Multilink–Central Demo User's Guide

Multilink_Central_Demo_User's_Guide

Contents

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1. Overview

This document explains how to setup an Multilink-Central demo using SAML21 Xplained Pro, BM71-XPro. This document briefly talks about setting up hardware, building application, programming firmware and running a demo.

This demo application showcases a Proof-of-Concept example of using **ble_host_sdk** to setup BM71 as Multilink-Central where it can connect with up to four GAP-Peripheral devices. This demo application scan for suitable GAP-Peripheral device and connects with it. Once connected it discovers device orientation service and characteristics in remote device and enable notifications to get accelerometer and gyroscope sensor data from remote device. Upon receiving data from remote GAP-Peripheral device, the Multilink-Central demo prints them on serial console.

The following table provides the list of expected BLE services and Characteristics in this application.

Name	UUID	Properties	Size (bytes)
Device Orientation Service (Custom)	0xF05ABAC1393611E587A60002A5D5C51B	-	-
Accelerometer Position Characteristic	0x1BC5D5A50200A687E5113639D7BA5AF0	Notify, Read	6
Gyroscope Position Characteristic	0x1BC5D5A50200A687E5113639D4BA5AF0	Notify, Read	6

2. Configuring the BM71 XPRO board

It is necessary to configure the BM71 XPRO board by making changes to the configuration file and flash the modified changes to BM71 XPRO board. The configuration changes demand the module to configure in Manual mode.

By default, the BM71 XPro board is configured to operate in Auto mode. The Microchip Studio project, however, requires the module to set up in Manual mode.

The following instructions show how to setup and configure the module to add configuration changes.

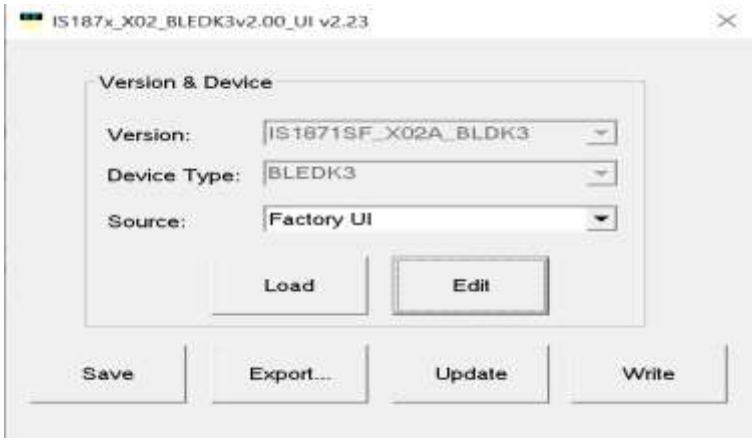
1. Connect the BM71 XPro directly to the PC using the MicroUSB on the board. The BM71 XPro board should enumerate a COM port. If not, check if the necessary MCP2200 drivers have been installed.

2. Set up the module to programming mode by configuring the Switch 1 in 3-pin DIP switch to ON state. The switch#1 sets the mode of operation on the module (between application mode and flash write mode). Refer to details on pin P2_0 in the BM70 datasheet for more details. The Blue LED (labeled BT_ACT, LD4) should be solid BLUE now. If not, check the following: a. Press 'Reset' button on the board.
NOTE: Make sure the jumper on J2 is set to USB.

3. Make sure that the BM71 module does have the correct BM71 firmware installed. By default, they should be. However, if you have programmed the module to be RN4871, change the firmware back to BM71.
If the module has RN871 firmware, the module will not operate as expected and the Studio project will fail.

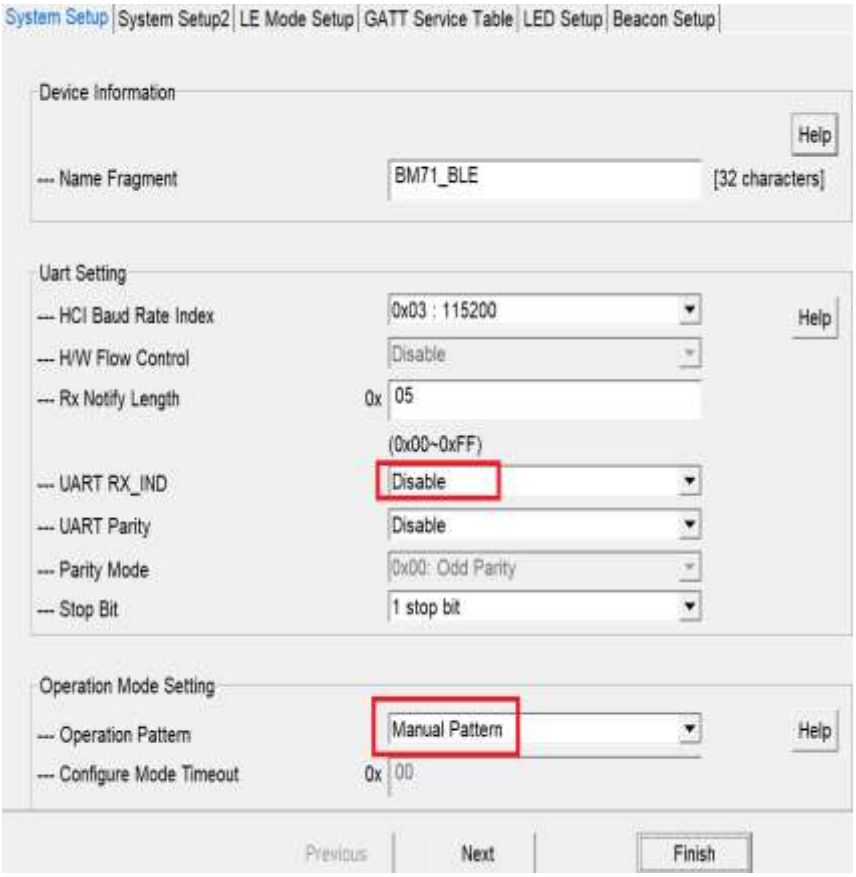
4. Open the UI tool for the BM70/71 modules. This tool is available for download from the BM70/71 webpage under the 'Software libraries/firmware' section.

