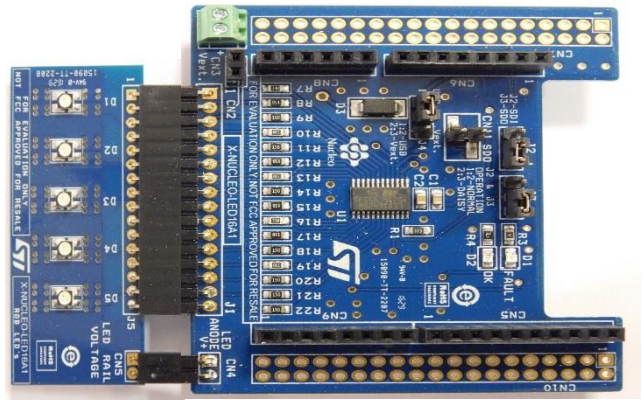
Quick Start Guide

16 Channels LED driver expansion board based on LED1642GW for STM32 Nucleo
(X-NUCLEO-LED16A1)



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Version 1.0.0 (Dec 06, 2016)

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X-NUCLEO-LED16A1: 16 Channels LED driver expansion board
Hardware and Software overview

Setup & Demo Examples
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STM32 Open Development Environment: Overview

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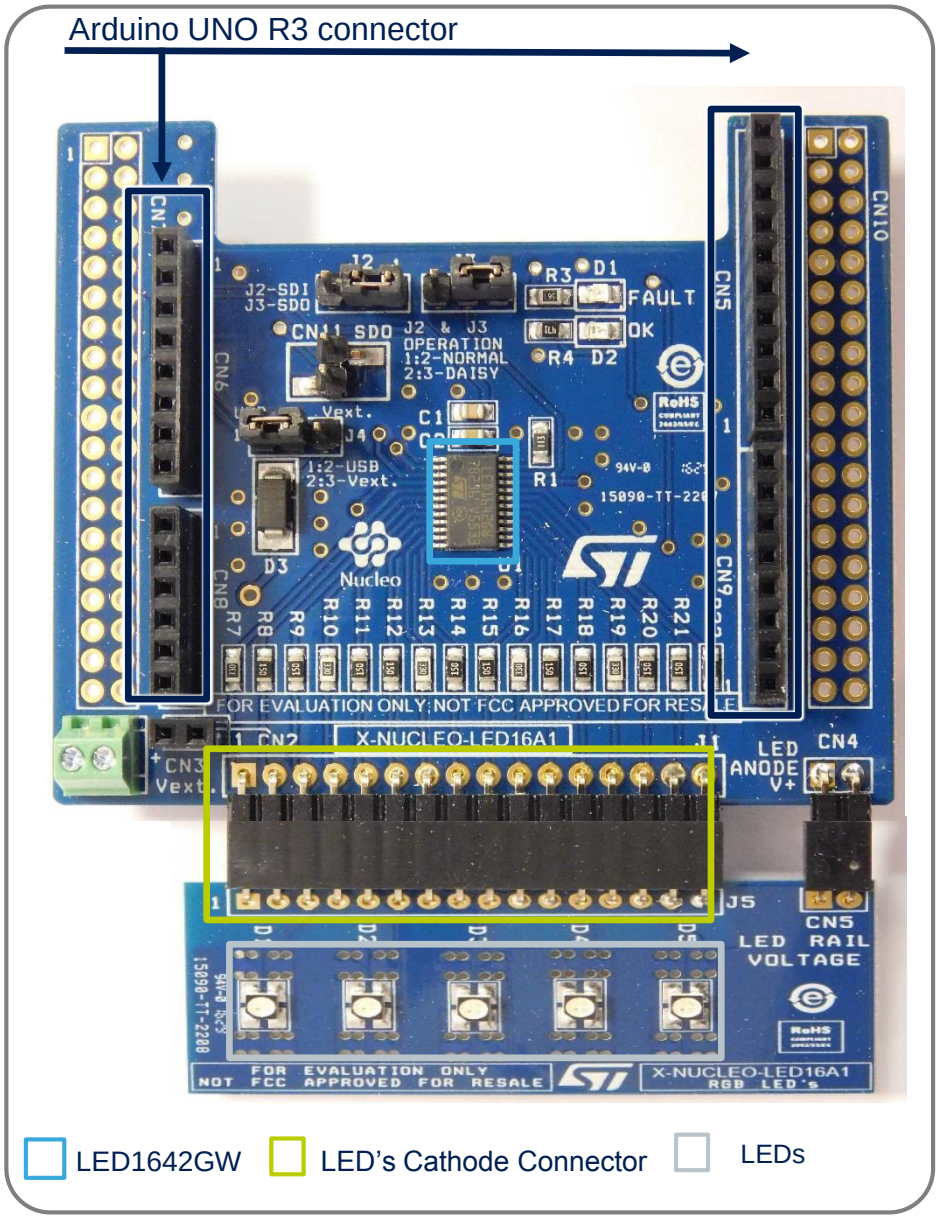
X-NUCLEO-LED16A1 Hardware Description

