



# **Transparent UART Demo User's Guide**

# Transparent\_UART\_Demo\_User's\_Guide

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## 1. Overview

This document explains how to setup an Transparent UART demo using SAML21 Xplained Pro, BM71 - XPro and Smart phone. 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 Transparent UART pipe. This demo application uses predefined Transparent UART service to send and receive user data with remote device.

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

Name	UUID	Properties	Size (bytes)
Transparent UART Service (Predefined)	0x49535343FE7D4AE58FA99FAFD205E455	-	-
Transparent TX Characteristic (Predefined)	0x495353431E4D4BD9BA6123C647249616	Notify, Write, Write without response	6
Transparent RX Characteristic (Predefined)	0x49535343884143F4A8D4ECBE34729BB3	Write, Write without response	6

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## 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:



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- 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.'

System Setup | System Setup2 | LE Mode Setup | GATT Service Table | LED Setup | Beacon Setup

Device Information

--- Name Fragment  [32 characters] [Help](#)

Uart Setting

--- HCI Baud Rate Index  [Help](#)

--- H/W Flow Control

--- Rx Notify Length  (0x00~0xFF)

--- UART RX\_IND

--- UART Parity

--- Parity Mode

--- Stop Bit

Operation Mode Setting

--- Operation Pattern  [Help](#)

--- Configure Mode Timeout

[Previous](#) [Next](#) [Finish](#)

