ATWINC3400

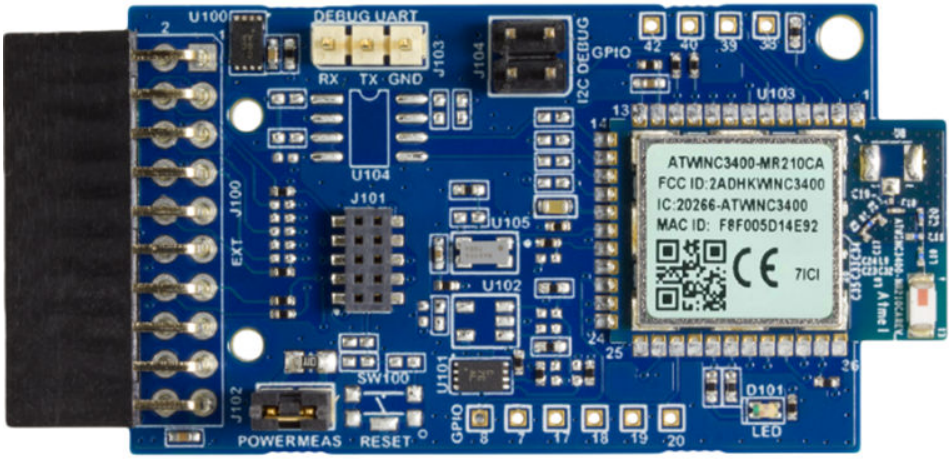
ATWINC3400 BLE Profiles Application User Guide

Introduction

This document describes how to set the ATWINC3400 evaluation boards for various example applications supported by Atmel Studio. This document also provides the list of supported hardware platforms and IDEs to be used in conjunction with the ATWINC3400 evaluation board (see Table 2-1).

Note: All the example applications are included in the software package.

Figure 1. ATWINC3400 Extension Board



Features

- Proximity Reporter Application:
  - Advertisement
  - Pairing/bonding
  - Provisioning Services – Scan for Wi-Fi® APs, send Wi-Fi provision details/configuration, trigger Wi-Fi connection
  - Proximity Services – Link Loss service (mandatory), Immediate Alert service, and Tx Power service
- Battery Service Application
  - Advertisement
  - Pairing/bonding
  - Provisioning Services – Scan for Wi-Fi APs, send Wi-Fi provision details/configuration, trigger Wi-Fi connection
  - Battery level
- Custom Serial Chat (CSC) Profile Application:

  - Device discovery and disconnection
  - Pairing/bonding
  - Send and receive messages
  - Console display
- Heart Rate Profile Application:
  - Advertisement
  - Pairing/bonding
  - Heart rate sensor measurements
  - Console display
- Transparent Service Application:
  - Advertisement
  - Pairing/bonding
  - Send and receive messages
  - Console display
- On-chip Provisioning Application:
  - Advertisement
  - Pairing/bonding
  - Provisioning Services – Scan for Wi-Fi APs, send Wi-Fi provision details/configuration, trigger Wi-Fi connection

Table of Contents

Introduction....1

Features....1

1. Functional Overview....5
   - 1.1. Proximity Reporter Application....5
   - 1.2. Battery Service Application....5
   - 1.3. Custom Serial Chat Profile Application....6
   - 1.4. Heart Rate Profile Application....6
   - 1.5. Transparent Service Application....6
   - 1.6. On-Chip Provisioning Application....7

2. Supported Hardware Platforms and IDEs....8

3. Hardware Setup....9
   - 3.1. ATWINC3400 Board....9
   - 3.2. SAM D21 Xplained Pro Setup....9

4. Software Setup....11
   - 4.1. Installation Steps....11
   - 4.2. Build Procedure....11

5. Running Example Applications....16
   - 5.1. Initializing the Device....17
   - 5.2. BLE Provisioning Procedure....17
   - 5.3. BLE Provisioning for Connecting ATWINC3400 with MSCHAPv2 Secured AP....19
   - 5.4. BLE Profile Scan and Connect....20
   - 5.5. Proximity Reporter Application....22
   - 5.6. Battery Service Application....26
   - 5.7. Custom Serial Chat Profile Application....27
   - 5.8. Heart Rate Profile Application....28
   - 5.9. Transparent Service Application....29
   - 5.10. On-chip Provisioning Application....32

6. Document Revision History....35

The Microchip Website....36

Product Change Notification Service....36

Customer Support....36

Microchip Devices Code Protection Feature....36

Legal Notice....37

Trademarks....37

Quality Management System..... 38

Worldwide Sales and Service.....39

1. Functional Overview

This chapter describes the functional overview of all the applications that are pre-defined in Atmel Studio.

1.1 Proximity Reporter Application

The Proximity profile is defined by the Bluetooth® SIG to enable proximity monitoring between two Bluetooth Low Energy (BLE) devices. The Proximity Monitor (a Generic Attribute (GATT) client) configures the behavior of the peer Proximity Reporter device (a GATT server) based on the link conditions. The configuration includes setting the alert level, which triggers on the Link Loss or based on a different threshold of the Path Loss. The Path Loss determines the quality of the connection and it is derived out of the Received Signal Strength Indicator (RSSI). The Proximity Monitor continuously evaluates the Path Loss and creates an immediate alert in the Proximity Reporter device when the Path Loss crosses threshold values.

On-Board LED Status

The on-board LED is configured to notify the user about the alerts received. The different alerts for the Link Loss and Immediate Alert services are explained in the following subsections.

Link Loss

On Link Loss, the LED blinks according to the alert level set by the Proximity Monitor. The alert levels are:

- NO_ALERT for No alert level
- MILD_ALERT for Mild alert level
- HIGH_ALERT for High alert level

Based on the alert level configuration set by the Proximity Monitor, the LED blinks at different rates:

- If the alert level is “HIGH_ALERT” then the LED blinks faster (1 second interval)
- If the alert level is “MILD_ALERT” then the LED blinks moderately (2 second interval)
- If the alert level is “NO_ALERT” the LED must be off

Alert on Path Loss (Immediate Alert)

This alert is applicable when the “Immediate Alert” service is implemented. The example application relies on the Path Loss configuration done by the Proximity Monitor and notifies accordingly. The alert levels are:

- NO_ALERT for No alert level
- MILD_ALERT for Mild alert level
- HIGH_ALERT for High alert level

Based on the alert level configuration set by the Proximity Monitor, the LED blinks at different rates:

- If the alert level is “HIGH_ALERT” then the LED blinks faster (3 second interval)
- If the alert level is “MILD_ALERT” then the LED blinks moderately (5 second interval)
- If the alert level is “NO_ALERT” the LED must be off

1.2 Battery Service Application

The Battery Service application is used for reporting the battery level of the device using the battery characteristics. Any application discovering the database can access the battery service instance during discovery services. This example application simulates the device battery level from 0% to 100%, with the step of 1% every second.

1.3 Custom Serial Chat Profile Application

The Custom Serial Chat application is used for sending and receiving data between the boards (SAM D21) and the Microchip SmartConnect mobile application. This is a custom profile example application implemented over GATT. The user can send the information to the mobile phone using the console terminal that is configured with the board and vice versa.

1.4 Heart Rate Profile Application

The Heart Rate Profile application is used for enabling the collector device (GATT client) to connect and interact with a heart rate sensor (GATT server) to be used in fitness applications. The heart rate sensor sends the heart rate measurement in bpm (beats per minute), energy expended in kJ (kilojoules), and R-R intervals in seconds. In addition to the heart rate service, this profile also implements the Device Information Service, which provides information about the heart rate sensor device.

The heart rate profile provided by Bluetooth SIG defines 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 bpm, R-R interval measurements, and other parameters like body sensor location and energy expended values. The optional “Heart Rate Control Point characteristic” is used by the heart rate monitor to reset the energy expended in the heart rate sensor.

The heart rate sensor, which is the GATT server, holds the characteristics and sends 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 sent to the monitor on a value change if the monitor has enabled the notifications.
- The body sensor location is read by the monitor via its 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.

Note: The example application simulates the sensor measurements and sends them to the heart rate collector.

1.5 Transparent Service Application

The Transparent Service is used as a data exchange method between the client and the server:

- Transparent Tx characteristic is used for data transmission by the server or client. Once the Client Characteristic Configuration Descriptor of Transparent Tx is enabled, the server sends data to the client through this channel. The client can also send the data via this channel.
- Transparent Rx characteristic is used for data transmission by the client. The client can send data to the server through this channel.
- Transparent Control Point characteristic: To ensure successful operation, this Client Characteristic Configuration Descriptor of Transparent Control Point (TCP) must be enabled to notify. The client must perform a write to the TCP to execute the desired procedure at the server. The Transparent Control Point is used by a client to control certain behaviors of the server. The procedures are triggered by writing a value that includes an Op code specifying the operation and the server notifies of the result of the operation.

When enable credit-based flow control Op code is written to the TCP, the server responds with the maximum MTU size and available credit to the client. The number of credits is checked by the client to know how many data lists can be transmitted to the server. The number of credits is decreased by the list of data sent by client. The client can only send data while the number of credits is non-zero. The server returns the credit to the client after the server finishes dealing with the received data.

1.6 On-Chip Provisioning Application

The On-Chip Provisioning application is used for receiving Wi-Fi provisioning data via Bluetooth and then triggering a Wi-Fi connection. The majority of the provisioning functionality is performed by the BLE Cortus of ATWINC3400, with the host application performing some helper functions via dedicated libraries. This application triggers a Wi-Fi scan and lists the APs found on the receiver. On receiving the Wi-Fi configuration data (which is passed to the host application where it is fed into the BLE Cortus provisioning API), it validates the data and starts the connection process. On successful Wi-Fi connection, the Bluetooth connection is terminated. If the Wi-Fi connection is not successful with the configuration received, the provisioning process restarts and lists the APs found by the latest scan.

2. Supported Hardware Platforms and IDEs

The following table provides the supported hardware platforms and IDEs for the ATWINC3400.

