Computer Architecture 2022 – Project 2

Sniper Tool Evaluation (Cross Compiler)

Deadline: 2022/11/18 23:59

I. Cross compiler check

Please check the sniper gcc is functional with the following instruction. The test files are included in the project2 file, which are single thread & multi thread.

First, download CA_project2 folder from cyber university(網路大學).

- ~Downloads/sniper-6.0$ mkdir project2
- ~Downloads/sniper-6.0$ cd project2 (please put hello.c in this folder)
- ~Downloads/sniper-6.0/project2$ gcc hello.c -o hello

(compile hello.c to generate the execution file)

- ~Downloads/sniper-6.0/project2$ cd ../
- ~Downloads/sniper-6.0/$ ./run-sniper ./projec2/hello

The output simulation result file is sim.out

```
[SNIPER] Start
[SNIPER] ------------------------------------------------------------------------
---------
[SNIPER] Sniper using Pin frontend
[SNIPER] Running full application in DETAILED mode
[SNIPER] ------------------------------------------------------------------------
---------
[SNIPER] Enabling performance models
[SNIPER] Setting instrumentation mode to DETAILED
hello world 1
hello world 2
hello world 3
[SNIPER] Disabling performance models
[SNIPER] Leaving ROI after 1.26 seconds
[SNIPER] Simulated 0.1M instructions, 0.3M cycles, 0.36 IPC
[SNIPER] Simulation speed 75.8 KIPS (75.8 KIPS / target core - 13199.3ns/instr)
[SNIPER] Setting instrumentation mode to FAST_FORWARD
[SNIPER] End
[SNIPER] Elapsed time: 1.49 seconds
```

- ~Downloads/sniper-6.0/$ ./tools/cpistack.py

```
sniper@ubuntu:~/Downloads/sniper-6.0$ ./tools/cpistack.py
                        CPI        Time
  base                 0.25       9.00%
  depend-int           0.05       1.97%
  depend-branch        0.04       1.38%
  issue                0.04       1.44%
  branch               0.50      17.94%
  ifetch               0.95      34.31%
  mem-l1d              0.07       2.58%
  mem-dram             0.86      31.18%
  other                0.01       0.19%

  total                2.77     100.00%
```

II. Multi thread Cross compiler check

- ~Downloads/sniper-6.0/project2$ cd project2
- ~Downloads/sniper-6.0/project2$ gcc hello_thread.c -o hello_thread -pthread
- ~Downloads/sniper-6.0/project2$ cd ../
- ~Downloads/sniper-6.0$ ./run-sniper -n 4 ./project2/hello_thread

```
[SNIPER] Start
[SNIPER] ----------------------------------------------------------------------
---------
[SNIPER] Sniper using Pin frontend
[SNIPER] Running full application in DETAILED mode
[SNIPER] ----------------------------------------------------------------------
---------
[SNIPER] Enabling performance models
[SNIPER] Setting instrumentation mode to DETAILED
hello world 1
hello world 2
hello world ^-^
hello world 3
[SNIPER] Disabling performance models
[SNIPER] Leaving ROI after 3.07 seconds
[SNIPER] Simulated 0.2M instructions, 0.5M cycles, 0.41 IPC
[SNIPER] Simulation speed 67.1 KIPS (16.8 KIPS / target core - 59568.5ns/instr)
[SNIPER] Setting instrumentation mode to FAST_FORWARD
[SNIPER] End
[SNIPER] Elapsed time: 3.40 seconds
```

III. Project Problem1

Please design a C code with single and multi thread, and compile them with cross compiler. Use run-sniper simulator to verify them on sniper. Is the result correct?

Problem 1 requirement in your report.

Please design a single thread C code and a multi thread C code separately.

a. Please prove your design's correctness. (result of compiling code)

b. How many cycles are used? (submit sim.out file)

c. How much is your CPI?

d. Best to submit your C code of single thread and multi thread.

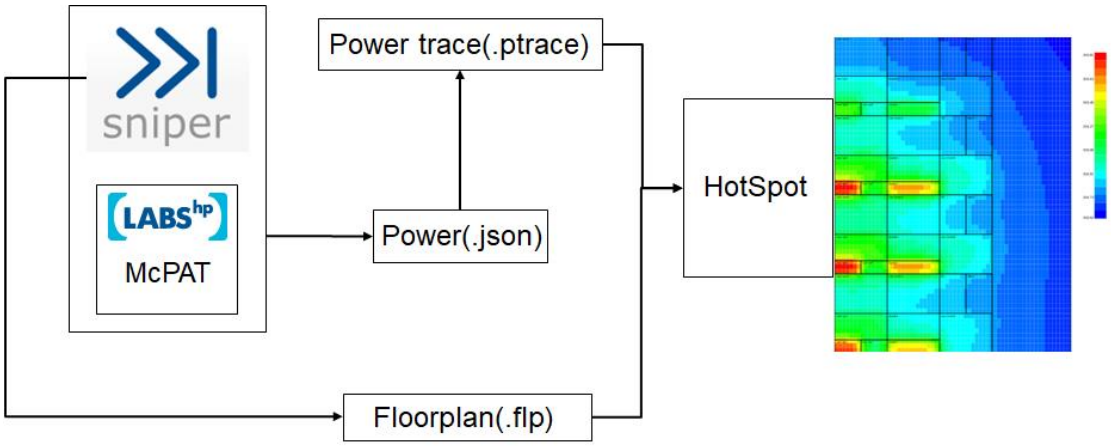
Reports must have result of single thread and multi thread.