- The X-NUCLEO-LED16A1 is an STM32 Nucleo 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.
- Depending upon the end application, RGB or single color LEDs can be connected to the board. Separate brightness control is possible for each channel.
- It is compatible with the STM32 Nucleo board family and with the Arduino™ UNO R3 connector layout.

Key Products on board

LED1642GW
16 Channels LED driver with Error detection, Current Gain Control and 12/16 bit PWM Brightness control.



Latest info available at www.st.com
X-NUCLEO-LED16A1

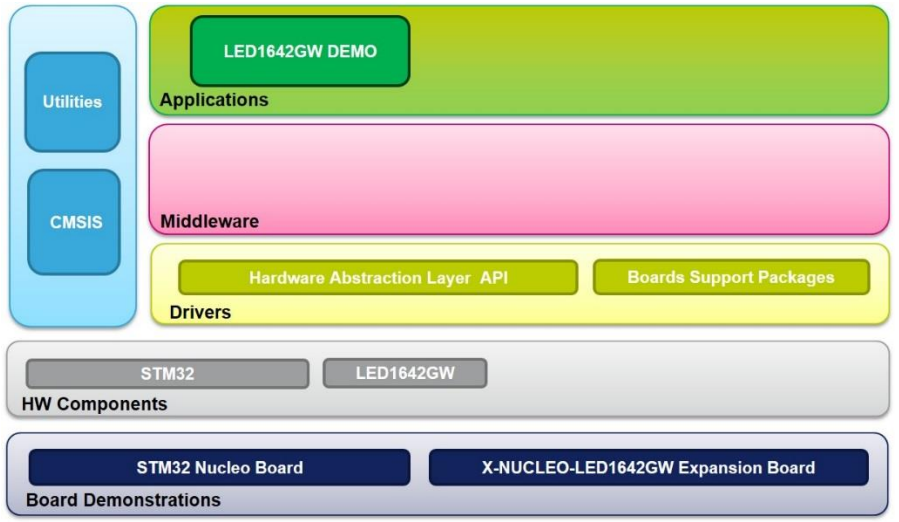
X-CUBE-LED1642 Software Description

- The X-CUBE-LED16A1 expansion software package for STM32Cube runs on the STM32 microcontroller with drivers and sample applications for the LED1642GW LED driver.
- An SPI interface facilitates communication between the STM32 Nucleo board and the XNUCLEO-LED16A1 expansion board. It is built on top of STM32Cube software technology that ease portability across different STM32 microcontrollers.
- The software includes sample driver implementations for the X-NUCLEO-LED16A1 expansion board on a NUCLEO-F401RE or NUCLEO-L053R8 development board.

Key features

- Complete middleware package to build applications using the LED1642GW LED driver on the X-NUCLEO-LED16A1 expansion board for STM32 Nucleo
- SPI interface between STM32 Nucleo and X-NUCLEO-LED16A1 expansion board
- Multiple stacking of X-NUCLEO-LED16A1 expansion boards allowed
- Easy portability across different MCU families, thanks to STM32Cube
- Free user-friendly license terms
- Sample implementations for X-NUCLEOLED16A1 expansion board(s) plugged on a NUCLEO-F401RE or NUCLEO-L053R8 development board

Overall Software Architecture



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X-CUBE-LED1642

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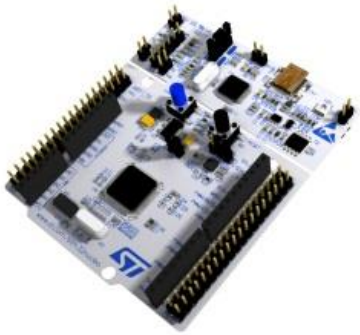
Setup & Demo Examples
HW prerequisites