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## 3. Hardware Setup

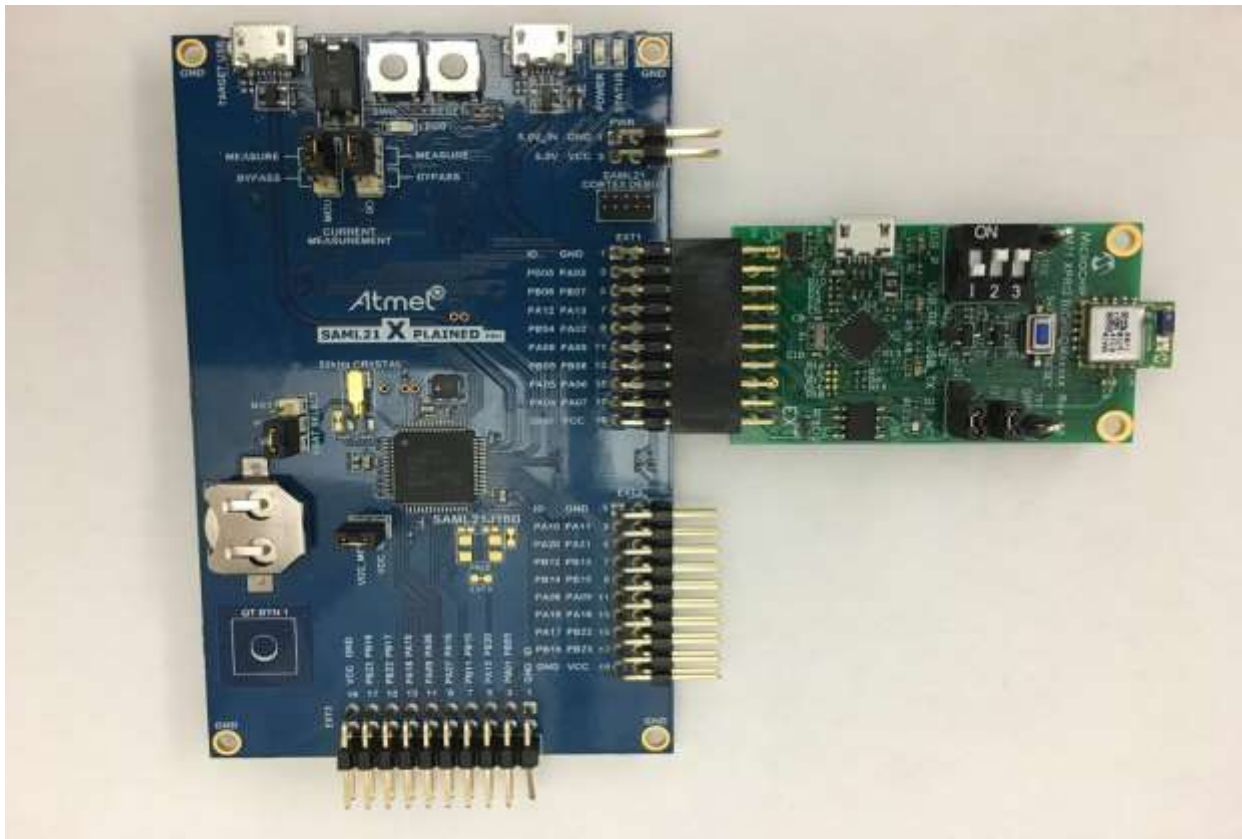


Figure 1: SAML21 Xplained Pro with BM71-XPro

1. Plug in 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 Transparent UART demo application uses the Universal Asynchronous Receiver/Transmitter (UART) interface on SAML21 Xplained Pro to get a user input and print the data received from remote device. Any serial application (ex: TeraTerm) can be used to interact with SAML21 Xplained Pro.

UART (COM port) Settings,

<b>Baud rate</b>	115200
<b>Data</b>	8 bits
<b>Parity</b>	none
<b>Stop</b>	1 bit
<b>Flow control</b>	none

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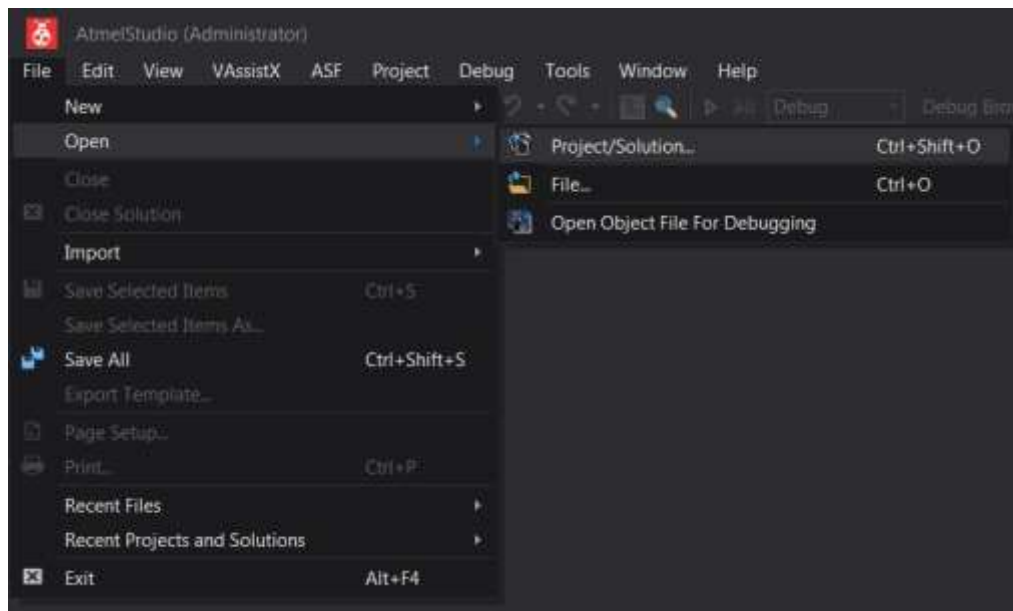
## 4. Build Procedure

This section describes build procedure of Transparent UART demo application on Microchip Studio 7.

