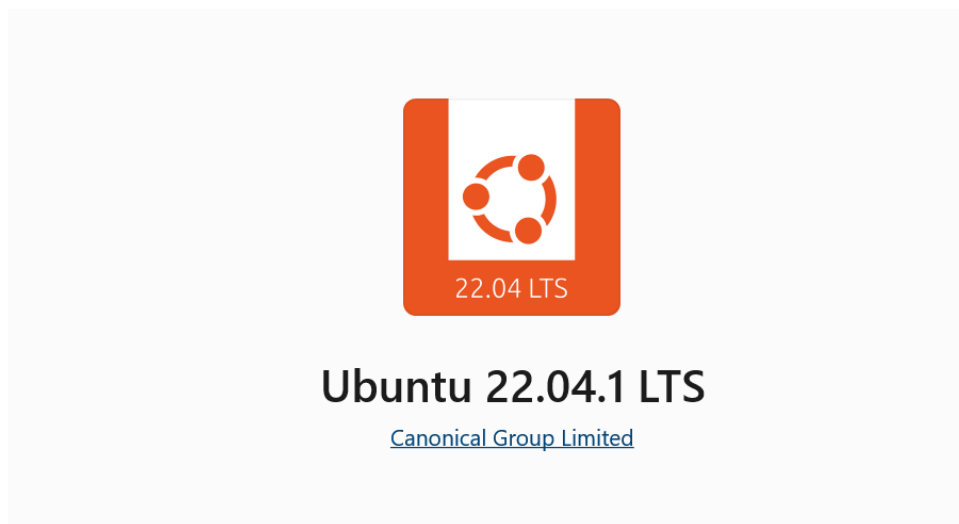


Setting up Texas Instruments CC2650: Sensor Tag Together with Contiki OS on Windows

1. Setting up your environment

Install WSL (Windows Subsystem for Linux) Ubuntu. You can find it in the Microsoft Store. Click “get” to install



Once the installation of windows subsystem for linux (WSL) is complete, you can launch it and the Bash Ubuntu shell will appear. You will be prompted to create a username and password. It's important to note that the C drive will be displayed as /mnt/c and the D drive will be displayed as /mnt/d.

Please install Contiki OS in your chosen directory:

```
git clone https://github.com/contiki-ng/contiki-ng.git --recursive
```

Next, we will install the ARM GCC compiler:

```
sudo apt-get install gcc-arm-none-eabi
```

Please note that if the above command produces an error, follow the alternate commands provided below to install the ARM GCC compiler:

```
sudo add-apt-repository ppa:team-gcc-arm-embedded/ppa
sudo apt-get update
```

```
sudo apt-get upgrade
sudo apt-get install gcc-arm-none-eabi
sudo apt-get install gdb-arm-none-eabi
```

2. Setting up UniFlash

You can install UniFlash using either of the two alternative procedures listed below:

There are two alternatives that you can choose

A. Cloud version of Uniflash

You can find it here <https://dev.ti.com/uniflash/#/> You need to create an account with your NUS email. Then you need to install a Chrome extension, and TICloudAgent on your Windows. If you are asked to update firmware, click YES

B. Offline version of Uniflash

You can find it here <https://www.ti.com/tool/download/UNIFLASH>

3. Running your program

3.1 Compiling

In the bash terminal in Ubuntu, please change directory and go to 'hello-world' folder in examples:

<your directory>/contiki-ng/examples/hello-world/

```
sudo make TARGET=cc26x0-cc13x0 BOARD=sensortag/cc2650  
PORT=/dev/ttyACM0 hello-world
```

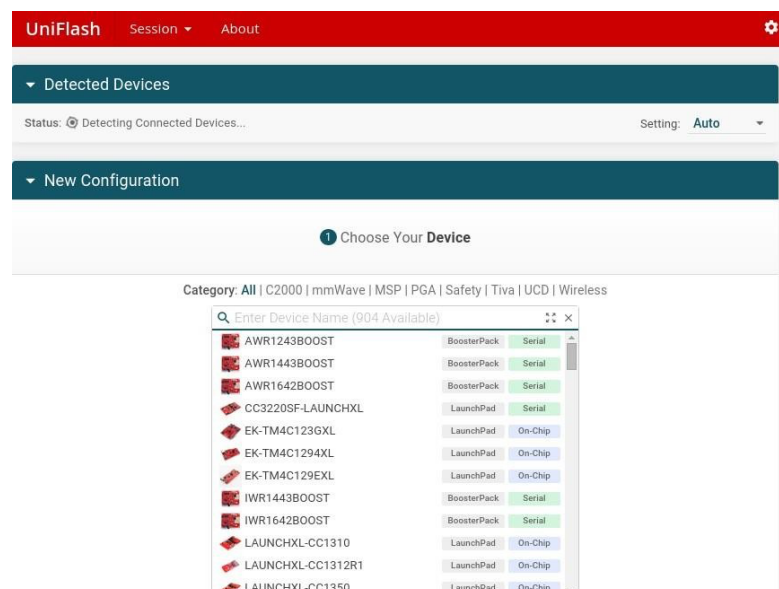
3.2 Flashing the SensorTag with the binary file

