NXP Hackathon Sensors GS

NXP Hackathon | Getting Started Guide for MPL3115

Rev. <1.0> — 05 Feb 2021 Getting Started Guide

Document information

Info	Content
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Abstract	NXP Hackathon Sensors Getting Started

Revision history

Rev	Date	Description
Rev <0.1>	01 Feb 2021	Draft Version
Rev. <1.0>	05 Feb 2021	Released Version

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1. Objectives

In this hands-on hackathon event, you will learn how to:

- Enable IoT (Industrial/medical) sensor applications using NXP's IoT sensors and IoT Sensing SDK framework (ISSDK, available as middleware component in MCUXpresso SDK).
- Get familiarity with NXP's sensor toolbox ecosystem: a complete ecosystem for product development with NXP's motion and pressure sensors targeted toward IoT, Industrial, Medical applications.
- Leverage FRDMSTBC-P3115 sensor development boards to create and run example sensor applications for:
    - NXP's absolute pressure sensor MPL3115A2 designed for industrial applications.

2. Prerequisites

This hands-on Hackathon event assumes following prior prerequisites actions to be completed:

1. Availability of Windows 10 development PC.
2. Availability of MIMXRT1020-EVK evaluation kit with Arduino I/O headers populated
3. Availability of FRDMSTBC-P3115 sensor development boards.
4. NXP's MCUXpresso IDE v11.3.0 in installed on the development PC.
5. mbed windows serial drivers are installed on development PC.
6. MIMXRT1020-EVK evaluation kit is pre-programmed with the latest OpenSDA bootloader and firmware application.
7. Generate and download EVK-MIMXRT1020 SDK package from web based MCUXpresso SDK builder.
8. Any serial terminal application (e.g. RealTerm) is installed on the training PC to view sensor output of ISSDK example applications.

3. Introduction to Sensors Developers Ecosystem

Sensor Development Toolbox is the complete ecosystem for product development with NXP's motion and pressure sensors targeted toward IoT, Industrial, Medical applications. It encompasses a wide spectrum of sensor evaluation hardware and software tools making our sensors easy to use.

3.1 Sensor Evaluation Boards

Sensor evaluation boards provide a wide spectrum of enablement hardware for quick sensor evaluation and development. It includes a demonstration kit, shield development board and breakout board for motion and pressure sensors targeted toward IoT, Industrial, Medical applications.

3.2 IoT Sensing SDK

The IoT Sensing Software Development Kit (ISSDK) is the embedded software framework for the Sensor Toolbox ecosystem enabling NXP's digital and analog sensors platforms for IoT applications. Following are key features and benefits provided by ISSDK framework:

- ISSDK provides a unified set of sensor support models that target NXP's portfolio of sensors across a broad range of NXP's Arm® Cortex®-M core-based microcontrollers including NXP's LPC, Kinetis and i.MX RT crossover platforms.
- ISSDK leverages latest version of MCUXpresso SDK (Kinetis, LPC and i.MX SDK) drivers and release infrastructure through MCUXpresso web.
- ISSDK combines a set of robust sensor drivers and algorithms along with out-of-box example applications to allow users to get started with using NXP sensors.
- Enables easy porting across broad range of NXP's Arm Cortex M based Microcontrollers by using Arm CMSIS Driver APIs.
- Provides NXP's sensor register definitions, register access interfaces and sensor level multiple register read/write interfaces.
- Provides reference algorithm examples, libraries and generic interfaces to access algorithms like sensor fusion and pedometer.

