

Quick Start Guide

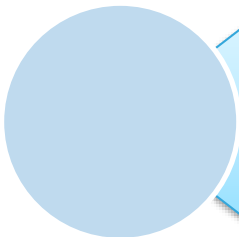
Analog MEMS microphone expansion board based on MP23ADS1 for
STM32 Nucleo
(X-NUCLEO-AMICAM1)



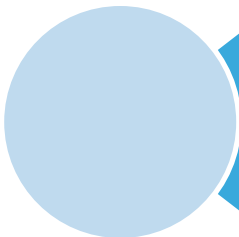
Version 1.0 (Jan 31, 2020)

Quick Start Guide Contents

2



X-NUCLEO-AMICAM1: Analog MEMS microphone expansion board
Hardware and Software overview



Setup & Demo Examples
Documents & Related Resources



STM32 Open Development Environment: Overview

Analog MEMS microphone expansion board (X-NUCLEO-AMICAM1)

Hardware Overview

3

Hardware Description

- The X-NUCLEO-AMICAM1 is an expansion board that has been designed around MP23ABS1 analog MEMS microphone and is compatible with the ST morpho connector layout and with analog microphone coupon boards (e.g., STEVAL-MIC004V1).
- The X-NUCLEO-AMICAM1 embeds three MP23ABS1 microphones: two connected to an external ADC and one directly routed to the STM32 embedded ADC.
- The analog amplification stage is achieved thanks to ST TSV91x wide bandwidth operational amplifiers.

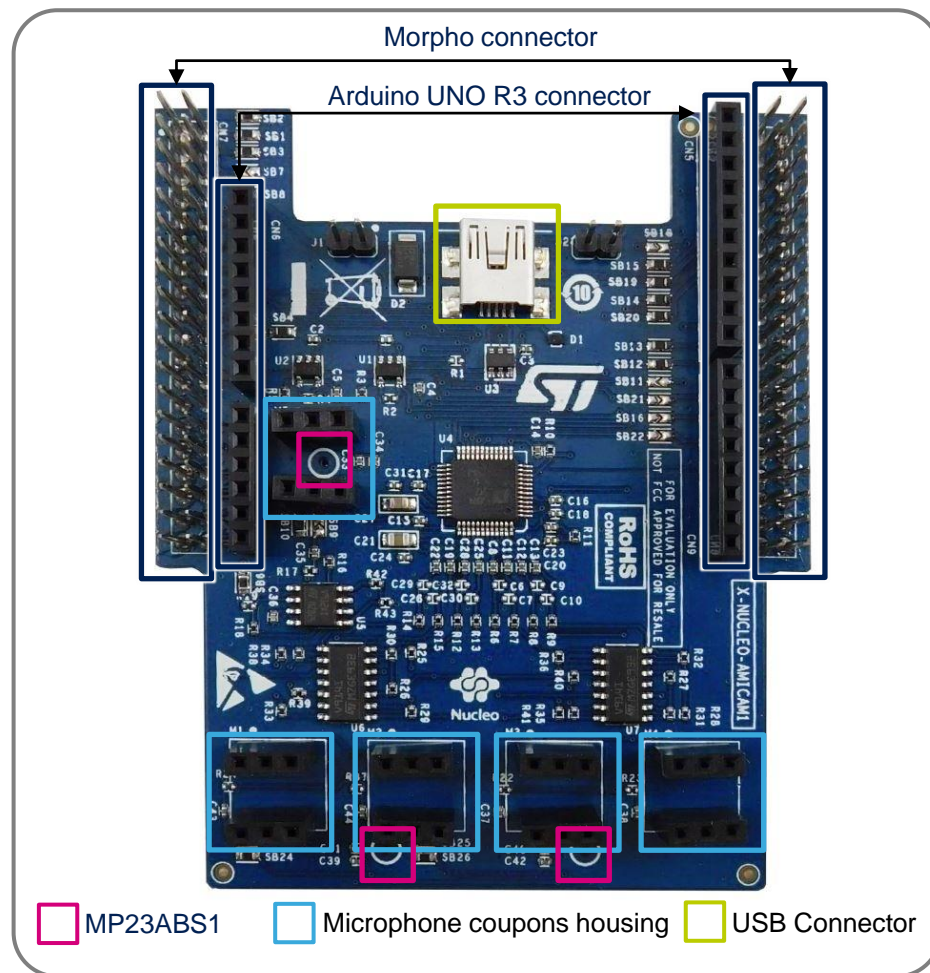
Key Products on board

MP23ABS1

High performance MEMS audio sensor single ended analog bottom-port microphone built with a capacitive sensing element and an IC interface.

