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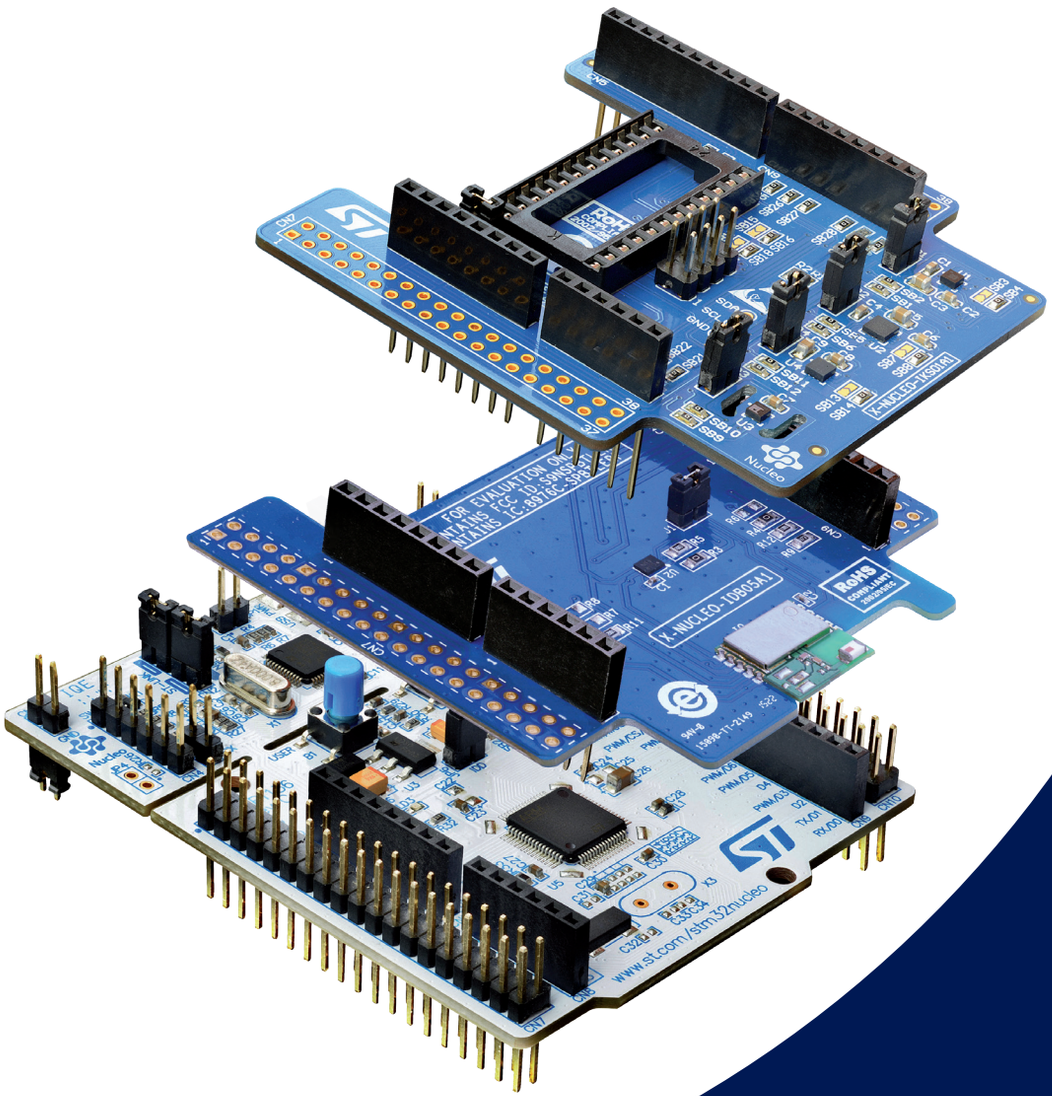
STM32
Open Development Environment



