

Simulation and Synthesis of a Stored Program Computer Architecture

ELEC 4200

Auburn University

October 31st, 2011

Overview

Pre-lab

Lab

Questions &
Reports

- Simulate an example program for PicoBlaze
- Write a PicoBlaze assembly language program to perform hexadecimal to 7-segment display conversion
- Simulate, debug, and verify the operation of your design
- Download, debug, and verify the operation of your program on the Spartan 3 FPGA

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- 1 Read the PicoBlaze User's Guide Chapters 10-12 (19 pages)
- 2 Read the PicoBlaze tutorial (3 pages)
- 3 Study PicoBlaze architecture and instruction set
- 4 Write an assembly language program for PicoBlaze to implement a hexadecimal to 7-segment decoder with
 - HEX input IN_PORT
 - 7-segment data on OUT_PORT

- Download & extract the PicoBlaze.zip file from class web page
 - Simulate tutorial.psm program using pBlazeIDE and assemble program using KCPSM2
 - Synthesize and download PicoBlaze with assembled tutorial.psm program with input port connected to switches and output port connected to LEDs
 - Record the number of slices from the synthesis report
 - Demonstrate synthesized circuitry to GTA
- Simulate and debug your PicoBlaze program for hex-to-7segment decoder pBlazeIDE
 - Assemble, synthesize, and download your Picoblaze based decoder on Spartan 3 PCB
 - Demonstrate synthesized circuitry to GTA

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- Note: increasing the number of “output” instructions will increase the brightness of the display
- An alternate approach is to include a latch or register enabled by the PicoBlaze `WRITE_STROBE` to hold the 7-segment values. You can use one of the following:
 - ① You can include a level-sensitive latch
 - ② Your parallel load register from Lab 5

You have now used three methods to create a 7-segment decoder: PicoBlaze, VHDL, and Schematic Capture. Discuss the ease of coding, simulating, debugging and efficiency of these three implementation methods.

Report must contain

- 1 Description of your assembly language program and how it works
- 2 PicoBlaze assembly code
- 3 Steps taken to simulate your code
- 4 Discussion of synthesis and download to the FPGA
- 5 What went right and wrong in your design and program
- 6 All prelab work including FPGA pin numbers