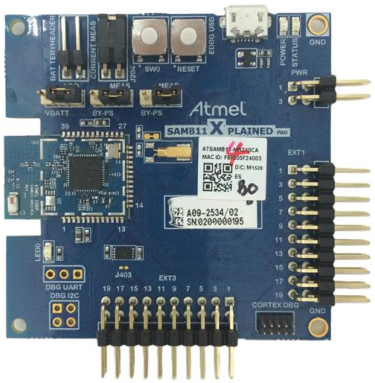
ATSAMB11 BluSDK SMART

Multi-Role/Multi-Connect Application – Getting Started Guide

USER GUIDE



Introduction

This getting started guide describes the setup of Atmel® ATSAMB11 with a supported platform (see Table 2-1) bringing up an example profile supplied as part of the BluSDK Smart release. This document explains bring up of Bluetooth® Multi-Role/Multi-Connect example application that is embedded as part of the software release package.

The Multi-Role application demonstrates ATSAMB11 as both GAP Central and GAP Peripheral at the same time. The Multi-Role application will initially scan (GAP Central) for the devices and initiate a connection to the peripheral device which is advertising using connectable advertisement packets. After the link establishment, ATSAMB11 will be exchanging the data as a GAP Central. Then the Multi-Role application will start advertising using connectable advertisement packets as a GAP Peripheral and gets connected to the remote device, which has sent a connection request and exchanges the data on the new link established.

In the Multi-Role application the GAP Central is the Proximity Monitor (GATT Client in Proximity Profile) and GAP Peripheral is Battery Application (GATT Server containing Battery Service). As a GAP Central ATSAMB11 will be scanning for the devices and connects to the proximity reporter to perform the link loss and path loss. As a GAP peripheral ATSAMB11 will advertise with Battery Service UUID in the advertisement data and gets connected with remote GAP Central to send the changing battery level.

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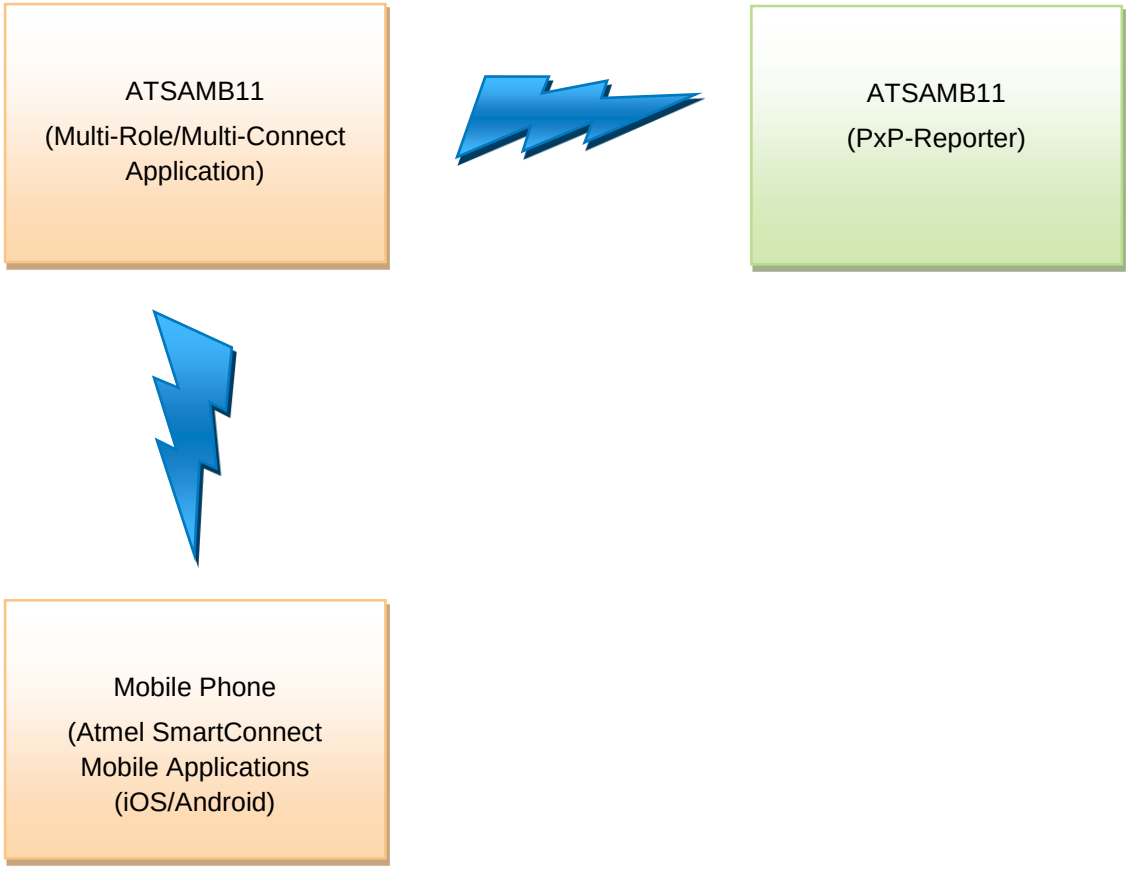
1 Demo Setup

