Quick Start Guide

Bluetooth Low Energy expansion board based on SPBTLE-RF module for STM32 Nucleo (X-NUCLEO-IDB05A1)

Version 1.6 (Mar 25, 2019)

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Quick Start Guide Contents

Bluetooth Low Energy Expansion Board (X-NUCLEO-IDB05A1)

Hardware Overview

Hardware Description

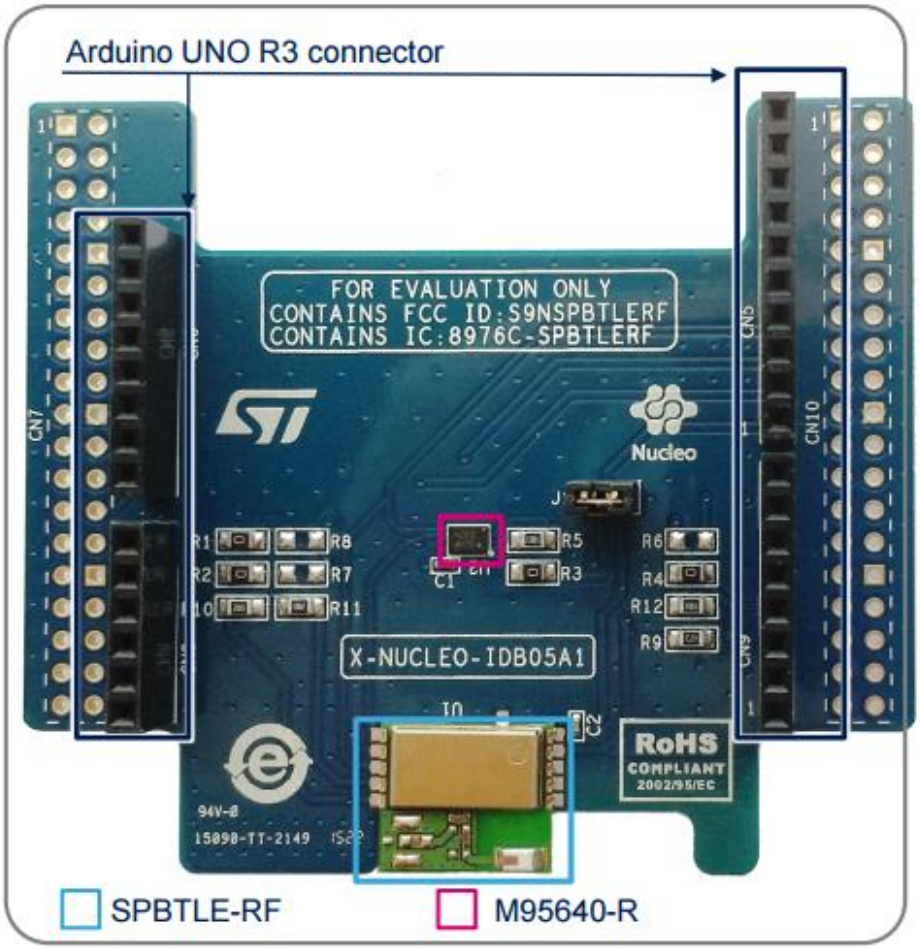
- The X-NUCLEO-IDB05A1 is a Bluetooth Low Energy (BLE) evaluation and development board system, designed around ST's SPBTLE-RF Bluetooth Low Energy module based on BlueNRG-MS.
- The BlueNRG-MS processor hosted in the SPBTLE-RF module communicates with the STM32 Nucleo developer board host microcontroller though an SPI link available on the Arduino UNO R3 connector.

Key Products on board

SPBTLE-RF
Bluetooth Low Energy, FCC and IC certified, module based on Bluetooth® Low Energy wireless network processor BlueNRG-MS, BLE4.2 compliant.

SPBTLE-RF integrates a BALF-NRG-01D3 balun and a chip antenna. It embeds 32 MHz and 32.768 kHz crystal oscillators for the BlueNRG-MS.