TSV91x

Wide-bandwidth (8MHz) rail to rail input/output 5V CMOS Op-Amp



Latest info available at www.st.com
X-NUCLEO-AMICAM1

Analog MEMS microphone expansion board (X-NUCLEO-AMICAM1)

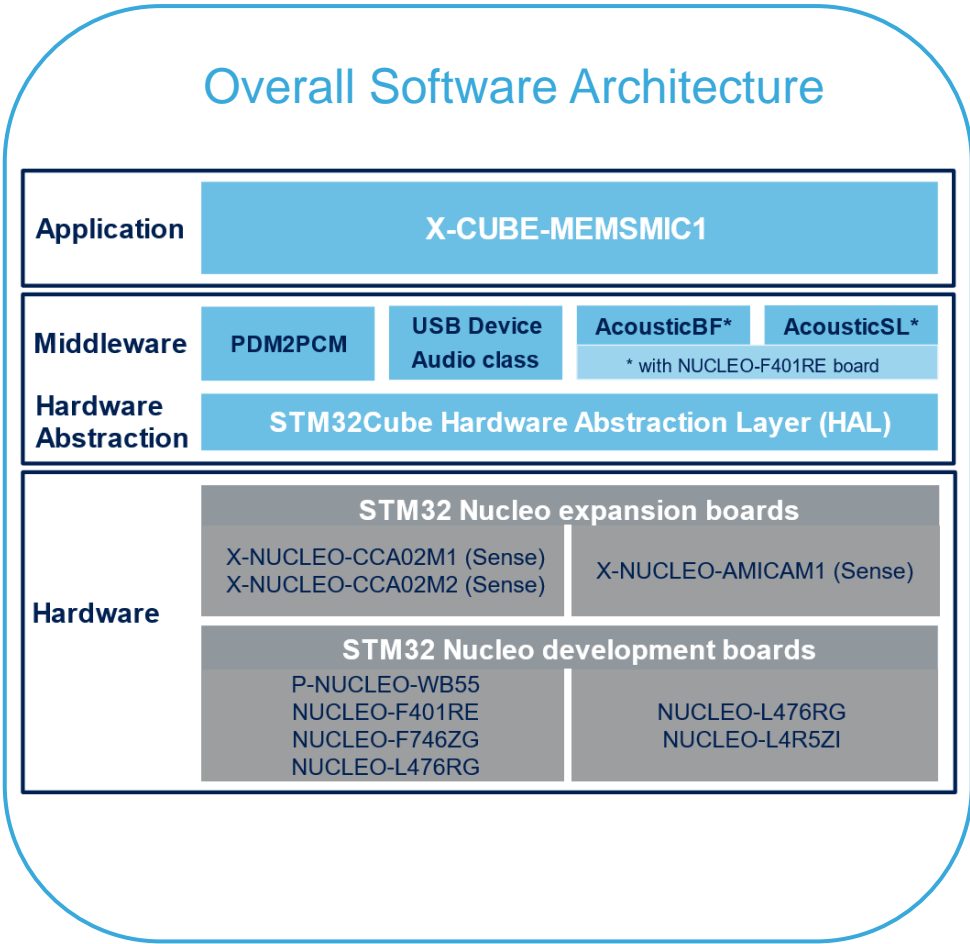
Software overview4

X-CUBE-MEMSMIC1 software description

- The X-CUBE-MEMSMIC1 software provides the complete STM32 middleware to build applications using analog and digital MEMS microphones. The software expands the STM32Cube range of solutions and is easily ported across different MCU families.
- Microphone acquisition sample implementation are available on the X-NUCLEO-AMICAM1 expansion board when connected to a NUCLEO-L476RG or NUCLEO-L4R5ZI development board

Key features

- Complete middleware to build applications using MEMS digital microphones (MP43DT06J) and analog microphones (MP23ABS1)
- Easy portability across different MCU families thanks to STM32Cube
- Audio input class USB driver to allow the recognition of the device as a standard USB microphone and enable audio streaming
- PC-based streaming using third-party standard audio editors
- Free, user-friendly license terms



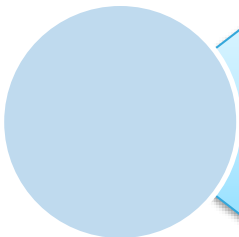
Latest info available at www.st.com
X-CUBE-MEMSMIC1

Quick Start Guide Contents

5



X-NUCLEO-AMICAM1: Analog MEMS microphone expansion board
Hardware and Software overview



