Multilink-Multirole Demo User’s Guide

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Contents

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1. Overview

This document explains how to setup a Multilink-Multirole demo using SAML21 Xplained Pro, BM71-XPro, BNO055 Click board. This document briefly talks about setting up hardware, building application, programming application and running a demo.

This demo application showcases a Proof-of-Concept example of using **ble_host_sdk** to setup BM71 as a Multilink-Multirole device where it plays both GAP-Central and GAP-Peripheral roles, simultaneously. This demo application uses custom GATT service to share accelerometer and gyroscope sensor data with remote device.

The following table provides the list of supported 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

1.1. Hardware Setup

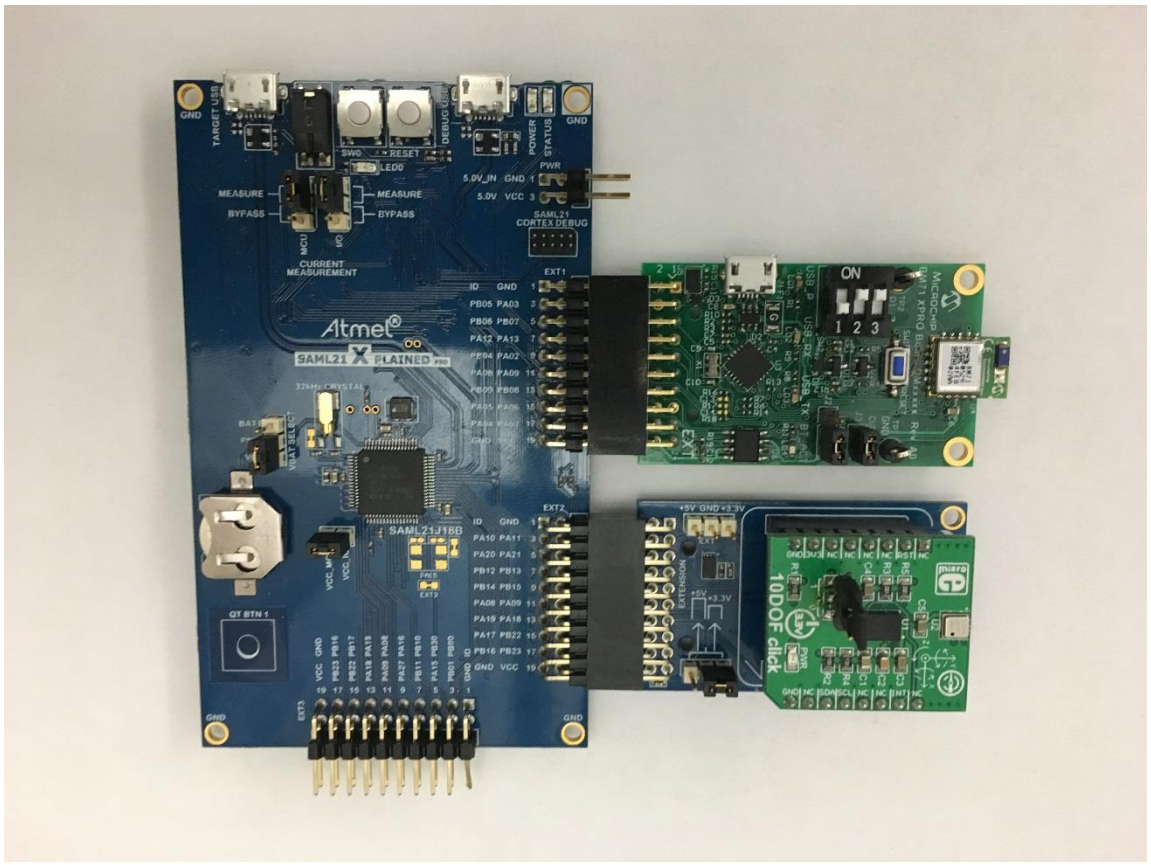


Figure 1: SAML21 Xplained Pro with BM71-XPro and MikroElektronika BNO055 Click Board

1. Plugin the BM71-XPro board into EXT1 of SAML21 Xplained Pro board as shown in Figure 1.
2. MikroElektronika BNO055 Click Board is used in this demo.
    a. You can find more details here, http://www.mikroe.com/click/10dof/
3. Plug-in the Click board adapter into the EXT2 of SAML21 Xplained Pro as shown in Figure 1.
4. Plug-in the Click board into the Click board adapter as shown in Figure 1.
5. Connect the SAML21 Xplained Pro board to the host PC using micro USB cable.

1.2. Smart Phone Application

You can download the BLESensorApp for Android or iOS phones from the following link.

Android:
https://play.google.com/store/apps/details?id=com.microchip.blesensorapp&hl=en

1.3. Console

The Multilink-Multirole demo application uses the Universal Asynchronous Receiver/Transmitter (UART) interface on SAML21 Xplained Pro to send the status messages like Advertising, Connected, Disconnected … etc. Any serial application (ex: TeraTerm) can be used to interact with SAML21 Xplained Pro.

Use the following serial port configuration to interact with BM71.

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

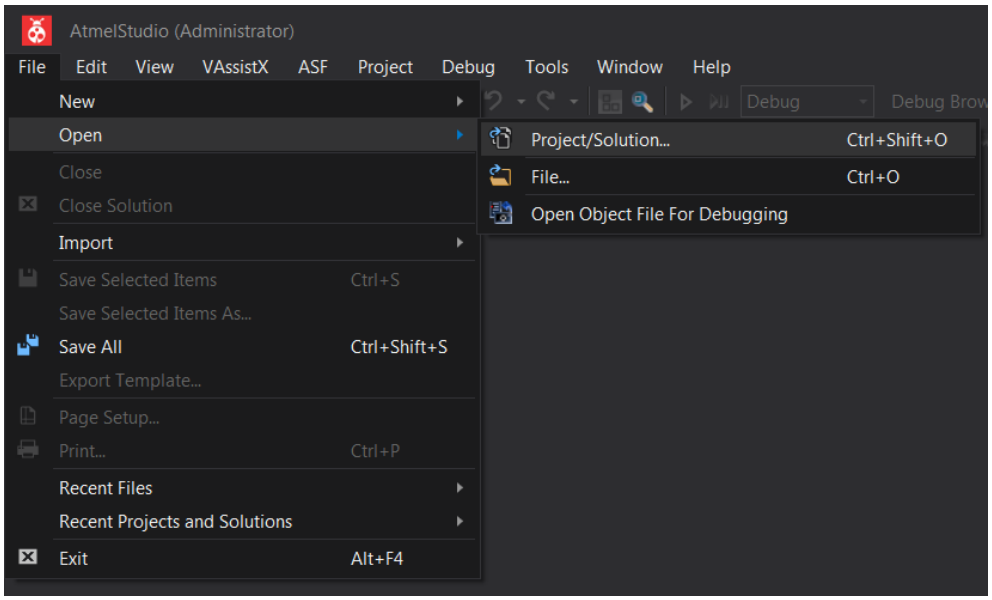
2. Build Procedure

This section describes the build procedure of Multilink-Multirole demo application on Atmel Studio 7.

