CS3237: A Tutorial for TI-RTOS on CC2650
[To be attempted in Lab sessions in Week 8]

Getting Started

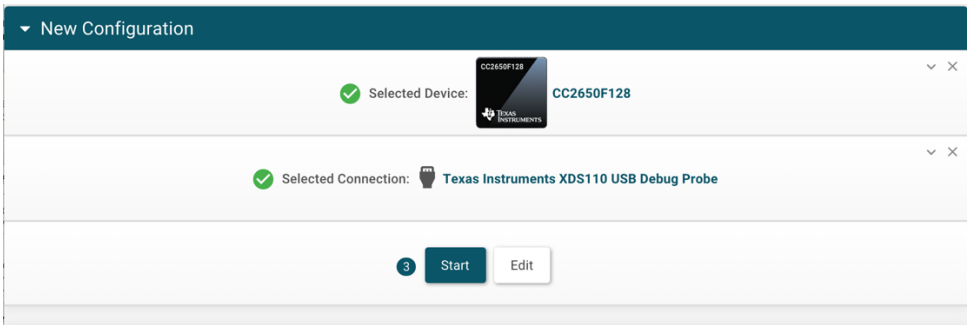
Your first task today is to check out the sensors of your SensorTag.

If your SensorTag CC2650 is **brand new**, getting started is super easy. Your first step is:

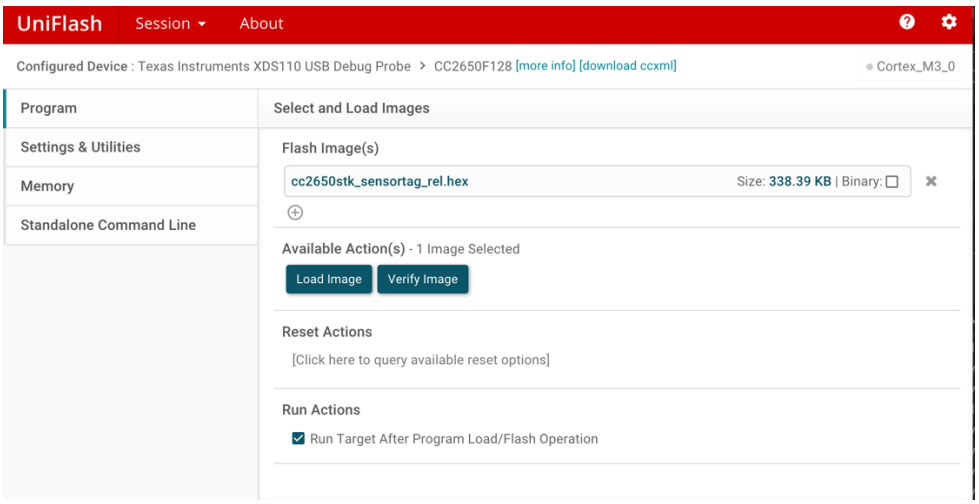
1. Pull the plastic tab on the SensorTag battery to power on. You should find that the green LED will blink 5 times.

If your SensorTag CC2650 has been used before, you will need to flash the default firmware onto the tag.

1. Download and install UniFlash from Texas Instruments: https://www.ti.com/tool/UNIFLASH
2. Download the default firmware here: https://www.dropbox.com/s/x2k9immbxt4c1q9/cc2650stk_sensortag_rel.hex?dl=0
3. Plug the **Debug DevPack** into the **SensorTag** and the USB into your computer.
4. Run **UniFlash** and select *CC2650128* and *Texas Instruments XDS110 USB Debug Probe* and click **Start**



5. Click **Browse**, select the flash image *cc2650stk_sensortag_rel.hex* and click **Load Image.** This will take a few seconds.



6. You have now put the default firmware on the tag! Great. Good as new.

Regardless, the next steps are:

1. Download the SensorTag app from the Apple App Store or the Google Play Store.
2. Within the app select your SensorTag from the device list, then select “Sensor View” to see the sensor’s readings.

   Note:. Please power off the board by pressing the power button for three seconds, if you do not use it.