Setup & Demo Examples
Documents & Related Resources



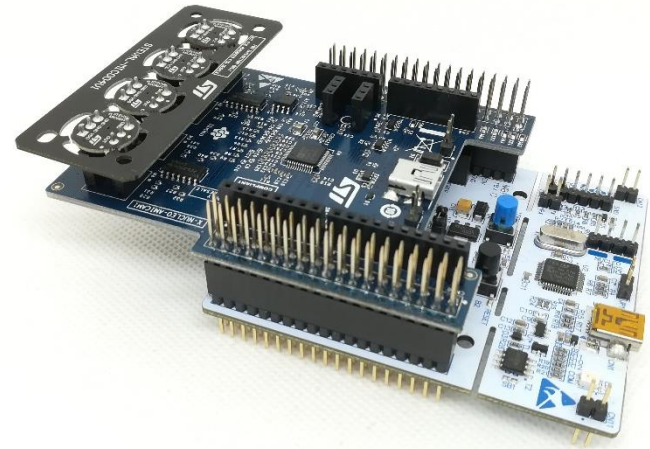
STM32 Open Development Environment: Overview

Setup & Demo Examples

HW prerequisites

6

- 1x Analog MEMS microphone expansion board (X-NUCLEO-AMICAM1)
- 1x STM32 Nucleo development board (NUCLEO-L476RG or NUCLEO-L4R5ZI)
- 1x USB type A to Mini-B USB cable to connect the X-NUCLEO-AMICAM1 to the PC for USB streaming
- Optional: microphone coupon board to allow acquisition of four microphones
 - Compatible with:
 - STEVAL-MIC004V1

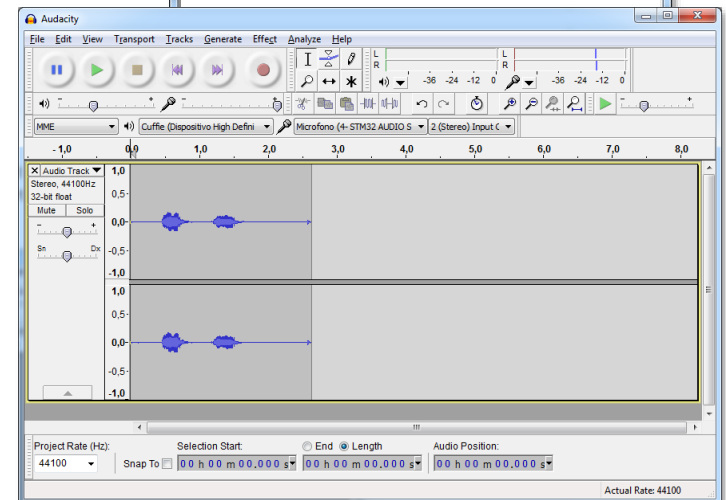
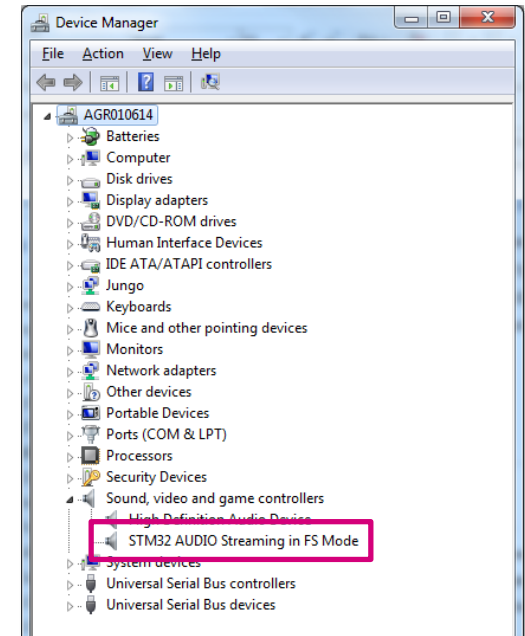


Setup & Demo Examples

SW prerequisites

7

- STSW-LINK008: ST-LINK/V2-1 USB driver
- STSW-LINK007: ST-LINK/V2-1 firmware upgrade
- X-CUBE-MEMSMIC1
 - The package contains source code example (Keil, IAR, STM32CubeIDE) based on NUCLEO-L476RG or NUCLEO-L4R5ZI performing audio acquisition and USB streaming
 - When the system is flashed and connected to the PC by means of the X-NUCLEO-AMICAM1 USB connector, it is recognized as a standard multichannel USB microphone
- Generic third-party software for audio acquisition
 - Audacity® is a free, open source, cross-platform software for recording and editing sounds. It can be a suitable choice to allow PC-based audio capture.
 - In Windows 7, the official version of Audacity can only record up to 2 microphone. In order to support more microphone on Windows seven you can have a look to the ASIO Audio interface.