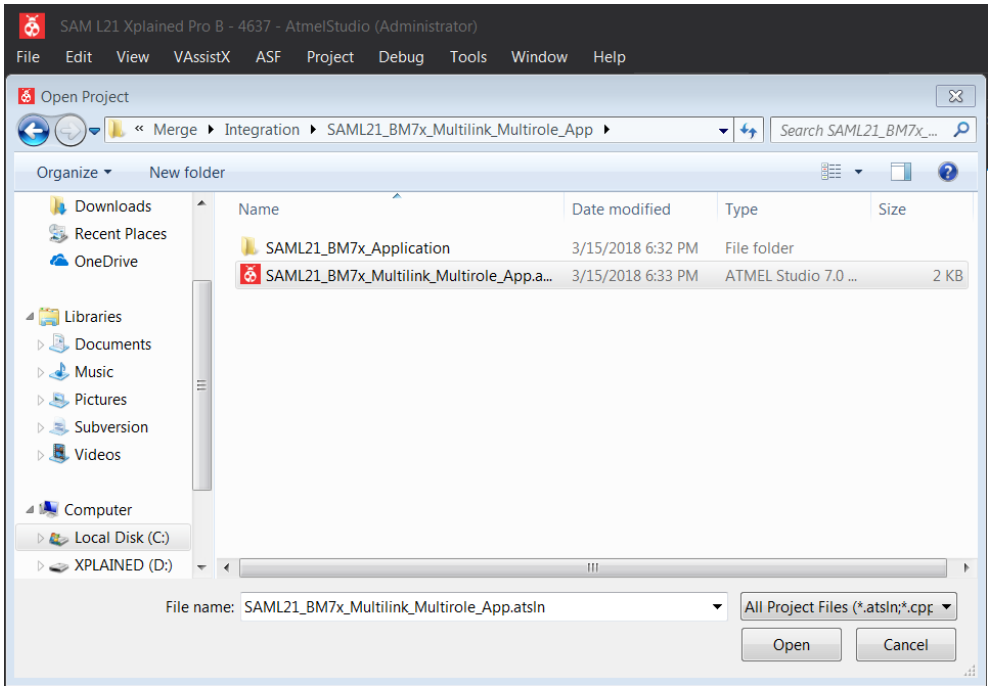
2.1. Open Atmel Studio 7

2.2. Open Multilink-Multirole Demo Application

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



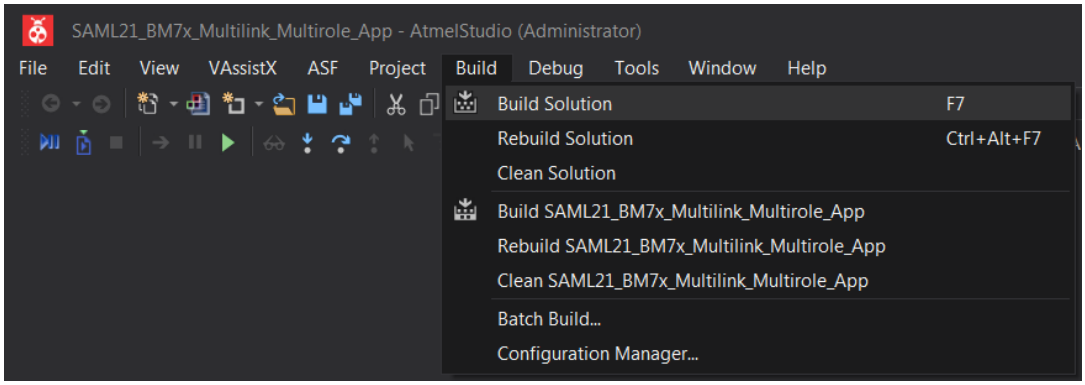
2. Select "SAML21_BM7x_Multilink_Multirole_App.atsln" and press **Open**.



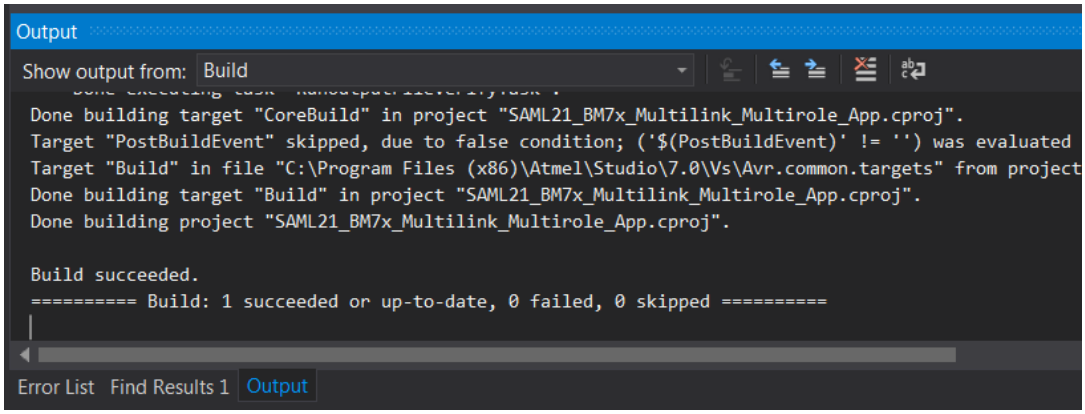
3. Once the project is opened, you can see the files attached to this project in Solution Explorer Window

