# Quick Start Guide

Bluetooth Low Energy expansion board based on BlueNRG-M0 module for STM32 Nucleo (X-NUCLEO-IDB05A2)

Version 3.0 (October 27, 2022)

# Agenda

# 1- Hardware and Software overview

# Bluetooth Low Energy Expansion Board (X-NUCLEO-IDB05A2)
## Hardware Overview

## Hardware Description

- The X-NUCLEO-IDB05A2 Bluetooth low energy expansion board is based on the BlueNRG-M0 BLE network processor module.

- The BlueNRG-MS processor hosted in the BlueNRG-M0 module communicates with the STM32 Nucleo developer board hosting microcontroller though an SPI link available on the Arduino UNO R3 connector.

## Key Product on board

- BlueNRG-M0 : Bluetooth v4.2 compliant, FCC and IC certified (FCC ID: S9NBNRGM0AL; IC: 8976C-BNRGM0AL). It supports master/slave roles simultaneously and can act at the same time as Bluetooth low energy sensor and hub device

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

Latest info available at www.st.com
X-NUCLEO-IDB05A2

# Bluetooth Low Energy Expansion Board (X-NUCLEO-IDB05A2)
## Software Overview

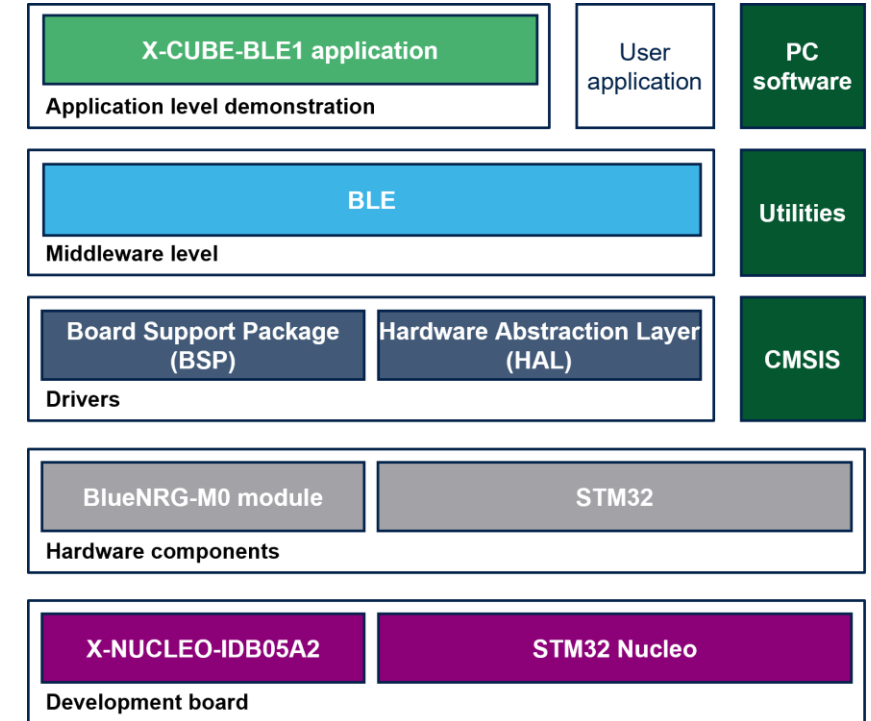## X-CUBE-BLE1 Software Description

The X-CUBE-BLE1 is a software package which provides STM32 drivers for the BlueNRG-M0 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 Bluetooth Low Energy expansion board (X-NUCLEO-IDB05A2) plugged on top of an STM32 Nucleo-L476RG board.

