STM32 Open Development Environment

Ecosystem

FAST AND AFFORDABLE PROTOTYPING AND DEVELOPMENT

The STM32 Open Development Environment (STM32ODE) is an open, flexible, easy, and affordable way to develop innovative devices and applications based on the STM32 32-bit microcontroller family, combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs.

The STM32 ODE includes the following five elements:

- STM32 Nucleo development boards. A comprehensive range of affordable development boards for all STM32 microcontroller series, with unlimited unified expansion capability, and with integrated debugger/programmer

STM32 Nucleo expansion boards. Boards with additional functionality to add sensing, control, connectivity, power, audio or other functions as needed. The expansion boards are plugged on top of the **STM32 Nucleo development boards.**

More complex functionalities can be achieved by stacking additional expansion boards

- STM32Cube software. A set of free-of-charge tools and embedded software bricks to enable fast and easy development on the STM32, including a hardware abstraction layer, middleware, and the STM32CubeMX PC-based configurator and code generator
- STM32Cube expansion software. Free expansion software for use with STM32 Nucleo expansion boards, and compatible with the STM32Cube software framework
- STM32Cube Function Packs. Set of function examples for some of the most common application cases built by leveraging- the modularity and interoperability of STM32 Nucleo development boards and expansions, with STM32Cube software and expansions.

The STM32 Open Development Environment is compatible with a wide range of development environments including **STM32CubeIDE**, IAR EWARM, Keil MDK-ARM, and GCC/LLVM-based IDEs, with the possibility of integrating various components such as **STM32CubeMX, STM32CubeProgrammer**, and **STM32CubeMonitor.**

FIND OUT MORE

www.st.com/stm32ode

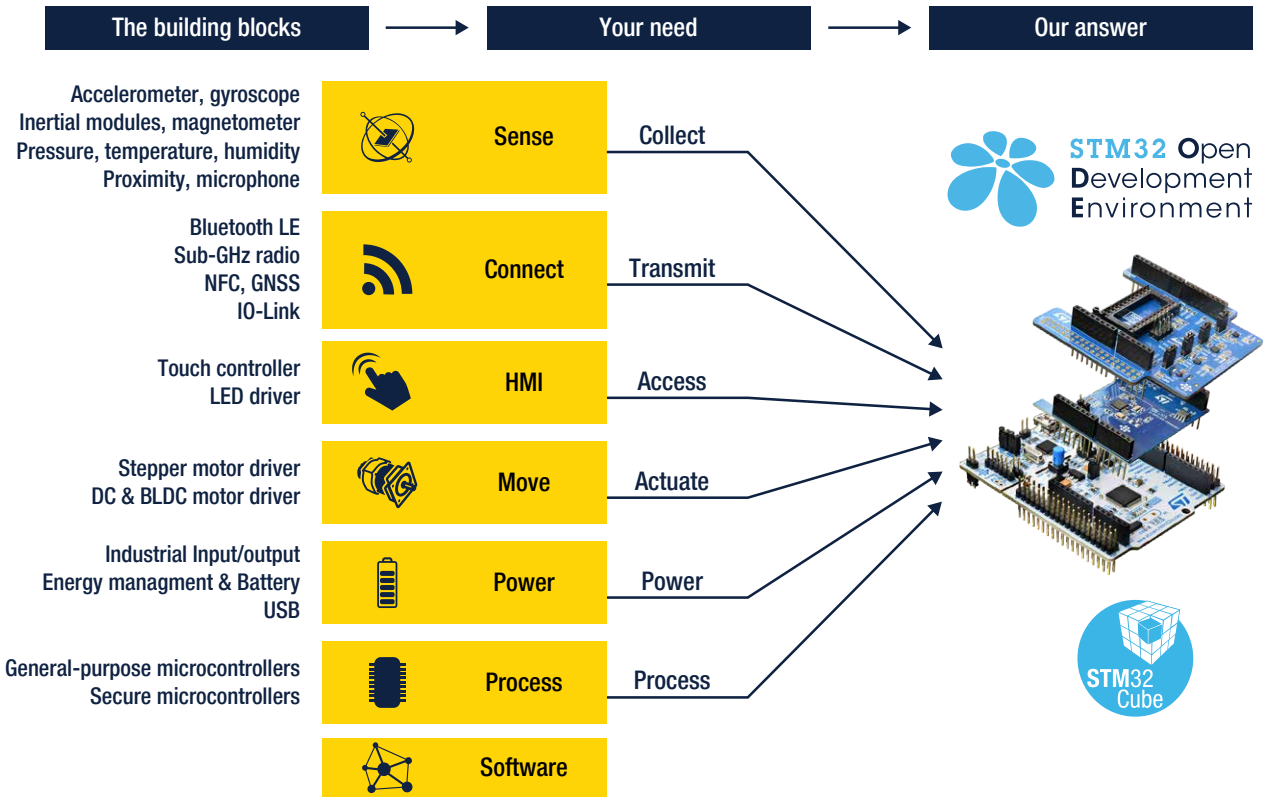
ALL THAT YOU NEED

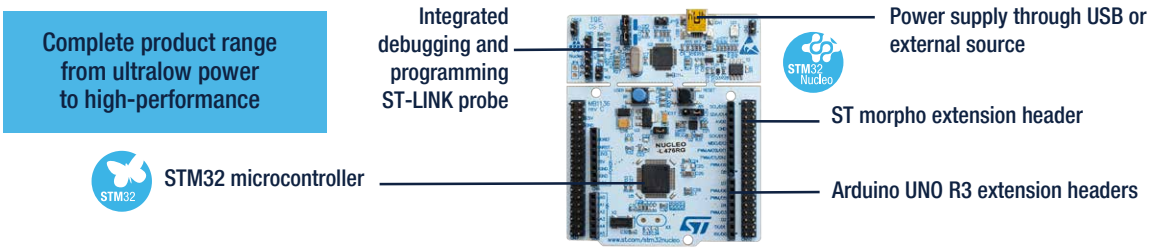
The combination of a broad range of expandable boards based on leading-edge commercial products and modular software, from driver to application level, enables fast prototyping of ideas that can be smoothly transformed into final designs.

Start your design:

- Choose the appropriate STM32 Nucleo development board (NUCLEO) and expansion (X-NUCLEO) boards (sensors, connectivity, audio, motor control, etc.) for the functionality you need.
- Select your development environment (IAR EWARM, Keil MDK, and GCC-based IDEs) and use the free STM32Cube tools and software such as STM32CubeMX, STM32CubeProgrammer, STM32CubeMonitor, or STM32CubeIDE.
- Download all the necessary software to run the functionality on the selected STM32 Nucleo expansion boards.
- Compile your design program for the STM32 Nucleo development board.
- Then start developing and testing your application.

Software developed on the STM32 Open Development Environment prototyping hardware can be directly used in advanced prototyping boards or in end product designs using the same commercial ST components, or components from the same family as those found on the STM32 Nucleo boards.