Table 2-1. Supported Hardware and IDEs

Platform	MCU	Supported BLE Device	Supported Evaluation Kits	Supported IDEs
SAM D21	ATSAMD21J18A	ATWINC3400	ATSAMD21-XPRO	Atmel Studio v7.0
SAM4S	ATSAM4SD32C	ATWINC3400	ATSAM4S-XPRO	Atmel Studio v7.0
SAME70	ATSAME70Q21	ATWINC3400	ATSAME70-XPLD	Atmel Studio v7.0
SAMG55	ATSAMG55J19	ATWINC3400	ATSAMG55-XPRO	Atmel Studio v7.0

3. Hardware Setup

3.1 ATWINC3400 Board

The following figure shows an example of the details of a SAM D21 and ATWINC3400 evaluation boards displayed in Atmel Studio.

Figure 3-1. SAM D21 Kit Details

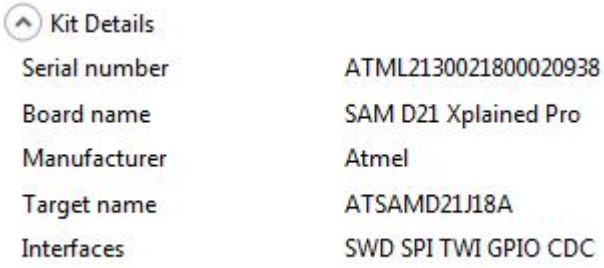
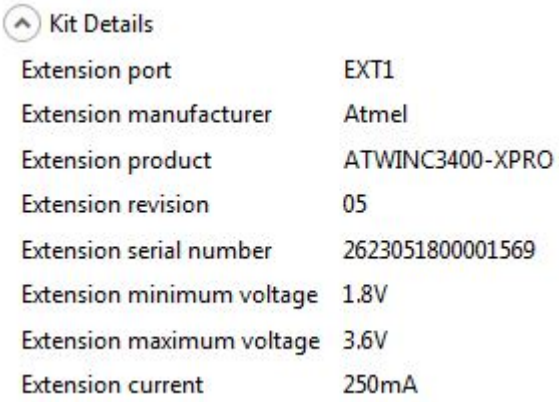


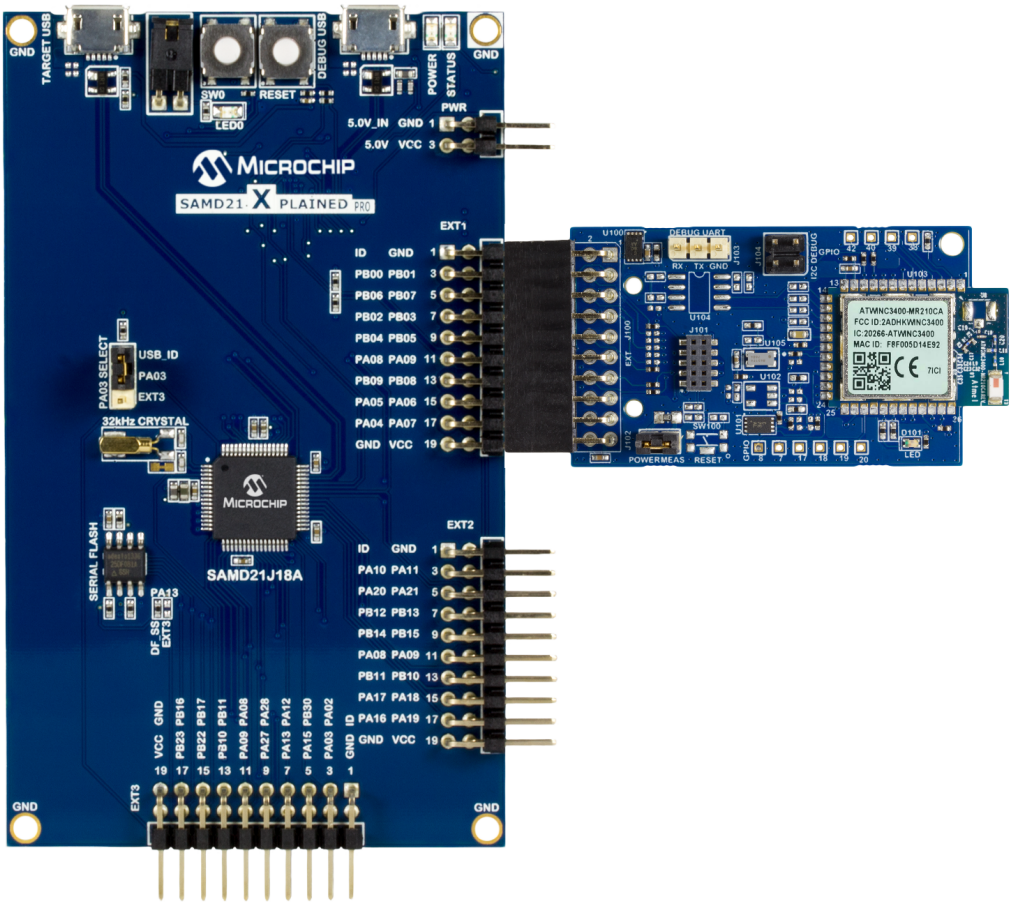
Figure 3-2. ATWINC3400 Kit Details



3.2 SAM D21 Xplained Pro Setup

The following figure illustrates an ATWINC3400 Xplained Pro extension board connected to a SAM D21 Xplained Pro.

Figure 3-3. SAM D21 Xplained Pro Board



4. Software Setup

4.1 Installation Steps

1. Download and install Atmel Studio.
2. Install the standalone Advanced Software Framework (ASF) package.
3. Android™ Application Installation – The android applications for testing BLE profiles are available in the following locations of the BLE application examples.
   - 3.1. BLE Provisioning Application – This application supports BLE Provisioning. This app is available in “provision_ap_with_ble_on_chip_profile_example” at `\common_components_wifi_winc3400_provision_ap_with_ble_on_chip_profile_example_samd21_xplained_pro\src\android_app\Atmel_WiFi_BLE_prov.apk`
   - 3.2. Transparent Service Application – This application is used to test the example Transparent Service application. This app is available in “provision_ap_with_ble_on_chip_profile_example” at `\ \common_components_wifi_winc3400_transparent_service_example_samd21_xplained_pro\ src\android_app\BLEDK3_V1.0.apk`
   - 3.3. Microchip SmartConnect Application – This application is used to test all the BLE profiles. Download and install the Microchip SmartConnect app on the mobile phone, available in the Google Play™ Store for Android.

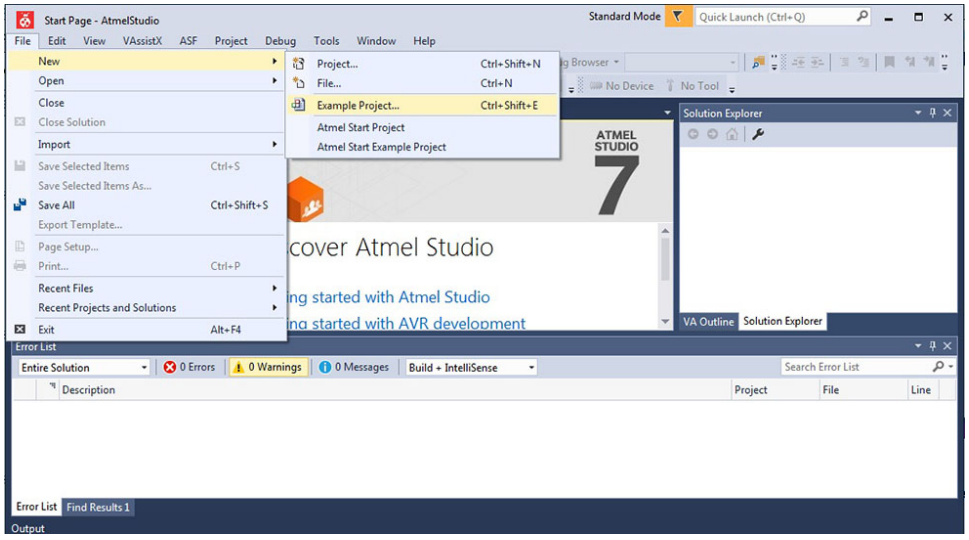
Note: Atmel Studio offers some example projects for the SAM D21 extension boards.

4.2 Build Procedure

Perform the following steps to build an example project using Atmel Studio IDE. This example build procedure is developed using a SAM D21 + ATWINC3400 Xplained Pro evaluation board set.

1. Open Atmel Studio and select `File > New > Example Project`.

Figure 4-1. Example Project from ASF



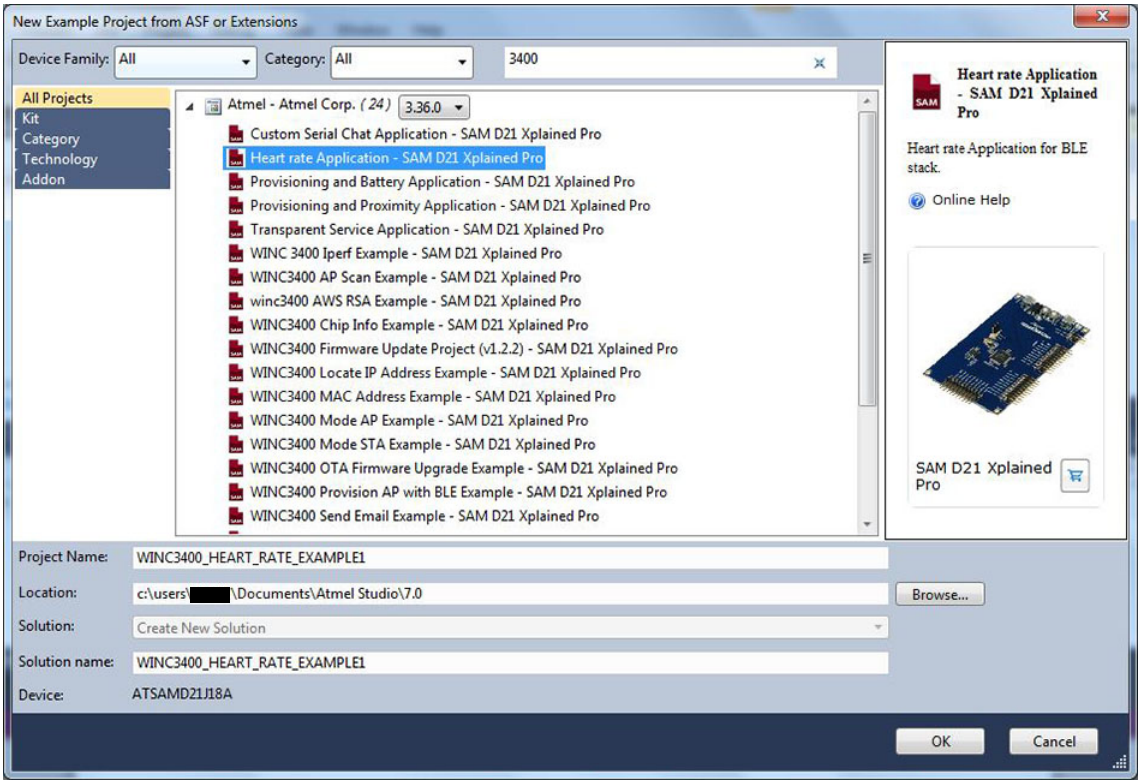
2. In the New Example Project from ASF or Extensions window:

2.1. Enter “3400” keyword in the search box, which lists all the supported examples for the SAM D21 Xplained Pro board.

2.2. Select the respective example application by expanding the “Atmel – Atmel Corp.” in the **All Projects** tab. This selection automatically populates the project Name, Location, Solution, Solution Name and Device.

