Lab 2

Author: Everett Periman

Results Table

Part#: Name	CPU Model	CPU Clock Freq (GHz)	Memory Model	Exit tick #
Part1(a): 1GHz	TimingSimpleCPU	1	DDR3_1600_8X8	454646000
Part1(b): 2GHz	TimingSimpleCPU	2	DDR3_1600_8X8	406055500
Part1(c): 4GHz	TimingSimpleCPU	3	DDR3_1600_8X8	379133750
Part1(c): DDR4	TimingSimpleCPU	1	DDR4_2400_8X8	450198000
Part1(c): DDR3	TimingSimpleCPU	1	DDR3_2133_8X8	437364000
Part1(c): HBM	TimingSimpleCPU	1	HBM_1000_4H_1X64	470718000
Part1(d):O3CPU	O3CPU	1	DDR3_1600_8X8	76822000
Part2: "MyHello"	TimingSimpleCPU	1	DDR3_1600_8X8	886789000

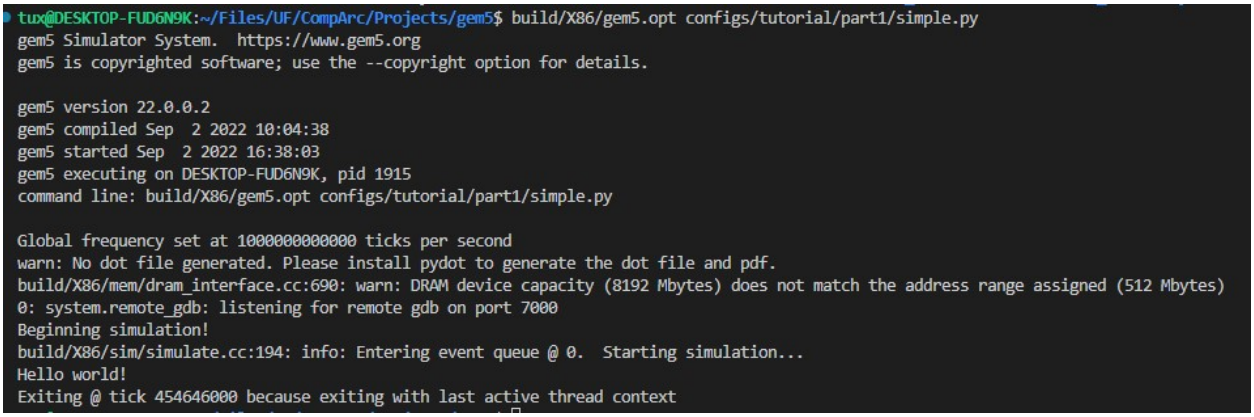
Table Summary

There are 3 trends that can be observed throughout the information in this table. The first of which is that the exit tick decreases greatly with the frequency increase of the processor. The decrease in tick time was 10% in the first increase in clock speed but it was only 6% after the second increase. The next observation in this graph would be that as the memory controllers get faster the Exit tick also increases. In order of increasing from least ticks the memory controllers would be DDR3_2133, DDR3_1600, DDR4_2400, HBM. This might be due to more overhead with more complex memory systems that does not scale well with single core processors, but works well with faster multi-core systems. The final observation would be that the O3CPU model runs a magnitude faster than the TimingSimpleCPU model.

