LoRa Provisioning Over BLE Getting Started Guide

LoRa_Provisioning_Over_BLE_Getting_Started_Guide

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1. Overview

This document explains how to setup a LoRa End-Device provisioning over BLE demo using SAMR34 and BTLC1000. 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 LoRaWAN SDK and BluSDK to setup SAMR34 and BTLC1000 as LoRa End-Device which uses BLE to provision from Smart phone. This demo uses two BLE custom services, LoRaWAN Provisioning Service and LoRaWAN RF Parameter Service defined my Microchip.

1.1. Hardware Setup

Figure 1: SAMR34 Xplained Pro with BTLC1000-XPro

1. Plugin BTLC1000-XPro board into EXT1 of SAMR34 Xplained Pro board as shown in Figure 1.
2. Interface between SAMR34 Xplained Pro board and BTLC1000-XPro board.

SAMR34 Xplained Pro - EXT1	BTLC1000-XPro Header	FTDI TTL-232R-3V3	Signal
3 (RTS)	16 (CTS)		BLE UART RTS/CTS
4 (CTS)	18 (RTS)		BLE UART CTS/RTS
13 (RXD)	15 (TXD)		BLE UART RXD/TXD
14 (TXD)	17 (RXD)		BLE UART TXD/RXD
5 (GPIO)	3 (WAKEUP PIN)		BTLC1000 WAKEUP
7 (GPIO)	7 (CHIP EN)		BTLC1000 CHIP EN
9 (IRQ)	9 (GPIO)		Host WAKEUP
15 (TXD)		RXD (Yellow)	CONSOLE UART TXD/RXD
17 (RXD)		TXD (Orange)	CONSOLE UART RXD/TXD
19 (GND)	19 (GND)		
20 (VCC)	20 (VCC		

3. Connect the SAMR34 Xplained Pro board to the host PC using micro USB cable.
4. Connect the FTDI cable to host PC.

1.2. Smart Phone Application

Install the MCHPLoRa.apk in Android phone. You can find the MCHPLoRa.apk file in the project folder.

Note: The MCHPLoRa APP requires Android version 8.0 or later.

1.3. Console

The LoRaWAN End-Device Provisioning Over BLE demo application uses the Universal Asynchronous Receiver/Transmitter (UART) interface to print the status messages. Any serial application (ex: TeraTerm) can be used to interact with SAMR34 Xplained Pro.

UART (COM port) settings,

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

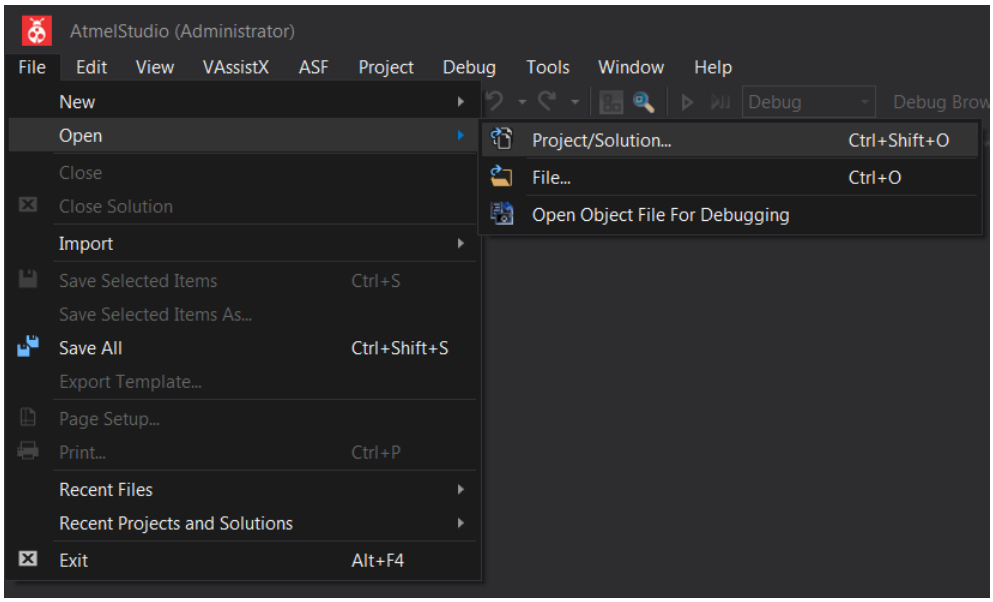
2. Build Procedure

This section describes the build procedure of SAMR34_LORA_PROVISIONING_OVER_BLE_APP application on Atmel Studio 7.

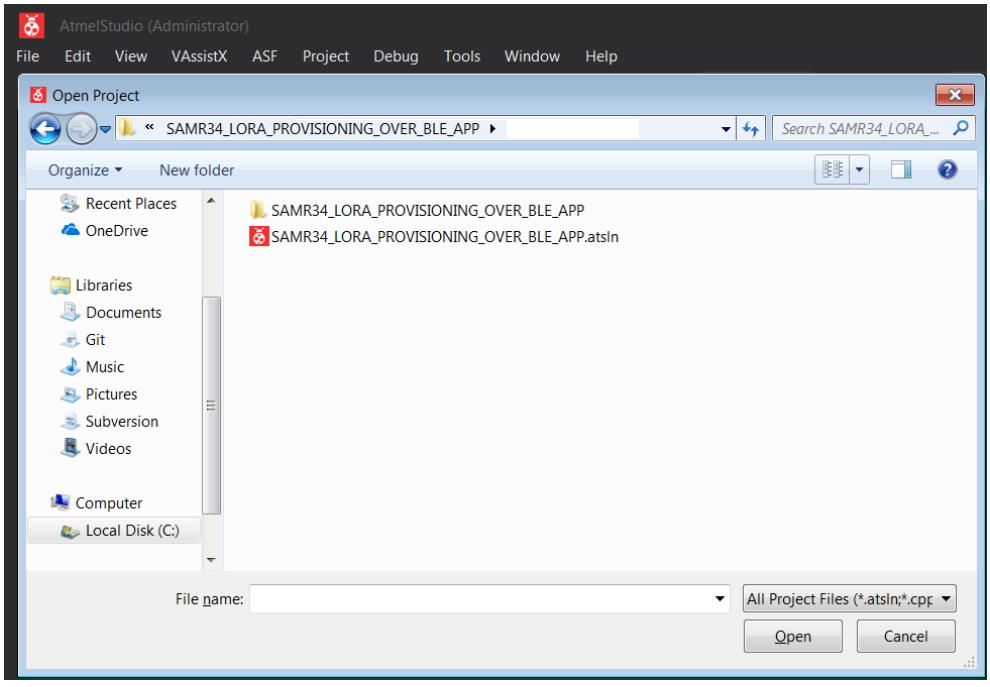
2.1. Open Atmel Studio 7

2.2. Open SAMR34_LORA_PROVISIONING_OVER_BLE_APP Application

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



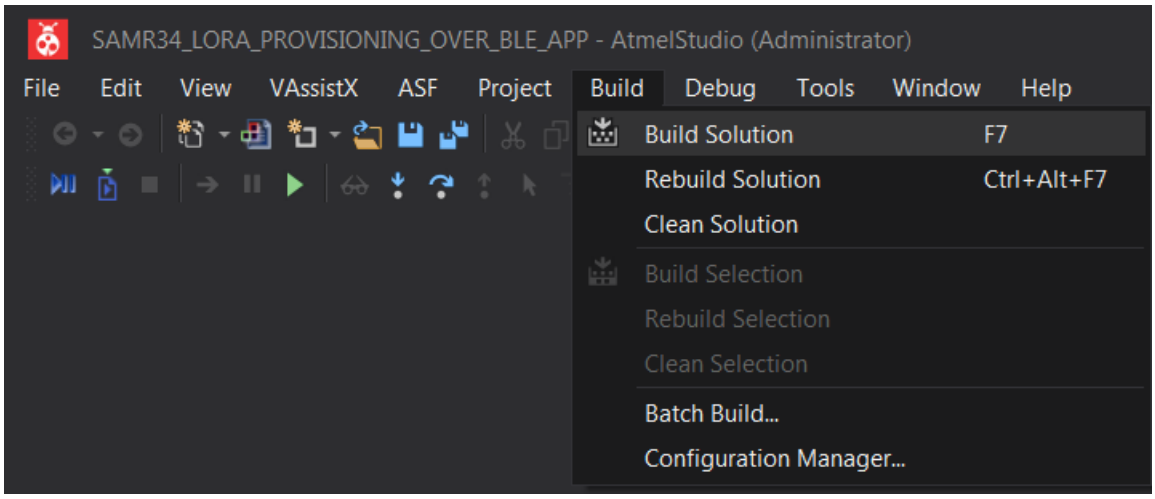
2. Select "SAMR34_LORA_PROVISIONING_OVER_BLE_APP.atsln" and press **Open**.



