# 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



Ubuntu 22.04.1 LTS

Canonical Group Limited

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 <u>https://dev.ti.com/uniflash/#!/</u> 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.

UniFlash	Session 👻	About						۰
- Detected I	Devices							
Status: 🖲 Detect	ing Connected De	vices				Setting:	Auto	*
➡ New Conf	iguration							
		1 Choose Your De	evice					
	Cate	gory: All   C2000   mmWave   MSP   PGA	Safety   Tiv	a   UCD   1	Wireless			
		Q Enter Device Name (904 Available)		50	×			
		KAWR1243BOOST	BoosterPack	Serial	-			
		KAWR1443BOOST	BoosterPack	Serial				
		AWR1642BOOST	BoosterPack	Serial				
		SCC3220SF-LAUNCHXL	LaunchPad	Serial				
		TIM4C123GXL	LaunchPad	On-Chip				
		EK-TM4C1294XL	LaunchPad	On-Chip				
		IK-TM4C129EXL	LaunchPad	On-Chip				
		IWR1443BOOST	BoosterPack	Serial				
		IWR1642BOOST	BoosterPack	Serial				
		LAUNCHXL-CC1310	LaunchPad	On-Chip				
		LAUNCHXL-CC1312R1	LaunchPad	On-Chip				
		LAUNCHXL-CC1350	LaunchPad	On-Chip	-			

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:

UniFlash Session - About	٠
✓ Detected Devices	
Status:   Inactive - Click 'Detect' to detect devices	Setting: Manual 👻 Detect
■ Device: Debug DevPack Serial Number: L300 Start ■ New Configuration	(rev 1.3 2818
Choose Your D	evice
Category: All   C2000   mmWave   MSP   PGA	Safety   Tiva   UCD   Wireless
<b>Q</b> Enter Device Name (904 Available	** ×
AWR1243BOOST	BoosterPack Serial
AWR1443BOOST	BoosterPack Serial
AWR1642BOOST	BoosterPack Serial

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

UniFlash	Session 👻	About					¢
Status: • Inactive	e - Click 'Detect' to	detect devices		Setting	Manual	•	Detect
		Device: Debu	g DevPack rev 1.3				
		Serial Num	ber: L3002818				
			Start				
			_				_
▼ New Conf	iguration						
		1 Choose	e Your <b>Device</b>				
	Cate	gory: All   C2000   mmWave   M	SP   PGA   Safety   Tiva	UCD   Wireless			_
		Q cc2650		** ×			
		LAUNCHXL-CC2650	LaunchPad	On-Chip			
		CC2650F128		On-Chip			
		Choose Y	our Connection				

UniFlash	Session 👻	About	٠
		Device: Debug DevPack rev 1.3	
		Serial Number: L3002818	
		Start	
✓ New Conf	iguration		
		Selected Device:	~ X
	ø	Selected Connection: 🖤 Texas Instruments XDS110 USB Debug Probe	~ X
		3 Start Edit	
	ssion From E	xisting Target Configuration File	
		Select a .ccxml file to create a new session.	

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

UniFlash Session - Al	pout 🌣				
Configured Device : Texas Instruments XDS110 USB Debug Probe > CC2650F128 [more info] [download ccxml]					
	Cortex_M3_0 Disconnected: Running Free				
Program	Select and Load Images				
Settings & Utilities	Flash Image(s)				
Memory	🚍 Browse				
Standalone Command Line	Available Action(s)				
	Load Image Verify Image				
	▼ Quick Settings				
	Create your personalize settings view. Click to add settings.				
Console	♥ Verbose				
[1/26/2019 12:04:41 AM] [INEO] Cortex	M2. 0: GEL Output: Mamory Man Initialization Complete				

[1/26/2018, 12:04:41 AM] [INFO] Cortex\_M3\_0: GEL Output: Memory Map Initialization Complete.
 [1/26/2018, 12:04:43 AM] [INFO] Cortex\_M3\_0: GEL Output: Board Reset Complete.
 [1/26/2018, 12:04:50 AM] [SUCCESS] Program Load completed successfully.

If you get **error** while flashing, the link below may be helpful: <u>https://www.zigbee2mqtt.io/information/flashing\_via\_uniflash.html</u> 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 installrealterm <a href="https://sourceforge.net/projects/realterm/">https://sourceforge.net/projects/realterm/</a>

Once finished, open it and change some settings.

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

Display Port	Capture Pins Send Echo Port 12C 12C-2 12CMisc Misc
Display As C Ascii (Ansi C Hex[space] C Hex + Ascii C uint8	Half Duplex         ✓         Invert       ZBits         ✓       Big Endian
C int8 C Hex C int16 C uint16 C Ascii C Biparu	Data <u>F</u> rames Bytes 2 <b>↓</b> Single <u>Gulp</u>
C Nibble C Float4 C Hex CSV	Terminal Font 40 = 80 = Cols

- In "Port" tab, set baudrate to 115200 and Port same as shown in your Device ManagerChoose the UART one since normally you will get two ports connected. In my examplebelow it is COM8
  - Ports (COM & LPT)
     XDS110 Class Application/User UART (COM8)
     XDS110 Class Auxiliary Data Port (COM7)
- Still in "Port" tab, set your settings as follow. Then press "Change" button. Lastly, press" Open"

aud 115200	▼ Port 8	= \USBSER000 ▼	Open Spy
Parity None	Data Bits	<u>S</u> top Bits	Software Flow Control Receive Xon Char: 17
C Even C Even C Mark C Space	C 7 bits C 6 bits C 5 bits	Hardware Flow Control None C RTS/CTS DTR/DSR C RS485-rts	Winsock is:

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



## 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 toyour 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 Fin Copyright (c) 1	mware Upgrade Utility 2008-2019 Texas Instruments Incorporated.	All rights	reserved.		
Scanning USB b	uses for supported XDS110 devices				
<<<< Device 0	>>>>				
VID: 0x0451 Device Name: Version: Manufacturer: Serial Num: Mode: Configuration:	PID: 0xbef3 XD5110 Embed with CMSIS-DAP 2.3.0.18 Texas Instruments L850L850 Runtime Standard				
Switching devi	ce 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



## 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)

Smart <mark>RF</mark> ™Flash	n Programmer 2 ver. 1.8.2	۶ 2
Connected devices:     XDS110, XDS-L4718     CC2050     XDS110 Class Application/User UART (     Unknown	Main     Edit     Info Page     MAC Address       Flash image(s)     Image (s)     Image (s)       Image Single     Image (s)     Image (s)       Image Multiple     Image (s)     Image (s)       Image Contract (state)     Image (s)     Image (s)       Image Contract (	Image Overrides Customer Config Disable Bootloader Flash lock Witte-protect pages
Refresh Auto-detect Selected target(1):	Actions Frase Actions Frase Program Verify CRC check Readback Skip Pages in image Pages in image	
Wireless MCU 2.4 GHz Radio	Specific pages:  Erase all unprotected pages  Status  Status	Retain secondary BLE address
State: Disconnected Flash size: 128 KB	<ul> <li>&gt;Reset arget</li> <li>&gt;Reset of target successful.</li> </ul>	