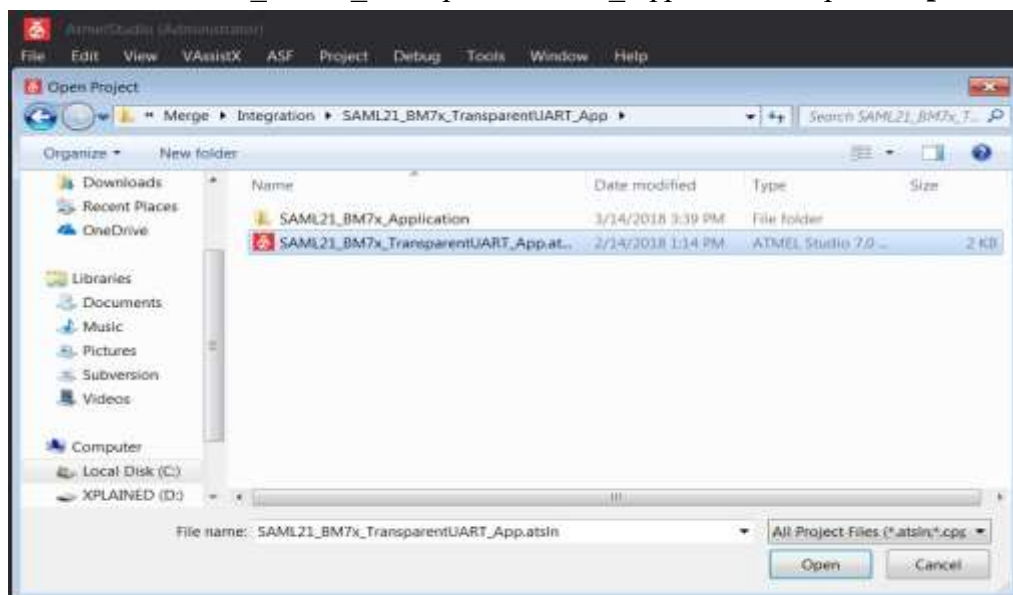
### 4.1 Open Microchip Studio 7

### 4.2 Open Transparent UART Demo Application

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



2. Select “SAML21\_BM7x\_TransparentUART\_App.atsln” and press **Open**.



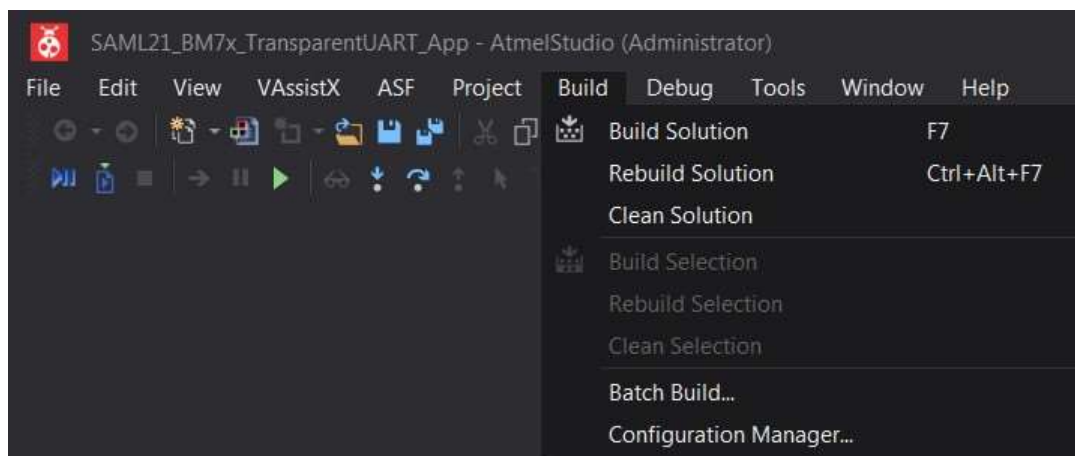
3. Once the project is opened, you can see the files attached to this project in Solution Explorer Window

