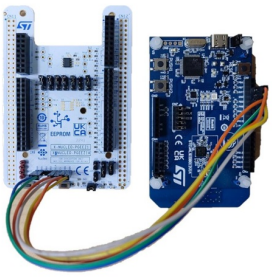

STSW-DFU-EEPRMA Device Firmware Upgrade Over Bluetooth Using External EEPROM User Guide

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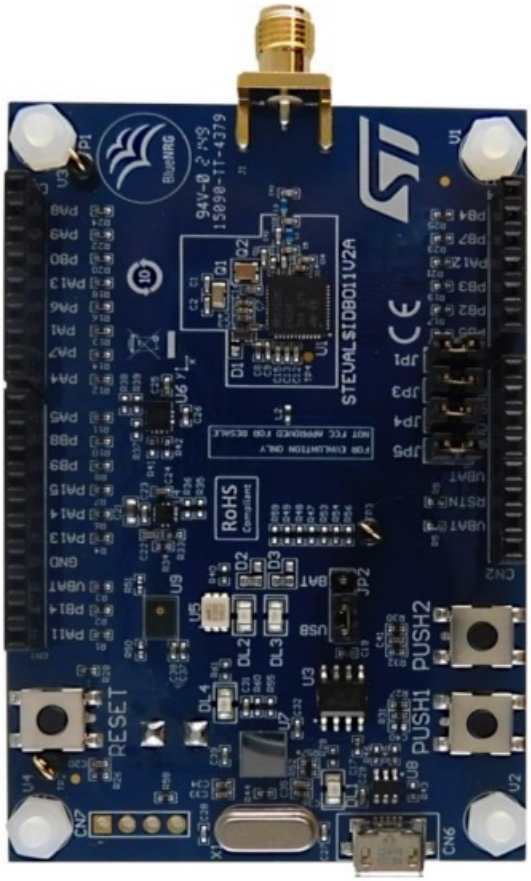
Quick Start Guide
Device Firmware Upgrade over Bluetooth using

external EEPROM
(STSW-DFU-EEPRMA)
Version 1.0.0

Contents

Hardware and Software overview

STEVAL-IDB011V1 / STEVAL-IDB011V2
Hardware Overview
Evaluation platform based on the BLUENRG-355MC system-on-chip
The STEVAL-IDB011V1 or STEVAL-IDB011V2 evaluation platform is designed to help you to develop and test Bluetooth® low energy applications using the BlueNRG-LP low-power system-on-chip in combination with inertial and environmental MEMS sensors, a digital MEMS microphone, various interface buttons, and LEDs.
It is compliant with the Bluetooth® LE specification and supports master, slave, and simultaneous master-and-slave roles.
It features data length extension, 2 Mbps, long range, extended advertising and scanning, as well as periodic advertising, periodic advertising sync transfer, LE L2CAP connection-oriented channel, and LE power control and path loss monitoring.
Key Product on board
64 MHz, 32-bit Arm®Cortex®-M0+core, a 256 KB programmable flash memory, a 64 KB SRAM, an MPU, and an extensive peripheral set (6x PWM, 2x I²C, 2x SPI/I2S, SPI, USART, UART, PDM, and 12-bit ADC SAR).



Latest info available at www.st.com

STEVAL-IDB011V1/2

Evaluation platform based on the BlueNRG-LPS system-on-chip

The STEVAL-IDB012V1 evaluation platform is designed to develop and test Bluetooth® Low Energy applications using the low power BlueNRG-LPS system-on-chip, in combination with inertial and environmental MEMS sensors, a digital MEMS microphone, and various interface buttons and LEDs.

The BlueNRG-LPS is compliant with the Bluetooth® Low Energy specification. It supports master, slave, simultaneous master and slave roles, data length extension, 2 Mbps, long range, extended advertising and scanning, channel selection algorithm #2, GATT caching, LE ping procedure, LE power control and path loss monitoring, and direction finding (angle of arrival/angle of departure) features.

Key Product on board

The BlueNRG-LPS features a 64 MHz, 32-bit Arm Cortex®-M0+ core, 192 KB programmable flash memory, 24 KB SRAM, MPU, and an extensive peripheral set (4x PWM, I²C, SPI/I2S, SPI, USART, LPUART, and 12-bit ADC SAR).

Latest info available at **www.st.com**

STEVAL-IDB012V1

X-NUCLEO-PGEEZ1

Hardware Overview

Standard SPI page EEPROM memory expansion board based on M95P32 series for STM32 Nucleo

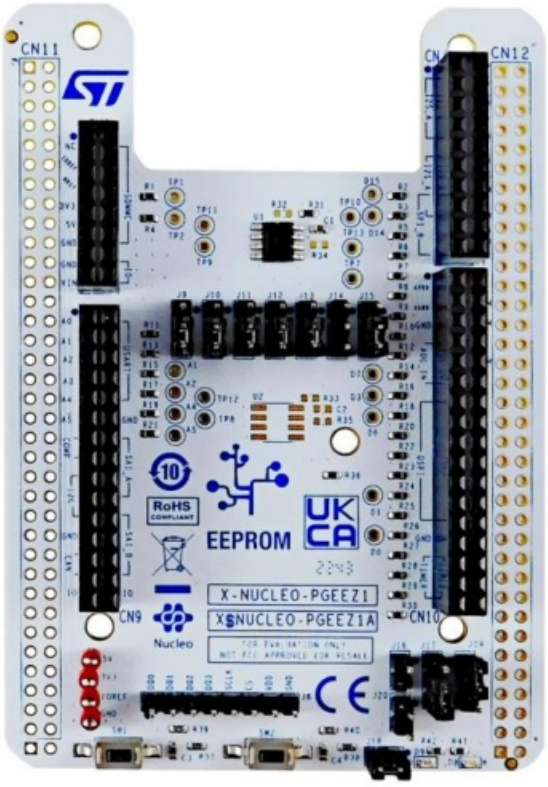
The X-NUCLEO-PGEEZ1 expansion board is designed for the M95P32 series SPI page EEPROM for data reading and writing.