SensorTag APP

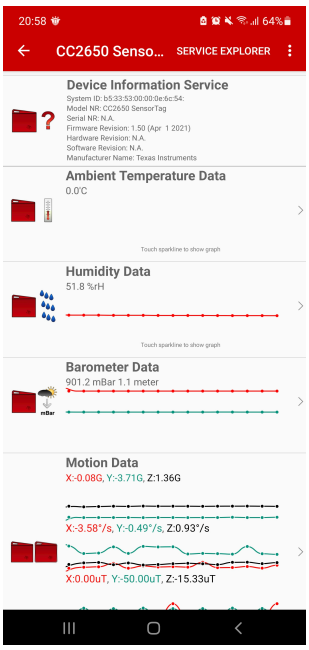


Figure 1 SensorTag APP User Interface

SensorTag Board

Power On

After inserting the battery, the LEDs are used to indicate the status of the power on self-test. If all sensors AND the external flash pass the self-test, the green LED will blink 5 times in rapid succession. If any of the tested units failed, the red LED will blink.

Power Off

Power button pressed for three seconds: the SensorTag is disconnected. The lifetime of the battery is around 16~20 hours. You can use the Debugger Dev to get the external power supply.

Debug DevPack

The Debug DevPack supplies power to the SensorTag in addition to providing a USB JTAG interface. This means the DevPack can load applications onto the SensorTag and subsequently debug them. It provides a debug solution based on the XDS-110 emulator, with official support for TI's Code Composer Studio. Using this DevPack is the topic for the second half of todays lab.

Installing TI-RTOS in Code Composer Studio

Your second task today is to install your own application to the SensorTag.

TI-RTOS is a scalable, one-stop embedded tools ecosystem for TI devices. It scales from a real-time multitasking kernel to a complete RTOS solution including additional middleware components and device drivers.

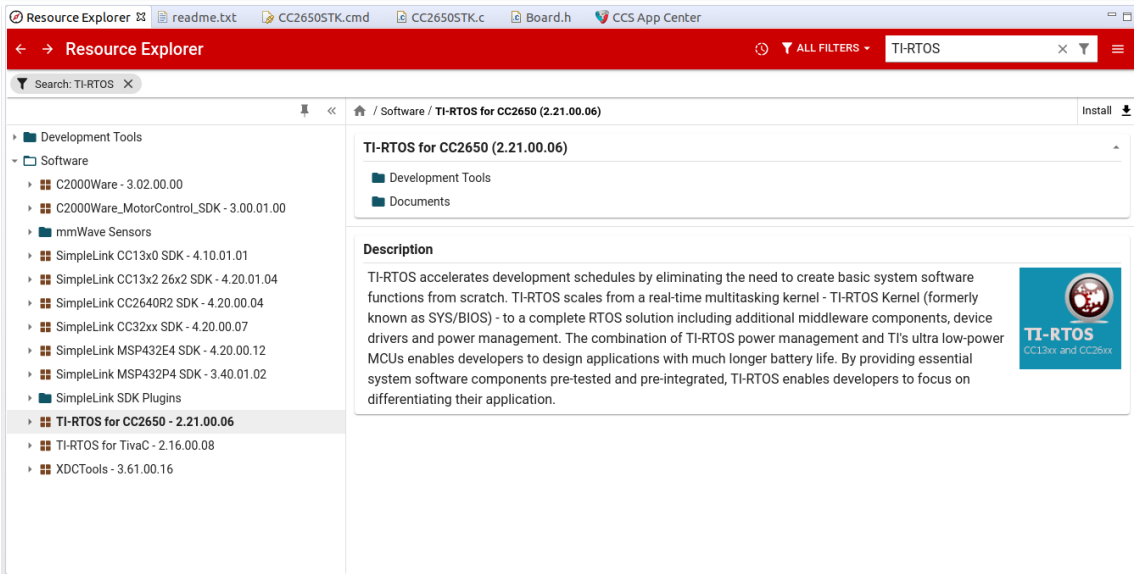
TI-RTOS is not installed automatically as part of the Code Composer Studio (CCS). Instead, you can install it through the CCS Resource Explorer.