## Key features

- Complete middleware to build applications using the BlueNRG-M0 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

### Overall Software Architecture

| X-CUBE-BLE1 application | User application | PC software |
| Application level demonstration | | |

| BLE | | Utilities |
| Middleware level | | |

| Board Support Package (BSP) | Hardware Abstraction Layer (HAL) | CMSIS |
| Drivers | | |

| BlueNRG-M0 module | STM32 | |
| Hardware components | | |

| X-NUCLEO-IDB05A2 | STM32 Nucleo | |
| Development board | | |

Latest info available at www.st.com
**X-CUBE-BLE1**

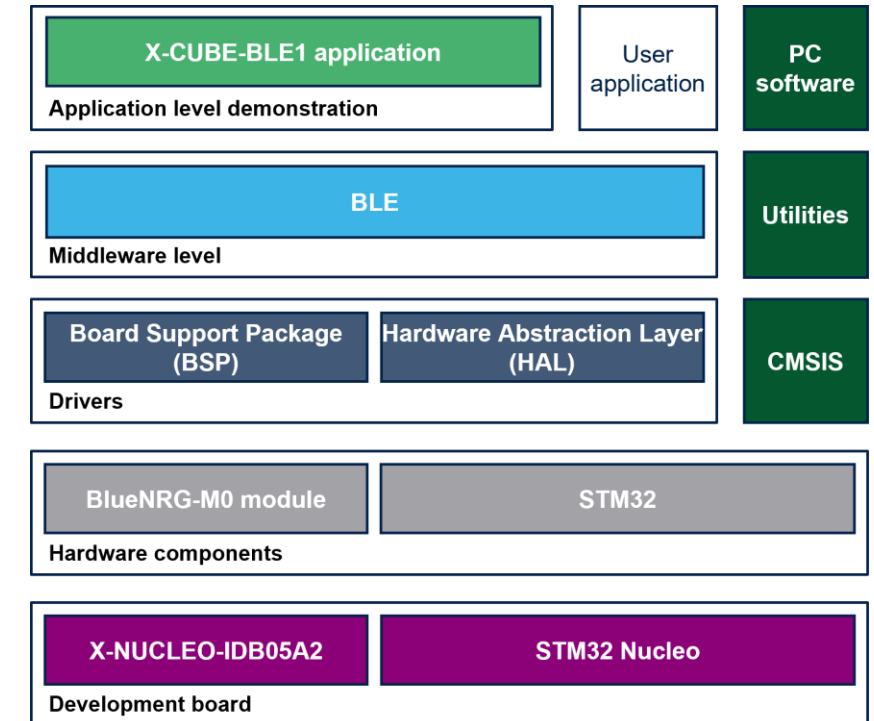life.augmented

## Software description for Peripheral Profiles

X-CUBE-BLE1 provides an implementation for Bluetooth Low Energy slave & central profiles and sample applications running on the STM32 for the BlueNRG-M0 Bluetooth Low Energy device

Implementation examples are available for the Bluetooth Low Energy expansion board (X-NUCLEO-IDB05A2) plugged on top of an STM32 Nucleo-L476RG board

## Key features

- Examples for easier evaluation and development

### Overall Software Architecture

| X-CUBE-BLE1 application | User application | PC software |
|---|---|---|
| **Application level demonstration** | | |

| BLE | Utilities |
|---|---|
| **Middleware level** | |

| Board Support Package (BSP) | Hardware Abstraction Layer (HAL) | CMSIS |
|---|---|---|
| **Drivers** | | |

| BlueNRG-M0 module | STM32 |
|---|---|
| **Hardware components** | |

| X-NUCLEO-IDB05A2 | STM32 Nucleo |
|---|---|
| **Development board** | |

Latest info available at www.st.com
**X-CUBE-BLE1**

# 2- Setup & Demo Examples

- 1 x Bluetooth Low Energy expansion board (X-NUCLEO-IDB05A2)

- 1 x STM32 Nucleo-L476RG development board

- 1 x BLE-enabled smartphone and associated apps
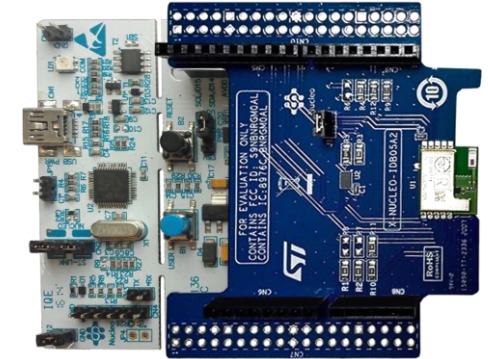
| Smartphone requirements | App for <u>Demo</u> | App for <u>Hands On</u> |
| --- | --- | --- |