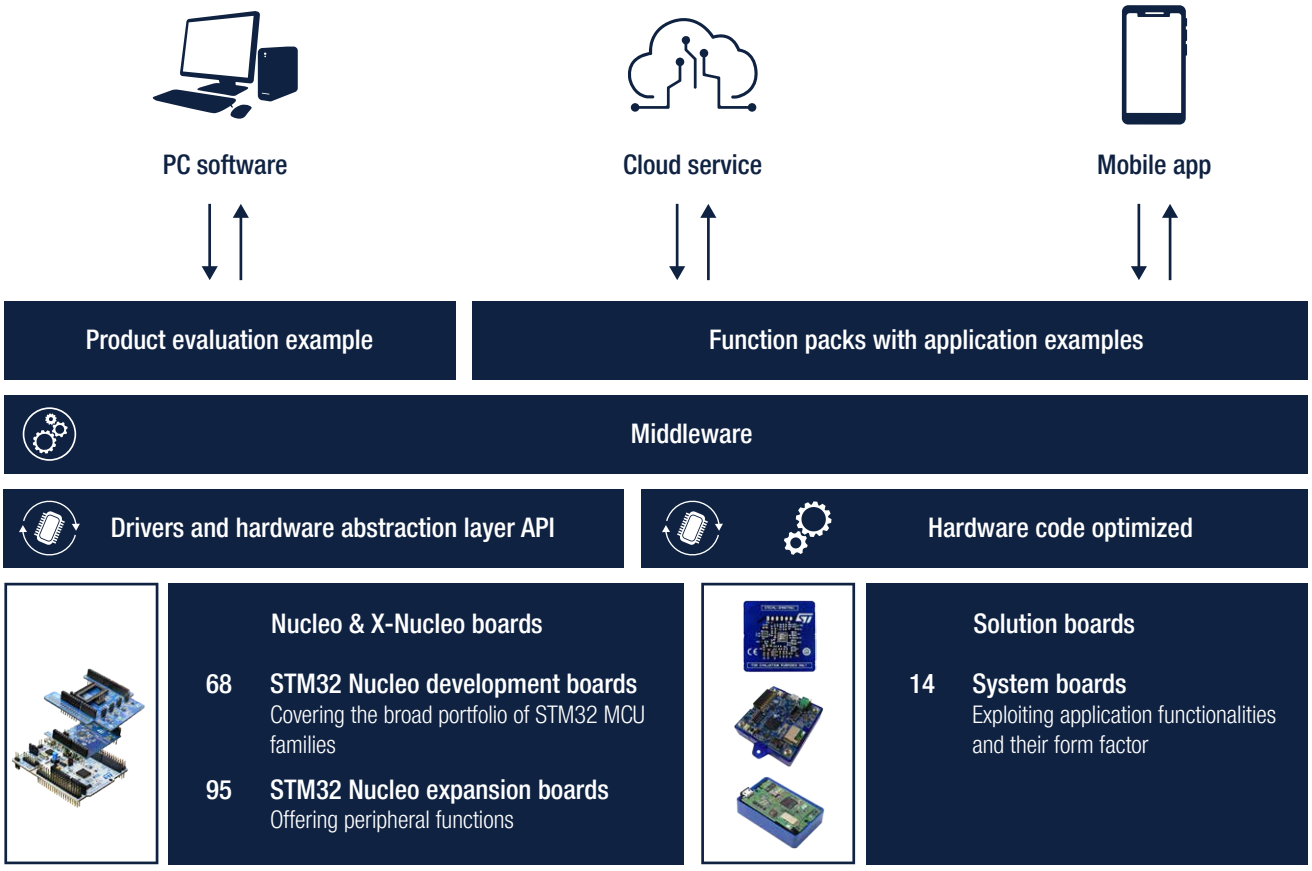
Ecosystem

The STM32 Open Development Environment consists of a set of stackable boards and a modular open software environment designed around the STM32 microcontroller family.

A wide variety of STM32 MCU Nucleo Boards, coupled with one or more X-Nucleo expansion boards, a hardware abstraction layer API, middleware, and interaction with cloud services, mobile apps, and PC software, allow users to develop and enhance custom applications. Function packs with application examples are provided to facilitate the development and testing of use cases.

In addition, dedicated solution boards integrating application functionalities in expected form factors are available.

The software layers used by the application software to access and use the expansion boards are:
STM32Cube HAL layer: consists of simple, generic, and multi-instance APIs (application programming interfaces) that interact with the upper layer applications, libraries, and stacks. These generic and extension APIs are based on a common framework so that overlying layers like middleware can function without requiring specific microcontroller unit (MCU) hardware information. This structure improves library code re-usability and guarantees easy portability across other devices.
Board support package (BSP) layer: provides software support for the STM32 Nucleo board peripherals, excluding the MCU. These specific APIs provide a programming interface for certain board-specific peripherals like LEDs, user buttons, etc., and can also be used to fetch individual board version information. It also provides support for initializing, configuring, and reading data.



X-Nucleo boards

Sharing Arduino connectors and ST morpho headers, STM32 Nucleo boards can easily be extended with a large number of expansion boards available from ST and from third parties. Stack as many boards as you need to create the functionality required.
Each board is provided with dedicated X-Cube driver library.

We also provide some P-Nucleo kits with Nucleo and expansion boards to simplify ordering the necessary hardware for the development of specific applications.

Category	Part number	Specifications
Sense / Proximity	X-NUCLEO-6180A1	Expansion board based on VL6180V1 FightSense proximity sensor up to 62 cm equipped with 3 breakout boards (VL6180-SATEL)
	P-NUCLEO-6180A1	NUCLEO pack based on NUCLEO-F401RE and X-NUCLEO-6180A1 expansion board
	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 based 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 based 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 based on NUCLEO-F401RE and X-NUCLEO-53L0A1 expansion board
	X-NUCLEO-53L1A2	Expansion board based on VL53L1CB FightSense long distance + multitarget detection sensor up to 4 meters and field of view (FoV) programming
	P-NUCLEO-53L1A2	NUCLEO pack based on NUCLEO-F401RE and X-NUCLEO-53L1A2 expansion board
	X-NUCLEO-53L3A2	Expansion board based on VL53L3CX FightSense proximity + multitarget detection up to 3 meters
	P-NUCLEO-53L3A2	NUCLEO pack based 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 based 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 to 6 m, short distance linearity down to 10 mm, histogram-based technology, multiobject detection capability
	P-NUCLEO-53L4A2	NUCLEO pack based on NUCLEO-F401RE and X-NUCLEO-53L4A2 expansion board
	X-NUCLEO-53L5A1	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), . Multizone distance measurements are possible up to 8x8 zones with a wide 63° diagonal FoV that can be reduced by software. Thanks to patented ST histogram algorithms, the VL53L5CX is able to detect different objects within the FoV. The histograms also provide immunity to cover glass crosstalk beyond 60 cm
	P-NUCLEO-53L5A1	NUCLEO pack based on NUCLEO-F401RE and X-NUCLEO-53L5A1expansion board