Please install the CCS first before TI-RTOS. On-demand (web) installers is recommended for installation. Please selection custom installation and only install “SimpleLink CC13xx and CC26xx Wireless MCUs” components. You can try other components later.
Download page: https://www.ti.com/tool/download/CCSTUDIO

Follow these steps to install TI-RTOS in CCS:

1. Run CCS (Recommend Version10.x, any operating system).
2. Choose View > Resource Explorer in CCS.
3. Type “TI-RTOS” in Keywords. Go to software and click “TI-RTOS for CC2650”
4. Install the “TI-RTOS”

A screenshot of installing TI-RTOS is below:



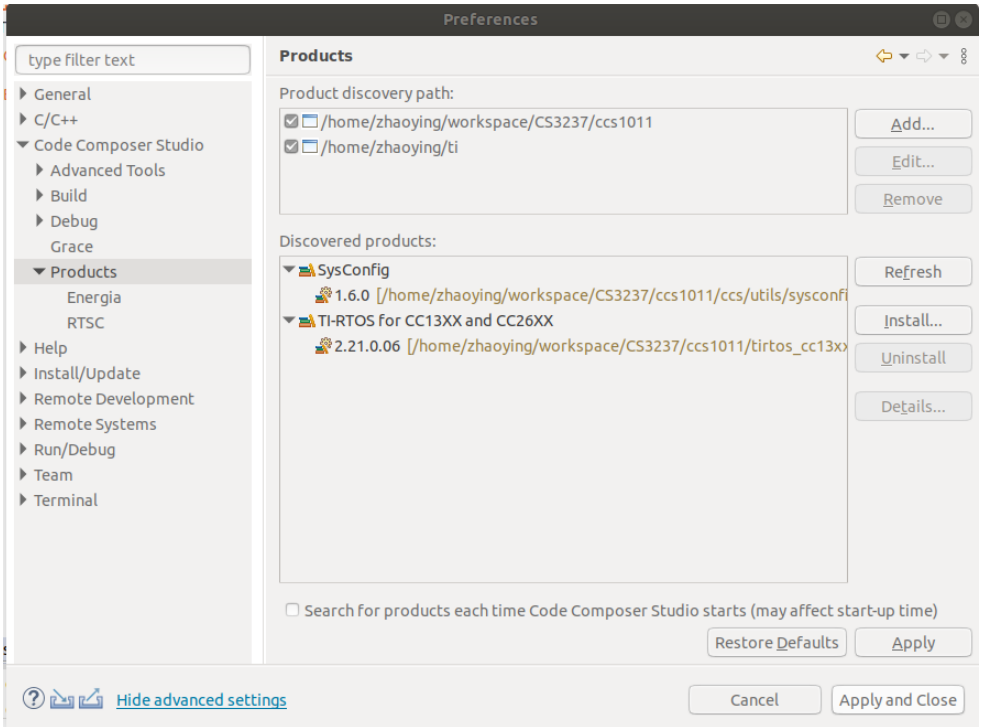
Examples for TI-RTOS

TI-RTOS comes with a number of examples that illustrate on how to use the individual components. Here we use an empty project operating LEDs as an example.

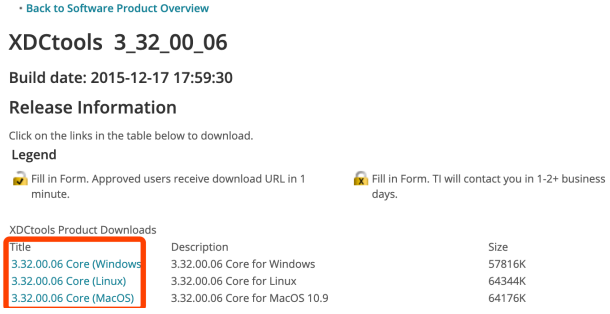
The starting point for the project will include the XDC (eXpress DSP Components) tools currently available from Texas Instruments as a free download. XDC tools is a product that contains all of the tools necessary to create, test, deploy, install, and use TI-RTOS components.

