Operating Systems Programming Assignment #5

Page Replacement Simulation: FIFO and LRU

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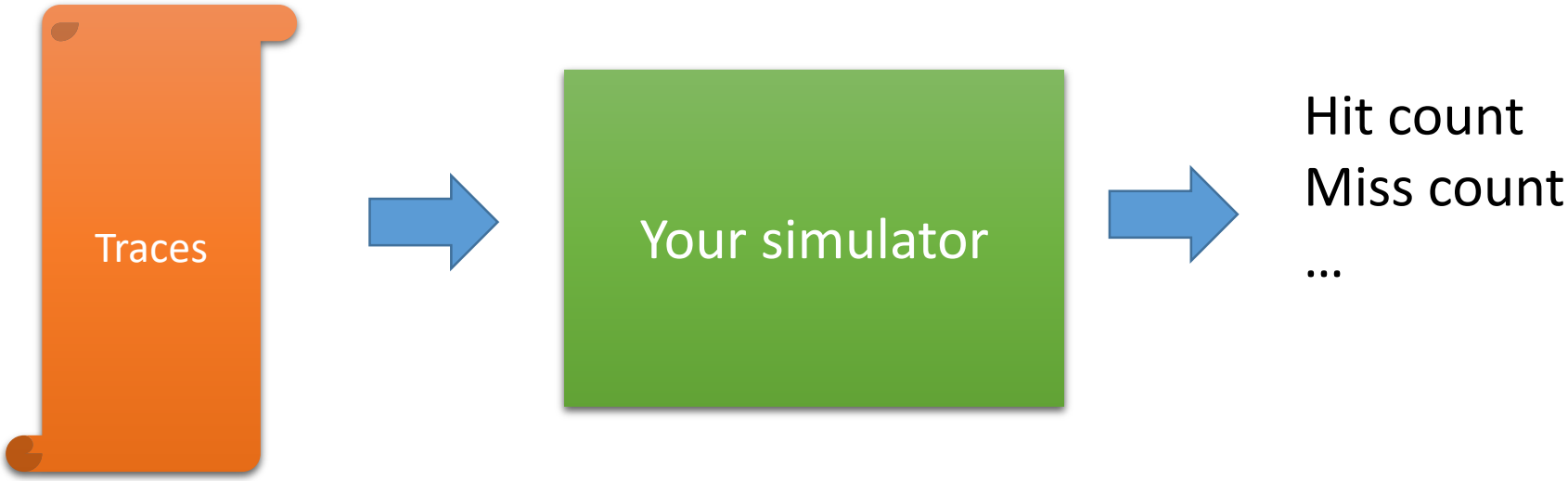
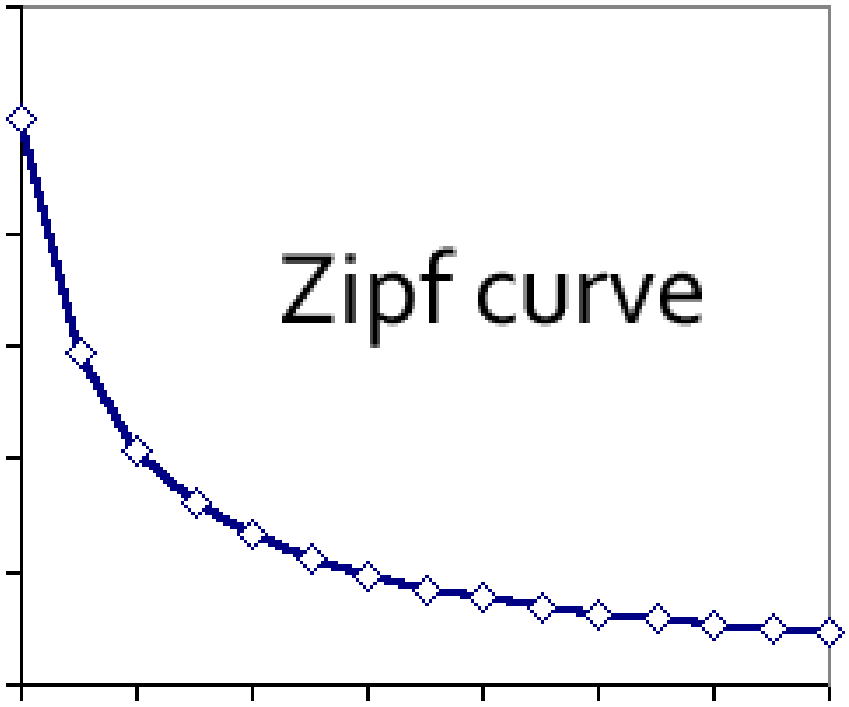
Simulation



