

REPORT #1

- I'm setting reference point to L1 size=16, block size=16 and L1 associativity=1. So, we'll see how L1 size / block size / L1 associativity changes affected the load miss rate.

→ L1 Size=16 – Block Size=16 – L1 Associativity=1 – N=500

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Stat Resets: 0

L1 Data Cache:
Load Hits: 2459554787
Load Misses: 169800054
Load Accesses: 2629354841
Load Miss Rate: 6.46%

Store Hits: 250109715
Store Misses: 1462428
Store Accesses: 251572143
Store Miss Rate: 0.58%

Total Hits: 2709664502
Total Misses: 171262482
Total Accesses: 2880926984
Total Miss Rate: 5.94%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:
Load Hits: 155050671
Load Misses: 14751031
Load Accesses: 169801702
```

Load Miss Rate: 6.46%

→ L1 Size=16 – Block Size=16 – L1 Associativity=2 – N=500

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Stat Resets: 0

L1 Data Cache:
Load Hits: 2477137932
Load Misses: 152216909
Load Accesses: 2629354841
Load Miss Rate: 5.79%

Store Hits: 250638171
Store Misses: 933972
Store Accesses: 251572143
Store Miss Rate: 0.37%

Total Hits: 2727776103
Total Misses: 153150881
Total Accesses: 2880926984
Total Miss Rate: 5.32%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:
Load Hits: 137658433
Load Misses: 14560124
Load Accesses: 152218557
```

Load Miss Rate: 5.79%

→ L1 Size=16 – Block Size=16 – L1 Associativity=4 – N=500

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 1841559152
Total Miss Rate: 0.00%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 2528305082
Load Misses: 101049759
Load Accesses: 2629354841
Load Miss Rate: 3.84%

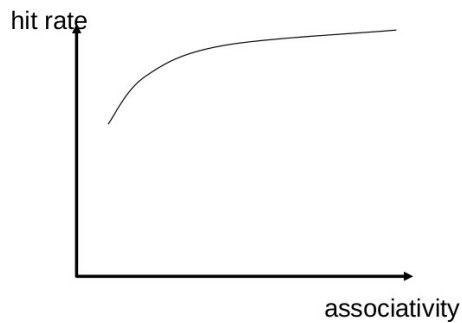
Store Hits: 250763662
Store Misses: 808481
Store Accesses: 251572143
Store Miss Rate: 0.32%

Total Hits: 2779068744
Total Misses: 101858240
Total Accesses: 2880926984
Total Miss Rate: 3.54%
Flushes: 0
Stat Resets: 0

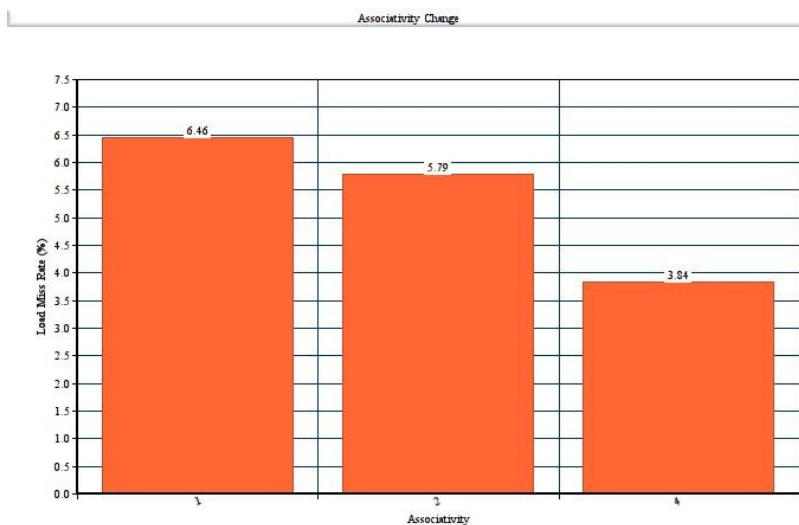
L2 Unified Cache:
```

Load Miss Rate: 3.84%

- We know that higher associativity means higher hit rate. The nature is:



- Our graph is here;



We have proved that higher associativity means lower miss rate.

Constants Variables are:

- L1 Size: 16
- Block Size: 16
- N=500

→ L1 Size=32 – Block Size=16 – Associativity=1 – N=500