3.2.1 Open the **Uniflash** program

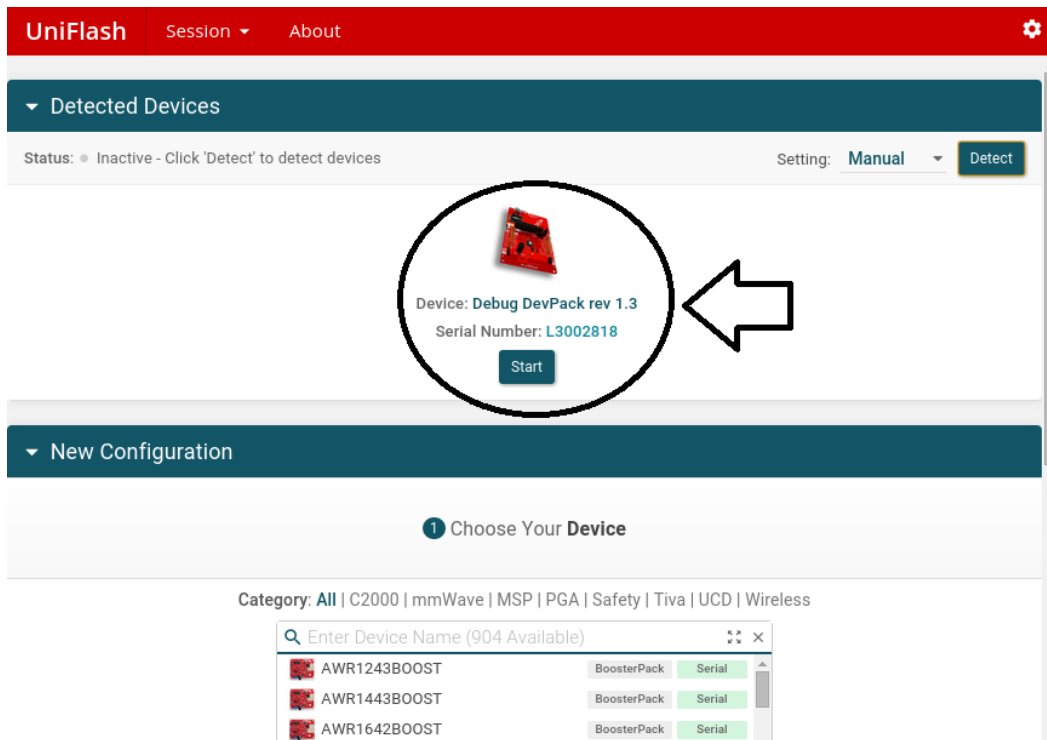
Make sure that your SensorTag is connected to your computer and start the Uniflash application.