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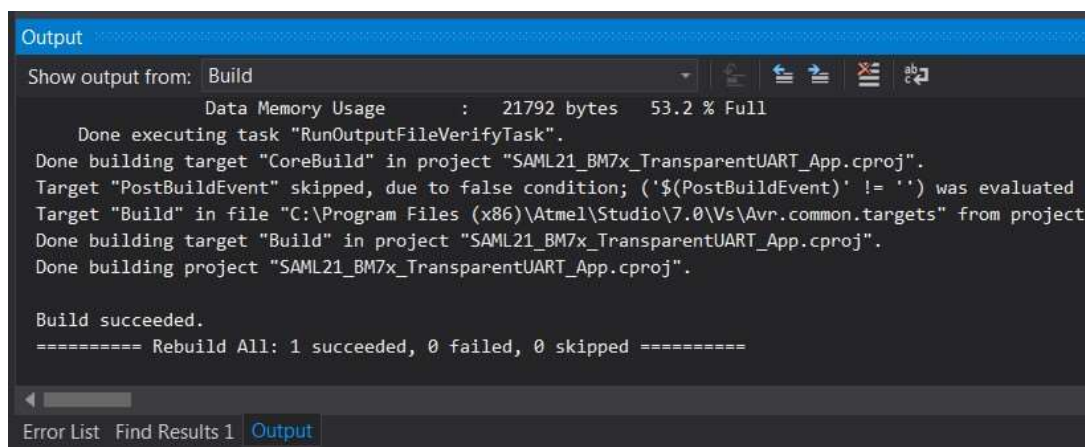
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## 4.3 Build Transparent UART Demo Application

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

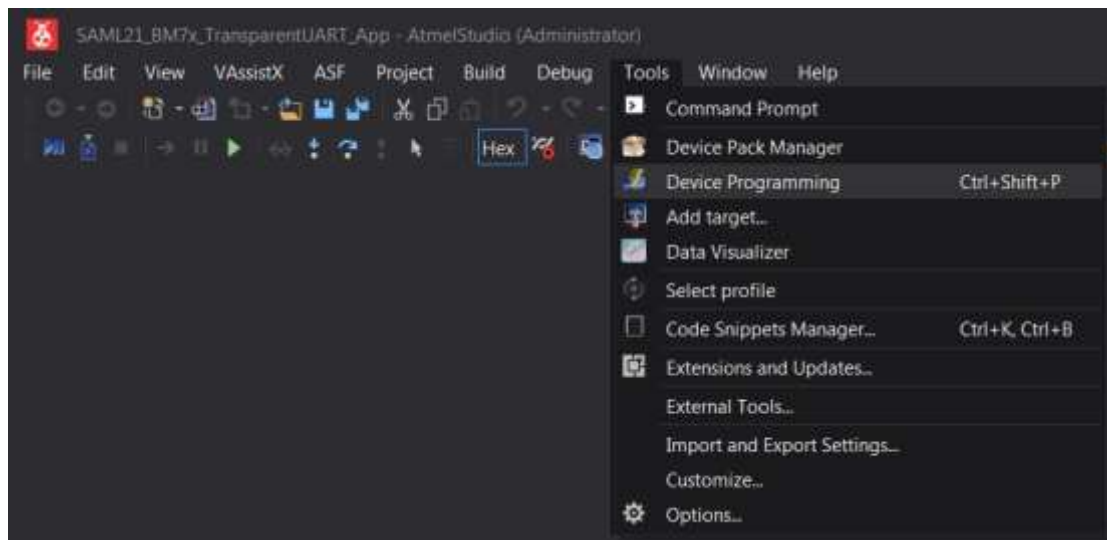
This section describes the procedure to program Transparent UART demo firmware on SAML21 Xplained Pro board.

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**.