5. Open the UI tool:



a. In the example below, the 'BM71 default table' is being used as the base file. Click on 'Edit' to start editing the memory parameters.

b. The following changes are made in the first 'System Setup' tab:
   i. Disable the low power operation.
   ii. Change the operation mode to 'Manual pattern.'



3. Hardware Setup

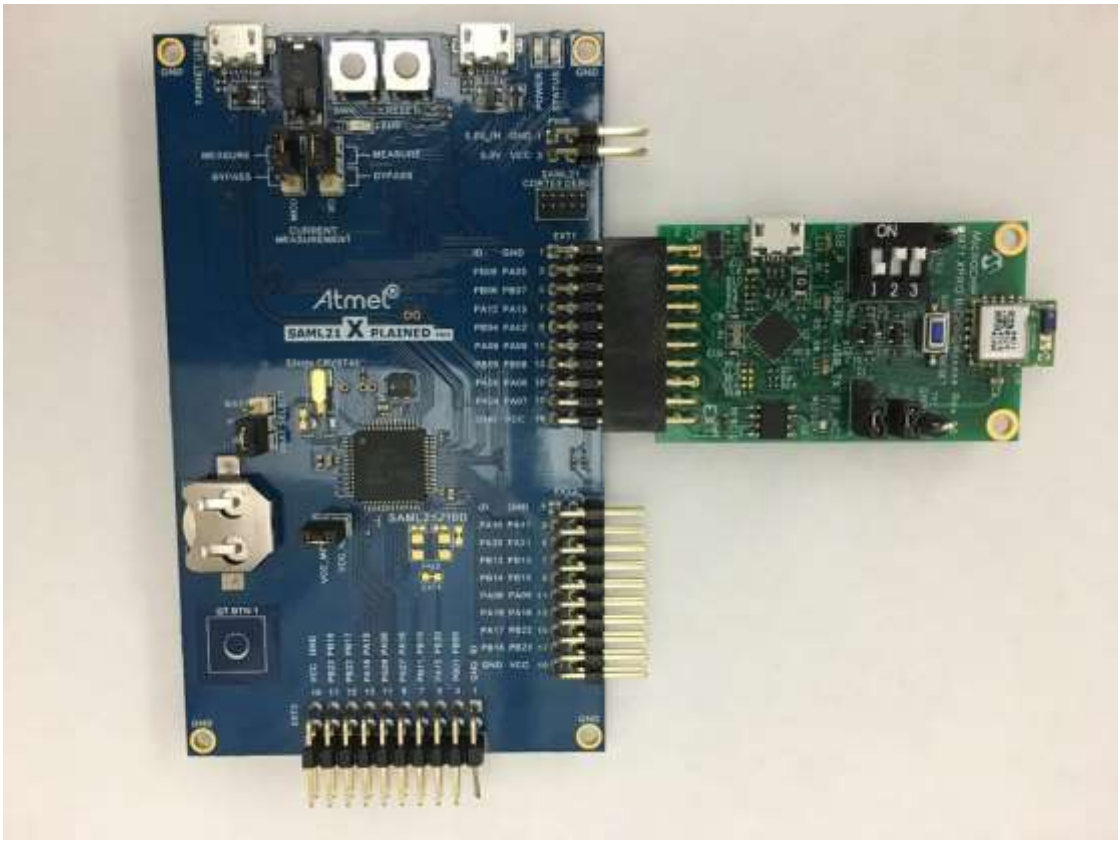


Figure 1: SAML21 Xplained Pro with BM71-XPro

1. Plugin the BM71-XPro board into EXT1 of SAML21 Xplained Pro board as shown in Figure 1.
2. Connect the SAML21 Xplained Pro board to the host PC using micro USB cable.

3.1. Console

The Multilink-Central demo application uses the Universal Asynchronous Receiver/Transmitter (UART) interface on SAML21 Xplained Pro to send the status messages like Scanning, Connected, Disconnected and the sensor data from remote device. Any serial application (ex: TeraTerm) can be used to interact with SAML21 Xplained Pro.

Use the following serial port configuration to interact with BM70.

