

CA Assignment-3

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a) Size of cache = 1024 kB

Block size = 4 B

Number of Ways = 4

⇒ Number of cache lines = 65,536 (2^{16})

Trace File Name	Number of Hits	Number of Misses	Hit Rate (%age)	Miss Rate (%age)	Hits/Misses
gcc.trace	483894	31879	93.8356	6.16445	15.2221
gzip.trace	320883	160161	66.7055	33.2945	2.0035
mcf.trace	7508	719722	1.03241	98.9676	0.0104318
swim.trace	280825	22368	92.6225	7.37748	12.5548
twolf.trace	476844	5980	98.7615	1.23855	79.7398

Screenshot of results: (On next page)

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Enter the number of ways: 4
Enter the cache size in kilobytes: 1024
Enter the block size in bytes: 4

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File name: gcc.trace
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Lines of cache: 65536
Total hits is: 483894
Total misses is: 31789
Hit Rate (as percent) of file is: 93.8356
Miss Rate (as percent) of file is: 6.16445
Hits\Miss: 15.2221

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File name: gzip.trace
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Lines of cache: 65536
Total hits is: 320883
Total misses is: 160161
Hit Rate (as percent) of file is: 66.7055
Miss Rate (as percent) of file is: 33.2945
Hits\Miss: 2.0035

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File name: mcf.trace
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Lines of cache: 65536
Total hits is: 7508
Total misses is: 719722
Hit Rate (as percent) of file is: 1.03241
Miss Rate (as percent) of file is: 98.9676
Hits\Miss: 0.0104318

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File name: swim.trace
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Lines of cache: 65536
Total hits is: 280825
Total misses is: 22368
Hit Rate (as percent) of file is: 92.6225
Miss Rate (as percent) of file is: 7.37748
Hits\Miss: 12.5548

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File name: twolf.trace
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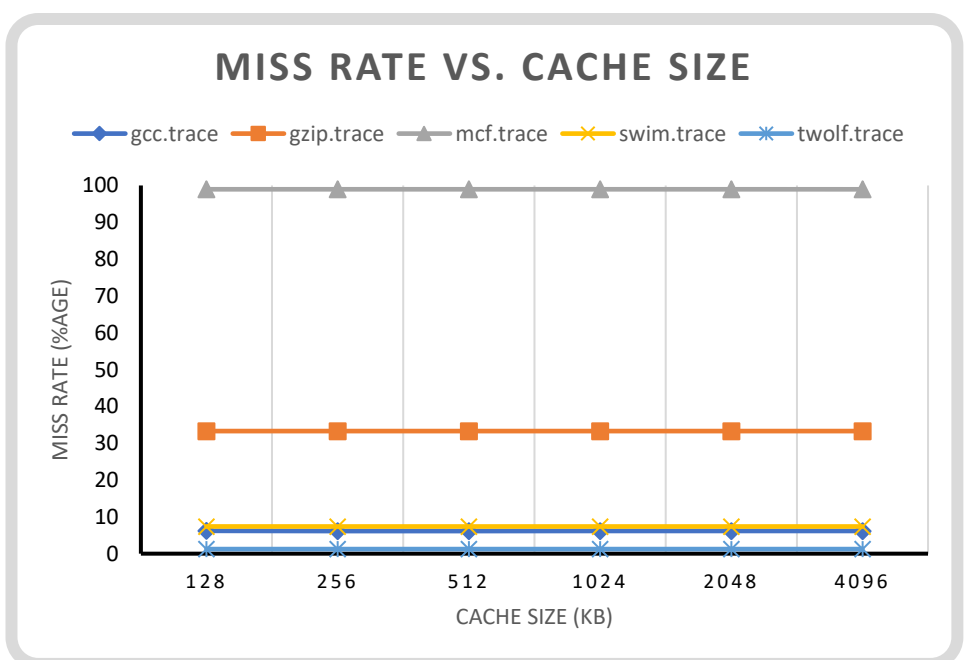
```

Lines of cache: 65536
Total hits is: 476844
Total misses is: 5980
Hit Rate (as percent) of file is: 98.7615
Miss Rate (as percent) of file is: 1.23855
Hits\Miss: 79.7398

```

- b) For this part, we will start with a cache size of 128 kB and then keep doubling the cache size till 4096 kB, with a 4-way set associative cache and a block size of 4 B.