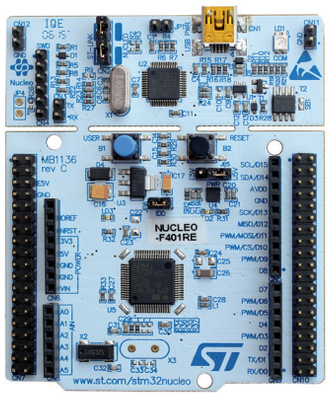
STM32 Open Development Environment

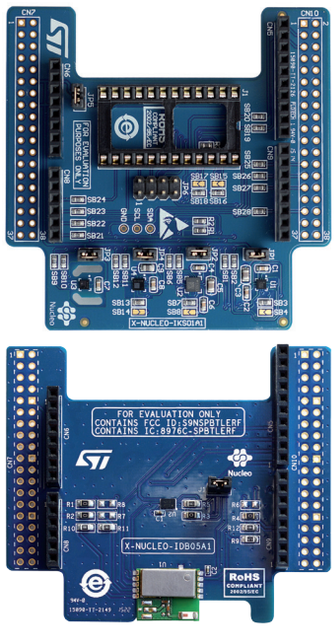
Fast, affordable
Development and prototyping

The STM32 Open Development Environment is a fast and affordable way to develop and prototype innovative devices and applications with state-of-the-art ST components leveraging the STM32 32-bit microcontroller family and a comprehensive set of functions for sensing, connectivity, power, audio, motor control and more. 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.

STM32 Nucleo

To start your design, choose the appropriate STM32 Nucleo development board (MCU) and expansion (X-NUCLEO) boards (sensors, connectivity, audio, motor control etc.) for the functionality you need.
(Refer to www.st.com/stm32ode for details of board availability and out-of-the-box compatibility.)





STM32 Cube

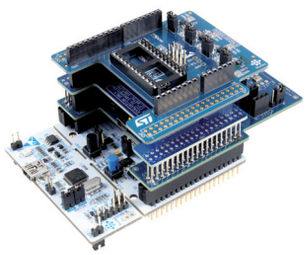
IAR SYSTEMS · KEIL Tools by ARM · GCC

Next select your **development environment** (IAR EWARM, Keil MDK, and GCC-based IDEs) and use the free **STM32Cube tools and software.**

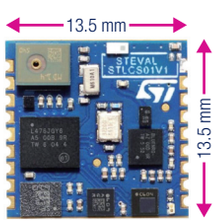
Download all the necessary software to run the functionality on the selected STM32 Nucleo expansion boards.

Compile your design and upload it to 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 an advanced prototyping board or in and end product design using the same commercial ST components, or components from the same family as those found on the STM32 Nucleo boards.



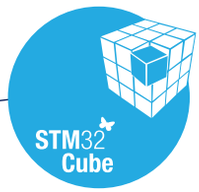
- Motion MEMS
- Environmental sensors
- MEMS microphone
- Low-power brain
- Sensor fusion
- Bluetooth Smart



All that you need

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

Developer community and support
Online communities, development tools, documentation and user guides



STM32Cube software

A set of free tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer and middleware bricks.

STM32Cube expansion software

Expansion software provided free for use with the STM32 Nucleo expansion board and fully compatible with the STM32Cube software framework. It provides abstracted access to expansion board functionality through high-level APIs and sample applications.

STM32 Nucleo development boards

A comprehensive range of affordable development boards for all the STM32 microcontroller series, with unlimited unified expansion capabilities and integrated debugger/programmer functionality.

STM32 Nucleo expansion boards (X-NUCLEO)

Boards with additional functionality that can be plugged directly on top of the STM32 Nucleo development board or stacked on another STM32 expansion board.

