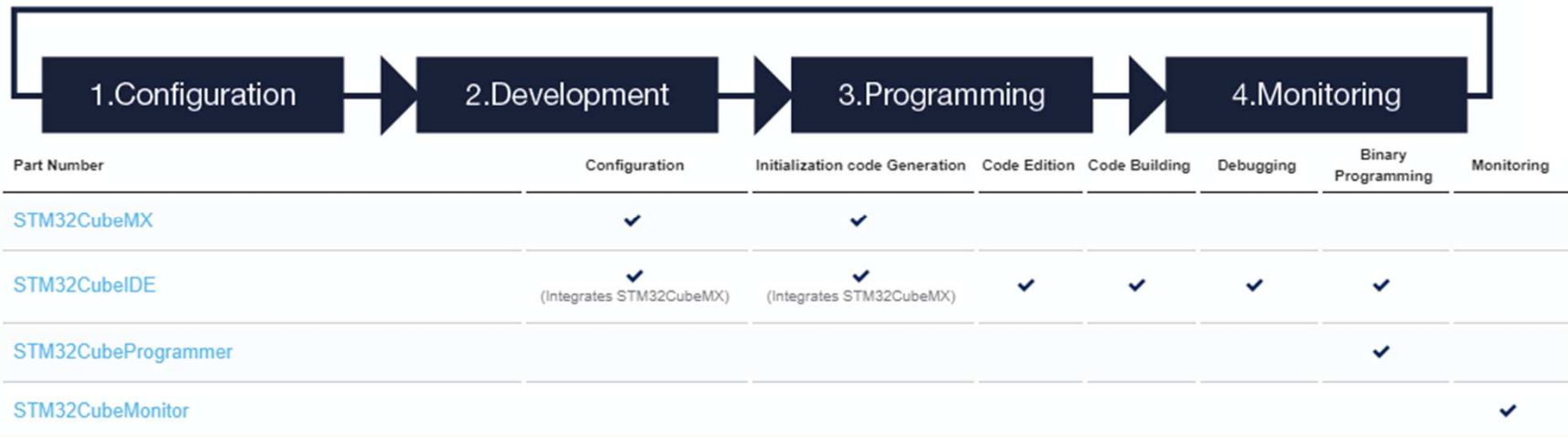
STM32Cube: Hardware Portfolio

STM32Cube: Firmware Portfolio

STM32Cube: Software Portfolio

STM32Cube Software Development Tools suite

- **STM32CubeMX**, a configuration tool for any STM32 device. This easy-to-use graphical user interface generates initialization C code for Cortex-M cores and generates the Linux device tree source for Cortex-A cores.
- **STM32CubeIDE**, an Integrated Development Environment. Based on open-source solutions like Eclipse or the GNU C/C++ toolchain, this IDE includes compilation reporting features and advanced debug features. It also integrate additional features present in other tools from the ecosystem, such as the HW and SW initialization and code generation from STM32CubeMX.
- **STM32CubeProgrammer** is a software tool for programming STM32 products
- **STM32CubeMonitor** helps to fine-tune and diagnose STM32 applications at run-time by reading and visualizing their variables in real-time.
- The STM32Cube Software Development Tools suite is based on a 4-step iterative development process:



STM32Cube: software portfolio

A broad range of PC and mobile applications. Support for the main Cloud SDKs



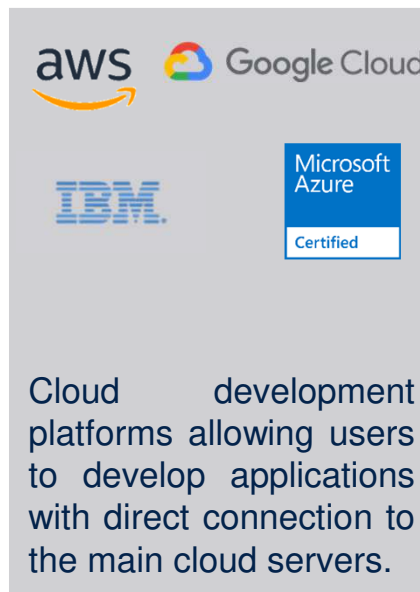
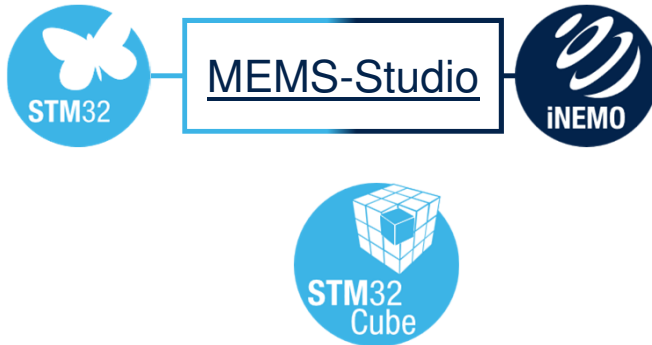
PC Software



Cloud Service



Mobile App



ST BLESensor

ST BLEMesh

ST BLEToolbox



ST NFCSensor

ST AssetTracking



Apps enable data logging, board parameter setting, firmware upgrades, ...

