# CECS 346 Lab 1. Hello LaunchPad

**Preparation**

You will need a LaunchPad and read Tiva™ C Series TM4C123G LaunchPad User's Guide.pdf on Beachboard "Reference" folder.

**Book Reading** Chapters 1 and 2 in textbook:
Embedded Systems: Introduction to ARM Cortex-M Microcontrollers

**Starter project** Lab2_HelloLaunchPad located in Labware folder.

**Purpose**

When first learning a new programming language it is tradition to begin by running a program that outputs the message "Hello World". Later you will write your own programs. This lab has three parts, in the first two parts, i.e., part a) and part b), you will run simply a program that we have written for you. In part c, you will modify the original code to implement slightly different features. The input and output on the microcontroller comes from physical devices like switches and LEDs. Consequently, our "Hello World" will ask you to push a switch and observe an LED. The purpose of this lab is to work through the process of configuring the development system for the microcontroller board and have a basic understanding on GPIO Port F.

**System Requirements**

The system will have one input and three outputs. The input is a switch called SW1, which is connected port pin PF4. Three outputs (PF3, PF2, PF1) are connected to one multi-color LED. The color of the LED is determined by the 3-bit value written to the outputs. If SW1 is not pressed the LED toggles blue-red, and if SW1 is pressed the LED toggles blue-green.

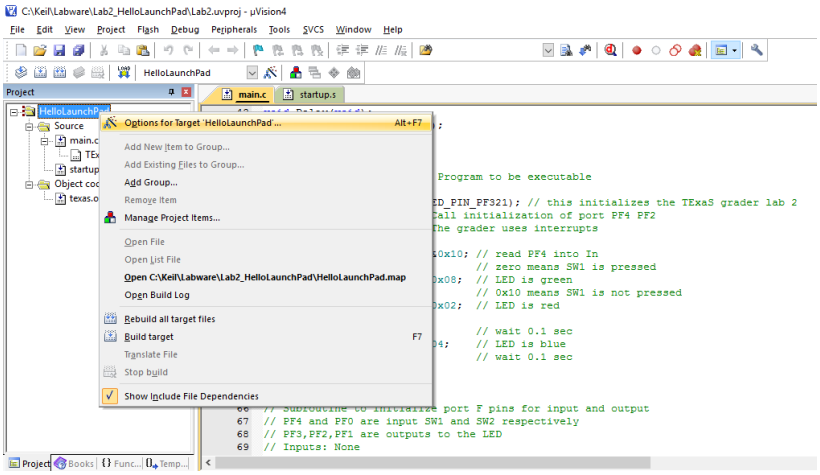
**Procedure**

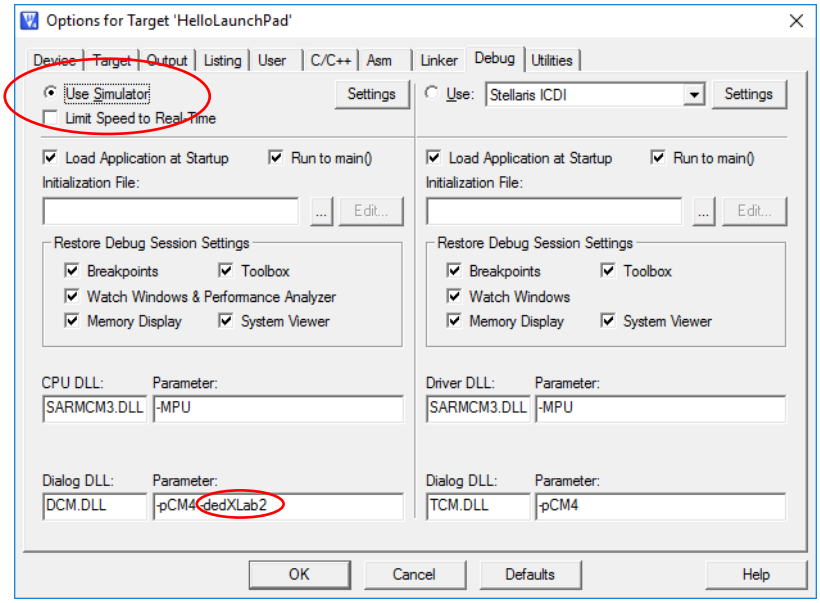
The basic approach to all labs will be to first develop and debug your system using the simulator. You will get a lab grade for this simulation phase of development. After the software is debugged, you will interface actual components to the LaunchPad and run your software on the real microcontroller. You will get a second lab grade for this real-board phase of development. In this lab, you will not need to write any software (just run the software provided) or build any hardware (just use the LaunchPad with the switches and LED already connected). There are three steps to the software installation and the details can be found in document "Getting started with CECS 347.pdf" located on Beachboard "Labs" folder.

