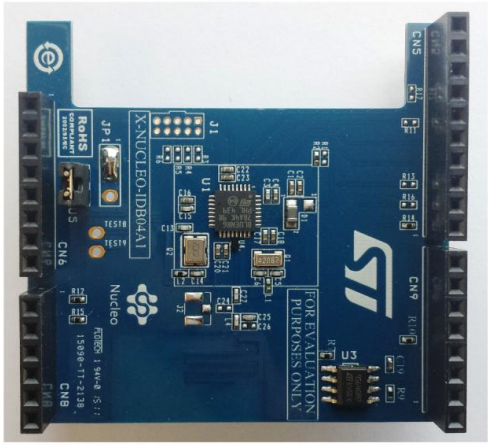
Quick Start Guide

Bluetooth Low Energy expansion board based on BlueNRG for STM32 Nucleo (X-NUCLEO-IDB04A1)



life.augmented

Version 1.6 (Feb 1, 2017)

Quick Start Guide Contents

Bluetooth Low Energy expansion board (X-NUCLEO-IDB04A1)

Hardware overview

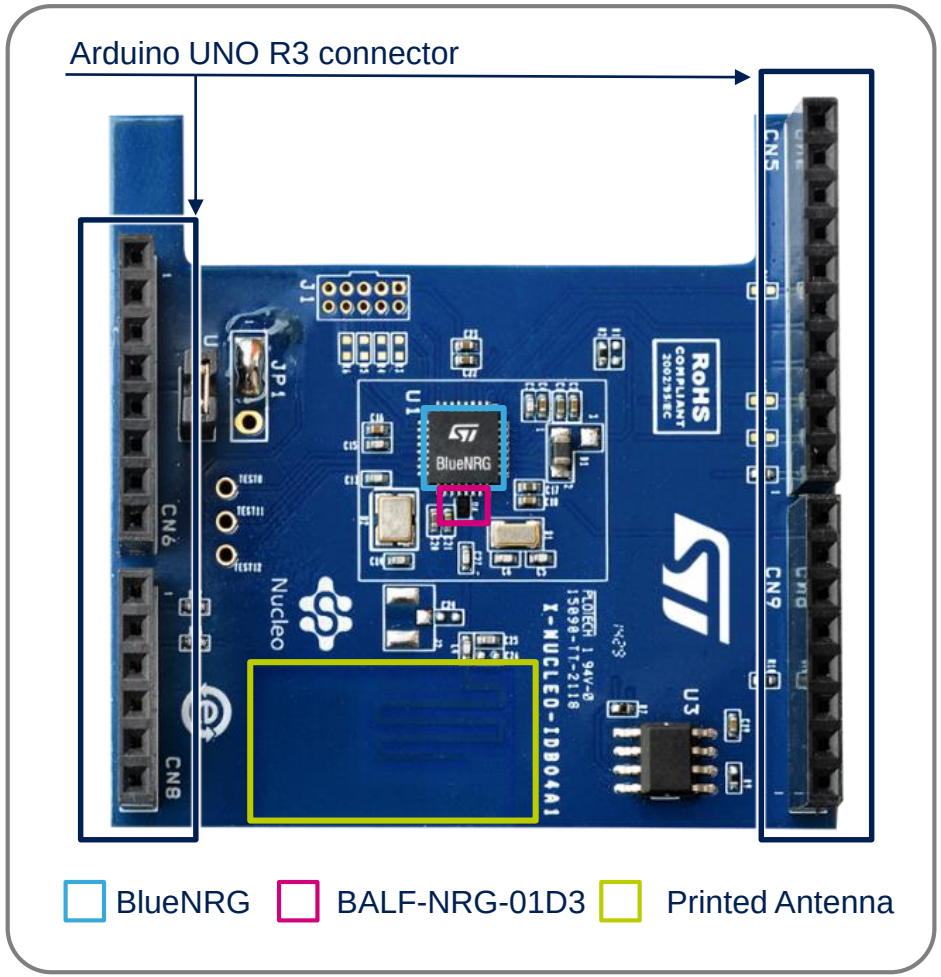
Hardware Description

- The X-NUCLEO-IDB04A1 is a Bluetooth Low Energy (BLE) evaluation and development board system, designed around ST's BlueNRG BLE network processor.
- The BlueNRG processor communicates with STM32 Nucleo developer board host microcontroller though an SPI link available on the Arduino UNO R3 connector.