Install XDC Product:

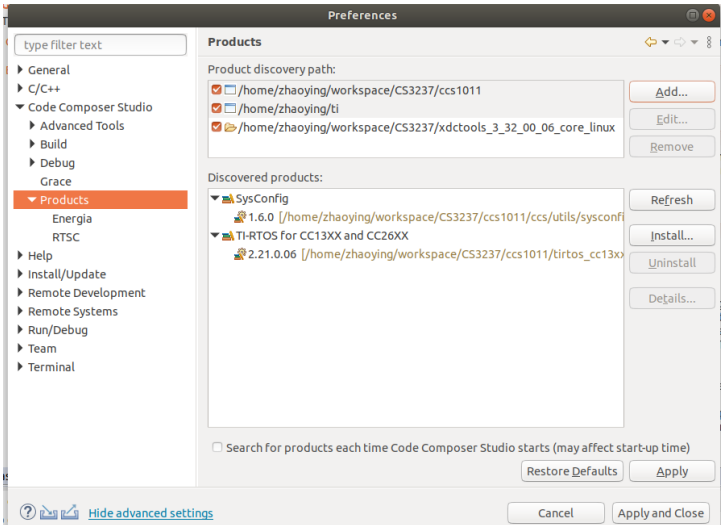
1. Go to Window and select Preferences. Go to Code Compose Studio and select Products.
2. We need to use XDCtools 3.32.0.06_core product. Make sure you remove other XDC tools. It is fine if you do not have TI-RTOS product. The window should look like this:



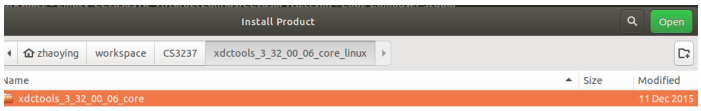
3. Download the product from this link: http://software-dl.ti.com/dsps/dsps_public_sw/sdo_sb/targetcontent/rtsc/3_32_00_06/index_FDS.html. Select the version of your OS. Extract anywhere you like.



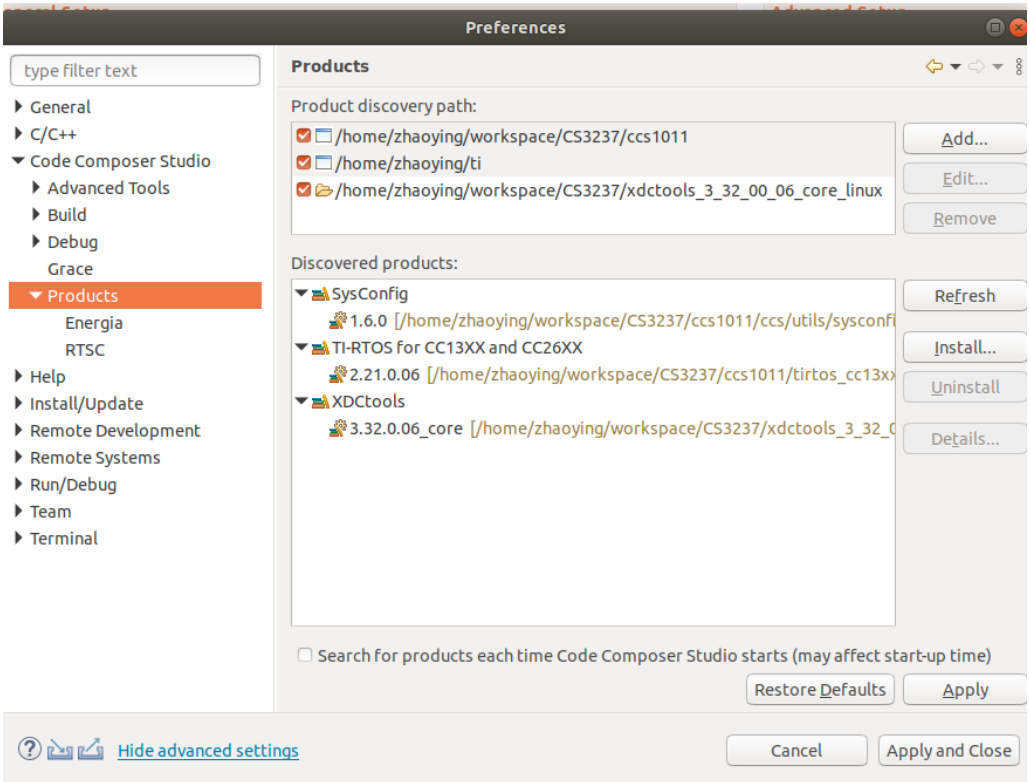
4. Add Path. In the right above of the CCS window, click “Add” to add the path of your extracted XDC folder. The window should look like this.



