



Introduction

This getting started guide describes the setup of Atmel® ATBTLC1000 with a [supported platform](#) (see Chapter 4) bringing-up an example profile supplied as part of BluSDK release. The Bluetooth Health Thermometer Profile (HTP) is an example profile application that is embedded as part of the software release package. The device advertises itself as a Health Thermometer. The ATBTLC1000 Xplained PRO Extension board includes an on-board temperature sensor (accessible from the host MCU) for the purpose of sensing the ambient temperature.

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1 Features

- Device Discovery and Disconnection
- Pairing / Bonding
- RSSI Sampling
- Health Thermometer Service
- Health Thermometer Profile iOS/Android Application

2 Description

The Health Thermometer Profile is used to enable a data collection device to obtain data from a thermometer sensor that exposes the Health Thermometer Service.

The profile defines two roles:

- Thermometer:

The Thermometer is the device that measures the temperature.

- Collector:

The Collector is the device that receives the temperature measurement and other data from a Thermometer.

This document explains the details about

1. Getting Started with the setup of [supported platform](#) (see Chapter 4) to be used as a Thermometer
2. Getting the Health Thermometer Profile Application working on the above mentioned setup.

3 Services and Characteristics

The Thermometer implements the one and only one Health Thermometer Service in addition to the Device Information Service to display the information about the Thermometer device.

The current Thermometer profile implementation implements the following characteristics.

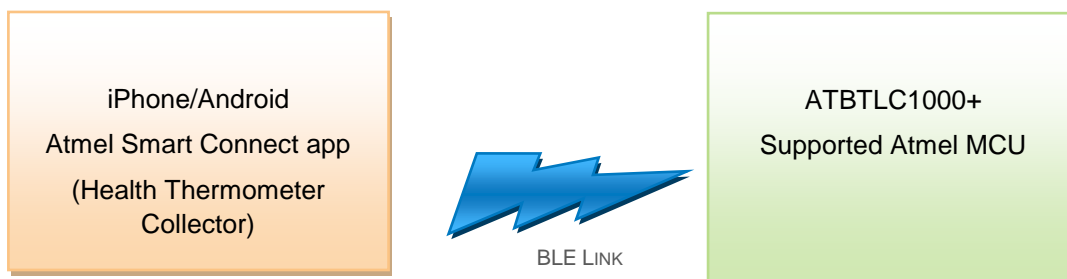
- Temperature Measurement
- Intermediate Temperature
- Measurement Interval

4 Supported Hardware Platforms and IDEs

Table 4-1. BluSDK – Supported Hardware and IDEs

Platform	MCU	Supported BLE device	Supported evaluation kits	Supported IDEs
SAM L21 (MCU)	ATSAML21J18B	ATBTLC1000	ATBTLC1000-XSTK (ATSAML21-XPRO-B + ATBTLC1000 XPRO)	Atmel Studio v7.0
SAM L21 (MCU)	ATSAML21J18A	ATBTLC1000	ATSAML21 XPRO + ATBTLC1000 XPRO	Atmel Studio v7.0
SAM D21 (MCU)	ATSAMD21J18A	ATBTLC1000	ATSAMD21-XPRO + ATBTLC1000 XPRO	Atmel Studio v7.0
SAM G55 (MCU)	ATSAMG55J19	ATBTLC1000	ATSAMG55-XPRO + ATBTLC1000 XPRO	Atmel Studio v7.0
SAM 4S (MCU)	ATSAM4SD32C	ATBTLC1000	ATSAM4S-XPRO + ATBTLC1000 XPRO	Atmel Studio v7.0

5 Demo Setup



6 Hardware Setup

6.1 SAM L21 Xplained Pro Health Thermometer Setup

Figure 6-1. ATBTLC1000 Xplained Pro Extension Connected to a SAM L21 Xplained Pro



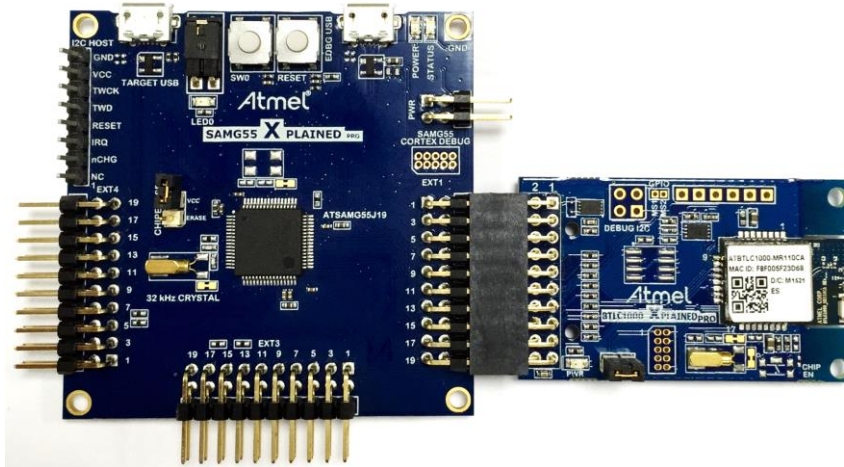
6.2 SAM D21 Xplained Pro Health Thermometer Setup

Figure 6-2. ATBTLC1000 Xplained Pro Extension Connected to a SAM D21 Xplained Pro