Key Products on board

BlueNRG
ST Bluetooth® Low Energy wireless network processor, BLE4.0 compliant

BALF-NRG-01D3
50 Ω nominal input / conjugate match balun to BlueNRG transceiver, with integrated harmonic filter, insuring matching and filtering



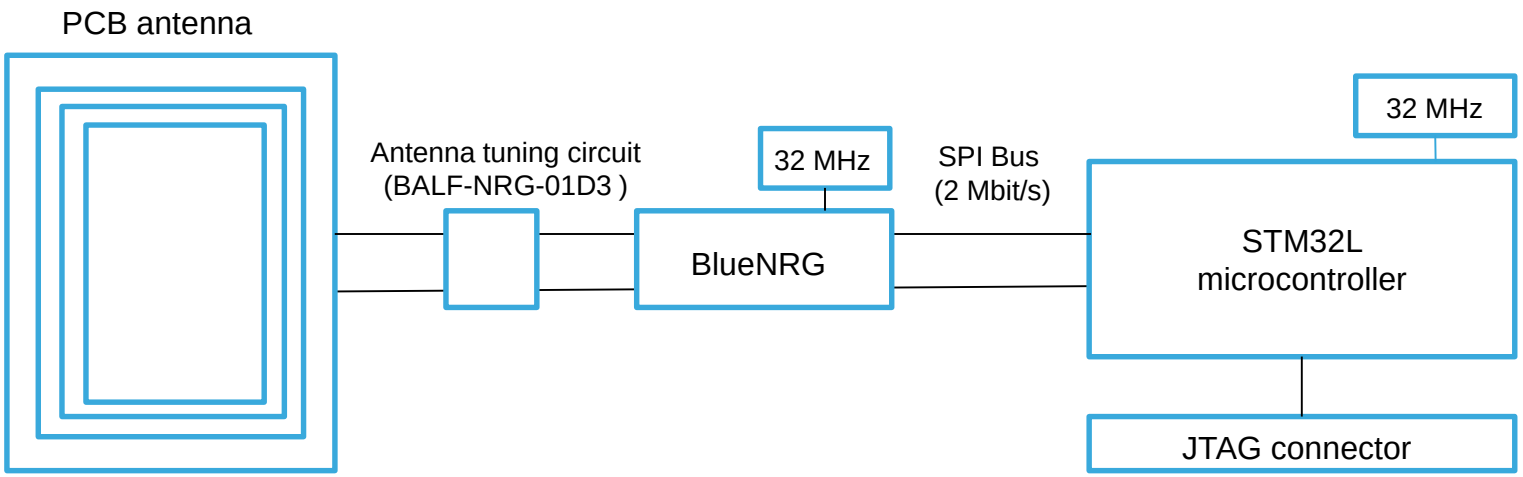
Latest info available at www.st.com
X-NUCLEO-IDB04A1

life.augmented

Bluetooth Low Energy expansion board (X-NUCLEO-IDB04A1)

Certification

- Due to the excellent performance of the BlueNRG and the best matching between BlueNRG and BALF-NRG-01D3, the X-NUCLEO-IDB04A1 passed the RF Test for Japan Radio Law certification with a higher margin above specification values, as well as being FCC certified (FCC ID: S9NIDB04A1)



