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Quick Start Guide

Bluetooth Low Energy expansion board based on BlueNRG-M2SP module for STM32 Nucleo (X-NUCLEO-BNRG2A1)

Version 2.0 (July 2, 2020)

Agenda

1 Hardware and Software overview

2 Setup & Demo Examples

3 Documents & Related Resources

4 STM32 Open Development Environment: Overview

1- Hardware and Software overview



Bluetooth Low Energy expansion board

Hardware Overview

X-NUCLEO-BNRG2A1 Hardware Description

- The X-NUCLEO-BNRG2A1 is a Bluetooth Low Energy (BLE) evaluation and development board system, designed around ST's BLUENRG-M2SP Bluetooth Low Energy module based on BlueNRG-2.
- The BlueNRG-2 processor hosted in the BLUENRG-M2SP module communicates with the STM32 microcontroller, hosted on the Nucleo development board, through an SPI link available on the Arduino UNO R3 connector.

Key Products on board

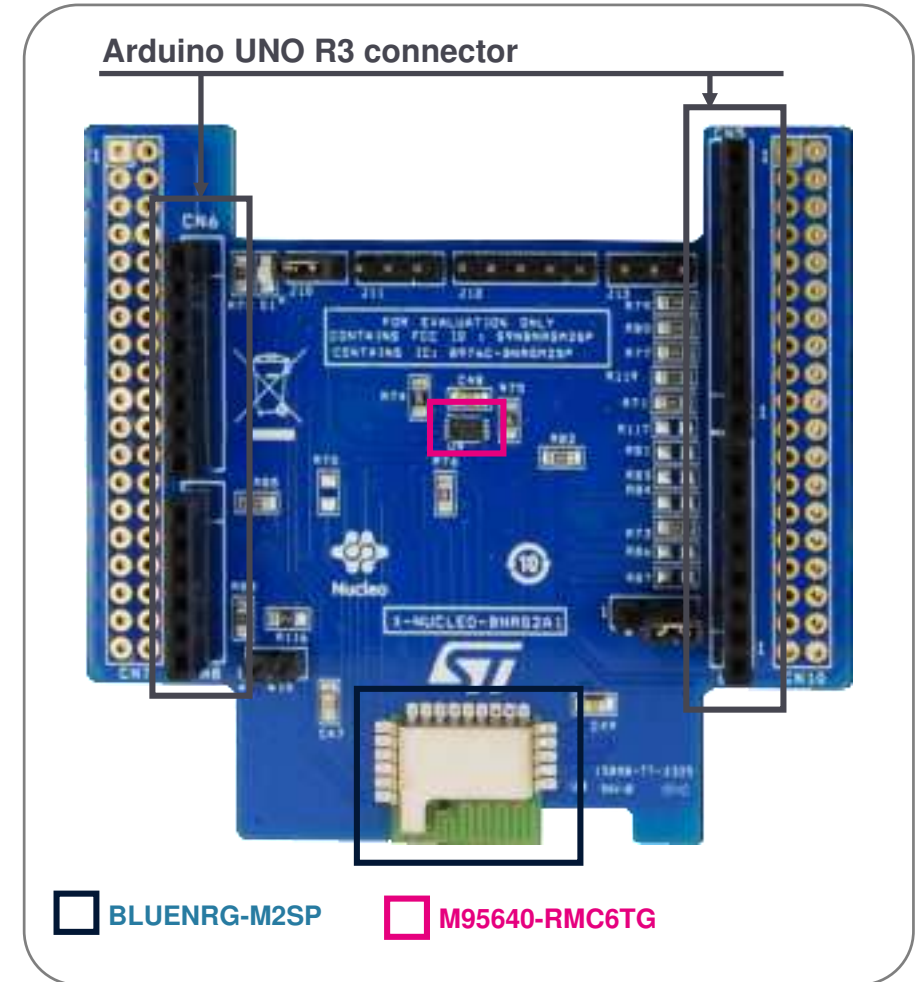
BLUENRG-M2SP

Bluetooth Low Energy, FCC and IC certified (FCC ID: S9NBNRGM2SP, IC: B976C-BNRGM2SP), module based on Bluetooth® Low Energy wireless network processor BlueNRG-2, BLE v5.0 compliant.