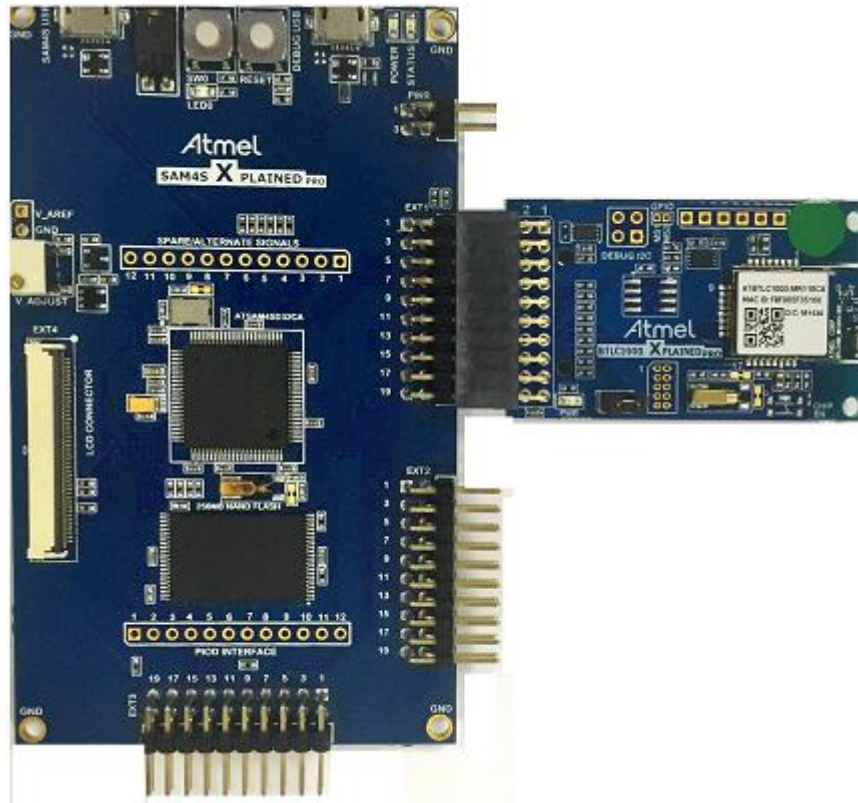
6.3 SAM G55 Xplained Pro Health Thermometer Setup

Figure 6-3. ATBTLC1000 Xplained Pro Extension Connected to a SAM G55 Xplained Pro



6.4 SAM 4S Xplained Pro Health Thermometer Setup

Figure 6-4. ATBTLC1000 Xplained Pro Extension Connected to a SAM 4S Xplained Pro



7 Temperature Measurement Location

Onboard the [supported platform](#) (see Chapter 4), the user button is configured to change the temperature measurement location in the human body

The Health Thermometer profile specifies the following locations at which temperature measurements can be read.

- Body (general)
- Ear (usually ear lobe)
- Finger
- Gastro-intestinal Tract
- Mouth
- Rectum
- Toe
- Tympanum (ear drum)

So in order to simulate the change of temperature measurement location from the Thermometer Sensor device ([supported platform](#), see Chapter 4), the user button had been programmed. So, every time the user button is pressed, the temperature location will be changed as per the above list.

This can clearly be observed on a Health Thermometer Collector (Mobile Application).

8 Temperature Type

One more parameter that needs to be simulated is the temperature measurement type which contains two values, Centigrade and Fahrenheit.

To simulate this change on the peripheral side, as there is only one user button available on board which had already been used for changing the temperature location, the trigger that is used for this is to run through all the locations once. Then the application shall toggle the temperature type.

B

9 Software Setup

9.1 Installation Steps

1. Atmel Studio installation [**Atmel Studio 7.0 (build 594) Installer – with .NET**]
<http://www.atmel.com/tools/atmelstudio.aspx>
(Note: SAM L21 Rev B/SAM D21/SAM G55/SAM 4S part pack is built-in as part of Atmel Studio 7.0)
2. Atmel USB Driver Installer from <http://www.atmel.com/tools/atmelstudio.aspx>.
3. Install the standalone ASF package from
<http://www.atmel.com/tools/AVRSOFTWAREFRAMEWORK.aspx>

Note: Refer to the BluSDK release notes for updates to version numbers of the components mentioned above.

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

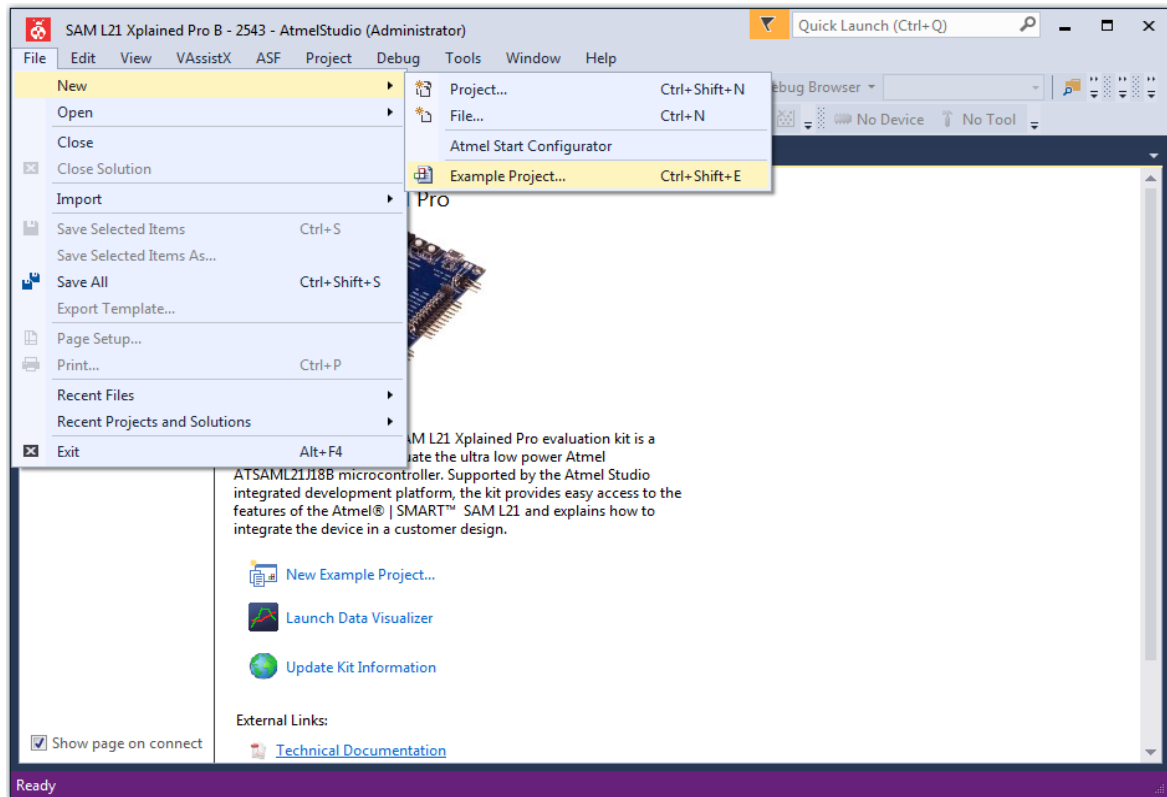
1. Health Thermometer Application for SAM L21.
2. Health Thermometer Application for SAM D21.
3. Health Thermometer Application for SAM G55.
4. Health Thermometer Application for SAM 4S.