STM32Cube cloud and apps

Category	Part number	Specifications	Associated PN
Web applications	<u>DSH-ASSETTRACKING</u>	Cloud based dashboard application powered by Amazon Web Services (AWS). It provides a highly functional and intuitive interface tailored for the collection, visualization and analysis of asset tracking position as well as data from motion and environmental sensors such as temperature, humidity and pressure	<u>FP-ATR-BLE1</u> <u>FP-ATR-LORA1</u> <u>FP-ATR-LTE1</u> <u>FP-ATR-SIGFOX1</u> <u>FP-SNS-SMARTAG1</u> <u>FP-SNS-SMARTAG2</u> <u>FP-CLD-AWS1</u> <u>FP-ATR-ASTRA1</u>
	<u>DSH-PREDMNT</u>	Predictive Maintenance Dashboard is a cloud application based on AWS services	<u>FP-IND-PREDMNT1</u> <u>FP-AI-PREDMNT2</u>
Mobile applications	<u>STAssetTracking</u>	Remotely configure a Sigfox or BLE asset tracking node from a compatible mobile device with Bluetooth connectivity. It provides the functionality to enable data logging for specific sensors and set threshold triggers to start and stop logging activity.	<u>FP-ATR-ASTRA1</u> <u>FP-ATR-BLE1</u> <u>FP-ATR-SIGFOX1</u> <u>FP-SNS-SMARTAG1</u> <u>FP-SNS-SMARTAG2</u>
	<u>ST BLE Mesh</u>	STBLEMesh application for Android and iOS allows you to create your own Bluetooth® Mesh Profile compliant mobile Apps. The App can be used for provisioning, configuring and controlling multiple Bluetooth® Mesh Profile compliant devices in a BLE Mesh network for Internet of Things (IoT) solutions.	<u>FP-SNS-BLEMESH1</u>
	<u>STNFCSensor</u>	Shows the data exported by sensor nodes via the NFC protocol. It allows you to configure and read data from any system running the FP-SNS-SMARTAG1 function pack (for example, the STEVAL-SMARTAG1 evaluation board).	<u>STEVAL-SMARTAG1</u>

STM32Cube cloud and apps

Category	Part number	Specifications	Associated PN
Mobile applications	STBLESensor	Android and iOS application to shows the data exported by a BLE device using the BlueST protocol. The app shows different panels based on the data types exported by the firmware, including environmental data, MEMS sensor fusion, plot, activity recognition, carry position, acceleration event, BlueVoice, speech to text, beamforming, sound source localization, pedometer, switch, motion intensity, compass, cloud logging, node status.	STEVAL-MKBOXPRO STEVAL-PROTEUS1 STEVAL-BCNKT01V1 STEVAL-STLKT01V1 STEVAL-STWINBX1 FP-AI-CTXAWARE1 FP-AI-PDMWBSOC FP-AI-PDMWBSOC2 FP-AI-PREDMNT2 FP-AI-SENSING1 FP-IND-PREDMNT1 FP-SNS-ALLMEMS1 FP-SNS-ALLMEMS2 FP-SNS-DATALOG1 FP-SNS-DATALOG2 FP-SNS-DATAPRO1 FP-SNS-FLIGHT1 FP-SNS-MOTENV1 FP-SNS-MOTENVWB1 FP-SNS-STBOX1
	STBLEToolbox	The ST BLE Toolbox is a user-friendly application to interact and debug ST Bluetooth Low Energy (BLE) devices. Upon launch, the app scans for BLE devices. For each device found it is possible to display advertisements and connect to it. The key features are Discovery peripherals, Show output of standard profile, Show peripheral services and characteristics, Perform Read, write and notification interactions with peripherals, Collect Cloud based Analytics on Azure App Center, Bond device	

Thank you

© STMicroelectronics - All rights reserved.

ST logo is a trademark or a registered trademark of STMicroelectronics International NV or its affiliates in the EU and/or other countries.

For additional information about ST trademarks, please refer to www.st.com/trademarks.

All other product or service names are the property of their respective owners.