Category	Part number	Specifications
Sense / proximity	X-NUCLEO-53L7A1	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
	P-NUCLEO-53L7A1	NUCLEO pack based on NUCLEO-F401RE and X-NUCLEO-53L7A1 expansion board
	X-NUCLEO-53L8A1	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
	P-NUCLEO-53L8A1	NUCLEO pack based on NUCLEO-F401RE and X-NUCLEO-53L8A1 expansion board
Sense / motion and environmental	X-NUCLEO-IKS4A1	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
	X-NUCLEO-IKS01A3	Motion MEMS and environmental sensor expansion board for the STM32 Nucleo, LSM6DSO MEMS 3D accelerometer + 3D gyroscope, LIS2MDL MEMS 3D magnetometer, LIS2DW12 MEMS 3D accelerometer, LPS22HH MEMS pressure sensor, HTS221 capacitive digital relative humidity and temperature, STTS751 temperature sensor
	X-NUCLEO-IKS02A1	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
	X-NUCLEO-IKS01A2	Motion MEMS and environmental sensor expansion board for the STM32 Nucleo, LSM6DSL MEMS 3D accelerometer + 3D gyroscope, LSM303AGR MEMS 3D accelerometer + MEMS 3D magnetometer, LPS22HB MEMS pressure sensor, HTS221 capacitive digital relative humidity and temperature
Sense / audio and microphones	X-NUCLEO-AMICAM1	Expansion board allowing synchronized acquisition and streaming of up 3 on-board MP23ABS1 analog MEMS microphones at a maximum sampling rate of 192 KHz. External microphone coupon board STEVAL-MIC004V1 allows acquisition from four microphones. Synchronized acquisition and streaming of up to 4 microphones
	X-NUCLEO-CCA02M2	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 microphones
Sense / gas	P-NUCLEO-IKA02A1	Evaluation pack build on NUCLEO-L053R8 and providing a reference design for various gas electrochemical sensors like CO, SO2, NO, and CL2. The P-NUCLEO-IKA02A1 evaluation pack features a Figaro TGS5141 carbon monoxide sensor, an STLM20 temperature sensor, and two TSU111 operational amplifiers for signal conditioning
Connect / BLE	X-NUCLEO-BNRG2A1	Expansion board that features the Bluetooth® 5.0 compliant and FCC certified BlueNRG-M2SP application processor module based on the ST BlueNRG-2 System-on-Chip
	X-NUCLEO-IDB05A2	Expansion board based on the BlueNRG-M0 BLE network processor module
Connect / GNSS	X-NUCLEO-GNSS1A1	Expansion board based on the Teseo-LIV3F tiny GNSS module
	X-NUCLEO-GNSS2A1	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
Connect / Sub 1 GHz	X-NUCLEO-S2868A2	Expansion board based on the S2-LP narrow band ultralow power sub-1 GHz transceiver operating in the 868 MHz ISM frequency band (Europe).
	X-NUCLEO-S2915A1	Expansion board based on the S2-LP narrow band ultralow power sub-1 GHz transceiver operating in the 915 MHz ISM frequency band (Australia and North America)
	X-NUCLEO-IDS01A4	Expansion board based on the SPSGRF-868 operating in the 868 MHz ISM band (Europe) and is ETSI certified
	X-NUCLEO-IDS01A5	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)
Connect / NFC	X-NUCLEO-NFC01A1	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 that also features an I^2C interface supporting 1 MHz protocol, preformatted for NFC transactions, and which can be protected by a unique and flexible 128-bit password scheme
	X-NUCLEO-NFC03A1	tExpansion board based on the CR95HF/ ST25R95-VMD5T NFC card reader/writer and card emulation device, ISO14443-A/B and ISO15693 compliant, 230 mW

Category	Part number	Specifications
Connect / NFC	X-NUCLEO-NFC06A1	Expansion board is based on the ST25R3916 IC NFC card reader/writer device, ISO14443-A/B, ISO15693 and ISO18092 compliant, 1.6W
	X-NUCLEO-NFC07A1	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
	X-NUCLEO-NFC08A1	Card reader expansion board is based on the ST25R3916B device. The expansion board is configured to support ISO14443A/B, ISO15693, FeliCa™, and AP2P communication
Connect / Power line	X-NUCLEO-PLM01A1	Expansion board based on the ST7580 FSK, PSK multimode 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-IOD01A1	Nucleo pack composed of the NUCLEO-L073RZ development board, STEVAL-IOD003V1 evaluation board, and X-NUCLEO-IKS01A2 expansion board. The STEVAL-IOD003V1 offers an IO-Link device PHY layer (L6362A), while the NUCLEO-L073RZ runs the IO-Link stack v1.1.3 included in the STSW-IOD01 (developed by and property of TEConcept Gmbh) and the firmware controlling the X-NUCLEO-IKS01A2 sensors
	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-IOD04A1	Nucleo pack composed of the X-NUCLEO-IOD02A1 and X-NUCLEO-OUT04A1 expansion boards stacked on the NUCLEO-L073RZ development board
	P-NUCLEO-IOM01M1	Nucleo pack for IO-Link controller with IO-Link v1.1 PHY and stack build on NUCLEO-F446RE board and STEVAL-IOM001V1.The STEVAL-IOM001V1 is a single IO-Link controller PHY layer (L6360) while the NUCLEO- F446RE runs an IO-Link stack rev 1.1
Power / In out	X-NUCLEO-OUT02A1	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, 0.7 A current per channel
	X-NUCLEO-OUT03A1	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
	X-NUCLEO-OUT04A1	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
	X-NUCLEO-OUT05A1	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
	X-NUCLEO-OUT06A1	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
	X-NUCLEO-OUT08A1	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 60 V
	X-NUCLEO-OUT09A1	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
	X-NUCLEO-OUT10A1	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 60 V
	X-NUCLEO-OUT11A1	Industrial digital output expansion board featuring the driving and diagnostic capabilities of the ISO808 octal high-side smart power solid state relay, with embedded 2 kV galvanic isolation, in a digital output module connected to 0.7 A industrial loads, operating range from 9.2 to 36 V
	X-NUCLEO-OUT12A1	Industrial digital output expansion board featuring the driving and diagnostic capabilities of the ISO808A octal high-side smart power solid state relay, with embedded 2 kV 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
	X-NUCLEO-OUT13A1	Industrial digital output expansion featuring the driving and diagnostic capabilities of the ISO808-1 octal high-side smart power solid state relay, with embedded 2 kV galvanic isolation, in a digital output module connected to 1.0 A industrial loads. Operating range 9.2 to 36 V
	X-NUCLEO-OUT14A1	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 2 kV galvanic isolation and 20 MHz SPI control interface, in a digital output module connected to 1.0 A industrial loads. Operating range 9.2 to 36 V

