

# DT0136 Design tip

### BlueNRG-1 and BlueNRG-2 modular BLE stack

Main components		
BlueNRG-1	Bluetooth Low Energy wireless system-on-chip	
BlueNRG-2	Bluetooth Low Energy wireless system-on-chip	

### **Purpose and benefits**

The BlueNRG-1 and BlueNRG-2 are very low power Bluetooth low energy (BLE) single-mode system-on-chip (SoC), compliant with Bluetooth specification. They extend the features of award-winning BlueNRG network processor, enabling the usage of the embedded ARM Cortex-M0 core for running the user application code.

The application running on BlueNRG-1 and BlueNRG-2 makes use of a production-ready BLE stack as library (linked to the application source code) provided in the device software development kits (SDKs). The BLE stack version may change from time to time without notice. The BLE stack is provided in library form because it is not intended for users to do modifications. Starting from the BLE stack version v2.1, a modular configuration of the stack is supported. The modularity of the BLE stack allows users to optimize the BLE stack memory footprint and RAM usage depending on the specific application needs.

The purpose of this design tip is to provide customers with a reference for how to configure the BLE stack.

Note that for details on how to determine the BLE stack version the reader should refer to the dedicated design tip "BlueNRG-1 and BlueNRG-2 BLE stack and Hardware versions" available on st.com.

The entire content of this design tip applies with no modifications both to BlueNRG-1 and to BlueNRG-2 devices when running BLE radio stack v2.1 and onwards.

### **Description**

The dedicated preprocessor defined symbol *BLE\_STACK\_CONFIGURATION* is available in all the reference user applications within the device SDK and it is used for configuring the BLE stack with all supported features.

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The following modular configurations are currently supported:

- BLE\_STACK\_FULL\_CONFIGURATION it supports the following features:
  - o Controller Privacy enabled
  - LE Secure Connection enabled
  - Master role enabled
  - o Data length extension enabled (valid only for BlueNRG-2 devices)
- BLE\_STACK\_BASIC\_CONFIGURATION it configures the BLE stack with a basic configuration:
  - Controller Privacy disabled
  - o LE Secure Connection disabled
  - Master role disabled (only Peripheral/Slave role supported)
  - Data length extension disabled
- BLE\_OTA\_BASIC\_CONFIGURATION it supports Over-The-Air (OTA) FW upgrade Service support with Data length extension (valid only for BlueNRG-2 device):
  - o Controller Privacy disabled
  - LE Secure Connections disabled
  - Master role disabled (only Peripheral/Slave role supported)
  - Data length extension enabled (only for BlueNRG-2 device)

BLE\_STACK\_BASIC\_CONFIGURATION is the default option. If no value is defined for the preprocessor option the basic configuration is selected.

Users that would like to configure the BLE stack with another configuration shall explicitly set the preprocessor defined symbol *BLE\_STACK\_CONFIGURATION* to the value corresponding to the desired stack configuration.

Additionally the two configuration files *stack\_user\_cfg.c* and *stack\_user\_cfg.h* are also available in the device SDK and used for enabling the BLE stack modular approach.

One last note: Data length extension feature is disabled on each configuration related to a BlueNRG-1 device since this feature is not supported on this device.



#### Helper function aci\_hal\_get\_firmware\_details in DTM mode

In the BlueNRG-1 and BlueNRG-2 driver library the following helper function is available:

```
tBleStatus aci_hal_get_firmware_details (uint8_t *DTM_version_major, uint8_t *DTM_version_minor, uint8_t *DTM_version_patch, uint8_t *DTM_version_variant, uint16_t *DTM_Build_Number, uint8_t *BTLE_stack_version_major, uint8_t *BTLE_stack_version_minor, uint8_t *BTLE_stack_version_patch, uint8_t *BTLE_stack_development, uint16_t *BTLE_stack_variant, uint16_t *BTLE_stack_Build_Number);
```

Note that this helper function is only available when the device is configured as a network coprocessor. For further details the reader should refer to the dedicated design tip "How to configure the BlueNRG-1 and BlueNRG-2 devices in network coprocessor mode" available on st.com.

The parameter *BTLE\_stack\_variant* returned from the *aci\_hal\_get\_firmware\_details* helper function reports to the user a bitmask of BLE stack features through the following flags:

- 0x0001: CONTROLLER\_PRIVACY\_ENABLED
- 0x0002: SECURE\_CONNECTIONS\_ENABLED
- 0x0004: CONTROLLER\_MASTER\_ENABLED
- 0x0008: CONTROLLER\_DATA\_LENGTH\_EXTENSION\_ENABLED
- 0x0010: LINK LAYER ONLY

Alternatively, customer can use the BlueNRG family GUI to gather the same information, as shown in the GUI screenshots in Figure 1 and with a zoom in Figure 2.

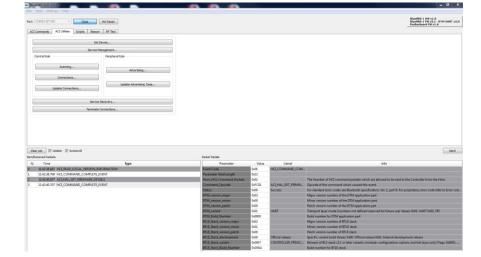
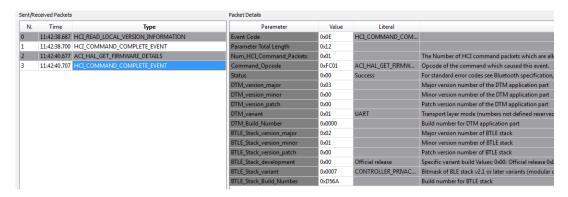


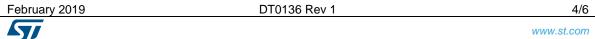
Figure 1: BlueNRG family GUI capture

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Figure 2: BlueNRG family GUI capture zoom

### ACI\_HAL\_GET\_FIRMWARE\_DETAILS command complete event







# **Support material**

### **Documentation**

Datasheet BlueNRG-1: Bluetooth® low energy wireless system-on-chip

Datasheet BlueNRG-2: Bluetooth® low energy wireless system-on-chip

Programming Manual PM0257: BlueNRG-1, BlueNRG-2 BLE stack v2.x programming guidelines

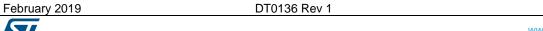
### **Embedded Software**

STSW-BLUENRG1-DK: BlueNRG-1, BlueNRG-2 DK SW package

STSW-BNRGUI: BLUENRG family GUI

# **Revision history**

Date	Version	Changes
06-Feb-2019	1	Initial release



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