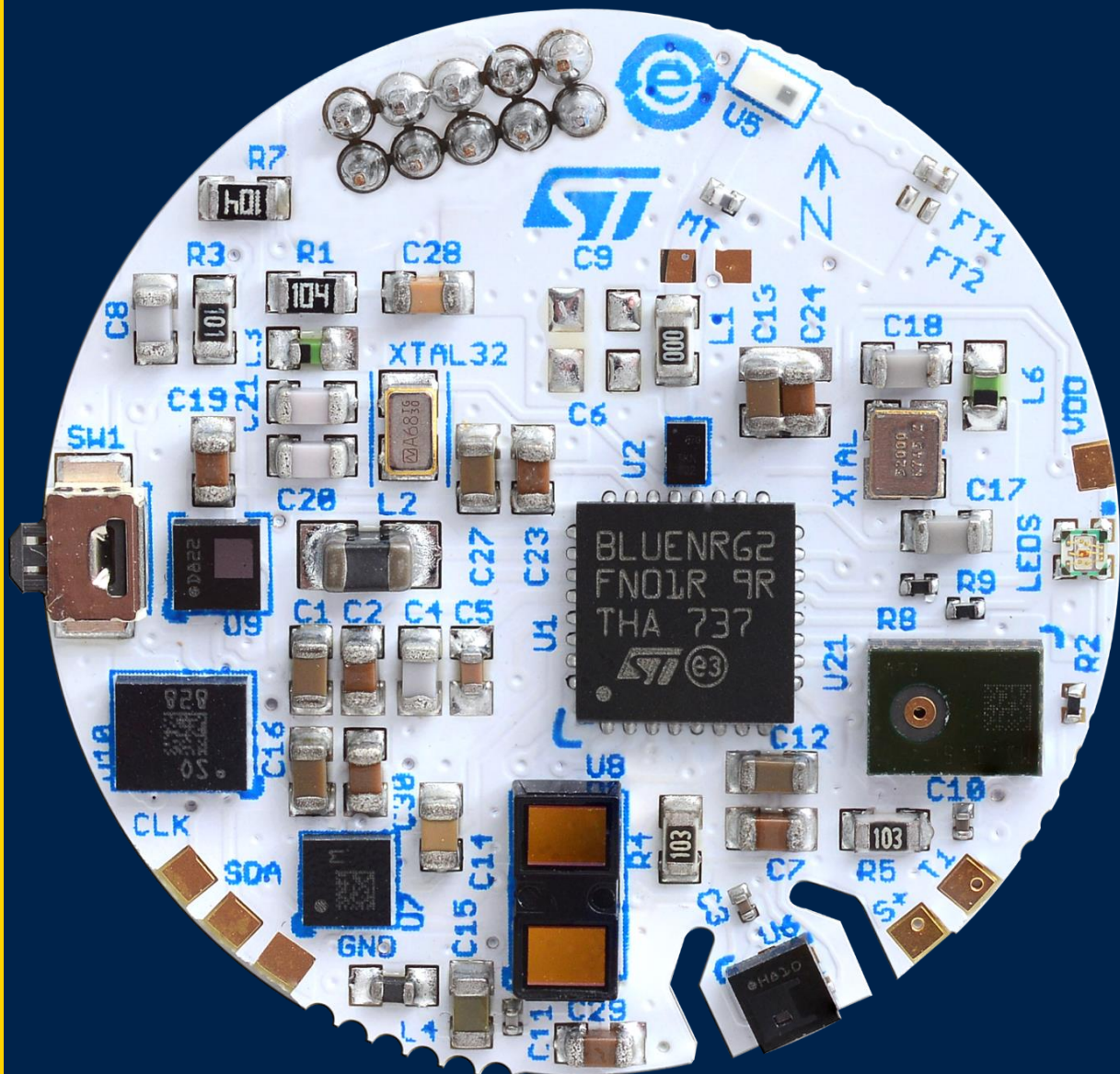




life.augmented



BlueNRG-2 Getting Started

Mohit ARORA



Low-power RF ecosystem

RF chipset

BlueNRG
SPIRIT

Evaluation Kit and Development Tools

RF modules

BlueNRG
SPIRIT

Graphical UI

RF Power Simulator
GUI PC application

SW development

IAR SYSTEMS
KEIL™ Tools by ARM
BlueNRG/Spirit NAVIGATOR

Sensors
Mic

MOTION SW libraries
VOICE SW libraries

LoWPAN
IPv6-based Low-power Wireless Personal Area Networks

M-Bus wireless

sigfox

iOS/Android SDK

BLUENRG-MESH TRIPLE SDK

BlueNRG BLE SDK
Android SDK
iOS SDK





Covered in this Presentation

Hardware Requirements

Install SDK and tools

Run BLE Chat Example

Install Keil and License

Test Debugger connection

Compilation and debug test with Keil

Install Mobile apps

Test BlueNRG-GUI connectivity



Hardware Requirements



BlueNRG-2 Target board with UART/VCOM



ST-Link V2 or ST Nucleo Board



Smart Phone with BLE 4.2 or higher with required apps installed



Your windows 7/10 PC Setup with all required software and setups

Install ST Software



BlueNRG-2 SDK

- Standard SDK for BlueNRG-1 and BlueNRG-2 devices from ST
- Contains basic tools like Navigator, Radio Init Wizard
- Download and Install BlueNRG-2 SDK from link below([STSW-BLUENRG1-DK](https://www.st.com/content/st_com/en/products/embedded-software/evaluation-tool-software/stsw-bluenrg1-dk.html))
https://www.st.com/content/st_com/en/products/embedded-software/evaluation-tool-software/stsw-bluenrg1-dk.html



STSW-BLUENRG1-DK post Install

C > Windows (C:) > Program

- Application
- Docs
- Firmware
- PCDriver
- unins000.dat
- unins000.exe

RORA > ST > BlueNRG-1_2 DK 3.1.0

- Library
- Project
- Utility

C > Windows (C:) > ProgramData

- BlueNRG-1 Navigator
- BlueNRG-1 Radio Init Wizard
- BlueNRG-2 Navigator
- Documentation
- Release folder
- Uninstall BlueNRG-1_2 DK

- Installation of the package creates three directories
- Installation Directory
 - C:\Program Files (x86)\STMicroelectronics\BlueNRG-1_2 DK 3.X.X
 - Contains compiled binary files, doxygen documentation, drivers and installed applications
- Example Projects Path
 - C:\Users\XXXXX\ST\BlueNRG-1_2 DK 3.X.X
 - Contains the example projects for BLE, prop radio and peripheral examples
- Utility launch directory
 - C:\ProgramData\Microsoft\Windows\Start Menu\Programs\ST BlueNRG-1_2 DK 3.X.X
 - Shortcuts to Release folder, Navigator and Radio Init Wizard



STSW-BLUENRG1-DK Examples

BLE Examples

- BLE_ANCS
- BLE_Beacon
- BLE_Beacon_FlashManagement
- BLE_Chat
- BLE_Chat_Master_Slave
- BLE_HID_Peripheral
- BLE_MS_Formula
- BLE_OTA_ResetManager
- BLE_OTA_ServiceManager
- BLE_Power_Consumption
- BLE_Privacy
- BLE_RemoteControl
- BLE_Security
- BLE_SensorDemo
- BLE_SensorDemo_BlueMSapp
- BLE_SensorDemo_Central
- BLE_SensorDemo_Static_Stack
- BLE_Static_Stack
- BLE_Throughput
- BLE_Throughput_EXT
- DTM
- DTM_basic
- DTM_Updater

Peripheral Examples

- ADC
- FLASH
- GPIO
- I2C
- MFT
- Micro
- PKA
- RADIO
- RNG
- RTC
- SPI
- SysTick
- UART
- WDG



Install ST Tools

- Install BlueNRG-GUI ([STSW-BNRGUI](#))

https://www.st.com/content/st_com/en/products/embedded-software/wireless-connectivity-software/stsw-bnrg1stlink.html

- Install BlueNRG ST-Link Utility ([STSW-BNRG1STLINK](#))

https://www.st.com/content/st_com/en/products/embedded-software/wireless-connectivity-software/stsw-bnrg1stlink.html

- Install BlueNRG-X Flasher ([STSW-BNRGFLASHER](#))

https://www.st.com/content/st_com/en/products/embedded-software/wireless-connectivity-software/stsw-bnrgflasher.html

- Install BlueNRG current consumption estimation tool (STSW-BNRG001)

<https://www.st.com/en/embedded-software/stsw-bnrg001.html>

Update ST-LINK firmware [STSW-LINK007](#) and USB driver as required [STSW-LINK009](#)



Supported Hardware

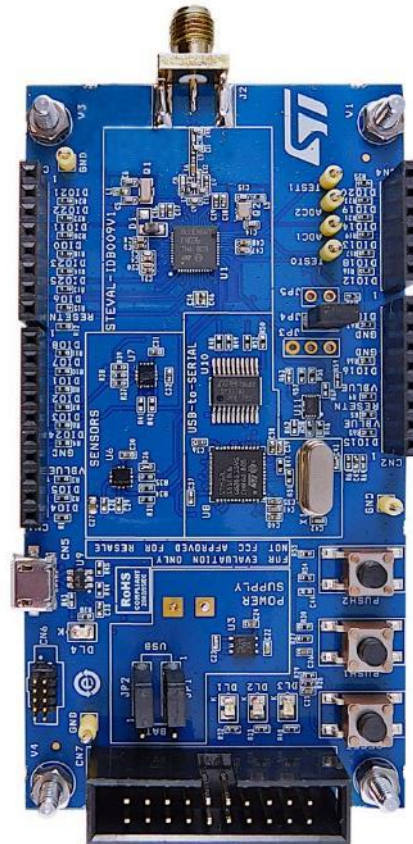
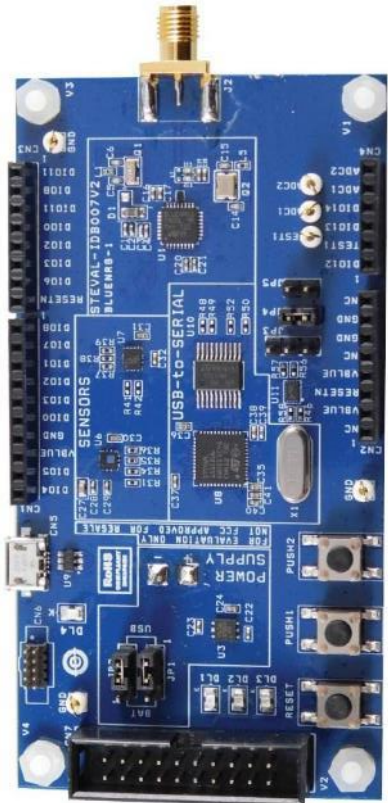
STEVAL-IDB007Vx
BlueNRG-1 (32QFN)