Figure 1-1. Demo Setup of Multi-Role Application on ATSAMB11



2 Supported Hardware Platforms and IDEs

Table 2-1. BluSDK Smart – Supported Hardware and IDEs

Platform	MCU	Supported IDEs
SAM B11 (MCU)	ATSAMB11G18A	Atmel Studio v7.0 and Keil

3 Hardware Setup

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

Figure 3-1. EDBG USB Port

4 Software Setup

4.1 Installation Setup

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.

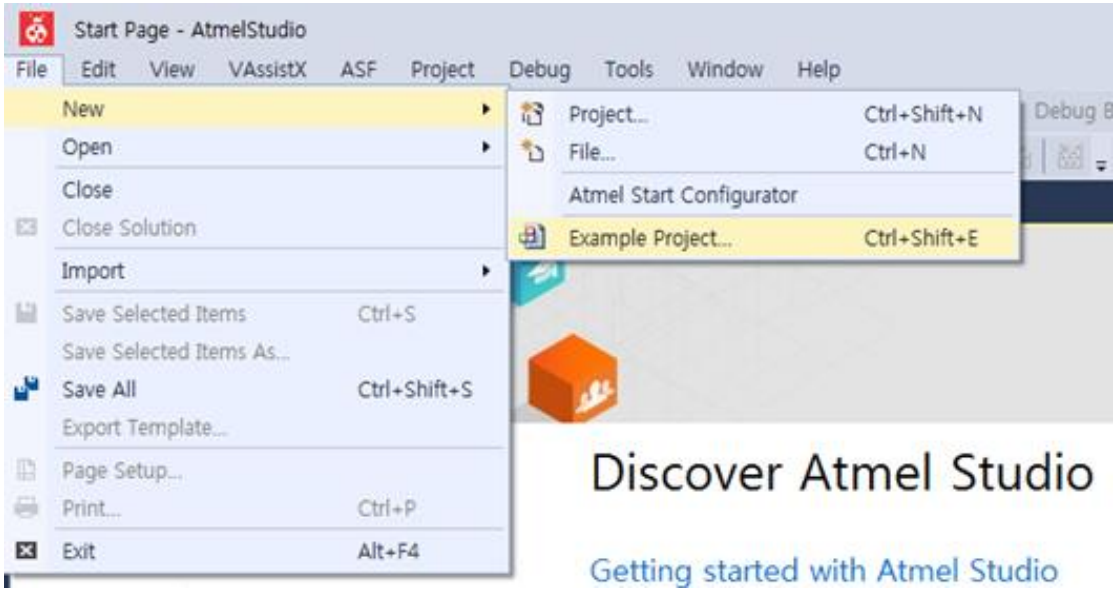
- Multi-Role and Multi-Connect Application for SAM B11

5 Build Procedure

The following procedure is explained for the ATSAMB11 application example.

