Quick Start Guide

Sub-1 GHz RF expansion board based on SPSGRF modules for STM32 Nucleo

X-NUCLEO-IDS01A4 (based on SPSGRF-868)

X-NUCLEO-IDS01A5 (based on SPSGRF-915)

life.augmented

Version 1.1.0 (Apr 28, 2016)

Quick Start Guide Contents

Sub-1 GHz RF expansion boards

Hardware overview

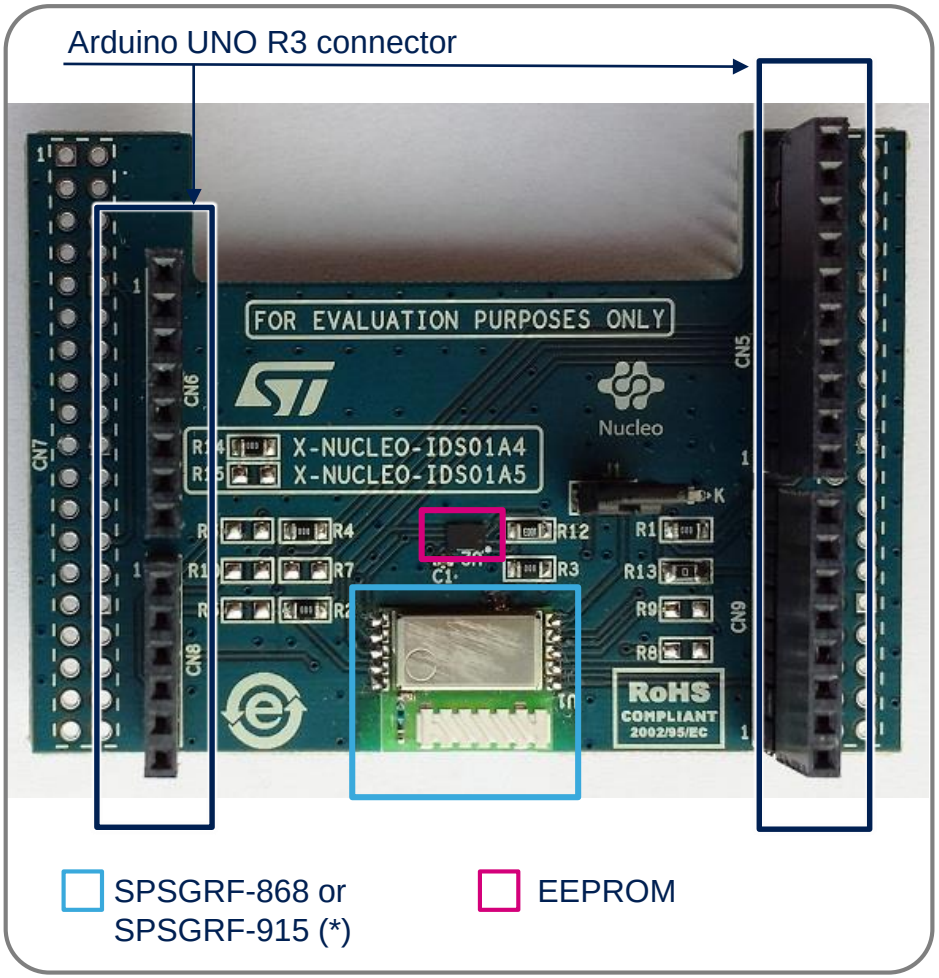
Hardware description

- The X-NUCLEO-IDS01A4, X-NUCLEO-IDS01A5 are evaluation boards based on the SPIRIT1 RF modules SPSGRF-868 and SPSGRF-915
- The SPIRIT1 module communicates with the STM32 Nucleo developer board host microcontroller though an SPI link available on the Arduino UNO R3 connector.

Key products on board

SPSGRF
SPIRIT1 (Low data-rate, low-power sub-1GHz transceiver) module

M95640-RMC6TG
64-Kbit serial SPI bus EEPROM



(*) Identification of the operating frequency of the X-NUCLEO-IDS01Ax (x=4 or 5) is performed through two resistors (R14 and R15).