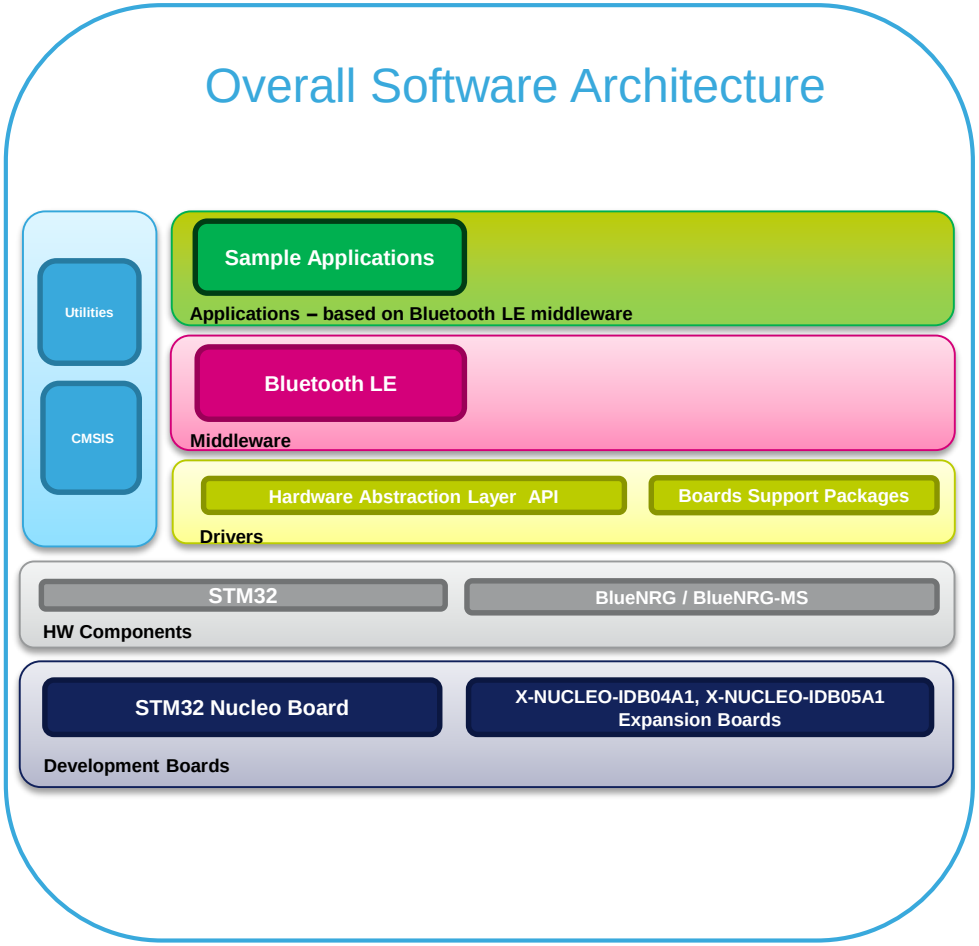
Bluetooth Low Energy expansion board
Software overview

X-CUBE-BLE1 software description

- The X-CUBE-BLE1 is a software package which provides STM32 drivers running for the BlueNRG / 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-IDB04A1, 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 / 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



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

life.augmented

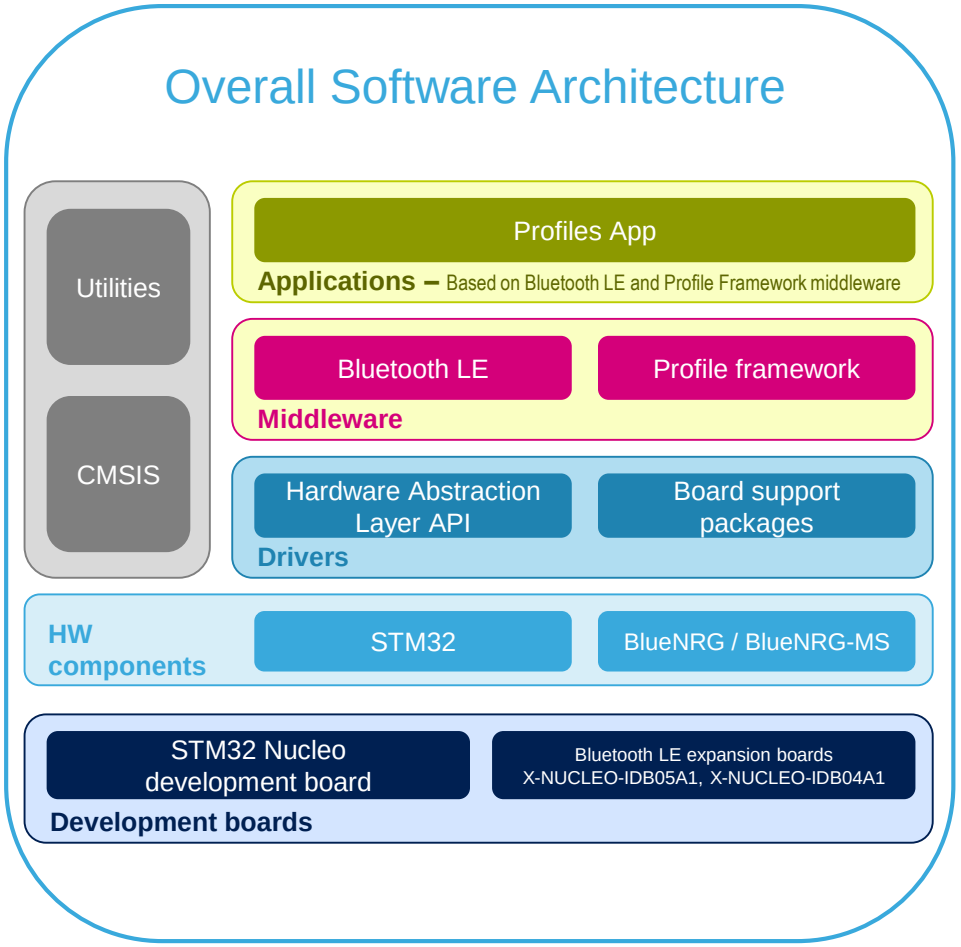
OSXSmartConnPS
Software add-on for X-CUBE-BLE1