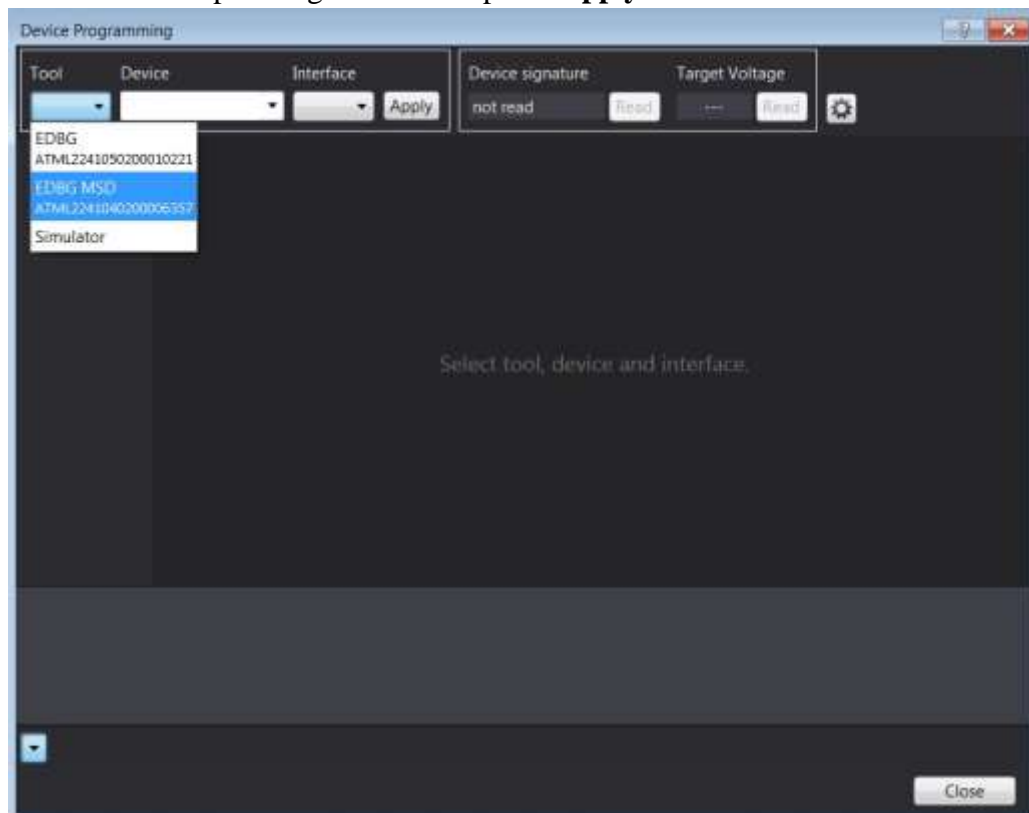


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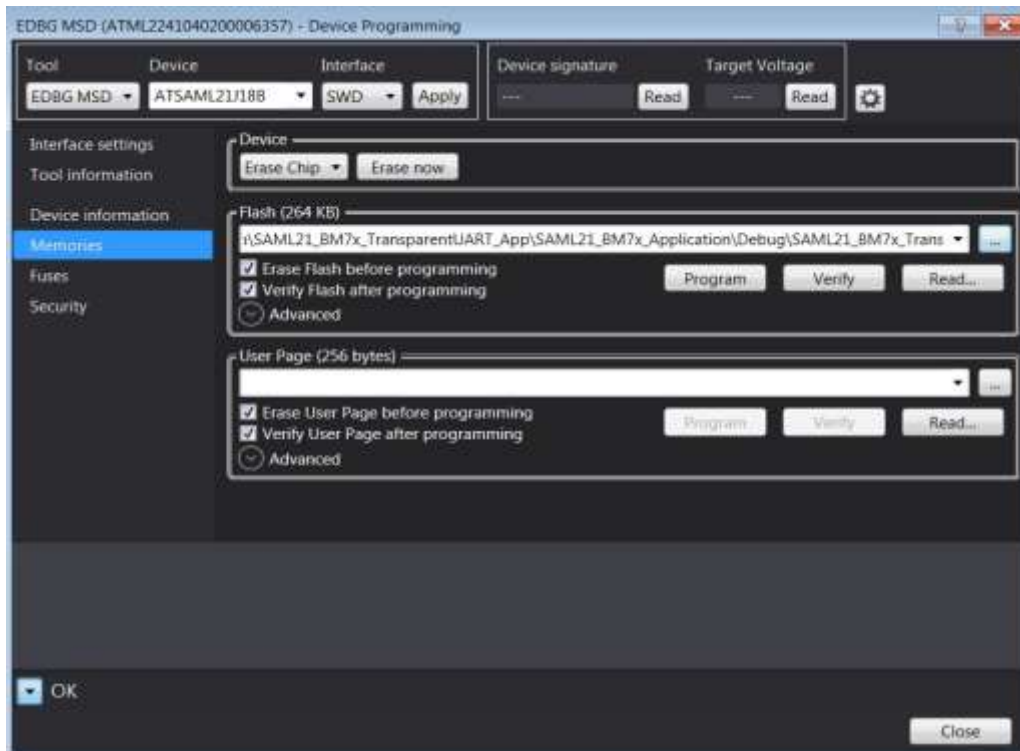