STEVAL-IDB008Vx
BlueNRG-2 (32QFN)

STEVAL-IDB009Vx
BlueNRG-2 (48QFN)

STEVAL-IDB008V1M
BlueNRG-M2 Module

STEVAL-FKI001V1
BlueNRG-1 + S2LP



STEVAL-FKI001V1 is supported via [STSW-BNRG-S2LP](#)

Quickly Run the BLE_Chat Example



BlueNRG-2 Navigator

- We will use BlueNRG-2 Navigator to quickly run the example
- This software is installed as part of STSW-BLUENRG1-DK
- You would need a STEVAL-IDB008x board to use it
- Supports direct flash write of example codes on STEVAL with UART Bootloader





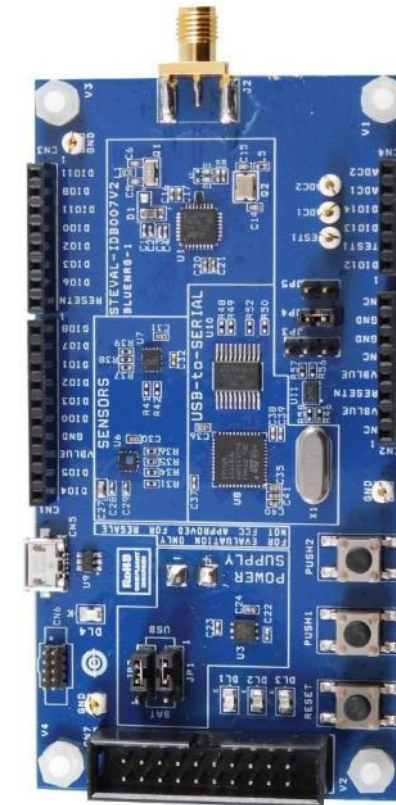
BlueNRG-2 Navigator: Hardware Setup



PC running BlueNRG-2 Navigator



Micro USB Cable



STEVAL-IDB008Vx



Run BLE_Chat using Navigator

- Open BlueNRG-2 Navigator
- Navigate to BLE_Chat
 - BLE demo and test apps
 - BLE_Chat
 - Server
- If drivers installed and board connected The Eval board pic will appear
- Click on Flash and Run button

The image shows a sequence of four overlapping screenshots from the BlueNRG-2 Navigator v.3.2.1 application, illustrating the steps to run the BLE_Chat application.

- Top Screenshot:** Shows the "Demonstration Applications" section. The "BLE demonstration & test applications" button is highlighted with a red box.
- Second Screenshot:** Shows the "BLE demonstration & test applications" list. The "BLE Chat" item is highlighted with a red box.
- Third Screenshot:** Shows the "Configurations" section for "BLE Chat". The "Server" configuration option is highlighted with a red box.
- Bottom Screenshot:** Shows the "Server" configuration page. The "Flash & Run" button is highlighted with a red box. Below the button, an image of the ST Eval board is visible, also highlighted with a red box.

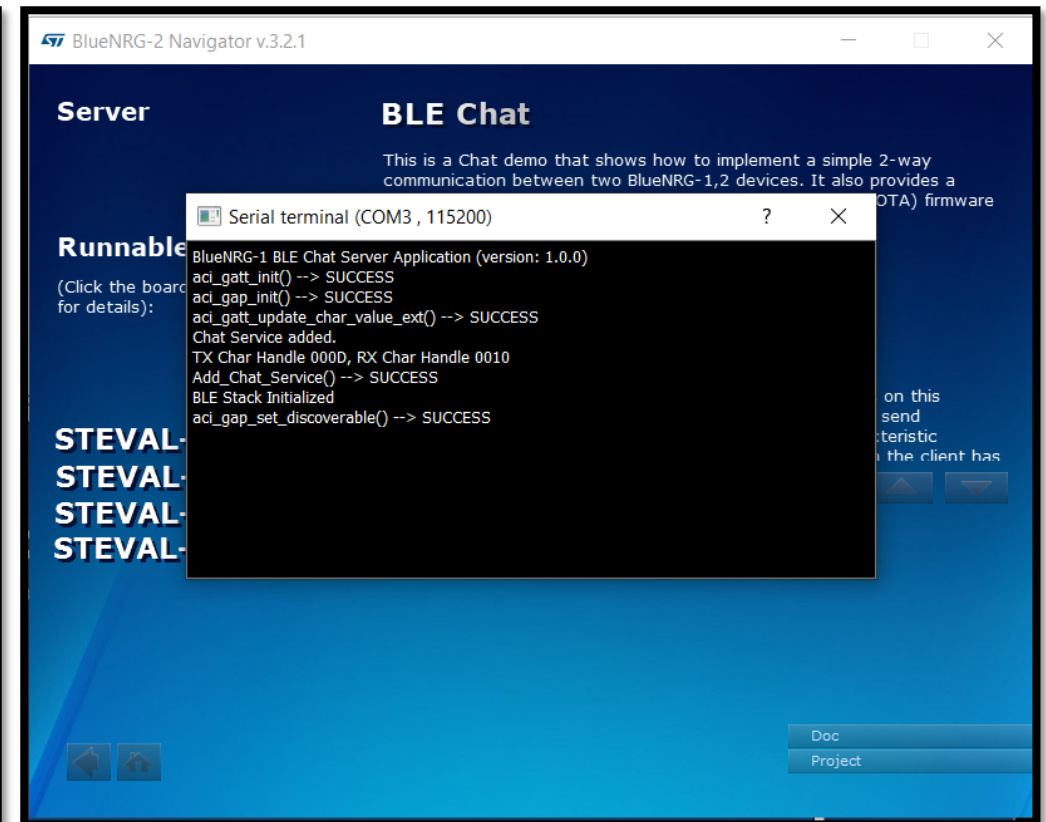
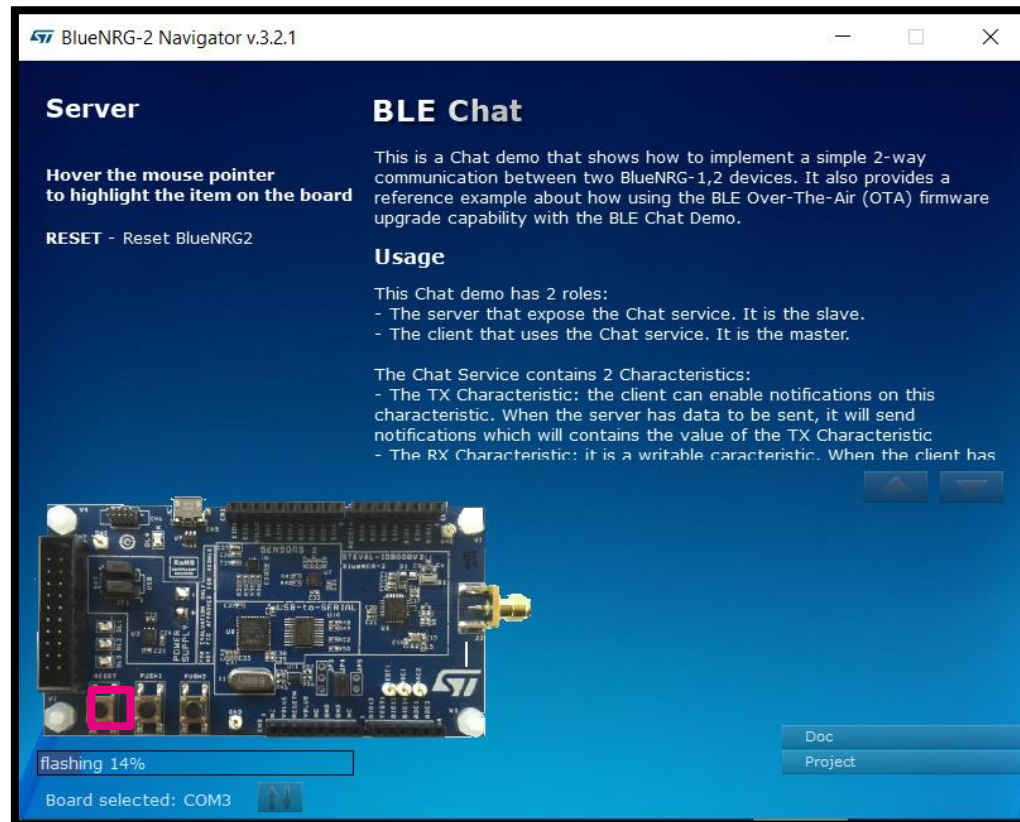
Additional text visible in the screenshots includes:

- Demonstration Applications:** "This section shows demo applications for the devices family."
- BLE demonstration & test applications:** "Bluetooth Low Energy demo applications can be used as an example to build other applications that use the Bluetooth technology with the BlueNRG-2. Project files for IAR, KEIL and Atollic toolchains are available."
- BLE Chat Configurations:** "This is a Chat demo that shows how to implement a simple 2-way communication between two BlueNRG-1,2 devices. It also provides a reference example about how using the BLE Over-The-Air (OTA) firmware upgrade capability with the BLE Chat Demo."
- Server Page:** "This is a Chat demo that shows how to implement a simple 2-way communication between two BlueNRG-1,2 devices. It also provides a reference example about how using the BLE Over-The-Air (OTA) firmware upgrade capability with the BLE Chat Demo." and "Usage: This Chat demo has 2 roles: - The server that expose the Chat service. It is the slave. - The client that uses the Chat service. It is the master. The Chat Service contains 2 Characteristics: - The TX Characteristic: the client can enable notifications on this characteristic. When the server has data to be sent, it will send notifications which will contains the value of the TX Characteristic - The RX Characteristic: it is a writable characteristic. When the client has..."