BLUENRG-M2SP integrates a BALF-NRG-02D3 balun and a PCB antenna. It embeds 32 MHz crystal oscillator for the BlueNRG-2.

M95640-RMC6TG

64-Kbit serial SPI EEPROM with high-speed clock interface



Latest info available at www.st.com
X-NUCLEO-BNRG2A1

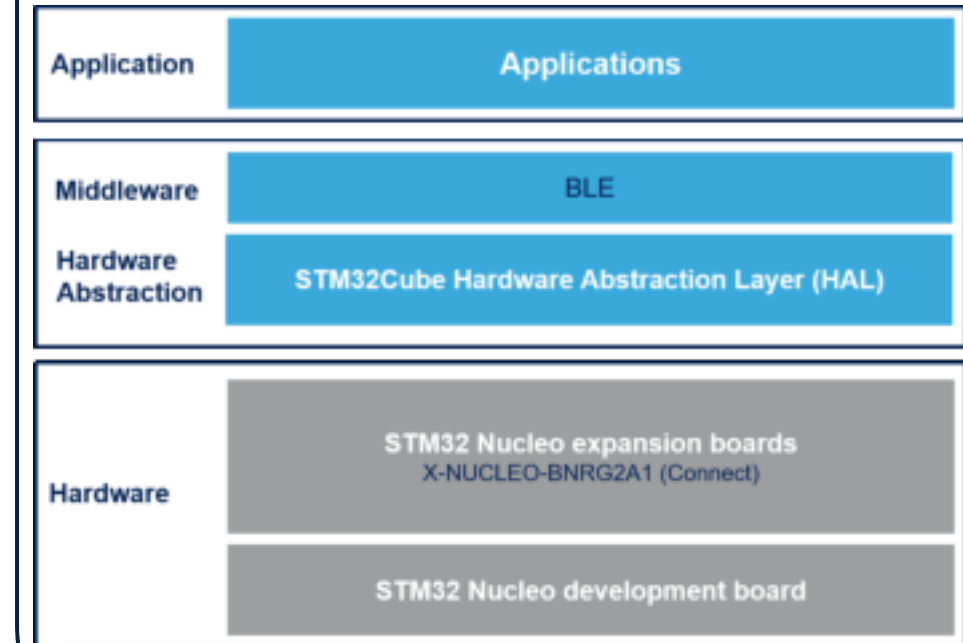
X-CUBE-BLE2 Software Description

- The X-CUBE-BLE2 is a software package which provides STM32 drivers running for the BlueNRG-2 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-BNRG2A1) plugged on top of an STM32 Nucleo board (NUCLEO-L476RG)

Key features

- Complete middleware to build applications using the BlueNRG-2 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



Latest info available at www.st.com
X-CUBE-BLE2

2- Setup & Demo Examples

Setup & Application Examples

HW prerequisites for X-NUCLEO-BNRG2A1

- 1x X-NUCLEO-BNRG2A1 Bluetooth Low Energy expansion board
- 1x STM32 Nucleo development board (Nucleo-L476RG)
- 1 x BLE-enabled smartphone and associated apps

Nucleo-L476RG +
X-NUCLEO-BNRG2A1



Smartphone requirements

Android OS device



iOS device



App for Demo

ST BLE Sensor



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

<https://apps.apple.com/it/app/st-bluems/id993670214>

App for Hands On

BLE Scanner



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

<https://apps.apple.com/us/app/ble-scanner-4-0/id1221763603>

Setup & Application Examples

HW limitation

- **Warning** Even if not strictly required for the correct working of the BlueNRG-2 module, to correctly set the BlueNRG-2 RESET pin on pin D7 of the Arduino connector a 0 Ohm resistor must be soldered on R117. Alternatively, the D7 pin and the pin #5 of the J12 on the X-NUCLEO-BNRG2A1 expansion board must be bridged (as shown in the picture).