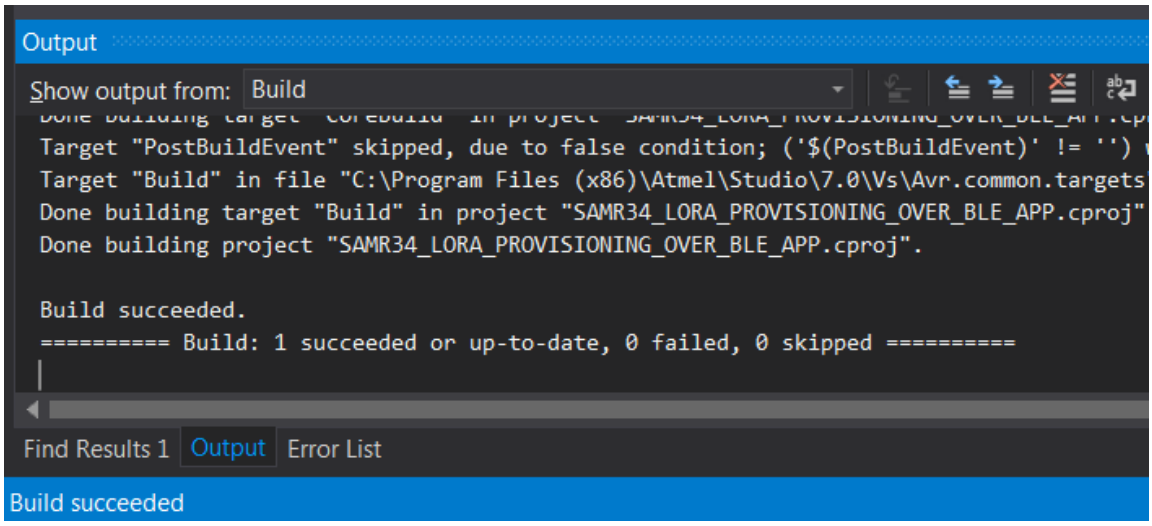
3. Once the project is opened, you can see the files attached to this project in Solution Explorer Window

2.3. Build SAMR34_LORA_PROVISIONING_OVER_BLE_APP Application

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



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

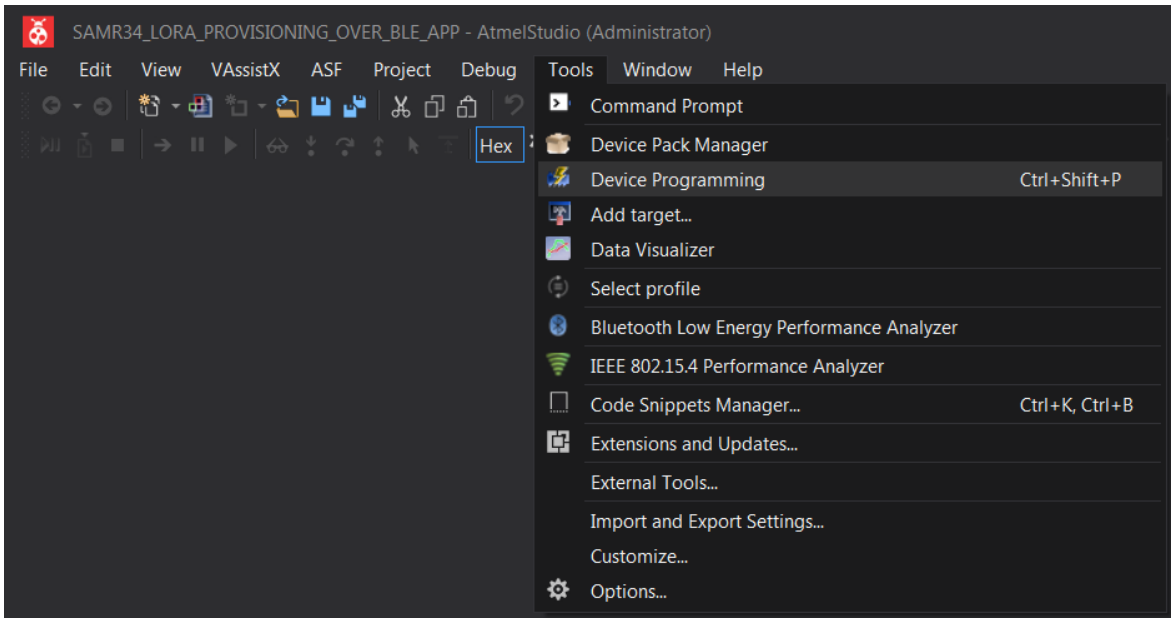


3. You can find the Hex image in "..\SAMR34_LORA_PROVISIONING_OVER_BLE_APP\Debug".

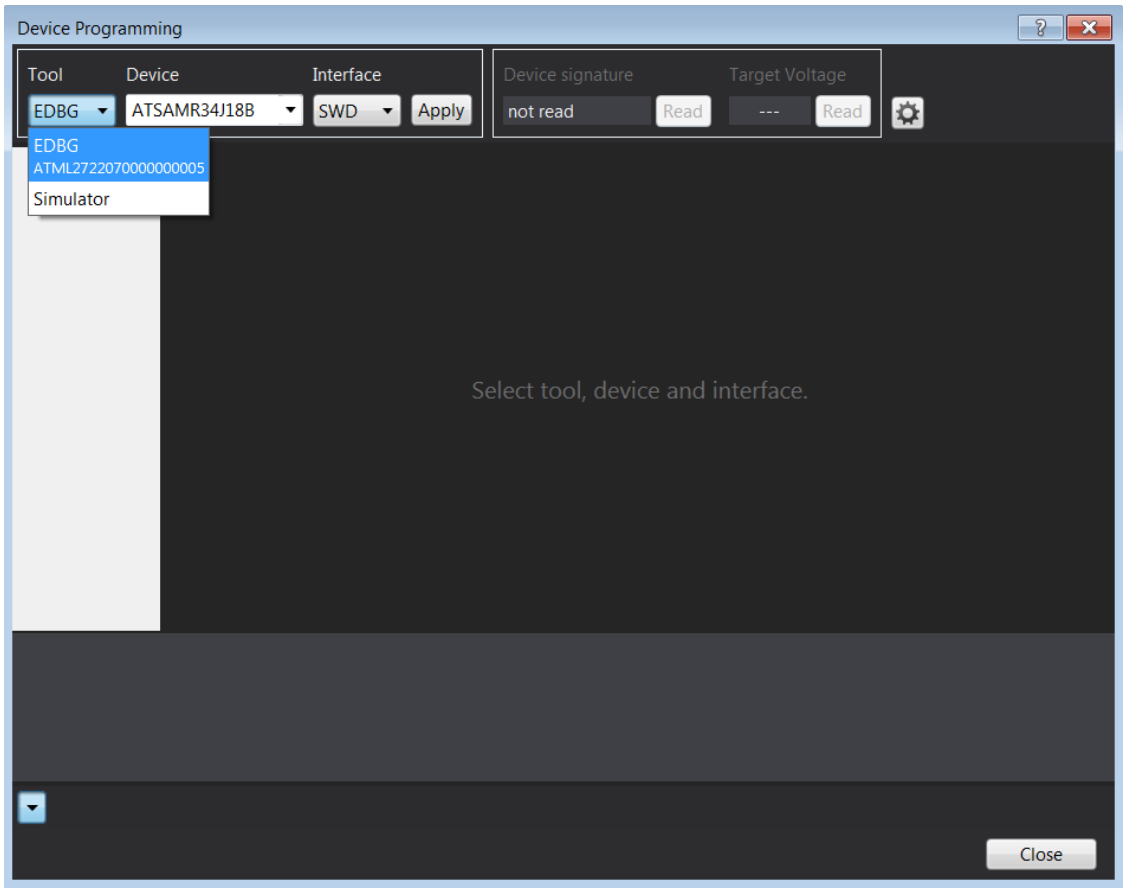
3. Programming Firmware

This section describes the procedure to program SAMR34_LORA_PROVISIONING_OVER_BLE_APP firmware on SAMR34 Xplained Pro board.