Analog MEMS microphone expansion board (X-NUCLEO-AMICAM1)

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

8

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



2 Select
X-NUCLEO-AMICAM1



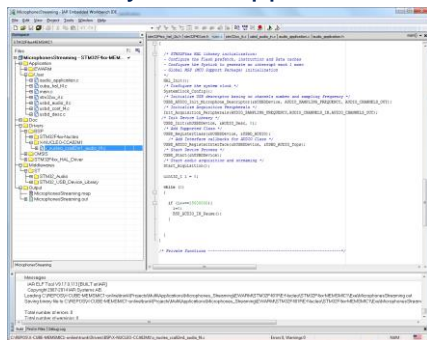
3
Download & unpack
X-CUBE-MEMSMIC1

X-CUBE-MEMSMIC1 package

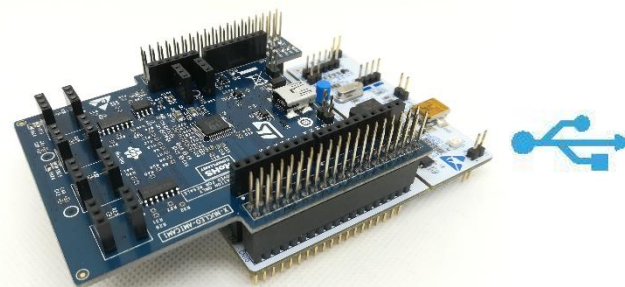
- _htmresc
- Documentation ← Nucleo & X-NUCLEO-AMICAM1 docs
- Drivers ← MEMS analog microphone BSP driver
- Middlewares ← USB Audio Class
- Projects ← Application example
- package.xml
- Release_Notes.html

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

6
Modify, build application



5
Open project example
Microphone Streaming

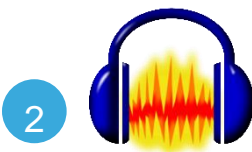
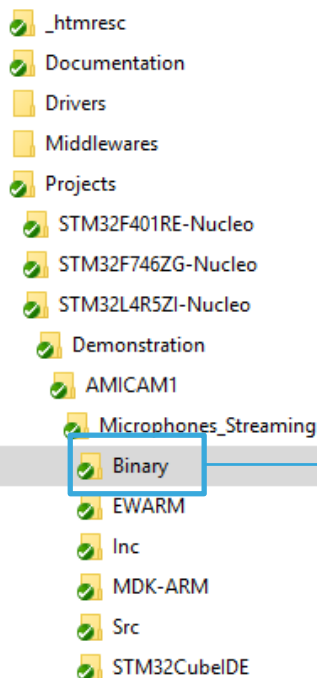


Analog MEMS microphone expansion board (X-NUCLEO-AMICAM1)

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

9

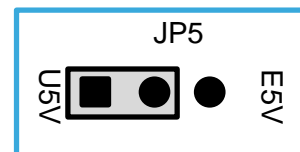
1 Download & install STM32 Nucleo [ST-LINK/V2-1 USB driver](#)



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

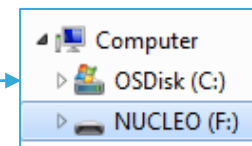


3 Move JP5 jumper on NUCLEO board on the U5V position



4 Connect USB cable to the STM32 Nucleo USB connector

5 From X-CUBE-MEMSMIC1 SW resource package
Drag and drop [Microphones_Streaming.bin](#) on Nucleo drive

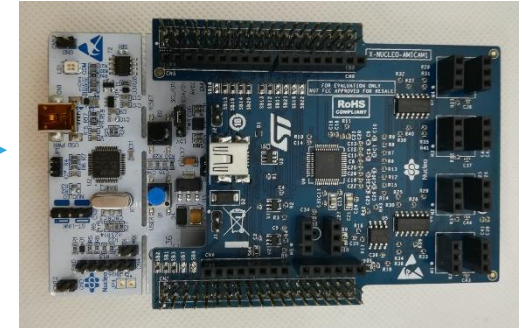
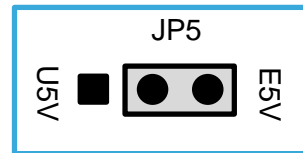


Analog MEMS microphone expansion board (X-NUCLEO-AMICAM1)