STSW-BlueNRG1-DK (4/7)

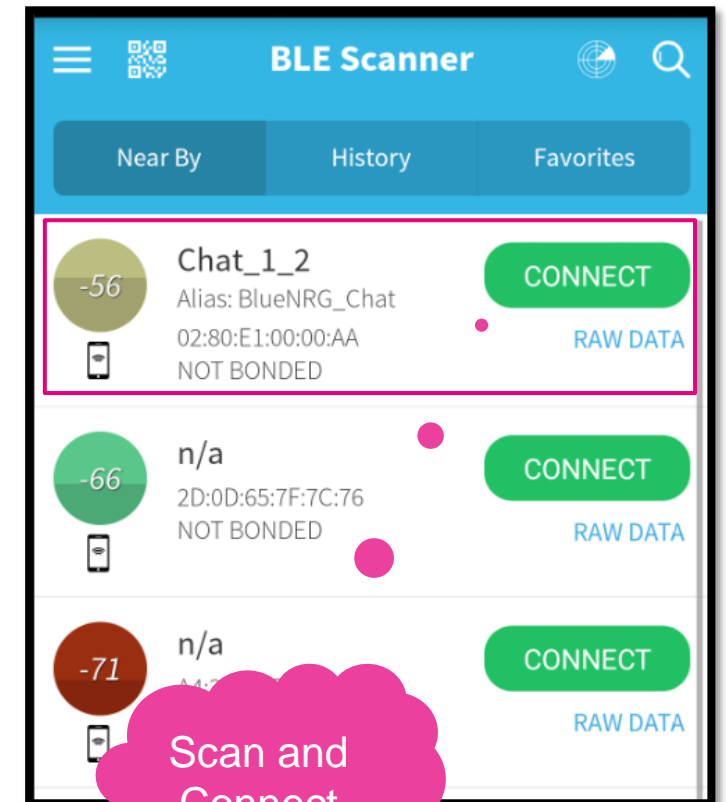
- The board will be flashed with the BLE_Chat Server configuration compiled code
- After flashing, serial terminal would automatically appear.
- Push the reset button and messages from board should display





Connect BLE_Chat with Phone

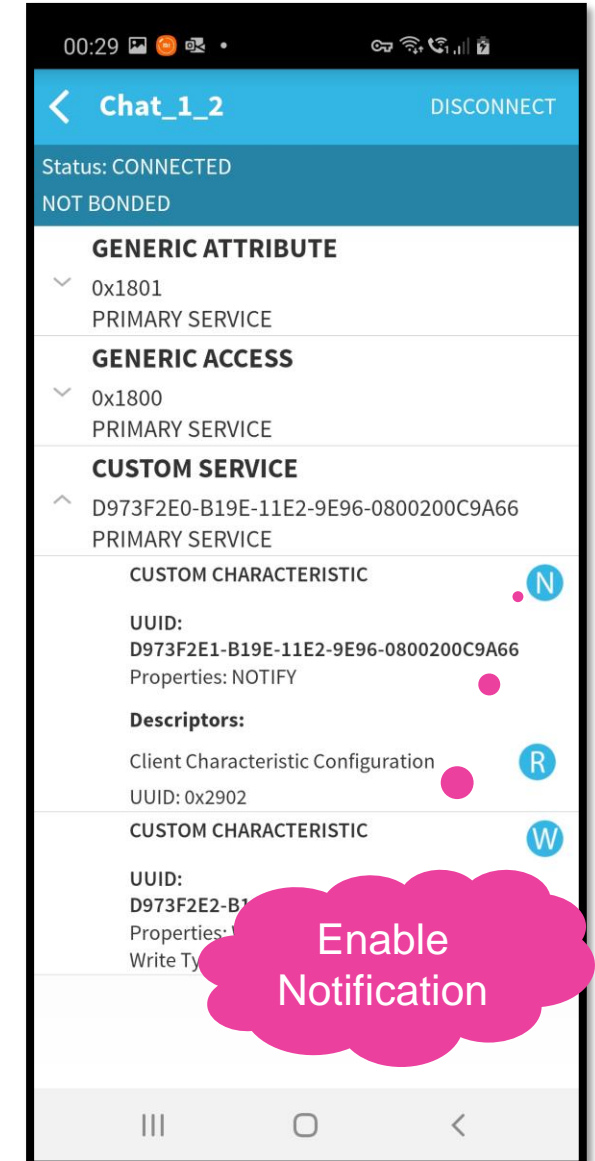
- Install a generic BLE service discovery tool like B-BLE or BLE Scanner on you phone
- Enable Bluetooth and location on your phone and start the application
- Click on “Scan” button
- The devices available should appear
- Click on CONNECT button against “Chat_1_2”





Connect BLE_Chat with Phone

- After you connect, the service discovery will start
- You would see three services
 - Generic Attribute (GATT 0x1800)
 - Generic Access (GAP 0x1801)
 - Custom Service (ST Chat Service)
- Click on custom service
- Then enable notifications by clicking on “N” Button. It would turn green



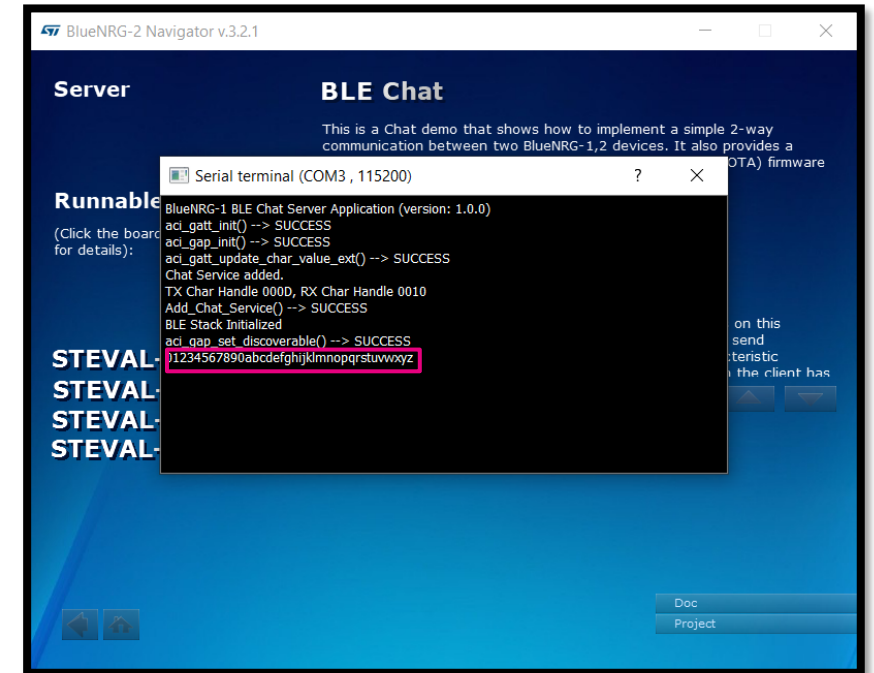
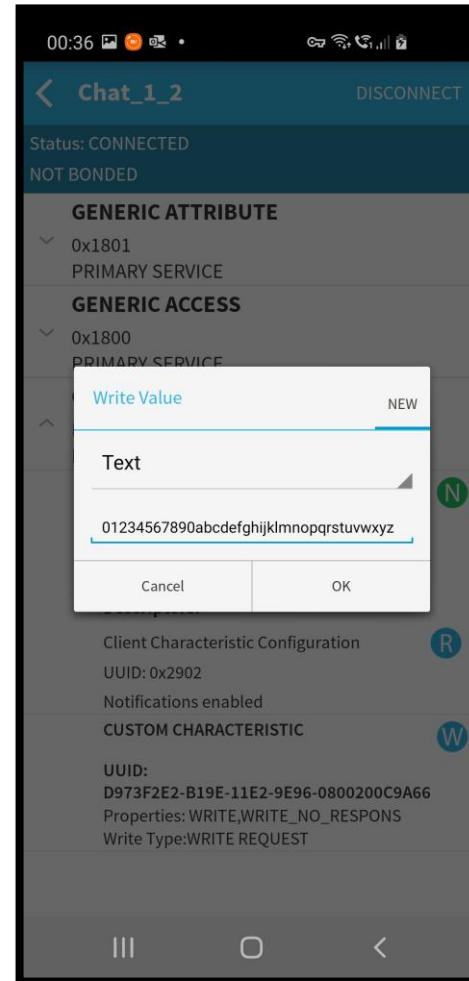


Exchange data from phone to UART

- Click on “W” button
- A window will appear
- Type in text (ASCII) any data to be send to the UART
- The click on “OK”

Note: If size exceeds 20 bytes, BLE scanner automatically breaks data in 20 bytes and send across multiple packets

This limit can be increased to 240 bytes per packet but depends on support of phone for “Data Length Extension (DLE)” feature





Exchange data from UART to Phone

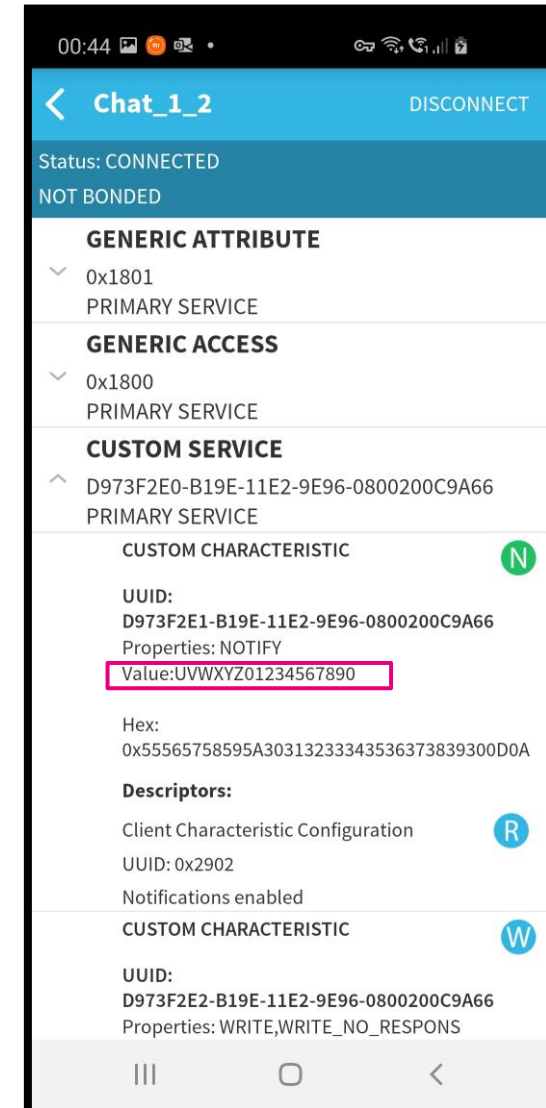
- Type data on the Serial terminal
- Hit enter key or send “\n” new line character
- The data will be sent to phone and will be visible if “N” notification button is green

Note: if size exceeds 20 bytes, BlueNRG-2 will automatically break the data in packets in 20 bytes and send to phone

On the phone, only last packet will display as previous packets were received and overwritten

If phone supports DLE, the code can request to increase packet size

```
BlueNRG-2 Navigator v3.2.1
Server BLE Chat
This is a Chat demo that shows how to implement a simple 2-way communication between two BlueNRG-1,2 devices. It also provides a (OTA) firmware
Serial terminal (COM3 , 115200)
BlueNRG-1 BLE Chat Server Application (version: 1.0.0)
aci_gatt_init() --> SUCCESS
aci_gap_init() --> SUCCESS
aci_gatt_update_char_value_ext() --> SUCCESS
Chat Service added.
TX Char Handle 000D, RX Char Handle 0010
Add_Chat_Service() --> SUCCESS
BLE Stack Initialized
aci_gap_set_discoverable() --> SUCCESS
01234567890abcdefghijklmnopqrstuvwxyz ABCDEFHIJKLMNOPQRSTUVWXYZ01234567890
```



