



Introduction

The Heart rate Profile enables the collector device (GATT Client) to connect and interact with a Heart Rate Sensor (GATT Server) for use in fitness applications. The Heart rate sensor sends the heart rate measurement in bpm, energy expended in kilo joules, and R-R intervals in seconds. In addition to the heart rate service the heart rate profile also implements the Device Information Service, which provides the information about the Heart Rate Sensor Device.

The example application simulates a Heart Rate Sensor (GATT Server role).

Features

- Device Discovery and Disconnection
- Pairing/Bonding
- Heart Rate Sensor Measurements
- Console Display

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1 Purpose

This getting started guide describes the setup of an Atmel® ATSAMB11 Xplained board and bringing-up an example profile supplied as part of BluSDK SMART release. The Bluetooth® Heart Rate Profile is an example application that is embedded as part of the software release package.

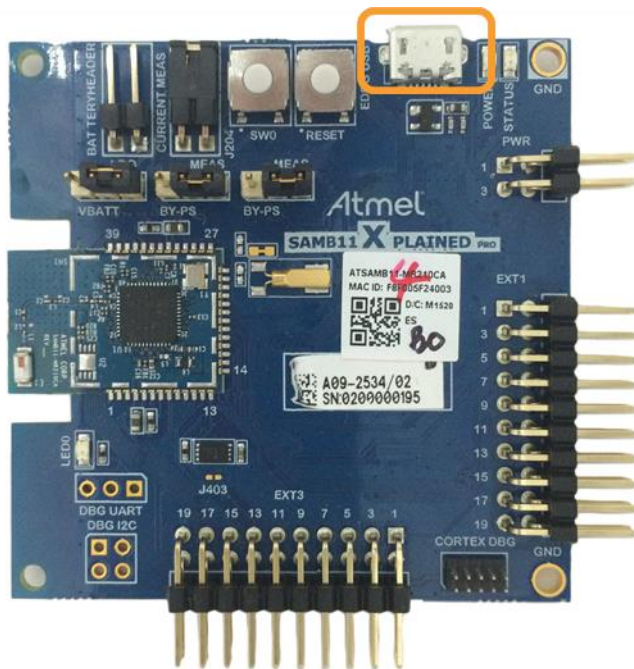
2 Demo Setup



3 Hardware Setup

Connect the ATSAMB11 board to the host PC using a Micro-USB cable.

Figure 3-1. EDBG USB Port



4 Heart Rate Measurements

Heart Rate Profile provided by Bluetooth SIG has defined three characteristics for the exchange of heart rate parameters between the sensor and monitor. The characteristics of the profile are used to transfer heart rate parameters like Beats per minute, R-R Interval Measurements and other parameters like Body Sensor location and Energy Expended values. The optional characteristic Heart Rate Control Point characteristic is used by the Heart Rate Monitor to reset the energy expended in the heart rate sensor.

Heart Rate sensor which is the GATT server will hold the characteristics and send the measurement values to the Heart Rate Monitor.

- The heart rate, R-R interval and energy expended are sent using the Heart Rate Measurement Characteristics
- The Heart rate measurements are notified to the monitor on a value change if the monitor has enabled the notifications
- The body sensor location will be read by the monitor by reading the body sensor location characteristic. The energy expended sent in the heart rate measurement can be reset by the monitor by writing to the heart rate control point characteristic.

The example application simulates the sensor measurements and sends to the Heart Rate Collector.

5 Software Setup

5.1 Installation Steps

1. Install the latest Atmel Studio [Atmel Studio 7.0 (build 629 or later) web installer (recommended)]
<http://www.atmel.com/tools/ATMELSTUDIO.aspx>.