Baud rate	115200
Data	8 bits
Parity	none
Stop	1 bit
Flow control	none

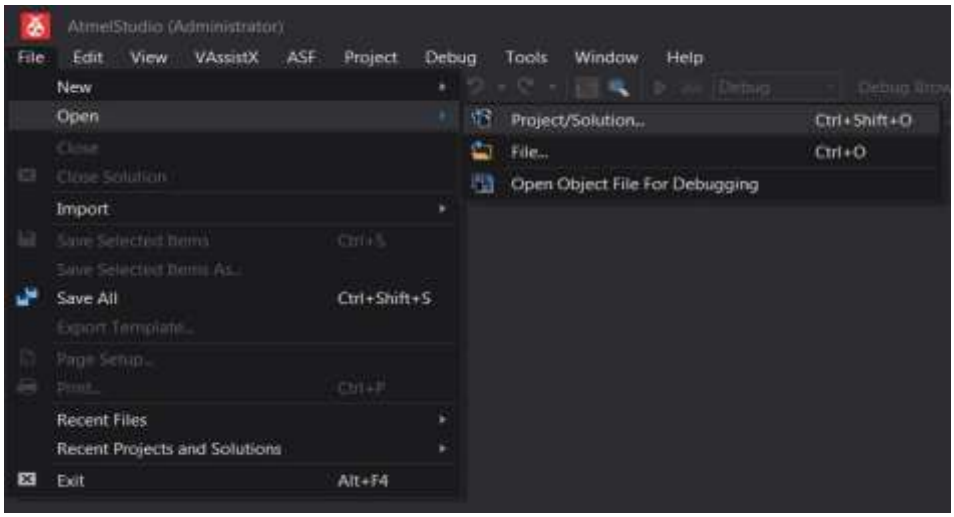
4. Build Procedure

This section describes the build procedure of Multilink-Central demo application on Microchip Studio 7.

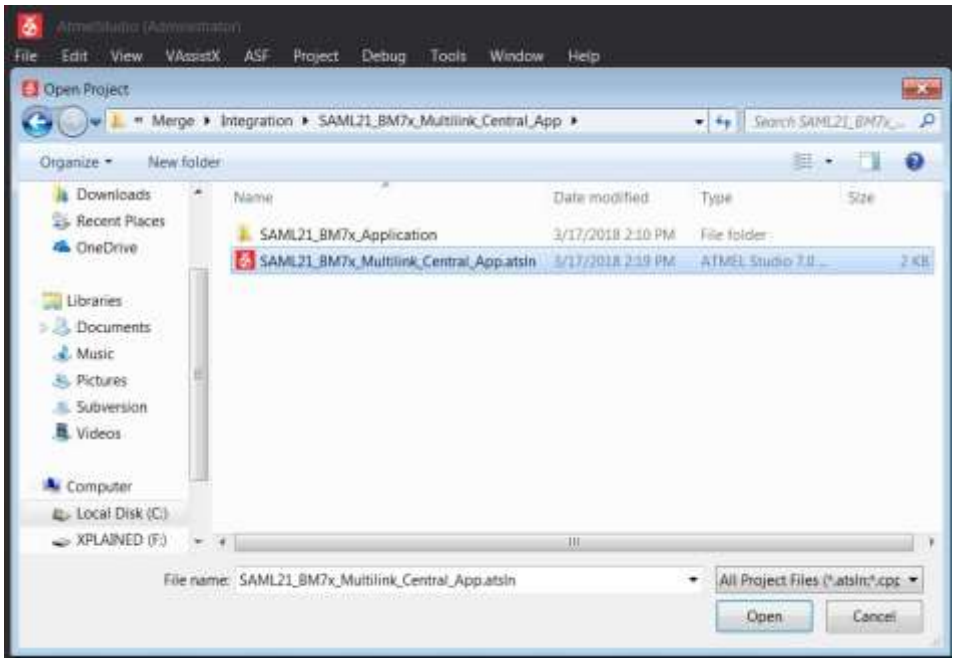
4.1. Open Microchip Studio 7

4.2. Open GAP-Central Demo Application

1. Go to menu **File → Open → Project/Solution.**



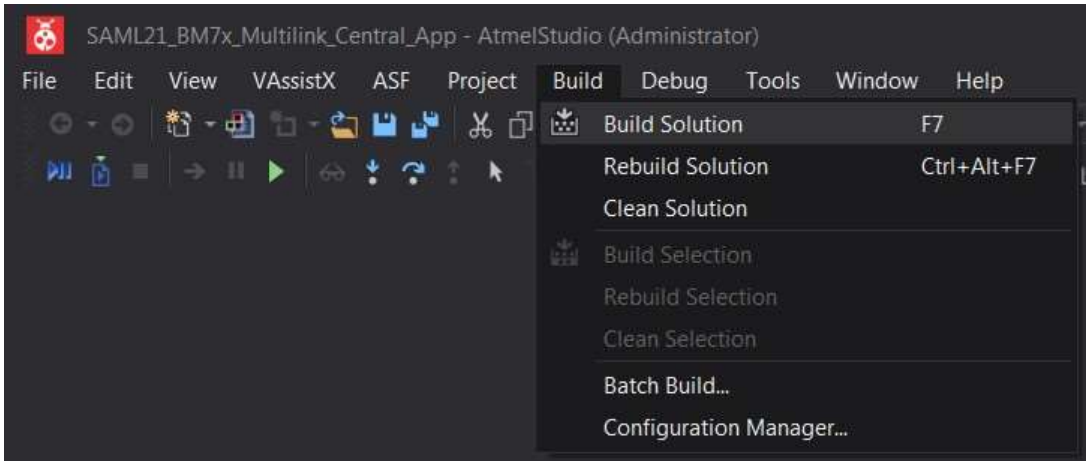
2. Select "SAML21_BM7x_Multilink_Central_App.atsln" and press **Open**.