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Power / In out	X-NUCLEO-OUT15A1	Industrial digital output expansion board for STM32 Nucleo. It provides a powerful and flexible environment 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
	X-NUCLEO-OUT16A1	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 2.8 k VRMS (4 k VPK) galvanic isolation between the two application sides: Logic and process sides. Operating range 10.5 to 36 V
	X-NUCLEO-OUT17A1	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 2.8 k VRMS (4 k VPK) galvanic isolation between the two application sides: logic and process sides. Operating range 10.5 to 36 V
	X-NUCLEO-OUT19A1	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
	X-NUCLEO-PLC01A1	Industrial input/output expansion board with a programmable logic controller (PLC) designed around 8x output VNI8200XP (solid state relay) and 8x input CLT01-38SQ7 (octal digital termination array)
	X-NUCLEO-CCA01M1	Expansion board based on the STA350BW Sound Terminal® 2.1-channel high-efficiency digital audio output system
Power / USB PD	X-NUCLEO-SRC1M1	Expansion board which allows evaluating the features of the TCPP02-M18 for USB Type-C and protections for V_{BUS} 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
	X-NUCLEO-SNK1M1	USB 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. The board is certified by the USB Implementers Forum and has a Test ID (TID 5205) number that confirms compliance with the USB Type-C Power Delivery specification.
	X-NUCLEO-DRP1M1	Expansion board allows evaluating the features of TCPP03-M20 and USB Type-C features and protections required for V_{BUS} 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. The board is certified by the USB Implementers Forum and has a test ID (TID 6408) number that confirms compliance with the USB Type-C Power Delivery specification.
HMI	X-NUCLEO-GFX01M2	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
	X-NUCLEO-GFX02Z1	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
	X-NUCLEO-LED16A1	Expansion board designed to provide an application for the 16-channel LED driver LED1642GW. Multiple drivers can also be cascaded by coupling X-NUCLEO-LED16A1 expansion boards
	X-NUCLEO-LED61A1	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
	X-NUCLEO-LED12A1	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	X-NUCLEO-SAFEA1	Expansion board 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 evaluation of its authentication and data management services connected to a local or remote host. Can be used in IoT devices, smart-home, smart-city, and industrial applications, consumer electronics devices, consumables and accessories. SPL02 and SPL03 personalization profiles are supported
Other / EEPROM	X-NUCLEO-EEPRMA2	Expansion board based on M24xx I^2C and M95xx SPI EEPROM. Up to 1-Mbit serial I^2C bus embedded EEPROM, up to 4-Mbit SPI bus embedded EEPROM
	X-NUCLEO-PGEEZ1	Expansion board 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
Motion / Stepper motors	X-NUCLEO-IHM01A1	Stepper motor driver expansion board based on L6474 microstepping motor driver; 16 microsteps. Operative range: 8-45 VDC, up to 3 Arms
	X-NUCLEO-IHM02A1	Two axis stepper motor driver expansion board based on two L6470s, a fully-integrated microstepping motor driver; 128 microsteps. Operative range: 8-45 VDC, up to 3 Arms

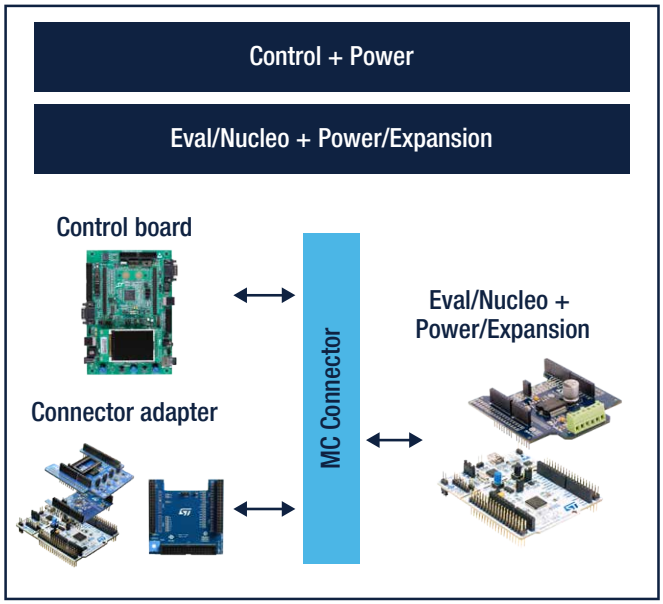
Category	Part number	Specifications
Motion / Stepper motors	X-NUCLEO-IHM03A1	High-power stepper motor driver expansion board based on powerSTEP01 driver for high current bipolar steppers; 128 microsteps. Operative range: 10.5–85 VDC, up to 10 Arms
	X-NUCLEO-IHM05A1	Bipolar stepper motor driver expansion board based on L6208 driver for bipolar stepper motors. Operative range: 8-50 VDC, up to 2.8 Arms
	X-NUCLEO-IHM06A1	Low-voltage stepper motor driver expansion board based on the STSPIN220, very compact 256 microsteps capable ultalow power microstepping driver. Operative range: 1.8-10 VDC, up to 1.3 Arms
	X-NUCLEO-IHM14A1	Stepper motor driver expansion board based on STSPIN820, cost optimized 256 microsteps capable and compact microstepping driver. Operative range: 7-45 VDC, up to 1.5 Arms
Motion / Brushed DC motors	X-NUCLEO-IHM04A1	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 VDC, 2.8 Arms (5.6 Arms in parallel mode, single driver)
	X-NUCLEO-IHM12A1	Low-voltage dual brushed DC motor driver expansion board based on STSPIN240, very compact and ultralow-power dual brushed DC motor driver. Operative range: 1.8-10 VDC, up to 1.3 Arms
	X-NUCLEO-IHM13A1	Low-voltage brushed DC motor driver based on the STSPIN250, very compact and ultralow-power single brushed DC motor driver. Operative range: 1.8-0 VDC, up to 2.6 Arms
	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 bidirectional 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 VDC, up to 1.5 Arms (3 Arms in parallel mode, single driver)
Motion / 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 VDC, 1.4 Arms
	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 VDC, 15 Arms
	X-NUCLEO-IHM11M1	Low-voltage three-phase brushless DC motor driver expansion board based on STSPIN230, very compact and ultralow-power triple half-bridge motor driver for BLDC motors; 6 INx driving mode. Operative range: 1.8-10 VDC, up to 1.3 Arms
	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 VDC, up to 1.5 Arms
	X-NUCLEO-IHM17M1	Low-voltage three-phase brushless DC motor driver expansion board based on STSPIN233, very compact and ultralow-power three-phase and three-sense motor driver; 3 INx driving mode. Operative range: 1.8-10 VDC, up to 1.3 Arms
	P-NUCLEO-IHM002	Nucleo pack based on NUCLEO-F302R8, X-NUCLEO-IHM07M1 and a bull-running model BR2804-1700 kV motor with power supply
	P-NUCLEO-IHM03	Nucleo pack based on NUCLEO-G431RB, X-NUCLEO-IHM16M1, and a Gimbal motor GBM2804H-100T with power supply
Interface	X-NUCLEO-IHM09M2	Motor control connector expansion board for STM32 Nucleo. It provides an easy way to evaluate motor control solutions for three-phase motors by adapting the STM32 Nucleo development board with an external ST motor control power board, thanks to the ST morpho and motor control connector

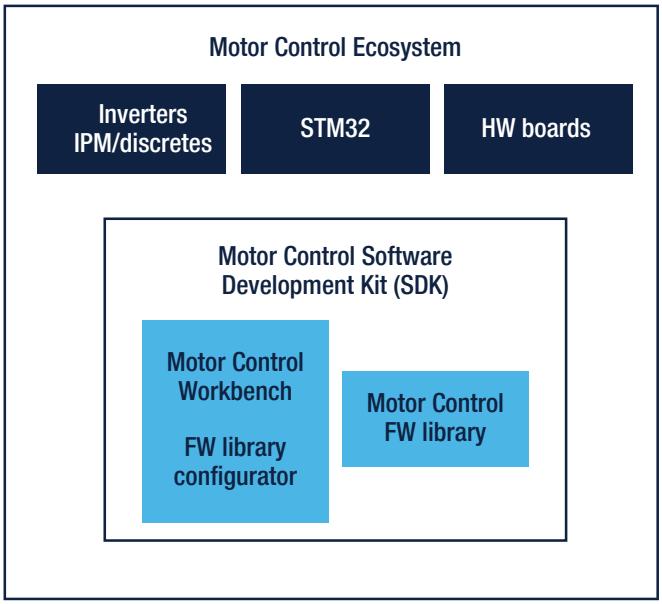
STM32 ecosystem for motor control

ST proposes a wide range of evaluation boards for comprehensive evaluation of ST products and solutions while reducing your development time. In particular, all ST microcontroller evaluation boards have ST standard MC connectors on-board, allowing them to be usedin conjunction with any of the power stage evaluation boards.