Setup Keil IDE





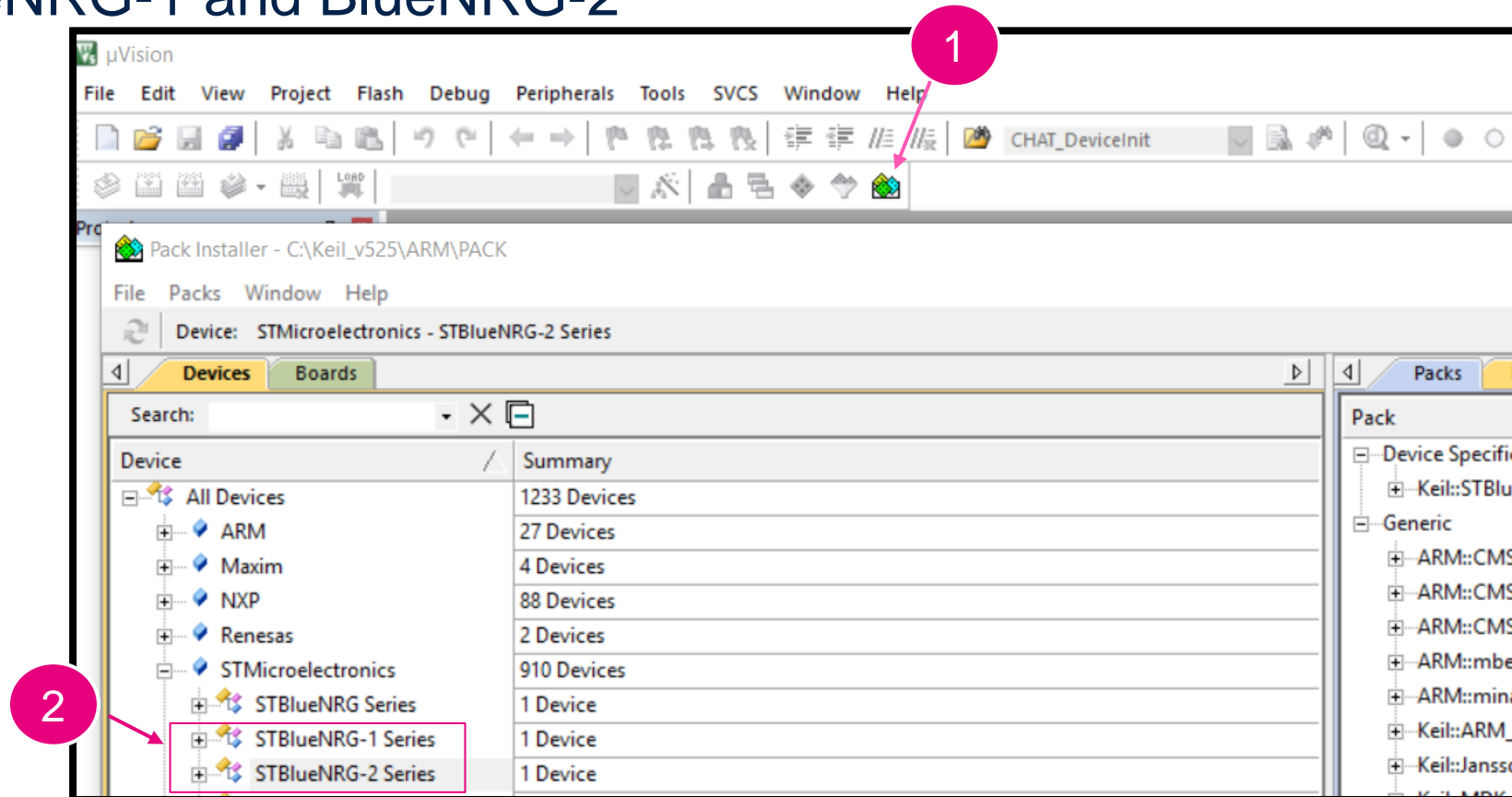
Install Keil

- Kindly refer below link for all details on ST version of Keil
 - <https://www2.keil.com/stmicroelectronics-stm32/mdk>
- Download Keil MDK-ARM v5 from <https://www.keil.com/demo/eval/arm.htm>
- Run the downloaded MDK5xx.exe installer.
- Install to any path you like. If you have existing MDK-ARM installations that you want to keep, select a new folder for MDK v5.



Install Keil Device Function Packs

1. Open Keil window, Click on the Pack Installer button and open it
2. Select device and Click Install to download and install the Device Function packs for BlueNRG-1 and BlueNRG-2





Get Keil ST License

- Follow instructions on the page link below to install the license after you install Keil
 - <https://www2.keil.com/stmicroelectronics-stm32/mdk>
- Login with an account that has administration rights.
- Right-click the μ Vision icon and select Run as Administrator... from the context menu.
- Open the dialog File — License Management... and select the Single-User License tab.
- Click the button Get LIC via Internet..., then click the button OK to register the product. This action opens the License Management page on the Keil web site.
- Enter the Product Serial Number 4RMW3-A8FIW-TUBLG along with your contact information and click the button Submit.
- An e-mail is sent back with the License ID Code (LIC) within a few minutes.



Activate Keil ST License

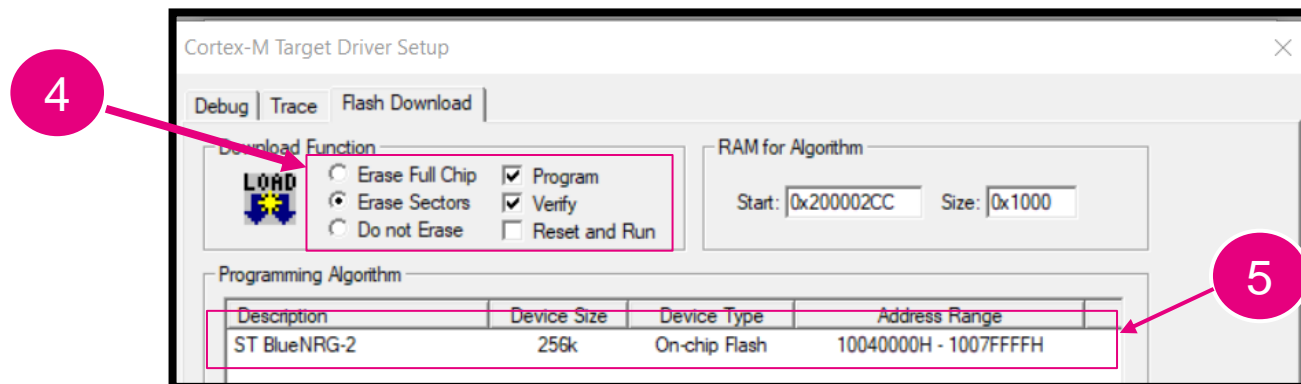
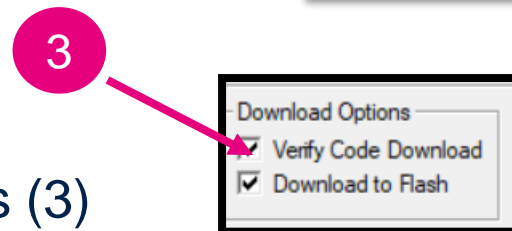
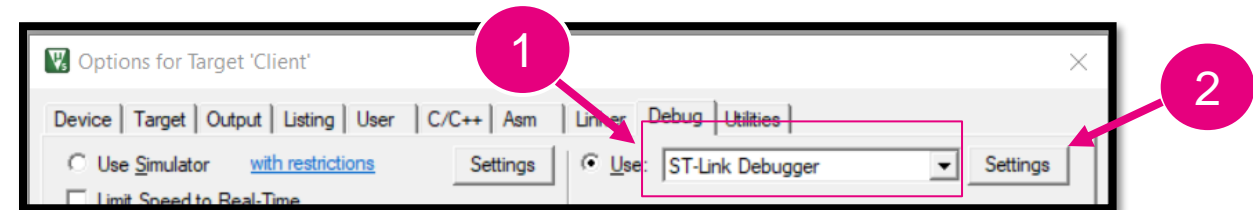
- To activate the Software Product
 - enter the LIC in the field New License ID Code (LIC) of the dialog License Management (2)
 - click Add LIC (3)
 - Verify the license as visible in screenshot with expiry date

The screenshot shows the 'License Management' dialog box with the following elements:

- Customer Information:** Fields for Name, Company, and Email. A red circle '1' is placed over the Name field.
- Computer ID:** CID: CUQW9-0EG7T. A red box highlights the 'Get LIC via Internet...' button.
- License Table:**

Product	License ID Code (LIC)/Product variant	Support Period
MDK-ARM Cortex-M0/M0+ for ST		Expires: Dec 2032
- New License ID Code (LIC):** A text input field with a red circle '2' over it.
- Add LIC:** A button with a red circle '3' over it.
- Uninstall...:** A button.
- Status:** A message box containing '*** LIC Added Successfully ***'.
- Buttons:** Evaluate MDK Professional, Close, and Help.