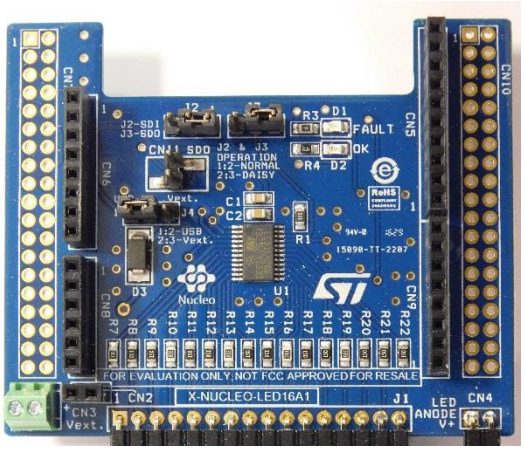
- 1x STM32 Nucleo development board (**NUCLEO-F401RE** or **NUCLEO-L053R8)**
- 1x 16 Channels LED Driver expansion board (**X-NUCLEO-LED16A1**)
- 1x LED string connected in parallel with anode shorted (**RGB LED's or 16 LED's**) *
- 1x Laptop/PC with Windows 8/7 installed
- 1x USB type A to Mini-B USB cable



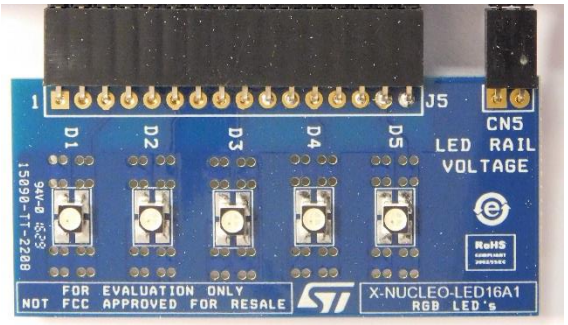
NUCLEO-F401RE
NUCLEO-L053R8



Mini USB Cable



X-NUCLEO-LED16A1



X-NUCLEO-LED16A1
RGB LEDs

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*** It is included in the X-NUCLEO-LED16A1**

SW prerequisites

- **STSW-LINK008**: ST-LINK/V2-1 USB driver
- **STSW-LINK007**: ST-LINK/V2-1 firmware upgrade
- **X-CUBE-LED1642**
  - Copy the .zip file content into a folder on your PC. The package will contain source code example (Keil, IAR, System Workbench) based only on **NUCLEO-F401RE** or **NUCLEO-L053R8**

16 Channels LED driver expansion board software

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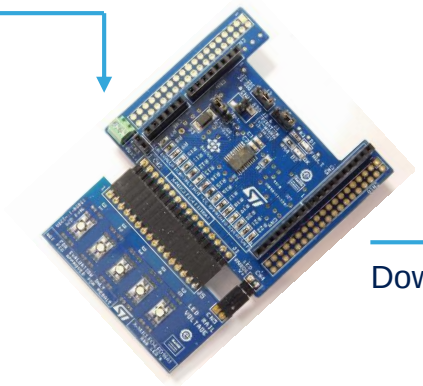
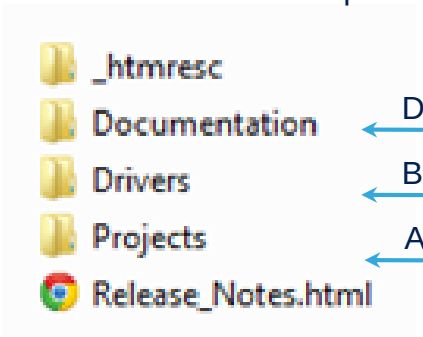
1 www.st.com/x-nucleo



2 Select X-CUBE-LED1642

3 Download & unpack

X-CUBE-LED1642 package structure



4 .\Projects\Multi\Examples\LED1642GW_Demo\EWARM\STM32F401RE-Nucleo

KEIL Tools by ARM
IAR SYSTEMS

5 Compile/Flash and Run the project



6



X-NUCLEO-LED16A1
Controls and Jumper setting

- **Push Button Controls:**
  - Pressing the **RESET** button on STM32 Nucleo development board triggers the initialization phase
  - Pressing the **USER** button the STM32 Nucleo development board will switch over to next demo
- **Jumper Setting:**
  - J4 – Jumper (USB Supply or External Voltage)

