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

Bluetooth Low Energy expansion board

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

Arduino UNO R3 connector

☐ BLUENRG-M2SP   ☐ M95640-RMC6TG
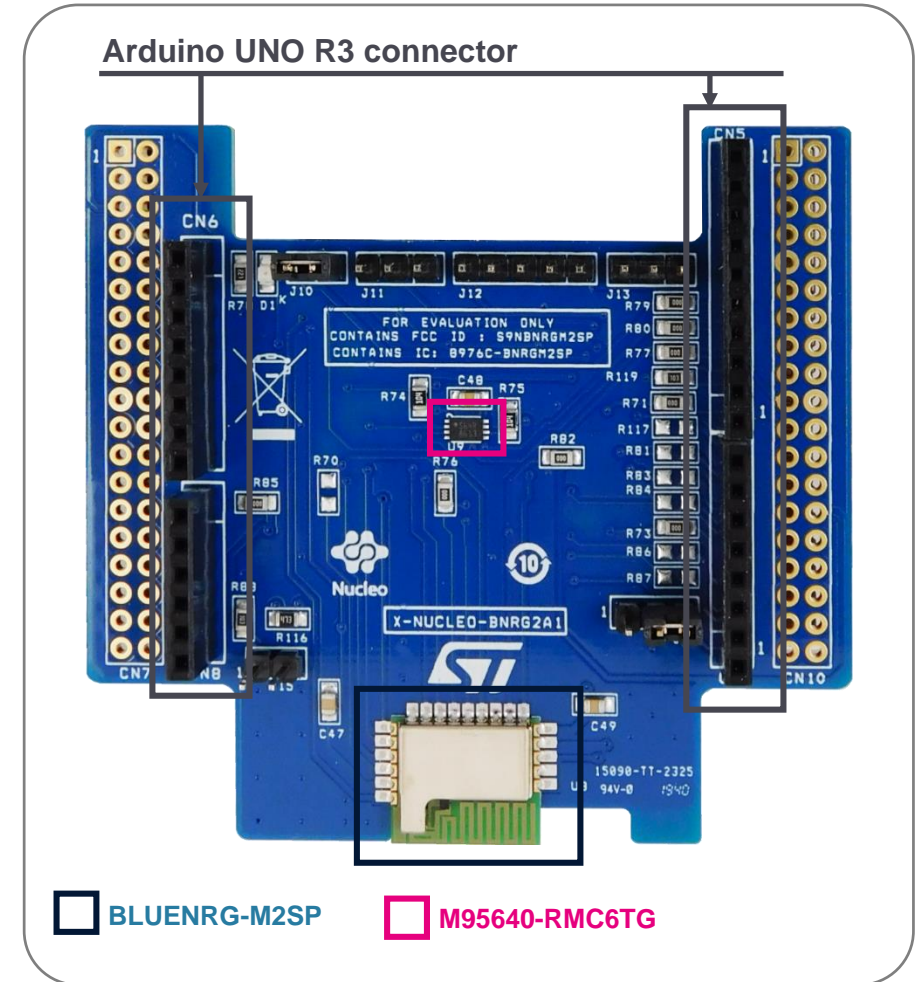
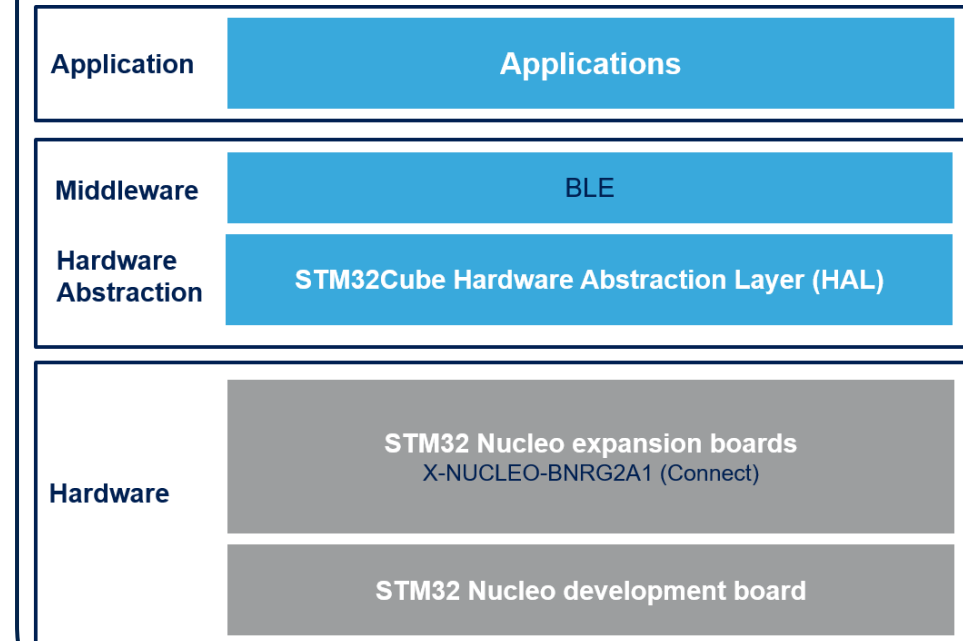Latest info available at www.st.com
X-NUCLEO-BNRG2A1