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

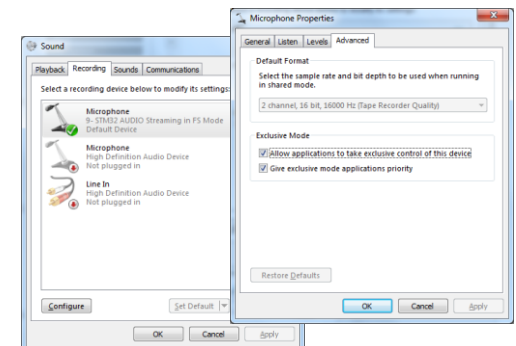
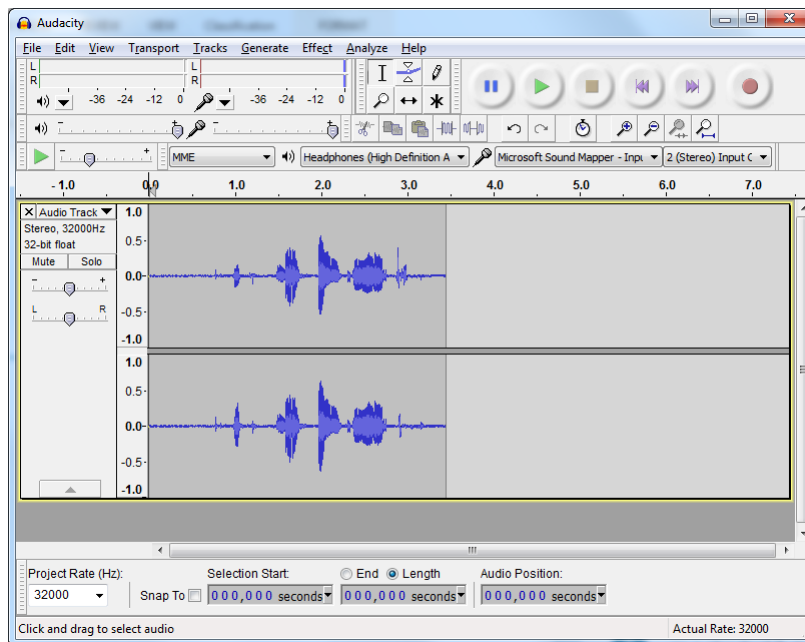
10

- 6 Move JP5 jumper on NUCLEO board on the E5V position



- 7 Connect USB cable to the X-NUCLEO-AMICAM1 USB connector and be sure that J1 on the same board is closed

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



Open Audacity and start recording

9

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

X-NUCLEO-AMICAM1:

- Gerber files, BOM, and schematics
- **DB4065:** Analog MEMS microphone expansion board based on MP23ABS1 for STM32 Nucleo – **Data brief**
- **UM2649:** Getting started with the X-NUCLEO-AMICAM1 analog MEMS microphone expansion board based on MP23ABS1 for STM32 Nucleo – **User Manual**

X-CUBE-MEMSMIC1:

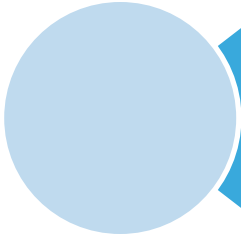
- **DB2599:** Analog and digital MEMS microphone acquisition and processing software expansion for STM32Cube – **Data brief**
- **UM1901:** Getting started with the software package for analog and digital MEMS microphones in X-CUBE-MEMSMIC1 expansion for STM32Cube – **User Manual**
- **Software setup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

Quick Start Guide Contents

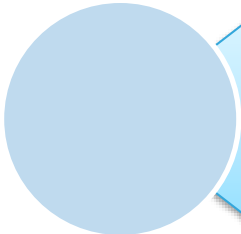
12



X-NUCLEO-AMICAM1: Analog MEMS microphone expansion board
Hardware and Software overview