- After DFP and License are installed, open BLE Chat example project in Keil
 \\STSW-BLUETILE-DK 1.3.0\Project\BLE_Examples\BLE_Chat\MDK-ARM\BlueNRG-2
- Select ST-Link as debugger
 Select ST-Link as debugger (1)
- Settings for ST-Link
 - Click on settings (2)
 - Check both the download options (3)
 - Verify download functions (4) and programming algorithm (5)



Important Documents



Important Documents for Reference

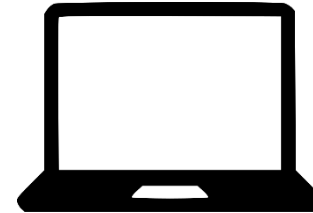
- BlueNRG-2 Datasheet [PDF](#)
- PM0257 BLE stack v2.x programming guidelines [PDF](#)
- UM2406 The BlueNRG-X Flasher SW package [PDF](#)
- DT0120 How to program and debug BlueNRG-1 and BlueNRG-2 devices [PDF](#)
- UM2058 BlueNRG GUI SW package [PDF](#)
- UM2109 BlueNRG-1 ST-LINK Utility software description [PDF](#)
- AN5187 BlueNRG-1, BlueNRG-2 improving robustness [PDF](#)

Test Debugger Connection



Erase the BlueNRG-2

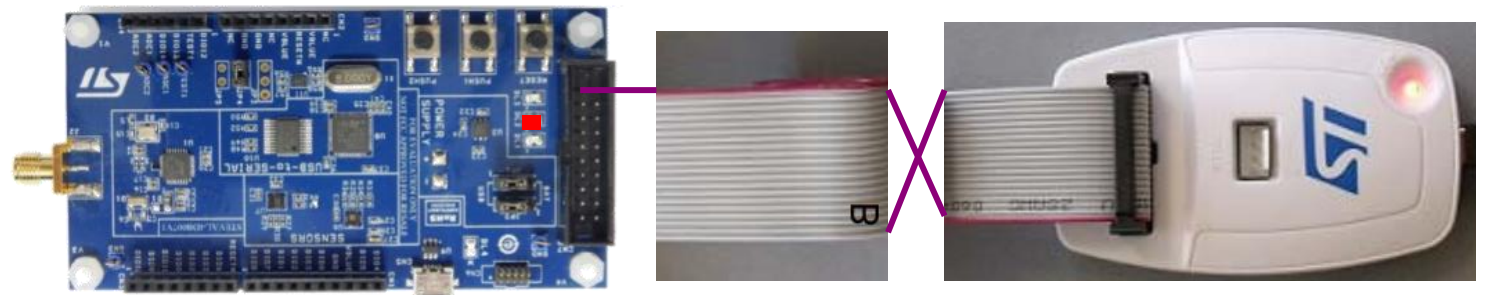
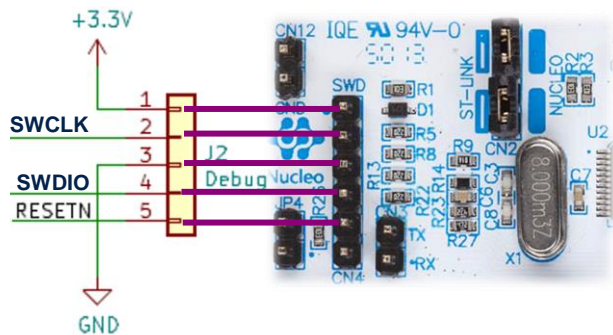
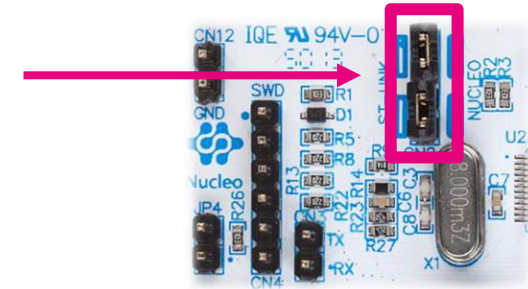
- Pull DIO7 High on BlueNRG-2 Target (Automatic in STEVAL)
- Connect the target to PC using VCOM/UART
- Open BlueNRG-X Flasher
- Select the relevant com port (ST DK)
- Press Ctrl + E and execute mass erase
- Click on “Read” button to verify the blank memory filled with FF
- Remove the micro USB cable now.





Setup Hardware for Debug

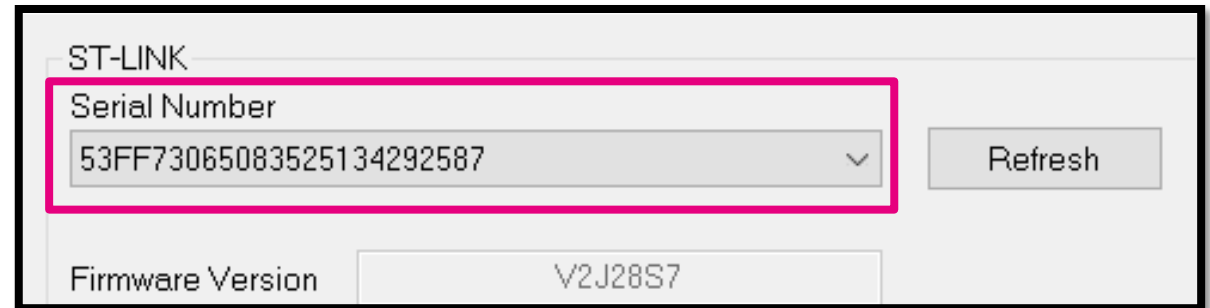
- If using Nucleo board, remove ST-LINK (CN2) jumpers
- Connect the Target board with ST-Link V2
 - Refer the picture for connector alignment
- Now, power up the target and then connect ST-Link V2
- If red led is blinking: your STEVAL is in DFU mode, remove ST-LINK and then connect power. Afterwards connect ST-LINK





Verify SWD Connection

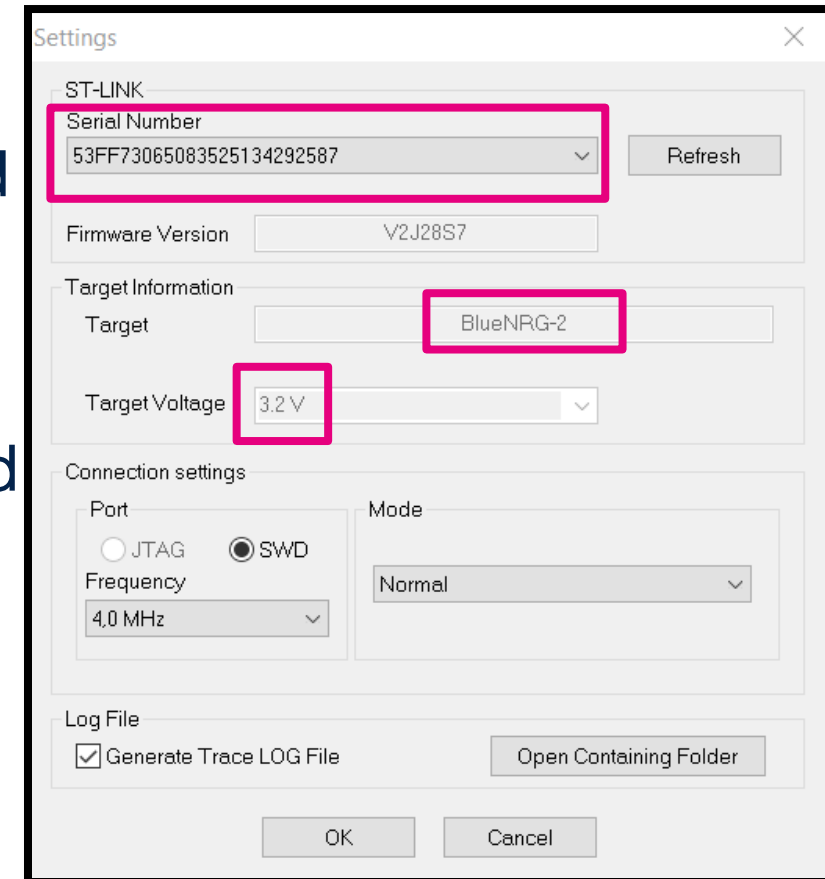
- Open BlueNRG-1 ST-Link Utility and Click on settings icon
- Check if the ST-Link Serial number is visible
- If you don't see the ST-Link serial number, then
 - Try clicking on the Refresh button
 - Then, try re-plugging setup again with ST-Link only
 - If persists, update the driver of ST-LINK and firmware of ST-LINK V2
 - Please check you are using BlueNRG-1 ST-Link utility and Not STM32 ST-LINK utility





Verify SWD Target

- If your setup is fine, you should see similar in Target Information
- If BlueNRG-2 is not visible, then you should match the settings as per snapshot
- Once you see the Target voltage and Target, you should click on “OK” button
- The device will now be read by debugger
- If device is not detected, try to reduce the frequency and change the mode



Test Compile and debug run of BLE_Chat project on Keil





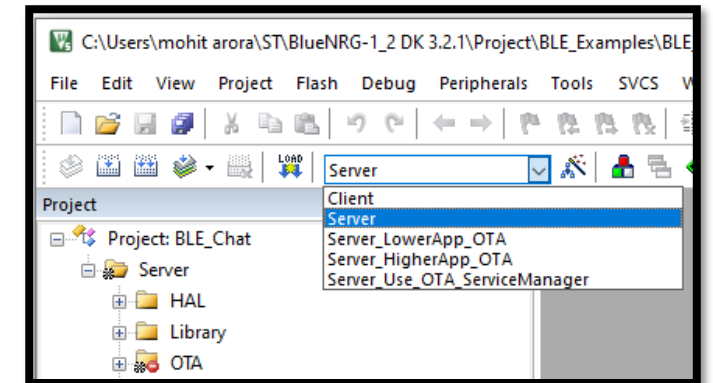
Compile BLE_Chat Project

- Open BLE_Chat project in Keil

Path: C:\Users\{USER NAME}\ST\BlueNRG-1_2 DK 3.2.1\Project\BLE_Examples\BLE_Chat\MDK-ARM\BlueNRG-2

The project file name is “BLE_Chat” with extension “.uvprojx”

- Select the “Server” from drop down
- Go to “Project” menu dropdown and click “Build Target”
- The Build Output window should show as below



```
Build Output
compiling BlueNRG1_it.c...
compiling chat.c...
compiling gatt_db.c...
linking...
Program Size: Code=65876 RO-data=792 RW-data=692 ZI-data=16200
FromELF: creating hex file...
After Build - User command #1: fromelf.exe --bin Server\Objects\BLE_Chat_Server.axf --output Server\Objects\BLE_Chat_Server.bin
".\Server\Objects\BLE_Chat_Server.axf" - 0 Error(s), 0 Warning(s).
Build Time Elapsed: 00:00:14
```





Establish Debug Session

- After build, go further only if you have tested the debugger connection
- Ensure that the BlueNRG-1 ST-Link utility is not connected to target
- Press F8 to program the device
- Press Ctrl+F5 to start the debug session
- Now Open any serial monitor (tera term etc) and open the serial port
- Select setting as 115200 8 N 1
- Enable “\n” new line character for Enter key
- Now press F5



