Quick Start Guide

Digital MEMS Microphones expansion board based on MP34DT01-M for STM32 Nucleo (X-NUCLEO-CCA02M1)

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Version 1.1.0 (May 31, 2016)

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Digital MEMS microphone expansion board

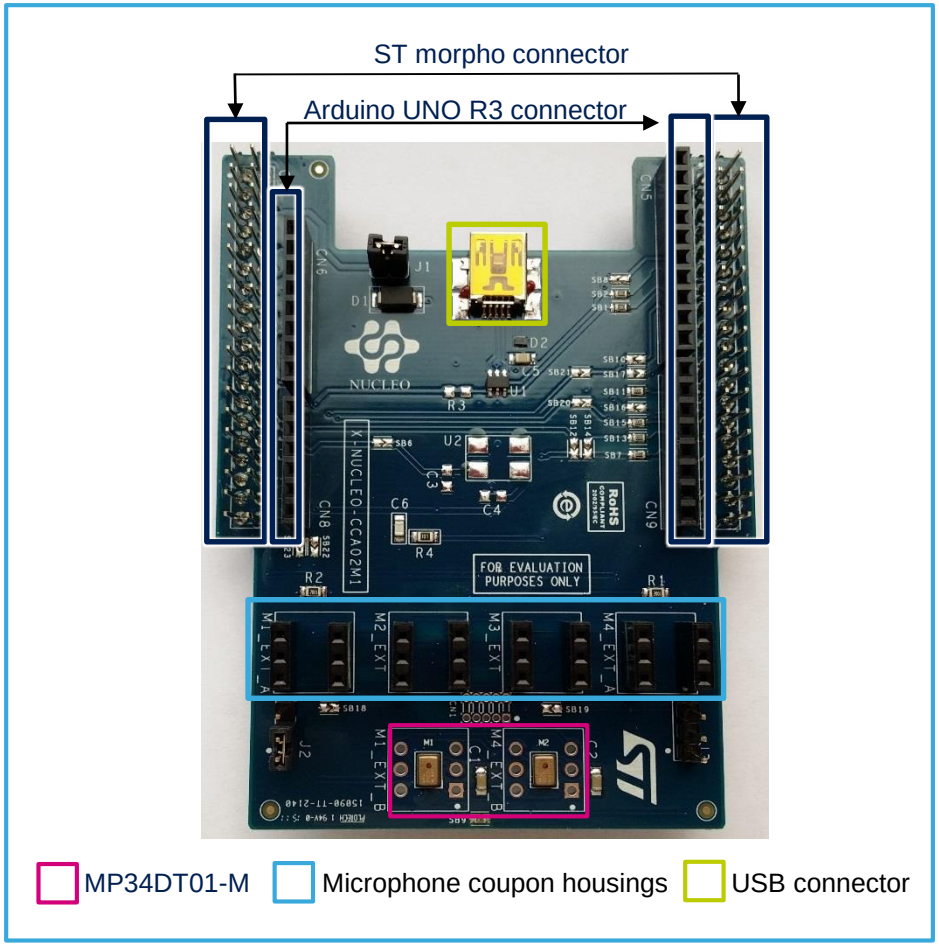
Hardware Overview

X-NUCLEO-CCA02M1 Hardware description

- The X-NUCLEO-CCA02M1 is an evaluation board based on digital MEMS microphones. It has two MP34DT01–M microphones soldered on the board and offers the possibility to plug in additional microphones using MP34DT01-based coupon evaluation boards (**STEVAL-MKI129V* or STEVAL-MKI155V***).
- The X-NUCLEO-CCA02M1 enables the acquisition and streaming of up to 4 microphones using both I²S and SPI busses available on ST morpho connector.

Key products on board

MP34DT01-M
Ultra-compact, low-power, omnidirectional, digital MEMS microphone built with a capacitive sensing element and an IC interface.