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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

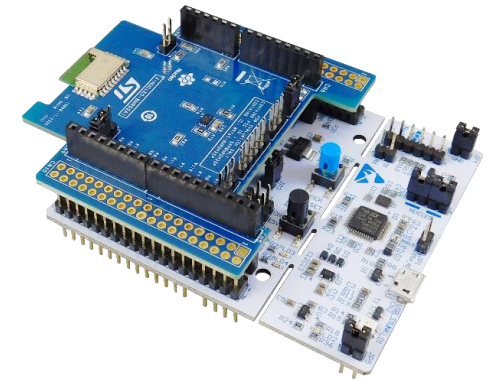|	
Application	**Applications**
Middleware	BLE
Hardware Abstraction	**STM32Cube Hardware Abstraction Layer (HAL)**
Hardware	**STM32 Nucleo expansion boards** X-NUCLEO-BNRG2A1 (Connect)
	STM32 Nucleo development board

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
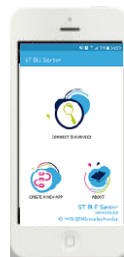
Nucleo-L476RG +
X-NUCLEO-BNRG2A1

Smartphone requirements	App for Demo	App for Hands On
Android OS device	ST BLE Sensor	BLE Scanner
iOS device	https://play.google.com/store/apps/details?id=com.st.bluems https://apps.apple.com/it/app/st-bluems/id993670214	https://play.google.com/store/apps/details?id=com.macdom.ble.blescanner https://apps.apple.com/us/app/ble-scanner-4-0/id1221763603

- 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 soldiered 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).

- **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
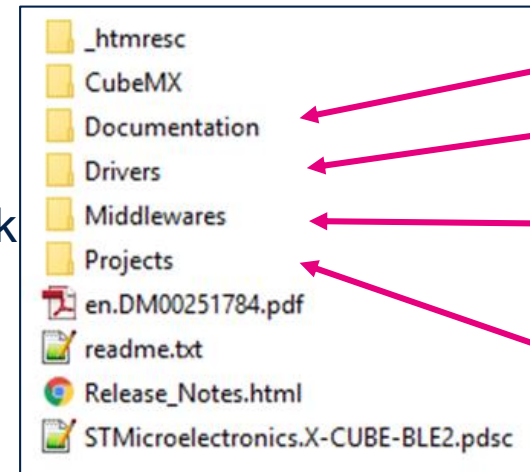## Start coding in just a few minutes

1 www.st.com/stm32ode

2

Select Expansion Pack:
X-CUBE-BLE2

3 Download & unpack

X-CUBE-BLE2 package structure

- _htmresc
- CubeMX
- Documentation → Docs
- Drivers → BSP, HAL drivers
- Middlewares → BLE HCI stack
- Projects → Sample applications, binary
- en.DM00251784.pdf
- readme.txt
- Release_Notes.html
- STMicroelectronics.X-CUBE-BLE2.pdsc