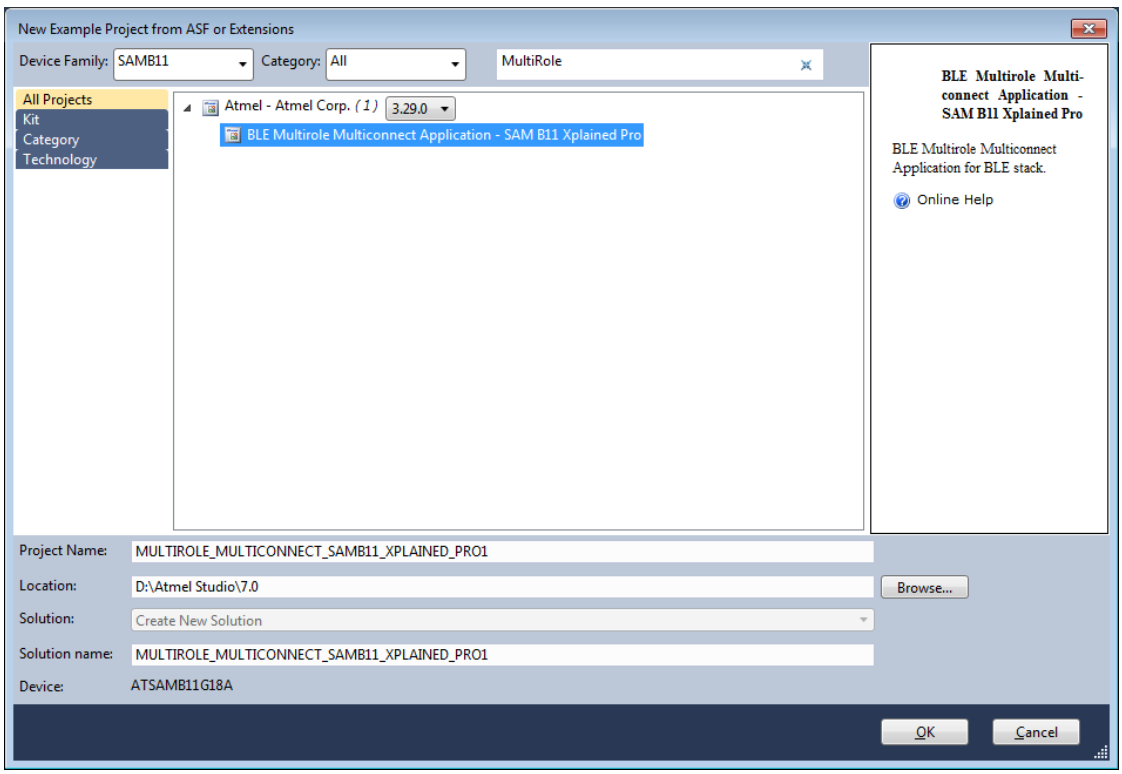
1. Select New Example Project.

Figure 5-1. Creating a New Project



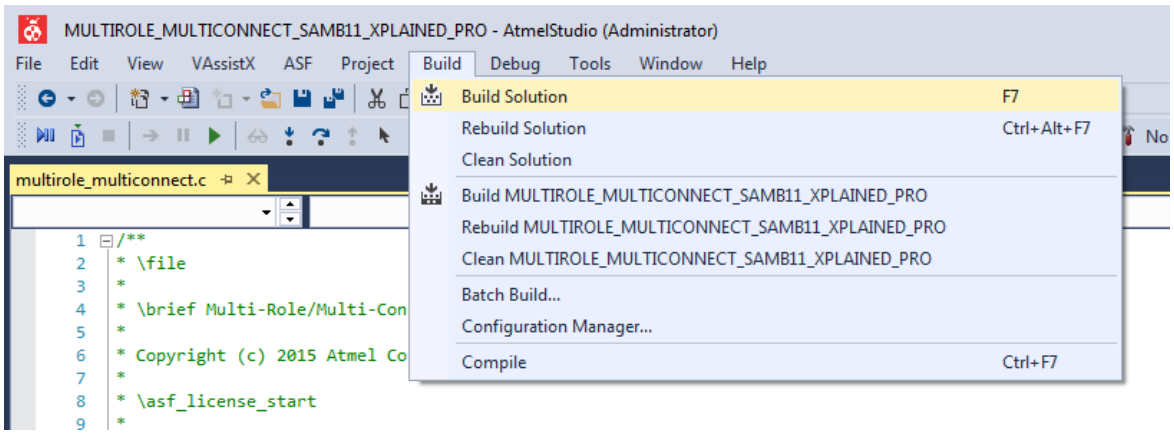
2. Select “SAMB11” in device family, enter “MultiRole” in the search window and expand Atmel Corp Projects. The location and the name of the project can be selected in the respective fields. Click OK.

