

# Computer Organization

## Lab 6: Cache Simulator

**Due: 2019/6/30**

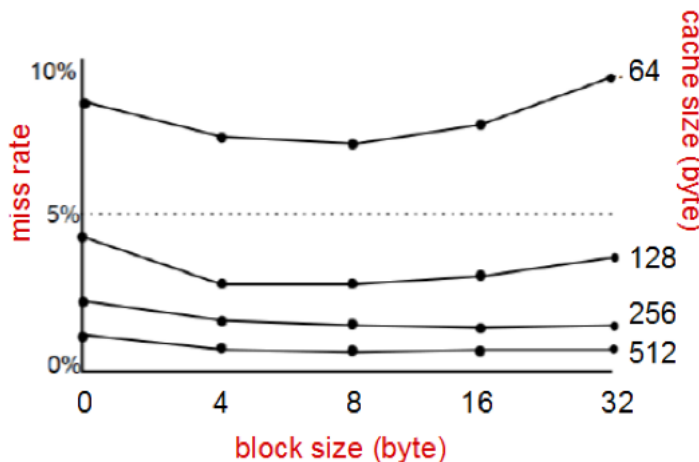
### 1. Goal

Cache performance is important for system performance. In this lab, you are demanded to simulate cache behaviors by C/C++ style cache simulators. By this training, you will understand the performance difference between different cache architectures.

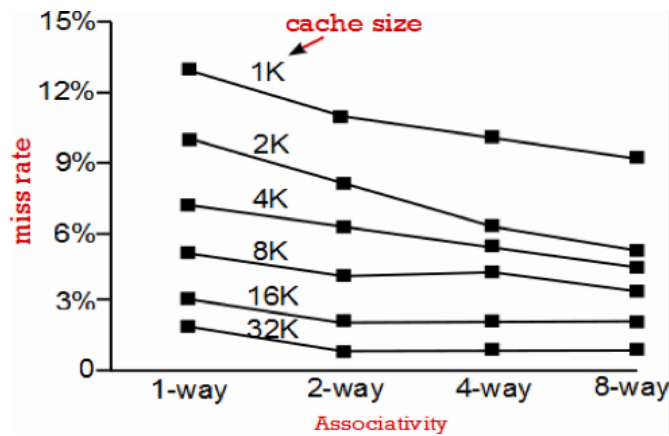
### 2. Problem

In this problem, you have to implement an n-way set-associative cache simulator (LRU replacement policy). Inputting the file Trace.txt that is the memory trace from a benchmark to the simulator. We will supply the direct\_map\_cache.cpp file, you can refer to this and implement your program.

- Fix the associativity on 1 (direct\_map\_cache), and then observe the difference when adapting the cache size and block size. Please draw a graph as the following example and describe the reason of rise and fall of the lines in the report.



- Fix the block size on 32 (byte), and then observe the difference when adapting the cache size and associativity. Please draw a graph as the following example and describe the reason of rise and fall of the lines in the report.



### 3. Input/Output

- Input
  - a. memory trace file (Trace.txt)
  - b. block size (16B to 256B)
  - c. cache size (1KB up to 256KB)
  - d. associativity (from direct-mapped to fully associative)
- Output
  - a. miss rate (%)
  - b. Hits instructions
  - c. Miss instructions

### 4. Execution Example

- Input: Trace1.txt (byte address)

```

0xbfa437cc
0xbfa437c8
0xbfa437c4
0xbfa437c0
0xbfa437bc
0xbfa437b8
0xbfa437b8
0xbfa43794
0xb8088ea8
0xb8088eac

```

```

cache size    = 1024 (bytes)
block size    = 32   (bytes)
associativity  = 2

```

- Output

Hits instructions: 2,3,4,6,7,10

Misses instructions: 1,5,8,9

Miss rate: 40%

## 5. Requirements

- Please implement this Lab in C/C++ language.
- One person form a group.
- Please submit your file to E3.
- Please compress your report and the code into one single file. The file should be named as: student\_ID.zip (Format must be correct or you will get some penalty)
- Files to upload
  - code (.cpp/.c/.h)
  - report (.pdf)
  - test file (Trace.txt)

## 7. Grade

- Total:** 100 points (Report 20% / Program 80%)
- Late submission:** No late submission is allowed.
- Score of this Lab is a reference to bias the final score of this course!**