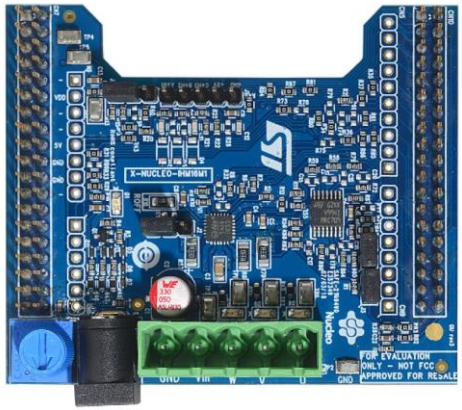
Quick Start Guide

Three-phase brushless DC motor driver expansion board based on STSPIN830 for STM32 Nucleo (X-NUCLEO-IHM16M1)



life.augmented

Version 1.0 (May 28, 2018)

Quick Start Guide Contents

3-phase brushless DC motor driver expansion board

Hardware overview

X-NUCLEO-IHM16M1 hardware description

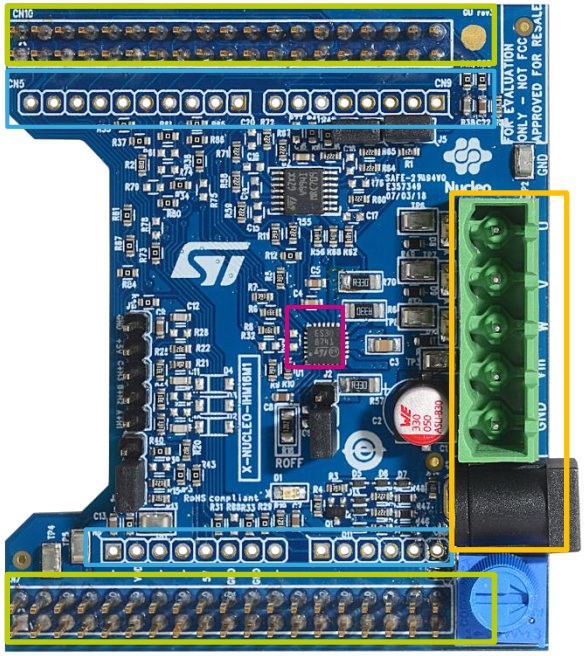
- The X-NUCLEO-IHM16M1 motor driver expansion board is based on the STSPIN830 monolithic driver for three-phase brushless motors.
- It represents an affordable, easy-to-use solution for driving brushless motors in your STM32 Nucleo project, implementing single and three-shunt current sensing. The STSPIN830 embeds a PWM current limiter with adjustable threshold together with a full set of protections.
- The X-NUCLEO-IHM16M1 expansion board is compatible with the Arduino and ST morpho connectors, so it can be plugged to an STM32 Nucleo development board and stacked with additional STM32 Nucleo expansion boards.

Key features

- Operative voltage from 7 to 45 V
- Output current up to 1.5 Arms
- Supporting single shunt and three-shunt sensing
- Standby mode
- Flexible direct driving settable between 3 or 6 PWM inputs
- Current limiter with adjustable reference
- Overcurrent, short-circuit and interlocking protections
- Thermal shutdown and undervoltage lockout
- BEMF sensing circuitry
- Bus voltage and PCB temperature sensing
- Input connector for Hall effect-based sensors and encoder