STM32 MC SDK (motor control software development kiy) 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 motos X-Nucleo are supported.

The STM32 Motor Control Workbench **(available in the X-CUBE-MCSDK)** PC software reduces the design effort and time needed for 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.





FIND OUT MORE

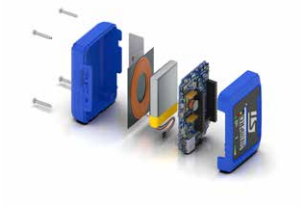
www.st.com/stm32-motor-control

Solution boards

Solution boards to meet customer expectations in terms of form factor. Their functionality is identical to stacking an STM32 Nucleo board with more 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 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	This 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. STM32L031K6, ST25DV64K dynamic NFC tag solution based on 64K-bit (8K-Byte) EEPROM, LIS2DW12 ultralow power high-performance threeaxis linear accelerometer, LPS22HB ultracompact 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, a 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 ultralow-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, ultralow power, 0.5°C accuracy I^2C/SMBus 3.0 temperature sensor, VD6283TX ambient light sensor with hybrid filter multispectral and with embedded light flicker engine
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)
	STEVAL-PROTEUS1	Evaluation tool designed for temperature and vibration 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 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 easy mounting on other equipment. The included comprehensive software and the firmware libraries with time and frequency domain vibration analysis facilitate software customization and can improve your time-to-market. The main board includes the STM32WB5MMG ultra-low-power and small form factor wireless radio module. 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
STWIN SensorTile Wireless Industrial Node	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. STM32L4R9, wide range of industrial IoT sensors: ultrawide 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, ultralow power high-performance MEMS motion sensor (IIS2DH), ultralow power 3-axis magnetometer (IIS2MDC), digital absolute pressure sensor (LPS22HH), relative humidity and temperature sensor (HTS221), lowvoltage digital local temperature sensor (STTS751), industrial grade digital MEMS microphone (IMP34DT05), wideband analog MEMS microphone (MP23ABS1), microSD 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

Category	Part number	Specifications
STWIN SensorTile Wireless Industrial Node	STEVAL-STWINBX1	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 ultralow 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, ultralow-power, 0.5°C accuracy I²C/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
SensorTile.box	STEVAL-MKSBOX1V1	Easy-to-use STE BLE Sensor app with immediate functionality for the following motion and environmental sensor applications: pedometer optimized for belt positioning, baby crying detection with cloud AI learning, barometer environmental monitoring, vehicle / goods tracking, Vibration monitoring / training, compass and inclinometer, human activity recognition, sensor data logger. Expert mode functionality: The STE BLE Sensor app can help you develop your own app or customize an existing one, which you can then upload and run on the SensorTile.box device. Pro mode functionality: SensorTile.box is fully compatible with the STM32 Open Development Environment (STM32 ODE) for developers to customize the SensorTile.box firmware. SensorTile.box is a ready-to-use box kit with wireless IoT and wearable sensor platform to help you use and develop apps based on remote motion and environmental sensor data, regardless of your level of expertise. STM32L4R9, digital temperature sensor (STTS751), 6-axis inertial measurement unit (LSM6DSOX), 3-axis accelerometers (LIS2DW12 and LIS3DHH), 3-axis magnetometer (LIS2MDL), altimeter / pressure sensor (LPS22HH), microphone / audio sensor (MP23ABS1). Humidity sensor (HTS221), Bluetooth smart connectivity v4.2 (SPBTLE-1S)
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. The STM32U585AI ultralow 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. Entry mode: run a wide range of already embedded IoT applications on your box with the STBLESensor app: motion: compass, free-fall detection, level, pedometer, sensor-fusion - quaternion; environmental: barometer; log: data recorder; AI and MLC: baby crying detector, human activity recognition; user interface: Qtouch; connectivity: NFC Tag. Expert Mode: 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. Pro Mode: SensorTile.box PRO is fully compatible with the STM32ODE 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



STEVAL-MKBOXPRO

STEVAL-SMARTAG1

STEVAL-BFA001V2B

STEVAL-STWINKT1B

STEVAL-STWINBX1

STEVAL-ASTRA1B

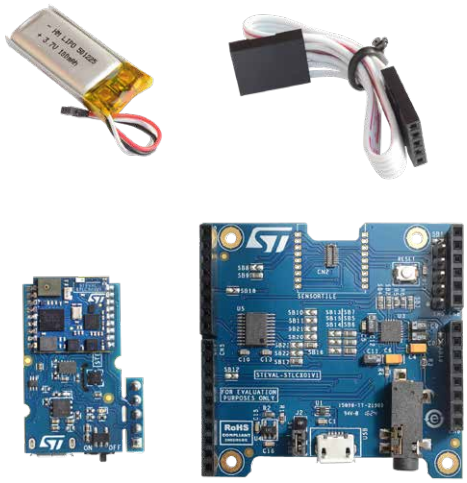
STEVAL-SMARTAG2

STEVAL-PROTEUS1

Development platforms

Tiny boards to accelerate solution development.

Category	Part number	Specifications
SensorTile	STEVAL-STLKT01V1	Highly integrated development kit that can be plugged into form-factor prototypes, adding sensing and connectivity capabilities to new designs through a smart hub solution. STM32L476JGY microcontroller, 3D digital accelerometer and a 3D digital gyroscope LSM6DSM, MEMS 3D accelerometer + MEMS3D magnetometer LSM303AGR, ultracompact piezoresistive absolute pressure sensor LPS22HB, digital microphone sensors MP34DT05-A, Bluetooth Low Energy connectivity BlueNRG-MS. The kit includes SensorTile module, SensorTile cradle expansion board with audio DAC, USB port, STM32 Nucleo, Arduino UNO R3 and SWD connector, SensorTile cradle with battery charger, humidity and temperature sensor, SD memory card slot, USB port and breakaway SWD connector, 100 mAh Li-ion battery, plastic box, and SWD programming cable
BlueCoin	STEVAL-BCNKT01V1	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 microcontroller, 3D digital accelerometer and a 3D digital gyroscope LSM6DSM, MEMS 3D accelerometer + MEMS3D magnetometer LSM303AGR, ultracompact 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



STEVAL-STLKT01V1
SensorTile development kit

STEVAL-BCNKT01V1
BlueCoin starter kit

Development boards

All-in-One IoT development platform.

