

# SDSC MIDSEM

Choudari Harshitha Reddy  
220010015

September 2024

## 1 sum11.c

As shown in the figures below, the command used to display the sizes of cache memory in each layer that exists in your local environment is:

```
lscpu | grep -i cache
```

```
make file commands are: make -f Makefile1 q11  
make -f Makefile1 q12  
make -f Makefile1 clean
```

### Command Output Summary

Command	Details
gcc -o sum11 sum11.c ./sum11 Result valgrind --tool=cachegrind ./sum11	Compiles <b>sum11.c</b> into an executable Runs the executable,size allocated for array is 10,000,000 sums 7 Value: -669867186 Cache simulation with Valgrind
Cache Details	
Cache Type	Details
L1 refs L1 misses L1 miss rate	3,035,153,554 1,375 0.00%
LL refs LL misses LL miss rate	75,536,305 40,336,536 7.9%
D refs D1 misses D1 miss rate	960,049,961 75,536,305 7.9%
LL cache L1i cache L2 cache	288 KiB (6 instances) 192 KiB (6 instances) 1.5 MiB (6 instances)

L3 cache	18 MiB (1 instance)
----------	---------------------

## 2 sum12.c

### Command Output Summary

[H]	
Command	Details
gcc -o sum12 sum12.c	Compiles sum12.c into an executable
./sum12	Runs the executable,size allocated for array 2,000,000 sums 7,500
Result	Value: 1664309326
valgrind --tool=cachegrind ./sum12	Cache simulation with Valgrind
Cache Details	
Cache Type	Details
L1 refs	2,947,153,488
L1 misses	1,370
L1 miss rate	0.00%
LL refs	74,668,260
LL misses	128,280
LL miss rate	0.0%
D refs	912,049,935
D1 misses	74,666,890
D1 miss rate	8.2%

```

user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$ gcc -o sum11 sum11.c
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$ ./sum11
Allocated array of size 10000000
Summing 75000000 random values...
Done. Value = -669867186
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$ valgrind --tool=cachegrind
==202665== Cachegrind, a cache and branch-prediction profiler
==202665== Copyright (C) 2002-2017, and GNU GPL'd, by Nicholas Nethercote et al.
==202665== Using Valgrind-3.18.1 and LibVEX; rerun with -h for copyright info
==202665== Command: ./sum11
==202665==
--202665-- warning: L3 cache found, using its data for the LL simulation.
--202665-- warning: specified LL cache: line_size 64  assoc 12  total_size 18,874,368
--202665-- warning: simulated LL cache: line_size 64  assoc 18  total_size 18,874,368
Allocated array of size 10000000
Summing 75000000 random values...
Done. Value = -669867186
==202665==
==202665== I   refs:      3,035,153,554
==202665== I1 misses:      1,375
==202665== LLi misses:      1,368
==202665== I1 miss rate:      0.00%
==202665== LLi miss rate:      0.00%
==202665==
==202665== D   refs:      960,049,961 (725,036,005 rd + 235,013,956 wr)
==202665== D1 misses:      75,536,305 ( 74,910,644 rd +    625,661 wr)
==202665== LLd misses:      40,336,536 ( 39,710,908 rd +    625,628 wr)
==202665== D1 miss rate:      7.9% (    10.3% +    0.3% )
==202665== LLd miss rate:      4.2% (    5.5% +    0.3% )
==202665==
==202665== LL refs:      75,537,680 ( 74,912,019 rd +    625,661 wr)
==202665== LL misses:      40,337,904 ( 39,712,276 rd +    625,628 wr)
==202665== LL miss rate:      1.0% (    1.1% +    0.3% )
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$ lscpu | grep -i cache
L1d cache:      288 KiB (6 instances)
L1i cache:      192 KiB (6 instances)
L2 cache:       7.5 MiB (6 instances)
L3 cache:       18 MiB (1 instance)
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$

```

Figure 1: sum11.c Cache Output

```

==203530== LL Miss Rate:      0.2% (      0.1% +      2.4% )
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$ gcc -o sum12 sum12.c
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$ ./sum12
Allocated array of size 2000000
Summing 7500000 random values...
Done. Value = 1664309326
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$ valgrind --tool=cachegrind ./sum12
==203536== Cachegrind, a cache and branch-prediction profiler
==203536== Copyright (C) 2002-2017, and GNU GPL'd, by Nicholas Nethercote et al.
==203536== Using Valgrind-3.18.1 and LibVEX; rerun with -h for copyright info
==203536== Command: ./sum12
==203536==
--203536-- warning: L3 cache found, using its data for the LL simulation.
--203536-- warning: specified LL cache: line_size 64  assoc 12  total_size 18,874,368
--203536-- warning: simulated LL cache: line_size 64  assoc 18  total_size 18,874,368
Allocated array of size 2000000
Summing 7500000 random values...
Done. Value = 1664309326
==203536==
==203536== I  refs:      2,947,153,488
==203536== I1 misses:      1,370
==203536== LL1 misses:      1,349
==203536== I1 miss rate:      0.00%
==203536== LL1 miss rate:      0.00%
==203536==
==203536== D  refs:      912,049,935 (685,035,987 rd + 227,013,948 wr)
==203536== D1 misses:      74,666,890 ( 74,541,229 rd +    125,661 wr)
==203536== LLD misses:      126,931 (    1,341 rd +    125,590 wr)
==203536== D1 miss rate:      8.2% (    10.9% +    0.1% )
==203536== LLD miss rate:      0.0% (    0.0% +    0.1% )
==203536==
==203536== LL refs:      74,668,260 ( 74,542,599 rd +    125,661 wr)
==203536== LL misses:      128,280 (    2,690 rd +    125,590 wr)
==203536== LL miss rate:      0.0% (    0.0% +    0.1% )
user@sysad-HP-Elite-Tower-600-G9-Desktop-PC:~/Downloads/cs601midsem-ocehuem-main$

```

Figure 2: sum12.c Output