This expansion board allows developers to evaluate the new memory page EEPROM through a single/dual/quad SPI interface.

It acts as an external storage device that can be used to store data, such as manufacturing traceability, calibration, user settings, error flags, data logs, and monitoring data to build more flexible and accurate applications.

Key Product on board

M95P32: Ultra low-power 32 Mbit Serial SPI Page EEPROM



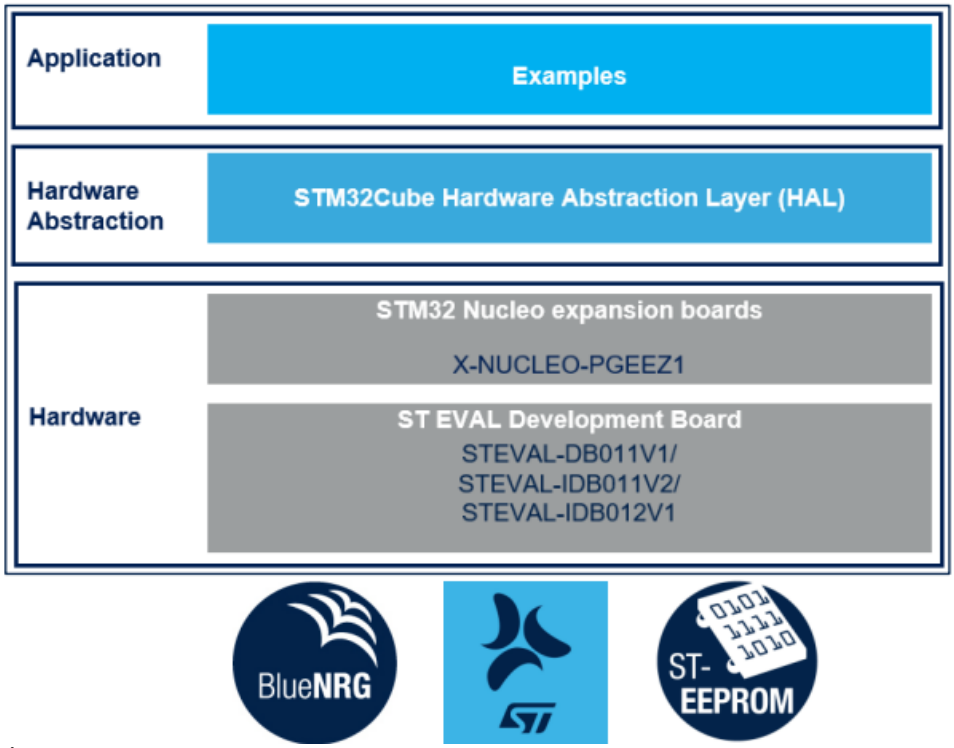
Latest info available at **www.st.com**
X-NUCLEO-PGEEZ1

STSW-DFU-EEPRMA
Software Overview

STSW-DFU-EEPRMA Software Description
STSW-DFU-EEPRMA is a Device Firmware Upgrade STSW package with support of external M95P32 EEPROM connected to either STEVAL-IDB011V1, STEVALIDB011V2 or STEVAL-IDB012V1 on X-NUCLEO-PGEEZ1 EEPROM memory expansion board.
Key features

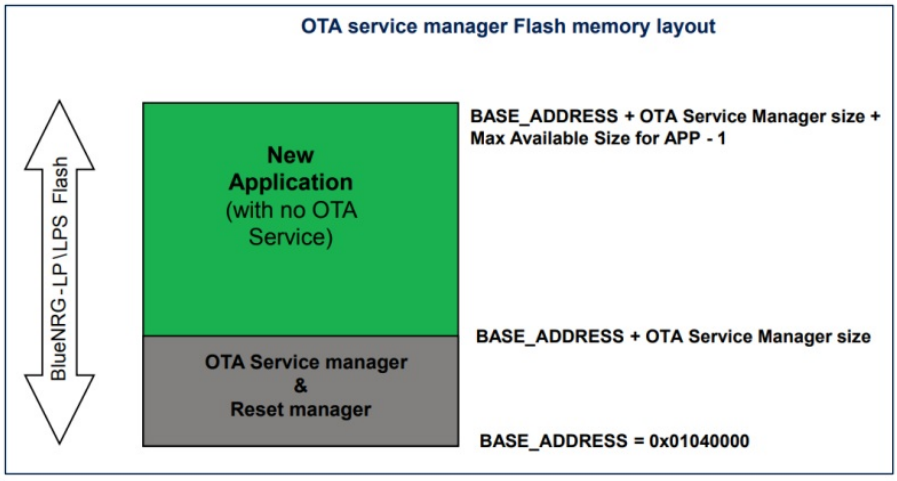
- Firmware demo for STEVAL-IDB011V1/2 or STEVAL-IDB012V1 with X-NUCLEOPGEEZ1 EEPROM memory expansion board
- Binary executables can be shared over Bluetooth to the device which are first written directly to external M95P32 EEPROM
- Flash upgrade from external M95P32 EEPROM
- OTA Service Manager based approach, which includes Bluetooth OTA service, it’s characteristics and OTA reset manager capabilities
- Application image not required to include OTA FW upgrade service
- Sample application demonstrating complete FOTA service

Overall Software Architecture



Latest info available at www.st.com
STSW-DFU-EEPRMA
FOTA : Flash Layout BlueNRG-LP/LPS
Software Overview

- BlueNRG-LP/LPS Flash Layout
- OTA Service Manager stored in Flash Memory of BlueNRG-LP/LPS is used to carry out Firmware Over The Air (FOTA) update
- On device reset, Service Manager decides where the device should boot from
- Service Manager starts from address 0x1004 0000
- User Application starts from address 0x1005 7800
- User can jump from User application to Service manager to start OTA session by pressing “Reset” once and then holding “PUSH1” button pressed