Questions

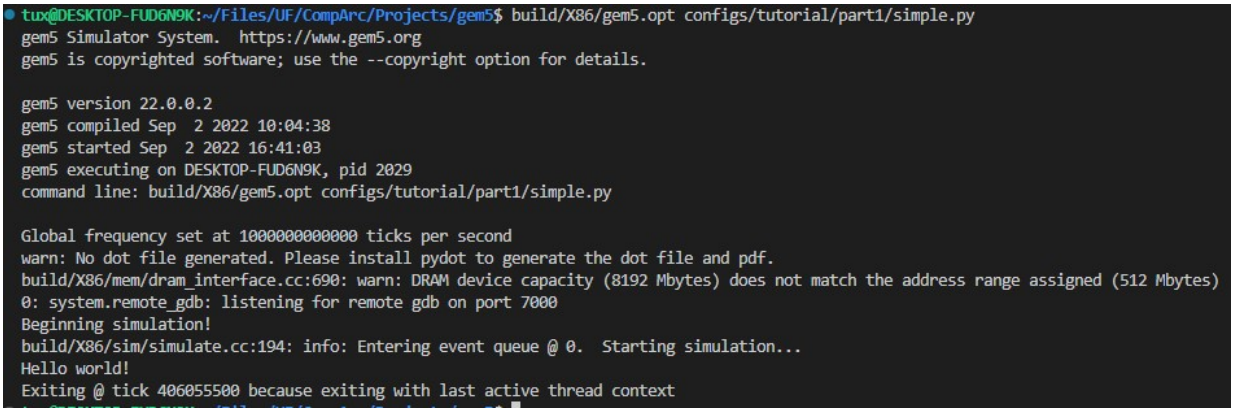
1) [system.clk_domain] clock=1000
2) [system.cpu] type=BaseTimingSimpleCPU
3) clk_domain, cpu, mem_ctrl, membus, workload
4)
    a. Line 6
    b. Lines 4, 5, 108, 113, 114, 484, 523, 550

Part 1(a)

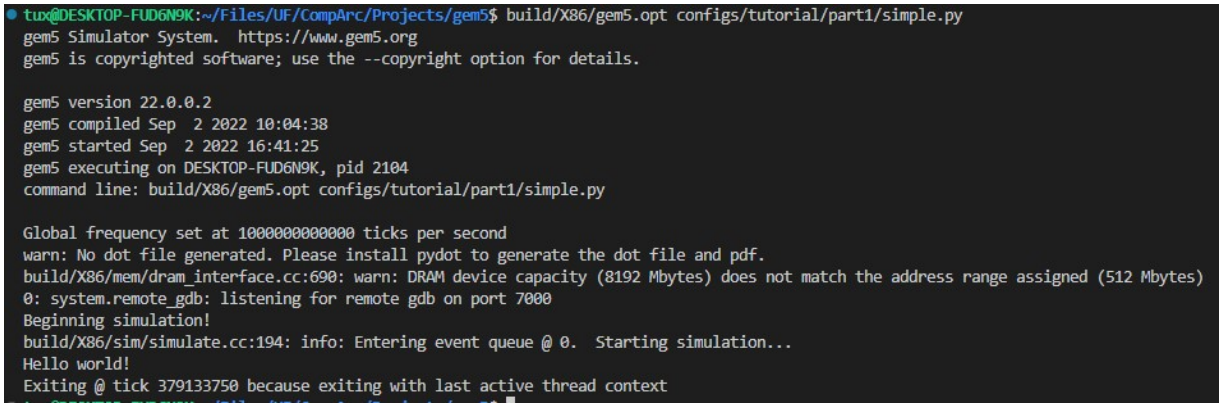

tux@DESKTOP-FUD6N9K:~/Files/UF/CompArc/Projects/gem5$ build/X86/gem5.opt configs/tutorial/part1/simple.py
gem5 Simulator System. https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.
gem5 version 22.0.0.2
gem5 compiled Sep 2 2022 10:04:38
gem5 started Sep 2 2022 16:38:03
gem5 executing on DESKTOP-FUD6N9K, pid 1915
command line: build/X86/gem5.opt configs/tutorial/part1/simple.py
Global frequency set at 1000000000000 ticks per second
warn: No dot file generated. Please install pydot to generate the dot file and pdf.
build/X86/mem/dram_interface.cc:690: warn: DRAM device capacity (8192 Mbytes) does not match the address range assigned (512 Mbytes)
0: system.remote_gdb: listening for remote gdb on port 7000
Beginning simulation!
build/X86/sim/simulate.cc:194: info: Entering event queue @ 0. Starting simulation...
Hello world!
Exiting @ tick 454646000 because exiting with last active thread context

