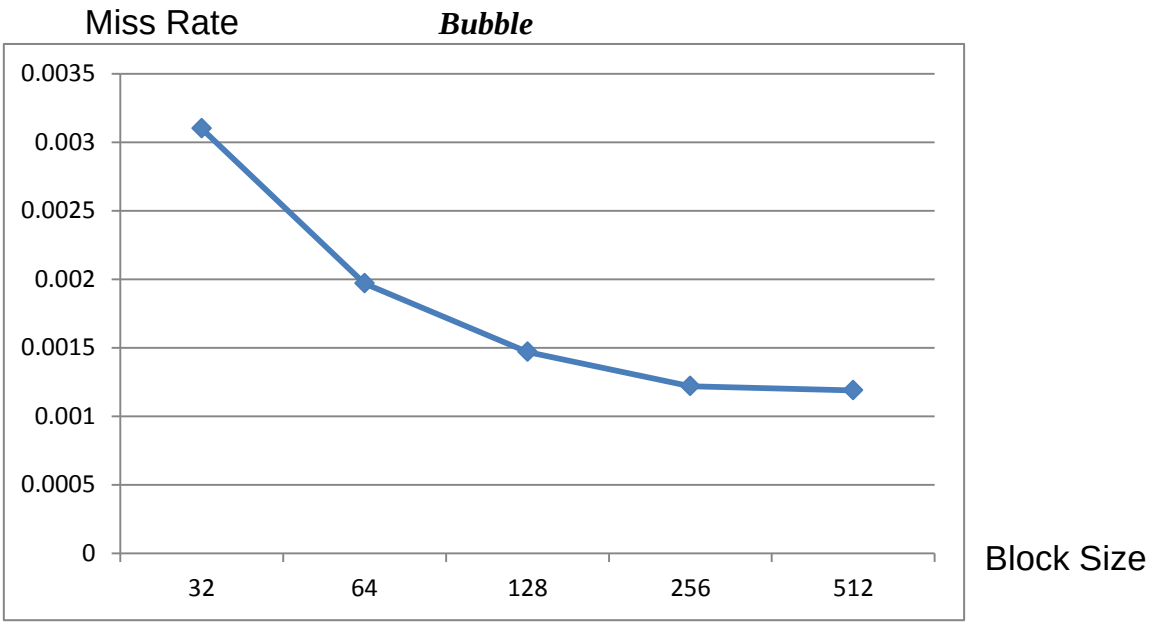
Data Structure by Sho Ko

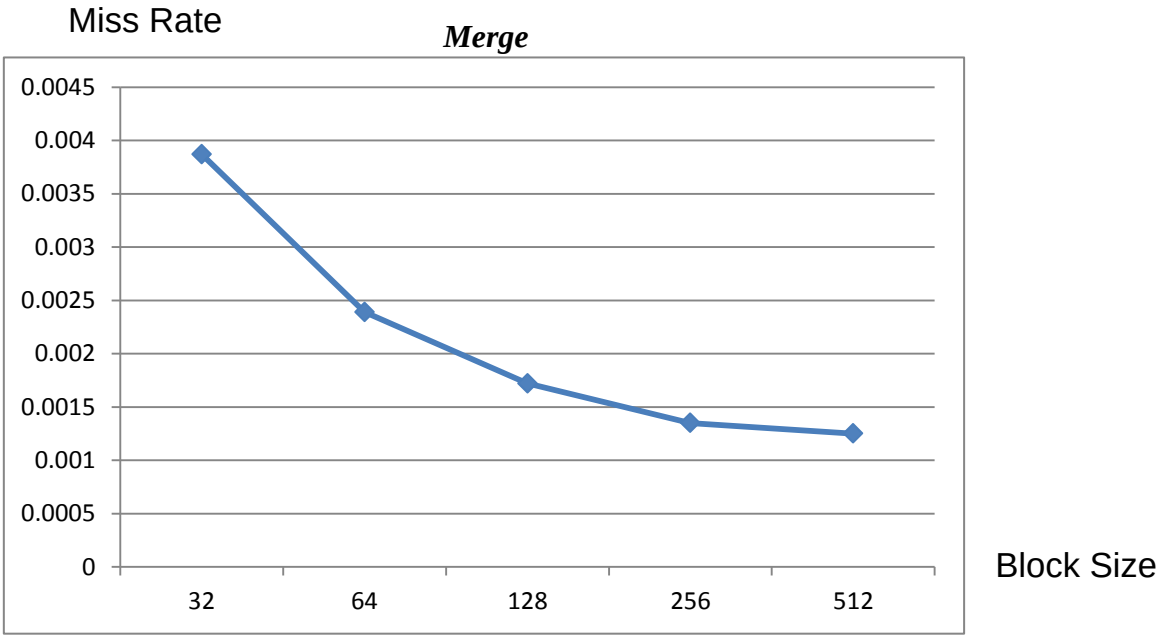
```
typedef struct set{
	int top;
	int stack[3000];
	int tag[3000];
	int valid[3000];
	int dirty[3000];
} set;

typedef struct cache{
	set sets[5000];
} cache;
```

I use a structure called cache to represent the only cache in this problem. I use another structure called set to represent a single set in the N-way associative cache. In the structure cache, there is an array of sets to manipulate all sets. In each structure set, there is an integer top to represent the top of the stack and there are four arrays of integers to represent all the stacks, tags, valid bits, and dirty bits respectively.