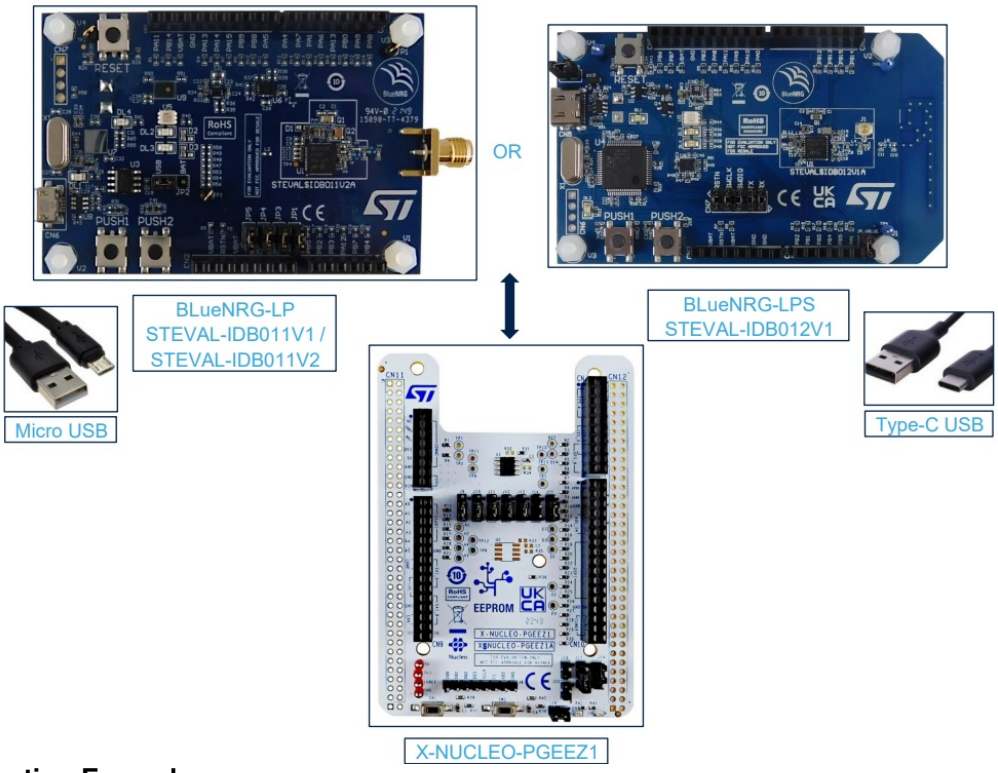


Overall Software Architecture

Setup & Demo Examples

Setup & Application Examples
HW prerequisites

- 1x BlueNRG-LP or BlueNRG-LPS (STEVAL-IDB011V1/2)
- 1x M95P32 EEPROM expansion board (X-NUCLEO-PGEEZ1)
- 1x BLE-enabledAndroid™ or iOS™ device
- Laptop/PC with Windows 7, 8 or 10
- 1x USB type A to Micro-B USB cable (BlueNRG-LP), or
- 1x USB type A to Type-C USB cable (BlueNRG-LPS)
- Connecting Wires



Setup & Application Examples
Software and Other prerequisites

- STSW-DFU-EEPRMA package
- Download and install STSW-BNRGFLASHER from **www.st.com**
- A toolchain to build the firmware

  The STSW-DFU-EEPRMA has been developed and tested with
  - IAR Embedded Workbench for ARM® (EWARM) toolchain + ST-Link
  - Real View Microcontroller Development Kit (MDK-ARM) toolchain + ST-LINK
- ST BLE-Sensor Classic Application, Android (**Link**), or
- ST BLE-Sensor Application, iOS (**Link**)
- Serial line monitor e.g., Tera term (Windows)

FOTA – Procedure

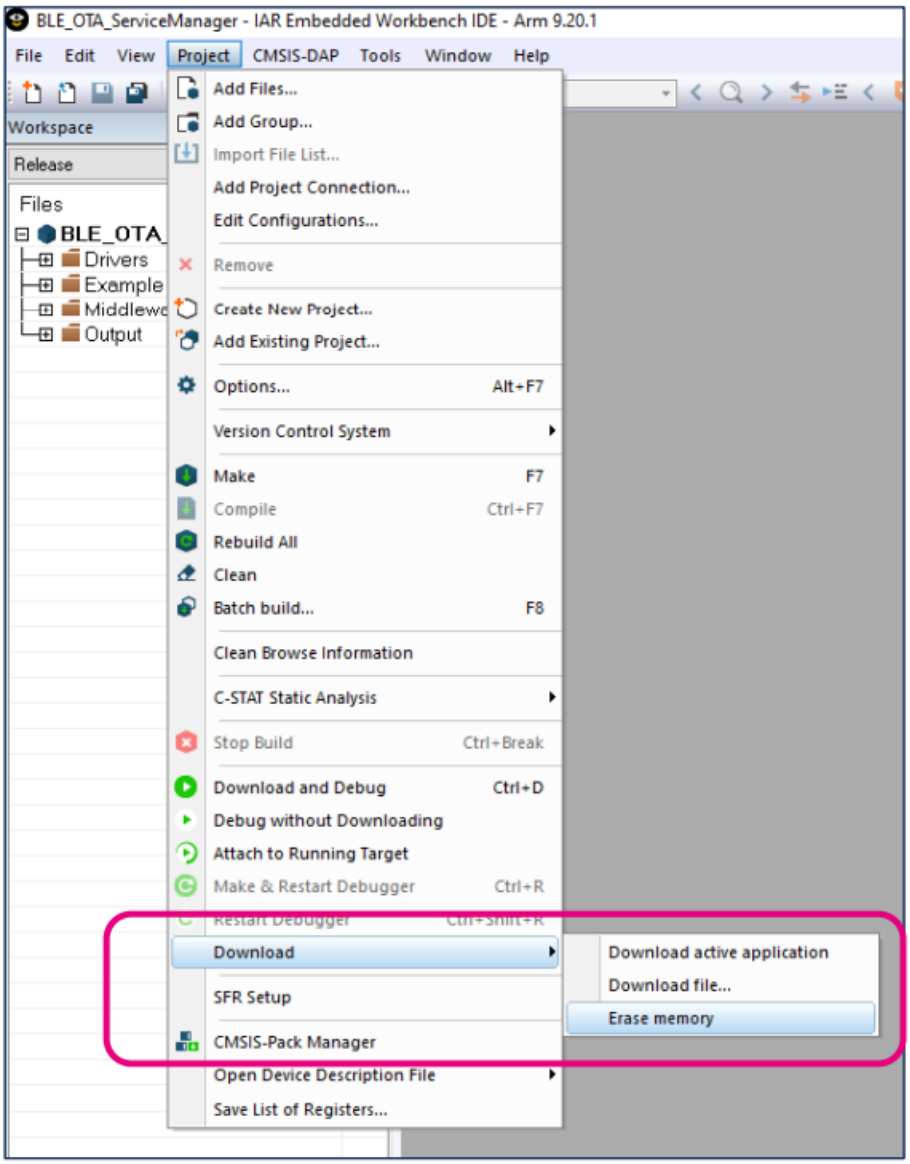
- The procedure to setup BlueNRG-LP/LPS for FOTA can be divided in these steps:
- Step 1 : Erase complete flash memory