```

Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Stat Resets: 0

L1 Data Cache:
Load Hits: 2508651112
Load Misses: 120703729
Load Accesses: 2629354841
Load Miss Rate: 4.59%

Store Hits: 250565372
Store Misses: 1006771
Store Accesses: 251572143
Store Miss Rate: 0.40%

Total Hits: 2759216484
Total Misses: 121710500
Total Accesses: 2880926084
Total Miss Rate: 4.22%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:
Load Hits: 105700525
Load Misses: 15004852
Load Accesses: 120705377

```

Load Miss Rate: 4.59%

→ L1 Size=64 – Block Size=16 – Associativity=1 – N=500

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help

Stat Resets: 0

L1 Data Cache:
Load Hits: 2536211679
Load Misses: 93143162
Load Accesses: 2629354841
Load Miss Rate: 3.54%

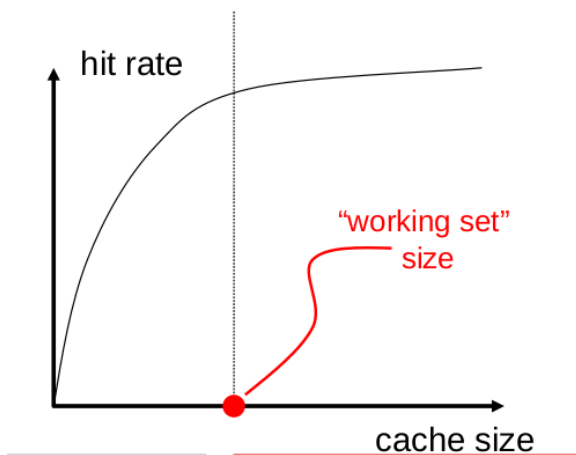
Store Hits: 250750695
Store Misses: 821448
Store Accesses: 251572143
Store Miss Rate: 0.33%

Total Hits: 2786962374
Total Misses: 93964610
Total Accesses: 2880926984
Total Miss Rate: 3.26%
Flushes: 0
Stat Resets: 0

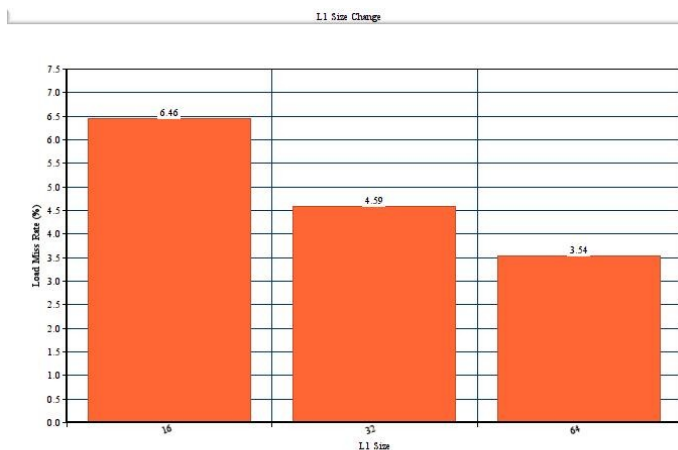
L2 Unified Cache:
Load Hits: 78985267
Load Misses: 14159543
Load Accesses: 93144810
```

Load Miss Rate: 3.54%

- The nature of cache size-hit rate curve is here;



- Our graph:



Our results are in parallel with the nature of cache size-hit rate.