4
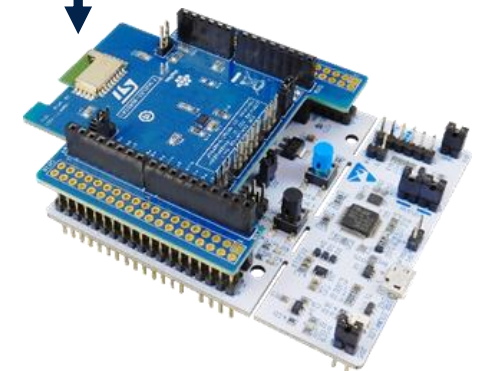
6

Evaluate / modify / build the code

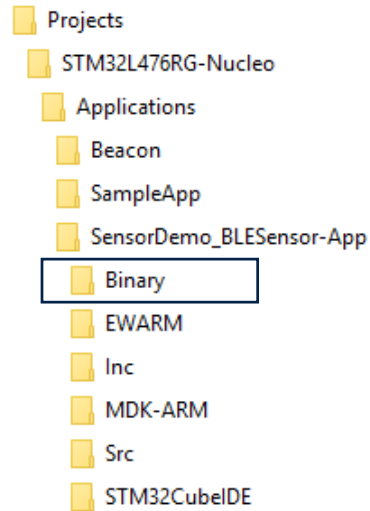KEIL Tools by ARM   IAR SYSTEMS   STM32 CubeIDE
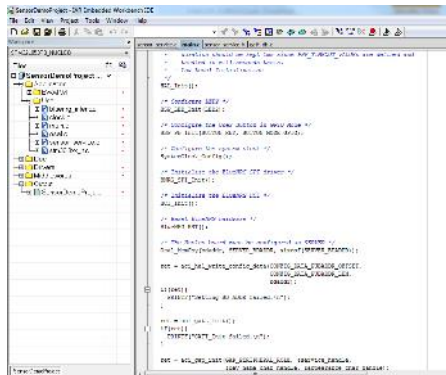
5

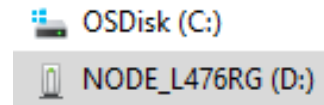Open project example (e.g. SensorDemo_BLESensor-App)

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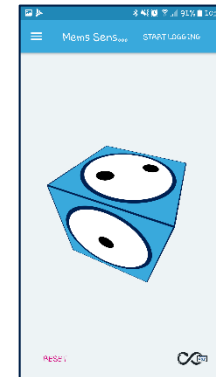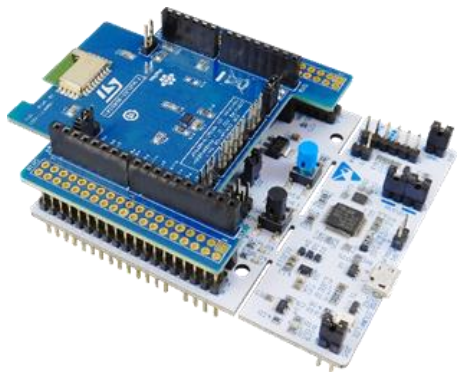
Projects
STM32L476RG-Nucleo
Applications
Beacon
SampleApp
SensorDemo_BLESensor-App
Binary
EWARM
Inc
MDK-ARM
Src
STM32CubeIDE

OSDisk (C:)
NODE_L476RG (D:)

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

Google play

Available on the App Store

X-CUBE-BLE2 sample applications
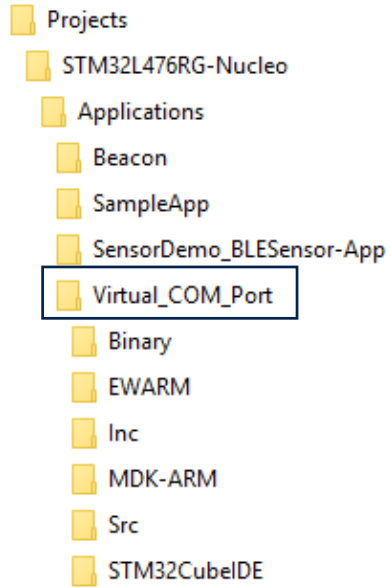
Evaluate in just a few minutes (2/2)