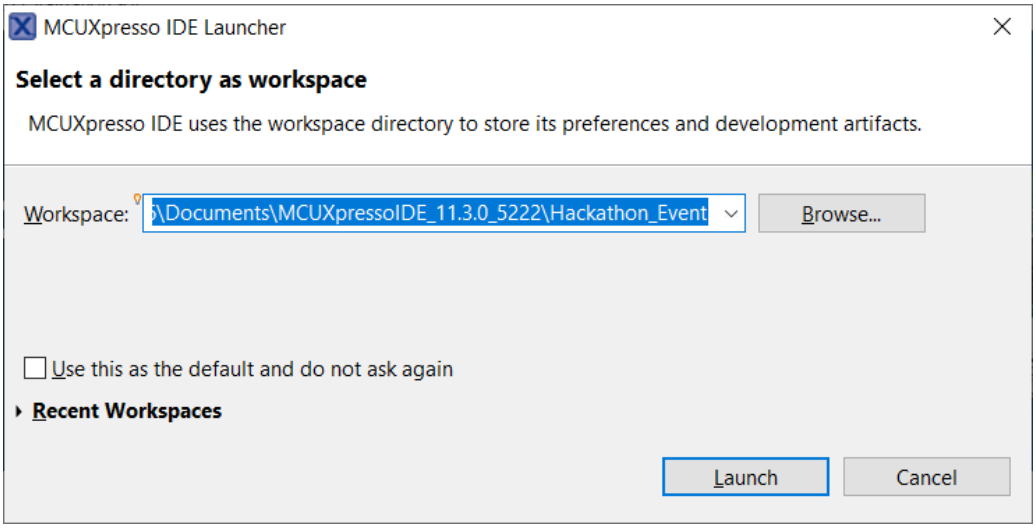
For more information on list of ISSDK supported sensors and development kits, refer to ISSDK Release Notes.
The out-of-box sensors (MPL3115) example projects are made available to all participants. These example projects are based on ISSDK framework using MPL3115 sensor drivers. Please refer to next sections on steps to run these out-of-box examples on MIMXRT1020-EVK attached with sensor development boards (FRDMSTBC-P3115).

4. Executing out-of-box sensor examples

4.1 Step#1 (Install SDK package and Import out-of-box examples on MCUXpresso IDE)

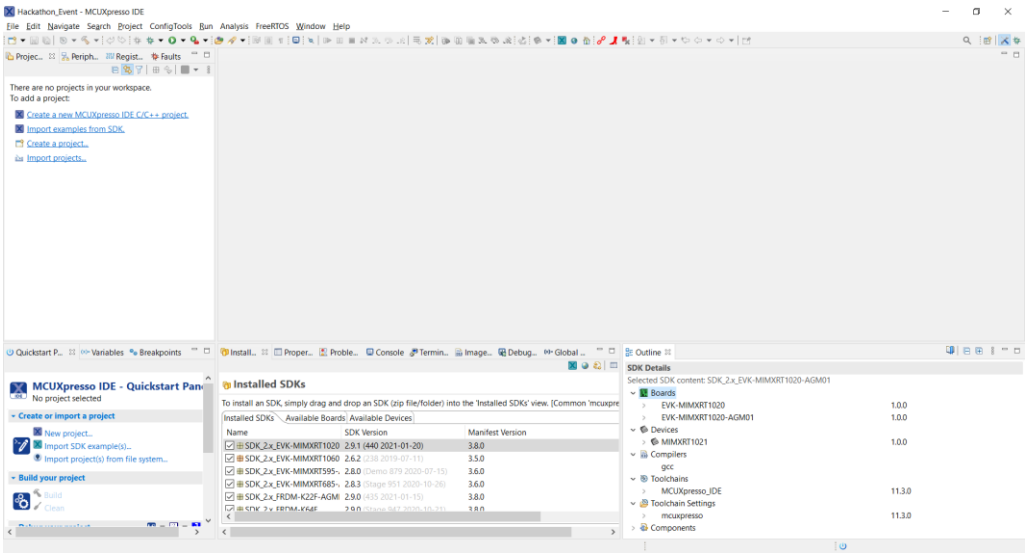
a) Double-click on MCUXpresso IDE (short cut) available on your PC desktop.

b) Select any directory on your PC as your workspace and “Launch” the IDE.



c) Install the downloaded EVK-MIMXRT1020SDK package into MCUXpresso IDE (Simply drag & drop the “SDK_2.9.1_EVK-MIMXRT1020.zip” zipped SDK package to the “Installed SDKs” view of MCUXpresso IDE).

d) Once the SDK package is installed on MCUXpresso IDE, you should be able to view SDK content by clicking on the installed SDK package and viewing “SDK Details”.