- Step 2 : Program Service Manager
- Step 3 : Perform FOTA

Step1 : Erase Complete Flash Memory

For BlueNRG-LP

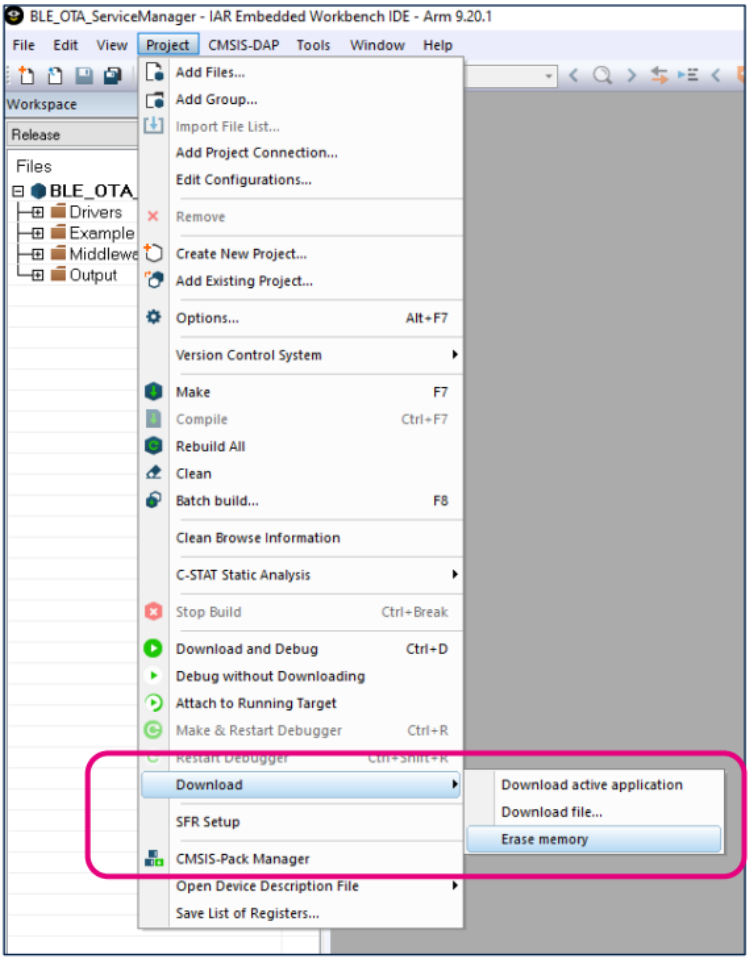
- Open EWARM project :
- \STSW-BlueNRG-FOTA\Projects\Applications\BLE_OTA_ServiceM anager\EWARM\STEVAL-IDB011V1**BLE_OTA_ServiceManager.eww**
- Go to Project → Download → Erase Memory and click on “OK” on the next popup to confirm erase of flash memory
- This step to be done only once
- **Note:** User can use any other tool also for complete flash erase



For BlueNRG-LPS

- Open EWARM project :

- .\STSW-BlueNRG-FOTA\Projects\Applications\BLE_OTA_ServiceM anager\EWARM\STEVAL-IDB012V1**BLE_OTA_ServiceManager.eww**
- Go to Project → Download → Erase Memory and click on “OK” on the next popup to confirm erase of flash memory
- This step to be done only once
- **Note:** User can use any other tool also for complete flash erase