1GHz

Part 1(b)


tux@DESKTOP-FUD6N9K:~/Files/UF/CompArc/Projects/gem5$ build/X86/gem5.opt configs/tutorial/part1/simple.py
gem5 Simulator System. https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.
gem5 version 22.0.0.2
gem5 compiled Sep 2 2022 10:04:38
gem5 started Sep 2 2022 16:41:03
gem5 executing on DESKTOP-FUD6N9K, pid 2029
command line: build/X86/gem5.opt configs/tutorial/part1/simple.py
Global frequency set at 1000000000000 ticks per second
warn: No dot file generated. Please install pydot to generate the dot file and pdf.
build/X86/mem/dram_interface.cc:690: warn: DRAM device capacity (8192 Mbytes) does not match the address range assigned (512 Mbytes)
0: system.remote_gdb: listening for remote gdb on port 7000
Beginning simulation!
build/X86/sim/simulate.cc:194: info: Entering event queue @ 0. Starting simulation...
Hello world!
Exiting @ tick 406055500 because exiting with last active thread context

2GHz


tux@DESKTOP-FUD6N9K:~/Files/UF/CompArc/Projects/gem5$ build/X86/gem5.opt configs/tutorial/part1/simple.py
gem5 Simulator System. https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.
gem5 version 22.0.0.2
gem5 compiled Sep 2 2022 10:04:38
gem5 started Sep 2 2022 16:41:25
gem5 executing on DESKTOP-FUD6N9K, pid 2104
command line: build/X86/gem5.opt configs/tutorial/part1/simple.py
Global frequency set at 1000000000000 ticks per second
warn: No dot file generated. Please install pydot to generate the dot file and pdf.
build/X86/mem/dram_interface.cc:690: warn: DRAM device capacity (8192 Mbytes) does not match the address range assigned (512 Mbytes)
0: system.remote_gdb: listening for remote gdb on port 7000
Beginning simulation!
build/X86/sim/simulate.cc:194: info: Entering event queue @ 0. Starting simulation...
Hello world!
Exiting @ tick 379133750 because exiting with last active thread context

4GHz

Part 1(c)

```
tux@DESKTOP-FUD6N9K:~/Files/UF/CompArc/Projects/gem5$ build/X86/gem5.opt configs/tutorial/part1/simple.py
gem5 Simulator System.  https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.

gem5 version 22.0.0.2
gem5 compiled Sep  2 2022 10:04:38
gem5 started Sep  2 2022 16:44:23
gem5 executing on DESKTOP-FUD6N9K, pid 2229
command line: build/X86/gem5.opt configs/tutorial/part1/simple.py

Global frequency set at 1000000000000 ticks per second
warn: No dot file generated. Please install pydot to generate the dot file and pdf.
build/X86/mem/dram_interface.cc:690: warn: DRAM device capacity (16384 Mbytes) does not match the address range assigned (512 Mbytes)
0: system.remote_gdb: listening for remote gdb on port 7000
Beginning simulation!
build/X86/sim/simulate.cc:194: info: Entering event queue @ 0.  Starting simulation...
Hello world!
Exiting @ tick 450198000 because exiting with last active thread context
```

DDR4_2400_8x8()

```
tux@DESKTOP-FUD6N9K:~/Files/UF/CompArc/Projects/gem5$ build/X86/gem5.opt configs/tutorial/part1/simple.py
gem5 Simulator System.  https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.

gem5 version 22.0.0.2
gem5 compiled Sep  2 2022 10:04:38
gem5 started Sep  2 2022 16:45:02
gem5 executing on DESKTOP-FUD6N9K, pid 2304
command line: build/X86/gem5.opt configs/tutorial/part1/simple.py

Global frequency set at 1000000000000 ticks per second
warn: No dot file generated. Please install pydot to generate the dot file and pdf.
build/X86/mem/dram_interface.cc:690: warn: DRAM device capacity (8192 Mbytes) does not match the address range assigned (512 Mbytes)
0: system.remote_gdb: listening for remote gdb on port 7000
Beginning simulation!
build/X86/sim/simulate.cc:194: info: Entering event queue @ 0.  Starting simulation...
Hello world!
Exiting @ tick 437364000 because exiting with last active thread context
```

DDR3_2133_8x8()