Setup & Application Examples

Software and Other prerequisites

- **STSW-LINK009**
 - ST-LINK/V2-1 USB driver
- **STSW-LINK007**
 - ST-LINK/V2-1 firmware upgrade
- **X-CUBE-BLE2**
 - 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, STM32CubeIDE) based on NUCLEO-L476RG
- **BlueNRG GUI SW package**
 - The BlueNRG GUI SW package contains the Graphical User interface (GUI) and script launcher PC applications which supports BlueNRG-2, BlueNRG-1, BlueNRG-MS and BlueNRG Bluetooth Low Energy (BLE) devices.

X-CUBE-BLE2 sample applications

Start coding in just a few minutes



1 www.st.com/stm32code

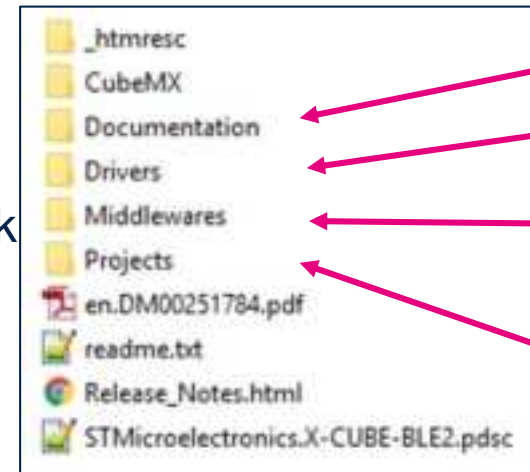
2

Select Expansion Pack:
X-CUBE-BLE2

3

Download & unpack

X-CUBE-BLE2 package structure



Docs
BSP, HAL drivers
BLE HCI stack
Sample applications, binary

4



6

Evaluate / modify / build the code



5

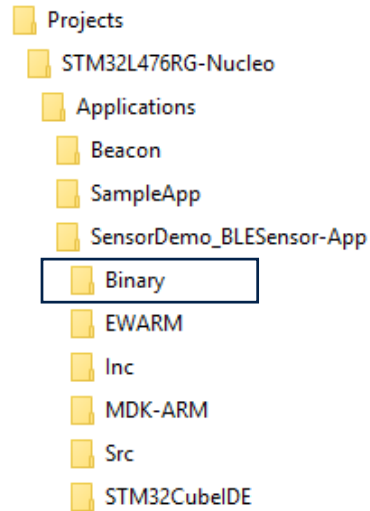
Open project example (e.g.
SensorDemo_BLESensor-App)



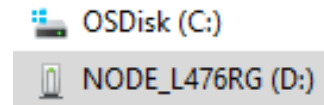
X-CUBE-BLE2 sample applications

Evaluate in just a few minutes (1/2)

1

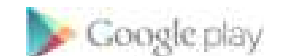


From X-CUBE-BLE2 software resource package drag and drop **SensorDemo_BLESensor-App_L476RG.bin** on Nucleo drive



2

Download and install the ST BLE Sensor application on your smartphone from Google Play or App Store



X-CUBE-BLE2 sample applications

Evaluate in just a few minutes (2/2)

- 3 Connect your smartphone application to the BlueNRG-2 device and control the cube on the smartphone
- 4 Simulated environmental and motion data are sent periodically from the STM32 Nucleo board to the smartphone app



X-CUBE-BLE2 sample applications

Evaluate using the BlueNRG GUI

- 1
 - Projects
 - STM32L476RG-Nucleo
 - Applications
 - Beacon
 - SampleApp
 - SensorDemo_BLESensor-App
 - Virtual_COM_Port**
 - Binary
 - EWARM
 - Inc
 - MDK-ARM
 - Src
 - STM32CubeIDE