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
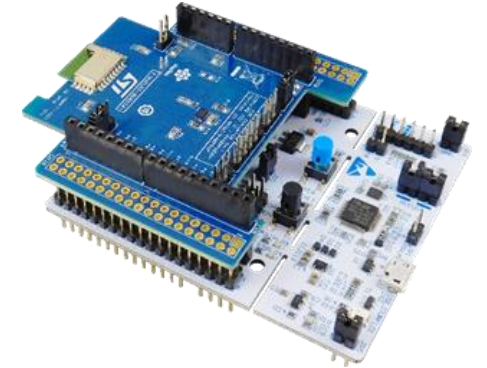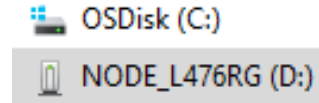STM32 Nucleo board to the smartphone app

X-CUBE-BLE2 sample applications
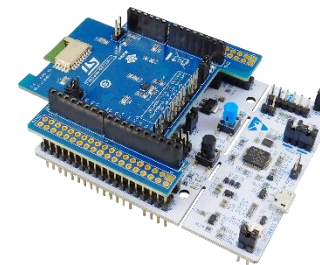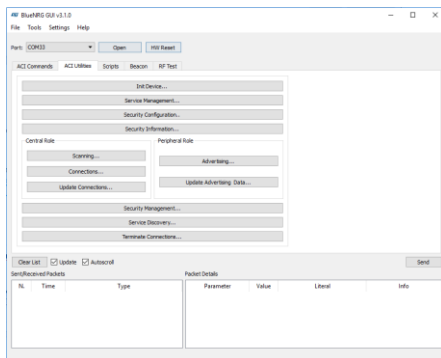## Evaluate using the BlueNRG GUI

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

1 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
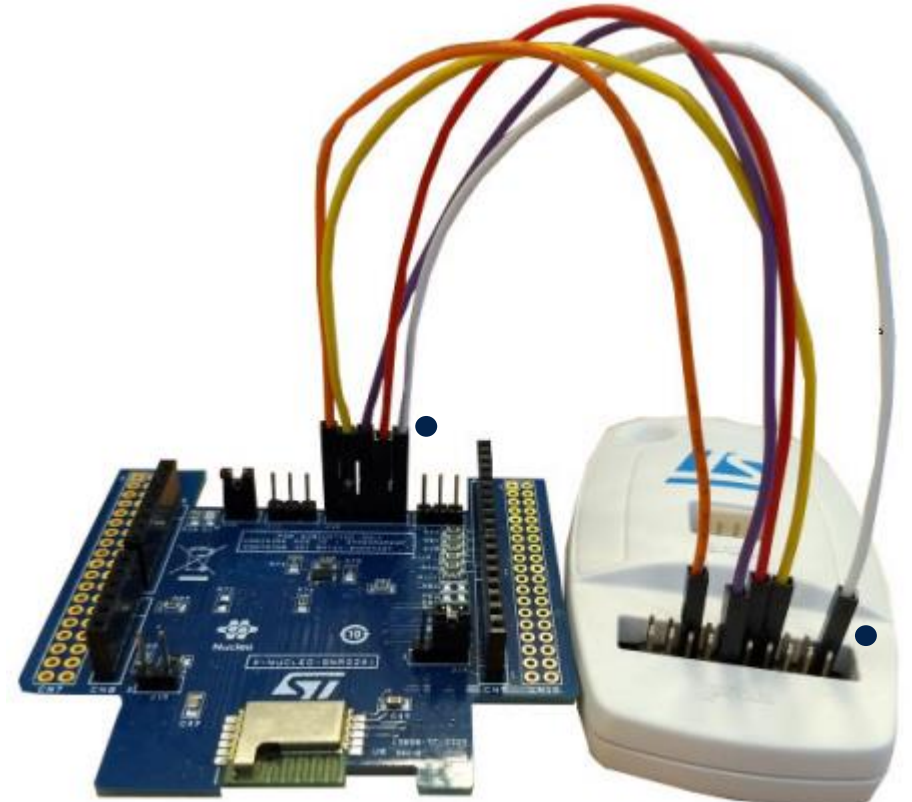
3