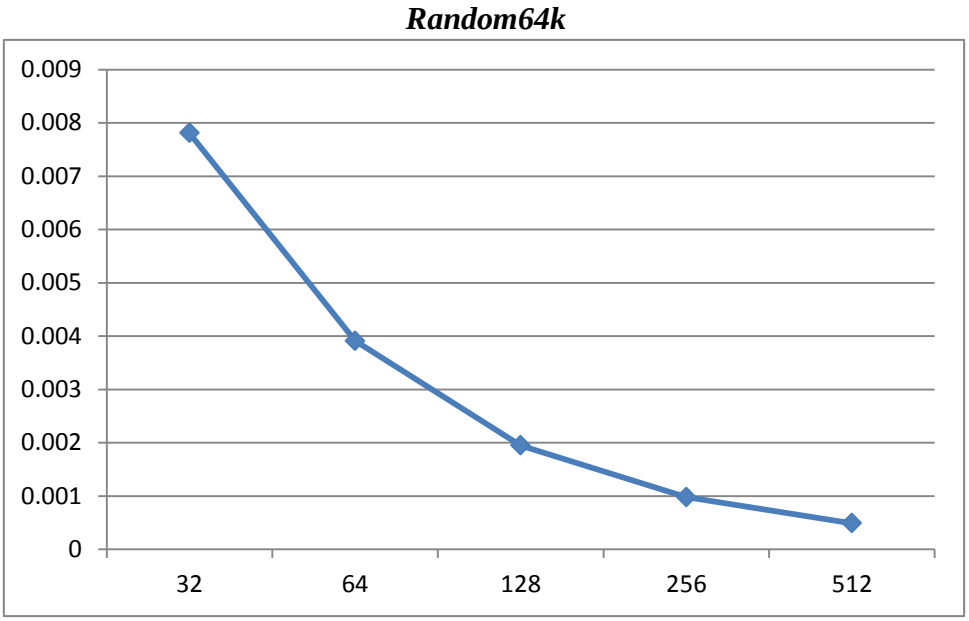
Miss Rate vs. Line Size by Sho Ko

Assume 64 Kbyte cache and associativity 4.



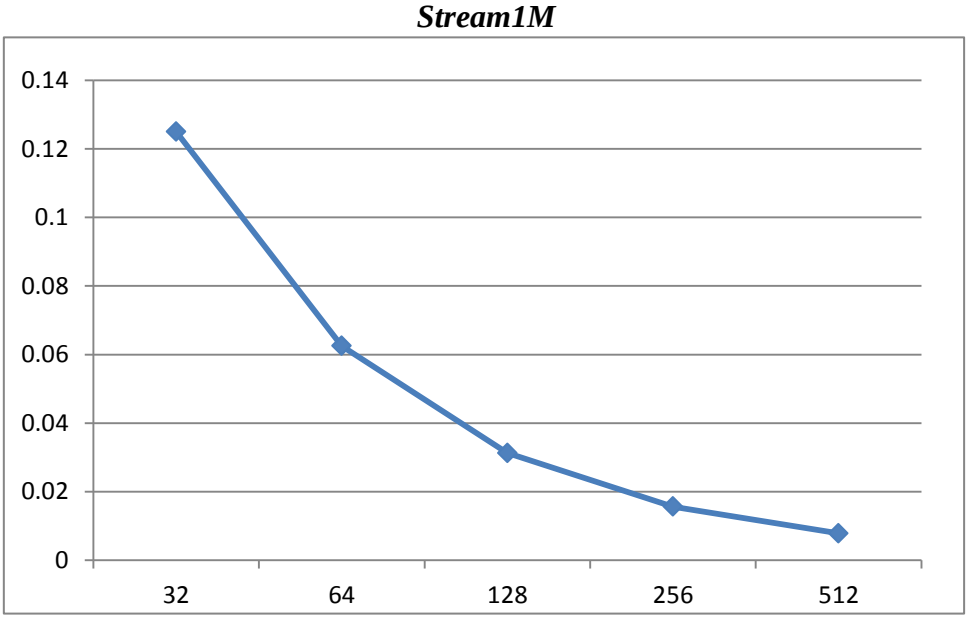


Miss Rate



Block Size

Miss Rate



Block Size

Best Configuration by Sho Ko

The best configuration is line size 512 byte and associativity 8. Total memory access volume is relatively small compared to total volume referenced.

Bubble

Overall Miss Rate: 6626/ 6322343 = 0.00105
Write Miss Rate: 618/656333 = 0.000942
Read Miss Rate: 6008/5666010 = 0.00106
Write-back Traffic Volume: 1587 * 512 = 812544 byte
Total Volume Referenced: 6322343 * 512 = 3237039616 byte
Total Memory Access Volume: 6626 * 512 = 3392512 byte

Merge

Overall Miss Rate: 8712/7678430 = 0.00113
Write Miss Rate: 1026/1133678 = 0.000905
Read Miss Rate: 7686/6544752 = 0.00117
Write-back Traffic Volume: 2324 * 512 = 1189888 byte
Total Volume Referenced: 7678430 * 512 = 3931356160 byte
Total Memory Access Volume: 8712 * 512 = 4460544 byte

Random64k

Overall Miss Rate: 128/262144 = 0.000488
Write Miss Rate: No writes
Read Miss Rate: 128/262144 = 0.000488
Write-back Traffic Volume: No writes, dirty bit always 0
Total Volume Referenced: 262144 * 512 = 134217728 byte
Total Memory Access Volume: 128 * 512 = 65536 byte

Stream1M

Overall Miss Rate: 2048/262144 = 0.0078125
Write Miss Rate: No writes
Read Miss Rate: 2048/262144 = 0.0078125
Write-back Traffic Volume: No writes, dirty bit always 0
Total Volume Referenced: 262144 * 512 = 134217728 byte
Total Memory Access Volume: 2048 * 512 = 1048576 byte