Latest info available at www.st.com
X-NUCLEO-IDS01A4
X-NUCLEO-IDS01A5

life.augmented

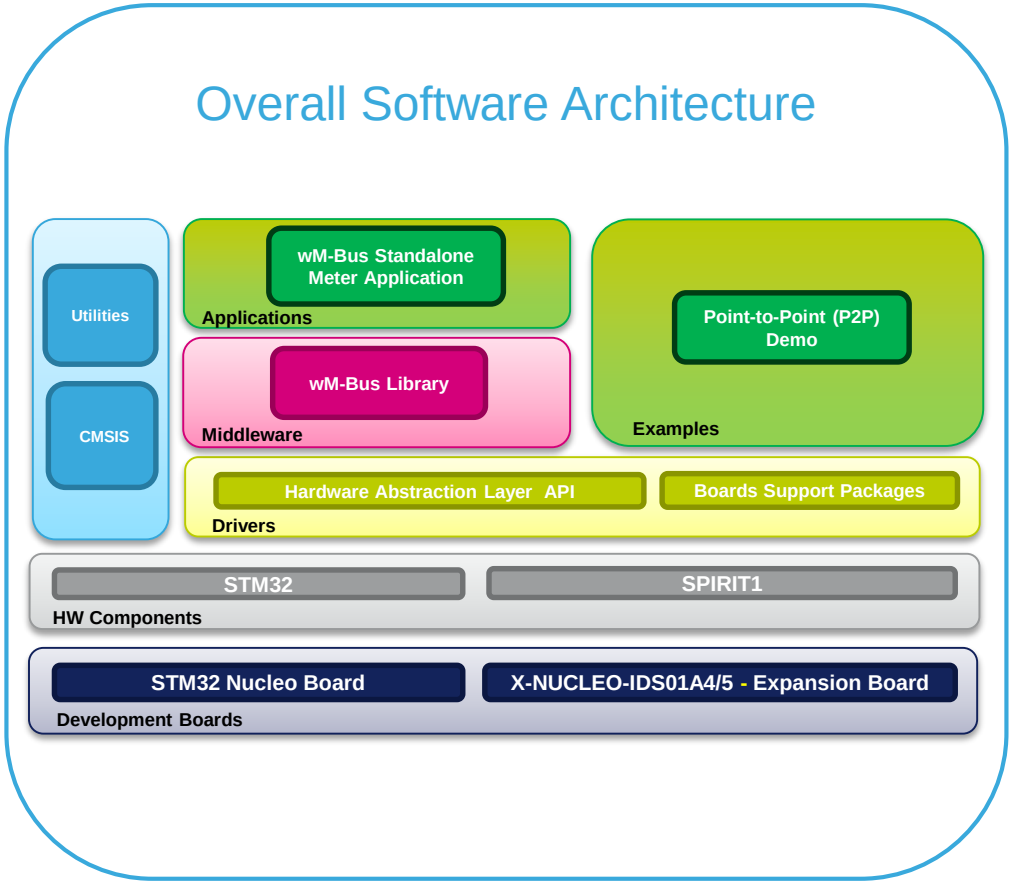
Sub-1 GHz RF expansion boards
Software overview

X-CUBE-SUBG1 software description

- X-CUBE-SUBG1 is an expansion software package for STM32Cube. It provides drivers running on the STM32 MCU for the SPIRIT1 device. It is built on top of the STM32Cube software technology, which eases portability across different STM32 microcontrollers.
- Implementation examples are available for the Sub-1 GHz RF expansion board (X-NUCLEO-IDS01A4, X-NUCLEO-IDS01A5) plugged on top of an STM32 Nucleo board (NUCLEO-F401RE or NUCLEO-L053R8 or NUCLEO-L152RE)

Key features

- Point-to-point communication firmware example to build applications using the SPIRIT1 device
- Middleware application example such as wM-Bus available for X-NUCLEO-IDS01A4 (868 MHz)
- wM-Bus physical and link library in binary format.
- Sample applications that the developer can use to start experimenting with the code
- Easy portability across different MCU families thanks to STM32Cube
- Free user-friendly license terms