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

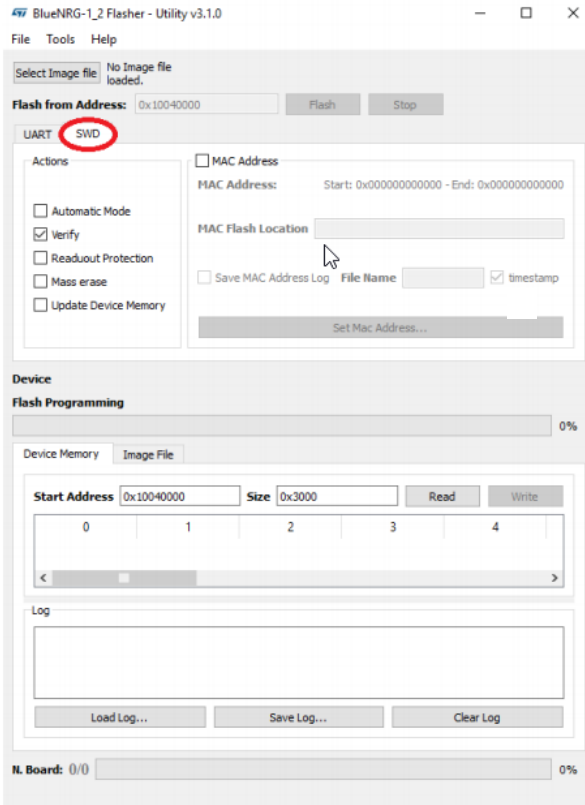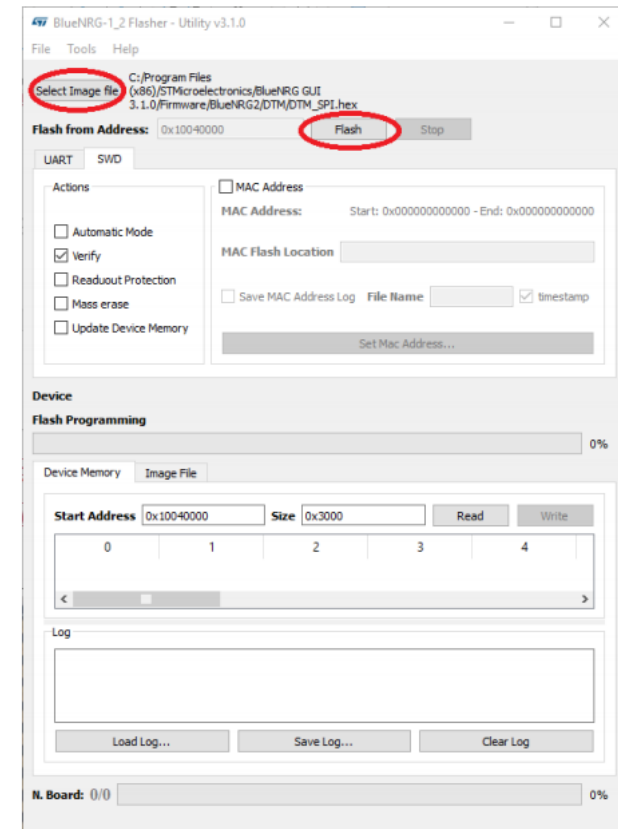**8** Open the BlueNRG-1_2 Flasher Utility (STSW-BNRGFLASHER)

a Select the SWD tab

b Erase the BlueNRG-2 flash memory
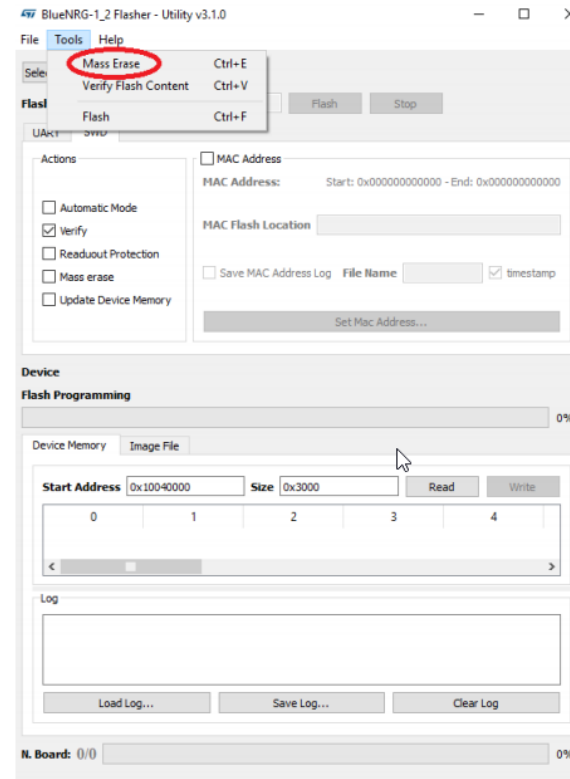
c Load the BlueNRG_2N_FW_V3_2_0.hex firmware contained in the STSW-BNRG2N-V320 and press the Flash button