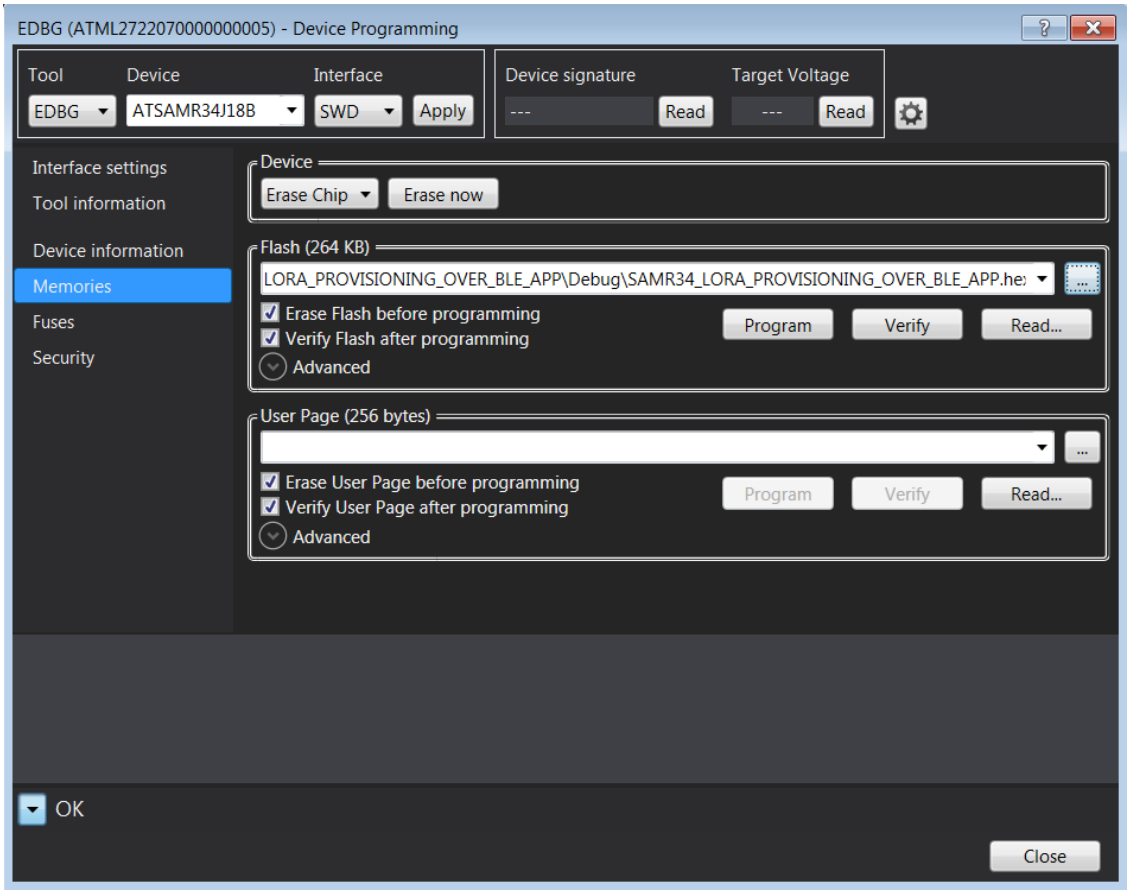
1. Connect the SAMR34 Xplained Pro board to the host PC using micro USB cable. Perform the following steps:
    a. Verify that the virtual COM port is enumerated on the host PC.
    b. Make sure that POWER LED (green) is solid ON.
2. To program the HEX files into the SAMR34, go to menu **Tools → Device Programming** or Press **Ctrl + Shift + P**.



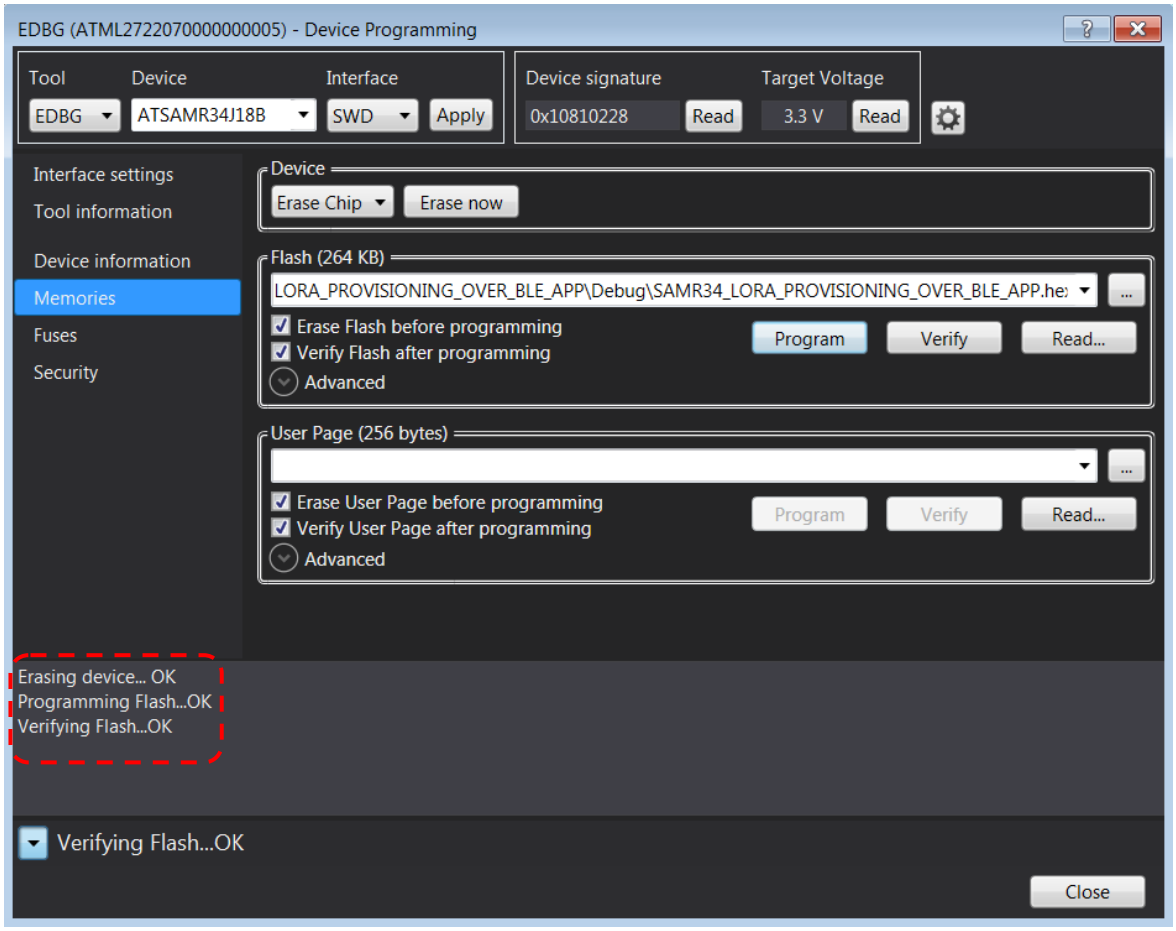
3. Select the corresponding **EDBG** and press **Apply**.