Setup & Demo Examples
Documents & Related Resources



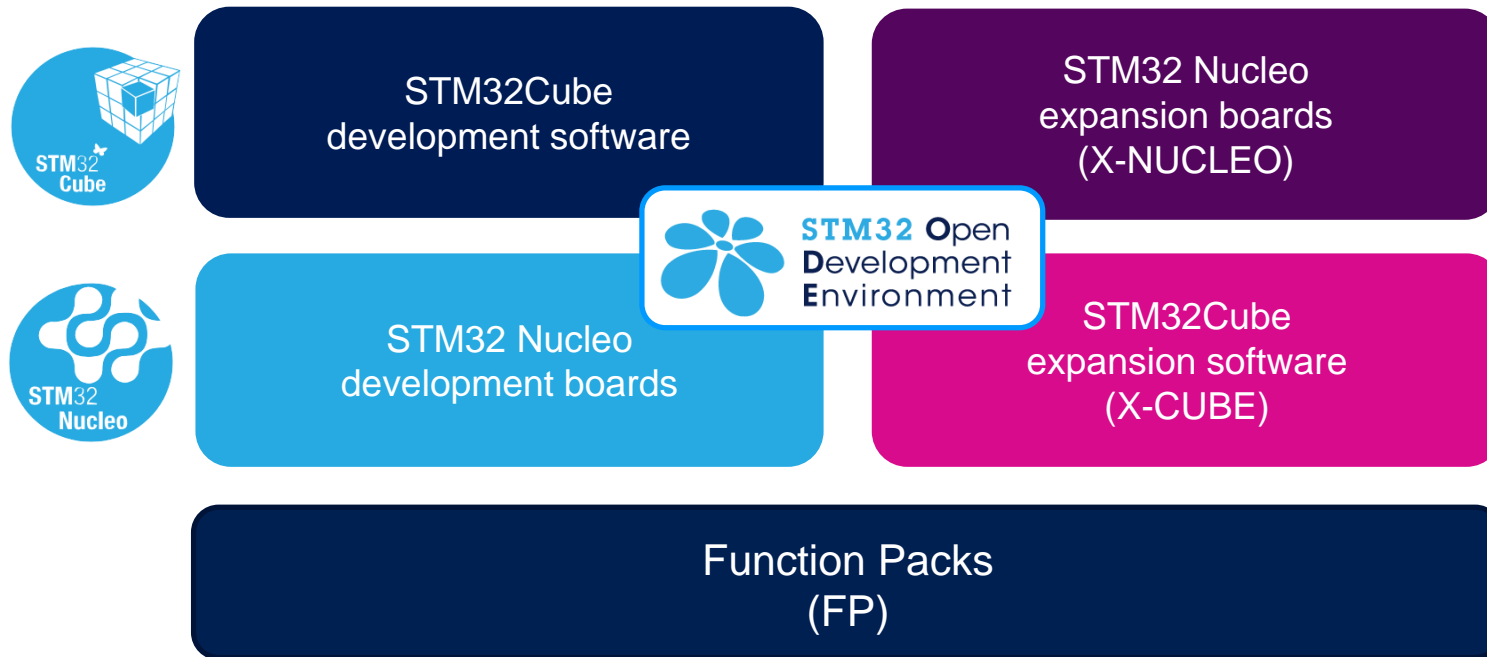
STM32 Open Development Environment: Overview

STM32 Open Development Environment

Fast, affordable Prototyping and Development

13

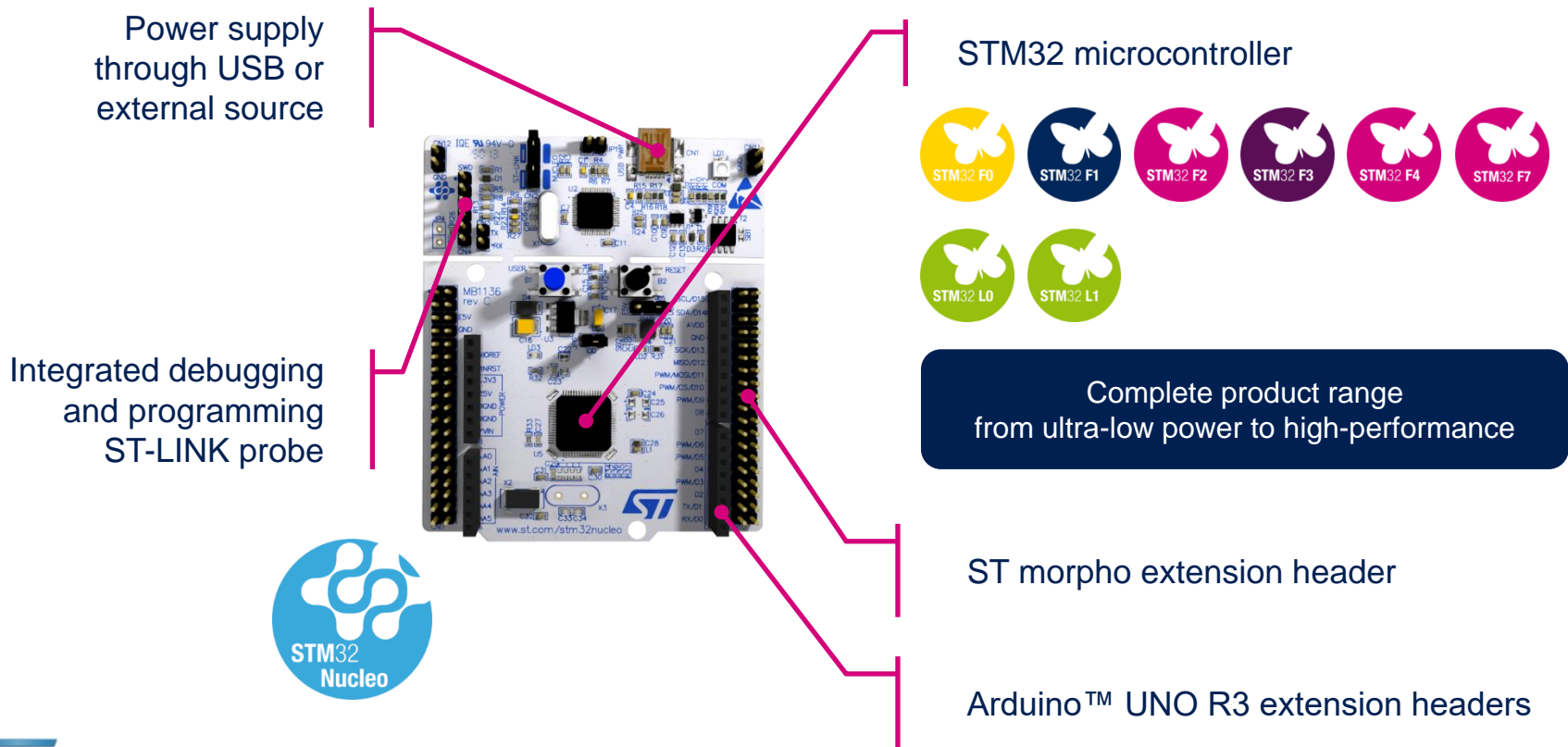
- The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.