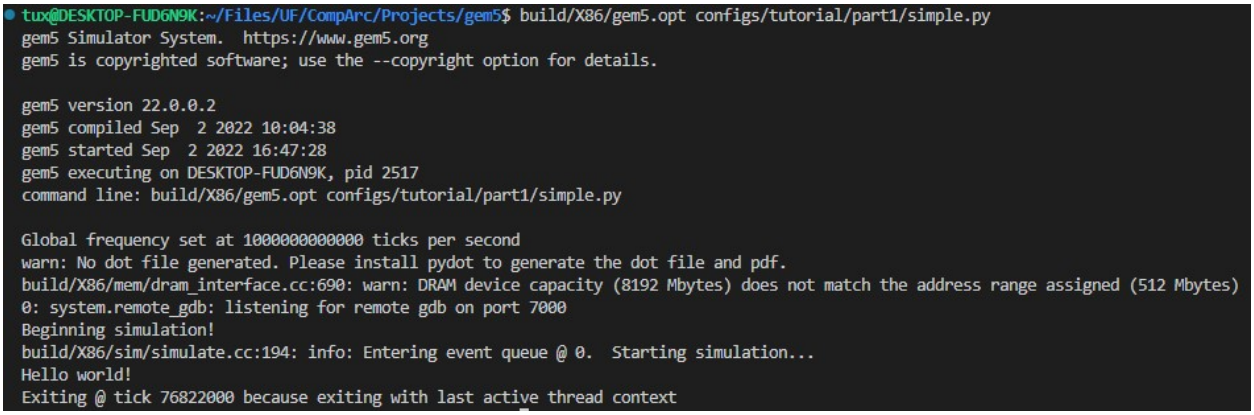
```
tux@DESKTOP-FUD6N9K:~/Files/UF/CompArc/Projects/gem5$ build/X86/gem5.opt configs/tutorial/part1/simple.py
gem5 Simulator System.  https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.

gem5 version 22.0.0.2
gem5 compiled Sep  2 2022 10:04:38
gem5 started Sep  2 2022 16:45:40
gem5 executing on DESKTOP-FUD6N9K, pid 2379
command line: build/X86/gem5.opt configs/tutorial/part1/simple.py

Global frequency set at 1000000000000 ticks per second
warn: No dot file generated. Please install pydot to generate the dot file and pdf.
build/X86/mem/dram_interface.cc:690: warn: DRAM device capacity (256 Mbytes) does not match the address range assigned (512 Mbytes)
0: system.remote_gdb: listening for remote gdb on port 7000
Beginning simulation!
build/X86/sim/simulate.cc:194: info: Entering event queue @ 0.  Starting simulation...
Hello world!
Exiting @ tick 470718000 because exiting with last active thread context
```

HBM_1000_4H_1x64()

Part 1(d)



O3CPU()

```
tux@DESKTOP-FUD6N9K:~/UF/CompArch/gem5/configs/tutorial/part1$ ../../../build/X86/gem5.opt simple.py
gem5 Simulator System.  https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.

gem5 version 22.0.0.2
gem5 compiled Sep  3 2022 21:26:41
gem5 started Sep  4 2022 13:14:17
gem5 executing on DESKTOP-FUD6N9K, pid 13318
command line: ../../../build/X86/gem5.opt simple.py

Global frequency set at 1000000000000 ticks per second
warn: No dot file generated. Please install pydot to generate the dot file and pdf.
build/X86/mem/dram_interface.cc:690: warn: DRAM device capacity (8192 Mbytes) does not match the address range assigned (512 Mbytes)
0: system.remote_gdb: listening for remote gdb on port 7000
Beginning simulation!
build/X86/sim/simulate.cc:194: info: Entering event queue @ 0.  Starting simulation...
build/X86/sim/mem_state.cc:443: info: Increasing stack size by one page.
build/X86/sim/syscall_emul.hh:1015: warn: readlink() called on '/proc/self/exe' may yield unexpected results in various settings.
      Returning '/home/tux/UF/CompArch/gem5/configs/tutorial/part1/a.out'
build/X86/sim/syscall_emul.cc:74: warn: ignoring syscall mprotect(...)
Everett Periman says hello!
Exiting @ tick 886789000 because exiting with last active thread context
```

Custom hello.c