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



5. Press **Program**, the tool will program SAMR34. You can check the status of programming.



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

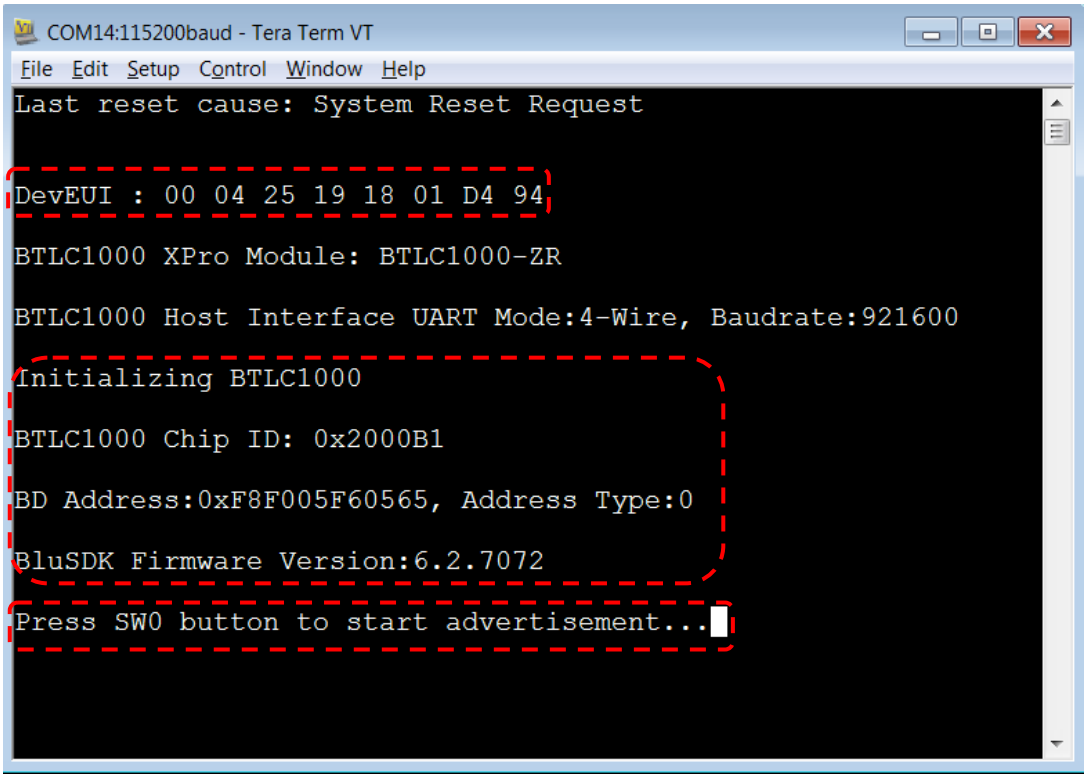
4. Running LoRaWAN Provisioning Over BLE Demo

This section describes the LoRaWAN Provisioning Over BLE demo procedures to work with Android MchpLORA.

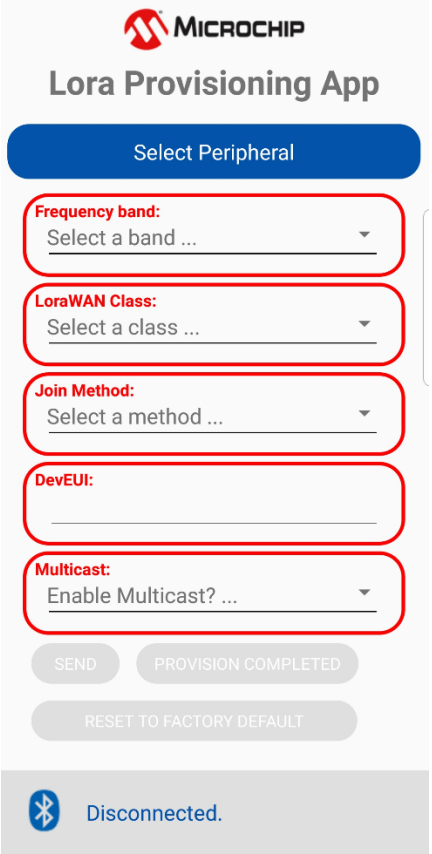
1. Connect BTLC1000-XPro on EXT1 of SAMR34 Xplained Pro board.
2. Connect the SAMR34 EDBG to the host PC using micro USB cable.
3. Connect the FTDI cable to the host PC and do the following
    a. Connect FTDI-RXD with PIN15 on EXT1 of SAMR34
    b. Connect FTDI-TXD with PIN17 on EXT1 of SAMR34
    c. Connect FTDI GND with SAMR34 Xplained Pro GND
    d. Verify that the virtual COM port is enumerated on the host PC.
    e. 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

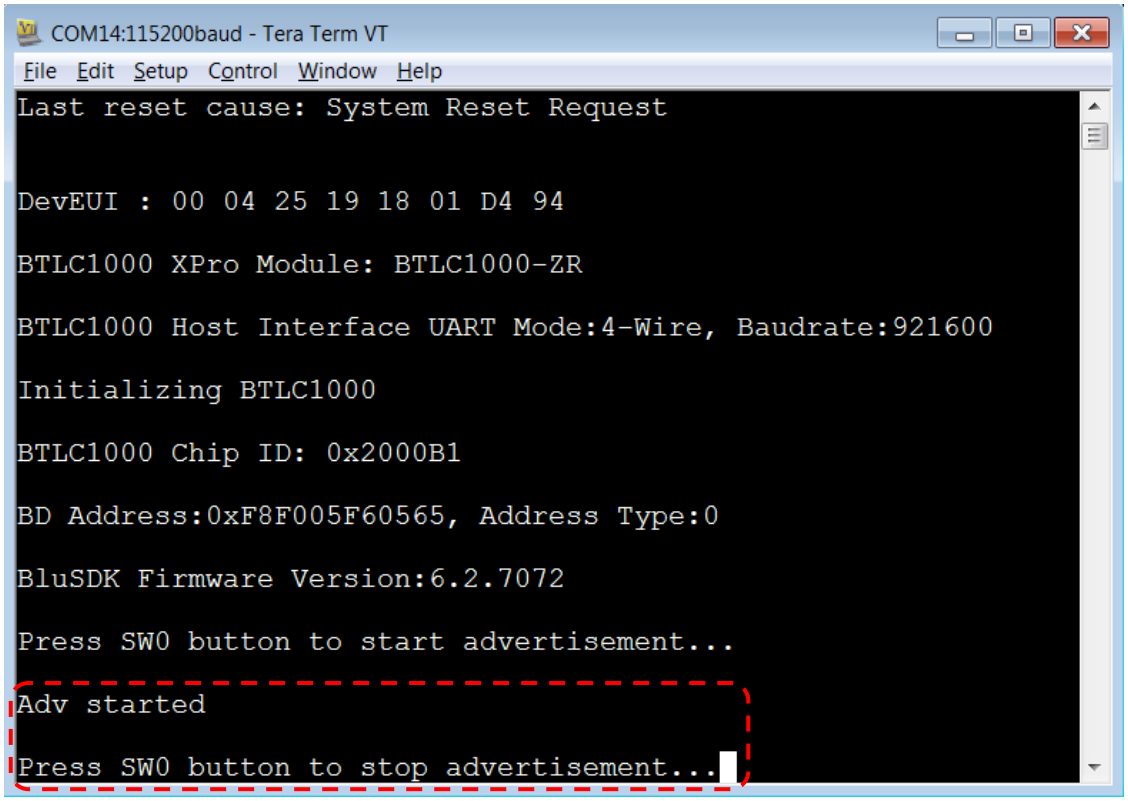
    f. Make sure that POWER LED (green) on SAMR34 Xplained Pro board is solid ON.
    g. Press Reset button on SAMR34 Xplained Pro board
4. Ensure that the SAMR34 is up and running and BTLC1000 is initialized properly by checking the serial console application.