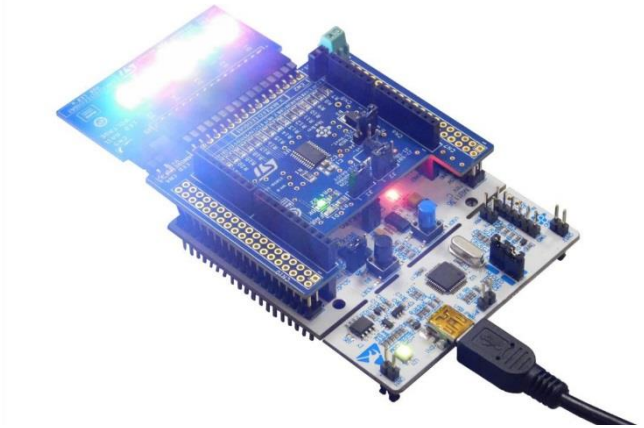
J4 (1 & 2)	USB Supply	USB Supply
J4 (2 & 3)	External Voltage	4. 8 – 5.2V

  - J2 – SPI SDI Selection

J2 (1 & 2)	SDI of LED1642GW is connected with MCU	
J2 (2 & 3)	SDI of LED1642GW is connected with SDO of adjacent below X-NUCLEO-LED16A1	DAISY CHAIN

  - J3 – SPI SDO Selection

J3 (1 & 2)	SDO of LED1642GW is connected with MCU	
J3 (2 & 3)	SDO of LED1642GW is connected with SDI of adjacent above X-NUCLEO-LED16A1	DAISY CHAIN



Documents & Related Resources

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

X-NUCLEO-LED16A1:

- Gerber files, BOM, Schematic
- **DB3044:** 16 Channels LED driver expansion board based on LED1642GW for STM32 Nucleo – **data brief**
- **UM2141:** Getting started with X-NUCLEO-LED16A1 16-channel LED driver expansion board for STM32 Nucleo – **user manual**

X-CUBE-LED1642:

- **DB3130:** 16 Channels LED driver software expansion for STM32Cube – **data brief**
- **UM2147:** Getting started with X-CUBE-LED1642 16 channel LED driver software expansion for STM32Cube – **user manual**
- Software setup file

X-NUCLEO-LED16A1 RGB LED's:

- Gerber files, BOM, Schematic

Consult www.st.com for the complete list

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STM32 Open Development Environment: Overview

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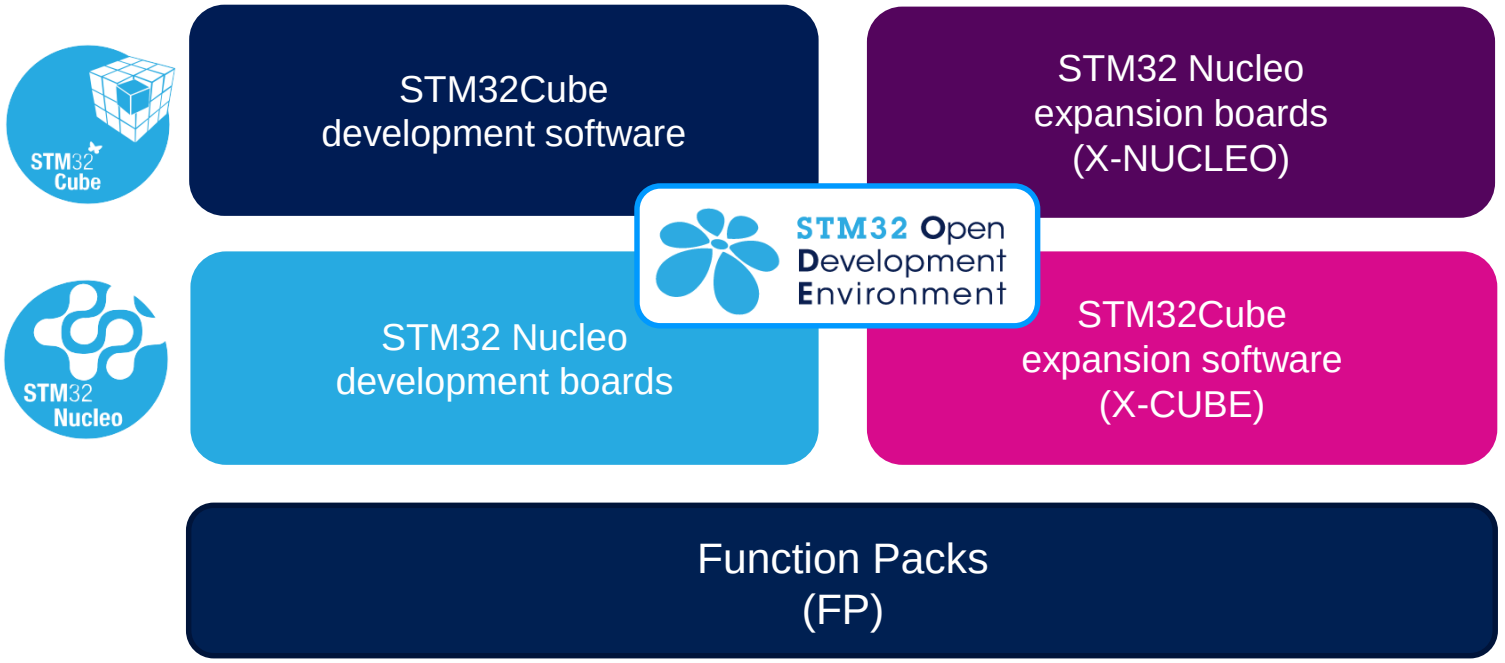
STM32 Open Development Environment
Fast, affordable Prototyping and Development