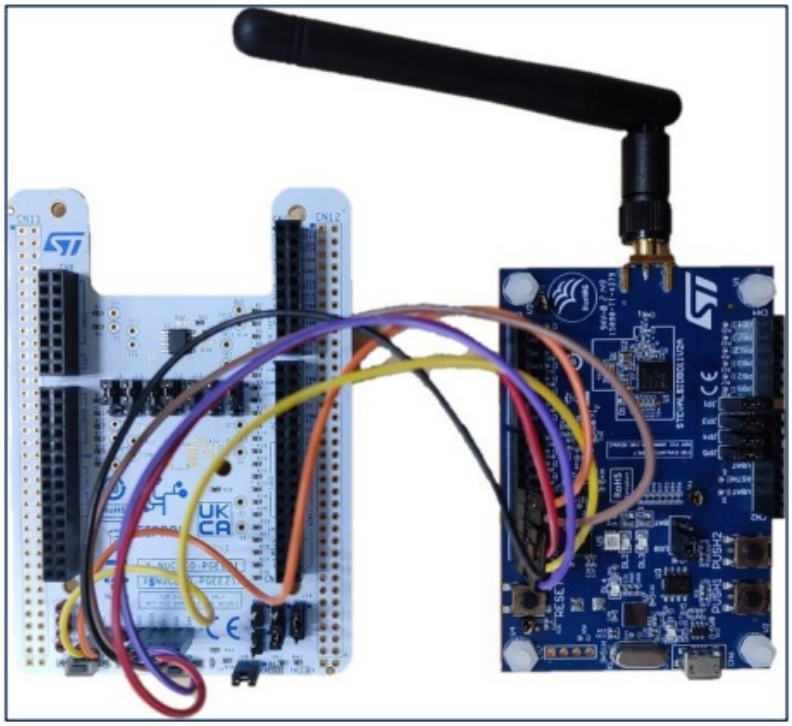
Step 2 : Program Service Manager

- For BlueNRG-LP
- Open EWARM project :
- .\STSW-BlueNRGFOTA\Projects\Applications\BLE_OTA_ServiceMa nager\EWARM\STEVAL-IDB011V1**BLE_OTA_ServiceManager.eww**
- Go to Project → Download → Download active application
- The following will be printed on UART terminal:

```
BlueNRG-LP BLE OTA Service Manager (version: 1.0.0)

OTA service added successfully.
```

- OTA Service Manager is programmed successfully



Signal	BlueNRG-LP	Jumper J8 on X-NUCLEO-PGEEZ1
SPI1_SCK	PA13	SCLK
SPI1_MISO	PA14	DQ1
SPI1_MOSI	PB14	DQ0
CS	PA11	CS

The project uses M95P32 External EEPROM mounted on X-NUCLEO-PGEEZ1 for FOTA service which should be connected to BlueNRG-LP/LPS

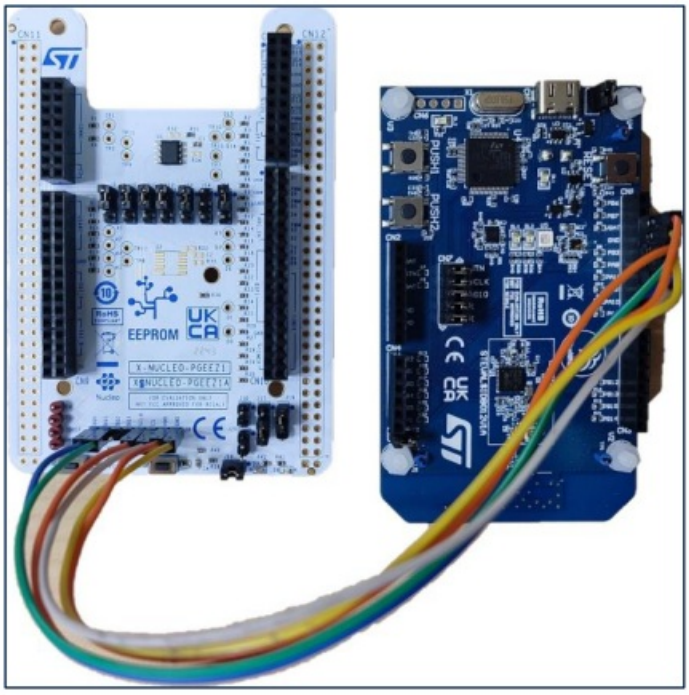
Step 2 : Program Service Manager

- For BlueNRG-LPS
- Open EWARM project :
- .\STSW-BlueNRGFOTA\Projects\Applications\BLE_OTA_ServiceMa nager\EWARM\STEVAL-IDB012V1\BLE_OTA_ServiceManager.eww
- Go to Project → Download → Download active application
- The following will be printed on UART terminal:

```
BlueNRG-LP BLE OTA Service Manager (version: 1.0.0)

OTA service added successfully.
```

- OTA Service Manager is programmed successfully



Signal	BlueNRG-LP	Jumper J8 on X-NUCLEO-PGEEZ1
SPI13_SCK	PB3	SCLK
SPI13_MISO	PA8	DQ1
SPI3_MOSI	PB11	DQ0
CS	PA9	CS

The project uses M95P32 External EEPROM mounted on X-NUCLEO-PGEEZ1 for FOTA service which should be connected to BlueNRG-LP/LPS

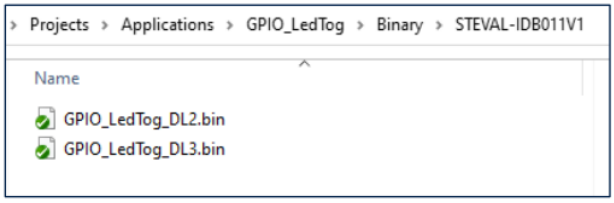
Step 3 : Perform FOTA (1/4)

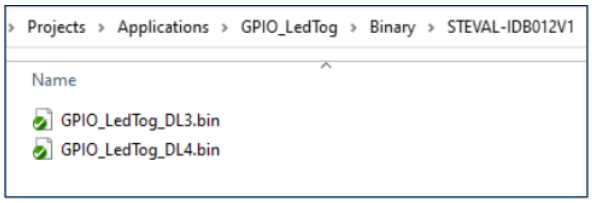
- Take any Android or iOS device and launch the application “ST Ble Sensor Classic”
- Download the application from Play/App store if not already installed
- The example application demonstrates different LED toggle which can be selected from the defined macro in preprocessor

BlueNRG-LP	**CONFIG_LED_DL2**	**CONFIG_LED_DL3**
	Toggle DL2 with 250ms delay	Toggle DL3 with 1000ms delay

BlueNRG-LPS	**CONFIG_LED_DL3**	**CONFIG_LED_DL4**
	Toggle DL3 with 250ms delay	Toggle DL4 with 1000ms delay