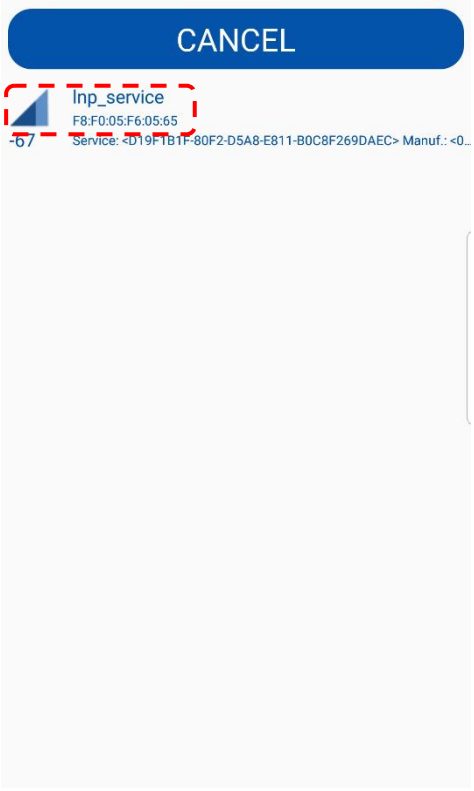
5. Open **MchpLORA APP** on Android phone
6. Press **Select Peripheral** on MchpLORA APP



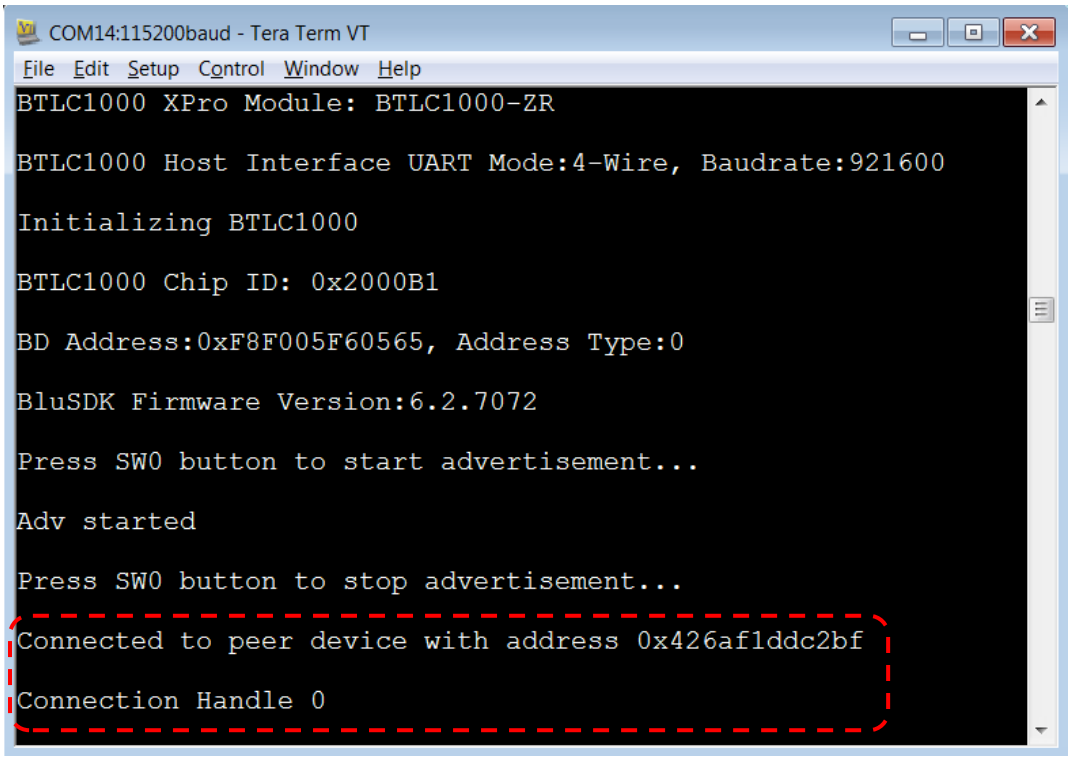
7. Start a BLE advertisement by pressing SW0 button on SAMR34 Xplained Pro board



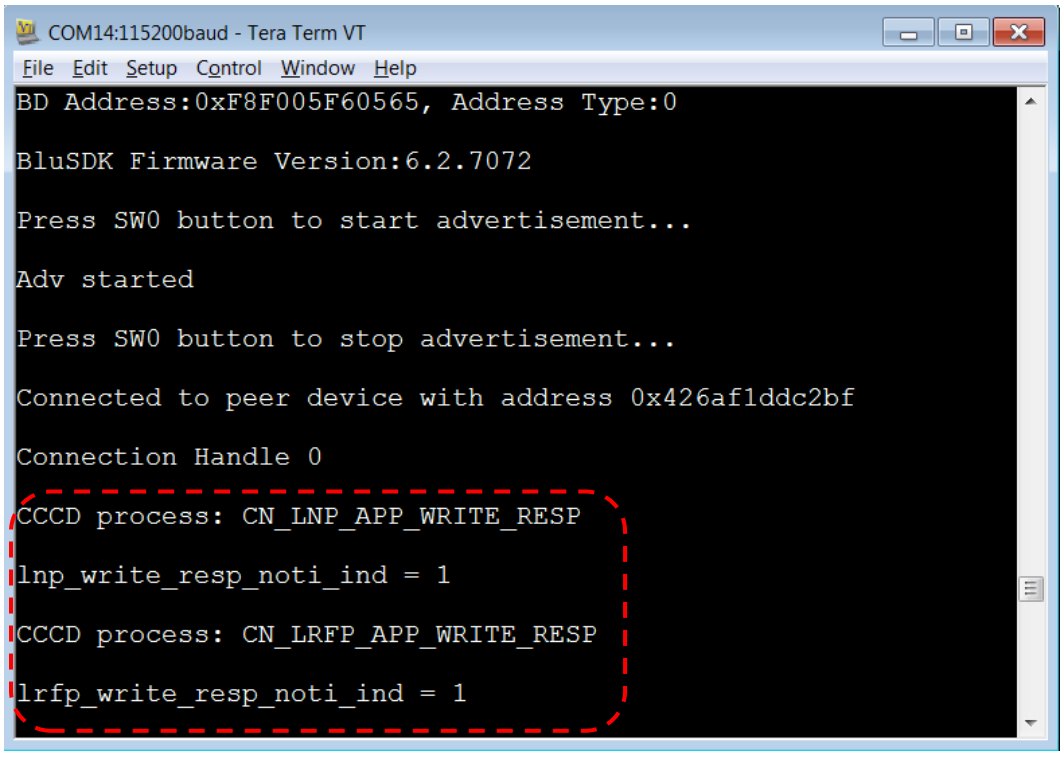
8. To connect, click on **lnp_service** in the MchpLORA APP scan list which matches BD Address with your BTLC1000 device.