Verify Successful Debug Session Start

- You will see a screen like one here if all works well
- Now click on F5 to run the code
- You can connect via phone following procedure explained with Navigator Usage

```
COM13 - Tera Term VT
File Edit Setup Control Window Help
BlueNRG-1 BLE Chat Server Application (version: 1.0.0)
aci_gatt_init() --> SUCCESS
aci_gap_init() --> SUCCESS
aci_gatt_update_char_value_ext() --> SUCCESS
Chat Service added.
TX Char Handle 000D, RX Char Handle 0010
Add_Chat_Service() --> SUCCESS
BLE Stack Initialized
aci_gap_set_discoverable() --> SUCCESS
]
```

```
Registers
Register Value
Core
R0 0x1004...
R1 0x2000...
R2 0x0000...
R3 0x1004...
R4 0x1005...
R5 0x0000...
R6 0x1005...
R7 0xFFFF...
R8 0xFFFF...
R9 0xFFFF...
R10 0xFFFF...
R11 0xFFFF...
R12 0xFFFF...
R13 (SP) 0x2000...
R14 (LR) 0x1004...
R15 (PC) 0x1004...
xPSR 0x6100...
Banked
System
Internal
Mode Thread
Stack MSP

Disassembly
164: SystemInit();
165:
166: /* Identify BlueNRG1 platform */
    0x1004EC14 F7FAFBF6 BL.W SystemInit (0x10049404)
167: SdkEvalIdentification();

BLE_Chat_main.c
156 void GPIO_Configuration(void);
157 void Interrupts_EXT_IO_Config(void);
158 /* Private functions -----*/
159
160 int main(void) {
161     uint8_t ret;
162
163     /* System Init */
164     SystemInit();
165
166     /* Identify BlueNRG1 platform */
167     SdkEvalIdentification();
168
169     /* Init Clock */
170     Clock_Init();
171
172     /* Configure I/O communication channel;
173     It requires the void IO_Receive_Data(uint8_t * rx_data, uint16_t data_size) function
174     where user received data should be processed */
175     SdkEvalComIOConfig(Process_InputData);
176
```



Help: In case of Build Error

If you face issues with Building the Project then

- Goto “File” → “License Management”
- The installed license should be visible as

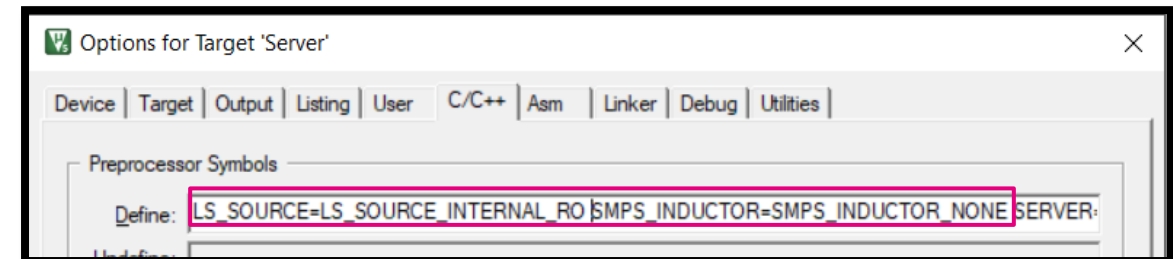
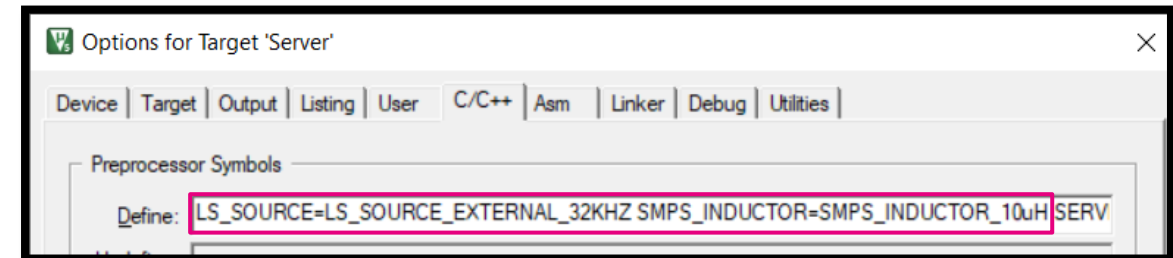
Product	Support Period
MDK-ARM Cortex-M0/M0+ 256K for ST	Expires: Dec 2032

- If you don't see above license, then refer License Installation section
- If License is installed and you still face issue, check below
 - Keil has write permission in the drive where project is located
 - Try running Keil as administrator
 - Verify if the DFP has been installed.



Help: Verify Preprocessor Settings

- There are different hardware available for BlueNRG-2 with combinations of
 - SMPS On/SMPS Off
 - External LF crystal/Internal RO
- After opening project in Keil Go to Project → Options for Target → C/C++ (tab)
- For STEVAL and BlueNRG-M2SA
 - LS_SOURCE=LS_SOURCE_EXTERNAL_32KHZ
 - SMPS_INDUCTOR=SMPS_INDUCTOR_10uH
- For BlueNRG-M2SP or low-cost modules
 - LS_SOURCE=LS_SOURCE_INTERNAL_RO
 - SMPS_INDUCTOR=SMPS_INDUCTOR_NONE





Help: Unable to establish debug

Please check below

- The DFP is installed
- You have configured debugger settings in Keil as per instructions
- Try reading the device vis BlueNRG-1 ST-LINK utility. If you see all FF starting at address 0x10040000 then you have either
 - You have not flashed the right code or used an OTA configuration
 - your flash erase setting is set for Erase chip, change to Erase sectors

Install Mobile Apps



Install Mobile apps

- Install ST BLE sensor mobile app (available for android and iOS)



- Install BLE Scanner app (available for android and iOS)



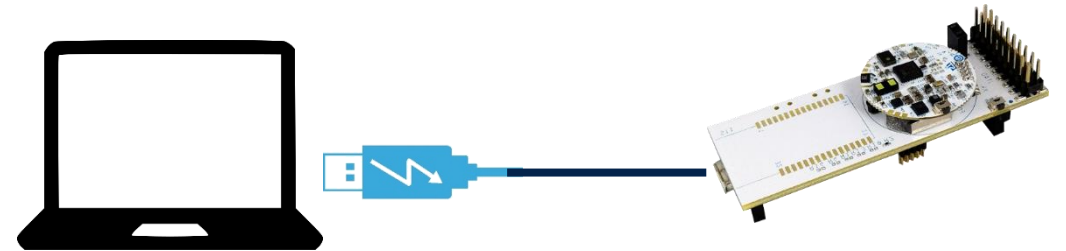
Test Board Connection with BlueNRG-GUI

The screenshot displays the BlueNRG GUI v4.0.0 interface. At the top left, the title bar reads "ST BlueNRG GUI v4.0.0". Below it is a menu bar with "File", "Tools", "Settings", and "Help". The main interface area includes a "Port:" dropdown menu set to "COM13 (ST DK)", a "Close" button, and a "HW Reset" button. In the top right corner, a status box displays: "BlueNRG-2 HW v1.2", "BlueNRG-2 FW v2.1c - DTM UART v3.1.0", and "Motherboard FW v1.8". A horizontal tab bar contains "ACI Commands", "ACI Utilities", "Scripts", "Beacon", "RF Test", and "Throughput". The main content area is divided into two columns: "Central Role" and "Peripheral Role". Under "Central Role", there are buttons for "Init Device...", "Service Management...", "Security Configuration..", "Security Information...", "Scanning...", "Connections...", and "Update Connections...". Under "Peripheral Role", there are buttons for "Advertising..." and "Update Advertising Data...".



Erase the BlueTile Board

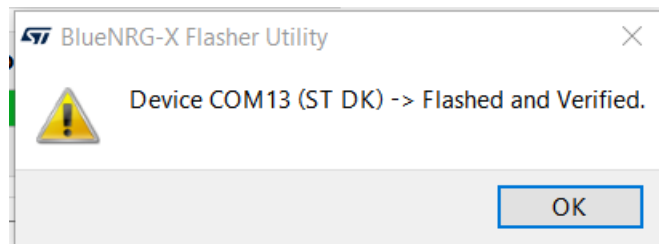
- Mount the Bluetile on the base board
- Connect the Bluetile base board to PC via Micro USB cable
- Check switches SW2 and SW3 on bluetile host board are on USB connector side
- Open BlueNRG-X Flasher
- Select the relevant com port (ST DK)
- Press Ctrl + E and execute mass erase
- You should see the green light on the BlueTile LED
- Click on “Read” button to verify the blank memory filled with FF





Flash DTM Code

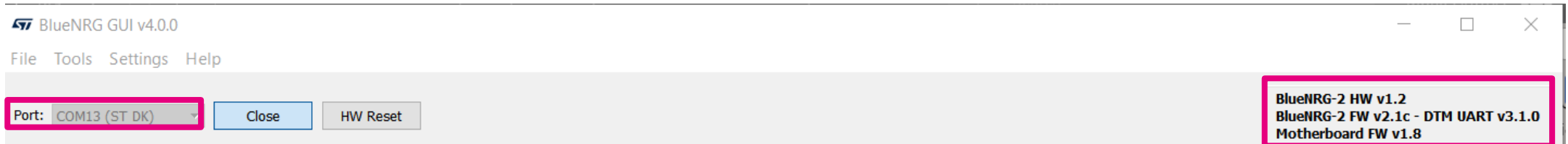
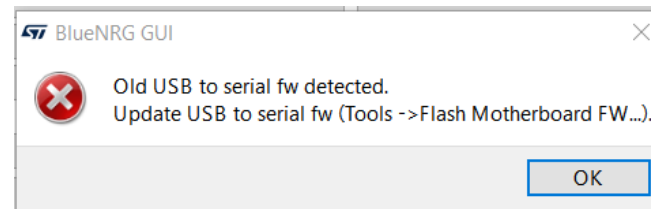
- Click on “Select Image file” button and navigate to \\STSW-BLUETILE-DK 1.3.0\Firmware\BLE_Examples\DTM
- Select file DTM_UART.hex and click on “Open”
- Switch to “Image File” tab
- Verify that the file starts from address 0x10040000
- Now click on the “Flash” button upper section of Flasher
- Once successful, you should see a popup like one below. Else, try to erase chip and change USB port and cable





Connect GUI and Verify Versions

- Close Flasher and Start BlueNRG-GUI
- Go to “Settings” → “Set Baud Rate” and select “115200”. Then click “OK”
- Select the relevant com port and click on open port button and see if the device and firmware versions are visible
- If you see a message like on below, you can click “OK” and continue.