9.2 Build Procedure

The following procedure is explained for SAM L21 application example. The same procedure is valid for the case of all the other [supported platforms](#) (see Chapter 4) as well.

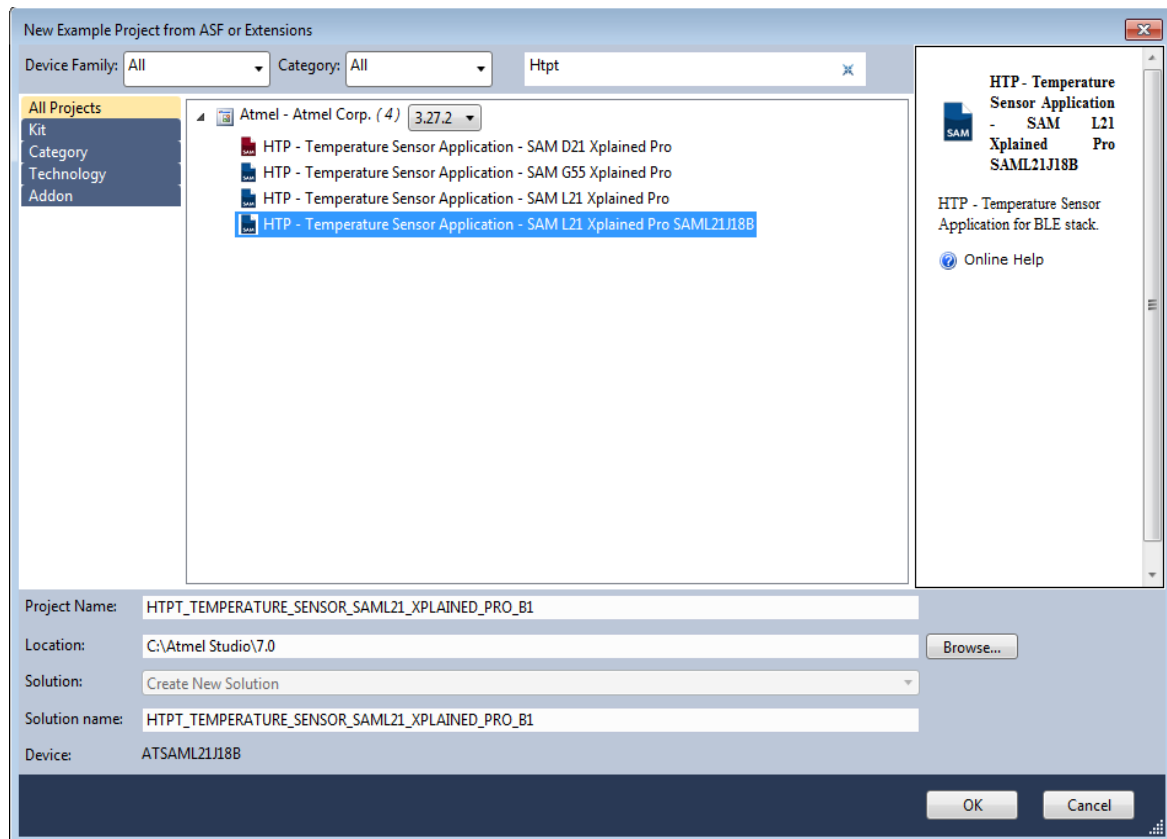
1. Select New Example Project.

Figure 9-1. Creating a New Project



2. Enter “htpt” 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.

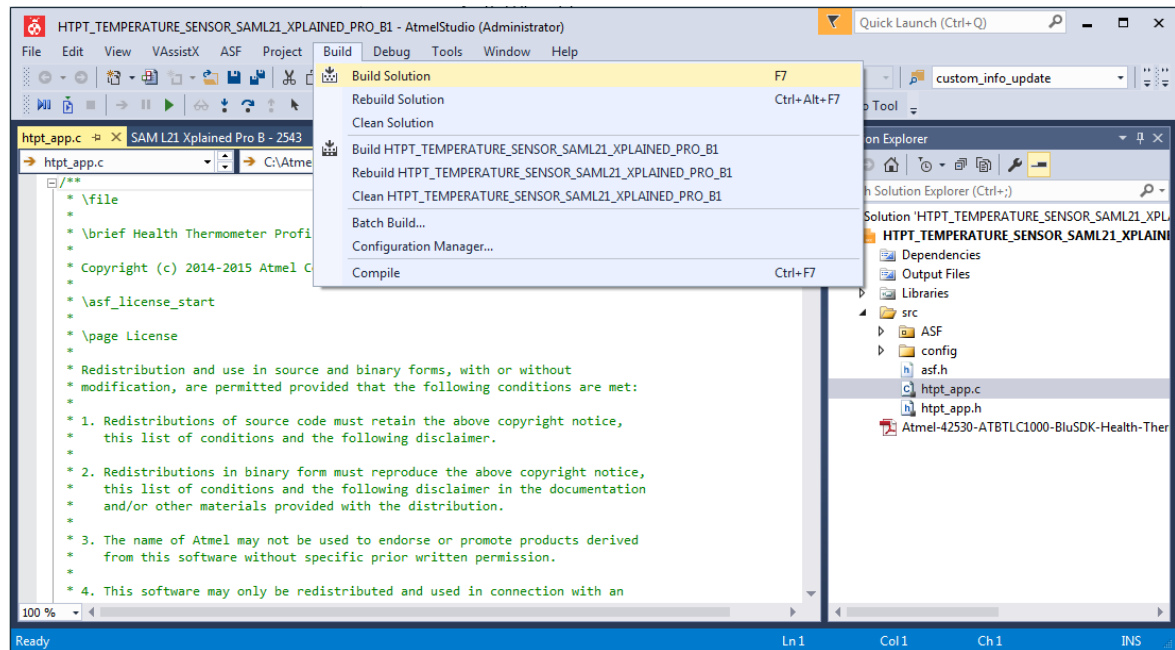
Figure 9-2. Selecting HTPT Sensor Application from Example Projects