**Part a)** To test the software development system is properly installed you will run an existing project called Lab2_HelloLaunchPad located in Labware folder. You should not need to edit any of the code. First you will run Lab 2 in simulation mode. I suggest you modify your Windows system to show file extensions. Here are the suggested steps:

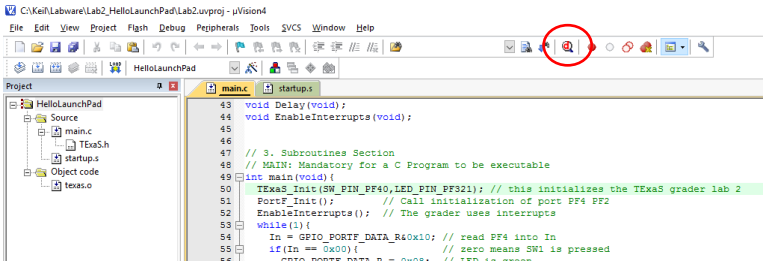
1) Open the starter project file, which is the file Lab2 of type **uvproj** in the Lab2_HelloLaunchPad folder.

2) Verify it is configured to run on the simulator: right click HelloLaunchPad, select “Options for Target ‘HelloLaunchPad’; then select “Debug” tab, and click “Use Simulator”, and the parameter setting has “-dedXLab2”. Keep default setting for all other fields.

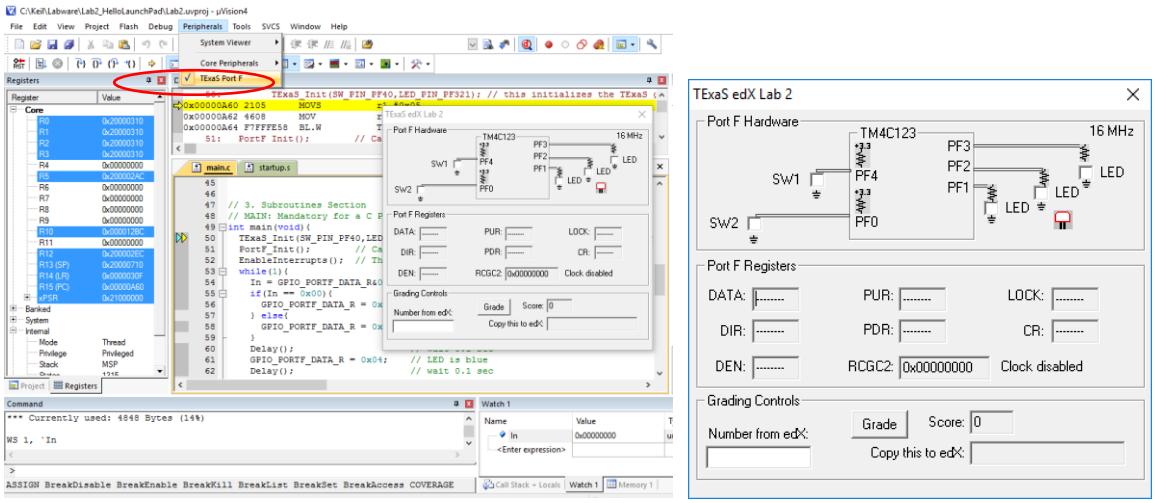



3) Build the project.
4) Start the debugger in simulation mode.