2. Install the latest Atmel Software Framework.

This package will install the following examples within the Atmel Studio environment:

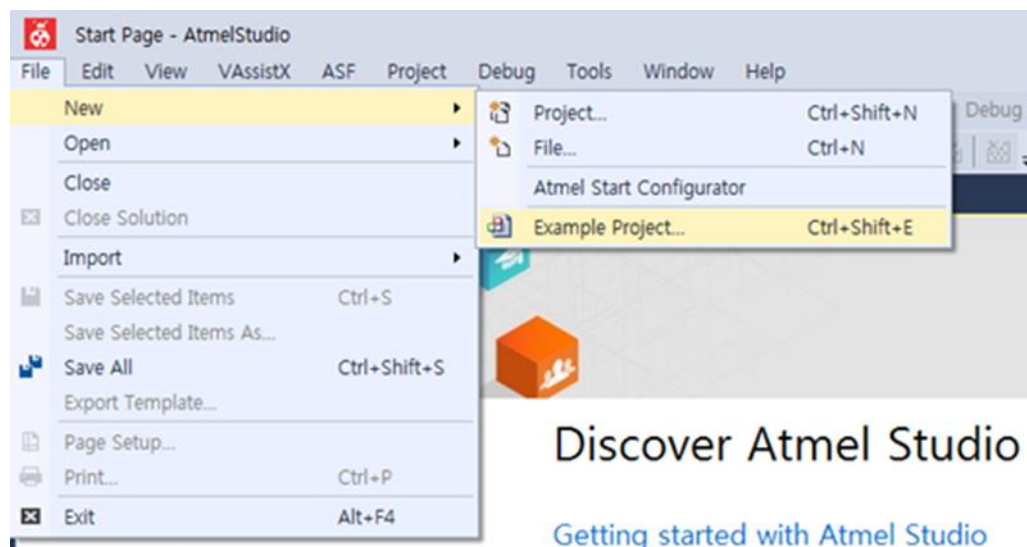
- Heart Rate application for ATSAMB11

5.2 Build Procedure

The following procedure is explained for ATSAMB11 application example.

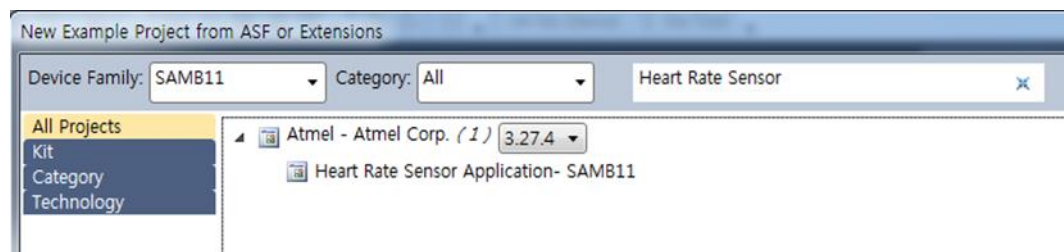
1. Select New Example Project.

Figure 5-1. Creating a New Example Project



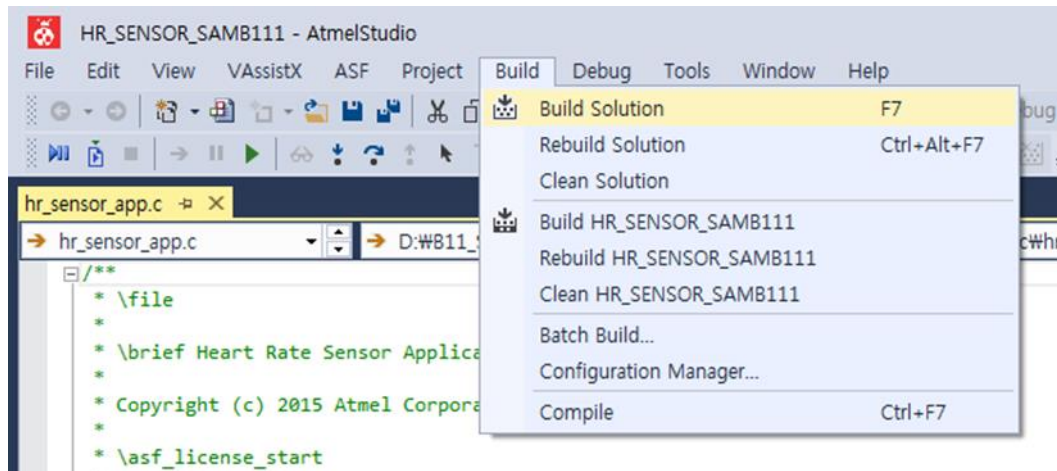
2. Select "SAMB11" in device family, enter "Heart Rate Sensor" in search window, and expand Atmel Corp Projects. The location and the name of the project can be selected in the respective fields. Click OK.