Latest info available at www.st.com

X-CUBE-SUBG1

life.augmented

Quick Start Guide Contents

STM32 Nucleo Sub-1 GHz RF expansion boards
Hardware and Software overview

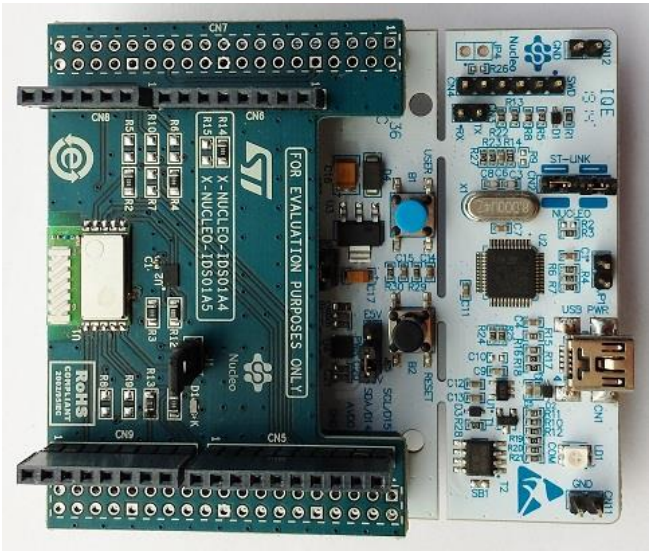
Setup & Demo Examples
Documents & Related Resources

STM32 Open Development Environment: Overview

life.augmented

Setup & demo examples
Hardware prerequisites

- STM32 Nucleo SPIRIT1 expansion board (**X-NUCLEO-IDS01A4**, **X-NUCLEO-IDS01A5**)
- STM32 Nucleo development board (**NUCLEO-F401RE**, **NUCLEO-L053R8**, **NUCLEO-L152RE**)
- For point-to-point demo: 2 sets of nodes X-NUCLEO-IDS01A4 and STM32 Nucleo (NUCLEO-F401RE or NUCLEO-L053R8 or NUCLEO-L152RE)
- Computer for running the graphical user interface of wM-Bus for testing the wM-Bus firmware example.
  - Only one set of STM32 Nucleo board (NUCLEO-F401RE or NUCLEO-L053R8 or NUCLEO-L152RE) with SPIRIT1 expansion board (X-NUCLEO-IDS01A4) is required
  - In the wM-Bus demo, the node acts as “meter”
  - For the Concentrator device, any of the STEVAL boards listed in the enclosed table can be used
  - The concentrator firmware is available in SPIRIT1 SDK STSW-CONNECT009



Demo board	wM-Bus device type
STEVAL- IKR002V*	meter / concentrator
STEVAL- IDS001V*	concentrator
STEVAL- IKR001V*	meter / concentrator
X-NUCLEO-IDS01A4	meter

* Used as a wildcard character for related part number

Setup & demo examples

Software prerequisites

- **STSW-LINK008**
  - ST-LINK/V2-1 USB driver
- **STSW-LINK007**
  - ST-LINK/V2-1 firmware upgrade
- **X-CUBE-SUBG1**
  - Copy the .zip file content into a folder on your PC. The package contains source code examples (Keil, IAR, SW4STM32) based on NUCLEO-F401RE, NUCLEO-L053R8, or NUCLEO-L152RE

Sub-1 GHz RF expansion boards

Start coding in just a few minutes with X-CUBE-SUBG1

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

life.augmented

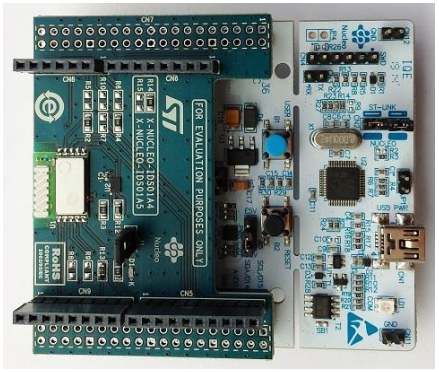
2 Select
X-NUCLEO-IDS01A4,
X-NUCLEO-IDS01A5

3 Download & unpack
X-CUBE-SUBG1

X-CUBE-SUBG1 package

- _htmresc
- Documentation ← **Generic Nucleo docs & SPIRIT1 porting**
- Drivers ← SPIRIT1 SPI driver
- Middlewares ← wM-Bus middleware stack
- Projects ← **Application examples**
- package.xml
- Release_Notes.html