Android OS phone

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

Android - BLE scanner

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

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

https://itunes.apple.com/us/app/st-bluems/id993670214

iOS - Light Blue

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

# Setup & Application Examples
## Software and Other prerequisites

- **STSW-LINK009**
  ST-LINK, ST-LINK/V2, ST-LINK/V2-1, ST-LINK/V3 USB driver

- **STSW-LINK007**
  ST-LINK, ST-LINK/V2, ST-LINK/V2-1, STLINK-V3 boards firmware upgrade

- **X-CUBE-BLE1**
  Expansion software package for STM32Cube running on the STM32 and including drivers for BlueNRG-M0 Bluetooth Low Energy devices. The package contains the source code examples based on NUCLEO-L476RG

- **STSW-BNRGGUI**
  Software package consisting of a graphical user interface (GUI) PC application that can be used to interact and evaluate the capabilities of the BlueNRG Bluetooth Low Energy network processors.

# Bluetooth Low Energy expansion board
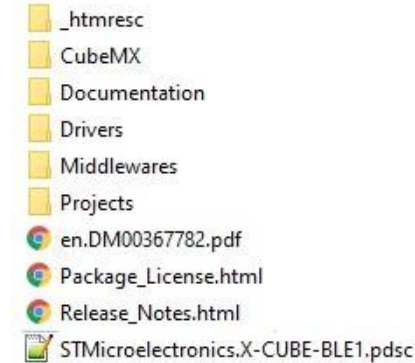## Start coding in just a few minutes

**1** www.st.com/x-nucleo

X-CUBE-BLE1 package structure

**2** Select expansion board

X-NUCLEO-IDB05A2

**3** Download & unpack

X-CUBE-BLE1

_htmresc
CubeMX
Documentation
Drivers
Middlewares
Projects
en.DM00367782.pdf
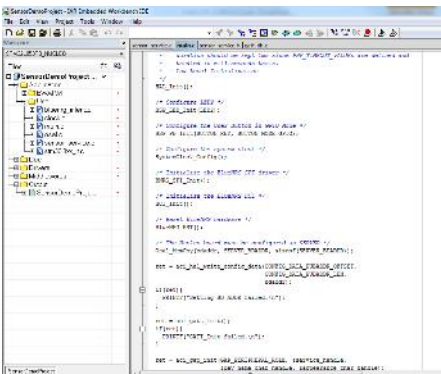Package_License.html
Release_Notes.html
STMicroelectronics.X-CUBE-BLE1.pdsc

X-CUBE-BLE1 docs
BlueNRG SPI drivers
Bluetooth LE HCI stack
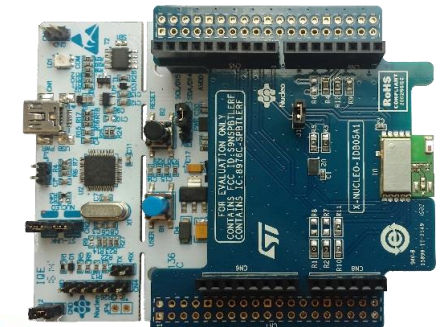Application examples

**6** Modify and build application

Download and install STM32
Nucleo ST-LINK/V2-1 USB driver for flashing
pre-compiled binaries

**4**

KEIL Tools by ARM      IAR SYSTEMS      STM32 CubeIDE

**5**

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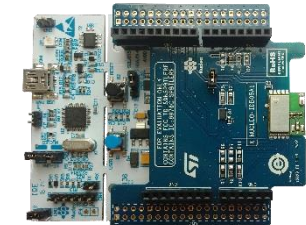## Evaluate using X-CUBE-BLE1 (1/2)