Figure 5-2. Selecting Heart Rate Sensor Application from Example Projects



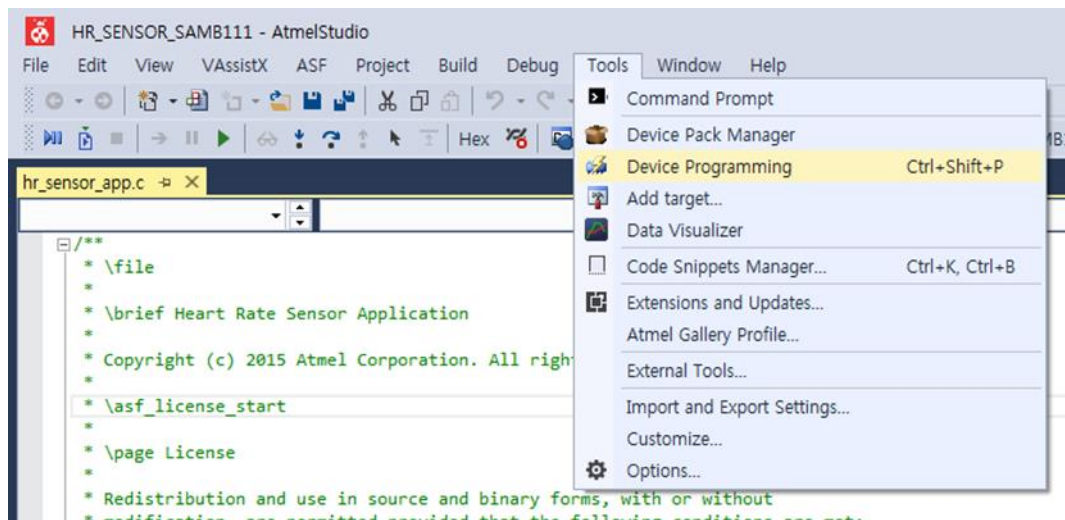
3. Accept the license Agreement. The Atmel studio will generate the Heart Rate Profile project for ATSAMB11.
4. Build the solution.

Figure 5-3. Building the Heart Rate Sensor Application



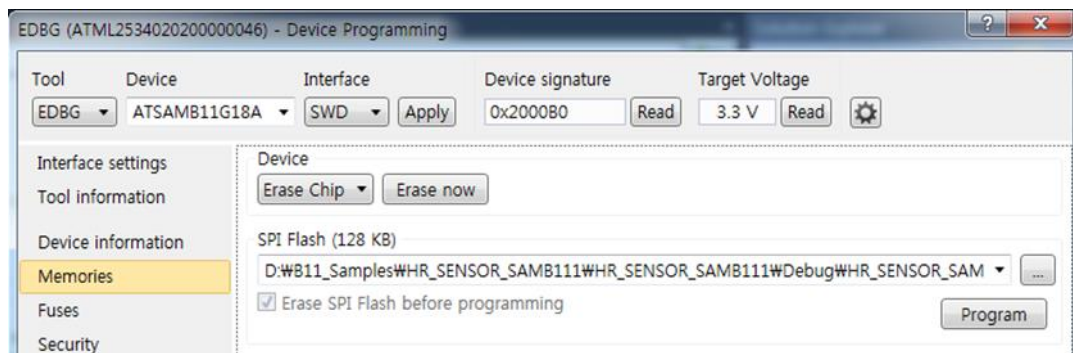
5. Download the application via the USB to the ATSAMB11 board by using the Device Programming option available in Tools as shown below.