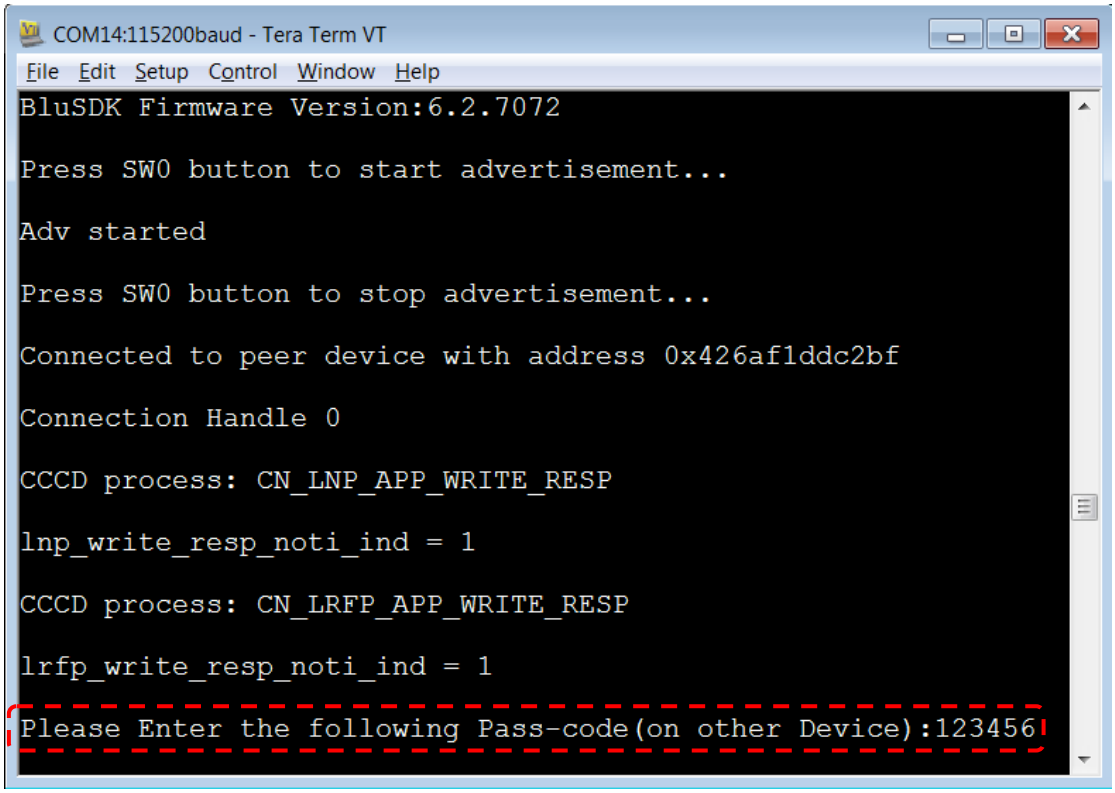
9. After successful connection, SAMR34 prints the connection details in console.

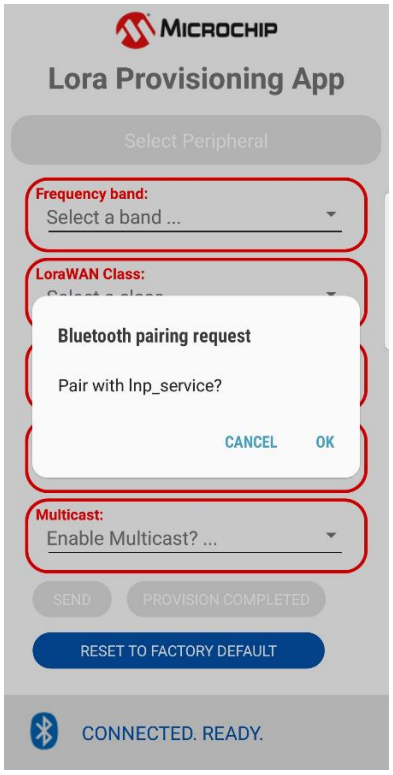


10. Once connected, the MCHPLoRa App discovers the AppWriteResponse characteristic in LoRaWAN Provisioning service and LoRaWAN RF Parameter service and enable notifications.



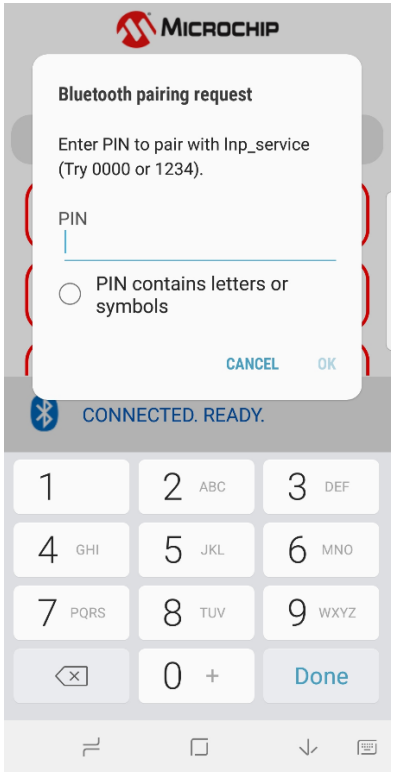
11. Once connected, the pairing will be initiated and the user has to enter the pin code 123456 in MCHPLoRa APP.