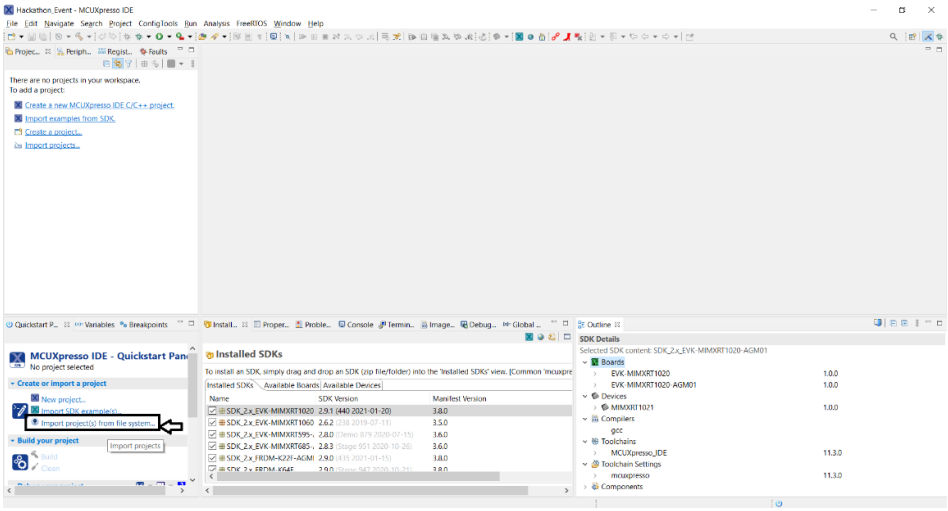


e) Download and unzip “Hackathon_Sensors_Collaterals.zip” package.

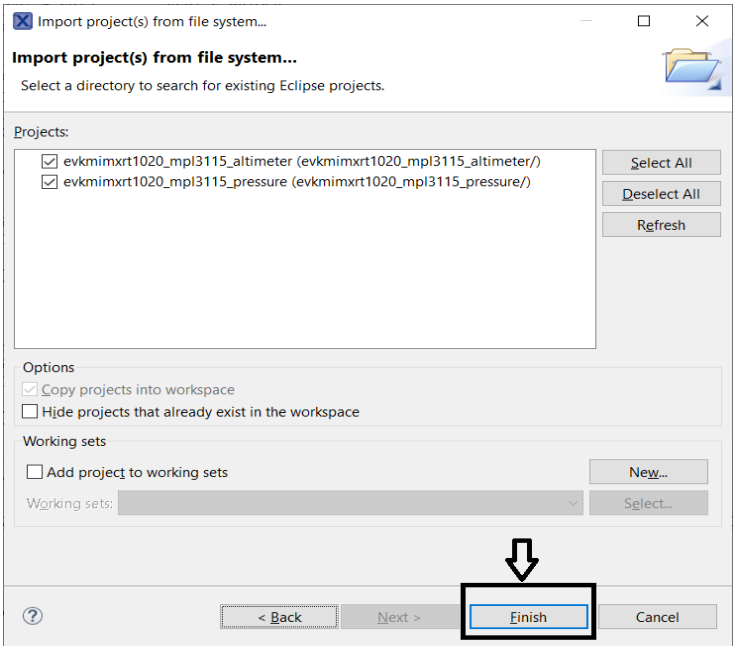
f) Go to folder “Hackathon_Sensors_Collaterals” and under “issdk_example_projects” locate “evkmimxrt1020_mpl3115_ewxamples.zip” file:

```
Hackathon_Sensors_Collaterals/
a)  └── issdk_example_projects
     ├── evkmimxrt1020_mpl3115_examples.zip
```

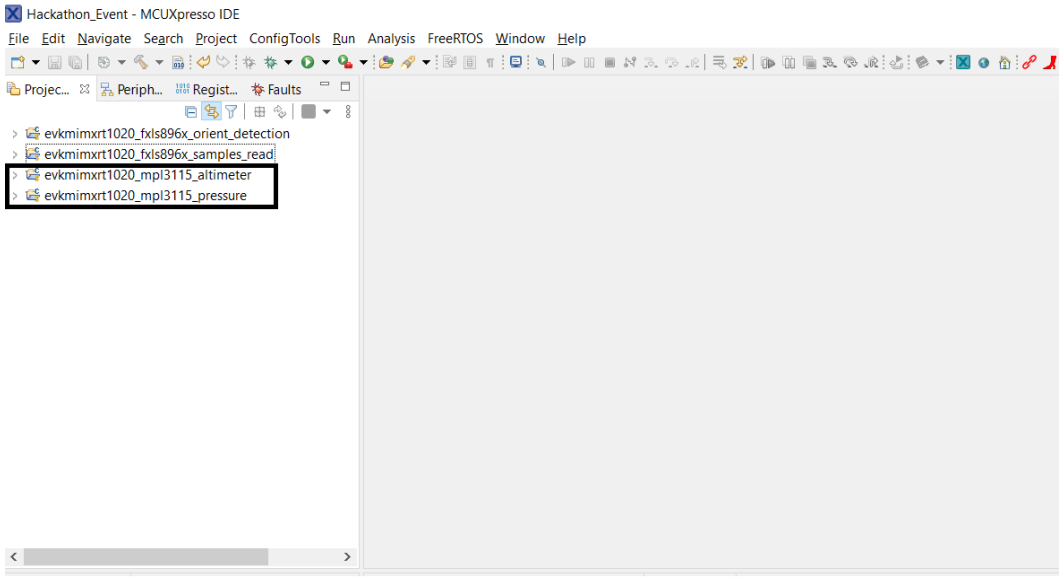
g) Click on the “Import project(s) from file system…” wizard on MCUXpresso IDE, browse to “evkmimxrt1020_mpl3115_examples.zip” on Project archive and click on “Next”.