5. Install the product. Click Install and open Product, as shown in the bellowing picture.



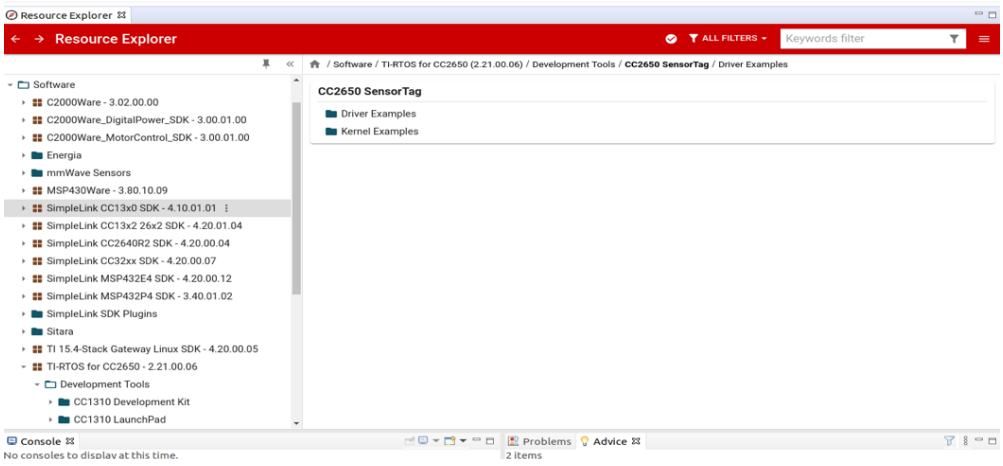
6. It will ask you to restart the CCS. After restart, check the Preferences. It should look like this:



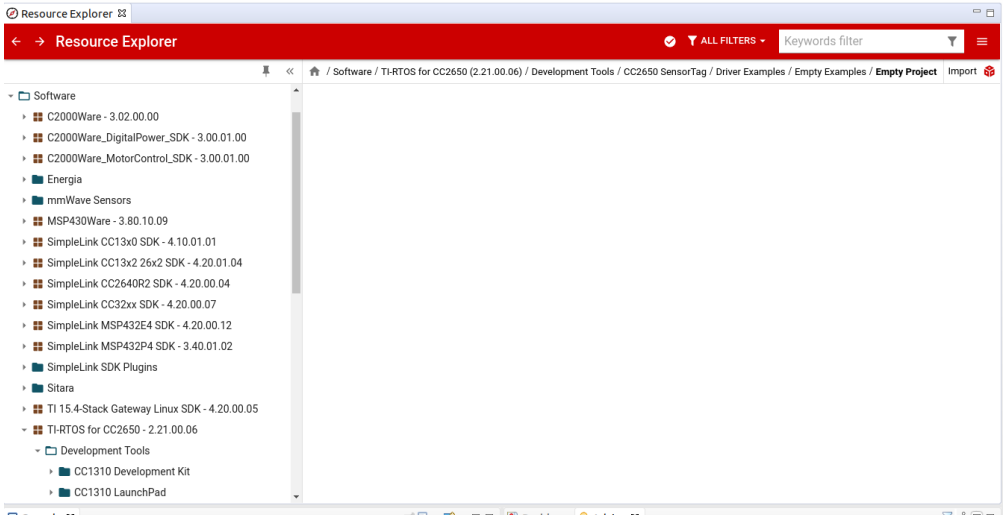
7. Click **Apply and Close.**

Creating Example Projects Using the Resource Explorer in CCS

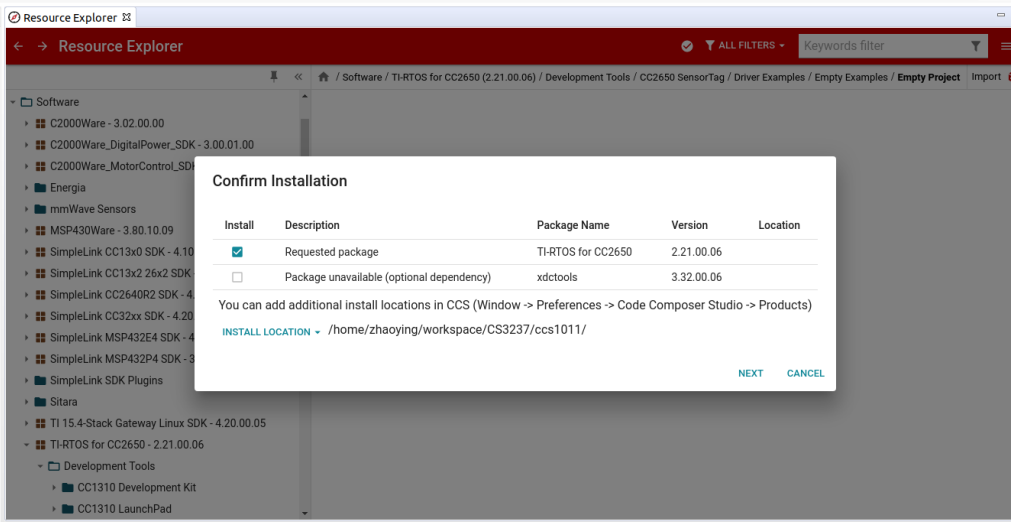
1. After installation of TI-RTOS, select **Development Tools** in the same window under Resource Explorer.
2. Then select **CC2650 SensorTag** and there will list some examples.
3. Here, we will use the driver examples to try out. Go to **Driver Examples** and select the **Empty Examples**.



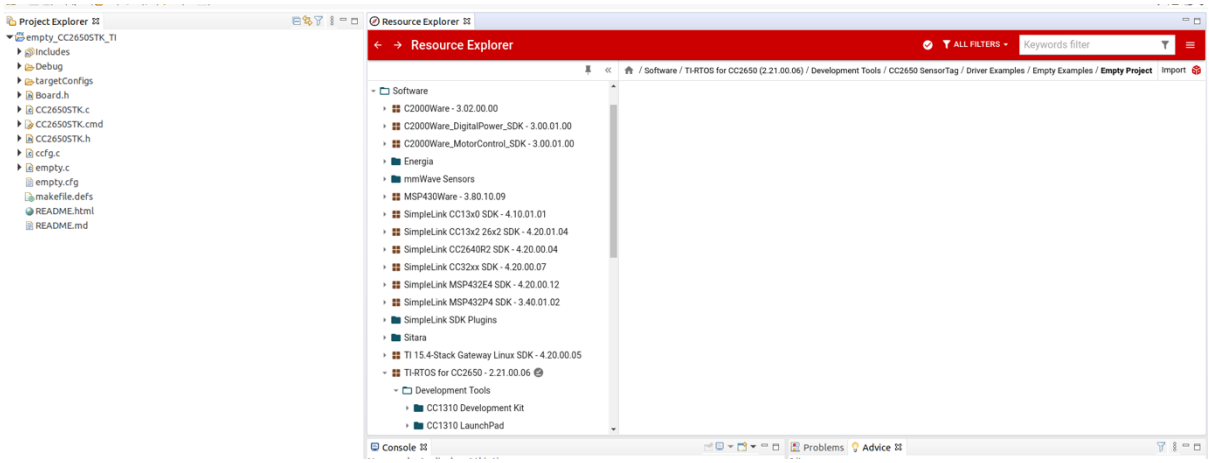
4. Open **Empty Project** and **import** it.