Latest info available at www.st.com
X-NUCLEO-CCA02M1

* is used as a wildcard character for related part number

Digital MEMS microphone expansion board

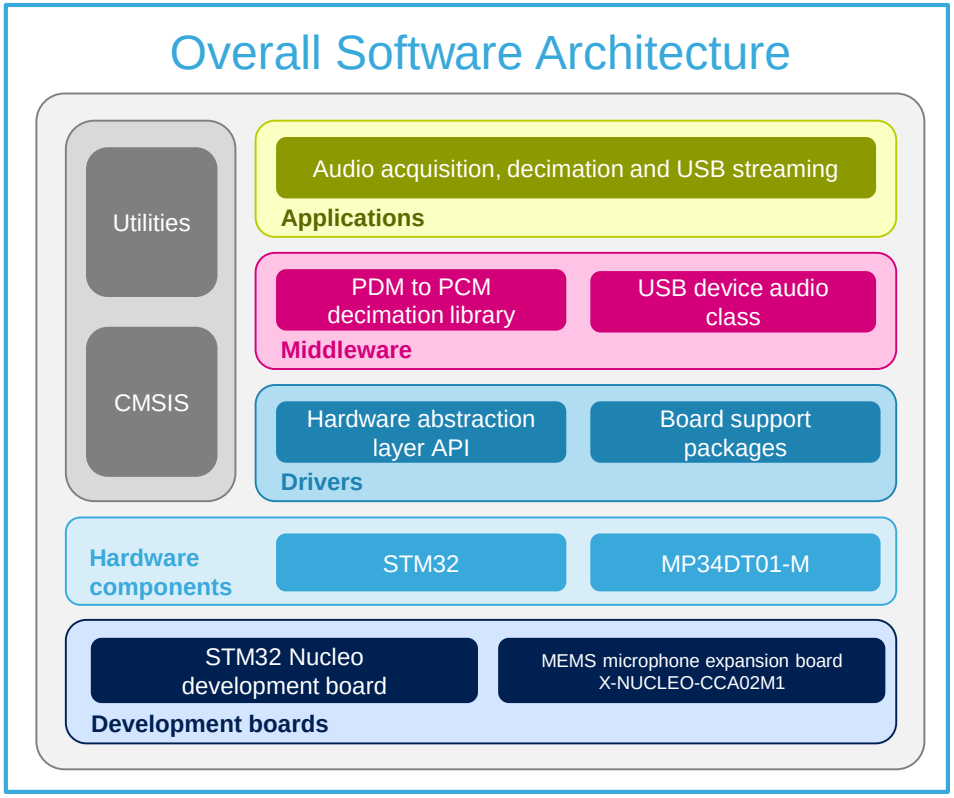
Software Overview

X-CUBE-MEMSMIC1 software description

- The software running on the STM32 MCU includes drivers and middleware for audio data acquisition from the MEMS digital microphones (MP34DT01-M) and USB streaming of the recorded signals.
- Implementation examples are available showing X-NUCLEO-CCA02M1 capabilities when connected to a NUCLEO-401RE, NUCLEO-F072RB or NUCLEO-L053R8 Nucleo board.
- It represents an easy and fast solution for the development of microphone-based applications as well as a starting point for audio algorithm implementation.

Key features

- Complete middleware to build applications using the digital MEMS microphone network processor
- Easy portability across different MCU families, thanks to the STM32Cube
- Sample applications that the developer can use to start experimenting with the code
- Free, user-friendly license terms



Latest info available at www.st.com
X-CUBE-MEMSMIC1

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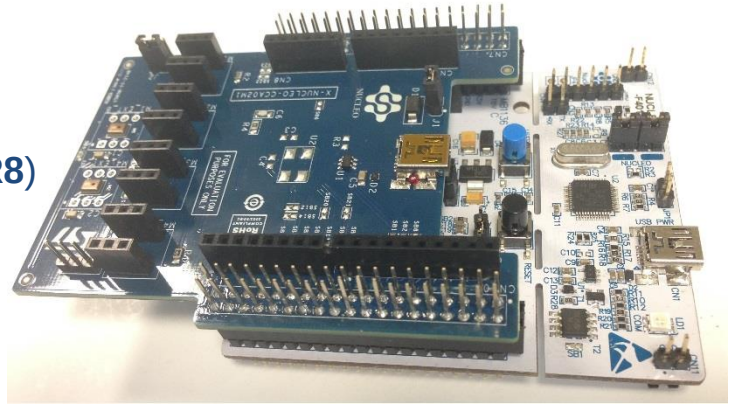
STM32 Open Development Environment: Overview