3. Accept the license Agreement. The studio will generate the Health Thermometer Profile project for SAM L21.

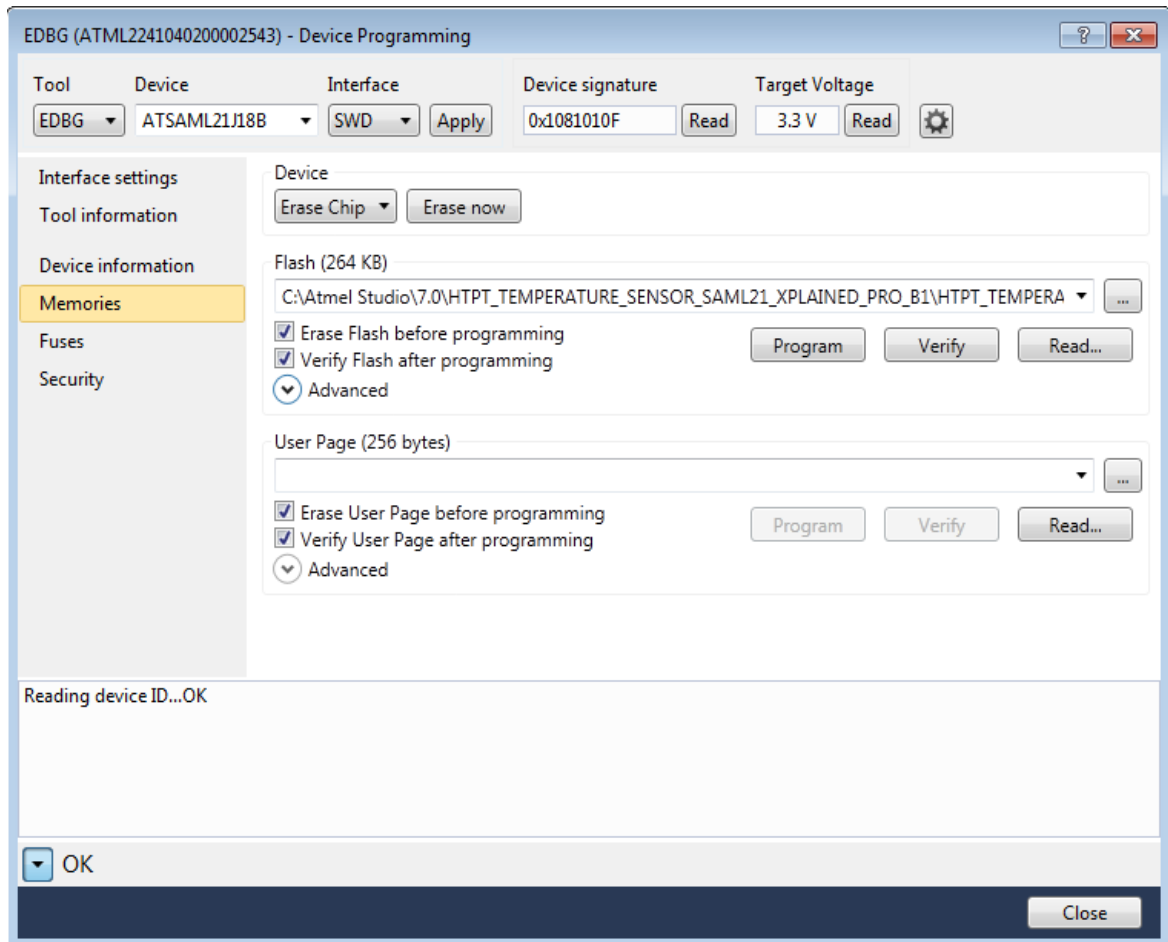
4. Build the solution.

Figure 9-3. Building the HTP Temperature Sensor Application



5. Download the application via the USB to the SAM L21 board.
6. Once the application is flashed, it is ready to be simulated as Health Thermometer Device.

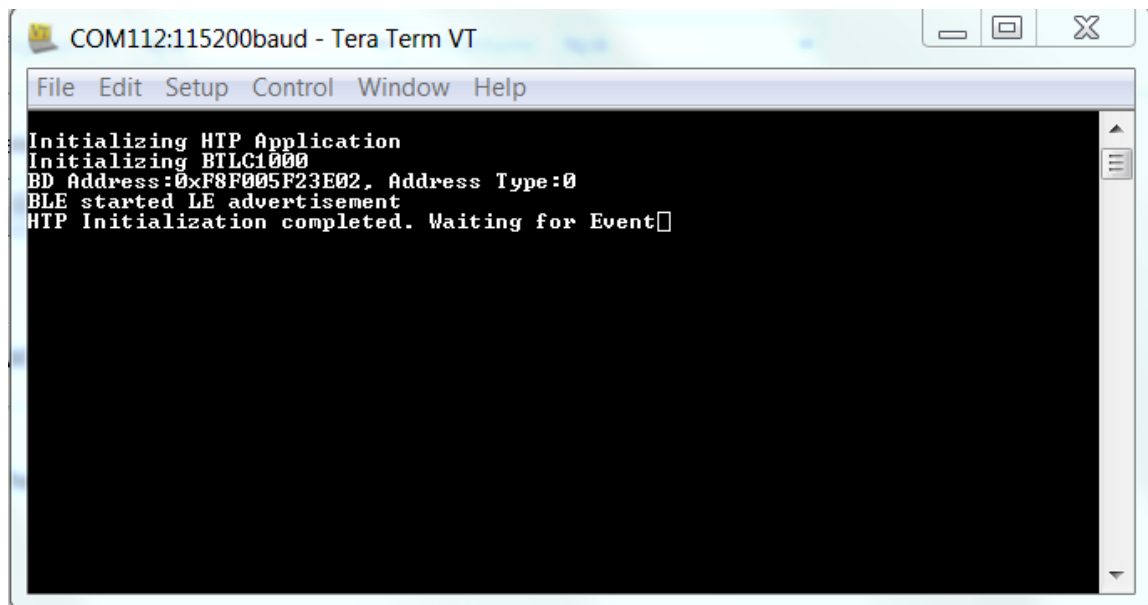
Figure 9-4. Flashing the Application on Atmel MCU