Drag and drop
Virtual_COM_Port_L476RG.bin
on Nucleo drive

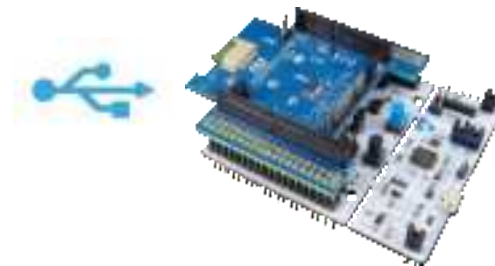
- OSDisk (C:)
- NODE_L476RG (D:)**



- 2 Download the BlueNRG GUI from st.com and install it on your PC



- 3
- ←-----→

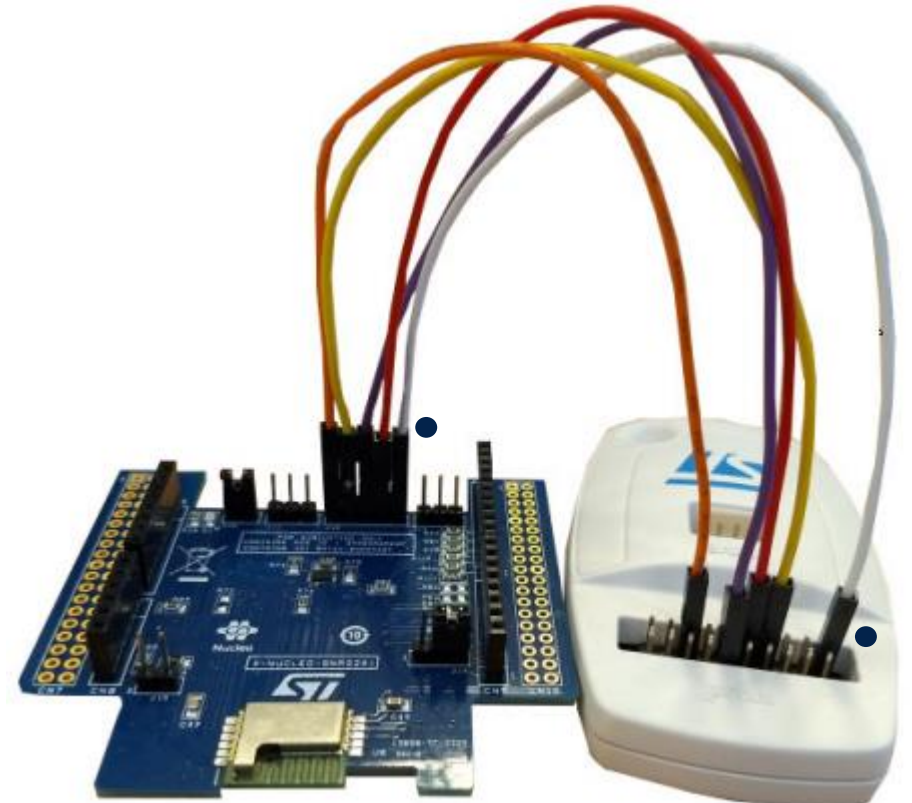


X-CUBE-BLE2 for BlueNRG-2N device

Emulating BlueNRG-2N device with X-NUCLEO-BNRG2A1 (1/3)

- 1 The X-CUBE-BLE2 software package can be used also with the BlueNRG-2N device
- 2 The BlueNRG-2 device on the X-NUCLEO-BNRG2A1 expansion board can be used to emulate the BlueNRG-2N device
- 3 To flash the BlueNRG-2N firmware on the BlueNRG-2 device, you need a standard ST-LINK/V2 debugger with 5 jumper wires (female-female)
- 4 Connect the J12 pins on the X-NUCLEO-BNRG2A1 and the ST-Link/V2 pins as shown in the table below

| | J12 pin no. | ST-Link/V2 pin no. |
|-------|-------------|--------------------|
| VDD | 1 | 1 |
| SWTCK | 2 | 9 |
| GND | 3 | 12 |
| SWDIO | 4 | 7 |
| RST | 5 | 15 |