Reference Material



Application Notes and User Manuals

Doc	Title	HW
AN4378	Using the BlueNRG family transceivers under FCC title 47 part 15 in the 2400 – 2483.5 MHz band	BlueNRG-MS, BlueNRG-1, BlueNRG-2
AN4387	Using the BlueNRG family transceivers under ETSI EN 300 328 in 2400 –2483.5 MHz band	BlueNRG-MS, BlueNRG-1, BlueNRG-2
AN4392	Using the BlueNRG family transceivers under ARIB STD-T66 in the 2400 – 2483.5 MHz band	BlueNRG-MS, BlueNRG-1, BlueNRG-2
AN4486	BlueNRG, BlueNRG-MS over-the-air bootloader	BlueNRG-MS
AN4491	BlueNRG, BlueNRG-MS updater	BlueNRG-MS
AN4494	Bringing up the BlueNRG and BlueNRG-MS devices	BlueNRG-MS
AN4630	PCB design guidelines for the BlueNRG and BlueNRG-MS devices	BlueNRG-MS
AN4818	Bringing up the BlueNRG-1, BlueNRG-2 devices	BlueNRG-1, BlueNRG-2
AN4819	PCB design guidelines for the BlueNRG-1 device	BlueNRG-1
AN4820	BlueNRG-1 and BlueNRG-2 low power modes	BlueNRG-1, BlueNRG-2
AN4869	BlueNRG-1, BlueNRG-2 BLE OTA (over-the-air) firmware upgrade	BlueNRG-1, BlueNRG-2
AN4872	BlueNRG-1 and BlueNRG-2 UART bootloader protocol	BlueNRG-1, BlueNRG-2
AN5187	The BlueNRG-1, BlueNRG-2 improving robustness	BlueNRG-1, BlueNRG-2
UM1770	BlueNRG, BlueNRG-MS profiles application interface	BlueNRG-MS
UM1865	BlueNRG-MS Bluetooth® LE stack application command interface (ACI)	BlueNRG-MS
UM1868	BlueNRG and BlueNRG-MS information register (IFR)	BlueNRG-MS
UM2058	BlueNRG GUI SW package	BlueNRG-MS, BlueNRG-1
UM2109	BlueNRG-1 ST-LINK Utility software description	BlueNRG-1
UM2211	BLE-Sub1GHz development kit	S2-LP, BlueNRG-1, BlueNRG-2
UM2379	The BlueNRG-1, BlueNRG-2 radio driver	BlueNRG-1, BlueNRG-2
UM2406	The BlueNRG-1, BlueNRG-2 Flasher SW package	BlueNRG-1, BlueNRG-2



Design Tips

Doc	Title	HW
DT0049	IFR configuration of BlueNRG/BlueNRG-MS using STM32ODE	BlueNRG-MS
DT0051	Quick guide on BLE RF technology: products, evaluation kits and software packages	BlueNRG-MS
DT0052	Quick guide on Sub-1GHz RF technology: products, evaluation kits and software packages	Spirit1, SPSGRF
DT0063	Bluetooth Low-Energy network: time-stamping and sample-rate-conversion	BlueNRG-MS, BlueNRG-1
DT0068	How to replace a low-speed wired connection using a BLE link	BlueNRG-MS, BlueNRG-1
DT0069	Enabling the Bluetooth Low Energy Direct Test Mode (DTM) with BlueNRG-MS	BlueNRG-MS
DT0070	How to set the Bluetooth device address on BlueNRG-MS	BlueNRG-MS
DT0074	BlueNRG-MS radio stack images versions	BlueNRG-MS
DT0093	How to mount the new balun BALF-NRG-02D3 without the top side marking	BlueNRG-1, BlueNRG-2
DT0107	Slot allocation and multiple connection timing strategy for BlueNRG, BlueNRG-MS, BlueNRG-1 and BlueNRG-2	BlueNRG-MS, BlueNRG-1, BlueNRG-2
DT0108	How to program and debug BlueNRG-1 and BlueNRG-2 devices	BlueNRG-1, BlueNRG-2
DT0109	How to configure the BlueNRG-1 and BlueNRG-2 devices in network coprocessor mode	BlueNRG-1, BlueNRG-2
DT0120	How to program and debug BlueNRG-1 and BlueNRG-2 devices	BlueNRG-1, BlueNRG-2
DT0129	BLE Module integration design guidelines	SPBTLE-RF0, SPBTLE-RF, SPBTLE-1S





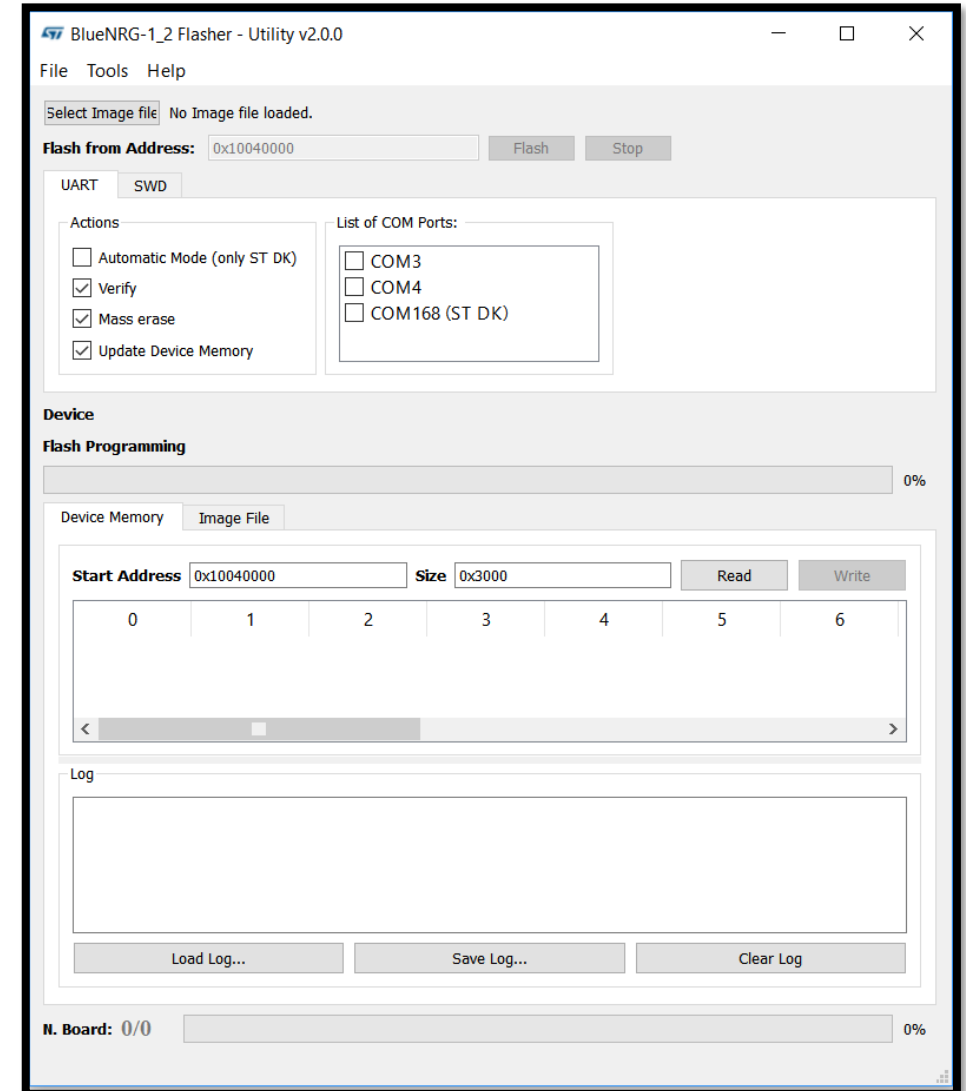
Software and Programming Manuals

Doc	Title	HW
ES0280	BlueNRG/BlueNRG-MS device limitations	BlueNRG-MS
PM0237	BlueNRG, BlueNRG-MS stacks programming guidelines	BlueNRG-MS
PM0257	BlueNRG-1, BlueNRG-2 BLE stack programming guidelines	BlueNRG-1, BlueNRG-2
STSW-BLEPROFILES	BlueNRG-1 BLE Profiles SW package	BlueNRG-1, BlueNRG-2
STSW-BLUENRG-DK	Setup for BlueNRG Kits	BlueNRG-MS
STSW-BLUENRG1-DK	BlueNRG-1, BlueNRG-2 DK SW package	BlueNRG-1, BlueNRG-2
STSW-BNRG001	BlueNRG current consumption estimation tool	BlueNRG-MS, BlueNRG-1, BlueNRG-2
STSW-BNRG1STLINK	BlueNRG-1 ST-LINK utility for BlueNRG-1, BlueNRG-2 MCU	BlueNRG-1, BlueNRG-2
STSW-BNRGUI	BLUENRG family GUI	BlueNRG-MS, BlueNRG-1, BlueNRG-2
STSW-BNRG_V1-DK	BlueNRG-1 DK SW package for BLE stack family v1.x	BlueNRG-1
STSW-BNRG-Mesh	Mesh over Bluetooth Low Energy	BlueNRG-MS, BlueNRG-1, BlueNRG-2
STSW-BNRG-S2LP	STSW-BNRG-S2LP evaluation software package based on BlueNRG-1 and S2-LP	S2-LP, BlueNRG-1, BlueNRG-2
STSW-BNRG-V71A	BLE Stack Image Package Release v7.1a	BlueNRG-MS
STSW-BNRG-V71C	BLE Stack Image Package Release v7.1c	BlueNRG-MS
STSW-BNRG-V71E	BLE Stack Image Package Release v7.1e	BlueNRG-MS
STSW-BNRG-V72C	BlueNRG-MS BLE Stack Image Package Release v7.2c	BlueNRG-MS
STSW-BNRG-V73	BlueNRG-MS BLE Stack Image Package Release v7.3	BlueNRG-MS



STSW-BNRGFLASHER

- BlueNRG-1,2 Flasher utility
- Supports programming via SWD and UART interface
- Supports flash to be read, mass erased, written and programmed
- Can connect to multiple hardware simultaneously
- Autobaud and forced baud rate supported
- Supports .bin and .hex formats