Setup & demo examples

HW prerequisites

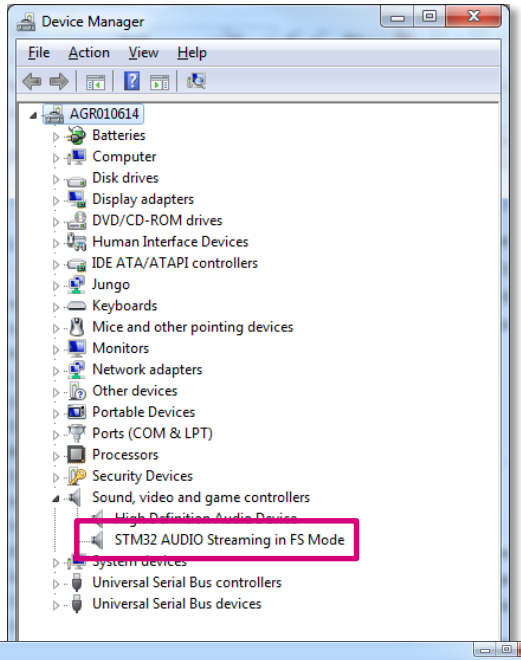
- 1x Digital MEMS microphone expansion board (**X-NUCLEO-CCA02M1**)
- 1x STM32 Nucleo development board (**NUCLEO-F401RE, NUCLEO-F072RB or NUCLEO-L053R8**)
- 1x USB type A to mini-B USB cable to connect the X-NUCLEO-CCA02M1 to the PC for USB streaming
- 1x PC based on Windows, Linux or OSX operating systems
- Optional: microphone coupon board to allow acquisition of four microphones
  - Compatible with:
    - **STEVAL-MKI155V1, STEVAL-MKI155V2, or STEVAL-MKI155V3**
    - **STEVAL-MKI129V1, STEVAL-MKI129V2, or STEVAL-MKI129V3**

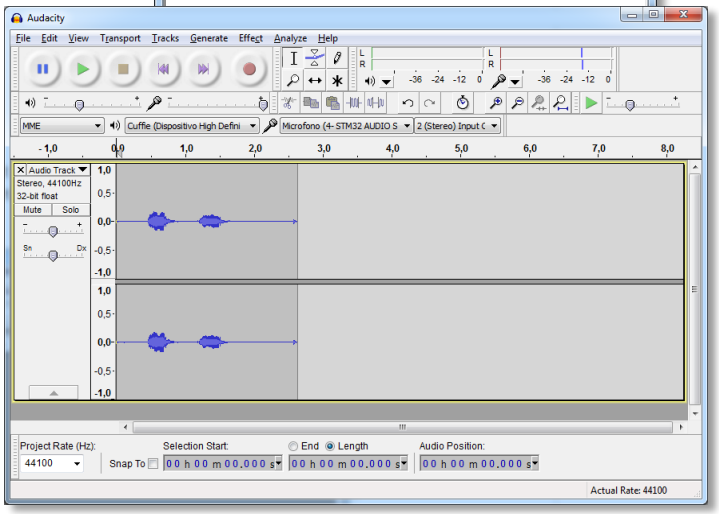


Setup & demo examples

SW prerequisites

- **STSW-LINK008**: ST-LINK/V2-1 USB driver
- **STSW-LINK007**: ST-LINK/V2-1 firmware upgrade
- **X-CUBE-MEMSMIC1**
  - The package contains source code examples (Keil, IAR, SW4STM32) based on **NUCLEO-F401RE, NUCLEO-F072RB** or **NUCLEO-L053R8** performing audio acquisition and USB streaming
  - When the system is flashed and connected to the PC by means of the X-NUCLEO-CCA02M1 USB connector, it is recognized as a standard multichannel USB microphone
- Generic third-party software for audio acquisition
  - Audacity® is free, open-source, cross-platform software for recording and editing sounds. It can be a suitable choice for PC-based audio capture.
  - In Windows 7, the Audacity version is capable of recording sound from up to 2 microphones