Category	Part number	Specifications
Discovery kit IoT node, low-power wireless, BLE, NFC, SubGHz, Wi-Fi	B-L475E-IOT01A	Discovery kit for IoT node allows users to develop applications with direct connection to cloud servers. STM32L4 , 64-Mbit Quad-SPI (Macronix) flash memory, Bluetooth® V4.1 module (SPBTLE-RF), sub-GHz (868 MHz or 915 MHz) low-power-programmable RF module (SPSGRF-868 or SPSGRF-915), 802.11 b/g/n compliant Wi-Fi module from Inventek Systems (ISM43362-M3G-L44), dynamic NFC tag based on M24SR with its printed NFC antenna, 2 digital omnidirectional microphones (MP34DT01), capacitive digital sensor for relative humidity and temperature (HTS221), High-performance 3-axis magnetometer (LIS3MDL), 3D accelerometer and 3D gyroscope (LSM6DSL), absolute digital output barometer (LPS22HB), Time-of-Flight and gesture-detection sensor (VL53L0X)
Discovery kit LoRa, Sigfox, low-power wireless	B-L072Z-LRWAN1	Discovery kit to learn and develop solutions based on LoRa, Sigfox, and FSK/OOK technologies. Features the all-inone CMWX1ZZABZ-091 open module by Murata, powered by STM32L0 MCU & SX1276 transceiver
Discovery kit with STM32L496AG MCU	32L496GDISCOVERY	Complete development platform for STM32L4 MCU. Easy prototyping of applications, including audio and graphics, with state-of-the-art energy efficiency. On-board ST-LINK/V2-1 debugger provides out-of-the-box loading and debugging capabilities. Supported in STM32ODE only in the configuration P-L496G-CELL02. Equipped with 1.54 inch 240 x 240 pixel-TFT color LCD with parallel interface, SAI Audio CODEC with a stereo headset jack and analog microphone input, stereo digital MEMS microphones, microSD card connector (card included), camera 8 bit-connector, STMod+ and Pmod connectors, 8 Mbit-PSRAM, IDD measurement, 64 Mbit-Quad-SPI flash 8 LEDs, reset button, 4 direction-joystick with selection
LTE Cellular to Cloud Pack	P-L496G-CELL02	Discovery pack for LTE IoT cellular to cloud (STM32-C2C/LTE IoT). A turnkey development platform for cellular and cloud technology-based solutions. The pack consists of an STM32L496AGI6-based low-power discovery mother board with preloaded firmware, and an STMod+ cellular expansion board with antenna. Equipped with switchable SIM interface, eSIM and MicroSIM, SAI Audio CODEC, ST-MEMS digital microphones, 8-Mbit PSRAM, 2 user LEDs, 1 user and 1 reset push-buttons, and 4-direction joystick with selection button

B-L475E-IOT01A

B-L072Z-LRWAN1

32L496GDISCOVERY

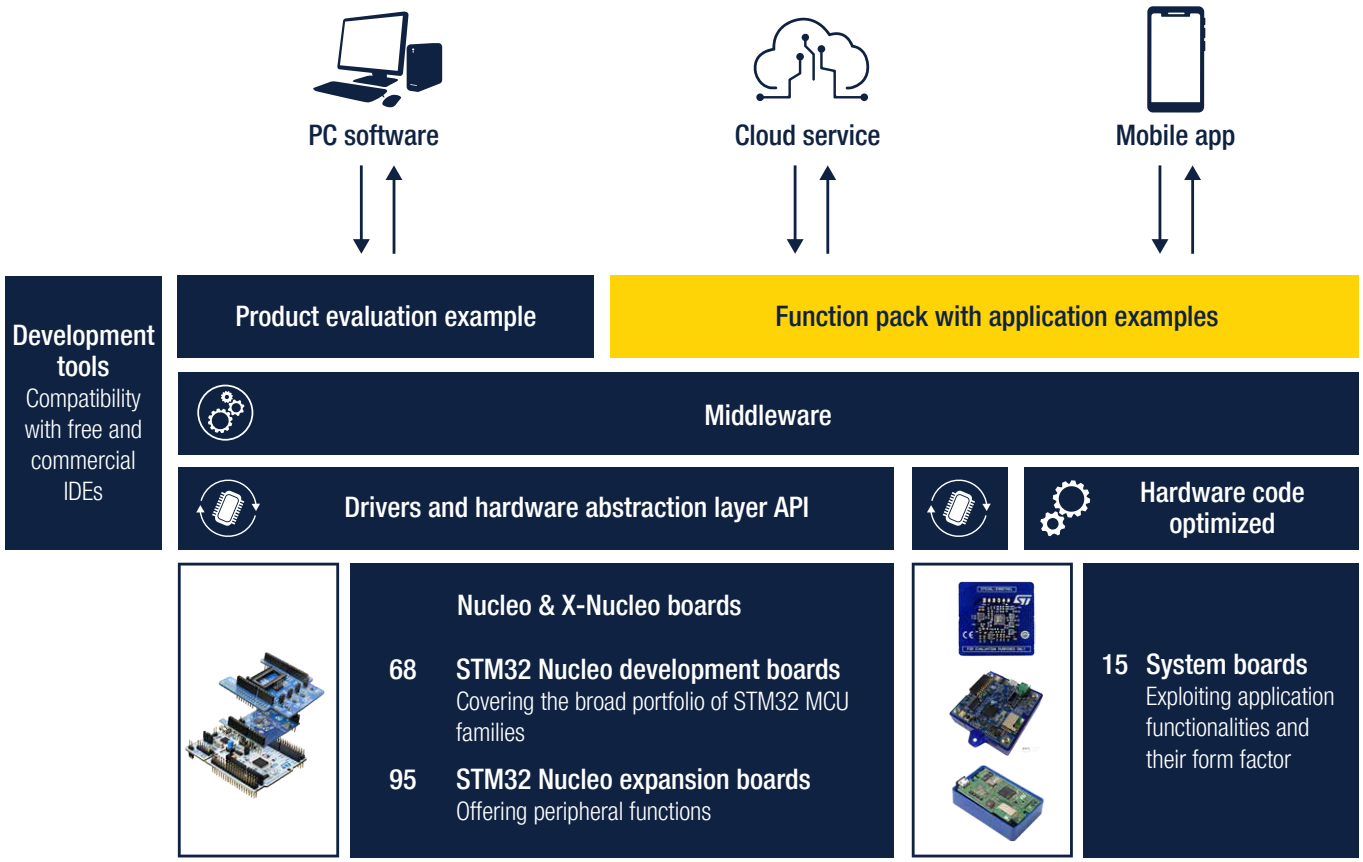
P-L496G-CELL02

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, and home and building automation.

Each function pack package is associated with two or more X-NUCLEO boards. For example, the **FP-IND-PREDMNT1** runs on the **X-NUCLEO-BNRG2A1**, **X-NUCLEO-CCA02M2**, and **X-NUCLEO-IKS01A3**. It can also run on solution boards **STEVAL-STWINKT1B** or **STEVAL-BFA001V2B.**

All function packs come with prebuilt projects with following IDEs: IAR EWARM, Keil MDK-ARM, **STM32CubeIDE** (starting from Q3/2019 for all the new firmware packages), and binaries that can be run out of the box.