Key products on board

STSPIN830: Compact and versatile three-phase and three-sense motor driver



STSPIN830

Arduino UNO R3 connector*

Supply and motor connector

ST morpho connector

Latest info available at www.st.com
X-NUCLEO-IHM16M1

(*) Not mounted

life.augmented

3-phase brushless DC motor driver expansion board

Software overview

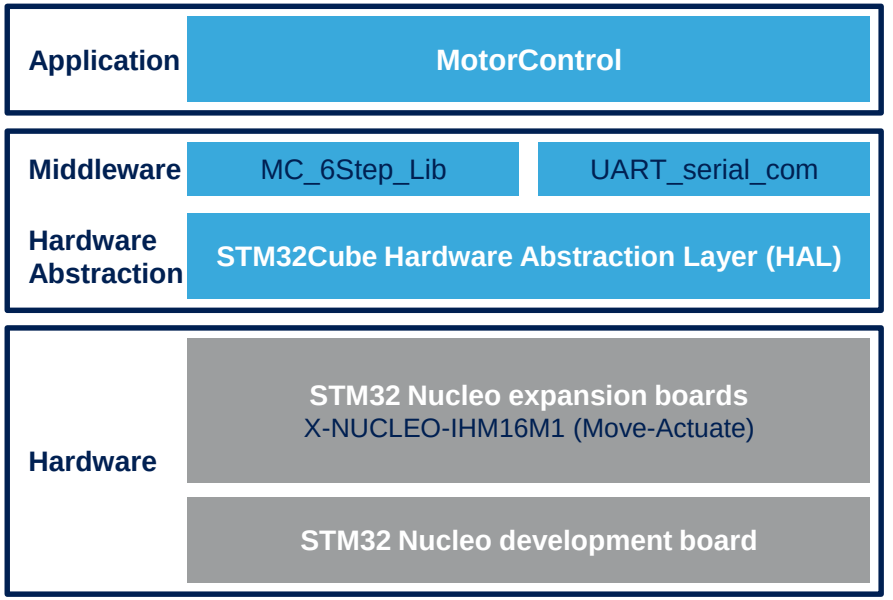
X-CUBE-SPN16 software description

- The X-CUBE-SPN16 is an expansion software package for STM32Cube. The software runs on the STM32 Nucleo providing management of STSPIN830 to control three-phase brushless DC motors. The expansion is built on STM32Cube software technology to ease portability across different STM32 microcontrollers. The software comes with a sample implementation driving a three-phase brushless DC motor, with BEMF sensing.
- It is compatible with the NUCLEO-F030R8, NUCLEO-F302R8, NUCLEO-F303RE or NUCLEO-F401RE development boards when connected to an X-NUCLEO-IHM16M1 expansion board.
- The package contains a user interface layer enabling real-time transmission of data to a PC through the terminal.

Key features

- The package contains a user interface layer enabling real-time transmission of data to a PC through the terminal.
- Sample application to drive a three-phase brushless motor, managing a single driver (STSPIN830) and an STM32 Nucleo expansion board (X-NUCLEOIHM16M1).
- GPIO, PWM and IRQ configuration
- API function available to send any application command to the motor driver
- User interface utility based on PC terminal to control the motor
- Speed control through potentiometer
- Motor control by user button
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

Overall system architecture



Latest software available at

X-CUBE-SPN16

life.augmented

Quick Start Guide Contents

X-NUCLEO-IHM16M1: Three-phase brushless DC motor driver expansion board

Hardware and Software overview

Setup & Demo Examples

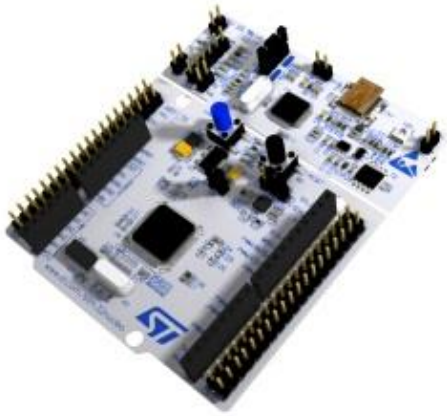
Documents & Related Resources

STM32 Open Development Environment: Overview

Setup & demo examples

HW prerequisites

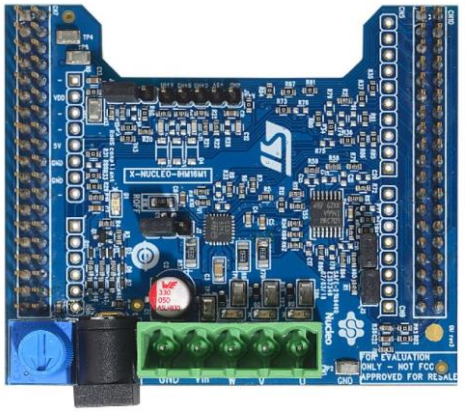
- 1x Three-phase brushless DC motor driver expansion boa
  (X-NUCLEO-IHM16m1)
- 1x STM32 Nucleo development board
  (NUCLEO-F401RE or **NUCLEO-F303RE** or **NUCLEO-F030R8** or **NUCLEO-F302R8)**
- 1x 3-phase brushless motor
- 1x USB type A to mini-B cable
- an external DC power supply with two electric cables (*)