Figure 5-4. Flashing the Application on Atmel MCU



6. Inside the device programming the user has to select the correct configuration for the device and finally program the device by using the program button.

Figure 5-5. Flashing the Heart Rate Sensor Application to ATSAMB11 Board



7. Once the application is flashed, the Heart Rate application is ready for usage.

6 Console Logging

For the purpose of debugging, a logging interface has been implemented in the Heart Rate application. The logging interface utilizes the same EDBG port that connects to ATSAMB11. A serial port monitor application (for example TeraTerm) shall be opened and attached to the corresponding COM port enumerated on the PC by the device. Baud rate should be set at 115200.

7 Running the Demo

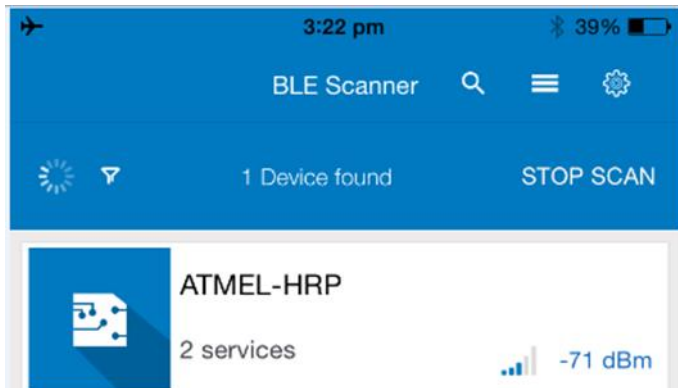
1. Power on the ATSAMB11 by connecting the USB cable.
2. Open a console window using TeraTerm or any equivalent serial port monitor application and connect to the corresponding COM port enumerated on the PC. Configure the COM Port with the following settings: Baudrate 115200, Parity None, one Stop bit, one Start bit, no Hardware Handshake.
3. Press the Reset button on the ATSAMB11 board.
4. Press the SW0 button on the ATSAMB11 board to start advertisement.
5. The device is now in advertising mode.

Figure 7-1. Console in Advertising Mode

```
Initializing Heart Rate Sensor Application
Initializing SAMB11
BD Address:0xF8F005F23FFF, Address Type:0
Press the button to start advertisement
Bluetooth device is in Advertising Mode
```

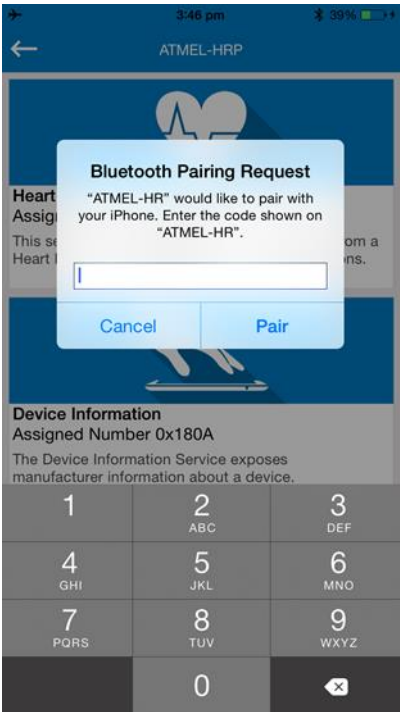
6. On the iPhone, enable Bluetooth in the Settings page. Open the Atmel SmartConnect mobile application. The phone will start to scan for devices. ATMEL-HRP will appear amongst the devices scanned. Click on ATMEL-HRP to connect to the ATSAMB11 device.