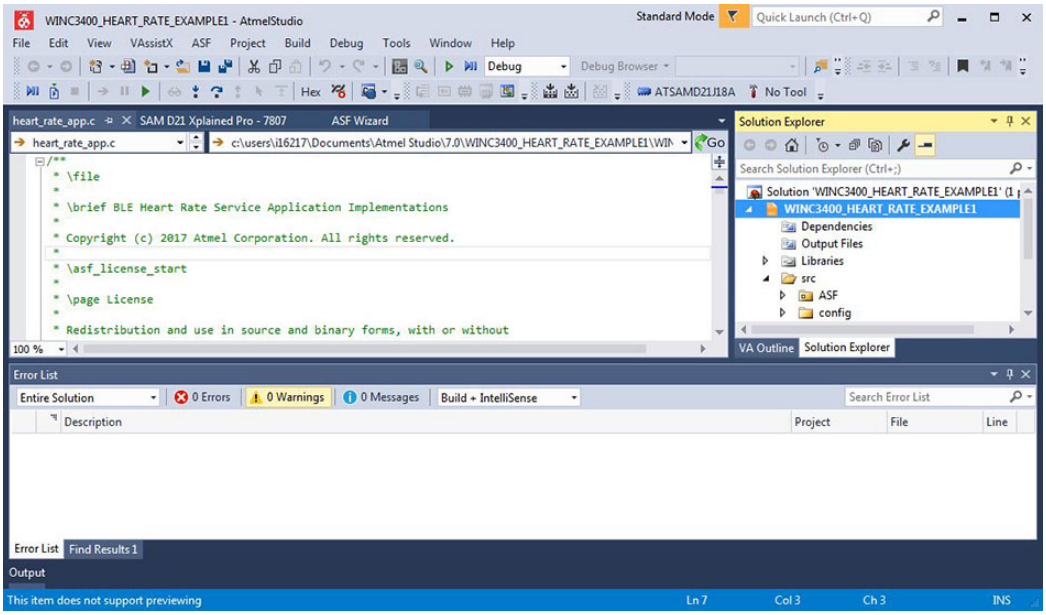
2.3. Click **OK**.

Figure 4-2. Searching for a Specific Example Application



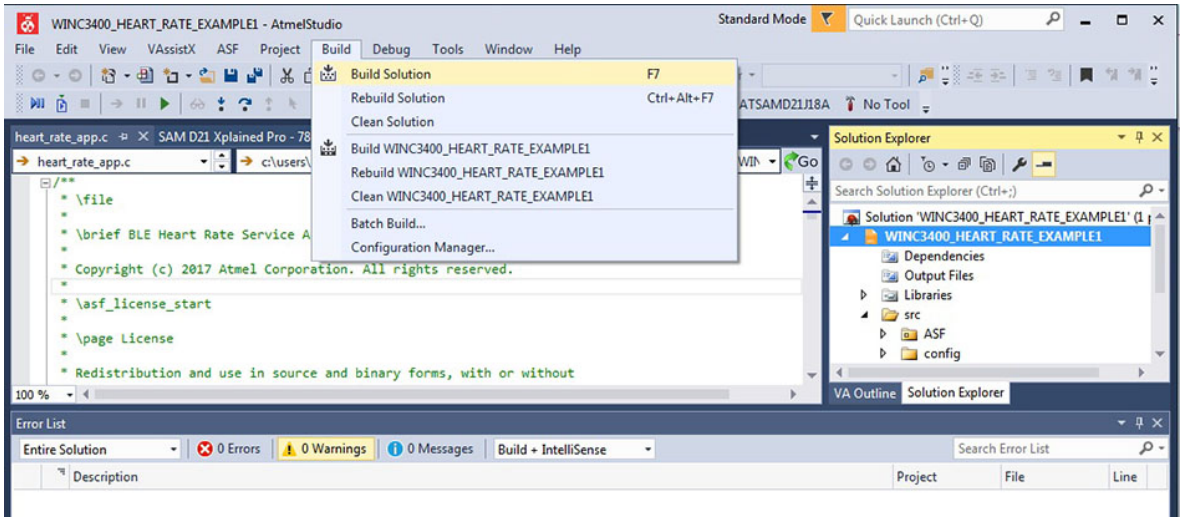
3. Select the “Accept License Agreement” check box and then click **Finish**.
4. Atmel Studio generates the project files for the selected application example that can be used in the SAM D21 Xplained Pro board.

Figure 4-3. Heart Rate Profile in ASF



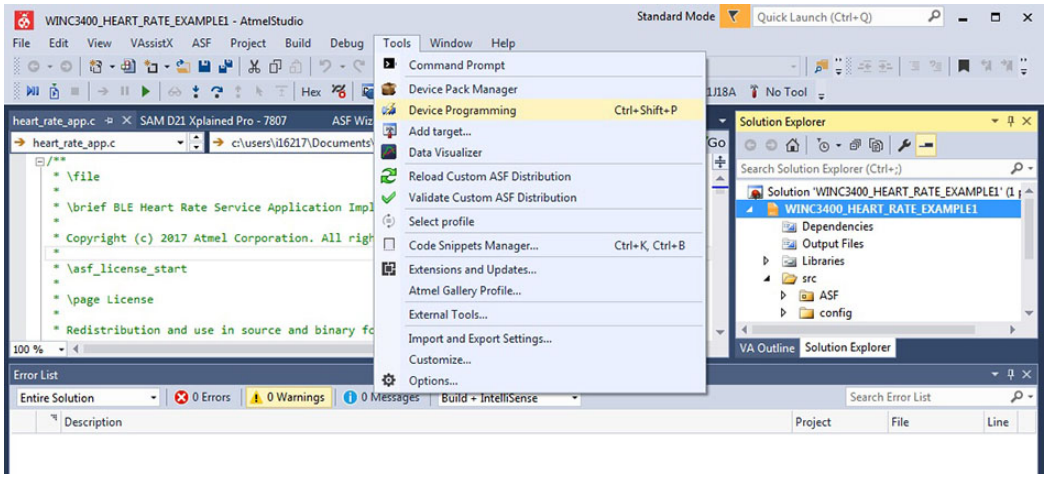
5. To build the solution, go to `Build > Build Solution`. Alternatively, press `<F7>` to build the solution.

Figure 4-4. Building the Solution



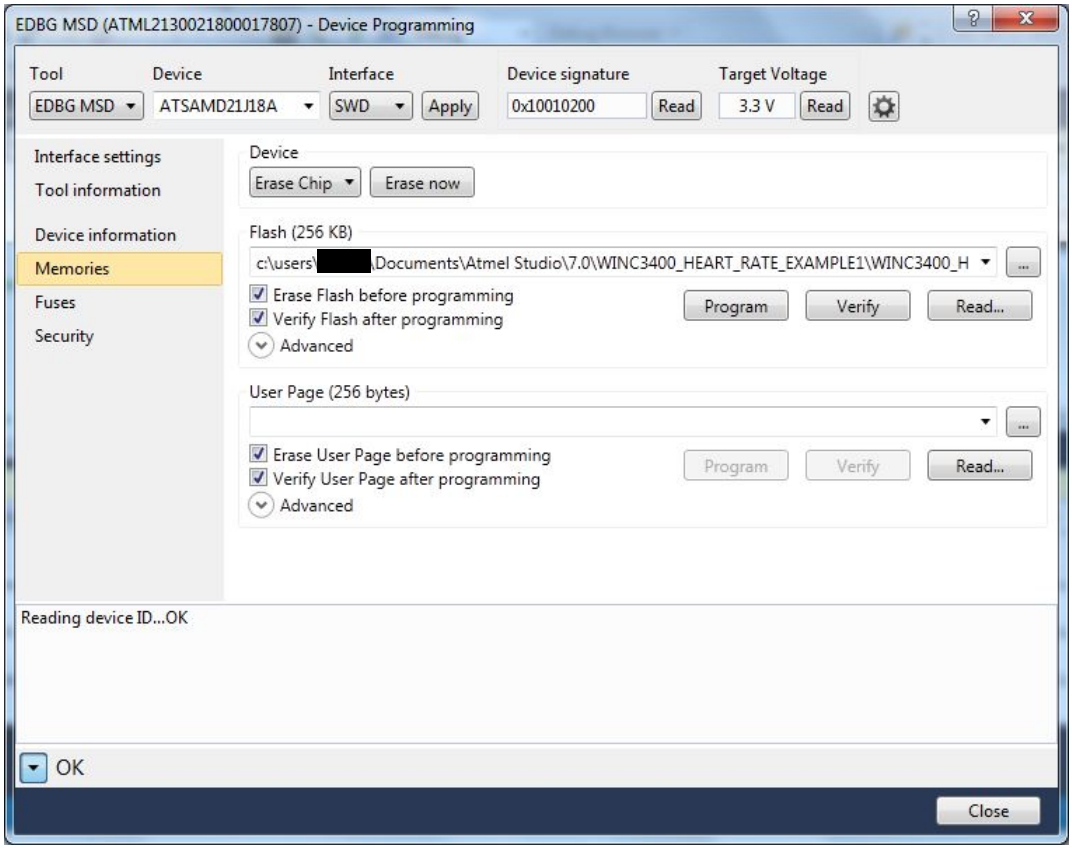
6. The generated solution is downloaded into the SAM D21 Xplained Pro board through the USB cable. To program the board, go to `Tools > Device Programming`. Alternatively, press `<Ctrl +Shift+P>` to program the board.