NUCLEO-F401RE
NUCLEO-F303RE
NUCLEO-F030R8
NUCLEO-F302R8

Mini USB Cable

Three-phase brushless DC motor



X-NUCLEO-IHM16M1

(*) Power stage supply voltage from 7 V to 45 V

Software prerequisites

- **STSW-LINK009**: ST-LINK/V2-1 USB driver
- **STSW-LINK007**: ST-LINK/V2-1 firmware upgrade
- A Windows PC with one of the supported development toolchains:
  - KEIL: MDK-ARM
  - IAR: EWARM
  - GCC-based IDE: System Workbench for STM32
- **X-CUBE-SPN16**: software expansion for STM32Cube

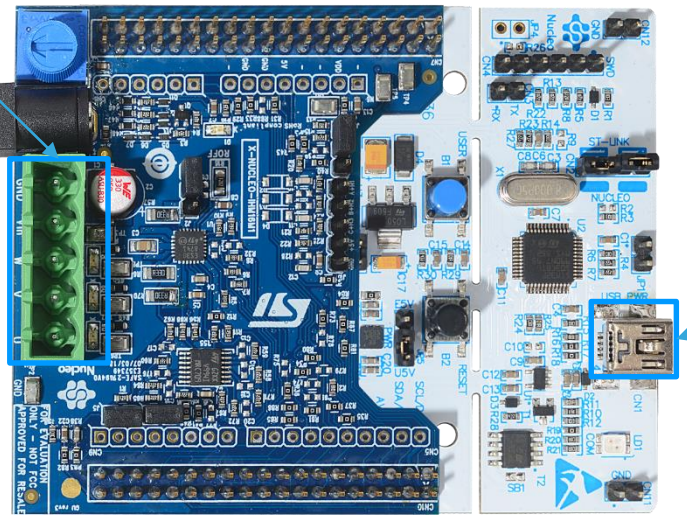
3 phase BLDC motor driver expansion board
Start coding in just a few minutes with X-CUBE-SPN16

Driving one 3-phase brushless motor with X-NUCLEO-IHM16M1 and X-CUBE-SPN16

1. On the X-NUCLEO-IHM16M1
   - J2 closed in 2-3 position
   - J3 closed in 1-2 position
   - Mounting options according to the STM32 Nucleo board (see board UM)

2. On the STM32 Nucleo board
   - JP1 off
   - JP5 (PWR) on UV5 side
   - JP6 (IDD) on

3. Stack the X-NUCLEO-IHM16M1 on the STM32 Nucleo board using the ST morpho connector and connect the 3-phase brushless motor (U,V,W) to the CN1 connector.



4. Connect the STM32 Nucleo board to the PC through the USB cable.

Start coding in just a few minutes with X-CUBE-SPN16

5. Open your preferred toolchain (MDK-ARM from Keil, EWARM from IAR, or SW4STM32 from www.openstm32.org)

6. open the software project from **Projects\Multi\Applications\MotionControl \YourToolChainName\YourSTM32NucleoBoard**

7. Open the file **Projects\Multi\Applications\MotorControl\Inc\MC_SixStep_param_Fxx.h** and modify the parameters according to your target configuration.

8. Build the project and download .bin file into the STM32 memory.

9. Connect the power supply (VIN\GND) to CN1 or J4 and power-up the board

10. Run the example and push the blue button to start and the black button to stop the motor

11. You can also use a User interface utility based on PC terminal to run the motor (for details please refer to the User Manual)

Documents & related resources

All documents are available in the DESIGN tab of the related products webpage

X-NUCLEO-IHM16M1:

- Gerber files, BOM, and schematics
- **DB3613:** Versatile 3-phase expansion board based on STSPIN830 for STM32 Nucleo – **Data brief**
- **UM2415:** Getting started with the X-NUCLEO-IHM16M1 3-phase brushless motor driver board based on STSPIN830 for STM32 Nucleo – **User manual**