Digital MEMS microphone expansion board

Start coding in just a few minutes with X-CUBE-MEMSMIC1

1 Go to www.st.com/x-nucleo

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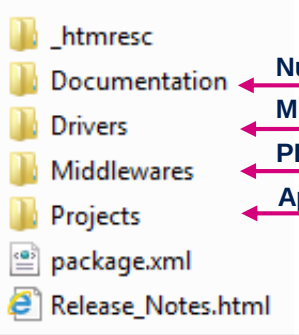
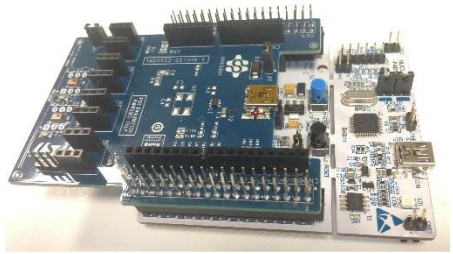
2 Select X-NUCLEO-CCA02M1

3 Download & unpack X-CUBE-MEMSMIC1

X-CUBE-MEMSMIC1 package



4 Download & install STM32 Nucleo ST-LINK/V2-1 USB driver



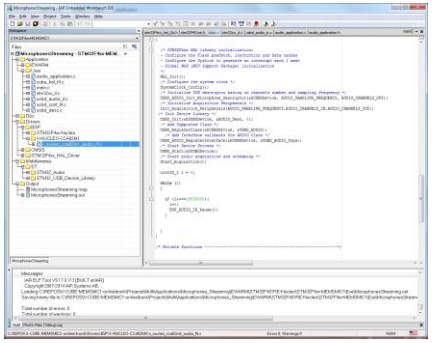
5 Open project example Microphone streaming

KEIL™ Tools by ARM

IAR SYSTEMS

ac6 Assistance Conseil Systemes

6 Modify and build application



Digital MEMS microphone expansion board

Evaluate audio streaming using X-CUBE-MEMSMIC1 and Audacity (1/2)

1 Download & install STM32 Nucleo ST-LINK/V2-1 USB driver

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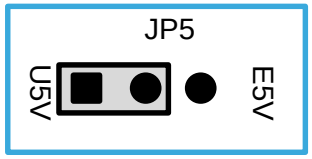
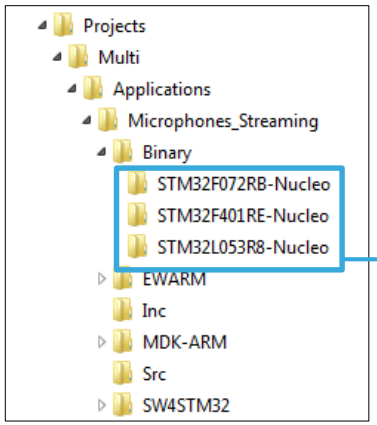
2 Install the open-source audio recording software Audacity from http://web.audacityteam.org/

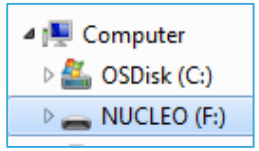
3 Move JP5 jumper on NUCLEO board to the U5V position



