

## ELC 463 - LABORATORY #3

# MIPS PIPELINE IMPLEMENTATION WITH FORWARDING AND HAZARD DETECTION

In this laboratory, the implementation of the pipelined MIPS architecture developed in Lab #2 will be augmented to include a Forwarding Unit and a Hazard Detection Unit. The design will be implemented and verified in Verilog® using an as high as possible level of abstraction design methodology. See Fig. 1. Make sure you study the slides for Chapter 4 of ELC451 that explains the conditions (equations) for these units. The textbook used in ELC451 will also serve as an excellent reference for this Lab.

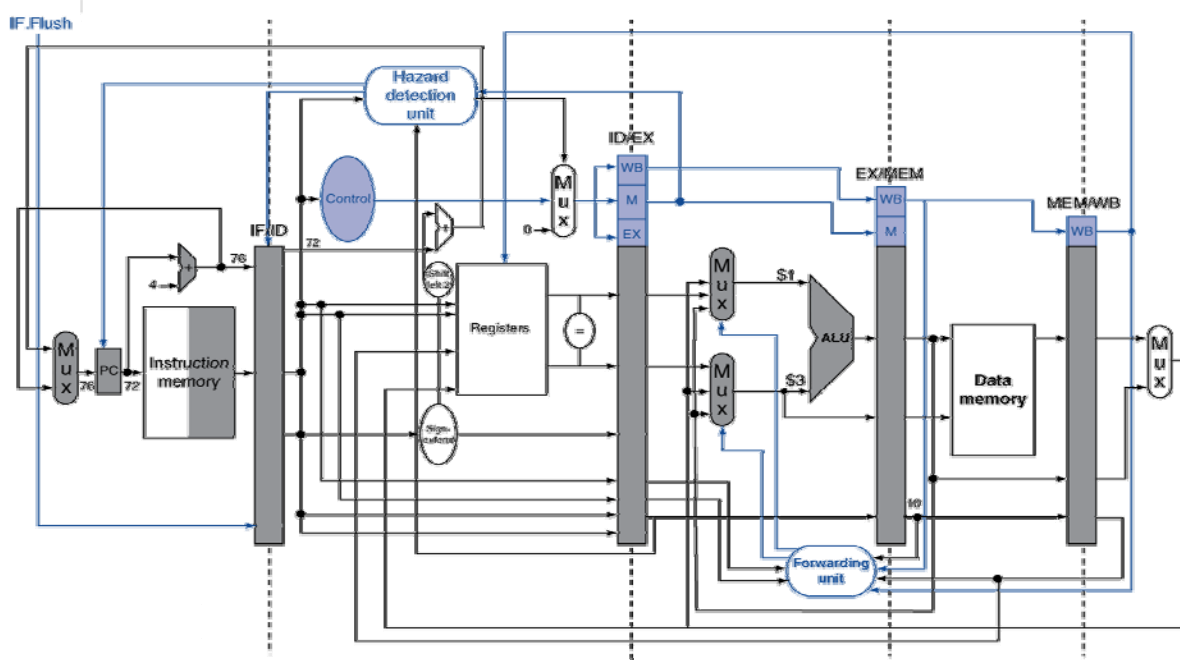


Fig. 1. Overall Architecture

The test program should exercise sufficient conditions to verify the correct implementation of the Forwarding and Hazard Detection Units. The minimum deliverables for this laboratory are the following:

- a) All Verilog® code files (design code files and test-bench code file).
- b) Test program in MIPS assembly language.
- c) Initial program memory load file (this is the assembled test program in machine language).
- d) Waveforms that show the state of the CPU (PC and pertinent registers), and the pertinent memory contents after each instruction has been executed.

The work should be done independently by each team. A report with, at a minimum, all the items requested to be turned in is to be submitted by students by the due date discussed in class. All reports should be written in a word processor and similar productivity computer tools; no hand written reports will be accepted.

GRADING RUBRIC: The total grade for this assignment will be 28 points normalized to 100% for your report. Part (a) above will be worth 12 points, parts (b) and (c) will be worth 1 point each, and part (d) will be worth 8 points. The rest of your report will be worth 6 points, for a total of 28 points.

REPORT FORMAT: Free form, but it must be:

- a. One report per team.
- b. Have a cover sheet with identification: Title, Class, Your Name, etc.
- c. COMPLETELY word-processed
- d. Double spaced
- e. 12 pt Times New Roman font
- f. Fully justified (optional)
- g. Outline of the body of the report: Introduction, Problem Description, Results, Discussion, and Conclusions.