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



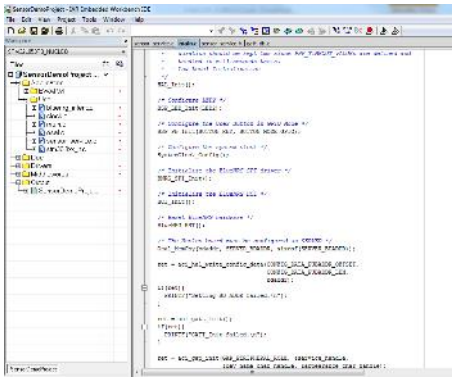
5 Open project example
P2P Demo
or
wMbusStandalone

KEIL™ Tools by ARM

IAR SYSTEMS

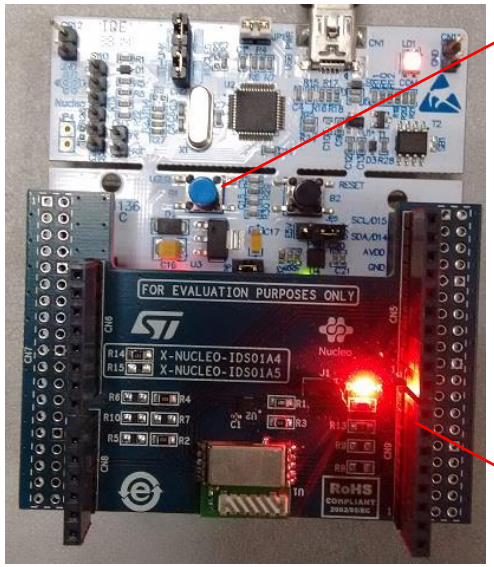
Open STM32 Tools

6 Modify and build application

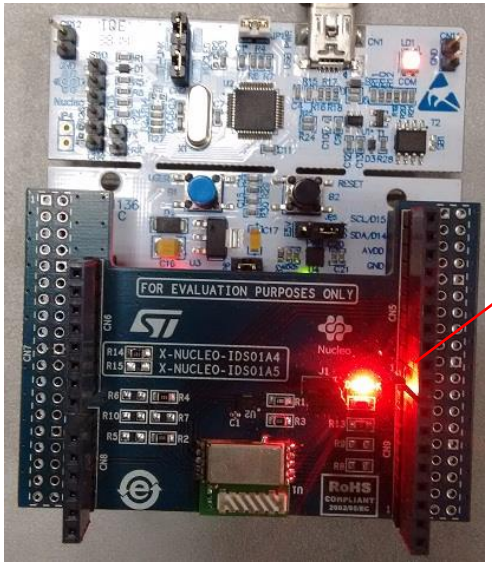


Sub-1 GHz RF expansion boards

Point-to-point demo application



1. User presses button
2. The node sends the command to the other node
3. The LED blinks on the Receiving node
4. Acknowledgement of command
5. The LED blinks when ACK is received



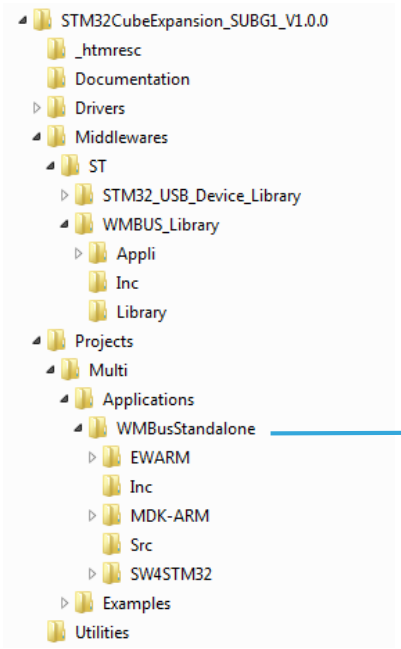
Press the User button on the STM32 Nucleo	→	LED blinks
LED blinks	←	ACK sent

LED blinks	←	Press User Switch B1 on STM32 Nucleo
ACK sent	→	LED blinks

life.augmented

Sub-1 GHz RF expansion boards

Evaluate SPIRIT1 using a GUI



1

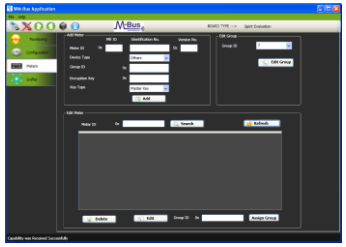
Program the wM-Bus firmware to
STM32 Nucleo equipped with X-NUCLEO-IDS01A4