Figure 4-5. Programming the Board



7. In the Device Programming window, perform the following steps:
   7.1. Select **EDBG MSD** in Tools.
   7.2. Click **Apply** and then click **Read** to read the Device Signature.
   7.3. After reading the device, in **Memories** tab, click **Program** after selecting the correct `.hex` file from <Atmel Studio path> (for example: `Atmel Studio \7.0\WINC3400_HEART_RATE_EXAMPLE1\WINC3400_HEART_RATE_EXAMPLE1\Debug`) to program the device.

Figure 4-6. Embedded Debugger Device Programming Window



8. After flashing/programming the example application onto the SAM D21 Xplained Pro board, it is ready to be used as a BLE device that supports the selected application example.

5. Running Example Applications

The following figure shows how to set up the board and the Microchip SmartConnect App for the purpose of running the example applications.

Figure 5-1. Running Example Application Setup

Table 5-1. Details for BLE Applications

Applications (Keywords)	BLE Node 1	BLE Node 2
Proximity Reporter Application	Supported by the Microchip SmartConnect application for Android devices to act as a Proximity Monitor	Supported by the ATWINC3400 extension board and microcontroller to act as a Proximity Reporter
Battery Service Application	Supported by the Microchip SmartConnect application for Android devices	Supported by the ATWINC3400 extension board and microcontroller to act as Battery Service application
Custom Serial Chat Profile Application	Supported by the Microchip SmartConnect application for Android devices to send and receive data	Supported by the ATWINC3400 extension board and microcontroller to act as Custom Serial Chat application
Heart Rate Profile Application	Supported by the Microchip SmartConnect application for Android devices to act as a Heart Rate Data Collector	Supported by the ATWINC3400 extension board and microcontroller to act as Heart Rate Sensor
Transparent Service Application	Supported by the Microchip SmartConnect application for Android devices to send and receive the data	Supported by the ATWINC3400 extension board and microcontroller to act as L2CAP Peripheral
On-chip Provisioning Application	Supported by the Microchip SmartConnect application for Android devices to trigger scan for Wi-Fi APs and send the configuration (Provision) data of the selected AP	Supported by the ATWINC3400 extension board and microcontroller to act as On-chip Provisioning application

5.1 Initializing the Device

Perform the following steps to initialize the device:

1. Open any Terminal Application (for example, TeraTerm). Select the COM port enumerated on the PC and set the following parameters:
   - Baudrate 115200
   - Parity None
   - One Stop bit
   - One Start bit
   - No Hardware Handshake
2. After loading the example application, press the Reset button on the SAM D21 Xplained Pro (XPro) board. The application starts running and the initialization output shows on the terminal.
3. When starting the application, the initialization output on the terminal/console displays information such as: driver version, driver HIF level, FW version, FW HIF level and Build data/time, and MAC address.

```
Wifi BLE Provisioning demo with Application
SAMD21_XPLAINED_PRO
<APP><INFO>Chip ID 3400d1
<APP><INFO>Curr driver ver: 1.0.7
<APP><INFO>Curr driver HIF Level: <2> 1.2
<APP><INFO>Fw HIF 8102
<APP><INFO>Firmware HIF <2> : 1.2
<APP><INFO>Firmware ver : 1.1.5
<APP><INFO>Firmware Build Apr 27 2017 Time 13:46:34
<APP><INFO>Ota HIF : 0000
<APP><INFO>No valid Ota image
<APP><INFO>OTP MAC
<APP><INFO>MAC Address: F8:F0:05:F2:52:6A
<APP><INFO>M2M_No_PS
<APP><INFO>POWER SAVE 0
<APP><INFO>Reset provision data
<APP><INFO>BLE provisioning started
```

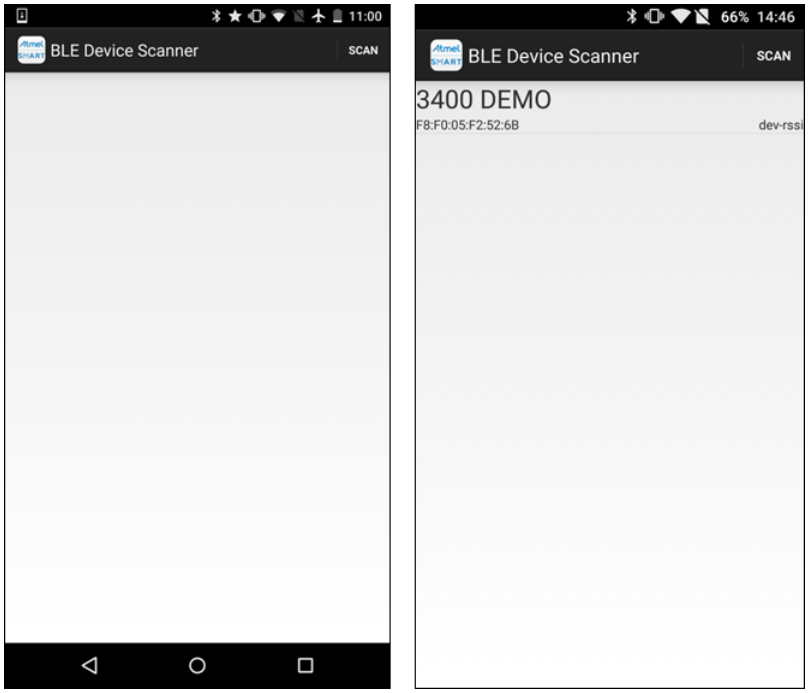
4. If BLE provisioning is added to the example BLE profile, the application starts BLE provisioning. Otherwise, the application starts the specific BLE profile steps directly.
   Note: 5.2 BLE Provisioning Procedure is required only when provisioning is enabled in the BLE profile example.

5.2 BLE Provisioning Procedure

Perform the following steps to pair the device with the mobile phone application:

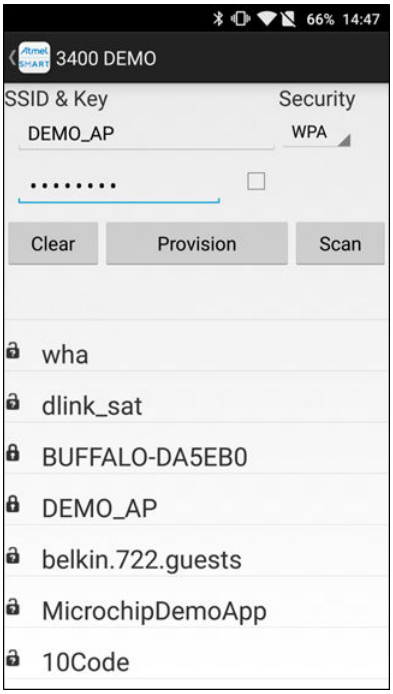
1. Open the BLEProvisioner application on a BLE compatible Android phone. Click **SCAN** and select “3400 DEMO” from the list for the ATWINC3400.

Figure 5-2. BLE Provisioner Application



2. The application triggers the ATWINC3400 to perform a Wi-Fi scan and displays the list of APs found. Select the AP, enter the security details, and click **Provision** to start the provisioning process.

Figure 5-3. Provisioning Process



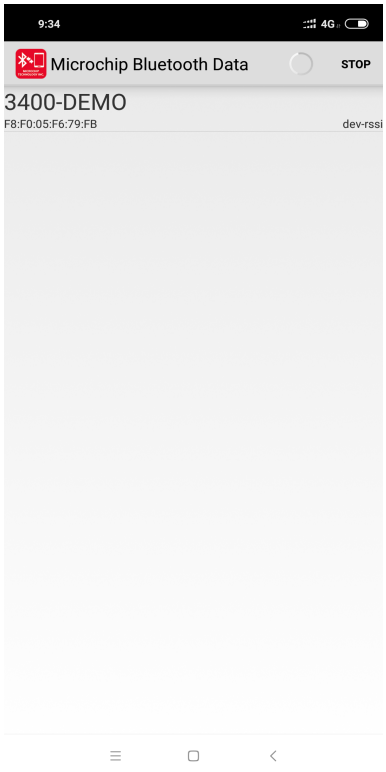
3. On successful connection with the AP, the provision process completes.

5.3 BLE Provisioning for Connecting ATWINC3400 with MSCHAPv2 Secured AP

Perform the following steps to connect the ATWINC3400 BLE Provisioning using MSCHAPv2 enterprise security.

1. In Atmel Studio, open WINC3400_WIFI_BLE_PROV_MSCHAPV2_EXAMPLE project.
2. Compile and flash the project to the ATWINC3400.
3. Open the serial port terminal application, and set the COM port configuration as follows:
   - Set Baudrate as 115200
   - Set Data Bits as 8 bit
   - Set Parity as none
   - Set Stop Bits as 1 bit
   - Set Flow control as none
4. Press and hold the **SW0** button of the SAM D21 Xplained Pro for two seconds to start the Wi-Fi provisioning.
   The BLE device starts to advertise the device name.
5. Open the Microchip Bluetooth Data Application on Android or iOS mobile device.
6. From the dashboard, press the **Ble Provisioner** button.
7. Choose the **SCAN** button.
   The device appears in the Microchip Bluetooth Data Application as shown in the following screenshot. The default device name is **3400-DEMO**.

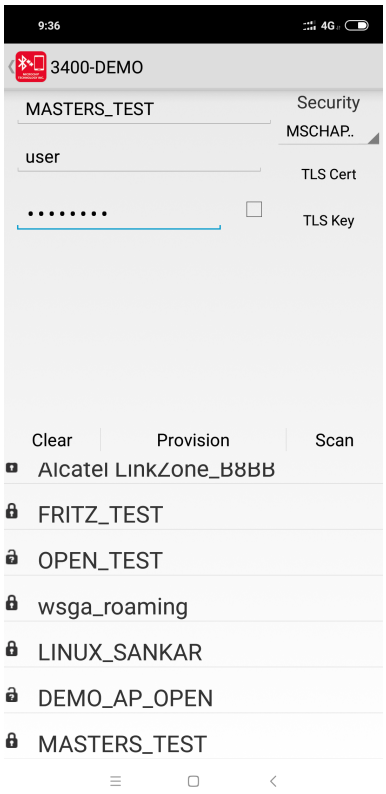
Figure 5-4. Scanning for Devices



Note: To change the device name, open the `wifi_provisioning.h` file and change the value of the macro `#define WIFI_PROVISION_ADV_DATA_NAME_DATA` as required.