h) The import project wizard will automatically identify 2 projects as part of the archive and select the projects, click on “Finish”.

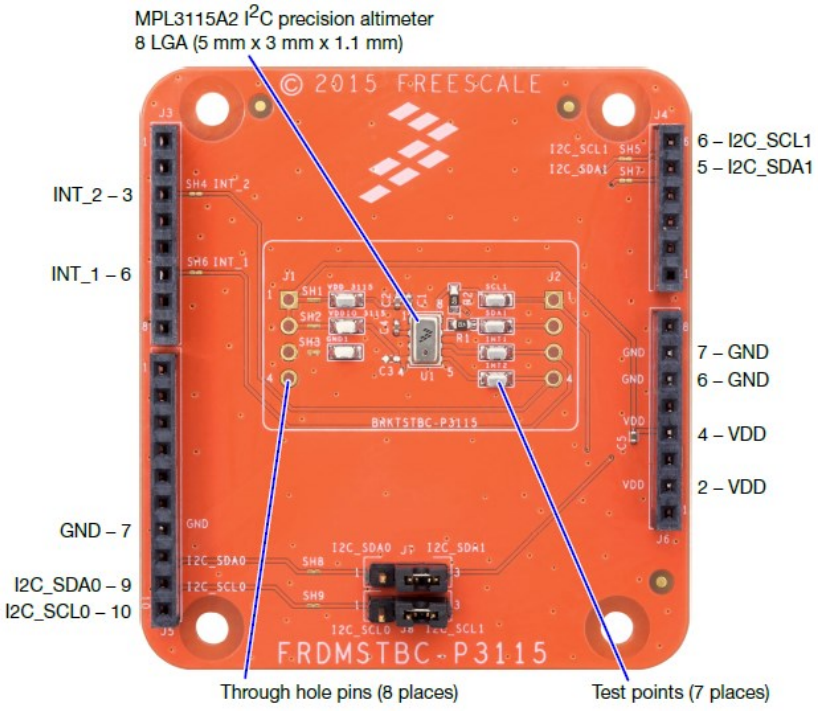


i) MCUXpresso IDE will open FXLS896x example projects: “evkmimxrt1020_mpl3115_pressure” and “evkmimxrt1020_mpl3115_altimeter”. For details about the examples, you can refer to the readme.txt available under doc folder of the example projects.



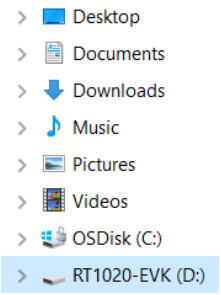
4.2 Step#2 (Build Imported sensor examples and see output on serial terminal)

a) Connect the FRDMSTBC-P3115 sensor shield board to MIMXRT1020-EVK using Arduino I/O headers.
Note: Make sure default jumper settings on FRDEMSTBC-P3115 board is following: J7 connected to pins 2-3 (I2C_SDA1) and J8 connected to pins 2-3 (I2C_SCL1).