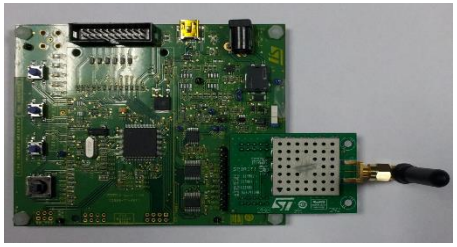
2

Program the concentrator firmware on one of the boards suggested for running the concentrator firmware (see the hardware pre-requisites slide)

Run the wM-Bus graphical user interface
on a PC connected to STEVAL-IKR001Vx

3





Concentrator

Meter

life.augmented

Documents & related resources

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

X-NUCLEO-IDS01A4:

- Gerber files, BOM, and schematics
- **DB2552**: Sub-1 GHz RF expansion board based on the SPSGRF-868 module for STM32 Nucleo - **Databrief**
- **UM1872**: Getting started with the Sub-1 GHz expansion board based on the SPSGRF-868 and SPSGRF-915 modules for STM32 – **User Manual**

X-NUCLEO-IDS01A5:

- Gerber files, BOM, and schematics
- **DB2553**: Sub-1 GHz RF expansion board based on the SPSGRF-915 module for STM32 Nucleo - **Databrief**
- **UM1872**: Getting started with the Sub-1 GHz expansion board based on the SPSGRF-868 and SPSGRF-915 modules for STM32 – **User Manual**

X-CUBE-SUBG1:

- **DB2556**: Sub-1 GHz RF communication software expansion for STM32Cube - **Databrief**
- **UM1892**: Getting started with the X-CUBE-SUBG1 for wM-BUS communications based on Sub-1 GHz RF STM32 expansion board – **User manual**
- **UM1904**: Getting started with the software package for Point-to-Point communications using SPIRIT1 sub-1GHz modules in X-CUBE-SUBG1, Expansion for STM32Cube – **User manual**
- Software setup file

Consult www.st.com for the complete list

Quick Start Guide Contents

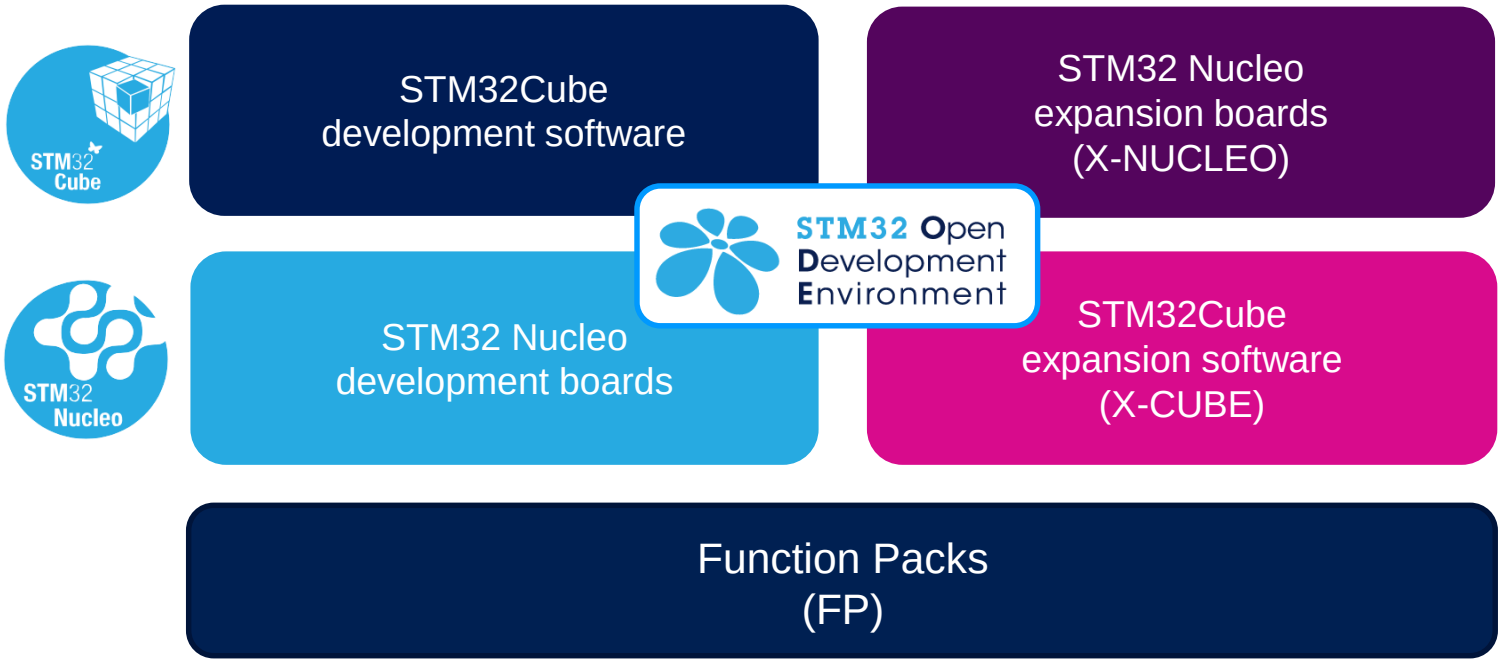
STM32 Nucleo Sub-1 GHz RF expansion boards
Hardware and Software overview