M95640-R
64-Kbit serial SPI bus EEPROM with high-speed clock interface



Latest info available at www.st.com
X-NUCLEO-IDB05A1

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Bluetooth Low Energy Expansion Board (X-NUCLEO-IDB05A1)

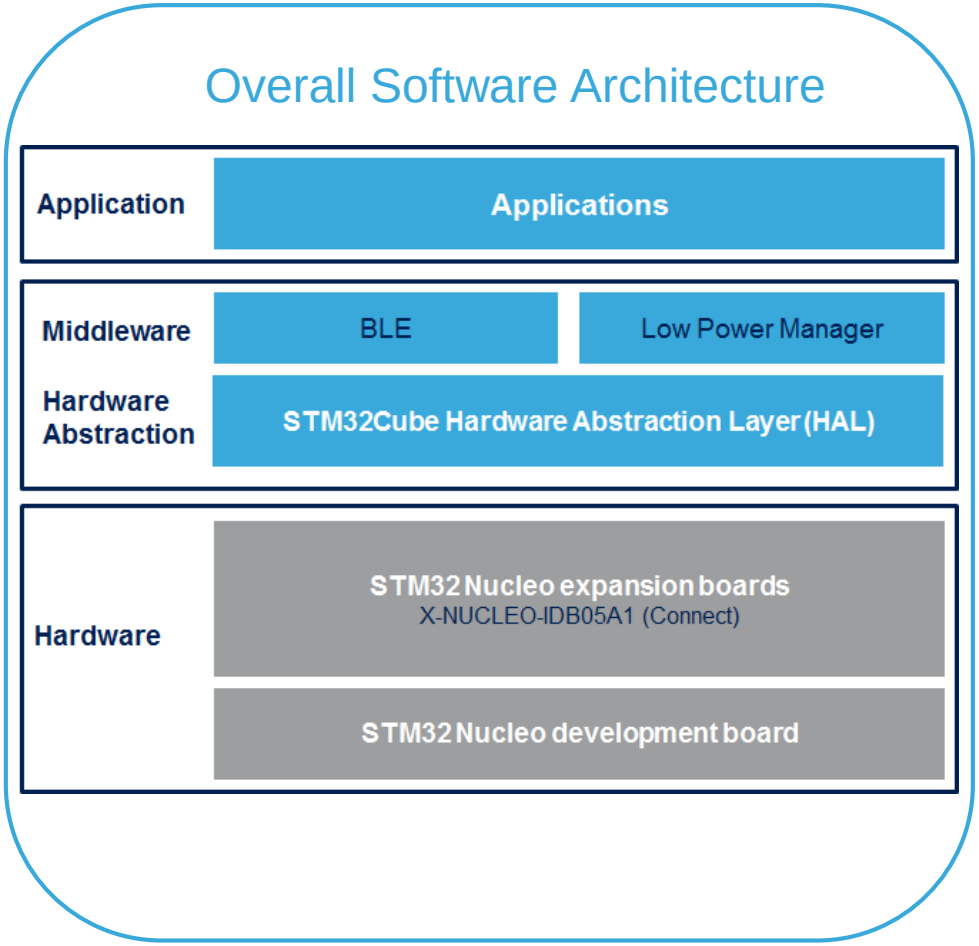
Software overview

X-CUBE-BLE1 software description

- The X-CUBE-BLE1 is a software package which provides STM32 drivers running for the BlueNRG-MS Bluetooth Low Energy device. It is an STM32Cube expansion software package that eases portability across different STM32 MCU families
- Implementation examples are available for the STM32 Nucleo Bluetooth Low Energy expansion board (X-NUCLEO-IDB05A1) plugged on top of an STM32 Nucleo board
(NUCLEO-L053R8, NUCLEO-L476RG, NUCLEO-F401RE or NUCLEO-F411RE)

Key features

- Complete middleware to build applications using the BlueNRG-MS 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
- References to free Android and iOS app that can be used along with the sample applications
- Free, user-friendly license terms