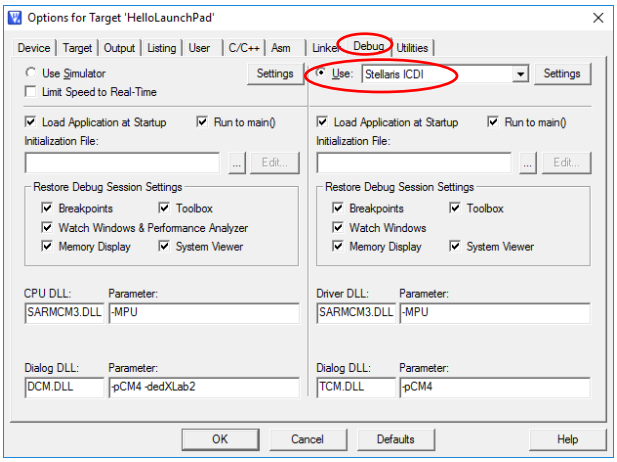


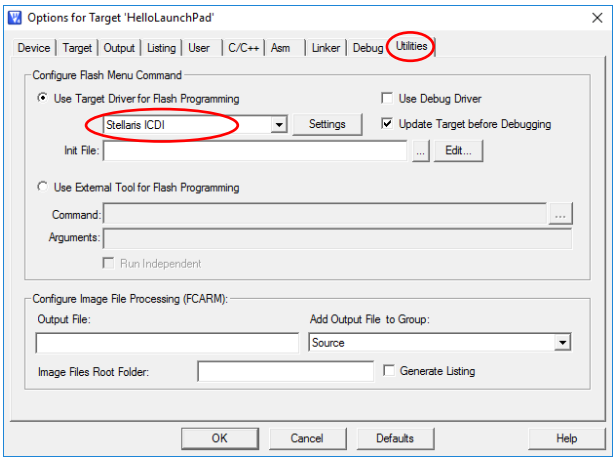
Make sure to bring up the user interface for Port F: click “Peripheral” tab and make sure “TExas Port F” is checked.




5) Run the program and interact with the switches, notice the LED outputs.

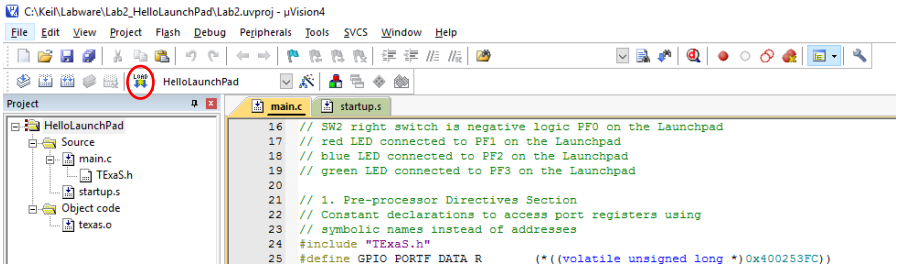
**Part b)** To test the software development system for the real board, you will run Lab 2 on the real board. Again, you will not need to edit any of the code. Modify project options setting to generate output file for board: right click HelloLaunchPad, select “Options for Target ‘HelloLaunchPad’; then select “Debug” tab, and click “Use Stellaris ICDI”, then select the “Utilities” tab and make sure “Use Target Driver for Flash Programming” set to “Stellaris ICID”.



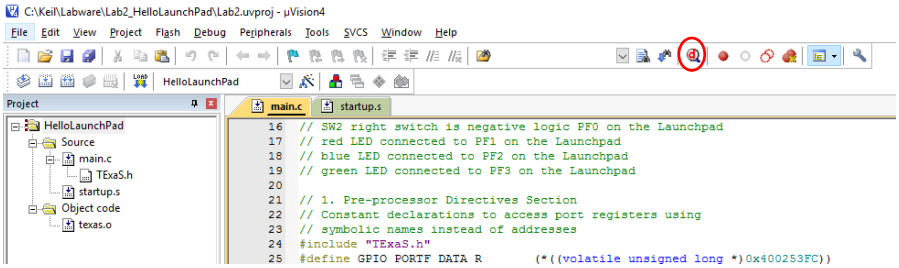



You will compile, and download the lab on the actual LaunchPad in two different ways:

1) Download and run only without debug interface: click the “Load” icon:




2) Download with debug interface which allows us to debug the code running real-time on board: click the “d” icon:




**Part c)** Modify the code so that 1) if SW1 is not pressed the LED toggles blue-yellow, and if SW1 is pressed the LED toggles blue-red; 2) the toggle rate is half as fast as the original code. Demonstrate your modified code on board and submit source code to dropbox Lab 1.