Figure 5-2. Selecting Multi-Role/Multi-Connect Profile Application from Example Projects



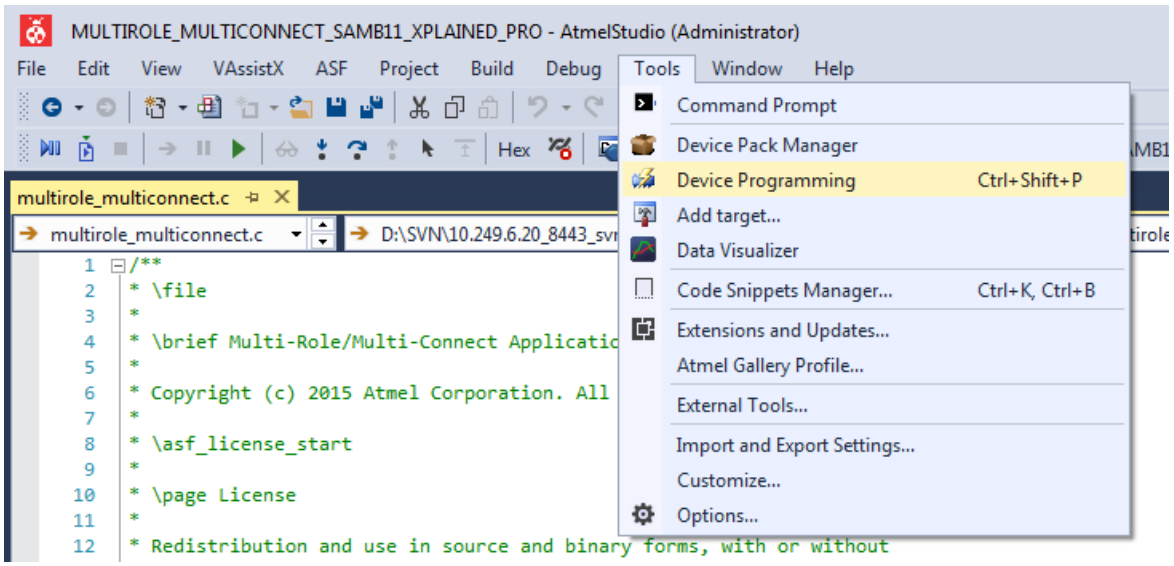
3. Accept the license agreement. The studio will generate the Multi-Role/Multi-Connect project for SAM B11.
4. Build the solution.