4 Connect USB cable to the NUCLEO USB connector

5 From X-CUBE-MEMSMIC1 SW resource package Drag and drop MicrophonesStreaming_2Channels_16kHz.bin on Nucleo drive

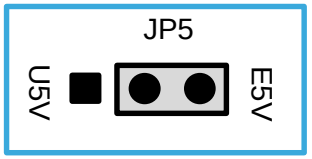


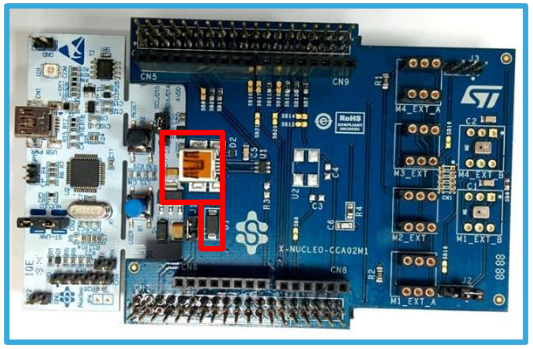


Digital MEMS microphone expansion board

Evaluate audio streaming using X-CUBE-MEMSMIC1 and Audacity (2/2)

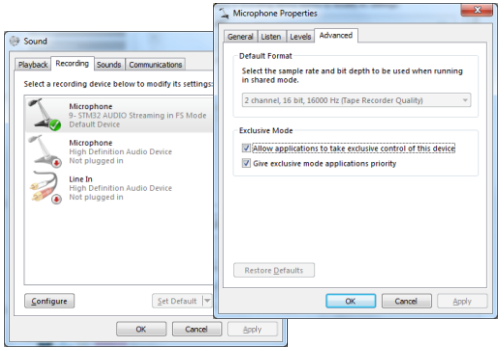
6 Move JP5 jumper on NUCLEO board to the E5V position

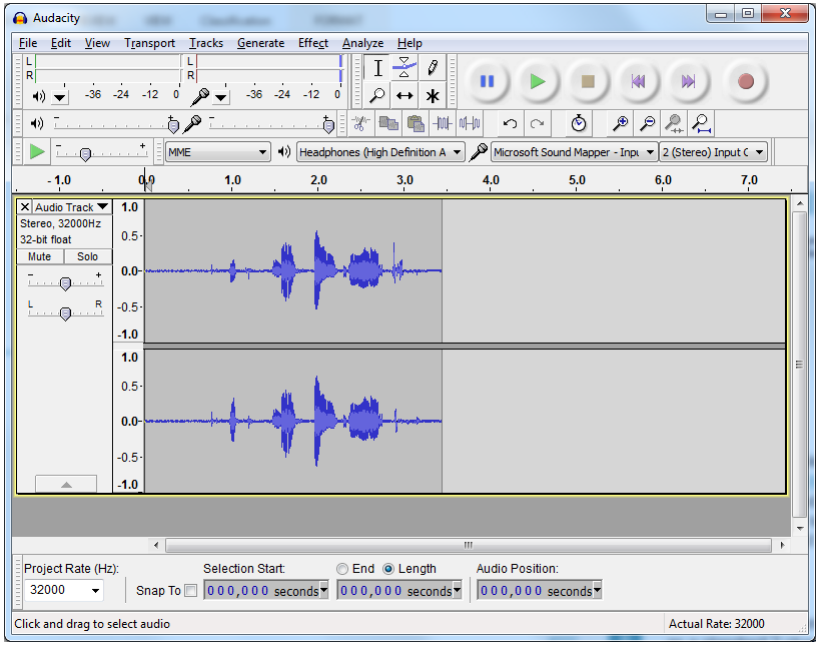




7 Connect USB cable to the X-NUCLEO-CCA02M1 USB connector and ensure that J1 on the same board is closed

8 The board is recognized as a standard 2-channel USB microphone





Open Audacity and start recording 9

Documents & Related Resources

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

X-NUCLEO-CCA02M1:

- **Gerber files, BOM, schematics**
- **DB2593:** Digital MEMS microphones expansion board based on MP34DT01-M for STM32 Nucleo – **Data brief**
- **UM1900:** Getting started with the digital MEMS microphones expansion board based on MP34DT01-M for STM32 Nucleo – **User manual**

X-CUBE-MEMSMIC1:

- **DB2599:** Digital MEMS microphone acquisition and processing software expansion for STM32Cube – **Data brief**
- **UM1901:** Getting started with the software package for digital MEMS microphones in X-CUBE-MEMSMIC1 expansion for STM32Cube – **User manual**
- **Software setup file**