3.2.1 Session configuration

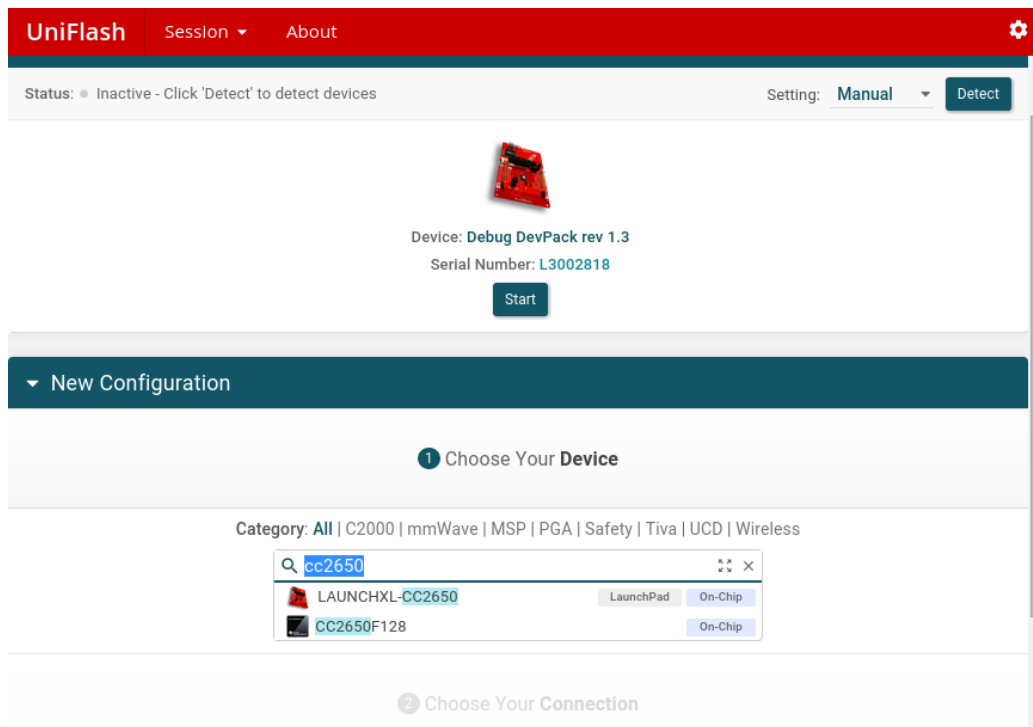
The first step is the SensorTag Debugger board detection. It starts with the **Auto** setting.

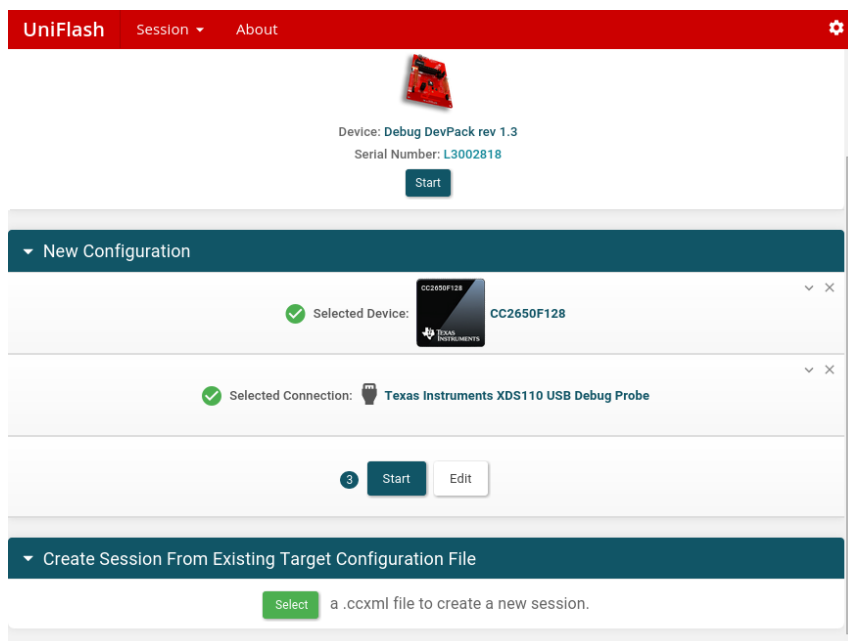


If your Sensor Tag Debugger board is not detected, change the setting to **manual** and click on **detect**. Wait until it is detected as shown below:



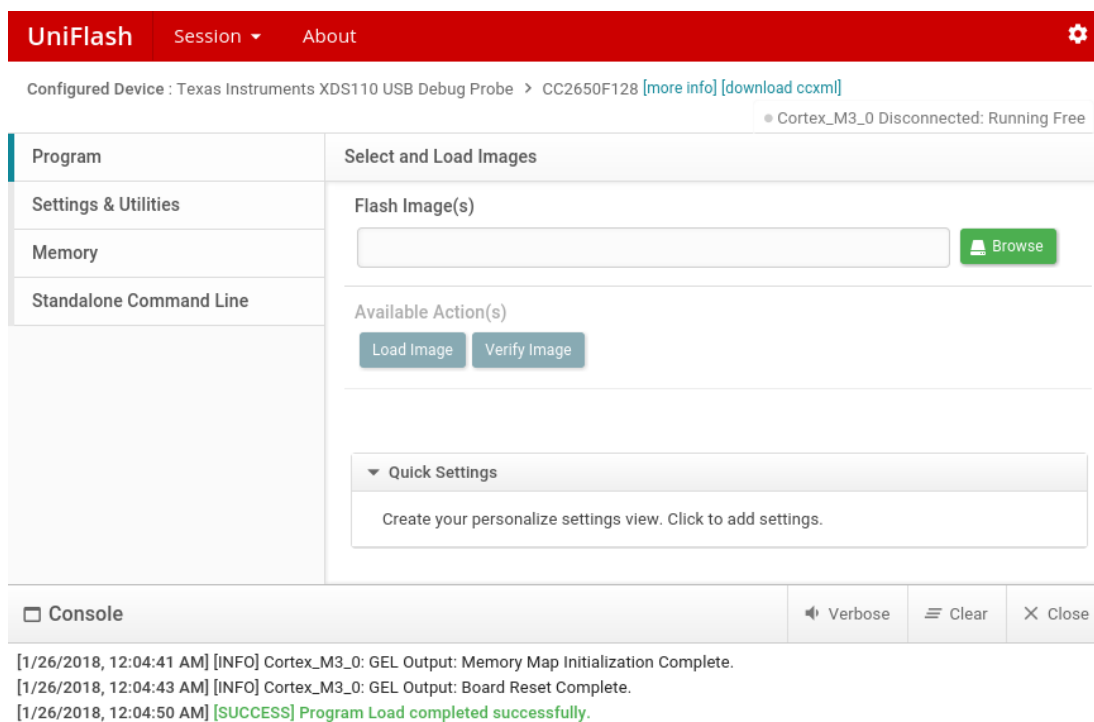
Next, choose your device by typing **CC2650** in the search field and select **CC2650F128**.





Next, choose the **Texas Instruments XDS110 USB Debug Probe** and hit the **Start** button as shown below.

Finally, browse for the file *[enter the command explorer.exe . in ubuntu bash to identify the location of the file]* generated from the compilation phase (**hello-world.cc26x0-cc13x0**) and click on Load Image



If you get **error** while flashing, the link below may be helpful:

https://www.zigbee2mqtt.io/information/flashing_via_uniflash.html

Basically, you just need to go to step "Erase entire flash" and then continue with "Load image"

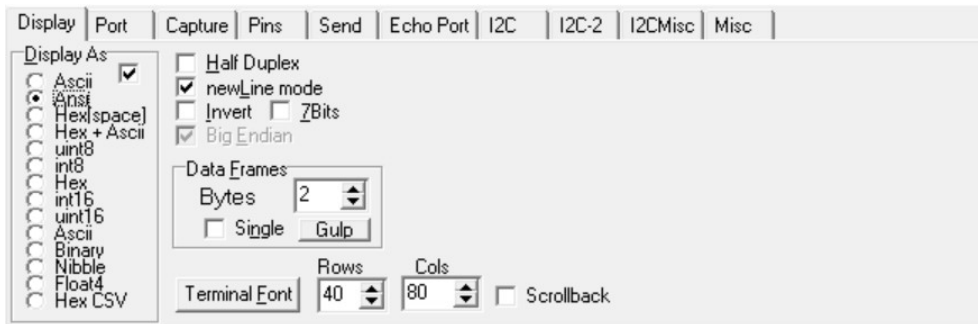
3.3 Showing the result

Unfortunately, Bash Ubuntu cannot detect your USB sensortag. To handle that, you can install `realterm`

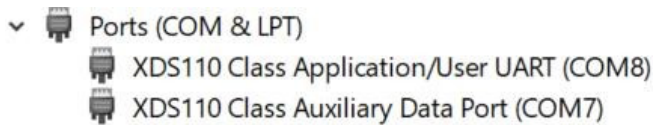
<https://sourceforge.net/projects/realterm/>

Once finished, open it and change some settings.