Function Packs

Set of function examples for some of the most common application cases

MULTIPLE DEVELOPMENT ENVIRONMENTS

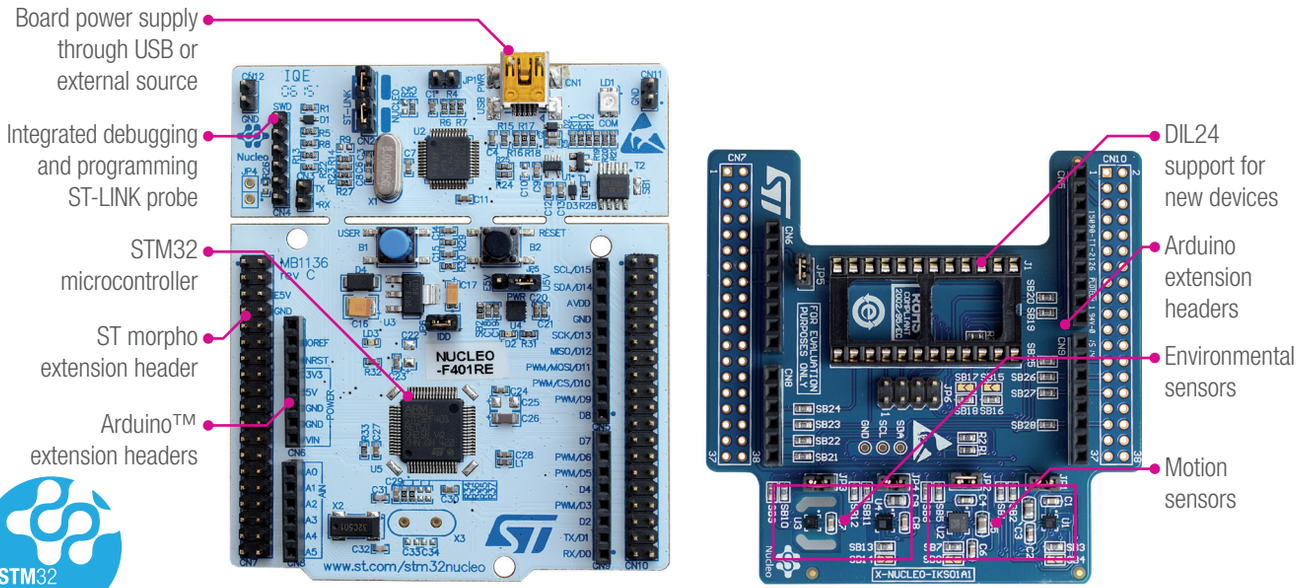
The STM32 Open Development Environment is compatible with a large number of IDEs including those from IAR EWARM and Keil MDK, and also some GCC-based environments.
Some IDEs from leading vendors are provided free of charge, in partnership with ST. These include Eclipse-based IDEs such as AC6 System Workbench for STM32 and the MDK-ARM environment*.

Note: * MDK-ARM is free when used with STM32L0 and STM32F0

STM32 Nucleo boards

THE SKY IS THE LIMIT

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.



Development board (NUCLEO) Expansion board (X-NUCLEO)