Consult www.st.com for the complete list

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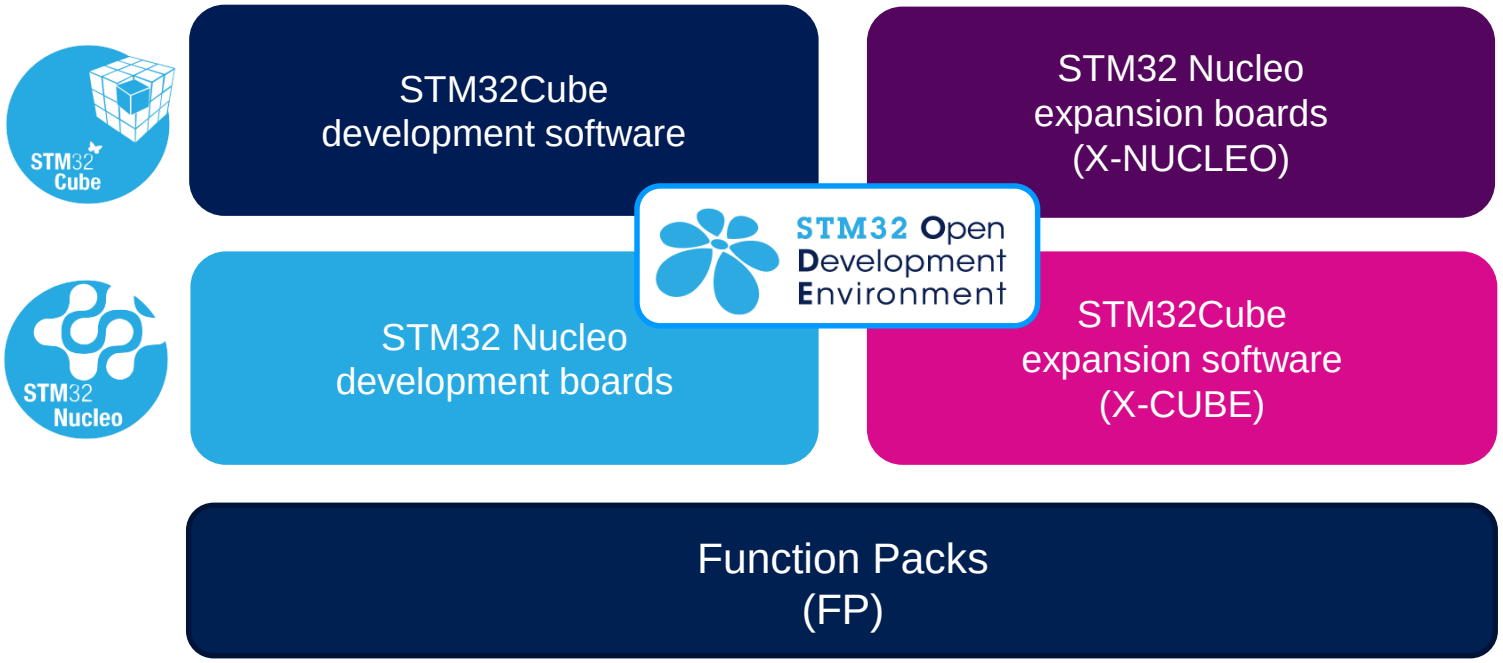
STM32 Open Development Environment: Overview

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.



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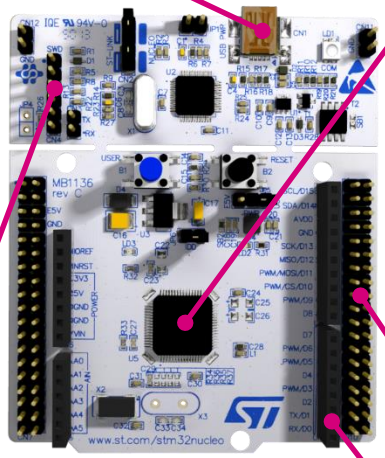
Development Boards (NUCLEO)