OSXSmartConnPS software description

- OSXSmartConnPS is an add-on for the X-CUBE-BLE1 providing an implementation for Bluetooth Low Energy slave & central profiles and sample applications running on the STM32 for the BlueNRG / BlueNRG-MS Bluetooth Low Energy device
- Implementation examples are available for the STM32 Nucleo Bluetooth Low Energy expansion board (X-NUCLEO-IDB04A1, 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 / 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



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

life.augmented

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-IDB04A1**)
- 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.bluenrg

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

life.augmented

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 example (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

life.augmented

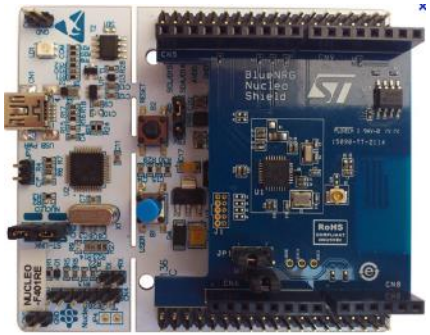
2 Select X-NUCLEO-IDB04A1

3 Download and unpack X-CUBE-BLE1

X-CUBE-BLE1 package

- _htmresc
- Documentation ← **Generic Nucleo docs & BLE porting**
- Drivers ← BlueNRG SPI driver
- Middlewares ← Bluetooth LE HCI stack
- Projects ← **Application examples**
- package.xml
- Release_Notes.html

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



5 Open project example SensorDemo

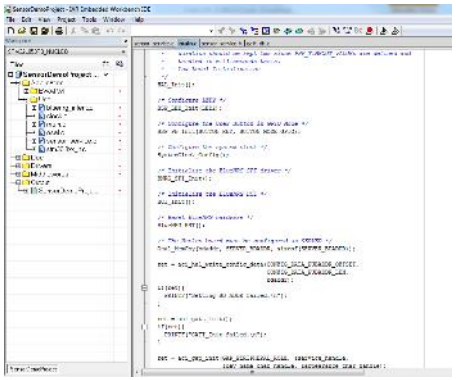
KEIL™ Tools by ARM

IAR SYSTEMS

ac6

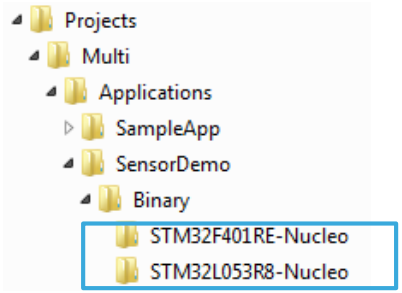
Open STM32 Tools

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 the ST BlueNRG application on your smarpthone from Google Play or App Store.

