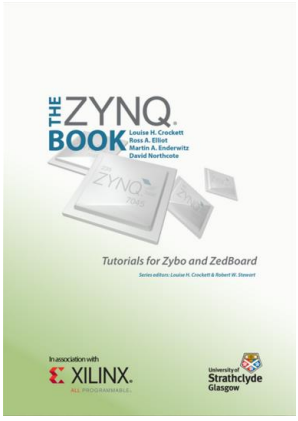
ECE3623 Embedded System Design Laboratory

Dennis Silage, PhD
silage@temple.edu

Vivado AXI Interrupt

In this Laboratory you will utilize the embedded development of a Vivado Zynq Processor System (PS) with a hardware interrupt in a standalone OS. The tasks are described in detailed in Chapter 2 of the eText *The Zynq Book Tutorials* with the supporting files in the *The Zynq Book Tutorials Sources* both of which are posted on *Canvas* and the Lecture PowerPoints.



The Laboratory requires you to study and initially execute the Exercises 2A, 2B and 2C.

The Laboratory tasks are as follows:

1. Run the complete *interrupt_controller_tut_2B.c* Vivado/SDK project without modification to verify its performance in a standalone OS.

2. Modify the original *interrupt_controller_tut_2B.c* project to perform the following tasks by configuring the *BTN_Intr_Handler* in SDK appropriately in a standalone OS:

   a) BTN0 turns all the LEDs ON (1111) and pauses the current LED count
   b) BTN1 increments the LED count by first 1 then 2 and repeat and outputs the count to the LEDs
   c) BTN2 decrements the LED count by first 1 then 2 and repeat and outputs the count to the LEDs
   d) BTN3 turns all the LEDs OFF (0000) and the count continues but not shown in the LEDs

e) If more than one BTN is depressed the LED count is paused and LED display is 1001 followed by 0110 and repeat
f) If no BTNs are depressed the LED count is incremented by 1 and the LED display continues

Describe in detail and list the modifications to the *BTN_Intr_Handler* to accomplish this Laboratory task.

The LED count and display *rolls over* as 4-bit binary whether incrementing or decrementing, that is 1111 → 0000 when incrementing and 0000 → 1111 when decrementing.

3. Describe in detail the operation of the following lines of code. All terms and operations of the function calls must be adequately described.

a) static void BTN_Intr_Handler(void *baseaddr_p);
static int InterruptSystemSetup(XScuGic *XScuGicInstancePtr);
static int IntcInitFunction(u16 DeviceId, XGpio *GpioInstancePtr);

b) if ((XGpio_InterruptGetStatus(&BTNInst) & BTN_INT) != BTN_INT)

c) Xil_ExceptionRegisterHandler(XIL_EXCEPTION_ID_INT,
(Xil_ExceptionHandler)XScuGic_InterruptHandler,
XScuGicInstancePtr);

d) IntcConfig = XScuGic_LookupConfig(DeviceId);
status = XScuGic_CfgInitialize(&INTCInst, IntcConfig,
IntcConfig->CpuBaseAddress);

e) status = IntcInitFunction(INTC_DEVICE_ID, &BTNInst);

You may be randomly asked to describe and demonstrate each of these tasks to the Laboratory Assistant at any point during the semester.

This Laboratory is for the week of February 3rd and due no later than Sunday February 9th 11:59 PM with an upload to Canvas and a hard copy to the Laboratory Assistant soon afterwards.

Spring 2020