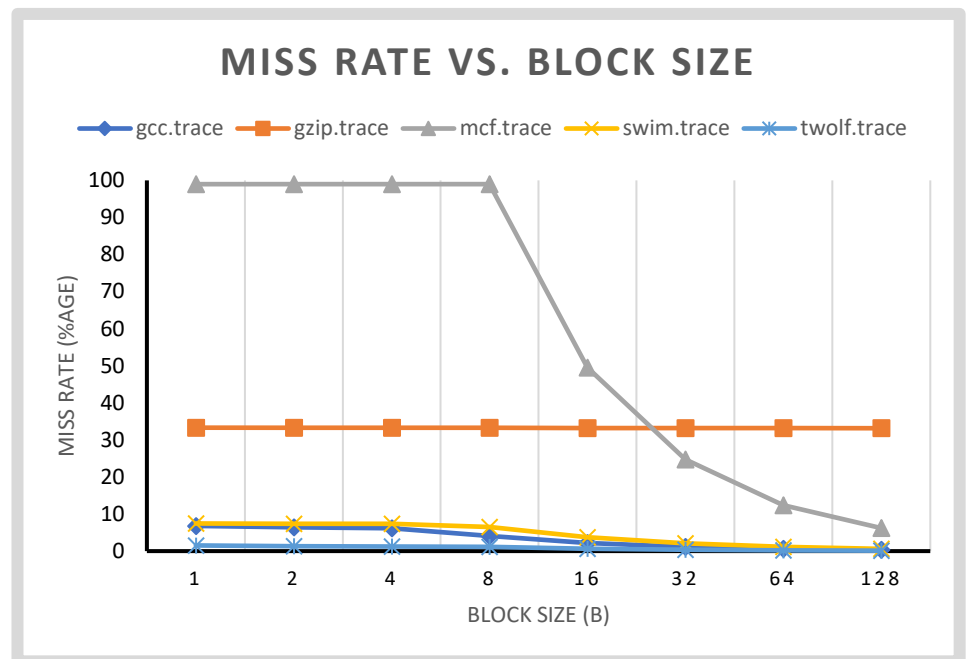
Graph of
Miss Rates
vs. Cache
Size:



Observation: We can see from the graph that all the trace files behave similarly when the cache size is changed, with the miss rate staying almost constant.

- c) For this part, we keep the cache size as 1024 kB and vary the block size from 1 B to 128 B in a 4-way set-associative cache.

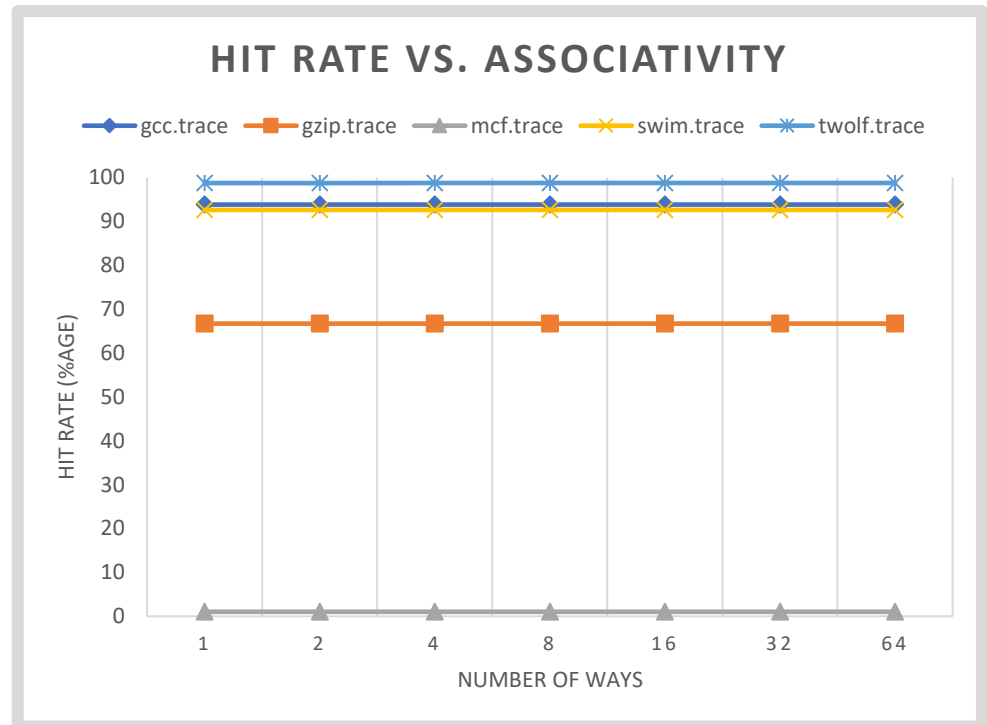
Graph of
Miss Rate
vs. Block
Size:



Observation: No, all the files do not behave in the same way, the files gcc.trace, swim.trace and twolf.trace behave similarly with a slightly downward-sloping line, while gzip.trace is almost constant (very slight decrease). The most impacted is mcf.trace, with its miss rate drastically declining after 8 B of block size.

- d) For this part, we keep the cache size as 1024 kB and the block size as 4 B, while varying the number of ways from 1 to 64.

Graph of
Hit Rate
vs.
Number
of Ways:



Observation: We can see that all graphs behave in the same way with the hit rate staying almost constant. There is a gradual increase in the hit rate, finally reaching saturation because the number of different addresses of data in the trace files is less than the number of lines of cache in the simulator, leading to the number of hits being constant.

Some files behave differently because the data in them are either too different, or too similar, leading to varying hit and miss rates.