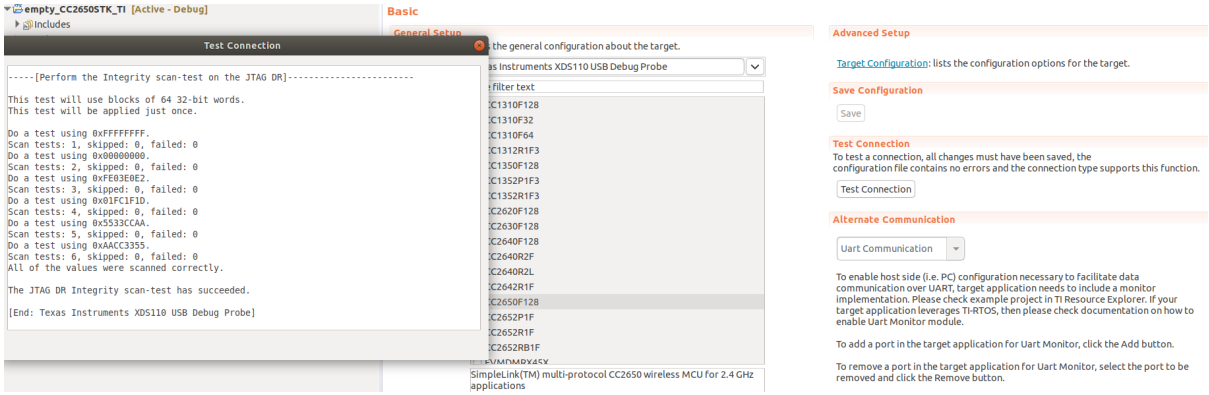
5. Confirm installation and select the location anywhere you will install it. Go to NEXT.



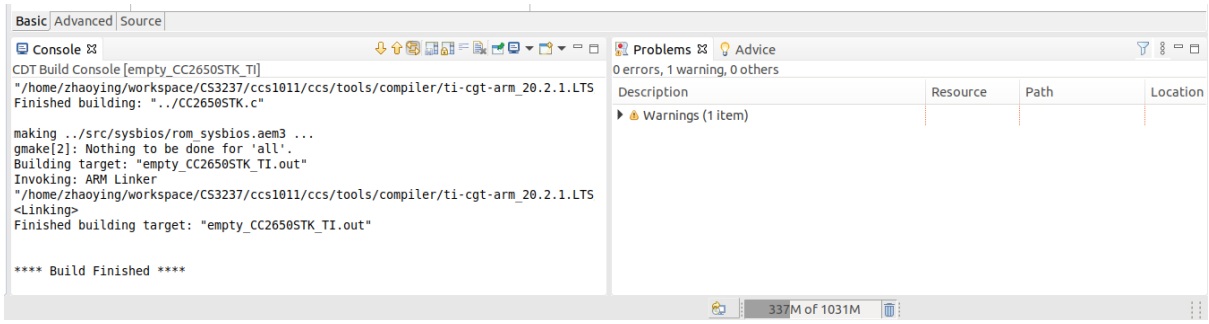
6. It will prompt that it will install the example into background. Wait and then it will let you import it. After import, the window should look like this.