**From X-CUBE-BLE1
software resource package**
Drag and drop
SensorDemo_BLESensor-App_L476RG.bin on
Nucleo drive

**1**

NUCLEO-L476RG › Applications › SensorDemo_BLESensor-App

| Name | Date modified |
|------|---------------|
| Binary | 12/10/2021 16:04 |
| EWARM | 12/10/2021 16:04 |
| Inc | 12/10/2021 16:04 |
| MDK-ARM | 12/10/2021 16:04 |
| Src | 12/10/2021 16:04 |
| STM32CubeIDE | 12/10/2021 16:04 |
| readme.md | 12/10/2021 16:04 |
| SensorDemo_BLESensor-App.ioc | 12/10/2021 16:04 |

Computer
OSDisk (C:)
NUCLEO (F:)

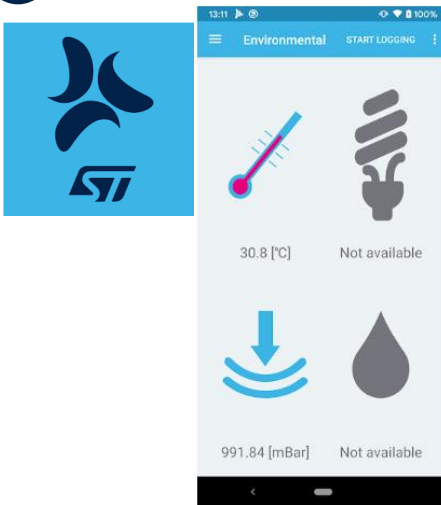**2** Download and install the ST BLE Sensor application on your smarphone from Google Play or App Store
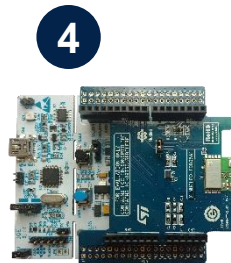
# Bluetooth Low Energy expansion board
## Evaluate using X-CUBE-BLE1 (2/2)

**3** After establishing the connection between the STM32 board and the smartphone

Temperature and Pressure emulated values are sent by STM32 board to the mobile device and are shown in the ENVIRONMENTAL tab

**4**

# 3- Documents & Related Resources

# Documents & Related Resources

**All documents are available in the DOCUMENTATION tab of the related products webpage**

**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**

**X-NUCLEO-IDB05A2:**

- **Gerber files, BOM, Schematic**
- **DB4170:** Bluetooth Low Energy expansion board based on BlueNRG-M0 module for STM32 Nucleo – **Data brief**
- **UM2700:** Getting started with X-NUCLEO-IDB05A2 BLE expansion board based on the – **User Manual**

Consult www.st.com for the complete list

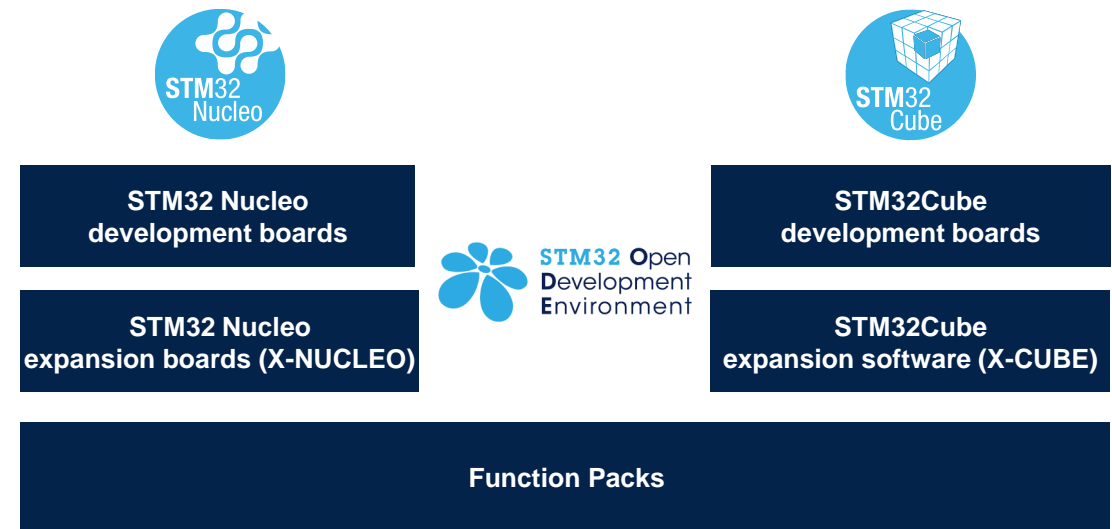# 4- STM32 Open Development Environment: Overview