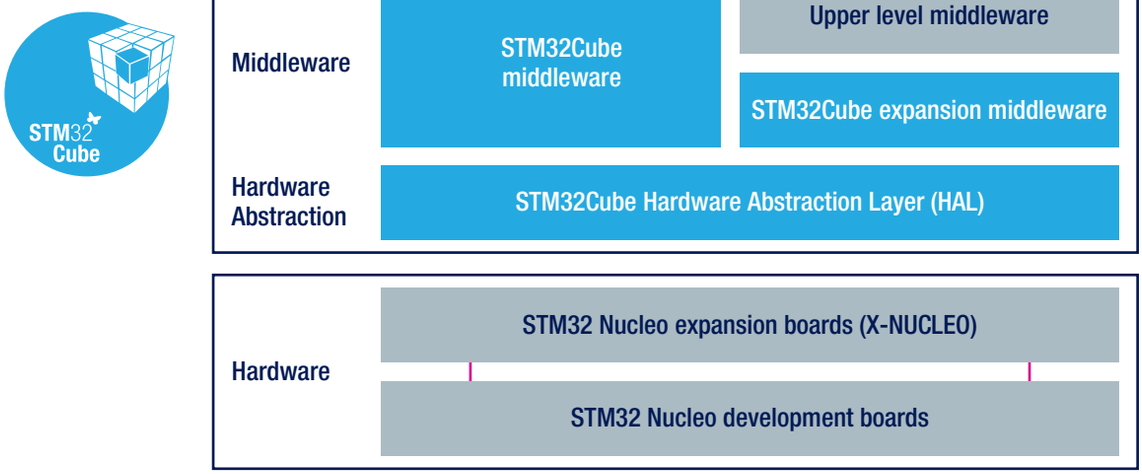
What you want to do	What we provide	Components	Board reference
Process*	Ultra-low power	STM32L0 - ARM® Cortex®-M0+ ultra-low power 32-bit MCU	NUCLEO-L053R8
	High performance	STM32F4 - ARM® Cortex®-M4 high-performance 32-bit MCU	NUCLEO-F401RE
	Rich peripheral set	STM32L4 - ARM® Cortex®-M4 ultra-low power, high-performance 100DMIPS 32-bit MCU with USB-OTG, rich peripheral set and security features	NUCLEO-L476RG
Sense motion, pressure, humidity, temperature, distance, light, sound	Motion & Environmental sensors	LSM6DS0 3-axis accelerometer + 3-axis gyroscope, LIS3MDL 3-axis magnetometer, HTS221 humidity and temperature, LPS25HB pressure	X-NUCLEO-IKS01A1
		LSM6DSL 3-axis accelerometer + 3-axis, LSM303AGR 3-axis magnetometer + 3-axis accelerometer, HTS221 humidity and temperature, LPS22HB pressure	X-NUCLEO-IKS01A2
	Proximity sensors	VL6180X FlightSense™ proximity, gesture and ambient light sensor	X-NUCLEO-6180XA1
		VL53L0X FlightSense™ ranging and gesture sensor	X-NUCLEO-53L0A1
	Microphone	MP34DT01-M digital microphone	X-NUCLEO-CCA02M1
Connect	Bluetooth Low Energy 4.1	BlueNRG-MS based Bluetooth Low Energy (V4.1) module	X-NUCLEO-IDB05A1
	Wi-Fi	Wi-Fi module (SPWF01SA.11)	X-NUCLEO-IDW01M1
	Sub-GHz radio	SPIRIT1 RF SPSGRF-868 module	X-NUCLEO-IDS01A4
		SPIRIT1 RF SPSGRF-915 module	X-NUCLEO-IDS01A5
	NFC	M24SR Dynamic NFC tag	X-NUCLEO-NFC01A1
		M24LR Dynamic NFC tag	X-NUCLEO-NFC02A1
		CR95HF NFC Reader	X-NUCLEO-NFC03A1
Move/Actuate	Motor driver	L6474 Stepper motor driver	X-NUCLEO-IHM01A1
		L6470 Two Axes motor driver	X-NUCLEO-IHM02A1
		PowerSTEP01 High-power stepper motor driver	X-NUCLEO-IHM03A1
		L6206 Dual brush DC motor driver	X-NUCLEO-IHM04A1
		L6208 Bipolar Stepper motor driver	X-NUCLEO-IHM05A1
		STSPIN220 Low-voltage stepper motor driver	X-NUCLEO-IHM06A1
		L6230 3-phase Brushless DC motor driver	X-NUCLEO-IHM07M1
		L6470 F7 MOSFET Low-voltage BLDC motor driver	X-NUCLEO-IHM08M1
		Motor control connector	X-NUCLEO-IHM09M1
		STSPIN230 Low-voltage BLDC 3-phase motor driver	X-NUCLEO-IHM11M1
Power/Drive	Battery and energy management	VPS2535H 24 V Intelligent power switch	X-NUCLEO-IPS02A1
	LED Lighting	LED6001 Single channel LED driver with integrated boost controller	X-NUCLEO-LED61A1
Translate signal conditioning	Audio processing	STA350BW High-efficiency digital audio system	X-NUCLEO-CCA01M1
	Op Amp	Operational Amplifiers (TSZ124)	X-NUCLEO-IKA01A1
	Industrial Input/Output	CLT01 Protected digital termination array and VNI8200XP smart power solid state relay	X-NUCLEO-PLC01A1