- 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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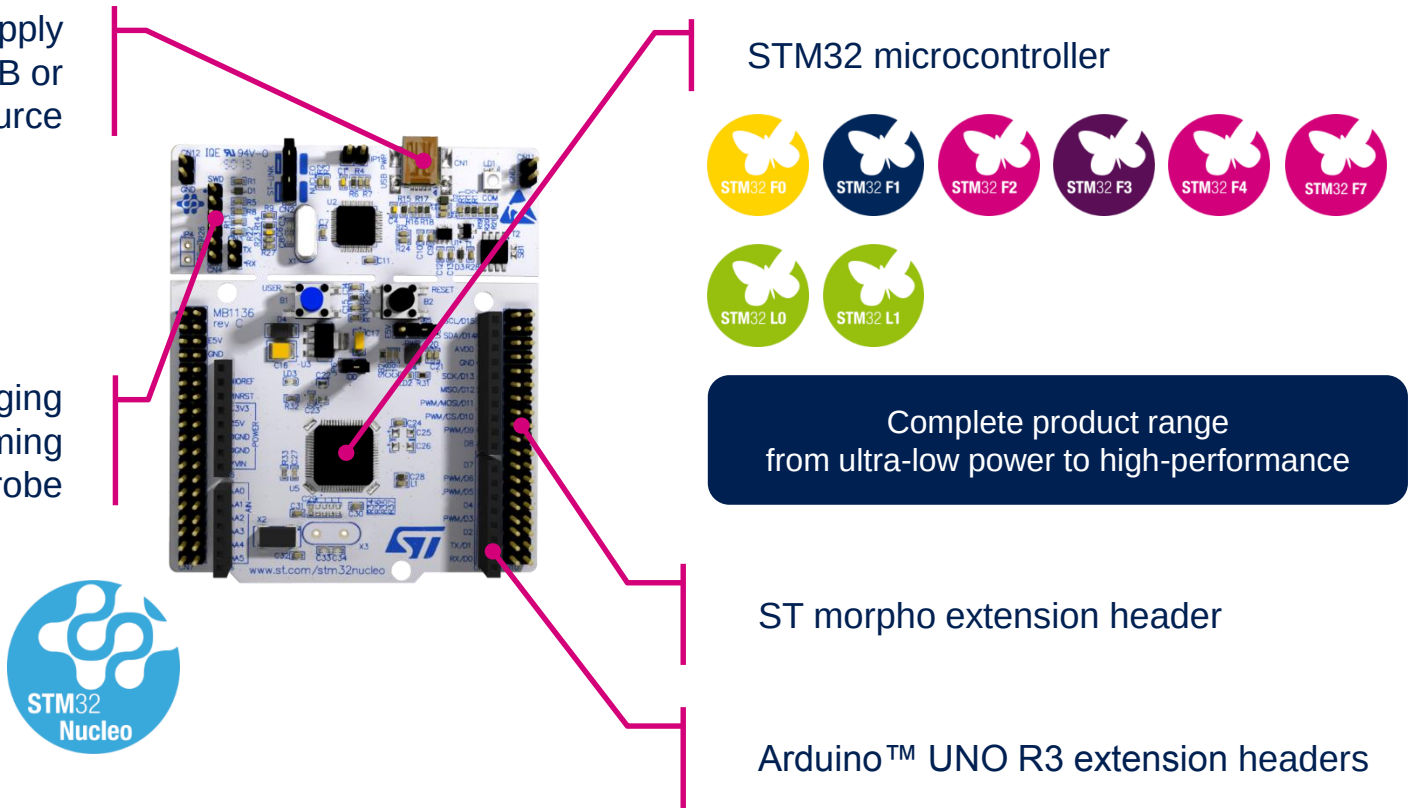
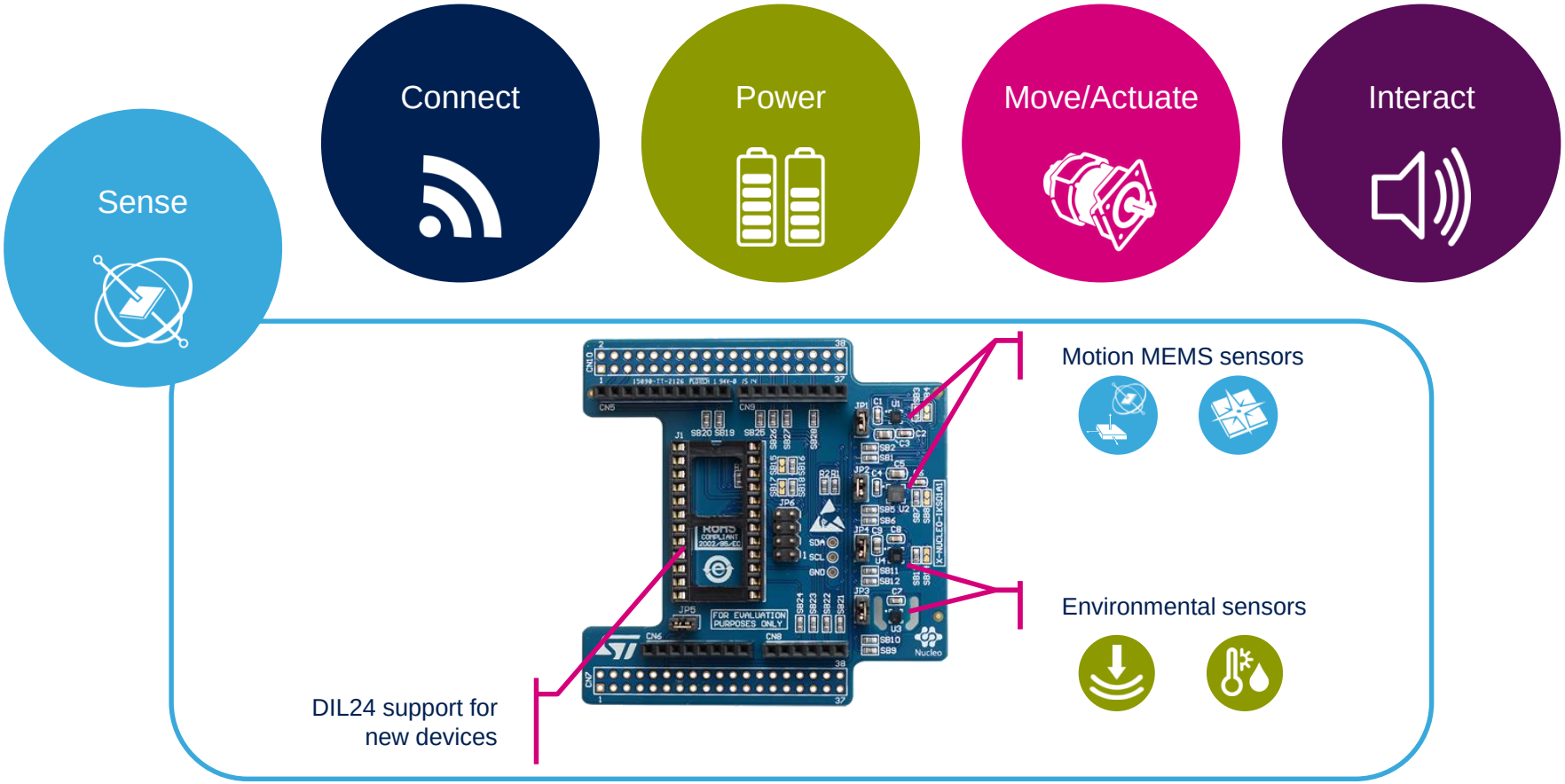
Development Boards (NUCLEO)