Trace File Format (trace.txt)

- The trace format and Zipfian distribution

```
1003
1003
9340
1243
1108
1786
1066
1312
1000
1000
1213
1249
2116
```



Unsigned integer

Page Replacement(FIFO)

- Example: Frame #=2

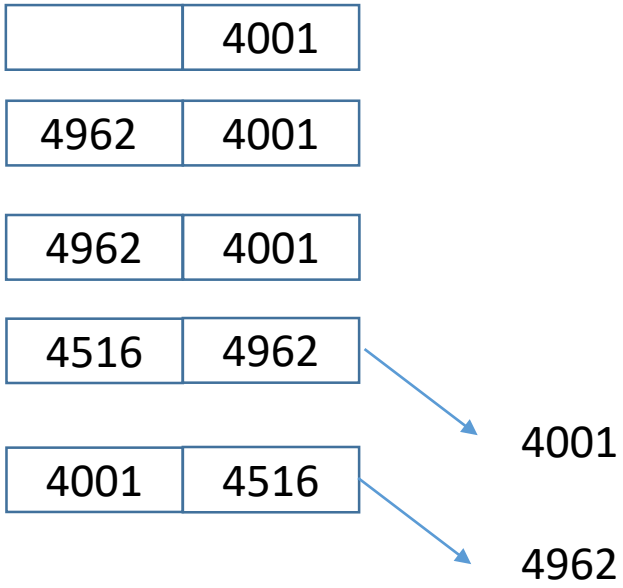
4001 (miss)

4962 (miss)

4001 (hit)

4516 (miss)

4001 (miss)



Page Replacement(LRU)

- Example: Frame #=2

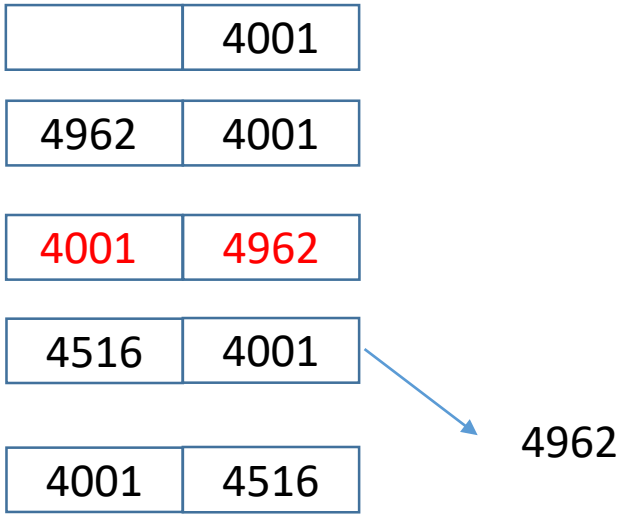
4001 (miss)

4962 (miss)