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X-CUBE-BLE1

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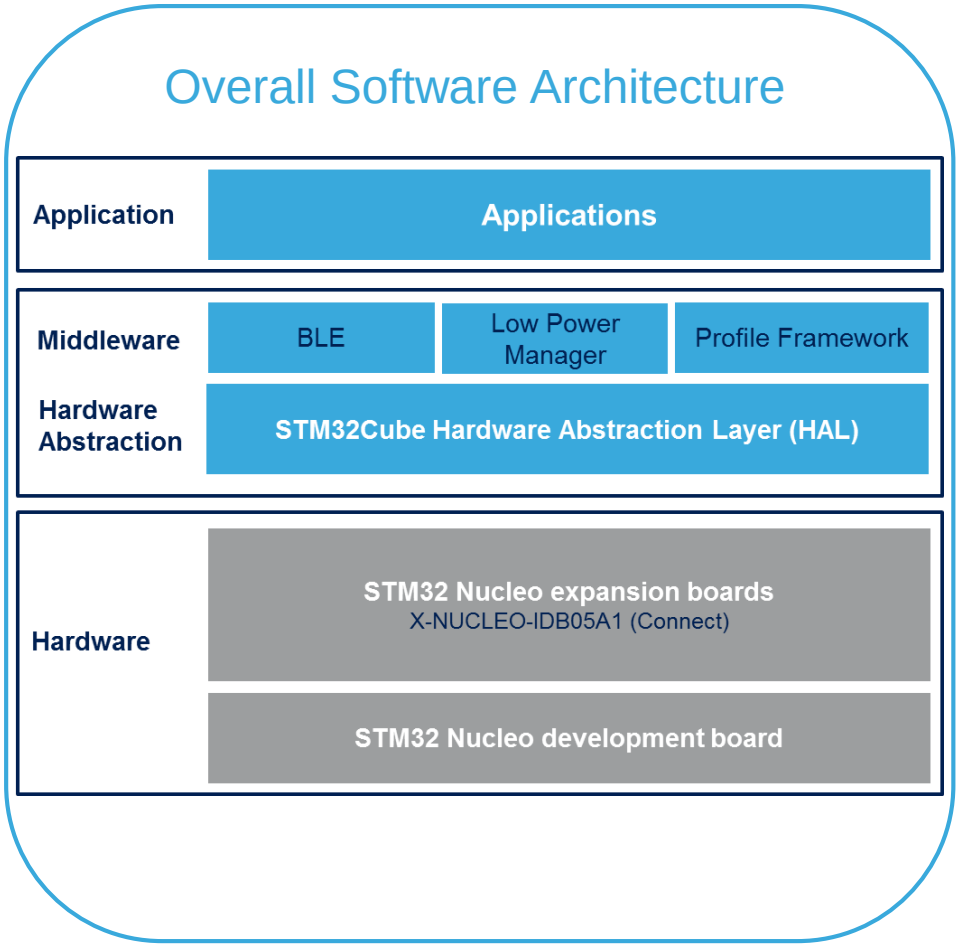
Peripheral and Central Profiles
Software Overview

Software description for Peripheral and Central Profiles

- X-CUBE-BLE1 provides an implementation for Bluetooth Low Energy slave & central profiles and sample applications running on the STM32 for the BlueNRG-MS Bluetooth Low Energy device
- Implementation examples are available for the STM32 Nucleo Bluetooth Low Energy expansion board (X-NUCLEO-IDB05A1) plugged on top of an STM32 Nucleo board (NUCLEO-L053R8, NUCLEO-L476RG, NUCLEO-F401RE or NUCLEO-F411RE)

Key features

- Support for Bluetooth Low Energy profiles using the BlueNRG-MS network processor:
  - ✓ Alert notification client, blood pressure sensor, find-me locator, find-me target, glucose sensor, health thermometer, heart rate, phone alert client, proximity monitor, proximity reporter, time client, time server.
- Low power optimization
- Examples for easier evaluation and development



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X-CUBE-BLE1

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Quick Start Guide Contents

STM32 Nucleo Bluetooth Low Energy expansion board
Hardware and Software overview

Setup & Demo Examples
Documents & Related Resources

STM32 Open Development Environment: Overview

Setup & demo examples
Hardware prerequisites

- 1 x STM32 Nucleo Bluetooth Low Energy expansion board (**X-NUCLEO-IDB05A1**)
- 1 x STM32 Nucleo development board (**NUCLEO-L053R8**, **NUCLEO-L476RG**, **NUCLEO-F401RE** or **NUCLEO-F411RE**)
- 1 x BLE-enabled smartphone and associated apps

Smartphone requirements

Android **KitKat** OS phone

iOS device (**starting from iPhone 4S**)