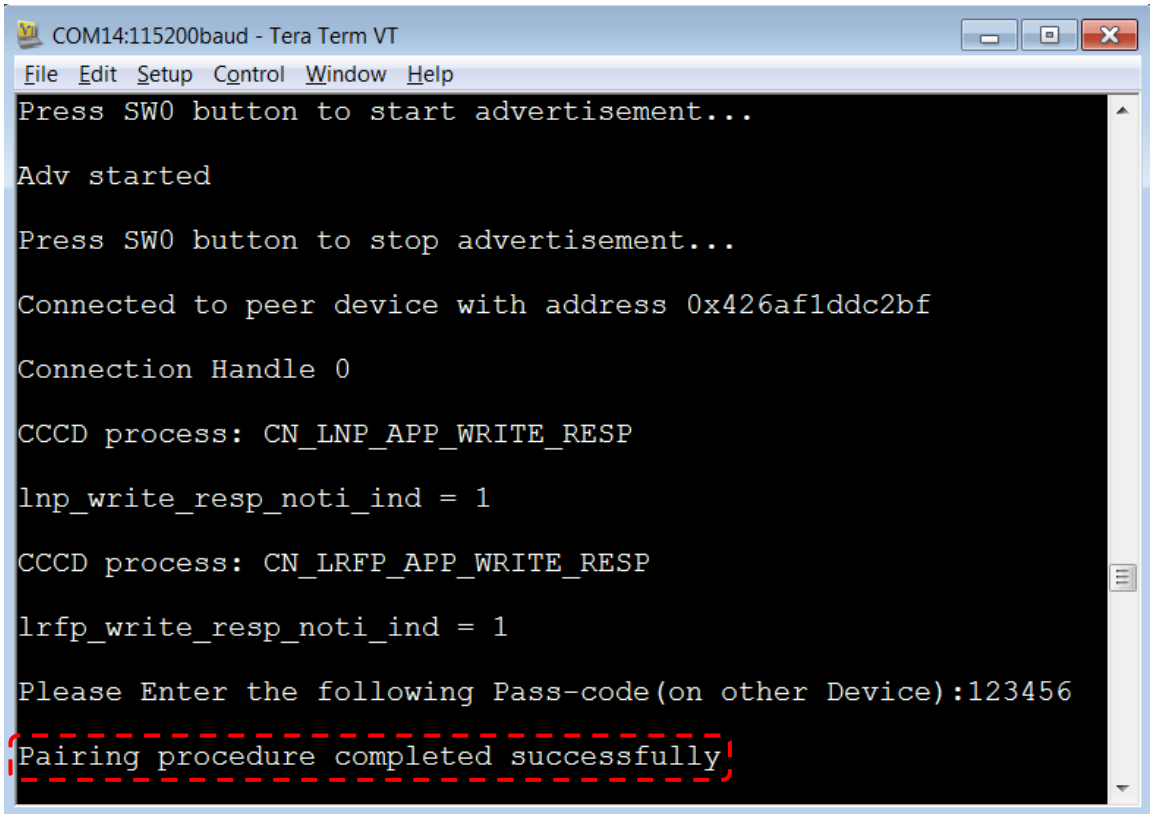


12. Press OK

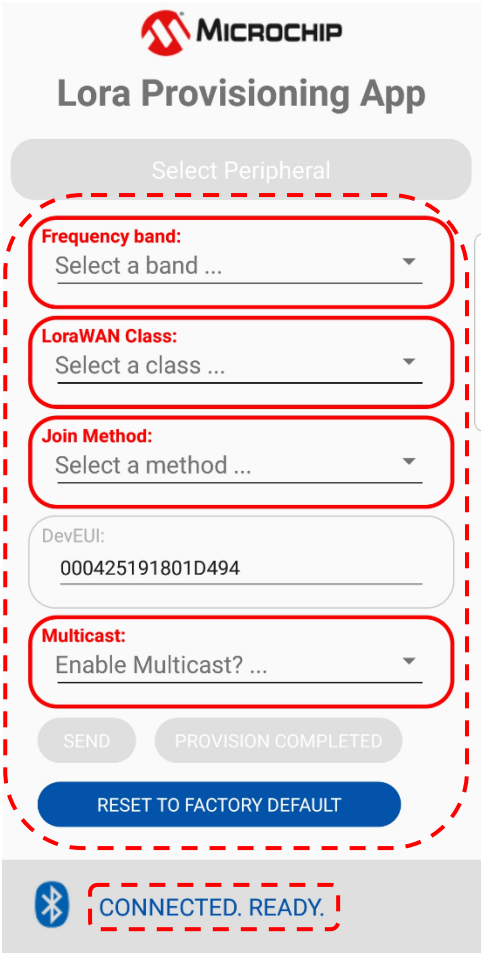
13. Enter the pin code in 123456



14. Pairing Completed successfully

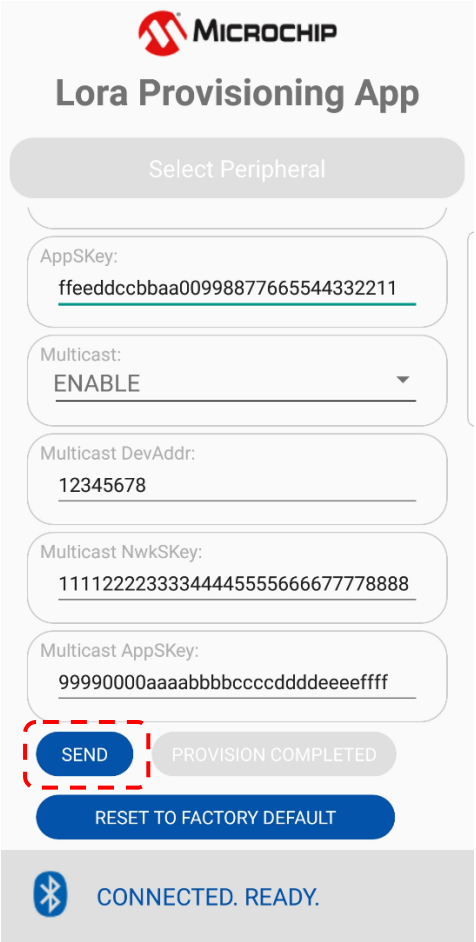


15. Once connected and paired the MCHPLoRa App will show the status as **CONNECTED. READY.** It will also list down the provisioning parameters (characteristics).

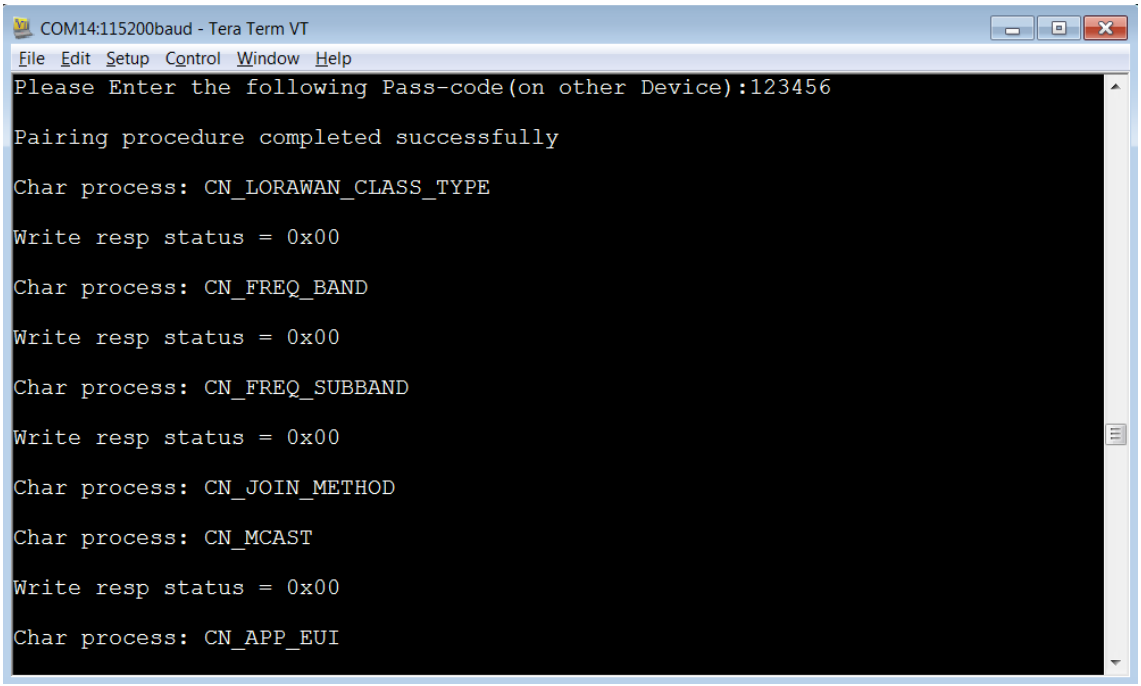


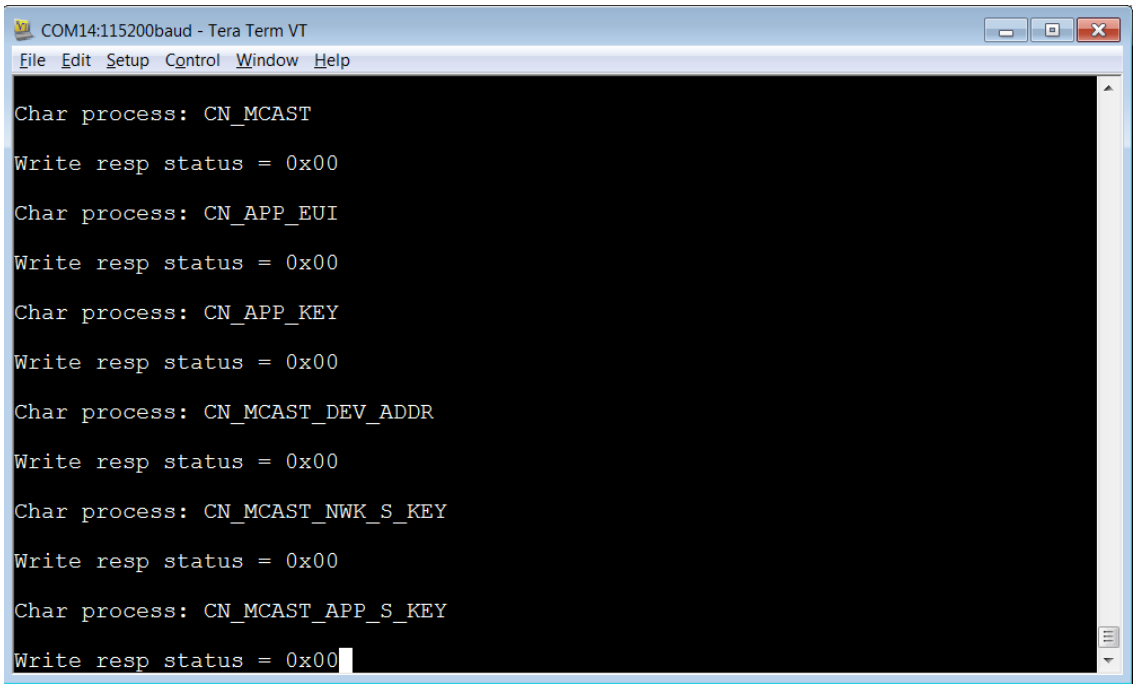
16. By default, the MCHPLoRa APP will list the following parameters,
    a. Frequency Band
    b. LoRaWAN Class
    c. Join Method
    d. DevEUI
    e. Multicast
17. By default, both SEND and PROVISION COMPLETED buttons will be disabled and RESET TO FACTORY DEFAULT button will be enabled.
18. The MCHPLoRa APP will read the DevEUI and display it in DevEUI field
19. Select an appropriate Frequency band
20. The Frequency sub band parameter will be enabled if the Frequency band supports it.
    a. For example, selecting the frequency band NA915 will enable Frequency sub band
21. Select an appropriate Frequency sub band