2.3. Build Multilink-Multirole Demo Application

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



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

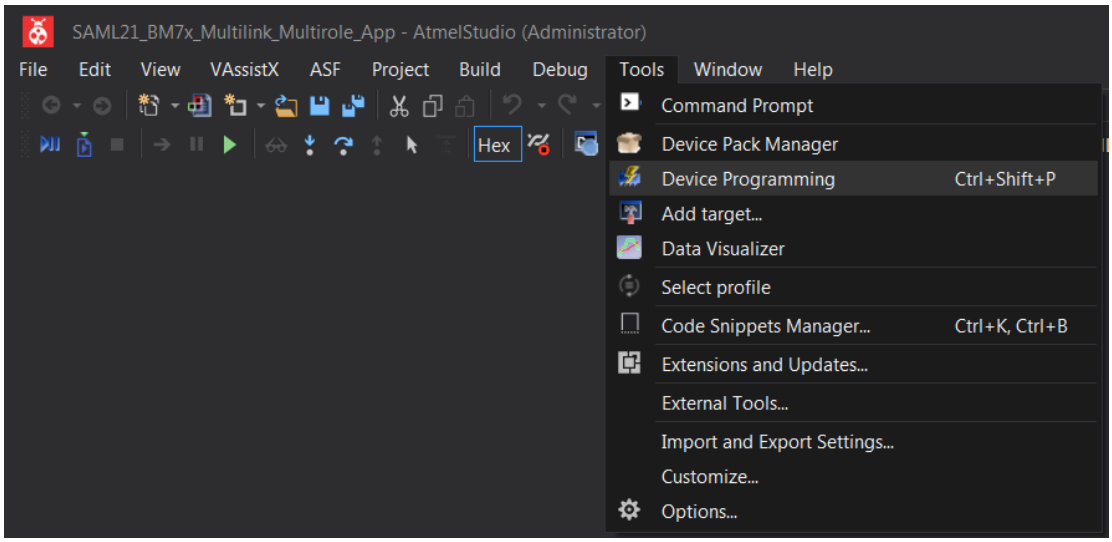


3. You can find the Hex images in "..\SAML21_BM7x_Application\Debug".

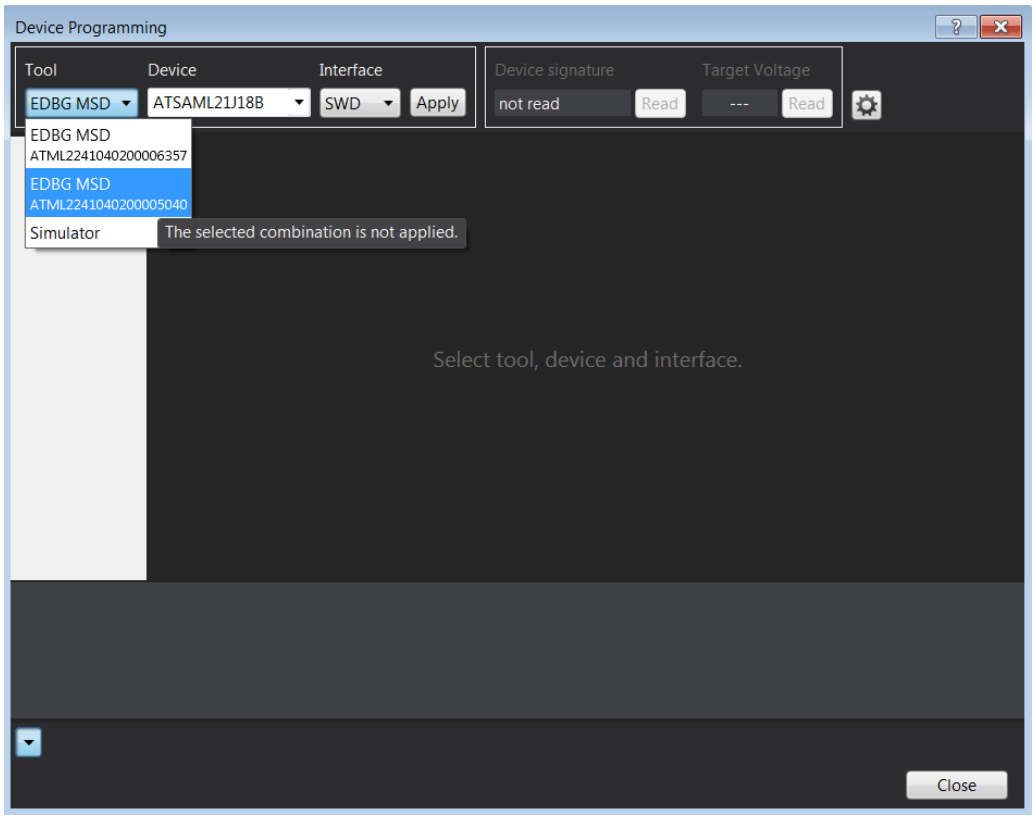
3. Programming Multilink-Multirole Firmware

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

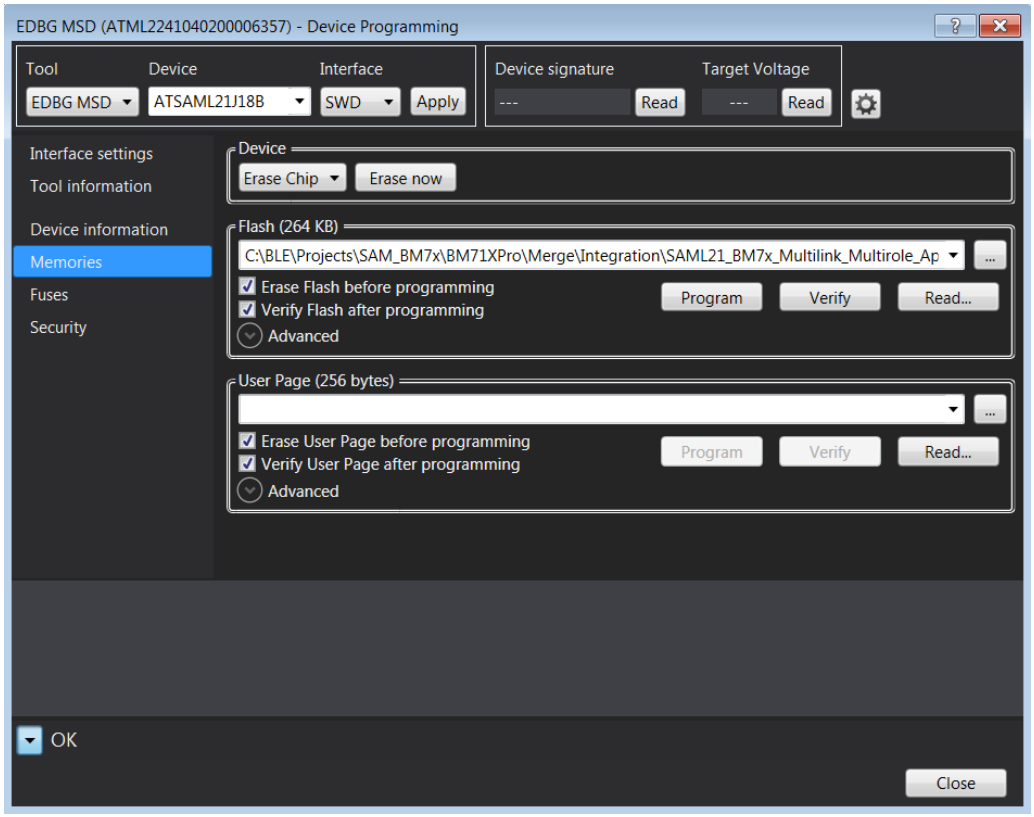
1. Connect the SAML21 Xplained Pro board to the host PC using micro USB cable. Perform the following steps:
    a. Verify that the virtual COM port is enumerated on the host PC.
    b. Make sure that POWER LED (green) is solid ON.
2. To program the HEX files into the SAML21, go to menu **Tools → Device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