Constant variables are:

- Block Size: 16
- L1 Associativity: 1
- N: 500

→ L1 Size=16 – Block Size=32 – L1 Associativity=1 – N=500

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 1841559152
Total Miss Rate: 0.00%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 2489771857
Load Misses: 139582984
Load Accesses: 2629354841
Load Miss Rate: 5.31%

Store Hits: 249528036
Store Misses: 2044107
Store Accesses: 251572143
Store Miss Rate: 0.81%

Total Hits: 2739299893
Total Misses: 141627091
Total Accesses: 2880926984
Total Miss Rate: 4.92%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:
```

Load Miss Rate: 5.31%

→ L1 Size=16 – Block Size=8 – L1 Associativity=1 – N=500

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Stat Resets: 0

L1 Data Cache:
Load Hits: 2394568270
Load Misses: 234786571
Load Accesses: 2629354841
Load Miss Rate: 8.93%

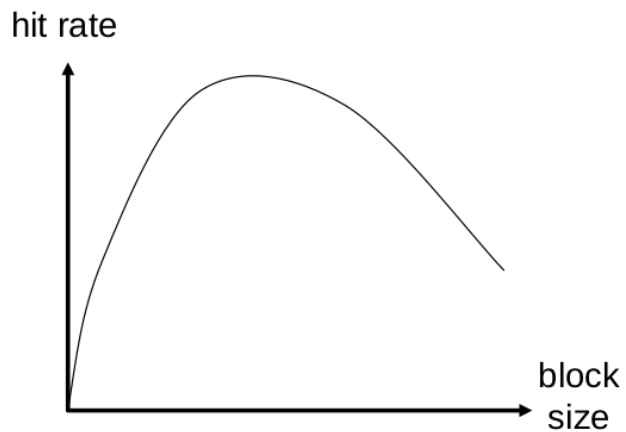
Store Hits: 250225749
Store Misses: 1346394
Store Accesses: 251572143
Store Miss Rate: 0.54%

Total Hits: 2644794019
Total Misses: 236132965
Total Accesses: 2880926984
Total Miss Rate: 8.20%
Flushes: 0
Stat Resets: 0

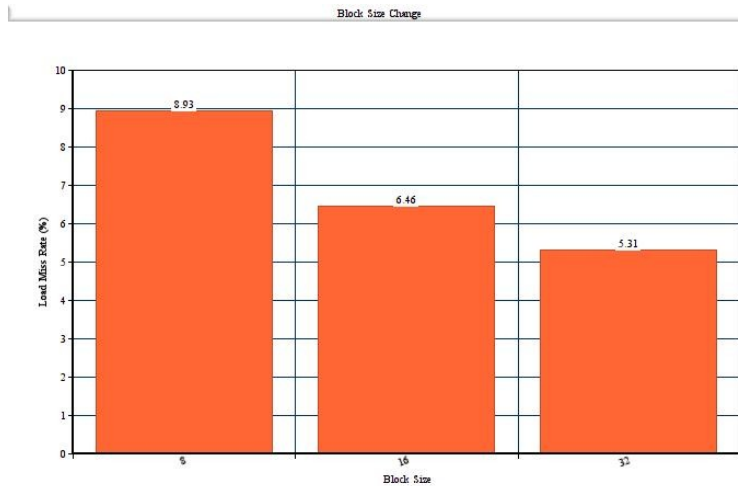
L2 Unified Cache:
Load Hits: 219890070
Load Misses: 14898149
Load Accesses: 234788219
```

Load Miss Rate: 8.93%

- The nature of block size – hit rate is here;



- Our graph;



Our results are in parallel with the nature of block size – hit rate. We increase block size and we have seen that load miss rate is decreased.

Constants variables are:

- L1 Size: 16
- L1 Associativity: 1
- N: 500

Second Experiment (N: 10)

- I'm setting reference point to L1 size=16, block size=16 and L1 associativity=1. So, we'll see how L1 size / block size / L1 associativity changes affected the load miss rate.

