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ECE 581 Computer Architecture Fall 2020
Instructor: Dr. Gülay Yalçın Alkan
Homework 4
Due Date: 14th December 2020 – 23:59

ANSWERS

FACTORIAL

- **Command1 :** ./build/X86/gem5.opt configs/example/se.py -c /home/ubuntu/Downloads/gem5/configs/tutorial/a.bin
   Output1 : stats_for_factorial_1.txt

Picture1 : Factorial Command1

- **Command2 :** ./build/X86/gem5.opt –debug-flags=O3PipeView –debug-file=trace.out configs/example/se.py –cpu-type=DerivO3CPU –caches -c /home/ubuntu/a.bin
  - Used O3PipeView to see the pipelining and changed the cpu-type from AtomicSimpleCPU to DerivO3CPU.
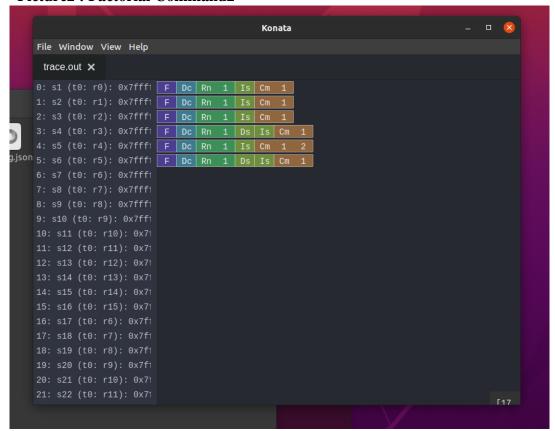 - Installed Konata(https://github.com/shioyadan/Konata) for pipeline visualizing.

  Outputs2 : stats_for_factorial_2.txt and trace.out(trace.out is too big for attachment)

Picture2 : Factorial Command2

Picture3 : PipelineView from trace.out (Used Konata)

1. From stats_for_factorial_1.txt

sim_insts   **2174259**   **# Number of instructions simulate**

2. From stats_for_factorial_1.txt

system.cpu.committedInsts   **2174259**   **# Number of instructions committed**

system.cpu.committedOps   **3798181**   **# Number of ops (including micro ops)**

                                                committed

Microinst. Comitted   **3798181 - 2174259 = 1623922**

3. From stats_for_factorial_2.txt

system.cpu.rename.fullRegistersEvents   **504**   **# Number of times there has been no**

                                                     free registers

system.cpu.numCycles   **4505664**   **# number of cpu cycles simulated**

Average Busy Register Per Cycle : 504 / 4505664 = 0,0001 (Calculating got from https://www.gem5.org/documentation/general_docs/statistics/)

4. There is also physical register file.

Rename
Renames instructions <u>using a physical register file</u> with a free list. Will stall if there are not enough registers to rename to, or if back-end resources have filled up. Also handles any serializing instructions at this point by stalling them in rename until the back-end drains. (Source https://www.gem5.org/documentation/general_docs/cpu_models/O3CPU)

5.

system.cpu.rename.runCycles   **624129**   **# Number of cycles rename is running**

system.cpu.rename.lookups   **12606768**   **# Number of register rename**

                                                     lookups that rename has made

BZIP2

- **Command1 :** ./build/X86/gem5.opt configs/example/se.py -c
  /home/ubuntu/Masaüstü/401.bzip2/exe/bzip2_base_compsys
  Output1 : stats_for_bzip2_1.txt

Picture4: bzip2 Command1

- **Command2 :** ./build/X86/gem5.opt –debug-flags=O3PipeView –debug-file=trace.out configs/example/se.py –cpu-type=DerivO3CPU –caches -c /home/ubuntu/Masaüstü/401.bzip2/exe/bzip2_base_compsys -m 1000000000
  Outputs2 : stats_for_bzip2_2.txt and trace.out (trace.out is too big for attachment and displaying)

Picture5: bzip2 Command2

1. From stats_for_bzip2_1.txt

   sim_insts   **15085543512**   **# Number of instructions simulate**

2. From stats_for_bzip2_1.txt

   system.cpu.committedInsts   **15085543512**   **# Number of instructions committed**

   system.cpu.committedOps   **24880270595**   **# Number of ops (including micro ops)**

                                                      committed

   Microinst. Comitted   **24880270595 - 15085543512 = 9794727083**

3. From stats_for_bzip2_2.txt

   system.cpu.rename.fullRegistersEvents   **NaN**   **# Number of times there has been no**

                                                  free registers

4. There is also physical register file.

Rename
Renames instructions <u>using a physical register file</u> with a free list. Will stall if there are not enough registers to rename to, or if back-end resources have filled up. Also handles any serializing instructions at this point by stalling them in rename until the back-end drains. (Source https://www.gem5.org/documentation/general_docs/cpu_models/O3CPU)

5.
   system.cpu.rename.runCycles   **197308**   **# Number of cycles rename is running**

   system.cpu.rename.lookups   **2880358 # Number of register rename**

                                           lookups that rename has made