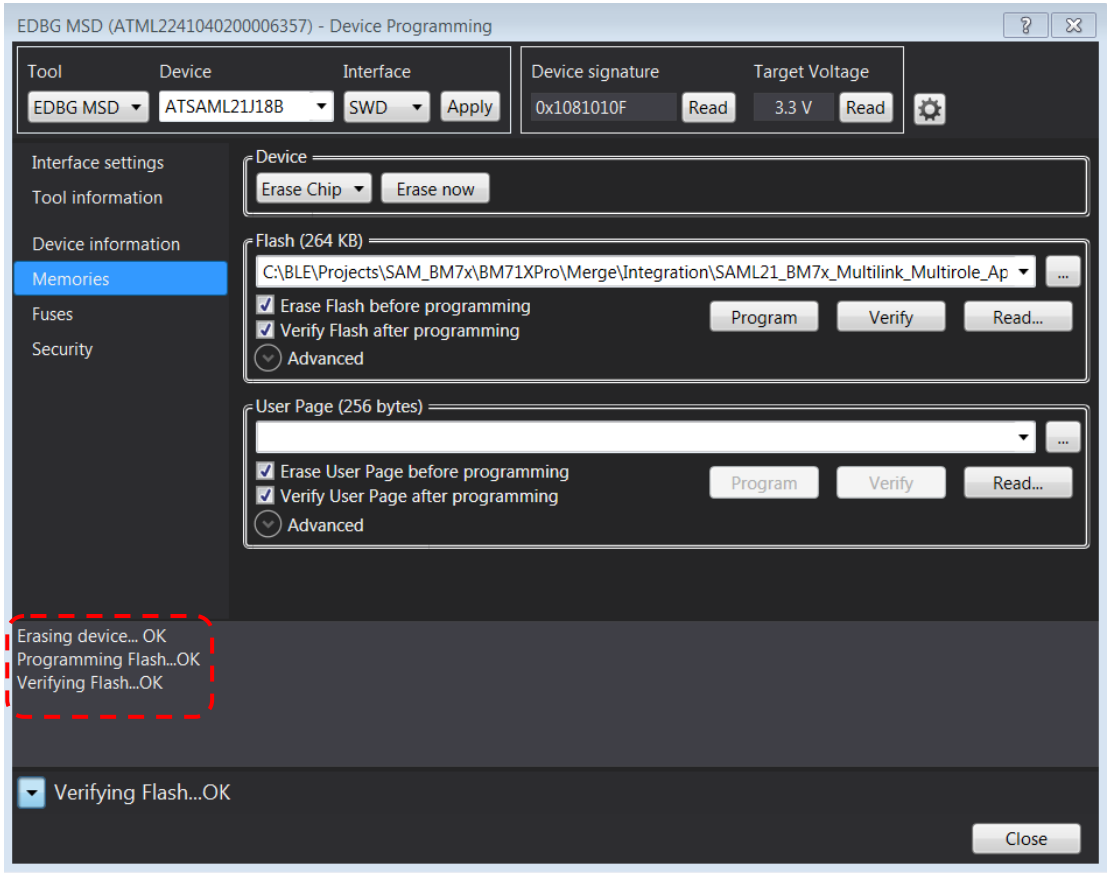
3. Select the corresponding **EDBG** and press **Apply**.



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



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

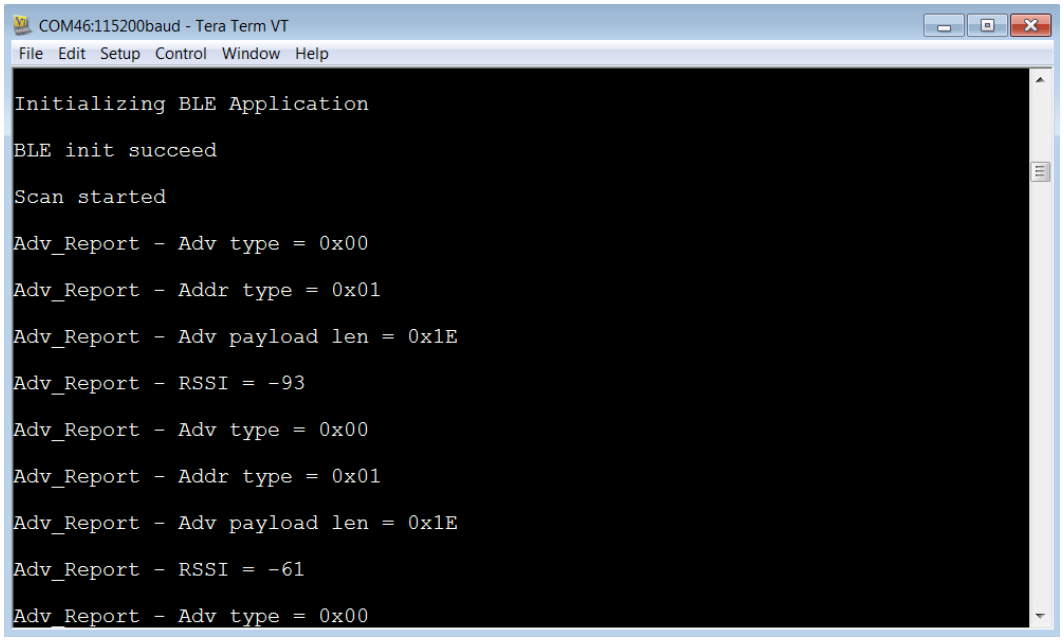


6. Once programming is done, close the Device Programming window.

4. Running Multilink-Multirole Demo

In this demo the Multilink-Multirole device plays both GAP-Central and GAP-Peripheral roles. First the device will play a GAP-Central role and it scans and connects with remote GAP-Peripheral device. Once connected Multilink-Multirole device will play a GAP-Peripheral role and it starts advertising and further accept connection from remote GAP-Central device.

1. After programming the demo, press a reset button on Multilink-Multirole device (Reset button on SAML21 Xplained Pro board).
    a. Make sure that POWER LED (green) on SAML21 Xplained Pro board is solid ON and the LD4 (blue) on BM71-XPro is blinking at a regular interval.
2. Ensure that the Multilink-Multirole device is scanning by checking the TeraTerm window for a message "Scan started".



3. Prepare a GAP-Peripheral device (Refer: GAP_Peripheral_Demo_Getting_Started_Guide.doc)
4. Connect the GAP-Peripheral 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 terminal application like TeraTerm with the following settings:

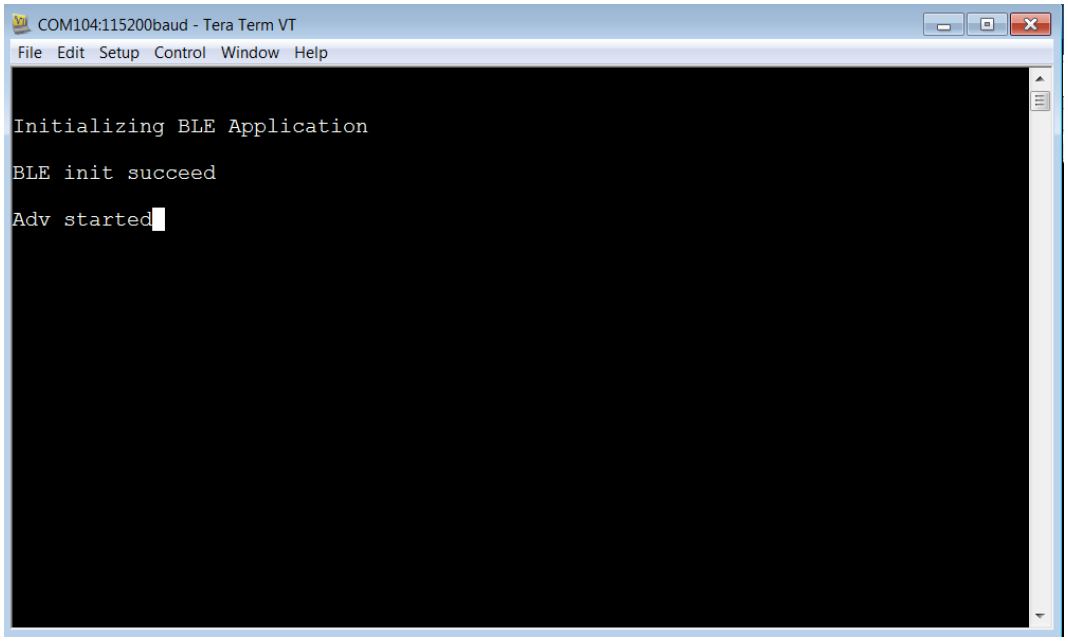
Baudrate	115200
Data	8 bits
Parity	none
Stop	1 bit