App for Demo

https://play.google.com/store/apps/details?id=com.st.blunrg

https://itunes.**apple**.com/fr/app/bluenrg/id705873549

App for Hands On

Android - BLE scanner

https://play.google.com/store/apps/details?id=com.macdom.ble.blescanner

iOS - Light Blue

https://itunes.apple.com/fr/app/lightblue-bluetooth-low-energy/id557428110?mt=8

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Software prerequisites

- **STSW-LINK009**: ST-LINK/V2-1 USB driver
- **STSW-LINK007**: ST-LINK/V2-1 firmware upgrade
- **X-CUBE-BLE1**
  - Copy the .zip file content into the “c:\Program Files (x86)\STMicroelectronics\” folder on your PC
  - The package contains the source code examples (Keil, IAR EWARM, System Workbench for STM32) based on NUCLEO-L053R8, NUCLEO-L476RG, NUCLEO-F401RE or NUCLEO-F411RE
- **BlueNRG DK**
  - The package contains the BlueNRG GUI

Bluetooth Low Energy expansion board

Start coding in just a few minutes with X-CUBE-BLE1

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

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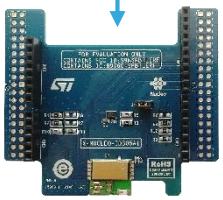
2 Select X-NUCLEO-IDB05A1



3 Download and unpack X-CUBE-BLE1

X-CUBE-BLE1 package

- _htmresc
- CubeMX
- Documentation ← Generic Nucleo docs & BLE porting
- Drivers ← BlueNRG SPI driver
- Middlewares ← Bluetooth LE HCI stack
- Projects ← Application examples
- Utilities
- en.DM00367782.pdf
- readme.txt
- Release_Notes.html
- STMicroelectronics.X-CUBE-BLE1.pdsc

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

5 Open project example SensorDemo

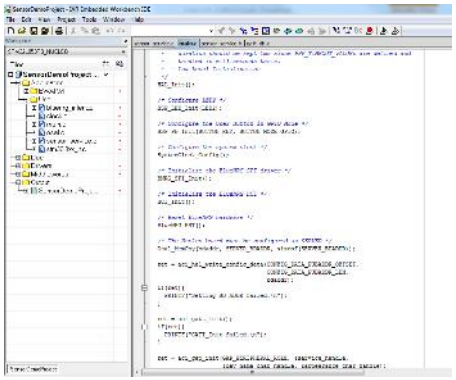
KEIL Tools by ARM

IAR SYSTEMS

ac6

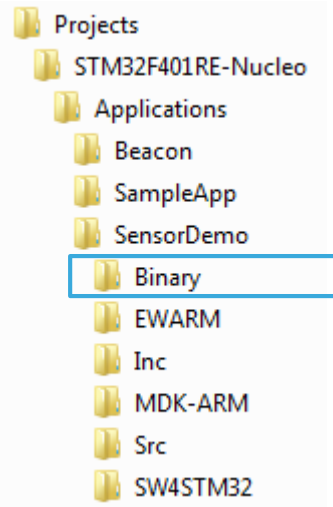
Open STM32 Tools

6 Modify and build application



Bluetooth Low Energy expansion board
Evaluate using X-CUBE-BLE1 (1/2)

1



From X-CUBE-BLE1
software resource package
Drag and drop
SensorDemo*.bin on Nucleo drive

2 Download and install the ST BlueNRG application on your smarpthone from Google Play or App Store

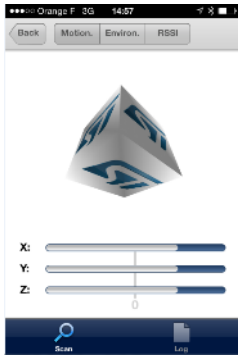
BlueNRG

Bluetooth Low Energy expansion board
Evaluate using X-CUBE-BLE1 (2/2)

3 Connect your smartphone application to the BlueNRG-MS device and control the cube on the smartphone app

Press the user button on the STM32 Nucleo board to rotate the cube on the smartphone app