22. Select LoRaWAN class type
23. Select Join method
24. If Join method is OTAA then following parameters will be enabled
    a. AppEUI: Enter valid application EUI
    b. AppKey: Enter appropriate application Key
25. If Join method is ABP then following parameters will be enabled
    a. DevAddr: Enter valid device address
    b. NwkSKey: Enter appropriate network session key
    c. AppSKey: Enter appropriate application session key
26. Select whether Multicast is **ENABLE/DISABLE**
27. If Multicast is **ENABLE,** then the following fields will be enabled (only one set of multicast info can be provisioned from current version of MCHPLoRa APP)
    a. Multicast DevAddr: Enter valid multicast group address
    b. Multicast NwkSKey: Enter appropriate multicast network session key
    c. Multicast AppSKey: Enter appropriate multicast application session key
28. Once entered all the parameters, press **SEND** button

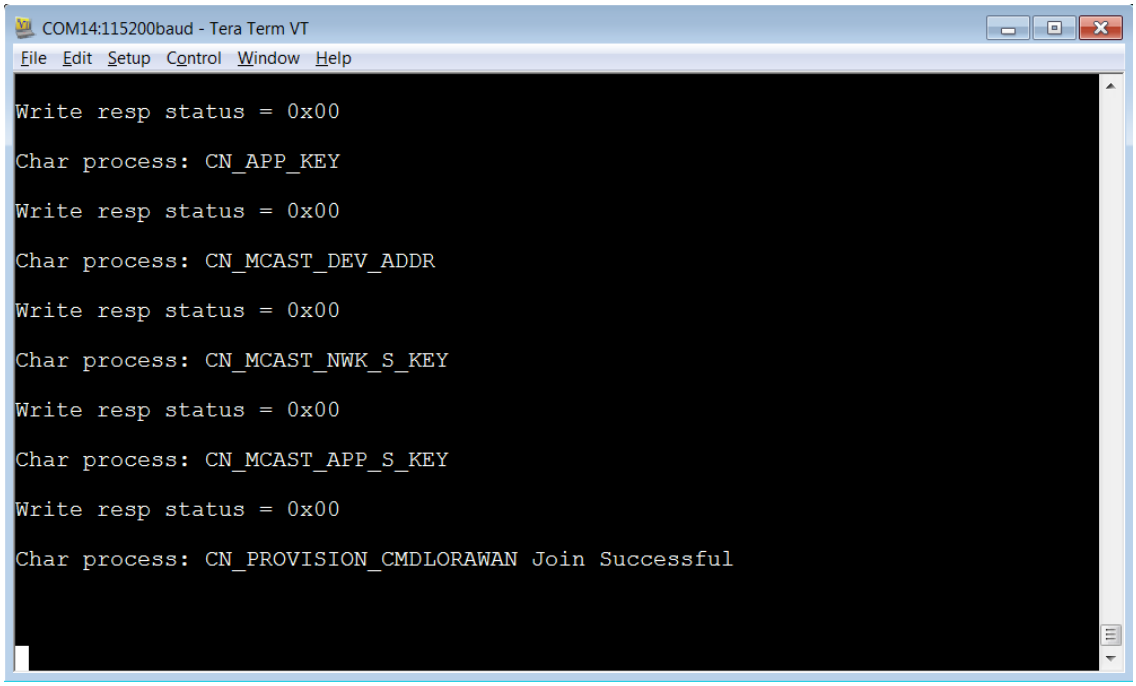


29. MCHPLoRa APP will send all the parameters to LoRaWAN End-Device.

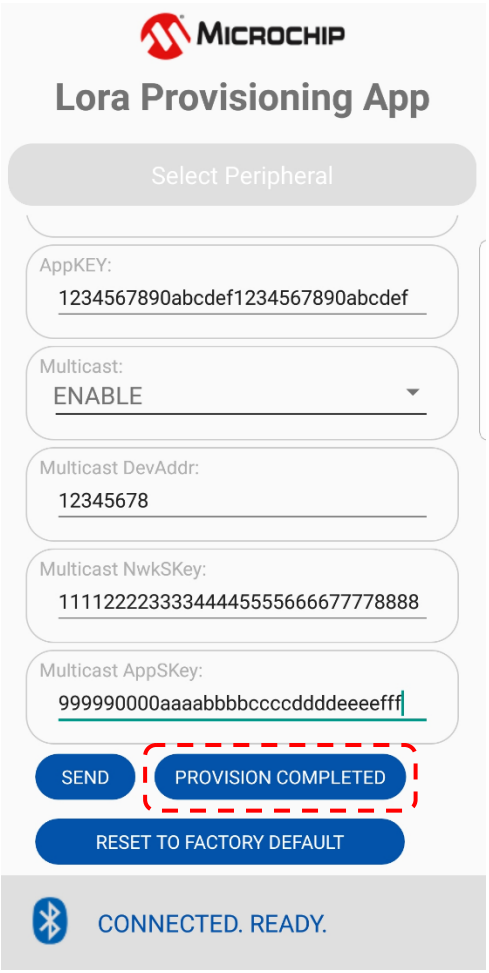




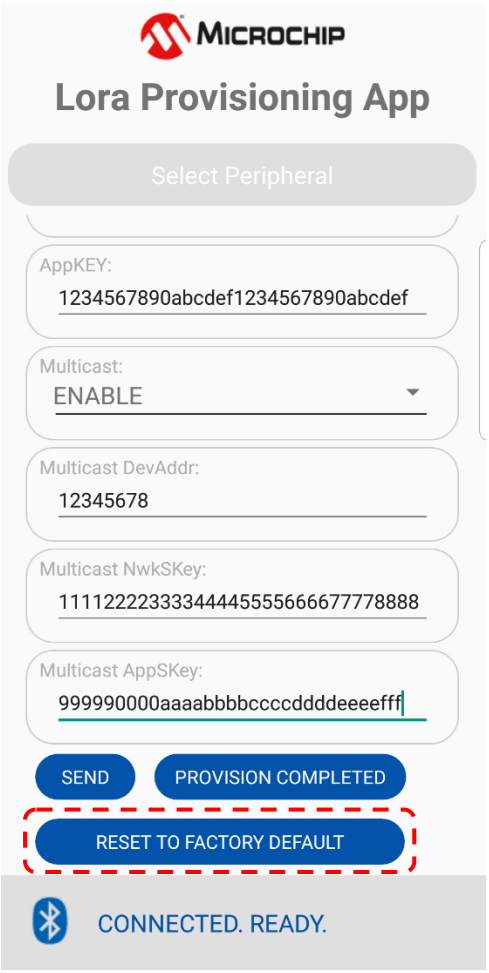
30. Once all the parameters are successfully sent to LoRaWAN End-Device, the MCHPLoRa APP will enable the **PROVISION COMPLETED** button.
31. Press **PROVISION COMPLETED** button.



32. The End-Device will print the LoRaWAN join status in the console.



33. Pressing PROVISION COMPLETED button will write a value 1 on the ProvisionCompleted characteristic and it will trigger an End-Device to store all the provisioning parameter in Persistence Data Server (PDS) and start LoRaWAN join procedure.
34. Pressing RESET TO FACTORY DEFAULT button will reset all the provisioning parameters in End-Device to its default value and it will reset the LoRaWAN stack.


MICROCHIP
Lora Provisioning App
Select Peripheral
AppKEY:
1234567890abcdef1234567890abcdef
Multicast:
ENABLE
Multicast DevAddr:
12345678
Multicast NwkSKey:
11112222333344445555666677778888
Multicast AppSKey:
999990000aaaabbbbccccddddeeeefff
SEND
PROVISION COMPLETED
RESET TO FACTORY DEFAULT
CONNECTED. READY.

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