STM32 Nucleo Development Boards (NUCLEO)

14

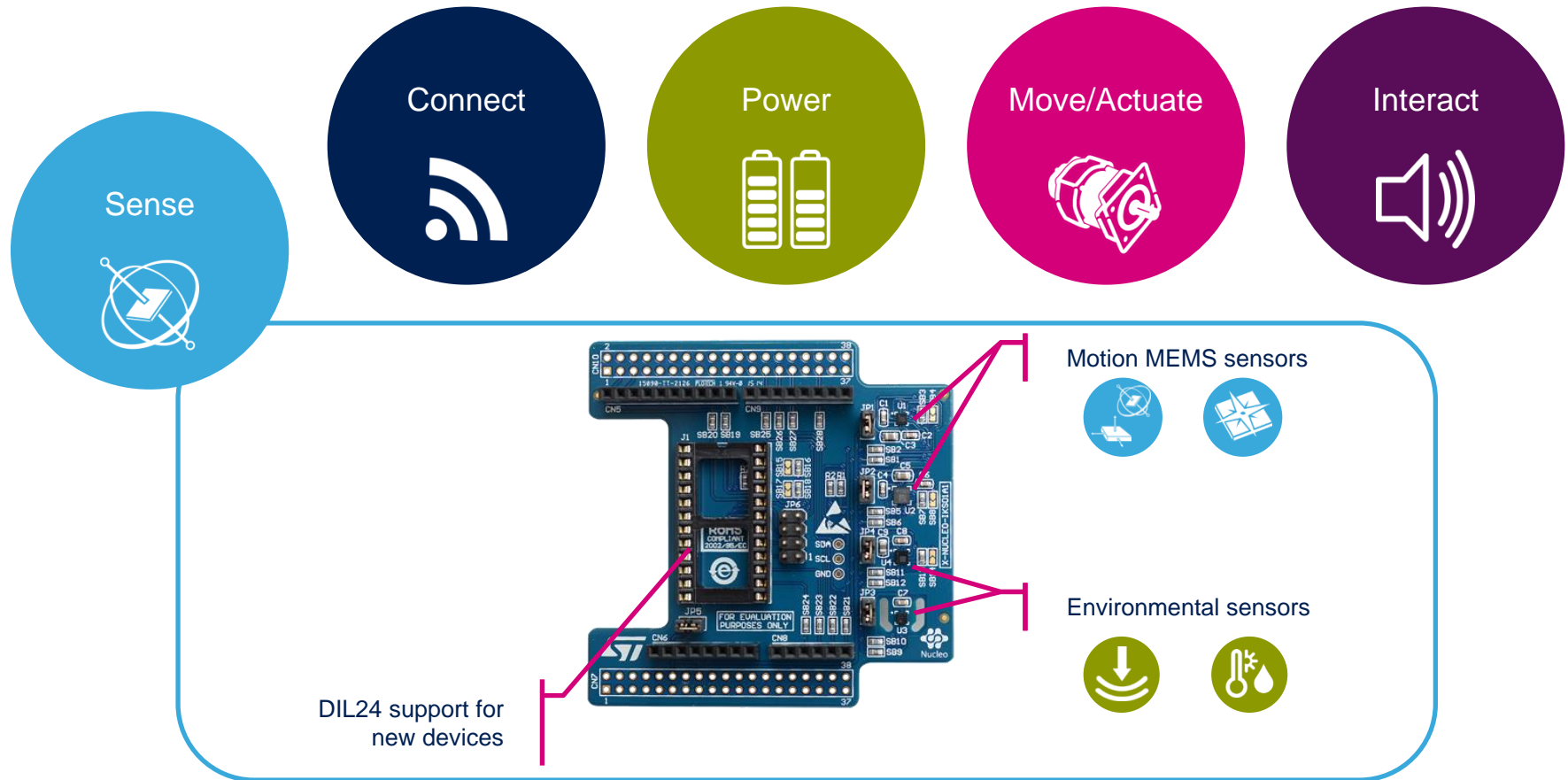
- A comprehensive range of affordable development boards for all the STM32 microcontroller series, with unlimited unified expansion capabilities and integrated debugger/programmer functionality.