8. Enter the device pairing password shown in the serial port terminal application to pair with the device. The Microchip Bluetooth Data Application lists the available APs.
9. Choose the required AP from the application. This populates the AP's SSID automatically as shown in the following screenshot.

Figure 5-5. Microchip Bluetooth Data Application



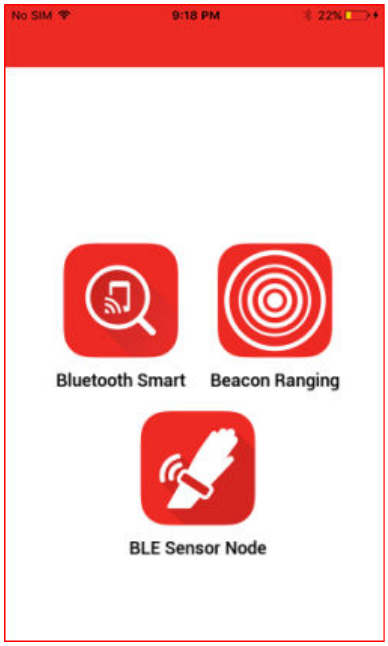
10. Enter the credentials of the AP to which the ATWINC3400 must be connected. For more details on configuring or creating the AP details for the Hostpad server and FreeRADIUS server, refer ATWINC Enterprise Security application note.
11. In Microchip Bluetooth Data Application, press **PROVISION** button to transfer the credentials to ATWINC3400.
12. Press and hold the SW0 button for two seconds in the SAM D21 Xplained Pro.

5.4 BLE Profile Scan and Connect

After successful initialization and starting of the application, the BLE device starts advertising.

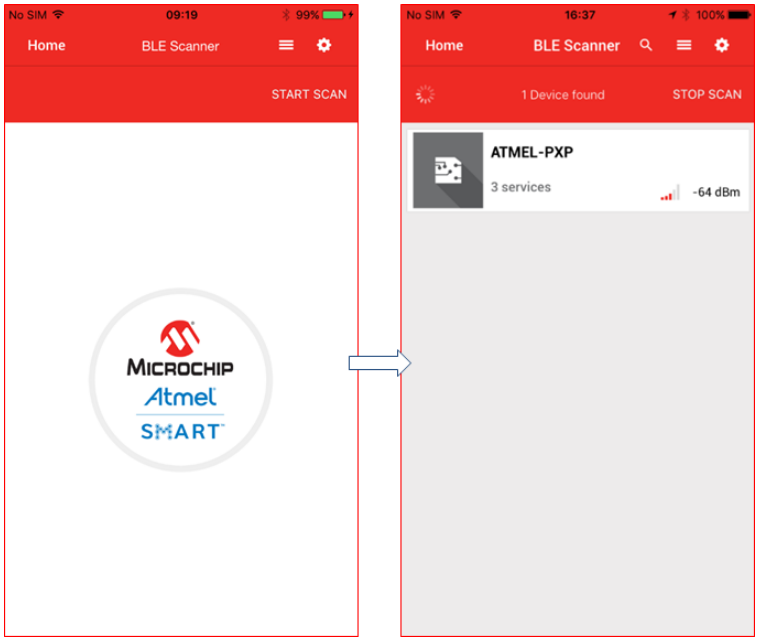
1. On the Android phone, open the Microchip SmartConnect application and click the **Bluetooth Smart** in the application dashboard as illustrated in the following figure.

Figure 5-6. Dashboard of Microchip SmartConnect Application



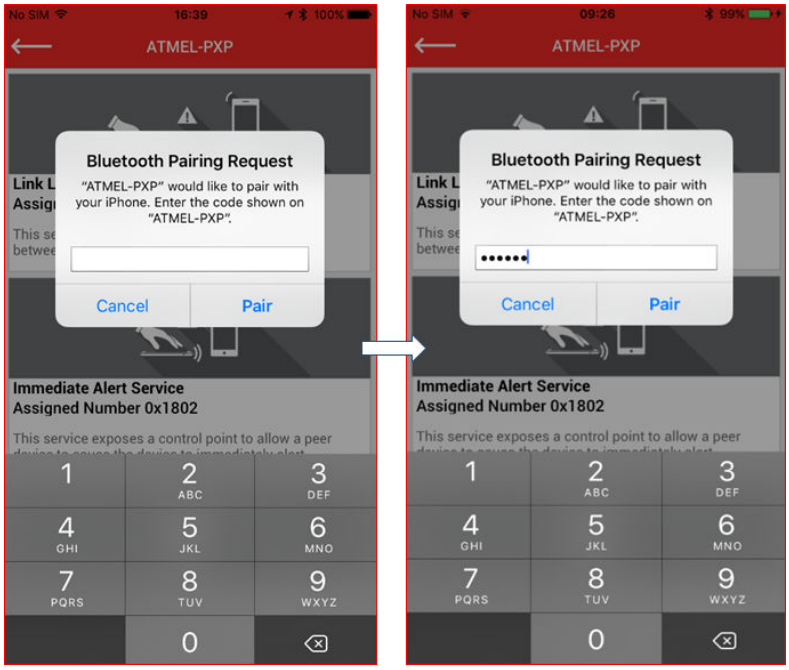
2. To scan for BLE devices, click the **START SCAN** option available in the scanning page. The device name (for example, ATMEL-PXP when running Proximity Reporter application and ATMEL-BAS when running Battery Service application) is displayed among the list of devices found during the scan.

Figure 5-7. Scanning for Devices



3. Select the device name in the scan results, which initiates the pairing procedure with the ATWINC3400. Enter the pass-key “123456” in the Bluetooth Pairing Request window and click **Pair**. The mobile app displays "Successful connection" upon successful pairing.

Figure 5-8. Pairing Request



4. On the device side, the console displays a message notifying of successful pairing.
5. On the Microchip SmartConnect app, the supported services are displayed.

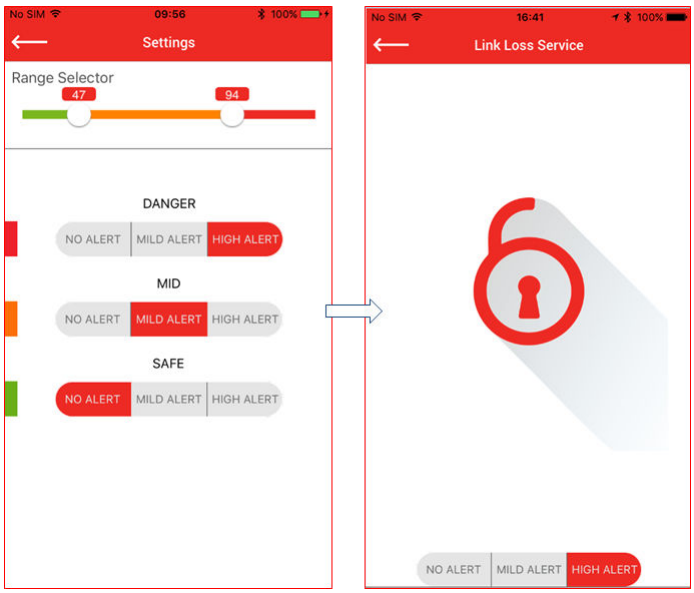
Figure 5-9. Display of Services Supported by the Proximity Reporter Application

5.5 Proximity Reporter Application

Perform the following steps to run the Proximity Reporter application demo:

1. Establish the connection between the device and mobile phone using the procedure listed in 5.1 Initializing the Device and 5.2 BLE Provisioning Procedure (if provisioning is enabled).
2. Select the desired service (Link Loss or Immediate Alert) for alert level characteristics configuration. Choose a value from the following:
   - HIGH ALERT
   - MILD ALERT
   - NO ALERT

Figure 5-10. Configuring Alert Level Settings



3. After configuring the desired alert levels, click **Immediate Alert** service and then move the mobile phone away from the Proximity Reporter. Based on the distance of separation, Path Loss is plotted on the zone radar (using RSSI values received from the Proximity Reporter). Based on the zone, the Proximity Monitor sends the corresponding alert level. The console log on the Proximity Reporter displays the corresponding alerts and on-board status LED behavior.