Setup & Demo Examples
Documents & Related Resources

STM32 Open Development Environment: Overview

STM32 Open Development Environment
Fast, affordable Prototyping and Development

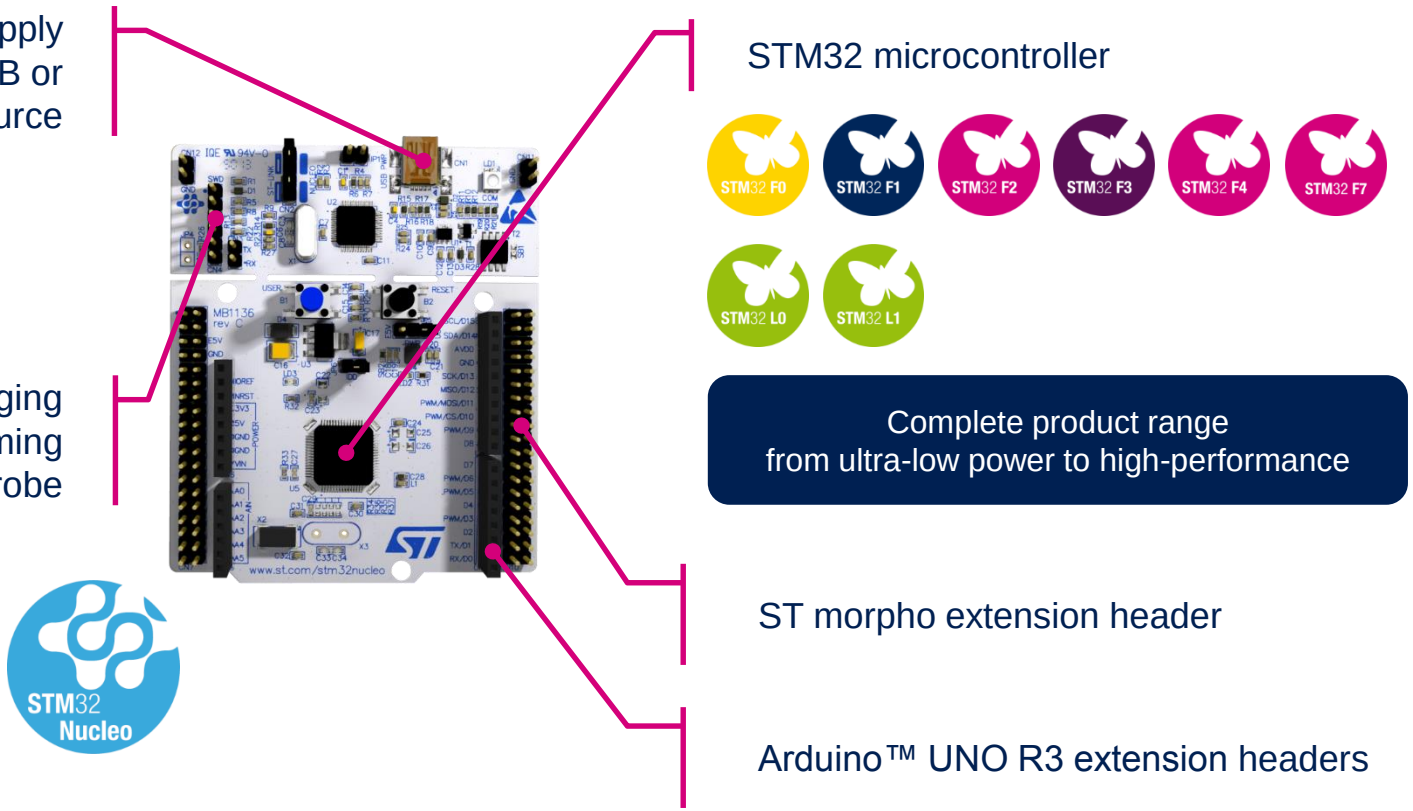
- The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.