10 Running the Demo

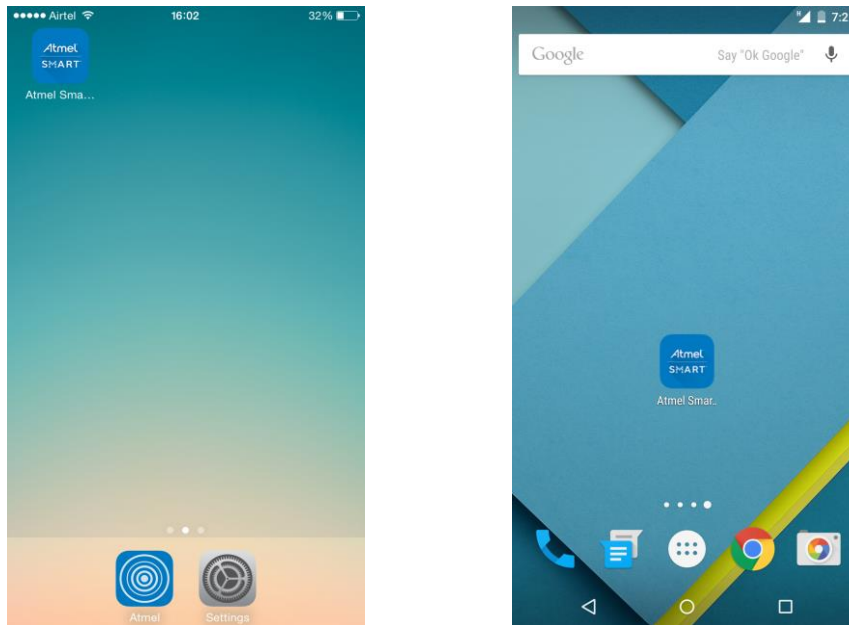
1. Power on the SAM L21 + ATBTLC1000 demo setup.
2. Open the console using TeraTerm or any serial port monitor application and connect to the corresponding COM port of "EDBG". Serial Port Settings: Baudrate 115200, Parity None, one Stop bit, one Start bit, no Hardware Handshake.
3. Press the Reset button on the SAM L21 board.
4. Wait for around 10 seconds for the patches to be downloaded from SAM L21 to ATBTLC1000 board.
5. The board should be in advertising mode. Ensure that the console log looks as shown below.

Figure 10-1. Console Log for Advertising Mode



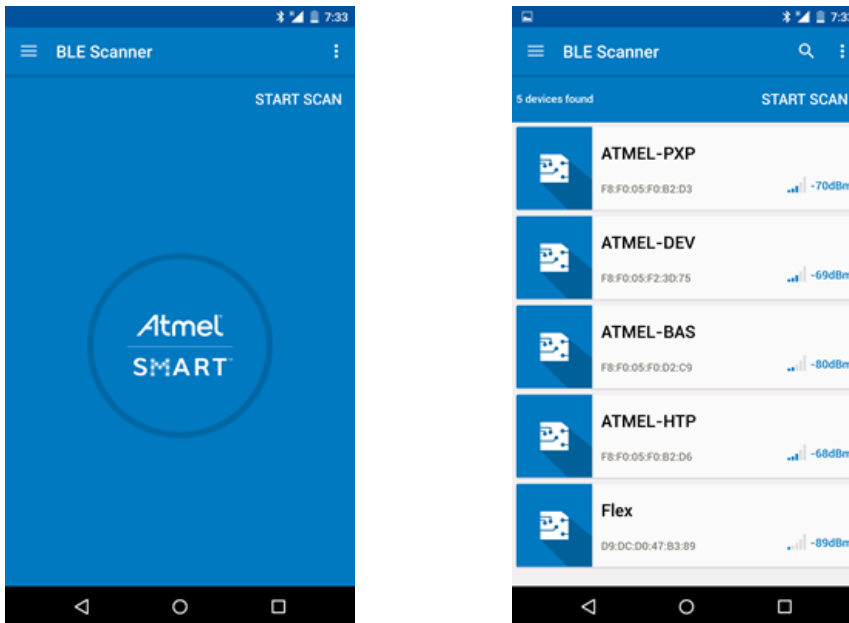
6. Start the Thermometer application on the iPhone/Android:

Figure 10-2. iOS (left)/Android (right) Thermometer Profile App Launch Screen



7. Use the Atmel Smart Connect app to scan for devices. A device with name 'ATMEL-HTP' will be seen in the list of discovered devices.

Figure 10-3. Atmel Smart Connect App Initial Screens



- Click on ATMEL-HTP to connect to the device. Subsequently the services page will be seen. Clicking on the services will result in initiation of pairing procedure. Enter the pass key "123456" show in the Tera term in the pairing pop up.