Note: * Additional STM32 Nucleo development boards can also be used with firmware adaption

Table as of September 1st 2016. For latest update please refer to www.st.com/x-nucleo

STM32Cube Development Software

STM32Cube is a set of free of charge tools and embedded software bricks to enable fast and easy development on the STM32 which simplifies and speeds up developers' work.
The embedded software bricks include a Hardware Abstraction Layer (HAL) for easy porting from one STM32 device to another and middleware bricks for the most common functions (such as RTOS, USB , file system, TCP/IP stack, touch sensing or graphics).
A large number of code use examples are also included making it even easier to get started.
Find out more **www.st.com/stm32cube**.



EXPANSION SOFTWARE

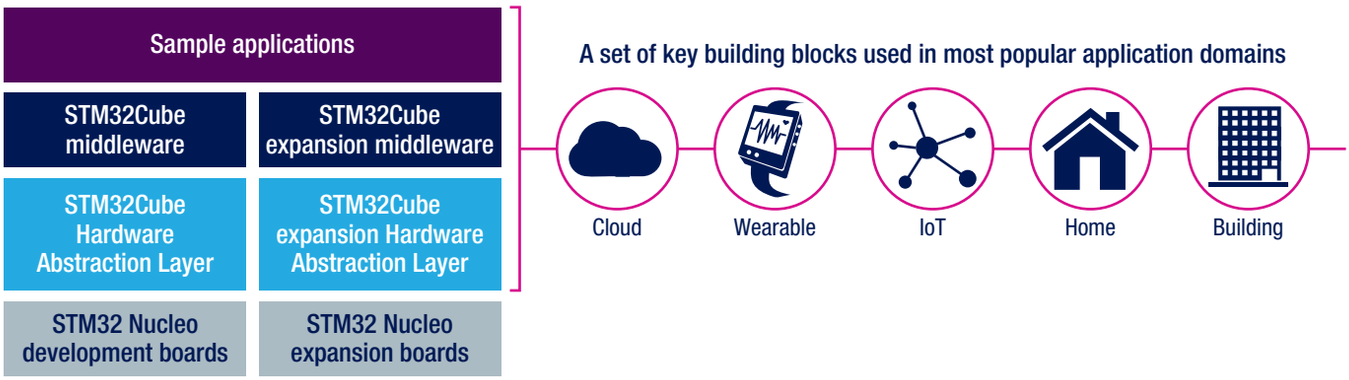
All STM32 Nucleo expansion boards come with STM32Cube expansion middleware. The middleware consists of source code drivers and sample applications built on top of the STM32Cube HAL, which provides abstracted access to board functionality through high-level APIs.

OPEN LICENSE MODELS

STM32Cube software and sample applications are covered by a mix of fully open source BSD license and ST licenses with very permissive terms.

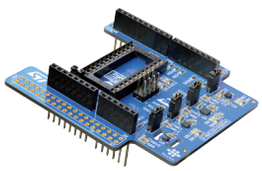
Function Packs
Pre-integrated applications

Pre-packaged software offer



FUNCTION PACK EXAMPLE

Required Hardware



Motion and environmental sensor expansion board

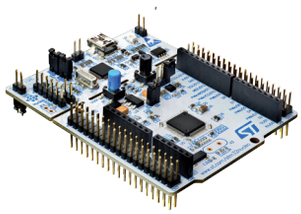
MEMS 3D accelerometer, gyroscope and magnetometer
MEMS pressure and humidity sensors

X-NUCLEO-IKS01A1

Bluetooth Low Energy expansion board

BlueNRG Bluetooth Low Energy network processor

X-NUCLEO-IDB05A1



STM32 Nucleo-64 development board

STM32F4 MCU

NUCLEO-F401RE

Software
(Free of charge)