Figure 7-2. Device Discovery in Atmel SmartConnect Mobile Application



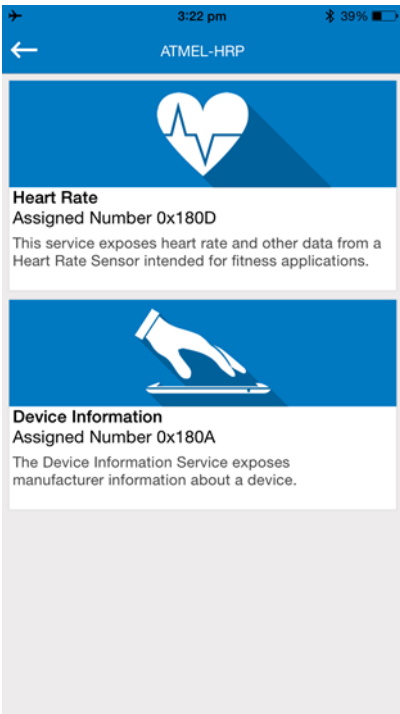
7. Once connected, the client side will request for the pairing procedure with the iPhone. The console log provides a guidance for the user to enter the pass-key on iPhone.
8. On the iPhone side, a pop-up screen prompting the user to enter the pass-key will appear. Enter '123456' in the text box and click on 'Pair'.

Figure 7-3. Pairing Request Pop-up in Mobile App



9. Once the device is connected, the supported services Heart Rate and Device Information will be displayed as shown.

Figure 7-4. Service Page when Connected to Heart Rate Sensor

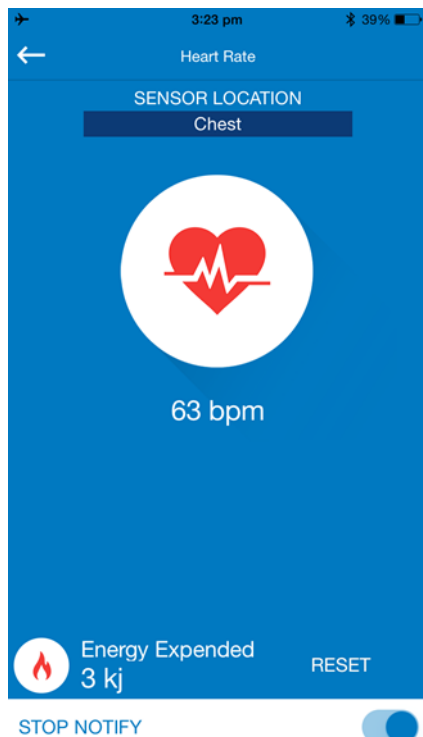


10. Once the notifications are enabled the HRM values are displayed as shown in the console and the corresponding mobile app.

Figure 7-5. Console Log when Notifications are Enabled

```
Initializing Heart Rate Sensor Application
Initializing SAMB11
BD Address:0xF8F005F23FFF, Address Type:0
Press the button to start advertisement
Bluetooth device is in Advertising Mode
Connected to peer device with address 0xccfa00710852
Connection Handle 0
Enable the notification in app to listen heart rate or press the
button to disconnect
Peer device request pairing
Sending pairing response
Please Enter the following Pass-code(on other Device):123456
Pairing procedure completed successfully
Notification Enabled
Heart Rate: 50 bpm      RR Values:(100,300)msec User Status:Idle
Heart Rate: 51 bpm      RR Values:(500,700)msec User Status:Idle
Heart Rate: 52 bpm      RR Values:(900,1100)msec User Status:Idle
Heart Rate: 53 bpm      RR Values:(100,300)msec User Status:Idle
Heart Rate: 54 bpm      RR Values:(500,700)msec User Status:Idle
```