X-CUBE-BLE2 for BlueNRG-2N device

Emulating BlueNRG-2N device with X-NUCLEO-BNRG2A1 (2/3)

- 5 Download and unpack the [STSW-BNRG2N-V320](#), containing the BlueNRG-2N firmware image (available on www.st.com)
- 6 Download and install the [STSW-BNRGFLASHER](#) (available only for Windows)
- 7 Connect the ST-Link/V2 debugger to your PC



X-CUBE-BLE2 for BlueNRG-2N device

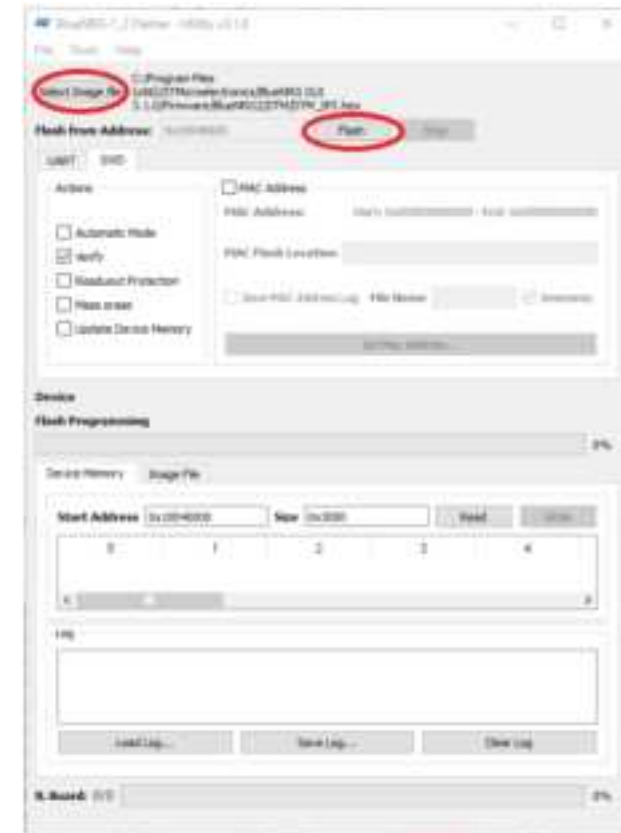
Emulating BlueNRG-2N device with X-NUCLEO-BNRG2A1 (3/3)

8 Open the BlueNRG-1_2 Flasher Utility (STSW-BNRGFLASHER)

a Select the SWD tab

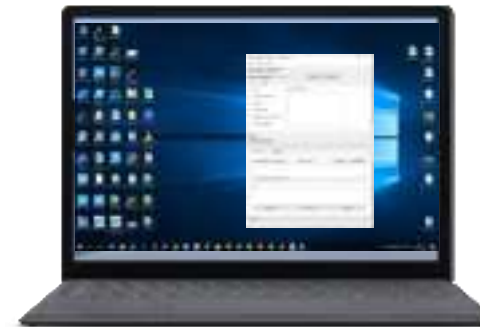
b Erase the BlueNRG-2 flash memory

c Load the BlueNRG_2N_FW_V3_2_0.hex firmware contained in the STSW-BNRG2N-V320 and press the Flash button



Restoring the BlueNRG-2 firmware image

- To restore the BlueNRG-2 firmware image on the BlueNRG-2 device, download and install the STSW-BNRGUI
- Execute all steps described in previous slide at point **8**, loading (**8.c**) the DTM_SPI.hex firmware contained in the STSW-BNRGUI installation folder (usually C:\Program Files (x86)\STMicroelectronics\BlueNRG GUI 3.2.1\Firmware\BlueNRG2\DTM for version 3.2.1)



3- Documents & Related Resources

Documents & Related Resources

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

X-NUCLEO-BNRG2A1:

- [Gerber files, BOM, Schematic](#)
- **DB4086:** Bluetooth Low Energy expansion board based on BLUENRG-M2SP module for STM32 Nucleo – [data brief](#)
- **UM2667:** Getting started with the X-NUCLEO-BNRG2A1 BLE expansion board based on BLUENRG-M2SP module for STM32 Nucleo – [user manual](#)

X-CUBE-BLE2:

- **DB4087:** Bluetooth Low Energy software expansion for STM32Cube – [databrief](#)
- **UM2666:** Getting started with the X-CUBE-BLE2 Bluetooth Low Energy software expansion for STM32Cube – [user manual](#)

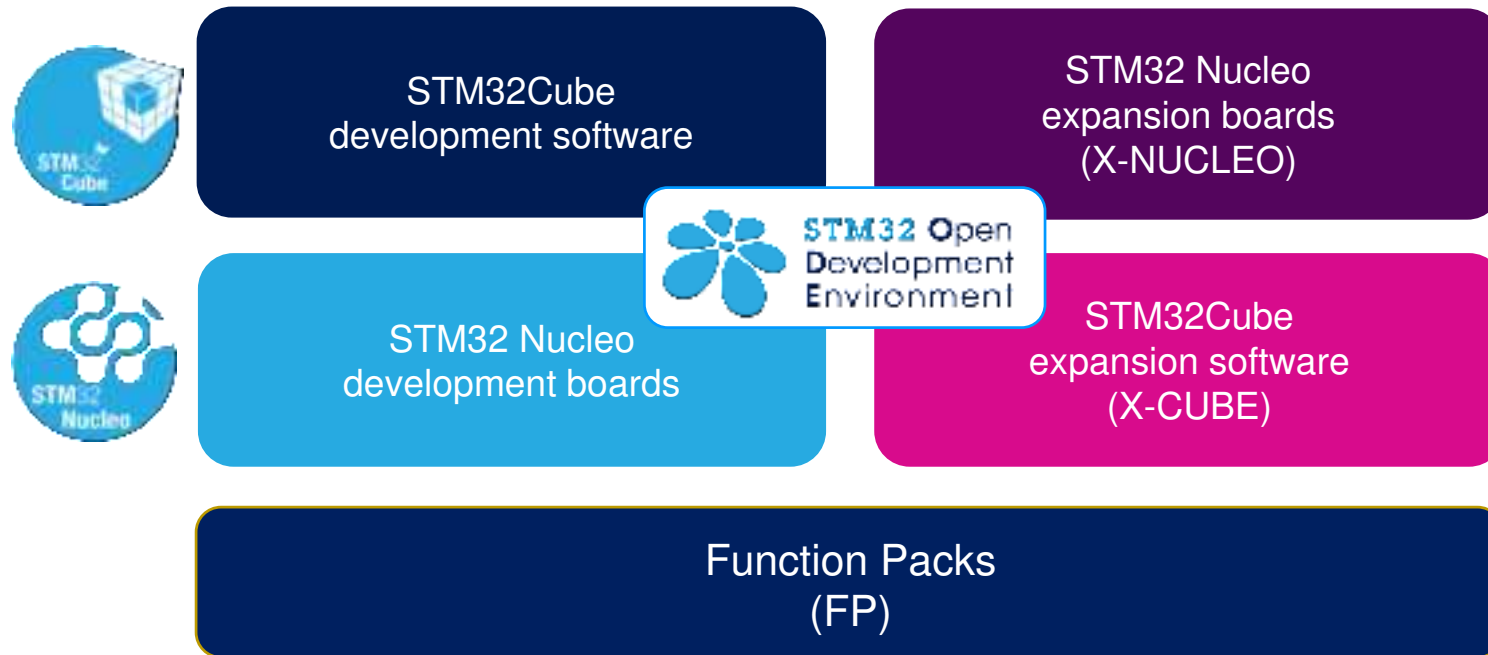
4- STM32 Open Development Environment: Overview



STM32 Open Development Environment

Fast, affordable Prototyping and Development

- The STM32 Open Development Environment (STM32 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



For further information, please visit www.st.com/stm32ode

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