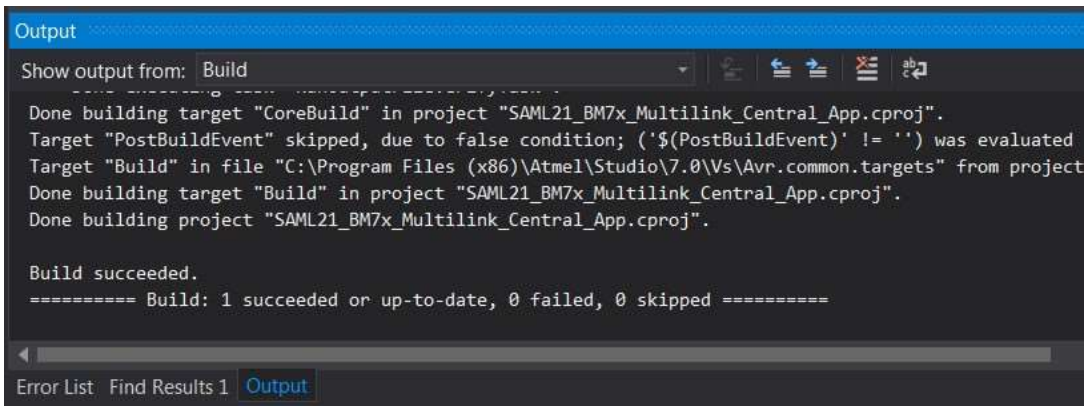
3. Once the project is opened, you can see the files attached to this project in Solution Explorer Window

4.3. Build Multilink-Central Demo Application

1. Go to menu **Build → Build Solution** or Press **F7**



2. Build status can be checked in **Output** window

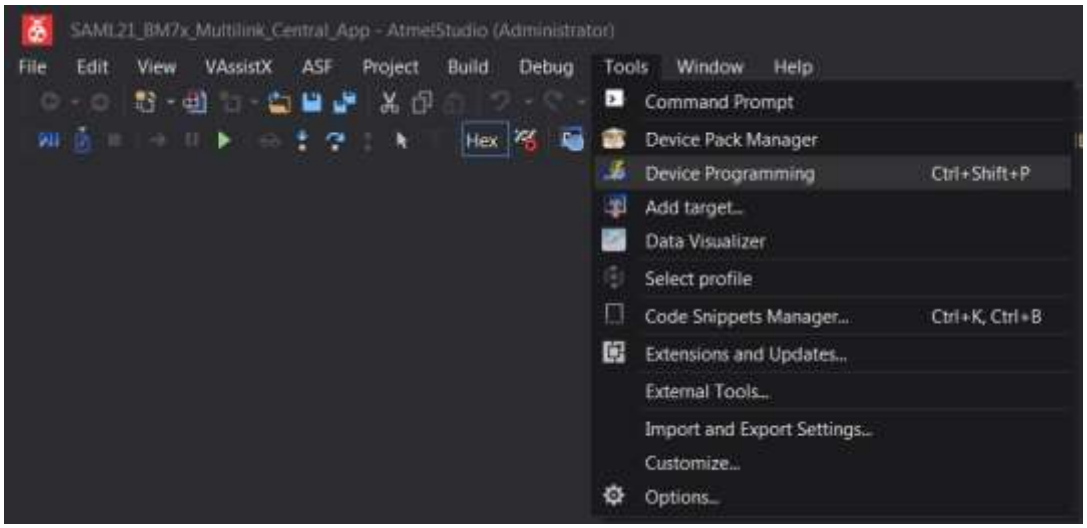


3. You can find the Hex images in "..\SAML21_BM7x_Application\Debug".

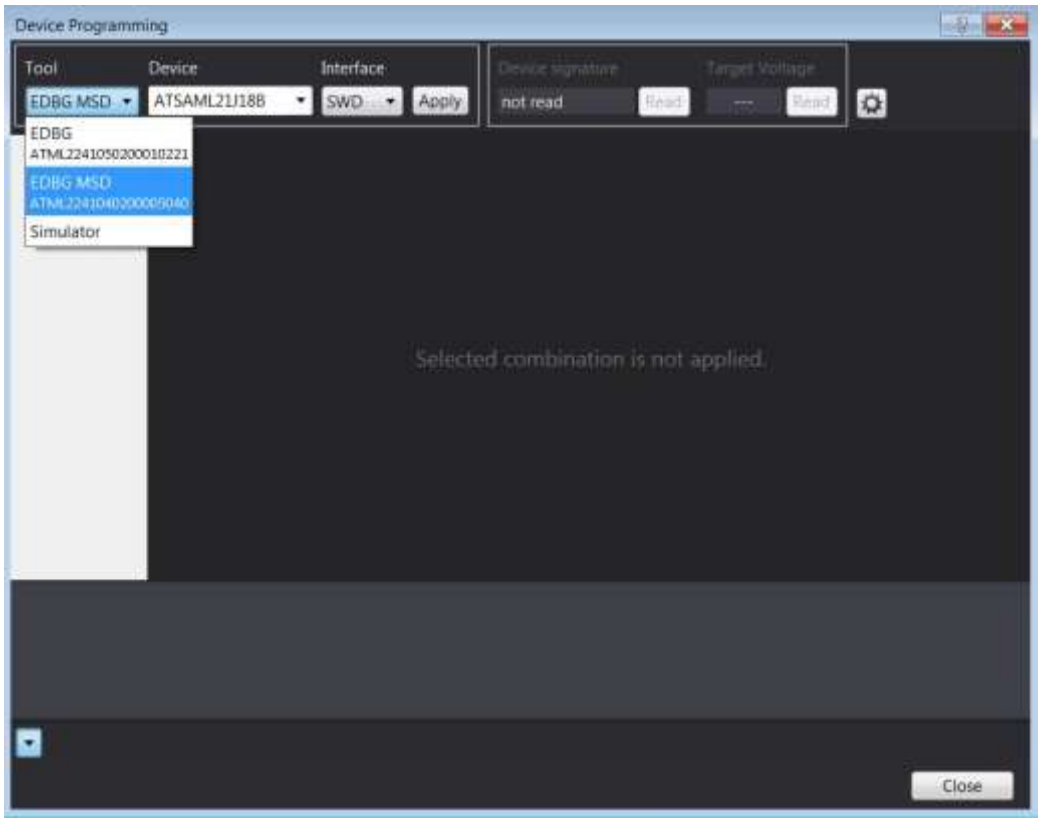
5. Programming Firmware

This section describes the procedure to program Multilink-Central demo firmware on SAML21 Xplained Pro board.