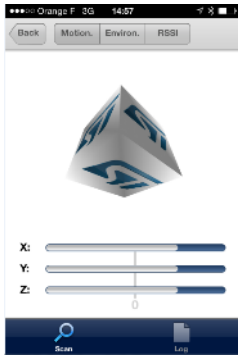
BlueNRG

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

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

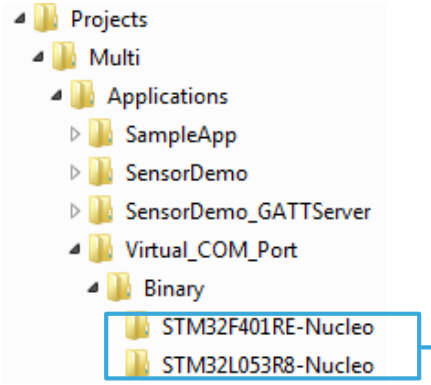
Press the user button on STM32 Nucleo developer board to rotate the cube on the smartphone app.

4



Bluetooth Low Energy expansion board
Evaluate BlueNRG using a GUI

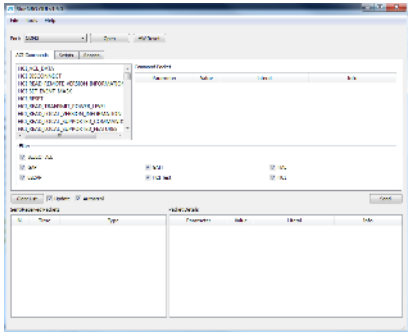
1



Drag and drop
Virtual_COM_Port*.bin
on Nucleo drive.

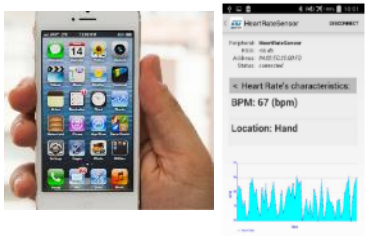
2 Install BlueNRG GUI from existing BlueNRG development kit.

3



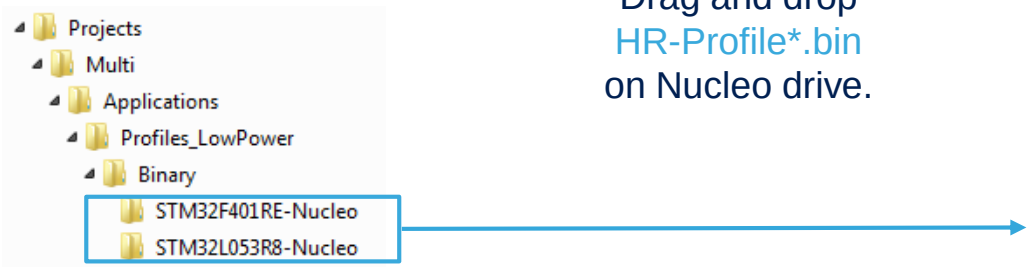
life.augmented

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
HR-Profile*.bin
on Nucleo drive.

2 Install STM32 BLE Toolbox application on your Android smarpthone.

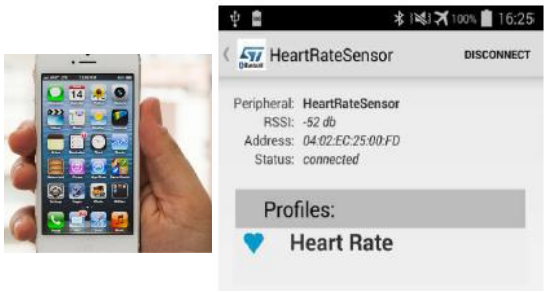
Install
STM32_BLE_Toolbox.apk
on your smartphone.

BlueNRG

life.augmented

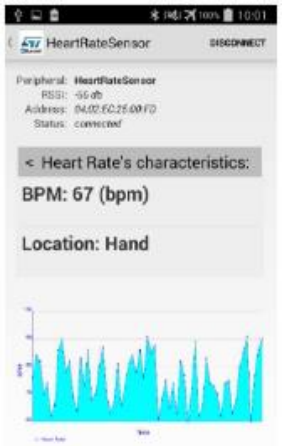
Bluetooth Low Energy expansion board
Evaluate the BLE Standard Profiles (2/2)

3 Connect your smartphone application to the BlueNRG 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 device) on the phone display.