X-CUBE-SPN16:

- **DB3618:** Three-phase motor driver software expansion for STM32Cube – **Data brief**
- **UM2419:** Getting started with the X-CUBE-SPN16 three-phase brushless DC motor driver software expansion for STM32Cube – **User manual**
- Software setup file

Consult www.st.com for the complete list

Quick Start Guide Contents

X-NUCLEO-IHM16M1: Three-phase brushless DC motor driver expansion board

Hardware and Software overview

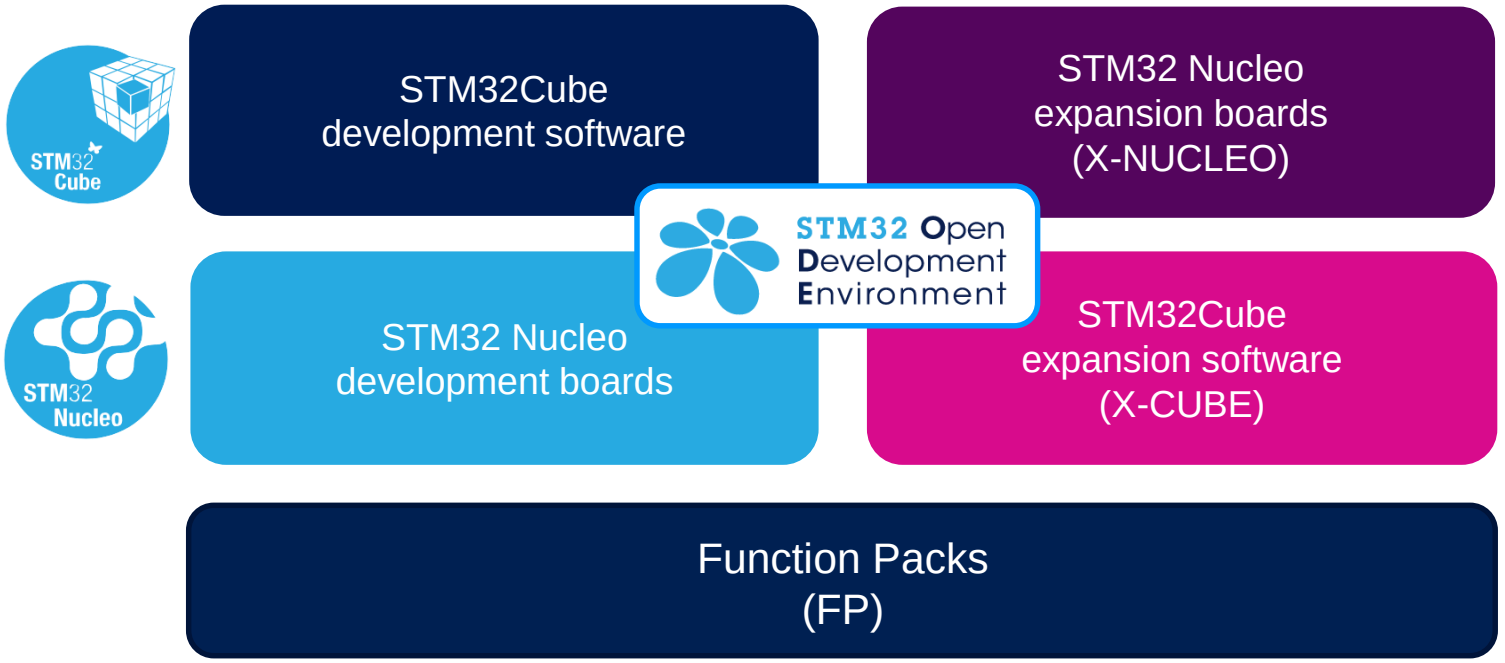
Setup & Demo Examples

Documents & Related Resources

STM32 Open Development Environment: Overview

STM32 Open Development Environment
Fast, affordable Prototyping and Development

- The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.