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Restoring the BlueNRG-2 firmware image

- To restore the BlueNRG-2 firmware image on the BlueNRG-2 device, download and install the <u>STSW-BNRGUI</u>
- 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**

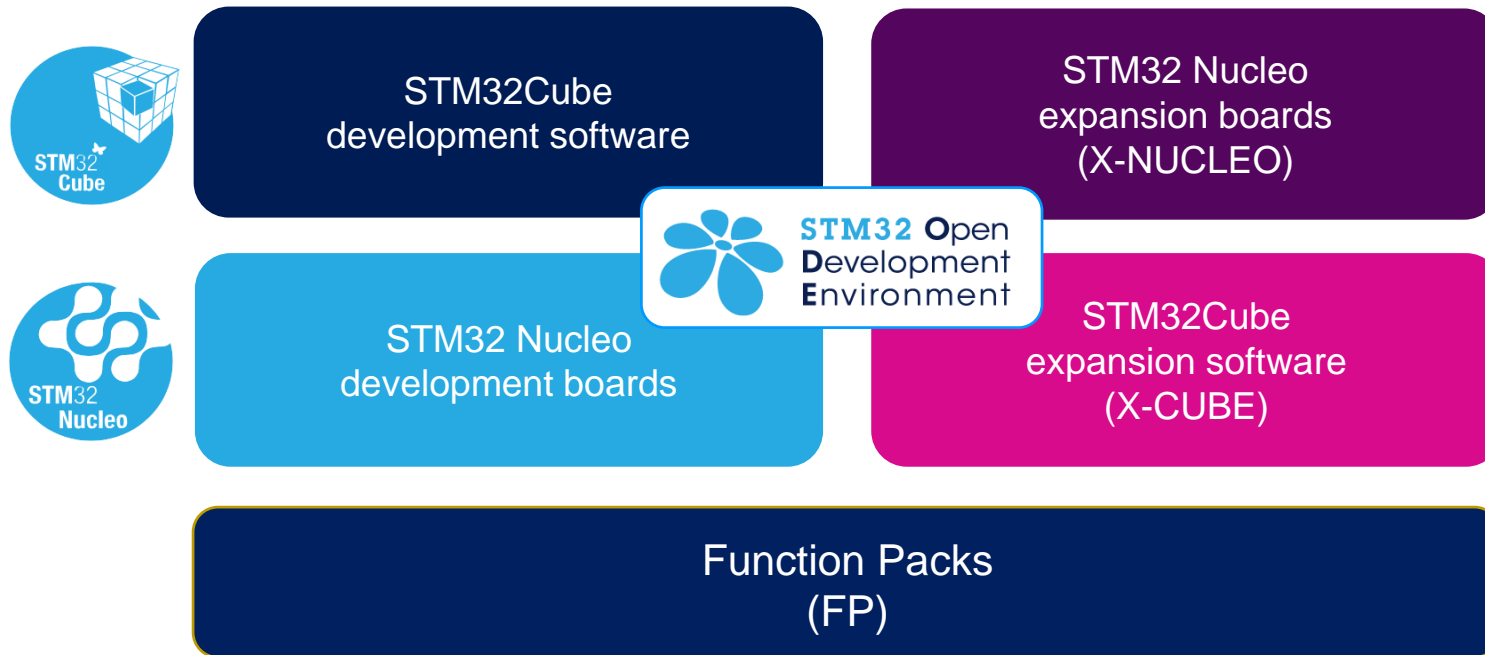Consult www.st.com for the complete list

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

STM32Cube
development software

STM32 Nucleo
expansion boards
(X-NUCLEO)

STM32 Nucleo
development boards

STM32Cube
expansion software
(X-CUBE)

Function Packs
(FP)

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

Thank you

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