- Save the example user application .bin files on the phone

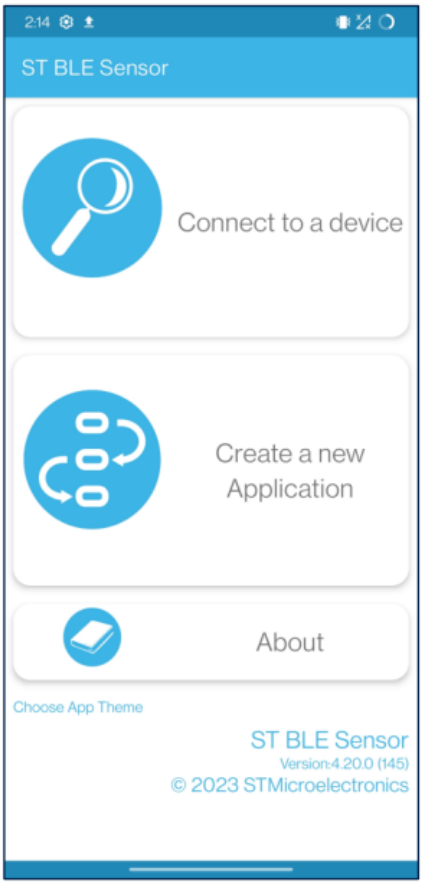




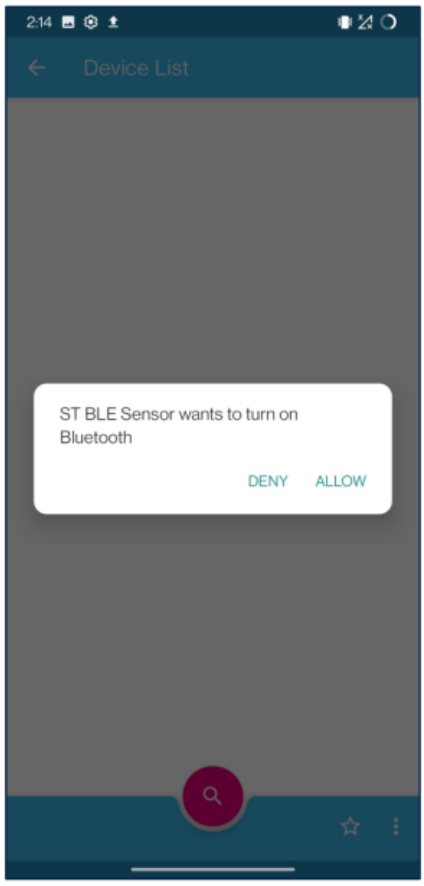
- The binary file is first stored on external M95P32 EEPROM via Bluetooth transfer from phone and then internally copied to flash memory of BlueNRG-LP/LPS
- Here, the steps are demonstrated with an Android phone

Step 3 : Perform FOTA (2/4)

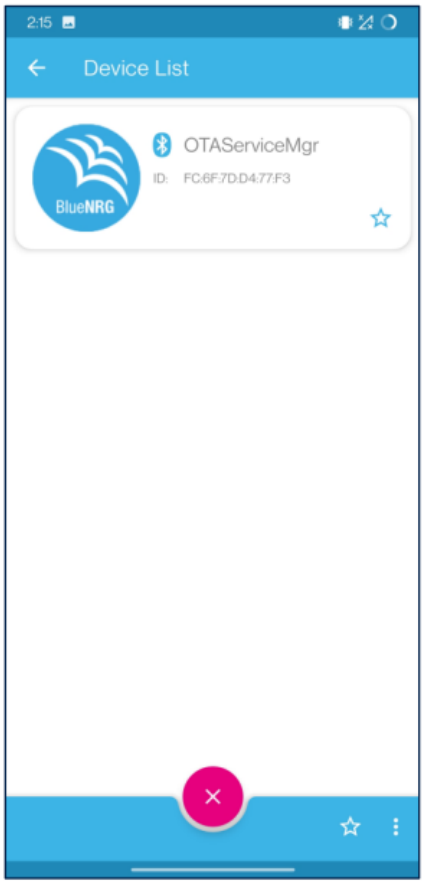
Click “Connect to a device”