5 Simulated heart rate measurements sent over the air.



life.augmented

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-IDB04A1:

- Gerber files, BOM, and schematics
- **DB2316**: Bluetooth Low Energy expansion board based on BlueNRG for STM32 Nucleo – **Data brief**
- **AN4642**: Overview of the BLE Profiles application for X-CUBE-BLE1, expansion for STM32Cube – **Application note**
- **UM1765**: Getting started with Bluetooth® low energy expansion board based on BlueNRG 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

Quick Start Guide Contents

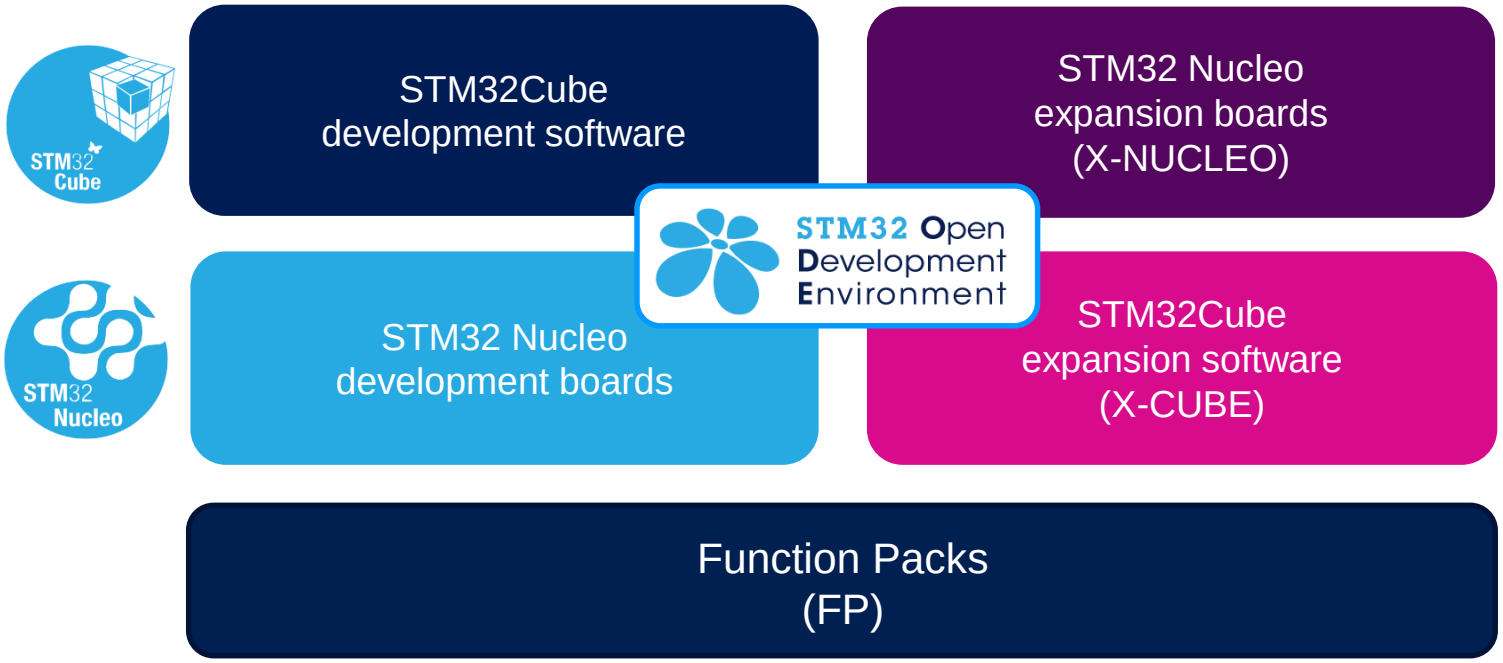
STM32 Nucleo Bluetooth Low Energy expansion board
Hardware and Software overview

Setup & Demo Examples
Documents & Related Resources

STM32 Open Development Environment: Overview

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.