➔ **L1 Size=16 – Block Size=16 – L1 Associativity=1 – N=10**

```

Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 247784
Total Miss Rate: 0.66%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 58549
Load Misses: 10125
Load Accesses: 68674
Load Miss Rate: 14.74%

Store Hits: 11316
Store Misses: 4609
Store Accesses: 15925
Store Miss Rate: 28.94%

Total Hits: 69865
Total Misses: 14734
Total Accesses: 84599
Total Miss Rate: 17.42%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:

```

Load Miss Rate: 14.74%

→ L1 Size=16 – Block Size=16 – L1 Associativity=2 – N=10

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 247784
Total Miss Rate: 0.66%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 59637
Load Misses: 9037
Load Accesses: 68674
Load Miss Rate: 13.16%

Store Hits: 11789
Store Misses: 4136
Store Accesses: 15925
Store Miss Rate: 25.97%

Total Hits: 71426
Total Misses: 13173
Total Accesses: 84599
Total Miss Rate: 15.57%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:
```

Load Miss Rate: 13.16%

→ L1 Size=16 – Block Size=16 – L1 Associativity=4 – N=10

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 247784
Total Miss Rate: 0.66%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 59681
Load Misses: 8993
Load Accesses: 68674
Load Miss Rate: 13.10%

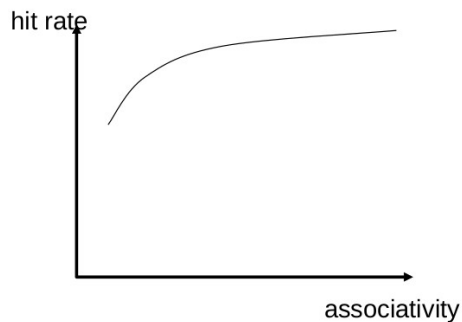
Store Hits: 11811
Store Misses: 4114
Store Accesses: 15925
Store Miss Rate: 25.83%

Total Hits: 71492
Total Misses: 13107
Total Accesses: 84599
Total Miss Rate: 15.49%
Flushes: 0
Stat Resets: 0

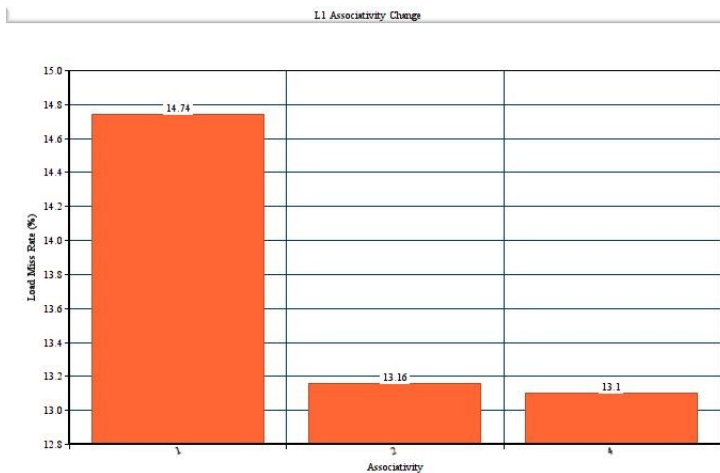
L2 Unified Cache:
```

Load Miss Rate: 13.10%

- We know that higher associativity means higher hit rate. The nature is:



- Our graph:



We have proved that higher associativity means lower miss rate.