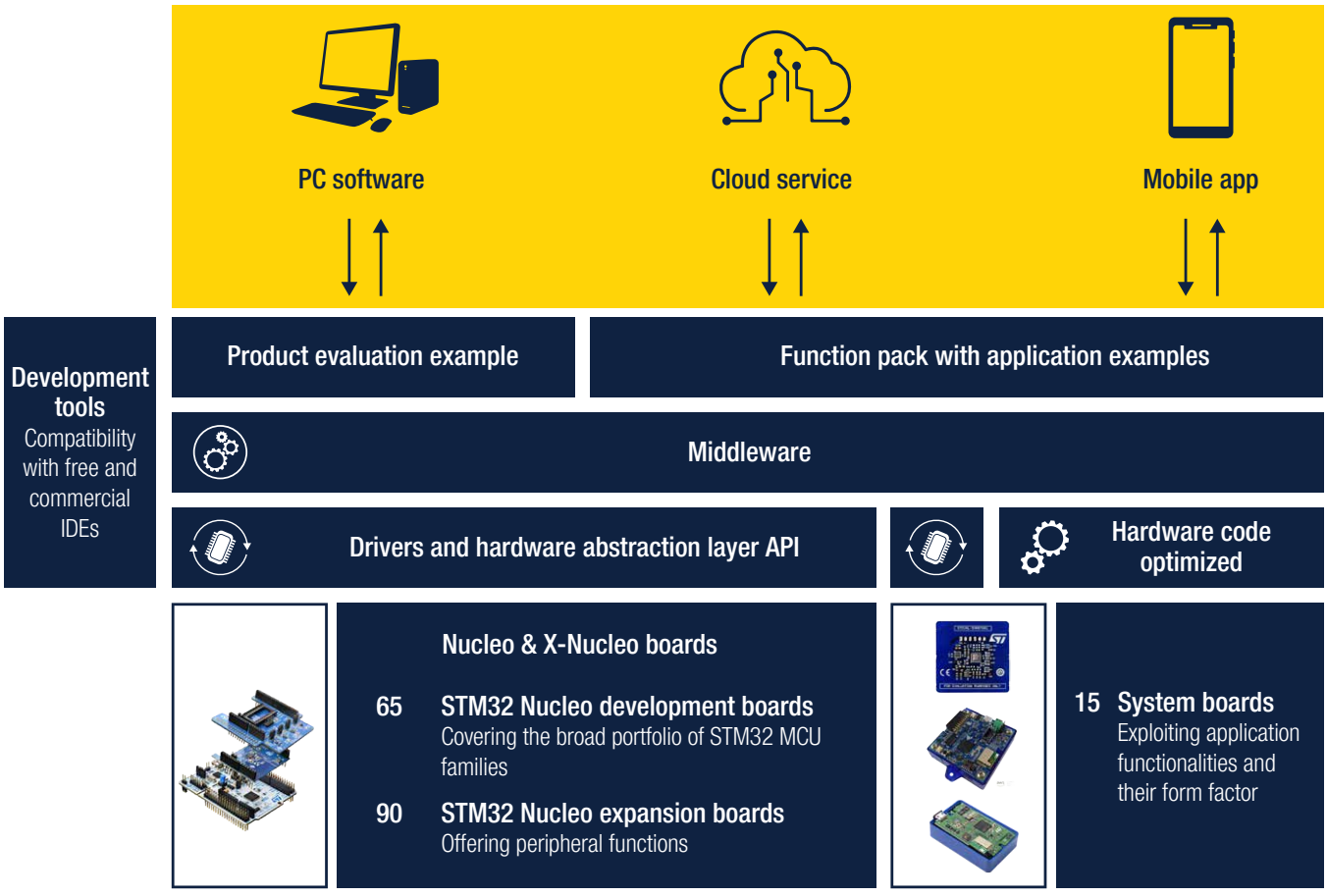
Category	Part number	Specifications	Associated part number
AI	FP-AI-PDMWBSOC	Function pack able to get motion sensor data, process them for anomaly detection, and send the results to the STBLESensor mobile app or a PC terminal console. The function pack helps explore the implementation and development of a predictive maintenance application that embeds the NanoEdge AI library middleware, able to provide an AI-based predictive maintenance solution (the NanoEdge AI library is generated using NanoEdgeAIStudio)	STEVAL-PROTEUS1 NanoEdgeAIStudio
	FP-AI-PDMWBSOC2	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	STEVAL-PROTEUS1 NanoEdgeAIStudio STBLESensClassic
	FP-AI-SENSING1	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 multinetwork library supporting both floating and fixed point arithmetics, generated by the X-CUBE-AI extension for STM32CubeMX tool	B-L475E-IOT01A STEVAL-STLKT01V1 STEVAL-MKSBOX1V1 STBLESensor
	FP-AI-VISION1	Examples of computer vision applications based on convolutional neural network (CNN)	STM32H747I-DISCO
	FP-AI-CTXAWARE1	Ultralow power context awareness with distributed artificial intelligence (AI): acoustic analysis with NN on MCU and motion analysis with ML on IMU	STEVAL-MKSBOX1V1 STBLESensor
	FP-AI-MONITOR1	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	STEVAL-STWINKT1B NanoEdgeAIStudio
	FP-AI-MONITOR2	Monitoring applications powered by artificial intelligence (AI) and optimized for latest ultralow 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	
	FP-AI-FACEREC	Software for face recognition application on the STM32H7 microcontroller and STM32MP1 microprocessor	STM32H747I-DISCO B-CAMS-OMV STM32MP157F-DK2
	FP-AI-PREDMNT2	Programs the STEVAL-STWINKT1B as an IoT Edge node, connected to the cloud, able to acquire sensor data, process them and send the results to the DSH-PREDMNT cloud dashboard. It includes dedicated algorithms for advanced time and frequency domain signal processing and analysis of 3D digital accelerometers with flat bandwidth up to 6 kHz	STEVAL-STWINKT1B STEVAL-STWINWFV1 STBLESensor DSH-PREDMNT NanoEdgeAIStudio AWS IoT Core
Asset Tracking	FP-ATR-ASTRA1	Function pack that implements a complete asset tracking application, which supports long-range 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	DSH-ASSETRACKING STAssetTracking STEVAL-ASTRA1B
	FP-ATR-LORA1	Read data from environmental and motion sensors, retrieve geo-position from GNSS and send collected data via LoRaWAN connectivity	X-NUCLEO-GNSS1A1 B-L072Z-LRWAN1 DSH-ASSETRACKING
	FP-ATR-SIGFOX1	Read data from environmental and GNSS sensors and send collected data via Sigfox connectivity	X-NUCLEO-IKS01A3 X-NUCLEO-GNSS1A1 X-NUCLEO-S2868A2 X-NUCLEO-S2915A1 DSH-ASSETRACKING STAssetTracking X-NUCLEO-IDB05A2
	FP-ATR-BLE1	Asset tracking using BLE connectivity for SensorTile.box wireless multisensor development kit	DSH-ASSETRACKING STAssetTracking
	FP-ATR-LTE1	Asset tracking with LTE connectivity, GNSS, and MEMS sensors	X-NUCLEO-GNSS1A1 X-NUCLEO-IKS01A3 P-L496G-CELL02 DSH-ASSETRACKING

