

The George Washington University
School of Engineering & Applied Science
Electrical & Computer Engineering Department

Instructor: Prof. Louri **Semester:** Fall 2022

Course: Computer Architecture & Design ECE 6005 / ECE 4535

Lab Assignment 3

Due Date: November 16

Step 1.

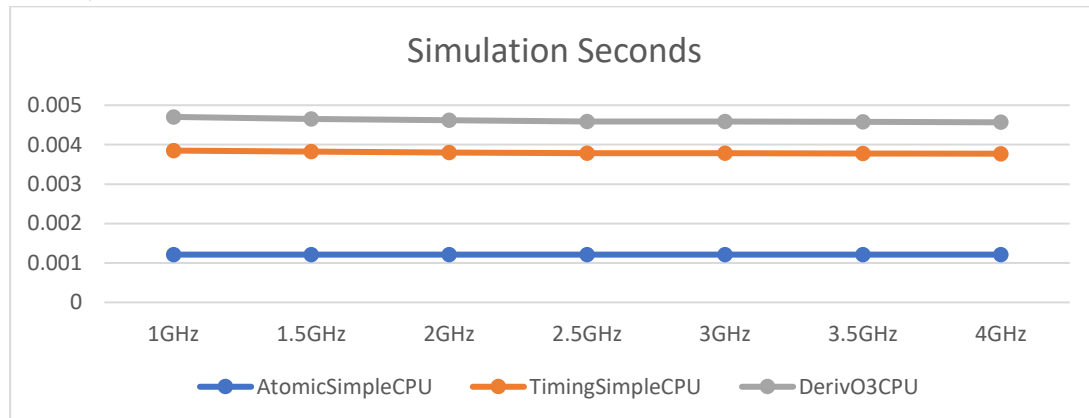
The simulation results are only showing simulation times here because the clock numbers have the same pattern as times.

- a) Since the Minor CPU is not supported by the GEM5 version we have, so I changed it to

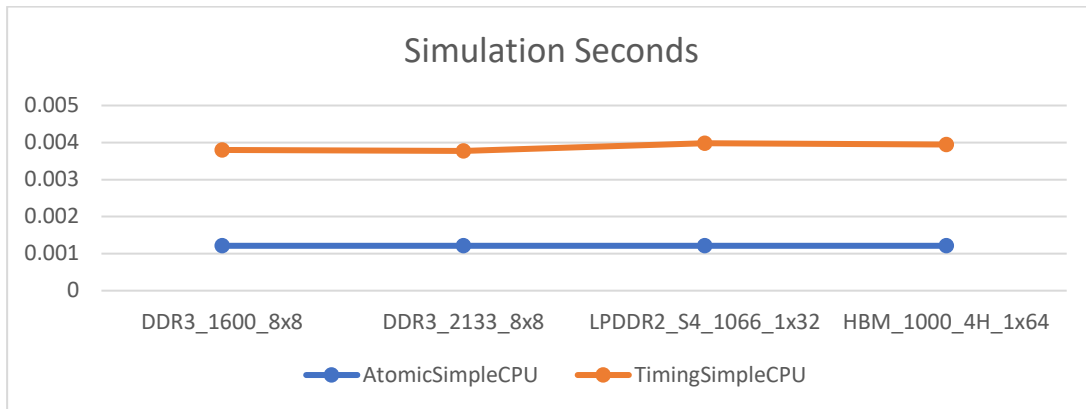
DerivO3CPU:

```
se.py: error: option --cpu-type: invalid choice: 'MinorCPU' (choose from 'TimingSimpleCPU', 'AtomicSimpleCPU', 'X86KvmCPU', 'DerivO3CPU', 'TraceCPU')
```

And because of the prime counting program for 100000000 costs too much time, so I did the simulation with 1000, which should have the result of 168. According to the simulation result [3-1-1.txt](#), the result is as follows:



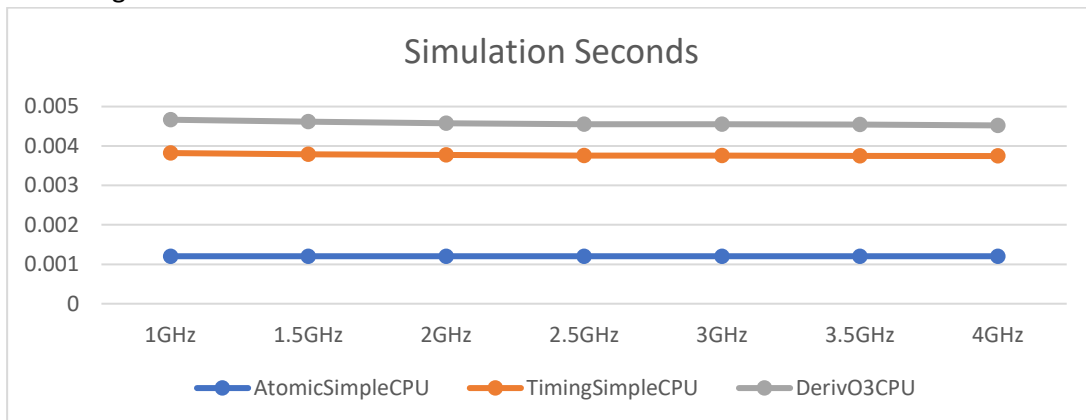
- b) According to the simulation result [3-1-2.txt](#):



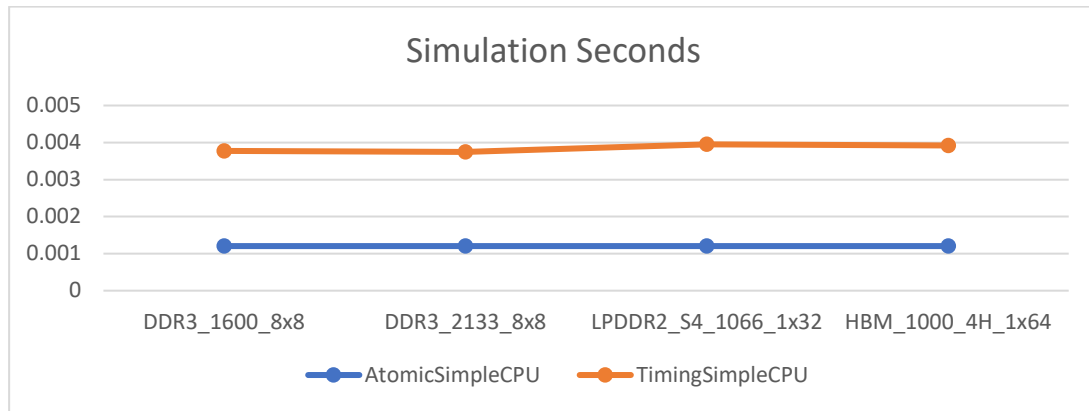
- c) **Which CPU model is more sensitive to changing the CPU frequency? Why do you think this is?**
 From the test results, DerivO3CPU and TimingSimpleCPU have the same sensitivity to frequency, only the AtomicSimpleCPU is not, that is because the AtomicSimpleCPU is not actually doing the simulation, is just giving the ideal cycles.
- d) **Which CPU model is more sensitive to the memory technology? Why?**
 The TimingSimpleCPU is more sensitive to memory, that is because the TimingSimpleCPU is actually doing the time simulation which means there will be different CPI for it.
- e) **Is the sieve application more sensitive to the CPU frequency or the memory technology? Why?**
 It is more sensitive to the memory technology because the program needs to read and write a lot.
- f) **If you were to use a different application, do you think your conclusions would change? Why?**
 Yes, it may change, because the application in this simulation needs much memory access than cpu process, if we change to a program need more complicated algorithms, the conclusion will change.

Step 2:

- a) According to the simulation result [3-2-1.txt](#):



- a) According to the simulation result [3-2-2.txt](#):



From the observation, the simulation speed of all CPU get faster with optimized program, that is because the compiler could do some optimization during the compiling process, such as minimize execute time or memory occupation.