Figure 5-3. Building the Multi-Role/Multi-Connect Application



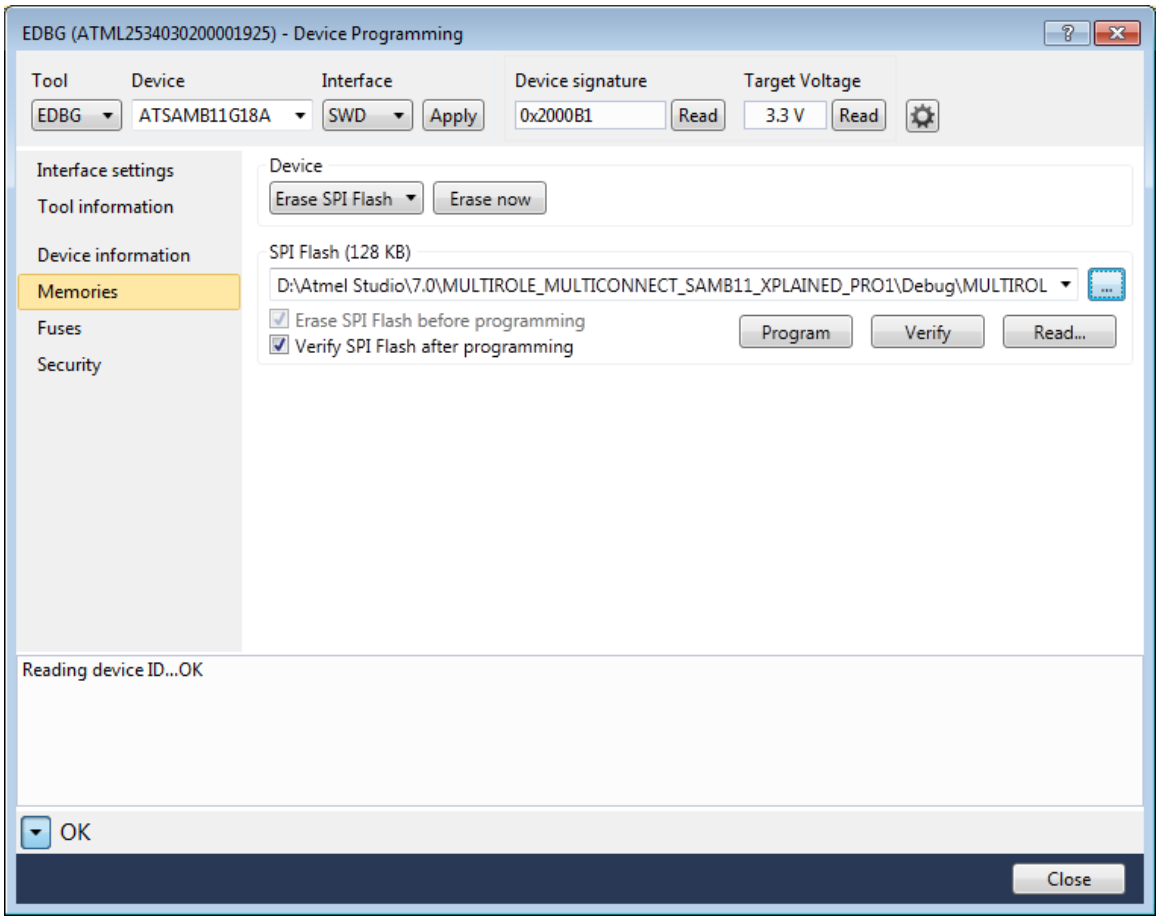
5. Download the application via the USB to the SAM B11 board using Device Programming option available in Tools as mentioned below.

Figure 5-4. Flashing the Application on Atmel MCU



6. Inside device programming, the user has to select the correct configuration for device and finally program the device by clicking on the ‘Program’ button as shown below.

Figure 5-5. Flash Programming



7. Once the application is flashed, it is ready to be function as a Multi-Role Device.

6 Console Logging

For the purpose of debugging, a logging interface has been implemented in the Multi-Role Application.

The logging interface utilizes the same EDBG port that connects to the supported platform. A serial port monitor application (for example TeraTerm) shall be opened and attached to the appropriate COM port enumerated by the device on the PC.

7 Running the Demo

1. Power on the SAM B11 (see Figure 3-1) by connecting the USB Cable.
2. Open the console using TeraTerm or any serial port monitor application and connect to the corresponding COM port enumerated by the device on the PC. (Settings: Baudrate 115200, Parity None, 1 Stop bit, 1 Start bit, No Hardware Handshake.)
3. Press the Reset button on the ATSAMB11 board.
4. The device will initialize and start-up – as seen in the console log shown below.