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



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.



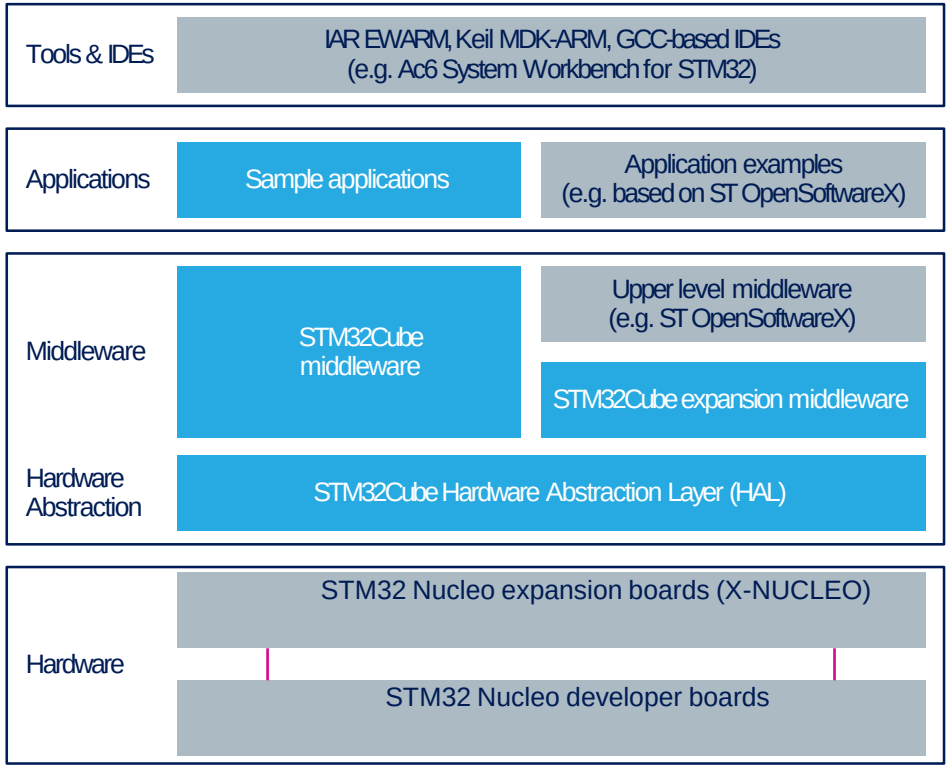
Example of STM32 expansion board (X-NUCLEO-IKS01A1)

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

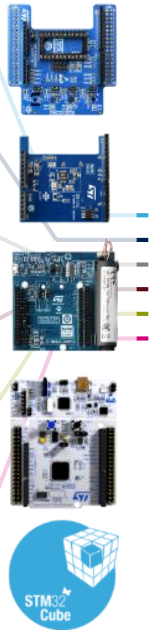
Energy management & battery

Power — POWER

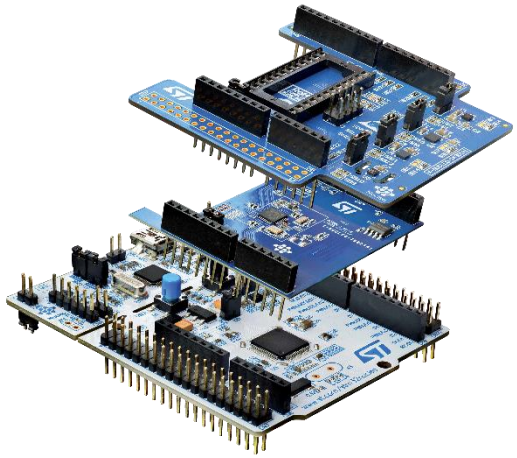
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



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