

ECE 486/586

Term Project

Spring 2020

Portland State University

Basics

- **Objective**
 - Develop an execution-driven MIPS-lite pipeline simulator
- **Programming Language**
 - Any high-level programming language (C, C++, JAVA etc.)
- **Simulator Inputs**
 - Memory image for the simulated program
 - Provided by the instructor
- **Simulator Output**
 - Program output (register values, memory contents)
 - Instruction type frequency statistics
 - Execution time in cycles

Simulator Components

- **Trace Reader**
 - Reads the memory image and passes the next instruction to the instruction decoder
- **Instruction Decoder**
 - Interprets instruction type , determines the source and destination registers
- **Functional Simulator**
 - Simulates instruction behavior, keeps track of register and memory state changes
- **Pipeline Simulator**
 - Keeps track of current clock cycle
 - Maintains track of instruction in each pipeline stage in each cycle
 - Identify different sources of stalls and hazards
 - Propagates instructions from one pipeline stage to next

Simulator Details

- You will write a simulator which models both the functional and timing behavior of a 5-stage MIPS-like pipelined processor
 - Pipeline details covered in class (Lectures 10, 11 and 12)
- You will need to do two things:
 - Simulate the computation performed by an instruction and record its impact on the machine state
 - Quantify the impact of instruction execution on the program execution time
 - You will simulate if this instruction needs to be stalled and what is the stall penalty
 - You will have to **visualize** the 5-stage pipeline and the instruction in every stage, and then program your simulator with that in mind

Logistics and Timeline

- You should form groups of up to 3 students
- Your simulator implementation should follow the detailed project specification document posted on D2L
- Each group will be provided with trace(s) that will be used to test the simulator
- At the completion of the project, you will need to turn in a project report, which should include all the simulation results
- Important Dates
 - Group names due to be sent to instructor: Thursday, April 30
 - Project specs uploaded on course website: Wednesday, May 6
 - Final project report due: Thursday, June 11