Flow control	none

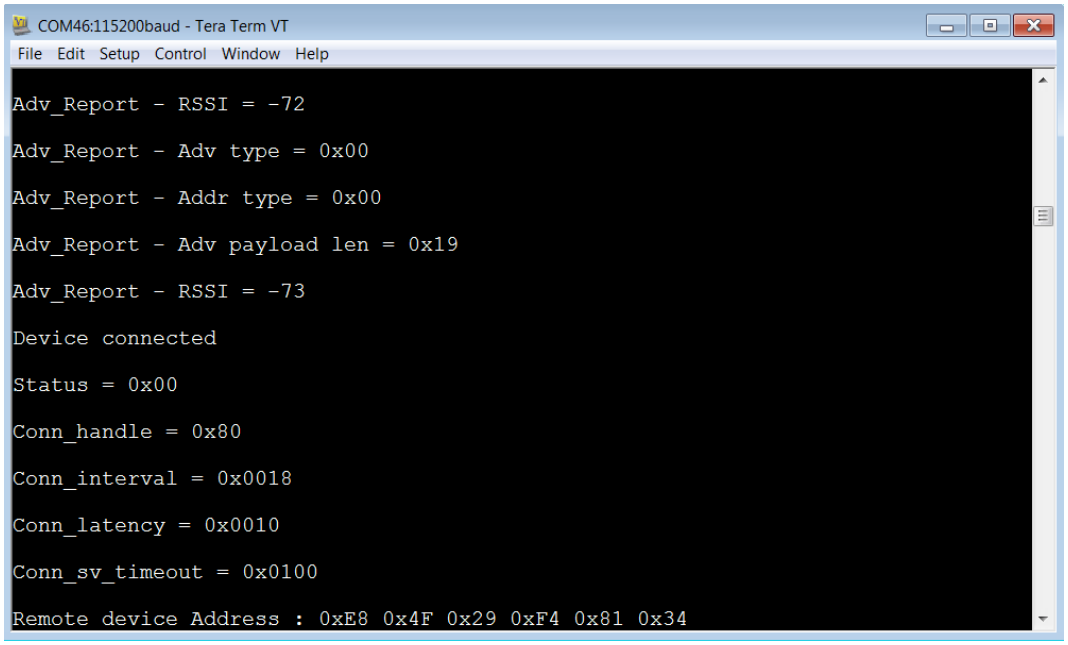
c. Make sure that POWER LED (green) on SAML21 Xplained Pro board is solid ON.

d. Press Reset button on SAML21 Xplained Pro board and verify that LD4 (blue) on BM71-XPro is blinking at a regular interval.

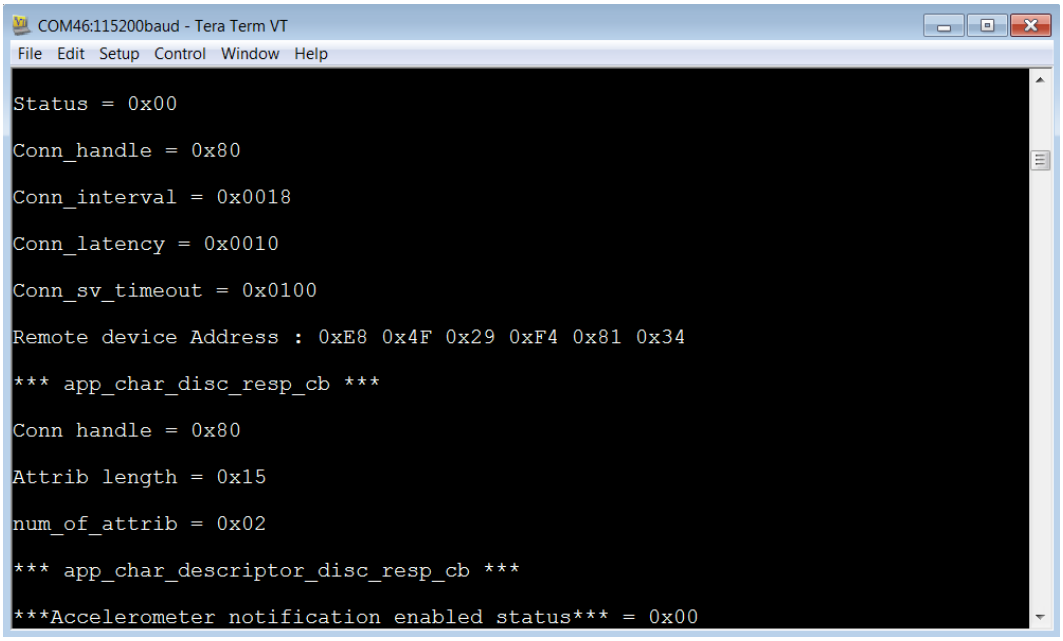
5. Ensure that the GAP-Peripheral device is advertising by checking the TeraTerm window for a message "Adv started".



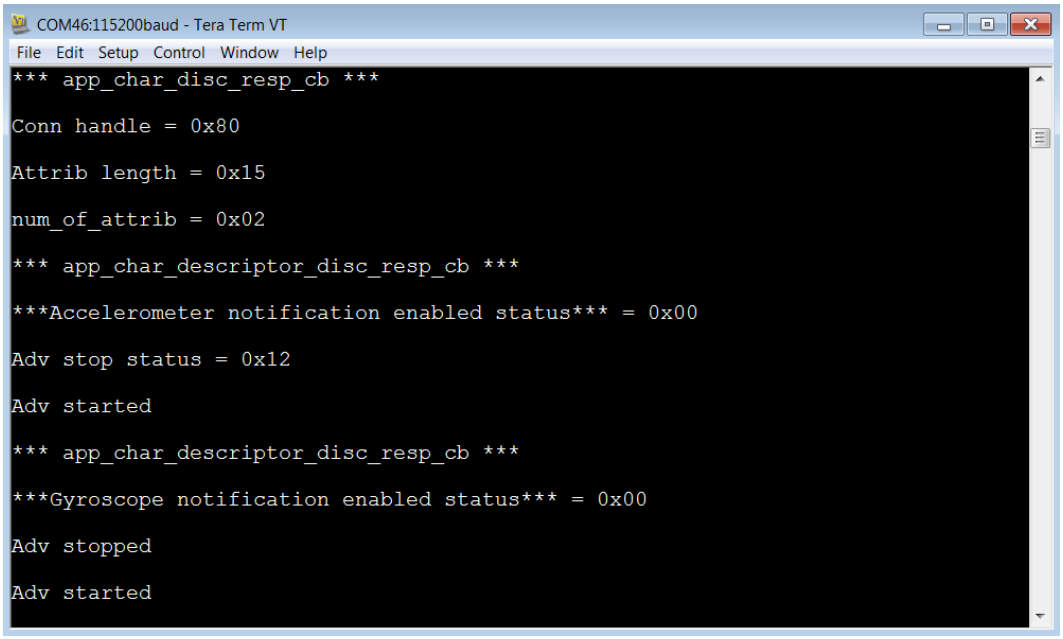
6. Multilink-Multirole device which is currently scanning will initiate a connection with GAP-Peripheral device, if it discovers GAP-Peripheral device and the advertising parameter matches its requirement.