Figure 7-1. Multi-Role/Multi-Connect Application Initialization

```
Initializing SAMB11
BD Address:0xF8F005F23FFF, Address Type:0
High Alert RSSI range: -91dBm and above
Mild Alert RSSI range: -70dBm to -90dBm
No Alert RSSI range:   -69dBm and below
Initializing Multi-Role/Multi-Connect Application
Scanning…Please wait…
```

5. Device will then start scanning and will display devices found as shown below.

Figure 7-2. Multi-Role/Multi-Connect Application – Scanning Devices

```
Initializing SAMB11
BD Address:0xF8F005F23FFF, Address Type:0
High Alert RSSI range: -91dBm and above
Mild Alert RSSI range: -70dBm to -90dBm
No Alert RSSI range:   -69dBm and below
Initializing Multi-Role/Multi-Connect Application
Scanning…Please wait…
Info: Device found address [0]  0xF8F005F23DED ---PXP
Info: Device found address [0]  0xD4C231C0BC78
Select Index number to Connect or [s] to scan
```

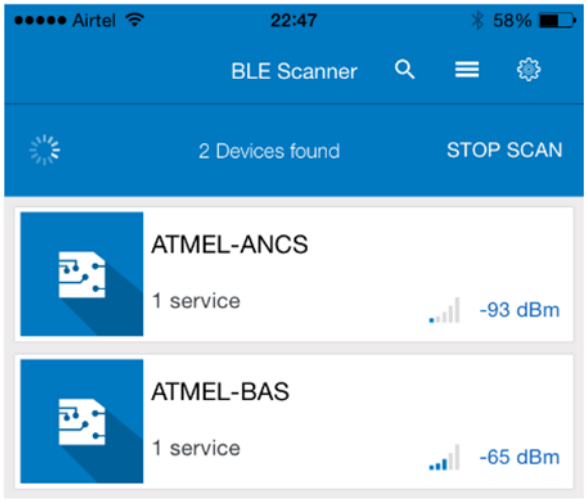
6. The GAP Central (Proximity Monitor) scans and then displays the list of all BLE devices which are advertising. Proximity Reporter devices (GATT server role) are indicated with tag “---PXP”. Select the appropriate index number for the Proximity Reporter. The GAP Central (Proximity Monitor) will then connect to the selected peer device.

Figure 7-3. GAP Central (Proximity Monitor) Connection with a GAP Peripheral (Proximity Reporter)

```
Initializing SAMB11
BD Address:0xF8F005F23FFF, Address Type:0
High Alert RSSI range: -91dBm and above
Mild Alert RSSI range: -70dBm to -90dBm
No Alert RSSI range:   -69dBm and below
Initializing Multi-Role/Multi-Connect Application
Scanning…Please wait…
Info: Device found address [0]  0xF8F005F23DED ---PXP
Info: Device found address [1]  0xD4C231C0BC78
Select Index number to Connect or [s] to scan
0
PXP Connect request sent
Connected to peer device with address 0xf8f005f23ded
Connection Handle 0
Enter the Passkey(6-Digit) in Terminal:123456
Entered Pass-code:123456
Pairing procedure completed successfully
BLE Started Advertisement
link loss service discovered
Immediate Alert service discovered
Tx power service discovered
Tx power of device is 00 dBm
Starting timer
Rx Power(RSSI):-039 dBm---No Alert
Rx Power(RSSI):-042 dBm---No Alert
Rx Power(RSSI):-038 dBm---No Alert
Rx Power(RSSI):-039 dBm---No Alert
Rx Power(RSSI):-037 dBm---No Alert
```

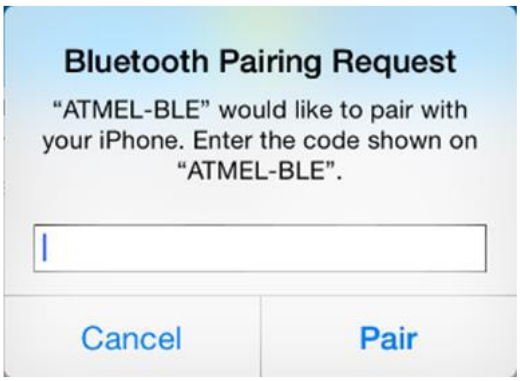
7. ATSAMB11 as a GAP Central pairs with the connected peripheral. Then ATSAMB11 acts as a GAP Peripheral by advertising with Battery Service UUID in the advertisement data. Now ATSAMB11 will send alert levels as a GAP Central and also starts advertising with Connectable advertisement packets.
8. Enable Bluetooth® from the Settings page on a BLE compatible Android device or iPhone®. Use the Atmel SmartConnect application to scan for peripheral devices. A device with the name ‘ATMEL-BAS’ will appear in the list of scanned devices.