STM32 Nucleo Expansion Boards (X-NUCLEO)

15

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



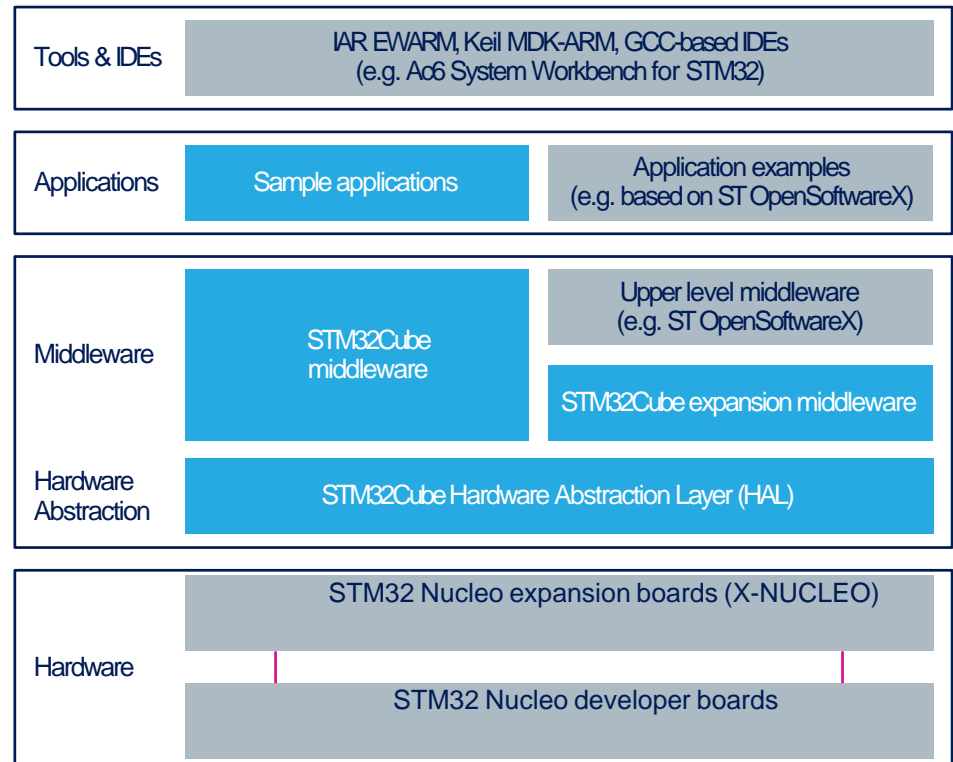
Example of STM32 expansion board (X-NUCLEO-1KS01A1)

STM32 Open Development Environment

Software components

16

- **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.

STM32 Open Development Environment

Building block approach

17

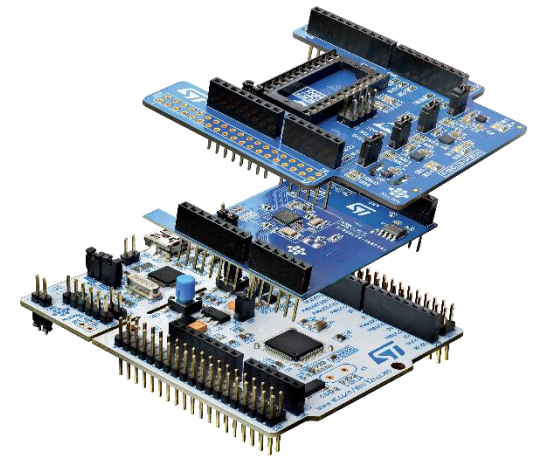
The building blocks

Your need

Our answer



 **STM32 Open Development Environment**



www.st.com/stm32code