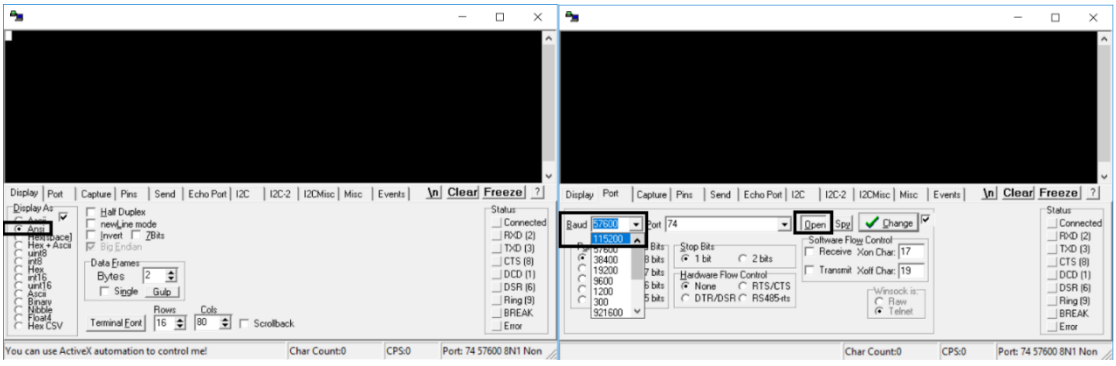
b) Connect MIMXRT1020-EVK to the development PC via the USB cable between the OpenSDA USB port on the board and the USB connector on the PC.

c) Check whether you see a virtual mass storage drive on your PC with name “RT1020-EVK (D:)”.

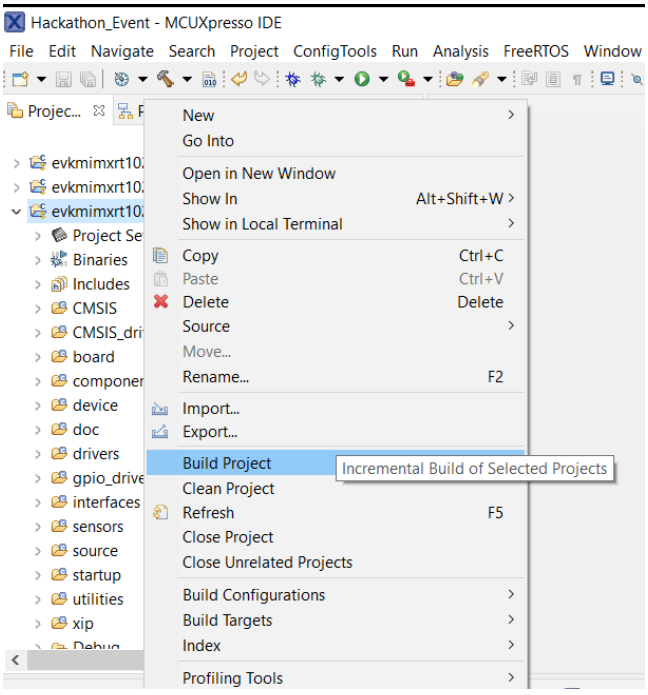


d) Double click on the serial terminal application (e.g.“Realterm” application) (short cut) available on your PC desktop and select following configurations:

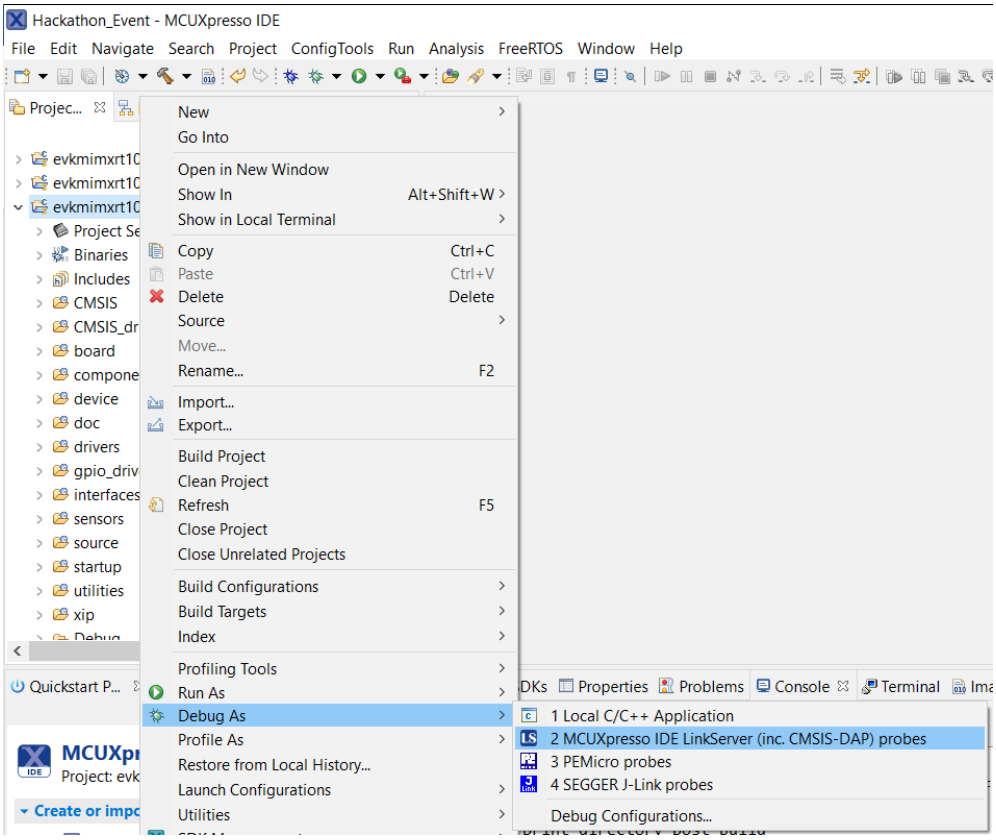
Display Settings: Select display as “Ansi”.
Port Setting: Select Baud rate as “115200”, port automatically selected and click on “Open”.



