BLE Heart Rate Sensor Example Project

1.0

Features

- BLE Heart Rate Service support in the GATT Server role
- Simulating the Heart Rate data
- Reporting the workflow status through UART
- LED status indication

General Description

This example project demonstrates the BLE Heart Rate Sensor workflow. The project simulates Heart Rate data and performs communication with BLE enabled central/client device.

Development Kit Configuration

Configure your device as follows:

- The UART RX pin is connected to port 1 pin 4.
- The UART TX pin is connected to port 1 pin 5.
- A mechanical button (port 2 pin 7) is used to wake up the device and start re-advertising.
- The red LED (port 2 pin 6) is used to indicate the BLE disconnection state.
- The green LED (port 3 pin 6) is used to indicate the advertising state.
- The blue LED (port 3 pin 7) is used to indicate the battery discharge (low power).

Project Configuration

The top design schematic is shown in Figure 1.

BLE Heart Rate Sensor Example project

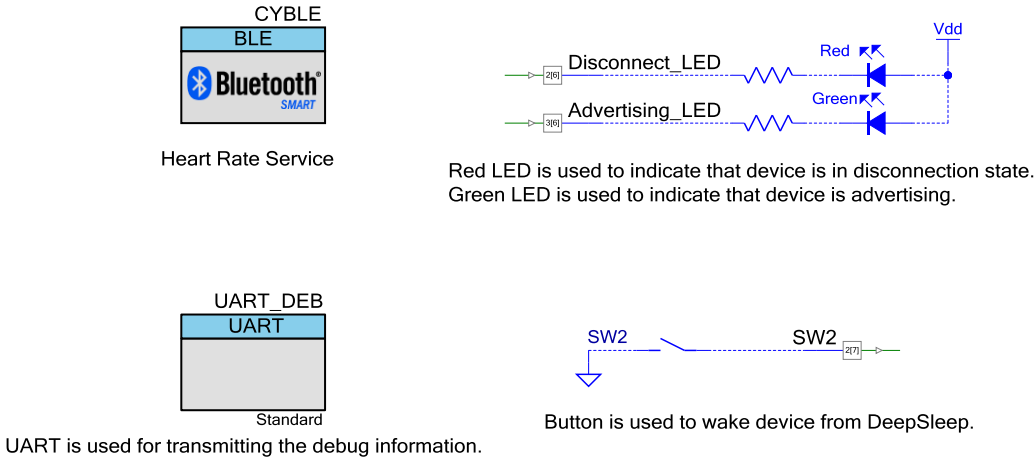

Figure 1. Top design schematic

The BLE component is configured as Heart Rate Sensor.