Figure 5-11. Proximity Reporter Path Loss Plot Across Safe, Mid, and Danger Zone

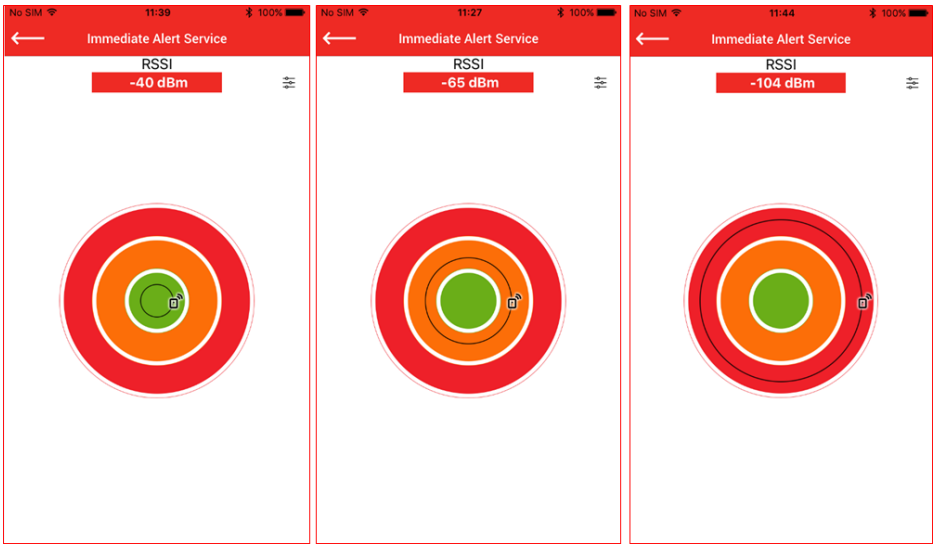
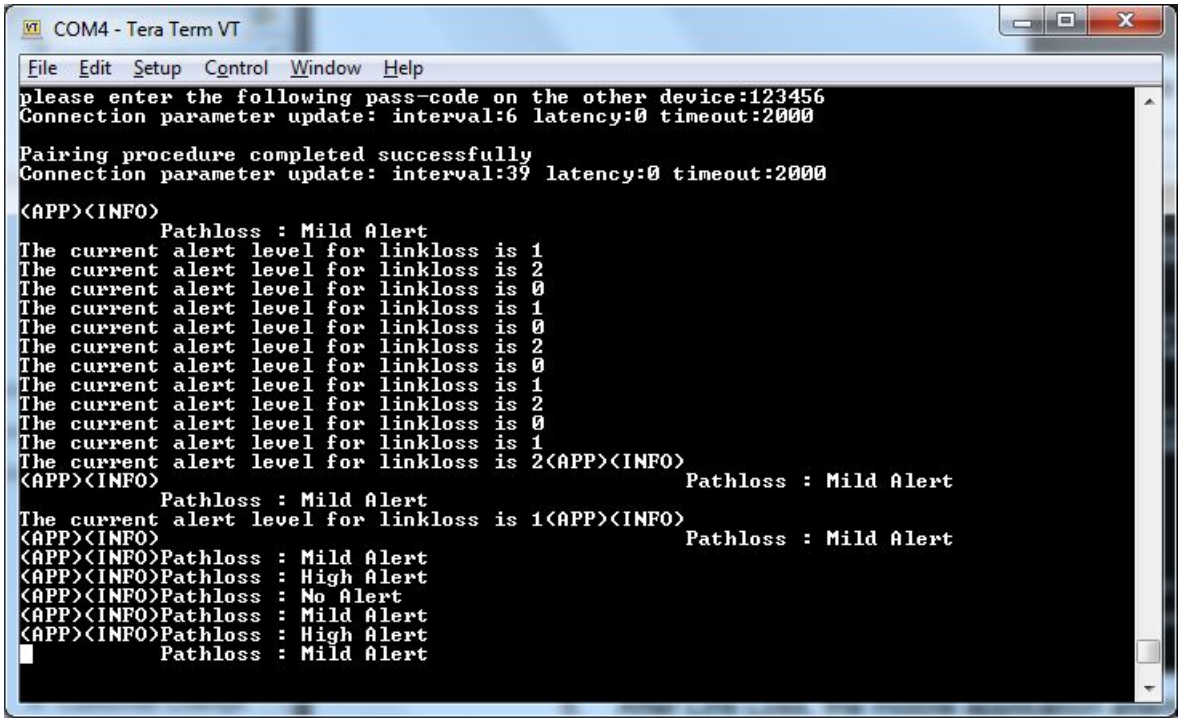


Figure 5-12. Proximity Reporter Path Loss Console Log Alerts Notification



4. After configuring the desired alert levels, click on the **Link Loss** service and then move the mobile phone away from the reporter. Based on the distance of separation, the Proximity Reporter receives the path loss notifications based on the alert settings. Keep moving away until the “Link Loss” pop-up appears. The console log displays the corresponding alerts on the Proximity Reporter and when Link Loss occurs, it reports the disconnection and the corresponding on-board status LED behavior. The lock screen emulates a common use-case application where the Link Loss service is used (for example, key fob). When the user is in close proximity, the lock remains open. Subsequently, the user moving out of range can be triggered to close the lock.

Figure 5-13. Link Loss Pop-up on Proximity Monitor

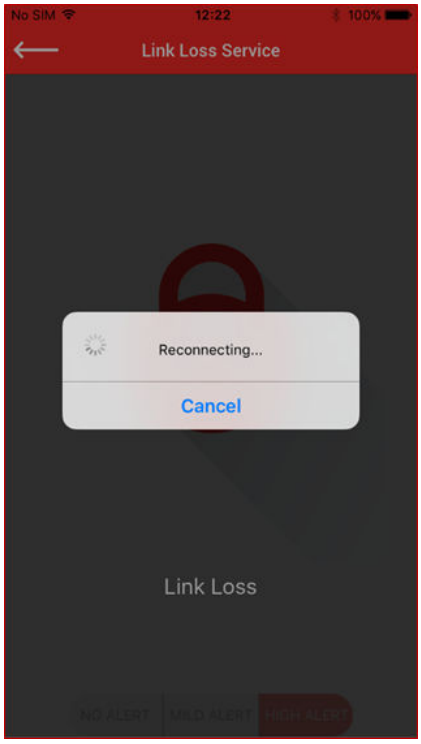
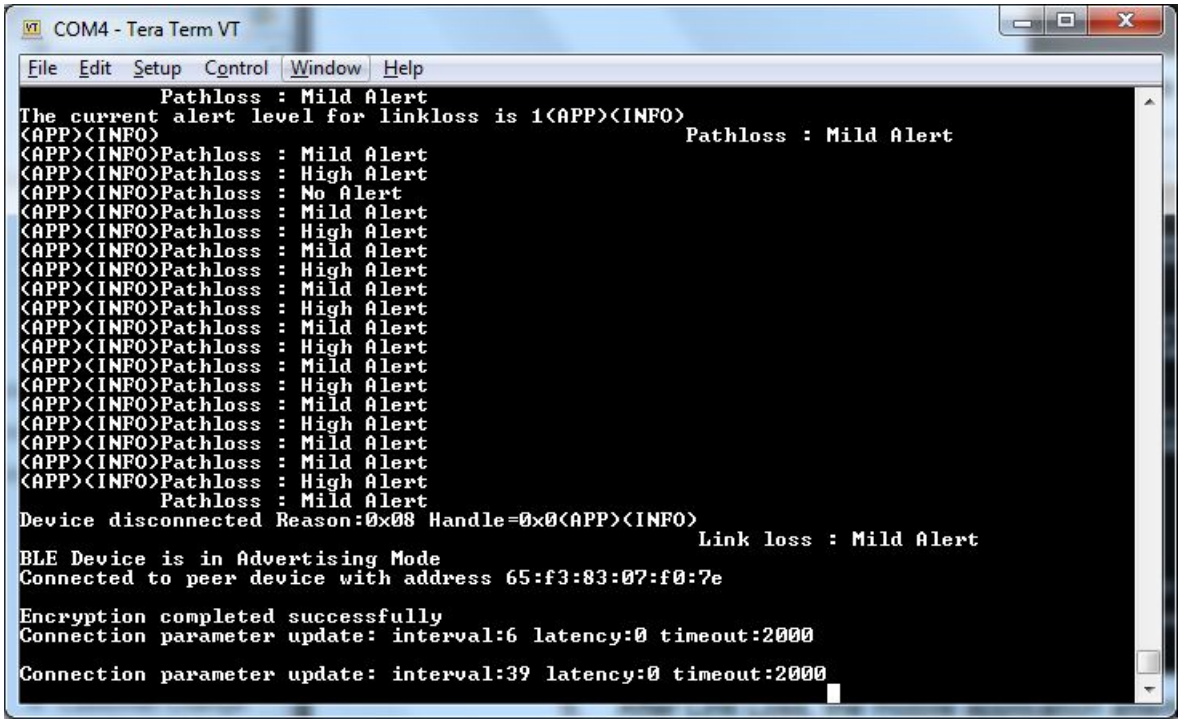


Figure 5-14. Proximity Reporter Console Log for Link Loss



5. After Link Loss, the mobile application attempts to reconnect to the Proximity Reporter. The connection is re-established by moving the mobile phone closer to the reporter.

6. The Tx Power service is used to retrieve the Tx Power of the Proximity Reporter. Click the **Tx Power Service** icon in the services screen. The Proximity Monitor reads the Tx Power value from the Proximity Reporter and displays the TX POWER LEVEL as shown in the following figure.

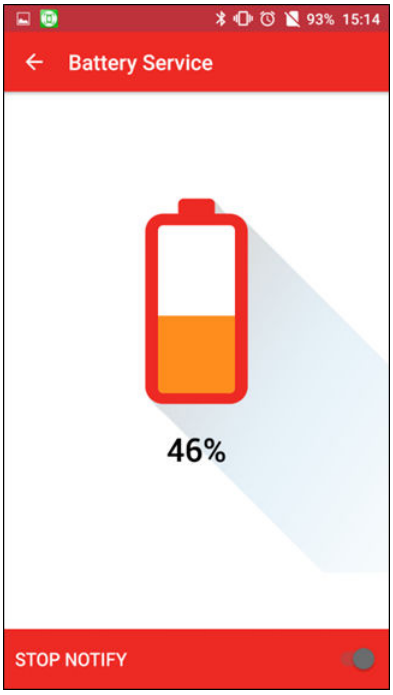
Figure 5-15. Proximity Monitor – Reading Tx Power Service

5.6 Battery Service Application

Perform the following steps to run the Battery Service Application demo:

1. Establish the connection between the device and mobile phone using the procedure listed in 5.1 Initializing the Device and 5.2 BLE Provisioning Procedure (if provisioning is enabled).
2. When paired, the application displays the Battery Service and the Generic Information service.
3. Select “Battery Service” to receive notifications for the battery level characteristic. The user can stop receiving the notifications by disabling notifications, as shown in the following figure.