4



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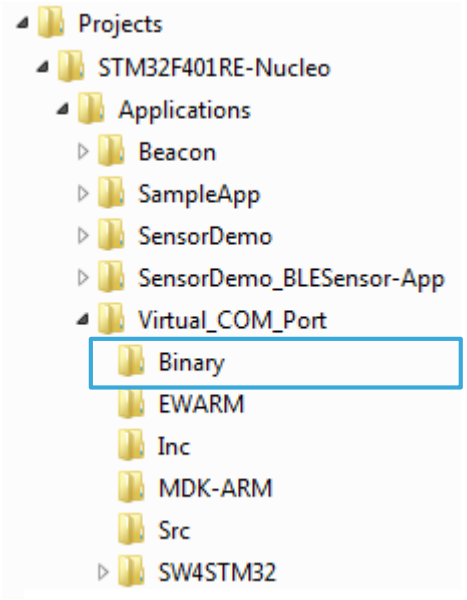
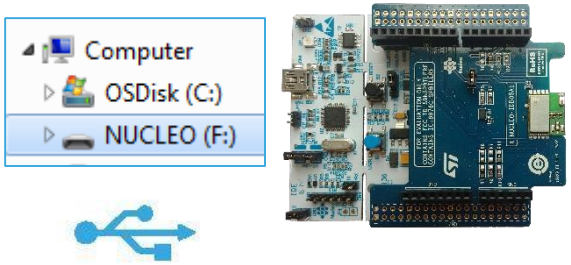
Bluetooth Low Energy expansion board
Evaluate BlueNRG-MS using a GUI



1

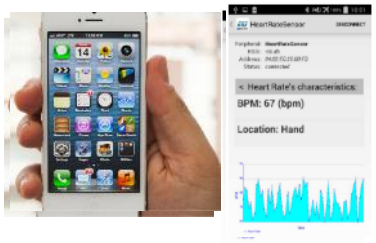
Drag and drop
Virtual_COM_Port*.bin
on Nucleo drive



2 Install BlueNRG GUI from existing BlueNRG DK

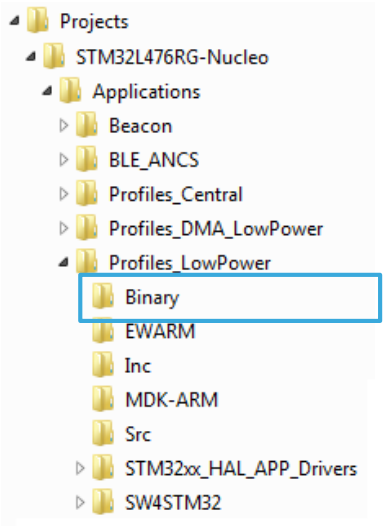
3

Bluetooth Low Energy expansion board
Evaluate the BLE Standard Profiles (1/2)



X-CUBE-BLE1 software expansion also provides different Bluetooth Low Energy standard profiles.

1

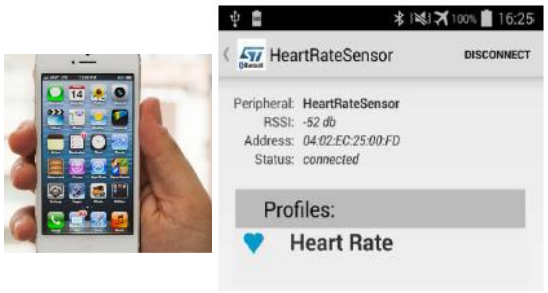


Drag and drop
ProfPerip_HeartRate_L476RG.bin
(or any other peripheral profile binary file)
on Nucleo-L476RG drive

2 Install the **ST BLE Profile** application on your Android/iOS device from the stores

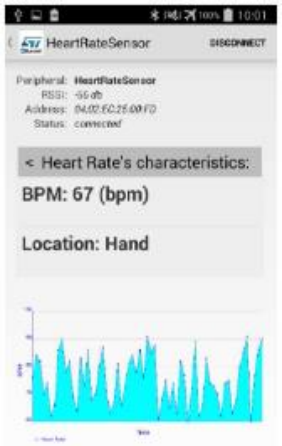
Bluetooth Low Energy expansion board
Evaluate the BLE Standard Profiles (2/2)

3 Connect your smartphone application to the BlueNRG-MS device and read the simulated Heart Rate measurements on the smartphone display.



4 Press Heart Rate on the app to start reading simulated Heart Rate measurements (sent from the BlueNRG-MS device) on the phone display.