3. Select the corresponding **EDBG** and press **Apply**.

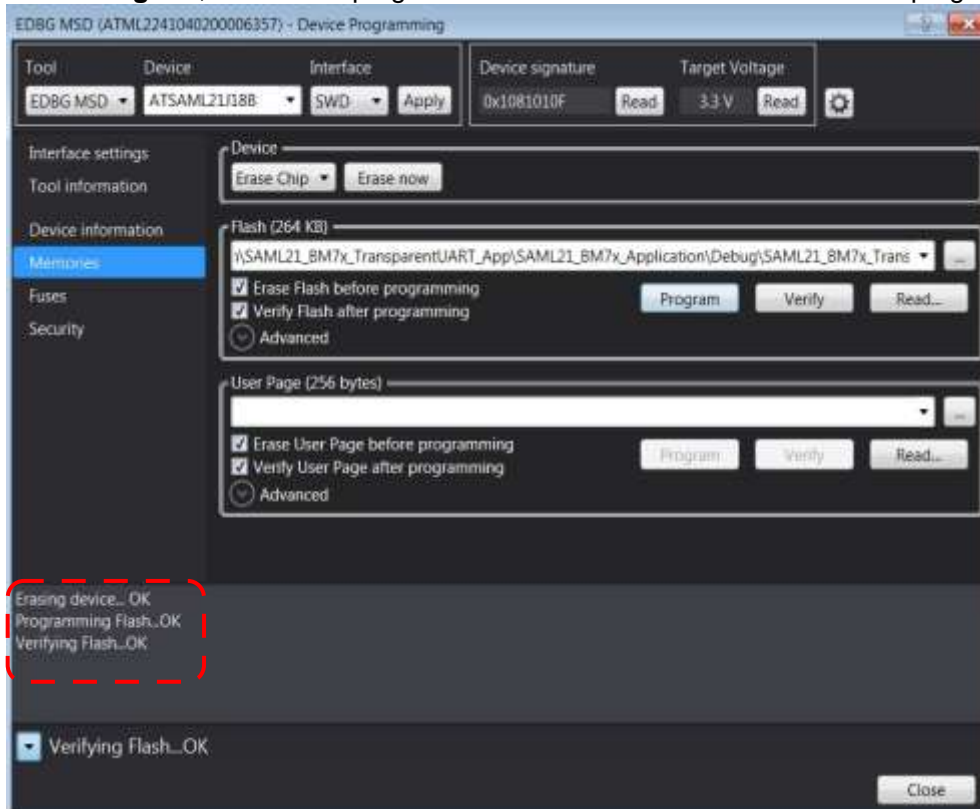


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4. Go to **Memories** Tab and select Hex file.



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.