FP-SNS-MOTENV1 SW package

Sample applications (streaming sensor data to Smartphone App)

Bluetooth Low Energy and Sensor software expansions for STM32Cube

X-CUBE-BLE1
X-CUBE-MEMS1

STM32Cube

"ST BlueMS" mobile application

Available on the App Store

ANDROID APP ON Google play

SDK available on Github (BlueSTSDK)

AVAILABLE FUNCTION PACKS

What you want to do	What we provide	Expansion boards supported	Development boards supported	Function pack reference	iOS/Android Application
Local and cloud connectivity	Motion & Environmental sensors, Wi-Fi module and dynamic NFC/RFID tag with Cloud connectivity for Microsoft Cloud services	X-NUCLEO-IDW01M1 X-NUCLEO-IKS01A1 X-NUCLEO-NFC01A1	NUCLEO-F401RE	FP-CLD-AZURE1	N/A
	Motion & Environmental sensors, Wi-Fi module and dynamic NFC/RFID tag with Cloud connectivity for IBM Cloud services	X-NUCLEO-IDW01M1 X-NUCLEO-IKS01A1 X-NUCLEO-NFC01A1	NUCLEO-F401RE	FP-CLD-BLUEMIX1	N/A
Sensing	Complete solution comprising sensors, NFC, Bluetooth Low Energy connectivity and FlightSense	X-NUCLEO-IDB05A1 X-NUCLEO-IKS01A1 X-NUCLEO-NFC01A1 X-NUCLEO-6180XA1	NUCLEO-F401RE NUCLEO-L476RG	FP-SNS-FLIGHT1	ST BlueMS
	SensorTile compatible package (environmental sensor, motion sensor and digital microphone)	X-NUCLEO-IDB05A1 X-NUCLEO-IKS01A1 X-NUCLEO-CCA02M1	NUCLEO-F401RE NUCLEO-L476RG	FP-SNS-ALLMEMS1	ST BlueMS
	Transmission of sensor data to an application via Bluetooth Low Energy connectivity	X-NUCLEO-IDB05A1 X-NUCLEO-IKS01A1	NUCLEO-F401RE NUCLEO-L476RG NUCLEO-L053R8	FP-SNS-MOTENV1	ST BlueMS
Safety and security	Bluetooth Low Energy pairing through NFC data	X-NUCLEO-IDB05A1 X-NUCLEO-NFC01A1	NUCLEO-F401RE NUCLEO-L053R8	FP-SEC-BLENFC1	ST BlueMS
	Wi-Fi Access Point authentication using information stored in NFC (for headless sensors)	X-NUCLEO-IDW01M1 X-NUCLEO-NFC01A1	NUCLEO-F401RE	FP-SEC-WIFINFC1	ST M24SR
Network infrastructure	Bluetooth Low Energy star-topology to Wi-Fi network conversion function	X-NUCLEO-IDW01M1 X-NUCLEO-IKS01A1 X-NUCLEO-IDB05A1	NUCLEO-F401RE NUCLEO-L476RG NUCLEO-L053R8	FP-NET-BLESTAR1	ST SensNet
	6LoWPAN to Bluetooth Low Energy network conversion function	X-NUCLEO-IDS01A4	NUCLEO-F401RE	FP-NET-6LPBLE1	N/A

Table as of September 1st 2016. For latest update please refer to www.st.com/stm32ode-fp

CHOOSE YOUR APPLICATION

Select an STM32 Nucleo development board* and add the expansion boards required (as mentioned in the table above).

Go to www.st.com/stm32ode-fp and download the function pack (containing a pre-configured STM32Cube and expansion software) to get your application up and running quickly.

Note: * Additional STM32 Nucleo development boards can also be used with firmware adaption, to take advantage of the whole STM32 microcontroller portfolio (as of September 1st 2016, 29 STM32 Nucleo development boards, allowing the evaluation of more than 600 STM32 part numbers).

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Order code: BRSTM32ODE0916

For more information on ST products and solutions, visit www.st.com/stm32ode