Report 5

1. What did you learn from this project?

I learned the VHDL language formats, and how to write them to complete a whole project with Modelsim Software. And I have a deep understanding in Multi-cycle datapath and how a CPU work in hard ware level. I also developed my patience in doing endless debug, and tried to avoid the mistakes taken by careless thinking.

1. What would you do differently next time?

For multi-cycle datapath, I would add some more function in the project, such as that we can initialize some register by changing switches on the DE2 board, and add some output signals to show which state the CPU is now . And develop the multi-cycle datapath into a pipline-datapath.

1. What is your advice to someone who is going to work on a similar project?

Firstly, I recommend that we can find a teammate who will give you a lot of help in debugging. Because, individual sometimes fixes the way of thinking then lose the ability to find which problem the project has.

Secondly, Multi-cycle’s control unit, its output signal is controlled by input signal and current state. At beginning of the project, I design the control unit like followings:

If (Clk’event and clk= ‘1’) then output the signals, current\_state <= next\_state;

 In this situation, we simulate only this unit, it looks right. But state change and force output signals occur at the same time, which always lead the next\_state to be undesired. And this problem puzzles me until I really familiar with VHDL language. Then I separate the control unit by 2 process, one is change its state, one is force signal based on the current state. What’s more use another state to reset your control signal which can help the PC starts at address 0 instead of 1.

Thirdly, every time we create a new project following the manual to avoid skip some steps, which can lead a problem which is cannot solved by change the program code. Once I created the memory.vhd, I forgot to add a value in the default parameters. It was really an awful time.

Lastly, find a Quartus 2 software with as many library as it can, which can help us simulate our program and debug happily. Sometimes, it’s hard to say where the problem is, all the result is incorrect. Try to change a computer to download the program into the board. Then it is funny to find the project works good, there is no problem.