Constants Variables are:

- L1 Size: 16
- Block Size: 16
- N=10

➔ L1 Size=32 – Block Size=16 – L1 Associativity=1 – N=10

```

Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 247784
Total Miss Rate: 0.66%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 58740
Load Misses: 9934
Load Accesses: 68674
Load Miss Rate: 14.47%

Store Hits: 11502
Store Misses: 4423
Store Accesses: 15925
Store Miss Rate: 27.77%

Total Hits: 70242
Total Misses: 14357
Total Accesses: 84599
Total Miss Rate: 16.97%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:

```

Load Miss Rate: 14.47%

➔ L1 Size=64 – Block Size=16 – L1 Associativity=1 – N=10

```

Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 247784
Total Miss Rate: 0.66%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 59968
Load Misses: 8706
Load Accesses: 68674
Load Miss Rate: 12.68%

Store Hits: 11980
Store Misses: 3945
Store Accesses: 15925
Store Miss Rate: 24.77%

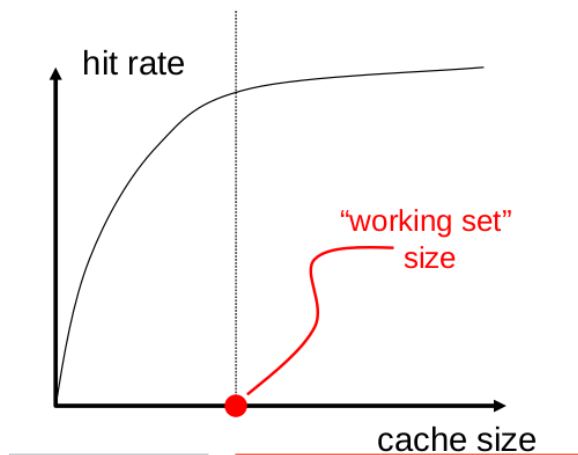
Total Hits: 71948
Total Misses: 12651
Total Accesses: 84599
Total Miss Rate: 14.95%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:

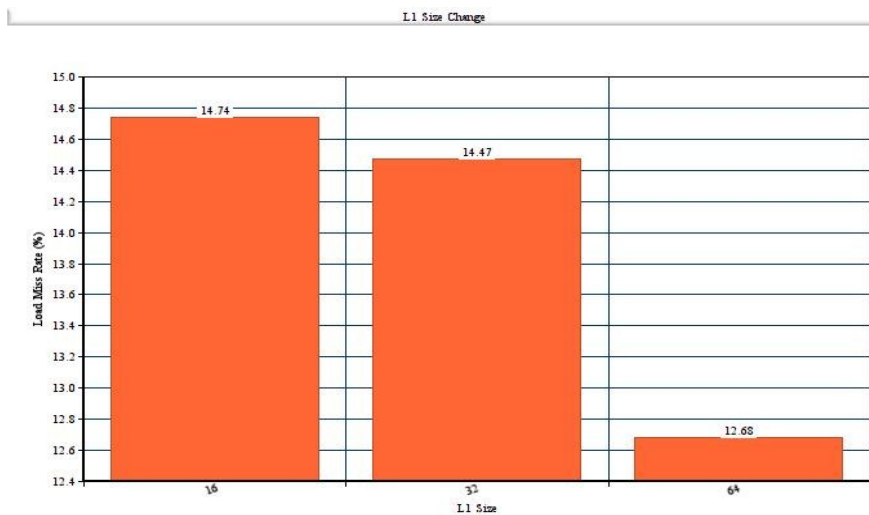
```

Load Miss Rate: 12.68%

- The nature of cache size-hit rate curve is here;



- Our graph:



Our results are in parallel with the nature of cache size-hit rate.

Constant variables are:

- Block Size: 16
- L1 Associativity: 1
- N: 10

→ L1 Size=16 – Block Size=32 – L1 Associativity=1 – N=10

```

Terminal - onur@onur-pc:~/Desktop/pin-3.7.97619-gd0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 247784
Total Miss Rate: 0.66%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 63366
Load Misses: 5308
Load Accesses: 68674
Load Miss Rate: 7.73%

Store Hits: 12260
Store Misses: 3665
Store Accesses: 15925
Store Miss Rate: 23.01%

Total Hits: 75626
Total Misses: 8973
Total Accesses: 84599
Total Miss Rate: 10.61%
Flushes: 0
Stat Resets: 0

L2 Unified Cache:

```

Load Miss Rate: 7.73%

→ L1 Size=16 – Block Size=8 – L1 Associativity=1 – N=10

```
Terminal - onur@onur-pc:~/Desktop/pin-3.7-97619-g0d0c92f4f-gcc-linux/source/tools/Memory
File Edit View Terminal Tabs Help
Total Accesses: 247784
Total Miss Rate: 0.66%
Flushes: 0
Stat Resets: 0

L1 Data Cache:
Load Hits: 53365
Load Misses: 15309
Load Accesses: 68674
Load Miss Rate: 22.29%

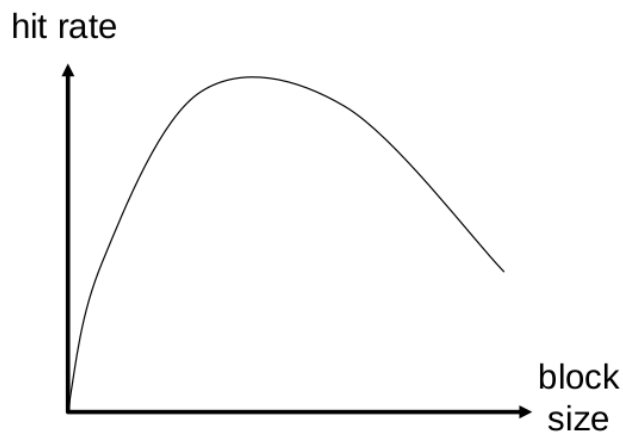
Store Hits: 10918
Store Misses: 5007
Store Accesses: 15925
Store Miss Rate: 31.44%

Total Hits: 64283
Total Misses: 20316
Total Accesses: 84599
Total Miss Rate: 24.01%
Flushes: 0
Stat Resets: 0

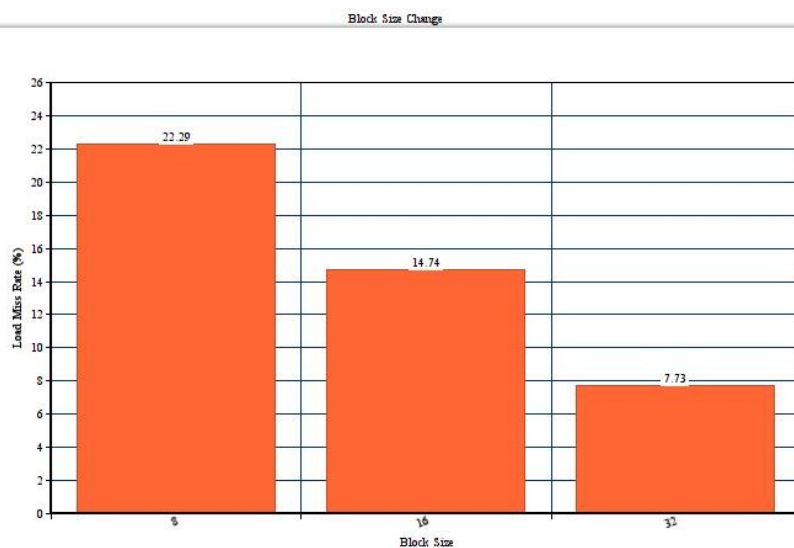
L2 Unified Cache:
```

Load Miss Rate: 22.29%

- The nature of block size – hit rate is here;



- Our graph:



Our results are in parallel with the nature of block size – hit rate. We increase block size and we have seen that load miss rate is decreased.

Constants variables are:

- L1 Size: 16
- L1 Associativity: 1
- N: 10

Conclusion:

- If we want to decrease miss rate, one way of this is to increase the cache size. So this operation will reduce the conflict misses.
- Another way is to increase the block size. This will decrease compulsory misses.
- In addition increasing associativity helps reduce conflict misses. So miss rate will be decreased.
- On the other hand, if we examine the two experiments, we will see that the miss rates are larger in the second experiments(N:10).