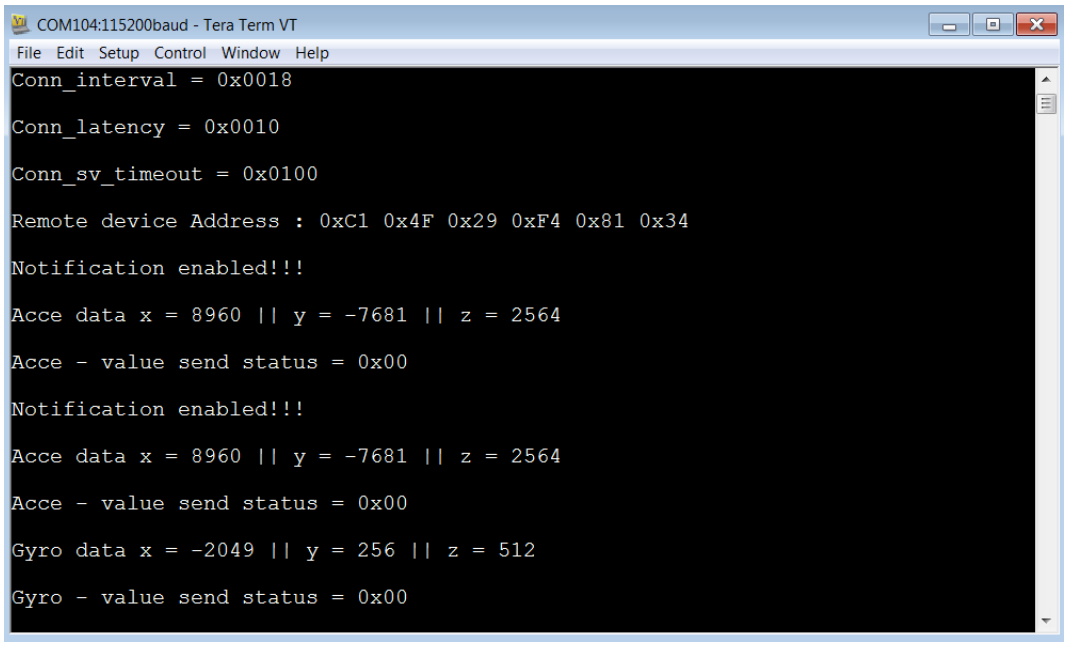
7. Once connected, the Multilink-Multirole device initiates service discovery and look for device orientation service.



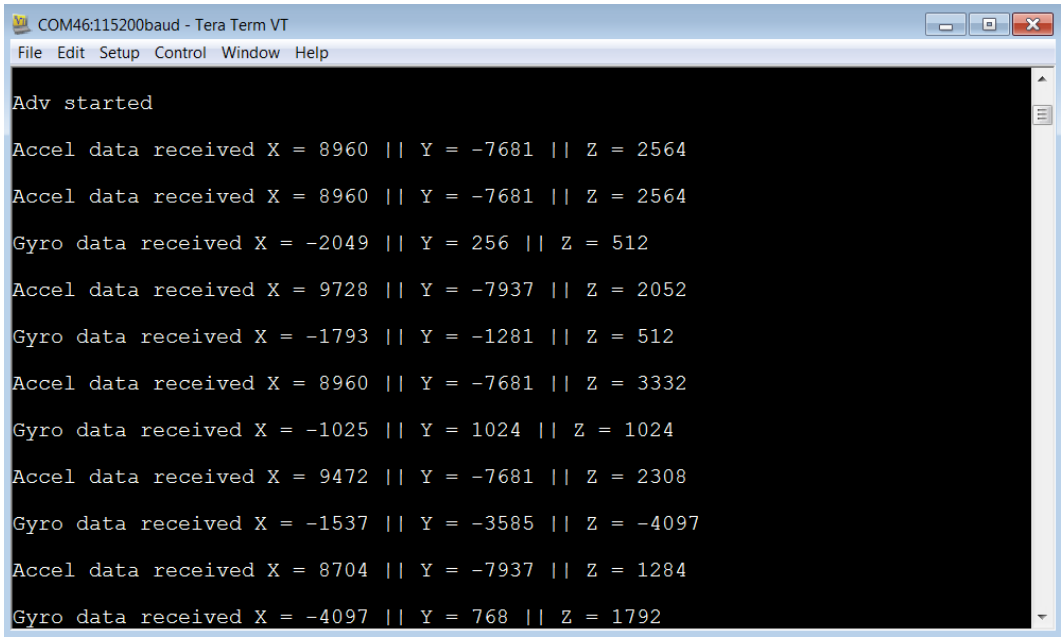
8. When the Multilink-Multirole device discovers the device orientation service and its characteristics, it enables notifications on the accelerometer and gyroscope sensor characteristics.



9. At this stage, Multilink-Multirole device will start advertising. So that the remote GAP-Central device can connect with Multilink-Multirole device.
10. Once the accelerometer and gyroscope sensor characteristics notifications enabled, the GAP-Peripheral device start sending accelerometer and gyroscope sensor data.