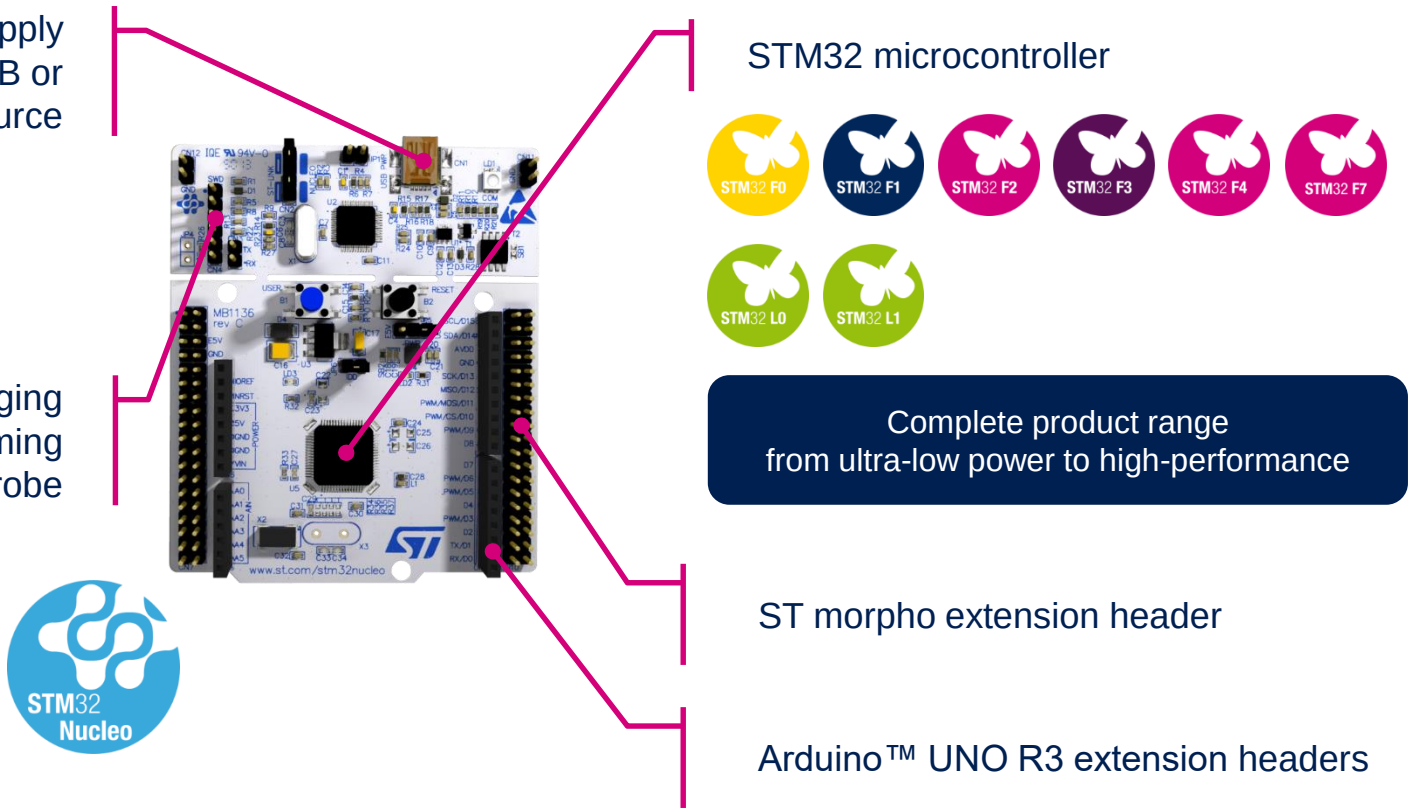


www.st.com/stm32ode

life.augmented

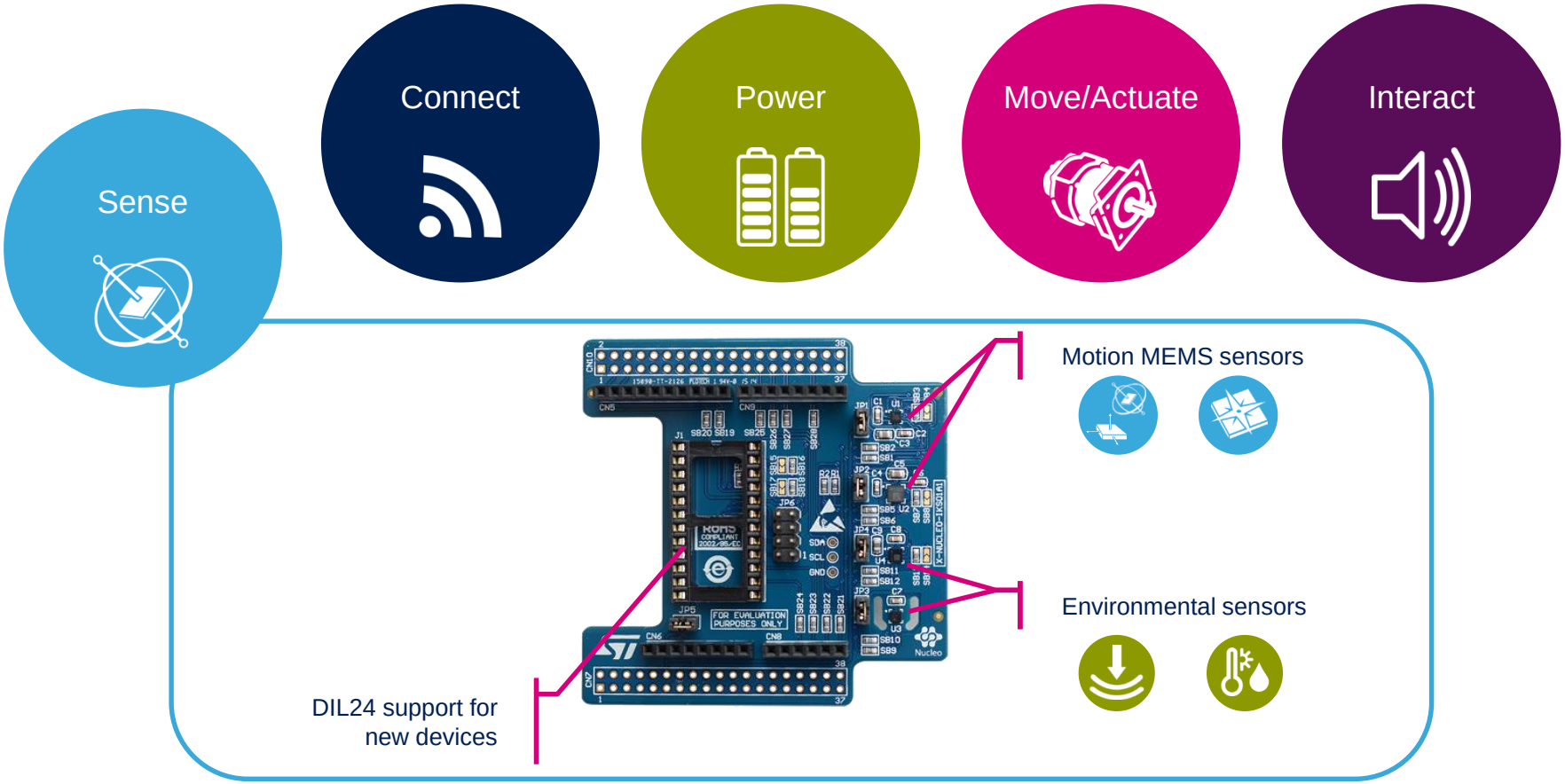
Development Boards (NUCLEO)

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



Expansion Boards (X-NUCLEO)