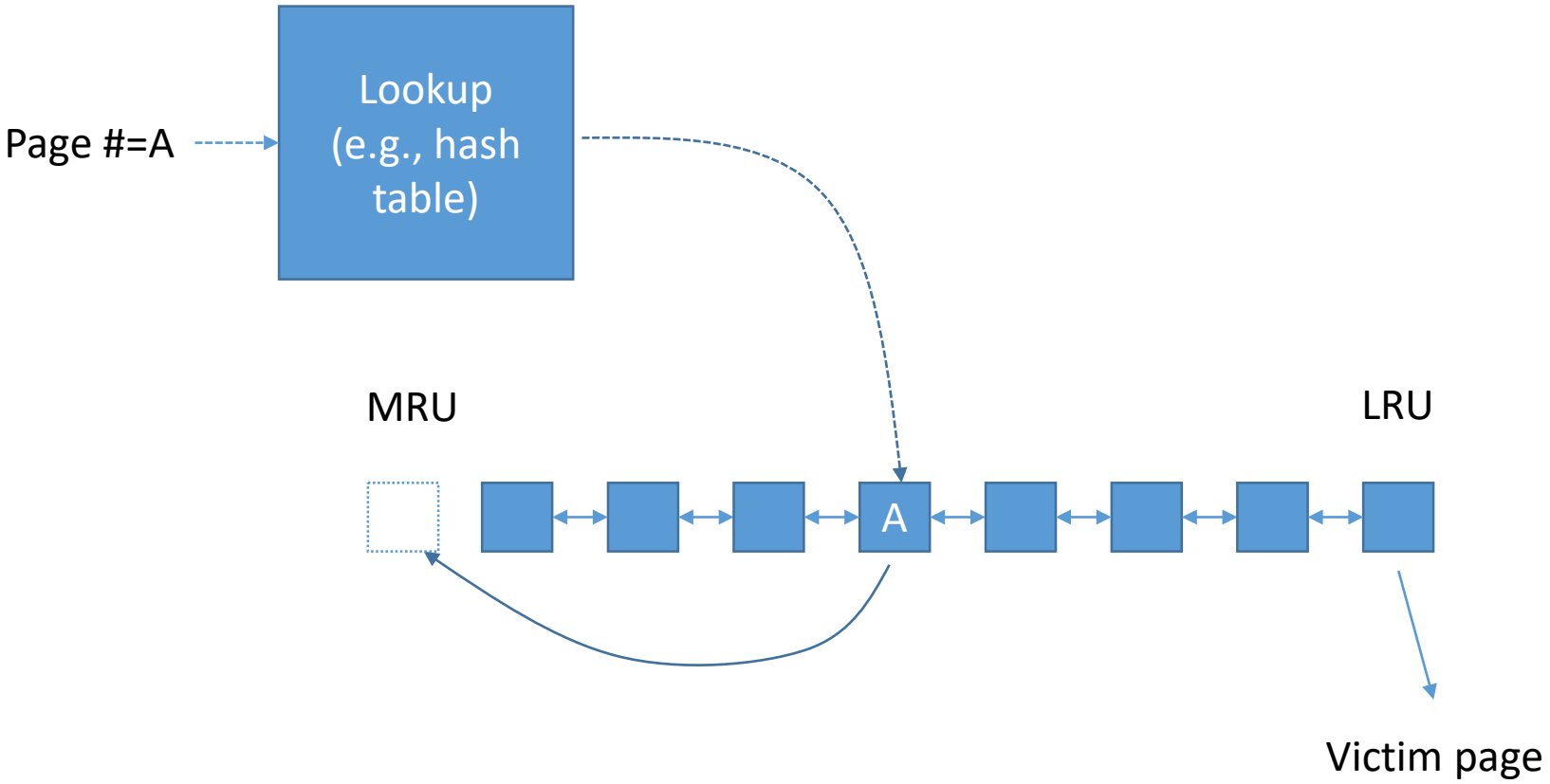
4001 (hit)

4516 (miss)

4001 (hit)



Simulator Structure (LRU)



Page Cache Operations

- Page lookup
  - Check whether or a new reference is a hit or a miss
  - Hash tables, binary search trees, skip lists….

- Do not use linear search!!!
  - You will receive a grade penalty if you do
  - Implement your own search, or reuse any existing libraries/classes for searching
  - TAs will read your code
  - Duplication in this part does not count

Page Cache Operations

- Victim selection
  - FIFO
    - The oldest page
  - LRU
    - The least recently used page

Procedure

1. Algorithm=FIFO
2. For (Frame #=128; <=1024; *=2)
   - Read the trace file “trace.txt”
   - Run simulation
   - Print out the miss count, hit count, page fault ratio
3. Algorithm=LRU
4. For (Frame #=128; <=1024; *=2)
   - Read the trace file “trace.txt”
   - Run simulation
   - Print out the miss count, hit count, page fault ratio

Output Format

FIFO---

size	miss	hit	page fault ratio
128	☹	☹	☹
256	1646760	8353240	0.164676000
512	☹	☹	☹
1024	631217	9368783	0.063121700

LRU---

size	miss	hit	page fault ratio
128	☹	☹	☹
256	1321597	8678403	0.132159700
512	☹	☹	☹
1024	471329	9528671	0.047132900

Correctness

- Your results must be exactly the same as ours
- You must not use linear search
  - Show the total execution time

Testing OS Environment

- Ubuntu 16.04, Ubuntu 14.04 or CS linux work station
  - Your code should compile successfully in one of the above environments