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

Power supply through USB or external source

Integrated debugging and programming ST-LINK probe



STM32 microcontroller

STM32 F0 STM32 F1 STM32 F2 STM32 F3 STM32 F4 STM32 F7

STM32 L0 STM32 L1

Complete product range
from ultra-low power to high-performance

ST morpho extension header

Arduino™ UNO R3 extension headers

STM32 Nucleo

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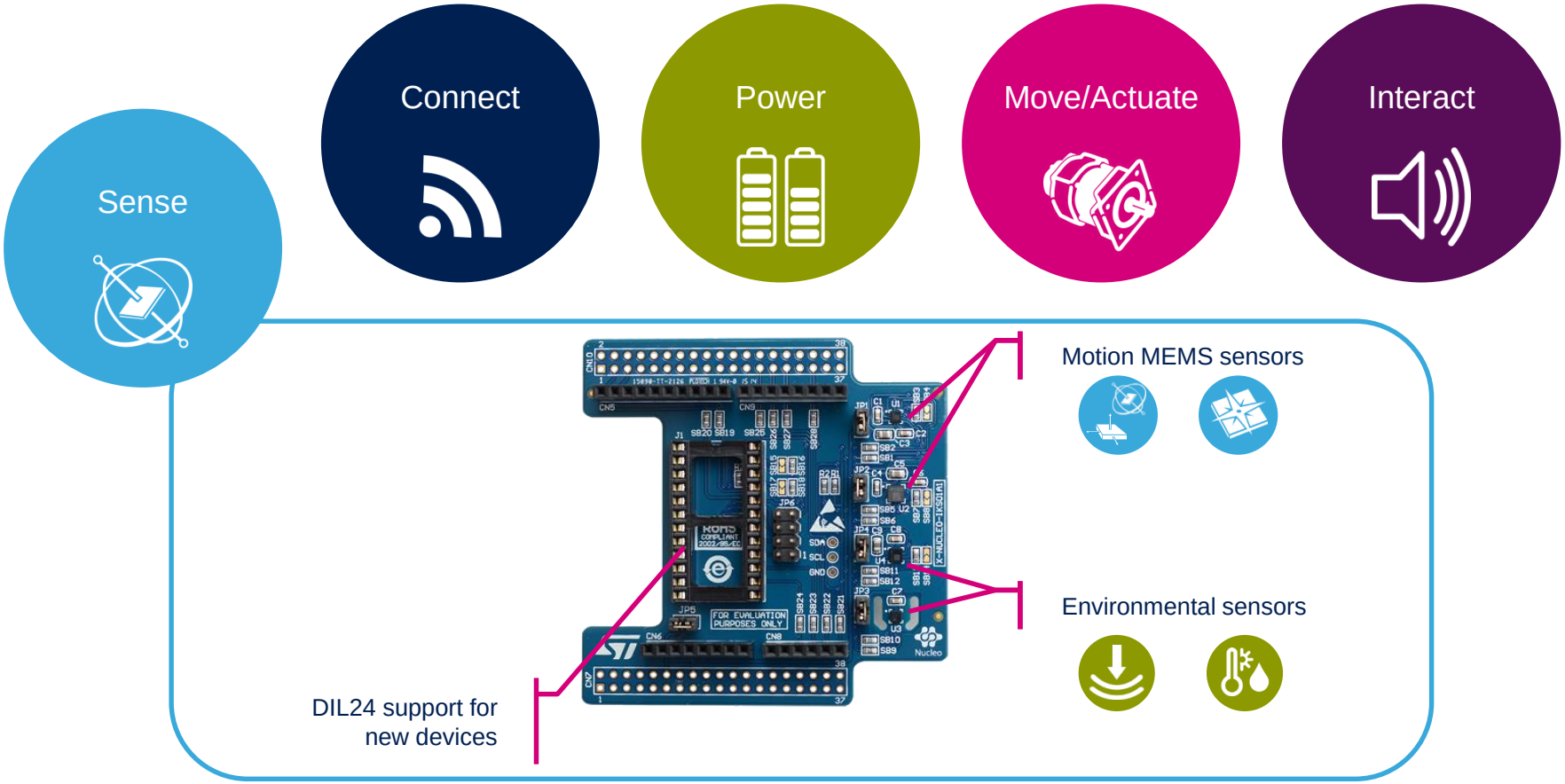
Expansion Boards (X-NUCLEO)