1. Connect the SAML21 Xplained Pro board to the host PC using micro USB cable. Perform the following steps:
    a. Verify that the virtual COM port is enumerated on the host PC.
    b. Make sure that POWER LED (green) is solid ON.
2. To program the HEX files into the SAML21, go to menu **Tools → Device Programming** or Press **Ctrl + Shift + P**.

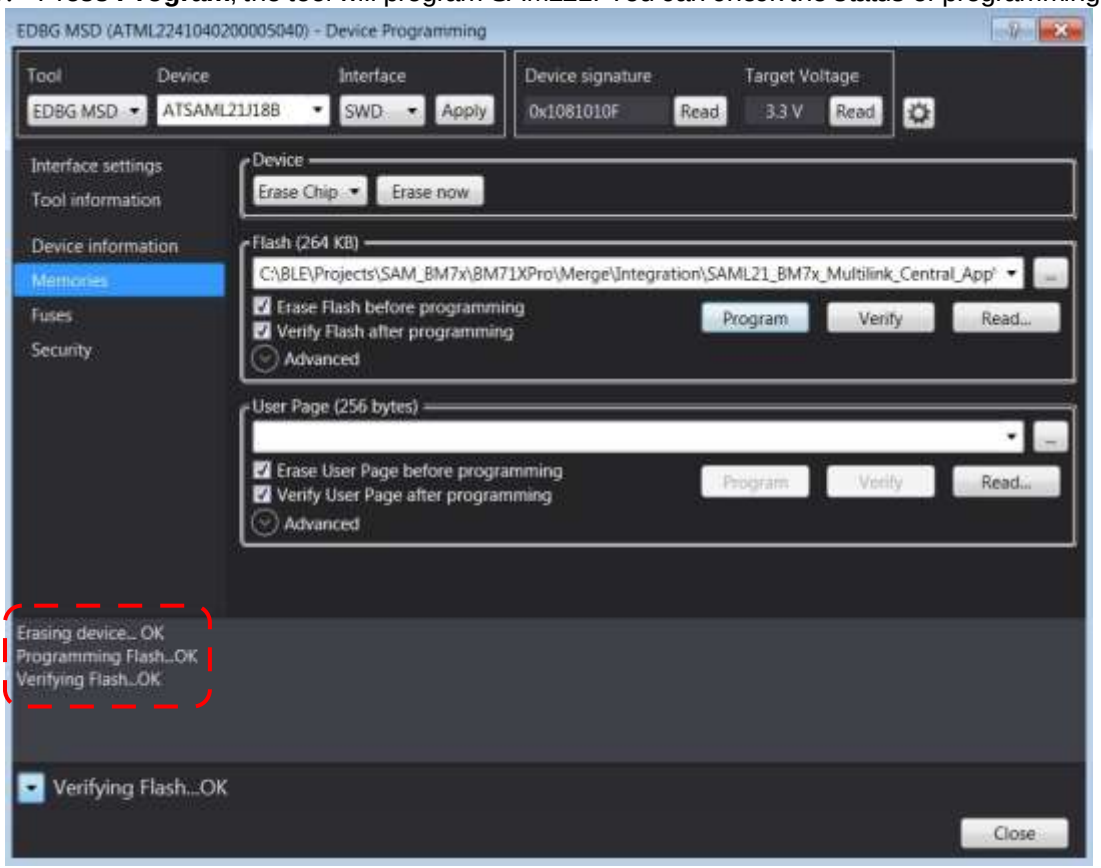


3. Select the corresponding **EDBG** and press **Apply**.



4. Go to **Memories** Tab and select Hex file.

5. Press **Program**, the tool will program SAML21. You can check the status of programming.



6. Once programming is done, close the Device Programming window.

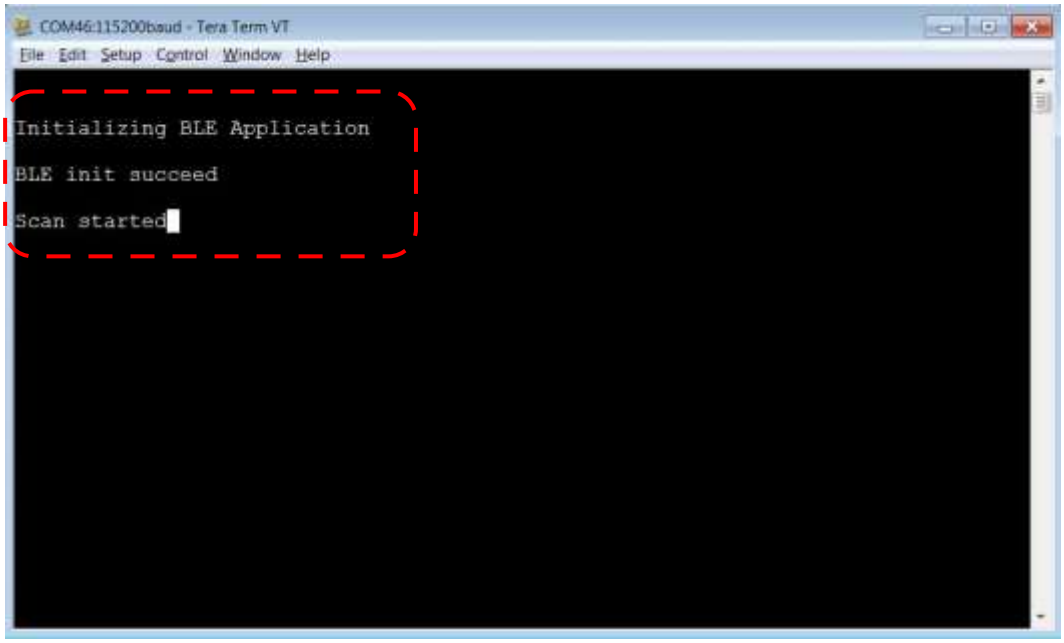
6. Running Multilink-Central Demo

This section describes the Multilink-Central Demo application procedures to work with four GAP-Peripheral devices.

1. Connect BM71-XPro on EXT1 of SAML21 Xplained Pro board (Multilink-Central device).