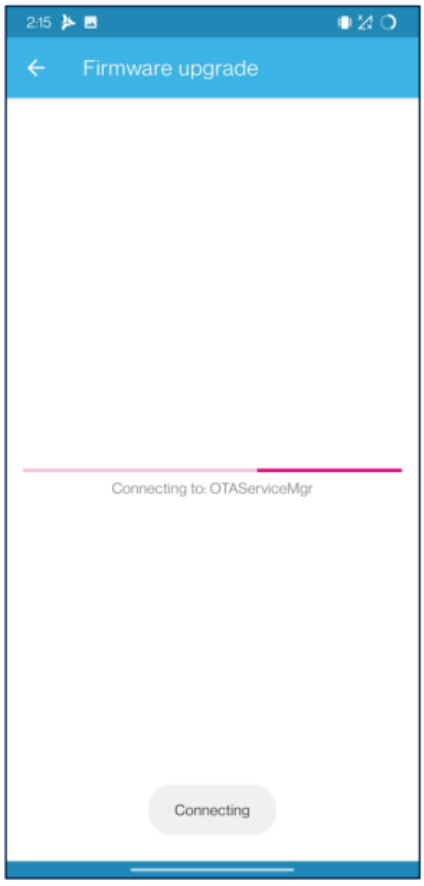
Allow Bluetooth



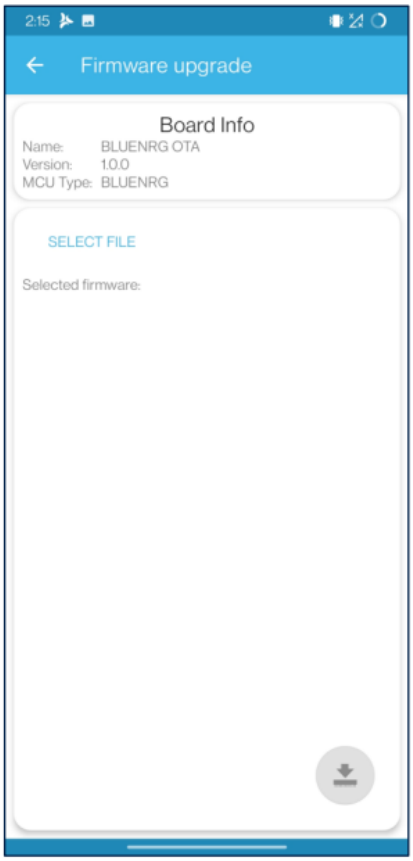
Select device



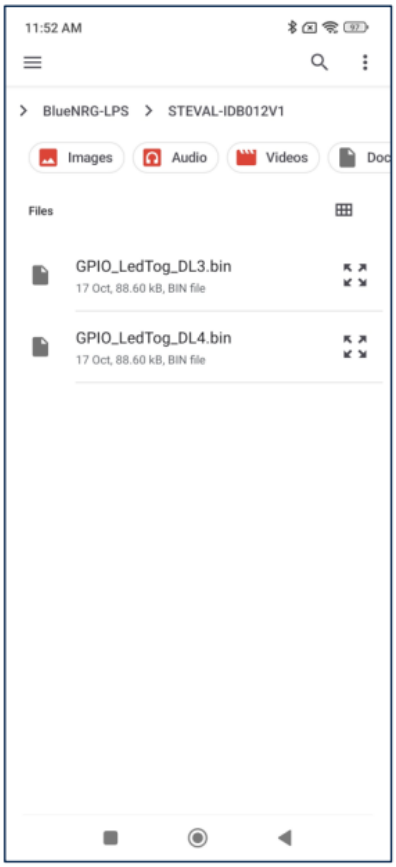
Wait for connection



Click “SELECT FILE”

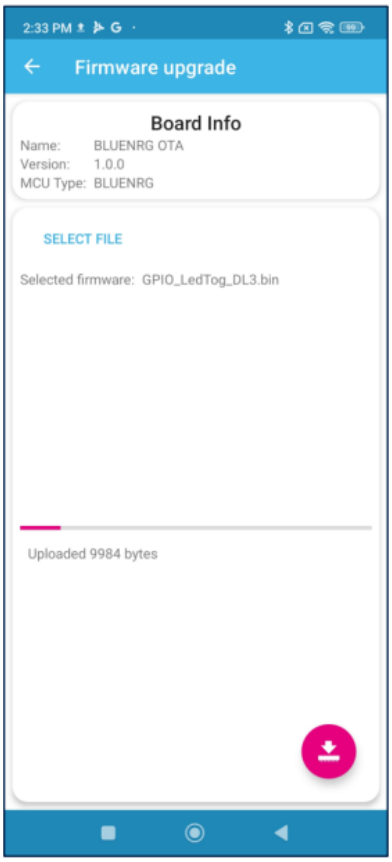


Select required .bin



Click on Download

Upload starts



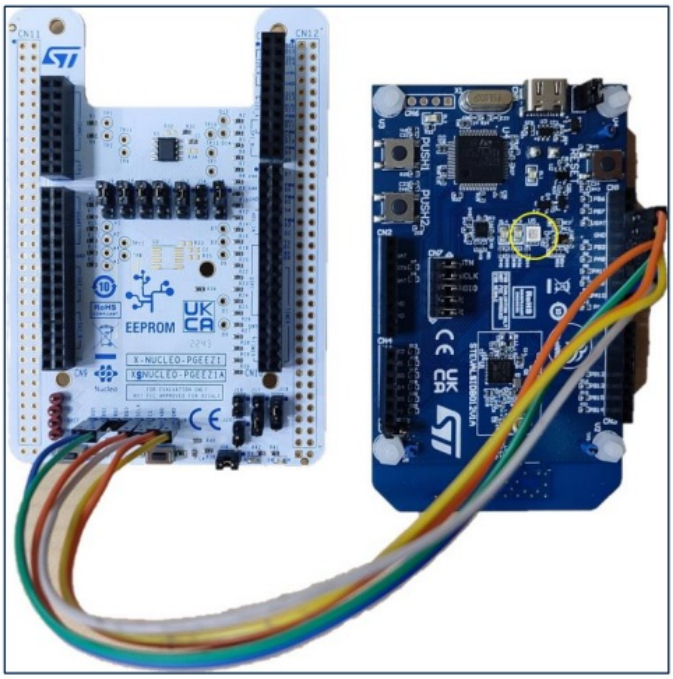
Step 3 : Perform FOTA (4/4)

- Wait for user led U5 on BlueNRG-LP/LPS to turn-off which denotes end of FOTA update

- Device resets and application boots up based on the binary flashed

```
** FOTA FW downloaded. Flashing from EXTERNAL EEPROM --> INTERNAL FLASH **
** FOTA Update complete **
** FOTA upgarde done, Application JUMPING to new base address: 0x10057800 **
Blinking DL2 LED with 250ms delay.
Blinking DL2 LED with 250ms delay.
Blinking DL2 LED with 250ms delay.
Blinking DL2 LED with 250ms delay.
Blinking DL2 LED with 250ms delay.
Blinking DL2 LED with 250ms delay.
Blinking DL2 LED with 250ms delay.
```

```
OTA service added successfully.
** FOTA FW downloaded. Flashing from EXTERNAL EEPROM --> INTERNAL FLASH **
** FOTA Update complete **
** FOTA upgarde done, Application JUMPING to new base address: 0x10057800 **
Blinking DL3 LED with 1000ms delay.
Blinking DL3 LED with 1000ms delay.
Blinking DL3 LED with 1000ms delay.
Blinking DL3 LED with 1000ms delay.
Blinking DL3 LED with 1000ms delay.
Blinking DL3 LED with 1000ms delay.
Blinking DL3 LED with 1000ms delay.
```