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



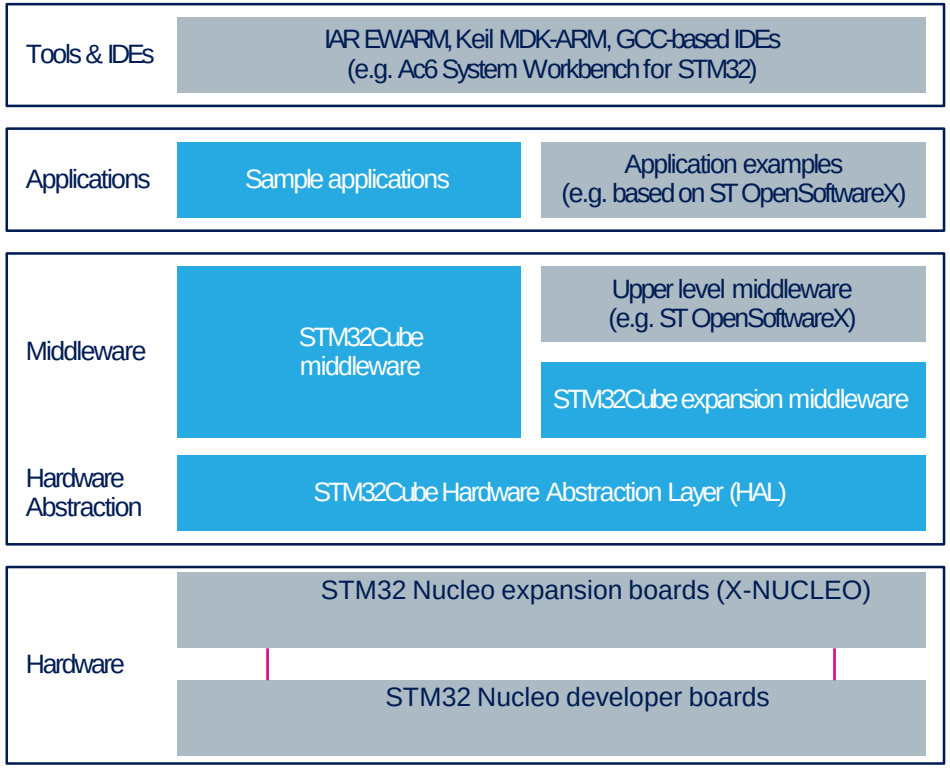
Example of STM32 expansion board (X-NUCLEO-IKS01A1)

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.

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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

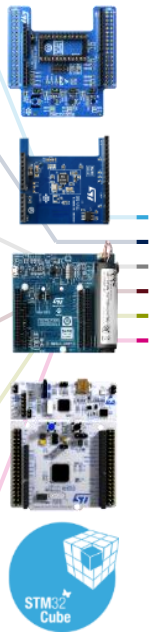
Energy management & battery

Power — POWER

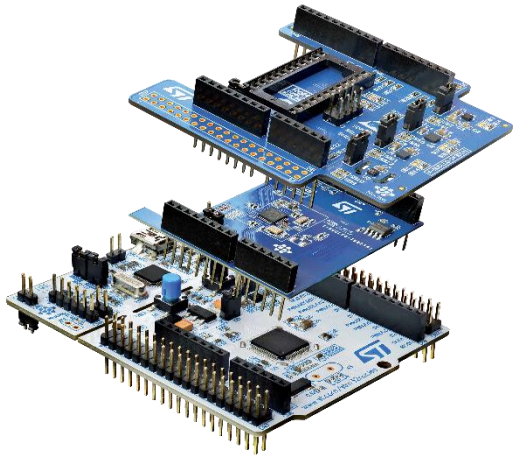
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



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