2. Connect the Multilink-Central device to the host PC using micro USB cable. Perform the following steps:
    a. Verify that the virtual COM port is enumerated on the host PC.
    b. Open the enumerated COM port on a serial console application like TeraTerm with the following settings:

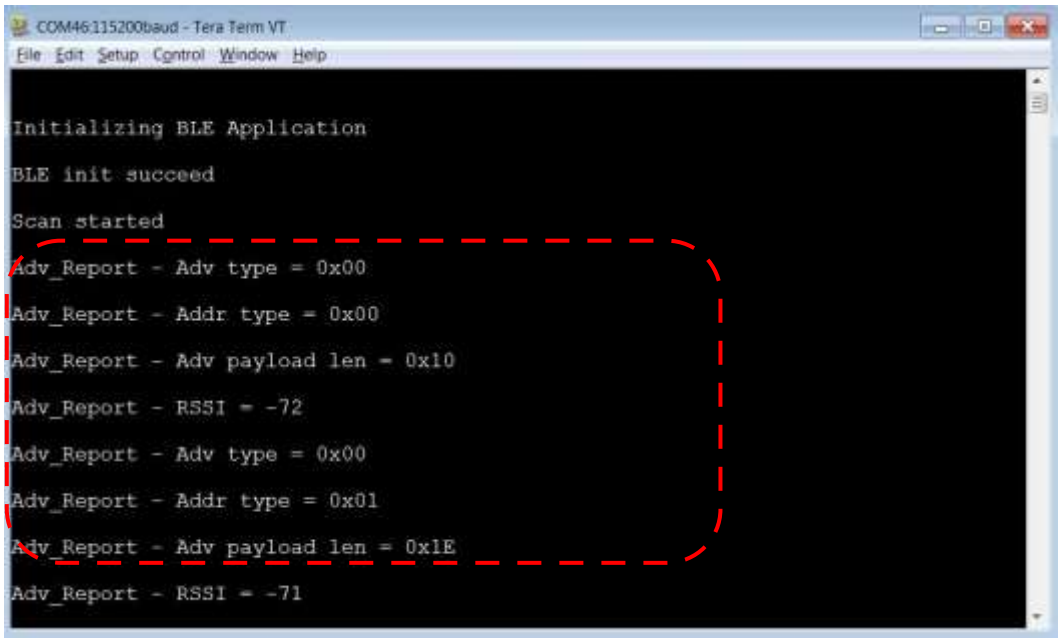
Baudrate	115200
Data	8 bits
Parity	none
Stop	1 bit
Flow control	none

    c. Make sure that POWER LED (green) on SAML21 Xplained Pro board is solid ON.
    d. Press Reset button on SAML21 Xplained Pro board and verify that LD4 (blue) on BM71-XPro is blinking at a regular interval.
3. Ensure that the Multilink-Central device is up and running and start scanning. Check status on a serial console application.



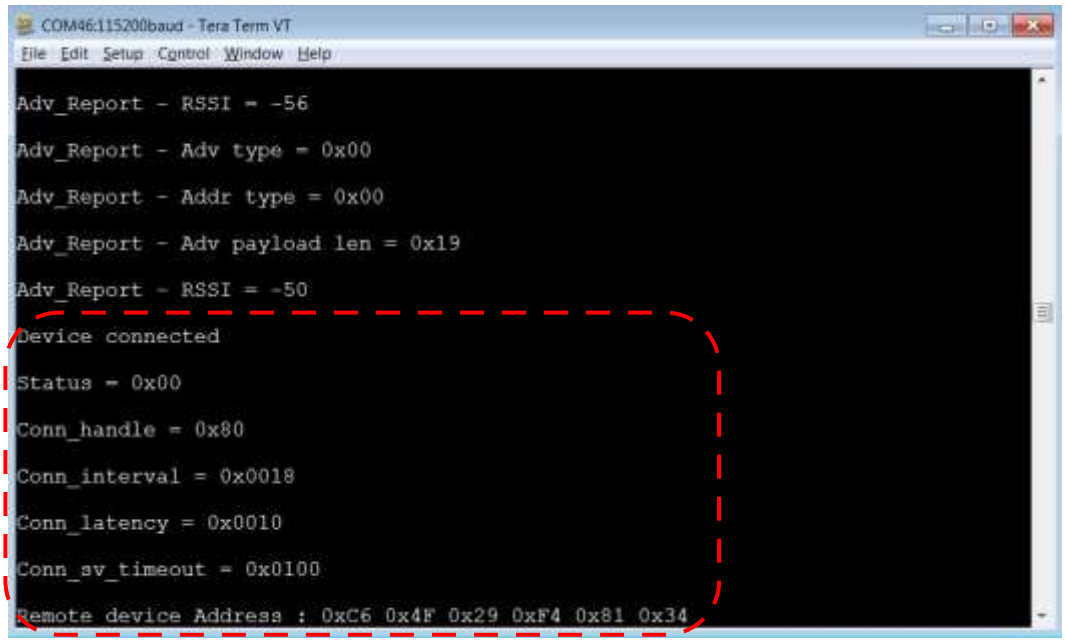
4. Prepare four GAP-Peripheral devices to connect with Multilink-Central device (Refer GAP_Peripheral_Demo_Getting_Started_Guide.doc).