e) Right click on the “evkmimxrt1020_mpl3115_pressure” project opened in MCUXpresso IDE and select “Build Project” to build the project. You can see the Build console showing you build log.



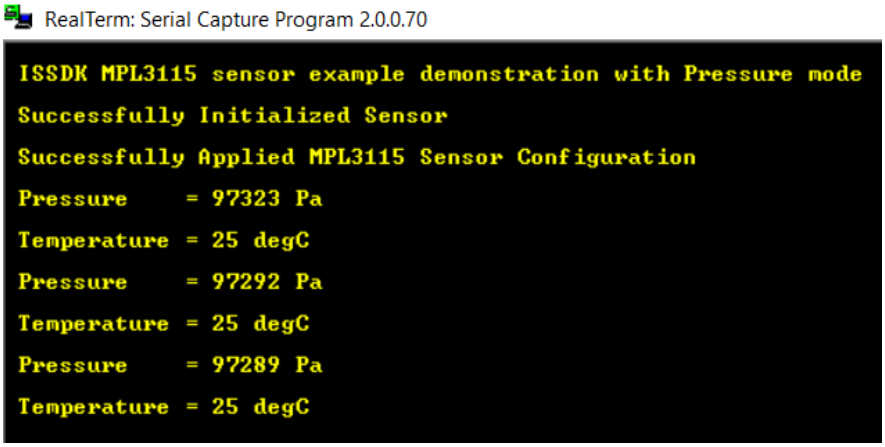
f) Upon successful build, again right click on the “evkmimxrt1020_ mpl3115_pressure” project and select “Debug As->MCUXpresso IDE LinkServer probes” to start loading the example image to the connected MIMXRT1020-EVK with FRDMSTBC-P3115 sensor shield board. Click on “OK” when prompted.



g) Once program is launched to the connected MIMXRT1020-EVK with FRDMSTBC-P3115 sensor shield board, click on “Resume” or press “F8” to run the program.

h) You can see “Realterm” application showing sensor samples. Click Enter on RealTerm terminal to continue running the application.

Note: The “evkmimxrt1020_mpl3115_pressure” program extracts pressure & temperature samples by polling data ready event and displays pressure & temperature values in ‘Pa’ & degC respectively on serial terminal.

