CMPEN431 Programming Project-2

This is the second programming project of CMPEN431, you will still use SimpleScalar to perform experiments. Specifically, you are going to test/compare the performance of different types of caches in the simulator, to measure the impact of capacity, associativity, block size. Please use sim-outorder for each benchmark run, and we already have bzip2, equake, hmmer, mcf, milc and sjeng, totally 6 benchmarks ready for you to use. All the benchmarks can be found in "/home/software/simplesim/ss-benchmark". You should copy these files to your own directory. The sample command for your runs can be found in "SimpleScalar/SimpleScalar_Lab_Setup.pdf" on canvas."

Requirement:
You need to study the impact of the capacity, associativity and the block size for the caches. You need to run all 6 benchmarks. Each benchmark needs to be run for 2,000,000 instructions.
For all the experiments, we only focus on L1 data cache. The default L2 cache is 1024 sets, 2 associativity and the block size of 64Bytes. (See "users_guide_v2.pdf" to know how to set number of sets, associativity and block size)

Capacity: The default cache (L1 data) has 256 sets with associativity of 4. The block size is 32Bytes. (See "users_guide_v2.pdf" to know how to set number of sets, associativity and block size)
Run all the benchmarks with 64 sets, 128 sets, 256 sets and 512 sets cache. All of these four cache has associativity of 4 and block size of 32Bytes. (So that the capacity will be 8KB, 16KB, 32KB and 64KB)

Associativity: The default cache (L1 data) has 256 sets with associativity of 4. The block size is 32Bytes.
Run all the benchmarks with <1-associativity, 1024 sets>, <2-associativity, 512 sets>, <4-associativity, 256 sets> and <8-associativity, 128 sets>. All of these four cache has block size of 32Bytes. (So that all of them have capacity of 32KB)

Block size: The default cache (L1 data) has 256 sets with associativity of 4. The block size is 32Bytes.
Run all the benchmarks with <16Bytes block size, 512 sets>, <32Bytes block size, 256 sets> and <64Bytes block size, 128 sets>. All of these three cache has block size of associativity of 4. (So that all of them have capacity of 32KB)

For your set of three experiments for each benchmark, you should write a report in tabulated form. Show the sim_IPC for each benchmark of different cache configurations. Here is the sample table. You just need to fill up all the blanks in the tables with the correspond IPC.

Capacity:

capacity	bzip2	equake	hmmer	mcf	milc	sjeng
64 sets / 8KB						
128 sets / 16KB						

	bzip2	equake	hmmer	mcf	milc	sjeng
256 sets / 32KB						
512 sets / 64KB						

Associativity:

associativity	bzip2	equake	hmmer	mcf	milc	sjeng
1-associativity, 1024 sets						
2-associativity, 512 sets						
4-associativity, 256 sets						
8-associativity, 128 sets						

Block size:

block size	bzip2	equake	hmmer	mcf	milc	sjeng
16Bytes / 512sets						
32Bytes / 256sets						
64Bytes / 128sets						

Project policy

i)   For this project, you may choose to pair up with another student (this is not a requirement; if you want, you can do it alone).

ii)   Each group should submit a single file (pdf) with four tables of described above. You also need to draw some figures to show how the different configurations (capacity, block size and associativity) impact the performance. You can draw any kinds of figures with several sentences of explain.

iii)   Please indicate the names and PSU IDs of the group members in your submission.

iv)   This project is due Dec 7th 11:59pm.