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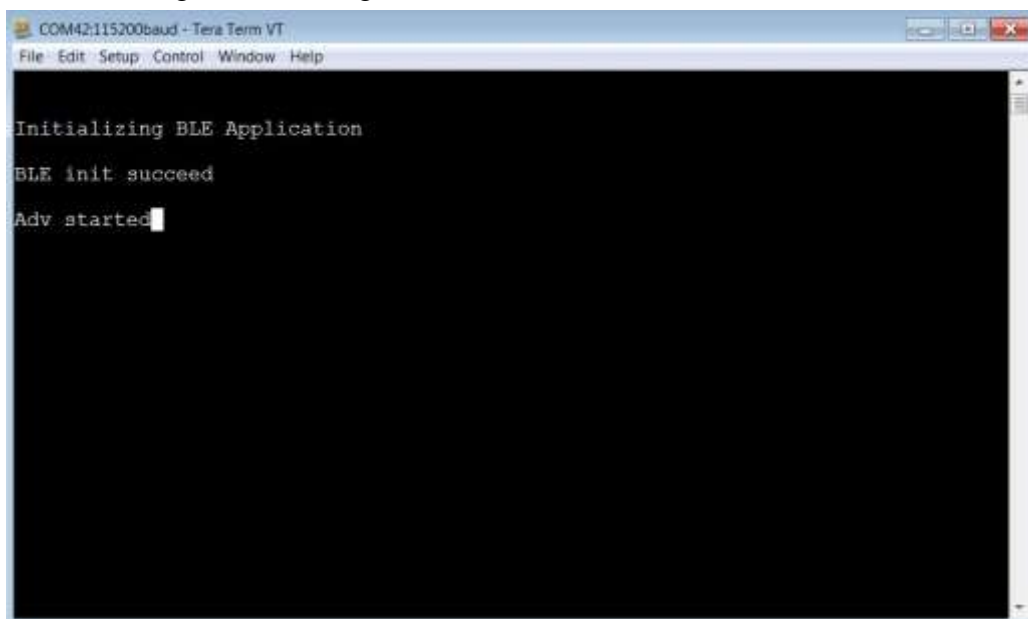
## 6. Running Transparent UART Demo with Microchip Bluetooth Data App

This section describes the Transparent UART Demo procedures to work with iOS Smart Data App.

1. Connect BM71-XPro on EXT1 of SAML21 Xplained Pro board (Transparent UART device).
2. Connect the Transparent UART 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:

<b>Baudrate</b>	115200
<b>Data</b>	8 bits
<b>Parity</b>	none
<b>Stop</b>	1 bit
<b>Flow control</b>	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 Transparent UART device is advertising by checking the TeraTerm window for advertising status message.



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## 7. Smart Phone Application

1. Download the Microchip Bluetooth Data (MBD) mobile application from the play store.



Microchip Bluetooth Data  
Microchip Technology Inc

2. Open MBD app on Smart phone.
3. Select BLE UART tab
4. Select BM70 tab from the available option.
5. Select Scan option.
6. Click on TransparentUARTDemo from device list showed in MBD App to connect to the BM71.
7. Once connected, the MBD App opens transparent UART pipe and ready to send/receive data.
8. Similarly, after successful connection Transparent UART application prints the connection details in console and opens transparent UART pipe.

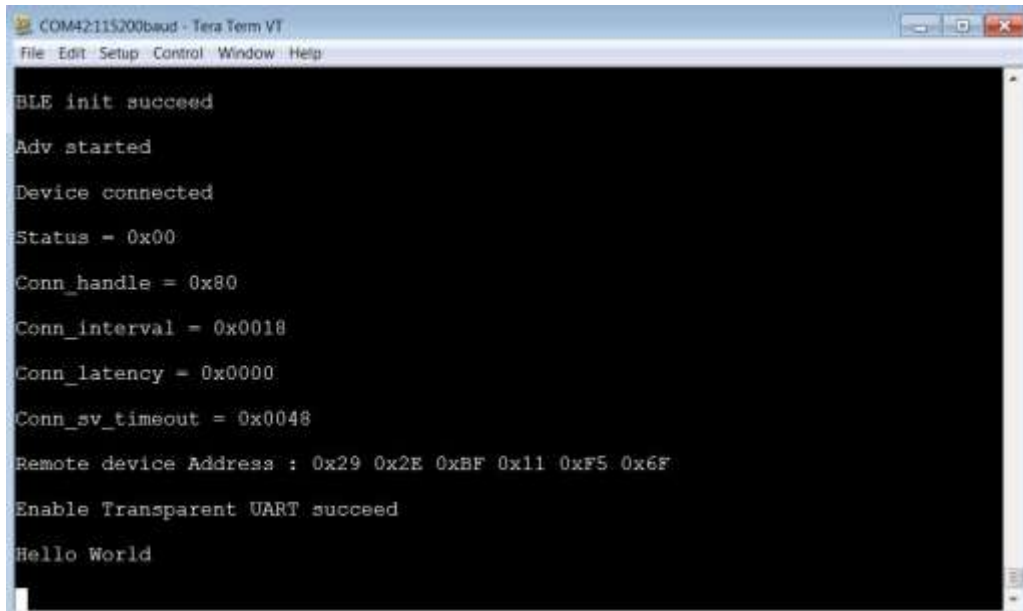
```
COM42:115200baud - Tera Term VT
File Edit Setup Control Window Help

Initializing BLE Application
BLE init succeed
Adv started
Device connected
Status = 0x00
Conn_handle = 0x80
Conn_interval = 0x0018
Conn_latency = 0x0000
Conn_sv_timeout = 0x0048
Remote device Address : 0x66 0x8C 0x88 0x27 0xEC 0x74
Enable Transparent UART succeed
```