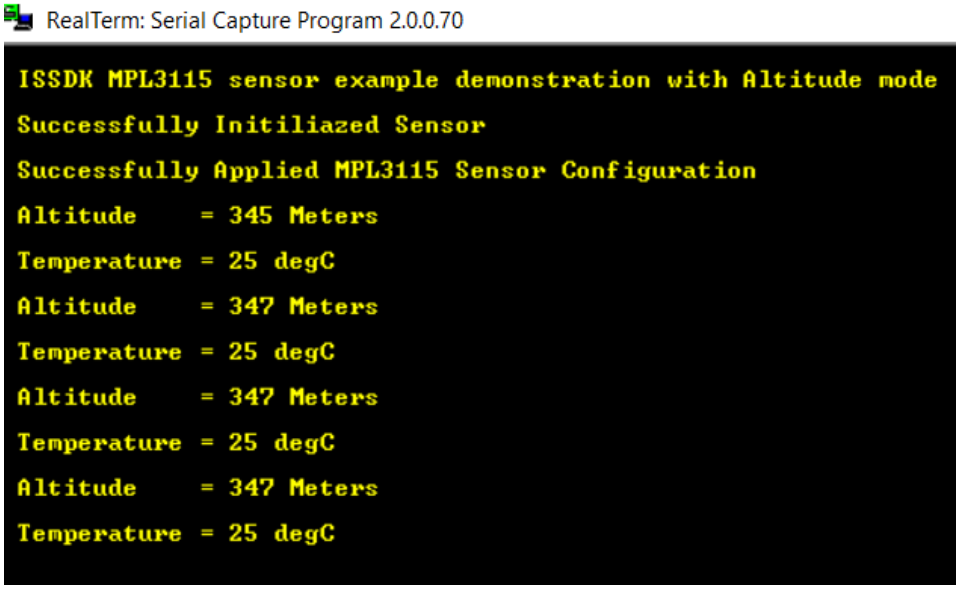


Note: Terminate this debug session (press “Ctrl + F2”) to stop the debugger before building/opening another project or modifying project source files.

i) Follow steps f), g) for building “evkmimxrt1020_mpl3115_altimeter” out-of-box example project and step h) for launching program to the connected MIMXRT1020-EVK with FRDMSTBC-P3115 sensor shield board.

j) Click on “Resume” or press “F8” on MCUXpresso IDE to run the “evkmimxrt1020_mpl3115_altimeter” program and see “Realterm” application showing output as following:

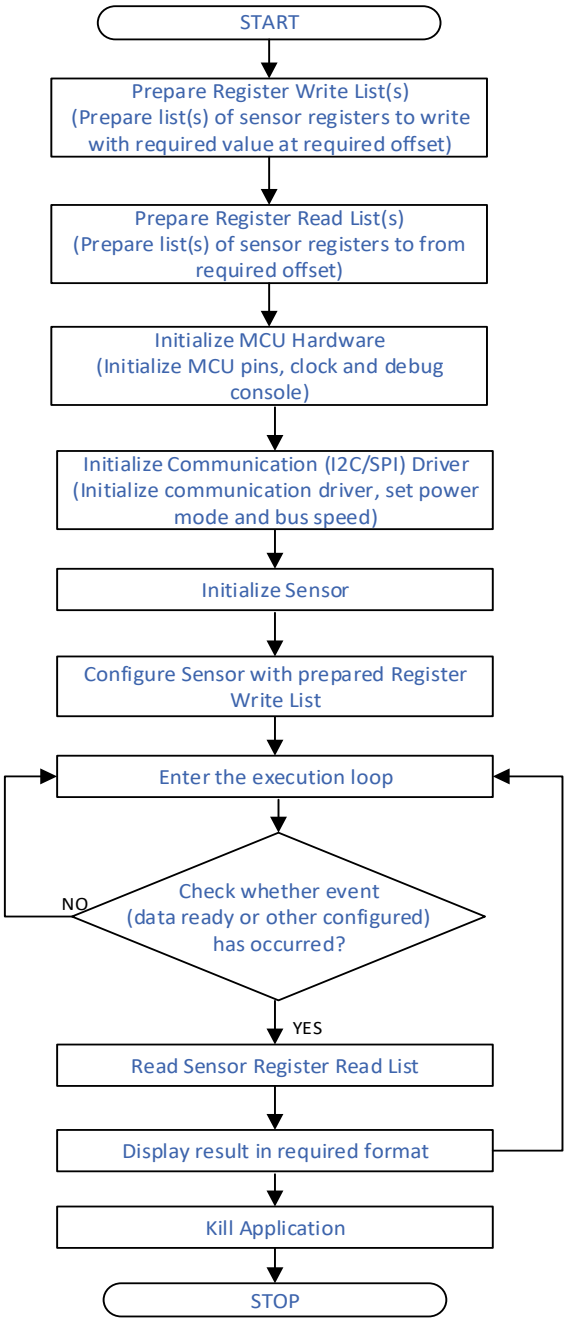
Note: The “evkmimxrt1020_mpl3115_altimeter” program extracts altitude & temperature samples by polling data ready event and displays altitude & temperature values in ‘meter’ & degC respectively on serial terminal.



4.3 Step#3 (Understand ISSDK out-of-box sensor example code flow)

a) Understand sensor out-of-box ISSDK example code flow:

- The flow diagram below shows typical flow of ISSDK out-of-box sensor example.



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