Figure 5-16. Battery Level Characteristic Notification Options

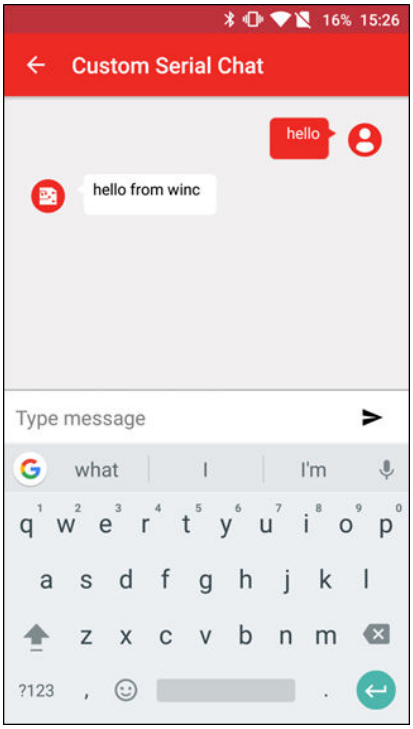


5.7 Custom Serial Chat Profile Application

Perform the following steps to run the Custom Serial Chat Profile application demo:

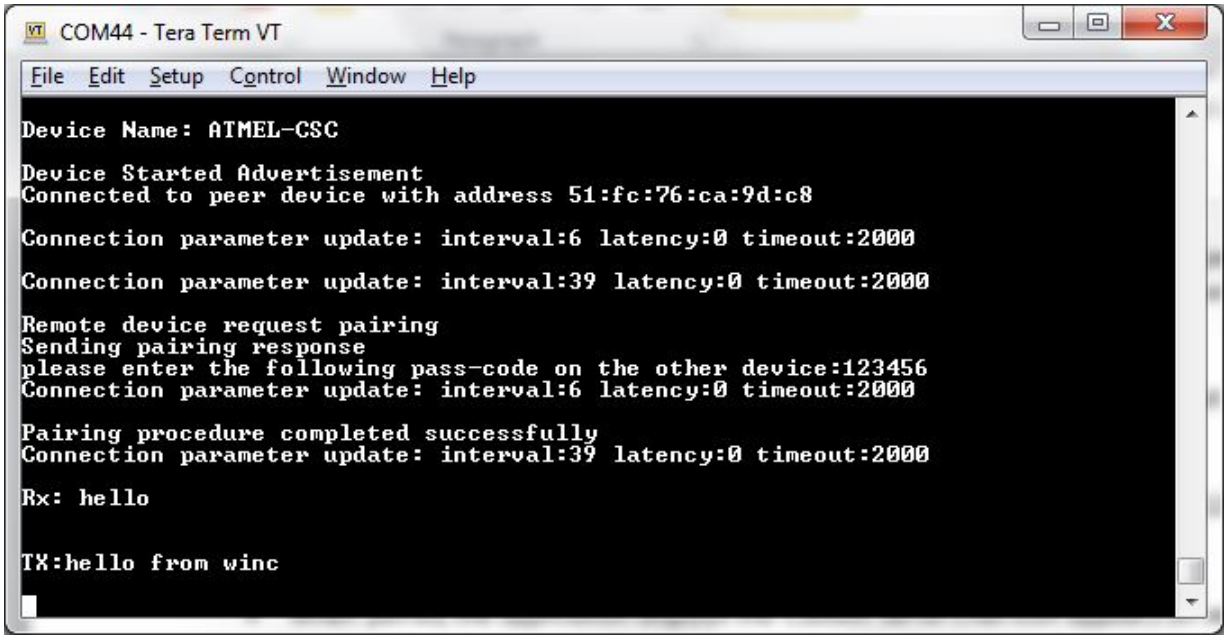
1. Establish the connection between the device and mobile phone using the procedure listed in 5.1 Initializing the Device and 5.4 BLE Profile Scan and Connect.
2. Once pairing is complete, the Custom Serial Chat icon appears on the service list page.
3. Click the **Custom Serial Chat** icon. The chat screen appears, and the user can type the text that is to be sent to the remote device and also see the text coming from the remote device.
4. Chat text “Hello” to remote device.

Figure 5-17. Sending/Receiving Data to/from Device



5. The user can also write the text on the console for the device and press the ENTER key for transmitting the chat text to the mobile application.

Figure 5-18. Console Log for Sending Data to Remote Device



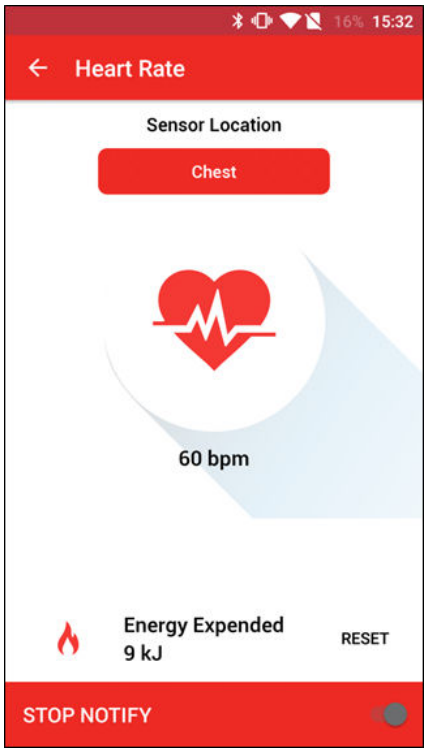
5.8 Heart Rate Profile Application

Perform the following steps to run the Heart Rate Profile application demo:

1. Establish the connection between the device and mobile phone using the procedure listed in 5.1 Initializing the Device and 5.4 BLE Profile Scan and Connect.
2. After the device is connected, the application displays the Heart Rate and the Device Information Service.
3. When notifications are enabled, the HRM values, Sensor Location and Energy Expended are displayed in the console and the corresponding mobile app. The LED on the SAM D21 board starts blinking while sending notifications.

```
Notification Enabled
Heart Rate: 70 bpm          RR Values:<900,1100>msec User Status:Idle
Heart Rate: 325 bpm         RR Values:<100,300>msec User Status:Idle
Heart Rate: 580 bpm         RR Values:<500,700>msec User Status:Idle
Heart Rate: 835 bpm         RR Values:<900,1100>msec User Status:Idle
Heart Rate: 1090 bpm        RR Values:<100,300>msec User Status:Idle
Heart Rate: 1345 bpm        RR Values:<500,700>msec User Status:Idle
Heart Rate: 1600 bpm        RR Values:<900,1100>msec User Status:Idle
Heart Rate: 1855 bpm        RR Values:<100,300>msec User Status:Idle
Heart Rate: 2110 bpm        RR Values:<500,700>msec User Status:Idle
Heart Rate: 2365 bpm        RR Values:<900,1100>msec User Status:Idle
Energy Expended :9KJ
```

Figure 5-19. Displaying Heart Rate Measurements



4. When the user disables with Stop Notify, the notifications are displayed in the console logs as:

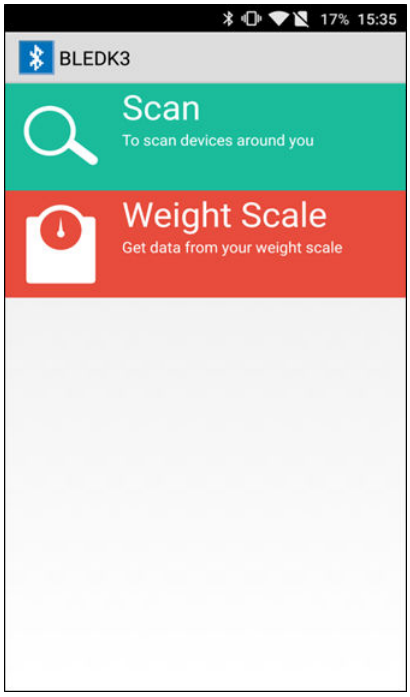
```
Notification Disabled
```

5.9 Transparent Service Application

Perform the following steps to run the Transparent Service application demo:

1. Follow all the steps from 5.1 Initializing the Device.
2. On a BLE-compatible Android phone, enable Bluetooth in the Settings page. Open the Microchip SmartConnect mobile application. In application click **Scan** to start scanning for the BLE devices.

Figure 5-20. Scanning for Device

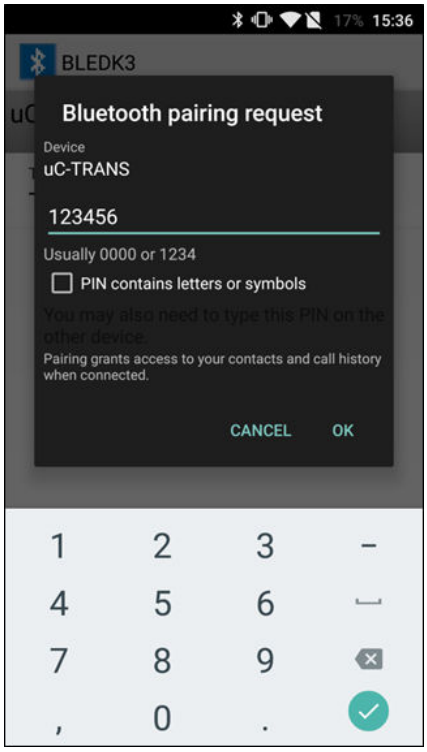


3. Select **uC-TRANS** from the list of devices and start pairing the phone with the device (SAM D21 + ATWINC3400).

Figure 5-21. Selecting Transparent Service

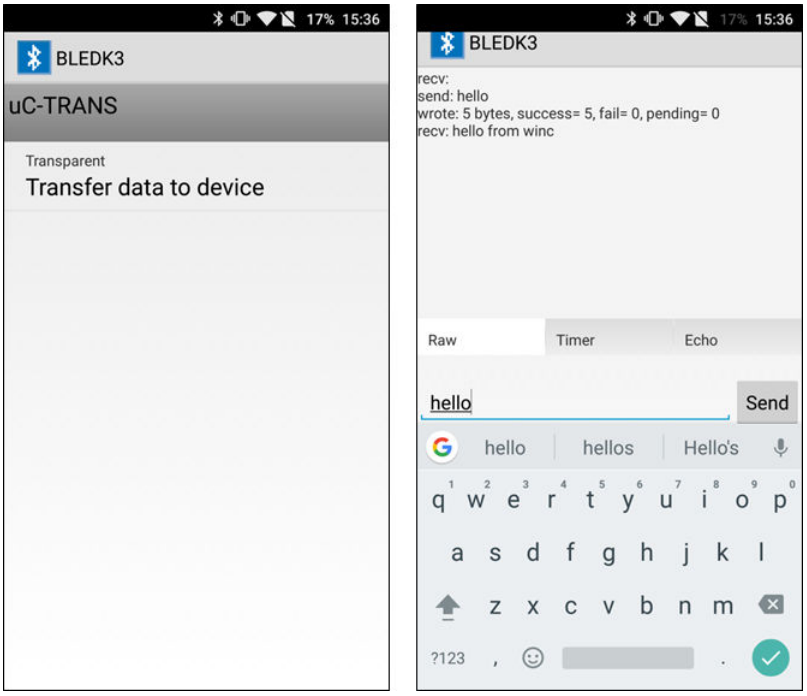
4. Enter the pass-key “123456” on the Bluetooth Pairing Request window and click **Pair**.