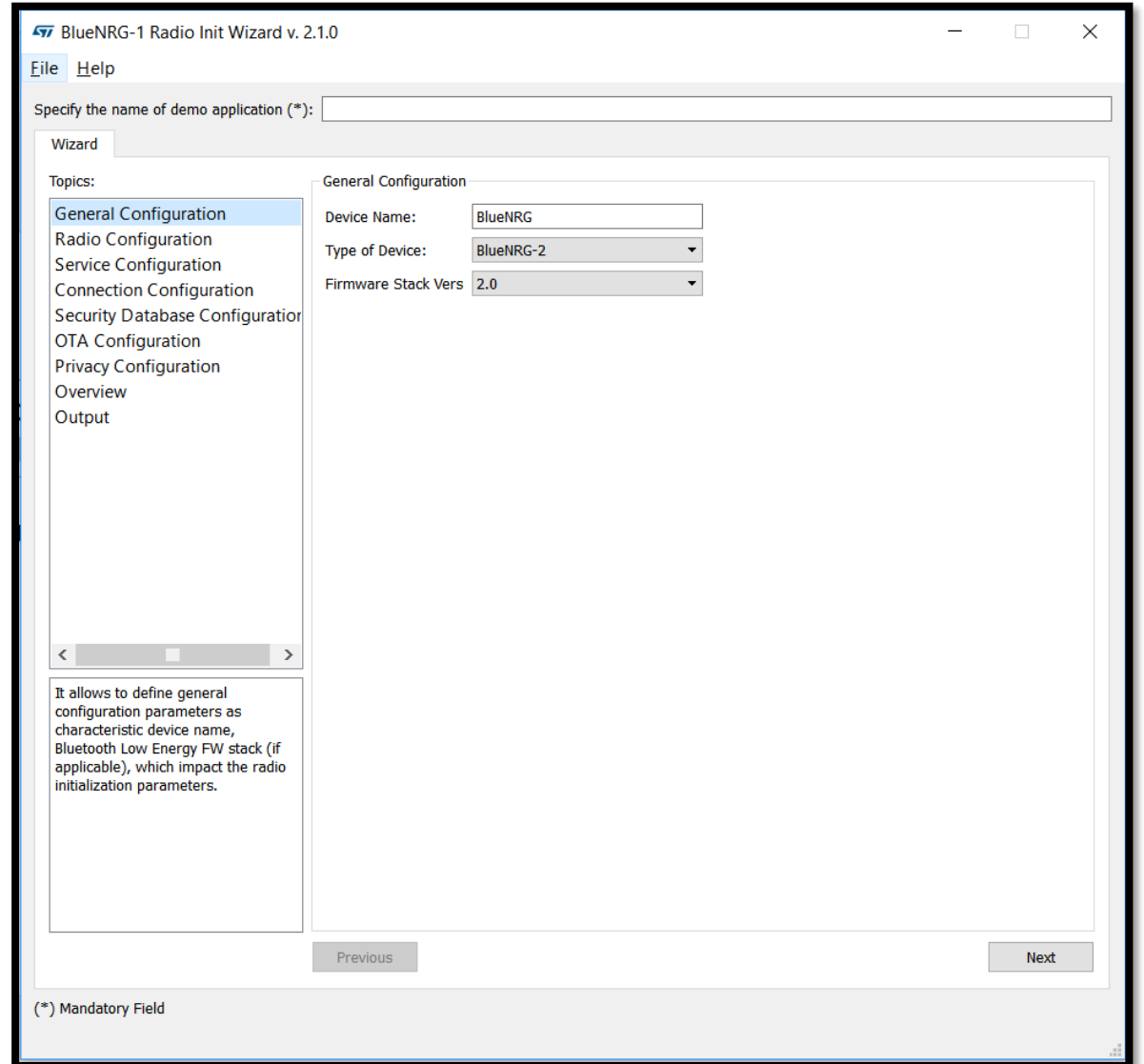
BlueNRG-1, 2 flasher for production programming

- BlueNRG-1,2 Flasher Launcher Utility can be launched through PC command window for integration under test environment
- Supports programming of multiple targets at a time (up to 10)
- Allows a MAC address to be stored on a specific Flash location selected by the user
- UART 'Automatic Mode' programming option allows user to enter a programming loop by selecting the connected devices on 'List of COM Ports' and press the Flash button
- Supports data logging into log files with time stamp



BlueNRG-1 Radio Init Wizard

- This tool allows to setup the BlueNRG-1/BlueNRG-2 initialization parameters and generate a configuration header file.
- Part of STSW-BLUENRG1-DK
- Allows to configure various parameters for
 - Stack
 - Security
 - Services
 - Radio
 - OTA





BlueNRG-1 Radio Init Wizard

- You can configure below parameters using the wizard
 - BLE Device Name and Stack version
 - Radio Packet configuration
 - Add service declaration for stack with number of services, respective characteristics and configure their properties
 - Define connection parameters and crystal tolerances
 - Enable OTA support
 - Configure privacy at Host or Controller
 - Estimate the RAM required by the BLE configuration and stack.

The generated header file can be directly replaced in the target folder.



BlueNRG Power Consumption Tool

- Quick and accurate estimate of average current consumption and battery lifetime
- Eddystone URL beacon as example, Adv Int 1000 ms (within Google recommended value), 31-byte Adv packet payload, 3 Adv channels

BlueNRG Current Consumption Estimation Tool v.1.4

File Plot Settings Window Help

Calculate Consumption

Events: Advertising

General Advertising Scanning Connection

Type of Device: BlueNRG-2 DC-DC Converter Active

High Power mode Pout: 7 (+8dBm)

Supply Voltage (V): 3.3 Crystal Startup Time (us): 512

Retention RAM: 24 KB Master SCA (ppm): 5 (31-50)

Internal Low Speed Clock Slave SCA (ppm): 100

Performance Summary

Time of active phase: 3.61 ms

Average current during the active phase: 7.03 mA

Total average current: 20.42 uA

Payload data rate: 0.19 Kbit/s

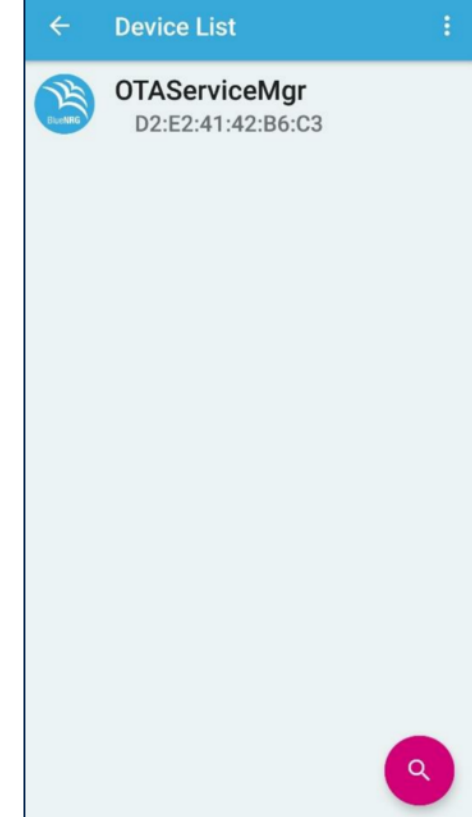
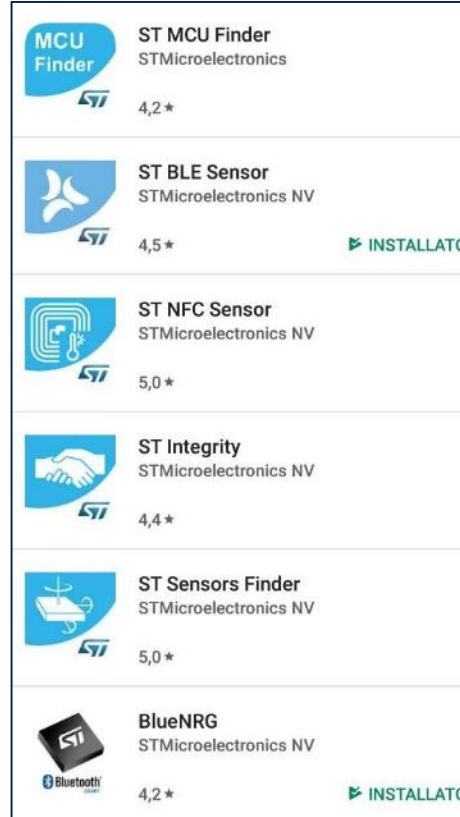
Battery lifetime

Battery capacity (mAh): 230

Battery lifetime: 1 year(s), 3 month(s), 14 day(s)



ST BLE Sensor App supporting FOTA1/2



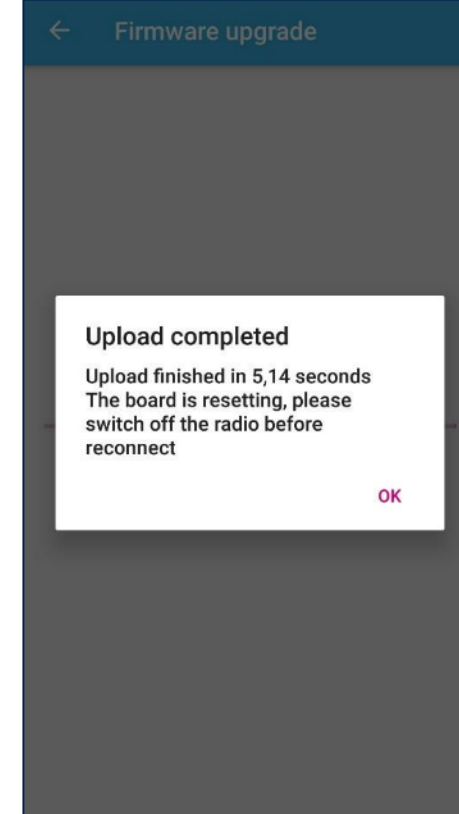
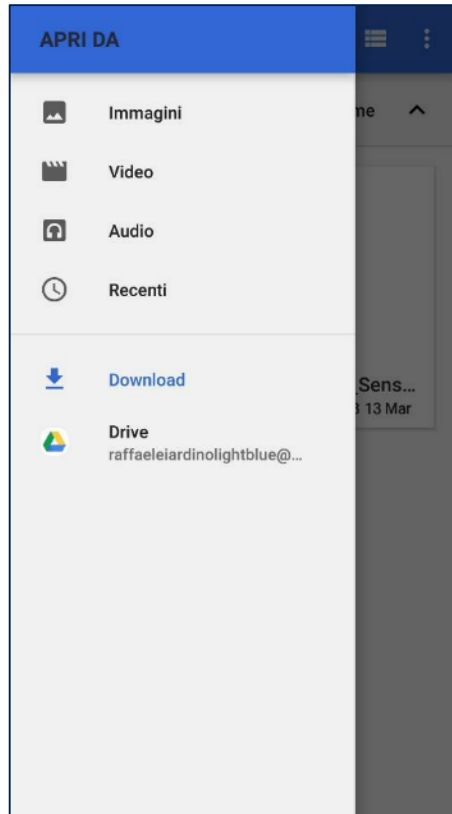
1 Flash the OTA Service Manager on the STEVAL-IDB008

2 Install the right version of the ST BLE Sensor
The BlueNRG App should be already installed otherwise install it on your smartpone.

3 Push **CONNECT TO A DEVICE** and then **OTAServiceMgr**



ST BLE Sensor App supporting FOTA 2/2



4

Select the file directly from the Cloud (Google Drive) or the one previously loaded in your mobile for instance the BLE_SensorDemo_OTA_ServiceManager.bin

5

The file will be flashed OTA and you can see the STEVAL-IDB008 Blue LED blinking **but only for 5 seconds !**

You have just experienced the powerful of the Data Length Extension feature embedded in the BlueNRG-232!

6

Now the Yellow LED on the STEVAL-IDB008 is active and finally you can play with the BlueNRG APP.

Also it is possible to re-enable the OTAServiceMgr pushing the button #1 (the middle one) to flash another image.

Thank you

© STMicroelectronics - All rights reserved.

ST logo is a trademark or a registered trademark of STMicroelectronics International NV or its affiliates in the EU and/or other countries.

For additional information about ST trademarks, please refer to www.st.com/trademarks.

All other product or service names are the property of their respective owners.



life.augmented