## FAST, AFFORDABLE PROTOTYPING AND DEVELOPMENT

The STM32 Open Development Environment (ODE) is an **open**, **flexible**, **easy** and **affordable** way to develop innovative devices and applications based on the STM32 32-bit microcontroller family combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs.

The STM32 ODE includes the following five elements:

o STM32 Nucleo development boards. A comprehensive range of affordable development boards for all STM32 microcontroller series, with unlimited unified expansion capability, and with integrated debugger/programmer

o STM32 Nucleo expansion boards. Boards with additional functionality to add sensing, control, connectivity, power, audio or other functions as needed. The expansion boards are plugged on top of the STM32 Nucleo development boards. More complex functionalities can be achieved by stacking additional expansion boards

o STM32Cube software. A set of free-of-charge tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer, middleware and the STM32CubeMX PC-based configurator and code generator

o STM32Cube expansion software. Expansion software provided free of charge for use with STM32 Nucleo expansion boards, and compatible with the STM32Cube software framework

o STM32Cube Function Packs. Set of function examples for some of the most common application cases built by leveraging the modularity and interoperability of STM32 Nucleo development boards and expansions, with STM32Cube software and expansions.

The STM32 Open Development Environment is compatible with a number of IDEs including IAR EWARM, Keil MDK, mbed and GCC-based environments.