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9. Once transparent UART pipe is opened, the data entered in serial console application will be transferred to MBD App over BLE transparent UART and MBD App will display the received data from BM71.

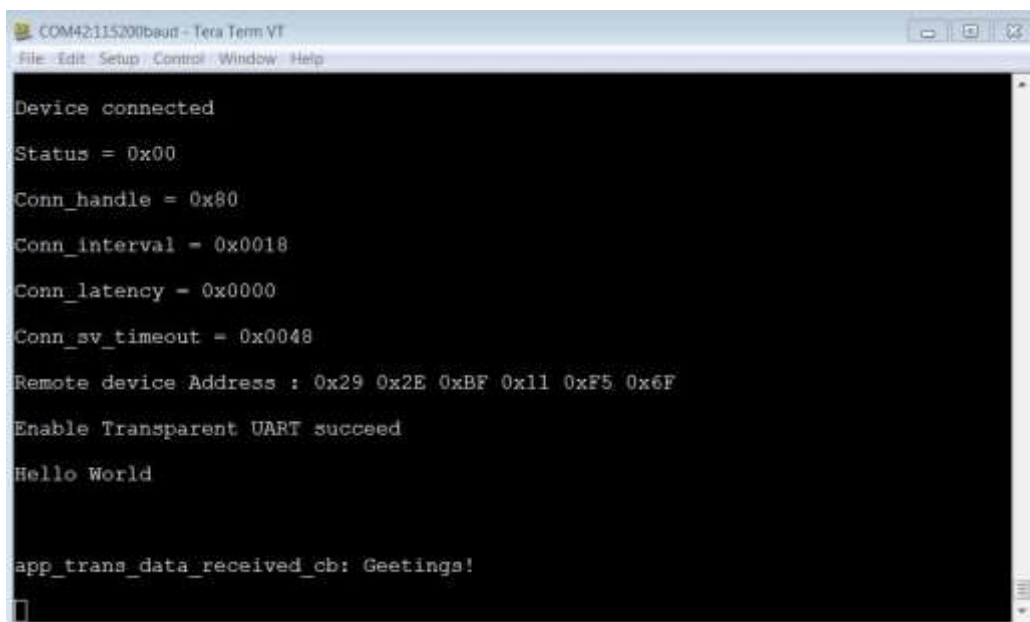


```
COM42:115200baud - Tera Term VT
File Edit Setup Control Window Help

BLE init succeed
Adv started
Device connected
Status = 0x00
Conn_handle = 0x80
Conn_interval = 0x0018
Conn_latency = 0x0000
Conn_sv_timeout = 0x0048
Remote device Address : 0x29 0x2E 0xBF 0x11 0xF5 0x6F
Enable Transparent UART succeed
Hello World
```

10. Smart Data App can also send data to BM71 by enter the message in text box and press Send.

11. Transparent UART demo application will print the received data in serial console.



```
COM42:115200baud - Tera Term VT
File Edit Setup Control Window Help

Device connected
Status = 0x00
Conn_handle = 0x80
Conn_interval = 0x0018
Conn_latency = 0x0000
Conn_sv_timeout = 0x0048
Remote device Address : 0x29 0x2E 0xBF 0x11 0xF5 0x6F
Enable Transparent UART succeed
Hello World

app_trans_data_received_cb: Geetings!
```

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