Figure 7-4. Atmel-BLE Device Discovered by Atmel SmartConnect Application



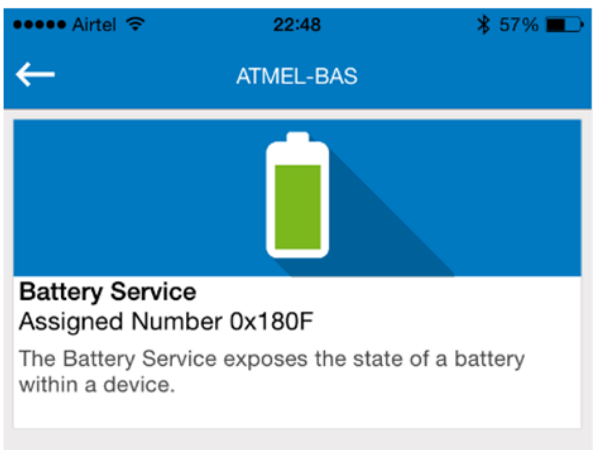
9. Click on the “ATMEL-BAS” device. A pop-up will appear requesting pass-key. Enter “123456” and click on ‘Pair’.

Figure 7-5. Pairing Pop-up Screen



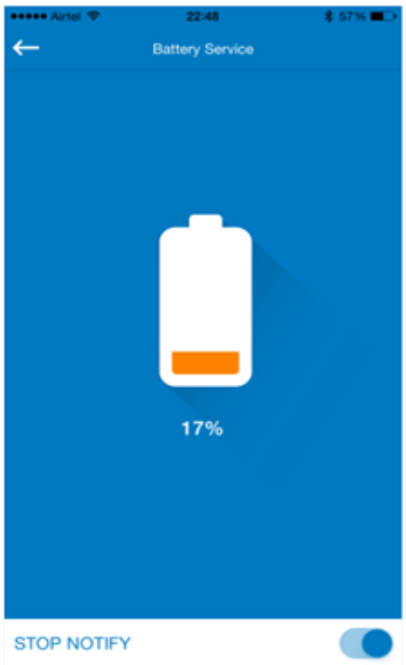
10. Once paired, the application displays the battery service.

Figure 7-6. Display of Battery Service



11. Once the “Battery Service” is clicked the user gets notifications for battery level characteristic. The user can stop receiving the notifications by disabling notifications.

Figure 7-7. Battery Level Characteristic Notification Options



12. ATSAMB11 will now transfer the data on the second established link with the mobile application.

Figure 7-8. GAP Peripheral (ATSAMB11) Connected to GAP Central (Mobile) and Transferring the Data