**STM32 Nucleo development boards**

**STM32Cube development boards**

STM32 Open Development Environment

**STM32 Nucleo expansion boards (X-NUCLEO)**

**STM32Cube expansion software (X-CUBE)**
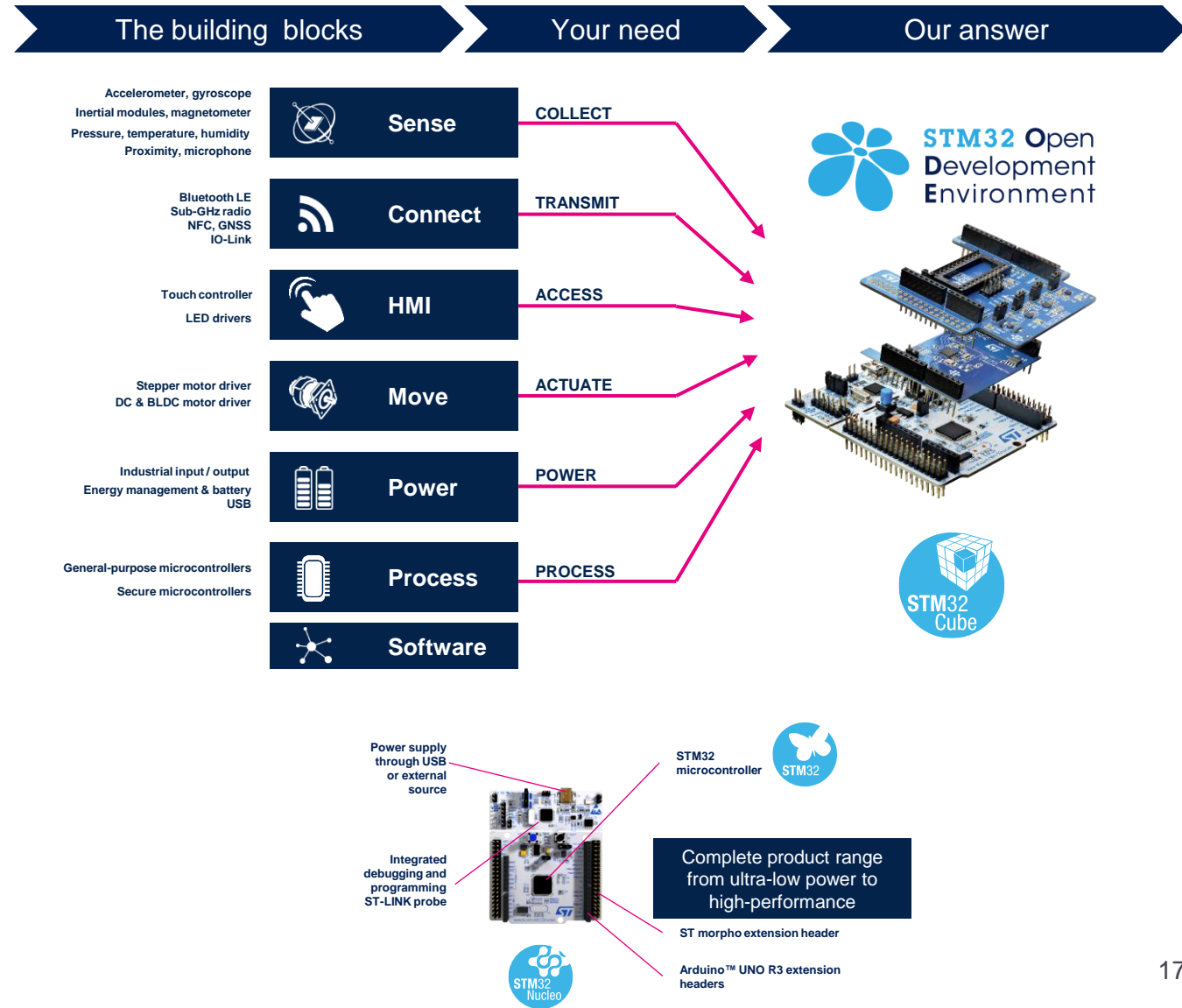
**Function Packs**

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# STM32 Open Development Environment: all that you need

The combination of a broad range of expandable boards based on leading-edge commercial products and modular software, from driver to application level, enables fast prototyping of ideas that can be smoothly transformed into final designs.

To start your design:

- Choose the appropriate STM32 Nucleo development board (MCU) and expansion (X-NUCLEO) boards (sensors, connectivity, audio, motor control etc.) for the functionality you need

- Select your development environment (IAR EWARM, Keil MDK, and GCC-based IDEs) and use the free STM32Cube tools and software.

- Download all the necessary software to run the functionality on the selected STM32 Nucleo expansion boards.

- Compile your design and upload it to the STM32 Nucleo development board.

- Then start developing and testing your application.

Software developed on the STM32 Open Development Environment prototyping hardware can be directly used in an advanced prototyping board or in and end product design using the same commercial ST components, or components from the same family as those found on the STM32 Nucleo boards.

| The building blocks | Your need | Our answer |
| --- | --- | --- |

| | | |
| --- | --- | --- |
| Accelerometer, gyroscope<br>Inertial modules, magnetometer<br>Pressure, temperature, humidity<br>Proximity, microphone | **Sense** | COLLECT |
| Bluetooth LE<br>Sub-GHz radio<br>NFC, GNSS<br>IO-Link | **Connect** | TRANSMIT |
| Touch controller<br>LED drivers | **HMI** | ACCESS |
| Stepper motor driver<br>DC & BLDC motor driver | **Move** | ACTUATE |
| Industrial input / output<br>Energy management & battery<br>USB | **Power** | POWER |
| General-purpose microcontrollers<br>Secure microcontrollers | **Process** | PROCESS |
| | **Software** | |

STM32 **O**pen **D**evelopment **E**nvironment

STM32Cube

Power supply through USB or external source

STM32 microcontroller

Integrated debugging and programming ST-LINK probe

**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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# Thank you

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