Category	Part number	Specifications	Associated part number
Audio Proc.	FP-AUD-BVLINK1	Performs voice streaming over Bluetooth low energy in a half-duplex configuration	STEVAL-BCNKT01V1 STEVAL-STLKT01V1
	FP-AUD-BVLINK2	Performs voice streaming over BLE in a full-duplex configuration using the advanced Opus compression algorithm	STEVAL-BCNKT01V1 STEVAL-STLKT01V1 STBLESensor
	FP-AUD-BVLINKWB1	Full-duplex voice streaming or stereo music streaming over BLE using the advanced Opus compression algorithm	X-NUCLEO-CCA02M2 STBLESensor
	FP-AUD-SMARTMIC1	This software package implements a complete application targeting advanced processing for MEMS microphone arrays, including digital MEMS microphone acquisition, beamforming, source localization, and acoustic echo cancellation. The processed audio is sent to a USB host and a loudspeaker connected to the relevant expansion boards	X-NUCLEO-CCA01M1 X-NUCLEO-CCA02M2 STEVAL-BCNKT01V1
	FP-AUD-AEC1	Features an example focused on acoustic echo cancellation and provides an implementation of a USB smart speaker use case with microphone	X-NUCLEO-CCA01M1 X-NUCLEO-CCA02M2
Local and Cloud Conn.	FP-CLD-AWS1	Safely connect your IoT node to Amazon AWS IoT service, transmit sensor data, and receive commands from AWS-based cloud applications	X-NUCLEO-IKS01A3 B-L475E-IOT01A DSH-ASSETRACKING STEVAL-STWINKT1B
Industrial	FP-IND-IODSNS1	Enable IO-Link communication between P-NUCLEO-IOD02A1 kit and an IO-Link controller through the L6364Q transceiver mounted on the X-NUCLEO-IOD02A1	P-NUCLEO-IOD02A1 X-NUCLEO-IKS02A1 X-NUCLEO-IOD02A1
	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-IOD04A1
	FP-IND-PREDMNT1	Dedicated algorithms for advanced time and frequency domain signal processing and analysis of 3D digital accelerometers with flat bandwidth up to 5 kHz	X-NUCLEO-BNRG2A1 X-NUCLEO-CCA02M2 X-NUCLEO-IKS01A3 STEVAL-STWINKT1B STEVAL-BFA001V2B DSH-PREDMNT STBLESensor
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
Sensing	FP-SNS-AGNSS1	Connect your IoT node to a cellular network and enable assisted-GNSS applications	P-L496G-CELL02 X-NUCLEO-GNSS1A1
	FP-SNS-DATALOG1	High-speed datalog application that 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 microSD 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-MKSBOX1V1 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 STEVAL-MKBOXPRO STEVAL-STWINBX1 STEVAL-STWINKT1B
	FP-SNS-BLEMESH1	Connect an IoT node with BLE Mesh connectivity and sensor model	X-NUCLEO-IKS01A3 X-NUCLEO-BNRG2A1 X-NUCLEO-IDB05A2 STEVAL-MKSBOX1V1 ST BLE Mesh
	FP-SNS-ALLMEMS1	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, motionsensor data, digital microphone levels, and battery level	X-NUCLEO-BNRG2A1 X-NUCLEO-CCA02M2 X-NUCLEO-IKS01A3 STEVAL-BCNKT01V1 STEVAL-MKSBOX1V1 STBLESensor

Category	Part number	Specifications	Associated part number
Sensing	FP-SNS-ALLMEMS2	Connect an ultralow power IoT node with BLE connectivity, digital microphone, environmental and motion sensors	X-NUCLEO-BNRG2A1 X-NUCLEO-CCA02M2 X-NUCLEO-IKS01A3 STEVAL-BCNKT01V1 STEVAL-STLKT01V1 STEVAL-MKSBOX1V1 STBLESensor
	FP-SNS-FLIGHT1	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	X-NUCLEO-53L3A2 X-NUCLEO-IDB05A2 STEVAL-BCNKT01V1 STBLESensor
	FP-SNS-MOTENV1	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	X-NUCLEO-BNRG2A1 X-NUCLEO-IKS01A3 STBLESensor
	FP-SNS-MOTENVWB1	Function pack that lets you 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, environmental (temperature, pressure, and relative humidity), and Time-of-Flight sensor data. The package also enables advanced functions such as sensor data fusion, accelerometer-based real-time activity recognition, carry position, gesture recognition, pedometer, motion intensity, compass, and object distance	X-NUCLEO-53L3A2 P-NUCLEO-WB55 STBLESensor
	FP-SNS-SMARTAG1	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	STAssetTracking STEVAL-SMARTAG1 DSH-ASSETRACKING
	FP-SNS-SMARTAG2	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 batteryoperated 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	STAssetTracking STEVAL-SMARTAG2 DSH-ASSETRACKING
	FP-SNS-STBOX1	For the Pro mode of the SensorTile.box wireless multisensor 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	STEVAL-MKBOXPRO STEVAL-MKSBOX1V1 STBLESensor

Cloud and applications

Support for the main cloud SDKs and Android and iOS mobile apps complete the software portfolio, extending the possibility to interact and control the boards and the associated function packs through a web dashboard or a mobile app.



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Category	Part number	Specifications	Associated part number
Web applications	DSH-ASSETRACKING	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	FP-ATR-BLE1 FP-ATR-LORA1 FP-ATR-LTE1 FP-ATR-SIGFOX1 FP-SNS-SMARTAG1 FP-SNS-SMARTAG2 FP-CLD-AWS1 FP-ATR-ASTRA1
	DSH-PREDMNT	Predictive maintenance dashboard is a cloud application based on AWS services	FP-IND-PREDMNT1 FP-AI-PREDMNT2
Mobile appications	STAssetTracking	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	FP-ATR-ASTRA1 FP-ATR-BLE1 FP-ATR-SIGFOX1 FP-SNS-SMARTAG1 FP-SNS-SMARTAG2
	STBLESensor	Android and iOS application to shows the data exported by a BLE device using the BlueST protocol	STEVAL-MKSBOX1V1 STEVAL-MKBOXPRO STEVAL-PROTEUS1 STEVAL-BCNKT01V1 STEVAL-STLKT01V1 STEVAL-STWINBX1 FP-AI-CTXAWARE1 FP-AI-PREDMNT2 FP-AI-SENSING1 FP-AUD-BVLINK2 FP-AUD-BVLINKWB1 FP-IND-PREDMNT1 FP-SNS-ALLMEMS1 FP-SNS-ALLMEMS2 FP-SNS-DATALOG2 FP-SNS-FLIGHT1 FP-SNS-MOTENV1 FP-SNS-MOTENVWB1 FP-SNS-STBOX1
	STBLESensClassic	Android and iOS application to shows the data exported by a BLE device using the BlueST protocol. The application shows different panels based on the data types exported by the firmware, including: environmental data, MEMS sensor fusion, FFT, plot, BlueVoice, compass, machine learning core, finite state machine, cloud logging	STEVAL-MKBOXPRO FP-AI-PDMWBSOC FP-AI-PDMWBSOC2 FP-SNS-DATALOG1
	ST BLE Mesh	ST BLE Mesh application for Android and iOS allows you to create your own Bluetooth® Mesh profile compliant mobile apps. The application can be used for provisioning, configuring, and controlling multiple Bluetooth® Mesh Profile compliant devices in a BLE Mesh network for IoT solutions	FP-SNS-BLEMESH1
	STNFCSensor	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).	FP-SNS-SMARTAG1
	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 of peripherals, shows output of standard profile, shows peripheral services and characteristics, performs read, write, and notification interactions with peripherals, collects cloud-based analytics on Azure App Center, bond device	-

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