11. Upon receiving sensor data notifications, the Multilink-Multirole device print them on serial console.



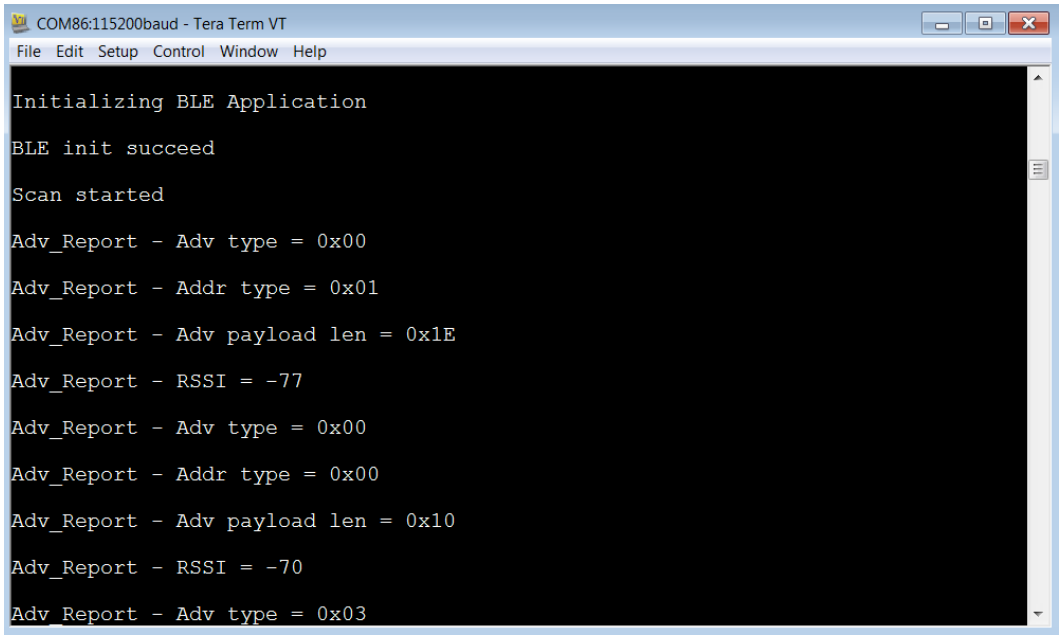
12. Prepare a GAP-Central device (Refer: GAP_Central_Demo_Getting_Started_Guide.doc)
13. Connect the GAP-Central device to the host PC using micro USB cable. Perform the following steps:
    a. Verify that the virtual COM port is enumerated on the host PC.
    b. Open the enumerated COM port on a serial terminal application like TeraTerm with the following settings:

Baudrate	115200

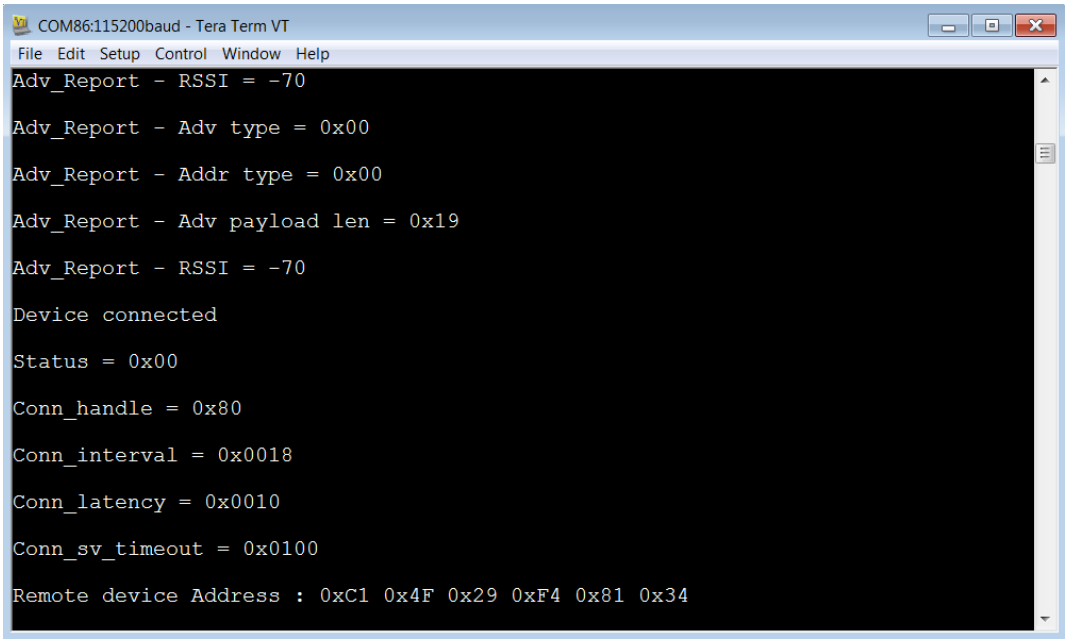
Data	8 bits
Parity	none
Stop	1 bit
Flow control	none

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.

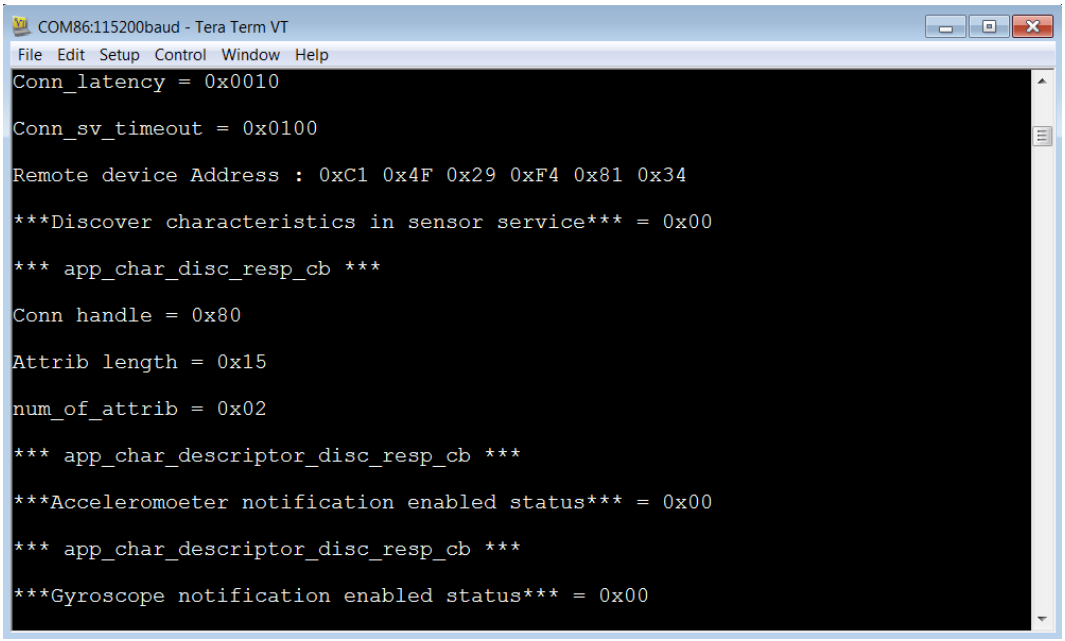
14. Ensure that the GAP-Central device is scanning by checking the TeraTerm window for a message "Scan started".