Figure 10-4. Pairing Procedure Initiation

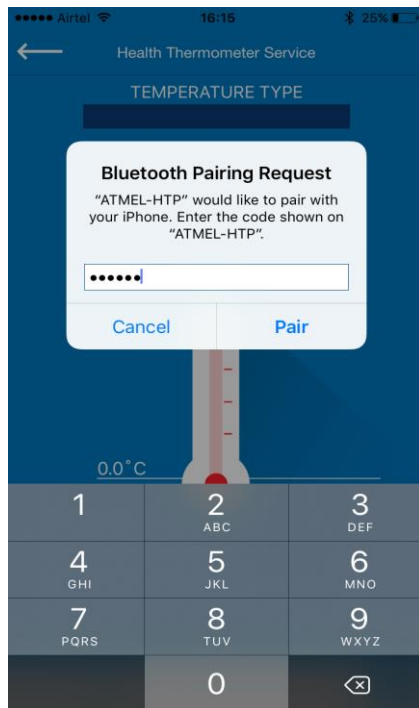
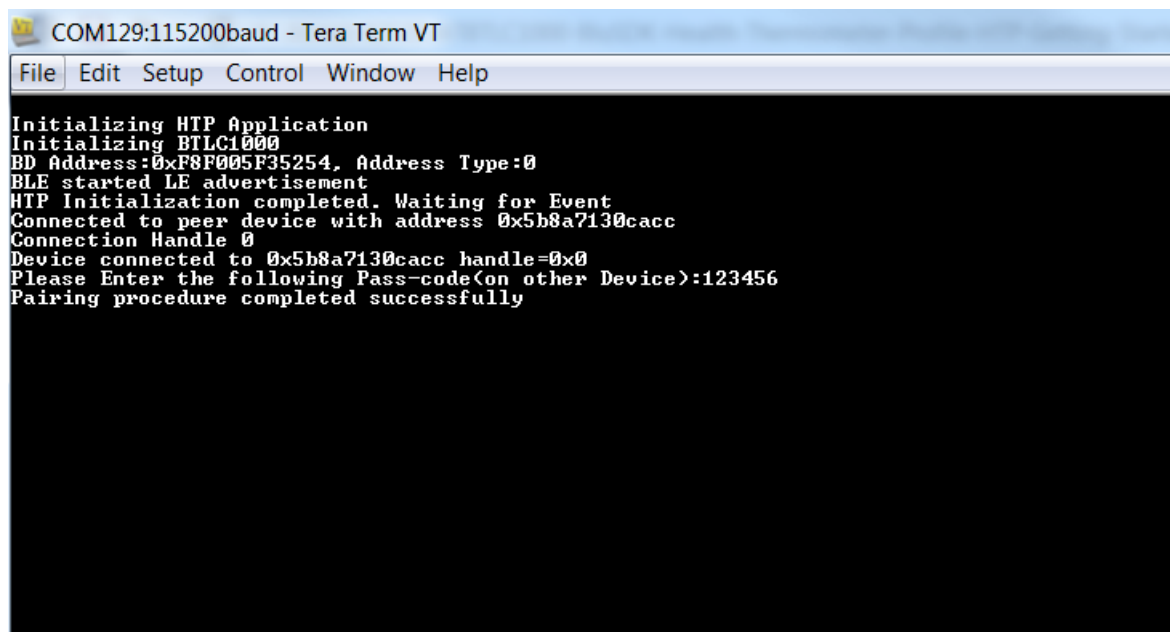


Figure 10-5. Console Log on the Device During Pairing



- The temperature value, RSSI and the device name are displayed on the Mobile App. Console log will be as shown below.

Figure 10-6. App Health Thermometer Connected Screen

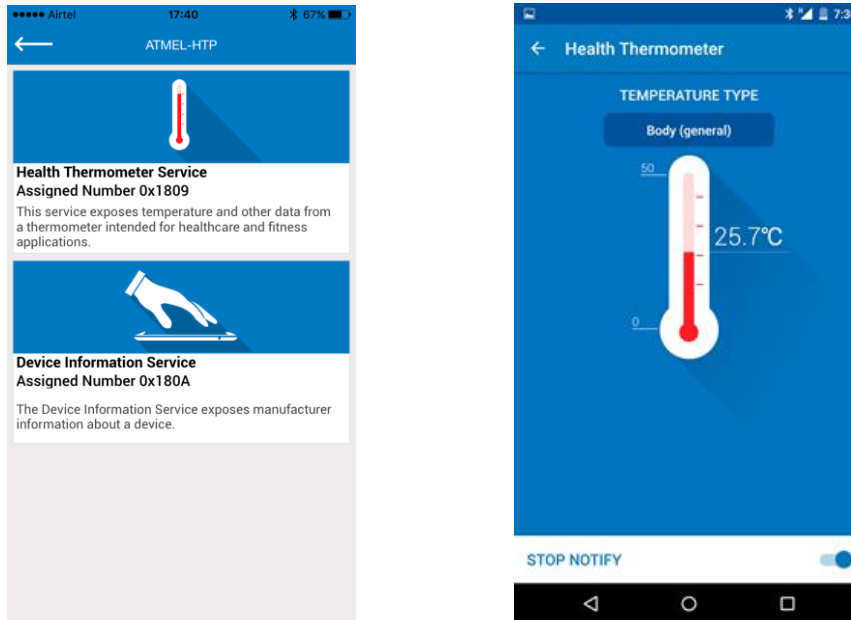
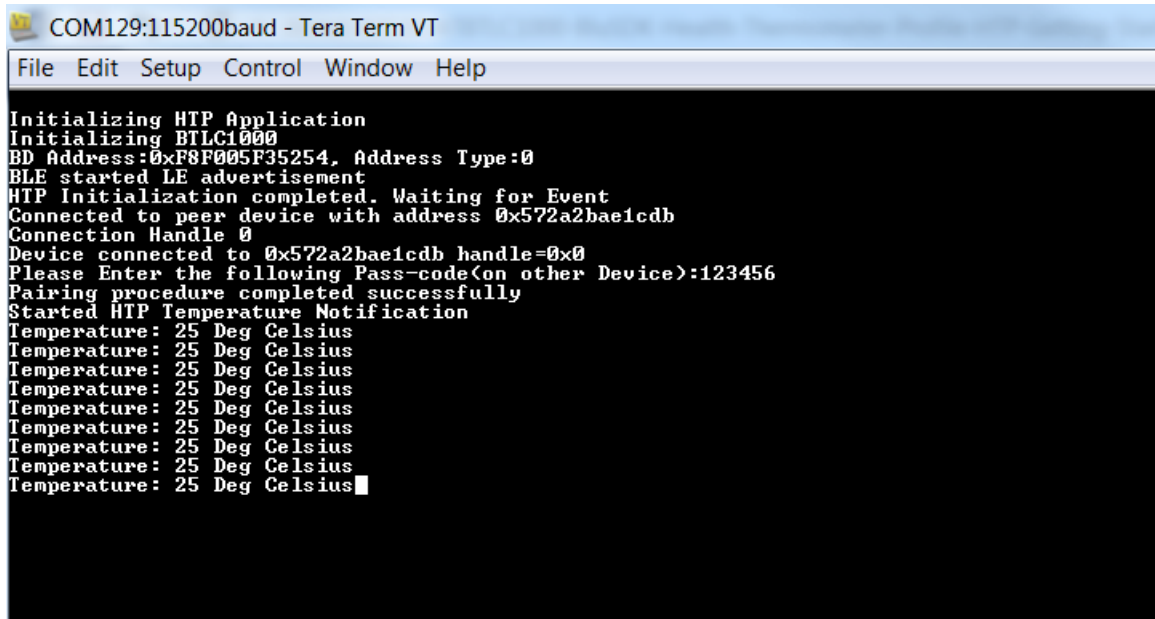