The Problem1 folder should include word file (name: CA_HW2_M0xxxxxxxx), single thread & multithread sim.out file, single thread & multithreadc code.

IV. Thermal simulation

Temperature analysis by using Sniper, McPAT and HotSpot.

1. HotSpot is temperature modeling tool.
2. Sniper is multicore simulator.



Hotspot simulator:

Check http://lava.cs.virginia.edu/HotSpot/HotSpot-HOWTO.htm **for more information about Hotspot simulator.**

1. Copy and extract Hotspot-6.0 under /home/sniper/Downloads/
   - cd ~/Downloads/Hotspot-6.0
   - ~Downloads/Hotspot-6.0 $ make
2. Copy folder convert under /home/sniper/Downloads/
3. Create a folder “result” under /home/sniper/Downloads/
   - mkdir result
   - cd ~/Downloads/result/
   - mkdir png gif svg

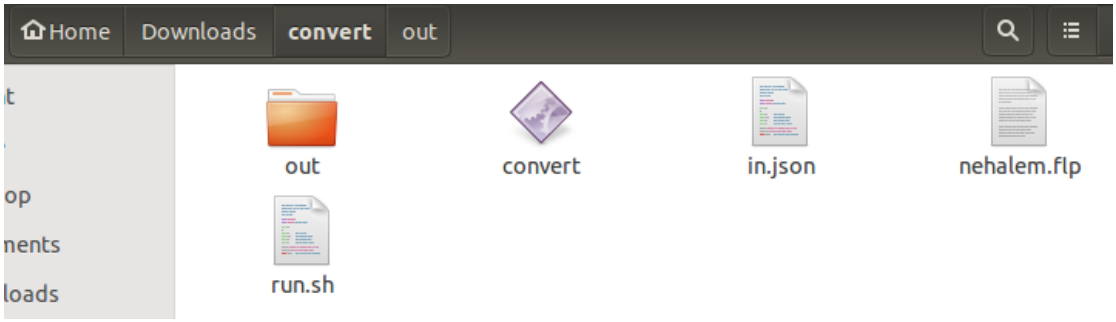
※ If you have the previous result, clean the previous result data

   - cd ~/Downloads/result/
   - rm -r png gif svg
   - mkdir png gif svg

4. Go to benchmarks folder
   - cd /home/sniper/Downloads/sniper-6.0/benchmarks
5. Run the benchmark, to generate the McPAT visualization in addition to the normal visualizations over time, use the --power option in combination with the --viz option to run-sniper.
   - ./run-sniper -p splash2-fft -d ../../dataoutput-sniper/ -n 4 -c gainestown --viz --power
6. Go to data folder
   - cd ~/Downloads/dataoutput-sniper/viz/levels/level2/data
7. Copy dataoutput-sniper-power.json under the conver folder and rename it to in.json
8. cd ~/Downloads/convert/

※ Warning: The convert folder must contain in.json, nehalem.flp, convert and out folder.

- mkdir out



9. Execute the convert that we provide. It can convert .json file to power trace file which Hotspot6.0 need.

- ./convert

10. Go to out folder and run the shell script that we provide. It can make power trace file to svg and png file.

- cd ~/Downloads/convert/out
- bash run.sh

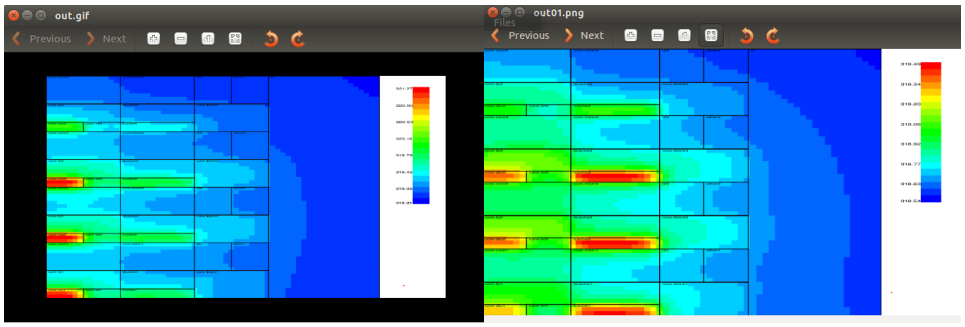
※ The benchmark is fft.

※ If you have the previous data, clean the previous data.

- Generate a gif file of thermal map
- cd ~/Downloads/result/png
- convert -delay 50 -loop 1 out* ../gif/out.gif
- cd ../gif
- xdg-open out.gif

V. Project Problem2

Please submit your in.josn、“result” and “out” folder. (include gif、png、svg、powertrace file)



VI. Contact Information

If you encountered any unsolvable problem, please email me. Pack your files as a compressed file and name as “CAProject2_ID_Name” like (CAProject2_M123456789 王大權) and upload it when you finished the report.

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