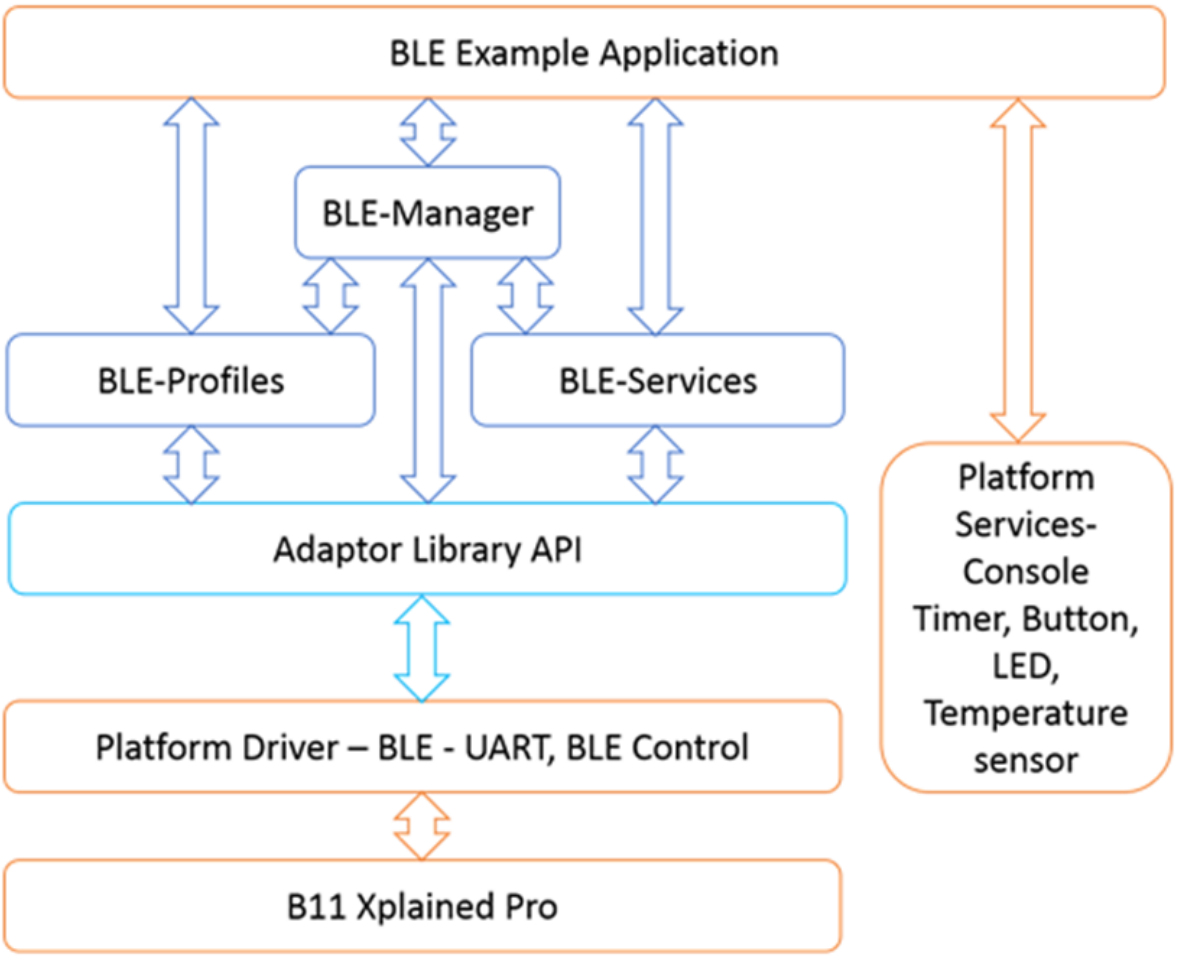
```
Rx Power(RSSI):-039 dBm---No Alert
Rx Power(RSSI):-042 dBm---No Alert
Rx Power(RSSI):-038 dBm---No Alert
Rx Power(RSSI):-039 dBm---No Alert
Rx Power(RSSI):-037 dBm---No Alert
Connected to peer device with address 0x712ff8994bf6
Connection Handle 1
Sending pairing response
Please Enter the following Pass-code(on other Device):123456
Rx Power(RSSI):-038 dBm---No Alert
Rx Power(RSSI):-036 dBm---No Alert
Rx Power(RSSI):-038 dBm---No Alert
Pairing procedure completed successfully
Battery Level:0%
Rx Power(RSSI):-037 dBm---No Alert
Battery Level:1%
Rx Power(RSSI):-036 dBm---No Alert
Battery Level:2%
Rx Power(RSSI):-037 dBm---No Alert
Battery Level:3%
```

13. Now the ATSAMB11 will continue to behave as Proximity Monitor (GAP Central) and Battery Service Application (GAP Peripheral) simultaneously with two connections. A continuous data transfer happens on both the links by the ATSAMB11 and even if one link gets disconnected the data transfer will happen on the other link.

8 BluSDK SMART Software Architecture

The following diagram illustrates the various layers in the BLE subsystem for the ATSAMB11 configuration.

Figure 8-1. ATSAMB11 Software Architecture



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10 Revision History

Doc Rev.	Date	Comments
42648A	12/2015	Initial document release.

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