Figure 10-7. Console Log after Connection, Pairing, and with Notifications



10. To change the body measurement location, press the user button (SW0) on the SAM L21 or on the [supported platform](#) (see Chapter 4). The new value should be updated in the application.

Figure 10-8. SW0 Button for changing Body Measurement Location



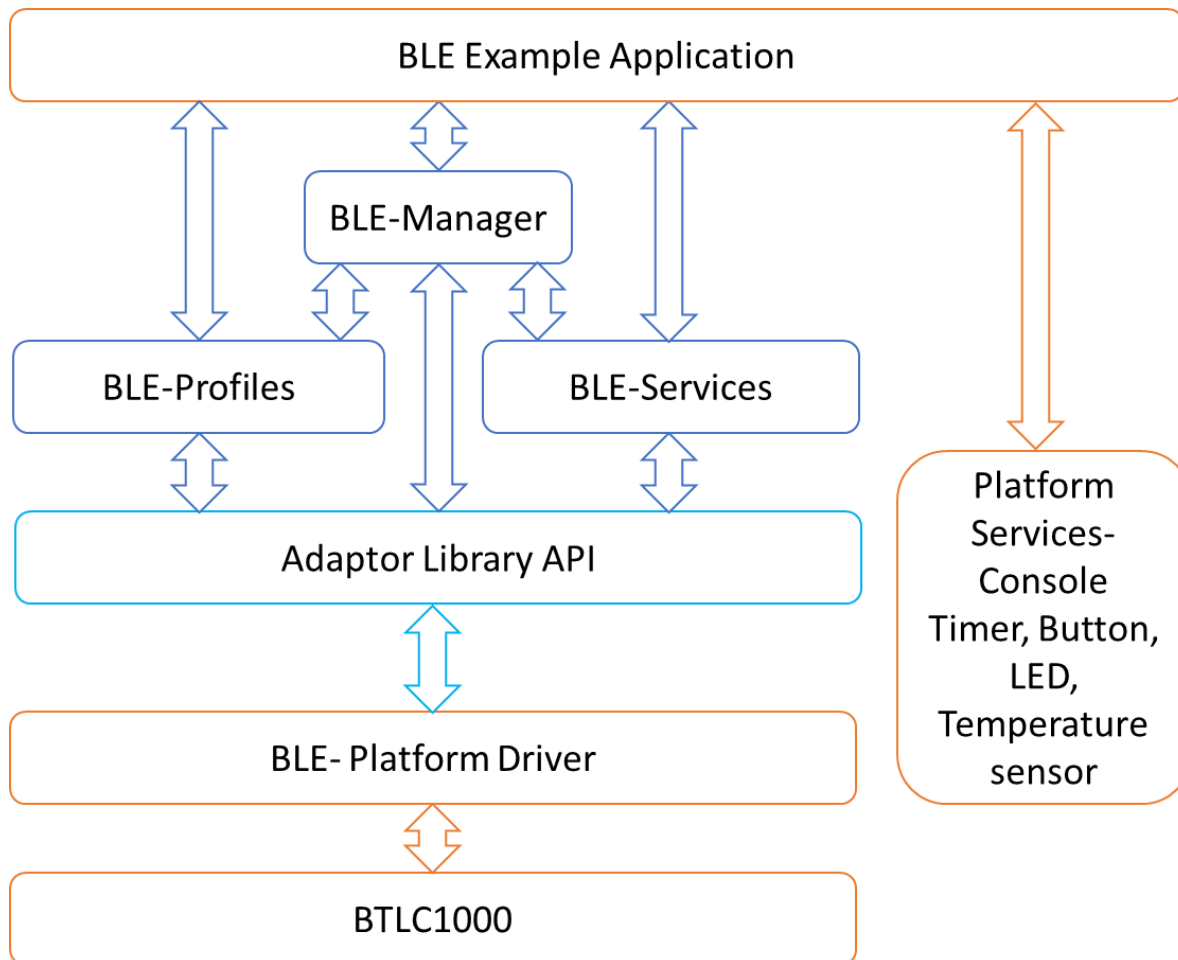
11. On the Atmel Smart Connect application, going back to the scanning screen will disconnect the device with mobile application.

11 Software Architecture

The following diagram illustrates the various layers in the BLE subsystem for the ATBTLC1000 configuration. The External host can be any [supported platform](#) (see Chapter 4).

The application in this example is Health Thermometer Sensor. In the case of Health Thermometer Profile, the profile in itself is implemented inside ATBTLC1000. Specific HTPPT APIs are provided as part of the Adapter API that is used by the HTP example application.