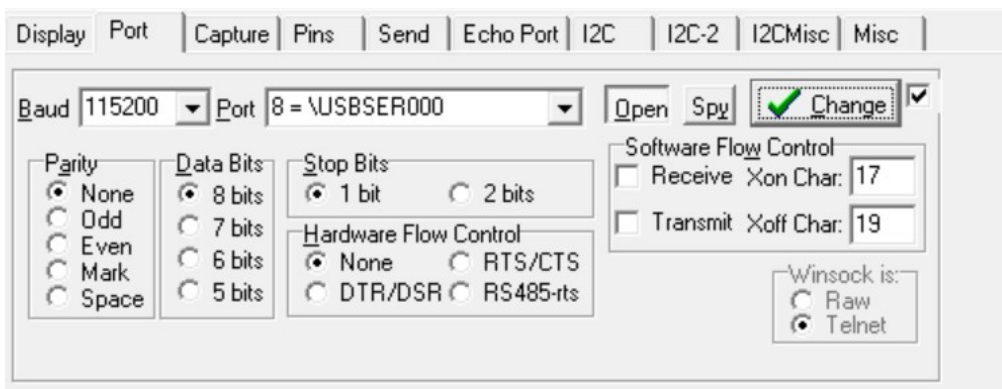
- In "Display" tab, choose Ansi instead of Ascii, check newLine mode, and change Rows to 40



- In "Port" tab, set baudrate to 115200 and Port same as shown in your Device Manager. Choose the UART one since normally you will get two ports connected. In my example below it is COM8



- Still in "Port" tab, set your settings as follow. Then press "Change" button. Lastly, press "Open"



Press the reset button in your sensortag. And finally, the result is displayed,

```
RealTerm: Serial Capture Program 2.0.0.70
Starting Contiki-3.x-3345-g32b5b17f6
With DriverLib v0.47020
TI CC2650 SensorTag
IEEE 802.15.4: Yes, Sub-GHz: No, BLE: Yes, Prop: Yes
Net: sicslowpan
MAC: CSMA
RDC: ContikiMAC, Channel Check Interval: 16 ticks
RF: Channel 25
Node ID: 52738
Hello, Ghozali
```

2 Updating sensortag firmware (optional)

The following file is also required (TI emulator pack) to update the sensortag's firmware

https://software-dl.ti.com/ccs/esd/documents/xdsdebugprobes/emu_xds_software_package_download.html

After installing the TI emulator, open your command prompt (open as administrator), go to your install path (e.g. C:\ti) and cd to C:\ti\ccs_base\common\uscif\xds110.

Your SensorTag device should be attached to the XDS110 development board. Connect the XDS development board to your laptop using the USB cable provided.

Now run this in your command prompt

```
xdsdfu -m
```

and make sure you get this response.

```
D:\Softwares\Installed\ti\ccs_base\common\uscif\xds110>xdsdfu -m
USB Device Firmware Upgrade Utility
Copyright (c) 2008-2019 Texas Instruments Incorporated. All rights reserved.
Scanning USB buses for supported XDS110 devices...

<<<< Device 0 >>>>

VID: 0x0451   PID: 0xbef3
Device Name:  XDS110 Embed with CMSIS-DAP
Version:      2.3.0.18
Manufacturer: Texas Instruments
Serial Num:   L850L850
Mode:         Runtime
Configuration: Standard

Switching device into DFU mode.
```

Then run this in your command prompt

```
xdsdfu -f firmware_3.0.0.13.bin -r
```

(the **version** can vary depending on the PC, e.g. latest version **3.0.0.15** works better) And you should get this response.

```
D:\Softwares\Installed\ti\ccs_base\common\uscif\xds110>xdsdfu -f firmware_3.0.0.13.bin -r
USB Device Firmware Upgrade Utility
Copyright (c) 2008-2019 Texas Instruments Incorporated. All rights reserved.
Scanning USB buses for supported XDS110 devices...
Downloading firmware_3.0.0.13.bin to device...
```

Now, when you run `xdsdfu -m` you should get your sensortag version has been changed

```
D:\Softwares\Installed\ti\ccs_base\common\uscif\xds110>xdsdfu -m
USB Device Firmware Upgrade Utility
Copyright (c) 2008-2019 Texas Instruments Incorporated. All rights reserved.
Scanning USB buses for supported XDS110 devices...

<<<< Device 0 >>>>

VID: 0x0451    PID: 0xbef3
Device Name:  XDS110 Embed with CMSIS-DAP
Version:      3.0.0.13
Manufacturer: Texas Instruments
Serial Num:   L850L850
Mode:        Runtime
Configuration: Standard

Switching device into DFU mode.
```

3 Solving locked memory (optional)

Some students report that they got this problem. To solve this, you can do force-erase to yoursensortag by using Flash Programmer 2. You can find it here

<https://www.ti.com/tool/download/FLASH-PROGRAMMER-2>

Once installed, open the flash programmer 2 and connect your sensortag.

Right click to the CC2650 (red circle) and click connect. Check Erase (yellow circle) and click the Play button (blue circle). If it is successful you must see the message in the status box (bottom side)