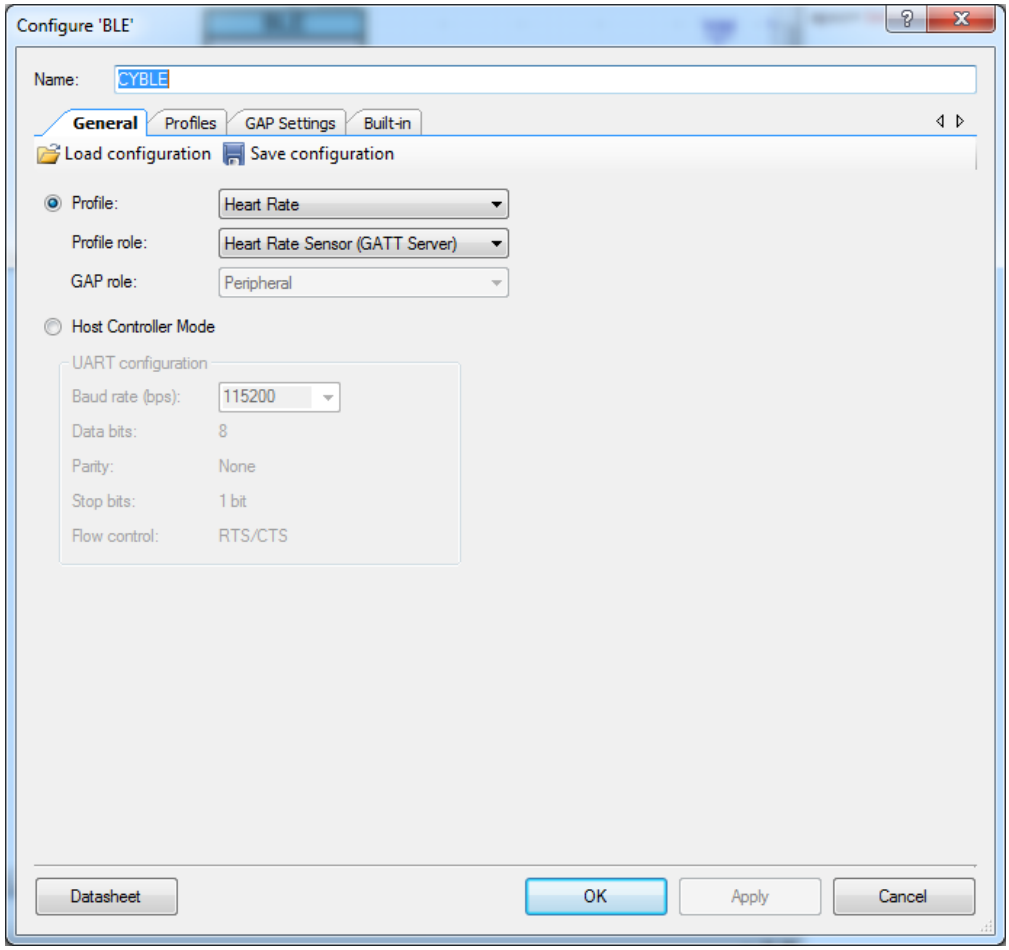

Figure 2. BLE configuration

The GATT settings:

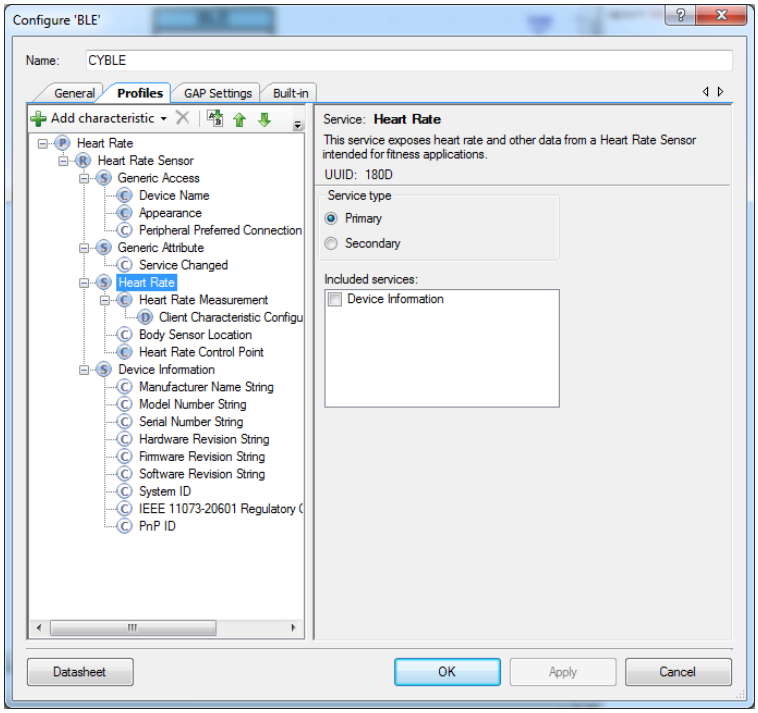

Figure 3. GATT settings

The GAP settings:

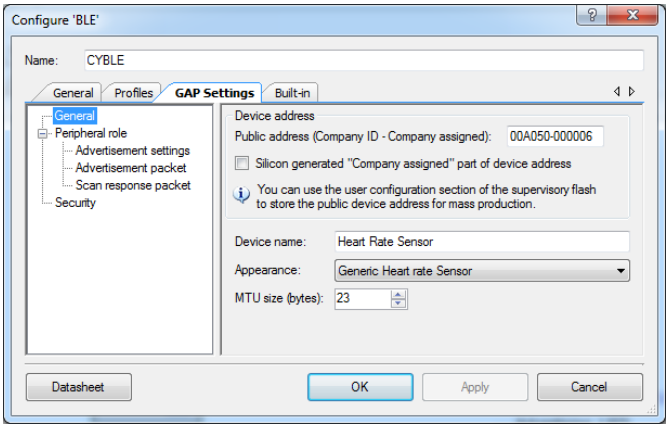

Figure 4. GAP settings

The Advertisement settings:

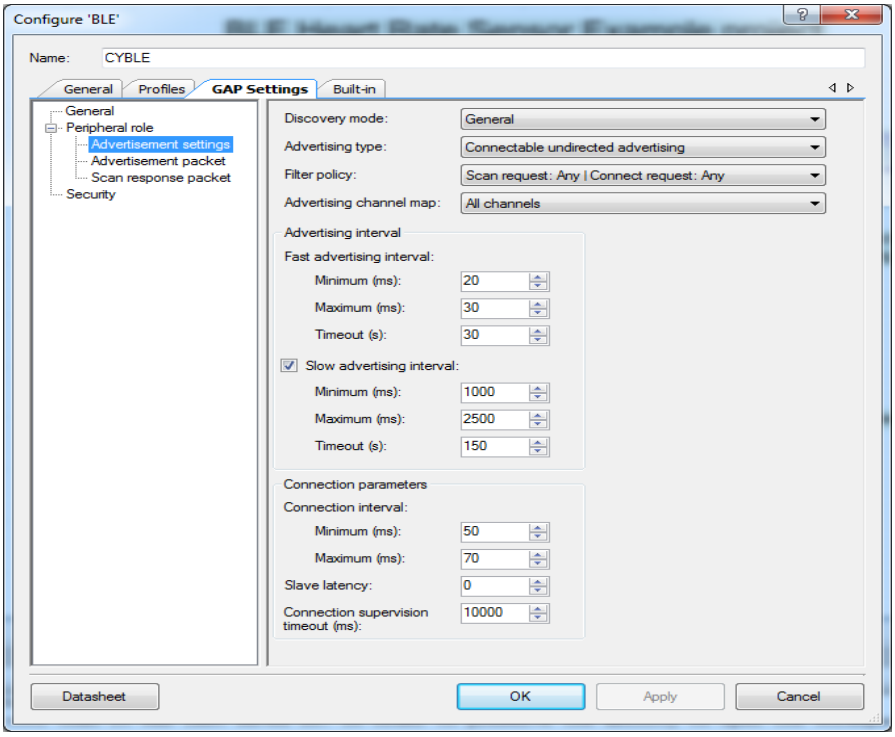

Figure 5. GAP settings -> Advertisement settings

The Advertisement packet:

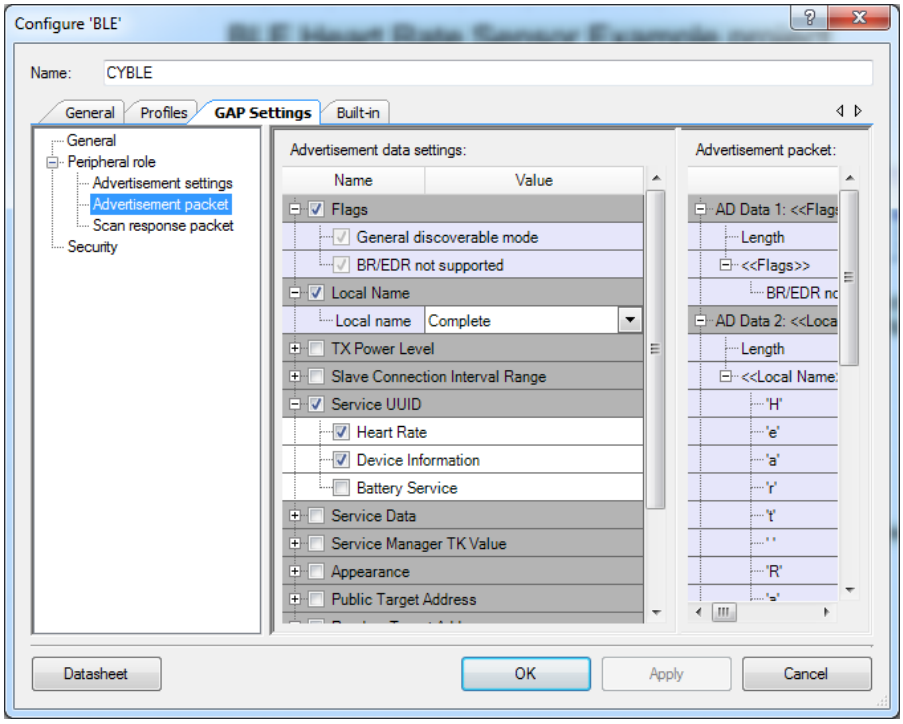

Figure 6. GAP settings -> Advertisement packet

The Scan response packet:

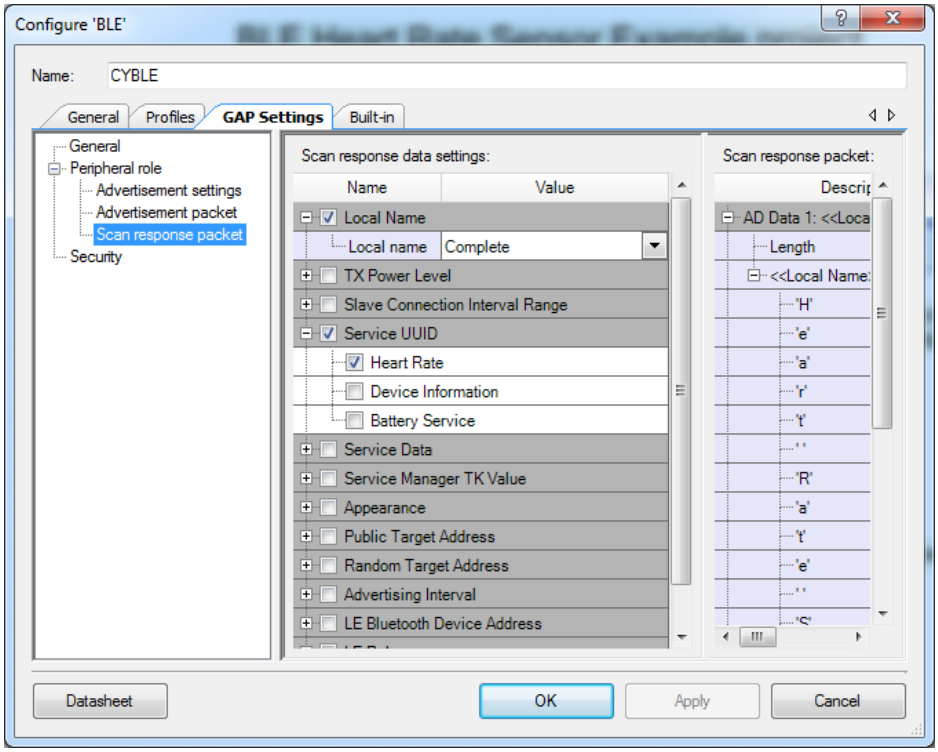

Figure 7. GAP settings -> Scan response packet

Security settings:

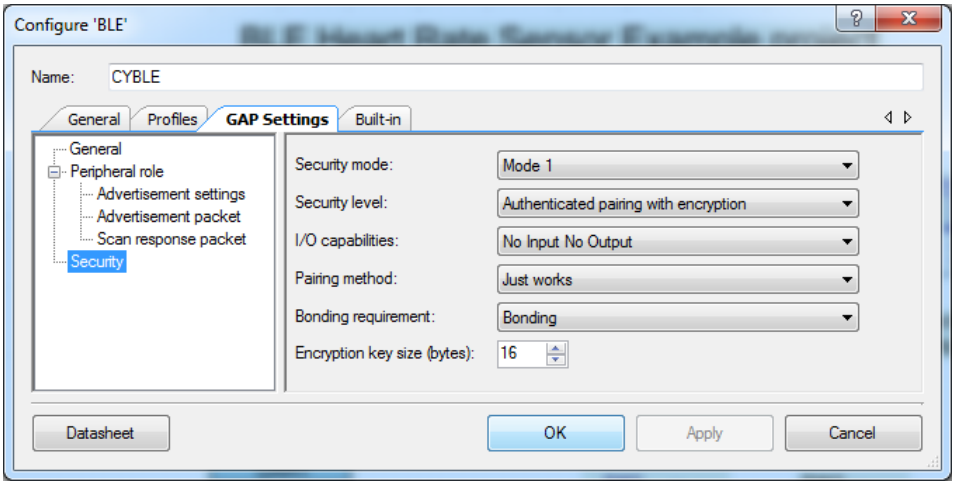

Figure 8. Security settings

Project Description

The project demonstrates the BLE workflow procedures like scanning, discovering, connecting, writing/reading characteristics/descriptors, receiving notifications etc.

The project is designed so there is no need to initiate any of mentioned actions manually – it automatically starts the BLE Sack, then when the Stack is on (STACK_ON event is received)

the scanning GAP procedure is initiated, then it receives and parses advertisement data. Once it finds out that there is a Heart Rate Service UUID in the advertisement packet, it immediately connects to that device and starts to discover all primary services which are supported (configured in the GATT tab). In this case the supported services are: Generic Access (GAP) and Attribute (GATT) Services, Heart Rate Service (HRS), Battery Service (BAS) and Device Information Service (DIS). Then the project discovers included services (which can be secondary) and characteristics of each mentioned above primary service. Then it discovers descriptors of each service characteristic which can have them.

After a discovery process (when the DISCOVERY_COMPLETE event is received) the project sends a request to read the Body Sensor Location characteristic and waits for HRSC_BSL_READ_RESPONSE event in the Heart Rate Profile's callback (HeartRateCallBack). In this event the project indicates a received Body Sensor Location value and enables the Heart Rate Measurement notification. The notifications come approximately once a second.

Expected Results

The working project sends the messages through UART.
The example log is shown below:

```
BLE Heart Rate Sensor Example Project
EVT_STACK_ON
Start Advertisement with addr: 00a050000006
EVT_ADVERTISING
EVT_GATT_CONNECT_IND: attId 0, bdHandle 4
EVT_GAP_DEVICE_CONNECTED: 4
EVT_GATTS_XCNHG_MTU_REQ
EVT_GAP_AUTH_REQEVT_GAP_ENCRYPT_CHANGE: 1
EVT_GAP_AUTH_COMPLETE: security:2, bonding:1, ekeySize:10, authErr 0
Heart Rate Measurement Notification is Enabled
Heart Rate Notification is sent successfully, Heart Rate = 72
Heart Rate Notification is sent successfully, Heart Rate = 84
Heart Rate Notification is sent successfully, Heart Rate = 96
Heart Rate Notification is sent successfully, Heart Rate = 108
Heart Rate Notification is sent successfully, Heart Rate = 120
Heart Rate Notification is sent successfully, Heart Rate = 132
Heart Rate Notification is sent successfully, Heart Rate = 144
```

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