Figure 5-22. Bluetooth Pairing Request



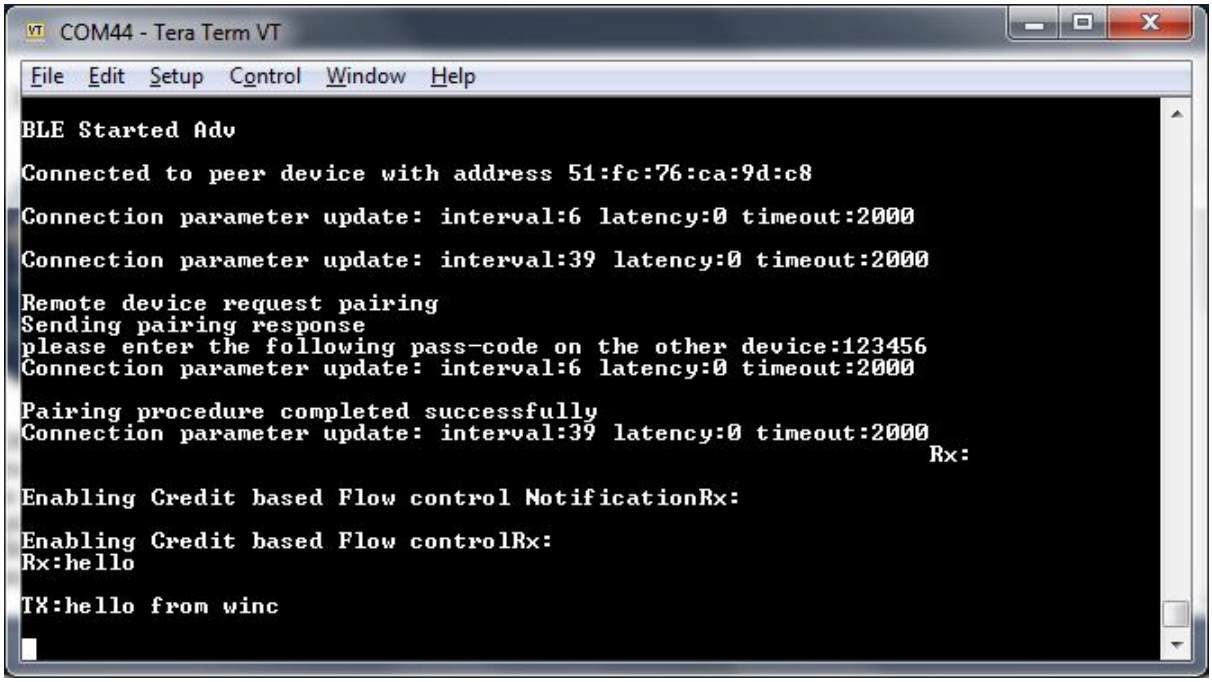
5. When paired, the application displays the “Transfer data to device” message on the service page.
6. Click **Transfer data to device**. The chat screen appears where the user can type the text that is to be sent to the remote device, and also see the text coming from the remote device.
7. Chat text “Hello” to the remote device. The data/text sent is displayed on the console/terminal for the device connected.

Figure 5-23. Transferring Data to/from Device



8. The user can also write the text on the console for the device and press the ENTER key for transmitting the chat text to the mobile application.

Figure 5-24. Console Log for Sending Data to Remote Device



5.10 On-chip Provisioning Application

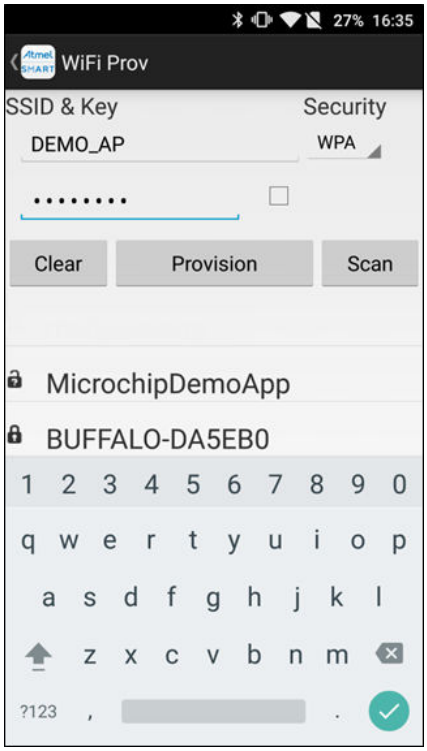
Perform the following steps to run the On-chip Provisioning application demo:

1. Follow all the steps from 5.1 Initializing the Device.
2. Open “BLEProvisioner” application on a BLE compatible Android phone and click **SCAN**. Select “WiFi Prov” from the list for the ATWINC3400.

Figure 5-25. Scanning for ATWINC3400

3. The application triggers the ATWINC3400 to perform a Wi-Fi scan and to display the list of APs found. Select the AP and enter the security details and click **Provision** to start provisioning process.

Figure 5-26. On-chip Provisioning Process



4. On successful connection with the given AP, the provision process is completed.

5. If the connection is not successful with the given AP, the application will return to the BLE scan state, scans for the “3400 DEMO”, and then the provisioning process will start again.

6. Document Revision History

Revision	Date	Section	Changes
B	06/2019	5.3 BLE Provisioning for Connecting ATWINC3400 with MSCHAPv2 Secured AP	Added new section
		2. Supported Hardware Platforms and IDEs	Updated the section
A	01/2018	Document	Initial release

The Microchip Website

Microchip provides online support via our website at http://www.microchip.com/. This website is used to make files and information easily available to customers. Some of the content available includes:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

Product Change Notification Service

Microchip's product change notification service helps keep customers current on Microchip products. Subscribers will receive email notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, go to http://www.microchip.com/pcn and follow the registration instructions.

Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the web site at: http://www.microchip.com/support

Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Legal Notice

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PackeTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TempTrackr, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, Vite, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KleerNet, KleerNet logo, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

ISBN: 978-1-5224-4703-0

Quality Management System

For information regarding Microchip's Quality Management Systems, please visit http://www.microchip.com/quality.

Worldwide Sales and Service

AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
Corporate Office 2355 West Chandler Blvd. Chandler, AZ 85224-6199 Tel: 480-792-7200 Fax: 480-792-7277 Technical Support: http://www.microchip.com/support Web Address: http://www.microchip.com **Atlanta** Duluth, GA Tel: 678-957-9614 Fax: 678-957-1455 **Austin, TX** Tel: 512-257-3370 **Boston** Westborough, MA Tel: 774-760-0087 Fax: 774-760-0088 **Chicago** Itasca, IL Tel: 630-285-0071 Fax: 630-285-0075 **Dallas** Addison, TX Tel: 972-818-7423 Fax: 972-818-2924 **Detroit** Novi, MI Tel: 248-848-4000 **Houston, TX** Tel: 281-894-5983 **Indianapolis** Noblesville, IN Tel: 317-773-8323 Fax: 317-773-5453 Tel: 317-536-2380 **Los Angeles** Mission Viejo, CA Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800 **Raleigh, NC** Tel: 919-844-7510 **New York, NY** Tel: 631-435-6000 **San Jose, CA** Tel: 408-735-9110 Tel: 408-436-4270 **Canada - Toronto** Tel: 905-695-1980 Fax: 905-695-2078	**Australia - Sydney** Tel: 61-2-9868-6733 **China - Beijing** Tel: 86-10-8569-7000 **China - Chengdu** Tel: 86-28-8665-5511 **China - Chongqing** Tel: 86-23-8980-9588 **China - Dongguan** Tel: 86-769-8702-9880 **China - Guangzhou** Tel: 86-20-8755-8029 **China - Hangzhou** Tel: 86-571-8792-8115 **China - Hong Kong SAR** Tel: 852-2943-5100 **China - Nanjing** Tel: 86-25-8473-2460 **China - Qingdao** Tel: 86-532-8502-7355 **China - Shanghai** Tel: 86-21-3326-8000 **China - Shenyang** Tel: 86-24-2334-2829 **China - Shenzhen** Tel: 86-755-8864-2200 **China - Suzhou** Tel: 86-186-6233-1526 **China - Wuhan** Tel: 86-27-5980-5300 **China - Xian** Tel: 86-29-8833-7252 **China - Xiamen** Tel: 86-592-2388138 **China - Zhuhai** Tel: 86-756-3210040	**India - Bangalore** Tel: 91-80-3090-4444 **India - New Delhi** Tel: 91-11-4160-8631 **India - Pune** Tel: 91-20-4121-0141 **Japan - Osaka** Tel: 81-6-6152-7160 **Japan - Tokyo** Tel: 81-3-6880- 3770 **Korea - Daegu** Tel: 82-53-744-4301 **Korea - Seoul** Tel: 82-2-554-7200 **Malaysia - Kuala Lumpur** Tel: 60-3-7651-7906 **Malaysia - Penang** Tel: 60-4-227-8870 **Philippines - Manila** Tel: 63-2-634-9065 **Singapore** Tel: 65-6334-8870 **Taiwan - Hsin Chu** Tel: 886-3-577-8366 **Taiwan - Kaohsiung** Tel: 886-7-213-7830 **Taiwan - Taipei** Tel: 886-2-2508-8600 **Thailand - Bangkok** Tel: 66-2-694-1351 **Vietnam - Ho Chi Minh** Tel: 84-28-5448-2100	**Austria - Wels** Tel: 43-7242-2244-39 Fax: 43-7242-2244-393 **Denmark - Copenhagen** Tel: 45-4450-2828 Fax: 45-4485-2829 **Finland - Espoo** Tel: 358-9-4520-820 **France - Paris** Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79 **Germany - Garching** Tel: 49-8931-9700 **Germany - Haan** Tel: 49-2129-3766400 **Germany - Heilbronn** Tel: 49-7131-72400 **Germany - Karlsruhe** Tel: 49-721-625370 **Germany - Munich** Tel: 49-89-627-144-0 Fax: 49-89-627-144-44 **Germany - Rosenheim** Tel: 49-8031-354-560 **Israel - Ra'anana** Tel: 972-9-744-7705 **Italy - Milan** Tel: 39-0331-742611 Fax: 39-0331-466781 **Italy - Padova** Tel: 39-049-7625286 **Netherlands - Drunen** Tel: 31-416-690399 Fax: 31-416-690340 **Norway - Trondheim** Tel: 47-72884388 **Poland - Warsaw** Tel: 48-22-3325737 **Romania - Bucharest** Tel: 40-21-407-87-50 **Spain - Madrid** Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 **Sweden - Gothenberg** Tel: 46-31-704-60-40 **Sweden - Stockholm** Tel: 46-8-5090-4654 **UK - Wokingham** Tel: 44-118-921-5800 Fax: 44-118-921-5820