Figure 11-1. BluSDK Software Architecture



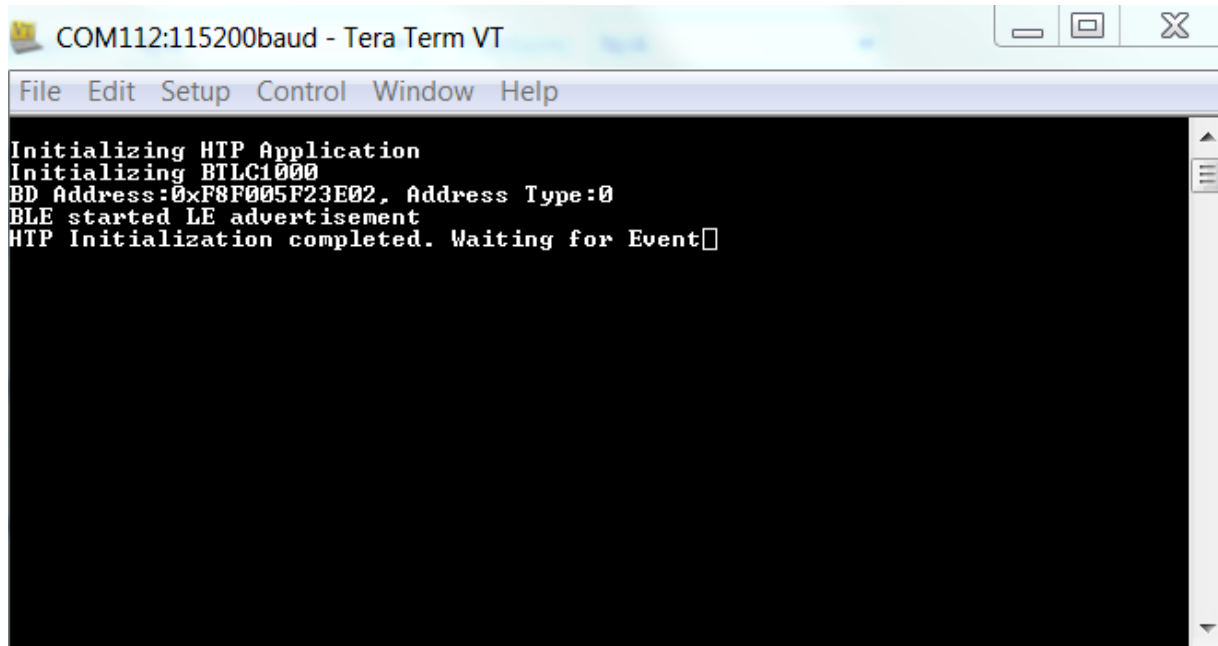
12 Console Logging

For the purpose of debugging, a logging interface had been implemented in the Health Thermometer Application.

The logging interface utilizes the same EDBG port that connects to [supported platform](#) (see Chapter 4). A serial port monitor application (for example TeraTerm) shall be opened and attached to the EDBG COM port.

Figure 12-1 shows the information about BLE and HTP initialization and advertisement.

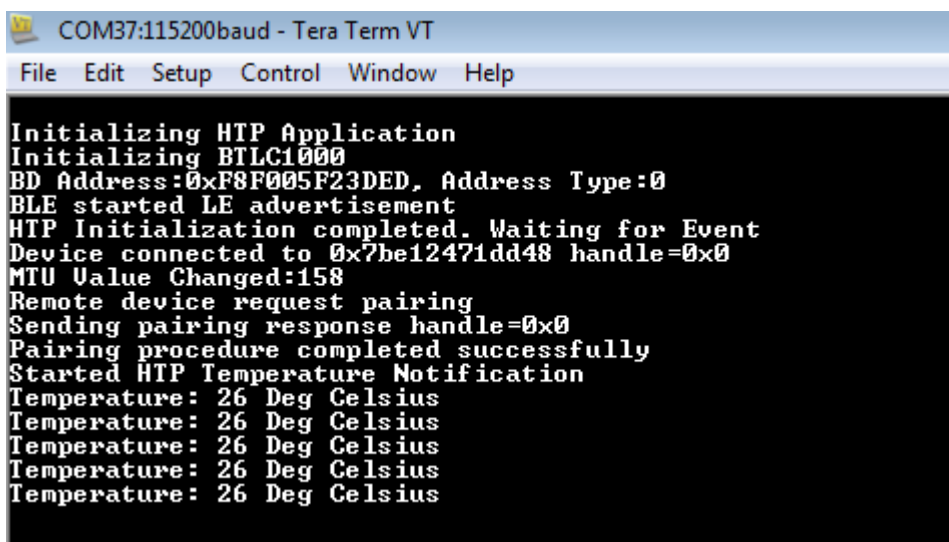
Figure 12-1. Example HTP App Console Log – After Initialization is Completed



```
COM112:115200baud - Tera Term VT
File Edit Setup Control Window Help
Initializing HTP Application
Initializing BTLC1000
BD Address:0xF8F005F23E02, Address Type:0
BLE started LE advertisement
HTP Initialization completed. Waiting for Event
```

The screenshot below shows the information about connection and temperature notification.

Figure 12-2. Example HTP App Console Log – Connection, Pairing, and Temperature Notification



```
COM37:115200baud - Tera Term VT
File Edit Setup Control Window Help
Initializing HTP Application
Initializing BTLC1000
BD Address:0xF8F005F23DED, Address Type:0
BLE started LE advertisement
HTP Initialization completed. Waiting for Event
Device connected to 0x7be12471dd48 handle=0x0
MTU Value Changed:158
Remote device request pairing
Sending pairing response handle=0x0
Pairing procedure completed successfully
Started HTP Temperature Notification
Temperature: 26 Deg Celsius
Temperature: 26 Deg Celsius
Temperature: 26 Deg Celsius
Temperature: 26 Deg Celsius
Temperature: 26 Deg Celsius
```

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14 Revision History

Doc Rev.	Date	Comments
42530C	02/2016	Table 4.1 is updated with SAM4S hardware support. Figure 6.4 is updated with SAM4S Xplained Pro image. Section 9.1 Installation Steps are updated.
42530B	11/2015	Figure 4-1 is updated. The screenshots in Chapter 9 are updated.
42530A	09/2015	Initial document release.



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