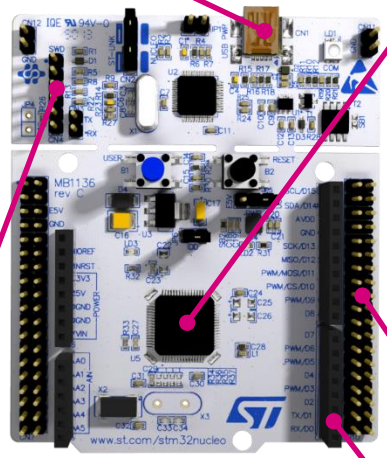
www.st.com/stm32ode

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

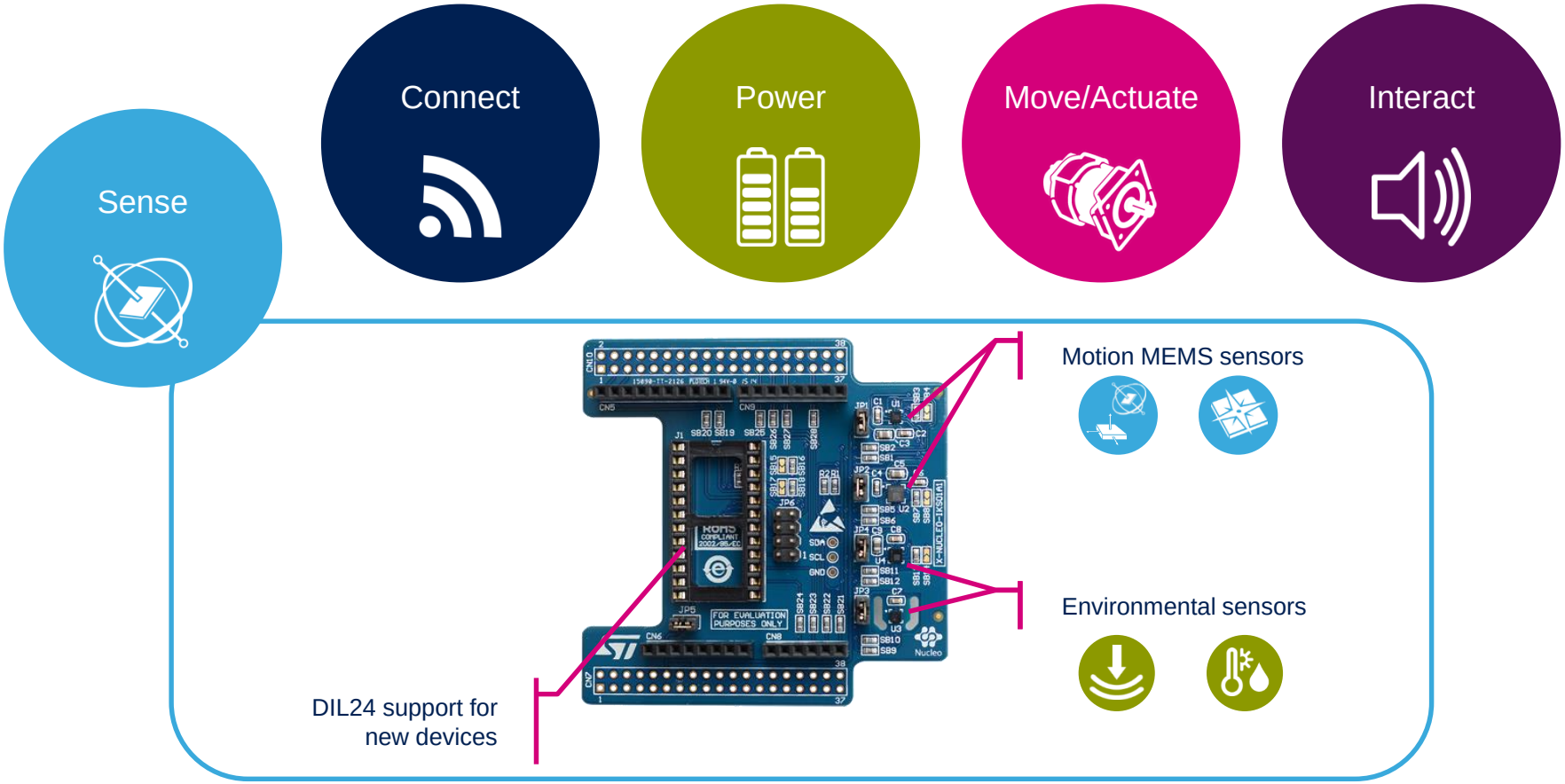
Arduino™ UNO R3 extension headers

STM32 Nucleo

life.augmented

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.