5 Simulated Heart Rate measurements are sent over the air.



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Bluetooth Low Energy expansion board
List of profiles supported by X-CUBE-BLE1

- Slave profiles (peripheral role):
  - Alert Notification Client
  - Blood Pressure Sensor
  - Find Me Locator
  - Find Me Target
  - Glucose Sensor
  - Health Thermometer
  - Heart Rate
  - Human Interface Device
  - Phone Alert Client
  - Proximity Monitor
  - Proximity Reporter
  - Time Client
  - Time Server
- Non Standard Slave profile (peripheral role):
  - Apple Notification Center Service
- Master profiles (central role):
  - Heart Rate Collector
  - Time Client
  - Find Me Locator
  - Blood Pressure Collector
  - Health Thermometer Collector
  - Alert Notification Client
  - Glucose Collector

Documents & related resources

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

X-NUCLEO-IDB05A1:

- Gerber files, BOM, and schematics
- **DB2592**: Bluetooth Low Energy expansion board based on SPBTLE-RF module for STM32 Nucleo – **Data brief**
- **UM1912**: Getting started with X-NUCLEO-IDB05A1 Bluetooth low energy expansion board based on SPBTLE-RF module for STM32 Nucleo – **User Manual**

X-CUBE-BLE1:

- **DB2461**: Bluetooth Low Energy software expansion for STM32Cube – **Data brief**
- **UM1873**: Getting started with the X-CUBE-BLE1 Bluetooth Low Energy software expansion for STM32Cube **– User Manual**
- **AN4642**: Overview of the BLE Profiles application for X-CUBE-BLE1, expansion for STM32Cube – **Application Note**

Consult www.st.com for the complete list

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STM32 Nucleo Bluetooth Low Energy expansion board
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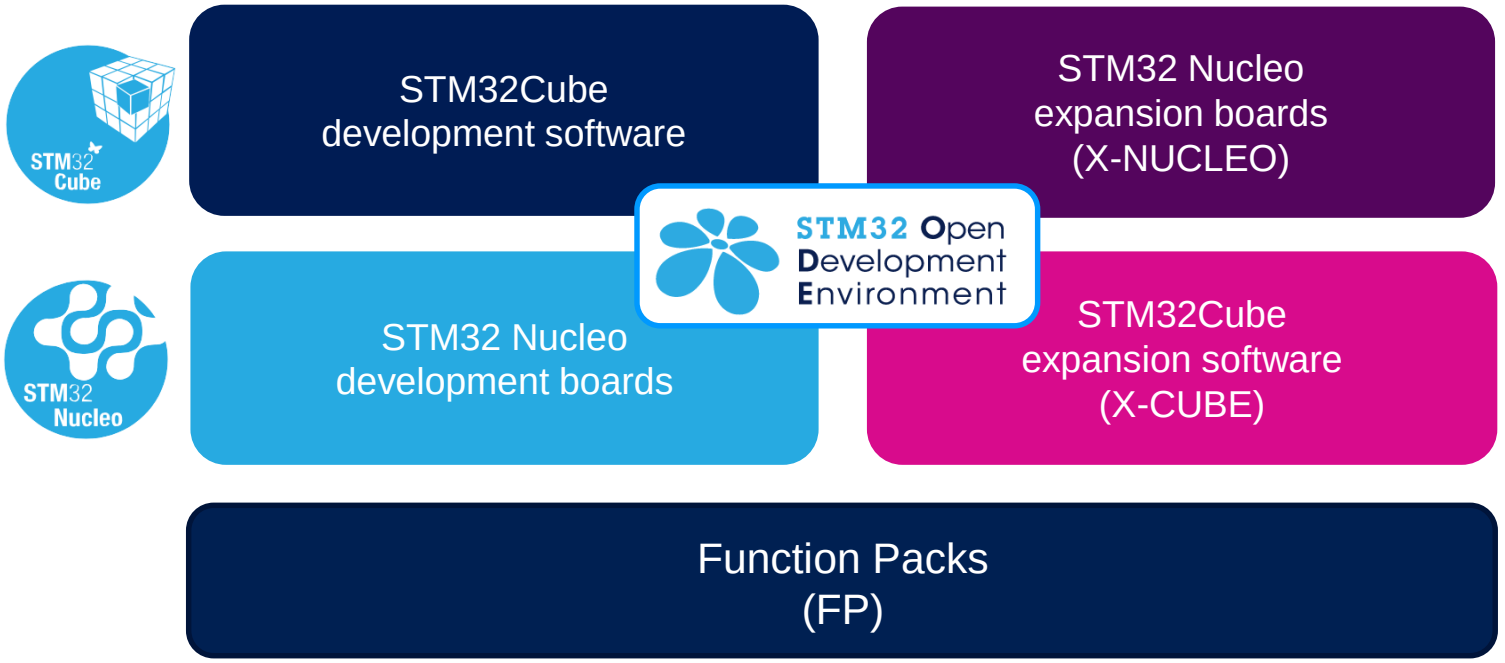
STM32 Open Development Environment: Overview

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.