Figure 7-6. Mobile Screen when Displaying Heart Rate Measurements



11. Once the user clicks on Stop Notify the notifications are displayed as shown in the console logs.

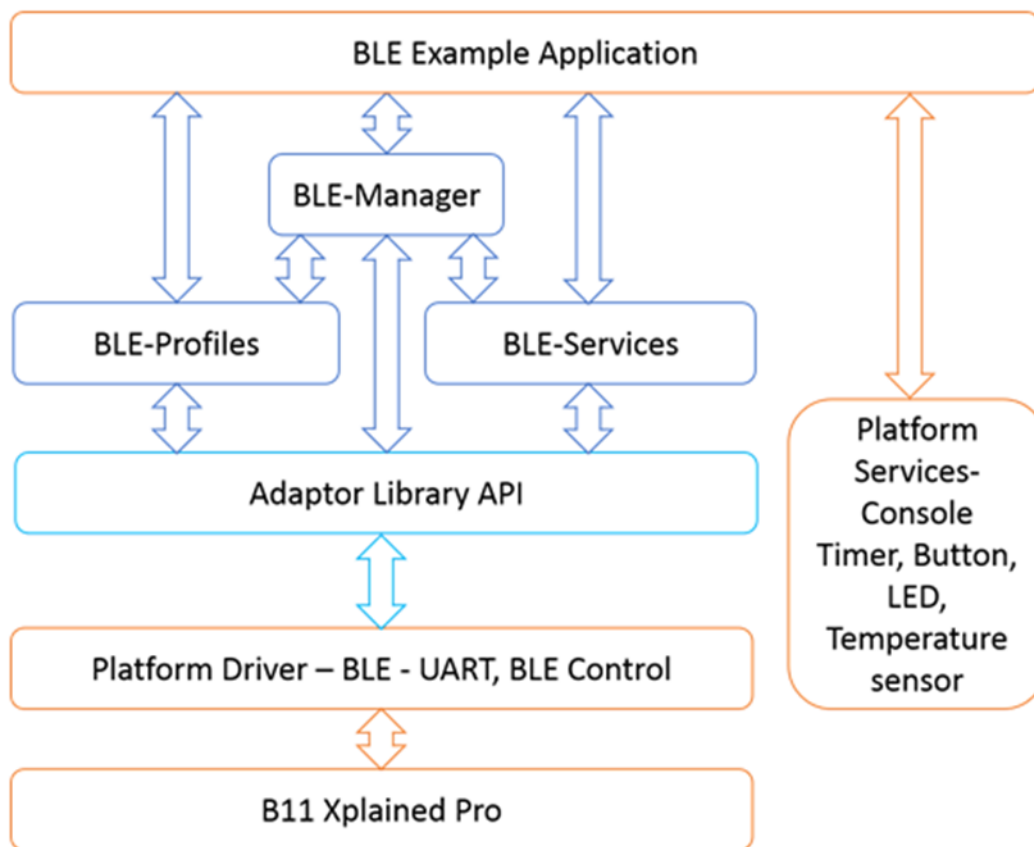
Figure 7-7. Console Log when Notifications are Disabled

```
Heart Rate: 54 bpm      RR Values:(500,700)msec User Status:Idle  
Heart Rate: 55 bpm      RR Values:(900,1100)msec User Status:Idle  
Heart Rate: 56 bpm      RR Values:(100,300)msec User Status:Idle  
Heart Rate: 57 bpm      RR Values:(500,700)msec User Status:Idle  
Notification Disabled
```

8 BluSDK SMART Software Architecture

Figure 8-1 illustrates the top level diagram for the ATSAMB11 configuration.

Figure 8-1. ATSAMB11 Software Architecture



9 ATMEL EVALUATION BOARD/KIT IMPORTANT NOTICE AND DISCLAIMER

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10 Revision History

Doc Rev.	Date	Comments
42614A	11/2015	Initial document release.



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