www.st.com/stm32ode

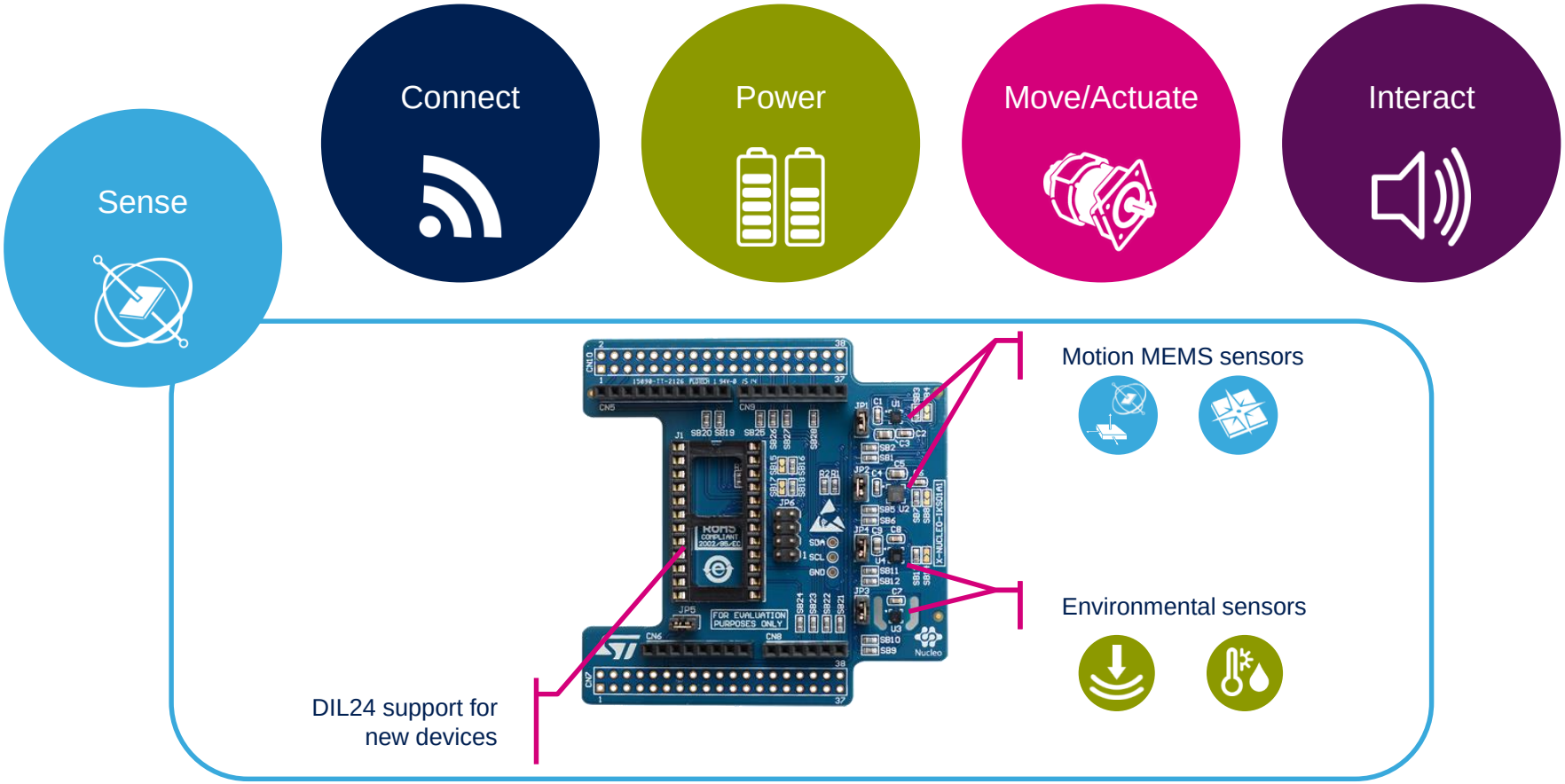
Development Boards (NUCLEO)

- 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.