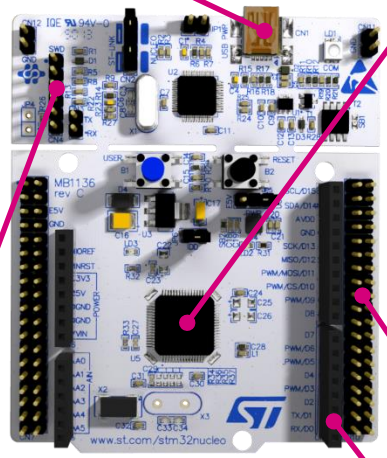
www.st.com/stm32ode

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.

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

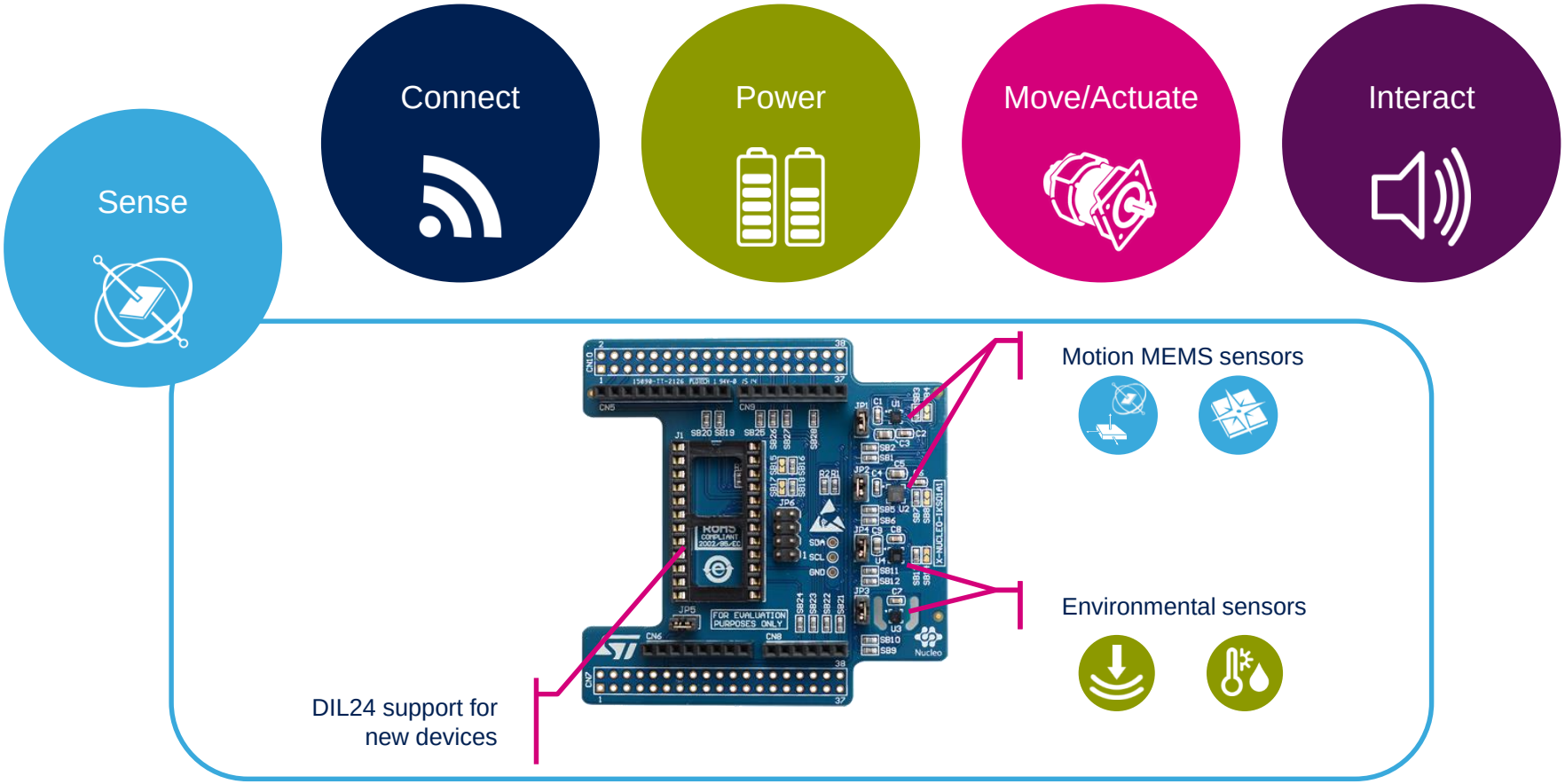
ST morpho extension header

Arduino™ UNO R3 extension headers

STM32 Nucleo

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.