5. Power on first GAP-Peripheral device.
6. As Multilink-Central device when it receives advertisements from devices in vicinity, it prints the advertisement report in serial console.

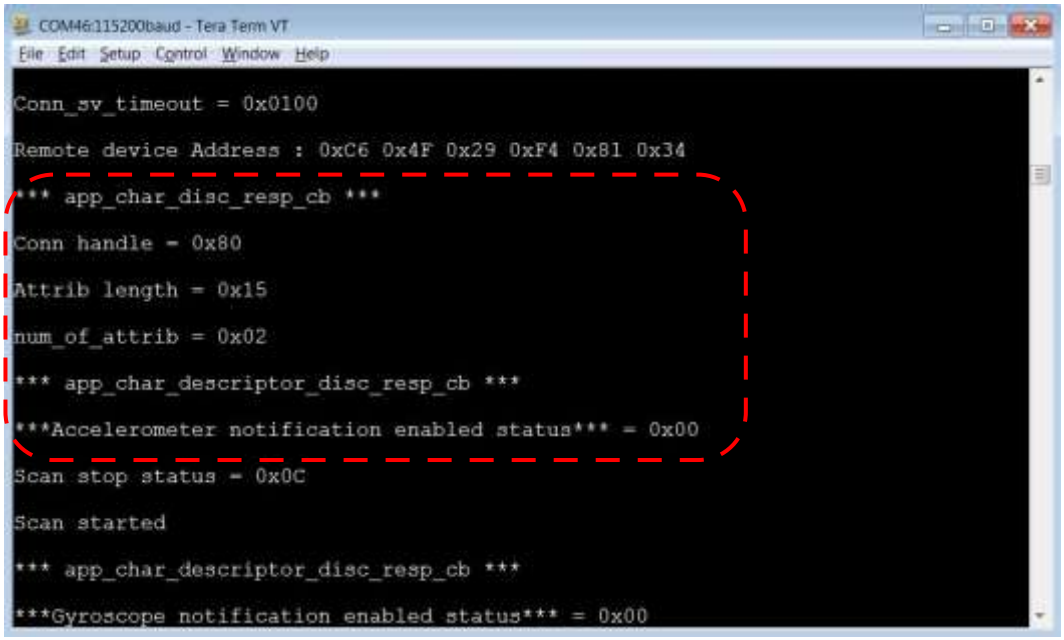


7. Multilink-Central device finds the GAP-Peripheral device based on the advertisement payload and initiates a connection.

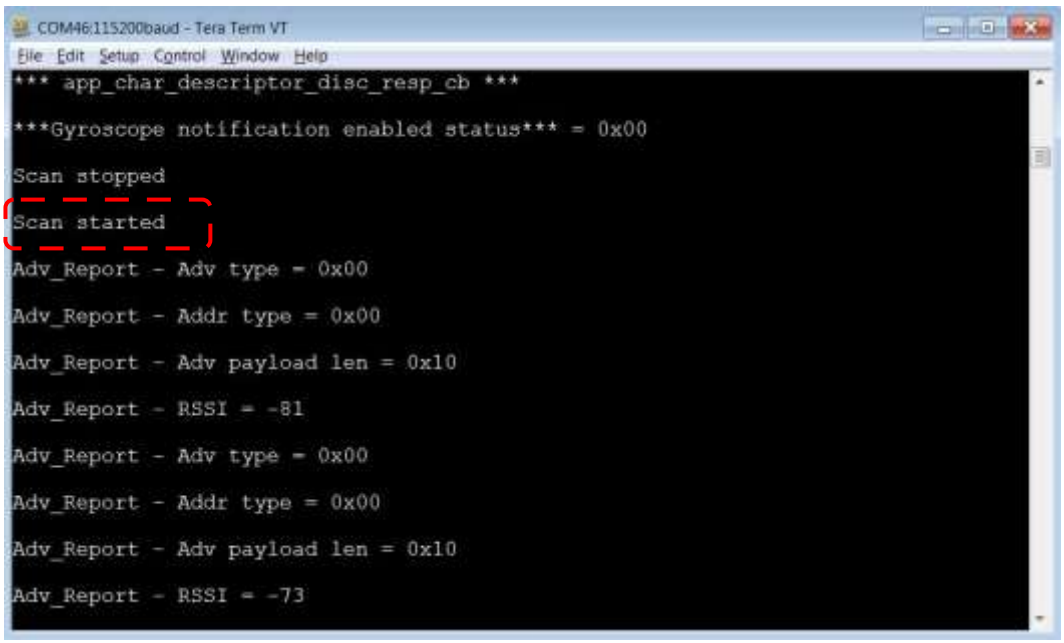
8. Once connected the Multilink-Central device prints the GAP-Peripheral device address and connection parameters in serial console.