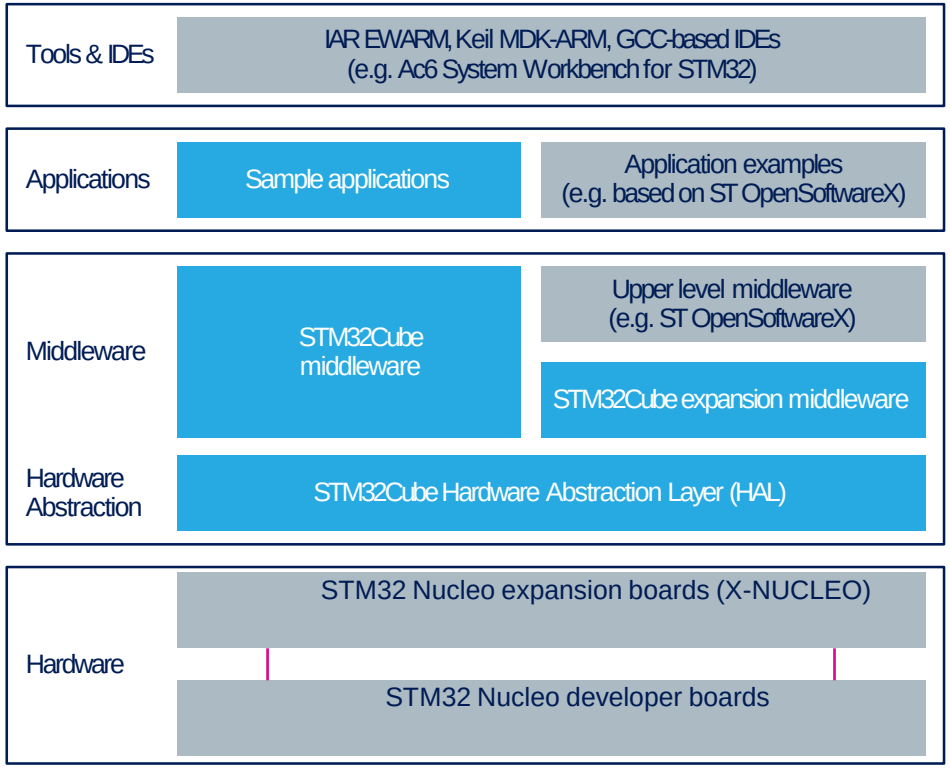
Example of STM32 expansion board (X-NUCLEO-IKS01A1)

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.

life.augmented

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

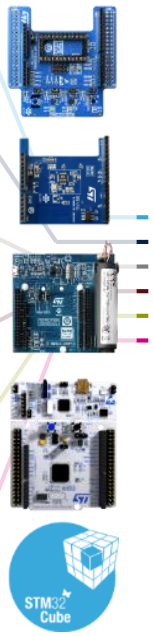
Energy management & battery

Power — POWER

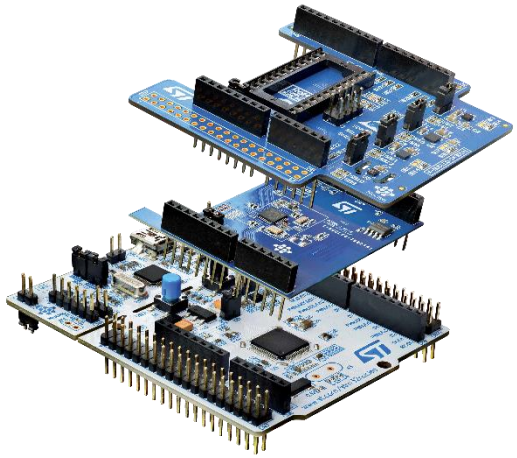
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



www.st.com/stm32ode

life.augmented