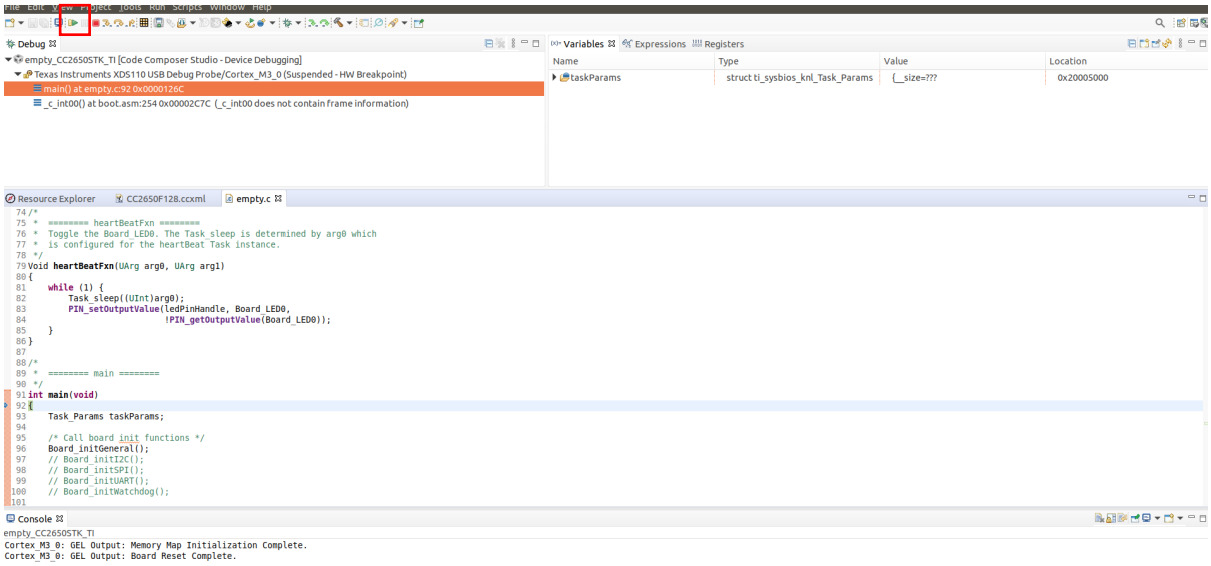
7. Make sure you have stacked the Debugger and SensorTag Board. Connect your debugger to laptop through the USB cable.
8. Test connection. Go to **targetConfigs** and double click “CC2650F128.ccxml” file. Click **Test Connection**. It will pop out a window and then show the connection it successful. If not, please go to the last section to check whether you successfully removed irrelevant XDL and install the right XDL product.



9. Build the project. Right click the **empty_CC2650TK_**TI project and select **Build Project**.

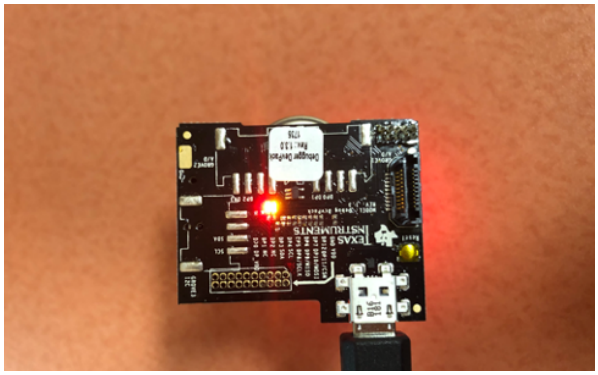


10. Run the project. Right click the **empty_CC2650TK_**TI project and select **“Debug As” → Code Composer Debug session**. It will take a few seconds. The window look like this:

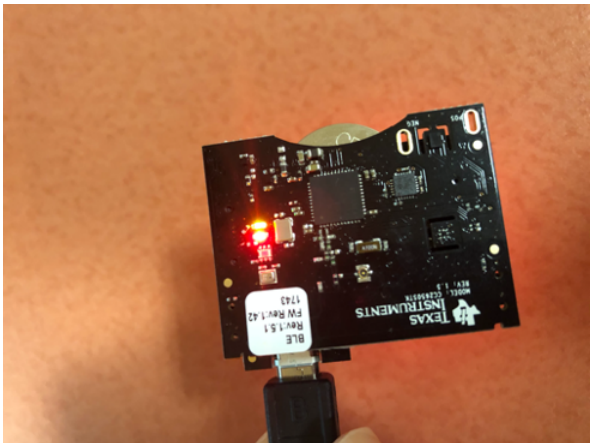


11. Click on **Resume** which is indicated on the above picture.

12. Then check the debugger board. The red and green LED should shine.



13. Check the SensorTag board. The red LED is shining, and the green LED should blink on the SensorTag board (not to be confused by the debugger).



14. Terminate the process, which is near the resume button.

For more detail, please refer this document:
https://www.ti.com/lit/ug/spruhu7d/spruhu7d.pdf?ts=1601389823859