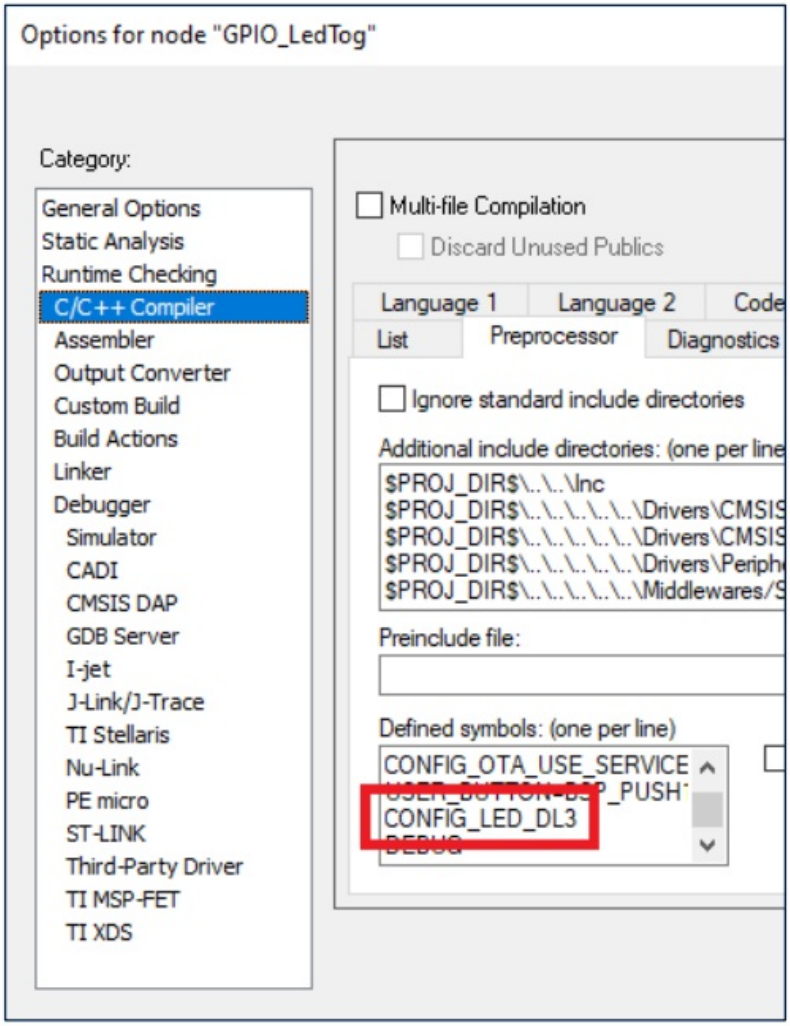
• The sample application demonstrates different LED toggle functionality which can be defined as a macro in preprocessor

FOTA – Application

BlueNRG-LP	**CONFIG_LED_DL2**	**CONFIG_LED_DL3**
	Toggle DL2 with 250ms delay	Toggle DL3 with 1000ms delay

BlueNRG-LPS	**CONFIG_LED_DL3**	**CONFIG_LED_DL4**
	Toggle DL3 with 250ms delay	Toggle DL4 with 1000ms delay

FOTA – Application



FOTA – Flasher Utility
If using a flasher utility tool, then the following steps should be followed

1. Erase complete flash
2. Flash BLE_OTA_ServiceManager.bin from address 0x1004 0000
3. Flash the required .bin from address 0x1005 7800

Documents & Related Resources

Documents & Related Resources
STSW-DFU-EEPRMA:
• DB5187: Device firmware upgrade over Bluetooth® using external page EEPROM (M95P32) with BlueNRG-LP or BlueNRG-LPS evaluation board **data brief**
X-NUCLEO-PGEEZ1:
Gerber files, **BOM**, **Schematic**

- DB4863: Standard SPI page EEPROM memory expansion board based on M95P32 series for STM32 Nucleo – **databrie**
- UM3096: Getting started with the X-NUCLEO-PGEEZ1 standard SPI page EEPROM memory expansion board based on M95P32 series for STM32 Nucleo– **user manual**

All documents are available in the DESIGN tab of the related products webpage.
Documents & Related Resources

STEVAL-IDB011V1:
Gerber files, BOM, Schematic

- DB4266: Evaluation platform based on BlueNRG-355MC system-on-chip– databrief
- UM2735 : BlueNRG-LP/BlueNRG-LPS development kits– user manual

STEVAL-IDB011V2:
Gerber files, BOM, Schematic

- DB4617: Evaluation platform based on the BLUENRG-355MC system-on-chip– databrief
- UM2735: BlueNRG-LP/BlueNRG-LPS development kits– user manual

STEVAL-IDB012V1 :
Gerber files, BOM, Schematic

- DB4694: Evaluation platform based on the BlueNRG-LPS system-on-chip– databrief
- UM2735: BlueNRG-LP/BlueNRG-LPS development kits – user manual

Consult www.st.com for the complete list

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Thank you

Documents / Resources

	ST STSW-DFU-EEPRMA Device Firmware Upgrade Over Bluetooth Using External EEPROM [pdf] User Guide STSW-DFU-EEPRMA Device Firmware Upgrade Over Bluetooth Using External EEPROM, STSW-DFU-EEPRMA, Device Firmware Upgrade Over Bluetooth Using External EEPROM, Firmware Upgrade Over Bluetooth Using External EEPROM, Upgrade Over Bluetooth Using External EEPROM, Over Bluetooth Using External EEPROM, Bluetooth Using External EEPROM, Using External EEPROM, External EEPROM, EEPROM

References

- User Manual