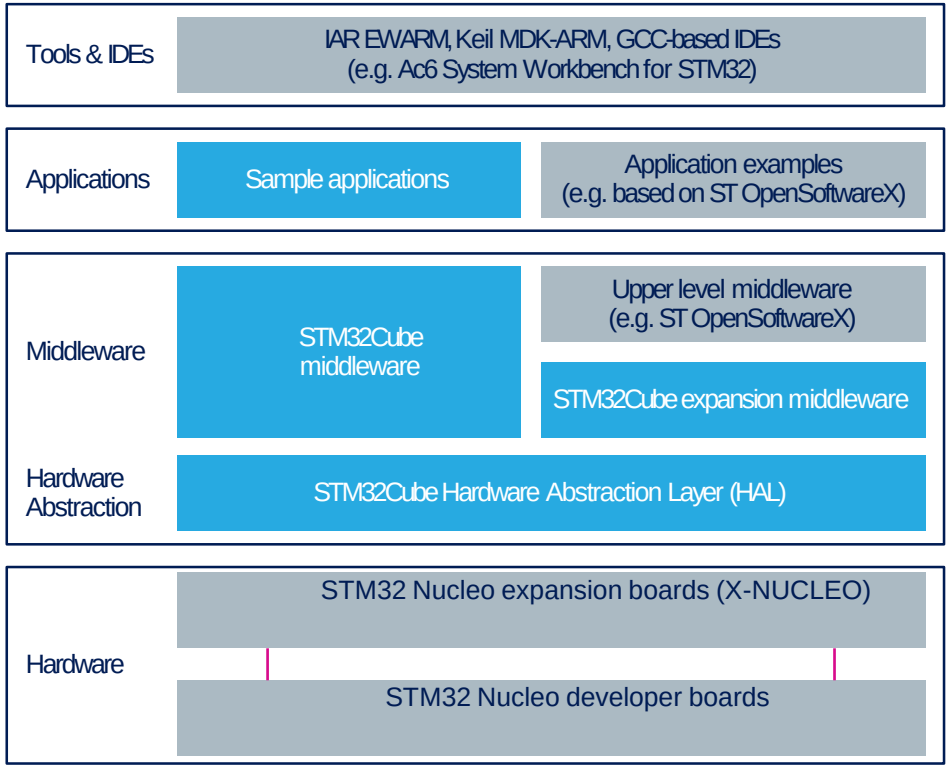


Example of STM32 expansion board (X-NUCLEO-IKS01A1)

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

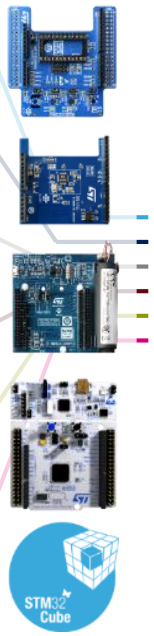
Energy management & battery

Power — POWER

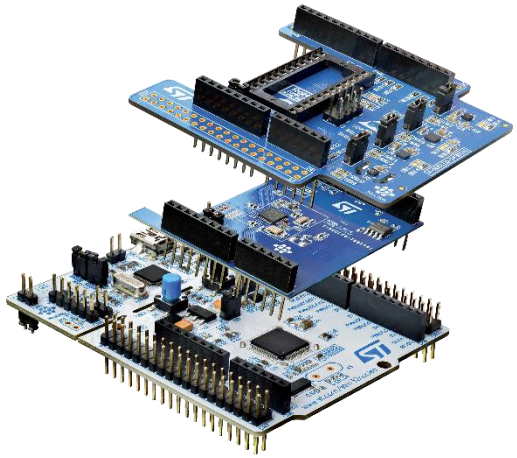
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



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