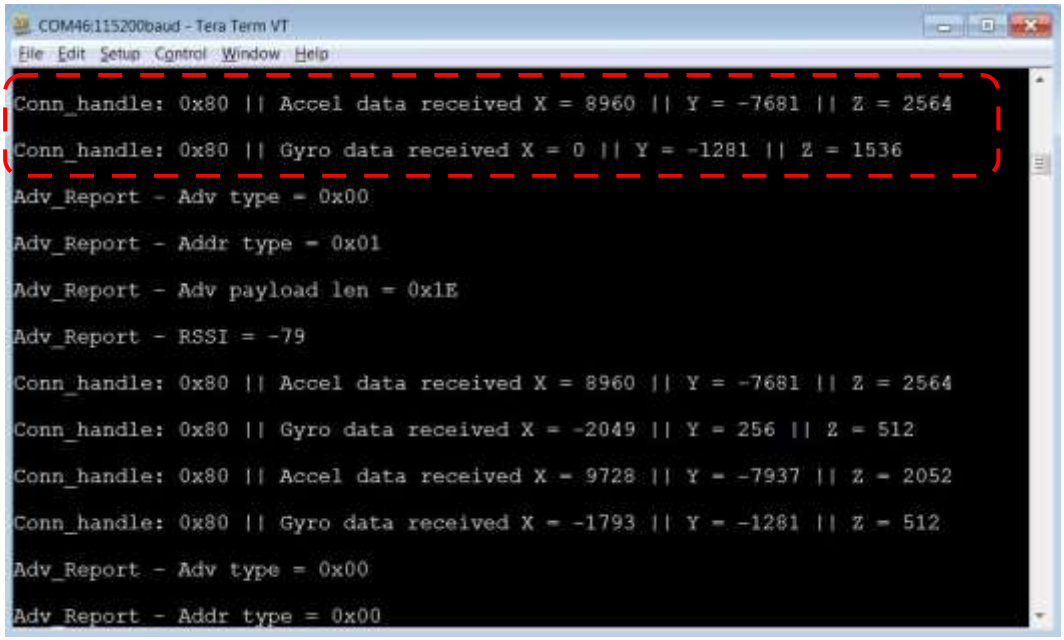
9. Once connected, Multilink-Central device discovers the device orientation service and characteristics in remote device based on the UUID.
10. It also discovers the Client Characteristic Configuration Descriptors (CCCD) of accelerometer and gyroscope sensor characteristics and enabled them to receive notifications.



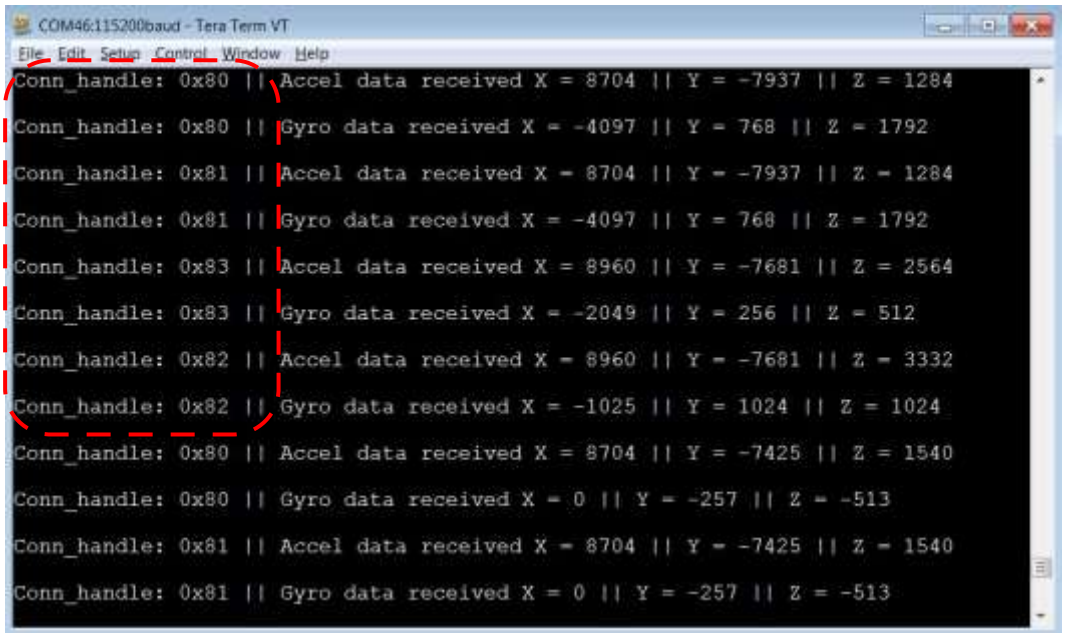
11. Once enable the accelerometer and gyroscope sensor data notifications, Multilink-Central device start scan to find next GAP-Peripheral device.



12. Upon notification enabled by Multilink-Central device, GAP-Peripheral device start notifies the accelerometer and gyroscope sensor data to Multilink-Central device.
13. Multilink-Central devices receive sensor data notifications and print them on serial console along with connection handle.



14. Similarly, power on GAP-Peripheral devices 2, 3 and 4.
15. The Multilink-Central device will find other GAP-Peripheral devices and connect with them. It also discovers the device orientation service and characteristics in remote devices and enable notifications.
16. Finally, Multilink-Central device start receiving data from all four GAP-Peripheral devices and print them on serial console along with connection handles.



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