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



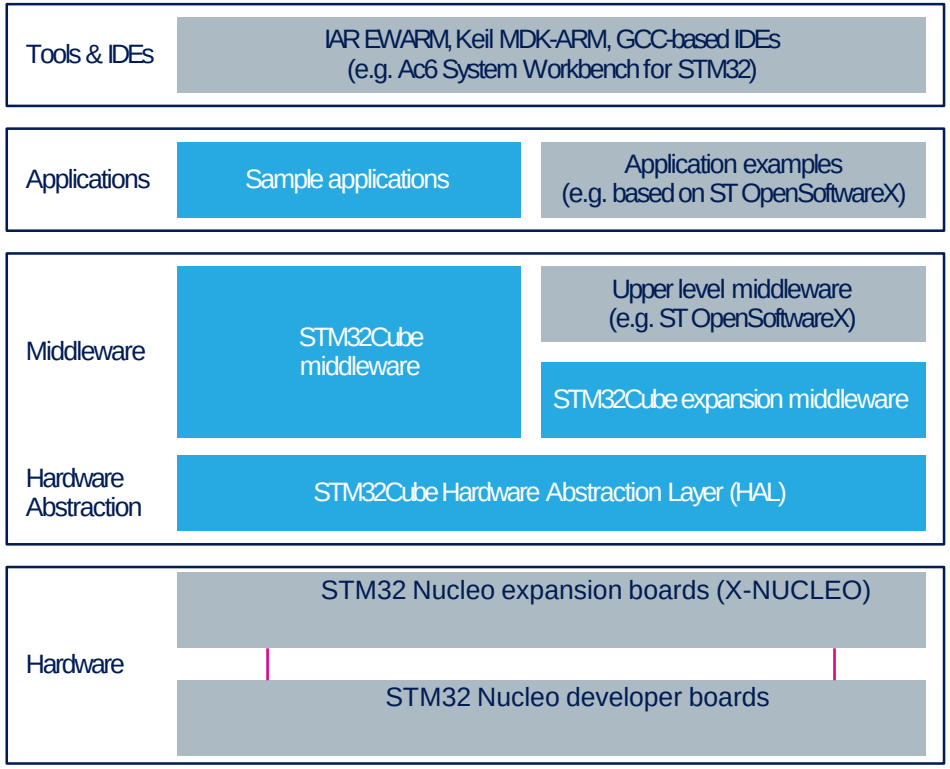
Example of STM32 expansion board (X-NUCLEO-IKS01A1)

STM32 Open Development Environment

Software components

- **STM32Cube software (CUBE)** - 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 (X-CUBE)** - 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.



- **Compatibility with multiple Development Environments -** The STM32 Open Development Environment is compatible with a number of IDEs including IAR EWARM, Keil MDK, and GCC-based environments. Users can choose from three IDEs from leading vendors, which are free of charge and deployed in close cooperation with ST. These include Eclipse-based IDEs such as Ac6 System Workbench for STM32 and the MDK-ARM environment.

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.

www.st.com/stm32cube

www.st.com/x-cube

STM32 Open Development Environment

Building block approach

The building blocks	Your need	Our answer

Accelerometer, gyroscope
Inertial modules, magnetometer
Pressure, temperature, humidity
Proximity, microphone

Sense — COLLECT

Bluetooth LE, Sub-GHz radio
NFC, Wi-Fi, GNSS

Connect — TRANSMIT

Audio amplifier
Touch controller
Operation Amplifier

Translate — ACCESS

Stepper motor driver
DC & BLDC motor driver
Industrial input / output

Move / Actuate — CREATE

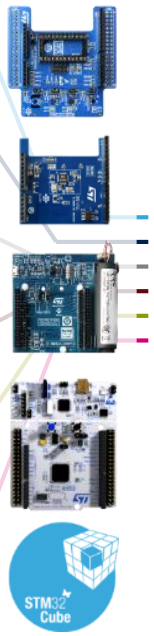
Energy management & battery

Power — POWER

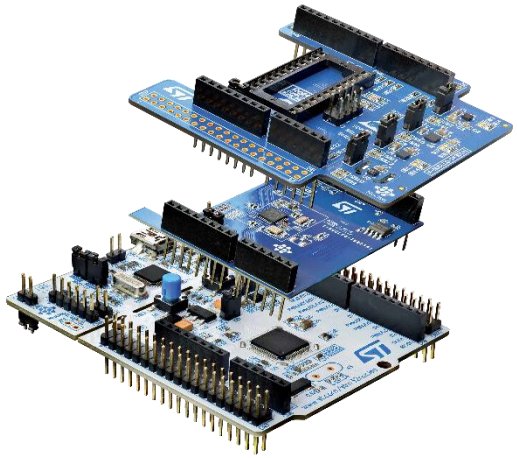
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



www.st.com/stm32ode

life.augmented