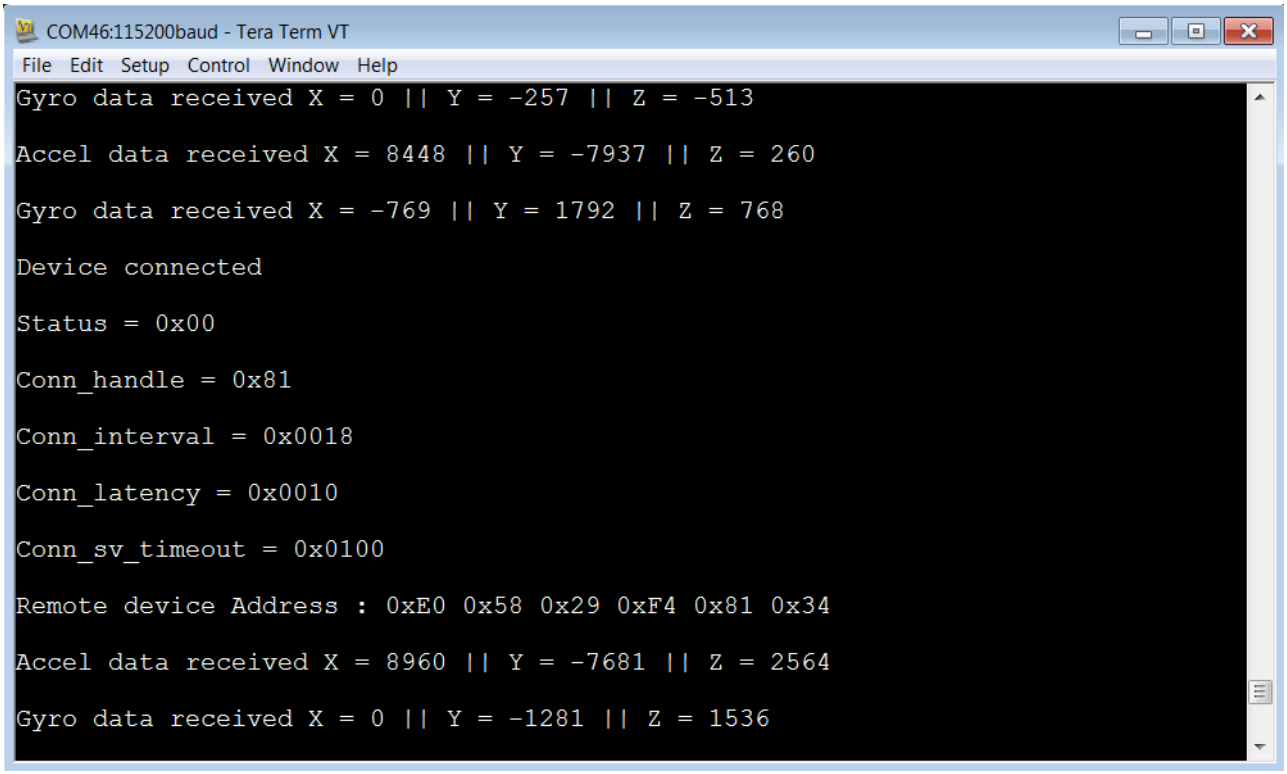


15. GAP-Central device which is currently scanning will initiate a connection with Multilink-Multirole device, if it discovers Multilink-Multirole device and the advertising parameter matches its requirement.

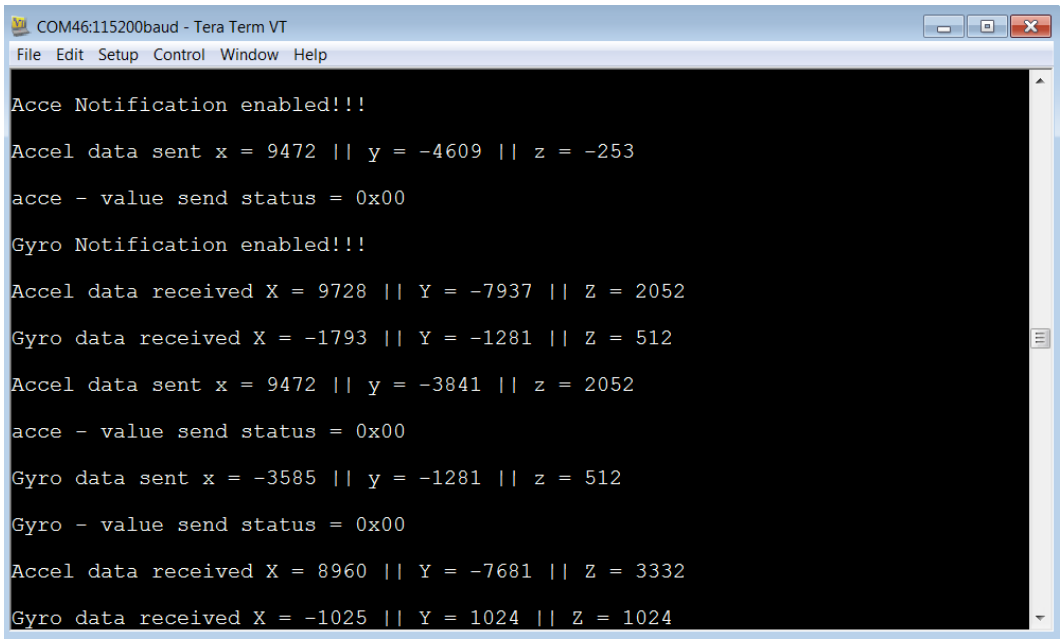


16. Once connected, the GAP-Central device initiates service discovery and look for device orientation service.

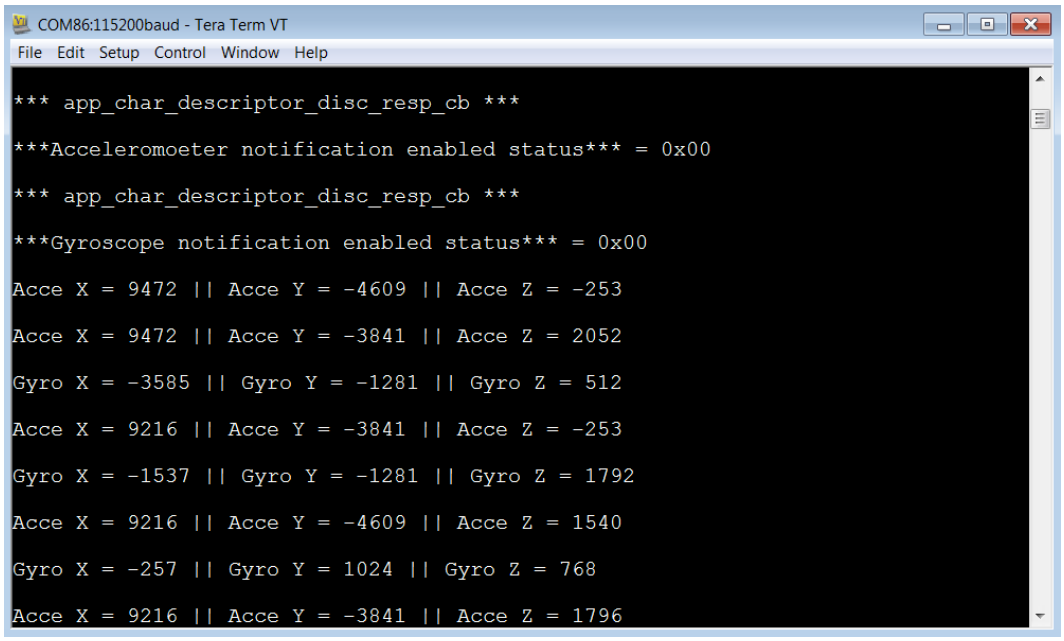




17. When the GAP-Central device discovers the device orientation service and its characteristics in Multilink-Multirole device, it enables notifications on the accelerometer and gyroscope sensor characteristics.
18. Once the accelerometer and gyroscope notifications enabled, the Multilink-Multirole device start sending accelerometer and gyroscope sensor data.



19. Upon receiving sensor data notifications, the GAP-Central device prints them on serial console.



20. In this demo, the GAP-Central device can be replaced by BLESensorApp (iOS)

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