DT0049
Design tip

IFR configuration of BlueNRG/BlueNRG-MS using STM32ODE

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Main components	
BlueNRG	Bluetooth® low energy wireless network processor
BlueNRG-MS	Bluetooth® low energy wireless network processor
X-NUCLEO-IDB04A1	Bluetooth low energy expansion board based on BlueNRG for STM32 Nucleo
X-NUCLEO-IDB05A1	Bluetooth Low Energy expansion board based on the SPBTLE-RF module for STM32 Nucleo

Specification

The evaluation of the BlueNRG and BlueNRG-MS devices can be easily and effectively completed based on the STM32 Open Development Environment (STM32ODE), i.e. STM32Nucleo boards and BlueNRG/BlueNRG-MS expansion boards, along with the supporting X-CUBE-BLE1 software package.

The BlueNRG and BlueNRG-MS device firmware stacks use a table of configurable and programmable parameters needed to make the device work properly in a customer's prototype boards. The full list of parameters can be found in the User Manual UM1868 "BlueNRG and BlueNRG-MS information register (IFR)" found on st.com. This table is 192 bytes and it resides in a specific sector of the device Flash called the information register (IFR).The address of the IFR sector is 0x10020000.

When moving from evaluation to prototyping, IFR programming of the BlueNRG/BlueNRG-MS IFR table becomes a required step. The necessary steps are the following:

- Download the BlueNRG/BlueNRG-MS Development Kit on st.com
- Start from the application example "*BlueNRG_Stack_IFR_Updater*" available in the folders:
  - "*\Projects\Projects_Cube\BlueNRG_Stack_IFR_Updater*" if you are using STM32 Cube Libraries
  - "*\Projects\Projects_STD_Library\BlueNRG_Stack_IFR_Updater*" if you are using STM32 Standard Peripheral Libraries

- Implement in your application the reference code in the file *BlueNRG_Stack_IFR_Updater_main.c* (within the "APPLY_BLUENRG_IFR_UPDATER" defined symbol).
  - Verify the content of the IFR sector, compared to the desired IFR data, through the *ret = verify_IFR(&IFR_config)* routine
  - Check the result of this verification. If the error code 0x06 is returned, then program IFR data through the *ret = program_IFR(&IFR_config)* routine
- Note: it is highly recommended to enter the BlueNRG/BlueNRG-MS updater mode using the HW procedure *void BlueNRG_HW_Bootloader(void)*

To determine the correct IFR data to be used in the customer prototype board, please refer to UM1868, in Section 2.1 "IFR View/Edit view". In particular, the BlueNRG/BlueNRG-MS GUI should be the preferred tool to obtain the C structure *const IFR_config_TypeDef IFR_config* to be used in the application for IFR programming.

Measurement results

The steps below can be useful to check the programming procedure:

- From the embedded application:
  - Check the return value of the function tBleStatus = program_IFR(sdadsa). A programming procedure completed with success will return the value 0x00.
- An additional verification could be made at the HW level:
  - Check through the spectrum analyzer that the RF path is consistent. Through the test command *tBleStatus = aci_hal_tone_start(uint8_t rf_channel)*, with channel value equal to 0x00, a Continuous Waveform tone should be present on the Bluetooth Low Energy channel 0, at the frequency f=2.402 GHz.

Variations

The same procedure described in the previous sections can be easily applied to all STM32 microprocessor families. Specifically, the X-CUBE-BLE1 SW package for X-NUCLEO-IDB04A1 and X-NUCLEO-IDB05A1 expansion boards support STM32L053 (Nucleo-L053R8) and STM32L476 (Nucleo-L476RG).

Support material

Related design support material
Product Evaluation boards: X-NUCLEO-IDB04A1 X-NUCLEO-IDB05A1 NUCLEO-F401RE NUCLEO-L053R8 NUCLEO-L476RG
Development kits: BLUENRG-DK X-CUBE-BLE1 Bluetooth Low Energy software expansion for STM32Cube
Documentation
Datasheets: blueNRG, Bluetooth® low energy wireless network processor blueNRG-MS, Bluetooth® low energy wireless network processor
User manual: UM1868: BlueNRG and BlueNRG-MS information register (IFR)
Application note: AN4494: Bringing up the BlueNRG and BlueNRG-MS devices

Revision history

Date	Version	Changes
15-Feb-2016	1	Initial release
11-Apr-2016	2	First Public release

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