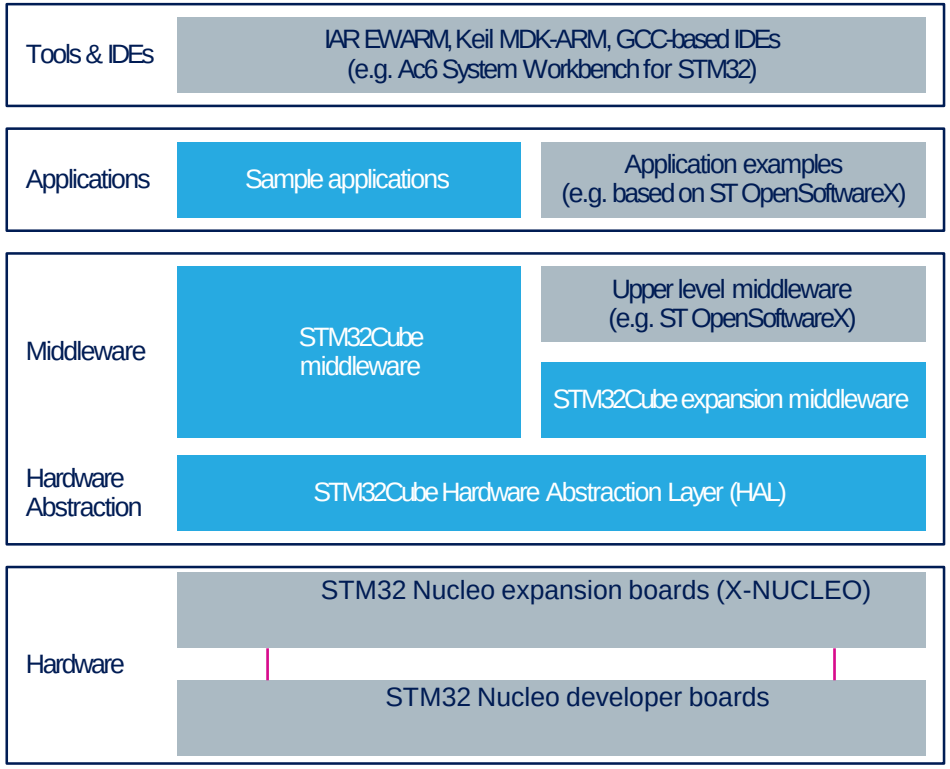


Example of STM32 expansion board (X-NUCLEO-IKS01A1)

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

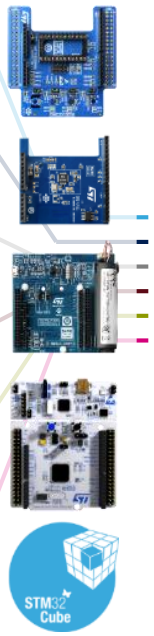
Energy management & battery

Power — POWER

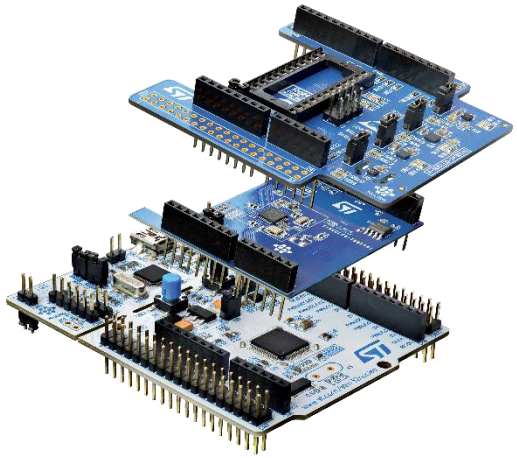
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



www.st.com/stm32ode

life.augmented