ECE3623 Embedded System Design Laboratory

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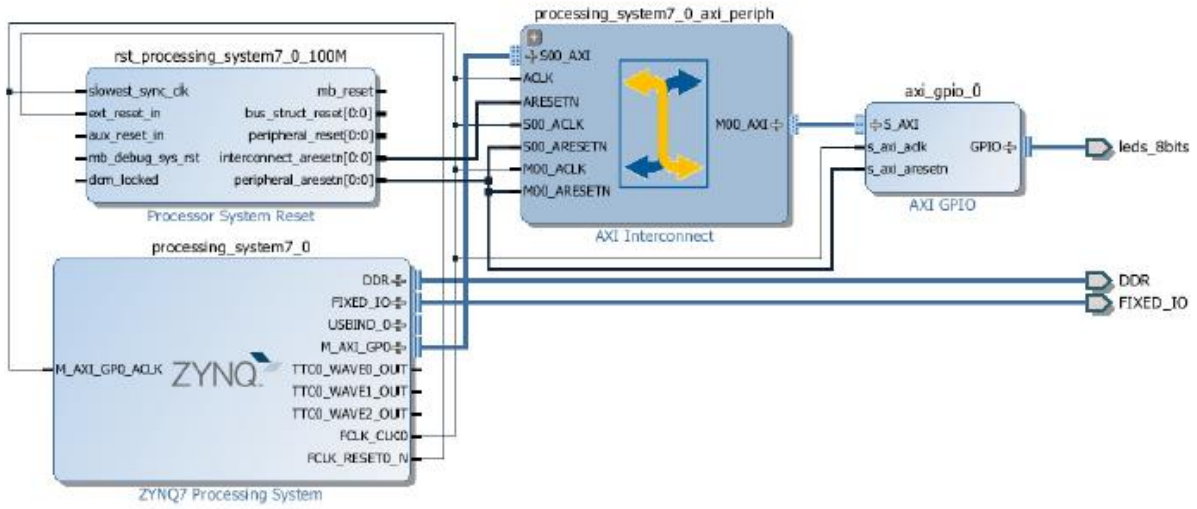
Time Slice Scheduling in FreeRTOS on Zybo v2

In this Laboratory you will investigate the Time Slice Scheduling of tasks in the FreeRTOS environment on the Zybo board. In Exercise 1A, 1B and 1C a Xilinx Vivado block design was created with a single axi_gpio IP module for the Zybo LEDs as shown below. The operating system was *standalone* (single tasking) by default.

For this Laboratory you are to create four tasks in FreeRTOS whose only process is to turn one LED ON when executing. That is, Task 1 turns LED0 ON when executing, Task 2 turns LED1 ON when executing, Task 3 turns LED2 ON when executing and Task 4 turns LED3 ON when executing.

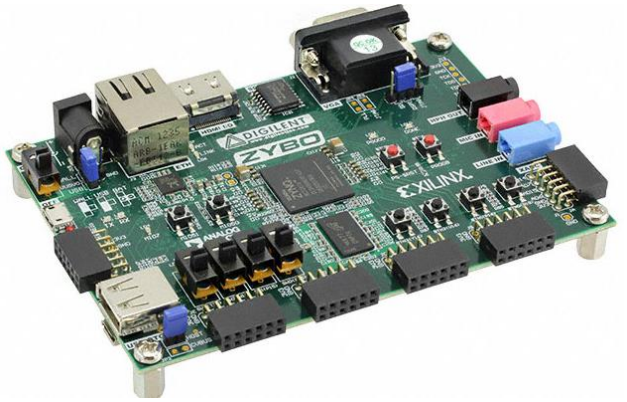
The AXI Timer, slide switches and push button interrupts and task interactions other than Time Slice Scheduling are not to be used.



You are to design a task management process for these four FreeRTOS tasks that demonstrates the following API function calls *of your own design*. Not every API function has be used in every task but in aggregate all are to be used and clearly indicated as comments referencing these item numbers in the process control code. You should set the LED is ON in the Task for at least 5 seconds (5000 msec) for observation. This could mean that more than one LED is ON at a time. Alternatively, you could temporarily raise the priority of that Task so that the LED is ON for 5 seconds before a task switch occurs at the next Tick interval.

The required task management API function calls are as follows:

1. xTaskCreate()
2. xTaskDelete()
3. xTaskGetHandle()
4. xTaskDelay()
5. xTaskDelayUntil()
6. xTaskAbortDelay()
7. vTaskSuspend()
8. vTaskResume()
9. vTaskPrioritySet()
10. uxTaskPriorityGet()
11. taskYIELD()



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You are to document the complete sequence of the process control software *of your own design* with a task execution table (or flow chart) and show that the process is complete and uses each of the API function calls at least once. Once completed the process should repeat.

The FreeRTOS Reference Manual should be consulted for these task management API function calls.

The completed Laboratories should be archived on your laptop and will form the basis of Exams.

You are to use the *Project Report Format* posted on *Canvas*. You are to upload your *Report* to Canvas for time and date stamping to avoid a late penalty. This Laboratory is for the weeks of February 17th and February 24th due no later than 11:59 PM March 8th after Spring Break.